IMPORTANT

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the words **⚠ WARNING**, **⚠ CAUTION** and **NOTE** have special meanings. Pay special attention to the messages highlighted by these signal words.

⚠ WARNING

Indicates a potential hazard that could result in death or injury.

⚠ CAUTION

Indicates a potential hazard that could result in vehicle damage.

NOTE:

Indicates special information to make maintenance easier or instructions clearer.

⚠ WARNING

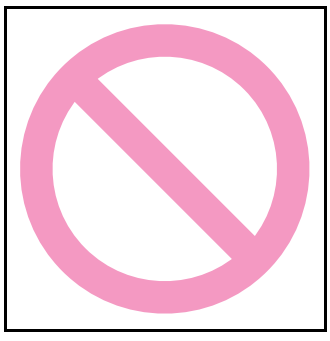
This service manual is intended for authorized Suzuki dealers and qualified service technicians only. Inexperienced technicians or technicians without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the technician and may render the vehicle unsafe for the driver and passengers.

⚠ WARNING

For vehicles equipped with a Supplemental Restraint (Air Bag) System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Service Precautions" under "On-Vehicle Service" in air bag system section before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, instrument panel or any other air bag system component on or around air bag system components or wiring. Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93 °C (200 °F), for example, during a paint baking process, remove the air bag system components, that is air bag (inflator) modules, SDM and/or seat belt with pretensioner, beforehand to avoid component damage or unintended activation.**

The circle with a slash in this manual means "Don't do this" or "Don't let this happen".



FOREWORD

This manual (Volumes 1 and 2) contains procedures for diagnosis, maintenance, adjustments, minor service operations, replacement of components (Service) and for disassembly and assembly of major components (Unit Repair-Overhaul).

VOLUME 1 contains General information, Engine, Suspension, Drive/Axle and Brakes sections (Sections 0 – 4).
VOLUME 2 contains Transmission/Transaxle, Steering, HVAC, Restraint, Body/Cab/Accessories and Control Systems sections (Sections 5 – 10).

Applicable model:
SWIFT (RS413/RS415/RS416/RS413D) on and after the following vehicle identification numbers (VINs).

M13A model
TSMMZA11S00500008~
TSMMZC11S00500008~
M15A model
TSMMZA21S00500008~
TSMMZC21S00500008~
M16A model
TSMMZA31S00500008~
D13A / Z13DTJ model
TSMMZA01S00500008~
TSMMZC01S00500008~

The contents are classified into sections each of which is given a section number as indicated in the Table of Contents on following page. And on the first page of each individual section is an index of that section.
This manual should be kept in a handy place for ready reference of the service work.
Strict observance of the so specified items will enable one to obtain the full performance of the vehicle.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. And used as the main subject of description is the vehicle of standard specifications among others.
Therefore, note that illustrations may differ from the vehicle being actually serviced.
The right is reserved to make changes at any time without notice.

MAGYAR SUZUKI CORPORATION LTD.

RECOMMENDATION OF GENUINE SUZUKI PARTS AND ACCESSORIES USE

SUZUKI strongly recommends the use of genuine SUZUKI parts* and accessories. Genuine SUZUKI parts and accessories are built to the highest standards of quality and performance, and are designed to fit the vehicle's exact specifications.

A wide variety of non-genuine replacement parts and accessories for SUZUKI vehicles are currently available in the market. Using these parts and accessories can affect the vehicle performance and shorten its useful life. Therefore, installation of non-genuine SUZUKI parts and accessories is not covered under warranty.

Non-Genuine SUZUKI Parts and Accessories
Some parts and accessories may be approved by certain authorities in your country.
Some parts and accessories are sold as SUZUKI authorized replacement parts and accessories. Some genuine SUZUKI parts and accessories are sold as re-use parts and accessories. These parts and accessories are non-genuine Suzuki parts and accessories and use of these parts are not covered under warranty.

Re-use of Genuine SUZUKI Parts and Accessories
The resale or re-use of the following items which could give rise to safety hazards for users is expressly forbidden:

1) Air bag components and all other pyrotechnic items, including their components (e.g. cushion, control devices and sensors)
2) Seatbelt system, including their components (e.g. webbing, buckles, and retractors)

The air bag and seat belt pretensioner components contain explosive chemicals. These components should be removed and disposed of properly by SUZUKI authorized service shop or scrap yard to avoid unintended explosion before scrapping.

*The parts remanufactured under SUZUKI's approval can be used as genuine SUZUKI parts in Europe.

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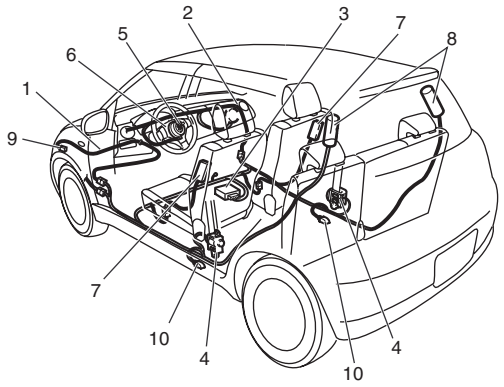
Precautions

Precautions for Vehicles Equipped with a Supplemental Restraint (Air Bag) System

S7N20A0000001

⚠ WARNING

- **The configuration of air bag system parts are as shown in the figure. When it is necessary to service (remove, reinstall and inspect) these parts, be sure to follow procedures described in Air Bag System section. Failure to follow proper procedures could result in possible air bag system activation, personal injury, damage to parts or air bag system being unable to activate when necessary.**
- **If the air bag system and another vehicle system both need repair, SUZUKI recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, dashboard, or any other air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93 °C (200 °F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended air bag system activation.**



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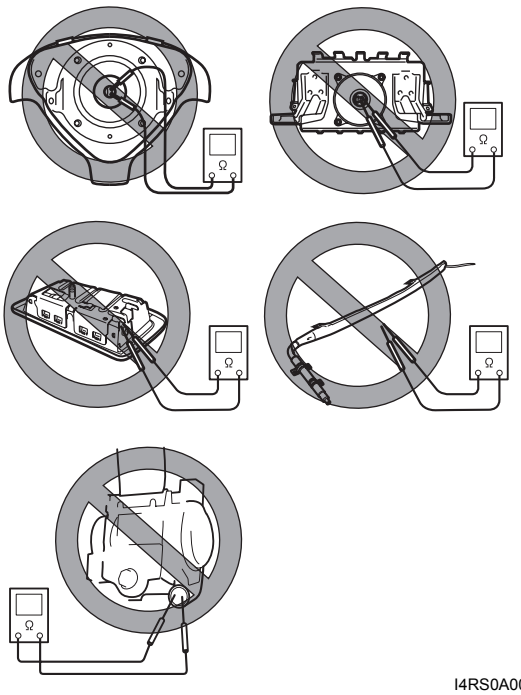
1. Air bag wire harness (in floor, main and instrument panel harness)	6. Driver air bag (inflator) module
2. Passenger air bag (inflator) module	7. Side air bag (inflator) module (if equipped)
3. SDM	8. Curtain air bag (inflator) module (if equipped)
4. Seat belt pretensioner	9. Forward sensor
5. Contact coil	10. Side sensor (if equipped)

Diagnosis

- When troubleshooting air bag system, be sure to follow “Diagnosis” in Air Bag System section. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.
- Never use electrical test equipment other than that specified.

⚠ WARNING

Never attempt to measure the resistance of the air bag (inflator) modules (driver, passenger, side and curtain) and seat belt pretensioners (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag or activate the pretensioner.



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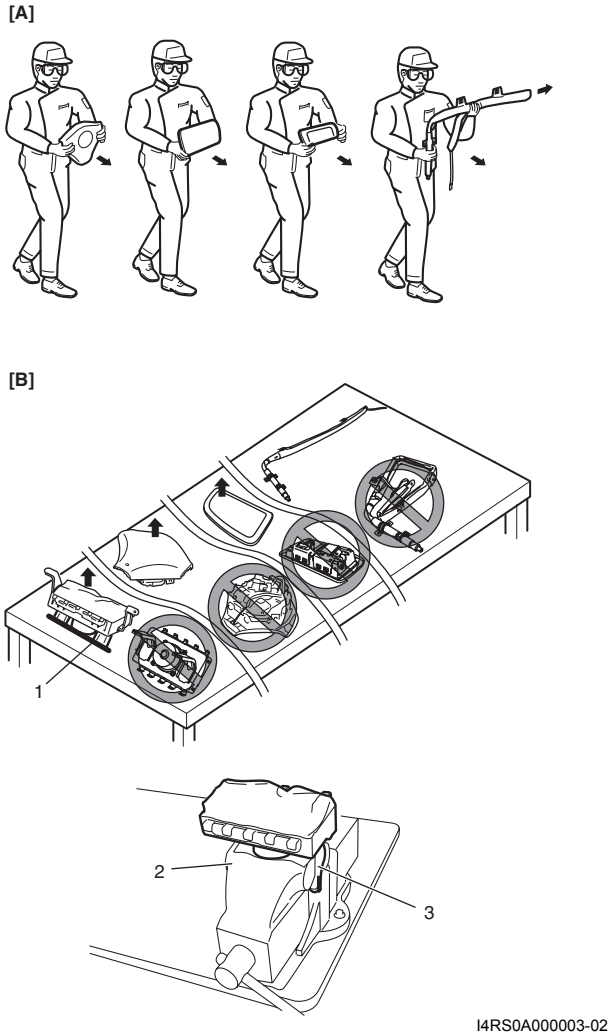
Servicing and Handling

⚠ WARNING

Many of service procedures require disconnection of "A/BAG" fuse and all air bag (inflator) module(s) from initiator circuit to avoid an accidental deployment.
Driver, Passenger, Side and Curtain Air Bag (Inflator) Modules

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module. When placing a live air bag (inflator) module on a bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3). It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment. Otherwise, personal injury may result.**
- **Never dispose of live (undeployed) air bag (inflator) modules (driver, passenger, side and curtain). If disposal is necessary, be sure to deploy them according to deployment procedures described in "Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal in Section 8B" before disposal.**
- **The air bag (inflator) module immediately after deployment is very hot. Wait for at least half an hour to cool it off before proceeding the work.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**



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[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

- **For handling and storage of a SDM, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM). Never strike or jar the SDM.**
- **Never power up the air bag system when the SDM is not rigidly attached to the vehicle. All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointing toward the front of the vehicle to ensure proper operation of the air bag system. The SDM could be activated when powered while not rigidly attached to the vehicle which could cause deployment and result in personal injury.**

⚠ WARNING

Driver and Passenger Seat Belt Pretensioners

- **For handling and storage of a live seat belt pretensioner, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry seat belt pretensioner by wire or connector of pretensioner. When placing a live seat belt pretensioner on the workbench or some place like that, never put something on seat belt pretensioner. Otherwise, personal injury may result.**
- **Never dispose of live (inactivated) seat belt pretensioners (drive and passenger). If disposal is necessary, be sure to activate them according to activation procedures described in "Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal in Section 8B" before disposal.**
- **The seat belt pretensioner immediately after activation is very hot. Wait for at least half an hour to cool it off before proceeding the work.**
- **With many service procedures, gloves and safety glasses should be worn to prevent any possible irritation of the skin or eyes.**

- Even when the accident was light enough not to cause air bags to activate, be sure to inspect system parts and other related parts according to instructions under "Repair and Inspection Required after Accident in Section 8B".
- When servicing parts other than air bag system, if shocks may be applied to air bag system component parts, remove those parts beforehand.
- When handling the air bag (inflator) modules (driver, passenger, side and curtain), seat belt pretensioners (driver and passenger), forward sensor, side sensors or SDM, be careful not to drop it or apply an impact to it. If an excessive impact was applied, never attempt disassembly or repair but replace it with a new one.
- When grease, cleaning agent, oil, water, etc. has got onto air bag (inflator) modules (driver, passenger, side and curtain) or seat belt pretensioners (drive and passenger), wipe off immediately with a dry cloth.
- Air bag wire harness is included in floor and instrument panel wire harnesses. Air bag wire harness branched off from floor and instrument panel wire harnesses can be identified easily as it is covered with a yellow protection tube and it has yellow connectors. Be very careful when handling it.
- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- Do not apply power to the air bag system unless all components are connected or a diagnostic flow requests it, as this will set a DTC.
- Never use air bag system component parts from another vehicle.
- When using electric welding, be sure to disconnect all air bag (inflator) module connectors and pretensioner connectors from air bag wire harness respectively.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.
- WARNING / CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.
- After vehicle is completely repaired, perform "Air Bag Diagnostic System Check in Section 8B".

General Precautions

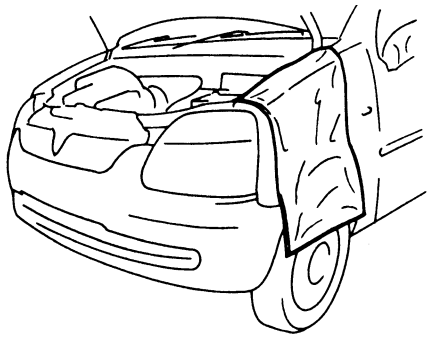
S7N20A0000002

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, and they will not necessarily be repeated with each procedure to which they apply.

⚠ WARNING

- **Whenever raising a vehicle for service, be sure to follow the instructions under "Vehicle Lifting Points in Section 0A".**
- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission vehicles) or Park (for automatic transmission vehicles), Keep hands, hair, clothing, tools, etc. away from the fan and belts when the engine is running.**
- **When it is necessary to run the engine indoors, make sure that the exhaust gas is forced outdoors.**
- **Do not perform service work in areas where combustible materials can come in contact with a hot exhaust system. When working with toxic or flammable materials (such as gasoline and refrigerant), make sure that the area you work in is well-ventilated.**
- **To avoid getting burned, keep away from hot metal parts such as the radiator, exhaust manifold, tail pipe, muffler, etc.**
- **New and used engine oil can be hazardous. Children and pets may be harmed by swallowing new or used oil. Keep new and used oil and used engine oil filters away from children and pets. Continuous contact with used engine oil has been found to cause [skin] cancer in laboratory animals. Brief contact with used oil may irritate skin. To minimize your 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.**
- **Be sure to observe following instructions when handling service materials such as fuel, oil, fluid, coolant, grease, sealant, thread lock cement, etc. Otherwise, your health may be ruined.**
  - **Whenever handling any of these service materials, wear safety glasses to protect your eyes. If it gets into your eye, it may cause inflammation.**
  - **Whenever handling any of these service materials, wear moisture-proof gloves to protect your skin. If it adheres to your skin, it may cause inflammation.**
  - **Do not swallow any of these service materials. It would cause diarrhea or nausea.**
  - **Keep all these materials out of children's reach.**
- **Make sure the bonnet is fully closed and latched before driving. If it is not, it can fly up unexpectedly during driving, obstructing your view and resulting in 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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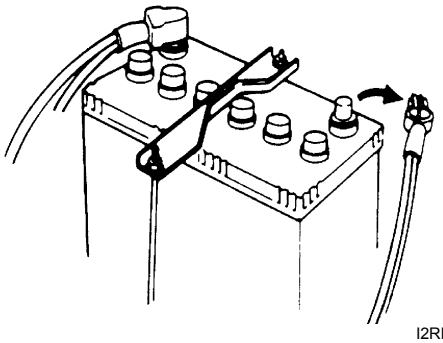
- When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.
- When disconnecting the negative cable from the battery, be careful to the following.
  - Check and record DTCs in ECM and/or immobilizer control module if necessary before disconnecting.
  - Record displayed contents of the clock and/or audio system, etc. before disconnecting and reset it as before after connecting.
  - For vehicle equipped with electric throttle body system, perform electric throttle body system calibration referring to "Electric Throttle Body System Calibration: M13A / M15A / M16A in Section 1C" after reconnecting the negative cable to the battery.
  - For vehicle equipped with ESP®, calibrate steering angle sensor referring to "Sensor Calibration in Section 4F" after reconnecting the negative cable to the battery.



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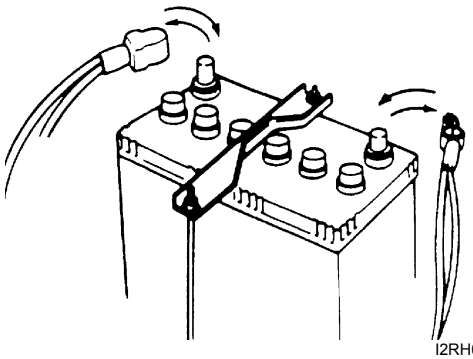
- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.



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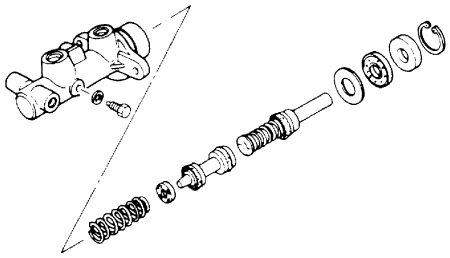
- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.



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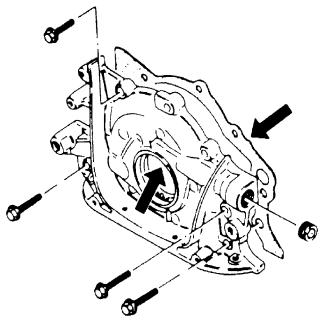
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.



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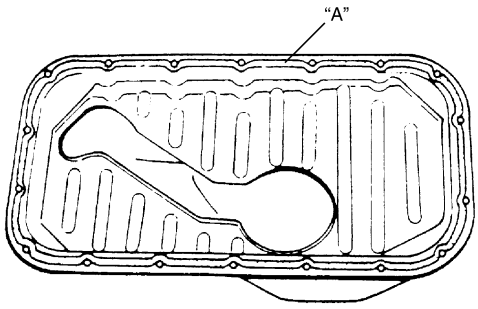
- Make sure that all parts used in reassembly are perfectly clean.
  When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

  "A": Water tight sealant 99000–31250 (SUZUKI Bond No.1207F)



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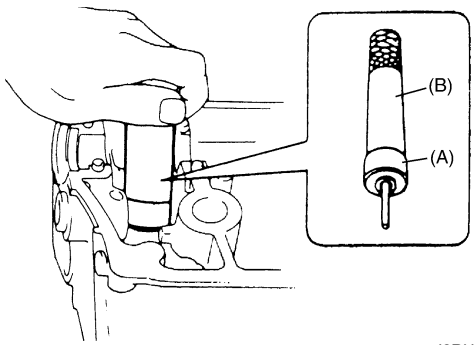
- Be sure to use special tools when instructed.

  Special tool
  (A): 09917-98221
  (B): 09916-58210



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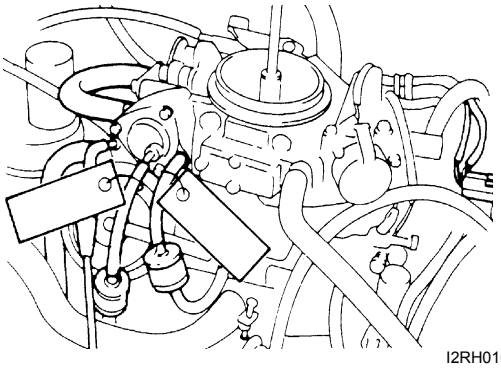
- When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.



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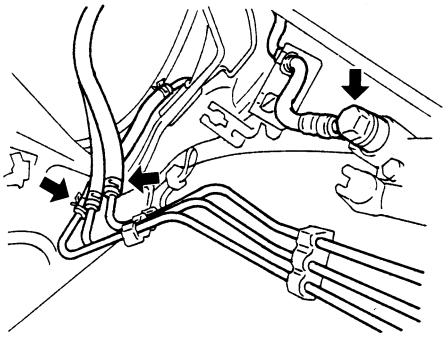
- After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.



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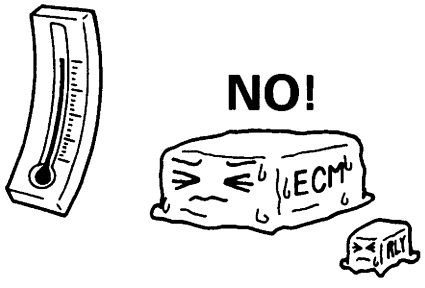
- For vehicles equipped with petrol engine, never disconnect the fuel line between the fuel pump and injector without first releasing the fuel pressure, or fuel can be sprayed out under pressure.
- For vehicles equipped with diesel engine, never disconnect fuel line within 60 sec. after ignition switch turned to OFF position, or fuel can be sprayed out under pressure.
- When performing a 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.



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- Use care not to expose connectors and electrical parts to water which will be a cause of a trouble.

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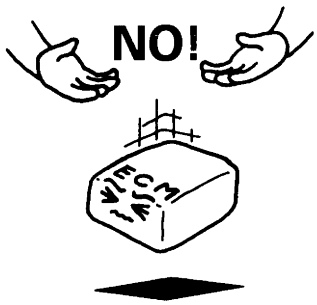
- Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.



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Warning for Wheel (with tire) Removal

S7N20A0000003

⚠ WARNING

Each wheel of this vehicle is installed using wheel bolts. When removing any of these wheels, never remove all wheel bolts at the same time. Leave at least 1 bolt for each wheel as it is to prevent wheel from dropping. When removing this remaining 1 bolt, hold wheel and tire so as not to allow them to come off.

Warning for Handling Emergency Flat Tire Repair Kit

S7N20A0000004

⚠ WARNING

If vehicle is equipped with Emergency Flat Tire Repair Kit instead of spare tire, be sure to observe "Precaution for Emergency Flat Tire Repair Kit in Section 2D" when handling Emergency Flat Tire Repair Kit and repairing flat tire.
Otherwise, your health may be ruined or it will be impossible to repair flat tire.

Precautions for Catalytic Converter

S7N20A0000005

For vehicles equipped with a catalytic converter, use only specified fuel and be careful not to let a large amount of unburned fuel enter the converter or it can be damaged.

- Conduct a spark jump test only when necessary, make it as short as possible, and do not open the throttle.
- Conduct engine compression checks within the shortest possible time.
- Avoid situations which can result in engine misfire (e.g. starting the engine when the fuel tank is nearly empty.)

Precautions for Catalytic Converter and Diesel Particulate Filter (DPF®) (Diesel Model)

S7N20A0000016

- Use only specified fuel and be careful not to let a large amount of unburned fuel enter the converter and filter or they can be damaged.
- Be careful not to expose catalytic converter and diesel particulate filter (DPF®) to excessive shock to avoid damage to them.

Precautions for Installing Mobile Communication Equipment

S7N20A0000006

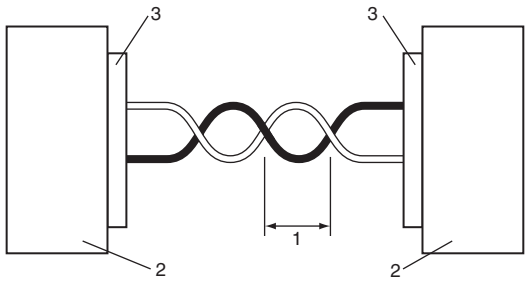
When installing mobile communication equipment such as CB (Citizens-Band)-radio or cellular-telephone, be sure to observe the following precautions.
Failure to follow cautions may adversely affect electronic control system.

- 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 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.

Precaution for CAN Communication System

S7N20A0000007

- The loose (1) in the wire harnesses twist of the CAN lines except around the connector (3) should be within 100 mm (3.9 in.). Refer to the wiring diagram for the CAN lines discrimination. Excessively-loosed lines may be influenced by the electric noise.



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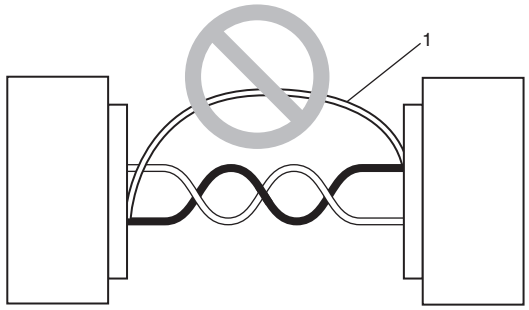
- Do not connect terminals of the CAN line using a bypass wire (1). Otherwise, the CAN line may be influenced by the electric noise.



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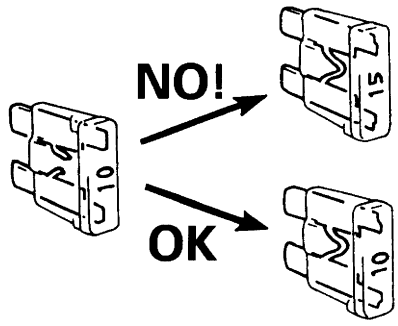
Precautions for Electrical Circuit Service

S7N20A0000008

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



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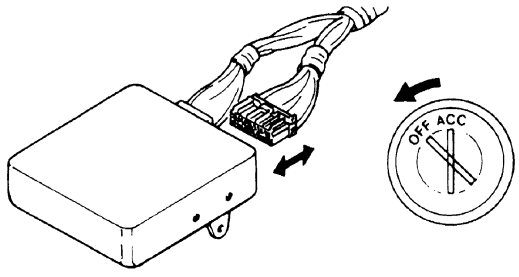
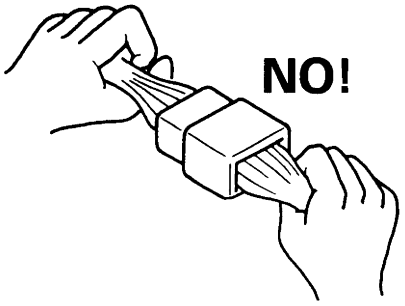
- When disconnecting and connecting coupler, make sure to turn ignition switch OFF, or electronic parts may get damaged.



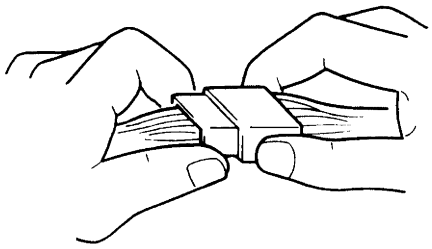
I2RH01010039-01

- When disconnecting connectors, never pull the wiring harness. Unlock the connector lock first and then pull them apart by holding connectors themselves.



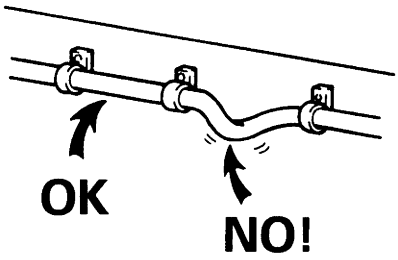
I2RH01010040-01

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



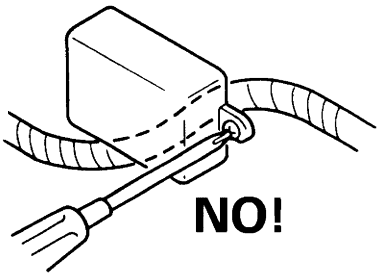
I2RH01010041-01

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



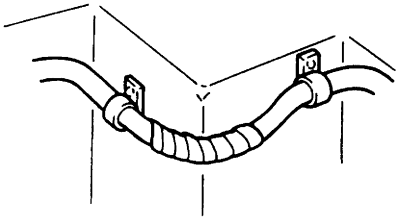
I2RH01010042-01

- When installing vehicle parts, be careful so that the wiring harness is not interfered with or caught by any other part.



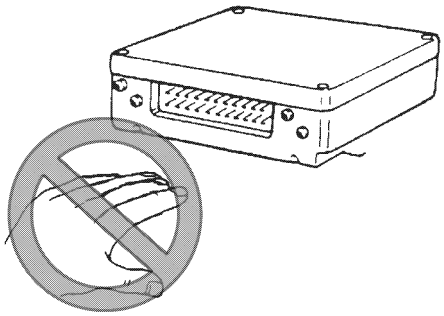
I2RH01010043-01

- To avoid damage to the harness, protect its part which may contact against a part forming a sharp angle by winding tape or the like around it.



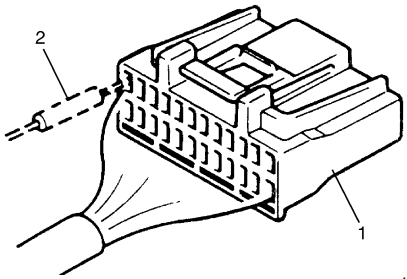
I2RH01010044-01

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



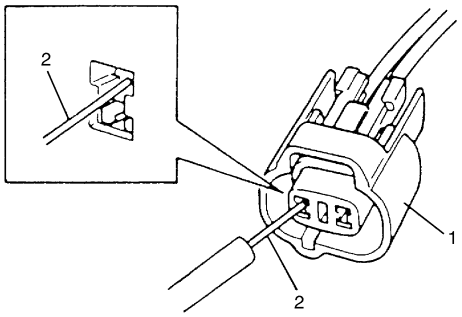
I3RM0A000004-01

- Never connect any tester (voltmeter, ohmmeter, or whatever) to electronic control unit when its coupler is disconnected. Attempt to do it may cause damage to it.
- Never connect an ohmmeter to electronic control unit with its coupler connected to it. Attempt to do it may cause damage to electronic control unit and sensors.
- Be sure to use a specified voltmeter / ohmmeter. Otherwise, accurate measurements may not be obtained or personal injury may result. If not 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).



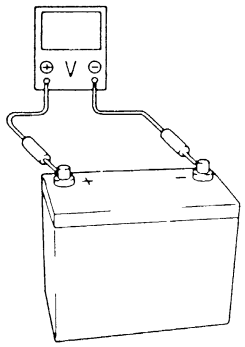
I2RH01010046-01

- When connecting meter probe (2) from terminal side of coupler (1) because it can't be connected from harness side, use extra care not to bend male terminal of coupler of force its female terminal open for connection.
  In case of such coupler as shown connect probe as shown to avoid opening female terminal.
  Never connect probe where male terminal is supposed to fit.



I2RH01010047-01

- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.
- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.



I2RH01010048-01

Air Bag Warning

S7N20A0000009

⚠ WARNING

For vehicles equipped with Supplemental Restraint (Air Bag) System:

- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components, Wiring and Connectors Location in Section 8B" in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and "Precautions on Service and Diagnosis of Air Bag System in Section 8B" before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintentional activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the LOCK position and the negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

Air Bag System Service Warning

S7N20A0000010

⚠ WARNING

- **Service on or around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Please observe all WARNINGS in Air Bag System and "Precautions on Service and Diagnosis of Air Bag System in Section 8B" before performing service on or around the air bag system components or wiring. Failure to follow WARNINGS could result in unintended activation of the system or could render the system inoperative. Either of these two conditions may result in severe injury.**
- **The procedures in the air bag system section must be followed in the order listed to disable the air bag system temporarily and prevent false DTCs from setting. Failure to follow procedures could result in possible activation of the air bag system, personal injury or otherwise unneeded air bag system repairs.**

Fastener Caution

S7N20A0000011

⚠ CAUTION

When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct torque value must be used when installing fasteners that require it. If the conditions are not followed, parts or system damage could result.

Suspension Caution

S7N20A0000012

⚠ CAUTION

- **All suspension fasteners are an important attaching part in that it could affect the performance of vital parts 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 this part.**
- **Never attempt to heat, quench or straighten any suspension part. Replace it with a new part or damage to the part may result.**

Wheels and Tires Caution

S7N20A0000013

⚠ CAUTION

All wheel fasteners are important attaching parts in that they could affect the performance of vital parts 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 all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

Precaution for Vehicle Equipped with ESP® System

S7N20A0000014

- When testing with any of the following equipments (when vehicle is tested by rotating wheels (tires) under vehicle stop), be sure to deactivate ESP® system referring to “Precautions in Speedometer Test or Other Tests in Section 4F” to obtain correct data. When vehicle acceleration is not sensed and wheels are rotating, ESP® control module judges that wheels are in slip condition and controls engine torque to reduce by TCS control.
  - 2 or 4-wheel chassis dynamometer
  - Speedometer tester
  - Brake tester
  - Etc.

ESP® control module

- When ESP® control module is removed / installed, do not use impact wrenches which generate shock or impact to avoid damaging sensors in ESP® control module.
- When any of the following operation is done, calibrate steering angle sensor referring to “Sensor Calibration in Section 4F”.
  - When battery or dome fuse is removed.
  - When steering angle sensor is replaced.
  - When ESP® control module is removed.

Brake Caution

S7N20A0000015

⚠ CAUTION

All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of 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 all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.

NOTE

Before inspecting and servicing brakes for vehicle equipped with ABS (ESP®), make sure that ABS (ESP®) is in good condition.

Repair Instructions

Electrical Circuit Inspection Procedure

S7N20A0006001

While there are various electrical circuit inspection methods, described here is a general method to check its open and short circuit by using an ohmmeter and a voltmeter.

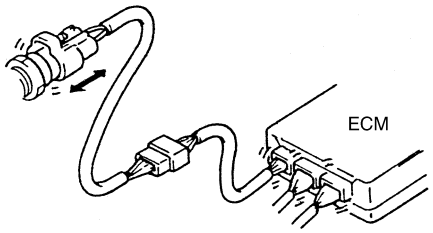
Open Circuit Check

Possible causes for the open circuit are as follows. As the cause is in the connector or terminal in many cases, 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.)
- Wire harness being open

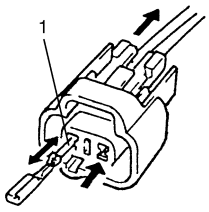
When checking system circuits including an electronic control unit such as ECM, TCM, ABS control module, etc., it is important to perform careful check, starting with items which are easier to check.

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



I2RH01010049-01

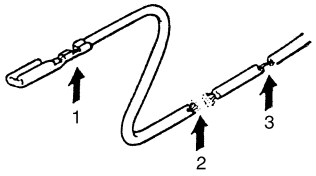
3) Using a test male terminal, check both terminals of the circuit being checked for contact tension of its female terminal. Check each terminal visually for poor contact (possibly caused by dirt, corrosion, rust entry of foreign object, etc.). At the same time, check to make sure that each terminal is locked in the connector fully.



I2RH01010050-01

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

4) Using continuity check or voltage check the following procedure, check the wire harness for open circuit and poor connection with its terminals. Locate abnormality, if any.

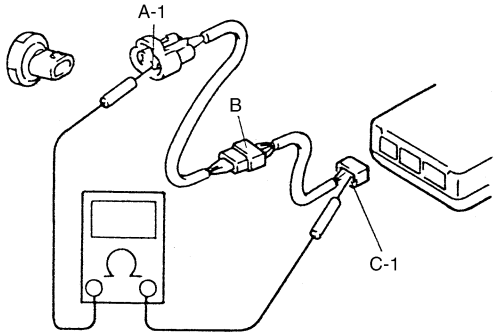


I2RH01010051-01

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

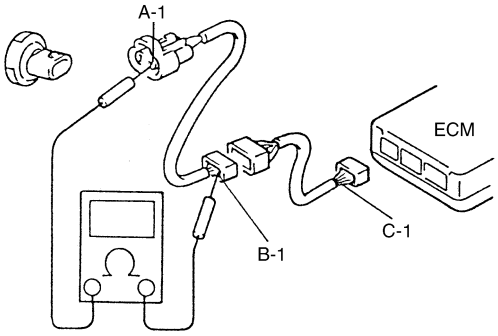
Continuity Check

1) Measure resistance between connector terminals at both ends of the circuit being checked (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 an abnormality in connector-B.



I2RH01010053-01

Voltage Check

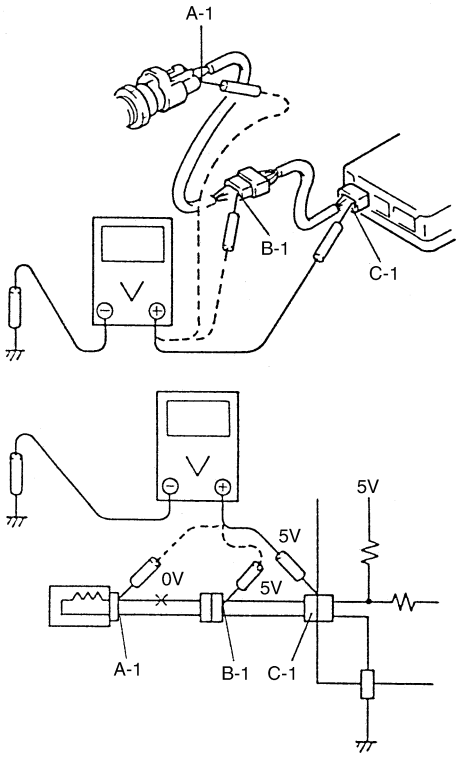
If voltage is supplied to the circuit being checked, voltage check can be used as circuit check.

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

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

   b) Also, if measured values were as listed in the following, it means that there is a resistance (abnormality) of such level that corresponds to the voltage drop in the circuit between terminals “A-1” and “B-1”.

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



I5RH01000005-01

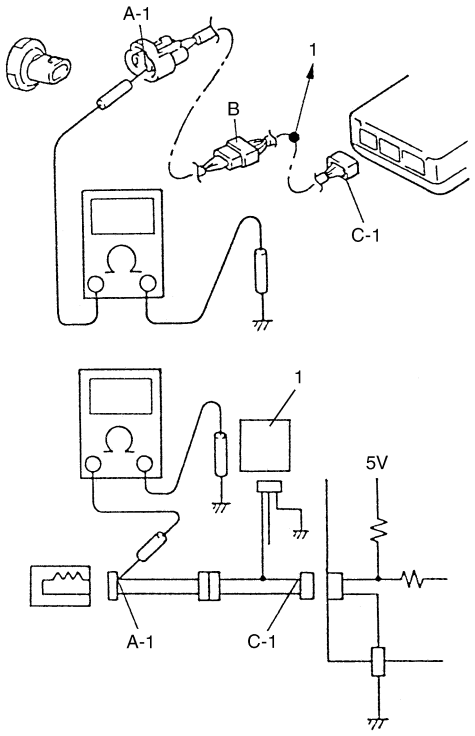
Short Circuit Check (Wire Harness to Ground)

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

NOTE

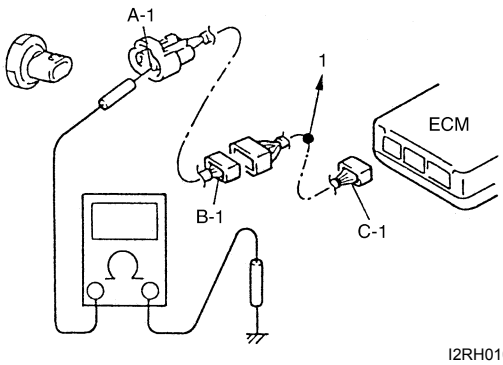
If the circuit to be checked is connected to other parts (1), disconnect all connectors of those parts.
Otherwise, diagnosis will be misled.

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



I5RH01000006-01

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



I2RH01010056-01

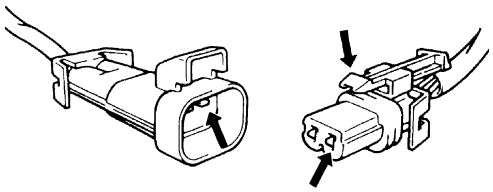
1. To other parts

Intermittent and Poor Connection Inspection

S7N20A0006002

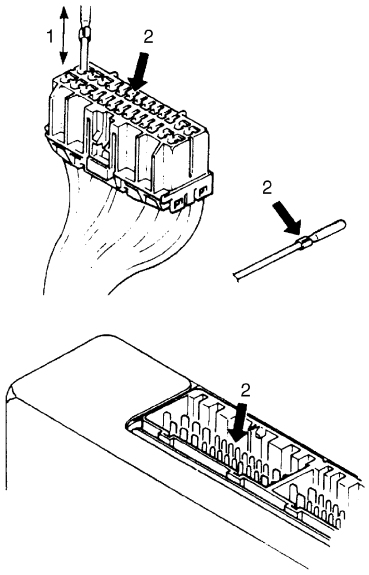
Most intermittent are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be at fault. When checking it for proper connection, perform careful check of suspect circuits for:

- 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, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.



I2RH01010057-01

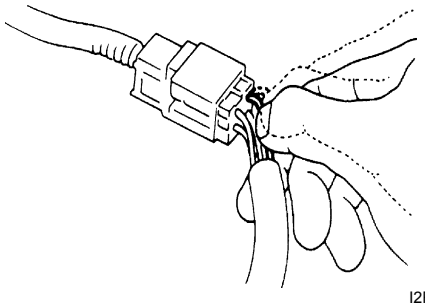
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal.
  If contact tension is not enough, reform it to increase contact tension or replace.



I5RH01000007-01

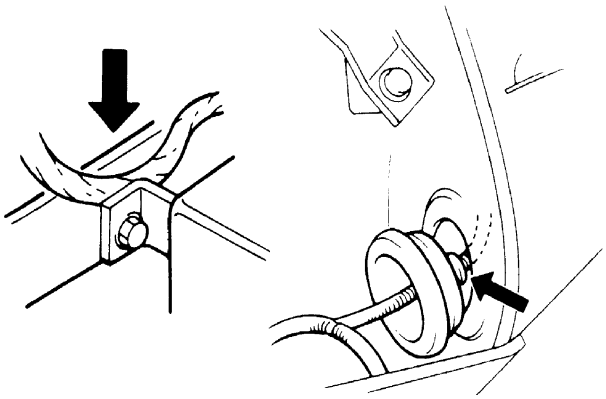
1.	Check contact tension by inserting and removing just once.
2.	Check each terminal for bend and proper alignment.

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



I2RH01010059-01

- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.
  If any abnormality is found, repair or replace.



I2RH01010060-01

Section 0

General Information

CONTENTS

General Information

General Description

Abbreviations

S7N20A0101001

A:
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 Mixture Ratio
ALR: Automatic Locking Retractor
API: American Petroleum Institute
APP sensor: Accelerator Pedal Position Sensor
A/T: Automatic Transmission, Automatic Transaxle
ATDC: After Top Dead Center
ATF: Automatic Transmission Fluid, Automatic Transaxle Fluid
B:
B+: Battery Positive Voltage
BBDC: Before Bottom Dead Center
BCM: Body Electrical Control Module
BTDC: Before Top Dead Center
C:
CAN: Controller Area Network
CKT: Circuit
CKP Sensor: Crankshaft Position Sensor
CMP Sensor: Camshaft Position Sensor
CO: Carbon Monoxide
CPP Switch: Clutch Pedal Position Switch (Clutch Switch, Clutch Start Switch)
CPU: Central Processing Unit
CRS: Child Restraint System
D:
DC: Direct Current
DLC: Data Link Connector (Assembly Line Diag. Link, ALDL, Serial Data Link, SDL)
DOHC: Double Over Head Camshaft
DOJ: Double Offset Joint
DPF®: Diesel Particulate Filter
DRL: Daytime Running Light
DTC: Diagnostic Trouble Code (Diagnostic Code)
E:
EBCM: Electronic Brake Control Module, ABS Control Module
EBD: Electronic Brake Force Distribution
ECM: Engine Control Module
ECT Sensor: Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
EFE Heater: Early Fuel Evaporation Heater (Positive Temperature Coefficient, PTC Heater)
EGR: Exhaust Gas Recirculation
EGRT Sensor: EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
EGT: Exhaust Gas Temperature
EPS: Electronic Power Steering
ESP®: Electronic Stability Program
EVAP: Evaporative Emission
EVAP Canister: Evaporative Emission Canister (Charcoal Canister)
F:
4WD: 4 Wheel Drive
G:
GEN: Generator
GND: Ground
GPS: Global Positioning System
H:
HVAC: Heating, Ventilating and Air Conditioning
HC: Hydrocarbons
HO2S: Heated Oxygen Sensor
I:
IAC Valve: Idle Air Control Valve (Idle Speed Control Solenoid Valve, ISC Solenoid Valve)
IAT Sensor: Intake Air Temperature Sensor (Air temperature Sensor, ATS)
ICM: Immobilizer Control Module
IG: Ignition
ISC Actuator: Idle Speed Control Actuator
ISO: International Organization for Standardization
J:
JIS: Japanese Industrial Standards
L:
LH: Left Hand
LHD: Left Hand Drive Vehicle
LSPV: Load Sensing Proportioning Valve
M:
MAF Sensor: Mass Air Flow Sensor (Air Flow Sensor, AFS, Air Flow Meter, AFM)
MAP Sensor: Manifold Absolute Pressure Sensor (Pressure Sensor, PS)
Max: Maximum
MFI: Multiport Fuel Injection (Multipoint Fuel Injection)
Min: Minimum
MIL: Malfunction Indicator Lamp (“SERVICE ENGINE SOON” Light)
M/T: Manual Transmission, Manual Transaxle
N:
NOx: Nitrogen Oxides
O:
OBD: On-Board Diagnostic System (Self-Diagnosis Function)
O/D: Overdrive
OHC: Over Head Camshaft
O2S: Oxygen Sensor
P:
PCM: Powertrain Control Module
PCV: Positive Crankcase Ventilation
PNP: Park / Neutral Position
P/S: Power Steering
PSP Switch: Power Steering Pressure Switch (P/S Pressure Switch)

R:
RH: Right Hand
RHD: Right Hand Drive Vehicle
S:
SAE: Society of Automotive Engineers
SDM: Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)
SFI: Sequential Multiport Fuel Injection
SOHC: Single Over Head Camshaft
T:
TBI: Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)
TCC: Torque Converter Clutch
TCSS: Traction Control Support System
TCM: Transmission Control Module (A/T Controller, A/T Control Module)
TP Sensor: Throttle Position Sensor
TVV: Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)
TWC: Three Way Catalytic Converter (Three Way Catalyst)
2WD: 2 Wheel Drive
V:
VIN: Vehicle Identification Number
VSS: Vehicle Speed Sensor
VVT: Variable Valve Timing (Camshaft Position Control)
W:
WU-OC: Warm Up Oxidation Catalytic Converter
WU-TWC: Warm Up Three Way Catalytic Converter

NOTE

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

Symbols

S7N20A0101002

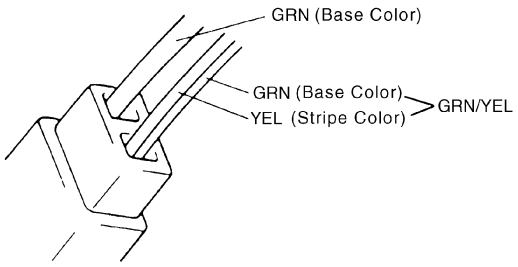
Symbol	Definition	Symbol	Definition
	Tightening torque	1216B	Apply SUZUKI BOND NO. 1216B 99000-31230
OIL	Apply oil (engine, transmission, transfer, differential)	Si	Apply SILICONE SEALANT 99000-31120
FLD	Apply fluid (brake, power steering or automatic transmission fluid)	366E	Apply SEALING COMPOUND 366E 99000-31090
A	Apply SUZUKI SUPER GREASE A 99000-25010		
C	Apply SUZUKI SUPER GREASE C 99000-25030	1322	Apply THREAD LOCK 1322 99000-32110
E	Apply SUZUKI SUPER GREASE E 99000-25050	1333B	Apply THREAD LOCK 1333B 99000-32020
H	Apply SUZUKI SUPER GREASE H 99000-25120	1342	Apply THREAD LOCK 1342 99000-32050
I	Apply SUZUKI SUPER GREASE I 99000-25210		
1215	Apply SUZUKI BOND NO. 1215 99000-31110		Do not reuse
1207F	Apply SUZUKI BOND NO. 1207F 99000-31250		Note on reassembly
1217G	Apply SUZUKI BOND NO. 1217G 99000-31260		

Wire Color Symbols

S7N20A0101003

Symbol		Wire Color	Symbol		Wire Color
B	BLK	Black	O, Or	ORN	Orange
Bl	BLU	Blue	R	RED	Red
Br	BRN	Brown	W	WHT	White
G	GRN	Green	Y	YEL	Yellow
Gr	GRY	Gray	P	PNK	Pink
Lbl	LT BLU	Light blue	V	PPL	Violet
Lg	LT GRN	Light green			

There are two kinds of colored wire used in this vehicle. One is single-colored wire and the other is dual-colored (striped) wire.
The single-colored wire uses only one color symbol (i.e. “GRN”).
The dual-colored wire uses two color symbols (i.e. “GRN/YEL”). The first symbol represents the base color of the wire (“GRN” in the figure) and the second symbol represents the color of the stripe (“YEL” in the figure).



I2RH01010010-01

Fasteners Information

S7N20A0101004

Metric Fasteners

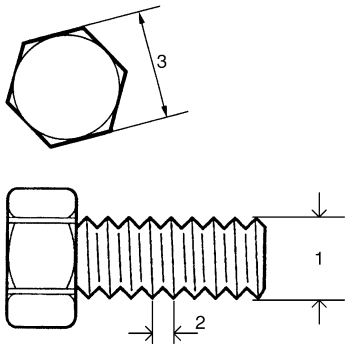
Most of the fasteners used for this vehicle are JIS-defined and ISO-defined metric fasteners. When replacing any fasteners, it is most important that replacement fasteners be the correct diameter, thread pitch and strength.

⚠ CAUTION

Even when the nominal diameter (1) of thread is the same, the thread pitch (2) or the width across flats (3) may vary between ISO and JIS. Refer to JIS-TO-ISO Main Fasteners Comparison Table below for the difference. Installing a mismatched bolt or nut will cause damage to the thread.
Before installing, check the thread pitch for correct matching and then tighten it by hand temporarily. If it is tight, recheck the thread pitch.

JIS-TO-ISO Main Fasteners Comparison Table

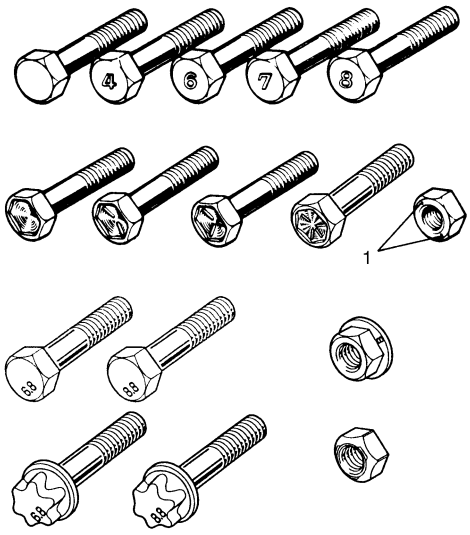
		Nominal diameter				
		M6	**M8**	**M10**	**M12**	**M14**
JIS	Thread pitch	1.0	1.25	1.25	1.25	1.5
	Width across flats	10	12	14	17	19
ISO	Thread pitch	1.0	1.25	1.5	1.5	1.5
	Width across flats	10	13	16	18	21



I4RH0A010005-01

Fastener Strength Identification

Most commonly used metric fastener strength property classes are 4T, 6.8, 7T, 8.8 and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch, 6 or 8 mark strength identification on the nut face. Figure shows the different strength markings.
When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct diameter and thread pitch. Correct replacement bolts and nuts are available through the parts division.
Metric bolts: Identification class numbers or marks correspond to bolt strength (increasing numbers represent increasing strength).



I5RH01010001-01

1. Nut strength identification

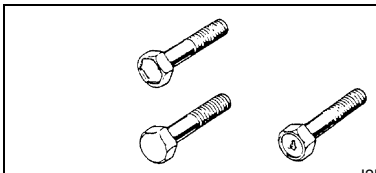
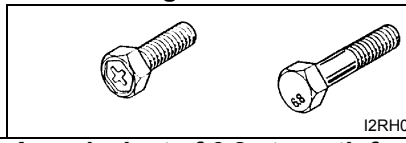
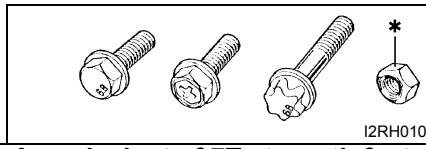
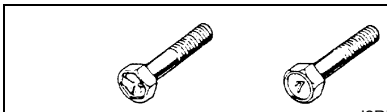
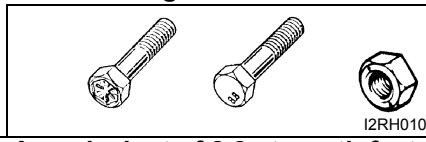
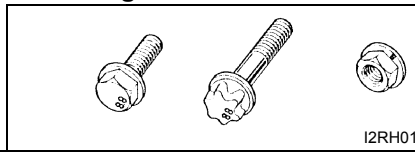
Standard Tightening Torque

Each fastener should be tightened to the torque specified in each section. If no description or specification is provided, 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, however, use the torque specified for the original fastener.

NOTE

- **For the flanged bolt, flanged nut and self-lock nut of 4T and 7T strength, add 10% to the tightening torque given in the following chart.**
- **The following chart is applicable only where the fastened parts are made of steel light alloy.**

Tightening torque chart

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
A equivalent of 4T strength fastener	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
	lbf-ft	1.0	2.5	4.0	9.5	21.0	32.5	47.0	76.0	116.0
 I2RH01010012-01										
A equivalent of 6.8 strength fastener without flange	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
	lbf-ft	2.0	3.5	6.0	14.5	30.5	58.0	90.5	139.5	202.5
 I2RH01010013-01										
A equivalent of 6.8 strength fastener with flange	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
*: Self-lock nut	lbf-ft	2.0	3.5	6.5	15.5	32.0	61.0	96.5	147.0	215.5
 I2RH01010014-01										
A equivalent of 7T strength fastener	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
 I2RH01010015-01										
A equivalent of 8.8 strength fastener without flange	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
 I2RH01010016-01										
A equivalent of 8.8 strength fastener with flange	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
 I2RH01010017-01										

***:Self-lock nut**

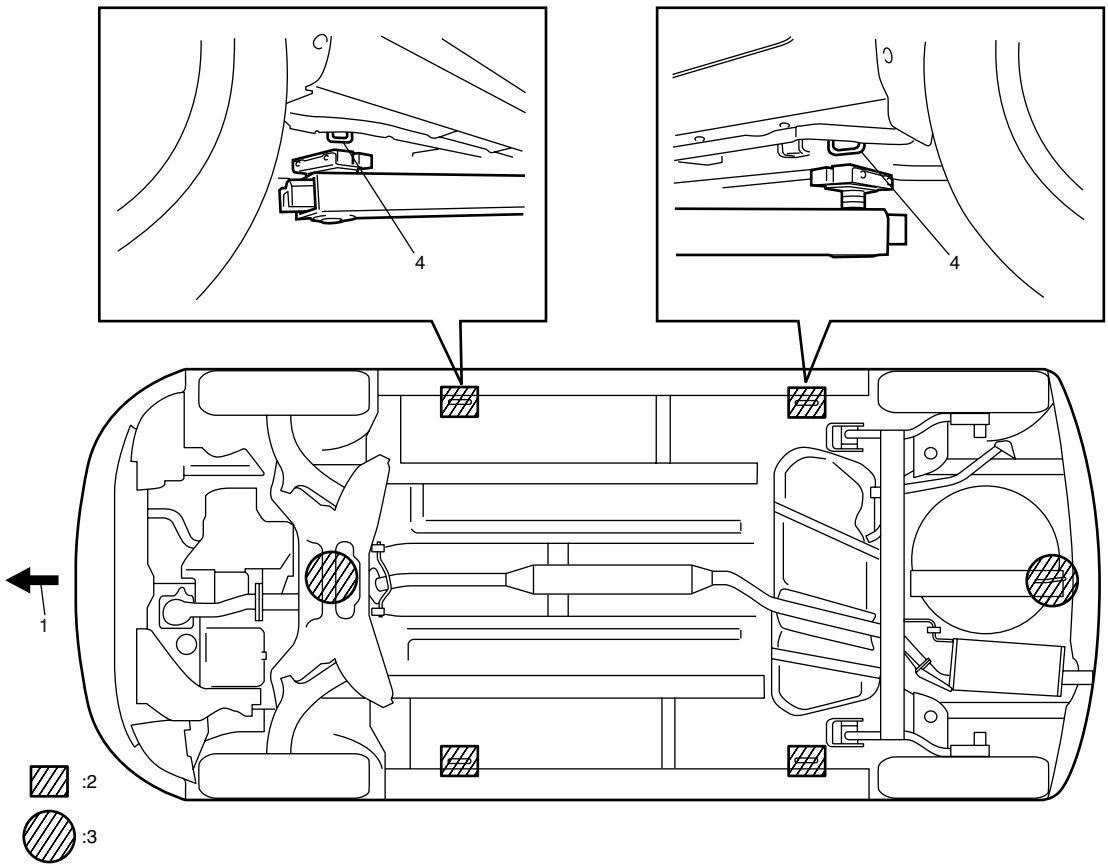
Vehicle Lifting Points

S7N20A0101005

⚠ WARNING

- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending on what part to be removed.**
- **Before lifting up the vehicle, check to be sure that end of hoist arm is not in contact with brake pipe, fuel pipe, bracket or any other part.**
- **When using frame contact hoist, apply hoist as shown (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**
- **Make absolutely sure to lock hoist after vehicle is hoisted up.**

When Using Frame Contact Hoist



I4RS0A010001-01

1. Vehicle front	3. Floor jack position
2. Support position for frame contact hoist and safety stand	4. Body mounting stay

When Using Floor Jack

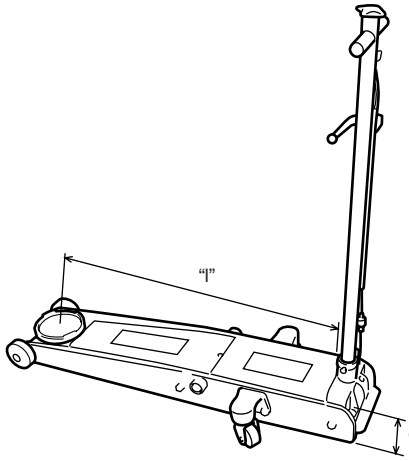
⚠ WARNING

If the vehicle to be jacked up only at the front or rear end, be sure to block the wheels on ground in order to ensure safety.
After the vehicle is jacked up, be sure to support it on stands. It is extremely dangerous to do any work on the vehicle raised on jack alone.

⚠ CAUTION

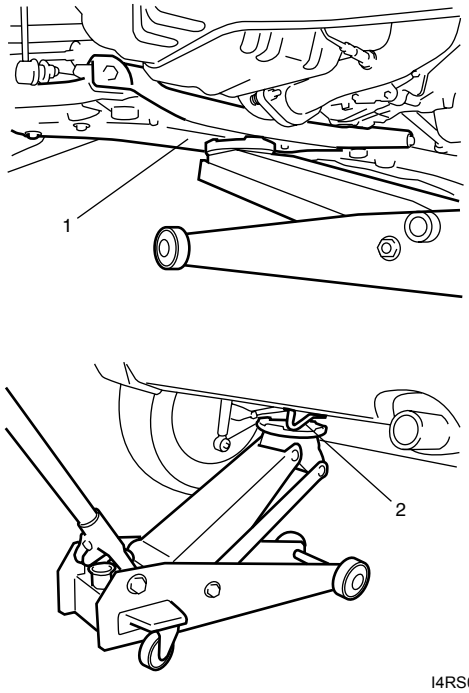
- **Never apply jack against rear suspension parts (i.e., stabilizer, etc.) or vehicle floor, or it may get deformed.**
- **When jacking up the front end, be sure to use an air type floor jack with the following specified height or a manual type floor jack of the following size. Otherwise, the jack may cause the bumper or vehicle body panel a damage.**

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



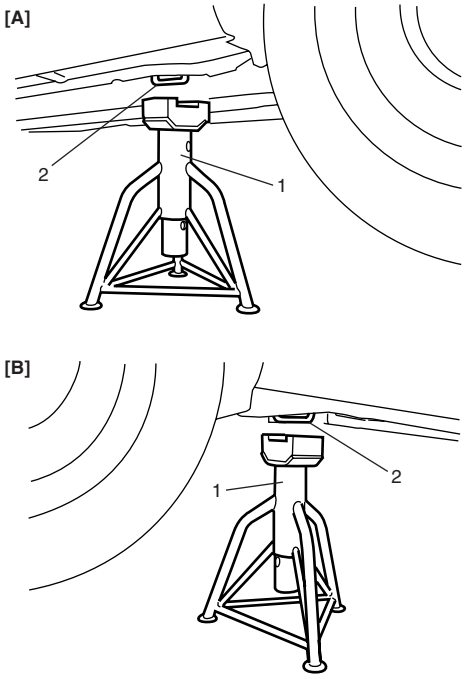
I4RS0A010002-01

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 jacking bracket (2).



I4RS0A010003-01

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



I4RS0A010004-01

[A]:	Front
[B]:	Rear

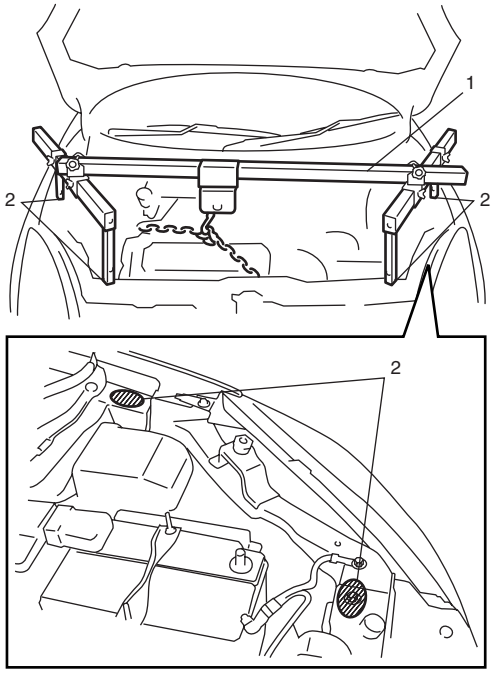
Engine Supporting Points

S7N20A0101006

⚠ WARNING

When using engine supporting device (1), be sure to observe the followings.
Otherwise, not only deformation of vehicle body but also personal injury may result.

- **Apply supporting device at the specified positions (2) indicated in figure**
- **Install supporting device taking a well-balanced posture.**
- **Do not contact supporting device with other parts than engine room body panel and engine hooks.**

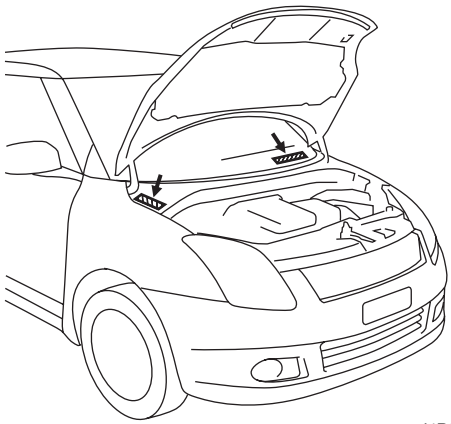


I4RS0A010005-01

Vehicle Identification Number

S7N20A0101007

The number is punched close by the right side strut support in engine room and it is also on the left side of instrument panel depending on the vehicle specification.

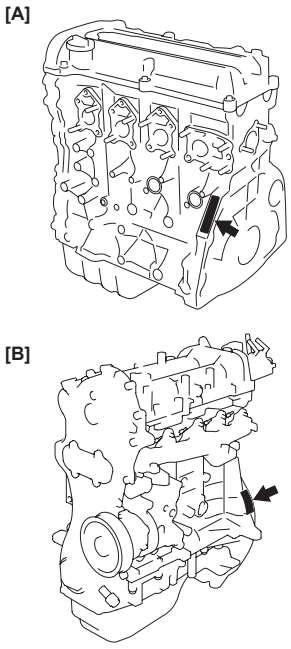


I4RS0B010003-01

Engine Identification Number

S7N20A0101008

The number is punched on cylinder block.



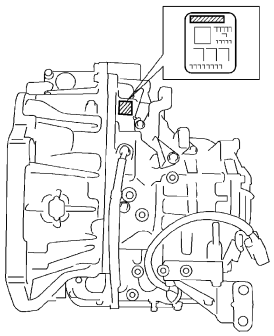
I7N20A010001-01

[A]: Petrol model	[B]: Diesel model

Transmission Identification Number (Petrol Engine Model)

S7N20A0101009

The automatic transmission identification number is located on transmission case.



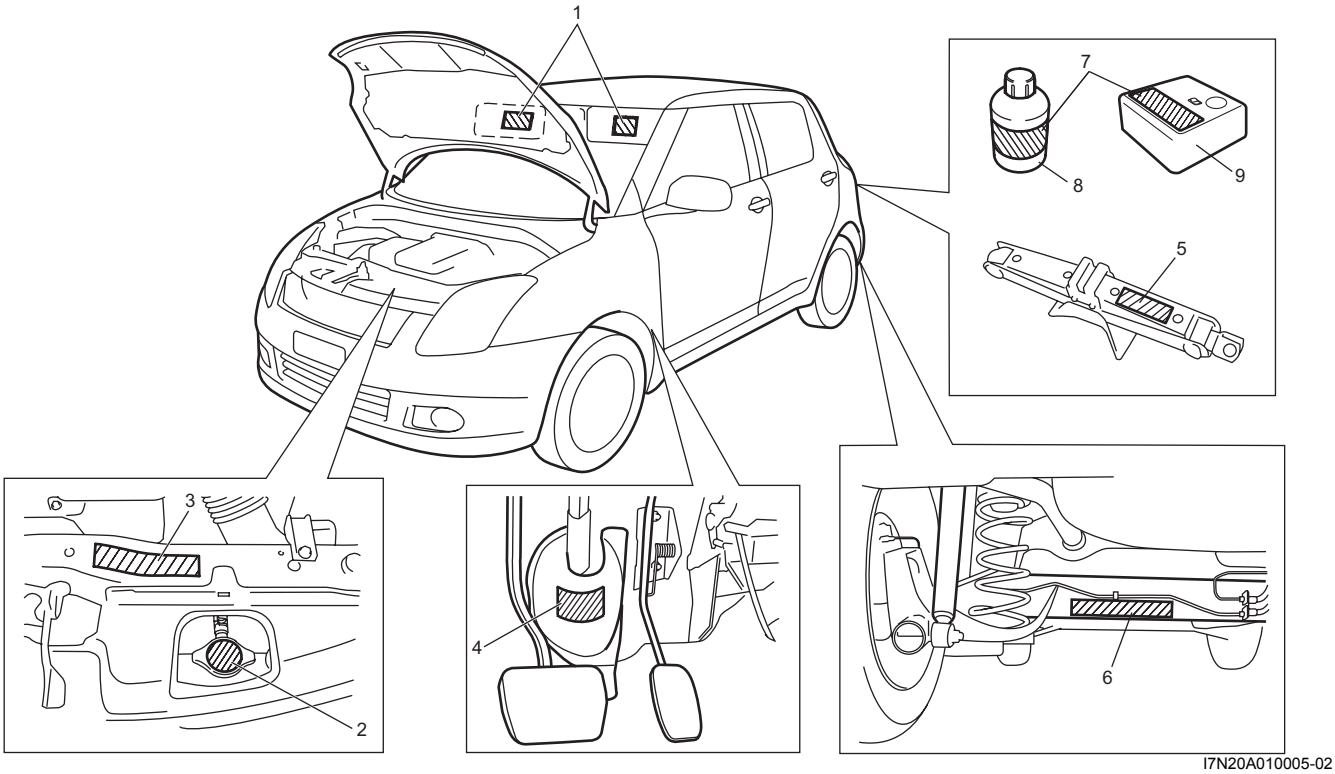
I4RS0A010008-01

Component Location

Warning, Caution and Information Labels Location (Petrol Engine Model)

S7N20A0103001

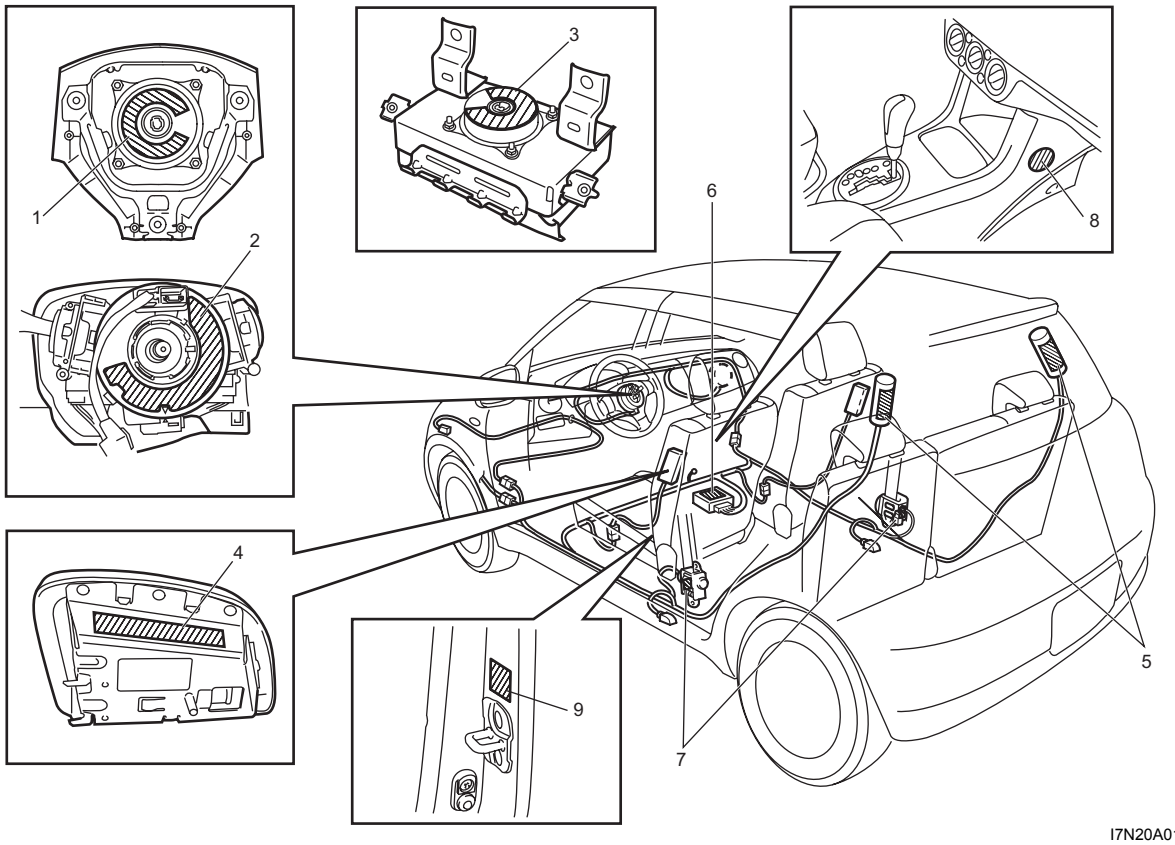
The figure shows main labels among others that are attached to vehicle component parts.
When servicing and handling parts, refer to WARNING / CAUTION instructions printed on labels.
If any WARNING / CAUTION label is found stained or damaged, clean or replace it as necessary.



I7N20A010005-02

1. Air bag label on sun visor (if equipped)	4. Steering shaft joint cover label (if equipped)	7. Tire repair kit label
2. Radiator cap label	5. Jack label	8. Sealant bottle
3. Engine cooling fan label	6. Rear beam label	9. Tire inflator

[A]



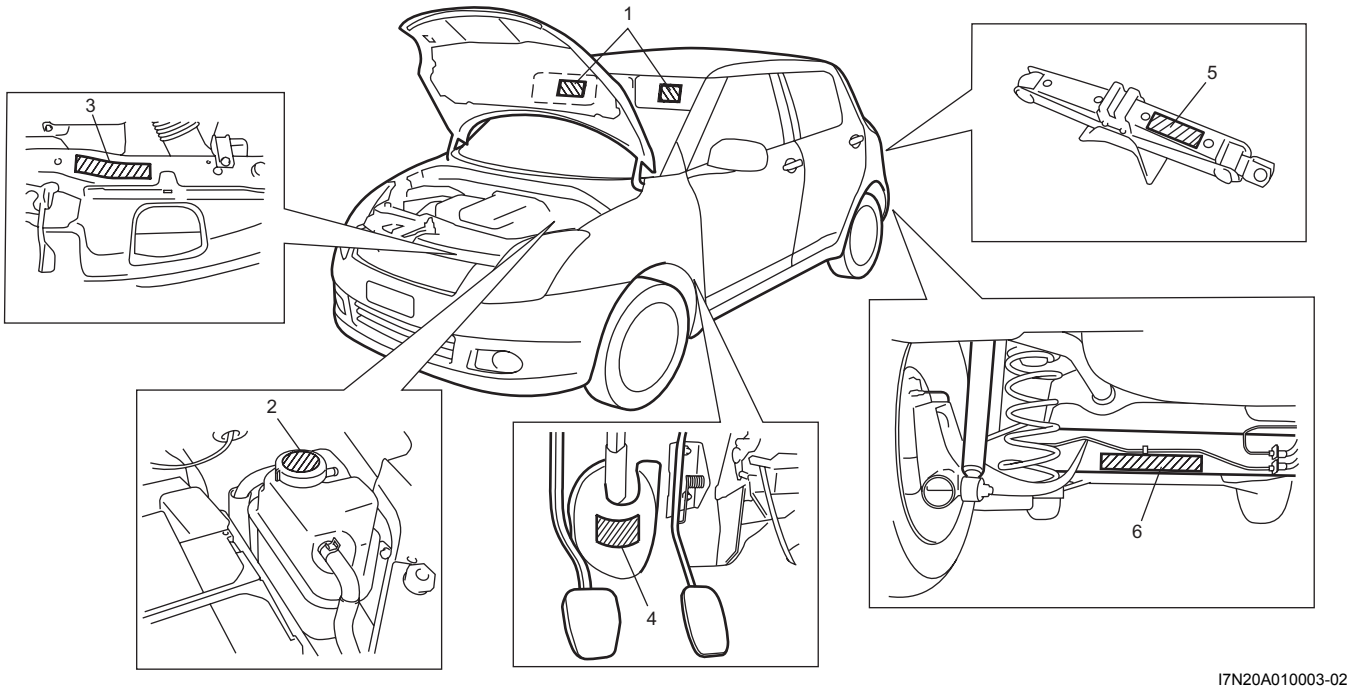
I7N20A010002-01

1. Air bag label on driver air bag (inflator) module	6. Air bag label on SDM
2. Air bag label on combination switch and contact coil assembly	7. Pretensioner label on seat belt retractor
3. Air bag label on passenger air bag (inflator) module	8. Child seat label (if equipped)
4. Air bag label on side air bag (inflator) module	9. Side/Curtain air bag label on pillar (both right and left sides)
5. Air bag label on curtain air bag (inflator) module	[A]: These labels are attached on vehicle equipped with air bag system only.

Warning, Caution and Information Labels Location (Diesel Engine Model)

S7N20A0103002

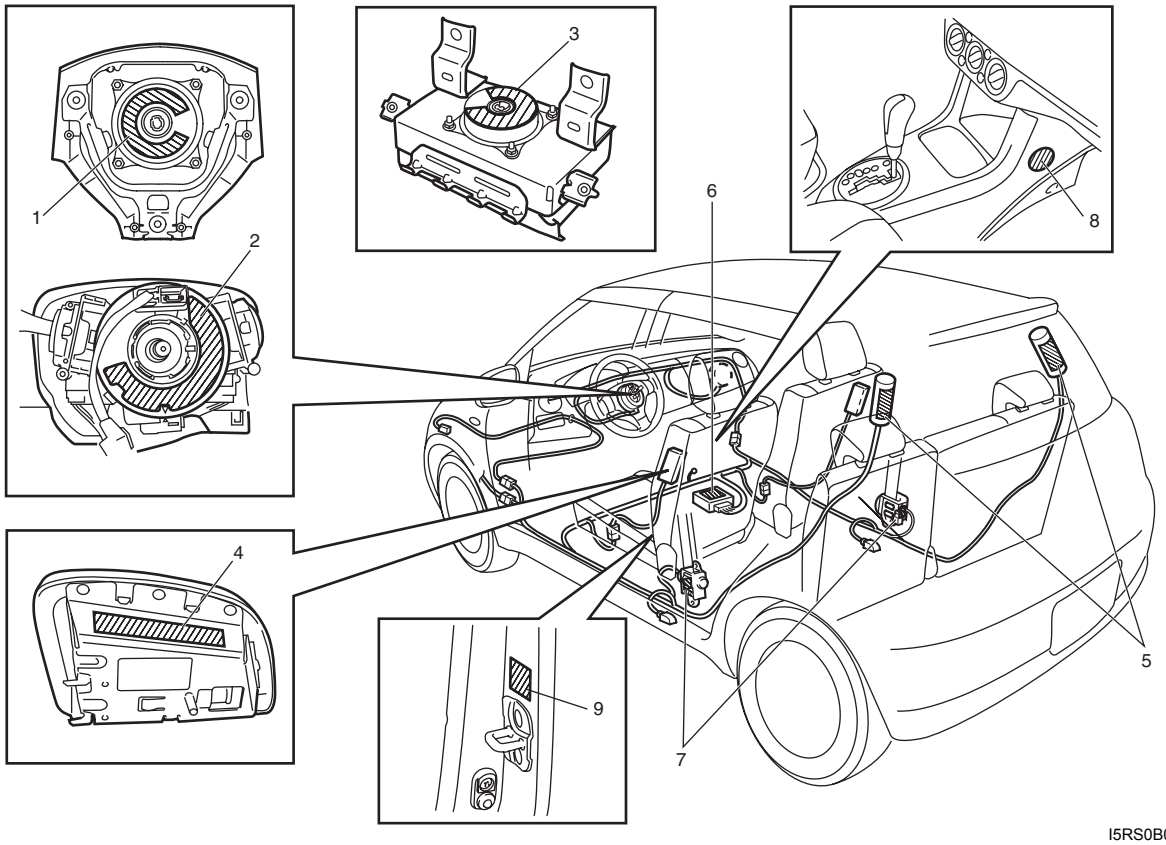
The figure shows main labels among others that are attached to vehicle component parts.
When servicing and handling parts, refer to WARNING / CAUTION instructions printed on labels.
If any WARNING / CAUTION label is found stained or damaged, clean or replace it as necessary.



I7N20A010003-02

1. Air bag label on sun visor (if equipped)	4. Steering shaft joint cover label (if equipped)
2. Degassing tank cap label	5. Jack label
3. Engine cooling fan label	6. Rear beam label

[A]



I5RS0B010003-01

1. Air bag label on driver air bag (inflator) module	6. Air bag label on SDM
2. Air bag label on contact coil assembly	7. Pretensioner label on seat belt retractor
3. Air bag label on passenger air bag (inflator) module	8. Child seat label (if equipped)
4. Air bag label on side air bag (inflator) module	9. Side/Curtain air bag label on pillar (both right and left sides)
5. Air bag label on curtain air bag (inflator) module	[A]: These labels are attached on vehicle equipped with air bag system only.

Maintenance and Lubrication

Precautions

Precautions for Maintenance and Lubrication

S7N20A0200001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

Scheduled Maintenance

Maintenance Schedule under Normal Driving Conditions (Petrol Engine Model)

S7N20A0205001

NOTE

- **This interval should be judged by odometer reading or months, whichever comes first.**
- **This table includes service as scheduled up to 90,000 km (54,000 miles) mileage. Beyond 90,000 km (54,000 miles), carry out the same services at the same intervals respectively.**

Interval					Km (x 1,000)	15	30	45	60	75	90
					Miles (x 1,000)	9	18	27	36	45	54
					Months	12	24	36	48	60	72
Engine											
Engine accessory drive belt (I: ☞, R: ☞)						—	—	I	—	—	R
Valve lash (clearance) (I: ☞)						—	I	—	I	—	I
Engine oil and oil filter (R: ☞)						R	R	R	R	R	R
Engine coolant (R: ☞)						—	—	R	—	—	R
Exhaust system (I: ☞)						—	I	—	I	—	I
Ignition system											
Spark plugs (R: ☞)	When unleaded fuel is used	Vehicle with O2S	Nickel Plug			—	—	R	—	—	R
			(Highly recommended) Iridium Plug	M13A / M15A engines		Replace every 105,000 km (63,000 miles) or 84 months					
				M16A engine		—	—	—	R	—	—
		Vehicle without O2S	Nickel Plug			—	R	—	R	—	R
			Iridium Plug			—	—	—	R	—	—
	When leaded fuel is used, refer to “Maintenance Recommended under Severe Driving Conditions (Petrol Engine Model)”.										
Fuel system											
Air cleaner filter (R: ☞, I: ☞)			Paved-road			I	I	R	I	I	R
			Dusty conditions			Refer to “Maintenance Recommended under Severe Driving Conditions (Petrol Engine Model)”.					
Fuel lines and connections (I: ☞)						—	I	—	I	—	I
Fuel tank (I: ☞)						—	—	I	—	—	I
Emission control system											
PCV valve (I: ☞)		Vehicle with O2S				—	—	—	—	—	I
		Vehicle without O2S				—	—	I	—	—	I
Fuel evaporative emission control system (I: ☞)						—	—	—	—	—	I
Brake											
Brake discs and pads (thickness, wear, damage) (I: ☞)						I	I	I	I	I	I
Brake drums and shoes (if equipped) (wear, damage) (I: ☞)						—	I	—	I	—	I
Brake hoses and pipes (leakage, damage, clamp) (I: ☞)						—	I	—	I	—	I
Brake fluid (R: ☞)						—	R	—	R	—	R
Brake lever and cable (damage, stroke, operation) (I: ☞)						Inspect at first 15,000 km (9,000 miles only)					
Chassis and body											
Clutch (pedal, fluid leakage, level) (I: ☞)						—	I	—	I	—	I

Interval							
	Km (x 1,000)	**15**	**30**	**45**	**60**	**75**	**90**
	Miles (x 1,000)	**9**	**18**	**27**	**36**	**45**	**54**
	Months	**12**	**24**	**36**	**48**	**60**	**72**
Tires (wear, damage, rotation) / wheels (damage) (I: ☞ / ☞)		I	I	I	I	I	I
Suspension system (tightness, damage, rattle, breakage) (I: ☞)		—	I	—	I	—	I
Steering system (tightness, damage, breakage, rattle) (I: ☞)		—	I	—	I	—	I
Drive shaft (axle) boots (I: ☞)		—	—	I	—	—	I
Manual transaxle oil (leakage, level) (I: ☞ 1st 15,000 km only) (R: ☞)		I	—	R	—	—	R
Automatic transaxle fluid	Fluid level (I: ☞)	—	I	—	I	—	I
	Fluid change (R: ☞)	Replace every 165,000 km (99,000 miles)					
	Fluid hose (I: ☞)	—	—	—	I	—	—
All latches, hinges and locks (I: ☞)		—	I	—	I	—	I
Air conditioning filter (if equipped) (I: ☞) (R: ☞)		—	I	R	—	I	R

NOTE

- **"R": Replace or change**
- **"I": Inspect and correct, replace or lubricate if necessary**
- **For spark plugs, replace every 50,000 km if the local law requires.**
- **Nickel spark plug: BKR6E-11 (NGK) or K20PR-U11 (DENSO)**
- **Iridium spark plug: IFR6J11 (NGK)**

Maintenance Schedule under Normal Driving Conditions (Diesel Engine Model)

S7N20A0205002

NOTE

- **This interval should be judged by odometer reading or months, whichever comes first.**
- **This table includes service as scheduled up to 90,000 km (54,000 miles) mileage. Beyond 90,000 km (54,000 miles), carry out the same services at the same intervals respectively.**

Interval								
		Km (x 1,000)	**15**	**30**	**45**	**60**	**75**	**90**
		Miles (x 1,000)	**9**	**18**	**27**	**36**	**45**	**54**
		Months	**12**	**24**	**36**	**48**	**60**	**72**
Engine								
Engine accessory drive belt and tensioner (I: ☞)			Inspection every 30,000 km (18,000 miles) or 24 months.					
Engine accessory drive belt (R: ☞)			Replace every 150,000 km (90,000 miles) or 120 months.					
Engine oil and oil filter (R: ☞)	without DPF® (Synthetic oil)		R	R	R	R	R	R
	with DPF® (Synthetic oil)		Replace when oil pressure warning light blinks or every 12 months.					
Engine coolant (R: ☞)			—	—	R	—	—	R
Exhaust system (I: ☞)			—	I	—	I	—	I
Fuel system								
Air cleaner filter (R: ☞)	Paved-road		—	—	R	—	—	R
	Dusty condition		Refer to "Maintenance Recommended under Severe Driving Conditions (Diesel Engine Model)".					
Fuel lines and connections (I: ☞)			—	I	—	I	—	I
Fuel filter (R: ☞, Drain: ☞)			—	R	—	R	—	R
			Drain water every 15,000 km (9,000 miles) or 12 months.					
Fuel tank (I: ☞)			—	—	I	—	—	I
Brake								
Brake discs and pads (thickness, wear, damage) (I: ☞)			I	I	I	I	I	I
Brake drums and shoes (wear, damage) (I: ☞)			—	I	—	I	—	I

Interval	Km (x 1,000)	15	30	45	60	75	90
	Miles (x 1,000)	9	18	27	36	45	54
	Months	12	24	36	48	60	72
Brake hoses and pipes (leakage, damage, clamp) (I: ☞)		—	I	—	I	—	I
Brake fluid (R: ☞)		—	R	—	R	—	R
Brake lever and cable (damage, stroke, operation) (I: ☞)		Inspect at first 15,000 km (9,000 miles only)					
Chassis and body							
Clutch (pedal, fluid leakage, level) (I: ☞)		—	I	—	I	—	I
Tires (wear, damage, rotation) / wheels (damage) (I: ☞ / ☞)		I	I	I	I	I	I
Suspension system (tightness, damage, rattle, breakage) (I: ☞)		—	I	—	I	—	I
Steering system (tightness, damage, breakage, rattle) (I: ☞)		—	I	—	I	—	I
Drive shaft (axle) boots (I: ☞)		—	—	I	—	—	I
Manual transaxle oil (leakage, level) (I:☞) 1st 15,000 km only) (R:☞)		I	—	R	—	—	R
All latches, hinges and locks (I: ☞)		—	I	—	I	—	I
Air conditioning filter (if equipped) (I: ☞) (R: ☞)		—	I	R	—	I	R

NOTE

- **"R": Replace or change**
- **"I": Inspect and correct, replace or lubricate if necessary**
- **Some maintenance items are required to be serviced at times other than the regular maintenance times shown at the top of above table. These items can be serviced at an earlier service opportunity according to customer's maintenance convenience. Their next maintenance service should be done within the specified period.**

Maintenance Recommended under Severe Driving Conditions (Petrol Engine Model)

S7N20A0205003

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, IT IS RECOMMENDED that applicable maintenance operation be performed at the particular interval as shown in the following table.

Severe condition code:

A: Repeated short trips
B: Driving on rough and/or muddy roads
C: Driving on dusty roads
D: Driving in extremely cold weather and/or salted roads
E: Repeated short trips in extremely cold weather
F: Leaded fuel use
G: – – – – –
H: Towing a trailer (if admitted)

Severe condition code	Maintenance		Maintenance operation	Maintenance interval
– B C D – – – –	Engine accessory drive belt		☞ I	Every 15,000 km (9,000 miles) or 12 months
			☞ R	Every 45,000 km (27,000 miles) or 36 months
A – C D E F – H	Engine oil and oil filter		☞ R	Every 7,500 km (4,500 miles) or 6 months
– – C – – – – –	Air cleaner filter *1		☞ I	Every 2,500 km (1,500 miles)
			☞ R	Every 30,000 km (18,000 miles) or 24 months
A B C – E F – H	Spark plugs	Nickel plug	☞ R	Every 10,000 km (6,000 miles) or 8 months
		Iridium plug (Highly recommended)		Every 30,000 km (18,000 miles) or 24 months
– B C D – – – H	Wheel bearings		☞ I	Every 15,000 km (9,000 miles) or 12 months
– B – D E – – H	Drive shaft boots		☞ I	Every 15,000 km (9,000 miles) or 12 months

Severe condition code	Maintenance	Maintenance operation	Maintenance interval
– B – – E – – H	Manual transaxle oil	☞ R	First time only: 15,000 km (9,000 miles) or 12 months
			Second time and after: Every 30,000 km (18,000 miles) or 24 months reckoning from 0 km (0 mile) or 0 month
– B – – E – – H	Automatic transaxle fluid	☞ R	Every 30,000 km (18,000 miles) or 24 months
– – C D – – – –	Air conditioning filter (if equipped) *2	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months

NOTE

- **"I": Inspect and correct or replace if necessary**
- **"R": Replace or change**
- ***1: Inspect or replace more frequently if the vehicle is used under dusty conditions.**
- ***2: Clean or replace more frequently if the air from the air conditioning decreases.**

Maintenance Recommended under Severe Driving Conditions (Diesel Engine Model)

S7N20A0205004

If the vehicle is usually used under the conditions corresponding to any severe condition code given below, IT IS RECOMMENDED that applicable maintenance operation be performed at the particular interval as shown in the following table.

Severe condition code:

A: Repeated short trips
B: Driving on rough and/or muddy roads
C: Driving on dusty roads
D: Driving in extremely cold weather and/or salted roads
E: Repeated short trips in extremely cold weather
F: Leaded fuel use
G: Idling the engine frequently
H: Towing a trailer (if admitted)

Severe condition code	Maintenance	Maintenance operation	Maintenance interval
– B C D – – – –	Engine accessory drive belt	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months
A – C D E – G H	Engine oil and oil filter	☞ R	Every 7,500 km (4,500 miles) or 6 months or when the oil pressure warning light blinks.
– – C – – – – –	Air cleaner filter *1	☞ I	Every 2,500 km (1,500 miles)
		☞ R	Every 30,000 km (18,000 miles) or 24 months
– B C D – – – H	Wheel bearings	☞ I	Every 15,000 km (9,000 miles) or 12 months
– B – D E – – H	Drive shaft boots	☞ I	Every 15,000 km (9,000 miles) or 12 months

Severe condition code	Maintenance	Maintenance operation	Maintenance interval
– B– – E– – H	Manual transaxle oil	☞ R	First time only: 15,000 km (9,000 miles) or 12 months
			Second time and after: Every 30,000 km (18,000 miles) or 24 months reckoning from 0 km (0 mile) or 0 month
– – C D – – – –	Air conditioning filter (if equipped) *2	☞ I	Every 15,000 km (9,000 miles) or 12 months
		☞ R	Every 45,000 km (27,000 miles) or 36 months

NOTE

- **"I": Inspect and correct or replace if necessary**
- **"R": Replace or change**
- ***1: Inspect or replace more frequently if the vehicle is used under dusty conditions.**
- ***2: Clean or replace more frequently if the air from the air conditioning decreases.**

Repair Instructions

Accessory Drive Belt Inspection (Petrol Engine)

S7N20A0206001

⚠ WARNING

All inspection and replacement are to be performed with ENGINE NOT RUNNING.

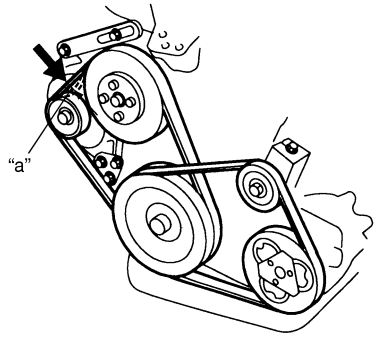
Water Pump and Generator Drive Belt

1) Disconnect negative (–) cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace.
   Check belt for tension.

Water pump and generator belt tension
"a": 4.5 – 5.5 mm (0.18 – 0.22 in.) deflection under 100 N (10 kg, 22 lb) pressure

NOTE

When replacing belt with a new one, adjust belt tension to 3.5 – 4 mm (0.14 – 0.16 in.)



I3RM0A020001-01

3) If belt is too tight or too loose, adjust it to specification by adjusting alternator position.
4) Tighten alternator adjusting bolts and pivot bolt.
5) Connect negative (–) cable to battery.

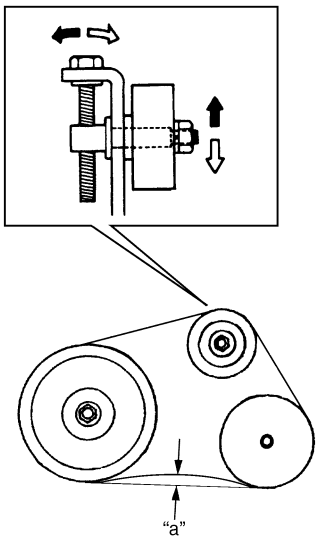
A/C Compressor Drive Belt (If Equipped)

1) Disconnect negative (–) cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace.
   Check belt for tension.
   If belt tension is out of specification, adjust it referring to "Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C in Section 7B".

A/C compressor drive belt tension
"a": 7 – 8 mm (0.28 – 0.31 in.) deflection under 100 N (10 kg, 22 lb) pressure

NOTE

When replacing belt with a new one, adjust belt tension to 6 – 7 mm (0.24 – 0.28 in.).



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3) Connect negative (–) cable to battery

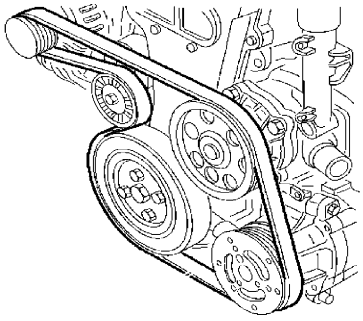
Engine accessory Drive Belt and Tensioner Inspection (Diesel Engine)

S7N20A0206002

⚠ WARNING

All inspection and replacement are to be performed with ENGINE NOT RUNNING.

Water Pump / Generator Drive Belt
Inspect belt for cracks, cuts, deformation, wear, tension and cleanliness referring to "Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F". If any defect exists, replace.



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Accessory Drive Belt Replacement (Petrol Engine)

S7N20A0206003

Water Pump and Generator Drive Belt
Replace belt with new one referring to "Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A in Section 1J".

A/C Compressor Drive Belt (If Equipped)
Replace belt with new one referring to "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C in Section 7B".

Engine accessory Drive Belt Replacement (Diesel Engine)

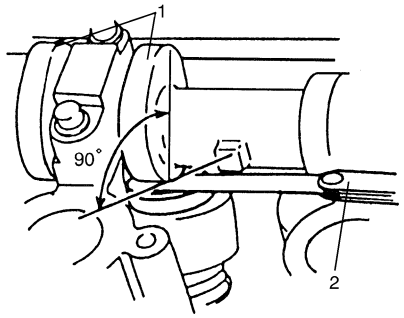
S7N20A0206004

Water Pump and Generator Drive Belt
Replace belt with new one referring to "Accessory Drive Belt Tensioner Removal and Installation: D13A / Z13DTJ in Section 1F".

Valve Lash (Clearance) Inspection

S7N20A0206005

Inspect intake and exhaust valve lash and adjust as necessary.
Refer to "Valve Lash (Clearance) Inspection: M13A / M15A / M16A in Section 1D" for valve lash inspection and adjustment procedure.



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1. Camshaft	2. Thickness gauge

Engine Oil and Filter Change (Petrol Engine)

S7N20A0206006

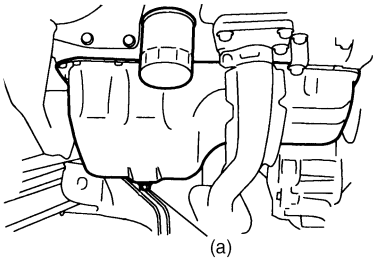
⚠ WARNING

- **New and used engine oil can be hazardous.**
  Be sure to read "WARNING" in "General Precautions in Section 00" and observe what is written there.
- **Step 1) – 7) outlined below must be performed with ENGINE NOT RUNNING.**
  For Step 8), be sure to have adequate ventilation while engine is running.

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug.

Tightening torque
Engine oil drain plug (Petrol Engine) (a): 35 N·m (3.5 kgf-m, 25.5 lbf-ft)



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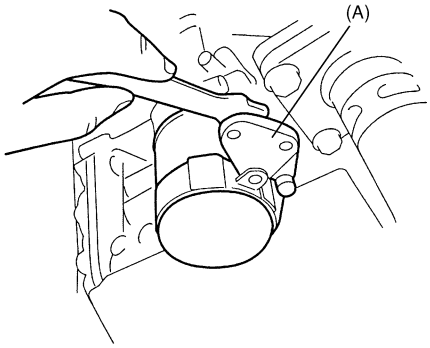
3) Loosen oil filter by using oil filter wrench (special tool).

Special tool
(A): 09915–47331



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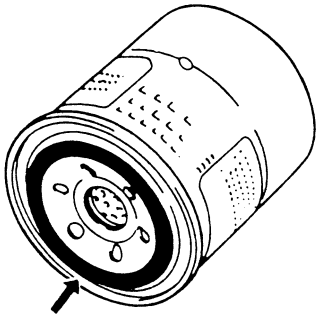
NOTE

Before fitting new oil filter, be sure to oil its O-ring. Use engine oil for this purpose.



IYSQ01020009-01

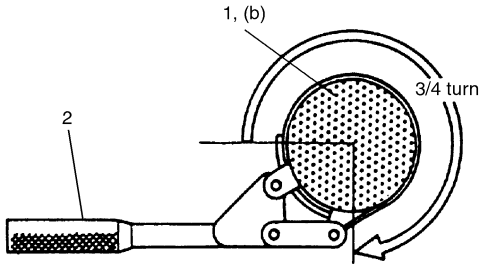
4) Screw new filter on oil filter stand by hand until the filter O-ring contacts mounting surface.

⚠ CAUTION

To tighten oil filter properly, it is important to accurately identify the position at which filter O-ring first contacts mounting surface.

5) Tighten the filter (1) 3/4 turn from the point of contact with the mounting surface using an oil filter wrench (2).

Tightening torque
Oil filter (Petrol Engine) (b): 14 N·m (1.4 kgf-m, 10.5 lbf-ft) for reference



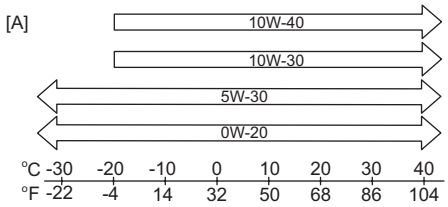
IYSQ01020010-01

6) Replenish oil until oil level is brought to FULL level mark on dipstick (oil pan and oil filter capacity). The filler inlet is at the top of the cylinder head cover. It is recommended to use engine oil of SG, SH, SJ, SL or SM grade. Select the appropriate oil viscosity according to the proper engine oil viscosity chart [A].

NOTE

Engine oil capacity is specified as the following.
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.).

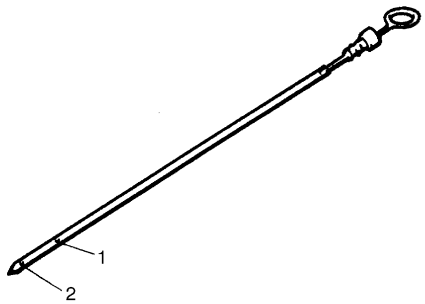
Engine oil specification
Oil pan capacity: About 3.7 liters (7.8 / 6.5 US / Imp pt.)
Oil filter capacity: About 0.2 liter (0.4 / 0.3 US / Imp pt.)
Others: About 0.3 liter (0.6 / 0.5 US / Imp pt.)
Total: About 4.2 liters (8.9 / 7.4 US / Imp pt.)



I7N20A020002-01

7) Check oil filter and drain plug for oil leakage.

8) Start engine and run it for 3 minutes. Stop it and wait another 5 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (1) on dipstick.



IYSQ01020012-01

2. Low level mark (hole)

Engine Oil and Filter Change (Diesel Engine)

S7N20A0206007

⚠ WARNING

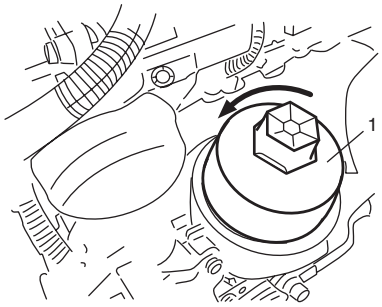
- **New and used engine oil can be hazardous.**
  Be sure to read "WARNING" in "General Precautions in Section 00" and observe what is written there.
- **Step 1) – 6) outlined below must be performed with ENGINE NOT RUNNING.**
  For Step 7), be sure to have adequate ventilation while engine is running.

⚠ CAUTION

- **For DPF® model, be sure to reset blinking of oil pressure light and engine oil parameter by using SUZUKI scan tool after replacing engine oil and filter.**
- **If not, engine will be destroyed by degraded engine oil.**

Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.

1) Remove oil filter element.
   a) Place oil collecting basin under filter.
   b) Loosen and remove oil filter housing cover (1).



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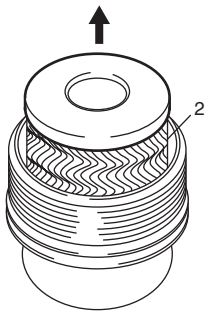
   c) Pull out oil filter element (2) from cover.



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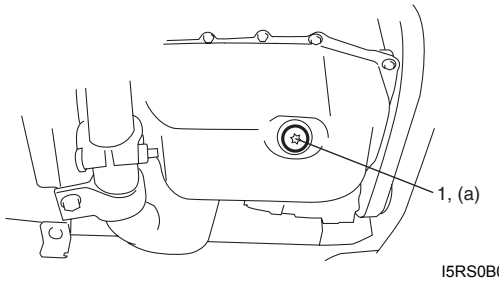
2) Drain engine oil by removing drain plug (1).
3) After draining oil, wipe drain plug clean and replace seal ring with a new one. Reinstall drain plug, and tighten it securely as specified below.

   Tightening torque
   Engine oil drain plug (Diesel Engine) (a): 20 N·m (2.0 kgf-m, 14.5 lbf-ft)



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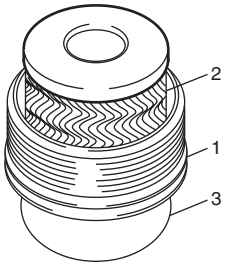
4) Install oil filter element.
   a) Replace seal ring (1) of oil filter housing cover (3) with new one and apply engine oil to seal ring.
   b) Install new oil filter element (2) to cover.



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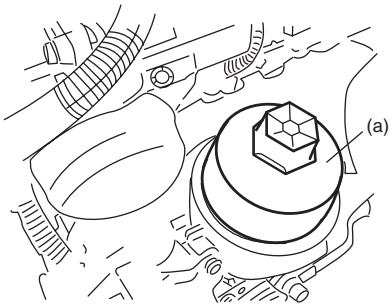
   c) Install oil filter housing cover with element.

   Tightening torque
   Oil filter housing cover (Diesel Engine) (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



I3RM0B020006-01

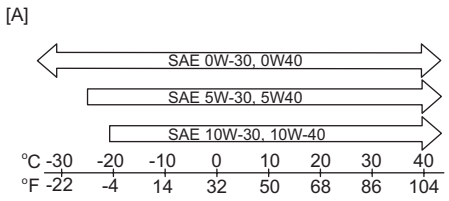
5) Replenish oil until oil level is brought to FULL level mark on dipstick. (about 3.2 liters (5.6 Imp pt.))

Engine oil specification
Oil pan capacity: About 3.2 liters (5.6 Imp pt.)

The filler inlet is by the engine oil filter.
Use specified synthetic engine oil of ACEA B4 grade. Select the appropriate oil viscosity according to the proper engine oil viscosity chart [A].

NOTE

Note that the amount of oil required when actually changing oil may somewhat differ from the data depending on various conditions (temperature, viscosity, etc.)



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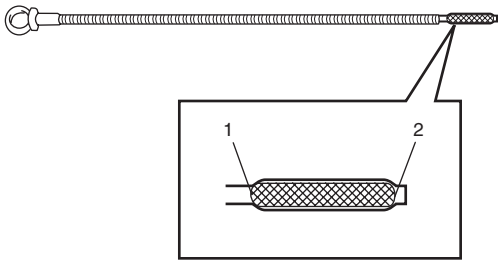
6) Check oil filter and drain plug for oil leakage.
7) Start engine and run it for 3 minutes. Stop it and wait 5 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (1) on dipstick.



I3RM0B020008-01

2. Low level mark

8) For DPF® model, reset blinking of oil pressure light and engine oil parameter as follows.

NOTE

For further details of SUZUKI scan tool, refer to its operator's manual.

a) Connect SUZUKI scan tool to DLC with ignition switch OFF.
b) Turn ignition switch to ON position.
c) Select "Reset Oil Pressure warning Light" under "Miscellaneous test" ("Misc test") mode of SUZUKI scan tool.
d) Turn ignition switch to OFF position, and wait 30 seconds or more.

Engine Coolant Change (Petrol Engine)

S7N20A0206008

⚠ WARNING

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.

⚠ CAUTION

When changing engine coolant, use mixture of 50% specified water and 50% ANTIFREEZE / ANTICORROSION COOLANT for the purpose of corrosion protection and lubrication.

Change engine coolant with new one referring to "Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F".

Engine Coolant Change (Diesel Engine)

S7N20A0206009

⚠ WARNING

To help avoid danger of being burned, do not remove degassing tank 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.

⚠ CAUTION

When changing engine coolant, use mixture of 50% specified water and 50% ANTIFREEZE / ANTICORROSION COOLANT for the purpose of corrosion protection and lubrication.

Change engine coolant with new one referring to "Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F".

Exhaust System Inspection

S7N20A0206010

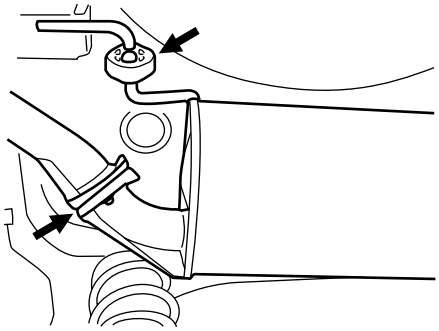
⚠ WARNING

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.

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 out of position.
- 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 mispositioned 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.



I4RS0A020003-01

- Any defects should be fixed at once.

Spark Plug Replacement

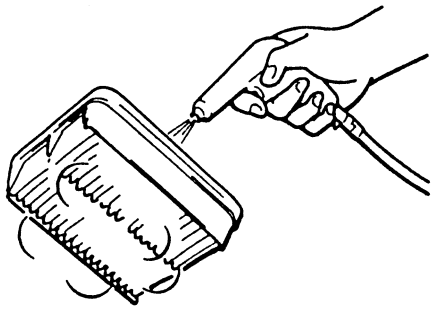
S7N20A0206011

Replace spark plugs with new ones referring to “Spark Plug Removal and Installation: M13A / M15A / M16A in Section 1H”.

Air Cleaner Filter Inspection (Petrol Engine)

S7N20A0206012

1) Remove air cleaner case clamps.
2) Take air cleaner filter out of case.
3) 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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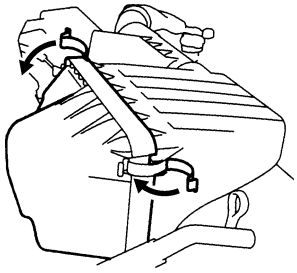
4) Install air cleaner filter and Clamp cap securely.



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Air Cleaner Filter Inspection (Diesel Engine)

S7N20A0206013

Check air cleaner filter for dirt, damage or clogging referring to “Air Cleaner Filter Inspection and Cleaning: D13A / Z13DTJ in Section 1D”.
Clean or replace if necessary.

Air Cleaner Filter Replacement (Petrol Engine)

S7N20A0206014

Replace air cleaner filter with new one according to Steps 1), 2) and 4) of “Air Cleaner Filter Inspection (Petrol Engine)”.

Air Cleaner Filter Replacement (Diesel Engine)

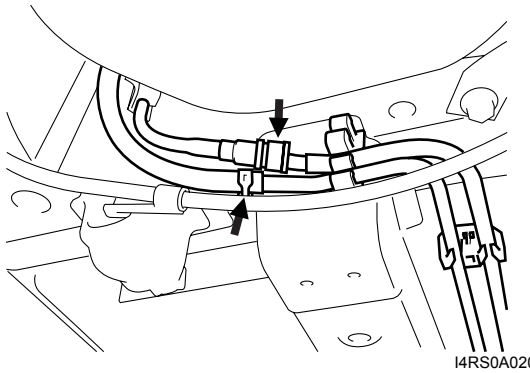
S7N20A0206015

Replace air cleaner filter with new one referring to “Air Cleaner Filter Removal and Installation: D13A / Z13DTJ in Section 1D”.

Fuel Lines and Connections Inspection (Petrol Engine Model)

S7N20A0206016

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.



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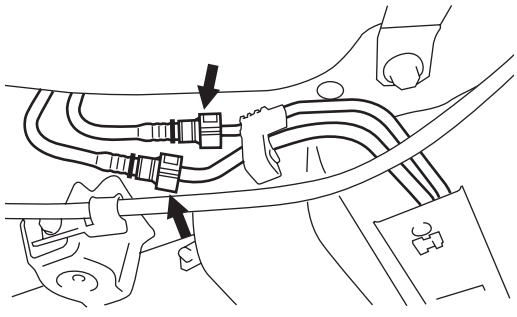
Fuel Lines and Connections Inspection (Diesel Engine Model)

S7N20A0206017

Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking and damage. Make sure all clamps are secure.
Repair leaky joints, if any.
Replace hoses that are suspected of being cracked.

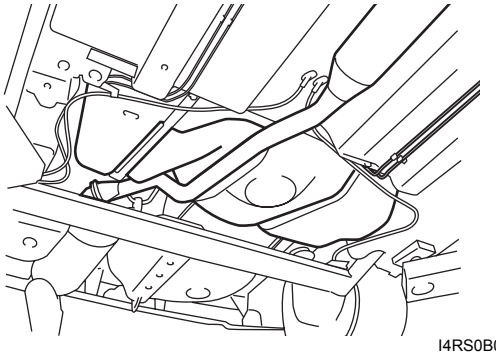


I5RS0B020002-01

Fuel Tank Inspection

S7N20A0206018

Check fuel tank damage, cracks, fuel leakage, corrosion and tank bolts looseness.
If a problem is found, repair or replace.



I4RS0B020002-02

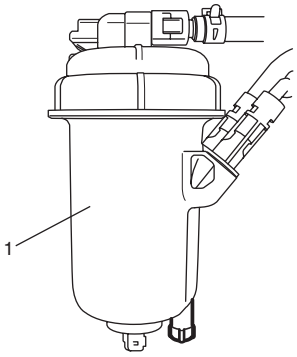
Fuel Filter Replacement (Diesel Engine)

S7N20A0206019

⚠ WARNING

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

Replace fuel filter element in fuel filter assembly (1) with new one referring to “Fuel Pump On-Vehicle Inspection: D13A / Z13DTJ in Section 1G”.



I5RS0B020003-01

Water Draining of Fuel Filter (Diesel Engine)

S7N20A0206020

Bleed fuel filter of water referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ in Section 1G”.

PCV Valve Inspection

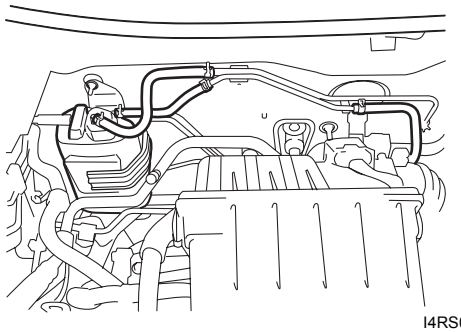
S7N20A0206021

Check crankcase ventilation hose and PCV hose for leaks, cracks or clog, and PCV valve for stick or clog. Refer to “PCV Valve Inspection: M13A / M15A / M16A in Section 1B” for PCV valve checking procedure.

Fuel Evaporative Emission Control System Inspection

S7N20A0206022

1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) Check EVAP canister for operation and clog, referring to “EVAP Canister Inspection: M13A / M15A / M16A in Section 1B”.
   If a malfunction is found, repair or replace.

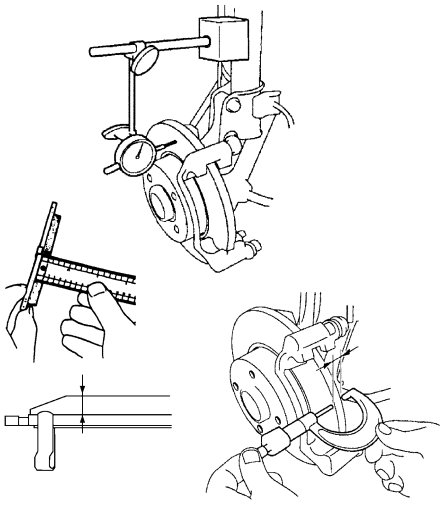


I4RS0B020003-01

Brake Discs and Pads Inspection

S7N20A0206023

1) Remove wheel and caliper but don’t disconnect brake hose from caliper.
2) Check disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For details, refer to “Front Disc Brake Pad Inspection in Section 4B”, “Front Brake Disc Inspection in Section 4B”, “Rear Disc Brake Pad Inspection: Disc Brake in Section 4C” and / or “Rear Brake Disc Inspection: Disc Brake in Section 4C”.
   Be sure to torque caliper pin bolts to specification.

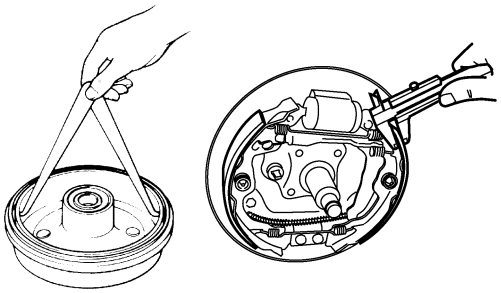


I3RM0A020006-01

Brake Drums and Shoes (Rear) Inspection

S7N20A0206024

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
   For details, refer to “Rear Brake Drum and Shoe Inspection: Drum Brake in Section 4C”.



I4RS0B020004-01

Brake Hoses and Pipes Inspection

S7N20A0206025

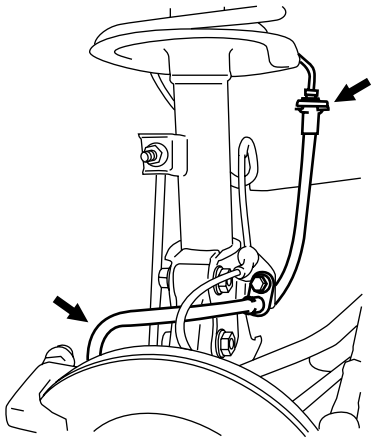
Perform this inspection where these is enough light and use a mirror as necessary.

- Check brake hoses and pipes for proper hookup, 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 as necessary.

⚠ CAUTION

After replacing any brake pipe or hose, be sure to carry out air purge operation.



I4RS0A020008-01

Brake Fluid Replacement

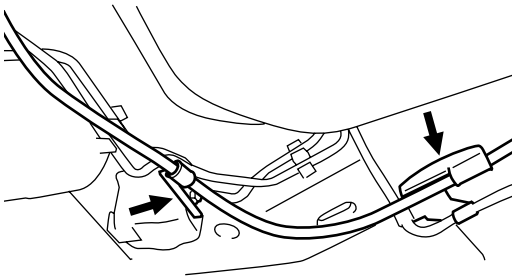
S7N20A0206026

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”.

Brake Lever and Cable Inspection

S7N20A0206027

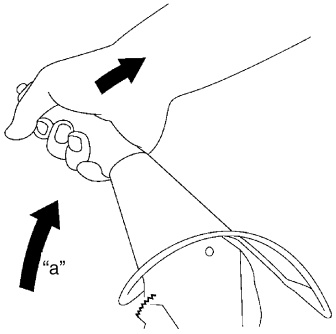
1) Inspect brake cable for damage and smooth movement.
   Replace cable if it is in deteriorated condition.



I4RS0A020009-01

2) Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking 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”.

Parking brake lever stroke
“a”: 4 – 9 notches (with 200 N (20 kgf, 44 lbf) of pull pressure)

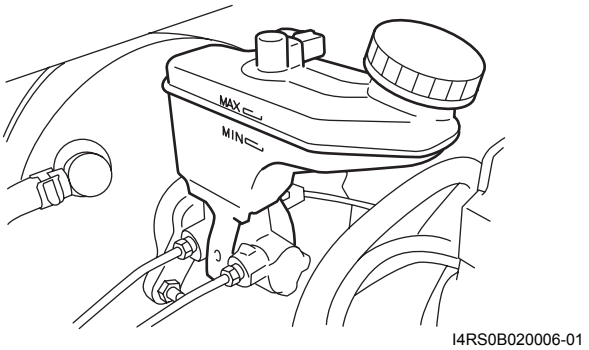


I4RS0B020005-01

Clutch Fluid Inspection

S7N20A0206028

1) Check clutch system for evidence of fluid leakage. Repair leaky point if any.
2) Check reservoir for fluid level referring to “Clutch Fluid Level Inspection in Section 5C”.
   If fluid is lower than minimum level of reservoir, refill reservoir with specified brake fluid indicated on reservoir cap.

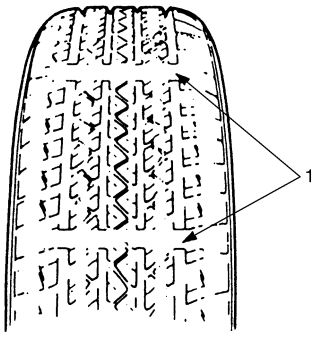


I4RS0B020006-01

Tires Inspection

S7N20A0206029

1) Check tires for uneven or excessive wear, or damage. If defective, replace.
   Refer to “Irregular and/or Premature Wear Description in Section 2D” and “Wear Indicators Description in Section 2D” for details.



I2RH01020022-01

1. Wear indicator

2) Check inflating pressure of each tire and adjust pressure to specification as necessary.

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 came with the vehicle.**

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

Wheel Discs Inspection

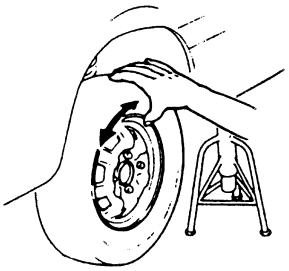
S7N20A0206030

Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.

Wheel Bearing Inspection

S7N20A0206031

1) Check front wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to “Front Wheel Hub, Disc, Nut and Bearing Check in Section 2B”.
2) Check rear wheel bearing for wear, damage, abnormal noise or rattles. For details, refer to “Rear Wheel Disc, bolt and Bearing Inspection in Section 2C”.

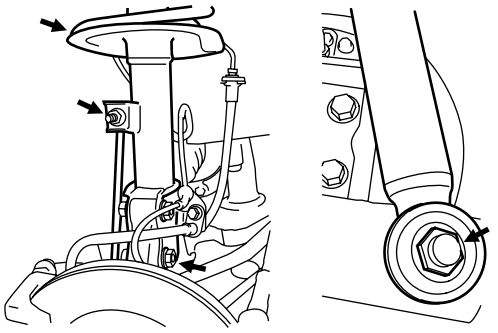


I2RH01020023-01

Suspension System Inspection

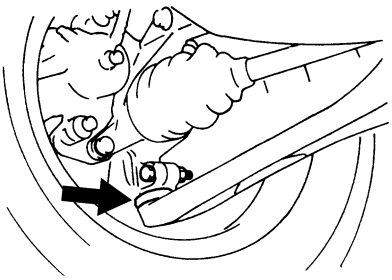
S7N20A0206032

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



I4RS0A020011-01

- Check front suspension arm ball joint stud dust seals for leakage, detachment, tear or any other damage. Replace defective boot, if any.



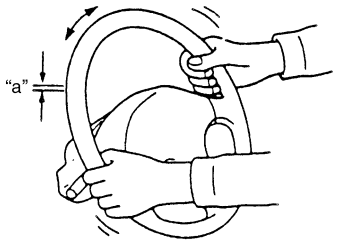
I4RS0A020012-01

Steering System Inspection

S7N20A0206033

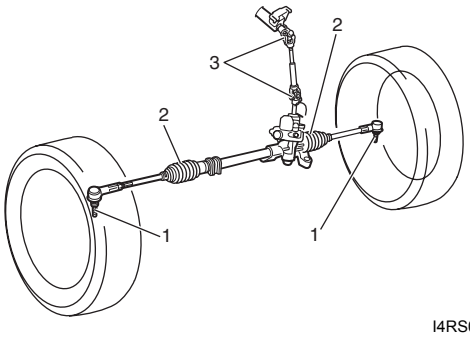
1) Check steering wheel for play and rattle, holding vehicle straight on ground.

   Steering wheel play
   "a": 0 – 30 mm (0 – 1.1 in.)



I2RH01020026-01

2) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
3) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.
4) Check boots (1) and (2) of steering linkage and steering gear case for damage (leak, detachment, tear, etc.). If damage is found, replace defective boot with new one.
   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 rattle and damage. If rattle or damage is found, replace defective part with a new one.



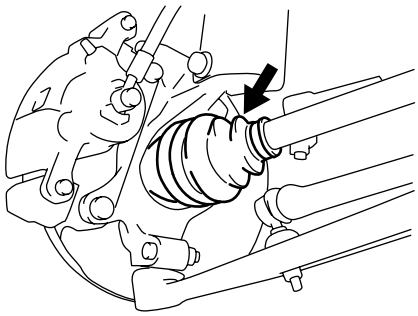
I4RS0B020007-01

6) Check that steering wheel can be turned fully to the right and left. Repair or replace defective parts, if any.
7) If equipped with power steering system, check also, in addition to check items, that steering wheel can be turned fully to the right and left more lightly when engine is running at idle speed than when it is stopped. Repair, if found faulty.
8) Check wheel alignment referring to "Front Wheel Alignment Inspection and Adjustment in Section 2B".

Drive Shaft (Axle) Boots Inspection

S7N20A0206034

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



I2RH01310001-01

Manual Transaxle Oil Inspection

S7N20A0206035

1) Inspect transaxle case for evidence of oil leakage. Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove oil filler/level plug of transaxle.
4) Check oil level.
   Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.
   If oil is found insufficient, pour specified oil up to level hole. For specified oil, refer to "Manual Transaxle Oil Change: M13A Model in Section 5B", "Manual Transaxle Oil Change: M15A and M16A Model in Section 5B" or "Manual Transaxle Oil Change: D13A and Z13DTJ Model in Section 5B".
5) Apply sealant to filler/level plug and tighten it to specified torque.

Manual Transaxle Oil Replacement

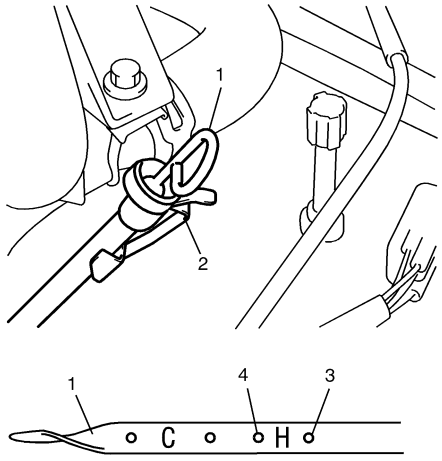
S7N20A0206036

1) Place the vehicle level and drain oil by removing drain plug.
2) Apply sealant to drain plug after cleaning it and tighten drain plug to specified torque.
3) Pour specified oil up to level hole.
4) Tighten filler plug to specified torque.
   For recommended oil, its amount and tightening torque data, refer to “Manual Transaxle Oil Change: M13A Model in Section 5B”, “Manual Transaxle Oil Change: M15A and M16A Model in Section 5B” or “Manual Transaxle Oil Change: D13A and Z13DTJ Model in Section 5B”.

Automatic Transaxle Fluid Level Inspection

S7N20A0206037

1) Inspect transaxle case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Pull out dipstick and check fluid level.
   For fluid level checking procedure, refer to “A/T Fluid Level Check in Section 5A” and be sure to perform it under specified conditions.
   If fluid level is low, replenish specified fluid.



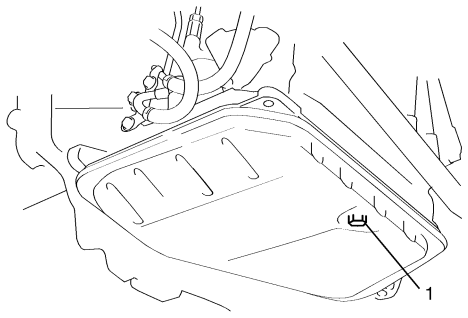
I4RS0A020016-01

1. Dipstick	3. FULL HOT mark
2. Clamp	4. LOW HOT mark

Automatic Transaxle Fluid Replacement

S7N20A0206038

1) Inspect transaxle case for evidence of fluid leakage. Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Change fluid. For its procedure, refer to “A/T Fluid Change in Section 5A”.



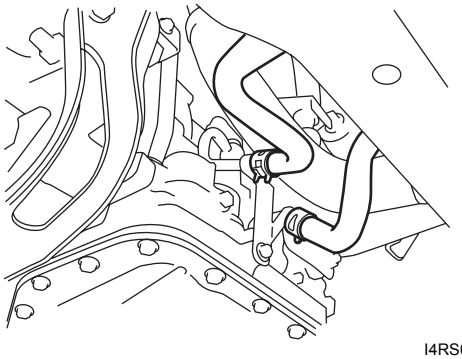
I4RS0A020017-01

1. Drain plug

Automatic Transaxle Fluid Cooler Hose Inspection

S7N20A0206039

Check automatic transaxle fluid cooler hose for fluid leakage, cracks, damage and deterioration.
Replace hose and/or clamp if any faulty condition is found.



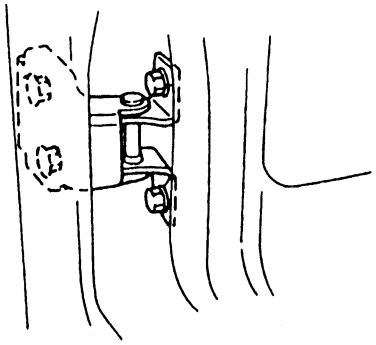
I4RS0A020020-01

All Latches, Hinges and Locks Inspection

S7N20A0206040

Doors

Check that each door of front, rear and back doors opens and closes smoothly and locks securely when closed.
If any malfunction is found, lubricate hinge and latch or repair door lock system.



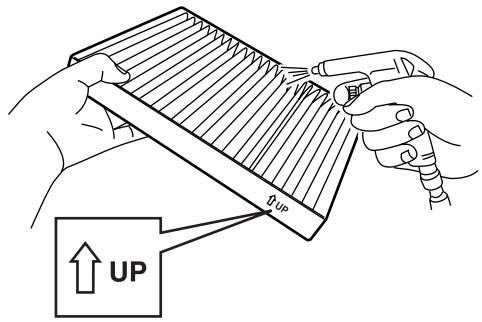
I2RH01020033-01

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.) Also check that hood opens and closes smoothly and properly and hood locks securely when closed.
If any malfunction is found, lubricate hinge and latch, or repair hood lock system.

Air Conditioning Filter (If Equipped) Inspection

S7N20A0206041

1) Remove the air conditioning filter from the HVAC unit referring to “Air Filter (If Equipped) Removal and Installation in Section 7A”.
2) Check for dirt and dust. If the air conditioning filter is excessively dirty, replace the air conditioning filter with the new one. If not, go to the next step.
3) Blow compressed air on the air outlet side of the air conditioning filter for removing dust.



I4RS0A020018-01

4) Install the air conditioning filter into the HVAC unit referring to “Air Filter (If Equipped) Removal and Installation in Section 7A”.

Air Conditioning Filter (If Equipped) Replacement

S7N20A0206042

Replace air conditioning filter with new one referring to “Air Filter (If Equipped) Removal and Installation in Section 7A”.

Final Inspection for Maintenance Service

S7N20A0206043

⚠ WARNING

When carrying out road tests, select a safe place where no man or no running vehicle is seen so as to prevent any accident.

Seats
Check that seat slides smoothly and locks securely at any position. Also check that reclining mechanism of front seat back allows it to be locked at any angle.

Seat Belt
Inspect belt system including webbing, buckles, latch plates, retractors and anchors for damage or wear.
Check that seat belt is securely locked. If “REPLACE BELT” label on front seat belt is visible, replace belt.

Battery Electrolyte Level Check
Check that the electrolyte level of all battery cells is between the upper and lower level lines on the case. If battery is equipped with built-in indicator, check battery condition by the indicator.

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

Engine Start
Check engine start for readiness.

⚠ WARNING

Before performing the following check, be sure to have enough room around the vehicle. Then, firmly apply both the parking brake and the regular brakes. Do not use the accelerator pedal. If the engine starts, be ready to turn off the ignition promptly. Take these precautions because the vehicle could move without warning and possibly cause personal injury or property damage.

On automatic transaxle vehicles, try to start the engine in each select lever position. The starting motor should crank only in “P” (Park) or “N” (Neutral).
On manual transaxle vehicles, place the shift lever in “Neutral,” depress clutch pedal fully and try to start.
On Automated Manual Transaxle vehicles, try to start the engine in each select lever position. The starting motor should crank only when select lever is in “N” (Neutral) and brake pedal is depressed.

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

Clutch (for Manual Transaxle)
Check for the following.

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

Gearshift or Select Lever (Transaxle)
Check gear shift or select lever for smooth shifting to all positions and for good performance of transaxle in any position.
With automatic transaxle or Automated Manual Transaxle equipped vehicle, also check that shift indicator indicates properly according to which position select lever is shifted to.
With automatic transaxle equipped vehicle, make sure that vehicle is at complete stop when shifting select lever to “P” range position and release all brakes.

Brake

Foot brake

Check the following:

- that brake pedal has proper travel,
- that brake works properly,
- that it is free from noise,
- that vehicle does not pull to one side when brake is applied.
- and that brake do not drag.

Parking brake

Check that lever has proper travel.

⚠ WARNING

With vehicle parked on a fairly steep slope, make sure nothing is in the way downhill to avoid any personal injury or property damage. Be prepared to apply regular brake quickly even if vehicle should start to move.

Check to ensure that parking brake is fully effective when the vehicle is stopped on the safe slope and brake lever is pulled all the way.

Steering

- Check to ensure that steering wheel is free from instability, or abnormally heavy feeling.
- Check that the vehicle does not wander or pull to one side.

Engine

- Check that engine responds readily at all speeds.
- Check that engine is free from abnormal noise and abnormal vibration.

Body, Wheels and Power Transmitting System

Check that body, wheels and power transmitting system are free from abnormal noise and abnormal vibration or any other abnormal condition.

Meters and Gauge

Check that speedometer, odometer, fuel meter, temperature gauge, etc. are operating accurately.

Lights

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 “HI” position for this check.

Specifications

Tightening Torque Specifications

S7N20A0207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Engine oil drain plug (Petrol Engine)	35	3.5	25.5	☞
Oil filter (Petrol Engine)	14	1.4	10.5	for reference ☞
Engine oil drain plug (Diesel Engine)	20	2.0	14.5	☞
Oil filter housing cover (Diesel Engine)	25	2.5	18.5	☞

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Fluids and Lubricants (Petrol Engine Model)

S7N20A0208001

Engine oil	SG, SH, SJ, SL or SM grade (Refer to “Engine Oil and Filter Change (Petrol Engine)” for engine oil viscosity.)
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	DOT 4 or SAE J1704
Manual transaxle oil	Refer to “Manual Transaxle Oil Change: M13A Model in Section 5B” or “Manual Transaxle Oil Change: M15A and M16A Model in Section 5B”.
Automatic transaxle fluid	Refer to “A/T Fluid Change in Section 5A”.
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

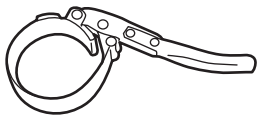
Recommended Fluids and Lubricants (Diesel Engine Model)

S7N20A0208002

Engine oil	Refer to “Engine Oil and Filter Change (Diesel Engine)” for engine oil grade and viscosity.
Engine coolant (Ethylene glycol base coolant)	“Antifreeze/Anticorrosion coolant”
Brake fluid	DOT 4 or SAE J1704
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	Engine oil or water resistance chassis grease
Key lock cylinder	Spray lubricant

Special Tool

S7N20A0208003

09915–47331 Oil filter wrench ☞ 	

Section 1

Engine

CONTENTS

Precautions

M13A / M15A / M16A

Precautions

Precautions for Engine

S7N20A1010001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

Precautions on Engine Service
Refer to “Precautions on Engine Service: M13A / M15A / M16A in Section 1A”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble: M13A / M15A / M16A in Section 1A”.

Precautions of ECM Circuit Inspection
Refer to “Precautions of ECM Circuit Inspection: M13A / M15A / M16A in Section 1A”.

Precautions on Fuel System Service
Refer to “Precautions on Fuel System Service: M13A / M15A / M16A in Section 1G”.

Precaution for CAN Communication System
Refer to “Precaution for CAN Communication System in Section 00”.

Precautions for Catalytic Converter
Refer to “Precautions for Catalytic Converter in Section 00”.

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service in Section 00”.

D13A / Z13DTJ

Precautions

Precautions for Engine

S7N20A1020001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

Precautions on Engine Service
Refer to “Precautions on Engine Service: D13A / Z13DTJ in Section 1A”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble: D13A / Z13DTJ in Section 1A”.

Precautions on Fuel System Service
Refer to “Precautions on Fuel System Service: D13A / Z13DTJ in Section 1G”.

Precaution for CAN Communication System
Refer to “Precaution for CAN Communication System in Section 00”.

Precautions for Catalytic Converter
Refer to “Precautions for Catalytic Converter in Section 00”.

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service in Section 00”.

Engine General Information and Diagnosis

M13A / M15A / M16A

Precautions

Precautions on Engine Service

S7N20A1110001

⚠ 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 can 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.

Precautions in Diagnosing Trouble

S7N20A1110002

- Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information (DTC, freeze frame data, etc.) stored in ECM memory. Such disconnection will erase memorized information in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool or OBD generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
  It is indistinguishable which module turns on MIL because not only ECM but also TCM (A/T or Automated Manual Transaxle model) turns on MIL (For details of on-board diagnostic system for A/T or Automated Manual Transaxle model, refer to "On-Board Diagnostic System Description in Section 5A" (A/T model) or "On-Board Diagnostic System Description in Section 5D" (Automated Manual Transaxle model). Therefore, check both ECM and TCM (A/T or Automated Manual Transaxle model) for DTC when MIL lights on.
  When checking ECM for DTC, keep in mind that DTC is displayed on the scan tool as follows depending on the scan tool used.
  - SUZUKI scan tool displays DTC detected by ECM.
  - OBD-II generic scan tool displays DTC detected by each of ECM and TCM (A/T or Automated Manual Transaxle model) simultaneously.
- Priorities for diagnosing troubles
  If two or more DTCs are stored, proceed to the DTC flow which has been detected earliest in the order and follow the instruction in that flow.
  If no instructions are given, troubleshoot DTCs according to the following priorities.
  a. DTCs other than DTC P0171 / P0172 (Fuel system too lean / too rich), DTC P0300 / P0301 / P0302 / P0303 / P0304 (Misfire detected) and DTC P0401 / P0402 (EGR flow malfunction)
  b. DTC P0171 / P0172 (Fuel system too lean / too rich) and DTC P0401 / P0402 (EGR flow malfunction)
  c. DTC P0300 / P0301 / P0302 / P0303 / P0304 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service in Section 00" before inspection and observe what is written there.
- ECM replacement:
  When substituting a known-good ECM, check for the following conditions. Neglecting this check may cause damage to a known-good ECM.
  - Resistance value of all relays, actuators is as specified respectively.
  - MAP sensor, A/C refrigerant pressure sensor (A/C model), accelerator pedal position (APP) sensor and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.
- Communication of ECM, BCM, ABS / ESP® control module, steering angle sensor (ESP® model), combination meter, keyless start control module and TCM is established by CAN (Controller Area Network). (For more detail of CAN communication for ECM, refer to "CAN Communication System Description: M13A / M15A / M16A"). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00".

- Immobilizer transponder code registration after replacing ECM
  When ECM is replaced with new one or with another one, make sure to register immobilizer transponder code to ECM correctly according to “Procedure after ECM Replacement: Petrol Model in Section 10C”.

Precautions of ECM Circuit Inspection

S7N20A1110003

- ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, when measuring circuit voltage, resistance and/or pulse signal at ECM connector, do not insert the tester’s probe into the sealed terminal at the harness side. When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to the ECM connectors. And, insert the tester’s probe into the special tool’s connectors at the harness side, and then measure voltage, resistance and/or pulse signal. Or, ECM and its circuits may be damaged by water.
- Wire colors of the special tool’s connectors are different from the ones of the ECM connectors. However, the circuit arrangement of the special tool’s connectors is same as the one of the ECM connectors. Therefore, measure circuit voltage and resistance by identifying the terminal location subject to the measurement.

Precautions of Electric Throttle Body System Calibration

S7N20A1110004

After performing any one of works described below, it is necessary to re-register the completely closed throttle valve reference position stored in memory of ECM. (For detailed information, refer to “Description of Electric Throttle Body System Calibration: M13A / M15A / M16A”.) For the procedure to register such data in ECM, refer to “Electric Throttle Body System Calibration: M13A / M15A / M16A in Section 1C”.

- To shut off backup power of ECM for such purposes of battery replacement and “RADIO” fuse removal
- To erase DTCs P0607, P0122, P0123, P0222, P0223, P2101, P2102, P2103, P2111, P2112, P2119, P2122, P2123, P2127, P2128, P2135 and/or P2138
- To replace ECM
- To replace throttle body and/or accelerator pedal position (APP) sensor assembly

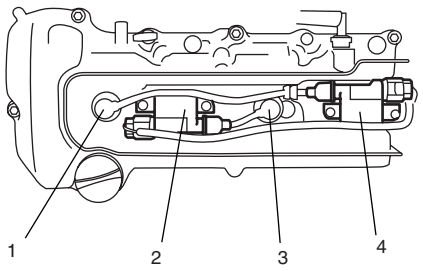
General Description

Statement on Cleanliness and Care

S7N20A1111001

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands 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 same 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 four cylinders of the engine are identified by numbers; No.1 (1), No.2 (2), No.3 (3) and No.4 (4) counted from crankshaft pulley side to flywheel side.



I3RM0A110001-01

Engine Diagnosis General Description

S7N20A1111002

This vehicle is equipped with an engine and emission control system which are under control of ECM.
The engine and emission control system in this vehicle are controlled by ECM. ECM has an On-Board Diagnostic 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 “On-Board Diagnostic System Description: M13A / M15A / M16A” and each item in “Precautions in Diagnosing Trouble: M13A / M15A / M16A” and execute diagnosis according to “Engine and Emission Control System Check: M13A / M15A / M16A”.

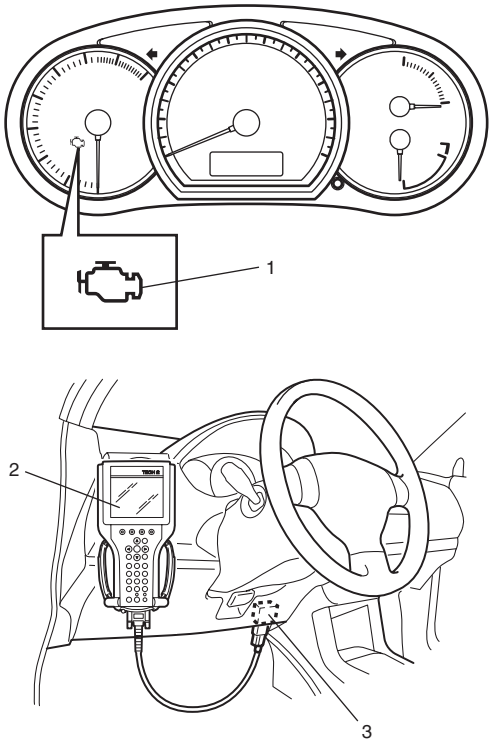
There is a close relationship between the engine mechanical, engine cooling system, ignition system, exhaust system, etc. and the engine and emission control system in their structure and operation. In case of an engine trouble, even when the malfunction indicator lamp (MIL) doesn't turn ON, it should be diagnosed according to "Engine and Emission Control System Check: M13A / M15A / M16A".

On-Board Diagnostic System Description

S7N20A1111003

ECM in this vehicle has the following functions.

- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) (1) turns ON to check the circuit of the malfunction indicator lamp (1).
- When ECM detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, it makes the malfunction indicator lamp (1) in the meter cluster of the instrument panel turn ON or flash (flashing only when detecting a misfire which can cause damage to the catalyst) and stores the malfunction area in its memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL (1) turn OFF although DTC stored in its memory will remain.)
- As a condition for detecting a malfunction in some areas in the system being monitored by ECM and turning ON the malfunction indicator lamp (1) due to that malfunction, 2 driving cycle detection logic is adopted to prevent erroneous detection.
- When a malfunction is detected, engine and driving conditions then are stored in ECM memory as freeze frame data. (For the details, refer to description on "Freeze Frame Data: M13A / M15A / M16A".)
- It is possible to communicate by using not only SUZUKI scan tool (2) but also OBD generic scan tool. (Diagnostic information can be accessed by using a scan tool.)



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3. DLC

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 and engine shutoff.

2 Driving Cycle Detection Logic

The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

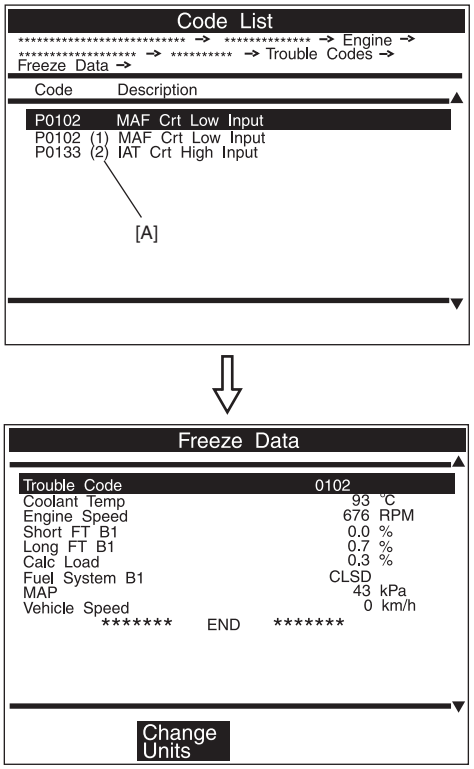
Pending DTC

Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

Freeze Frame Data

ECM stores the engine and driving conditions (in the form of data as shown in the figure) 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, where the vehicle was running or stopped, where 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 as each malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.



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[A]: 1st or 2nd in parentheses here represents which position in the order the malfunction is detected.

Priority of freeze frame data:

ECM has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described. (If malfunction as described in the upper square “1” is detected while the freeze frame data in the lower square “2” has been stored, the freeze frame data “2” will be updated by the freeze frame data “1”.)

Priority	Freeze frame data in frame 1
1	Freeze frame data at initial detection of malfunction among misfire detected (P0300 – P0304), fuel system too lean (P0171) and fuel system too rich (P0172)
2	Freeze frame data when a malfunction other than those in “1” is detected

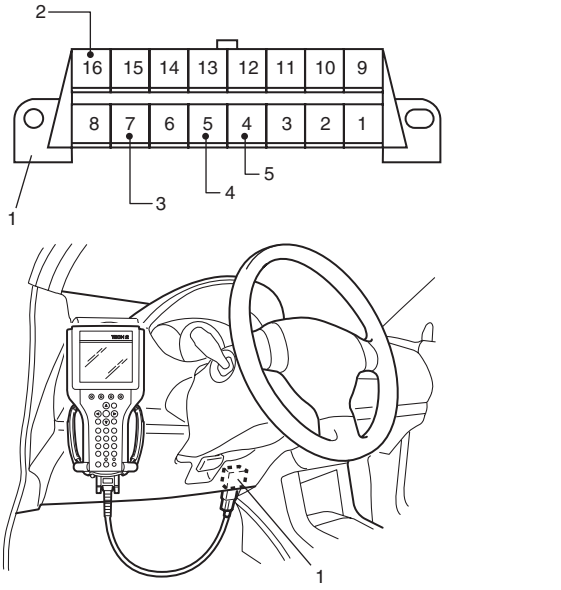
In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as each malfunction is detected. These data are not updated.

Shown in the table are examples of how freeze frame data are stored when two or more malfunctions are detected.

Malfunction detected order		Frame			
		Frame 1	Frame 2	Frame 3	Frame 4
		Freeze frame data to be updated	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
No malfunction		No freeze frame data			
1	P0401 (EGR) detected	Data at P0401 detection	Data at P0401 detection	—	—
2	P0171 (Fuel system) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	—
3	P0300 (Misfire) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0300 detection
4	P0301 (Misfire) detected	Data at P0171 detection	Data at P0401 detection	Data at P0171 detection	Data at P0300 detection

Freeze frame data clearance:
The freeze frame data is cleared at the same time as clearance of DTC.

Data Link Connector (DLC)
DLC (1) is in compliance with SAE J1962 in the shape of connector and pin assignment.
OBD serial data line (3) (K line of ISO 9141) is used for SUZUKI scan tool or OBD generic scan tool to communicate with ECM, Air bag SDM, immobilizer control module (in ECM), BCM (Body electrical Control Module), TCM (Transmission Control Module (A/T or Automated Manual Transaxle model)) and ABS control module.



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2.	B + (Unswitched vehicle battery positive)
4.	ECM ground (Signal ground)
5.	Vehicle body ground (Chassis ground)

Engine and Emission Control System Description

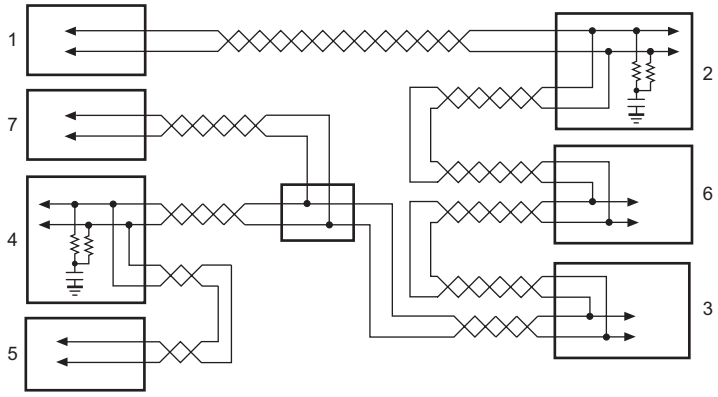
S7N20A1111004

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 EGR, EVAP and PCV system.

CAN Communication System Description

S7N20A1111005

ECM (2), TCM (1), BCM (3), ABS / ESP® control module (6), steering angle sensor (7), combination meter (4) and keyless start control module (5) of this vehicle communicate control data between each control module.
Communication of each control module is established by CAN (Controller Area Network) communication system.



I7N20A111001-01

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a function to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates control data with each control module as follows.

ECM Transmission Data

				TCM (A/T model)	TCM (Automated Manual Transaxle model)	BCM	ABS Control Module	ESP® Control Module	Combination Meter	Keyless Start Control Module
ECM	Transmit	DATA	Engine torque signal	○				○		
			Throttle position signal	○	○					
			Accelerator pedal position signal		○			○		
			Engine speed signal	○	○	○		○	○	
			Vehicle speed signal		○	○			○	○
			Engine coolant temperature signal	○	○	○			○	
			Brake pedal switch signal	○			○	○		
			Fuel consumption signal			○				
			MIL control signal						○	
			A/C refrigerant pressure signal			○				
			A/C compressor clutch signal	○		○				
			Immobilizer indicator light control signal						○	

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ECM Reception Data

				TCM (A/T model)	TCM (Automated Manual Transaxle model)	BCM	ABS Control Module	ESP® Control Module	Keyless Start Control Module
ECM	Receive	DATA	A/T selector position signal	○					
			Torque request signal	○				○	
			Actual gear position signal		○				
			A/C switch ON signal			○			
			Electric load signal			○			
			Wheel speed signal (front right)				○*	○*	
			Wheel speed signal (front left)				○*	○*	
			ABS indication signal				○	○	
			ESP® status signal					○	
			ECM-keyless start control module code						○

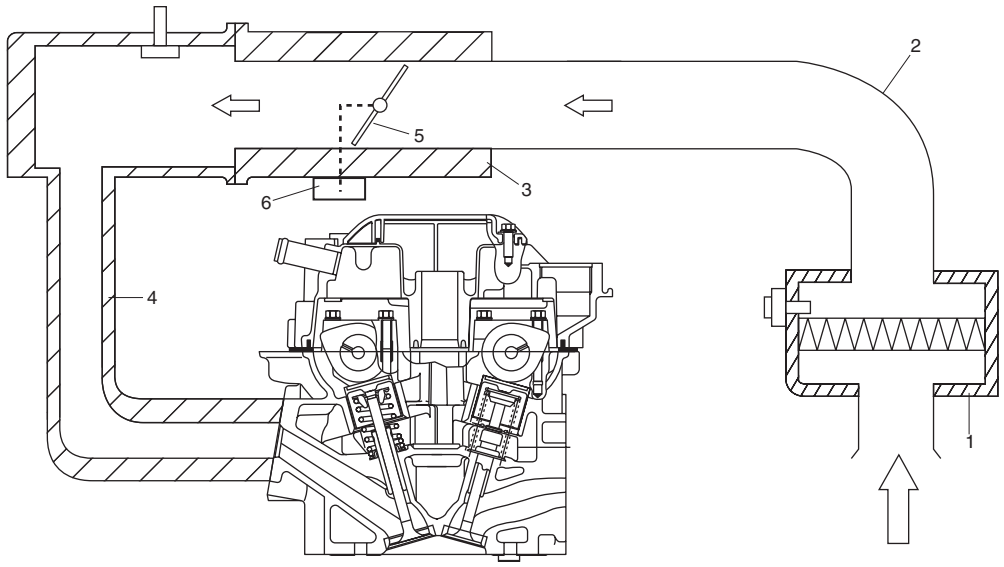
I7N20A111005-02

*: Only non-automated-manual-transaxle model

Air Intake System Description

S7N20A1111006

The main components of the air intake system are air cleaner (1), air cleaner outlet hose (2), electric throttle body (3), and intake manifold (4).
The air (by the amount corresponding to throttle valve (5) opening and engine speed) is filtered by the air cleaner, passes through the throttle body, 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 Body System Description: M13A / M15A / M16A”.)



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Electric Throttle Body System Description

S7N20A1111007

The Electric Throttle Body System consists of electric throttle body assembly, accelerator position (APP) sensor assembly, ECM and throttle actuator control relay.
Among them, assembly components are as follows.

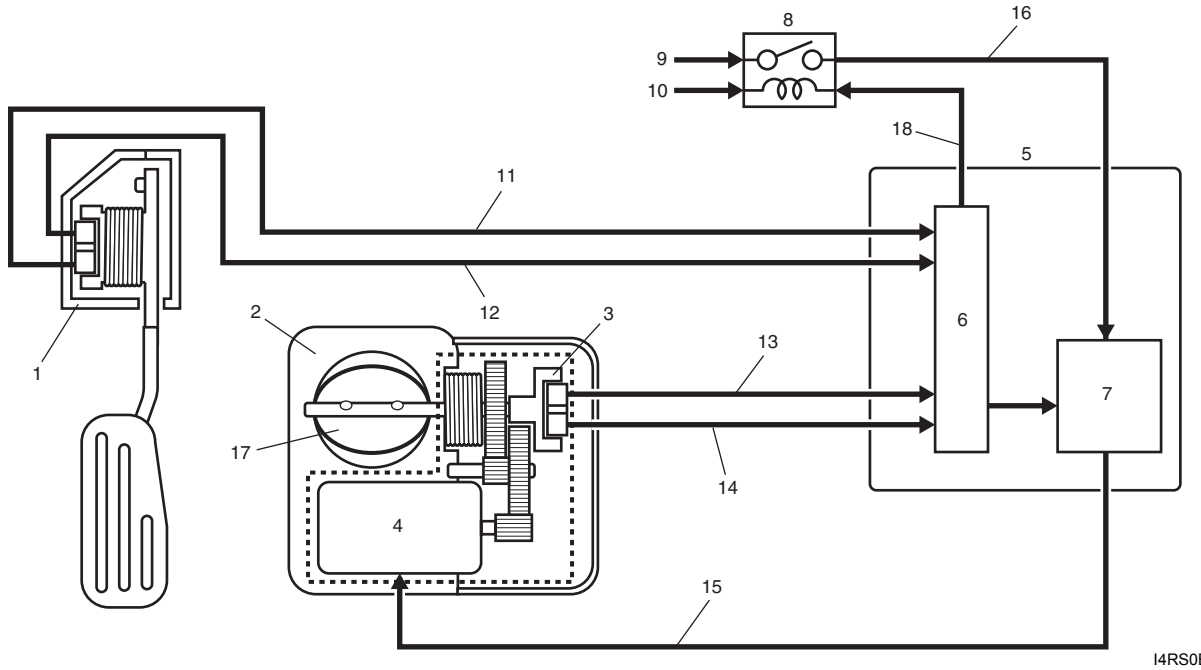
- Electric throttle body assembly: throttle valve, throttle actuator, 2 throttle position sensors
- Accelerator pedal position (APP) sensor assembly: Accelerator pedal, 2 accelerator position sensors

Operation Description

ECM (5) detects opening (depressed extent of pedal) of the accelerator pedal based on signal voltage of the accelerator pedal position (APP) sensor (1) and using that data and engine operation condition, it calculates the optimum throttle valve opening. On the other hand, it detects the throttle valve opening based on the signal voltage of the throttle position sensor (3) included in the throttle body (2) and compares it with the above calculated optimum throttle valve opening. When there is a difference between them, ECM controls the duty ratio (100% – 0%) according to this difference to drive the throttle actuator (motor) (4) included in the throttle body. When there is no difference, ECM controls the duty ratio to about 15% to maintain the throttle valve opening. In this way, the throttle valve (17) is opened and closed to achieve the optimum throttle valve opening.
In this system, as the throttle position sensor and accelerator pedal position (APP) sensor have 2 sensors (main and sub) each, highly accurate and highly reliable control and abnormality detection are assured. Also, when ECM detects an abnormality in the system, it turns off the throttle actuator control relay (8) to stop controlling the throttle actuator. When the throttle actuator control relay is turned off, the throttle valve is fixed at the specified opening below from its completely closed position (default opening) by the force of the return spring and open spring included in the throttle body.

This throttle body is not equipped with IAC valve for idle speed control. Idle speed control is done by the throttle actuator which opens/closes the throttle valve.

Throttle valve opening when throttle actuator control is OFF
M13A and M15A engines: Approx. 8°
M16A engine: Approx. 6°



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6. CPU	11. Accelerator pedal position (APP) sensor (main) signal	15. Drive signal of throttle actuator
7. Drive circuit of throttle actuator	12. Accelerator pedal position (APP) sensor (sub) signal	16. Power supply of throttle actuator
9. From “TH MOT” fuse	13. Throttle position sensor (main) signal	18. Control signal of throttle actuator control relay
10. From main relay	14. Throttle position sensor (sub) signal	

Description of Electric Throttle Body System Calibration

S7N20A1111008

ECM calculates controlled opening of the throttle valve on the basis of the completely closed throttle valve position of the electric throttle body 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 body 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 of Electric Throttle Body System Calibration: M13A / M15A / M16A” is performed.
Also, after replacement of the throttle body and/or accelerator pedal position (APP) sensor 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 Body System Calibration: M13A / M15A / M16A in Section 1C”. (After the completely closed position data is cleared, ECM, for the first time only, opens and closes the throttle valve for about 5 seconds after the ignition switch is turned ON position, 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 revolution speed immediately after start-up” may occur. However, turning OFF the ignition switch once and restarting will set correct registration.)

Fuel Cut Control Description

S7N20A1111009

The fuel cut control in the vehicle stop is added as follows in order to prevent the over-rev.

Fuel Cut Control Table (M13A / M15A)

Vehicle Condition	Operative Condition
Stop	• Engine r/min > 6,800 • Engine r/min > 4,000 for 180 seconds
Run	• Engine r/min > 6,800

Fuel Cut Control Table (M16A)

Vehicle Condition	Operative Condition
Stop	• Engine r/min > 7,500 • Engine r/min > 4,000 for 180 seconds
Run	• Engine r/min > 7,500

Generator Control System Description (M16A Engine)

S7N20A1111010

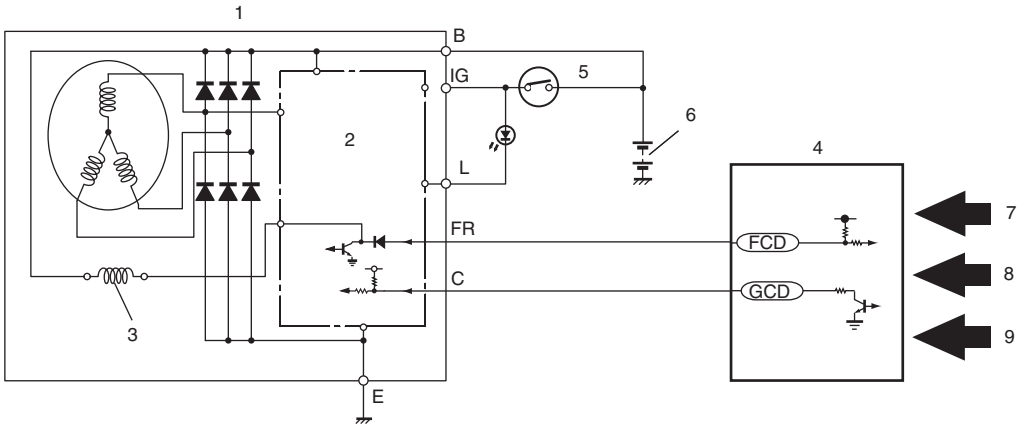
Generator Control System consists of a generator (1) and ECM (4).
ECM controls generated electricity (adjusting voltage of IC regulator (2)) so that it is suitable for the engine and electric load conditions. When the electric load increases quickly, generation load of the generator increases quickly and causes idling to change. To prevent this, ECM makes generated electricity volume vary gradually to stabilize idling. Also, it reduces the engine load caused by temporary increase in electricity generation to cope with the engine condition (such as when accelerating).

Operation

ECM controls the generated voltage of the generator using “C” terminal (generator control terminal) duty, based on following information.

- Engine condition (ECT, vehicle speed, engine speed, TP, etc.) (7)
- Battery voltage (ECM backup power voltage) (8)
- Electric load condition (blower motor, rear defogger, head lights, radiator fan, A/C, etc.) (9)
- “FR” terminal output (field coil (3) control duty) which indicates the operation rate (electricity generation condition) of the generator.

Then the generator uses “C” terminal duty to regulate the adjusting voltage of the IC regulator with the field coil control duty so as to control its generated voltage (“B” terminal output voltage).
(For more information of the generated voltage, refer to Charging System in Section 1J.)



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5. Ignition switch	6. Battery

Electronic Control System Description

S7N20A1111011

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, it is divided into the following sub systems:

- Fuel injection control system
- Ignition control system
- Electric Throttle Body Control System (electric throttle body model)
- Fuel pump control system
- Radiator cooling fan control system
- Evaporative emission control system
- EGR system
- Oxygen sensor heater control system
- A/C control system (A/C model)
- Camshaft position control system
- Immobilizer control system
- Controller (computer) communication system

Especially, ECM (Engine Control Module), BCM (Body electrical Control Module), ABS / ESP® control module, steering angle sensor (ESP® model), combination meter, TCM (Transmission Control Module (A/T or Automated Manual Transaxle model)) and keyless start control module (keyless start model) intercommunicate by means of CAN (Controller Area Network) communication.

Refer to “Engine and Emission Control System Flow Diagram: M13A / M15A / M16A” and “ECM Input / Output Circuit Diagram: M13A / M15A / M16A”.

Engine and Emission Control Input / Output Table

S7N20A1111012

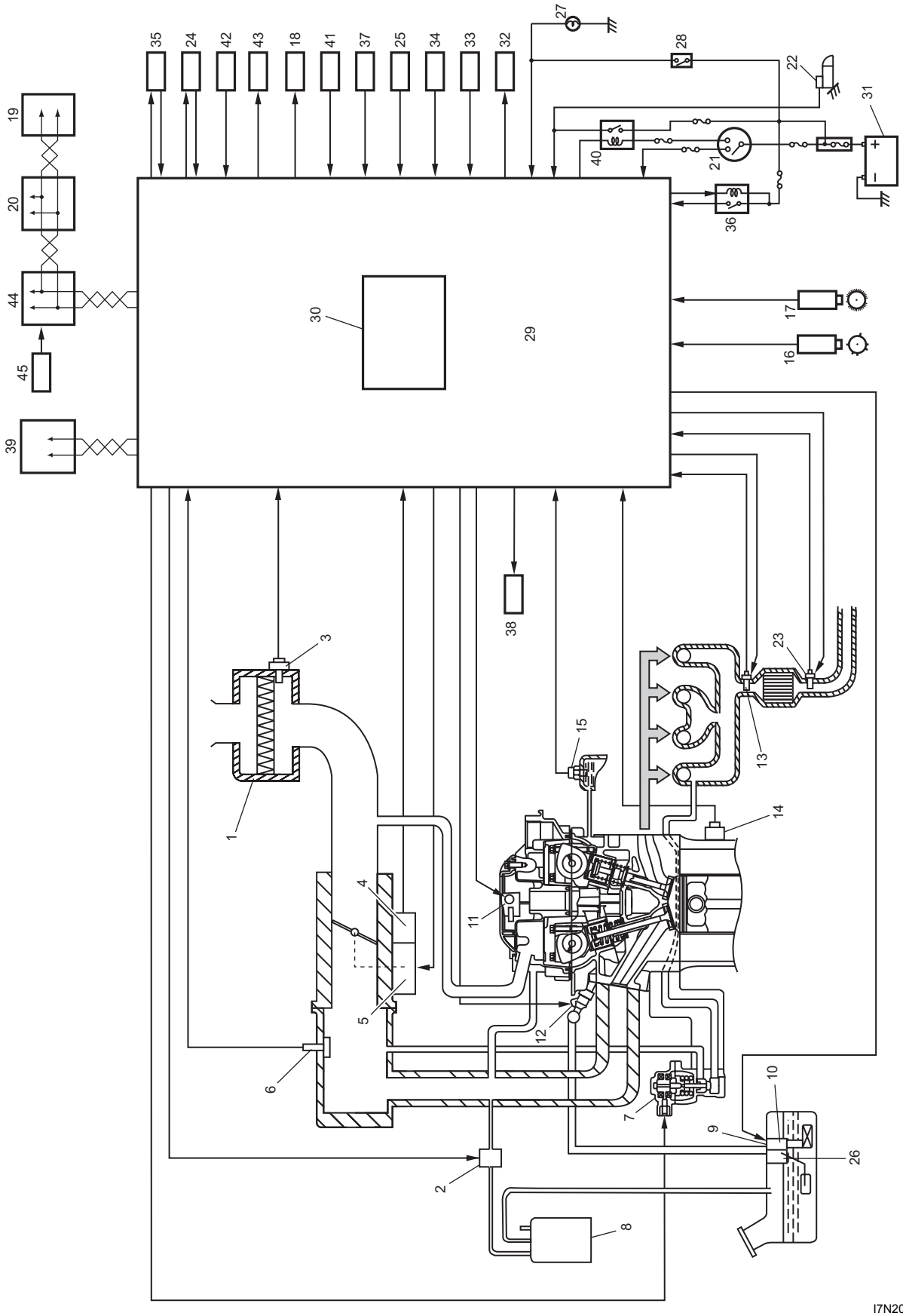
INPUT \ OUTPUT		ELECTRIC CONTROL DEVICE													
		FUEL PUMP RELAY	FUEL INJECTOR	HO2S HEATER	THROTTLE ACTUATOR	IGNITION COIL WITH IGNITER	EGR VALVE	EVAP CANISTER PURGE VALVE	A/C COMPRESSOR RELAY (A/C model)	RADIATOR COOLING FAN RELAY	MIL	MAIN RELAY	OIL CONTROL VALVE (VVT model)	THROTTLE ACTUATOR CONTROL RELAY
SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE	BAROMETRIC PRESSURE SENSOR		○		○	○	○	○			○			
	STOP LAMP SWITCH		○		○									
	START SWITCH	○	○		○	○			○					
	IGNITION SWITCH	○	○	○	○	○	○	○	○	○	○	○	○	○
	A/C REFRIGERANT PRESSURE SENSOR (A/C model)		○		○				○	○				
	BLOWER SWITCH				○				○					
	A/C SWITCH (A/C model)		○		○			○	○	○				
	A/C EVAP OUTLET AIR TEMP. SENSOR (A/C model)		○		○				○	○				
	VSS or WHEEL SPEED SENSOR		○	○	○	○	○	○	○	○	○		○	
	HEATED OXYGEN SENSOR-1		○					○			○			
	HEATED OXYGEN SENSOR-2		○								○			
	MAF SENSOR OF MAF AND IAT SENSOR		○	○	○	○	○	○			○		○	
	IAT SENSOR OF MAF AND IAT SENSOR		○		○	○	○	○			○		○	
	ECT SENSOR		○	○	○	○	○	○	○	○	○		○	
	TP SENSOR		○	○	○	○	○	○	○		○			○
	ACCELERATOR PEDAL POSITION (APP) SENSOR				○						○			○
	MAP SENSOR		○			○	○				○			
	CMP SENSOR		○			○					○		○	
	CKP SENSOR	○	○	○	○	○	○	○	○		○		○	
	KNOCK SENSOR					○					○			
	ABS / ESP® CONTROL MODULE				○									
	IMMOBILIZER CONTROL MODULE (in ECM)	○	○			○					○			
	TCM (Automated Manual Transaxle model)				○									

I7N20A111009-01

Schematic and Routing Diagram

Engine and Emission Control System Diagram

S7N20A1112001

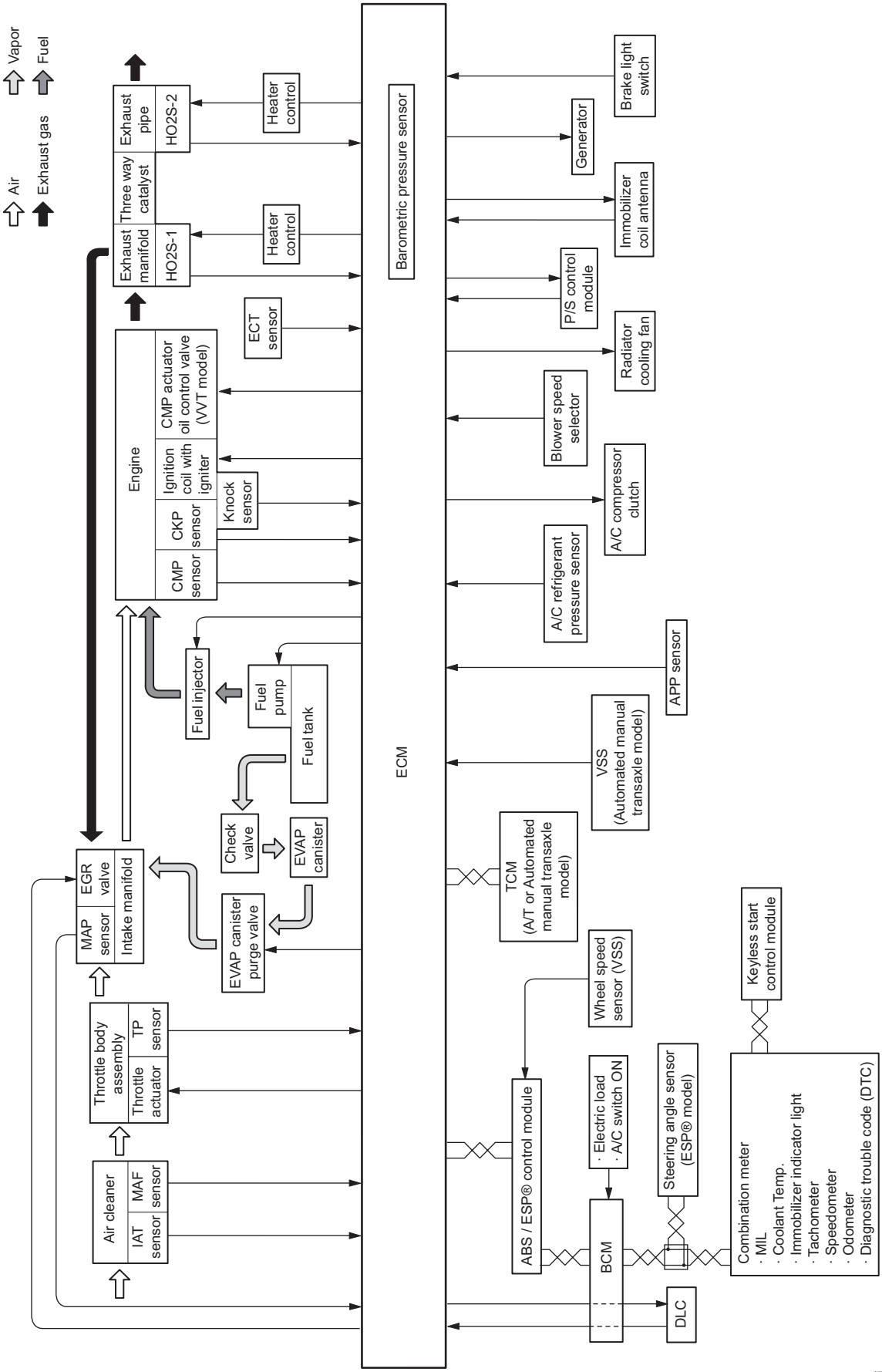


I7N20A111010-01

1. Air cleaner	16. CMP sensor	31. Battery
2. EVAP canister purge valve	18. Radiator cooling fan	32. A/C compressor relay (A/C model)
3. MAF and IAT sensor	19. Combination meter	33. A/C switch (A/C model)
4. TP sensor	20. BCM	34. A/C evaporator outlet air temp. sensor (A/C model)
5. Throttle actuator	21. Ignition switch	35. Immobilizer coil antenna
6. MAP sensor	22. Starter magnetic switch	36. Main relay
7. EGR valve	23. Heated oxygen sensor (HO2S)-2	37. VSS (automated manual transaxle model)
8. EVAP canister	24. DLC	38. Oil control valve (VVT model)
9. Tank pressure control valve (built-in fuel pump)	25. Electric load	39. TCM (A/T or Automated Manual Transaxle model)
10. Fuel pump (with pressure regulator)	26. Fuel level sensor	40. Starting motor control relay
11. Ignition coil assembly	27. Stop lamp	41. A/C refrigerant pressure sensor (A/C model)
12. Fuel injector	28. Stop lamp switch	42. Accelerator pedal position (APP) sensor
13. Heated oxygen sensor (HO2S)-1	29. ECM	43. Throttle actuator control relay
14. Knock sensor	30. Barometric pressure sensor	44. ABS / ESP® control module
15. ECT sensor	17. CKP sensor	45. Wheel speed sensor

Engine and Emission Control System Flow Diagram

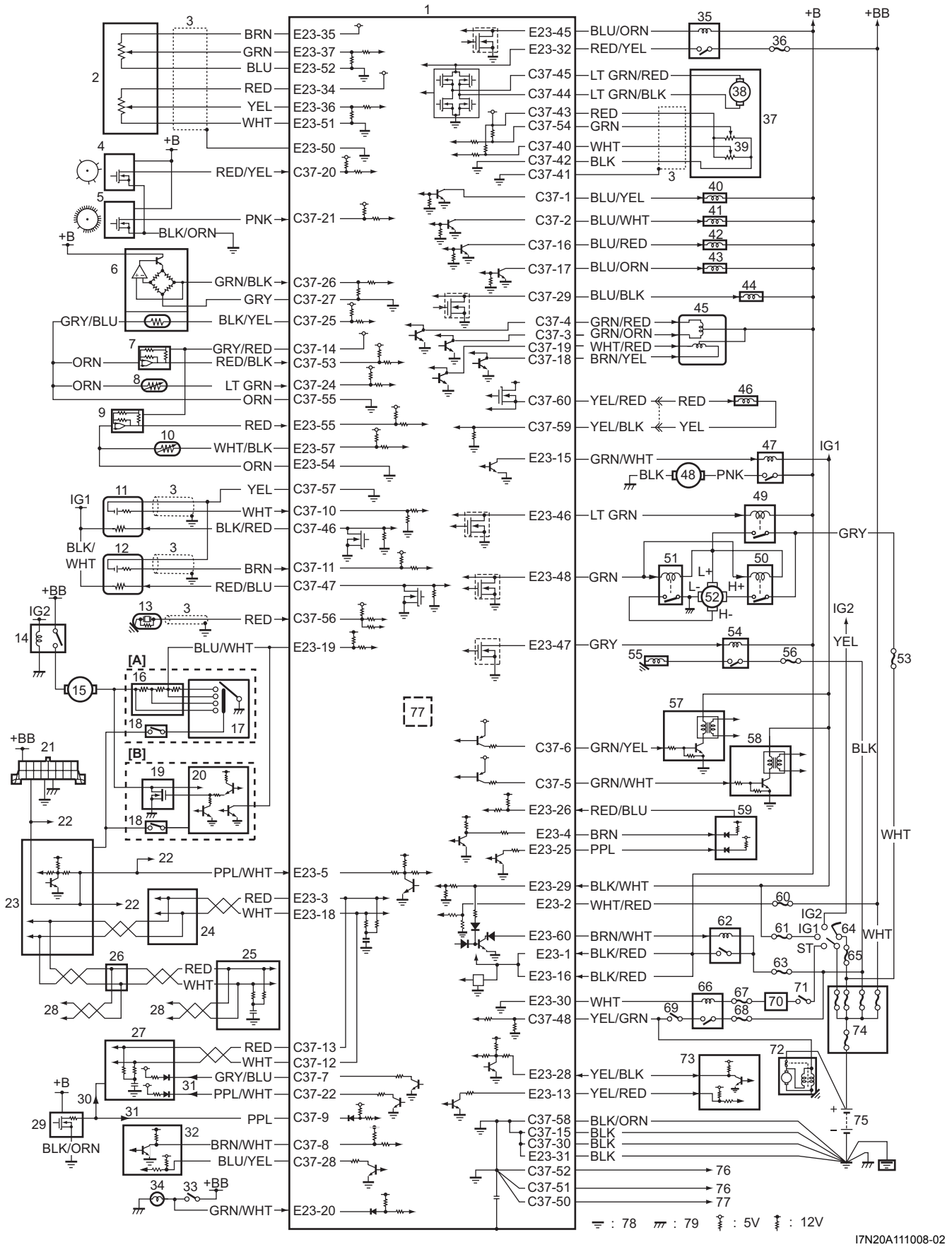
S7N20A1112002



I7N20A111006-01

ECM Input / Output Circuit Diagram

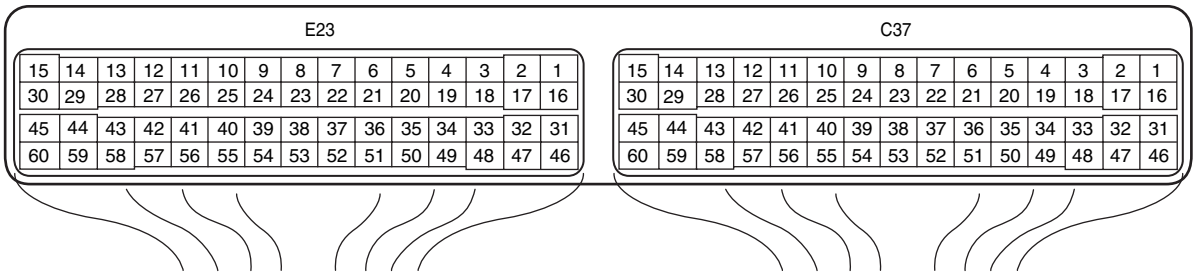
S7N20A1112003



[A]: Manual A/C model	26. CAN junction connector (ESP® model)	53. "RDTR FAN" fuse
[B]: Auto A/C model	27. TCM	54. A/C compressor relay

1. ECM	28. To other control module connected to CAN	55. Magnet clutch of A/C compressor
2. APP sensor assembly	29. VSS	56. “A/C COMP” fuse
3. Shield wire	30. Only for A/T model	57. Ignition coil assembly (for No.1 and No.4 spark plugs)
4. CMP sensor	31. Only for automated manual transaxle model	58. Ignition coil assembly (for No.2 and No.3 spark plugs)
5. CKP sensor	32. Generator (M16A engine)	59. P/S control module
6. MAF and IAT sensor	33. Brake light switch	60. “RADIO” fuse
7. MAP sensor	34. Brake light	61. “IG COIL” fuse
8. ECT sensor	35. Throttle actuator control relay	62. Main relay
9. A/C refrigerant pressure sensor	36. “TH MOT” fuse	63. “FI” fuse
10. A/C evaporator outlet air temperature sensor (Manual A/C model)	37. Electric throttle body assembly	64. Ignition switch
11. HO2S-1	38. Throttle actuator	65. “IG ACC” fuse
12. HO2S-2	39. Throttle position sensor	66. Starting motor control relay
13. Knock sensor	40. Injector No.1	67. “ST SIG” fuse
14. Blower motor relay	41. Injector No.2	68. “ST MOT” fuse
15. Blower motor	42. Injector No.3	69. Transmission range switch (A/T model)
16. Blower motor resistor	43. Injector No.4	70. TCM (Automated manual transaxle model)
17. Blower speed selector	44. EVAP canister purge valve	71. Neutral start switch (Automated manual transaxle model)
18. A/C switch	45. EGR valve	72. Starting motor
19. Blower motor controller	45. Oil control valve (Camshaft position control) (VVT model)	73. Immobilizer coil antenna
20. HVAC control module	47. Fuel pump relay	74. Main fuse box
21. Data link connector (DLC)	48. Fuel pump	75. Battery
22. To other control module connected to DLC via K-line	49. Radiator cooling fan relay No.1	76. Shield ground
23. BCM	50. Radiator cooling fan relay No.2	77. Barometric pressure sensor
24. ABS / ESP® control module	51. Radiator cooling fan relay No.3	78. Engine ground
25. Combination meter	52. Radiator cooling fan motor	79. Body ground

Terminal Arrangement of ECM Coupler (Viewed from Harness Side)



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Connector: C37

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLU/YEL	Fuel injector No.1 output	31	—	—
2	BLU/WHT	Fuel injector No.2 output	32	—	—
3	GRN/ORN	EGR valve (stepper motor coil 2) output	33	—	—
4	GRN/RED	EGR valve (stepper motor coil 1) output	34	—	—
5	GRN/WHT	Ignition coil No.2 and No.3 output	35	—	—
6	GRN/YEL	Ignition coil No.1 and No.4 output	36	—	—
7	GRY/BLU	Engine revolution signal output for TCM (Automated manual transaxle model)	37	—	—
8	BRN/WHT	Generator field coil monitor signal (M16A engine)	38	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
9	PPL	Vehicle speed sensor signal (Automated manual transaxle models)	39	—	—
10	WHT	Oxygen signal of heated oxygen sensor-1	40	WHT	Throttle position sensor (sub) signal
11	BRN	Oxygen signal of heated oxygen sensor-2	41	—	Ground for shield wire of TP sensor circuit
12	WHT	CAN (low) communication line (active low signal) to TCM (A/T and automated manual transaxle models)	42	BLK	Ground for throttle position sensor
13	RED	CAN (high) communication line (active high signal) to TCM (A/T and automated manual transaxle models)	43	RED	Output for 5 V power source of throttle position sensor
14	GRY/RED	Output of 5 V power source for MAP sensor and A/C refrigerant pressure sensor (A/C model)	44	LT GRN/BLK	Output of throttle actuator
15	BLK	Ground for ECM	45	LT GRN/RED	Output of throttle actuator
16	BLU/RED	Fuel injector No.3 output	46	BLK/RED	Heater output of heated oxygen sensor-1
17	BLU/ORN	Fuel injector No.4 output	47	RED/BLU	Heater output of heated oxygen sensor-2
18	BRN/YEL	EGR valve (stepper motor coil 4) output	48	YEL/GRN	Starting motor signal
19	WHT/RED	EGR valve (stepper motor coil 3) output	49	—	—
20	RED/YEL	CMP sensor signal	50	—	Ground of ECM for shield wire
21	PNK	CKP sensor signal	51	—	Ground of ECM for shield wire
22	PPL/WHT	Vehicle speed signal output for TCM (Automated manual transaxle model)	52	—	Ground of ECM for shield wire
23	—	—	53	RED/BLK	Manifold absolute pressure (MAP) sensor signal
24	LT GRN	Engine coolant temp. (ECT) sensor signal	54	GRN	Throttle position sensor (main) signal
25	BLK/YEL	Intake air temp. (IAT) sensor signal	55	ORN	Ground for sensors
26	GRN/BLK	Mass air flow (MAF) sensor signal	56	RED	Knock sensor signal
27	GRY	Ground for MAF sensor	57	YEL	Ground for sensors
28	BLU/YEL	Generator control signal output (M16A engine)	58	BLK/ORN	Ground for ECM
29	BLU/BLK	EVAP canister purge valve output	59	YEL/BLK	Oil control valve ground (VVT model)
30	BLK	Ground for ECM	60	YEL/RED	Oil control valve output (VVT model)

Connector: E23

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
1	BLK/RED	Main power supply	31	BLK	Ground for ECM
2	WHT/RED	Power source for ECM internal memory	32	RED/YEL	Power supply of throttle actuator drive circuit
3	RED	CAN communication line (active high signal) for ABS / ESP® control module, BCM, combination meter	33	—	—

Terminal	Wire color	Circuit	Terminal	Wire color	Circuit
4	BRN	Engine revolution signal output for P/S control module	34	RED	Output for 5 V power source of accelerator pedal position (APP) sensor (sub)
5	PPL/WHT	12 V serial communication line of data link connector	35	BRN	Output for 5 V power source of accelerator pedal position (APP) sensor (main)
6	—	—	36	YEL	Accelerator pedal position (APP) sensor (sub) signal
7	—	—	37	GRN	Accelerator pedal position (APP) sensor (main) signal
8	—	—	38	—	—
9	—	—	39	—	—
10	—	—	40	—	—
11	—	—	41	—	—
12	—	—	42	—	—
13	YEL/RED	Clock signal for immobilizer coil antenna	43	—	—
14	—	—	44	—	—
15	GRN/WHT	Fuel pump relay output	45	BLU/ORN	Throttle actuator control relay output
16	BLK/RED	Main power supply	46	LT GRN	Radiator cooling fan relay No.1 output
17	—	—	47	GRY	A/C compressor relay output (A/C model)
18	WHT	CAN communication line (active low signal) for ABS / ESP®, control module BCM, combination meter	48	GRN	Radiator cooling fan relay No.2 and No.3 output
19	BLU/WHT	Electric load signal for heater blower motor	49	—	—
20	GRN/WHT	Stop lamp switch signal	50	—	Ground for shield wire of accelerator pedal position (APP) sensor
21	—	—	51	WHT	Ground for accelerator pedal position (APP) sensor (sub) signal
22	—	—	52	BLU	Ground for accelerator pedal position (APP) sensor (main) signal
23	—	—	53	—	—
24	—	—	54	ORN	Ground for sensors
25	PPL	Vehicle speed signal output for P/S control module	55	RED	A/C refrigerant pressure sensor signal (A/C model)
26	RED/BLU	P/S signal	56	—	—
27	—	—	57	WHT/BLK	A/C evaporator outlet air temp. sensor signal (Manual A/C model)
28	YEL/BLK	Serial communication line for immobilizer coil antenna	58	—	—
29	BLK/WHT	Ignition switch signal	59	—	—
30	WHT	Ground for starting motor relay	60	BRN/WHT	Main power supply relay output

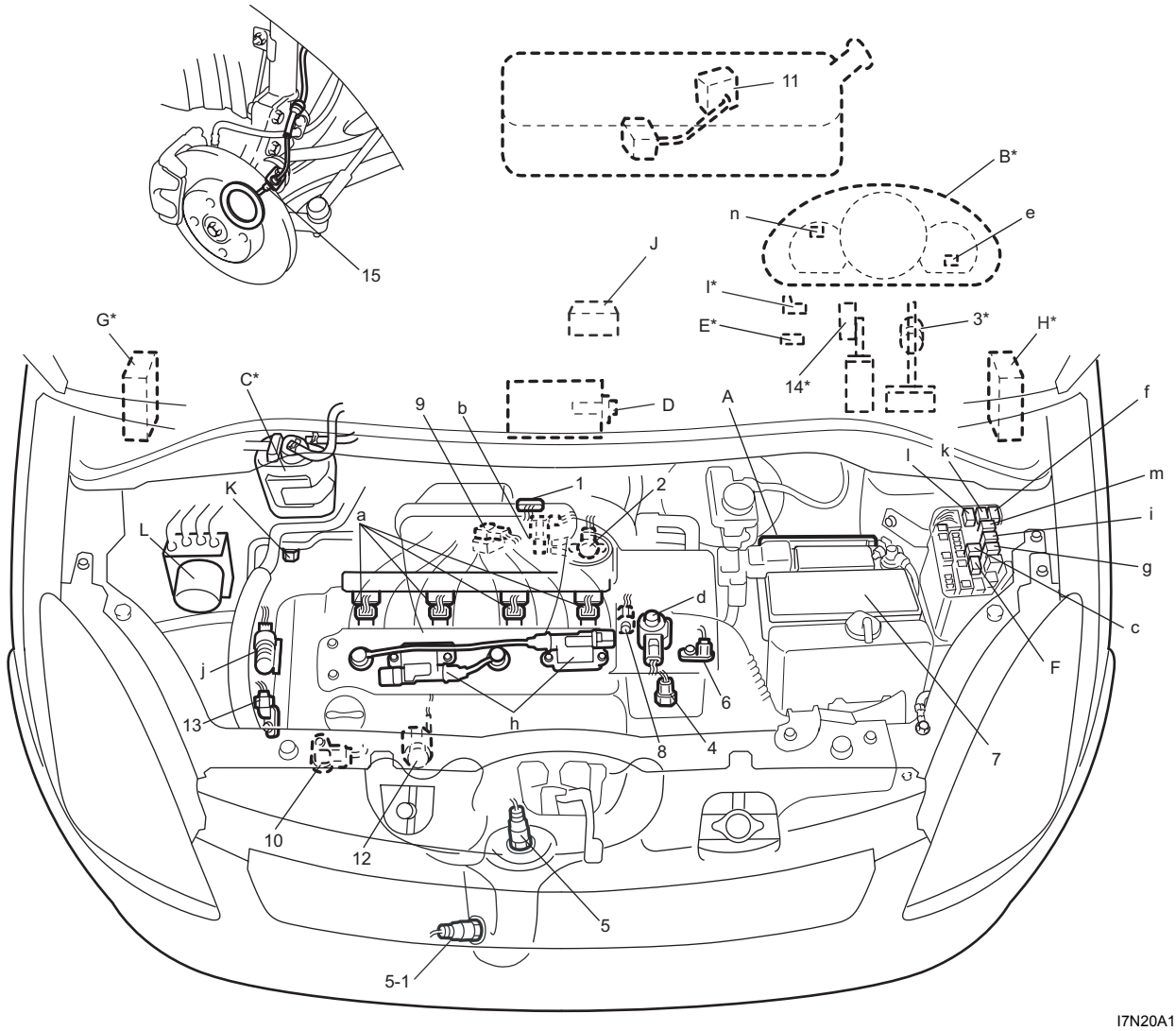
Component Location

Electronic Control System Components Location

S7N20A1113001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



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Information sensors	Control devices	Others
1. MAF and IAT sensor	a: Fuel injector	A: ECM
2. Electric throttle body assembly (built-in throttle position sensor and throttle actuator)	b: EVAP canister purge valve	B: Combination meter
3. Stop lamp switch	c: Fuel pump relay	C: EVAP canister
4. ECT sensor	d: EGR valve	D: A/C evaporator outlet air temp. sensor (A/C model)
5. Heated oxygen sensor-1	e: Malfunction indicator lamp	E: Data link connector
5-1. Heated oxygen sensor-2	f: Radiator cooling fan relay No.1	F: A/C compressor relay (A/C model)
6. VSS (automated manual transaxle model)	g: Throttle actuator control relay	G: TCM (A/T or automated manual transaxle model)
7. Battery	h: Ignition coil assembly (with ignitor)	H: BCM (included in junction block assembly)
8. CMP sensor (VVT model)	i: Main relay	I: Immobilizer coil antenna
9. MAP sensor	j: Oil control valve (VVT model)	J: P/S control module
10. CKP sensor	k: Radiator cooling fan relay No.2	K: A/C refrigerant pressure sensor (A/C model)
11. Fuel level sensor	l: Radiator cooling fan relay No.3	L: ABS / ESP® control module
12. Knock sensor	m: Starting motor control relay	
13. CMP sensor (Non-VVT model)	n: Immobilizer indicator lamp	

Information sensors	Control devices	Others
14. Accelerator pedal position (APP) sensor		
15. Wheel speed sensor		

Diagnostic Information and Procedures

Engine and Emission Control System Check

S7N20A1114001

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 "Customer Complaint Analysis". *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 (including pending DTC) referring to "DTC / Freeze Frame Data Check, Record and Clearance". *Is there any DTC(s)?*	Print DTC and freeze frame data or write them down and clear them by referring to "DTC Clearance: M13A / M15A / M16A", and go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection referring to "Visual Inspection". *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection referring to "Visual Inspection". *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom referring to "Trouble Symptom Confirmation". *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / Freeze frame data** 1) Recheck for DTC and freeze frame data referring to "DTC Check: M13A / M15A / M16A". *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 referring to "DTC Check: M13A / M15A / M16A". *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **Engine basic inspection and engine symptom diagnosis** 1) Check and repair according to "Engine Basic Inspection: M13A / M15A / M16A" and "Engine Symptom Diagnosis: M13A / M15A / M16A". *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC diag. flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.

Step	Action	Yes	No
10	☞ **Intermittent problems check** 1) Check for intermittent problems referring to “Intermittent Problems Check”. *Is there any faulty condition?*	Repair or replace malfunction 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 “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.

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 at (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall when** ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ 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

Malfunction indicator lamp condition	☐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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NOTE

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

Step 2: DTC / Freeze Frame Data Check, Record and Clearance
First, check DTC (including pending DTC), referring to "DTC Check: M13A / M15A / M16A". If DTC is indicated, print it and freeze frame data or write them down and then clear them by referring to "DTC Clearance: M13A / M15A / M16A". DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, check the symptom in question according to Step 5 and recheck DTC according to Step 6 and 7.
Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

Step 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 referring to "Visual Inspection: M13A / M15A / M16A".

Step 5: Trouble Symptom Confirmation
Based on information obtained in "Step 1: Customer Complaint Analysis: M13A / M15A / M16A" and "Step 2: DTC / Freeze Frame Data Check, Record and Clearance: M13A / M15A / M16A", confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each DTC diag. flow.

Step 6 and 7: Rechecking and Record of DTC / Freeze Frame Data
Refer to "DTC Check: M13A / M15A / M16A" for checking procedure.

Step 8: Engine Basic Inspection and Engine Symptom Diagnosis
Perform basic engine check according to "Engine Basic Inspection: M13A / M15A / M16A" first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to "Engine Symptom Diagnosis: M13A / M15A / M16A" and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

Step 9: Troubleshooting for DTC (See each DTC Diag. Flow)
Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM or other part and repair or replace faulty parts.

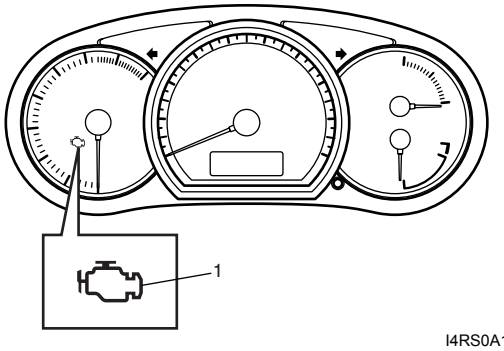
Step 10: Intermittent Problems Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent and Poor Connection Inspection in Section 00" and related circuit of DTC recorded in Step 2.

Step 11: Final Confirmation Test
Confirm that the problem symptom has gone and the engine 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.

Malfunction Indicator Lamp (MIL) Check

S7N20A1114002

1) Turn ON ignition switch (with engine at stop) and check that MIL (1) lights.
   If MIL does not light up (or MIL dims) but engine can be starting, go to "Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started): M13A / M15A / M16A" for troubleshooting.
   If MIL does not light with ignition switch ON and engine does not start though it is cranked up, go to "ECM Power and Ground Circuit Check: M13A / M15A / M16A".
2) Start engine and check that MIL turns OFF.
   If MIL remains ON and no DTC is stored in ECM, go to "Malfunction Indicator Lamp Remains ON after Engine Starts: M13A / M15A / M16A" for troubleshooting.



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DTC Check

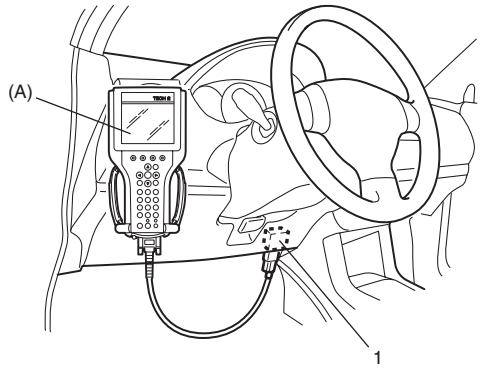
S7N20A1114003

NOTE

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each ECM and TCM stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the ECM and TCM for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the ECM and TCM needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time.

1) Prepare OBD generic scan tool or SUZUKI scan tool.
2) With ignition switch turned OFF, connect it to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



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3) Turn ignition switch ON and confirm that MIL lights.
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 not possible, check if scan tool is communicable by connecting it to ECM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible. If connector and circuit are OK, check that power supply and ground circuits of ECM and DLC are in good condition referring to "ECM Power and Ground Circuit Check: M13A / M15A / M16A".
5) After completing the check, turn ignition switch OFF and disconnect scan tool from data link connector.

DTC Clearance

S7N20A1114004

1) Connect OBD generic scan tool or SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch OFF and then ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

NOTE

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

- **When power to ECM is cut off (by disconnecting battery cable, removing fuse or disconnecting ECM connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles. (See "Warm-Up Cycle" of "On-Board Diagnostic System Description: M13A / M15A / M16A".)**

DTC Table

S7N20A1114005

NOTE

- **With the generic scan tool, only star (*) marked DTC No. in the following table can be read.**
- **1 driving cycle: MIL lights up when DTC is detected during 1 driving cycle.**
- **2 driving cycles: MIL lights up when the same DTC is detected also in the next driving cycle after DTC is detected and stored temporarily in the first driving cycle.**
- ***2 driving cycles:**
  MIL blinks or lights up. Refer to "DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected: M13A / M15A / M16A" for details.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0010	Camshaft position actuator circuit (VVT model)	Oil control valve circuit open or short.	1 driving cycle
☞ *P0011	Camshaft position – timing over-advanced or system performance (VVT model)	Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding.	2 driving cycles
☞ *P0012	Camshaft position – timing over-retarded (VVT model)		2 driving cycles
☞ *P0031	HO2S heater control circuit low (Sensor-1)	Heater current is less than specification while heater ON.	2 driving cycles
☞ *P0032	HO2S heater control circuit high (Sensor-1)	Heater current is more than specification while heater ON.	2 driving cycles
☞ *P0037	HO2S heater control circuit low (Sensor-2)	Heater current is less than specification while heater ON.	2 driving cycles
☞ *P0038	HO2S heater control circuit high (Sensor-2)	Heater current is more than specification while heater ON.	2 driving cycles
☞ *P0101	Mass air flow circuit range/ performance	MAF sensor volume is more than specification or less than specification.	2 driving cycles
☞ *P0102	Mass air flow circuit low input	Output voltage of MAF sensor is less than specification.	1 driving cycle
☞ *P0103	Mass air flow circuit high input	Output voltage of MAF sensor is more than specification.	1 driving cycle
☞ *P0106	Manifold absolute pressure circuit range/performance	Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than specification or difference between barometric pressure value and manifold pressure value is less than specification	2 driving cycles
☞ *P0107	Manifold absolute pressure circuit low input	Output voltage of MAP sensor is less than specification.	1 driving cycle
☞ *P0108	Manifold absolute pressure circuit high input	Output voltage of MAP sensor is more than specification.	1 driving cycle
☞ *P0111	Intake air temperature sensor circuit range/performance	Variation of intake air temperature from engine start is less than specification.	2 driving cycles
☞ *P0112	Intake air temperature sensor circuit low	Circuit voltage of IAT sensor is less than specification.	1 driving cycle
☞ *P0113	Intake air temperature sensor circuit high	Circuit voltage of IAT sensor is more than specification.	1 driving cycle
☞ *P0116	Engine coolant temperature circuit range/performance	Engine coolant temperature is less than specified temperature for specified time from engine start.	2 driving cycles
☞ *P0117	Engine coolant temperature circuit low	Circuit voltage of ECT sensor is less than specification.	1 driving cycle
☞ *P0118	Engine coolant temperature circuit high	Circuit voltage of ECT sensor is more than specification.	1 driving cycle
☞ *P0122	Throttle position sensor (main) circuit low	Output voltage of throttle position sensor (main) is lower than specification.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0123	Throttle position sensor circuit high	Output voltage of TP sensor is more than specification.	1 driving cycle
☞ *P0131	O2 sensor (HO2S) circuit low voltage (Sensor-1)	Max. output voltage of HO2S-1 is less than specification.	2 driving cycles
☞ *P0132	O2 sensor (HO2S) circuit high voltage (Sensor-1)	Min. output voltage of HO2S-1 is more than specification.	2 driving cycles
☞ *P0133	O2 sensor (HO2S) circuit slow response (Sensor-1)	Response time of HO2S-1 output voltage between rich and lean is longer than specification.	2 driving cycles
☞ *P0134	O2 sensor (HO2S) circuit no activity detected (Sensor-1)	Output voltage of HO2S-1 is more than specification or less than specification. (or HO2S-1 circuit open or short)	2 driving cycles
☞ *P0137	O2 sensor (HO2S) circuit low voltage (Sensor-2)	Output voltage of HO2S-2 is less than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0138	O2 sensor (HO2S) circuit high voltage (Sensor-2)	Output voltage of HO2S-2 is more than specification while engine is idling after driving with high engine load and Max. output voltage of HO2S-2 minus Min. output voltage of HO2S-2 is less than specification.	2 driving cycles
☞ *P0140	O2 sensor (HO2S) circuit no activity detected (Sensor-2)	Output voltage of HO2S-2 is more than specification after warming up engine.	2 driving cycles
☞ *P0171	System too lean	Total fuel trim is larger than specification for specified time or longer. (Fuel trim toward rich side is large.)	2 driving cycles
☞ *P0172	System too rich	Total fuel trim is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.)	2 driving cycles
☞ *P0222	Throttle position sensor (sub) circuit low	Output voltage of throttle position sensor (sub) is lower than specification.	1 driving cycle
☞ *P0223	Throttle position sensor (sub) circuit high	Output voltage of throttle position sensor (sub) is higher than specification.	1 driving cycle
☞ *P0300	Random misfire detected	Misfire of such level as to cause damage to three way catalyst.	*2 driving cycles
☞ *P0301 / *P0302 / *P0303 / *P0304	Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 misfire detected Cylinder 4 misfire detected	Misfire of such level as to deteriorate emission but not to cause damage to three way catalyst.	*2 driving cycles
☞ *P0327	Knock sensor circuit low	Output voltage of knock sensor is less than specification.	1 driving cycle
☞ *P0328	Knock sensor circuit high	Output voltage of knock sensor is more than specification.	1 driving cycle
☞ *P0335	Crankshaft position sensor circuit	No signal of CKP sensor for specified time even if starting motor signal is input.	1 driving cycle
☞ *P0340	Camshaft position sensor circuit	CMP sensor pulse is out of specification.	1 driving cycle
☞ *P0401	Exhaust gas recirculation flow detected as insufficient	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is less than specification.	2 driving cycles
☞ *P0402	Exhaust gas recirculation flow detected as excessive	Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is more than specification.	2 driving cycles
☞ *P0403	Exhaust gas recirculation control circuit	Output voltage is different from output command with more than one pole out of 4 poles.	1 driving cycle
☞ *P0420	Catalyst system efficiency below threshold	Output waveforms of HO2S-1 and HO2S-2 are similar.	2 driving cycles
☞ *P0443	Evaporative emission system purge control valve circuit	Monitor signal of EVAP canister purge valve is different from command signal. (circuit open or shorted to ground)	2 driving cycles
☞ *P0480	Fan 1 (Radiator cooling fan) control circuit	Monitor signal of radiator cooling fan relay is different from command signal.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P0500	Vehicle speed sensor (VSS) malfunction	No VSS signal during fuel cut for specified time or longer, or VSS signal is not input even if vehicle is driving with more than specified engine speed and D-range (A/T model).	2 driving cycles
☞ P0532	A/C refrigerant pressure sensor circuit low	Output voltage of A/C refrigerant pressure sensor is less than specification.	—
☞ P0533	A/C refrigerant pressure sensor circuit high	Output voltage of A/C refrigerant pressure sensor is more than specification.	—
☞ *P0601	Internal control module memory check sum error	Data write error or check sum error.	1 driving cycle
☞ P0602	Control module programming error	Data programming error.	—
☞ *P0607	Control module performance	Data programming error.	1 driving cycle
☞ *P0616	Starter relay circuit low	Starter signal is low voltage even though engine is started with vehicle at stop.	2 driving cycles
☞ *P0617	Starter relay circuit high	Starter signal is high voltage for specified time while engine is running.	2 driving cycles
☞ P0620	Generator control circuit	Battery voltage is higher than specification even through generator control is maximum regulation, or battery voltage is lower than specification even through generator control is minimum regulation and electric load is less than 15 A.	—
☞ P0625	Generator field terminal circuit low	Generator field coil duty is 0% (high voltage) for more than specified time even through generator control is minimum regulation	—
☞ P0626	Generator field terminal circuit high	Generator field coil duty is 100% (low voltage) for more than specified time even through generator control is maximum regulation, or generator field coil duty is 100% (low voltage) when engine is starting.	—
☞ *P1510	ECM backup power supply malfunction	Backup power voltage is out of specification after starting engine.	1 driving cycle
☞ P1603	TCM trouble code detected	When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control and so on by TCM, this DTC is detected by ECM.	—
☞ *P1674	CAN communication (buss off error)	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	1 driving cycle
☞ *P1675	CAN communication (transmission error) (Automated manual transaxle model)	Transmission error of communication data for ECM is detected for longer than specified time continuously.	1 driving cycle
☞ *P1676	CAN communication (reception error for TCM)	Reception error of communication data for TCM is detected for longer than specified time continuously.	1 driving cycle
☞ P1678	CAN communication (reception error for BCM)	Reception error of communication data for BCM is detected for longer than specified time continuously.	—
☞ *P1685	CAN communication (reception error for ABS / ESP® control module)	Reception error of communication data for ABS / ESP® control module is detected for longer than specified time continuously.	1 driving cycle
☞ *P2101	Throttle actuator control motor circuit range/performance	Monitor signal of throttle actuator output (duty output) is inconsistent with throttle actuator control command.	1 driving cycle
☞ *P2102	Throttle actuator control motor circuit low	Power supply voltage of throttle actuator control circuit is lower than specification even if throttle actuator control relay turned on.	1 driving cycle
☞ *P2103	Throttle actuator control motor circuit high	Power supply voltage of throttle actuator control circuit is higher than specification even if throttle actuator control relay turned off.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting:)	MIL
☞ *P2111	Throttle actuator control system – stuck open	Throttle valve default opening is greater than specified value from complementary closed position when diagnosing throttle valve at ignition switch turned OFF.	1 driving cycle
☞ *P2112	Throttle actuator control system – stuck closed	Throttle valve default opening is smaller than specified value from complementary closed position when diagnosing throttle valve at ignition switch turned OFF.	1 driving cycle
☞ *P2119	Throttle actuator control throttle body range/performance	Difference between actual throttle valve opening angle and opening angle calculated by ECM is more than specification.	1 driving cycle
☞ *P2122	Pedal position sensor (main) circuit low input	Output voltage of pedal position sensor (main) is lower than specification.	1 driving cycle
☞ *P2123	Pedal position sensor (main) circuit high input	Output voltage of pedal position sensor (main) is higher than specification.	1 driving cycle
☞ *P2127	Pedal position sensor (sub) circuit low input	Output voltage of pedal position sensor (sub) is lower than specification.	1 driving cycle
☞ *P2128	Pedal position sensor (sub) circuit high input	Output voltage of pedal position sensor (sub) is higher than specification.	1 driving cycle
☞ *P2135	Throttle position sensor (main / sub) voltage correlation	Difference between the opening angle based on throttle position sensor (main) and the opening angle based on throttle position sensor (sub) is more than specification.	1 driving cycle
☞ *P2138	Pedal position sensor (main / sub) voltage correlation	Difference between the opening angle based on accelerator pedal position sensor (main) and the opening angle based on accelerator pedal position sensor (sub) is more than specification.	1 driving cycle
☞ *P2227	Barometric pressure circuit range/performance	Difference of barometric pressure value and intake manifold pressure value is more than specification at engine start.	2 driving cycles
☞ *P2228	Barometric pressure circuit low	Barometric pressure sensor voltage is less than specification.	1 driving cycle
☞ *P2229	Barometric pressure circuit high	Barometric pressure sensor voltage is more than specification.	1 driving cycle
P1614	Transponder response error	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
*P1615	ID code does not registered (keyless start model)	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
*P1616	Different registration ID codes (keyless start model)	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
*P1618	CAN communication error (reception error for keyless start control module) (keyless start model)	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
P1621	Immobilizer communication line error	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
P1622	EEPROM error	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
P1623	Unregistered transponder	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
P1625	Immobilizer antenna error	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
P1636	Immobilizer information registration failure	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle
P1638	Immobilizer information mismatched	Refer to “Diagnostic Trouble Code (DTC) Table: Petrol Model in Section 10C”.	1 driving cycle

For A/T Model

When using OBD generic scan tool, not only the previous star (*) marked ECM DTC(s) but also the following DTC(s) is displayed on OBD generic scan tool simultaneously.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
*P0705	Transmission range sensor circuit malfunction (PRNDL input)	Refer to “DTC Table in Section 5A”.
*P0707	Transmission range sensor circuit low	
*P0711	Transmission fluid temperature sensor circuit range/performance	
*P0712	Transmission fluid temperature sensor circuit low	
*P0713	Transmission fluid temperature sensor circuit high	
*P0717	Input / Turbine speed sensor circuit no signal	
*P0722	Output speed sensor circuit no signal	
*P0741	Torque converter clutch circuit performance or stuck off	
*P0742	Torque converter clutch circuit stuck on	
*P0751	Shift solenoid-A (No.1) performance or stuck off	
*P0752	Shift solenoid-A (No.1) stuck on	
*P0756	Shift solenoid-B (No.2) performance or stuck off	
*P0757	Shift solenoid-B (No.2) stuck on	
*P0787	Shift / Timing solenoid control circuit low	
*P0788	Shift / Timing solenoid control circuit high	
*P0961	Pressure control solenoid control circuit range/performance	
*P0962	Pressure control solenoid control circuit low	
*P0963	Pressure control solenoid control circuit high	
*P0973	Shift solenoid-A (No.1) control circuit low	
*P0974	Shift solenoid-A (No.1) control circuit high	
*P0976	Shift solenoid-B (No.2) control circuit low	
*P0977	Shift solenoid-B (No.2) control circuit high	
*P1702	Internal control module memory check sum error	
*P1774	Control module communication bus off	
*P1777	TCM lost communication with ECM (Reception error)	
*P2762	Torque converter clutch pressure control solenoid control circuit range / performance	
*P2763	Torque converter clutch pressure control solenoid control circuit high	
*P2764	Torque converter clutch pressure control solenoid control circuit low	

For Automated Manual Transaxle Model

When using OBD generic scan tool, not only the previous star (*) marked ECM DTC(s) but also the following DTC(s) is displayed on OBD generic scan tool simultaneously.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
*P0807	Clutch position sensor circuit low	Refer to “DTC Table in Section 5D”.
*P0808	Clutch position sensor circuit high	
*P0906	Gate select position circuit low	
*P0907	Gate select position circuit high	
*P0916	Gate shift position circuit low	
*P0917	Gate shift position circuit high	
*P1774	Control module communication bus off	
*P1777	TCM (Automated Manual Transaxle) lost communication with ECM	
*P1840	TCM (Automated Manual Transaxle) system voltage	
*P1856	Clutch position sensor “B” circuit low	
*P1857	Clutch position sensor “B” circuit high	
*P1858	Gate select position “B” circuit low	
*P1859	Gate select position “B” circuit high	
*P1882	Gate shift position circuit “B” low	
*P1883	Gate shift position circuit “B” high	

Fail-Safe Table

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When any of the following DTCs is detected, ECM enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when ECM detects normal condition after that.

DTC No.	Detected item	Fail-safe operation
☞ P0102	Mass air flow circuit low input	• ECM controls injector drive time (fuel injection volume) according to throttle valve opening (closed throttle position or not). • ECM stops EGR control.
☞ P0103	Mass air flow circuit high input	
☞ P0112	Intake air temperature sensor circuit low	ECM controls actuators assuming that intake air temperature is 20 °C (68 °F).
☞ P0113	Intake air temperature sensor circuit high	
☞ P0117	Engine coolant temperature circuit low	• ECM controls actuators assuming that engine coolant temperature is 80 °C (176 °F). • ECM operates radiator cooling fan.
☞ P0118	Engine coolant temperature circuit high	
☞ P0122	Throttle position sensor (main) circuit low	• ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Electric Throttle Body System Description: M13A / M15A / M16A”. • ECM controls fuel cut at specified engine speed. • ECM stops air/fuel ratio control.
☞ P0123	Throttle position sensor circuit high	• ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Electric Throttle Body System Description: M13A / M15A / M16A”. • ECM controls fuel cut at specified engine speed. • ECM stops air/fuel ratio control.
☞ P0222	Throttle position sensor (sub) circuit low	
☞ P0223	Throttle position sensor (sub) circuit high	
☞ P0335	Crankshaft position sensor circuit	• Ignition timing is fixed. • ECM changes injection control system from sequential injection to simultaneous one.
☞ P0340	Camshaft position sensor circuit	ECM changes injection control system from sequential injection to simultaneous one.
☞ P0500	Vehicle speed sensor	• ECM controls actuators assuming that vehicle speed is 0 km/h (0 mile/h). • ECM stops IAC feedback control.
☞ P2101	Throttle actuator control motor circuit range / performance	• ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System Calibration: M13A / M15A / M16A”. • ECM controls fuel cut at specified engine speed. • ECM stops air/fuel ratio control.
☞ P2102	Throttle actuator control motor circuit low	
☞ P2103	Throttle actuator control motor circuit high	ECM controls fuel cut at specified engine speed.

DTC No.	Detected item	Fail-safe operation
☞ P2111	Throttle actuator control system – stuck open	• ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System Calibration: M13A / M15A / M16A”. • ECM controls fuel cut at specified engine speed. • ECM stops air/fuel ratio control.
☞ P2112	Throttle actuator control system – stuck closed	
☞ P2119	Throttle actuator control throttle body range / performance	• ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Description of Electric Throttle Body System Calibration: M13A / M15A / M16A”. • ECM controls fuel cut at specified engine speed.
☞ P2122	Pedal position sensor (main) circuit low input	• ECM turns off throttle actuator control relay and throttle valve is fixed at the specified opening from its completely closed position (default opening). For details, refer to “Electric Throttle Body System Description: M13A / M15A / M16A”. • ECM controls fuel cut at specified engine speed. • ECM stops air/fuel ratio control.
☞ P2123	Pedal position sensor (main) circuit high input	
☞ P2127	Pedal position sensor (sub) circuit low input	
☞ P2128	Pedal position sensor (sub) circuit high input	
☞ P2135	Throttle position sensor (main) / (sub) voltage correlation	
☞ P2138	Pedal position sensor (main) / (sub) voltage correlation	
☞ P2227	Barometric pressure sensor performance problem	ECM controls actuators assuming that barometric pressure is 101.33 kPa (762 mmHg).

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 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, 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.

NOTE

- **With the generic scan tool, only star (*) marked data in the following table can be read.**
- **When checking the data with the engine running at idle or racing, be sure to shift M/T or Automated Manual Transaxle gear to the neutral gear position and A/T gear to the “Park” position and pull the parking brake fully. Also, if nothing or “no load” is indicated, turn OFF A/C (if equipped with A/C), all electric loads, P/S and all the other necessary switches.**

	Scan tool data	Vehicle condition	Normal condition / reference values
*	☞COOLANT TEMP (ENGINE COOLANT TEMP.)	At specified idle speed after warming up	80 – 100 °C, 176 – 212 °F
*	☞INTAKE AIR TEMP.	At specified idle speed after warming up	–5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp.
*	☞ENGINE SPEED	It idling with no load after warming up	Desired idle speed ± 50 rpm
	☞INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH)	At specified idle speed with no load after warming up	2.0 – 4.0 msec.
		At 2500 r/min. with no load after warming up	2.0 – 3.6 msec.

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞DESIRED IDLE (DESIRED IDLE SPEED)	It idling with radiator cooling fan stopped and all electrical parts turned OFF after warming up, M/T at neutral		700 rpm
	☞IAC THROTTLE OPENING (IDLE AIR CONTROL THROTTLE VALVE OPENING)	It idling with no load after warming up		5 – 55%
*	☞SHORT FT B1 (SHORT TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
*	☞LONG FT B1 (LONG TERM FUEL TRIM)	At specified idle speed after warming up		–20 – +20%
	☞TOTAL FUEL TRIM B1	At specified idle speed after warming up		–35 – +35%
*	☞MAF (MASS AIR FLOW RATE)	At specified idle speed with no load after warming up		1.0 – 4.0 g/s 0.14 – 0.52 lb/ min.
		At 2500 r/min. with no load after warming up		4.0 – 12.0 g/s 0.53 – 1.58 lb/ min.
*	☞CALC LOAD (CALCULATED LOAD VALUE) (M13A and M15A engines)	At specified idle speed with no load after warming up		0 – 10%
		At 2500 r/min. with no load after warming up		0 – 10%
	☞CALC LOAD (CALCULATED LOAD VALUE) (M16A engine)	At specified idle speed with no load after warming up		18 – 28%
		At 2500 r/min. with no load after warming up		13 – 23%
*	☞THROTTLE POSITION (ABSOLUTE THROTTLE POSITION)	Ignition switch ON / warmed up engine stopped	Accelerator pedal released	0 – 5%
			Accelerator pedal depressed fully	90 – 100%
*	☞O2S B1 S1 (HEATED OXYGEN SENSOR-1)	At specified idle speed after warming up		0.1 – 0.95 V
	☞O2S B1 S1 ACT	At specified idle speed after warming up		ACTIVE
*	☞O2S B1 S2 (HEATED OXYGEN SENSOR-2)	At 2000 r/min. for 3 min. or longer after warming up.		0.1 – 0.95 V
	☞O2S B1 S2 ACT	At specified idle speed after warming up		ACTIVE
*	☞FUEL SYSTEM B1 (FUEL SYSTEM STATUS)	At specified idle speed after warming up		CLSD (closed loop)
*	☞MAP (INTAKE MANIFOLD ABSOLUTE PRESSURE)	At specified idle speed with no load after warming up		24 – 38 kPa, 7.1 – 11.2 in.Hg
	☞BAROMETRIC PRES	—		Barometric pressure is displayed
	☞STEP EGR FLOW DUTY	At specified idle speed after warming up		0%
	☞FUEL CUT	Engine at fuel cut condition		ON
		Engine at other than fuel cut condition		OFF
	☞A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE)	Engine running	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F) and humidity: 50%	1350 – 1650 kPa For more details, refer to pressure of high pressure gage under “A/C System Performance Inspection: Manual A/C in Section 7B”.
			A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 – 100 °C (194 – 212 °F)	600 – 1000 kPa After longer than 10 min from A/C switch turned off
	☞CLOSED THROTTLE POS (CLOSED THROTTLE POSITION)	Throttle valve at idle position		ON
		Throttle valve opens larger than idle position		OFF

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞CANIST PRG DUTY (EVAP CANISTER PURGE FLOW DUTY)	At specified idle speed after warming up		0%
*	☞IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER)	At specified idle speed with no load after warming up		5 – 15° BTDC (Non-VVT model), 3 – 13° BTDC (VVT model)
	☞BATTERY VOLTAGE	Ignition switch ON / engine at stop		10 – 14 V
	☞FUEL PUMP	Within 2 seconds after ignition switch ON or engine running		ON
		Engine at stop with ignition switch ON		OFF
	☞ELECTRIC LOAD	Ignition switch ON / Headlight, small light, all turned OFF		OFF
		Ignition switch ON / Headlight, small light, turned ON		ON
	☞BRAKE SWITCH	Ignition switch ON	Brake pedal is released	OFF (Other than Automated Manual Transmission model), CANCEL (Automated Manual Transmission model)
			Brake pedal is depressed	ON (Other than Automated Manual Transmission model), SET (Automated Manual Transmission model)
	☞RADIATOR FAN (RADIATOR COOLING FAN CONTROL RELAY)	Ignition switch ON	Engine coolant temp.: Lower than 95 °C (203 °F)	OFF
			Engine coolant temp.: 97.5 °C (208 °F) or higher	ON
	☞BLOWER FAN	Ignition switch ON	Blower fan switch: 2nd speed position or more	ON
			Blower fan switch: under 1st speed position	OFF
	☞A/C SWITCH	Engine running after warming up, A/C not operating		OFF
		Engine running after warming up, A/C operating		ON
	☞A/C COMP RELAY	Engine running	A/C switch and blower motor switch turned ON	ON
			A/C switch and blower motor switch turned OFF	OFF
*	☞VEHICLE SPEED	At stop		0 km/h (0 mph)
	☞VVT GAP (TARGET-ACTUAL POSITION) (VVT model)	At specified idle speed after warming up		0 – 3°
	☞TP SENSOR 1 VOLT (THROTTLE POSITION SENSOR (MAIN) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.6 – 1.0 V
			Accelerator pedal depressed fully	3.37 – 4.55 V
	☞TP SENSOR 2 VOLT (THROTTLE POSITION SENSOR (SUB) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	1.4 – 1.8 V
			Accelerator pedal depressed fully	3.58 – 4.76 V
	☞APP SENSOR 1 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (MAIN) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	0.5 – 0.9 V
			Accelerator pedal depressed fully	3.277 – 3.915 V
	☞APP SENSOR 2 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (SUB) OUTPUT VOLTAGE)	Ignition switch ON after warmed up engine	Accelerator pedal released	1.3 – 1.7 V
			Accelerator pedal depressed fully	4.077 – 4.715 V

	Scan tool data	Vehicle condition		Normal condition / reference values
	☞ACCEL POSITION (ABSOLUTE ACCELERATOR PEDAL POSITION)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 5%
			Accelerator pedal depressed fully	90 – 100%
	☞THROTTLE TARGET POSI (TARGET THROTTLE VALVE POSITION)	Ignition switch ON after warmed up engine	Accelerator pedal released	0 – 5%
			Accelerator pedal depressed fully	90 – 100%

Scan Tool Data Definitions

COOLANT TEMP (ENGINE COOLANT TEMPERATURE, °C, °F)
It is detected by engine coolant temp. sensor.

INTAKE AIR TEMP. (°C, °F)
It is detected by intake air temp. sensor.

ENGINE SPEED (rpm)
It is computed by reference pulses from the camshaft position sensor.

INJ PULSE WIDTH (FUEL INJECTION PULSE WIDTH, msec.)
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (but injector drive time of NO.1 cylinder for multiport fuel injection).

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

IAC THROTTLE OPENING (IDLE AIR (SPEED) CONTROL THROTTLE VALVE OPENING, %)
This parameter indicates throttle valve opening of idle air control in %.
(100% indicates the maximum idle air flow.)

SHORT FT B1 (SHORT TERM FUEL TRIM, %)
Short term fuel trim value represents short term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

LONG FT B1 (LONG TERM FUEL TRIM, %)
Long term fuel trim value represents long term corrections to the air/fuel mixture computation. A value of 0 indicates no correction, a value greater than 0 means an enrichment correction, and a value less than 0 implies an enleanment correction.

TOTAL FUEL TRIM B1 (%)
The value of Total Fuel Trim is obtained by calculating based on values of Short Term Fuel Trim and Long Term Fuel Trim. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

MAF (MASS AIR FLOW RATE, g/s, lb/min.)
It represents total mass of air entering intake manifold which is measured by mass air flow sensor.

CALC LOAD (CALCULATED LOAD VALUE, %)
Engine load displayed as a percentage of maximum possible load. Value is calculated mathematically using the formula: actual (current) intake air volume ÷ maximum possible intake air volume × 100%

THROTTLE POS (ABSOLUTE THROTTLE POSITION, %) (A/T and M/T models)
When throttle position sensor is at fully closed position, throttle opening is indicated as 0 – 5% and 90 – 100% full open position.

O2S SENSOR B1 S1 (HEATED OXYGEN SENSOR-1, V)
It indicates output voltage of HO2S-1 installed on exhaust manifold (pre-catalyst).

O2S B1 S1 ACT (HEATED OXYGEN SENSOR-1, ACTIVE / INACTIVE)
This parameter indicates activation condition of HO2S-1
ACTIVE: Activating
INACTIVE: warming up or at stop

O2S SENSOR B1 S2 (HEATED OXYGEN SENSOR-2, V)
It indicates output voltage of HO2S-2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

O2S B1 S2 ACT (HEATED OXYGEN SENSOR-2, ACTIVE / INACTIVE)
This parameter indicates activation condition of HO2S-2
ACTIVE: Activating
INACTIVE: warming up or at stop

FUEL SYSTEM (FUEL SYSTEM STATUS)
Air/fuel ratio feedback loop status displayed as one of the followings.
OPEN: Open-loop has not yet satisfied conditions to go closed loop.
CLOSED: Closed-loop using oxygen sensor(s) as feedback for fuel control.
OPEN-DRIVE COND: Open-loop due to driving conditions (Power enrichment, etc.).
OPEN SYS FAULT: Open-loop due to detected system fault.

MAP (MANIFOLD ABSOLUTE PRESSURE, in.Hg, kPa)
This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.
It is detected by manifold absolute pressure sensor.

BAROMETRIC PRESS (kPa, in.Hg)
This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity and IAC valve control.

STEP EGR FLOW DUTY (%)
This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

FUEL CUT (ON/OFF)
ON: Fuel being cut (output signal to injector is stopped)
OFF: Fuel not being cut

A/C PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE, kPa)
This parameter indicates A/C refrigerant absolute pressure calculated by ECM.

CLOSED THROTTLE POS (CLOSED THROTTLE POSITION, ON/OFF)
This parameter reads ON when throttle valve is fully closed, or OFF when it is not fully closed.

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.

IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)
Ignition timing of No.1 cylinder is commanded by ECM. The actual ignition timing should be checked by using the timing light.

BATTERY VOLTAGE (V)
This parameter indicates battery positive voltage inputted from main relay to ECM.

FUEL PUMP (ON/OFF)
ON is displayed when ECM activates the fuel pump via the fuel pump relay switch.

ELECTRIC LOAD (ON/OFF)
ON: Headlight or small light ON signal inputted.
OFF: Above electric loads all turned OFF.

BRAKE SW (ON/OFF: Other than Automated Manual Transmission model, CANCEL / SET: Automated Manual Transmission model)
This parameter indicates the state of the brake switch.

RADIATOR COOLING FAN (RADIATOR COOLING FAN CONTROL RELAY, ON/OFF)
ON: Command for radiator cooling fan control relay operation being output.
OFF: Command for relay operation not being output.

BLOWER FAN (ON/OFF)
This parameter indicates the state of the blower fan motor switch.

A/C SWITCH (ON/OFF)
This parameter indicates the state of the A/C switch.

A/C COMP RELAY (A/C COMPRESSOR RELAY, ON/OFF)
ON: Command for A/C operation being output from ECM to HVAC.
OFF: Command for A/C operation not being output.

VEHICLE SPEED (km/h, mph)
It is computed based on pulse signals from vehicle speed sensor.

VVT GAP (TARGET-ACTUAL POSITION, °) (VVT model)
It is calculated using the formula: target valve timing advance – actual valve timing advance.

TP SENSOR 1 VOLT (THROTTLE POSITION SENSOR (MAIN) OUTPUT VOLTAGE, V)
The Throttle Position Sensor (Main) reading provides throttle valve opening information in the form of voltage.

TP SENSOR 2 VOLT (THROTTLE POSITION SENSOR (SUB) OUTPUT VOLTAGE, V)
The Throttle Position Sensor (Sub) reading provides throttle valve opening information in the form of voltage.

APP SENSOR 1 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (MAIN) OUTPUT VOLTAGE, V)
The Accelerator Pedal Position (APP) Sensor (Main) reading provides accelerator pedal opening information in the form of voltage.

APP SENSOR 2 VOLT (ACCELERATOR PEDAL POSITION (APP) SENSOR (SUB) OUTPUT VOLTAGE, V)
The Accelerator Pedal Position (APP) Sensor (Sub) reading provides accelerator pedal opening information in the form of voltage.

ACCEL POSITION (ABSOLUTE ACCELERATOR PEDAL POSITION, %)
When accelerator pedal is at fully released position, accelerator pedal is indicated as 0 – 5% and 90 – 100% fully depressed position.

THROTTLE TARGET POSI (TARGET THROTTLE VALVE POSITION, %)
Target Throttle Valve Position is ECM internal parameter which indicates the ECM requested throttle valve position.

Visual Inspection

S7N20A1114008

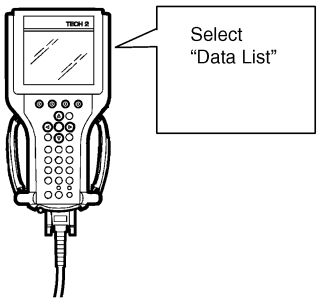
Visually check the following parts and systems.

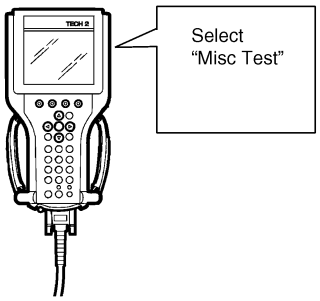
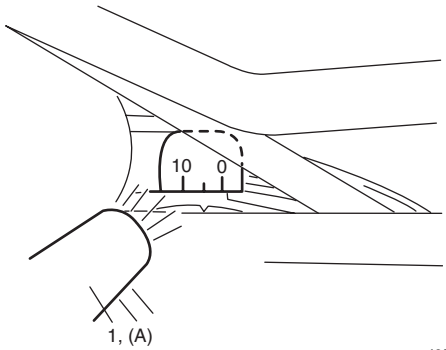
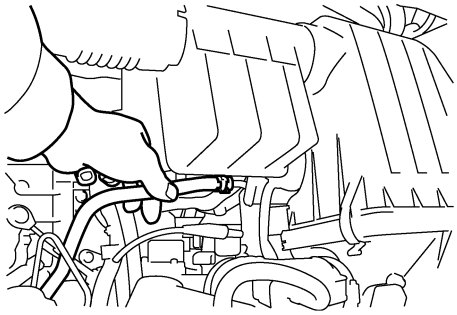
Inspection item	Reference section
• Engine oil – level, leakage	"Engine Oil and Filter Change (Petrol Engine) in Section 0B"
• Engine coolant – level, leakage	"Coolant Level Check: M13A / M15A / M16A in Section 1F"
• Fuel – level, leakage	"Fuel Lines and Connections Inspection (Petrol Engine Model) in Section 0B"
• Air cleaner element – dirt, clogging	"Air Cleaner Filter Inspection (Petrol Engine) in Section 0B"
• Battery – fluid level, corrosion of terminal	"Battery Description: M13A / M15A / M16A in Section 1J"
• Water pump belt – tension damage	"Accessory Drive Belt Inspection (Petrol Engine) in Section 0B"
• Throttle valve – operating sound	"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"
• Vacuum hoses of air intake system – disconnection, looseness, deterioration, bend	"Vacuum Hose and Purge Valve Chamber Inspection: M13A / M15A / M16A in Section 1B"
• Connectors of electric wire harness – disconnection, friction	
• Fuses – burning	
• Parts – installation, bolt – looseness	
• Parts – deformation	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible	
• Malfunction indicator lamp – Operation	"Malfunction Indicator Lamp (MIL) Check: M13A / M15A / M16A"
• Charge warning lamp – Operation	"Generator Symptom Diagnosis: M13A / M15A / M16A in Section 1J"
• Engine oil pressure warning lamp – Operation	"Oil Pressure Switch Inspection in Section 9C"
• Engine coolant temp. meter – Operation	"Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C"
• Fuel level meter – Operation	"Fuel Level Sensor Inspection in Section 9C"
• Tachometer – Operation	
• Abnormal air being inhaled from air intake system	
• Exhaust system – leakage of exhaust gas, noise	
• Other parts that can be checked visually	

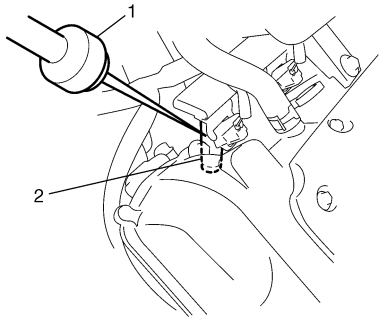
Engine Basic Inspection

S7N20A1114009

This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: M13A / M15A / M16A”.
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: M13A / M15A / M16A”.
2	**Check battery voltage** *Is it 11 V or more?*	Go to Step 3.	Charge or replace battery.
3	*Is vehicle equipped with keyless start control system?*	Go to Step 4.	Go to Step 5.
4	**Check keyless start control system malfunction** 1) Check keyless start control system referring to “Keyless Start System Operation Inspection in Section 10E”. *Is check result satisfactory?*	Go to Step 5.	Keyless start control system malfunction.
5	*Is engine cranked?*	Go to Step 6.	Go to “Cranking System Symptom Diagnosis: M13A / M15A / M16A in Section 1I”.
6	*Does engine start?*	Go to Step 7.	Go to Step 9.
7	**Check idle speed** 1) Warm up engine to normal operating temperature. 2) Shift transmission to neutral position for M/T and Automated Manual Transaxle models (“P” position for A/T model). 3) Make sure that all electrical loads are switched off. 4) Check engine idle speed with scan tool.  I2RH01110005-01 *Is it 650 – 750 r/min.?*	Go to Step 8.	Go to “Engine Symptom Diagnosis: M13A / M15A / M16A”.

Step	Action	Yes	No
8	**Check ignition timing** 1) Using SUZUKI scan tool, select "Misc Test" mode on SUZUKI scan tool and fix ignition timing to initial one.  I2RH01110006-01 2) Using timing light (1), check initial ignition timing. **Special tool** **(A): 09930–76420**  I3RB0A180004-02 *Is it 5 °± 3 °BTDC at specified idle speed?*	Go to "Engine Symptom Diagnosis: M13A / M15A / M16A".	Check ignition control related parts referring to "Ignition Timing Inspection: M13A / M15A / M16A in Section 1H".
9	**Check immobilizer system malfunction** 1) Check immobilizer indicator lamp for flashing. *Is it flashing when ignition switch is turned to ON position?*	Go to "Diagnostic Trouble Code (DTC) Check: Petrol Model in Section 10C".	Go to Step 10.
10	**Check fuel supply** 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn ON ignition switch for 2 seconds and then OFF. 3) Repeat Step 2) a few times. *Is fuel pressure felt from fuel feed hose when ignition switch is turned ON?*  I3RM0A110014-01	Go to Step 12.	Go to Step 11.

Step	Action	Yes	No
11	**Check fuel pump for operation** *Was fuel pump operating sound heard from fuel filler for about 2 seconds after ignition switch ON and stop?*	Go to “Fuel Pressure Check: M13A / M15A / M16A”.	Go to “Fuel Pump and Its Circuit Check: M13A / M15A / M16A”.
12	**Check ignition spark** 1) Disconnect injector couplers. 2) Remove spark plugs and connect them to high-tension cords or ignition coil assemblies. 3) Ground spark plugs. 4) Crank engine and check if each spark plug sparks. *Is it in good condition?*	Go to Step 13.	Go to “Ignition Spark Test: M13A / M15A / M16A in Section 1H”.
13	**Check fuel injector for operation** 1) Install spark plugs and connect injector connectors. 2) Using sound scope (1), check operating sound of each injector (2) when cranking engine.  I3RM0A110015-01 *Was injector operating sound heard from all injectors?*	Go to “Engine Symptom Diagnosis: M13A / M15A / M16A”.	Go to “Fuel Injector Circuit Check: M13A / M15A / M16A”.

Engine Symptom Diagnosis

S7N20A1114010

Perform troubleshooting referring to the followings when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: M13A / M15A / M16A” and “Engine Basic Inspection: M13A / M15A / M16A”.

Condition	Possible cause	Correction / Reference Item
Hard starting (Engine cranks OK)	Faulty spark plug	*“Spark Plug Inspection: M13A / M15A / M16A in Section 1H”*
	Leaky high-tension cord	*“High-Tension Cord Inspection: M13A / M15A / M16A in Section 1H”*
	Loose connection or disconnection of high-tension cord(s) or lead wire(s)	*“High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H”*
	Faulty ignition coil	*“Ignition Coil Assembly (Including ignitor) Inspection: M13A / M15A / M16A in Section 1H”*
	Dirty or clogged fuel hose or pipe	*“Fuel Pressure Check: M13A / M15A / M16A”*
	Malfunctioning fuel pump	*“Fuel Pressure Check: M13A / M15A / M16A”*
	Air drawn in through intake manifold gasket or throttle body gasket	
	Faulty electric throttle body assembly	*“Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”*
	Faulty accelerator pedal position (APP) sensor assembly	*“Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C” or “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C”*
	Faulty ECT sensor or MAF sensor	*“Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C” or “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C”*
	Faulty ECM	
	Low compression	*“Compression Check: M13A / M15A / M16A in Section 1D”*
	Poor spark plug tightening or faulty gasket	*“Spark Plug Removal and Installation: M13A / M15A / M16A in Section 1H”*
	Compression leak from valve seat	*“Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D”*
	Sticky valve stem	*“Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D”*
	Weak or damaged valve springs	*“Valve Spring Inspection: M13A / M15A / M16A in Section 1D”*
	Compression leak at cylinder head gasket	*“Cylinder Head Inspection: M13A / M15A / M16A in Section 1D”*
	Sticking or damaged piston ring	*“Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D”*
	Worn piston, ring or cylinder	*“Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D”*
	Malfunctioning PCV valve	*“PCV Valve Inspection: M13A / M15A / M16A in Section 1B”*
	Camshaft position control (VVT) system out of order (VVT model)	*“Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D”*
	Faulty EGR system	*“EGR System Inspection: M13A / M15A / M16A in Section 1B”*

Condition	Possible cause	Correction / Reference Item
Low oil pressure	Improper oil viscosity	*"Engine Oil and Filter Change (Petrol Engine) in Section 0B"*
	Malfunctioning oil pressure switch	*"Oil Pressure Switch Inspection in Section 9C"*
	Clogged oil strainer	*"Oil Pan and Oil Pump Strainer Cleaning: M13A / M15A / M16A in Section 1E"*
	Functional deterioration of oil pump	*"Oil Pump Inspection: M13A / M15A / M16A in Section 1E"*
	Worn oil pump relief valve	*"Oil Pump Inspection: M13A / M15A / M16A in Section 1E"*
	Excessive clearance in various sliding parts	
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, Tappet and Shim Inspection: M13A / M15A / M16A in Section 1D"*
	Worn valve stem and guide	*"Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D"*
	Weak or broken valve spring	*"Valve Spring Inspection: M13A / M15A / M16A in Section 1D"*
	Warped or bent valve	*"Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D"*
Engine noise – Piston, ring and cylinder noise ***NOTE*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, ring and cylinder bore	*"Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D"*
Engine noise – Connecting rod noise ***NOTE*** ***Before checking mechanical noise, make sure that:*** • ***Specified spark plug is used.*** • ***Specified fuel is used.***	Worn piston, ring and cylinder bore	*"Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D"*
	Worn rod bearing	*"Crank Pin and Connecting Rod Bearings Inspection: M13A / M15A / M16A in Section 1D"*
	Worn crank pin	*"Crank Pin and Connecting Rod Bearings Inspection: M13A / M15A / M16A in Section 1D"*
	Loose connecting rod nuts	*"Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: M13A / M15A / M16A in Section 1D"*
	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 bearing	*"Main Bearings Inspection: M13A / M15A / M16A in Section 1D"*
	Worn crankshaft journal	*"Crankshaft Inspection: M13A / M15A / M16A in Section 1D"*
	Loose bearing cap bolts	*"Main Bearings, Crankshaft and Cylinder Block Removal and Installation: M13A / M15A / M16A in Section 1D"*
	Excessive crankshaft thrust play	*"Crankshaft Inspection: M13A / M15A / M16A in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Engine overheating	Inoperative thermostat	*"Thermostat Inspection: M13A / M15A / M16A in Section 1F"*
	Poor water pump performance	*"Water Pump Inspection: M13A / M15A / M16A in Section 1F"*
	Clogged or leaky radiator	*"Radiator On-Vehicle Inspection and Cleaning: M13A / M15A / M16A in Section 1F"*
	Improper engine oil grade	*"Engine Oil and Filter Change (Petrol Engine) in Section 0B"*
	Clogged oil filter or oil strainer	*"Oil Pressure Check: M13A / M15A / M16A in Section 1E"*
	Poor oil pump performance	*"Oil Pressure Check: M13A / M15A / M16A in Section 1E"*
	Faulty radiator cooling fan control system	*"Radiator cooling fan Low Speed Control System Check: M13A / M15A / M16A" or "Radiator cooling fan High Speed Control System Check: M13A / M15A / M16A"*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis in Section 5C" for M/T model or "Slipping clutch" in "Automated Manual Transaxle Symptom Diagnosis in Section 5D" for Automated Manual Transaxle model.*
	Blown cylinder head gasket	*"Cylinder Head Inspection: M13A / M15A / M16A in Section 1D"*
	Air mixed in cooling system	

Condition	Possible cause	Correction / Reference Item
Poor gasoline mileage	Leaks or loose connection of high-tension cord	*"High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H"*
	Faulty spark plug (improper gap, heavy deposits and burned electrodes, etc.)	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	High idle speed	*Condition "Improper engine idling or engine fails to idle"*
	Poor performance of ECT sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Low compression	*"Compression Check: M13A / M15A / M16A in Section 1D"*
	Poor valve seating	*"Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D"*
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in"Clutch System Symptom Diagnosis in Section 5C" (M/T model) or "Slipping clutch" in "Automated Manual Transaxle Symptom Diagnosis in Section 5D" (Automated Manual Transaxle model)*
	Thermostat out of order	*"Thermostat Inspection: M13A / M15A / M16A in Section 1F"*
	Improper tire pressure	*"Tires Description in Section 2D"*
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*
Excessive engine oil consumption – Oil leakage	Blown cylinder head gasket	*"Cylinder Head Inspection: M13A / M15A / M16A in Section 1D"*
	Leaky camshaft oil seals	*"Camshaft, Tappet and Shim Inspection: M13A / M15A / M16A in Section 1D"*
Excessive engine oil consumption – Oil entering combustion chamber	Sticky piston ring	*"Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D"*
	Worn piston and cylinder	*"Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D"*
	Worn piston ring groove and ring	*"Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D"*
	Improper location of piston ring gap	*"Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly: M13A / M15A / M16A in Section 1D"*
	Worn or damaged valve stem seal	*"Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D"*
	Worn valve stem	*"Valves and Valve Guides Inspection: M13A / M15A / M16A in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Engine hesitates – Momentary lack of response as accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make vehicle move, as from a stop sign.	Spark plug faulty or plug gap out of adjustment	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Leaky high-tension cord	*"High-Tension Cord Inspection: M13A / M15A / M16A in Section 1H"*
	Fuel pressure out of specification	*"Fuel Pressure Check: M13A / M15A / M16A"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Poor performance of ECT sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C"*
	Faulty fuel injector	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check: M13A / M15A / M16A in Section 1D"*
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*
Surge – Engine power variation under steady throttle or cruise. Feels like vehicle speeds up and down with no change in accelerator pedal.	Leaky or loosely connected high-tension cord	*"High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H"*
	Faulty spark plug (excess carbon deposits, improper gap, burned electrodes, etc.)	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Variable fuel pressure	*"Fuel Pressure Check: M13A / M15A / M16A"*
	Kinky or damaged fuel hose and lines	
	Faulty fuel pump (clogged fuel filter)	
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Poor performance of MAF sensor	*"Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty fuel injector	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C"*

Condition	Possible cause	Correction / Reference Item
Excessive detonation – Engine makes continuously sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.	Faulty spark plug	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Loose connection of high-tension cord	*"High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H"*
	Engine overheating	*Condition "Engine overheating"*
	Clogged fuel filter (faulty fuel pump) or fuel lines	*"Fuel Pressure Check: M13A / M15A / M16A" or "Fuel Pump and Its Circuit Check: M13A / M15A / M16A"*
	Air drawn in through intake manifold or throttle body gasket	
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Poor performance of knock sensor, ECT sensor or MAF sensor	*"DTC P0327 / P0328: Knock Sensor Circuit Low / High: M13A / M15A / M16A", "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Excessive combustion chamber deposits	*"Cylinders, Pistons and Piston Rings Inspection: M13A / M15A / M16A in Section 1D" and/or "Piston Pins and Connecting Rods Inspection: M13A / M15A / M16A in Section 1D"*
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Engine has no power	Faulty spark plug	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: M13A / M15A / M16A in Section 1H"*
	Leaks, loose connection or disconnection of high-tension cord	*"High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H"*
	Faulty knock sensor	*"DTC P0327 / P0328: Knock Sensor Circuit Low / High: M13A / M15A / M16A"*
	Clogged fuel hose or pipe	*"Fuel Pressure Check: M13A / M15A / M16A"*
	Malfunctioning fuel pump	*"Fuel Pump and Its Circuit Check: M13A / M15A / M16A"*
	Air drawn in through intake manifold gasket or throttle body gasket	
	Engine overheating	*Condition "Engine overheating"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Poor performance of ECT sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Dragging brakes	*Condition "Dragging brakes" in "Brakes Symptom Diagnosis in Section 4A"*
	Slipping clutch	*Condition "Slipping clutch" in "Clutch System Symptom Diagnosis in Section 5C" for M/T model or "Slipping clutch" in "Automated Manual Transaxle Symptom Diagnosis in Section 5D" for Automated Manual Transaxle model*
	Low compression	*"Compression Check: M13A / M15A / M16A in Section 1D"*
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Improper engine idling or engine fails to idle	Faulty spark plug	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Leaky or disconnected high-tension cord	*"High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: M13A / M15A / M16A in Section 1H"*
	Fuel pressure out of specification	*"Fuel Pressure Check: M13A / M15A / M16A"*
	Leaky manifold, throttle body, or cylinder head gasket	
	Malfunctioning EGR valve	*"EGR Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Faulty evaporative emission control system	*"EVAP Canister Purge Inspection: M13A / M15A / M16A in Section 1B"*
	Faulty EGR system	*"EGR System Inspection: M13A / M15A / M16A in Section 1B"*
	Faulty fuel injector(s)	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Poor performance of ECT sensor or MAF sensor	*"Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C"*
	Faulty ECM	
	Loose connection or disconnection of vacuum hoses	
	Malfunctioning PCV valve	*"PCV Valve Inspection: M13A / M15A / M16A in Section 1B"*
	Engine overheating	*Condition "Engine overheating"*
	Low compression	*"Compression Check: M13A / M15A / M16A in Section 1D"*
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*

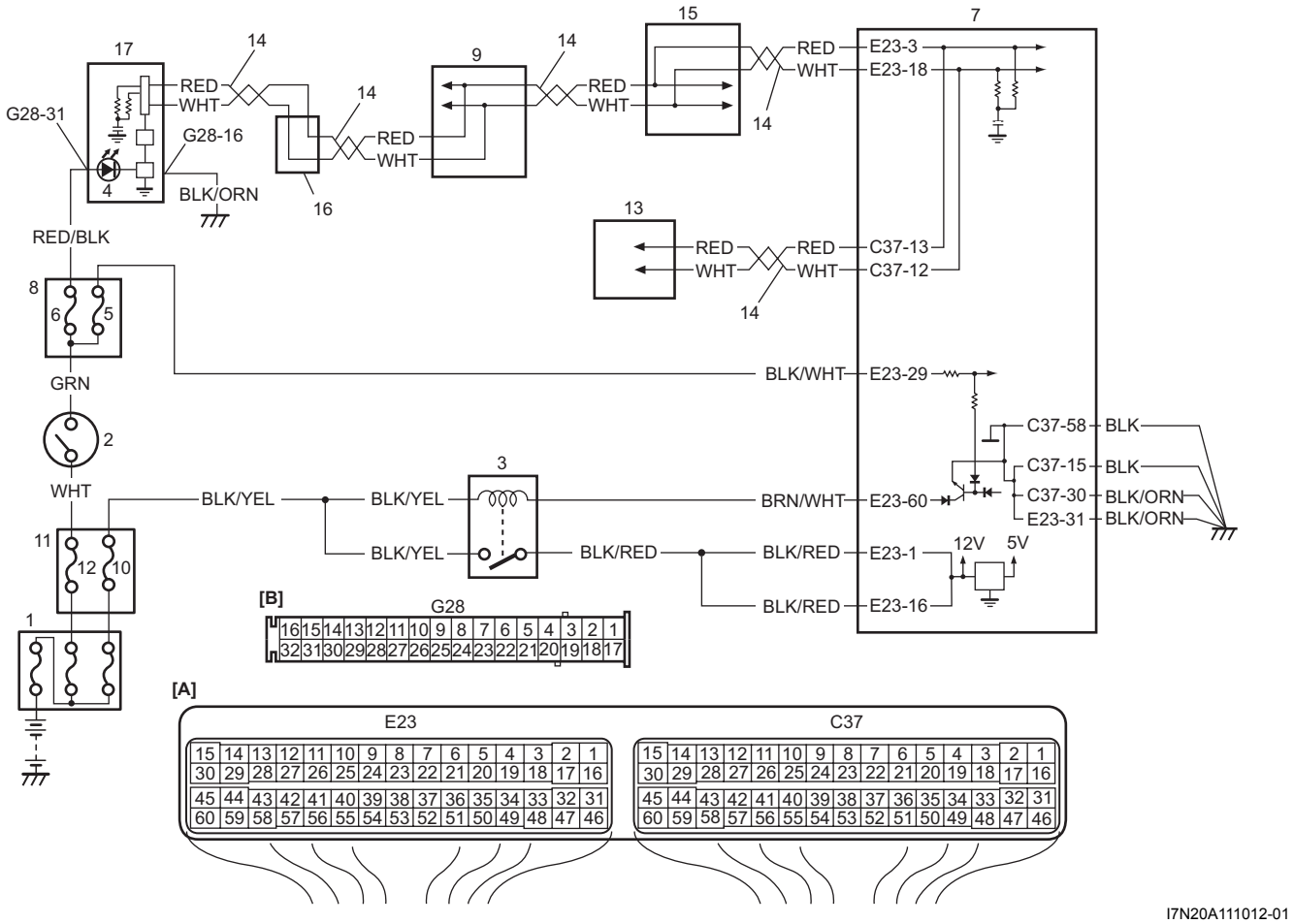
Condition	Possible cause	Correction / Reference Item
Excessive hydrocarbon (HC) emission or carbon monoxide (CO)	Faulty spark plug	*"Spark Plug Inspection: M13A / M15A / M16A in Section 1H"*
	Leaky or disconnected high-tension cord	*"High-Tension Cord Removal and Installation: M13A / M15A / M16A in Section 1H"*
	Faulty ignition coil with ignitor	*"Ignition Coil Assembly (Including ignitor) Inspection: M13A / M15A / M16A in Section 1H"*
	Low compression	*"Compression Check: M13A / M15A / M16A in Section 1D"*
	Lead contamination of three way catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty evaporative emission control system	*"EVAP Canister Purge Inspection: M13A / M15A / M16A in Section 1B"*
	Fuel pressure out of specification	*"Fuel Pressure Check: M13A / M15A / M16A"*
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C"*
	Faulty injector(s)	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Engine not at normal operating temperature	
	Clogged air cleaner	*"Air Cleaner Element Inspection and Cleaning: M13A / M15A / M16A in Section 1D"*
	Vacuum leaks	*"Engine Vacuum Check: M13A / M15A / M16A in Section 1D"*
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*

Condition	Possible cause	Correction / Reference Item
Excessive nitrogen oxides (NOx) emission	Improper ignition timing	*"Ignition Timing Inspection: M13A / M15A / M16A in Section 1H"*
	Lead contamination of catalytic converter	*Check for absence of filler neck restrictor.*
	Faulty EGR system	*"EGR System Inspection: M13A / M15A / M16A in Section 1B"*
	Fuel pressure out of specification	*"Fuel Pressure Check: M13A / M15A / M16A"*
	Closed loop system (A/F feedback compensation) fails (Faulty TP sensor, Poor performance of ECT sensor or MAF sensor)	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C", "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty electric throttle body assembly	*"Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C"*
	Faulty accelerator pedal position (APP) sensor assembly	*"Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C"*
	Faulty injector(s)	*"Fuel Injector Circuit Check: M13A / M15A / M16A"*
	Faulty ECM	
	Camshaft position control (VVT) system out of order (VVT model)	*"Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D"*

Malfunction Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop (but Engine Can Be Started)

S7N20A1114011

Wiring Diagram



I7N20A111012-01

[A]: ECM connector (viewed from harness side)	6. "METER" fuse	13. TCM (A/T or Automated Manual Transaxle model)
[B]: Combination meter connector (viewed from harness side)	7. ECM	14. CAN communication line
1. Main fuse box	8. Junction block assembly	15. ABS / ESP® control module
2. Ignition switch	9. BCM	16. CAN junction connector (ESP® model)
3. Main relay	10. "FI" fuse	17. Combination meter
4. Malfunction indicator lamp in combination meter	11. Individual circuit fuse box No.1	
5. "IG COIL" fuse	12. "IG ACC" fuse	

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE

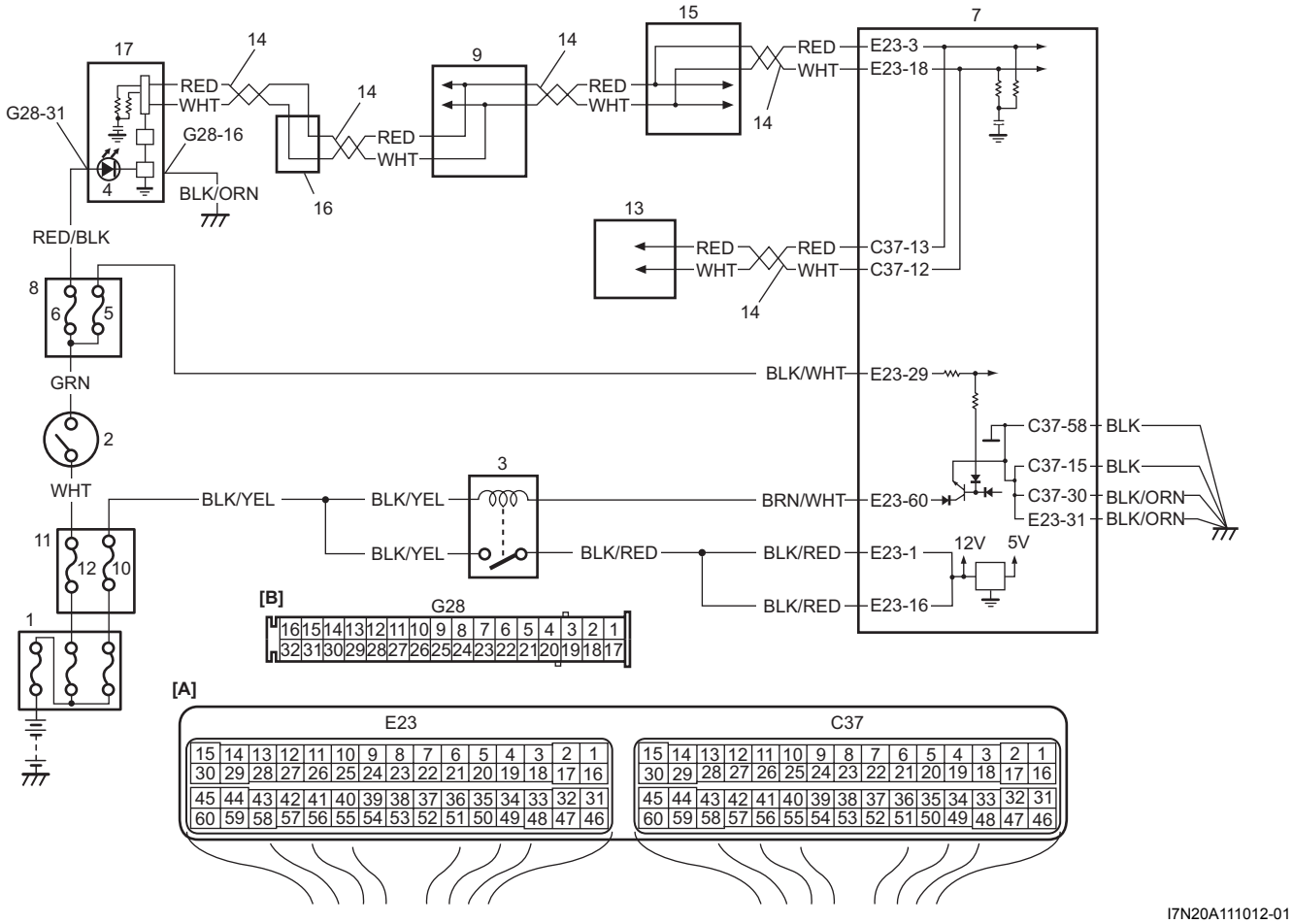
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	**MIL power supply check** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. *Is there DTC(s) P1674, P1675 and/or P1678?*	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.
3	**CAN communication line circuit check** 1) Check CAN communication circuit between combination meter and ECM, TCM (A/T or Automated Manual Transaxle model) referring to Step 11 to 19 in "For Non-ESP® model" under "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A" (Non-ESP® model) or step 12 to 23 in "For ESP® model" under "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A" (ESP® model®). *Is circuit in good condition?*	Go to Step 4.	Repair or replace.
4	**"METER" fuse check** 1) Turn ignition switch to OFF position. 2) Check for fuse blown at "METER" fuse in junction block assembly. *Is "METER" fuse in good condition?*	Go to Step 5.	Replace "METER" fuse and check for short.
5	**Combination meter power supply check** 1) Remove combination meter referring to "Combination Meter Removal and Installation in Section 9C". 2) Check for proper connection to combination meter connector at "G28-31" and "G28-16" terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at "G28-31" terminal and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	"RED/BLK" wire is open circuit.
6	**Combination meter circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "G28-16" terminal of combination meter connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	"BLK/ORN" wire is open or high resistance circuit.

Malfunction Indicator Lamp Remains ON after Engine Starts

S7N20A1114012

Wiring Diagram



I7N20A111012-01

[A]: ECM connector (viewed from harness side)	6. "METER" fuse	13. TCM (A/T or Automated Manual Transaxle model)
[B]: Combination meter connector (viewed from harness side)	7. ECM	14. CAN communication line
1. Main fuse box	8. Junction block assembly	15. ABS / ESP® control module
2. Ignition switch	9. BCM	16. CAN junction connector (ESP® model)
3. Main relay	10. "FI" fuse	17. Combination meter
4. Malfunction indicator lamp in combination meter	11. Individual circuit fuse box No.1	
5. "IG COIL" fuse	12. "IG ACC" fuse	

Circuit Description

When the ignition switch is turned ON, ECM causes the main relay to turn ON (close the contact point). Then, ECM being supplied with the main power, transmits indication ON signal of malfunction indicator lamp (MIL) to combination meter in order to turn MIL ON. And then, combination meter turns MIL ON. When the engine starts to run and no malfunction is detected in the system, ECM transmits MIL indication OFF signal to combination meter in order to turn MIL OFF. And then, combination meter turns MIL OFF, but if a malfunction was or is detected, MIL remains ON even when the engine is running.

Troubleshooting

NOTE

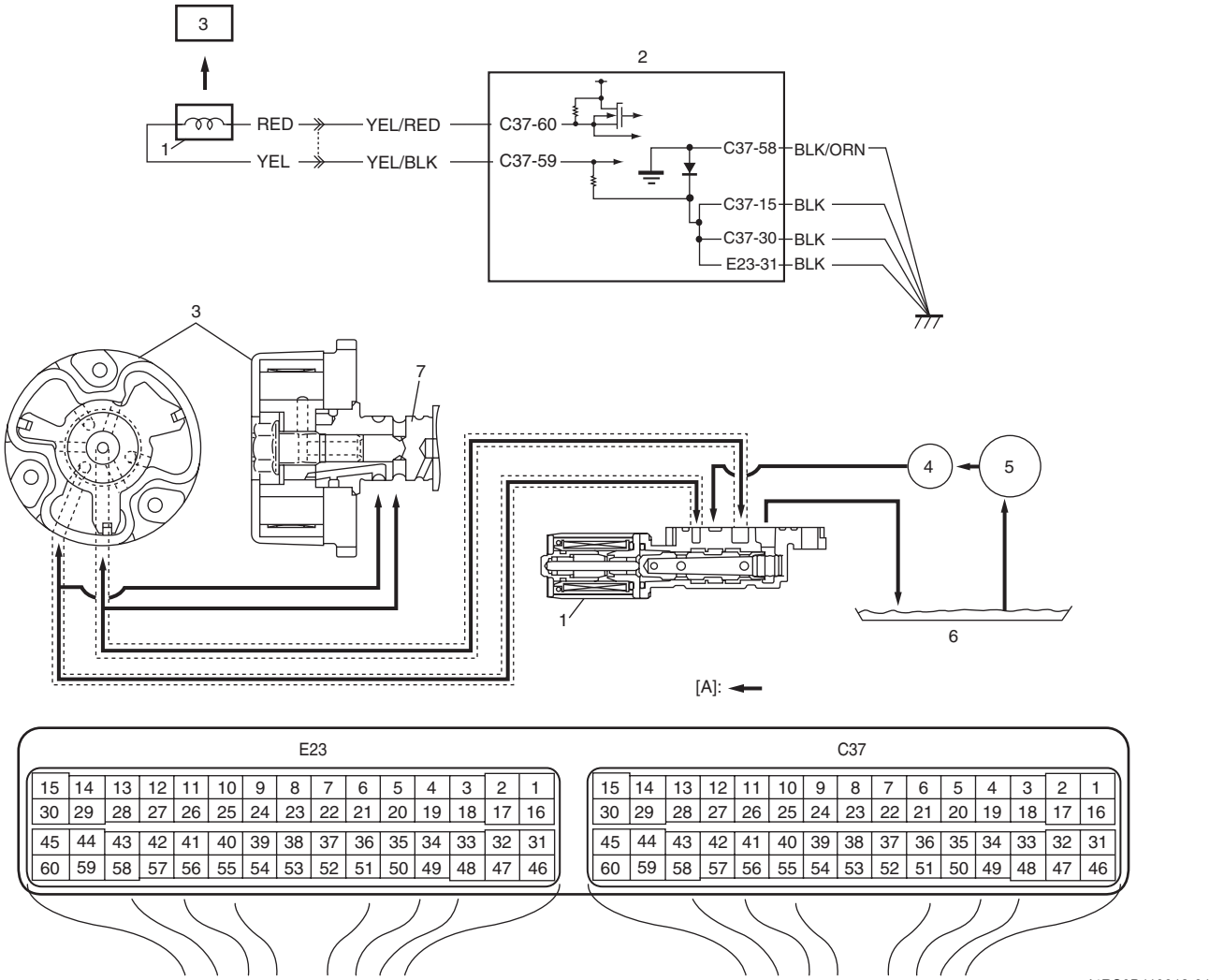
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	**DTC check** 1) Start engine and recheck DTC of ECM and TCM (A/T or Automated Manual Transaxle model) while engine running. *Is there any DTC(s)?*	Go to Step 2 of "Engine and Emission Control System Check: M13A / M15A / M16A", Step 2 of "A/T System Check in Section 5A" or "Automated Manual Transaxle System Check in Section 5D".	Go to Step 2.
2	**CAN communication line circuit check** 1) Check CAN communication line circuit between combination meter and ECM, TCM (A/T or Automated Manual Transaxle model) referring to Step 9 to 15 "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A". *Is circuit in good condition?*	Substitute a known-good combination meter and recheck. If MIL still remains OFF, substitute a known-good ECM and recheck.	Repair or replace CAN communication circuit.

DTC P0010: Camshaft Position Actuator Circuit (VVT Model)

S7N20A1114013

System and Wiring Diagram



I4RS0B110012-01

[A]: Oil flow	3. Camshaft timing sprocket	6. Oil pan
1. Oil control valve	4. Oil filter	7. Intake camshaft
2. ECM	5. Oil pump	

Circuit Description

Actual valve timing fails to become close to target advance level of each function although advance control function or retarded advance control function is at work.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of oil control valve is different from command signal. (Circuit open or short) (1 driving cycle detection logic)	• Oil control valve • Oil control valve circuit • ECM

DTC Confirmation Procedure

1) Clear DTC. Refer to “DTC Clearance: M13A / M15A / M16A”.
2) Start engine and keep it at idle for 10 seconds.
3) Check DTC. Refer to “DTC Check: M13A / M15A / M16A”.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Oil control valve electrical circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection at "C37-60" and "C37-59" terminals of ECM connector. 3) If OK, measure resistance between "C37-60" and "C37-59" terminals of ECM connector. *Is resistance below 10 Ω?*	Go to Step 3.	Go to Step 8.
3	**Oil control valve electrical circuit check** *Was resistance more than 6.5 Ω in Step 2?*	Go to Step 4.	Go to Step 7.
4	**Oil control valve electrical circuit for power short check** 1) Turn ON ignition switch. 2) Measure voltage between "C37-60" terminal of ECM connector and engine ground. *Is voltage below 1 V?*	Go to Step 5.	"RED", "YEL/RED", "YEL" or "YEL/BLK" wire is shorted to power supply circuit.
5	**Oil control valve electrical circuit for ground short check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C37-60" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 6.	"YEL/RED" wire is shorted to ground circuit.
6	**Oil control valve electrical circuit for ground short check** 1) Measure resistance between "C37-59" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 9.	"YEL/BLK" wire is shorted to ground circuit.
7	**Oil control valve electrical circuit for short check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between "C37-60" and "C37-59" terminals of ECM connector. *Is resistance infinity?*	Go to Step 9.	"YEL/RED" wire is shorted to "YEL/BLK" wire.

Step	Action	Yes	No
8	**Oil control valve electrical circuit check** 1) Disconnect connector from oil control valve with ignition switch turned OFF. 2) Measure resistance between “C37-60” terminal of ECM connector and “YEL/RED” wire terminal of oil control valve connector and between “C37-59” terminal of ECM connector and “YEL/BLK” wire terminal of oil control valve connector. *Is resistance below 1 Ω?*	Go to Step 9.	“YEL/RED” wire or “YEL/BLK” wire circuit is open or high resistance.
9	**Oil control valve check** Check oil control valve referring to “Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D”. *Is resistance within specified value?*	Substitute a known-good ECM and recheck.	Faulty oil control valve.

DTC P0011 / P0012: Camshaft Position - Timing Over-Advanced or System Performance / -Retarded (VVT Model)

S7N20A1114014

System Description

Actual value of advanced valve timing does not reach target value.
Valve timing is advanced although ECM command is most retarding.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Actual value of advanced valve timing does not reach target value, or valve timing is advanced although ECM command is most retarding. (2 driving cycle detection logic)	• Oil control valve • Oil galleries of timing sprocket • Intake camshaft timing sprocket (Camshaft position control (VVT) actuator) • Oil control valve circuit • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and tester, on a level road.**

NOTE

Check to make sure that the following conditions are satisfied when using this “DTC Confirmation Procedure”.

- **altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) Clear DTC. Refer to “DTC Clearance: M13A / M15A / M16A”.
2) Start engine and drive vehicle under usual driving condition for 5 minutes or longer until engine is warmed up to normal operating temperature.
3) Stop vehicle.
4) Run engine at idle speed for 1 minute.
5) Start vehicle and increase vehicle speed up to 80 km/h (50 mile/h).
6) Keep vehicle speed at 80 km/h (50 mile/h) for 1 minute or longer at 5th gear (M/T and Automated Manual Transaxle model) or “D” range (A/T model).
7) Decrease vehicle speed gradually.
8) Stop vehicle and turn OFF ignition switch.

9) Repeat Step 4) to 7) one time.
10) Stop vehicle.
11) Check DTC. Refer to “DTC Check: M13A / M15A / M16A”.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: M13A / M15A / M16A”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

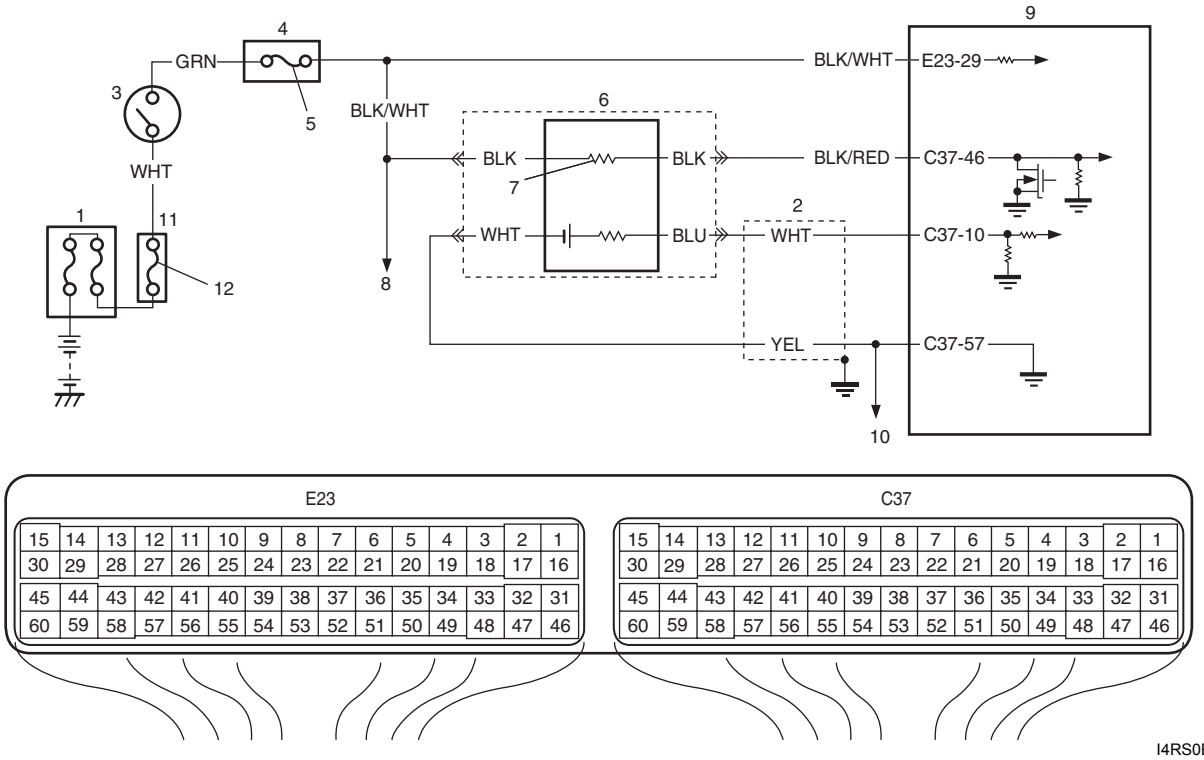
Step	Action	Yes	No
1	*Is DTC P0010 detected together?*	Go to “DTC P0010: Camshaft Position Actuator Circuit (VVT Model): M13A / M15A / M16A”.	Go to Step 2.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 5.
3	**Camshaft position control check** 1) With ignition switch turned OFF, connect SUZUKI scan tool. 2) Start engine and warm up to normal operating temperature. 3) Select menu to DATA LIST. 4) Check that “VVT GAP” displayed on SUZUKI scan tool is 0 – 5°. *Is it OK?*	Go to Step 4.	Check valve timing referring to “Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A in Section 1D”. If OK, go to Step 5.
4	**Camshaft position control check** 1) Drive vehicle under following conditions. • Vehicle speed at 80 km/h (50 mile/h). • Gear position at 5th or D range. 2) Check that “VVT GAP” displayed on SUZUKI scan tool is 0 – 5°. *Is it OK?*	Substitute a known-good ECM and recheck.	Go to Step 5.
5	**Oil control circuit visual inspection** 1) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: M13A / M15A / M16A in Section 1D”. 2) Check oil pressure leakage from oil control circuit. *Is it in good condition?*	Go to Step 6.	Repair or replace.

Step	Action	Yes	No
6	**Oil control valve and oil gallery pipe check** 1) Remove oil control valve referring to “Oil Control Valve Removal and Installation (For Engine with VVT): M13A / M15A / M16A in Section 1D”. 2) Remove oil gallery pipe referring to “Timing Chain Cover Removal and Installation: M13A / M15A / M16A in Section 1D”. 3) Check oil gallery pipe and oil control valve for clog or sludge. *Are they in good condition?*	Go to Step 7.	Clean oil control valve and oil gallery pipe. Replace oil control valve if a problem is not solved after cleaning oil control valve and oil gallery pipe.
7	**Oil control valve electrical circuit check** 1) Check that oil control valve circuit is in good condition referring to “DTC P0010: Camshaft Position Actuator Circuit (VVT Model): M13A / M15A / M16A”. *Is circuit in good condition?*	Repair circuit.	Go to Step 8.
8	**Oil control valve check** 1) Check oil control valve referring to“Oil Control Valve Inspection (For Engine with VVT): M13A / M15A / M16A in Section 1D”. *Is it in good condition?*	Replace camshaft timing sprocket.	Replace oil control valve.

DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1)

S7N20A1114015

Wiring Diagram



I4RS0B110013-02

1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Current of HO2S-1 heater is more than specified value or lower than specified value for 5 seconds continuously. (2 driving cycle detection logic)	• HO2S-1 heater circuit • HO2S-1 heater • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 1 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

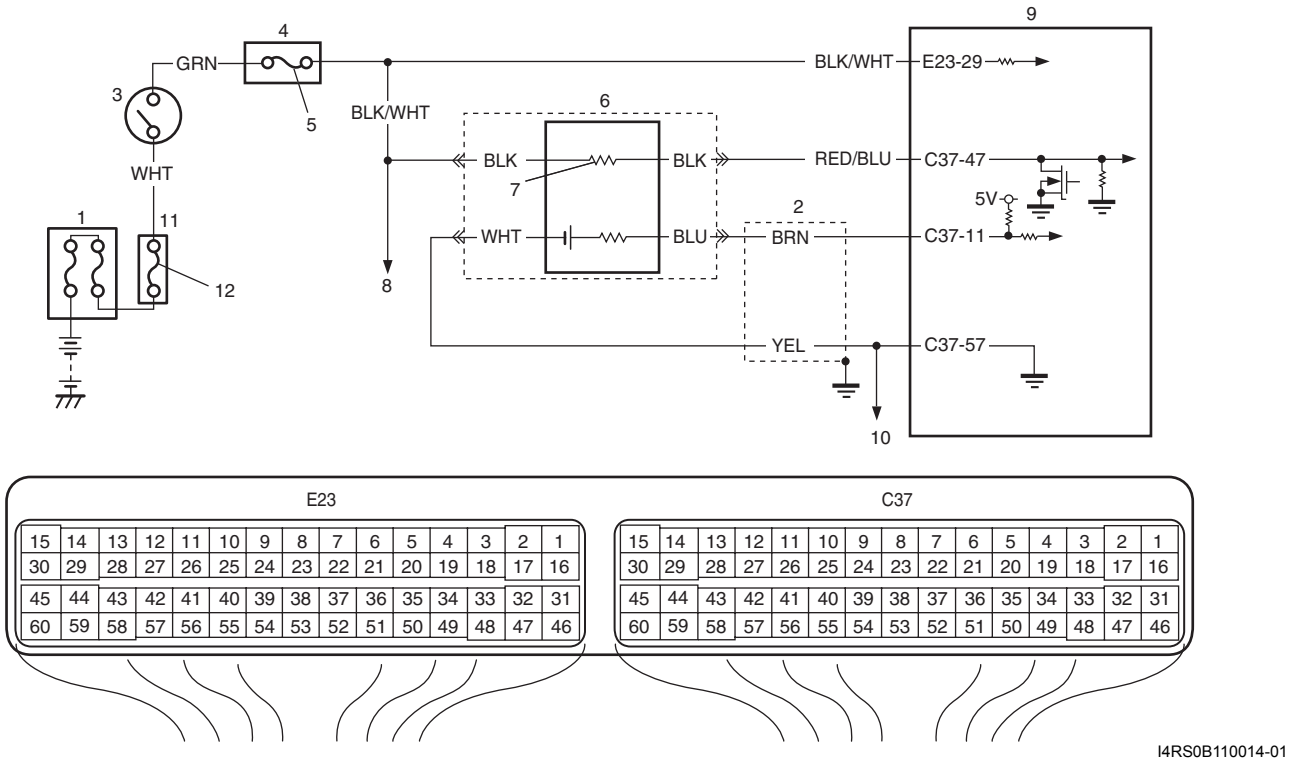
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**HO2S-1 heater power circuit check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 at "BLK/WHT" and "BLK/RED" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal and engine ground with ignition switch turned ON. *Is voltage over 10 V?*	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	**HO2S-1 heater power circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S-1 connector and "E23-29" terminal of ECM connector. *Is resistance below 5 Ω?*	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	**HO2S-1 heater drive circuit check** 1) Measure resistance between "C37-46" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"BLK/RED" wire is shorted to ground circuit.

Step	Action	Yes	No
5	**HO2S-1 heater drive circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “C37-46” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 6.	“BLK/RED” wire is shorted to power circuit.
6	**HO2S-1 heater drive circuit check** 1) Connect connector to HO2S-1 with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between “C37-46” terminal of ECM connector and vehicle body ground with connector disconnected from ECM. *Is voltage over 10 V?*	Go to Step 7.	“BLK/RED” wire is open circuit.
7	**HO2S-1 heater check** 1) Disconnect HO2S-1 connector with ignition switch turned OFF. 2) Check HO2S-1 heater resistance referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is resistance within specified value range?*	Go to Step 8.	Replace HO2S-1.
8	**HO2S-1 heater power circuit check** 1) Connect connector to HO2S-1 with ignition switch turned OFF. 2) Measure resistance between “E23-29” and “C37-46” terminals of ECM connector. *It resistance below 12 Ω?*	HO2S-1 heater circuit is OK. Substitute a known-good ECM and recheck.	“BLK/WHT”, “BLK/RED” and / or “BLK” wire is high resistance circuit.

DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2)

S7N20A1114016

Wiring Diagram



I4RS0B110014-01

1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-1
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-1 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-2	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Current of HO2S-2 heater is more than specified value or less than specified value for 5 seconds continuously (2 driving cycle detection logic)	• HO2S-2 heater • HO2S-2 heater circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 1 min.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

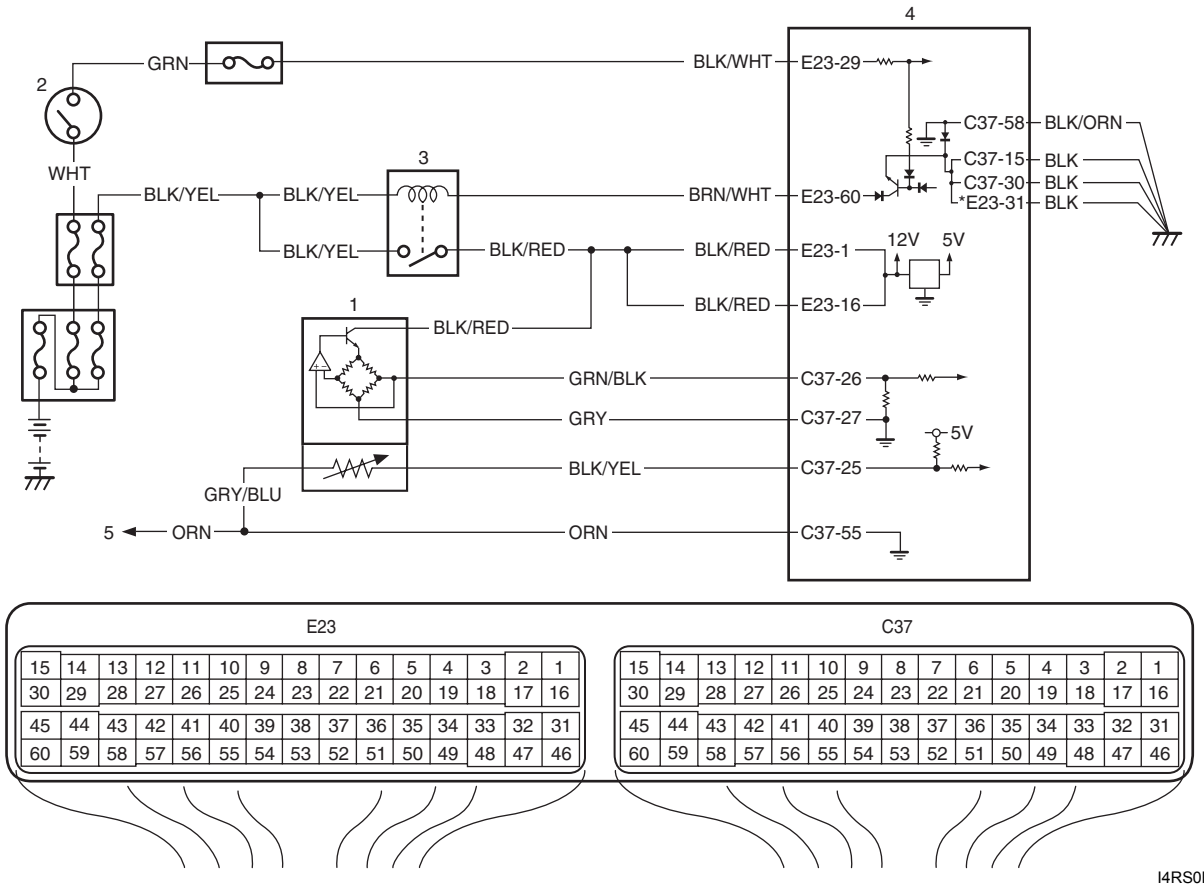
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**HO2S-2 heater power circuit check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 at "BLK/WHT" and "RED/BLU" wire terminals. 3) If wire and connection are OK, measure voltage between "BLK/WHT" wire terminal of HO2S-2 connector and engine ground with ignition switch turned ON. *Is voltage over 10 V?*	Go to Step 3.	"BLK/WHT" wire is open circuit or shorted to ground circuit.
3	**HO2S-2 heater power circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/WHT" wire terminal of HO2S-2 connector and "E23-29" terminal wire of ECM connector. *Is resistance below 5 Ω?*	Go to Step 4.	"BLK/WHT" wire is high resistance circuit.
4	**HO2S-2 heater drive circuit check** 1) Measure resistance between "RED/BLU" wire terminal of HO2S-2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"RED/BLU" wire is shorted to ground circuit.
5	**HO2S-2 heater drive circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "RED/BLU" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 6.	"RED/BLU" wire is shorted to power circuit.
6	**HO2S-2 heater drive circuit check** 1) Connect connector to HO2S-2 with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "C37-47" terminal of disconnected ECM connector and vehicle body ground. *Is voltage over 10 V?*	Go to Step 7.	"RED/BLU" wire is open circuit.

Step	Action	Yes	No
7	**HO2S-2 heater check** 1) Disconnect HO2S-2 connector with ignition switch turned OFF. 2) Check HO2S-2 heater resistance referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is resistance within specified value?*	Go to Step 8.	Replace HO2S-2.
8	**HO2S-2 heater power circuit check** 1) Connect connector to HO2S-2 with ignition switch turned OFF. 2) Measure resistance between “E23-9” and “C37-47” terminals of ECM connector. *Is resistance below 30 Ω?*	HO2S-2 heater circuit is OK. Substitute a known-good ECM and recheck.	“RED/BLU” wire is high resistance circuit.

DTC P0101: Mass Air Flow Circuit Range / Performance

S7N20A1114017

Wiring Diagram



I4RS0B110015-02

1. MAF and IAT sensor	3. Main relay	5. To other sensors
2. Ignition switch	4. ECM	*: Electric throttle body model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• MAF volume is greater than 20 g/sec even if engine revolution is less than 900 rpm and intake manifold pressure is less than 40 kPa (5.80 psi) with TP less than 1.5°. • MAF volume is lower than 10 g/sec even if engine revolution is more than 2500 rpm and intake manifold pressure is more than 60 kPa (8.70 psi) with TP more than 12°. (2 driving cycle detection logic)	• Air intake system (clog or leakage) • MAF sensor circuit • MAF sensor • TP sensor and/or its circuit • MAP sensor and/or its circuit • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

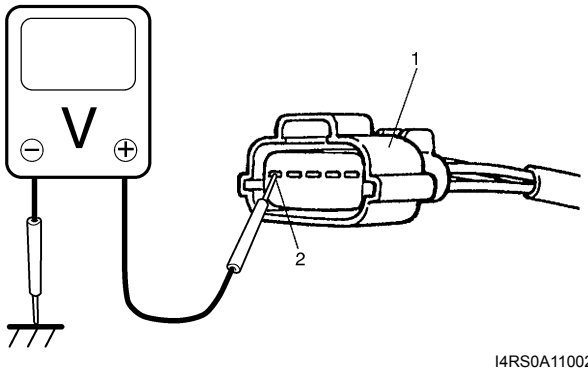
- **Intake air temperature at engine start: -10 °C (14°F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle with engine speed: more than 2500 rpm for 1 min.
5) Increase vehicle speed to 80 km/h (45 mile/h) at 5th gear or D range.
6) Release accelerator pedal to decrease vehicle speed to 40 km/h (25 mile/h).
7) Stop vehicle and run it idle for 1 min.
8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

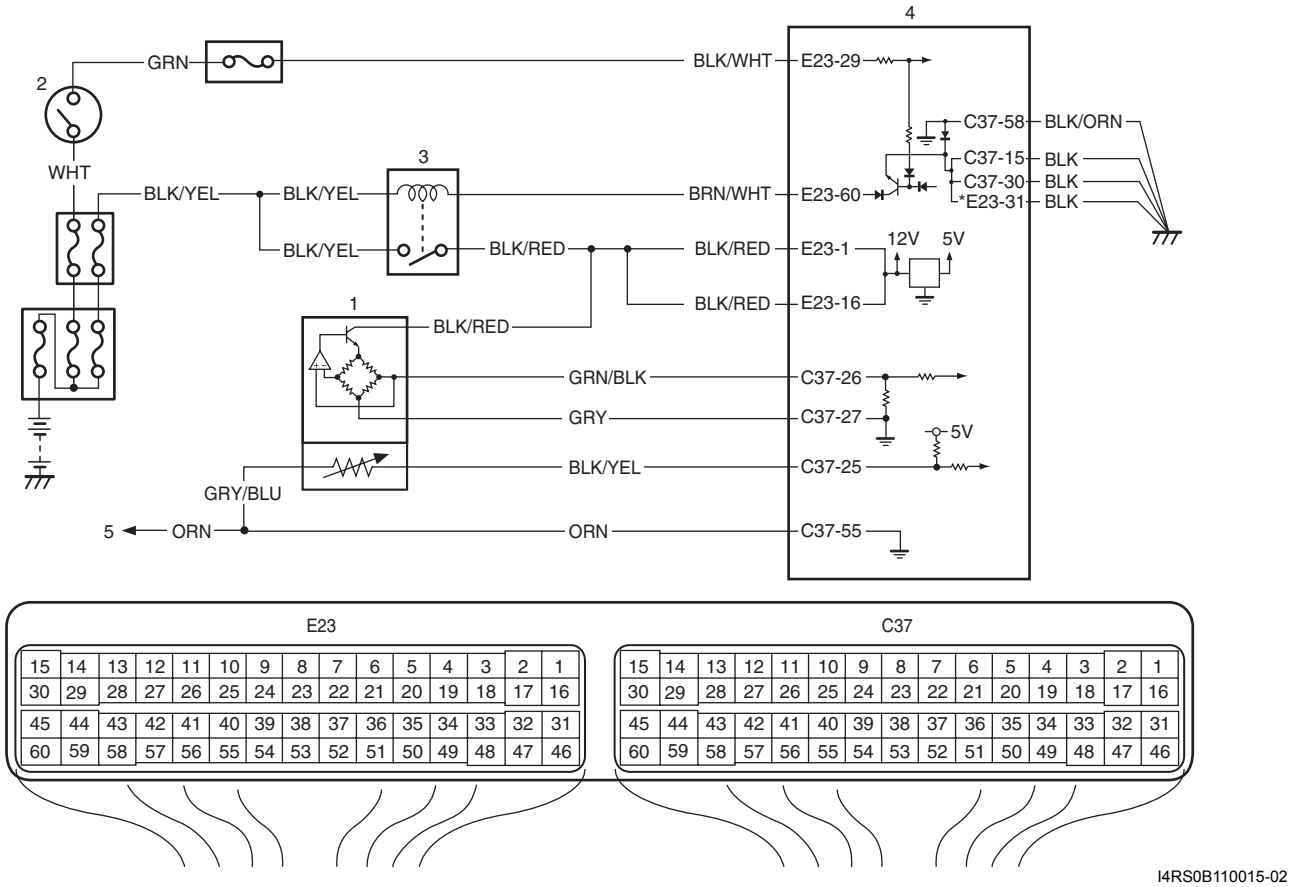
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Visual inspection** Check MAF sensor and air intake system for: • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass the MAF sensor. *Are they in good condition?*	Go to Step 3.	Repair or replace.
3	**MAF sensor and its circuit check** 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operation temperature. 3) Check MAF value using scan tool. (Refer to "Scan Tool Data: M13A / M15A / M16A" for normal value.) *Is each value within specified range?*	Go to Step 11.	Go to Step 4.
4	**MAF sensor output voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure voltage between "C37-26" and "C37-27" terminals of ECM connector referring to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is each value within specified range?*	Poor "C37-26" and/or "C37-27" terminal connection. If OK, substitute a known-good ECM and recheck.	Go to Step 5.
5	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal (2) of MAF and IAT sensor connector (1).  I4RS0A110020-01 *Is voltage 10 – 14 V?*	Go to Step 6.	"BLK/RED" wire is open circuit.
6	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 8.	Go to Step 7.

Step	Action	Yes	No
7	**Ground circuit check** 1) Measure resistance between “C37-27” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“GRY” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15”, “C37-30” and/or “E23-31” (Electric throttle body model) circuit is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
8	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is voltage 0 V?*	Go to Step 9.	“GRN/BLK” wire is shorted to others circuit.
9	**MAF sensor signal circuit check** 1) Turn OFF ignition switch, measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance infinity?*	Go to Step 10.	“GRN/BLK” wire is shorted to ground circuit.
10	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and “C37-26” terminal of ECM connector. *Is resistance below 3 Ω?*	Faulty MAF and IAT sensor.	“GRN/BLK” wire is open or high resistance circuit.
11	*Is DTC P0106 displayed?*	Go to “DTC P0106: Manifold Absolute Pressure Range / Performance: M13A / M15A / M16A”.	Substitute a known-good ECM and recheck.

DTC P0102: Mass Air Flow Circuit Low Input

S7N20A1114018

Wiring Diagram



I4RS0B110015-02

1. MAF and IAT sensor	4. ECM
2. Ignition switch	5. To other sensors
3. Main relay	*: Electric throttle body model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of MAF sensor output is less than specified value for specified time continuously. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

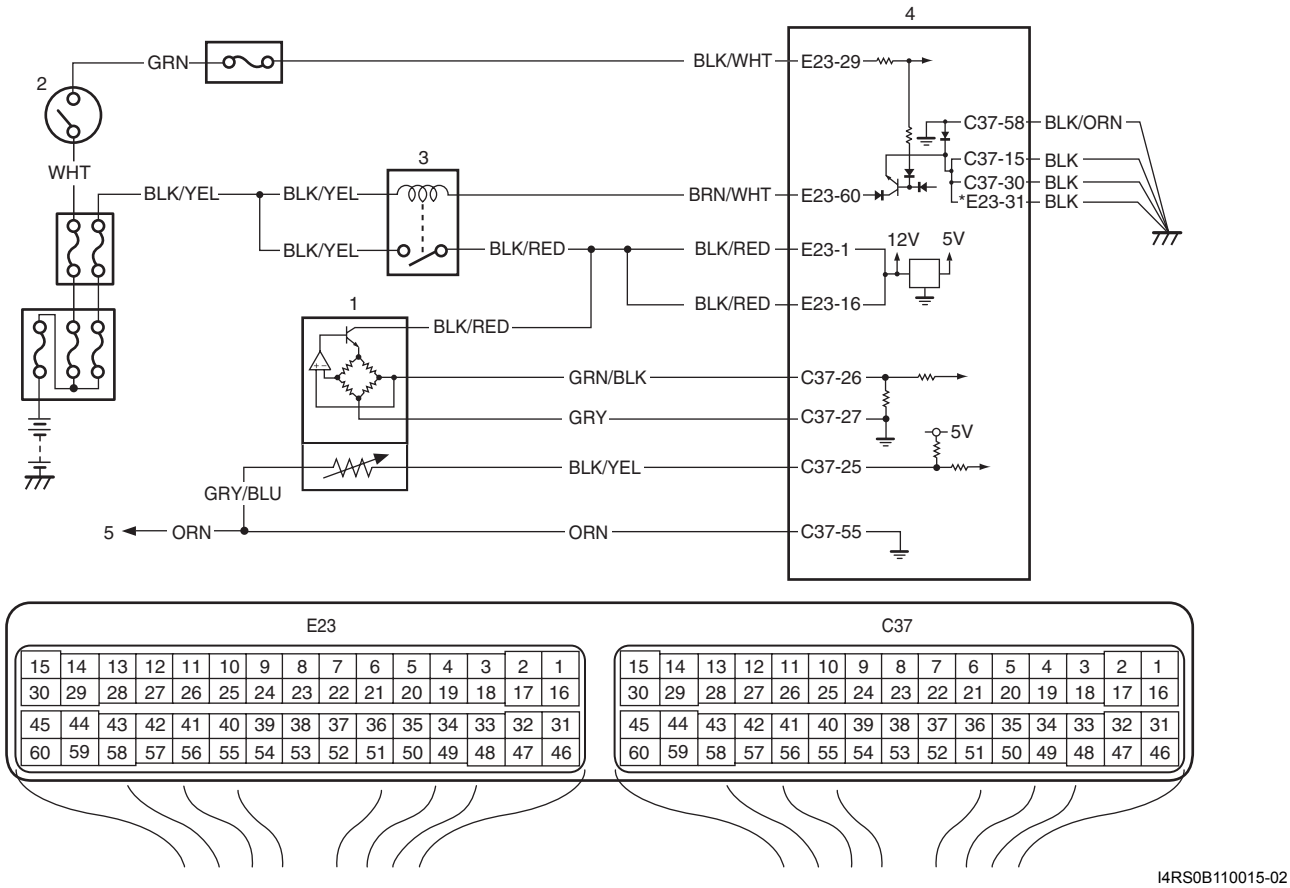
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**MAF sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data: M13A / M15A / M16A" for normal value.) *Is normal value indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 6.	Go to Step 5.
5	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-27" terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	"GRY" wire is open or high resistance circuit.	ECM grounds "C37-58", "C37-15", "C37-30" and/or "E23-31" (Electric throttle body model) circuit is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
6	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "GRN/BLK" wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	"GRN/BLK" wire is shorted to other circuit.

Step	Action	Yes	No
7	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and engine ground with ignition switch turned OFF. *Is resistance infinity?*	Go to Step 8.	“GRN/BLK” wire is shorted to ground circuit.
8	**MAF sensor signal circuit check** 1) Measure resistance between “GRN/BLK” wire terminal of MAF and IAT sensor connector and “C37-26” terminal of ECM connector. *Is resistance below 3 Ω?*	Go to Step 9.	“GRN/BLK” wire is open or high resistance circuit.
9	**MAF sensor output signal check** 1) Connect connectors to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between “C37-26” and “C37-27” terminals of ECM connector referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is each value within specified range?*	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0103: Mass Air Flow Circuit High Input

S7N20A1114019

Wiring Diagram



I4RS0B110015-02

1. MAF and IAT sensor	4. ECM
2. Ignition switch	5. To other sensors
3. Main relay	*: Electric throttle body model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of MAF sensor output is more than specified value for specified time continuously. (1 driving cycle detection logic)	• Open or short in MAF sensor circuit • MAF sensor • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

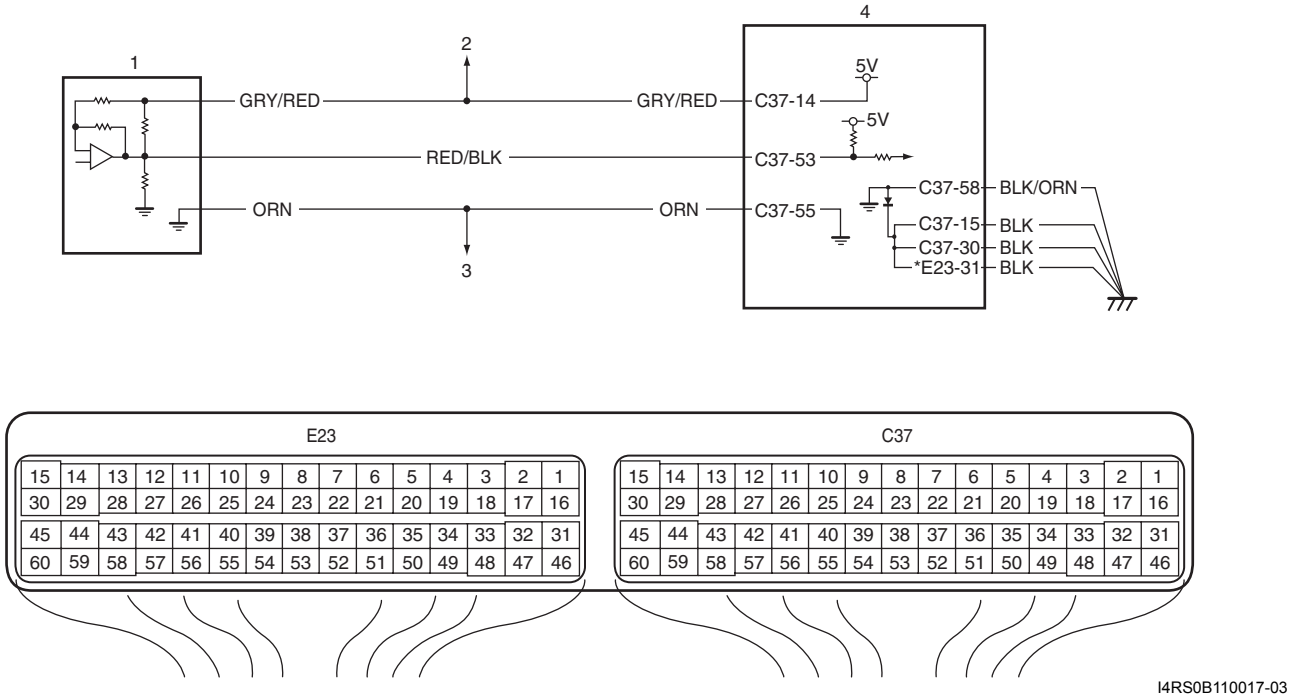
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**MAF sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data: M13A / M15A / M16A" for normal value.) *Is normal value indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**MAF sensor power supply voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch tuned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "BLK/RED" wire terminal of MAF and IAT sensor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**MAF sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between "GRY" wire terminal of MAF and IAT sensor connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 6.	Go to Step 5.

Step	Action	Yes	No
5	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-27” terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	“GRY” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15”, “C37-30” and/or “E23-31” (Electric throttle body model) circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
6	**MAF sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between “GRY/BLK” wire terminal of MAF and IAT sensor connector and engine ground. *Is voltage 0 V?*	Go to Step 7.	“GRY/BLK” wire is shorted to other circuit.
7	**MAF sensor output signal check** 1) Connect connector to MAF and IAT sensor and ECM with ignition switch turned OFF. 2) Measure voltage between “C37-26” and “C37-27” terminal of ECM connector referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is each value within specified range?*	Substitute a known-good ECM and recheck.	Faulty MAF and IAT sensor.

DTC P0106: Manifold Absolute Pressure Range / Performance

S7N20A1114020

Wiring Diagram



I4RS0B110017-03

1. Manifold absolute pressure sensor	3. To other sensors	*: Electric throttle body model
2. To TP sensor and A/C refrigerant pressure sensor (A/C model)	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Difference between Max. manifold absolute pressure value and Min. manifold pressure value is less than 1.3 kPa (0.19 psi) when engine running at idle speed. • Difference between barometric pressure value and manifold pressure value is less than 33.3 kPa (4.83 psi) for 2 sec. at 2000 r/mini. or more. (2 driving cycle detection logic)	• Manifold absolute pressure sensor • Manifold absolute pressure sensor vacuum passage • Air intake system • ECM

DTC Confirmation Procedure

NOTE

Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

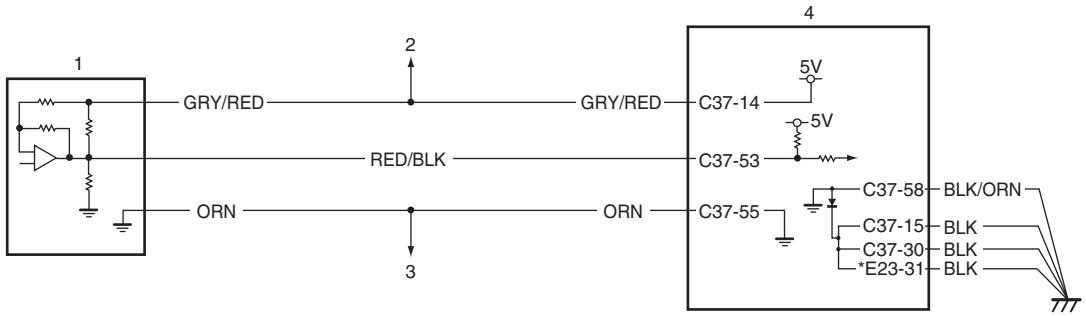
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC. *Is there DTC P0107 or DTC P0108?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**MAP sensor output signal check** 1) Check MAP sensor according to "Manifold Absolute Pressure (MAP) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Go to Step 4.	Faulty MAP sensor.

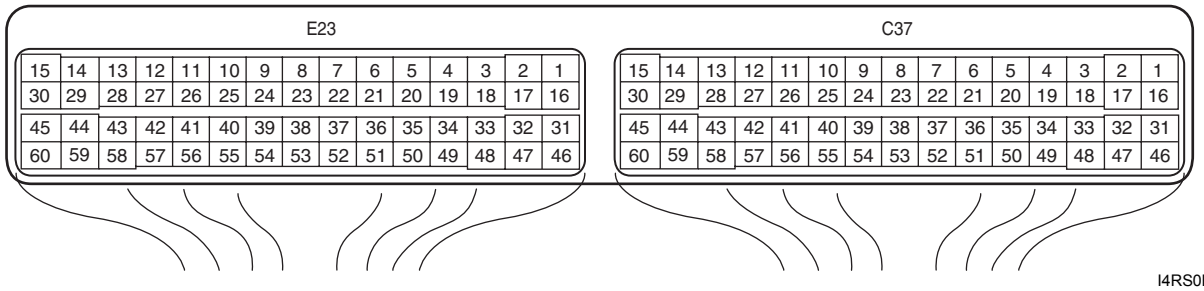
Step	Action	Yes	No
4	**MAP sensor circuit check** 1) Check MAP sensor circuit referring to Step 3 to 6 of "DTC P0107: Manifold Absolute Pressure Circuit Low Input: M13A / M15A / M16A" or Step 3 to 8 of "DTC P0108: Manifold Absolute Pressure Circuit High Input: M13A / M15A / M16A". *Is circuit in good condition?*	Go to Step 5.	Repair or replace.
5	**Air intake system check** 1) Check air intake system for clog or leak. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0107: Manifold Absolute Pressure Circuit Low Input

S7N20A1114021

Wiring Diagram





I4RS0B110017-03

1. Manifold absolute pressure sensor	3. To other sensors	*: Electric throttle body model
2. To TP sensor and A/C refrigerant pressure sensor (A/C model)	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is lower than specified value for specified time continuously. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • TP sensor • A/C refrigerant pressure sensor (A/C model) • ECM

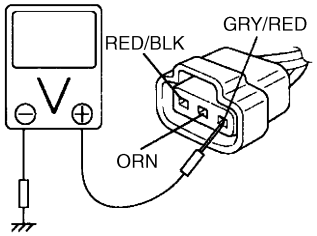
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

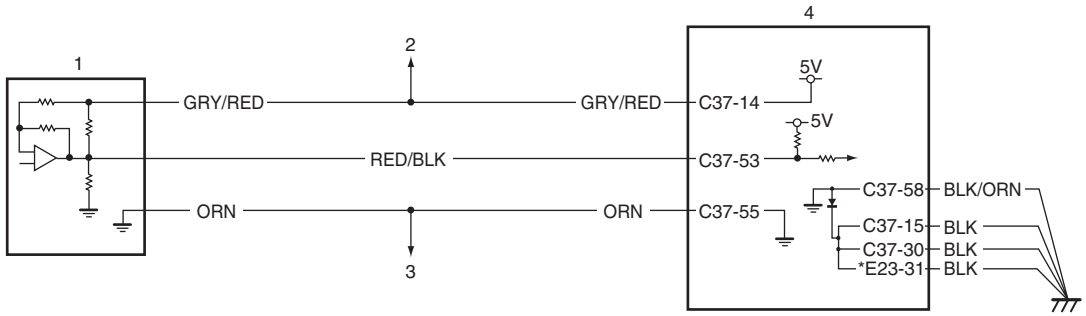
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake manifold pressure displayed on scan tool. *Is it 0 kPa (0 in.Hg)?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**MAP sensor power supply voltage check** 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I4RS0B110019-03 *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**MAP sensor power supply circuit check** 1) Disconnect connectors from TP sensor and A/C refrigerant pressure sensor (A/C model) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or A/C refrigerant pressure sensor (A/C model).	"GRY/RED" wire is shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	**MAP sensor signal circuit check** 1) Measure voltage between "RED/BLK" wire terminal of MAP sensor connector and engine ground. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 6.

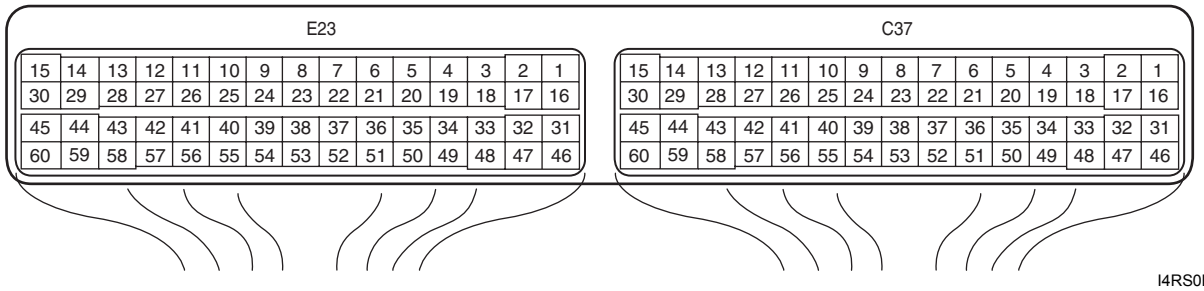
Step	Action	Yes	No
6	**MAP sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “C37-53” terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	“RED/BLK” wire is shorted to ground circuit.
7	**MAP sensor output signal check** 1) Check MAP sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0108: Manifold Absolute Pressure Circuit High Input

S7N20A1114022

Wiring Diagram





I4RS0B110017-03

1. Manifold absolute pressure sensor	3. To other sensors	*: Electric throttle body model
2. To TP sensor and A/C refrigerant pressure sensor (A/C model)	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Manifold absolute pressure sensor output voltage is higher than specified value for specified time continuously. (1 driving cycle detection logic)	• Manifold absolute pressure sensor circuit • Manifold absolute pressure sensor • TP sensor • A/C refrigerant pressure sensor (A/C model) • ECM

NOTE

When DTC P0113 and P0118 are indicated together, it is possible that “ORN” wire circuit is open.

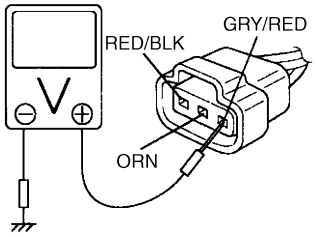
DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

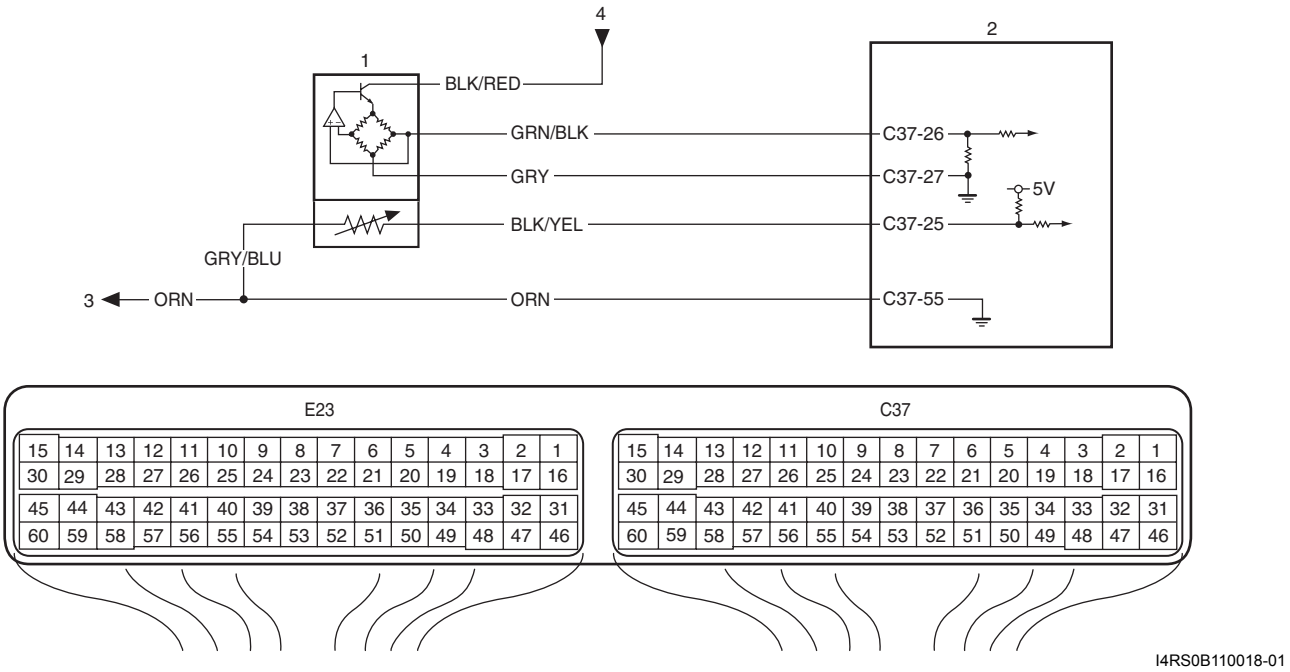
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**MAP sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON. 3) Check intake manifold pressure displayed on scan tool. *Is it 127 kPa (37.5 in.Hg)?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**MAP sensor power supply voltage check** 1) Disconnect connector from MAP sensor with ignition switch turned OFF. 2) Check for proper connection of MAP sensor at "GRY/RED", "RED/BLK" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.  I4RS0B110019-03 *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**MAP sensor power supply circuit check** 1) Disconnect connectors from TP sensor and A/C refrigerant pressure sensor (A/C model) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or A/C refrigerant pressure sensor (A/C model).	"GRY/RED" wire is open or shorted to power circuit.

Step	Action	Yes	No
5	**MAP sensor ground circuit check** 1) Measure resistance between “ORN” wire terminal of MAP sensor connector and engine ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	Go to Step 6.
6	**Ground circuit check** 1) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15”, “C37-30” and/or “E23-31” (Electric throttle body model) circuit are open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
7	**MAP sensor signal circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “RED/BLK” wire terminal of MAP sensor connector and engine ground. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 8.
8	**MAP sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “RED/BLK” wire terminal of MAP sensor connector and “C37-53” terminal of ECM connector. *Is resistance below 2 Ω?*	“RED/BLK” wire is shorted to power supply circuit.	“RED/BLK” wire is open or high resistance circuit.
9	**MAP sensor output signal check** 1) Check MAP sensor according to “Manifold Absolute Pressure (MAP) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty MAP sensor.

DTC P0111: Intake Air Temperature Circuit Range / Performance

S7N20A1114023

Wiring Diagram



I4RS0B110018-01

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference of maximum IAT minus minimum IAT is less than 0.3 °C (32.5 °F) while ECT is over 70 °C (158 °F) after 10 min from cold engine start (ECT is lower than 30°C (86 °F) at engine start). (2 driving cycle detection logic)	• High resistance circuit • MAF and IAT sensor • ECM

DTC Confirmation Procedure

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

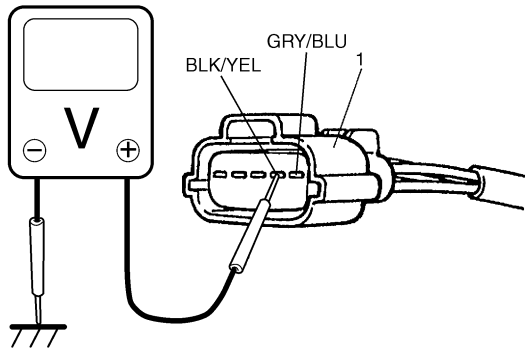
- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature at engine start: less than 30 °C (86 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch, clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle speed for 10 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

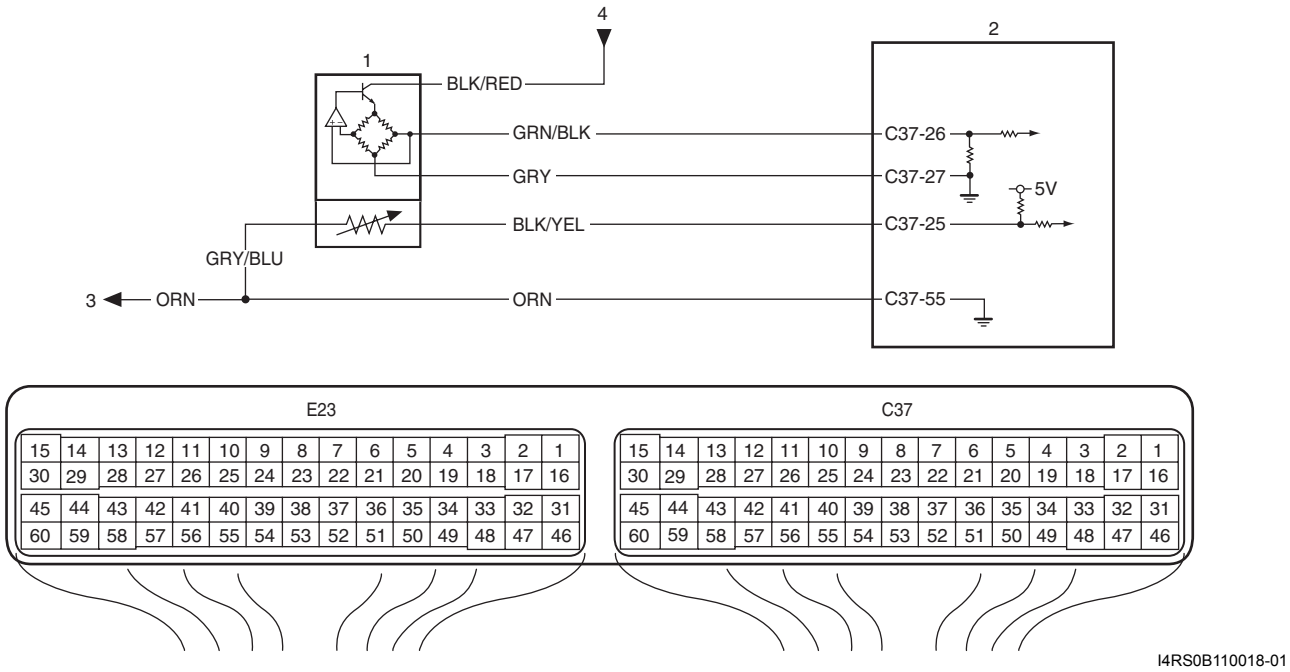
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check intake air temp. displayed on scan tool. *Is –40 °C (–40 °F) or 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**Wire harness check** 1) Disconnect MAF and IAT sensor connector (1) with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor connector (1) at "BLK/YEL" and "ORN" wire terminals. 3) If OK, then with ignition switch turned ON, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground.  I4RS0B110020-01 *Is measured voltage applied to "BLK/YEL" wire terminal about 4 – 6 V?*	Go to Step 8.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-25" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-25" terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V at terminal?*	"BLK/YEL" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.

Step	Action	Yes	No
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	“BLK/YEL” wire is shorted to ground or other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Turn ignition switch to ON position. 2) Measure voltage between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 7.	“BLK/YEL” wire shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
7	**Wire circuit check** 1) Measure resistance between “C37-25” terminal of ECM connector and “BLK/YEL” wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. *Is resistance below 3 Ω?*	Go to Step 8.	“BLK/YEL” wire is high resistance circuit.
8	**Ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of MAF and IAT sensor connector at “GRY/BLU” wire terminal. 3) Measure resistance between “GRY/BLU” wire terminal of MAF and IAT sensor connector and vehicle body ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 3 Ω?*	“GRY/BLU” wire and/or “ORN” wire is open or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**IAT sensor check** 1) Check IAT sensor according to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0112: Intake Air Temperature Sensor Circuit Low

S7N20A1114024

Wiring Diagram



1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of IAT sensor output is less than specified value (High intake air temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

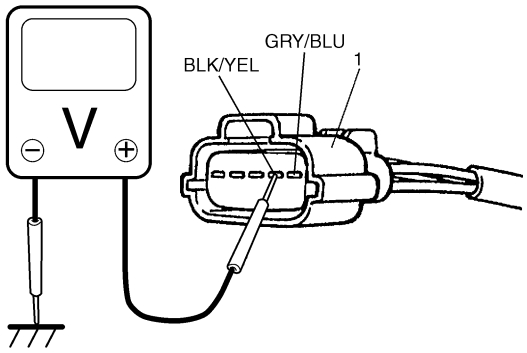
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

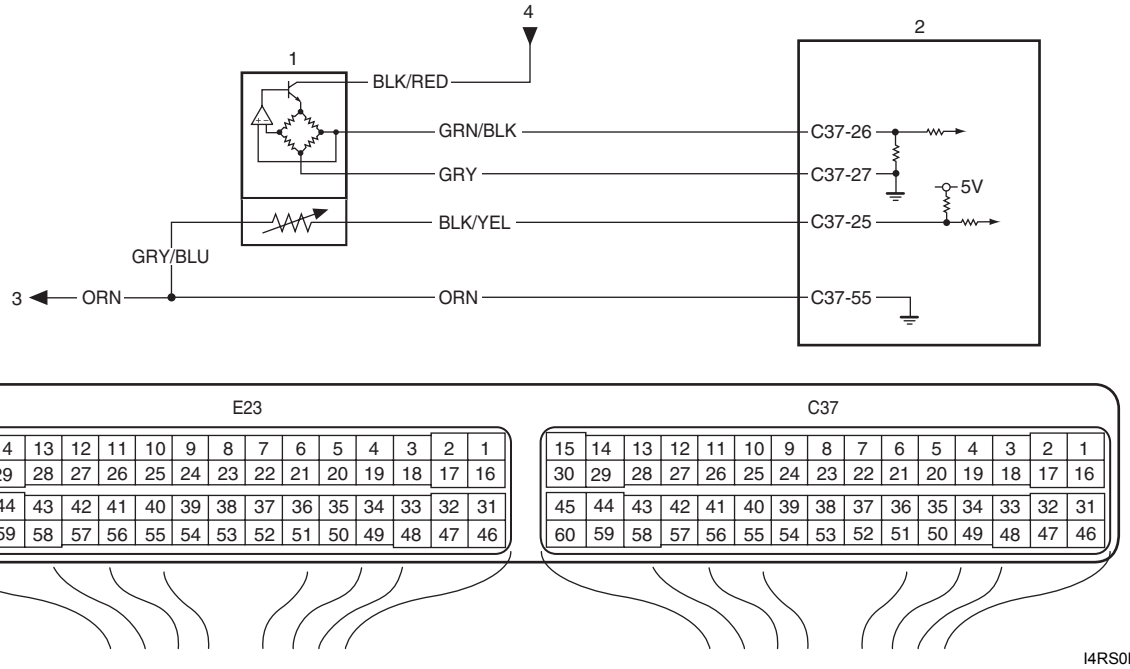
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. *Is 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**ECM voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "BLK/YEL" and "GRY/BLU" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0B110020-01 *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**IAT short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"BLK/YEL" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
5	**IAT short circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “BLK/YEL” wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	“BLK/YEL” wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**IAT sensor for performance check** 1) Check IAT sensor according to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0113: Intake Air Temperature Sensor Circuit High

S7N20A1114025

Wiring Diagram



I4RS0B110018-01

1. MAF and IAT sensor	3. To other sensors
2. ECM	4. From main relay

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of IAT sensor output is more than specified value (Low intake air temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• IAT sensor circuit • IAT sensor • ECM

NOTE

When DTC P0108 and P0118 are indicated together, it is possible that “ORN” wire circuit is open.

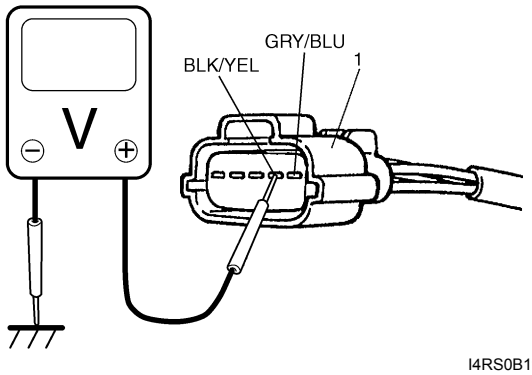
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

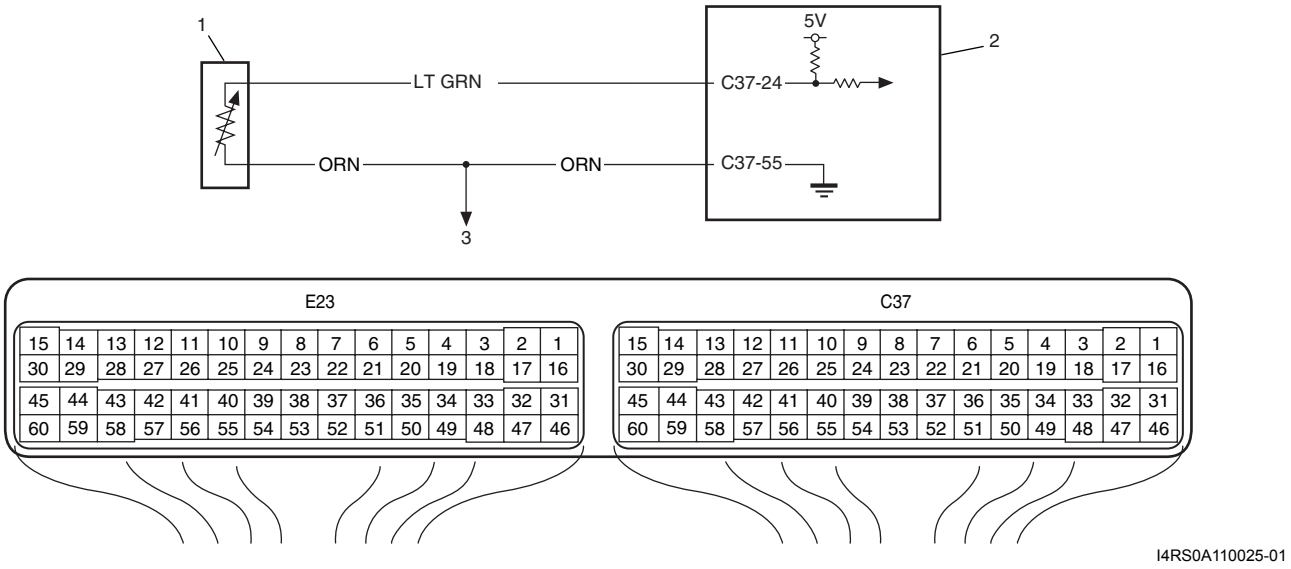
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**IAT sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check intake air temp. displayed on scan tool. *Is –40 °C (–40 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**IAT sensor voltage check** 1) Disconnect connector from MAF and IAT sensor with ignition switch turned OFF. 2) Check for proper connection to MAF and IAT sensor at "BLK/YEL" and "GRY/BLU" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector (1) and vehicle body ground.  I4RS0B110020-01 *Is voltage about 4 – 6 V?*	Go to Step 7.	Go to Step 4.

Step	Action	Yes	No
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-25" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-25" terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"BLK/YEL" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between "BLK/YEL" wire terminal of MAF and IAT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"BLK/YEL" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Measure resistance between "C37-25" terminal of ECM connector and "BLK/YEL" wire terminal of MAF and IAT sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 7.	"BLK/YEL" wire is high resistance circuit.
7	**Ground circuit check** 1) Connect connectors to ECM. 2) Measure resistance between "GRY/BLU" wire terminal of MAF and IAT sensor connector and vehicle body ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 9.	Go to Step 8.
8	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-55" terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	"GRY/BLU" wire and/or "ORN" wire is open circuit or high resistance circuit. Poor "C37-55" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	**IAT sensor for performance check** 1) Check IAT sensor according to "Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace MAF and IAT sensor.

DTC P0116: Engine Coolant Temperature Circuit Range / Performance

S7N20A1114026

Wiring Diagram



1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
ECT sensor values is less than 5 °C, 41 °F (non-VVT model) or –5 °C, 23 °F (VVT model) while engine is running under more than specified engine load (more than 1000 rpm) for 2 to 1112 min (depending on ECT at engine start) continuously from engine start. (2 driving cycle detecting logic)	• ECT sensor • ECT sensor circuit • Thermostat • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

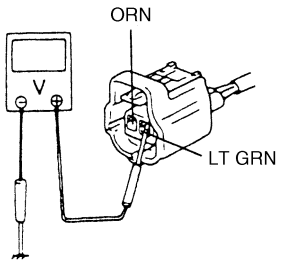
- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch, clear DTC.
3) Start engine.
4) Drive vehicle at 40 mph (60 km/h) or higher for 20 min. or more.
5) Stop vehicle.
6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

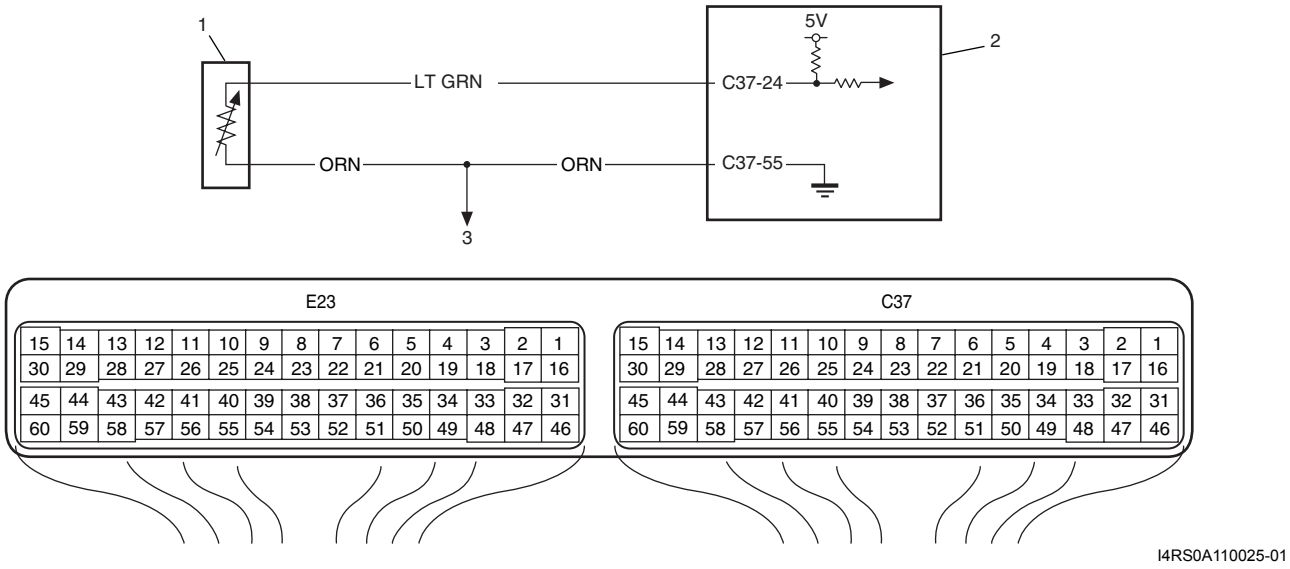
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**DTC check** 1) With ignition switch turned OFF, install scan tool to DLC. 2) Turn ON ignition switch and check DTC with scan tool. *Is DTC P0118 displayed?*	Go to "DTC P0118: Engine Coolant Temperature Circuit High: M13A / M15A / M16A".	Go to Step 3.
3	**Engine coolant temp. check** 1) Turn ON ignition switch and check engine coolant temp. displayed on scan tool. 2) Warm up engine to normal operating temp. and check engine coolant temp. displayed on scan tool. *Does engine coolant temp. vary more than 1 °C (1 °F) and rise higher than 70 °C (158 °F)?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 4.
4	**Thermostat check** *Is there a symptom due to thermostat remaining open (it takes a long time before vehicle heater becomes effective or before engine is warmed to normal operating temp., etc.)?*	Check thermostat referring to "Thermostat Inspection: M13A / M15A / M16A in Section 1F".	Go to Step 5.
5	**Wire harness check** 1) Disconnect ECT sensor connector with ignition switch turned OFF. 2) Check for proper connection to ECT sensor connector at "ORN" and "LT GRN" wire terminals. 3) If OK, then with ignition switch ON, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I2RH01110067-01 *Is measured voltage applied to "LT GRN" wire terminal about 4 – 6 V?*	Go to Step 9.	Go to Step 6.

Step	Action	Yes	No
6	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-24" terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 7.	Go to Step 7.
7	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and body ground. *Is voltage about 0 V?*	Go to Step 8.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
8	**Wire circuit check** 1) Measure resistance between "C37-24" terminal of ECM connector and "LT GRN" wire terminal of ECT sensor connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 9.	"LT GRN" wire is high resistance circuit.
9	**Ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at "ORN" wire terminal. 3) Measure resistance between "ORN" wire terminal of ECT sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 11.	Go to Step 10.
10	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between "C37-55" terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	"ORN" wire is high resistance circuit. Poor "C37-55" connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	**ECT sensor check** 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0117: Engine Coolant Temperature Circuit Low

S7N20A1114027

Wiring Diagram



I4RS0A110025-01

1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of ECT sensor output is less than specified value (High engine coolant temperature (low voltage / low resistance)) (1 driving cycle detection logic)	• ECT sensor circuit • ECT sensor • ECM

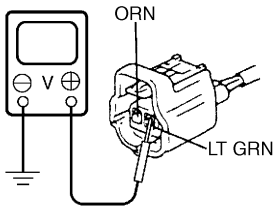
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

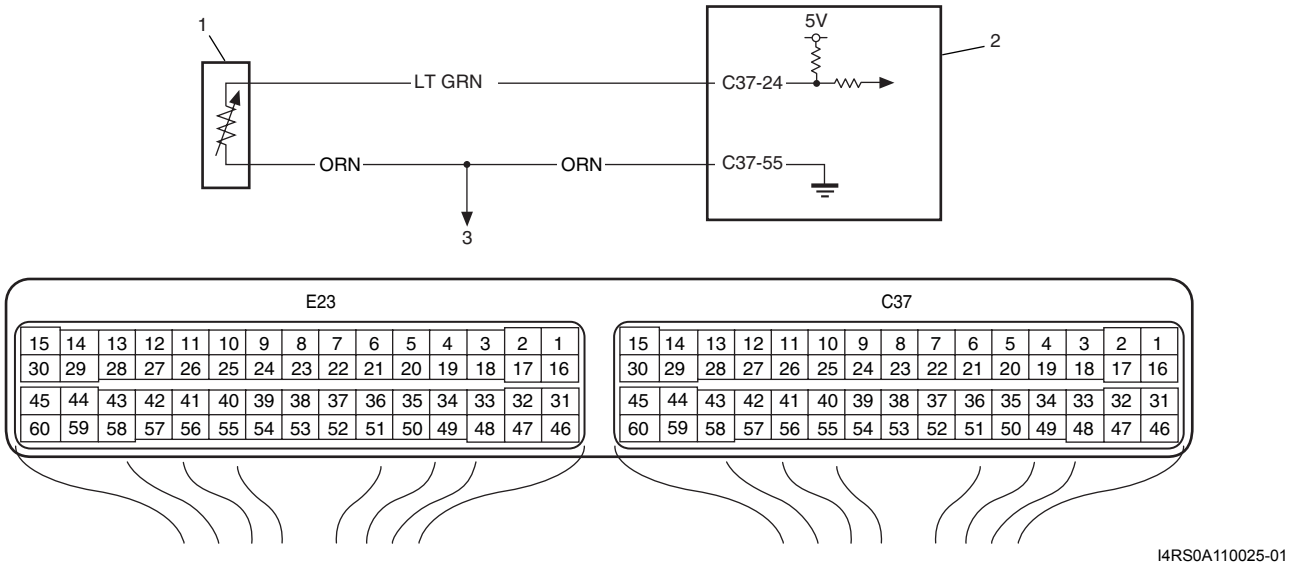
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**ECT sensor and its circuit check** 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. *Is 119 °C (246 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**ECM voltage check** 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I4RS0A110026-01 *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**ECT sensor short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	"LT GRN" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.
5	**ECT sensor short circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	"LT GRN" wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**ECT sensor for performance check** 1) Check ECT sensor according to "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0118: Engine Coolant Temperature Circuit High

S7N20A1114028

Wiring Diagram



1.	ECT sensor
2.	ECM
3.	To other sensors

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. • Engine is running • Voltage of ECT sensor output is more than specified value (Low engine coolant temperature (high voltage / high resistance)) (1 driving cycle detection logic)	• ECT sensor circuit • ECT sensor • ECM

NOTE

When DTC P0108 and P0113 are indicated together, it is possible that "ORN" wire circuit open.

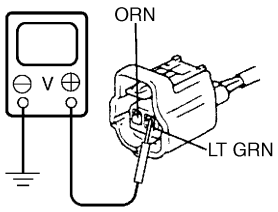
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

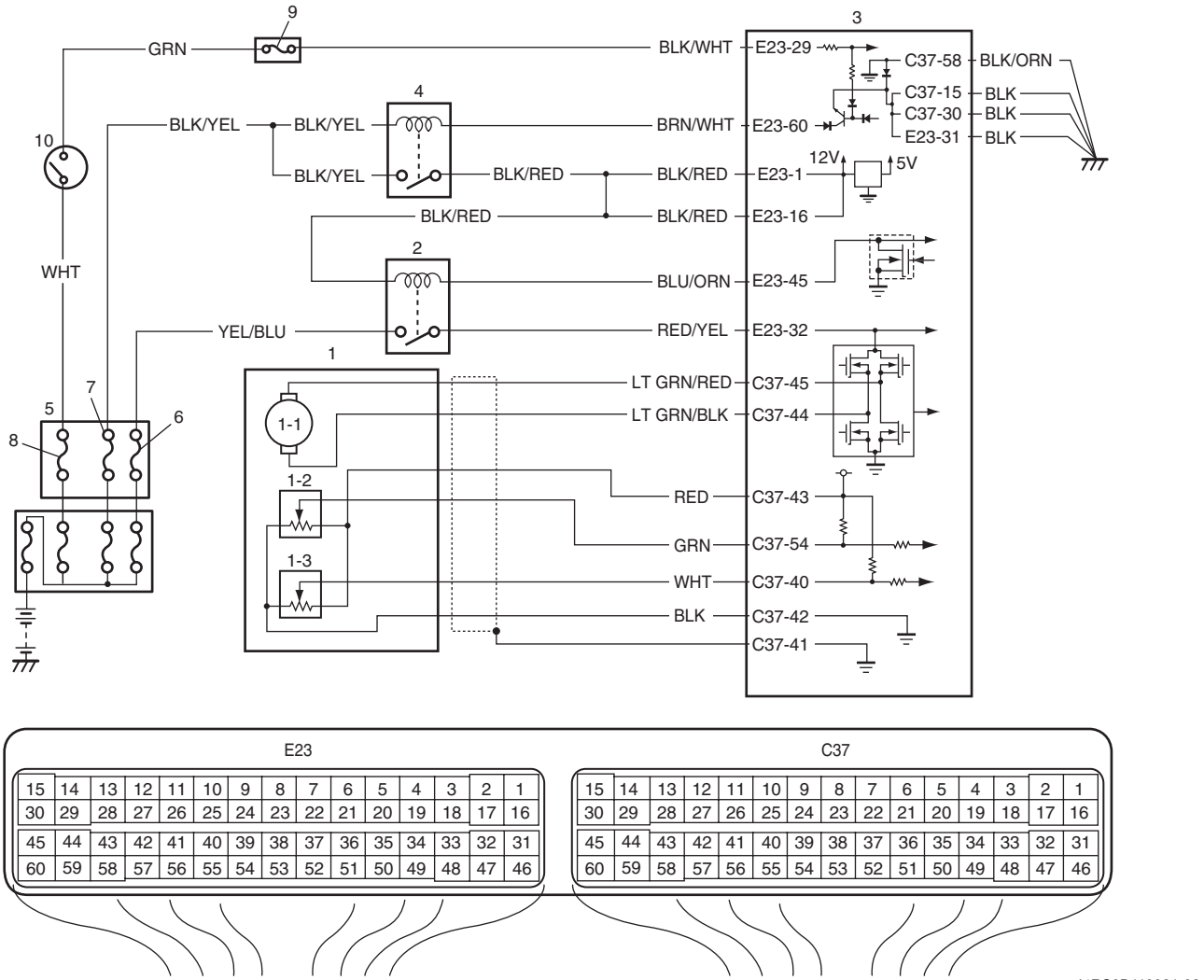
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**ECT sensor and its circuit check** 1) Connect scan tool with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check engine coolant temp. displayed on scan tool. *Is –40 °C (–40 °F) indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**ECT voltage check** 1) Disconnect connector from ECT sensor with ignition switch turned OFF. 2) Check for proper connection to ECT sensor at "LT GRN" and "ORN" wire terminals. 3) If OK, then turn ON ignition switch, measure voltage between "LT GRN" wire terminal of ECT sensor connector and vehicle body ground.  I4RS0A110026-01 *Is voltage about 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-24" terminal. 4) If OK, then turn ON ignition switch, measure voltage between "C37-24" wire terminal of ECM connector and vehicle body ground. *Is voltage about 4 – 6 V?*	"LT GRN" wire is open circuit. If wire and connection are OK, go to Step 5.	Go to Step 5.

Step	Action	Yes	No
5	**ECT sensor harness voltage check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between “LT GRN” wire terminal of ECT sensor connector and vehicle body ground. *Is voltage about 0 V?*	Go to Step 6.	“LT GRN” wire is shorted to other circuit. If wire is OK, substitute a known-good ECM and recheck.
6	**ECT sensor harness resistance check** 1) Measure resistance between “C37-24” terminal of ECM connector and “LT GRN” wire terminal of ECT sensor connector with ignition switch turn OFF. *Is resistance below 5 Ω?*	Go to Step 7.	“LT GRN” wire is high resistance circuit.
7	**ECT sensor ground circuit check** 1) Connect connectors to ECM. 2) Check for proper connection of ECT sensor connector at “ORN” wire terminal. 3) Measure resistance between “ORN” wire terminal of ECT sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 9.	Go to Step 8.
8	**ECT sensor ground circuit check** 1) Measure resistance between “C37-55” terminal of ECM connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire is open circuit or high resistance circuit. Poor “C37-55” connection.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
9	**ECT sensor for performance check** 1) Check ECT sensor according to “Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

DTC P0122: Throttle Position Sensor (Main) Circuit Low

S7N20A1114031

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. “IG ACC” fuse
1-1. Throttle actuator	4. Main relay	9. “IG COIL” fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. “TH MOT” fuse	
2. Throttle actuator control relay	7. “FI” fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (main) is less than specified value for specified time continuously. (1 driving detection logic)	• Throttle position sensor (main) circuit • Electric throttle body assembly • ECM

NOTE

When DTC P0122 and P0222 are indicated together, it is possible that “RED” wire open circuit.

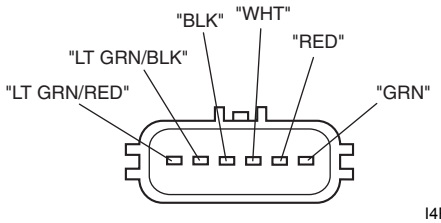
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

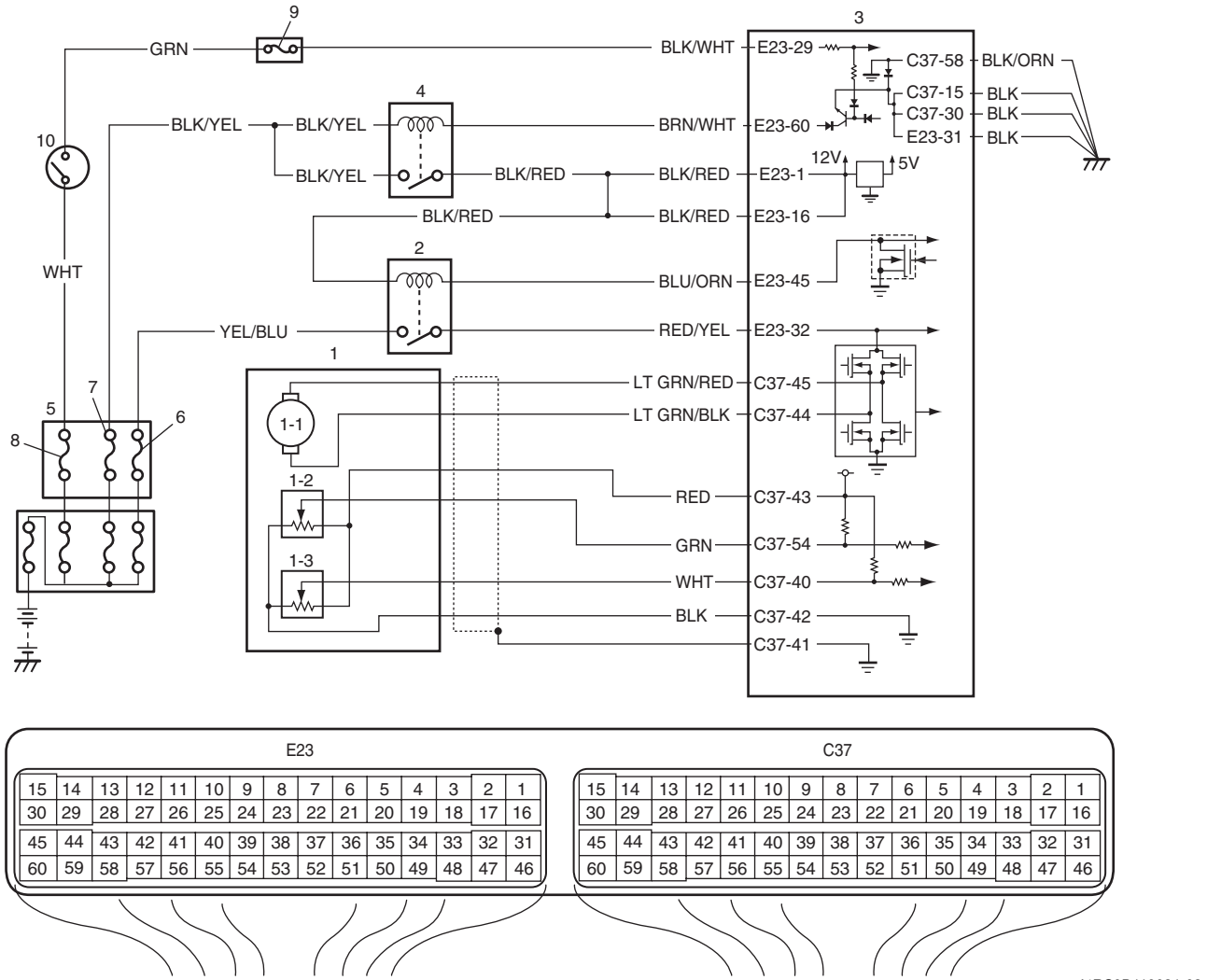
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Throttle position sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 1 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed TP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**ECM voltage check** 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "GRN" and "BLK" wire terminals.  I4RS0B110022-02 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.

Step	Action	Yes	No
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "C37-43" terminal. 4) If OK, measure voltage between "C37-43" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	"RED" wire is open or high resistance circuit.	Go to Step 5.
5	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-43" terminal of ECM connector and engine ground. *Is resistance infinity?*	Substitute a known-good ECM and recheck.	"RED" wire is shorted to ground circuit.
6	**Wire harness check** 1) Measure voltage between "GRN" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 7.
7	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C37-54" and "C37-42" terminals. 3) If OK, measure resistance between "GRN" and "BLK" wire terminals of electric throttle body assembly connector. *Is resistance infinity?*	Go to Step 8.	"GRN" wire is shorted to "BLK" wire.
8	**Wire harness check** 1) Measure resistance between "GRN" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned OFF. *Is resistance infinity?*	Substitute a known-good ECM and recheck.	"GRN" wire is shorted to ground circuit.
9	**Electric throttle body assembly check** 1) Check throttle pedal position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0123: Throttle Position Sensor (Main) Circuit High

S7N20A1114033

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. "IG ACC" fuse
1-1. Throttle actuator	4. Main relay	9. "IG COIL" fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. "TH MOT" fuse	
2. Throttle actuator control relay	7. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (main) is more than specified value for specified time continuously. (1 driving detection logic)	• Throttle position sensor (main) circuit • Electric throttle body assembly • ECM

NOTE

When DTC P0123 and P0223 are indicated together, it is possible that "RED" wire shorted to power circuit and/or "BLK" wire open.

DTC Confirmation Procedure

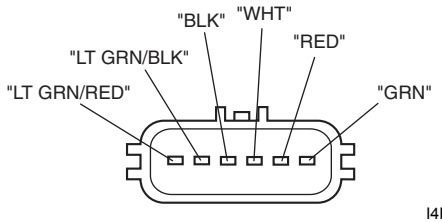
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.

5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

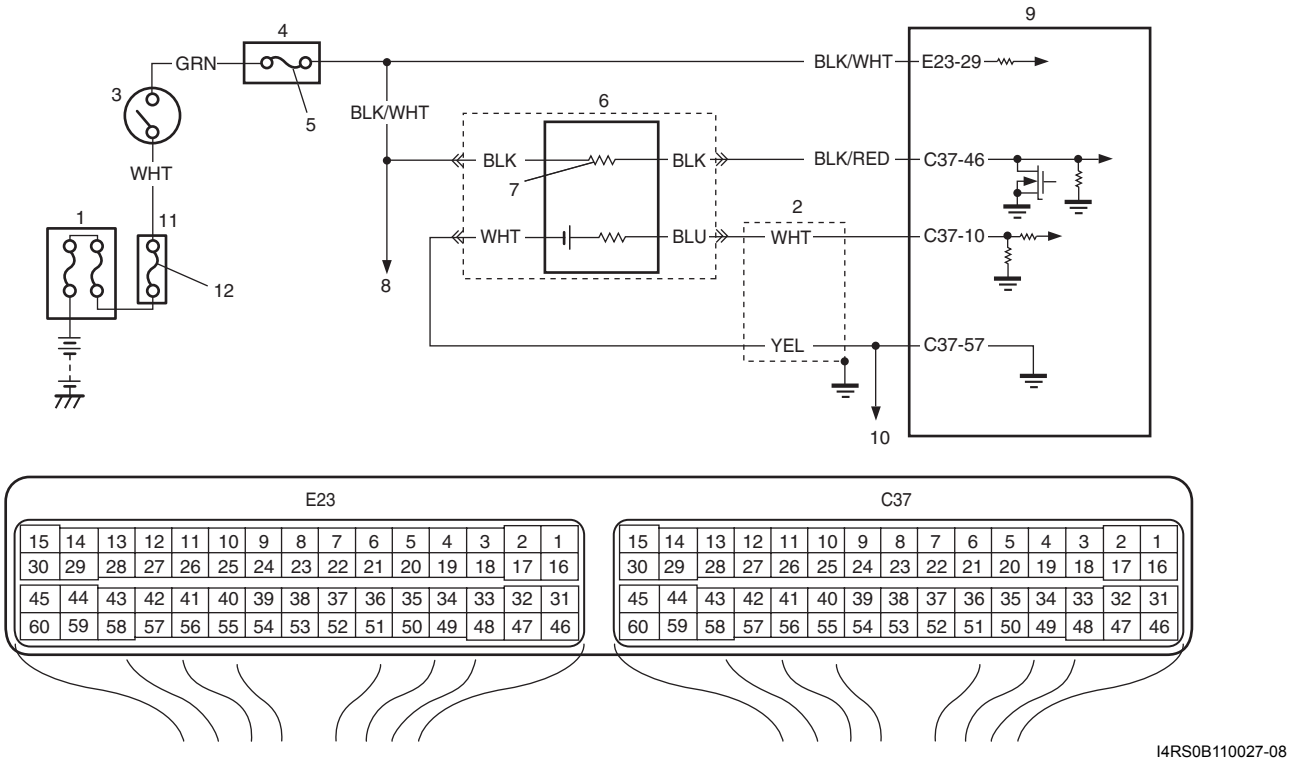
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Throttle position sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 1 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed TP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**ECM voltage check** 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "GRN" and "BLK" wire terminals.  I4RS0B110022-02 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C37-43" terminal. 3) Measure voltage between "C37-43" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	"RED" wire is shorted to power circuit.

Step	Action	Yes	No
5	**Wire harness check** 1) Measure voltage between “GRN” wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 6.
6	**Wire harness check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-43” and “C37-54” terminals. 4) If OK, measure voltage between “C37-54” terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	“GRN” wire is open or high resistance circuit.	Go to Step 7.
7	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “GRN” and “RED” wire terminals of electric throttle body assembly connector. *Is resistance infinity?*	Go to Step 8.	“GRN” wire is shorted to “RED” wire.
8	**Wire harness check** 1) Turn ON ignition switch. 2) Measure voltage between “C37-54” terminal of ECM connector and engine ground. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	“GRN” wire is shorted to power circuit.
9	**Ground circuit check** 1) Turn OFF ignition switch. 2) Measure resistance between “BLK” wire terminal of electric throttle body assembly connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 11.	Go to Step 10.
10	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at “C37-42” terminal. 3) Measure resistance between “C37-42” terminal of ECM connector and engine ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	“BLK” wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	**Electric throttle body assembly check** 1) Check throttle pedal position sensor referring to “Throttle Position Sensor Performance Check” under “Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1)

S7N20A1114034

Wiring Diagram



I4RS0B110027-08

1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-2 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-1	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0131: Maximum HO2S voltage is less than 0.6 V (2 driving cycle detection logic) **DTC P0132:** Minimum HO2S voltage is 0.3 V or more (*2 driving cycle detection logic, monitoring once / 1 driving)	• HO2S-1 circuit • HO2S-1 • Fuel system • ECM • Fuel shortage • Exhaust system • Air intake system

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 72 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)
5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

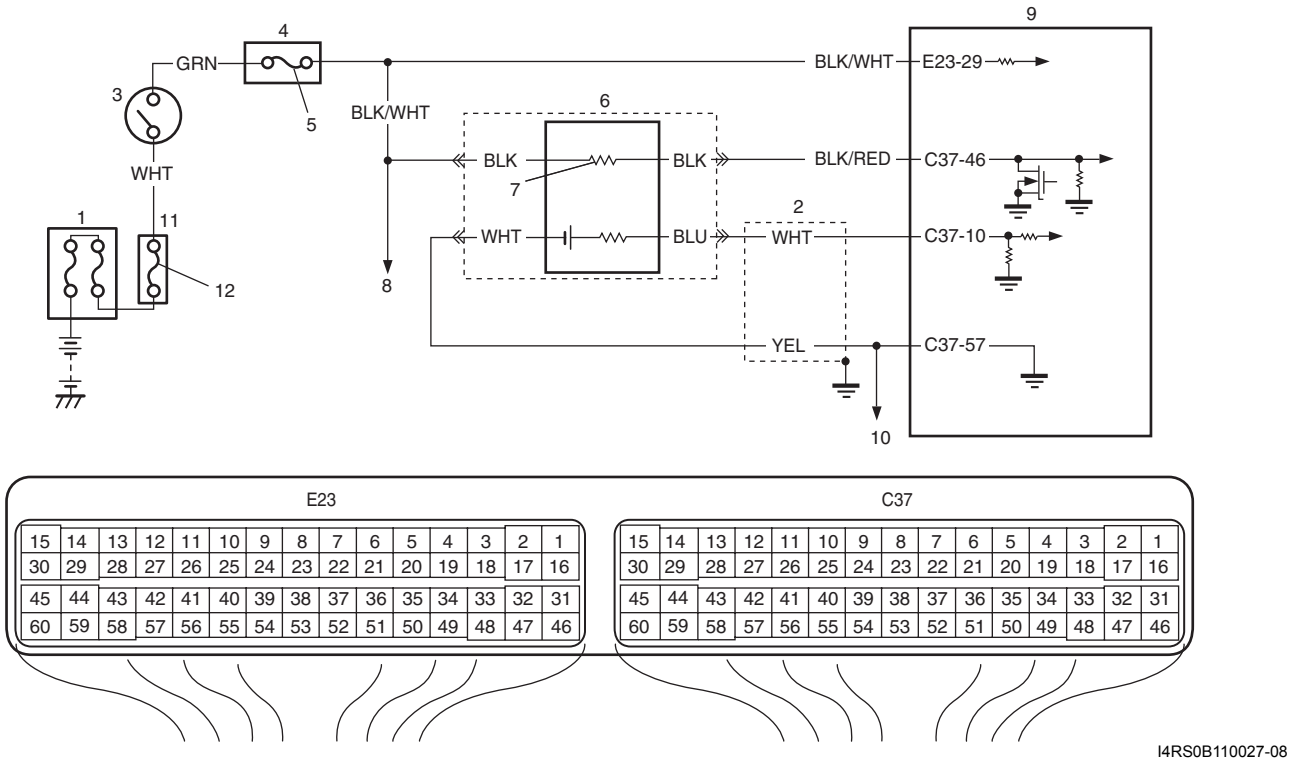
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	*Is there DTC(s) other than HO2S-1?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**HO2S-1 signal check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). *Does HO2S-1 output voltage deflect between below 0.3 V and over 0.6 V repeatedly?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If check result is OK, go to Step 9.	Go to Step 4.

Step	Action	Yes	No
4	**HO2S-1 ground check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 connector at "BLK/RED", "WHT", "BLK/WHT" and "YEL" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-1 connector and engine ground. *Is measured resistance less than 5 Ω?*	Go to Step 5.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "WHT" wire terminal of HO2S-1 connector and "C37-10" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 6.	"WHT" wire is high resistance circuit or open circuit. Poor "C37-10" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turn OFF. 2) Measure resistance between "WHT" wire terminal of HO2S-1 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"WHT" wire is shorted to ground circuit.
7	**HO2S-1 signal circuit check** 1) Measure voltage between "WHT" wire terminal of HO2S-1 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	"WHT" wire is shorted to other circuit.
8	**HO2S-1 heater circuit check** 1) Check HO2S-1 heater circuit referring to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1): M13A / M15A / M16A". *Is circuit in good condition?*	Go to Step 9.	Repair HO2S-1 circuit.
9	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: M13A / M15A / M16A". If it is in good condition, go to Step 10.	Repair leakage of exhaust system.
10	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-1 referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0133: O2 Sensor (HO2S) Circuit Slow Response (Sensor-1)

S7N20A1114035

Wiring Diagram



I4RS0B110027-08

1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-2 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-1	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Response time (time to change from lean to rich or from rich to lean) of HO2S-1 output voltage is about 1 sec. at minimum or average time of 1 cycle is 5 sec. at minimum. (*2 driving cycle detection logic, monitoring once / 1 driving)	Heated oxygen sensor-1

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)

5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check if DTC and pending DTC exist by using scan tool. If not, check if oxygen sensor monitoring test has been completed by using scan tool. If not in both of above checks (i.e., no DTC and pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 6).

DTC Troubleshooting

NOTE

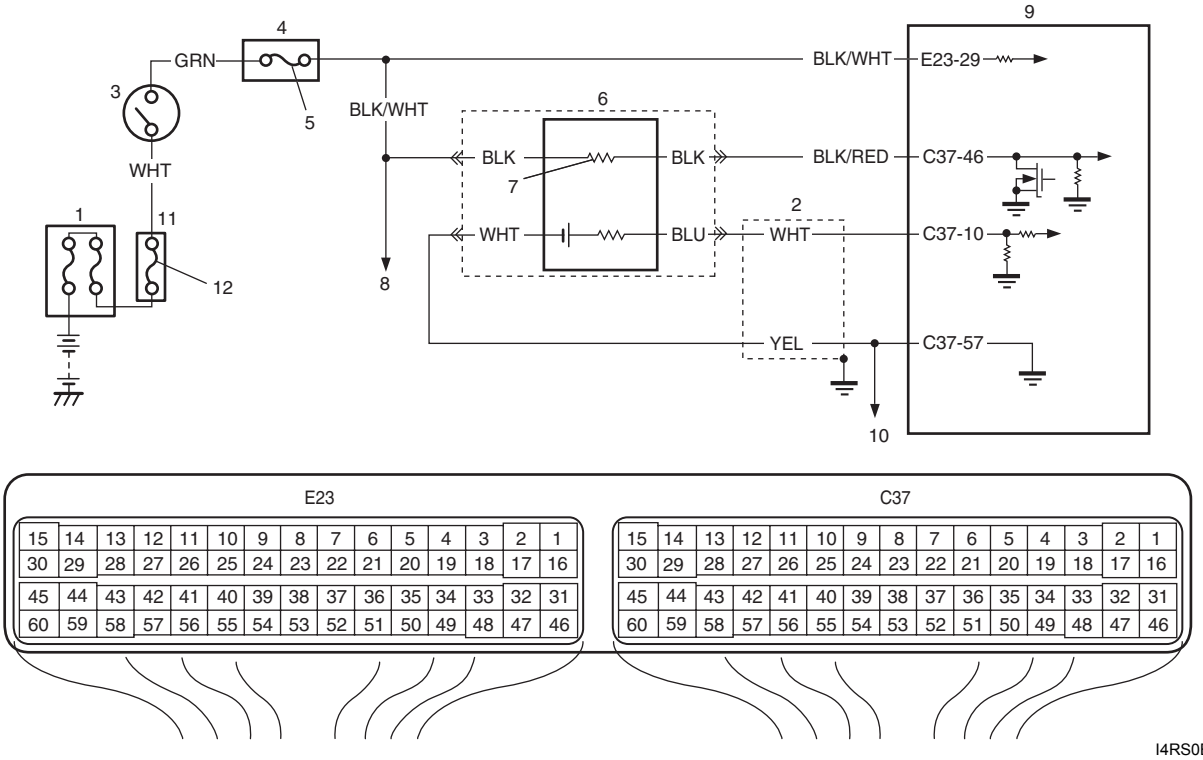
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	*Is there DTC(s) other than HO2S-1 (DTC P0133)?*	Go to applicable DTC diag. flow.	Replace HO2S-1.

DTC P0134: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-1)

S7N20A1114036

Wiring Diagram



I4RS0B110027-08

1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-2
2. Shield wire	5. "IG COIL" fuse	8. To HO2S-2 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-1	9. ECM	12. "IG ACC" fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S voltage is higher than 0.6 V for more than 1 min continuously after warming up engine or HO2S voltage is lower than 0.3 V for more than 1 min continuously after warming up engine. (2 driving cycle detection logic)	• HO2S-1 • HO2S-1 circuit • Exhaust gas leakage • ECM • Air intake system

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine Coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Drive vehicle at 40 mph (60 km/h) or higher. (engine speed: 2500 – 3000 r/min.)
5) Keep above vehicle speed for 6 min. or more. (Throttle valve opening is kept constant in this step.)
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 3 sec. or more) and then stop vehicle.
7) Check if DTC and pending DTC exist by using scan tool. If not, check if oxygen sensor monitoring test has been completed by using scan tool. If not in both of above checks (i.e., no DTC and pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 6).

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

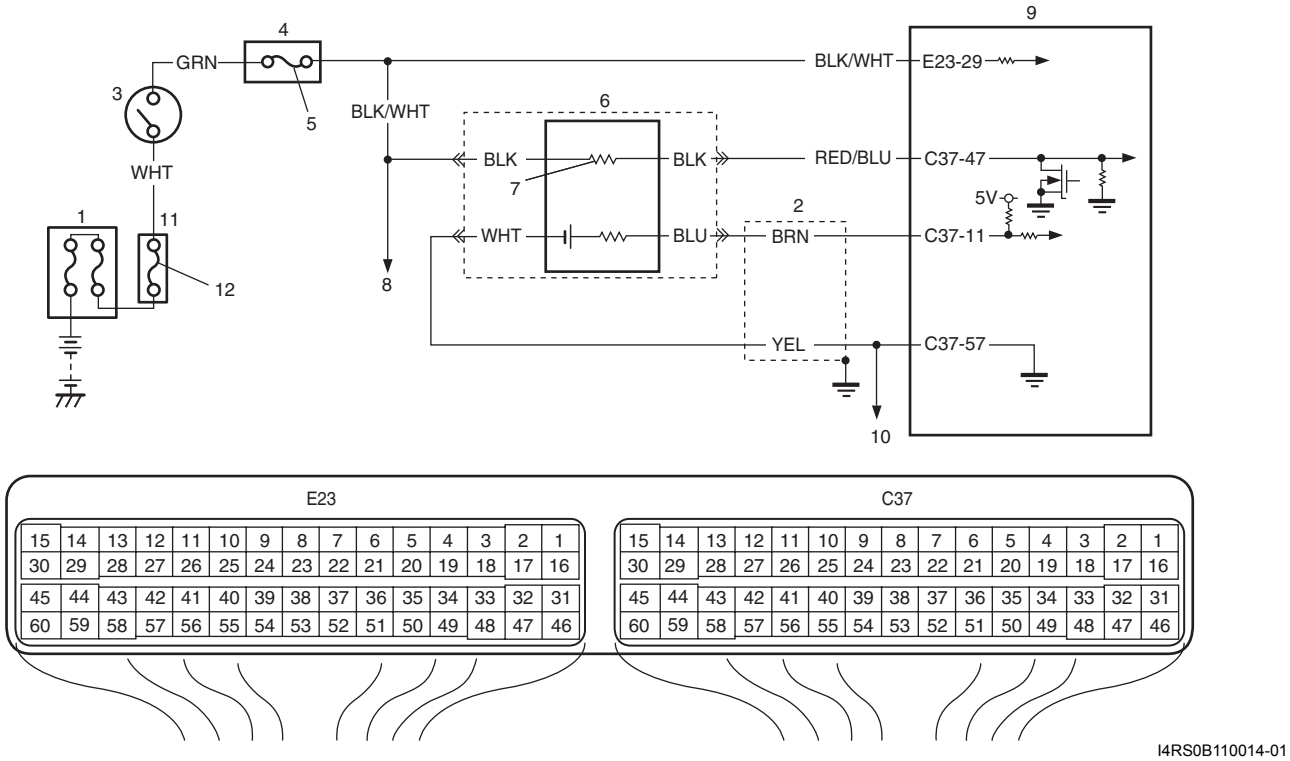
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**HO2S-1 output voltage check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it) and check HO2S output voltages displayed on scan tool. *Is over 0.6 V and below 0.3 V indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If check result is OK, go to Step 3.	Go to Step 3.
3	**HO2S-1 ground check** 1) Disconnect connector from HO2S-1 with ignition switch turned OFF. 2) Check for proper connection to HO2S-1 at "BLK/RED", "WHT", "BLK/WHT" and "YEL" wire terminals. 3) If wire and connection are OK, measure resistance between "YEL" wire terminal of HO2S-1 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 4.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "WHT" wire terminal of HO2S-1 connector and "C37-10" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 5.	"WHT" wire is high resistance circuit or open circuit. Poor "C37-10" terminal connection of ECM connector. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "WHT" wire terminal of HO2S-1 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"WHT" wire is shorted to ground circuit.
6	**HO2S-1 heater circuit check** 1) Check HO2S-1 heater circuit referring to "DTC P0031 / P0032: HO2S Heater Control Circuit Low / High (Sensor-1): M13A / M15A / M16A". *Is it in good condition?*	Go to Step 7.	Repair HO2S-1 circuit.
7	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: M13A / M15A / M16A". If it is in good condition, go to Step 8.	Repair leakage of exhaust system.

Step	Action	Yes	No
8	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-1 referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2)

S7N20A1114037

Wiring Diagram



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1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-1
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-1 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-2	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0137: HO2S-2 voltage is lower than 0.4 V while engine is idling after driving with high engine load (high speed) for specified time. And HO2S-2 max. voltage minus HO2S-2 min. voltage is less than 0.2 V for 40 sec continuously. (2 driving cycle detection logic) **DTC P0138:** HO2S-2 voltage is higher than 0.85 V while engine is idling after driving with high engine load (high speed) for specified time. And HO2S-2 max. voltage minus HO2S-2 min. voltage is less than 0.2 V for 40 sec continuously. (2 driving cycle detection logic)	• HO2S-2 • HO2S-2 circuit • Fuel system • ECM • Fuel shortage • Exhaust system • Air intake system

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine Coolant temperature: 70 °C (158 °F) to 150 °C (302°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
6) Repeat Step 4).
7) Keep above vehicle speed for 8 min. or more. (Throttle valve opening is kept constant in this step.)
8) Repeat Step 5).
9) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	*Is there DTC(s) other than fuel system (DTC P0171 / P0172) and HO2S-2 (DTC P0140)?*	Go to applicable DTC diag. flow.	Go to Step 3.

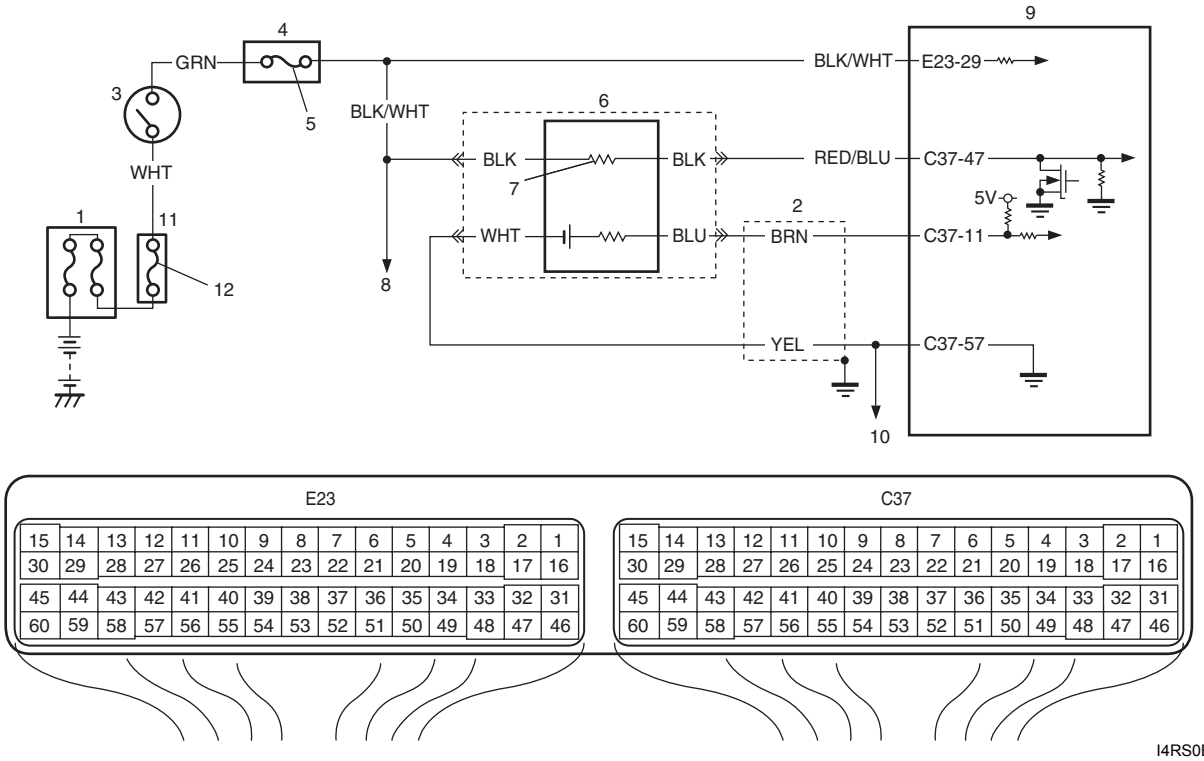
Step	Action	Yes	No
3	**HO2S-2 and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec. 3) Repeat racing engine (Repeat depressing accelerator pedal 5 to 6 times continuously to enrich A/F mixture and take foot off from pedal to enlean it). *Does HO2S-2 output voltage indicate deflection between over 0.35 V and below 0.25 V?*	Go to "DTC P0171 / P0172: Fuel System Too Lean / Rich: M13A / M15A / M16A".	Go to Step 4.
4	**HO2S-2 ground check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 connector at "RED/BLU", "BRN", "YEL" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-2 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 5.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S-2 connector and "C37-11" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 6.	"BRN" wire is high resistance circuit or open circuit. Poor "C37-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.
6	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	"BRN" wire is shorted to ground circuit.
7	**HO2S-2 signal circuit check** 1) Measure voltage between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	"BRN" wire is shorted to other circuit.
8	**HO2S-2 heater circuit check** 1) Check HO2S-2 heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2): M13A / M15A / M16A". *Is circuit in good condition?*	Go to Step 9.	Repair HO2S-2 circuit.
9	**Exhaust system check** 1) Check exhaust system for exhaust gas leakage. *Is it OK?*	Go to Step 4 in "DTC P0171 / P0172: Fuel System Too Lean / Rich: M13A / M15A / M16A". If it is in good condition, go to Step 10.	Repair leakage of exhaust system.

Step	Action	Yes	No
10	**Air intake system check** 1) Check air intake system for clog or leak. *Is it OK?*	Check HO2S-2 referring to “Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. If it is in good condition, substitute a known-good ECM and recheck.	Repair or replace air intake system.

DTC P0140: O2 Sensor (HO2S) Circuit No Activity Detected (Sensor-2)

S7N20A1114038

Wiring Diagram



I4RS0B110014-01

1. Main fuse box	4. Junction block assembly	7. Heater	10. To HO2S-1
2. Shield wire	5. “IG COIL” fuse	8. To HO2S-1 heater	11. Individual circuit fuse box No.1
3. Ignition switch	6. HO2S-2	9. ECM	12. “IG ACC” fuse

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HO2S-2 voltage is higher than specified value after warming up engine (circuit open). (2 driving cycle detection logic)	• HO2S-2 • HO2S-2 circuit • ECM • Exhaust gas leakage • Air intake system

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Increase vehicle speed to 60 – 80 km/h (37 – 50 mile/h) at 5th gear or D range.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting (with fuel cut for 4 sec. or more), then stop vehicle and run engine at idle speed for 60 sec. or more.
6) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**HO2S-2 ground check** 1) Disconnect connector from HO2S-2 with ignition switch turned OFF. 2) Check for proper connection to HO2S-2 connector at "RED/BLU", "BRN", "YEL" and "BLK/WHT" wire terminals. 3) If connections are OK, measure resistance between "YEL" wire terminal of HO2S-2 connector and engine ground. *Is resistance less than 5 Ω?*	Go to Step 3.	"YEL" wire is open or high resistance circuit. Poor "C37-57" terminal connection. Faulty ECM ground. If they are OK, substitute a known-good ECM and recheck.
3	**Wire circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure resistance between "BRN" wire terminal of HO2S-2 connector and "C37-11" terminal of ECM connector. *Is resistance less than 5 Ω?*	Go to Step 4.	"BRN" wire is high resistance circuit or open circuit. Poor "C37-11" terminal connection. If they are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
4	**HO2S-2 signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure voltage between "BRN" wire terminal of HO2S-2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 5.	"BRN" wire is shorted to other circuit.
5	**HO2S-2 heater circuit check** 1) Check HO2S-2 heater circuit referring to "DTC P0037 / P0038: HO2S Heater Control Circuit Low / High (Sensor-2): M13A / M15A / M16A". *Is circuit in good condition?*	Go to Step 6.	Repair HO2S-2 circuit. If circuit is OK, substitute a known-good ECM and recheck.
6	**HO2S-2 check** 1) Check HO2S-2 referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace HO2S-2.

DTC P0171 / P0172: Fuel System Too Lean / Rich

S7N20A1114039

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0171: Total fuel trim is higher than 35% or short term fuel trim is higher than 20% for more than 1 min. continuously. (2 driving cycle detection logic) **DTC P0172:** Total fuel trim is lower than –35% or short term fuel trim is lower than –20% for more than 1 min. continuously. (2 driving cycle detection logic)	• Vacuum leakage • Exhaust gas leakage • Fuel pressure out of specification • Fuel injector malfunction • Heated oxygen sensor-1 malfunction • MAF sensor malfunction • ECT sensor malfunction

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and print Freeze Frame Data or write them down using scan tool.
3) Clear DTC using scan tool.
4) Start engine and warm up to normal operating temperature.
5) Operate vehicle with condition as noted freeze frame data for 5 min.
6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE

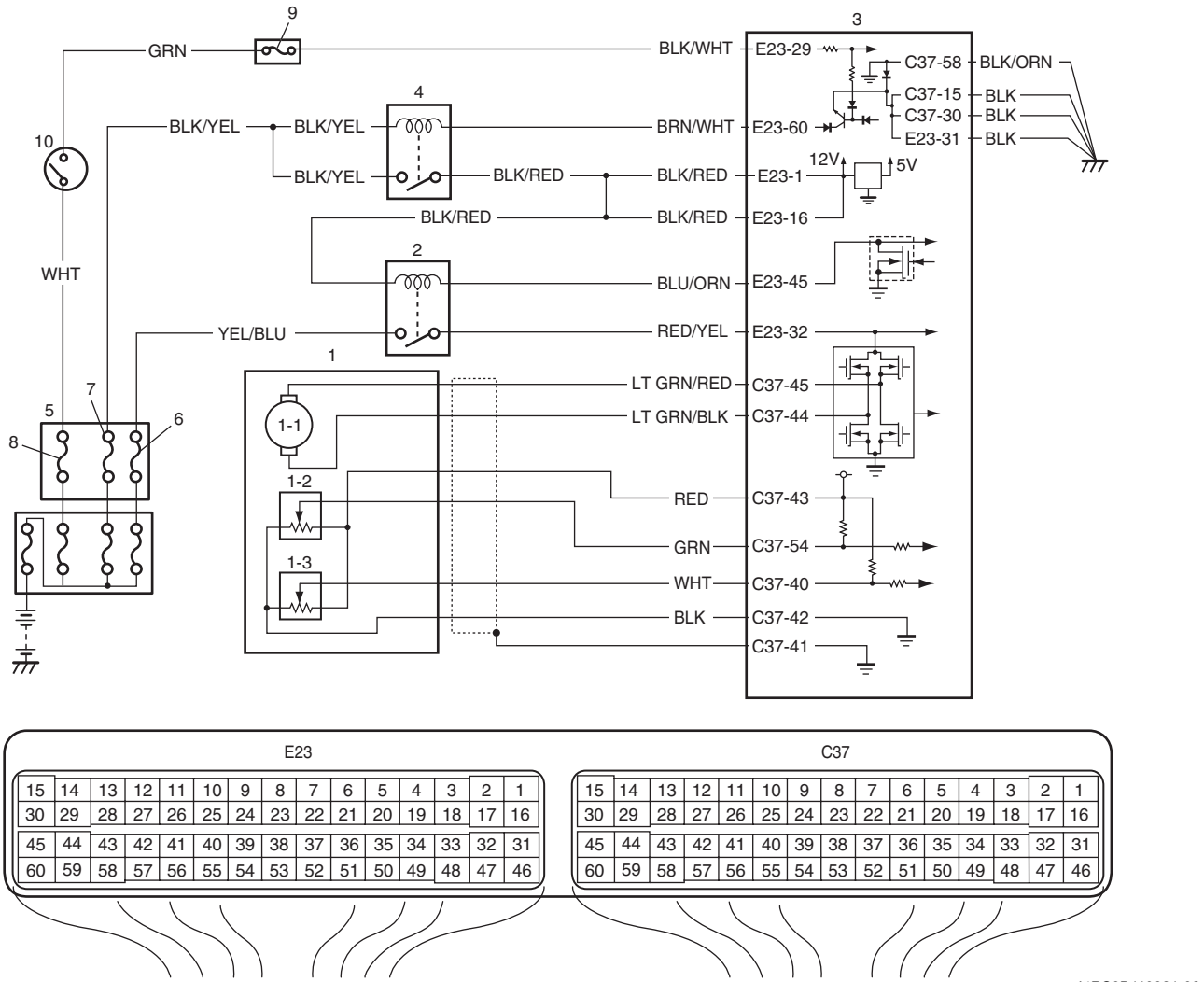
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	*Is there DTC(s) other than fuel system (DTC P0171 / P0172)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Intake system and exhaust system for leakage check** *Are intake system and exhaust system in good condition?*	Go to Step 4.	Repair or replace defective part.
4	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Check: M13A / M15A / M16A". *Is check result satisfactory?*	Go to Step 5.	Repair or replace defective part.
5	**Fuel injectors and its circuit check** 1) Check fuel injectors referring to "Fuel Injector Inspection: M13A / M15A / M16A in Section 1G". *Is check result satisfactory?*	Go to Step 6.	Faulty injector(s) or its circuit.
6	**Visual inspection** 1) Check MAF sensor and air intake system. • Objects which block measuring duct and resistor of MAF sensor. • Other air flow which does not pass MAF sensor. *Are they in good condition?*	Go to Step 7.	Repair or replace defective part.
7	**MAF sensor for performance check** 1) With ignition switch turned OFF, install scan tool. 2) Start engine and warm up to normal operating temperature. 3) Check MAF value using scan tool (Refer to "Scan Tool Data: M13A / M15A / M16A" for normal value.). *Is each value within specified range?*	Go to Step 8.	Go to "DTC P0101: Mass Air Flow Circuit Range / Performance: M13A / M15A / M16A".
8	**ECT sensor for performance check** 1) Check ECT sensor referring to Step 3 and 4 of "DTC P0118: Engine Coolant Temperature Circuit High: M13A / M15A / M16A". *Is check result satisfactory?*	Go to Step 9.	Faulty ECT sensor or its circuit.
9	**HO2S-1 for performance check** 1) Check HO2S-1 referring to Step 3 of "DTC P0131 / P0132: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-1): M13A / M15A / M16A". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Faulty HO2S-1 or its circuit.

DTC P0222: Throttle Position Sensor (Sub) Circuit Low

S7N20A1114040

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. "IG ACC" fuse
1-1. Throttle actuator	4. Main relay	9. "IG COIL" fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. "TH MOT" fuse	
2. Throttle actuator control relay	7. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (sub) is less than specified value for specified time continuously. (1 driving detection logic)	• Throttle position sensor (sub) circuit • Electric throttle body assembly • ECM

NOTE

When DTC P0122 and P0222 are indicated together, it is possible that "RED" wire open circuit.

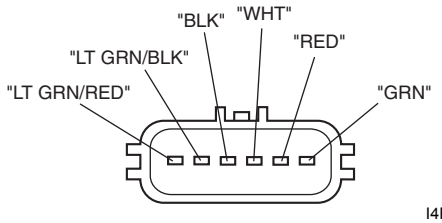
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

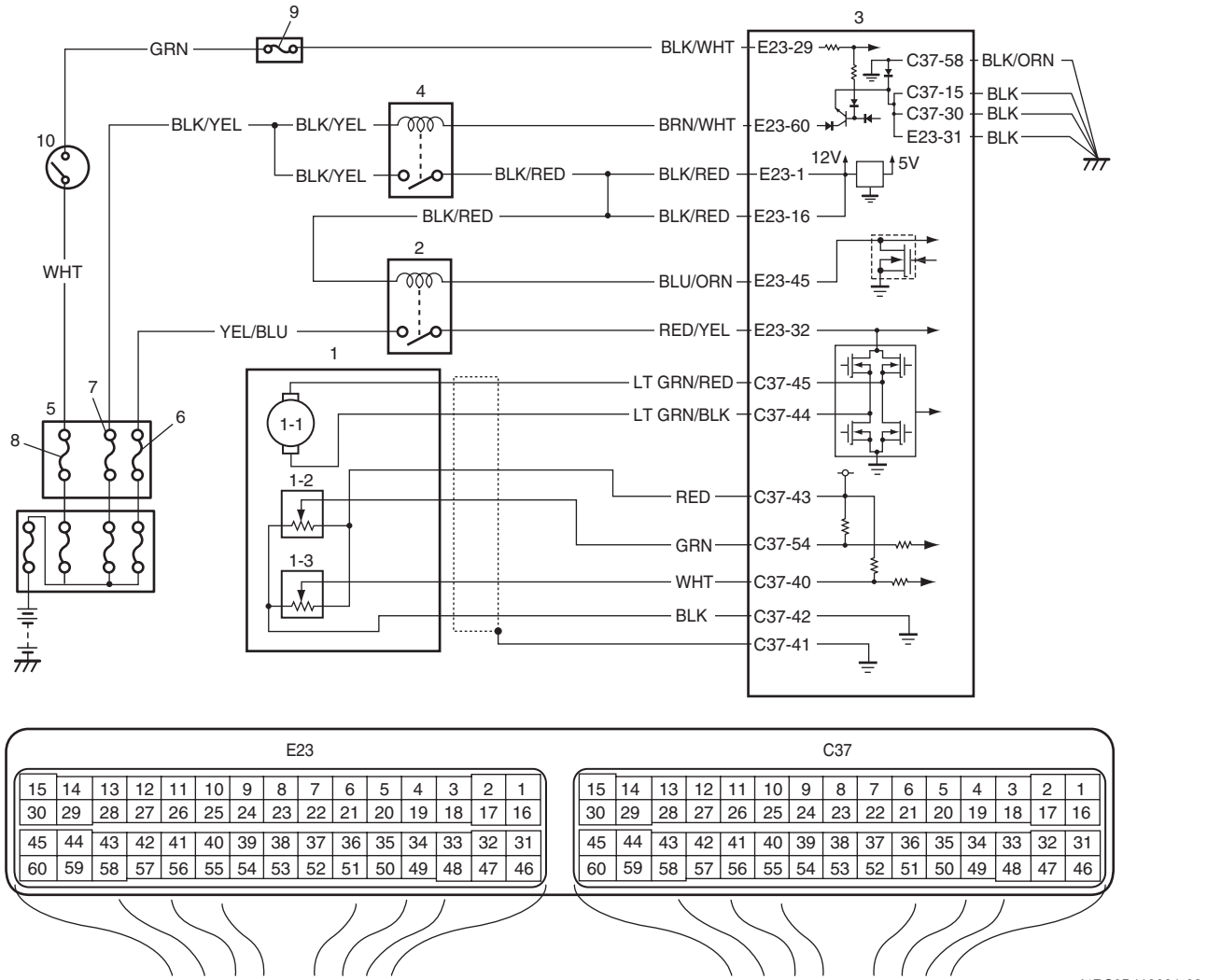
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Throttle position sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed TP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**ECM voltage check** 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "WHT" and "BLK" wire terminals.  I4RS0B110022-02 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.

Step	Action	Yes	No
4	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-43” terminal. 4) If OK, measure voltage between “C37-43” terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	“RED” wire is open or high resistance circuit.	Go to Step 5.
5	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “C37-43” terminal of ECM connector and engine ground. *Is resistance infinity?*	Substitute a known-good ECM and recheck.	“RED” wire is shorted to ground circuit.
6	**Wire harness check** 1) Measure voltage between “WHT” wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 7.
7	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at “C37-40” and “C37-42” terminals. 3) If OK, measure resistance between “WHT” and “BLK” wire terminals of electric throttle body assembly connector. *Is resistance infinity?*	Go to Step 8.	“WHT” wire is shorted to “BLK” wire.
8	**Wire harness check** 1) Measure resistance between “WHT” wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned OFF. *Is resistance infinity?*	Substitute a known-good ECM and recheck.	“WHT” wire is shorted to ground circuit.
9	**Electric throttle body assembly check** 1) Check throttle pedal position sensor referring to “Throttle Position Sensor Performance Check” under “Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0223: Throttle Position Sensor (Sub) Circuit High

S7N20A1114041

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. "IG ACC" fuse
1-1. Throttle actuator	4. Main relay	9. "IG COIL" fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. "TH MOT" fuse	
2. Throttle actuator control relay	7. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of throttle position sensor (sub) is more than specified value for specified time continuously. (1 driving detection logic)	• Throttle position sensor (sub) circuit • Electric throttle body assembly • ECM

NOTE

When DTC P0123 and P0223 are indicated together, it is possible that "RED" wire shorted to power circuit and/or "BLK" wire open.

DTC Confirmation Procedure

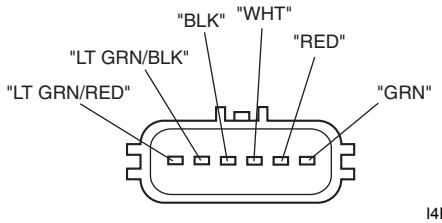
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.

5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Throttle position sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed TP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**ECM voltage check** 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "WHT" and "BLK" wire terminals.  I4RS0B110022-02 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 4.
4	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "C37-43" terminal. 3) Measure voltage between "C37-43" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	"RED" wire is shorted to power circuit.

Step	Action	Yes	No
5	**Wire harness check** 1) Measure voltage between “WHT” wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 9.	Go to Step 6.
6	**Wire harness check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at “C37-43” and “C37-40” terminals. 4) If OK, measure voltage between “C37-40” terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	“WHT” wire is open or high resistance circuit.	Go to Step 7.
7	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “WHT” and “RED” wire terminals of electric throttle body assembly connector. *Is resistance infinity?*	Go to Step 8.	“WHT” wire is shorted to “RED” wire.
8	**Wire harness check** 1) Turn ON ignition switch. 2) Measure voltage between “C37-40” terminal of ECM connector and engine ground. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	“WHT” wire is shorted to power circuit.
9	**Ground circuit check** 1) Turn OFF ignition switch. 2) Measure resistance between “BLK” wire terminal of electric throttle body assembly connector and engine ground. *Is resistance below 5 Ω?*	Go to Step 11.	Go to Step 10.
10	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at “C37-42” terminal. 3) Measure resistance between “C37-42” terminal of ECM connector and engine ground with ignition switch turned OFF. *Is resistance below 5 Ω?*	“BLK” wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
11	**Electric throttle body assembly check** 1) Check throttle position sensor referring to “Throttle Position Sensor Performance Check” under “Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P0300 / P0301 / P0302 / P0303 / P0304: Random Misfire Detected / Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Misfire Detected

S7N20A1114042

System Description

ECM measures the angle of the crankshaft based on the pulse signal from the CKP sensor and CMP sensor for each cylinder. If it detects a large change in the angle speed of the crankshaft, it concludes occurrence of a misfire. When the number of misfire is counted by ECM beyond the DTC detecting condition, it determines the cylinder where the misfire occurred and output it as DTC.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0300: • Misfire, which causes catalyst to overheat during 200 engine revolutions, is detected at 2 or more cylinders. (MIL flashes as long as this misfire occurs continuously.) or • Misfire, which affects exhaust emission adversely during 1000 engine revolution, is detected at 2 or more cylinders. (2 driving cycle detection logic)	• Ignition system • Fuel injector and its circuit • Fuel pressure • EGR system • Abnormal air drawn in • Engine compression • Valve lash adjuster • Valve timing • Fuel shortage • Exhaust system • Fuel of poor quality
DTC P0301, P0302, P0303, P0304: • Misfire, which causes catalyst to overheat during 200 engine revolutions, is detected at 1 cylinder. (MIL flashes as long as this misfire occurs continuously.) or • Misfire, which affects exhaust emission adversely during 1000 engine revolution, is detected at 1 cylinder. (2 driving cycle detection logic)	

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temp.: –7 °C, 19.4 °F or higher**
- **Engine coolant temp.: –10 °C, 14 °F or higher**
- **Altitude (barometric pressure): 2500 m, 8200 ft or less (540 mmHg, 72 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and print Freeze Frame Data or write them down using scan tool.
3) Clear DTC using scan tool.
4) Drive vehicle under freeze frame data condition as noted for 1 min. or more.
5) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

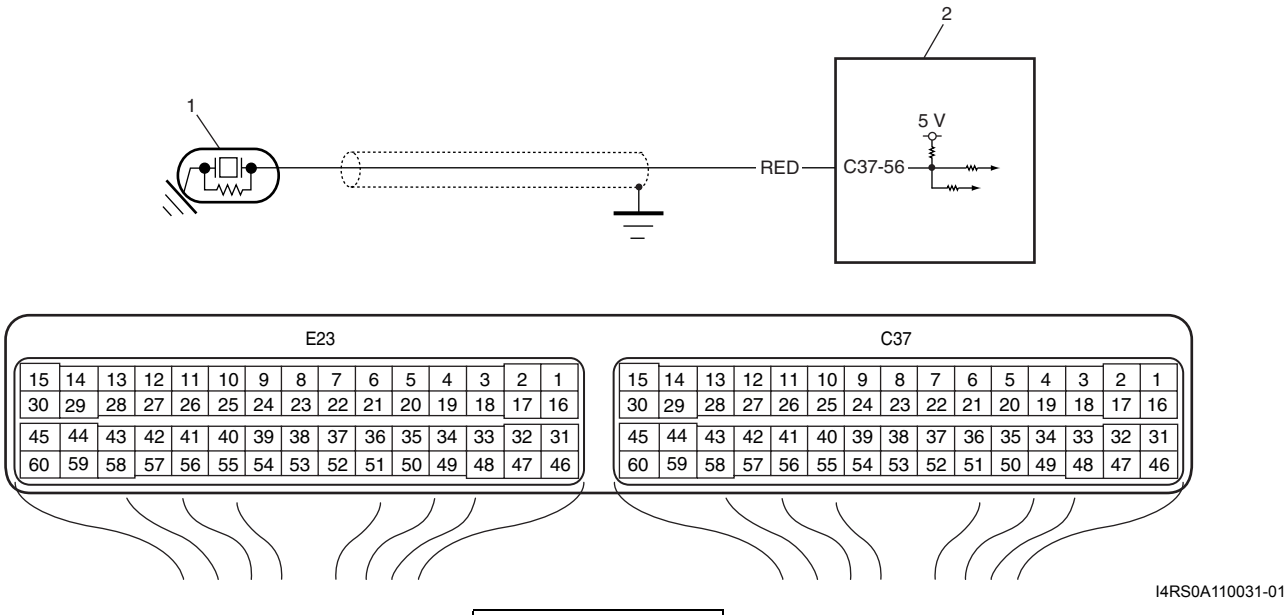
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	*Does fuel level meter indicate "E" level (empty)?*	Add fuel and recheck.	Go to Step 3.
3	**Fuel quality check** 1) Check that there is fuel of good quality in the fuel tank. *Is it OK?*	Go to Step 4.	Clean in fuel system circuit and change fuel.
4	**Ignition system check** 1) Check spark plug and ignition spark of cylinder where misfire occurs, referring to "Spark Plug Inspection: M13A / M15A / M16A in Section 1H" and "Ignition Spark Test: M13A / M15A / M16A in Section 1H". *Are they in good condition?*	Go to Step 5.	Faulty ignition coil, wire harness, spark plug or other system parts.
5	**Fuel injector circuit check** 1) Using sound scope, check each injector operating sound at engine cranking or idling. *Do all injectors make operating sound?*	Go to Step 6.	Check coupler connection and wire harness of injector not making operating sound and injector itself. If OK, substitute a known-good ECM and recheck.
6	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Check: M13A / M15A / M16A". *Is check result satisfactory?*	Go to Step 7.	Repair or replace fuel system.
7	**Fuel injector check** 1) Check fuel injector(s) referring to "Fuel Injector Inspection: M13A / M15A / M16A in Section 1G". *Is check result satisfactory?*	Go to Step 8.	Replace defective injector.
8	**Ignition timing check** 1) Check ignition timing referring to "Ignition Timing Inspection: M13A / M15A / M16A in Section 1H". *Is check result satisfactory?*	Go to Step 9.	Check related sensors.
9	**EGR system check** 1) Check EGR system referring to "EGR System Inspection: M13A / M15A / M16A in Section 1B". *Is check result satisfactory?*	Go to Step 10.	Repair or replace EGR system.
10	**Exhaust system check** 1) Check exhaust system for exhaust gas clogged. *Is it OK?*	Go to Step 11.	Repair clogged of exhaust system.

Step	Action	Yes	No
11	**Engine mechanical system check** 1) Check engine mechanical parts or system which can cause engine rough idle or poor performance. • Engine compression (Refer to "Compression Check: M13A / M15A / M16A in Section 1D".) • Valve lash (Refer to "Valve Lash (Clearance) Inspection: M13A / M15A / M16A in Section 1D".) • Valve timing (Refer to "Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A in Section 1D".) *Are they in good condition?*	Check wire harness and connection of ECM ground, ignition system and fuel injector for intermittent open and short.	Repair or replace defective part.

DTC P0327 / P0328: Knock Sensor Circuit Low / High

S7N20A1114043

Wiring Diagram



1.	Knock sensor
2.	ECM

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC will be set when all of following conditions are detected for 0.5 seconds continuously. **DTC P0327:** • Engine is running • Voltage of knock sensor is less than 1.23 V (1 driving cycle detection logic) **DTC P0328:** • Engine is running • Voltage of knock sensor is 3.91 V or more (1 driving cycle detection logic)	• Knock sensor circuit (open or short) • Knock sensor • ECM

DTC Confirmation Procedure

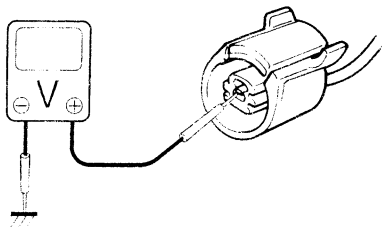
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it for 10 sec.

4) Check DTC by using scan tool.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

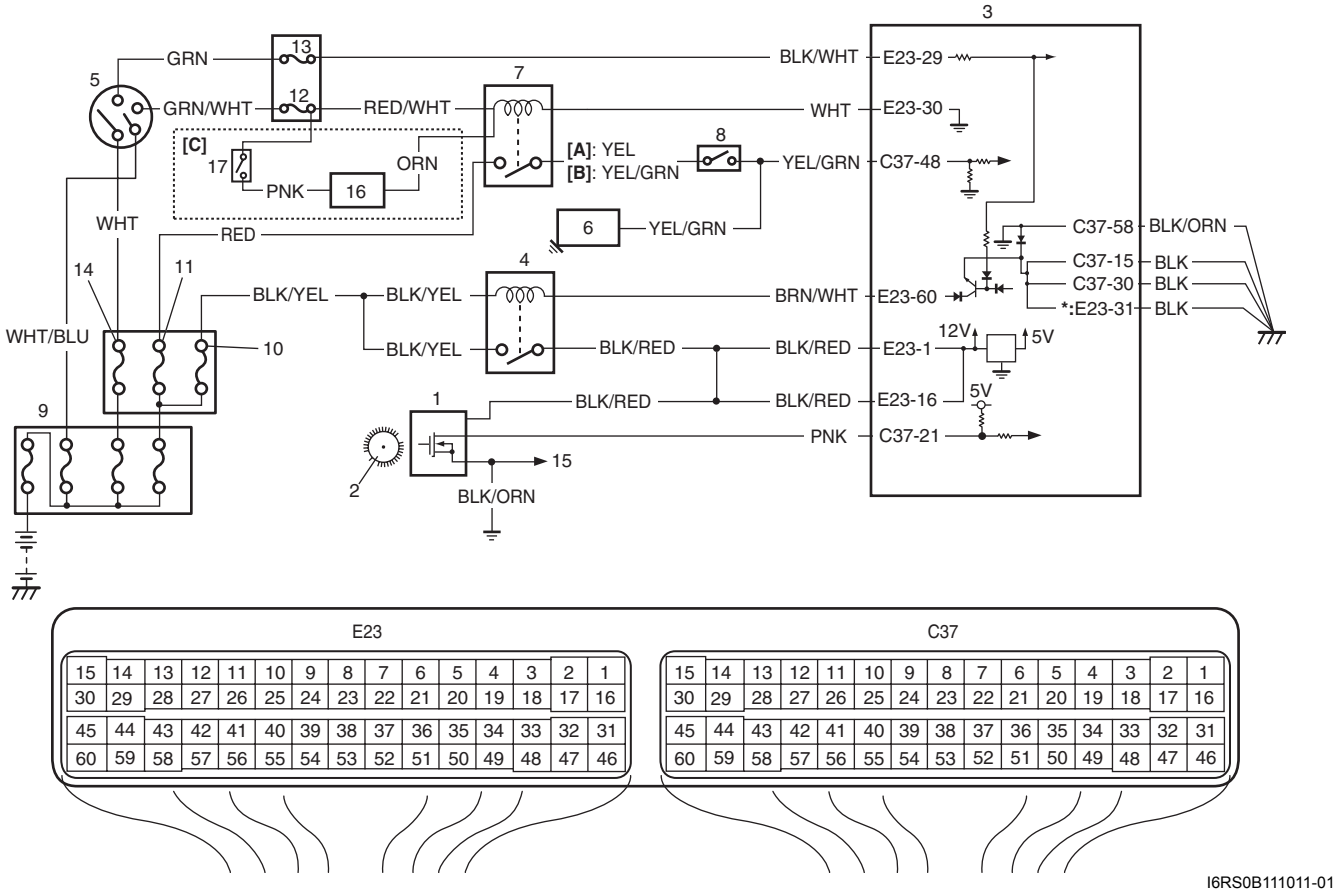
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Knock sensor circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure voltage between "C37-56" terminal of ECM connector and vehicle body ground with engine running. *Is voltage within 1.23 – 3.91 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	**Knock sensor circuit for open check** 1) Disconnect connector from knock sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between "RED" wire of knock sensor connector and engine ground.  I2RH01110089-01 *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**Knock sensor circuit for open check** 1) Turn ON ignition switch, measure voltage between "C37-56" terminal of ECM connector and engine ground *Is voltage 4 – 6 V?*	"RED" wire is open circuit.	Go to Step 5.
5	**Knock sensor circuit for short check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-56" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"RED" wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
6	**Knock sensor circuit for short check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “C37-56” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 7.	“RED” wire is shorted to other circuit.
7	**Knock sensor circuit for high resistance check** 1) Turn OFF ignition switch, measure resistance between “C37-56” terminal of ECM connector and “RED” wire terminal of knock sensor harness connector. *Is resistance below 5 Ω?*	Faulty knock sensor.	“RED” wire is high resistance circuit.

DTC P0335: Crankshaft Position (CKP) Sensor Circuit

S7N20A1114044

Wiring Diagram



I6RS0B111011-01

[A]: For A/T model	5. Ignition switch	12. “ST SIG” fuse
[B]: For M/T model	6. Starting motor	13. “IG COIL” fuse
[C]: For Automated Manual Transaxle model	7. Starting motor control relay	14. “IG ACC” fuse
1. CKP sensor	8. Transmission range switch (A/T model)	15. To CMP sensor
2. Sensor plate on crankshaft	9. Main fuse box	16. TCM (Automated Manual Transaxle model)
3. ECM	10. “FI” fuse	17. Neutral start switch
4. Main relay	11. “ST MOT” fuse	*: Electric throttle body model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No CKP sensor signal for 2 sec. even if starting motor signal is inputted at engine cranking. (1 driving cycle detection logic)	• CKP sensor circuit open or short • Sensor plate teeth damaged • CKP sensor malfunction, foreign material being attached or improper installation • ECM • Engine start signal circuit malfunction

DTC Confirmation Procedure

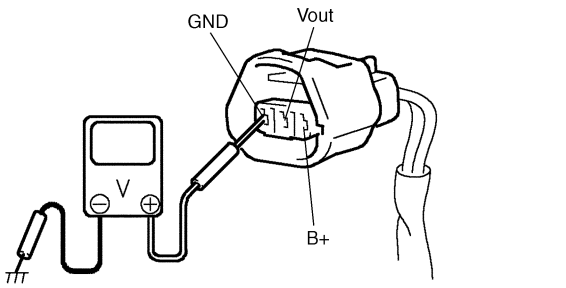
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Crank engine for 3 – 5 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**CKP sensor and connector for proper installation check** *Is CKP sensor installed properly and connector connected securely?*	Go to Step 3.	Correct.

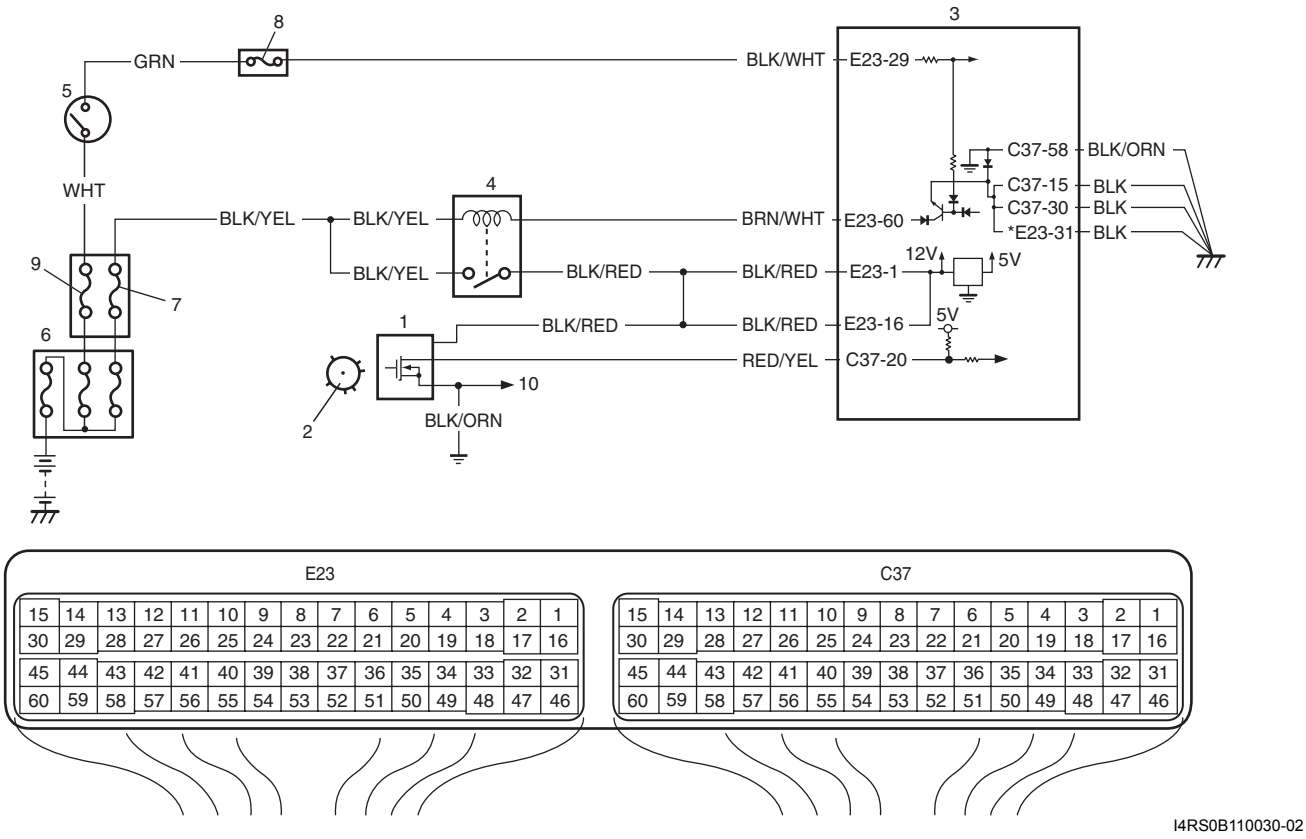
Step	Action	Yes	No
3	**Wire harness and connection check** 1) Disconnect connector from CKP sensor with ignition switch turned OFF. 2) Check for proper connection to CKP sensor at "BLK/RED", "PNK" and "BLK/ORN" wire terminals. 3) If OK, turn ON ignition switch and check voltage at "BLK/RED", "PNK" and "BLK/ORN" wire terminals of disconnected CKP sensor connector. **CKP sensor voltage** **Terminal "B+": 10 – 14 V** **Terminal "Vout": 4 – 5 V** **Terminal "GND": 0 V**  I2RH0B110048-01 *Is check result satisfactory?*	Go to Step 7.	Go to Step 4.
4	*Was terminal "Vout" voltage in Step 3 within specification?*	Go to Step 5.	"PNK" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
5	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK/ORN" wire terminal of CKP sensor connector and engine ground. *Is measured resistance value less than 3 Ω?*	Go to Step 6.	"BLK/ORN" wire is open or high resistance.
6	*Was terminal "B+" voltage in Step 3 within specification?*	Go to Step 7.	"BLK/RED" wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
7	**Engine start signal check** 1) Check starting motor circuit for opening and short referring to Step 2 of "DTC P0616: Starter Relay Circuit Low: M13A / M15A / M16A" and Step 3 and 4 of "DTC P0617: Starter Relay Circuit High: M13A / M15A / M16A". *Is check result satisfactory?*	Go to Step 8.	Repair or replace.

Step	Action	Yes	No
8	**CKP sensor check** 1) Check CKP sensor and sensor plate tooth referring to "Camshaft Position (CMP) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace CKP sensor and/or sensor plate.

DTC P0340: Camshaft Position (CMP) Sensor Circuit

S7N20A1114045

Wiring Diagram



I4RS0B110030-02

1. CMP sensor	4. Main relay	7. "FI" fuse	10. To CKP sensor
2. Signal rotor	5. Ignition switch	8. "IG COIL" fuse	*: Electric throttle body model
3. ECM	6. Main fuse box	9. "IG ACC" fuse	

System Description

The CMP sensor located on the transmission side of cylinder head (VVT model) or timing chain cover (non-VVT model) consists of the signal generator (magnetic sensor) and signal rotor (intake camshaft portion (VVT model) or exhaust camshaft timing sprocket (non-VVT model)).
The signal generator generates reference signal through slits in the slit plate which turns together with the camshaft.

Reference signal

The CMP sensor generates 6 pulses of signals each of which has a different waveform length while the camshaft makes one full rotation. Refer to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".
Based on these signals, ECM judges which cylinder piston is in the compression stroke and the engine speed.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• CMP sensor pulse is less than 20 pulses per crankshaft 8 revolutions • CMP sensor pulse is more than 28 pulses per crankshaft 8 revolutions • CMP sensor pulse is less than 20 pulses between BTDC 155° CA (VVT model) or BTDC 75° CA (non-VVT model) and BTDC 5° CA with crankshaft 8 revolutions from engine start. (1 driving cycle detection logic)	• CMP sensor circuit open or short • Signal rotor teeth damaged • CMP sensor malfunction, foreign material being attached or improper installation • ECM

DTC Confirmation Procedure

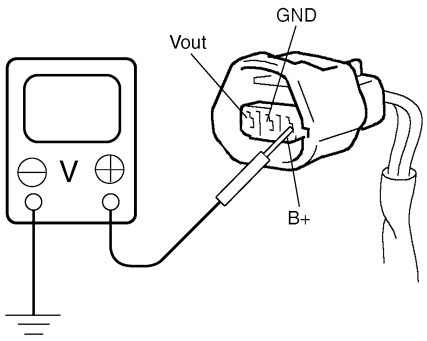
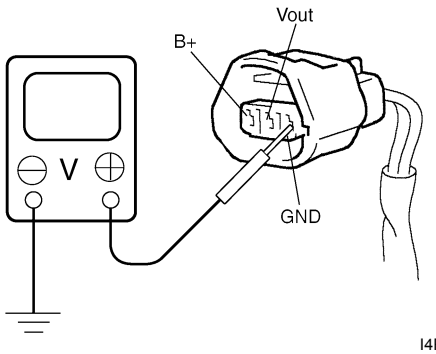
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Crank engine for 5 sec.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**CMP sensor and connector for proper installation check** *Is CMP sensor installed properly and connector connected securely?*	Go to Step 3.	Correct.

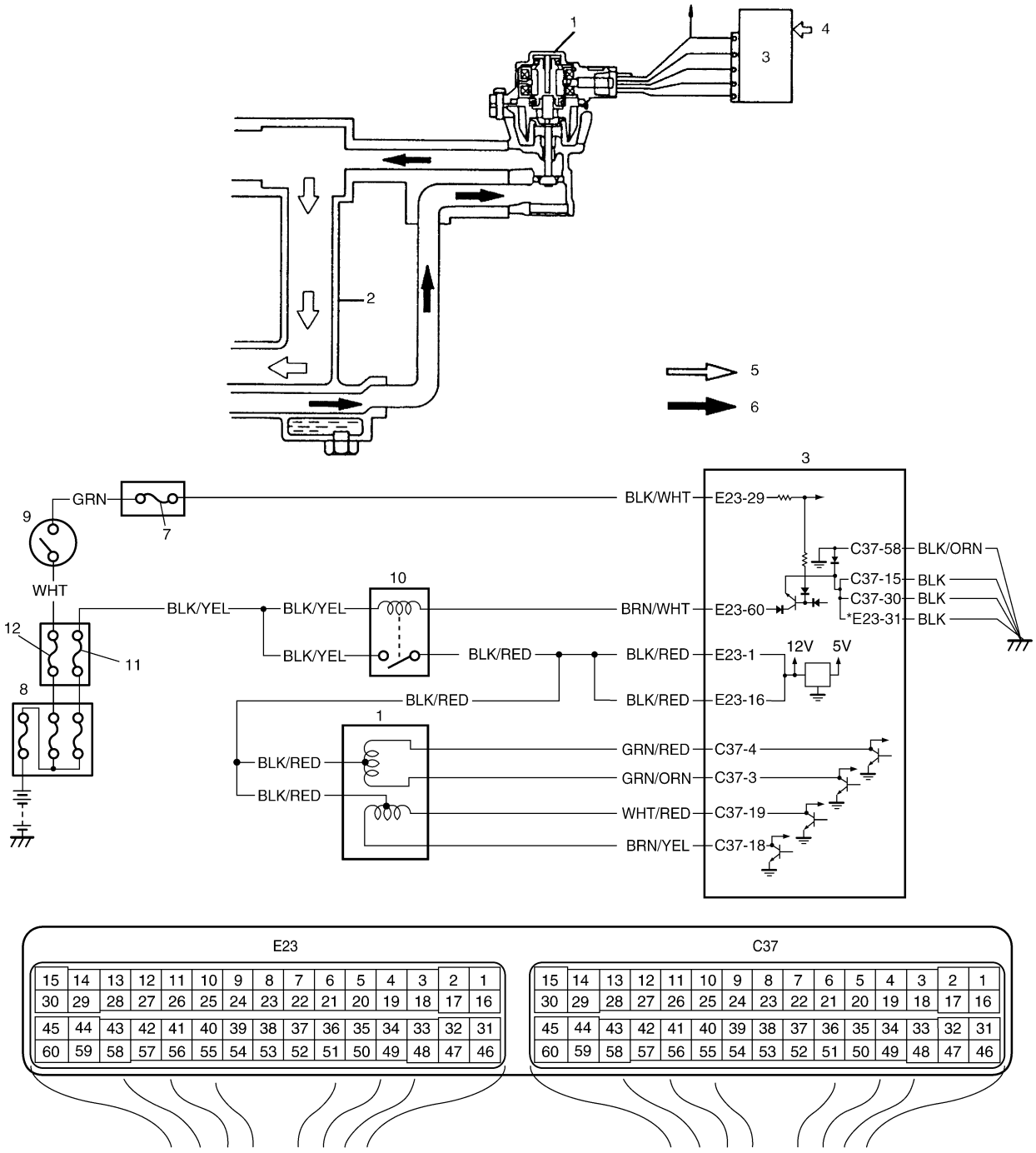
Step	Action	Yes	No
3	**Wire harness and connection check** 1) Disconnect connector from CMP sensor. 2) Check for proper connection to CMP sensor at "BLK/RED", "RED/YEL" and "BLK/ORN" wire terminals. 3) If OK, turn ON ignition switch and check voltage at "BLK/RED", "RED/YEL" and "BLK/ORN" wire terminals of disconnected CMP sensor connector. **CMP sensor voltage** **Terminal "B+": 10 – 14 V** **Terminal "Vout": 4 – 5 V** **Terminal "GND": 0 V** **For M13 engine**  I4RS0B110031-01 **For M15 engine**  I4RS0B110094-01 *Is check result satisfactory?*	Go to Step 7.	Go to Step 4.
4	*Was terminal "Vout" voltage in Step 3 within specification?*	Go to Step 5.	"RED/YEL" wire is open or shorted to ground / power supply circuit. If wire and connection are OK, substitute a known-good ECM and recheck.
5	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK/ORN" wire terminal of CMP sensor connector and engine ground. *Is measured resistance value less than 3 Ω?*	Go to Step 6.	"BLK/ORN" wire is open or high resistance circuit.
6	*Was terminal "B+" voltage in Step 3 within specification?*	Go to Step 7.	"BLK/RED" wire is open circuit. If wire and connection are OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
7	**CMP sensor check** 1) Check CMP sensor and signal rotor tooth referring to "Camshaft Position (CMP) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace CMP sensor and/or intake camshaft (VVT model) or exhaust camshaft (non-VVT model).

DTC P0401 / P0402: Exhaust Gas Recirculation Flow Insufficient Detected / Excessive Detected

S7N20A1114046

System and Wiring Diagram



I4RS0B110032-02

1. EGR valve	5. Fresh air	9. Ignition switch	*: Electric throttle body model
2. Intake manifold	6. Exhaust gas	10. Main relay	
3. ECM	7. "IG COIL" fuse	11. "FI" fuse	

4. Sensed information	8. Main fuse box	12. "IG ACC" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0401: Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is smaller than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving) **DTC P0402:** Difference in intake manifold absolute pressure between opened EGR valve and closed EGR valve is larger than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving)	• EGR valve • EGR passage • MAP sensor • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC confirmation procedure".

- **Intake air temperature at engine start: –10 °C (14 °F) to 80 °C (176 °F)**
- **Intake air temperature: –10 °C (14 °F) to 70 °C (158 °F)**
- **Engine coolant temperature: 70 °C (158 °F) to 150 °C (302 °F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up to normal operating temperature.
4) Run engine at idle for 10 min.
5) Drive vehicle and increase engine speed 3000 rpm in 3rd gear.
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 sec. or more. (Keep fuel cut condition for 5 sec. or more) If fuel cut condition is not kept for 5 sec. or more, coast down a slope in engine speed 1000 – 3000 rpm for 5 sec. or more.
7) Stop vehicle and run engine at idle.
8) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE

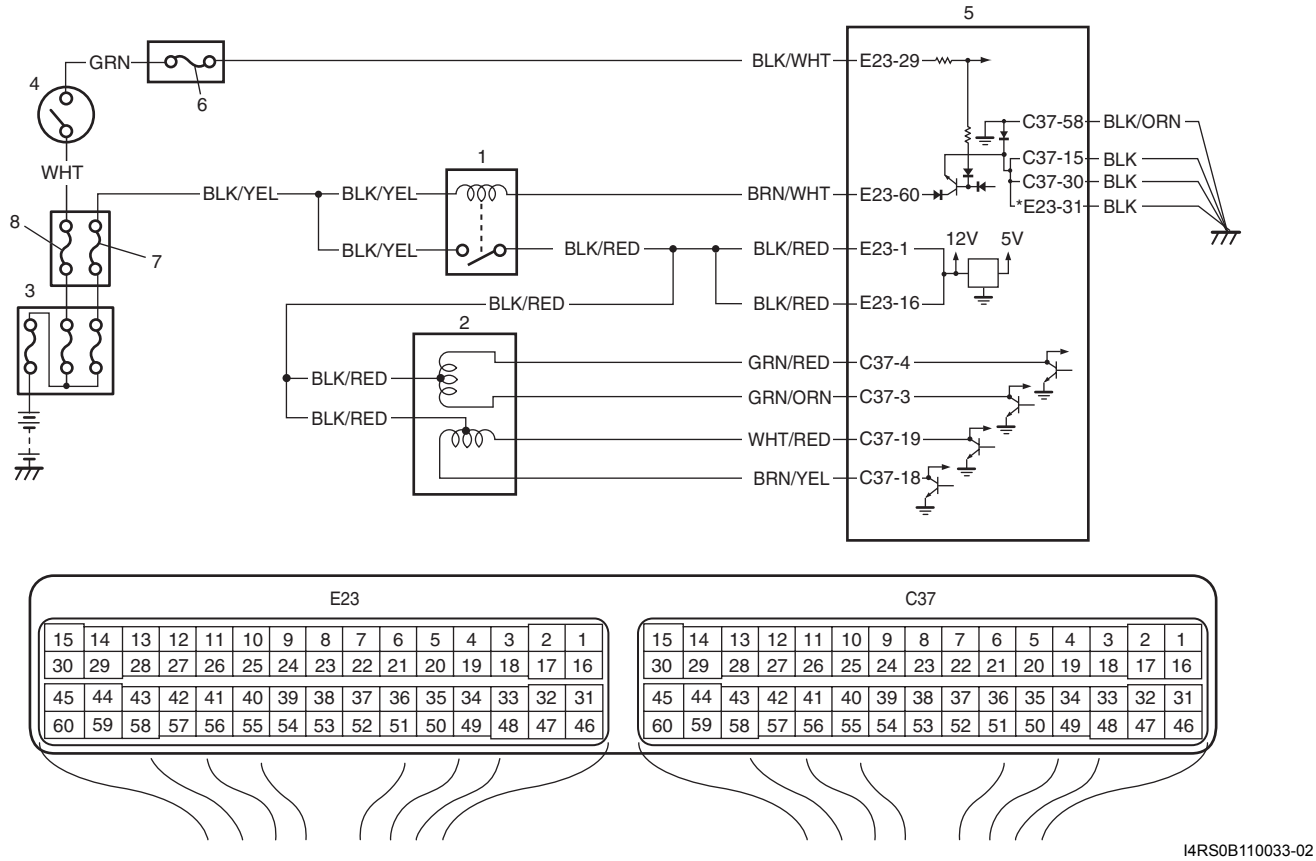
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 5.
3	**EGR valve operation check** 1) With ignition switch turned OFF, install SUZUKI scan tool to DTC. 2) Check EGR system referring to "EGR System Inspection: M13A / M15A / M16A in Section 1B". *Is it in good condition?*	Go to Step 4.	Go to Step 5.
4	**MAP sensor check** 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Replace MAP sensor.
5	**EGR valve control circuit check** 1) Check that EGR valve control circuits are in good condition referring to Step 2 to 5 of "DTC P0403: Exhaust Gas Recirculation Control Circuit: M13A / M15A / M16A" *Are circuits in good condition?*	Go to Step 6.	Repair or replace EGR valve control circuit(s).
6	**EGR valve check** 1) Check EGR valve referring to "EGR Valve Inspection: M13A / M15A / M16A in Section 1B". *Is check result satisfactory?*	Go to Step 7.	Faulty EGR valve.
7	**MAP sensor check** 1) Check MAP sensor for performance referring to "Manifold Absolute Pressure (MAP) Sensor Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	EGR passage clogged. If OK, substitute a known-good ECM and recheck.	Replace MAP sensor.

DTC P0403: Exhaust Gas Recirculation Control Circuit

S7N20A1114047

Wiring Diagram



I4RS0B110033-02

1. Main relay	4. Ignition switch	7. "FI" fuse
2. EGR valve	5. ECM	8. "IG ACC" fuse
3. Main fuse box	6. "IG COIL" fuse	*: Electric throttle body model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
EGR valve output voltage is different from output command with more than one pole out of 4 poles. (1 driving cycle detection logic)	• EGR valve circuit open • EGR valve • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch turned OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle in 2000 – 3500 rpm of engine speed.
5) Keep above vehicle speed for 1 min. (Throttle valve opening is kept constant in this step.)
6) Stop vehicle and check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

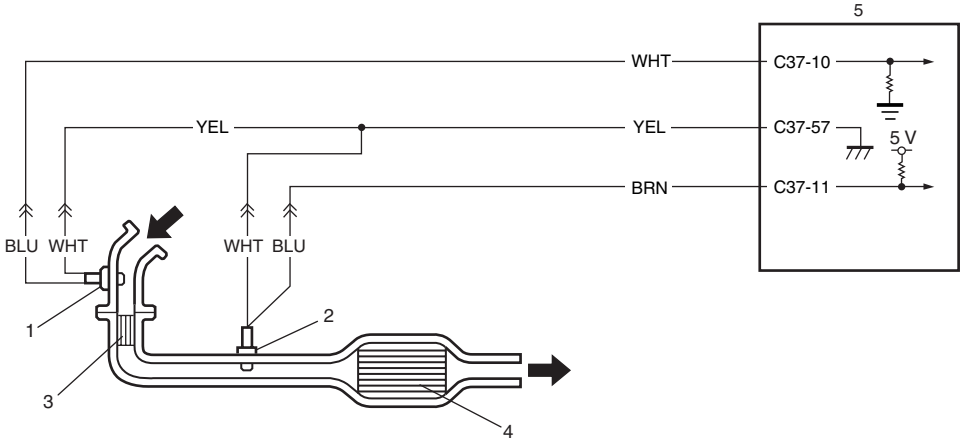
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Description: M13A / M15A / M16A".
2	**EGR valve power supply circuit check** 1) Remove air intake pipe. 2) With ignition switch turned OFF, disconnect EGR valve connector. 3) With ignition switch turned ON, measure voltage between "BLK/RED" wire terminal of EGR valve connector and vehicle body ground. *Is check voltage 10 – 14 V?*	Go to Step 3.	"BLK/RED" wire is open circuit.
3	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. *Is each voltage 0 V?*	Go to Step 4.	Faulty wire(s) are shorted to other circuit. If wires are OK, substitute a known-good ECM and recheck.
4	**Wire circuit check** 1) With ignition switch turned OFF, measure resistance between engine ground and each "GRN/RED", "GRN/ORN", "WHT/RED", "BRN/YEL" wire terminals of EGR valve connector. *Is resistance infinity?*	Go to Step 5.	Faulty wire(s) are shorted to ground circuit. If wires are OK, substitute a known-good ECM and recheck.
5	**Short circuit check for EGR valve control circuit** 1) With ignition turned OFF, measure resistance between each EGR valve control circuit wire ("GRN/RED", "GRN/ORN", "WHT/RED" and "BRN/YEL" wire) and each EGR valve control circuit wire. *Is each resistance infinity?*	Go to Step 6.	Faulty wire(s) are short circuit.
6	**EGR valve stepper motor coil circuit check** 1) With ignition switch turned OFF, connect EGR valve connector. 2) Measure resistance between "E23-1/16" and each "C37-4", "C37-3", "C37-19", "C37-18" terminals of ECM connector. *Is each resistance 20 – 31 Ω at 20 °C, 68 °F?*	Faulty ECM. Substitute a known-good ECM and recheck.	Go to Step 7.

Step	Action	Yes	No
7	**EGR valve check** 1) Check EGR valve resistance referring to “EGR Valve Inspection: M13A / M15A / M16A in Section 1B”. *Is resistance within specified value?*	Faulty wire(s) are open or high resistance circuit. If wires are OK, substitute a known-good ECM and recheck.	Faulty EGR valve.

DTC P0420: Catalyst System Efficiency below Threshold

S7N20A1114048

System and Wiring Diagram



I4RS0A110037-01

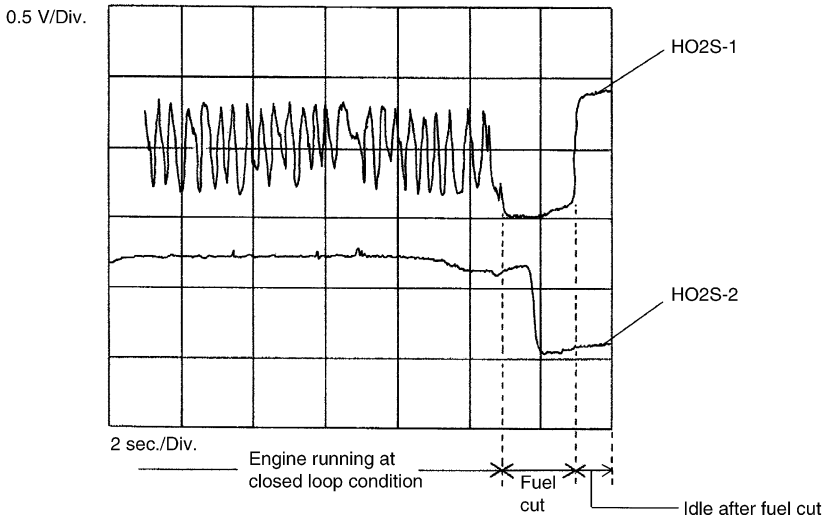
1. HO2S-1	3. Warm up three way catalytic converter	5. ECM
2. HO2S-2	4. Three way catalytic converter	

Circuit Description

ECM monitors oxygen concentration in the exhaust gas which has passed the warm up three way catalytic converter by HO2S-2. When the catalyst is functioning properly, the variation cycle of HO2S-2 output voltage (oxygen concentration) is slower than that of HO2S-1 output voltage because of the amount of oxygen in the exhaust gas which has been stored in warm up three way catalytic converter.

Reference

Oscilloscope waveforms



I2RH01110102-01

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• While vehicle running at constant speed under other than high load. • Time from rich or lean switching command is output till HO2S-2 output voltage crosses 0.45 V is less than specified value. (*2 driving cycle detection logic, monitoring once / 1 driving)	• Exhaust gas leak • Warm up three way catalytic converter malfunction • HO2S-2 malfunction • HO2S-1 malfunction

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

NOTE

Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".

- **Intake air temp.: –7 °C, 19.4 °F or higher**
- **Engine coolant temp.: 70 °C, 158 °F or higher**
- **Altitude (barometric pressure): 2500 m, 8200 ft or less (540 mmHg, 72 kPa or more)**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Increase vehicle speed to 50 – 60 mph, 80 – 100 km/h. (engine speed: 2500 – 3000 r/min.)
4) Keep above vehicle speed for 10 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if DTC / pending DTC exists using scan tool. If not, check if catalyst monitoring test has been completed using scan tool. If not in both of above checks (i.e., no DTC / pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

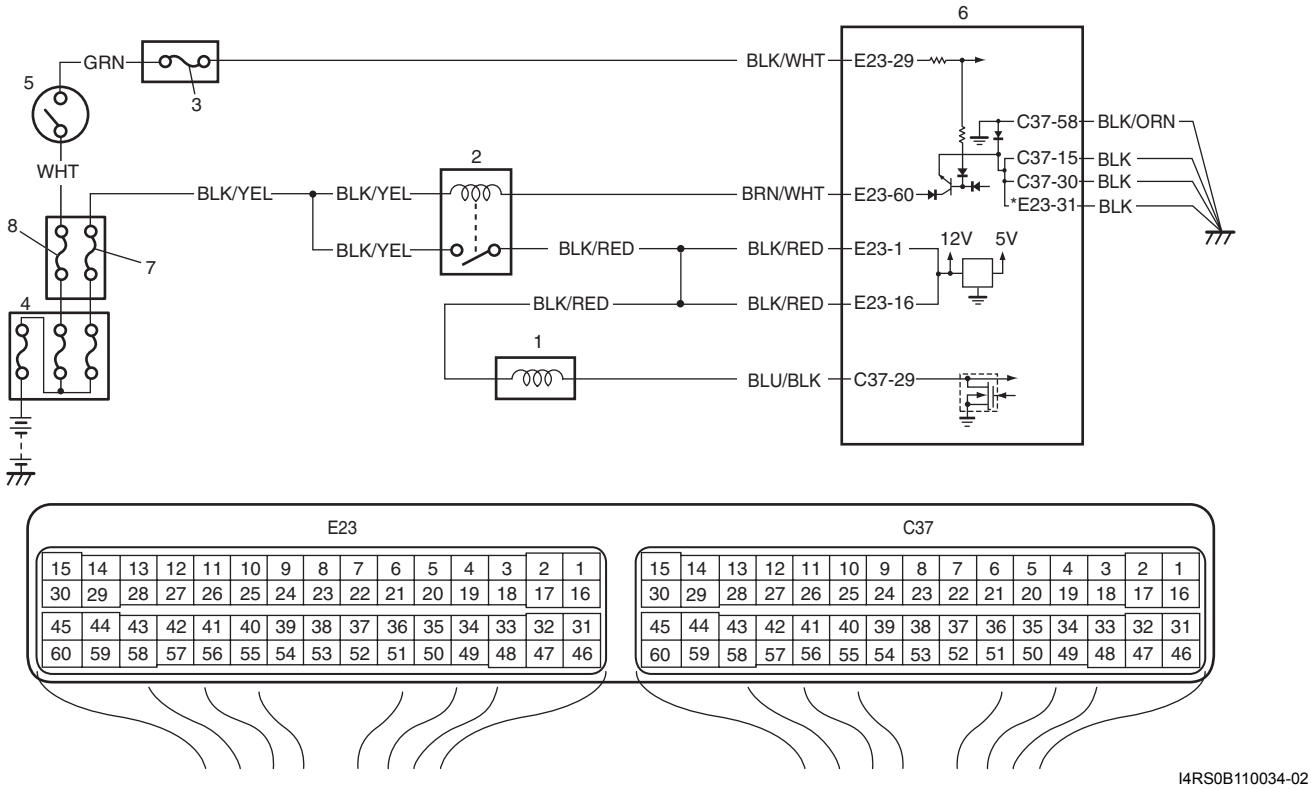
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Exhaust system visual check** 1) Check exhaust system for leaks, damage and loose connection. *Is it in good condition?*	Go to Step 3.	Repair or replace defective part.

Step	Action	Yes	No
3	**HO2S-2 output voltage check** 1) Check output voltage of HO2S-2 referring to “DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2): M13A / M15A / M16A” and “DTC P0137 / P0138: O2 Sensor (HO2S) Circuit Low Voltage / High Voltage (Sensor-2): M13A / M15A / M16A”. *Is check result satisfactory?*	Replace exhaust manifold (built in warm up three way catalytic converter) and exhaust center pipe (built in three way catalytic converter).	Check “BRN” and / or “YEL” wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S-2.

DTC P0443: Evaporative Emission System Purge Control Valve Circuit

S7N20A1114049

Wiring Diagram



I4RS0B110034-02

1. EVAP canister purge valve	4. Main fuse box	7. “FI” fuse
2. Main relay	5. Ignition switch	8. “IG ACC” fuse
3. “IG COIL” fuse	6. ECM	*: Electric throttle body module

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of EVAP canister purge valve is different from command signal. (Circuit open or short) (2 driving cycle detection logic)	• EVAP canister purge valve • EVAP canister purge valve circuit • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) With ignition switch OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and warm up normal operating temperature.
4) Drive vehicle at more than 40 km/h, 25 mph for 5 min. or more.
5) Check DTC and pending DTC.

DTC Troubleshooting

⚠ WARNING

In order to reduce risk of fire and personal injury, this work must be performed in a well ventilated area and away from any open flames such as gas water heater.

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

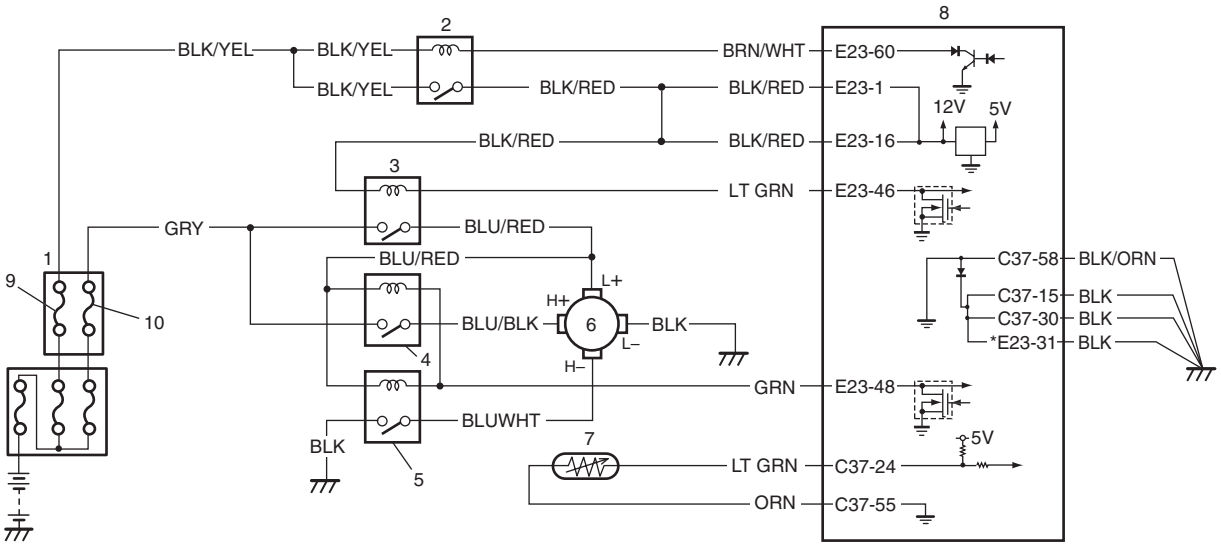
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**EVAP canister purge power supply circuit check** 1) Turn OFF ignition switch and disconnect connector from EVAP canister purge valve. 2) Measure voltage between engine ground and "BLK/RED" wire terminal of EVAP canister purge valve connector with ignition switch turned ON. *Is it voltage 10 – 14 V?*	Go to Step 3.	"BLK/RED" wire is open circuit.
3	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-29" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	"BLU/BLK" wire is shorted to ground circuit.
4	**Wire circuit check** 1) Measure voltage between "C37-29" terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	"BLU/BLK" wire is shorted to other circuit.
5	**Wire circuit check** 1) Connect connector to purge control valve with ignition switch turned OFF. 2) Turn ON ignition switch and measure voltage between "C37-29" terminal of ECM connector and vehicle body ground. *Is it voltage 10 – 14 V?*	Go to Step 6.	"BLU/BLK" wire is open circuit.

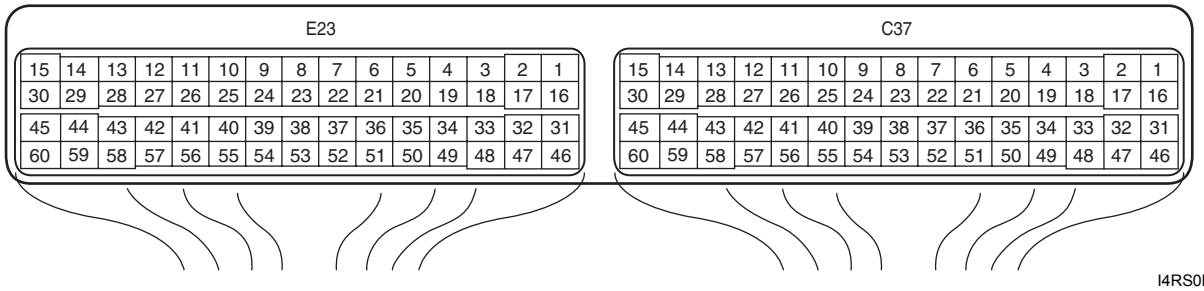
Step	Action	Yes	No
6	**EVAP canister purge control valve check** 1) Check EVAP canister purge control valve referring to "EVAP Canister Purge Valve Inspection: M13A / M15A / M16A in Section 1B". *Is it in good condition?*	Go to Step 7.	Faulty EVAP canister purge control valve.
7	**EVAP canister purge control circuit check** 1) With ignition switch turn OFF, measure resistance between "E23-1/16" terminal and "C37-29" terminal of ECM connector. *Is resistance below 40 Ω at 20 °C, 68 °F?*	Faulty ECM. Substitute a known-good ECM and recheck.	"BLK/RED" and/or "BLU/BLK" wire are high resistance circuit.

DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit

S7N20A1114051

Wiring Diagram





I4RS0B110036-02

1. Individual circuit fuse box No.1	5. Radiator cooling fan relay No. 3	9. "FI" fuse
2. Main relay	6. Radiator cooling fan motor	10. "RDTR FAN" fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	*: Electric throttle body model
4. Radiator cooling fan relay No. 2	8. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of radiator cooling fan relay is different from command signal. (1 driving cycle detection logic)	• Radiator cooling fan relay circuit malfunction • Radiator cooling fan relay malfunction • ECM malfunction

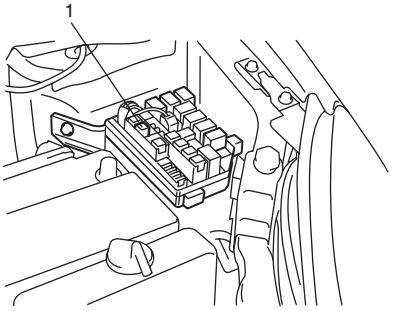
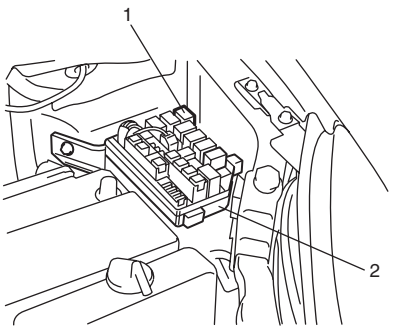
DTC Confirmation Procedure

1) Turn OFF ignition switch.
2) Clear DTC with ignition switch turned ON.
3) Run engine at idle speed.
4) Check pending DTC in “ON BOARD TEST” or “PENDING DTC” mode and DTC in “DTC” mode.

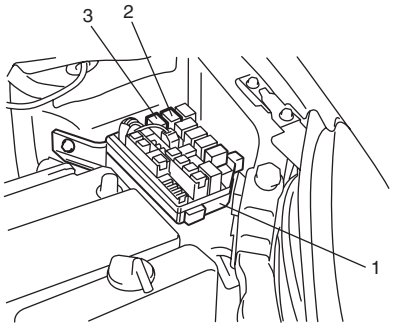
DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: M13A / M15A / M16A”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A”.
2	**Circuit fuse check** 1) Check “RDTR FAN” fuse (1) in individual circuit fuse box No.1 with ignition switch turned OFF.  I4RS0B110037-02 *Is “RDTR FAN” fuse in good condition?*	Go to Step 3.	Check for short in circuits connected to this fuse.
3	**Wire circuit check** 1) Disconnect radiator cooling fan relay No. 1 (1) from individual circuit fuse box No.1 (2) with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between each engine ground to “BLK/RED” and “GRY” wire terminal.  I4RS0B110038-02 *Is voltage 10 – 14 V?*	Go to Step 4.	Open wire in “BLK/RED” and/or “GRY” wire are open circuit.

Step	Action	Yes	No
4	**Wire circuit check** 1) Connect radiator cooling fan relay No. 1 to individual circuit fuse box No.1 with ignition switch turned OFF. 2) Remove ECM from its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and “E23-46” terminal of ECM connector when engine coolant temp. is below 97.5 °C, 207.5 °F. *Is voltage 10 – 14 V?*	Go to Step 8.	Go to Step 5.
5	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Disconnect radiator cooling fan relay No. 1 from individual circuit fuse box No.1. 3) Measure resistance between “E23-46” terminal of ECM connector and vehicle ground. *Is resistance infinity?*	Go to Step 6.	“LT GRN” wire is shorted to ground circuit.
6	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-46” terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 7.	“LT GRN” wire is shorted to other circuit.
7	**Radiator cooling fan relay No. 1 check** 1) Check radiator cooling fan relay No. 1 referring to “Radiator Cooling Fan Relay Inspection: M13A / M15A / M16A in Section 1F”. *Is check result satisfactory?*	“LT GRN” wire is open circuit.	Replace relay.
8	**Radiator cooling fan control No. 1 check** 1) Run engine until ECT is over 97.5 °C, 207.5 °F. 2) Measure voltage between vehicle body ground and “E23-46” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Go to Step 9.	Faulty ECM. Substitute a known-good ECM and recheck.

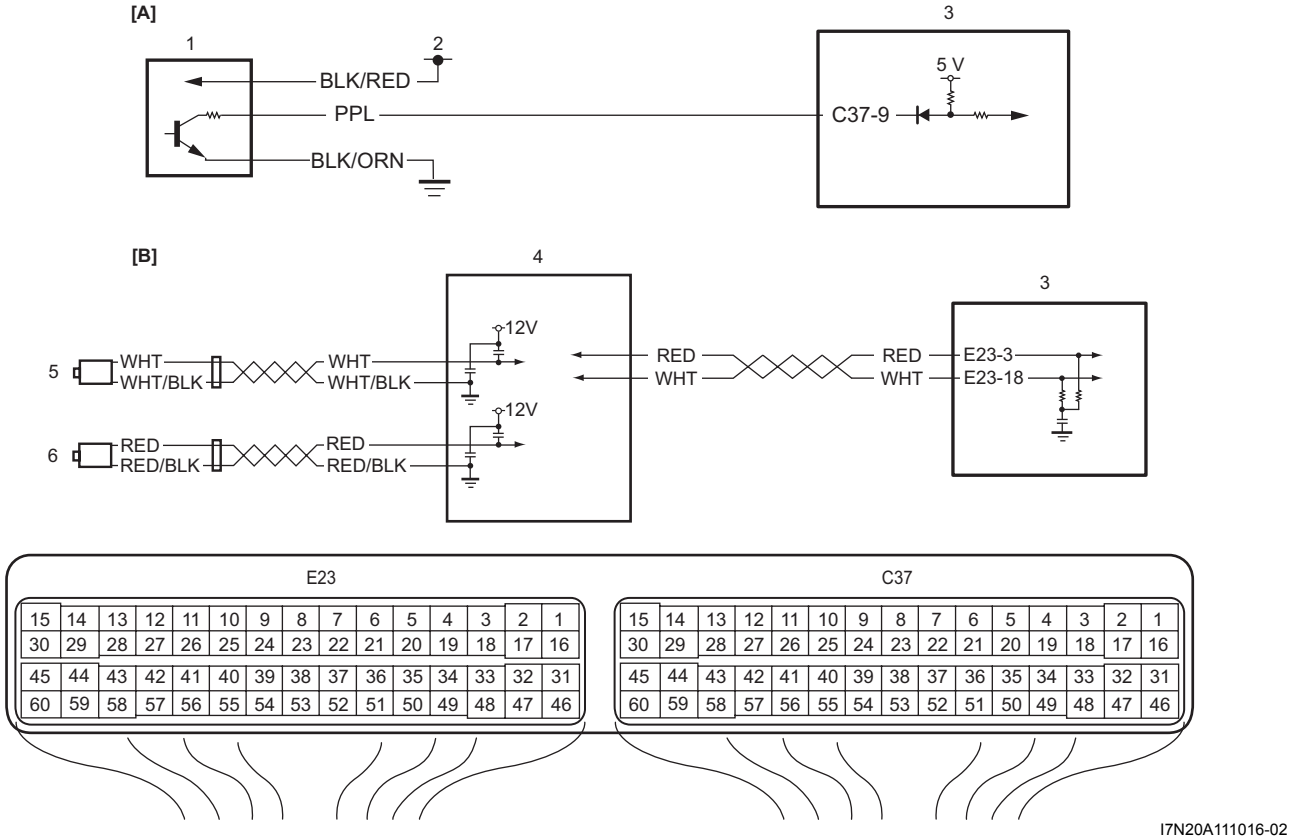
Step	Action	Yes	No
9	**Radiator cooling fan control check** 1) Disconnect radiator cooling fan relay No. 2 (2) and No. 3 (3) from individual circuit fuse box No.1 (1) with ignition switch turned OFF. 2) Run engine until ECT is over 97.5 °C, 207.5 °F. 3) Measure voltage between vehicle body ground and each "BLU/RED" wire terminal of radiator cooling fan control relay No. 2 and No. 3 connectors.  I4RS0B110039-02 *Is voltage 10 – 14 V?*	Go to Step 10.	"BLU/RED" wire is open circuit.
10	**Wire circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Connect radiator cooling fan relay No. 2 to individual circuit fuse box No.1. 3) Using service wire, ground "E23-46" and "E23-60" terminals of ECM connector. 4) Turn ON ignition switch, measure voltage between vehicle body ground and "E23-48" terminal of ECM connector. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 12.
11	**Wire circuit check** 1) Disconnect radiator cooling fan relay No. 2 and then connect radiator cooling fan relay No. 3 to individual circuit fuse box No.1 with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between vehicle body ground and "E23-48" terminal of ECM connector. *Is voltage 10 – 14 V?*	Go to Step 15.	Go to Step 12.
12	**Wire circuit check** 1) Disconnect radiator cooling fan control relay No. 2 and No. 3 from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Measure resistance between "E23-48" terminal of ECM connector and vehicle body ground. *Is resistance infinity?*	Go to Step 13.	"GRN" wire is shorted to ground circuit.
13	**Wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between "E23-48" terminal of ECM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 14.	"GRN" wire is shorted to power supply circuit.

Step	Action	Yes	No
14	**Radiator cooling fan relay No. 2 and No. 3 check** 1) Check radiator cooling fan relay No. 2 and No. 3 referring to “Radiator Cooling Fan Relay Inspection: M13A / M15A / M16A in Section 1F”. *Are relays in good condition?*	“GRN” wire is open circuit.	Replace relay.
15	**Radiator cooling fan control No. 2 and No. 3 check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Connect radiator cooling fan relay No. 2 to individual circuit fuse box No.1. 3) Run engine until ECT is over 102.5 °C, 216.5 °F. 4) Measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Intermittent trouble. Check for intermittent refer to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good ECM and recheck.	Faulty ECM.

DTC P0500: Vehicle Speed Sensor (VSS) Malfunction

S7N20A1114052

Wiring Diagram



I7N20A111016-02

[A]: For automated manual transaxle model	2. To main relay	5. Front left side wheel speed sensor
[B]: For non-automated-manual-transaxle model	3. ECM	6. Front right side wheel speed sensor
1. VSS	4. ESP® control module	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Vehicle speed signal is not input while fuel is cut at deceleration for 4 seconds continuously at 3600 rpm or less. • Vehicle speed signal is not input even if engine is running with more than 3000 rpm at D-Range for 4 sec. (A/T model). (2 driving cycle detection logic)	• VSS circuit (automated manual transaxle model) • Wheel speed sensor circuit (non-automated-manual-transaxle model) • VSS malfunction (automated manual transaxle model) • ESP® control module (non-automated-manual-transaxle model) • TCM malfunction • ECM malfunction

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester.**

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Warm up engine to normal operating temperature.
4) Drive vehicle at 4000 rpm (engine speed) with 3rd gear (M/T and Automated Manual Transaxle model) or “3” range (A/T model).
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 6 sec. or more (fuel cut condition for 5 sec. or more) and stop vehicle.
6) For A/T model, drive vehicle at more than 3000 rpm for 10 sec.
7) Check pending DTC and DTC.

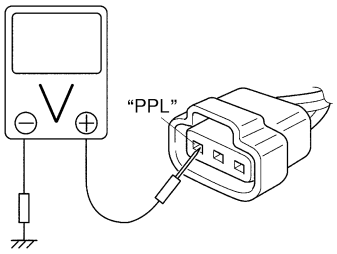
DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the “Precautions of ECM Circuit Inspection: M13A / M15A / M16A”.**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A”.**
- **Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” and confirm that the trouble has been corrected.**

Automated manual transaxle model

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: M13A / M15A / M16A”.
2	**Vehicle speed signal check** *Is vehicle speed displayed on scan tool in Step 4) and 5) of “DTC Confirmation Procedure”?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 3.

Step	Action	Yes	No
3	**Power supply circuit check** 1) With ignition switch turned OFF, disconnect connector from VSS. 2) Check for proper connection to “BLK/RED”, “PPL” and “BLK/ORN” wire terminals of VSS connector. 3) If wires are OK, turn ON ignition switch, measure voltage between engine ground and “BLK/RED” wire terminal of VSS connector. *Is voltage 10 – 14 V?*	Go to Step 4.	“BLK/RED” wire is open circuit.
4	**Ground circuit check** 1) Measure resistance between engine ground and “BLK/ORN” wire terminal of VSS connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 5.	“BLK/ORN” wire is open or high resistance circuit.
5	**Wire circuit check** 1) Turn ON ignition switch, measure voltage between engine ground and “PPL” wire terminal of VSS connector.  I4RS0B110040-01 *Is measured voltage 4 – 5 V?*	Go to Step 9.	Go to Step 6.
6	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM form its bracket with ECM connectors connected. 3) Turn ON ignition switch, measure voltage between vehicle body ground and “C37-9” terminal of ECM connector. *Is measured voltage 4 – 5 V?*	“PPL” wire is open circuit.	Go to Step 7.
7	**Short circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and “C37-9” terminal of ECM connector. *Is measured voltage 0 V?*	Go to Step 8.	“PPL” wire is shorted to power supply circuit.
8	**Short circuit check** 1) Measure resistance between engine ground and “C37-9” terminal of ECM connector with ignition switch turned OFF. *Is resistance infinity?*	Go to Step 9.	“PPL” wire is shorted to ground circuit. If wire is OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
9	**VSS check** 1) Check VSS and signal rotor tooth referring to “Vehicle Speed Sensor (VSS) Inspection (If Equipped): M13A / M15A / M16A in Section 1C”. *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace VSS or signal rotor.

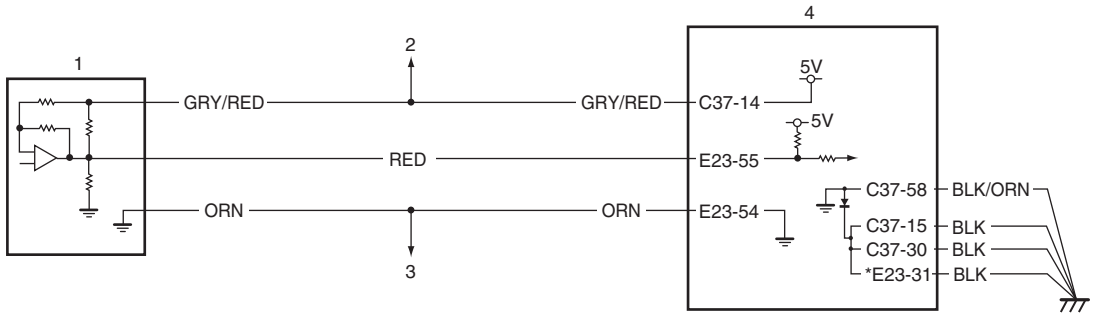
Non-automated-manual-transaxle model

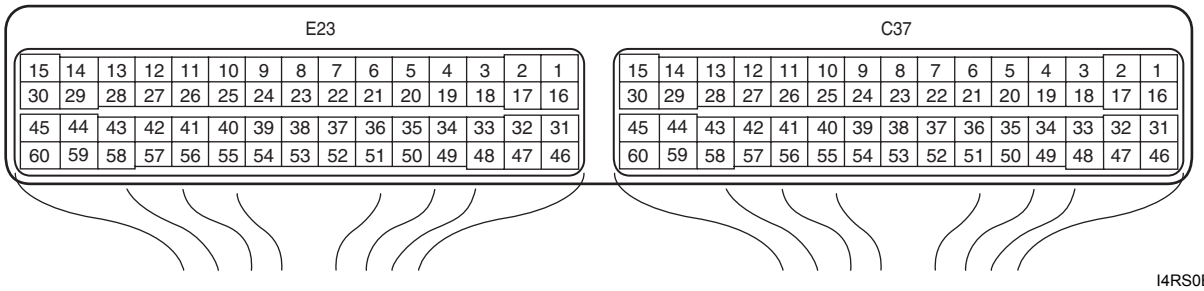
Step	Action	Yes	No
1	*Was “Engine and Emission Control System Check” performed?*	Go to Step 2.	Go to “Engine and Emission Control System Check: M13A / M15A / M16A”.
2	**Vehicle speed signal check** *Is vehicle speed displayed on scan tool in Step 4) and 5) of “DTC Confirmation Procedure”?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 3.
3	**DTC check in ABS / ESP® control module** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ABS / ESP® control module for DTC. *Is there any DTC(s) in ABS / ESP® control module?*	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

DTC P0532: A/C Refrigerant Pressure Sensor Circuit Low

S7N20A1114054

Wiring Diagram





I4RS0B110042-02

1. A/C refrigerant pressure sensor	3. To other sensors	*: Electric throttle body model
2. To TP sensor and MAP sensor	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is less than 0.15 V for 0.5 sec. continuously. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • TP sensor • MAP sensor • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Check DTC and pending DTC.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

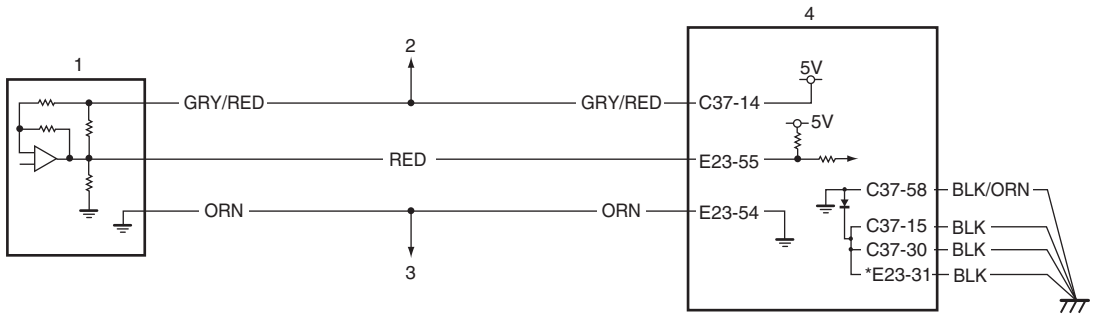
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 3.
3	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from TP sensor and MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or MAP sensor.	Go to Step 4.

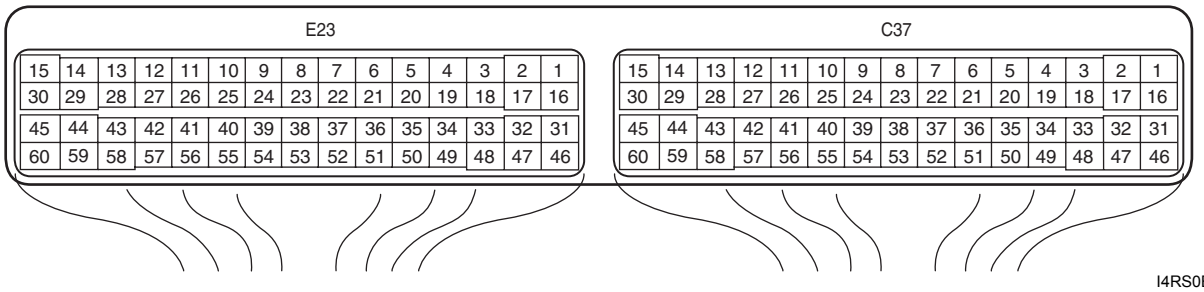
Step	Action	Yes	No
4	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and “C37-14” terminal of ECM connector. *Is resistance infinity?*	Go to Step 6.	“GRY/RED” wire is shorted to ground circuit.
5	**A/C refrigerant pressure sensor signal circuit check** 1) Connect connectors to ECM. 2) Turn ON ignition switch, measure voltage between engine ground and “RED” wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 6.
6	**A/C refrigerant pressure sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and “E23-55” terminal of ECM connector. *Is resistance infinity?*	Go to Step 7.	“RED” wire is shorted to ground circuit.
7	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual A/C in Section 7B” *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0533: A/C Refrigerant Pressure Sensor Circuit High

S7N20A1114055

Wiring Diagram





I4RS0B110042-02

1. A/C refrigerant pressure sensor	3. To other sensors	*: Electric throttle body model
2. To TP sensor and MAP sensor	4. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is higher than 4.93 V for 0.5 sec. continuously. (1 driving detection logic but MIL does not light up)	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • TP sensor • MAP sensor • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Check DTC and pending DTC.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A"
2	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connector from A/C refrigerant pressure sensor with ignition switch turned OFF. 2) Check for proper connection of A/C refrigerant pressure sensor at "GRY/RED", "RED" and "ORN" wire terminals. 3) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 4.	Go to Step 3.
3	**A/C refrigerant pressure sensor power supply circuit check** 1) Disconnect connectors from TP sensor and MAP sensor with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between engine ground and "GRY/RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Faulty TP sensor and/or MAP sensor.	"GRY/RED" wire is open or shorted to power circuit.
4	**A/C refrigerant pressure sensor signal circuit check** 1) Turn ON ignition switch, measure voltage between engine ground and "RED" wire terminal of A/C refrigerant pressure sensor connector. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 5.

Step	Action	Yes	No
5	**A/C refrigerant pressure sensor signal circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “RED” wire terminal of A/C refrigerant pressure sensor connector and “E23-55” terminal of ECM connector. *Is resistance below 2 Ω?*	“RED” wire is shorted to power supply circuit.	“RED” wire is open or high resistance circuit.
6	**A/C refrigerant pressure sensor ground circuit check** 1) Turn OFF ignition switch, measure resistance between engine ground and “ORN” wire terminal of A/C refrigerant pressure sensor connector. *Is resistance below 5 Ω?*	Go to Step 8.	Go to Step 7.
7	**ECM ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Measure resistance between engine ground and “E23-54” terminal of ECM connector. *Is resistance below 5 Ω?*	“ORN” wire is open or high resistance circuit.	ECM grounds “C37-58”, “C37-15”, “C37-30” and/or “E23-31” (Electric throttle body model) is open or high resistance circuit.
8	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual A/C in Section 7B” *Is it good condition?*	Substitute a known-good ECM and recheck.	Faulty A/C refrigerant pressure sensor.

DTC P0601 / P0607: Internal Control Module Memory Check Sum Error / Control Module Performance

S7N20A1114056

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area

NOTE

After reprogramming of ECM is executed, if the DTC P0601 and/or P0602 are indicated, it is possible that the reprogramming of ECM is not completed correctly.

DTC detecting condition	Trouble area
DTC P0601: ECM internal failure (check sum error) (1 driving cycle detection logic) **DTC P0607:** ECM internal failure (electric throttle control system error) (1 driving cycle detection logic)	• ECM power supply circuit and/or ground circuit • ECM

DTC Confirmation Procedure

1) Turn ignition switch to ON position.
2) Start engine, if possible.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC referring to "DTC Clearance: M13A / M15A / M16A". 2) Turn OFF ignition switch. 3) Turn ON ignition switch and check DTC. *Is DTC P0601 or P0607 still indicated?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00"
2	**ECM power and ground circuit check** 1) Check that ECM power supply circuit and ECM ground circuit is in good condition referring to "ECM Power and Ground Circuit Check: M13A / M15A / M16A". *Are check results OK?*	Substitute a known-good ECM and recheck.	Repair ECM power or ground circuit.

DTC P0602: Control Module Programming Error

S7N20A1114090

DTC Detecting Condition and Trouble Area

NOTE

After reprogramming of ECM is executed, if the DTC P0601 and/or P0602 are indicated, it is possible that the reprogramming of ECM is not completed correctly.

DTC detecting condition	Trouble area
DTC P0602: ECM internal failure. (data programming error) (1 driving cycle detection logic but MIL does not light up)	• ECM power supply circuit and/or ground circuit • ECM

DTC Confirmation Procedure

1) Turn ignition switch to ON position.

DTC Troubleshooting

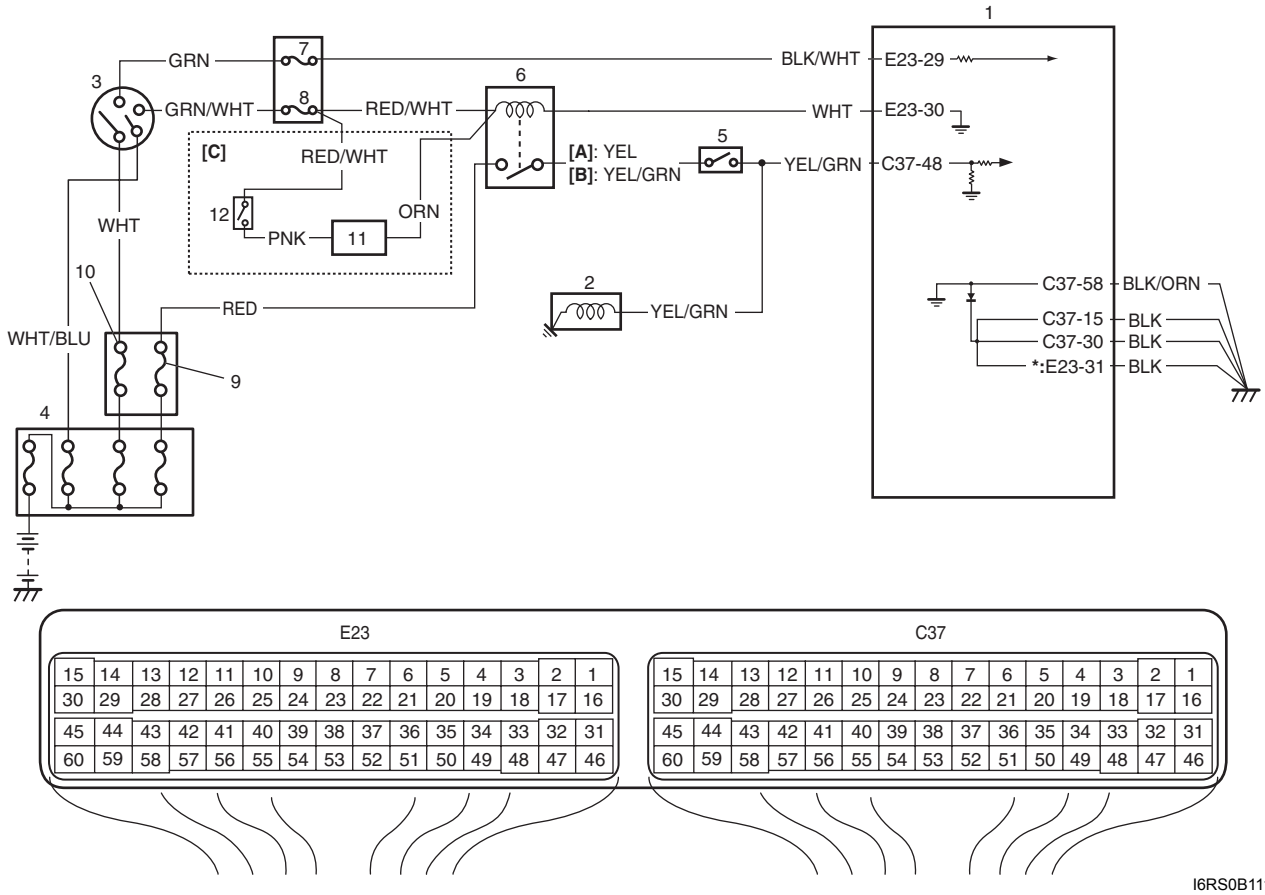
Step	Action	Yes	No
1	**DTC recheck** 1) Clear DTC referring to "DTC Clearance". 2) Turn OFF ignition switch. 3) Perform DTC confirmation procedure and check DTC. *Is DTC P0602 still detected?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
2	**ECM reprogramming check** *Was reprogramming of ECM executed?*	Go to Step 3.	Execute reprogramming of ECM correctly once again.

Step	Action	Yes	No
3	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: M13A / M15A / M16A". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace ECM power and ground circuit.

DTC P0616: Starter Relay Circuit Low

S7N20A1114057

Wiring Diagram



I6RS0B111014-02

[A]: For A/T model	4. Main fuse box	10. "IG ACC" fuse
[B]: For M/T model	5. Transmission range switch (A/T model)	11. TCM (Automated Manual Transaxle model)
[C]: For Automated Manual Transaxle model	6. Starting motor control relay	12. Neutral start switch
1. ECM	7. "IG COIL" fuse	*: Electric throttle body model
2. Starter motor	8. "ST SIG" fuse	
3. Ignition switch	9. "ST MOT" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine starter signal is high voltage for 180 seconds continuously while engine is running. (2 driving cycle detection logic)	• Engine starter signal circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

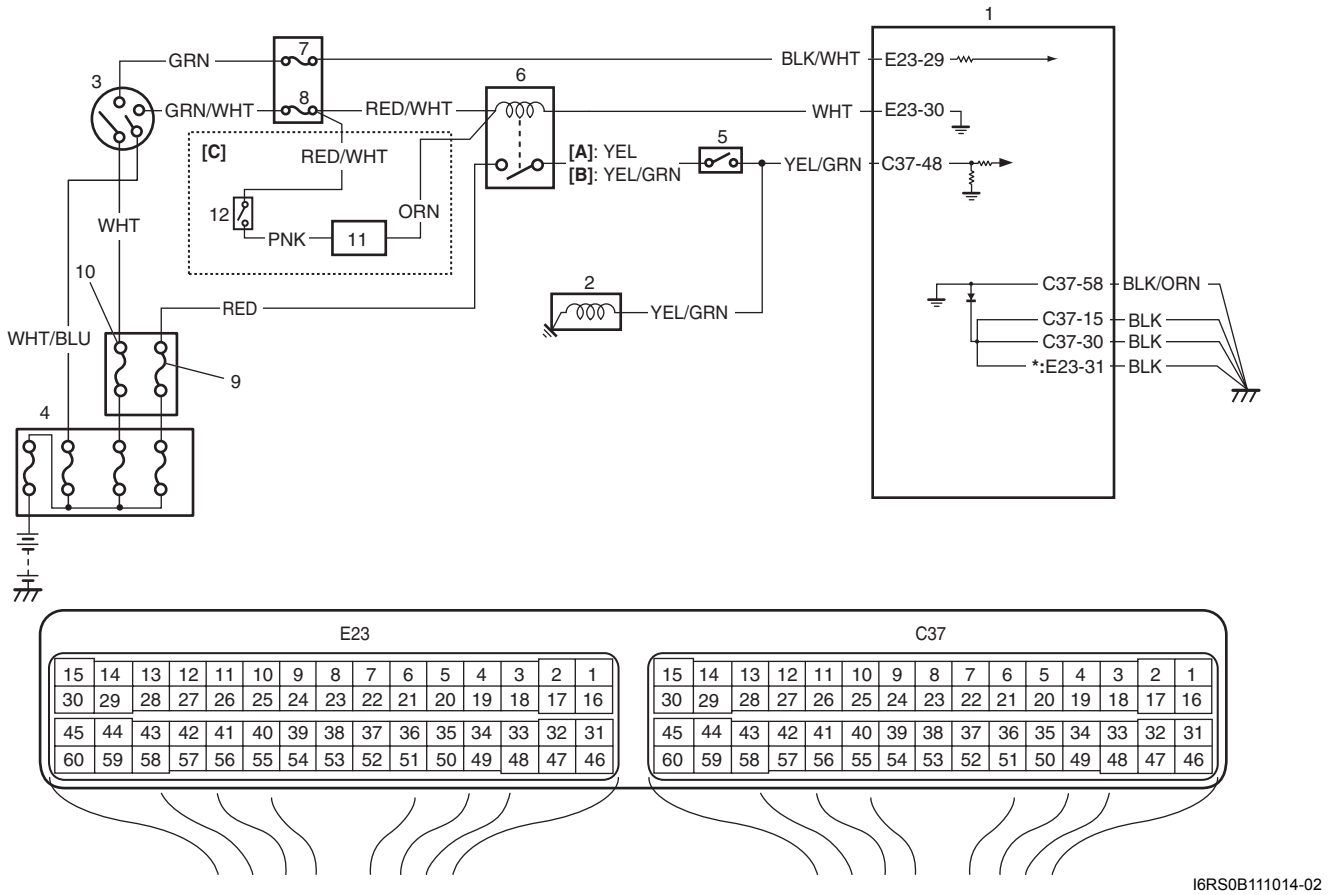
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Signal circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Measure voltage at terminal "C37-48" of ECM connector, under following condition. **Voltage at terminal "C37-48" of ECM connector** **While engine cranking: 6 – 14 V** **After starting engine: 0 – 1 V** *Is each voltage within specified range?*	Poor "C37-48" connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If wire and connections are OK, substitute a known-good ECM and recheck.	"YEL/GRN" wire is open or high resistance circuit.

DTC P0617: Starter Relay Circuit High

S7N20A1114058

Wiring Diagram



I6RS0B111014-02

[A]: For A/T model	4. Main fuse box	10. "IG ACC" fuse
[B]: For M/T model	5. Transmission range switch (A/T model)	11. TCM (Automated Manual Transaxle model)
[C]: For Automated Manual Transaxle model	6. Starting motor control relay	12. Neutral start switch
1. ECM	7. "IG COIL" fuse	*: Electric throttle body model
2. Starter motor	8. "ST SIG" fuse	
3. Ignition switch	9. "ST MOT" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine starter signal is high voltage for 180 seconds continuously while engine is running. (2 driving cycle detection logic)	• Engine starter signal circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it at idle for 3 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

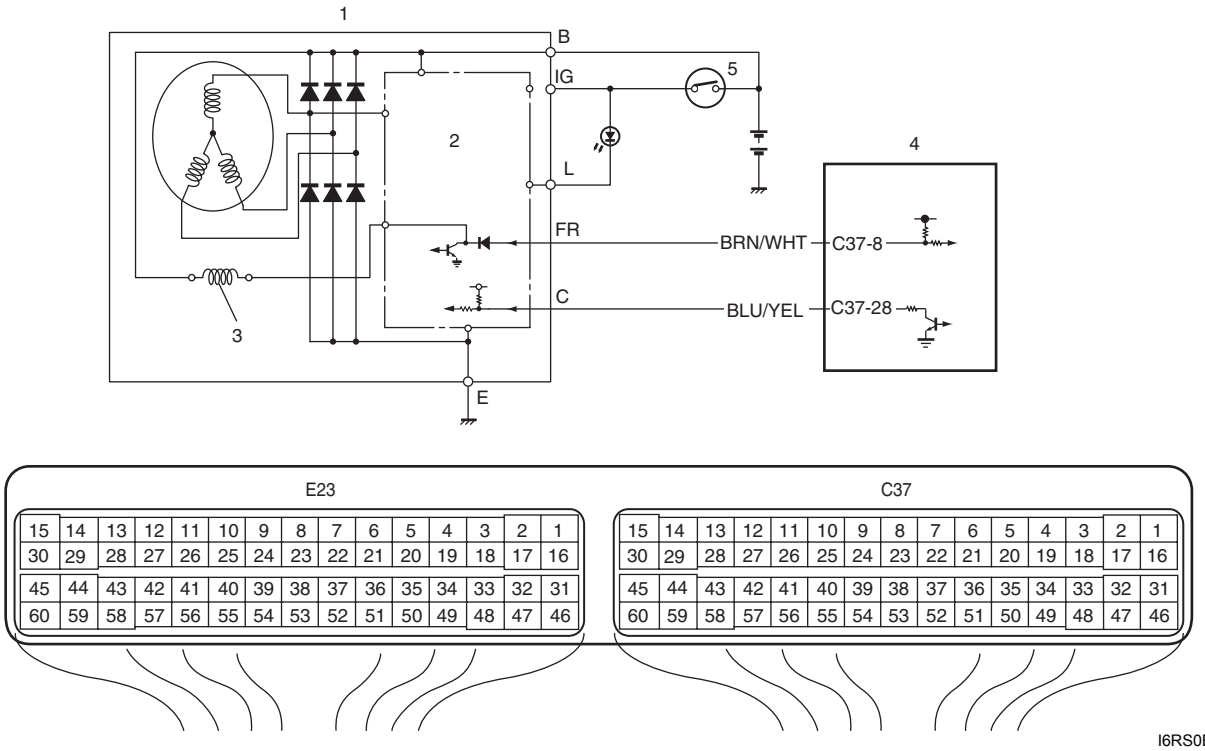
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Starter signal check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Start engine, measure voltage between "C37-48" terminal of ECM connector and vehicle body ground. *Is voltage 0 – 1 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	**Wire circuit check** 1) Disconnect starting motor control relay in individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to starting motor control relay at "RED/WHT" (A/T and M/T models), "ORN" (Automated Manual Transaxle model), "RED", "WHT", "YEL" (A/T model) and "YEL/GRN" (M/T or Automated Manual Transaxle model) wire terminals. 3) Disconnect connector from starting motor. 4) Measure voltage between "C37-48" terminal of ECM connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 – 1 V?*	Go to Step 4.	For A/T model, "YEL" or "YEL/GRN" wire is shorted to power circuit. For M/T or Automated Manual Transaxle model, "YEL/GRN" wire is shorted to power circuit. If wires are OK, substitute a known good ECM and recheck.
4	**Wire circuit check** 1) Measure voltage between "RED/WHT" (A/T and M/T models), "ORN" (Automated Manual Transaxle model) wire terminal of starting motor control relay connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 – 1 V?*	Check starting motor control relay. If OK, substitute a known-good ECM and recheck.	Faulty ignition switch, check ignition switch referring to "Ignition Switch Inspection in Section 9C". If ignition switch is OK, check for short circuit between ignition switch and starting motor control relay to power circuit.

DTC P0620: Generator Control Circuit

S7N20A1114059

System and Wiring Diagram



I6RS0B111015-01

1. Generator	3. Field coil	5. Ignition switch
2. IC regulator	4. ECM	6. Charge lamp

Generator Control System Description

Refer to “Generator Control System Description (M16A Engine): M13A / M15A / M16A”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• Battery voltage is higher than specification even through generator control is maximum regulation (duty 100%). • Battery voltage is lower than specification even through generator control is minimum regulation (duty 0%) and electric load is less than 15 A. (1 driving cycle detecting logic but MIL does not light up)	• Generator and/or its circuit • Electric load current sensor • ECM • Generator drive belt

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool to DLC
2) Turn ON ignition switch and clear DTC.
3) Make sure that all accessory switches are tuned OFF.
4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
5) Turn ON the following accessory switches.
   - Head light switch.
   - Blower motor switch (max position).
   - Rear defogger switch.
6) Increase engine speed to 4000 rpm and keep it for 10 sec or more.
7) Decrease engine speed to idle.
8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

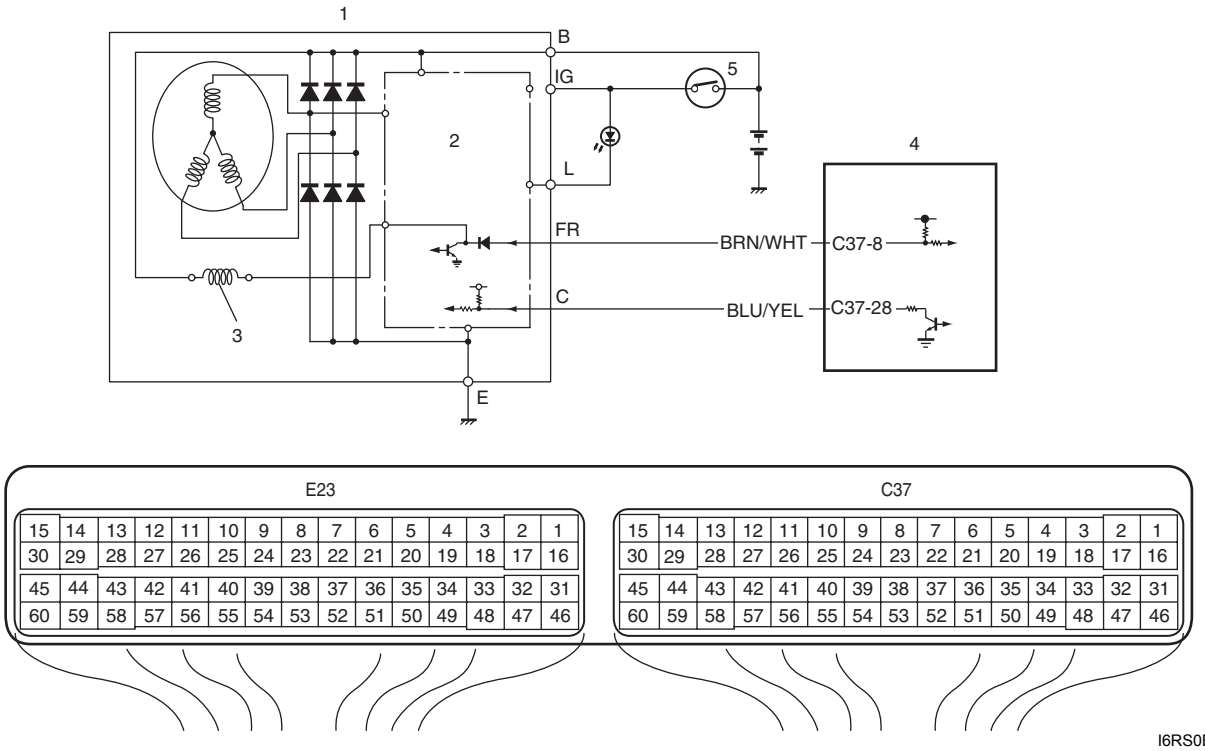
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Generator drive belt check** 1) Check generator drive belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: M13A / M15A / M16A in Section 1F". *Is check result satisfactory?*	Go to Step 3.	Adjust or replace generator drive belt.
3	**Generator control circuit check** 1) Disconnect connector from generator and ECM with ignition switch turned OFF. 2) Check for proper connection of wire terminal to generator connector and to ECM connector. 3) If connections are OK, check generator control circuit for the following. • Resistance of generator control circuit wire between generator connector and ECM connector is less than 1 Ω (continuity check) • Resistance between generator control circuit wire of generator connector and vehicle body ground is infinity (ground circuit short check) • Voltage between generator control circuit wire of generator connector and vehicle body ground is 0 V with ignition switch tuned ON (power circuit short check) *Are they in good condition?*	Go to Step 3.	Repair or replace defective wire.
4	**Generator check** 1) Check for generator output referring to "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Repair or replace generator.

DTC P0625 / P0626: Generator Field Terminal Circuit Low / High

S7N20A1114060

System and Wiring Diagram



I6RS0B111015-01

1. Generator	3. Field coil	5. Ignition switch
2. IC regulator	4. ECM	6. Charge lamp

Generator Control System Description

Refer to “Generator Control System Description (M16A Engine): M13A / M15A / M16A”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0625: Generator field coil duty is 0% (high voltage) for more than specified time even through generator control is minimum regulation (control duty 0%). (1 driving cycle detection logic but MIL does not light up) **P0626:** Generator field coil duty is 100% (low voltage) for more than specified time even through generator control is maximum regulation (control duty 100%) or Generator field coil duty is 100% (low voltage) when engine is starting. (1 driving cycle detection logic but MIL does not light up)	• Generator and/or its circuit • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool to DLC.
2) Turn ON ignition switch and clear DTC.
3) Make sure that all accessory switch is tuned OFF.
4) Start engine and warm it up to normal operating temperature (ECT approx. 90 – 95 °C, 193 – 203 °F).
5) Turn ON following accessory switch.
   - Head lights switch.
   - Blower motor switch (max position).
   - Rear defogger switch.

6) Increase engine speed to 4000 rpm and keep it for 10 sec. or more.
7) Decrease engine speed to idle.
8) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

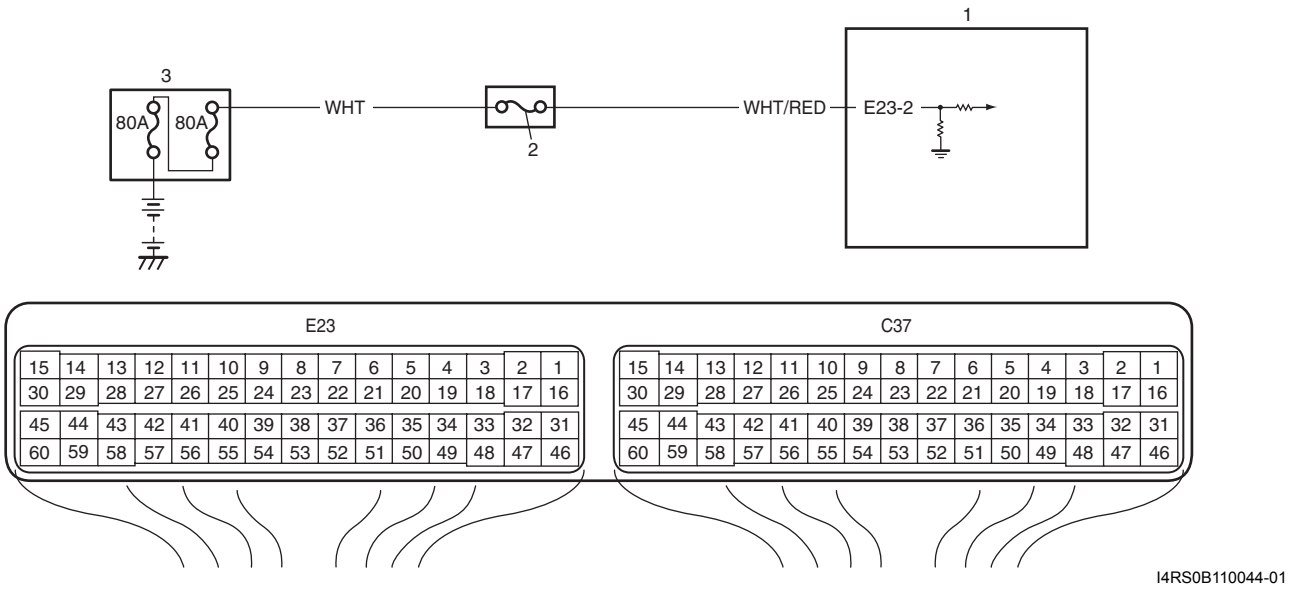
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Generator control circuit check** 1) Disconnect connector from generator and ECM with ignition switch turned OFF. 2) Check for proper connection of wire terminal to generator connector and to ECM connector. 3) If connections are OK, check generator control (generator "C" terminal) circuit and field coil monitor (generator "FR" terminal) circuit for the following. • Resistance of each generator control wire and field coil monitor wire between generator connector and ECM connector is less than 1 Ω (continuity check) • Resistance between generator control wire and field coil monitor wire of generator connector is infinity (insulation check) • Resistance between each generator control wire and field coil monitor wire of generator connector and vehicle body ground is infinity (ground circuit short check) • Voltage between each generator control wire and field coil monitor wire of generator connector and vehicle body ground is 0 V with ignition switch tuned ON (power circuit short check) *Are they in good condition?*	Go to Step 3.	Repair or replace defective wire.
3	**Generator check** 1) Check for generator output referring to "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J" and "Generator Inspection: M13A / M15A / M16A in Section 1J". *Is check result satisfactory?*	Substitute a known good ECM and recheck.	Repair or replace generator.

DTC P1510: ECM Back-Up Power Supply Malfunction

S7N20A1114061

Wiring Diagram



1. ECM
2. “RADIO” fuse
3. Main fuse box

Circuit Description

Battery voltage is supplied so that DTC memory, values for engine control learned by ECM, etc. are kept in ECM even when the ignition switch is turned OFF.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Back-up power circuit voltage is less than 70% battery voltage for 5 seconds continuously while engine is running. (1 driving cycle detection logic)	Battery voltage supply circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC using scan tool and run engine at idle speed for 1 min.
3) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

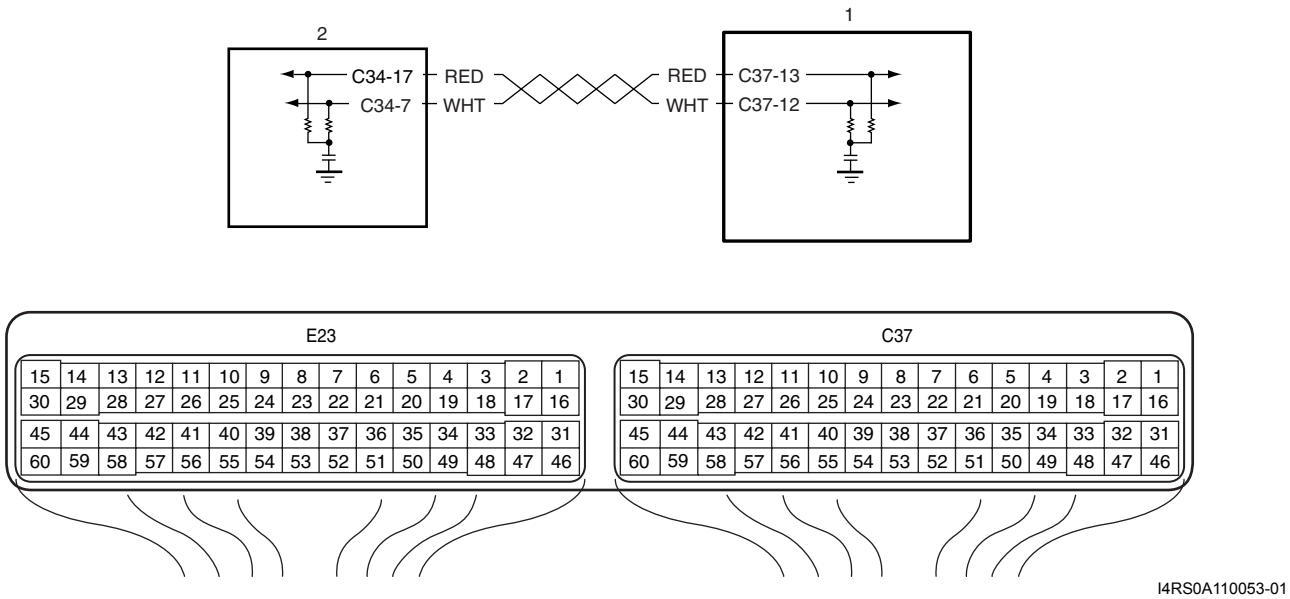
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Battery voltage supply circuit check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) With engine running, measure voltage between "E23-2" terminal of ECM connector and engine ground. *Is voltage 10 – 14 V?*	Poor "E23-2" connection or intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If wire and connections are OK, substitute a known-good ECM and recheck.	"RADIO" fuse blown, "WHT" or "WHT/RED" wire is circuit open or short circuit.

DTC P1603: TCM Trouble Code Detected

S7N20A1114062

Wiring Diagram



I4RS0A110053-01

1. ECM	2. TCM (A/T model)

DTC Detecting Condition

When ECM receives a trouble code from TCM, which indicates that some problem occurred in sensor circuits and its calculated values used for operations such as idle speed control, engine power control, and so on by TCM, ECM sets DTC P1603. (TCM outputs the trouble code to ECM when TCM can not compute the engine control signal due to malfunctions of sensor circuits used for gear shift control.)

DTC Troubleshooting

NOTE

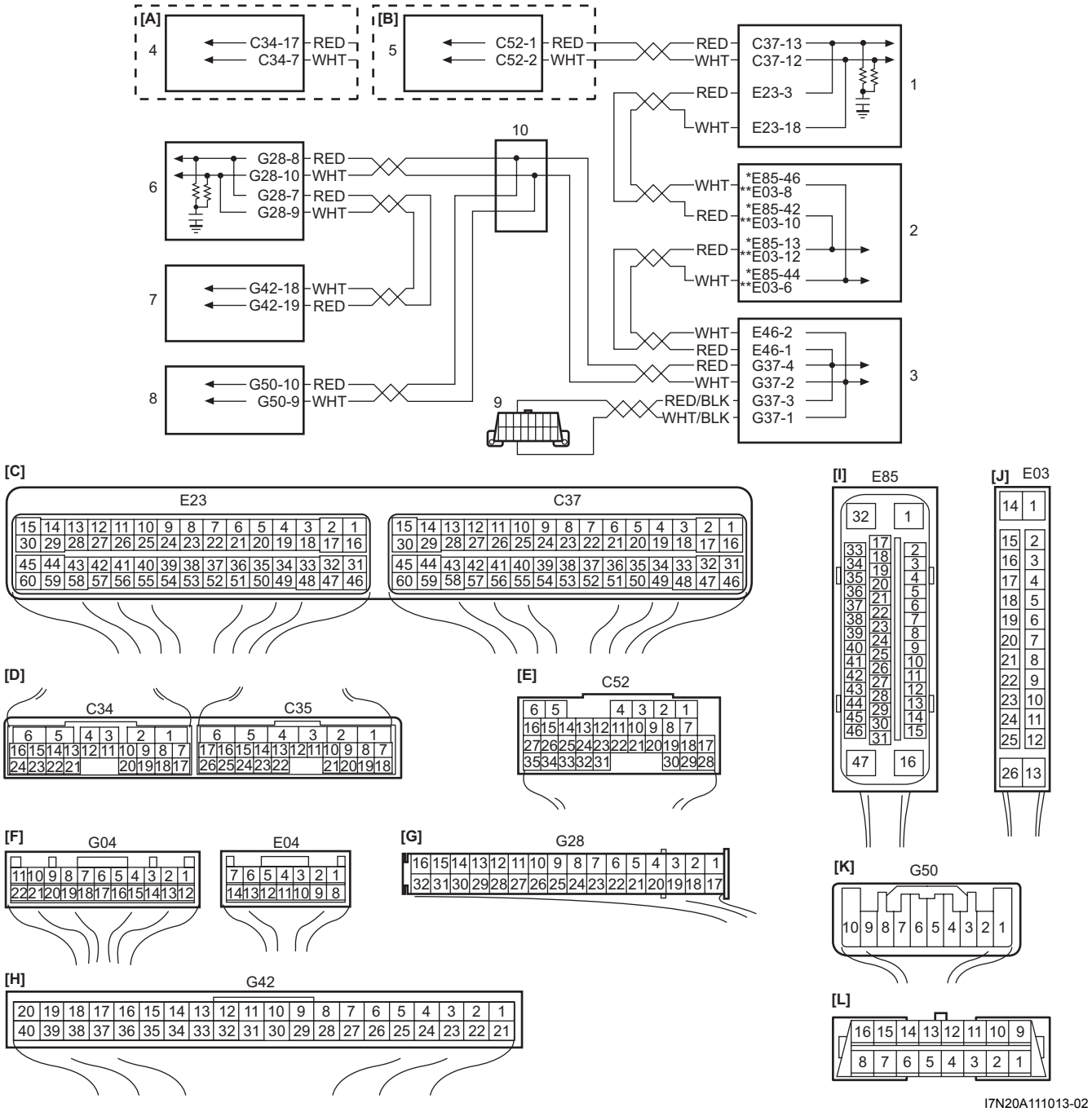
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**DTC check** 1) Check DTC of TCM referring to "DTC Check in Section 5A". *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good ECM and recheck.

DTC P1674: CAN Communication (Bus Off Error)

S7N20A1114063

Wiring Diagram
For M13A and M15A engines



I7N20A111013-02

[A]: A/T model	1. ECM
[B]: Automated manual transaxle model	2. ABS / ESP® control module
[C]: ECM connector (viewed from harness side)	3. BCM
[D]: TCM connector (A/T model) (viewed from harness side)	4. TCM (A/T model)
[E]: TCM connector (automated manual transaxle model) (viewed from harness side)	5. TCM (automated manual transaxle model)
[F]: BCM connector (viewed from harness side)	6. Combination meter
[G]: Combination meter connector (viewed from harness side)	7. Keyless start control module
[H]: Keyless start control module connector (viewed from harness side)	8. Steering angle sensor connector (ESP® model)
[I]: ESP® control module connector (viewed from terminal side)	9. DLC
[J]: ABS control module connector (viewed from terminal side)	10. CAN junction connector (ESP® model)
[K]: Steering angle sensor connector (ESP® model) (viewed from harness side)	*: For ESP® model
[L]: DLC (viewed from terminal side)	**: For non-ESP® model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	• ECM • BCM • TCM (A/T or Automated Manual Transaxle model) • ABS / ESP® control module • Steering angle sensor (ESP® model) • Keyless start control module (keyless start model) • Combination meter • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

For Non-ESP® model

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: M13A / M15A / M16A".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model), ABS control module, keyless start control module (keyless start model) and BCM for DTC. *Is there any DTC(s) (other than DTC P1674 / P1675 / P1676 / P1678 in ECM, DTC P1774 / P1775 / P1777 / P1778 in TCM (A/T or Automated Manual Transaxle model), DTC U1071 / U1100 in ABS control module, DTC U1073 / U1001 / U1100 / U1101 in BCM and DTC No.31 / 33 in keyless start control module (keyless start model))?*	Go to applicable DTC diag. flow.	Go to Step 3.

Step	Action	Yes	No
3	**ECM, TCM (A/T or Automated Manual Transaxle model), BCM, ABS control module, combination meter and keyless start control module (keyless start model) connectors check** 1) Check for proper connection at each ECM, TCM (A/T or Automated Manual Transaxle model), BCM, ABS control module, combination meter and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1674?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.
4	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to “ECM Power and Ground Circuit Check: M13A / M15A / M16A”. *Are they in good condition?*	Go to Step 5.	Repair ECM power and/or ground circuits.
5	**DTC check in BCM, TCM (A/T or Automated Manual Transaxle model), ABS control module and keyless start control module (keyless start model) (bus off)** 1) Check DTC(s) in TCM (A/T or Automated Manual Transaxle model) and BCM. *Is there DTC(s) P1774 in TCM (A/T or Automated Manual Transaxle model), U1073 in BCM, ABS control module and/or DTC No.33 in keyless start control module (keyless start model)?*	Go to Step 6.	Go to Step 7.
6	**DTC check in ECM (bus off)** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check TCM (A/T or Automated Manual Transaxle model) and BCM, ABS control module for DTC(s). *Is there DTC(s) P1774 in TCM (A/T or Automated Manual Transaxle model), U1073 in BCM, ABS control module and/or DTC No.33 in keyless start control module (keyless start model)?*	Go to Step 7.	“E23-3”, “E23-18”, “C37-13” or “C37-12” circuit wire between ECM and ABS control module or TCM is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
7	**DTC check in ECM** 1) Connect connectors to ECM and disconnect connectors from TCM (A/T or Automated Manual Transaxle model) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 8.	“C37-13” or “C37-12” circuit wire between ECM and TCM is open or high resistance. If wires are OK, substitute a known-good TCM (A/T or Automated Manual Transaxle model) and recheck.
8	**DTC check in ECM** 1) Disconnect connector from keyless start control module (keyless start model) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 9.	“G49-18” or “G49-19” circuit wire between combination meter and keyless start control module (keyless start model) is open or high resistance. If wires are OK, substitute a known-good keyless start control module and recheck.

Step	Action	Yes	No
9	**DTC check in ECM** 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 10.	"G28-8" or "G28-10" circuit wire between BCM and combination meter is open or high resistance. If wires are OK, substitute a known-good combination meter or keyless start control module (keyless start model) and recheck.
10	**DTC check in ECM** 1) Disconnect connector from BCM with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 11.	"E46-2" or "E46-1" circuit wire between BCM and ABS control module is open or high resistance. If wires are OK, substitute a known-good ABS control module, combination meter or keyless start control module (keyless start model) and recheck.
11	**ABS control module check** 1) Measure resistance at the following connector terminals. • Between "E03-12" and "E03-10" terminal of ABS control module connector. • Between "E03-6" and "E03-8" terminal of ABS control module connector. *Is measured resistance below 1Ω?*	Go to Step 12.	Substitute a known-good ABS control module and recheck.
12	**CAN communication line circuit insulation check** 1) Disconnect connector from ABS control module with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E03-12" and "E03-6" terminal of ABS control module connector. • Between "E03-10" and "E03-8" terminal of ABS control module connector. *Is resistance infinity?*	Go to Step 13.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
13	**CAN communication line circuit insulation check** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance between "G37-2" and "G37-4" terminals of BCM connector. *Is resistance infinity?*	Go to Step 14.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
14	**CAN communication line circuit insulation check (keyless start model)** 1) Disconnect connector from keyless start control module with ignition switch turned OFF. 2) Measure resistance between "G49-18" and "G49-19" terminals of keyless start control module connector. *Is resistance infinity?*	Go to Step 15.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".

Step	Action	Yes	No
15	**CAN communication line circuit insulation check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-3” and “E23-18” terminals of ECM connector. *Is resistance infinity?*	Go to Step 16.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
16	**CAN communication line circuit insulation check (A/T or Automated Manual Transaxle model)** 1) Measure resistance between “C37-13” and “C37-12” terminals of ECM connector. *Is resistance infinity?*	Go to Step 17.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
17	**CAN communication line circuit continuity check** 1) Measure resistance at the following connector terminals. • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM (A/T) connector (A/T model) or “C52-1” terminal of TCM (Automated Manual Transaxle) connector (Automated Manual Transaxle model) • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM (A/T) connector (A/T model) or “C52-2” terminal of TCM (Automated Manual Transaxle) connector (Automated Manual Transaxle model) • Between “E23-3” terminal of ECM connector and “E03-10” terminal of ABS control module connector • Between “E23-18” terminal of ECM connector and “E03-8” terminal of ABS control module connector • Between “E03-6” terminal of ABS control module connector and “E46-2” terminal of BCM connector • Between “E03-12” terminal of ABS control module connector and “E46-1” terminal of BCM connector • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector • Between “G28-7” terminal of combination meter connector and “G49-19” terminal of keyless start control module connector (keyless start model) • Between “G28-9” terminal of combination meter connector and “G49-18” terminal of keyless start control module connector (keyless start model) *Is each resistance below 1 Ω?*	Go to Step 18.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

Step	Action	Yes	No
18	**CAN communication line circuit ground short check** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) • Between “C37-12” terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) • Between “E03-12” terminal of ABS control module connector and vehicle body ground • Between “E03-6” terminal of ABS control module connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground • Between “G49-19” terminal of keyless start control module connector and vehicle body ground (keyless start model) • Between “G49-18” terminal of keyless start control module connector and vehicle body ground (keyless start model) *Is each resistance infinity?*	Go to Step 19.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

Step	Action	Yes	No
19	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) • Between “C37-12” terminal of ECM connector and vehicle body ground (A/T or Automated Manual Transaxle model) • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground • Between “E03-12” terminal of ABS control module connector and vehicle body ground • Between “E03-6” terminal of ABS control module connector and vehicle body ground • Between “G49-19” terminal of keyless start control module connector and vehicle body ground (keyless start model) • Between “G49-18” terminal of keyless start control module connector and vehicle body ground (keyless start model) *Is each voltage 0 – 1 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

For ESP® model

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: M13A / M15A / M16A”.
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM,TCM (A/T model), ESP® control module, keyless start control module (keyless start model) and BCM for DTC. *Is there any DTC(s) other than CAN communication DTC(s) at each control module (other than DTC P1674 / P1675 / P1678 / P1685 in ECM, DTC P1774 / P1775 / P01777 / P1778 in TCM (A/T model), DTC U1073 / U1001 / U1100 / U1144 in BCM, DTC U1073 / U1100 / U1101 / U1126 / U1139 / U1140 in ESP® control module and DTC No.31 / 33 in keyless start control module (keyless start model))?*	Go to applicable DTC diag. flow.	Go to Step 3.

Step	Action	Yes	No
3	**ECM, TCM (A/T model), BCM, ESP® control module, combination meter, steering angle sensor and keyless start control module (keyless start model) connectors check** 1) Check for proper connection at each ECM, TCM (A/T model), BCM, ESP® control module, combination meter, steering angle sensor and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1674?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.
4	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to “ECM Power and Ground Circuit Check: M13A / M15A / M16A”. *Are they in good condition?*	Go to Step 5.	Repair ECM power and/or ground circuits.
5	**DTC check in TCM (A/T model), BCM, ESP® control module and keyless start control module (keyless start model) (bus off)** 1) Check DTC(s) in TCM (A/T model), BCM, ESP® control module and keyless start control module (keyless start model). *Is there DTC(s) P1774 in TCM (A/T model), DTC U1073 in BCM, ESP® control module and/or DTC No.33 in keyless start control module (keyless start model)?*	Go to Step 6.	Go to Step 7.
6	**DTC check in ECM (bus off)** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check TCM (A/T model), BCM, keyless start control module and ESP® control module for DTC(s). *Is there DTC(s) P1774 in TCM (A/T model), DTC U1073 in BCM, ESP® control module and/or DTC No.33 in keyless start control module (keyless start model)?*	Go to Step 7.	“E23-3”, “E23-18”, “C37-13” or “C37-12” circuit wire between ECM and ESP® control module is open or high resistance. If wires are OK, substitute a known-good ECM and recheck.
7	**DTC check in ECM** 1) Connect connectors to ECM and disconnect connectors from TCM (A/T model) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 8.	“C37-13” or “C37-12” circuit wire between ECM and TCM is open or high resistance. If wires are OK, substitute a known-good TCM (A/T model) and recheck.
8	**DTC check in ECM** 1) Disconnect connector from ESP® control module with ignition switch turned OFF. 2) Check ECM for DTC(s). *Is there DTC P1674?*	Go to Step 9.	“E85-13” or “E85-44” circuit wire between ESP® control module and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good ESP® control module and recheck.

Step	Action	Yes	No
9	**DTC check in ECM** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 10.	"G95-2" or "G95-4" circuit wire between BCM and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good BCM and recheck.
10	**DTC check in ECM** 1) Disconnect connectors from steering angle sensor (ESP® model) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 11.	"G50-9" or "G50-10" circuit wire between steering angle sensor and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good steering angle sensor and recheck.
11	**DTC check in ECM** 1) Disconnect connector from keyless start control module (keyless start model) with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 12.	"G44-19" or "G44-18" circuit wire between keyless start control module and combination meter is open or high resistance. If wires are OK, substitute a known-good steering angle sensor and recheck.
12	**DTC check in ECM** 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P1674?*	Go to Step 13.	"G28-10" or "G28-8" circuit wire between combination meter and CAN circuit junction connector is open or high resistance. If wires are OK, substitute a known-good combination meter and recheck.
13	**ESP® control module check** 1) Measure resistance at the following connector terminals. • Between "E85-13" terminal and "E85-42" terminal of ESP® control module connector • Between "E03-10" terminal and "E03-12" terminal of ESP® control module connector *Is measured resistance below 1Ω?*	Go to Step 14.	Substitute a known-good ESP® control module and recheck.
14	**CAN communication line circuit insulation check** 1) Disconnect connector from ESP® control module with ignition switch turned OFF. 2) Measure resistance between "E85-13" and "E85-44" terminals of ESP® control module (ESP® model) connector. *Is resistance infinity?*	Go to Step 15.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".

Step	Action	Yes	No
15	**CAN communication line circuit insulation check** 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-3” and “E23-18” terminals of ECM connector. *Is resistance infinity?*	Go to Step 16.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
16	**CAN communication line circuit insulation check** 1) Disconnect connector from BCM with ignition switch turned OFF. 2) Measure resistance between “G95-2” and “G95-4” terminals of BCM connector. *Is resistance infinity?*	Go to Step 17.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
17	**CAN communication line circuit insulation check** 1) Disconnect connector from steering angle sensor (ESP® model) with ignition switch turned OFF. 2) Measure resistance between “G50-9” and “G50-10” terminals of steering angle sensor (ESP® model) connector. *Is resistance infinity?*	Go to Step 18.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
18	**CAN communication line circuit insulation check** 1) Disconnect connector from combination meter with ignition switch turned OFF. 2) Measure resistance between “G28-8” and “G28-10” terminals of combination meter connector. *Is resistance infinity?*	Go to Step 19.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
19	**CAN communication line circuit insulation check** 1) Disconnect connector from keyless start control module (keyless start model) with ignition switch turned OFF. 2) Measure resistance between “G49-18” and “G49-19” terminals of keyless start control module (keyless start model) connector. *Is resistance infinity?*	Go to Step 20.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
20	**CAN communication line circuit insulation check (A/T model)** 1) Measure resistance between “C37-13” and “C37-12” terminals of ECM connector. *Is resistance infinity?*	Go to Step 21.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

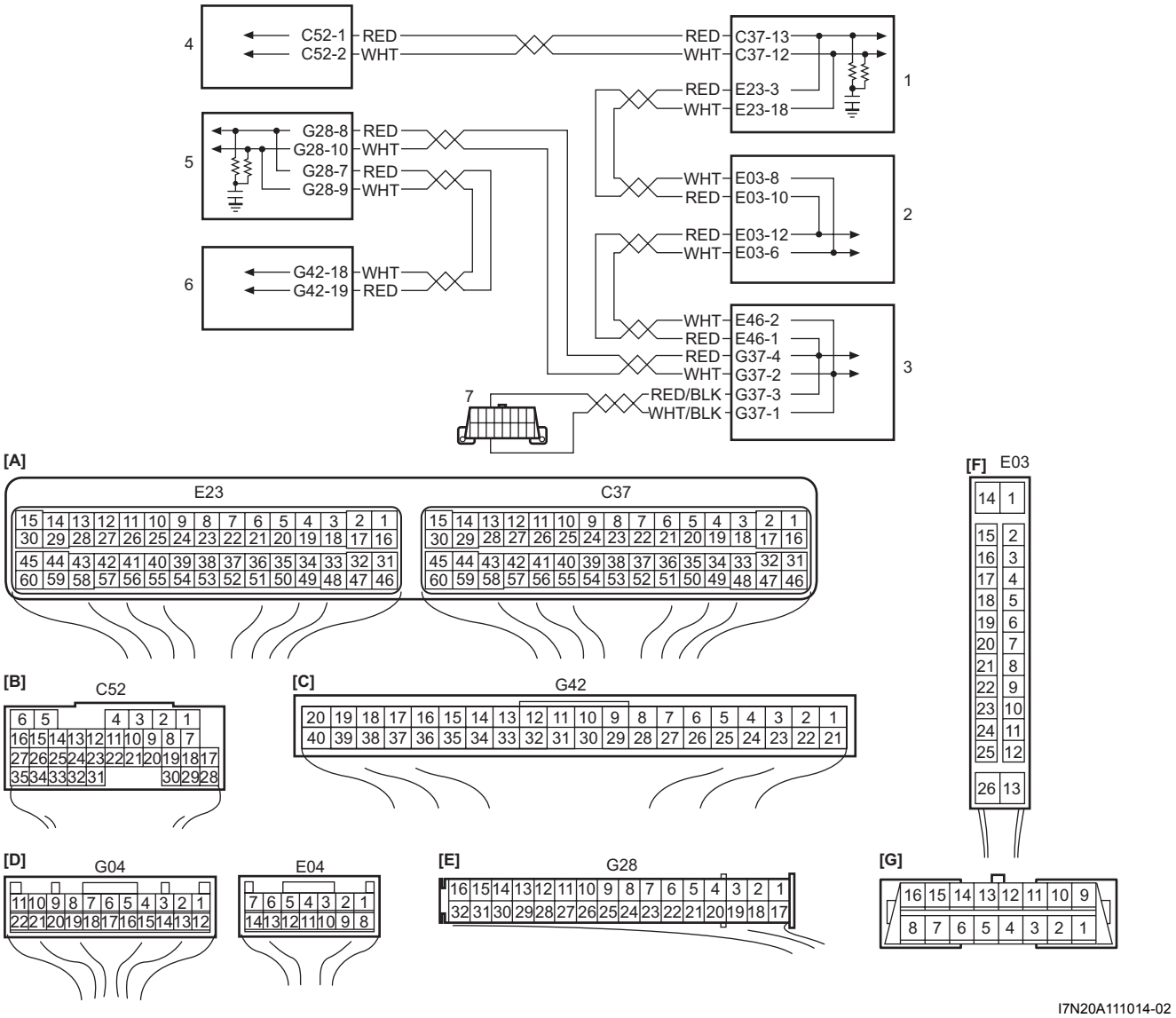
Step	Action	Yes	No
21	**CAN communication line circuit continuity check** 1) Measure resistance at the following connector terminals. • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector (A/T model) • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector (A/T model) • Between “E23-3” terminal of ECM connector and “E85-42” terminal of ESP® control module connector • Between “E23-18” terminal of ECM connector and “E85-46” terminal of ESP® control module connector • Between “E85-13” terminal of ESP® control module connector and “E84-1” terminal of BCM connector • Between “E85-44” terminal of ESP® control module connector and “E84-2” terminal of BCM connector • Between “G95-4” terminal of BCM connector and each “G50-9” terminal of steering angle sensor (ESP® model) connector, “G28-8” terminal of combination meter connector • Between “G95-2” terminal of BCM connector and each “G50-10” terminal of steering angle sensor (ESP® model) connector, “G28-10” terminal of combination meter connector • Between “G28-7” terminal of combination meter connector and “G49-19” terminal of keyless start control module (keyless start model) connector • Between “G28-9” terminal of combination meter connector and “G49-18” terminal of keyless start control module (keyless start model) connector *Is each resistance below 1Ω?*	Go to Step 20.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
22	**CAN communication line circuit ground short check** 1) Measure resistance at the following connector terminals. • Between “C37-13” terminal of ECM connector and vehicle body ground (A/T model) • Between “C37-12” terminal of ECM connector and vehicle body ground (A/T model) • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “E85-13” terminal of ESP® control module connector and vehicle body ground • Between “E85-44” terminal of ESP® control module connector and vehicle body ground • Between “G95-4” terminal of BCM connector and vehicle body ground • Between “G95-2” terminal of BCM connector and vehicle body ground • Between “G28-7” terminal of combination meter connector and vehicle body ground • Between “G28-9” terminal of combination meter connector and vehicle body ground *Is each Is each resistance infinity?*	Go to Step 23.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

Step	Action	Yes	No
23	**CAN communication line circuit power short check** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C37-13” terminal of ECM connector and vehicle body ground (A/T model) • Between “C37-12” terminal of ECM connector and vehicle body ground (A/T model) • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “E85-13” terminal of ESP® control module (ESP® model) connector and vehicle body ground • Between “E85-44” terminal of ESP® control module (ESP® model) connector and vehicle body ground • Between “G95-4” terminal of BCM connector and vehicle body ground • Between “G95-2” terminal of BCM connector and vehicle body ground • Between “G28-7” terminal of combination meter connector and vehicle body ground • Between “G28-9” terminal of combination meter connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good ESP® control module (ESP® model) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

DTC P1675: CAN Communication (Transmission Error) (Automated Manual Transaxle Model)

S7N20A1114064

Wiring Diagram



I7N20A111014-02

[A]: ECM connector (viewed from harness side)	1. ECM
[B]: TCM connector (automated manual transaxle model) (viewed from harness side)	2. ABS control module
[C]: Keyless start control module connector (viewed from harness side)	3. BCM
[D]: BCM connector (viewed from harness side)	4. TCM (automated manual transaxle model)
[E]: Combination meter connector (viewed from harness side)	5. Combination meter
[F]: ABS control module connector (viewed from terminal side)	6. Keyless start control module
[G]: DLC (viewed from terminal side)	7. DLC

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for ECM is detected for longer than specified time continuously. (1 driving detection logic)	• ECM • BCM • TCM (Automated manual transaxle model) • ABS control module • Keyless start control module (keyless start model) • Combination meter • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A"
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM, ABS control module and BCM for DTC. *Is there any DTC(s) (other than DTC P1674 / P1675 / P1676 / P1678 in ECM, DTC P1774 / P1775 / P1777 / P1778 in TCM, U1073 / U1100 in ABS control module, DTC U1073 / U1001 / U1100 / U1101 in BCM and DTC No.31 / 33 in keyless start control module (keyless start model))?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A"	Go to Step 4.
4	**CAN communication error check for BCM, TCM, ABS control module and keyless start control module (keyless start model)** 1) Check BCM, TCM, ABS control module and keyless start control module (keyless start model) for DTC(s). *Are there DTC U1073 in BCM, DTC P1774 in TCM, DTC U1073 in ABS control module and DTC No.33 in keyless start control module (keyless start model)?*	Go to applicable DTC diag. flow.	Go to Step 5.

Step	Action	Yes	No
5	**ECM, TCM, ABS control module, BCM, combination meter and keyless start control module (keyless start model) connectors check** 1) Check for proper connection at each ECM, TCM, ABS control module, BCM, combination meter and keyless start control module (keyless start model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1675?*	Go to Step 6.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”
6	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to “ECM Power and Ground Circuit Check: M13A / M15A / M16A”. *Are they in good condition?*	Go to Step 7.	Repair ECM power and/ or ground circuits.
7	**DTC check in ECM** 1) Check ECM for DTC(s). *Are there DTCs P1676 and P1678?*	Go to Step 8.	Go to Step 10.
8	**DTC check in TCM (A/T or Automated Manual Transaxle model) and BCM** 1) Check TCM (A/T or Automated Manual Transaxle model) and BCM for DTC(s). *Are there DTCs P1777, P1778 in TCM, DTC U1100 in ABS control module and DTCs U1100, U1101 in BCM?*	Go to Step 10.	Go to Step 9.
9	**Combination meter operation check** 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and shift position indicator lamp with ignition switch turned ON. *Are they OK?*	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly), TCM, ABS control module and recheck.

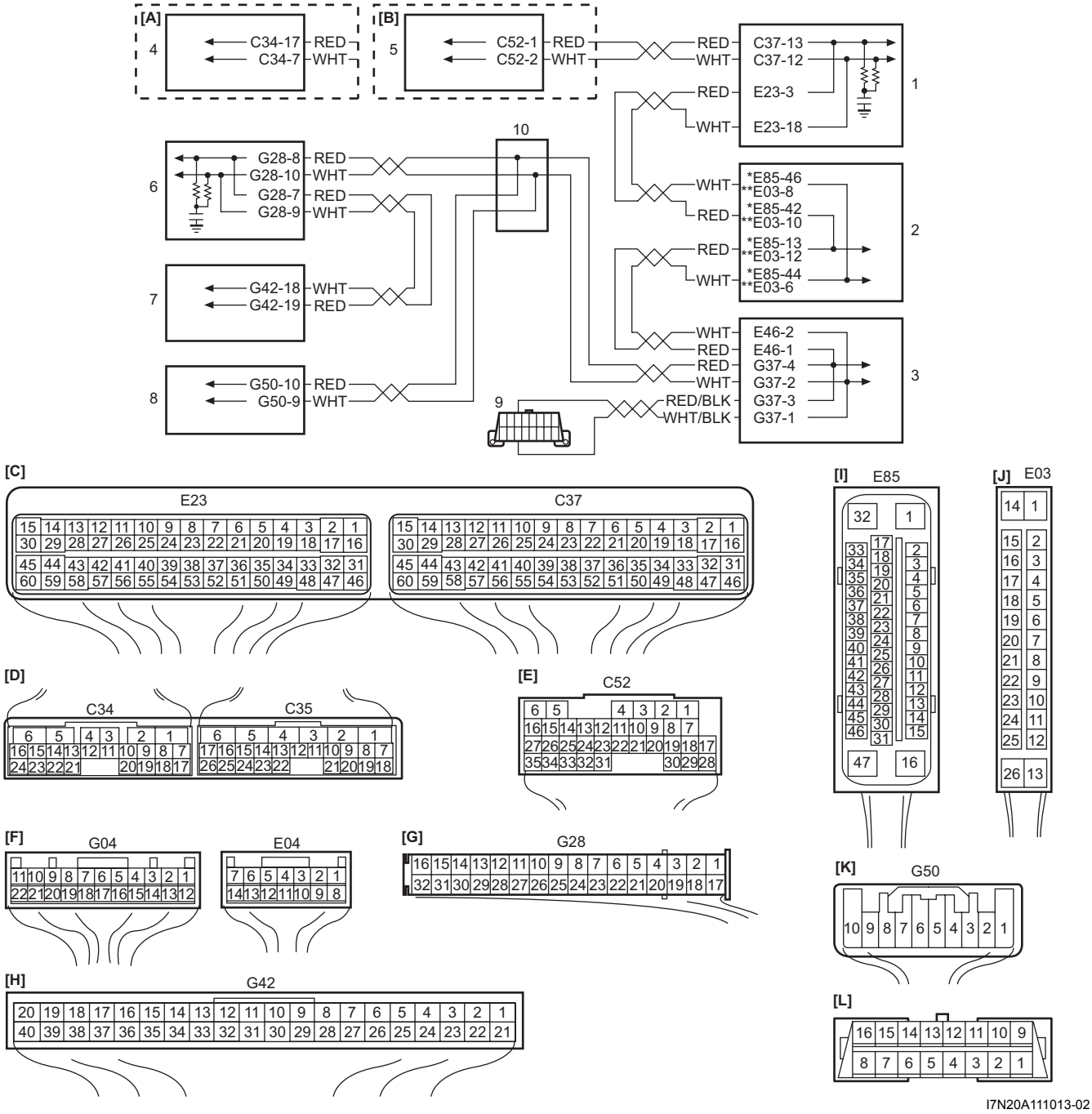
Step	Action	Yes	No
10	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM, BCM, TCM, ABS control module, combination meter and keyless start control module (keyless start model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and “E03-10” terminal of ABS control module connector • Between “E23-18” terminal of ECM connector and “E03-8” terminal of ABS control module connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector • Between “E03-12” terminal of ABS control module connector and “E46-1” terminal of BCM connector • Between “E03-6” terminal of ABS control module connector and “E46-2” terminal of BCM connector • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector • Between “G28-7” terminal of combination meter connector and “G49-19” terminal of keyless start control module connector (keyless start model) • Between “G28-9” terminal of combination meter connector and “G49-18” terminal of keyless start control module connector (keyless start model) *Is each resistance below 1 Ω?*	Go to Step 11.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
11	**CAN communication line circuit insulation check** 1) Measure resistance at the following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector • Between “E03-12” and “E03-6” terminal of ABS control module connector • Between “G37-4” and “G37-2” terminals of BCM connector • Between “G28-7” and “G28-9” terminals of combination meter connector (keyless start model) *Is each resistance infinity?*	Go to Step 12.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

Step	Action	Yes	No
12	**CAN communication line circuit ground short check** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “E03-12” terminal of ABS control module connector and vehicle body ground • Between “E03-6” terminal of ABS control module connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground • Between “G49-19” terminal of keyless start control module connector and vehicle body ground (keyless start model) • Between “G49-18” terminal of keyless start control module connector and vehicle body ground (keyless start model) *Is each resistance infinity?*	Go to Step 13.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
13	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “E03-12” terminal of ABS control module connector and vehicle body ground • Between “E03-6” terminal of ABS control module connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground • Between “G49-19” terminal of keyless start control module connector and vehicle body ground (keyless start model) • Between “G49-18” terminal of keyless start control module connector and vehicle body ground (keyless start model) *Is each voltage 0 – 1 V?*	Substitute a known-good ECM and recheck.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

DTC P1676: CAN Communication (Reception Error for TCM (A/T or Automated Manual Transaxle model))

S7N20A1114065

Wiring Diagram



I7N20A111013-02

[A]: A/T model	1. ECM
[B]: Automated manual transaxle model	2. ABS / ESP® control module
[C]: ECM connector (viewed from harness side)	3. BCM
[D]: TCM connector (A/T model) (viewed from harness side)	4. TCM (A/T model)
[E]: TCM connector (automated manual transaxle model) (viewed from harness side)	5. TCM (automated manual transaxle model)
[F]: BCM connector (viewed from harness side)	6. Combination meter
[G]: Combination meter connector (viewed from harness side)	7. Keyless start control module
[H]: Keyless start control module connector (viewed from harness side)	8. Steering angle sensor connector (ESP® model)
[I]: ESP® control module connector (viewed from terminal side)	9. DLC
[J]: ABS control module connector (viewed from terminal side)	10. CAN junction connector (ESP® model)
[K]: Steering angle sensor connector (ESP® model) (viewed from harness side)	*: For ESP® model
[L]: DLC (viewed from terminal side)	**: For non-ESP® model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for TCM or Automated Manual Transaxle control module is detected for longer than specified time continuously. (1 driving detection logic)	• ECM • TCM (A/T or Automated Manual Transaxle model) • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model), ABS control module and BCM for DTC. *Is there any DTC(s) (other than DTC P1674 / P1675 / P1676 / P1678 in ECM, DTC P1774 / P1775 / P1777 / P1778 in TCM (A/T or Automated Manual Transaxle model), DTC U1073 / U1100 in ABS control module and DTC U1073 / U1001 / U1100 / U1101 in BCM)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check CAN communication error for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A".	Go to Step 4.
4	**ECM and TCM (A/T or Automated Manual Transaxle model) connector check** 1) Check for proper connection at each ECM and TCM (A/T or Automated Manual Transaxle model) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1676?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".

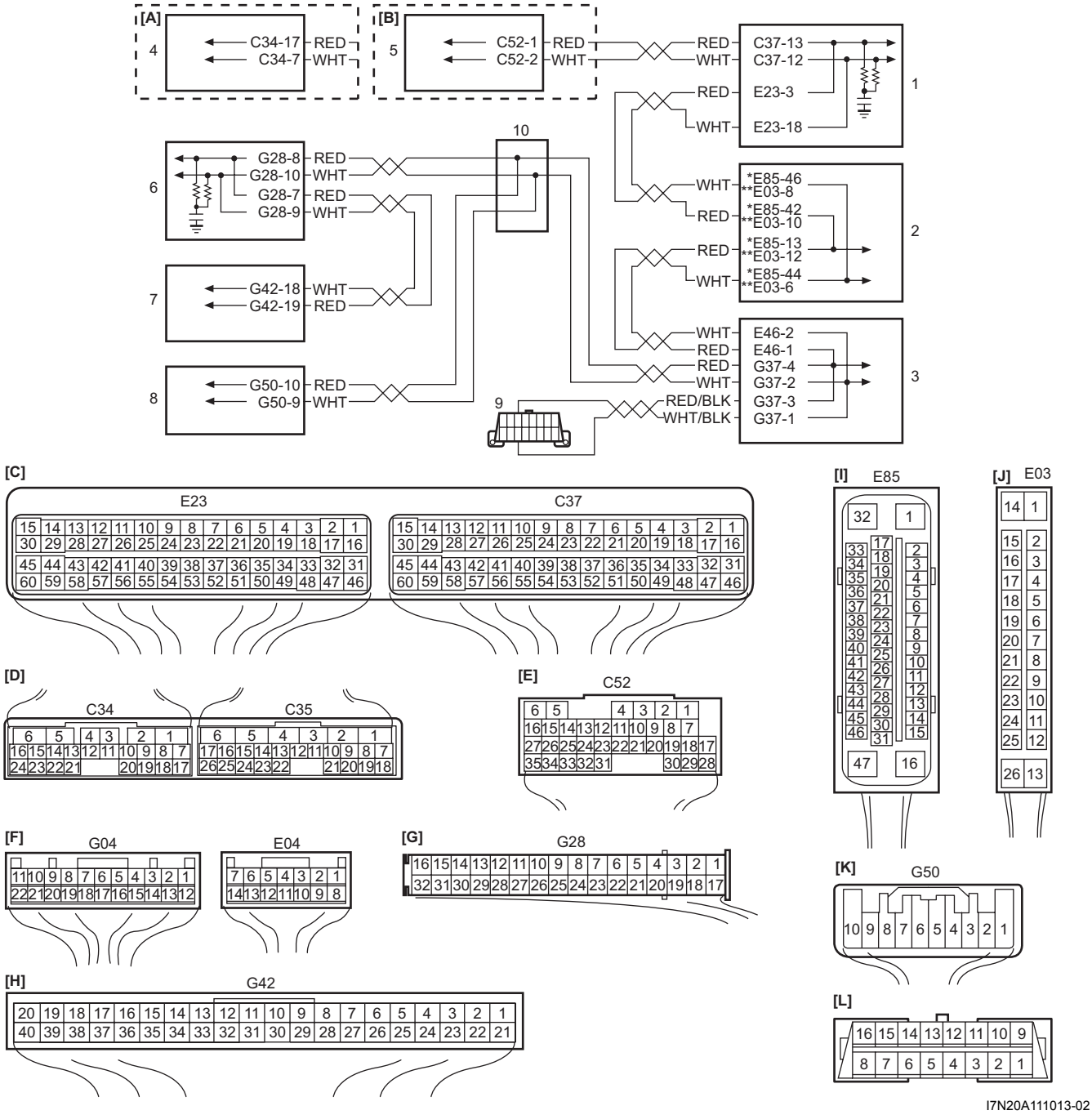
Step	Action	Yes	No
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuits referring to "ECM Power and Ground Circuit Check: M13A / M15A / M16A". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/ or ground circuits.
6	**DTC check in TCM (A/T or Automated Manual Transaxle model)** 1) Check DTC P1774 in TCM (A/T or Automated Manual Transaxle model). *Is it indicated?*	Go to"DTC P1774: Control Module Communication Bus Off in Section 5A" (A/T model) or "DTC P1774: Control Module Communication Bus Off in Section 5D" (Automated Manual Transaxle model).	Go to Step 7.
7	**DTC check in BCM and ESP® control module (ESP® model)** 1) Check DTC U1101 in BCM and ESP® control module (ESP® model) *Is it indicated?*	Go to applicable DTC diagnosis flow.	Go to Step 8
8	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM and TCM (A/T or Automated Manual Transaxle model) with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM (A/T model) connector or "C52-1" terminal of TCM (Automated Manual Transaxle model) connector • Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM (A/T model) connector or "C52-2" terminal of TCM (Automated Manual Transaxle model) connector *Is each resistance below 1 Ω?*	Go to Step 9.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
9	**CAN communication line circuit insulation check** 1) Measure resistance between "C37-13" and "C37-12" terminals of ECM connector. *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
10	**CAN communication line circuit ground short check** 1) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and vehicle body ground • Between "C37-12" terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 11.	Repair short to ground of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".

Step	Action	Yes	No
11	**Check for short circuit of CAN communication line to power circuit** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 12.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
12	**ECM circuit check** 1) Disconnect connectors from ABS / ESP® control module with ignition switch turned OFF. 2) Connect connectors to ECM. 3) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connectors • Between “E23-18” and “C37-12” terminals of ECM connectors *Is resistance below 1 Ω?*	Substitute a known-good TCM (A/T or Automated Manual Transaxle model) and recheck.	Substitute a known-good ECM and recheck.

DTC P1678: CAN Communication (Reception Error for BCM)

S7N20A1114066

Wiring Diagram



I7N20A111013-02

[A]: A/T model	1. ECM
[B]: Automated manual transaxle model	2. ABS / ESP® control module
[C]: ECM connector (viewed from harness side)	3. BCM
[D]: TCM connector (A/T model) (viewed from harness side)	4. TCM (A/T model)
[E]: TCM connector (automated manual transaxle model) (viewed from harness side)	5. TCM (automated manual transaxle model)
[F]: BCM connector (viewed from harness side)	6. Combination meter
[G]: Combination meter connector (viewed from harness side)	7. Keyless start control module
[H]: Keyless start control module connector (viewed from harness side)	8. Steering angle sensor connector (ESP® model)
[I]: ESP® control module connector (viewed from terminal side)	9. DLC
[J]: ABS control module connector (viewed from terminal side)	10. CAN junction connector (ESP® model)
[K]: Steering angle sensor connector (ESP® model) (viewed from harness side)	*: For ESP® model
[L]: DLC (viewed from terminal side)	**: For non-ESP® model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected for longer than specified time continuously. (1 driving detection logic but MIL does not light up)	• ECM • BCM • ABS / ESP® control module • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM, TCM (A/T or Automated Manual Transaxle model), ABS / ESP® control module and BCM for DTC. *Is there any DTC(s) (other than DTC P1674 / P1675 / P1678 / P1685 in ECM, DTC P1774, P1775, P1777, P1778 in TCM (A/T or Automated Manual Transaxle), DTC U1073 / U1001 / U1100 / U1144 in BCM, DTC U1073 / U1100 in ABS control module and DTC U1073 / U1100 / U1101 / U1126 / U1139 / U1140 in ESP® control module (ESP® model))?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A".	Go to Step 4.
4	**ECM, TCM (A/T or automated manual transaxle model), BCM and ABS / ESP® control module connectors check** 1) Check for proper connection at each ECM, BCM and ABS / ESP® control module connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1678?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".

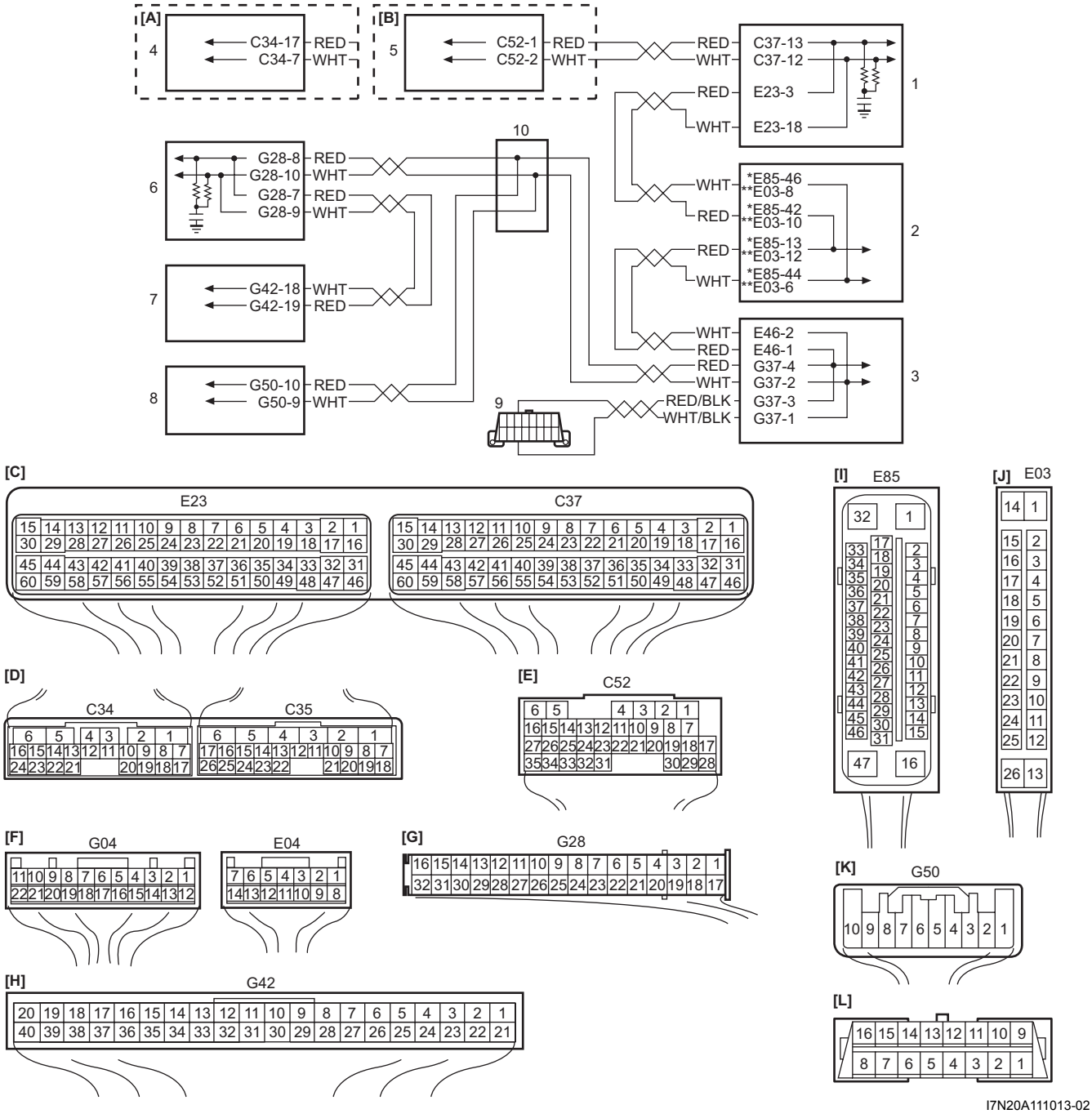
Step	Action	Yes	No
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: M13A / M15A / M16A". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/ or ground circuits.
6	**DTC check in BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off in Section 10B".	Go to Step 7.
7	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM, BCM and ABS / ESP® control module with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E23-3" terminal of ECM connector and "E85-42" terminal of ESP® control module connector (ESP® model) • Between "E23-18" terminal of ECM connector and "E85-46" terminal of ESP® control module connector (ESP® model) • Between "E23-3" terminal of ECM connector and "E03-10" terminal of ABS control module connector (Non-ESP® model) • Between "E23-18" terminal of ECM connector and "E03-8" terminal of ABS control module connector (Non-ESP® model) • Between "E85-13" terminal of ESP® control module connector and "E84-1" terminal of BCM connector (ESP® model) • Between "E85-44" terminal of ESP® control module connector and "E84-2" terminal of BCM connector (ESP® model) • Between "E03-12" terminal of ABS control module connector and "E84-1" terminal of BCM connector (Non-ESP® model) • Between "E03-6" terminal of ABS control module connector and "E84-2" terminal of BCM connector (Non-ESP® model) *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
8	**CAN communication line circuit insulation check** 1) Measure resistance at the following connector terminals. • Between "E23-3" and "E23-18" terminal of ECM connector • Between "E85-13" and "E85-44" terminal of ESP® control module connector (ESP® model) • Between "E03-12" and "E03-6" of ABS control module connector (Non-ESP® model) *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".

Step	Action	Yes	No
9	**CAN communication line circuit ground short check** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “E85-13” terminal of ESP® control module connector and vehicle body ground (ESP® model) • Between “E85-44” terminal of ESP® control module connector and vehicle body ground (ESP® model) • Between “E03-12” terminal of ABS control module connector and vehicle body ground (Non-ESP® model) • Between “E03-6” terminal of ABS control module connector and vehicle body ground (Non-ESP® model) *Is each resistance infinity?*	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
10	**CAN communication line circuit power short check** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “E85-13” terminal of ESP® control module connector and vehicle body ground (ESP® model) • Between “E85-44” terminal of ESP® control module connector and vehicle body ground (ESP® model) • Between “E03-12” terminal of ABS control module connector and vehicle body ground (Non-ESP® model) • Between “E03-6” terminal of ABS control module connector and vehicle body ground (Non-ESP® model) *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
11	**Combination meter operation check** 1) Check combination meter operation for seat belt warning lamp (fastening and unfastening driver side seat belt) and ABS warning lamp with ignition switch turned ON. *Are they OK?*	Go to Step 12.	Substitute a known-good BCM (included in junction block assembly) and recheck.
12	**BCM circuit check** 1) Disconnect connectors from combination meter with ignition switch turned off. 2) Connect connectors to BCM. 3) Measure resistance at the following connector terminals. • Between “E84-1” and “G95-4” terminal of BCM connector • Between “E84-2” and “G95-2” terminal of BCM connector *Is resistance below 1 Ω?*	Substitute a known-good ECM and recheck.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC P1685: CAN Communication (Reception Error ABS / ESP® Control Module)

S7N20A1114067

Wiring Diagram



I7N20A111013-02

[A]: A/T model	1. ECM
[B]: Automated manual transaxle model	2. ABS / ESP® control module
[C]: ECM connector (viewed from harness side)	3. BCM
[D]: TCM connector (A/T model) (viewed from harness side)	4. TCM (A/T model)
[E]: TCM connector (automated manual transaxle model) (viewed from harness side)	5. TCM (automated manual transaxle model)
[F]: BCM connector (viewed from harness side)	6. Combination meter
[G]: Combination meter connector (viewed from harness side)	7. Keyless start control module
[H]: Keyless start control module connector (viewed from harness side)	8. Steering angle sensor connector (ESP® model)
[I]: ESP® control module connector (viewed from terminal side)	9. DLC
[J]: ABS control module connector (viewed from terminal side)	10. CAN junction connector (ESP® model)
[K]: Steering angle sensor connector (ESP® model) (viewed from harness side)	*: For ESP® model
[L]: DLC (viewed from terminal side)	**: For non-ESP® model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ABS / ESP® control module is detected for longer than specified time continuously. (1 driving detection logic but MIL does not light up)	• ECM • ABS / ESP® control module • CAN communication line circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and ABS / ESP® control module for DTC. *Is there any DTC(s) (other than DTC P1674 / P1675 / P1678 / P1685 in ECM, DTC U1073 / U1100 in ABS control module and DTC U1073 / U1100 / U1101 / U1126 / U1139 / U1140 in ESP® control module (ESP® model))?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication error check for ECM** 1) Check ECM for DTC. *Is there DTC P1674?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A".	Go to Step 4.
4	**ECM and ABS / ESP® control module connectors check** 1) Check for proper connection at each ECM and ABS / ESP® control module connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck ECM for DTC with engine running. *Is there DTC P1685?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**ECM power and ground circuit check** 1) Check ECM power and ground circuit referring to "ECM Power and Ground Circuit Check: M13A / M15A / M16A". *Are they in good condition?*	Go to Step 6.	Repair ECM power and/or ground circuits.

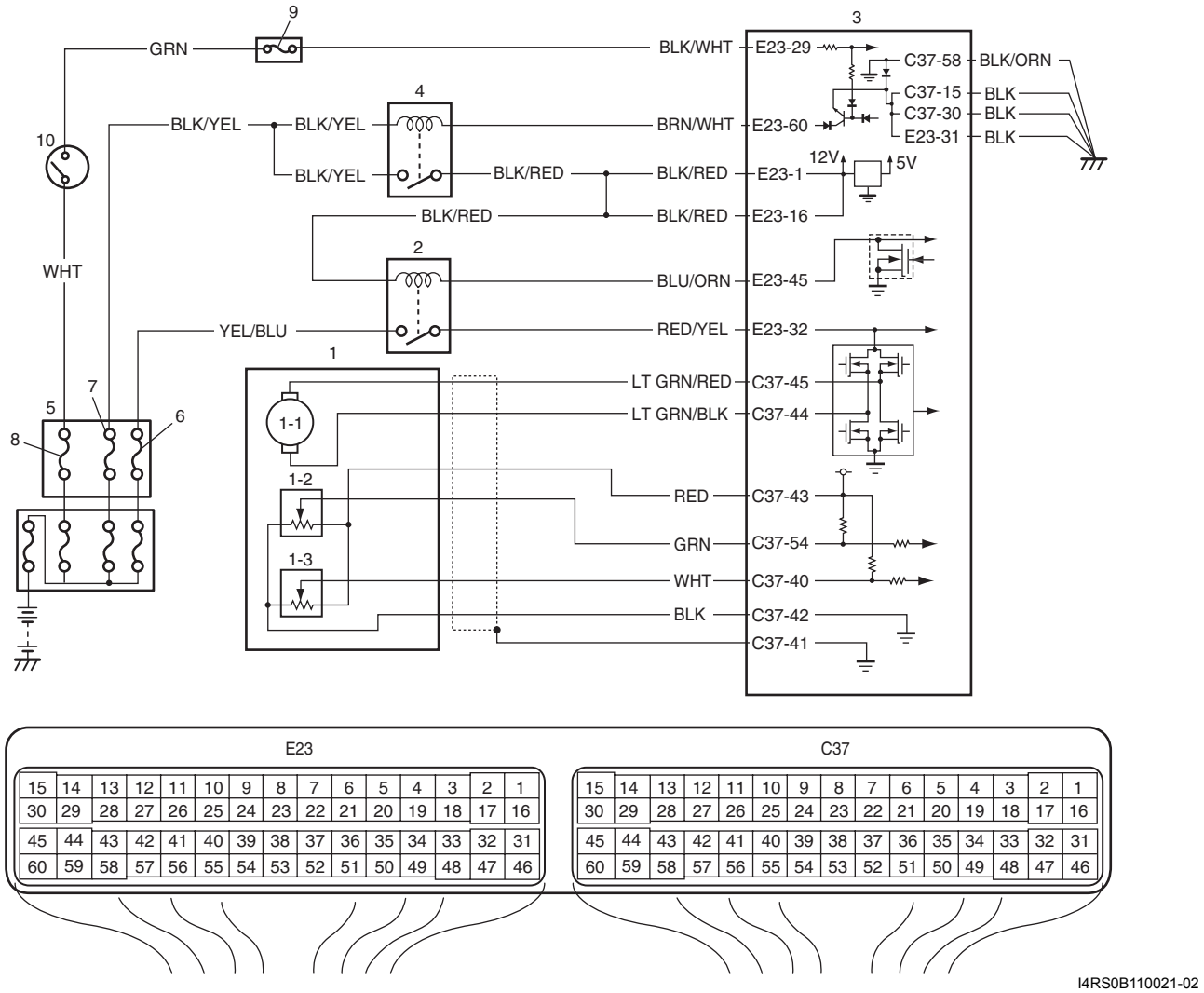
Step	Action	Yes	No
6	**DTC check in ABS / ESP® control module** 1) Check DTC U1073 in ABS / ESP® control module. *Is it indicated?*	Go to applicable DTC diagnosis flow.	Go to Step 7.
7	**CAN communication line circuit continuity check** 1) Disconnect connectors from ECM and ABS / ESP® control module with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and “E85-42” terminal of ESP® control module connector (ESP® model) • Between “E23-18” terminal of ECM connector and “E85-46” terminal of ESP® control module connector (ESP® model) • Between “E23-3” terminal of ECM connector and “E03-10” terminal of ABS control module connector (Non-ESP® model) • Between “E23-18” terminal of ECM connector and “E03-8” terminal of ABS control module connector (Non-ESP® model) *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
8	**CAN communication line circuit insulation check** 1) Measure resistance at the following connector terminals. • Between “E23-3” and “E23-18” terminal of ECM connector *Is each resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
9	**CAN communication line circuit ground short check** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair short to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
10	**CAN communication line circuit power short check** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair short to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

Step	Action	Yes	No
11	**ABS / ESP® control module circuit check** 1) Connect connectors to ABS / ESP® control module. 2) Measure resistance at the following connector terminals. • Between “E85-42” and “E85-13” terminal of ESP® control module connector (ESP® model) • Between “E85-46” and “E85-44” terminal of ESP® control module connector (ESP® model) • Between “E03-10” and “E03-12” terminal of ABS control module connector (Non-ESP® model) • Between “E03-12” and “E03-6” terminal of ABS control module connector (Non-ESP® model) *Is resistance below 1 Ω?*	Substitute a known-good ECM and recheck.	Substitute a known-good ESP® control module (ESP® model) and recheck.

DTC P2101: Throttle Actuator Control Motor Circuit Range / Performance

S7N20A1114068

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. “IG ACC” fuse
1-1. Throttle actuator	4. Main relay	9. “IG COIL” fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. “TH MOT” fuse	
2. Throttle actuator control relay	7. “FI” fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Monitor signal of throttle actuator output (duty output) is inconsistent with throttle actuator control command. (1 driving detection logic)	• Throttle actuator circuit • Electric throttle body assembly • ECM

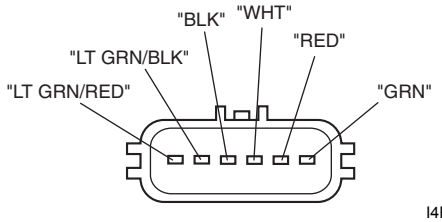
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

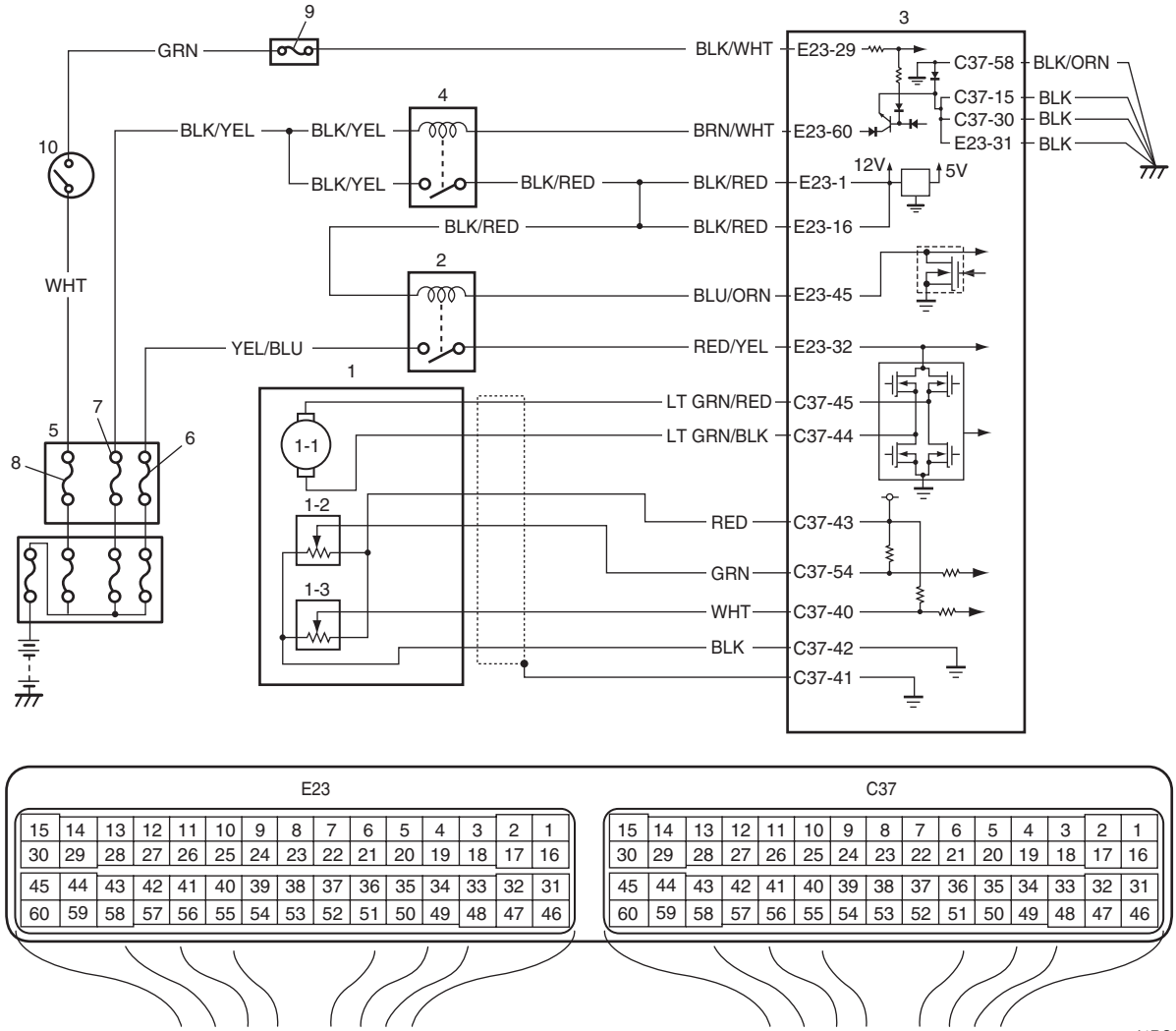
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Throttle actuator circuit check** 1) Disconnect connectors from electric throttle body assembly and ECM with ignition switch turned OFF. 2) Check for proper connection of electric throttle body assembly and ECM connectors at "LT GRN/RED" wire, "LT GRN/BLK" wire, "C37-45" and "C37-44" terminals.  I4RS0B110022-02 3) Turn ON ignition switch. 4) Measure voltage between "LT GRN/RED" wire terminal of electric throttle body assembly connector and engine ground, between "LT GRN/BLK" wire terminal of electric throttle body assembly connector and engine ground. *Is voltage 0 V?*	Go to Step 3.	"LT GRN/RED" wire and/or "LT GRN/BLK" wire is shorted to power circuit.

Step	Action	Yes	No
3	**Throttle actuator circuit check** 1) Turn OFF ignition switch. 2) Measure resistance between “LT GRN/RED” wire terminal of electric throttle body assembly connector and engine ground, between “LT GRN/BLK” wire terminal of electric throttle body assembly connector and engine ground. *Is resistance infinity?*	Go to Step 4.	“LT GRN/RED” wire and/or “LT GRN/BLK” wire is shorted to ground circuit.
4	**Throttle actuator circuit check** 1) Check throttle actuator referring to “Throttle Actuator Performance Check” under “Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2102: Throttle Actuator Control Motor Circuit Low

S7N20A1114069

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. “IG ACC” fuse
1-1. Throttle actuator	4. Main relay	9. “IG COIL” fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. “TH MOT” fuse	

2. Throttle actuator control relay	7. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of throttle actuator control circuit is less than 5 V for specified time even if throttle actuator control relay is turned on. (1 driving detection logic)	• Throttle actuator control relay circuit • Throttle actuator control relay • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

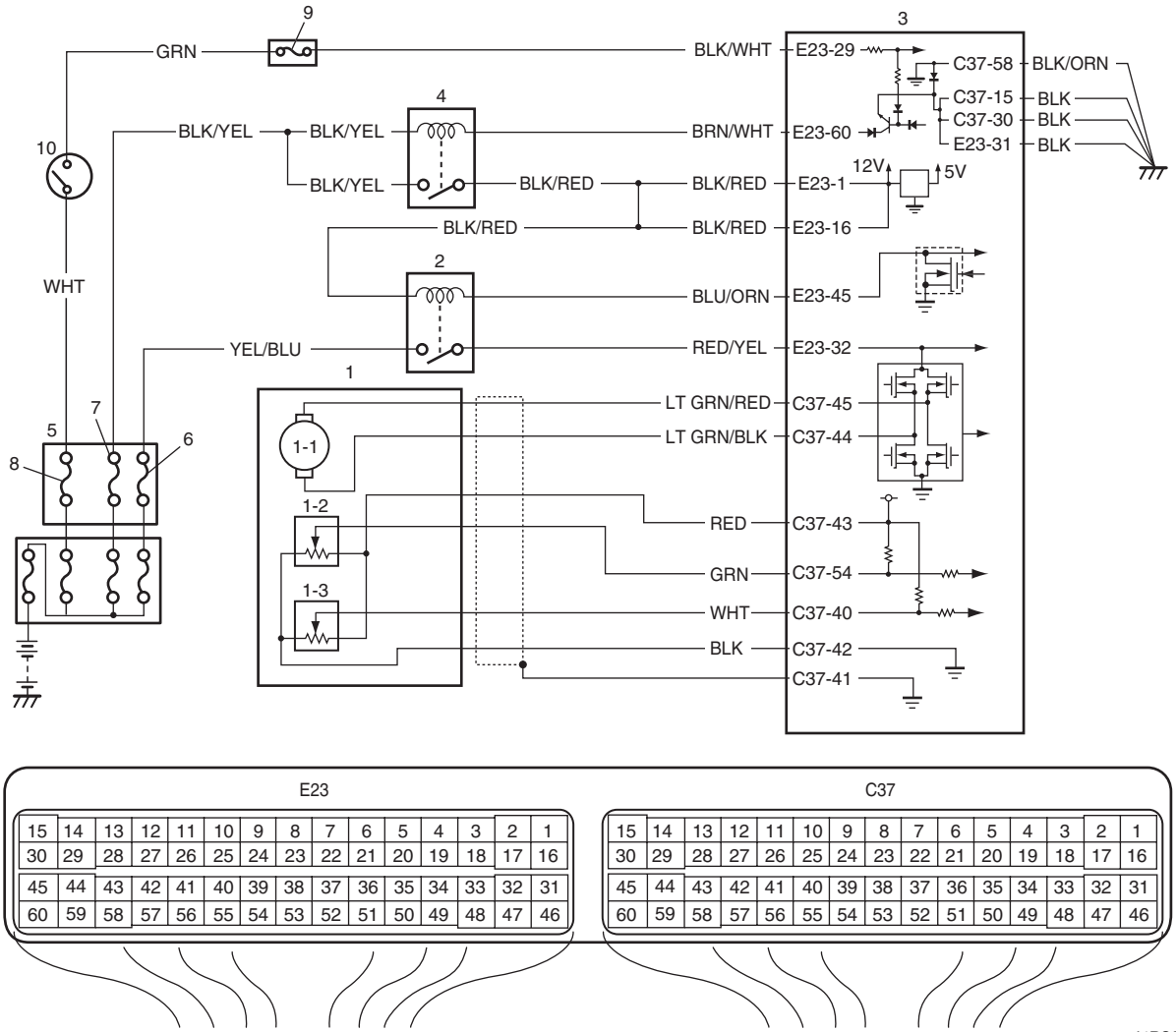
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A"
2	**Throttle actuator control relay circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at "E23-45" and "E23-32" terminals. 3) Turn ON ignition switch. 4) Measure voltage between "E23-32" terminal of ECM connector and engine ground. *Is voltage 10 – 14 V?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	*Is "TH MOT" fuse in good condition?*	Go to Step 4	Replace fuse and check for short in circuits connected to this fuse.
4	**Throttle actuator control relay circuit check** 1) Remove throttle actuator control relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to throttle actuator control relay at "BLK/RED", "YEL/BLU", "BLU/ORN" and "RED/YEL" wire terminals. 3) Measure voltage between engine ground and each "BLK/RED", "YEL/BLU" wire terminal with ignition switch turned ON. *Is each voltage 10 – 14 V?*	Go to Step 5	"BLK/RED" wire and/or "YEL/BLU" wire is open or high resistance.

Step	Action	Yes	No
5	**Throttle actuator control relay circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “BLU/ORN” wire terminal of throttle actuator control relay connector and “E23-45” terminal of ECM connector • Between “RED/YEL” wire terminal of throttle actuator control relay connector and “E23-32” terminal of ECM connector *Is each resistance below 5 Ω?*	Go to Step 6.	“BLU/ORN” wire and/or “RED/YEL” wire is open or high resistance.
6	**Throttle actuator control relay check** 1) Check throttle actuator control relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: M13A / M15A / M16A in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace throttle actuator control relay.

DTC P2103: Throttle Actuator Control Motor Circuit High

S7N20A1114070

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. “IG ACC” fuse
1-1. Throttle actuator	4. Main relay	9. “IG COIL” fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. “TH MOT” fuse	
2. Throttle actuator control relay	7. “FI” fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of throttle actuator control circuit is more than 5 V for specified time even if throttle actuator control relay is turned off. (1 driving detection logic)	• Throttle actuator control relay circuit • Throttle actuator control relay • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Ignition switch turned OFF for 20 sec. or more.
4) Turn ON ignition switch and check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Throttle actuator control relay circuit check** 1) Remove throttle actuator control relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to throttle actuator control relay at "BLK/RED", "YEL/BLU", "BLU/ORN" and "RED/YEL" wire terminals. 3) Turn ON ignition switch. 4) Measure voltage between engine ground and "E23-32" terminal of ECM connector. *Is voltage 0 V?*	Go to Step 3.	"RED/YEL" wire is shorted to other circuit.
3	**Throttle actuator control relay circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between engine ground and "E23-45" terminal of ECM connector. *Is resistance infinity?*	Go to Step 4.	"BLU/ORN" wire is shorted to ground circuit.
4	**Throttle actuator control relay check** 1) Check throttle actuator control relay referring to "Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace throttle actuator control relay.

DTC P2111 / P2112: Throttle Actuator Control System - Stuck Open / Closed

S7N20A1114071

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2111: Throttle valve default opening is greater than 8° (other than M16A engine) or 6° (M16A engine) from complementary closed position when diagnosing throttle valve at ignition switch turned OFF. (1 driving detection logic) **P2112:** Throttle valve default opening is smaller than 8° (other than M16A engine) or 6° (M16A engine) from complementary closed position when diagnosing throttle valve at ignition switch turned OFF. (1 driving detection logic)	• Electric throttle body assembly • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Ignition switch turned OFF for 20 sec. or more.
4) Turn ON ignition switch and check DTC.

DTC Troubleshooting

NOTE

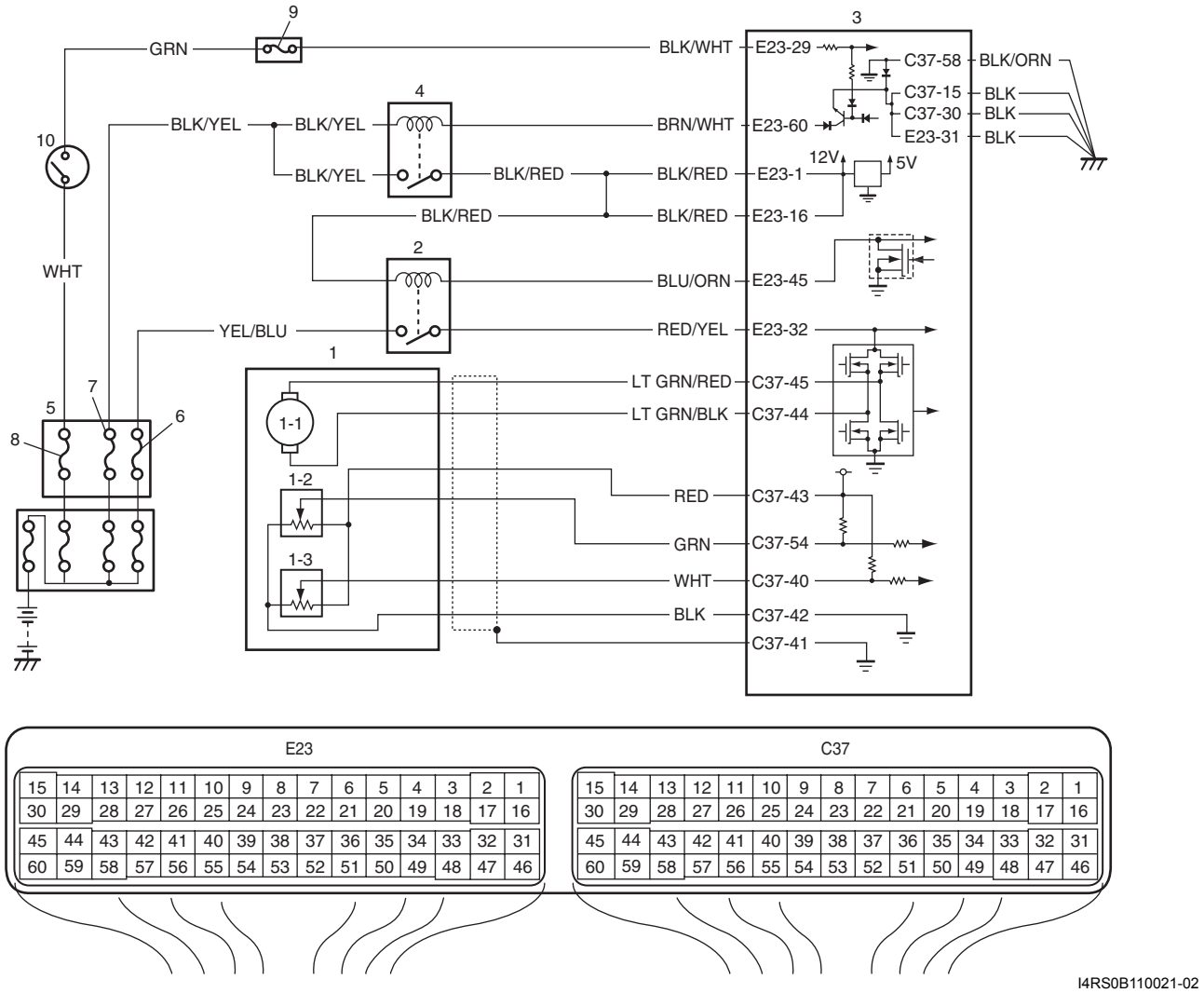
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Throttle valve visual check** 1) Check that there isn't any foreign matter caught between throttle valve and throttle body housing referring to "Throttle Valve Visual Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is it in good condition?*	Go to Step 3.	Take it out after removing throttle body and clean inside of throttle body thoroughly.
3	**Throttle valve operation check** 1) Check operation of throttle valve referring to "Throttle Valve Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Go to Step 4.	Replace electric throttle body assembly.
4	**Throttle actuator operation check** 1) Check operation of throttle actuator referring to "Throttle Actuator Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Go to Step 5.	Replace electric throttle body assembly.
5	**Throttle position sensor performance check** 1) Check performance of throttle position sensor referring to "Throttle Position Sensor Performance Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2119: Throttle Actuator Control Throttle Body Range / Performance

S7N20A1114072

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. "IG ACC" fuse
1-1. Throttle actuator	4. Main relay	9. "IG COIL" fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. "TH MOT" fuse	
2. Throttle actuator control relay	7. "FI" fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the measured (actual) throttle valve opening angle and the target throttle valve opening angle which is calculated based on accelerator pedal opening angle and engine condition is more than specification for specified time continuously. (1 driving detection logic)	• Throttle actuator circuit • Electric throttle body assembly • ECM

DTC Confirmation Procedure

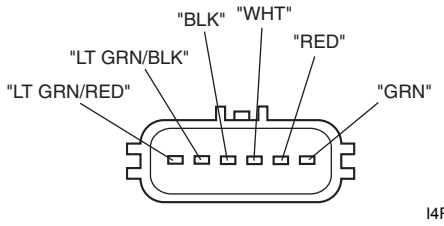
1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.

6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

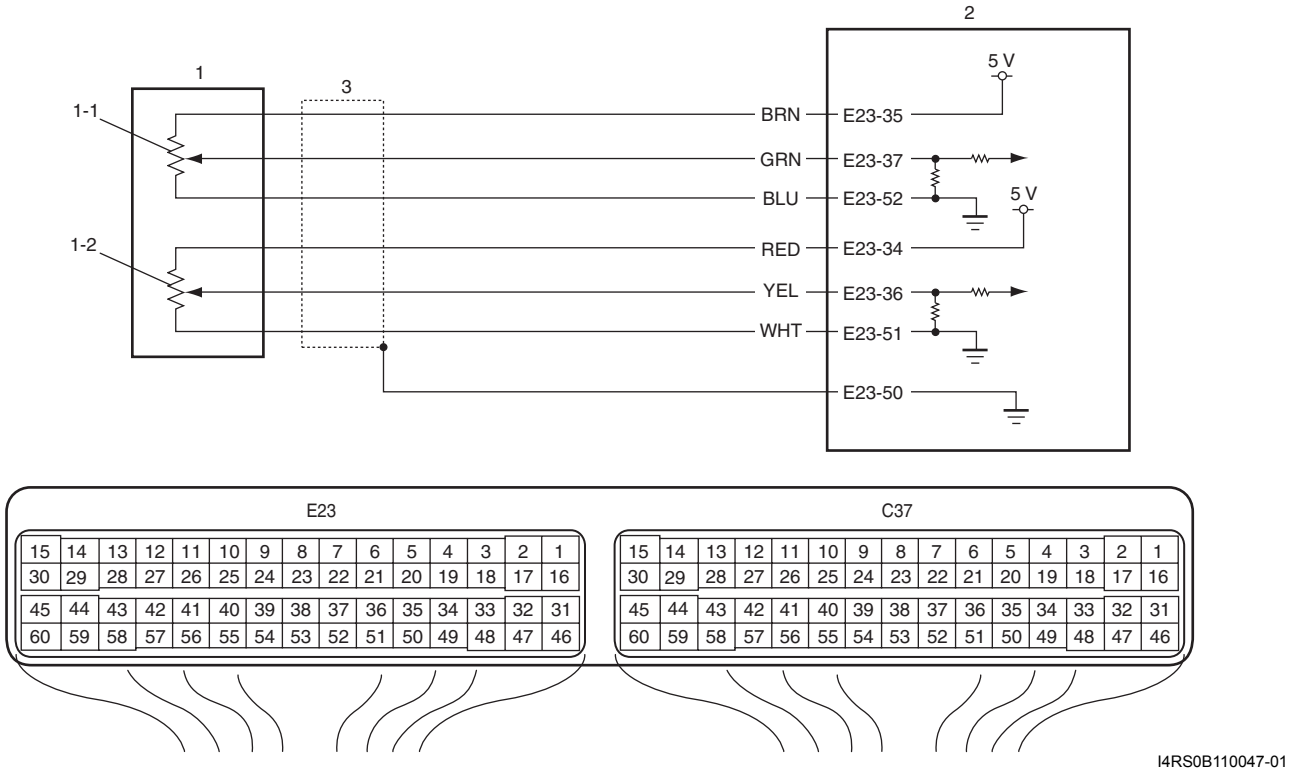
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Electric throttle body assembly system check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check each voltage of "TP Sensor 1 Volt" and "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed each TP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**Throttle actuator circuit check** 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "LT GRN/RED" and "LT GRN/BLK" wire terminals.  I4RS0B110022-02 3) Disconnect connectors from ECM. 4) Check for proper connection to ECM at "C37-45" and "C37-44" terminals. 5) Measure resistance at the following connector terminals. • Between "LT GRN/RED" wire terminal of electric throttle body assembly connector and "C37-45" terminal of ECM connector • Between "LT GRN/BLK" wire terminal of electric throttle body assembly connector and "C37-44" terminal of ECM connector *Is each resistance below 5 Ω?*	Go to Step 4.	"LT GRN/RED" wire and/or "LT GRN/BLK" wire is open or high resistance.

Step	Action	Yes	No
4	**Electric throttle body assembly check** 1) Check electric throttle body assembly referring to "Electric Throttle Body Assembly and Its Circuit Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2122: Pedal Position Sensor (Main) Circuit Low Input

S7N20A1114073

Wiring Diagram



I4RS0B110047-01

1. Accelerator pedal position (APP) sensor assembly	1-2. Accelerator pedal position (APP) sensor (sub)	3. Ground of accelerator pedal position (APP) sensor for shield wire
1-1. Accelerator pedal position (APP) sensor (main)	2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of accelerator pedal position sensor (main) is lower than specified value for 0.2 seconds continuously. (1 driving detection logic)	• Accelerator pedal position (APP) sensor (main) circuit • Accelerator pedal position (APP) sensor assembly • ECM • Incorrect mounting of accelerator pedal position (APP) sensor assembly

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

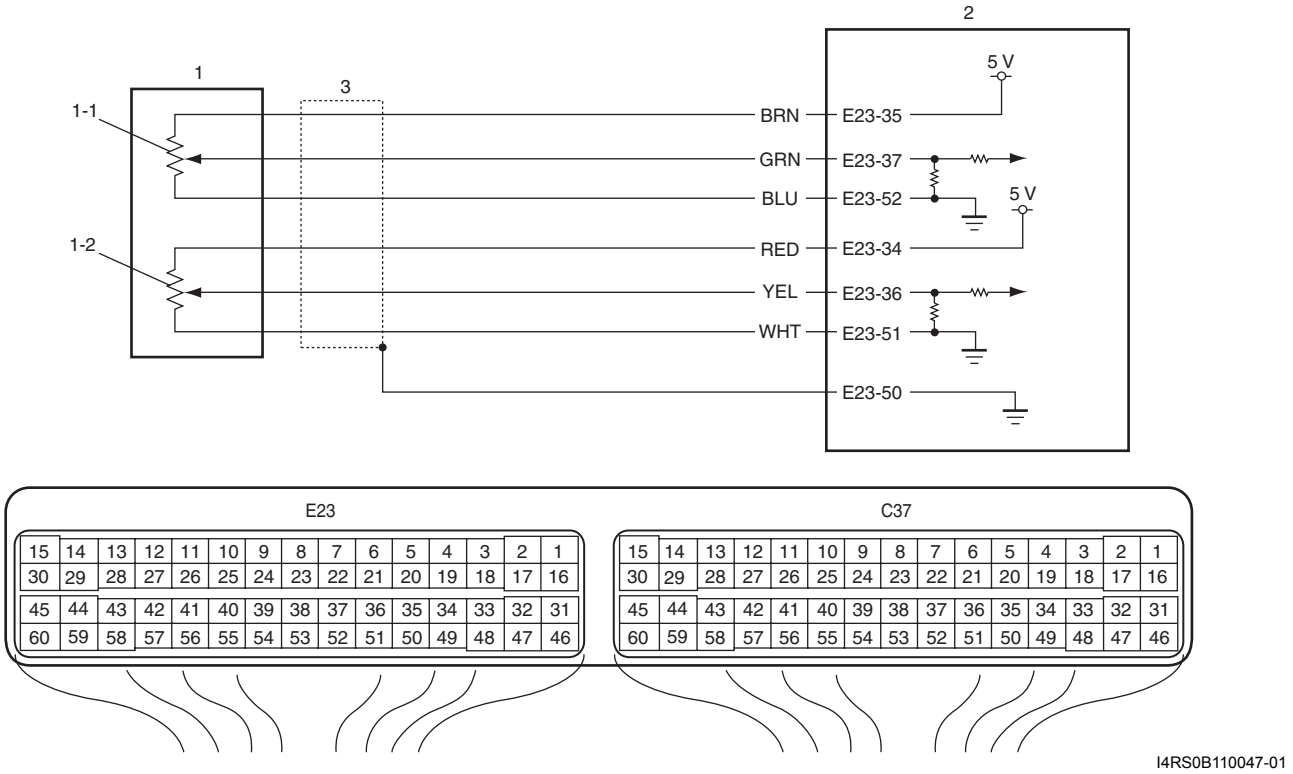
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A"
2	**Accelerator pedal position (APP) sensor assembly mounting check** 1) Check that accelerator pedal position (APP) sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). *Is it OK?*	Go to Step 3.	Reinstall accelerator pedal position (APP) sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A in Section 1C".
3	**Accelerator pedal position sensor (main) and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 1 Volt" displayed on scan tool. *Is displayed voltage below 0.384 V?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**ECM voltage check** 1) Disconnect connector from accelerator pedal position (APP) sensor assembly with ignition switch turned OFF. 2) Check for proper connection to accelerator pedal position (APP) sensor assembly at "BRN", "GRN" and "BLU" wire terminals. 3) If OK, measure voltage between "BRN" wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 5.
5	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "E23-35" terminal. 4) If OK, measure voltage between "E23-35" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	"BRN" wire is open or high resistance circuit.	Go to Step 6.

Step	Action	Yes	No
6	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-35” terminal of ECM connector and engine ground. *Is resistance infinity?*	Substitute a known-good ECM and recheck.	“BRN” wire is shorted to ground circuit.
7	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at “E23-37”, “E23-52” and “E23-51” terminals. 3) If OK, measure resistance between “GRN” wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground. *Is resistance infinity?*	Go to Step 8.	“GRN” wire is shorted to ground circuit.
8	**Wire harness check** 1) Measure resistance between “E23-37” and each “E23-52”, “E23-51”, “E23-50” terminals of ECM connector with ignition switch turned OFF. *Is each resistance infinity?*	Go to Step 9.	“GRN” wire is shorted to “BLU” wire and/or “WHT” wire and/or “E23-50” circuit.
9	**Wire harness check** 1) Measure resistance between “GRN” wire terminal of accelerator pedal position (APP) sensor assembly connector and “E23-37” terminal of ECM connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 10.	“GRN” wire is open or high resistance circuit.
10	**Accelerator pedal position (APP) sensor assembly check** 1) Check accelerator pedal position sensor (main) referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C” or “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace accelerator pedal position (APP) sensor assembly.

DTC P2123: Pedal Position Sensor (Main) Circuit High Input

S7N20A1114074

Wiring Diagram



I4RS0B110047-01

1. Accelerator pedal position (APP) sensor assembly	1-2. Accelerator pedal position (APP) sensor (sub)	3. Ground of accelerator pedal position (APP) sensor for shield wire
1-1. Accelerator pedal position (APP) sensor (main)	2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of accelerator pedal position sensor (main) is more than specified value for 0.2 seconds continuously. (1 driving detection logic)	• Accelerator pedal position (APP) sensor (main) circuit • Accelerator pedal position (APP) sensor assembly • ECM • Incorrect mounting of accelerator pedal position (APP) sensor assembly

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

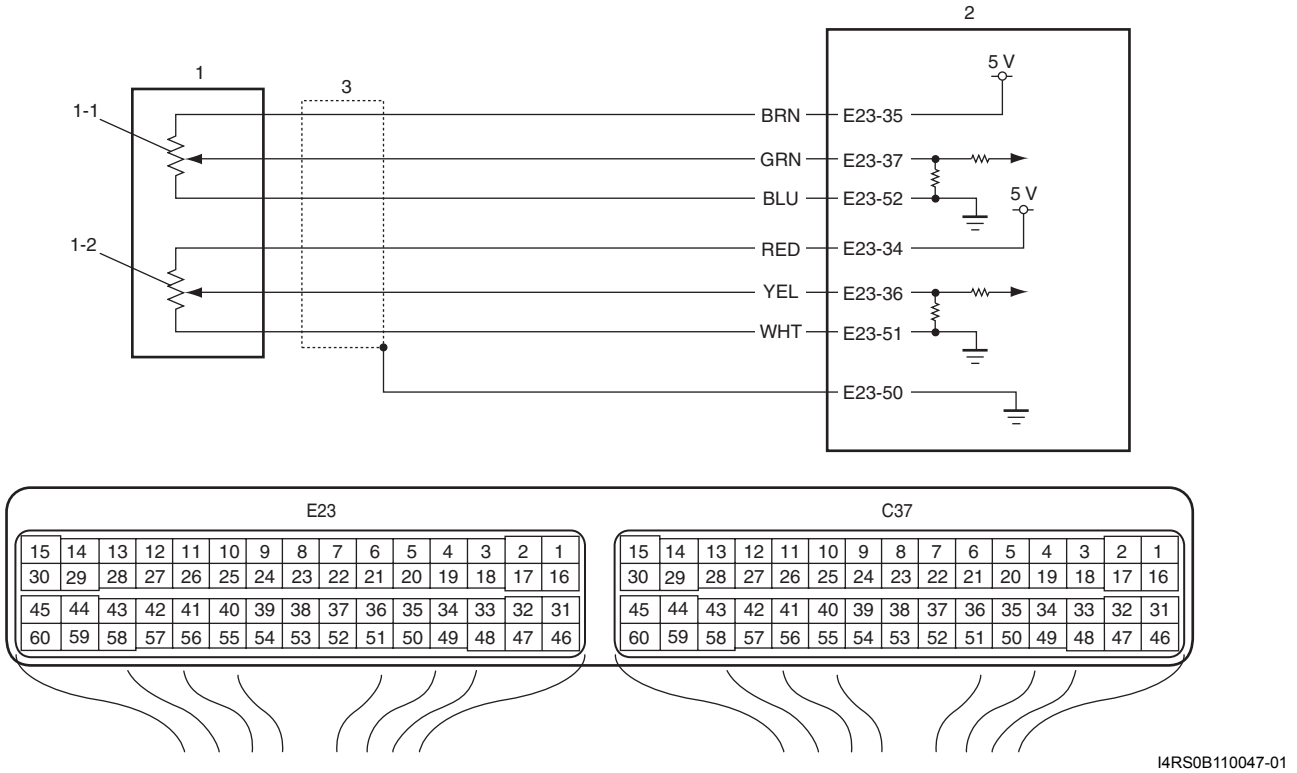
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Accelerator pedal position (APP) sensor assembly mounting check** 1) Check that accelerator pedal position (APP) sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). *Is it OK?*	Go to Step 3.	Reinstall accelerator pedal position (APP) sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A in Section 1C".
3	**Accelerator pedal position sensor (main) and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 1 Volt" displayed on scan tool. *Is displayed voltage 4.75 V or more?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**ECM voltage check** 1) Disconnect connector from accelerator pedal position (APP) sensor assembly with ignition switch turned OFF. 2) Check for proper connection to accelerator pedal position (APP) sensor assembly at "BRN", "GRN" and "BLU" wire terminals. 3) If OK, measure voltage between "BRN" wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 5.
5	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E23-35" terminal. 3) If OK, measure voltage between "E23-35" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	"BRN" wire is shorted to power circuit.

Step	Action	Yes	No
6	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at “E23-35”, “E23-37” and “E23-34” terminals. 3) If OK, measure resistance between “GRN” wire terminal and each “BRN”, “RED” wire terminals of accelerator pedal position (APP) sensor assembly connector. *Is each resistance infinity?*	Go to Step 7.	“GRN” wire is shorted to “BRN” wire and/or “RED” wire.
7	**Wire harness check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-37” terminal of ECM connector and engine ground. *Is voltage 0 V?*	Go to Step 8.	“GRN” wire is shorted to power circuit.
8	**Ground circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between “BLU” wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at “E23-52” terminal. 3) If OK, measure resistance between “E23-52” terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	“BLU” wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**Accelerator pedal position (APP) sensor assembly check** 1) Check accelerator pedal position sensor (main) referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C” or “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace accelerator pedal position (APP) sensor assembly.

DTC P2127: Pedal Position Sensor (Sub) Circuit Low Input

S7N20A1114075

Wiring Diagram



1. Accelerator pedal position (APP) sensor assembly	1-2. Accelerator pedal position (APP) sensor (sub)	3. Ground of accelerator pedal position (APP) sensor for shield wire
1-1. Accelerator pedal position (APP) sensor (main)	2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of accelerator pedal position sensor (sub) is less than specified value for 0.2 seconds continuously. (1 driving detection logic)	• Accelerator pedal position (APP) sensor (sub) circuit • Accelerator pedal position (APP) sensor assembly • ECM • Incorrect mounting of accelerator pedal (APP) sensor assembly

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

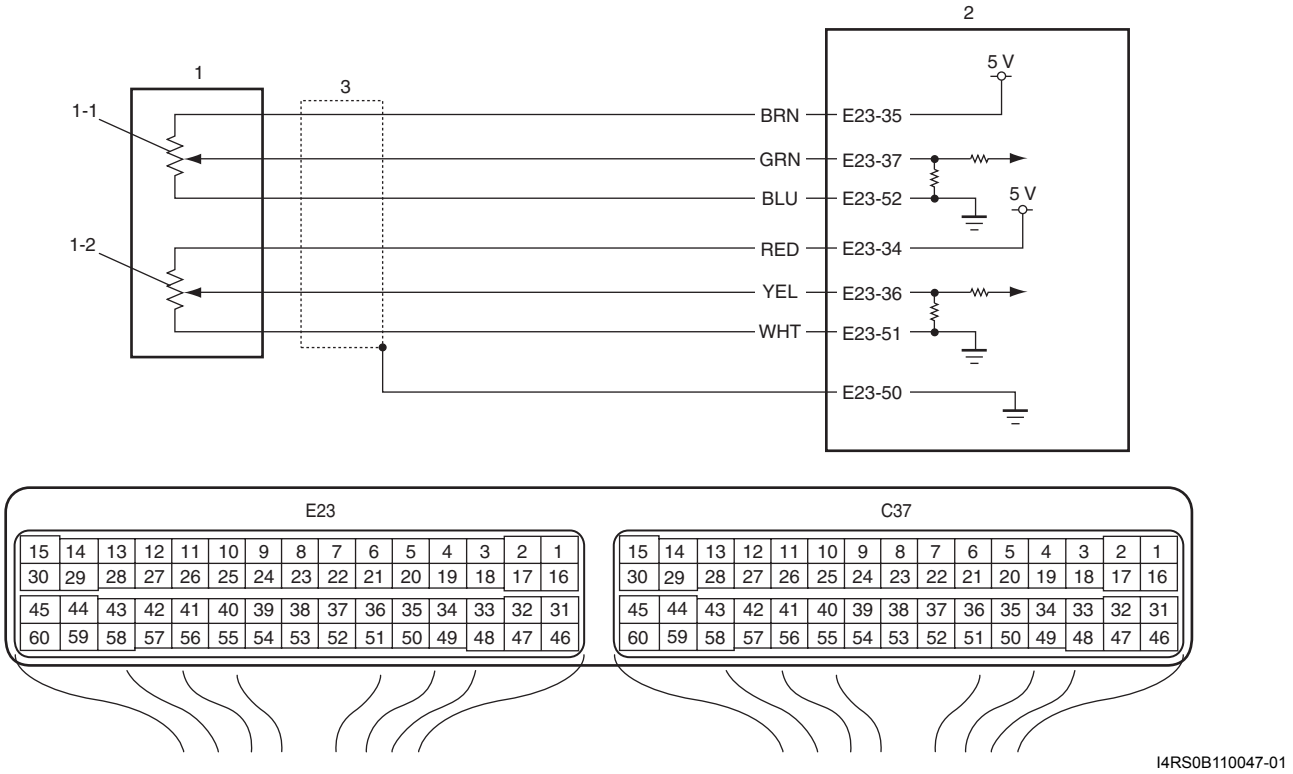
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Accelerator pedal position (APP) sensor assembly mounting check** 1) Check that accelerator pedal position (APP) sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). *Is it OK?*	Go to Step 3.	Reinstall accelerator pedal position (APP) sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A in Section 1C".
3	**Accelerator pedal position sensor (sub) and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 2 Volt" displayed on scan tool. *Is displayed voltage below 0.384 V?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**ECM voltage check** 1) Disconnect connector from accelerator pedal position (APP) sensor assembly with ignition switch turned OFF. 2) Check for proper connection to accelerator pedal position (APP) sensor assembly at "RED", "YEL" and "WHT" wire terminals. 3) If OK, measure voltage between "RED" wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 7.	Go to Step 5.
5	**ECM voltage check** 1) Turn OFF ignition switch. 2) Remove ECM from its bracket with ECM connectors connected. 3) Check for proper connection of ECM connector at "E23-34" terminal. 4) If OK, measure voltage between "E23-34" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	"RED" wire is open or high resistance circuit.	Go to Step 6.

Step	Action	Yes	No
6	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between “E23-34” terminal of ECM connector and engine ground. *Is resistance infinity?*	Substitute a known-good ECM and recheck.	“RED” wire is shorted to ground circuit.
7	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at “E23-36”, “E23-52” and “E23-51” terminals. 3) If OK, measure resistance between “YEL” wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground. *Is resistance infinity?*	Go to Step 8.	“YEL” wire is shorted to ground circuit.
8	**Wire harness check** 1) Measure resistance between “E23-36” and each “E23-52”, “E23-51”, “E23-50” terminals of ECM connector with ignition switch turned OFF. *Is each resistance infinity?*	Go to Step 9.	“YEL” wire is shorted to “BLU” wire and/or “WHT” wire and/or “E23-50” circuit.
9	**Wire harness check** 1) Measure resistance between “YEL” wire terminal of accelerator pedal position (APP) sensor assembly connector and “E23-36” terminal of ECM connector with ignition switch turned OFF. *Is resistance below 5 Ω?*	Go to Step 10.	“YEL” wire is open or high resistance circuit.
10	**Accelerator pedal position (APP) sensor assembly check** 1) Check accelerator pedal position sensor (sub) referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C” or “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace accelerator pedal position (APP) sensor assembly.

DTC P2128: Pedal Position Sensor (Sub) Circuit High Input

S7N20A1114076

Wiring Diagram



I4RS0B110047-01

1. Accelerator pedal position (APP) sensor assembly	1-2. Accelerator pedal position (APP) sensor (sub)	3. Ground of accelerator pedal position (APP) sensor for shield wire
1-1. Accelerator pedal position (APP) sensor (main)	2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Output voltage of accelerator pedal position sensor (sub) is more than specified value for 0.2 seconds continuously. (1 driving detection logic)	• Accelerator pedal position (APP) sensor (sub) circuit • Accelerator pedal position (APP) sensor assembly • ECM • Incorrect mounting of accelerator (APP) sensor assembly

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

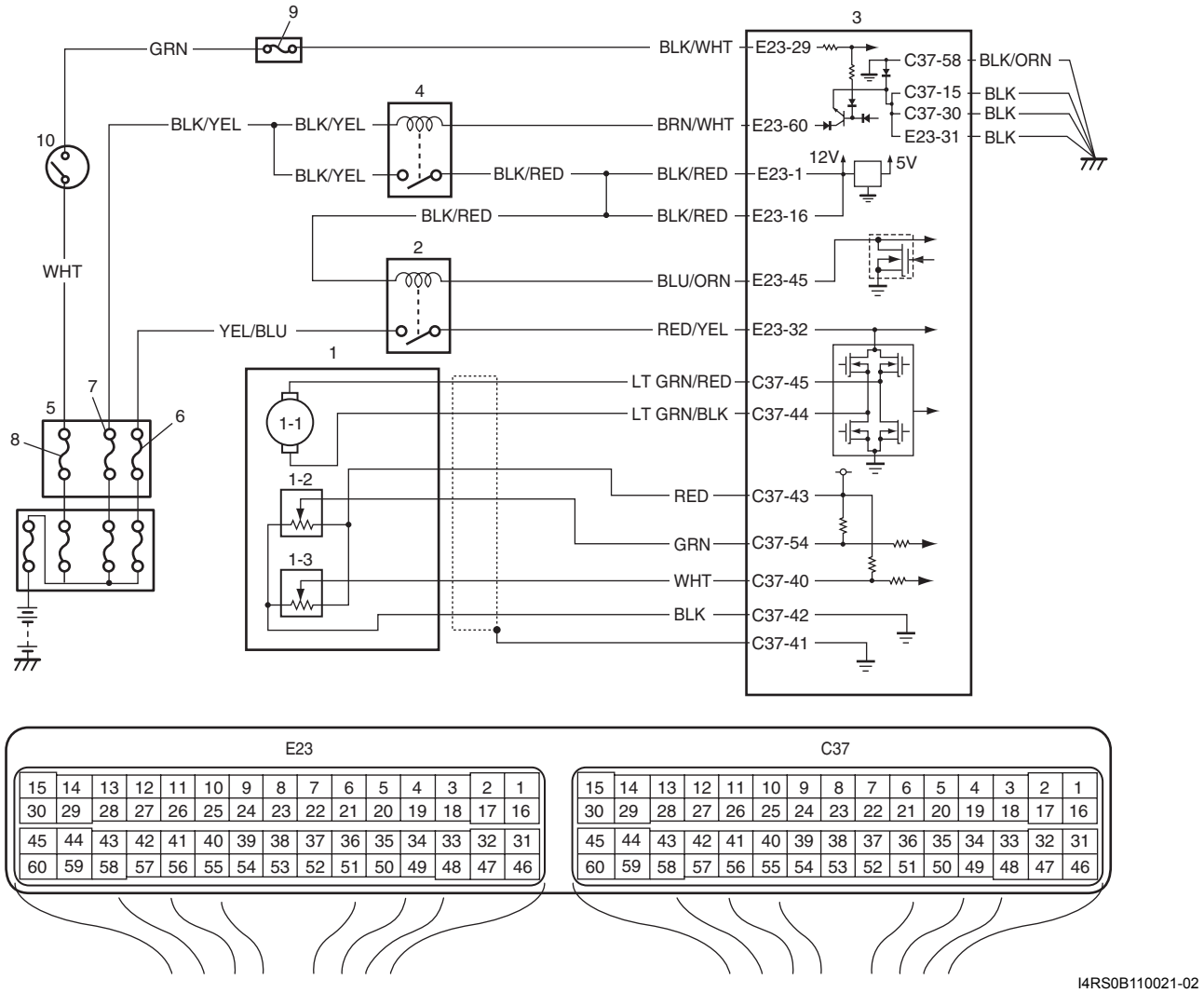
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Accelerator pedal position (APP) sensor assembly mounting check** 1) Check that accelerator pedal position (APP) sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.). *Is it OK?*	Go to Step 3.	Reinstall accelerator pedal position (APP) sensor assembly properly referring to"Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A in Section 1C".
3	**Accelerator pedal position sensor (sub) and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check "APP Sensor 2 Volt" displayed on scan tool. *Is displayed voltage 4.75 V or more?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**ECM voltage check** 1) Disconnect connector from accelerator pedal position (APP) sensor assembly with ignition switch turned OFF. 2) Check for proper connection to accelerator pedal position (APP) sensor assembly at "RED", "YEL" and "WHT" wire terminals. 3) If OK, measure voltage between "RED" wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 5.
5	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E23-34" terminal. 3) If OK, measure voltage between "E23-34" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	"RED" wire is shorted to power circuit.

Step	Action	Yes	No
6	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at “E23-35”, “E23-36” and “E23-34” terminals. 3) If OK, measure resistance between “YEL” wire terminal and each “BRN”, “RED” wire terminals of accelerator pedal position (APP) sensor assembly connector. *Is each resistance infinity?*	Go to Step 7.	“YEL” wire is shorted to “BRN” wire and/or “RED” wire.
7	**Wire harness check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-36” terminal of ECM connector and engine ground. *Is voltage 0 V?*	Go to Step 8.	“YEL” wire is shorted to power circuit.
8	**Ground circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Measure resistance between “WHT” wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 10.	Go to Step 9.
9	**Ground circuit check** 1) Remove ECM from its bracket with ECM connectors connected. 2) Check for proper connection of ECM connector at “E23-51” terminal. 3) If OK, measure resistance between “E23-51” terminal of ECM connector and engine ground. *Is resistance below 5 Ω?*	“WHT” wire is open or high resistance circuit.	Faulty ECM ground circuit. If circuit is OK, substitute a known-good ECM and recheck.
10	**Accelerator pedal position (APP) sensor assembly check** 1) Check accelerator pedal position sensor (sub) referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C” or “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace accelerator pedal position (APP) sensor assembly.

DTC P2135: Throttle Position Sensor (Main / Sub) Voltage Correlation

S7N20A1114077

Wiring Diagram



I4RS0B110021-02

1. Electric throttle body assembly	3. ECM	8. “IG ACC” fuse
1-1. Throttle actuator	4. Main relay	9. “IG COIL” fuse
1-2. Throttle position sensor (main)	5. Individual circuit fuse box No.1	10. Ignition switch
1-3. Throttle position sensor (sub)	6. “TH MOT” fuse	
2. Throttle actuator control relay	7. “FI” fuse	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the opening angle based on throttle position sensor (main) and the opening angle based on throttle position sensor (sub) is more than specification for specified time continuously. (1 driving detection logic)	• Throttle position sensor (main) and (sub) circuit • Electric throttle body assembly • ECM

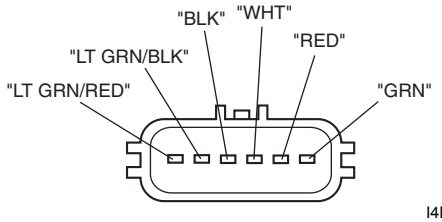
DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

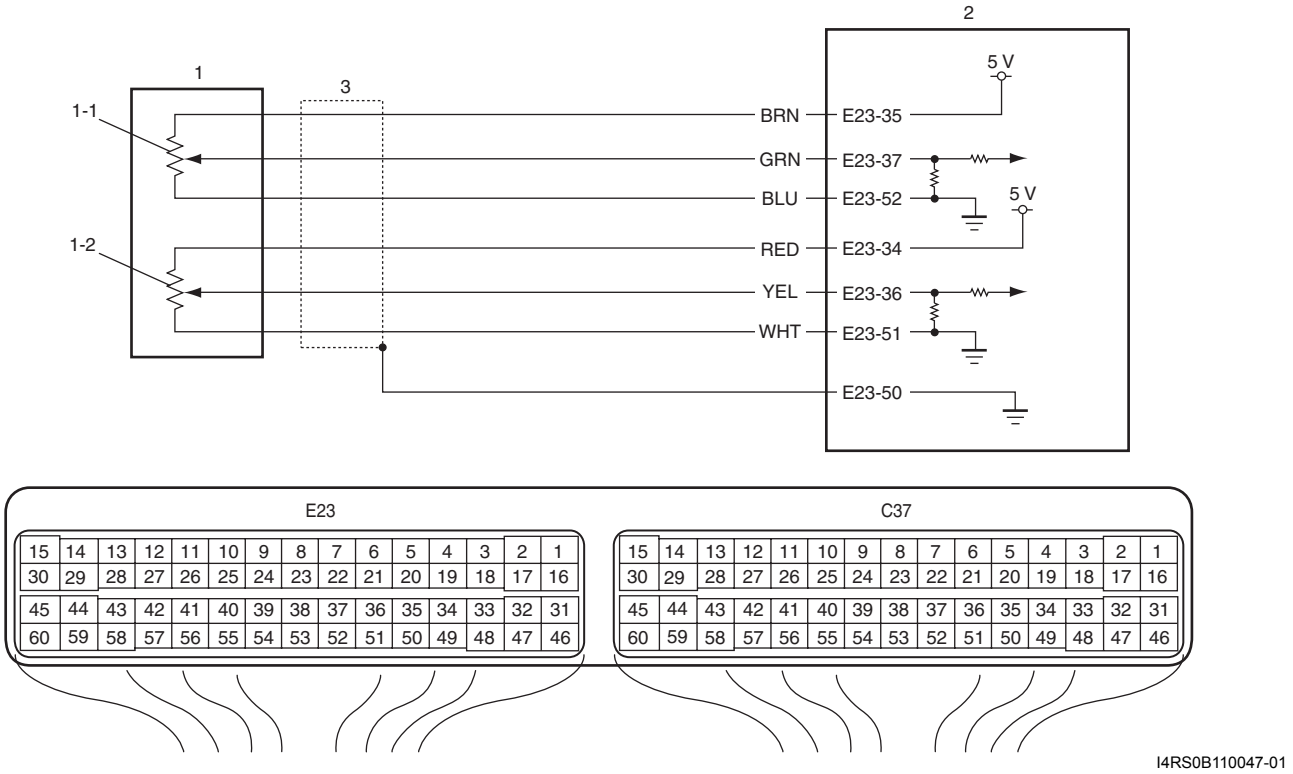
Step	Action	Yes	No
1	*Was "Engine and Emission Control System Check" performed?*	Go to Step 2.	Go to "Engine and Emission Control System Check: M13A / M15A / M16A".
2	**Throttle position sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch, check each voltage of "TP Sensor 1 Volt" and "TP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed each TP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 3.
3	**ECM voltage check** 1) Disconnect connector from electric throttle body assembly with ignition switch turned OFF. 2) Check for proper connection to electric throttle body assembly at "RED", "GRN", "WHT" and "BLK" wire terminals.  I4RS0B110022-02 3) If OK, measure voltage between "RED" wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Measure resistance between "C37-43" terminal of ECM connector and engine ground. *Is resistance infinity?*	Go to Step 5.	"RED" wire is shorted to other circuit.
5	**Wire harness check** 1) Measure voltage between "C37-43" terminal of ECM connector and engine ground with ignition switch turned ON. *Is voltage 0 V?*	Substitute a known-good ECM and recheck.	"RED" wire is shorted to other circuit.

Step	Action	Yes	No
6	**Wire harness check** 1) Measure voltage between “GRN” wire terminal of electric throttle body assembly connector and engine ground, between “WHT” wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned ON. *Is each voltage 4 – 6 V?*	Go to Step 9.	Go to Step 7.
7	**Wire harness check** 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM. 3) Check for proper connection of ECM connector at “C37-54” and “C37-40” terminals. 4) If OK, measure voltage between “C37-54” terminal of ECM connector and engine ground, between “C37-40” terminal of ECM connector and engine ground. *Is each voltage 0 V?*	Go to Step 8.	“GRN” wire or “WHT” wire is shorted to other circuit.
8	**Wire harness check** 1) Measure resistance between “GRN” wire terminal of electric throttle body assembly connector and engine ground, between “WHT” wire terminal of electric throttle body assembly connector and engine ground with ignition switch turned OFF. *Is each resistance infinity?*	Substitute a known-good ECM and recheck.	“GRN” wire or “WHT” wire is shorted to other circuit.
9	**Electric throttle body assembly check** 1) Check throttle position sensor referring to “Throttle Position Sensor Performance Check” under “Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”. *Is each output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace electric throttle body assembly.

DTC P2138: Pedal Position Sensor (Main / Sub) Voltage Correlation

S7N20A1114078

Wiring Diagram



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1. Accelerator pedal position (APP) sensor assembly	1-2. Accelerator pedal position (APP) sensor (sub)	3. Ground of accelerator pedal position (APP) sensor for shield wire
1-1. Accelerator pedal position (APP) sensor (main)	2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference between the opening angle based on accelerator pedal position sensor (main) and the opening angle based on accelerator pedal position sensor (sub) is more than specification for specified time continuously. (1 driving detection logic)	• Accelerator pedal position (APP) sensor (main) and (sub) circuit • Accelerator pedal position (APP) sensor assembly • ECM

DTC Confirmation Procedure

1) With ignition switch turned OFF, connect scan tool.
2) Turn ON ignition switch and clear DTC using scan tool.
3) Keep the accelerator pedal at idle position for 2 seconds.
4) Keep the accelerator pedal at fully depressed position for 2 seconds.
5) Repeat Step 3) and 4) for 3 times.
6) Check DTC.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	**Accelerator pedal position sensor and its circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check each voltage of "APP Sensor 1 Volt" and "APP Sensor 2 Volt" displayed on scan tool when accelerator pedal is idle position and fully depressed. *Is displayed each APP sensor value as described voltage in "Scan Tool Data: M13A / M15A / M16A"?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00"	Go to Step 3.
3	**ECM voltage check** 1) Disconnect connector from accelerator pedal position (APP) sensor assembly with ignition switch turned OFF. 2) Check for proper connection to accelerator pedal position (APP) sensor assembly at "BRN", "GRN", "BLU", "RED", "YEL" and "WHT" wire terminals. 3) If OK, measure voltage between "BRN" wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground, between "RED" wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground with ignition switch turned ON. *Is each voltage 4 – 6 V?*	Go to Step 6.	Go to Step 4.
4	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at "E23-35" and "E23-34" terminals 3) If OK, measure resistance between "E23-35" terminal of ECM connector and engine ground, between "E23-34" terminal of ECM connector and engine ground. *Is each resistance infinity?*	Go to Step 5.	"BRN" wire or "RED" wire is shorted to other circuit.
5	**Wire harness check** 1) Measure voltage between "E23-35" terminal of ECM connector and engine ground, between "E23-34" terminal of ECM connector and engine ground with ignition switch turned ON. *Is each voltage 0 V?*	Substitute a known-good ECM and recheck.	"BRN" wire or "RED" wire is shorted to other circuit.

Step	Action	Yes	No
6	**Wire harness check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection of ECM connector at “E23-37”, “E23-52”, “E23-36” and “E23-51” terminals. 3) If OK, measure resistance between “GRN” wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground, between “YEL” wire terminal of accelerator pedal position (APP) sensor assembly connector and vehicle body ground. *Is each resistance infinity?*	Go to Step 7.	“GRN” wire or “YEL” wire is shorted to other circuit.
7	**Wire harness check** 1) Turn ON ignition switch. 2) Measure voltage between “E23-37” terminal of ECM connector and engine ground, between “E23-36” terminal of ECM connector and engine ground. *Is each voltage 0 V?*	Go to Step 8.	“GRN” wire or “YEL” wire is shorted to other circuit.
8	**Accelerator pedal position (APP) sensor assembly check** 1) Check accelerator pedal position sensor referring to “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C” or “Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A in Section 1C”. *Is output voltage within specified value?*	Substitute a known-good ECM and recheck.	Replace accelerator pedal position (APP) sensor assembly.

DTC P2227 / P2228 / P2229: Barometric Pressure Circuit Malfunction

S7N20A1114079

DTC P2227: Barometric Pressure Circuit Range / Performance
DTC P2228: Barometric Pressure Circuit Low
DTC P2229: Barometric Pressure Circuit High

System Description
Barometric pressure sensor is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P2227: Difference of barometric pressure value and intake manifold pressure value is higher than specified value while engine cranking. (2 driving cycle detection logic)	• Manifold absolute pressure sensor performance problem • Barometric pressure sensor in ECM
DTC P2228: Barometric pressure signal less than specified value is detected. (1 driving cycle detection logic)	• Barometric pressure sensor in ECM
DTC P2229: Barometric pressure signal more than specified value is detected. (1 driving cycle detection logic)	

DTC Confirmation Procedure
DTC P2227:

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine to normal operating temperature.
3) Check DTC and pending DTC by using scan tool.

DTC P2228 / P2229:

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch, clear DTC by using scan tool and run engine for 1 min.
3) Check DTC and pending DTC by using scan tool.

DTC Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" and confirm that the trouble has been corrected.**

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: M13A / M15A / M16A".
2	*Is DTC P2227 set?*	Go to Step 3.	Substitute a known-good ECM and recheck.
3	**MAP sensor check** 1) Check MAP sensor and its circuit referring to "DTC P0107: Manifold Absolute Pressure Circuit Low Input: M13A / M15A / M16A"and/or "DTC P0108: Manifold Absolute Pressure Circuit High Input: M13A / M15A / M16A". *Is check result satisfactory?*	Substitute a known-good ECM and recheck.	MAP sensor or its circuit malfunction.

Inspection of ECM and Its Circuits

S7N20A1114080

ECM and its circuits can be checked by measuring voltage, pulse signal and resistance with special tool connected.

⚠ CAUTION

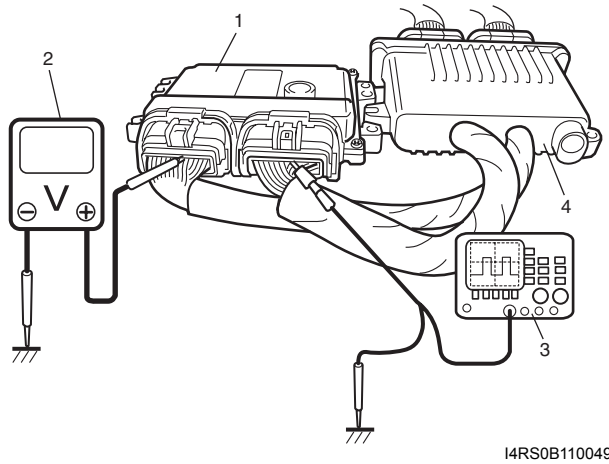
ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with ECM connectors disconnected from it.

Voltage Check

1) Remove ECM (1) from its bracket referring to “Engine Control Module (ECM) Removal and Installation: M13A / M15A / M16A in Section 1C”.
2) Connect special tool (4) between ECM and ECM connectors securely.
3) Check voltage and/or pulse signal using voltmeter (2) and oscilloscope (3).

NOTE

- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is turned ON.**
- **Voltage with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check if necessary.**



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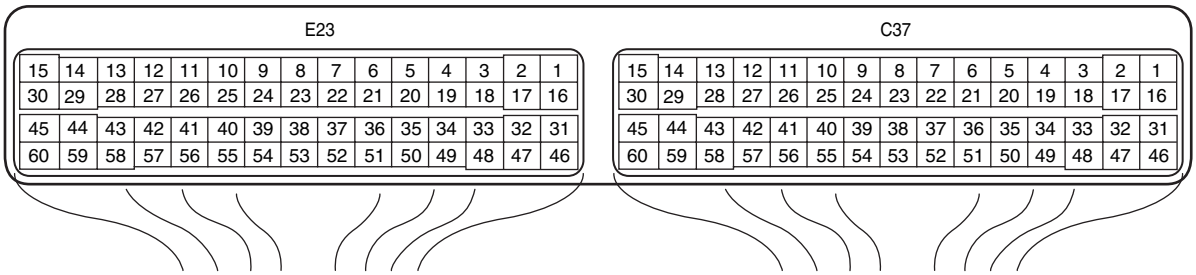
- **Before performed this inspection, be sure to read the “Precautions of ECM Circuit Inspection: M13A / M15A / M16A”.**

Viewed from harness side



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Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-1	BLU/YEL	Fuel injector No.1 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: M13A / M15A / M16A”, “Reference waveform No.2: M13A / M15A / M16A” and “Reference waveform No.32: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-2	BLU/ WHT	Fuel injector No.2 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: M13A / M15A / M16A” and “Reference waveform No.3: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-3	GRN/ ORN	EGR valve (stepper motor coil 2) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: M13A / M15A / M16A”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-4	GRN/ RED	EGR valve (stepper motor coil 1) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: M13A / M15A / M16A”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-5	GRN/ WHT	Ignition coil No.2 and No.3 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V (“Reference waveform No.5: M13A / M15A / M16A” and “Reference waveform No.6: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.
C37-6	GRN/ YEL	Ignition coil No.1 and No.4 output	0 – 0.6 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 3 – 5 V (“Reference waveform No.6: M13A / M15A / M16A”, “Reference waveform No.7: M13A / M15A / M16A” and “Reference waveform No.32: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active high pulse. Pulse frequency varies depending on engine speed.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-7	GRY/ BLU	Engine revolution signal output for TCM (Automated Manual Transaxle model)	4 – 6 V	Ignition switch turned ON with engine stop.	—
			*0 – 1 V ↑↓ 4 – 5 V (“Reference waveform No.28: M13A / M15A / M16A”)	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (12 pulses are generated per 1 crankshaft revolution.)
C37-8	BRN/ WHT	Generator field coil monitor signal (M16A engine)	10 – 14 V	Ignition switch turned ON.	Signal is duty pulse. Duty ratio varies depending on vehicle condition.
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.33: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	
C37-9	PPL	Vehicle speed sensor signal (automated manual transaxle model)	*0 – 1 V ↑↓ 4 – 5 V (“Reference waveform No.29: M13A / M15A / M16A” (Automated Manual Transaxle))	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (69 pulses (M/T) or 21 pulses (Automated Manual Transaxle) are generated per sec. at 30 km/h, 19 mph.) (8232 pulses/km (M/T)) (2561 pulses/km (Automated Manual Transaxle))
C37-10	WHT	Oxygen signal of heated oxygen sensor-1	0 – 1 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V (“Reference waveform No.9: M13A / M15A / M16A” and “Reference waveform No.10: M13A / M15A / M16A”)	While engine running at 2,000 r/min. for 1 min. or longer after warmed up.	
C37-11	BRN	Oxygen signal of heated oxygen sensor-2	4 – 5 V	Ignition switch turned ON.	—
			*Deflects between over 0.5 V and under 0.45 V (“Reference waveform No.11: M13A / M15A / M16A”)	While engine running at 2,000 r/min. or more after vehicle running over 30 km/h, 19 mph for 5 min.	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-12	WHT	CAN (low) (communication line (active low signal) to TCM (A/T or Automated Manual Transaxle model)	*0.5 – 2.5 V (“Reference waveform No.12: M13A / M15A / M16A”)	Ignition switch turned ON with engine stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
C37-13	RED	CAN (high) communication line (active high signal) to TCM (A/T or Automated Manual Transaxle model)	*2.5 – 4.5 V (“Reference waveform No.12: M13A / M15A / M16A”)		
C37-14	GRY/ RED	Output of 5 V power source for MAP sensor, A/C refrigerant pressure sensor (A/C model)	4.5 – 5.5 V	Ignition switch turned ON.	—
C37-15	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-16	BLU/ RED	Fuel injector No.3 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: M13A / M15A / M16A” and “Reference waveform No.13: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-17	BLU/ ORN	Fuel injector No.4 output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.1: M13A / M15A / M16A” and “Reference waveform No.14: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active low pulse. Pulse frequency varies depending on engine speed.
C37-18	BRN/ YEL	EGR valve (stepper motor coil 4) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: M13A / M15A / M16A”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.
C37-19	WHT/ RED	EGR valve (stepper motor coil 3) output	10 – 14 V	Ignition switch turned ON.	—
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.4: M13A / M15A / M16A”)	Ignition switch is turned to ST (cranking) position.	Output signal is active low duty pulse. Number of pulse generated times varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-20	RED/ YEL	CMP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*0 – 0.6 V ↑↓ 4 – 5 V (“Reference waveform No.15: M13A / M15A / M16A” and “Reference waveform No.16: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated per 1 camshaft revolution.)
C37-21	PNK	CKP sensor signal	0 – 1 V or 4 – 5 V	Ignition switch turned ON.	—
			*4 – 5 V ↑↓ 0 – 0.6 V (“Reference waveform No.15: M13A / M15A / M16A” and “Reference waveform No.16: M13A / M15A / M16A”)	Engine running at idle after warming up engine.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (30 (36 – 6) pulses are generated per 1 crankshaft revolution.)
C37-22	PPL/ WHT	Vehicle speed signal output for TCM (Automated Manual Transaxle model)	*0 – 1 V ↑↓ 4 – 5 V (“Reference waveform No.29: M13A / M15A / M16A”)	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (21 pulses are generated per sec. at 30 km/h, 19 mph.) (2561 pulses/km)
C37-23	—	—	—	—	—
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.8 V	Ignition switch turned ON, ECT at 0 °C, 32 °F.	—
			1.38 – 1.72 V	Ignition switch turned ON, ECT at 50 °C, 122 °F.	
			0.40 – 0.53 V	Ignition switch turned ON, ECT at 100 °C, 212 °F.	
C37-25	BLK/ YEL	Intake air temp. (IAT) sensor signal	3.18 – 3.67 V	Ignition switch turned ON, IAT at 0 °C, 32 °F.	—
			1.32 – 1.65 V	Ignition switch turned ON, IAT at 40 °C, 104 °F.	
			0.46 – 0.60 V	Ignition switch turned ON, IAT at 80 °C, 176 °F.	
C37-26	GRN/ BLK	Mass air flow (MAF) sensor signal	0.5 – 1.5 V	Ignition switch turned ON with engine at stop.	—
			1.5 – 2.0 V (“Reference waveform No.17: M13A / M15A / M16A”)	When engine running at specified idle speed after warmed up.	
C37-27	GRY	Ground for MAF sensor	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-28	BLU/ YEL	Generator control signal output (M16A engine)	*0 – 0.6 V ↑↓ 5 – 8 V (“Reference waveform No.34: M13A / M15A / M16A”)	Engine running at idle speed, headlight switch turned ON.	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
C37-29	BLU/ BLK	EVAP canister purge valve output	10 – 14 V	Ignition switch turned ON with engine at stop.	—
			*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.18: M13A / M15A / M16A”)	Set EVAP canister purge valve at 52% by using “Misc Test” of scan tool.	Output signal is active low duty pulse. Duty ratio varies depending on vehicle condition.
C37-30	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-31	—	—	—	—	—
C37-32	—	—	—	—	—
C37-33	—	—	—	—	—
C37-34	—	—	—	—	—
C37-35	—	—	—	—	—
C37-36	—	—	—	—	—
C37-37	—	—	—	—	—
C37-38	—	—	—	—	—
C37-39	—	—	—	—	—
C37-40	WHT	Throttle position sensor (sub) signal	1.57 – 1.90 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			3.88 – 4.45 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
C37-41	—	Ground for shield wire of TP sensor circuit	Below 0.3 V	Ignition switch turned ON.	—
C37-42	BLK	Ground for throttle position sensor	Below 0.3 V	Ignition switch turned ON.	—
C37-43	RED	Output for 5 V power source of throttle position sensor	4.5 – 5.5 V	Ignition switch turned ON.	—
C37-44	LT GRN/ BLK	Output of throttle actuator	0 – 1 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	Output signal is pulse. Duty ratio varies depending on throttle valve and accelerator pedal position.
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.30: M13A / M15A / M16A” and “Reference waveform No.31: M13A / M15A / M16A”)	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-45	LT GRN/ RED	Output of throttle actuator	0 – 1 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	Output signal is pulse. Duty ratio varies depending on throttle valve and accelerator pedal position.
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.30: M13A / M15A / M16A” and “Reference waveform No.31: M13A / M15A / M16A”)	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	
C37-46	BLK/ RED	Heater output of heated oxygen sensor-1	10 – 14 V	Ignition switch turned ON.	—
			*0 – 2 V ↑↓ 10 – 14 V (“Reference waveform No.9: M13A / M15A / M16A” and “Reference waveform No.10: M13A / M15A / M16A”)	Engine running at idle after warmed up engine.	Output signal is active low duty pulse. Duty ratio varies depending on engine condition.
C37-47	RED/ BLU	Heater output of heated oxygen sensor-2	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V (“Reference waveform No.11: M13A / M15A / M16A”)	Engine running at idle after vehicle running over 30 km/h, 19 mph for 5 min.	
C37-48	YEL/ GRN	Starting motor signal	0 – 1 V	Ignition switch turned ON.	—
			6 – 14 V	While engine cranking.	
C37-49	—	—	—	—	—
C37-50	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-51	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-52	—	Ground of ECM for shield wire	Below 0.3 V	Ignition switch turned ON.	—
C37-53	RED/ BLK	Manifold absolute pressure (MAP) sensor signal	Approx. 4 V (“Reference waveform No.19: M13A / M15A / M16A”)	Ignition switch turned ON with barometric pressure at 100 kPa, 760 mmHg.	—
			0.4 – 2.0 V (“Reference waveform No.20: M13A / M15A / M16A”)	While engine running at specified idle speed after warmed up with barometric pressure at 100 kPa, 760 mmHg.	
C37-54	GRN	Throttle position sensor (main) signal	0.75 – 1.08 V	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			3.67 – 4.24 V	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-56	RED	Knock sensor signal	2 – 3 V (“Reference waveform No.21: M13A / M15A / M16A” and “Reference waveform No.22: M13A / M15A / M16A”)	Ignition switch turned ON.	—
				Engine running at 4000 r/min. after warmed up.	
C37-57	YEL	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
C37-59	YEL/BLK	Oil control valve ground (VVT model)	Below 1.3 V	Ignition switch turned ON.	—
C37-60	YEL/RED	Oil control valve output (VVT model)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No.23: M13A / M15A / M16A” and “Reference waveform No.24: M13A / M15A / M16A”)	At the moment of ignition switch turned ON.	Output signal is active high pulse. Duty ratio varies depending on vehicle condition.

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-1	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—
E23-2	WHT/RED	Power source for ECM internal memory	10 – 14 V	Ignition switch turned ON.	—
E23-3	RED	CAN (high) communication line (active high signal) for ABS / ESP® control module, BCM, combination meter	*2.5 – 4.5 V (“Reference waveform No.25: M13A / M15A / M16A”)	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency with varies depending on engine condition.
E23-4	BRN	Engine revolution P/S control module	0 – 0.8 V	Ignition switch turned ON with engine at stop.	—
			*0 – 1 V ↑↓ 8 – 14 V (“Reference waveform No.26: M13A / M15A / M16A” and “Reference waveform No.27: M13A / M15A / M16A”)	While engine running.	Output signal is pulse. Pulse frequency varies depending on engine speed. (2 pulses are generated per 1 crankshaft revolution.) (3000 r/min. = 100 Hz)
E23-5	PPL/WHT	Serial communication line of data link connector 12 V	8 – 14 V	Ignition switch turned ON.	—
E23-6	—	—	—	—	—
E23-7	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-8	—	—	—	—	—
E23-9	—	—	—	—	—
E23-10	—	—	—	—	—
E23-11	—	—	—	—	—
E23-12	—	—	—	—	—
E23-13	YEL/RED	Clock signal for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—
E23-14	—	—	—	—	—
E23-15	GRN/WHT	Fuel pump relay output	0 – 2.5 V	For 2 sec. from the time ignition switch is turned ON or while engine is running.	—
			10 – 14 V	On and after 2 sec. from the time ignition switch is turned ON or while engine is at stop.	
E23-16	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON.	—
E23-17	—	—	—	—	—
E23-18	WHT	CAN (low) communication line (active low signal) for ABS / ESP® control module, BCM, combination meter	*0.5 – 2.5 V (“Reference waveform No.25: M13A / M15A / M16A”)	Ignition switch turned ON with engine at stop.	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E23-19	BLU/WHT	Electric load signal for heater blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position.	—
			0 – 1 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more.	
E23-20	GRN/WHT	Stop lamp switch signal	0 – 1 V	Ignition switch turned ON, stop lamp not lit up.	—
			10 – 14 V	Ignition switch turned ON, stop lamp lit up.	
E23-21	—	—	—	—	—
E23-22	—	—	—	—	—
E23-23	—	—	—	—	—
E23-24	—	—	—	—	—
E23-25	PPL	Vehicle speed signal output for P/S control module	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.8: M13A / M15A / M16A”)	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (21 pulses are generated per sec. at 30 km/h, 19 mph.) (2561 pulses/km)
E23-26	RED/BLU	EPS signal	10 – 14 V	Ignition switch turned ON.	—
			0 – 1 V	With engine running at idle speed, and steering wheel turned to the right or left as far as it stops.	
E23-27	—	—	—	—	—
E23-28	YEL/BLK	Serial communication line for immobilizer coil antenna	10 – 14 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-29	BLK/WHT	Ignition switch signal	0 – 1 V	Ignition switch turned OFF.	—
			10 – 14 V	Ignition switch turned ON.	
E23-30	WHT	Ground for starting motor relay	0 – 1 V	Ignition switch turned ON.	—
			0 – 1 V	Ignition switch is turned to ST (engine cranking) position.	
E23-31	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.	—
E23-32	RED/YEL	Power supply of throttle actuator drive circuit	10 – 14 V	Ignition switch turned ON.	—
E23-33	—	—	—	—	—
E23-34	RED	Output for 5 V power source of accelerator pedal position (APP) sensor (sub)	4.5 – 5.5 V	Ignition switch turned ON.	—
E23-35	BRN	Output for 5 V power source of accelerator pedal position (APP) sensor (main)	4.5 – 5.5 V	Ignition switch turned ON.	—
E23-36	Accelerator pedal position (APP) sensor (sub) signal		1.55 – 1.65 V (M16A and automated manual transaxle model)	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			0.325 – 0.425 V (M13A and M15A without automated manual transaxle model)		
			3.988 V – 4.650 V (M16A and automated manual transaxle model)	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
			1.85 – 2.20 V (M13A and M15A without automated manual transaxle model)		
E23-37	Accelerator pedal position (APP) sensor (main) signal		0.75 – 0.85 V (M16A and automated manual transaxle model)	Ignition switch turned ON and accelerator pedal at idle position after warmed up engine.	—
			0.70 – 0.80 V (M13A and M15A without automated manual transaxle model)		
			3.188 – 3.850 V (M16A and automated manual transaxle model)	Ignition switch turned ON and accelerator pedal at full depressed position after warmed up engine.	
			3.70 – 4.40 V (M13A and M15A without automated manual transaxle model)		
E23-38	—	—	—	—	—

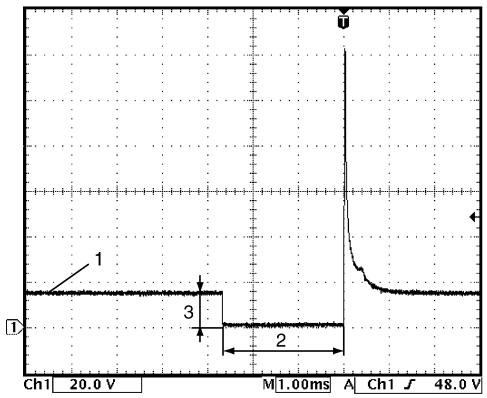
Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-39	—	—	—	—	—
E23-40	—	—	—	—	—
E23-41	—	—	—	—	—
E23-42	—	—	—	—	—
E23-43	—	—	—	—	—
E23-44	—	—	—	—	—
E23-45	BLU/ ORN	Throttle actuator control relay output	0 – 1 V	Ignition switch turned ON.	—
E23-46	LT GRN	Radiator cooling fan relay No.1 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 95 °C (203 °F), or A/C refrigerant pressure (if equipped with A/C): below 600 kPa (87 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 97.5 °C (207.5 °F) or higher, or A/C refrigerant pressure (if equipped with A/C): 1100 kPa (159.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-47	GRY	A/C compressor relay output (A/C model)	10 – 14 V	Engine running, A/C switch OFF and blower selector at OFF position.	—
			0 – 1 V	Engine running, A/C switch ON and blower selector at 1st position or more.	
E23-48	GRN	Radiator cooling fan relay No.2 and No.3 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 100 °C (212 °F), or A/C refrigerant pressure (if equipped with A/C): below 1200 kPa (174 psi) with A/C switch turned ON while engine is running.	—
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 102.5 °C (216.5 °F) or higher, or A/C refrigerant pressure (if equipped with A/C): 1500 kPa (217.5 psi) or higher with A/C switch turned ON while engine is running.	
E23-49	—	—	—	—	—
E23-50	—	Ground for shield wire of accelerator pedal position (APP) sensor	Below 0.3 V	Ignition switch turned ON.	—
E23-51	WHT	Ground for accelerator pedal position (APP) sensor (sub)	Below 0.3 V	Ignition switch turned ON.	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E23-52	BLU	Ground for accelerator pedal position (APP) sensor (main)	Below 0.3 V	Ignition switch turned ON.	—
E23-53	—	—	—	—	—
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON.	—
E23-55	RED	A/C refrigerant pressure sensor signal (Manual A/C model)	1.38 – 1.52 V	Engine running, A/C switch OFF and blower selector at OFF position, A/C refrigerant pressure: 800 kPa (116 psi)	—
			2.15 – 2.38 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1400 kPa (203 psi)	
			2.67 – 2.95 V	Engine running, A/C switch ON and blower selector at 1st position or more, A/C refrigerant pressure: 1800 kPa (261 psi)	
E23-56	—	—	—	—	—
E23-57	WHT/ BLK	A/C evaporator outlet air temp. sensor signal (A/C model)	3.4 – 3.7 V	Ignition switch turned ON at A/C evaporator outlet temperature 0 °C (32 °F).	—
			2.5 – 2.8 V	Ignition switch turned ON at A/C evaporator outlet temperature 15 °C (59 °F).	
			1.7 – 2.0 V	Ignition switch turned ON at A/C evaporator outlet temperature 30 °C (86 °F).	
E23-58	—	—	—	—	—
E23-59	—	—	—	—	—
E23-60	BRN/ WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF.	—
			0 – 2 V	Ignition switch turned ON.	

Reference waveform No.1

Fuel injector signal (1) with engine idling

Measurement terminal	CH1: “C37-2” to “C37-58”
Oscilloscope setting	CH1: 20 V/DIV TIME: 1 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



I4RS0B110050-01

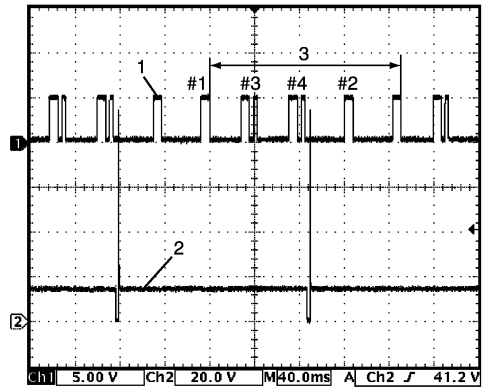
2. Fuel injection pulse width: 2-4 msec.
3. 10 – 14 V

Reference waveform No.2

No.1 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-1” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



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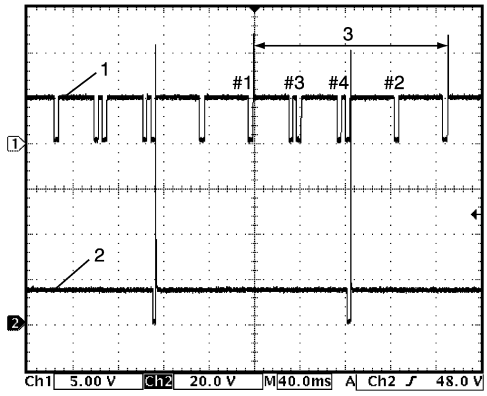


I4RS0B110051-01

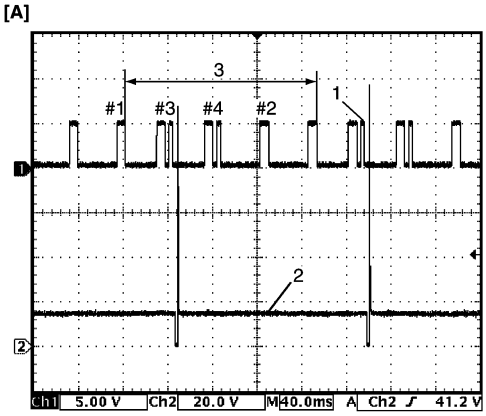
[A]:	VVT model
[B]:	Non-VVT model
1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.3

No.2 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-2” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



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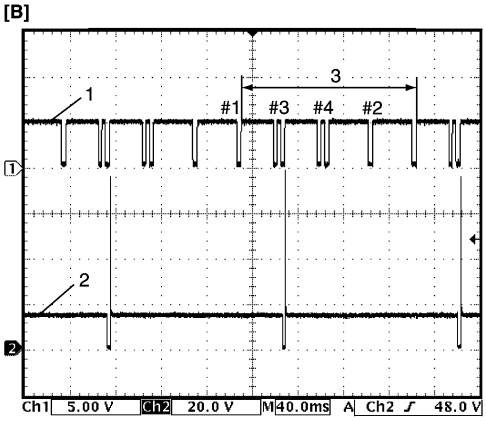


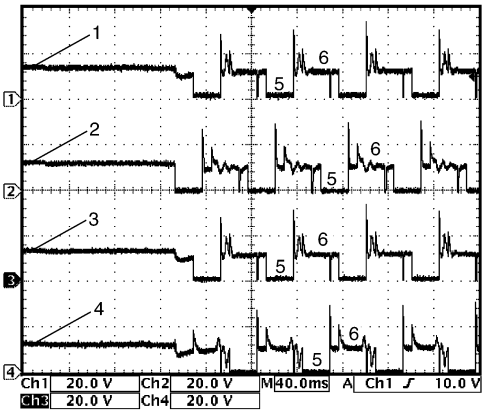
I4RS0B110052-01

[A]:	VVT model
[B]:	Non-VVT model
1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.4

EGR valve signal

Measurement terminal	CH1: “C37-4” to “C37-58” CH2: “C37-3” to “C37-58” CH3: “C37-19” to “C37-58” CH4: “C37-18” to “C37-58”
Oscilloscope setting	CH1: 20 V/DIV, CH2: 20 V/DIV CH3: 20 V/DIV, CH4: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	Engine at cranking



I4RS0B110053-01

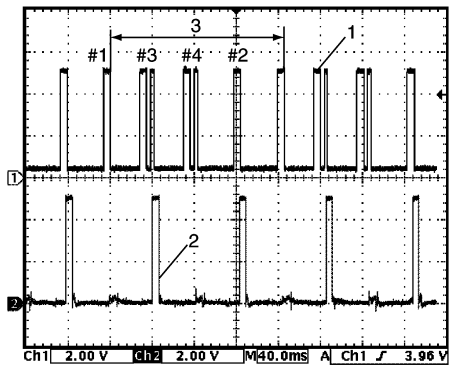
1. EGR valve stepper motor coil 1 signal
2. EGR valve stepper motor coil 2 signal
3. EGR valve stepper motor coil 3 signal
4. EGR valve stepper motor coil 4 signal
5. ON signal
6. OFF signal

Reference waveform No.5

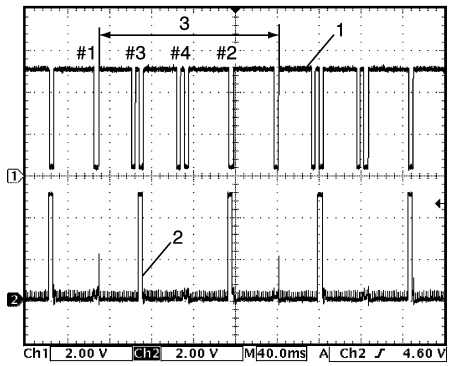
Ignition coil No.2 and No.3 signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-5” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



[B]



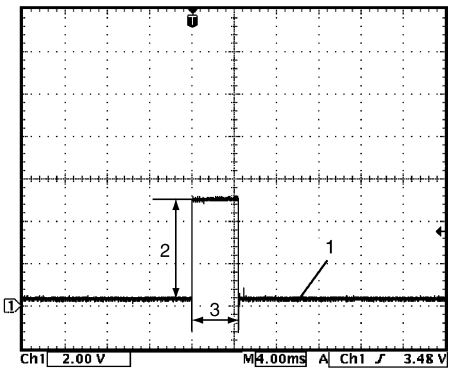
I4RS0B110054-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.6

Ignition coil signal (1) with engine idling

Measurement terminal	CH1: “C37-6” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



I4RS0B110055-02

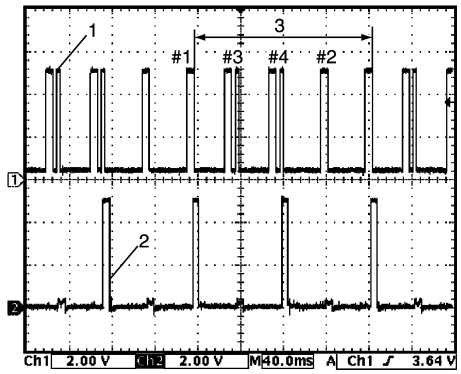
2. 4 – 6 V
3. Ignition coil pulse width: 4 – 5 msec.

Reference waveform No.7

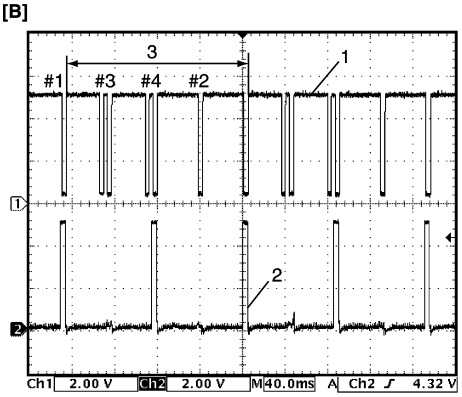
Ignition coil No.1 and No.4 signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



[B]



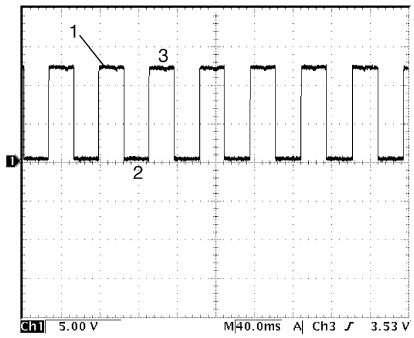
I4RS0B110056-01

[A]:	VVT model
[B]:	Non-VVT model
1.	Cylinder reference signal (CMP reference signal)
3.	720° crank angle

Reference waveform No.8

VSS signal at 30 km/h (19 mph)

Measurement terminal	CH1: “E23-25” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 30 km/h (19 mph)



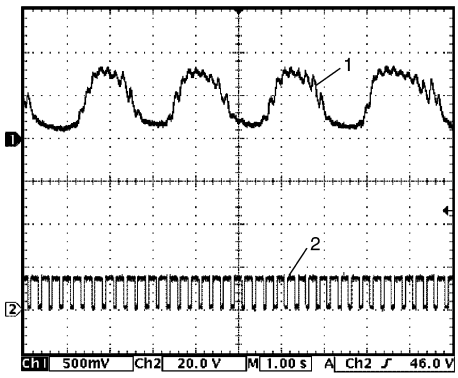
I6RS0C110047-01

1.	VSS signal for EPS control module
2.	ON
3.	OFF

Reference waveform No.9

Heated oxygen sensor-1 signal (1) with engine idling

Measurement terminal	CH1: “C37-10” to “C37-57” CH2: “C37-46” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 20 V/DIV TIME: 1 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



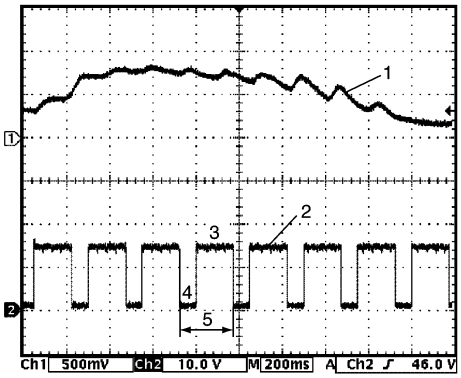
I4RS0B110058-01

2.	Heated oxygen sensor-1 heater signal

Reference waveform No.10

Heated oxygen sensor-1 heater signal (2) with engine idling

Measurement terminal	CH1: “C37-10” to “C37-57” CH2: “C37-46” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



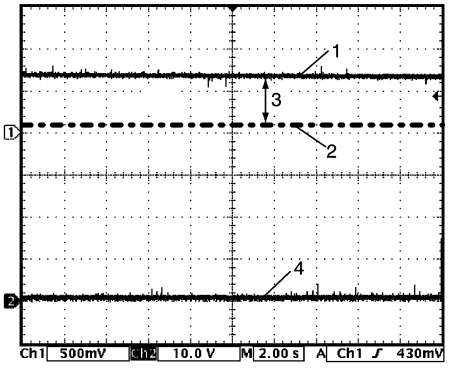
I4RS0B110059-01

1. Heated oxygen sensor-1 signal
3. OFF signal
4. ON signal
5. One duty cycle

Reference waveform No.11

Heated oxygen sensor-2 heater signal (4) with engine idling

Measurement terminal	CH1: “C37-11” to “C37-57” CH2: “C37-47” to “C37-58”
Oscilloscope setting	CH1: 500 mV/DIV, CH2: 10 V/DIV TIME: 2 s/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mph) for 10 min. • Engine at specified idle speed



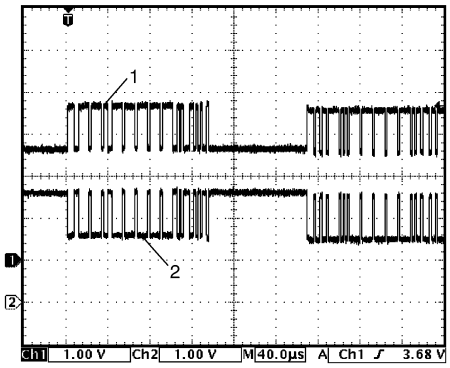
I4RS0B110060-01

1. Heated oxygen sensor-2 signal upper limit
2. Heated oxygen sensor-2 signal lower limit
3. Normal waveform range

Reference waveform No.12

CAN communication line signal from TCM (A/T or Automated Manual Transaxle model) with ignition switch turned ON

Measurement terminal	CH1: “C37-13” to “C37-58” CH2: “C37-12” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



I4RS0B110061-01

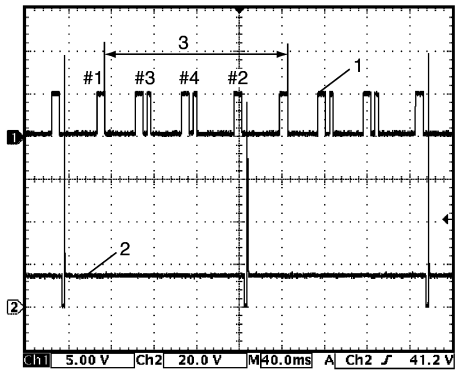
1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No.13

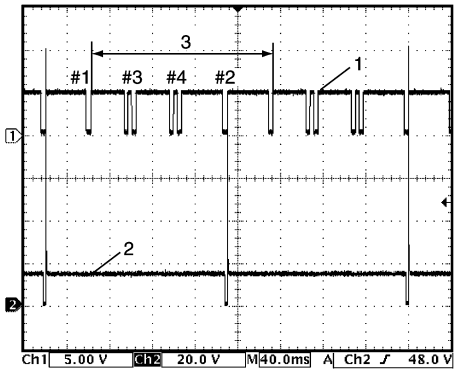
No.3 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-16” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



[B]



I4RS0B110062-01

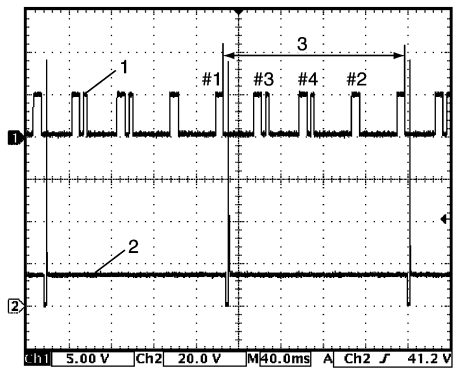
[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.14

No.4 fuel injector signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-17” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 20 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



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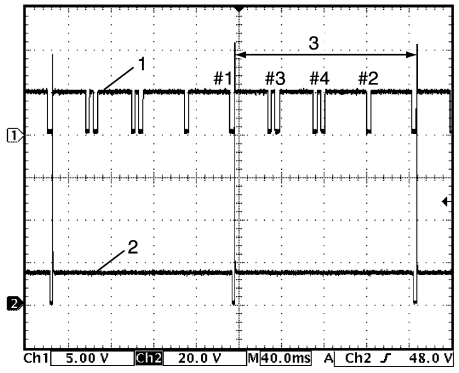


I4RS0B110063-01

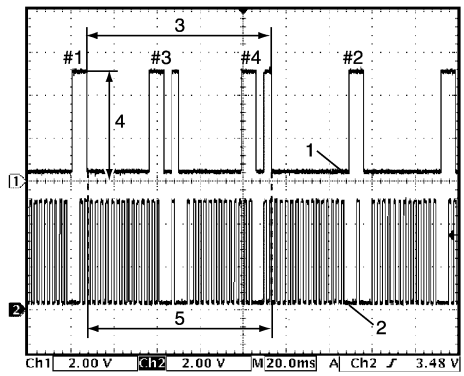
[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.15

CMP sensor signal with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-21” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



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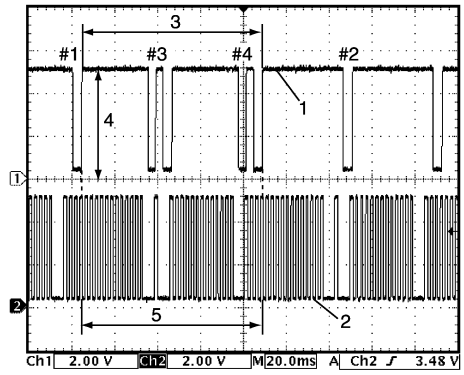


I4RS0B110064-01

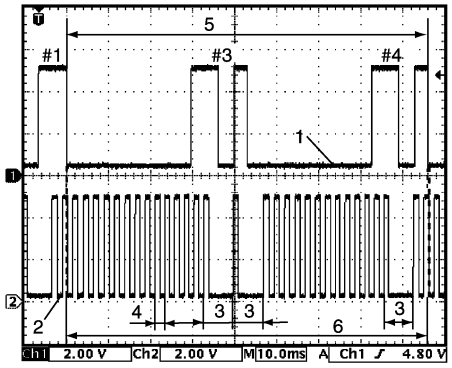
[A]:	VVT model
[B]:	Non-VVT model
1.	Cylinder reference signal (CMP reference signal)
2.	CKP signal
3.	360° crank angle
4.	4 – 5 V
5.	36 – 6 = 30 CKP pulse

Reference waveform No.16

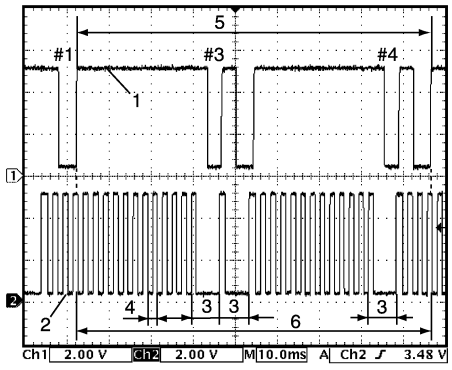
CMP sensor signal with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-21” to “C37-58”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



[B]



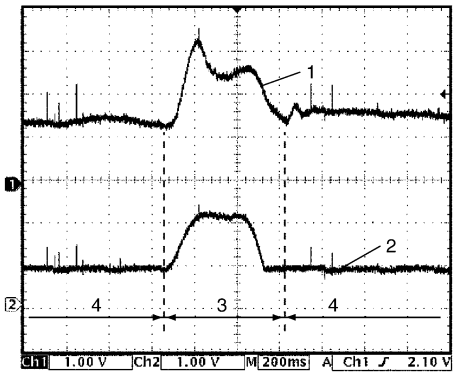
I4RS0B110065-01

[A]:	VVT model
[B]:	Non-VVT model
1.	Cylinder reference signal (CMP reference signal)
2.	CKP signal
3.	30° crank angle
4.	10° crank angle
5.	360° crank angle
6.	36 – 6 = 30 CKP pulse

Reference waveform No.17

Mass air flow sensor signal (1) with engine racing

Measurement terminal	CH1: “C37-26” to “C37-27” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine racing



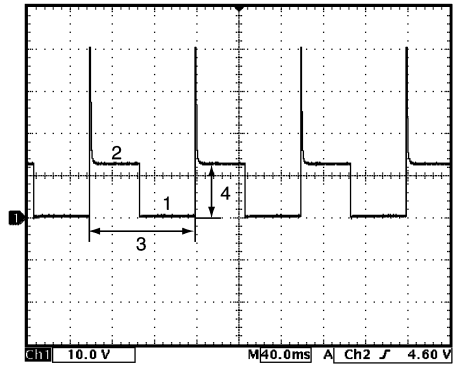
I4RS0B110066-01

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.18

EVAP canister purge valve signal

Measurement terminal	CH1: “C37-29” to “C37-58”
Oscilloscope setting	CH1: 10 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Set EVAP canister purge valve at 52% by using “Misc Test” of scan tool



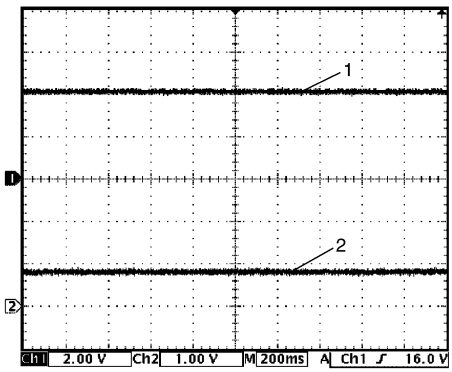
I4RS0B110067-01

1. ON signal
2. OFF signal
3. One duty cycle
4. 10 – 14 V

Reference waveform No.19

Manifold absolute pressure sensor signal (1) with ignition switch turned ON

Measurement terminal	CH1: “C37-53” to “C37-55” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 1 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON



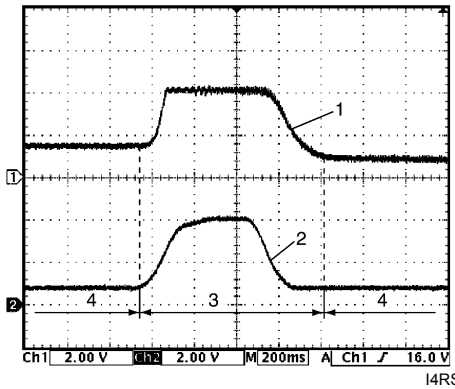
I4RS0B110070-01

2. Throttle position sensor signal

Reference waveform No.20

Manifold absolute pressure sensor signal (1) with engine racing

Measurement terminal	CH1: “C37-53” to “C37-55” CH2: “C37-54” to “C37-55”
Oscilloscope setting	CH1: 2 V/DIV, CH2: 2 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine racing



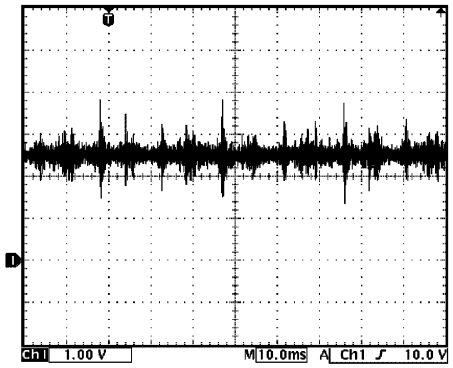
I4RS0B110071-01

2. Throttle position sensor signal
3. Racing
4. Idle

Reference waveform No.21

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: “C37-56” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Run engine at 4000 r/min.

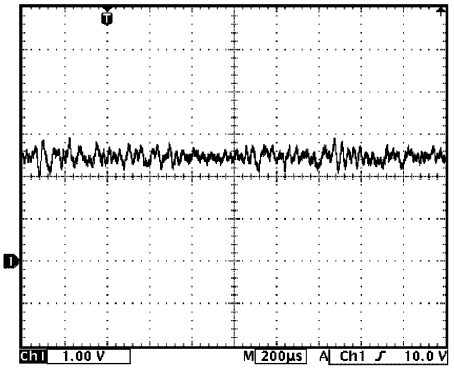


I4RS0B110072-01

Reference waveform No.22

Knock sensor signal at engine speed 4000 r/min.

Measurement terminal	CH1: “C37-56” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV TIME: 200 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Run engine at 4000 r/min.

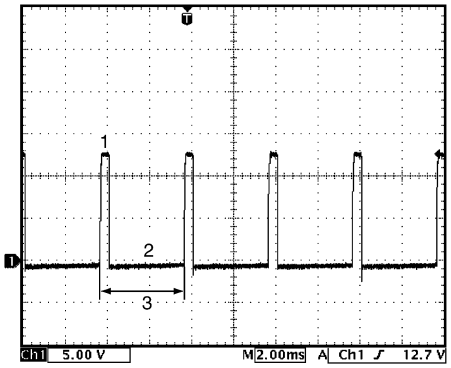


I4RS0B110073-01

Reference waveform No.23

Oil control valve signal with engine idling (VVT model)

Measurement terminal	CH1: “C37-60” to “C37-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	At the moment of the ignition switch turned on



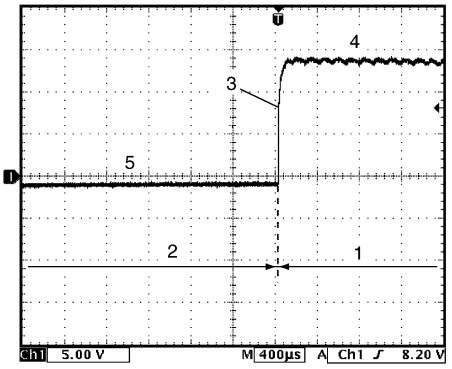
I4RS0B110074-01

1. ON signal
2. OFF signal
3. Only duty cycle

Reference waveform No.24

Oil control valve signal with engine racing (VVT model)

Measurement terminal	CH1: “C37-60” to “C37-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 400 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 20 km/h (12 mph) and depress accelerator pedal fully



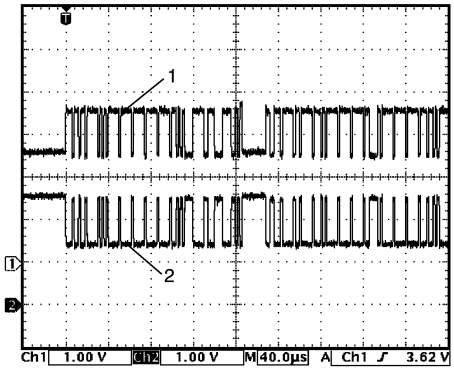
I4RS0B110075-01

1. Accelerator pedal depressed fully
2. Accelerator pedal depressed partially
3. Oil control valve signal
4. ON signal
5. OFF signal

Reference waveform No.25

CAN communication line signal from BCM with ignition switch turned ON

Measurement terminal	CH1: “E23-3” to “C37-58” CH2: “E23-18” to “C37-58”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Signal pattern is depending on engine condition)



I4RS0B110076-01

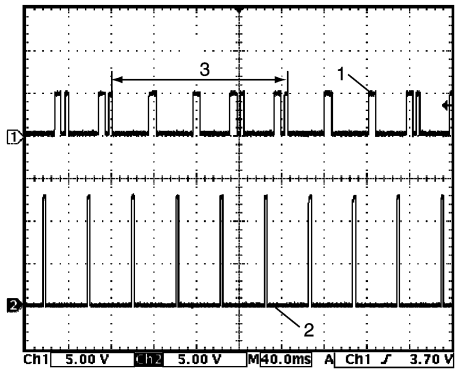
1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No.26

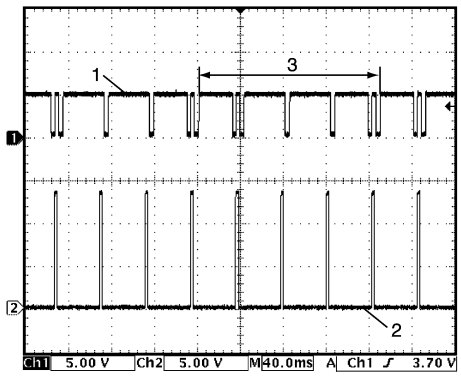
Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “E23-4” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 40 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



[B]



I4RS0B110077-01

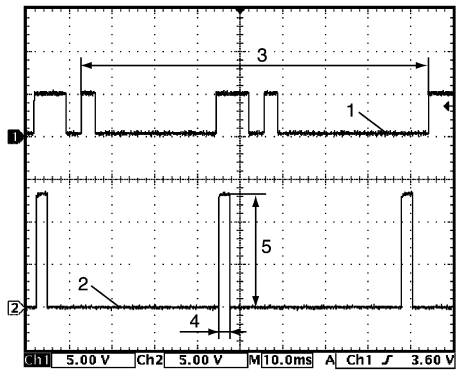
[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 720° crank angle

Reference waveform No.27

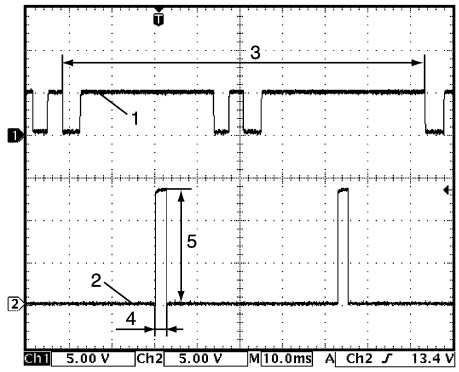
Ignition pulse (engine revolution) signal (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “E23-4” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed

[A]



[B]



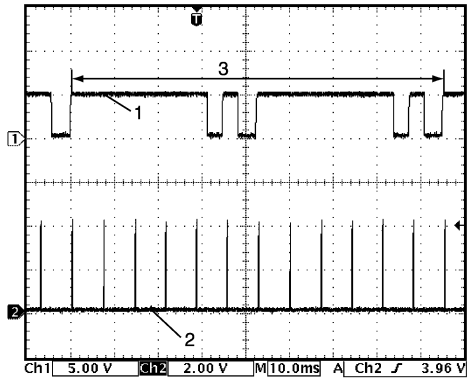
I4RS0B110078-01

[A]: VVT model
[B]: Non-VVT model
1. Cylinder reference signal (CMP reference signal)
3. 360° crank angle
4. 2 to 4 msec.
5. 10 – 14 V

Reference waveform No.28

Engine revolution signal for TCM (Automated Manual Transaxle model) (2) with engine idling

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-7” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed



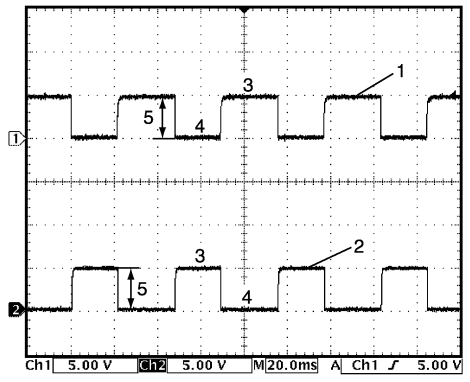
I4RS0B110079-01

1. Cylinder reference signal (CMP reference signal)
3. 360° crank angle

Reference waveform No.29

VSS signal at 30 km/h (19 mph) (Automated Manual Transaxle model)

Measurement terminal	CH1: “C37-9” to “C37-58” CH2: “C37-22” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 30 km/h (19 mph)



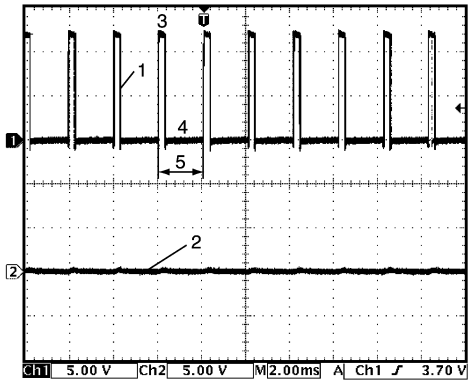
I4RS0B110080-02

1. VSS signal (Automated Manual Transaxle)
2. VSS signal for TCM (Automated Manual Transaxle)
3. OFF
4. ON
5. 4 – 5 V

Reference waveform No.30

Throttle actuator output signal with ignition switch turned ON

Measurement terminal	CH1: “C37-45” to “C37-58” CH2: “C37-44” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON and accelerator pedal at idle position



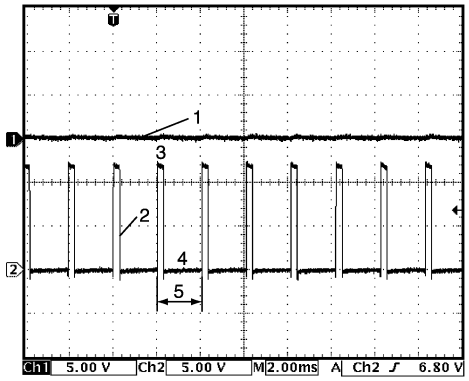
I4RS0B110081-02

1.	Throttle actuator drive signal (“C37-45” terminal)
2.	Throttle actuator drive signal (“C37-44” terminal)
3.	ON signal
4.	OFF signal
5.	One duty cycle

Reference waveform No.31

Throttle actuator output signal with ignition switch turned ON

Measurement terminal	CH1: “C37-45” to “C37-58” CH2: “C37-44” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Ignition switch turned ON and accelerator pedal at full depressed position



I4RS0B110082-02

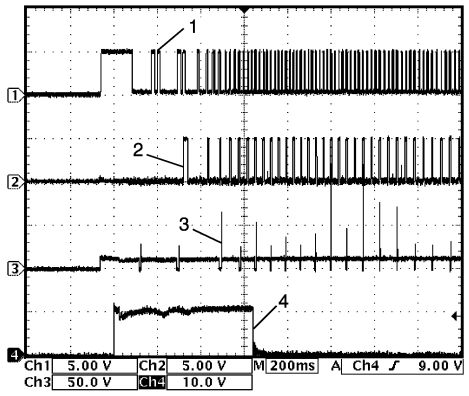
1.	Throttle actuator drive signal (“C37-45” terminal)
2.	Throttle actuator drive signal (“C37-44” terminal)
3.	ON signal
4.	OFF signal
5.	One duty cycle

Reference waveform No.32

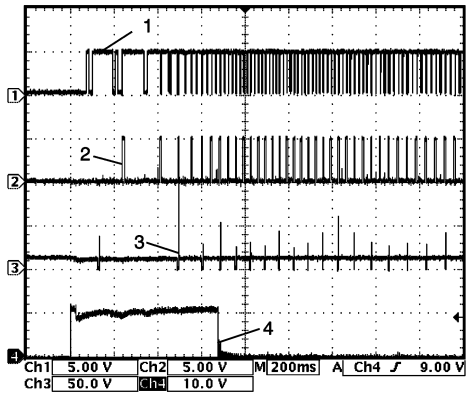
Ignition coil signal and fuel injector signal with engine cranking

Measurement terminal	CH1: “C37-20” to “C37-58” CH2: “C37-6” to “C37-58” CH3: “C37-1” to “C37-58” CH4: “C37-48” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV CH3: 50 V/DIV, CH4: 10 V/DIV TIME: 200 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at cranking

[A]



[B]



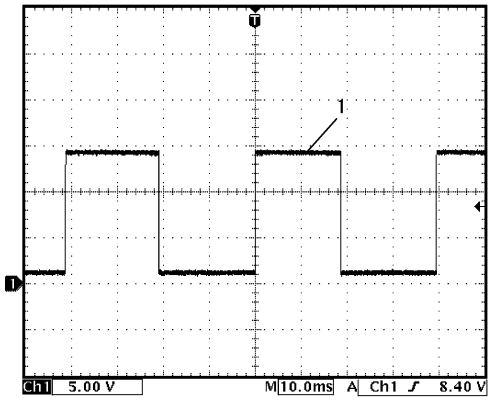
I4RS0B110083-01

[A]:	VVT model
[B]:	Non-VVT model
1.	Cylinder reference signal (CMP reference signal)
2.	Ignition coil No.1 and No.4 signal
3.	No.1 fuel injector signal
4.	Engine start signal

Reference waveform No.33

Generator field coil monitor signal (1) at engine idling (M16A engine)

Measurement terminal	CH1: “C37-8” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed • Lighting switch at CLEARANCE position

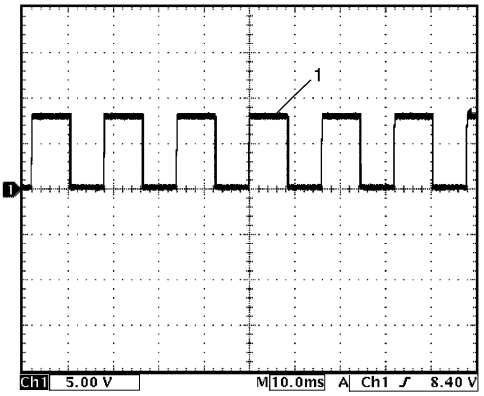


I5RS0C110016-01

Reference waveform No.34

Generator control signal (1) at engine idling (M16A engine)

Measurement terminal	CH1: “C37-28” to “C37-58”
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed • For a few sec. from headlight switch turned ON



I5RS0C110017-01

Resistance Check

1) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: M13A / M15A / M16A in Section 1C”.

⚠ CAUTION

Never touch terminals of ECM itself or connect voltmeter or ohmmeter (2).

2) Connect special tool to ECM connectors securely.

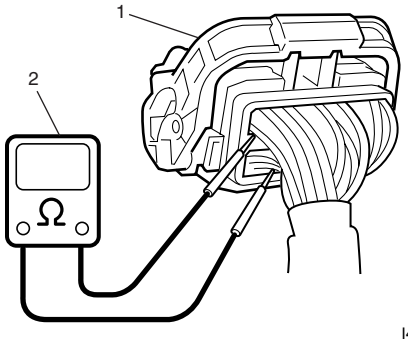
NOTE

Do not connect the other connector of special tool to ECM.

3) Check resistance between each pair of terminals of disconnected connectors (1) as listed in the following table.

⚠ CAUTION

- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in the following table represents that measured when parts temperature is 20 °C (68 °F).**



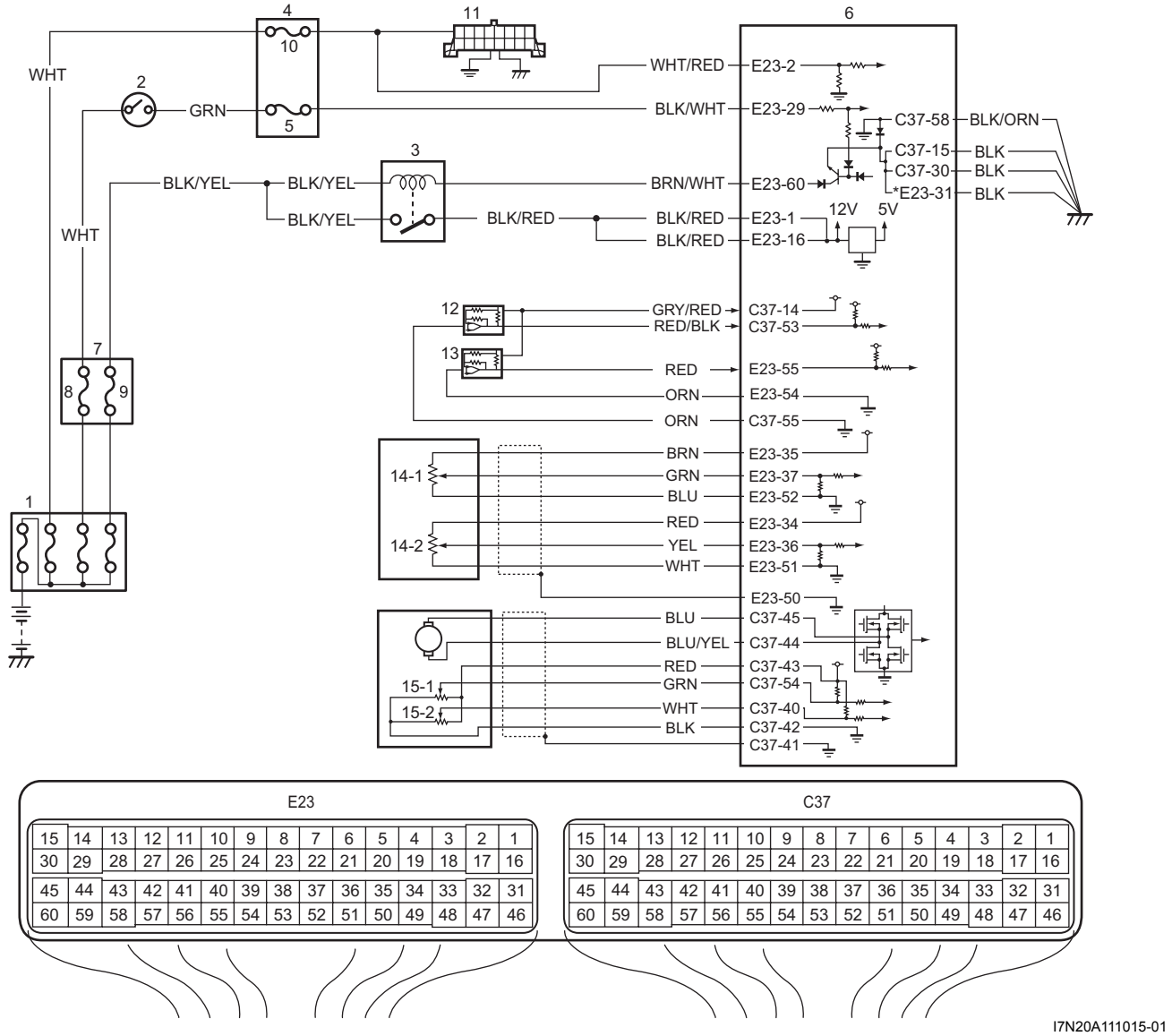
I4RS0A110086-02

Terminals	Circuit	Standard resistance	Condition
C37-47 to E23-29	Heater of HO2S-2	4 – 15 Ω	—
E23-46 to E23-1/16	Radiator cooling fan relay No.1	160 – 240 Ω	—
E23-60 to E23-29	Main relay	160 – 240 Ω	Battery disconnected and ignition switch turned ON
E23-15 to E23-29	Fuel pump relay	160 – 240 Ω	—
C37-16 to E23-1/16	No.3 fuel injector	10.8 – 18.2 Ω	—
C37-17 to E23-1/16	No.4 fuel injector		
C37-4 to E23-1/16	EGR valve (stepping motor No.1 coil)	20 – 31 Ω	—
C37-29 to E23-1/16	EVAP canister purge valve	28 – 35 Ω	—
C37-2 to E23-1/16	No.2 fuel injector	10.8 – 18.2 Ω	—
C37-3 to E23-1/16	EGR valve (stepping motor No.2 coil)	20 – 31 Ω	—
C37-18 to E23-1/16	EGR valve (stepping motor No.4 coil)		
C37-19 to E23-1/16	EGR valve (stepping motor No.3 coil)		
C37-46 to E23-29	Heater of HO2S-1	2 – 11 Ω	—
C37-1 to E23-1/16	No.1 fuel injector	10.8 – 18.2 Ω	—
E23-47 to E23-1/16	A/C compressor relay (A/C model)	160 – 240 Ω	—
C37-60 to C37-59	Oil control valve (VVT model)	6 – 15 Ω	—
E23-45 to E23-1/16	Throttle actuator control relay	160 – 240 Ω	—

ECM Power and Ground Circuit Check

S7N20A1114081

Wiring Diagram



I7N20A111015-01

1. Main fuse box	7. Individual circuit fuse box No.1	13. A/C refrigerant pressure sensor (A/C model)
2. Ignition switch	8. “IG ACC” fuse	14-1. Accelerator pedal position (APP) sensor (main)
3. Main relay	9. “FI” fuse	14-2. Accelerator pedal position (APP) sensor (sub)
4. BCM (included in junction block assembly)	10. “RADIO” fuse	15-1. TP sensor (main)
5. “IG COIL” fuse	11. DLC	15-2. TP sensor (sub)
6. ECM	12. MAP sensor	

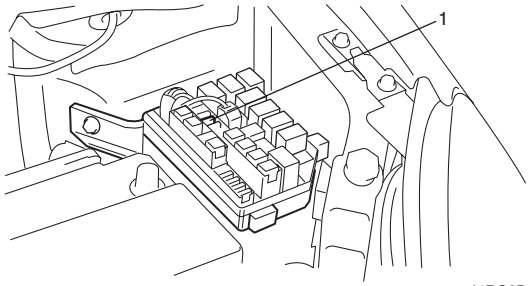
Circuit Description

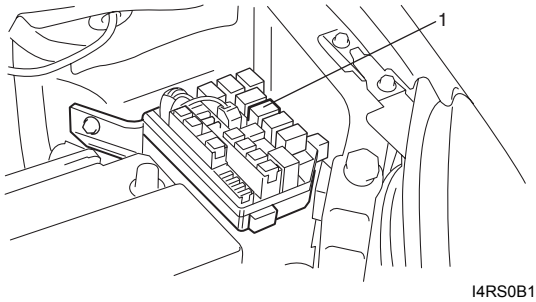
When the ignition switch is turned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM.

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	**Circuit fuse check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to ECM connector at "E23-2", "E23-29", "E23-60", "E23-1", "E23-16", "E23-31", "C37-58", "C37-15" and "C37-30" terminals. 3) If OK, check "RADIO" fuse and "IG COIL" fuse for blowing. *Are "RADIO" fuse and "IG COIL" fuse in good condition?*	Go to Step 2.	Replace fuse (s) and check for short in circuits connected to fuse(s).
2	**Power supply circuit check** 1) Measure voltage between "E23-2" terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	"WHT/RED" or "WHT" wire is open circuit.
3	**Ignition signal check** 1) Turn ignition switch to ON position. 2) Measure voltage between "E23-29" terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/WHT" or "GRN" wire is open circuit.
4	**Main relay circuit check** 1) Turn ignition switch to OFF position. 2) Check "FI" fuse (1) (15 A) in individual circuit fuse box No.1 for blowing.  I4RS0B110085-01 3) If OK, measure voltage between "E23-60" terminal of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 5.	Go to Step 9.
5	**Main relay circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Measure voltage between "E23-60" terminal of ECM connector and body ground. *Is voltage 0 – 1 V?*	Go to Step 7.	Go to Step 6.

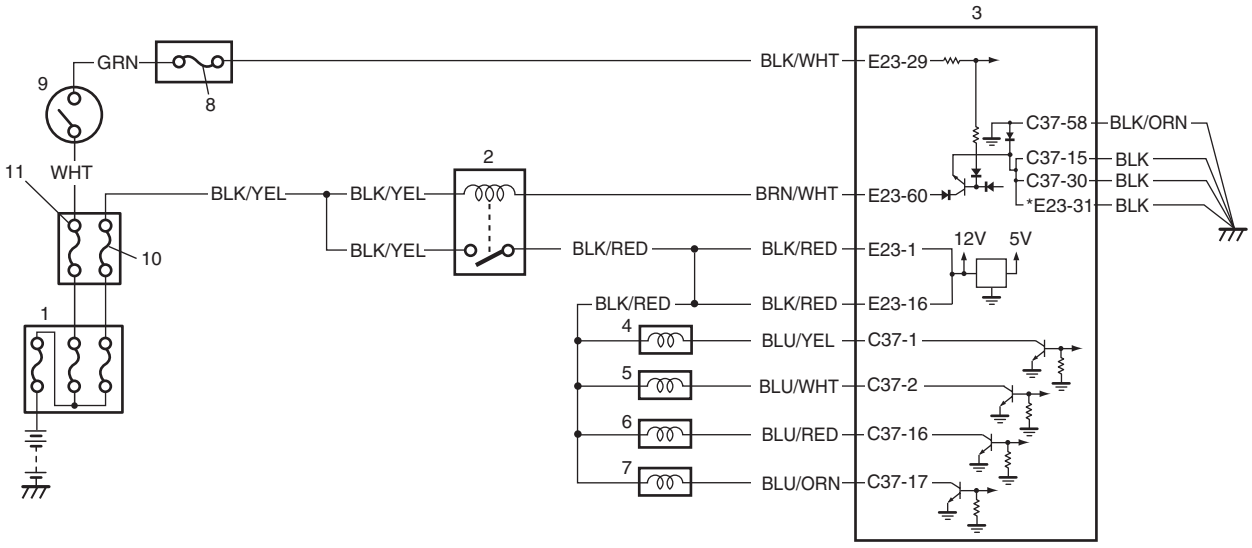
Step	Action	Yes	No
6	**ECM ground circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Measure resistance between each “E23-31”, “C37-58”, “C37-15” and “C37-30” terminals of ECM connector and body ground. *Is resistance 1 Ω or less?*	Substitute a known-good ECM and recheck.	“BLK/ORN” or “BLK” wire is open or high resistance circuit.
7	**Main relay circuit check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Using service wire, ground “E23-60” terminal of ECM connector and measure voltage between each “E23-1” and “E23-16” terminals of ECM connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 8.
8	**Main relay circuit check** 1) Remove main relay (1) from individual circuit fuse box No.1.  I4RS0B110086-01 2) Check for proper connection to main relay connector at “BLK/YEL” and “BLK/RED” wire terminals. 3) If OK, measure resistance between each “E23-1” and “E23-16” wire terminals of ECM connector and “BLK/RED” wire terminal of main relay connector. *Is resistance 1 Ω or less?*	Go to Step 9.	“BLK/RED” wire is open circuit or high resistance circuit.
9	**Main relay circuit check** 1) Remove main relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Measure voltage between “BLK/YEL” wire terminal of main relay connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 10.	“BLK/YEL” wire is open circuit.
10	**Main relay check** 1) Check main relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: M13A / M15A / M16A in Section 1C”. *Is main relay in good condition?*	“BRN/WHT” wire is open or high resistance circuit.	Replace main relay.

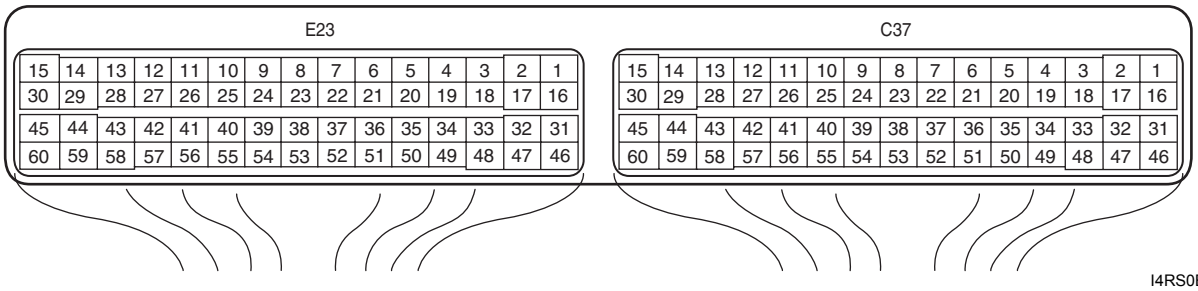
Step	Action	Yes	No
11	**Sensor power source circuit check** 1) Connect connectors to ECM with ignition switch turned OFF. 2) Turn ON ignition switch, measure each voltage between “C37-14”, “E23-35”, “E23-34” and “C37-43” terminal of ECM connector and vehicle body ground. *Is each voltage 4 – 6 V?*	ECM power and ground circuit is in good condition.	Go to Step 12.
12	**Sensor power source circuit check** 1) Disconnect connectors from ECM, TP sensor, MAP sensor, A/C refrigerant pressure sensor (A/C model) and accelerator pedal position (APP) sensor with ignition switch turned OFF. 2) Measure each resistance between “C37-14”, “E23-35”, “E23-34” and “C37-43” terminal of ECM connector and vehicle body ground. *Is each resistance infinity?*	Check internal short circuit of TP sensor, MAP sensor, A/C refrigerant pressure sensor (A/C model) and/or accelerator pedal position (APP) sensor.	“GRY/RED”, “BRN” and/or “RED” wire is shorted to ground circuit.

Fuel Injector Circuit Check

S7N20A1114082

Wiring Diagram





I4RS0B110087-02

1. Main fuse box	4. No.1 injector	7. No.4 injector	10. “FI” fuse
2. Main relay	5. No.2 injector	8. “IG COIL” fuse	11. “IG ACC” fuse
3. ECM	6. No.3 injector	9. Ignition switch	*: Electric throttle body model

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

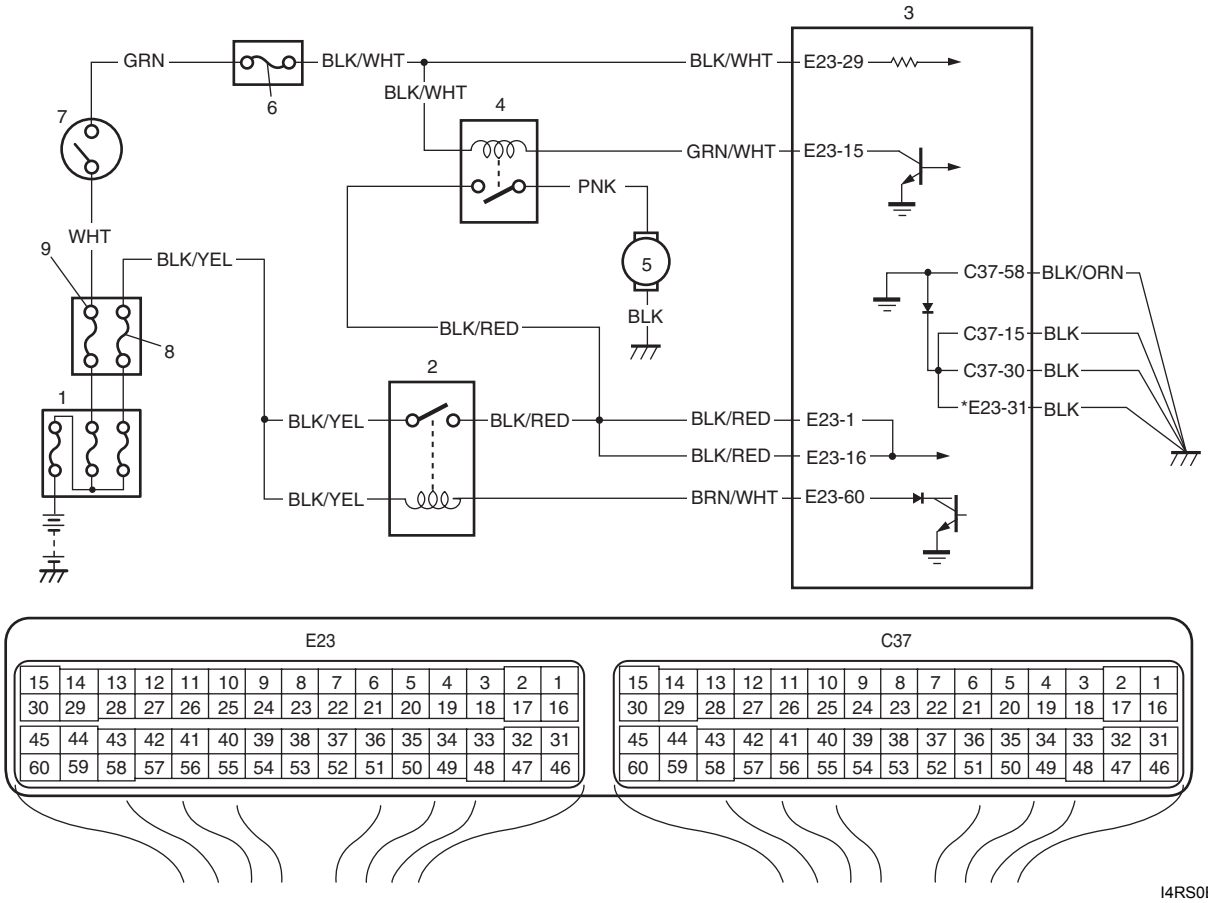
Step	Action	Yes	No
1	**Fuel injector check for operating sound** 1) Using sound scope, check each injector for operating sound at engine cranking. *Do all 4 injector make operating sound?*	Fuel injectors circuit is in good condition.	Go to Step 2.
2	**Fuel injector resistance check** 1) Disconnect connectors from fuel injectors with ignition switch turned OFF. 2) Check for proper connection to fuel injector at each terminals. 3) If OK, check all 4 fuel injectors for resistance referring to "Fuel Injector On-Vehicle Inspection: M13A / M15A / M16A in Section 1G". *Are all injectors in good condition?*	Go to Step 3.	Faulty fuel injector.
3	**Fuel injector insulation resistance check** 1) Check that there is insulation between each fuel injector terminal and engine ground. *Is there insulation?*	Go to Step 4.	Faulty fuel injector.
4	**Fuel injector power supply check** 1) Measure voltage between each "BLK/RED" wire terminal of fuel injector connector and engine ground with ignition switch turned ON. *Is voltage 10 – 14 V?*	Go to Step 5.	"BLK/RED" wire is open or shorted to ground circuit. If it is in good condition, go to "ECM Power and Ground Circuit Check: M13A / M15A / M16A".
5	**Wire circuit check** 1) Turn OFF ignition switch. 2) Disconnect connectors from ECM. 3) Measure resistance between each "BLU/YEL", "BLU/WHT", "BLU/RED", "BLU/ORN" wire terminal of fuel injector connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are shorted to ground.
6	**Wire circuit check** 1) Measure voltage between each "BLU/YEL", "BLU/WHT", "BLU/RED", "BLU/ORN" wire terminal of fuel injector connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	"BLU/YEL", "BLU/WHT", "BLU/RED" and/or "BLU/ORN" wire(s) are shorted to power supply circuit.

Step	Action	Yes	No
7	**Fuel injector drive signal check** 1) Connect connectors to each fuel injector and ECM with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Measure voltage between each “C37-1”, “C37-2”, “C37-16”, “C37-17” terminal of ECM connector and vehicle body ground. *Is voltage 10 – 14 V?*	Check fuel injector referring to “Fuel Injector Inspection: M13A / M15A / M16A in Section 1G”. If check result is satisfactory, substitute a known-good ECM and recheck.	“BLU/YEL”, “BLU/WHT”, “BLU/RED” and/or “BLU/ORN” wire(s) are open circuit.

Fuel Pump and Its Circuit Check

S7N20A1114083

Wiring Diagram



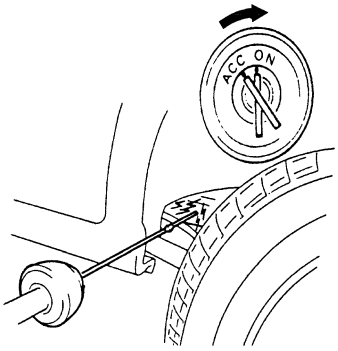
I4RS0B110088-02

1. Main fuse box	4. Fuel pump relay	7. Ignition switch	*: Electric throttle body model
2. Main relay	5. Fuel pump	8. “FI” fuse	
3. ECM	6. “IG COIL” fuse	9. “IG ACC” fuse	

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	**Fuel pump control system check for operation** *Is fuel pump heard to operate 2 sec. after ignition switch is turned ON?*  I2RH01110132-01	Fuel pump circuit is in good condition.	Go to Step 2.
2	**Fuel pump relay power supply check** 1) Disconnect fuel pump relay from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Check for proper connection to fuel pump relay at each terminal. 3) If OK, turn ON ignition switch, measure voltage between "BLK/WHT" wire terminal of fuel pump relay connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 3.	"BLK/WHT" wire is open or shorted to ground circuit.
3	**Fuel pump relay power supply check** 1) Turn ON ignition switch, measure voltage between "BLK/RED" wire terminal of fuel pump relay connector and engine ground. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLK/RED" wire is open circuit.
4	**Fuel pump relay check** 1) Check fuel pump relay referring to "Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: M13A / M15A / M16A in Section 1C". *Is relay in good condition?*	Go to Step 5.	Faulty relay.

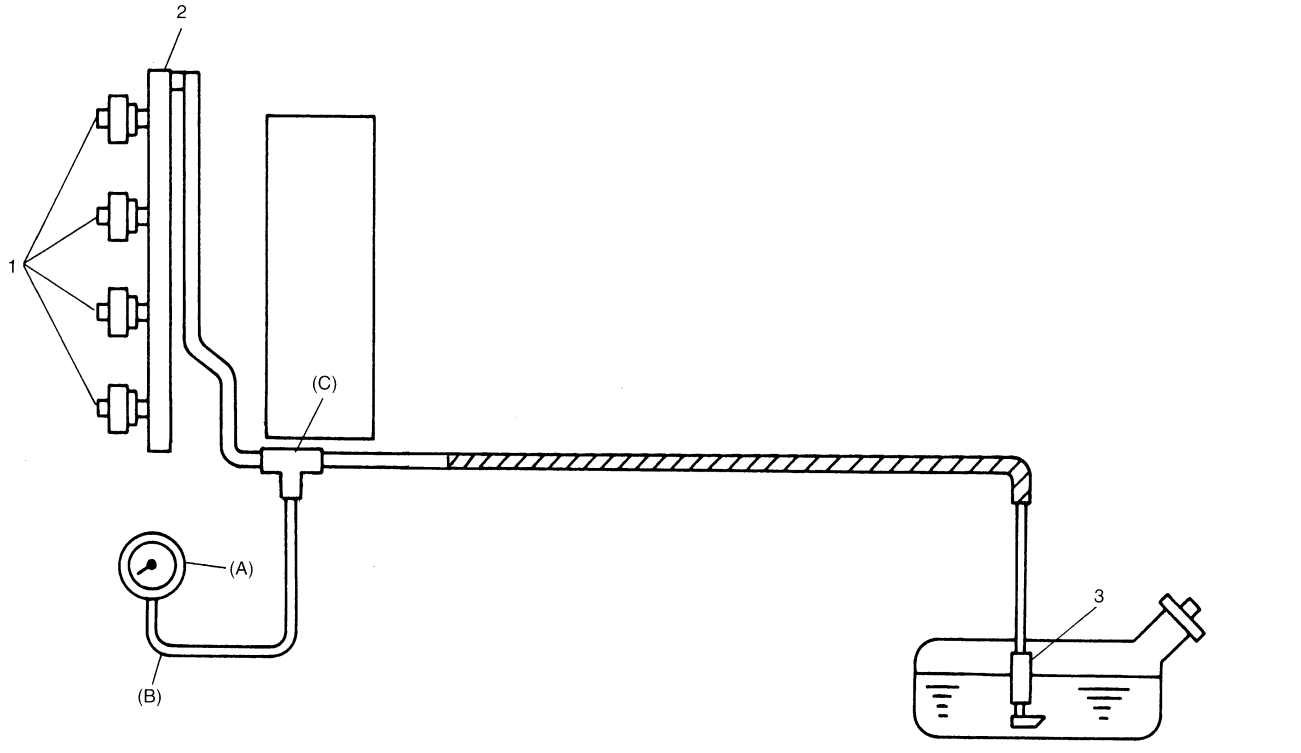
Step	Action	Yes	No
5	**Fuel pump relay drive signal check** 1) Connect fuel pump relay to individual circuit fuse box No.1. 2) Connect voltmeter between “E23-15” terminal of ECM connector and vehicle body ground. 3) Measure voltage 2 second after ignition switch is turned ON. *Is voltage 10 – 14 V?*	Go to Step 6.	“GRN/WHT” wire is open circuit or shorted to ground circuit.
6	**Fuel pump relay drive signal check** 1) Measure voltage within 2 second after ignition switch is turned ON. *Is voltage 0 – 1 V?*	Go to Step 7.	Substitute a known-good ECM and recheck.
7	**Wire circuit check** 1) Turn OFF ignition switch. 2) Detach fuel tank referring to “Fuel Tank Removal and Installation: M13A / M15A / M16A in Section 1G”. 3) Disconnect connector from fuel pump. 4) Measure resistance between “PNK” wire terminal of fuel pump connector and vehicle body ground. *Is resistance infinity?*	Go to Step 8.	“PNK” wire is shorted to ground.
8	**Fuel pump circuit check** 1) Connect service wire between “E23-15” terminal of ECM connector and vehicle body ground. 2) Turn ON ignition switch, measure voltage between “PNK” terminal at fuel pump connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 9.	“PNK” wire is open circuit.
9	**Fuel pump circuit check** 1) Turn OFF ignition switch. 2) Measure resistance between “BLK” wire terminal at fuel pump connector and vehicle body ground. *Is resistance less than 5 Ω?*	Faulty fuel pump.	“BLK” wire is open circuit.

Fuel Pressure Check

S7N20A1114084

System Diagram

Special tool
(A): 09912–58442
(B): 09912–58432
(C): 09912–58490



I3RM0A110081-01

1.	Injector
2.	Delivery pipe
3.	Fuel filter and fuel pump

Troubleshooting

NOTE

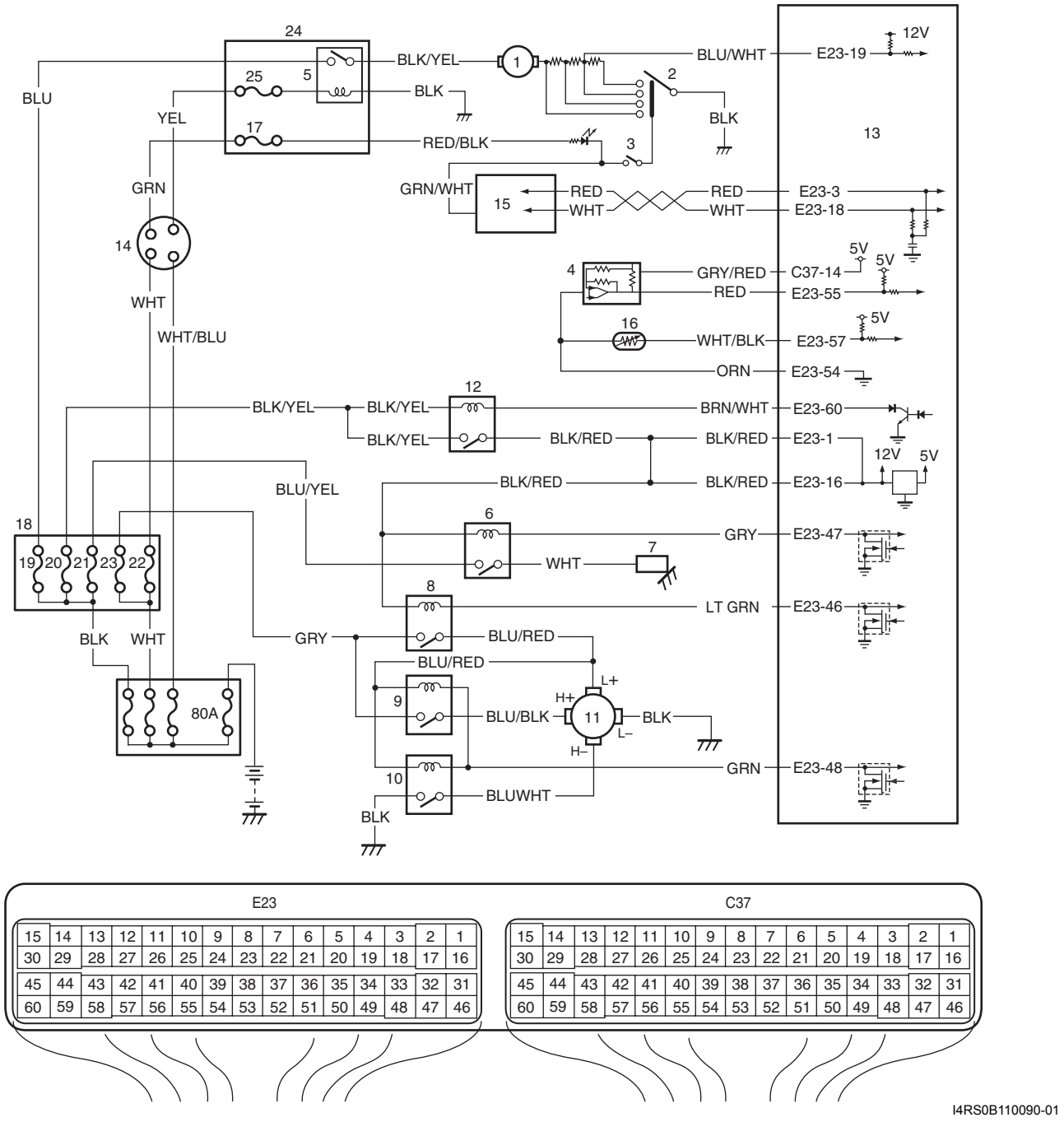
Before using following flow, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.

Step	Action	Yes	No
1	**Fuel pressure check** 1) Check fuel pressure referring to "Fuel Pressure Inspection: M13A / M15A / M16A in Section 1G". *Is check result satisfactory?*	Go to Step 2.	Go to Step 5.
2	**Fuel pressure check** 1) Start engine and warm it up to normal operating temperature. 2) Keep engine speed at 4000 rpm. *Does fuel pressure show about the same value as Step 1?*	Go to Step 3.	Go to Step 8.
3	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for fuel leakage. *Are they in good condition?*	Go to Step 4.	Repair or replace defective part.
4	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Faulty fuel pressure regulator.	Repair or replace damaged or damaged part.
5	*Was fuel pressure higher than specification in Step 1?*	Go to Step 6.	Go to Step 7.
6	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Faulty fuel pressure regulator.	Repair or replace damaged or damaged part.
7	**Fuel pump operating sound check** 1) Remove fuel filler cap and then turn ON ignition switch. *Can you hear operating sound?*	Go to Step 8.	Faulty fuel pump.
8	**Fuel line check** 1) Check fuel pipe, fuel hose and joint for damage or deform. *Are they in good condition?*	Clogged fuel filter, faulty fuel pump, faulty fuel pressure regulator or fuel leakage from hose connection in fuel tank.	Repair or replace defective part.

A/C System Circuits Check

S7N20A1114086

Wiring Diagram



I4RS0B110090-01

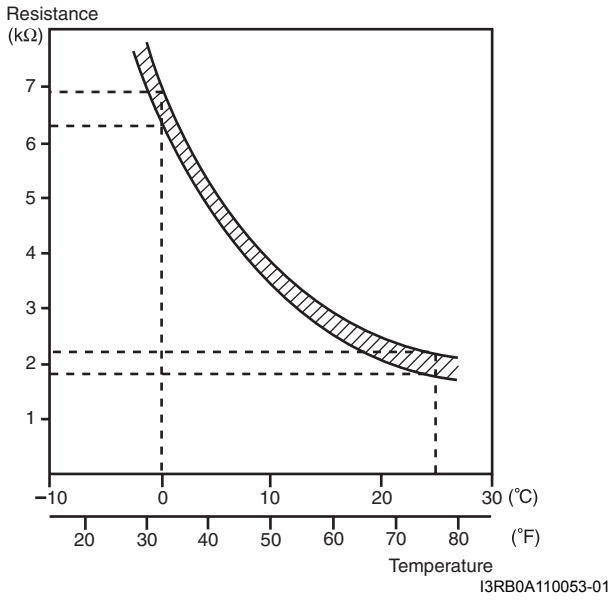
1. Blower fan motor	8. Radiator cooling fan motor relay No.1	15. BCM	22. “IG ACC” fuse
2. Blower fan switch	9. Radiator cooling fan motor relay No.2	16. Evaporator outlet air temp. sensor	23. “RDTR FAN” fuse
3. A/C switch	10. Radiator cooling fan motor relay No.3	17. “BACK” fuse	24. Junction block assembly
4. A/C refrigerant pressure sensor	11. Radiator cooling fan motor	18. Individual circuit fuse box No.1	25. “IG2 SIG” fuse
5. Blower motor relay	12. Main relay	19. “HTR FAN” fuse	
6. Compressor relay	13. ECM	20. “FI” fuse	
7. A/C compressor	14. Ignition switch	21. “A/C COMP” fuse	

Troubleshooting

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**
- **When A/C evaporator outlet air temp. is below 2.5 °C (36.5 °F), A/C remains OFF ("E23-47" terminal voltage becomes 10 – 14 V). This condition is not abnormal.**

Step	Action	Yes	No
1	**Reception data check from BCM** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check DTC for reception data from BCM. *Is there DTC P1678?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**A/C switch signal circuit check** 1) Start engine and select "DATA LIST" mode on scan tool. 2) Check A/C switch signal under following conditions respectively. **A/C switch signal** **Engine running, A/C switch OFF: OFF** **Engine running, A/C switch ON and blower speed selector turned 1st position or more: ON** *Is check result satisfactory?*	Go to Step 3.	Check A/C switch circuit.
3	**DTC check of ECT sensor circuit** 1) Check ECM for DTC of ECT sensor circuit. *Is there DTC P0116, DTC P0117 or DTC P0118?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**Radiator cooling fan control system check** *Is radiator cooling fan started when A/C and blower speed selector switch are turned ON with engine running?*	Go to Step 10.	Go to Step 5.
5	**Radiator cooling fan control circuit check** 1) Check DTC with scan tool. *Is DTC P0480 displayed?*	Go to "DTC P0480: Fan 1 (Radiator Cooling Fan) Control Circuit: M13A / M15A / M16A".	Go to Step 6.

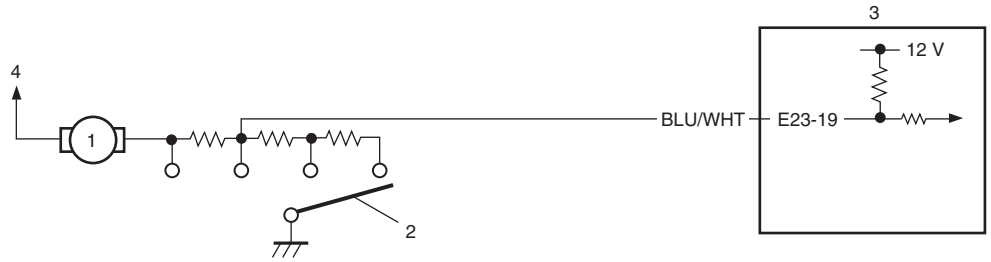
Step	Action	Yes	No
6	**A/C evaporator outlet air temp. sensor check** 1) Disconnect connectors from ECM with ignition switch turned OFF. 2) Check for proper connection to “E23-57” and “E23-54” wire terminals of ECM connector. 3) If OK, measure resistance between “E23-57” and “E23-54” wire terminals of ECM connector. **Evaporator temp. sensor resistance** **At 0 °C: 6.3 – 6.9 kΩ** **At 25 °C: 1.8 – 2.2 kΩ**  *Is resistance within specification?*	Go to Step 7.	Faulty A/C evaporator outlet air temp. sensor or its circuit.
7	**DTC check of A/C refrigerant pressure sensor circuit** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch. 3) Check ECM for DTC of A/C refrigerant pressure sensor circuit. *Is there DTC P0532 or DTC P0533?*	Go to applicable DTC diag. flow.	Go to Step 8.
8	**A/C refrigerant pressure sensor voltage check** 1) Check A/C refrigerant pressure sensor voltage referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A”. *Is voltage within specified value?*	Go to Step 9.	Check amount of refrigerant. If OK, replace A/C refrigerant pressure sensor.
9	**Radiator cooling fan check** 1) Check radiator cooling fan referring to “Radiator Cooling Fan Motor On-Vehicle Inspection: M13A / M15A / M16A in Section 1F”. *Is check result satisfactory?*	Radiator cooling fan drive circuit malfunction. If circuit is OK, go to Step 6.	Replace radiator cooling fan motor.
10	**A/C compressor control system check** *Is A/C compressor started when A/C and blower speed selector switch are turned ON with engine running?*	A/C system is in good condition.	Go to Step 11.

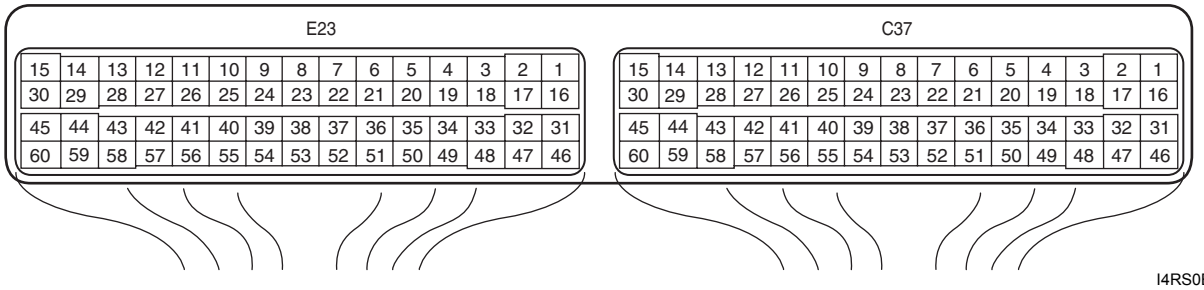
Step	Action	Yes	No
11	**A/C compressor relay circuit check** 1) Measure voltage between “E23-47” wire terminal of ECM connector and vehicle body ground under following conditions respectively. **Voltage between “E23-47” terminal of ECM connector and ground** **While engine running and A/C switch turned OFF: 10 – 14 V** **While engine running, A/C and blower speed selector switch turned ON: 0 – 1 V** *Is check result satisfactory?*	Go to Step 12.	Go to Step 13.
12	**A/C compressor relay check** 1) Check A/C compressor relay referring to “Compressor Relay Inspection: Manual A/C in Section 7B”. *Is it in good condition?*	A/C compressor drive circuit malfunction.	Replace A/C compressor relay.
13	**A/C compressor relay circuit check** 1) Remove A/C compressor relay with ignition switch turned OFF. 2) Turn ON ignition switch, measure voltage between “BLK/RED” wire terminal of A/C compressor relay connector and vehicle body ground. *Is voltage 10 –14 V?*	Go to Step 14.	“BLK/RED” wire is open circuit.
14	**A/C compressor relay check** 1) Check A/C compressor relay referring to “Compressor Relay Inspection: Manual A/C in Section 7B”. *Is it in good condition?*	“GRY” wire is open circuit. If OK, substitute a known-good ECM and recheck.	Replace A/C compressor relay.

Electric Load Signal Circuit Check

S7N20A1114087

Wiring Diagram





I4RS0B110091-01

1. Blower fan motor	3. ECM
2. Blower fan switch	4. To blower motor relay

Troubleshooting

NOTE

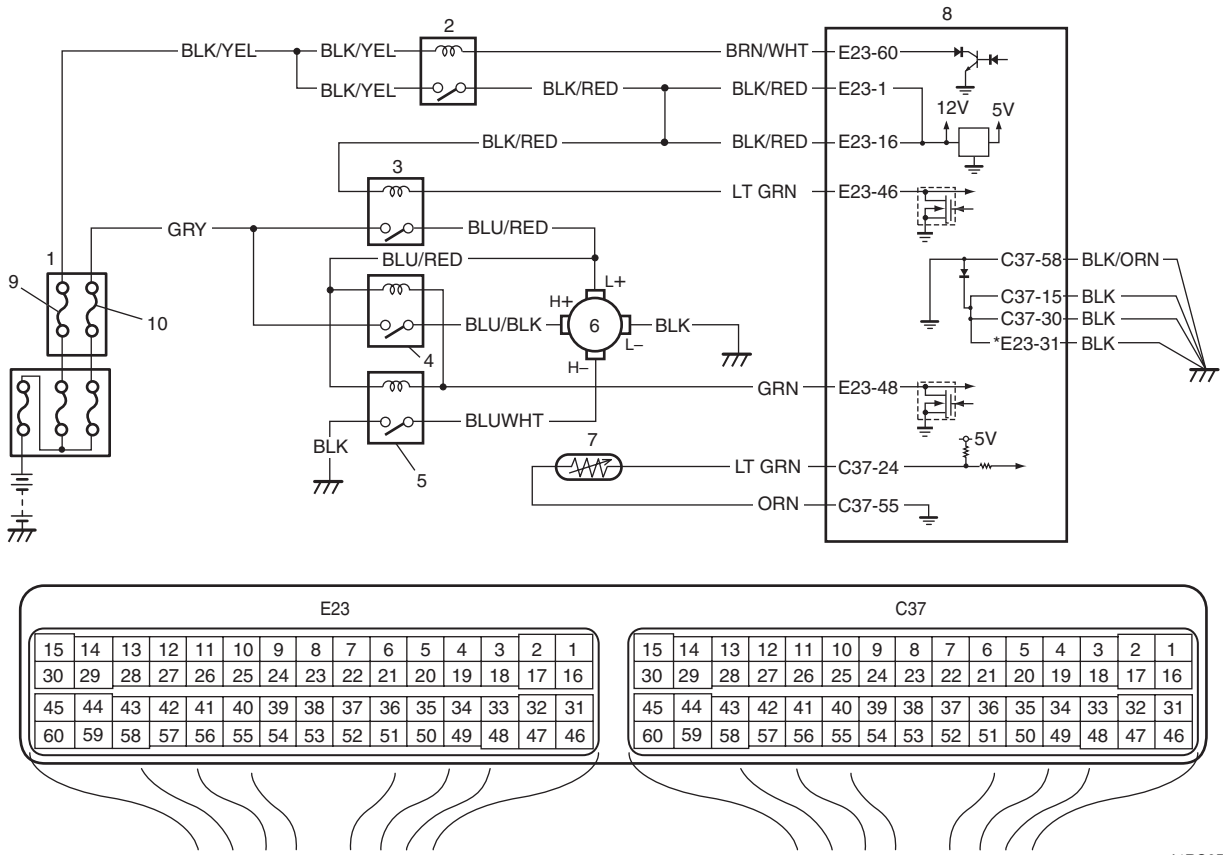
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	*Do you have SUZUKI scan tool?*	Go to Step 2.	Go to Step 3.
2	**Electric load signal circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Check electric load signal under following conditions respectively. **Electric load signal** **Ignition switch turned ON, blower speed selector turned OFF or 1st position: OFF** **Ignition switch turned ON, blower speed selector turned to 3rd position or more: ON** *Is check result satisfactory?*	Electric load signal circuit is in good condition.	"BLU/WHT" wire is open or short circuit, or blower circuit malfunction.
3	**Electric load signal circuit check** 1) Turn ON ignition switch. 2) Check voltage at terminal "E23-19" of ECM connector connected, under following conditions respectively. **Voltage at "E23-19"** **Ignition switch turned ON, blower speed selector turned OFF or 1st position: 10 – 14 V** **Ignition switch turned ON, blower speed selector turned to 3rd position or more: 0 V** *Is each voltage as specified?*	Electric load signal circuit is in good condition.	"BLU/WHT" wire is open or short circuit, or electric load circuit malfunction.

Radiator cooling fan Low Speed Control System Check

S7N20A1114088

Wiring Diagram



I4RS0B110036-02

1. Individual circuit fuse box No.1	5. Radiator cooling fan relay No. 3	9. “FI” fuse
2. Main relay	6. Radiator cooling fan motor	10. “RDTR FAN” fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	*: Electric throttle body model
4. Radiator cooling fan relay No. 2	8. ECM	

Troubleshooting

⚠ WARNING

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

NOTE

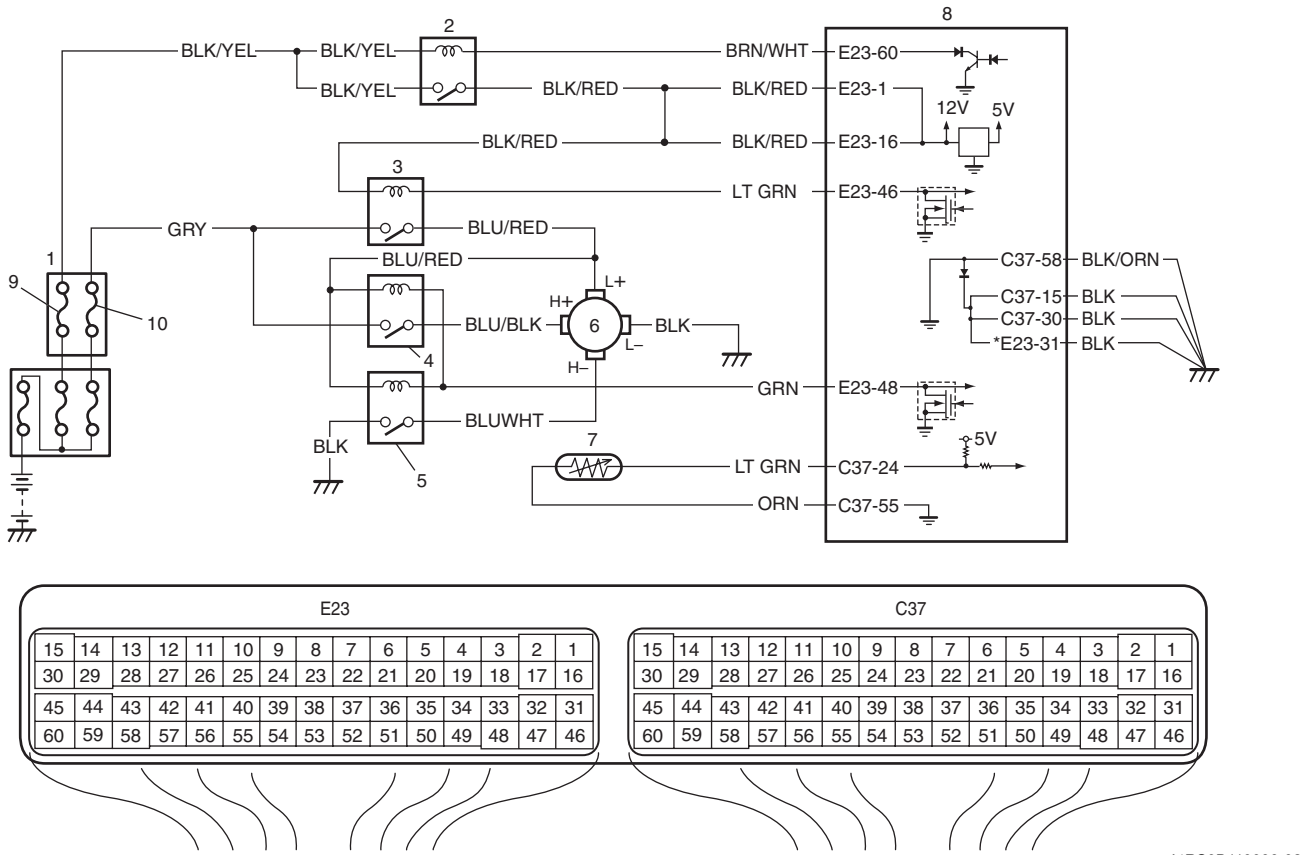
- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	*Is there DTC(s) of ECT sensor circuit (DTC P0116 / P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?*	Go to corresponding DTC flow.	Go to Step 2.
2	**Low speed radiator cooling fan control circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select "DATA LIST" mode on scan tool. 3) Warm up engine until coolant temp. is 97.5 °C, 207.5 °F or higher and A/C switch turns OFF (A/C model). (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?*	Radiator cooling fan low speed control system is in good condition.	Perform from Step 2 to Step 8 in DTC P0480 diag. flow. If OK, Go to Step 3.
3	**Radiator cooling fan control check** 1) Disconnect radiator cooling fan control relays No. 2, and No. 3 from individual circuit fuse box No.1 with ignition switch turned OFF. 2) Run engine when ECT is over 97.5 °C, 207.5 °F. 3) Measure voltage between vehicle body ground and "BLU/RED" wire terminal of disconnected radiator cooling fan motor connector. *Is voltage 10 – 14 V?*	Go to Step 4.	"BLU/RED" wire is open or high resistance circuit.
4	**Check radiator cooling fan wire circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "BLK" wire terminal of disconnected radiator cooling fan motor connector and vehicle body ground. *Is resistance below 1 Ω?*	Go to Step 5.	"BLK" wire is open or high resistance circuit.
5	**Radiator cooling fan check** 1) Check radiator cooling fan referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: M13A / M15A / M16A in Section 1F". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Radiator cooling fan High Speed Control System Check

S7N20A1114089

Wiring Diagram



I4RS0B110036-02

1. Individual circuit fuse box No.1	5. Radiator cooling fan relay No. 3	9. "FI" fuse
2. Main relay	6. Radiator cooling fan motor	10. "RDTR FAN" fuse
3. Radiator cooling fan relay No. 1	7. ECT sensor	*: Electric throttle body model
4. Radiator cooling fan relay No. 2	8. ECM	

Troubleshooting

⚠ WARNING

Keep hands, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch at the "ON" position.

NOTE

- **Before performed trouble shooting, be sure to read the "Precautions of ECM Circuit Inspection: M13A / M15A / M16A".**
- **When measuring circuit voltage, resistance and/or pulse signal at ECM connector, connect the special tool to ECM and/or the ECM connectors referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A".**

Step	Action	Yes	No
1	*Is there DTC(s) of ECT sensor circuit (DTC P0116 / P0117 / P0118) and/or radiator cooling fan circuit (DTC P0480)?*	Go to corresponding DTC flow.	Go to Step 2.
2	**Low speed radiator cooling fan control circuit check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Warm up engine until coolant temp. is 97.5 °C, 207.5 °F or higher and A/C switch turns OFF (A/C model). (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at low speed when engine coolant temp. reached above temp.?*	Go to Step 3.	Perform from Step 2 to Step 5 in “Radiator cooling fan Low Speed Control System Check: M13A / M15A / M16A”.
3	**High speed radiator cooling fan control circuit check** 1) Start engine and select “DATA LIST” mode on scan tool. 2) Warm up engine until coolant temp. is 102.5 °C, 216.5 °F or higher and A/C switch turns OFF (A/C model). (If engine coolant temp. dose not rise, check engine cooling system or ECT sensor.) *Is radiator cooling fan started at high speed when engine coolant temp. reached above temp?*	Radiator cooling fan control system is in good condition.	Perform from Step 9 to Step 14 in DTC P0480 diag. flow. If OK, Go to Step 4.
4	**Radiator cooling fan control No. 2 and No. 3 check** 1) Run engine when ECT is over 102.5 °C, 216.5 °F. 2) Measure voltage between vehicle body ground and “E23-48” terminal of ECM connector. *Is voltage lower than 1.5 V?*	Go to Step 5.	Faulty ECM.
5	**Radiator cooling fan No. 2 wire circuit check** 1) Remove radiator cooling fan control relay No.2 with ignition switch turned OFF. 2) Measure voltage between “GRY” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 6.	“GRY” wire is open or high resistance circuit.
6	**Radiator cooling fan No. 2 wire circuit check** 1) Disconnect connector from radiator cooling fan motor with ignition switch turned OFF. 2) Measure resistance between “BLU/BLK” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is resistance infinity?*	Go to Step 7.	“BLU/BLK” wire is shorted to ground circuit.
7	**Radiator cooling fan No. 2 wire circuit check** 1) Turn ON ignition switch. 2) Measure voltage between “BLU/BLK” wire terminal of disconnected radiator cooling fan control relay No. 2 connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 8.	“BLU/BLK” wire is shorted to power supply circuit.

Step	Action	Yes	No
8	**Radiator cooling fan control No. 2 check** 1) Connect radiator cooling fan control relay No. 2 to individual circuit fuse box No.1 with ignition switch turned OFF. 2) Run engine when ECT is over 102.5 °C, 216.5 °F. 3) Measure voltage between vehicle body ground and "BLU/BLK" wire terminal of disconnected radiator cooling fan motor connector. *Is voltage 10 – 14 V?*	Go to Step 10.	Go to Step 9.
9	**Radiator cooling fan control relay No.2 check** 1) Remove radiator cooling fan control relay No.2 with ignition switch turned OFF. 2) Check radiator cooling fan control relay No.2 referring to "Radiator Cooling Fan Relay Inspection: M13A / M15A / M16A in Section 1F". *Is it in good condition?*	"BLU/BLK" wire is open or high resistance circuit.	Faulty radiator cooling fan control relay No.2.
10	**Radiator cooling fan No. 3 wire circuit check** 1) Remove radiator cooling fan control relay No.3 with ignition switch turned OFF. 2) Measure resistance between vehicle body ground and "BLK" wire terminal of disconnected radiator cooling fan control relay No. 3 connector in individual circuit fuse box No.1. *Is resistance below 1 Ω?*	Go to Step 11.	"BLK" wire is open or high resistance circuit.
11	**Radiator cooling fan control No. 3 check** 1) Connect radiator cooling fan control relay No. 3 to individual circuit fuse box No.1 with ignition switch turned OFF. 2) Run engine when ECT is over 102.5 °C, 216.5 °F. 3) Measure resistance between vehicle body ground and "BLU/WHT" wire terminal of disconnected radiator cooling fan motor connector. *Is resistance below 2 Ω?*	Go to Step 13.	Go to Step 12.
12	**Radiator cooling fan control relay No. 3 check** 1) Remove radiator cooling fan control relay No.3 with ignition switch turned OFF. 2) Check radiator cooling fan control relay No.3 referring to "Radiator Cooling Fan Relay Inspection: M13A / M15A / M16A in Section 1F". *Is it in good condition?*	"BLU/WHT" wire is open or high resistance circuit.	Faulty radiator cooling fan control relay No.3.
13	**Radiator cooling fan check** 1) Check radiator cooling fan referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: M13A / M15A / M16A in Section 1F". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Faulty radiator cooling fan.

Repair Instructions

Idle Speed and IAC Throttle Valve Opening Inspection

S7N20A1116002

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 accessories (wipers, heater, lights, A/C, etc.) are out of service.
- Air cleaner has been properly installed and is in good condition.
- No abnormal air drawn in from air intake system.

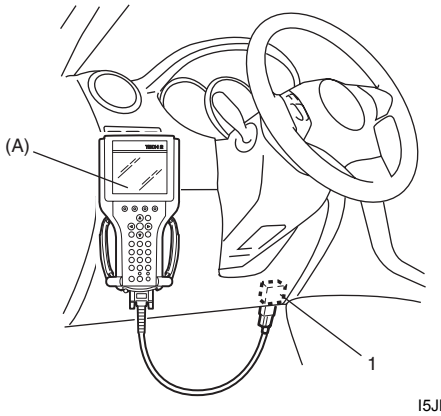
After all items are confirmed, check idle speed and IAC throttle opening as follows.

NOTE

Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "N" range for A/T and Automated Manual Transaxle model), and set parking brake and block drive wheels.

1) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool



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2) Warm up engine to normal operating temperature.
3) Check engine idle speed and "IAC throttle opening" by using "Data List" mode on scan tool to check "IAC throttle opening".
4) If check result is out of specification, inspect electric throttle body assembly referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C".

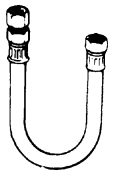
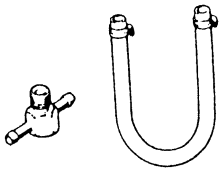
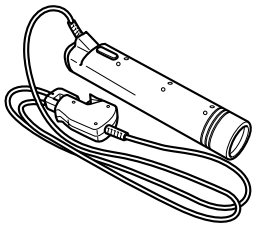
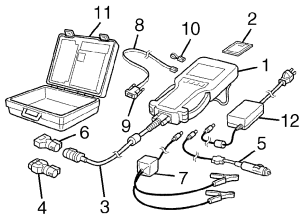
Engine idle speed
For Automated Manual Transaxle model and M16 engine:
- **A/C OFF: 700 ± 50 rpm (IAC throttle opening: 5 – 55%)**
- **A/C ON: 850 ± 50 rpm**

5) Check that specified engine idle speed is obtained with A/C turned ON if vehicle is equipped with A/C. If not, check A/C system.

Special Tools and Equipment

Special Tool

S7N20A1118001

09912–58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413).☞ 	09912–58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413).☞ 
09912–58490 3-way joint & hose ☞ 	09930–76420 Timing-light (dry cell type) ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞ 	

D13A / Z13DTJ

Precautions

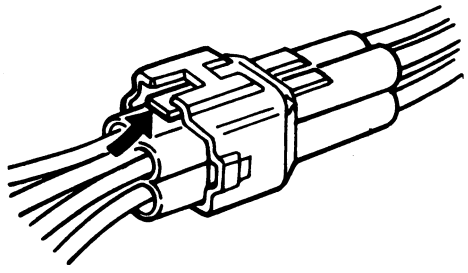
Precautions on Engine Service

S7N20A1120001

⚠ 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 possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, air cleaner outlet hose, turbocharger, intercooler, intercooler outlet hose 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 couplers, don't pull wire harness but make sure to hold coupler itself. With lock type coupler, be sure to unlock before disconnection. Attempt to disconnect coupler without unlocking may result in damage to coupler. When connecting lock type coupler, insert it till clicking sound is heard and connect it securely.



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Precautions in Diagnosing Trouble

S7N20A1120002

- Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming diagnostic information (DTC) stored in ECM memory.
  Such disconnection will erase memorized information in ECM memory.
- Diagnostic information stored in ECM memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00" before inspection and observe what is written there.
- Replacement of the ECM
  Before replacement of the ECM, save the data of vehicle information (injector calibration code) into SUZUKI scan tool from ECM according to procedure described in "ECM Registration: D13A / Z13DTJ in Section 1C".
- ECM registration:
  If ECM is replaced with new one or with substitute one, register vehicle information (fuel injector calibration code, DPF®and vehicle variant data) and immobilizer system data (password and secret key code) into ECM referring to "ECM Registration: D13A / Z13DTJ in Section 1C".
- Communication of ECM, BCM, ABS / ESP® control module, steering angle sensor (ESP® model) and combination meter, is established by CAN. (For more detail of CAN communication for ECM, refer to "CAN Communication System Description: D13A / Z13DTJ").
  Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00".

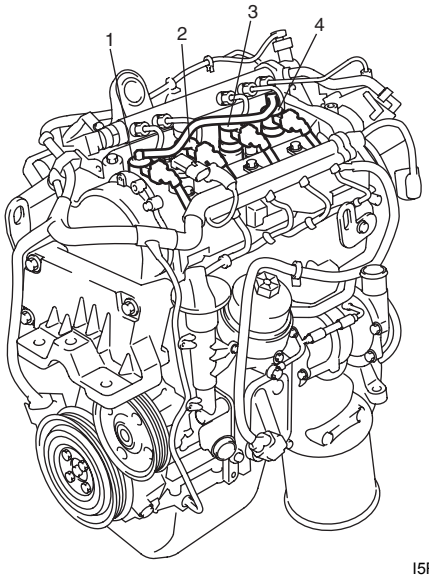
General Description

Statement on Cleanliness and Care

S7N20A1121006

An automobile engine is a combination of many machined, honed, polished and lapped surfaces with tolerances that are measured in the thousands of an millimeter (ten thousands of 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, connecting rod bearings, and crankshaft main bearings are removed for service, they should be retained in order.
  At the time of installation, they should be installed in the same 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 four cylinders of the engine are identified by numbers; No.1 (1), No.2 (2), No.3 (3) and No.4 (4) as counted from crankshaft pulley side to flywheel side.



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Engine Diagnosis General Description

S7N20A1121002

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: D13A / Z13DTJ” and each item in “Precautions in Diagnosing Trouble: D13A / Z13DTJ” and execute diagnosis according to “Engine and Emission Control System Check: D13A / Z13DTJ”. There is a close relationship between the engine mechanical, engine cooling 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 or SVS light doesn’t turn ON, it should be diagnosed according to this flow table.

OBD System Description

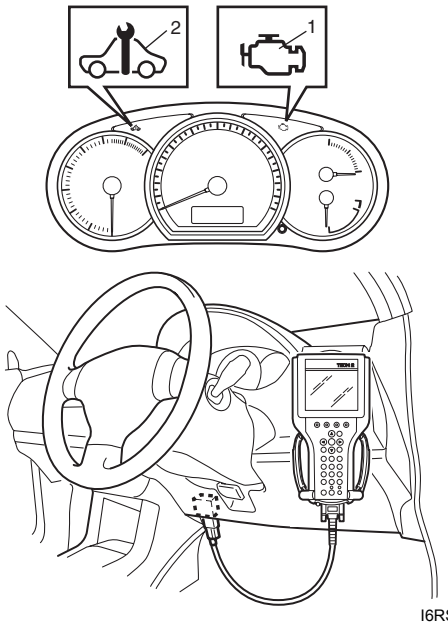
S7N20A1121003

ECM in this vehicle has the following functions.

- When the ignition switch is turned ON with the engine at a stop, MIL (1) and SVS light (2) are operated as follows in order to check MIL, SVS light and its circuit.
  – MIL: ON continuously
  – SVS light: ON for 3 seconds

NOTE

If SVS light stays ON over 3 seconds or flashing when IG switch is turned ON with the engine at a stop, ECM or immobilizer control module have detected some trouble.



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- When ECM detects a malfunction which gives an adverse effect to vehicle emission while the engine is running, it makes the MIL in the meter cluster of the instrument panel turn ON and stores the malfunction area in its memory.
- When ECM detects a malfunction which is no effect on vehicle emission, it makes the SVS light in the meter cluster of the instrument panel turn ON and store the malfunction area in its memory.
- As a condition for detecting a malfunction in some areas in the system being monitored by ECM and turning on MIL or SVS light due to that malfunction, 2 driving cycle or 3 driving cycle detection logic is adopted to prevent erroneous detection.

NOTE

When SVS light flashes, ECM or immobilizer control module has detected some trouble in the immobilizer control system.

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).

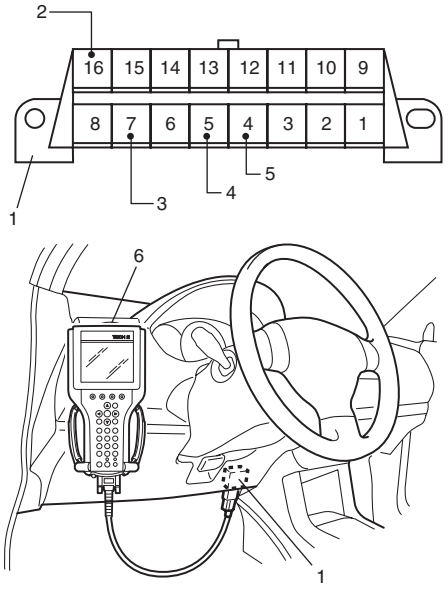
Driving Cycle
A “driving cycle” consists of two parts, engine startup and engine shutoff.

2 Driving Cycle Detection Logic
The malfunction detected in the first driving cycle is stored in ECM memory (in the form of pending DTC) but the MIL does not light at this time.
It lights up at the second detection of the same malfunction also in the next driving cycle.

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 the MIL does not light at this time.
The MIL does not light up at the second detection of the same malfunction also in the second driving cycle. The MIL lights up at the third detection of the same malfunction also in the third driving cycle.

Pending DTC
Pending DTC means a DTC detected and stored temporarily at first or second driving cycle of the DTC which is detected in the 2 or 3 driving cycle detection logic.

DLC
DLC (1) is in compliance with SAE J1962 in its installation position, the shape of connector and pin assignment.
K line (3) of ISO 9141 is used for SUZUKI scan tool (6) or generic scan tool to communicate with ECM, immobilizer control module, BCM, P/S control module and SDM.



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2.	B+ (Continuously battery power)
4.	ECM ground (Signal ground)
5.	Vehicle body ground (Chassis ground)

CAN Communication System Description

S7N20A1121007

ECM, BCM, ABS / ESP® control module steering angle sensor, keyless start control module and combination meter of this vehicle communicate control data between each control module.
Communication of each control module is established by CAN communication system.
CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a function to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. ECM communicates control data with each control module as follows.

ECM Transmission Data

Transmits data of ECM	BCM	Combination meter	ABS control module	ESP® control module	Keyless start control module
Engine speed signal	○	○		○	
Engine coolant temperature signal	○	○			
Vehicle speed signal	○	○			○
Engine oil pressure warning light control signal	○	○			
Glow plug indicator light control signal	○	○			
Brake pedal switch signal	○		○	○	
A/C compressor clutch signal	○				
Fuel heater signal	○				
Fuel consumption signal	○				
A/C refrigerant pressure signal	○				
SVS light control signal		○			
DPF warning light control signal		○			
Engine torque signal				○	
Accelerator pedal position signal				○	
ECM-keyless start control module code					○

I7N20A112015-05

ECM Reception Data

Received data of ECM	BCM	Combination meter	ABS control module	ESP® control module	Keyless start control module
A/C switch ON signal	○				
Engine oil request signal		○			
Wheel speed signal (front right)			○	○	
Wheel speed signal (front left)			○	○	
Wheel speed signal (rear right)			○	○	
Wheel speed signal (rear left)			○	○	
ABS active			○	○	
Torque up request			○	○	
Torque down request				○	
ESP® system (other than ABS) active				○	
TCSS OFF indication ON				○	
ECM-keyless start control module code					○

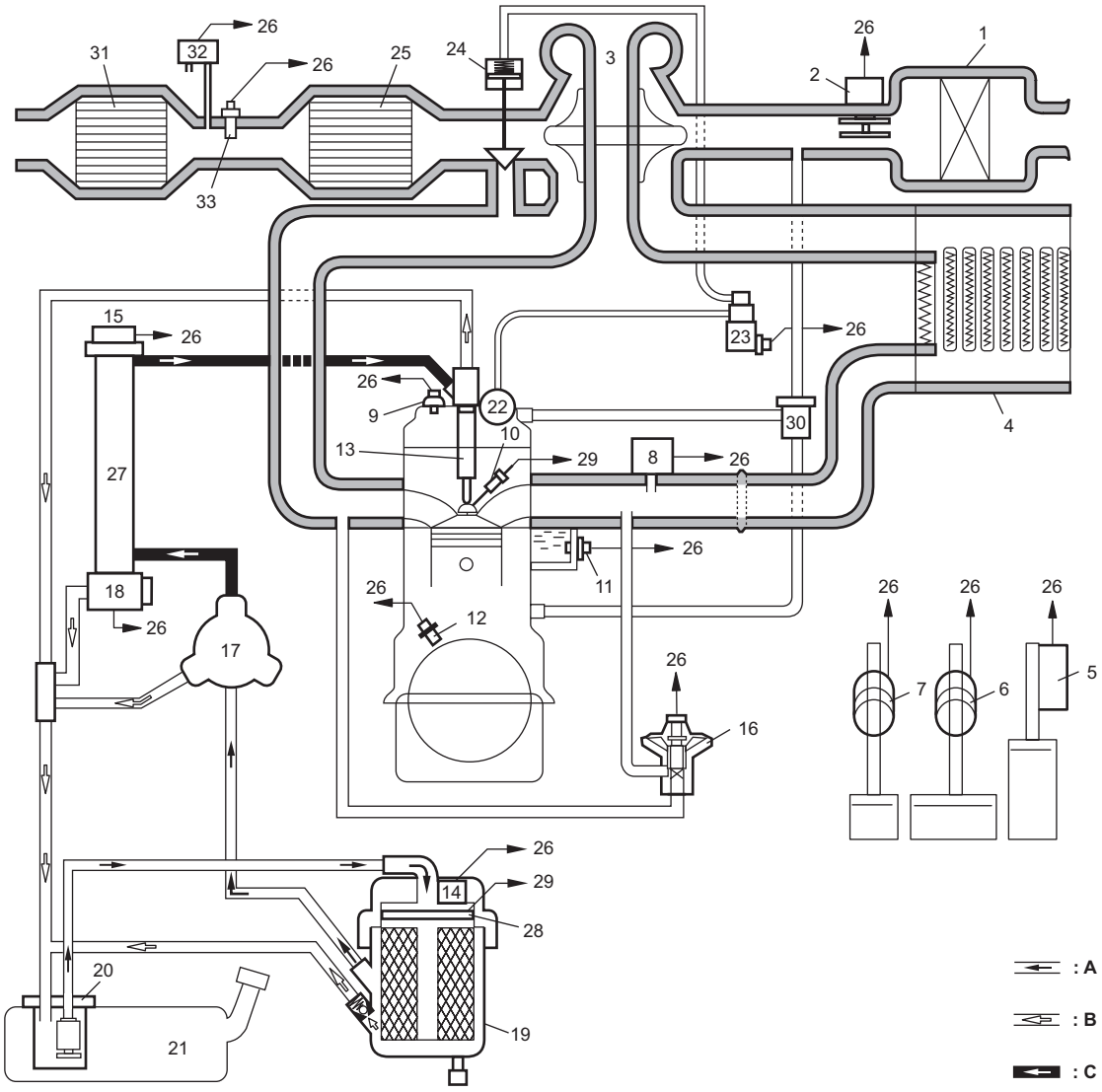
I7N20A112016-02

Schematic and Routing Diagram

Electronic Control System Description

S7N20A1122001

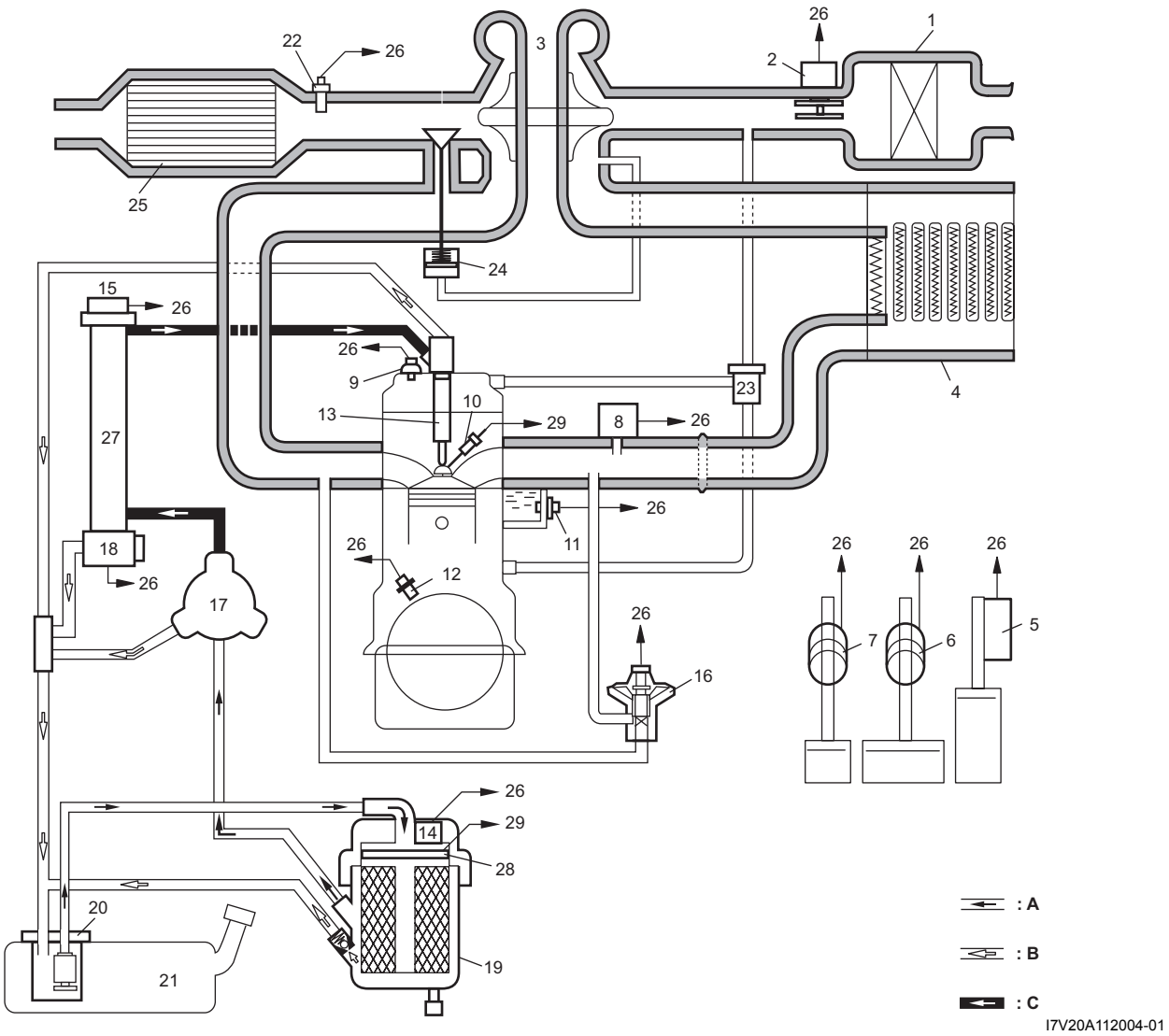
DPF® model



I7V20A112003-01

A: Fuel feed line	10. Glow plug	22. Vacuum pump
B: Fuel return line	11. ECT sensor	23. Boost pressure control solenoid valve
C: Fuel high pressure line	12. CKP sensor	24. Boost pressure control valve
1. Air cleaner	13. Fuel injector	25. Catalytic converter
2. MAF and IAT sensor	14. Fuel temperature sensor	26. To ECM
3. Turbocharger	15. Fuel pressure sensor	27. Common rail
4. Intercooler	16. EGR valve	28. Fuel heater
5. APP sensor	17. High pressure pump	29. To glow plug control module
6. Brake light switch / Brake switch	18. Fuel pressure regulator	30. Oil separator
7. CPP switch	19. Fuel filter	31. DPF®
8. Boost pressure sensor	20. Fuel pump	32. DPF® differential pressure sensor
9. CMP sensor	21. Fuel tank	33. EGT sensor

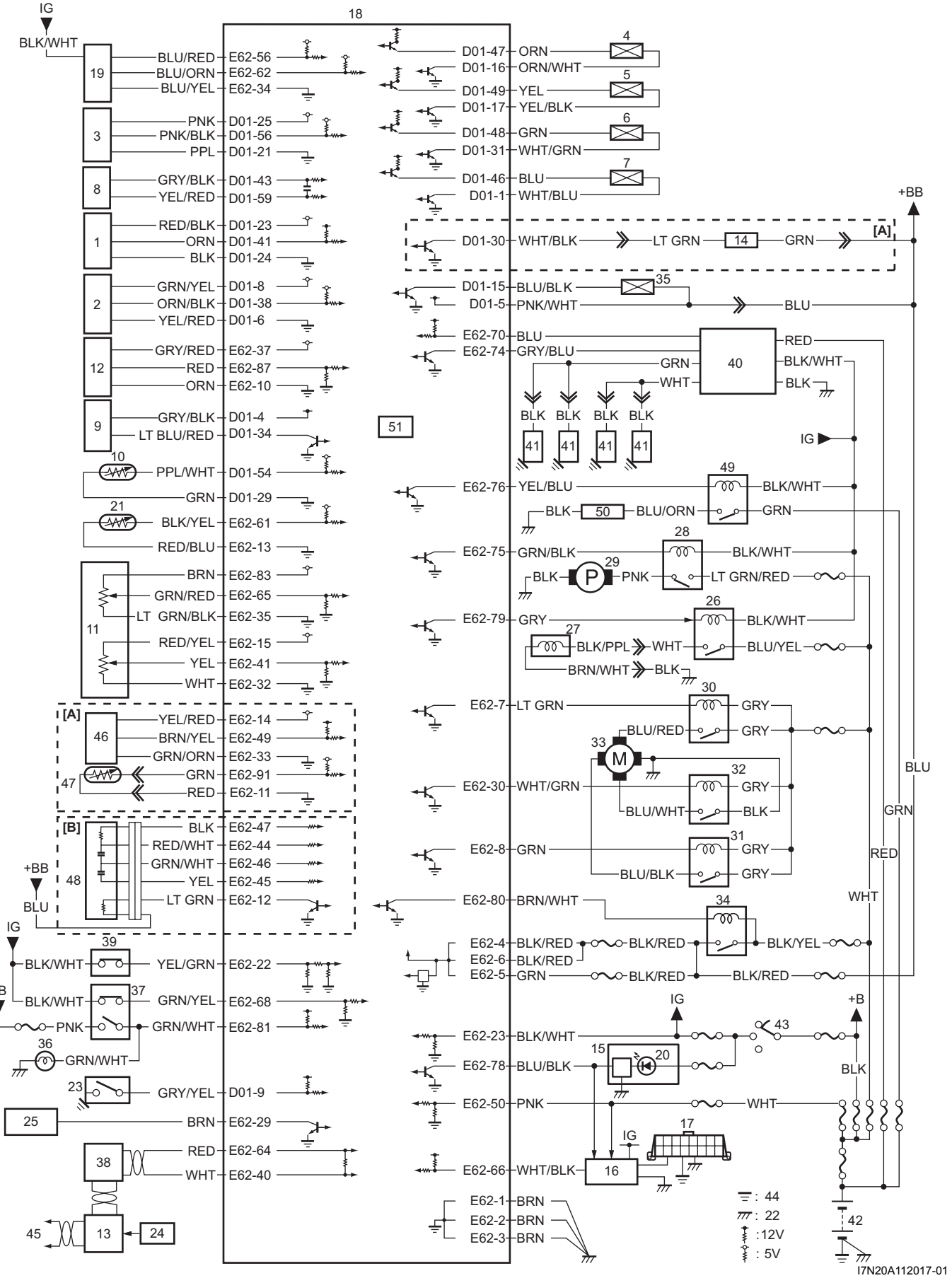
Non-DPF® model



A: Fuel feed line	9. CMP sensor	20. Fuel pump
B: Fuel return line	10. Glow plug	21. Fuel tank
C: Fuel high pressure line	11. ECT sensor	22. A/F sensor
1. Air cleaner	12. CKP sensor	23. Oil separator
2. MAF and IAT sensor	13. Fuel injector	24. Boost pressure control valve
3. Turbocharger	14. Fuel temperature sensor	25. Catalytic converter
4. Intercooler	15. Fuel pressure sensor	26. To ECM
5. APP sensor	16. EGR valve	27. Common rail
6. Brake light switch / Brake switch	17. High pressure pump	28. Fuel heater
7. CPP switch	18. Fuel pressure regulator	29. To glow plug control module
8. Boost pressure sensor	19. Fuel filter	

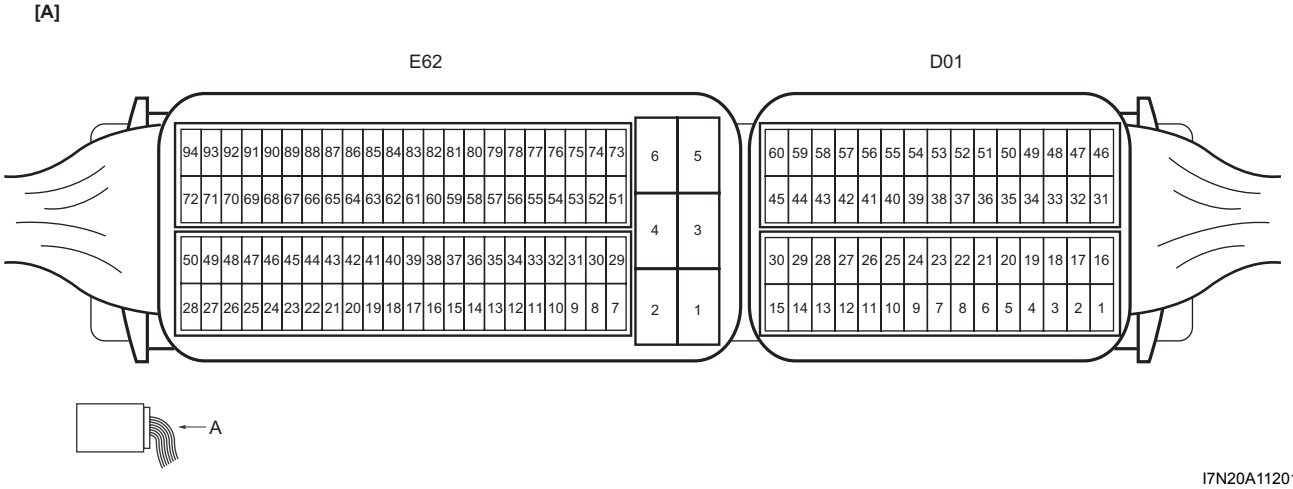
ECM Input / Output Circuit Diagram

S7N20A1122002



[A]: DPF® model	13. BCM	27. A/C compressor	41. Glow plug
[B]: Non-DPF® model	14. Boost pressure control solenoid valve	28. Fuel pump relay	42. Battery
1. Boost pressure sensor	15. Combination meter	29. Fuel pump	43. Ignition switch
2. Fuel pressure sensor	16. Immobilizer control module	30. Radiator cooling fan motor relay No.1	44. Engine ground
3. CMP sensor	17. Data link connector (DLC)	31. Radiator cooling fan motor relay No.2	45. To ECUs / sensors connected to CAN and DLC
4. Fuel injector No.1	18. ECM	32. Radiator cooling fan motor relay No.3	46. DPF® differential pressure sensor
5. Fuel injector No.2	19. MAF and IAT sensor	33. Radiator cooling fan motor	47. EGT sensor
6. Fuel injector No.3	20. Malfunction indicator lamp (MIL)	34. Main relay	48. A/F sensor
7. Fuel injector No.4	21. Fuel temperature sensor	35. EGR valve	49. Fuel heater relay
8. CKP sensor	22. Vehicle body ground	36. Brake light	50. Fuel heater
9. Fuel pressure regulator	23. Engine oil pressure switch	37. Brake light switch / Brake switch	51. Barometric pressure sensor
10. ECT sensor	24. A/C switch	38. ABS / ESP® control module	
11. APP sensor	25. P/S control module	39. CPP switch	
12. A/C refrigerant pressure sensor	26. A/C compressor relay	40. Glow plug control module	

Terminal Arrangement of ECM Connector (Viewed A from Harness Side)



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[A]: ECM connector (View: A)

Connector: D01

Terminal	Circuit	Terminal	Circuit
1	Fuel injector No.4 drive circuit (low side)	31	Fuel injector No.3 drive circuit (low side)
2	—	32	—
3	—	33	—
4	Fuel pressure regulator power supply circuit (12 V)	34	Fuel pressure regulator drive circuit
5	EGR valve power supply circuit (12 V)	35	—
6	Fuel pressure sensor ground circuit	36	—
7	—	37	—
8	Fuel pressure sensor power supply circuit (5 V)	38	Fuel pressure sensor signal circuit
9	Oil pressure switch signal circuit	39	—
10	—	40	—
11	—	41	Boost pressure sensor signal circuit
12	—	42	—
13	—	43	CKP sensor signal circuit (+)
14	—	44	—
15	EGR valve drive circuit	45	—
16	Fuel injector No.1 drive circuit (low side)	46	Fuel injector No.4 drive circuit (high side)
17	Fuel injector No.2 drive circuit (low side)	47	Fuel injector No.1 drive circuit (high side)
18	—	48	Fuel injector No.3 drive circuit (high side)
19	—	49	Fuel injector No.2 drive circuit (high side)
20	—	50	—

Terminal	Circuit	Terminal	Circuit
21	CMP sensor ground circuit	51	—
22	—	52	—
23	Boost pressure sensor power supply circuit (5 V)	53	—
24	Boost pressure sensor ground circuit	54	ECT sensor signal circuit
25	CMP sensor power supply circuit (5 V)	55	—
26	—	56	CMP sensor signal circuit
27	—	57	—
28	—	58	—
29	ECT sensor ground circuit	59	CKP sensor signal circuit (–)
30	Boost pressure control solenoid drive circuit	60	—

Connector: E62

Terminal	Circuit	Terminal	Circuit
1	ECM ground circuit 1	48	—
2	ECM ground circuit 2	49	DPF® differential pressure sensor signal circuit
3	ECM ground circuit 3	50	Backup power supply circuit (12 V)
4	Main power supply circuit 1 (12 V)	51	—
5	Main power supply circuit 2 (12 V)	52	—
6	Main power supply circuit 3 (12 V)	53	—
7	Radiator cooling fan relay 1 control circuit	54	—
8	Radiator cooling fan relay 2 control circuit	55	—
9	—	56	MAF sensor signal circuit
10	A/C refrigerant pressure sensor ground circuit	57	—
11	EGT sensor ground circuit	58	—
12	A/F sensor heater control signal	59	—
13	Fuel temperature sensor ground circuit	60	—
14	DPF® differential pressure sensor power supply circuit (5 V)	61	Fuel temperature sensor signal circuit
15	APP sensor (sub) power supply circuit (5 V)	62	IAT sensor signal circuit
16	—	63	—
17	—	64	CAN (high) communication circuit to ABS / ESP® control module
18	—	65	APP sensor (main) signal circuit
19	—	66	Serial communication circuit (for immobilizer control module)
20	—	67	—
21	—	68	Brake switch signal circuit
22	CPP switch signal circuit	69	—
23	Ignition switch signal circuit	70	Glow plug control module monitor circuit
24	—	71	—
25	—	72	—
26	—	73	—
27	—	74	Glow plug control module control circuit
28	—	75	Fuel pump relay drive circuit
29	Engine speed signal circuit (for P/S control module)	76	Fuel heater relay drive circuit
30	Radiator cooling fan relay 3 control circuit	77	—
31	—	78	Malfunction indicator lamp (MIL) drive circuit
32	APP sensor (sub) ground circuit	79	A/C compressor clutch: relay drive circuit
33	DPF® differential pressure sensor ground circuit	80	Main relay drive circuit
34	MAF and IAT sensor ground circuit	81	Brake light switch signal
35	APP sensor (main) ground circuit	82	—
36	—	83	APP sensor (main) power supply circuit (5 V)
37	A/C refrigerant pressure sensor power supply circuit (5 V)	84	—
38	—	85	—
39	—	86	—

Terminal	Circuit	Terminal	Circuit
40	CAN (low) communication circuit to ABS / ESP® control module	87	A/C refrigerant pressure sensor signal circuit
41	APP sensor (sub) signal circuit	88	—
42	—	89	—
43	—	90	—
44	A/F sensor signal circuit (VS)	91	EGT sensor signal circuit
45	A/F sensor signal circuit (IP)	92	—
46	A/F sensor signal circuit (VSIP)	93	—
47	A/F sensor signal circuit (RC)	94	—

Diesel Particulate Filter (DPF®) Description

S7N20A1122004

Diesel Particulate Filter (DPF®) is a filter, mounted on the exhaust system after the catalytic converter, that collects the diesel particulate matter (diesel PM) coming out from the diesel engine exhaust gas.
After a period (about 500 km / 310 mile, but it depends on the driving condition), the DPF® gets filled out and it is necessary that accumulated diesel PM should be burned and DPF® should be regenerated.
Long-time idling and traffic jam at low speed will cause the exhaust gas temperature drop and expedite diesel PM accumulation in the DPF®.
For details of the regeneration, refer to “Diesel Particulate Filter (DPF®) Description: D13A / Z13DTJ”.

Diesel Particulate Filter (DPF®) Regeneration Description

S7N20A1122005

General Description

Regeneration starts when the exhaust gas temperature (EGT) exceeds 605 °C (1,121 °F).
There are three ways of regeneration as follows.

- Natural regeneration
- Forced regeneration with/without speed request
- After-sales regeneration

Natural Regeneration

“Natural Regeneration” is activated when EGT exceeds 605 °C (1,121 °F) in the normal driving condition. The driver will not recognize that the vehicle is in “Natural Regeneration”.

Forced Regeneration without Speed Request

“Forced regeneration without Speed Request” is activated by ECM automatically when the DPF® clogging become approx. 70 – 110% (depending on vehicle speed). In this state, ECM recognizes that “Natural Regeneration” is insufficient and increases EGT to 605 °C (1,121 °F) by the post-injection control, suppressing the EGR control, etc.
In this operation, as no warning light comes on, the driver will not recognize that “Forced regeneration” is activated while driving.

NOTE

Even if vehicle is under idling condition, forced regeneration without speed request is activated according to the DPF® clogging. In this state, the driver will recognize the activation by the increment of idling engine speed (+100 rpm).

Forced Regeneration with Speed Request

“Forced regeneration with Speed Request” is performed by ECM manually when DPF® warning light in the combination meter is turned ON.
When the DPF® clogging becomes approx. 115% or more, ECM recognizes it as “Impossible to regenerate by only ECU itself and incapable of continuing driving” and asks the driver for a help.
This is “Speed Request” which informs the driver of DPF® clogging by the DPF® warning light so as to increase the vehicle speed to 75 km/h (47 mile/h) or more until the warning light goes off (max. 30 minutes).
When the driver accepts “Speed Request”, ECM activates “Forced Regeneration” just like “Forced Regeneration without Speed Request” until DPF® clogging decreases to normal value. After completion of “Forced Regeneration with Speed Request”, ECM turns off the DPF® warning light. If the engine stops before completion of “Forced Regeneration with Speed Request”, ECM will inform the driver of DPF® clogging by the DPF® warning light again.

After-sales Regeneration

“After-sales Regeneration” can be activated by SUZUKI scan tool only when DTC P1901 is detected (SVS light: ON).
When the DPF® flow resistance calculated in ECM is higher than the specified value, ECM sets DTC P1901 and operates the followings.

- ECM turns on SVS light in the combination meter in order to inform that the DPF® would be clogged completely.
- ECM turns off DPF® warning light
- ECM limits the driving performance slightly and cancels “Forced Regeneration” in order to prevent the DPF® from melting and cracking.

In this situation, “After-sales regeneration” using SUZUKI scan tool should be performed, or DPF® will have to be replaced in the worst case which will be set P2003.

For the method of after-sales regeneration, refer to “DPF® After-sales Regeneration: D13A / Z13DTJ in Section 1C”.

Diesel particulate filter state table

DPF® clogging	DPF® warning light	SVS light	DTC	Forced regeneration	Description
Approx. 0 – 70%	OFF	OFF	–	Not approved	DPF® is fully regenerated.
Approx. 70 – 115%	OFF	OFF	–	Approved	DPF® is a little clogged.
Approx. 115– 200%	ON	OFF	–	Approved	DPF® is almost clogged.
Approx. 200% or more	OFF	ON	P1901	Not approved	DPF® is fully clogged and slight limitation is implemented.

NOTE

- **For the “DPF® clogging” in the table above, it can be monitored using SUZUKI scan tool as the data list.**
- **P1901 is detected if DPF® flow resistance calculated in ECM is higher than specified value and above-mentioned DPF® clogging (approx. 200% or more) is only rough standard.**

Oil Life Monitoring System (DPF® model)

S7N20A1122006

The oil life monitoring system informs the driver that the engine oil must be replaced by the blinking of oil pressure light. This system is only software programmed in ECM and it is not necessary to use any specific sensors.
The ECM has the oil degradation (%) for this system, and the oil pressure light will blink when oil degradation reaches zero.
The threshold of oil degradation is 100%. This system will reduce these thresholds according to the driving condition and above all according to the regeneration. Especially, during the regeneration, the post-injections occur during the piston down-stroke. In this case, the injected fuel reaches the cylinder walls, washing the liner and consequently degrading the engine oil. The oil degradation reduces its lubricating efficiency according to the count of regenerations.

⚠ CAUTION

- **After replacing the engine oil and the engine oil filter, be sure to reset the blinking of oil pressure warning light and the parameters related to engine oil by using SUZUKI scan tool. If not, the engine will be damaged by the degraded engine oil.**
- **After replacing or reprogramming ECM be sure to replace the engine oil / the engine oil filter and reset the blinking of oil pressure light / the parameters related to engine oil by using SUZUKI scan tool. Otherwise, the new ECM will not be able to provide the necessary blinking for the oil pressure warning light and the engine will be damaged due to the degraded engine oil.**

NOTE

For the procedure to reset the blinking of oil pressure warning light and the parameters related to engine oil, refer to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”.

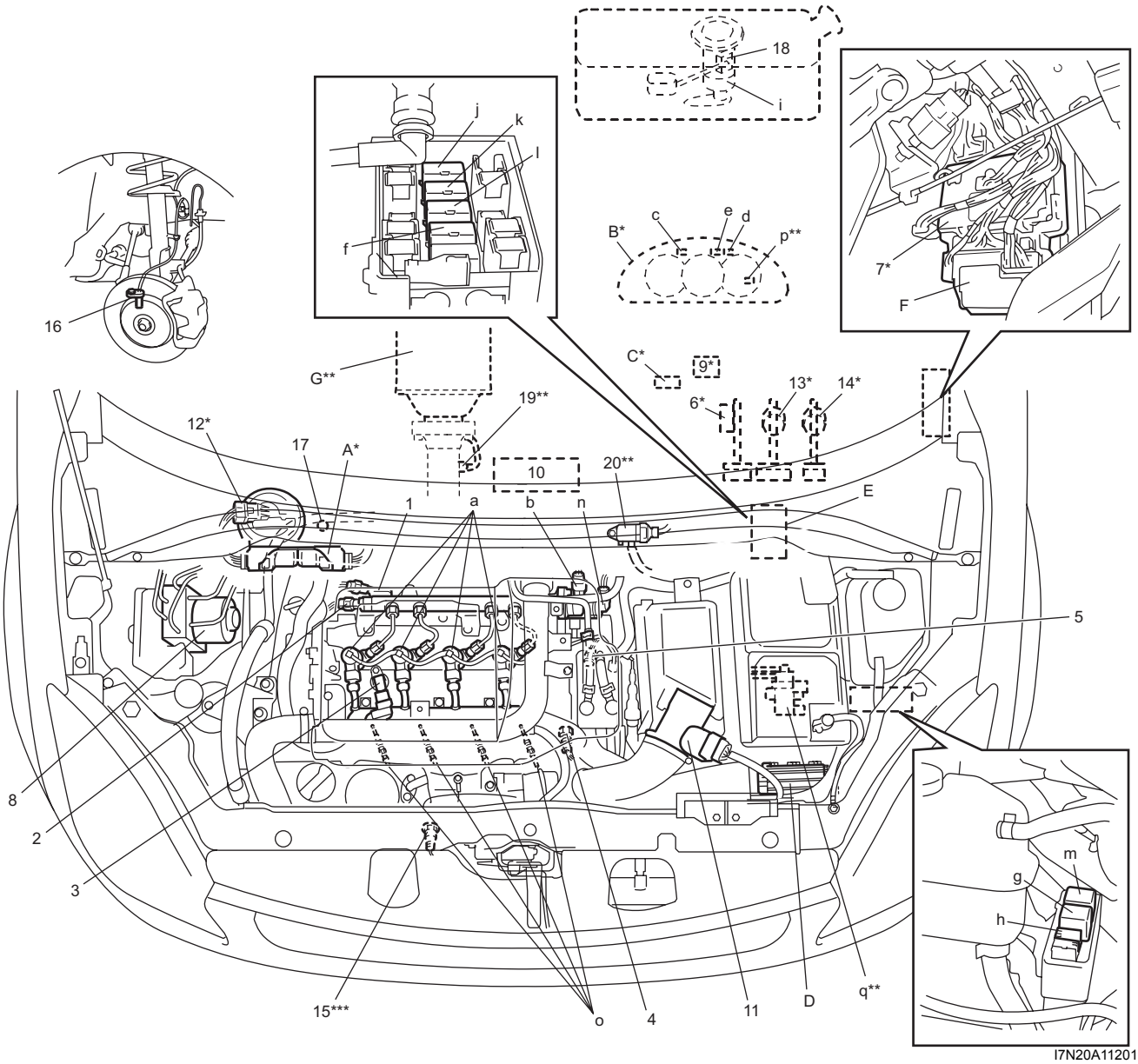
Component Location

Electronic Control System Components Location

S7N20A1123001

NOTE

- **The figure shows LHD. For RHD, alphabets / numbers / parts with asterisks (*) are installed at the opposite side.**
- **For Non-DPF® model, alphabets / numbers / parts with asterisk (**) below are not equipped.**
- **For DPF® model, alphabets / numbers / parts with asterisk (***) below are not equipped.**



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Information sensors	Control devices	Others
1. Boost pressure sensor	a: Fuel injector	A: ECM*
2. Fuel pressure sensor	b: Fuel pressure regulator	B: Combination meter*
3. CMP sensor	c: Malfunction indicator lamp (MIL)	C: Data link connector (DLC)*
4. CKP sensor	d: SVS light	D: Glow plug control module
5. ECT sensor	e: Glow indicator light	E: Main fuse box
6. APP sensor*	f: A/C compressor relay	F: Circuit fuse box
7. BCM*	h: Fuel pump relay	G: DPF®**
8. ABS / ESP® control module	g: Fuel heater relay	
9. Immobilizer control module*	i: Fuel pump	
10. HVAC control module (A/C model)	j: Radiator cooling fan motor relay 1	

Information sensors	Control devices	Others
11. MAF and IAT sensor	k: Radiator cooling fan motor relay 2	
12. Fuel heater and temperature sensor*	l: Radiator cooling fan motor relay 3	
13. Brake light switch / Brake switch*	m: Main relay	
14. CPP switch*	n: EGR valve	
15. A/F sensor***	o: Glow plug	
16. Wheel speed sensor (VSS)	p: DPF® warning light**	
17. A/C refrigerant pressure sensor	q: Boost pressure control solenoid valve**	
18. Fuel level sensor		
19. EGT sensor**		
20. DPF® differential pressure sensor**		

Diagnostic Information and Procedures

Malfunction Indicator Lamp (MIL) Check

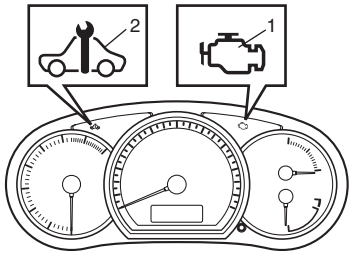
S7N20A1124309

Description

MIL (1) indicates malfunction which gives adverse effect on vehicle emission. Check its operation as follows.

Operation check

1) Check that it turns ON continuously when ignition switch is turned ON and the engine is not running.
   If MIL does not turn ON, check MIL and its circuit.
2) Check that it turns OFF when engine is running.
   If MIL remains ON, there is some trouble in engine control system. Refer to “DTC Check: D13A / Z13DTJ”.



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2. SVS light

Service Vehicle Soon (SVS) Light Check

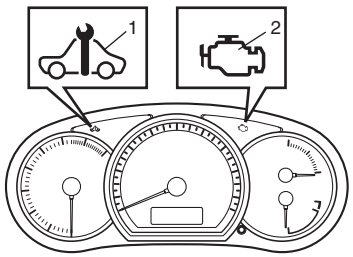
S7N20A1124310

Description

SVS light (1) indicates malfunction which is no effect on vehicle emission. Check its operation as follows.

Operation check

1) Check that it turns ON for 4 seconds then turns OFF when ignition switch is turned ON with engine is not running.
   If SVS light does not turn ON, check SVS light and its circuit (CAN).
   If SVS light flashes, there is some trouble in immobilizer control. Refer to “On-Board Diagnostic System Description: Diesel Model in Section 10C”.
2) If SVS light remains ON, there is some trouble in engine control system. Refer to “DTC Check: D13A / Z13DTJ”.



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2. MIL

Engine and Emission Control System Check

S7N20A1124004

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: D13A / Z13DTJ”. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **DTC record and clearance** 1) Check for DTC referring to “Step 2: DTC Record and Clearance: D13A / Z13DTJ”. *Is there any DTC(s)?*	Print DTC or write them down and clear them by referring to “DTC Clearance: D13A / Z13DTJ”, and go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection referring to “Visual Inspection: D13A / Z13DTJ”. *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection referring to “Visual Inspection: D13A / Z13DTJ”. *Is there any faulty condition?*	Repair or replace malfunction 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: D13A / Z13DTJ”. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC** 1) Recheck for DTC referring to “DTC Check: D13A / Z13DTJ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 8.
7	☞ **Rechecking and record of DTC** 1) Recheck for DTC referring to “DTC Check: D13A / Z13DTJ”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **Engine basic inspection and engine symptom diagnosis** 1) Check and repair according to “Engine Basic Inspection: D13A / Z13DTJ” and “Engine Symptom Diagnosis: D13A / Z13DTJ”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC diag. flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s), and go to Step 11.
10	☞ **Intermittent problems check** 1) Check for intermittent problems referring to “Step 10: Intermittent Problems Check: D13A / Z13DTJ”. *Is there any faulty condition?*	Repair or replace malfunction part(s), and go to Step 11.	Go to Step 11.

Step	Action	Yes	No
11	☞ **Final confirmation test** 1) Clear DTC if any. 2) Perform final confirmation test referring to “Step 11: Final Confirmation Test: D13A / Z13DTJ”. *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.

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 at (☐cold ☐warm ☐always) ☐ Other_____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐After fire ☐ Lack of power ☐ Surging ☐ abnormal knocking ☐ Other_____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐High ☐Low) (r/min.) ☐ Unstable ☐ Hunting (r/min. to r/min.) ☐ Other_____	☐ **Engine Stall when** ☐ Immediately after start ☐ Accel. pedal is depressed ☐ Accel. pedal is released ☐ 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

Malfunction indicator lamp condition	☐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 Record and Clearance
First, check DTC, referring to “DTC Check: D13A / Z13DTJ”. If DTC is indicated, print it or write DTC down and then clear DTC by referring to “DTC Clearance: D13A / Z13DTJ”. DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, check the symptom in question according to Step 5 and recheck DTC according to Step 6 and 7. Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

Step 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 referring to “Visual Inspection: D13A / Z13DTJ”.

Step 5: Trouble Symptom Confirmation
Based on information obtained in “Step 1: Customer Complaint Analysis: D13A / Z13DTJ” and “Step 2: DTC Record and Clearance: D13A / Z13DTJ”, confirm trouble symptoms. Also, reconfirm DTC according to “DTC Confirmation Procedure: D13A / Z13DTJ”.

Step 6 and 7: Rechecking and Record of DTC
Refer to “DTC Check: D13A / Z13DTJ” for checking procedure.

Step 8: Engine Basic Inspection and Engine Symptom Diagnosis
Perform basic engine check according to “Engine Basic Inspection: D13A / Z13DTJ” first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to “Engine Symptom Diagnosis: D13A / Z13DTJ” and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or basic engine check) and repair or replace faulty parts, if any.

Step 9: Troubleshooting for DTC (See each DTC Diag. Flow)
Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM or other part 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 and Poor Connection Inspection in Section 00” and related circuit of DTC recorded in Step 2.

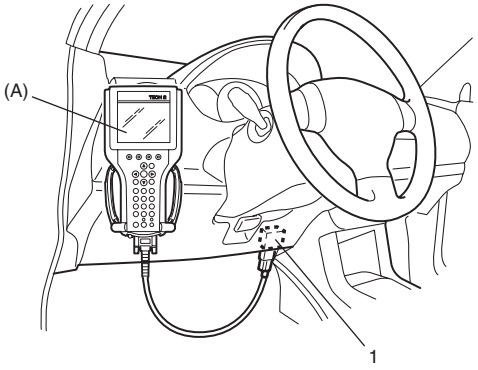
Step 11: Final Confirmation Test
Confirm that the problem symptom has gone and the engine is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

DTC Check

S7N20A1124005

1) Turn ignition switch OFF.
2) Connect SUZUKI scan tool to DLC (1) located on underside of instrument panel at driver’s seat side.

   Special tool
   (A): SUZUKI scan tool



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3) Turn ignition switch ON.
4) Read DTC, 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 not possible, check if scan tool is communicable by connecting it to ECM in another vehicle.
   If communication is possible in this case, scan tool is in good condition. Then DLC and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch OFF and disconnect scan tool from DLC.

DTC Clearance

S7N20A1124006

1) Connect SUZUKI scan tool to DLC in the same manner as when making this connection for DTC check.
2) Turn ignition switch OFF and then ON (but engine at stop).
3) Clear DTC according to instructions displayed on scan tool. Refer to scan tool operator’s manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from DLC.

DTC Confirmation Procedure

S7N20A1124346

There are two kinds of DTC confirmation procedures.

- DTC confirmation procedure without road test.
- DTC confirmation procedure with road test.

Most DTC can be detected by performing “For DTC Confirmation Procedure Without Road Test: D13A / Z13DTJ”. However, in order to be detected the following specified DTCs, it is necessary to carry out road test according to “For DTC Confirmation Procedure With Road Test: D13A / Z13DTJ”.

DTC to be Carried Out Road Test at Confirmation Procedure

DTC No	DTC name	DTC No	DTC name
☞ P0030	H2OS Sensor Heater Control Circuit	☞ P0500	Vehicle Speed Sensor
☞ P0093	Fuel System Leak Detected – Large Leak	☞ P0571	Brake Light Switch Circuit
☞ P0100	Mass Air Flow Circuit	☞ P0704	Clutch Switch Input Circuit Malfunction
☞ P0106	Boost Pressure / Barometric Pressure Circuit Range / Performance	☞ P1191	Fuel Pressure Regulator Range / Performance
☞ P0107	Boost Pressure / Barometric Pressure Circuit Low Input	☞ P1571	Brake Switch Circuit
☞ P0108	Boost Pressure / Barometric Pressure Circuit High Input	☞ P1660	Shut Off Valve
☞ P0130	O2 Sensor (HO2S) Circuit	☞ P1725	Crankshaft Position Sensor Circuit / Short
☞ P0135	O2 Sensor (HO2S) Heater Circuit	☞ P1811	Engine Torque Control Invalid Communication with ABS / ESP®
☞ P0168	Fuel Temperature Too High	☞ P1901	Differential Pressure Sensor
☞ P0201	Injector Circuit / Open – Cylinder 1	☞ P1902	EGT Sensor Circuit Intermittent
☞ P0202	Injector Circuit / Open – Cylinder 2	☞ P2003	Particulate Trap Efficiency Below Threshold
☞ P0203	Injector Circuit / Open – Cylinder 3	☞ P2237	O2 Sensor Positive Current Control Circuit/ Open
☞ P0204	Injector Circuit / Open – Cylinder 4	☞ P2244	O2 Sensor Reference Voltage Performance
☞ P0217	Engine Coolant Over Temperature Condition	☞ P2297	O2 Sensor Out of Range During Deceleration
☞ P0243	Boost Pressure Control Solenoid Valve Circuit	☞ U2108	Lost Communication with ABS / ESP® Control Module
☞ P0335	Crankshaft Position Sensor Circuit	☞ U2116	Lost Communication with Combination meter
☞ P0400	Exhaust Gas Recirculation Flow		

For DTC Confirmation Procedure Without Road Test

1) Start engine and warm it up to normal operating temperature.
2) Stop engine.
3) Check DTC.

For DTC Confirmation Procedure With Road Test

⚠ WARNING

- **Carry out test in very little traffic area to prevent an accident.**
- **Test requires 2 persons, a driver and a tester.**

1) Start engine and warm it up to normal operating temperature.
2) Drive vehicle at 60 km/h (97 mph) for 5 min.
3) Increase vehicle speed to 100 km/h (161 mph) for 5 min.
4) Stop vehicle.
5) Check DTC.

DTC Table

S7N20A1124007

NOTE

- **DTC with delta (△) mark in the following table can be detected only DPF® model.**
- **DTC with circle (□) mark in the following table can be detected only non-DPF® model.**
- **For "ON/OFF" (MIL or SVS light operation) with asterisk (*) in this table, its operation is different depending on detecting condition.**
  For details of operation, refer to each description.

DTC No.	DTC Name	Detecting condition (DTC will set when detecting:)	MIL	SVS
☞ □P0030	A/F Sensor Heater Control Circuit	This DTC is detected if A/F sensor heater circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P0088	Fuel Rail System Pressure – Too High	This DTC is detected if fuel pressure in common rail is higher than 175,000 kPa (1,784.5 kgf/cm^2, 25,400 psi, 1,750 bar).	–	ON
☞ P0090	Fuel Pressure Regulator Control Circuit	This DTC is detected if fuel pressure regulator circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P0093	Fuel System Leak Detected – Large Leak	This DTC is detected if fuel pressure in common rail is lower than specified value. (depending on engine speed)	–	ON
☞ P0100	Mass Air Flow Circuit	This DTC is detected if any one of the following conditions is satisfied. • MAF sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. • MAF sensor signal is out of specified range.	ON	*ON/ OFF
☞ P0106	Boost Pressure / Barometric Pressure Circuit Range / Performance	This DTC is detected if difference between boost pressure and barometric pressure is more than specified value at idling condition.	ON	ON
☞ P0107	Boost Pressure / Barometric Pressure Circuit Low Input	This DTC is detected if difference between boost pressure and barometric pressure is lower than specified value when turbocharger is operated.	ON	ON
☞ P0108	Boost Pressure / Barometric Pressure Circuit High Input	This DTC is detected if difference between boost pressure and barometric pressure is more than specified value when turbocharger is operated.	–	ON
☞ P0110	Intake Air Temperature Sensor Circuit	This DTC is detected if any one of the following conditions is satisfied. • IAT sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. • For DPF® model: – Difference between actual IAT and reference IAT is more than specified value for 1.65 sec. within 4 sec. after turning ignition ON at cold start.	*ON/ OFF	–
☞ P0115	Engine Coolant Temperature Circuit	This DTC is detected if ECT sensor circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ □P0130	A/F Sensor Circuit	This DTC is detected if any one of A/F sensor signal voltage is in abnormal condition.	–	–
☞ □P0135	A/F Sensor Heater Circuit	This DTC is detected if any one of the following conditions is satisfied. • A/F sensor signal voltage (VS) is in abnormal condition. • A/F sensor temperature is out of specified range.	–	–
☞ P0168	Fuel Temperature Too High	This DTC is detected if fuel temperature is higher than specified value.	–	–

DTC No.	DTC Name	Detecting condition (DTC will set when detecting:)	MIL	SVS
☞ P0180	Fuel Temperature Sensor Circuit	This DTC is detected if any one of the following conditions is satisfied. • Fuel temperature sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. • For DPF® model: – Difference between actual fuel temperature and reference fuel temperature is more than specified value for 1.65 sec. within 4 sec. after turning ignition ON at cold start.	–	*ON/ OFF
☞ P0190	Fuel Rail Pressure Sensor Circuit	This DTC is detected if any one of the following conditions is satisfied. • Fuel pressure sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. • Difference between current fuel pressure and previous fuel pressure at specified vehicle condition is more than specified value. • Fuel pressure in common rail after turning ignition switch to OFF position is out of specified range. • Fuel pressure in common rail is fixed even if fuel pressure regulator is operated.	*ON/ OFF	ON
☞ P0201	Injector Circuit / Open-Cylinder 1	This DTC is detected if any one of the following conditions is satisfied. • Asymmetry index of relevant fuel injector is higher than specified value. • Relevant fuel injector control circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P0202	Injector Circuit / Open – Cylinder 2			
☞ P0203	Injector Circuit / Open – Cylinder 3			
☞ P0204	Injector Circuit / Open – Cylinder 4			
☞ P0217	Engine Coolant Over Temperature Condition	This DTC is detected if engine coolant temperature is higher than specified value.	–	–
☞ P0219	Engine Overspeed Condition	This DTC is detected if engine speed exceeds 6,000 rpm for 2 seconds.	–	–
☞ P0230	Fuel Pump Relay Circuit	This DTC is detected if fuel pump relay control circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P0235	Boost Pressure Sensor Circuit	This DTC is detected if boost pressure sensor circuit is open, shorted to power supply circuit or shorted to ground circuit.	ON	ON
☞ △P0243	Boost Pressure Control Solenoid Valve	This DTC is detected if any one of the following conditions is satisfied. • Boost pressure control solenoid valve circuit is open, shorted to power supply circuit or shorted to ground circuit. • Difference between actual boost pressure and reference boost pressure is out of specified value for 5 sec.	–	ON
☞ P0335	Crankshaft Position Sensor Circuit	This DTC is detected if CKP sensor signal is not input even if CMP sensor signal input two times.	–	–
☞ P0340	Camshaft Position Sensor Circuit	This DTC is detected if any one of the following conditions is satisfied. • CMP sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. • CMP sensor signal is low when cylinder No.1 is at TDC compression. • CMP sensor signal is high when cylinder No.4 is at TDC compression.	–	–

DTC No.	DTC Name	Detecting condition (DTC will set when detecting:)	MIL	SVS
☞ P0380	Glow Plug Control Module Control Circuit	This DTC is detected if glow plug control module circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P0400	Exhaust Gas Recirculation Flow	This DTC is detected if any one of the following conditions is satisfied. • Difference between measured MAF and reference MAF is out of specified range. • EGR valve is stuck open.	*ON/ OFF	*ON/ OFF
☞ P0403	Exhaust Gas Recirculation Control Circuit	This DTC is detected if EGR valve circuit is open, shorted to power supply circuit or shorted to ground circuit.	ON	–
☞ P0500	Vehicle Speed Sensor	This DTC is detected if abnormal vehicle speed signal is detected.	–	–
☞ P0520	Engine Oil Pressure Switch Circuit	This DTC is detected if engine oil pressure switch circuit is open or shorted to power supply circuit.	–	–
☞ P0530	A/C Refrigerant Pressure Sensor Circuit	This DTC is detected if A/C refrigerant pressure sensor circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P0560	System Voltage	This DTC is detected if supply voltage from main relay is lower than 6 V or higher than 16 V.	–	–
☞ P0571	Brake Light Switch Circuit	This DTC is detected if any one of the following conditions is satisfied. • Brake light switch circuit is open, shorted to power supply circuit or shorted to ground circuit. • Brake light switch signal is not appropriate for brake switch signal.	–	–
☞ P0602	Control Module Program Error	This DTC is detected if any one of the following conditions is satisfied. • Fuel injector calibration code is not registered in ECM. • Vehicle variant data is not registered in ECM.	–	ON
☞ P0603	Internal Control Module Keep Alive Memory (KAN) Error	This DTC is detected if ECM has internal fault.	–	–
☞ P0604	Internal Control Module Random Access Memory (RAM) Error	This DTC is detected if ECM has internal fault.	–	–
☞ P0605	Internal Control Module Read Only Memory (ROM) Error	This DTC is detected if ECM has internal fault.	–	–
☞ P0650	Malfunction Indicator Lamp (MIL) Control Circuit	This DTC is detected if MIL circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P0683	Glow Plug Control Circuit	This DTC is detected if glow plug circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P0685	ECM Power Relay Control Circuit / Open	This DTC is detected if main relay (coil side) circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P0704	Clutch Switch Input Circuit Malfunction	This DTC is detected if CPP switch circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P1093	Low Pressure Fuel Circuit Leakage	This DTC is detected if low pressure fuel circuit has malfunction.	–	ON
☞ P1105	Barometric Pressure Sensor Range / Performance	This DTC is detected if barometric pressure sensor signal is out of specified range.	ON	–

DTC No.	DTC Name	Detecting condition (DTC will set when detecting:)	MIL	SVS
☞ P1120	APP sensor 1 Circuit	This DTC is detected if any one of the following conditions is satisfied. • APP sensor (main) circuit is open, shorted to power supply circuit or shorted to ground circuit. • Difference between APP sensor (main) signal voltage and APP sensor (sub) signal voltage is more than specified value.	–	ON
☞ P1122	APP sensor 2 Circuit	This DTC is detected if any one of the following conditions is satisfied. • APP sensor (sub) circuit is open, shorted to power supply circuit or shorted to ground circuit. • APP sensor (main) and (sub) signal voltages are lower than specified value.	–	ON
☞ P1180	Fuel heater relay circuit	This DTC is detected if fuel heater relay circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P1190	Fuel Pressure Regulator Flow	This DTC is detected if difference between measured fuel pressure in common rail and reference fuel pressure in common rail is more than specified value when fuel pressure regulator is close.	–	ON
☞ P1191	Fuel Pressure Regulator Range / Performance	This DTC is detected if any one of the following conditions is satisfied. • Difference between measured fuel pressure in common rail and reference fuel pressure is more than specified value when fuel pressure regulator is open. • Fuel pressure in common rail is lower than specified value (depending on engine speed).	–	ON
☞ P1481	Radiator Fan Output 1 Circuit Malfunction	This DTC is detected if radiator cooling fan relay No.1 circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P1482	Radiator Fan Output 2 Circuit Malfunction	This DTC is detected if radiator cooling fan relay No.2 circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P1483	Radiator Fan Output 3 Circuit Malfunction	This DTC is detected if radiator cooling fan relay No.3 circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	ON
☞ P1530	A/C Compressor Relay Circuit	This DTC is detected if A/C compressor relay circuit is open, shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P1571	Brake Switch Circuit	This DTC is detected if any one of the following conditions is satisfied. • Brake switch circuit is open, shorted to power supply circuit or shorted to ground circuit. • Brake switch signal is not appropriate for brake light switch.	–	–
☞ P1600	A/D Converter Malfunction	This DTC is detected if ECM has internal fault.	–	ON
P1610	Secret Key / Password Not Program	Refer to “DTC Table: Diesel Model in Section 10C”.		
P1611	Password is Not Matched			
P1612	No Signal From Immobilizer Control Module			
P1613	Immobilizer System Malfunction			
P1614	Incorrect Signal From Immobilizer Control Module			
☞ P1620	Sensor Supply Circuit 1 Fail	This DTC is detected if sensor power supply 1 voltage is out of specified range.	–	ON

DTC No.	DTC Name	Detecting condition (DTC will set when detecting:)	MIL	SVS
☞ P1625	ECM Power Relay Circuit Malfunction	This DTC is detected if main relay (switch side) circuit is shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P1635	Sensor Supply Circuit 2 Fail	This DTC is detected if sensor power supply 2 voltage is out of specified range.	–	ON
☞ P1639	Sensor Supply Circuit 3 Fail	This DTC is detected if sensor power supply 3 voltage is out of specified range.	–	ON
☞ P1660	Shut Off Valve	This DTC is detected if shut off valve in high pressure pump has mechanical faulty.	–	ON
☞ P1725	Engine Speed Output Signal Circuit	This DTC is detected if engine speed output signal circuit is shorted to power supply circuit or shorted to ground circuit.	–	–
☞ P1811	Engine Torque Control Invalid Communication with ABS / ESP®	This DTC is detected if abnormal vehicle speed signal is detected.	–	ON
☞ △P1901	DPF® Differential Pressure Sensor or Flow Resistance Malfunction	This DTC is detected if any one of the following conditions is satisfied. • DPF® differential pressure sensor signal voltage is out of specified range (0.2 – 4.8 V) for 1 sec. • Difference between differential pressure at previous D/C and differential pressure at current D/C is more than specified value. • Difference between actual DPF® flow resistance and mean DPF® flow resistance is more than specified value with specified condition. • Differential pressure is lower than 3 mbar for 8 sec. when engine speed is 1,500 rpm or more. • Calculated DPF® flow resistance is higher than specified value for approx. 100 sec. with specified condition.	–	*ON/ OFF
☞ △P1902	EGT Sensor Circuit	This DTC is detected if EGT sensor signal voltage is out of specified range (0.2 – 4.8 V) for 1 sec.	–	ON
☞ △P2003	DPF® Flow Resistance Too High	This DTC is detected if calculated DPF® flow resistance is higher than specified value with specified condition immediately.	–	ON
☞ P2146	Fuel Injector Supply Voltage Circuit / Open	This DTC is detected if capacitor voltage of fuel injector in ECM is out of specification.	–	–
☞ □P2237	A/F Sensor Positive Current Control Circuit / Open	This DTC is detected if any one of A/F sensor signal voltage is in abnormal condition.	–	–
☞ □P2244	A/F Sensor Reference Voltage Performance	This DTC is detected if A/F sensor supply voltage is out of specified range.	–	–
☞ □P2297	A/F Sensor Out of Range During Deceleration	This DTC is detected if A/F value at fuel cut is out of specified value.	–	–
☞ U2101	Control Module Program Error	This DTC is detected if vehicle variant data is not registered in ECM.	–	ON
☞ U2103	Control Module Communication Bus Off	Transmission error that is inconsistent between transmission data monitor	–	–
☞ U2107	Lost Communication with BCM	Reception error of communication data for BCM	–	–
☞ U2108	Lost Communication with ABS / ESP® Control Module	Reception error of communication data for ABS / ESP® control module	–	–
☞ U2116	Lost Communication with Combination Meter	Reception error of communication data for combination meter	–	–

Fail-Safe Table

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When any of the following DTCs is detected, ECM enters fail-safe mode as long as malfunction continues to exist but that mode is canceled when ECM detects normal condition after that.

DTC No.	DTC Name	Fail-Safe Operation
☞ P0030	A/F Sensor Heater Control Circuit	ECM stops closed loop (air/fuel ratio feedback) and executes open loop.
☞ P0088	Fuel Rail System Pressure – Too High	ECM stops engine running.
☞ P0090	Fuel Pressure Regulator Control Circuit	ECM stops engine running.
☞ P0093	Fuel System Leak Detected – Large Leak	ECM stops engine running.
☞ P0100	Mass Air Flow Circuit	• ECM stops EGR valve control. • ECM controls actuators assuming that air flow values measured is specified value. (only for circuit error) • For non-DPF® model: – ECM stops closed loop (air/fuel ratio feedback) and executes open loop. • For DPF® model: – ECM prevents after-sales regeneration. – ECM stops boost pressure control solenoid valve control (only for signal error).
☞ P0106	Boost Pressure / Barometric Pressure Circuit Range / Performance	• ECM stops EGR valve control. • For DPF® model: – ECM controls that driving performance is slightly limited. – ECM stops boost pressure control solenoid valve control. – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0107	Boost Pressure / Barometric Pressure Circuit Low Input	• ECM stops EGR valve control. • For DPF® model: – ECM controls that driving performance is slightly limited. – ECM stops boost pressure control solenoid valve control. – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0108	Boost Pressure / Barometric Pressure Circuit High Input	• ECM stops EGR valve control. • ECM controls that driving performance is slightly limited. • For DPF® model: – ECM stops boost pressure control solenoid valve control. – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0110	Intake Air Temperature Sensor Circuit	• ECM controls actuators assuming that intake air temperature is 40 °C (104 °F). • ECM stops idle speed control related to A/C and additional heater. • ECM stops air/fuel ratio feedback (closed loop) control. • For DPF® model: – ECM prevents after-sales regeneration.

DTC No.	DTC Name	Fail-Safe Operation
☞ P0115	Engine Coolant Temperature Circuit	• ECM controls actuators assuming that ECT is fuel temperature at cranking. • ECM stops A/C control. • ECM operates radiator cooling fan at high speed. • ECM stops idle speed control related to A/C and additional heater. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P0130	A/F Sensor Circuit	ECM stops closed loop (air/fuel ratio feedback) and executes open loop.
☞ P0135	A/F Sensor Heater Circuit	ECM stops closed loop (air/fuel ratio feedback) and executes open loop.
☞ P0168	Fuel Temperature Too High	No recovery
☞ P0180	Fuel Temperature Sensor Circuit	• ECM controls actuators assuming that fuel temperature is 20 °C (68 °F). • ECM controls fuel heater according to value of ECT sensor (only for circuit error). • ECM controls actuators assuming that fuel temperature is value of ECT sensor at cranking (only for circuit error).
☞ P0190	Fuel Rail Pressure Sensor Circuit	• ECM controls actuators assuming that rail pressure is specified range. • ECM controls that driving performance is slightly limited. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P0201	Injector Circuit / Open-Cylinder 1	For signal error: • ECM stops engine running. For circuit error: • ECM stops applicable fuel injector control. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0202	Injector Circuit / Open-Cylinder 2	
☞ P0203	Injector Circuit / Open-Cylinder 3	
☞ P0204	Injector Circuit / Open-Cylinder 4	
☞ P0217	Engine Coolant Over Temperature Condition	No recovery
☞ P0219	Engine Overspeed Condition	No recovery
☞ P0230	Fuel Pump Relay Circuit	No recovery
☞ P0235	Boost Pressure Sensor Circuit	• ECM controls actuators assuming that boost pressure is barometric pressure. • ECM stops EGR valve control. • ECM controls that driving performance is slightly limited. • For DPF® model: – ECM stops boost pressure control solenoid valve control. – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0243	Boost Pressure Control Solenoid Valve	For circuit error: • ECM controls that driving performance is slightly limited. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off. For signal error: • ECM stops EGR control.

DTC No.	DTC Name	Fail-Safe Operation
☞ P0335	Crankshaft Position Sensor Circuit	For non-DPF® model: • No recovery For DPF® model: • ECM prevents after-sales regeneration.
☞ P0340	Camshaft Position Sensor Circuit	ECM stops engine running.
☞ P0380	Glow Plug Control Module Control Circuit	For non-DPF® model: • No recovery For DPF® model: • ECM prevents after-sales regeneration.
☞ P0400	Exhaust Gas Recirculation Flow	• ECM stops EGR valve control. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0403	Exhaust Gas Recirculation Control Circuit	ECM stops EGR valve control. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P0500	Vehicle Speed Sensor	• ECM controls actuators assuming that vehicle speed is specified value. • For DPF® model: – ECM controls that driving performance is slightly limited. – ECM prevents after-sales regeneration.
☞ P0520	Engine Oil Pressure Switch Circuit	No recovery
☞ P0530	A/C Refrigerant Pressure Sensor Circuit	• ECM controls actuators assuming that A/C refrigerant pressure sensor is specified value. • ECM stops A/C control. • ECM operates radiator cooling fan at high speed.
☞ P0560	System Voltage	ECM controls actuators assuming that battery voltage is recovery value.
☞ P0571	Brake Light Switch Circuit	• ECM controls engine speed at specified value. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P0602	Control Module Program Error	No recovery
☞ P0603	Internal Control Module Keep Alive Memory (KAN) Error	No recovery
☞ P0604	Internal Control Module Random Access Memory (RAM) Error	No recovery
☞ P0605	Internal Control Module Read Only Memory (ROM) Error	No recovery
☞ P0650	Malfunction Indicator Lamp (MIL) Control Circuit	No recovery
☞ P0683	Glow Plug Control Circuit	For non-DPF® model: • No recovery For DPF® model: • ECM prevents after-sales regeneration.
☞ P0685	ECM Power Relay Control Circuit / Open	No recovery
☞ P0704	Clutch Switch Input Circuit Malfunction	• ECM controls actuators assuming that clutch pedal is depressed. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1093	Low Pressure Fuel Circuit Leakage	ECM controls that driving performance is slightly limited.

DTC No.	DTC Name	Fail-Safe Operation
☞ P1105	Barometric Pressure Sensor Range / Performance	• ECM controls actuators assuming that barometric pressure sensor is specified value. • ECM controls that driving performance is slightly limited. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P1120	APP Sensor 1 Circuit	For circuit error: • ECM controls actuators assuming that value of APP is value of other APP sensor or 0. • ECM controls that driving performance is slightly limited. • ECM controls engine speed at specified value. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off. For signal error: • ECM controls actuators assuming that APP is value of minimum value of APP sensor (main) or APP sensor (sub). • ECM controls that driving performance is slightly limited. • ECM controls engine speed at specified value. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P1122	APP Sensor 2 Circuit	
☞ P1180	Fuel Heater Relay Circuit	No recovery
☞ P1190	Fuel Pressure Regulator Flow	• ECM controls actuators assuming that rail pressure is specified range. • ECM controls that driving performance is slightly limited. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1191	Fuel Pressure Regulator Range / Performance	• ECM controls that driving performance is slightly limited. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1481	Radiator Fan Output 1 Circuit Malfunction	• ECM operates radiator cooling fan at high speed. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1482	Radiator Fan Output 2 Circuit Malfunction	• ECM operates radiator cooling fan at low speed. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1483	Radiator Fan Output 3 Circuit Malfunction	• ECM operates radiator cooling fan at low speed. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1530	A/C Compressor Relay Circuit	ECM operates radiator cooling fan at high speed.
☞ P1571	Brake Switch Circuit	• ECM controls engine speed at specified value. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1600	A/D Converter Malfunction	• ECM limits engine speed. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.

DTC No.	DTC Name	Fail-Safe Operation
☞ P1620	Sensor Supply Circuit 1 Fail	• ECM limits engine speed. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P1625	ECM Power Relay Circuit Malfunction	No recovery
☞ P1635	Sensor Supply Circuit 2 Fail	• ECM limits engine speed. • For DPF® model: – ECM prevents forced/after-sales regeneration. – ECM controls that DPF® warning light turns off.
☞ P1639	Sensor Supply Circuit 3 Fail	• ECM controls actuators assuming that sensor supply voltage is specified value. • ECM limits engine speed. • For DPF® model: – ECM prevents after-sales regeneration.
☞ P1660	Shut Off Valve	No recovery
☞ P1725	Engine Speed Output Signal Circuit	No recovery
☞ P1811	Engine Torque Control Invalid Communication with ABS / ESP®	ECM excludes torque request signal from ABS/ESP® control module.
☞ P1901	DPF® Differential Pressure Sensor or Flow Resistance Malfunction	For circuit error: • ECM controls actuators assuming that DPF® differential pressure is specified value. • ECM prevents after-sales regeneration. For DPF® flow resistance too high: ECM controls that driving performance is slightly limited.
☞ P1902	EGT Sensor Circuit	• ECM stops calculation of DPF® flow resistance. • ECM controls that driving performance is slightly limited. • ECM prevents forced/after-sales regeneration. • ECM controls that DPF® warning light turns off.
☞ P2003	DPF® Flow Resistance Too High	• ECM controls that driving performance is slightly limited. • ECM prevents forced/after-sales regeneration. • ECM controls that DPF® warning light turns off.
☞ P2146	Fuel Injector Supply Voltage Circuit / Open	ECM stops injector electric diagnosis.
☞ P2237	A/F Sensor Positive Current Control Circuit / Open	ECM stops closed loop (air/fuel ratio feedback) and executes open loop.
☞ P2244	A/F Sensor Reference Voltage Performance	ECM stops closed loop (air/fuel ratio feedback) and executes open loop.
☞ P2297	A/F Sensor Out of Range During Deceleration	ECM stops closed loop (air/fuel ratio feedback) and executes open loop.

Scan Tool Data

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As the data values below are standard values estimated on the basis of values obtained from the normally operating vehicles by using a SUZUKI 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, conditions that can be checked by the SUZUKI 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 SUZUKI scan tool.

⚠ CAUTION

In case that ECM detects DTC and enters fail-safe mode, scan tool data is changed from its normal operating value. And, it may also result in misdiagnosis.
Therefore, be sure to check DTC and repair its malfunction if DTC is detected before checking scan tool data.

NOTE

- **When checking the data with the engine running at idle or racing, be sure to shift M/T gear to the neutral position and pull the parking brake fully.**
- **Even if vehicle is under idling condition, forced regeneration without speed request is activated according to DPF® clogging.**
  In this state, the following scan tool data are changed to reference value with forced regeneration.
  - **Engine Speed**
  - **Desired Idle**
  - **EGR Valve**
  - **EGR Sol duty cycle**
  - **Radiator cooling fan**
  - **EGT**
  - **BP Valve duty cycle**

For details of forced regeneration, refer to "Forced regeneration without Speed Request" under "Diesel Particulate Filter (DPF®) Regeneration Description: D13A / Z13DTJ".

Scan tool data	Vehicle condition		Normal condition / reference value	Reference item
☞ Engine Speed	It idling with no load after warming up	Without forced regeneration	Approx. 800 rpm	—
		With forced regeneration	Approx. 900 to 950 rpm	
☞ Desired Idle	It idling with radiator cooling fan stopped and all electrical parts turned OFF after warming up	Without forced regeneration	800 rpm	—
	It idling with all electrical parts turned OFF after warming up	With forced regeneration	900 to 950 rpm	
☞ Vehicle Speed	At vehicle stop		0 km/h (0 mph)	"Table C-7: Speed Signal Check: D13A / Z13DTJ"
☞ Coolant Temp	At specified idle speed after warming up		80 – 110 °C, 176 – 230 °F	—
☞ Intake Air Temp	At specified idle speed after warming up		–5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp.	"Table C-5: IAT Sensor Check: D13A / Z13DTJ"
☞ MAF	At specified idle speed after warming up and EGR OFF		5.5 g/sec. or more	—
	At specified idle speed after warming up and EGR ON		3.0 g/sec. or more	
☞ Boost pressure	At specified idle speed after warming up		Barometric pressure is displayed	—
	Increase engine speed to 3,500 rpm		120 kPa or more	
☞ APP Sensor 1 Volt	Ignition switch ON and accelerator pedal released		0.60 – 1.10 V	"Table C-6: Accelerator Pedal Check: D13A / Z13DTJ"
	Ignition switch ON and accelerator pedal depressed fully		3.60 – 4.30 V	
☞ APP Sensor 2 Volt	Ignition switch ON and accelerator pedal released		0.20 – 0.55 V	
	Ignition switch ON and accelerator pedal depressed fully		1.80 – 2.15 V	
☞ Accel Position	Ignition switch ON and accelerator pedal released		0 – 5%	
	Ignition switch ON and accelerator pedal depressed fully		95 – 100%	

Scan tool data	Vehicle condition		Normal condition / reference value	Reference item
☞ A/C Pressure	Engine running	- A/C ON (A/C is operating) - Ambient temperature: 30 °C (86 °F) - Humidity: 50%	1,600 – 2,040 kPa	"A/C System Performance Inspection: Manual A/C in Section 7B" or "A/C System Performance Inspection: Auto A/C in Section 7B"
		- A/C OFF (A/C is not operating) - After longer than 10 minutes from A/C OFF - Ambient temperature: 30 °C (86 °F)	600 – 1,000 kPa	
☞ Fuel temperature	Ignition switch ON		–25 to 95 °C (–13 to 194 °F)	"Table A-3: Fuel Temperature Sensor Check: D13A / Z13DTJ"
☞ Fuel Rail Pressure	At specified idle speed after warming up		25.00 – 45.00 Mpa (250 – 450 Bar)	—
	Increase engine speed to 3,500 rpm		60.00 Mpa (600 Bar) or more	—
☞ Desired Rail Press	At specified idle speed after warming up		25.00 – 45.00 Mpa (250 – 450 Bar)	—
	Increase engine speed to 3,500 rpm		60.00 Mpa (600 bar) or more	—
☞ Rail Press Regulator	At specified idle speed after warming up		15 – 20%	—
	Increase engine speed to 3,500 rpm		25 – 35%	—
☞ Closed Throttle Pos	At specified idle speed after warming up		ON	—
	Increase engine speed to 3,500 rpm		OFF	
☞ EGR Valve	Without forced regeneration	At specified idle speed after warming up	ON	—
		Increase engine speed to 4,000 rpm	OFF	—
	With forced regeneration		OFF	
☞ EGR Sol duty cycle	Without forced regeneration	At specified idle speed after warming up	20 – 70%	—
		Increase engine speed to 4,000 rpm	20% or less	
	With forced regeneration		Approx. 2%	
☞ Barometric Pres	Ignition switch ON		Barometric pressure is displayed	"Table B-4: Barometric Pressure Check: D13A / Z13DTJ"
☞ Battery Voltage	Ignition switch ON / engine at stop		10 – 14 V	"Battery Inspection: D13A / Z13DTJ in Section 1J"
☞ SVS light	Ignition switch ON without cranking		ON	"Service Vehicle Soon (SVS) Light Check: D13A / Z13DTJ"
	Engine running without faulty condition		OFF	
☞ Glow Indicator light	Within a few seconds after ignition switch ON		ON	—
	At specified idle speed after warming up		OFF	
☞ Glow Plug	Within a few seconds after ignition switch ON		ON	"Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ"
	At specified idle speed after warming up		OFF	

Scan tool data	Vehicle condition		Normal condition / reference value	Reference item
☞ Main relay	Ignition switch ON		ON	"Table C-2: Main Relay Operation Check: D13A / Z13DTJ"
	Ignition switch OFF		OFF	
☞ MIL	Ignition switch ON without cranking		ON	"Malfunction Indicator Lamp (MIL) Check: D13A / Z13DTJ"
	Engine running without faulty condition		OFF	
☞ A/C Comp Relay	Engine running after warming up, A/C not operating		OFF	—
	Engine running after warming up, A/C operating		ON	
☞ A/C Switch	Engine running after warming up, A/C not operating		OFF	—
	Engine running after warming up, A/C operating		ON	
☞ Radiator cooling fan	With forced regeneration		LOW	—
	Without forced regeneration	At rising ECT: ECT < 98 °CAt falling ECT: ECT < 95 °C	OFF	—
	At rising ECT: 98 °C < ECT < 103 °C At falling ECT: 95 °C < ECT < 98 °C		LOW	—
	At rising ECT: ECT > 103 °C At falling ECT: ECT > 98 °C		HIGH	—
☞ Fuel Pump	Within 20 sec. after ignition switch ON or engine running		ACTIVE	—
	Except above-mentioned condition		INACTIVE	
☞ Brake light switch	Ignition switch ON and brake pedal released		OFF	—
	Ignition switch ON and brake pedal depressed fully		ON	
☞ Brake Switch	Ignition switch ON and brake pedal released		ON	—
	Ignition switch ON and brake pedal depressed fully		OFF	
☞ Ignition Switch	Ignition switch ON		ON	—
	Ignition switch OFF		OFF	
☞ CPP Switch	Ignition switch ON and clutch pedal released		OFF	—
	Ignition switch ON and clutch pedal depressed fully		ON	
☞ Fuel heater	Fuel heater ON		ON	"Table A-8: Fuel Heater Operation Check: D13A / Z13DTJ"
	Fuel heater OFF		OFF	
☞ Oil life warning	Engine oil life is not end		OFF	—
	Engine oil life is end		ON	
☞ DPF Diff Press	At specified idle speed after warming up		0 – 10 kPa (0 – 100 mbar)	—
☞ EGT	At specified idle speed after warming up	Without forced regeneration	30 – 250 °C, 86 – 482 °F	—
		With forced regeneration	500 – 700 °C, 932 – 1,292 °F	—
☞ DPF clogging	At specified idle speed after warming up		0 – 220%	—
☞ Mileage from DPF rep	Ignition switch ON		Distance from Diesel particulate filter substitution is displayed.	—

Scan tool data	Vehicle condition		Normal condition / reference value	Reference item
☞ Mileage from regene	Ignition switch ON		Distance from last regeneration is displayed.	—
☞DPF warning light	At specified idle speed after warming up		OFF	—
☞ DPF flow resistance	At specified idle speed after warming up		0 – 1.3 kPa / m3h, 0 – 13 mbar / m3h	—
☞ BP Valve duty cycle	At specified idle speed after warming up	Without forced regeneration	15 – 25%	—
		With forced regeneration	55 – 65%	
	Increase engine speed to 3,500 rpm	Without forced regeneration	30 – 40%	
		With forced regeneration	50 – 60%	

Scan Tool Data Definitions

Engine Speed (rpm):
This parameter indicates revolutions per minute of engine.

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

Vehicle Speed (km/h, mph):
This parameter indicates vehicle speed.

Coolant Temp (Engine coolant temperature) (°C, °F):
This parameter indicates engine coolant temperature measured by ECT sensor

Intake Air Temp. (Intake air temperature) (°C, °F):
This parameter indicates intake air temperature measured by IAT sensor.

MAF (Mass air flow rate) (g/sec.):
This parameter indicates mass air flow rate measured by MAF sensor.

Boost pressure (kPa):
This parameter indicates boost pressure measured by boost pressure sensor.

APP Sensor 1 Volt (APP Sensor (Main) Output Voltage) (V):
The Accelerator Pedal Position (APP) (Main) reading provides accelerator pedal opening information in the form of voltage.

APP Sensor 2 Volt (APP Sensor (Sub) Output Voltage) (V):
The Accelerator Pedal Position (APP) (Sub) reading provides accelerator pedal opening information in the form of voltage.

Accel Position (Accelerator pedal position) (%):
When accelerator pedal is at fully released position, accelerator pedal is indicated as 0 – 3% and 90 – 100% fully depressed position.

A/C Pressure (A/C refrigerant pressure) (kPa):
This parameter indicates A/C refrigerant absolute pressure calculated by ECM.

Fuel temperature (°C, °F):
This parameter indicates fuel temperature measured by fuel temperature sensor.

Fuel Rail Pressure (Fuel pressure in rail) (MPa, bar):
This parameter indicates fuel pressure in common rail measured by fuel pressure sensor.

Desired Rail Press (Fuel pressure in rail (target)) (MPa, bar):
The Desired Rail Press is an ECM internal parameter. This parameter indicates fuel pressure in common rail targeted by ECM.

Rail Press Regulator (Fuel pressure regulator valve opening) (%):
This parameter indicates opening rate of fuel pressure regulator.

Closed Throttle Pos (Closed Throttle Position) (ON/OFF):
This parameter indicates operating state of accelerator pedal.
ON: Accelerator pedal is depressed.
OFF: Accelerator pedal is released.

EGR Valve (ON/OFF):
This parameter indicates operating state of EGR valve.

EGR sol duty cycle (EGR solenoid valve duty cycle) (%):
This parameter indicated valve ON (valve open) time rate within a certain set cycle of EGR valve which control the amount of EGR.

Barometric Pres (Barometric pressure) (kPa):
This parameter represents a measurement of barometric air pressure and is used for altitude correction of the fuel injection quantity.

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

SVS light (ON/OFF):
This parameter indicates operating state of SVS light.

Glow Indicator light (ON/OFF):
This parameter indicates operating state of glow indicator light.

Glow Plug (ON/OFF):
This parameter indicates operating signal of glow plug from ECM to glow control module.

Main relay (ON/OFF):
This parameter indicates operating state of main relay.

MIL (ON/OFF):
This parameter indicates operating state of MIL.

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

A/C Switch (ON/OFF):
ON: Command for A/C operation being output from ECM to HVAC control unit.
OFF: Command for A/C operation not being output.

Radiator cooling fan (OFF/LOW/HIGH):
LOW: ON command being output to radiator cooling fan relay No.1.
HIGH: ON command being output to radiator cooling fan relay No.1, No.2 and No.3.
OFF: No command being output.

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

Brake light switch (ON/OFF):
This parameter indicates operating state of brake light switch.

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

Ignition Switch (ON/OFF):
This parameter indicates operating state of ignition switch.

CPP Switch (Clutch Pedal Position Switch) (ON/OFF):
This parameter indicates operating state of CPP switch.

Fuel heater (Fuel heater status) (ON/OFF):
This parameter indicates operating state of fuel heater.

Oil life warning (ON/OFF):
This parameter indicates operating state of blinking of oil pressure.
ON: Engine oil life is end.
OFF: Engine oil life is not end.

DPF Diff Press (DPF® differential pressure) (Pa, mbar):
This parameter indicates differential pressure between inlet of DPF® and barometric pressure.
This parameter is measured by DPF® differential pressure sensor.

EGT (°C, °F):
This parameter indicates exhaust gas temperature at inlet of DPF®.
This parameter is detected by EGT sensor.

DPF clogging (DPF® clogging) (%):
This parameter indicates clogging rate of DPF®.

Mileage from DPF rep (Mileage form DPF® is replaced) (km/mile):
This parameter indicates distance when replacing DPF®.

Mileage from regene (Mileage from DPF® is regeneration) (Km/mile):
This parameter indicates distance from last regeneration of DPF®.

DPF warning light (ON/OFF):
This parameter indicates operating state of DPF® warning light.
ON: Speed request is requested.
OFF: Speed request is not requested.

DPF flow resistance (DPF® flow resistance) (kPa (mbar) / m3h):
This parameter indicates flow resistance of DPF®.

BP valve duty cycle (Boost pressure control solenoid valve duty cycle) (%):
This parameter indicated valve ON (valve open) time rate within a certain set cycle of boost control solenoid valve which controls the boost pressure.

Visual Inspection

S7N20A1124009

Visually check the following parts and systems.

Inspection item	Referring section
• Engine oil-level, leakage	"Engine Oil and Filter Change (Diesel Engine) in Section 0B"
• Engine coolant-level, leakage	"Coolant Level Check: D13A / Z13DTJ in Section 1F"
• Fuel-level, leakage	"Fuel Lines and Connections Inspection (Diesel Engine Model) in Section 0B"
• Air cleaner filter-dirt, clogging	"Air Cleaner Filter Inspection and Cleaning: D13A / Z13DTJ in Section 1D"
• Battery-fluid level, corrosion of terminal	"Battery Description: D13A / Z13DTJ in Section 1J"
• Water pump belt-tension damage	"Accessory Drive Belt On-Vehicle Inspection: D13A / Z13DTJ in Section 1F"
• Vacuum hoses of air intake system-disconnection, looseness, deterioration, bend	—
• Connectors of electric wire harness-disconnection, friction	—
• Fuses-burning	—
• Parts-installation, bolt-looseness	—
• Parts-deformation	—
• Other parts that can be checked visually	—
Also check the following items at engine start, if possible	
• MIL-Operation	"Malfunction Indicator Lamp (MIL) Check: D13A / Z13DTJ"
• SVS light-Operation	"Service Vehicle Soon (SVS) Light Check: D13A / Z13DTJ"
• DPF® warning light-Operation	—
• Charging light-Operation	"Generator Symptom Diagnosis: D13A / Z13DTJ in Section 1J"
• Oil pressure light-Operation	"Oil Pressure Switch On-Vehicle Inspection: D13A / Z13DTJ in Section 1E"
• High engine temperature warning light-Operation	—
• Fuel level meter-Operation	"Fuel Level Sensor Inspection: D13A / Z13DTJ in Section 1G"
• Tachometer-Operation	—
• Abnormal air being inhaled from air intake system	—
• Exhaust system-leakage of exhaust gas, noise	—
• Other parts that can be checked visually	—

Engine Basic Inspection

S7N20A1124010

This check is very important for troubleshooting when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: D13A / Z13DTJ”.
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: D13A / Z13DTJ”.
2	**Check battery voltage** *Is it 11 V or more?*	Go to Step 3.	Charge or replace battery.
3	*Is engine cranked?*	Go to Step 4.	Go to “Cranking System Symptom Diagnosis: D13A / Z13DTJ in Section 1I”.
4	*Does engine start?*	Go to “Engine Symptom Diagnosis: D13A / Z13DTJ”.	Go to Step 5.
5	**Check immobilizer system** Refer to “Immobilizer Control System Check: Diesel Model in Section 10C”. *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 7.	Repair or replace.
7	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to “Hard Starting (Engine Cranks OK)” under “Engine Symptom Diagnosis: D13A / Z13DTJ”.	Repair or replace.

Engine Symptom Diagnosis

S7N20A1124174

Perform troubleshooting referring to the followings when ECM has detected no DTC and no abnormality has been found in “Visual Inspection: D13A / Z13DTJ” and “Engine Basic Inspection: D13A / Z13DTJ”.

Condition	Correction / Reference Item
Hard starting (Engine cranks OK)	Refer to “Hard Starting (Engine cranks OK): D13A / Z13DTJ”.
Engine not running smoothly	Refer to “Engine Not Running Smoothly: D13A / Z13DTJ”.
Engine does not produce best performance	Refer to “Engine Does Not Produce Best Performance: D13A / Z13DTJ”.
Engine hesitates-Momentary lack of response as accelerator is depressed	Refer to “Engine Hesitates – Momentary Lack of Response as Accelerator is Depressed.: D13A / Z13DTJ”.
Improper engine idle or engine stops at idle	Refer to “Improper Engine Idling or Engine Stops at Idle: D13A / Z13DTJ”.
Engine cuts out whilst driving	Refer to “Engine Cuts Out Whilst Driving: D13A / Z13DTJ”.
Engine knocking	Refer to “Engine Knocking: D13A / Z13DTJ”.
White exhaust fumes	Refer to “White Exhaust Fumes: D13A / Z13DTJ”.
Black exhaust fumes	Refer to “Black Exhaust Fumes: D13A / Z13DTJ”.
Excessive exhaust fumes	Refer to “Excessive Exhaust Fumes: D13A / Z13DTJ”.
Engine oil excessive level	Refer to “Engine Oil Excessive Level: D13A / Z13DTJ”.
Poor fuel mileage	Refer to “Poor Fuel Mileage: D13A / Z13DTJ”.

Condition	Correction / Reference Item
Engine oil excessive consumption	Refer to “Engine Oil Excessive Consumption: D13A / Z13DTJ”.

Hard Starting (Engine cranks OK)

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check that main and circuit fuses have not blown. • Check fuel heater referring to “Table A-8: Fuel Heater Operation Check: D13A / Z13DTJ”. • Wiring on engine correctly fastened to ground. • Battery correctly fastened to ground. • Positive battery terminal and all leads connected to it correctly fastened. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Environmental parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check the value of the following parameters referring to “Scan Tool Data: D13A / Z13DTJ”. • Battery Voltage • Accel position • APP sensor 1 Volt • APP sensor 2 Volt • Barometric Pres • Fuel Temp *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Are they in good condition?*	Go to Step 4.	Repair or replace.
4	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Repair or replace.

Step	Action	Yes	No
6	**Lubrication system check** 1) Check lubrication system is working properly referring to "Oil Pressure Check: D13A / Z13DTJ in Section 1E". *Is it in good condition?*	Go to Step 7.	Repair or replace.
7	**Cylinder compression check** 1) Carry out cylinder compression check referring to "Compression Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 8.	Cylinder compression insufficient. Go to Step 6.
8	**Timing check** 1) Check that valve timing is correct referring to "Timing Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 9.	Valve timing is not correct. Adjust valve timing referring to "Installation" under "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D".
9	**Combustion chamber check** Check combustion chamber for excessive deposit referring to "Valves and Guides Inspection: D13A / Z13DTJ in Section 1D", "Cylinder Head Inspection: D13A / Z13DTJ in Section 1D" and "Cylinders, Pistons and Piston Rings Inspection: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 10.	Repair or replace.
10	**Valve spring and lash adjuster check** 1) Check valve spring and hydraulic valve adjuster referring to "Valve Springs Inspection: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	End.	Repair or replace.

Engine Not Running Smoothly

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B". • Check that intake air / turbocharger circuit is working properly referring to "Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ". • Check that main and circuit fuses not blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.

Step	Action	Yes	No
2	**Environmental parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check the value of the following parameters referring to "Scan Tool Data: D13A / Z13DTJ". • Battery Voltage • Accel position • APP Sensor 1 Volt • APP Sensor 2 Volt • Barometric Pres • Fuel temperature *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to "Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Vehicle speed signal check** 1) Check that vehicle speed signal is correct referring to "Table C-7: Speed Signal Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**A/C system check** 1) Check that A/C system is working properly referring to "A/C System Performance Inspection: Manual A/C in Section 7B" or "Air Conditioning System Check: Auto A/C in Section 7B". *Is it in good condition?*	Go to Step 7.	Repair or replace.
7	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to "Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 8.	Repair or replace.
8	**EGR valve check** 1) Check EGR valve referring to "Table B-5: EGR Valve Operation Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 9.	Repair replace.
9	**Turbocharger system check** 1) Check turbocharger system is working properly referring to "Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ". *Is it in good condition?*	DPF® model: Go to Step 10. Non-DPF® model: Go to Step 11	Repair or replace.

Step	Action	Yes	No
10	**Boost pressure control solenoid valve operation check (DPF® model)** 1) Check boost pressure control solenoid valve operation referring to "Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model): D13A / Z13DTJ". *Is it in good condition?*	Go to Step 11.	Repair or replace.
11	**Timing check** 1) Check that valve timing is correct referring to "Timing Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 12.	Valve timing is not correct. Adjust valve timing referring to "Installation" under "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D".
12	**Cylinder compression check** 1) Carry out cylinder compression check referring to "Compression Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 13.	Cylinder compression insufficient. Repair or replace.
13	**Lubrication system check** 1) Check lubrication system is working properly referring to "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	End.	Repair or replace.

Engine Does Not Produce Best Performance

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B". • Check that intake air/turbocharger circuit is working properly referring to "Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ". • Check that main and circuit fuses have not blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check the value of the following parameters referring to "Scan Tool Data: D13A / Z13DTJ". • Battery Voltage • Accel position • APP Sensor 1 Volt • APP Sensor 2 Volt • Barometric Pres • Intake Air Temp • Fuel temperature *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.

Step	Action	Yes	No
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**EGR valve check** 1) Check EGR valve referring to “Table B-5: EGR Valve Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 7.	Repair or replace.
7	**Brake light switch check** 1) Check that brake light switch is working properly referring to “Stop (Brake) Lamp Switch Inspection in Section 9B”. *Is it in good condition?*	DPF® model: Go to Step 8. Non-DPF® model: Go to Step 9.	Brake pedal does not return. Eliminate cause of the sticking. Switch stuck closed or wiring short circuit. Repair circuit or replace brake light switch.
8	**Boost pressure control solenoid valve operation check (DPF® model)** 1) Check boost pressure control solenoid valve operation referring to “Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model): D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 9.	Repair or replace.
9	**Turbocharger system check** 1) Check turbocharger system is working properly referring to “Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 10.	Repair or replace.
10	**Timing check** 1) Check that valve timing is correct referring to “Installation” under “Timing Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 11.	Valve timing is not correct. Adjust valve timing referring to “Installation” under “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D”.
11	**Cylinder compression check** 1) Carry out cylinder compression check referring to “Compression Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 12.	Cylinder compression is insufficient. Repair or replace.

Step	Action	Yes	No
12	**Brake system check** 1) Check brake system for dragging referring to “Brakes Symptom Diagnosis in Section 4A”. *Is it in good condition?*	Go to Step 13.	Repair or replace.
13	**Clutch system check** 1) Check clutch system for slipping referring to “Clutch System Symptom Diagnosis in Section 5C”. *Is it in good condition?*	End.	Repair or replace.

Engine Hesitates – Momentary Lack of Response as Accelerator is Depressed.

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / vacuum circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check that main and circuit fuses have not blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to “Scan Tool Data: D13A / Z13DTJ”. • Battery Voltage • Accel position • APP Sensor 1 Volt • APP Sensor 2 Volt • Barometric Pres • Intake Air Temp • Fuel temperature *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Low fuel Pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Repair or replace.

Step	Action	Yes	No
6	**Cylinder compression check** 1) Carry out cylinder compression check referring to“Compression Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	End.	Cylinder compression insufficient. Repair or replace.

Improper Engine Idling or Engine Stops at Idle

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check main and circuit fuses have blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Configuration tests** 1) If symptom is occurred after replacing any of the following component(s), it is necessary to register data into ECM referring to “ECM Registration: D13A / Z13DTJ in Section 1C”. • Fuel pressure sensor • Fuel injector • DPF® Differential pressure sensor • DPF® *Are they in good condition?*	Go to Step 3.	Carry out register data of replacing component(s) in ECM described in “ECM Registration: D13A / Z13DTJ in Section 1C”.
3	**Environmental parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to “Scan Tool Data: D13A / Z13DTJ”. • Battery Voltage • Accel position • APP Sensor 1 Volt • APP Sensor 2 Volt • Barometric Pres • Intake Air Temp. • A/C Pressure • Fuel temperature *Are they in good condition?*	Go to Step 4.	Check that system of faulty parameter.
4	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.

Step	Action	Yes	No
5	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 7.	Repair or replace.
7	**EGR valve check** 1) Check EGR valve referring to “Table B-5: EGR Valve Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 8.	Repair or replace.
8	**A/C compressor magnet clutch check** 1) Check magnet clutch operation for stuck ON and chattering. *Is it in good condition?*	Go to Step 9.	Repair or replace.
9	**Cylinder compression check** 1) Carry out cylinder compression check referring to “Compression Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 10.	Cylinder compression insufficient. Repair or replace.
10	**Lubrication system check** 1) Check lubrication system is working properly referring to “Oil Pressure Check: D13A / Z13DTJ in Section 1E”. *Is it in good condition?*	End.	Repair or replace.

Engine Cuts Out Whilst Driving

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check that main and circuit fuses have not blown. • Wiring on engine correctly fastened to ground. • Battery correctly fastened to ground. • Positive battery terminal and all leads connected to it correctly fastened. *Are they in good condition?*	Go to Step 2.	Repair or replace.

Step	Action	Yes	No
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to "Scan Tool Data: D13A / Z13DTJ". • Battery Voltage *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to "Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair.
4	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to "Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	End.	Repair or replace.

Engine Knocking

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B". • Check that intake air / turbocharger circuit is working properly referring to "Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ". *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to "Scan Tool Data: D13A / Z13DTJ". • Battery Voltage • Barometric Pres • Intake Air Temp • Fuel temperature *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair or replace.

Step	Action	Yes	No
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Replace.
6	**Combustion chamber check** 1) Check combustion chamber for excessive deposit referring to “Valves and Guides Inspection: D13A / Z13DTJ in Section 1D”, “Cylinder Head Inspection: D13A / Z13DTJ in Section 1D” and “Cylinders, Pistons and Piston Rings Inspection: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	End.	Repair or replace.

White Exhaust Fumes

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check that main and circuit fuses have not blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to “Scan Tool Data: D13A / Z13DTJ”. • Battery Voltage • Barometric Pres • Fuel temperature • Intake Air Temp *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**Cylinder compression check** 1) Carry out cylinder compression check referring to “Compression Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 5.	Cylinder compression insufficient. Repair or replace.

Step	Action	Yes	No
5	**Check cylinder head gasket and valve oil seals** 1) Check the following. • Check that cylinder head is correctly tightened • Check seal of cylinder head gasket • Check seal of valve oil seals *Are they in good condition?*	Go to Step 6.	Cylinder head tightening incorrect: Proceed with removing-refitting of cylinder head and renew correct tightening, refer to “Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”. Cylinder head gasket damaged: Change cylinder head gasket referring to“Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”. Valve oil seal missing: Replace valve oil seals referring to “Valve and Cylinder Head Assembly Disassembly and Reassembly: D13A / Z13DTJ in Section 1D”.
6	**Blow-by gas intake circuit check** 1) Check condition of blow-by gas intake circuit, in particular check that there are no obstructions in separator or in hoses. *Is it in good condition?*	Go to Step 7.	Fault in hose between oil separator and intake manifold: • Restore circuit to working order • Change pipe if necessary Fault in oil separator: • Restore circuit to working order • If necessary, replace cylinder head cover
7	**Turbocharger seal check** 1) Check that there are no engine oil leaks from turbocharger impeller shaft. *Is it in good condition?*	End.	Gasket seal insufficient Replace turbocharger referring to “Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D”.

Black Exhaust Fumes

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B". • Check that intake air / vacuum circuit is working properly referring to "Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ". • Check that main and circuit fuses have not blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to "Scan Tool Data: D13A / Z13DTJ". • Battery Voltage • Barometric Pres • Fuel temperature *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to "Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**EGR valve check** 1) Check EGR valve referring to "Table B-5: EGR Valve Operation Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to "Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ". *Is it in good condition?*	DPF® model: Go to Step 8. Non-DPF® model: Go to Step 7.	Repair or replace.
7	**A/F sensor check (Non-DPF® model)** 1) Check A/F sensor operation referring to "Table B-9: A/F Sensor Check (Non-DPF® Model): D13A / Z13DTJ". *Is it in good condition?*	Go to Step 8.	Repair or Replace.

Step	Action	Yes	No
8	**Timing check** 1) Check that valve timing is correct referring to “Timing Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 9.	Valve timing is not correct. Adjust valve timing referring to “Installation” under “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D”.
9	**Turbocharger system check** 1) Check turbocharger system is working properly referring to “Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	End.	Repair or replace.

Excessive Exhaust Fumes

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check that main and circuit fuses not blown. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Ambient parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check value of the following parameters referring to “Scan Tool Data: D13A / Z13DTJ”. • Battery Voltage • Barometric Pres • Coolant Temp *Are they in good condition?*	Go to Step 3.	Check that system of faulty parameter.
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Glow plug control module and its circuit check** 1) Check that glow plugs are working properly referring to “Table C-8: Glow Plugs Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Repair or replace.

Step	Action	Yes	No
6	**Cylinder compression check** 1) Carry out cylinder compression check referring to "Compression Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	DPF® model: Go to Step 8. Non-DPF® model: Go to Step 7.	Cylinder compression insufficient. Repair or replace.
7	**A/F sensor check (Non-DPF® model)** 1) Check A/F sensor operation referring to "Table B-9: A/F Sensor Check (Non-DPF® Model): D13A / Z13DTJ". *Is it in good condition?*	Go to Step 8.	Repair or Replace.
8	**Timing check** 1) Check that valve timing is correct referring to "Timing Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 9.	Valve timing is not correct. Adjust valve timing referring to "Installation" under "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D".
9	**Turbocharger system check** 1) Check turbocharger system is working properly referring to "Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ". *Is it in good condition?*	End.	Repair or replace.

Engine Oil Excessive Level

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B". • Check condition of fuel circuit and make sure that it is working properly referring to "Table A-1: Fuel Pump Relay Operation Check: D13A / Z13DTJ". *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Cylinder compression check** 1) Carry out cylinder compression check referring to "Compression Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 3.	Cylinder compression insufficient. Repair or replace.
3	**Timing check** 1) Check that valve timing is correct referring to "Timing Check: D13A / Z13DTJ in Section 1D". *Is it in good condition?*	Go to Step 4.	Valve timing not correct. Adjust valve timing referring to "Installation" under "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D".
4	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 5.	Repair or replace.

Step	Action	Yes	No
5	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	End.	Repair or replace.

Poor Fuel Mileage

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. • Check that intake air / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. • Check tire pressure referring to “Tires Description in Section 2D”. *Are they in good condition?*	Go to Step 2.	Repair or replace.
2	**Environmental parameters check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check the value of the following parameters referring to “Scan Tool Data: D13A / Z13DTJ”. • Battery Voltage • Accel position • APP sensor 1 Volt • APP sensor 2 Volt • Barometric Pres *Are they in good condition?*	Go to Step 3.	Check that system faulty parameter.
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Cylinder compression check** 1) Carry out cylinder compression check referring to “Compression Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 6.	Cylinder compression insufficient. Repair or replace.
6	**Turbocharger system check** 1) Check turbocharger system is working properly referring to “Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 7.	Repair or replace.

Step	Action	Yes	No
7	**Timing check** 1) Check that valve timing is correct referring to “Timing Chain Cover and Timing Chain Inspection: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	DPF® model: Go to Step 9. Non-DPF® model: Go to Step 8.	Valve timing is not correct. Adjust valve timing referring to “Installation” under “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D”.
8	**A/F sensor check (Non-DPF® model)** 1) Check A/F sensor operation referring to “Table B-9: A/F Sensor Check (Non-DPF® Model): D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 9.	Repair or Replace.
9	**Lubrication system check** 1) Check lubrication system is working properly referring to “Oil Pressure Check: D13A / Z13DTJ in Section 1E”. *Is it in good condition?*	Go to Step 10.	Repair or replace.
10	**A/C compressor magnet clutch check** 1) Check magnet clutch operation for stuck ON and chattering. *Is it in good condition?*	Go to Step 11.	Repair or replace.
11	**Brake system check** 1) Check brake system for dragging referring to “Brakes Symptom Diagnosis in Section 4A”. *Is it in good condition?*	Go to Step 12.	Repair or replace.
12	**Clutch system check** 1) Check clutch system for slipping referring to “Clutch System Symptom Diagnosis in Section 5C”. *Is it in good condition?*	Go to Step 13.	Repair or replace.
13	**Combustion chamber check** 1) Check combustion chamber for excessive deposit referring to “Valves and Guides Inspection: D13A / Z13DTJ in Section 1D”, “Cylinder Head Inspection: D13A / Z13DTJ in Section 1D” and “Cylinders, Pistons and Piston Rings Inspection: D13A / Z13DTJ in Section 1D”. *Are they in good condition?*	End.	Repair or replace.

Engine Oil Excessive Consumption

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check that engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. *Is it in good condition?*	Go to Step 2.	Refill or replace.
2	**Cylinder compression check** 1) Carry out cylinder compression check referring to “Compression Check: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 3.	Cylinder compression insufficient. Repair or replace.

Step	Action	Yes	No
3	**Check cylinder head gasket and valve oil seals** 1) Check the following. • Check that cylinder head is correctly tightened • Check seal of cylinder head gasket • Check seal of stem seals *Are they in good condition?*	Go to Step 4.	Cylinder head tightening incorrect: Proceed with removing-refitting of cylinder head and renew correct tightening, refer to "Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ in Section 1D". Cylinder head gasket damaged. Change cylinder head gasket referring to "Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ in Section 1D". Valve oil seal missing. Replace stem seals referring to "Valve and Cylinder Head Assembly Disassembly and Reassembly: D13A / Z13DTJ in Section 1D".
4	**Blow-by gas intake circuit check** 1) Check condition of blow-by gas intake circuit, in particular check that there are no obstructions in separator or in hoses. *Is it in good condition?*	Go to Step 5.	Fault in hose between oil separator and intake manifold • Restore circuit to working order • Change pipe if necessary Fault in oil separator: • Restore circuit to working order • If necessary, replace cylinder head cover
5	**Turbocharger seal check** 1) Check that there are no engine oil leaks from turbocharger impeller shaft. *Is it in good condition?*	End.	Gasket seal insufficient Replace turbocharger referring to "Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D".

DTC P0030:

S7N20A1124351

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0030: A/F Sensor Heater Control Circuit This DTC is detected if A/F sensor heater circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• A/F sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuse check** 1) Check that main and circuit fuses have not blown. *Is it in good condition?*	Go to Step 3.	Replace fuse and check for short circuit to ground.
3	**A/F sensor heater power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from A/F sensor. 3) Turn ignition switch to ON. 4) Check that voltage between “BLU” terminal of A/F sensor connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace power supply circuit of A/F sensor heater.
4	**A/F sensor heater circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from ECM. 3) Check that resistance between “LT GRN” terminal of A/F sensor valve connector and “E62-12” terminal of ECM connector is less than 5 Ω. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and A/F sensor.
5	**A/F sensor heater circuit check** 1) Check that resistance between “LT GRN” terminal of A/F sensor valve connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and A/F sensor.
6	**A/F sensor heater circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “LT GRN” terminal of A/F sensor valve connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Connect connectors to A/F sensor and ECM. Go to Step 7.	Repair or, if necessary, replace wiring harness between ECM and A/F sensor.

Step	Action	Yes	No
7	**A/F sensor heater circuit check** 1) Check A/F sensor heater referring to "Air Fuel Ratio (A/F) Sensor On-Vehicle Inspection (Non-DPF® Model): D13A / Z13DTJ in Section 1B". *Is it in good condition?*	Replace A/F sensor referring to "Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model): D13A / Z13DTJ in Section 1B".	Substitute a known-good ECM and recheck.

DTC P0088:

S7N20A1124177

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0088: Fuel System Rail Pressure – Too High This DTC is detected if fuel pressure in common rail is higher than 175,000 kPa (1,784.5 kgf/cm^2, 25,400 psi, 1,750 bar). (SVS light: 1 driving cycle detection logic)	• Fuel pressure regulator and/or its circuit • Fuel pressure sensor and/or its circuit • High pressure pump • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

DTC Troubleshooting

⚠ WARNING

Before performing the following troubleshooting, be sure to read "Precautions on Fuel System Service: D13A / Z13DTJ in Section 1G".

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: D13A / Z13DTJ".
2	**Fuel pressure regulator operation check** 1) Check fuel pressure regulator referring to "Table A-5: Fuel Pressure Regulator Operation Check: D13A / Z13DTJ" *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to "Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Pressure regulator replacement** 1) Replace high pressure pump referring to "High Pressure Pump Removal and Installation: D13A / Z13DTJ in Section 1G" and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0090:

S7N20A1124178

DTC Detecting Condition and Table Area

DTC detecting condition	Trouble area
P0090: Fuel Pressure Regulator Control Circuit This DTC is detected if fuel pressure regulator circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Fuel pressure regulator and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel pressure regulator power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from fuel pressure regulator. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY/BLK” terminal of fuel pressure regulator connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and fuel pressure regulator. If OK, substitute a known-good ECM and recheck.
3	**Fuel pressure regulator power supply and control circuit check** 1) Check that voltage between “GRY/BLK” and “LT BLU/RED” terminals of fuel pressure regulator connector is higher than 11 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and fuel pressure regulator. If OK, substitute a known-good ECM and recheck.
4	**Fuel pressure regulator control circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “LT BLU/RED” terminal of fuel pressure regulator connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel pressure regulator and ECM.
5	**Fuel pressure regulator control circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “LT BLU/RED” terminal of fuel pressure regulator connector and “D01-34” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between fuel pressure regulator and ECM.
6	**Fuel pressure regulator control circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “LT BLU/RED” terminal of fuel pressure regulator connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between fuel pressure regulator and ECM.

Step	Action	Yes	No
7	**Fuel pressure regulator check** 1) Connect “D01” connector to ECM. 2) Check fuel pressure regulator referring to “Fuel Pressure Regulator Inspection: D13A / Z13DTJ in Section 1G”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel pressure regulator.

DTC P0093:

S7N20A1124181

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0093: Fuel System Leak Detected-Large Leak This DTC is detected if fuel pressure in common rail is lower than specified value. (depending on engine speed) (SVS light: 1 driving cycle detection logic)	• Fuel leaks in low and/or high pressure fuel circuit • Clog in low – pressure fuel supply circuit • Fuel injector • High pressure pump • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High pressure pump replacement** 1) Replace high pressure pump referring to “High Pressure Pump Removal and Installation: D13A / Z13DTJ in Section 1G” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0100:

S7N20A1124184

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0100: Mass Air Flow Circuit This DTC is detected if any one of the following conditions is satisfied. • MAF sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL: 3 driving cycles detection logic) • MAF sensor signal is out of specified range. (MIL: 3 driving cycles detection logic / SVS light: 1 driving cycle detection logic)	• Air intake circuit leakage or clog • MAF sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Air intake / turbocharger circuit check** 1) Check that air intake / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**MAF operation check** 1) Check that MAF sensor is working properly referring to “Table B-2: MAF Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**MAF sensor replacement** 1) Replace MAF and IAT sensor referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good and recheck.

DTC P0106:

S7N20A1124312

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0106: Boost Pressure / Barometric Pressure Circuit Range / Performance This DTC is detected if difference between boost pressure and barometric pressure is more than specified value at idling condition. (MIL: 3 driving cycles detection logic / SVS light: 1 driving cycle detection logic)	• Boost pressure sensor and/or its circuit • Barometric pressure sensor (in ECM) • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**Barometric pressure check** 1) Check that barometric pressure sensor is working properly referring to "Table B-4: Barometric Pressure Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Boost pressure sensor operation check** 1) Check that boost pressure sensor is working properly referring to "Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**Boost pressure sensor replacement** 1) Replace boost pressure sensor referring to "Boost Pressure Sensor Removal and Installation: D13A / Z13DTJ in Section 1C" and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0107 / P0108:

S7N20A1124313

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0107: Boost Pressure / Barometric Pressure Circuit Low Input This DTC is detected if difference between boost pressure and barometric pressure is lower than specified value when turbocharger is operated. (MIL: 3 driving cycles detection logic / SVS light: 1 driving detection logic)	• Air cleaner filter clogged • Air intake passage clogged • Air leaks of air intake system circuit • Boost pressure sensor and/or its circuit • Barometric pressure sensor (in ECM) • Turbocharger / Waste gate valve • Boost pressure control solenoid valve (DPF® model) • ECM
P108: Boost pressure / Barometric Pressure Circuit High Input This DTC is detected if difference between boost pressure and barometric pressure is more than specified value when turbocharger is operated. (SVS light: 1 driving cycle detection logic)	

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Air intake / turbocharger circuit check** 1) Check that air intake / turbocharger circuit is working properly referring to "Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 3.	Repair or replace.

Step	Action	Yes	No
3	**Barometric pressure check** 1) Check that barometric pressure sensor is working properly referring to “Table B-4: Barometric Pressure Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**Boost pressure sensor operation check** 1) Check that boost pressure sensor is working properly referring to “Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	DPF®-model: Go to Step 5. Non-DPF® model: Go to Step 6.	Repair or replace.
5	**Boost pressure control solenoid valve check** 1) Check that boost pressure control solenoid valve is working properly referring to “Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model): D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 6.	Repair or replace.
6	**Boost pressure sensor replacement** 1) Replace boost pressure sensor referring to “Boost Pressure Sensor Removal and Installation: D13A / Z13DTJ in Section 1C” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0110:

S7N20A1124186

DTC Detecting Condition and Table Area

DTC detecting condition	Trouble area
P0110: Intake Air Temperature Sensor Circuit This DTC is detected if any one of the following conditions is satisfied. • IAT sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL: 3 driving cycles detection logic) • For DPF® model: – Difference between actual IAT and reference IAT is more than specified value for 1.65 sec. within 4 sec. after turning ignition ON at cold start. (MIL/SVS light: Not applicable)	• IAT sensor and/or its circuit. • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.

Step	Action	Yes	No
2	**MAF and IAT sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from MAF and IAT sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/WHT” terminal of MAF and IAT sensor connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Repair or, if necessary, replace MAF and IAT sensor power supply circuit.
3	**MAF and IAT sensor power supply and ground circuit check** 1) Check that voltage between “BLK/WHT” and “BLU/YEL” terminals of MAF and IAT sensor connector is higher than 11 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and MAF and IAT sensor. If OK, substitute a known-good ECM and recheck.
4	**IAT sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLU/ORN” terminal of MAF and IAT sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and MAF and IAT sensor.
5	**IAT sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BLU/ORN” terminal of MAF and IAT sensor connector and vehicle body ground is higher than 1 MΩ. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and MAF and IAT sensor.
6	**IAT sensor signal circuit check** 1) Check that resistance between “BLU/ORN” terminal of MAF and IAT sensor connector and “D62-62” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between MAF and IAT sensor and ECM.
7	**MAF and IAT sensor replacement** 1) Replace MAF and IAT sensor referring to “Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0115:

S7N20A1124187

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0115: Engine Coolant Temperature Circuit This DTC is detected if ECT sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 3 driving cycle detection logic)	• ECT sensor and/or its circuit. • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**ECT sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from ECT sensor. 3) Check that voltage between "PPL/WHT" terminal of ECT sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and ECT sensor. If OK, substitute a known-good ECM and recheck.
3	**ECT sensor signal circuit and ground circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between "PPL/WHT" and "GRN" terminals of ECT sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and ECT sensor. If OK, substitute a known-good ECM and recheck.
4	**ECT sensor check** 1) Check ECT sensor referring to "Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor referring to "Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C".

DTC P0130 / P0135:

S7N20A1124352

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0130: A/F Sensor Circuit This DTC is detected if any one of A/F sensor signal voltage is in abnormal condition. (MIL/SVS light: Not applicable)	• A/F sensor and/or its circuit • ECM
P0135: A/F Sensor Heater Circuit This DTC is detected if any one of the following conditions is satisfied. • A/F sensor signal voltage (VS) is in abnormal condition. • A/F sensor temperature is out of specified range. (MIL/SVS light: Not applicable)	• A/F sensor heater and/or its circuit • A/F sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

DTC Troubleshooting

NOTE

After replacing A/F sensor and/or MAF and IAT sensor, be sure to initialize A/F data in ECM referring to "A/F Data Initialization (Non-DPF® Model): D13A / Z13DTJ in Section 1C".
Failure to follow this procedure may result in detection of this DTC.

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: D13A / Z13DTJ".

Step	Action	Yes	No
2	**A/F sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and A/F sensor. 3) Turn ignition switch to ON position. 4) Check voltage between the following terminals is less than 0.3 V. • "YEL" terminal of A/F sensor connector and vehicle body ground. • "GRN/WHT" terminal of A/F sensor connector and vehicle body ground. • "BLK" terminal of A/F sensor connector and vehicle body ground. • "RED/WHT" terminal of A/F sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between A/F sensor and ECM.
3	**A/F sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check resistance between the following terminals is more than 500 kΩ. • "YEL" terminal of A/F sensor connector and vehicle body ground. • "GRN/WHT" terminal of A/F sensor connector and vehicle body ground. • "BLK" terminal of A/F sensor connector and vehicle body ground. • "RED/WHT" terminal of A/F sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between A/F sensor and ECM.
4	**A/F sensor circuit check** 1) Check resistance between the following terminals is less than 5 Ω. • "E62-45" terminal of ECM connector and "YEL" terminal of A/F sensor connector. • "E62-46" terminal of ECM connector and "GRN/WHT" terminal of A/F sensor connector. • "E62-47" terminal of ECM connector and "BLK" terminal of A/F sensor connector. • "E62-44" terminal of ECM connector and "RED/WHT" terminal of brake A/F sensor connector. *Are they in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between A/F sensor and ECM.
5	**A/F sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect connectors to ECM. 3) Replace A/F sensor referring to "Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model): D13A / Z13DTJ in Section 1B". 4) Check that DTC P0130 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0168:

S7N20A1124191

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0168: Fuel Temperature Too High This DTC is detected if fuel temperature is higher than specified value. (MIL/SVS light: Not applicable)	• Fuel heater • Fuel temperature sensor • Engine oil insufficient • Engine cooling system • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel heater operation check** 1) Check fuel heater operation check is working properly referring to “Table A-8: Fuel Heater Operation Check: D13A / Z13DTJ”. *Is it good condition?*	Go to Step 3.	Repair or replace
3	**Fuel temperature sensor check** 1) Replace fuel heater referring to “Fuel Heater and Fuel Temperature Sensor Removal and Installation: D13A / Z13DTJ in Section 1G” and check that DTC is not detected. *Is it good condition?*	Go to Step 4.	Replace fuel temperature sensor.
4	**Engine lubrication system check** 1) Check that there are no engine oil leaks and that the engine oil level is correct referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Engine cooling system check** 1) Check the engine cooling system is working properly referring to “Engine Cooling Symptom Diagnosis: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0180:

S7N20A1124192

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0180: Fuel Temperature Sensor Circuit This DTC is detected if any one of the following conditions is satisfied. • Fuel temperature sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 3 driving cycle detection logic) • For DPF® model: – Difference between actual fuel temperature and reference fuel temperature is more than specified value for 1.65 sec. within 4 sec. after turning ignition ON at cold start. (MIL/SVS light: Not applicable)	• Fuel temperature sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel temperature sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from fuel temperature sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/YEL” terminal of fuel temperature sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and fuel temperature sensor. If OK, substitute a known-good ECM and recheck.
3	**Fuel temperature sensor signal circuit and ground circuit check** 1) Check that voltage between “BLK/YEL” and “RED/BLU” terminals of fuel temperature sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and fuel temperature sensor. If OK, substitute a known-good ECM and recheck.
4	**Fuel temperature sensor check** 1) Check fuel temperature sensor referring to “Fuel Heater and Fuel Temperature Sensor Inspection: D13A / Z13DTJ in Section 1G”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel temperature sensor.

DTC P0190:

S7N20A1124193

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0190: Fuel Rail Pressure Sensor Circuit This DTC is detected if any one of the following conditions is satisfied. • Fuel pressure sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL: 3 driving cycles detection logic / SVS light: 1 driving cycle detection logic) • Difference between current fuel pressure and previous fuel pressure at specified vehicle condition is more than specified value. (MIL: 3 driving cycles detection logic / SVS light: 1 driving cycle detection logic) • Fuel pressure in common rail after turning ignition switch to OFF position is out of specified range. (MIL: 2 driving cycles detection logic / SVS light: 1 driving cycle detection logic) • Fuel pressure in common rail is fixed even if fuel pressure regulator is operated. (SVS light: 1 driving cycle detection logic)	• Fuel pressure sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel pressure sensor circuit check** 1) Check fuel pressure sensor circuit referring to “Table A-4: Fuel Pressure Sensor Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Low-fuel pressure circuit check** 1) Check low-fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High-fuel pressure circuit check** 1) Check high-fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**High-pressure sensor replacement** 1) Replace high-pressure pump and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0201 / P0202 / P0203 / P0204:

S7N20A1124194

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0201: Injector Circuit/Open – Cylinder 1 **P0202: Injector Circuit/Open – Cylinder 2** **P0203: Injector Circuit/Open – Cylinder 3** **P0204: Injector Circuit/Open – Cylinder 4** This DTC is detected if any one of the following conditions is satisfied. • Asymmetry index of relevant fuel injector is higher than specified value. (SVS light: 1 driving cycle detection logic) • Relevant fuel injector control circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Fuel injector and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel injector check** 1) Check that fuel injector is working properly referring to “Table A-2: Injector Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Fuel injector replacement** 1) Replace relevant fuel injector referring to detected DTC number. 2) Check that DTC is not detected. *Is it in good condition?*	End	Substitute a known-good ECM and recheck.

DTC P0217:

S7N20A1124315

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0217: Engine Coolant Over Temperature Condition This DTC is detected if engine coolant temperature is higher than specified value. (MIL/SVS light: Not applicable)	• Engine cooling system • ECT sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.

Step	Action	Yes	No
2	**Cooling system check** 1) Check coolant level and engine cooling system referring to “Coolant Level Check: D13A / Z13DTJ in Section 1F” and “Engine Cooling System Inspection and Cleaning: D13A / Z13DTJ in Section 1F”. *Are they in good condition?*	Go to Step 3.	Repair or replace.
3	**Cooling fan operation check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON. 3) Check radiator cooling fan for operation by using “output test” of SUZUKI scan tool. *Is it in good condition?*	Go to Step 4.	Check cooling fan motor and/or its circuit.
4	**ECT sensor operation check** 1) Check that ECT sensor is working properly referring to “Table C-4: ECT Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Thermostat assembly replacement** 1) Replace thermostat assembly referring to “Thermostat Assembly Removal and Installation: D13A / Z13DTJ in Section 1F”. 2) Check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good condition ECM and recheck.

DTC P0219:

S7N20A1124196

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0219: Engine Overspeed Condition This DTC is detected if engine speed exceeds 6,000 rpm for 2 seconds. (MIL/SVS light: Not applicable)	• CKP sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Check engine speed is higher than 6,000 rpm for 2 seconds in customer’s driving condition. *Is it in good condition?*	Go to Step 3.	Inform customer that this high engine speed may cause mechanical damage.
3	**Engine speed check** 1) Check engine speed referring to “Table C-3: Engine Speed Check: D13A / Z13DTJ”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0230:

S7N20A1124198

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0230: Fuel Pump Relay Circuit This DTC is detected if fuel pump relay control circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Fuel pump relay and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel pump relay power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove fuel pump relay. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/WHT” terminal of fuel pump relay connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Repair power supply circuit of fuel pump relay.
3	**Fuel pump relay check** 1) Check fuel pump relay referring to “Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Go to Step 4.	Replace fuel pump relay.
4	**Fuel pump relay control circuit check** 1) Turn ignition switch to OFF position. 2) Install fuel pump relay. 3) Disconnect connectors from ECM. 4) Turn ignition switch to ON position. 5) Check that voltage between “E62-75” terminal of ECM connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel pump relay and ECM.
5	**Fuel pump relay control circuit check** 1) Turn ignition switch to OFF position. 2) Remove fuel pump relay. 3) Check that resistance between “GRN/BLK” terminal of fuel pump relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between fuel pump relay and ECM.
6	**Fuel pump relay control circuit check** 1) Check that resistance between “E62-75” terminal of ECM connector and “GRN/BLK” terminal of fuel pump relay connector is lower than 5 Ω. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between fuel pump relay and ECM.

DTC P0235:

S7N20A1124199

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0235: Boost Pressure Sensor Circuit This DTC is detected if boost pressure sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL: 3 driving cycles detection logic / SVS light: 1 driving cycle detection logic)	• Boost Pressure sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Boost pressure sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from boost pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “RED/BLK” terminal of boost pressure sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and boost pressure. If OK, substitute a known-good ECM and recheck.
3	**Boost pressure sensor power supply circuit and ground circuit check** 1) Check that voltage between “RED/BLK” and “BLK” terminals of boost pressure sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and boost pressure sensor. If OK, substitute a known good ECM and recheck.
4	**Boost pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “RED/BLK” terminal of boost pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.
5	**Boost pressure sensor output signal circuit check** 1) Check that voltage between “ORN” terminal of boost pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.
6	**Boost pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “RED/BLK” terminal of boost pressure sensor connector and “D01-23” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.

Step	Action	Yes	No
7	**Boost pressure sensor output signal circuit check** 1) Check that resistance between “ORN” terminal of boost pressure sensor connector and “D01-41” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.
8	**Boost pressure sensor replacement** 1) Connect “D01” connector to ECM. 2) Replace boost pressure sensor referring to “Boost Pressure Sensor Removal and Installation: D13A / Z13DTJ in Section 1C” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0243:

S7N20A1124354

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0243: Boost Pressure Control Solenoid Valve This DTC is detected if any one of the following conditions is satisfied. • Boost pressure control solenoid valve circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Boost pressure control solenoid valve and/or its circuit • ECM
• Difference between actual boost pressure and reference boost pressure is out of specified value for 5 sec. (SVS light: 1 driving cycle detection logic)	• Boost pressure control solenoid valve • Air intake system • Turbocharger • Boost pressure sensor • Barometric pressure sensor • EGR system

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Boost pressure control solenoid valve power supply voltage check** 1) Turn ignition switch to ON position. 2) Check that voltage between “GRN” terminal of boost pressure control solenoid valve connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Repair or, if necessary, replace boost pressure control solenoid valve power supply circuit.

Step	Action	Yes	No
3	**Boost pressure control solenoid valve control circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check condition of main and circuit fuses. If not, replace fuse and check for short circuit to ground. 3) Disconnect connector from boost pressure control solenoid valve. 4) Turn ignition switch to ON 5) Carry out output test for boost pressure control solenoid valve. 6) Check that voltage between “GRN” and “LT GRN” terminals of boost pressure control solenoid valve connector is higher than 11 V. *Is it in good condition?*	Go to Step 7.	Go to Step 4.
4	**Boost pressure control solenoid valve circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “LT GRN” terminal of boost pressure control solenoid valve connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and boost pressure control solenoid valve.
5	**Boost pressure control solenoid valve circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “LT GRN” terminal of boost pressure control solenoid valve connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and boost pressure control solenoid valve.
6	**Boost pressure control solenoid valve circuit check** 1) Check that resistance between “LT GRN” terminal of boost pressure control solenoid valve connector and “D01-30” terminal of ECM connector is less than 5 Ω. *Is it in good condition?*	Connect connectors to boost pressure control solenoid valve and ECM. Go to Step 7.	Repair or, if necessary, replace wiring harness between ECM and boost pressure control solenoid valve.
7	**Boost pressure control solenoid valve check** 1) Check boost pressure control solenoid valve referring to “Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model): D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 8.	Repair or replace.
8	**Air intake / turbocharger circuit check** 1) Check air intake / turbocharger circuit referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 9.	Repair or replace.
9	**Boost pressure sensor operation check** 1) Check boost pressure sensor operation referring to “Table B-3: Boost Pressure Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 10.	Repair or replace.

Step	Action	Yes	No
10	**Barometric pressure check** 1) Check barometric pressure referring to “Table B-4: Barometric Pressure Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 11.	Repair or replace.
11	**Boost pressure control solenoid valve operation check** 1) Check boost pressure control solenoid valve operation referring to “Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model): D13A / Z13DTJ”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0335:

S7N20A1124202

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0335: Crankshaft Position Sensor Circuit This DTC is detected if CKP sensor signal is not input even if CMP sensor signal input two times. (MIL/SVS light: Not applicable)	• CKP sensor rotor • CKP sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**CKP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and CKP sensor. 3) Check that resistance between the following terminals are less than 5 Ω. • “D01-43” terminal of ECM connector and “GRY/BLK” terminal of CKP sensor connector. • “D01-59” terminal of ECM connector and “YEL/RED” terminal of CKP sensor connector. *Are they in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between ECM and CKP sensor.
3	**CKP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between the following terminals are higher than 1 MΩ. • “GRY/BLK” terminal of CKP sensor connector and vehicle body ground. • “YEL/RED” terminal of CKP sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and CKP sensor.

Step	Action	Yes	No
4	**CKP sensor circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between the following terminals are lower than 0.3 V. • "GRY/BLK" terminal of CKP sensor connector and vehicle body ground. • "YEL/RED" terminal of CKP sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and CKP sensor.
5	**CKP sensor teeth check** 1) Check that there are no faults such as intermittent contacts, missing teeth, reference point or incorrect gap in CKP sensor. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace faulty components.
6	**CKP sensor replacement** 1) Replace CKP sensor referring to "Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: D13A / Z13DTJ in Section 1C" and check that DTC is not detected. *Is it in good condition?*	END.	Substitute a known-good ECM and recheck.

DTC P0340:

S7N20A1124203

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0340: Camshaft Position Sensor Circuit This DTC is detected if any one of the following conditions is satisfied. • CMP sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable) • CMP sensor signal is low when cylinder No.1 is at TDC compression. (MIL/SVS light: Not applicable) • CMP sensor signal is high when cylinder No.4 is at TDC compression. (MIL/SVS light: Not applicable)	• CMP sensor and/or its circuit • CMP sensor rotor • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".

Step	Action	Yes	No
2	**CMP sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from CMP sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “PNK” terminal of CMP sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and CMP sensor. If OK, substitute a known-good ECM and recheck.
3	**CMP sensor circuit check** 1) Check that voltage between “PNK” and “PPL” terminals of CMP sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and CMP sensor. If OK, substitute a known-good ECM and recheck.
4	**CMP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “PNK/BLK” terminal of CMP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and CMP sensor.
5	**CMP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “PNK/BLK” terminal of CMP sensor connector and vehicle body ground is higher than 1 MΩ. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and CMP sensor.
6	**CMP sensor circuit check** 1) Check resistance between “PNK/BLK” terminal of CMP sensor connector and “D01-56” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between CMP sensor and ECM.
7	**CMP sensor rotor check** 1) Remove CMP sensor referring to “Camshaft Position (CMP) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C”. 2) Check that there are no faults such as intermittent contacts, missing teeth, reference point or incorrect gap in CMP sensor. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace faulty condition.
8	**CMP sensor replacement** 1) Replace CMP sensor referring to “Camshaft Position (CMP) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0380 / P0683:

S7N20A1124347

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0380: Glow Plug Control Module Control Circuit This DTC is detected if glow plug control module circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Glow plug and/or its circuit • Glow plug control module and/or its circuit • ECM
P0683: Glow Plug Control Circuit This DTC is detected if glow plug circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 3 driving cycle detection logic)	

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuse check** 1) Check that main and circuit fuses have not blown. *Is it in good condition?*	Go to Step 3.	Replace fuse and check for short circuit to ground.
3	**Glow plug check** 1) Check glow plugs for resistance referring to “Glow Plug Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Go to Step 4.	Replace faulty glow plug referring to “Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C”.
4	**Glow plug control module power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from glow plug control module. 3) Check voltage between “RED” terminal of glow plug control module connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 5.	Repair power supply circuit of glow plug control module.
5	**Glow plug control module power supply and ground circuit check** 1) Check voltage between “RED” and “BLK” terminals of glow plug control module connector is higher than 11 V. *Is it in good condition?*	Go to Step 6.	Repair ground circuit of glow plug control module.
6	**Glow plug control module ignition switch signal circuit check** 1) Turn ignition switch to ON position. 2) Check voltage between “BLK/WHT” terminal of glow plug control module connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 7.	Repair ignition switch signal circuit of glow plug control module.

Step	Action	Yes	No
7	**Glow plug control module circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Check the following terminals for open, short to ground circuit and short to power supply circuit. • Between “BLU” terminal of glow plug control module connector and “E62-70” terminal of ECM connector. • Between “GRY/BLU” terminal of glow plug control module connector and “E62-74” terminal of ECM connector. *Are they in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.
8	**Glow plug circuit check** 1) Disconnect connectors from glow plugs. 2) Check the following terminals for open, short to ground circuit and short to power supply circuit. • Between glow plug No.1 connector and “GRN” terminal of glow plug control module connector. • Between glow plug No.2 connector and “GRN” terminal of glow plug control module connector. • Between glow plug No.3 connector and “WHT” terminal of glow plug control module connector. • Between glow plug No.4 connector and “WHT” terminal of glow plug control module connector. *Are they in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between glow plug and glow plug control module.
9	**Glow control module replacement** 1) Replace glow plug control module referring to “Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C”, and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0400:

S7N20A1124205

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC P0400 Exhaust Gas Recirculation Flow This DTC is detected if any one of the following conditions is satisfied. • Difference between measured MAF and reference MAF is out of specified range. (SVS light: 1 driving cycle detection logic) • EGR valve is stuck open. (MIL: 3 driving cycles detection logic)	• Air intake system (air leaks or blocked intake air circuit) • Exhaust system (leakage, blockage) • MAF sensor and/or its circuit • EGR valve and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.

Step	Action	Yes	No
2	**Air intake / turbocharger circuit check** 1) Check that air intake / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Exhaust system check** 1) Check exhaust system check referring to “Exhaust System Check: D13A / Z13DTJ in Section 1K”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**MAF sensor operation check** 1) Check MAF sensor for operation referring to “Table B-2: MAF Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**EGR operation check** 1) Check that EGR valve is working properly referring to “Table B-5: EGR Valve Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P0403:

S7N20A1124207

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0403: Exhaust Gas Recirculation Control Circuit This DTC is detected if EGR valve circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL: 3 driving cycles detection logic)	• EGR valve and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**EGR valve power supply voltage check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check condition of main and circuit fuses. If not, replace fuse and check for short circuit to ground. 3) Disconnect connector from EGR valve. 4) Turn ignition switch to ON 5) Carry out “output test” for EGR valve. 6) Check that voltage between “PNK/WHT” terminal of EGR valve connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 5.	Go to Step 3.

Step	Action	Yes	No
3	**EGR valve circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLU/BLK” terminal of EGR valve connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and EGR valve.
4	**EGR valve circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BLU/BLK” terminal of EGR valve connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and EGR valve.
5	**EGR valve circuit check** 1) Check that resistance between “BLU/BLK” terminal of EGR valve connector and “D01-15” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Connect connectors to EGR valve and ECM. Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and EGR valve.
6	**EGR valve check** 1) Check EGR valve referring to “EGR Valve Inspection: D13A / Z13DTJ in Section 1B”. *Is it in good condition?*	Replace EGR valve referring to “EGR Valve and EGR Cooler Removal and Installation: D13A / Z13DTJ in Section 1D”.	Substitute a known-good ECM and recheck.

DTC P0500:

S7N20A1124211

DTC Detecting Condition and Trouble Area

DTC detection condition	Trouble area
P0500: Vehicle Speed Sensor This DTC is detected if abnormal vehicle speed signal is detected. (MIL/SVS light: Not applicable)	• Wheel speed sensor and/or its circuit • CAN communication circuit • ECM • ABS / ESP® control module

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check DTC in ABS / ESP® control module is not detected. *Is it in good condition?*	Go to Step 3.	Go to applicable DTC troubleshooting.

Step	Action	Yes	No
3	**DTC check** 1) Check DTC related to CAN communication in ECM and ABS / ESP® control module is not detected. *Is it in good condition?*	Go to Step 4.	Go to applicable DTC troubleshooting.
4	**ECM replacement** 1) Replace ECM referring to "Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C" and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ABS / ESP® control module and recheck.

DTC P0520:

S7N20A1124214

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0520: Engine Oil Pressure Switch Circuit This DTC is detected if engine oil pressure switch circuit is open or shorted to power supply circuit. (MIL/SVS light: Not applicable)	• Engine oil pressure switch and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Engine oil pressure switch circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and engine oil pressure switch. 3) Turn ignition switch to ON position. 4) Check that voltage between "GRY/YEL" terminal of ECM connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between engine oil pressure switch and ECM.
3	**Engine oil pressure switch circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between "GRY/YEL" terminal of ECM connector and vehicle body ground is lower than 500 kΩ. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between engine oil pressure switch and ECM.
4	**Engine oil pressure switch circuit check** 1) Check that resistance between "D01-9" terminal of ECM connector and "GRY/YEL" terminal of engine oil pressure switch connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between engine oil pressure switch and ECM.
5	**Engine oil pressure switch check** 1) Check engine oil pressure switch referring to "Oil Pressure Switch On-Vehicle Inspection: D13A / Z13DTJ in Section 1E". *Is it in good condition?*	Substitute a known good ECM and recheck.	Replace engine oil pressure switch.

DTC P0530:

S7N20A1124215

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0530: A/C Refrigerant Pressure Sensor Circuit This DTC is detected if A/C refrigerant pressure sensor circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• A/C refrigerant pressure sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**A/C refrigerant pressure sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY/RED” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and A/C refrigerant pressure sensor. If OK, substitute a known-good ECM and recheck.
3	**A/C refrigerant pressure sensor power supply and ground circuit check** 1) Check that voltage between “GRY/RED” and “ORN” terminals of A/C refrigerant pressure sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and A/C refrigerant pressure sensor. If OK, substitute a known-good ECM and recheck.
4	**A/C refrigerant pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “RED” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.
5	**A/C refrigerant pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “RED” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is higher than 500 kΩ *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.

Step	Action	Yes	No
6	**A/C refrigerant pressure sensor circuit check** 1) Check that resistance between “E62-87” of ECM connector “RED” terminal of A/C refrigerant pressure sensor connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.
7	**A/C refrigerant pressure sensor replacement** 1) Replace A/C refrigerant pressure sensor referring to “A/C Refrigerant Pressure Sensor Removal and Installation: Manual A/C in Section 7B” or “A/C Refrigerant Pressure Sensor Removal and Installation: Auto A/C in Section 7B” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0560:

S7N20A1124216

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0560: System Voltage This DTC is detected if supply voltage from main relay is lower than 6 V or higher than 16 V. (MIL/SVS light: Not applicable)	• Main relay and/or its circuit • Charging system • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Main relay operation check** 1) Check that main relay working properly referring to “Table C-2: Main Relay Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Charging system check** 1) Check that charging system working properly referring to “Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J” or “Generator Test (Overcharged Battery Check): D13A / Z13DTJ in Section 1J”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**DTC check** 1) Clear DTC. 2) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0571:

S7N20A1124316

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0571: Brake Light Switch Circuit This DTC is detected if any one of the following conditions is satisfied. • Brake light switch circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable) • Brake light switch signal is not appropriate for brake switch signal. (MIL/SVS light: Not applicable)	• Brake light switch and/or its circuit • Brake switch and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Brake light switch / brake switch power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from brake light switch. 3) Turn ignition switch to ON position. 4) Check voltage between the following terminals are higher than 11 V. • “BLK/WHT” terminals of brake switch connector and vehicle body ground. • “PNK” terminals of brake light switch connector and vehicle body ground. *Are they in good condition?*	Go to Step 3.	Check power supply circuit of brake light switch / brake switch.
3	**Brake light switch / brake switch signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check voltage between the following terminals is lower than 0.3 V. • “GRN/YEL” terminal of brake switch connector and vehicle body ground. • “GRN/WHT” terminal of brake light switch connector and vehicle body ground. *Are they in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between brake light switch / brake switch and ECM.

Step	Action	Yes	No
4	**Brake light switch / brake switch signal circuit check** 1) Turn ignition switch to OFF position. 2) Check resistance between the following terminals is more than 500 kΩ. • "GRN/YEL" terminal of brake switch connector and vehicle body ground. • "GRN/WHT" terminal of brake light switch connector and vehicle body ground. *Are they in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between brake light switch / brake switch and ECM.
5	**Brake light switch / brake switch signal circuit check** 1) Disconnect connectors from brake light. 2) Check resistance between the following terminals is lower than 5 Ω. • "E62-81" terminal of ECM connector and "GRN/WHT" terminal of brake light switch connector. • "E62-68" terminal of ECM connector and "GRN/YEL" terminal of brake switch connector. *Are they in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between brake light switch / brake switch and ECM.
6	**Brake light switch check** 1) Check brake light switch referring to "Stop (Brake) Lamp Switch Inspection in Section 9B". *Is it in good condition?*	Substitute a known good ECM and recheck.	Replace brake light switch.

DTC P0602:

S7N20A1124217

DTC Detecting Condition Trouble Area

DTC detecting condition	Trouble area
P0602: Control Module Program Error This DTC is detected if any one of the following conditions is satisfied. • Fuel injector calibration code is not registered in ECM. (SVS light: 1 driving cycle detection logic) • Vehicle variant data is not registered in ECM. (SVS light: 1 driving cycle detection logic)	• Registered data error in ECM • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Fuel injector calibration code check** 1) Using SUZUKI scan tool, register fuel injector calibration codes into ECM correctly referring to "Fuel Injector Registration: D13A / Z13DTJ in Section 1C". 2) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Go to Step 3.

Step	Action	Yes	No
3	**Vehicle variant data registration** 1) Using SUZUKI scan tool, register vehicle variant data in ECM correctly referring to “Registration for ECM Replacement: D13A / Z13DTJ in Section 1C”. 2) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0603:

S7N20A1124218

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0603: Internal Control Module Keep Alive Memory (KAM) Error This DTC is detected if ECM has internal fault. (MIL/SVS light: Not applicable)	• ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait for 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0604:

S7N20A1124219

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0604: Internal Control Module Random Access Memory (RAM) Error This DTC is detected if ECM has internal fault. (MIL/SVS light: Not applicable)	• ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait for 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0605:

S7N20A1124220

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0605: Internal Control Module Read Only Memory (ROM) Error This DTC is detected if ECM has internal fault. (MIL/SVS light: Not applicable)	• ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait for 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P0650:

S7N20A1124348

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0650: Malfunction Indicator Lamp (MIL) Control Circuit This DTC is detected if MIL circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• MIL in combination meter and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Warning light initial operation check** 1) Turn ignition switch to ON position and confirm that warning light other than MIL turns ON. *Is it in good condition?*	Go to Step 3.	Check combination meter power supply and ground circuits. If circuit is OK, replace combination meter.
3	**MIL check** 1) Connect SUZUKI scan tool with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check MIL operation by using "output test" of SUZUKI scan tool. Ensure that MIL turns ON and OFF. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Go to Step 4.
4	**Immobilizer control module check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from immobilizer control module. 3) Turn ignition switch to ON position. 4) Check MIL operation by using "output test" of SUZUKI scan tool. Ensure that MIL turns ON and OFF. *Is it in good condition?*	Substitute a known-good immobilizer control module and recheck.	Go to Step 5.
5	**Circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from ECM. 3) Check MIL control circuit between the following terminals for open, short to ground circuit and short to power supply circuit. • "E62-78" terminal of ECM connector and "BLU/BLK" terminal of combination meter connector. • "G24-4" terminal of immobilizer control module connector and "BLU/BLK" terminal of combination meter connector. *Are they in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM, immobilizer control module and combination meter.
6	**MIL check** 1) Connect service wire between "BLU/BLK" terminal of combination meter connector and vehicle body ground. 2) Turn ignition switch to ON position. Ensure that MIL turns ON. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace combination meter.

DTC P0685 / P1625:

S7N20A1124349

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0685: ECM Power Relay Control Circuit / Open This DTC is detected if main relay (coil side) circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Main relay and/or its circuit • ECM
P1625: ECM Power Relay Circuit Malfunction This DTC is detected if main relay (switch side) circuit is shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Main relay power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove main relay. 3) Turn ignition switch to ON position. 4) Check voltage between “BLK/YEL” terminals of main relay connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 3.	Repair power supply circuit of main relay.
3	**Main relay circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Check main relay (coil side) circuit between “E62-80” terminal of ECM connector and “BRW/WHT” terminals of main relay connector for open, short circuit to ground and short circuit to power supply circuit. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and main relay.
4	**ECM power supply circuit check** 1) Check the following terminals for open, short to ground circuit and short to power supply circuit. • Between “E62-4” terminal of ECM connector and “BLK/RED” terminal of main relay connector • Between “E62-5” terminal of ECM connector and “GRN” terminal of main relay connector • Between “E62-6” terminal of ECM connector and “BLK/RED” terminal of main relay connector *Are they in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and main relay.

Step	Action	Yes	No
5	**Main relay check** 1) Check main relay for operation referring to “Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace main relay.

DTC P0704:

S7N20A1124233

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0704: Clutch Switch Input Circuit Malfunction This DTC is detected if CPP switch circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• CPP switch and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**CPP switch signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and CPP switch. 3) Turn ignition switch to ON position. 4) Check that voltage between “YEL/GRN” terminal of CPP switch connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between CPP switch and ECM.
3	**CPP switch signal circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “YEL/GRN” terminal of CPP switch connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between CPP switch and ECM.
4	**CPP switch signal circuit check** 1) Check that resistance between “E62-22” terminal of ECM connector and “YEL/GRN” terminal of CPP switch connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between CPP switch and ECM.
5	**CPP switch power supply voltage check** 1) Turn ignition switch to ON position. 2) Check that voltage between “BLK/WHT” terminal of CPP switch connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 6.	Check CPP switch power supply circuit.

Step	Action	Yes	No
6	**CPP switch check** Check CPP switch referring to “Clutch Pedal Position (CPP) Switch Inspection (Diesel Model) in Section 5C”. *Is it in good condition?*	Substitute a known good ECM and recheck.	Replace CPP switch.

DTC P1093:

S7N20A1124319

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1093: Low Pressure Fuel Circuit Leakage This DTC is detected if low pressure fuel circuit has malfunction. (SVS light: 1 driving cycle detection logic)	• Empty tank • Fuel pump relay • Fuel pump • Fuel filter element • Over flow valve • Fuel hose and pipe • Fuel pressure regulator • High pressure pump • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Low fuel pressure circuit check** 1) Check low pressure fuel circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**High pressure pump replacement** 1) Replace high pressure pump and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P1105:

S7N20A1124320

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1105: Barometric Pressure Sensor Range / Performance This DTC is detected if barometric pressure sensor signal is out of specified range. (MIL: 3 driving cycles detection logic)	• ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait for 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P1120:

S7N20A1124321

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1120: APP Sensor 1 Circuit This DTC is detected if any one of the following conditions is satisfied. • APP sensor (main) circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic) • Difference between APP sensor (main) signal voltage and APP sensor (sub) signal voltage is more than specified value. (SVS light: 1 driving cycle detection logic)	• APP sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**APP sensor check** 1) Check that APP sensor is working properly referring to "Table C-6: Accelerator Pedal Check: D13A / Z13DTJ". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC P1122:

S7N20A1124322

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1122: APP Sensor 2 Circuit This DTC is detected if any one of the following conditions is satisfied. • APP sensor (sub) circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic) • APP sensor (main) and (sub) signal voltages are lower than specified value. (SVS light: 1 driving cycle detection logic)	• APP sensor and/or its circuit • ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**APP sensor check** 1) Check that APP sensor is working properly referring to “Table C-6: Accelerator Pedal Check: D13A / Z13DTJ”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or replace.

DTC 1180:

S7N20A1124368

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1180: Fuel Heater Relay Circuit This DTC is detected if fuel heater relay circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• Fuel heater relay and/or its circuit • ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel heater relay power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove fuel heater relay. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/WHT” terminal of fuel heater relay connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Repair power supply circuit of fuel heater relay.
3	**Fuel heater relay check** 1) Check fuel heater relay referring to “Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Go to Step 4.	Replace fuel heater relay.
4	**Fuel heater relay control circuit check** 1) Turn ignition switch to OFF position. 2) Install fuel heater relay. 3) Disconnect connectors from ECM. 4) Turn ignition switch to ON position. 5) Check that voltage between “E62-76” terminal of ECM connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel heater relay and ECM.

Step	Action	Yes	No
5	**Fuel heater relay control circuit check** 1) Turn ignition switch to OFF position. 2) Remove fuel heater relay. 3) Check that resistance between "YEL/BLU" terminal of fuel heater relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between fuel heater relay and ECM.
6	**Fuel heater relay control circuit check** 1) Check that resistance between "E62-76" terminal of ECM connector and "YEL/BLU" terminal of fuel heater relay connector is lower than 5 Ω. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between fuel heater relay and ECM.

DTC P1190:

S7N20A1124323

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1190: Fuel Pressure Regulator Flow This DTC is detected if difference between measured fuel pressure in common rail and reference fuel pressure in common rail is more than specified value when fuel pressure regulator is close. (SVS light: 1 driving cycle detection logic)	• Fuel pressure regulator • Fuel pressure sensor • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Preliminary check** 1) Visually, check fuel leakage in low and high pressure fuel circuits. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**Fuel pressure regulator operation check** 1) Check that fuel pressure regulator is working properly referring to "Table A-5: Fuel Pressure Regulator Operation Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**Fuel pressure sensor check** 1) Check fuel pressure sensor circuit referring to "Table A-4: Fuel Pressure Sensor Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	**Low fuel pressure circuit check** 1) Check low pressure fuel circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ". *Is it in good condition?*	Go to Step 6.	Repair or replace.

Step	Action	Yes	No
6	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Replace high pressure pump. If DTC is still detected, substitute a known-good ECM and check.	Repair or replace.

DTC P1191:

S7N20A1124324

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1191: Fuel Pressure Regulator Range / Performance This DTC is detected if any one of the following conditions is satisfied. • Difference between measured fuel pressure in common rail and reference fuel pressure is more than specified value when fuel pressure regulator is open. (SVS light: 1 driving cycle detection logic) • Fuel pressure in common rail is lower than specified value (depending on engine speed). (SVS light: 1 driving cycle detection logic)	• Empty tank • Fuel hose and pipe • Fuel pump relay • Fuel pump • Fuel filter element • Over flow valve • Fuel injector • Fuel pressure regulator • Fuel pressure sensor • High pressure pump • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Low fuel pressure circuit check** 1) Check low fuel pressure circuit referring to “Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**High fuel pressure circuit check** 1) Check high fuel pressure circuit referring to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	**High pressure pump replacement** 1) Replace high pressure pump and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P1481:

S7N20A1124325

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1481: Radiator Fan Output 1 Circuit Malfunction This DTC is detected if radiator cooling fan motor relay No.1 circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Radiator cooling fan motor relay No.1 and/or its circuit. • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Output test** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Confirm radiator cooling fan operate at low speed by using “output test” of SUZUKI scan tool. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Go to Step 3.
3	**Radiator fan motor relay No.1 power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove fan motor relay No.1. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY” terminals of fan motor relay No.1 connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 4.	Repair power supply circuit of fan motor relay No.1.
4	**Radiator cooling fan motor relay No.1 check** 1) Check fan motor relay No.1 for operation referring to “Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Go to Step 5.	Replace radiator cooling fan motor relay No.1.
5	**Radiator fan motor relay No.1 control circuit check** 1) Turn ignition switch to OFF position. 2) Check fan motor relay No.1 control circuit between “E62-7” terminal of ECM connector and “LT GRN” terminal of fan motor relay No.1 connector for open, short and short to power supply circuit. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between ECM and fan motor relay No.1.

DTC P1482 / P1483:

S7N20A1124350

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1482: Radiator Fan Output 2 Circuit Malfunction This DTC is detected if radiator cooling fan motor relay No.2 circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	• Radiator cooling fan motor relay No.2 and/or its circuit • Radiator cooling fan motor relay No.3 and/or its circuit • ECM
P1483: Radiator Fan Output 3 Circuit Malfunction This DTC is detected if radiator cooling fan motor relay No.3 circuit is open, shorted to power supply circuit or shorted to ground circuit. (SVS light: 1 driving cycle detection logic)	

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check DTC and check that DTC P1481 is not detected. *Is it in good condition?*	Go to Step 3.	Go to “DTC P1481:: D13A / Z13DTJ”.
3	**Output test** 1) Confirm radiator cooling fan operate at high speed by using “output test” of SUZUKI scan tool. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Go to Step 4.
4	**Radiator cooling fan motor relay check** 1) Check radiator cooling fan motor relay No.2 and No.3 for operation at referring to “Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Go to Step 5.	Replace faulty fan motor relay.
5	**Radiator fan motor relay No.2 power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove fan motor relay No.2. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY” terminals of fan motor relay No.2 connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 6.	Repair power supply circuit of fan motor relay No.2.

Step	Action	Yes	No
6	**Radiator fan motor relay No.3 power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove fan motor relay No.3. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY” terminal of fan motor relay No.3 connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 7.	Repair power supply circuit of fan motor relay No.3.
7	**Radiator fan motor relay No.2 power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check fan motor relay No.2 control circuit between “E62-8” terminal of ECM connector and “GRN” terminal of fan motor relay No.2 connector for open, shorted to ground circuit and shorted to power supply circuit or short. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between ECM and fan motor relay No.2.
8	**Radiator fan motor relay No.3 power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check fan motor relay No.3 control circuit between “E62-30” terminal of ECM connector and “WHT/GRN” terminal of fan motor relay No.3 connector for open, shorted to ground circuit and shorted to power supply circuit or short. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between ECM and fan motor relay No.3.

DTC P1530:

S7N20A1124328

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1530: A/C Compressor Relay Circuit This DTC is detected if A/C compressor relay circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• A/C compressor relay and/or its circuit. • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.

Step	Action	Yes	No
2	**A/C compressor relay power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove A/C compressor relay. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/WHT” terminal of A/C compressor relay connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Repair power supply circuit of A/C compressor relay.
3	**A/C compressor relay check** 1) Check A/C compressor relay for operation referring to “Compressor Relay Inspection: Manual A/C in Section 7B” or “Compressor Relay Inspection: Auto A/C in Section 7B”. *Is it in good condition?*	Go to Step 4.	Replace A/C compressor relay.
4	**A/C compressor relay control circuit check** 1) Turn ignition switch to OFF position. 2) Check A/C compressor relay control circuit between “E62-79” terminal of ECM connector and “GRY” terminal of A/C compressor relay connector for open, short to ground circuit and short to power supply circuit. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between ECM and A/C compressor relay.

DTC P1571:

S7N20A1124329

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1571: Brake Switch Circuit This DTC is detected if any one of the following conditions is satisfied. • Brake switch circuit is open, shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable) • Brake switch signal is not appropriate for brake light switch. (MIL/SVS light: Not applicable)	• Brake light switch and/or its circuit • Brake switch and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

DTC Troubleshooting

Refer to “DTC P0571:: D13A / Z13DTJ”.

DTC P1600:

S7N20A1124330

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1600: A/D Converter Malfunction This DTC is detected if ECM has internal fault. (SVS light: 1 driving cycle detection logic)	• ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait for 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P1620:

S7N20A1124331

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1620: Sensor Supply Circuit 1 Fail This DTC is detected if sensor power supply 1 voltage is out of specified range. (SVS light: 1 driving cycle detection logic)	• Fuel pressure sensor and/or its power supply circuit • Boost pressure sensor and/or its power supply circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Disconnect connector from fuel pressure sensor. 3) Turn ignition switch to ON position. 4) Check that DTC P1620 is not detected. *Is it in good condition?*	Go to Step 3.	Go to Step 6.
3	**Fuel pressure sensor ground circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect "D01" connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between "YEL/RED" terminal of fuel pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between fuel pressure sensor and ECM.
4	**Fuel pressure sensor signal circuit check** 1) Check that voltage between "ORN/BLK" terminal of fuel pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel pressure sensor and ECM.

Step	Action	Yes	No
5	**Fuel pressure sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “D01” connector to ECM. 3) Replace fuel pressure sensor and check that DTC P1620 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
6	**DTC check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from boost pressure sensor. 3) Turn ignition switch to ON position. 4) Check that DTC P1620 is not detected. *Is it in good condition?*	Go to Step 7.	Go to Step 10.
7	**Boost pressure sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “ORN” terminal of boost pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.
8	**Boost pressure sensor ground circuit check** 1) Check that voltage between “BLK” terminal of boost pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.
9	**Boost pressure sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “D01” connector to ECM. 3) Replace boost pressure sensor and check that DTC P1620 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
10	**Fuel pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRN/YEL” terminal of fuel pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 11.	Repair or, if necessary, replace wiring harness between fuel pressure sensor and ECM.
11	**Fuel pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “GRN/YEL” terminal of fuel pressure sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 12.	Repair or, if necessary, replace wiring harness between fuel pressure sensor and ECM.

Step	Action	Yes	No
12	**Boost pressure sensor power supply circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “RED/BLK” terminal of boost pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 13.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.
13	**Boost pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “RED/BLK” terminal of boost pressure sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between boost pressure sensor and ECM.

DTC P1635:

S7N20A1124333

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1635: Sensor Supply Circuit 2 Fail This DTC is detected if sensor power supply 2 voltage is out of specified range. (SVS light: 1 driving cycle detection logic)	• CMP sensor and/or its power supply circuit • APP sensor (main) and/or its power supply circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Disconnect connector from CMP sensor. 3) Turn ignition switch to ON position. 4) Check that DTC P1635 is not detected. *Is it in good condition?*	Go to Step 3.	Go to Step 6.
3	**CMP sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “PNK/BLK” terminal of CMP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between CMP sensor and ECM.
4	**CMP sensor ground circuit check** 1) Check that voltage between “PPL” terminal of CMP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between CMP sensor and ECM.

Step	Action	Yes	No
5	**CMP sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “D01” connector to ECM. 3) Replace CMP sensor and check that DTC P1635 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
6	**DTC check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from APP sensor. 3) Turn ignition switch to ON position. 4) Check that DTC P1635 is not detected. *Is it in good condition?*	Go to Step 7.	Go to Step 10.
7	**APP sensor (main) signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “E62” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRN/RED” terminal of APP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.
8	**APP sensor (main) ground circuit check** 1) Check that voltage between “LT GRN/BLK” terminal of APP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.
9	**APP sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “E62” connector to ECM. 3) Replace APP sensor and check that DTC P1635 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
10	**CMP sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “PNK” terminal of CMP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 11.	Repair or, if necessary, replace wiring harness between CMP sensor and ECM.
11	**CMP sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “PNK” terminal of CMP sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 12.	Repair or, if necessary, replace wiring harness between CMP sensor and ECM.

Step	Action	Yes	No
12	**APP sensor (main) power supply circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “BRN” terminal of APP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 13.	Repair or, if necessary replace wiring harness between APP sensor and ECM.
13	**APP sensor (main) power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BRN” terminal of APP sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.

DTC P1639:

S7N20A1124334

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1639: Sensor Supply Circuit 3 Fail This DTC is detected if sensor power supply 3 voltage is out of specified range. (SVS light: 1 driving cycle detection logic)	• APP sensor (sub) and/or its power supply circuit • A/C refrigerant pressure sensor and/or its power supply circuit • DPF® differential pressure sensor and/or its circuit power supply • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Disconnect connector from APP sensor. 3) Turn ignition switch to ON position. 4) Check that DTC P1639 is not detected. *Is it in good condition?*	Go to Step 3.	For A/C model, go to Step 6. For non-A/C model, go to Step 10.
3	**APP sensor (sub) signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “E62” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “YEL” terminal of APP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.

Step	Action	Yes	No
4	**APP sensor (sub) ground circuit check** 1) Check that voltage between “WHT” terminal of APP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.
5	**APP sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “E62” connector to ECM. 3) Replace APP sensor and check that DTC P1639 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
6	**DTC check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from A/C refrigerant pressure sensor. 3) Turn ignition switch to ON position. 4) Check that P1639 is not detected. *Is it in good condition?*	Go to Step 7.	Go to Step 10.
7	**A/C refrigerant pressure sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “E62” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “RED” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.
8	**A/C refrigerant pressure sensor ground circuit check** 1) Check that voltage between “ORN” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.
9	**A/C refrigerant pressure sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “E62” connector to ECM. 3) Replace A/C refrigerant pressure sensor and check that DTC P1639 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
10	**DTC check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from differential pressure sensor. 3) Turn ignition switch to ON position. 4) Check that DTC P1635 is not detected. *Is it in good condition?*	Go to Step 11.	Go to Step 14.

Step	Action	Yes	No
11	**DPF® differential pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “E62” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “BRN/YEL” terminal of DPF® differential pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 12.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.
12	**DPF® differential pressure sensor ground circuit check** 1) Check that voltage between “GRN/ORN” terminal of DPF® differential pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 13.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.
13	**DPF® differential pressure sensor replacement** 1) Turn ignition switch to OFF position. 2) Connect “E62” connector to ECM. 3) Replace DPF® differential pressure sensor and check that DTC P1635 is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.
14	**A/C refrigerant pressure sensor power supply circuit check** 1) Check that voltage between “GRY/RED” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 15.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.
15	**A/C refrigerant pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “GRY/RED” terminal of A/C refrigerant pressure sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 16.	Repair or, if necessary, replace wiring harness between A/C refrigerant pressure sensor and ECM.
16	**APP sensor (sub) power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that voltage between “RED/YEL” terminal of APP sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 17.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.
17	**APP sensor (sub) power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “RED/YEL” terminal of APP sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 18.	Repair or, if necessary, replace wiring harness between APP sensor and ECM.

Step	Action	Yes	No
18	**DPF® differential pressure sensor power supply circuit check** 1) Turn ignition switch to ON position. 2) Check that resistance between “YEL/RED” terminal of DPF® differential pressure sensor connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 19.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.
19	**DPF® differential pressure sensor power supply circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “YEL/RED” terminal of DPF® differential pressure sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.

DTC P1660:

S7N20A1124335

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1660: Shut Off Valve This DTC is detected if shut off valve in high pressure pump has mechanical faulty. (SVS light: 3 driving cycle detection logic)	• Fuel pump relay and/or its circuit • Fuel pump • High pressure pump • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Fuel pump relay and fuel pump operation** 1) Check fuel pump relay and fuel pump for operation referring to “Table A-1: Fuel Pump Relay Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	**High pressure pump replacement** 1) Replace high pressure pump and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P1725:

S7N20A1124355

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1725: Engine Speed Output Signal Circuit This DTC is detected if engine speed output signal circuit is shorted to power supply circuit or shorted to ground circuit. (MIL/SVS light: Not applicable)	• P/S control module • ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Check DTC in P/S control module is not detected. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Go to applicable DTC troubleshooting.

DTC P1811:

S7N20A1124356

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1811: Engine Torque Control Invalid Communication with ABS / ESP® This DTC is detected if abnormal vehicle speed signal is detected. (SVS light: 1 driving cycle detection logic)	• CAN communication circuit • ECM • ABS / ESP® control module

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check DTC in ABS / ESP® control module is not detected. *Is it in good condition?*	Go to Step 3.	Go to applicable DTC troubleshooting.
3	**DTC check** 1) Check DTC related to CAN communication in ECM and ABS / ESP® control module is not detected. *Is it in good condition?*	Go to Step 4.	Go to applicable DTC troubleshooting.
4	**ECM replacement** 1) Substitute a known-good ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C” and check DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ABS / ESP® control module referring to “ABS Hydraulic Unit / Control Module Assembly Removal and Installation in Section 4E” or “ESP® Hydraulic Unit / Control Module Assembly Removal and Installation in Section 4F” and recheck.

DTC P1901:

S7N20A1124358

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1901: DPF® Differential Pressure Sensor or Flow Resistance Malfunction This DTC is detected if any one of the following conditions is satisfied. • DPF® differential pressure sensor signal voltage is out of specified range (0.2 – 4.8 V) for 1 sec. (SVS light: 1 driving cycle detection logic) • Difference between differential pressure at previous D/C and differential pressure at current D/C is more than specified value. (MIL/SVS light: Not applicable) • Difference between actual DPF® flow resistance and mean DPF® flow resistance is more than specified value with specified condition. (SVS light: 1 driving cycle detection logic) • Differential pressure is lower than 3 mbar for 8 sec. when engine speed is 1,500 rpm or more. (MIL/SVS light: Not applicable) • Calculated DPF® flow resistance is higher than specified value for approx. 100 sec. with specified condition. (SVS light: 1 driving cycle detection logic)	• Intake air system (abnormal air inhaled) • Clogging DPF® • DPF® differential pressure sensor pipe and/or hose • DPF® differential pressure sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

DTC Troubleshooting

NOTE

After replacing DPF® and/or DPF® differential pressure sensor, be sure to initialize DPF® Data and/or DPF® Differential Pressure Sensor Data in ECM referring to “DPF® Data Initialization: D13A / Z13DTJ in Section 1C” and/or “DPF® Differential Pressure Sensor Data Initialization: D13A / Z13DTJ in Section 1C”.
Failure to follow this procedure may result in detection of this DTC.

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: D13A / Z13DTJ”.
2	**DTC check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that DTC P2003 is not detected. *Is it in good condition?*	Go to Step 3.	Go to “DTP P2003:: D13A / Z13DTJ”.
3	**Air intake / turbocharger circuit check** 1) Check that air intake / turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 4.	Repair or replace and go to Step 4.

Step	Action	Yes	No
4	**After- sales regeneration** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Carry out after-sales regeneration referring to "DPF® After-sales Regeneration: D13A / Z13DTJ in Section 1C". *Are "Regeneration successful" displayed on SUZUKI scan tool?*	END	Go to Step 5.
5	**Error code check** 1) Check error displayed on SUZUKI scan tool. *Are "Error C: Regeneration is canceled" and "Error code 1: 91.5" displayed on SUZUKI scan tool?*	Go to Step 6.	Follow instruction described in "After-sales Regeneration Failure: D13A / Z13DTJ in Section 1C".
6	**DTC Check** 1) Check DTC. *Is DTC other than P1901 detected?*	Go to applicable DTC troubleshooting.	Go to Step 7.
7	**DPF® differential pressure sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from boost pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between "YEL/RED" terminal of DPF® differential pressure sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 8.	Check wiring harness between ECM and DPF® differential pressure sensor. If OK, substitute a known-good ECM and recheck.
8	**DPF® differential pressure sensor power supply and ground circuit check** 1) Check that voltage between "YEL/RED" and "GRN/ORN" terminals of DPF® differential pressure sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 9.	Check wiring harness between ECM and DPF® differential pressure sensor. If OK, substitute a known-good ECM and recheck.
9	**DPF® Differential pressure sensor circuit** 1) Turn ignition switch to OFF position. 2) Disconnect "D01" connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between "YEL/RED" terminal of DPF® differential pressure sensor connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Go to Step 10.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.
10	**DPF® differential pressure sensor circuit** 1) Check that voltage between "BRN/YEL" terminal of DPF® differential pressure sensor connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Go to Step 11.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.
11	**DPF® differential pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between "BRN/YEL" terminal of DPF® differential pressure sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 12.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.

Step	Action	Yes	No
12	**DPF® differential pressure sensor circuit check** 1) Check that resistance between “BRN/YEL” terminal of DPF® differential pressure sensor connector and “E62-49” terminal of ECM connector is less than 5 Ω. *Is it in good condition?*	Go to Step 13.	Repair or, if necessary, replace wiring harness between DPF® differential pressure sensor and ECM.
13	**DPF® differential pressure sensor replacement** 1) Connect “E62” connector to ECM. 2) Replace DPF® differential pressure sensor referring to “DPF® Differential Pressure Sensor Removal and Installation: D13A / Z13DTJ in Section 1B” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P1902:

S7N20A1124359

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1902: EGT Sensor Circuit This DTC is detected if EGT sensor signal voltage is out of specified range (0.2 – 4.8 V) for 1 sec. (SVS light: 1 driving cycle detection logic)	• EGT sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**EGT sensor circuit check** 1) Check that voltage between “GRN” terminal of ECT sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and EGT sensor. If OK, substitute a known-good ECM and recheck.
3	**EGT sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from EGT sensor. 3) Turn ignition switch to ON position. 4) Check voltage between “GRN” and “RED” terminals of EGT sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and EGT sensor. If OK, substitute a known-good ECM and recheck.
4	**EGT sensor check** 1) Check EGT sensor referring to “Exhaust Gas Temperature (EGT) Sensor Inspection (DPF® Model): D13A / Z13DTJ in Section 1B”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace EGT sensor referring to “Exhaust Gas Temperature (EGT) Sensor Removal and Installation (DPF® Model): D13A / Z13DTJ in Section 1B”.

DTP P2003:

S7N20A1124360

⚠ CAUTION

When DTC P2003 is detected, ECM will not allow performing after-sales regeneration in order to prevent risk of a thermal incident due to high flow resistance of DPF.
Although after-sales regeneration will be possible after clearance of P2003 by scan tool, be sure not to perform after-sales regeneration.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2003: DPF® Flow Resistance Too High This DTC is detected if calculated DPF® flow resistance is higher than specified value with specified condition immediately. (SVS light: 1 driving cycle detection logic)	• Intake air system (abnormal air inhaled) • Clogging DPF® • ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Preliminary check** 1) Check that air intake turbocharger circuit is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 3.	Repair or replace, and go to Step 3.
3	**DPF® replacement** 1) Replace DPF® referring to “DPF® Removal and Installation: D13A / Z13DTJ in Section 1K” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P2146:

S7N20A1124337

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2146: Fuel Injector Supply Voltage Circuit / Open This DTC is detected if capacitor voltage of fuel injector in ECM is out of specification. (MIL/SVS light: Not applicable)	• ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P2237 / P2297:

S7N20A1124361

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2237: A/F Sensor Positive Current Control Circuit / Open This DTC is detected if any one of A/F sensor signal voltage is in abnormal condition. (MIL/SVS light: Not applicable)	• A/F sensor and/or its circuit • ECM
P2297: A/F Sensor Out of Range During Deceleration This DTC is detected if A/F value at fuel cut is out of specified value. (MIL/SVS light: Not applicable)	• A/F sensor and/or its circuit • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

DTC Troubleshooting

NOTE

After replacing A/F sensor and/or MAF and IAT sensor, be sure to initialize A/F data in ECM referring to "A/F Data Initialization (Non-DPF® Model): D13A / Z13DTJ in Section 1C".
Failure to follow this procedure may result in detection of this DTC.

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: D13A / Z13DTJ".
2	**A/F sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and A/F sensor. 3) Check the following terminals for open, short to ground circuit and short to power supply circuit. • Between "RED/WHT" terminal of A/F sensor connector and "E62-44" terminal of ECM. • Between "GRN/WHT" terminal of A/F sensor connector and "E62-46" terminal of ECM. • Between "YEL" terminal of A/F sensor connector and "E62-45" terminal of ECM. • Between "BLK" terminal of A/F sensor connector and "E62-47" terminal of ECM *Are they in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between ECM and A/F sensor.

Step	Action	Yes	No
3	**A/F sensor replacement** 1) Connect connector to ECM. 2) Replace A/F sensor referring to “Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model): D13A / Z13DTJ in Section 1B”, and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC P2244:

S7N20A1124369

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P2244: A/F Sensor Reference Voltage Performance This DTC is detected if A/F sensor supply voltage is out of specification range. (MIL/SVS light: Not applicable)	• ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ”.
2	**Recheck DTC** 1) Clear DTC. 2) Turn ignition switch to OFF position and wait 30 seconds. 3) Recheck DTC and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC U2101:

S7N20A1124339

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
U2101: Control Module Program Error This DTC is detected if vehicle variant data is incorrect or not registered in ECM. (SVS light: 1 driving cycle detection logic)	• No vehicle information in ECM • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

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: D13A / Z13DTJ".
2	**Vehicle variant data registration** 1) Using SUZUKI scan tool, register vehicle variant data in ECM correctly referring to "Registration for ECM Replacement: D13A / Z13DTJ in Section 1C". 2) Check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

DTC U2103:

S7N20A1124340

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
U2103: Control Module Connection Bus off Transmission error that is inconsistent between transmission data monitor. (MIL/SVS light: Not applicable)	• CAN communication circuit • Combination meter • BCM • ECM

Wiring Diagram

For wiring circuit and connector number, refer to "ECM Input / Output Circuit Diagram: D13A / Z13DTJ".

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: D13A / Z13DTJ".
2	**Vehicle variant data registration** 1) Using SUZUKI scan tool, register vehicle variant data in ECM correctly referring to "Registration for ECM Replacement: D13A / Z13DTJ in Section 1C". 2) Check that DTC is not detected. *Is it in good condition?*	End.	Go to Step 3.
3	**Control module connection check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM, BCM and combination meter. 3) Check for proper connection to terminal of each CAN line of ECM, BCM and combination meter. 4) If OK, connect ECM, BCM and combination meter securely. 5) Check that DTC is not detected. *Is it in good condition?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 4.

Step	Action	Yes	No
4	**CAN line check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM, BCM and combination meter. 3) Check all the following CAN lines for open, short to power supply circuit, short to ground circuit, short to other CAN line and high resistance. • Between ECM connector and ABS / ESP® control module connector • Between ABS / ESP® control module connector and BCM connector • Between BCM connector and DLC • Between BCM connector and combination meter connector • Between combination meter connector and keyless start control module connector • Between keyless start control module connector and steering angle sensor (ESP® model) *Is it in good condition?*	Go to Step 5.	Repair or replace CAN line.
5	**Substitute combination meter and recheck** 1) Substitute a known-good combination meter. 2) Check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck

DTC U2107:

S7N20A1124342

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
U2107: Lost communication with BCM Reception error of communication data for BCM. (MIL/SVS light: Not applicable)	• CAN communication circuit • ABS / ESP® control module • Combination meter • BCM • ECM

Wiring Diagram

For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

DTC Troubleshooting

Refer to “DTC U2103:: D13A / Z13DTJ”.

DTC U2108:

S7N20A1124371

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
U2108: Lost communication with ABS / ESP® control module Reception error of communication data for combination meter. (MIL/SVS light: Not applicable)	• CAN communication circuit • ABS / ESP® control module • ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

DTC Troubleshooting
Refer to “DTC U2103:: D13A / Z13DTJ”.

DTC U2116:

S7N20A1124373

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
U2116: Lost communication with combination meter Reception error of communication data for combination meter. (MIL/SVS light: Not applicable)	• CAN communication circuit • Combination meter • BCM • ECM

Wiring Diagram
For wiring circuit and connector number, refer to “ECM Input / Output Circuit Diagram: D13A / Z13DTJ”.

DTC Troubleshooting
Refer to “DTC U2103:: D13A / Z13DTJ”.

Table A-1: Fuel Pump Relay Operation Check

S7N20A1124270

Step	Action	Yes	No
1	**Output test** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that fuel pump operating sound is heard by “output test” of scan tool. *Is it in good condition?*	End.	Go to Step 2.
2	**Fuel pump relay power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove fuel pump relay. 3) Turn ignition switch to ON position. 4) Check that voltage between the following terminals is higher than 11 V. • “BLK/WHT” terminal of fuel pump relay connector and vehicle body ground. • “LT GRN/RED” terminal of fuel pump relay connector and vehicle body ground. *Are they in good condition?*	Go to Step 3.	Repair power supply circuit of fuel pump relay.
3	**Fuel pump relay control circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and fuel pump. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRN/BLK” terminal of fuel pump relay connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between fuel pump relay and ECM.

Step	Action	Yes	No
4	**Fuel pump relay control circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “GRN/BLK” terminal of fuel pump relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel pump relay and ECM.
5	**Fuel pump relay control circuit check** 1) Check that resistance between “E62-75” terminal of ECM connector and “GRN/BLK” terminal of fuel pump relay connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between fuel pump relay and ECM.
6	**Fuel pump relay output circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “PNK” terminal of fuel pump relay connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between fuel pump relay and fuel pump.
7	**Fuel pump relay output circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “PNK” terminal of fuel pump relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between fuel pump relay and fuel pump.
8	**Fuel pump relay output circuit check** 1) Check that resistance between “PNK” terminal of fuel pump relay connector and “PNK” terminal of fuel pump connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between fuel pump relay and fuel pump.
9	**Fuel pump relay power supply circuit and fuel pump grand circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “LT GRN/RED” terminal of fuel pump relay connector and “BLK” terminal of fuel pump connector is higher than 11 V. *Is it in good condition?*	Go to Step 10.	Repair or, if necessary, replace wiring harness of fuel pump ground circuit.
10	**Fuel pump relay check** 1) Check fuel pump relay referring to “Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Go to Step 11.	Replace fuel pump relay.
11	**Fuel pump operation check** 1) Connect connectors to ECM and fuel pump. 2) Connect service wire between “LT GRN/RED” and “PNK” terminals of fuel pump relay connector. 3) Turn ignition switch to ON position and check that fuel pump operating sound is heard. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel pump.

Table A-2: Injector Circuit Check

S7N20A1124308

NOTE

This procedure is to troubleshoot only open, short to ground circuit and short to power supply circuit of fuel injector circuit. If it is necessary to troubleshoot for injector operation, be sure to perform "Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ".

Troubleshooting

Step	Action	Yes	No
1	**Fuel injector and high pressure pipe check** 1) Carry out a visual check and confirm that condition of fuel injectors and high pressure pipes. *Is it in good condition?*	Go to Step 2.	Replace faulty component.
2	**Fuel injector circuit check** 1) Disconnect connectors from ECM and all fuel injectors with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that voltage between the following terminals is lower than 0.3 V. • For injector No.1: – "ORN" terminal of fuel injector No.1 connector and vehicle body ground. – "ORN/WHT" terminal of fuel injector No.1 connector and vehicle body ground. • For injector No.2: – "YEL" terminal of fuel injector No.2 connector and vehicle body ground. – "YEL/BLK" terminal of fuel injector No.2 connector and vehicle body ground. • For injector No.3: – "GRN" terminal of fuel injector No.3 connector and vehicle body ground. – "WHT/GRN" terminal of fuel injector No.3 connector and vehicle body ground. • For injector No.4: – "BLU" terminal of fuel injector No.4 connector and vehicle body ground. – "WHT/BLU" terminal of fuel injector No.4 connector and vehicle body ground. *Are they in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between ECM and fuel injector.

Step	Action	Yes	No
3	**Fuel injector circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between the following terminals is higher than 500 kΩ. • For injector No1: – "ORN" terminal of fuel injector No.1 connector and vehicle body ground. – "ORN/WHT" terminal of fuel injector No.1 connector and vehicle body ground. • For injector No.2: – "YEL" terminal of fuel injector No.2 connector and vehicle body ground. – "YEL/BLK" terminal of fuel injector No.2 connector and vehicle body ground. • For injector No.3: – "GRN" terminal of fuel injector No.3 connector and vehicle body ground. – "WHT/GRN" terminal of fuel injector No.3 connector and vehicle body ground. • For injector No.4: – "BLU" terminal of fuel injector No.4 connector and vehicle body ground. – "WHT/BLU" terminal of fuel injector No.4 connector and vehicle body ground. *Are they in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and fuel injector.
4	**Fuel injector circuit check** 1) Check that resistance between the following terminals is lower than 5 Ω. • For injector No.1: – "ORN" terminal of fuel injector No.1 connector and "D01-47" terminal of ECM connector. – "ORN/WHT" terminal of fuel injector No.1 connector and "D01-16" terminal of ECM connector. • For injector No.2: – "YEL" terminal of fuel injector No.2 connector and "D01-49" terminal of ECM connector. – "YEL/BLK" terminal of fuel injector No.2 connector and "D01-17" terminal of ECM connector. • For injector No.3: – "GRN" terminal of fuel injector No.3 connector and "D01-48" terminal of ECM connector. – "WHT/GRN" terminal of fuel injector No.3 connector and "D01-31" terminal of ECM connector. • For injector No.4: – "BLU" terminal of fuel injector No.4 connector and "D01-46" terminal of ECM connector. – "WHT/BLU" terminal of fuel injector No.4 connector and "D01-1" terminal of ECM connector. *Are they in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and fuel injector.

Step	Action	Yes	No
5	**Fuel injector check** 1) Check fuel injector referring to “Fuel Injector On-Vehicle Inspection: D13A / Z13DTJ in Section 1G”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel injector.

Table A-3: Fuel Temperature Sensor Check

S7N20A1124272

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and warm it up to normal operating temperature, check that “Fuel temperature” displayed on SUZUKI scan tool is within –25 to 95 °C (–13 to 203 °F). *Is it in good condition?*	End.	Go to Step 2.
2	**Fuel temperature sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from fuel temperature sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/YEL” terminal of fuel temperature sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and fuel temperature sensor. If OK, substitute a known-good ECM and recheck.
3	**Fuel temperature sensor circuit check** 1) Check that voltage between “BLK/YEL” and “RED/BLU” terminals of fuel temperature sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and fuel temperature sensor. If OK, substitute a known-good ECM and recheck.
4	**Fuel temperature sensor check** 1) Check fuel temperature sensor referring to “Fuel Heater and Fuel Temperature Sensor Inspection: D13A / Z13DTJ in Section 1G”. *Is it in good condition?*	End.	Replace fuel temperature sensor.

Table A-4: Fuel Pressure Sensor Circuit Check

S7N20A1124307

Troubleshooting

Step	Action	Yes	No
1	**Fuel pressure sensor power supply voltage** 1) Turn ignition switch to OFF position. 2) Disconnect connector from fuel pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRN/YEL” terminal of fuel pressure sensor connector and vehicle body ground. Check that it is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 2.	Check wiring harness between ECM and fuel pressure sensor. If OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
2	**Fuel pressure sensor power supply and ground circuit check** 1) Check that voltage between “GRN/YEL” and “YEL/RED” terminals of fuel pressure sensor, and check that it is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and fuel pressure sensor. If OK, substitute a known-good ECM and recheck.
3	**Fuel pressure sensor signal circuit check** 1) Check that voltage between “ORN/BLK” terminal of fuel pressure sensor and vehicle body ground, and check that it is within 4.8 – 5.2 V. *Is it in good condition?*	Wiring harness of fuel pressure sensor is good condition. If fault is detected again, fuel pressure sensor or other component may be in malfunction. Go to “Table A-7: High-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ”.	Check wiring harness between ECM and fuel pressure sensor. If OK, substitute a known-good ECM and recheck.

Table A-5: Fuel Pressure Regulator Operation Check

S7N20A1124298

Troubleshooting

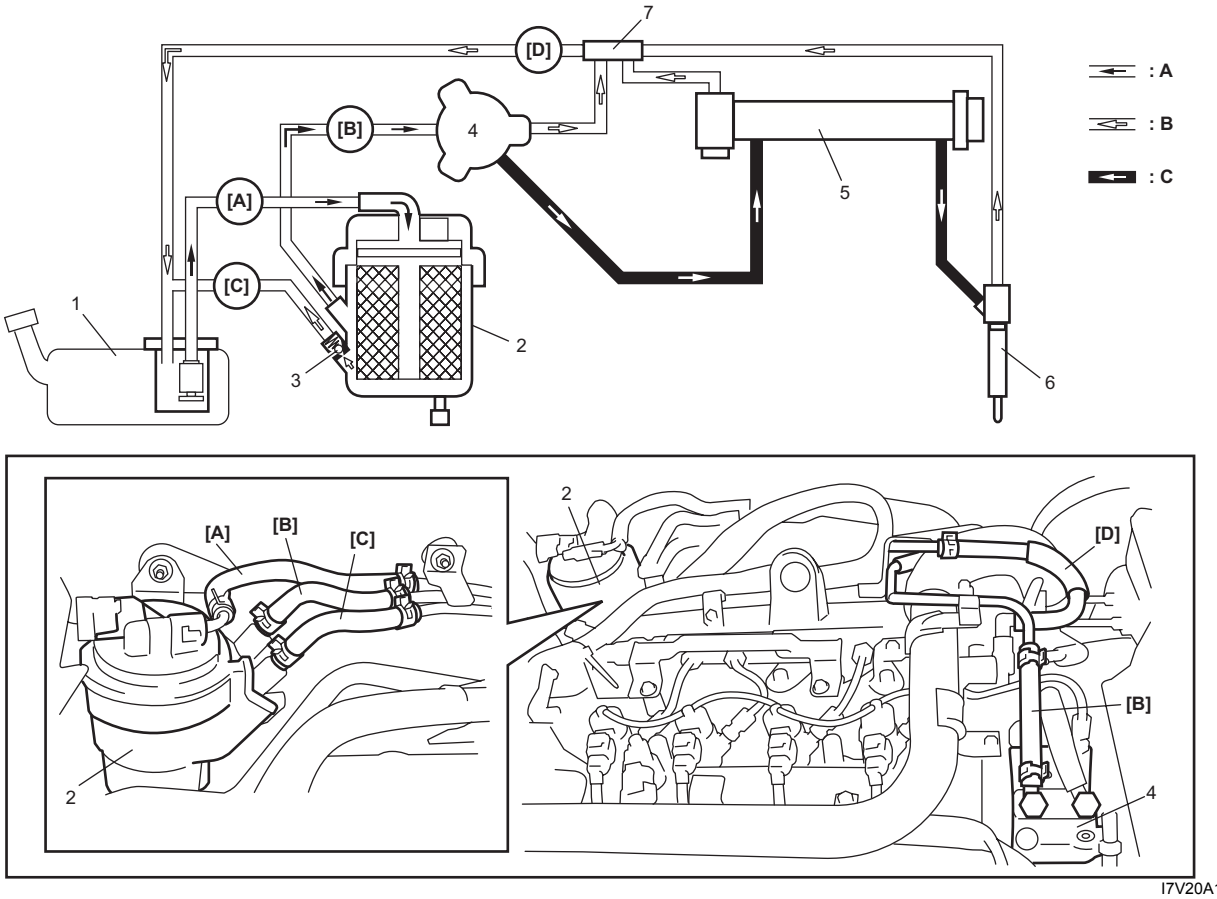
Step	Action	Yes	No
1	**Output test** 1) Connect SUZUKI scan tool with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Confirm that fuel pressure regulator operating sound is heard by using “output test” of SUZUKI scan tool. *Is it in good condition?*	End.	Go to Step 2.
2	**Fuel pressure regulator power supply circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from fuel pressure regulator. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY/BLK” terminal of fuel pressure regulator connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and fuel pressure regulator. If OK, substitute a known-good ECM and recheck.
3	**Fuel pressure regulator power supply and ground circuit check** 1) CHeck that voltage between “GRY/BLK” and “LT BLU/RED” terminals of fuel pressure regulator connector is higher than 11 V. *Is it in good condition?*	End.	Go to Step 4.
4	**Fuel pressure regulator ground circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect “D01” connector from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “LT BLU/RED” terminal of fuel pressure regulator connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel pressure regulator and ECM.

Step	Action	Yes	No
5	**Fuel pressure regulator ground circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “LT BLU/RED” terminal of fuel pressure regulator connector and “D01-34” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between fuel pressure regulator and ECM.
6	**Fuel pressure regulator check** 1) Check fuel pressure regulator referring to “Fuel Pressure Regulator Inspection: D13A / Z13DTJ in Section 1G”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel pressure regulator.

Table A-6: Low-Pressure Fuel Supply Circuit Check

S7N20A1124283

Circuit Diagram



I7V20A112011-01

A: Fuel feed line	[C]: Pinching point [C] at return hose of fuel filter	4. High pressure pump
B: Fuel return line	[D]: Pinching point [D] at return hose of fuel damper	5. Common rail
C: Fuel high pressure line	1. Fuel tank	6. Fuel injector
[A]: Measurement point [A] between fuel pump and fuel filter	2. Fuel filter	7. Return fuel
[B]: Measurement point [B] between fuel filter and high pressure pump	3. Over flow valve	

Troubleshooting

⚠ WARNING

Before performing the following troubleshooting, be sure to read "Precautions on Fuel System Service: D13A / Z13DTJ in Section 1G".

NOTE

Before performing the following check, make sure that battery voltage is 11 V or more.

Step	Action	Yes	No
1	**Preliminary check** 1) Check that fuel tank contains correct type of fuel. *Is it in good condition?*	Go to Step 2.	Fuel tank contains irregular substances (petrol, other fluids). Clean fuel tank and refill it correctly.
2	**Preliminary check** 1) Rest of fuel should be more than 5 liters (10.67/8.80 US/Imp pt.). *Is it in good condition?*	Go to Step 3.	Top up fuel level so that more than 5 liters (10.67/8.80 US/Imp pt.).
3	**Preliminary check** 1) Check the following. • Check fuel leaks in fuel circuit. • Check hoses and pipes to identify any obstructions, damage, leak, breaks, scratches, etc. • Check fittings and seals are correctly fitted. • Check for blockages, air or water in fuel system. *Are they in good condition?*	Go to Step 4.	Repair or, if necessary, replace faulty components.
4	**Fuel pump operation check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that fuel pump operating sound is heard by "output test" command of scan tool. *Is it in good condition?*	Go to Step 5.	Fuel pump operation faulty. Go to "Table A-1: Fuel Pump Relay Operation Check: D13A / Z13DTJ".
5	**Fuel pump operation check** 1) Turn ignition switch to OFF position. 2) Connect special tools at measurement point [A] as shown in figure. **Special tool** **: 09914–08410** **: 09919–48410** 3) Within 20 seconds after turning ignition switch to ON position, check that fuel pressure is 190 – 250 kPa (2.0 – 3.1 kgf/cm^2, 29.0 – 43.5 psi, 2 – 3 bar). *Is it in good condition?*	End.	• If fuel pressure is higher than 250 kPa (3.1 kgf/cm^2, 43.5 psi, 3 bar), go to Step 6. • If fuel pressure is lower than 190 kPa (2.0 kgf/cm^2, 29.0 psi, 2 bar), go to Step 8.

Step	Action	Yes	No
6	**Low fuel pressure circuit check** 1) Turn ignition switch to OFF position. 2) Pinch fuel return hose at pinching point [C] by hand in order to block up fuel flow. 3) Within 20 seconds after turning ignition switch to ON position. 4) Check that fuel pressure is pressure 330 – 390 kPa (3.4 – 3.9 kgf/cm^2, 47.9 – 56.5 psi, 3.3 – 3.9 bar). *Is it in good condition?*	Go to Step 7.	High pressure pump stuck open or close. Replace high pressure pump.
7	**Low fuel pressure circuit check** 1) Turn ignition switch to OFF position. 2) Remove special tools connected at Step 5. 3) Connect fuel feed hose (from fuel tank) to fuel filter. 4) Connect special tools at measurement point [B] as shown in figure. **Special tool** **: 09919–48410** 5) Within 20 seconds after turning ignition switch to ON position, check that fuel pressure is lower than fuel pressure measured at Step 5. *Is it in good condition?*	Fuel filter element is clogged. Replace fuel filter.	Over flow valve stuck close. Replace fuel filter assembly.
8	**Low fuel pressure circuit check** 1) Turn ignition switch to OFF position. 2) Pinch fuel return hose at pinching point [C] by hand in order to block up fuel flow. 3) Within 20 seconds after turning ignition switch to ON position, check that fuel pressure is higher than fuel pressure measured at Step 5 by 80 kPa (0.8 kgf/cm^2, 11.6 psi, 0.8 bar). *Is it in good condition?*	Over flow valve stuck open. Replace fuel filter assembly.	Go to Step 9.
9	**Low fuel pressure circuit check** 1) Turn ignition switch to OFF position. 2) Pinch fuel return hose at pinching point [B] by hand in order to block up fuel flow. 3) Within 20 seconds after turning ignition switch to ON position, check that fuel pressure is higher than fuel pressure measured at Step 5 by 10 kPa (0.1 kgf/cm^2, 1.45 psi, 0.1 bar). *Is it in good condition?*	High pressure pump stuck open. Replace high pressure pump.	Fuel pump faulty. Replace fuel pump.

Table A-7: High-Pressure Fuel Supply Circuit Check

S7N20A1124284

⚠ WARNING

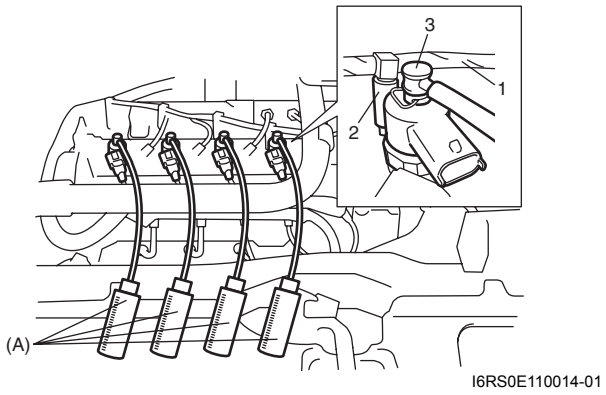
Before troubleshooting, be sure to read "Precautions on Fuel System Service: D13A / Z13DTJ in Section 1G".

Troubleshooting

NOTE

- **Before troubleshooting, be sure to check low-pressure fuel circuit referring to "Table A-6: Low-Pressure Fuel Supply Circuit Check: D13A / Z13DTJ".**
- **Before troubleshooting, make sure that battery voltage is 11 V or more.**

Step	Action	Yes	No
1	**Fuel injector calibration code check** 1) Using SUZUKI scan tool, check that fuel injector calibration codes registered in ECM are corresponded with calibration codes stamped on fuel injectors. *Is it in good condition?*	Go to Step 2.	Register correct fuel injector calibration codes in ECM referring to "Fuel Injector Registration: D13A / Z13DTJ in Section 1C".
2	**Fuel injector check** 1) Check fuel injector for resistance referring to "Fuel Injector On-Vehicle Inspection: D13A / Z13DTJ in Section 1G". *Is it in good condition?*	Go to Step 3.	Replace faulty fuel injector.
3	**Power balance check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and warm up to normal operating temperature. 3) Stop fuel injector No.1 operation by using "output test" of SUZUKI scan tool and check that engine idle condition is changed. 4) Carry out Step 3) at fuel injector No.2 through No.4. *Does engine idling change to at stop of each fuel injector?*	Go to Step 4.	Replace applicable fuel injector referring to "Fuel Injector Removal and Installation: D13A / Z13DTJ in Section 1G".

Step	Action	Yes	No
4	**Fuel injector leak check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from all injectors. 3) After removing clips, disconnect fuel return hose (1) from all fuel injectors. 4) Plug fuel return hose with plug cap (2) so that no fuel comes out during this check. For details, refer to "Precautions on Fuel System Service: D13A / Z13DTJ in Section 1G". 5) Connect special tool to fuel injectors. **NOTE** **For adapters (3) between special tool and injectors, use return fuel hose supplied as spare part.** **Special tool** **(A): 09912–96540**  I6RS0E110014-01 6) Crank engine for 5 seconds. 7) Check that quantities of return fuel from each injector is approximately same and small. *Is it in good condition?*	Go to Step 5.	Replace faulty fuel injector.
5	**Fuel injector leak check** 1) Turn ignition switch to OFF position. 2) Connect connectors to all injectors. 3) Check that quantities of return fuel from each injector is approximately same in the following condition respectively as same manner as Step 3. • Engine running at idle speed for 3 min. • Engine running at 1500 rpm for 3 min. • Engine running at 3000 rpm for 3 min. *Is it in good condition?*	Go to Step 6.	Replace faulty fuel injector.

Step	Action	Yes	No
6	**High pressure fuel circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from all fuel injectors. 3) Connect SUZUKI scan tool to DLC. 4) Crank engine for 5 seconds. 5) Check that “Fuel Rail Pressure” displayed on SUZUKI scan tool is higher than 30 MPa (300 bar) with engine speed higher than 200 rpm. *Is it in good condition?*	End.	Go to Step 7.
7	**Fuel pressure sensor circuit check** 1) Check fuel pressure sensor circuit referring to “Table A-4: Fuel Pressure Sensor Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 8.	Repair or replace.
8	**Fuel pressure regulator operation check** 1) Check that fuel pressure regulators is working properly referring to “Table A-5: Fuel Pressure Regulator Operation Check: D13A / Z13DTJ”. *Is it in good condition?*	End.	Repair or replace.

Table A-8: Fuel Heater Operation Check

S7N20A1124362

Troubleshooting

Step	Action	Yes	No
1	**Output test** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that “Fuel temperature” displayed on SUZUKI scan tool lower than 30 °C (86 °F). 4) Carry out fuel heater “output test” of scan tool. 5) Check that “Fuel temperature” displayed on SUZUKI scan tool higher than fuel temperature measured at Step 3). *Is it in good condition?*	End.	Go to Step 2.
2	**Fuel heater relay circuit check** 1) Turn ignition switch to OFF position. 2) Remove fuel heater relay. 3) Turn ignition switch to ON position. 4) Check that voltage between the following terminals is higher than 11 V. • “BLK/WHT” terminal of fuel heater relay connector and vehicle body ground. • “GRN” terminal of fuel heater relay connector and vehicle body ground. *Are they in good condition?*	Go to Step 3.	Repair power supply circuit of fuel heater relay.

Step	Action	Yes	No
3	**Fuel heater relay circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and fuel heater with fuel temperature sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “YEL/BLU” terminal of fuel heater relay connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between fuel heater relay and ECM.
4	**Fuel heater relay circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “YEL/BLU” terminal of fuel heater relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between fuel heater relay and ECM.
5	**Fuel heater relay circuit check** 1) Check that resistance between “E62-76” terminal of ECM connector and “BLU/ORN” terminal of fuel heater relay connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between fuel heater relay and ECM.
6	**Fuel heater relay circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “BLU/ORN” terminal of fuel heater relay connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between fuel heater relay and fuel heater.
7	**Fuel heater relay circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BLU/ORN” terminal of fuel heater relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between fuel heater relay and fuel heater.
8	**Fuel heater relay circuit check** 1) Check that resistance between “BLU/ORN” terminal of fuel heater relay connector and “BLU/ORN” terminal of fuel heater with fuel temperature sensor connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between fuel heater relay and fuel heater.
9	**Fuel heater relay circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “GRN” terminal of fuel heater relay connector and “BLK” terminal of fuel heater with fuel temperature sensor connector is higher than 11 V. *Is it in good condition?*	Go to Step 10.	Repair or, if necessary, replace wiring harness between fuel heater relay and fuel heater.
10	**Fuel heater relay check** 1) Check fuel heater relay referring to “Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Go to Step 11.	Replace fuel heater relay.

Step	Action	Yes	No
11	1) Connect connectors to ECM. 2) Connect service wire between “GRN” and “BLU/ORN” terminals of fuel heater relay connector. 3) Turn ignition switch to ON position and check that voltage between “BLU/ORN” and “BLK” terminals of fuel heater with fuel temperature sensor connector is higher than 11 V. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace fuel filter.

Table B-1: Air Intake / Turbocharger Circuit Check

S7N20A1124271

Troubleshooting

Step	Action	Yes	No
1	**Preliminary check** 1) Check the following. • Check seal of turbocharger system hoses. • Check intercooler for leaks. • Check that hose clamp in air intake system are correctly fitted and tightened. • Check air intake hoses and pipes to identify any obstructions, damage etc. • Check that MAF and IAT sensor is not contaminated. • Visually, check turbocharger for oil leakage and damage. *Are they in good condition?*	Go to Step 2.	Repair or if necessary replace faulty components.
2	**Air cleaner filter condition check** 1) Check that air cleaner filter is not contaminated. *Is it in good condition?*	Go to Step 3.	Replace air cleaner filter referring to “Air Cleaner Filter Removal and Installation: D13A / Z13DTJ in Section 1D”.
3	**Air cleaner filter condition check** 1) Check that air cleaner filter is correctly fitted. *Is it in good condition?*	Go to Step 4.	Refit correctly.
4	**Turbocharger check** 1) Check turbocharger referring to “Turbocharger Inspection: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	DPF® model: Go to Step 5. Non-DPF® model: Go to Step 6.	Repair or replace.
5	**Boost pressure control solenoid valve check** 1) Check that boost pressure control solenoid valve is working properly referring to “Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model): D13A / Z13DTJ”. *Is it good condition?*	Go to Step 6.	Repair or replace.
6	**MAF sensor operation check** 1) Check that MAF sensor is working properly referring to “Table B-2: MAF Sensor Check: D13A / Z13DTJ”. *Is it in good condition?*	End.	Repair or replace.

Table B-2: MAF Sensor Check

S7N20A1124274

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Confirm that engine stops and all electrical loads turned off. 4) Check that “MAF” parameter displayed on SUZUKI scan tool is within 0 – 1 g/sec. *Is it in good condition?*	Go to Step 2.	Go to Step 5.
2	**Parameter check** 1) Start engine and warm it up to normal operating temperature. 2) With engine idle speed, EGR OFF and accelerator pedal not operated, check that “MAF” parameter displayed on SUZUKI scan tool higher than 5.5 g/sec. *Is it in good condition?*	Go to Step 3.	Go to Step 5.
3	**Parameter check** 1) With all electrical loads turned off, when accelerator pedal is depressed several times, check that “MAF” parameter displayed on SUZUKI scan tool is changed in a short time. *Is it in good condition?*	Go to Step 4.	Go to Step 5.
4	**Parameter check** 1) When EGR ON and accelerator pedal is not depressed, “MAF” parameter displayed on SUZUKI scan tool higher than 3.0 g/sec. *Is it in good condition?*	End.	Go to Step 5.
5	**MAF and IAT sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from MAF and IAT sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/WHT” terminal of MAF and IAT sensor connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace power supply circuit of MAF and IAT sensor.
6	**MAF and IAT sensor power supply and ground circuit check** 1) Check that voltage between “BLK/WHT” and “BLU/YEL” terminals of MAF and IAT sensor connector is higher than 11 V. *Is it in good condition?*	Go to Step 7.	Check wiring harness between ECM and IAT sensor. If OK, substitute a known-good ECM and recheck.
7	**MAF sensor circuit check** 1) Check that voltage between “BLU/RED” terminal of MAF and IAT sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Replace MAF and IAT sensor.	Check wiring harness between ECM and MAF and IAT sensor. If OK, substitute a known-good ECM and recheck.

Table B-3: Boost Pressure Sensor Check

S7N20A1124273

Troubleshooting

Step	Action	Yes	No
1	**Air intake system check** 1) Check that air intake system is working properly referring to “Table B-1: Air Intake / Turbocharger Circuit Check: D13A / Z13DTJ”. *Is it in good condition?*	Go to Step 2.	Repair or replace.
2	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON. 3) Confirm that engine stops and all electrical loads turned off. 4) Check “Boost pressure” displayed on SUZUKI scan tool. Displayed value must be approximately equal to “Barometric Pres”. *Is it in good condition?*	Go to Step 3.	Go to Step 5.
3	**Parameter check** 1) With engine idle speed and accelerator pedal not depressed, “Boost pressure” must be approximately equal to “Barometric Pres”. *Is it in good condition?*	Go to Step 4.	Go to Step 5.
4	**Parameter check** 1) With accelerator pedal depressed and engine speed equal to 3,500 rpm, “Boost pressure” must be higher than 120 kPa (1.2 kgf/cm^2, 17.4 psi, 1.2 bar). *Is it in good condition?*	End.	Go to Step 5.
5	**Boost pressure sensor power supply and ground circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from boost pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “RED/BLK” and “BLK” terminals of boost pressure sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Replace boost pressure sensor.	Go to Step 6.
6	**Boost pressure sensor signal circuit check** 1) Check that voltage between “ORN” terminal of boost pressure sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Replace boost pressure sensor.	Check wiring harness between ECM and boost pressure sensor. If OK, substitute a known-good ECM and recheck.

Table B-4: Barometric Pressure Check

S7N20A1124290

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Confirm that engine stops and all electrical loads turned off. 4) Check “Barometric Pres” displayed on SUZUKI scan tool. Displayed value must be approximately equal to barometric pressure. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

Table B-5: EGR Valve Operation Check

S7N20A1124282

Troubleshooting

Step	Action	Yes	No
1	**Output test** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Check condition of main and circuit fuses. If not, replace fuse and check for short circuit to ground. 3) Turn ignition switch to ON position. 4) Confirm that EGR valve operating sound is heard by using “output test” of SUZUKI scan tool. *Is it in good condition?*	End.	Go to Step 2.
2	**EGR valve power supply voltage check** 1) Disconnect connector from EGR valve with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that voltage between “PNK/WHT” terminal of EGR valve connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 5.	Go to Step 3.
3	**EGR valve circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLU/BLK” terminal of EGR valve connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and EGR valve.
4	**EGR valve circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BLU/BLK” terminal of EGR valve connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 5.	Repair or, if, necessary replace wiring harness between ECM and EGR valve.

Step	Action	Yes	No
5	**EGR valve circuit check** 1) Check that resistance between “BLU/BLK” terminal of EGR valve connector and “D01-15” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and EGR valve.
6	**EGR valve check** 1) Check EGR valve referring to “EGR Valve On-Vehicle Inspection: D13A / Z13DTJ in Section 1B”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace EGR valve.

Table B-6: Boost Pressure Control Solenoid Valve Operation Check (DPF® Model)

S7N20A1124363

Troubleshooting

Step	Action	Yes	No
1	**Vacuum pump check** 1) Check vacuum pump referring to “Vacuum Pump Inspection: D13A / Z13DTJ in Section 1D”. *Is it in good condition?*	Go to Step 2.	Repair or replace.
2	**Output check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Confirm that boost pressure control solenoid valve operating sound is heard by using “output test” of SUZUKI scan tool. *Is it in good condition?*	End.	Go to Step 3.
3	**Boost pressure control solenoid valve circuit check** 1) Disconnect connector from boost pressure control solenoid valve with ignition switch turned OFF. 2) Turn ignition switch to ON. 3) Check that voltage between “GRN” terminal of boost pressure control solenoid valve connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary replace power supply circuit of boost pressure control solenoid.
4	**Boost pressure control solenoid valve circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “LT GRN” terminal of boost pressure control solenoid valve connector and vehicle body ground is less than 0.3 V. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and boost pressure control solenoid valve.
5	**Boost pressure control solenoid valve circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “LT GRN” terminal of boost pressure control solenoid valve connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 5.	Repair or, if, necessary replace wiring harness between ECM and boost pressure control solenoid valve.

Step	Action	Yes	No
6	**Boost pressure control solenoid valve circuit check** 1) Check that resistance between “WHT/BLK” terminal of boost pressure control solenoid valve connector and “D01-30” terminal of ECM connector is less than 5 Ω. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between ECM and boost pressure control solenoid valve.
7	**Boost pressure control solenoid valve check** 1) Check boost pressure control solenoid valve referring to “Boost Pressure Control Solenoid Valve Inspection (DPF® Model): D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace boost pressure control solenoid valve.

Table B-7: DPF® Differential Pressure Sensor Check

S7N20A1124364

Troubleshooting

Step	Action	Yes	No
1	**DPF® differential pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from DPF® differential pressure sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “YEL/RED” and “GRN/ORN” terminals of DPF® differential pressure sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 2.	Check wiring harness between ECM and DPF® differential pressure sensor. If OK, substitute a known-good ECM and recheck.
2	**DPF® differential pressure sensor circuit check** 1) Check that voltage between “YEL/RED” terminal of DPF® differential pressure sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and DPF® differential pressure sensor. If OK, substitute a known-good ECM and recheck.
3	**DPF® differential pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “BRN/YEL” terminal of DPF® differential pressure sensor connector and vehicle body is lower than 0.3 V. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and DPF® differential pressure sensor.
4	**DPF® differential pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BRN/YEL” terminal of DPF® differential pressure sensor connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and DPF® differential pressure sensor.
5	**DPF® differential pressure sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BRN/YEL” terminal of DPF® differential pressure sensor connector and “E62-49” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and DPF® differential pressure sensor.

Step	Action	Yes	No
6	**DPF® differential pressure sensor check** 1) Check DPF® differential pressure sensor referring to "DPF® Differential Pressure Sensor Inspection: D13A / Z13DTJ in Section 1B". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace DPF® differential pressure sensor.

Table B-8: Exhaust Gas Temperature (EGT) Sensor Check (DPF® Model)

S7N20A1124365

NOTE

Even if vehicle is under idling condition, forced regeneration without speed request is activated according to DPF® clogging.
In this state, engine speed at idling is increased.
For details of forced regeneration, refer to "Forced regeneration without Speed Request" under "Diesel Particulate Filter (DPF®) Regeneration Description: D13A / Z13DTJ".

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and warm it up to normal operating temperature, check that "EGT" displayed on SUZUKI scan tool is specified value below. • Without forced regeneration: 30 – 250 °C (86 – 482 °F) • With forced regeneration: 500 – 700 °C (932 – 1,292 °F) *Is it in good condition?*	End.	Go to Step 2.
2	**EGT sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from EGT sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between "GRN" terminal of EGT sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and EGT sensor. If OK, substitute a known-good ECM and recheck.
3	**EGT sensor circuit check** 1) Check that voltage between "GRN" and "RED" terminals of EGT sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and EGT sensor. If OK, substitute a known-good ECM and recheck.
4	**EGT sensor check** 1) Check EGT sensor referring to "Exhaust Gas Temperature (EGT) Sensor Inspection (DPF® Model): D13A / Z13DTJ in Section 1B". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace EGT sensor.

Table B-9: A/F Sensor Check (Non-DPF® Model)

S7N20A1124366

Troubleshooting

Step	Action	Yes	No
1	**A/F sensor heater power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect A/F sensor connector. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLU” terminals of A/F sensor connector and vehicle body ground is within 10 and 14 V. *In it in good condition?*	Go to Step 2.	Repair power supply circuit of A/F sensor heater.
2	**A/F sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM and A/F sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between the following terminals is less than 0.3 V. • “E62-12” terminal of ECM connector and vehicle body ground. • “E62-44” terminal of ECM connector and vehicle body ground. • “E62-45” terminal of ECM connector and vehicle body ground. • “E62-46” terminal of ECM connector and vehicle body ground. • “E62-47” terminal of ECM connector and vehicle body ground. *Are they in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between A/F sensor and ECM.
3	**A/F sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check voltage between the following terminals is higher than 500 kΩ. • “E62-12” terminal of ECM connector and vehicle body ground. • “E62-44” terminal of ECM connector and vehicle body ground. • “E62-45” terminal of ECM connector and vehicle body ground. • “E62-46” terminal of ECM connector and vehicle body ground. • “E62-47” terminal of ECM connector and vehicle body ground. *Are they in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between A/F sensor and ECM.

Step	Action	Yes	No
4	**A/F sensor circuit check** 1) Check voltage between the following terminals is less than 5 Ω. • "E62-12" terminal of ECM connector and "LT GRN" terminal of A/F sensor connector. • "E62-45" terminal of ECM connector and "YEL" terminal of A/F sensor connector. • "E62-44" terminal of ECM connector and "RED/WHT" terminal of A/F sensor connector. • "E62-46" terminal of ECM connector and "GRN/WHT" terminal of A/F sensor connector. • "E62-47" terminal of ECM connector and "LT GRN" terminal of A/F sensor connector. *Are they in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between A/F sensor and ECM.
5	**A/F sensor check** 1) Check A/F sensor referring to "Air Fuel Ratio (A/F) Sensor On-Vehicle Inspection (Non-DPF® Model): D13A / Z13DTJ in Section 1B". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace A/F sensor.

Table C-1: Battery Voltage Check

S7N20A1124287

Troubleshooting

Step	Action	Yes	No
1	**Battery voltage check** 1) Turn ignition switch to ON position. 2) All electrical loads are switched OFF. 3) Check that battery voltage should be between 10 and 14 V. *Is it in good condition?*	Go to Step 2.	Go to Step 3.
2	**Battery voltage check** 1) Check that battery voltage is more than 8 V while engine is cranking. *Is it in good condition?*	End.	Go to Step 3.
3	**Charging system check** 1) Start engine and warm it up to normal operating temperature. 2) Check charging system for operation referring to "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J" and "Generator Test (Overcharged Battery Check): D13A / Z13DTJ in Section 1J". *Is it in good condition?*	End.	Repair or replace.

Table C-2: Main Relay Operation Check

S7N20A1124292

Troubleshooting

Step	Action	Yes	No
1	**Main relay power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove main relay. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLK/YEL” terminals of main relay connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 2.	Repair power supply circuit of main relay.
2	**Main relay circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Check that resistance between “BRN/WHT” terminal of main relay connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 3.	Repair or, if necessary, replace wiring harness between ECM and main relay.
3	**Main relay circuit check** 1) Check that resistance between “E62-80” terminal of ECM connector and “BRN/WHT” terminal of main relay connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and main relay.
4	**Main relay operation check** 1) Check main relay for operation referring to “Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	End.	Replace main relay.

Table C-3: Engine Speed Check

S7N20A1124275

NOTE

Even if vehicle is under idling condition, forced regeneration without speed request is activated according to DPF® clogging.
In this state, EGT at idling is increased.
For details of forced regeneration, refer to “Forced regeneration without Speed Request” under “Diesel Particulate Filter (DPF®) Regeneration Description: D13A / Z13DTJ”.

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Check that the engine rpm does not exceed 60 rpm without engine running. *Is it in good condition?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	**Idle speed check** 1) Start engine and warm it up to normal operating temperature. 2) With engine idle speed, all electrical loads turned off and accelerator pedal not operated, check engine speed is specified value below. • Without forced regeneration: Approx. 800 rpm • With forced regeneration: Approx. 900 to 950 rpm *Is it in good condition?*	End.	Go to Step 3.
3	**CKP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between the following terminals is lower than 0.3 V. • "GRY/BLK" terminal of CKP sensor connector and vehicle body ground. • "YEL/RED" terminal of CKP sensor connector and vehicle body ground. *Is it in good condition?*	Go to Step 4.	Repair or, if necessary, replace wiring harness between ECM and CKP sensor.
4	**CKP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between the following terminals is higher than 1 MΩ. • "GRY/BLK" terminal of CKP sensor connector and vehicle body ground. • "YEL/RED" terminal of CKP sensor connector and vehicle body ground. *Is it in good condition?*	Go to Step 5.	Repair or, if necessary, replace wiring harness between ECM and CKP sensor.
5	**CKP sensor circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between the following terminals is lower than 5 Ω. • "GRY/BLK" terminal of CKP sensor connector and "D01-43" terminal of ECM connector. • "YEL/RED" terminal of CKP sensor connector and "D01-59" terminal of ECM connector. *Is it in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and CKP sensor.
6	**CKP sensor rotor check** 1) Check that there are no faults such as intermittent contacts, missing teeth, reference point or incorrect gap in CKP sensor. *Are they in good condition?*	Go to Step 7.	Repair or, if necessary, replace faulty components.
7	**CKP sensor check** 1) Check CKP sensor referring to "Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Inspection: D13A / Z13DTJ in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace CKP sensor.

Table C-4: ECT Sensor Check

S7N20A1124276

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and warm it up normal operating temperature. 3) Turn off all electrical loads. 4) Check that “Coolant Temp” displayed on SUZUKI scan tool is within 80 – 110 °C (176 – 230 °F). *Is it in good condition?*	End.	Go to Step 2.
2	**ECT sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from ECT sensor. 3) Turn ignition switch to ON position. 4) Check voltage between “PPL/WHT” terminal of ECT sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and ECT sensor. If OK, substitute a known-good ECM and recheck.
3	**ECT sensor circuit check** 1) Check that voltage between “PPL/WHT” terminal and “GRN” of ECT sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 4.	Check wiring harness between ECM and EGT sensor. If OK, substitute a known-good ECM and recheck.
4	**ECT sensor check** 1) Check ECT sensor referring to “Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace ECT sensor.

Table C-5: IAT Sensor Check

S7N20A1124277

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Start engine and warm it up to normal operating temperature. 3) With engine idle speed, all electrical loads turned off and accelerator pedal not depressed, check that “Intake Air Temp” is within –5 °C (23 °F) + environmental temp. to 40 °C (104 °F) + environmental temp. *Is it in good condition?*	End.	Go to Step 2.

Step	Action	Yes	No
2	**IAT sensor circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from MAF and IAT sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLU/ORN” terminal of MAF and IAT sensor connector and vehicle body ground is within 4.8 – 5.2 V. *Is it in good condition?*	Go to Step 3.	Check wiring harness between ECM and MAF and IAT sensor. If OK, substitute a known-good ECM and recheck.
3	**IAT sensor circuit check** 1) Check voltage between “BLU/ORN” and “BUL/YEL” terminals of MAF and IAT sensor connector is within 4.8 – 5.2 V. *Is it in good condition?*	Replace MAF and IAT sensor.	Check wiring harness between ECM and MAF and IAT sensor. If OK, substitute a known-good ECM and recheck.

Table C-6: Accelerator Pedal Check

S7N20A1124279

Troubleshooting

Step	Action	Yes	No
1	**Parameter check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) With all electrical loads turned off and accelerator pedal not depressed, check the following parameters displayed on SUZUKI scan tool are within reference value. • “Accel Position”: 0 – 5% • “APP Sensor 1 Volt”: 0.60 – 1.10 V • “APP Sensor 2 Volt”: 0.20 – 0.55 V *Are they in good condition?*	Go to Step 2.	Go to Step 3.
2	**Parameter check** 1) Check the following parameters displayed on SUZUKI scan tool are within reference value. • With accelerator pedal depressed fully, “Accel Position” value must be within 95 – 100%. • With accelerator pedal depressed fully, value of “APP Sensor 1 Volt” should be within 3.60 – 4.30 V and “APP Sensor 2 Volt” within 1.80 V – 2.15 V. *Are they in good condition?*	End.	Go to Step 3.
3	**APP sensor power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from APP sensor. 3) Turn ignition switch to ON position. 4) Check that voltage between the following terminals is within 4.8 – 5.2 V. • “BRN” terminal of APP sensor connector and vehicle body ground. • “RED/YEL” terminal of APP sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 4.	Check wiring harness between ECM and APP sensor. If OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
4	**APP sensor power supply and ground circuit check** 1) Check that voltage between the following terminals is within 4.8 – 5.2 V. • "BRN" and "LT GRN/BLK" terminals of APP sensor connector. • "RED/YEL" and "WHT" terminals of APP sensor connector. *Are they in good condition?*	Go to Step 5.	Check wiring harness between ECM and APP sensor. If OK, substitute a known-good ECM and recheck.
5	**APP sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between the following terminals is lower than 0.3 V. • "GRN/RED" terminal of APP sensor connector and vehicle body ground. • "YEL" terminal of APP sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 6.	Repair or, if necessary, replace wiring harness between ECM and APP sensor.
6	**APP sensor signal circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between the following terminals is higher than 500 kΩ. • "GRN/RED" terminal of APP sensor connector and vehicle body ground. • "YEL" terminal of APP sensor connector and vehicle body ground. *Are they in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between ECM and APP sensor.
7	**APP sensor signal circuit check** 1) Check that resistance between the following terminals is lower than 5 Ω. • "GRN/RED" terminal of APP sensor connector and "E62-65" terminal of ECM connector. • "YEL" terminal of APP sensor connector and "E62-41" terminal of ECM connector. *Are they in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between ECM and APP sensor.
8	**APP sensor check** 1) Check APP sensor referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection: D13A / Z13DTJ in Section 1C". *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace APP sensor.

Table C-7: Speed Signal Check

S7N20A1124344

Troubleshooting

⚠ 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.**
- **Road test should be carried out by 2 persons, a driver and a tester.**

Step	Action	Yes	No
1	**Scan tool data check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Carry out a road test and drive vehicle at constant speed of 30 km/h (19 MPH). 3) Check the following parameter displayed on SUZUKI scan tool. *Is it in good condition?*	End.	Go to Step 2.
2	**DTC check** 1) Check ABS / ESP® control module for DTC. *Is there any DTC related to wheel speed sensor?*	Go to applicable DTC troubleshooting.	Go to Step 3.
3	**DTC check** 1) Check ECM and ABS / ESP® control module for DTC. *Is there any DTC related to CAN?*	Go to applicable DTC troubleshooting.	Go to Step 4.
4	**ECM replacement** 1) Substitute a known-good ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	End.	ABS / ESP® control module referring to“ABS Hydraulic Unit / Control Module Assembly Removal and Installation in Section 4E” or “ESP® Hydraulic Unit / Control Module Assembly Removal and Installation in Section 4F”.

Table C-8: Glow Plugs Operation Check

S7N20A1124281

Troubleshooting

Step	Action	Yes	No
1	**Glow plug check** 1) Check glow plugs for resistance referring to “Glow Plug Inspection: D13A / Z13DTJ in Section 1C”. *Is it in good condition?*	Go to Step 2.	Replace faulty glow plug referring to “Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C”.

Step	Action	Yes	No
2	**Output test** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Disconnect glow plug connector from glow plug. 3) Turn ignition switch to ON position. Carry out glow plug control module “output test” of scan tool. 4) Check that voltage between each glow plug connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	End.	Go to Step 3.
3	**Glow plug control module power supply voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from glow plug control module. 3) Check that voltage between “RED” terminal of glow plug control module connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 4.	Repair power supply circuit of glow plug control module.
4	**Glow plug control module power supply and ground circuit check** 1) Check that voltage between “RED” and “BLK” terminals of glow plug control module connector is higher than 11 V. *Is it in good condition?*	Go to Step 5.	Repair ground circuit of glow plug control module.
5	**Glow plug control module power supply circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “BLK/WHT” terminal of glow plug control module connector and vehicle body ground is higher than 11 V. *Is it in good condition?*	Go to Step 6.	Repair power supply circuit of glow plug control module.
6	**Glow plug control module circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from ECM. 3) Turn ignition switch to ON position. 4) Check that voltage between “BLU” terminal of glow plug control module connector and vehicle body is lower than 0.3 V. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.
7	**Glow plug control module circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “BLU” terminal of glow plug control module connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 8.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.
8	**Glow plug control module circuit check** 1) Check that resistance between “BLU” terminal of glow plug control module connector and “E62-70” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 9.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.

Step	Action	Yes	No
9	**Glow plug control module circuit check** 1) Turn ignition switch to ON position. 2) Check that voltage between “GRY/BLU” terminal of glow plug control module connector and vehicle body ground is lower than 0.3 V. *Is it in good condition?*	Go to Step 10.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.
10	**Glow plug control module circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between “GRY/BLU” terminal of glow plug control module connector and vehicle body ground is higher than 500 kΩ. *Is it in good condition?*	Go to Step 11.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.
11	**Glow plug control module circuit check** 1) Check that resistance between “GRY/BLU” terminal of glow plug control module connector and “E62-74” terminal of ECM connector is lower than 5 Ω. *Is it in good condition?*	Go to Step 12.	Repair or, if necessary, replace wiring harness between ECM and glow plug control module.
12	**Glow plug control module output circuit check** 1) Disconnect connectors from glow plugs. 2) Turn ignition switch to ON position. 3) Check that voltage between the following terminals is lower than 0.3 V. • Glow plug No.1 connector and vehicle body ground. • Glow plug No.2 connector and vehicle body ground. • Glow plug No.3 connector and vehicle body ground. • Glow plug No.4 connector and vehicle body ground. *Are they in good condition?*	Go to Step 13.	Repair or, if necessary, replace wiring harness between glow plug and glow plug control module.
13	**Glow plug control module output circuit check** 1) Turn ignition switch to OFF position. 2) Check that resistance between the following terminals is higher than 500 kΩ. • Glow plug No.1 connector and vehicle body ground. • Glow plug No.2 connector and vehicle body ground. • Glow plug No.3 connector and vehicle body ground. • Glow plug No.4 connector and vehicle body ground. *Are they in good condition?*	Go to Step 14.	Repair or, if necessary, replace wiring harness between glow plug and glow plug control module.
14	**Glow plug control module output circuit check** 1) Disconnect connectors from glow plugs. Terminal are less than 5 Ω. 2) Check that resistance between the following. • Glow plug No.1 connector and “GRN” terminal of glow plug control module connector. • Glow plug No.2 connector and “GRN” terminal of glow plug control module connector. • Glow plug No.3 connector and “WHT” terminal of glow plug control module connector. • Glow plug No.4 connector and “WHT” terminal of glow plug control module connector. *Are they in good condition?*	Go to Step 15.	Repair or, if necessary, replace wiring harness between glow plug and glow plug control module.

Step	Action	Yes	No
15	**Glow plug control module replacement** 1) Replace glow plug control module referring to “Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C” and check that DTC is not detected. *Is it in good condition?*	End.	Substitute a known-good ECM and recheck.

Table C-9: Radiator Cooling Fan Operation Check

S7N20A1124345

Troubleshooting

Step	Action	Yes	No
1	**Output test** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position. 3) Confirm radiator cooling fan operates low-speed by using “output test” of SUZUKI scan tool. *Is it in good condition?*	Go to Step 2.	Go to Step 3.
2	**Output test** 1) Confirm radiator cooling fan operates high-speed by using “output test” of SUZUKI scan tool. *Is it in good condition?*	End.	Go to Step 9.
3	**Radiator cooling fan motor relay No.1 power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove radiator cooling fan motor relay No.1. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY” terminals of radiator cooling fan motor relay No.1 connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 4.	Repair power supply circuit of radiator cooling fan motor relay No.1.
4	**Radiator cooling fan motor relay No.1 check** 1) Check radiator cooling fan motor relay No.1 for operation referring to “Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Go to Step 5.	Replace radiator cooling fan motor relay No.1.
5	**Radiator cooling fan motor relay No.1 circuit check** 1) Turn ignition switch to OFF position. 2) Check radiator cooling fan motor relay No.1 control circuit between “E62-7” terminal of ECM connector and “LT GRN” terminal of radiator cooling fan motor relay No.1 connector for open, short to ground circuit and short to power supply circuit. *Is it in good condition?*	Go to Step 6.	Check wiring harness between ECM and radiator cooling fan motor relay No.1. If OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
6	**Radiator cooling fan motor relay No.1 circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Install radiator cooling fan motor relay No.1. 3) Turn radiator cooling ignition switch to ON position. 4) Confirm radiator cooling fan operate at low speed by using “output test” of SUZUKI scan tool. 5) Check that voltage between “BLU/RED” terminal of radiator cooling fan motor connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 7.	Repair or, if necessary, replace wiring harness between radiator cooling fan motor and radiator cooling fan motor relay No.1.
7	**Radiator fan motor relay No.1 circuit check** 1) Confirm radiator cooling fan operate at low speed by using “output test” of SUZUKI scan tool. 2) Check that voltage between “BLU/RED” and “BLK” terminals of radiator cooling fan motor connector is within 10 and 14 V. *Is it in good condition?*	Go to Step 8.	Repair ground circuit of radiator cooling fan motor.
8	**Radiator cooling fan motor check** 1) Check radiator cooling fan motor referring to “Radiator Cooling Fan Assembly On-Vehicle Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace radiator cooling fan motor.
9	**Radiator cooling fan motor relay No.2 power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove radiator cooling fan motor relay No.2. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY” terminals of radiator cooling fan motor relay No.2 connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 10.	Repair power supply circuit of radiator cooling fan motor relay No.2.
10	**Radiator cooling fan motor relay No.2 check** 1) Check radiator cooling fan motor relay No.2 for operation referring to “Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Go to Step 11.	Replace radiator cooling fan motor relay No.2.
11	**Radiator cooling fan motor relay No.2 circuit check** 1) Turn ignition switch to OFF position. 2) Check radiator cooling fan motor relay No.2 control circuit between “E62-8” terminal of ECM connector and “GRN” terminal of radiator cooling fan motor relay No.2 connector for open, short to ground circuit and short to power supply circuit. *Is it in good condition?*	Go to Step 12.	Check wiring harness between ECM and radiator cooling fan motor relay No.2. If OK, substitute a known-good ECM and recheck.

Step	Action	Yes	No
12	**Radiator cooling fan motor relay No.2 circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Install radiator cooling fan motor relay No.2. 3) Turn ignition switch to ON position. 4) Confirm radiator cooling fan operate at high speed by using “output test” of SUZUKI scan tool. 5) Check that voltage between “BLU/BLK” terminal of radiator cooling fan motor connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 13.	Repair or, if necessary, replace wiring harness between radiator cooling fan motor and radiator cooling fan motor relay No.2.
13	**Radiator cooking fan motor relay No.3 power supply voltage check** 1) Turn ignition switch to OFF position. 2) Remove radiator cooling fan motor relay No.3. 3) Turn ignition switch to ON position. 4) Check that voltage between “GRY” terminal of radiator cooling fan motor relay No.3 connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 14.	Repair power supply circuit of radiator cooling fan motor relay No.3.
14	**Radiator cooling fan motor relay No.3 check** 1) Check radiator cooling fan motor relay No.3 for operation referring to “Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Go to Step 15.	Replace radiator cooling fan motor relay No.3.
15	**Radiator cooling fan motor relay No.3 circuit check** 1) Turn ignition switch to OFF position. 2) Check radiator cooling fan No.3 control circuit between “E62-30” terminal of ECM connector and “WHT/GRN” terminal of radiator cooling fan motor relay No.3 connector for open, short to ground circuit and short to power supply circuit. *Is it in good condition?*	Go to Step 16.	Check wiring harness between ECM and radiator cooling fan motor relay No.3. If OK, substitute a known-good ECM and recheck.
16	**Radiator cooling fan motor relay No.3 circuit check** 1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF. 2) Install radiator cooling fan motor relay No.3. 3) Turn ignition switch to ON position. 4) Confirm radiator cooling fan operate at high speed by using “output test” of SUZUKI scan tool. 5) Check that voltage between “BLU/WHT” terminal of radiator cooling fan motor connector and vehicle body ground is within 10 and 14 V. *Is it in good condition?*	Go to Step 17.	Repair or, if necessary, replace wiring harness between radiator cooling fan motor and radiator cooling fan motor relay No. 3.
17	**Radiator cooling fan motor check** 1) Check radiator cooling fan motor referring to “Radiator Cooling Fan Assembly On-Vehicle Inspection: D13A / Z13DTJ in Section 1F”. *Is it in good condition?*	Substitute a known-good ECM and recheck.	Replace radiator cooling fan motor.

ECM and Its Circuits Voltage Value (for Reference)

S7N20A1124370

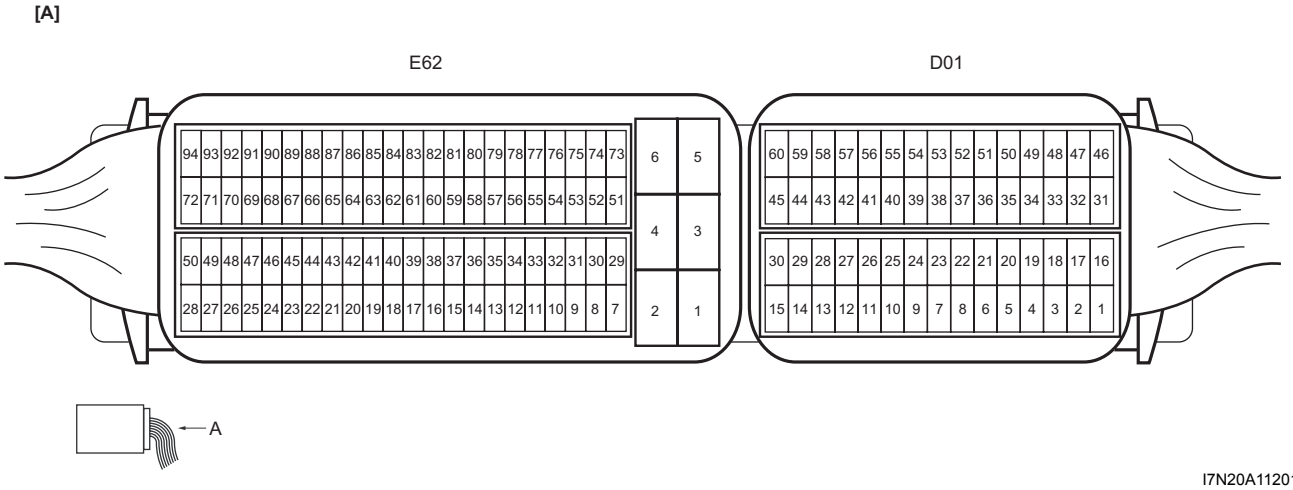
⚠ CAUTION

ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter to ECM with ECM connectors disconnected from it.

NOTE

- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is turned ON.**
- **Voltage with asterisk (*) cannot be measured with voltmeter because it is pulse signal. Use oscilloscope for its check if necessary.**

Terminal Arrangement of ECM Connector (Viewed form Harness Side)



I7N20A112018-01

[A]: ECM connector (view: A)

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
D01-1	WHT/BLU	Fuel injector No.4 drive circuit (low side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-2	—	—	—	—	—
D01-3	—	—	—	—	—
D01-4	GRY/BLK	Fuel pressure regulator power supply circuit (12 V)	10 – 14 V	Ignition switch: ON	—
D01-5	PNK/WHT	EGR valve power supply circuit (12 V)	10 – 14 V	Ignition switch: ON	—
D01-6	YEL/RED	Fuel pressure sensor ground circuit	Below 0.3 V	Ignition switch: ON	—
D01-7	—	—	—	—	—
D01-8	GRN/YEL	Fuel pressure sensor power supply circuit (5 V)	4 – 6 V	Engine: Idle speed after warming up	—
D01-9	GRY/YEL	Oil pressure switch signal circuit	0 – 1 V	Ignition switch: ON	—
			10 – 14 V	Engine: Idle speed after warming up	—
D01-10	—	—	—	—	—
D01-11	—	—	—	—	—
D01-12	—	—	—	—	—
D01-13	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
D01-14	—	—	—	—	—
D01-15	BLU/BLK	EGR valve drive circuit	*0 – 1 V ↑↓ 10 – 14 V Refer to “Reference waveform No.2: D13A / Z13DTJ”.	Engine: Running after warming up	—
D01-16	ORN/WHT	Fuel injector No.1 drive circuit (low side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-17	YEL/BLK	Fuel injector No.2 drive circuit (low side)	*–30 to –40 V ↑↓ 40 to 60 V “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-18	—	—	—	—	—
D01-19	—	—	—	—	—
D01-20	—	—	—	—	—
D01-21	PPL	CMP sensor ground circuit	Below 0.3 V	Ignition switch: ON	—
D01-22	—	—	—	—	—
D01-23	RED/BLK	Boost pressure sensor power supply circuit (5 V)	4 – 6 V	Engine: Idle speed after warming up	—
D01-24	BLK	Boost pressure sensor ground circuit	Below 0.3 V	Ignition switch: ON	—
D01-25	PNK	CMP sensor power supply circuit (5 V)	4 – 6 V	Engine: Idle speed after warming up	—
D01-26	—	—	—	—	—
D01-27	—	—	—	—	—
D01-28	—	—	—	—	—
D01-29	GRN	ECT sensor ground circuit	Below 0.3 V	Ignition switch: ON	—
D01-30	WHT/BLK	Boost pressure control solenoid drive circuit	*0 – 1 V ↑↓ 10 – 14 V Refer to “Reference waveform No.3: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-31	WHT/GRN	Fuel injector No.3 drive circuit (low side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-32	—	—	—	—	—
D01-33	—	—	—	—	—
D01-34	LT BLU/RED	Fuel pressure regulator drive circuit	*0 – 1 V ↑↓ 10 – 14 V Refer to “Reference waveform No.4: D13A / Z13DTJ”.	Engine: After warming up Engine: Idle speed or running at 3,500 rpm	—
D01-35	—	—	—	—	—
D01-36	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
D01-37	—	—	—	—	—
D01-38	ORN/BLK	Fuel pressure sensor signal circuit	Approx. 1.2 V	Engine: Idle speed after warming up Reference rail pressure: 30 Mpa (305.9 kgf/cm^2, 4,350 psi, 300 bar)	—
			Approx. 2.2 V	Engine: Running at 3,500 rpm after warmed up Reference rail pressure: 75 Mpa (764.8 kgf/cm^2, 10,900 psi, 750 bar)	—
D01-39	—	—	—	—	—
D01-40	—	—	—	—	—
D01-41	ORN	Boost pressure sensor signal circuit	Approx. 1.9 V	Engine: Idle speed after warming up Reference boost pressure: 100 kPa (1.0 kgf/cm^2, 14.5 psi, 1.00 bar)	—
			Approx. 3.0 V	Engine: Running at 3,500 rpm. after warmed up Reference boost pressure: 160 kPa (1.63 kgf/cm^2, 23.2 psi, 1.60 bar)	—
D01-42	—	—	—	—	—
D01-43	GRY/BLK	CKP sensor signal circuit (+)	*–3 to –8 V ↑↓ 7 – 12 V Refer to “Reference waveform No.5: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-44	—	—	—	—	—
D01-45	—	—	—	—	—
D01-46	BLU	Fuel injector No.4 drive circuit (high side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-47	ORN	Fuel injector No.1 drive circuit (high side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-48	GRN	Fuel injector No.3 drive circuit (high side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
D01-49	YEL	Fuel injector No.2 drive circuit (high side)	*–30 to –40 V ↑↓ 40 to 60 V Refer to “Reference waveform No.1: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-50	—	—	—	—	—
D01-51	—	—	—	—	—
D01-52	—	—	—	—	—
D01-53	—	—	—	—	—
D01-54	PPL/WHT	ECT sensor signal circuit	Approx. 2.78 V	Ignition switch: ON ECT: Approx. 20 °C (68 °F)	—
			Approx.1.83 V	Ignition switch: ON ECT: Approx. 40 °C (104 °F)	—
			Approx. 0.67 V	Ignition switch: ON ECT: Approx. 80 °C (176 °F)	—
D01-55	—	—	—	—	—
D01-56	PNK/BLK	CMP sensor signal circuit	*0 – 0.6 V ↑↓ 4 – 6 V Refer to “Reference waveform No.6: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-57	—	—	—	—	—
D01-58	—	—	—	—	—
D01-59	YEL/RED	CKP sensor signal circuit (–)	*–3 to –8 V ↑↓ 7 – 12 V Refer to “Reference waveform No.5: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
D01-60	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E62-1	BRN	ECM ground circuit 1	Below 0.3 V	Ignition switch: ON	—
E62-2	BRN	ECM ground circuit 2	Below 0.3 V	Ignition switch: ON	—
E62-3	BRN	ECM ground circuit 3	Below 0.3 V	Ignition switch: ON	—
E62-4	BLK/RED	Main power supply circuit 1 (12 V)	10 – 14 V	Ignition switch: ON	—
E62-5	GRN	Main power supply circuit 2 (12 V)	10 – 14 V	Ignition switch: ON	—
E62-6	BLK/RED	Main power supply circuit 3 (12 V)	10 – 14 V	Ignition switch: ON	—
E62-7	LT GRN	Radiator cooling fan relay No.1 control circuit	0 – 1 V	Radiator cooling fan motor operates low speed.	—
			10 – 14 V	Radiator cooling fan motor not operates	—
E62-8	GRN	Radiator cooling fan relay No.2 control circuit	0 – 1 V	Radiator cooling fan motor operates high speed.	—
			10 – 14 V	Radiator cooling fan motor not operates	—
E62-9	—	—	—	—	—
E62-10	ORN	A/C refrigerant pressure sensor ground circuit	Below 0.3 V	Ignition switch: ON	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E62-11	RED	EGT sensor ground circuit	Below 0.3 V	Ignition switch: ON	—
E62-12	LT GRN	A/F sensor heater control signal	—	—	—
E62-13	RED/BLU	Fuel temperature sensor ground circuit	Below 0.3 V	Ignition switch: ON	—
E62-14	YEL/RED	DPF® differential pressure sensor power supply circuit (5 V)	4 – 6 V	Ignition switch: ON	—
E62-15	RED/YEL	APP sensor (sub) power supply circuit (5 V)	4 – 6 V	Ignition switch: ON	—
E62-16	—	—	—	—	—
E62-17	—	—	—	—	—
E62-18	—	—	—	—	—
E62-19	—	—	—	—	—
E62-20	—	—	—	—	—
E62-21	—	—	—	—	—
E62-22	YEL/GRN	CPP switch signal circuit	10 – 14 V	Ignition switch: ON Clutch pedal: Released	—
			0 – 1 V	Ignition switch: ON Clutch pedal: Depressed fully	—
E62-23	BLK/WHT	Ignition switch signal circuit	10 – 14 V	Ignition switch: ON	—
E62-24	—	—	—	—	—
E62-25	—	—	—	—	—
E62-26	—	—	—	—	—
E62-27	—	—	—	—	—
E62-28	—	—	—	—	—
E62-29	BRN	Engine speed signal circuit (for P/S control module)	*0 – 1 V ↑↓ 10 – 14 V Refer to “Reference waveform No.7: D13A / Z13DTJ”.	Engine: Idle speed after warming up	—
E62-30	WHT/GRN	Radiator cooling fan relay No.3 control circuit	0 – 1 V	Radiator cooling fan motor operates high speed.	—
			10 – 14 V	Radiator cooling fan motor not operates	—
E62-31	—	—	—	—	—
E62-32	WHT	APP sensor (sub) ground circuit	Below 0.3 V	Engine: Idle speed after warming up	—
E62-33	GRN/ORN	DPF® differential pressure sensor ground circuit	Below 0.3 V	Engine: Idle speed after warming up	—
E62-34	BLU/YEL	MAF and IAT sensor ground circuit	Below 0.3 V	Engine: Idle speed after warming up	—
E62-35	LT GRN/BLK	APP sensor (main) ground circuit	Below 0.3 V	Engine: Idle speed after warming up	—
E62-36	—	—	—	—	—
E62-37	GRY/RED	A/C refrigerant pressure sensor power supply circuit (5 V)	4 – 6 V	Engine: Idle speed after warming up	—
E62-38	—	—	—	—	—
E62-39	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E62-40	WHT	CAN (low) communication circuit to ABS / ESP® control module	*1.0 – 1.4 V ↑↓ 40 – 60 V Refer to “Reference waveform No.8: D13A / Z13DTJ”.	Engine: Idle speed	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E62-41	YEL	APP sensor (sub) signal circuit	1.74 – 2.17 V	Ignition switch: ON Accelerator pedal: Full depressed position	—
			0.30 – 0.44 V	Ignition switch: ON Accelerator pedal: Idle position	—
E62-42	—	—	—	—	—
E62-43	—	—	—	—	—
E62-44	RED/WHT	A/F sensor signal circuit (VS)			—
E62-45	YEL	A/F sensor signal circuit (IP)			—
E62-46	GRN/WHT	A/F sensor signal circuit (VSIP)			—
E62-47	BLK	A/F sensor signal circuit (RC)	—		—
E62-48	—	—	—	—	—
E62-49	BRN/YEL	DPF® differential pressure sensor signal circuit	Approx. 200 mV	Engine: Idle speed after warming up DPF® differential pressure: 0 kPa (0 kgf/cm^2, 0 psi, 0 bar)	—
E62-50	PNK	Backup power supply circuit (12 V)	10 – 14 V	—	—
E62-51	—	—	—	—	—
E62-52	—	—	—	—	—
E62-53	—	—	—	—	—
E62-54	—	—	—	—	—
E62-55	—	—	—	—	—
E62-56	BLU/RED	MAF sensor signal circuit	*0 – 0.6 V ↑↓ 4 – 6 V Refer to “Reference waveform No.9: D13A / Z13DTJ”.	Engine: Running after warming up	—
E62-57	—	—	—	—	—
E62-58	—	—	—	—	—
E62-59	—	—	—	—	—
E62-60	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E62-61	BLK/YEL	Fuel temperature sensor signal circuit	Approx. 2.54 V	Engine: Idle speed after warming up Fuel temperature: 25 °C (77 °F)	—
			Approx. 1.14 V	Engine: Idle speed after warming up Fuel temperature: 60 °C (140 °F)	
			Approx. 0.43 V	Engine: Idle speed after warming up Fuel temperature: 100 °C (212 °F)	
E62-62	BLU/ORN	IAT sensor signal circuit	*0 – 1 V ↑↓ 4.5 – 5.5 V Refer to “Reference waveform No.10: D13A / Z13DTJ”.	Engine: Idle speed after warming up IAT: Approx. 24 °C (75.2 °F)	—
E62-63	—	—	—	—	—
E62-64	RED	CAN (high) communication circuit to ABS/ESP® control module	*2 – 3 V ↑↓ 4.5 – 5.5 V Refer to “Reference waveform No.8: D13A / Z13DTJ”.	Engine: Idle speed	CAN communication line signal is pulse. Pulse signal displayed with a regular frequency which varies depending on engine condition.
E62-65	GRN/RED	APP sensor (main) signal circuit	3.50 – 4.27 V	Ignition switch: ON Accelerator pedal: Full depressed position	—
			0.65 – 0.82 V	Ignition switch: ON Accelerator pedal: Idle position	—
E62-66	WHT/BLK	Serial communication circuit (for immobilizer control module)	*0 – 1 V ↑↓ 10 – 14 V Refer to “Reference waveform No.11: D13A / Z13DTJ”.	Ignition switch: ON	—
E62-67	—	—	—	—	—
E62-68	GRN/YEL	Brake switch signal circuit	12 – 14 V	Ignition switch: ON Brake pedal: Released	—
			0 – 1 V	Ignition switch: ON Brake pedal: Depressed fully	—
E62-69	—	—	—	—	—
E62-70	BLU	Glow plug control module monitor circuit	0 – 1 V	Time: Within 15 sec. after turning ignition switch ON	—
			12 – 14 V	Other than above-mentioned condition	—
E62-71	—	—	—	—	—
E62-72	—	—	—	—	—
E62-73	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E62-74	GRY/BLU	Glow plug control module control signal	12 – 14 V	Time: Within 15 sec. after turning ignition switch ON	
			0 – 1 V	Other than above-mentioned condition	
E62-75	GRN/BLK	Fuel pump relay drive circuit	0 – 1 V	Time: Within 20 sec. after turning ignition switch ON	—
				Engine: Running	—
			12 – 14 V	Other than above-mentioned condition	—
E62-76	YEL/BLU	Fuel heater relay drive circuit	0 – 1 V	Fuel heater: ON	—
			12 – 14 V	Fuel heater: OFF	—
E62-77	—	—	—	—	—
E62-78	BLU/BLK	Malfunction indicator lamp (MIL) drive circuit	0 – 1 V	MIL: ON	—
			12 – 14 V	MIL: OFF	—
E62-79	GRY	A/C compressor clutch: relay drive circuit	0 – 1 V	Engine: Idle speed after warming up A/C compressor clutch: ON	—
			12 – 14 V	Engine: Idle speed after warming up A/C compressor clutch: OFF	—
E62-80	BRN/WHT	Main relay drive circuit	12 – 14 V	Ignition switch: OFF	—
			0 – 1 V	Ignition switch: ON	—
E62-81	GRN/WHT	Brake light switch signal	0 – 1 V	Ignition switch: ON	—
			12 – 14 V	Ignition switch: ON	—
E62-82	—	—	—	—	—
E62-83	BRN	APP sensor (main) power supply circuit (5 V)	4 – 6 V	Ignition switch: ON	—
E62-84	—	—	—	—	—
E62-85	—	—	—	—	—
E62-86	—	—	—	—	—
E62-87	RED	A/C refrigerant pressure sensor signal circuit	Approx. 1.315 V	Engine: Idle speed after warming up A/C switch: OFF A/C refrigerant pressure: 850 kPa (8.7 kgf/cm^2, 123 psi, 8.5 bar)	—
			Approx. 1.940 V	Engine: Idle speed after warming up A/C switch: ON Blower selector > OFF A/C refrigerant pressure: 1300 kPa (13.3 kgf/cm^2, 188 psi, 13 bar)	—
			Approx. 2.35 V	Engine: Idle speed after warming up A/C switch: ON Blower selector > OFF A/C refrigerant pressure: 1600 kPa (16.3 kgf/cm^2, 232 psi, 16 bar)	—
E62-88	—	—	—	—	—

Terminal No.	Wire color	Circuit	Normal voltage	Condition	Remarks
E62-89	—	—	—	—	—
E62-90	—	—	—	—	—
E62-91	GRN	EGT sensor signal circuit	Approx. 0.90 V	Engine: Idle speed after warming up Approx. 25 °C (77 °F)	—
			Approx. 1.08 V	Engine: Idle speed after warming up Approx. 100 °C (212 °F)	—
			Approx. 1.29 V	Engine: Idle speed after warming up Approx. 200 °C (392 °F)	—
E62-92	—	—	—	—	—
E62-93	—	—	—	—	—
E62-94	—	—	—	—	—

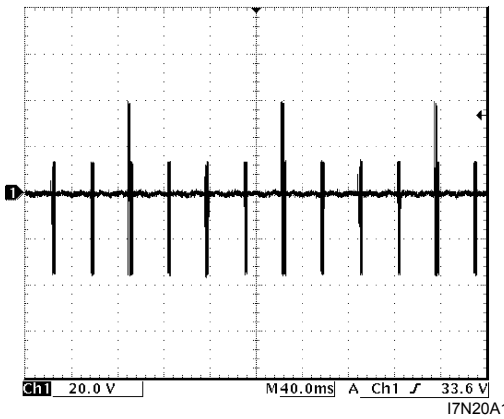
Reference waveform No.1
Fuel injector signal with engine idling

NOTE

Even if vehicle is under idling condition, forced regeneration without speed request is activated according to DPF® clogging. In this state, fuel injector signal is changed by activation of post injection.
For details of forced regeneration, refer to "Forced regeneration without Speed Request" under "Diesel Particulate Filter (DPF®) Regeneration Description: D13A / Z13DTJ".

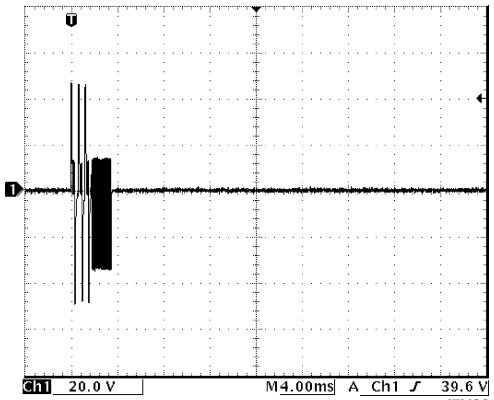
Measurement terminal	CH1: "D01-47" to "D01-16" (No.1) or "D01-49" to "D01-17" (No.2) or "D01-48" to "D01-31" (No.3) or "D01-46" to "D01-1" (No.4)
Oscilloscope setting	CH1: 20 V/DIV TIME: 40 ms/DIV TIME: 4 ms/DIV
Measurement condition	• Engine: Idle speed after warming up

Without forced regeneration (40 ms/DIV)



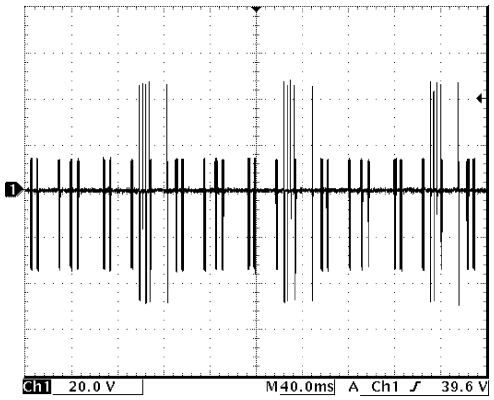
I7N20A112001-02

Without forced regeneration (4 ms/DIV)



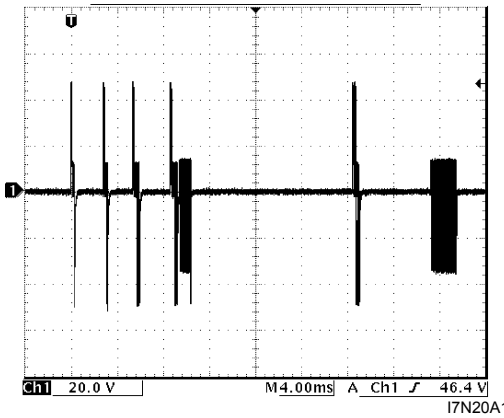
I7N20A112002-03

With forced regeneration (40 ms/DIV)



I7N20A112021-01

With forced regeneration (4 ms/DIV)



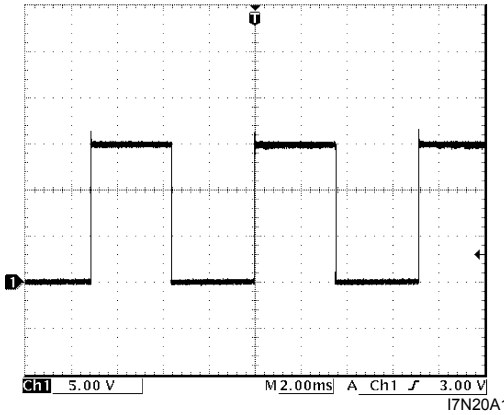
I7N20A112022-01

Reference waveform No.2

EGR valve signal

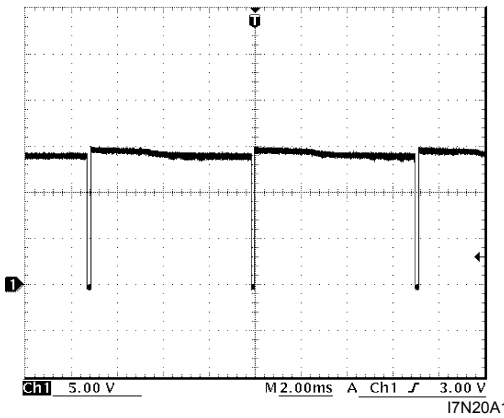
Measurement terminal	CH1: “D01-15” to “E62-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• Engine: Running after warming up • EGR valve duty: 50.5% or 1.9%

EGR valve duty: 50.5%



I7N20A112003-02

EGR valve duty: 1.9%

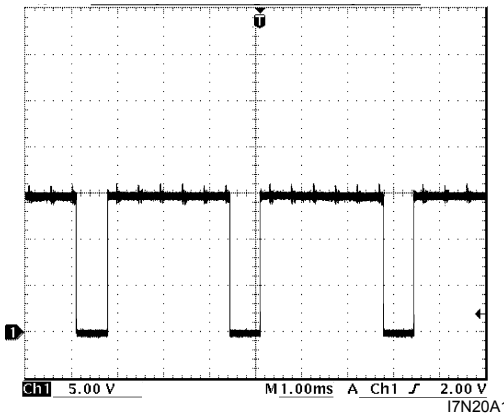


I7N20A112004-02

Reference waveform No.3

Boost pressure control solenoid valve signal

Measurement terminal	CH1: “D01-30” to “E62-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 1 ms/DIV
Measurement condition	• Engine: Idle speed after warming up

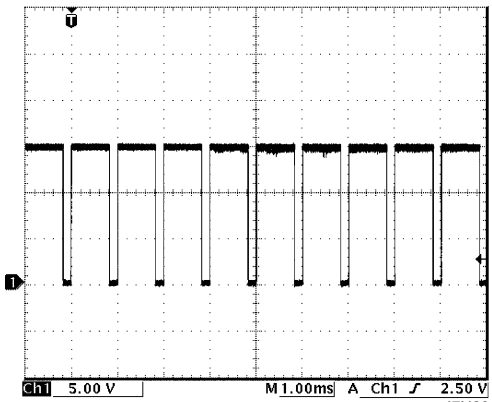


I7N20A112005-02

Reference waveform No.4

Fuel pressure regulator signal

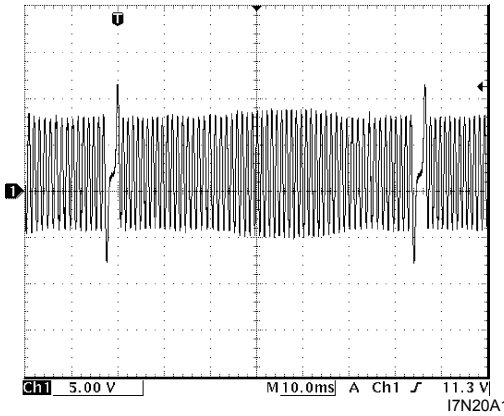
Measurement terminal	CH1: “D01-34” to “E62-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 1 ms/DIV
Measurement condition	• Engine: After warming up



I7N20A112006-02

Reference waveform No.5
CKP sensor signal

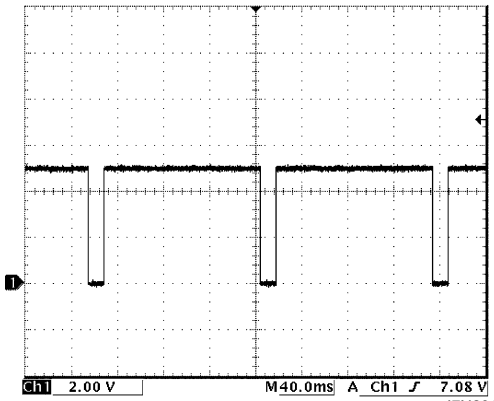
Measurement terminal	CH1: “D01-43” to “D01-59”
Oscilloscope setting	CH1: 5 V/DIV TIME: 10 ms/DIV
Measurement condition	• Engine: Idle speed after warming up



I7N20A112008-03

Reference waveform No.6
CMP sensor signal

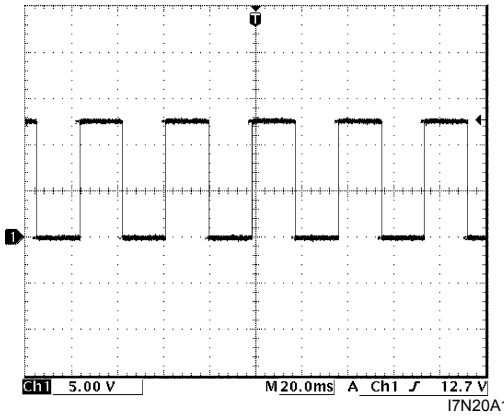
Measurement terminal	CH1: “D01-56” to “E62-1”
Oscilloscope setting	CH1: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• Engine: Idle speed after warming up



I7N20A112009-02

Reference waveform No.7
To P/S control module engine speed signal

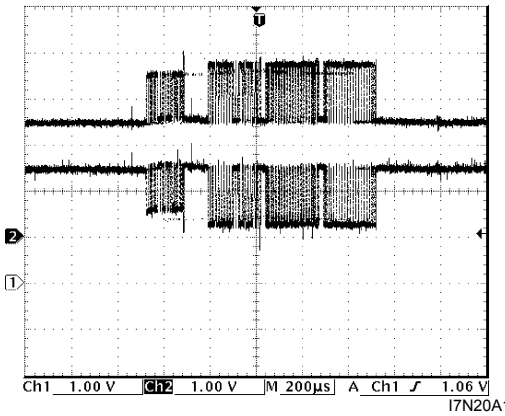
Measurement terminal	CH1: “E62-29” to “E62-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	• Engine: Idle speed after warming up



I7N20A112010-02

Reference waveform No.8
CAN communication line signal

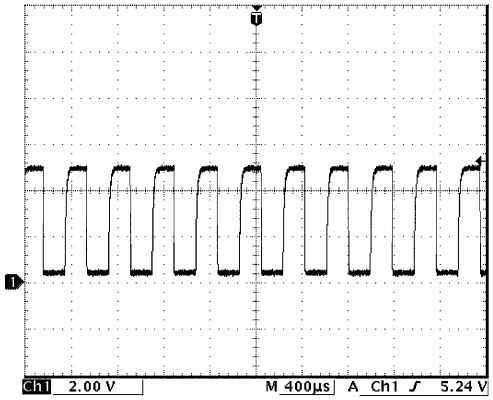
Measurement terminal	CH1: “E62-40” to “E62-1” CH2: “E62-64” to “E62-1”
Oscilloscope setting	CH1: 1 V/DIV CH2: 1 V/DIV TIME: 200 μs/DIV
Measurement condition	• Engine: Idle speed



I7N20A112011-03

Reference waveform No.9
MAF sensor signal

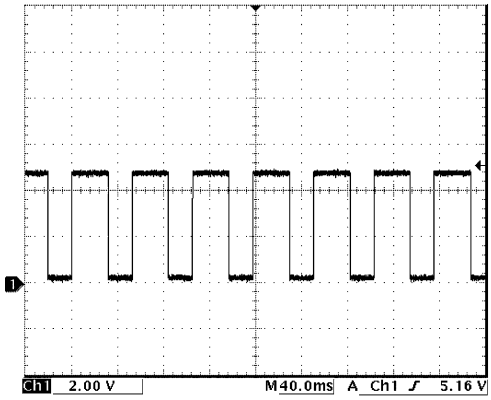
Measurement terminal	CH1: “E62-56” to “E62-1”
Oscilloscope setting	CH1: 2 V/DIV TIME: 400 μs/DIV
Measurement condition	• Engine: Idle speed after warming up



I7N20A112012-02

Reference waveform No.10
IAT sensor signal

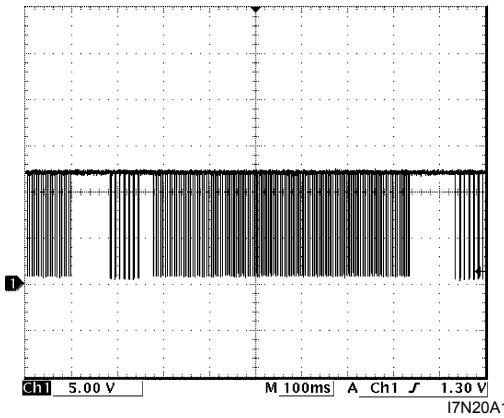
Measurement terminal	CH1: “E62-62” to “E62-1”
Oscilloscope setting	CH1: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	• Engine: Idle speed after warming up



I7N20A112013-02

Reference waveform No.11
Serial communication (for immobilizer control module)

Measurement terminal	CH1: “E62-66” to “E62-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 100 ms/DIV
Measurement condition	• Ignition switch: ON



I7N20A112014-02

Repair Instructions

Idle Speed Inspection

S7N20A1126001

NOTE

Even if vehicle is under idling condition, forced regeneration without speed request is activated according to DPF® clogging.In this state, engine speed at idling is increased.For details of forced regeneration, refer to “Forced regeneration without Speed Request” under “Diesel Particulate Filter (DPF®) Regeneration Description: D13A / Z13DTJ”.

1) Shift transmission into neutral.
2) Start engine and warm it up to normal operating temperature.
3) Turn all electrical loads OFF.
4) Using SUZUKI scan tool, verify that idle speed is within specification.

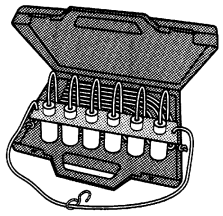
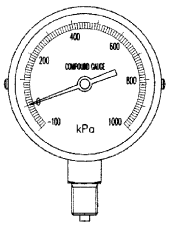
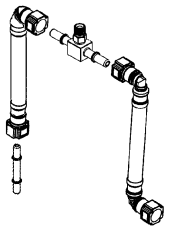
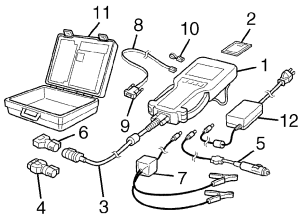
   Engine speed
   Without forced regeneration: Approx. 800 rpm
   With forced regeneration: Approx. 900 to 950 rpm

5) If not, go to “Improper Engine Idling or Engine Stops at Idle” under “Engine Symptom Diagnosis: D13A / Z13DTJ”.

Special Tools and Equipment

Special Tool

S7N20A1128001

09912–96540 Injector flow measuring kit Mot. 1711☞ 	09914–08410 Gauge, diesel fuel pressure ☞ 
09919–48410 Fuel pressure gauge adapter set ☞ / ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ 

Aux. Emission Control Devices

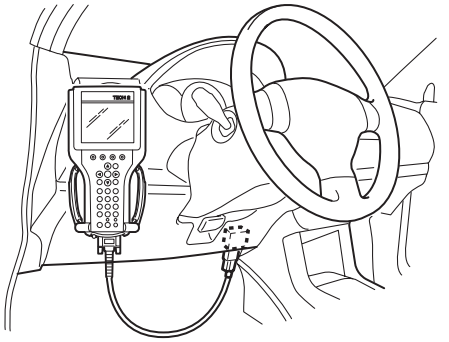
M13A / M15A / M16A

Diagnostic Information and Procedures

EGR System Inspection

S7N20A1214001

1) Connect SUZUKI scan tool to data link connector (DLC) with ignition switch turned OFF.
2) Turn ON ignition switch and erase DTC using “CLEAR DTC” in “TROUBLE CODES” menu.
3) Start engine and warm it up to normal operating temperature, then select “DATA LIST” mode on scan tool.
4) Make sure that vehicle condition is as follows.
   - Vehicle speed = 0 km/h (0 KPH)
   - Engine speed ≤ 900 rpm
   - Engine coolant temp. ≥ 90 °C, 164 °F
5) With engine idling (without depressing accelerator pedal), open EGR valve by using “STEP EGR” mode in “MISC TEST” menu. In this state, as EGR valve opening increases engine idle speed drops. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve.



I4RS0B120001-01

1.	SUZUKI scan tool display
2.	EGR valve opening (0: Close, 100: Full open)

Repair Instructions

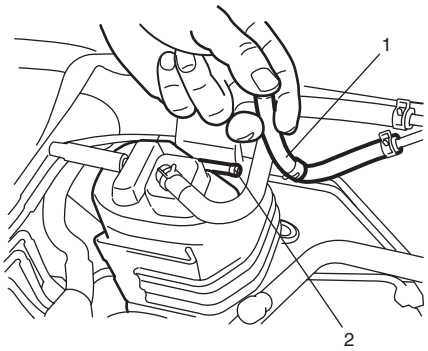
EVAP Canister Purge Inspection

S7N20A1216001

NOTE

Before inspection, check to make sure that gear shift lever is in neutral position (with A/T model, selector lever in “P” range) and that parking brake lever is pulled all the way up.

1) Disconnect purge hose (1) from EVAP canister (2).
2) Place finger against the end of disconnected hose and check that vacuum is not felt there when engine is cool and running at idle speed. If check result is not satisfactory, check EVAP canister purge valve, wire harness and ECM.



I4RS0B120002-01

EVAP Canister Purge Valve and Its Circuit Inspection

S7N20A1216002

⚠ WARNING

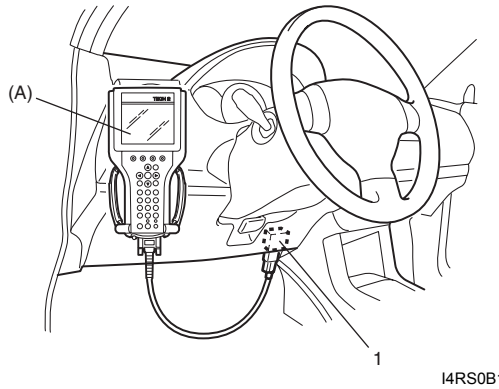
Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

⚠ CAUTION

Do not apply vacuum more than –86 kPa (–12.47 psi); otherwise EVAP canister purge valve could be damaged.

1) Prepare to operate EVAP canister purge valve as follows.
   a) When using SUZUKI scan tool:
      i) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF and disconnect purge valve vacuum hoses from intake manifold and EVAP canister.
      ii) Turn ON ignition switch, clear DTC and select “MISC TEST” mode on SUZUKI scan tool.

      Special tool
      (A): SUZUKI scan tool



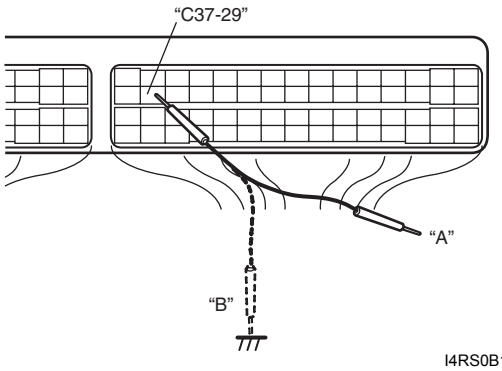
I4RS0B120003-03

   b) When not using SUZUKI scan tool:

NOTE

Before performed this check, be sure to read the “Precautions of ECM Circuit Inspection: M13A / M15A / M16A in Section 1A”.

      i) Disconnect purge valve vacuum hoses from intake manifold and EVAP canister.
      ii) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: M13A / M15A / M16A in Section 1C”.
      iii) Connect special tool between ECM and ECM connector referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”
      iv) Turn ON ignition switch.
      Using service wire, ground “C37-29” terminal circuit of special tool (valve ON: “B”) and unground it (valve OFF: “A”).

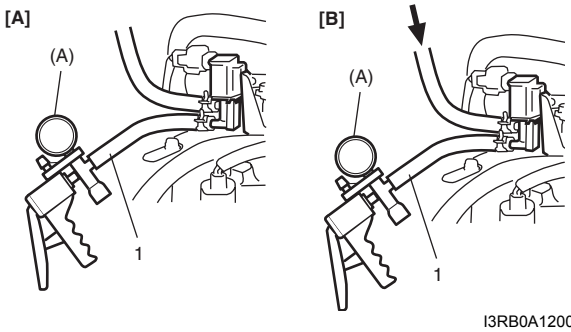


I4RS0B120006-02

2) Check purge valve for operation and vacuum passage for clog when valve is switched ON and OFF by using SUZUKI scan tool or service wire.
   If check result is not satisfactory, check vacuum hoses, EVAP canister purge valve, wire harness and connections.

EVAP canister purge valve specification
[A] Valve OFF: When vacuum (–60 kPa (–8.7 psi)) is applied to hose (1), vacuum can be applied.
[B] Valve ON: When vacuum is applied to hose (1), vacuum can not be applied.

Special tool
(A): 09917–47011

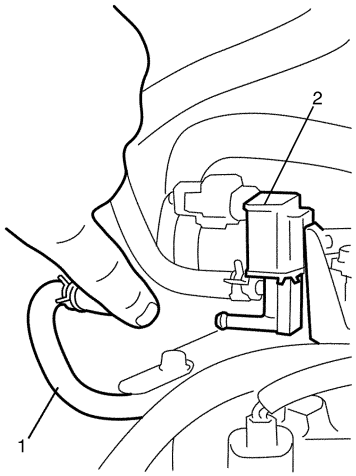


I3RB0A120005-02

Vacuum Passage Inspection

S7N20A1216003

Start engine and run it at idle speed. Disconnect vacuum hose (1) from EVAP canister purge valve (2). With finger placed against disconnected hose, check that vacuum is applied.
If it is not applied, clean vacuum passage by blowing compressed air.

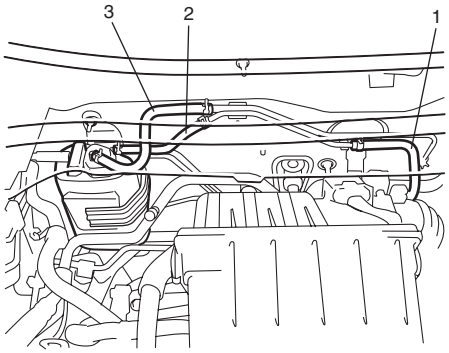


I3RM0A120006-01

Vacuum Hose and Purge Valve Chamber Inspection

S7N20A1216004

Check hoses and purge valve chamber for connection, leakage, clog and deterioration.
Replace as necessary.



I4RS0B120004-02

1.	Purge hose (EVAP canister purge valve side)
2.	Purge hose (EVAP canister side)
3.	Tank pressure hose

EVAP Canister Purge Valve Inspection

S7N20A1216005

⚠ WARNING

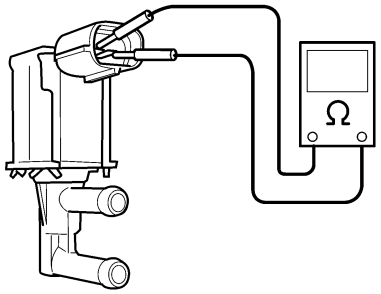
Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.

⚠ CAUTION

Do not apply vacuum more than –86 kPa (–12.47 psi); otherwise EVAP canister purge valve could be damaged.

1) With ignition switch turned OFF, disconnect coupler and vacuum hoses from canister purge valve.
2) Remove EVAP canister purge valve from air cleaner assembly.
3) Check resistance between two terminals of EVAP canister purge valve.
   If resistance is not as specified, replace EVAP canister purge valve.

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



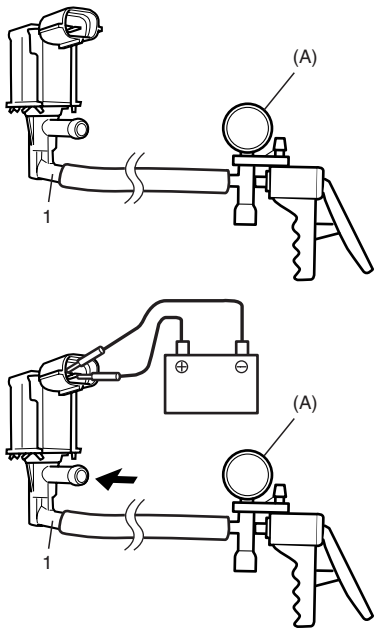
I3RM0A120008-01

4) With coupler disconnected, apply vacuum (–60 kPa (–8.7 psi)) to pipe (1). If vacuum can be applied, go to next step. If vacuum can not be applied, replace EVAP canister purge valve.
5) In this state, connect 12 V-battery to EVAP canister purge valve terminals. If vacuum can not be applied, EVAP canister purge valve is in good condition.
   If applied, replace EVAP canister purge valve.

⚠ WARNING

Do not suck the air through valve. Fuel vapor inside valve is harmful.

Special tool
(A): 09917–47011



I3RB0A120007-01

6) Install EVAP canister purge valve to air cleaner assembly.

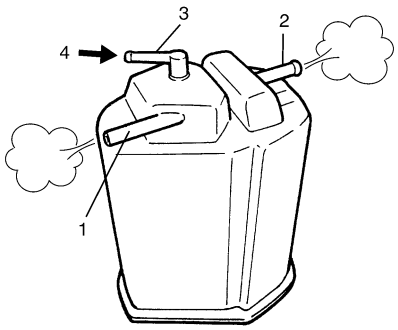
EVAP Canister Inspection

S7N20A1216006

⚠ WARNING

DO NOT SUCK nozzles on EVAP canister.
Fuel vapor inside EVAP canister is harmful.

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 pipe (1) and air pipe (2) when air is blown (4) into tank pipe (3).
If any faulty condition is found in this inspection, replace EVAP canister.



I4RS0B120005-01

EGR Valve Removal and Installation

S7N20A1216007

Removal

1) Disconnect negative cable at battery.
2) Remove air intake pipe.
3) Remove EGR pipe.
4) Disconnect EGR valve connector.
5) Remove EGR valve and gasket from cylinder head.

Installation

Reverse removal procedure noting the following.

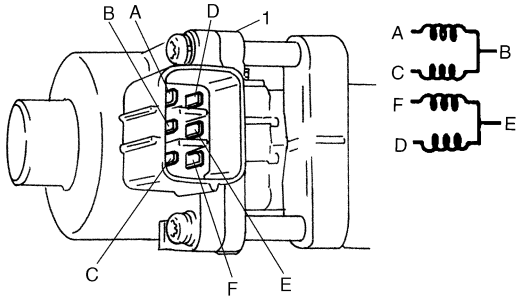
- Clean mating surface of valve and cylinder head.
- Use new gaskets.

EGR Valve Inspection

S7N20A1216008

1) Check resistance between following terminals of EGR valve (1) in each pair.
If found faulty, replace EGR valve assembly.

EGR valve resistance (A – B, C – B, F – E, D – E terminal)
20 – 24 Ω



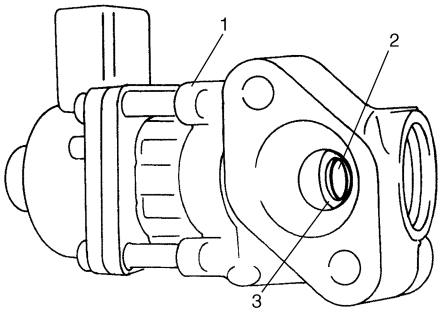
I2RH0B120005-01

2) Remove carbon from EGR valve gas passage.

⚠ CAUTION

Do not use any sharp-edged tool to remove carbon.
Be careful not to damage or bend EGR valve (1), valve seat (3) and rod.

3) Inspect valve (2), valve seat and rod for fault, cracks, bend or other damage.
If found faulty, replace EGR valve assembly.



I2RH0B120006-01

PCV Hose Inspection

S7N20A1216009

NOTE

Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC throttle opening, for obstructed PCV valve or hose hampers its accurate adjustment.

Check hoses for connection, leakage, clog and deterioration.
Replace as necessary.

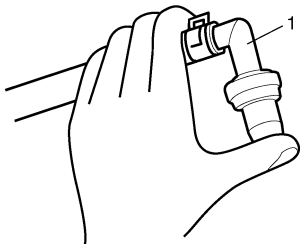
PCV Valve Inspection

S7N20A1216010

NOTE

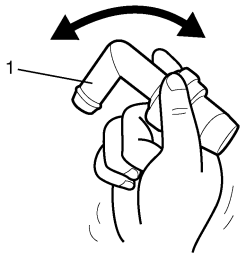
Be sure to check that there is no obstruction in PCV valve or its hoses before checking IAC throttle opening, for obstructed PCV valve or hose hampers its accurate adjustment.

1) Detach air cleaner assembly.
2) Disconnect PCV valve from cylinder head cover and install plug to head cover hole.
3) Install air cleaner assembly temporarily.
4) Run engine at idle.
5) Place your finger over end of PCV valve (1) to check for vacuum.
   If there is no vacuum, check for clogged valve. Replace as necessary.



I2RH0B120007-01

6) After checking vacuum, stop engine and remove PCV valve (1).
   Shake valve and listen for rattle of check needle inside the valve. If valve does not rattle, replace PCV valve.



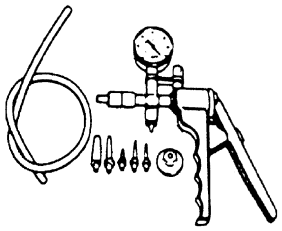
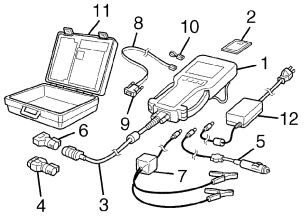
I2RH0B120008-01

7) After checking, remove plug and install PCV valve.
8) Install air cleaner assembly securely.

Special Tools and Equipment

Special Tool

S7N20A1218001

09917–47011 Vacuum pump gauge ☞ / ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞	

D13A / Z13DTJ

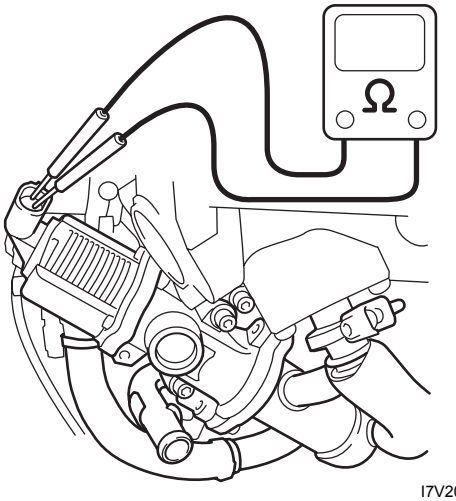
Repair Instructions

EGR Valve On-Vehicle Inspection

S7N20A1226010

1) Disconnect negative cable at battery.
2) Disconnect connector from EGR valve.
3) Check resistance between terminals of EGR valve. If resistance is out of specification, replace EGR valve.

EGR valve resistance
7.5 – 8.5 Ω at 20 °C (68 °F)

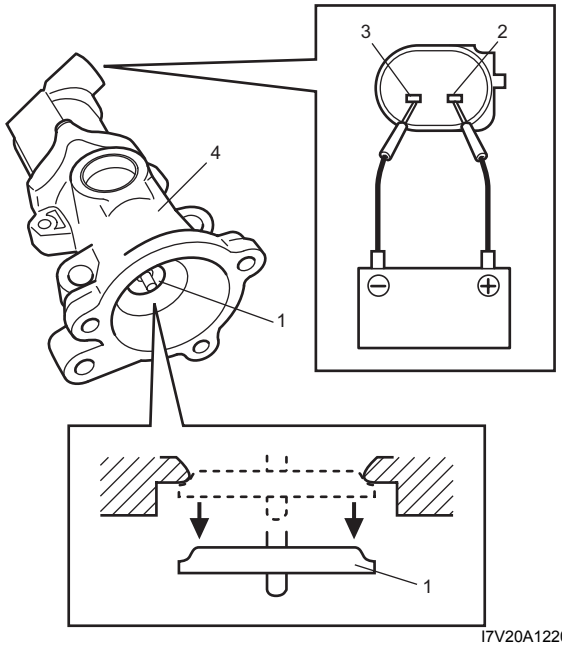


I7V20A122001-01

EGR Valve Inspection

S7N20A1226011

1) Remove EGR valve referring to “EGR Valve and EGR Cooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
2) Check EGR valve operation as following steps.
   a) Connect battery positive terminal to “Power supply” terminal (2) and negative terminal to “Ground” terminal (3) of EGR valve (4).
   b) Check valve (1) operation as shown in figure. If it is not operated, replace EGR valve.



I7V20A122002-01

Exhaust Gas Temperature (EGT) Sensor Removal and Installation (DPF® Model)

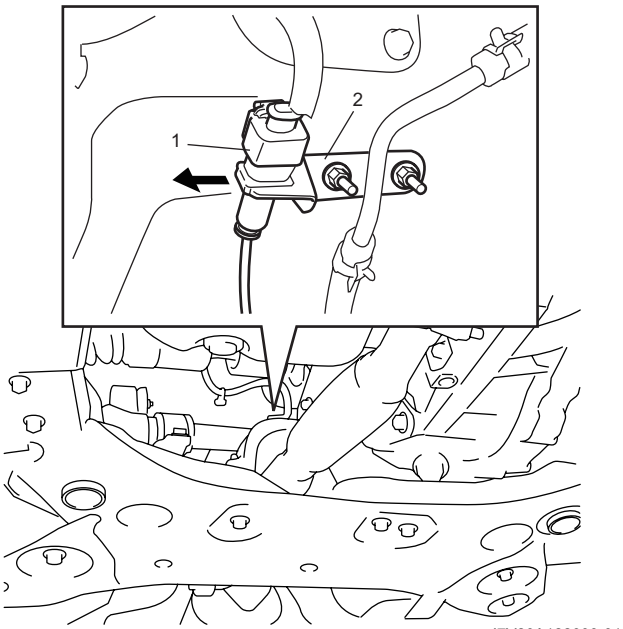
S7N20A1226012

⚠ WARNING

To avoid danger of being burned, do not touch exhaust system when system is hot. Any service on exhaust system should be performed when system is cool.

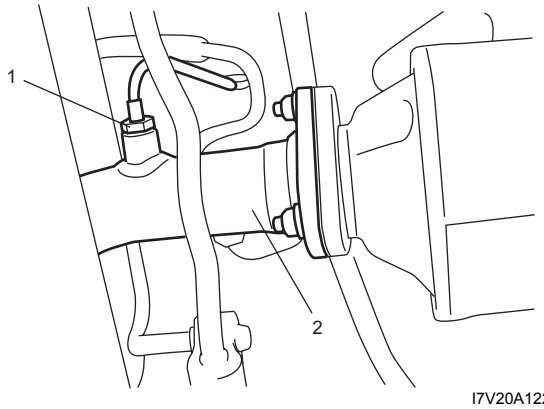
Removal

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle.
3) Remove EGT sensor connector (1) from its bracket (2) by sliding it in arrow direction as shown in figure.
4) Disconnect EGT sensor connector (1).



I7V20A122003-01

5) Remove exhaust No.1 pipe (2) referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
6) Remove EGT sensor (1) from exhaust No.1 pipe (2).



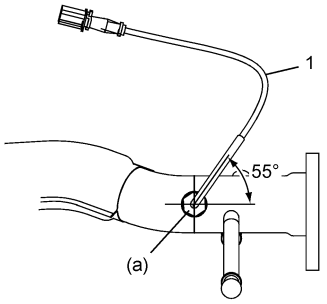
I7V20A122004-01

Installation

Reverse removal procedure noting the following.

- Install EGT sensor (1) in proper direction as shown in figure.
- Tighten EGT sensor to specified torque.

Tightening torque
EGT sensor (a): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)



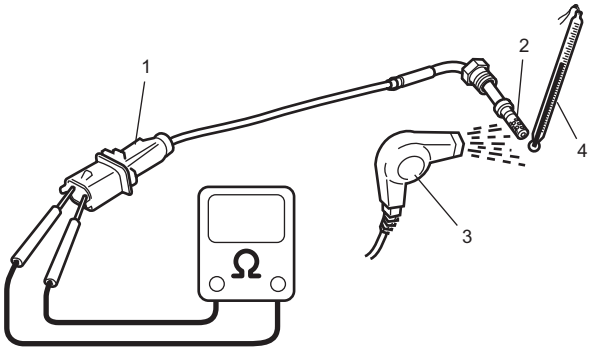
I7V20A122005-01

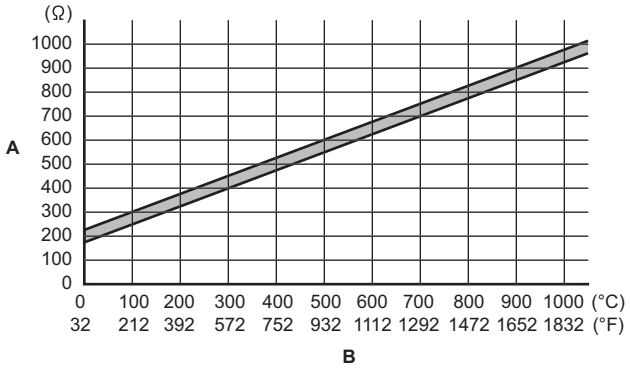
- Connect EGT sensor connector

Exhaust Gas Temperature (EGT) Sensor Inspection (DPF® Model)

S7N20A1226013

Measure resistance between sensor terminals varies, depending on temperature while blowing hot air to temperature sensing part (2) of EGT sensor using hot air drier (3).
If faulty condition is found, replace EGT sensor.





I7V20A122007-01

A: Resistance	1. EGT sensor connector
B: Temperature	4. Temperature gauge

DPF® Differential Pressure Sensor Removal and Installation

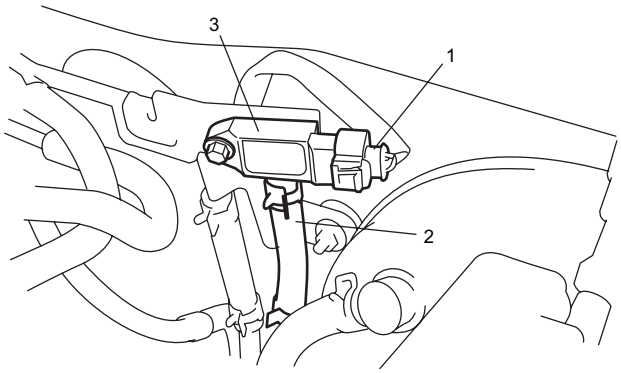
S7N20A1226014

⚠ CAUTION

If DPF® differential pressure sensor is replaced, be sure to initialize differential pressure data in ECM.
For details, refer to "ECM Registration: D13A / Z13DTJ in Section 1C".

Removal

1) Disconnect negative (–) cable from battery.
2) Disconnect connector (1) and hose (2) from DPF® differential pressure sensor (3).
3) Remove DPF® differential pressure sensor (3) from its bracket.



I7V20A122008-01

Installation

Reverse removal procedure noting the following.

- When replacing DPF® differential pressure sensor, initialize DPF® differential pressure sensor data in ECM referring to "DPF® Differential Pressure Sensor Data Initialization: D13A / Z13DTJ in Section 1C".

DPF® Differential Pressure Sensor Inspection

S7N20A1226015

⚠ CAUTION

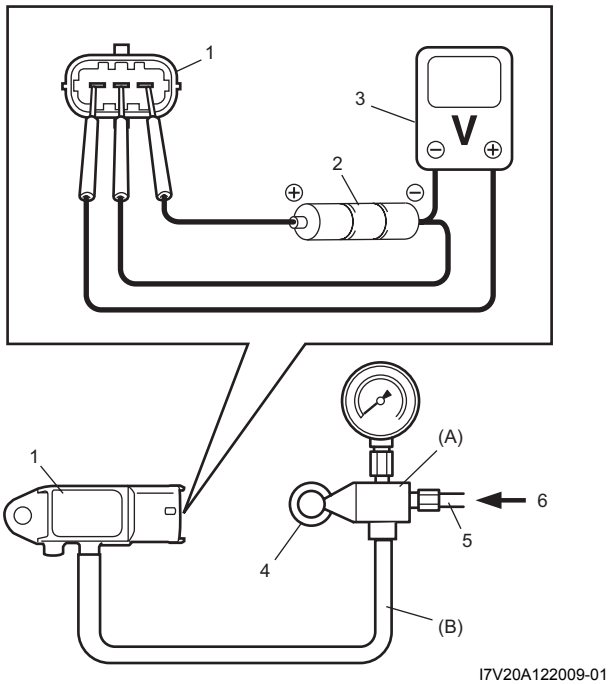
- **If DPF® differential pressure sensor is replaced, be sure to initialize differential pressure data in ECM.**
  For details, refer to "ECM Registration: D13A / Z13DTJ in Section 1C".
- **Do not apply pressure more than 100 kPa (1.0 kgf/cm², 14.5 psi, 100 bar); otherwise DPF® differential pressure sensor could be damaged.**

Measure output voltage variation of DPF® differential pressure sensor as follows.

1) Arrange 3 new 1.5 V batteries (2) in series, and check that total voltage is 4.75 – 5.25 V.
2) Connect voltmeter (3) and batteries to DPF® differential pressure sensor (1) as shown in figure.
3) Set special tool as follows.

Special tool
(A): 09918–18111
(B): 09355–35754–601

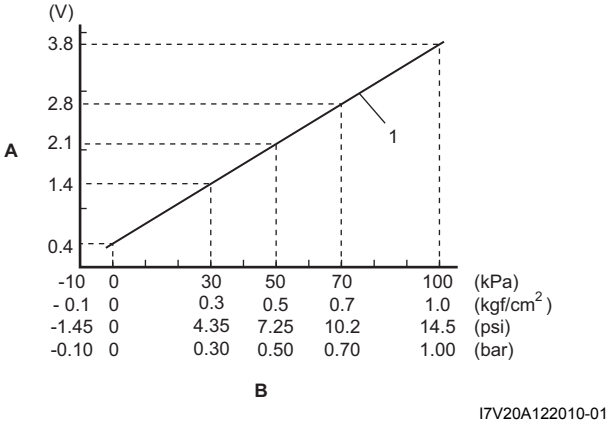
a) Loosen adjusting screw (4) fully.
b) Connect air hose (5) to special tool.
c) Connect special tool (A) to DPF® differential pressure sensor (1) using hose (B).



I7V20A122009-01

6. Compressed air

4) Check output voltage for variation as the following graph when applying up to 100 kPa (1.0 kgf/cm², 14.5 psi, 1.00 bar) from 0 kPa (0 kgf/cm², 0 psi, 0 bar) by using special tool and compressed air.
If faulty condition is found, replace DPF® differential pressure sensor referring to "DPF® Differential Pressure Sensor Removal and Installation: D13A / Z13DTJ".



I7V20A122010-01

A: Voltage	1. Reference line
B: Pressure	

Air Fuel Ratio (A/F) Sensor On-Vehicle Inspection (Non-DPF® Model)

S7N20A1226016

⚠ CAUTION

If A/F sensor is replaced, be sure to initialize A/F data in ECM.
For details, refer to "ECM Registration: D13A / Z13DTJ in Section 1C".

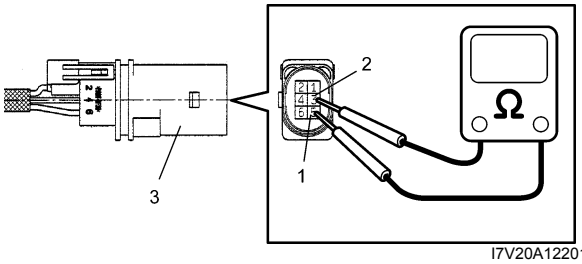
A/F Sensor Heater

1) Disconnect negative (–) cable at battery.
2) Disconnect A/F sensor connector.
3) Using ohmmeter, measure resistance between terminals "Heater +" (1) and "Heater –" (2) at sensor connector (3).
If resistance is out of specification, replace A/F sensor referring to "Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model): D13A / Z13DTJ".

NOTE

Ambient temperature of sensor affects resistance value largely. Make sure that sensor heater is at reference temperature.

A/F sensor heater resistance
2.43 – 3.23 Ω at 25 °C (77 °F)



I7V20A122011-01

Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model)

S7N20A1226017

⚠ CAUTION

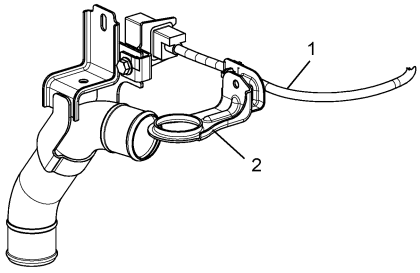
If A/F sensor is replaced, be sure to initialize A/F data in ECM.
For details, refer to"ECM Registration: D13A / Z13DTJ in Section 1C".

⚠ WARNING

To avoid danger of being burned, do not touch exhaust system when system is hot. Any service on exhaust system should be performed when system is cool.

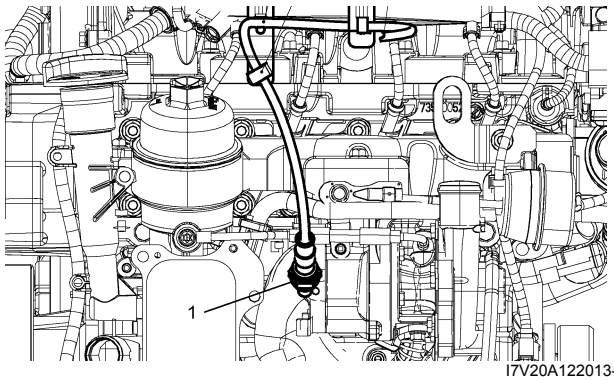
Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to "Front Bumper and Rear Bumper Components in Section 9K".
3) Remove intercooler referring to "Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D"
4) Disconnect A/F sensor connector.
5) Remove A/F sensor wire (1) from radiator support upper bracket (2).



I7V20A122012-01

6) Remove A/F sensor (1).

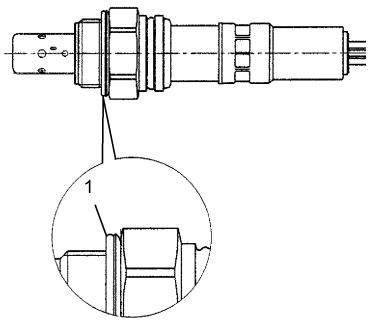


I7V20A122013-01

Installation

Reverse removal procedure noting the following.

- Check Gasket (1) for deterioration and damage. If malfunction is found, replace A/F sensor.



I7V20A122014-01

- Tighten A/F sensor to specified torque.

  Tightening torque
  A/F sensor: 45 N·m (4.6 kgf-m, 33.5 lbf-ft)

- When replacing A/F sensor, initialize A/F data in ECM referring to "A/F Data Initialization (Non-DPF® Model): D13A / Z13DTJ in Section 1C"

Specifications

Tightening Torque Specifications

S7N20A1227001

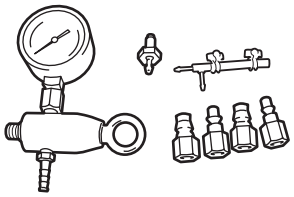
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
EGT sensor	45	4.6	33.5	☞
A/F sensor	45	4.6	33.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A1228001

09355–35754–601 ☞ 	09918–18111 Air pressure regulator ☞ 

Engine Electrical Devices

M13A / M15A / M16A

Repair Instructions

Engine Control Module (ECM) Removal and Installation

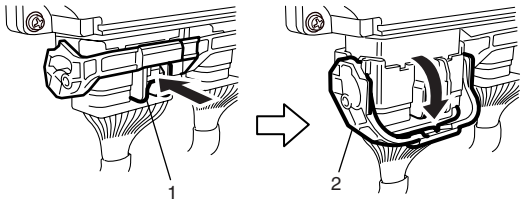
S7N20A1316004

⚠ CAUTION

As ECM consists of precision parts, be careful not to expose it to excessive shock.

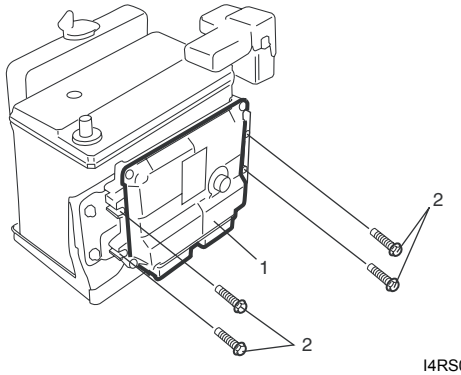
Removal

1) Disconnect negative cable at battery.
2) Disconnect connectors from ECM as follows.
   a) Push lock (1) to release locking of lock lever (2).
   b) Turn lock lever to arrow direction until it stops.



I4RS0A130003-01

3) Remove ECM (1) from its bracket by removing its mounting bolts (2).



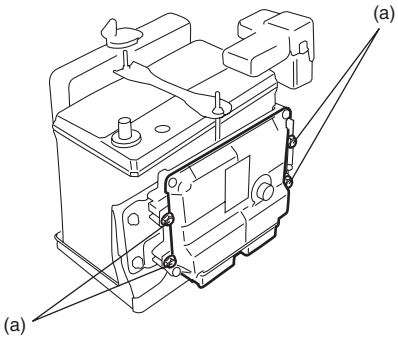
I4RS0B130002-01

Installation

Reverse removal procedure noting the following:

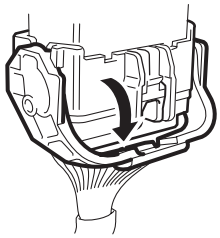
- Tighten ECM mounting bolts to specified torque.

  Tightening torque
  ECM mounting bolt (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)



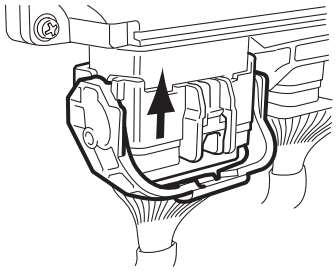
I4RS0B130003-01

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



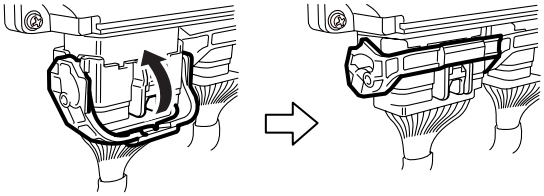
I4RS0B130021-01

  b. Insert ECM connectors to ECM until it stops with unlocked lock lever.



I4RS0B130022-01

  c. Lock ECM connectors securely by pulling its lock lever up.



I4RS0A130004-01

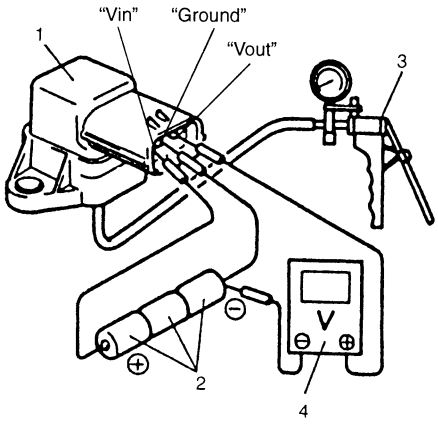
Manifold Absolute Pressure (MAP) Sensor Inspection

S7N20A1316005

1) Remove air cleaner assembly.
2) Disconnect connector from MAP sensor.
3) Remove MAP sensor.
4) Arrange 3 new 1.5 V batteries (2) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal of sensor and negative terminal to “Ground” terminal. Then check voltage between “Vout” and “Ground”. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump (3).
If check result is not satisfactory, replace MAP sensor (1).

Output voltage (When input voltage is 4.5 – 5.5 V, ambient temp. 20 – 30 °C, 68 – 86 °F)

Altitude (Reference)		Barometric pressure		Output voltage
(ft)	(m)	(mmHg)	(kPa)	(V)
0 – 2000	0 – 610	760 – 707	100 – 94	3.3 – 4.3
2001 – 5000	611 – 1524	Under 707 over 634	94 – 85	3.0 – 4.1
5001 – 8000	1525 – 2438	Under 634 over 567	85 – 76	2.7 – 3.7
8001 – 10000	2439 – 3048	Under 567 over 526	76 – 70	2.5 – 3.3



I3RM0A130005-01

5) Install MAP sensor securely.
6) Connect MAP sensor connector securely.
7) Install air cleaner assembly.

Electric Throttle Body Assembly On-Vehicle Inspection

S7N20A1316008

⚠ WARNING

Never touch throttle valve with finger while ignition switch is turned ON and accelerator pedal is depressed. Otherwise, injury may result by pinching the finger between throttle valve and throttle body housing.

⚠ CAUTION

- **Do not disassemble electric throttle body assembly.**
- **Do not expose electric throttle body assembly to excessive shock like a dropping it. If electric throttle body assembly has been exposed to excessive shock, it should be replaced.**
- **Be careful not to accurate a foreign material (like dust and/or metallic particle) to the throttle body housing and/or throttle valve.**
  Otherwise, the throttle body assembly is breaking down by throttle valve accretion.
- **Do not apply excessive moving force to throttle valve for throttle valve operation check and/or TP sensor performance check.**
  Otherwise, the throttle body assembly is breaking down by damaging the internal resinous gear of throttle valve actuator.

NOTE

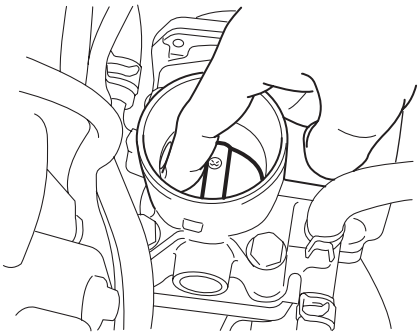
After replacing electric throttle body assembly, perform calibration of electric throttle body assembly referring to “Electric Throttle Body System Calibration: M13A / M15A / M16A”.

Throttle Valve Visual Check

1) Remove air cleaner outlet hose.
2) Check that there isn’t any foreign matter caught between throttle valve and throttle body housing. If there is, take it out after removing throttle body referring to “Electric Throttle Body Assembly Removal and Installation: M13A / M15A / M16A in Section 1D” and clean inside of throttle body thoroughly.

Throttle Valve Operation Check

1) Remove air cleaner outlet hose.
2) Turn OFF ignition switch.
3) Move throttle valve with finger to its full open position and check that it moves smoothly.
4) Move throttle valve with finger to its completely closed position and check that it moves smoothly.

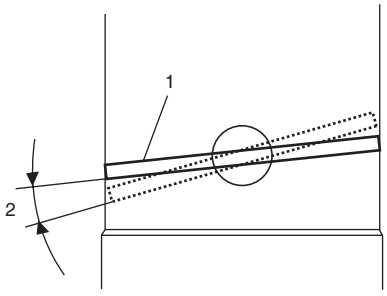


I4RS0B130004-01

5) Take off finger from throttle valve (1) which is at full open position and check that it moves smoothly by its return spring and open spring force back to default position (2) (position where throttle valve is open as specified below from completely closed position).

Default position
For other than M16A engine: 8°
For M16A engine: 6°

6) Take off finger from throttle valve (1) which is at completely closed position and check that it moves smoothly by its return spring and open spring force back to default position.
If check result is not satisfactory, replace electric throttle body assembly.

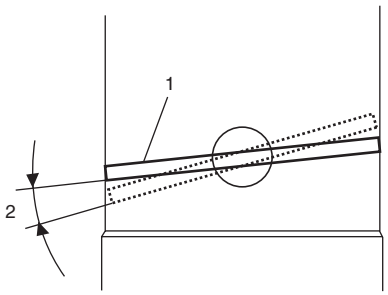


I4RS0B130005-01

Electric Throttle Body Assembly Operation Check

1) Remove air cleaner outlet hose.
2) Turn ON ignition switch.
3) Depress accelerator pedal gradually and check that throttle valve moves smoothly until it opens fully.
4) Release accelerator pedal depressed in Step 3) and check that throttle valve (1) moves back to default position (2) (position where throttle valve is open as specified below from its completely closed position).

Default position
For other than M16A engine: 8°
For M16A engine: 6°



I4RS0B130005-01

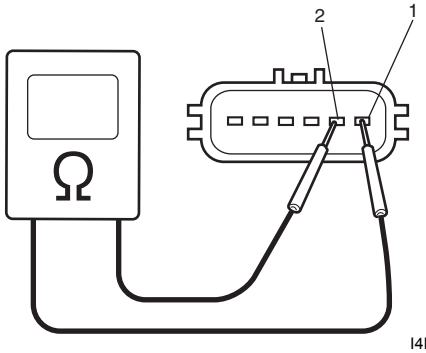
If check result is satisfactory, electric throttle body system is in good condition.If check result is not satisfactory, proceed to next step.

5) Perform “Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection: M13A / M15A / M16A”, “Throttle Actuator (Motor) Check: M13A / M15A / M16A” and “Throttle Position Sensor Performance Check: M13A / M15A / M16A”.
If check results are not satisfactory, replace electric throttle body assembly.
If check results are satisfactory, wire circuit and/or ECM are faulty.

Throttle Actuator (Motor) Check

1) Turn OFF ignition switch.
2) Disconnect connector from electric throttle body assembly.
3) Measure resistance between “M1” terminal (1) and “M2” terminal (2) of electric throttle body assembly.
If measured resistance is out of specified value, replace electric throttle body assembly.

Throttle actuator (motor) resistance
0.3 – 100 Ω at 20 °C, 68 °F

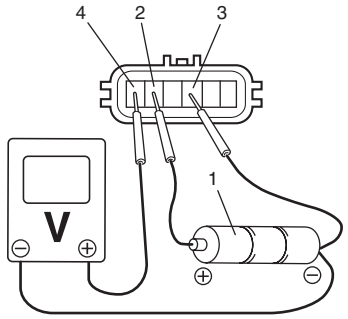


I4RS0B130023-01

Throttle Position Sensor Performance Check

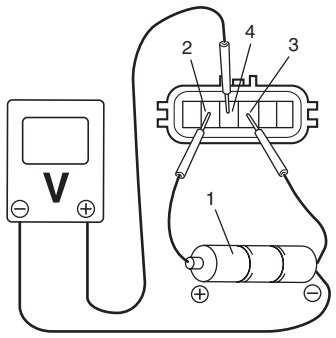
1) Remove air cleaner outlet hose.
2) Turn OFF ignition switch.
3) Disconnect connector from electric throttle body assembly.

4) Check throttle position sensor (main and sub) output voltage as following steps.
   a) For throttle position sensor (main), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 1” terminal (4) of sensor and negative terminal to battery.



I4RS0B130007-02

   b) For throttle position sensor (sub), arrange 3 new 1.5 V batteries (1) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using voltmeter, connect positive terminal to “Vout 2” terminal (4) of sensor and negative terminal to battery.



I4RS0B130008-01

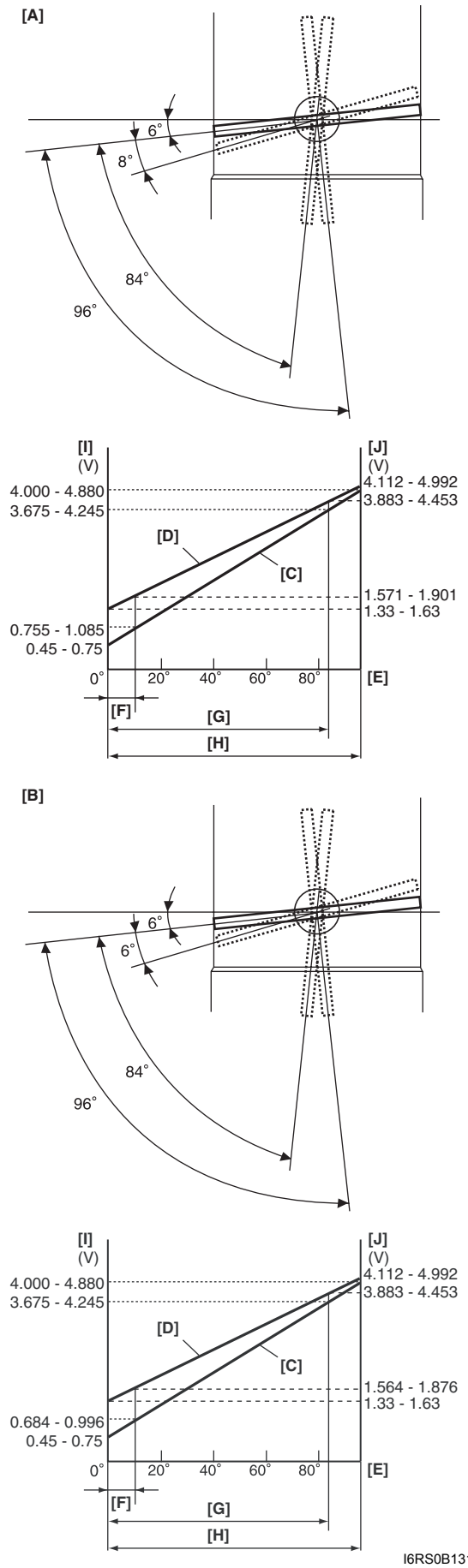
   c) Measure output voltage variation while throttle valve is opened and closed as following specification.

If sensor voltage is out of specified value and linear variation as the following graph, replace electric throttle body assembly.

Throttle position sensor output voltage

Throttle position sensor (main) [C]: 0.45 – 4.88 V, varying according to throttle valve opening by finger (Voltage should vary by 0.04 V for each 1° valve opening)

Throttle position sensor (sub) [D]: 1.33 – 4.992 V varying according to throttle valve opening by finger (Voltage should vary by about 0.032 V for each 1° valve opening)



I6RS0B131001-03

[A]:	Other than M16A engine model
[B]:	M16A engine model

[E]:	Throttle valve opening
[F]:	Position where throttle valve is open in default position from completely closed position
[G]:	Angle obtained when accelerator pedal is depressed fully (84°)
[H]:	Angle obtained when throttle valve is fully opened with finger (96°)
[I]:	Throttle position sensor (main) output voltage
[J]:	Throttle position sensor (sub) output voltage

Electric Throttle Body System Calibration

S7N20A1316009

NOTE

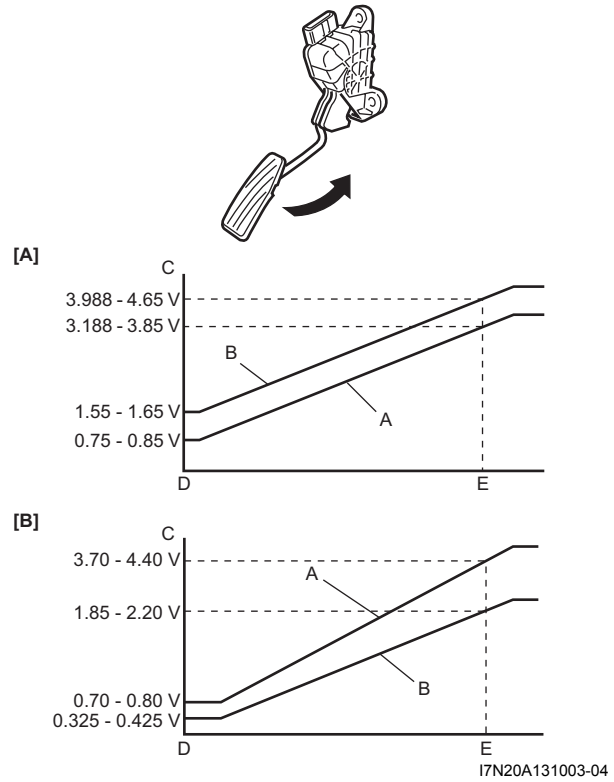
If working the service described under the "Precautions of Electric Throttle Body System Calibration: M13A / M15A / M16A in Section 1A", perform following steps for electric throttle body system calibration.

1) If electric throttle body assembly and/or accelerator pedal position (APP) sensor assembly are replaced, perform following steps.
   a) Disconnect negative cable at battery for 20 seconds or more for the purpose of clearing calibration data of closed throttle position from memory in ECM.
   b) Connect negative cable to battery.
2) Keep ignition switch at ON position for 5 seconds or more without running engine.

Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection

S7N20A1316010

1) Check that accelerator pedal position (APP) sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.).
   If mounting is not properly, reinstall accelerator pedal position (APP) sensor assembly properly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A".
2) Connect scan tool to DLC with ignition switch turned OFF.
3) Turn ON ignition switch and select "Data List" mode on scan tool.
4) Check that accelerator pedal position sensor voltage varies as the following graph.
   If sensor voltage is out of specified value or does not vary linearly as the following graph, check accelerator pedal position (APP) sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model): M13A / M15A / M16A" or "Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model): M13A / M15A / M16A".



I7N20A131003-04

[A]:	For M16A and automated manual transaxle model
[B]:	For M13A and M15A without automated manual transaxle model
A:	APP sensor (main) voltage
B:	APP sensor (sub) voltage
C:	Voltage
D:	Idle position of accelerator pedal
E:	Full depressed position of accelerator pedal

Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation

S7N20A1316011

⚠ CAUTION

- **Do not expose accelerator pedal position (APP) sensor assembly to excessive shock like a dropping it. If accelerator pedal position (APP) sensor assembly has been exposed to excessive shock, it should be replaced.**
- **Be careful not to expose sensor section of accelerator pedal position (APP) sensor assembly to water.**

NOTE

After replacing accelerator pedal position (APP) sensor assembly, perform calibration of throttle valve referring to "Electric Throttle Body System Calibration: M13A / M15A / M16A".

Removal

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

Installation

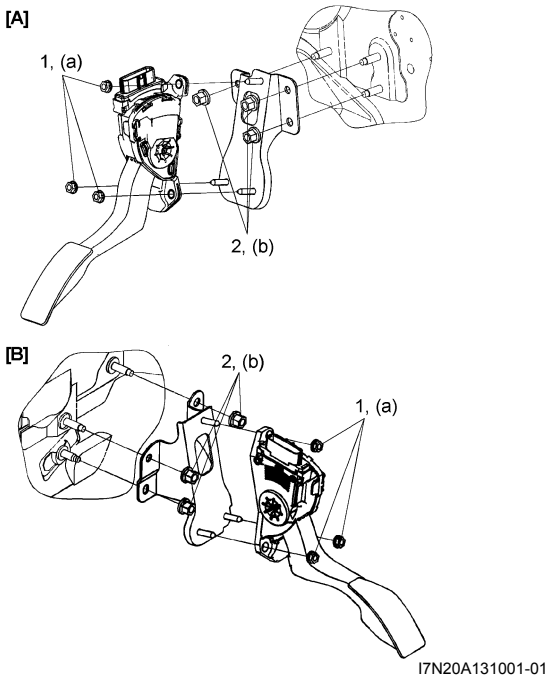
Reverse removal procedure for installation noting the following.

- Tighten accelerator pedal position (APP) sensor assembly nut (1) and bracket nut (2) to specified torque.

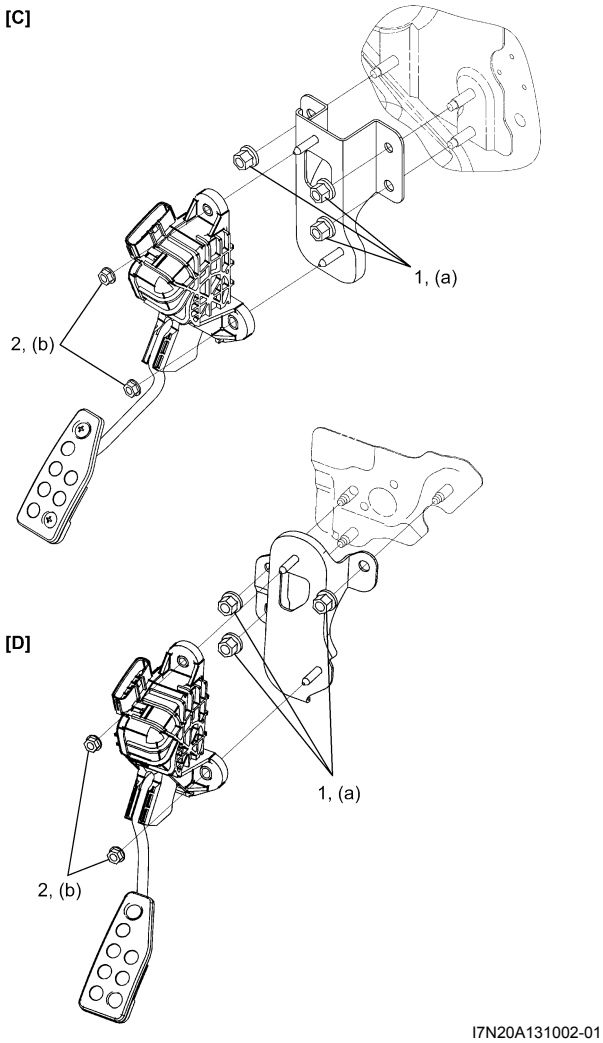
Tightening torque

APP sensor assembly nut (a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

APP sensor bracket bolt (b): 13 N·m (1.3 kgf-m, 9.0 lbf-ft)



I7N20A131001-01



I7N20A131002-01

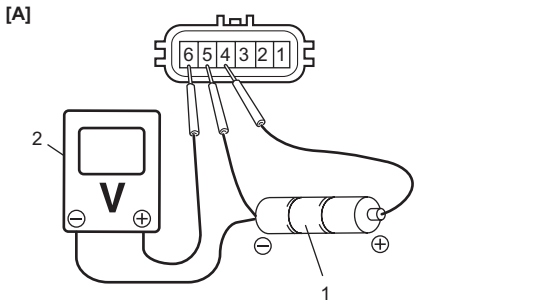
[A]:	LHD (M13A and M15A without automated manual transaxle) model
[B]:	RHD (M13A and M15A without automated manual transaxle) model
[C]:	LHD (M16A and automated manual transaxle) model
[D]:	RHD (M16A and automated manual transaxle) model

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

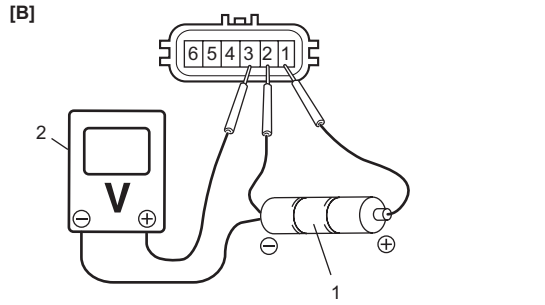
Accelerator Pedal Position (APP) Sensor Assembly Inspection (M16A and Automated Manual Transaxle Model)

S7N20A1316027

1) Remove APP sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A".
2) Check APP sensor output voltage as follows.
   If faulty condition is found, replace APP sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A".
   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.



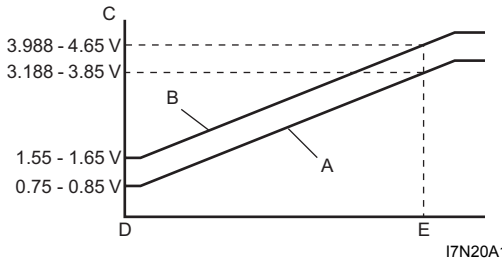
I7N20A131004-01



I7N20A131005-01

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

   c) Check that APP sensor voltage varies depending on accelerator opening angle as the following graph while accelerator pedal is released and fully depressed.



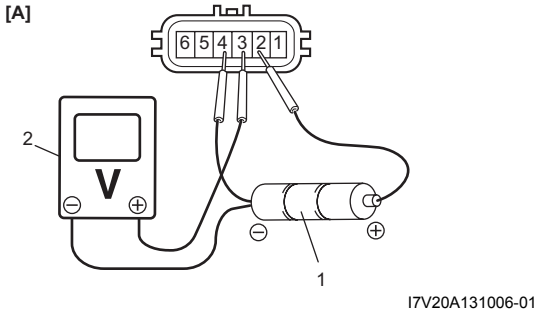
I7N20A131006-02

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

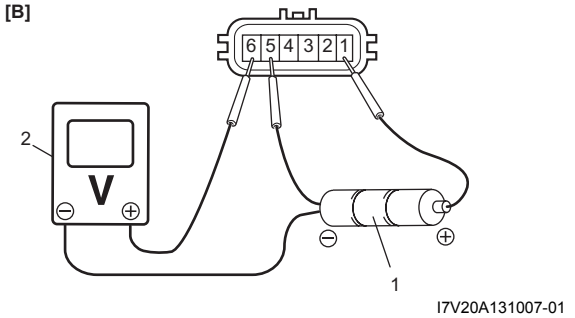
Accelerator Pedal Position (APP) Sensor Assembly Inspection (M13A and M15A without Automated Manual Transaxle Model)

S7N20A1316028

1) Remove APP sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A".
2) Check APP sensor output voltage as follows.
   If faulty condition is found, replace APP sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: M13A / M15A / M16A".
   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.



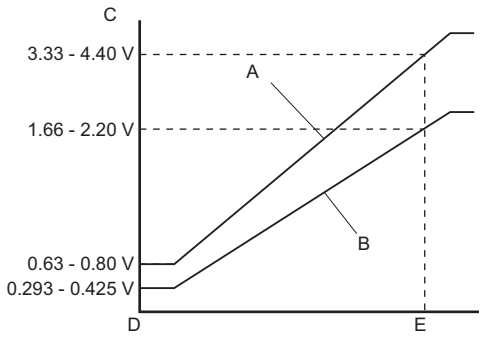
I7V20A131006-01



I7V20A131007-01

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

c) Check that APP sensor voltage varies depending on accelerator opening angle as the following graph while accelerator pedal is released and fully depressed.



I7V20A131004-03

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

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S7N20A1316013

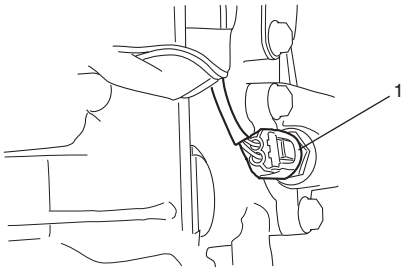
Removal

1) Disconnect negative cable at battery.
2) Drain coolant referring to “Cooling System Draining: M13A / M15A / M16A in Section 1F”.

⚠ WARNING

To 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.

3) Remove air intake pipe.
4) Disconnect connector from ECT sensor (1).



I2RH0B130008-01

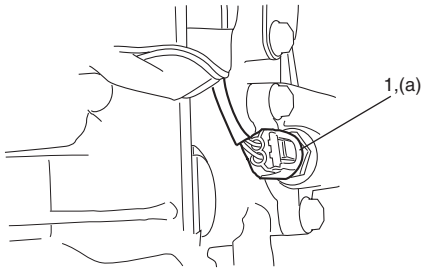
5) Remove ECT sensor from thermostat case.

Installation

Reverse removal procedure noting the following.

- Clean mating surfaces of ECT sensor and thermostat case.
- Check O-ring for damage and replace, if necessary.
- Tighten ECT sensor (1) to specified torque.

Tightening torque
ECT sensor (a): 15 N·m (1.5 kgf-m, 11.0 lbf-ft)



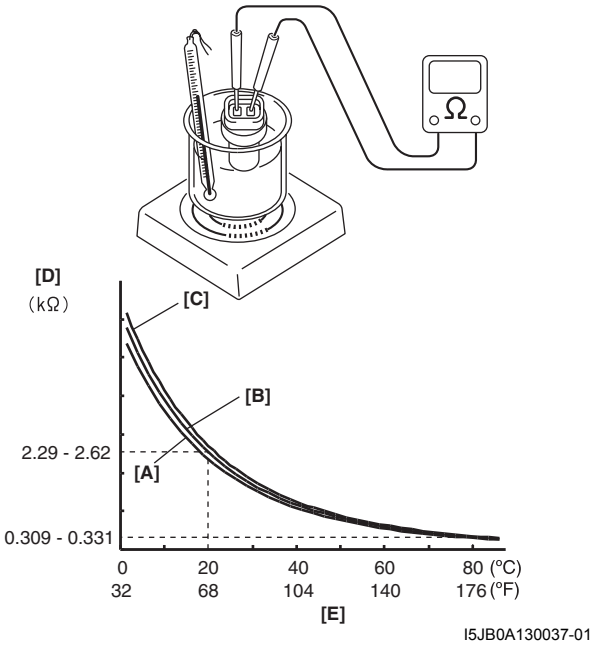
I2RH0B130009-01

- Connect connector to ECT sensor securely.
- Refill coolant referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.

Engine Coolant Temperature (ECT) Sensor Inspection

S7N20A1316014

Immerse temperature sensing part of ECT sensor (1) in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn’t show such characteristic as shown, replace ECT sensor.



I5JB0A130037-01

[A]: Lower limit	[D]: Resistance
[B]: Normal	[E]: Temperature
[C]: Upper limit	

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Heater On-Vehicle Inspection

S7N20A1316015

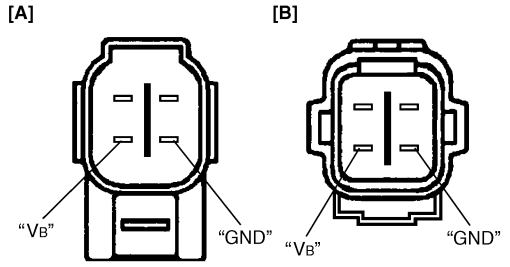
1) Disconnect sensor connector.
2) Using ohmmeter, measure resistance between terminals "V_B" and "GND" of sensor connector. If found faulty, replace oxygen sensor.

NOTE

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

Resistance of oxygen sensor heater
HO2S-1: 5.0 – 6.4 Ω at 20 °C (68 °F)
HO2S-2: 11.7 – 14.5 Ω at 20 °C (68 °F)

Viewed from terminal side



I4RS0A130006-01

[A]: HO2S-1
[B]: HO2S-2

3) Connect sensor connector securely.

Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation

S7N20A1316016

Removal

⚠ WARNING

To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

1) Disconnect negative cable at battery.
2) Disconnect connector of heated oxygen sensor and release its wire harness from clamps.
3) Perform following items before removing heated oxygen sensor.
   a) For HO2S-1, remove exhaust manifold referring to "Exhaust Manifold Removal and Installation: M13A / M15A / M16A in Section 1K", if necessary.
   b) For HO2S-2, hoist vehicle.
4) Remove heated oxygen sensor from exhaust pipe or exhaust manifold.

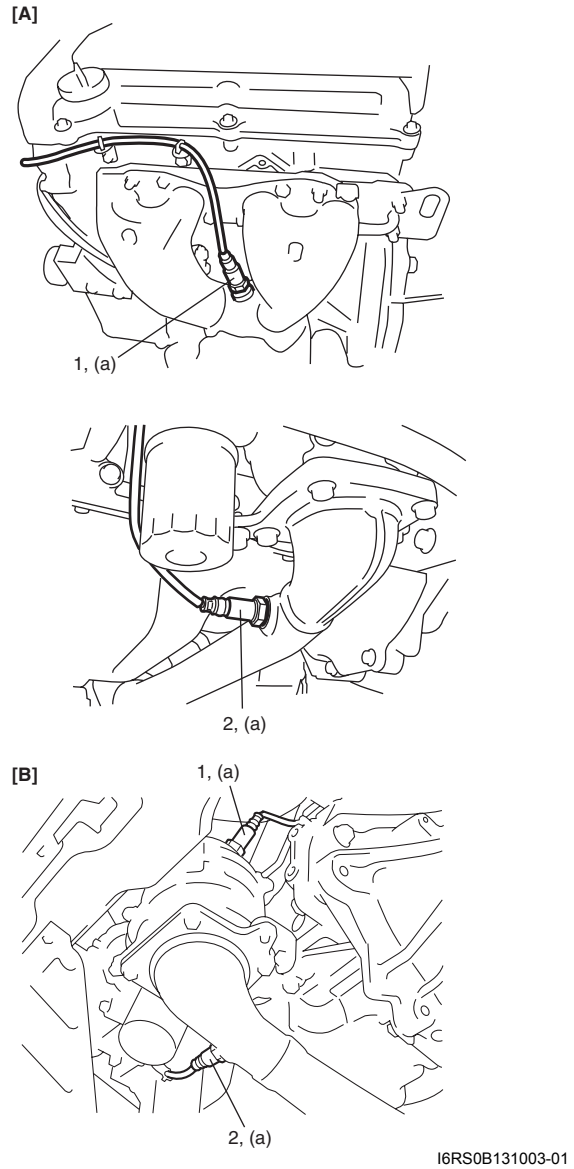
Installation

Reverse removal procedure noting the following.

- Tighten heated oxygen sensor to specified torque.

  Tightening torque
  Heated oxygen sensor (a): 45 N·m (4.5 kgf-m, 32.5 lbf-ft)

- Install exhaust manifold referring to "Exhaust Manifold Removal and Installation: M13A / M15A / M16A in Section 1K", if removed.
- Connect connector of heated oxygen sensor and clamp wire harness securely.
- After installing heated oxygen sensor, start engine and check that no exhaust gas leakage exists.



I6RS0B131003-01

[A]: M13A and M15A engines
[B]: M16A engine
1. HO2S-1
2. HO2S-2

Camshaft Position (CMP) Sensor Removal and Installation

S7N20A1316017

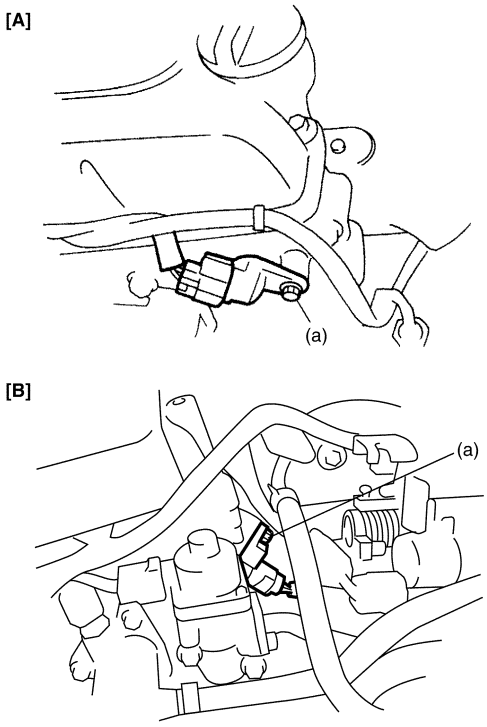
Removal

1) Disconnect negative cable at battery.
2) Disconnect connector from CMP sensor.
3) Remove camshaft position sensor from timing chain cover (non-VVT model) or cylinder head (VVT model).

Installation

1) Install camshaft position sensor to timing chain cover (non-VVT model) or cylinder head (VVT model).

Tightening torque
CMP sensor bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0B130014-01

[A]:	Non-VVT model
[B]:	VVT model

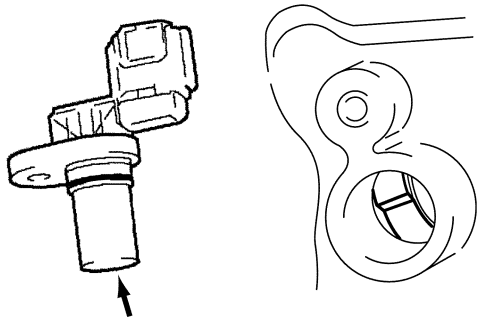
2) Connect connector to CMP sensor securely.
3) Connect negative cable to battery.

Camshaft Position (CMP) Sensor Inspection

S7N20A1316018

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.

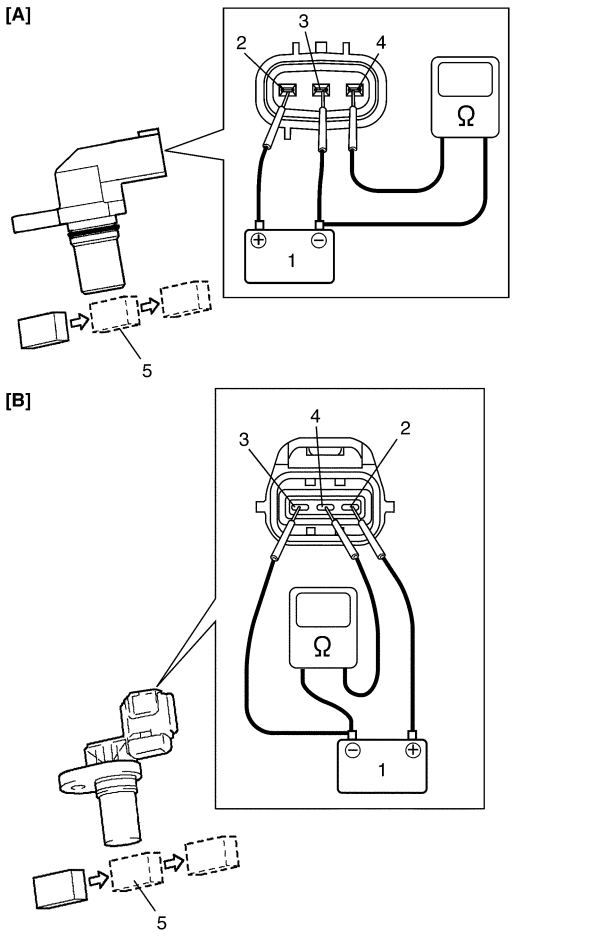


I4RS0B130015-01

Performance check

1) Remove metal particles on end face of CMP sensor, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CMP sensor.
If resistance does not vary as specified below, replace CMP sensor.

CMP sensor resistance
Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



I4RS0B130016-02

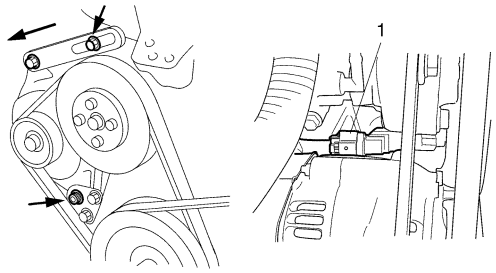
[A]: Non-VVT model
[B]: VVT model

Crankshaft Position (CKP) Sensor Removal and Installation

S7N20A1316019

Removal

1) Disconnect negative cable at battery.
2) Remove generator drive belt, loosen pivot bolt and move generator rearward.
3) Disconnect connector from crankshaft position sensor.
4) Remove crankshaft position sensor (1) from cylinder block.

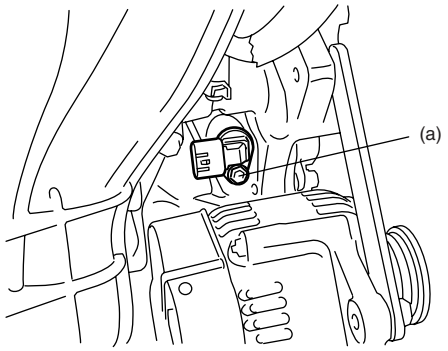


I2RH0B130012-01

Installation

1) Install crankshaft position sensor to cylinder block. Tighten CKP sensor bolt to specified torque.

Tightening torque
CKP sensor bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0A130007-01

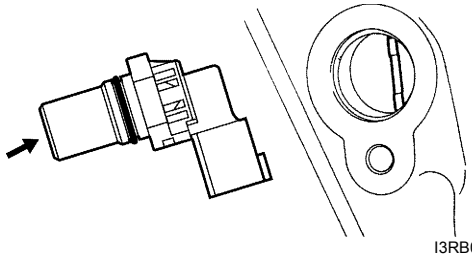
2) Connect connector to CKP sensor securely.
3) Adjust generator drive belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: M13A / M15A / M16A in Section 1F".
4) Connect negative cable to battery.

Crankshaft Position (CKP) Sensor Inspection

S7N20A1316020

Visual check

- Check that O-ring is free from damage.
- Check that end face of sensor and signal pulley tooth are free from any metal particles and damage.



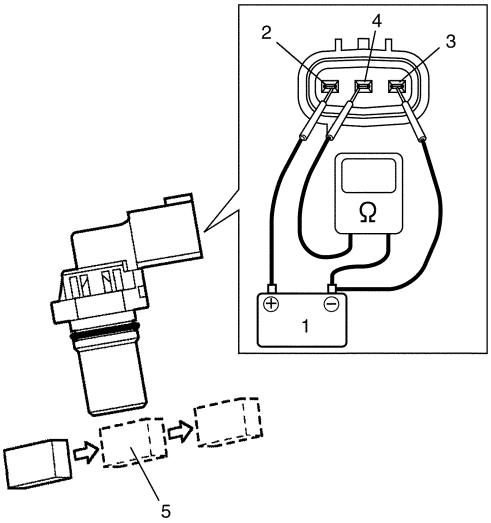
I3RB0A130006-01

Performance check

1) Remove metal particles on end face of CKP sensor, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of CKP sensor.
   If resistance does not vary as specified below, replace CKP sensor.

CKP sensor resistance

Resistance varies from less than 220 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 220 Ω (ON)



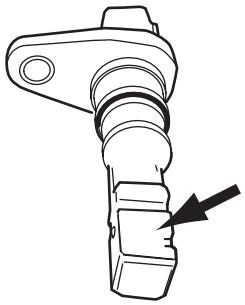
I4RS0B130017-01

Vehicle Speed Sensor (VSS) Inspection (If Equipped)

S7N20A1316021

Visual check

- Check that O-ring is free from damage
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.



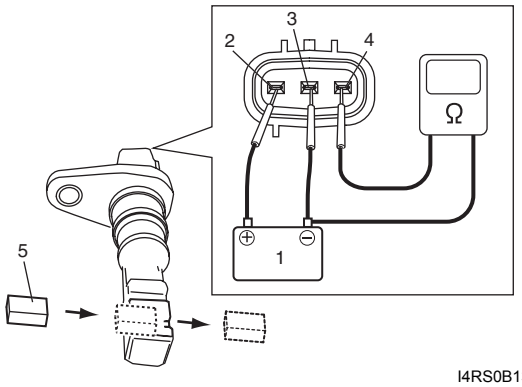
I4RS0B130018-02

Performance check

1) Remove metal particles on end face of VSS, if any.
2) Arrange 12 V battery (1) and connect its positive terminal to “Vin” terminal (2) and negative terminal to “Ground” terminal (3) of sensor. Then using ohmmeter, measure resistance between “Vout” terminal (4) of sensor and negative terminal of battery by passing magnetic substance (iron) (5) while keeping approximately 1 mm (0.03 in.) gap with respect to end face of VSS.
   If resistance does not vary as specified below, replace VSS.

VSS resistance

Resistance varies from less than 100 Ω (ON) to infinity (OFF) or from infinity (OFF) to less than 100 Ω (ON)



I4RS0B130019-01

Knock Sensor Removal and Installation

S7N20A1316022

Removal

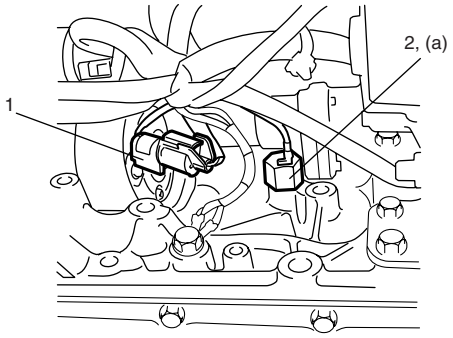
1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Remove right side drive shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
4) Disconnect knock sensor connector (1).
5) Remove knock sensor (2) from cylinder block.

Installation

Reverse removal procedure for installation.

Tightening torque

Knock sensor (a): 22 N·m (2.2 kgf-m, 16.0 lbf-ft)

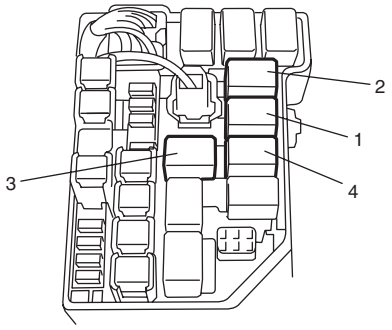


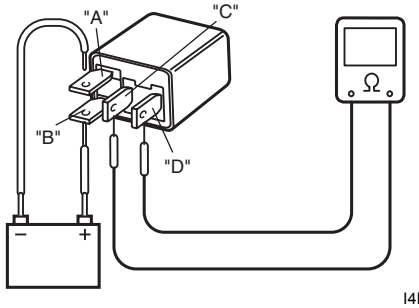
I3RB0A130007-01

Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection

S7N20A1316023

1) Disconnect negative cable at battery.
2) Remove main relay (1), fuel pump relay (3), starting motor control relay (2) and/or throttle actuator control relay (4) from individual circuit fuse box No.1.
3) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay. Connect battery negative (–) terminal to terminal “A” of relay. Check for continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.





I4RS0B130020-01

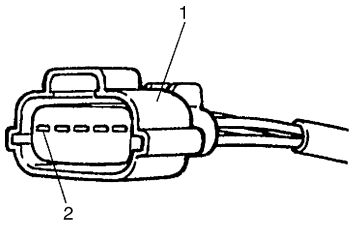
Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor On-Vehicle Inspection

S7N20A1316024

NOTE

Before performed this inspection, be sure to read the “Precautions of ECM Circuit Inspection: M13A / M15A / M16A in Section 1A”.

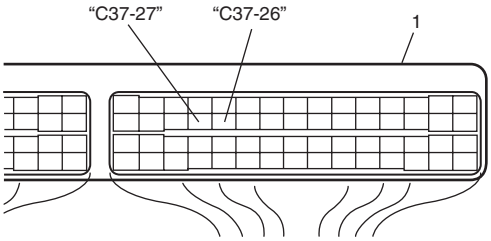
1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Connect voltmeter to “BLK/RED” wire terminal (2) of MAF and IAT sensor connector (1) disconnected and ground.



I3RB0A130009-01

4) Turn ON ignition switch position and check that voltage is battery voltage.
   If not, check if wire harness is open or connection is poor.
5) Turn OFF ignition switch position and connect connector to MAF and IAT sensor.
6) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: M13A / M15A / M16A”
7) Connect special tool between ECM and ECM connector referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”
8) Turn ON ignition switch position and check MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool.

   MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool
   MAF signal voltage of MAF and IAT sensor with ignition switch turned ON: 0.5 – 1.0 V



I4RS0A130009-01

1. ECM

9) Start engine and check that voltage is lower than 5 V and it rises as engine speed increases.

   MAF signal voltage between “C37-26” terminal circuit and “C37-27” terminal circuit of special tool
   MAF signal reference voltage of MAF and IAT sensor at specified Idle speed: 1.3 – 1.8 V

10) If check result is not as specified above, cause may lie in wire harness, connector connection, MAF and IAT sensor or ECM.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation

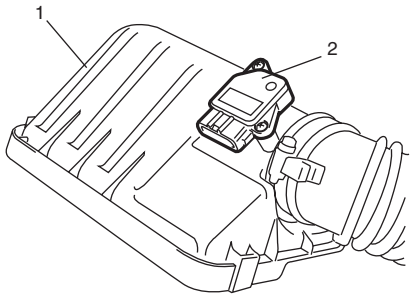
S7N20A1316025

⚠ CAUTION

- **Do not disassemble MAF and IAT sensor.**
- **Do not expose MAF and IAT sensor to any shock.**
- **Do not clean MAF and IAT sensor.**
- **If MAF and IAT sensor has been dropped, it should be replaced.**
- **Do not blow compressed air by using air gun or the like.**
- **Do not put finger or any other object into MAF and IAT sensor. Malfunction may occur.**

Removal

1) Disconnect negative cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Remove air cleaner case (1).
4) Remove MAF and IAT sensor (2) from air cleaner case.



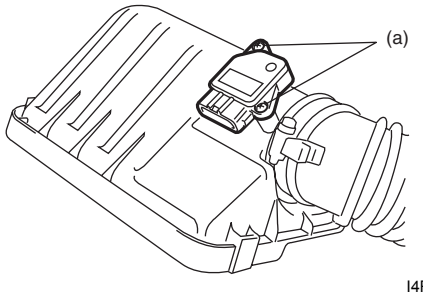
I4RS0A130010-01

Installation

Reverse removal procedure noting the followings.

- Tighten MAF and IAT sensor screws to specified torque.

  Tightening torque
  MAF and IAT sensor screw (a): 1.5 N·m (0.15 kgf-m, 1.1 lbf-ft)



I4RS0A130011-01

- Connect MAF and IAT sensor connector securely.

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Inspection

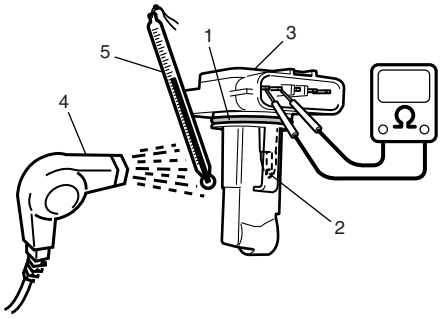
S7N20A1316026

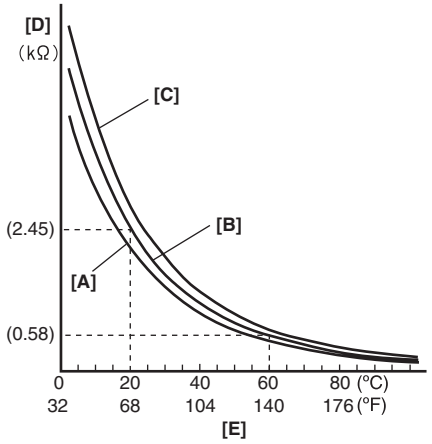
⚠ CAUTION

Do not heat up MAF and IAT sensor more than 100 °C (212 °F). Otherwise, MAF and IAT sensor will be damaged.

- Check sensor O-ring (1) for damage and deterioration. Replace as necessary.
- Blow hot air to temperature sensing part (2) of MAF and IAT sensor (3) using hot air drier (4) and measure resistance between sensor terminals while heating air gradually.
  If measured resistance does not show such characteristic as shown, replace MAF and IAT sensor.

Intake air temperature sensor resistance
–20 °C (–4 °F): 13.6 – 18.4 kΩ
20 °C (68 °F): 2.21 – 2.69 kΩ
60 °C (140 °F): 0.493 – 0.667 kΩ





I4RS0A130012-01

[A]:	Lower limit
[B]:	Nominal
[C]:	Upper limit
[D]:	Resistance
[E]:	Temperature
5.	Temperature gauge

Specifications

Tightening Torque Specifications

S7N20A1317001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
ECM mounting bolt	8	0.8	6.0	☞
APP sensor assembly nut	5.5	0.56	4.0	☞
APP sensor bracket bolt	13	1.3	9.0	☞
ECT sensor	15	1.5	11.0	☞
Heated oxygen sensor	45	4.5	32.5	☞
CMP sensor bolt	10	1.0	7.5	☞
CKP sensor bolt	10	1.0	7.5	☞
Knock sensor	22	2.2	16.0	☞
MAF and IAT sensor screw	1.5	0.15	1.1	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

D13A / Z13DTJ

Precautions

Precaution in Replacing ECM

S7N20A1320001

- Be sure to register the following vehicle information to new or substituted ECM according to “Registration for ECM Replacement: D13A / Z13DTJ”. Otherwise, the engine cannot be started and it will affect an original engine performance.

  NOTE

  Vehicle information with asterisk (*) below are applicable to DPF® model.

  – Fuel injector calibration codes
  – Vehicle variant data
  – DPF® data*
  – Password and secret key code (immobilizer model)
- For DPF® model, engine oil parameter cannot register new or substitute ECM.
  Be sure to replace engine oil and reset engine oil parameter according to “Registration for ECM Replacement: D13A / Z13DTJ”.
  Otherwise, new ECM or substituted ECM will not be able to provide the necessary blinking for the oil pressure warning light and the engine will be damaged due to degraded engine oil.
  For the details of oil life monitoring system, refer to “Oil Life Monitoring System (DPF® model): D13A / Z13DTJ in Section 1A”.

General Description

ECM Registration

S7N20A1321001

NOTE

- **Vehicle information with asterisk (*) below are applicable to DPF® model.**
- **Vehicle information with two asterisk (**) below are applicable to Non-DPF® model**

The following vehicle information are registered in ECM.

- Fuel injector calibration code
- Vehicle variant data (A/C, ESP® and DPF®)
- A/F data**
- Engine oil parameter*
- DPF® data*
- DPF® difference pressure sensor data*
- Catalytic converter data*
- Password and secret key code (immobilizer model)

If any one of the following parts is replaced, register / initialize the necessary information in ECM as table below.

Part	Registered / initialized data	Reference
ECM (Replacement)	• Fuel injector calibration code • Vehicle variant data • A/F data** • DPF® data* • Engine oil parameter* • Password and secret key code (immobilizer model)	Go to “Registration for ECM Replacement: D13A / Z13DTJ”.
Fuel injector(s)	• Fuel injector calibration code	Go to “Fuel Injector Registration: D13A / Z13DTJ”.

Part	Registered / initialized data	Reference
A/F sensor**	• A/F data**	Go to “A/F Data Initialization (Non-DPF® Model): D13A / Z13DTJ”.
MAF sensor**		
DPF®*	• DPF® data	Go to “DPF® Data Initialization: D13A / Z13DTJ”.
DPF® Differential pressure sensor*	• DPF® differential pressure sensor data*	Go to “DPF® Differential Pressure Sensor Data Initialization: D13A / Z13DTJ”.
Catalytic converter*	• Catalytic converter data*	Go to “Catalytic Converter Data Initialization (DPF® Model): D13A / Z13DTJ”.
Engine oil*	• Engine oil parameter*	Go to “Registration for ECM Replacement: D13A / Z13DTJ”.

Repair Instructions

Engine Control Module (ECM) Removal and Installation

S7N20A1326002

⚠ CAUTION

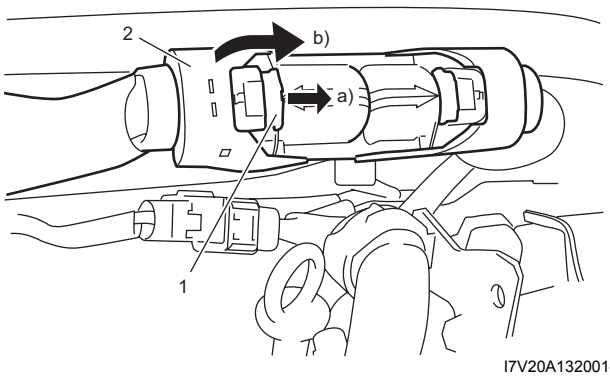
- **As ECM consists of precision parts, be careful not to expose it to excessive shock.**
- **In case of replacement to new ECM or substitute ECM, be sure to register vehicle information. For detail, refer to “ECM Registration: D13A / Z13DTJ”.**

NOTE

In case of replacement to new or substitute ECM, upload vehicle information from ECM to be replaced by SUZUKI scan tool before replacement.

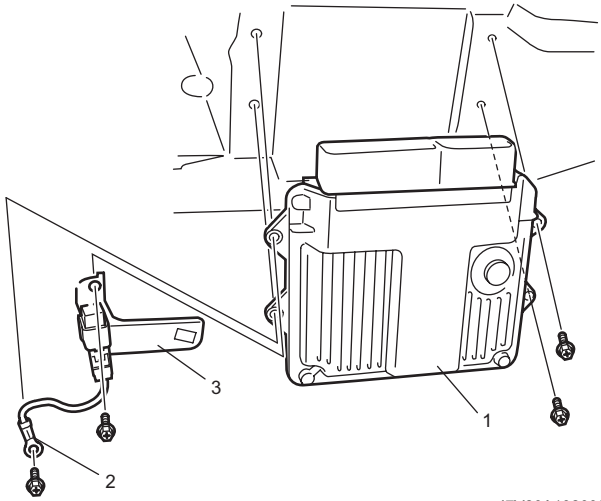
Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connectors from ECM as follows.
   a) Pull out lock slider (1) to release locking of lock lever.
   b) Pull up the lock lever (2).



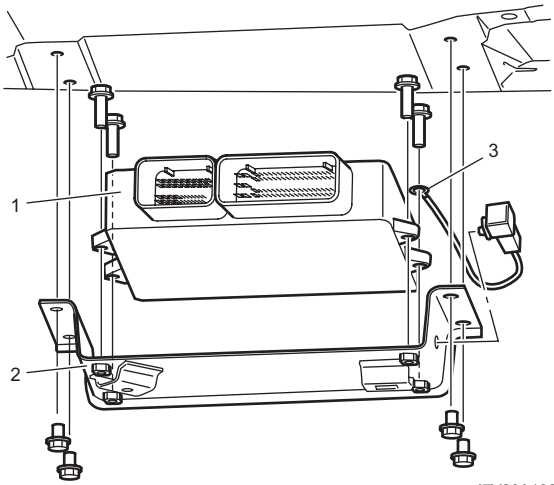
I7V20A132001-01

3) Disconnect ECM ground harness connector.
4) Remove ECM as follows.
   a) For LHD model:
      Remove ECM (1) and ground wire (2) with bracket (3) from cowl top panel.



I7V20A132002-01

   b) For RHD model:
      Remove ECM as follows.
      i) Remove ECM (1) with its bracket (2) from cowl top panel.
      ii) Remove ECM (1) and ground wire (3) from ECM bracket (2).



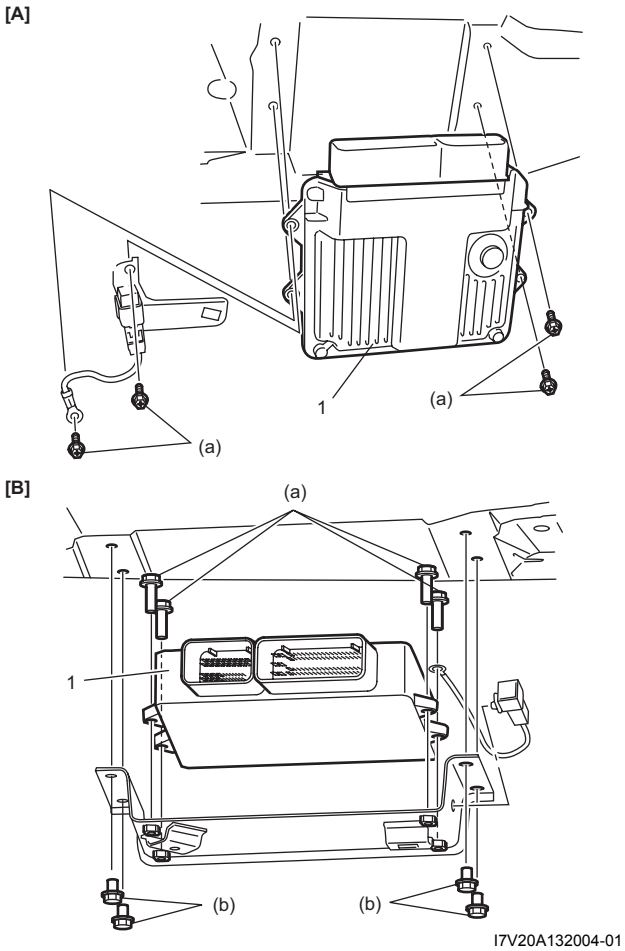
I7V20A132003-01

Installation

Reverse removal procedure for installation noting the following.

- Tighten each bolts to specified torque.

  Tightening torque
  ECM bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
  ECM bracket bolt (b): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I7V20A132004-01

[A]: LHD model	1. ECM
[B]: RHD model	

- In case of replacement to new ECM or substitute ECM, register vehicle information in ECM referring to "Registration for ECM Replacement: D13A / Z13DTJ".

Registration for ECM Replacement

S7N20A1326024

⚠ CAUTION

For DPF® model, be sure to replace engine oil and reset engine oil parameter according to the following procedure.
Otherwise, the new ECM or substituted ECM will not be able to provide the necessary blinking for oil pressure warning light and engine will be damaged due to degraded engine oil.
For details of oil life monitoring system, refer to "Oil Life Monitoring System (DPF® model): D13A / Z13DTJ in Section 1A".

NOTE

For details of SUZUKI scan tool, refer to its operator's manual.

1) Register vehicle information (fuel injector calibration codes) to new or substitute ECM as follows.

NOTE

If fuel injector calibration codes cannot be uploaded from ECM installed in vehicle being repaired due to its malfunction, select "Replace ECM without upload" and register fuel injector calibration codes to new or substitute ECM manually.

   a) Connect SUZUKI scan tool to DLC with ignition switch OFF.
   b) Turn ignition switch to ON position.
   c) Select "Replace ECM with upload" under "Miscellaneous test" ("Misc test") mode of SUZUKI scan tool.
   d) Upload fuel injector calibration code from ECM installed in vehicle being repaired to SUZUKI scan tool.
   e) Replace ECM referring to "Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ".
   f) Download vehicle information from SUZUKI scan tool to new or substitute ECM.
   g) Turn ignition switch to OFF position, and wait 40 seconds or more.

2) For DPF® model, replace engine oil and reset engine oil parameter referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B".
3) Register password and secret key code referring to "Procedure after ECM Replacement: Diesel Model in Section 10C".

Fuel Injector Registration

S7N20A1326025

After replacing one or more fuel injector(s) with new one, perform the following procedure.

1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF.
2) Record fuel injector calibration codes stamped on top of fuel injector referring to “Fuel Injector Removal and Installation: D13A / Z13DTJ in Section 1G”.
3) Select “Injector Calibration Code” under “Misc Test” menu.
4) Input fuel injector calibration codes manually according to instructions displayed on SUZUKI scan tool.
5) Check that fuel injector calibration codes have correctly input in ECM.
6) Disconnect SUZUKI scan tool from DLC with ignition switch turned OFF.

A/F Data Initialization (Non-DPF® Model)

S7N20A1326026

After replacing A/F sensor, MAF sensor or fuel pressure sensor with new one, perform the following procedure.

1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF.
2) Select menu under “Misc. Test” on SUZUKI scan tool according to replaced sensor.
   - For A/F sensor. “Replace A/F sensor”
   - For MAF sensor. “Replace MAF sensor”
   - For fuel sensor. “Replace fuel pressure sensor”
3) Disconnect SUZUKI scan tool from DLC with ignition switch turned OFF.

DPF® Data Initialization

S7N20A1326027

After replacing DPF® with new one, perform the following procedure.

1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF.
2) Execute “Replace DPF” of “ECM Setting” under “Misc Test” menu according to instructions displayed on SUZUKI scan tool.
3) Disconnect SUZUKI scan tool from DLC with ignition switch turned OFF.

DPF® Differential Pressure Sensor Data Initialization

S7N20A1326028

After replacing DPF® differential pressure sensor, perform the following procedure.

1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF.
2) Execute “Replace Diesel Pres Sen” under “Misc Test” menu according to instructions displayed on SUZUKI scan tool.
3) Disconnect SUZUKI scan tool from DLC with ignition switch turned OFF.

Catalytic Converter Data Initialization (DPF® Model)

S7N20A1326029

After replacing catalytic converter, perform the following procedure.

1) Connect SUZUKI scan tool to DLC with ignition switch turned OFF.
2) Execute “Replace Catalyst Converter” under “Misc Test” menu according to instructions displayed on SUZUKI scan tool.
3) Disconnect SUZUKI scan tool from DLC with ignition switch turned OFF.

DPF® After-sales Regeneration

S7N20A1326030

⚠ WARNING

- **During after-sales regeneration, exhaust gas temperature rises significantly and excessive smoke and strong smell are emitted. In order to reduce risk of fire and personal injury, this work must be performed under the following conditions.**
  - **Vehicle should be located at a well-ventilated place outside the workshop.**
  - **Inflammable material must not be left in vicinity of exhaust system components.**
- **Especially, exhaust gas from muffler tail pipe is significantly hot (approx. 600 °C/ 1112 °F). Make sure that there is no person, no obstruction and no inflammable material from muffler tail pipe within 2 m (7 ft).**

⚠ CAUTION

- **Check the engine oil level before performing after-sales regeneration in order to prevent engine damage. Engine oil level should be between LOW and Full level marks on oil level gauge.**
- **After-sales regeneration should be performed only when “DTC P1901: DPF® Differential Pressure Sensor or Flow Resistance Malfunction” is detected in order to avoid any damage to the engine.**
- **Be sure not to cancel after-sales regeneration once started in order to prevent DPF® from damaging by thermal shock.**
- **Be sure to open engine hood before performing after-sales regeneration. Otherwise, plastic parts and rubber parts will be damaged.**

NOTE

- **For detail of SUZUKI scan tool, refer to its operator's manual.**
- **Under one of the following conditions, after-sales regeneration is canceled.**
  - **DTC other than P1901 is detected.**
  - **ECT is below 70 °C (158 °F).**
  - **Vehicle speed signal is inputted.**
  - **Brake pedal is depressed.**
  - **Accelerator pedal is depressed.**
  - **Clutch pedal is depressed.**
  - **Ignition switch is turned OFF.**

1) Check engine oil level referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B".
2) Check if fuel level is 1/4 or more.
3) Check if all electrical load (rear defogger, blower fan, heater, light, A/C, etc.).
4) Locate vehicle at a well-ventilated place outside the workshop.
5) Open engine hood.
6) Connect SUZUKI scan tool to DLC with ignition switch OFF.
7) Check DTC referring to "DTC Check: D13A / Z13DTJ in Section 1A".
   If DTC other than P1901 is detected, repair it according to applicable DTC troubleshooting.
8) Start engine and wait until ECT is 70 °C (158 °F) or more.
9) Select "After-sales Regeneration" under "MISC. TEST" on SUZUKI scan tool, and follow instructions displayed on SUZUKI scan tool.
10) After-sales regeneration is automatically performed as follows:
    a) Phase 1: Check of DPF® differential pressure
       Engine speed is raised to 2,000 rpm for 30 seconds in order to check if DPF® differential pressure is within allowable range or not.

NOTE

If DPF® differential pressure is out of allowable range, "Error A: DPF flow resistance is out of range" is displayed on SUZUKI scan tool.
Repair this faulty condition according to "After-sales Regeneration Failure".

    b) Phase 2: After-sales regeneration
       Engine speed is raised to 3500 rpm and regeneration is started.

NOTE

Phase 2 will last 5 – 15 minutes.
This period depends on soot deposit in DPF®.

    c) Phase 3: End of regeneration
       Engine speed is reduced to idle speed.
       Result of after-sales regeneration is displayed on SUZUKI scan tool after approx. 30 seconds.
11) Confirm the display of SUZUKI scan tool shows "Regeneration successfully".
    If not, repair faulty condition according to "After-sales Regeneration Failure: D13A / Z13DTJ".

⚠ CAUTION

Even if result of after-sales regeneration is displayed, be sure not to turn ignition switch to OFF position immediately. It may cause damage to diesel particulate filter by thermal shock.

12) Wait for 5 minuets at idle speed for cooling down.
13) Turn ignition switch to OFF position, and wait for 30 seconds.
14) Turn ignition switch to ON position.
15) Clear DTC referring to "DTC Clearance: D13A / Z13DTJ in Section 1A".

After-sales Regeneration Failure

S7N20A1326031

General description

After after-sales regeneration, result of after after-sales regeneration is displayed on SUZUKI scan tool.
If any error is displayed, repair its faulty condition according to table below.

Possible Cause Table for After-sales Regeneration Failure

Error	Description	Error code	Possible Cause
Error A: DPF® flow resistance is out of range	This error indicates differential pressure of diesel particulate filter is too high.	91.0 91.6 94.3 94.4	• DPF® clogged completely • DPF® differential pressure sensor faulty • Connection and/or Hose of DPF® differential pressure sensor faulty
Error B: DPF® inlet Temp. is out of range	This error indicates diesel particulate filter inlet temperature does not reach specified temperature for after-sales regeneration.	92.0 92.1 92.6 94.1	• Exhaust system leakage • Catalytic converter faulty • DPF® faulty • Injector faulty • EGT sensor faulty
Error C: Regeneration is cancelled	This error indicates after-sales regeneration is canceled by safety function.	91.5	DTC other than P1901 detected
		92.3	ECT < 70 °C (158 °F)
		91.1	Vehicle speed > 10 km/h (6.2 mile/h)
		91.3	Brake pedal depressed
		91.2	Clutch pedal depressed
		94.2	Engine overheating
		91.4	Out of engine speed range

Mass Air Flow (MAF) and Intake Air Temperature (IAT) Sensor Removal and Installation

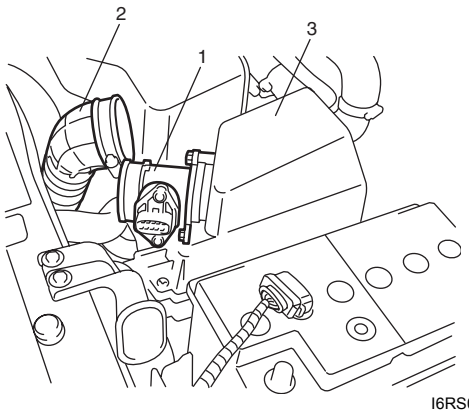
S7N20A1326005

⚠ CAUTION

- **For non-DPF® model:**
  If MAF sensor is replaced, be sure to initialize A/F data in ECM.
  For details, refer to "ECM Registration: D13A / Z13DTJ".
- **Do not cleansing MAF and IAT sensor.**
- **If MAF and IAT sensor has been dropped it should be replaced.**
- **Don't disassemble MAF and IAT sensor.**
- **Do not expose MAF and IAT sensor to any shock.**
- **Do not blow compressed air by using air gun or the like.**
- **Do not put finger or any other object into MAF and IAT sensor. Malfunction may occur.**

Removal

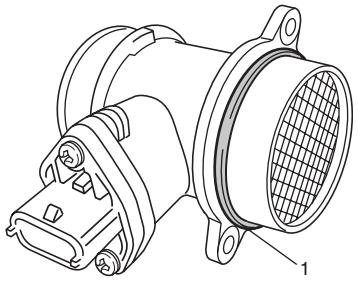
1) Disconnect negative cable at battery and connector from MAF and IAT sensor (1).
2) Disconnect air cleaner outlet hose (2) from MAF and IAT sensor.
3) Remove MAF and IAT sensor from air cleaner case (3).



I6RS0E130005-01

Installation
Reverse removal procedure noting the following.

- Check O-ring (1) for deterioration and damage. If malfunction is found, replace O-ring.
- For non-DPF® model:
  When replacing MAF sensor, be sure to initialize A/F data in ECM referring to "A/F Data Initialization (Non-DPF® Model): D13A / Z13DTJ".



I5RS0B130003-01

Glow Plug Removal and Installation

S7N20A1326006

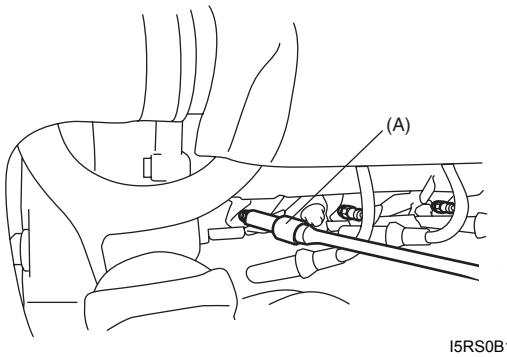
Removal

⚠ CAUTION

- **Do not damage heating section of glow plug.**
- **Do not use glow plug that has been dropped.**
- **When removing glow plug, first loosen it by using a tool so that one or more screw threads remain engaged, then loosen and remove by hand.**

1) Disconnect negative (–) cable at battery.
2) Pull off glow plug wires.
3) Using special tool, remove glow plugs from cylinder head.

Special tool
(A): 09911–78610



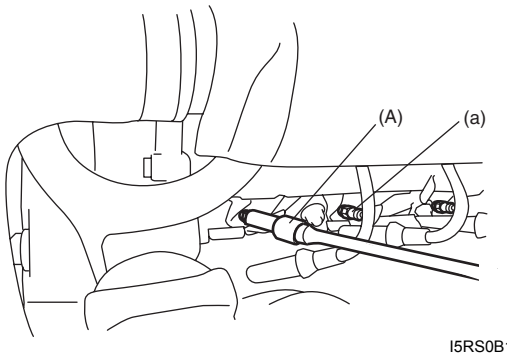
I5RS0B130004-02

Installation
For installation, reverse removal procedure noting the following.

- Using special tool, tightening glow plug to specified torque.

Special tool
(A): 09911–78610

Tightening torque
Glow plug (a): 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)



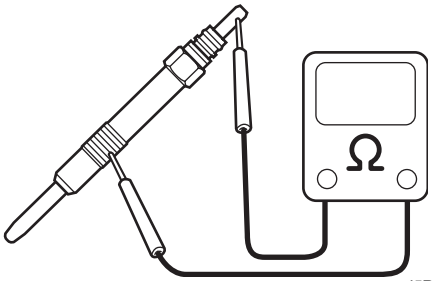
I5RS0B130005-03

Glow Plug Inspection

S7N20A1326016

Check glow plug for resistance as shown.
If resistance is not as specified, replace glow plug.

Glow plug resistance
Approx. 1.4 Ω at 20 °C (68 °F)



I5RW0D130003-01

Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection

S7N20A1326032

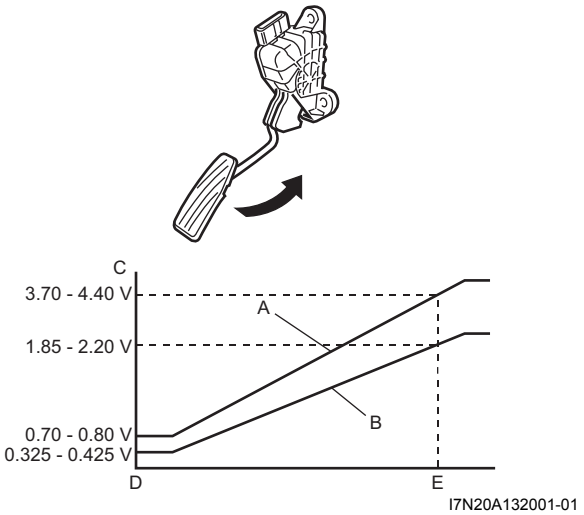
⚠ CAUTION

- **Do not expose APP sensor assembly to excessive shock like a dropping it. If APP sensor assembly has been exposed to excessive shock, it should be replaced.**
- **Be careful not to expose sensor section of APP sensor assembly to water and oil.**

NOTE

Do not disassemble APP sensor assembly.

1) Check that APP sensor assembly has been mounted to vehicle body properly (no pinched floor carpet, etc.).
   If mounting is not properly, reinstall APP sensor assembly referring to “Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: D13A / Z13DTJ”.
2) Connect scan tool to DLC with ignition switch turned OFF.
3) Turn ON ignition switch and select “Data List” mode.
4) Check that APP sensor voltage varies depending on accelerator position as the following graph.
   If faulty condition is found, check the followings.
   - Wire harness and connections
   - APP sensor (Refer to “Accelerator Pedal Position (APP) Sensor Assembly Inspection: D13A / Z13DTJ”.)



I7N20A132001-01

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

Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation

S7N20A1326033

⚠ CAUTION

- **Do not expose APP sensor assembly to excessive shock like a dropping it. If APP sensor assembly has been exposed to excessive shock, it should be replaced.**
- **Be careful not to expose sensor section of APP sensor assembly to water and oil.**

NOTE

Do not disassemble APP sensor assembly.

Removal

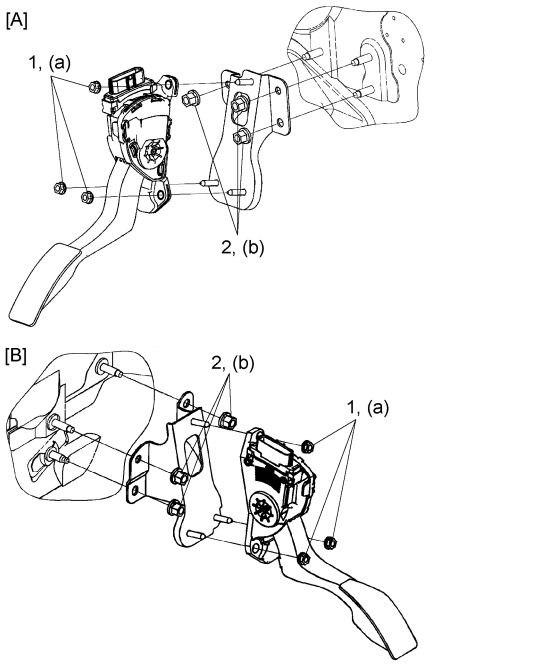
1) Disconnect negative cable at battery.
2) Disconnect connector from APP sensor assembly.
3) Remove APP sensor assembly from its bracket.

Installation

Reverse removal procedure for installation noting the following.

- Tighten APP sensor assembly nut (1) and APP sensor bracket bolt (2) to specified torque.

  Tightening torque
  APP sensor assembly nut (a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
  APP sensor bracket bolt (b): 13 N·m (1.3 kgf-m, 9.0 lbf-ft)



I7V20A131005-01

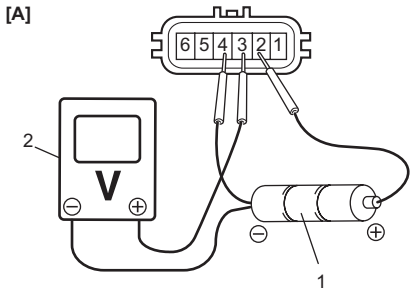
[A]: LHD	[B]: RHD

- Connect connector to APP sensor assembly securely.

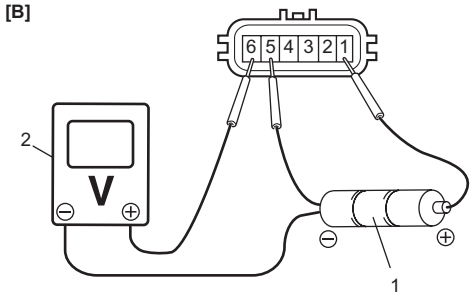
Accelerator Pedal Position (APP) Sensor Assembly Inspection

S7N20A1326034

1) Remove APP sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly On-Vehicle Inspection: D13A / Z13DTJ".
2) Check APP sensor output voltage as follows. If faulty condition is found, replace APP sensor assembly referring to "Accelerator Pedal Position (APP) Sensor Assembly Removal and Installation: D13A / Z13DTJ".
   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.



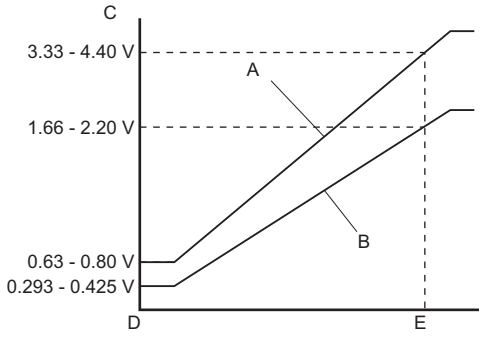
I7V20A131006-01



I7V20A131007-01

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

   c) Check that APP sensor voltage varies depending on accelerator opening angle as the following graph while accelerator pedal is released and fully depressed.



I7V20A131004-03

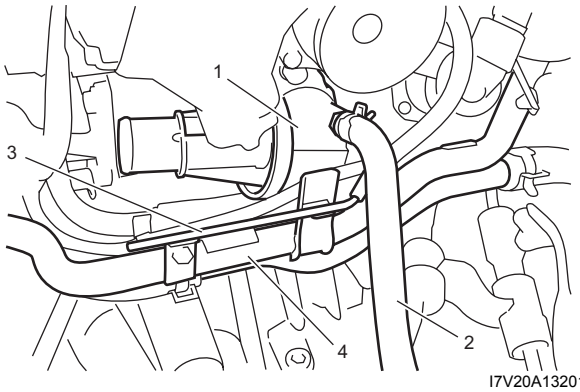
A: APP sensor (main) voltage
B: APP sensor (sub) voltage
C: Voltage
D: Accelerator pedal: Idle position
E: Accelerator pedal: Fully depressed position

Engine Coolant Temperature (ECT) Sensor Removal and Installation

S7N20A1326010

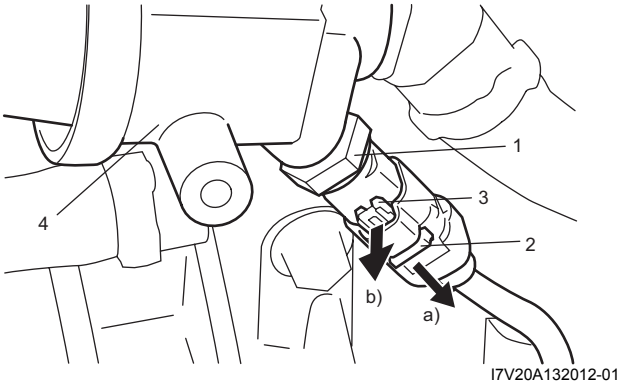
Removal

1) Remove battery from vehicle.
2) Drain cooling system referring to "Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F".
3) Remove air cleaner assembly from vehicle referring to "Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D".
4) Disconnect water engine outlet hose (2) from thermostat housing (1).
5) For DPF® model, remove vacuum pipe (3).
6) Remove heater outlet pipe (4).



I7V20A132011-01

7) Disconnect connector from ECT sensor as follows.
   a) Move connector lock pin (2) in arrow direction as shown in figure.
   b) Raise connector lock lever (3) and remove ECT sensor connector.
8) Remove ECT sensor (1) from thermostat assembly (4).



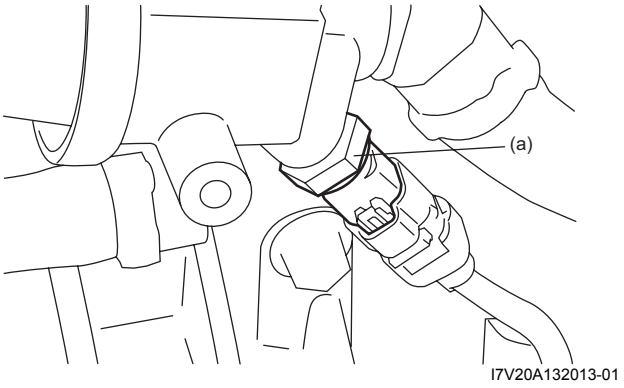
I7V20A132012-01

Installation

Reverse removal procedure noting the following.

- Check ETC sensor gasket for deterioration and damage. If malfunction is found, replace ETC sensor.
- Tighten ECT sensor to specified torque.

  Tightening torque
  ECT sensor (a): 22 N·m (2.2 kgf-m, 16.5 lbf-ft)



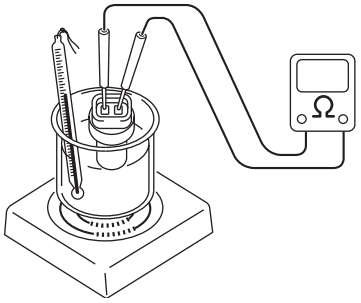
I7V20A132013-01

- Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F”.
- Check cooling system leakage referring to “Engine Cooling System Inspection and Cleaning: D13A / Z13DTJ in Section 1F”.

Engine Coolant Temperature (ECT) Sensor Inspection

S7N20A1326017

Immerse temperature sensing part of ECT sensor (1) in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance is not as specified, replace ECT sensor.



I6RS0E130003-01

Reference resistance of ECT sensor

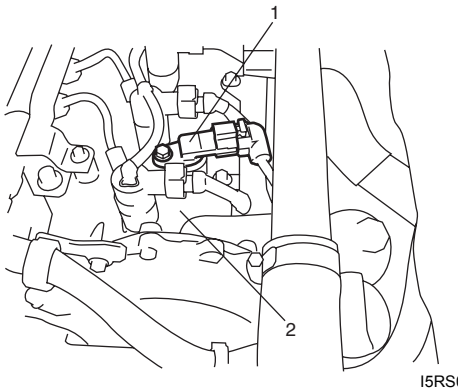
Temperature	Resistance
–20 °C (–4 °F)	Approx. 15.97 kΩ
–10 °C (14 °F)	Approx. 9.62 kΩ
0 °C (32 °F)	Approx. 5.97 kΩ
10 °C (50 °F)	Approx. 3.81 kΩ
20 °C (68 °F)	Approx. 2.5 kΩ
30 °C (86 °F)	Approx. 1.68 kΩ
40 °C (104 °F)	Approx. 1.15 kΩ
60 °C (140 °F)	Approx. 0.58 kΩ
80 °C (176 °F)	Approx. 0.31 kΩ

Camshaft Position (CMP) Sensor Removal and Installation

S7N20A1326011

Removal

1) Disconnect negative cable at battery.
2) Remove engine cover.
3) Disconnect CMP sensor connector.
4) Remove CMP sensor (1) from camshaft housing (2).

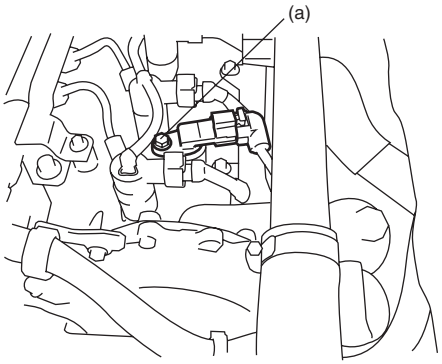


I5RS0B130012-01

Installation
Reverse removal procedure noting the following.

- Check O-ring for deterioration and damage. If malfunction is found, replace O-ring.
- Tighten each bolts to specified torque.

Tightening torque
CMP sensor bolt (a): 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)



I5RS0B130013-01

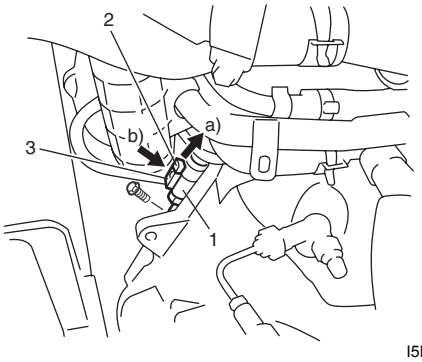
- Connect CMP sensor connector securely.

Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation

S7N20A1326012

Removal

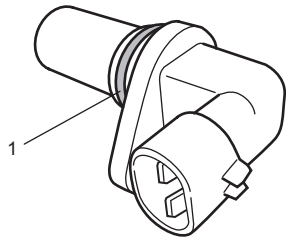
1) Disconnect negative cable at battery.
2) Remove air cleaner assembly from vehicle referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Disconnect connector from CKP sensor as follows.
   a) Move connector lock pin (2) in arrow direction as shown in figure.
   b) Push connector lock lever (3) and remove CKP sensor connector.
4) Remove CKP sensor (1) from cylinder block.



I5RS0B130014-02

Installation
Reverse removal procedure for installation noting the following.

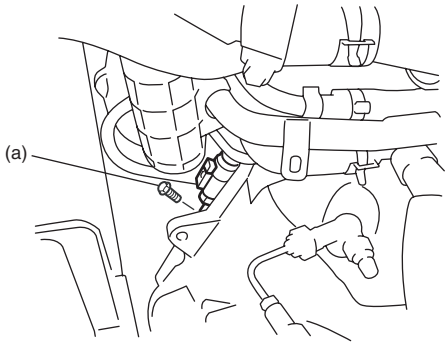
- Check O-ring (1) for deterioration and damage. If malfunction is found, replace O-ring.



I7V20A132014-01

- Clean CKP sensor and sensor rotor teeth before installation.
- Tighten CKP sensor bolt to specified torque.

Tightening torque
CKP sensor bolt (a): 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)



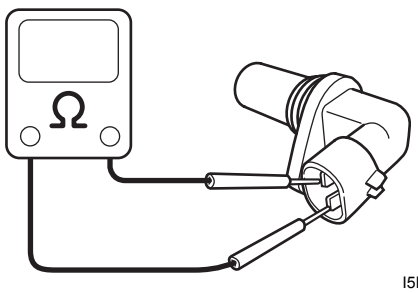
I5RS0B130015-01

Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Inspection

S7N20A1326018

1) Remove CKP sensor referring to “Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: D13A / Z13DTJ”.
2) Check that CKP sensor and sensor rotor tooth are free from any metal particles and damage.
3) Check that resistance between terminals of CKP sensor is within specification.
   If resistance is out of specification, replace CKP sensor.

CKP sensor resistance
632 – 948 Ω at 20 °C (68 °F)



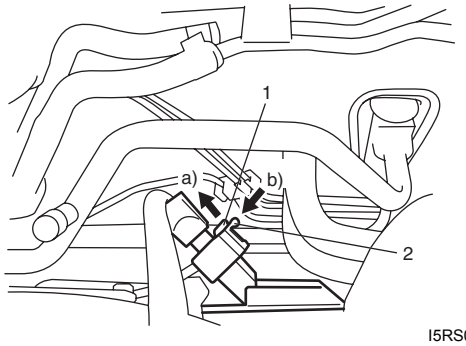
I5RW0D130011-01

Boost Pressure Sensor Removal and Installation

S7N20A1326013

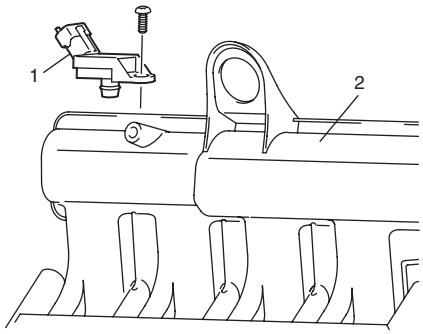
Removal

1) Disconnect negative cable at battery.
2) Remove engine cover.
3) Disconnect connector from boost pressure sensor as follows.
   a) Move connector lock pin (1) in arrow direction as shown in figure.
   b) Push connector lock lever (2) and remove boost pressure sensor connector.



I5RS0B130016-01

4) Remove boost pressure sensor (1) from intake manifold (2).

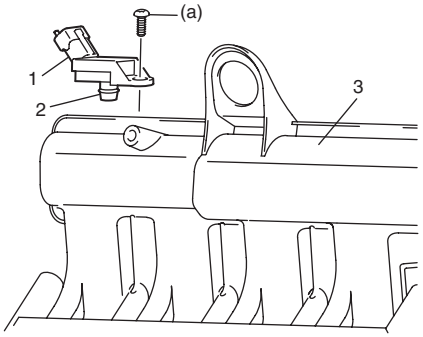


I3RM0B132016-01

Installation

1) Check O-ring (2) of boost pressure sensor (1) deformed or damage.
   If malfunction is found, replace boost pressure sensor.
2) Install boost pressure sensor (1) to intake manifold (3).
   Tighten boost pressure sensor bolt to specified torque.

   Tightening torque
   Boost pressure sensor bolt (a): 1.0 N·m (0.10 kgf-m, 1.0 lbf-ft)



I3RM0B132017-01

3) Connect connector to boost pressure sensor securely.
4) Install engine cover.

   Tightening torque
   Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

5) Connect negative cable at battery.

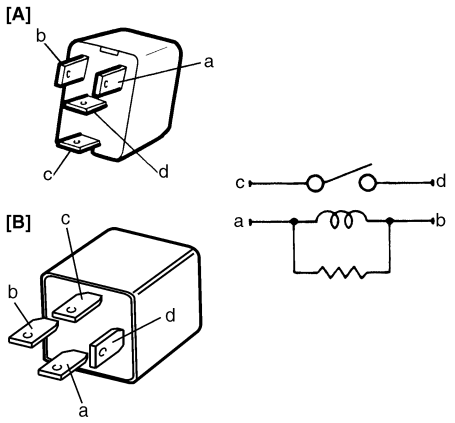
Fuel Pump Relay, Starting Motor Control Relay, Main Relay and Fuel Heater Relay Inspection

S7N20A1326014

NOTE

Check for installation position of each relay referring to "Connector Layout Diagram in Section 9A".

1) Check that there is no continuity between terminal "c" and "d". If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal "b" of relay. Connect battery negative (–) terminal "a" of relay. Check continuity between terminal "c" and "d". If there is no continuity when relay is connected to the battery, replace relay.



I5RS0B130017-01

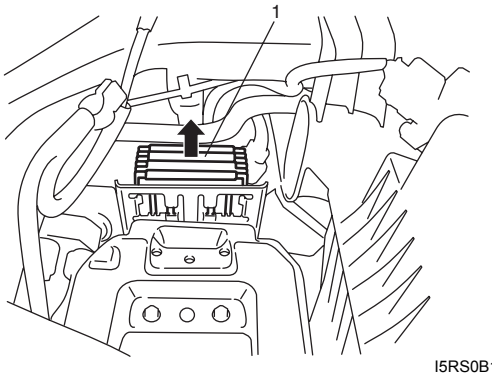
[A]:	Fuel pimp relay, Starting motor control relay
[B]:	Main relay, Fuel heating relay

Glow Plug Control Module Removal and Installation

S7N20A1326015

Removal

1) Remove battery from vehicle.
2) Remove glow plug control module (1) from bracket.



I5RS0B130018-01

3) Disconnect connector from glow plug control module.

Installation

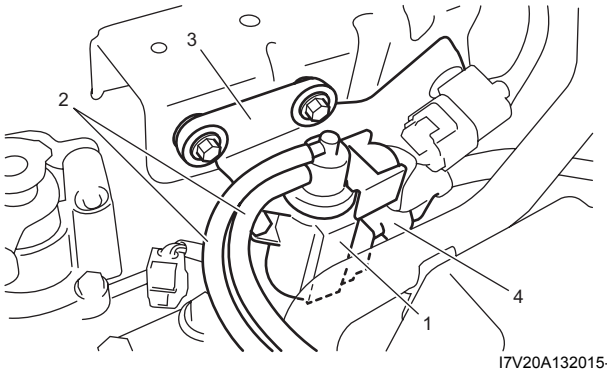
Reverse removal procedure for installation.

Boost Pressure Control Solenoid Valve Removal and Installation (DPF® Model)

S7N20A1326035

Removal

1) Disconnect negative (–) and positive (+) cable at battery.
2) Remove air cleaner assembly from vehicle referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Remove battery and battery tray.
4) Disconnect vacuum hoses (2) from boost pressure control solenoid valve (1).
5) Remove bracket (3) with boost pressure control solenoid valve (1).
6) Disconnect connector (4) from boost pressure control solenoid valve (1).
7) Remove boost pressure control solenoid valve (1) from bracket (3).



I7V20A132015-01

Installation

Reverse removal procedure for installation.

Boost Pressure Control Solenoid Valve Inspection (DPF® Model)

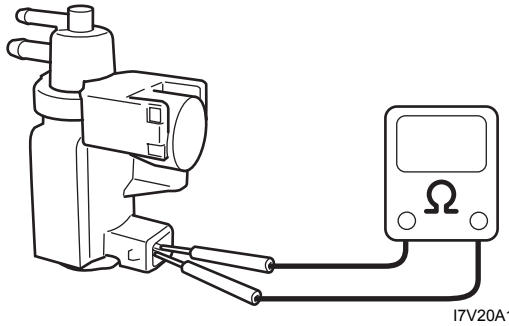
S7N20A1326036

⚠ CAUTION

Do not apply vacuum more than –90 kPa (–0.9 kgf/cm², –13.1 psi, 0.90 bar); otherwise boost pressure control solenoid valve could be damaged.

1) Check resistance between two terminals of boost pressure control solenoid valve.If resistance is out of specification, replace boost pressure control solenoid valve.

Resistance of boost pressure control solenoid valve
: 14.8 – 16.2 Ω at 20 °C (68 °F)

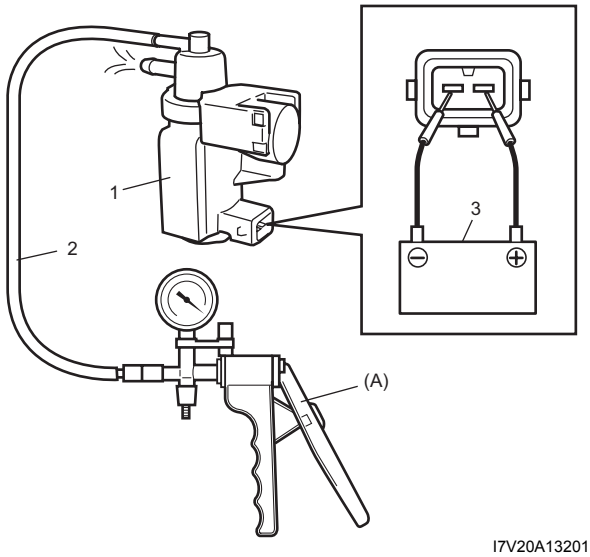


I7V20A132016-01

2) Check boost pressure control solenoid valve operation as follows.
   If faulty condition is found, replace boost pressure control solenoid valve.
   a) Connect special tool, hose (2) and 12 V battery (3) to boost pressure control solenoid valve (1).

      Special tool
      (A): 09917–47011

   b) When connecting 12 V battery to boost pressure control solenoid valve terminals, check that vacuum (–90 kPa, –0.9 kgf/cm^2, –13.1 psi, –0.90 bar) cannot be applied to boost pressure control solenoid valve.
   c) When not connecting 12 V battery to boost pressure control solenoid valve terminals, check that vacuum (–90 kPa, –0.9 kgf/cm^2, –13.1 psi, –0.90 bar) can be applied to boost pressure control solenoid valve.



I7V20A132017-01

Specifications

Tightening Torque Specifications

S7N20A1327001

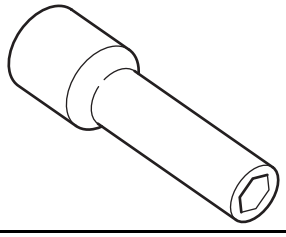
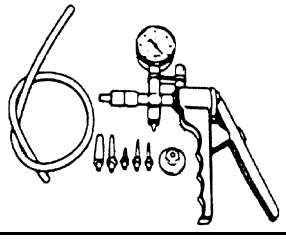
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
ECM bolt	10	1.0	7.5	☞
ECM bracket bolt	10	1.0	7.5	☞
Glow plug	8.0	0.82	6.0	☞
APP sensor assembly nut	5.5	0.56	4.0	☞
APP sensor bracket bolt	13	1.3	9.0	☞
ECT sensor	22	2.2	16.5	☞
CMP sensor bolt	8.0	0.82	6.0	☞
Engine cover bolt	8.0	0.82	6.0	☞ / ☞
CKP sensor bolt	8.0	0.82	6.0	☞
Boost pressure sensor bolt	1.0	0.10	1.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A1328001

09911–78610 Glow plug wrench ☞ / ☞		09917–47011 Vacuum pump gauge ☞	

Engine Mechanical

M13A / M15A / M16A

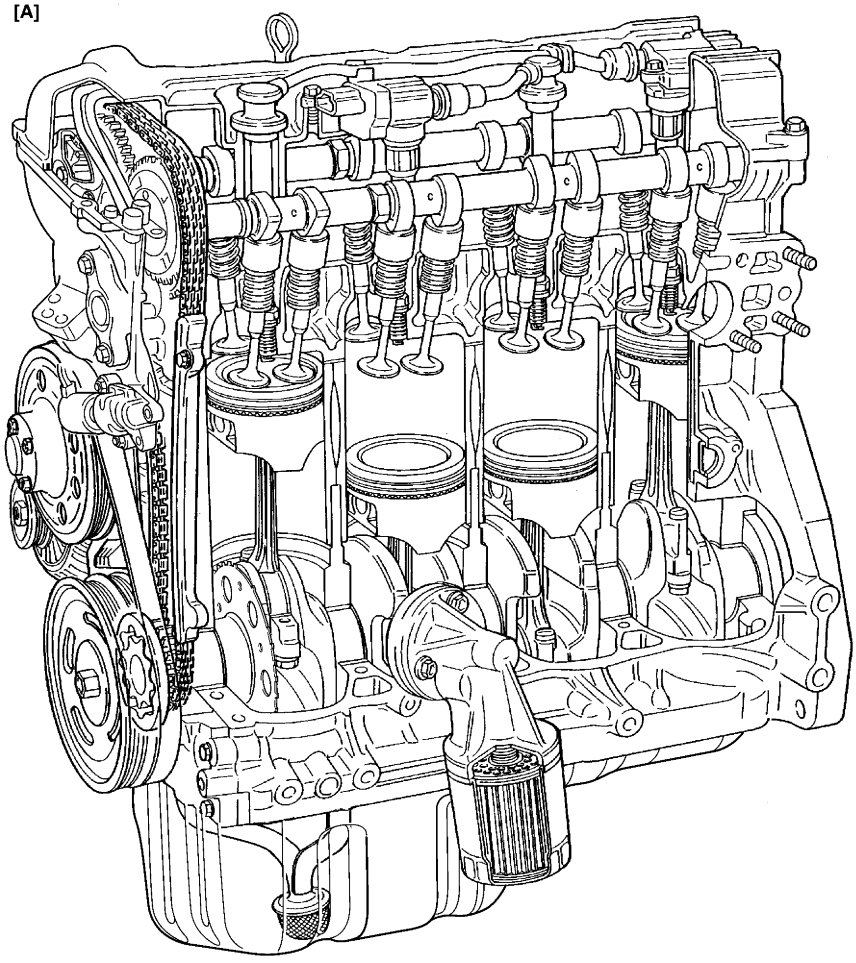
General Description

Engine Construction Description

S7N20A1411001

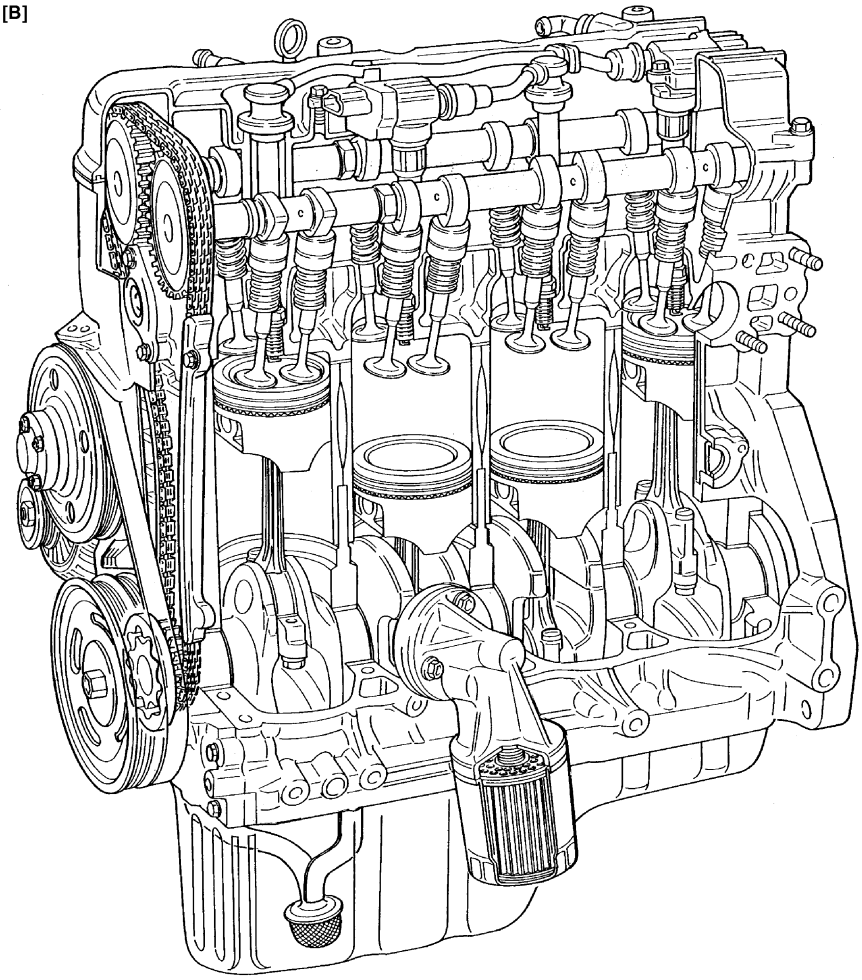
The engine is water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit with its DOHC (Double overhead camshaft) valve mechanism arranged for “V” type valve configuration and 16 valves (4 valves/one cylinder). The double overhead camshaft is mounted over the cylinder head; it is driven from crankshaft through timing chain, and no push rods are provided in the valve train system.

[A]



I4RS0B140001-05

[B]



I4RS0B140002-01

[A]: For engine with VVT system
[B]: For engine without VVT system

Camshaft Position Control (VVT Variable Valve Timing) System Description

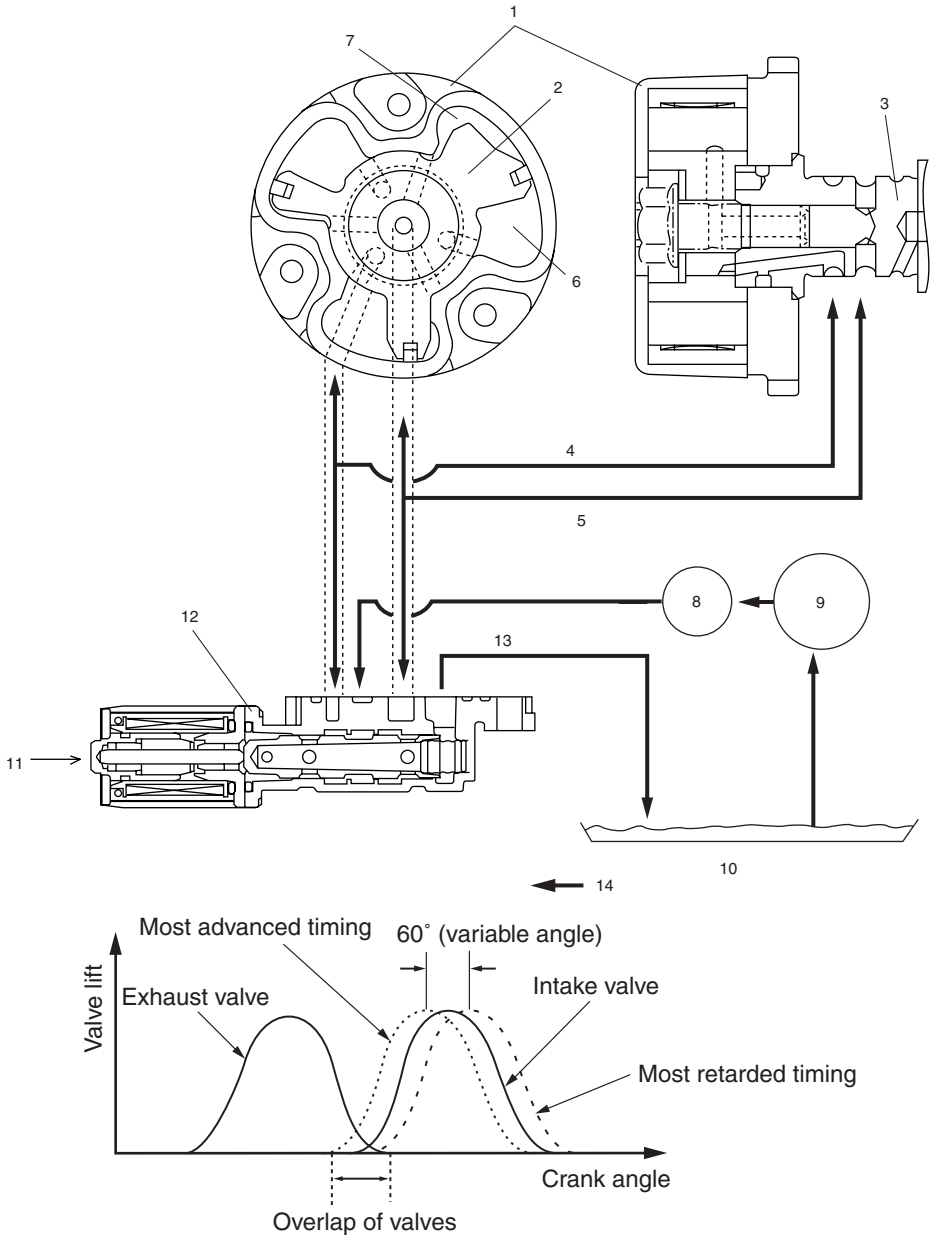
S7N20A1411002

System Description

The VVT system is an electronic control system which continuously vary and optimize the intake valve timing in response to the engine operating condition.

The optimized intake valve timing produce such an air intake with high efficiency that both the higher power generation and lower fuel consumption can be attained in the whole engine speed range from low to high. In the area of the average engine load, low emission of nitrogen oxides (NOx) and high fuel efficiency can also be attained by making the valve opening overlap between the intake and exhaust valves longer.

For the brief of the system operation, the intake valve timing is varied by the cam timing sprocket (1) which varies the rotational phase between the intake camshaft (3) and sprocket. The rotor (2) in the cam timing sprocket is actuated by switching or adjusting the hydraulic pressure applied to the chambers for the timing advancing (7) and/or retarding (6). To switch or adjust the hydraulic pressure appropriately, ECM operates the oil control valve (12) with detecting the engine speed, intake air value, throttle opening, engine coolant temperature and camshaft position (angle).



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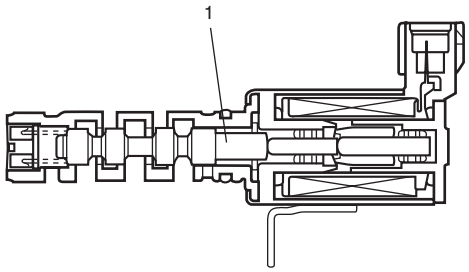
4. Oil passage to chamber for timing retarding	8. Oil filter	10. Oil pan	13. Oil return
5. Oil passage to chamber for timing advancing	9. Oil pump	11. Control signal from ECM	14. Oil flow

Oil Control Valve

The oil control valve switches and adjusts the hydraulic pressure applied to the cam timing sprocket by moving the spool valve (1) according to the duty pulse signals output from the ECM. By this operation, the intake valve timing is varied continuously. Signals output from the ECM are the duty pulse of about 240 Hz.



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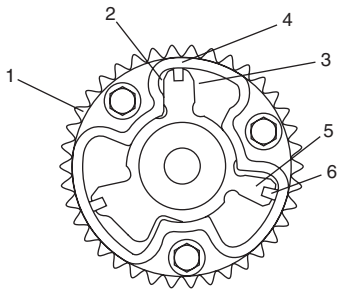
Cam Timing Sprocket

The cam timing sprocket is equipped with the chambers for timing advancing (2) and retarding (3) which are separated by the rotor (5). The rotor rotates receiving the hydraulic pressure applied to both the chambers. The sprocket (1) is installed on the housing (4) and the rotor is secured on the intake camshaft by fastening the bolts. Therefore, the actuation of the rotor makes the phase difference between the sprocket and intake camshaft.



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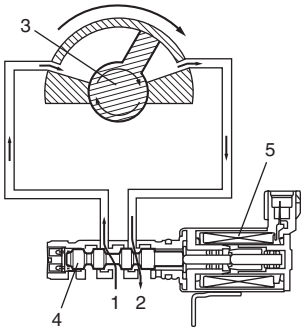
6. Seal

Timing Advancing

When the duty ratio of the signal output from the ECM is heavy, the spool valve (4) of the oil control valve moves to the left (opposite direction against the coil (5)). By this spool valve movement, the pressurized oil (1) is led into the chambers for timing advancing and the oil in the chambers for timing retarding is drained. This operations actuate the rotor (3) and result in the advanced timing of the intake valve.



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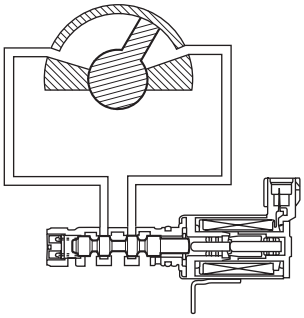
2. Drain

Timing Holding

When the duty ratio of the signal output from the ECM shows that of holding, the spool valve of the oil control valve is located at hold position. Because this condition generates no oil pressure changes in both chambers, the rotor is fixed at a target position.



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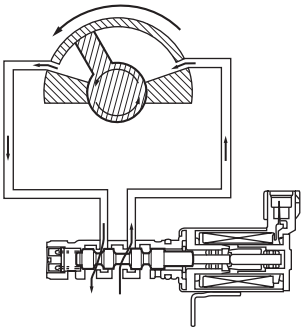
Timing Retarding

When the duty ratio of the signal output from the ECM is light, the spool valve of the oil control valve moves to the right (head for the coil). By this spool valve movement, the pressurized oil is led into the chambers for timing retarding and the oil in the chambers for timing advancing is drained. This operations actuate the rotor and result in the retarded timing of the intake valve.



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Targeted Timing Varying Operation

Driving condition	Valve timing	Target of control	Effect
Engine running at idle speed	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Stabilization of the engine rotation at idle speed.
Average engine load range	To the advanced side	To lengthen the valve opening overlap in order to enhance the internal exhaust gas recirculation and reduce the pumping loss.	Improvement of the fuel efficiency. Lowering of the exhaust emission.
Light engine load range	To the retarded side	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Keeping of the engine stability.
Low or average engine speed range with heavy engine load	To the advanced side	To advance the closing timing of the intake valve in order to improve the volumetric efficiency.	Improvement of generating the engine torque at low and average engine speed.
High engine speed range with heavy engine load	To the retarded side	To retard the closing timing of the intake valve in order to improve the volumetric efficiency.	Improvement of generating the engine power.
Low engine coolant temperature	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold and reduce the fuel increasing. To slow the fast idle speed of the engine as a result of stabilizing the engine idling.	Stabilization of the fast idling of the engine. Improvement of the fuel efficiency.
At engine starting and stopping	Most retarded	To shorten the valve opening overlap in order to prevent the exhaust gas counterflow to intake manifold.	Improvement of start ability.

Diagnostic Information and Procedures

Compression Check

S7N20A1414001

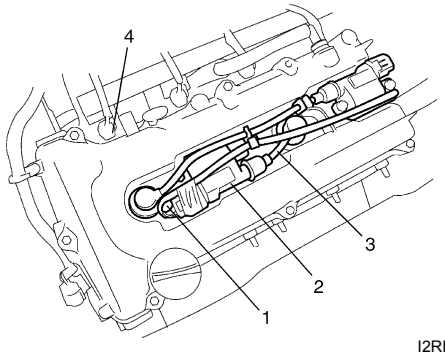
Check compression pressure on all 4 cylinders as follows:

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

NOTE

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

3) Disconnect negative cable at battery.
4) Remove engine cover (for M16A engine model).
5) Remove air cleaner assembly and air suction hose referring to "Air Cleaner Components: M13A / M15A / M16A".
6) Remove cylinder head upper cover.
7) Disconnect ignition coil couplers (1).
8) Remove ignition coil assemblies (2) with high-tension cord (3).
9) Remove all spark plugs.
10) Disconnect fuel injector wires (4) at the coupler.



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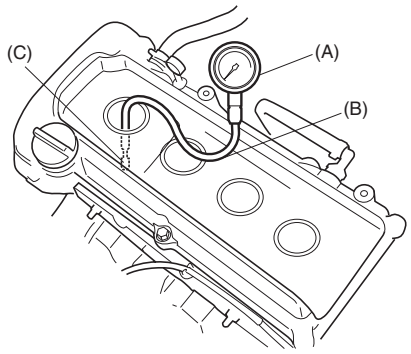
11) Connect negative cable at battery.
12) Install special tools (Compression gauge) into spark plug hole.

Special tool
(A): 09915–64512
(B): 09915–64530
(C): 09915–67010



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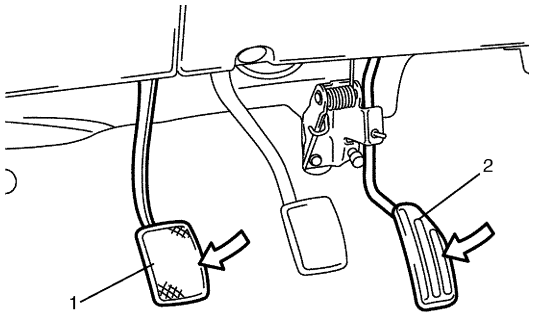
13) Disengage clutch (1) (to lighten starting load on engine) for M/T vehicle, and depress accelerator pedal (2) all the way to make throttle fully open.



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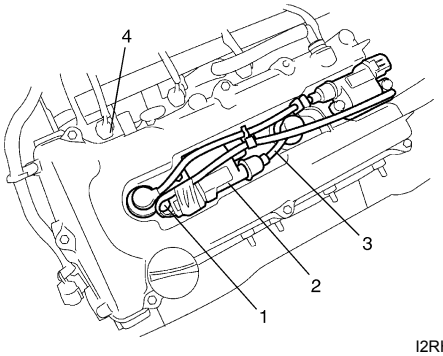
14) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE

- **For measuring compression pressure, crank engine at least 250 r/min. 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 where piston ring and valve contact.**

Compression pressure
Standard: 1400 kPa (14.0 kg/cm², 199.0 psi)
Limit: 1100 kPa (11.0 kg/cm², 156.0 psi)
Max. difference between any two cylinders: 100 kPa (1.0 kg/cm², 14.2 psi)

15) Carry out Steps 12) through 14) on each cylinder to obtain 4 readings.
16) Disconnect negative cable at battery.
17) After checking, install spark plugs and ignition coil assemblies (2) with high-tension cord (3).
18) Connect ignition coil couplers (1).
19) Connect fuel injector wires (4) at the coupler.



I2RH0B140003-01

20) Install cylinder head upper cover.
21) Install air cleaner assembly and air suction hose referring to “Air Cleaner Components: M13A / M15A / M16A”.
22) Install engine cover (for M16A engine model).
23) Connect negative cable at battery.

Engine Vacuum Check

S7N20A1414002

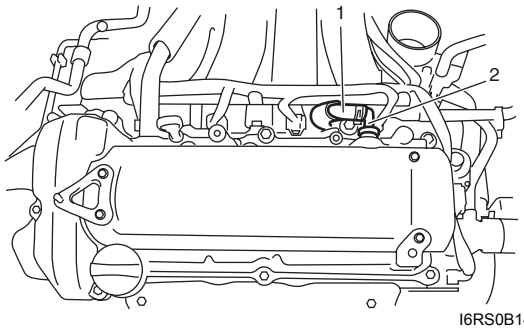
The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1) Warm up engine to normal operating temperature.

NOTE

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

2) Stop engine and turn off the all electric switches.
3) Remove engine cover (for M16A engine model).
4) Remove air cleaner assembly and air suction hose referring to “Air Cleaner Components: M13A / M15A / M16A”.
5) Remove PCV hose (1) from PCV valve (2).

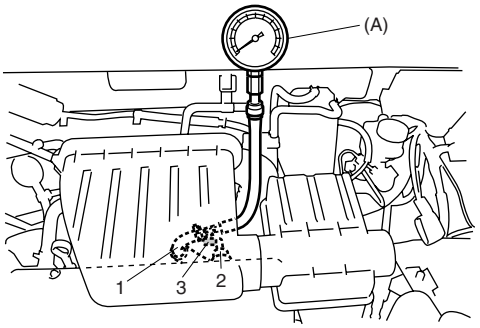


I6RS0B141001-01

6) Connect special tool (Vacuum gauge) to PCV hose (1).

Special tool
(A): 09915–67311

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



I3RM0A140003-01

8) Install air cleaner assembly and air suction hose referring to “Air Cleaner Components: M13A / M15A / M16A”.
9) Run engine at specified idle speed and read vacuum gauge. Vacuum should be within specification.

Vacuum specification (at sea level)
59 – 73 kPa (45 – 55 cmHg, 17.7 – 21.6 in.Hg) at specified idle speed

10) Remove air cleaner assembly and air suction hose referring to “Air Cleaner Components: M13A / M15A / M16A”.
11) Disconnect special tool (vacuum gage) from PCV valve.
12) Detach blind cap from PCV valve, and connect PCV hose to PCV valve.
13) Install air cleaner assembly and air suction hose referring to “Air Cleaner Components: M13A / M15A / M16A”.
14) Install engine cover (for M16A engine model).

Valve Lash (Clearance) Inspection

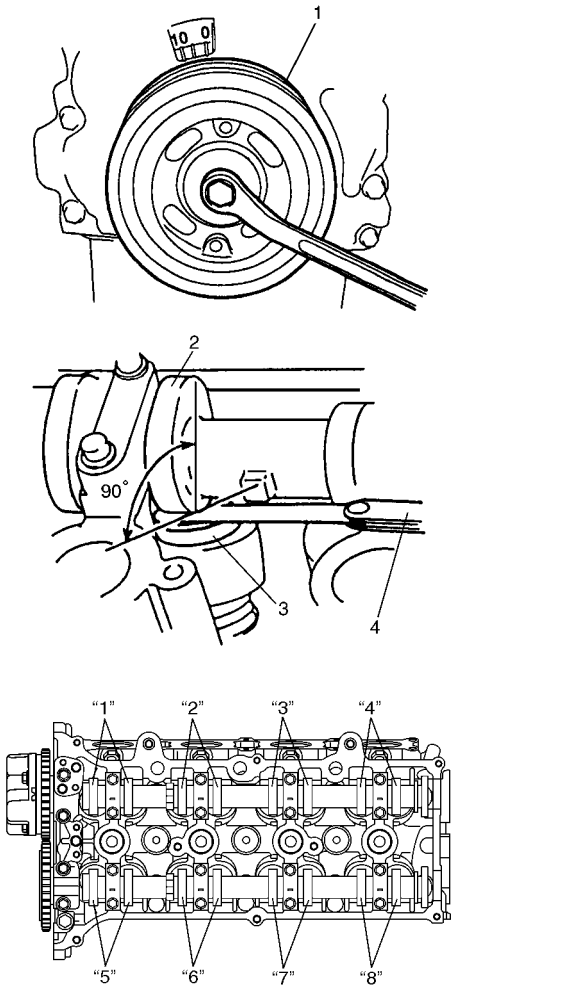
S7N20A1414003

1) Remove negative cable at battery.
2) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: M13A / M15A / M16A”.
3) Remove right side engine under cover, if necessary.
4) Using 17 mm wrench, turn crankshaft pulley (1) clockwise until cam lobes (2) become perpendicular to shim faces (3) at valves “1” and “7” as shown in the figure.
5) Check valve lashes with thickness gauge (4) according to the following procedure.
   a) Check valve lashes at valves “1” and “7”.
   b) Turn camshafts by 90° (by turning crankshaft with wrench).
   c) Make sure that cam lobes are perpendicular to shim faces at valves to be checked (in this case, “3” and “8”), if not, adjust it by turning crankshaft. Check valve lashes.
   d) In the same manner as b) – c), check valve lashes at valves “4” and “6”.
   e) In the same manner as b) – c) again, check valve lashes at valves “2” and “5”.

If valve lash is out of specification, record valve lash and adjust it to specification by replacing shim.

Valve clearance specification
When cold (Coolant temperature is 15 – 25 °C (59 – 77 °F)):
- **Intake: 0.18 – 0.22 mm (0.007 – 0.009 in.)**
- **Exhaust: 0.28 – 0.32 mm (0.011 – 0.013 in.)**

When hot (Coolant temperature is 60 – 68 °C (140 – 154 °F)):
- **Intake: 0.21 – 0.27 mm (0.008 – 0.011 in.)**
- **Exhaust: 0.30 – 0.36 mm (0.012 – 0.014 in.)**



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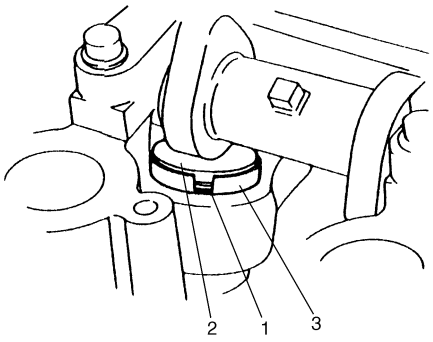
Replacement of Shim

1) Close the valve whose shim (2) is to be replaced by turning crankshaft, then turn tappet (3) till its cut section (1) faces inside as shown in the figure.



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2) Lift down the valve by turning crankshaft to 360°.

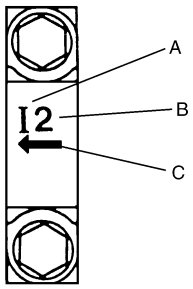
3) Hold tappet at that position using special tool as follows.

a) Remove its housing bolts.

b) Check housing No. and select special tool corresponding to housing No., referring to "Special tool selection table".

Special tool selection table

No. on camshaft housing	Embossed mark on special tool
I2	IN2
I3, I4, I5	IN345
E2	EX2
E3, E4, E5	EX345



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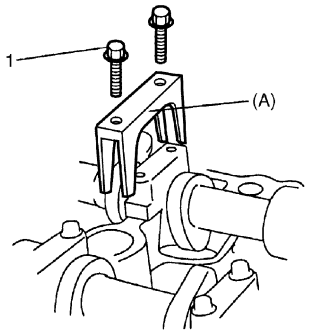
A:	I: Intake side or E: Exhaust side
B:	Position from timing chain side
C:	Pointing to timing chain side

c) Hold down the tappet so as not to contact the shim by installing special tool on camshaft housing with housing bolt (1) tighten housing bolts to by hand.

Special tool
(A): 09916–67020
(A): 09916–67021



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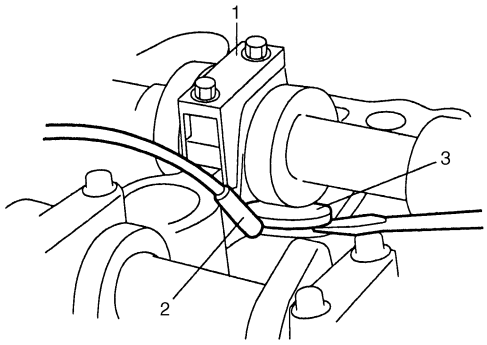
4) Turn camshaft by approximately 90° clockwise and remove shim (3).

⚠ WARNING

Never put in the hand between camshaft and tappet.

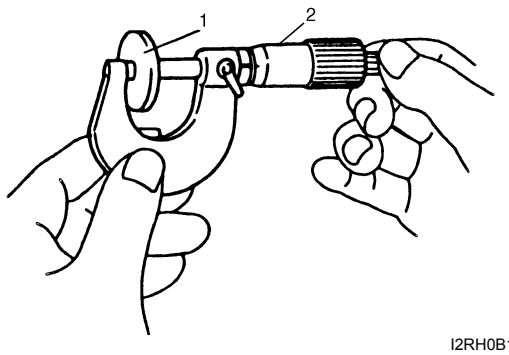


I2RH0B140013-01

1.	Special tool
2.	Magnet

5) Using a micrometer (2), measure the thickness of the removed shim (1), and determine replacement shim by calculating the thickness of new shim with the following formula and table.

Shim thickness specification
Intake side:
A = B + C – 0.20 mm (0.008 in.)
Exhaust side:
A = B + C – 0.30 mm (0.012 in.)
A: Thickness of new shim
B: Thickness of removed shim
C: Measured valve clearance



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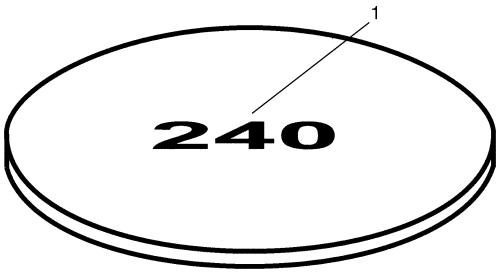
For example of intake side:
When thickness of removed shim is 2.40 mm (0.094 in.), and measured valve clearance is 0.45 mm (0.018 in.).
A = 2.40 mm (0.094 in.) + 0.45 mm (0.018 in.) – 0.20 mm (0.008 in.) = 2.65 mm (0.104 in.)
Calculated thickness of new shim = 2.65 mm (0.104 in.)

6) Select new shim No. (1) with a thickness as close as possible to calculated value.

Available new shims No.

Thickness mm (in.)	Shim No.	Thickness mm (in.)	Shim No.
2.175 (0.0856)	218	2.600 (0.1024)	260
2.200 (0.0866)	220	2.625 (0.1033)	263
2.225 (0.0876)	223	2.650 (0.1043)	265
2.250 (0.0886)	225	2.675 (0.1053)	268
2.275 (0.0896)	228	2.700 (0.1063)	270
2.300 (0.0906)	230	2.725 (0.1073)	273
2.325 (0.0915)	233	2.750 (0.1083)	275
2.350 (0.0925)	235	2.775 (0.1093)	278
2.375 (0.0935)	238	2.800 (0.1102)	280
2.400 (0.0945)	240	2.825 (0.1112)	283
2.425 (0.0955)	243	2.850 (0.1122)	285
2.450 (0.0965)	245	2.875 (0.1132)	288
2.475 (0.0974)	248	2.900 (0.1142)	290
2.500 (0.0984)	250	2.925 (0.1152)	293
2.525 (0.0994)	253	2.950 (0.1161)	295
2.550 (0.1004)	255	2.975 (0.1171)	298
2.575 (0.1014)	258	3.000 (0.1181)	300

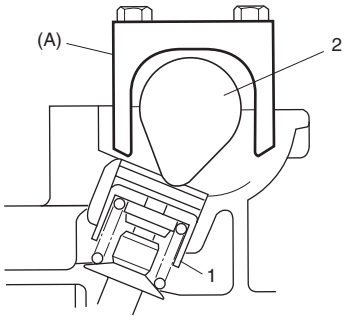
7) Install new shim facing shim No. side with tappet.



I2RH0B140015-01

8) Lift valve by turning crankshaft counterclockwise (in opposite direction against above Step 4)) and remove special tool.

Special tool
(A): 09916–67020
(A): 09916–67021

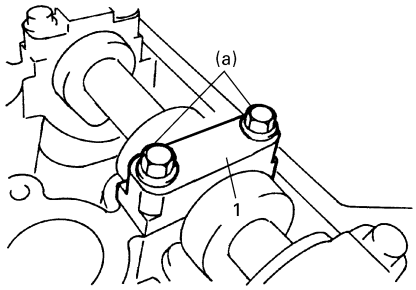


I3RM0A140006-01

1.	Tappet
2.	Camshaft

9) Install camshaft housing (1) and tighten bolts to specified torque.

Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



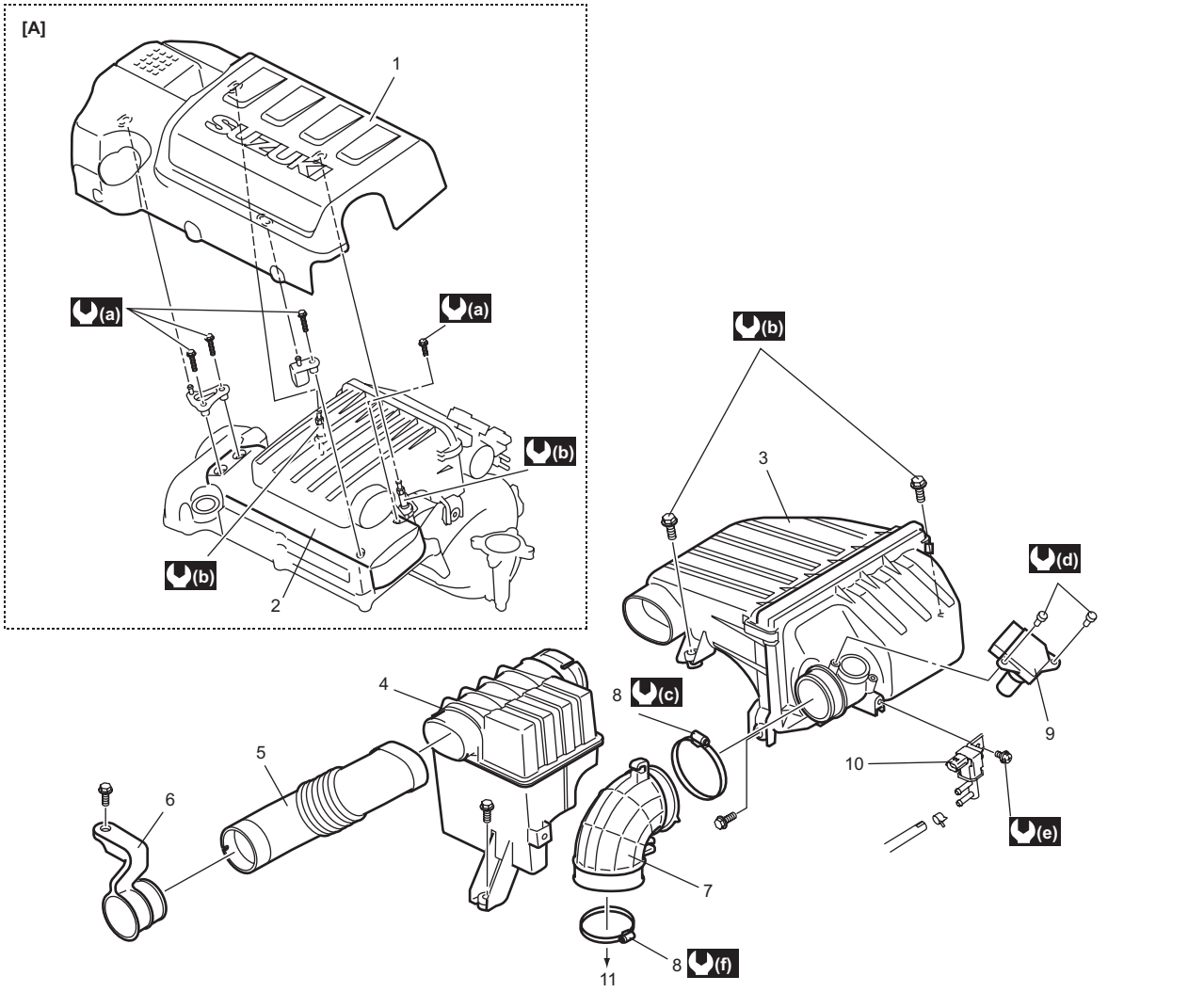
I2RH0B140149-01

10) Check valve clearance again after adjusting it.
11) After checking and adjusting all valves.
12) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: M13A / M15A / M16A”.

Repair Instructions

Air Cleaner Components

S7N20A1416001



I7N20A141001-01

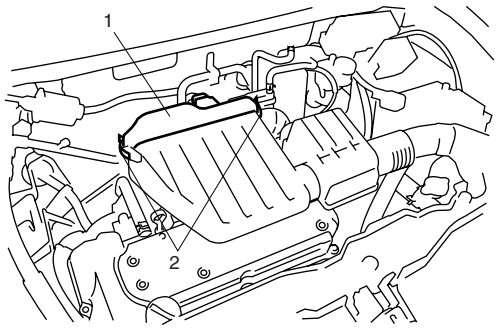
[A]: For M16A engine model	6. Air cleaner suction pipe	(a) : 8 N·m (0.8 kgf-m, 6.0 lbf-ft)
1. Engine Cover	7. Air cleaner outlet hose	(b) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
2. Cylinder head upper cover	8. Hose clamp	(c) : 2 N·m (0.2 kgf-m, 1.5 lbf-ft)
3. Air cleaner assembly	9. MAF sensor	(d) : 1.5 N·m (0.15 kgf-m, 1.0 lbf-ft)
4. Air intake pipe	10. EVAP canister purge valve	(e) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)
5. Air suction hose	11. To throttle body	(f) : 3.1 N·m (0.31 kgf-m, 2.5 lbf-ft)

Air Cleaner Element Removal and Installation

S7N20A1416002

Removal

1) Remove engine cover (for M16A engine model).
2) Open air cleaner case (1) by unhooking its clamps (2).
3) Remove air cleaner element from case.



I3RM0A140007-01

Installation

Reverse removal procedure for installation.

Air Cleaner Element Inspection and Cleaning

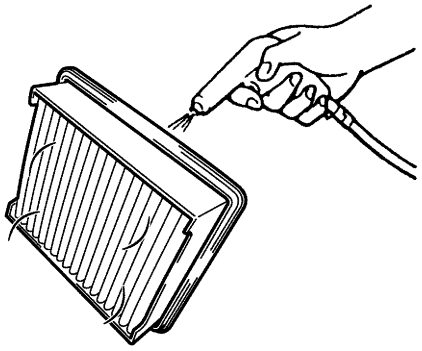
S7N20A1416003

Inspection

Check air cleaner element for dirt. Replace excessive dirty element.

Cleaning

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



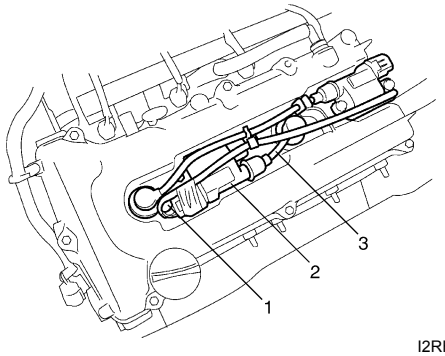
I2RH0B140150-01

Cylinder Head Cover Removal and Installation

S7N20A1416004

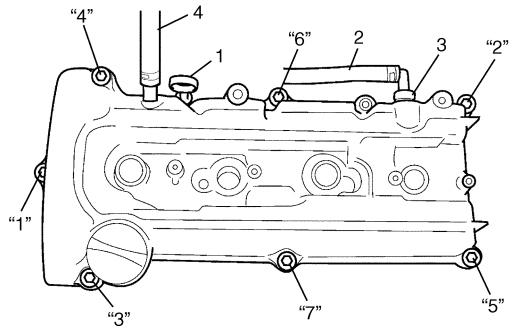
Removal

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly and air suction hose referring to “Air Cleaner Components: M13A / M15A / M16A”.
3) Remove cylinder head upper cover.
4) Disconnect ignition coil couplers (1).
5) Remove ignition coil assemblies (2) with high-tension cord (3).
6) Remove wire harness clamp from cylinder head cover.



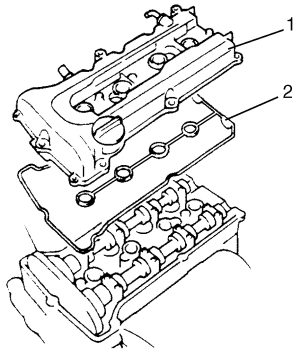
I2RH0B140032-01

7) Remove oil level gauge (1).
8) Disconnect PCV hose (2) from PCV valve (3) and disconnect breather hose (4) from cylinder head cover.
9) Remove cylinder head cover mounting bolts in such order as indicated in the figure.



I2RH0B140033-01

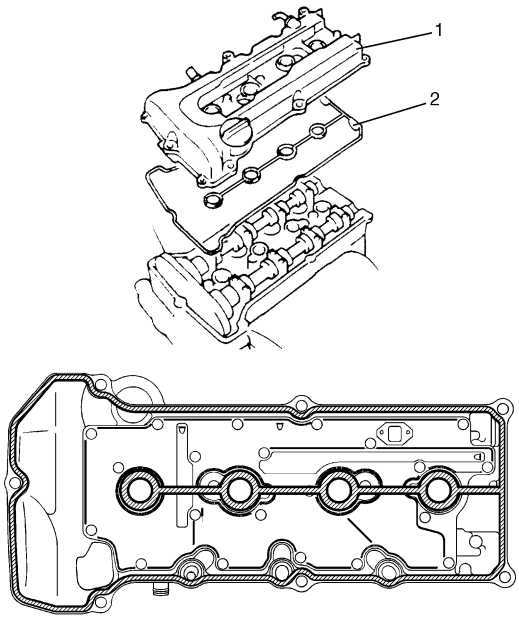
10) Remove cylinder head cover (1) with cylinder head cover gasket (2).



I6RS0B141004-01

Installation

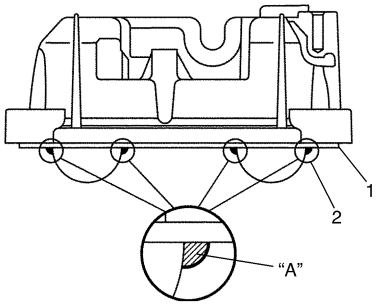
1) Install new cylinder head cover gasket (2) to cylinder head cover (1) as shown in the figure.



I6RS0B141005-01

2) Remove oil, old sealant, and dust from sealing surfaces on cylinder head and cover. After cleaning, apply sealant “A” to the following point.
   - Cylinder head cover gasket (1) sealing surface area (2) as shown.

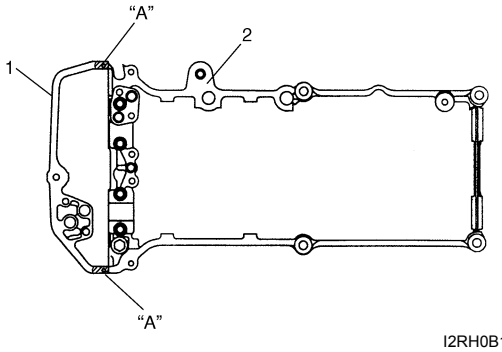
     “A”: Sealant 99000–31250 (SUZUKI Bond No.1207F)



I2RH0B140036-01

   - Timing chain cover (1) and cylinder head (2) mating surface as shown.

     “A”: Water tight sealant 99000–31250 (SUZUKI Bond No.1207F)



I2RH0B140037-01

3) Install cylinder head cover to cylinder head.

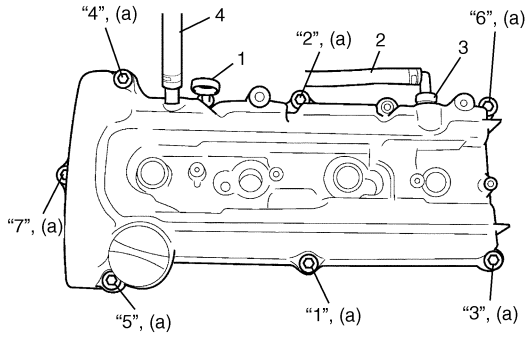
NOTE

When installing cylinder head cover, use care so that cylinder head cover gasket or spark plug hole gaskets will not get out of place or fall off.

4) Tighten cylinder head cover bolts as follows.
   a) Tighten cylinder head cover bolts to 3 N·m (0.3 kgf-m, 2.5 lbf-ft) according to numerical order (“1” through “7”) as shown in figure.
   b) In the same manner as in Step, a) tighten them to 5 N·m (0.5 kgf-m, 4.0 lbf-ft).
   c) Retighten them by turning through 8 N·m (0.8 kgf-m, 6.0 lbf-ft) in same manner as Step a).

Tightening torque
Cylinder head cover bolt (a): Tighten 3 N·m (0.3 kgf-m, 2.5 lbf-ft), 5 N·m (0.5 kgf-m, 4.0 lbf-ft) and 8 N·m (0.8 kgf-m, 6.0 lbf-ft) by the specified procedure

5) Connect PCV hose (2) to PCV valve (1).
6) Connect breather hose (4).
7) Install oil level gauge.

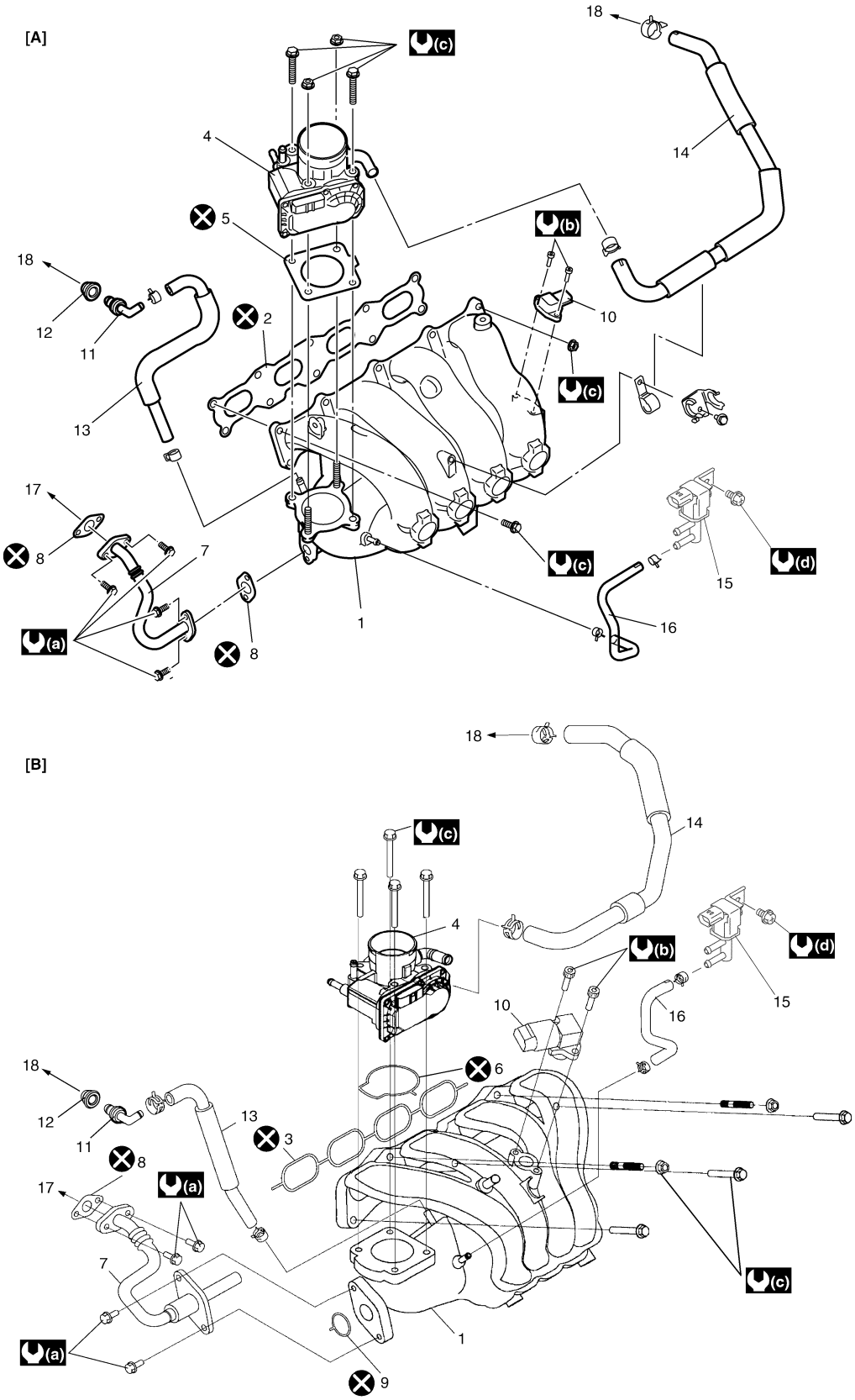


I3RH0B140016-01

8) Install wire harness clamp to cylinder head cover.
9) Install ignition coil assemblies with high-tension cord.
10) Connect ignition coil couplers and clamp harness securely.
11) Install cylinder head upper cover.
12) Install air cleaner case and resonator.
13) Connect negative cable at battery.

Throttle Body and Intake Manifold Components

S7N20A1416006



I7N20A141007-01

[A]: For M16A engine model	6. Throttle body O-ring	13. PCV hose	(b) : 8 N·m (0.8 kgf-m, 6.0 lbf-ft)
[B]: For other than M16A engine model	7. EGR pipe	14. Breather hose	(c) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
1. Intake manifold	8. Gasket	15. EVAP canister purge valve	(d) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)

2. Intake manifold gasket	9. O-ring	16. EVAP canister purge valve hose	⊗ : Do not reuse.
3. Intake manifold O-ring	10. MAP sensor	17. To EGR valve	
4. Throttle body	11. PCV valve	18. To cylinder head cover	
5. Throttle body gasket	12. PCV valve seal	(a) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)	

Throttle Body On-Vehicle Inspection

S7N20A1416007

Check electric throttle body assembly referring to "Throttle Valve Operation Check" and "Electric Throttle Body Assembly Operation Check" under "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C".

Electric Throttle Body Assembly Removal and Installation

S7N20A1416010

⚠ CAUTION

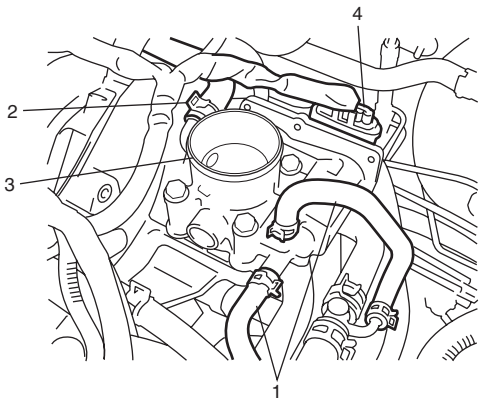
Never disassemble electric throttle body. Disassembly will spoil its original performance. If faulty condition is found, replace it with new one.

NOTE

After replacing electric throttle body assembly, perform calibration of throttle valve referring to "Electric Throttle Body System Calibration: M13A / M15A / M16A in Section 1C".

Removal

1) Disconnect negative cable at battery.
2) Drain coolant referring to "Cooling System Draining: M13A / M15A / M16A in Section 1F".
3) Remove air cleaner assembly referring to "Air Cleaner Components: M13A / M15A / M16A".
4) Detach EVAP canister and purge valve chamber, and remove air cleaner outlet hose.
5) Disconnect engine coolant hoses (1) and breather hose (2) from electric throttle body assembly (3).
6) Disconnect connector (4) from electric throttle body assembly.

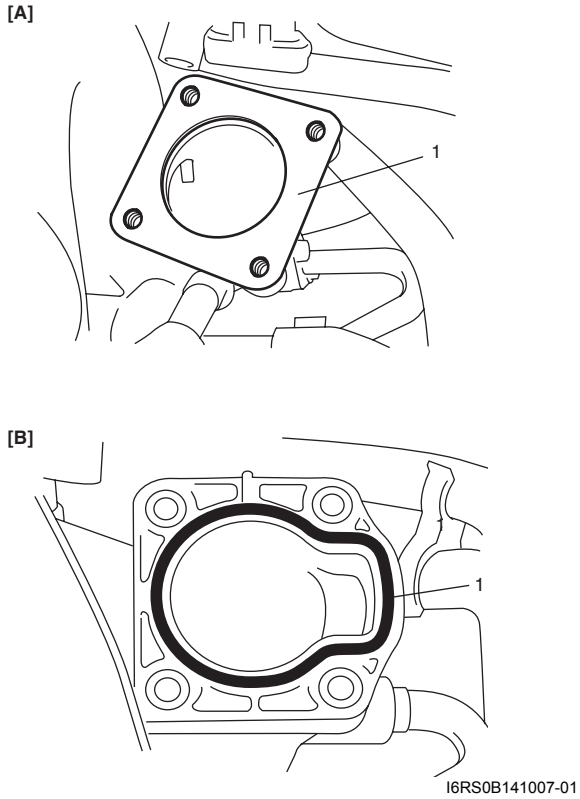


I4RS0B140004-02

7) Remove electric throttle body assembly from intake manifold.

Installation

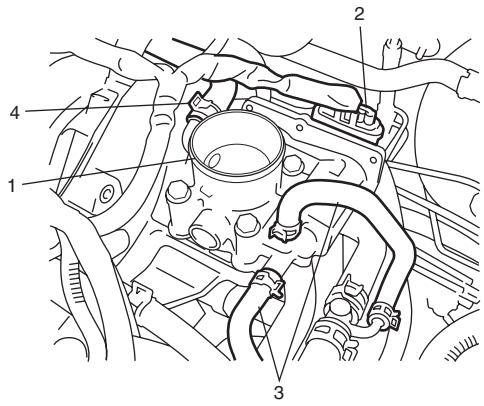
1) Clean mating surfaces and install new throttle body gasket (1) to intake manifold.



I6RS0B141007-01

[A]: For M16A engine model
[B]; For other than M16A engine model

2) Install electric throttle body assembly (1) to intake manifold.
3) Connect connector (2) to electric throttle body assembly securely.
4) Connect engine coolant hoses (3) and breather hose (4) to electric throttle body assembly (1).



I4RS0B140006-01

5) Install air cleaner assembly referring to “Air Cleaner Components: M13A / M15A / M16A”.
6) Install EVAP canister and purge valve chamber and air cleaner outlet hose.
7) Refill coolant referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
8) Connect negative cable at battery.

Throttle Body Cleaning

S7N20A1416011

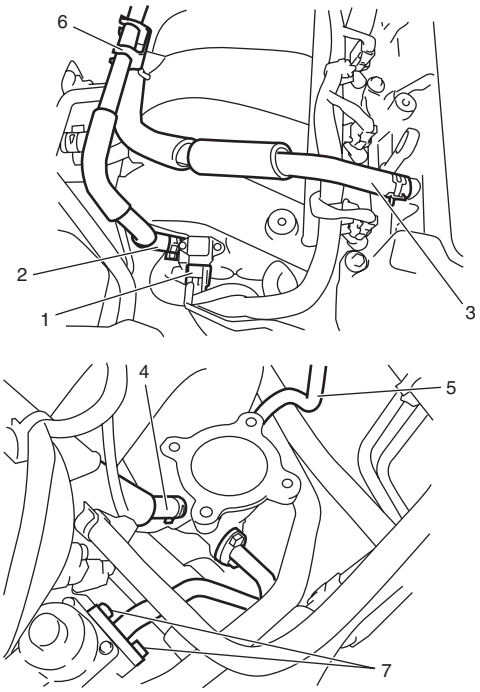
Clean electric throttle body assembly referring to “Throttle Valve Visual Check” under “Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C”.

Intake Manifold Removal and Installation (For M16A Engine Model)

S7N20A1416013

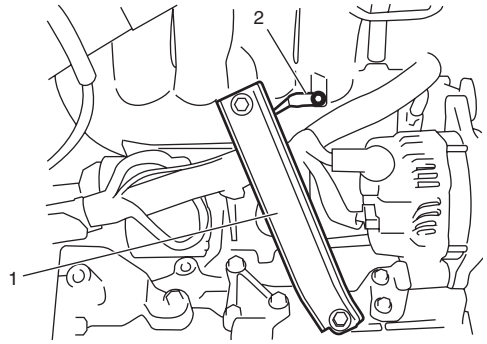
Removal

1) Remove cowl top plate referring to “Cowl Top Components in Section 9K”.
2) Remove throttle body referring to “Electric Throttle Body Assembly Removal and Installation: M13A / M15A / M16A”.
3) Disconnect MAP sensor coupler (1).
4) Disconnect the following hoses:
   - Brake booster hose (2) from cylinder head cover
   - Breather hose (3) from cylinder head cover
   - PCV hose (4) from intake manifold
   - EVAP canister purge valve hose (5) from intake manifold
5) Remove hose clamp (6) from intake manifold.
6) Remove EGR pipe bolt (7) from EGR valve.



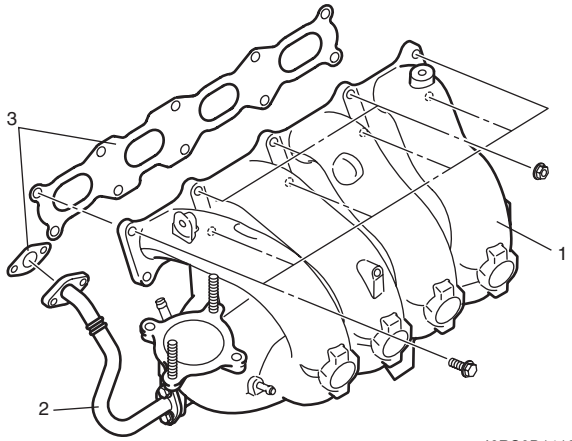
I6RS0B141008-01

7) Remove stiffener (1) and ground terminal (2) from intake manifold.



I6RS0B141010-01

8) Remove intake manifold (1) with EGR pipe (2) from cylinder head, and then remove their gaskets (3).



I6RS0B141009-01

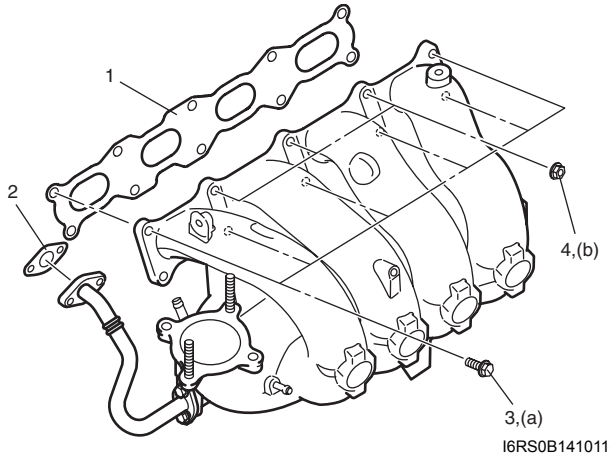
9) Remove EGR pipe from intake manifold, if necessary.

Installation

Reverse removal procedure for installation noting the followings.

- Use new intake manifold gasket (1).
- Use new EGR pipe gasket (2).
- Install intake manifold bolts (3) and nuts (4) to specified torque.

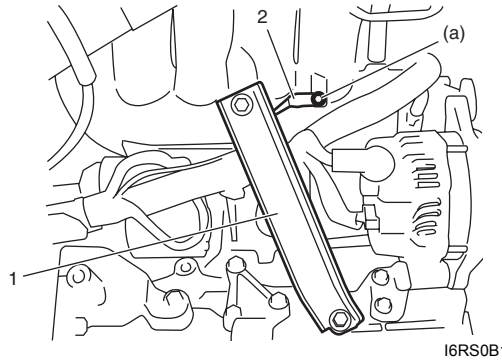
Tightening torque
Intake manifold bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
Intake manifold nut (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I6RS0B141011-01

- Install intake manifold rear stiffener (1) as shown in figure.
- Connect ground terminal (2) to intake manifold to specified torque.

Tightening torque
Intake manifold ground terminal bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I6RS0B141012-01

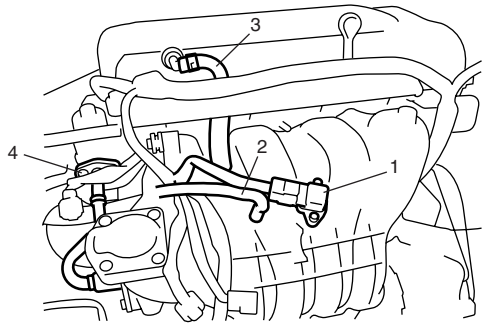
- Install throttle body referring to “Electric Throttle Body Assembly Removal and Installation: M13A / M15A / M16A”.
- Install cowl top plate referring to “Cowl Top Components in Section 9K”.
- Refill cooling system referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine coolant leaks.

Intake Manifold Removal and Installation (For Other Than M16A Engine Model)

S7N20A1416014

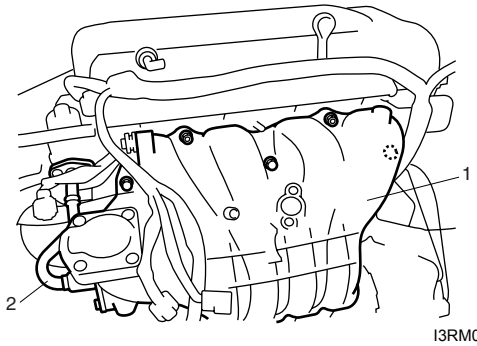
Removal

1) Remove throttle body referring to “Electric Throttle Body Assembly Removal and Installation: M13A / M15A / M16A”.
2) Disconnect MAP sensor coupler (1).
3) Disconnect the following hoses:
   - Brake booster hose (2) from intake manifold
   - PCV hose (3) from PCV valve
4) Remove EGR pipe bolt (4) from EGR valve.



I4RS0A140004-01

5) Remove EGR pipe (2) from intake manifold and intake manifold (1) from cylinder head, and then remove its gasket and O-ring.



I3RM0A140018-01

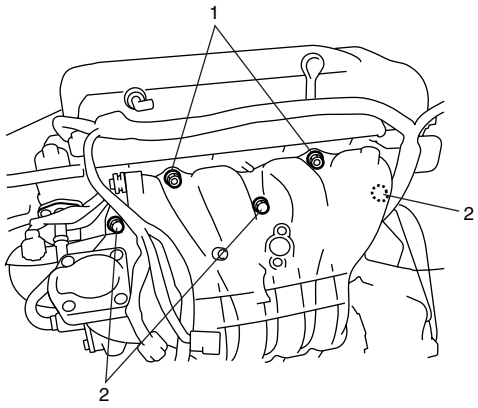
Installation

Reverse removal procedure for installation noting the followings.

- Use new intake manifold O-ring.
- Use new EGR pipe gasket and O-ring.
- Tighten EVAP canister purge valve bracket bolt to specified torque.

  Tightening torque
  EVAP canister purge valve bracket bolt: 5 N·m (0.5 kgf-m, 4.0 lbf-ft)

- Install intake manifold bolt (2) and nut (1) as shown in figure.

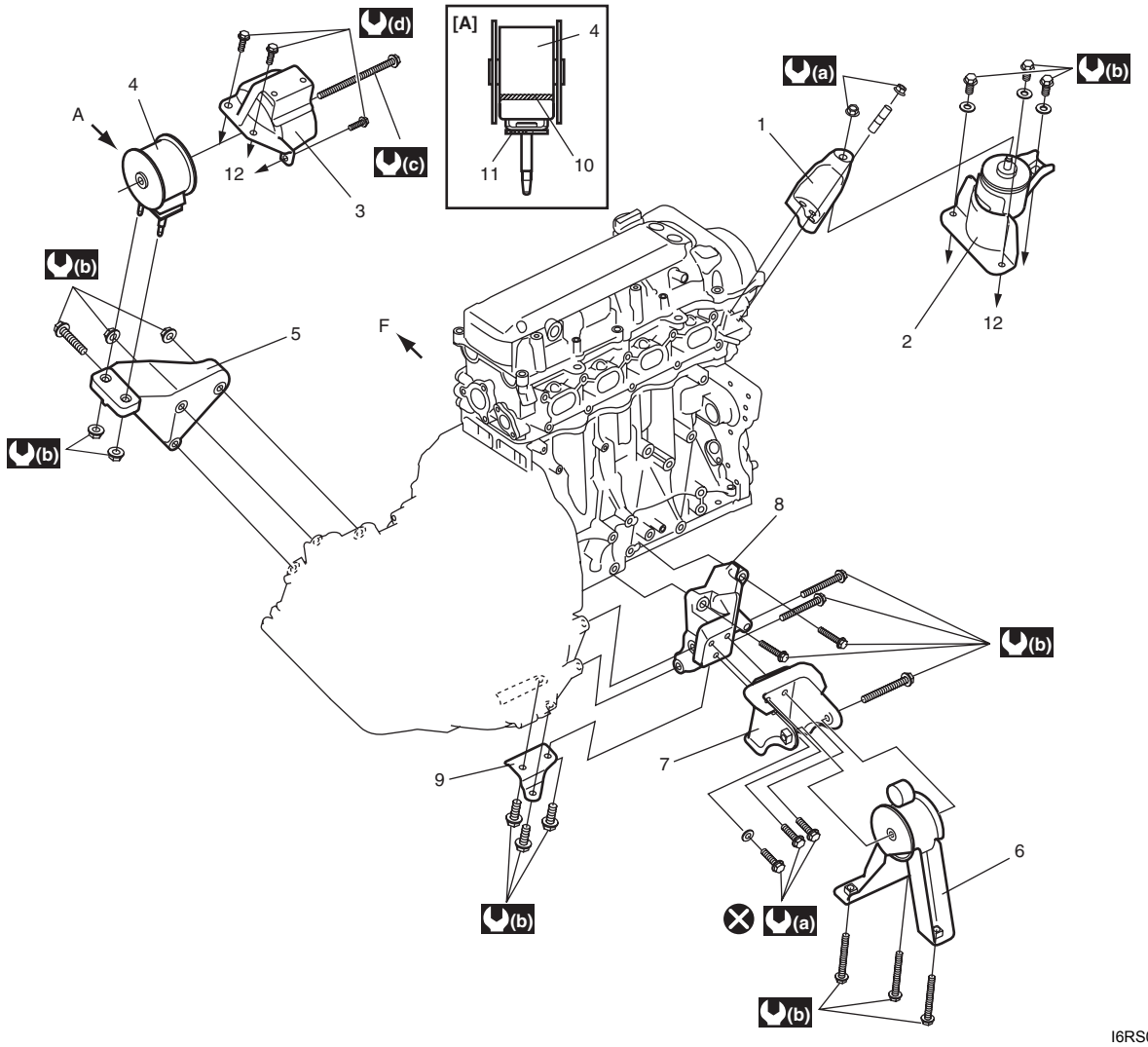


I4RS0A140005-01

- Check to ensure that all removed parts are back in place.
  Reinstall any necessary parts which have not been reinstalled.
- Refill cooling system referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine coolant leaks.

Engine Mountings Components (For M16A Engine Model)

S7N20A1416015

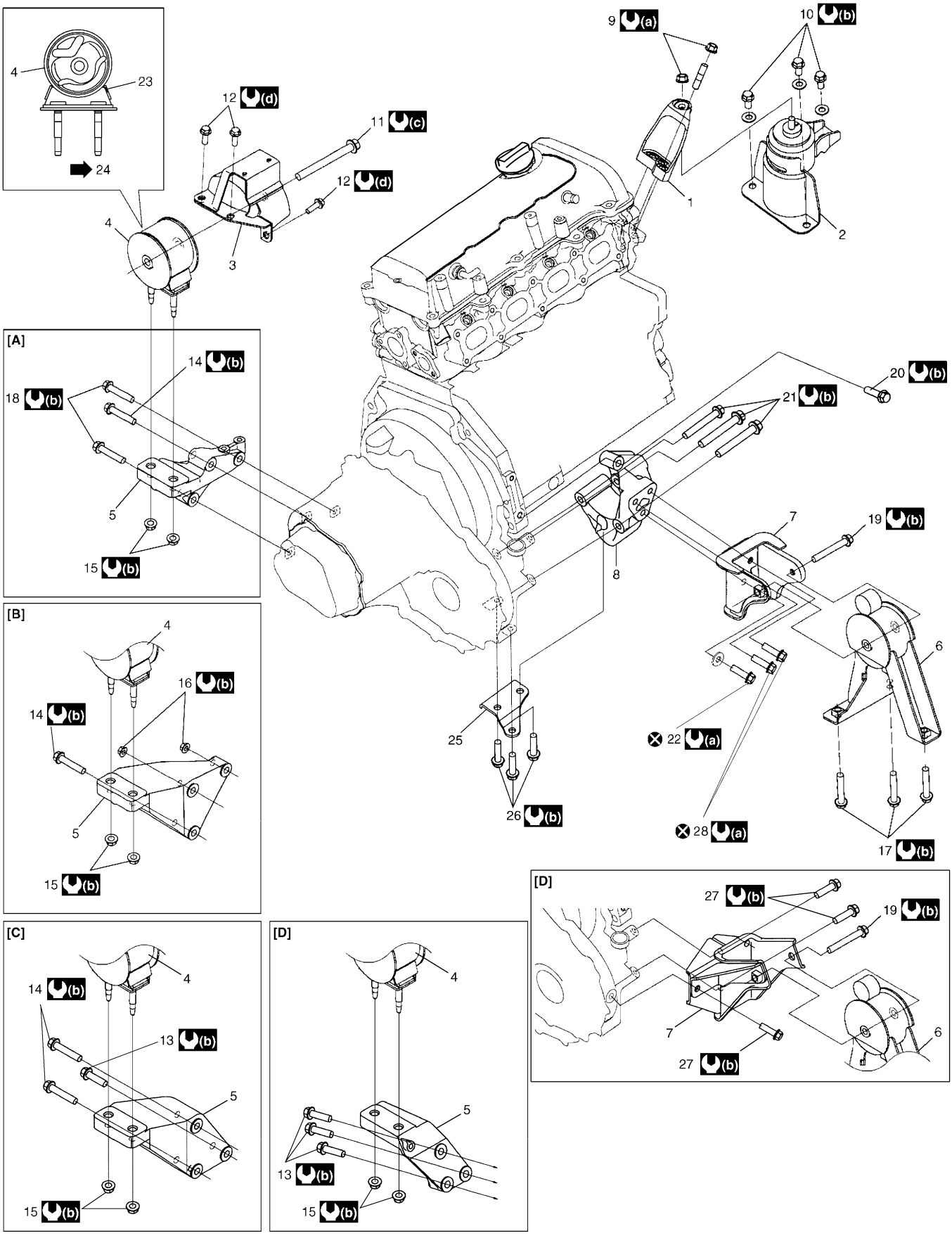


I6RS0B141013-04

[A]: View A	6. Engine rear mounting	(a) : 65 N·m (6.5 kgf-m, 47.0 lbf-ft)
F: Vehicle front	7. Engine rear mounting No.1 bracket	(b) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
1. Engine right mounting bracket	8. Engine rear mounting No.2 bracket	(c) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
2. Engine right mounting	9. Engine rear mounting stiffener	(d) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
3. Engine left mounting No.1 bracket	10. Yellow mark	⊗ : Do not reuse.
4. Engine left mounting	11. Front mark	
5. Engine left mounting No.2 bracket	12. To vehicle body	

Engine Mountings Components (For Other Than M16A Engine Model)

S7N20A1416016



I4RS0B140008-05

[A]: For M15 engine with A/T	10. Engine right mounting bolt	23. Yellow mark
[B]: For M15 engine with M/T	11. Engine left mounting bush bolt	24. Vehicle forward
[C]: For M13 engine with M/T	12. Engine left mounting No.1 bracket bolt	25. Engine rear mounting stiffener
[D]: For M13 engine with Automated Manual Transaxle	13. Engine left mounting No.2 bracket bolt (short)	26. Engine rear mounting stiffener bolt
1. Engine right mounting bracket	14. Engine left mounting No.2 bracket bolt (long)	27. Engine rear mounting No.4 bracket bolt
2. Engine right mounting	15. Engine left mounting bracket nut	28. Engine rear mounting No.1 bracket bolt (Pre-coated bolt with adhesive)
3. Engine left mounting No.1 bracket	16. Engine left mounting nut	(a) : 65 N·m (6.5 kgf-m, 47.0 lbf-ft)
4. Engine left mounting	17. Engine rear mounting bolt	(b) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
5. Engine left mounting No.2 bracket	18. Engine left mounting No.2 bracket bolt (middle)	(c) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
6. Engine rear mounting	19. Engine rear mounting bush bolt	(d) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
7. Engine rear mounting No.1 bracket	20. Engine rear mounting No.2 bracket bolt	: Do not reuse.
8. Engine rear mounting No.2 bracket	21. Engine rear mounting body bracket bolt	
9. Engine right mounting nut	22. Engine rear mounting No.3 bracket bolt	

Engine Assembly Removal and Installation (For M16A Engine Model)

S7N20A1416017

NOTE

After replacing electric throttle body assembly, perform calibration of throttle valve referring to "Electric Throttle Body System Calibration: M13A / M15A / M16A in Section 1C".

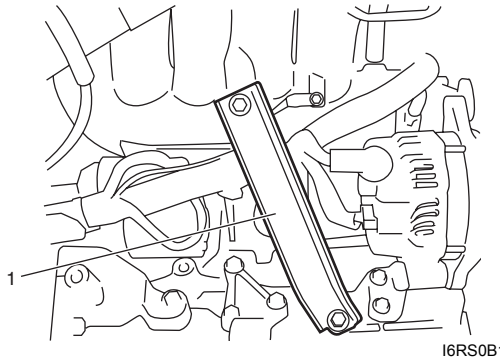
Removal

1) Relieve fuel pressure according to "Fuel Pressure Relief Procedure: M13A / M15A / M16A in Section 1G".
2) Disconnect negative and positive cable at battery.
3) Remove battery and tray.
4) Remove engine hood after disconnecting windshield washer hose.
5) Remove right and left side engine under covers.
6) Remove A/C compressor belt by referring to "Compressor Drive Belt Removal and Installation: Auto A/C in Section 7B".
7) Drain engine oil referring to "Engine Oil and Filter Change (Petrol Engine) in Section 0B".
8) Drain transaxle oil.
9) Drain coolant referring to "Cooling System Draining: M13A / M15A / M16A in Section 1F".
10) Remove cowl top plate referring to "Cowl Top Components in Section 9K".
11) Remove air cleaner assembly referring to "Air Cleaner Components: M13A / M15A / M16A".
12) With hose connected, detach A/C compressor from its bracket (if equipped) referring to "Compressor Assembly Removal and Installation: Auto A/C in Section 7B".

⚠ CAUTION

Suspend removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

13) Remove intake manifold rear stiffener (1) from intake manifold and cylinder block.



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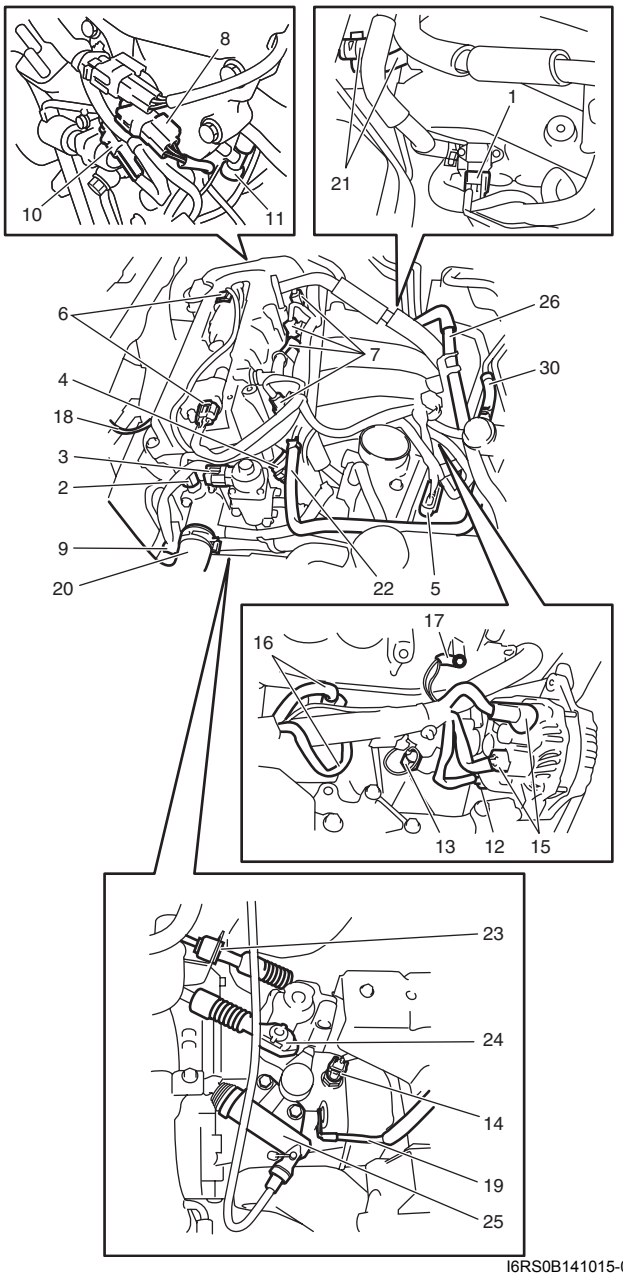
14) Disconnect the following electric wires:
- MAP sensor (1)
- ECT sensor (2)
- EGR valve (3)
- CMP sensor (4)
- Electric throttle body assembly (5)
- Ignition coil assembly (6)
- Injectors (7)
- Heated oxygen sensor No. 1 (8) and No. 2 (9)
- Oil control valve (10)
- Engine oil pressure switch (11)
- CKP sensor (12)
- Knock sensor (13)
- Back up light switch (14)
- Generator (15)
- Starting motor (16)
- Ground terminal (17) from intake manifold
- Battery ground terminal (18) from exhaust manifold
- Battery ground cable (19) from transaxle
- Magnet clutch switch of A/C compressor (if equipped)
- Each wire harness clamps

15) Remove fuse box from its bracket.
16) Disconnect the following cables:
    - Gear select control cable (23) (for M/T model)
    - Gear shift control cable (24) (for M/T model)
17) Disconnect the following hoses:
    - Brake booster hose (26) from intake manifold
    - Radiator inlet and outlet hoses (20) from each pipe
    - Heater inlet and outlet hoses (21) from each pipe
    - Fuel feed hoses (22) from fuel feed pipe
    - EVAP canister purge valve hose (30) from purge pipe
18) With hose connected, detach clutch operating cylinder (25). (for M/T model)

⚠ CAUTION

Suspend removed clutch operating cylinder at a place where no damage will be caused during removal and installation of engine assembly.



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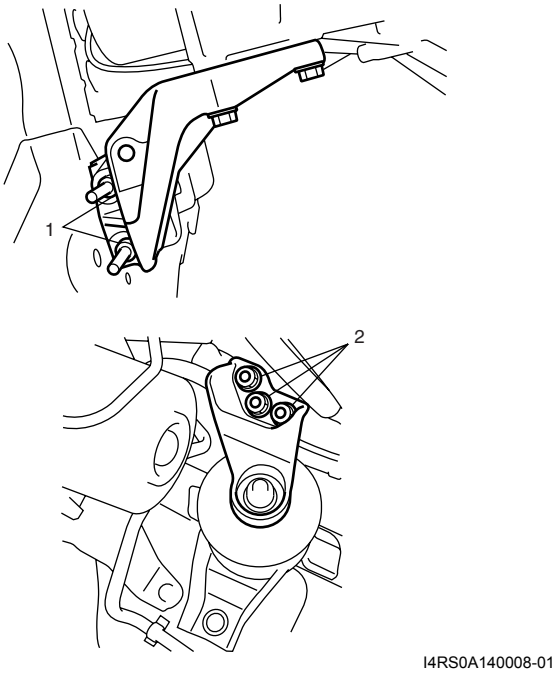
19) Disconnect right and left drive shaft joints from differential gear referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.

NOTE

For engine and transaxle removal, it is not necessary to remove drive shafts from steering knuckle.

20) Remove exhaust No.1, No.2 and center pipes referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.
21) Support engine assemble by using chain hoist.
22) Remove suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
23) Remove engine rear mounting from engine rear mounting No.1 bracket.

24) Support engine and transaxle with jack, and then remove chain hoist.
25) Remove engine left mounting bracket nuts (1) and engine right mounting nuts (2).

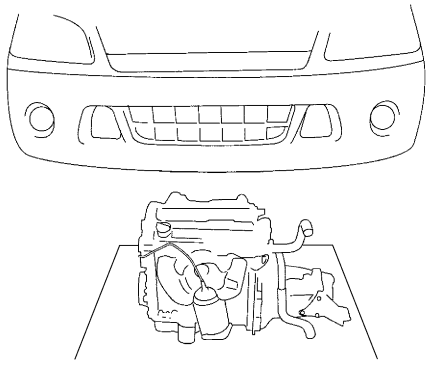


I4RS0A140008-01

26) Before removing engine with transaxle from engine compartment, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transaxle.
27) Lower engine with transaxle from engine compartment.

⚠ CAUTION

Before lowering engine, to avoid damage to A/C compressor and clutch operating cylinder, make clearance by rising them. Be sure not to damage suspended A/C compressor and clutch operating cylinder.



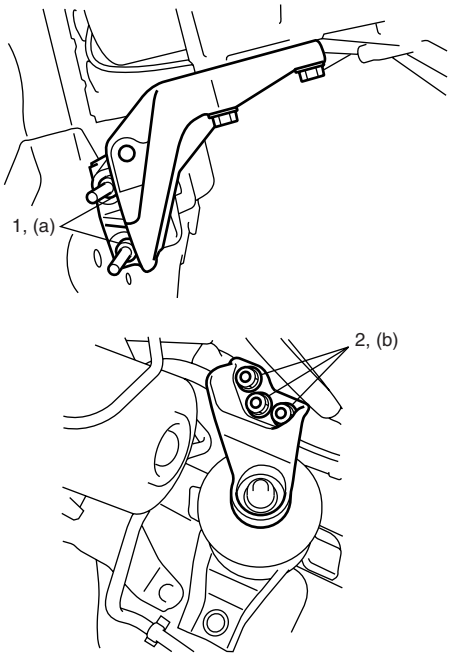
I4RS0A140009-01

28) Disconnect transaxle from engine, referring to "Manual Transaxle Unit Dismounting and Remounting: M15A and M16A Model in Section 5B".
29) Remove clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C".

Installation

1) Install clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C".
2) Connect transaxle to engine referring to "Manual Transaxle Unit Dismounting and Remounting: M15A and M16A Model in Section 5B".
3) Lift engine and transaxle into engine compartment with jack.
4) Install engine left mounting bracket nuts (1) and engine right mounting nuts (2).Tighten these nuts to specified torque.

Tightening torque
Engine left mounting bracket nut (a): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
Engine right mounting nut (b): 65 N·m (6.5 kgf-m, 47.0 lbf-ft)



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5) Support engine assemble by using chain hoist.
6) Install engine rear mounting to engine rear mountingNo.1 bracket.

Tightening torque
Engine rear mounting bush bolt: 55 N·m (5.5 kgf-m, 40.0 lbf-ft)

7) Install suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
8) Remove chain hoist.
9) Install exhaust No.1, No.2 and center pipes referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.
10) Connect drive shaft joints referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
11) Reverse disconnected hoses, cables and electric wires for connection noting the followings.
    - Tighten nuts to specified torque.

    Tightening torque
    Starting motor terminal nut: 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
    Generator terminal nut: 6 N·m (0.6 kgf-m, 4.5 lbf-ft)
    Intake manifold ground terminal bolt: 11 N·m (1.1 kgf-m, 18.0 lbf-ft)
12) Install intake manifold rear stiffener to intake manifold and cylinder block.
13) Install air cleaner assembly referring to “Air Cleaner Components: M13A / M15A / M16A”.
14) Install cowl top referring to “Cowl Top Components in Section 9K”.
15) Install A/C compressor to its bracket (if equipped) referring to “Compressor Assembly Removal and Installation: Auto A/C in Section 7B”.
16) Adjust A/C compressor belt tension (if equipped) referring to “Compressor Drive Belt Inspection and Adjustment: Auto A/C in Section 7B”.
17) Check to ensure that all removed parts are back in place.
    Reinstall any necessary parts which have not been reinstalled.
18) Refill cooling system with coolant referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
19) Refill engine with engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B”.
20) Refill transaxle with transaxle oil referring to“Manual Transaxle Oil Change: M15A and M16A Model in Section 5B”.
21) Install battery and tray.
22) Connect positive and negative cable at battery.
23) Install engine hood and connect windshield washer hose.
24) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Engine Assembly Removal and Installation (For Other Than M16A Engine Model)

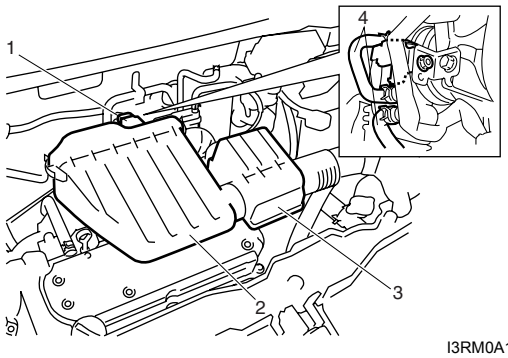
S7N20A1416018

NOTE

After replacing electric throttle body assembly, perform calibration of throttle valve referring to “Electric Throttle Body System Calibration: M13A / M15A / M16A in Section 1C”.

Removal

1) Initialize TCM (Automated Manual Transaxle) referring to “TCM (Automated Manual Transaxle) Initialization in Section 5D”.
2) Set clutch to specific position before removing automated manual transaxle assembly referring to “Clutch Position Control in Section 5D”.
3) Relieve fuel pressure according to “Fuel Pressure Relief Procedure: M13A / M15A / M16A in Section 1G”.
4) Disconnect negative and positive cable at battery.
5) Remove battery and tray.
6) Remove engine hood after disconnecting windshield washer hose.
7) Remove right and left side engine under covers.
8) Remove A/C compressor belt by referring to “Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C in Section 7B”.
9) Drain engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B”.
10) Drain transaxle oil referring to “Automated Manual Transaxle Oil Change in Section 5D”, “Manual Transaxle Oil Change: M13A Model in Section 5B”, “Manual Transaxle Oil Change: M15A and M16A Model in Section 5B” or “A/T Fluid Change in Section 5A”.
11) Drain coolant referring to “Cooling System Draining: M13A / M15A / M16A in Section 1F”.
12) Remove cowl top plate referring to “Cowl Top Components in Section 9K”.
13) Disconnect MAF sensor coupler (1).
14) Remove air cleaner case (2) and air intake pipe (3).
15) Remove canister purge hose (4) from EVAP canister purge valve.



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16) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation (Petrol Engine Model): Manual A/C in Section 7B”.

⚠ CAUTION

Suspend removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

17) Disconnect the following electric wires:
- Electric throttle body assembly connector (1)
- MAP sensor (2)
- ECT sensor (3)
- EGR valve (4)
- CMP sensor (5)
- Ignition coil assembly (6)
- Injectors (7)
- Heated oxygen sensor (8)
- Oil control valve (9) (for engine with VVT)
- Engine oil pressure switch (10)
- CKP sensor (11)
- Knock sensor (12)
- VSS (13)
- Back up light switch (14) (for M/T and Automated Manual Transaxle models)
- Generator (15)
- Starting motor (16)
- Ground terminal (17) from cylinder block
- Battery ground cable (18) from transaxle
- Output shaft speed sensor (VSS) (26) (for A/T model)
- Solenoid valve (27) (for A/T model)
- Transmission range sensor (28) (for A/T model)
- Input shaft speed sensor (29) (for A/T and Automated Manual Transaxle models)
- Magnet clutch switch of A/C compressor (if equipped)
- Clutch actuator motor (32) (for Automated Manual Transaxle model)
- Clutch stroke sensor (33) (for Automated Manual Transaxle model)
- Shift actuator motor (34) (for Automated Manual Transaxle model)
- Shift stroke sensor (35) (for Automated Manual Transaxle model)
- Select actuator motor (36) (for Automated Manual Transaxle model)
- Select stroke sensor (37) (for Automated Manual Transaxle model)
- Neutral start switch (31) (for Automated Manual Transaxle model)
- Each wire harness clamps

18) Remove fuse box from its bracket.

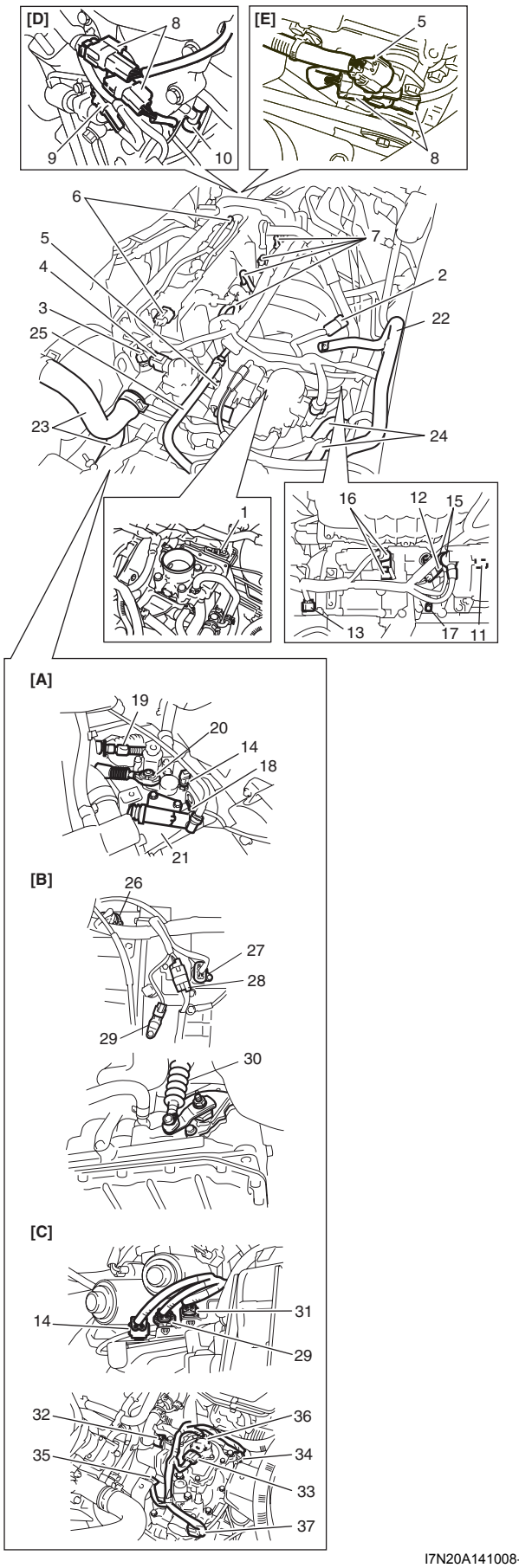
19) Disconnect the following cables:
- Gear select control cable (19) (for M/T model)
- Gear shift control cable (20) (for M/T model)
- A/T select cable (30) (for A/T model)

20) Disconnect the following hoses:
- A/T fluid cooler hoses
- Brake booster hose (22) from intake manifold
- Radiator inlet and outlet hoses (23) from each pipe
- Heater inlet and outlet hoses (24) from each pipe
- Fuel feed hoses (25) from fuel feed pipe

21) With hose connected, detach clutch operating cylinder (21). (for M/T model)

⚠ CAUTION

Suspend removed clutch operating cylinder at a place where no damage will be caused during removal and installation of engine assembly.



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[A]:	For M/T model
[B]:	For A/T model
[C]:	For Automated Manual Transaxle model
[D]:	For M15 engine
[E]:	For M13 engine

22) Disconnect right and left drive shaft joints from differential gear referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.

NOTE

For engine and transaxle removal, it is not necessary to remove drive shafts from steering knuckle.

23) Remove exhaust No.1, No.2 and center pipes referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.

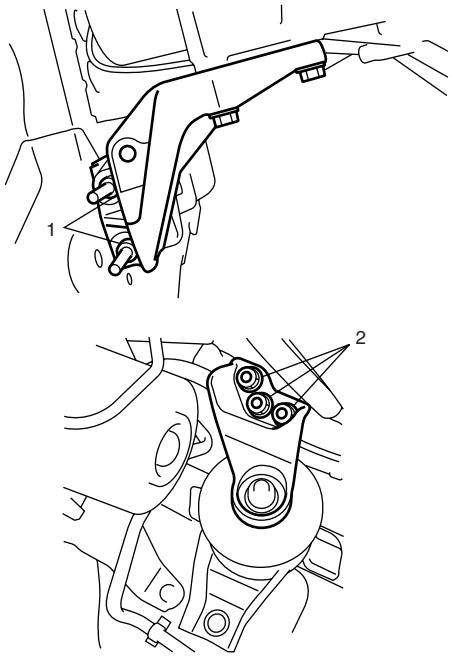
24) Support engine assemble by using supporting device referring to “Engine Supporting Points in Section 0A”.

25) Remove suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.

26) Remove engine rear mounting from engine rear mounting No.1 bracket.

27) Support engine and transaxle with jack, and then remove supporting device.

28) Remove engine left mounting bracket nuts (1) and engine right mounting nuts (2).

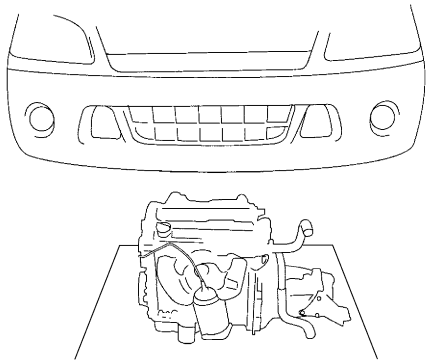


I4RS0A140008-01

29) Before removing engine with transaxle from engine compartment, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transaxle.
30) Lower engine with transaxle from engine compartment.

⚠ CAUTION

Before lowering engine, to avoid damage to A/C compressor and clutch operating cylinder, make clearance by rising them. Be sure not to damage suspended A/C compressor and clutch operating cylinder.



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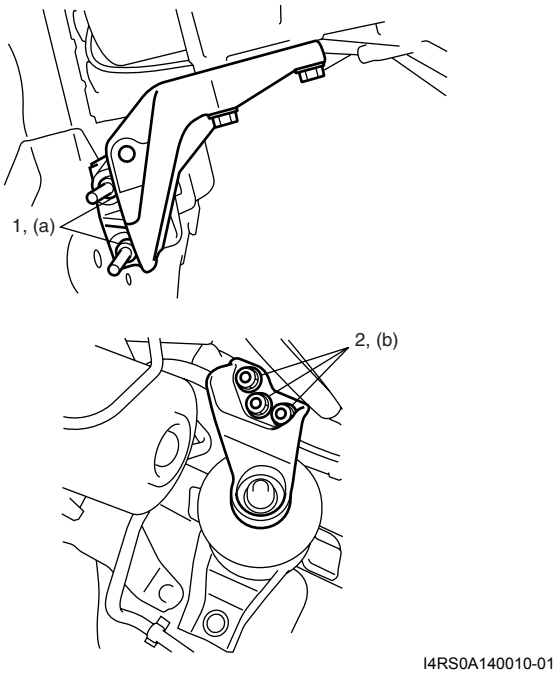
31) Disconnect transaxle from engine, referring to "Manual Transaxle Unit Dismounting and Remounting: M13A Model in Section 5B", "Manual Transaxle Unit Dismounting and Remounting: M15A and M16A Model in Section 5B", "Automatic Transaxle Unit Dismounting and Remounting in Section 5A" or "Automated Manual Transaxle Unit Dismounting and Remounting in Section 5D".
32) Remove clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C" (for M/T model) or "Clutch Cover and Clutch Disc Removal and Installation in Section 5D" (for Automated Manual Transaxle model).

Installation

1) Install clutch cover and clutch disk referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C" (for M/T model) or "Clutch Cover and Clutch Disc Removal and Installation in Section 5D" (for Automated Manual Transaxle model).
2) Connect transaxle to engine referring to "Manual Transaxle Unit Dismounting and Remounting: M13A Model in Section 5B", "Manual Transaxle Unit Dismounting and Remounting: M15A and M16A Model in Section 5B", "Automatic Transaxle Unit Dismounting and Remounting in Section 5A" or "Automated Manual Transaxle Unit Dismounting and Remounting in Section 5D".
3) Lift engine and transaxle into engine compartment with jack.
4) Install engine left mounting bracket nuts (1) and engine right mounting nuts (2).
Tighten these nuts to specified torque.

Tightening torque
Engine left mounting bracket nut (a): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
Engine right mounting nut (b): 65 N·m (6.5 kgf-m, 47.0 lbf-ft)



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5) Support engine assemble by using supporting device referring to "Engine Supporting Points in Section 0A".
6) Install engine rear mounting to engine rear mounting No.1 bracket.

Tightening torque
Engine rear mounting bush bolt: 55 N·m (5.5 kgf-m, 40.0 lbf-ft)

7) Install suspension frame referring to "Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B".
8) Remove supporting device.
9) Install exhaust No.1, No.2 and center pipes referring to "Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K".
10) Connect drive shaft joints referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".

11) Reverse disconnected hoses, cables and electric wires for connection noting the followings.
    - Tighten nuts to specified torque.

    Tightening torque
    Starting motor terminal nut: 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
    Generator terminal nut: 6 N·m (0.6 kgf-m, 4.5 lbf-ft)
12) Install air cleaner case and air intake pipe.
13) Install cowl top referring to “Cowl Top Components in Section 9K”.
14) Install A/C compressor to its bracket (if equipped) referring to “Compressor Assembly Removal and Installation (Petrol Engine Model): Manual A/C in Section 7B”.
15) Adjust A/C compressor belt tension (if equipped) referring to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C in Section 7B”.
16) Check to ensure that all removed parts are back in place.
    Reinstall any necessary parts which have not been reinstalled.
17) Refill cooling system with coolant referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
18) Refill engine with engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B”.
19) Refill transaxle with transaxle oil referring to “Automated Manual Transaxle Unit Dismounting and Remounting in Section 5D”, “Manual Transaxle Oil Change: M13A Model in Section 5B”, “Manual Transaxle Oil Change: M15A and M16A Model in Section 5B” or “A/T Fluid Change in Section 5A”.
20) Install battery and tray.
21) Connect positive and negative cable at battery.
22) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Timing Chain Cover Components

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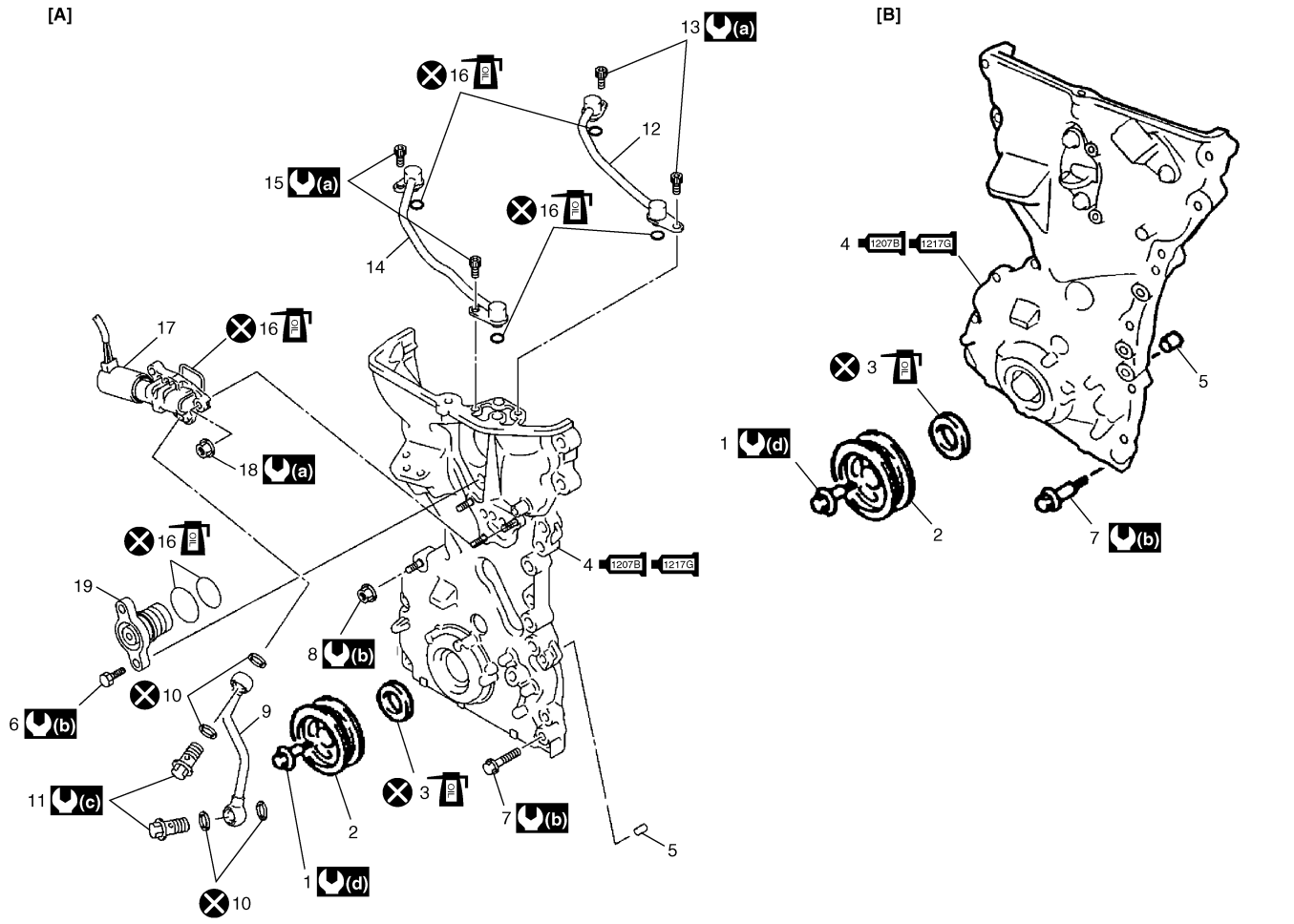


I4RS0B140010-03

[A]: For engine with VVT	8. Timing chain cover mounting nut	17. Oil control valve
[B]: For engine without VVT	9. Oil gallery pipe No.1	18. Oil control valve mounting nut
1. Crankshaft pulley bolt	10. Copper washer	19. Cap

2. Crankshaft pulley	11. Oil gallery pipe No.1 bolt	(a) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
3. Oil seal : Apply engine oil to oil seal lip.	12. Oil gallery pipe No.2	(b) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
1207B 1217G 4. Timing chain cover : Apply sealant 99000-31140 to the mating surface of cylinder and cylinder head. : Apply sealant 99000-31260 to the mating surface of timing chain cover referring to the figure of Step 4) of "Installation" under "Timing Chain Cover Removal and Installation: M13A / M15A / M16A".	13. Oil gallery pipe No.2 bolt	(c) : 30 N·m (3.0 kgf-m, 22.0 lbf-ft)
5. Pin	14. Oil gallery pipe No.3	(d) : 150 N·m (15.0 kgf-m, 108.5 lbf-ft)
6. Cap bolt	15. Oil gallery pipe No.3 bolt	: Do not reuse.
7. Timing chain cover mounting bolts	16. O-ring : Apply engine oil.	

Timing Chain Cover Removal and Installation

S7N20A1416020

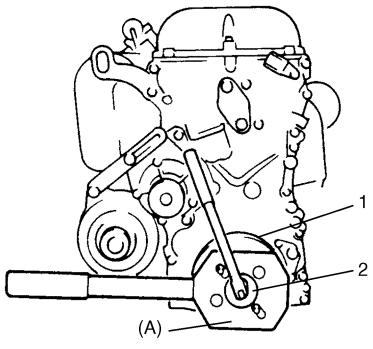
⚠ CAUTION

- **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 referring to "Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A" or "Engine Assembly Removal and Installation (For M16A Engine Model): M13A / M15A / M16A".
2) Remove water pump / generator drive belt referring to "Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A in Section 1F".
3) Remove crankshaft pulley bolt.
   To lock crankshaft pulley (1), use special tool with it as shown in the figure.

   Special tool
   (A): 09917–68221



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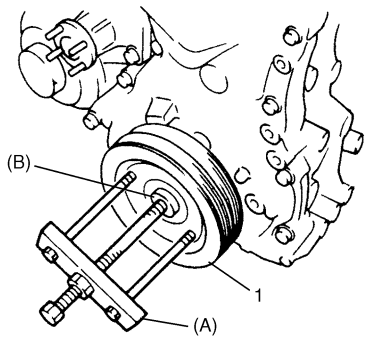
4) Remove crankshaft pulley (1).
   If it is hard to remove, use special tools as shown in the figure.

   Special tool
   (A): 09944–36011
   (B): 09926–58010



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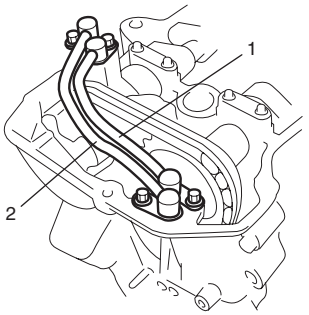
5) Remove cylinder head cover referring to "Cylinder Head Cover Removal and Installation: M13A / M15A / M16A".
6) Remove oil pan referring to "Oil Pan and Oil Pump Strainer Removal and Installation: M13A / M15A / M16A in Section 1E".
7) Remove water pump pulley.
8) Remove A/C bracket from cylinder block.
9) For engine with VVT, remove oil gallery pipes No.2 (1) and No.3 (2).



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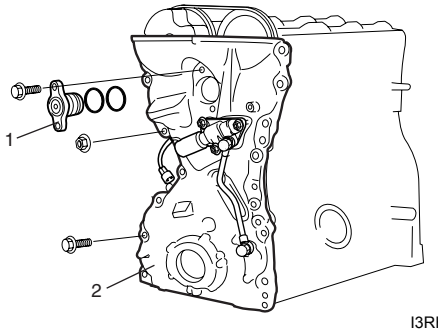
10) Remove cap (1) from timing chain cover (2).
11) Remove timing chain cover (2).



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12) Remove oil control valve from timing chain cover referring to “Oil Control Valve Removal and Installation (For Engine with VVT): M13A / M15A / M16A”.

Installation

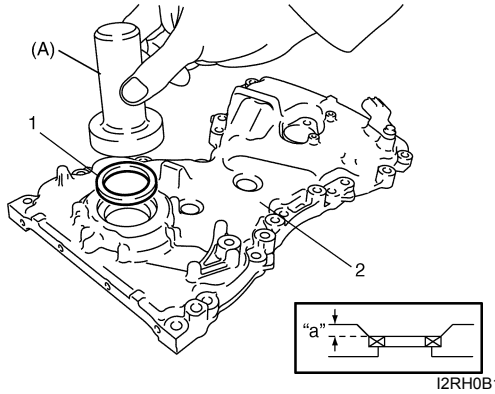
1) Clean sealing surface on timing chain cover, cylinder block and cylinder head.
Remove oil, old sealant and dust from sealing surface.
2) Install oil seal (1) to timing chain cover, if removed.

NOTE

When installing new oil seal, press fit to timing chain cover (2) by using special tool (bearing installer) as shown in the figure.

Drive in dimension
“a”: 1.5 mm (0.06 in.)

Special tool
(A): 09913–75810



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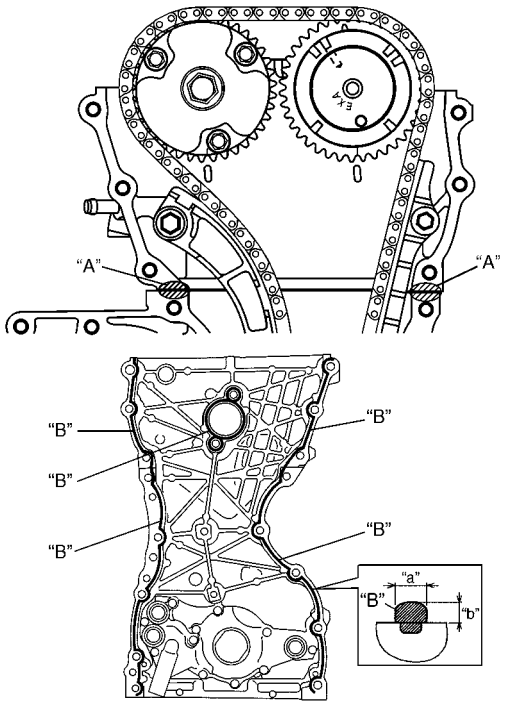
3) Install oil control valve to timing chain cover referring to “Oil Control Valve Removal and Installation (For Engine with VVT): M13A / M15A / M16A”.
4) Apply sealant “A” to mating surface of cylinder and cylinder head and “B” to mating surface of timing chain cover as shown in the figure.

“A”: Water tight sealant 99000–31140 (SUZUKI Bond No.1207B)
“B”: Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant amount for timing chain cover
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)



I3RH0B140025-01

5) Apply engine oil to oil seal lip, then install timing chain cover (1). Tighten bolts and nut to specified torque.

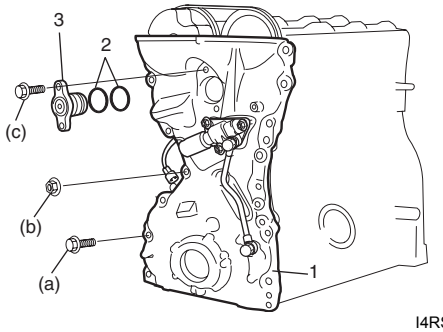
NOTE

Before installing timing chain cover, check that pin is securely fitted.

Tightening torque
Timing chain cover bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
Timing chain cover nut (b): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

6) Apply engine oil to new O-rings (2) and install them to cap (3).
7) Install cap (3) to timing chain cover (1).
Tighten bolts to specified torque.

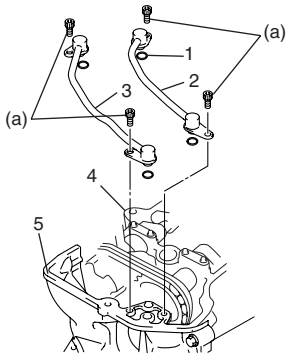
Tightening torque
Cap bolt (c): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



I4RS0B140011-02

8) For engine with VVT, install new O-ring (1) to oil gallery pipes No.2 (2) and No.3 (3).
9) For engine with VVT, install oil gallery pipes No.2 and No.3 to cylinder head (4) and timing chain cover (5).
Tighten bolts to specified torque.

Tightening torque
Oil gallery pipe No.2 and No.3 bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

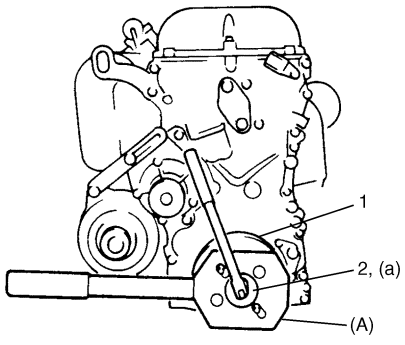


I3RH0B140027-01

10) Install water pump pulley.
11) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: M13A / M15A / M16A”.
12) Install oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: M13A / M15A / M16A in Section 1E”.
13) Install crankshaft pulley (1). Tighten bolt (2) to specified torque. To lock crankshaft pulley, use special tool with it as shown in the figure.

Special tool
(A): 09917–68221

Tightening torque
Crankshaft pulley bolt (a): 150 N·m (15.0 kgf-m, 108.5 lbf-ft)



I2RH0B140056-01

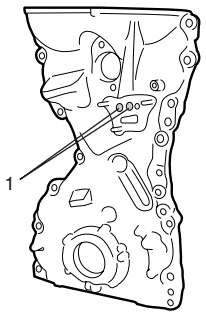
14) Install engine assembly to vehicle referring to “Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A” or “Engine Assembly Removal and Installation (For M16A Engine Model): M13A / M15A / M16A”.

Timing Chain Cover Inspection

S7N20A1416021

Oil Seal
Check oil seal lip for fault or other damage. Replace as necessary.

Timing Chain Cover
Inspect strainer (1) of oil passage for driving intake cam timing sprocket assembly (VVT actuator).
If clog or foreign matter exists, clean strainer.



I3RH0B140028-01

Oil Control Valve Removal and Installation (For Engine with VVT)

S7N20A1416022

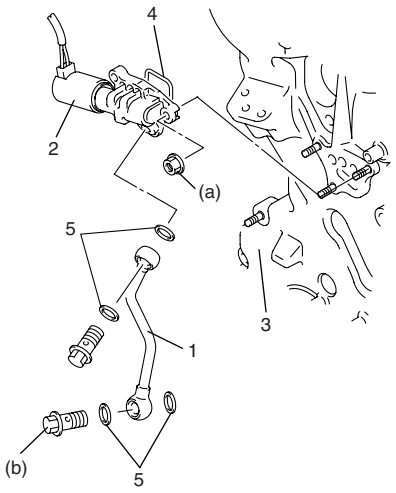
Removal
Remove oil gallery pipe No.1 (1) and oil control valve (2) from timing chain cover (3).

Installation
1) Install new O-ring (4) to oil control valve.
2) Install oil control valve to timing chain cover.
Tighten nuts to specification.

Tightening torque
Oil control valve mounting nut (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

3) Install oil gallery pipe No.1 with new copper washers (5) to timing chain cover.
Tighten bolts to specification.

Tightening torque
Oil gallery pipe No.1 bolt (b): 30 N·m (3.0 kgf-m, 21.5 lbf-ft)



I3RM0A140027-01

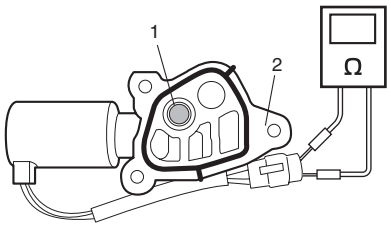
Oil Control Valve Inspection (For Engine with VVT)

S7N20A1416023

Oil Control Valve

1) Inspect strainer (1) and mating surface (2) of oil control valve for clog or damage. Clean oil control valve if clog or foreign matter is present on strainer or mating surface of oil control valve. Replace oil control valve if its mating surface is damaged.
2) Check resistance between terminals of oil control valve.

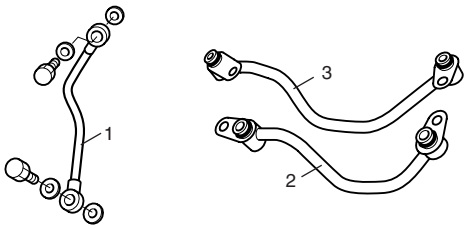
Oil control valve resistance
6.7 – 7.7 Ω (at 20 °C (68 °F))



I3RM0A140028-01

Oil Gallery Pipe

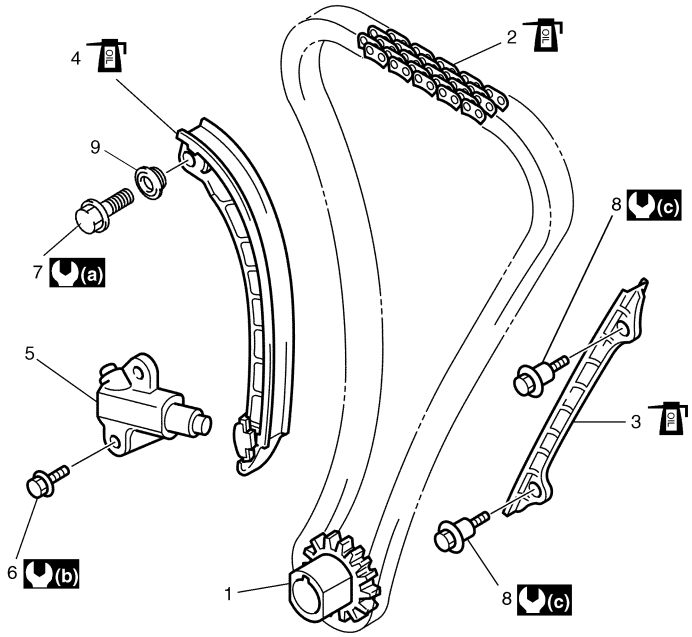
Inspect oil gallery pipes No.1, No.2 (2) and No.3 (3). Replace if crack, deformation or clog exists.



I3RH0B140030-01

Timing Chain and Chain Tensioner Components

S7N20A1416024



I4RS0A140012-04

1. Crankshaft timing sprocket	5. Timing chain tensioner adjuster assembly	9. Spacer
2. Timing chain : Apply engine oil.	6. Chain tensioner adjuster mounting bolt	(a) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
3. Timing chain No.1 guide : Apply engine oil to sliding surface.	7. Timing chain tensioner bolt	(b) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
4. Timing chain tensioner : Apply engine oil to sliding surface.	8. Timing chain No.1 guide bolt	(c) : 9 N·m (0.9 kgf-m, 6.5 lbf-ft)

Timing Chain and Chain Tensioner Removal and Installation

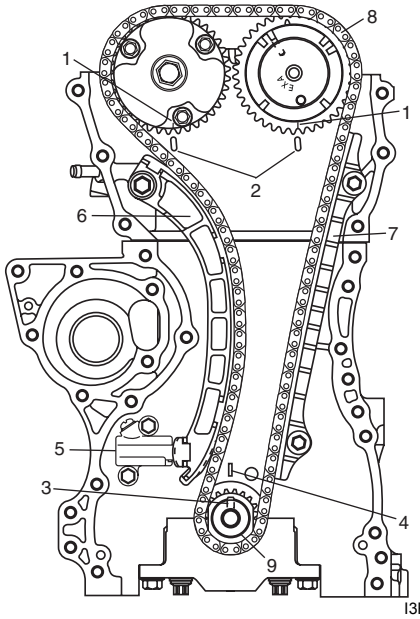
S7N20A1416025

Removal

⚠ CAUTION

After timing chain is removed, never turn crankshaft and camshafts independently more than its allowable turning range described in "Installation".
If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

1) Remove timing chain cover referring to "Timing Chain Cover Removal and Installation: M13A / M15A / M16A".
2) By turning crankshaft, align camshafts and crankshaft at specific position as follows.
   a) Align both intake and exhaust camshaft timing sprocket marks (1) with notches (2) of cylinder head respectively.
   b) For engine with VVT, align crankshaft sprocket key (3) with notch of cylinder block (4).
   For engine without VVT, position crankshaft sprocket key (3) at upside of crankshaft as shown in figure.
3) Remove timing chain tensioner adjuster assembly (5).
4) Remove timing chain tensioner (6).
5) Remove timing chain No.1 guide (7).
6) Remove timing chain (8) with crankshaft timing sprocket (9).



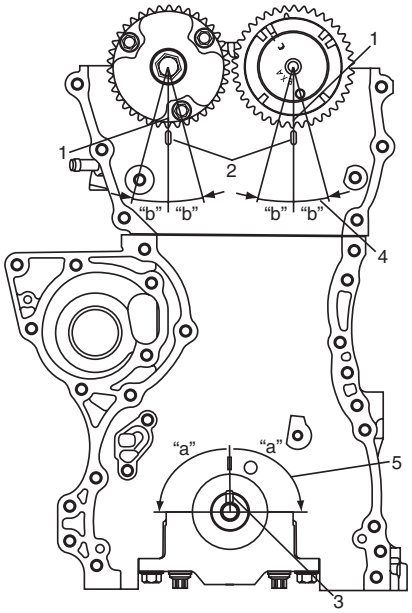
I3RH0B140032-01

Installation

⚠ CAUTION

After timing chain is removed, never turn crankshaft and camshafts independently more than such an extent ("a", "b") as shown in the figure.
If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

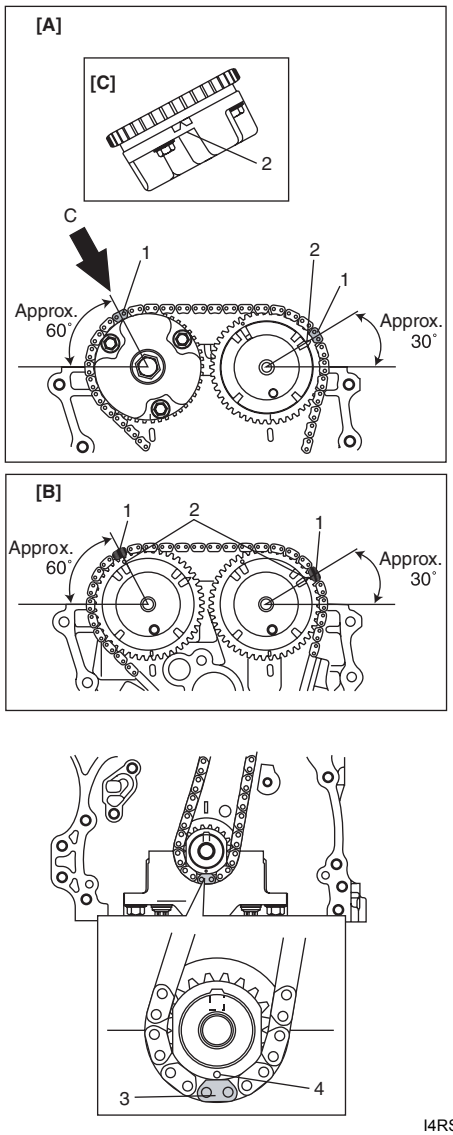
1) Check that match marks (1) on intake and exhaust camshaft timing sprockets are in match with notches (2) on cylinder head as shown in the figure.
2) Set key (3) and turn crankshaft to position key on upside of crankshaft.



I4RS0A140021-01

"a": 90°	4. Camshaft (IN and EX) allowable turning range. By marks on camshaft timing sprocket within 15° from notches on cylinder head on both right and left.
"b": 15°	5. Crankshaft allowable turning range. By key on crankshaft, within 90° from top on both right and left.

3) Install timing chain by aligning dark blue plate (1) of timing chain and triangle mark (2) on camshaft timing sprocket as shown in the figure.
4) Fit crankshaft timing sprocket to timing chain by aligning gold plate (3) of timing chain and circle mark (4) on crankshaft timing sprocket. Then install crankshaft timing sprocket fitted with chain to crankshaft.

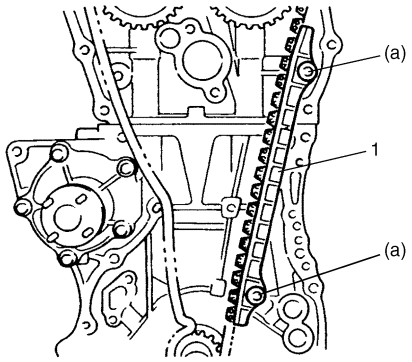


I4RS0B140012-04

[A]:	For engine with VVT
[B]:	For engine without VVT
[C]:	View C

5) Apply engine oil to sliding surface of timing chain No.1 guide (1) and install it as shown in the figure. Tighten guide bolts to specified torque.

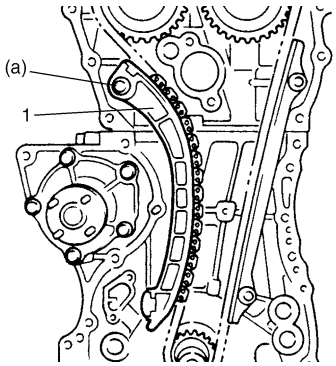
Tightening torque
Timing chain No.1 guide bolt (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)



I2RH0B140062-01

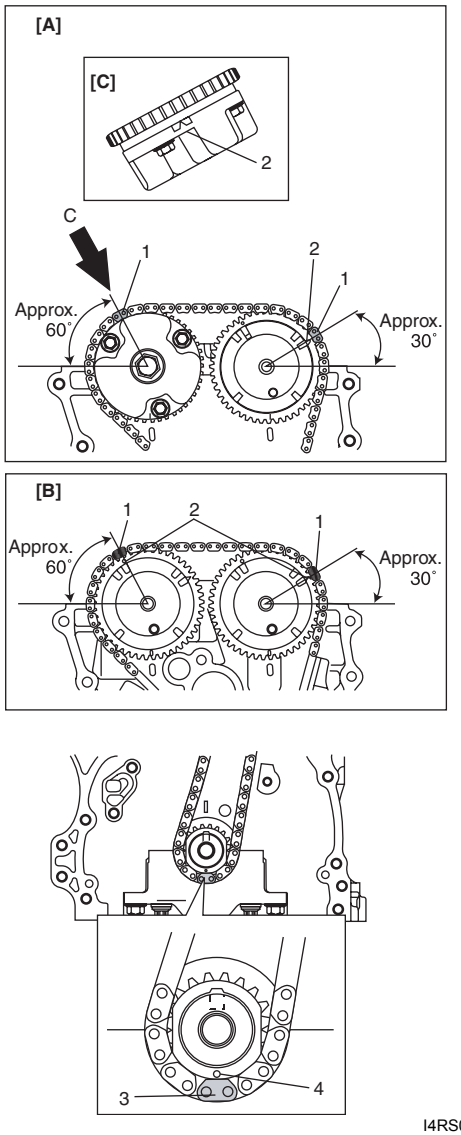
6) Apply engine oil to sliding surface of chain tensioner (1) and install chain tensioner and spacer. Tighten tensioner bolt to specified torque.

Tightening torque
Timing chain tensioner bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



I2RH0B140063-01

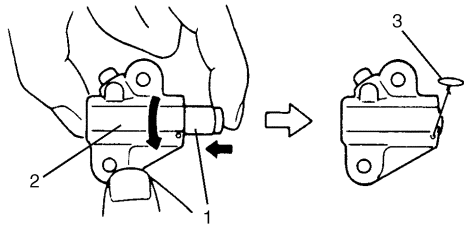
7) Check that match marks (2) on intake and exhaust camshaft timing sprockets are in match with dark blue plates (1) of timing chain and match mark (4) on crankshaft timing sprocket is in match with gold plate (3) of timing chain.



I4RS0B140012-04

[A]:	For engine with VVT
[B]:	For engine without VVT
[C]:	View C

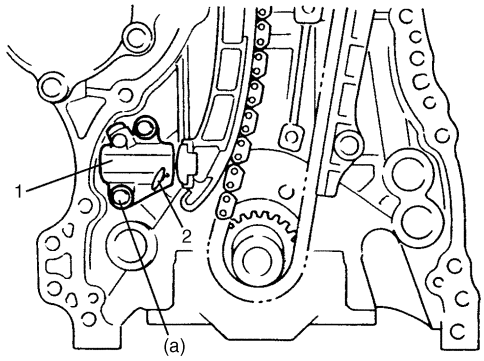
8) Screw in plunger (1) by turning body (2) in arrow direction and install a retainer (3) (wire) to hold plunger in place.



I2RH0B140065-01

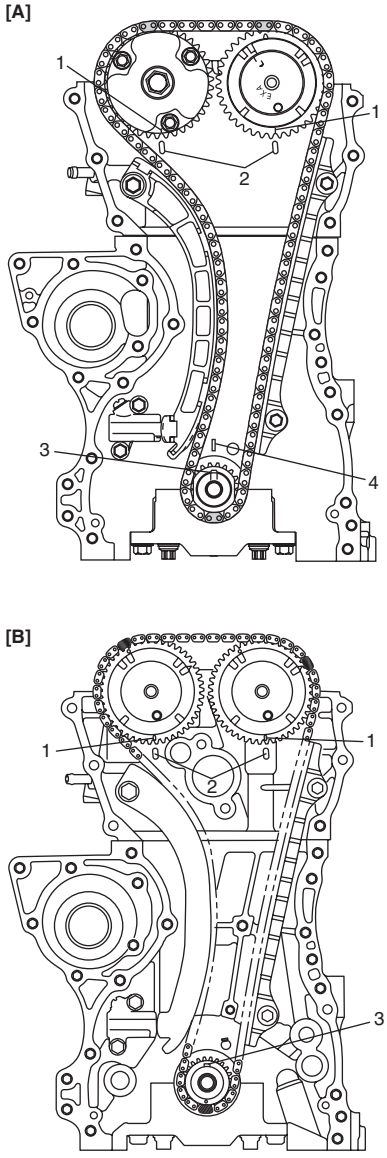
9) Install timing chain tensioner adjuster assembly (1) with a retainer (2).
Tighten adjuster bolts to specified torque and then remove a retainer from chain tensioner adjuster assembly.

Tightening torque
Timing chain tensioner adjuster bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I2RH0B140066-01

10) Apply engine oil to timing chain, and then turn crankshaft clockwise by 2 revolutions and check that match marks (1) are at the following specific positions.
   - Intake and exhaust camshaft timing sprockets makes (1) are in match with notches (2) on cylinder head.
   - For engine with VVT, crankshaft sprocket key (3) is in match with notch of cylinder block (4).
   - For engine without VVT, crankshaft sprocket key (3) is on upside of crankshaft as shown in figure.



I4RS0B140013-01

[A]:	For engine with VVT
[B]:	For engine without VVT

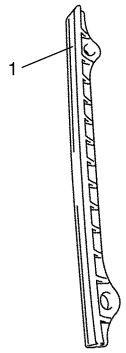
11) Install timing chain cover referring to “Timing Chain Cover Removal and Installation: M13A / M15A / M16A”.

Timing Chain and Chain Tensioner Inspection

S7N20A1416026

Timing Chain No.1 Guide

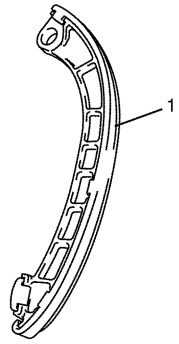
Check shoe (1) for wear or damage.



I2RH0B140068-01

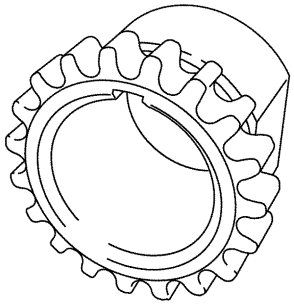
Timing Chain Tensioner

Check shoe (1) for wear or damage.



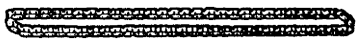
I2RH0B140069-01

Crankshaft Timing Sprocket
Check teeth of sprocket for wear or damage.



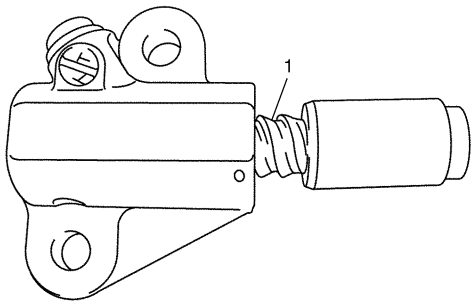
I2RH0B140070-01

Timing Chain
Check timing chain for wear or damage.



I2RH01140077-01

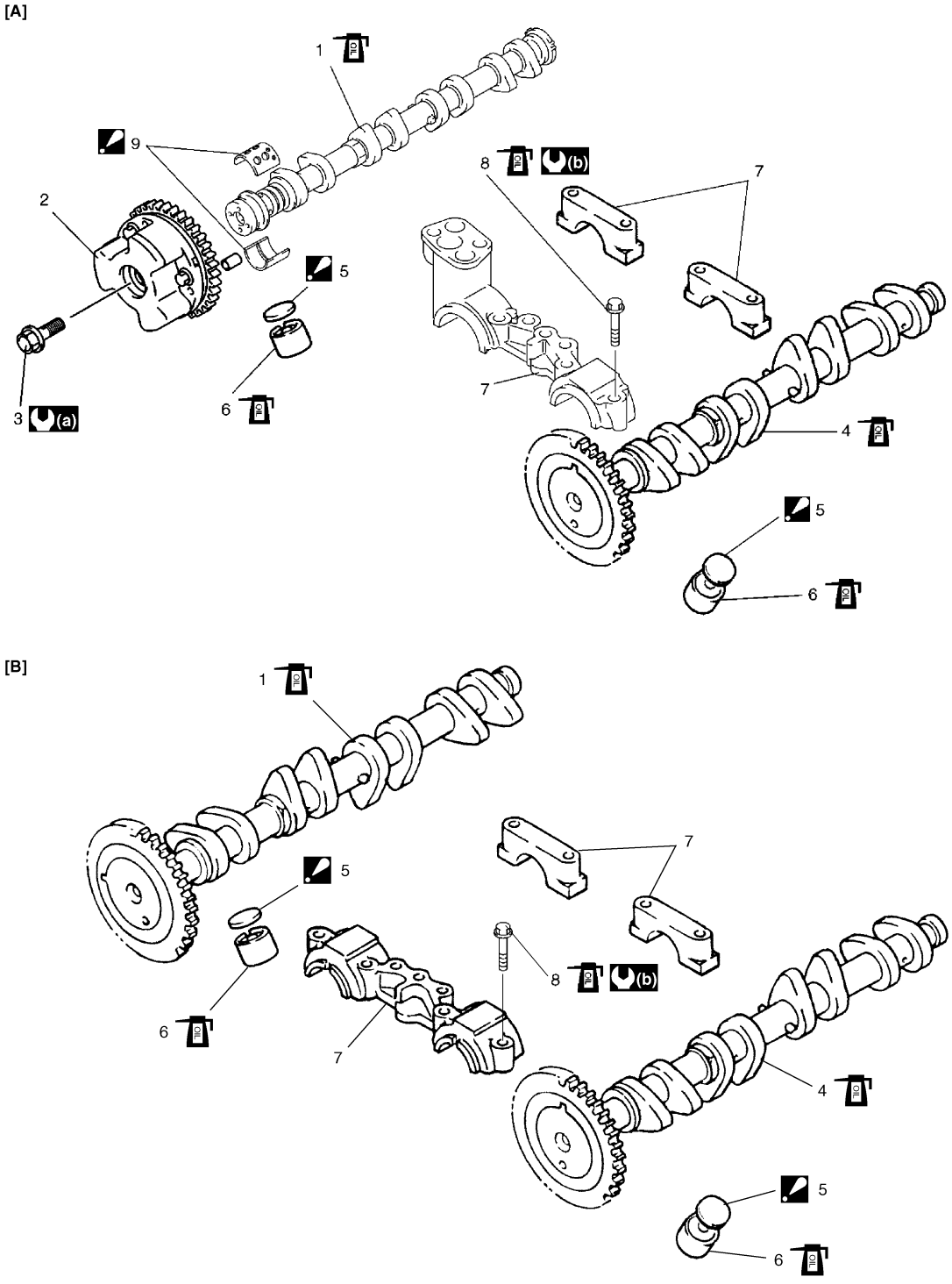
Timing Chain Tensioner Adjuster
Check that tooth surface (1) are free from damage.



I2RH0B140071-01

Camshaft, Tappet and Shim Components

S7N20A1416027



I4RS0B140014-03

[A]: For engine with VVT	4. Exhaust camshaft	9. Camshaft bearing : Install a bearing half with some holes to upper side of intake camshaft No.1 bearing.
[B]: For engine without VVT	5. Shim : Shim No. on it faces tappet side.	(a) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
1. Intake camshaft	6. Tappet	(b) : Tighten 5 N·m (0.5 kgf-m, 4.0 lbf-ft) and 11 N·m (1.1 kgf-m, 8.0 lbf-ft) by the specified procedure.
2. Intake camshaft sprocket assembly	7. Camshaft housing	: Apply engine oil to sliding surface of each part.
3. Intake camshaft sprocket bolt	8. Camshaft housing bolt	

Camshaft, Tappet and Shim Removal and Installation

S7N20A1416028

⚠ CAUTION

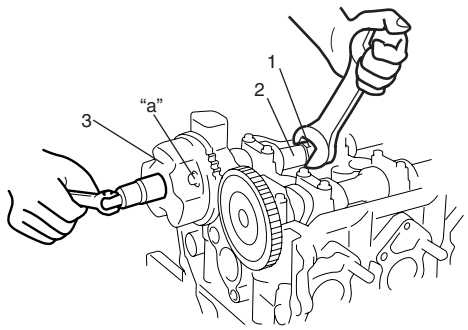
- **Keep working table, tools and hands clean while overhauling.**
- **Use special care to handle aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Keep them always clean.**

Removal

1) Remove timing chain cover referring to “Timing Chain Cover Removal and Installation: M13A / M15A / M16A”.
2) Remove timing chain referring to “Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A”.
3) For engine with VVT, with hexagonal section (1) of intake camshaft (2) held stationary with spanner or the like, loosen mounting bolt of intake cam timing sprocket assembly (3) and remove it.

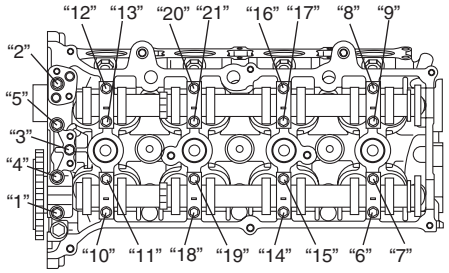
⚠ CAUTION

Never attempt to loosen mounting bolt with intake cam timing sprocket assembly held stationary. Failure to follow this could result in damage to lock pin.
Do not loosen bolt “a” because intake cam timing sprocket assembly is not serviceable.



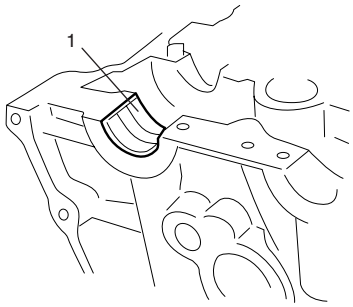
I3RM0A140030-01

4) Loosen camshaft housing bolts in such order as indicated in the figure and remove them.



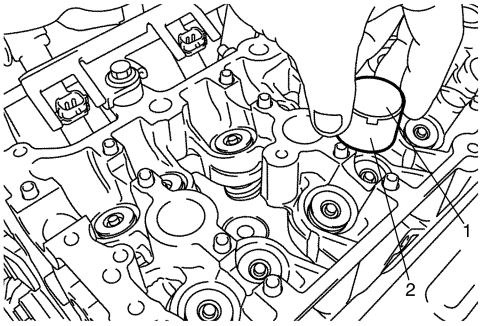
I3RM0A140031-01

5) Remove camshaft housings.
6) Remove intake and exhaust camshafts.
7) For engine with VVT, remove camshaft bearing (1).



I3RH0B140039-01

8) Remove tappets (2) with shims (1).



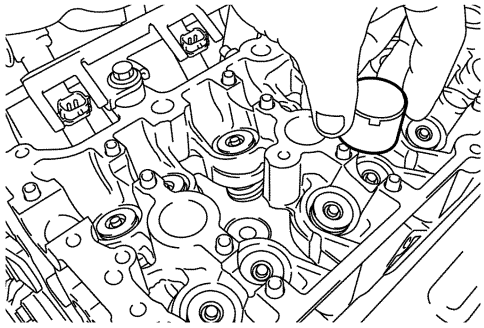
I2RH0B140074-01

Installation

1) Install tappets and shims to cylinder head.
Apply engine oil around tappet and then install it to cylinder head.

NOTE

When installing shim, make sure to direct shim No. side toward tappet.

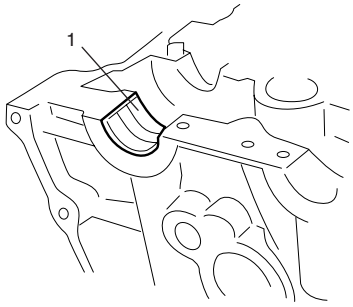


I2RH0B140075-01

2) For engine with VVT, install camshaft bearing (1) to cylinder head.

⚠ CAUTION

Do not apply engine oil to camshaft bearing back.
Only a upper half bearing of intake camshaft bearing No.1 has some holes. Other bearings.

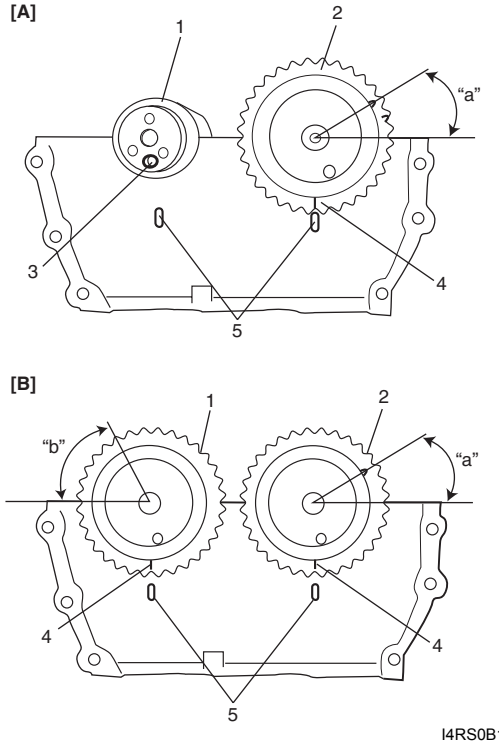


I3RH0B140039-01

3) Install intake camshaft (1) and exhaust camshaft (2). Align knock pin (3) and match mark (4) with notches (5) as shown in the figure.

NOTE

Before installing camshafts, turn crankshaft until key position faces upward.
Refer to "Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A".

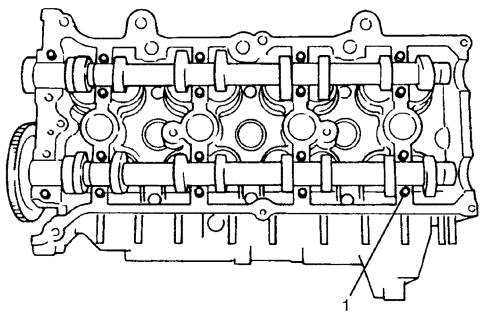


I4RS0B140015-01

[A]:	For engine with VVT
[B]:	For engine without VVT
"a":	Approx. 30°
"b":	Approx. 60°

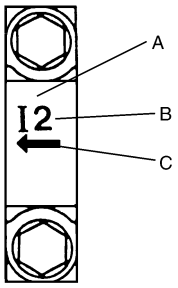
4) Apply engine oil to sliding surface of each camshaft and camshaft journal then install them as shown in the figure.

5) Install camshaft housing pins (1) as shown in the figure.



I3RM0A140033-01

6) Check position of camshaft housings.
Embossed marks are provided on each camshaft housing, indicating position and direction for installation. Install housings as indicated by these marks.



I2RH0B140078-01

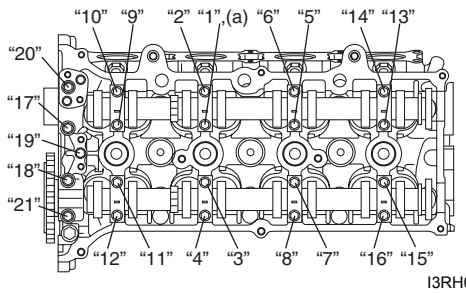
A:	I: Intake side or E: Exhaust side
B:	Position from timing chain side
C:	Pointing to timing chain side

7) Install camshaft housing.
8) Tighten camshaft housing bolts as follows.
For engine with VVT:
   a) Apply engine oil to camshaft housing bolts.
   b) Tighten camshaft housing bolts by hand.
   c) Tighten camshaft housing bolts to 5 N·m (0.5 kgf-m, 4.0 lbf-ft) according to numerical order (“1” through “21”) as shown in figure.
   d) Retighten them by turning through 11 N·m (1.1 kgf-m, 8.0 lbf-ft) in same manner as Step c).

Tightening torque
Camshaft housing bolt (a): 5 N·m (0.5 kgf-m, 4.0 lbf-ft) and 11 N·m (1.1 kgf-m, 8.0 lbf-ft) by the specified procedure

For engine without VVT:
After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by the numerical order in the figure. Tighten a little at a time and evenly among bolts and repeat tightening sequence two or three times before they are tightened to specified torque.

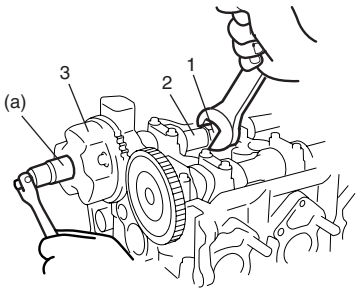
Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I3RH0B140041-01

9) For engine with VVT, with hexagonal section (1) of intake camshaft (2) held stationary with spanner or the like, tighten bolt of intake cam timing sprocket assembly (3) to specification.

Tightening torque
Intake cam timing sprocket bolt (a): 60 N·m (6.0 kgf-m, 43.5 lbf-ft)



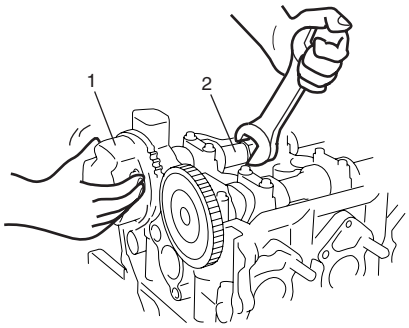
I3RH0B140042-01

10) Install timing chain with crankshaft sprocket referring to “Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A”.
11) Install timing chain cover referring to “Timing Chain Cover Removal and Installation: M13A / M15A / M16A”.
12) Check valve lashes referring to “Valve Lash (Clearance) Inspection: M13A / M15A / M16A”.
13) Perform Steps 9) to 14) of “Installation” of “Timing Chain Cover Removal and Installation: M13A / M15A / M16A”.

Camshaft, Tappet and Shim Inspection

S7N20A1416029

Intake Cam Timing Sprocket Assembly
Fit intake cam timing sprocket assembly to camshaft (2) and hold hexagonal section of camshaft by using spanner or the like.
Check if sprocket (1) is not turned by hand.
If moved, replace intake cam timing sprocket assembly.



I3RH0B140043-01

Cam Wear

Using a micrometer, measure cam height “a”. If measured height underruns its limit, replace camshaft.

Cam height “a”

[For M16A engine model]

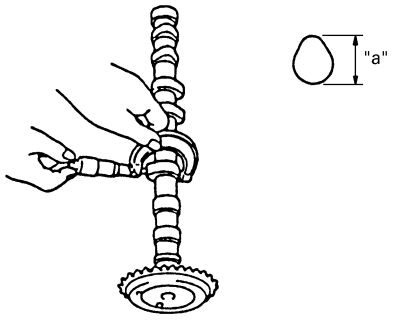
Cam height	Standard	Limit
Intake cam	45.424 – 45.584 mm (1.789 – 1.794 in.)	45.30 mm (1.783 in.)
Exhaust cam	45.030 – 45.190 mm (1.773 – 1.779 in.)	44.91 mm (1.768 in.)

[For M15A engine model]

Cam height	Standard	Limit
Intake cam	44.929 – 45.089 mm (1.769 – 1.775 in.)	44.80 mm (1.764 in.)
Exhaust cam	44.399 – 44.559 mm (1.748 – 1.754 in.)	44.28 mm (1.743 in.)

[For M13A engine model]

Cam height	Standard	Limit
Intake cam	44.919 – 45.079 mm (1.768 – 1.775 in.)	44.80 mm (1.764 in.)
Exhaust cam	44.399 – 44.559 mm (1.748 – 1.754 in.)	44.28 mm (1.743 in.)



I2RH0B140080-01

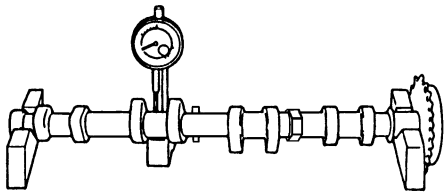
Camshaft Runout

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

0.10 mm (0.0039 in.)

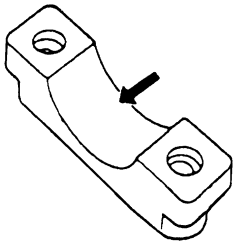


I2RH0B140081-01

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. Checking procedure is as follows.

1) Clean housings and camshaft journals.
2) Remove all tappets with shims.
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.
6) Install camshaft housing as follows.
   For engine with VVT:
   After applying engine oil to camshaft housing bolts, tighten them temporarily first. Then tighten them as follows.
   a) Tighten camshaft housing bolts to 5 N·m (0.5 kgf-m, 4.0 lbf-ft) according to numerical order (“1” through “21”) as shown in figure.
   b) Retighten them by turning through 11 N·m (1.1 kgf-m, 8.0 lbf-ft) in same manner as Step a).

NOTE

Do not rotate camshaft while gauging plastic is installed.

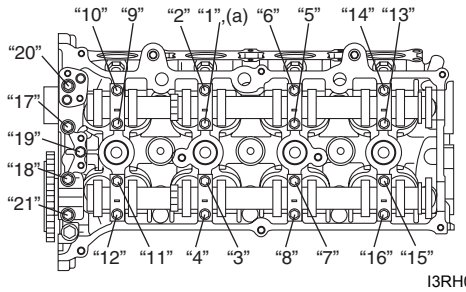
Tightening torque
Camshaft housing bolt (a): 5 N·m (0.5 kgf-m, 4.0 lbf-ft) and 11 N·m (1.1 kgf-m, 8.0 lbf-ft) by the specified procedure

For engine without VVT:
Tighten camshaft housing bolts in such order as indicated in the figure a little at a time till they are tightened to specified torque.

NOTE

Do not rotate camshaft while gauging plastic is installed.

Tightening torque
Camshaft housing bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I3RH0B140041-01

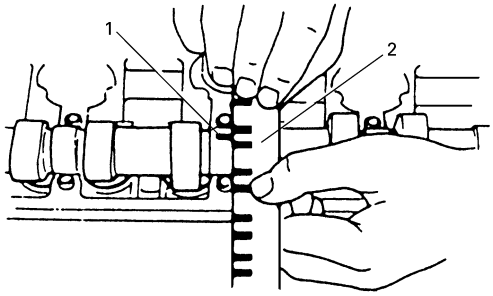
7) Remove housing, and using scale (2) on gauging plastic envelop, measure gauging plastic (1) width at its widest point.

Camshaft journal clearance
[For engine with VVT]

	Standard	Limit
Intake side No.1 housing	0.020 – 0.072 mm (0.0008 – 0.0028 in.)	0.10 mm (0.0039 in.)
Others	0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.12 mm (0.0047 in.)

[For engine without VVT]

Standard	Limit
0.045 – 0.087 mm (0.0018 – 0.0034 in.)	0.12 mm (0.0047 in.)



I2RH0B140083-01

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]
[For engine with VVT]

Item	Standard
Intake side No.1 housing	26.940 – 26.955 mm (1.0606 – 1.0612 in.)
Exhaust side No.1 housing	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

[For engine without VVT]

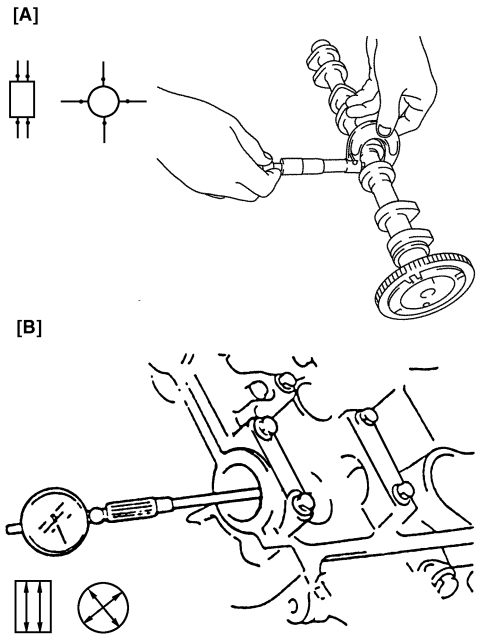
Item	Standard
Intake and Exhaust side No.1 housing	26.934 – 26.955 mm (1.0604 – 1.0612 in.)
Others	22.934 – 22.955 mm (0.9029 – 0.9037 in.)

Camshaft journal bearing bore [B]
[For engine with VVT]

Item	Standard
Intake side No.1 housing	—
Exhaust side No.1 housing	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)

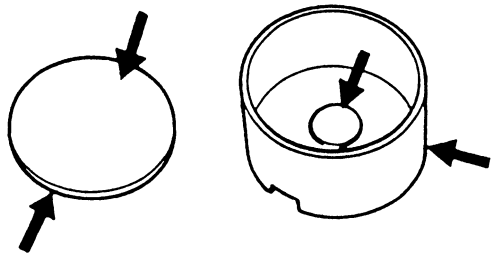
[For engine without VVT]

Item	Standard
Intake and Exhaust side No.1 housing	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	23.000 – 23.021 mm (0.9055 – 0.9063 in.)



I2RH0B140084-01

Wear of Tappet and Shim
Check tappet and shim for pitting, scratches, or damage. If any malcondition is found, replace.



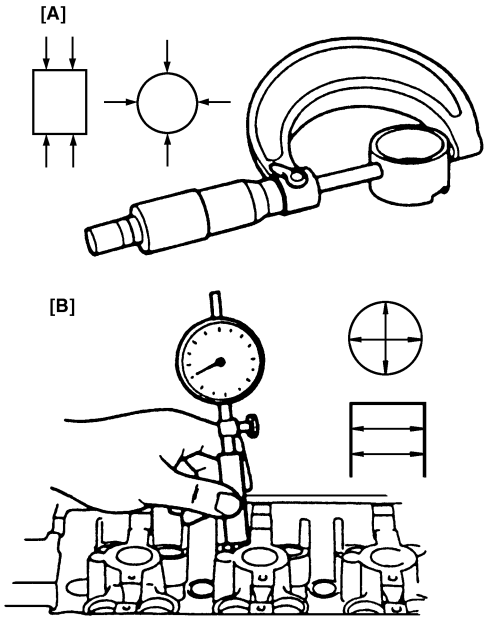
I2RH0B140085-01

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 – 0.066 mm (0.0010 – 0.026 in.)
Limit: 0.15 mm (0.0059 in.)

Tappet outside diameter [A]
Standard: 30.959 – 30.975 mm (1.2189 – 1.2195 in.)

Cylinder head tappet bore [B]
Standard: 31.000 – 31.025 mm (1.2205 – 1.2215 in.)



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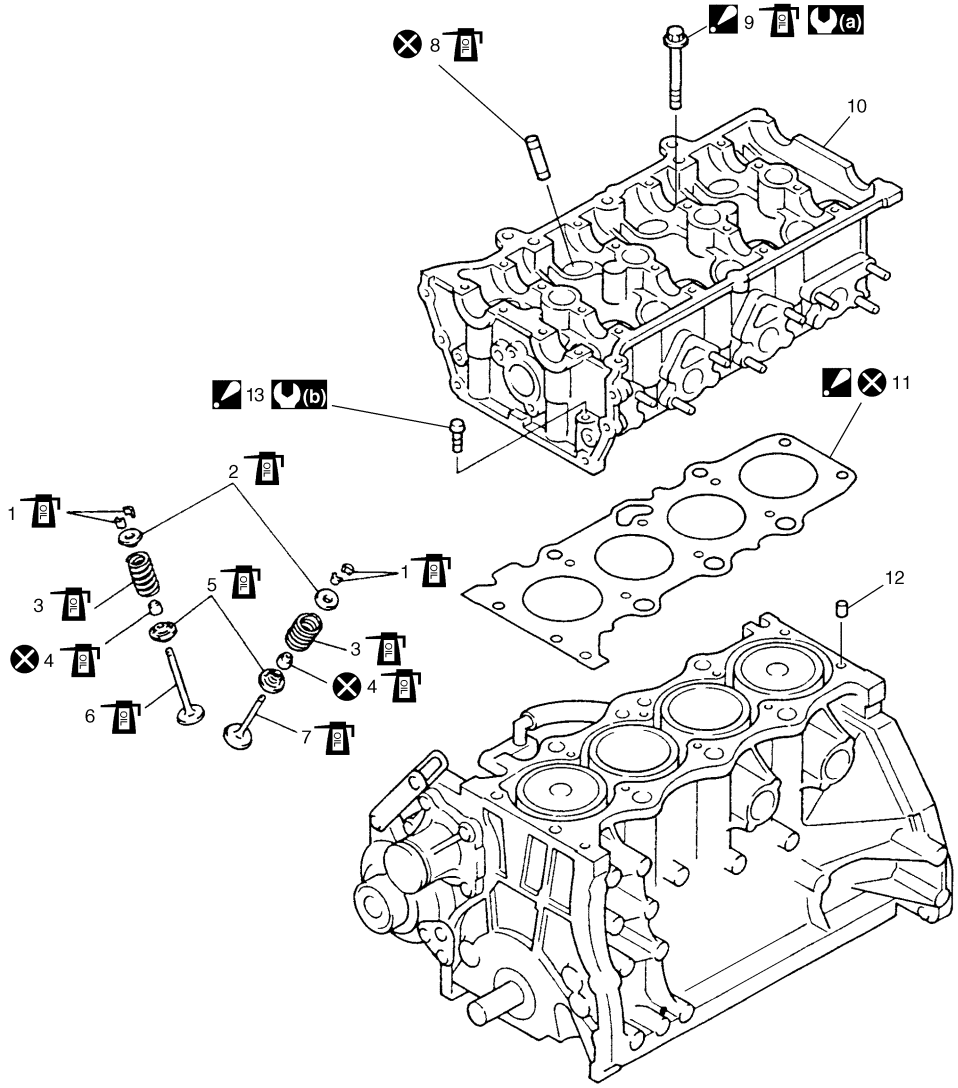
Valves and Cylinder Head Components

S7N20A1416030



I4RS0A140015-01

1. Valve cotters	7. Exhaust valve	13. Cylinder head bolt (M8) : Be sure to tighten cylinder head bolt (M8) after securing the other cylinder head bolt (M10).
2. Valve spring retainer	8. Valve guide	(a) : Tighten 20 N·m (2.0 kgf-m, 14.5 lbf-ft), 40 N·m (4.0 kgf-m, 29.0 lbf-ft), 60° and 60° by the specified procedure.
3. Valve spring	9. Cylinder head bolt (M10) : Never reuse cylinder head bolts once disassembled it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.	(b) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
4. Valve stem seal	10. Cylinder head	: Do not reuse.
5. Valve spring seat	11. Cylinder head gasket : "TOP" mark provided on gasket comes to crankshaft pulley side, facing up.	: Apply engine oil to sliding surface of each part.
6. Intake valve	12. Knock pin	

Valves and Cylinder Head Removal and Installation

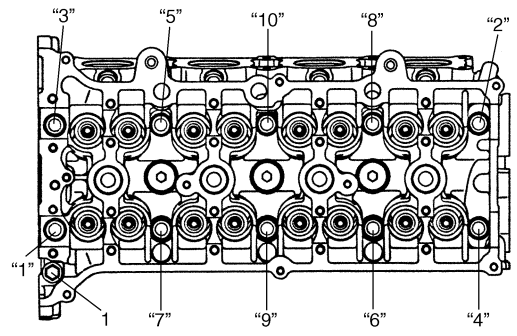
S7N20A1416031

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A” or “Engine Assembly Removal and Installation (For M16A Engine Model): M13A / M15A / M16A”.
2) Remove oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: M13A / M15A / M16A in Section 1E”.
3) Remove cylinder head cover referring to “Cylinder Head Cover Removal and Installation: M13A / M15A / M16A”.
4) Remove timing chain cover referring to Steps 2) to 11) of “Removal” in “Timing Chain Cover Removal and Installation: M13A / M15A / M16A”.
5) Remove timing chain referring to Steps 2) to 6) of “Removal” in “Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A”.
6) Remove intake and exhaust camshafts referring to Steps 3) to 8) of “Removal” in “Camshaft, Tappet and Shim Removal and Installation: M13A / M15A / M16A”.
7) Loosen cylinder head bolts in such order as indicated in the figure by using a 12 corner socket wrenches and remove them.

NOTE

- **Don’t forget to remove bolt (M8) (1) as shown in the figure.**
- **Never reuse cylinder head bolts once disassembled it due to plastic deformation tightening. Be sure to use new cylinder head bolts when installing.**

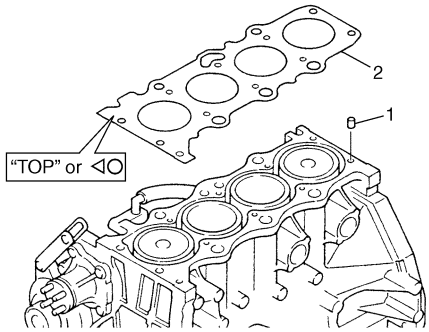


I2RH0B140088-01

8) Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.
9) Remove exhaust manifold, if necessary referring to “Exhaust Manifold Removal and Installation: M13A / M15A / M16A in Section 1K”.
10) Remove cylinder head with intake manifold and exhaust manifold. Use lifting device, if necessary.

Installation

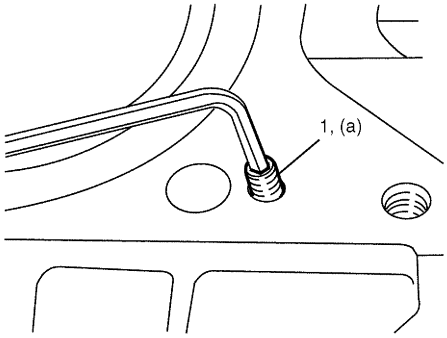
1) Clean mating surface of cylinder head and cylinder block. Remove oil, old gasket and dust from mating surface.
2) Install knock pins (1) to cylinder block.
3) Install new cylinder head gasket (2) to cylinder block. “Top” or “Triangle/circle” mark provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).



I4RS0B140018-01

4) Make sure that oil jet (venturi plug) (1) is not clogged. If it is not installed, install it as specified torque.

Tightening torque
Venturi plug (a): 5 N·m (0.5 kgf-m, 3.5 lbf-ft)



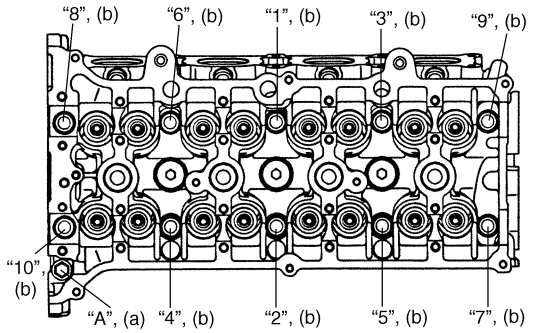
I2RH0B140089-01

5) Install cylinder head to cylinder block.
   Apply engine oil to new cylinder head bolts and tighten them gradually as follows.
   a) Tighten cylinder head bolts (“1” – “10”) to 20 N·m (2.0 kgf-m, 14.5 lbf-ft) according to numerical order as shown by using a 12 corner socket wrenches.
   b) In the same manner as in Step a), tighten them to 40 N·m (4.0 kgf-m, 29.0 lbf-ft).
   c) Turn all bolts 60° according to numerical order in the figure.
   d) Repeat Step c).
   e) Tighten bolt “A” to specified torque.

NOTE

Be sure to tighten M8 bolt “A” after securing the other bolts.

Tightening torque
Cylinder head bolt for M8 (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
Cylinder head bolt for M10 (b): 20 N·m (2.0 kgf-m, 14.5 lbf-ft), 40 N·m (4.0 kgf-m, 29.0 lbf-ft) and then retighten by turning through to 60° twice



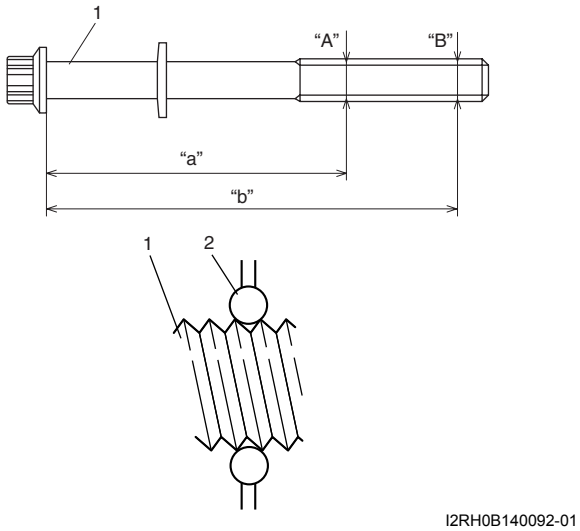
I2RH0B140091-01

NOTE

- **If they are reused, check thread diameters of cylinder head bolt (1) for deformation according to the follows and replace them with new ones if thread diameter difference exceeds limit.**
- **Measure each thread diameter of cylinder head bolt (1) at “A” on 83.5 mm (2.81 in.) from seat side of flange bolt and “B” on 115 mm (4.53 in.) from seat side of flange bolt by using a micrometer (2).**
  Then calculate difference in diameters (“A” – “B”). If it exceeds limit, replace with new one.

Cylinder head bolt diameter measurement points
“a”: 83.5 mm (2.81 in.)
“b”: 115 mm (4.53 in.)

Cylinder head bolt diameter difference (deformation)
Limit (“A” – “B”): 0.1 mm (0.004 in.)



I2RH0B140092-01

6) Install camshafts, tappet and shim referring to “Camshaft, Tappet and Shim Removal and Installation: M13A / M15A / M16A”.
7) Install timing chain referring to “Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A”.
8) Install timing chain cover referring to “Timing Chain Cover Removal and Installation: M13A / M15A / M16A”.
9) Install cylinder head cover referring to “Cylinder Head Cover Removal and Installation: M13A / M15A / M16A”.
10) Install oil pan referring to “Oil Pan and Oil Pump Strainer Removal and Installation: M13A / M15A / M16A in Section 1E”.

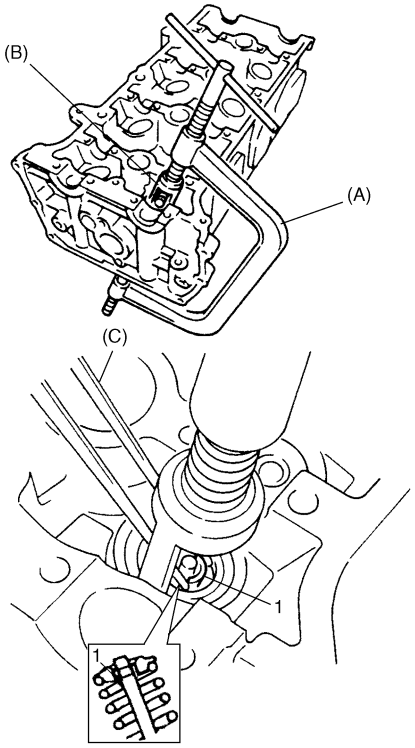
Valves and Cylinder Head Disassembly and Assembly

S7N20A1416032

Disassembly

1) For ease in servicing cylinder head, remove intake manifold, injectors, exhaust manifold from cylinder head.
2) Using special tools (Valve lifter), compress valve spring and then remove valve cotters (1) also by using special tool (Forceps).

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511

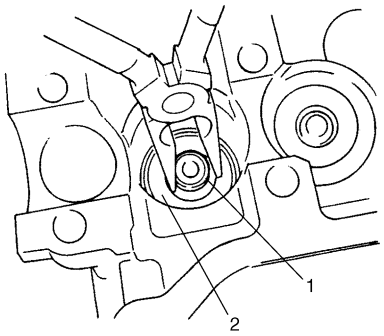


I2RH0B140093-01

3) Release special tools (Valve lifter), and remove spring retainer and valve spring.
4) Remove valve from combustion chamber side.
5) Remove valve stem seal (1) from valve guide and valve spring seat (2).

NOTE

Do not reuse valve stem seal once disassembled. Be sure to use new seal when assembling.



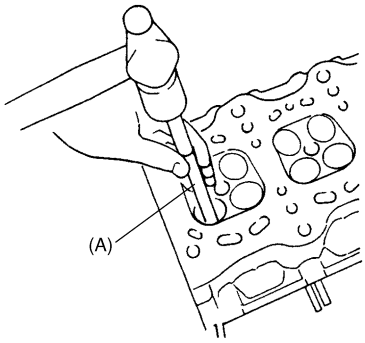
I2RH0B140094-01

6) Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

Special tool
(A): 09916–44910

NOTE

Do not reuse valve guide once disassembled. Be sure to use new valve guide (oversize) when assembling.



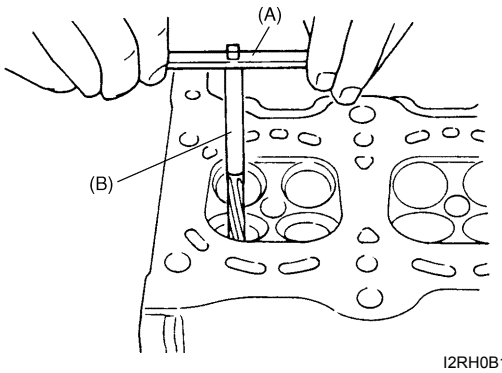
I2RH0B140095-01

7) Place disassembled parts except valve stem seal and valve guide in order so that they can be installed in their original position.

Assembly

1) Before installing valve guide into cylinder head, ream guide hole with special tool (10.5 mm reamer) so as to remove burrs and make it truly round.

Special tool
(A): 09916–34542
(B): 09916–37320



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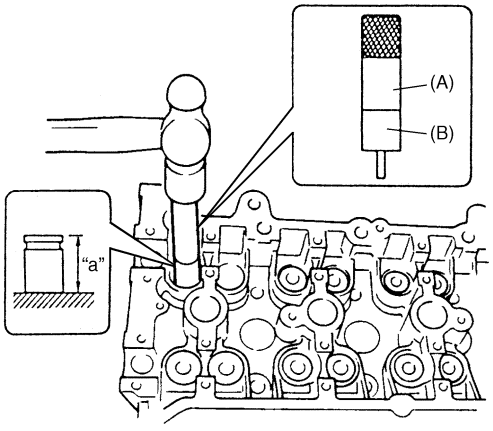
2) Install valve guide to cylinder head.
Heat cylinder head uniformly at a temperature of 80 to 100 °C (176 to 212 °F) so that head will not be distorted, and drive new valve guide into hole with special tools.
Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head.
After installing, make sure that valve guide protrudes by specified dimension “a” from cylinder head.

Special tool
(A): 09916–58210
(B): 09916–56011

NOTE

- **Never reuse valve guide once disassembled. Make sure to install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

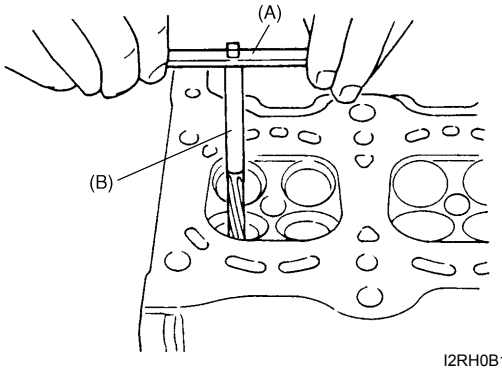
Valve guide protrusion (In and Ex)
“a”: 11.3 mm (0.44 in.)



I2RH0B140097-01

3) Ream valve guide bore with special tool (5.5 mm reamer). After reaming, clean bore.

Special tool
(A): 09916–34542
(B): 09916–34550



I2RH0B140096-01

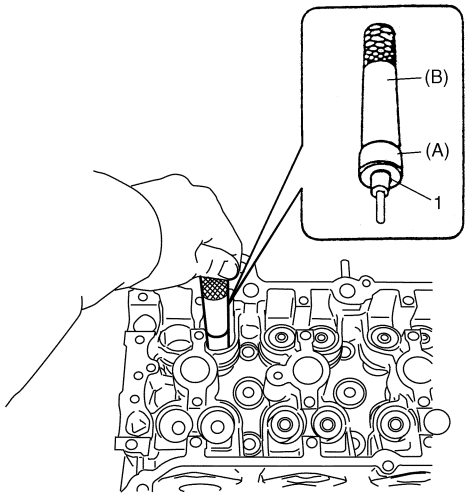
4) Install valve spring seat to cylinder head.

5) Install new valve stem seal (1) to valve guide.
After applying engine oil to seal and spindle of special tool (Valve guide installer handle), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
After installing, check to be sure that seal is properly fixed to valve guide.

Special tool
(A): 09917–98221
(B): 09916–58210

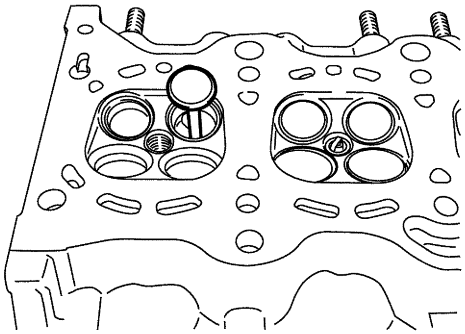
NOTE

- **Do not reuse seal once disassembled. Be sure to install new seal.**
- **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.**



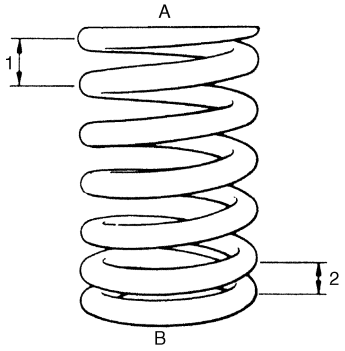
I2RH0B140098-01

6) Install valve to valve guide.
Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore and valve stem.



I2RH0B140099-01

7) 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).



I2RH0B140100-01

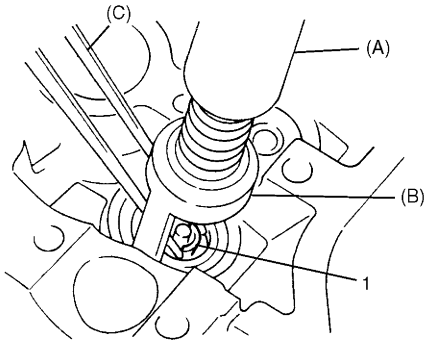
A:	Valve spring retainer side
B:	Valve spring seat side

8) Using special tools (Valve lifter), compress valve spring and fit two valve cotters (1) into groove in valve stem.

NOTE

When compressing the valve spring, be carefully to free from damage in inside face of tappet installing hole.

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511



I2RH0B140101-01

9) Install intake manifold referring to “Intake Manifold Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A” or “Intake Manifold Removal and Installation (For M16A Engine Model): M13A / M15A / M16A”.
10) Install fuel injectors referring to “Fuel Injector Removal and Installation: M13A / M15A / M16A in Section 1G”.
11) Install exhaust manifold referring to “Exhaust Manifold Removal and Installation: M13A / M15A / M16A in Section 1K”.

Valves and Valve Guides Inspection

S7N20A1416033

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.

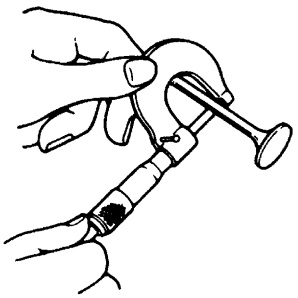
Valve stem and valve guide specification
[For engine with VVT]

Item		Standard	Limit
Valve stem diameter [A]	In	5.465 – 5.480 mm (0.2150 – 0.2157 in.)	—
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	—
Valve guide bore [B]	In & Ex	5.500 – 5.512 mm (0.2165 – 0.2170 in.)	—
Stem-to-guide clearance	In	0.020 – 0.047 mm (0.0008 – 0.0018 in.)	0.070 mm (0.0028 in.)
	Ex	0.045 – 0.072 mm (0.0017 – 0.0028 in.)	0.090 mm (0.0035 in.)

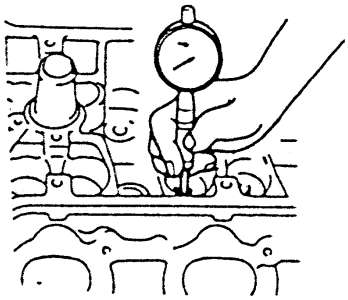
[For engine without VVT]

Item		Standard	Limit
Valve stem diameter [A]	In	5.465 – 5.480 mm (0.2150 – 0.2157 in.)	—
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	—
Valve guide bore [B]	In & Ex	5.485 – 5.510 mm (0.2160 – 0.2170 in.)	—
Stem-to-guide clearance	In	0.005 – 0.045 mm (0.0002 – 0.0017 in.)	0.070 mm (0.0028 in.)
	Ex	0.030 – 0.070 mm (0.0012 – 0.0027 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.

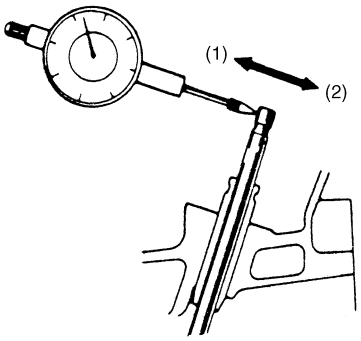
Move stem end in directions (1) and (2) to measure end deflection.

If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit

In: 0.14 mm (0.005 in.)

Ex: 0.18 mm (0.007 in.)

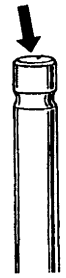


IYSQ01141096-01

Valve

Visual inspection

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem end, as necessary, replace it.
- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not too much to grind off its chamber. When it is worn out too much that its chamber is gone, replace valve.



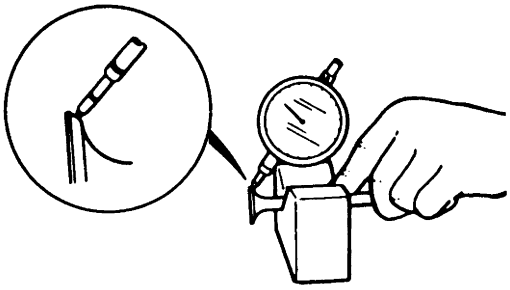
I2RH01140135-01

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

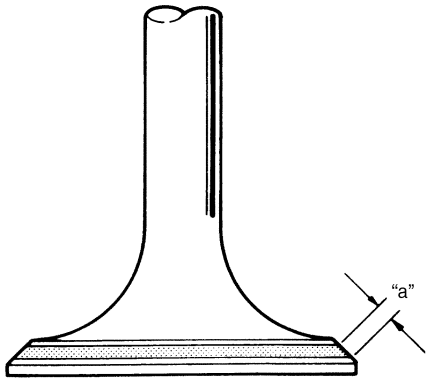
Limit: 0.08 mm (0.003 in.)



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 rotatingly 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
[For engine with VVT]
Intake and Exhaust: 1.0 – 1.4 mm (0.0389 – 0.0551 in.)
[For engine without VVT]
Intake and Exhaust: 1.1 – 1.3 mm (0.0433 – 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.

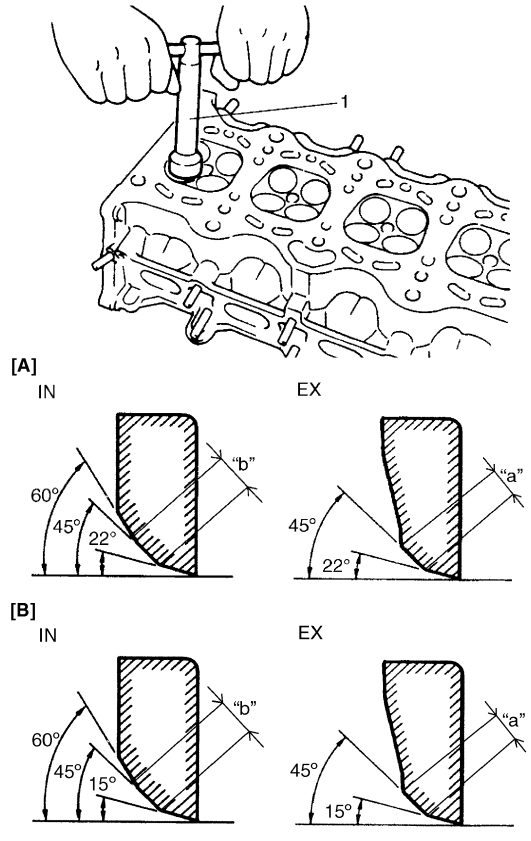
1) **Exhaust valve seat:**
Use valve seat cutters (1) to make two cuts as illustrated in the figure. Two cutters must be used: the first for making 22° angle (for M15A engine) or 15° angle (for M13A engine), and the second for making 45° angle. The second cut must be made to produce desired seat width.

Seat width for exhaust valve seat
[For engine with VVT]
"a": 1.0 – 1.4 mm (0.0389 – 0.0551 in.)
[For engine without VVT]
"a": 1.1 – 1.3 mm (0.0433 – 0.0512 in.)

2) **Intake valve seat:**
Use valve seat cutters (1) to make three cuts as illustrated in the figure. Three cutters must be used: the 1st for making 22° angle, the 2nd for making 60° 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
[For engine with VVT]
"b": 1.0 – 1.4 mm (0.0389 – 0.0551 in.)
[For engine without VVT]
"b": 1.1 – 1.3 mm (0.0433 – 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.



I4RS0B140017-01

[A]: For engine with VVT
[B]: For engine without VVT

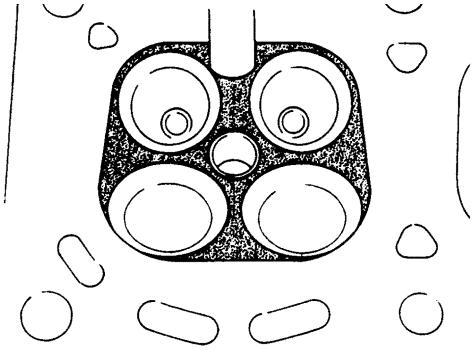
Cylinder Head Inspection

S7N20A1416034

- Remove all carbon deposits from combustion chambers.

NOTE

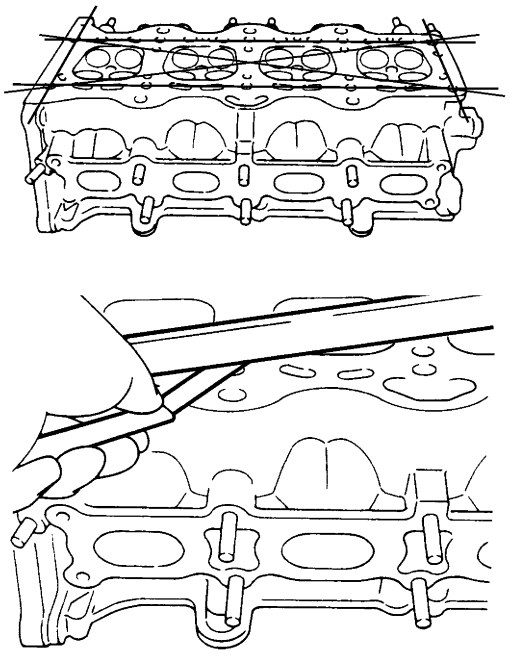
Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when decarbonizing. The same applies to valves and valve seats, too.



I2RH0B140105-01

- Check cylinder head for cracks on intake and exhaust ports, combustion chambers, and head surface. Using a straightedge and thickness gauge, check flatness of gasketed surface at a total of 6 locations. If distortion limit is exceeded, correct gasketed 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 gasketed surface against paper to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head.
  Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface: such leakage results in reduced power output.

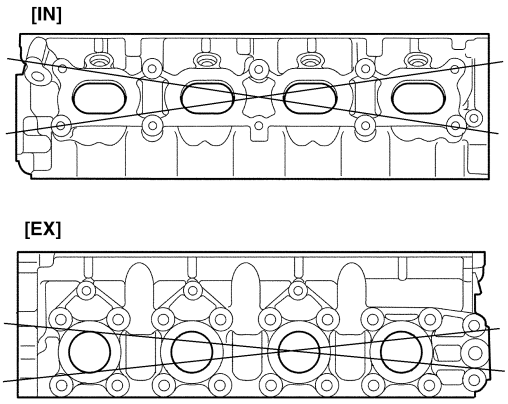
  Distortion for cylinder head surface on piston side
  Limit: 0.03 mm (0.001 in.)



I2RH0B140106-01

- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, 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 (0.002 in.)



I2RH0B140107-01

Valve Spring Inspection

S7N20A1416035

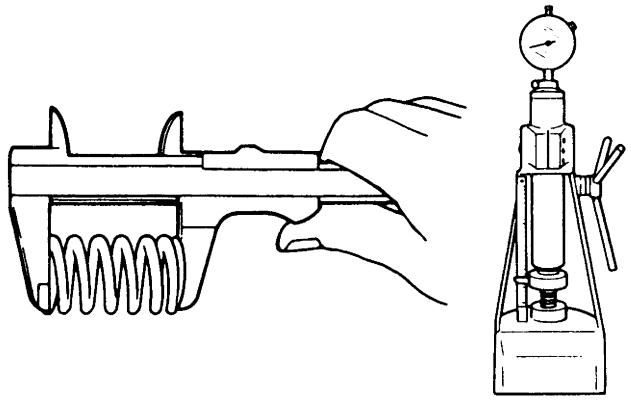
Valve Spring Free Length and Preload
Referring to data, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Valve spring free length
[For M16A engine model]
Standard: 37.49 mm (1.476 in.) (ID Color: Red)
Limit: 36.49 mm (1.437 in.)
Standard: 39.37 mm (1.550 in.) (ID Color: Yellow)
Limit: 36.49 mm (1.437 in.)

[For other than M16A engine model]
Standard: 36.83 mm (1.450 in.)
Limit: 35.83 mm (1.411 in.)

Valve spring preload
[For M16A engine model]
Standard: 120 – 136 N (12.0 – 13.6 kg) for 31.50 mm (26.5 – 30.0 lb / 1.240 in.) (ID Color: Red)
Limit: 114 N (11.4 kg) for 31.50 mm (25.1 lb / 1.240 in.)
Standard: 161 – 185 N (16.1 – 18.5 kg) for 31.50 mm (35.4 – 40.7 lb / 1.240 in.) (ID Color: Yellow)
Limit: 159 N (15.9 kg) for 31.50 mm (35.1 lb / 1.240 in.)

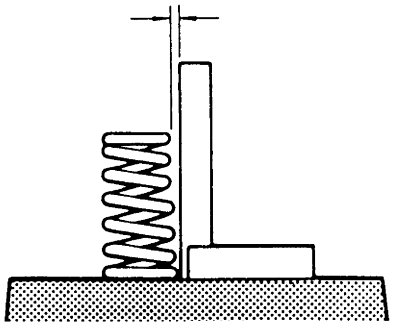
[For other than M16A engine model]
Standard: 107 – 125 N (10.7 – 12.5 kg) for 31.50 mm (23.6 – 27.6 lb/1.240 in.)
Limit: 102 N (10.2 kg) for 31.50 mm (22.5 lb/1.240 in.)



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.

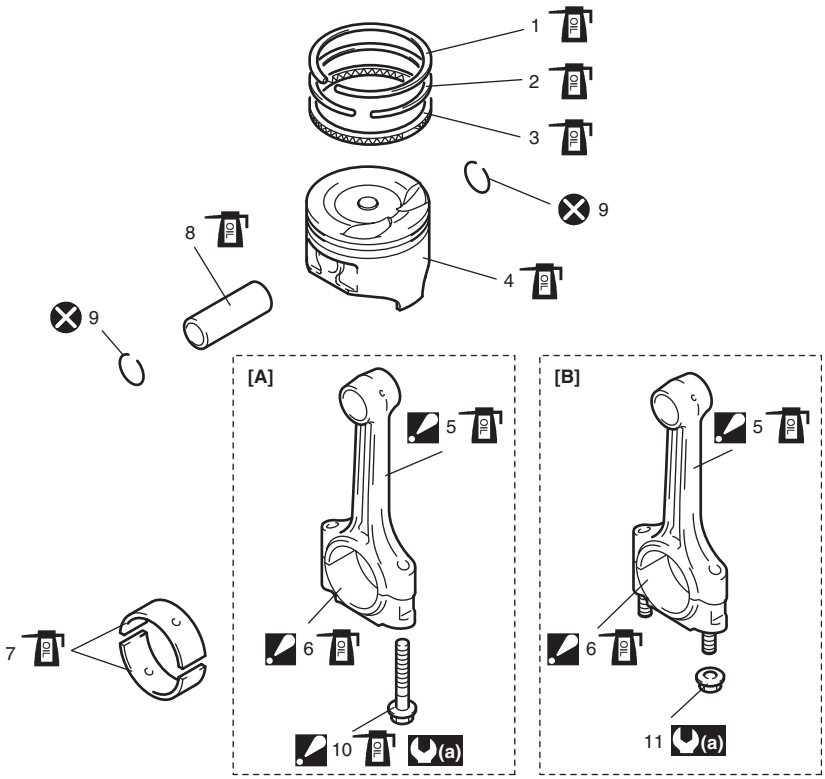
Valve spring squareness
Limit: 1.6 mm (0.063 in.) (ID Color: Red)
Limit: 1.7 mm (0.067 in.) (ID Color: Yellow)



I2RH01140144-01

Pistons, Piston Rings, Connecting Rods and Cylinders Components

S7N20A1416036



I6RS0B141024-01

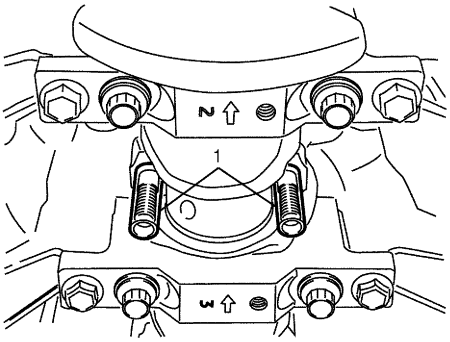
[A]: For M16A engine model	5. Connecting rod : See “A”	11. Connecting rod bearing cap nut
[B]: For other than M16A engine model	6. Connecting rod bearing cap : See “B”	(a) : Tighten15 N·m (1.5 kgf-m, 11.0 lbf-ft), 45° and 45° by the specified procedure.
1. Top ring	7. Connecting rod bearing	: Apply engine oil to sliding surface of each part.
2. 2nd ring	8. Piston pin	: Do not reuse.
3. Oil ring	9. Piston pin circlip	
4. Piston	10. Connecting rod bearing cap bolt : See “C”	
“A”: Apply engine oil to sliding surface except inner surface of big end, and rod bolts (for other than M16A engine model). Make sure rod bolt diameter when reuse it due to plastic deformation tightening. Refer to “Piston Pins and Connecting Rods Inspection: M13A / M15A / M16A” (for other than M16A engine model).		
“B”: Point arrow mark on cap to crankshaft pulley side.		
“C”: Make sure bearing cap bolt diameter when reuse it due to plastic deformation tightening. Refer to “Piston Pins and Connecting Rods Inspection: M13A / M15A / M16A”.		

Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation

S7N20A1416037

Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A” or “Engine Assembly Removal and Installation (For M16A Engine Model): M13A / M15A / M16A”.
2) Remove cylinder head referring to “Valves and Cylinder Head Removal and Installation: M13A / M15A / M16A”.
3) Mark cylinder number on all pistons, connecting rods and connecting rod caps using silver pencil or quick drying paint.
4) Remove rod bearing caps.
5) Install guide hose (1) over threads of rod bolts. This prevents damage to bearing journal and rod bolt threads when removing connecting rod (for other than M16A engine model).



I2RH0B140109-01

6) Decarbonize top of cylinder bore before removing piston from cylinder.
7) Push piston and connecting rod assembly out through the top of cylinder bore.

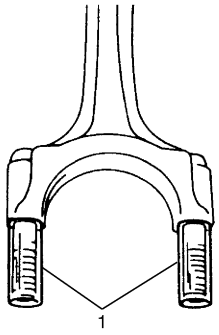
Installation

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crank pins.

NOTE

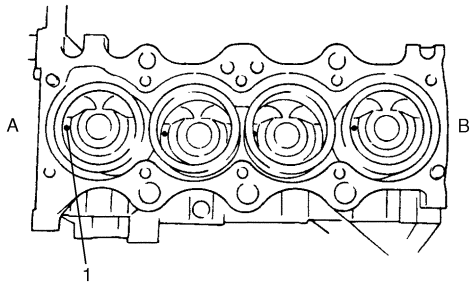
Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

2) Install guide hoses (1) over connecting rod bolts. These guide hoses protect crank pin and threads of rod bolt from damage during installation of connecting rod and piston assembly.



I2RH01140147-01

3) When installing piston and connecting rod assembly into cylinder bore, point front mark or arrow mark (1) on piston head to crankshaft pulley side.

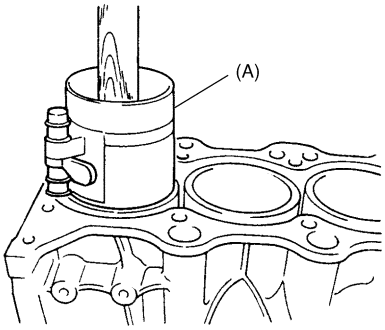


I2RH0B140110-01

A: Crankshaft pulley side
B: Flywheel 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, 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): 09916–77310



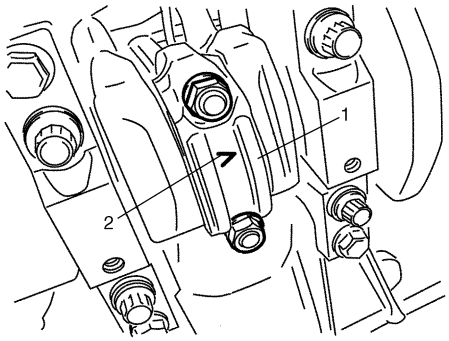
I2RH0B140111-01

5) Install bearing cap (1):
Point arrow mark (2) on cap to crankshaft pulley side.
After applying engine oil to rod bolts or bearing cap bolts and tighten cap nuts or bolts gradually as follows.
a) Tighten all cap nuts or bolts to 15 N·m (1.5 kgf-m, 11.0 lbf-ft).
b) Retighten them to 45°.
c) Repeat Step b) once again.

NOTE

Before installing bearing cap, make sure that checking for connecting rod bolt or bearing cap bolt deformation. Refer to "Piston Pins and Connecting Rods Inspection: M13A / M15A / M16A".

Tightening torque
Connecting rod bearing cap nut: 15 N·m (1.5 kgf-m, 11.0 lbf-ft) and then retighten by turning through 45° twice
Connecting rod bearing cap bolt: 15 N·m (1.5 kgf-m, 11.0 lbf-ft) and then retighten by turning through 45° twice



I6RS0B141025-01

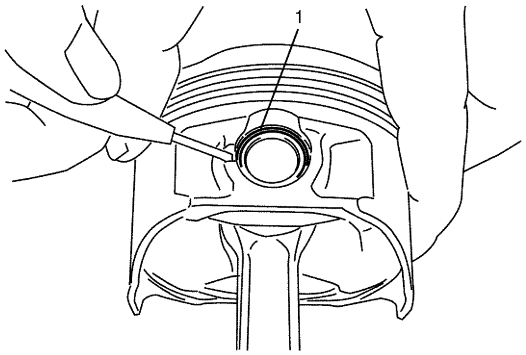
6) Install cylinder head referring to "Valves and Cylinder Head Removal and Installation: M13A / M15A / M16A".

Pistons, Piston Rings, Connecting Rods and Cylinders Disassembly and Assembly

S7N20A1416038

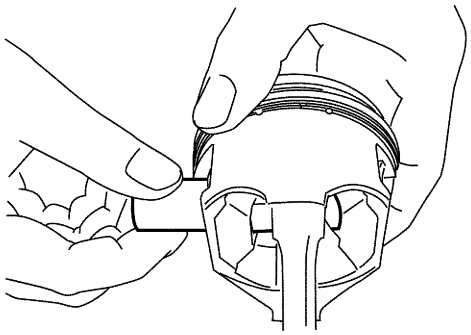
Disassembly

1) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.
2) Remove piston pin from connecting rod as follows.
a) Ease out piston pin circlip (1), as shown.



I2RH0B140113-01

b) Force piston pin out.



I2RH0B140114-01

Assembly

1) Decarbonize piston head and ring grooves using a suitable tool.
2) Install piston pin to piston (1) and connecting rod (2):
   a) After applying engine oil to piston pin and piston pin holes in piston and connecting rod.
   b) Fit connecting rod as shown in figure.

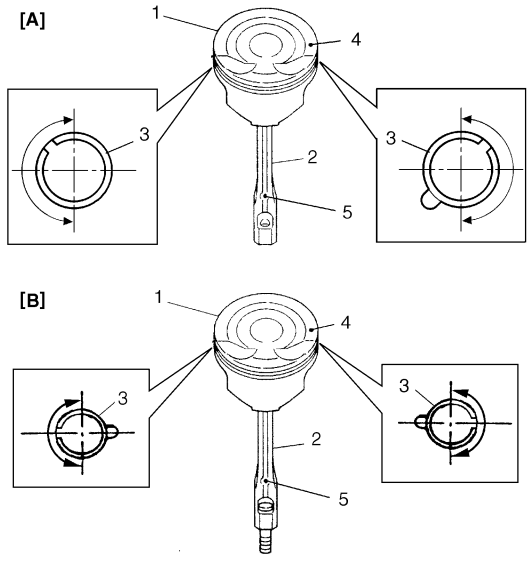
NOTE

Be sure to position front mark (4) or arrow mark (6) 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 piston pin circlips (3).

NOTE

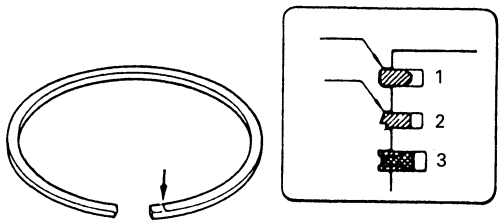
Circlip should be installed with its cut part facing as shown in figure. Install so that circlip end gap comes within such range as indicated by arrow.



I6RS0B141016-04

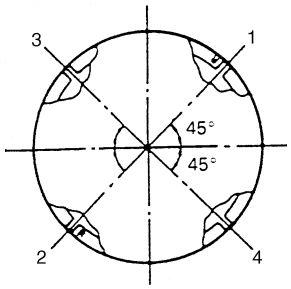
[A]:	For M16A engine model
[B]:	For other than M16A engine model

3) Install piston rings to piston:
   - As indicated in the figure, 1st and 2nd rings have discrimination mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
   - 1st ring (1) differs from 2nd ring (2) 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 (3), install spacer first and then two rails.



I2RH0B140116-01

4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in the figure.



I6RS0B141018-01

1. 1st ring end gap	3. Oil ring upper rail gap
2. 2nd ring end gap and oil ring spacer gap	4. Oil ring lower rail gap

Cylinders, Pistons and Piston Rings Inspection

S7N20A1416039

Cylinder

Visual inspection

Inspect cylinder walls for scratches, roughness or ridges which indicate excessive wear. If cylinder bore is very rough or deeply scratched, or ridged, rebore cylinder and use over size piston.

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”) as shown in the figure.
If any of the following conditions is noted, rebore cylinder.

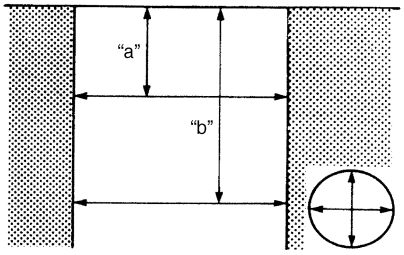
1) Cylinder bore dia. exceeds limit.
2) Difference of measurements at two positions exceeds taper limit.
3) Difference between thrust and axial measurements exceeds out-of-round limit.

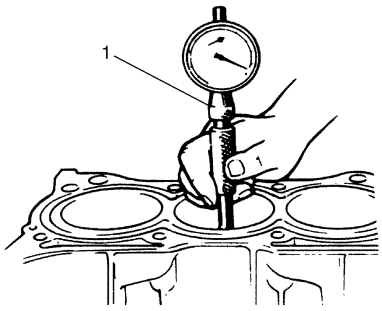
Cylinder bore diameter
Standard: 78.000 – 78.014 mm (3.0709 – 3.0714 in.)
Limit: 78.114 mm (3.075 in.)

Cylinder taper and out-of-round
Limit: 0.10 mm (0.004 in.)

NOTE

If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.





I2RH0B140117-01

“a”: 50 mm (1.96 in.)	“b”: 95 mm (3.74 in.)

Piston

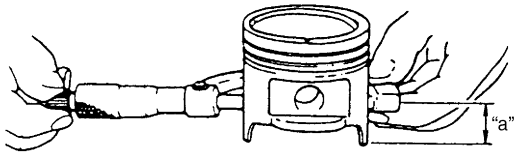
Visual inspection

Inspect piston for faults, cracks or other damages. Damaged or faulty piston should be replaced.

Piston diameter

As indicated in the figure, piston diameter should be measured at a position “a” from piston skirt end in the direction perpendicular to piston pin.

Piston diameter specification
[For M16A engine model]
Standard size (used piston):
77.953 – 77.968 mm (3.0690 – 3.0696 in.)
Standard size (new piston with coating):
77.963 – 77.990 mm (3.0694 – 3.0704 in.)
Oversize (0.05 mm (0.0196 in.)):
78.453 – 78.468 mm (3.0887 – 3.0893 in.)
[For other than M16A engine model]
Standard size (used piston): 77.953 – 77.968 mm (3.0690 – 3.0696 in.)
Standard size (new piston with coating): 77.963 – 77.990 mm (3.0694 – 3.0705 in.)
Oversize (0.50 mm (0.0196 in.)): 78.453 – 78.468 mm (3.0887 – 3.0893 in.)



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“a”: 19.5 mm (0.77 in.) (M13A and M15A engine models)
“a”: 7.0 mm (0.28 in.) (for M16A engine model)

Piston clearance

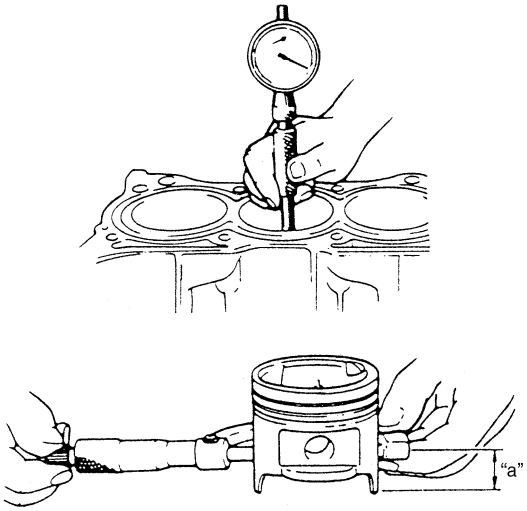
Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as follows. If it is out of specification, rebore cylinder and use oversize piston.

NOTE

Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance

[For M16A engine model]
Standard (used piston): 0.032 – 0.061 mm (0.0013 – 0.0024 in.)
Standard (new piston with coating): 0.010 – 0.051 mm (0.0004 – 0.0020 in.)
Limit: 0.161 mm (0.0063 in.)
[For other than M16A engine model]
Standard (used piston): 0.032 – 0.061 mm (0.0013 – 0.0024 in.)
Standard (new piston with coating): 0.010 – 0.051 mm (0.0006 – 0.0018 in.)
Limit: 0.161 mm (0.0065 in.)



I4RS0A140022-01

"a": 19.5 mm (0.77 in.) (M13A and M15A engine models)
"a": 7.0 mm (0.28 in.) (for M16A engine model)

Ring groove clearance

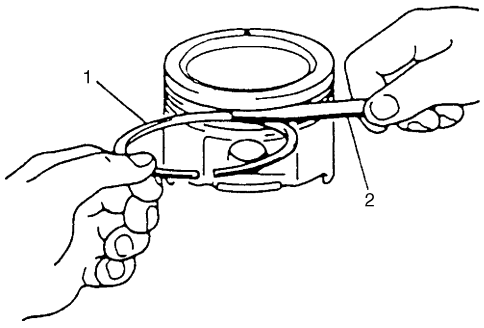
Before checking, piston grooves must be clean, dry and free of carbon deposits.
Fit new piston ring (1) into piston groove, and measure clearance between ring and ring land by using thickness gauge (2). If clearance is out of specification, replace piston.

Ring groove clearance (for M16A engine model)

	Standard	Limit
Top ring	0.04 – 0.08 mm (0.0016 – 0.0031 in.)	0.12 mm (0.0047 in.)
2nd ring	0.03 – 0.07 mm (0.0012 – 0.0027 in.)	0.10 mm (0.0394 in.)
Oil ring	0.04 – 0.12 mm (0.0016 – 0.0047 in.)	—

Ring groove clearance (for other than M16A engine model)

	Standard	Limit
Top 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	0.03 – 0.17 mm (0.0012 – 0.0067 in.)	—



I2RH01140159-01

Piston Ring

Piston ring end gap

To measure end gap, insert piston ring (2) into cylinder bore and then measure the gap by using thickness gauge (1).

If measured gap exceeds limit, replace ring.

NOTE

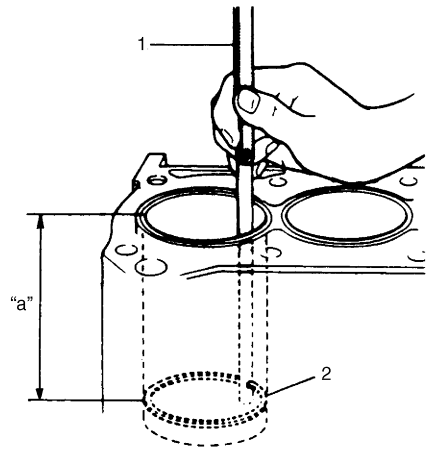
Decarbonize and clean top of cylinder bore before inserting piston ring.

Ring groove clearance (for M16A engine model)

Item	Standard	Limit
Top ring	0.20 – 0.33 mm (0.0079 – 0.0129 in.)	0.7 mm (0.0276 in.)
2nd ring	0.43 – 0.56 mm (0.0170 – 0.0220 in.)	1.0 mm (0.0394 in.)
Oil ring	0.10 – 0.40 mm (0.0040 – 0.0157 in.)	0.7 mm (0.0276 in.)

Piston ring end gap (for other than M16A engine model)

Item	Standard	Limit
Top ring	0.20 – 0.35 mm (0.0079 – 0.0138 in.)	0.7 mm (0.0276 in.)
2nd ring	0.35 – 0.50 mm (0.0138 – 0.0197 in.)	1.0 mm (0.0394 in.)
Oil ring	0.20 – 0.70 mm (0.0079 – 0.0276 in.)	1.2 mm (0.0472 in.)



I2RH01140161-01

"a": 120 mm (4.72 in.)

Piston Pins and Connecting Rods Inspection

S7N20A1416040

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 bush. 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 – 0.014 mm (0.0001 – 0.0006 in.)

Piston pin clearance in piston

Standard: 0.006 – 0.017 mm (0.00024 – 0.00067 in.)

Small-end bore

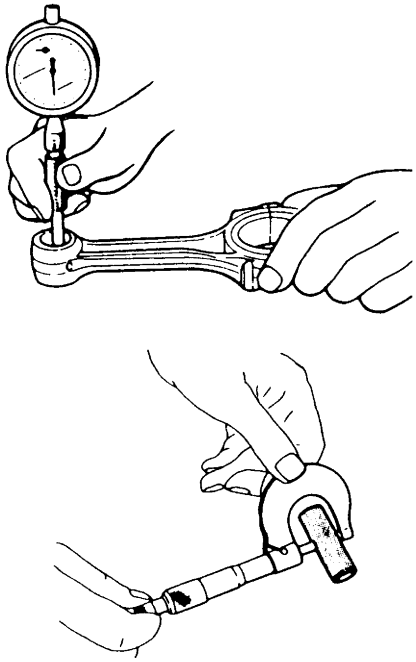
20.003 – 20.011 mm (0.7875 – 0.7878 in.)

Piston pin dia.

19.997 – 20.000 mm (0.7873 – 0.7874 in.)

Piston bore

20.006 – 20.014 mm (0.7876 – 0.7880 in.)



I4RS0A140023-01

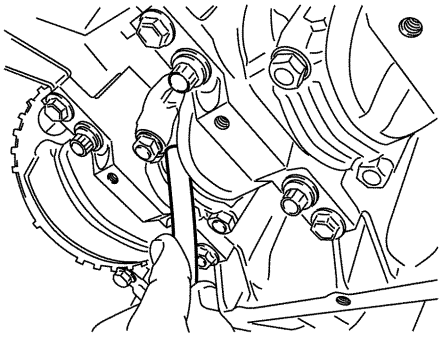
Connecting Rod

Big-end side clearance

Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Big-end side clearance

Standard: 0.25 – 0.40 mm (0.0098 – 0.0157 in.)
Limit: 0.55 mm (0.0217 in.)



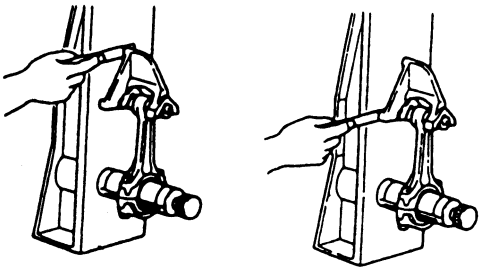
I2RH0B140148-01

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 or connecting rod bearing cap bolt deformation (Plastic deformation tightening bolt)

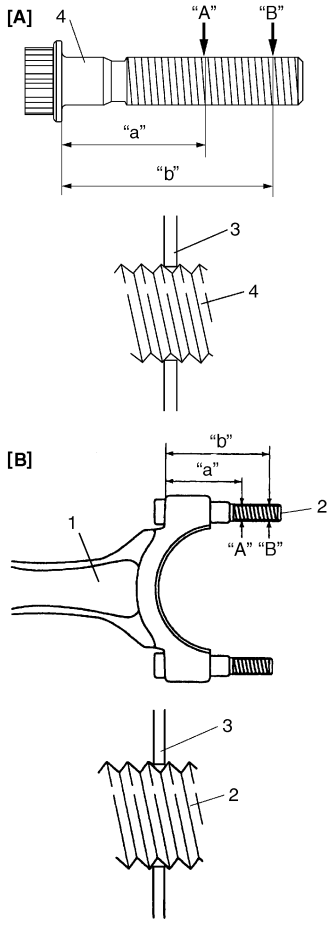
Measure each thread diameter of connecting rod bolt (2) or connecting rod bearing cap bolt (4) at “A” on 32 mm (1.25 in.) from bolt mounting surface and “B” on 40 mm (1.57 in.) from bolt mounting surface by using a micrometer (3).
Calculate difference in diameters (“A” – “B”). If it is exceeds limit, replace connected rod (1) or connecting rod bearing cap bolt (4).

Connecting rod bolt measurement points

“a”: 32 mm (1.25 in.) (M13A and M15A engine models)
“a”: 25 mm (0.98 in.) (M16A engine model)
“b”: 40 mm (1.57 in.)

Connecting rod bolt diameter difference

Limit (“A” – “B”): 0.1 mm (0.004 in.)



I6RS0B141019-01

[A]: For M16A engine model
[B]: For other than M16A engine model

Crank Pin and Connecting Rod Bearings Inspection

S7N20A1416041

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.

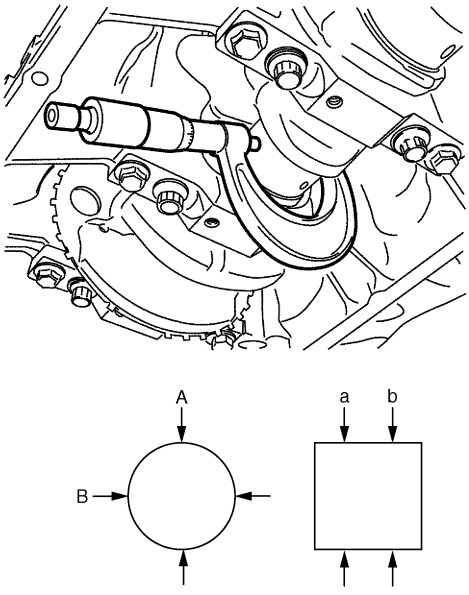
Crank pin diameter

Connecting rod bearing size	Crank pin diameter
Standard	41.982 – 42.000 mm (1.6528 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round
A – B

Taper
a – b

Crank pin taper and out-of-round
Limit: 0.01 mm (0.0004 in.)



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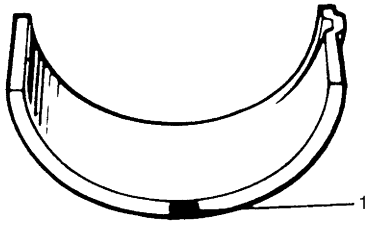
Connecting Rod Bearing General Information

Service connecting rod bearings are available in standard size and 0.25 mm (0.0098 in.) 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 as indicated in the figure, undersize bearing thickness is 1.605 – 1.615 mm (0.0632 – 0.0635 in.) at the center of it.



I2RH01140164-01

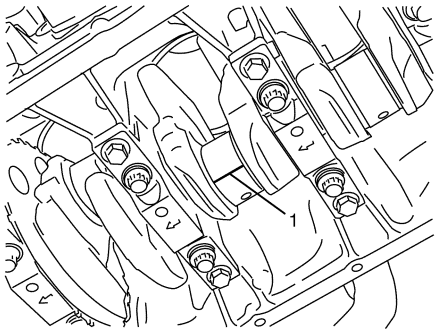
1. Red paint

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

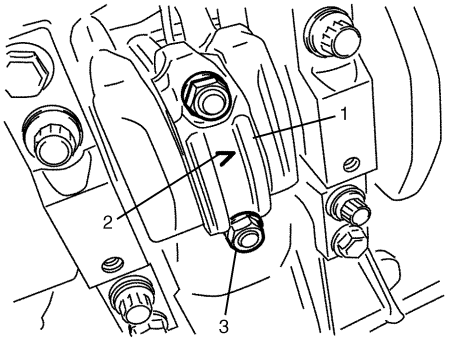
1) Before checking bearing clearance, clean bearing and crank pin.
2) Install bearing in connecting rod and bearing cap.
3) Place a piece of gauging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



I2RH0B140121-01

4) Install rod bearing cap (1) to connecting rod.
When installing cap, be sure to point arrow mark (2) on cap to crankshaft pulley side, as shown in figure.
After applying engine oil to rod bolts, tighten cap nuts (3) or bolts gradually as follows.
   a) Tighten all cap nuts or bolts to 15 N·m (1.5 kgf-m, 11.0 lbf-ft)
   b) Retighten them to 45°
   c) Repeat Step b) once again.

Tightening torque
Connecting rod bearing cap bolt: 15 N·m (1.5 kgf-m, 11.0 lbf-ft) and then retighten by turning through 45° twice
Connecting rod bearing cap nut: 15 N·m (1.5 kgf-m, 11.0 lbf-ft) and then retighten by turning through 45° twice



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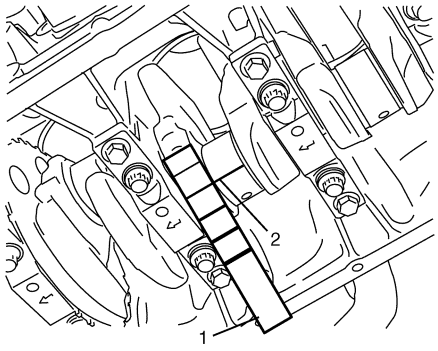
5) Remove cap and using a scale (1) on gauging plastic envelope (2), measure gauging plastic (2) width at the widest point (clearance).
If clearance exceed its limit, use a new standard size bearing referring to "Selection of Connecting Rod Bearings: M13A / M15A / M16A".
After selecting new bearing, recheck clearance.

Connecting rod bearing clearance
Standard: 0.029 – 0.047 mm (0.0011 – 0.0018 in.)
Limit: 0.065 mm (0.0026 in.)



I2RH0B140123-01

6) If clearance can not 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 Bearings

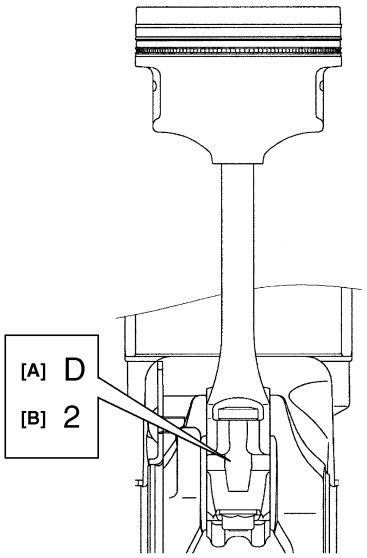
NOTE

- **If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.**
- **When replacing crankshaft or connecting rod and its bearing due to any reason, select new standard bearings to be installed by referring to numbers stamped on connecting rod and its cap and/or alphabets stamped on crank web of No.3 cylinder.**

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 45.000 – 45.006 mm (1.7717 – 1.7718 in.).

Connecting rod big end inside diameter

Stamped numbers	Connecting rod big end inside diameter
1	45.0000 – 45.0060 mm (1.7717 – 1.7718 in.)
2	45.0061 – 45.0120 mm (1.7719 – 1.7721 in.)
3	45.0121 – 45.0180 mm (1.7722 – 1.7723 in.)



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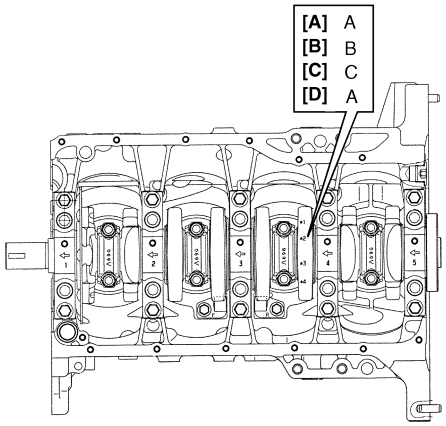
[A]: Weight indication mark
[B]: Connecting rod big end inside diameter number

2) Next, check crankshaft pin diameter. On crank web No.3, four alphabets are stamped as shown in the 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 41.994 – 42.000 mm (1.6533 – 1.6534 in.).

Crankshaft pin outer diameter

Stamped alphabet	Crankshaft pin diameter
A	41.9940 – 42.0000 mm (1.6533 – 1.6534 in.)
B	41.9880 – 41.9939 mm (1.6531 – 1.6532 in.)
C	41.9820 – 41.9879 mm (1.6529 – 1.6530 in.)



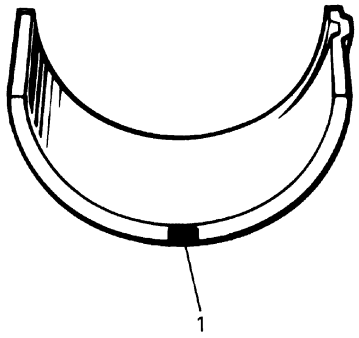
I3RH0A140018-01

[A]: Crankshaft pin diameter for No.1 cylinder
[B]: Crankshaft pin diameter for No.2 cylinder
[C]: Crankshaft pin diameter for No.3 cylinder
[D]: Crankshaft pin diameter for No.4 cylinder

3) There are five kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.
Each color indicated the following thickness at the center of bearing.

Standard size of connecting rod bearing thickness

Color painted	Bearing thickness
Blue	1.4991 – 1.5020 mm (0.05902 – 0.05913 in.)
Yellow	1.4961 – 1.4990 mm (0.05890 – 0.05901 in.)
Nothing	1.4931 – 1.4960 mm (0.05878 – 0.05889 in.)
Black	1.4901 – 1.4930 mm (0.05867 – 0.05877 in.)
Green	1.4870 – 1.4900 mm (0.05855 – 0.05866 in.)



I3RH0A140019-01

1. Paint

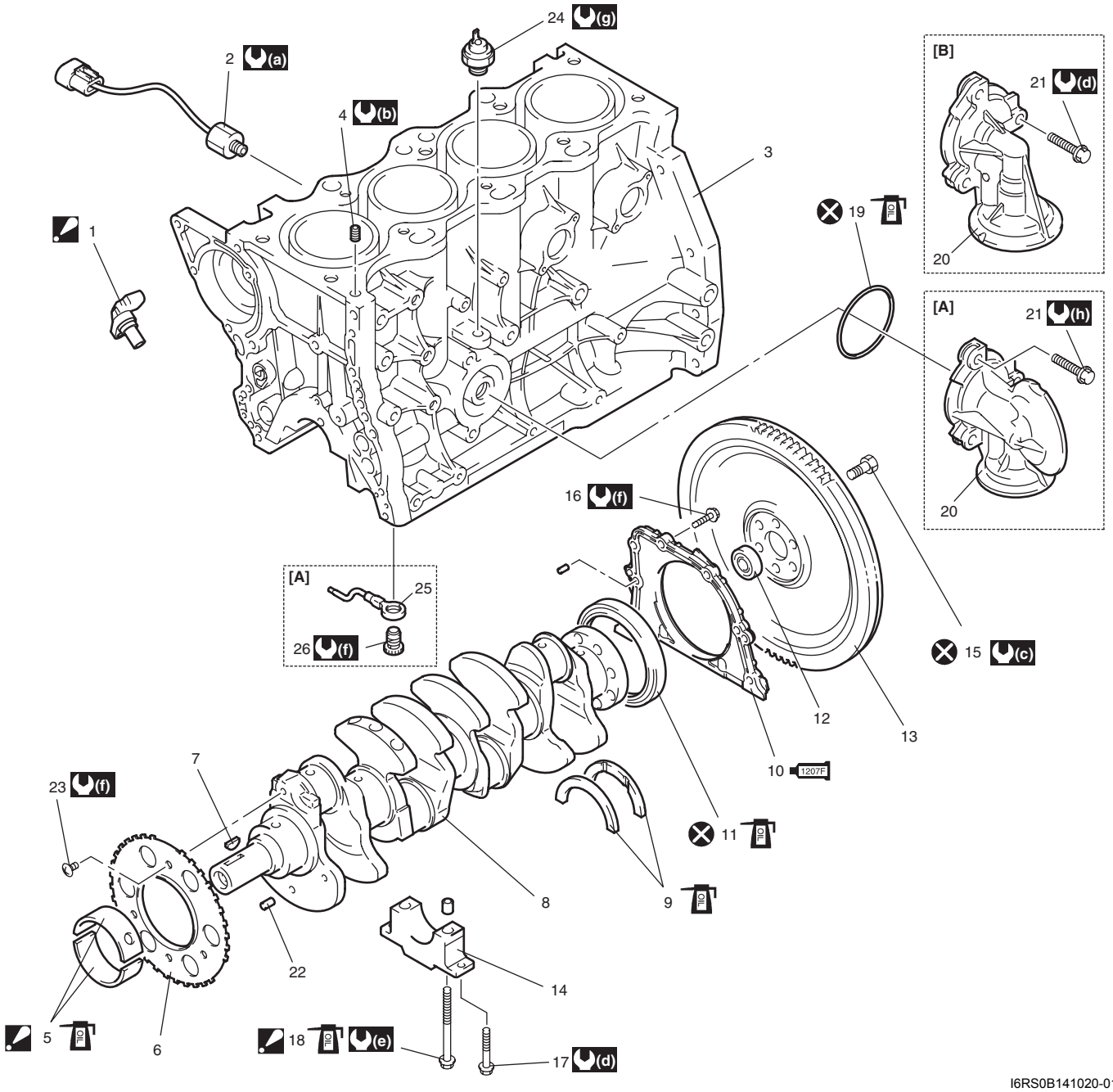
4) From number stamped on connecting rod and its cap and alphabets stamped on crank web No.3, determine new standard bearing to be installed to connecting rod big end inside, by referring to the table.
For example, if number stamped on connecting rod and its cap is “1” and alphabet stamped on crank web No.3 is “B”, install a new standard bearing painted in “Black” to its connecting rod big end inside.

Specification of new standard connecting rod bearing size

		Number stamped on connecting rod and its cap (connecting rod big end inside diameter)		
		1	2	3
Alphabet stamped on crank web No.3 (Crankshaft pin diameter)	A	Green	Black	Nothing
	B	Black	Nothing	Yellow
	C	Nothing	Yellow	Blue
		New standard bearing to be installed.		

Main Bearings, Crankshaft and Cylinder Block Components

S7N20A1416042



I6RS0B141020-01

[A]: For M16A engine model	11. Rear oil seal	23. Sensor plate bolt
[B]; For other than M16A engine model	12. Input shaft bearing (For A/T and M/T models)	24. Oil pressure switch
1. CKP sensor (if equipped) : See “A”	13. Flywheel or drive plate	25. Piston cooling nozzle
2. Knock sensor	14. Main bearing cap	26. Piston cooling valve
3. Cylinder block	15. Flywheel or drive plate bolt	(a) : 22 N·m (2.2 kgf-m, 16.0 lbf-ft)
4. Venturi plug	16. Rear oil seal housing mounting bolt	(b) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)
5. Main bearing : See “B”	17. Main bearing cap No.2 bolt	(c) : 70 N·m (7.0 kgf-m, 51.0 lbf-ft)
6. Sensor plate	18. Main bearing cap No.1 bolt : See “D”	(d) : Tighten 25 N·m (2.5 kgf-m, 18.0 lbf-ft) by the specified procedure.
7. Crankshaft timing sprocket key	19. O-ring	(e) : Tighten 30 N·m (3.0 kgf-m, 22.0 lbf-ft), 50 N·m (5.0 kgf-m, 36.5 lbf-ft) and 60° by the specified procedure.
8. Crankshaft	20. Oil filter adapter case	(f) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
9. Thrust bearing	21. Oil filter adapter bolt	(g) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
1207F 10. Rear oil seal housing : See “C”	22. Spring pin	(h) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

"A": When servicing CKP sensor, refer to "Crankshaft Position (CKP) Sensor Removal and Installation: M13A / M15A / M16A in Section 1C".	: Do not reuse.
"B": Upper half of bearing has an oil groove.	: Apply engine oil to inside / sliding surface.
"C": Apply sealant 99000-31250 to mating surface.	
"D": Make sure of main bearing cap No.1 bolt deformation referring to "Main Bearings Inspection: M13A / M15A / M16A" when reuse it due to plastic deformation tightening bolts.	

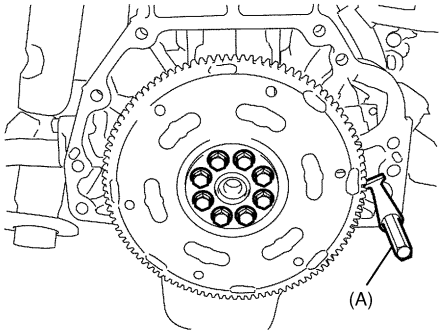
Main Bearings, Crankshaft and Cylinder Block Removal and Installation

S7N20A1416043

Removal

1) Remove engine assembly from vehicle referring to "Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A" or "Engine Assembly Removal and Installation (For M16A Engine Model): M13A / M15A / M16A".
2) Remove clutch cover, clutch disc and flywheel (drive plate for A/T) by using special tool.

Special tool
(A): 09924–17811



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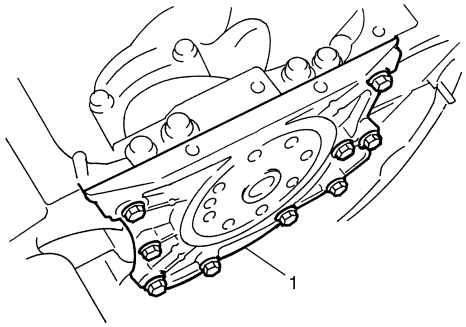
3) Remove piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: M13A / M15A / M16A".
4) Remove rear oil seal housing (1).



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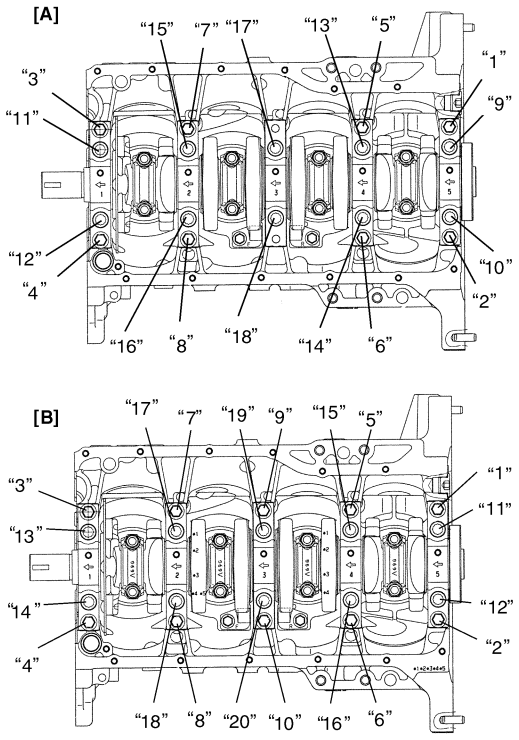
5) Loosen main bearing cap No.1 and No.2 bolts in such order as indicated in figure and remove them.



I6RS0B141021-03

[A]: For M16A engine model
[B]: For other than M16A engine model

6) Remove crankshaft from cylinder block.
7) Remove piston cooling valves and nozzles, if necessary (for M16A engine model).

Installation

NOTE

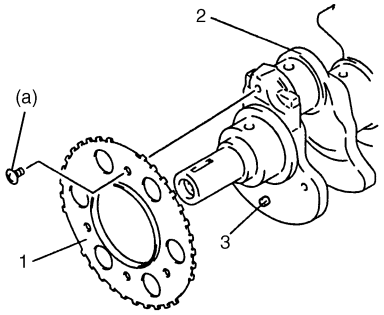
- **Use new bearing cap No.1 bolts. They are deformed once they are used because they are plastic deformation tightening bolts.**
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**

1) Install sensor plate (1) to crankshaft (2) and tighten bolts to specified torque.

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, 8.0 lbf-ft)



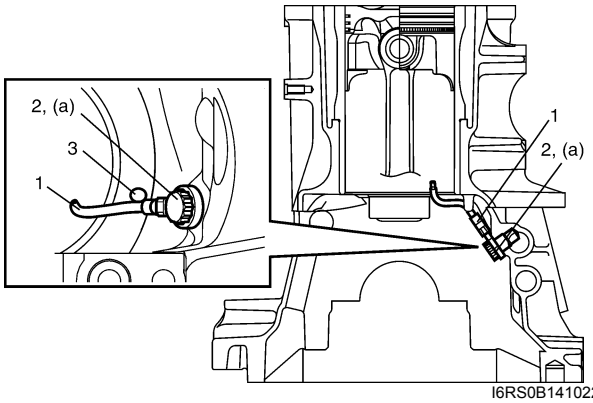
I2RH0B140128-01

2) Install piston cooling valves and nozzles, if removed (for M16A engine model).

NOTE

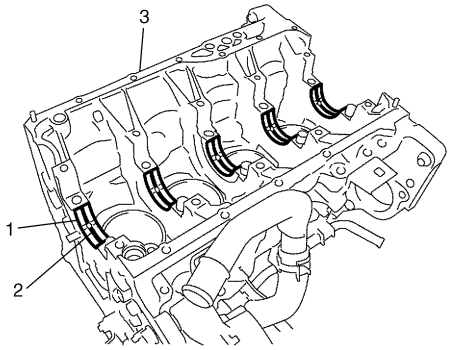
Install piston cooling valve while matching piston cooling nozzle (1) to positioning (3) of cylinder block when installed piston cooling valve (2).

Tightening torque
Piston cooling valve (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



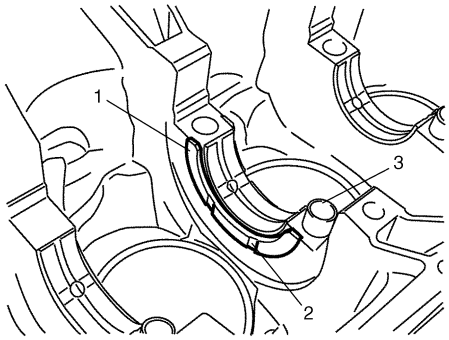
I6RS0B141022-02

3) 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.
Make sure that two halves are painted in the same color.



I2RH0B140129-01

4) Confirm that dowel pins (3) are installed to intake side of each journal.



I2RH0B140130-01

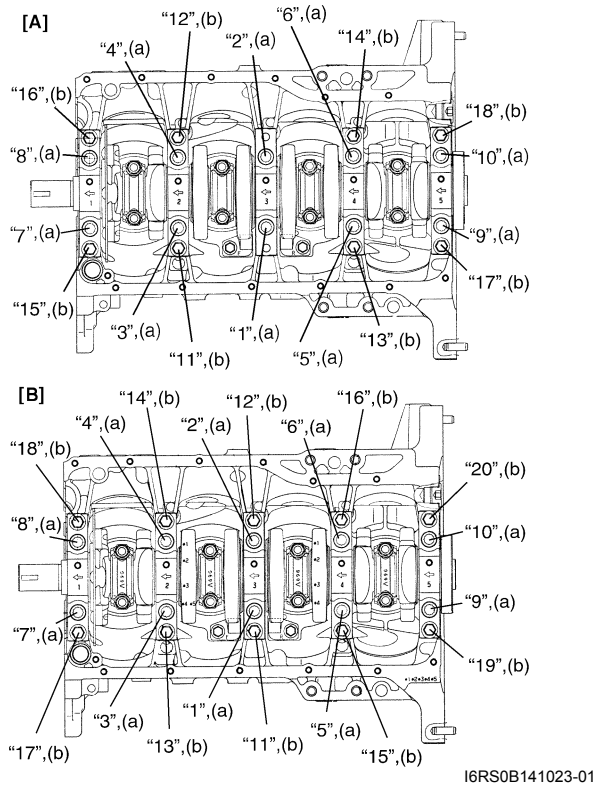
5) Install crankshaft to cylinder block.
6) Install thrust bearings (1) to cylinder block between No.2 and No.3 cylinders. Face oil groove (2) sides to crank webs.
7) Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.
After applying engine oil to main bearing cap No.1 bolts (a) and main bearing cap No.2 bolts (b), tighten them gradually as follows.

a) Tighten bolts (“1” through “10”) to 30 N·m (3.0 kgf-m, 22.0 lbf-ft) according to numerical order as shown by using a 12 corner socket wrenches.
b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kgf-m, 36.5 lbf-ft).
c) In the same manner as in Step a), retighten them to 60°.
d) Tighten bolts (“11” through “18”) (for M16A engine model) or (“11” through “20”) (for other than M16A engine model) to 25 N·m (2.5 kgf-m, 18.0 lbf-ft) according to numerical order as shown.

Tightening torque
Main bearing cap No.1 bolt (a): 30 N·m (3.0 kgf-m, 22.0 lbf-ft), 50 N·m (5.0 kgf-m, 36.5 lbf-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt (b): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

⚠ CAUTION

After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turning it by 12 N·m (1.2 kgf-m, 9.0 lbf-ft) torque or below.



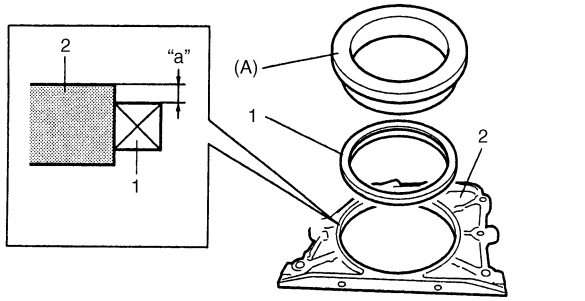
I6RS0B141023-01

[A]: For M16A engine model
[B]: For other than M16A engine model

8) If necessary, press-fit rear oil seal (1) to oil seal housing (2) by using special tool as shown in the figure.

Special tool
(A): 09911–97821

Crank rear oil seal installing position (dimension)
“a”: 2 mm (0.08 in.)

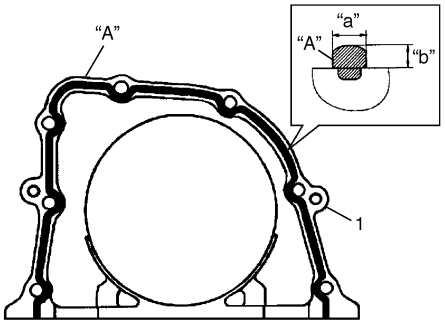


I4RS0A140017-01

9) Apply sealant to mating surface of rear oil seal housing (1).

“A”: Water tight sealant 99000–31250 (SUZUKI Bond No.1207F)

Sealant amount for rear oil seal housing
Width: “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)

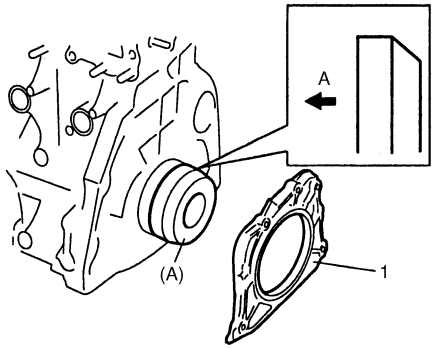


I4RS0A140018-01

10) Install rear oil seal housing (1) and tighten bolts to specified torque by using special tool.

Special tool
(A): 09911–97720

Tightening torque
Rear oil seal housing bolt: 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I4RS0A140019-01

A: Crankshaft side

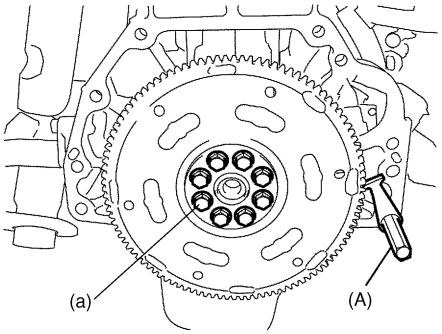
11) Install flywheel (drive plate for A/T).
Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specified torque.

NOTE

Use new flywheel or drive plate bolts.

Special tool
(A): 09924–17811

Tightening torque
Flywheel or drive plate bolt (a): 70 N·m (7.0 kgf-m, 51.0 lbf-ft)



I6RS0B141029-01

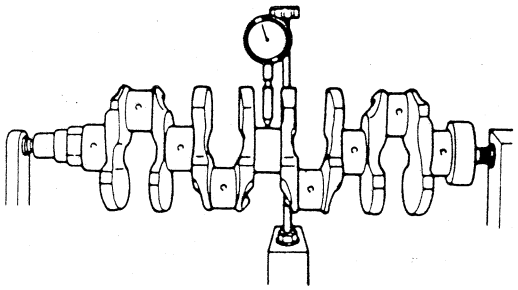
12) Install piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinders Removal and Installation: M13A / M15A / M16A".
13) Install cylinder head referring to "Valves and Cylinder Head Removal and Installation: M13A / M15A / M16A".
14) Install camshafts, tappet and shim referring to "Camshaft, Tappet and Shim Removal and Installation: M13A / M15A / M16A".
15) Install timing chain referring to "Timing Chain and Chain Tensioner Removal and Installation: M13A / M15A / M16A".
16) Install timing chain cover referring to "Timing Chain Cover Removal and Installation: M13A / M15A / M16A".
17) Install cylinder head cover referring to "Cylinder Head Cover Removal and Installation: M13A / M15A / M16A".
18) Install oil pan referring to "Oil Pan and Oil Pump Strainer Removal and Installation: M13A / M15A / M16A in Section 1E"
19) Install engine assembly to vehicle referring to "Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A" or "Engine Assembly Removal and Installation (For M16A Engine Model): M13A / M15A / M16A".

Crankshaft Inspection

S7N20A1416044

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.)

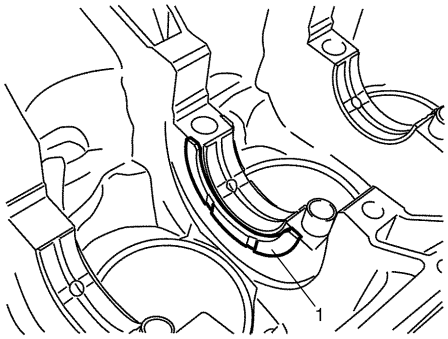


I2RH0B140135-01

Crankshaft Thrust Play

1) Measure this play with crankshaft set in cylinder block in the normal manner, that is with thrust bearing (1) and journal bearing caps installed.

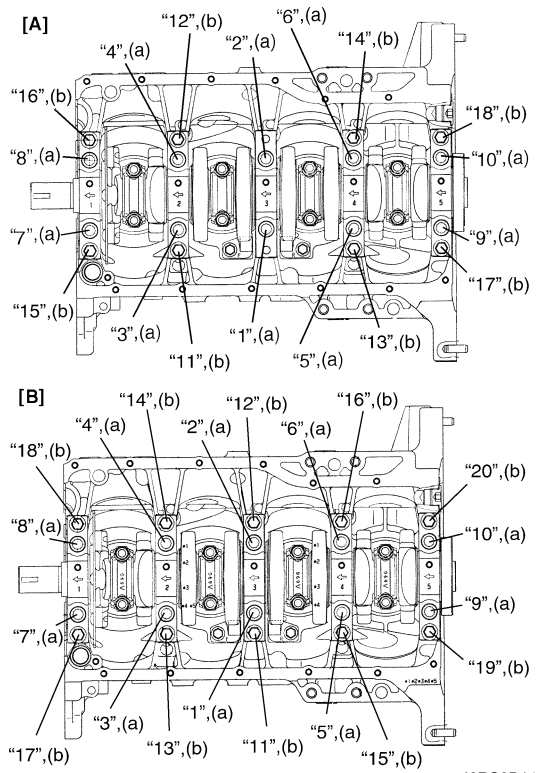
Thickness of crankshaft thrust bearing
Standard: 2.500 mm (0.0984 in.)
Oversize (0.125 mm (0.0049 in.)): 2.563 mm (0.1009 in.)



I2RH0B140136-01

2) Tighten main bearing cap No.1 bolts (a) and main bearing cap No.2 bolts (b) gradually as follows.
   a) Tighten bolts (“1” through “10”) to 30 N·m (3.0 kgf-m, 22.0 lbf-ft) according to numerical order in the figure.
   b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kgf-m, 36.5 lbf-ft).
   c) In the same manner as in Step a), retighten them to 60°.
   d) Tighten bolts (“11” through “18”) (for M16A engine model) or (“11” through “20”) (for other than M16A engine model) to 25 N·m (2.5 kgf-m, 18.0 lbf-ft) according to numerical order in the figure.

Tightening torque
Main bearing cap No.1 bolt (a): 30 N·m (3.0 kgf-m, 22.0 lbf-ft), 50 N·m (5.0 kgf-m, 36.5 lbf-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt (b): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



I6RS0B141023-01

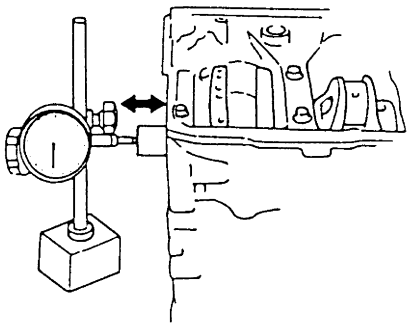
[A]: For M16A engine model
[B]: For other than M16A engine model

3) Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.
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.)

NOTE

After checking the thrust play, make sure that thread deformation of each bearing cap No.1 bolt referring to “Main Bearing Cap No.1 Bolt” in “Main Bearings Inspection: M13A / M15A / M16A”.



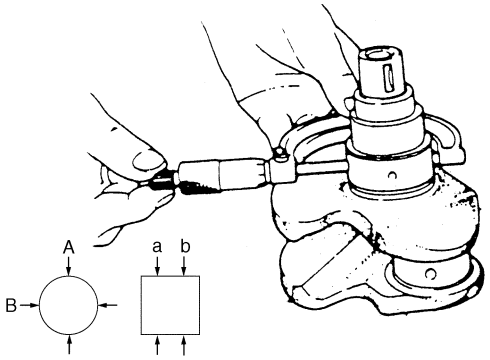
I2RH01140183-01

Out-of-Round and Taper (Uneven Wear) of Journals
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 if amount of uneven wear in the sense exceeds its limit, regrind or replace crankshaft.

Crankshaft out-of-round and taper
Limit: 0.01 mm (0.0004 in.)

Out-of-round
A – B

Taper
a – b



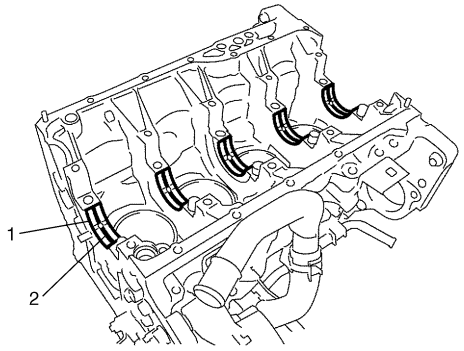
I2RH0B140138-01

Main Bearings Inspection

S7N20A1416045

General Information

- Service main bearings are available in standard size and 0.25 mm (0.0098 in.) 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 the figure.
  Install this half with oil groove to cylinder block.
- Lower half of bearing does not have an oil groove.



I2RH0B140139-01

Visual Inspection

Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves. Never replace either half without replacing the other half.

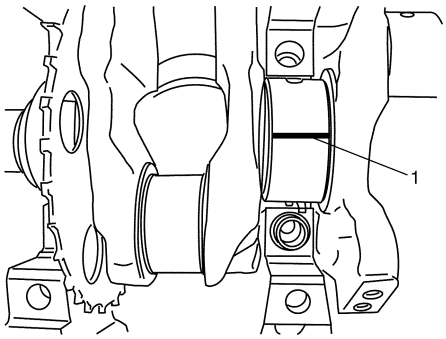
Main Bearing Clearance

NOTE

Do not rotate crankshaft while gauging plastic is installed.

Check clearance by using gauging plastic according to the following procedure.

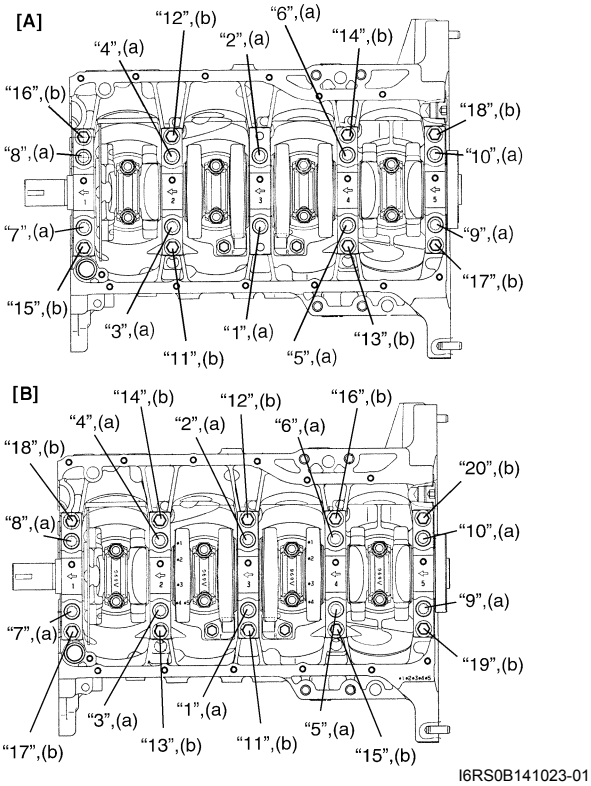
1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gauging plastic (1) the full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



I2RH0B140140-01

4) Tighten main bearing cap No.1 bolts (a) and main bearing cap No.2 bolts (b) gradually as follows.
   a) Tighten bolts (“1” through “10”) to 30 N·m (3.0 kgf-m, 22.0 lbf-ft) according to numerical order in the figure.
   b) In the same manner as in Step a), tighten them to 50 N·m (5.0 kgf-m, 36.5 lbf-ft).
   c) In the same manner as in Step a), retighten them to 60°.
   d) Tighten bolts (“11” through “18”) (for M16A engine model) or (“11” through “20”) (for other than M16A engine model) to 25 N·m (2.5 kgf-m, 18.0 lbf-ft) according to numerical order in the figure.

Tightening torque
Main bearing cap No.1 bolt (a): 30 Nm (3.0 kgf-m, 22.0 lbf-ft), 50 Nm (5.0 kgf-m, 36.5 lbf-ft) and then retighten by turning through 60°
Main bearing cap No.2 bolt (b): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

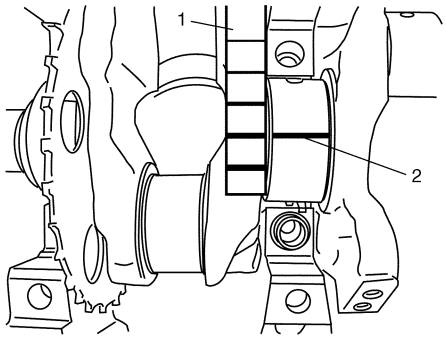


I6RS0B141023-01

[A]: For M16A engine model
[B]: For other than M16A engine model

5) Remove bearing caps and using scale (1) on gauging plastic envelop (2), 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
[For engine with VVT]
Standard: 0.021 – 0.041 mm (0.0008 – 0.0016 in.)
Limit: 0.054 mm (0.0021 in.)
[For engine without VVT]
Standard: 0.025 – 0.045 mm (0.0010 – 0.0018 in.)
Limit: 0.065 mm (0.0026 in.)



I2RH0B140141-01

Selection of Main Bearings
Standard bearing
If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.

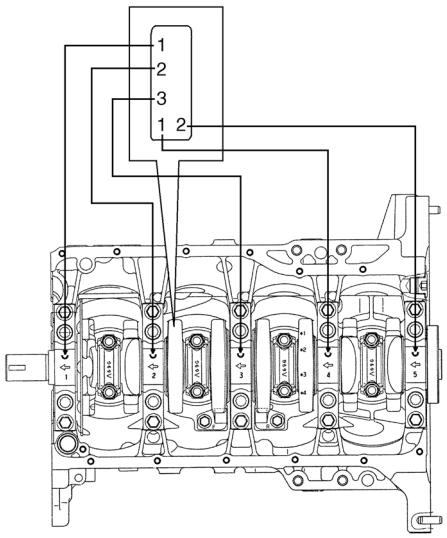
1) First check journal diameter. As shown in the figure, crank web No.2 has stamped numbers.
Three kinds of numbers (“1”, “2” and “3”) represent the following journal diameters.
Stamped numbers on crank web No.2 represent journal diameters marked with an arrow in the figure respectively. For example of engine with VVT, stamped number “1” indicates that corresponding journal diameter is 51.9940 – 52.0000 mm (2.0471 – 2.0472 in.).

Crankshaft journal diameter
[For engine with VVT]

Stamped numbers	Journal diameter
1	51.9940 – 52.0000 mm (2.0471 – 2.0472 in.)
2	51.9880 – 51.9939 mm (2.0468 – 2.0470 in.)
3	51.9820 – 51.9879 mm (2.0465 – 2.0467 in.)

[For engine without VVT]

Stamped numbers	Journal diameter
1	44.9940 – 45.0000 mm (1.7715 – 1.7716 in.)
2	44.9880 – 44.9939 mm (1.7712 – 1.7714 in.)
3	44.9820 – 44.9879 mm (1.7710 – 1.7711 in.)



I2RH0B140142-02

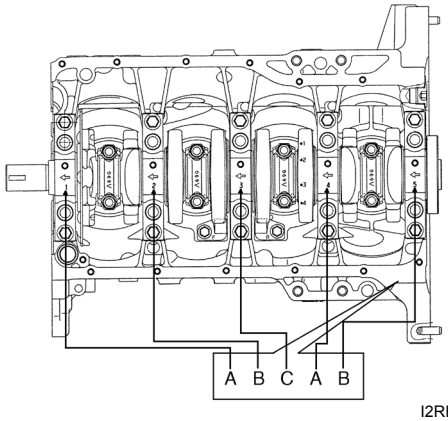
2) Next, check bearing cap bore diameter without bearing. On mating surface of cylinder block, five alphabets are stamped as shown in the figure.
Three kinds of alphabets (“A”, “B” and “C”) or numbers (“1”, “2” and “3”) represent the following cap bore diameters.
Stamped alphabets or numbers on cylinder block represent bearing cap bore diameter marked with an arrow in the figure respectively.
For example of engine with VVT, stamped “A” or “1” indicates that corresponding bearing cap bore diameter is 56.0000 – 56.0060 mm (2.2048 – 2.2049 in.).

Crankshaft bearing cap bore
[For engine with VVT]

Stamped alphabet (number)	Bearing cap bore diameter (without bearing)
A or 1	56.0000 – 56.0060 mm (2.2048 – 2.2049 in.)
B or 2	56.0061 – 56.0120 mm (2.2050 – 2.2051 in.)
C or 3	56.0121 – 56.0180 mm (2.2052 – 2.2054 in.)

[For engine without VVT]

Stamped alphabet (number)	Bearing cap bore diameter (without bearing)
A or 1	49.0000 – 49.0060 mm (1.9292 – 1.9293 in.)
B or 2	49.0061 – 49.0120 mm (1.9294 – 1.9296 in.)
C or 3	49.0121 – 49.0180 mm (1.9297 – 1.9298 in.)



I2RH0B140143-02

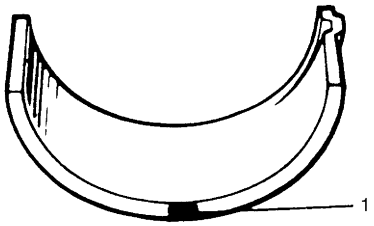
3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position as indicated in the figure.
Each color indicated the following thickness at the center of bearing.

Standard size of crankshaft main bearing thickness
[For engine with VVT]

Color painted	Bearing thickness
Purple	1.992 – 1.996 mm (0.07843 – 0.07858 in.)
Brown	1.995 – 1.999 mm (0.07855 – 0.07870 in.)
Green	1.998 – 2.002 mm (0.07867 – 0.07882 in.)
Black	2.001 – 2.005 mm (0.07878 – 0.07893 in.)
Colorless (no paint)	2.004 – 2.008 mm (0.07890 – 0.07906 in.)

[For engine without VVT]

Color painted	Bearing thickness
Pink	1.990 – 1.994 mm (0.0783 – 0.0785 in.)
Purple	1.993 – 1.997 mm (0.0785 – 0.0786 in.)
Brown	1.996 – 2.000 mm (0.0786 – 0.0787 in.)
Green	1.999 – 2.003 mm (0.0787 – 0.0789 in.)
Black	2.002 – 2.006 mm (0.0788 – 0.0790 in.)



I2RH01140191-01

1. Paint

4) From number stamped on crank web No.2 and alphabets stamped on cylinder block, determine new standard bearing to be installed to journal, by referring to the table shown.
For example of engine with VVT, if number stamped on crank web No.2 is “1” and alphabet stamped on cylinder block is “B”, install a new standard bearing painted in “Brown” to its journal.

New standard size crankshaft main bearing specification

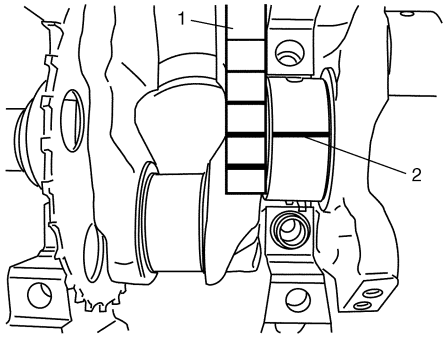
[For engine with VVT]

		Number stamped on crank web No.2 (Journal diameter)		
		1	2	3
Alphabet stamped on cylinder block (Cap bore dia.)	A or 1	Purple	Brown	Green
	B or 2	Brown	Green	Black
	C or 3	Green	Black	Colorless
		New standard bearing to be installed		

[For engine without VVT]

		Number stamped on crank web No.2 (Journal diameter)		
		1	2	3
Alphabet stamped on cylinder block (Cap bore dia.)	A or 1	Pink	Purple	Brown
	B or 2	Purple	Brown	Green
	C or 3	Brown	Green	Black
		New standard bearing to be installed		

5) Using scale (1) on gauging plastic (2), check bearing clearance with newly selected standard bearing.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.



I2RH0B140141-01

6) When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to number stamped on new crankshaft or alphabets stamped on new cylinder block.

Undersize bearing (0.25 mm (0.0098 in.))

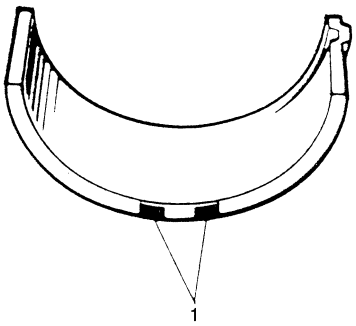
- 0.25 mm (0.0098 in.) undersize bearing is available, in five kinds varying in thickness.
  To distinguish them, each bearing is painted in the following colors at such position as indicated in the figure.
  Each color represents the following thickness at the center of bearing.

Undersize of crankshaft main bearing thickness
[For engine with VVT]

Color painted	Bearing thickness
Red and Purple	2.117 – 2.121 mm (0.08335 – 0.08350 in.)
Red and Brown	2.120 – 2.124 mm (0.08347 – 0.08362 in.)
Red and Green	2.123 – 2.127 mm (0.08359 – 0.08374 in.)
Red and Black	2.126 – 2.130 mm (0.08371 – 0.08385 in.)
Red only	2.129 – 2.133 mm (0.08382 – 0.08397 in.)

[For engine without VVT]

Color painted	Bearing thickness
Red and Pink	2.115 – 2.119 mm (0.0833 – 0.0834 in.)
Red and Purple	2.118 – 2.122 mm (0.0834 – 0.0835 in.)
Red and Brown	2.121 – 2.125 mm (0.0835 – 0.0837 in.)
Red and Green	2.124 – 2.128 mm (0.0836 – 0.0838 in.)
Red and Black	2.127 – 2.131 mm (0.0837 – 0.0839 in.)



I2RH01140192-01

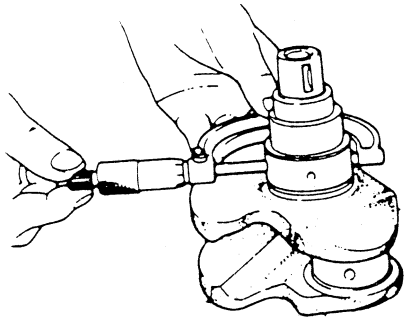
1. Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.
  a. Regrind journal to the following finished diameter.

Finished journal diameter
[For engine with VVT]
51.7320 – 51.7500 mm (2.0367 – 2.0374 in.)
[For engine without VVT]
44.7320 – 44.7500 mm (1.7611 – 1.7618 in.)

b. Using micrometer, measure regrind journal diameter.
Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.

c. 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

New undersize crankshaft main bearing specification
[For engine with VVT]

		Measured journal diameter		
		51.7320 – 51.7379 mm (2.0367 – 2.0369 in.)	51.7380 – 51.7439 mm (2.0370 – 2.0371 in.)	51.7440 – 51.7500 mm (2.0372 – 2.0373 in.)
Alphabets stamped on cylinder block	A (1)	Red and Green	Red and Brown	Red and Purple
	B (2)	Red and Black	Red and Green	Red and Brown
	C (3)	Red only	Red and Black	Red and Green
		Undersize bearing to be installed		

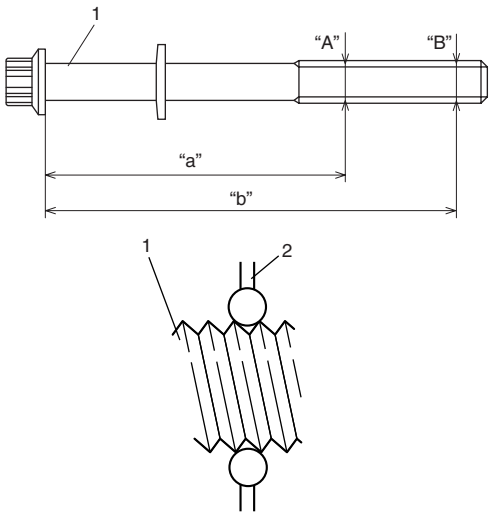
[For engine without VVT]

		Measured journal diameter		
		44.7320 – 44.7379 mm (1.7611 – 1.7613 in.)	44.7380 – 44.7439 mm (1.7614 – 1.7615 in.)	44.7440 – 44.7500 mm (1.7616 – 1.7618 in.)
Alphabets stamped on cylinder block	A (1)	Red and Brown	Red and Purple	Red and Pink
	B (2)	Red and Green	Red and Brown	Red and Purple
	C (3)	Red and Black	Red and Green	Red and Brown
		Undersize bearing to be installed		

Main Bearing Cap No.1 Bolt
Measure each thread diameter main bearing cap No.1 bolts (1) at “A” on 60 mm (2.36 in.) from seat side of flange bolt and “B” on 90 mm (3.54 in.) from seat side of flange bolt by using a micrometer (2).
Calculate difference in diameters (“A” – “B”).
If it exceeds limit, replace with new one.

Main bearing cap No.1 bolt diameter measurement points
“a”: 60 mm (2.36 in.)
“b”: 90 mm (3.54 in.)

Main bearing cap No.1 bolt diameter difference
Limit (“A” – “B”): 0.2 mm (0.008 in.)

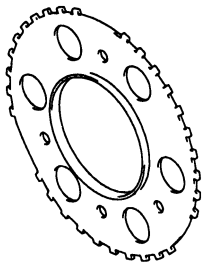


I2RH0B140145-01

Sensor Plate Inspection

S7N20A1416046

Check sensor plate for crack damage.
If malcondition is found, replace it.

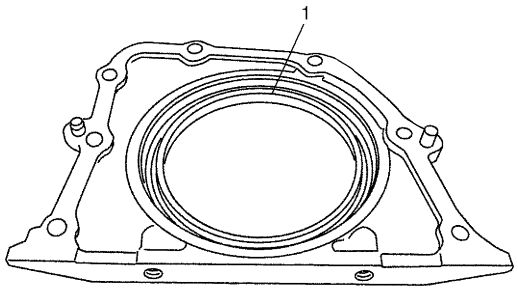


I2RH0B140151-01

Rear Oil Seal Inspection

S7N20A1416047

Carefully inspect oil seal (1) for wear or damage. If its lip is worn or damaged, replace it.



I4RS0A140020-01

Flywheel Inspection

S7N20A1416048

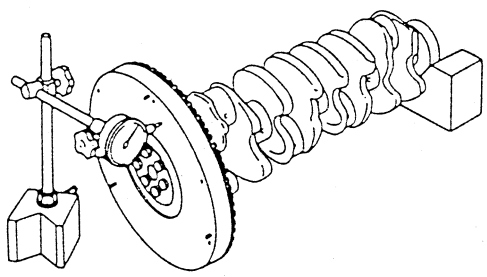
Visual Inspection

- 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 face runout
Limit: 0.2 mm (0.0079 in.)



I2RH01140198-01

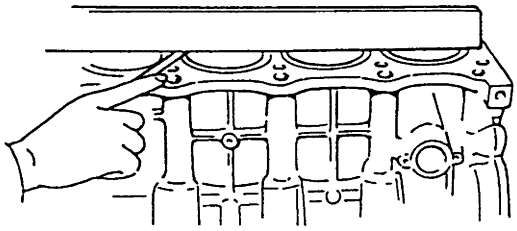
Cylinder Block Inspection

S7N20A1416049

Distortion of Gasketed Surface

Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct It.

Cylinder block flatness
Limit: 0.03 mm (0.0012 in.)



I2RH01140199-01

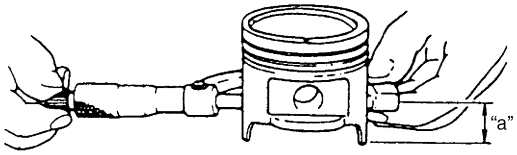
Honing or Reboring Cylinders

1) When any cylinder needs reboring, all other cylinders must also be rebored at the same time.
2) Select oversized piston according to amount of cylinder wear.

   Oversize piston specification
   Oversize 0.50: 78.453 – 78.468 mm (3.0887 – 3.0893 in.)

3) Using micrometer, measure piston diameter.

   Measurement position for piston diameter
   "a": 19.5 mm (0.77 in.) (M13A and M15A engine models)
   "a": 7.0 mm (0.28 in.) (M16A engine model)



I2RH01140157-01

4) Rebore and hone cylinder to the following dimension.

   NOTE

   Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

   Cylinder bore diameter to be rebored
   Oversize 0.50: 78.500 – 78.514 mm (3.0906 – 3.0911 in.)

5) Measure piston clearance after honing.

   Piston clearance
   0.032 – 0.061 mm (0.0013 – 0.0024 in.)

Specifications

Tightening Torque Specifications

S7N20A1417001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Camshaft housing bolt	11	1.1	8.0	☞ / ☞ / ☞
Cylinder head cover bolt	Tighten 3 N·m (0.3 kgf-m, 2.5 lbf-ft), 5 N·m (0.5 kgf-m, 4.0 lbf-ft) and 8 N·m (0.8 kgf-m, 6.0 lbf-ft) by the specified procedure			☞
Intake manifold bolt	23	2.3	17.0	☞
Intake manifold nut	23	2.3	17.0	☞
Intake manifold ground terminal bolt	11	1.1	8.0	☞
EVAP canister purge valve bracket bolt	5	0.5	4.0	☞
Engine left mounting bracket nut	55	5.5	40.0	☞
Engine right mounting nut	65	6.5	47.0	☞ / ☞
Engine rear mounting bush bolt	55	5.5	40.0	☞
Starting motor terminal nut	11	1.1	8.0	☞ / ☞
Generator terminal nut	6	0.6	4.5	☞ / ☞
Intake manifold ground terminal bolt	11	1.1	18.0	☞
Engine left mounting bracket nut	55	5.5	40.0	☞
Engine rear mounting bush bolt	55	5.5	40.0	☞
Timing chain cover bolt	25	2.5	18.0	☞
Timing chain cover nut	25	2.5	18.0	☞
Cap bolt	25	2.5	18.0	☞
Oil gallery pipe No.2 and No.3 bolt	11	1.1	8.0	☞
Crankshaft pulley bolt	150	15.0	108.5	☞
Oil control valve mounting nut	11	1.1	8.0	☞
Oil gallery pipe No.1 bolt	30	3.0	21.5	☞
Timing chain No.1 guide bolt	9	0.9	6.5	☞
Timing chain tensioner bolt	25	2.5	18.0	☞
Timing chain tensioner adjuster bolt	11	1.1	8.0	☞
Camshaft housing bolt	5 N·m (0.5 kgf-m, 4.0 lbf-ft) and 11 N·m (1.1 kgf-m, 8.0 lbf-ft) by the specified procedure			☞ / ☞
Intake cam timing sprocket bolt	60	6.0	43.5	☞
Venturi plug	5	0.5	3.5	☞
Cylinder head bolt for M8	25	2.5	18.0	☞
Cylinder head bolt for M10	20 N·m (2.0 kgf-m, 14.5 lbf-ft), 40 N·m (4.0 kgf-m, 29.0 lbf-ft) and then retighten by turning through to 60° twice			☞
Connecting rod bearing cap nut	15 N·m (1.5 kgf-m, 11.0 lbf-ft) and then retighten by turning through 45° twice			☞ / ☞
Connecting rod bearing cap bolt	15 N·m (1.5 kgf-m, 11.0 lbf-ft) and then retighten by turning through 45° twice			☞ / ☞
Sensor plate bolt	11	1.1	8.0	☞
Piston cooling valve	11	1.1	8.0	☞
Main bearing cap No.1 bolt (a)	30 N·m (3.0 kgf-m, 22.0 lbf-ft), 50 N·m (5.0 kgf-m, 36.5 lbf-ft) and then retighten by turning through 60°			☞
Main bearing cap No.2 bolt (b)	25	2.5	18.0	☞
Rear oil seal housing bolt	11	1.1	8.0	☞
Flywheel or drive plate bolt	70	7.0	51.0	☞
Main bearing cap No.1 bolt	30 N·m (3.0 kgf-m, 22.0 lbf-ft), 50 N·m (5.0 kgf-m, 36.5 lbf-ft) and then retighten by turning through 60°			☞
Main bearing cap No.2 bolt	25	2.5	18.0	☞ / ☞
Main bearing cap No.1 bolt	30 Nm (3.0 kgf-m, 22.0 lbf-ft), 50 Nm (5.0 kgf-m, 36.5 lbf-ft) and then retighten by turning through 60°			☞

NOTE

The specified tightening torque is also described in the following.
“Air Cleaner Components: M13A / M15A / M16A”
“Throttle Body and Intake Manifold Components: M13A / M15A / M16A”
“Engine Mountings Components (For M16A Engine Model): M13A / M15A / M16A”
“Engine Mountings Components (For Other Than M16A Engine Model): M13A / M15A / M16A”
“Timing Chain Cover Components: M13A / M15A / M16A”
“Timing Chain and Chain Tensioner Components: M13A / M15A / M16A”
“Camshaft, Tappet and Shim Components: M13A / M15A / M16A”
“Valves and Cylinder Head Components: M13A / M15A / M16A”
“Pistons, Piston Rings, Connecting Rods and Cylinders Components: M13A / M15A / M16A”
“Main Bearings, Crankshaft and Cylinder Block Components: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1418001

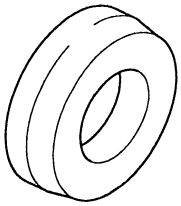
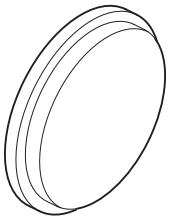
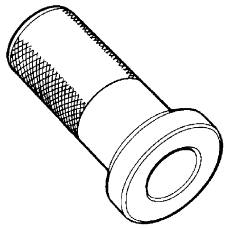
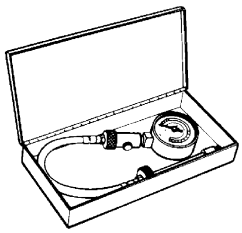
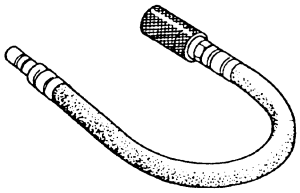
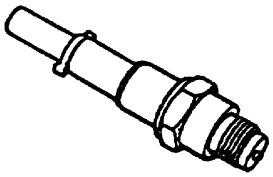
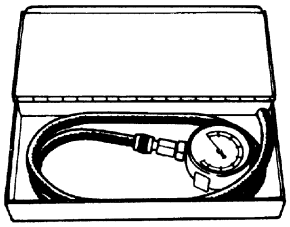
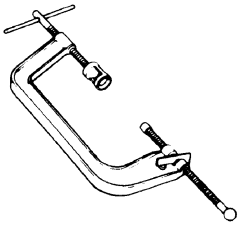
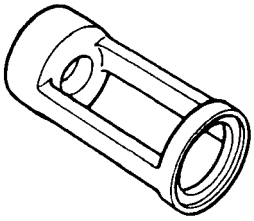
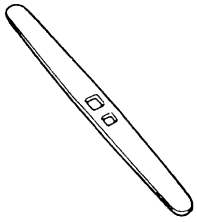
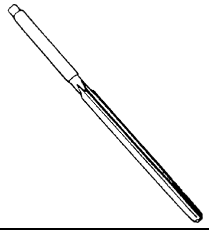
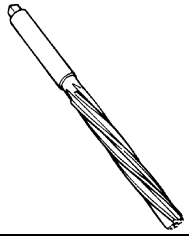
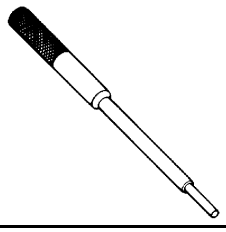
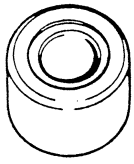
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞
	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞
Water tight sealant	SUZUKI Bond No.1207B	P/No.: 99000–31140	☞
	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞ / ☞

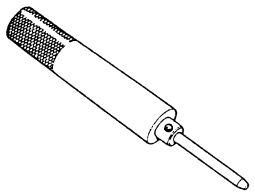
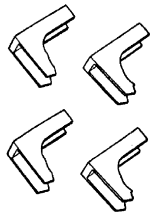
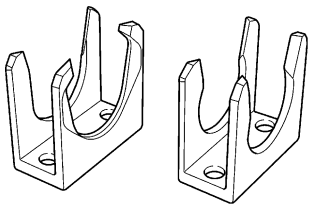
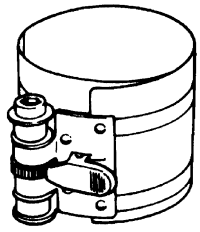
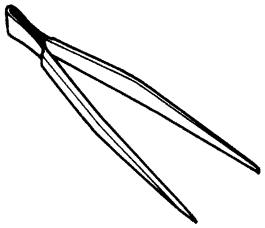
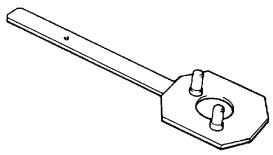
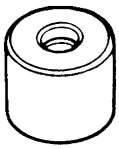
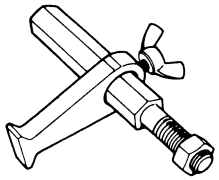
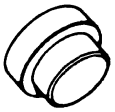
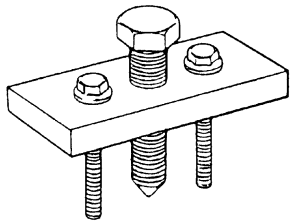
NOTE

Required service material is also described in the following.
“Timing Chain Cover Components: M13A / M15A / M16A”
“Timing Chain and Chain Tensioner Components: M13A / M15A / M16A”
“Camshaft, Tappet and Shim Components: M13A / M15A / M16A”
“Valves and Cylinder Head Components: M13A / M15A / M16A”
“Pistons, Piston Rings, Connecting Rods and Cylinders Components: M13A / M15A / M16A”
“Main Bearings, Crankshaft and Cylinder Block Components: M13A / M15A / M16A”

Special Tool

S7N20A1418002

09911–97720 Oil seal installer ☞ 	09911–97821 Oil seal installer ☞ 
09913–75810 Bearing installer ☞ 	09915–64512 Compression gauge ☞ 
09915–64530 Compression gauge hose ☞ 	09915–67010 Compression gauge attachment (C) ☞ 
09915–67311 Vacuum gauge ☞ 	09916–14510 Valve lifter ☞ / ☞ 
09916–14521 Valve spring compressor attachment ☞ / ☞ 	09916–34542 Reamer handle ☞ / ☞ 
09916–34550 Reamer handle ☞ 	09916–37320 Valve guide outer reamer (10.5 mm) ☞ 
09916–44910 Valve guide installer & remover ☞ 	09916–56011 Valve guide installer attachment (protrusion: 11.5 mm) ☞ 

09916–58210 Valve guide installer handle ☞ / ☞ 	09916–67020 Tappet holder (Overseas) ☞ / ☞ 
09916–67021 Tappet holder ☞ / ☞ 	09916–77310 Piston ring compressor (50-125 mm) ☞ 
09916–84511 Forceps ☞ / ☞ 	09917–68221 Camshaft pulley holder ☞ / ☞ 
09917–98221 Valve guide stem attachment ☞ 	09924–17811 Flywheel holder ☞ / ☞ 
09926–58010 Bearing remover attachment ☞ 	09944–36011 Steering wheel remover ☞ 

D13A / Z13DTJ

Diagnostic Information and Procedures

Compression Check

S7N20A1424001

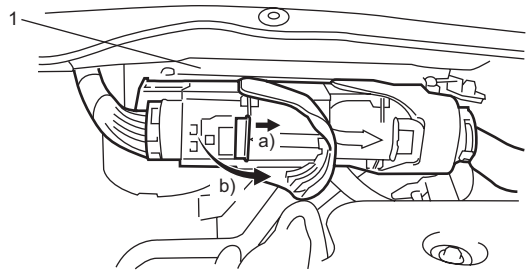
Check compression pressure on all 4 cylinders as follows:

1) Warm up engine.
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.

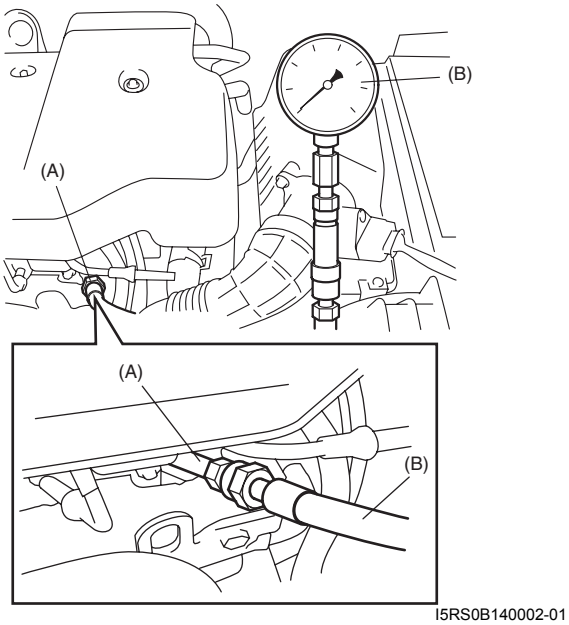
3) Disconnect negative (–) cable at battery.
4) Disconnect glow plug control module connector referring to "Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C".
5) Remove all glow plugs referring to "Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C".
6) Disconnect connectors from ECM (1) as follows.
   a) Pull out lock slider to release locking of lock lever a).
   b) Pull up the lock lever b).



I7V20A142001-04

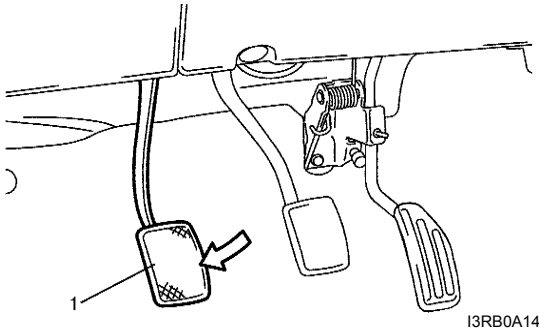
7) Install special tools into glow plug hole.

Special tool
(A): 09915–68610
(B): 09912–57822



I5RS0B140002-01

8) Connect negative (–) cable at battery.
9) Disengage clutch (1) in order to lighten starting load on engine.



I3RB0A143003-01

10) Crank engine with fully charged battery and read highest pressure on compression gauge.
11) Carry out Steps 7) to 10) on each cylinder in order to obtain 4 readings.

NOTE

- **For measuring compression pressure, crank engine at least 200 rpm. by using fully charged battery.**
- **If measured compression pressure is excessively low at one of 4 cylinder, check installation condition of special tool. If it is properly installed, possibility is compression pressure leakage from where piston ring, valve contact and cylinder head gasket.**

Compression pressure
Standard: 1800 kPa (18.4 kgf/cm^2, 261.1 psi, 18 bar)
Max. difference between any two cylinders: 150 kPa (1.5 kgf/cm^2, 21.8 psi, 1.5 bar)

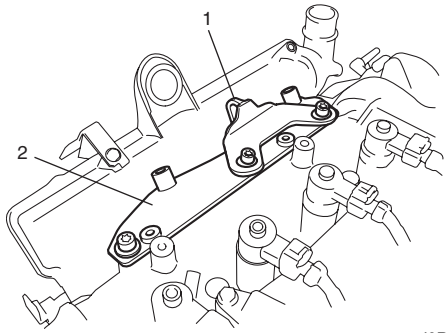
12) Disconnect negative (–) cable at battery.
13) After checking, install glow plugs referring to "Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C".
14) Connect ECM connectors.
15) Connect glow plug control module connector referring to "Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C".
16) Connect negative (–) cable at battery.

Timing Check

S7N20A1424002

Check timing between camshafts and crankshaft as follows.

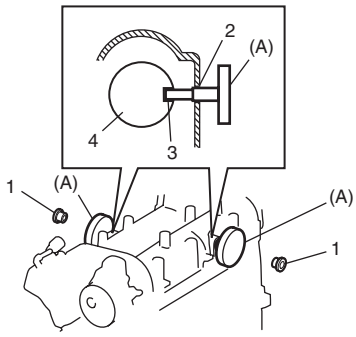
1) Disconnect negative (–) cable at battery.
2) Remove right side engine under cover.
3) Remove common rail referring to "Common Rail Removal and Installation: D13A / Z13DTJ in Section 1G".
4) Remove engine hook (1) and common rail bracket (2) from camshaft housing.



I3RB0A143007-01

5) Disconnect wiring harness connector of injectors, CMP sensor and glow plugs.
6) Remove camshaft housing plugs (1).
7) Align camshaft housing plug hole (2) with camshaft gap (3) turning crankshaft pulley clockwise as shown in figure.
8) Lock camshafts (4) inserting special tools (A) to plug holes.

Special tool
(A): 09917–68610

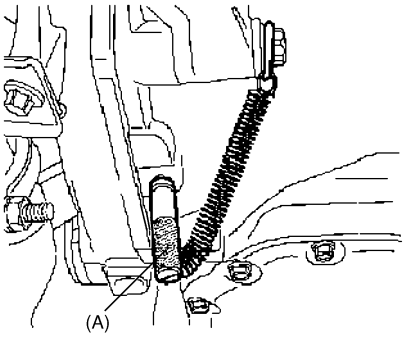


I3RB0A143010-01

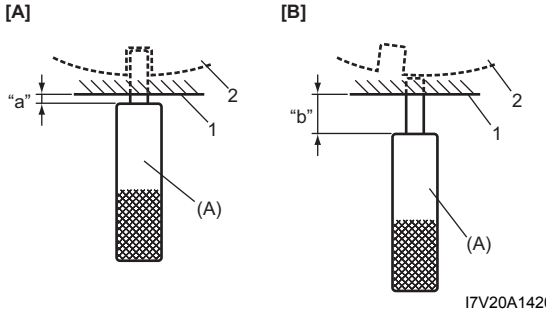
9) Insert special tool to hole of transaxle case (1) with lightly swing crankshaft pulley by hand.
And, confirm special tool is inserted in proper position as shown in figure.

Special tool
(A): 09912–46310

If not, adjust timing by reinstalling timing chain referring to "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ".



I5RS0B140003-01



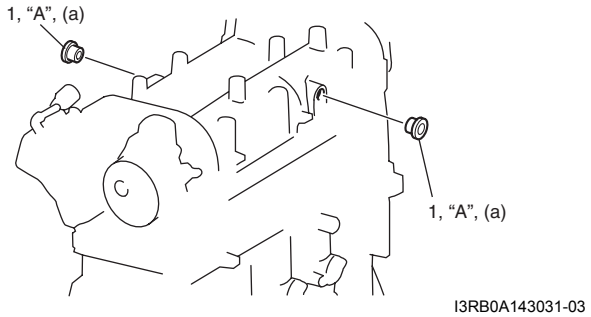
I7V20A142002-01

1. Transaxle case	[A]: Proper position	"a": 4 mm (0.16 in.)
2. Fly wheel	[B]: Improper position	"b": 12 mm (0.47 in.)

10) After checking, remove all special tools inserted in Step 8) and 9).
11) Apply thread lock compound to thread part of camshaft housing plugs (1), and tighten them to specified torque.

"A": Thread lock cement (Loctite omnifit 100M spezial®)

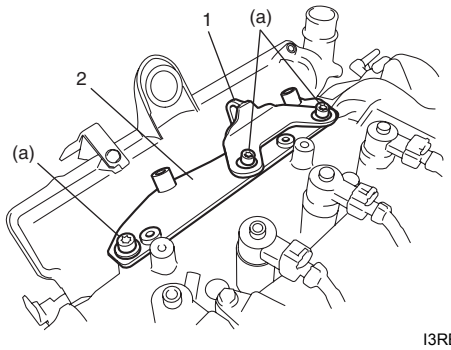
Tightening torque
Camshaft housing plug (a): 15 N·m (1.5 kgf-m, 11.0 lbf-ft)



I3RB0A143031-03

12) Connect wiring harness connector of injectors, CMP sensor and glow plugs.
13) Install common rail bracket (2) and engine hook (1) to camshaft housing.Tighten common rail bracket bolts to specified torque.

Tightening torque
Common rail bracket bolt (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)



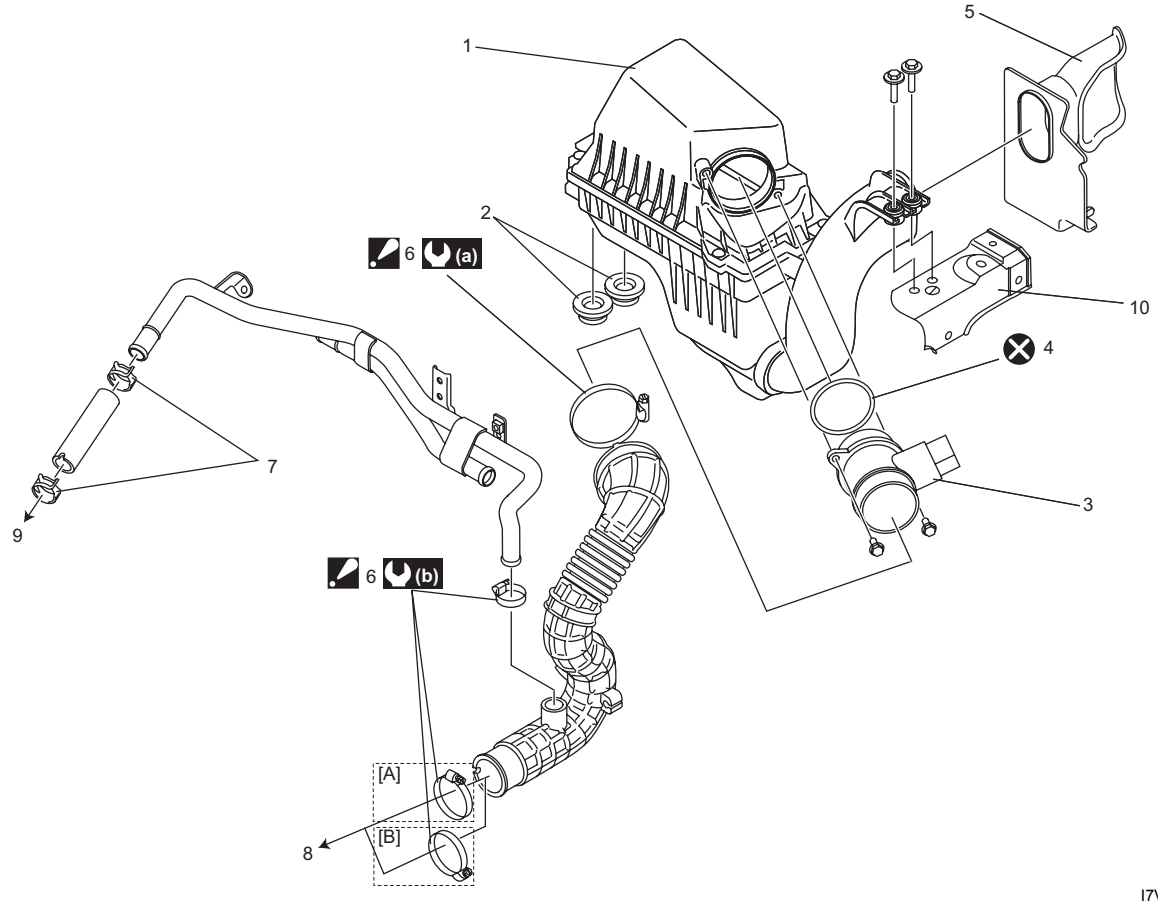
I3RB0A143034-01

14) Install common rail referring to "Common Rail Removal and Installation: D13A / Z13DTJ in Section 1G".
15) Install right side engine under cover.
16) Connect negative (–) cable at battery.

Repair Instructions

Air Cleaner Components

S7N20A1426001



I7V20A142003-02

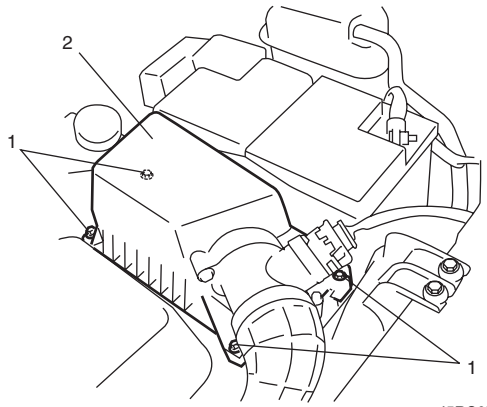
[A]: Non-DPF® model	4. MAF and IAT sensor O-ring	9. To engine
[B]: DPF® model	5. Air cleaner suction protector	(a) : 4 N·m (0.41 kgf-m, 3.0 lbf-ft)
1. Air cleaner assembly	6. Hose clamp :Be sure to position clamp screw in specified place as shown in the figure.	(b) : 2.5 N·m (0.25 kgf -m, 2.0 lbf -ft)
2. Air cleaner grommet	7. Breather hose clip :Be sure to position clip in specified direction as shown in the figure.	: Do not reuse.
3. MAF and IAT sensor	8. To turbocharger	

Air Cleaner Filter Removal and Installation

S7N20A1426002

Removal

1) Loosen air cleaner assembly bolts (1).
2) Open air cleaner assembly (2).



I5RS0B140006-01

3) Remove air cleaner filter from air cleaner assembly.

Installation

Reverse removal procedure for installation.

Air Cleaner Filter Inspection and Cleaning

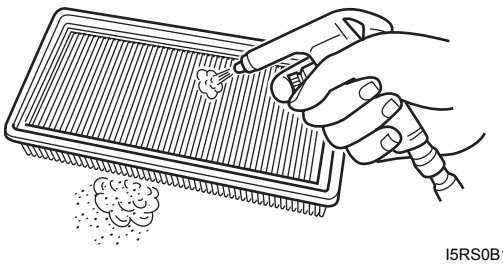
S7N20A1426003

Inspection

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

Cleaning

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



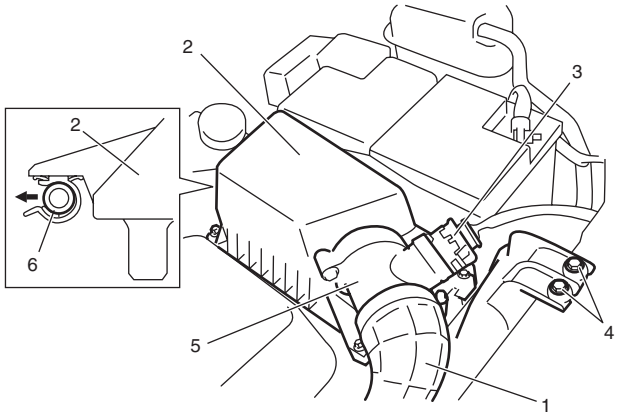
I5RS0B140007-01

Air Cleaner Assembly Removal and Installation

S7N20A1426004

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect air cleaner outlet hose (1) from air cleaner assembly (2).
3) Disconnect MAF and IAT sensor connector (3) from MAF and IAT sensor (5).
4) Remove air cleaner assembly bolts (4) from air cleaner assembly (2).
5) Remove air cleaner suction protector.
6) Detach water engine outlet hose (6), and remove air cleaner assembly (2).



I5RS0B140008-01

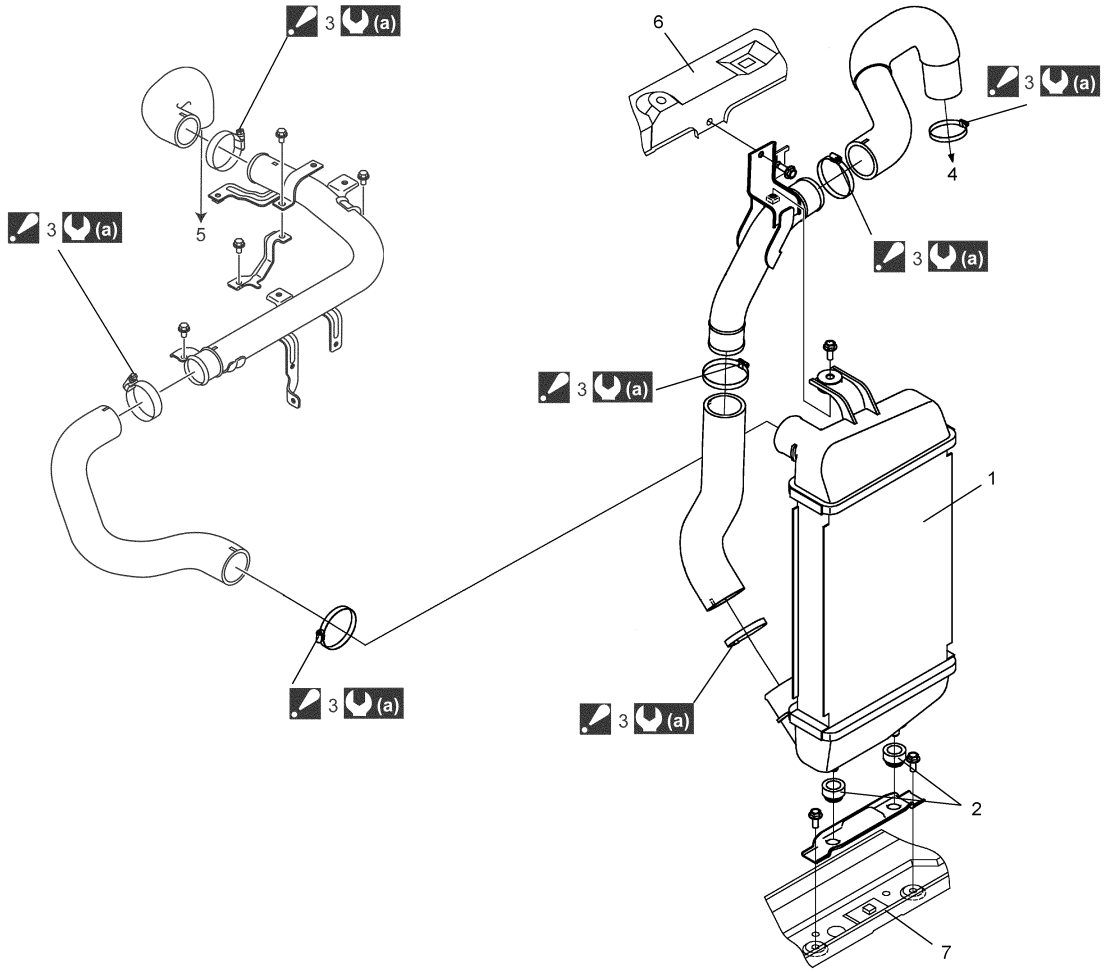
Installation

Reverse removal procedure for installation noting the following.

- Clamp each hose securely.
- Tighten air cleaner outlet hose clamp to specified torque referring to “Air Cleaner Components: D13A / Z13DTJ”.

Intercooler Components

S7N20A1426005



I7N20A142002-03

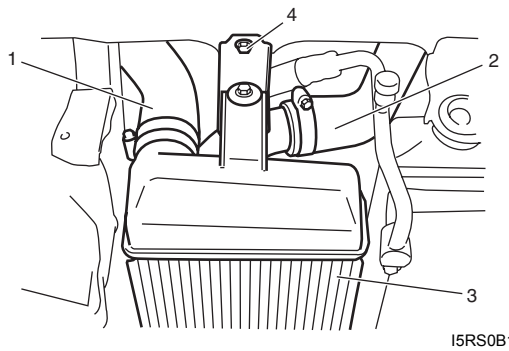
1. Intercooler	4. To turbocharger	7. Lower member
2. Intercooler mounting	5. To air intake joint	(a) : 4.0 N·m (0.41 kgf-m, 3.0 lbf-ft)
3. Hose clamp : Be sure to position clamp screw in specified position as shown in the figure	6. Upper member	: Do not reuse.

Intercooler Removal and Installation

S7N20A1426006

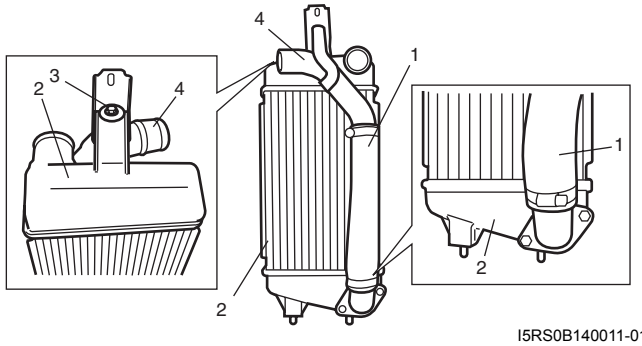
Removal

1) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
2) Disconnect intercooler outlet No.1 hose (1) and inlet No.1 hose (2) from intercooler (3).
3) Remove intercooler with intercooler inlet pipe by removing intercooler inlet pipe bolt (4).



I5RS0B140010-01

4) Remove intercooler inlet No. 2 hose (1) from intercooler (2), if necessary.
5) Remove intercooler inlet pipe (4) from intercooler (2), if necessary.



I5RS0B140011-01

3. Intercooler inlet pipe bolt

Installation

Reverse removal procedure for installation noting the following.

- Tighten hose clamps to specified torque referring to "Intercooler Components: D13A / Z13DTJ".
- Install front bumper referring to "Front Bumper and Rear Bumper Components in Section 9K".

Vacuum Pump Removal and Installation

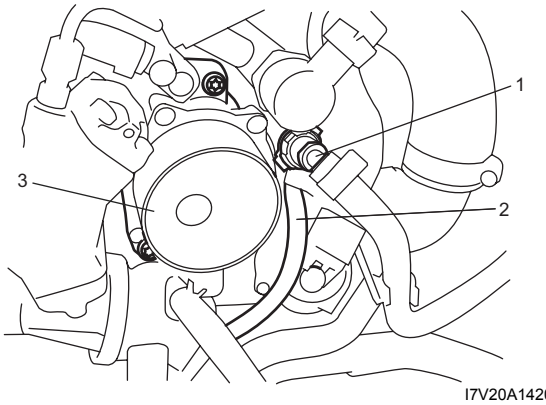
S7N20A1426033

⚠ CAUTION

Never disassemble vacuum pump. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.

Removal

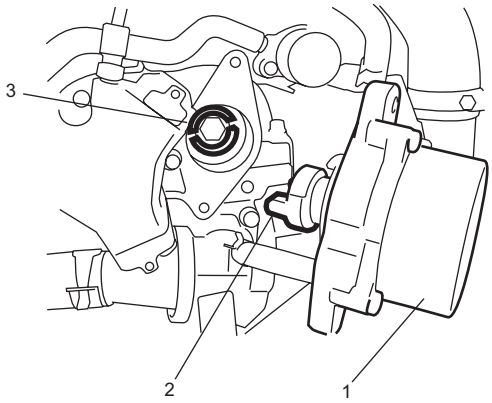
1) Disconnect negative (–) cable from battery.
2) Remove air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ".
3) Disconnect brake booster hose (1) from vacuum pump.
4) Disconnect vacuum hose (2) (for DPF® model)
5) Remove vacuum pump (3) from camshaft housing.



I7V20A142009-01

Installation

1) Install new gasket to vacuum pump.
2) Install vacuum pump (1) to camshaft housing. Fit the protrusion of vacuum pump coupling (2) into the slot (3) of camshaft.

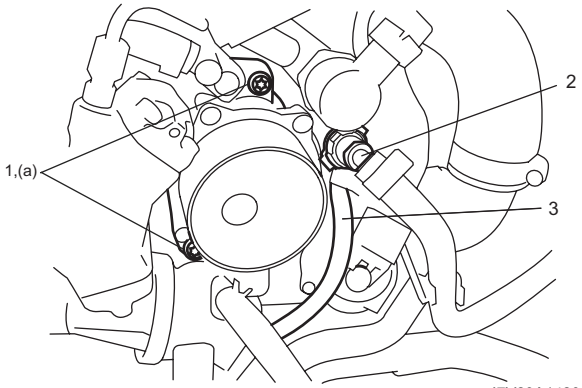


I7V20A142010-01

3) Tighten vacuum pump bolts (1) to specified torque.

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

4) Connect brake booster hose (2) to vacuum pump.
5) Connect vacuum hose (3) (for DPF® model).



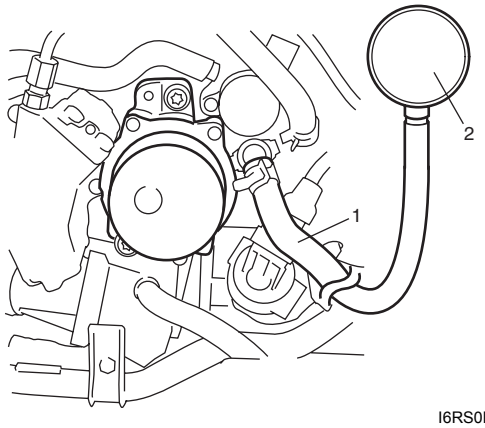
I7V20A142011-01

6) Install air cleaner assembly referring to "Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ".
7) Connect negative (–) cable to battery.

Vacuum Pump Inspection

S7N20A1426045

1) Start engine and warm it up to normal operating temperature.
2) Stop engine.
3) Connect vacuum gauge to brake booster hose (1).



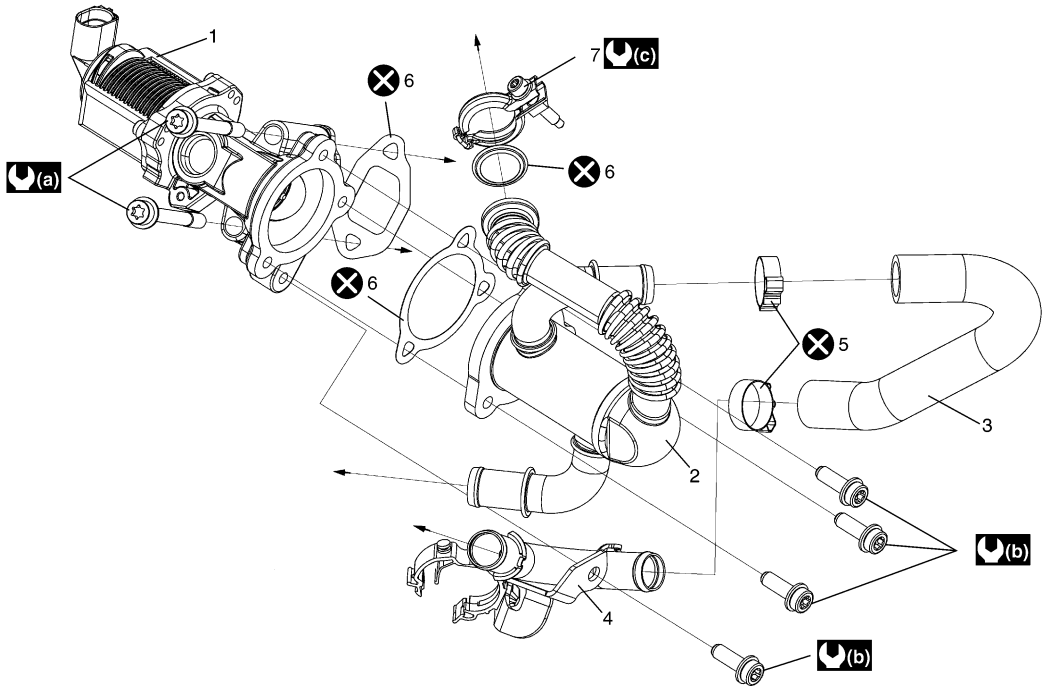
I6RS0E120003-02

4) Check vacuum pressure in the following conditions. If vacuum pressure is out of specification, replace vacuum pump.

Vacuum pressure specification
More than –50 kpa (–0.5kgf/cm^2, –7.25psi –0.5 bar) within 5 seconds at idle speed

EGR Valve and EGR Cooler Components

S7N20A1426034



I7V20A142012-02

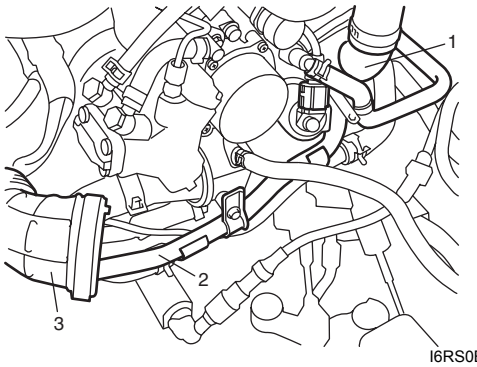
1. EGR valve	4. EGR cooler pipe	7. EGR pipe clamp	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
2. EGR cooler	5. Clamp	(a) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)	⊗ : Do not reuse.
3. EGR cooler hose	6. Gasket	(b) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)	

EGR Valve and EGR Cooler Removal and Installation

S7N20A1426035

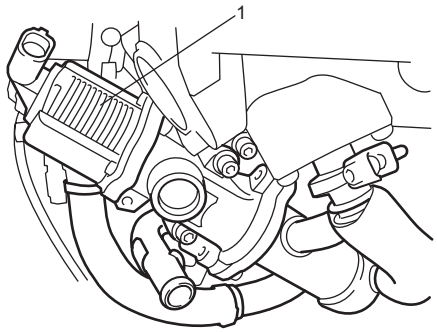
Removal

1) Remove battery from vehicle.
2) Remove glow plug control module referring to “Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C”.
3) Remove battery tray from vehicle.
4) Drain cooling system referring to “Cooling System Draining: D13A / Z13DTJ in Section 1F”.
5) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ”.
6) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
7) Remove cowl top panel referring to “Cowl Top Components in Section 9K”.
8) Disconnect air intake joint (1) from intake manifold.
9) Remove heater outlet pipe (2) from EGR cooler.
10) Remove air cleaner outlet hose (3) from turbocharger.



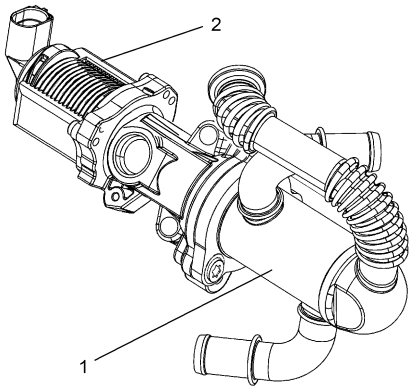
I6RS0E120009-01

11) Disconnect connector from EGR valve.
12) Disconnect water hoses from EGR cooler.
13) Remove EGR valve (1) with EGR cooler from cylinder head.



I7V20A142013-03

14) Remove EGR cooler (1) from EGR valve (2), if necessary.



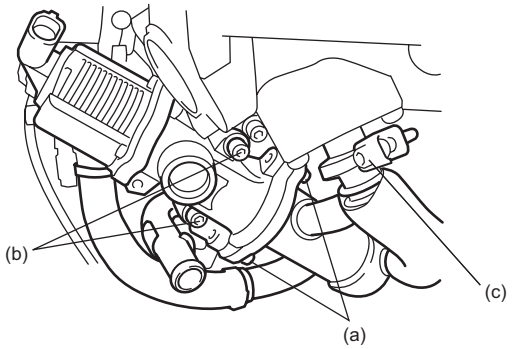
I7V20A142016-01

Installation

Reverse removal procedure for installation noting the following.

- Clean mating surface of EGR valve and cylinder head.
- Use new gaskets.
- Tighten EGR valve bolts, EGR cooler bolts and EGR pipe clamp to specified torque.

Tightening torque
EGR cooler bolt (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)
EGR valve bolt (b): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
EGR pipe clamp (c): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

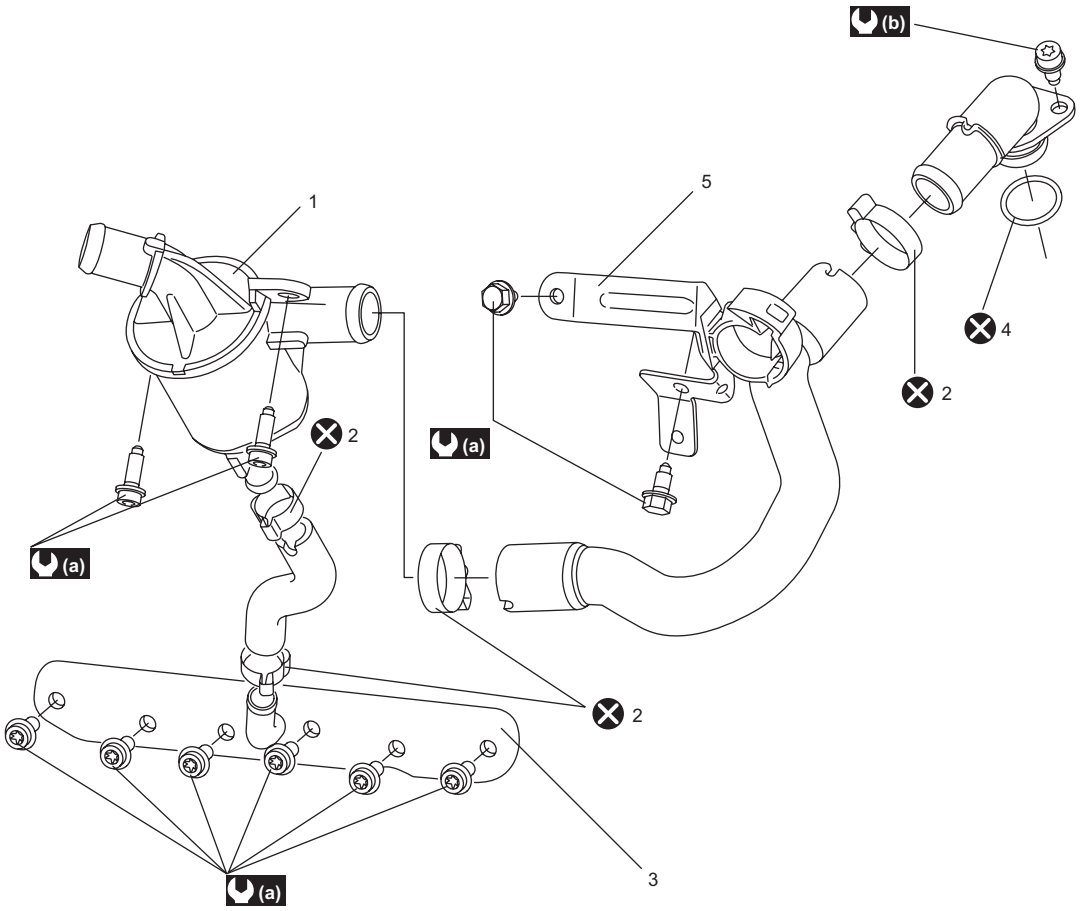


I7V20A142014-02

- Use new hose clamps.
- Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F”.
- Check cooling system leakage referring to “Engine Cooling System Inspection and Cleaning: D13A / Z13DTJ in Section 1F”.

Crankcase Ventilation System Component

S7N20A1426036



I7V20A142059-01

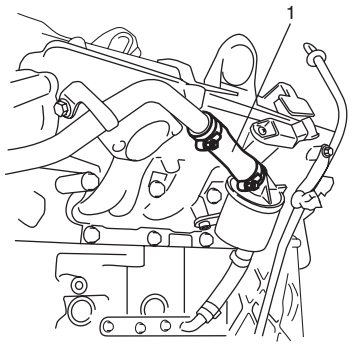
1. Oil separator	4. O-ring	(b) : 8.5 N·m (0.85 kgf-m, 6.5 lbf-ft)
2. Clamp	5. Hose bracket	⊗ : Do not reuse.
3. Crankcase ventilation cover	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)	

Oil Separator and Crankcase Ventilation Cover Removal and Installation

S7N20A1426037

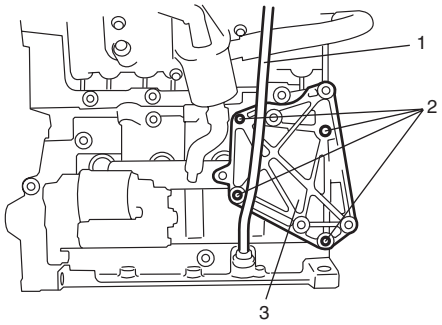
Removal

1) Disconnect negative (–) cable at battery.
2) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
3) Remove cowl top panel referring to “Cowl Top Components in Section 9K”.
4) Disconnect breather hose (1) from oil separator.



I3RB0A123002-01

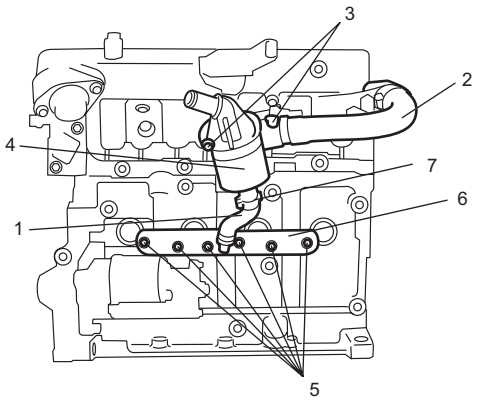
5) Remove generator referring to “Generator Removal and Installation: D13A / Z13DTJ in Section 1J”.
6) Remove oil level gauge guide (1) with level gauge.
7) Remove generator bracket (3) from cylinder block by removing generator bracket mounting bolts (2).



I3RB0A123003-01

1. Oil lever gauge

8) Disconnect ventilation hose No.2 (2) from oil separator.
9) Loosen ventilation hose No.1 clamp at oil separator side (7).
10) Remove oil separator mounting bolts (3).
11) Remove oil separator (4) by disconnecting ventilation hose No.1 (1).
12) Remove crankcase ventilation cover (6) with ventilation hose No.1 by removing crankcase ventilation cover mounting bolts (5).

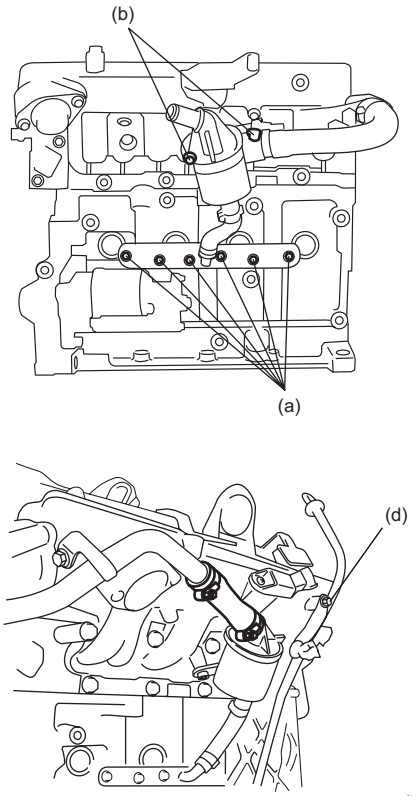


I7V20A142019-01

Installation
Reverse removal procedure for installation noting the followings.

- Clean mating surfaces of crankcase ventilation cover and cylinder block.
- Use new crankcase ventilation cover gaskets and ventilation hose clamps.
- Tighten each bolts to specified torque.

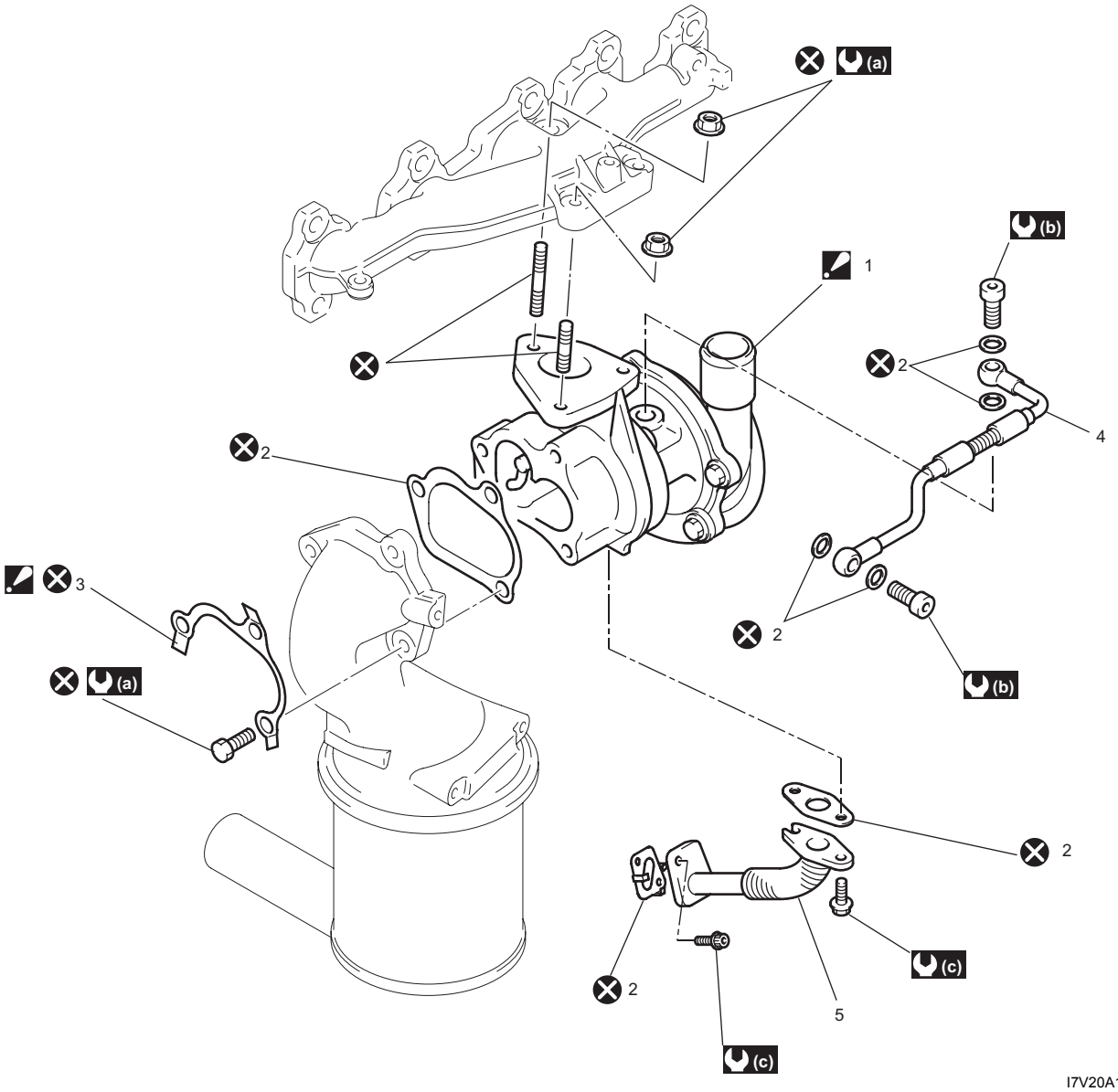
Tightening torque
Crankcase ventilation cover mounting bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
Oil separator mounting bolt (b): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
Generator bracket mounting bolt (c): 22 N·m (2.2 kgf-m, 16.5 lbf-ft)
Oil level gauge guide mounting bolt (d): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I7V20A142020-01

Turbocharger Components

S7N20A1426007



I7V20A142021-02

1. Turbocharger : Do not disassemble.	4. Turbocharger lubrication pipe	(b) : 22 N·m (2.2 kgf-m, 16.5 lbf-ft)
2. Gasket	5. Oil return pipe	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Lock plate : Bend lock part in order to prevent catalytic converter bolt from loosening.	(a) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)	: Do not reuse.

Turbocharger Removal and Installation

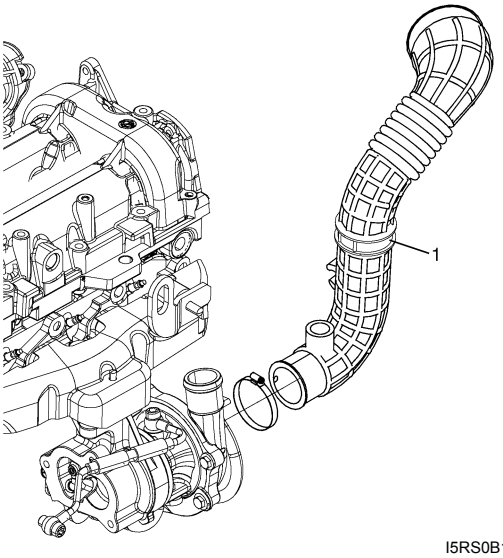
S7N20A1426008

Removal

⚠ WARNING

To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

1) Disconnect negative (–) cable at battery.
2) Remove engine cover from engine assembly.
3) Remove air cleaner assembly with MAF and IAT sensor referring to“Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ”.
4) Remove intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ”.
5) Remove air cleaner outlet hose (1) from turbocharger.



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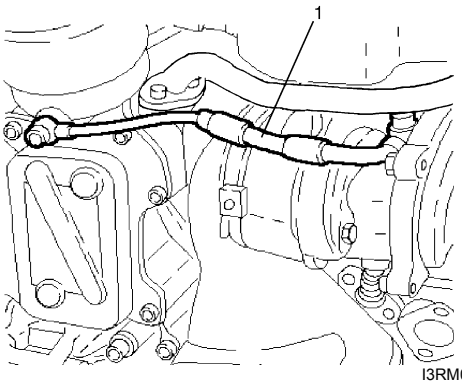
6) Remove exhaust manifold side engine hanger referring to “Exhaust Manifold Components: D13A / Z13DTJ in Section 1K”.
7) Disconnect glow plug connectors referring to “Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C”.
8) Remove lubrication pipe (1).



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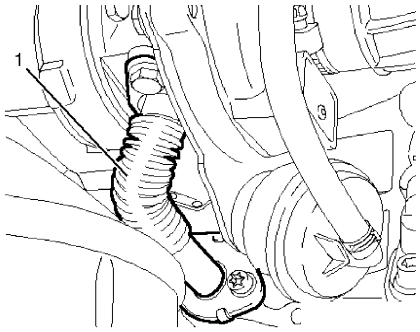
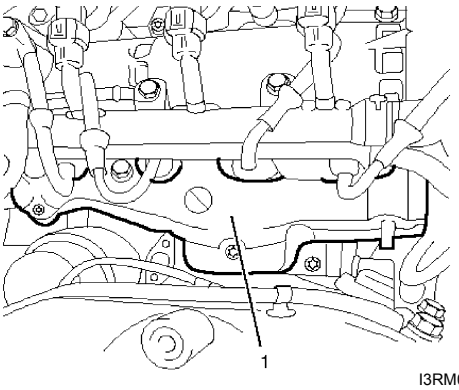
9) Remove oil cooler referring to “Oil Cooler Removal and Installation: D13A / Z13DTJ in Section 1E”.
10) Disconnect oil return pipe (1) from cylinder block.



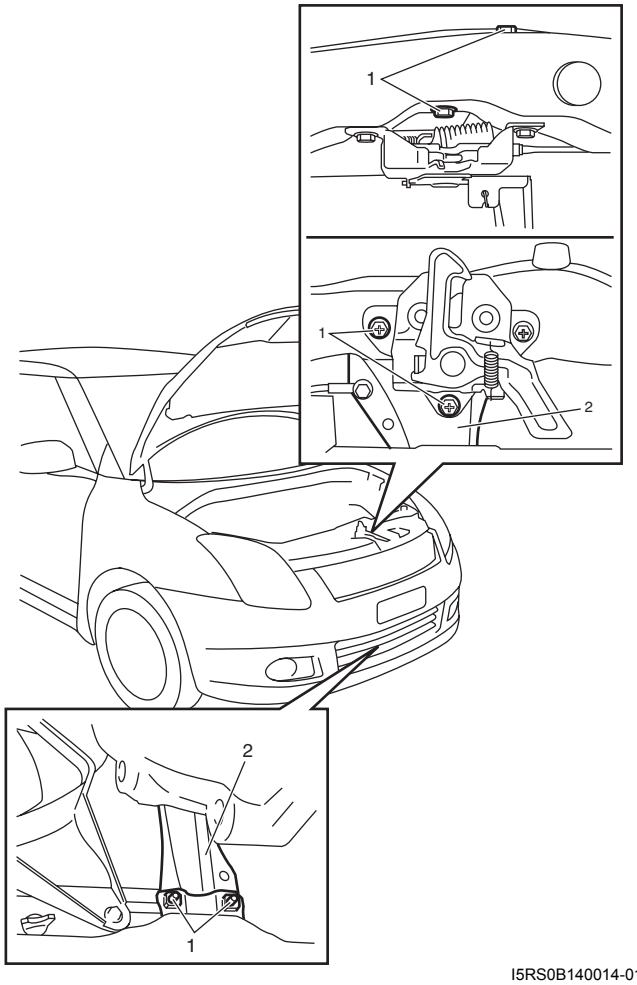
I3RM0B142014-01

11) Remove exhaust manifold cover (1) from exhaust manifold.



I3RM0B142015-01

12) Remove exhaust No.1 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
13) For Non-DPF® model, disconnect A/F sensor connector referring to “Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model): D13A / Z13DTJ in Section 1B”.
14) Remove bolts (1) and hood lock brace (2).



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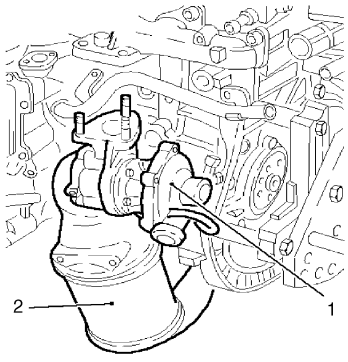
15) Remove catalytic converter bracket referring to “Exhaust System Components: D13A / Z13DTJ in Section 1K”.
16) Remove turbocharger (1) with catalytic converter (2).



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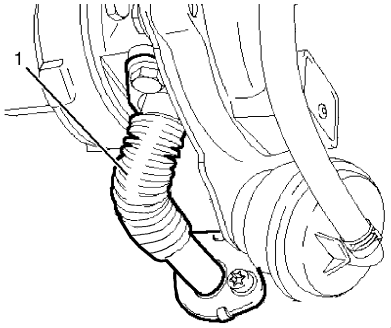
17) Remove catalytic converter from turbocharger referring to “Catalytic Converter Removal and Installation: D13A / Z13DTJ in Section 1K”, if necessary.
18) Remove oil return pipe (1) from turbocharger, if necessary.



I3RM0B142036-01

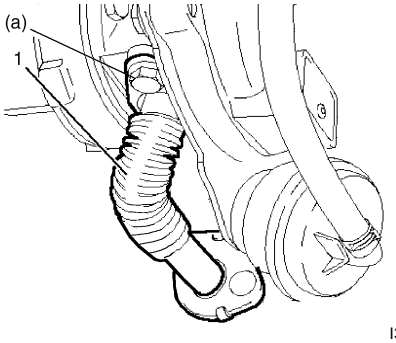
Installation

NOTE

Clean mating surfaces of turbocharger, catalytic converter and exhaust manifold.

1) Install oil return pipe (1) with new gasket to turbocharger.

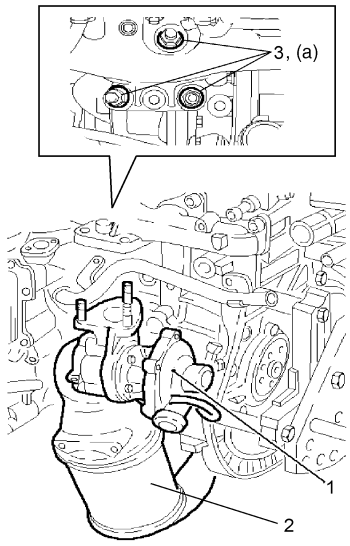
Tightening torque
Oil return pipe bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I3RM0B142018-01

2) Install catalytic converter (1) referring to “Catalytic Converter Removal and Installation: D13A / Z13DTJ in Section 1K”, if necessary.
3) Install turbocharger (1) with catalytic converter (2) using new turbocharger nuts (3).

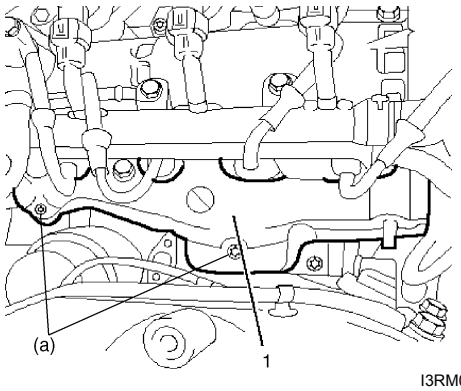
Tightening torque
Turbocharger nut (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)



I7V20A142023-02

4) Install catalytic converter bracket referring to “Exhaust System Components: D13A / Z13DTJ in Section 1K”.
5) Install exhaust manifold cover (1) and ground wire.

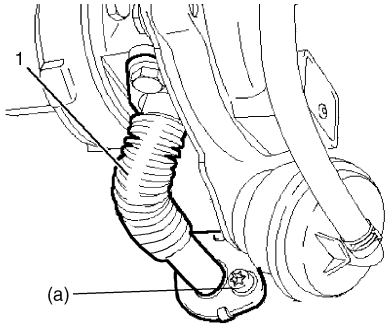
Tightening torque
Exhaust manifold cover nut (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I3RM0B142022-01

6) For Non-DPF® model, connect A/F sensor connector referring to “Air Fuel Ratio (A/F) Sensor Removal and Installation (Non-DPF® Model): D13A / Z13DTJ in Section 1B”.
7) Install hood lock brace and adjust hood latch referring to “Hood Inspection and Adjustment in Section 9J”.
8) Install exhaust No.1 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
9) Connect return pipe (1) to cylinder block with new gasket.

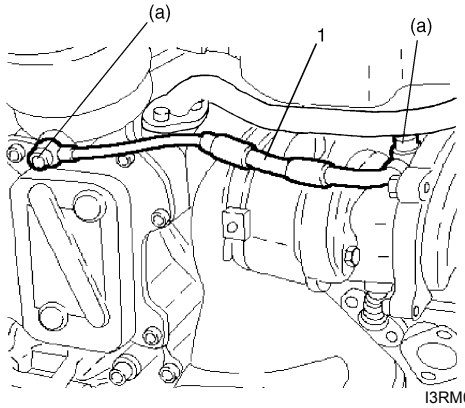
Tightening torque
Oil return pipe bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I3RM0B142023-01

10) Install oil cooler referring to “Oil Cooler Removal and Installation: D13A / Z13DTJ in Section 1E”.
11) Install lubrication pipe (1) with new gasket.

Tightening torque
Lubrication pipe union bolt (a): 22 N·m (2.2 kgf-m, 16.5 lbf-ft)

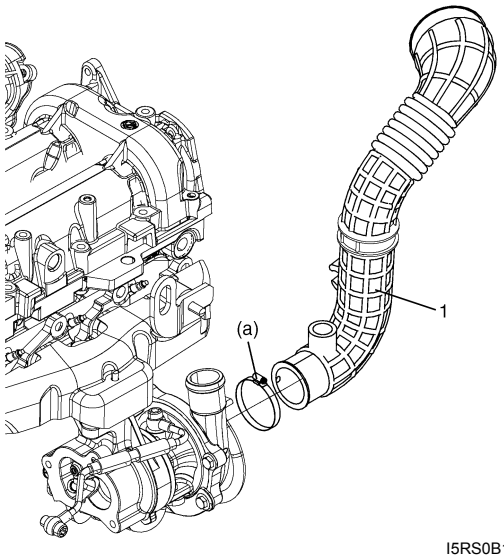


I3RM0B142024-01

12) Install exhaust manifold side engine hanger referring to “Exhaust Manifold Components: D13A / Z13DTJ in Section 1K”.
13) Connect glow plug connectors referring to “Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C”.

14) Install air cleaner outlet hose (1) to turbocharger and then tighten its clamp to specified torque.

Tightening torque
Air cleaner outlet hose clamp (a): 2.5 N·m (0.25 kgf-m, 2.0 lbf-ft)



I5RS0B140017-01

15) Install intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ”.
16) Install air cleaner assembly with MAF and IAT sensor, referring to“Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ”.
17) Install engine cover to engine assembly.

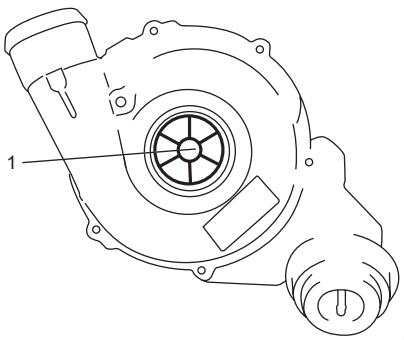
Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

18) Connect negative (–) cable at battery.
19) Check to make sure that there is no oil leakage and exhaust gas leakage at each connection.

Turbocharger Inspection

S7N20A1426009

Visual Inspection
Rotate turbine shaft (1) by hand and verify that it turns smoothly without any abnormal noise and excessive runout.
If a malfunction is found, replace the turbocharger.



I7V20A142024-01

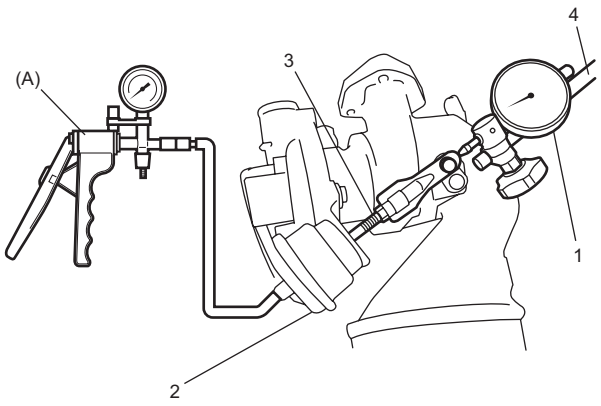
Boost Pressure Control Valve (DPF® model)

1) Set magnetic base (4) with dial gauge (1) as shown in figure.
2) Connect special tool to boost pressure control valve (2).

Special tool
(A): 09917–47011

3) Measure stroke of boost pressure control valve rod (3) when applying specified pressure.
If measured stroke is out of specification, replace turbocharger.

Boost pressure control valve rod stroke:
3.85 – 4.85 mm (0.152 – 0.190 in.) at –50 kPa (–0.50 kgf/cm², –7.25 psi, –0.5 bar)



I7V20A142025-02

Boost Pressure Control Valve (Non-DPF® model)

⚠ CAUTION

Do not apply pressure more than 138 kPa (1.38 kgf/cm², 20.0 psi, 1.38 bar); otherwise boost pressure control valve could be damaged.

Measure stroke of boost pressure control valve rod (1) as the following steps.

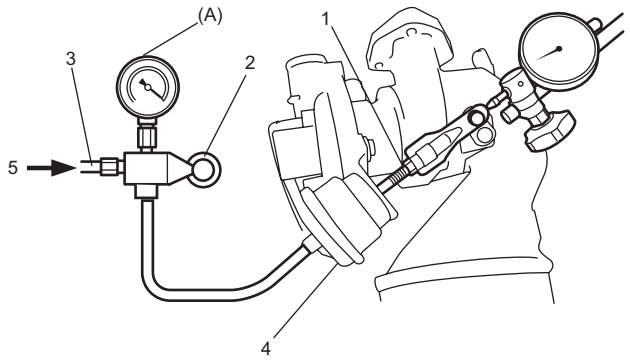
1) Set special tool as follows.

Special tool
(A): 09918–18111

a) Loosen adjusting screw (2) fully.
b) Connect air hose (3) to special tool.
c) Connect special tool to boost pressure control valve (4).

2) Measure stroke of boost pressure control valve when applying specified pressure by using special tool and compressed air (5).
If measured stroke is out of specification, replace turbocharger.

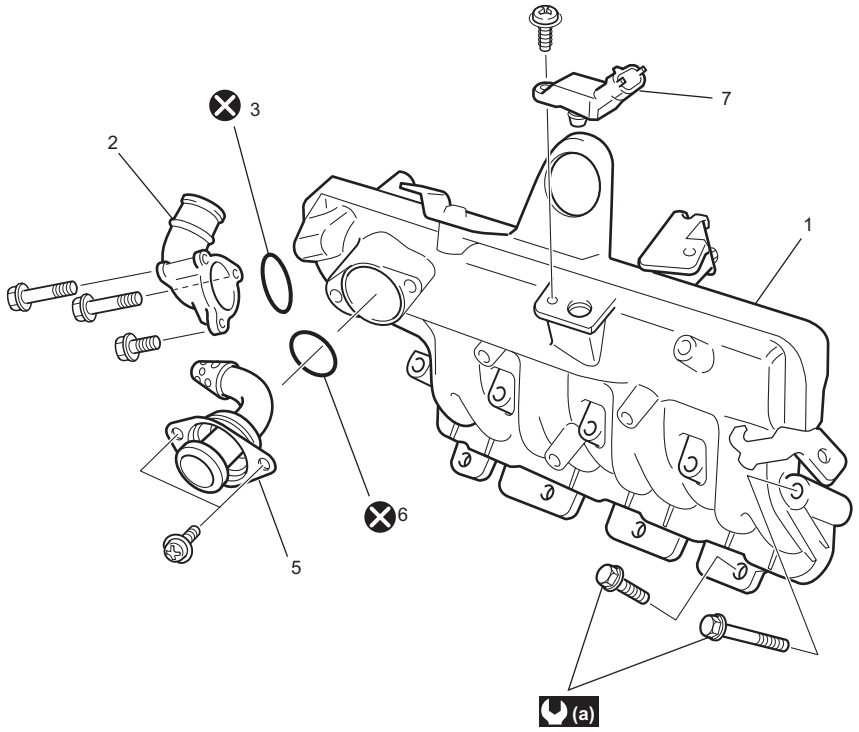
Boost pressure control valve rod stroke:
1.5 – 2.5 mm (0.059 – 0.098in.) at 138 kPa (1.38 kgf/cm², 20.0 psi, 1.38 bar)



I7V20A142027-02

Intake Manifold Components

S7N20A1426010



I7V20A142028-02

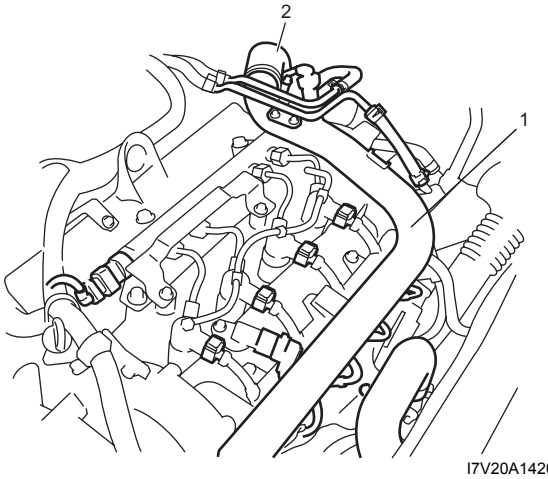
1. Intake manifold	5. EGR pipe	(a) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)
2. Air intake joint	6. EGR pipe gasket	⊗ : Do not reuse.
3. Air intake joint gasket	7. Boost pressure sensor	

Intake Manifold Removal and Installation

S7N20A1426011

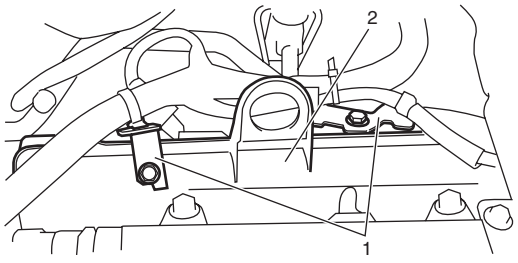
Removal

1) Disconnect negative (–) cable at battery.
2) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
3) Remove cowl top cover and cowl top panel referring to “Cowl Top Components in Section 9K”.
4) Remove engine cover from engine assembly.
5) Remove air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ”.
6) Remove intercooler outlet pipe (1) and outlet No.2 hose (2) referring to “Intercooler Components: D13A / Z13DTJ”.



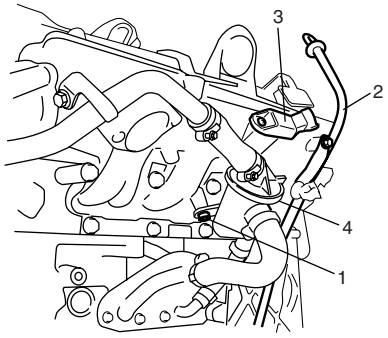
I7V20A142029-02

7) Remove EGR valve referring to “EGR Valve and EGR Cooler Removal and Installation: D13A / Z13DTJ”.
8) Remove harness clamp (1) with wire harness from intake manifold (2).



I5RS0B140019-01

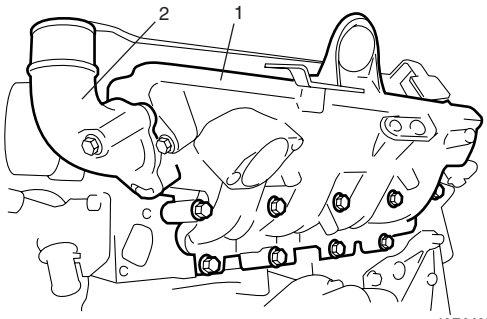
9) Remove oil separator bolt (1) from intake manifold.
10) Remove oil level gauge guide (2) with level gauge.
11) Disconnect connector from boost pressure sensor (3).



I3RM0B142028-01

4. Oil separator

12) Remove intake manifold (1) and gasket from cylinder head.
13) Remove EGR pipe and air intake joint (2) from intake manifold.

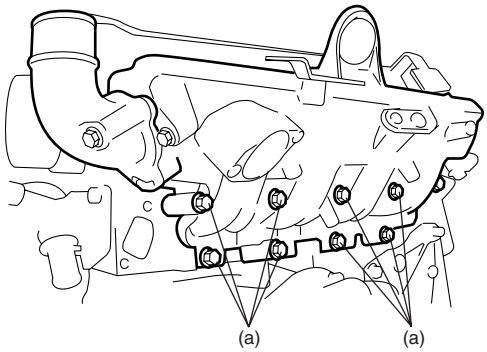


I3RM0B142029-01

Installation
Reverse removal procedure for installation noting the followings.

- Clean mating surfaces of intake manifold and cylinder head.
- Use new gasket for intake manifold, air intake joint and EGR pipe.
- Tighten intake manifold bolts to specified torque.

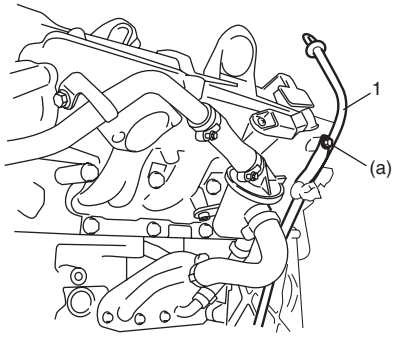
Tightening torque
Intake manifold bolt (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)



I3RM0B142030-01

- Install oil level gauge guide (1) with level gauge.

Tightening torque
Oil level gauge guide mounting bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I3RB0A143004-01

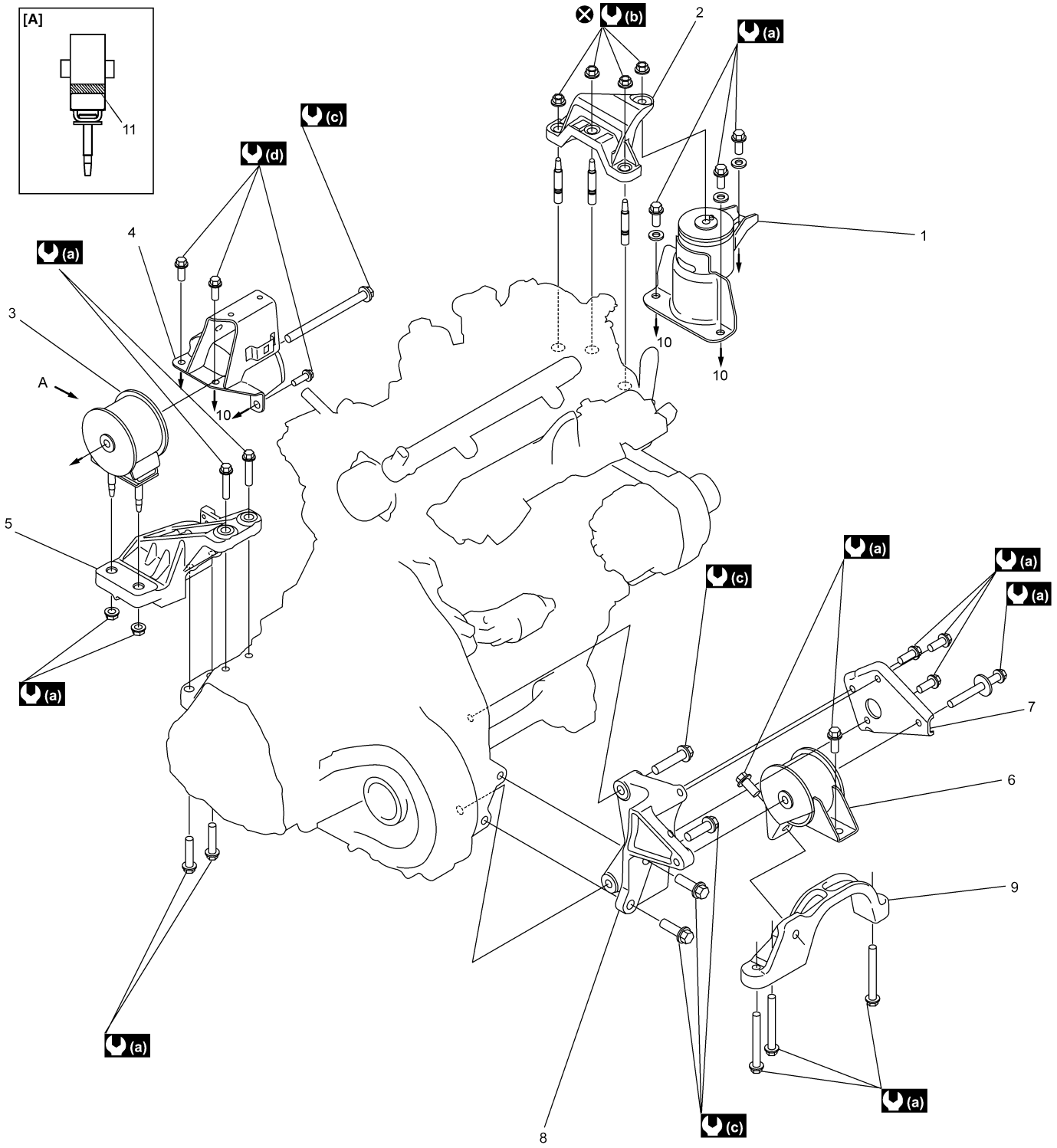
- Install EGR valve assembly referring to “EGR Valve and EGR Cooler Removal and Installation: D13A / Z13DTJ”.
- Install engine cover to engine assembly.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

- Check to ensure that all removed parts are back in place.
  Reinstall any necessary parts which have not been reinstalled.

Engine Mounting Components

S7N20A1426038



I7V20A142030-02

[A]: View A	6. Engine rear mounting	(a) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
1. Engine right mounting	7. Engine rear mounting No. 1 bracket	(b) : 65 N·m (6.6 kgf-m, 48.0 lbf-ft)
2. Engine right mounting bracket	8. Engine rear mounting No. 2 bracket	(c) : 85 N·m (8.7 kgf-m, 63.0 lbf-ft)
3. Engine left mounting	9. Engine rear mounting No. 3 bracket	(d) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
4. Engine left mounting No. 1 bracket	10. To vehicle body	⊗ : Do not reuse.
5. Engine left mounting No. 2 bracket	11. Yellow mark	

Engine Assembly Removal and Installation

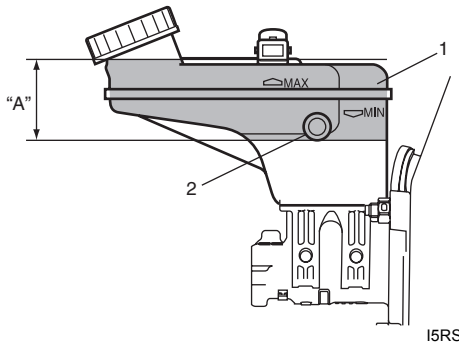
S7N20A1426039

Removal

1) Disconnect negative (–) and positive (+) cable at battery.
2) Remove battery from vehicle.
3) Remove glow plug control module referring to “Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C”.
4) Remove battery tray from vehicle.
5) Remove engine hood after disconnecting windshield washer hose.
6) Remove engine cover.
7) Remove air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ”.
8) Remove intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ”.
9) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
10) Remove cowl top cover and cowl top panel referring to “Cowl Top Components in Section 9K”.
11) Drain engine oil referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”.
12) Drain transaxle oil referring to “Manual Transaxle Oil Change: D13A and Z13DTJ Model in Section 5B”, if necessary.
13) Drain cooling system referring to “Cooling System Draining: D13A / Z13DTJ in Section 1F”.
14) Take out clutch fluid from brake master cylinder reservoir (1) in space “A” as shown in the figure with syringe or such.

⚠ CAUTION

Do not allow fluid to get on painted surface. It may cause painted surface damage.



I5RS0B140024-01

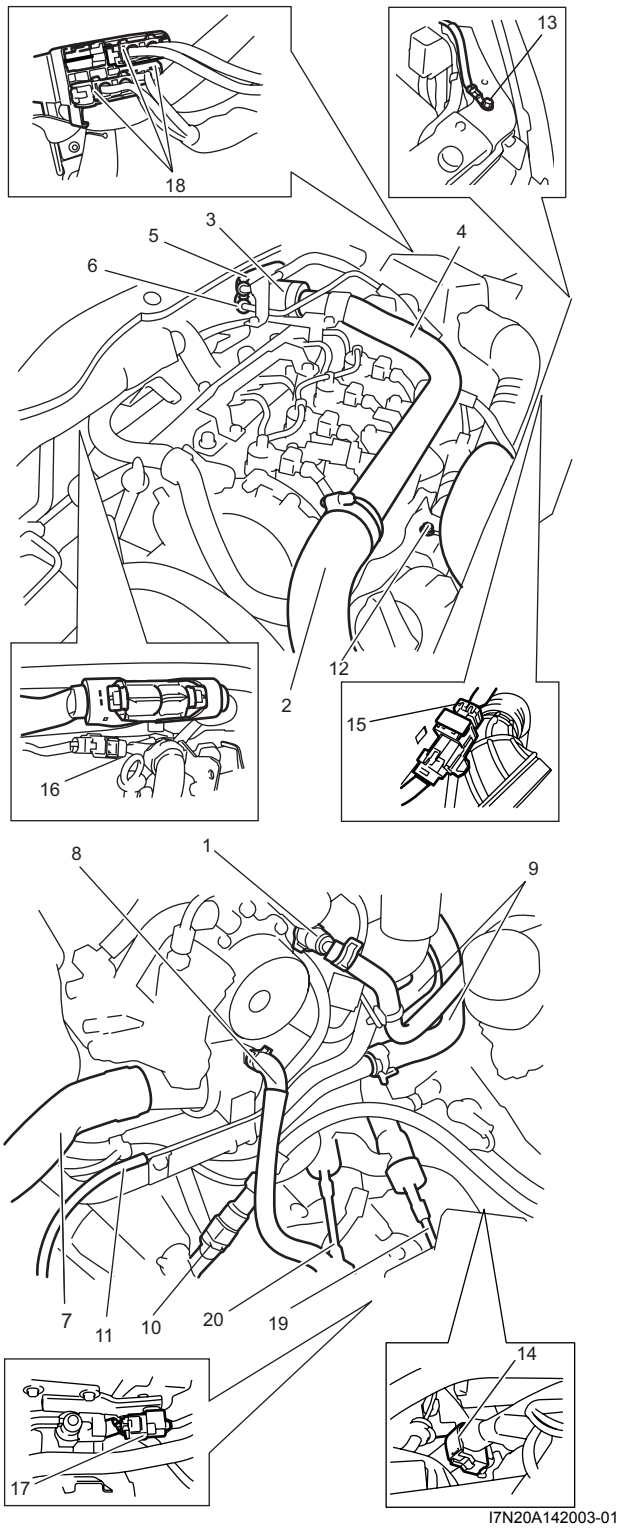
2. Clutch nipple

15) Remove right and left side engine under covers.
16) Remove accessory drive belt referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F”.
17) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation (Diesel Engine Model): Manual A/C in Section 7B”.

⚠ CAUTION

Suspend removed A/C compressor at a place where no damage will be caused during removal and installation of engine assembly.

18) Disconnect the following pipes and hoses:
    - Brake booster hose (1)
    - Intercooler outlet No.1 hose (2) and outlet No.2 hose (2)
    - Intercooler outlet pipe (3)
    - Fuel feed hose (4)
    - Fuel return hose (5)
    - Radiator inlet hose (6) and outlet hose
    - Degassing tank outlet hose (7)
    - Heater inlet and outlet hoses (8)
    - Clutch hose and pipe (9)
    - Vacuum hose (DPF® model) (10)
19) Disconnect the following electric wires:
    - Ground wire from exhaust manifold (11)
    - Ground wire from upper member (12)
    - Magnet clutch switch of A/C compressor (if equipped)
    - Each wire harness clamps (13)
    - Injector harness (14)
    - Injector harness from ECM (15)
    - Engine harness (16)
    - Main harness (17)
20) Disconnect the following cables from transaxle:
    - Gear select control cable (18)
    - Gear shift control cable (19)



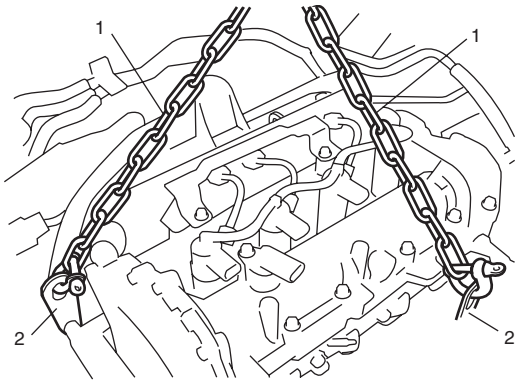
I7N20A142003-01

21) Remove exhaust No.1 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.

22) By using chain hoist (1), support engine assemble with engine hangers (2).

⚠ CAUTION

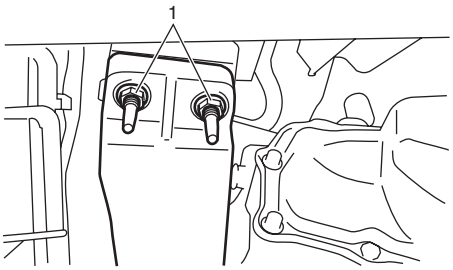
Be sure to remove / disconnect part(s), which interfere with chain hoist, if necessary. Failure to follow this CAUTION could result in damage by chain hoist.

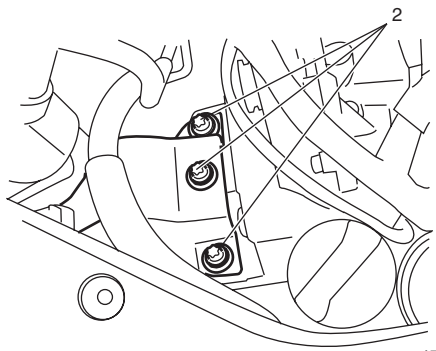


I5RS0B220001-01

23) Remove suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.

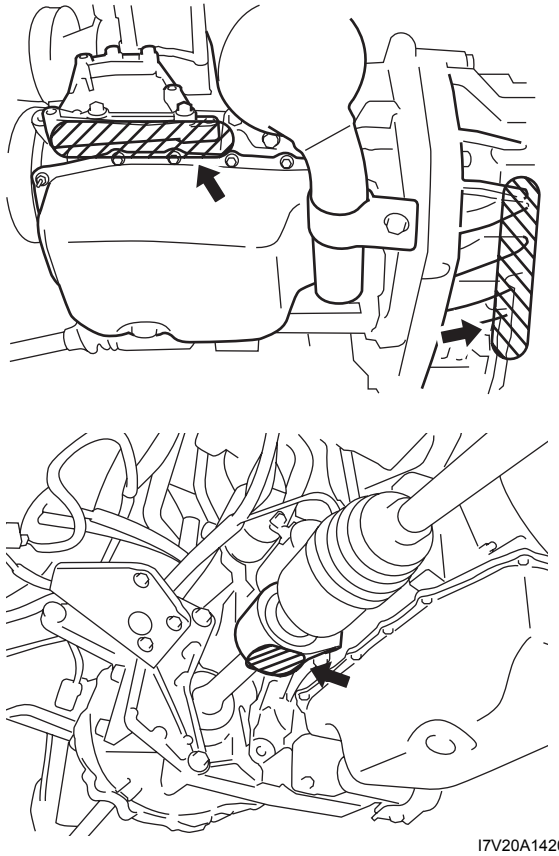
24) Remove engine left mounting bracket nuts (1) and engine right mounting bracket nuts (2).





I5RS0B140022-01

25) Before removing engine with transaxle from engine compartment, recheck to make sure all hoses, pipes, electric wires and cables are disconnected from engine and transaxle.
26) Lower engine with transaxle from engine compartment.
27) Support center bearing support, transaxle case and lower crankcase using pad at hatched parts (1) indicated in figure.



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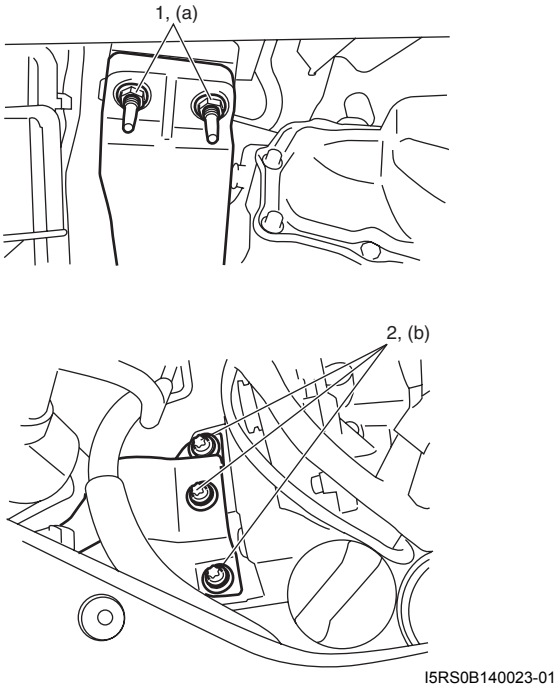
28) Disconnect transaxle from engine referring to “Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C”.
29) Remove clutch cover and clutch disk referring to “Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C”.

Installation

1) Install clutch cover and clutch disk referring to “Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C”.
2) Connect transaxle to engine referring to “Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B”.
3) Lift engine with transaxle into engine compartment using chain hoist.
4) Install engine left mounting bracket nuts (1) and new engine right mounting bracket nuts (2). Tighten these nuts to specified torque.

Tightening torque
Engine left mounting bracket nut (a): 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
Engine left mounting bracket nut (b): 55 N·m (5.6 kgf-m, 40.5 lbf-ft)



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5) Install suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
6) Remove chain hoist.
7) Install exhaust No.1 pipes referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
8) Reverse disconnected hoses, pipes, cables and electric wires for connection in removal procedure.
9) Install A/C compressor to its bracket (if equipped) referring to “Compressor Assembly Removal and Installation (Diesel Engine Model): Manual A/C in Section 7B”.
10) Install accessory drive belt referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F”.
11) Install right and left side engine under covers.
12) Install intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ”.
13) Install cowl top cover and cowl top panel referring to “Cowl Top Components in Section 9K”.
14) Install ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
15) Install air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ”.

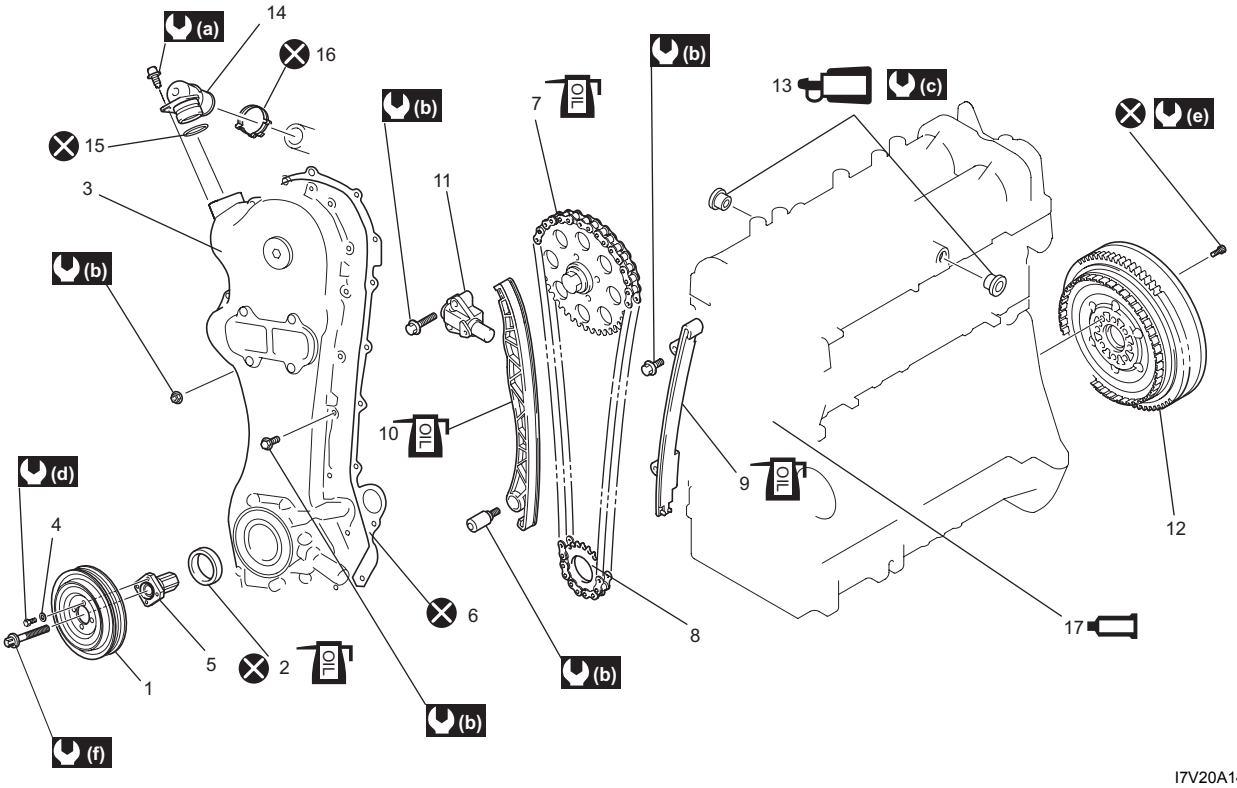
16) Install engine cover.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

17) Refill engine with engine oil referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”.
18) Refill transaxle with transaxle oil referring to “Manual Transaxle Oil Change: D13A and Z13DTJ Model in Section 5B”.
19) Refill cooling system with coolant referring to “Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F”.
20) Refill clutch fluid and bleed air from system referring to “Air Bleeding of Clutch System (For Diesel Model) in Section 5C”.
21) Install engine hood and connect windshield washer hose.
22) Install battery tray.
23) Install glow plug control module referring to “Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C”.
24) Connect positive (+) and negative (–) cable at battery.
25) Install battery.
26) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.

Timing Chain Cover and Timing Chain Components

S7N20A1426013



I7V20A142035-01

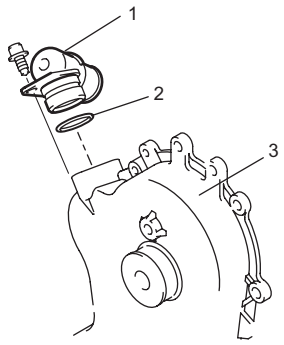
1. Crankshaft pulley	9. Timing chain guide : Apply engine oil to sliding surface.	17. Camshaft housing / cylinder head / cylinder block : Apply sealant 99000-85E11 to mating surfaces.
2. Crankshaft pulley side crankshaft oil seal : Apply engine oil to oil seal lip.	10. Timing chain tensioner : Apply engine oil to sliding surface.	(a) : 8.3 N·m (0.85 kgf-m, 6.5 lbf-ft)
3. Timing chain cover	11. Timing chain tensioner adjuster	(b) : 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)
4. Washer	12. Flywheel	(c) : 15 N·m (1.5 kgf-m, 11.0 lbf-ft)
5. Crankshaft pulley flange	13. Camshaft housing plug : Apply Loctite omnifit 100M spezial® to thread parts.	(d) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
6. Timing chain cover gasket	14. Ventilation connector	(e) : 44 N·m (4.5 kgf-m, 32.5 lbf-ft)
7. Timing chain : Apply engine oil.	15. O-ring	(f) : 230 N·m (23.5 kgf-m, 170.0lbf-ft)
8. Crankshaft timing sprocket	16. Hose clamp	: Do not reuse.

Timing Chain Cover and Timing Chain Removal and Installation

S7N20A1426014

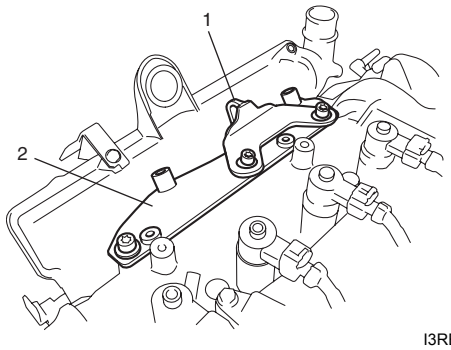
Removal

1) Remove engine assembly from engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.
2) Remove oil pan referring to “Oil Pan Removal and Installation: D13A / Z13DTJ in Section 1E”.
3) Remove ventilation connector (1) and O-ring(2) from timing chain cover (3).



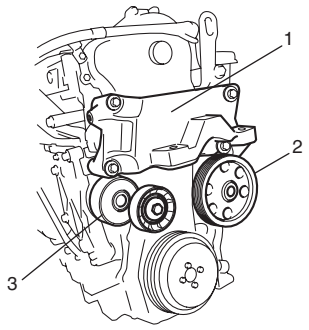
I7V20A142036-01

4) Remove common rail referring to “Common Rail Removal and Installation: D13A / Z13DTJ in Section 1G”.
5) Remove engine hook (1) and common rail bracket (2) from camshaft housing.



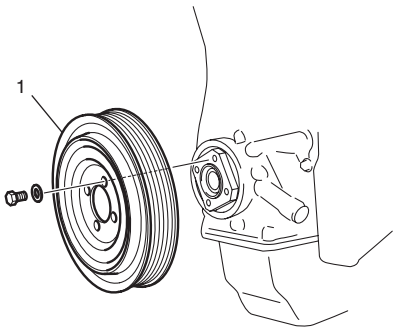
I3RB0A143007-01

6) Remove engine right mounting bracket (1).
7) Remove water pump (2) referring to “Water Pump Removal and Installation: D13A / Z13DTJ in Section 1F”.
8) Remove accessory drive belt tensioner (3) referring to “Accessory Drive Belt Tensioner Removal and Installation: D13A / Z13DTJ in Section 1F”.



I3RB0A143008-01

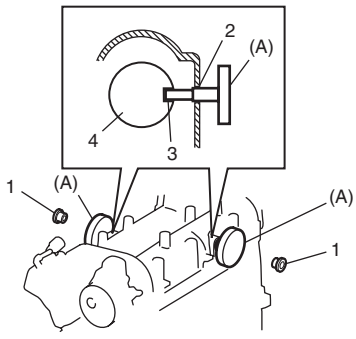
9) Remove crankshaft pulley (1).



I3RB0A143009-01

10) Remove camshaft housing plugs (1).
11) Align camshaft housing plug hole (2) with camshaft gap (3) turning crankshaft clockwise as shown in figure.
12) Lock camshafts (4) inserting special tools (A) to plug holes.

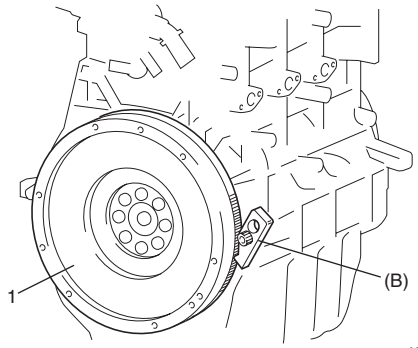
Special tool
(A): 09917–68610



I3RB0A143010-01

13) Lock flywheel (1) using special tool (B).

Special tool
(B): 09916–98610



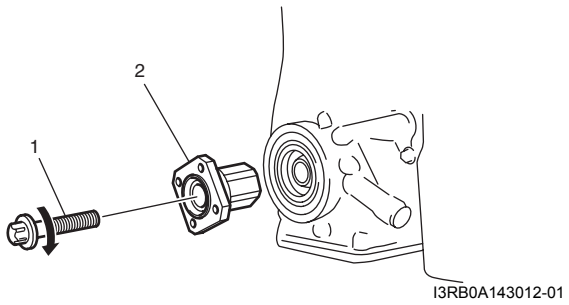
I3RB0A143011-01

14) Remove special tools (A) installed at step 12).

15) Loosen crankshaft pulley flange bolt (1) turning it clockwise, and remove crankshaft pulley flange (2).

NOTE

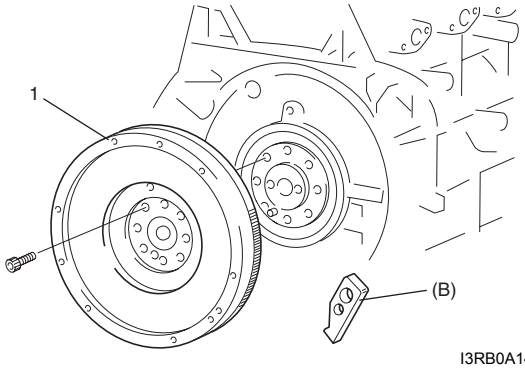
Be sure to turn crankshaft pulley flange bolt clockwise in order to loosen it.



I3RB0A143012-01

16) Reinstall special tools (A) removed at step 14).

17) Remove flywheel (1), and then special tool (B) installed at step 13).



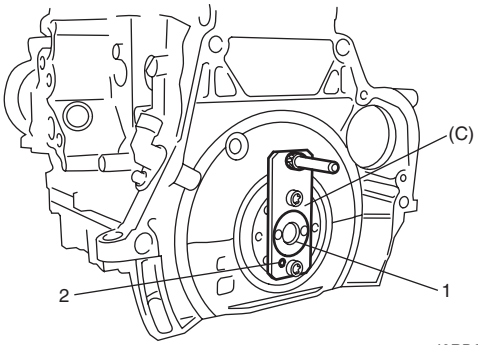
I3RB0A143013-01

18) Lock crankshaft (1) installing special tool (C) as shown in the figure.

NOTE

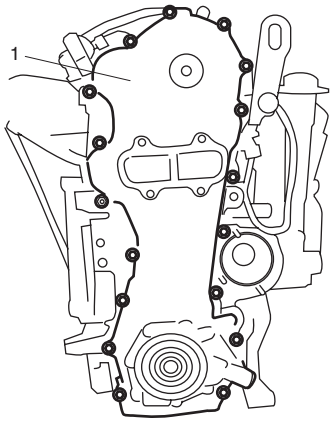
Be sure to align hole (2) of special tool with knock pin securely.

Special tool
(C): 09912–38300



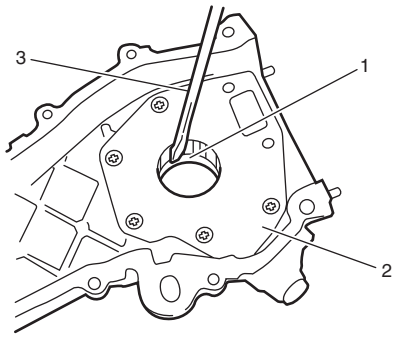
I3RB0A143014-01

19) Remove timing chain cover (1) and its gasket.



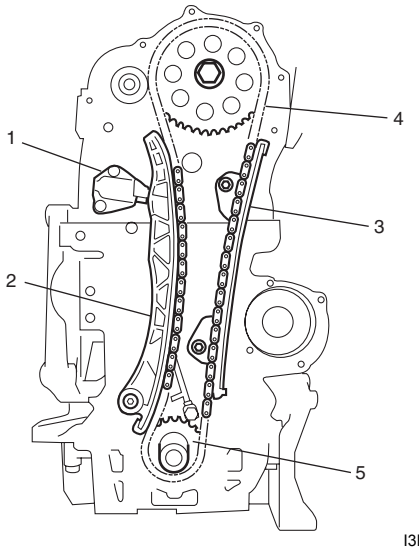
I3RB0A143015-01

20) Remove crankshaft pulley side crankshaft oil seal (1) from timing chain cover (2) using flat head screw driver (3) or the like, if necessary.



I3RB0A143016-01

21) Remove timing chain tensioner adjuster assembly (1).
22) Remove timing chain tensioner (2).
23) Remove timing chain guide (3).
24) Remove timing chain (4) with crankshaft timing sprocket (5).

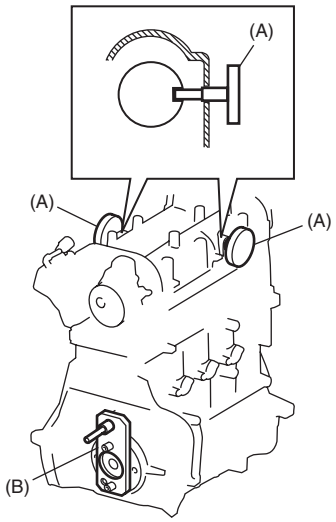


I3RB0A143017-01

Installation

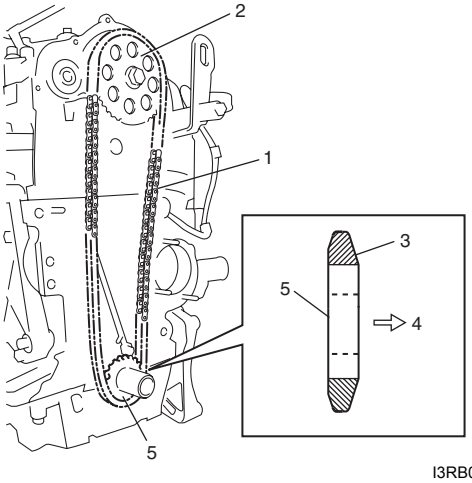
1) Clean mating surface on timing chain cover, cylinder block, cylinder head, camshaft housing and flywheel.
2) Confirm that special tools (A) and (B) are installed. If special tool(s) is removed, install special tool(s) referring to “Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation: D13A / Z13DTJ” or “Pistons, Piston Rings, Connecting Rods and Cylinder Disassembly and Reassembly: D13A / Z13DTJ”.

Special tool
(A): 09917–68610
(B): 09912–38300



I3RB0A143018-01

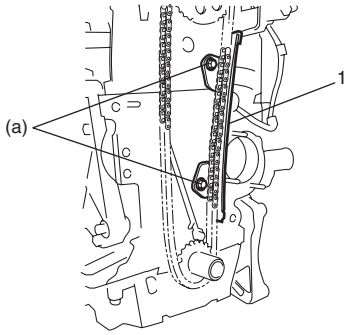
3) Install timing chain (1) to camshaft timing sprocket (2).
4) Install crankshaft timing sprocket (5) to timing chain with its long taper side (3) faced to outside (4) as shown in the figure.



I3RB0A143019-01

5) Insert crankshaft timing sprocket with timing chain to crankshaft.
6) Apply engine oil to sliding surface of timing chain guide (1), and install it.

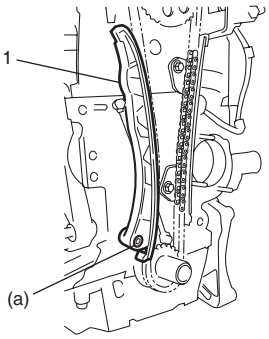
Tightening torque
Chain guide mounting bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I3RB0A143020-01

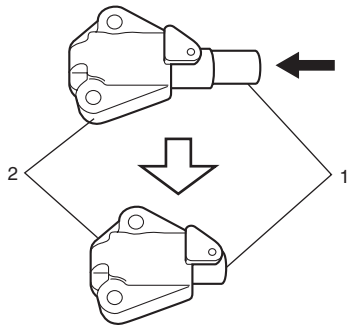
7) Apply engine oil to sliding surface of timing chain tensioner (1), and install it.

Tightening torque
Chain tensioner mounting bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I3RB0A143021-01

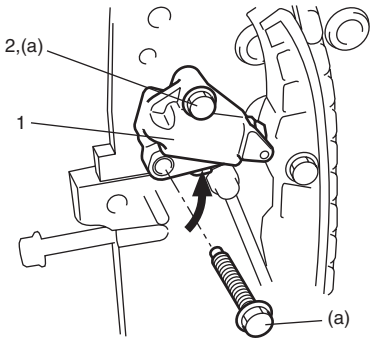
8) Push plunger (1) in timing chain tensioner adjuster body (2) till plunger is held in place as shown in figure.



I3RB0A143022-01

9) Install timing chain tensioner adjuster (1) as follows.
   a) Tighten upper chain tensioner adjuster mounting bolt (2) by hand.
   b) Push tensioner adjuster assembly in arrow direction as shown in figure, and then tighten tensioner adjuster bolts to specified torque.

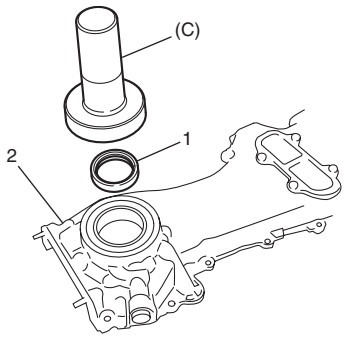
Tightening torque
Chain tensioner adjuster bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I3RB0A143025-01

10) Apply engine oil to timing chain.
11) Install new crankshaft pulley side crankshaft oil seal (1) to timing chain cover (2) using special tool (C) as shown in figure, if removed.

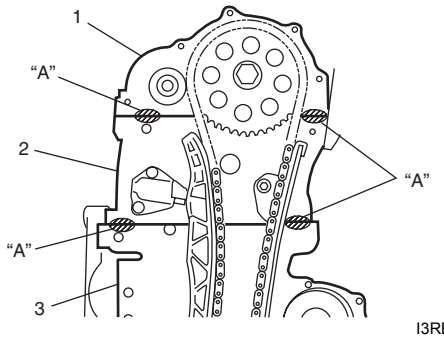
Special tool
(C): 09913–75510



I3RB0A143023-01

12) Apply sealant to camshaft housing / cylinder head / cylinder block as shown in figure.

"A": Sealant 99000–85E11 (Three Bond TB 1227®)



I3RB0A143024-01

1. Camshaft housing	3. Cylinder block
2. Cylinder head	

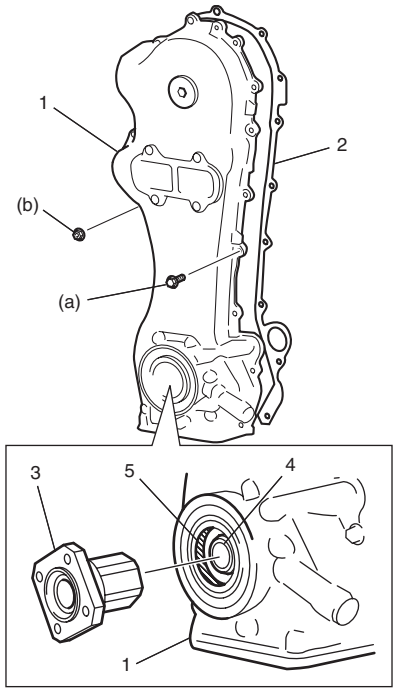
13) Install timing chain cover (1) as follows.
   a) Fit timing chain cover and new gasket (2).
   b) Install crankshaft pulley flange (3).

NOTE

When inserting crankshaft pulley flange, be careful not to damage to oil seal (5) installed in timing chain cover.

   c) Tighten timing chain cover bolts and nuts to specified torque.

Tightening torque
Timing chain cover bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)
Timing chain cover nut (b): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I3RB0A143026-01

14) Install knock pin (1) to crankshaft (2), if removed.

NOTE

Be sure to install knock pin to ϕ 6.75 mm (0.266 in.) hole of crankshaft.

15) Remove special tool (B) confirmed at step 2).

16) Install flywheel (3) as follows.

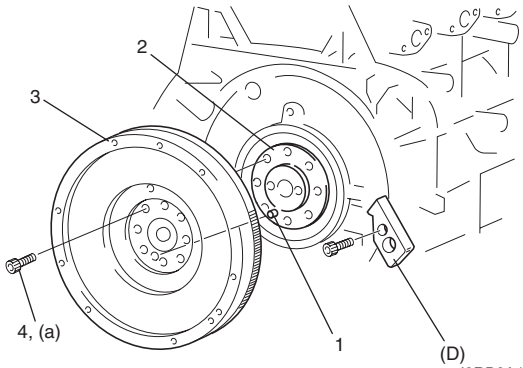
a) Tighten new flywheel bolts (4) by hand.

b) Lock flywheel using special tool (D).

Special tool
(D): 09916–98610

c) Tighten flywheel bolts to specified torque.

Tightening torque
Flywheel bolts (a): 44 N·m (4.5 kgf-m, 32.5 lbf-ft)

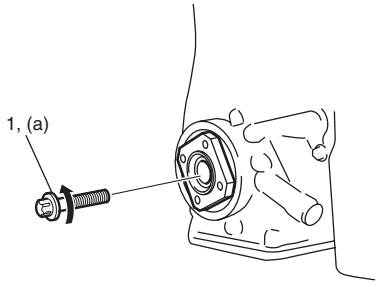


I3RB0A143027-01

17) Remove special tools (A) confirmed at step 2).

18) Tighten crankshaft pulley flange bolt (1) turning it counterclockwise.

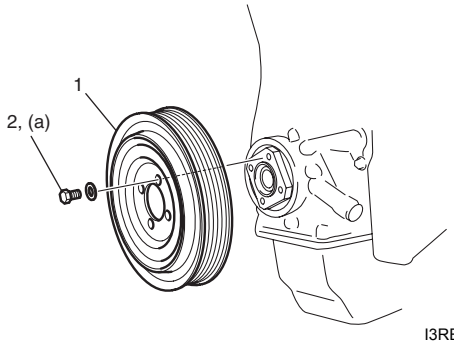
Tightening torque
Crankshaft pulley flange bolt (a): 230 N·m (23.5 kgf-m, 170.0 lbf-ft)



I3RB0A143028-01

19) Install crankshaft pulley (1), and tighten crankshaft pulley bolts (2) to specified torque.

Tightening torque
Crankshaft pulley bolt (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



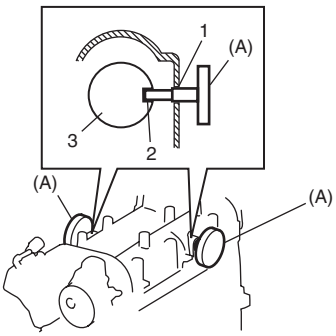
I3RB0A143032-01

20) Remove special tool (D) installed at step 16).

21) Turn crankshaft clockwise two revolutions.

22) Lock camshafts (3) inserting special tools (A) to camshaft housing plug holes after aligning camshaft housing plug hole(1) with camshaft gap (2) as shown in figure.

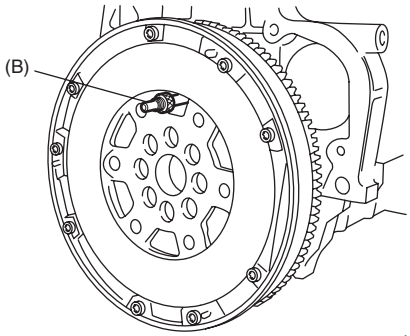
Special tool
(A): 09917–68610



I3RB0A143029-01

23) Check that special tool (B) can be inserted in holes of flywheel and cylinder block smoothly.
If not, remove timing chain and flywheel and repeat step 2) to 22).

Special tool
(B): 09912–38300

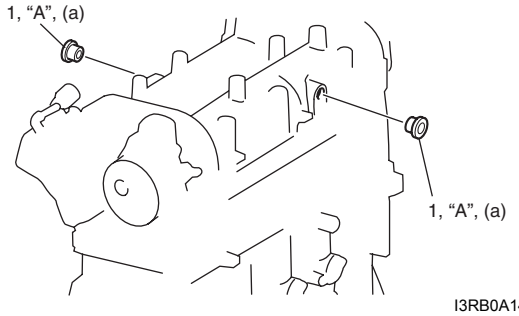


I3RB0A143030-01

24) Remove special tools (A) installed at step 22) and (B) installed at step 23).
25) Apply thread lock compound to thread part of camshaft housing plugs (1), and install them.

"A": Thread lock cement (Loctite omnifit 100M spezial®)

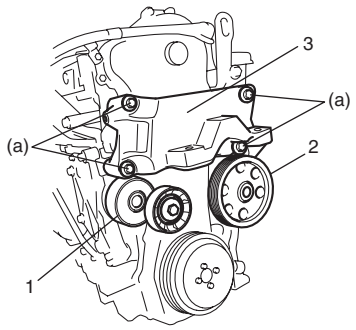
Tightening torque
Camshaft housing plug (a): 15 N·m (1.5 kgf-m, 11.0 lbf-ft)



I3RB0A143031-03

26) Install accessory drive belt tensioner (1) referring to "Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F".
27) Install water pump (2) referring to "Water Pump Removal and Installation: D13A / Z13DTJ in Section 1F".
28) Install engine right mounting bracket (3).

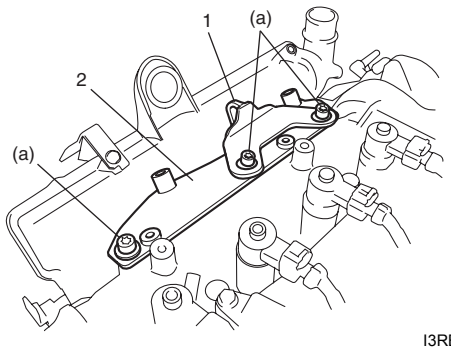
Tightening torque
Engine right mounting bracket No.2 bolt (a): 60 N·m (6.1 kgf-m, 44.5 lbf-ft)



I3RB0A143033-01

29) Install oil pan referring to "Oil Pan Removal and Installation: D13A / Z13DTJ in Section 1E".
30) Install common rail bracket (2) and engine hook (1) to camshaft housing.

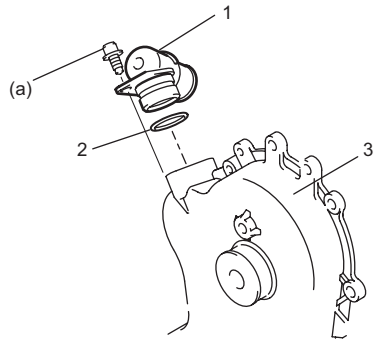
Tightening torque
Common rail bracket bolt (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)



I3RB0A143034-01

31) Install common rail referring to "Common Rail Removal and Installation: D13A / Z13DTJ in Section 1G".
32) Install ventilation connector (1), with new O-ring (2) to timing chain cover (3).

Tightening torque
Ventilation connector bolt (a): 8.3 N·m (0.85 kgf-m, 6.5 lbf-ft)



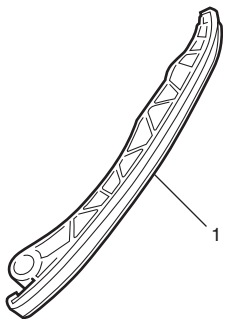
I7V20A142037-01

33) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: D13A / Z13DTJ".

Timing Chain Cover and Timing Chain Inspection

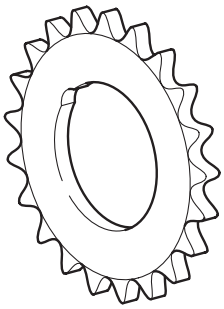
S7N20A1426015

Timing Chain Tensioner
Check shoe (1) for wear or damage.
If any malcondition is found, replace timing chain tensioner.



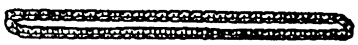
I3RB0A143036-01

Crankshaft Timing Sprocket
Check teeth of sprocket for wear or damage.
If any malcondition is found, replace crankshaft timing sprocket.



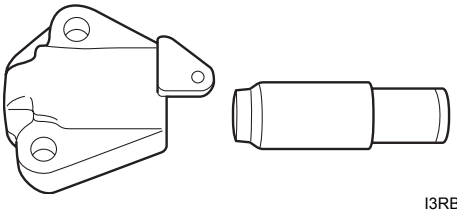
I3RB0A143037-01

Timing Chain
Check timing chain for wear or damage.
If any malcondition is found, replace timing chain.



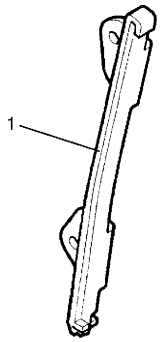
I3RB0A143038-01

Timing Chain Tensioner Adjuster
Check that sliding surfaces are free from damage.
If any malcondition is found, replace timing chain tensioner adjuster.



I3RB0A143039-01

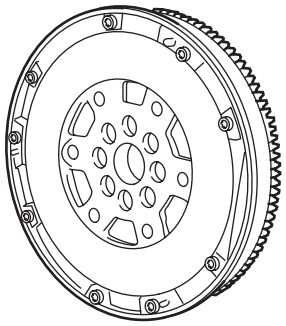
Timing Chain Guide
Check shoe (1) for wear or damage.
If any malcondition is found, replace timing chain guide.



I3RB0A143040-01

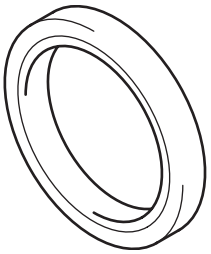
Flywheel

- Check sensor teeth for being missing damaged or deformed.
  If malcondition is found, replace flywheel.
- Check gear for crack or wear.
  If malcondition is found, replace flywheel.
- Check surface for damage or excessively wear.
  If malcondition is found, replace flywheel.



I3RB0A143041-01

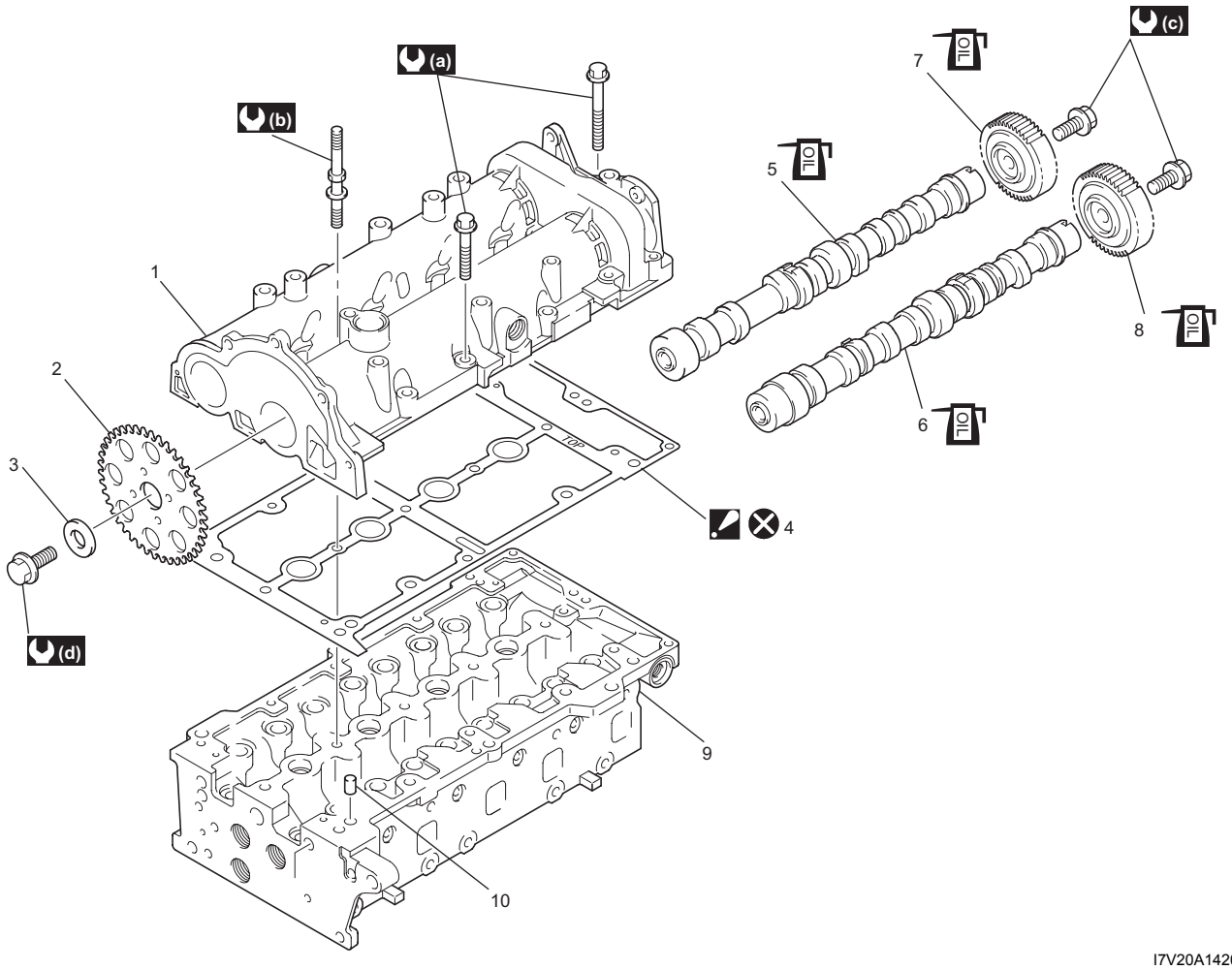
Crankshaft Pulley Side Crankshaft Oil Seal
Check oil seal lip for fault or damage.
Replace as necessary.



I3RB0A143042-01

Camshaft Housing Components

S7N20A1426016



I7V20A142038-02

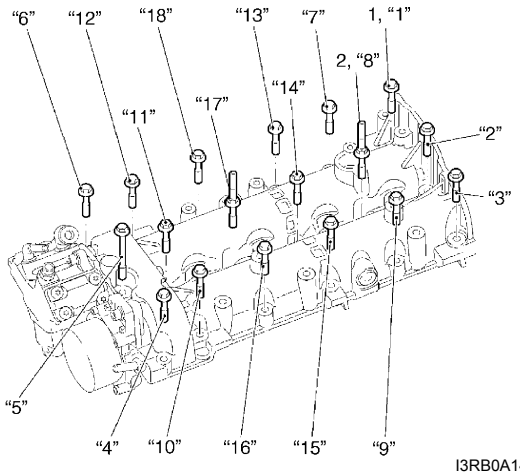
1. Camshaft housing	6. Exhaust manifold side camshaft : Apply engine oil to sliding surface.	(a) : 18 N·m (1.8 kgf-m, 13.5 lbf-ft)
2. Camshaft timing sprocket	7. Intake manifold side camshaft gear : Apply engine oil to gear.	(b) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
3. Washer	8. Exhaust manifold side camshaft gear : Apply engine oil to gear.	(c) : 120 N·m (12.2 kgf-m, 88.5 lbf-ft)
4. Camshaft housing gasket : “TOP” mark provided on gasket comes to facing up.	9. Cylinder head	(d) : 150 N·m (15.3 kgf-m, 111.0 lbf-ft)
5. Intake manifold side camshaft : Apply engine oil to sliding surface.	10. Knock pin	: Do not reuse.

Camshaft Housing Assembly Removal and Installation

S7N20A1426017

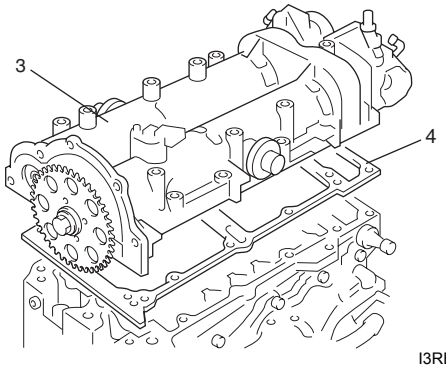
Removal

1) Remove engine assembly from engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.
2) Remove timing chain referring to “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ”.
3) Remove fuel injector referring to “Fuel Injector Removal and Installation: D13A / Z13DTJ in Section 1G”.
4) Loosen camshaft housing bolt (1) and camshaft housing stud bolt (2) in numerical order as shown in figure, a little at a time, and remove them.



I3RB0A143044-01

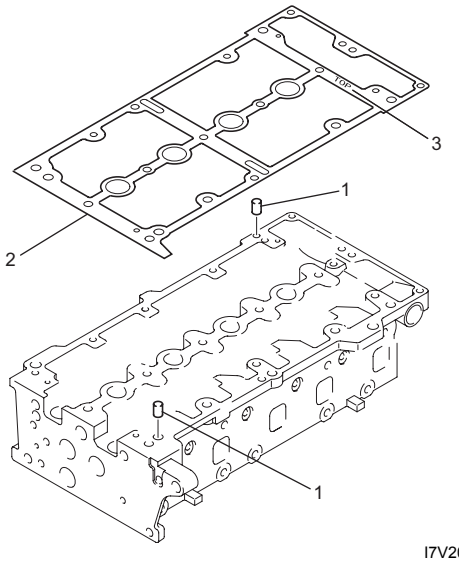
5) Remove camshaft housing assembly (3) and camshaft housing gasket (4).



I3RB0A143045-01

Installation

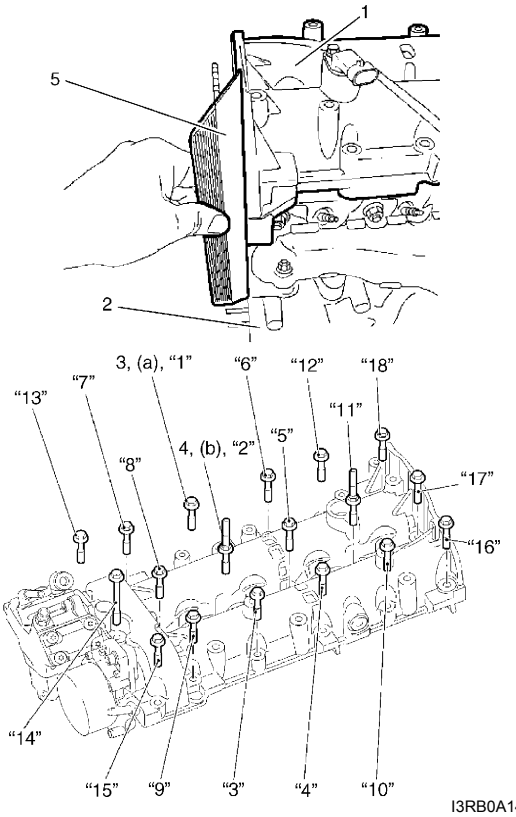
1) Clean mating surface of camshaft housing and cylinder head.
2) Install knock pins (1) to cylinder head, if removed.
3) Install new camshaft housing gasket (2) to cylinder head. “TOP” mark (3) provided on gasket comes to facing up.



I7V20A142039-01

4) Install camshaft housing assembly (1) to cylinder head (2) as follows.
   a) Install camshaft housing assembly, and tighten camshaft housing bolt (3) and camshaft housing stud bolt (4) by hand.
   b) Align end faces of camshaft housing assembly (1) and cylinder head (2) using straightedge (5).
   c) Tighten camshaft housing bolt (3) and camshaft housing stud bolt (4) to specified torque according to numerical order as shown in the figure.

Tightening torque
Camshaft housing bolt (a): 18 N·m (1.8 kgf-m, 13.5 lbf-ft)
Camshaft housing stud bolt (b): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)

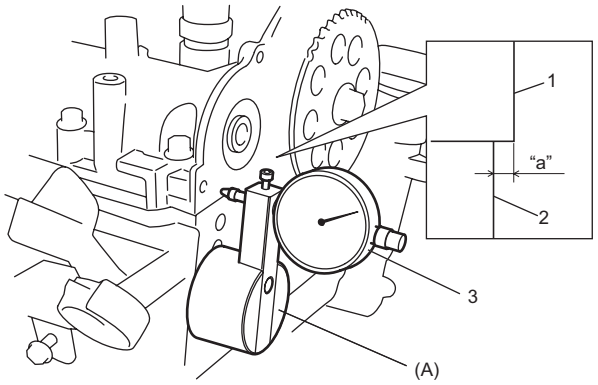


I3RB0A143047-01

5) Measure bump "a" between camshaft housing (1) and cylinder head (2) (flatness) using dial gauge (3) and special tool (A) as shown in figure.
If it is out of specification, reinstall camshaft housing.

Special tool
(A): 09910–26550

Bump between camshaft housing and cylinder head (flatness)
"a": –0.1 to 0.1 mm (–0.0039 to 0.0039 in.)



I7V20A142040-01

6) Install fuel injector referring to "Fuel Injector Removal and Installation: D13A / Z13DTJ in Section 1G".
7) Install timing chain and timing chain cover referring to "Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ".
8) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: D13A / Z13DTJ".

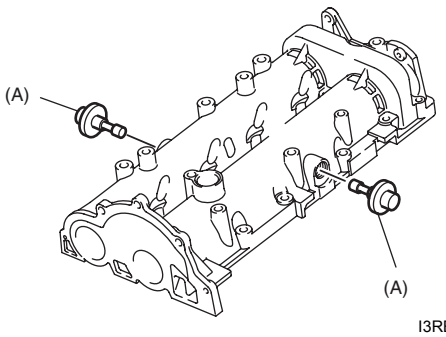
Camshaft Housing Assembly Disassembly and Reassembly

S7N20A1426018

Disassembly

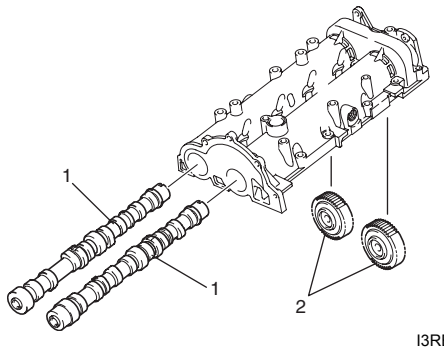
1) Remove camshaft housing assembly referring to "Camshaft Housing Assembly Removal and Installation: D13A / Z13DTJ".
2) Remove vacuum pump referring to "Vacuum Pump Removal and Installation: D13A / Z13DTJ".
3) Remove injection pump referring to "High Pressure Pump Removal and Installation: D13A / Z13DTJ in Section 1G".
4) Remove CMP sensor referring to "Camshaft Position (CMP) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C".
5) Remove special tools from camshaft housing.

Special tool
(A): 09917–68610



I3RB0A143049-01

6) Remove camshafts (1), camshaft timing sprocket and camshaft gears (2) from camshaft housing as follows.



I3RB0A143050-01

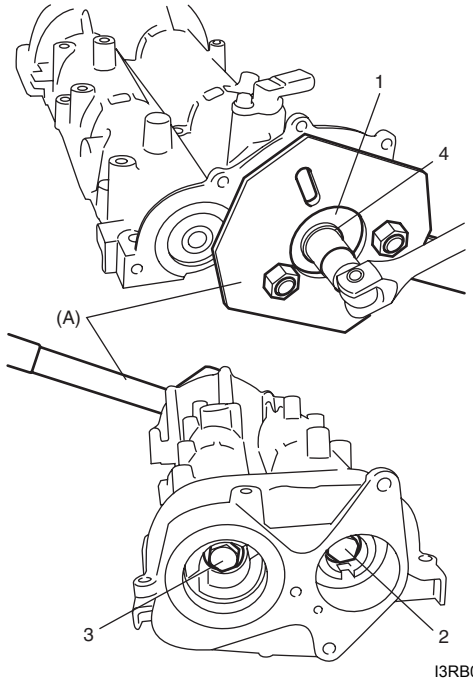
a) Lock camshaft timing sprocket (1) using special tool.

Special tool
(A): 09917–68221

b) Loosen camshaft gear bolt (2) of intake manifold side.

c) Loosen camshaft gear bolt (3) of exhaust manifold side.

d) Loosen camshaft timing sprocket bolt (4), and remove camshaft timing sprocket (1).



I3RB0A143051-01

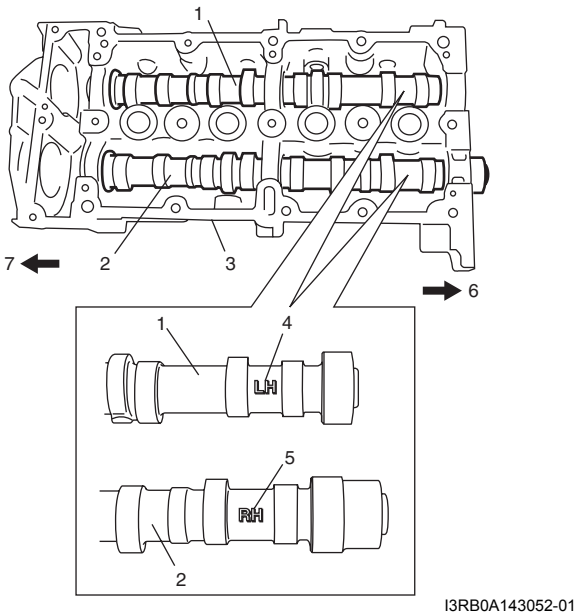
e) Remove camshafts and camshaft gears.

Reassembly

1) Apply engine oil to sliding surface of each camshaft and camshaft housing, and then install intake manifold side camshaft (1) and exhaust manifold side camshaft (2) to camshaft housing (3).

NOTE

Be sure to identify intake manifold side and exhaust manifold side camshafts by marks shown in the figure.

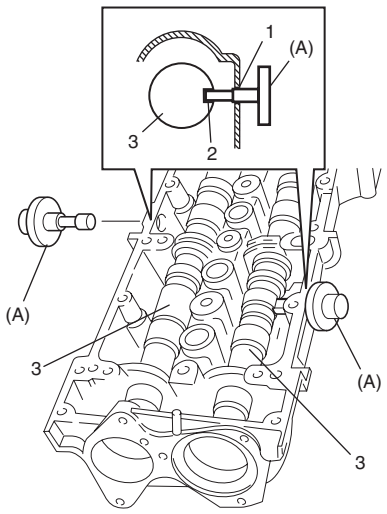


I3RB0A143052-01

4. “LH” mark	6. Crankshaft pulley side
5. “RH” mark	7. Flywheel side

2) Install special tools (A) as follows.
   a) Align camshaft housing plug hole (1) with camshaft gap (2) turning intake manifold side and exhaust manifold side camshafts as shown in figure.
   b) Lock camshafts (3) inserting special tools (A) to plug holes.

Special tool
(A): 09917–68610

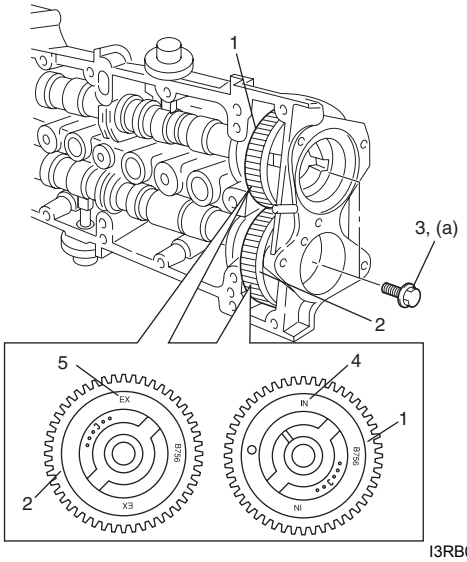


I3RB0A143053-01

3) Install intake manifold side camshaft gear (1) and exhaust manifold side camshaft gear (2) to camshaft housing, and tighten camshaft gear bolts (3) by hand.

NOTE

Be sure to identify intake and exhaust side camshaft gears by punched marks shown in figure.



I3RB0A143054-01

4. "IN" mark	5. "EX" mark

4) Tighten camshaft timing sprocket bolt and camshaft gear bolts as follows.
   a) Lock camshaft timing sprocket (1) using special tool.

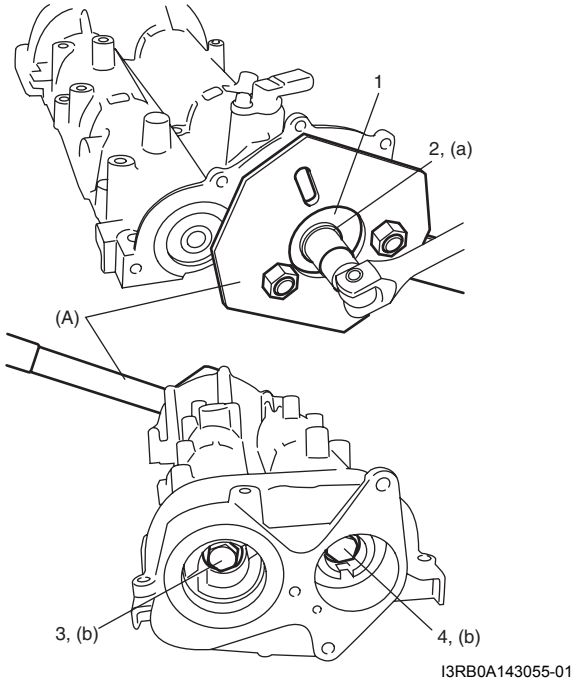
Special tool
(A): 09917–68221

   b) Install camshaft timing sprocket (1), and tighten camshaft timing sprocket bolt (2) to specified torque.

Tightening torque
Camshaft timing sprocket bolt (a): 150 N·m (15.3 kgf-m, 111 lbf-ft)

   c) Tighten exhaust manifold side camshaft gear bolt (3) then intake manifold side camshaft gear bolt (4) to specified torque.

Tightening torque
Camshaft gear bolt (b): 120 N·m (12.2 kgf-m, 88.5 lbf-ft)



I3RB0A143055-01

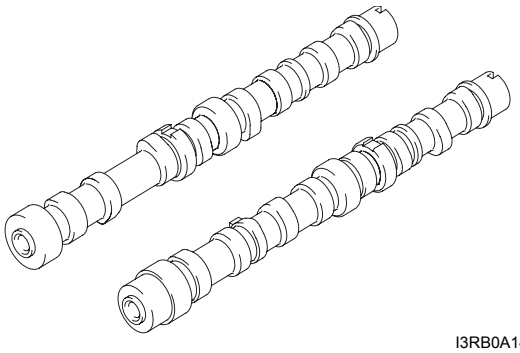
5) Install CMP sensor referring to “Camshaft Position (CMP) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C”.
6) Install high pressure pump referring to “High Pressure Pump Removal and Installation: D13A / Z13DTJ in Section 1G”.
7) Install vacuum pump referring to “Vacuum Pump Removal and Installation: D13A / Z13DTJ”.
8) Install camshaft housing assembly referring to “Camshaft Housing Assembly Removal and Installation: D13A / Z13DTJ”.
9) Install timing chain and timing chain cover referring to “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ”.
10) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.

Camshaft Inspection

S7N20A1426019

Camshaft

- Check journals and cam faces for wear or damage.
  If any malcondition is found, replace camshaft.
- Check CMP sensor pickup for being missing, damaged or deformed.
  If any malcondition is found, replace camshaft.

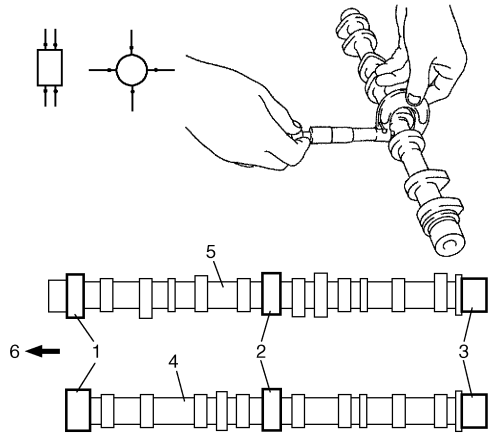


I3RB0A143056-01

Camshaft Journal

Check camshaft journal outside diameter using micrometer.
If measured diameter is out of specification, replace camshaft.

Camshaft journal outside diameter
No.1: 38.500 – 38.515 mm (1.5158 – 1.5163 in.)
No.2: 38.000 – 38.015 mm (1.4961 – 1.4966 in.)
No.3: 30.000 – 30.015 mm (1.1812 – 1.1816 in.)

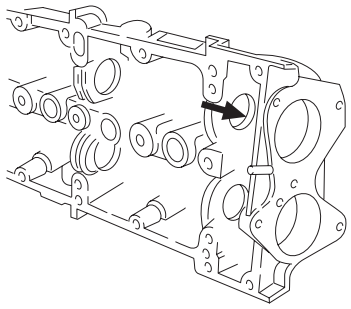


I3RB0A143127-02

1. Camshaft journal No.1	4. Intake manifold side camshaft
2. Camshaft journal No.2	5. Exhaust manifold side camshaft
3. Camshaft journal No.3	6. Crankshaft pulley side

Camshaft Housing

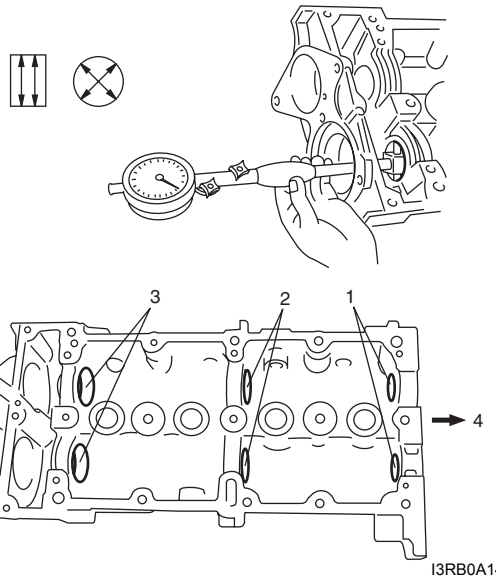
- Check camshaft journals and camshaft housings for pitting, scratch, wear or damage.
  If any malcondition is found, replace camshaft housing.



I3RB0A143058-01

- Check camshaft journal bore diameter using bore gauge.
  If measured diameter is out of specification, replace camshaft housing.

  Camshaft journal bore diameter
  No.1: 38.545 – 38.570 mm (1.5176 – 1.5185 in.)
  No.2: 38.045 – 38.070 mm (1.4979 – 1.4988 in.)
  No.3: 30.045 – 30.070 mm (1.1829 – 1.1838 in.)

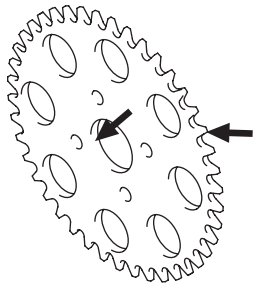


I3RB0A143059-01

1. Camshaft journal bore No.1	3. Camshaft journal bore No.3
2. Camshaft journal bore No.2	4. Crankshaft pulley side

Camshaft Timing Sprocket

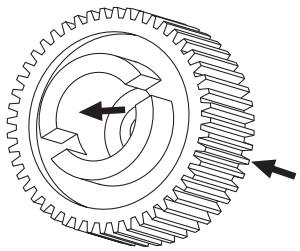
Check camshaft timing sprocket for pitting, scratch or damage.
If any malcondition is found, replace camshaft timing sprocket.



I3RB0A143060-01

Intake Manifold Side Camshaft Gear and Exhaust Manifold Side Camshaft Gear

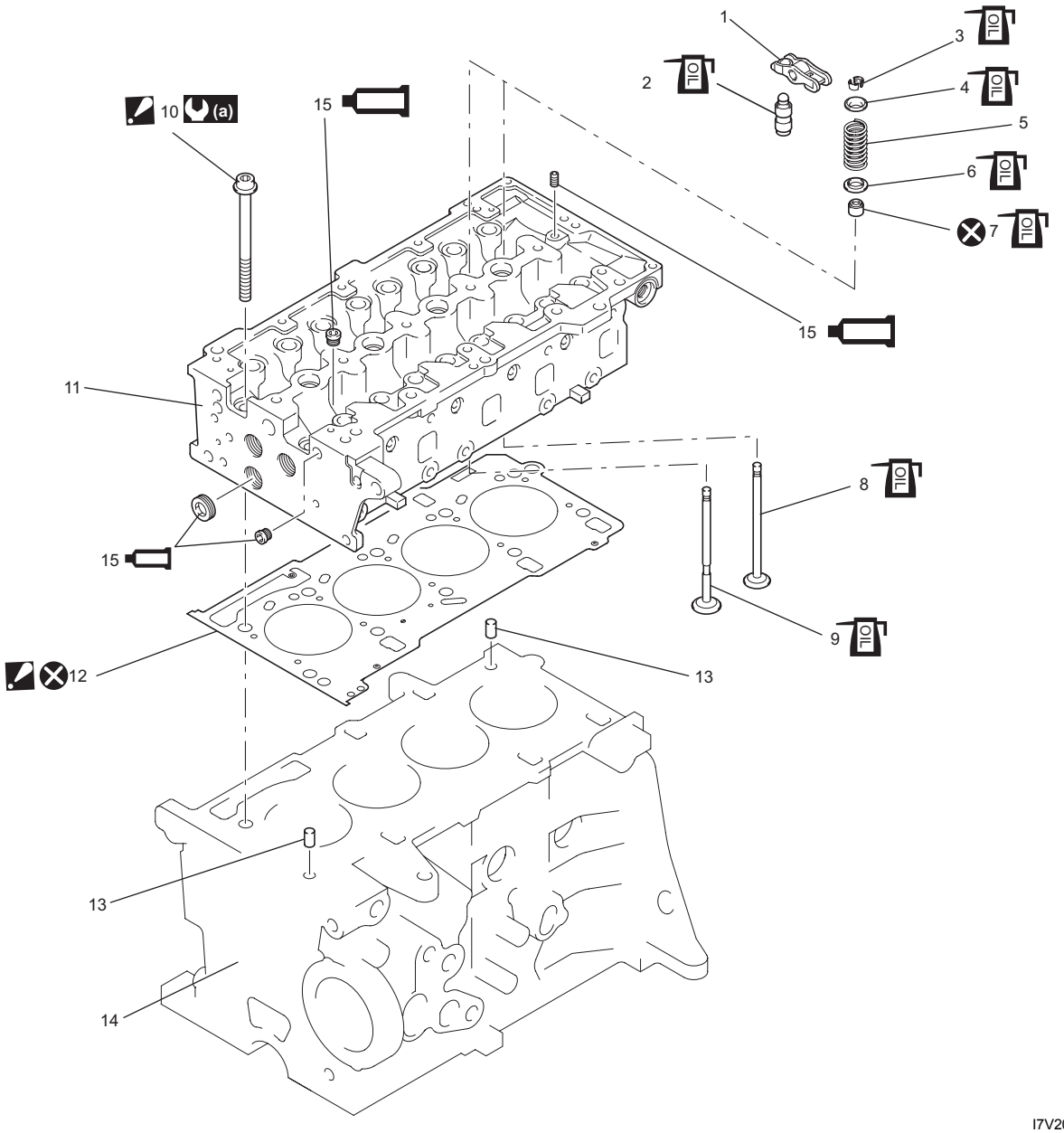
Check intake manifold side and exhaust manifold side camshaft gears for pitting, scratch or damage.
If any malcondition is found, replace intake manifold side and/or exhaust manifold side camshaft gear.



I3RB0A143061-01

Valve and Cylinder Head Components

S7N20A1426020



I7V20A142041-04

1. Valve rocker arm	7. Valve stem seal	13. Knock pin
2. Hydraulic valve lash adjuster	8. Intake valve	14. Cylinder block
3. Valve cotter	9. Exhaust valve	15. Plug : Apply sealant 99000-85E00 to all around thread part.
4. Valve spring retainer	10. Cylinder head bolt	(a) : 40 N·m → +90° → +90° (4.1 kgf-m → +90° → +90°, 29.5 lbf-ft → +90°→ +90°)
5. Valve spring	11. Cylinder head	: Do not reuse.
6. Valve spring seat	12. Cylinder head gasket : "TOP" mark provided on gasket comes to crankshaft pulley side, facing up.	: Apply engine oil to sliding surface.

Valve and Cylinder Head Assembly Removal and Installation

S7N20A1426021

⚠ CAUTION

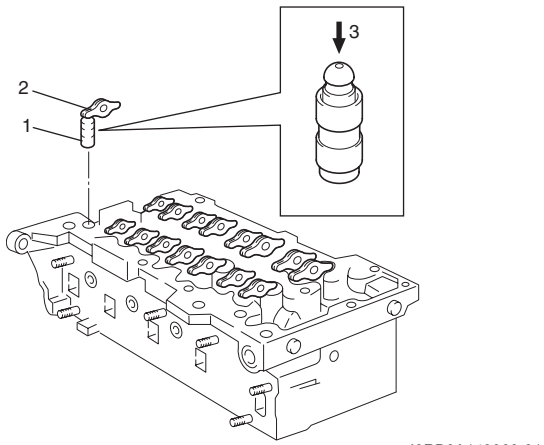
Note original position in which each valve rocker arms and hydraulic valve lash adjuster were installed, and then install them to original position.
If each valve rocker arm or hydraulic valve lash adjuster is not installed to original position, engine will spoil its original performance.

Removal

1) Remove engine assembly from engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.
2) Remove camshaft housing assembly referring to “Camshaft Housing Assembly Removal and Installation: D13A / Z13DTJ”.
3) Remove exhaust manifold to “Exhaust Manifold Removal and Installation: D13A / Z13DTJ in Section 1K”.
4) Remove thermostat assembly referring to “Thermostat Assembly Removal and Installation: D13A / Z13DTJ in Section 1F”.
5) Remove oil separator referring to “Oil Separator and Crankcase Ventilation Cover Removal and Installation: D13A / Z13DTJ”.
6) Remove intake manifold referring to “Intake Manifold Removal and Installation: D13A / Z13DTJ”.
7) Remove oil pressure switch referring to “Oil Pressure Switch Removal and Installation: D13A / Z13DTJ in Section 1E”.
8) Remove glow plugs referring to “Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C”.
9) Remove hydraulic valve lash adjuster (1) with valve rocker arm (2).

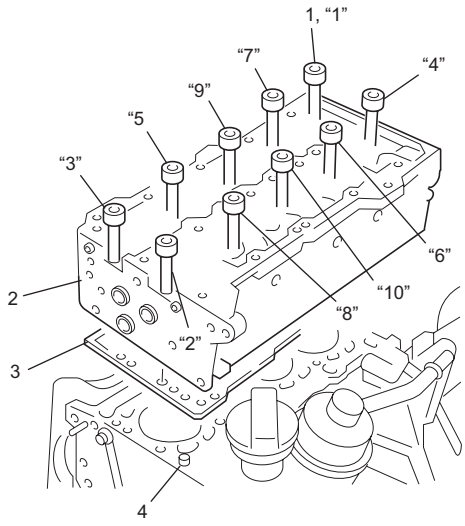
NOTE

- **Never disassemble hydraulic valve lash adjuster.**
- **Don’t apply force (3) to body of hydraulic valve lash adjuster. It will leak oil in high pressure chamber.**
- **Immerse removed hydraulic valve lash adjuster in clean engine oil and keep it there till reinstalling it so as to prevent oil leakage.**



I3RB0A143063-01

10) Loosen cylinder head bolts (1) according to numerical order as shown in figure a little at a time, and remove them.
11) Remove cylinder head (2) and cylinder head gasket (3).
12) Remove knock pins (4), if necessary.

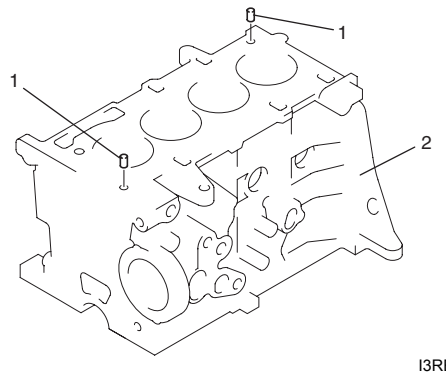


I7V20A142042-01

13) Check all around cylinder head for any other parts required to be removed or disconnected.

Installation

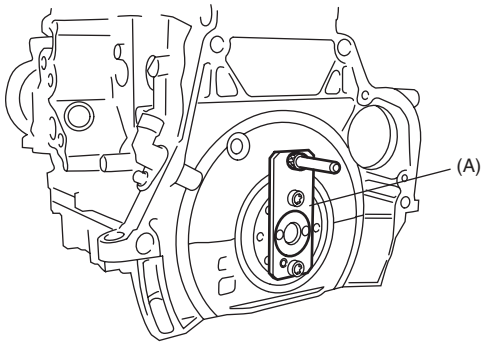
1) Clean mating surface of cylinder head and cylinder block.
2) Install knock pins (1) to cylinder block (2), if removed.



I3RB0A143065-01

3) Select and install new cylinder head gasket as follows.
   a) Remove special tool (A).

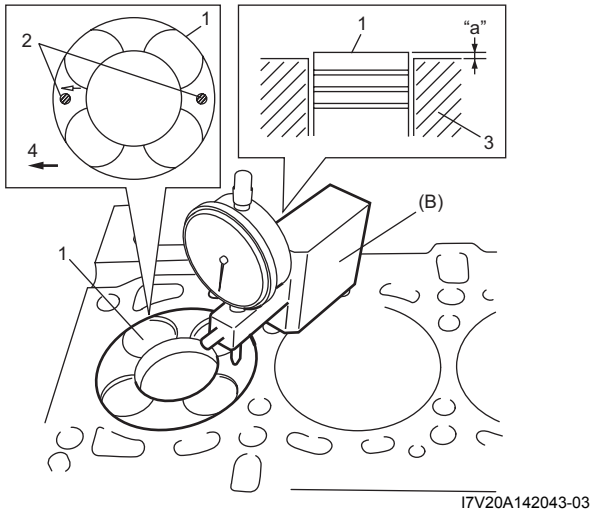
      Special tool
      (A): 09912–38300



I3RB0A143066-01

   b) Using special tool and dial gauge, measure piston protrusion “a” at specified measurement positions (2) of TDC position as shown in figure. Repeat this procedure in all pistons (1).

      Special tool
      (B): 09910–26550



I7V20A142043-03

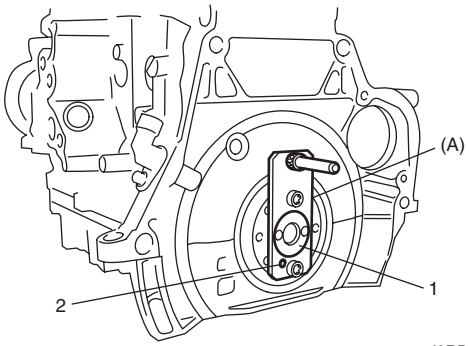
3. Cylinder block	4. Crankshaft pulley side

   c) Lock crankshaft (1) using special tool.

NOTE

Be sure to align hole (2) of special tool with knock pin securely.

      Special tool
      (A): 09912–38300



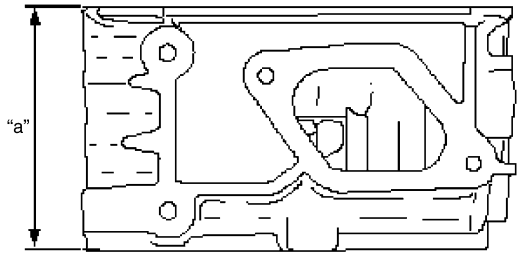
I3RB0A143068-01

   d) Select cylinder head gasket according to maximum value of protrusion “a” measured at step b).

	Gasket thickness	Piston protrusion
Type A	0.67 – 0.77 mm (0.0264 – 0.0303 in.)	0.028 – 0.127 mm (0.00111 – 0.00500 in)
Type B	0.77 – 0.87 mm (0.0304 – 0.0342 in.)	0.128 – 0.227 mm (0.00503 – 0.00893 in.)
Type C	0.87 – 0.97 mm (0.0343 – 0.0381 in.)	0.228 – 0.327 mm (0.00898 – 0.0128 in.)

e) Measure cylinder head height.
When cylinder head height is specified value or less, cylinder head had been ground.
If cylinder head had been ground, change cylinder head gasket selected at step d) according to the following table or replace cylinder head.

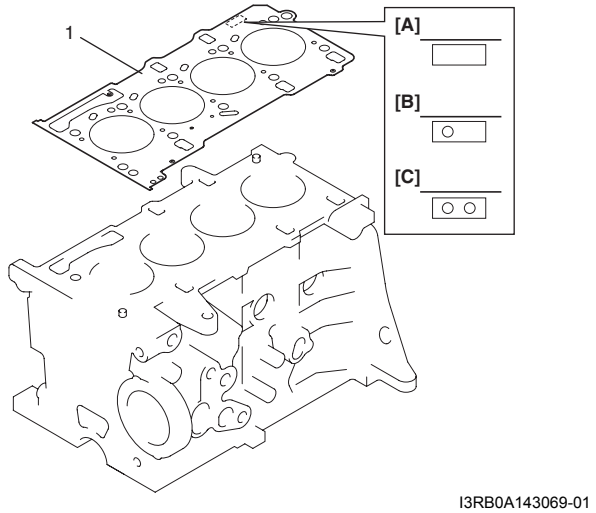
Cylinder head height "a"
Standard: 105.45 – 105.55 mm (4.152 – 4.155 in.)



I5RS0B140025-02

Cylinder head height	Selected cylinder head gasket by step d)	Installed cylinder head gasket
105.35 – 105.45 mm (4.147 – 4.151 in.)	Type A	Type B
	Type B	Type C
	Type C	Replace cylinder head
105.25 – 105.35 mm (4.143 – 4.147 in.)	Type A	Type C
	Type B	Replace cylinder head
	Type C	Replace cylinder head
105.25 mm (4.143 in.) or less	Replace cylinder head	

f) Install new cylinder head gasket (1) to cylinder block.

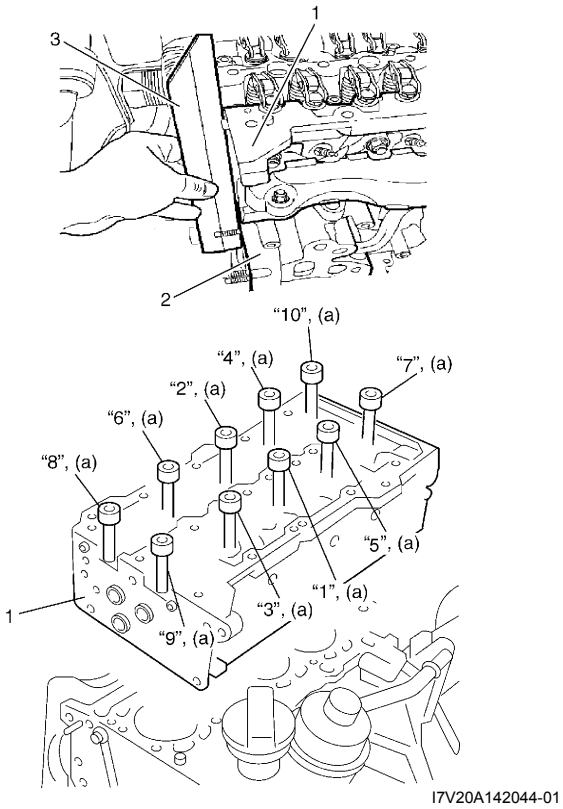


I3RB0A143069-01

[A]: Type A (without hole)	[C]: Type C (with two holes)
[B]: Type B (with one hole)	

4) Install cylinder head (1) to cylinder block (2) as follows.
a) Install cylinder head, and tighten new cylinder head bolts by hand.
b) Be flush with end faces of cylinder head (1) and cylinder block (2) using straightedge (3).
c) Tighten all bolts to 40 N·m (4.0 kgf-m, 29.0 lbf-ft) according to numerical order in the figure.
d) Retighten all bolts 90° according to numerical order as shown in figure.
e) Repeat Step d).

Tightening torque
Cylinder head bolt (a)*: 40 N·m → +90° → 90° (41 kgf-m, → +90° → +90°, 29.5 lbf-ft → +90° → +90°).

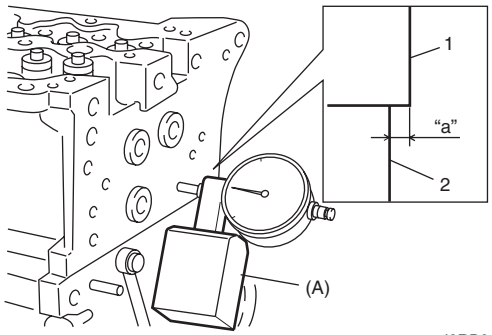


I7V20A142044-01

5) Measure bump “a” between cylinder head (1) and cylinder block (2) (flatness) using dial gauge and special tool as shown in figure.
If measured notch is out of specification, remove cylinder head and return to step 4).

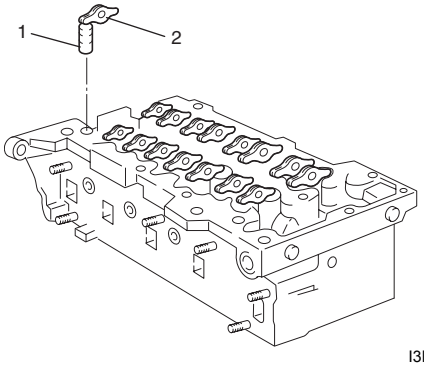
Special tool
(A): 09910–26550

Notch between cylinder head and cylinder block (flatness)
“a”: –0.1 to 0.1 mm (–0.0039 to 0.0039 in.)



I3RB0A143071-01

6) Apply engine oil around hydraulic valve lash adjuster (1) and valve rocker arm (2), and install them to cylinder head.



I3RB0A143072-01

7) Install glow plugs referring to “Glow Plug Removal and Installation: D13A / Z13DTJ in Section 1C”.
8) Install oil pressure switch referring to “Oil Pressure Switch Removal and Installation: D13A / Z13DTJ in Section 1E”.
9) Install intake manifold referring to “Intake Manifold Removal and Installation: D13A / Z13DTJ”.
10) Install oil separator referring to “Oil Separator and Crankcase Ventilation Cover Removal and Installation: D13A / Z13DTJ”.
11) Install thermostat assembly referring to “Thermostat Assembly Removal and Installation: D13A / Z13DTJ in Section 1F”.
12) Install exhaust manifold to “Exhaust Manifold Removal and Installation: D13A / Z13DTJ in Section 1K”.
13) Install camshaft housing assembly referring to “Camshaft Housing Assembly Removal and Installation: D13A / Z13DTJ”.
14) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.

Valve and Cylinder Head Assembly Disassembly and Reassembly

S7N20A1426022

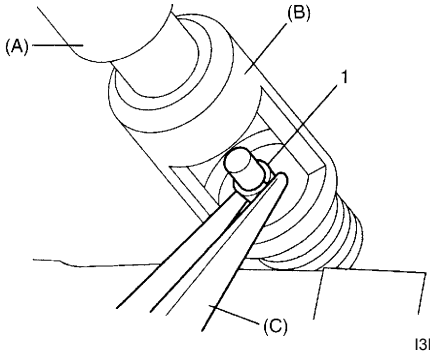
⚠ CAUTION

Note original position in which each valve and valve spring seat were installed, and then install them to original position.
If each valve or valve spring seat is not installed to original position, engine will spoil its original performance.

Disassembly

1) Using special tool (A) and (B), compress valve springs and then remove valve cotters (1) using special tool (C).

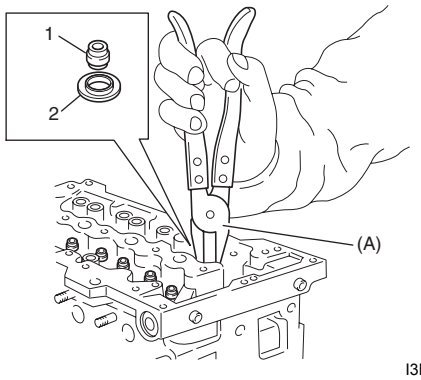
Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511



I3RB0A143073-01

2) Release special tool, and remove valve spring retainer and valve spring.
3) Remove valve from combustion chamber side.
4) Remove valve stem seal (1) from valve guide using special tool, and then remove valve spring seat (2).

Special tool
(A): 09917–98610



I3RB0A143074-01

Reassembly

1) Install valve spring seats to cylinder head.
2) Install new valve stem seal (1) to valve guide.
   After applying engine oil to seal and spindle of special tool (valve guide installer handle), fit stem seal to spindle, and then install seal to valve guide by pushing special tool by hand.
   After installing, check to be sure that seal is properly installed to valve guide.

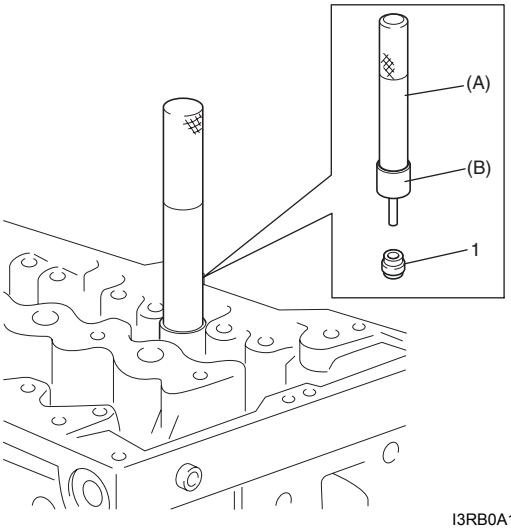
⚠ CAUTION

When installing, never tap or hit special tool with a hammer or the like. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.

NOTE

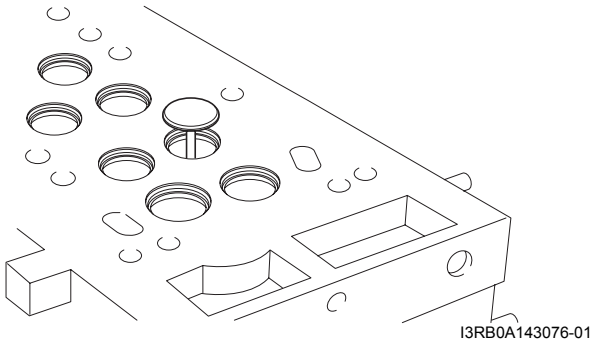
Do not reuse once-disassembled seal. Be sure to install new seal.

Special tool
(A): 09916–58210
(B): 09917–98221



I3RB0A143075-01

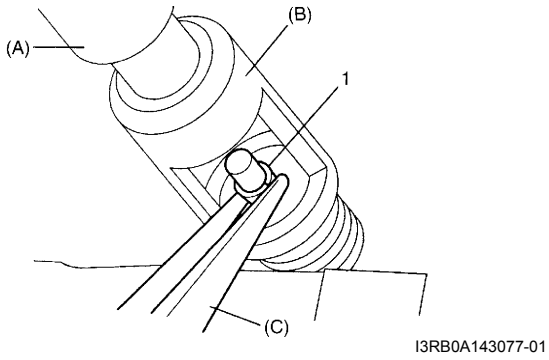
3) Apply engine oil to stem seal, valve guide bore and valve stem, and then install valve to valve guide.
4) Install valve spring and valve spring retainer.



I3RB0A143076-01

5) Using special tool (A) and (B), compress valve spring. And, fit two valve cotters (1) into groove in valve stem using special tool (C).

Special tool
(A): 09916–14510
(B): 09916–14521
(C): 09916–84511



I3RB0A143077-01

Valves and Guides Inspection

S7N20A1426023

Valve Guide

Valve stem-to-guide clearance

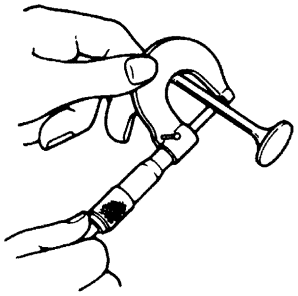
Using a micrometer and bore gauge, measure diameter of valve stems and guides to check stem-to-guide clearance.
Be sure to measure diameter at more than one place along the length of each stem and guide.
If clearance is out of specification, replace valve and/or cylinder head.

Valve stem diameter [A]
In and EX: 5.974 – 5.992 mm (0.2352 – 0.2359 in.)

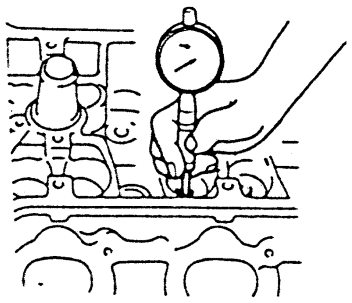
Valve guide bore [B]
In and EX: 6.020 – 6.038 mm (0.2371 – 0.2377 in.)

Stem-to-guide clearance
In and EX: 0.028 – 0.064 mm (0.0012 – 0.0025 in.)

[A]



[B]

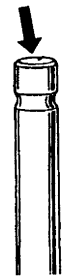


I7V20A142058-01

Valve

Visual inspection

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem end.
  If necessary, replaces it.
- Inspect valve stem end face for pitting and wear.
  If pitting or wear is found, valve stem end may be resurfaced, but not too much to grind off its combustion chamber.
  When it is worn out too much that its chamber is gone, replace valve.



I2RH01140135-01

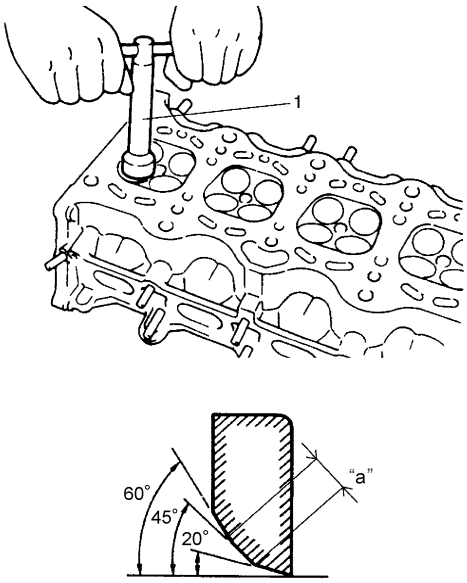
Valve seat repair

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) **Valve seat:**
   Use valve seat cutters (1) to make three cuts as illustrated in figure. Three cutters must be used: the 1st for making 20° angle, the 2nd for making 60° angle, and 3rd for making 45° angle.

   Seat width for valve seat
   "a": 1.35 – 1.62 mm (0.0532 – 0.0637 in.)

2) **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.

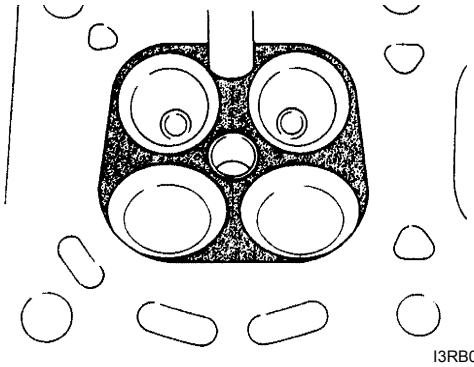


I7V20A142045-01

Cylinder Head Inspection

S7N20A1426044

- Remove all carbon deposits from combustion chambers.



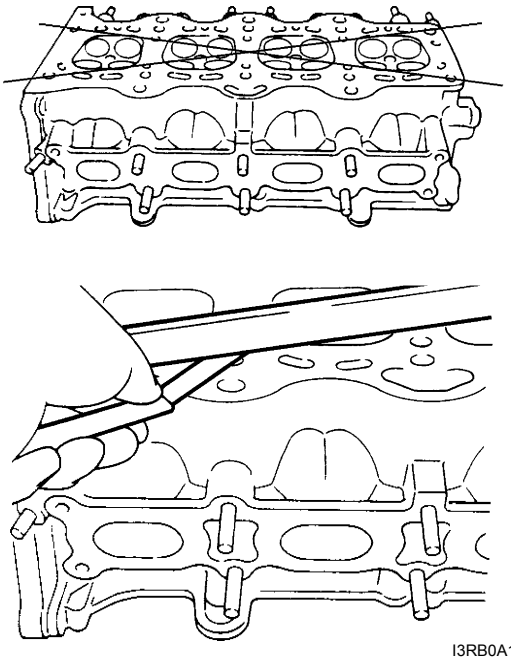
I3RB0A143078-01

NOTE

Do not use any sharp-edged tool to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when decarboning. The same applies to valves and valve seats, too.

- Check cylinder head for cracks on intake and exhaust ports combustion chambers and head surface. Using a straightedge and thickness gauge, check flatness of gasketed surface at a total of 2 locations. If distortion limit, given below, is exceeded, replace cylinder head or regrind cylinder head.

Limit of distortion for surface of cylinder head piston side:
0.10 mm (0.00394 in.)



I3RB0A143079-01

NOTE

When cylinder head had been ground, it is necessary to change gasket referring to Step 3) of "Installation" under "Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ".

Valve Springs Inspection

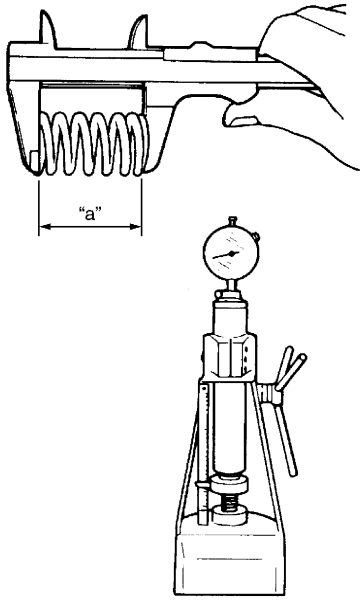
S7N20A1426040

Valve Spring Free Length and Preload

By referring to data given below, check to be sure that each spring is in good condition, 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 (In and Ex) "a":
37.9 mm (1.492 in.)

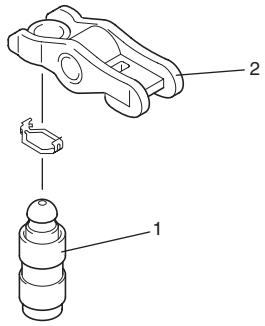
Valve spring preload (In and Ex):
162 – 180 N (16.2 – 18.0 kgf) for 31.0 mm (35.7 – 39.7 lbf/1.220 in.)
361 – 395 N (36.1 – 39.5 kgf) for 23.5 mm (79.6 – 87.1 lbf/0.925 in.)



I3RB0A143080-01

Hydraulic Valve Lash Adjuster and Valve Rocker Arm

Check hydraulic valve lash adjuster (1) and valve rocker arm (2) for pitting, scratches, wear or damage.
If any malcondition is found, replace them.



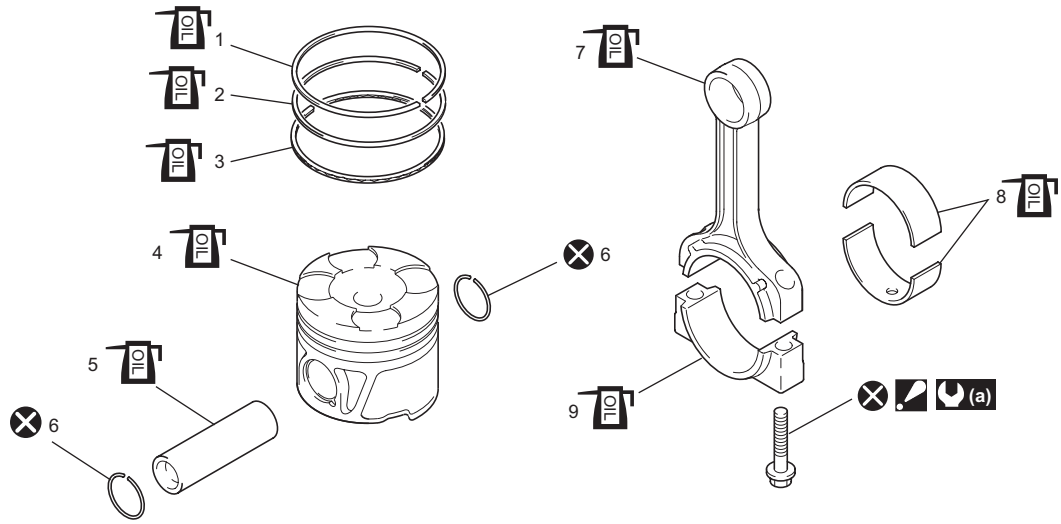
I3RB0A143081-01

Piston, Piston Ring, Connecting Rod and Cylinder Components

S7N20A1426024

⚠ CAUTION

- **Connecting rod and connecting rod bearing cap must be replaced as a set when either replacement becomes necessary.**
- **Note original position in which each piston, piston ring, connecting rod and connecting rod bearing cap were installed, and install them to original position.**
  If each piston, piston ring, connecting rod and connecting rod bearing cap is not installed to original position, engine will spoil its original performance.



I7V20A142046-02

1. Top ring	5. Piston pin	9. Connecting rod bearing cap
2. 2nd ring	6. Piston pin circlip	(a) : 20 N·m → 40° (20 kgf-m → 40°, 15.0 lbf-ft → 40°)
3. Oil ring	7. Connecting rod	: Do not reuse.
4. Piston	8. Connecting rod bearing	OIL : Apply engine oil to sliding surface.

Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation

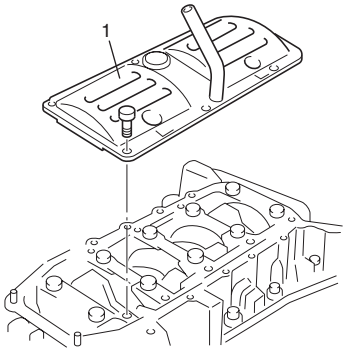
S7N20A1426025

⚠ CAUTION

- **Connecting rod and connecting rod bearing cap must be replaced as a set when either replacement becomes necessary.**
- **Note original position in which each piston, piston ring, connecting rod and connecting rod bearing cap were installed, and install them to original position. If each piston, piston ring, connecting rod and connecting rod bearing cap is not installed to original position, engine will spoil its original performance.**

Removal

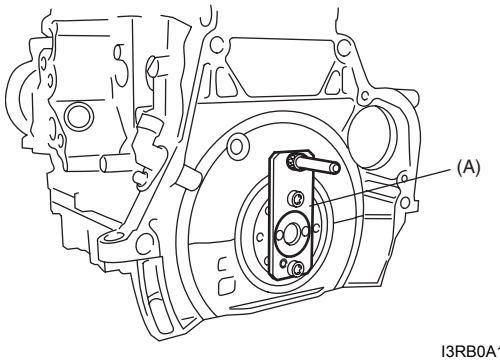
1) Remove engine assembly from engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.
2) Remove cylinder head referring to “Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ”.
3) Remove oil pan referring to “Oil Pan Removal and Installation: D13A / Z13DTJ in Section 1E”.
4) Remove oil pan baffle plate (1) from lower crankcase.



I3RB0A143083-01

5) Remove special tool (A).

Special tool
(A): 09912–38300



I3RB0A143084-01

6) Mark cylinder number on all pistons using silver pencil or quick drying paint for installation.
7) Remove connecting rod bearing caps (1).

I3RB0A143085-01

8) Decarbonize top of cylinder bore before removing piston from cylinder.
9) Push piston and connecting rod assembly out through the top of cylinder bore.

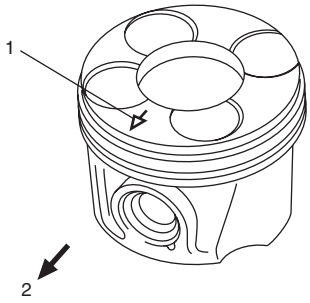
Installation

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crank pins.

NOTE

Do not apply oil the followings.

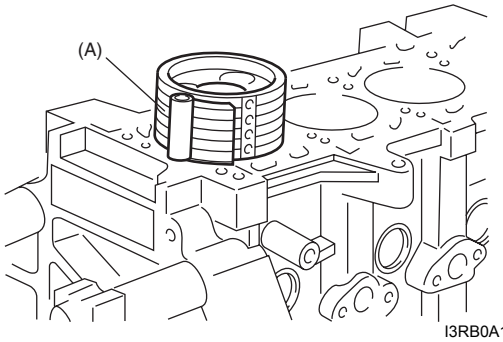
2) When installing piston and connecting rod assembly into cylinder bore, point arrow mark (1) on piston head to crankshaft pulley side (2).



I3RB0A143086-01

3) Install piston and connecting rod assembly into cylinder bore matching cylinder number marked in removal. Use special tool (piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.
Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

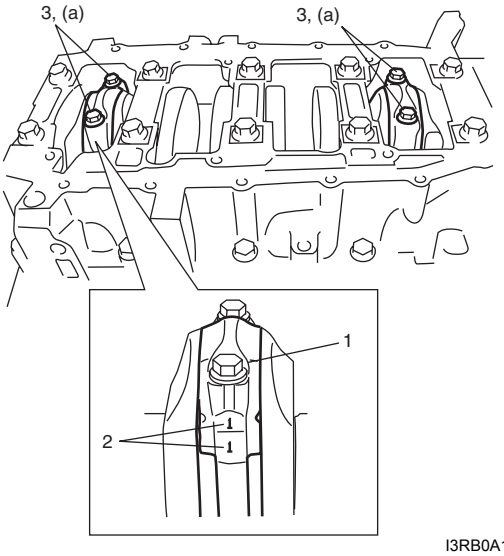
Special tool
(A): 09916–77310



I3RB0A143087-01

4) Install bearing cap (1) to applicable cylinder matching cylinder number (2) on bearing cap and connecting rod, and then tighten new bearing cap bolts as follows.
   a) Tighten all connecting rod bearing cap bolts (3) to 20 N·m (2.0 kgf-m, 14.5 lbf-ft).
   b) Retighten them by turning through 40°.

Tightening torque
Connecting rod bearing cap bolt (a)*: 20 N·m → +40° (2.0 kgf-m → +40°, 15.0 lbf-ft → +40°)



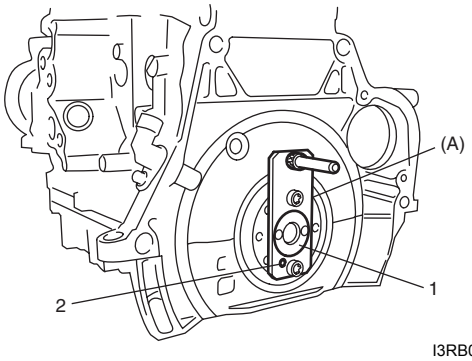
I3RB0A143088-01

5) Lock crankshaft (1) using special tool.

NOTE

Be sure to align hole (2) of special tool with knock pin securely.

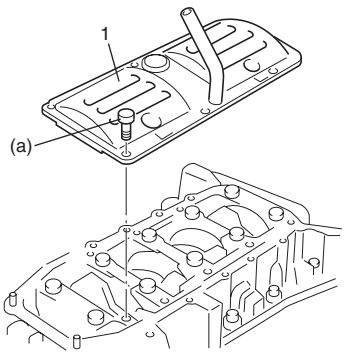
Special tool
(A): 09912–38300



I3RB0A143089-01

6) Install oil pan baffle plate (1) to lower crankcase.

Tightening torque
Oil pan baffle plate bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I3RB0A143090-02

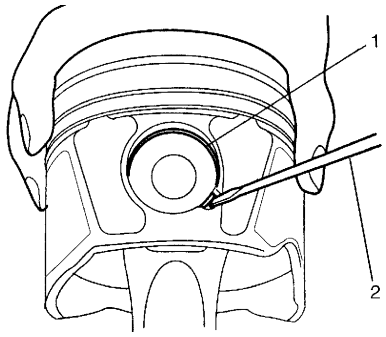
7) Install oil pan referring to “Oil Pan Removal and Installation: D13A / Z13DTJ in Section 1E”.
8) Install cylinder head referring to “Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ”.
9) Install camshaft housing assembly referring to “Camshaft Housing Assembly Removal and Installation: D13A / Z13DTJ”.
10) Install timing chain and timing chain cover referring to “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ”.
11) Install engine assembly to engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.

Pistons, Piston Rings, Connecting Rods and Cylinder Disassembly and Reassembly

S7N20A1426026

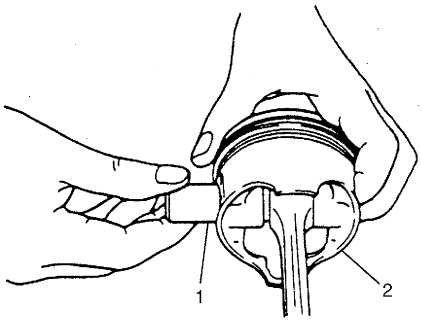
Disassembly

1) Using piston ring expander, remove top and 2nd compression rings and oil ring from piston.
2) Remove piston pin from piston and connecting rod as follows.
   a) Using flat head screw driver (2) or the like, remove piston pin circlips (1).



I3RB0A143091-01

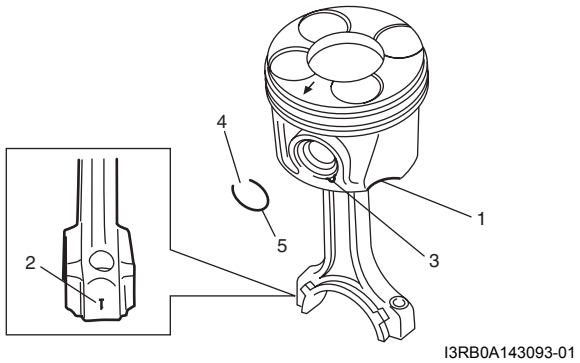
   b) Remove piston pin (1) from piston (2) and connecting rod.



I3RB0A143092-01

Reassembly

1) Clean carbon from piston head and ring grooves using a suitable tool.
2) Install piston pin to piston and connecting rod as follows.
   a) After applying engine oil to piston pin, piston pin holes in piston and connecting rod, fit connecting rod to piston so that cylinder number (2) of connecting rod bearing and chip of piston skirt (1) come on the opposite side (intake side), and insert piston pin to piston and connecting rod.
   b) Install piston pin circlips (5).
   c) Position opening (4) of piston pin circlip to opposite side of removal and fitting channel (3).

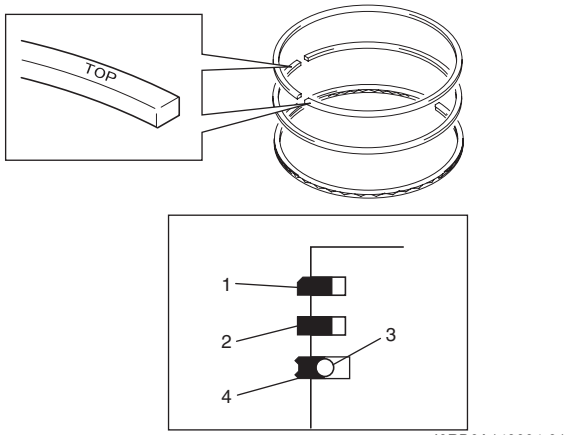


I3RB0A143093-01

3) Install piston rings to piston.

NOTE

- **As indicated in figure, 1st and 2nd rings have "TOP" mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.**
- **1st ring (1) differs from 2nd ring (2) in thickness and shape.**
  Distinguish 1st ring from 2nd ring by referring to figure.
- **When installing oil ring, install spiral ring (3) first and then rail (4).**



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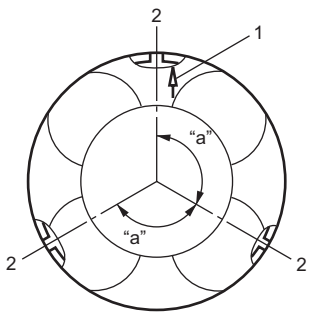
4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in the figure.



I7V20A142047-01

1. Arrow mark	2. Ring end gap
"a": 120°	

Cylinders, Pistons and Piston Rings Inspection

S7N20A1426027

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, rebore cylinder and use oversize piston.

Cylinder bore diameter, taper and out-of-round

Using a cylinder gauge (1), measure cylinder bore in thrust and axial directions at any positions as shown in figure.
If any of the following conditions is noted, rebore cylinder block.

- Cylinder bore diameter exceeds specification.
- Difference of measurements at two positions exceeds taper limit.
- Difference between thrust and axial measurements exceeds out-of-round limit.

Cylinder bore diameter

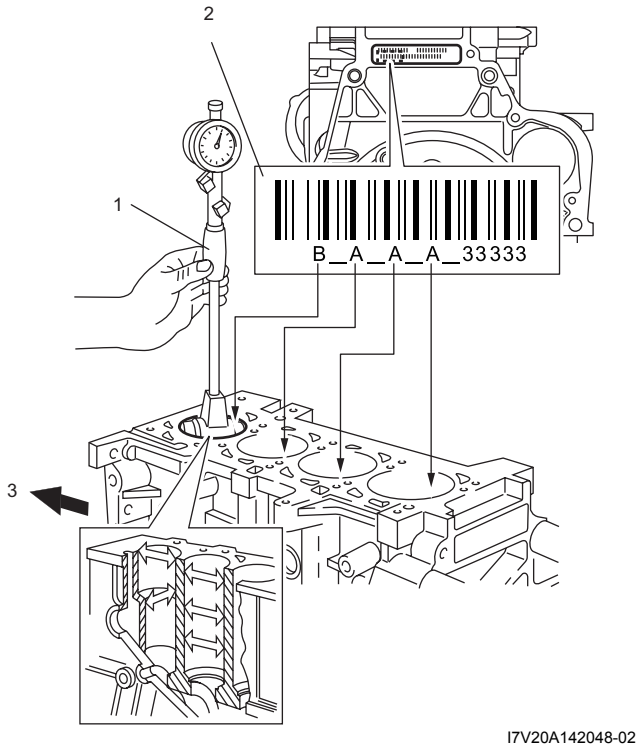
Category (2)	Cylinder bore diameter
A	69.600 – 69.610 mm (2.74016 – 2.74054 in.)
B	69.610 – 69.620 mm (2.74055 – 2.74093 in.)
C	69.620 – 69.630 mm (2.74094 – 2.74133 in.)

Cylinder taper difference
Limit: 0.001 mm (0.00004 in.)

Out-of-round difference
Limit: 0.005 mm (0.00020 in.)

NOTE

If any one of four cylinder has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.



I7V20A142048-02

3. Crankshaft pulley side

Pistons

Visual inspection

Inspect piston for faults, cracks or other damaged. Damaged or faulty piston should be replaced.

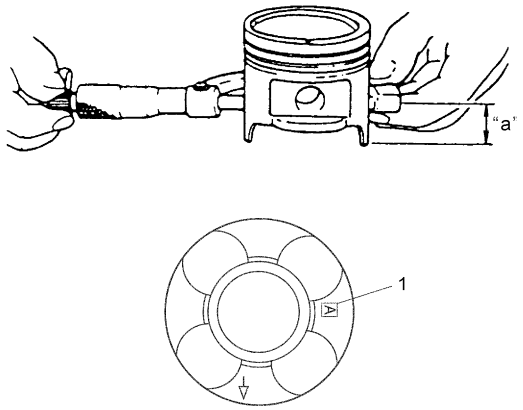
Piston diameter

As indicated in figure, piston diameter should be measured at a position 7.00 mm (0.28 in.) (“a”) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter specification

Index (1) on piston head	Piston diameter
A	**69.546 – 69.556 mm (2.3781 – 2.7384 in.)**
B	**69.556 – 69.566 mm (2.7385 – 2.7388 in.)**
C	**69.566 – 69.576 mm (2.7389 – 2.7392 in.)**

Oversize (0.4 mm): 69.946 – 69.956 mm (2.7538 – 2.7541 in.)



I7V20A142049-01

Piston clearance
Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. If it is out of specification, rebore cylinder and/or use oversize piston.

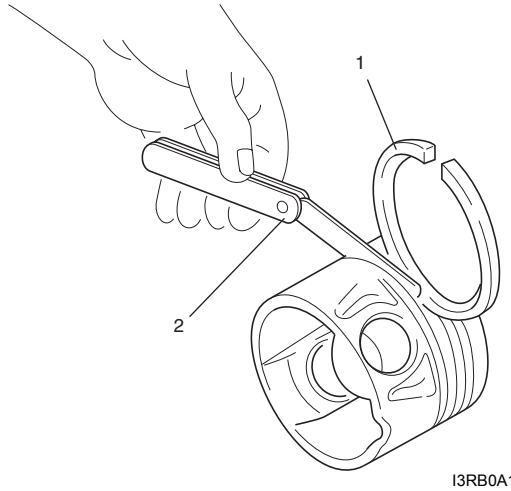
NOTE

Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance:
0.024 – 0.064 mm (0.00094 – 0.0025 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 thickness gauge (2). If clearance is out of specification, replace piston ring and/or piston.

Ring groove clearance
Top ring: 0.11 – 0.15 mm (0.0044 – 0.0059 in.)
2nd ring: 0.05 – 0.09 mm (0.0020 – 0.0035 in.)
Oil ring: 0.03 – 0.07 mm (0.0012 – 0.00275 in.)



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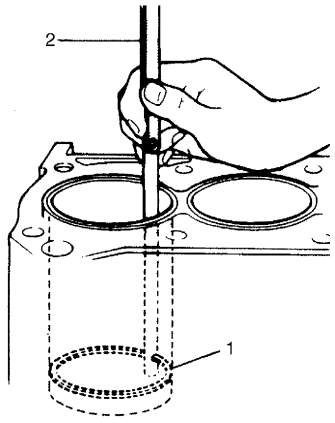
Piston Rings
Piston ring end gap
To measure end gap, insert piston ring (1) into cylinder bore and then measure the gap by using thickness gauge (2).
If measured gap is out of specification, replace ring.

NOTE

Decarbonize and clean top of cylinder bore before inserting piston ring.

Piston ring end gap
Top ring: 0.20 – 0.30 mm (0.0079 – 0.0118 in.)
2nd ring: 1.00 – 1.50 mm (0.0394 – 0.0590 in.)
Oil ring: 0.25 – 0.50 mm (0.0099 – 0.0196 in.)



I3RB0A143099-01

Piston Pins and Connecting Rods Inspection

S7N20A1426041

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 bush. 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 damage.

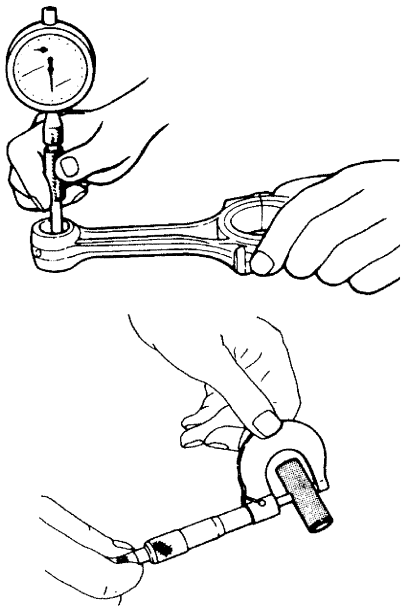
Piston pin clearance in connecting rod small end:
0.019 – 0.03 mm (0.00075 – 0.00118 in.)

Piston pin clearance in piston:
0.008 – 0.018 mm (0.00032 – 0.00071 in.)

Piston pin diameter:
22.982 – 22.987 mm (0.90481 – 0.90500 in.)

Connecting rod small-end bore:
23.006 – 23.012 mm (0.90575 – 0.90598 in.)

Piston bore:
22.995 – 23.000 mm (0.90532 – 0.90551 in.)

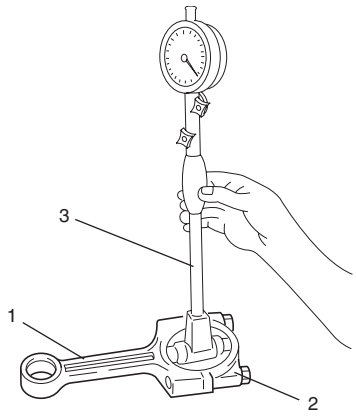


I3RB0A143098-01

Connecting Rod

- Connecting rod big end bore and length.
  a. Install bearing cap (2) to connecting rod (1).
  b. Measure connecting rod big end bore by using bore gauge (3).
     If measured bore is out of specification, replace connecting rod and bearing cap as a set.

     Big end bore:
     45.734 – 45.744 mm (1.8006 – 1.8009 in.)



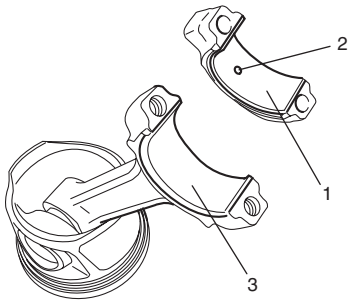
I3RB0A143100-01

Crank Pin and Connecting Rod Bearings Inspection

S7N20A1426042

Connecting rod bearing general information

- Cap side connecting rod bearing (1) has oil hole (2) as shown in figure.
  Install this half with oil hole to connecting rod bearing cap.
- Connecting rod side connecting rod bearing (3) does not have oil hole.



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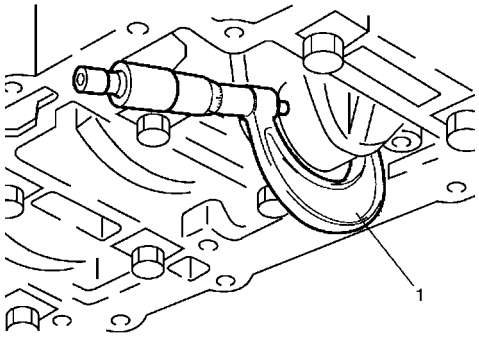
Crank Pin Diameter

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 specification, regrind or replace crankshaft.

Crank pin diameter:
42.582 – 42.600 mm (1.6765 – 1.6771 in.)



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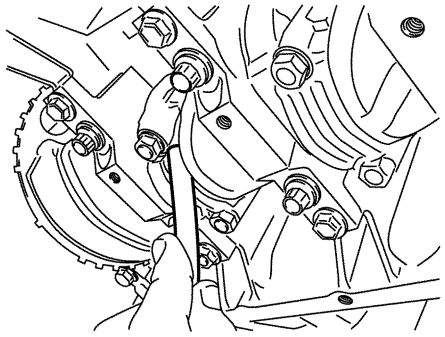
Big-end side clearance
Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in normal manner.
If measured clearance is out of specification, replace connecting rod.

Big-end side clearance:
0.12 – 0.45 mm (0.0048 - 0.0177 in.)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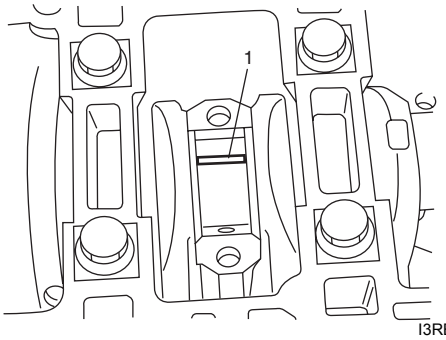
Connecting rod bearing visual inspection
Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.

Connecting rod bearing clearance

NOTE

Do not rotate crankshaft while gauging plastic is installed.

1) Before checking bearing clearance, clean bearing and crank pin.
2) Install bearing in connecting rod and bearing cap.
3) Place a piece of gaging plastic (1) to full width of crank pin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



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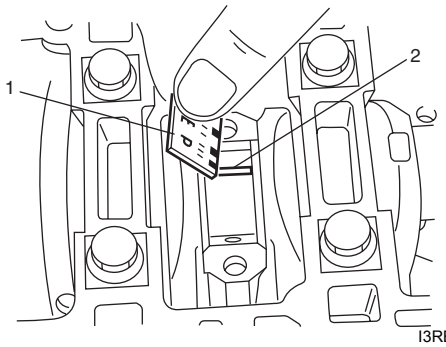
4) Install connecting rod and bearing cap referring to "Piston, Piston Ring, Connecting Rod and Cylinder Components: D13A / Z13DTJ".

NOTE

It is not necessary to replace new bearing cap bolts for measuring procedure.

5) Using a scale (1) on gauging plastic (2) envelope, measure gauging plastic width at the widest point (clearance) after removing cap.
If clearance exceed its specification, use a new standard size bearing and/or crankshaft.
After selecting new bearing, recheck clearance.

Connecting rod bearing clearance:
0.030 – 0.062 mm (0.0012 – 0.0024 in.)



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Selection of Connecting Rod Bearings

NOTE

- **If bearing is in malcondition or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.**
- **When replacing crankshaft or connecting rod and its bearings due to any reason, select new standard bearings to be installed referring to alphabets stamped on crank web No.4.**

Standard size of connecting rod bearing

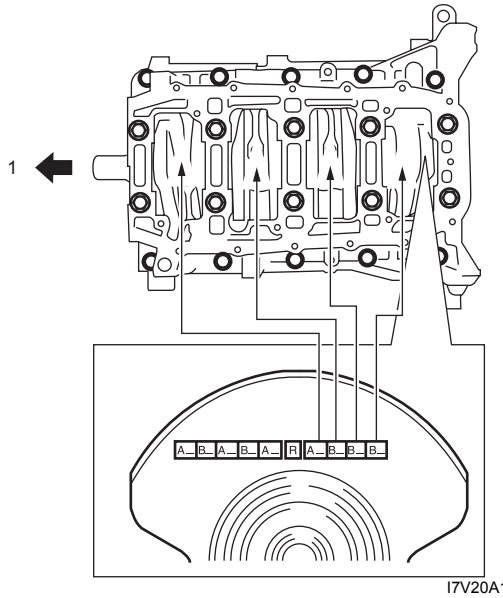
1) Check connecting rod big-end inside diameter. If measured big-end inside diameter out of specification, replace connecting rod and/or bearing cap.

Connecting rod big-end inside diameter:
45.734 – 45.744 mm (1.8006 – 1.8009 in.)

2) Next, check crankshaft pin diameter. As shown in figure, crank web No.4 has stamped alphabets. Two kinds of alphabet “A” and “B” represent the following crankshaft shaft pin diameter respectively. For example, stamped “A” indicates that corresponding crankshaft pin diameter is 42.591 – 42.600 mm (1.6769 – 1.66771 in.).

Crankshaft pin diameter

Class	Crankshaft pin diameter
A	42.591 – 42.600 mm (1.6769 – 1.6771 in.)
B	42.582 – 42.591 mm (1.6765 – 1.6768 in.)



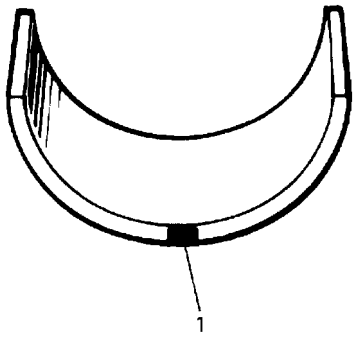
I7V20A142050-01

1. Crankshaft pulley side

3) There are two kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at position as indicated in figure. Each color indicated the following thickness at the center of bearing.

Standard size of connecting rod bearing thickness

Color painted	Bearing thickness
Red	1.546 – 1.552 mm (0.06087 – 0.06110in.)
Blue	1.550 – 1.556 mm (0.06103 – 0.06125 in.)



I5RS0B140031-01

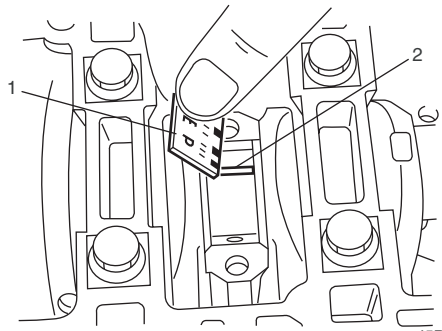
1. Paint

4) From alphabet stamped on crank web No.4, determine new standard bearing to be installed to connecting rod big-end inside, by referring to the table.
For example, if number stamped on crank web No.4 is “A“, install a new standard bearing painted in “Red” to its connecting rod big end inside.

Specification of new standard connecting rod bearing size

Alphabet stamped on crank web No.4 (Crankshaft pin diameter)	Color painted
A	Red
B	Blue

5) Check bearing clearance with newly selected standard bearing referring to “Crank Pin and Connecting Rod Bearings Inspection: D13A / Z13DTJ”.
If clearance is out of limit, use next thicker bearing and recheck clearance.



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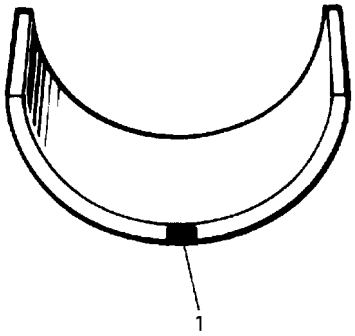
Undersize bearing (0.127 mm)

- 0.127 mm undersize bearing is available, in two 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
Brown	1.609 – 1.615 mm (0.06335 – 0.06358 in.)
Green	1.613 – 1.619 mm (0.06351 – 0.06374 in.)



I5RS0B140031-01

1. Paint

- If necessary, regrind crankshaft pin and select undersize bearing to use with it as follows.

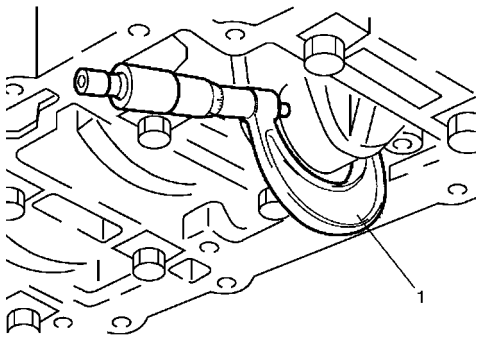
1) Regrind crankshaft pin to the following finished diameter.

Finished diameter
42.455 – 42.473 mm (1.6715 – 1.6721 in.)

2) Using micrometer (1), measure regrind crankshaft pin diameter. Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
3) Using crankshaft pin diameter measured above, select an undersize bearing by referring to table given below. Check bearing clearance with newly selected undersize bearing.

Specification of new undersize connecting rod bearing

Measured crankshaft pin diameter	Color painted
42.464 – 42.473 mm (1.6719 – 1.6721 in.)	Brown
42.455 – 42.464 mm (1.6715 – 1.6718 in.)	Green



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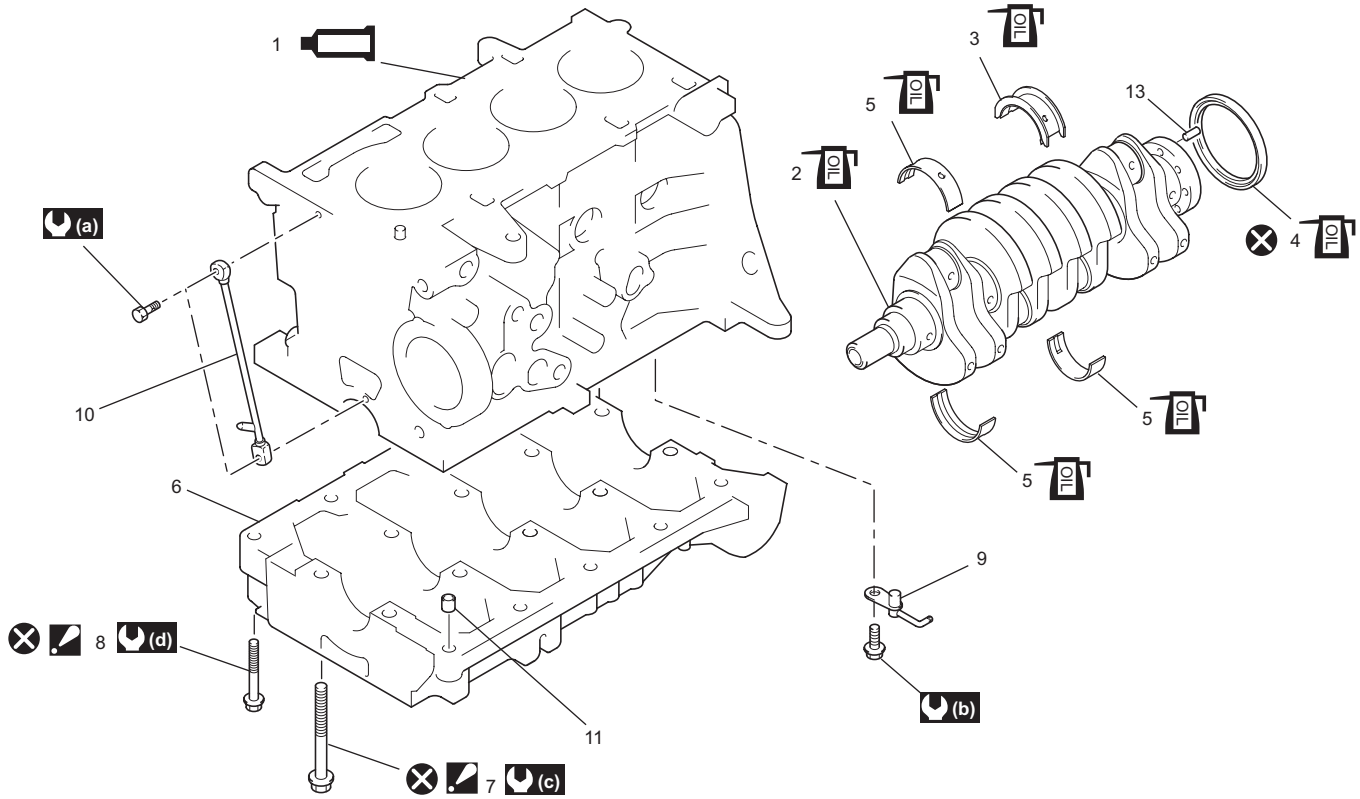
Main Bearing, Crankshaft and Cylinder Block Components

S7N20A1426028

⚠ CAUTION

Note original position in which each main bearing were installed, and install them to original position. If each main bearing is not installed to original position, engine will spoil its original performance.



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1. Cylinder block : Apply sealant 99000-85E11 referring to "Main Bearing, Crankshaft and Cylinder Block Removal and Installation: D13A / Z13DTJ".	7. Crankcase bolt (M10)	(b) : 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)
2. Crankshaft : Apply engine oil to sliding surface.	8. Crankcase bolt (M8)	(c) : 20 N·m (2.0 kgf-m, 15.0 lbf-ft)
3. Main bearing (with thrust bearing) : Apply engine oil to sliding surface.	9. Oil jet	(d) : 30 N·m (3.1 kgf-m, 22.5 lbf-ft)
4. Flywheel side crankshaft oil seal : Apply engine oil-to-oil seal lip.	10. Timing chain oil jet	: Do not reuse.
5. Main bearing : Apply engine oil to bearing inside surfaces.	11. Knock pin	
6. Lower crankcase	(a) : 6 N·m (0.61 kgf-m, 4.5 lbf-ft)	

Main Bearing, Crankshaft and Cylinder Block Removal and Installation

S7N20A1426029

⚠ CAUTION

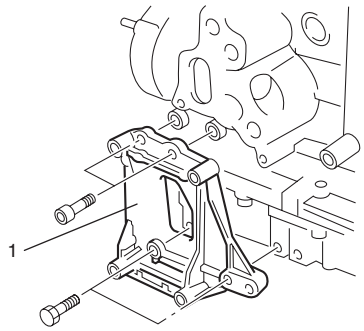
Note original position in which each main bearing were installed, and install them to original position.
If each main bearing is not installed to original position, engine will spoil its original performance.

NOTE

- **All parts to be installed must be perfectly clean.**
- **Be sure to apply oil to crankshaft journals, main bearings, main bearing (with thrust bearing), crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**

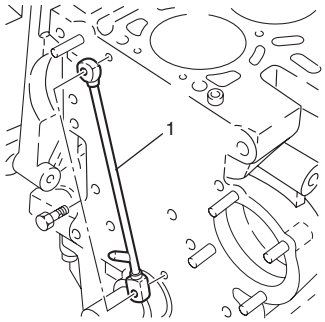
Removal

1) Remove engine assembly from engine compartment referring to “Engine Assembly Removal and Installation: D13A / Z13DTJ”.
2) Remove cylinder head assembly referring to “Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ”.
3) Remove CKP sensor referring to “Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: D13A / Z13DTJ in Section 1C”.
4) Remove heater outlet pipe referring to “Cooling System Components: D13A / Z13DTJ in Section 1F”.
5) Remove oil cooler referring to “Oil Cooler Removal and Installation: D13A / Z13DTJ in Section 1E”.
6) Remove generator referring to “Generator Removal and Installation: D13A / Z13DTJ in Section 1J”.
7) Remove starting motor referring to “Starting Motor Removal and Installation: D13A / Z13DTJ in Section 1I”.
8) Remove A/C compressor bracket (1), if equipped.



I3RB0A143105-01

9) Remove timing chain oil jet (1) from cylinder block.



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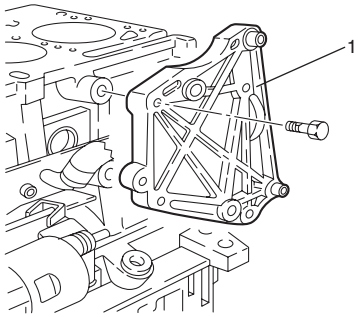
10) Remove generator bracket (1) from cylinder block.



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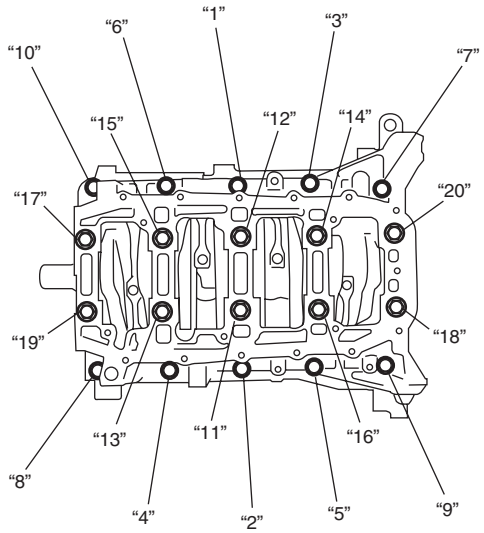
11) Remove crank ventilation cover from cylinder block referring to “Oil Separator and Crankcase Ventilation Cover Removal and Installation: D13A / Z13DTJ”.
12) Remove piston and connecting rod referring to “Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation: D13A / Z13DTJ”
13) Loosen crankcase bolt (M10) and crankcase bolt (M8) in numerical order as shown in figure a little at a time, and remove them.



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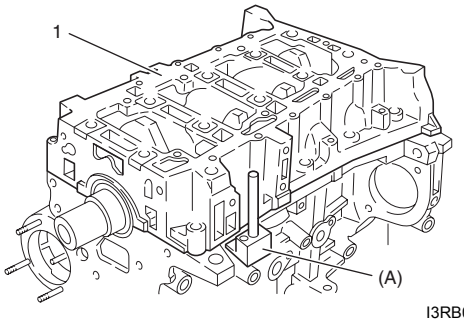
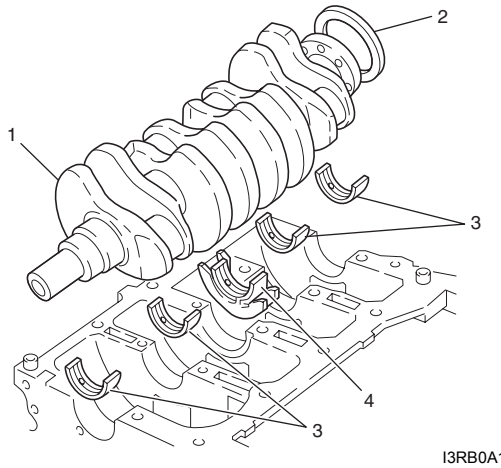
14) Remove lower crankcase (1) from cylinder block using special tool.

Special tool
(A): 09921–96510



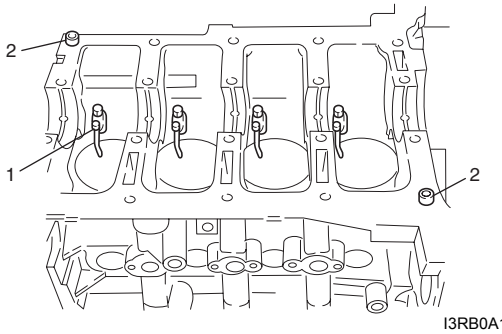
I3RB0A143109-01

15) Remove crankshaft (1) and flywheel side crankshaft oil seal (2) from cylinder block.
16) Remove main bearings (3) and main bearing (with thrust bearing) (4) from cylinder block and lower crankcase.



I3RB0A143110-01

17) Remove oil jet (1) from cylinder block, if necessary.
18) Remove knock pin (2) from cylinder block, if necessary.

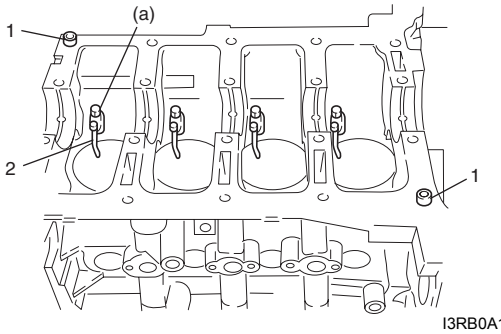


I3RB0A143111-01

Installation

1) Install knock pin (1) to cylinder block, if removed.
2) Install oil jet (2) to cylinder block, if removed.

Tightening torque
Oil jet bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)

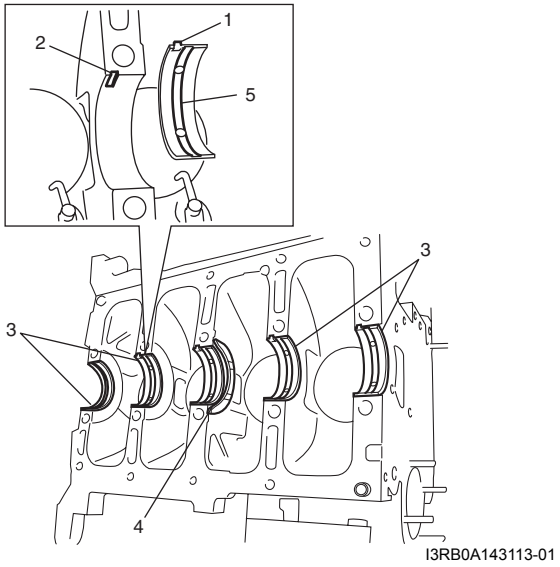


I3RB0A143112-01

3) Install main bearings (3) and main bearings (with thrust bearing) (4) to cylinder block and lower crankcase aligning tab (1) with gap (2).

NOTE

- **One of two halves of main bearing has an oil groove (5).**
  Install it to cylinder block, and the other half without oil groove to lower crankcase.
  Make sure that two halves are painted in the same color.
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**

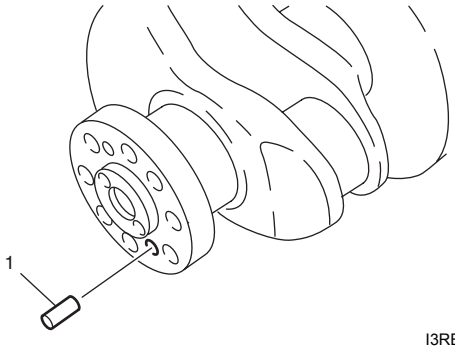


I3RB0A143113-01

4) Install knock pin (1) to crankshaft, if removed.

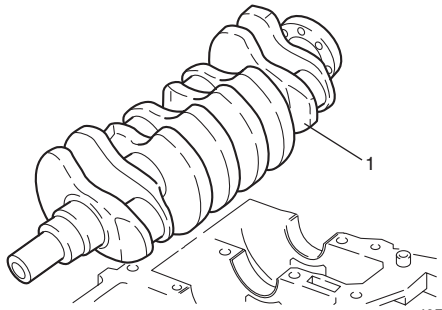
NOTE

Be sure to install knock pin to ϕ 6.75 mm (0.266 in.) hole of crankshaft.



I3RB0A143114-01

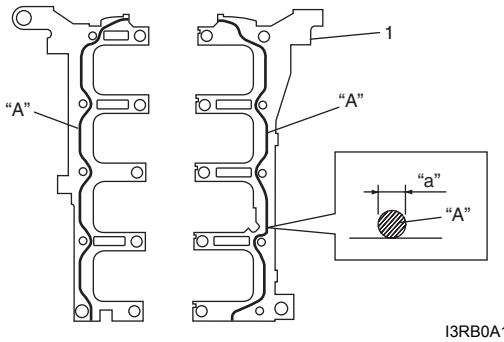
5) Install crankshaft (1) to cylinder block.



I3RB0A143115-01

6) Apply sealant to cylinder block (1) as shown in figure.

"A": Sealant 99000–85E11 (Three Bond TB 1227®)



I3RB0A143116-01

"a": 3.0 mm (0.118 in.)

7) Install lower crankcase to cylinder block.

8) Tighten new crankcase bolts (M10) ("1" – "10") and new crankcase bolts (M8) ("11" – "20") as follows.

NOTE

Tighten these bolts in numerical order as indicated in the figure in this procedure.

a) Tighten crankcase bolts (M10) to 20 N·m (2.0 kgf-m, 15.0 lbf-ft).

b) Retighten by turning crankcase bolts (M10) to 80°.

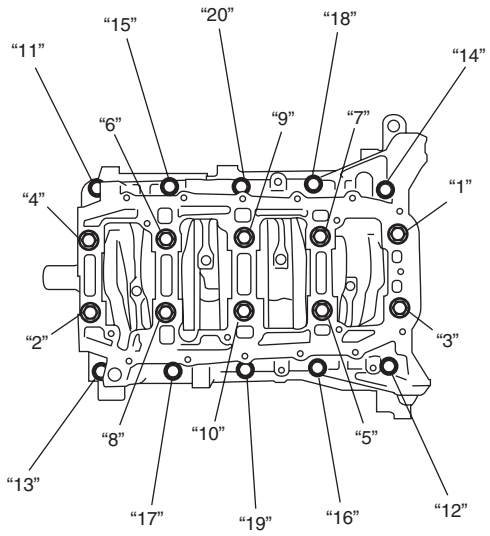
c) Tighten crankcase bolts (M8) to 15 N·m (1.5 kgf-m, 11.0 lbf-ft)

d) Retighten crankcase bolts (M8) to 30 N·m (3.0 kgf-m, 22.0 lbf-ft).

Tightening torque
Crankcase bolt (M10)*: 20 N·m → +80° (2.0 kgf-m → +80°, 15.0 lbf-ft → +80°)
Crankcase bolt (M8)*: 15 N·m → 30 N·m (1.5 kgf-m → 3.1 kgf-m, 11.0 lbf-ft → 22.5 lbf-ft)

NOTE

After tightening lower crankcase bolts, check to be sure that crankshaft rotates smoothly.



I3RB0A143117-01

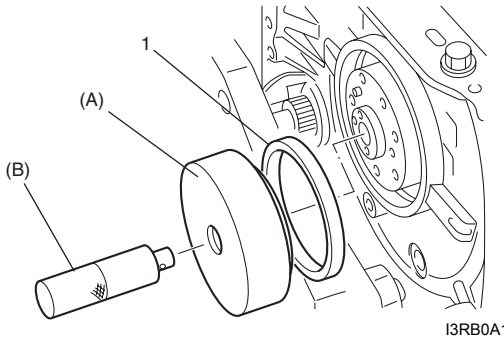
9) Using special tools, install flywheel side crankshaft oil seal (1) as follows.

Special tool
(A): 09913–58620
(B): 09924–74510

a) Fit crankshaft oil seal to special tool (A).

b) Install special tool (B) to special tool (A), and install crankshaft oil seal by tapping special tool (B) lightly with a plastic hammer.

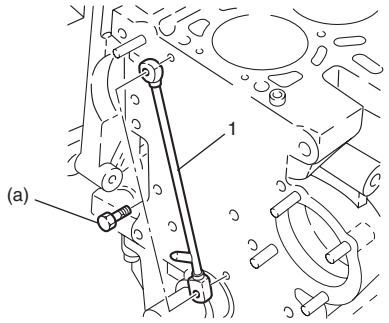
c) Remove special tool (A) and (B).



I3RB0A143118-01

10) Install timing chain oil jet (1) to cylinder block.

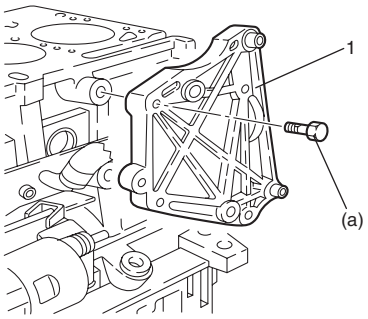
Tightening torque
Oil jet union bolt (a): 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)



I3RB0A143119-01

11) Install piston and connecting rod referring to "Pistons, Piston Rings, Connecting Rods and Cylinder Removal and Installation: D13A / Z13DTJ".
12) Install crank ventilation cover to cylinder block referring to "Oil Separator and Crankcase Ventilation Cover Removal and Installation: D13A / Z13DTJ".
13) Install generator bracket (1) to cylinder block.

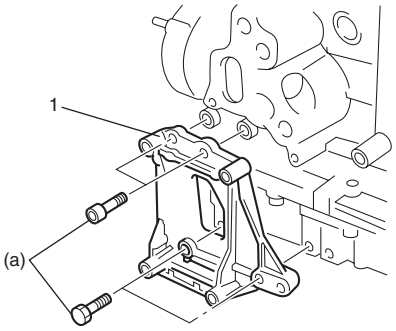
Tightening torque
Generator bracket bolt (a): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)



I3RB0A143120-01

14) Install A/C compressor bracket (1), if removed.

Tightening torque
A/C compressor bracket bolt (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)



I3RB0A143121-01

15) Install starting motor referring to "Starting Motor Removal and Installation: D13A / Z13DTJ in Section 1I".
16) Install generator referring to "Generator Removal and Installation: D13A / Z13DTJ in Section 1J".
17) Install oil cooler referring to "Oil Cooler Removal and Installation: D13A / Z13DTJ in Section 1E".
18) Install heater outlet pipe referring to "Cooling System Components: D13A / Z13DTJ in Section 1F".
19) Install CKP sensor referring to "Crankshaft Position (CKP) Sensor (Engine Speed Sensor) Removal and Installation: D13A / Z13DTJ in Section 1C".
20) Install cylinder head assembly referring to "Valve and Cylinder Head Assembly Removal and Installation: D13A / Z13DTJ".
21) Install engine assembly to engine compartment referring to "Engine Assembly Removal and Installation: D13A / Z13DTJ".

Main Bearing, Crankshaft and Cylinder Block Inspection

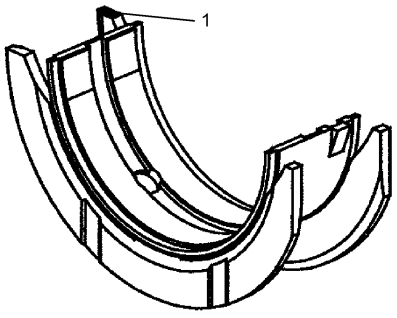
S7N20A1426030

Thrust Bearing Inspection

1) There are 2kinds of standard and oversize bearings differing in thickness. To distinguish them, they are painted in the following colors at position as indicated in figure.
2) If measured value is out of specification, replace thrust bearing.

Thickness of crankshaft thrust bearing

	Color painted	Bearing thickness
Standard	**Yellow Blue Red Black Green Brown**	**2.290 – 2.320 mm (0.0902 – 0.0913 in.)**
Oversize	**Yellow / White Blue / White Red / White Black / White Green / White Brown / White**	**2.420 – 2.450 mm (0.0953 – 0.0964 in.)**



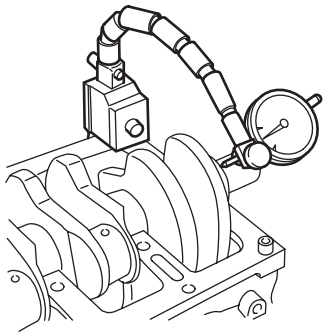
I7V20A142052-02

1. Paint

Crankshaft Thrust Play

1) Install main bearing, main bearing (with thrust bearing), crankshaft and lower crankcase referring to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation: D13A / Z13DTJ”.
2) Using a dial gauge, measure displacement in axial (thrust) direction of crankshaft.
   If measured value is out of specification, replace main bearing (with thrust bearing).

Crankshaft thrust play:
0.19 – 0.30 mm (0.0073 – 0.0120 in.)



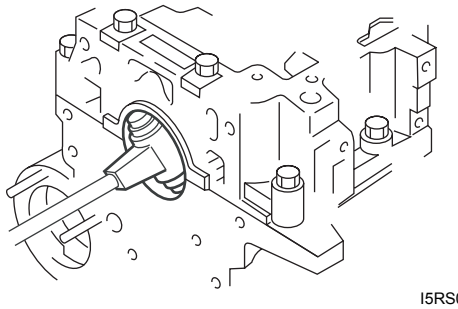
I7V20A142053-02

Crankshaft journal bore

Inspect crankshaft journal bore for uneven wear or damage. Measure crankshaft journal bore. If crankshaft journal bore is damaged or diameter is out of specification, replace cylinder block.

Crankshaft journal bore diameter

Class 1	**54.710 – 54.714 mm (2.1540 – 2.1540 in.)**
Class 2	**54.714 – 54.718 mm (2.1541 – 2.1542 in.)**
Class 3	**54.718 – 54.722 mm (2.1543 – 2.1544 in.)**



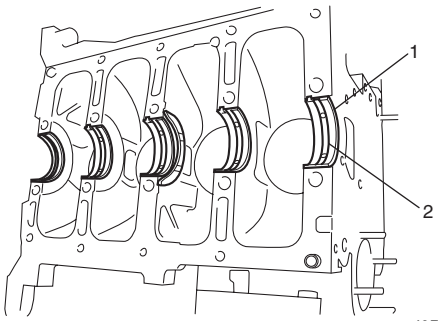
I5RS0B140029-01

Main Bearings Inspection

S7N20A1426043

General information

- Service main bearings are available in standard size and 0.127 mm undersize, and standard size and undersize has 3 kinds of bearings differing in thickness.
- Upper half of bearing (1) has oil groove (2) as shown in figure.
  Install this half with oil groove to cylinder block.
- Lower half of bearing does not have oil groove.



I3RB0A143123-01

Visual inspection

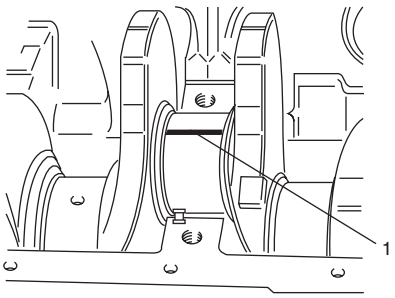
Check bearings for pitting, scratches, wear or damage. If any malcondition is found, replace both upper and lower halves.
Never replace either half without replacing the other half.

Main bearing clearance

NOTE

Do not rotate crankshaft while gauging plastic is installed.

1) Before checking bearing clearance, clean bearing and crankshaft journal.
2) Install bearing to cylinder block and main bearing cap referring to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation: D13A / Z13DTJ”
3) Place a piece of gauging plastic (1) to full width of crankshaft journal as contacted by bearing (parallel to crankshaft), avoiding oil hole.



I3RB0A143124-01

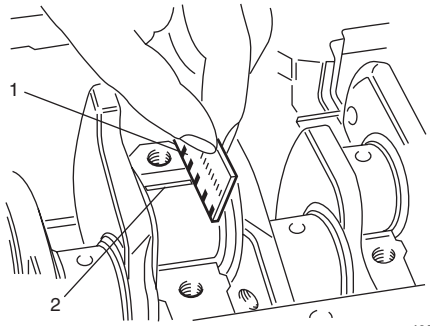
4) Install lower crankcase referring to “Main Bearing, Crankshaft and Cylinder Block Removal and Installation: D13A / Z13DTJ”.

NOTE

It is not necessary to replace new crankcase bolts for measuring procedure.

5) Remove cap and using a scale (1) on gauging plastic (2) envelope, measure gauging plastic width at the widest point (clearance).
If clearance is out of specification, replace bearing. Always replace both upper and lower bearing as a set.

Main bearing clearance:
0.026 – 0.050 mm (0.0012 – 0.0019 in.)



I3RB0A143125-01

Selection of Main Bearings

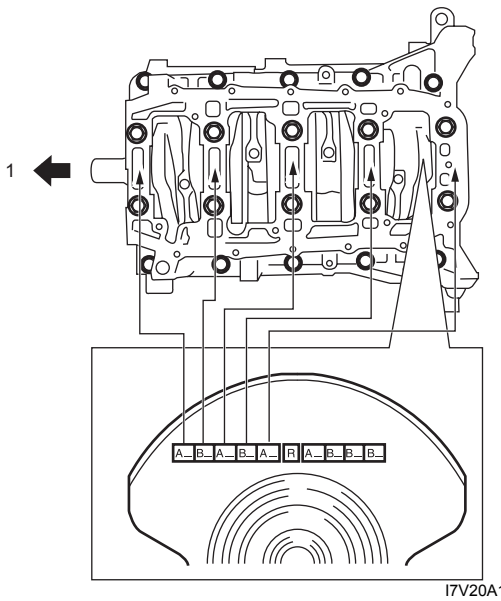
Standard bearing

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to the following procedure and install it.

1) First check journal diameter. As shown in figure, crank web No.4 has stamped alphabets.
Three kinds of alphabets (“A”, “B” and “C”) represent the following journal diameters.
Stamped alphabets on crank web No.4 represent journal diameters marked with an arrow in figure respectively. For example, stamped alphabet “A” indicates that corresponding journal diameter is 50.994 – 51.0000 mm (2.0077 – 2.0078 in.).

Crankshaft journal diameter

Stamped alphabet	Journal diameter
A	50.994 – 51.000 mm (2.0077 – 2.0078 in.)
B	50.988 – 50.994 mm (2.0074 – 2.0076 in.)
C	50.982 – 50.998 mm (2.0072 – 2.0074 in.)



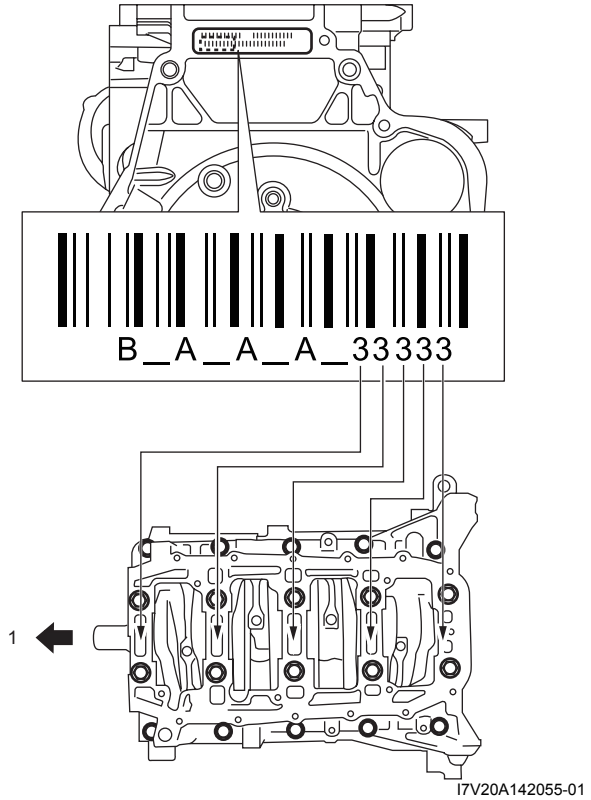
I7V20A142054-01

1. Crankshaft pulley side

2) Next, check journal bore diameter. On mating surface of cylinder block, three numbers are stamped as shown in figure.
Three kinds of numbers (“1”, “2” and “3”) represent the following journal bore diameters.
Stamped numbers on cylinder block represent journal bore diameter marked with an arrow in figure respectively.
For example, stamped “1” indicates that corresponding journal bore diameter is 54.710 – 54.714 mm (2.5140 – 2.1540 in.).

Crankshaft journal bore

Stamped number	Journal bore diameter
1	54.710 – 54.714 mm (2.1540 – 2.1540 in.)
2	54.714 – 54.718 mm (2.1540 – 2.1542 in.)
3	54.718 – 54.722 mm (2.1543 – 2.1544 in.)



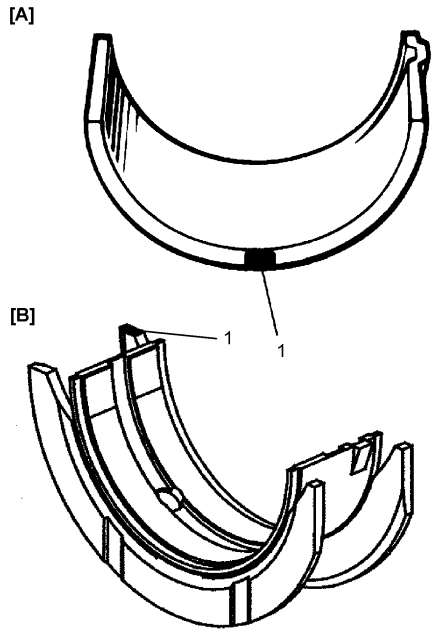
I7V20A142055-01

1. Crankshaft pulley side

3) There are 3 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 indicated the following thickness at the center of bearing.

Standard size of crankshaft main bearing thickness

Color painted		Bearing thickness
Without thrust bearing With Standard size thrust bearing	With over size thrust bearing	
Red	Red / White	1.836 – 1.841 mm (0.07229 – 0.07248 in.)
Blue	Blue / White	1.841 – 1.846 mm (0.07249 – 0.07267 in.)
Yellow	Yellow / White	1.846 – 1.851 mm (0.07268 – 0.07287 in.)



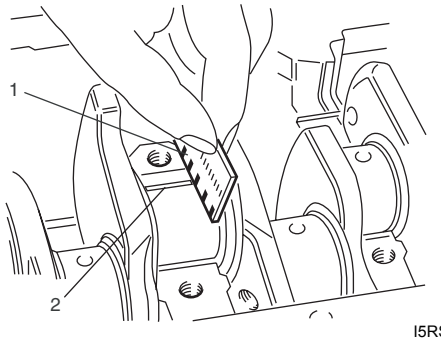
I7V20A142056-02

[A]: Without thrust bearing	[B]: With thrust bearing

4) From alphabet stamped on crank web No.4 and numbers stamped on cylinder block, determine new standard bearing to be installed to journal, by referring to the table shown.
For example, if alphabet stamped on crank web No.4 is “A” and number stamped on cylinder block is “1”, install a new standard bearing painted in “Red” or “Red / White” for upper and “Red” for lower to its journal.

Main bearing cross-reference table (standard size)

			Alphabet stamped on crank web No.4 (Journal diameter)		
			A	B	C
Number stamped on cylinder block (Cap bore dia.)	1	Upper	Red or Red / White	Red or Red / White	Blue or Blue / White
		Lower	Red	Blue	Blue
	2	Upper	Red or Red / White	Blue or Blue / White	Blue or Blue / White
		Lower	Blue	Blue	Yellow
	3	Upper	Blue or Blue / White	Blue or Blue / White	Yellow or Yellow / White
		Lower	Blue	Yellow	Yellow



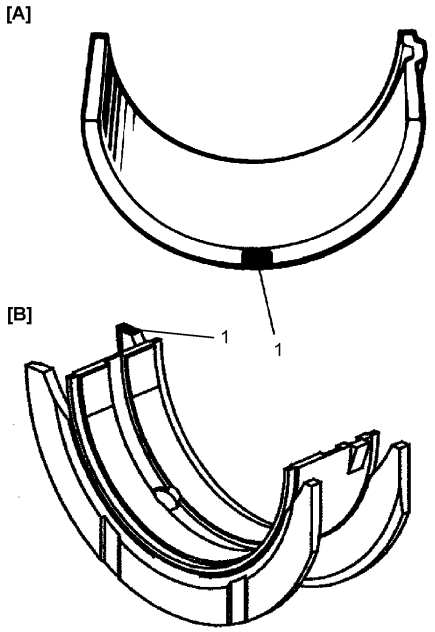
I5RS0B140036-01

Undersize bearing (0.127 mm)

- 0.127 mm undersize bearing is available, in three 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
Without thrust bearing With standard size thrust bearing	With over size thrust bearing	
Brown	Brown / White	1.899 – 1.904 mm (0.07477 – 0.07496 in.)
Green	Green / White	1.904 – 1.909 mm (0.07497 – 0.07515 in.)
Black	Black / White	1.909 – 1.914 mm (0.07516 – 0.07535 in.)



I7V20A142056-02

[A]: Without thrust bearing	1. Paint
[B]: With thrust bearing	

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.

1) Regrind journal to the following finished diameter.

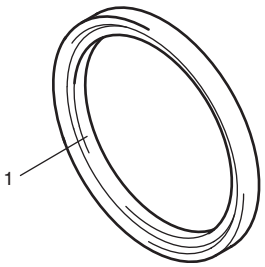
Finished diameter
50.855 – 50.873 mm (2.00216 – 2.00287 in.)

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, select an undersize bearing by referring to table given below. Check bearing clearance with newly selected undersize bearing.

Main bearing cross-reference table (undersize)

			Alphabet stamped on crank web No.4 (Journal diameter)		
			50.867 – 50.873 mm (2.0027 – 2.0028 in.)	50.861 – 50.867 mm (2.0024 – 2.0026 in.)	50.855 – 50.861 mm (2.0022 – 2.0024 in.)
Number stamped on cylinder block (Cap bore dia.)	1	Upper	Brown or Brown / White	Brown or Brown / White	Green or Green / White
		Lower	Brown	Green	Green
	2	Upper	Brown or Brown / White	Green or Green / White	Green or Green / White
		Lower	Green	Green	Black
	3	Upper	Green or Green / White	Green or Green / White	Black or Black /White
		Lower	Green	Black	Black

Flywheel side crankshaft oil seal
Carefully inspect flywheel side crankshaft oil seal (1) for wear or damage.
If its lip is worn or damaged, replace it.



I3RB0A143126-01

Cylinder Block Inspection

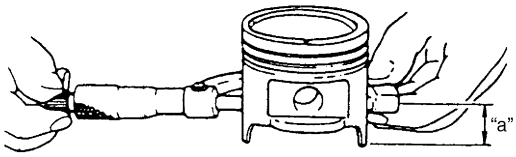
S7N20A1426032

Honing or reboring cylinder

1) When any cylinder needs reboring, all other cylinder must also be rebored at the same time.
2) Use oversized piston according to amount of cylinder wear.

Oversize piston diameter

Size	Piston diameter
Oversize 0.40	69.946 – 69.956 mm (2.7538 – 2.7541 in.)



I2RH01140157-01

"a": 7 mm (0.287 in)

3) Using micrometer, measure piston diameter.
4) Rebore and hone cylinder to the following dimension.

Cylinder bore diameter to be rebored:
70.000 – 70.010 mm (2.7560 – 2.7562 in.)

NOTE

Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.

5) Measure piston clearance after honing. If clearance is out of specification, replace cylinder block and all pistons.

Piston clearance:
0.044 mm – 0.064 mm (0.0018 – 0.0025 in.)

Specifications

Tightening Torque Specifications

S7N20A1427001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Camshaft housing plug	15	1.5	11.0	☞ / ☞
Common rail bracket bolt	28	2.9	21.0	☞ / ☞
Vacuum pump bolt	23	2.3	17.0	☞
EGR cooler bolt	28	2.9	21.0	☞
EGR valve bolt	25	2.5	18.5	☞
EGR pipe clamp	10	1.0	7.5	☞
Crankcase ventilation cover mounting bolt	10	1.0	7.5	☞
Oil separator mounting bolt	10	1.0	7.5	☞
Generator bracket mounting bolt	22	2.2	16.5	☞
Oil level gauge guide mounting bolt	9.0	0.92	7.0	☞ / ☞
Oil return pipe bolt	10	1.0	7.5	☞ / ☞
Turbocharger nut	28	2.9	21.0	☞
Exhaust manifold cover nut	10	1.0	7.5	☞
Lubrication pipe union bolt	22	2.2	16.5	☞
Air cleaner outlet hose clamp	2.5	0.25	2.0	☞
Engine cover bolt	8.0	0.82	6.0	☞ / ☞ / ☞
Intake manifold bolt	28	2.9	21.0	☞
Engine left mounting bracket nut	55	5.6	40.5	☞ / ☞
Chain guide mounting bolt	9.0	0.92	7.0	☞
Chain tensioner mounting bolt	9.0	0.92	7.0	☞
Chain tensioner adjuster bolt	9.0	0.92	7.0	☞
Timing chain cover bolt	9.0	0.92	7.0	☞
Timing chain cover nut	9.0	0.92	7.0	☞
Flywheel bolts	44	4.5	32.5	☞
Crankshaft pulley flange bolt	230	23.5	170.0	☞
Crankshaft pulley bolt	25	2.5	18.5	☞
Engine right mounting bracket No.2 bolt	60	6.1	44.5	☞
Ventilation connector bolt	8.3	0.85	6.5	☞
Camshaft housing bolt	18	1.8	13.5	☞
Camshaft housing stud bolt	25	2.5	18.5	☞
Camshaft timing sprocket bolt	150	15.3	111	☞
Camshaft gear bolt	120	12.2	88.5	☞
Cylinder head bolt (a)*	40 N·m → +90° → 90° (41 kgf-m, → +90° → +90°, 29.5 lbf-ft → +90° → +90°).			☞
Connecting rod bearing cap bolt (a)*	20 N·m → +40° (2.0 kgf-m → +40°, 15.0 lbf-ft → +40°)			☞
Oil pan baffle plate bolt	9.0	0.92	7.0	☞
Oil jet bolt	9.0	0.92	7.0	☞
Crankcase bolt (M10)*	20 N·m → +80° (2.0 kgf-m → +80°, 15.0 lbf-ft → +80°)			☞
Crankcase bolt (M8)*	15 N·m → 30 N·m (1.5 kgf-m → 3.1 kgf-m, 11.0 lbf-ft → 22.5 lbf-ft)			☞
Oil jet union bolt	6.0	0.61	4.5	☞
Generator bracket bolt	19	1.9	14.0	☞
A/C compressor bracket bolt	21	2.1	15.5	☞

NOTE

The specified tightening torque is also described in the following.
“Air Cleaner Components: D13A / Z13DTJ”
“Intercooler Components: D13A / Z13DTJ”
“EGR Valve and EGR Cooler Components: D13A / Z13DTJ”
“Crankcase Ventilation System Component: D13A / Z13DTJ”
“Turbocharger Components: D13A / Z13DTJ”
“Intake Manifold Components: D13A / Z13DTJ”
“Engine Mounting Components: D13A / Z13DTJ”
“Timing Chain Cover and Timing Chain Components: D13A / Z13DTJ”
“Camshaft Housing Components: D13A / Z13DTJ”
“Valve and Cylinder Head Components: D13A / Z13DTJ”
“Piston, Piston Ring, Connecting Rod and Cylinder Components: D13A / Z13DTJ”
“Main Bearing, Crankshaft and Cylinder Block Components: D13A / Z13DTJ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1428001

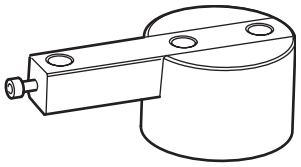
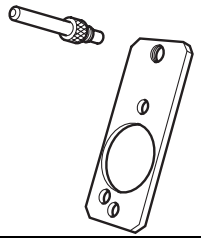
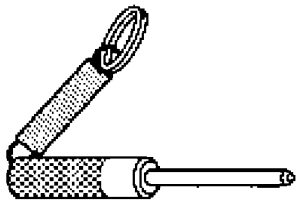
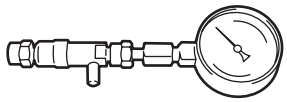
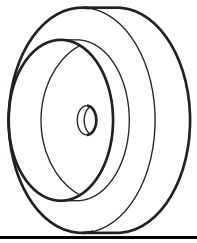
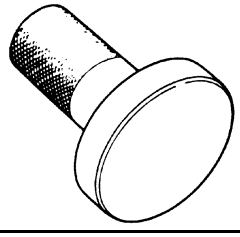
Material	SUZUKI recommended product or Specification		Note
Sealant	Three Bond TB 1227®	P/No.: 99000–85E11	☞ / ☞
Thread lock cement	Loctite omnifit 100M spezial®	—	☞ / ☞

NOTE

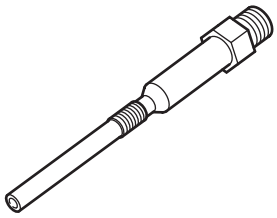
Required service material is also described in the following.
“Timing Chain Cover and Timing Chain Components: D13A / Z13DTJ”
“Camshaft Housing Components: D13A / Z13DTJ”
“Valve and Cylinder Head Components: D13A / Z13DTJ”
“Piston, Piston Ring, Connecting Rod and Cylinder Components: D13A / Z13DTJ”
“Main Bearing, Crankshaft and Cylinder Block Components: D13A / Z13DTJ”

Special Tool

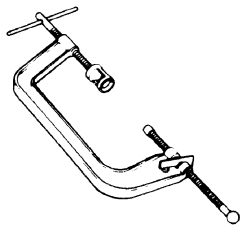
S7N20A1428002

09910–26550 Dial gauge support ☞ / ☞ / ☞ 	09912–38300 Crankshaft locking tool ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09912–46310 TDP definition pin EN-46785☞ 	09912–57822 Compression gauge ☞ 
09913–58620 Oil seal installer ☞ 	09913–75510 Bearing installer ☞ 

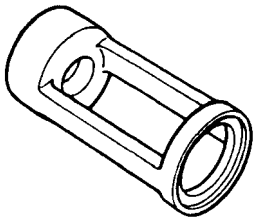
09915–68610
Dummy heater plug
☞



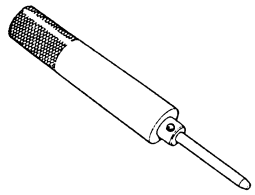
09916–14510
Valve lifter
☞ / ☞



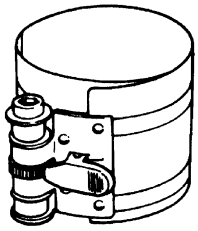
09916–14521
Valve spring compressor attachment
☞ / ☞



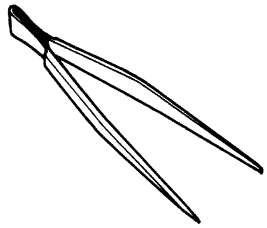
09916–58210
Valve guide installer handle
☞



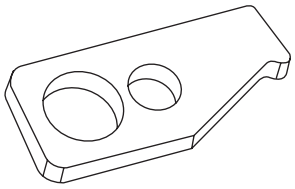
09916–77310
Piston ring compressor (50-125 mm)
☞



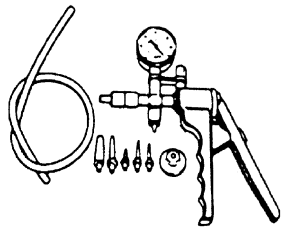
09916–84511
Forceps
☞ / ☞



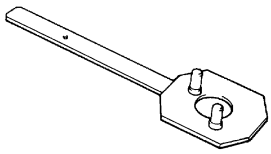
09916–98610
Flywheel locking tool
KM-652☞ / ☞



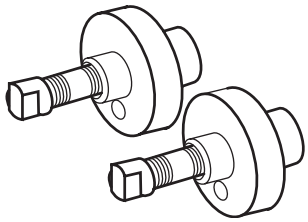
09917–47011
Vacuum pump gauge
☞



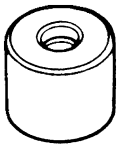
09917–68221
Camshaft pulley holder
☞ / ☞



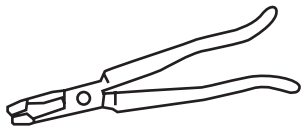
09917–68610
Camshaft locking tool
EN-46781☞ / ☞ / ☞ / ☞ / ☞ / ☞



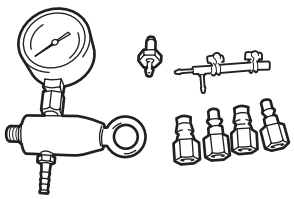
09917–98221
Valve guide stem attachment
☞



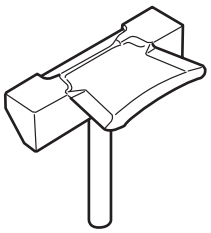
09917–98610
Valve stem seal pliers
KM-840☞



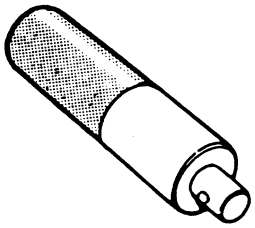
09918–18111
Air pressure regulator
☞



09921–96510
Oil pan seal cutter
☞



09924–74510
Bearing and oil seal handle
☞



Engine Lubrication System

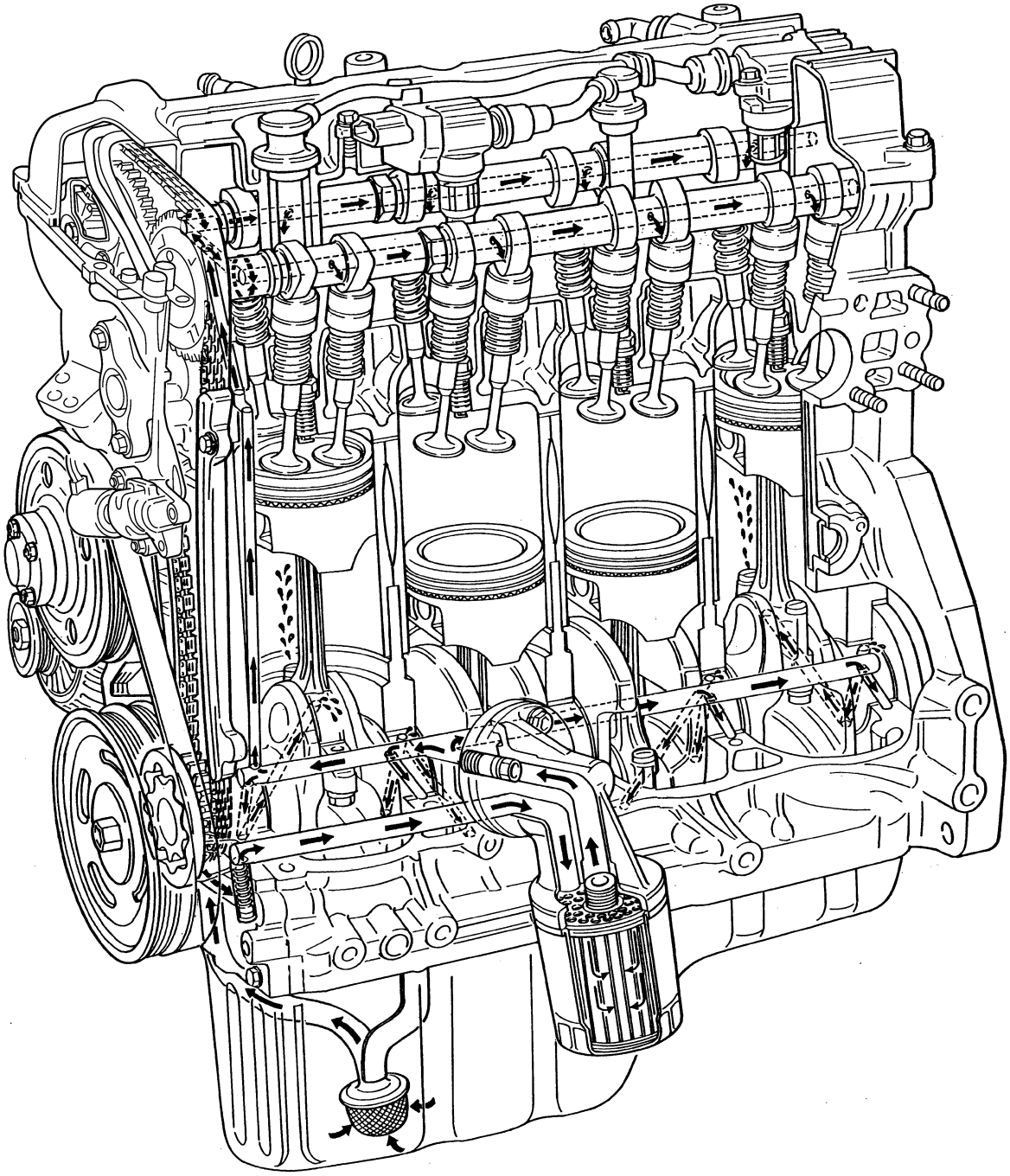
M13A / M15A / M16A

General Description

Engine Lubrication Description

S7N20A1511001

The oil pump is of a trochoid type, and mounted on the crankshaft. Oil is drawn up through the oil pump strainer and passed through the pump to the oil filter.
For M13A and M15A engine models, the filtered oil flows into two paths in cylinder block.
The filtered oil is passed to the passage in heat exchanger and cylinder block to piston cooling valve of oil gushed to the lower side of piston.
In one path, oil reaches the crankshaft journal bearings. Oil from the crankshaft journal 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, 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 way of camshafts.
An oil relief valve is provided on the oil pump. This valve starts relieving oil pressure when the pressure exceeds about 350 kPa (3.5 kg/cm^2, 49.8 psi).



I3RH0B150001-01

Diagnostic Information and Procedures

Oil Pressure Check

S7N20A1514001

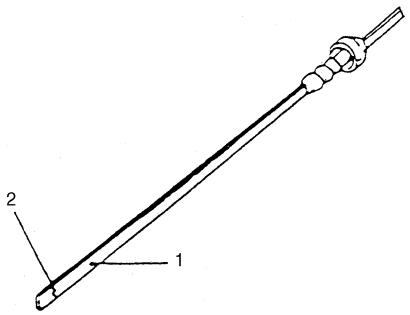
⚠ WARNING

To avoid danger of being burned, do not touch exhaust system when it is still hot.

NOTE

Prior to checking oil pressure, check the following.

- **Oil level in oil pan**
  If oil level is low, add oil up to Full level mark (hole) (1) on oil level gauge referring to "Engine Oil and Filter Change (Petrol Engine) in Section 0B".

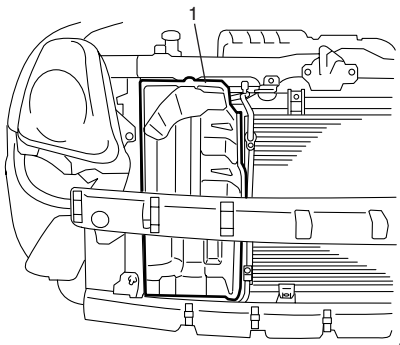


I2RH0B150002-01

2. Low level mark (hole)

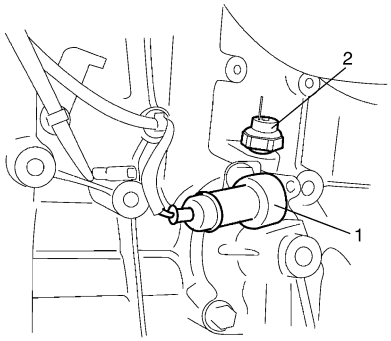
- **Oil quality**
  If oil is discolored or deteriorated, change it. For particular oil to be used, refer to "Engine Oil and Filter Change (Petrol Engine) in Section 0B".
- **Oil leaks**
  If leak is found, repair it.

1) Remove front bumper referring to "Front Bumper and Rear Bumper Components in Section 9K".
2) Remove engine front cover (1).



I4RS0A150001-01

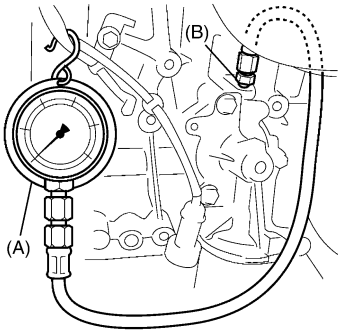
3) Disconnect oil pressure switch coupler (1).
4) Remove oil pressure switch (2) from cylinder block.



I2RH0B150003-01

5) Install special tools (oil pressure gauge) to vacated threaded hole of oil pressure switch.

Special tool
(A): 09915–77310
(B): 09915–78211



I2RH0B150004-01

6) Start engine and warm engine up to normal operating temperature.

NOTE

Be sure to shift transaxle gear shift lever in "Neutral" (shift select lever in "P" range for A/T vehicle), set parking brake and block drive wheels.

7) After warming up, raise engine speed to 4,000 r/min. and measure oil pressure.

Oil pressure specification
More than 270 kPa (2.7 kg/cm², 39.8 psi) at 4,000 r/min. (rpm)

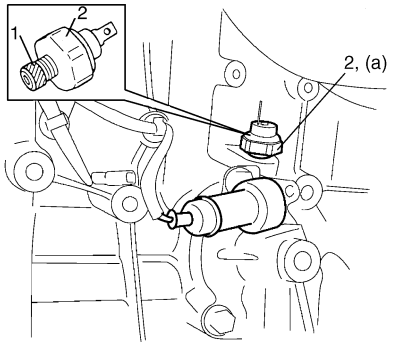
8) After checking oil pressure, stop engine and remove oil pressure gauge and attachment.

9) Before reinstalling oil pressure switch (2), be sure to wrap its screw threads with sealing tape (1) and tighten switch to specified torque.

NOTE

If sealing tape edge is bulged out from screw threads of switch, cut it off.

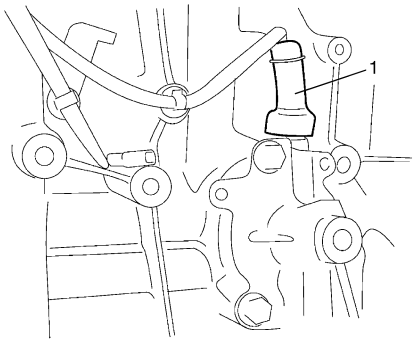
Tightening torque
Oil pressure switch (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



I2RH0B150005-01

10) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.

11) Connect oil pressure switch coupler (1).

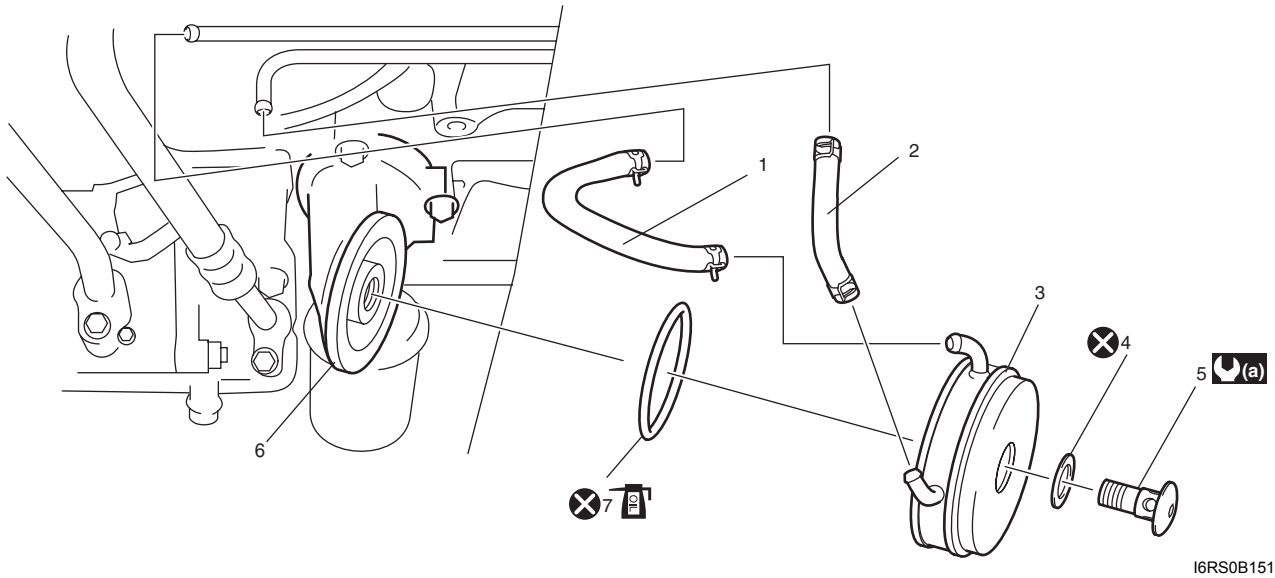


I2RH0B150006-01

Repair Instructions

Heat Exchanger Components (For M16A Engine Model)

S7N20A1516001



I6RS0B151001-02

1. Heat exchanger inlet No. 1 hose	4. Gasket	7. O-ring : Apply engine oil.
2. Heat exchanger outlet No. 1 hose	5. Heat exchanger stand bolt	(a) : 22 N·m (2.2 kgf-m, 16.0 lbf-ft)
3. Heat exchanger	6. Oil filter adapter case	: Do not reuse.

Heat Exchanger On-Vehicle Inspection (For M16A Engine Model)

S7N20A1516002

- Check heat exchanger for deformation wear or damage.
- Check heat exchanger for coolant leakage and oil leakage.

If any malcondition is found, replace O-ring, stand bolt gasket and/or heat exchanger.

Heat Exchanger Removal and Installation (For M16A Engine Model)

S7N20A1516003

Removal

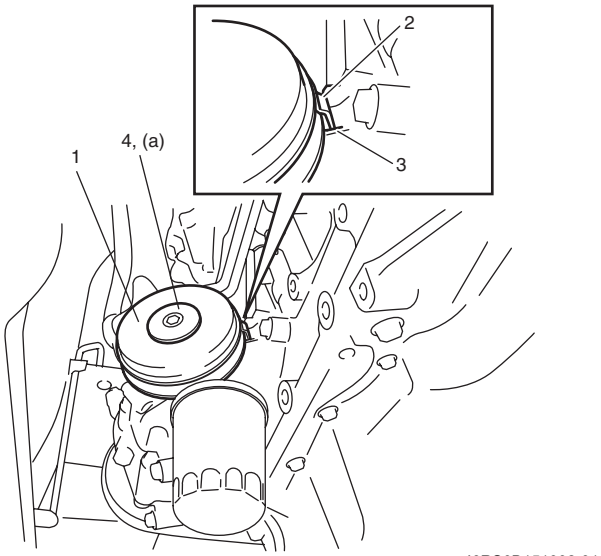
1) Drain engine oil by removing drain plug.
2) Drain coolant referring to “Cooling System Draining: M13A / M15A / M16A in Section 1F”.
3) Remove exhaust manifold referring to “Exhaust Manifold Removal and Installation: M13A / M15A / M16A in Section 1K”.
4) Remove heat exchanger inlet No. 1 hose and outlet No. 1 hose.
5) Remove heat exchanger, O-ring and gasket by removing heat exchanger stand bolt.

Installation

Reverse removal procedure for installation noting the followings.

- Use new stand bolt gasket.
- Apply engine oil to new O-ring and install it to heat exchanger.
- Install heat exchanger (1) while matching the projection of heat exchanger (2) in rib of the cylinder block (3) as shown in figure.
- Install heat exchanger stand bolt (4) to specified torque.

Tightening torque
Heat exchanger stand bolt (a): 22 N·m (2.2 kgf-m, 16.0 lbf-ft)

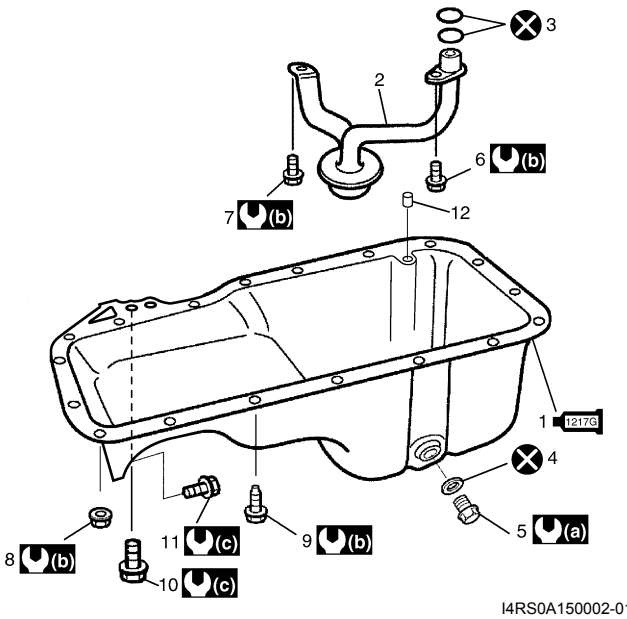


I6RS0B151002-01

- Refill cooling system with coolant referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
- Refill engine with engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B”.
- Upon completion of installation, check for engine coolant and oil leaks.

Oil Pan and Oil Pump Strainer Components

S7N20A1516004



I4RS0A150002-01

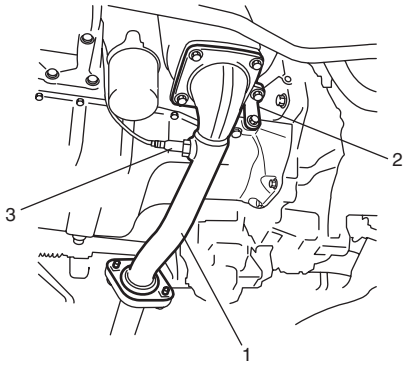
1217G	1.	Oil pan : Apply sealant 99000-31260 to mating surface.
	2.	Strainer
	3.	O-ring
	4.	Gasket
	5.	Drain plug
	6.	Strainer bolt
	7.	Bracket bolt
	8.	Oil pan nut
	9.	Oil pan bolt (M6)
	10.	Oil pan bolt (M10)
	11.	Transaxle stiffener bolt
(a)	:	35 N·m (3.5 kgf-m, 25.5 lbf-ft)
(b)	:	Tighten 11 N·m (1.1 kgf-m, 8.0 lbf-ft) by the specified procedure.
(c)	:	55 N·m (5.5 kgf-m, 40.0 lbf-ft)
	:	Do not reuse.

Oil Pan and Oil Pump Strainer Removal and Installation

S7N20A1516005

Removal

1) Remove oil level gauge.
2) Drain engine oil by removing drain plug.
3) Remove exhaust No.1 pipe (1), exhaust manifold stiffener (2) and heated oxygen sensor No.1 (connector color: green) (3) referring to “Exhaust System Components: M13A / M15A / M16A in Section 1K”.

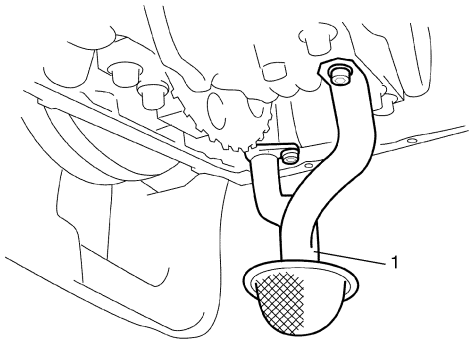


I4RS0A150003-01

4) Remove clutch housing lower plate (1).

I4RS0A150004-01

5) Remove oil pan and then oil pump strainer (1) from cylinder block.

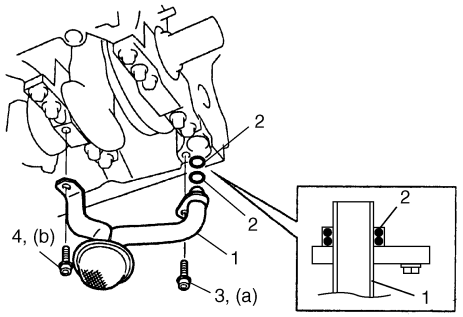


I2RH0B150010-01

Installation

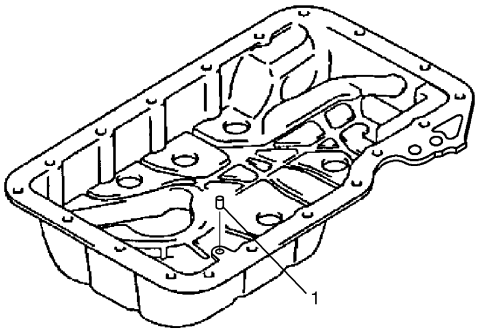
1) Install new O-rings (2) in the position as shown in the figure and install oil pump strainer (1).
Tighten strainer bolt (3) first and then bracket bolt (4) to specified torque.

Tightening torque
Oil pump strainer bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
Oil pump strainer bracket bolt (b): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I2RH0B150012-01

2) Install dowel pin (1) to oil pan.

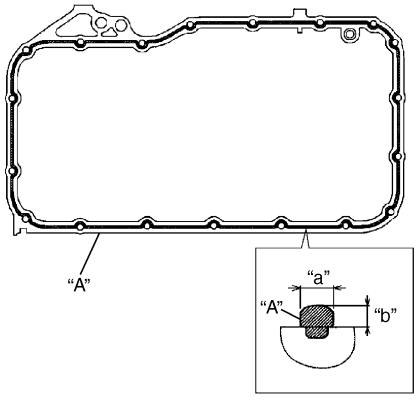


I4RS0A150005-01

3) Apply sealant continuously to oil pan mating surface as shown in the figure.

"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.)

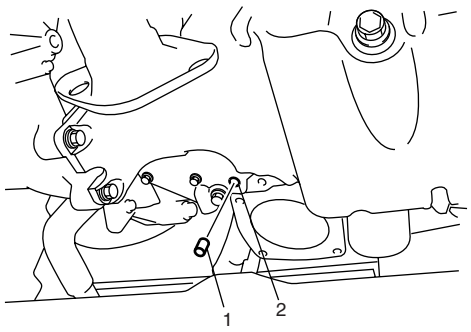


I4RS0A150006-01

4) Install oil pan to cylinder block temporarily.
5) Insert knock pin (1) in hole (2) of oil pan in order to locate oil pan precisely.

NOTE

Knock pin is available as a spare part (part number: 04211–13189).



I4RS0A150007-01

6) After fitting oil pan to cylinder block, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time. Tighten bolts and nuts to specified torque.

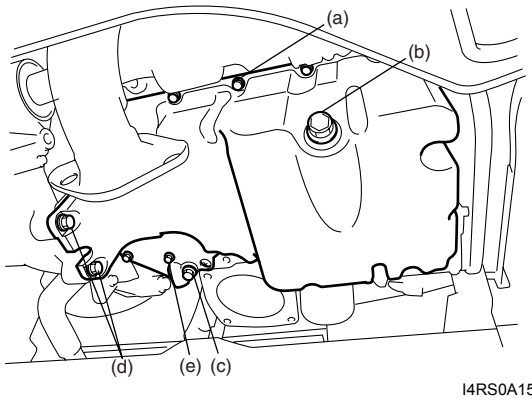
Tightening torque
Oil pan bolt (M6) (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
Oil pan bolt (M10) (c): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
Oil pan nut (e): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

7) Install new gasket and drain plug to oil pan.
Tighten drain plug to specified torque.

Tightening torque
Oil pan drain plug (b): 35 N·m (3.5 kgf-m, 25.5 lbf-ft)

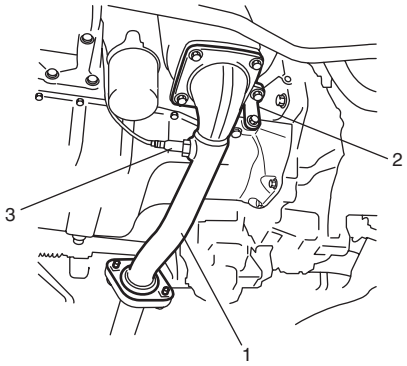
8) Tighten transaxle stiffener bolts to specified torque.

Tightening torque
Transaxle stiffener bolt (d): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)



I4RS0A150008-01

9) Install exhaust manifold stiffener (2) and exhaust No.1 pipe (1) and heated oxygen sensor No.1 (connector color: green) (3) referring to “Exhaust System Components: M13A / M15A / M16A in Section 1K”.



I4RS0A150003-01

10) Install clutch housing lower plate (1).

I4RS0A150004-01

11) Install oil level gauge.

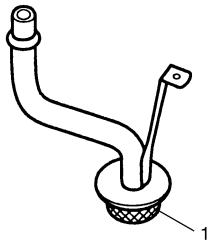
12) Refill engine with engine oil referring to “Engine Oil and Filter Change (Petrol Engine) in Section 0B”.

13) Verify that there is no engine oil leakage and exhaust gas leakage at each connection.

Oil Pan and Oil Pump Strainer Cleaning

S7N20A1516006

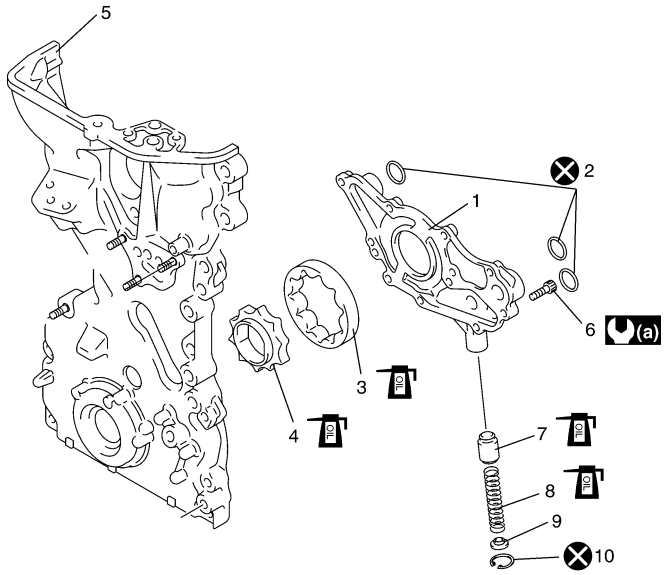
- Clean sealing surface between oil pan and cylinder block.
  Remove oil, old sealant, and dust from sealing surface.
- Clean oil pump strainer screen (1).



I2RH0B150016-01

Oil Pump Components

S7N20A1516007



I4RS0A150010-01

1. Rotor plate	6. Rotor plate bolt	10. Circlip
2. O-ring	7. Relief valve	(a) : 11 N·m (1.1 kgf-mm 8.0 lbf-ft)
3. Outer rotor	8. Spring	: Do not reuse.

4. Inner rotor	9. Retainer	: Apply thin coat of engine oil to sliding surface.
5. Timing chain cover	10. Circlip	

Oil Pump Removal and Installation

S7N20A1516008

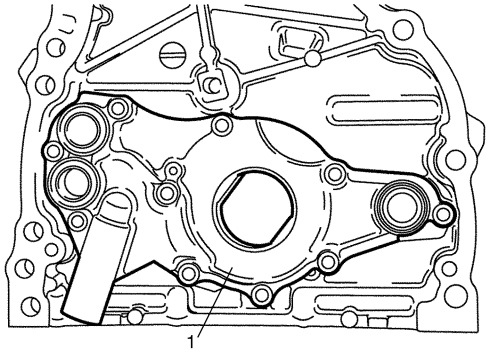
Oil pump is incorporated with timing chain cover.
For removal and installation, refer to “Timing Chain Cover Removal and Installation: M13A / M15A / M16A in Section 1D”.

Oil Pump Disassembly and Reassembly

S7N20A1516009

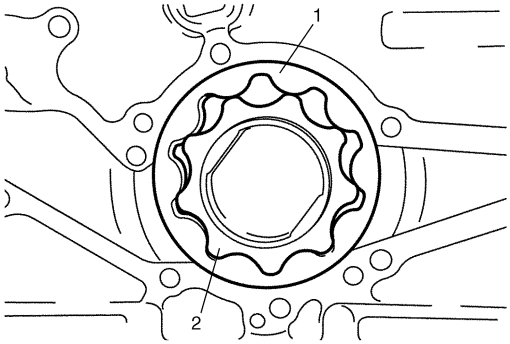
Disassembly

1) Remove rotor plate (1) by removing its mounting bolts.



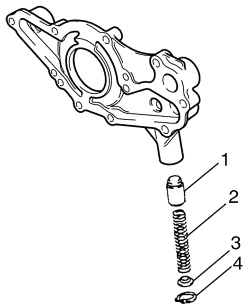
I2RH0B150018-01

2) Remove outer rotor (1) and inner rotor (2).



I2RH0B150019-01

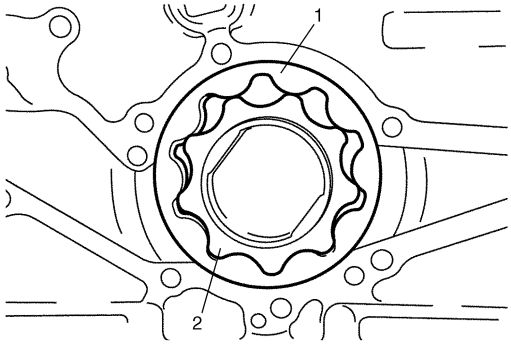
3) Remove relief valve (1), spring (2) and retainer (3) by removing circlip (4).



I2RH0B150020-01

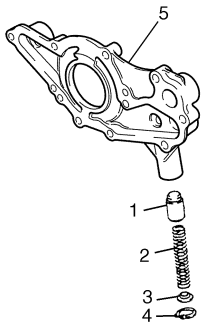
Reassembly

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.



I2RH0B150019-01

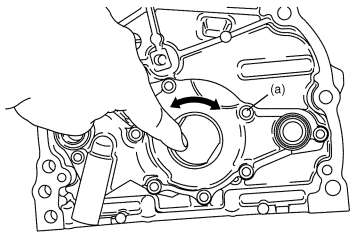
4) Apply engine oil to relief valve (1) and spring (2), and install them with retainer (3) and new circlip (4) to rotor plate (5).



I3RM0A150005-01

5) Install rotor plate and tighten all bolts to specified torque. After installing plate, check to be sure that rotors turn smoothly by hand (0.3 N·m (0.03 kgf-m, 0.25 lbf-ft) torque or below).

Tightening torque
Oil pump rotor plate bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



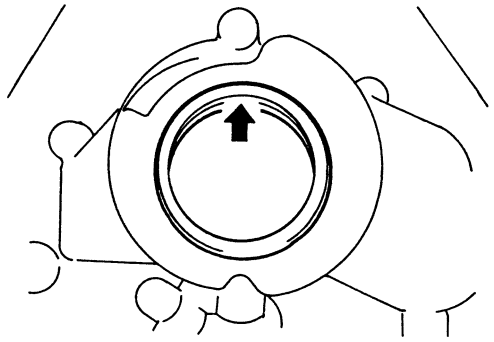
I2RH0B150022-01

Oil Pump Inspection

S7N20A1516010

Oil Seal

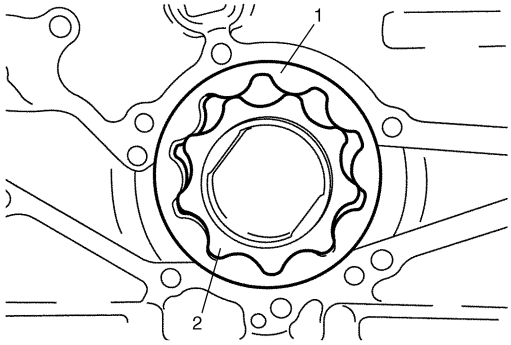
Check oil seal lip for fault or other damage. Replace as necessary.



I2RH0B150023-01

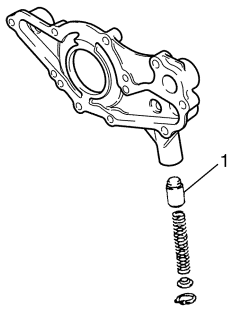
Oil Pump

- Check outer (1) and inner rotors (2), rotor plate, and oil pump case for excessive wear or damage.



I2RH0B150019-01

- Check relief valve (1) for excessive wear or damage and operates smoothly.

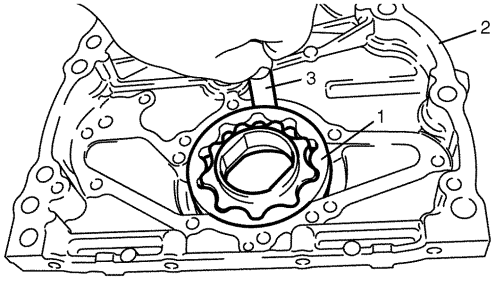


I2RH0B150025-01

Radial clearance

Check radial clearance between outer rotor (1) and case (2) using thickness gauge (3).
If clearance exceeds its limit, replace outer rotor or case.

Radial clearance between outer rotor and case for oil pump
Limit: 0.310 mm (0.0122 in.)

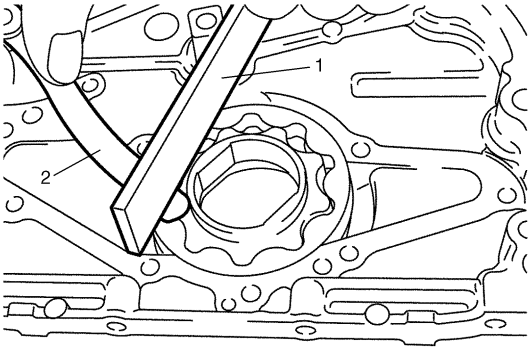


I2RH0B150026-01

Side clearance

Using straightedge (1) and thickness gauge (2), measure side clearance.
If side clearance exceeds its limit, replace oil pump assembly.

Side clearance for oil pump inner rotor
Limit: 0.15 mm (0.0059 in.)

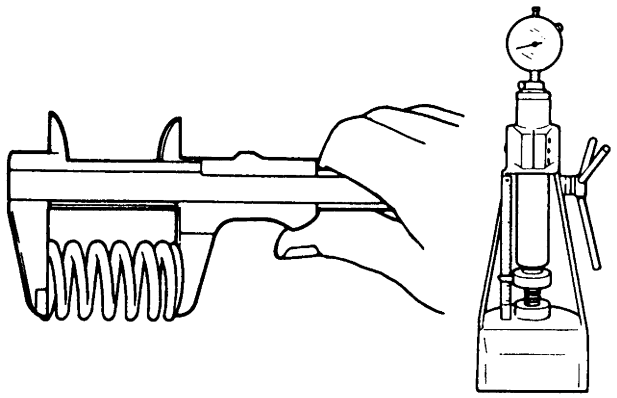


I2RH0B150027-01

Relief valve spring free length and load
Check relief valve spring free length and load as shown in the figure. If the measured valve spring length is lower than the specification, replace relief valve spring.

Relief valve spring free length and load

	Standard	Limit
Free length	**52.4 mm (2.06 in.)**	**—**
Load at spring length 38.5 mm (1.52 in.)	**77 N (7.7 kgf, 17.0 lb)**	**69 N (6.9 kgf, 15.0 lb)**



I2RH01150023-01

Specifications

Tightening Torque Specifications

S7N20A1517001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Oil pressure switch	13	1.3	9.5	☞
Heat exchanger stand bolt	22	2.2	16.0	☞
Oil pump strainer bolt	11	1.1	8.0	☞
Oil pump strainer bracket bolt	11	1.1	8.0	☞
Oil pan bolt (M6)	11	1.1	8.0	☞
Oil pan bolt (M10)	55	5.5	40.0	☞
Oil pan nut	11	1.1	8.0	☞
Oil pan drain plug	35	3.5	25.5	☞
Transaxle stiffener bolt	55	5.5	40.0	☞
Oil pump rotor plate bolt	11	1.1	8.0	☞

NOTE

The specified tightening torque is also described in the following.
“Heat Exchanger Components (For M16A Engine Model): M13A / M15A / M16A”
“Oil Pan and Oil Pump Strainer Components: M13A / M15A / M16A”
“Oil Pump Components: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1518001

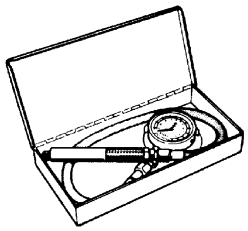
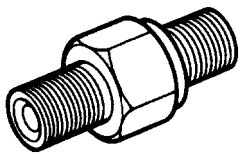
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞

NOTE

Required service material is also described in the following.
"Heat Exchanger Components (For M16A Engine Model): M13A / M15A / M16A"
"Oil Pan and Oil Pump Strainer Components: M13A / M15A / M16A"
"Oil Pump Components: M13A / M15A / M16A"

Special Tool

S7N20A1518002

09915–77310 Oil pressure gauge (0-10kg/cm²) ☞		09915–78211 Oil pressure gauge attachment ☞	

D13A / Z13DTJ

Diagnostic Information and Procedures

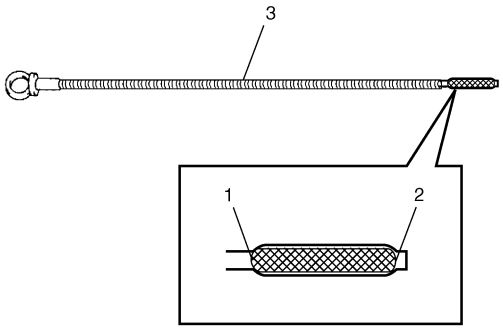
Oil Pressure Check

S7N20A1524001

⚠ WARNING

To avoid danger of being burned, do not touch exhaust manifold when exhaust system is hot.

1) Prior to checking oil pressure, check the following items.
   - Oil level in oil pan
     If oil level is low, add oil up to full level mark (1) on oil level gauge (3).
   - Oil quality
     If oil is discolored or deteriorated, change it. For particular oil to be used, refer to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”.
   - Oil leaks
     If leak is found, repair it.



I3RB0A153001-01

2. Low level mark

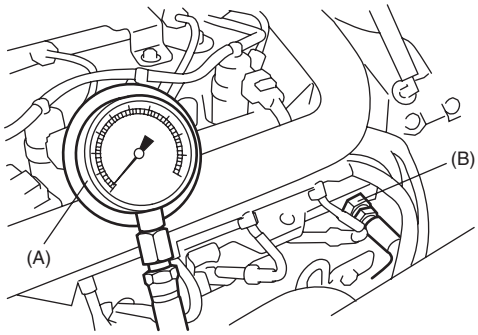
2) Remove oil pressure switch referring to “Oil Pressure Switch Removal and Installation: D13A / Z13DTJ”.

3) Install special tools to vacated threaded hole.

⚠ CAUTION

Be careful not to make special tool touch exhaust manifold when installing because exhaust manifold becomes very hot.

Special tool
(A): 09915–77311
(B): 09919–46010



I5RS0B150001-01

4) Start engine and warm it up to normal operating temperature.

NOTE

Be sure to place transmission gear shift lever in “Neutral” and set parking brake and block drive wheels.

5) After warming up, measure oil pressure at specified engine speed.

NOTE

For specified idle speed, refer to “Idle Speed Inspection: D13A / Z13DTJ in Section 1A”.

Oil pressure specification:
More than 100 kPa (1.0 kgf/cm^2, 14.5 psi, 1.00 bar) at specified idle speed
300 – 400 kPa (3.1 – 4.1 kgf/cm^2, 43.5 – 58.0 psi, 3.10 – 4.10 bar) at 4000 rpm.

6) Stop engine, and remove oil pressure gauge and attachment.
7) Install oil pressure switch referring to “Oil Pressure Switch Removal and Installation: D13A / Z13DTJ”.
8) Start engine, and check oil pressure switch for oil leakage.
   If oil leakage is found, repair it.

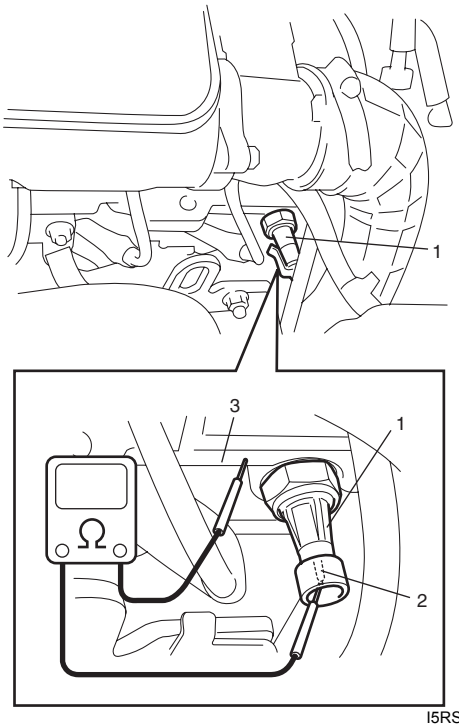
Repair Instructions

Oil Pressure Switch On-Vehicle Inspection

S7N20A1526013

1) Disconnect oil pressure switch (1) lead wire.
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 (1).

Oil pressure sensor specification
During engine running: No continuity
At engine stop: Continuity



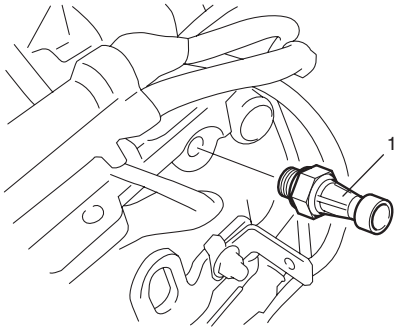
I5RS0B930002-01

Oil Pressure Switch Removal and Installation

S7N20A1526001

Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Disconnect oil pressure switch connector.
4) Remove oil pressure switch (1) from cylinder head.



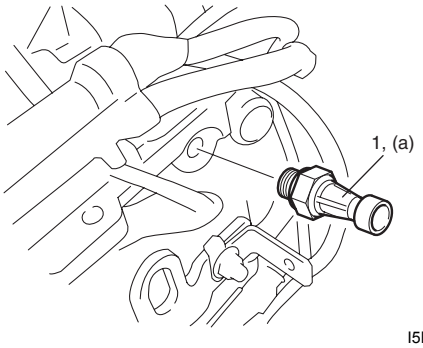
I5RS0B150002-01

Installation

Reverse removal procedure for installation noting the following.

- Check oil pressure switch gasket for deterioration and damage. If malfunction is found, replace oil pressure switch.
- Tighten oil pressure switch (1) to specified torque.

Tightening torque
Oil pressure switch (a): 32 N·m (3.3 kgf-m, 24.0 lbf-ft)



I5RS0B150003-01

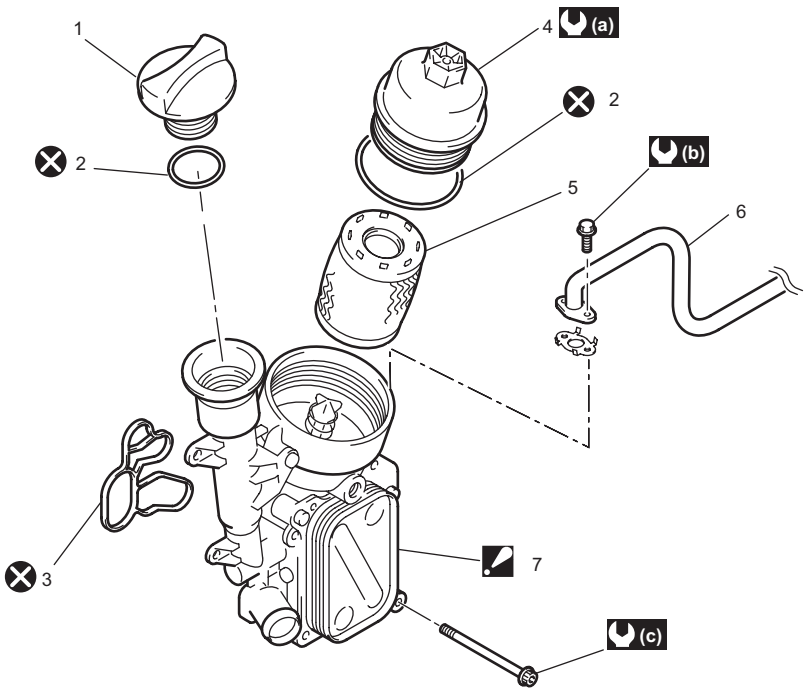
- Install engine cover.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

- Check to make sure that there is no engine oil leakage.

Oil Cooler Components

S7N20A1526002



I7V20A152003-01

1. Filler cap	4. Oil filter housing cover	7. Oil cooler assembly : Never disassemble oil cooler assembly.	(c) : 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)
2. O-ring	5. Oil filter	(a) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)	: Do not reuse.
3. Gasket	6. Coolant feed pipe	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)	

Oil Cooler Removal and Installation

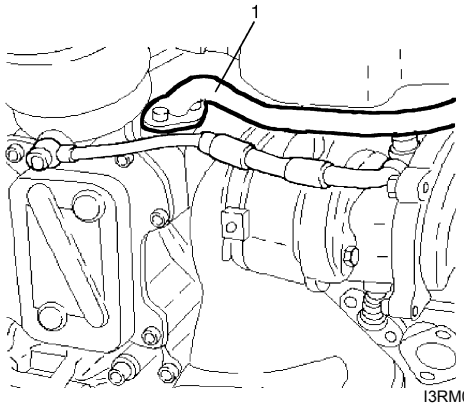
S7N20A1526003

⚠ CAUTION

Never disassemble oil cooler assembly. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.

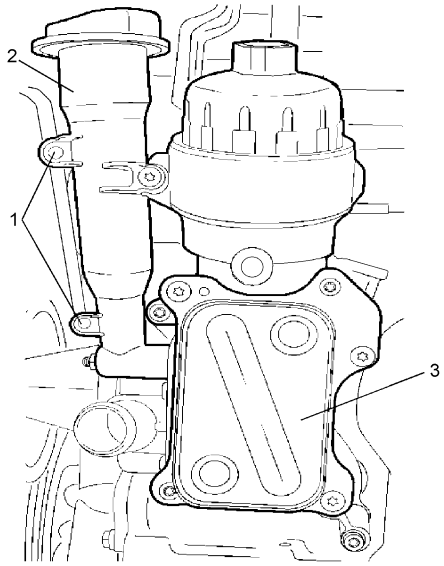
Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant referring to “Cooling System Draining: D13A / Z13DTJ in Section 1F”.
3) Remove air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
4) Remove intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
5) Remove lubrication pipe referring to “Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D”.
6) Remove coolant feed pipe (1) and radiator outlet hose.



I3RM0B152005-01

7) Disconnect wire harness clamps (1) from filler port (2).
8) Remove oil cooler assembly (3).



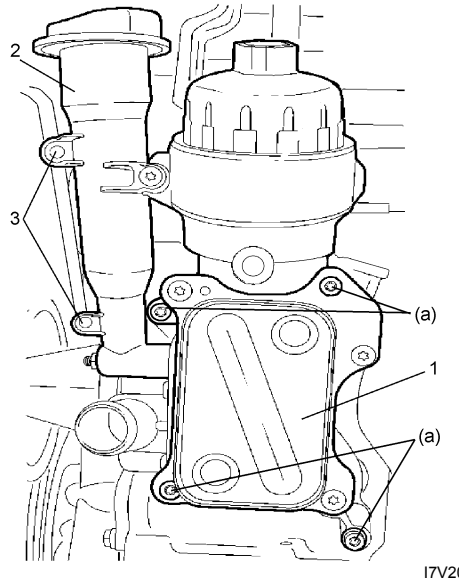
I7V20A152005-01

Installation

1) Install oil cooler assembly (1) using new gasket.

Tightening torque
Oil cooler bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)

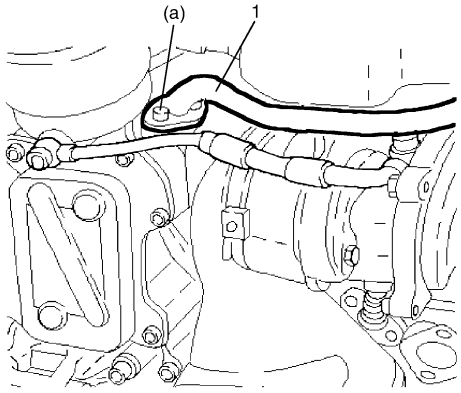
2) Connect wire harness clamp (3) to filler port (2).



I7V20A152006-01

3) Install coolant feed pipe (1) and lower hose.

Tightening torque
Coolant feed pipe bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

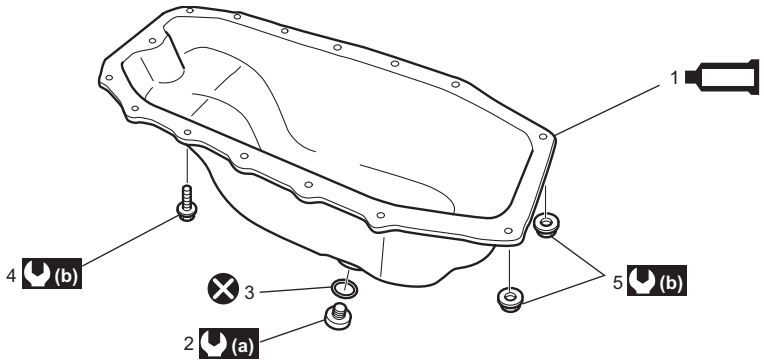


I3RM0B152018-01

4) Install lubrication pipe referring to “Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D”.
5) Install intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
6) Install air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
7) Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F”.
8) Connect negative (–) cable at battery.
9) Check to make sure that there is no oil leakage and coolant leakage at each connection.

Oil Pan Components

S7N20A1526004



I7V20A152007-01

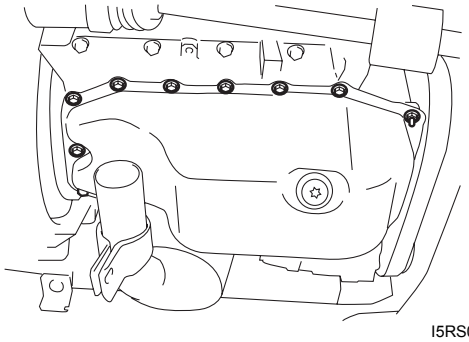
1. Oil pan : Apply sealant 99000-85E11 to mating surface.	3. O-ring	(b) : 9.0 N·m (0.92 kgf-m, 6.5 lbf-ft)
2. Drain plug	(a) : 20 N·m (2.0 kgf-m, 15.0 lbf-ft)	: Do not reuse.

Oil Pan Removal and Installation

S7N20A1526005

Removal

1) Remove oil level gauge.
2) Hoist vehicle.
3) Drain engine referring to “Engine Oil and Filter Change (Diesel Engine) in Section 0B”.
4) Remove exhaust No.1 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
5) Remove transaxle stiffener referring to “Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B”.
6) Remove oil pan bolts and nuts.



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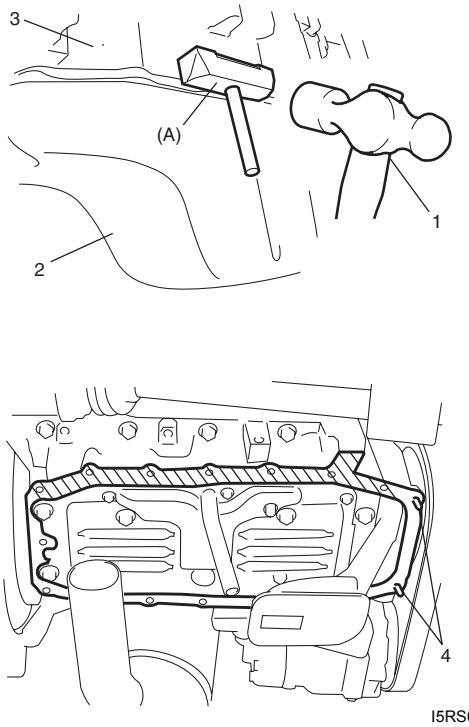
7) Cut sealant at hatched part shown in the figure using special tool and hammer (1).

Special tool
(A): 09921–96510

NOTE

Be careful not to damage stud bolt (4) between oil pan and crankcase when cutting sealant.

8) Remove oil pan (2) from lower crankcase (3).



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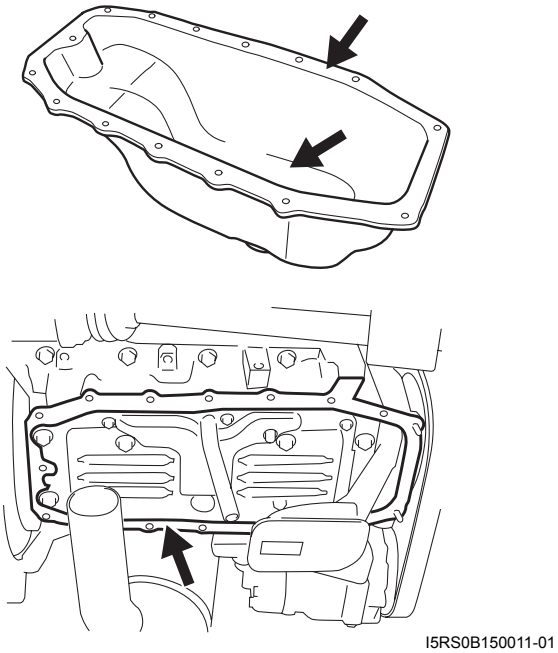
Installation

1) Clean mating surfaces of oil pan and lower crankcase.



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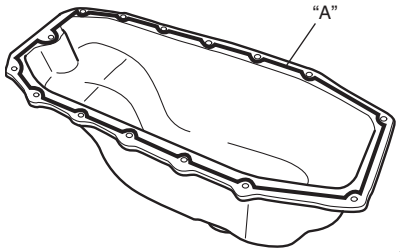
2) Apply sealant to oil pan mating surface continuously as shown in the figure.

"A": Sealant 99000–85E11 (Three Bond TB 1227®)



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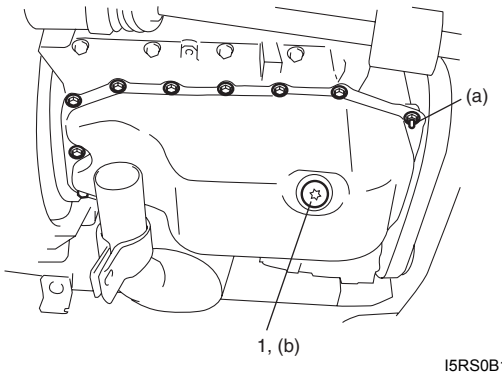
3) After fitting oil pan to lower crankcase, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time. Tighten oil pan bolts and nuts to specified torque.

Tightening torque
Oil pan bolt and nut (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)

4) Install new O-ring and drain plug (1) to oil pan. Tighten drain plug to specified torque.

Tightening torque
Drain plug (b): 20 N·m (2.0 kgf-m, 14.5 lbf-ft)



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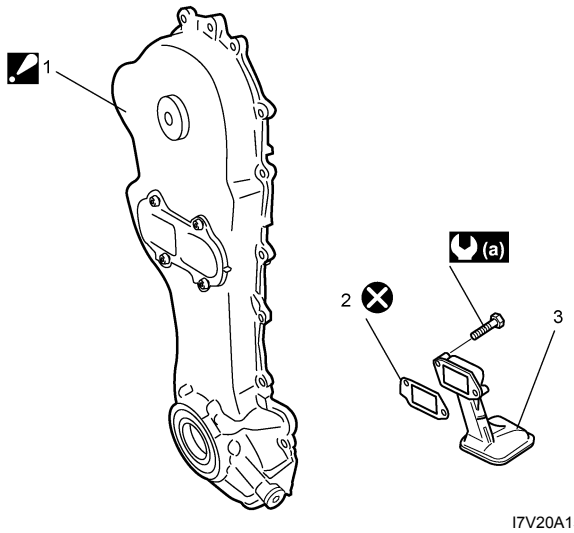
5) Install transaxle stiffener referring to "Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B".
6) Install exhaust No.1 pipe referring to "Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K".
7) Connect oil level switch connector.
8) Install oil level gauge.
9) Refill engine with engine oil referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B".
10) Check to make sure that there is no engine oil leakage and exhaust gas leakage at each connection.

Oil Pump / Oil Pump Strainer Components

S7N20A1526008



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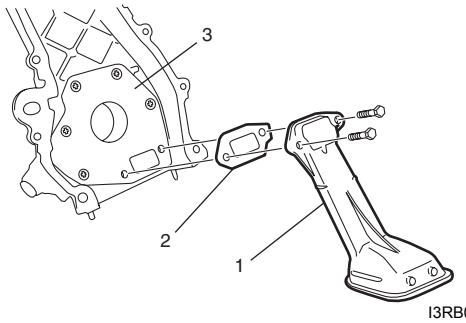
1. Timing chain cover : Oil pump is incorporated with timing chain cover.	(a) : 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)
2. Oil pump strainer gasket	: Do not reuse.
3. Oil pump strainer	

Oil Pump / Oil Pump Strainer Removal and Installation

S7N20A1526009

Removal

1) Remove timing chain cover referring to “Timing Chain Cover and Timing Chain Removal and Installation: D13A / Z13DTJ in Section 1D”.
2) Remove oil pump strainer (1) and gasket (2) from rotor plate (3).



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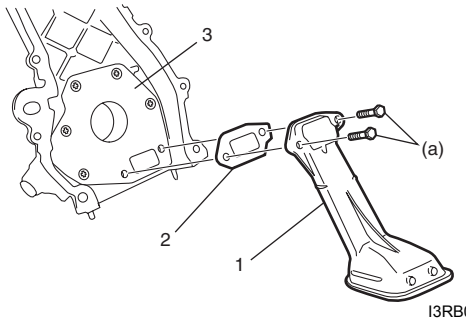
Installation

Reverse removal procedure for installation noting the following.

- Clean mating surfaces of timing chain cover (3) and oil pump strainer (1).
- Install oil pump strainer with new gasket (2) to timing chain cover.
- Tighten oil strainer bolts to specified torque.

Tightening torque
Oil strainer bolt (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



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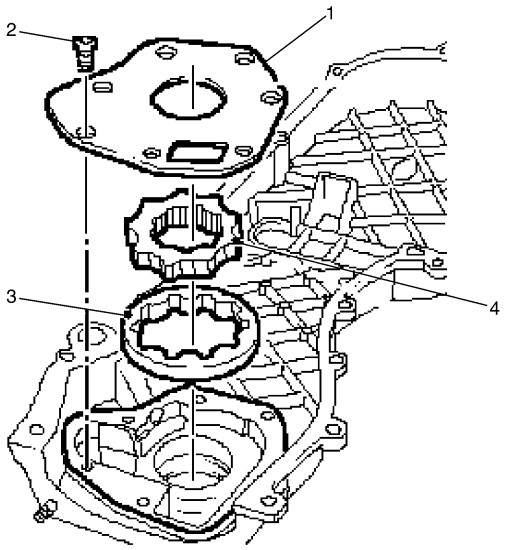
Oil Pump Disassembly and Reassembly

S7N20A1526012

Disassembly

1) Remove rotor plate (1) by removing its mounting bolts (2).
2) Remove outer rotor (3) and inner rotor (4) from timing chain cover.



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Reassembly

For reassembly, reverse disassembly procedure noting the following.

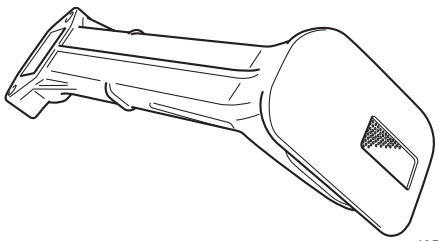
- Wash, clean and then dry all disassembled parts.
- Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, inside surfaces of timing chain cover and rotor plate.
- Tighten rotor plate bolts to specified torque.

Tightening torque
Rotor plate bolt: 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

Oil Pump Strainer Cleaning

S7N20A1526010

Clean oil pump strainer screen.



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Oil Pump Inspection

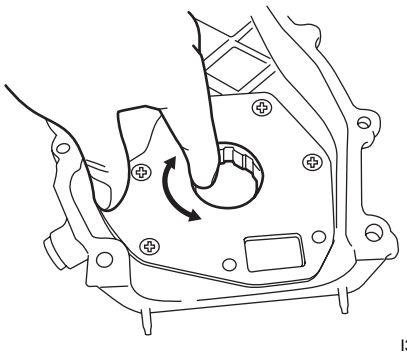
S7N20A1526011

Oil Seal

Refer to “Timing Chain Cover and Timing Chain Inspection: D13A / Z13DTJ in Section 1D”.

Oil Pump

Check rotor turn smoothly by hand.
If rotors is not smoothly, replace timing chain cover.



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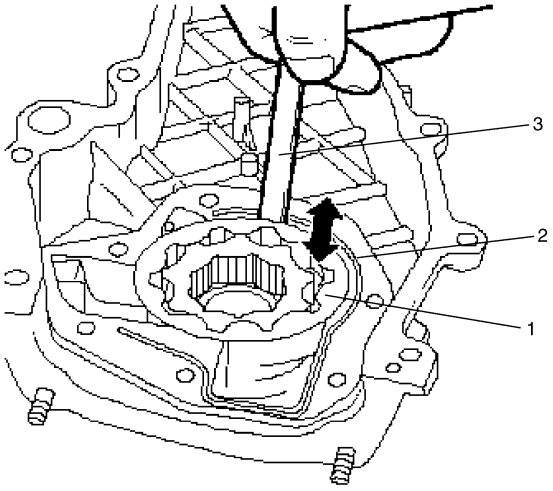
Radial clearance

Check radial clearance between outer rotor (1) and timing chain cover (2) using thickness gauge (3). If clearance is out of specification, replace timing chain cover.

Radial clearance between outer rotor and timing chain cover for oil pump:
0.10 – 0.23 mm (0.004 – 0.009 in.)

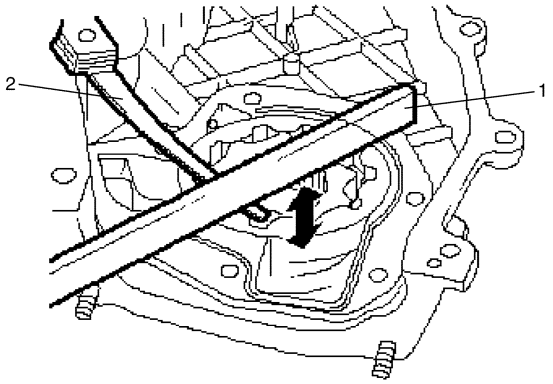


I5RS0B150016-01

Side clearance

Using straightedge (1) and thickness gauge (2), measure side clearance. If side clearance is out of specification, replace timing chain cover.

Side clearance for oil pump inner rotor:
0.050 – 0.075 mm (0.0020 – 0.0029 in.)



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Specifications

Tightening Torque Specifications

S7N20A1527001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Oil pressure switch	32	3.3	24.0	☞
Engine cover bolt	8.0	0.82	6.0	☞
Oil cooler bolt	9.0	0.92	7.0	☞
Coolant feed pipe bolt	10	1.0	7.5	☞
Oil pan bolt and nut	9.0	0.92	7.0	☞
Drain plug	20	2.0	14.5	☞
Oil strainer bolt	9.0	0.92	7.0	☞
Rotor plate bolt	10	1.0	7.5	☞

NOTE

The specified tightening torque is also described in the following.
“Oil Cooler Components: D13A / Z13DTJ”
“Oil Pan Components: D13A / Z13DTJ”
“Oil Pump / Oil Pump Strainer Components: D13A / Z13DTJ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1528001

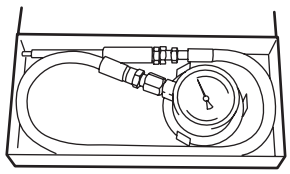
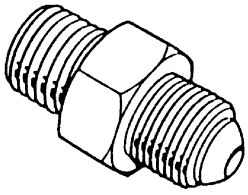
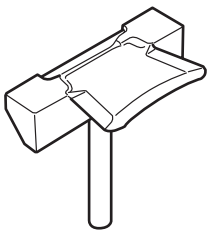
Material	SUZUKI recommended product or Specification		Note
Sealant	Three Bond TB 1227®	P/No.: 99000–85E11	☞

NOTE

Required service material is also described in the following.
“Oil Pan Components: D13A / Z13DTJ”

Special Tool

S7N20A1528002

09915–77311 Oil pressure gauge ☞ 	09919–46010 Fuel pressure hose attachment ☞ 
09921–96510 Oil pan seal cutter ☞ 	

Engine Cooling System

M13A / M15A / M16A

General Description

Cooling System Description

S7N20A1611001

The cooling system consists of the radiator cap, radiator, coolant reservoir, hoses, water pump, cooling fan and thermostat. The radiator is of tube-and-fin type.

Coolant Description

S7N20A1611002

⚠ WARNING

- **Do not remove radiator cap to check engine coolant level; check coolant visually at the see-through coolant reservoir. Coolant should be added only to reservoir as necessary.**
- **As long as there is pressure in the cooling system, the temperature can be considerably higher than the boiling temperature of the solution in the radiator without causing the solution to boil. Removal of the radiator cap while engine is hot and pressure is high will cause the solution to boil instantaneously and possibly with explosive force, spewing the solution over engine, fenders and person removing cap. If the solution contains flammable anti-freeze such as alcohol (not recommended for use at any time), there is also the possibility of causing a serious fire.**
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cable from battery terminal before removing any part.**

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 50/50 mixture of water and ethylene glycol antifreeze.
This 50/50 mixture coolant solution provides freezing protection to –36 °C (–33 °F).

- Maintain cooling system freeze protection at –36 °C (–33 °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 –36 °C (–33 °F).

NOTE

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Coolant must be mixed with deminerated water or distilled water.**

Anti-freeze proportioning table

		For M/T and Automated Manual Transaxle models	For A/T model
Freezing temperature	°C	–36	–36
	°F	–33	–33
Anti-freeze / Anti-corrosion coolant concentration	%	50	50
Ratio of compound to cooling water	ltr.	3.10/3.10	3.05/3.05
	US pt.	6.55/6.55	6.44/6.44
	Imp pt.	5.46/5.46	5.37/5.37

Coolant capacity

For M/T and Automated Manual Transaxle models:

- **Engine, radiator and heater: 5.5 liters (11.62/9.68 US/Imp pt.)**
- **Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)**
- **Total: 6.2 liters (13.10/10.91 US/Imp pt.)**

For A/T model:

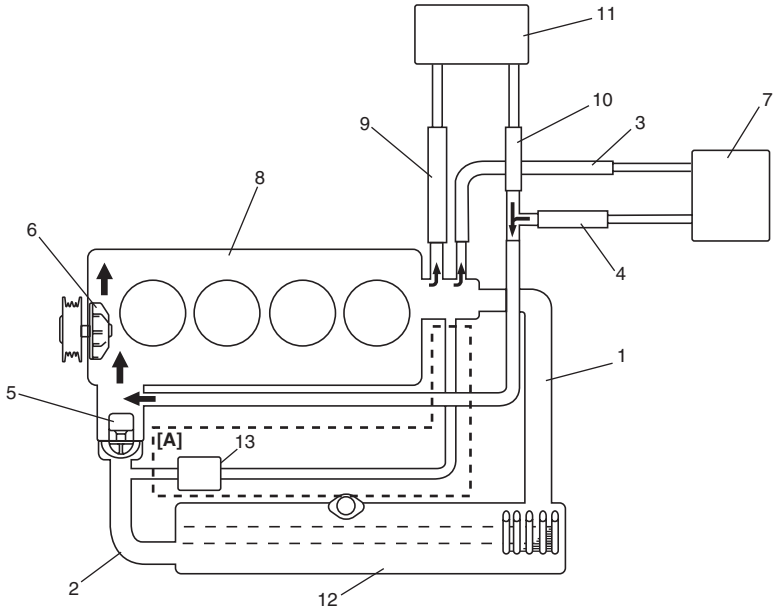
- **Engine, radiator and heater: 5.4 liters (11.41/9.50 US/Imp pt.)**
- **Reservoir: 0.7 liters (1.48/1.23 US/Imp pt.)**
- **Total: 6.1 liters (12.89/10.74 US/Imp pt.)**

Schematic and Routing Diagram

Coolant Circulation

S7N20A1612001

While the engine is warmed up (thermostat closed), coolant circulates as follows.



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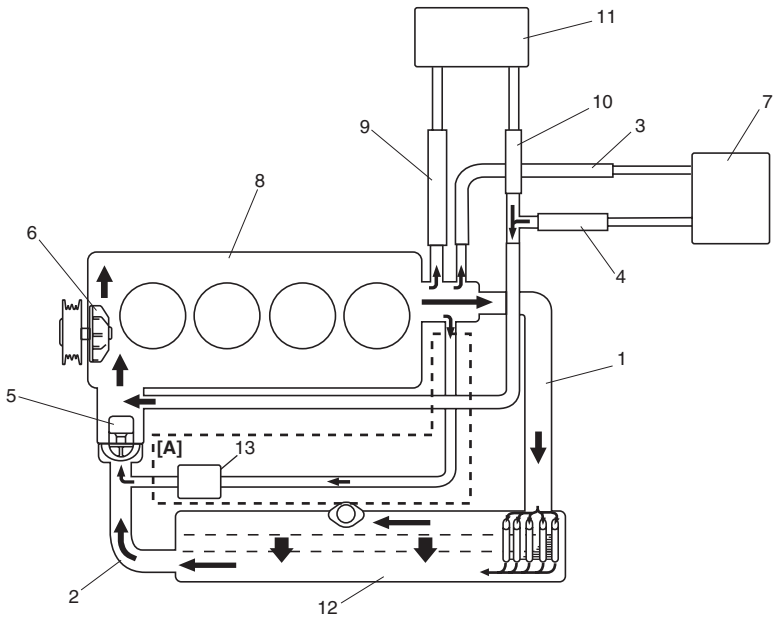
[A]: For M16A engine model only	5. Thermostat	10. Heater core outlet hose
1. Radiator inlet hose	6. Water pump	11. Heater core
2. Radiator outlet hose	7. Throttle body	12. Radiator
3. Throttle body inlet hose	8. Engine	13. Heat exchanger
4. Throttle body outlet hose	9. Heater core inlet hose	

When coolant is warmed up to normal temperature and the thermostat opens, coolant passes through the radiator core to be cooled as follows.



I6RS0B161002-01

[A]: For M16A engine model only	5. Thermostat	10. Heater core outlet hose
1. Radiator inlet hose	6. Water pump	11. Heater core
2. Radiator outlet hose	7. Throttle body	12. Radiator
3. Throttle body inlet hose	8. Engine	13. Heat exchanger
4. Throttle body outlet hose	9. Heater core inlet hose	

Diagnostic Information and Procedures

Engine Cooling Symptom Diagnosis

S7N20A1614001

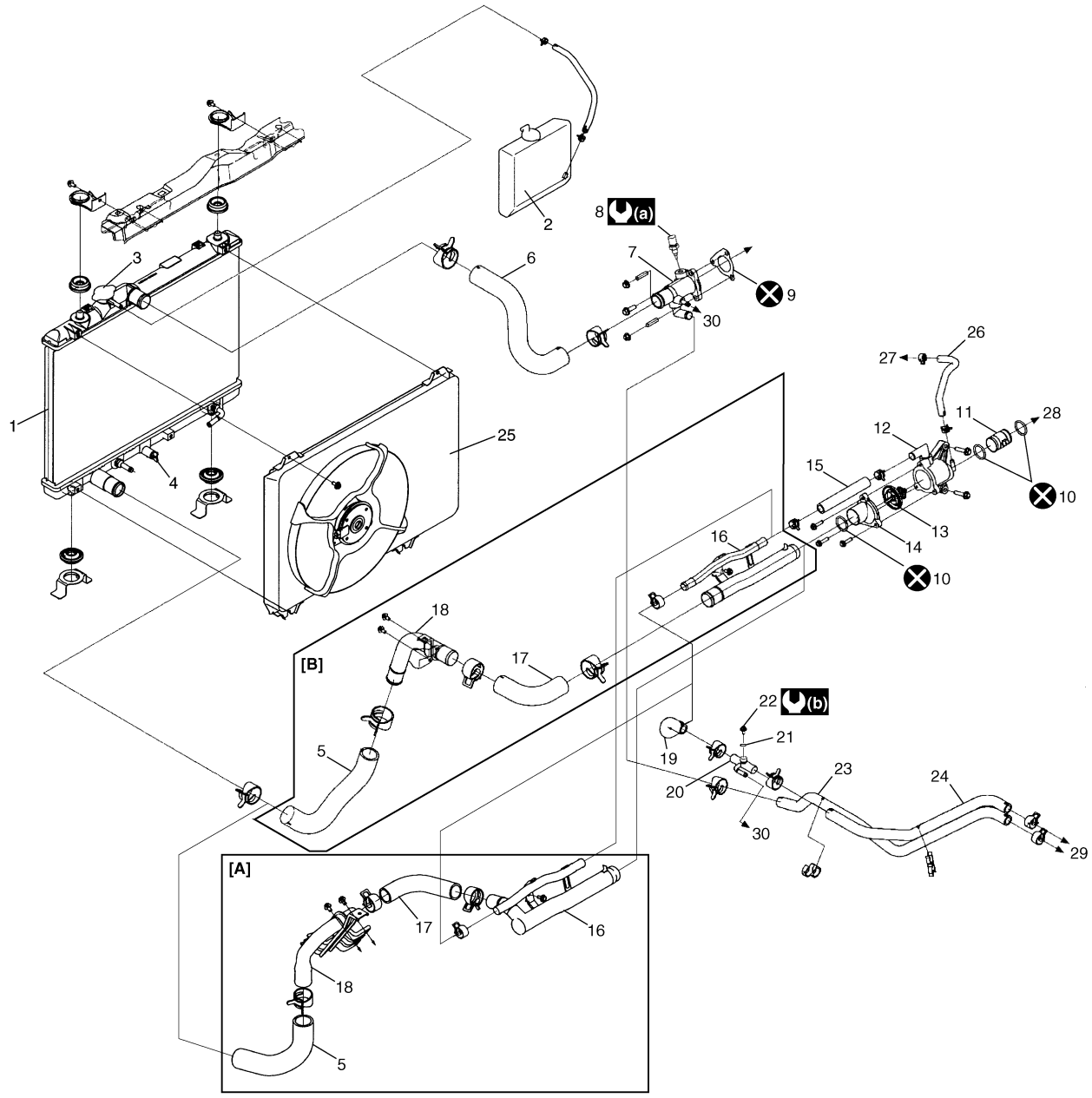
Condition	Possible cause	Correction / Reference Item
Engine overheats (Radiator fan operates)	Loose or broken water pump belt	*Adjust or replace.*
	Not enough coolant	*Check coolant level and add as necessary.*
	Faulty thermostat	*Replace.*
	Faulty water pump	*Replace.*
	Dirty or bent radiator fins	*Clean or remedy.*
	Coolant leakage on cooling system	*Repair.*
	Clogged radiator	*Check and replace radiator as necessary.*
	Faulty radiator cap	*Replace.*
	Improper ignition timing	*Adjust.*
	Dragging brakes	*Adjust brake.*
	Slipping clutch	*Adjust or replace.*
	Poor charge battery	*Check and replace as necessary.*
	Poor generation generator	*Check and repair.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan relay No.2 and/or No.3 faulty	*Check and replace as necessary.*
	Radiator fan motor faulty	*Check and replace as necessary.*
	ECM faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	Equipped with too much electric load part(s)	*Dismount.*
Engine overheats (Radiator fan does not operate)	Fuse blown	*Check 30 A fuse of relay/fuse box and check for short circuit to ground.*
	Radiator cooling fan relay No.1 faulty	*Check and replace as necessary.*
	ECT sensor faulty	*Check and replace as necessary.*
	Radiator cooling fan motor faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check and replace as necessary.*

Repair Instructions

Cooling System Components

S7N20A1616001

For M13A and M15A Engine Models



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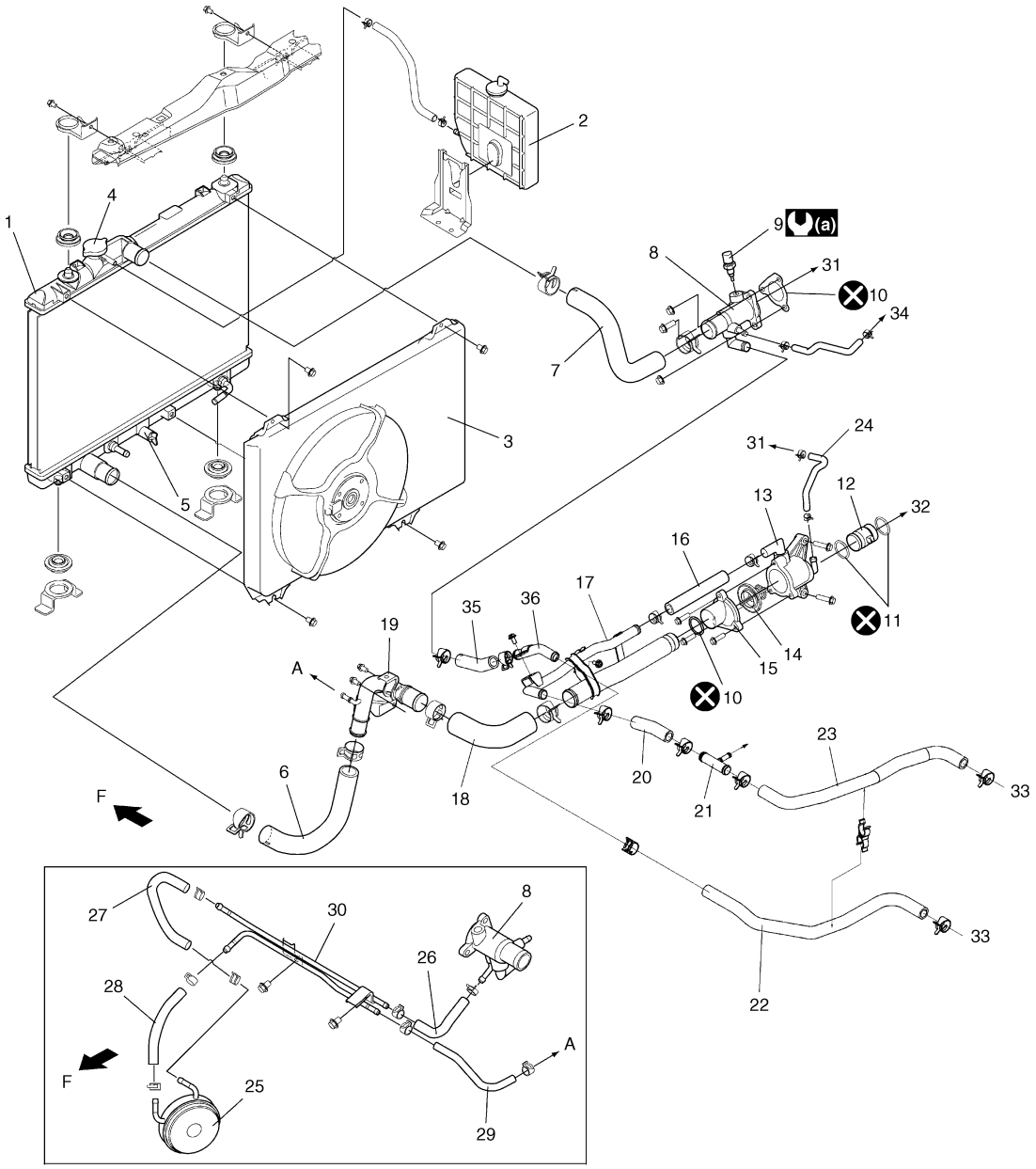
[A]: For Automated Manual Transaxle model	11. Thermostat case water outlet pipe	23. Heater inlet hose
[B]: For A/T and M/T models	12. Thermostat case	24. Heater outlet No.1 hose
1. Radiator	13. Thermostat	25. Engine cooling fan assembly
2. Reservoir	14. Thermostat cap	26. Water bypass No.2 hose
3. Radiator cap	15. Water bypass No.1 hose	27. To cylinder head
4. Drain plug	16. Water inlet No.1 pipe	28. To water pump
5. Radiator outlet hose	17. Water inlet hose	29. To heater core
6. Radiator inlet hose	18. Water inlet No.2 pipe	30. To throttle body
7. Water outlet cap	19. Heater outlet No.2 hose	(a): 15 N·m (1.5 kgf-m, 11.0 lbf-ft)
8. ECT sensor	20. Heater union	(b): 4.5 N·m (0.45 kgf-m, 3.5 lbf-ft)
9. Water outlet cap gasket	21. Heater union gasket	: Do not reuse.
10. O-ring	22. Air ventilation bolt	

For M16A Engine Model



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F: Vehicle forward	10. Water outlet cap gasket	20. Heater outlet No.2 hose	30. Heat exchanger water pipe
1. Radiator	11. O-ring	21. Heater union	31. To cylinder head
2. Reservoir	12. Thermostat case water outlet pipe	22. Heater inlet No.1 hose	32. To water pump
3. Engine cooling fan assembly	13. Thermostat case	23. Heater outlet No.1 hose	33. To heater core
4. Radiator cap	14. Thermostat	24. Water bypass No.2 hose	34. To throttle body
5. Drain plug	15. Thermostat cap	25. Heat exchanger	35. Heater inlet No.2 hose
6. Radiator outlet hose	16. Water bypass No.1 hose	26. Heat exchanger inlet No.1 hose	36. Heater inlet pipe
7. Radiator inlet hose	17. Water inlet No.1 pipe	27. Heat exchanger inlet No.2 hose	(a) : 15 N·m (1.5 kgf-m, 11.0 lbf-ft)
8. Water outlet cap	18. Water inlet hose	28. Heat exchanger outlet No.1 hose	(b) : 4.5 N·m (0.45 kgf-m, 3.5 lbf-ft)
9. ECT sensor	19. Water inlet No.2 pipe	29. Heat exchanger outlet No.2 hose	: Do not reuse.

Coolant Level Check

S7N20A1616002

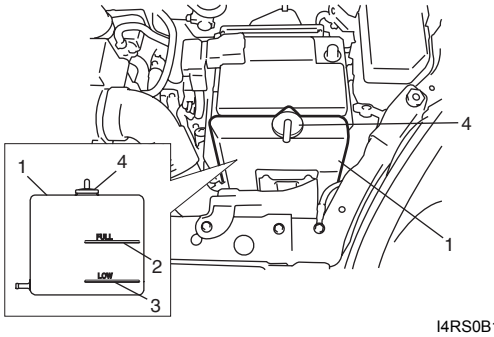
⚠ WARNING

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 radiator cap is taken off too soon.

To check level, lift hood and look at “see-through” coolant reservoir.
It is not necessary to remove radiator cap to check coolant level.
When engine is cool, check coolant level in reservoir (1). A normal coolant level should be between FULL mark (2) and LOW mark (3) on reservoir (1).
If coolant level is below LOW mark (3), remove reservoir cap (4) and add proper coolant to reservoir to bring coolant level up to FULL mark (2).

NOTE

If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



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Engine Cooling System Inspection and Cleaning

S7N20A1616003

⚠ WARNING

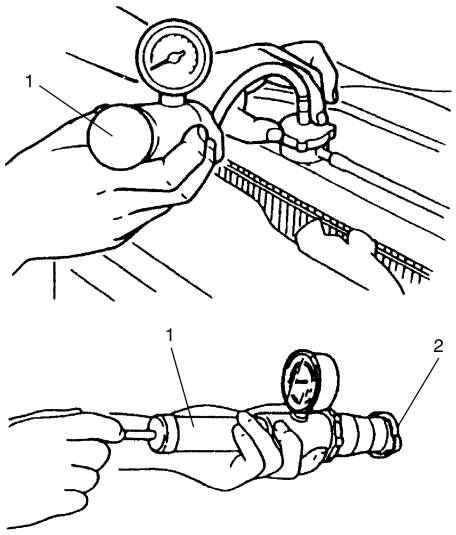
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) Check cooling system for leakage or damage.
2) Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3) Check coolant for proper level and freeze protection.
4) Using a pressure tester (1), check system and radiator cap (2) for proper pressure holding capacity. If replacement of cap is required, use a proper cap for this vehicle.

NOTE

After installing radiator cap to radiator, make sure that the ear of cap lines is parallel to radiator.

Cooling system and radiator cap holding pressure (for inspection)
110 kPa (1.1 kg/cm^2, 15.6 psi)



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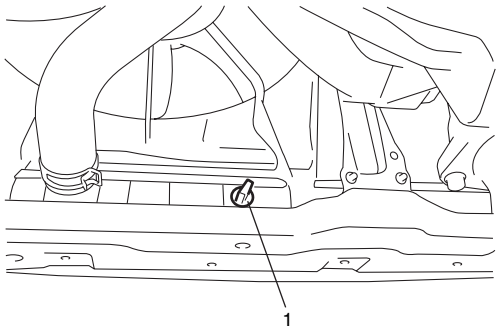
5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6) Clean frontal area of radiator core.

Cooling System Draining

S7N20A1616004

1) Remove radiator cap.
2) Drain coolant from radiator drain plug (1).
3) After draining coolant, be sure to tighten drain plug (1) securely.



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Cooling System Flush and Refill

S7N20A1616005

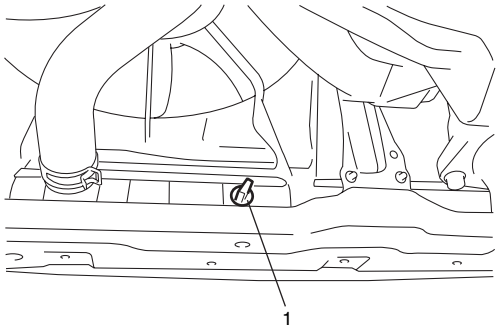
⚠ WARNING

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.

NOTE

For detail of coolant specification, refer to "Coolant Description: M13A / M15A / M16A".

1) Remove radiator cap when engine is cool as follows.
   a) Turn cap counterclockwise slowly until it reaches a "stop" (Do not press down while turning it).
   b) Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it counterclockwise.
2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3) Stop engine and drain coolant from radiator drain plug (1).
4) Close radiator drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
6) Close radiator drain plug (1) tightly.



I4RS0A160003-01

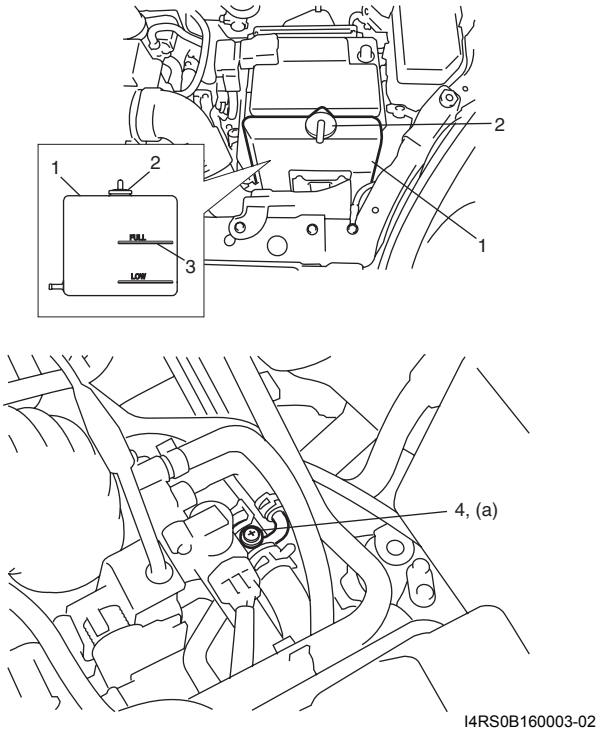
7) Remove reservoir (1) and remove cap (2) from reservoir (1).
8) Pour out any fluid, scrub and clean inside of reservoir with soap and water.
   Flush it well with clean water and drain, Reinstall reservoir.
9) Fill reservoir with coolant up to "Full" level mark (3).
10) Install reservoir cap (2) on reservoir.
11) Loosen air ventilation bolt (4) (if equipped) one and a half turns.
12) Fill radiator with coolant up to spilling coolant from air ventilation bolt (4).
13) Tighten air ventilation bolt (4) (if equipped) to specified torque.

Tightening torque
Air ventilation bolt (a): 4.5 N·m (0.45 kgf-m, 3.5 lbf-ft)

14) Fill radiator with coolant up to bottom of radiator filler neck and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
15) Run engine at idle speed.
16) Loosen air ventilation bolt (4) (if equipped) one and a half turns.
17) If equipped air ventilation bolt (4), run engine at 2000 – 3000 rpm, and tighten air ventilation bolt (4) to specified torque after spilling coolant from air ventilation bolt (4).

Tightening torque
Air ventilation bolt (a): 4.5 N·m (0.45 kgf-m, 3.5 lbf-ft)

18) Run engine until radiator fan motor is operated.
19) Stop engine and wait until engine comes cooled down to help avoid danger of being burned.
20) Add coolant to radiator up to bottom of radiator filler neck, and install radiator cap, making sure that the ear of cap lines is parallel to radiator.
21) Repeat Step 15) through 20).
22) Confirm that reservoir coolant level is "Full" level mark (3). If coolant is insufficient, repeat Step 9) and 10).



I4RS0B160003-02

Cooling Water Pipes or Hoses Removal and Installation

S7N20A1616006

Removal

1) Drain coolant referring to “Cooling System Draining: M13A / M15A / M16A”.
2) To remove these pipes or hoses, loosen clamp on each hose and pull hose end off.

Installation

Install removed parts in reverse order of removal procedure, noting the following.

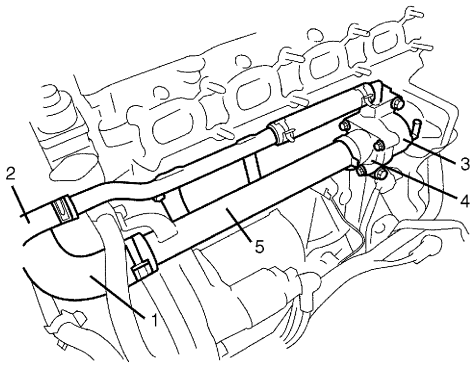
- Tighten each clamp securely referring to “Cooling System Components: M13A / M15A / M16A”.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: M13A / M15A / M16A”.

Thermostat Removal and Installation

S7N20A1616007

Removal

1) Drain coolant referring to “Cooling System Draining: M13A / M15A / M16A”.
2) Remove intake manifold referring to “Intake Manifold Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D”.
3) Remove generator referring to “Generator Dismounting and Remounting: M13A / M15A / M16A in Section 1J”.
4) Disconnect water hose (1) and heater hose (2) from each pipe.
5) Remove thermostat case (3) with thermostat cap (4) and water inlet pipe (5).
6) Remove water inlet pipe with thermostat cap from thermostat case.
7) Remove thermostat from thermostat case (3).

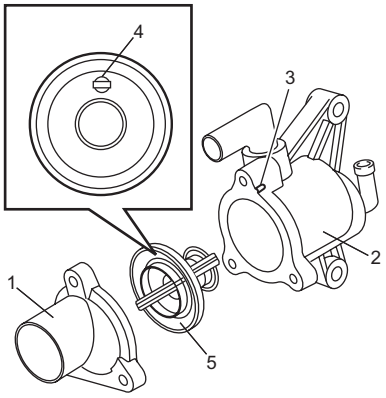


I3RM0A160007-01

Installation

Reverse removal procedure for installation noting the following points.

- Align match mark (3) of thermostat case (2) with air bleed valve (4) of thermostat (5).



I7RS0A160001-01

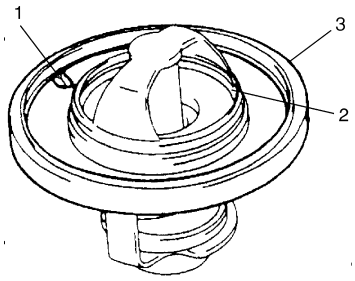
1. Thermostat cap

- Use new O-rings when installing.
- Adjust water pump belt tension referring to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: M13A / M15A / M16A”.
- Adjust A/C compressor belt tension referring to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C in Section 7B” or “Compressor Drive Belt Inspection and Adjustment: Auto A/C in Section 7B”.
- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: M13A / M15A / M16A”.
- Verify that there is no coolant leakage at each connection.

Thermostat Inspection

S7N20A1616008

- Make sure that air bleed valve (1) of thermostat is clean.
- Check to make sure that valve seat (2) is free from foreign matters which would prevent valve from seating tight.
- Check thermostat seal (3) for breakage, deterioration or any other damage.



I3RM0A160008-01

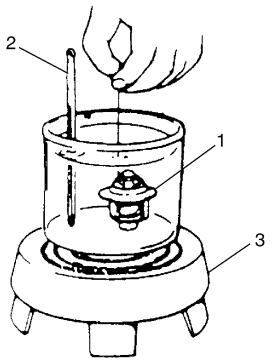
- Check thermostatic movement of wax pellet as follows:
  a. Immerse thermostat (1) in water, and heat water gradually.
  b. Check that valve starts to open at specific temperature.

  Temperature at which valve begins to open
  80 – 84 °C (176 – 183 °F)

  Temperature at which valve become fully open
  95 – 97 °C (203 °F)

  Valve lift
  More than 8 mm at 95 °C (203 °F)

If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if reused, will bring about overcooling or overheating tendency.



I2RH01160012-01

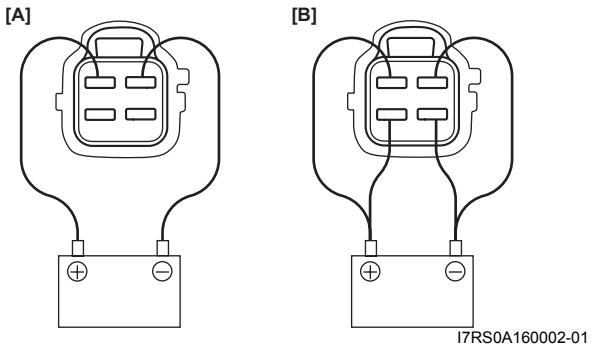
2. Thermometer	3. Heater

Radiator Cooling Fan Motor On-Vehicle Inspection

S7N20A1616009

1) Check low speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure.
   b) Check that radiator cooling fan rotates smoothly. If any abnormality is found, replace fan motor.
2) Check high speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure.
   b) Check that radiator cooling fan rotates smoothly and its rotational speed is faster than low speed operation.
   If any abnormality is found, replace fan motor.

   Reference: Fan motor specified current at 12 V
   Low speed operation: 14.0 A maximum
   High speed operation: 18.0 A maximum



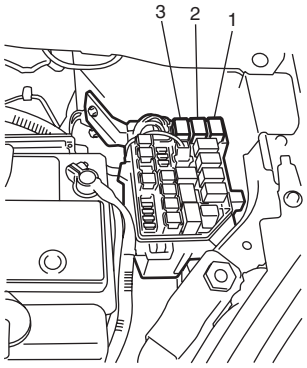
I7RS0A160002-01

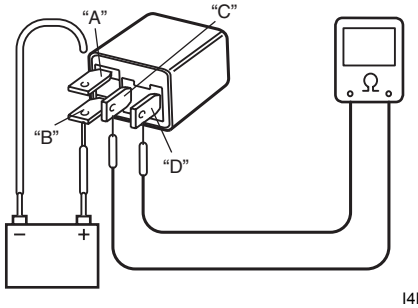
[A]: Low speed operation	
[B]: High speed operation	

Radiator Cooling Fan Relay Inspection

S7N20A1616010

1) Disconnect negative (–) cable at battery.
2) Remove radiator cooling fan relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
3) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay.
5) Connect battery negative (–) terminal “A” of relay.
6) Check continuity between terminal “C” and “D”. If there is no continuity when relay is connected to the battery, replace relay.





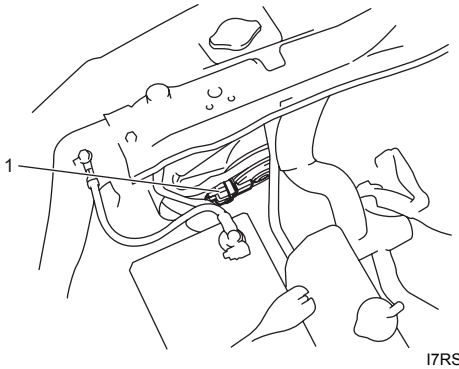
I4RS0B160004-01

Radiator Cooling Fan Removal and Installation

S7N20A1616011

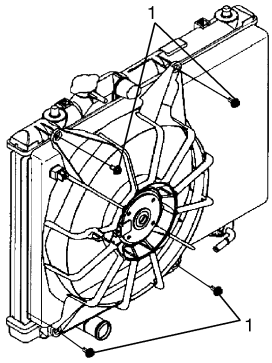
Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect connector (1) of cooling fan motor.



I7RS0A160004-01

3) Drain coolant.
4) Remove front bumper, front bumper upper absorber and upper member referring to “Front Bumper and Rear Bumper Components in Section 9K”.
5) Remove radiator inlet hose and reservoir hose.
6) Remove cooling fan mounting bolts (1).



I4RS0A160009-01

7) Slide condenser with radiator, and then remove radiator cooling fan.

⚠ CAUTION

Be sure not to damage condenser outlet pipe.

Installation

Reverse removal procedure for installation noting the following.

- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: M13A / M15A / M16A”.
- After installation, verify there is no coolant leakage at each connection.

Radiator On-Vehicle Inspection and Cleaning

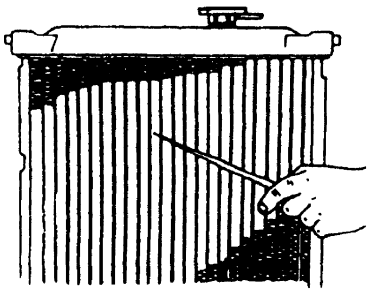
S7N20A1616012

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean frontal area of radiator cores.



I2RH01160014-01

Radiator Removal and Installation

S7N20A1616013

Removal

1) Disconnect negative cable at battery.
2) Drain A/T fluid.
3) Drain coolant.
4) Remove cooling fan assembly referring to “Radiator Cooling Fan Removal and Installation: M13A / M15A / M16A”.
5) Remove A/T fluid cooler inlet and outlet hoses.
6) Remove radiator outlet hose from radiator.
7) Remove radiator from vehicle.

Installation

Reverse removal procedures, noting the following.

- Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: M13A / M15A / M16A”.
- After installation, verify there is no coolant leakage each connection.
- Refill A/T fluid referring to “A/T Fluid Change in Section 5A”.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

S7N20A1616014

Refer to “Water Pump / Generator Drive Belt Tension Inspection and Adjustment: M13A / M15A / M16A in Section 1J”.

Water Pump / Generator Drive Belt Removal and Installation

S7N20A1616015

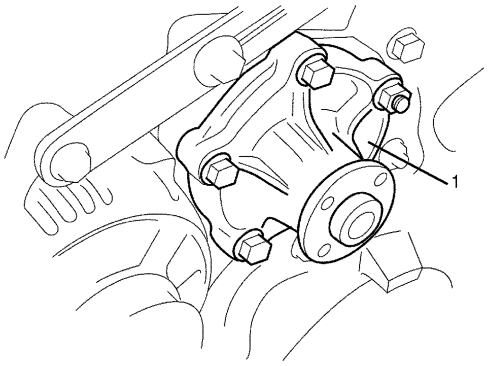
Refer to “Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A in Section 1J”.

Water Pump Removal and Installation

S7N20A1616016

Removal

1) Disconnect negative cable at battery.
2) Drain coolant.
3) Remove water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A”.
4) Remove water pump assembly (1).



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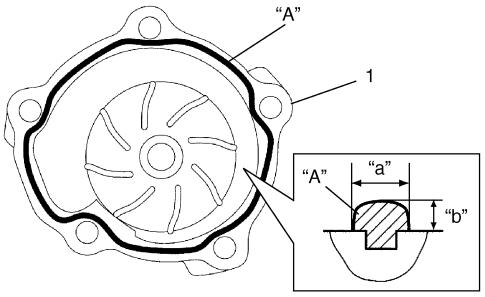
Installation

1) Apply sealant to mating surface of water pump (1) as shown in the figure.

“A”: Water tight sealant 99000–31250 (SUZUKI Bond No.1207F)

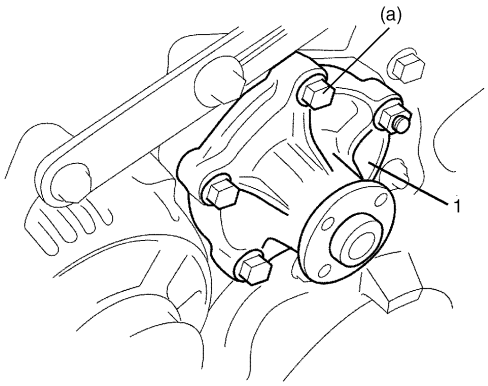
Sealant quantity (to mating surface of water pump)
Width “a”: 3 mm (0.12 in.)
Height “b”: 2 mm (0.08 in.)



I3RM0A160016-01

2) Install water pump assembly (1) 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, 18.0 lbf-ft)



I2RH0B160018-01

3) Install water pump pulley.
4) Install water pump / generator drive belt referring to “Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A”.
5) Install A/C compressor belt (if equipped) referring to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C in Section 7B” or “Compressor Drive Belt Inspection and Adjustment: Auto A/C in Section 7B”.
6) Refill cooling system referring to Step 7) to 22) of “Cooling System Flush and Refill: M13A / M15A / M16A”.
7) Connect negative cable at battery.
8) Check each part for leakage.

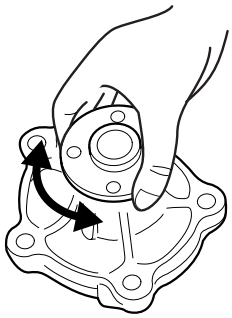
Water Pump Inspection

S7N20A1616017

⚠ CAUTION

Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



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Specifications

Tightening Torque Specifications

S7N20A1617001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Air ventilation bolt	4.5	0.45	3.5	☞ / ☞
Water pump bolt and nut	25	2.5	18.0	☞

NOTE

The specified tightening torque is also described in the following.
“Cooling System Components: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1618001

Material	SUZUKI recommended product or Specification		Note
Water tight sealant	SUZUKI Bond No.1207F	P/No.: 99000–31250	☞

D13A / Z13DTJ

General Description

Cooling System Description

S7N20A1621001

The cooling system consists of the radiator, degassing tank, hoses, water pump, cooling fan and thermostat. The radiator is of tube-and-fin type.

Coolant Description

S7N20A1621002

⚠ WARNING

- **Keep hands, tools and clothing away from radiator cooling fan to help prevent personal injury. This fan is electric and can turn on whether engine is running or not. The fan can start automatically in response to ECM with ignition switch turned on.**
- **To help avoid danger of being burned, do not remove degassing tank 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.**
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cable from battery terminal before removing any part.**

When the system cools down, the coolant is drawn back into the radiator.
The cooling system has been filled at the factory with a quality coolant that is a 50/50 mixture of water and ethylene glycol antifreeze.
This 50/50 mixture coolant solution provides freezing protection to –36 °C (–33 °F).

- Maintain cooling system freeze protection at –36 °C (–33 °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 –36 °C (–33 °F).

NOTE

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Coolant must be mixed with demineralized water or distilled water.**

Anti-freeze proportioning table

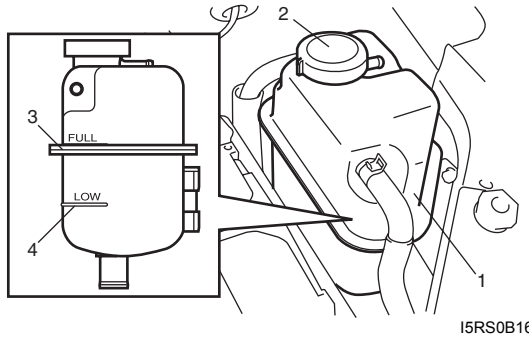
Freezing temperature	**°C**	**–36**
	°F	**–33**
Anti-freeze / Anti-corrosion coolant concentration	**%**	**50**
Ratio of compound to cooling water	**ltr.**	**3.25/3.25**
	US pt.	**6.87/6.87**
	Imp pt.	**5.72/5.72**

Coolant capacity
Total: Engine, radiator, heater and degassing tank etc.: 6.5 liters (13.74/11.44 US/Imp pt.)

Coolant Degassing Tank Description

S7N20A1621003

The degassing tank (1) consists of a “see-through” plastic tank, a hose and a degassing tank cap (2). During operation, inside of the degassing tank is under pressure.
As the coolant warms up and expands, the coolant level in the degassing tank rises. On the other hand, it lowers as the coolant cools down and contracts. When the pressure applied to the inside of the degassing tank constantly exceeds the specified value, the pressure is relieved through the degassing tank cap. Therefore, cooling level should be between FULL (3) and LOW (4) marks on the degassing tank.



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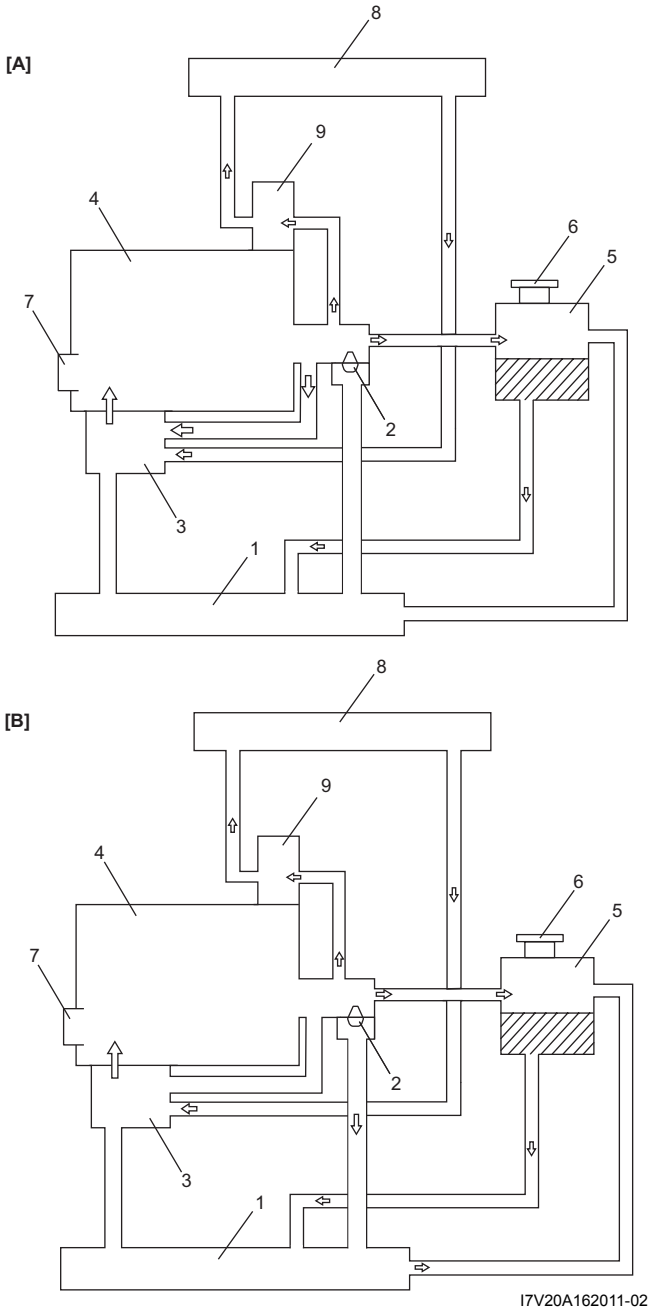
Schematic and Routing Diagram

Coolant Circulation

S7N20A1622001



I7V20A162011-02

[A]: Thermostat: close	3. Engine oil cooler	7. Water pump
[B]: Thermostat: open	4. Engine	8. Heater core
1. Radiator	5. Degassing tank	9. EGR cooler
2. Thermostat	6. Degassing tank cap	

Diagnostic Information and Procedures

Engine Cooling Symptom Diagnosis

S7N20A1624001

Condition	Possible cause	Correction / Reference Item
Engine overheats (It is in case that radiator fan operates)	Loose or broken accessory drive belt	*Replace accessory drive belt and/or accessory drive belt tensioner referring to "Accessory Drive Belt Removal and Installation: D13A / Z13DTJ" and/or "Accessory Drive Belt Tensioner Removal and Installation: D13A / Z13DTJ".*
	Not enough coolant	*Check coolant level and add coolant as necessary, referring to "Coolant Level Check: D13A / Z13DTJ".*
	Faulty thermostat	*Replace thermostat assembly referring to "Thermostat Assembly Removal and Installation: D13A / Z13DTJ".*
	Faulty water pump	*Replace water pump referring to "Water Pump Removal and Installation: D13A / Z13DTJ".*
	Dirty or bent radiator fins	*Clean or remedy radiator referring to "Radiator On-Vehicle Inspection and Cleaning: D13A / Z13DTJ".*
	Coolant leakage on cooling system	*Repair.*
	Clogged radiator	*Check and replace radiator as necessary, referring to "Radiator On-Vehicle Inspection and Cleaning: D13A / Z13DTJ" or "Radiator Removal and Installation: D13A / Z13DTJ"*
	Faulty degassing tank cap	*Replace.*
	Dragging brakes	*Check brake referring to "Brakes Symptom Diagnosis in Section 4A".*
	Slipping clutch	*Replace clutch cover and clutch disc referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C".*
	Poor charge battery	*Check and replace battery as necessary, referring to "Battery Inspection: D13A / Z13DTJ in Section 1J" and/or "Battery Removal and Installation: D13A / Z13DTJ in Section 1J".*
	Poor generation generator	*Check and repair generator as necessary, referring to"Generator Removal and Installation: D13A / Z13DTJ in Section 1J", "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".*
	ECT sensor faulty	*Check and replace ECT sensor as necessary, referring to "Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C" and/or "Engine Coolant Temperature (ECT) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C".*
	Radiator cooling fan motor faulty	*Check and replace radiator cooling fan motor as necessary, referring to"Radiator Cooling Fan Assembly On-Vehicle Inspection: D13A / Z13DTJ" and/or "Radiator Cooling Fan Disassembly and Reassembly: D13A / Z13DTJ".*
	Radiator cooling fan relay faulty	*Check and replace radiator cooling fan relay as necessary, referring to "Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ".*

Condition	Possible cause	Correction / Reference Item
Engine overheats (It is in case that radiator fan operates)	ECM faulty	*Check and replace as necessary.*
	Wiring or grounding faulty	*Repair as necessary.*
	Equipped with too much electric load part(s)	*Dismount.*
Engine overheats (It is in case that radiator fan won't operate)	Fuse blown	*Check fuse of relay/fuse box and check for short circuit to ground.*
	Radiator cooling fan relay faulty	*Check and replace radiator cooling fan relay as necessary, referring to "Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ".*
	ECT sensor faulty	*Check and replace ECT sensor as necessary, referring to "Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C" and/or "Engine Coolant Temperature (ECT) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C".*
	Radiator cooling fan motor faulty	*Check and replace radiator cooling fan motor as necessary, referring to "Radiator Cooling Fan Assembly On-Vehicle Inspection: D13A / Z13DTJ" and/or "Radiator Cooling Fan Disassembly and Reassembly: D13A / Z13DTJ".*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check and replace as necessary.*

Radiator Fan Control System Inspection

S7N20A1624002

⚠ WARNING

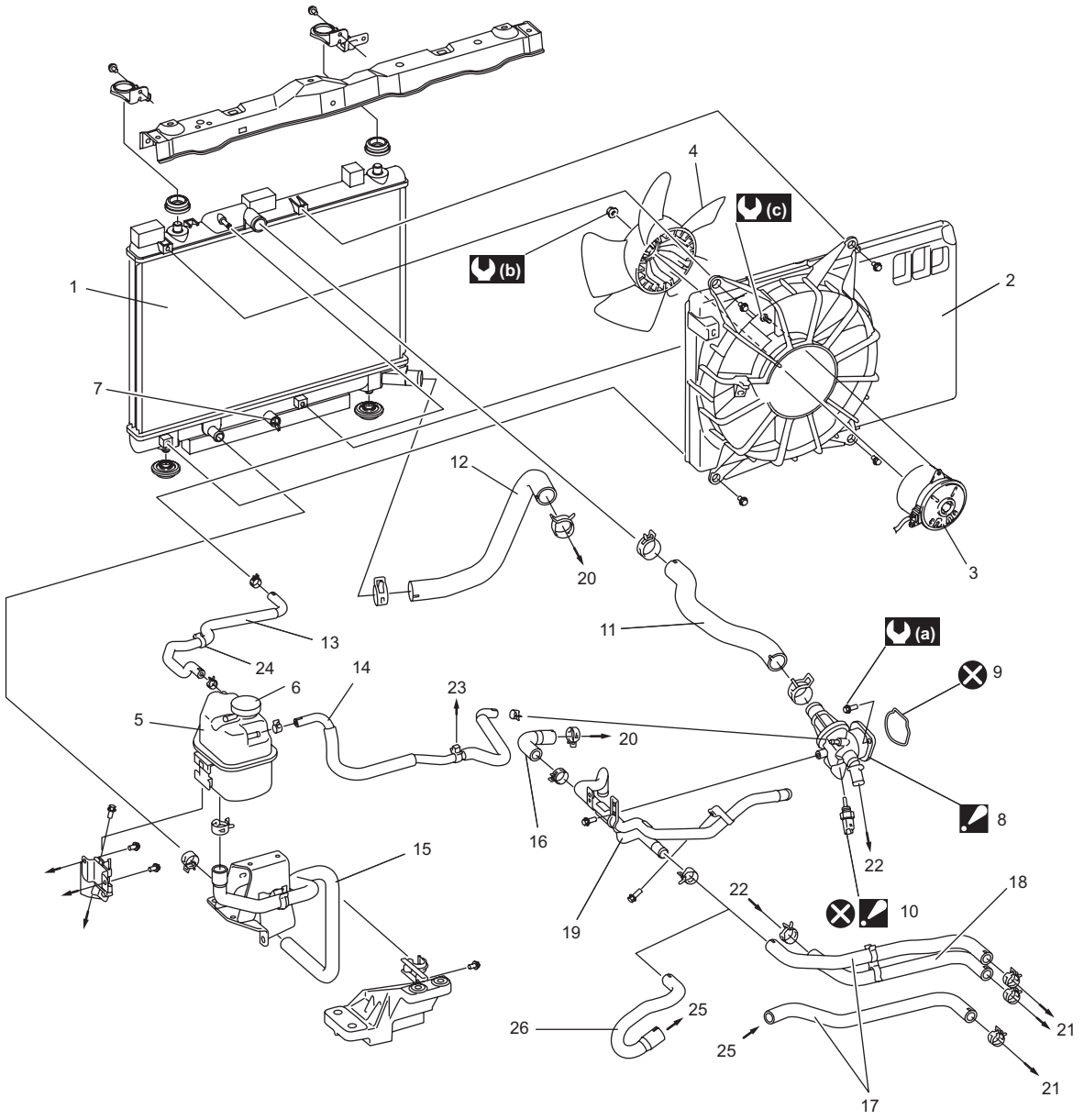
Keep hand, tools, and clothing away from engine cooling fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECM with the ignition switch in the ON position.

Check system for operation referring to "Table C-9: Radiator Cooling Fan Operation Check: D13A / Z13DTJ in Section 1A".

Repair Instructions

Cooling System Components

S7N20A1626001



I7N20A162002-01

1. Radiator	16. Heater outlet No.2 hose
2. Radiator cooling fan guide	17. Heater outlet No.1 hose
3. Radiator cooling fan motor	18. Heater inlet hose
4. Radiator cooling fan	19. Heater outlet pipe
5. Degassing tank	20. To engine side
6. Degassing tank cap	21. To heater core
7. Drain plug	22. To EGR cooler
8. Thermostat assembly : Do not disassemble.	23. To air cleaner assembly
9. O-ring	24. Hose clamp
10. ECT sensor : For detail of servicing, refer to “Engine Coolant Temperature (ECT) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C” and “Table C-4: ECT Sensor Check: D13A / Z13DTJ in Section 1A”.	25. To additional heater
11. Radiator inlet hose	(a) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
12. Radiator outlet hose	(b) : 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)
13. Radiator to degassing tank hose	(c) : 4.0 N·m (0.41 kgf-m, 3.0lbf-ft)
14. Water engine outlet hose	: Do not reuse.
15. Degassing tank outlet hose	

Coolant Level Check

S7N20A1626002

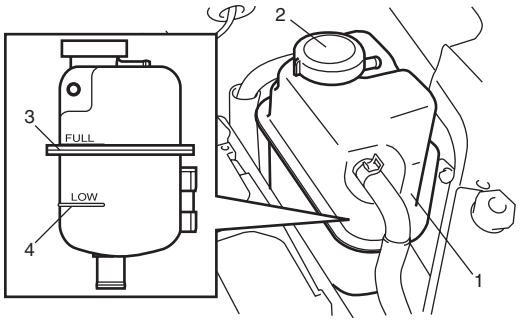
⚠ WARNING

To help avoid danger of being burned, do not remove degassing tank 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.

To check level, lift hood and look at “see-through” degassing tank (1).
It is not necessary to remove degassing tank cap (2) to check coolant level.
When engine is cool, check coolant level in degassing tank.
A normal coolant level should be between FULL mark (3) and LOW mark (4) on degassing tank (1).
If coolant level is below LOW mark, remove degassing tank cap (2) and add recommended coolant to tank to bring coolant level up to FULL mark. Then, install degassing tank cap turning it clockwise up to stop.

NOTE

If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.



I5RS0B160001-01

Engine Cooling System Inspection and Cleaning

S7N20A1626003

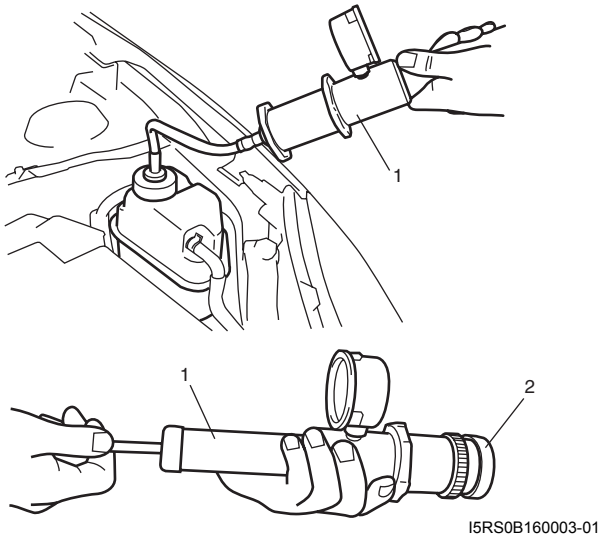
⚠ WARNING

To help avoid danger of being burned, do not remove degassing tank 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.

Cooling system should be serviced as follows.

1) Check cooling system for leakage or damage.
2) Wash degassing tank cap and filler neck with clean water by removing degassing tank cap when engine is cold.
3) Check coolant for proper level and freeze protection.
4) Using a pressure tester (1), check system and degassing tank cap (2) for proper pressure holding capacity.
   If replacement of cap is required, use a proper cap for this vehicle.

   Cooling system and degassing tank cap holding pressure (for inspection)
   140 kPa (1.4 kgf/cm^2, 20.3 psi, 1.4 bar)



I5RS0B160003-01

5) Install degassing tank cap to degassing tank turning it clockwise up to stop.
6) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
7) Clean frontal area of radiator core.

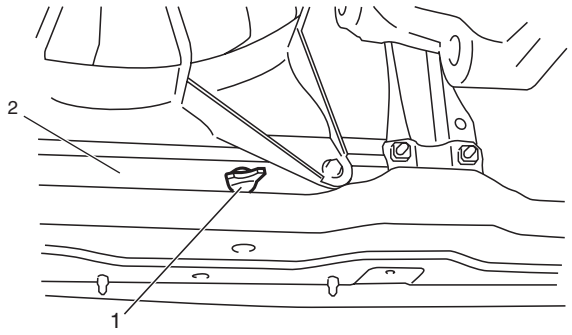
Cooling System Draining

S7N20A1626004

⚠ WARNING

To help avoid danger of being burned, do not remove degassing tank 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 degassing tank cap by turning it counterclockwise slowly in order to release any pressure.
2) Loosen drain plug (1) on radiator (2) to drain coolant.
3) After draining coolant, be sure to tighten drain plug securely.

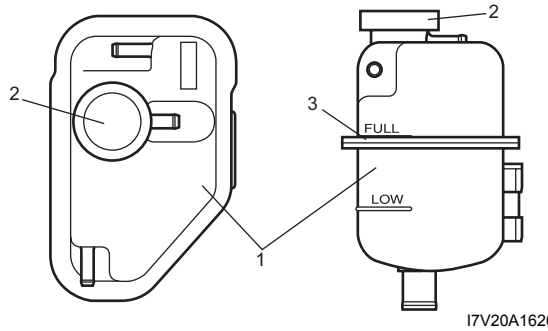


I5RS0B160004-01

Cooling System Refill

S7N20A1626005

1) Add 50/50 mixture of good quality ethylene glycol antifreeze and water to degassing tank (1). Fill to FULL mark (3).
2) Run engine, with degassing tank cap (2) removed, until radiator upper hose is hot.
3) With engine idling, add coolant to degassing tank (1) until level reaches FULL mark (3). Install degassing tank cap (2) turning it clockwise up to stop.



I7V20A162003-03

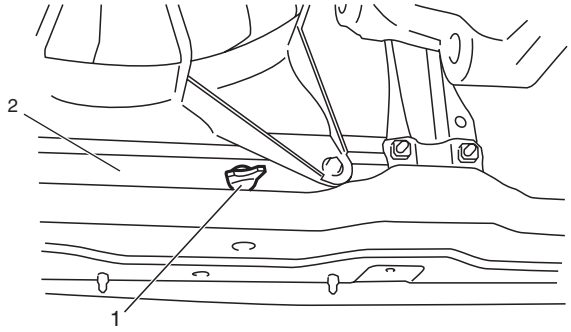
Cooling System Flush and Refill

S7N20A1626006

⚠ WARNING

To help avoid danger of being burned, do not remove degassing tank 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 degassing tank cap by turning it counterclockwise slowly in order to release any pressure.
2) With degassing tank cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).
3) Stop engine and drain coolant.
4) Close radiator drain plug (1). Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat Steps 3) and 4) several times until drained liquid is nearly colorless.
6) Drain system and then close radiator drain plug (1) tightly.

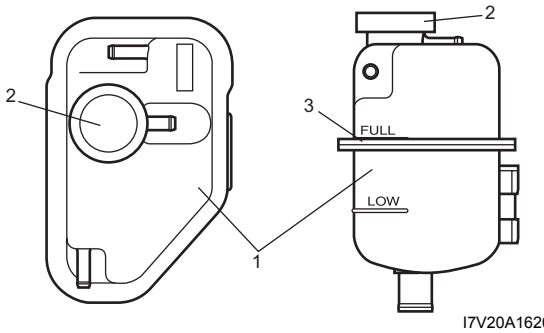


I5RS0B160004-01

2. Radiator

7) Disconnect coolant hose of upper side from thermostat case. If it is hard to disconnect it after removing clip, push to insert hose to pipe a little further in order to unstick hose from pipe and disconnect it.
8) Pour coolant (50/50 mixture of good quality ethylene glycol antifreeze and water) to degassing tank up to FULL mark (3). Put a shop cloth under disconnected hose end so that coolant is not spilled on engine and floor because a small amount of air bubbles and/or coolant may come out of it.
9) Connect hose to thermostat case.

10) Run engine, with degassing tank cap (2) removed, until radiator inlet hose is hot.
11) With engine idling, add coolant to degassing tank (1) until level reaches FULL mark (3).
Install degassing tank cap (2) turning it clockwise up to stop.



I7V20A162003-03

Cooling Water Pipes or Hoses Removal and Installation

S7N20A1626007

Removal

1) Drain coolant referring to “Cooling System Draining: D13A / Z13DTJ”.
2) To remove these pipes or hoses, loosen clip on each hose and pull hose end off.

Installation

Reverse removal procedure for installation noting the following.

- Connect each clip securely referring to “Cooling System Components: D13A / Z13DTJ”.
- Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ”.

Thermostat Assembly Removal and Installation

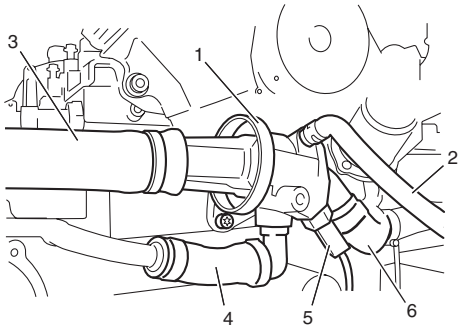
S7N20A1626008

⚠ CAUTION

Do not disassemble thermostat assembly. Disassembly will spoil it original function. If any malcondition is found in thermostat assembly, replace if as assembly.

Removal

1) Drain coolant referring to “Cooling System Draining: D13A / Z13DTJ”.
2) Remove air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Remove heater outlet pipe referring to “Cooling System Components: D13A / Z13DTJ”.
4) Disconnect engine outlet hose (2), radiator inlet hose (3), coolant feed hose (4), ECT sensor connector (5) and EGR cooler hose (6) from thermostat assembly.
5) Remove thermostat assembly (1).



I5RS0B160006-01

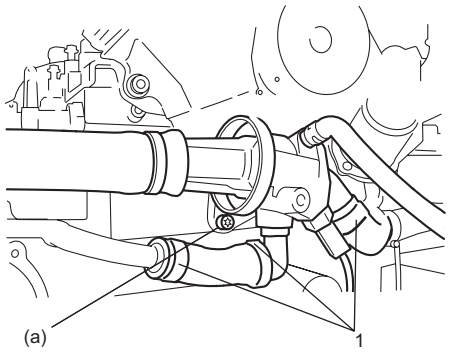
Installation

Reverse removal procedure for installation noting the following.

- Use new O-ring when installing.
- Use new hose clamp (1).
- Tighten thermostat bolts to specified torque.

  Tightening torque
  Thermostat bolt (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)

- If ECT sensor has been removed, replace new ECT sensor, referring to “Engine Coolant Temperature (ECT) Sensor Removal and Installation: D13A / Z13DTJ in Section 1C”.



I7V20A162004-01

- Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ”.
- Verify that there is no coolant leakage at each connection.

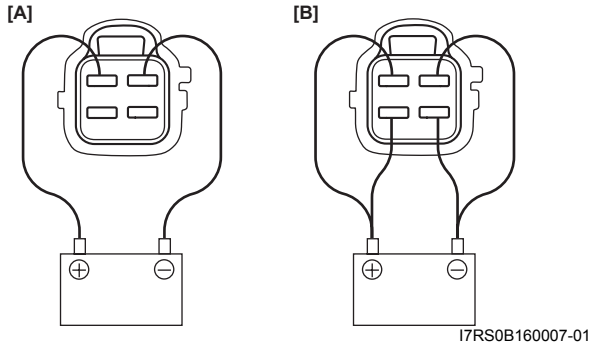
Radiator Cooling Fan Assembly On-Vehicle Inspection

S7N20A1626009

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Check low speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure [A].
   b) Check that radiator cooling fan rotates smoothly. If any abnormality is found, replace fan assembly.
4) Check high speed operation of radiator cooling fan as follows.
   a) Connect battery to fan motor coupler as shown in figure [B].
   b) Check that radiator cooling fan rotates smoothly and its rotational speed is faster than low speed operation.
   If any abnormality is found, replace fan assembly.

Reference: Fan motor specified current at 12 V

Low speed operation: 9.3 – 14.3 A
High speed operation: 13.3 – 18.3 A



I7RS0B160007-01

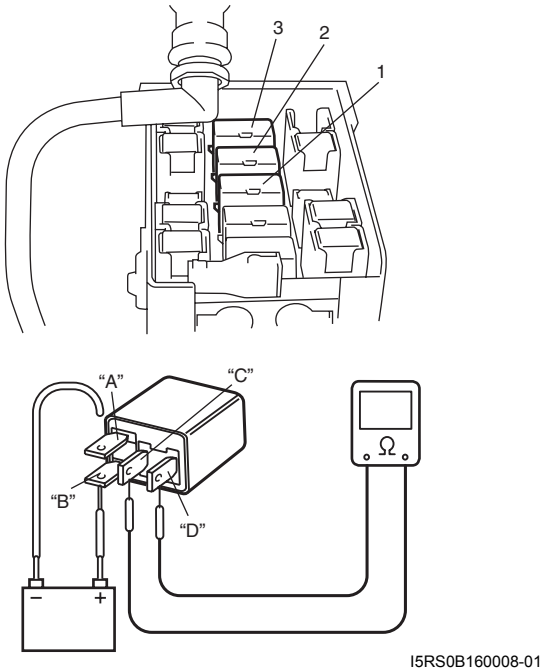
[A]: Low speed operation	[B]: High speed operation

Radiator Cooling Fan Relay Inspection

S7N20A1626018

1) Disconnect negative (–) and positive (+) cable at battery.
2) Remove battery.
3) Remove radiator cooling fan relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
4) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
5) Connect battery positive (+) terminal to terminal “B” of relay.
6) Connect battery negative (–) terminal “A” of relay.
7) Check continuity between terminal “C” and “D”.

If there is no continuity when relay is connected to the battery, replace relay.



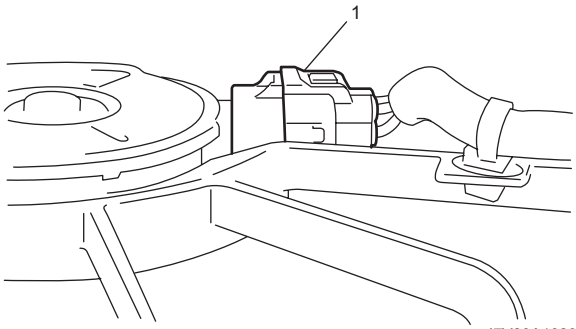
I5RS0B160008-01

Radiator Cooling Fan Assembly Removal and Installation

S7N20A1626010

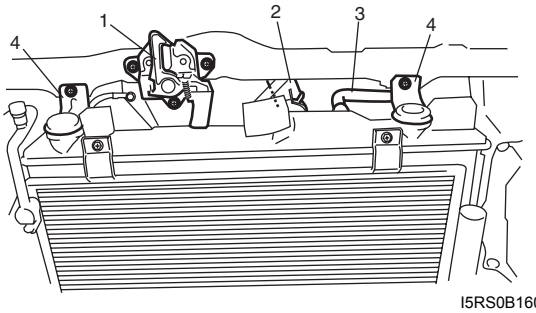
Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant referring to “Cooling System Draining: D13A / Z13DTJ”.
3) Remove air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
4) Disconnect connector (1) of cooling fan motor.



I7V20A162005-01

5) Remove front bumper, front bumper upper absorber and upper member referring to “Front Bumper and Rear Bumper Components in Section 9K”.
6) Remove intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
7) With wire connected, detach hood latch (1) to engine room upper member.
8) Remove radiator inlet hose (2) and radiator to degassing tank hose (3).
9) Remove radiator brackets (4).

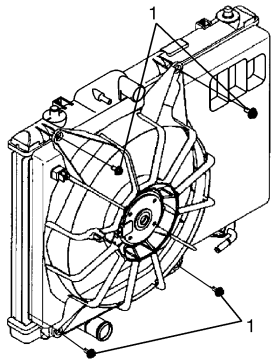


I5RS0B160010-01

10) Remove cooling fan mounting bolts (1).
11) Slide condenser with radiator, and then remove radiator cooling fan assembly.

⚠ CAUTION

Be sure not to damage condenser outlet pipe while removing.



I5RS0B160011-01

Installation

Reverse removal procedure for installation noting the following.

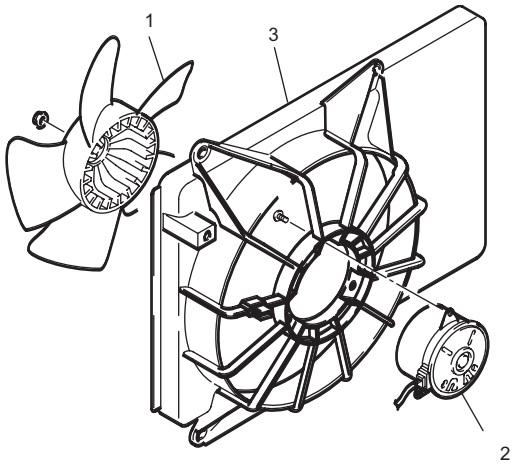
- Install intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
- Install front bumper upper absorber, upper member and front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
- Install air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
- Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ”.
- After installation, verify there is no coolant leakage at each connection.

Radiator Cooling Fan Disassembly and Reassembly

S7N20A1626020

Disassembly

1) Remove radiator cooling fan (1) from radiator cooling fan motor (2).
2) Remove radiator cooling fan motor (2) from radiator cooling fan guide (3).



I7V20A162008-01

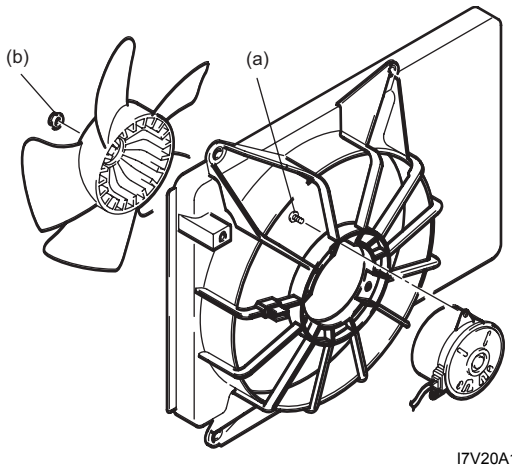
Reassembly

Reverse removal procedure for installation noting the following.

- Tighten each bolts and nuts to specified torque.

Tightening torque
Radiator cooling fan motor bolt (a): 4.0 N·m (0.41 kgf-m, 3.0 lbf-ft)

Tightening torque
Radiator cooling fan nut (b): 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)



I7V20A162009-01

Radiator On-Vehicle Inspection and Cleaning

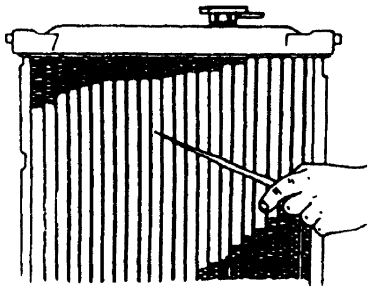
S7N20A1626019

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean frontal area of radiator cores.



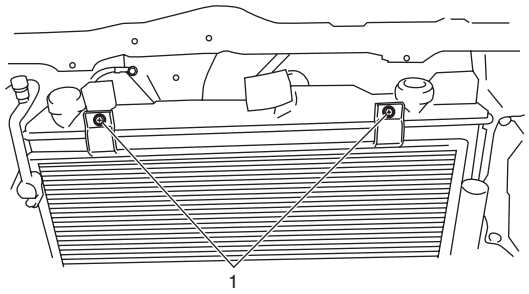
I2RH01160014-01

Radiator Removal and Installation

S7N20A1626012

Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant referring to “Cooling System Draining: D13A / Z13DTJ”.
3) Remove radiator cooling fan referring to “Radiator Cooling Fan Assembly Removal and Installation: D13A / Z13DTJ”.
4) Disconnect radiator outlet hose and degassing tank outlet hose from radiator.
5) Remove condenser assembly mounting bolts (1).



I5RS0B160012-01

6) Remove radiator from vehicle.

Installation

Reverse removal procedures for installation noting the following.

- Install radiator cooling fan assembly referring to “Radiator Cooling Fan Assembly Removal and Installation: D13A / Z13DTJ”.
- Refill cooling system referring to “Cooling System Flush and Refill: D13A / Z13DTJ”.
- After installation, check each joint for leakage.

Accessory Drive Belt On-Vehicle Inspection

S7N20A1626021

Inspect belt for cracks, cuts, deformation, wear and cleanliness. If any of these conditions are found, replace belt, referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ”.

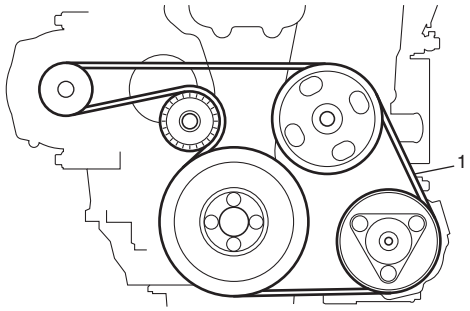
Accessory Drive Belt Tension Inspection

S7N20A1626013

⚠ WARNING

- **To help avoid danger of being burned, do not remove degassing tank 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.**
- **All inspection and replacement are to be performed with ENGINE NOT RUNNING.**

1) Disconnect negative (–) cable at battery.
2) Inspect drive belt (1) for tension, cracks, cuts, deformation, wear and cleanliness. If any defect exists, replace belt, refer to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ”.



I3RM0B162015-01

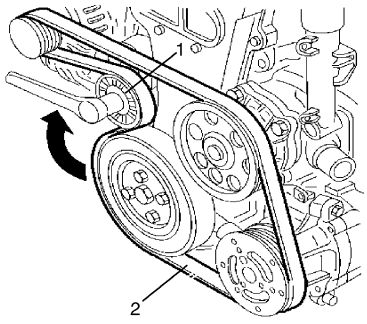
3) Connect negative (–) cable at battery.

Accessory Drive Belt Removal and Installation

S7N20A1626014

Removal

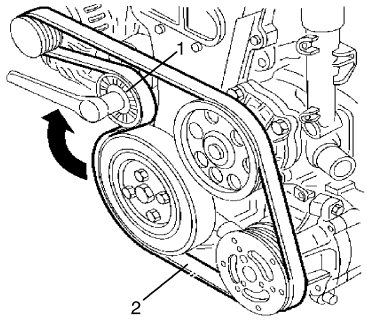
1) Disconnect negative (–) cable at battery.
2) Remove right side engine under cover.
3) Remove accessory drive belt (2) while turning tensioner (1) clockwise until stopping.



I3RM0B162016-01

Installation

1) Install accessory drive belt (2) while turning tensioner (1) clockwise until stopping.
2) Check accessory drive belt tension referring to “Accessory Drive Belt Tension Inspection: D13A / Z13DTJ”.



I3RM0B162016-01

3) Install right side engine under cover.
4) Lower vehicle.
5) Connect negative (–) cable at battery.

Accessory Drive Belt Tensioner Removal and Installation

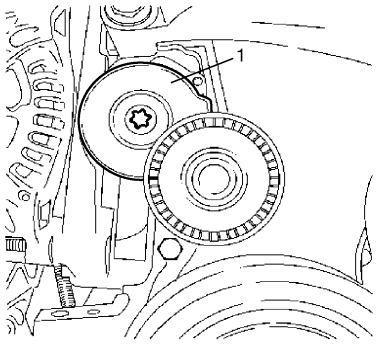
S7N20A1626015

⚠ CAUTION

Do not disassemble accessory drive belt tensioner assembly. Disassembly will spoil its original function. If any malcondition is found in drive belt tensioner assembly, replace it as assembly.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove accessory drive belt referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ”.
3) Remove accessory drive belt tensioner (1).

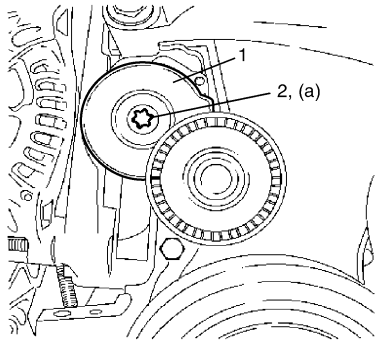


I3RM0B162017-01

Installation
Reverse removal procedure for installation noting the following.

- Tighten accessory drive belt tensioner bolt (2) to specified torque.

  Tightening torque
  Accessory drive belt tensioner bolt (a): 48 N·m (4.9 kgf-m, 35.5 lbf-ft)



I3RM0B162018-01

1. Accessory drive belt tensioner

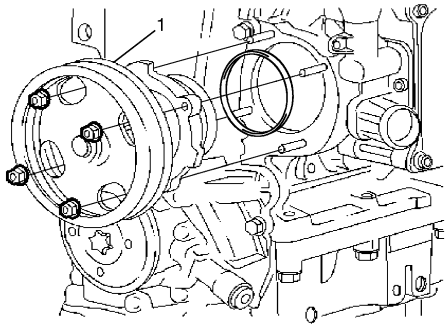
- Install accessory drive belt referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ”.
- Check accessory drive belt referring to “Accessory Drive Belt Tension Inspection: D13A / Z13DTJ”.

Water Pump Removal and Installation

S7N20A1626016

Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant referring to “Cooling System Draining: D13A / Z13DTJ”.
3) Remove intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
4) Disconnect radiator outlet hose from oil cooler.
5) Remove right side engine under cover.
6) Remove accessory drive belt referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ”.
7) With hose connected, detach A/C compressor from its bracket (if equipped) referring to “Compressor Assembly Removal and Installation (Diesel Engine Model): Manual A/C in Section 7B”.
8) Remove water pump (1).

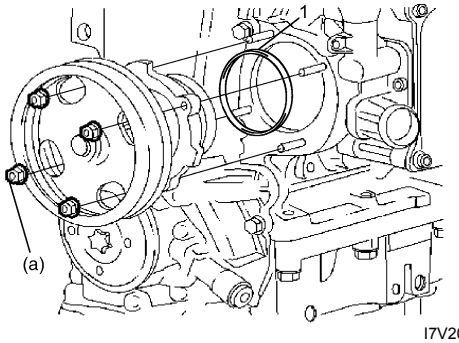


I3RM0B162019-01

Installation
Reverse removal procedure for installation noting the following.

- Use new O-ring (1) when installing
- Tighten water pump nuts to specified torque.

Tightening torque
Water pump nut (a): 9.0 N·m (0.92 kgf-m, 7.0 lbf-ft)



I7V20A162010-01

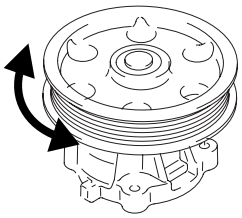
Water Pump Inspection

S7N20A1626017

⚠ CAUTION

Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.



I3RM0B162021-01

Specifications

Tightening Torque Specifications

S7N20A1627001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Thermostat bolt	28	2.9	21.0	☞
Radiator cooling fan motor bolt	4.0	0.41	3.0	☞
Radiator cooling fan nut	6.0	0.61	4.5	☞
Accessory drive belt tensioner bolt	48	4.9	35.5	☞
Water pump nut	9.0	0.92	7.0	☞

NOTE

The specified tightening torque is also described in the following.
“Cooling System Components: D13A / Z13DTJ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Fuel System

M13A / M15A / M16A

Precautions

Precautions on Fuel System Service

S7N20A1710001

⚠ WARNING

Before attempting service of any type on fuel system, the following should be always observed in order to reduce the risk or fire and personal injury.

- **Disconnect negative cable at battery.**
- **Do not smoke, and place no smoking signs near work 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 hot 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 referring to "Fuel Pressure Relief Procedure: M13A / M15A / M16A".**
- **A small amount of fuel may be released when the fuel line is disconnected. In order to reduce the risk of personal injury, cover a shop cloth to the fitting to be disconnected. Be sure to put that cloth in an approved container after disconnecting.**
- **Never run engine with fuel pump relay disconnected 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 referring to "Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A". After connecting, make sure that it has no twist or kink.**
- **When installing injector or fuel feed pipe, lubricate its O-ring with gasoline.**
- **When servicing the fuel tank, it should be treated with respect, with no contact with sharp edges or hot surfaces. In addition, the fuel tank should not be dropped since fuel tank, fuel pump and other components can be damaged by the impact. If dropped, all components should be replaced because there is a risk of damage.**
- **The fuel tank is made of resin.**
  Be sure not to allow solvent (chemical article such as grease and sealant) to attach to the fuel tank as some chemical reaction may occur, causing the fuel tank to be swollen, hardened or distorted leakage and resulting in fuel leakage from the fuel tank.

General Description

Fuel System Description

S7N20A1711001

⚠ CAUTION

This engine requires the unleaded fuel only.
The leaded and/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 fuel filter, fuel level gauge, fuel pressure regulator), fuel feed line and fuel vapor line.
For the details of fuel flow, refer to “Fuel Delivery System Diagram: M13A / M15A / M16A”.

Fuel Delivery System Description

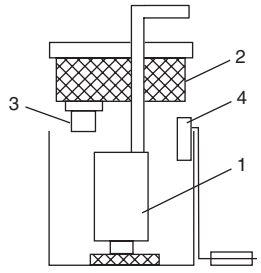
S7N20A1711002

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 and its pressure is regulated before being sent to the feed pipe.
The excess fuel at fuel pressure regulation process is 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: M13A / M15A / M16A”.

Fuel Pump Description

S7N20A1711003

The fuel pump (1) is an in-tank type electric pump. Incorporated in the pump assembly are;
a fuel filter (2), a fuel pressure regulator (3) and a fuel level gauge (4).
Addition of the fuel pressure regulator to the fuel pump makes it possible to maintain the fuel pressure at constant level and ECM controls compensation for variation in the intake manifold pressure.



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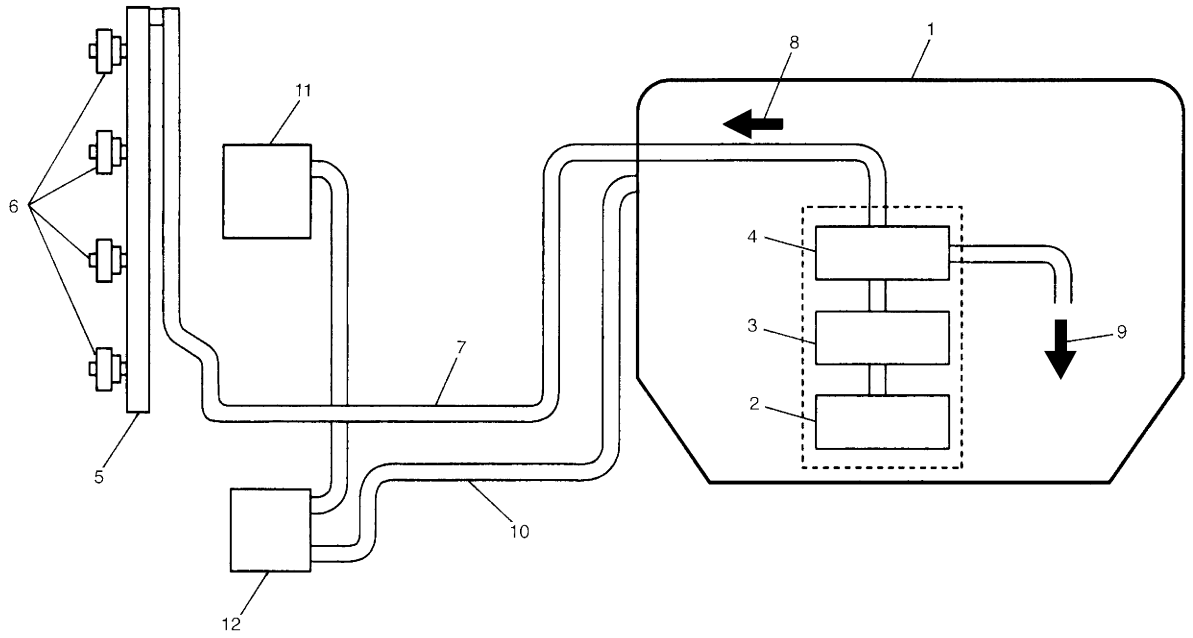
Schematic and Routing Diagram

Fuel Delivery System Diagram

S7N20A1712001



I4RS0A170002-01

1. Fuel tank	5. Delivery pipe	9. Returned back fuel
2. Fuel pump	6. Fuel injector	10. Fuel vapor line
3. Fuel filter	7. Fuel feed line	11. Intake manifold
4. Fuel pressure regulator	8. Fuel	12. EVAP canister

Diagnostic Information and Procedures

Fuel Pressure Inspection

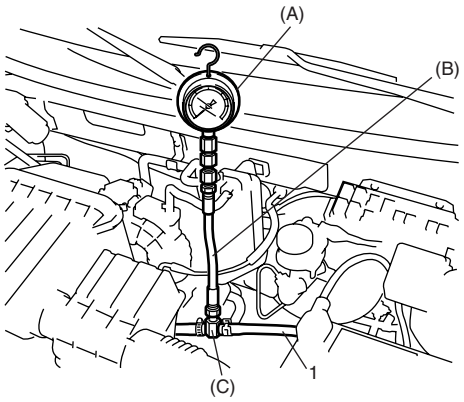
S7N20A1714001

⚠ WARNING

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: M13A / M15A / M16A” in order to reduce the risk or fire and personal injury.

1) Relieve fuel pressure in fuel feed line referring to “Fuel Pressure Relief Procedure: M13A / M15A / M16A”.
2) Disconnect fuel feed hose from fuel delivery pipe.
3) Connect special tools and hose between fuel feed hose (1) and fuel delivery pipe as shown in the figure, and clamp hoses securely in order to ensure that no leaks occur during checking.

Special tool
(A): 09912–58442
(B): 09912–58432
(C): 09912–58490



I3RM0A170004-01

4) Check that battery voltage is 11 V or more.
5) Measure fuel pressure at each condition.
   If measured pressure is out of specification, refer to "Fuel Pressure Check: M13A / M15A / M16A in Section 1A" and check each possibly defective part. Replace if found defective.
   a) Turn ignition switch ON to operate fuel pump and after 2 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.

      Fuel pressure specification
      With fuel pump operating and engine stopped: 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)

   b) Start engine and warm it up to normal operating temperature, and measure fuel pressure at idling.

      Fuel pressure specification
      At specified idle speed: 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)

   c) Stop engine, and measure fuel pressure at one minute after stopping.

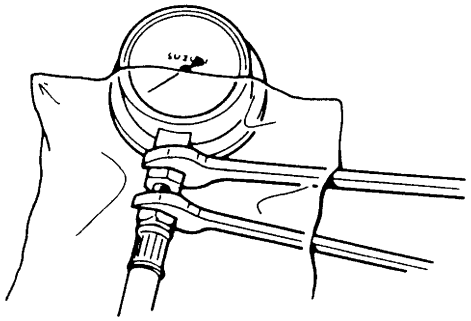
      Fuel pressure specification
      With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes): Over 300 kPa (3.0 kg/cm^2, 42.7 psi)

6) After checking fuel pressure, remove fuel pressure gauge.

⚠ WARNING

As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to the following procedures.

- **Place fuel container under joint.**
- **Cover joint with rag and loosen joint nut slowly in order to release fuel pressure gradually.**



I2RH01170032-01

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 OFF and ignition switch ON, check for fuel leaks.

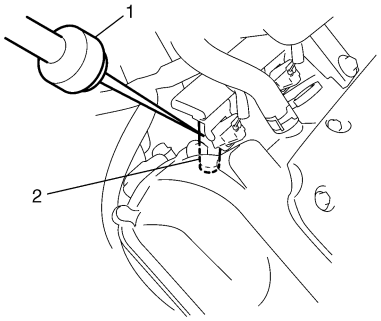
Fuel Cut Operation Inspection

S7N20A1714002

NOTE

Before inspection, make sure that gear shift lever is in neutral position (shift select lever is "P" range for A/T vehicle), A/C is OFF and parking brake lever is pulled all the way up.

1) Warm engine up to normal operating temperature.
2) While listening to sound of injector (2) by using sound scope (1) or such, increase engine speed to higher than 3,000 r/min.



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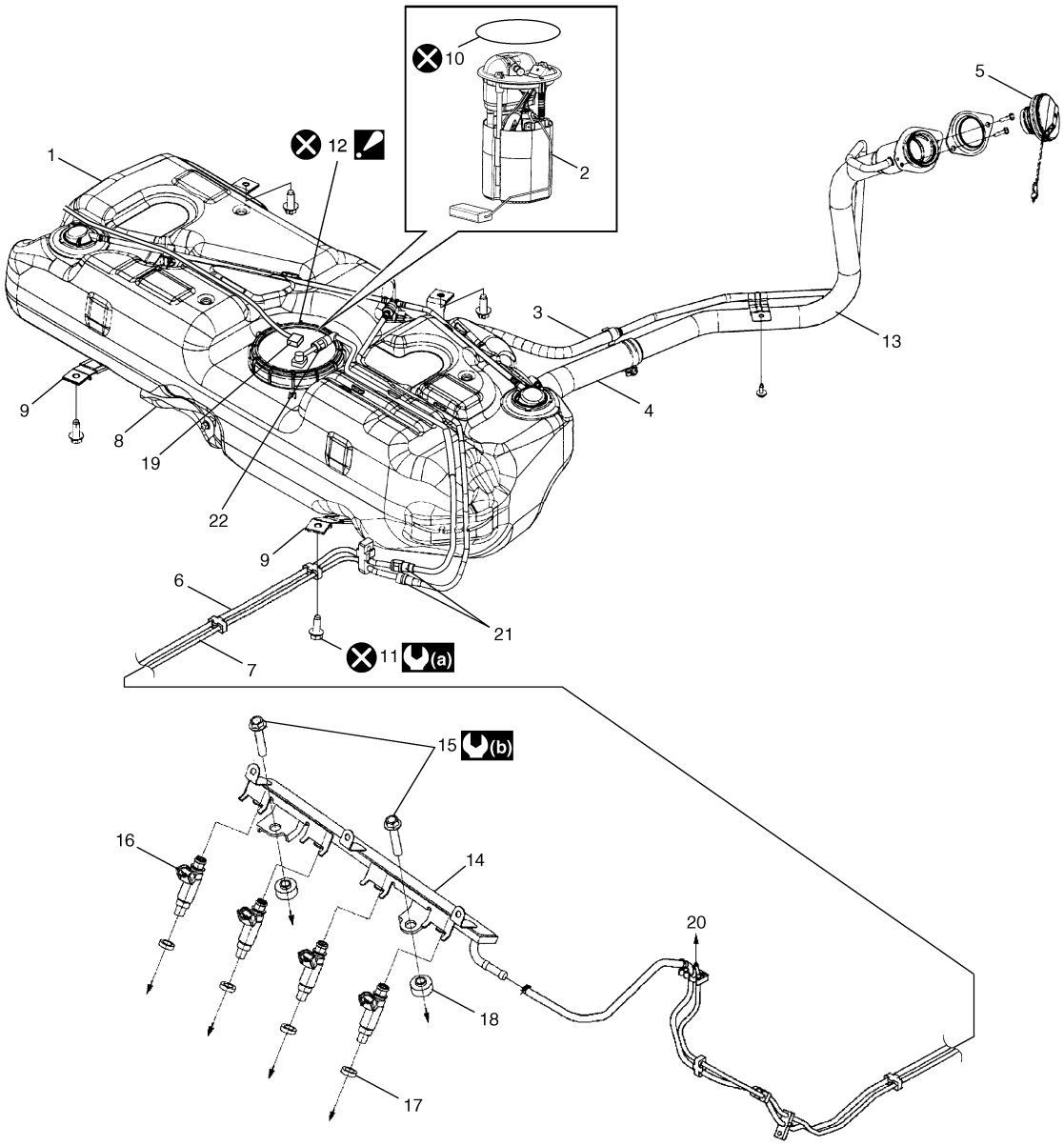
3) Check to make sure that injector operation sound is stop when throttle valve is closed instantly and it is heard again when engine speed is reduced to approx. 2,000 r/min or less.

Repair Instructions

Fuel System Components

S7N20A1716001



I4RS0B170002-04

1. Fuel tank	10. O-ring	19. Wire harness for fuel pump
2. Fuel pump assembly	11. Fuel tank bolt	20. To canister
3. Breather hose	12. Fuel pump lock nut : For tightening procedure, refer to “Fuel Pump Assembly Removal and Installation: M13A / M15A / M16A”.	21. Quick joint (fuel pipe)
4. Fuel tank filler hose	13. Fuel filler neck	22. Quick joint (fuel pump)
5. Fuel filler cap	14. Fuel delivery pipe	: Do not reuse.
6. Fuel feed line	15. Fuel delivery pipe bolt	(a) : 45 N·m (4.5 kgf-m, 32.5 lbf-ft)
7. Fuel vapor line	16. Fuel injector	(b) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
8. Fuel tank protector	17. Injector cushion	
9. Fuel tank belt	18. Fuel delivery pipe insulator	

Fuel Hose Disconnecting and Reconnecting

S7N20A1716002

⚠ WARNING

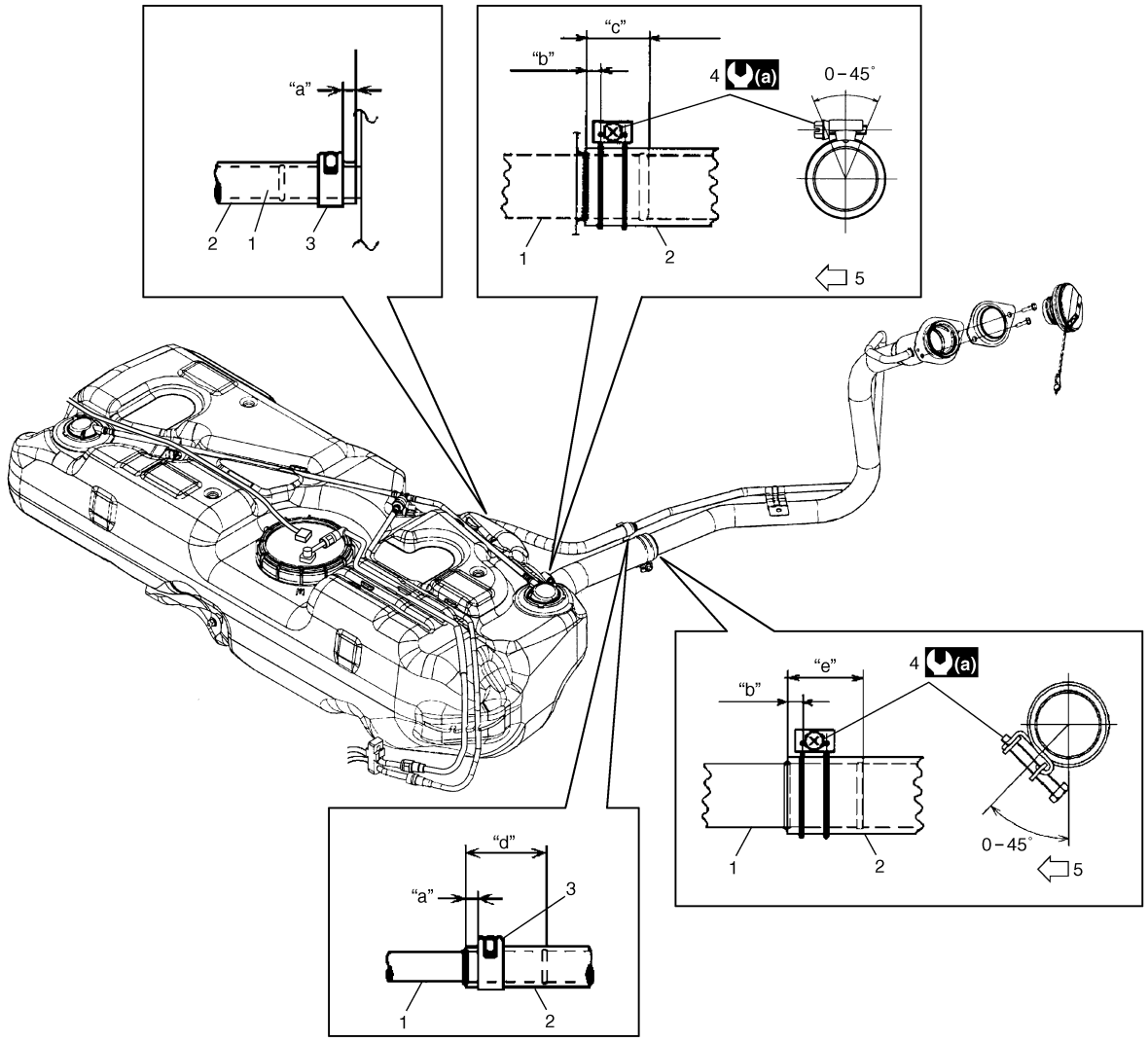
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: M13A / M15A / M16A" in order to reduce the risk or fire and personal injury.

For Conventional Clamp

Fuel tank system

NOTE

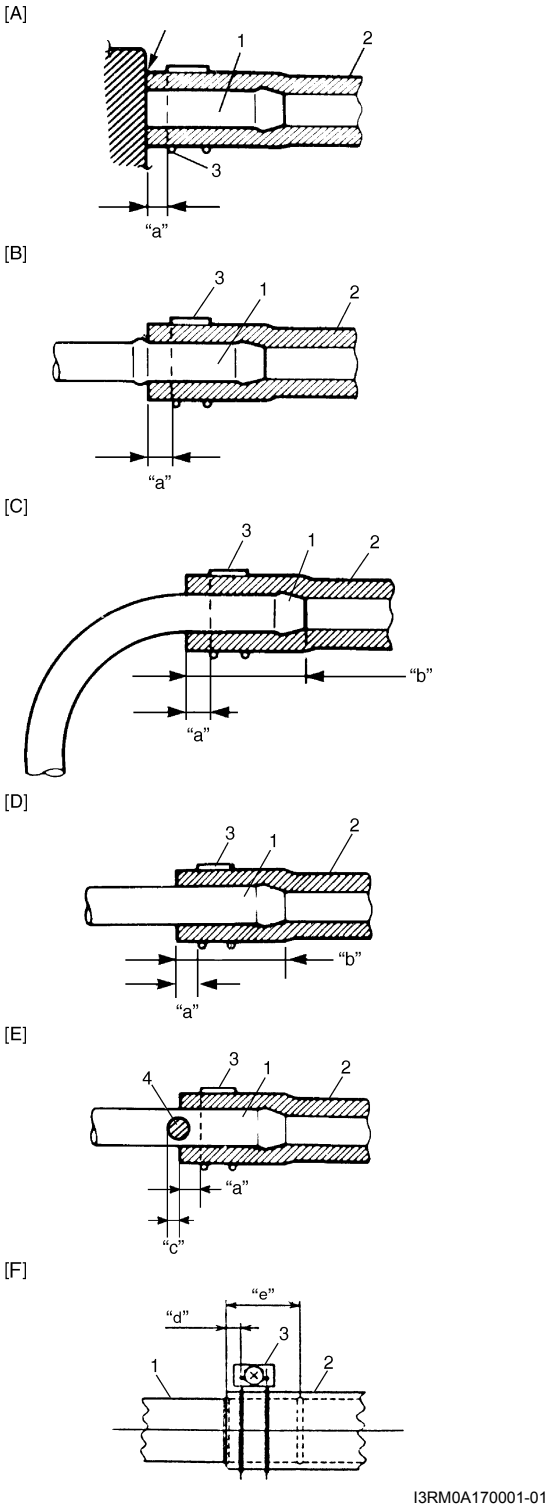
Be sure to install hose to spool of pipe surely.



I4RS0B170003-04

1. Pipe	5. Vehicle leftward	"d" 30 mm (1.18 in.)
2. Hose	"a" 3 – 7 mm (0.12 – 0.28 in.)	"e" 38 mm (1.50 in.)
3. Clamp	"b" 5 – 12 mm (0.20 – 0.48 in.)	(a) : 2 N·m (0.2 kgf-m, 1.5 lbf-ft)
4. Fuel filler hose clamp screw	"c" 33 mm (1.30 in.)	

The other than fuel tank system



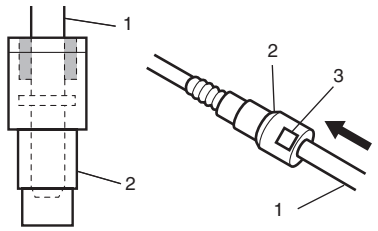
I3RM0A170001-01

[A]:	With short pipe, fit hose as far as it reaches pipe joint as shown.
[B]:	With the following type pipe, fit hose as far as its peripheral projection as shown.
[C]:	With bent pipe, fit hose as its bent part as shown or till depth "b".
[D]:	With straight pipe, fit hose till depth "b".
[E]:	With red marked pipe, fit hose end reaches red mark on pipe.
[F]:	For fuel tank filler hose, insert it to spool or welding-bead.
"a":	Clamp securely at a position 3 – 7 mm (0.12 – 0.27 in.) from hose end.
"b":	20 – 30 mm (0.79 – 1.18 in.)
"c":	0 – 5 mm (0 – 0.19 in.)
"d":	5 – 12 mm (0.2 – 0.47 in.)
"e":	40 mm (1.57 in.)
1.	Pipe
2.	Hose
3.	Clamp
4.	Red mark

For Quick Joint (Fuel Pipe)

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pipe) (2) by blowing compressed air.
2) Disconnect quick joint (fuel pipe) while pushing lock button (3).



I4RS0B170004-01

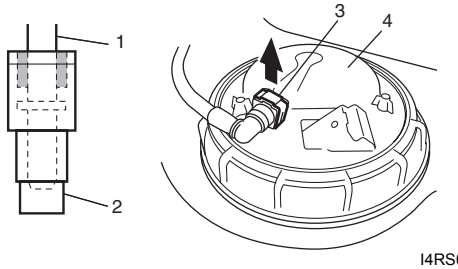
Reconnecting

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.

For Quick Joint (Fuel Pump)

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pump) (2) by blowing compressed air.
2) Release lock plate (3) completely in arrow direction, and then remove quick joint (fuel pump) (2) from fuel pump assembly (4).



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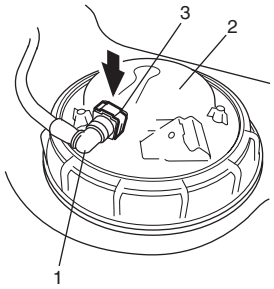
Reconnecting

1) Connect quick joint (fuel pump) (1) to fuel pump assembly (2), and then push lock plate (3) completely in arrow direction.



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2) Confirm that quick joint is not disconnected by hand.

Fuel Pressure Relief Procedure

S7N20A1716003

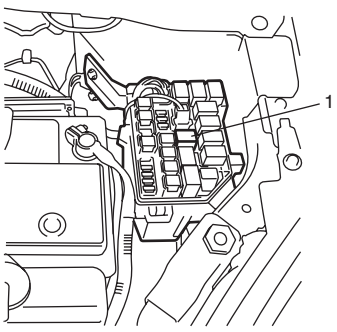
⚠ CAUTION

This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.

NOTE

If ECM detects DTC(s) after servicing, clear DTC(s) referring to "DTC Clearance: M13A / M15A / M16A in Section 1A".

1) Make sure that engine is cold.
2) Shift transaxle gear shift lever in "Neutral" (shift select lever in "P" range for A/T model), set parking brake and block drive wheels.
3) Remove relay / fuse box cover.
4) Disconnect fuel pump relay (1) from relay / fuse box (2).
5) Remove fuel filter cap in order to release fuel vapor pressure in fuel tank, and then reinstall it.
6) Start engine and run it until engine stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time in order to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
7) After servicing, connect fuel pump relay (1) to relay / fuse box and install relay / fuse box cover.



I4RS0B170005-01

Fuel Leakage Check Procedure

S7N20A1716004

After performing any service on fuel system, check to make sure that there are no fuel leakages as follows.

1) Turn ON ignition switch for 3 seconds (to operate fuel pump) and then turn it OFF.
   Repeat this (ON and OFF) 3 or 4 times and apply fuel pressure to fuel line until fuel pressure is felt by hand placed on fuel feed hose.
2) In this state, check to see that there are no fuel leakages from any part of fuel system.

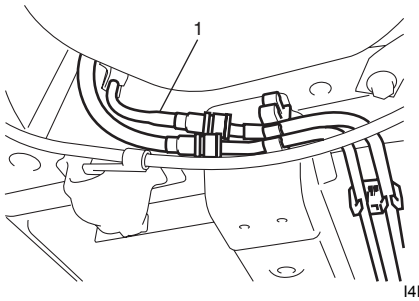
Fuel Lines On-Vehicle Inspection

S7N20A1716005

⚠ CAUTION

Due to the fact that fuel feed line (1) is under high pressure, use special care when servicing it.

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration or damage.
Make sure all clamps are secure.
Replace parts as needed.



I4RS0B170006-01

Fuel Pipe Removal and Installation

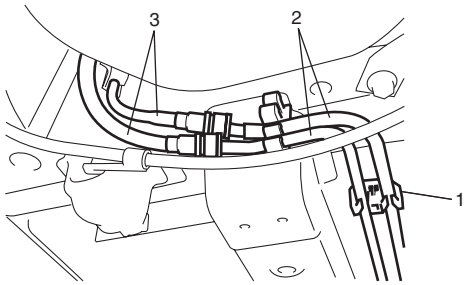
S7N20A1716006

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: M13A / M15A / M16A" in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure in fuel feed line according to "Fuel Pressure Relief Procedure: M13A / M15A / M16A".
2) Disconnect negative cable at battery.
3) Disconnect fuel pipe joint and fuel hose (3) from fuel pipe (2) at the front and rear of each fuel pipe referring to "Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A".
4) Mark the location of clamps (1) on fuel pipes (2), so that the clamps can be reinstalled to where they were.
5) Remove pipes (2) with clamp (1) from vehicle.
6) Remove clamp (1) from pipes (2).



I4RS0B170007-01

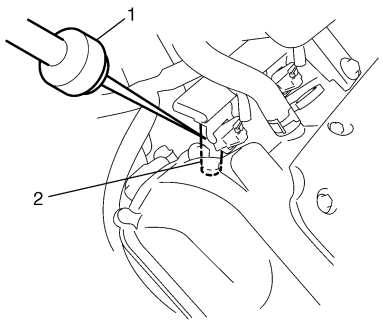
Installation

1) Install clamps to marked location on pipes. If clamp is deformed, its claw is bent or broken, replace it with new one.
2) Install pipes with pipe clamps to vehicle.
3) Connect fuel hoses and pipes to each pipe referring to "Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A".
4) Connect negative cable at battery.
5) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Injector On-Vehicle Inspection

S7N20A1716007

1) Using sound scope (1) or such, 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 an unusual sound is heard, check injector circuit (wire or coupler) or injector.



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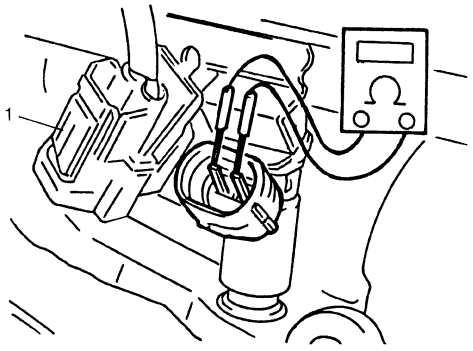
2) Disconnect connector (1) from injector, connect ohmmeter between terminals of injector and check resistance.
   If resistance is out of specification, replace.

Resistance of fuel injector
11.3 – 13.8 Ω at 20 °C, 68 °F



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3) Connect connector to injector securely.

Fuel Injector Removal and Installation

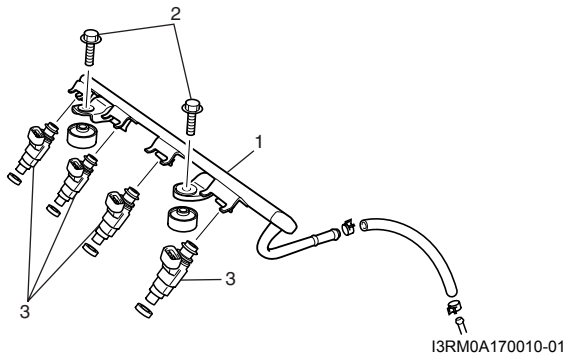
S7N20A1716008

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: M13A / M15A / M16A" in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure according to "Fuel Pressure Relief Procedure: M13A / M15A / M16A".
2) Disconnect negative cable at battery.
3) Disconnect MAF sensor connector, and detach EVAP canister purge valve.
4) Remove air cleaner assembly with air intake pipe.
5) Disconnect fuel injector couplers.
6) Disconnect fuel feed hose from fuel delivery pipe (1).
7) Remove fuel delivery pipe bolts (2).
8) Remove fuel injector(s) (3).



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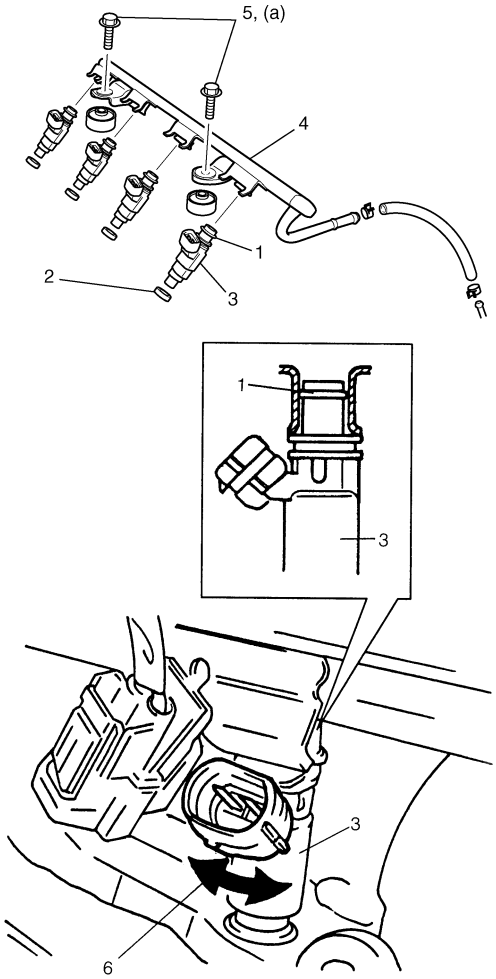
Installation

Reverse removal procedure for installation noting the following.

- Replace injector O-ring (1) with new one using care not to damage it.
- Check if cushion (2) is scored or damaged. If it is, replace with new one.
- Apply thin coat of fuel to O-rings (1) and then install injectors (3) into delivery pipe (4) and cylinder head. Make sure that injectors rotate smoothly (6). If not, probable cause is incorrect installation of O-ring. Replace O-ring with new one.
- Tighten delivery pipe bolts (5) to specified torque and make sure that injectors rotate smoothly.

Tightening torque
Fuel delivery pipe bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



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- After installation, with engine OFF and ignition switch ON, check for fuel leaks around fuel line connection.

Fuel Injector Inspection

S7N20A1716009

⚠ WARNING

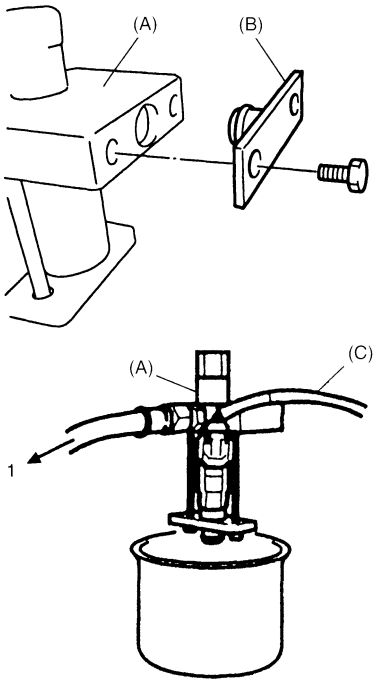
Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: M13A / M15A / M16A” in order to reduce the risk or fire and personal injury.

1) Install injector to special tool (injector checking tool).

   Special tool
   (A): 09912–58421
   (B): 09912–57610

2) Connect special tools (hose and attachment) to fuel feed pipe (1) of vehicle.
3) Connect special tool (test lead) to injector.

   Special tool
   (C): 09930–88530



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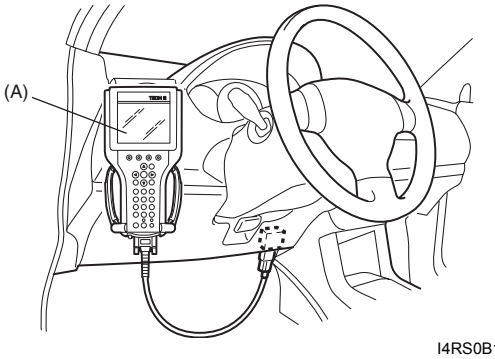
4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5) Put graduated cylinder under injector.
6) Operate fuel pump and apply fuel pressure to injector as follows:
   a) When using scan tool:
      i) Connect scan tool to DLC with ignition switch OFF.
      ii) Turn ignition switch ON, clear DTC and select “MISC TEST” mode on scan tool.
      iii) Turn fuel pump ON by using scan tool.

      Special tool
      (A): SUZUKI scan tool



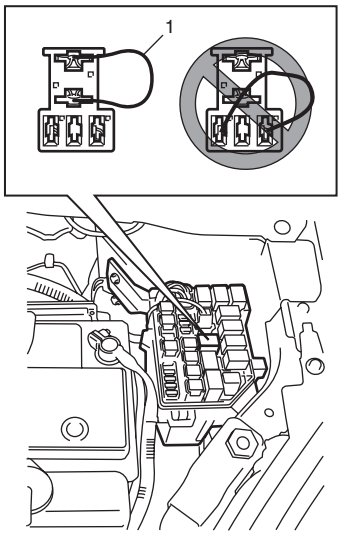
I4RS0B170008-01

   b) When not using scan tool:
      i) Remove fuel pump relay from connector.
      ii) Connect two terminals of relay connector using service wire (1) as shown in the figure.

⚠ CAUTION

Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.

      iii) Turn ignition switch ON.



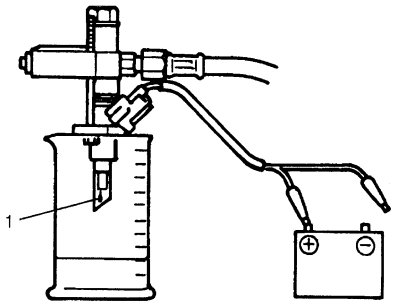
I4RS0B170009-02

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 not within specification, replace injector.

Injected fuel volume
43 – 47 cc/15 sec. (1.45/1.51 – 1.58/1.65 US/Imp oz/15 sec.)

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.

Fuel leakage
Less than 1 drop/min.



I2RH0B170013-01

Fuel Filler Cap Inspection

S7N20A1716010

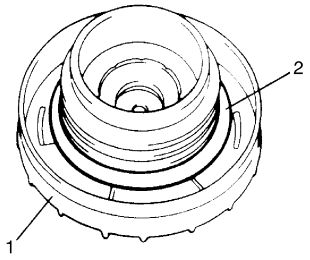
⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: M13A / M15A / M16A" in order to reduce the risk or fire and personal injury.

Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.

NOTE

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in fire and personal injury.



I2RH01170008-01

Fuel Tank Removal and Installation

S7N20A1716011

⚠ WARNING

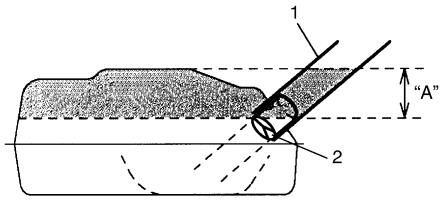
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: M13A / M15A / M16A" in order to reduce the risk or fire and personal injury.

Removal

1) Relieve fuel pressure in fuel feed line according to "Fuel Pressure Relief Procedure: M13A / M15A / M16A".
2) Disconnect negative cable at battery.
3) Remove fuel filler cap.
4) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" as shown in figure.

⚠ CAUTION

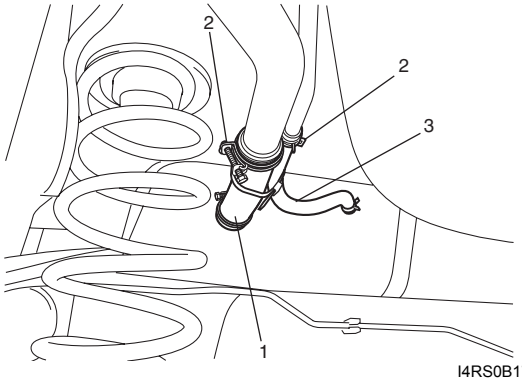
Do not force pump hose into fuel tank.



I4RS0B170022-01

2. Inlet valve

5) Hoist vehicle, and remove clamp (2), fuel filler hose (1) and breather hose (3) from fuel tank.



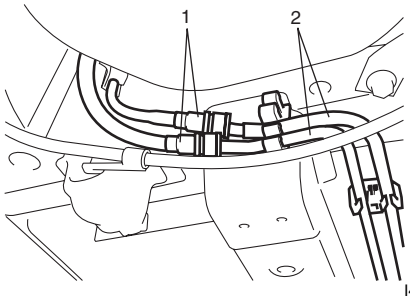
I4RS0B170010-01

6) Remove exhaust center pipe.
7) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

⚠ CAUTION

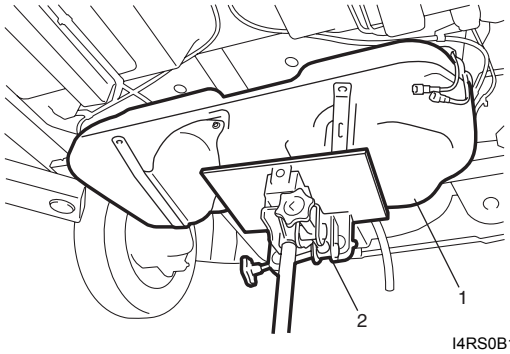
- **Do not force pump hose into fuel tank.**
- **Never store fuel in an open container due to possibility of fire or explosion.**

8) Disconnect quick joint (fuel pipe) (1) from fuel pipes (2) referring to "Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A".



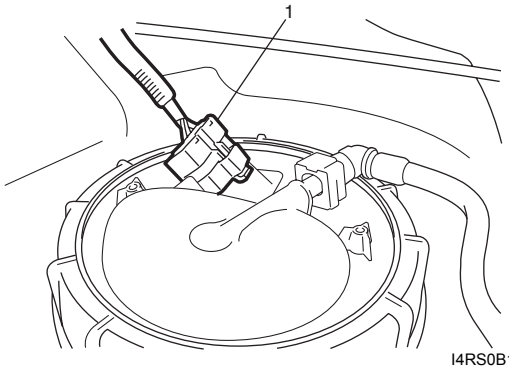
I4RS0B170011-01

9) Support fuel tank (1) with jack (2) and remove its mounting bolts.



I4RS0B170012-01

10) Lower fuel tank a little as to disconnect wire harness at connector (1), then remove fuel tank.



I4RS0B170013-01

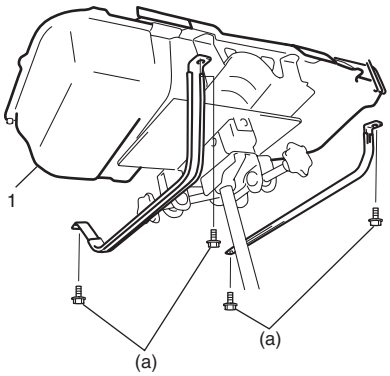
Installation

⚠ CAUTION

- **When connecting joint, clean outside surfaces 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.**
- **Never let the fuel hoses touch the ABS sensor harness (if equipped).**

1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
2) Raise fuel tank (1) with jack and connect fuel pump connector and clamp wire harness.
3) Install fuel tank to vehicle and tighten new fuel tank bolts to specified torque.

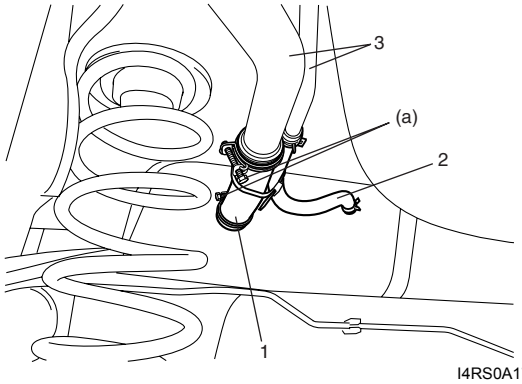
Tightening torque
Fuel tank bolt (a): 45 N·m (4.5 kgf-m, 32.5 lbf-ft)



I4RS0A170011-02

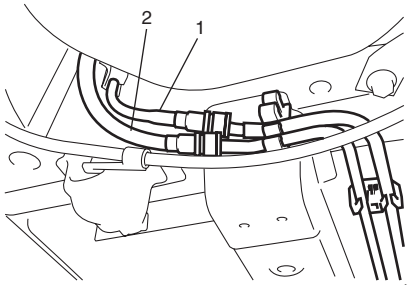
4) Connect fuel filler hose (1) and breather hose (2) to filler neck (3) as shown in figure, and clamp them securely.

Tightening torque
Fuel filler hose clamp (a): 2 N·m (0.2 kgf-m, 1.5 lbf-ft)



I4RS0A170012-01

5) Connect fuel feed hose (1) and vapor hose (2) to each pipe as shown in figure, and clamp them securely.



I4RS0B170014-01

6) Install exhaust center pipe referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.
7) Connect negative cable at battery.
8) With engine OFF, turn ignition switch to ON position and check for fuel leaks.

Fuel Tank Inspection

S7N20A1716012

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

Fuel Tank Purging Procedure

S7N20A1716013

⚠ WARNING

- **Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: M13A / M15A / M16A” in order to reduce the risk or fire and personal injury.**
- **This purging procedure will not remove all fuel vapor.**
  Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

⚠ CAUTION

Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.

The following procedure are used for purging 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. Replace tank if its inside is rusty.
5) Completely flush out remaining water after washing.
6) Be sure to dry fuel tank assembly thoroughly out of direct sunlight after washing.

Fuel Pump On-Vehicle Inspection

S7N20A1716014

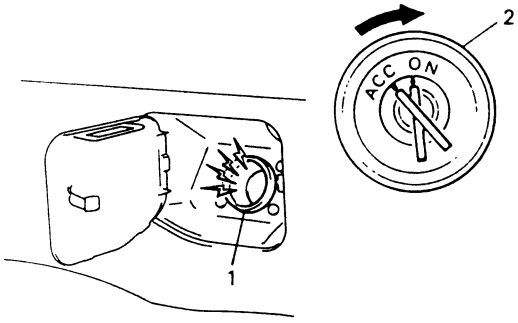
⚠ WARNING

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: M13A / M15A / M16A” in order to reduce the risk or fire and personal injury.

NOTE

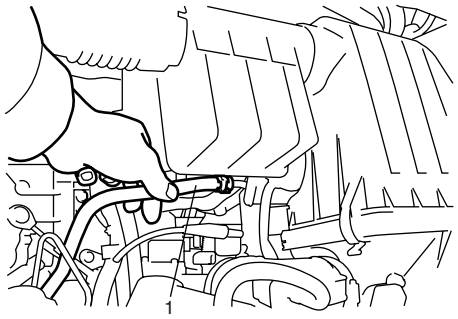
The fuel pressure regulator is incorporated with the fuel pump assembly so individual inspection of it is impossible.

1) Remove filler cap and turn ON ignition switch (2). Then fuel pump operating sound should be heard from fuel filler (1) for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking.
   If the check result is not satisfactory, go to “Fuel Pump and Its Circuit Check: M13A / M15A / M16A in Section 1A”.



IVSY01170013-01

2) Turn OFF ignition switch and leave over 10 minutes as it is.
3) Fuel pressure should be felt at fuel feed hose (1) for about 2 seconds after ignition switch ON.
   If fuel pressure is not felt, go to “Fuel Pressure Check: M13A / M15A / M16A in Section 1A”.



I3RM0A170019-01

Fuel Pump Assembly Removal and Installation

S7N20A1716015

⚠ WARNING

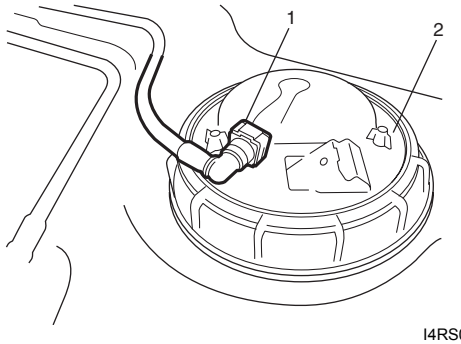
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: M13A / M15A / M16A" in order to reduce the risk or fire and personal injury.

⚠ CAUTION

Never disassemble fuel pump assembly except fuel level sensor. Disassembly will spoil its original performance. If faulty condition is found, replace it with new one.

Removal

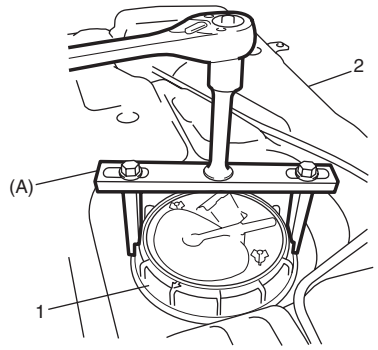
1) Remove fuel tank from vehicle referring to "Fuel Tank Removal and Installation: M13A / M15A / M16A".
2) Disconnect fuel feed pipe (1) from fuel pump assembly (2) referring to "Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A".



I4RS0B170015-01

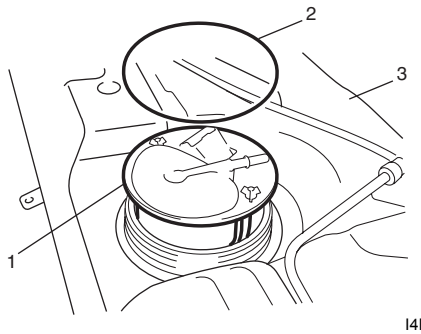
3) Remove fuel pump lock nut (1) from fuel tank (2) using special tool.

Special tool
(A): 09941–51010



I4RS0B170016-01

4) Remove fuel pump assembly (1) and O-ring (2) from fuel tank (3).



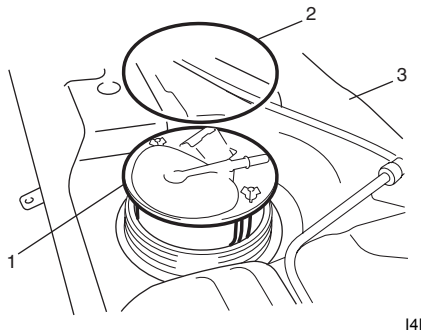
I4RS0B170017-01

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 surfaces of fuel pump assembly and fuel tank.
2) Install fuel pump assembly (1) and new O-ring (2) to fuel tank (3).



I4RS0B170017-01

3) Install new fuel pump lock nut (1) to fuel tank (2) as follows.
   a) Tighten new fuel pump lock nut (1) by hand.

NOTE

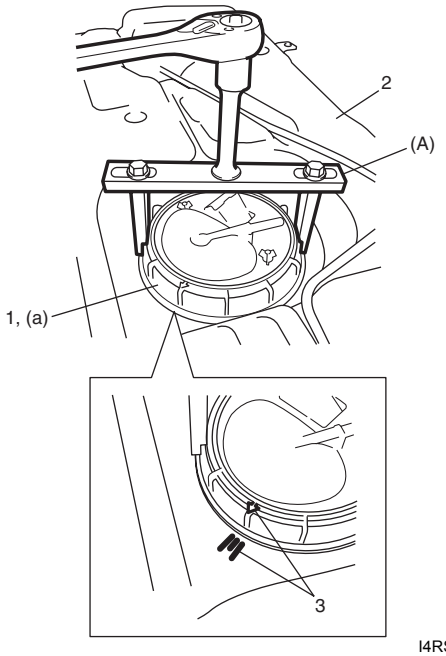
Tighten lock nut while pressing straight on it so that it will not tilt.

b) Using special tool, tighten fuel pump lock nut (1) until indexes (3) of fuel pump lock nut and fuel tank are aligned.

NOTE

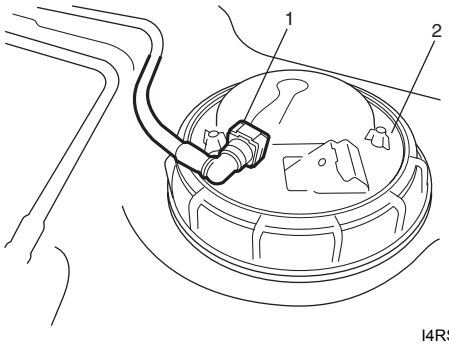
- **Indexes are aligned when fuel pump lock nut is tightened by approx. 1 and 1/3 rotations.**
- **After tightening fuel pump lock nut, check for loosening and play.**

Special tool
(A): 09941–51010



I4RS0B170018-02

4) Connect fuel feed pipe (1) to fuel pump assembly (2) referring to “Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A”.



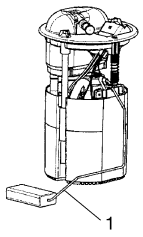
I4RS0B170015-01

5) Install fuel tank to vehicle referring to “Fuel Tank Removal and Installation: M13A / M15A / M16A”.

Fuel Pump Inspection

S7N20A1716016

- Check fuel pump assembly for damage.
- Check fuel suction filter for evidence of dirt and contamination.
  If present, replace or clean and check for presence of dirt in fuel tank.
- For electrical circuit, refer to “Fuel Pressure Check: M13A / M15A / M16A in Section 1A”.
- For inspection of fuel level gauge (1), refer to “Fuel Level Sensor Inspection in Section 9C”.



I4RS0B170021-01

Specifications

Tightening Torque Specifications

S7N20A1717001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Fuel delivery pipe bolt	25	2.5	18.0	☞
Fuel tank bolt	45	4.5	32.5	☞
Fuel filler hose clamp	2	0.2	1.5	☞

NOTE

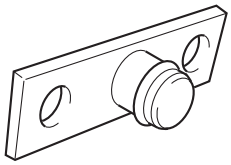
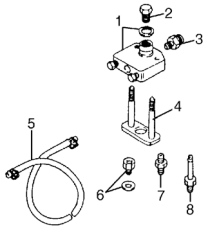
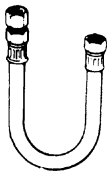
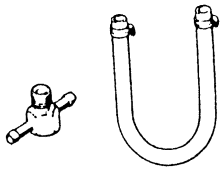
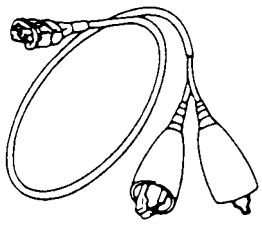
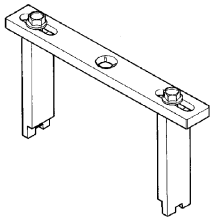
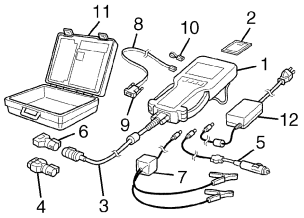
The specified tightening torque is also described in the following.
“Fuel System Components: M13A / M15A / M16A”
“Fuel Hose Disconnecting and Reconnecting: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A1718001

09912–57610 Injector checking tool plate ☞ 	09912–58421 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☞ 
09912–58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413).☞ 	09912–58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413).☞ 
09912–58490 3-way joint & hose ☞ 	09930–88530 Injector test lead ☞ 
09941–51010 Lock ring wrench ☞ / ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ 

D13A / Z13DTJ

Precautions

Precautions on Fuel System Service

S7N20A1720001

⚠ WARNING

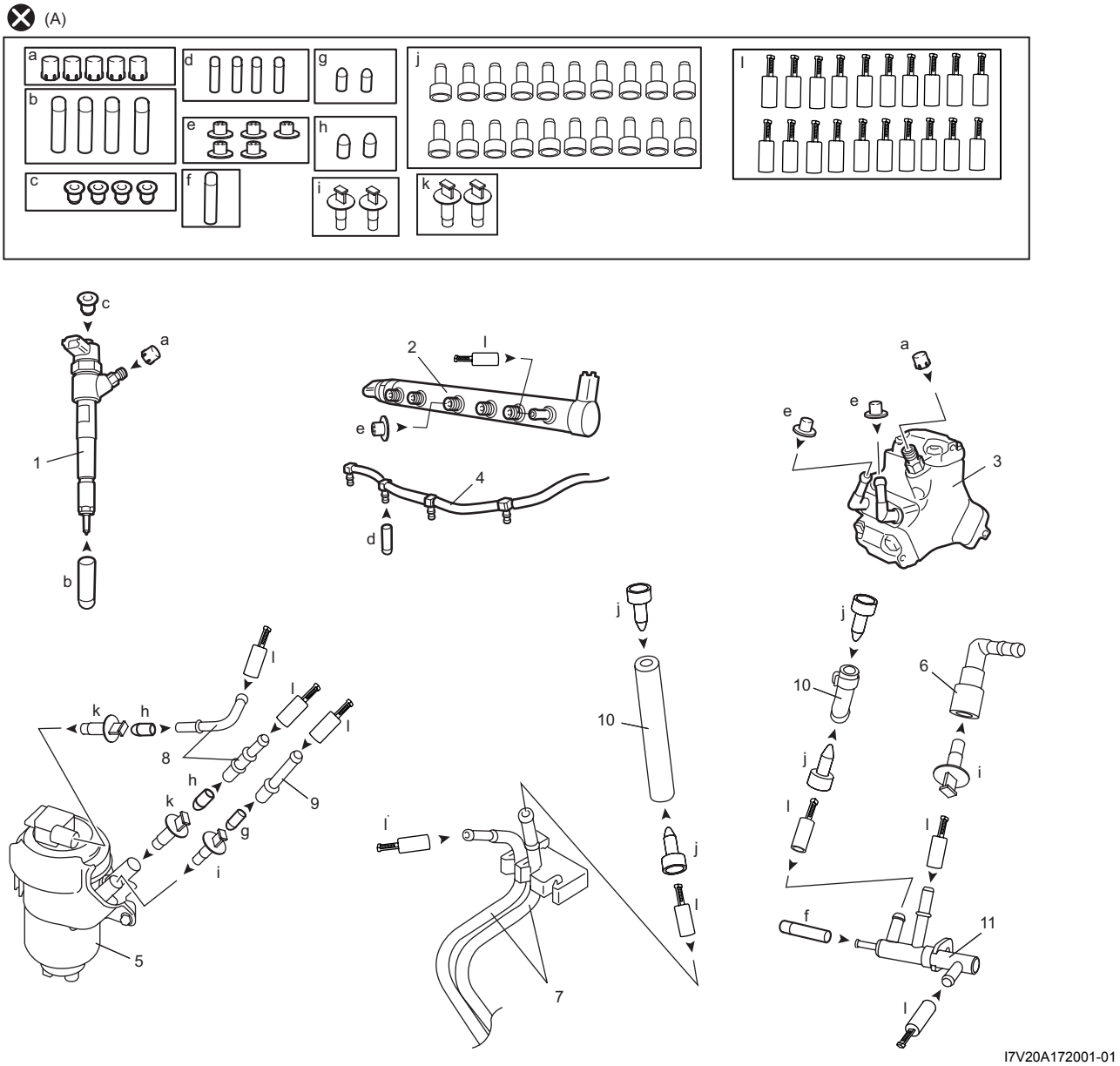
- **Before attempting service of any type on fuel system, the following should be always observed in order to reduce the risk or fire and personal injury.**
  - **– Disconnect negative (–) cable at battery.**
  - **– Do not smoke, and place no smoking signs near work area.**
  - **– Be sure to have CO_2 fire extinguisher handy.**
  - **– Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot 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 engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel high pressure line, make sure to relief fuel pressure referring to "Fuel Pressure Relief Procedure: D13A / Z13DTJ".**
  - **– A small amount of fuel may be released after the fuel line is disconnected. In order to reduce the chance of personal injury, cover the fitting to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**
  - **– Never run engine with fuel main relay disconnected 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 referring to "Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ". After connecting, make sure that it has no twist or kink.**
  - **– When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O-ring with fuel.**
  - **– When connecting fuel pipe flare nut, first tighten flare nut by hand and then tighten it to specified torque, using back-up wrench.**
  - **– The system can inject the diesel fuel into the engine at a pressure up to 160,000 kPa (1631.5 kgf/cm^2, 22,760 psi, 1600 bar). Before carrying out any work, check that the injector rail is not under pressure and that the fuel temperature is not too high.**
  - **– Do not place your hand near to a leak on the high pressure fuel circuit.**
  - **– Do not run engine with disconnecting fuel pipe and/or removing fuel system components.**
  - **– As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel high pressure line, make sure to relieve fuel pressure referring to "Fuel Pressure Relief Procedure: D13A / Z13DTJ".**
  - **– Do not expose removed fuel system parts to dust. Keep them always clean.**
  - **– When servicing the fuel tank, it should be treated with respect, with no contact with sharp edges or hot surfaces. In addition, the fuel tank should not be dropped since fuel tank, fuel pump and other components can be damaged by the impact. If dropped, all components should be replaced because there is a risk of damage.**
  - **– The fuel tank is made of resin. Be sure not to allow solvent (chemical article such as grease and sealant) to attach to the fuel tank as some chemical reaction may occur, causing the fuel tank to be swollen, hardened or distorted leakage and resulting in fuel leakage from the fuel tank.**
- **Fuel vapor is hazardous. It can very easily ignite, causing serious injury and damage. Always keep sparks and flames away from fuel. Fuel line spills and leaks are dangerous. Fuel can ignite and cause serious injuries or death and damage.**
- **Fuel can also irritate skin and eyes. To prevent this, always complete the following instructions.**

- The fuel system must be checked for leaks after service work, refer to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.
- The fuel system is very sensitive to contamination. The risks caused by the introduction of contamination are:
  – damage or destruction of the high pressure injection system and the engine.
  – seizing or leaking of a component.
- When servicing on the high pressure direct injection system, must be performed under very clean conditions. This means that no contamination get into the system during dismantling or into the circuits via the fuel unions.
- The cleanliness principle must be applied from the fuel filter to the injectors.
- Contamination is caused by the following.
  – Metal or plastic chips
  – Paint
  – Fibres: boxes, brushes, paper, clothing or cloths
  – Foreign bodies such as hair
  – Ambient air
  – etc.
- It is not possible to clean the engine using a high pressure washer because of the risk of damaging connections. In addition, moisture may collect in the connectors and create electrical connection problems.
- The technician should wear clean overalls.
- Ensure that you have the plug caps (special tool) for the unions to be opened in order to prevent. Plug caps are to be used once only.
  After use, they must be thrown away (once used they are soiled and cleaning is not sufficient to make them reusable).
  Unused plug caps must be thrown away, also.

  Special tool
  (A): 09919–46310

  NOTE

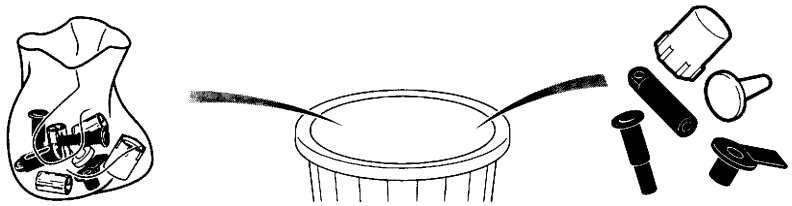
  Plug unions as soon as possible when removing / disconnecting fuel system component in order to prevent dust from invading.
  Similarly, do not remove plug cap immediately before when installing / connecting fuel system component.



I7V20A172001-01

1. Fuel injector	4. Fuel return hose of fuel injector	7. Fuel pipe	10. Fuel hose
2. Common rail	5. Fuel filter assembly	8. Fuel feed joint	11. Fuel damper
3. High pressure pump	6. Fuel return connector	9. Fuel return joint	⊗ : Do not reuse.

- Ensure that you have hermetically resalable plastic bags for storing removed parts. Stored parts will therefore be less subject to the risk of impurities. The bags must be used only once, and after use they must be thrown away.



I3RB0A173003-01

- Make sure that lint-free towelettes. The use of a normal cloth or paper for cleaning purposes is forbidden.
  These are not lint-free and may contaminate the fuel circuit of the system. Each lint-free cloth should only be used once.
- Carry out any servicing as much as possible with the plug cap installed in order to prevent impurities from entering the system.
- Be sure to follow the instructions below before opening the fuel circuit.
  - For each operation, use new thinner (used thinner contains impurities). Pour it into a clean receptacle.
  - For each operation, use a clean brush which is in good condition (the brush must not shed its bristles).
  - Use a brush and thinners to clean the connections to be opened.
  - Blow compressed air over the cleaned parts (tools, cleaned the same way as the parts, connections and injection system zone) Check that no bristles remain adhered.
  - Wash your hands before and during the operation if necessary.
  - When wearing leather protective gloves, cover these with latex gloves.
- Be sure to follow the instructions below during the operation.
  - As soon as the circuit is open, all openings must be plugged to prevent impurities from entering the system by using the plug cap. They must not, under any circumstances, be reused.
  - Close the hermetically seated bag, even if it has to be reopened shortly afterwards.
    Ambient air carries contamination.
  - All components of the injection system that are removed must be stored in a hermetically sealed plastic bag once the plugs have been inserted.
  - The use of a brush, thinner, bellows, sponge or normal cloth is strictly forbidden once the circuit has been opened.
    These items are likely to allow impurities to enter the system.
  - A new component replacing an old one must not be removed from its packaging until it is to be fitted to the vehicle.

General Description

Fuel System Description

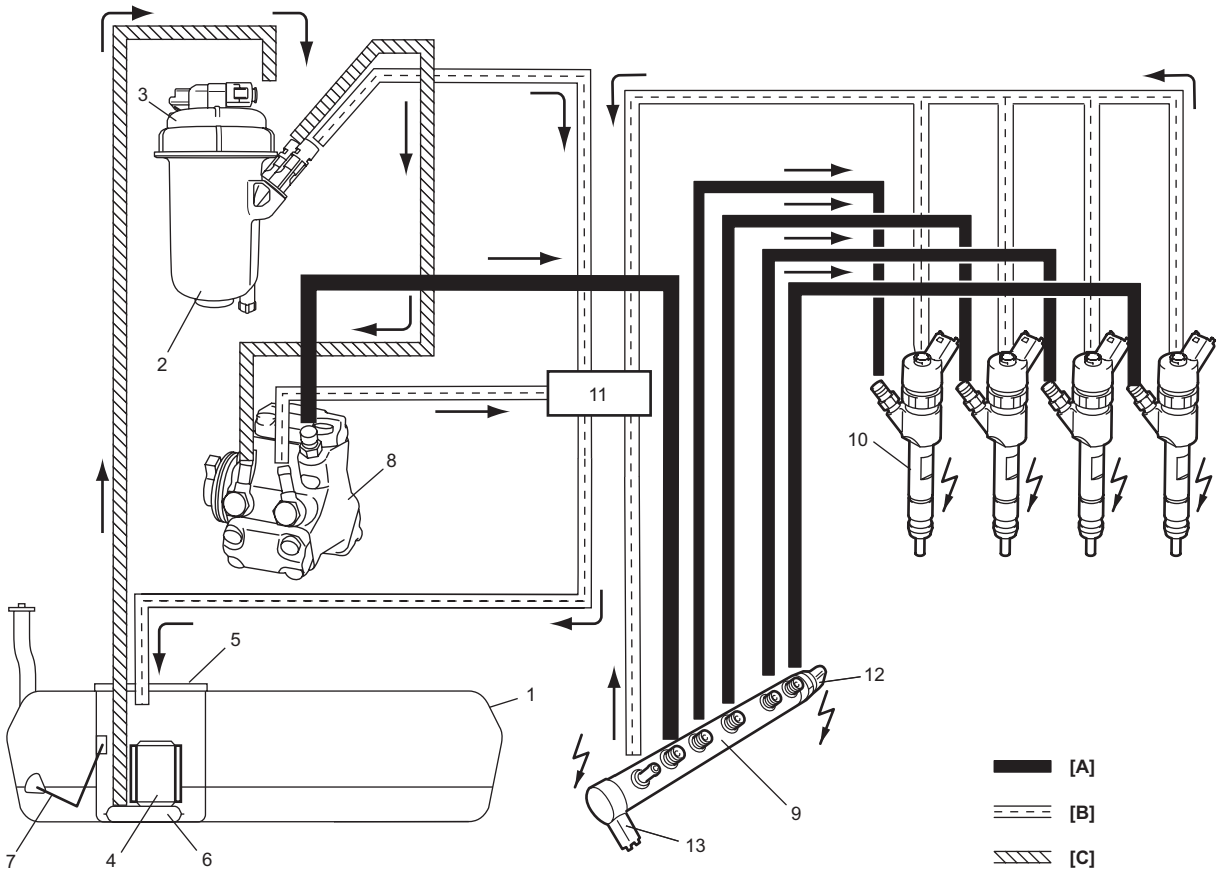
S7N20A1721001

⚠ CAUTION

The engine of this vehicle requires the use of unleaded fuel only.
Use of leaded and/or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.

Low-pressure fuel supply circuit [A]
The fuel in the fuel tank (1) is pumped up to the high pressure fuel supply circuit [B] through the fuel filter (2) and the fuel heater (3) by the fuel pump (4) in fuel tank.
The fuel pump assembly (5) is composed of a fuel pump (4) a fuel suction filter (6), a main fuel level gauge (7). The fuel pump is an in-tank type electric pump.

High-pressure fuel supply circuit [B]
The high pressure pump (8) driven by engine rotation creates high-pressure fuel by the low pressure fuel. The high pressure fuel is supplied to the common rail (9) through the high-pressure fuel pipe. And, the injectors (10) atomize the fuel in the cylinders.
The fuel pressure regulator valve (13) regulates the fuel pressure in the common rail.



I7V20A172002-02

[C]: Return for circuit	11. Fuel damper	12. Fuel pressure sensor

Repair Instructions

Fuel Hose Disconnecting and Reconnecting

S7N20A1726028

⚠ WARNING

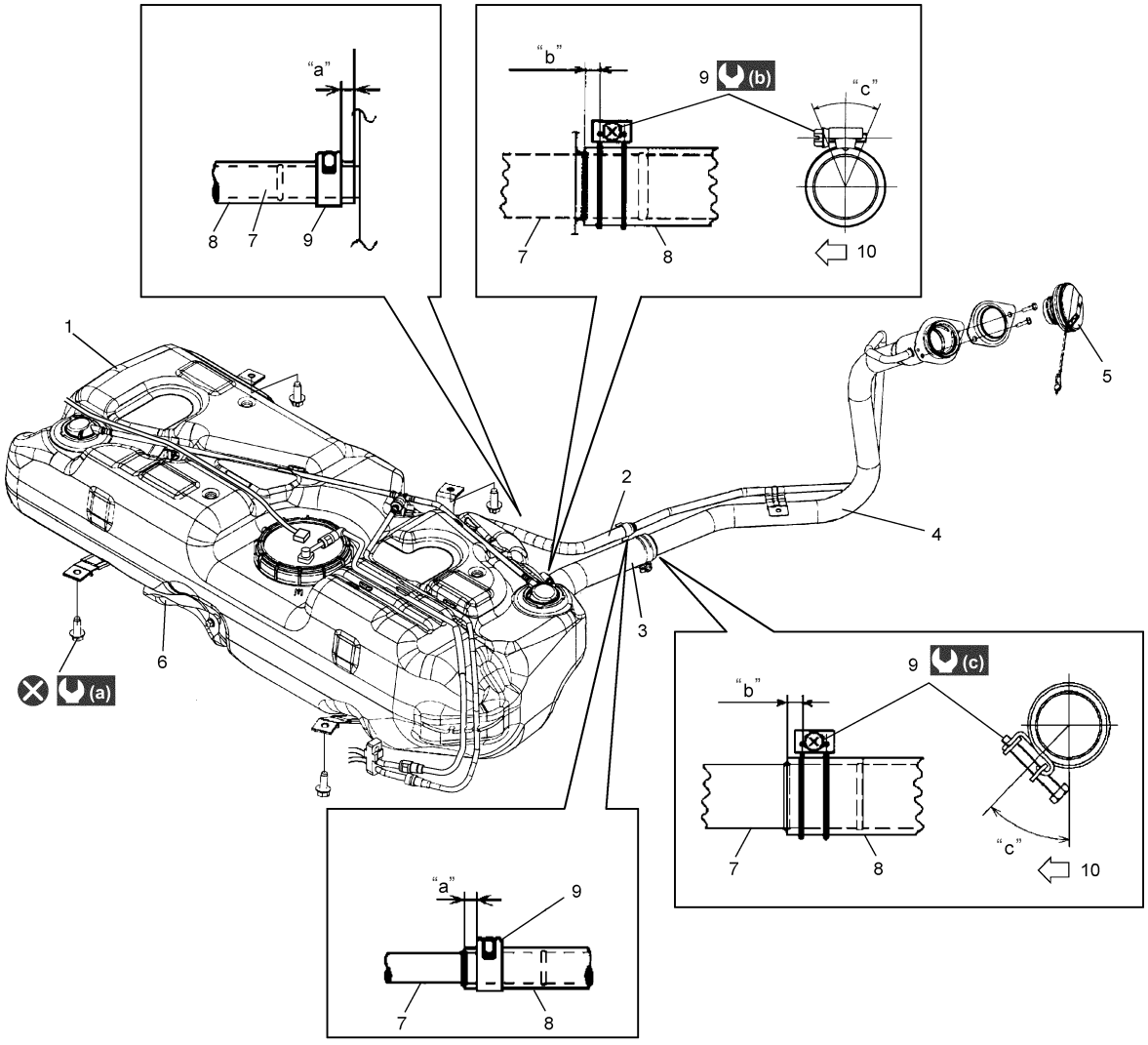
Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

For Conventional Clamp

Fuel tank system

NOTE

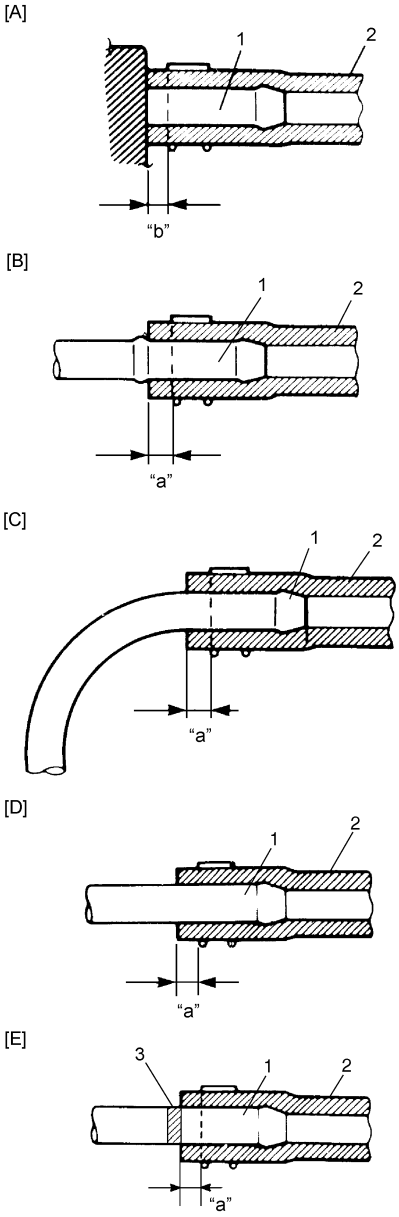
Be sure to install hose to spool of pipe surely.



I7V20A172003-01

1. Fuel tank	6. Fuel tank protector	"a": 3 – 7 mm (0.12 – 0.28 in.)	(c) : 1.5 N·m (0.15 kgf-m, 1.5 lbf-ft)
2. Breather hose	7. Pipe	"b": 5 – 12 mm (0.20 – 0.48 in.)	⊗ : Do not reuse.
3. Fuel tank filler hose	8. Hose	"c": 0 – 45°	
4. Fuel filler neck	9. Clamp	(a) : 45 N·m (4.6 kgf-m, 33.5 lbf-ft)	
5. Fuel filler cap	10. Vehicle leftward	(b) : 2.0 N·m (0.20 kgf-m, 1.5 lbf-ft)	

The other than fuel tank system

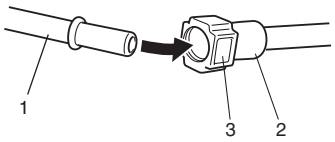


I7V20A172004-01

[A]:	With short pipe, fit hose as far as it reaches pipe joint as shown.
[B]:	With the following type pipe, fit hose as far as its peripheral projection as shown.
[C]:	With bend pipe, insert the hose up to the end of pipe.
[D]:	With straight pipe.
[E]:	With white marked pipe, insert the hose up to white marking.
"a"	Clamp securely at a position 3 – 7 mm (0.12 – 0.27 in.) from hose end.
"b"	2.0 – 4.0 mm (0.079 – 0.16 in.)
"c"	5 – 12 mm (0.2 – 0.47 in.)
1.	Pipe
2.	Hose
3.	White mark

For Quick Joint (Fuel Pipe)
Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pipe) (2) by blowing compressed air.
2) Disconnect quick joint (fuel pipe) while pushing lock button (3).



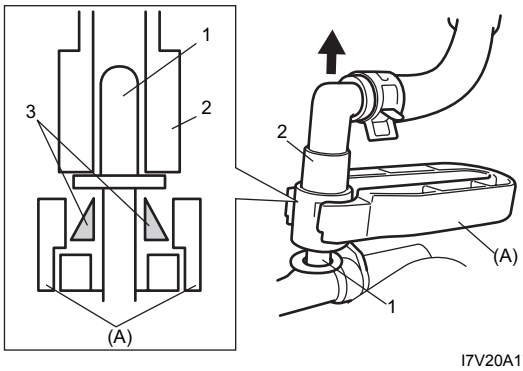
I5RW0B170006-02

Reconnecting
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.

For Quick Joint (Fuel Filter / Fuel Damper)
Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.
2) Unlock quick joint lock (3) using special tool between pipe (1) and quick joint (2) as shown in figure.

Special tool
(A): 09912–58310

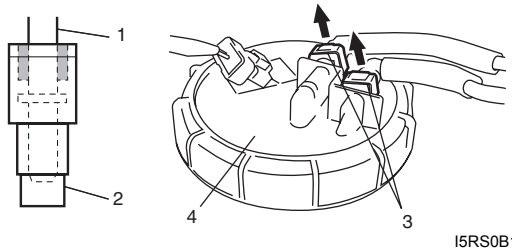


I7V20A172006-01

Reconnecting
Insert quick joint to pipe until they lock securely (a click is heard), and confirm that quick joint is not disconnected by hand.

For Quick Joint (Fuel Pump)
Disconnecting

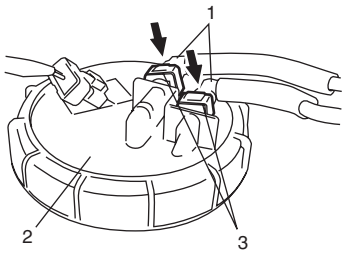
1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (fuel pump) (2) by blowing compressed air.
2) Release lock plate (3) completely in arrow direction, and then remove quick joint (fuel pump) (2) from fuel pump assembly (4).



I5RS0B170003-01

Reconnecting

1) Connect quick joint (fuel pump) (1) to fuel pump assembly (2), and then push lock plate (3) completely in arrow direction.



I5RS0B170004-01

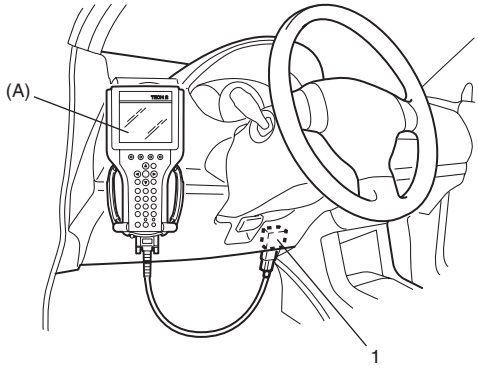
2) Confirm that quick joint is not disconnected by hand.

Fuel Pressure Relief Procedure

S7N20A1726030

1) Check that engine is cold.
2) Connect SUZUKI scan tool to DLC (1) with ignition switch turned OFF.

Special tool
(A): SUZUKI scan tool



I4RS0B130001-02

3) Turn ON ignition switch.
4) Confirm that fuel pressure line is not under pressure by using “Fuel Rail Pressure” parameter of SUZUKI scan tool.

Fuel Leakage Check Procedure

S7N20A1726003

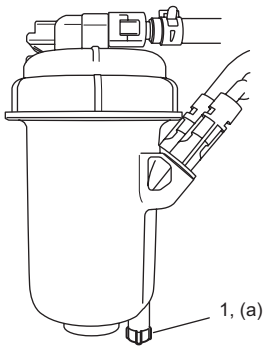
1) Turn ignition switch to ON position.
2) Check for the fuel leakage in each part, which was serviced.
3) Start the engine, and then check for the fuel leakage in each part, which was serviced.
4) Run engine at 4000 rpm. for about 30 seconds and then stop engine.
5) Check for the fuel leakage in each part, which was serviced.

Water Draining of Fuel Filter

S7N20A1726004

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle.
3) Place container under bleed screw (1), and drain water loosening it from lower side of engine until fuel flows out.
4) Tighten bleed screw (1) to specified torque.

Tightening torque
Bleed screw (a): 1.5 N·m (0.15 kgf-m, 1.5 lbf-ft)



I7V20A172008-01

5) Lower vehicle.
6) Connect negative (–) cable at battery.

Air Bleeding of Fuel System

S7N20A1726005

Air bleeding must be carried out when fuel system has been disassembled or when vehicle ran out of fuel. Turn ignition switch ON to operate fuel pump and after about 5 seconds turn it OFF. Repeat this 6 times and then check engine starts.

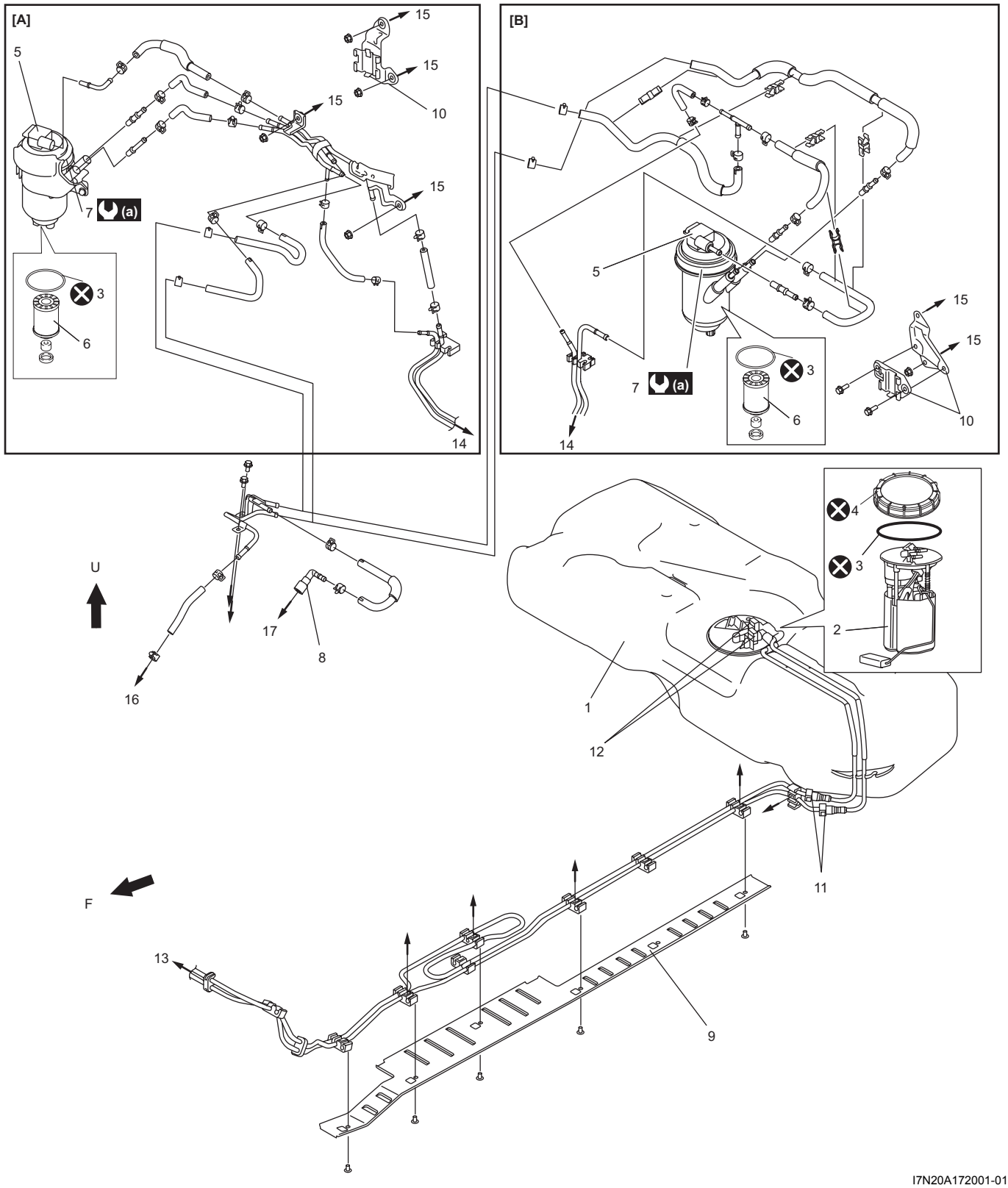
Fuel System Components

S7N20A1726002

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

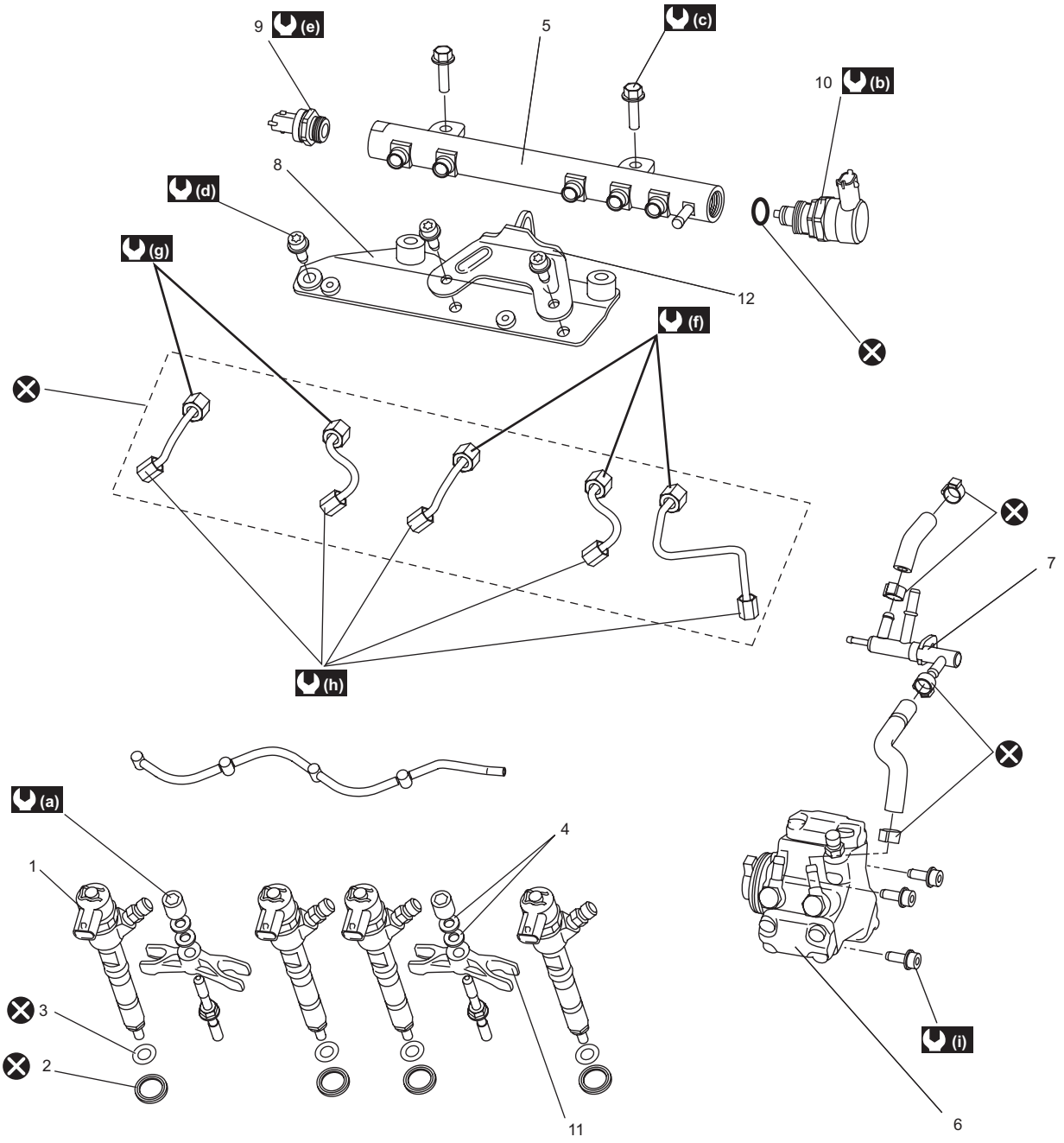
Low-Pressure Fuel Supply Circuit



I7N20A172001-01

[A] LHD model	5. Fuel filler	13. To fuel filter
[B] RHD model	6. Fuel filter element	14. To fuel tank
F: Forward	7. Fuel filter fasteners	15. To dash panel
U: Upward	8. Fuel return connector	16. To high pressure pump
1. Fuel tank	9. Fuel pipe cover	17. To fuel damper
2. Fuel pump	10. Fuel filter bracket	(a) : 30 N·m (3.1 kgf-m, 22.5 lbf-ft)
3. O-ring	11. Quick joint (fuel pipe)	⊗ : Do not reuse.
4. Fuel pump lock nut	12. Quick joint (fuel pump)	

High-Pressure Fuel Supply Circuit



I7V20A172011-02

1. Fuel injector	7. Fuel damper	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	(g) : 29 N·m (3.0 kgf-m, 21.5 lbf-ft)
2. Sealing ring	8. Common rail bracket	(b) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)	(h) : 27 N·m (2.8 kgf-m, 20.0 lbf-ft)
3. Sealing washer	9. Fuel pressure sensor	(c) : 85 N·m (8.7 kgf-m, 63.0 lbf-ft)	(i) : 17 N·m (1.7 kgf-m, 12.5 lbf-ft)
4. Washer	10. Fuel pressure regulator	(d) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)	⊗ : Do not reuse.
5. Common rail	11. Fuel injector bracket	(e) : 70 N·m (7.1 kgf-m, 52.0 lbf-ft)	
6. High pressure pump	12. Engine side hook	(i) : 32 N·m (3.3 kgf-m, 24.0 lbf-ft)	

High-Pressure Pipe Removal and Installation

S7N20A1726031

⚠ WARNING

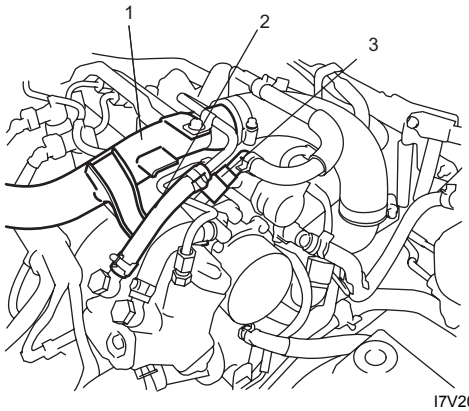
Before servicing fuel system, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ".

Removal

⚠ CAUTION

A small amount of fuel may come out during removal of high pressure pipes, cover high pressure pipes with plug cap.

1) Relief fuel pressure referring to "Fuel Pressure Relief Procedure: D13A / Z13DTJ".
2) Disconnect negative (–) cable at battery.
3) Remove engine cover and engine cover bracket.
4) Remove intercooler outlet pipe referring to "Intercooler Components: D13A / Z13DTJ in Section 1D".
5) Disconnect fuel feed hose (2) and fuel return connector (3).



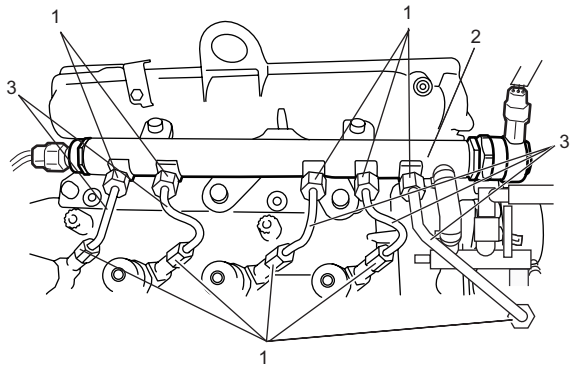
I7V20A172012-01

6) Remove high pressure pipes as follows.
   - For high pressure pipe between fuel injector and common rail.
     a. Loosen high pressure pipe union nuts (1) from injector.

⚠ CAUTION

When loosing union nut of injector side, hold union nut with wrench.
Otherwise, pipe way bend or break.

     b. Loosen high pressure pipe union nuts (1) from common rail (2), and remove high pressure pipes (3).

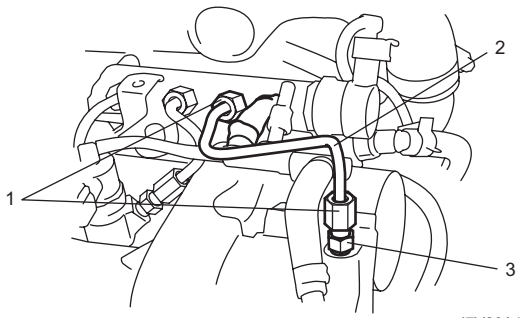


I7V20A172013-01

   - For high pressure pipe between high pressure pump and common rail
     a. Loose high pressure pipe union nuts (1), and remove high pressure pipe (2).

⚠ CAUTION

When loosing union nut of high pressure pump side, hold union nut (3) with wrench.



I7V20A172014-01

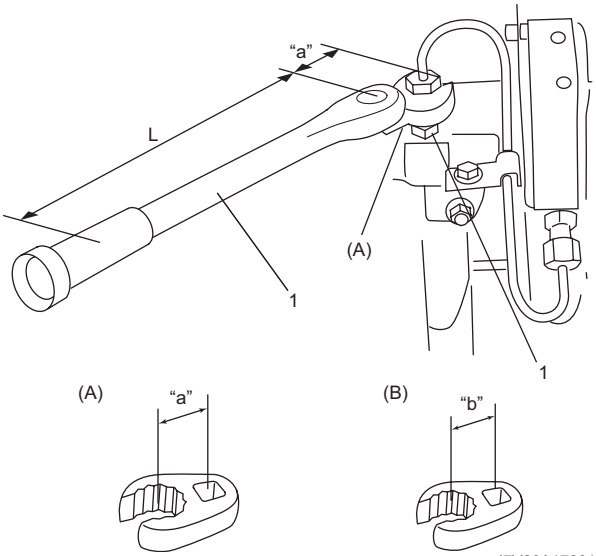
Installation

⚠ CAUTION

- **Do not touch pipes with wrench when tightening union nut to avoid a damage of high pressure pipe.**
- **When using extension special tool combined with torque wrench, reading value of torque wrench is smaller than specified tightening torque. Reading value should be calculated according to formula below.**
- **When tightening union nut of high pressure pump side and injector side, hold union nut (1) with wrench.**

Tightening torque formula.
M = T x L / (L + "a")
M: Reading value using extension special tool
T: Specified tightening torque
L: Length of torque wrench
"a": Length of special tool

Special tool
(A): 09911–75420
(B): 09950–76510



I7V20A172015-01

"a": 19.5 mm (0.768 in.)	"b": 20.3 mm (0.799 in.)

Reverse removal procedure for installation noting the following.

- Use new high pressure pipe.
- Tighten injector side union nut and high pressure pump side union nut to specified torque.

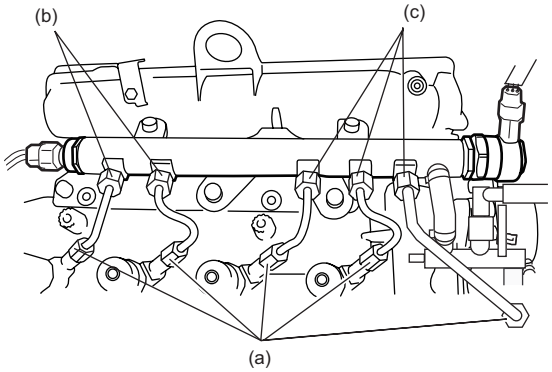
  Special tool
  : 09950–76510

  Tightening torque
  High pressure pipe union nut (fuel injector side and high pressure pump side) (a): 27 N·m (2.8 kgf-m, 20.0 lbf-ft)

- Tighten common rail side union nut to specified torque.

  Special tool
  : 09911–75420

  Tightening torque
  High pressure No.1 / No.2 pipe union nut (common rail side) (b): 29 N·m (3.0 kgf-m, 21.5 lbf-ft)
  High pressure No.3 / No.4 / high pressure pump pipe union nut (common rail side) (c): 32 N·m (3.3 kgf-m, 24.0 lbf-ft)



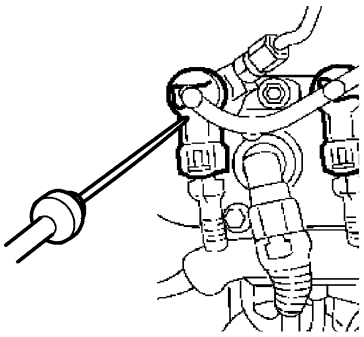
I7V20A172016-01

- Check fuel leakage referring to "Fuel Leakage Check Procedure: D13A / Z13DTJ"

Fuel Injector On-Vehicle Inspection

S7N20A1726008

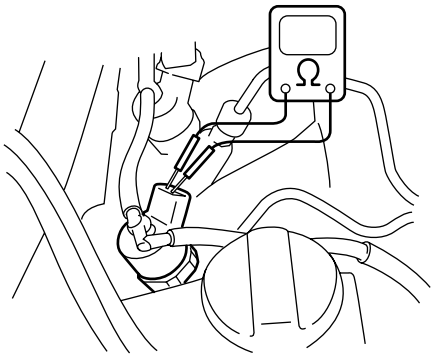
1) Using sound scope or such, check operating sound of injector when engine is running or cranking.
   Cycle of operating sound should vary according to engine speed.
   If no sound or an unusual sound is heard, check result of each step is in good condition referring to "Table A-2: Injector Circuit Check: D13A / Z13DTJ in Section 1A".



I3RM0B172008-01

2) Disconnect connector from injector.
3) Connect ohmmeter between terminals of injector and check resistance.
If resistance is out of specification, replace.

Resistance of fuel injector
About 0.5 Ω



I3RM0B172009-01

4) Connect connector to injector securely.

Fuel Injector Removal and Installation

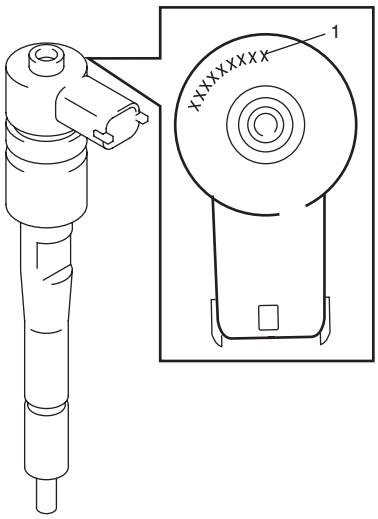
S7N20A1726009

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

⚠ CAUTION

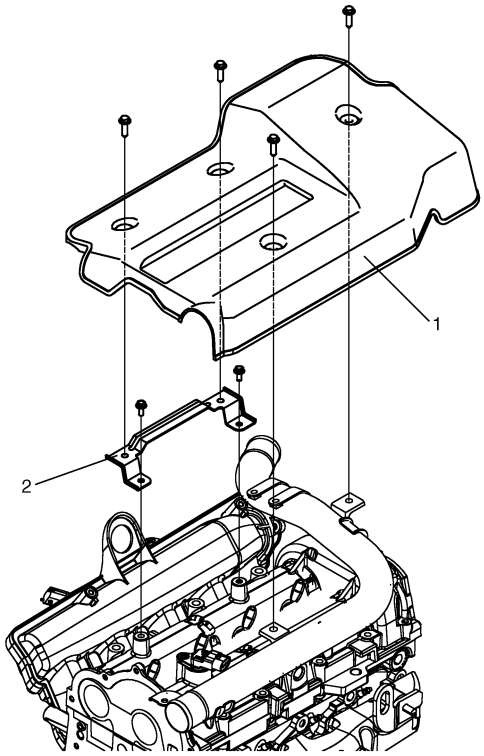
The calibration code (1) is given to each fuel injector, and it represents the performance characteristics of the fuel injector. It is registered in ECM, and ECM controls fuel injection according to the performance characteristics of the fuel injector. Therefore, after removing fuel injectors, be sure to install them as they were. In case that the fuel injectors is replaced with new one, be sure to register each calibration code in ECM. For details, refer to "ECM Registration: D13A / Z13DTJ in Section 1C". If it is not registered correctly, DTC is stored in ECM and SVS light is turned ON.
Also calibration codes registration in ECM can be checked by SUZUKI scan tool.



I3RM0B172010-01

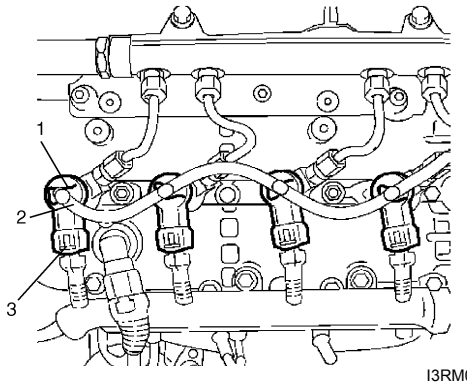
Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover (1) and engine cover bracket (2).



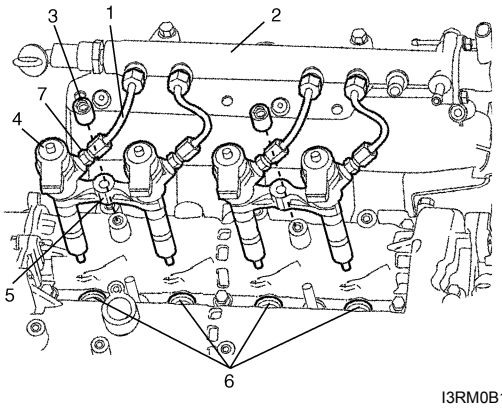
I5RS0B170009-01

3) Remove high pressure pipe between fuel injector and common rail referring to “High-Pressure Pipe Removal and Installation: D13A / Z13DTJ”.
4) Remove clips (1), and then disconnect return hose (2) from fuel injectors.
5) Disconnect fuel injector connectors (3).



I3RM0B172011-01

6) Remove fuel injector bracket nut (3).
7) Remove fuel injectors with its bracket (5) from camshaft housing.
8) Remove sealing rings (6) from camshaft housing.



I3RM0B172012-01

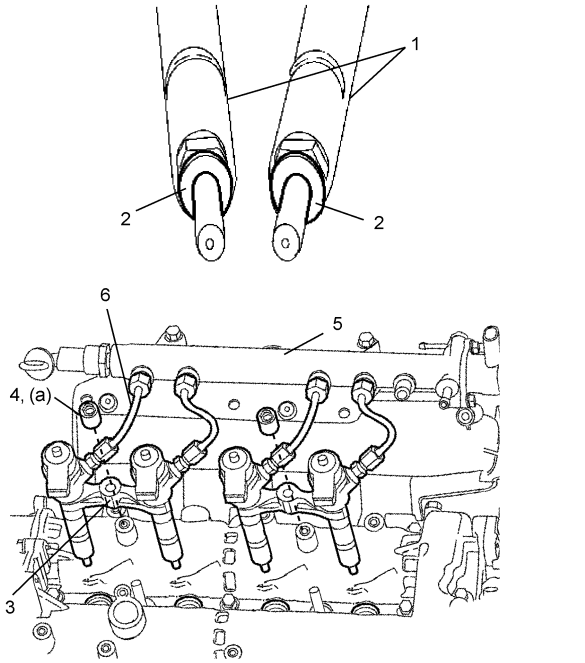
2. Common rail

Installation

1) Install new sealing washer (2) to fuel injectors (1).
2) Set fuel injector bracket (3) to fuel injectors.
3) Install fuel injectors to camshaft housing, and tighten fuel injector bracket nut (4) temporarily by hand.
4) Install new high pressure pipes (6) and tighten each union nut temporarily by hand.
5) Tighten fuel injector bracket nut to specified torque.

Tightening torque
Fuel injector bracket nut (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

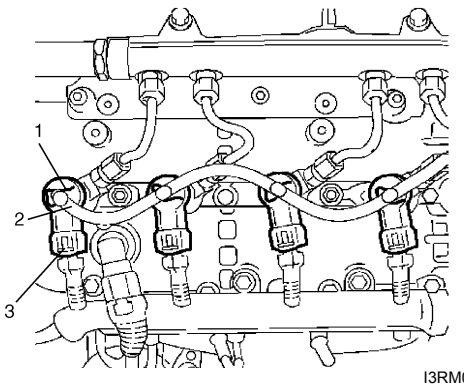
6) Tighten high pressure pipe union nuts to specified torque referring to “High-Pressure Pipe Removal and Installation: D13A / Z13DTJ”.



I7V20A172017-01

5. Common rail

7) Connect return hose (2) to fuel injectors, and then install clips (1) to fuel injectors.
8) Connect fuel injector connectors (3).



I3RM0B172014-01

9) Install engine cover and engine cover bracket.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

10) Connect negative (–) cable at battery.
In case that the fuel injector(s) was replaced, perform “ECM Registration: D13A / Z13DTJ in Section 1C” to register the fuel injector calibration code into ECM.
11) Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.
12) When replacing any one of injectors, register injector calibration code in ECM referring to “Fuel Injector Registration: D13A / Z13DTJ in Section 1C”.

Common Rail Removal and Installation

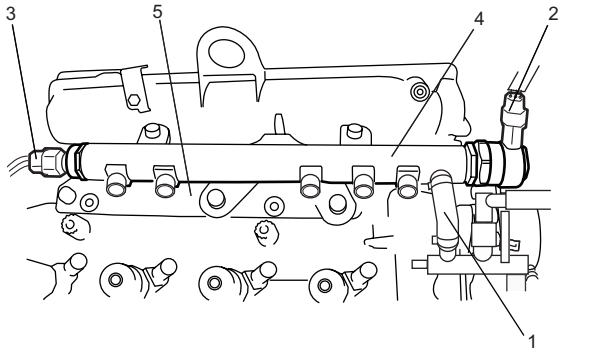
S7N20A1726010

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

Removal

1) Relief fuel pressure referring to "Fuel Pressure Relief Procedure: D13A / Z13DTJ".
2) Disconnect negative (–) cable from battery.
3) Remove engine cover and engine cover bracket.
4) Remove high pressure pipes referring to "High-Pressure Pipe Removal and Installation: D13A / Z13DTJ".
5) Disconnect fuel return hoses (1) from common rail.
6) Disconnect connectors from fuel pressure regulator (2) and fuel pressure sensor (3).
7) Remove common rail (4) from its bracket (5).



I7V20A172018-01

Installation

1) Install common rail (1) to its bracket (2) and tighten common rail bolts (3) temporarily by hand.
2) Install each high pressure pipes. Tighten each union nut temporarily by hand.

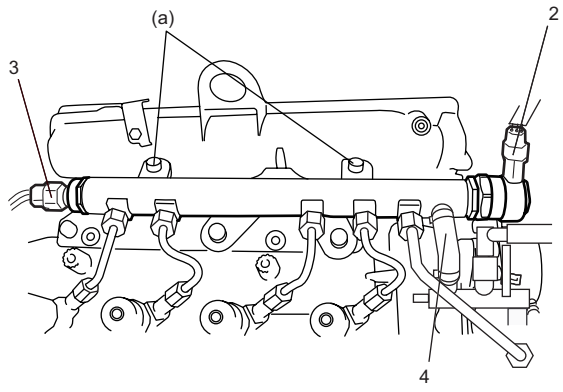
⚠ CAUTION

Do not reuse high pressure pipe.

3) Tighten common rail bolts to specified torque.

Tightening torque
Common rail bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

4) Tighten high pressure pipe union nuts to specified torque referring to "High-Pressure Pipe Removal and Installation: D13A / Z13DTJ".
5) Connect connectors to fuel pressure regulator (2) and fuel pressure sensor (3).
6) Connect fuel return hoses (4) to common rail.



I7V20A172019-01

7) Install engine cover and engine cover bracket.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

8) Connect negative (–) cable at battery.
9) Check fuel leakage referring to "Fuel Leakage Check Procedure: D13A / Z13DTJ".

High Pressure Pump Removal and Installation

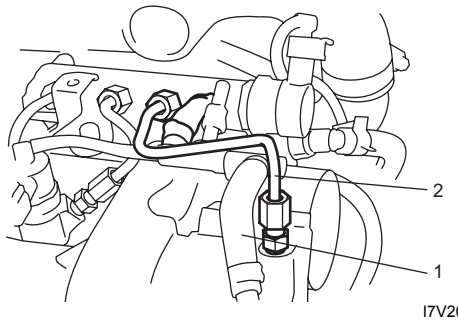
S7N20A1726011

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

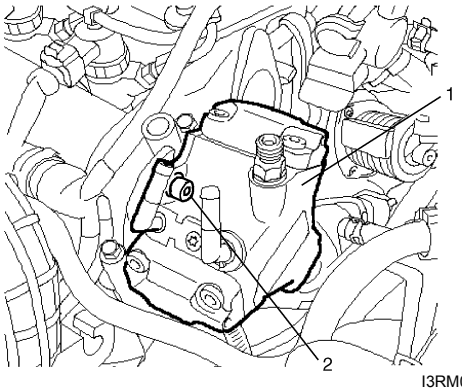
Removal

1) Relief fuel pressure referring to "Fuel Pressure Relief Procedure: D13A / Z13DTJ".
2) Disconnect negative (–) cable at battery.
3) Remove engine cover.
4) Remove air cleaner assembly with MAF and IAT sensor referring to "Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D".
5) Remove vacuum pump referring to "Vacuum Pump Removal and Installation: D13A / Z13DTJ in Section 1D".
6) Remove high pressure pipe (2) between common rail and high pressure pump referring to "High-Pressure Pipe Removal and Installation: D13A / Z13DTJ".
7) Disconnect fuel return hose (1) from high pressure pump.



I7V20A172020-01

8) Remove high pressure pump (1) from camshaft housing by removing 3 bolts (2).

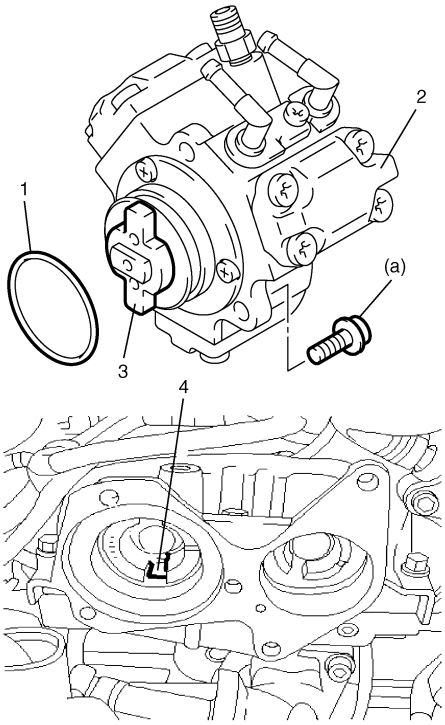


I3RM0B172019-01

Installation

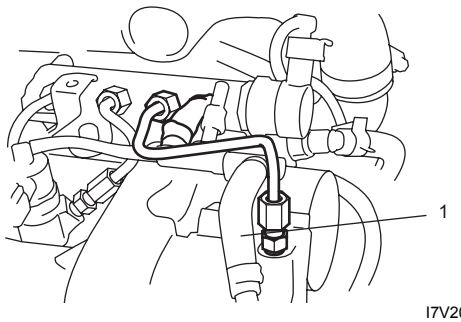
1) Clean mating surfaces of high pressure pump and camshaft housing.
2) Install new gasket (1) to high pressure pump.
3) Install high pressure pump (2) to camshaft housing. Fit dogs (3) of high pressure pump coupling into the groove (4) of camshaft.
4) Tighten high pressure pump bolts to specified torque.

Tightening torque
High pressure pump bolt (a): 17 N·m (1.7 kgf-m, 12.5 lbf-ft)



I3RM0B172020-01

5) Connect fuel return hose (1) to high pressure pump.



I7V20A172021-01

6) Install high pressure pipes between high pressure pump and common rail referring to “High-Pressure Pipe Removal and Installation: D13A / Z13DTJ”.

⚠ CAUTION

Do not reuse high pressure pipe.

7) Install vacuum pump referring to “Vacuum Pump Removal and Installation: D13A / Z13DTJ in Section 1D”.
8) Install air cleaner assembly with MAF and IAT sensor referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
9) Install engine cover.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

10) Connect negative (–) cable to battery.
11) Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.

Fuel Pressure Sensor Removal and Installation

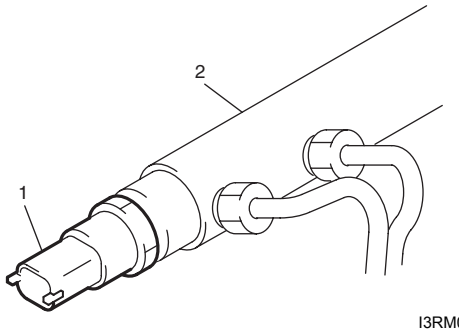
S7N20A1726014

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Disconnect fuel pressure sensor connector.
4) Remove fuel pressure sensor (1) from common rail (2).

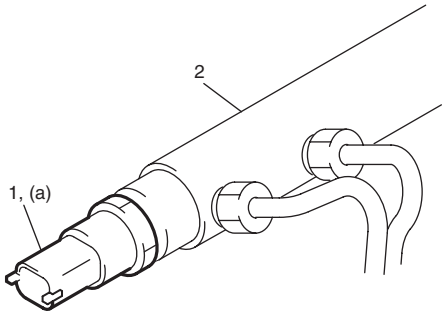


I3RM0B172022-01

Installation

1) Install fuel pressure sensor (1) to common rail (2). Tighten fuel pressure sensor to specified torque.

Tightening torque
Fuel pressure sensor (a): 70 N·m (7.1 kgf-m, 52.0 lbf-ft)



I3RM0B172023-01

2) Connect fuel pressure sensor connector.
3) Install engine cover.

Tightening torque
Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

4) Connect negative (–) cable at battery.
5) Check fuel leakage referring to "Fuel Leakage Check Procedure: D13A / Z13DTJ".

Fuel Pressure Regulator Removal and Installation

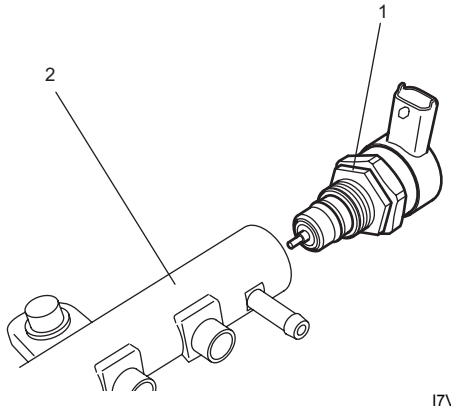
S7N20A1726015

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Disconnect fuel pressure regulator connector.
4) Remove fuel pressure regulator (1) from common rail (2).



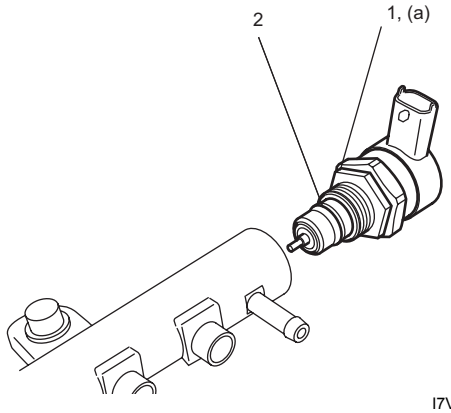
I7V20A172023-01

Installation

Reverse removal procedure for installation noting the following.

- Use new O-ring (2).
- Tighten fuel pressure regulator (1) to specified torque.

Tightening torque
Fuel pressure regulator (a): 85 N·m (8.7 kgf-m, 63.0 lbf-ft)



I7V20A172024-02

- Install engine cover.

  Tightening torque
  Engine cover bolt: 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)

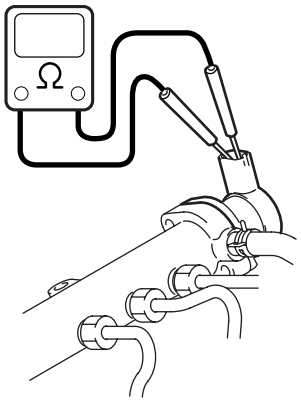
- Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.

Fuel Pressure Regulator Inspection

S7N20A1726016

Check resistance between terminals of fuel pressure regulator.
If resistance is out of specification, replace fuel pressure regulator referring to “Fuel Pressure Regulator Removal and Installation: D13A / Z13DTJ”.

Fuel pressure regulator resistance
2.07 – 2.53 Ω at 20 °C, 68 °F



I3RM0B172038-01

Fuel Lines and Connections Inspection

S7N20A1726006

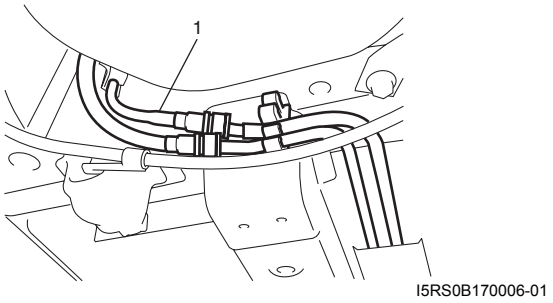
⚠ WARNING

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: D13A / Z13DTJ” in order to reduce the risk or fire and personal injury.

⚠ CAUTION

Due to the fact that fuel feed line (1) is under high pressure, use special care when servicing it.

Visually inspect fuel lines and connections for evidence of fuel leakage, hose crack and deterioration, or damage.
Make sure all clamps are secure.
Replace hoses that are suspected of being cracked.



I5RS0B170006-01

Fuel Pipe Removal and Installation

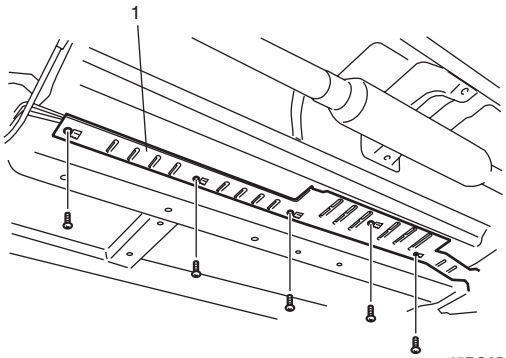
S7N20A1726007

⚠ WARNING

- **Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: D13A / Z13DTJ” in order to reduce the risk or fire and personal injury.**
- **A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth.**
  Be sure to put that cloth in an approved container when disconnection is completed.

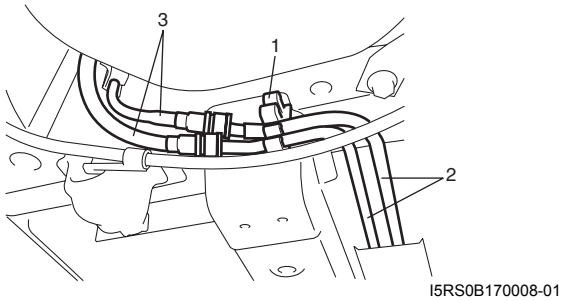
Removal

1) Disconnect negative (–) cable at battery.
2) Remove suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
3) Remove pipe cover (1) from vehicle.



I5RS0B170007-01

4) Disconnect fuel pipe joint and fuel hoses (3) from fuel pipes (2) at the front and rear of each fuel pipe referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.
5) Mark the location of clamps (1) on fuel pipes (2), so that the clamps can be reinstalled to where they were.
6) Remove pipes (2) with clamp (1) from vehicle.
7) Remove clamp (1) from pipes (2).



I5RS0B170008-01

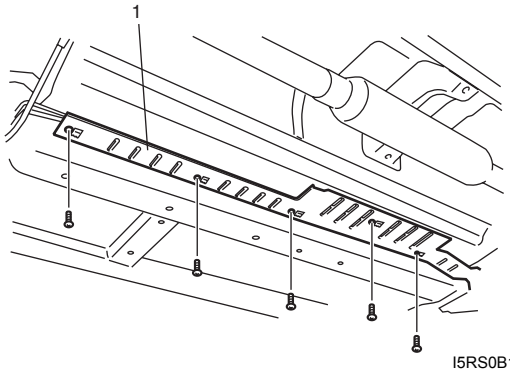
Installation

1) Install clamps to marked location on pipes. If clamp is deformed or its claw is bent or broken, replace it with new one.
2) Install pipes with pipe clamps to vehicle.
3) Connect fuel hoses and pipes to each pipe referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.

⚠ CAUTION

When connecting joint, clean outside surfaces 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.

4) Install pipe cover (1) to vehicle.



I5RS0B170007-01

5) Install suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
6) Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.

Fuel Filler Cap Inspection

S7N20A1726017

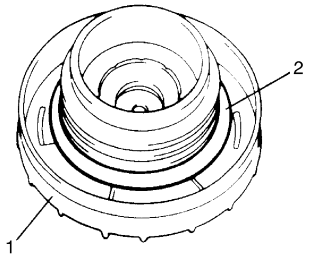
⚠ WARNING

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: D13A / Z13DTJ” in order to reduce the risk or fire and personal injury.

Remove cap (1), and check gasket for even filler neck imprint, and deterioration or any damage. If gasket (2) is in malcondition, replace cap.

NOTE

If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in fire and personal injury.

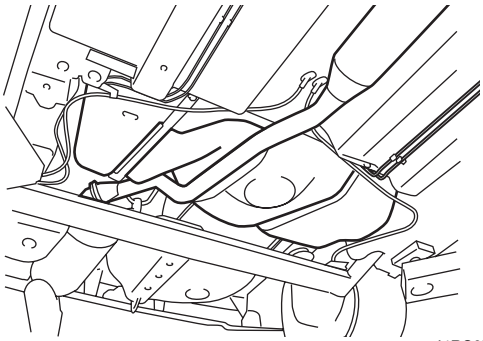


I2RH01170008-01

Fuel Tank On-Vehicle Inspection

S7N20A1726032

Check fuel tank damage, cracks, fuel leakage, corrosion and tank bolts looseness.
If a problem is found, repair or replace.


I4RS0B020002-02

Fuel Tank Removal and Installation

S7N20A1726020

Removal

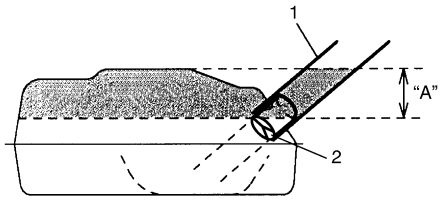
⚠ WARNING

- **Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ".**
- **A small amount of fuel may be released after the fuel hose is disconnected. In order to reduce the chance of personal injury, cover the hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.**

1) Disconnect negative (–) cable at battery.
2) Remove fuel filler cap.
3) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" as shown in the figure.

⚠ CAUTION

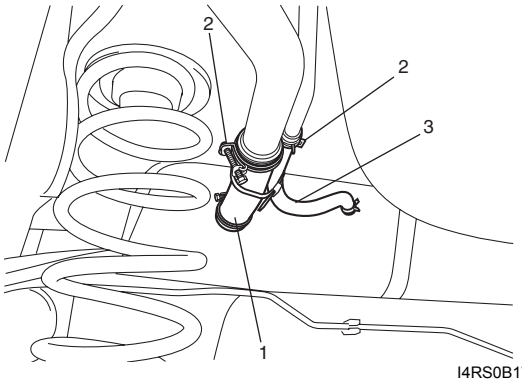
Do not force pump hose into fuel tank.



I4RS0B170022-01

2. Inlet valve

4) Hoist vehicle, and remove clamp (2), fuel filler hose (1) and breather hose (3) from fuel tank.



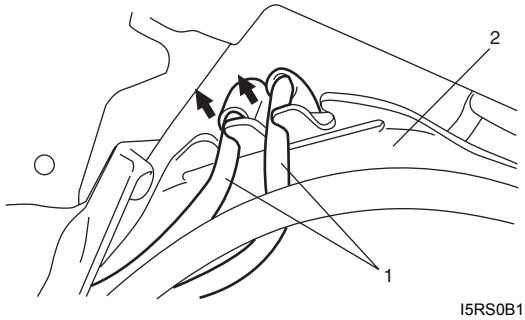
I4RS0B170010-01

5) Remove exhaust No.2 pipe referring to "Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K".
6) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler. Use hand operated pump device to drain fuel tank.

⚠ CAUTION

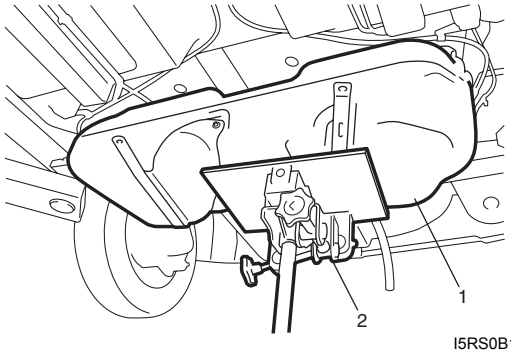
- **Do not force pump hose into fuel tank.**
- **Never drain or store fuel in an open container due to possibility of fire or explosion.**

7) Disconnect fuel pipes (1) from fuel tank (2).



I5RS0B170010-01

8) Support fuel tank (1) with jack (2) and remove its mounting bolts.

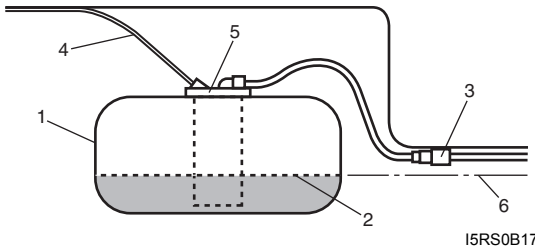


I5RS0B170011-01

9) Lower fuel tank (1) until fuel level (2) in fuel tank is lower than installation position of quick joint (fuel pipe) (3) in order to prevent fuel outflow after disconnecting quick joint (fuel pipe).

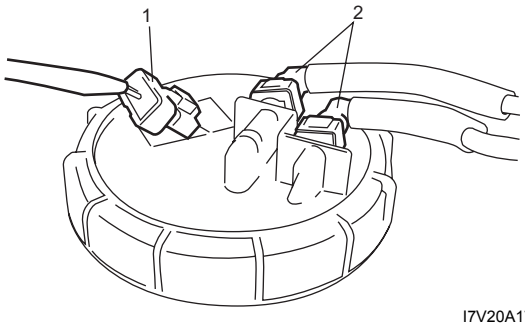
⚠ CAUTION

Be sure not to lower fuel tank (1) more than instructed level (6) due to wiring harness (4) of fuel pump (5) is still connected.



I5RS0B170012-02

10) Disconnect fuel feed hose and fuel return hose referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.
11) Disconnect wire harness at connector (1).
12) Disconnect fuel pipes (2) referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.



I7V20A172005-01

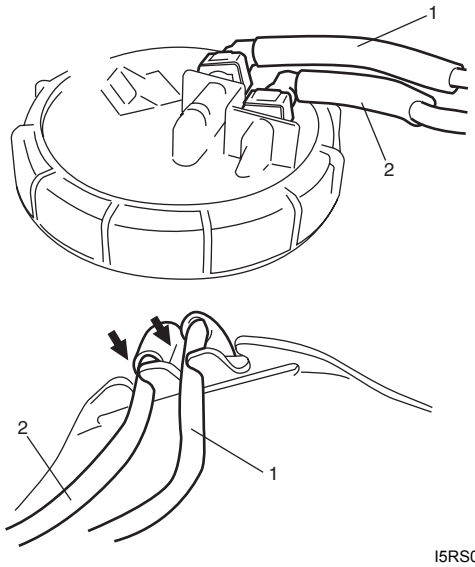
13) Remove fuel tank from vehicle.

Installation

⚠ CAUTION

When connecting joint, clean outside surfaces 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.

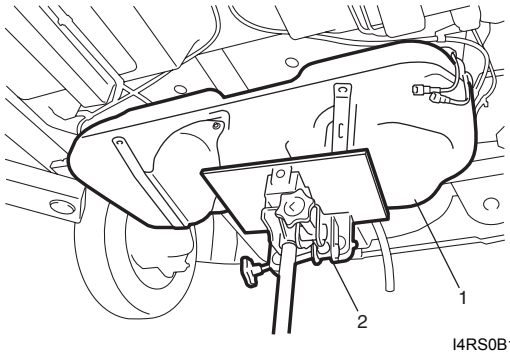
1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
2) Connect fuel feed pipe (1) and fuel return pipe (2) to fuel pump referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.



I5RS0B170014-01

3) Raise fuel tank (1) with jack and connect fuel pump and gauge and clamp wire harness.
4) Install fuel tank to vehicle, and tighten new fuel tank bolts to specified torque.

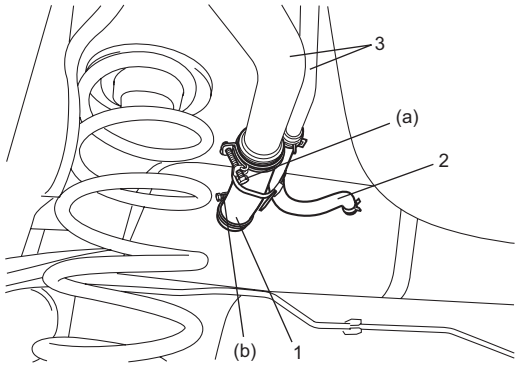
Tightening torque
Fuel tank bolt (a): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)



I4RS0B170012-01

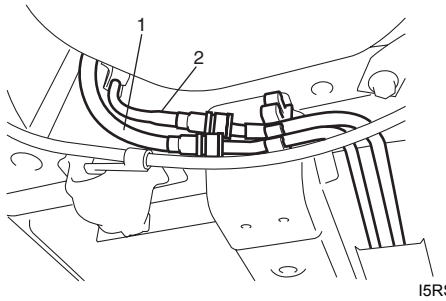
5) Connect fuel filler hose (1) and breather hose (2) to filler neck (3) as shown in the figure and clamp them securely referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.

Tightening torque
Fuel filler hose clamp bolt (fuel tank side) (a): 2.0 N·m (0.20 kgf-m, 1.5 lbf-ft)
Fuel filter hose clamp bolt (fuel filler neck side) (b): 1.5 N·m (0.15 kgf-m, 1.5 lbf-ft)



I7V20A172025-01

6) Connect fuel return hose (1) and fuel feed hose (2) to each pipe as shown in the figure and clamp them securely referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.



I5RS0B170015-01

7) Install exhaust No.2 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
8) Connect negative (–) cable at battery.
9) Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.

Fuel Tank Inspection

S7N20A1726021

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

Fuel Tank Purging Procedure

S7N20A1726022

⚠ WARNING

- **Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ" in order to reduce the risk or fire and personal injury.**
- **This purging procedure will not remove all fuel vapor.**
- **Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.**

⚠ CAUTION

Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.

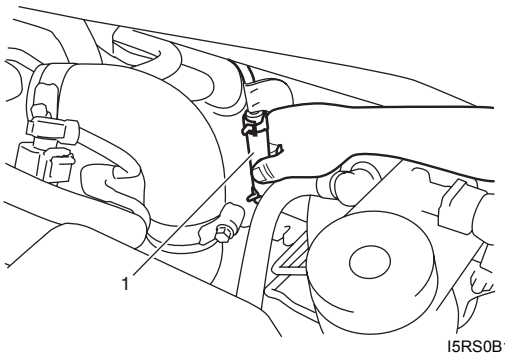
The following procedure are used for purging fuel tank.

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. Replace tank if its inside is rusty.
5) Completely flush out remaining water after washing.
6) Be sure to dry fuel tank assembly thoroughly out of direct sunlight after washing.

Fuel Pump On-Vehicle Inspection

S7N20A1726023

1) Check that fuel pump operating sound is heard from fuel pump for about 20 seconds and then stop when turning ignition switch to ON position.
   If above check result is not satisfactory, confirm that check result of each step is in good condition referring to "Table A-1: Fuel Pump Relay Operation Check: D13A / Z13DTJ in Section 1A".
2) Check that fuel pressure is felt at fuel feed hose (1) for about 20 seconds after ignition switch ON.
   If fuel pressure is not felt, check fuel leakage from fuel line and clogged fuel line.



I5RS0B170016-01

Fuel Pump Assembly Removal and Installation

S7N20A1726024

⚠ WARNING

Before starting the following procedure, be sure to observe "Precautions on Fuel System Service: D13A / Z13DTJ".

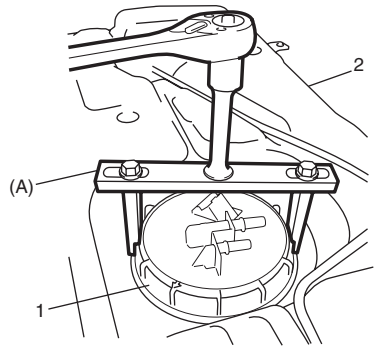
⚠ CAUTION

Do not disassemble fuel pump assembly. Disassembly will spoil its original performance.

Removal

1) Remove fuel tank from vehicle referring to "Fuel Tank Removal and Installation: D13A / Z13DTJ".
2) Remove fuel pump lock nut (1) from fuel tank (2) using special tool.

Special tool
(A): 09941–51012



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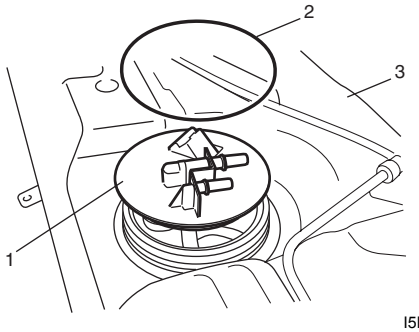
3) Remove fuel pump assembly (1) and O-ring (2) from fuel tank (3).



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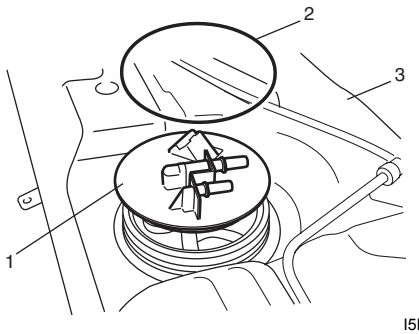
Installation

⚠ 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 surfaces of fuel pump assembly (1) and fuel tank.
2) Install fuel pump assembly (1) and new O-ring (2) to fuel tank (3).



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3) Install new fuel pump lock nut (1) to fuel tank (2) as follows.
   a) Tighten new fuel pump lock nut (1) by hand.

NOTE

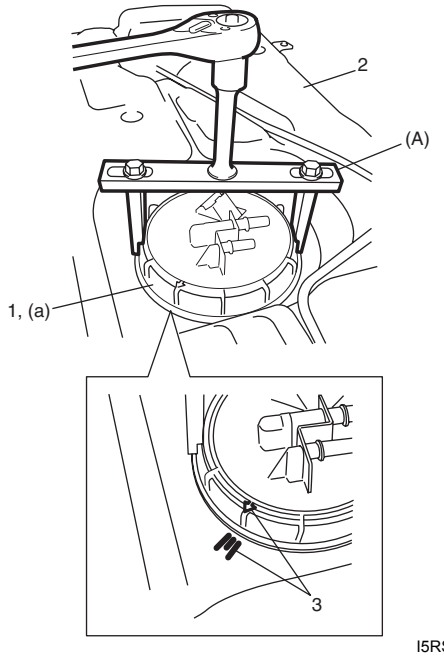
Tighten lock nut while pressing straight on it so that it will not tilt.

   b) Using special tool, tighten fuel pump lock nut (1) 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.**
- **After tightening fuel pump lock nut, check for loosening and play.**

Special tool
(A): 09941–51012



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4) Install fuel tank to vehicle referring to “Fuel Tank Removal and Installation: D13A / Z13DTJ”.

Fuel Pump Inspection

S7N20A1726025

- Check fuel pump assembly for damage.
- Check fuel suction filter for evidence of dirt and contamination. If present, replace or clean and check for presence of dirt in fuel tank.

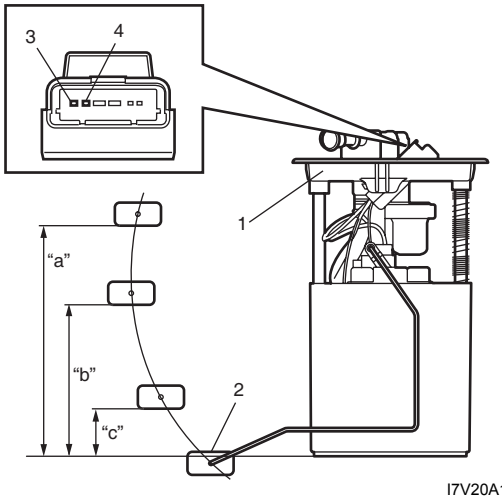
Fuel Level Sensor Inspection

S7N20A1726033

Check resistance between terminals “3” and “4” at each float position in the following.
If resistance is out of specification, replace fuel pump.

Fuel level sensor specifications

Float position		Resistance (Ω)
“a”	162.0 mm (6.378 in.)	74.6 – 80.6
“b”	108.1 mm (4.256 in.)	157 – 163
“c”	40.9 mm (1.62 in.)	260 – 268



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1. Fuel pump	2. Float

Fuel Filter Element Removal and Installation

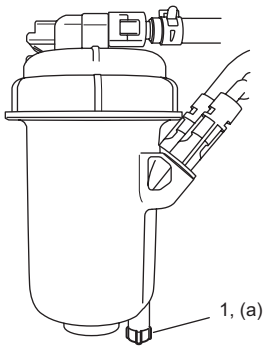
S7N20A1726026

⚠ WARNING

- **Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: D13A / Z13DTJ” in order to reduce the risk or fire and personal injury.**
- **This work must be performed in a well ventilated area and away from any open flames (such as gas hot water heaters).**

Removal

1) Disconnect negative (–) cable at battery.
2) Remove ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
3) Remove cowl top cover and cowl top panel referring to “Cowl Top Components in Section 9K”.
4) Place container under bleed screw (1), and drain fuel loosening bleed screw.



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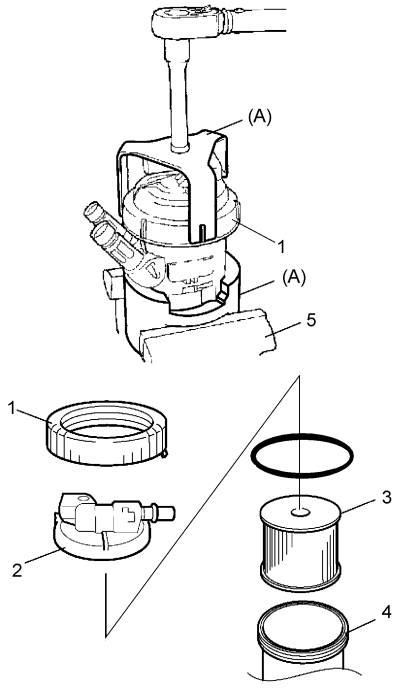
5) Disconnect fuel filter joint from fuel filter assembly referring to “Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”.
6) Disconnect connector (4) from fuel filter assembly.
7) Remove fuel filter assembly.
8) For LHD model vehicle, remove fuel filter protector.
9) By turning fuel filter fastener (1) counterclockwise, remove fuel filter fastener (1) from fuel filter case (4) using special tool and vise (5).

Special tool
(A): 09919–48610

10) Remove fuel filter cap (2) and fuel filter element (3).



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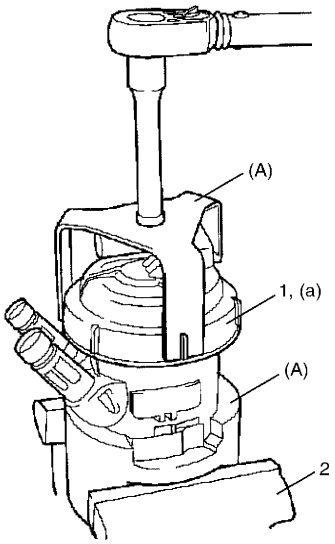
Installation
Reverse removal procedure for installation noting the following.

- Be sure to replace fuel filter element and O-ring as new one.
- Clean fuel filter case as follows.
  a. Place container under bleed screw, and drain fuel loosing bleed screw.
  b. Tighten bleed screw.
  c. Remove fuel filter case.
  d. Clean fuel filter case with brush.
  e. Dry and wipe out fuel filter case.
- Tighten fuel filter fastener (1) to specified torque using special tool and vise (2).

Special tool
(A): 09919–48610

Tightening torque
Fuel filter fastener (a): 30 N·m (3.1 kgf-m, 22.5 lbf-ft)



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- For LHD model vehicle, install fuel filter protector.
- Install cowl top cover and cowl top panel referring to “Cowl Top Components in Section 9K”.
- Install ECM referring to “Engine Control Module (ECM) Removal and Installation: D13A / Z13DTJ in Section 1C”.
- Bleed air in system referring to “Air Bleeding of Fuel System: D13A / Z13DTJ”.
- Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.

Fuel Filter Assembly Removal and Installation

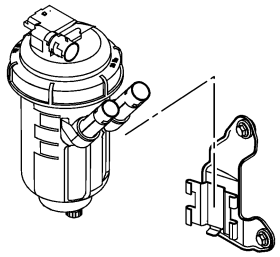
S7N20A1726027

⚠ WARNING

Before starting the following procedure, be sure to observe “Precautions on Fuel System Service: D13A / Z13DTJ” in order to reduce the risk or fire and personal injury.

Removal

1) Disconnect fuel joints in the same manner as Step 1) through 6) of “Removal” under “Fuel Filter Element Removal and Installation: D13A / Z13DTJ”.
2) Remove fuel filter assembly.



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Installation
Reverse removal procedure for installation noting the following.

- Bleed air in system referring to “Air Bleeding of Fuel System: D13A / Z13DTJ”.
- Check fuel leakage referring to “Fuel Leakage Check Procedure: D13A / Z13DTJ”.

Fuel Heater and Fuel Temperature Sensor Removal and Installation

S7N20A1726012

Removal
Remove fuel heater and fuel temperature sensor (included in fuel filter cap) referring to “Fuel Filter Element Removal and Installation: D13A / Z13DTJ”.

Installation
Reverse removal procedure for installation.

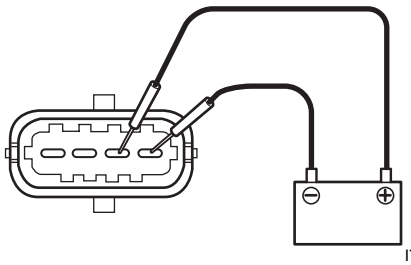
Fuel Heater and Fuel Temperature Sensor Inspection

S7N20A1726013

Fuel heater

- Check for terminals of fuel heater for damage. If damage is found, replace fuel filter assembly.
- Connect battery to fuel heater terminals as shown in figure.
  Check that ammeter indicates specified current.
  If current is out of specification, replace fuel filter assembly.

  Reference: Fuel heater specified current at 13.5 V: Approx. 18.5 A



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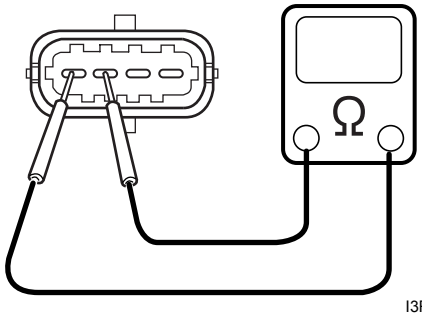
1) Remove fuel temperature sensor referring to “Fuel Heater and Fuel Temperature Sensor Removal and Installation: D13A / Z13DTJ”.
2) Check for resistance between fuel temperature sensor terminals.
   If resistance is out of specification, replace fuel filter assembly.

Fuel temperature sensor resistance

Fuel temperature °C (°F)	Resistance (kΩ)
–30 (–22)	23.5 – 28.6
0 (32)	5.46 – 6.32
25 (77)	1.94 – 2.17
60 (140)	0.58 – 0.61
100 (212)	0.18 – 0.19
115 (239)	0.12 – 0.13



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Specifications

Tightening Torque Specifications

S7N20A1727001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Bleed screw	1.5	0.15	1.5	☞
High pressure pipe union nut (fuel injector side and high pressure pump side)	27	2.8	20.0	☞
High pressure No.1 / No.2 pipe union nut (common rail side)	29	3.0	21.5	☞
High pressure No.3 / No.4 / high pressure pump pipe union nut (common rail side)	32	3.3	24.0	☞
Fuel injector bracket nut	23	2.3	17.0	☞
Engine cover bolt	8.0	0.82	6.0	☞ / ☞ / ☞ / ☞ / ☞
Common rail bolt	25	2.5	18.0	☞
High pressure pump bolt	17	1.7	12.5	☞
Fuel pressure sensor	70	7.1	52.0	☞
Fuel pressure regulator	85	8.7	63.0	☞
Fuel tank bolt	45	4.6	33.5	☞
Fuel filler hose clamp bolt (fuel tank side)	2.0	0.20	1.5	☞
Fuel filter hose clamp bolt (fuel filler neck side)	1.5	0.15	1.5	☞
Fuel filter fastener	30	3.1	22.5	☞

NOTE

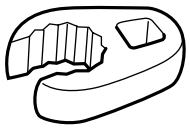
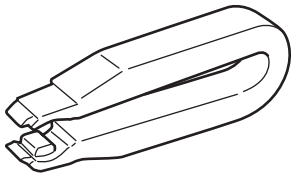
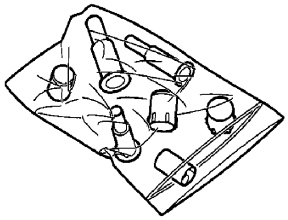
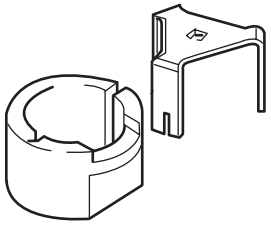
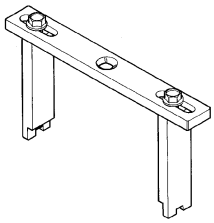
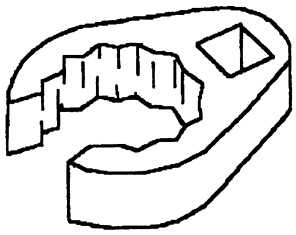
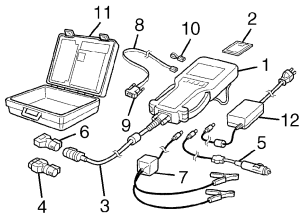
The specified tightening torque is also described in the following.
“Fuel Hose Disconnecting and Reconnecting: D13A / Z13DTJ”
“Fuel System Components: D13A / Z13DTJ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A1728001

09911–75420 Crow foot flare-nut wrench 18.17☞ / ☞ 	09912–58310 Remover (fuel line) (KM-796-A)☞ 
09919–46310 Fuel system, plug set ☞ 	09919–48610 Fuel filter locking tool (EN-46784)☞ / ☞ 
09941–51012 Lock ring wrench ☞ / ☞ 	09950–76510 Pipe spanner OUT0000148☞ / ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ 	

Ignition System

M13A / M15A / M16A

General Description

Ignition System Construction

S7N20A1801001

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below.

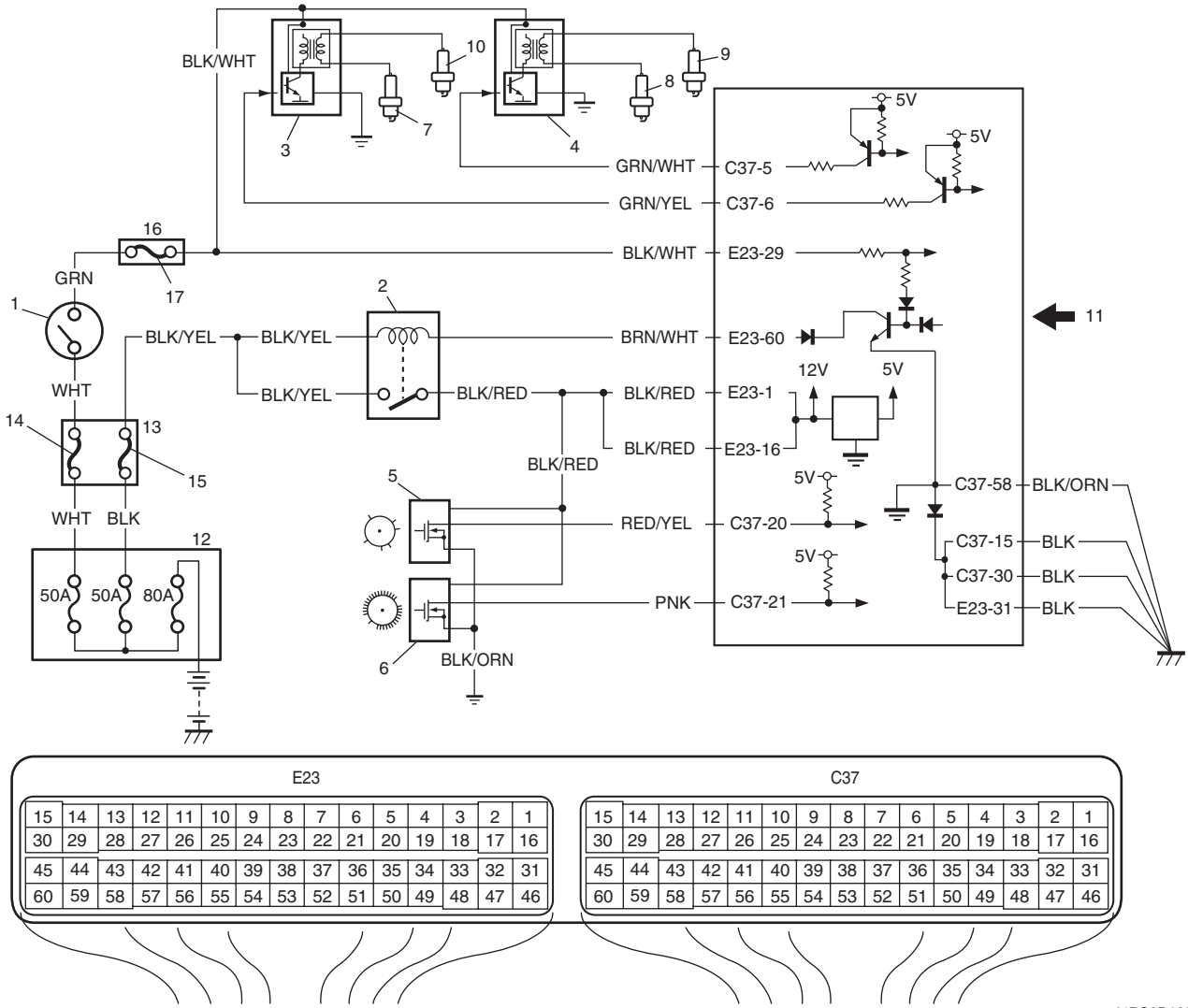
- **ECM**
  It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.
- **Ignition coil assembly (including an ignitor)**
  The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow 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.
- **High-tension cords and spark plugs**
- **CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position 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, MAF sensor, IAT sensor, knock sensor and other sensors / switches**

Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and that passes through the high-tension cords and causes No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

Schematic and Routing Diagram

Ignition System Wiring Circuit Diagram

S7N20A1802001



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1. Ignition switch	7. No.1 spark plug	13. Relay box
2. Main relay	8. No.2 spark plug	14. “IG ACC” fuse
3. Ignition coil assembly for No.1 and No.4 spark plugs	9. No.3 spark plug	15. “FI” fuse
4. Ignition coil assembly for No.2 and No.3 spark plugs	10. No.4 spark plug	16. Junction block assembly
5. CMP sensor	11. Sensed information	17. “IG COIL” fuse
6. CKP sensor	12. Battery fuse box	

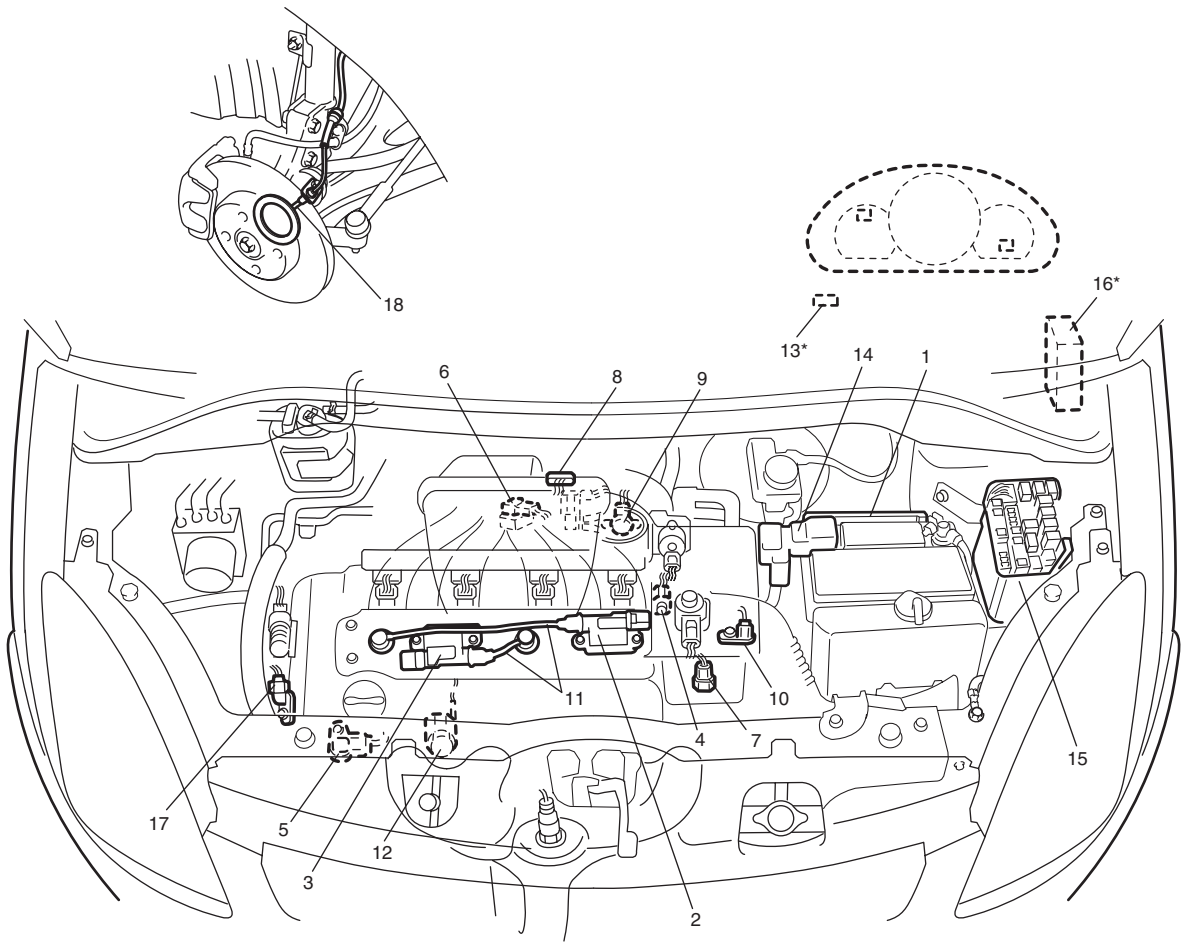
Component Location

Ignition System Components Location

S7N20A1803001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



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1. ECM	7. ECT sensor	13. Data link connector
2. Ignition coil assembly for No.1 and No.4 spark plugs	8. MAF and IAT sensor	14. Battery fuse box
3. Ignition coil assembly for No.2 and No.3 spark plugs	9. Electric throttle body assembly	15. Relay box
4. CMP sensor (VVT model)	10. VSS (Non-M16A engine model)	16. Junction block assembly
5. CKP sensor	11. High-tension cords	17. CMP sensor (for M13A engine model)
6. MAP sensor	12. Knock sensor	18. Wheel speed sensor (for M16A engine model)

Diagnostic Information and Procedures

Ignition System Symptom Diagnosis

S7N20A1804001

Condition	Possible cause	Correction / Reference Item
Engine cranks, but will not start or hard to start (No spark)	Blown fuse for ignition coil	*Replace.*
	Loose connection or disconnection of lead wire or high-tension cord(s)	*Connect securely.*
	Faulty high-tension cord(s)	*Replace.*
	Faulty spark plug(s)	*Replace.*
	Faulty ignition coil	*Replace ignition coil assembly.*
	Faulty CKP sensor or CKP sensor plate	*Clean, tighten or replace.*
	Faulty CMP sensor or sensor rotor tooth of camshaft	*Clean, tighten or replace.*
	Faulty ECM	*Replace.*
Poor fuel economy or engine performance	Incorrect ignition timing	*Check related sensors and CKP sensor plate.*
	Faulty spark plug(s) or high-tension cord(s)	*Adjust, clean or replace.*
	Faulty ignition coil assembly	*Replace.*
	Faulty CKP sensor or CKP sensor plate	*Clean, tighten or replace.*
	Faulty CMP sensor or sensor rotor tooth of camshaft	*Clean, tighten or replace.*
	Faulty knock sensor	*Replace.*
	Faulty ECM	*Replace.*

Reference Waveform of Ignition System

S7N20A1804002

Refer to “Reference waveform No.5”, “Reference waveform No.6” and “Reference waveform No.7” under “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A” for waveform of Ignition trigger signal.

Ignition System Check

S7N20A1804003

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: M13A / M15A / M16A in Section 1A”.
2	**Ignition spark test** 1) Check all spark plugs for condition and type referring to “Spark Plug Inspection: M13A / M15A / M16A”. 2) If OK, perform ignition spark test referring to “Ignition Spark Test: M13A / M15A / M16A”. *Is spark emitted from all spark plugs?*	Go to Step 13.	Go to Step 3.
3	**DTC check** 1) Perform DTC check referring to “DTC Check: M13A / M15A / M16A in Section 1A”. *Is DTC stored in ECM?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**Electrical connection check** 1) Check ignition coil assemblies and high-tension cords for electrical connection. *Are they connected securely?*	Go to Step 5.	Connect securely.
5	**High-tension cords check** 1) Check high-tension cord for resistance referring to “High-Tension Cord Inspection: M13A / M15A / M16A”. *Is check result satisfactory?*	Go to Step 6.	Replace high-tension cord(s).

Step	Action	Yes	No
6	**Ignition coil assembly power supply and ground circuit check** 1) Check ignition coil assembly power supply and ground circuits for open and short. *Are circuits in good condition?*	Go to Step 7.	Repair or replace.
7	**Ignition coil assembly check** 1) Check ignition coil for resistance referring to “Ignition Coil Assembly (Including ignitor) Inspection: M13A / M15A / M16A”. *Is check result satisfactory?*	Go to Step 8.	Replace ignition coil assembly.
8	**CKP sensor check** 1) Check CKP sensor referring to “Crankshaft Position (CKP) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is check result satisfactory?*	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or CKP sensor plate.
9	**CMP sensor check** 1) Check CMP sensor referring to “Camshaft Position (CMP) Sensor Inspection: M13A / M15A / M16A in Section 1C”. *Is check result satisfactory?*	Go to Step 10.	Tighten CMP sensor bolt, replace CMP sensor or intake camshaft.
10	**Ignition trigger signal circuit check** 1) Check ignition trigger signal wire for open, short and poor connection. *Is circuit in good condition?*	Go to Step 11.	Repair or replace.
11	**A known-good ignition coil assembly substitution** 1) Substitute a known-good ignition coil assembly and then repeat Step 2. *Is check result of Step 2 satisfactory?*	Go to Step 12.	Substitute a known-good ECM and then repeat Step 2.
12	**Knock sensor check** 1) Confirm that knock sensor circuit is in good condition referring to “DTC P0327 / P0328: Knock Sensor Circuit Low / High: M13A / M15A / M16A in Section 1A”. 2) Check oscilloscope waveform of knock sensor signal referring to “Reference waveform No.23” and “Reference waveform No.24” under “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”. *Is check result satisfactory?*	Go to Step 13.	Substitute a known-good knock sensor and recheck.
13	**Ignition timing check** 1) Check initial ignition timing and ignition timing advance referring to “Ignition Timing Inspection: M13A / M15A / M16A”. *Is check result satisfactory?*	System is in good condition.	Check CMP sensor, CMP sensor rotor tooth of camshaft, CKP sensor, CKP sensor plate and/or input signals related to this system.

Ignition Spark Test

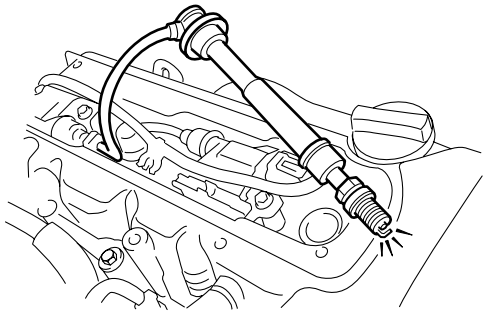
S7N20A1804004

1) Remove air cleaner assembly with air intake pipe.
2) Disconnect all injector couplers from injectors.

⚠ WARNING

Without disconnection of injector couplers, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.

3) Remove spark plug and check it for condition and type referring to “Spark Plug Inspection: M13A / M15A / M16A”.
4) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly or high-tension cord. Ground spark plug.
5) Crank engine and check if each spark plug sparks.



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6) If no spark is emitted, inspect the related parts as described in “Ignition System Symptom Diagnosis: M13A / M15A / M16A”.

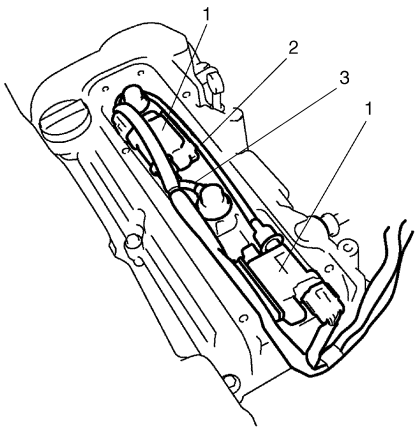
Repair Instructions

High-Tension Cord Removal and Installation

S7N20A1806001

Removal

1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
2) Disconnect No.1 cylinder (2) and No.3 cylinder (3) high-tension cords from ignition coil assemblies (1) while gripping each cap.



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3) Pull out high-tension cords from spark plugs while gripping each cap.

⚠ CAUTION

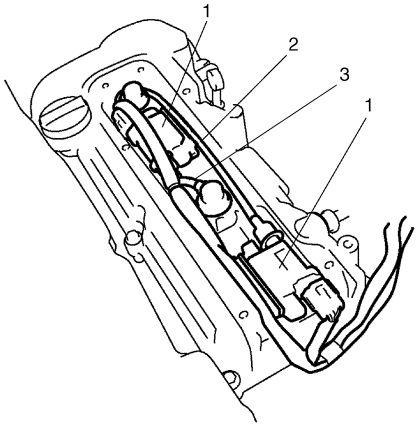
- **Removal of high-tension cords together with clamps will be recommended so as not to damage their inside wire (resistive conductor).**
- **For the same reason, pull out each connection by gripping cap portion.**

Installation

1) Install No.1 cylinder (2) and No.3 cylinder (3) high-tension cords to spark plugs and ignition coil assemblies (1) while gripping each cap.

⚠ CAUTION

- **Never attempt to use metal conductor high-tension cords as replacing parts.**
- **Insert each cap portion fully when installing high-tension cords.**



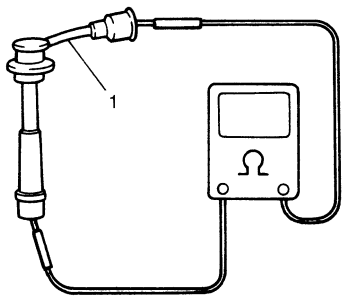
I4RS0A180004-01

High-Tension Cord Inspection

S7N20A1806002

Measure resistance of high-tension cord (1) by using ohmmeter.
If resistance exceeds specification, replace high-tension cord(s).

High-tension cord resistance
No.1 cylinder high-tension cord resistance: 1.4 – 4.0 kΩ
No.3 cylinder high-tension cord resistance: 0.6 – 2.0 kΩ



I2RH0B180005-01

Spark Plug Removal and Installation

S7N20A1806003

Removal

1) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
2) Pull out high-tension cords by gripping their caps and then remove ignition coil assemblies referring to "Ignition Coil Assembly (Including ignitor) Removal and Installation: M13A / M15A / M16A".
3) Remove spark plugs.

Installation

1) Install spark plugs and tighten them to specified torque.

   Tightening torque
   Spark plug: 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

2) Install ignition coil assemblies referring to "Ignition Coil Assembly (Including ignitor) Removal and Installation: M13A / M15A / M16A".
3) Install high-tension cords securely by gripping their caps.
4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.

Spark Plug Inspection

S7N20A1806004

⚠ CAUTION

- **When servicing the iridium / platinum spark plugs (slender center electrode type plugs), do not touch the center electrode to avoid damage to it. The electrode is not strong enough against mechanical force as it is slender and its material is not mechanically tough.**
- **Do not clean or adjust gap for the iridium / platinum spark plugs.**

Inspect spark plug for:

- Electrode wear
- Carbon deposits
- Insulator damage

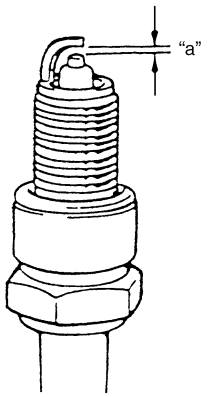
If any abnormality is found for nickel spark plugs, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.
For iridium / platinum spark plugs, replace them with new plugs.

Spark plug air gap "a"
: 1.0 – 1.1 mm (0.040 – 0.043 in.)

Spark plug type
NGK: BKR6E-11 (Nickel) / IFR6J11 (Iridium)
DENSO: K20PR-U11 (Nickel)

NOTE

NGK IFR6J11 is highly recommended for better engine starting performance under –25 °C (–13 °F).



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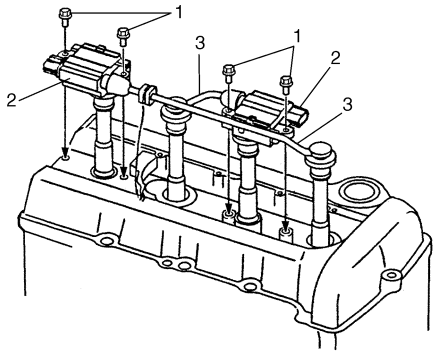
Ignition Coil Assembly (Including ignitor) Removal and Installation

S7N20A1806005

Removal

1) Disconnect negative cable at battery.
2) Remove air cleaner assembly with air intake pipe and cylinder head upper cover.
3) Disconnect ignition coil coupler.
4) Disconnect high-tension cord (3) from ignition coil assembly (2).
5) Remove ignition coil bolts (1) and then pull out ignition coil assembly.



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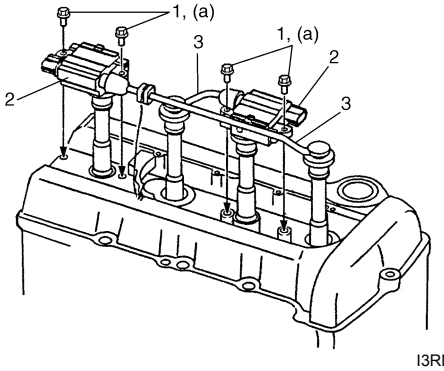
Installation

1) Install ignition coil assembly (2).
2) Tighten ignition coil bolts (1) to specified torque, and then connect ignition coil coupler.

Tightening torque
Ignition coil bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

3) Install high-tension cord (3) to ignition coil assembly while gripping its cap.



I3RM0A180004-01

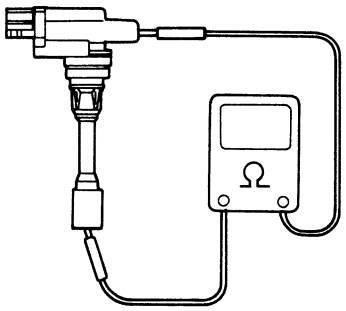
4) Install cylinder head upper cover and air cleaner assembly with air intake pipe.
5) Connect negative cable to battery.

Ignition Coil Assembly (Including ignitor) Inspection

S7N20A1806006

Measure secondary coil for resistance.
If resistance is out of specification, replace ignition coil assembly.

Secondary coil resistance
7.0 – 9.5 kΩ at 20 °C, 68 °F



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Ignition Timing Inspection

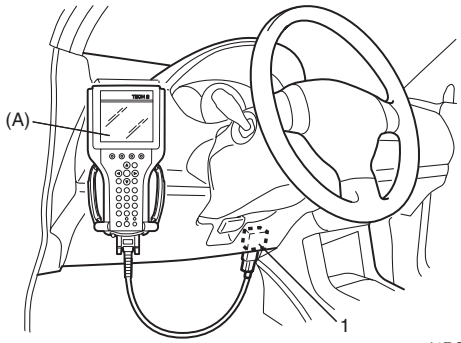
S7N20A1806007

NOTE

- **Ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.**
- **Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.**

1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



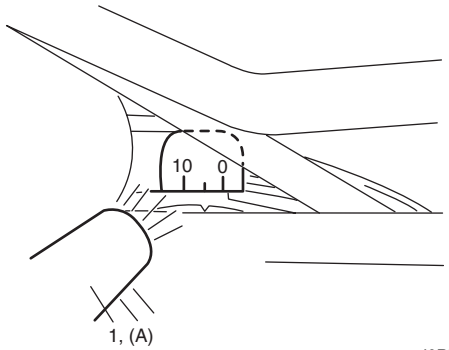
I4RS0B180003-01

2) Start engine and warm it up to normal operating temperature.
3) Make sure that all of electrical loads except ignition are switched off.
4) Check to be sure that idle speed is within specification referring to “Idle Speed and IAC Throttle Valve Opening Inspection: M13A / M15A / M16A in Section 1A”.
5) Fix ignition timing by using “Fixed Spark” of “Misc Test” mode on scan tool.
6) Set timing light (1) to high-tension cord for No.1 cylinder and check that ignition timing is within specification.

Initial ignition timing
Fixed with SUZUKI scan tool: 5 ± 3° BTDC (at specified idle speed)

Ignition order
1 – 3 – 4 – 2

Special tool
(A): 09930–76420



I3RB0A180004-02

7) If ignition timing is out of specification, check the followings.
   - CKP sensor
   - CKP sensor plate
   - CMP sensor
   - CMP sensor rotor tooth of camshaft
   - VSS (automated manual transaxle model)
   - Vehicle speed signal from ESP® control module (non-automated-manual-transaxle model)
   - Timing chain cover installation
8) After checking initial ignition timing, release ignition timing fixation by using scan tool.
9) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 5° – 15° BTDC for M13A and M16A engines or 3° – 13° BTDC for M15A engine. (Constant variation within a few degrees from 5° – 15° BTDC for M13A and M16A engines or 3° – 13° BTDC for M15A engine indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
   If the check results are not satisfactory, check CKP sensor and ECM.

Specifications

Tightening Torque Specifications

S7N20A1807001

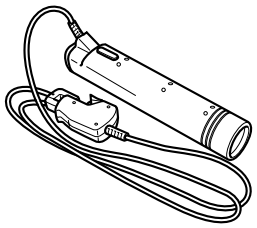
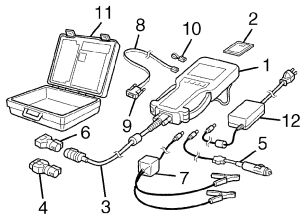
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Spark plug	25	2.5	18.0	☞
Ignition coil bolt	10	1.0	7.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A1808001

09930–76420 Timing-light (dry cell type) ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞	

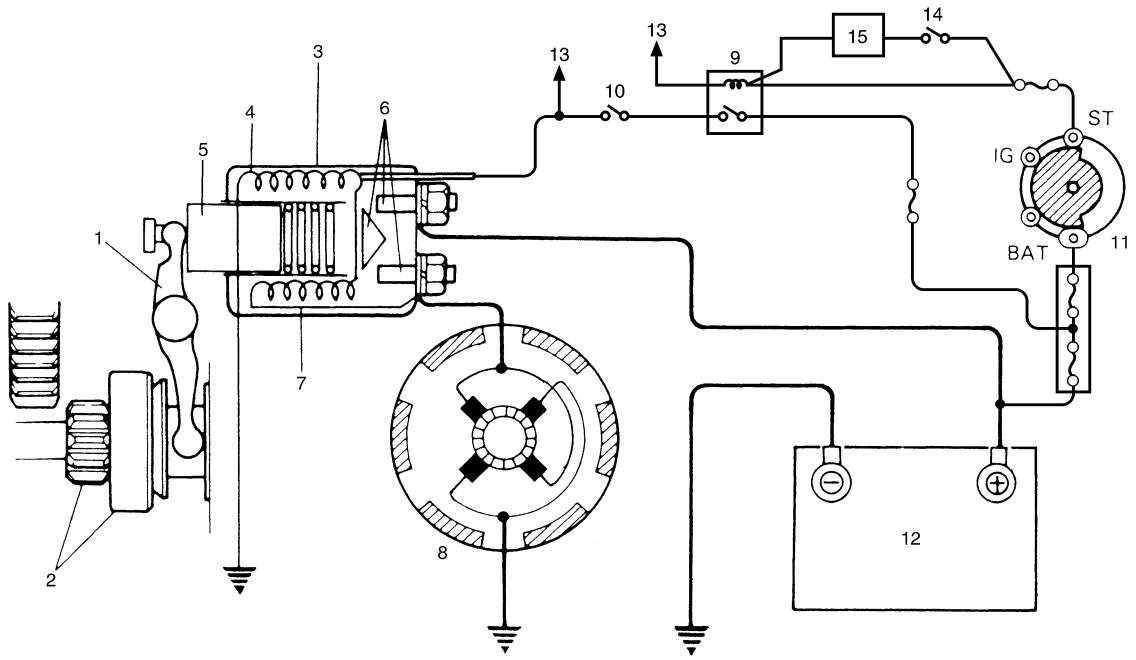
Starting System

M13A / M15A / M16A

Schematic and Routing Diagram

Cranking System Circuit Diagram

S7N20A1912001



I4RS0B190006-01

1. Pinion drive lever	6. Magnetic switch contacts	11. Ignition & Starter switch
2. Pinion & Over-running clutch	7. Pull-in coil	12. Battery
3. Magnetic switch	8. Starting motor	13. To ECM
4. Hold-in coil	9. Starting motor control relay	14. Neutral start switch (for Automated Manual Transaxle model)
5. Plunger	10. Transmission range switch (for A/T model)	15. TCM (for Automated Manual Transaxle model)

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

S7N20A1914001

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 exactly where the cause of each trouble lies in battery, wiring harness, (including starting motor switch), starting motor or engine.

Do not remove motor just because starting motor does not run. Check the following items and narrow down scope of possible causes.

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
Motor not running (No operating sound of magnetic switch)	Shift lever switch is not in P or N, or not adjusted (for A/T model)	*Shift in P or N, or adjust switch. (for A/T model)*
	Faulty neutral start switch (for Automated Manual Transaxle model)	*"Neutral Start Switch Inspection in Section 5D".*
	Faulty stop (brake) lamp switch (for Automated Manual Transaxle model)	*"Stop (Brake) Lamp Switch Inspection in Section 9B".*
	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Poor contact in battery terminal connection	*Retighten or replace.*
	Loose grounding cable connection	*Retighten.*
	Fuse set loose or blown off	*Tighten or replace.*
	Poor contacting action of ignition switch and magnetic switch	*Replace.*
	Lead wire coupler loose in place	*Retighten.*
	Open-circuit between ignition switch and magnetic switch	*Repair.*
	Open-circuit in pull-in coil	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Poor sliding of plunger and/or pinion	*Repair.*
	Faulty starting motor control relay	*"Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: M13A / M15A / M16A in Section 1C".*
	Faulty ECM and its circuit	*"Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A".*
Motor not running (Operating sound of magnetic switch heard)	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Loose battery cable connections	*Retighten.*
	Burnt main contact point, or poor contacting action of magnetic switch	*Replace magnetic switch.*
	Brushes are seating poorly or worn down	*Repair or replace.*
	Weakened brush spring	*Replace.*
	Burnt commutator	*Replace armature.*
	Layer short-circuit of armature	*Replace.*
	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.*
	Layer short-circuit of armature	*Replace.*
	Disconnected, burnt or worn commutator	*Repair commutator or replace armature.*
	Worn brushes	*Replace brush.*
	Weakened brush springs	*Replace spring.*
	Burnt or abnormally worn end bush	*Replace bush.*
Starting motor running, but not cranking engine	Worn pinion tip	*Replace over-running clutch.*
	Poor sliding of over-running clutch	*Repair.*
	Over-running clutch slipping	*Replace over-running clutch.*
	Worn teeth of ring gear	*Replace flywheel (for M/T and Automated Manual Transaxle models) or drive plate (for A/T model).*

Condition	Possible cause	Correction / Reference Item
Noise	Abnormally worn bush	*Replace bush.*
	Worn pinion or worn teeth of ring gear	*Replace over-running clutch, flywheel (for M/T and Automated Manual Transaxle models) or drive plate (for A/T model).*
	Poor sliding of pinion (failure in return movement)	*Repair or replace.*
	Worn internal or planetary gear teeth	*Replace.*
	Lack of oil in each part	*Lubricate.*
Starting motor does not stop running	Fused contact points of magnetic switch	*Replace magnetic switch.*
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	*Replace magnetic switch.*
	Failure of returning action in ignition switch	*Replace.*

Cranking System Test

S7N20A1914002

⚠ CAUTION

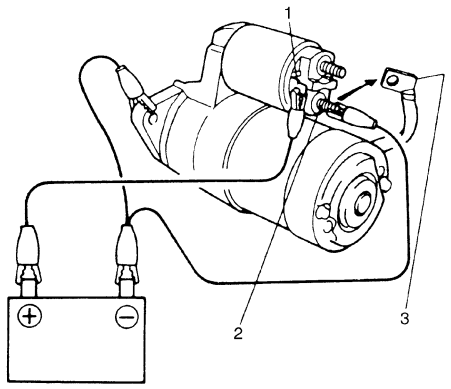
Each test must be performed within 3 – 5 seconds to avoid coil from burning.

Pull-In Test

Connect battery to the magnetic switch as shown.
Check that plunger and pinion move outward.
If plunger and pinion don't move, replace the magnetic switch.

NOTE

Before testing, disconnect lead wire from terminal "M" (2).

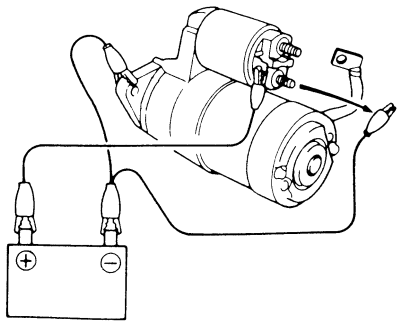


I2RH01190002-01

1.	Terminal "S"
3.	Lead wire (switch to motor)

Hold-In Test

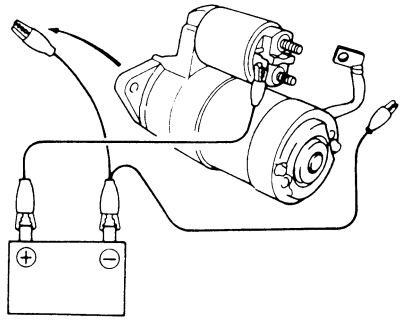
While connected as the figure with plunger out, disconnect negative lead from terminal "M".
Check that plunger and pinion remain out.
If plunger and pinion return inward, replace the magnetic switch.



I2RH01190003-01

Plunger and Pinion Return Test

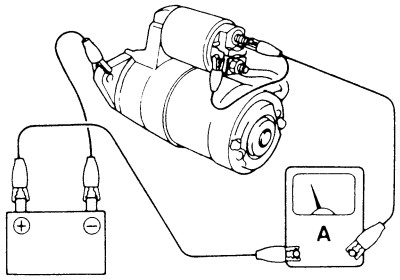
Disconnect negative lead from starting motor body.
Check that plunger and pinion return inward.
If plunger and pinion don't return, replace the magnetic switch.



I2RH01190004-01

No-Load Performance Test
Connect battery and ammeter to starter as shown. Check that starter rotates smoothly and steadily with pinion moving out. Check that ammeter indicates specified current.

Specified current (No-load performance test)
0.8 kW type: 53A MAX. at 11.5 V
1.2 kW type: 90 A MAX. at 11 V



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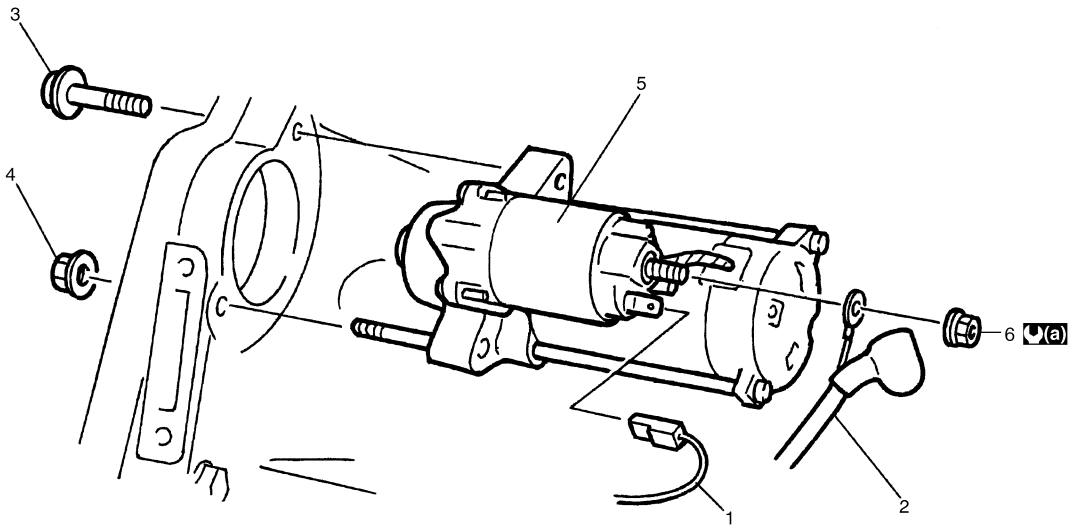
Repair Instructions

Starting Motor Dismounting and Remounting

S7N20A1916001



I4RS0A190002-01

(a) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

Dismounting

1) Disconnect negative (–) battery lead at battery.
2) Disconnect magnetic switch lead wire (1) and battery cable (2) from starting motor terminals.
3) Detach shift & select control cable bracket (for M/T model) or clutch actuator (for Automated Manual Transaxle model) from transaxle.
4) Remove starting motor mount bolt (3) and nut (4).
5) Remove starting motor (5).

Remounting

Reverse the dismounting procedure noting the following.

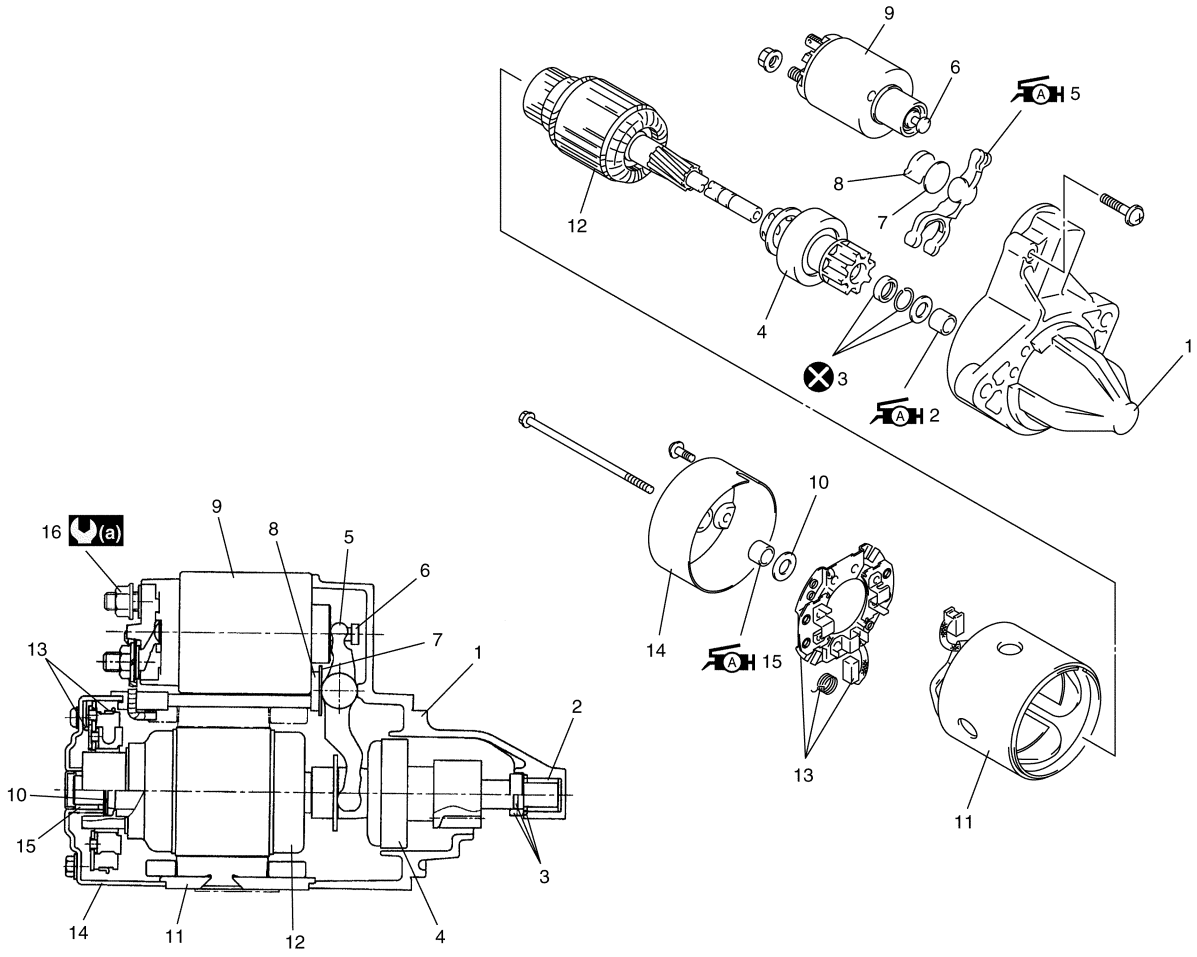
- Tighten battery cable nut (6) to specified torque.

Tightening torque
Starting motor battery cable nut (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

Starting Motor Components

S7N20A1916002

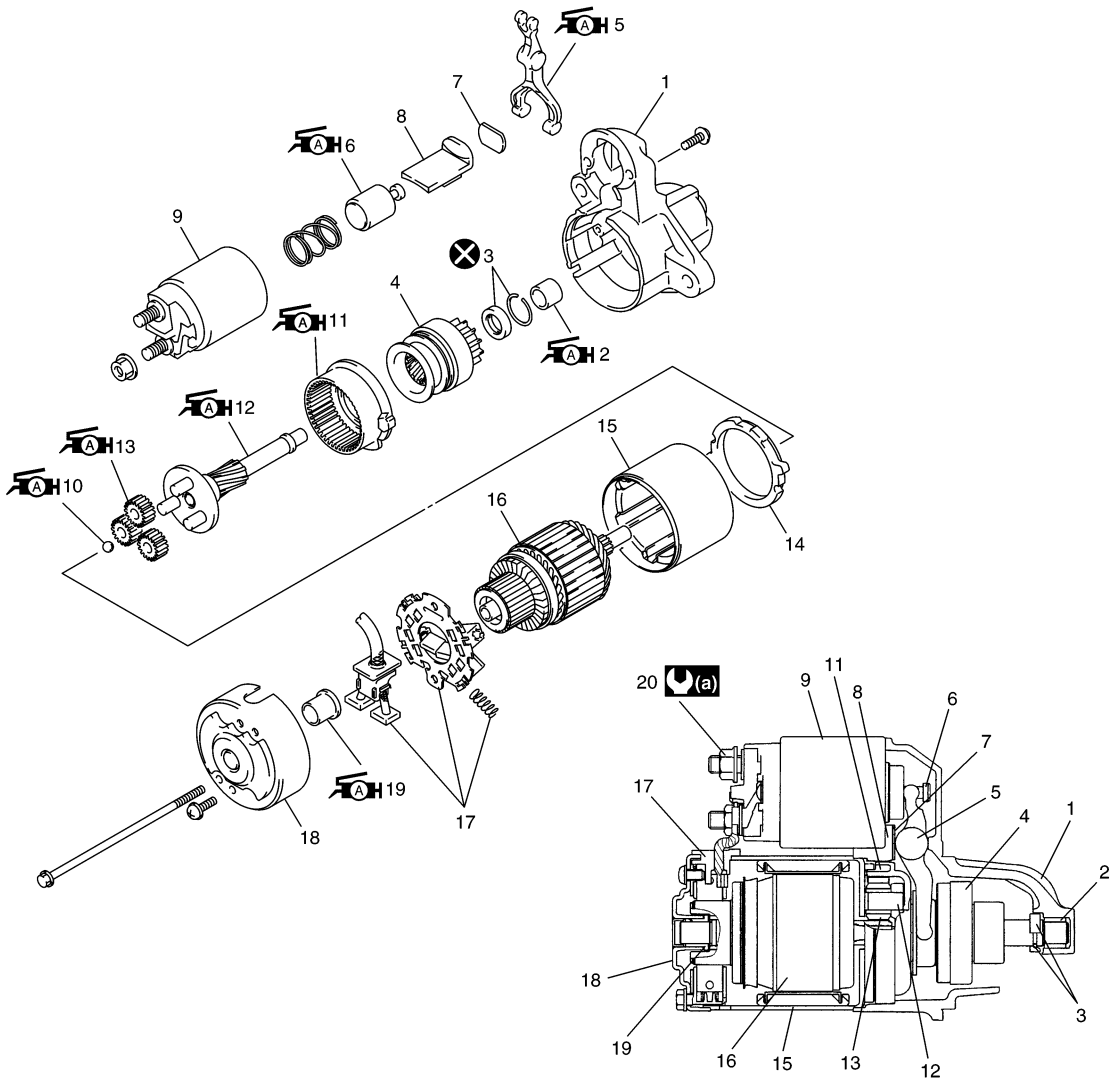
0.8 kW type



I4RS0B190001-01

1. Front housing	6. Plunger	11. Yoke	16. Starting motor battery cable nut
2. Bush	7. Plate	12. Armature	(a) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
3. Pinion stop ring	8. Seal rubber	13. Brush assembly	: Do not reuse.
4. Over-running clutch	9. Magnetic switch	14. Rear bracket	: Apply grease 99000-25010 to sliding surface of each part.
5. Lever	10. Washer	15. Rear bush	

1.2 kW type



I4RS0A190003-01

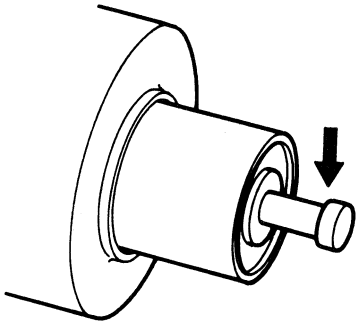
1. Front housing	7. Plate	13. Planetary gear	20. Starting motor battery cable nut
2. Bush	8. Seal rubber	14. Packing	(a) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
3. Pinion stop ring	9. Magnetic switch	15. Yoke	: Do not reuse.
4. Over-running clutch	10. Ball	16. Armature	: Apply grease 99000-25010 to sliding surface of each part.
5. Lever	11. Internal gear	17. Brush assembly	
6. Plunger	12. Planetary carrier shaft	19. Rear bush	

Starting Motor Inspection

S7N20A1916003

Plunger

Inspect plunger for wear. Replace if necessary.



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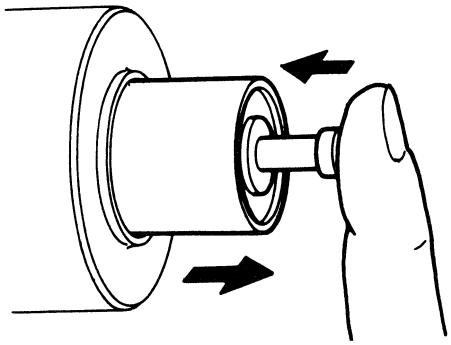
Magnetic Switch

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.



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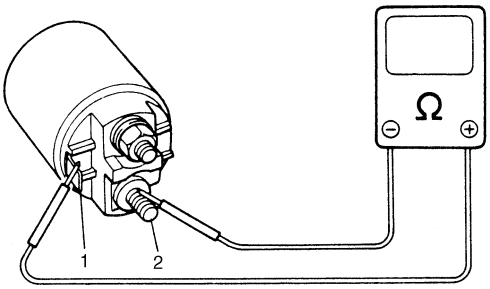
Pull-in coil open circuit test

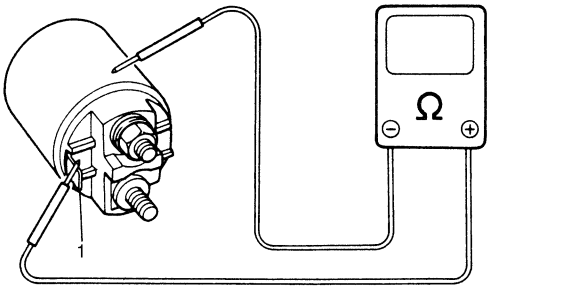
Check for continuity across magnetic switch “S” terminal (1) and “M” terminal (2). If no continuity, coil is open and should be replaced.



I2RH01190010-01

Hold-in coil open circuit test

Check for continuity across magnetic switch “S” terminal (1) and coil case. If no continuity, coil is open and should be replaced.



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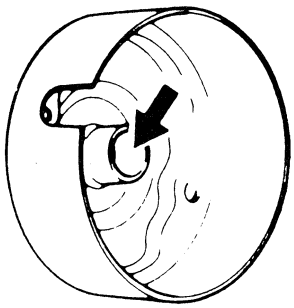
Rear Bracket Bush

Inspect bush for wear or damage. Replace if necessary.



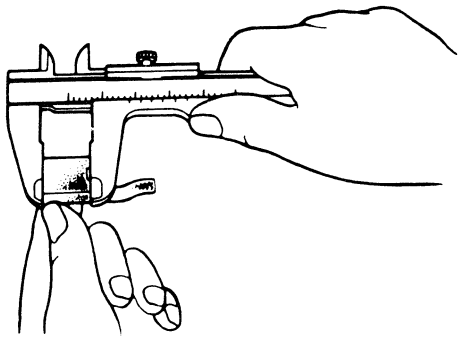
I2RH01190012-01

Brush

- Check brushes for wear.
  Measure length of brushes and if below the limit, replace the brush.

Brush length

	0.8 kW	1.2 kW
Standard	17.0 mm (0.67 in)	12.3 mm (0.48 in.)
Limit	11.5 mm (0.46 in.)	7.0 mm (0.28 in.)



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- Install brushes to each brush holder and check for smooth movement.

Spring

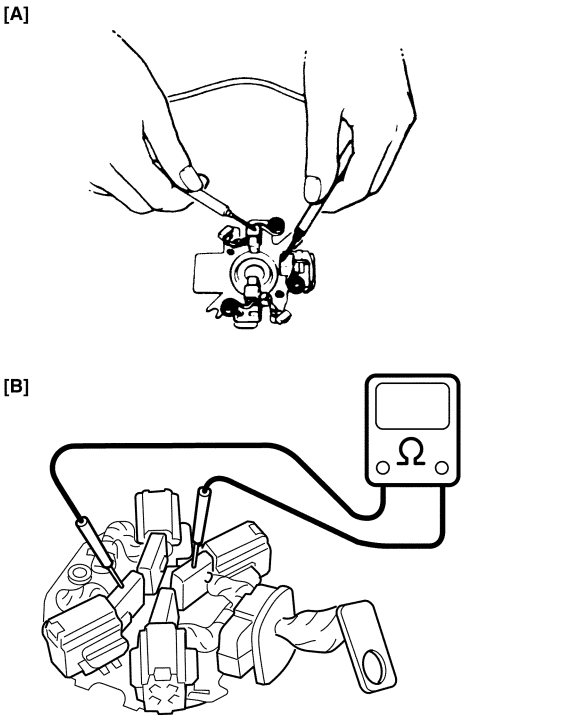
Inspect brush springs for wear, damage or other abnormal conditions. Replace if necessary.

Brush spring tension

	0.8 kW	1.2 kW
Standard	1.95 kg (4.3 lb)	2.2 kg (4.85 lb)
Limit	0.9 kg (1.99 lb)	0.6 kg (1.33 lb)

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 across insulated brush (positive side) and grounded brush (negative side).
  If continuity exists, brush holder is grounded due to defective insulation and should be replaced.



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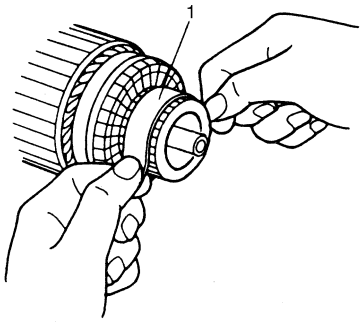
[A]: 0.8 kW
[B]: 1.2 kW

Armature

- Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.



I4RS0B190003-01

1. Sandpaper of #300 – 400

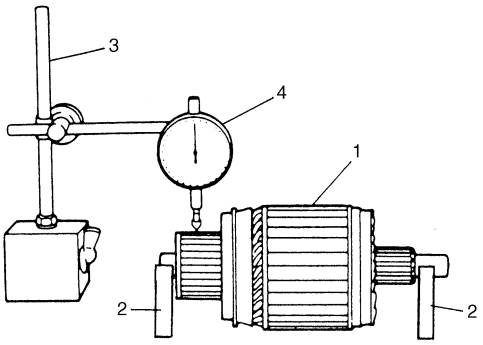
- Check commutator for uneven wear with armature (1) supported on V-blocks (2). If deflection of dial gauge (4) pointer exceeds limit, repair or replace.

NOTE

The following specification presupposes that the armature is free from bend. Bent armature must be replaced.

Commutator out of round

	0.8 kW and 1.2 kW
Standard	0.05 mm (0.002 in.) or less
Limit	0.4 mm (0.016 in.)



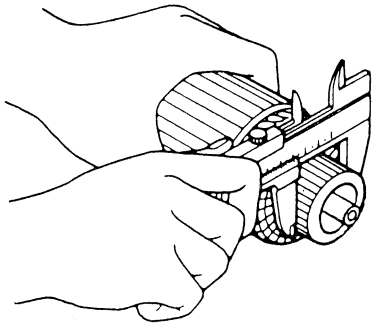
I2RH01190016-01

3. Magnetic stand

- Inspect the commutator for wear. If diameter is below limit, replace the armature.

Commutator outside diameter

	0.8 kW	1.2 kW
Standard	32.0 mm (1.26 in.)	29.4 mm (1.16 in.)
Limit	31.4 mm (1.23 in.)	28.8 mm (1.14 in.)

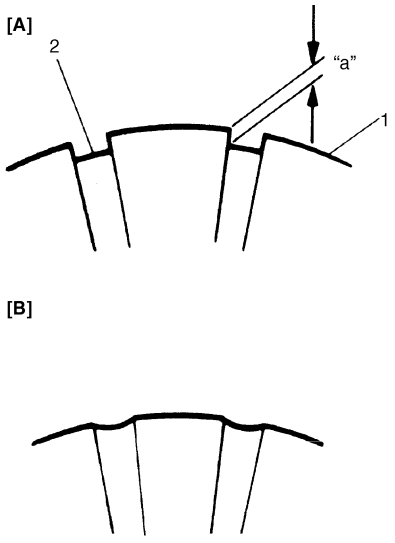


I2RH01190017-01

- Inspect the commutator (1) for insulator (2) depth. Correct or replace if below limit.

Commutator insulator depth "a"

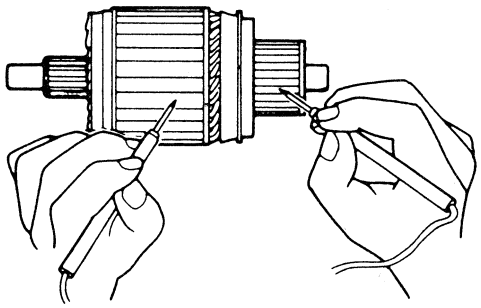
	0.8 kW and 1.2 kW
Standard	0.4 – 0.6 mm (0.016 – 0.023 in.)
Limit	0.2 mm (0.008 in.)



I3RH0A190005-01

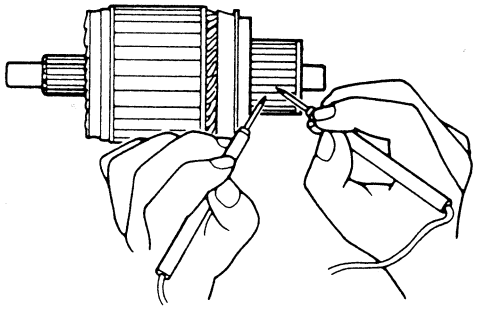
[A]: Correct
[B]: Incorrect

- Check the commutator and armature core. If there is continuity, the armature is grounded and must be replaced.



I2RH01190019-01

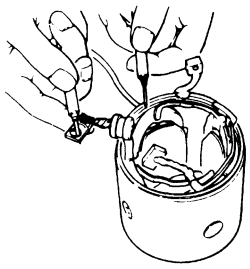
- Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and the armature must be replaced.



I2RH01190020-01

Ground Test of Field Coil (0.8 kW Type)

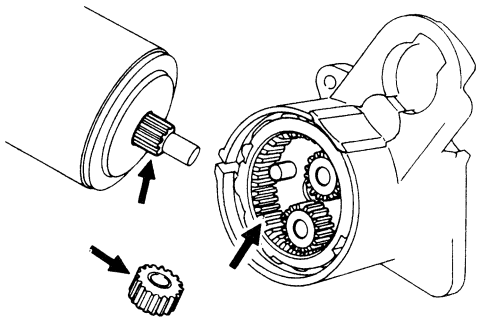
Check continuity between brush and bare surface. If there is continuity, filed windings are grounded. The yoke assembly must be replaced.



I4RS0B190004-01

Gears (1.2 kW Type)

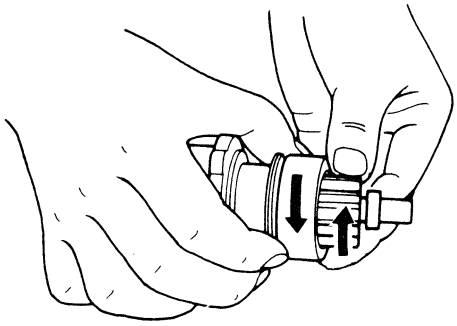
Inspect the internal gear and the planetary gears for wear, damage or other abnormal conditions. Replace if necessary.



I2RH01190021-01

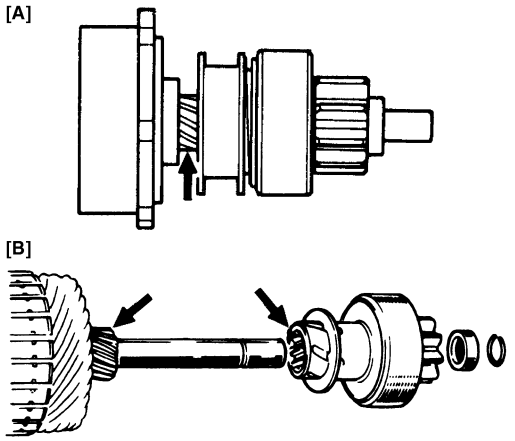
Pinion and Over-Running Clutch

- Inspect the 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.
  Replace if necessary.



I2RH01190022-01

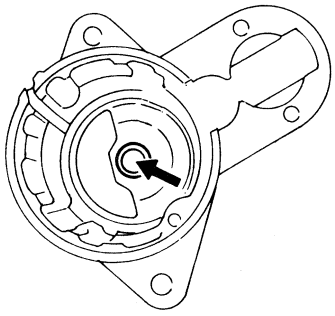
- Inspect the spline teeth for wear or damage. Replace if necessary.
  Inspect the pinion for smooth movement.



I4RS0B190005-01

[A]: 1.2 kW
[B]: 0.8 kW

Front Housing Bush
Inspect the bush for wear or damage. Replace if necessary.



I2RH01190024-01

Specifications

Cranking System Specifications

S7N20A1917001

0.8 kW type

Voltage			12 volts
Output			0.8 kW
Rating			30 seconds
Direction of rotation			Clockwise as viewed from pinion side
Brush length			Standard: 17.0 mm (0.67 in.) | Limit: 11.5 mm (0.46 in.)
Number of pinion teeth			8
Performance		Condition	Guarantee
Around at 20 °C (68 °F)	No load characteristic	11.5 V	53 A maximum 6,000 rpm minimum
	Load characteristic	9 V 150 A	2.8 N·m (0.28 kgf-m, 2.0 lbf-ft) minimum 2000 rpm minimum
	Locked characteristic	5 V	360 A maximum 6.86 N·m (0.7 kgf-m, 5.1 lbf-ft) minimum
	Magnetic switch operating voltage		8 volts maximum

1.2 kW type

Voltage			12 volts
Output			1.2 kW
Rating			30 seconds
Direction of rotation			Clockwise as viewed from pinion side
Brush length			Standard: 12.3 mm (0.48 in.) | Limit: 7.0 mm (0.28 in.)
Number of pinion teeth			8
Performance		Condition	Guarantee
Around at 20 °C (68 °F)	No load characteristic	11.0 V	90 A maximum 2370 rpm minimum
	Load characteristic	7.5 V 300 A	10.65 N·m (1.065 kgf-m, 7.70 lbf-ft) minimum 840 rpm minimum
	Locked characteristic	4.0 V	780 A maximum 20 N·m (2.0 kgf-m, 14.5 lbf-ft) minimum
	Magnetic switch operating voltage		8 volts maximum

Tightening Torque Specifications

S7N20A1917002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Starting motor battery cable nut	11	1.1	8.0	☞

NOTE

The specified tightening torque is also described in the following.
“Starting Motor Dismounting and Remounting: M13A / M15A / M16A”
“Starting Motor Components: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1918001

NOTE

Required service material is also described in the following.
“Starting Motor Components: M13A / M15A / M16A”

D13A / Z13DTJ

General Description

Cranking System Description

S7N20A1921001

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

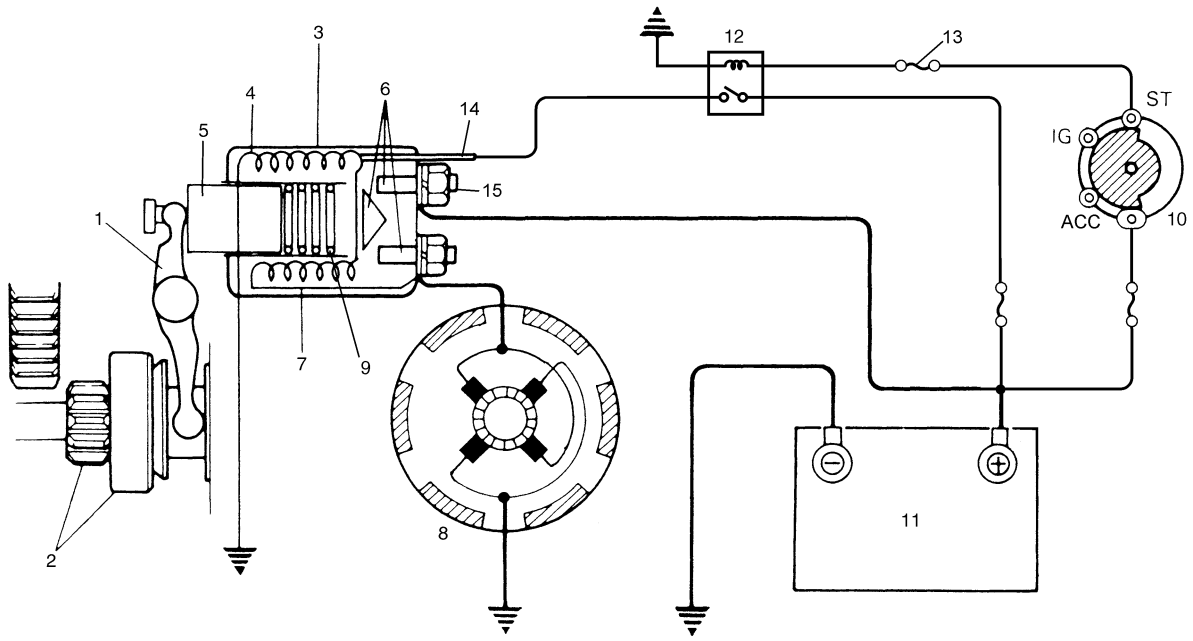
In the circuit shown in “Cranking System Circuit Diagram: D13A / Z13DTJ”, the hold-in coil and the pull-in coil are magnetized when turned the ignition switch to ST position. The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and the cranking takes place.

When the engine starts, the pinion over-running 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

S7N20A1922001



I7V20A192002-02

1. Pinion drive lever	5. Plunger	9. Return spring	13. Starting motor signal fuse
2. Pinion & Over-running clutch	6. Magnetic switch contacts	10. Ignition & Starter switch	14. Terminal “S”
3. Magnetic switch	7. Pull-in coil	11. Battery	15. Terminal “M”
4. Hold-in coil	8. Starting motor	12. Starting motor control relay	

Diagnostic Information and Procedures

Cranking System Symptom Diagnosis

S7N20A1924001

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
- Starting motor does not stop running

Proper diagnosis must be made to determine exactly where the cause of each trouble lies.....in battery, wiring harness, starting motor (including magnetic switch) or engine.

Do not remove motor just because starting motor does not run. Check the following items and narrow down the possible causes.

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
Motor not running (No operating sound of magnetic switch)	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Poor contact in battery terminal connection	*Retighten or replace.*
	Loose grounding cable connection	*Retighten.*
	Fuse blown off	*Replace fuse.*
	Starting motor control relay faulty	*Replace starting motor control relay.*
	Poor contacting action of ignition switch and magnetic switch	*Replace ignition switch and/or magnetic switch referring to "Ignition Switch Removal and Installation in Section 9C" and/or "Starting Motor Components: D13A / Z13DTJ".*
	Lead wire connector loose in place	*Retighten.*
	Open-circuit between ignition switch and magnetic switch	*Repair.*
	Open-circuit in pull-in coil	*Replace magnetic switch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Brushes are seating poorly or worn down	*Repair or replace brush assembly referring to "Starting Motor Components: D13A / Z13DTJ".*
	Poor sliding of plunger and/or pinion	*Repair or replace magnetic switch referring to"Starting Motor Components: D13A / Z13DTJ".*
Motor not running (Operating sound of magnetic switch heard)	Battery run down	*Recharge battery.*
	Battery voltage too low due to battery deterioration	*Replace battery.*
	Loose battery cable connections	*Retighten.*
	Burnt main contact point, or poor contacting action of magnetic switch	*Repair or replace magnetic switch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Brushes are seating poorly or worn down	*Repair or replace brush assembly referring to "Starting Motor Components: D13A / Z13DTJ".*
	Weakened brush spring	*Replace brush assembly referring to "Starting Motor Components: D13A / Z13DTJ".*
	Burnt commutator	*Replace armature referring to "Starting Motor Components: D13A / Z13DTJ".*
	Layer short-circuit of armature	*Replace armature referring to "Starting Motor Components: D13A / Z13DTJ".*
	Crankshaft rotation obstructed	*Repair.*

Condition	Possible cause	Correction / Reference Item
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 referring to "Starting Motor Components: D13A / Z13DTJ".*
	Layer short-circuit of armature	*Replace armature referring to "Starting Motor Components: D13A / Z13DTJ".*
	Disconnected, burnt or worn commutator	*Replace armature referring to "Starting Motor Components: D13A / Z13DTJ".*
	Worn brushes	*Replace brush assembly referring to "Starting Motor Components: D13A / Z13DTJ".*
	Weakened brush springs	*Replace brush assembly referring to "Starting Motor Components: D13A / Z13DTJ".*
Starting motor running, but not cranking engine	Worn pinion tip	*Replace over-running clutch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Poor sliding of over-running clutch	*Replace over-running clutch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Over-running clutch slipping	*Replace over-running clutch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Worn teeth of ring gear	*Replace flywheel referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C".*
Noise	Worn pinion or worn teeth of ring gear	*Replace over-running clutch and/or flywheel referring to "Starting Motor Components: D13A / Z13DTJ" and/or "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C".*
	Poor sliding of pinion (failure in return movement)	*Replace over-running clutch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Worn internal or planetary gear teeth	*Replace starting motor referring to "Starting Motor Removal and Installation: D13A / Z13DTJ".*
	Lack of oil in each part	*Lubricate.*
Starting motor does not stop running	Fused contact points of magnetic switch	*Replace magnetic switch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Short-circuit between turns of magnetic switch coil (layer short-circuit)	*Replace magnetic switch referring to "Starting Motor Components: D13A / Z13DTJ".*
	Failure of returning action in ignition switch	*Replace ignition switch referring to "Ignition Switch Removal and Installation in Section 9C".*

Repair Instructions

Starting Motor Removal and Installation

S7N20A1926001

Removal

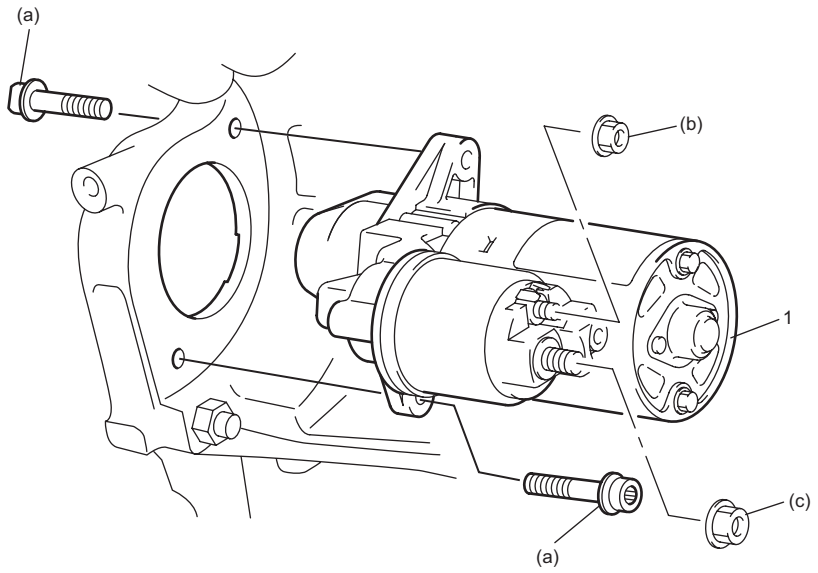
1) Remove battery from vehicle.
2) Remove glow plug control module referring to “Glow Plug Control Module Removal and Installation: D13A / Z13DTJ in Section 1C”.
3) Remove battery tray from vehicle.
4) Remove air cleaner assembly, if necessary referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
5) Remove starting motor mount bolt (upper side).
6) Disconnect wire harnesses from starting motor terminals.
7) Remove starting motor mount bolt (lower side).
8) Remove starting motor.

Installation

Reverse removal procedure for installation noting the following.

- Tighten each bolts and nuts to specified torque.

Tightening torque
Starting motor mount bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
Magnetic switch lead wire nut (b): 5.8 N·m (0.58 kgf-m, 4.5 lbf-ft)
Battery cable nut (c): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

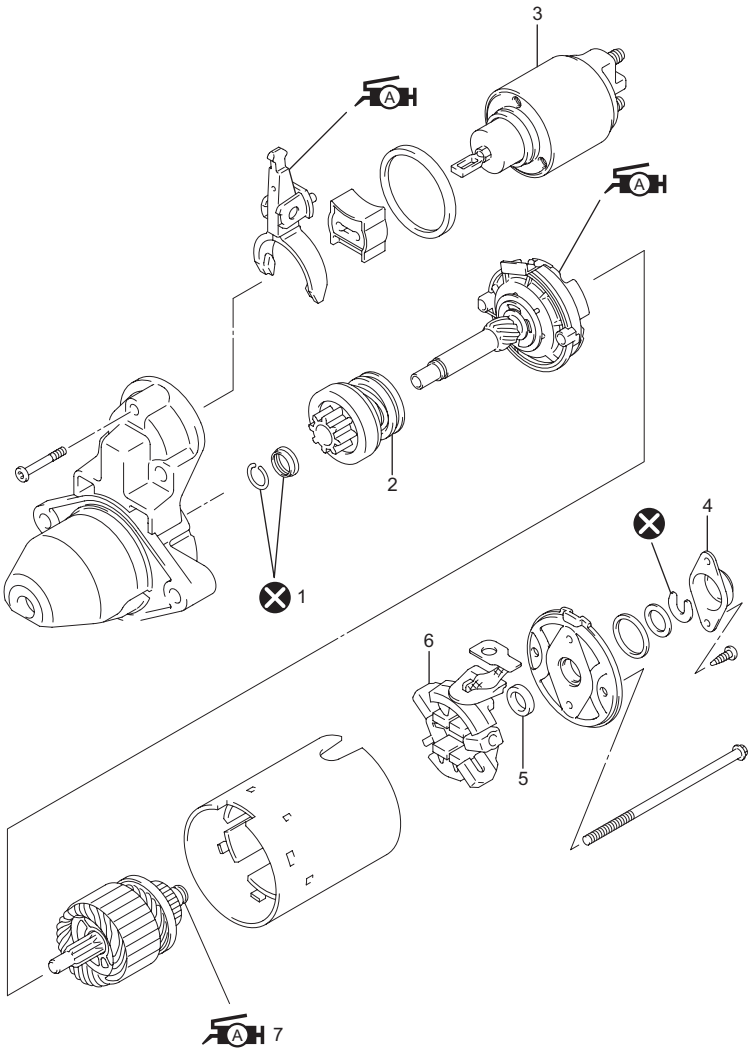


I7V20A192003-02

1. Starting motor

Starting Motor Components

S7N20A1926004



I7V20A192004-02

1. Pinion stop ring	4. Cap	7. Armature
2. Over-running clutch	5. Bush	⊗ : Do not reuse.
3. Magnetic switch	6. Brush assembly	A : Apply grease 99000-25010 to sliding surface of each part.

Starting Motor Inspection

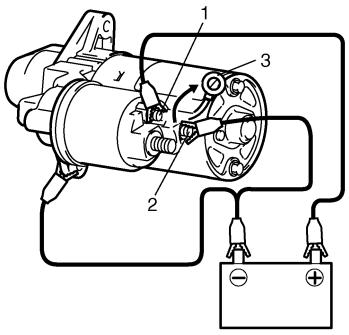
S7N20A1926005

Starting Motor Operation Check

⚠ CAUTION

Each test must be performed within 3 – 5 seconds to avoid coil from burning.

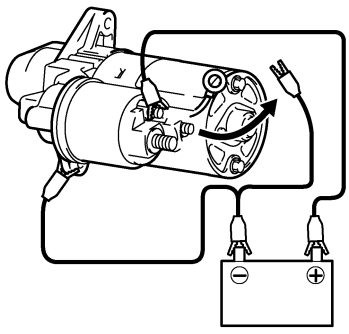
1) Perform pull-in test as follows.
   a) Disconnect lead wire (3) from terminal “M” (2).
   b) Connect battery to the magnetic switch as shown in figure.
   c) Check that plunger and pinion move outward. If plunger and pinion don't move, replace magnetic switch.



I5RS0B190002-01

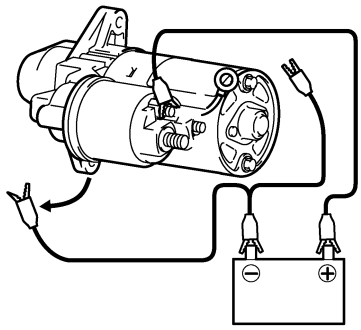
1. Terminal “S”

2) Perform hold-in test as follows.
   a) While connected as above with plunger out, disconnect negative lead from terminal “M”.
   b) Check that plunger and pinion remain out. If plunger and pinion return inward, replace magnetic switch.



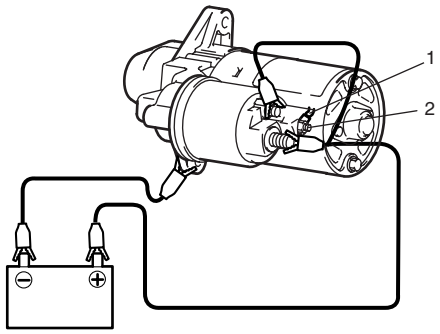
I5RS0B190003-01

3) Perform plunger and pinion return test as follows.
   a) Disconnect negative lead from starting motor body.
   Check that plunger and pinion return inward.If plunger and pinion don't return, replace magnetic switch.



I5RS0B190004-01

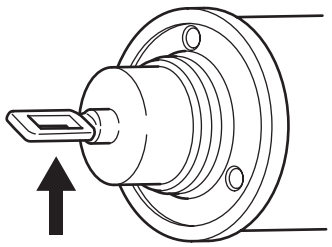
4) Non-load performance test
   a) Connect lead wire (1) to terminal “M” (2). Connect battery to starting motor as shown.
   b) Check that starting motor rotates smoothly and steadily with pinion moving out.
   If check result is not satisfactory, repair or replace starting motor.



I3RM0B190001-01

Plunger

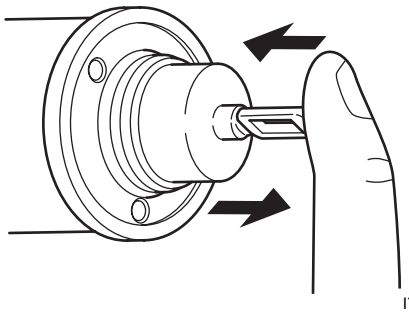
Inspect plunger for wear. Replace if necessary.



I7V20A192005-02

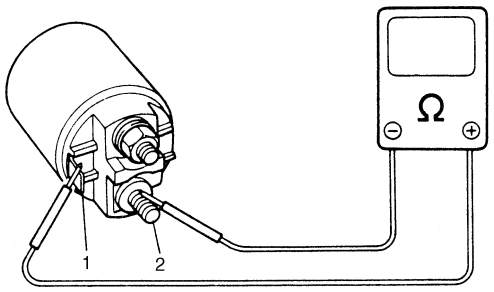
Magnetic Switch

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.



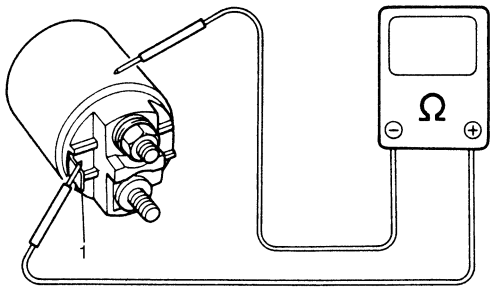
I7V20A192006-01

Pull-in coil open circuit test
Check for continuity across magnetic switch “S” terminal (1) and “M” terminal (2). If no continuity, coil is open and should be replaced.



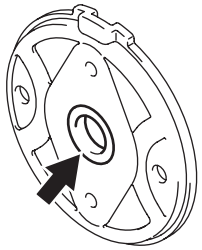
I2RH01190010-01

Hold-in coil open circuit test
Check for continuity across magnetic switch “S” terminal (1) and coil case. If no continuity, coil is open and should be replaced.



I2RH01190011-01

Rear Bracket Bush
Inspect bush for wear or damage. Replace if necessary.



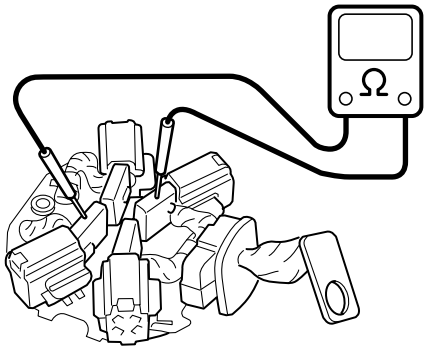
I7V20A192007-01

Brush
Install brushes to each brush holder and check for smooth movement.

Spring
Inspect brush spring for wear, damage or other abnormal conditions. Replace if necessary.

Brush Holder

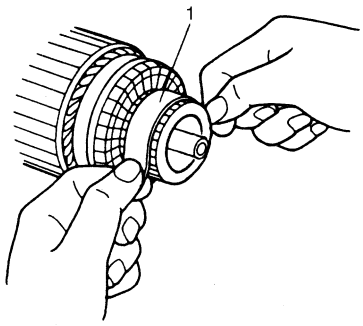
- Check movement of brush in brush holder. If brush movement within brush holder is sluggish, check brush holder for distortion and sliding faces for contamination.
  Clean or correct as necessary.
- Check for continuity across insulated brush (positive side) and grounded brush (negative side).
  If continuity exists, brush holder is grounded due to defective insulation and should be replaced.



I4RS0A190004-01

Armature

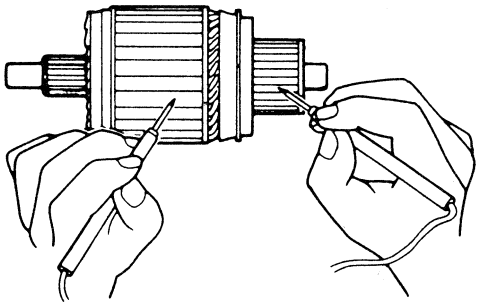
- Inspect commutator for dirt or burn. Correct with sandpaper or lathe, if necessary.



I7RW01190005-02

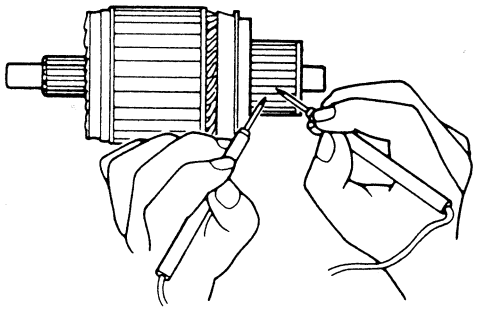
1. Sandpaper of #300 – 400

- Check the commutator and armature core. If there is continuity, the armature is grounded and must be replaced.



I2RH01190019-01

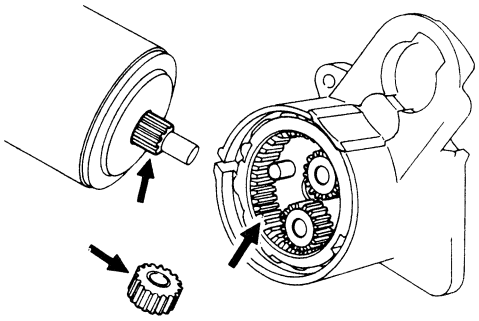
- Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and the armature must be replaced.



I2RH01190020-01

Gears

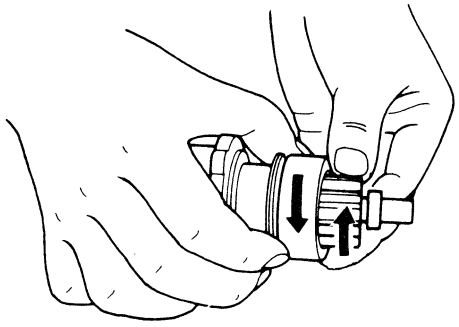
Inspect the internal gear and the planetary gears for wear, damage or other abnormal conditions. Replace if necessary.



I2RH01190021-01

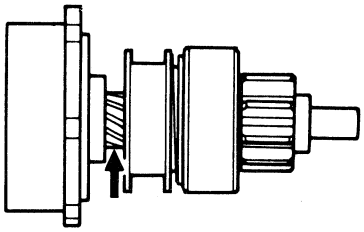
Pinion and Over-Running Clutch

- Inspect the 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.
  Replace if necessary.



I2RH01190022-01

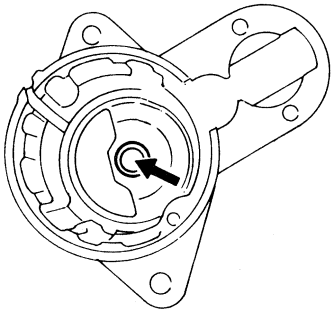
- Inspect the spline teeth for wear or damage. Replace if necessary.
  Inspect the pinion for smooth movement.



I2RH01190023-01

Front Housing Bush

Inspect the bush for wear or damage. Replace if necessary.



I2RH01190024-01

Specifications

Cranking System Specifications

S7N20A1927001

Voltage	12 V		
Output	1.6 kW		
Rating	30 seconds		
Direction of rotation	Clockwise as viewed from pinion end		
Number of pinion teeth	9		
	Voltage	**Current**	**Revolution**
No-load at 20 °C (68 °F)	11.6 V	Max. 72 A	Min. 3,950 rpm
Cranking at 20 °C (68 °F)	10.1 V	Max. 325 A	Min. 1,740 rpm

Tightening Torque Specifications

S7N20A1927002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Starting motor mount bolt	25	2.5	18.0	☞
Magnetic switch lead wire nut	5.8	0.58	4.5	☞
Battery cable nut	11	1.1	8.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A1928001

NOTE

Required service material is also described in the following.
“Starting Motor Components: D13A / Z13DTJ”

Charging System

M13A / M15A / M16A

General Description

Battery Description

S7N20A1A11001

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the 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 the generator.

Carrier and Hold-Down

The battery carrier should be in good condition so that it will support the battery securely and keep it level. Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.
To prevent the 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 is frozen accidentally, it should not be charged until it is warmed.

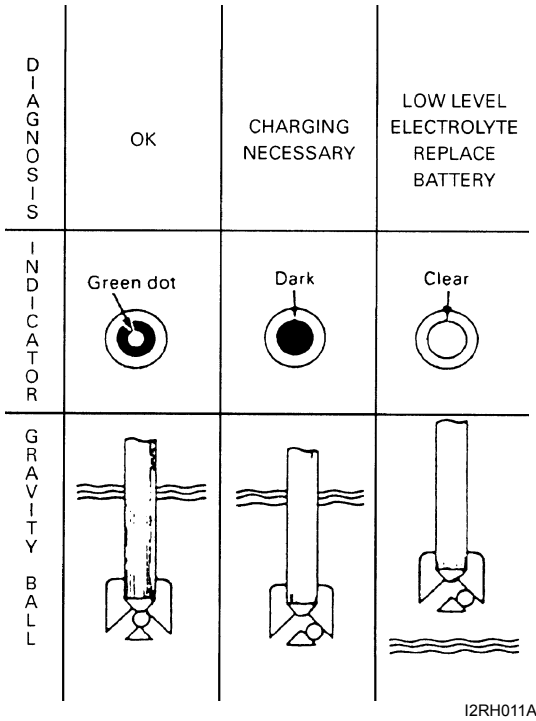
Sulfation

If the battery is allowed to stand 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.

Built-In Indicator (If Equipped)

The battery has a built-in temperature compensated indicator in the top of the battery. This indicator is to be used with the following diagnostic procedure. When checking the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.
Three types of indication available under normal operation are as follows.

- **Green dot**
  Battery is sufficiently charged for testing.
- **Dark**
  Battery must be charged before testing. If there is a cranking complaint, battery should be tested as described in “Battery Inspection: M13A / M15A / M16A”. Charging and electrical systems should also be checked at this time.
- **Clear**
  This means that fluid level is below the bottom of hydrometer. Its possible cause is excessive or prolonged charging, a broken case, excessive tipping or normal battery deterioration. When the battery is found in such condition, it is possible that high charging voltage is caused by the faulty charging system and therefore, charging and electrical systems need to be checked. If there is a trouble in cranking and its cause lies in the battery, it should be replaced.



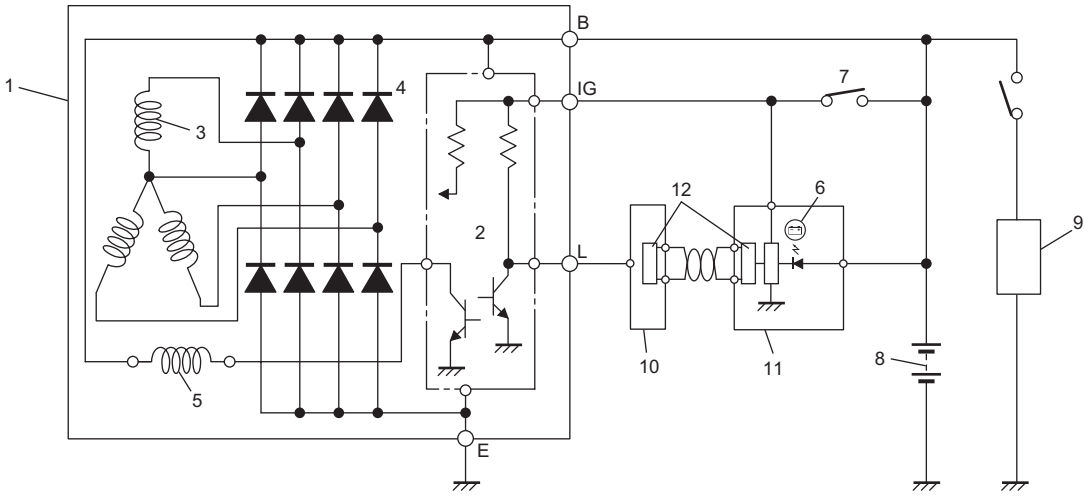
I2RH011A0001-01

Generator Description (For 75A Type)

S7N20A1A11002

The generator is a small and high performance type with an IC regulator incorporated. The internal components are connected electrically as shown in the following 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 housing.
- 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 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.



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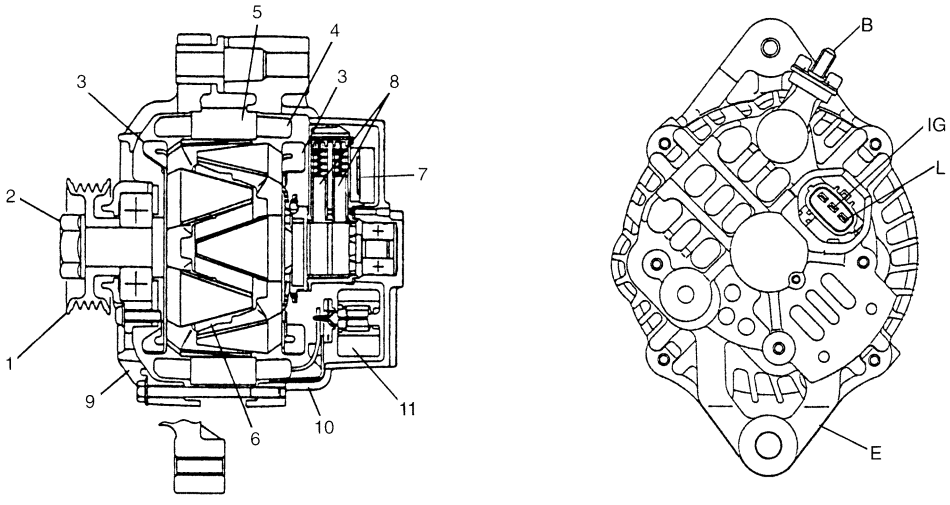
1. Generator with regulator assembly	3. Stator coil	5. Field coil (rotor coil)	7. Ignition switch	9. Load	11. Combination meter
2. I.C. regulator	4. Diode	6. Charge indicator light	8. Battery	10. BCM	12. CAN driver



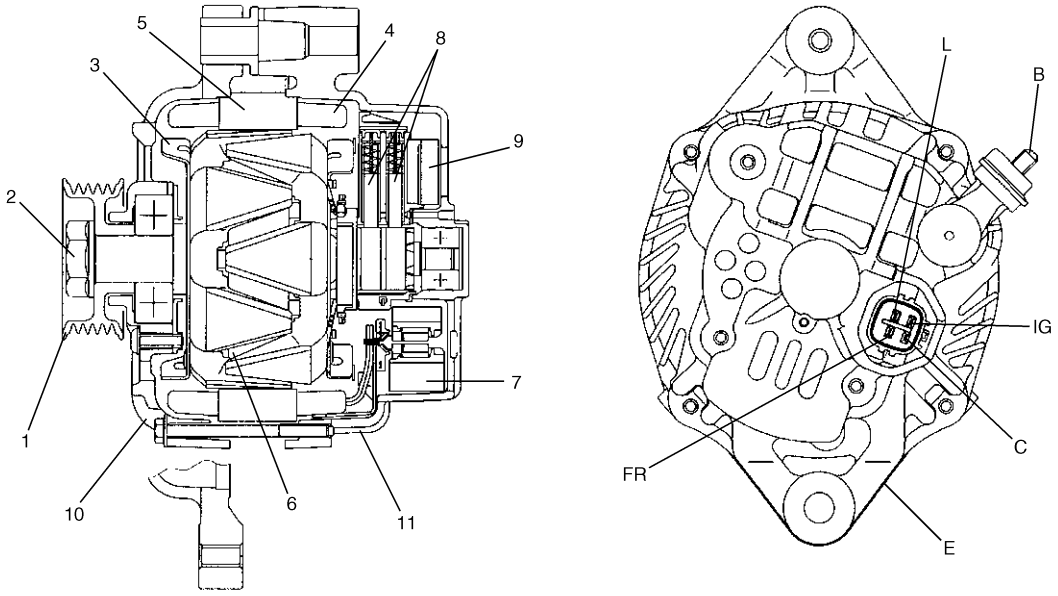
I4RS0B1A0002-01

1. Pulley	5. Stator core	9. Drive end frame	E: Ground
2. Pulley nut	6. Field coil	10. Rear end frame	IG: Ignition terminal
3. Rotor fan	7. Regulator	11: Rectifier	L: Lamp terminal
4. Stator coil	8. Brush	B: Generator output (Battery terminal)	

Generator Description (For 80A Type)

S7N20A1A11003

The basic charging system is the IC integral regulator charging system. The internal components are connected electrically as shown below.



I5JB0A1A0004-01

1. Pulley	6. Field coil	11. Rear housing	IG: Ignition terminal
2. Pulley nut	7. Rectifier	B: Generator output (Battery terminal)	L: Lamp terminal
3. Rotor fan	8. Brush	C: Generator cut	
4. Stator coil	9. Regulator	E: Ground	
5. Stator core	10. Front housing	FR: Field duty monitor	

Charging System Circuit

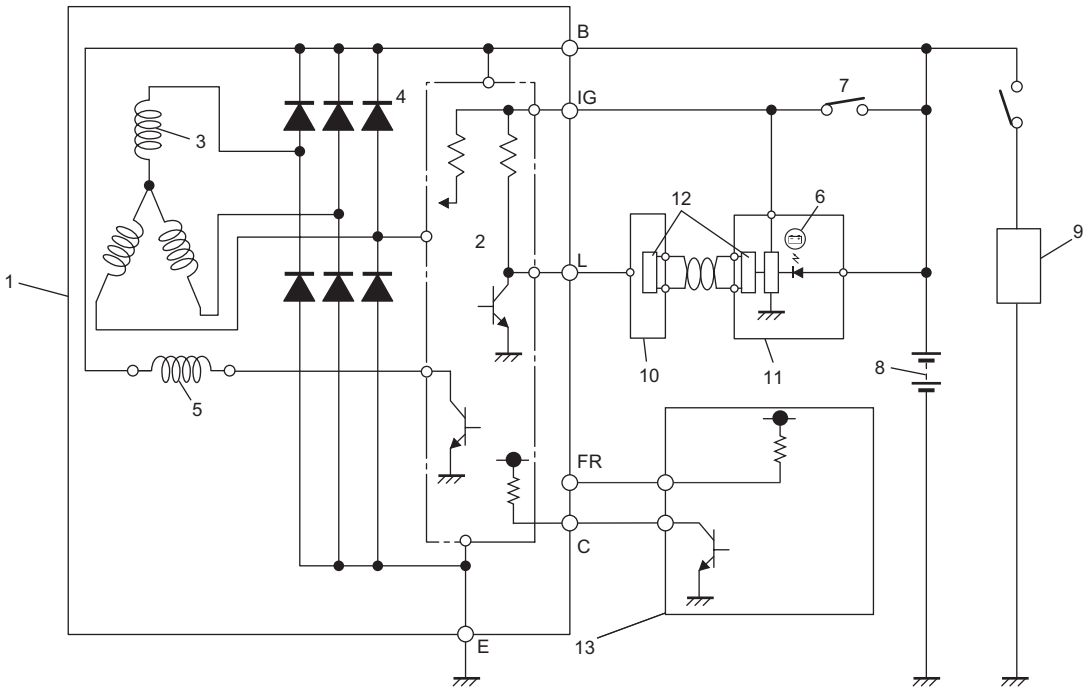
The generator features solid state regulator that it mounted inside the generator. All regulator components are enclosed into a solid mold, and this unit along with the brush holder assembly is attached to the rear housing. The regulator voltage is being controlled by ECM under some conditions while driving. Refer to “Generator Control System Description (M16A Engine): M13A / M15A / M16A in Section 1A”.

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 will provide long period of attention-free service.

The stator windings are assembled inside a laminated core that forms part of the generator frame.

A rectifier bridge connected to the stator windings contains diodes, and electrically changes the stator AC. voltages to a D.C. voltage which appears at the generator output terminal.



I7N20A1A1002-01

1. Generator with regulator assembly	5. Field coil (rotor coil)	9. Load	13. ECM
2. I.C. regulator	6. Charge indicator light	10. BCM	
3. Stator coil	7. Main switch	11. Combination meter	
4. Diode	8. Battery	12. CAN driver	

Diagnostic Information and Procedures

Battery Inspection

S7N20A1A14001

Common Causes of Failure

A battery is not designed to last indefinitely; however, with proper care, it will provide many years of service. If the battery performs satisfactorily during test but fails to operate properly for no apparent reason, the following are some factors that may point to the cause of trouble:

- Accessories left on overnight or for an extended period without the generator operating.
- Slow average driving speeds for short periods.
- Electrical load exceeding generator output particularly with addition of aftermarket equipment.
- Defects in charging system such as high resistance, slipping drive belt, loose generator output terminal, faulty generator or voltage regulator, Refer to “Generator Symptom Diagnosis: M13A / M15A / M16A”.
- Battery abuse, including failure to keep battery cable terminals clean and tight or loose battery hold down.
- Mechanical problems in electrical system such as shorted or pinched wires.

Visual Inspection

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Generator Symptom Diagnosis

S7N20A1A14002

⚠ CAUTION

- **Do not mistake polarities of "IG" terminal and "L" terminal.**
- **Do not create short circuit between "IG" and "L" terminals. Always connect these terminals through a lamp.**
- **Do not connect any load between "L" and "E" terminals.**
- **When connecting charger or booster battery to vehicle battery, refer to "Jump Starting in Case of Emergency: M13A / M15A / M16A".**

Trouble in charging system will show up as one or more of the following conditions:

1) Faulty indicator lamp operation.
2) An undercharged battery as evidenced by slow cranking or indicator dark.
3) An overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Condition	Possible cause	Correction / Reference Item
Noisy generator	Loose drive belt	*Adjust or replace drive belt.*
	Loose drive belt pulley	*Check generator.*
	Loose mounting bolts	*Check mounting connection.*
	Worn or dirty bearings	*Check generator.*
	Defective diode or stator	*Check generator.*
Charge light does not light with ignition ON and engine off	Fuse blown	*Check fuse.*
	Indicator lamp (LED) faulty	*Replace combination meter.*
	Wiring connection loose	*Tighten loose connection.*
	IC regulator or field coil faulty	*Check generator.*
	Poor contact between brush and slip ring	*Repair or replace.*
Charge light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	*Adjust or replace drive belt.*
	IC regulator or generator faulty	*Check charging system.*
	Wiring faulty	*Repair wiring.*

Generator Test (Undercharged Battery Check) (For 75A Type)

S7N20A1A14003

This condition, as evidenced by slow cranking or low specific gravity can be caused by one or more of the following conditions even though indicator lamp may be operating normal. The following procedure also applies to cars with voltmeter and ammeter.

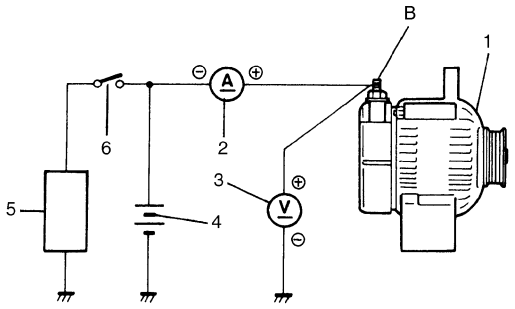
- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to "Battery Description: M13A / M15A / M16A".
- Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor and ignition ground cable.

No-Load Check

1) Connect voltmeter and ammeter as shown in the figure.

NOTE

Use fully charged battery.



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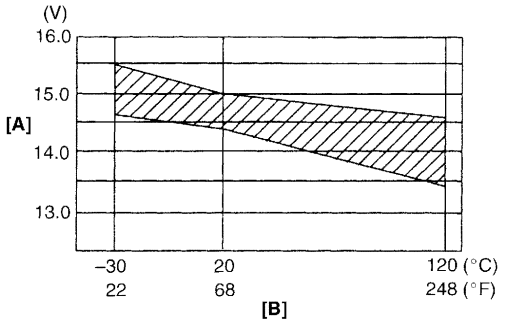
1.	Generator
2.	Ammeter (between generator "B" terminal and battery (+) terminal)
3.	Voltmeter (between generator "B" terminal and ground)
4.	Battery
5.	Load
6.	Switch

2) Run engine from idling up to 2,000 rpm with all accessories turned off and read meters.
If voltage is higher than standard value, check ground of brushes.
If brushes are not grounded, replace IC regulator.
If voltage is lower than standard value, proceed to the following check.

Specification for undercharged battery (No-load check)
Current: 10 A
Voltage: 14.2 – 14.8 V (at 20 °C, 68 °F)

NOTE

Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in the graph.



I4RS0B1A0004-01

[A]:	Regulated voltage (V)
[B]:	Heatsink temperature (°C)

Load Check

1) Run engine at 2,000 rpm and turn on head light and blower motor.
2) Measure current.
If measure current is less than 20 A, repair or replace generator.

Generator Test (Undercharged Battery Check) (For 80A Type)

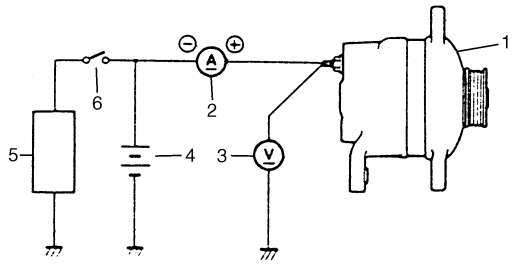
S7N20A1A14004

This condition, as evidenced by slow cranking or indicator clear with dark or light yellow dot can be caused by one or more of the following conditions even though indicator lamp may be operating normal.
The following procedure also applies to cars with voltmeter and ammeter.

1) Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
2) Check drive belt for proper tension.
3) If battery defect is suspected, refer to “Battery Description: M13A / M15A / M16A”.
4) Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starting motor, ignition ground cable and no “C” terminal circuit at ground.
5) Connect switch (6), load (5), battery (4), voltmeter (3) and ammeter (2) to generator (1) as shown in figure.
Voltmeter: Set between generator “B” terminal and ground.
Ammeter: Set between generator “B” terminal and battery (+) terminal.

NOTE

Use fully charged battery.



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6) Measure current and voltage.

No-Load Check

1) Run engine from idling up to 2000 rpm and read meters.

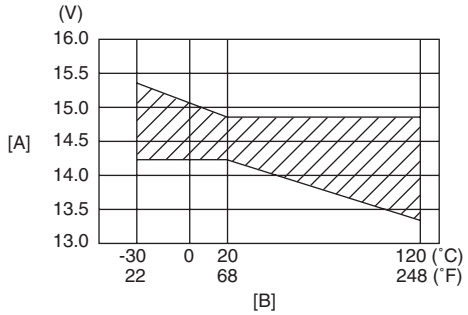
NOTE

Turn off switches of all accessories (wiper, heater etc.).

Specification for undercharged battery (No-load check)
Current: 10 A
Voltage: 14.2 – 14.8 V (at 20 °C, 68 °F)

NOTE

Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in figure.



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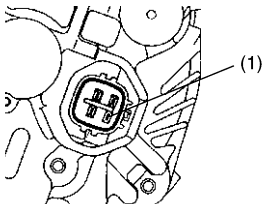
[A]:	Regulated voltage (V)
[B]:	Heat sink temperature (°C)

2) Using service wire, ground “C” terminal (1) of generator.



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3) Measure voltage between “B” terminal of generator and body ground.

Standard voltage
: 12.5 – 13.1 V (at 20 °C, 68 °F)

- **If voltage is higher than standard value**
  If voltage is higher than standard value, check ground of brushes.
  If brushes are not grounded, replace IC regulator.
  If voltage is lower than standard value, proceed to the following check.

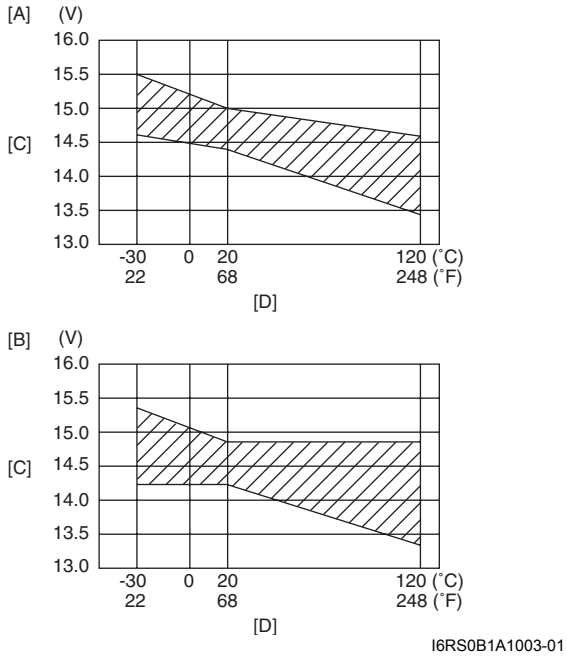
Load Check

1) Run engine at 2000 rpm and turn on head light and blower motor.
2) Measure current.
   If measure current is less than 30 A, repair or replace generator.

Generator Test (Overcharged Battery Check)

S7N20A1A14005

1) To determine battery condition, refer to “Battery Description: M13A / M15A / M16A”.
2) If obvious overcharge condition exists as evidenced by excessive spewing of electrolyte, measure generator “B” terminal voltage at engine 2000 rpm.



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[A]:	For 75A type
[B]:	For 80A type
[C]:	Regulated voltage (V)
[D]:	Heat sink temperature (°C)

3) If measured voltage is higher than upper limit value, proceed to disassemble generator.
4) Check ground of brushes. If brushes are not grounded, replace IC regulator. Then check field coil for grounds and shorts, referring to “Generator Inspection: M13A / M15A / M16A”.

Repair Instructions

Jump Starting in Case of Emergency

S7N20A1A16001

⚠ CAUTION

If vehicle is manual transaxle model and 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 from such causes as battery explosion, battery acid, or electrical burns.**
  - **– Damage to electronic components of either vehicle.**
- **Remove rings, watches, and other jewelry. Wear approved eye protection.**
- **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.**
- **Never expose battery to open flame or electric spark. Batteries generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surface 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.**
- **Do not connect negative cable directly to negative terminal of dead battery.**

1) Set parking brake and place automatic transaxle in PARK (NEUTRAL on manual transaxle and automated manual transaxle). Turn off ignition, turn off 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 the other end of the 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 the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
5) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine of the vehicle with discharged battery.

With Charging Equipment

⚠ CAUTION

When jump starting engine with charging equipment, be sure equipment used is 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 Dismounting and Remounting

S7N20A1A16002

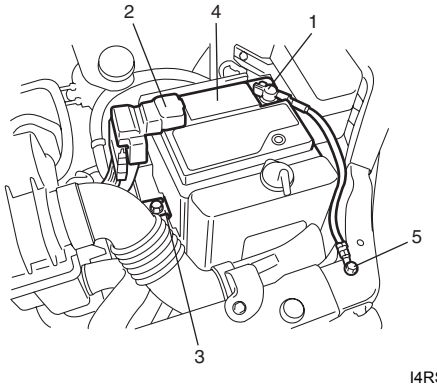
⚠ WARNING

When handling battery, following safety precautions should be followed:

- **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.**

Dismounting

1) Disconnect negative cable (1).
2) Disconnect positive cable (2).
3) Remove retainer (3).
4) Remove battery (4).



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5. Body ground bolt

Remounting

1) Reverse removal procedure.
2) Tighten battery cables securely.

Water Pump / Generator Drive Belt Tension Inspection and Adjustment

S7N20A1A16003

⚠ WARNING

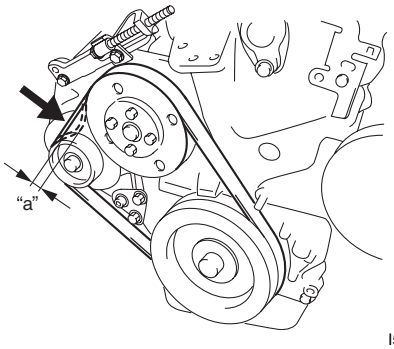
Disconnect negative cable at battery before checking and adjusting belt tension.

1) Inspect belt for cranks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to "Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A".
2) Check belt for tension. Belt is in proper tension when it deflects the following specification under thumb pressure (about 100 N (10 kgf, 22 lbf)).
   If belt tension is out of specification, go to next steps.

   Water pump / generator drive belt tension
   "a": 4.5 – 5.5 mm (0.18 – 0.22 in.) as deflection / 100 N (10 kgf, 22 lbf)

   NOTE

   When replacing belt with a new one, adjust belt tension to 3.5 – 4 mm (0.14 – 0.16 in.)



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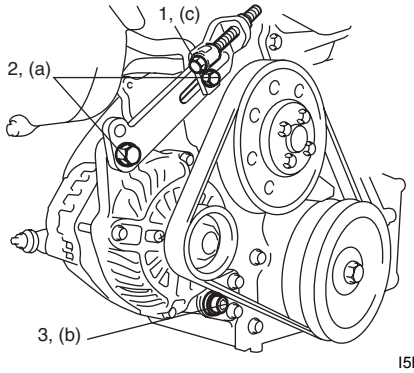
3) Adjust drive belt as follows.
   a) After loosening generator bracket bolts (2) and pivot bolt (3), adjust belt tension to specification described at step 2) by loosening / tightening generator adjust bolt (1).
   b) Tighten generator bracket bolts and pivot bolt as specified torque.

      Tightening torque
      Generator bracket bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
      Generator pivot bolt (b): 50 N·m (5.0 kgf-m, 36.0 lbf-ft)

   c) Check belt tension for specification after turning crankshaft two rotations clockwise.
   d) Tighten generator adjusting bolt (1) as specified torque.

      Tightening torque
      Generator adjusting bolt (c): 7 N·m (0.7 kgf-m, 5.0 lbf-ft) by the specified procedure.



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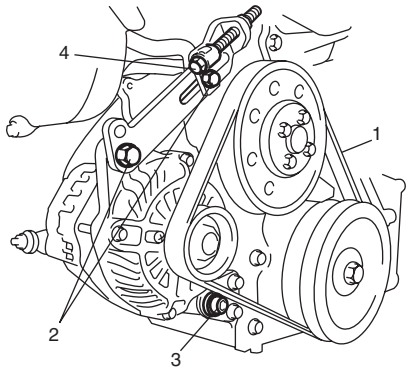
   e) Connect negative cable at battery.

Water Pump / Generator Drive Belt Removal and Installation

S7N20A1A16004

Removal

1) Disconnect negative cable at battery.
2) If vehicle equipped with A/C, remove compressor drive belt before removing water pump belt (1). Refer to "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C in Section 7B" or "Compressor Drive Belt Removal and Installation: Auto A/C in Section 7B".
3) Loosen drive belt adjusting bolt (2) and generator pivot bolt (3).
4) Loosen generator adjusting bolt (4), and then remove water pump belt.



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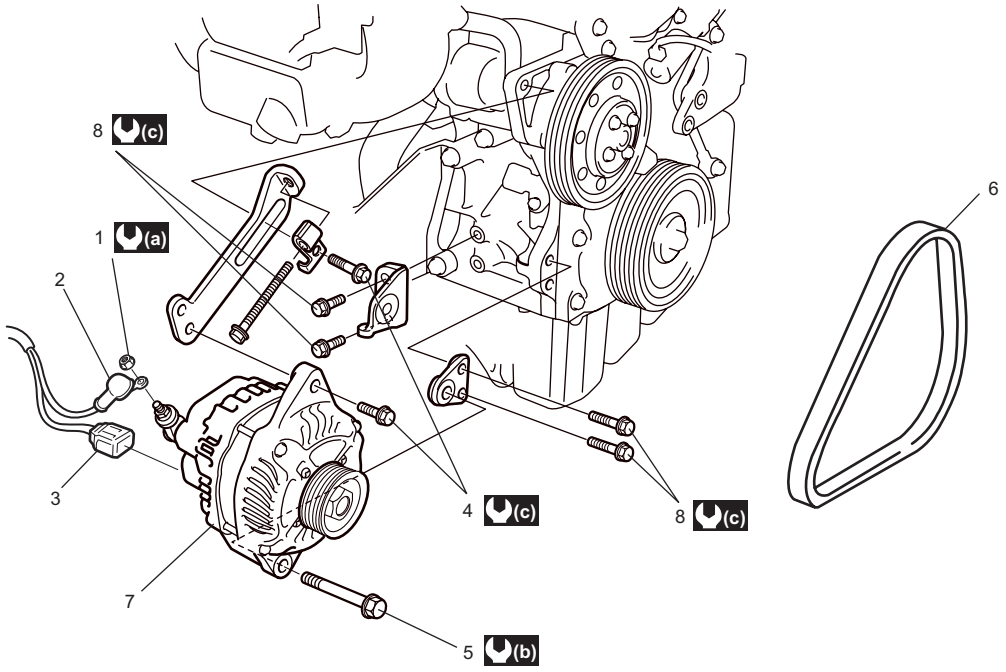
Installation

Reverse removal procedure for installation noting the following.

- Adjust belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: M13A / M15A / M16A" and "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C in Section 7B" or "Compressor Drive Belt Removal and Installation: Auto A/C in Section 7B".

Generator Unit Components

S7N20A1A16005



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1. "B" terminal nut	5. Generator pivot bolt	(a) : 5 N·m (0.5 kgf-m, 3.5 lbf-ft)
2. "B" terminal wire	6. Generator belt	(b) : 50 N·m (5.0 kgf-m, 36.0 lbf-ft)
3. Connector	7. Generator	(c) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
4. Generator adjusting bolt : Only loosen this bolt.	8. Generator bracket bolt	

Generator Dismounting and Remounting

S7N20A1A16006

Dismounting

1) Disconnect negative (–) cable at battery.
2) Remove right side drive shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".
3) Disconnect generator lead wire ("B" terminal wire) and coupler from generator.
4) Remove generator belt. Refer to "Water Pump / Generator Drive Belt Removal and Installation: M13A / M15A / M16A".
5) Remove generator bracket bolts and generator pivot bolt.
6) Remove generator.

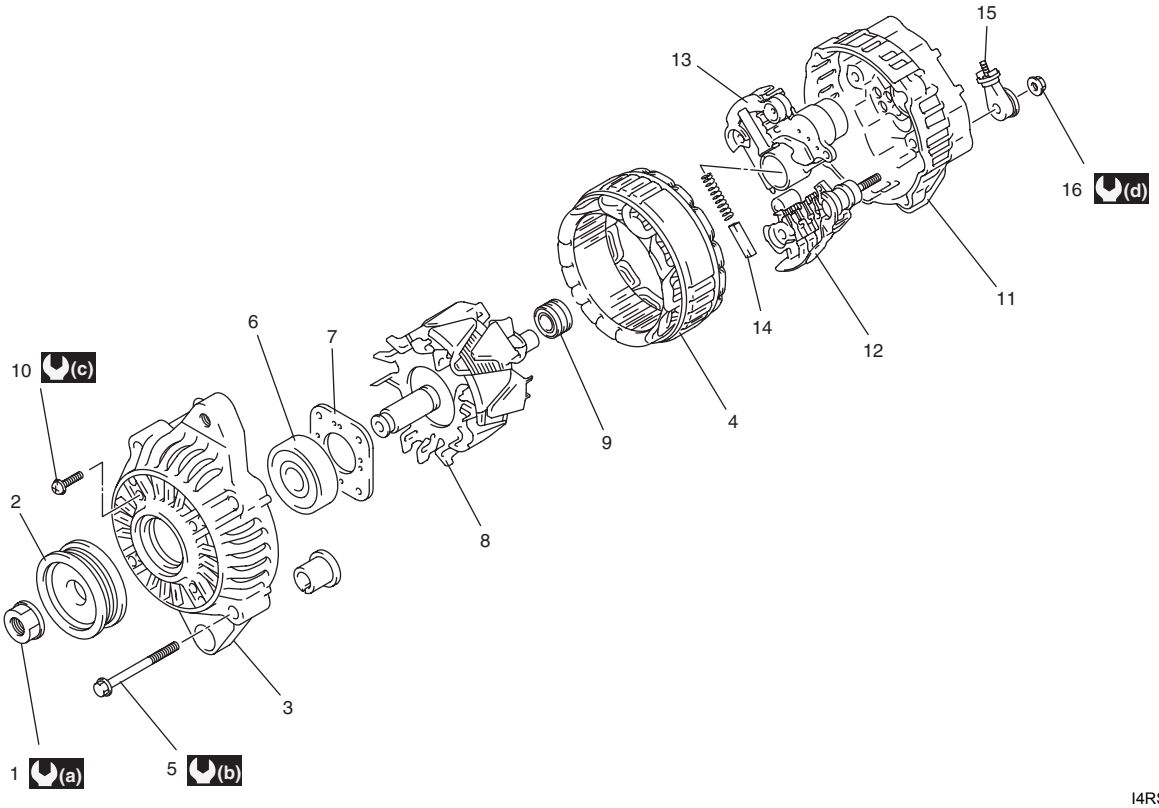
Remounting

Reverse dismounting procedure for remounting noting the followings.

- Tighten each bolt and nut to specified torque referring to "Generator Unit Components: M13A / M15A / M16A".
- Adjust belt tension referring to "Water Pump / Generator Drive Belt Tension Inspection and Adjustment: M13A / M15A / M16A".

Generator Components

S7N20A1A16007



I4RS0B1A0007-01

1. Pulley nut	6. Drive end bearing	11. Rear housing	16. “B” terminal nut
2. Pulley	7. Bearing retainer	12. Rectifier	(a) : 118 N·m (11.8 kgf-m, 85.5 lbf-ft)
3. Front housing	8. Rotor	13. Regulator	(b) : 4.5 N·m (0.45 kgf-m, 3.5 lbf-ft)
4. Stator	9. Rear end bearing	14. Brush	(c) : 3.5 N·m (0.35 kgf-m, 2.5 lbf-ft)
5. Frame bolt	10. Retainer screw	15. “B” terminal	(d) : 8.0 N·m (0.8 kgf-m, 6.0 lbf-ft)

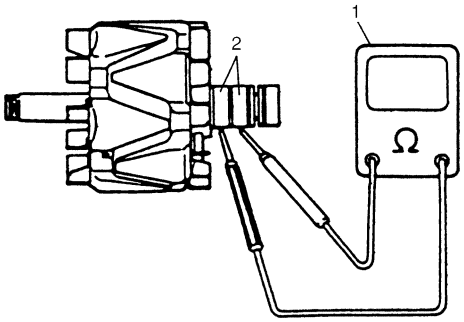
Generator Inspection

S7N20A1A16008

Rotor

1) Using an ohmmeter (1), check for continuity between slip rings (2) of rotor. If there is no continuity, replace the rotor.

Standard resistance between slip rings of rotor
For 75A type
: 2.5 – 2.9 Ω
For 80A type
: 1.7 – 2.0 Ω



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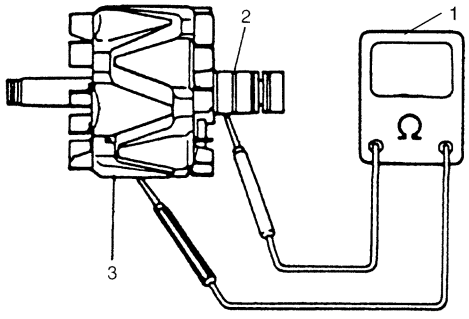
2) Using an ohmmeter (1), check that there is no continuity between slip ring (2) and rotor core (3). If there is continuity, replace the rotor.

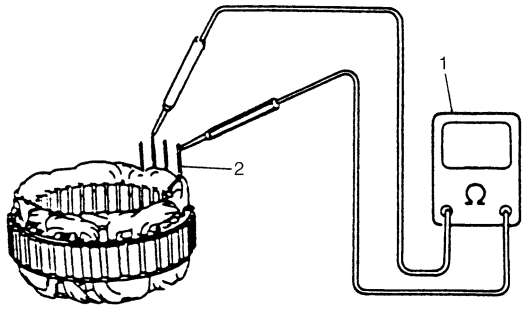


I4RS0B1A0008-01

3) Check slip rings for roughness or scoring. If rough or scored, replace the rotor.

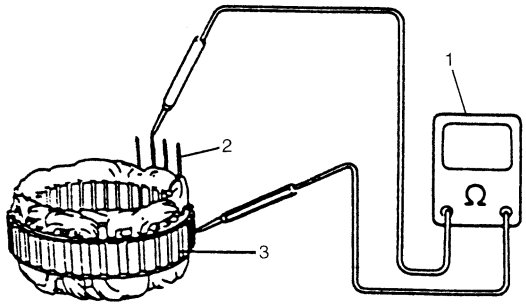
Stator

1) Using an ohmmeter (1), check all leads (2) for continuity. If there is no continuity, replace the stator.



I4RS0B1A0009-01

2) Using an ohmmeter (1), check that there is no continuity between coil leads (2) and stator core (3). If there is continuity, replace the stator.

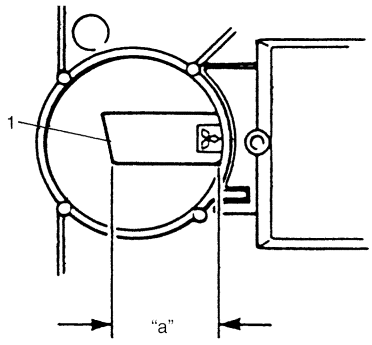


I4RS0B1A0010-01

Brush and Brush Holder

Check each brush (1) for wear by measuring its length as shown. If brush is found worn down to service limit, replace brush.

Exposed brush length "a"
Standard: 16 mm (0.63 in.)
For 75A type
: Limit: 2.0 mm (0.08 in.)
For 80A type
: Limit: 5.0 mm (0.20 in.)

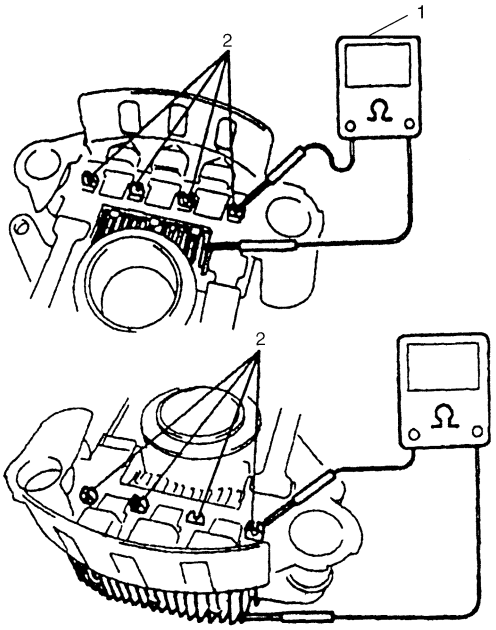


I4RS0B1A0011-01

Rectifier

For 75A type

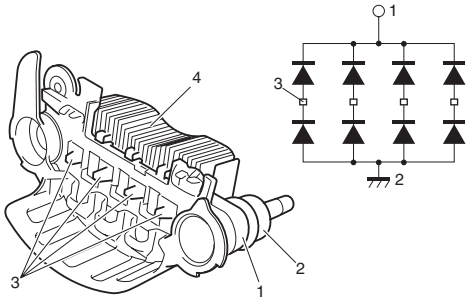
Using ohmmeter (1), check continuity between each of upper and lower rectifier bodies and each diode lead (2). Check both directions by reversing probes of ohmmeter and there should be only one-way continuity in each case. If check result is not satisfactory, replace rectifier.



I4RS0B1A0012-01

For 80A type

Using ohmmeter, check continuity between "B" terminal (1) or "E" terminal (2) and each diode lead (3).
Check both directions by reversing probes of ohmmeter and there should be only one-way continuity in each case. If check result is not satisfactory, replace rectifier (4).



I6RS0B1A1010-01

Specifications

Charging System Specifications

S7N20A1A17001

Battery

NOTE

The battery used in each vehicle is one of the following two types, depending on specification.

Battery
: CCA 180A (36AH/20H, 28AH/5H), CCA 210A (44AH/20H, 36AH/5H) 12V

Battery Type	CCA 180A	CCA 210A
Nominal output	12 V	
Rated capacity	36 Ah/20 h	44 Ah/20 h
	28 Ah/5 h	36 Ah/5 h
Cold cranking amperes	180 A (DIN)	210 A (DIN)

Generator

NOTE

The generator used in each vehicle is one of the following two types, depending on specification.

Type	75A type	80A type
Rated voltage	12 V	
Nominal output	75A	80A
Permissible max. speed	18,000 r/min.	
No-load speed	1020 r/min. (rpm)	1200 r/min. (rpm)
Regulated voltage	14.2 – 14.8 V at 25 °C (77 °F)	
Exposed brush length	Standard: 16 mm (0.63 in.) Limit: 2.0 mm (0.08 in.)	Standard: 16 mm (0.63 in.) Limit: 5.0 mm (0.02 in.)
Permissible ambient temperature	–30 to 100 °C (–22 to 212 °F)	
Polarity	Negative ground	
Rotation	Clockwise viewed from pulley side	

Tightening Torque Specifications

S7N20A1A17002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Generator bracket bolt	25	2.5	18.0	☞
Generator pivot bolt	50	5.0	36.0	☞
Generator adjusting bolt	7 N·m (0.7 kgf-m, 5.0 lbf-ft) by the specified procedure.			☞

NOTE

The specified tightening torque is also described in the following.
“Generator Unit Components: M13A / M15A / M16A”
“Generator Components: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

D13A / Z13DTJ

General Description

Battery Description

S7N20A1A21001

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the 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 the generator.

Carrier and Hold-Down

The battery carrier should be in good condition so that it will support the battery securely and keep it level. Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.
To prevent the 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 is frozen accidentally, it should not be charged until it is warmed.

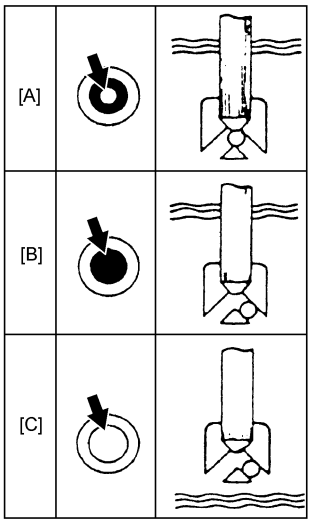
Sulfation

If the battery is allowed to stand 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.

Built-In Indicator (If Equipped)

The battery has a built-in temperature compensated indicator at the top of the battery. This indicator is to be used with the following diagnostic procedure. When checking the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.
Three types of indication available under normal operation are as follows.

- **Green dot [A]**
  Battery is sufficiently charged for testing.
- **Dark [B]**
  Battery must be charged before testing. If there is a cranking complaint, battery should be tested as described in “Battery Inspection: D13A / Z13DTJ”. Charging and electrical systems should also be checked at this time.
- **Clear or light yellow [C]**
  This means that fluid level is below the bottom of hydrometer. Its possible cause is excessive or prolonged charging, a broken case, excessive tipping or normal battery deterioration. When the battery is found in such condition, it is possible that high charging voltage is caused by the faulty charging system and therefore, charging and electrical systems need to be checked. If there is a trouble in cranking and its cause lies in the battery, it should be replaced.



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Care of Battery

⚠ WARNING

- **Never expose battery to open flame or electric spark because of battery generate gas which 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 the battery tray clean
   - Prevent rust formation on the terminal posts
   - Keep the electrolyte up to the upper level uniformly in all cells.

- 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 2000 to 3000 rpm. Make sure all electric switches are off before storing the vehicle.
  - Recharge the battery twice a month to prevent it from discharging excessively. This is especially important when ambient temperature is low.
    The battery discharges even when it is not used, while vehicles are being stored. Battery electrolyte can freeze and battery case can crack at cold ambient condition if battery is not properly charged.

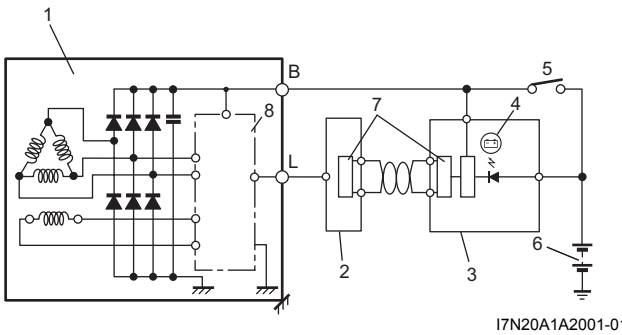
2) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current.
   Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.
3) Be always in the know as to the state of charge of the 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 (S.G.) of the battery electrolyte. The S.G. of the electrolyte is indicative of the state of charge. Refer to “Hydrometer Test” in “Battery Inspection: D13A / Z13DTJ”.

Generator Description

S7N20A1A21002

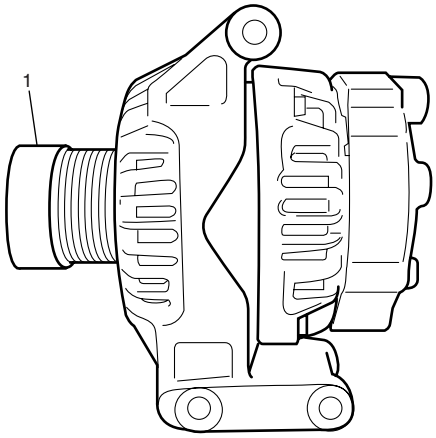
The generator is a small and high performance type with an IC regulator incorporated.
The generator features are as follows:

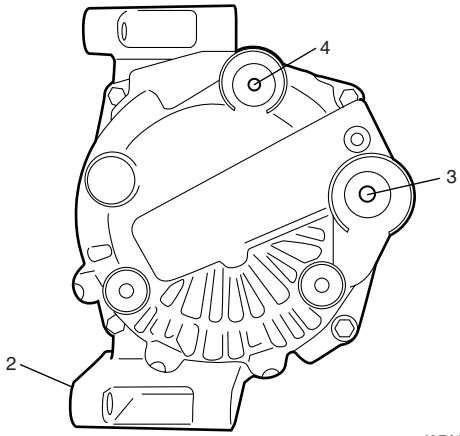
- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear housing.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the 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 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.



I7N20A1A2001-01

1. Generator with regulator assembly	5. Ignition switch
2. BCM	6. Battery
3. Combination meter	7. CAN driver
4. Charge warning light	8. IC regulator





I3RM0B1A0001-01

1. Pulley	3. “B” terminal
2. Ground	4. “L” terminal

Diagnostic Information and Procedures

Battery Inspection

S7N20A1A24001

Common Causes of Failure

A battery is not designed to last indefinitely; however, with proper care, it will provide many years of service. If the battery performs satisfactorily during test but fails to operate properly for no apparent reason, the following are some factors that may point to the cause of trouble:

- Accessories left on overnight or for an extended period without the generator operating.
- Slow average driving speeds for short periods.
- Electrical load exceeding generator output particularly with addition of aftermarket equipment.
- Defects in charging system such as high resistance, slipping drive belt, loose generator output terminal, faulty generator of voltage regulator. Refer to “Generator Symptom Diagnosis: D13A / Z13DTJ”.
- Battery abuse, including failure to keep battery cable terminals clean and tight or loose battery hold down.
- Mechanical problems in electrical system such as shorted or pinched wires.

Visual Inspection

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

Hydrometer Test

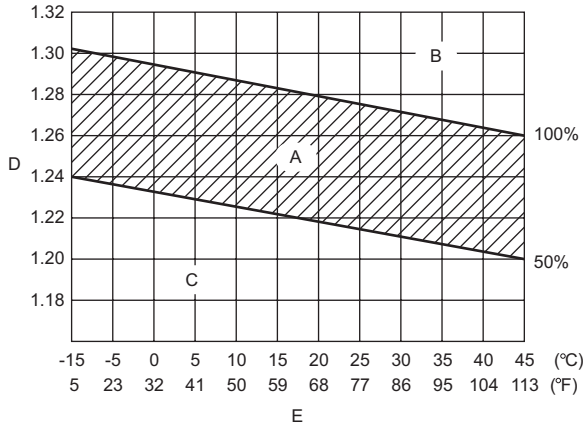
The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter and an expensive instrument used in the service shops, but not recommendable to the user of the vehicle.
At 20 °C of battery temperature (electrolyte temperature):

- The battery is in FULLY CHARGED STATE if the electrolyte S.G. is 1.280.
- The battery is in HALF CHARGED STATE if the S.G. is 1.220.
- The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.

As the S.G. varies with the temperature, if battery temperature is not at 20 °C (68 °F), you have to correct your S.G. reading (taken with your hydrometer) to the value at 20 °C (68 °F) and apply the corrected S.G. value to the three-point guide stated value.
For the manner of correction, refer to the graph showing the relation between S.G. value and temperature.

How to use the temperature-corrected state-of-charge graph

Suppose your S.G. reading is 1.28 and the battery temperature is –5 °C (23 °F). Locate the intersection of the –5 °C (23 °F) line and the 1.28 S.G. line.
The intersection is within the “A” zone (shaded area in the graph) and that means CHARGED STATE.
To know how much the battery is charged, draw a line parallel to the zone demarcation line and extend it to the right till it meets with the percentage scale. In the present example, the line meets at about 85% point on the percentage scale. Therefore, the battery is charged up to the 85% level.



I7N20A1A2003-01

B: Over charge	D: Specific gravity
C: Should be charged	E: Temperature

Generator Symptom Diagnosis

S7N20A1A24002

⚠ CAUTION

When connecting charger or (auxiliary) booster battery to vehicle battery, refer to "Jump Starting in Case of Emergency: D13A / Z13DTJ".

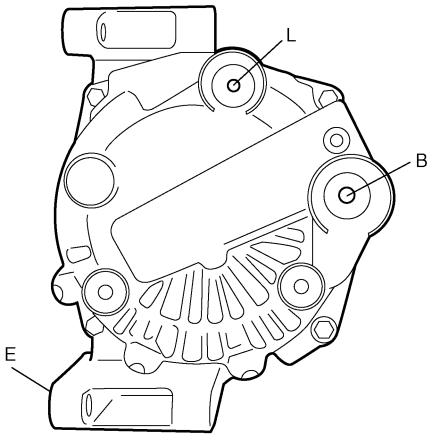
Trouble in charging system will show up as one or more of the following conditions:

1) Faulty charge warning light operation.

2) An undercharged battery as evidenced by slow cranking.

3) An overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Noise from generator may be caused by loose drive pulley, loose mounting bolts, worn or dirty bearings.



I5RS0B1A0002-01

B: Generator output (Battery terminal)	L: Light terminal
E: Ground	

Charging Warning Light Operation

Condition	Possible cause	Correction / Reference Item
Charge warning light does not light with ignition ON and engine off	Fuse blown	*Check fuse.*
	Combination meter faulty	*Replace combination meter referring to "Combination Meter Removal and Installation in Section 9C".*
	Wiring connection loose	*Tighten loose connection.*
	IC regulator or field coil faulty	*Replace generator.*
Charge warning light does not go out with engine running (battery requires frequent recharging)	Drive belt loose or worn	*Replace accessory drive belt and/or accessory drive belt tensioner referring to "Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F" and/or "Accessory Drive Belt Tensioner Removal and Installation: D13A / Z13DTJ in Section 1F".*
	IC regulator or generator faulty	*Check charging system.*
	Wiring faulty	*Repair wiring.*
Noise from radio	Condenser faulty	*Replace generator.*

Generator Test (Undercharged Battery Check)

S7N20A1A24003

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 may be operating normal.

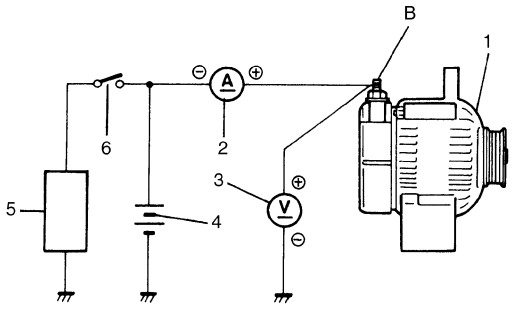
- Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
- Check drive belt for proper tension.
- If battery defect is suspected, refer to “Battery Description: D13A / Z13DTJ”.
- Inspect wiring for defects. Check all connections for tightness, cleanliness, battery cable connections at battery and starting motor ground cable.

No-Load Check

1) Connect voltmeter ammeter as shown in figure.

NOTE

Use fully charged battery.



I2RH011A0006-01

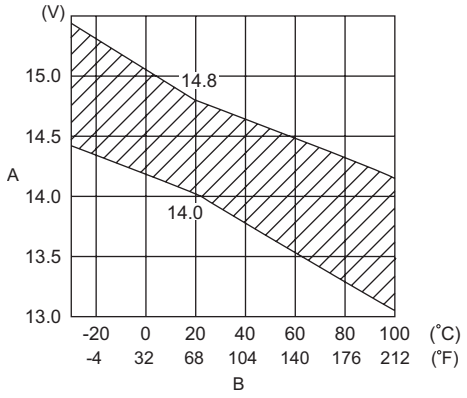
1. Generator	4. Battery
2. Ammeter	5. Load
3. Voltmeter	6. Switch

2) Run engine from idling up to 2,000 rpm with all accessories turned off and read meters.
If voltage is out of standard value, replace generator.

Specification for undercharged battery (No-load check)
Voltage: 14.0 – 14.8 V (at 20 °C, 68 °F)

NOTE

Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in figure.



I7V20A1A2005-04

A: Regulated voltage	B: Heatsink temperature

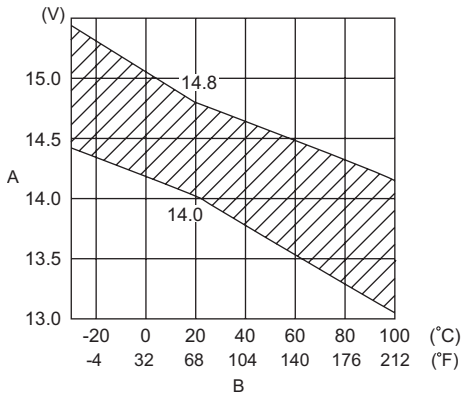
Load Check

1) Run engine at 2,000 rpm and turn on head light and blower motor.
2) Measure current and if it is less than 20 A, replace generator.

Generator Test (Overcharged Battery Check)

S7N20A1A24004

1) To determine battery condition, refer to “Battery Description: D13A / Z13DTJ”.
2) If obvious overcharged condition exists as evidenced by excessive spewing of electrolyte, measure generator “B” terminal voltage at engine 2,000 rpm.
3) If measured voltage is higher than upper limit value as the following graph, replace generator.



I7V20A1A2005-04

A: Regulated voltage	B: Heatsink temperature

Repair Instructions

Jump Starting in Case of Emergency

S7N20A1A26001

With Auxiliary (Booster) Battery

⚠ CAUTION

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 from such causes as battery explosion, battery acid or electrical burns.**
  - **– Damage to electronic components of either vehicle.**
- **Remove rings, watches and other jewelry.**
- **Wear approved eye protection.**
- **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 cable directly to negative terminal of dead battery.**

1) Set parking brake and place NEUTRAL on manual transaxle (automatic transaxle in PARK). 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 the other end of the 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 the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.
5) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine of the vehicle with discharged battery.
6) Disconnect jumper cables in the exact reverse order.

With Charging Equipment

⚠ CAUTION

When jump starting engine with charging equipment, be sure equipment used is 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

S7N20A1A26002

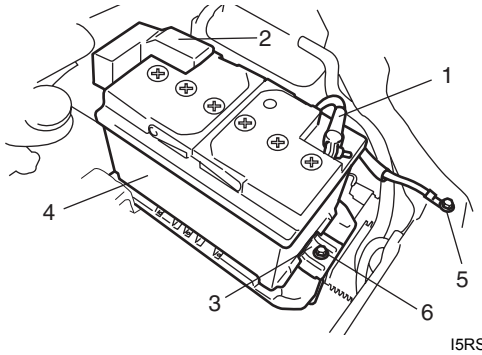
⚠ WARNING

When handling battery, the following safety precautions should be followed:

- **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 (1).
2) Disconnect positive cable (2).
3) Loosen retainer bolt (6) and remove retainer (3).
4) Remove battery (4).



I5RS0B1A0003-01

5. Body ground bolt

Installation
Reverse removal procedure for installation noting the following.

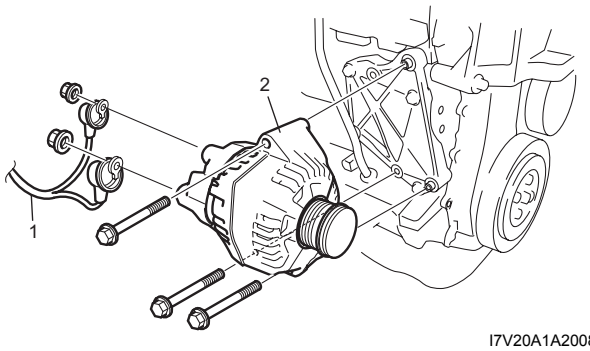
- Check to be sure that ground cable has enough clearance to hood panel by terminal.

Generator Removal and Installation

S7N20A1A26003

Removal

1) Disconnect negative cable at battery.
2) Remove accessory drive belt referring to “Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F”.
3) Disconnect wire harness from generator (1).
4) Remove generator (2) from its bracket.

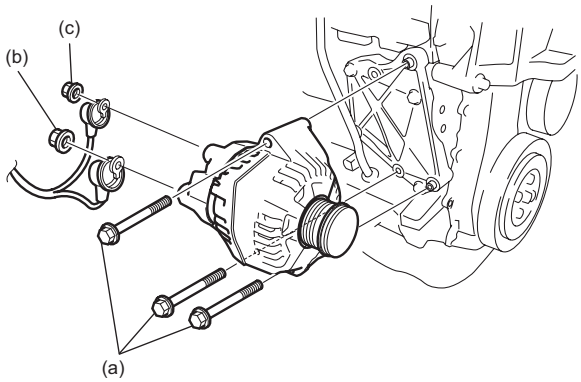


I7V20A1A2008-01

Installation
Reverse removal procedure for installation noting the following.

- Tighten each bolts and nuts to specified torque.

Tightening torque
Generator bolt (a): 20 N·m (2.0 kgf-m, 15.0 lbf-ft)
“B” terminal nut (b): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
“L” terminal nut (c): 4.0 N·m (0.41 kgf-m, 3.0 lbf-ft)



I7V20A1A2009-01

Specifications

Charging System Specifications

S7N20A1A27001

Battery
: CCA 370 A (60AH / 20 H) 12V

Generator

Rated voltage	14 V
Nominal output	45 A at 1,800 rpm / 91 A at 6,000 rpm
Polarity	Negative ground
Rotation	Clockwise viewed from pulley side

Tightening Torque Specifications

S7N20A1A27002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Generator bolt	20	2.0	15.0	☞
“B” terminal nut	10	1.0	7.5	☞
“L” terminal nut	4.0	0.41	3.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Exhaust System

M13A / M15A / M16A

General Description

Exhaust System Description

S7N20A1B11001

The exhaust system consists of an exhaust manifold, three-way catalytic converter (TWC) in catalyst case, exhaust pipes, a muffler and seals, gasket and etc.
The three-way catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) pollutants in the exhaust gas.

Diagnostic Information and Procedures

Exhaust System Check

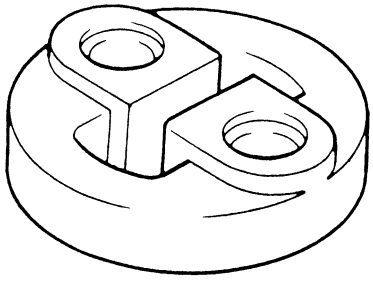
S7N20A1B14001

⚠ WARNING

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.



IYSY011B0003-01

- Check exhaust system for leakage, loose connection, dent and damage.
- If bolts or nuts are loosened, tighten them to specified torque referring to “Exhaust System Components: M13A / M15A / M16A”.
- Check nearby body areas damaged, missing, or mispositioned part, open seam, hole connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

Repair Instructions

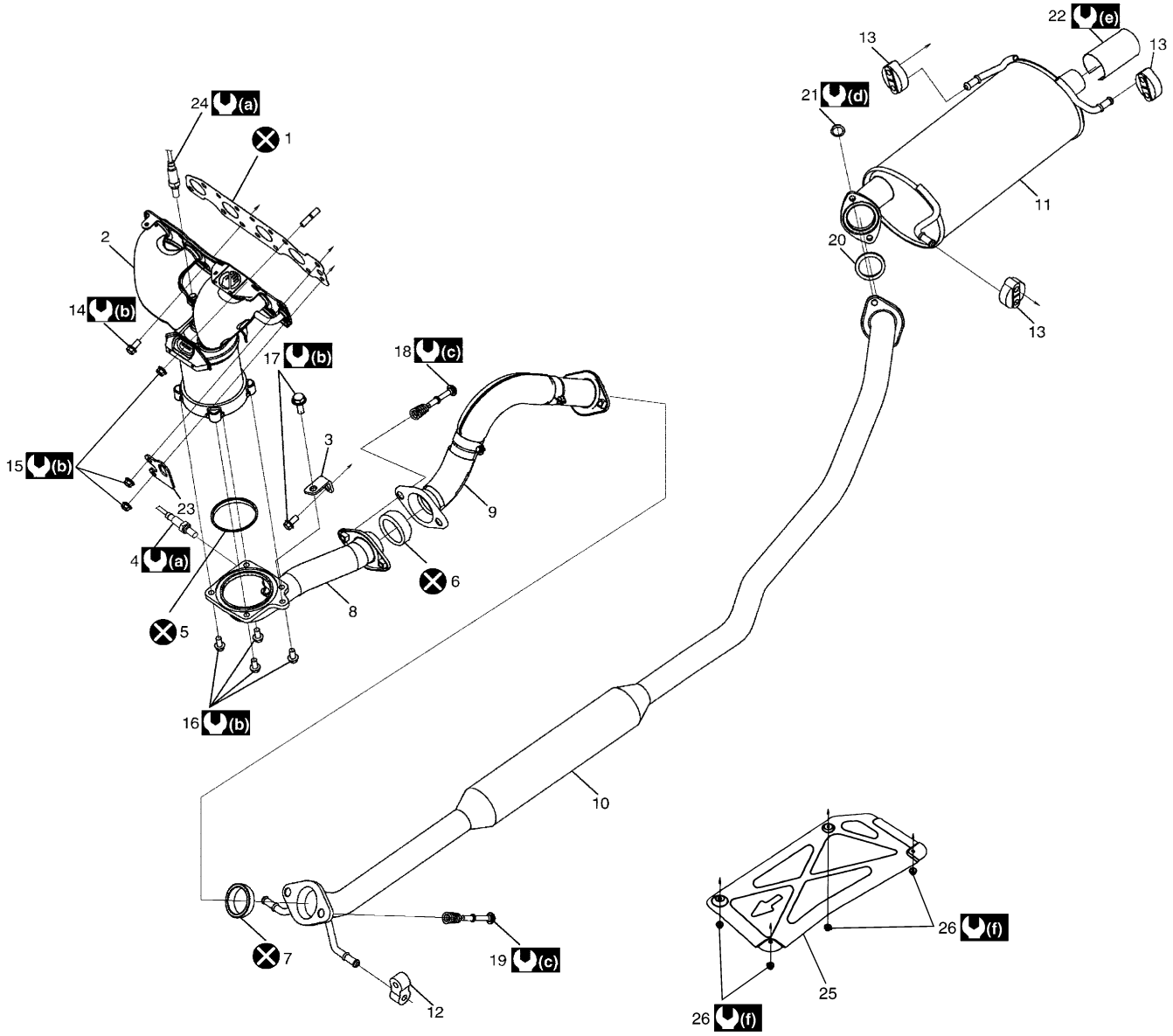
Exhaust System Components

S7N20A1B16001

⚠ WARNING

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

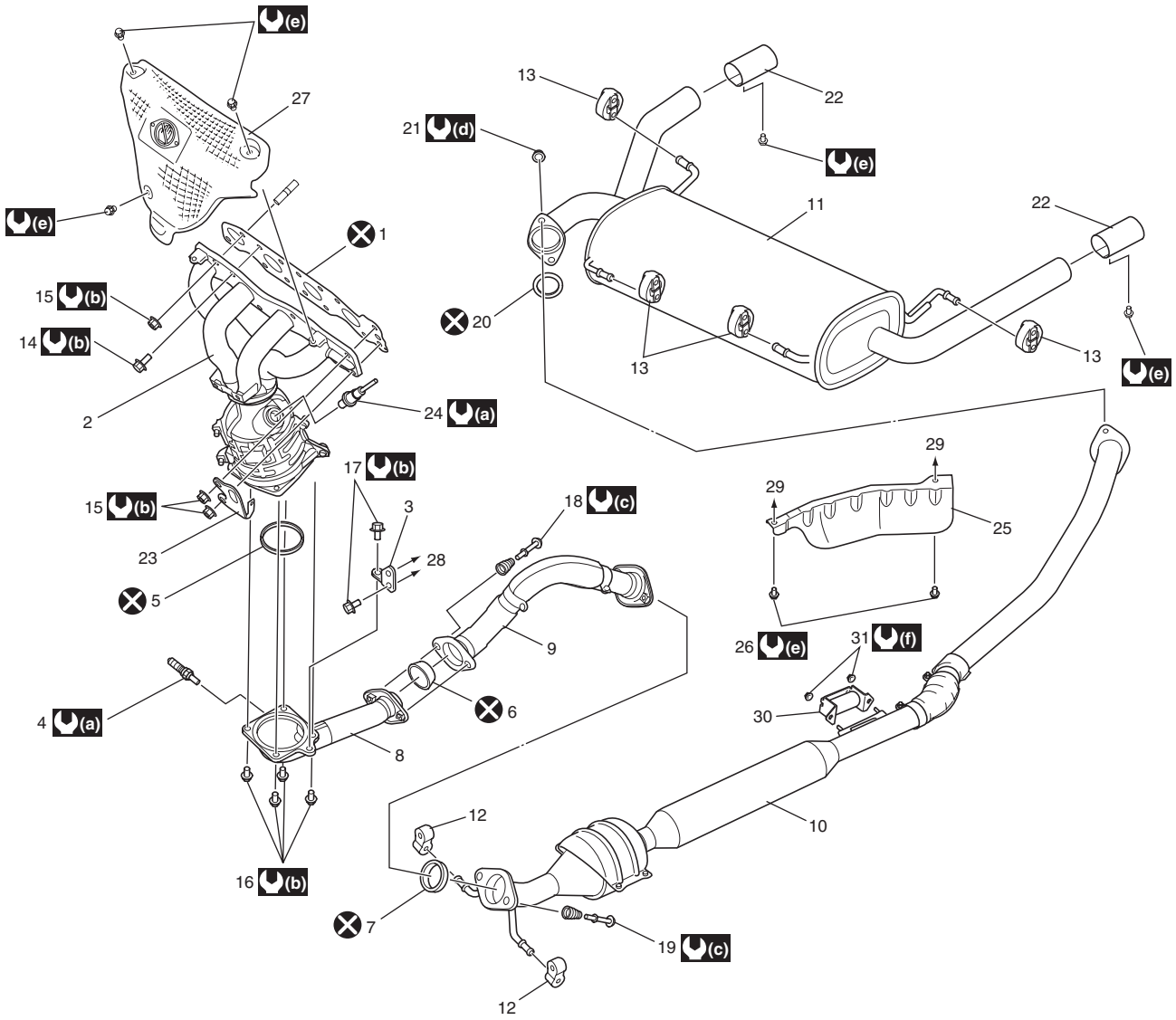
For Except M16 Engine Model



I6RS0B1B1001-01

1. Exhaust manifold gasket	12. Center pipe mounting	23. Engine hook
2. Exhaust manifold	13. Muffler mounting	24. Heated oxygen sensor No.1 (connector color: gray)
3. Exhaust manifold stiffener	14. Exhaust manifold bolt	25. Heat insulator
4. Heated oxygen sensor No.2 (connector color: green)	15. Exhaust manifold nut	26. Heat insulator bolt
5. Exhaust pipe No.1 gasket	16. Exhaust No.1 pipe bolt	(a) : 45 N·m (4.5 kgf-m, 32.5 lbf-ft)
6. No.1 seal ring	17. Exhaust manifold stiffener bolt	(b) : 50 N·m (5.0 kgf-m, 36.5 lbf-ft)
7. No.2 seal ring	18. Exhaust No.2 pipe bolt	(c) : 43 N·m (4.3 kgf-m, 31.0 lbf-ft)
8. Exhaust No.1 pipe	19. Exhaust center pipe bolt	(d) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
9. Exhaust No.2 pipe	20. Exhaust pipe No.2 gasket	(e) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
10. Exhaust center pipe	21. Muffler nut	(f) : 3 N·m (0.3 kgf-m, 2.5 lbf-ft)
11. Muffler	22. Muffler tail pipe	⊗ : Do not reuse.

For M16 Engine Model



I6RS0B1B1002-04

1. Exhaust manifold gasket	14. Exhaust manifold bolt	27. Exhaust manifold cover
2. Exhaust manifold	15. Exhaust manifold nut	28. To transmission
3. Exhaust manifold stiffener	16. Exhaust No.1 pipe bolt	29. To vehicle body
4. Heated oxygen sensor No.2 (connector color: green)	17. Exhaust manifold stiffener bolt	30. Damper
5. Exhaust pipe No.1 gasket	18. Exhaust No.2 pipe bolt	31. Damper nut
6. No.1 seal ring	19. Exhaust center pipe bolt	(a) : 45 N·m (4.5 kgf-m, 32.5 lbf-ft)
7. No.2 seal ring	20. Exhaust pipe No.2 gasket	(b) : 50 N·m (5.0 kgf-m, 36.5 lbf-ft)
8. Exhaust No.1 pipe	21. Muffler nut	(c) : 43 N·m (4.3 kgf-m, 31.0 lbf-ft)
9. Exhaust No.2 pipe	22. Muffler tail pipe	(d) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
10. Exhaust center pipe	23. Engine hook	(e) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
11. Muffler	24. Heated oxygen sensor No.1 (connector color: gray)	(f) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
12. Center pipe mounting	25. Heat insulator	: Do not reuse.
13. Muffler mounting	26. Heat insulator bolt	

Exhaust Manifold Removal and Installation

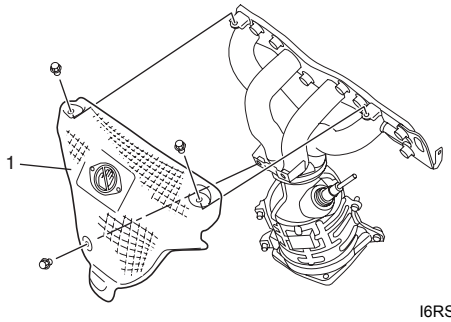
S7N20A1B16002

Removal

⚠ WARNING

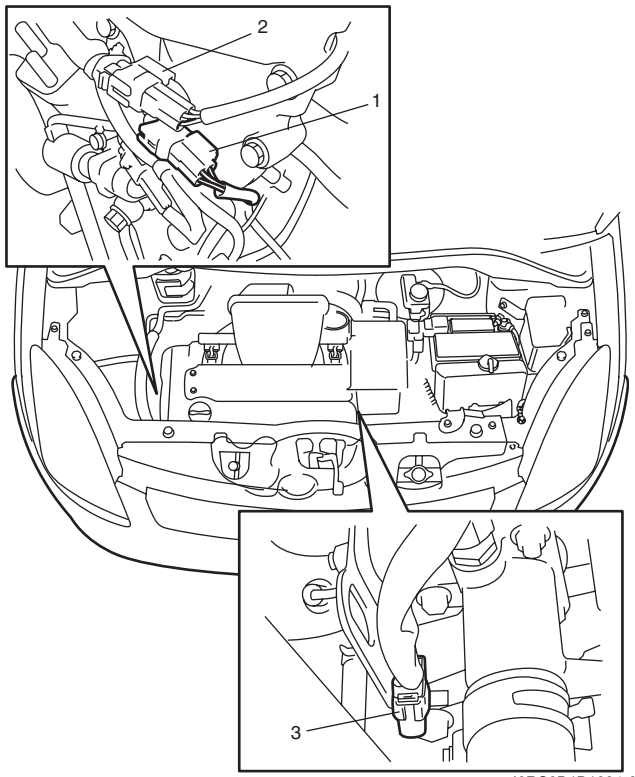
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

1) Disconnect negative cable at battery.
2) For M16 engine model, remove engine cover.
3) Remove front bumper with front grille referring to “Front Bumper and Rear Bumper Components in Section 9K”.
4) Remove radiator referring to “Radiator Removal and Installation: M13A / M15A / M16A in Section 1F” for equipped with A/C.
5) With hose connected, detach A/C condenser from vehicle body for equipped with A/C.
6) For M16 engine model, remove exhaust manifold cover (1) from exhaust manifold.



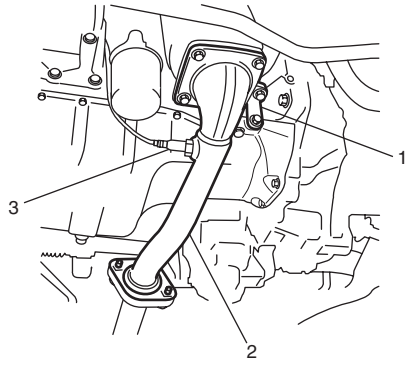
I6RS0B1B1003-01

7) Disconnect heated oxygen sensor No.2 connector (1) (connector color: green) and heated oxygen sensor No.1 connector (2) (connector color: gray (for except M16 engine model)) or (3) (connector color: black (for M16 engine model)), and then detach it from its stay.



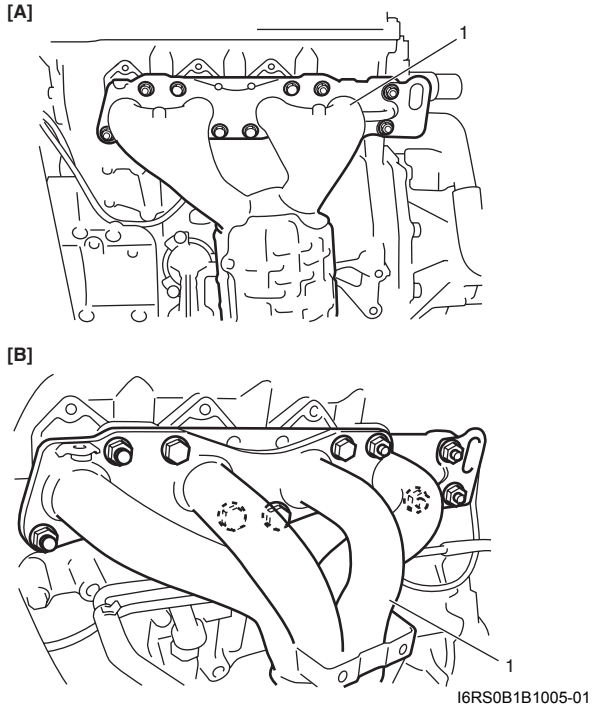
I6RS0B1B1004-01

8) Remove exhaust manifold stiffener (1).
9) Remove heated oxygen sensors (3) from exhaust manifold and exhaust No.1 pipe, if necessary.
10) Disconnect exhaust No.1 pipe (2) from exhaust manifold.



I4RS0A1B0002-01

11) Remove exhaust manifold (1) and its gasket from cylinder head.



[A]:	For except M16 engine model
[B]:	For M16 engine model

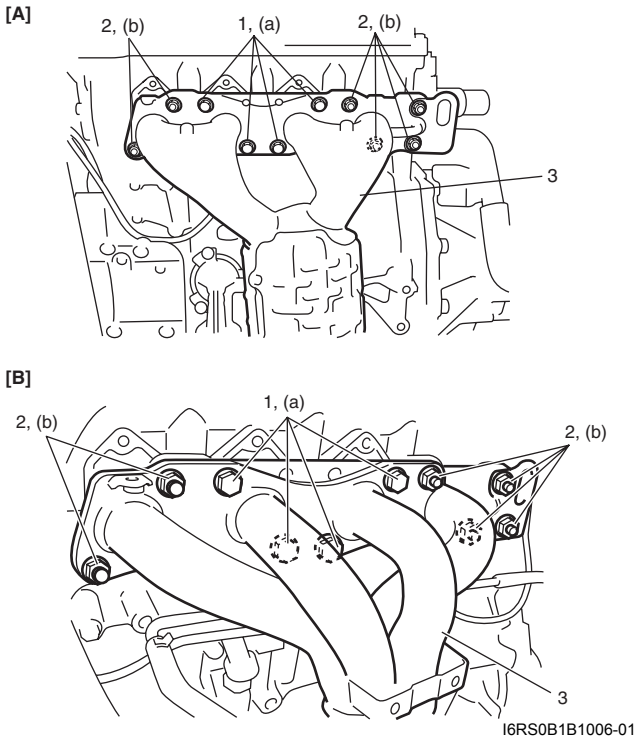
Installation

1) Install new gasket to cylinder head. Then install exhaust manifold (3).
Tighten manifold bolts (1) and nuts (2) to specified torque.

Tightening torque
Exhaust manifold bolt (a): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)
Exhaust manifold nut (b): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)

NOTE

Be sure to install exhaust manifold bolts and nuts to proper location referring to "Exhaust System Components: M13A / M15A / M16A".



[A]:	For except M16 engine model
[B]:	For M16 engine model

2) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust manifold.
Tighten pipe fasteners to specified torque.

Tightening torque
Exhaust No.1 pipe bolt (a): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)

3) Install exhaust manifold stiffener (2).
Tighten exhaust manifold stiffener bolts to specified torque.

Tightening torque
Exhaust manifold stiffener bolt (b): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)

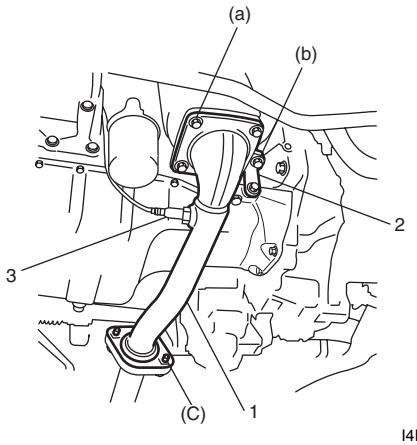
4) Install new seal ring and connect exhaust No.1 pipe (1) to exhaust No.2 pipe. Tighten pipe fasteners to specified torque.

Tightening torque
Exhaust No.2 pipe bolt (c): 43 N·m (4.3 kgf-m, 31.0 lbf-ft)

5) Install heated oxygen sensors (3) referring to "Heated Oxygen Sensor (HO2S-1 and HO2S-2) Removal and Installation: M13A / M15A / M16A in Section 1C", if removed.

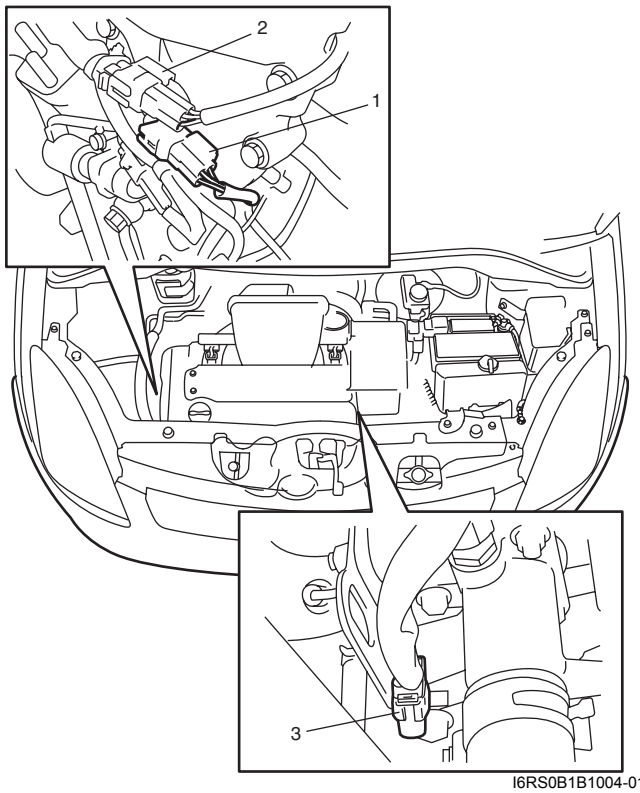
NOTE

Be sure to identify heated oxygen sensor No.1 and No.2 by its connector color.



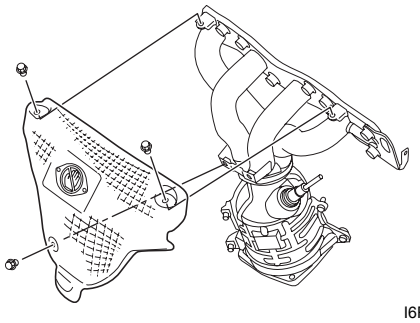
I4RS0A1B0005-01

6) Connect heated oxygen sensor No.2 connector (1) (connector color: green) and heated oxygen sensor No.1 connector (2) (connector color: gray (for except M16 engine model)) or (3) (connector color: black (for M16 engine model)), and then fit coupler to bracket securely.



I6RS0B1B1004-01

7) For M16 engine model, install exhaust manifold cover (1) to exhaust manifold.



I6RS0B1B1007-01

8) Install A/C condenser to vehicle body for equipped with A/C.
9) Install radiator referring to "Radiator Removal and Installation: M13A / M15A / M16A in Section 1F" for equipped with A/C.
10) Install front bumper with front grille by referring to "Front Bumper and Rear Bumper Components in Section 9K".
11) For M16 engine model, install engine cover.
12) Connect negative cable at battery.
13) Check exhaust system for exhaust gas leakage.

Exhaust Pipe and Muffler Removal and Installation

S7N20A1B16003

For replacement of exhaust pipe, be sure to hoist vehicle and observe WARNING under "Exhaust System Components: M13A / M15A / M16A" and the following.

⚠ CAUTION

Exhaust manifold have three way catalytic converter in it, it should not be exposed to any impulse.
Be careful not to drop it or hit it against something.

- Tighten bolts and nuts to specified torque when reassembling. Refer to "Exhaust System Components: M13A / M15A / M16A".
- After installation, start engine and check each joint of exhaust system for leakage.

Specifications

Tightening Torque Specifications

S7N20A1B17001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Exhaust manifold bolt	50	5.0	36.5	☞
Exhaust manifold nut	50	5.0	36.5	☞
Exhaust No.1 pipe bolt	50	5.0	36.5	☞
Exhaust manifold stiffener bolt	50	5.0	36.5	☞
Exhaust No.2 pipe bolt	43	4.3	31.0	☞

NOTE

The specified tightening torque is also described in the following.
“Exhaust System Components: M13A / M15A / M16A”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

D13A / Z13DTJ

General Description

Exhaust System Description

S7N20A1B21001

The exhaust system consists of an exhaust manifold, catalytic converter, a turbocharger, diesel particulate filter (DPF®), exhaust pipe, a muffler and seal, gasket and etc.

The catalytic converter is an emission control device added to the exhaust system to lower the levels of Hydrocarbon (HC) and Carbon Monoxide (CO) pollutants in the exhaust gas.

Diesel Particulate Filter (DPF®)

The DPF® is emission control device and it accumulates the diesel particular in the exhaust emission.
The DPF® is made up of a special ceramic monolith.

Diagnostic Information and Procedures

Exhaust System Check

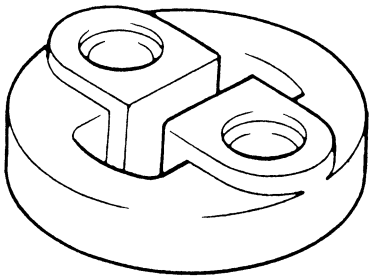
S7N20A1B24001

⚠ WARNING

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when vehicle is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.



IYSY011B0003-01

- Check exhaust system for leakage, loose connection, dent and damage.
- If bolts or nuts are loosened, tighten them to specified torque referring to “Exhaust System Components: D13A / Z13DTJ”.
- Check nearby body areas damaged, missing, or mispositioned part, open seam, hole connection or any other defect which could permit exhaust fumes to seep into vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

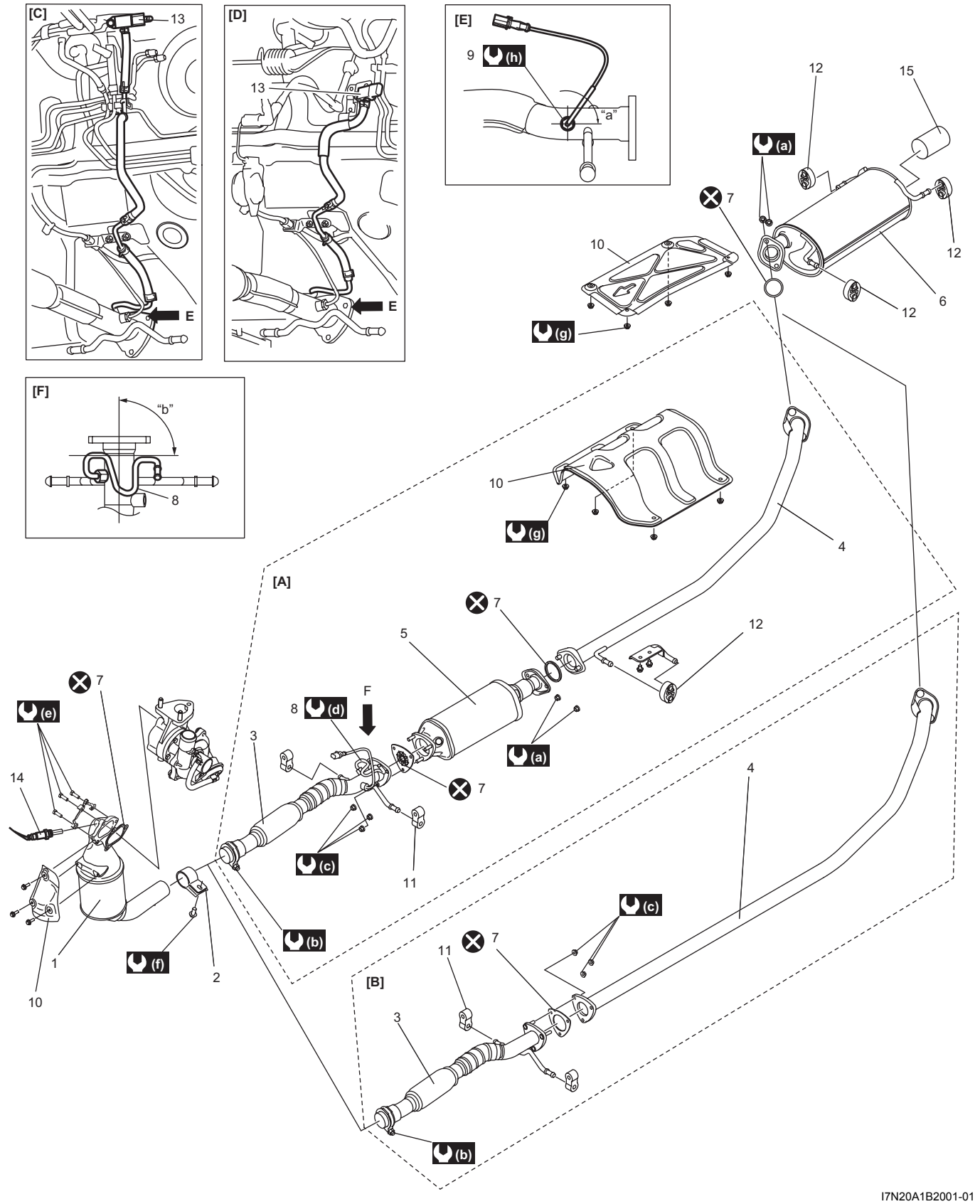
Repair Instructions

Exhaust System Components

S7N20A1B26001

⚠ WARNING

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.



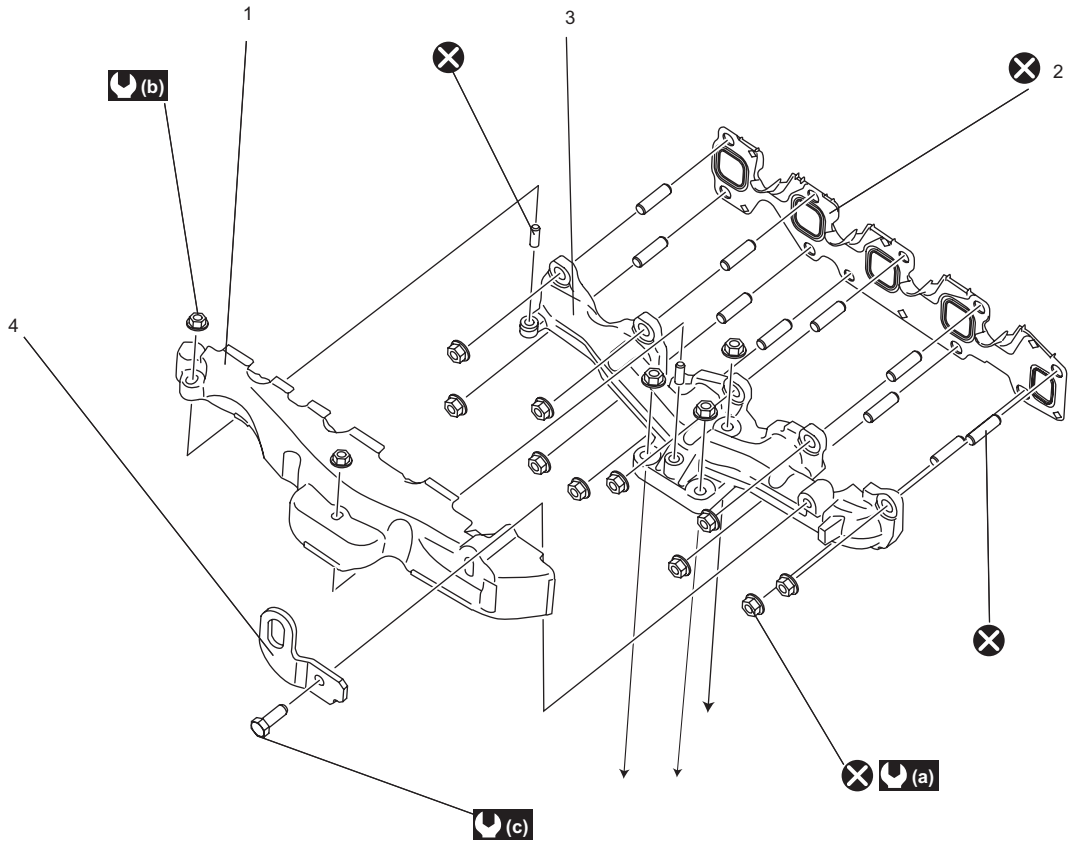
I7N20A1B2001-01

[A]: DPF® model	4. Exhaust No.2 pipe	15. Muffler tail pipe
[B]: Non-DPF® model	5. DPF®	(a) : 60 N·m (6.1 kgf-m, 44.5 lbf-ft)
[C]: LHD model	6. Muffler	(b) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
[D]: RHD model	7. Exhaust gasket	(c) : 32 N·m (3.3 kgf-m, 24.0 lbf-ft)
[E]: View E	8. DPF® differential pressure sensor pipe	(d) : 30 N·m (3.1 kgf-m, 22.5 lbf-ft)
[F]: View F	9. EGT sensor (DPF® model)	(e) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)

"a": 55°	10. Heat insulator	(f) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
"b": 90°	11. Mounting No.1	(g) : 2.4 N·m (0.24 kgf-m, 2.0 lbf-ft)
1. Catalytic converter	12. Mounting No.2	(h) : 45 N·m (4.6 kgf-m, 33.5 lbf-ft)
2. Catalytic converter bracket	13. DPF® differential pressure sensor	⊗ : Do not reuse.
3. Exhaust No.1 pipe	14. A/F sensor (Non-DPF® model)	

Exhaust Manifold Components

S7N20A1B26002



I7V20A1B2002-02

1. Exhaust manifold cover	(a) : 15 N·m → + 30° (1.5 kgf-m → + 30°, 11.0 lbf-ft + 30°)
2. Exhaust manifold gasket	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Exhaust manifold	(c) : 28 N·m (2.9 kgf-m, 21.0 lbf-ft)
4. Engine hanger	⊗ : Do not reuse.

Exhaust Manifold Removal and Installation

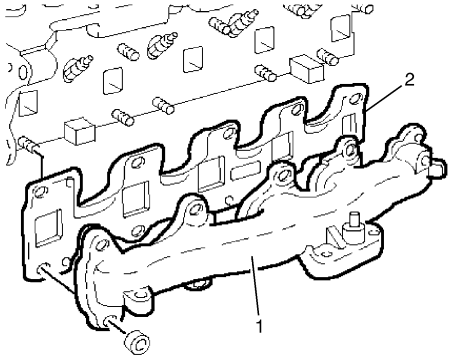
S7N20A1B26003

Removal

⚠ WARNING

To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

1) Disconnect negative (–) cable at battery.
2) Drain engine coolant referring to "Cooling System Draining: D13A / Z13DTJ in Section 1F".
3) Remove air cleaner assembly with MAF and IAT sensor referring to "Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D".
4) Remove turbocharger referring to "Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D".
5) Remove exhaust manifold (1) and exhaust manifold gasket (2).

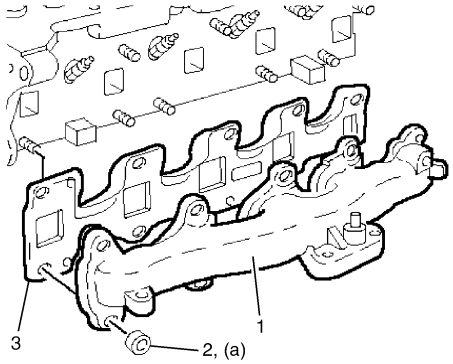


I3RM0B1B2004-01

Installation

1) Install exhaust manifold (1) with new gasket (3).
2) Tighten new exhaust manifold nut (2) as follows.
   a) Tighten exhaust manifold nut (2) to 15 N·m (1.5 kgf-m, 11.0 lbf-ft).
   b) Retighten them by turning through 30°.

Tightening torque
Exhaust manifold nut (a): 15 N·m → + 30° (1.5 kgf-m → + 30°, 11.0 lbf-ft → + 30°)



I3RM0B1B2005-01

3) Install turbocharger referring to "Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D".
4) Install air cleaner assembly with MAF and IAT sensor referring to "Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D".
5) Refill cooling system referring to "Cooling System Flush and Refill: D13A / Z13DTJ in Section 1F" for equipped with A/C.
6) Refill engine with engine oil referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B".
7) Connect negative (–) cable at battery.
8) Check to make sure that there is no oil leakage, coolant leakage and exhaust gas leakage at each connection.

Exhaust Manifold Inspection

S7N20A1B26004

Check exhaust manifold for crack and damage.
Replace exhaust manifold as necessary.

Catalytic Converter Removal and Installation

S7N20A1B26007

Removal

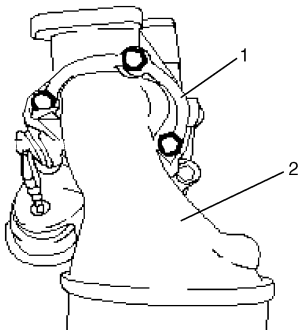
⚠ WARNING

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

⚠ CAUTION

- **Catalytic converter should not be exposed to any impulse.**
  Be careful not to drop it or hit it against something.
- **For DPF® model:**
  If catalytic converter is replaced, be sure to initialize catalytic converter data in ECM.
  For details, refer to "ECM Registration: D13A / Z13DTJ in Section 1C".

1) Disconnect negative (–) cable at battery.
2) Remove exhaust No.1 pipe referring to "Exhaust System Components: D13A / Z13DTJ".
3) Remove oil cooler referring to "Oil Cooler Removal and Installation: D13A / Z13DTJ in Section 1E".
4) Remove catalytic converter (2) from turbocharge after unbending lock plate (1) and loosening bolts.



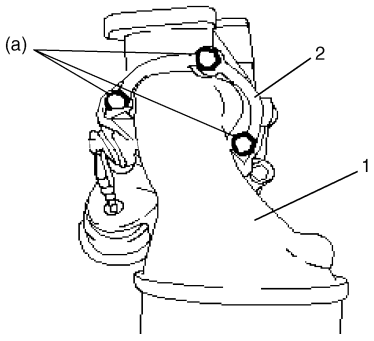
I3RM0B142017-01

Installation

Reverse removal procedure for installation noting the following.

- Install new gasket, new lock plate (2).
- Tighten catalytic converter bolts to specified torque.

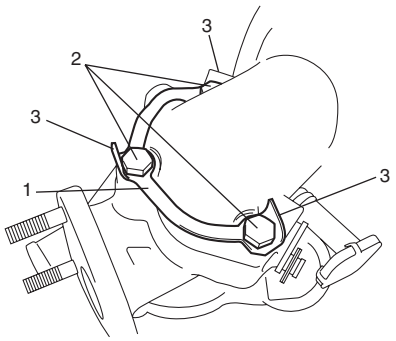
Tightening torque
Catalytic converter bolt (a): 28 N·m (2.9 kgf-m, 21.0 lbf-ft)



I3RM0B142019-01

1. Catalytic converter

- Bend claws (3) of lock plate (1) to prevent catalytic converter bolt (2) from loosening.



I3RM0B142020-01

- Tighten catalytic converter bracket bolt and exhaust No.1 pipe nuts to specified torque referring to "Exhaust System Components: D13A / Z13DTJ".
- Check to make sure that there is exhaust gas leakage at each connection.
- For DPF® model:
  When replacing catalytic converter, initialize catalytic converter data in ECM referring to "Catalytic Converter Data Initialization (DPF® Model): D13A / Z13DTJ in Section 1C".

DPF® Removal and Installation

S7N20A1B26008

⚠ WARNING

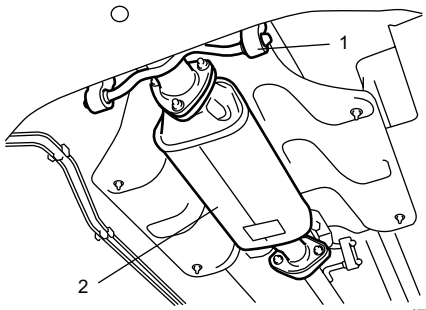
To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

⚠ CAUTION

- **DPF® should not be exposed to any impulse.**
  Be careful not to drop it or hit it against something.
- **If DPF® is replaced, be sure to initialize DPF® data in ECM.**
  For details, refer to "ECM Registration: D13A / Z13DTJ in Section 1C".

Removal

1) Disconnect negative (–) cable at battery.
2) Remove muffler mounting (1) from DPF®.
3) Remove DPF® (2).



I7V20A1B2003-01

Installation

Reverse removal procedure for installation noting the following.

- Install DPF® with new gasket using new nut.
- Tighten exhaust No.1 nuts and DPF® nuts to specified torque referring to "Exhaust System Components: D13A / Z13DTJ".
- After installation, verify there is no exhaust gas leakage each connection.
- When replacing DPF®, initialize DPF® data in ECM referring to "DPF® Data Initialization: D13A / Z13DTJ in Section 1C".

Exhaust Pipe and Muffler Removal and Installation

S7N20A1B26006

For replacement of exhaust pipe, be sure to hoist vehicle and observe WARNING under "Exhaust System Components: D13A / Z13DTJ" and the following.

⚠ CAUTION

Catalytic converter and DPF® should not be exposed to any impulse.
Be careful not to drop or hit them against something.

- Tighten bolts and nuts to specified torque when resembling. Refer to "Exhaust System Components: D13A / Z13DTJ".
- After installation, start engine and check each joint of exhaust system for leakage.

Specifications

Tightening Torque Specifications

S7N20A1B27001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Exhaust manifold nut	15 N·m → + 30° (1.5 kgf-m → + 30°, 11.0 lbf-ft → + 30°)			☞
Catalytic converter bolt	28	2.9	21.0	☞

NOTE

The specified tightening torque is also described in the following.
“Exhaust System Components: D13A / Z13DTJ”
“Exhaust Manifold Components: D13A / Z13DTJ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Section 2

Suspension

CONTENTS

Precautions

Precautions

Precautions on Suspension

S7N20A2000001

Emergency Flat Tire Repair Kit handle Warning
Refer to “Warning for Handling Emergency Flat Tire Repair Kit in Section 00”.

Suspension Caution
Refer to “Suspension Caution in Section 00”.

Wheels and Tires Caution
Refer to “Wheels and Tires Caution in Section 00”.

General Precautions
Refer to “General Precautions in Section 00”.

Vehicle Lifting Points
Refer to “Vehicle Lifting Points in Section 0A”.

Fastener Caution
Refer to “Fastener Caution in Section 00”.

Fastener Information
Refer to “Fasteners Information in Section 0A”.

Brake Caution
Refer to “Brake Caution in Section 00”.

Suspension General Diagnosis

Diagnostic Information and Procedures

Suspension, Wheels and Tires Symptom Diagnosis

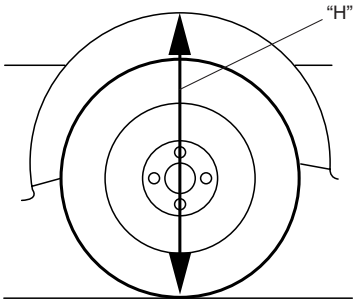
S7N20A2104001

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.*
	Radial tire lateral force	*Replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Brake dragging in one road wheel	*Repair brake.*
	Loose, bent or broken front or rear suspension parts	*Tighten or replace related suspension parts.*
Abnormal or excessive tire wear	Sagging or broken coil spring	*Replace coil spring.*
	Tire out of balance	*Adjust balance or replace tire.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Faulty strut (shock absorber)	*Replace strut (shock absorber).*
	Hard driving	*Replace tires.*
	Overloaded vehicle	*Replace tires and check suspension parts.*
	Not rotated tires	*Replace or rotate tires.*
	Worn or loose wheel bearing	*Replace wheel bearing.*
	Wobbly wheel or tire	*Replace wheel or tire.*
	Tires not adequately inflated	*Adjust tire pressure.*
Wheel tramp	Blister or bump on tire	*Replace tire.*
	Improper strut (shock absorber) action	*Replace strut (shock absorber).*
Shimmy, shake or vibration	Tire or wheel out of balance	*Balance wheel or replace tire and/or wheel.*
	Loosen wheel bearings	*Replace wheel bearings.*
	Worn tie-rod ends	*Replace tie-rod ends.*
	Loosen tie-rod ends	*Tighten or replace tie-rod ends.*
	Worn lower ball joints	*Replace front suspension arm.*
	Excessive wheel runout	*Repair or replace wheel and/or tire.*
	Blister or bump on tire	*Replace tire.*
	Excessively loaded radial runout of tire / wheel assembly	*Replace tire or wheel.*
	Disturbed wheel alignment	*Check and adjust wheel alignment.*
	Loose or worn steering linkage	*Tighten or replace steering linkage.*
	Loose steering gear case bolts	*Tighten steering gear case bolts.*
Abnormal noise, front end	Worn, sticky or loose tie-rod ends, lower ball joints, tie-rod inside ball joints or drive shaft joints	*Replace tie-rod end, suspension arm, tie-rod or drive shaft joint.*
	Damaged struts or mountings	*Repair or replace struts or mountings.*
	Worn suspension arm bushings	*Replace suspension arm bushings.*
	Loose stabilizer bar	*Tighten bolts or nuts and/or replace bushes.*
	Loose wheel bolts	*Tighten wheel bolts.*
	Loose suspension bolts or nuts	*Tighten suspension bolts or nuts.*
	Broken or damaged wheel bearings	*Replace wheel bearings.*
	Broken suspension springs	*Replace suspension springs.*
	Poorly lubricated or worn strut bearings	*Replace strut bearing.*
	Malfunction of Power Steering System	*Check and correct malfunction.*
Low or uneven trim height	Broken or sagging coil springs	*Replace coil springs.*
NOTE	Over loaded	*Check loading.*
	Incorrect coil springs	*Replace coil spring.*
See NOTE *1.	Tires not adequately inflated	*Adjust tire pressure.*
Ride too soft	Faulty strut (shock absorber)	*Replace strut (shock absorber).*
Suspension bottoms	Overloaded	*Check loading.*
	Faulty strut (shock absorber)	*Replace strut (shock absorber).*
	Incorrect, broken or sagging coil springs	*Replace coil spring.*

Condition	Possible cause	Correction / Reference Item
Body leans or sways in corners	Loose stabilizer bar	*Tighten stabilizer bar bolts or nuts, or replace bushes.*
	Faulty strut (shock absorber) or mounting	*Replace strut (shock absorber) and/or mounting.*
	Broken or sagging coil springs	*Replace coil springs.*
	Overloaded	*Check loading.*
Cupped tires	Front struts defective	*Replace struts.*
	Worn wheel bearings	*Replace wheel bearings.*
	Excessive tire or wheel run-out	*Replace tire and/or wheel.*
	Worn ball joints	*Replace front suspension arm.*
	Tire out of balance	*Adjust tire balance.*

NOTE

***1: Right-to-left trim height ("H") difference should be within 15 mm (0.6 in.) with curb weight. (same with rear side.)**



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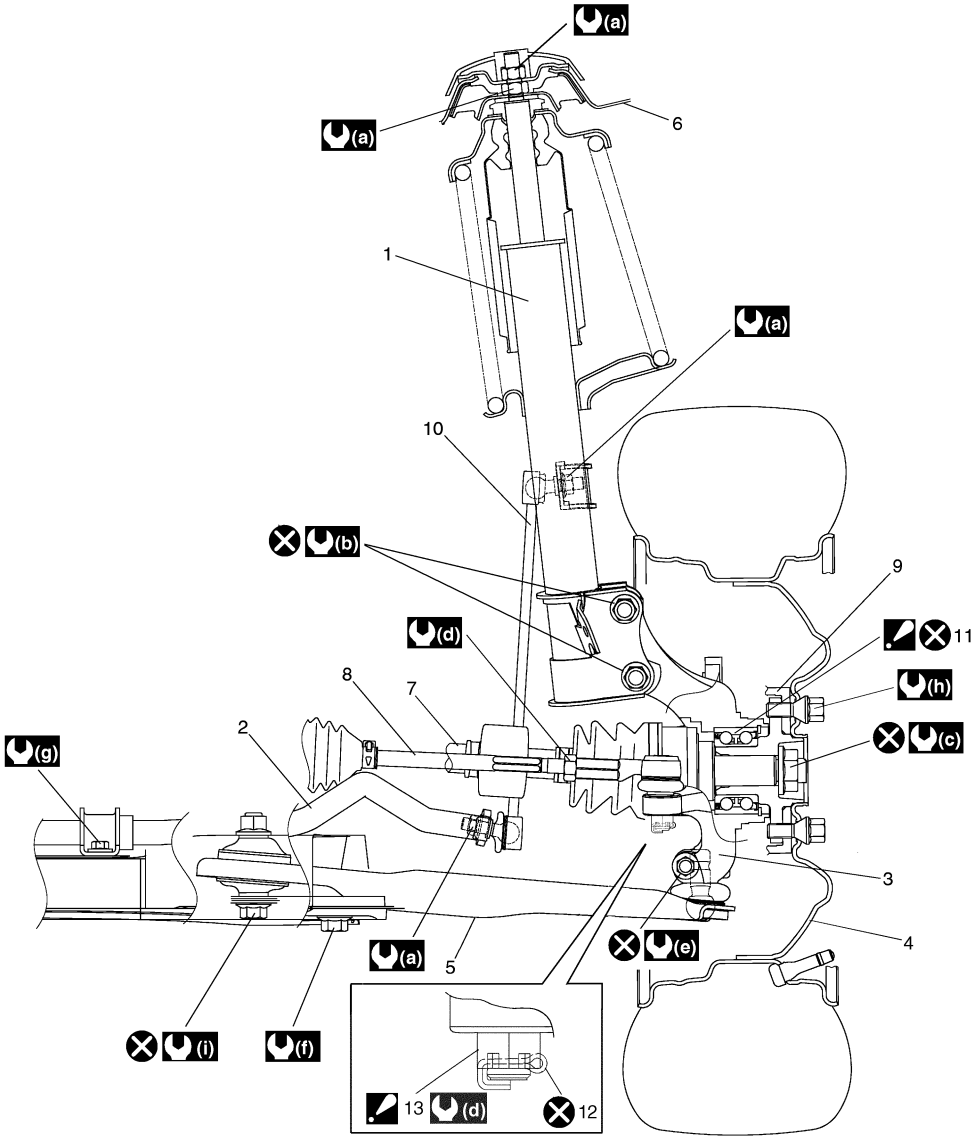
Front Suspension

General Description

Front Suspension Construction (Other Than M16A Engine Model)

S7N20A2201001

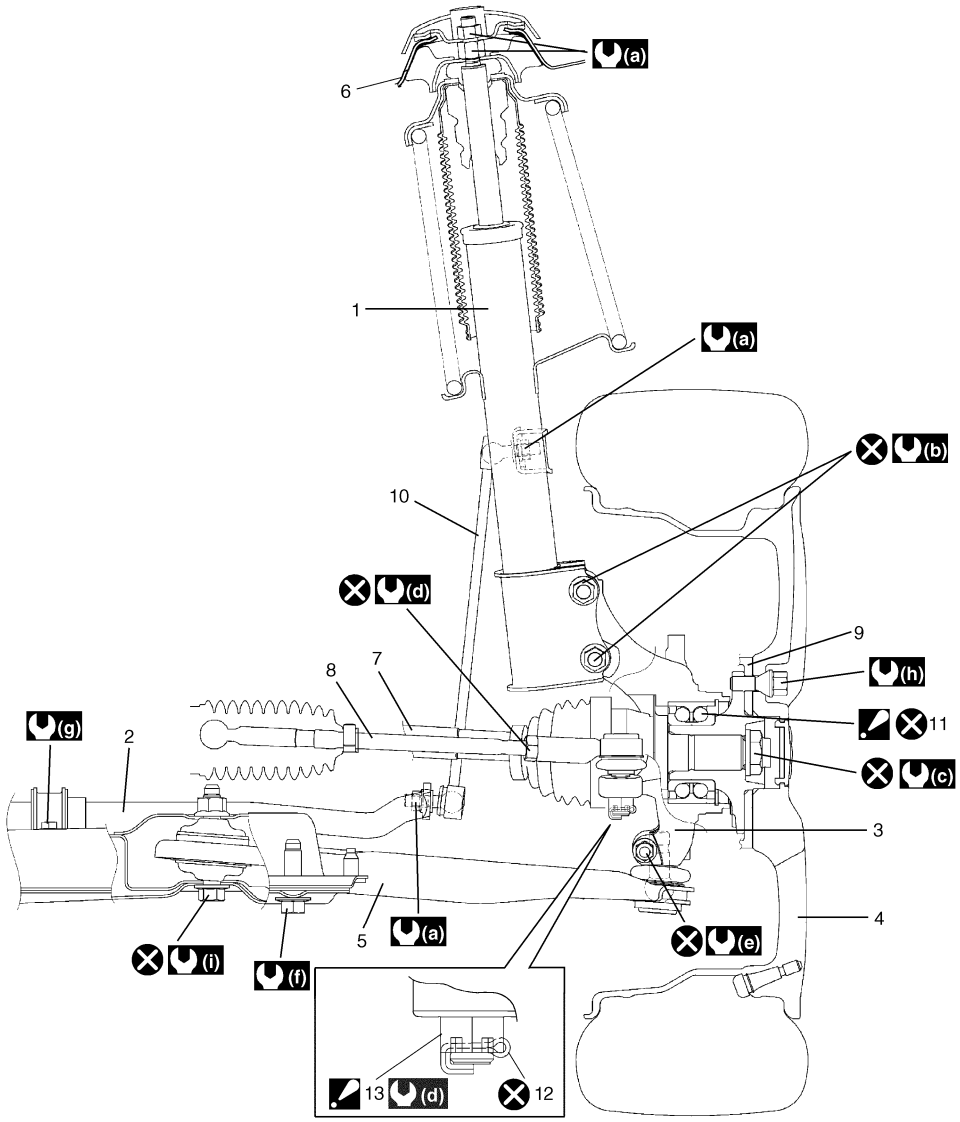


I7N20A220011-01

1. Strut assembly	9. Brake disc	(d) : 45 N·m (4.5 kgf-m, 32.5 lbf-ft)
2. Stabilizer bar	10. Stabilizer bar joint	(e) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
3. Steering knuckle	11. Wheel bearing : Rubber seal side of bearing faces vehicle outside.	(f) : 150 N·m (15.0 kgf-m, 108.5 lbf-ft)
4. Wheel	12. Split pin	(g) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
5. Suspension arm	13. Tie-rod end nut : Referring to “Tie-Rod End Removal and Installation in Section 6C”	(h) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
6. Vehicle body	(a) : 50 N·m (5.0 kgf-m, 36.5 lbf-ft)	(i) : 95 N·m (9.5 kgf-m, 69.0 lbf-ft)
7. Drive shaft	(b) : 90 N·m (9.0 kgf-m, 66.5 lbf-ft)	: Do not reuse.
8. Tie-rod	(c) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)	

Front Suspension Construction (M16A Engine Model)

S7N20A2201002



I7N20A220002-01

1. Strut assembly	9. Brake disc	(d) : 45 N·m (4.5 kgf-m, 32.5 lbf-ft)
2. Stabilizer bar	10. Stabilizer bar joint	(e) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
3. Steering knuckle	11. Wheel bearing : Rubber seal side of bearing faces vehicle outside.	(f) : 150 N·m (15.0 kgf-m, 108.5 lbf-ft)
4. Wheel	12. Split pin	(g) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
5. Suspension arm	13. Tie-rod end nut : Referring to “Tie-Rod End Removal and Installation in Section 6C”	(h) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
6. Vehicle body	(a) : 50 N·m (5.0 kgf-m, 36.5 lbf-ft)	(i) : 95 N·m (9.5 kgf-m, 69.0 lbf-ft)
7. Drive shaft	(b) : 90 N·m (9.0 kgf-m, 65.5 lbf-ft)	: Do not reuse.
8. Tie-rod	(c) : 200 N·m (20.0 kgf-m, 145.0 lbf-ft)	

Front Wheel Alignment Construction

S7N20A2201003

Among factors for front wheel alignment, only toe setting can be adjusted. Camber and caster are not adjustable. 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 and damaged body should be repaired or damaged suspension should be replaced.

Preliminary Checks Prior to Adjustment Front Wheel Alignment

Steering and vibration complaints are not always the result of improper wheel alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. “Lead” is the vehicle deviation from a straight path on a level road without hand pressure on the steering wheel. Refer to “Radial Tire Lead / Pull Description in Section 2D” in order to determine if the vehicle has a tire lead problem. Before making any adjustment affecting wheel alignment, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

- Check all tires for proper inflation pressures and approximately the same tread wear.
- Check for loose of ball joints. Check tie-rod ends; if excessive looseness is noted, it must be corrected before adjusting.
- Check for run-out of wheels and tires.
- Check vehicle trim heights; if it is out of limit and a correction is needed, it must be done before adjusting toe.
- Check for loose of suspension arms.
- Check for loose or missing stabilizer bar attachments.
- Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
- Consider condition of equipment being used to check alignment and follow manufacturer’s instructions.
- Regardless of equipment used to check alignment, vehicle must be placed on a level surface.

NOTE

To prevent possible incorrect reading of toe, camber or caster, vehicle front and rear end must be moved up and down a few times before inspection.

Repair Instructions

Front Wheel Alignment Inspection and Adjustment

S7N20A2206001

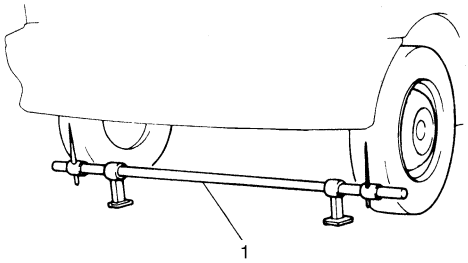
Toe Inspection and Adjustment

Preparation for toe inspection and adjustment.

- Place vehicle in unloaded state on level surface.
- Set steering wheel in straight state.
- Check that inflation pressure of each tire is adjusted properly and wheel is free from deflection.
- Check that each suspension part is free from bend, dent, wear or damage in any other form.
- Check that ground clearance at the right and left is just about the same.

Inspection

Measure toe with toe-in gauge (1).
If toe is out of the specification, adjust toe properly at tie-rod.



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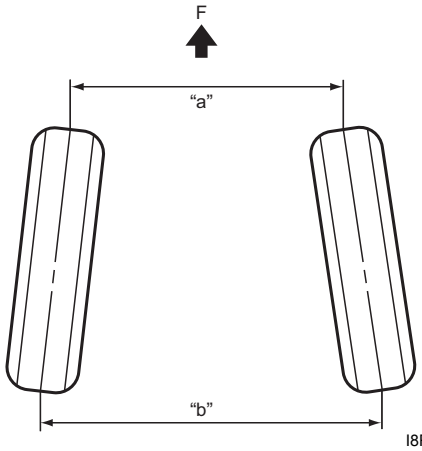
Front toe (total) “b”-“a”
: IN 1.0 ± 1.0 mm (IN 0.0394 ± 0.0394 in.)



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F: Forward

Adjustment

⚠ CAUTION

Make sure that rack boot is not twisted. Otherwise, rack boot may be broken.

1) Loosen right and left tie-rod end lock nuts (1) first.
2) Rotate right and left tie-rods (2) by the same amount to align toe to specification. In this adjustment, right and left tie-rods (2) should become equal in length "A".

NOTE

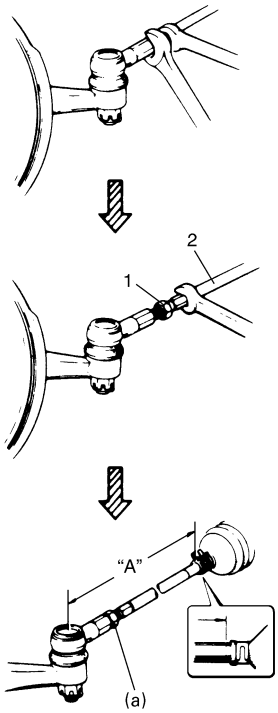
Before rotating tie-rods (2), apply grease between tie-rods and rack boots so that boots won't be twisted.

3) After adjustment, tighten lock nuts (1) to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kgf-m, 32.5 lbf-ft)

NOTE

Make sure that rack boots are not twisted.



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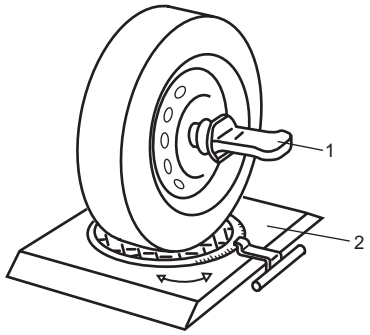
Camber and Caster Check
Check camber and caster by camber caster kingpin gauge (1) and turning radius gauge (2).
If measured value is out of specified value, check following items for damage, deformation and crack.

- Strut and component
- Suspension arm and bush
- Suspension frame
- Wheel hub, steering knuckle or wheel bearing
- Vehicle body



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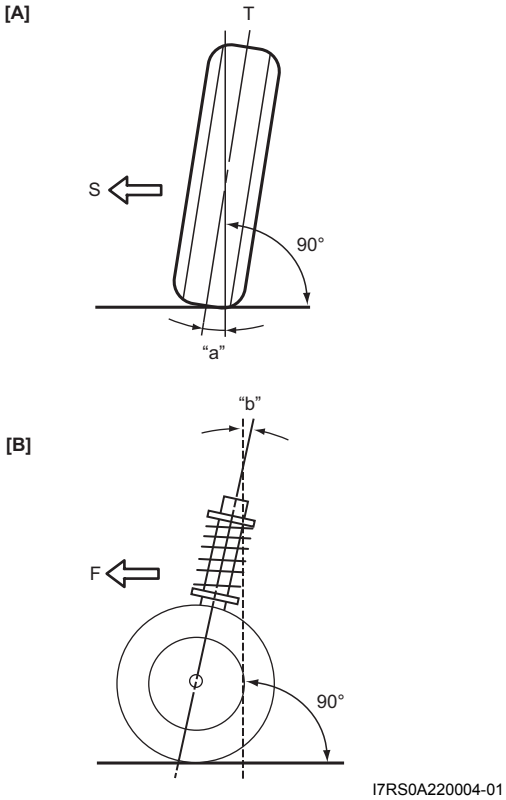
Camber "a"
Front: 0° 00' ± 1°

Caster "b"
Front: 5° 12' ± 2°

NOTE

Front camber and caster are not adjustable.



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[A]: Camber (Front view)	S: Body center
[B]: Caster (Side view)	T: Center line of wheel
F: Forward	

Steering Angle Check and Adjustment
When tie-rod or tie-rod end was replaced, check toe and then also steering angle with turning radius gauge.
If measured value is out of specified value, perform inspection and adjustment of toe.

Steering angle
M13A and M15A engine model: Inside 39.1° ± 3°, Outside 33.3° (Reference)
Diesel engine model: Inside 39.0° ± 3°, Outside 33.8° (Reference)
M16A engine model: Inside 33.8° ± 3°, Outside 29.8° (Reference)

Reference Information
Side slip
When checked with side slip tester, side slip should satisfy following specification.

Side slip
IN 3.0 to 0 mm/m (IN 0.118 to 0 in./3.3 ft)

If side slip is greatly different, toe or front wheel alignment may not be correct.

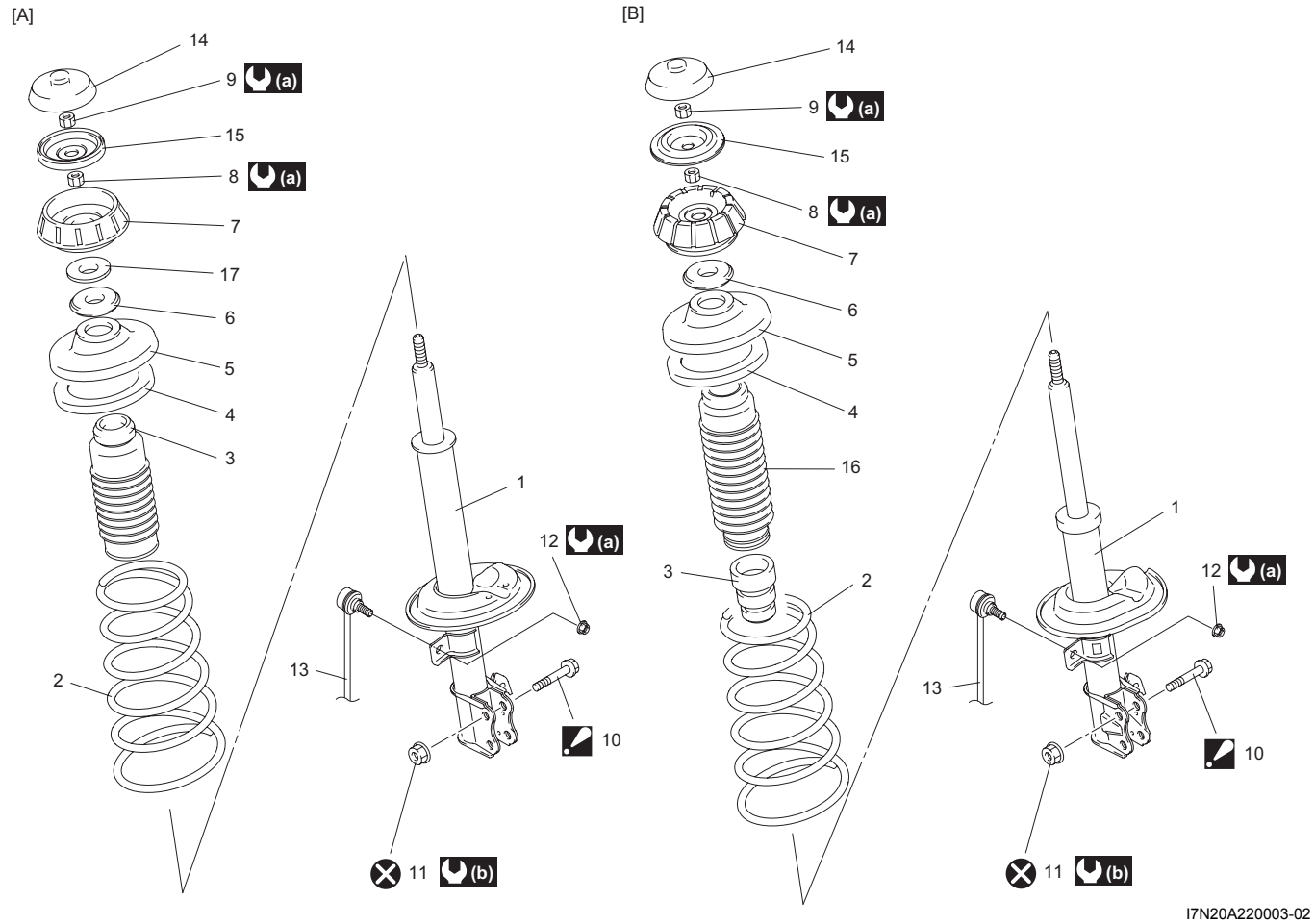
Toe angle
When checked front toe angle with total wheel alignment tester or the like, refer to the following specification.

Toe angle (Each Wheel)
Front: IN 12' to 0°

If front toe angle is out of specification, measure toe with toe-in gauge and then adjust it at the tie-rod.

Front Strut Assembly Components

S7N20A2206002



I7N20A220003-02

[A]: Other than M16A engine model	5. Coil spring upper seat	11. Strut bracket nut	17. Bearing plate
[B]: M16A engine model	6. Strut bearing	12. Stabilizer joint nut	(a) : 50 N·m (5.0 kgf-m, 36.5 lbf-ft)
1. Strut assembly	7. Strut support	13. Stabilizer joint	(b) : 90 N·m (9.0 kgf-m, 66.5 lbf-ft)
2. Coil spring	8. Strut support lower nut	14. Strut rod cap	: Do not reuse
3. Bump stopper	9. Strut nut	15. Rebound stopper	
4. Coil spring seat	10. Strut bracket bolt : Insert from vehicle front side.	16. Strut dust cover	

Front Strut Assembly Removal and Installation

S7N20A2206003

⚠ CAUTION

When rebound stopper and strut assembly were removed, check strut support lower nut for specified torque before installing strut assembly.

Removal

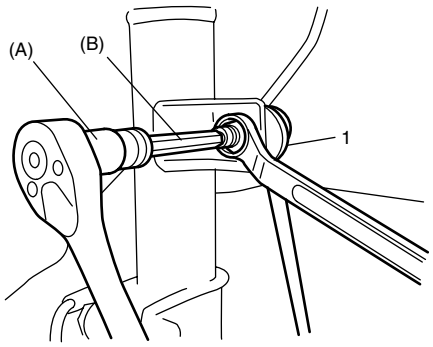
1) Remove cowl top garnish from vehicle referring to “Cowl Top Components in Section 9K”.

NOTE

When servicing component parts of strut assembly, remove strut rod cap and then loosen strut nut a little before removing strut assembly. This will make service work easier. Note that the nut must not be removed at this point.

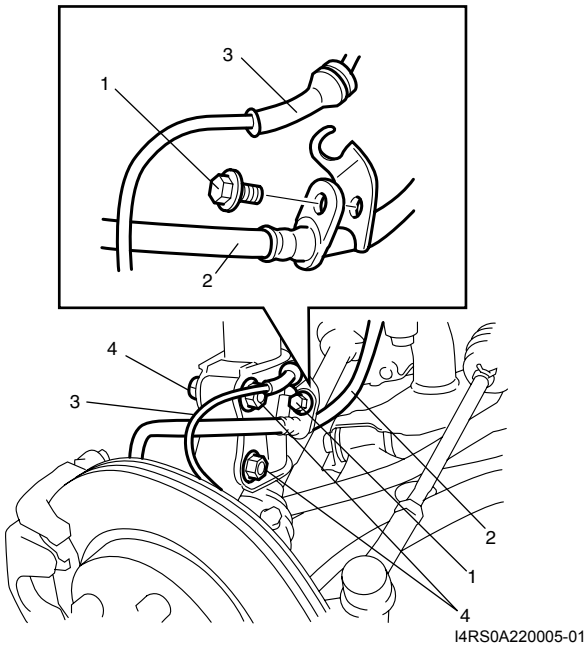
2) Hoist vehicle, allowing front suspension to hang free.
3) Remove wheel (with tire).
4) Disconnect stabilizer joint (1) from strut bracket. When loosening joint nut, hold stud with special tools.

Special tool
(A): 09900–00411 socket
(B): 09900–00413 5 mm



I4RS0A220004-01

5) Remove brake hose mounting bolt (1) and remove brake hose (2) from bracket and then wheel speed sensor harness (3) from strut bracket as shown in figure.
6) Remove strut bracket bolts and nuts (4).

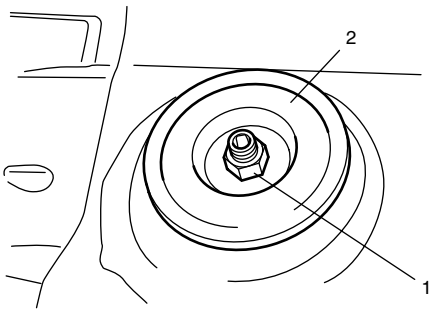


I4RS0A220005-01

7) Remove strut rod cap.
8) Remove strut nut (1), and remove rebound stopper (2).

NOTE

Hold strut by hand so that it will not fall off.



I4RS0A220006-01

9) Remove strut assembly.

Installation

⚠ CAUTION

Never reuse strut bracket nut. Nuts are pre-coated with friction stabilizer. Be sure to replace pre-coated nut with a new one, or nut may loosen.

Install strut assembly by reversing removal procedure, noting the following instructions.

- Insert bolts in such direction as shown in figure.
- Tighten all fasteners to specified torque.

  Tightening torque
  Strut bracket nut (a): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)
  Brake hose mounting bolt (c): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
  Stabilizer joint nut (d): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)

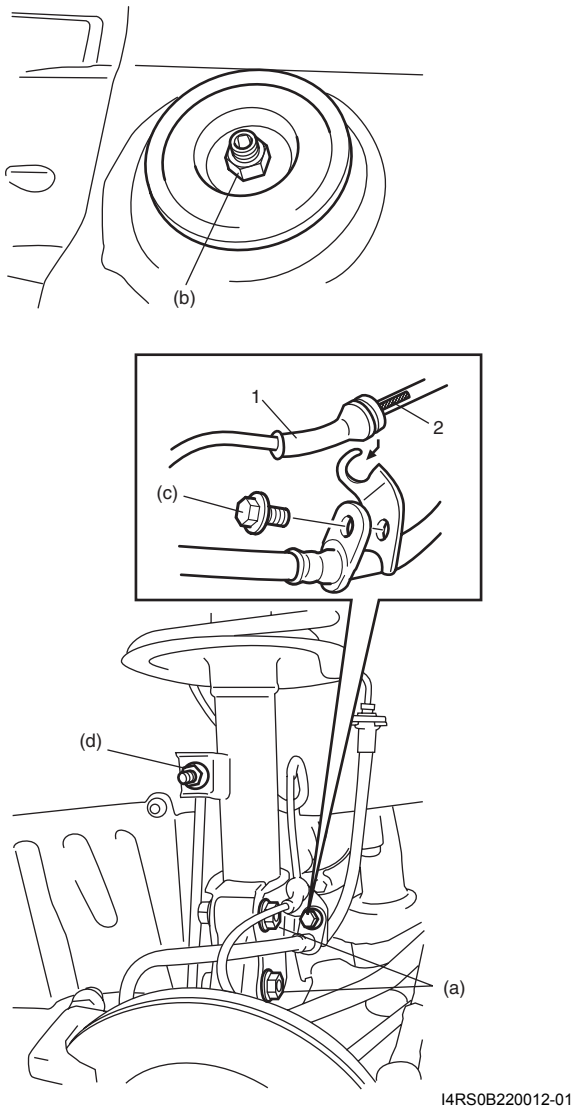
- Lower hoist and vehicle in non-loaded condition, tighten strut nut (b) to specified torque.

  Tightening torque
  Strut nut (b): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)

- Install windshield wiper arms with blades referring to “Windshield Wiper Removal and Installation in Section 9D”.

NOTE

- **Don’t twist brake hose and wheel speed sensor harness when installing them.**
- **Install wheel speed sensor harness (1) which marking (2) in figure is placed to open hook side of the bracket.**



I4RS0B220012-01

- Tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
- After installation, confirm front wheel alignment.

Front Strut Assembly Disassembly and Assembly

S7N20A2206004

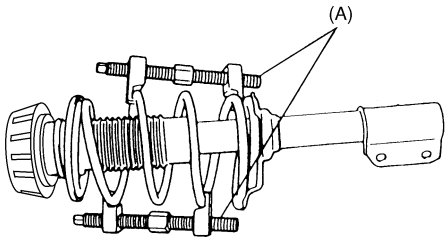
⚠ WARNING

Use a commercially available spring compressor and follow the operation procedure described in the Instruction Manual supplied with that spring compressor.

Disassembly

1) With special tool (A) placed to coil spring as shown, turn special tool bolts alternately until coil spring tension is released. Whether it is released or not can be known by whether strut turns lightly while strut spring is held stationary.

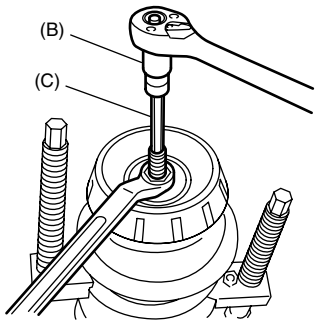
Special tool
(A): 09940-71431



I4RS0A220009-01

2) While keeping coil spring compressed with special tools as shown, remove strut support lower nut.

Special tool
(B): 09900-00411 socket
(C): 09900-00414 6 mm



I4RS0A220007-01

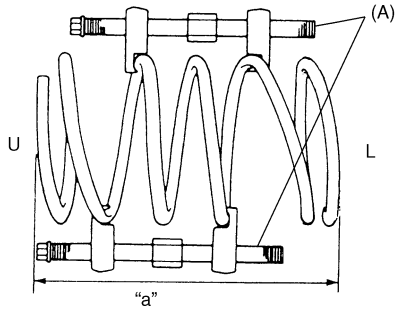
3) Disassemble strut assembly.

Assembly

For assembly, reverse disassembly procedure, noting the following instructions.

1) Compress coil spring with special tool (A) until total length becomes about 280 mm (11.0 in.) as shown.

Length
"a": 280 mm (11.0 in.)



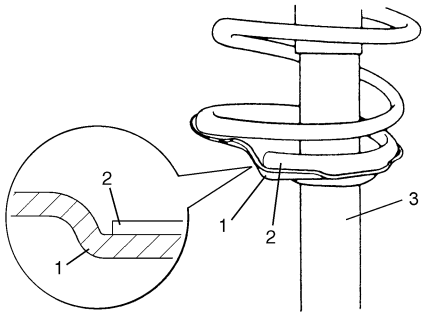
I4RS0A220010-01

U:	Upper side (small dia.)
L:	Lower side (large dia.)

2) Install compressed coil spring to strut (3), and mate coil spring end (2) with stepped part of spring lower seat (1) as shown.

NOTE

End of coil spring must not interfere with step of spring lower seat.

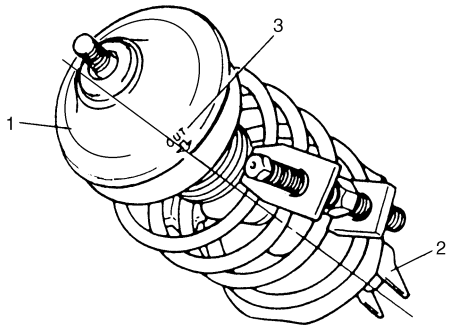


I7N20A220010-01

3) Install bump stopper onto strut rod. For installing direction, refer to the figure in "Front Suspension Construction (Other Than M16A Engine Model)".

4) Pull strut rod as far up as possible and use care not to allow it to retract into strut.

5) Install spring seat on coil spring and then spring upper seat (1) aligning "OUT" mark (3) on spring upper seat and center of strut bracket (2).

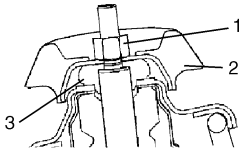


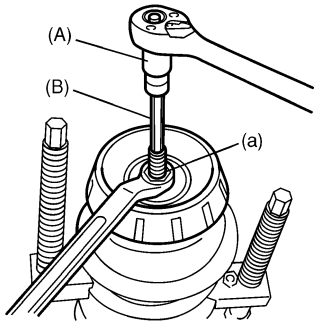
I4RS0A220012-01

6) Install bearing (3), bearing plate (other than M16A engine model), strut support (2) and strut support lower nut (1) in this sequence.
Tighten strut support lower nut (1) to specified torque.
When tightening strut support lower nut, hold stud with special tools.

Special tool
(A): 09900–00411 socket
(B): 09900–00414 6 mm

Tightening torque
Strut support lower nut (a): 50 N·m (5.0 kgf-m, 36.5 lbf-ft)



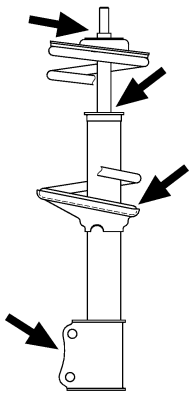


I6RS0B220006-01

Front Strut Assembly Check

S7N20A2206005

- Inspect strut for oil leakage, damage or deformation.
- If defect is found, replace strut as an assembly unit, because it can not be disassembled.



I4RS0A220014-01

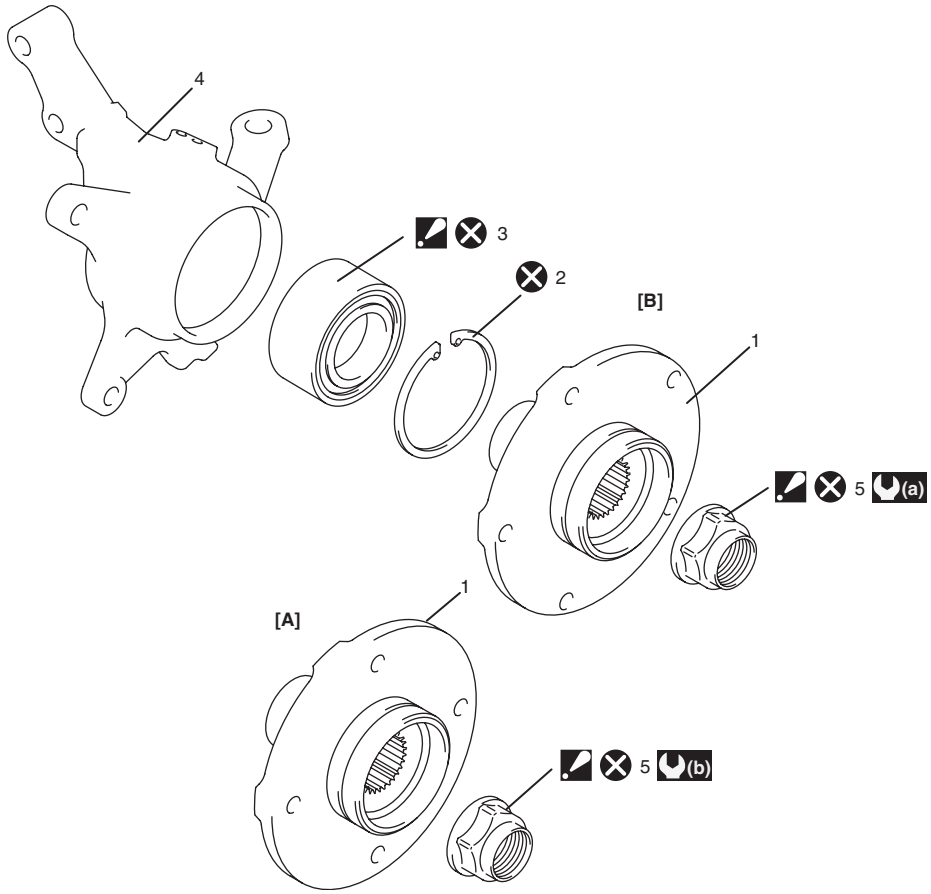
- Inspect strut function referring to the following procedures:
  1) Check and adjust tire pressures as specified.
  2) Bounce vehicle body up and down 3 or 4 times continuously by pushing front end of the vehicle side body to check strut.
     Also, note how many times vehicle body rebounds to stop after force application.
  3) 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.

- Inspect bearing for wear, abnormal noise or gripping. If defective, replace.
- Inspect coil spring seat for cracks or deformation. If defective, replace.
- Inspect bump stopper for deterioration. If defective, replace.
- Inspect rebound stopper and strut mount for wear, cracks or deformation. If defective, replace.

Front Wheel Hub and Steering Knuckle Components

S7N20A2206006



I7N20A220004-01

[A]: Other than M16A engine model	2. Circlip	5. Drive shaft nut : Calk, after tightening.	: Do not reuse.
[B]: M16A engine model	3. Wheel bearing : Face grooved rubber seal side to wheel hub.	(a) : 200 N·m (20.0 kgf-m, 145 lbf-ft)	
1. Front wheel hub	4. Steering knuckle	(b) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)	

Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation

S7N20A2206007

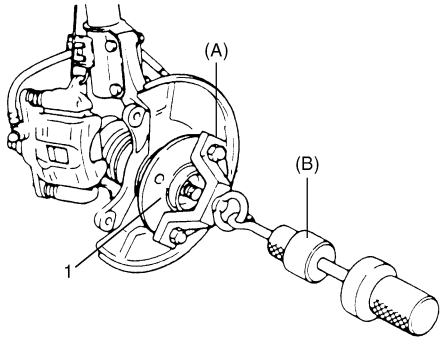
⚠ CAUTION

- **When removing and installing steering knuckle assembly, be careful not to damage dust boots of suspension arm joint by drive shaft dust cover and brake dust cover.**
- **When wheel hub is removed, replace wheel bearing with new one.**

Removal

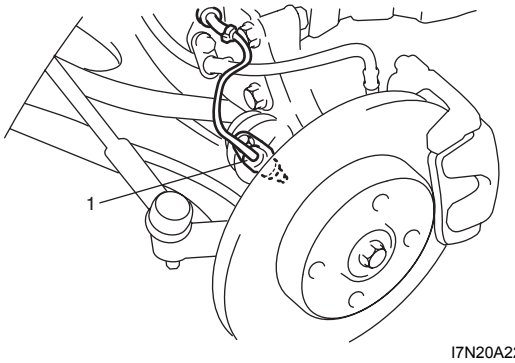
1) Hoist vehicle and remove front wheels (with tires).
2) Uncaulk drive shaft nut.
3) Depress foot brake pedal and hold it. Remove drive shaft nut.
4) Remove brake disc referring to “Front Brake Disc Removal and Installation in Section 4B”.
5) Pull out wheel hub (1) with special tools.

Special tool
(A): 09943-17912
(B): 09942-15511



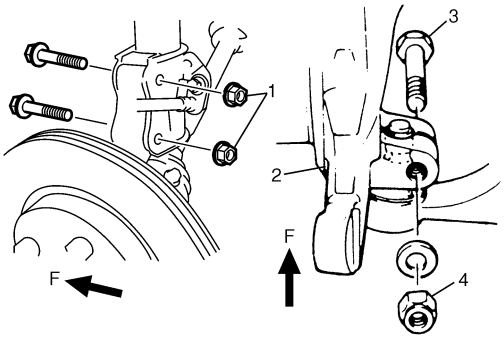
I3RM0A220023-01

6) Remove split pin and tie-rod end nut, and then disconnect tie-rod end from steering knuckle referring to “Tie-Rod End Removal and Installation in Section 6C”.
7) Remove wheel speed sensor (1) from knuckle.



I7N20A220005-01

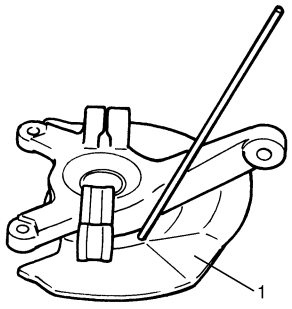
8) Loosen strut bracket nuts (1).
9) Remove suspension arm ball joint bolt (3) and nut (4).
10) Remove strut bracket bolts from strut bracket and then steering knuckle (2).



I4RS0B220013-01

F: Vehicle front

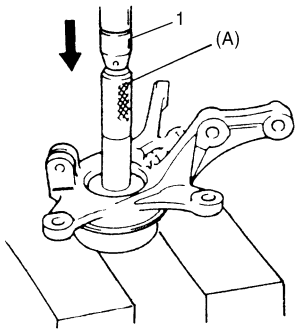
11) Uncaulk and remove dust cover (1).



I2RH01220032-01

12) Remove circlip from knuckle.
13) Using hydraulic press (1) and special tool, remove wheel bearing.

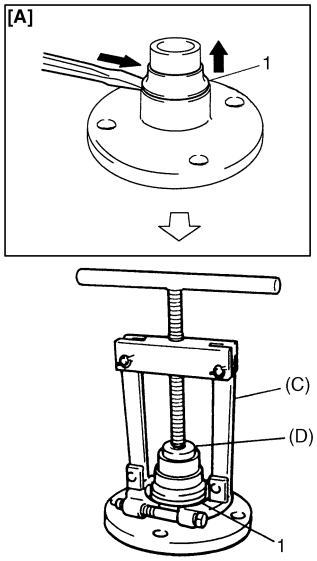
Special tool
(A): 09913-75520



I2RH01220033-01

14) Remove wheel bearing outside inner race (1).

Special tool
(C): 09913-65810
(D): 09926–37610–003 (other than M16A engine model)
: 09913–85230 (M16A engine model)



I6RS0B220012-02

[A]: Other than M16A engine model

Installation

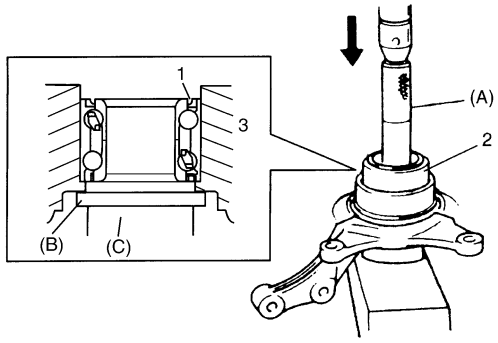
⚠ CAUTION

- **Never reuse wheel bearing and circlip. Otherwise, abnormal noise and abnormal vibration or any other abnormal condition may occur.**
- **When drive in dust cover, be careful not to deform it.**
- **Never reuse the removed suspension arm joint nut.**
- **Never reuse strut bracket nuts. Nuts are pre-coated with friction stabilizer. Be sure to replace pre-coated nut with a new one, or nut may loosen.**
- **Never reuse drive shaft nut.**
- **Be careful while caulking nut so that no crack will occur in caulked part of nut. Cracked nut must be replaced with new one.**

For installation, reverse removal procedure, noting the following instructions.

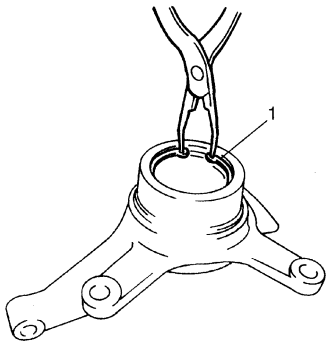
1) Face grooved rubber seal side (1) of new wheel bearing (2) upward as shown in figure and press-fit it into knuckle (3) using special tool.

Special tool
(A): 09913-75510
(B): 09926–68310
(C): 09951–18210



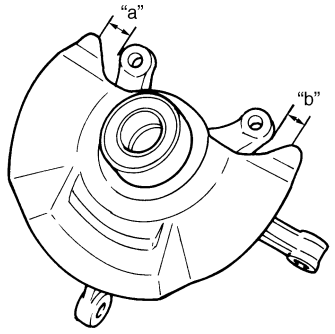
I3RM0A220032-01

2) Install new circlip (1).



I2RH01220037-01

3) Drive in dust cover so that dimensions “a” and “b” become equal as shown in figure.



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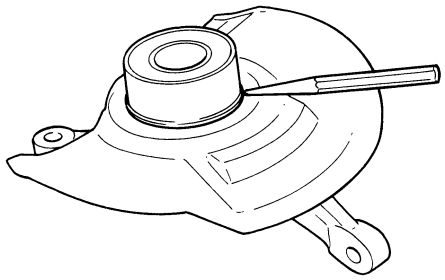
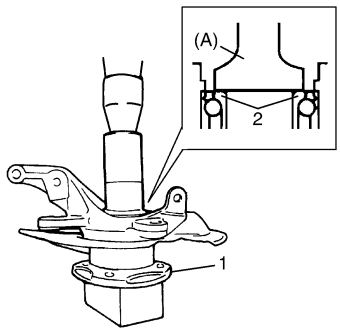
4) Caulk more than 6 places with a punch.



I2RH01220039-01

5) Using special tool and hydraulic press, press fit wheel hub (1) into wheel bearing (2) (Face grooved rubber seal side to wheel hub).

Special tool
(A): 09913–75810 (other than M16A engine model)
: 09913–75510 (M16A engine model)



I3RM0A220026-01

6) Install suspension arm ball joint bolt (1) and nut (2) from the direction as shown in figure.

7) Tighten new suspension arm ball joint nut (2) to specified torque.

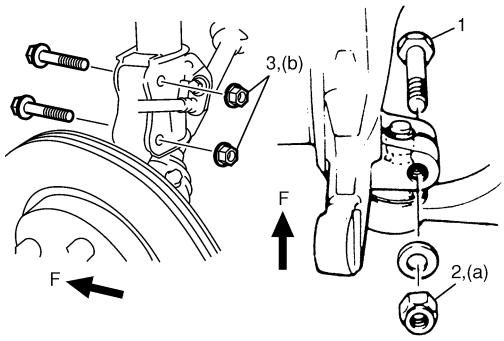
Tightening torque
Suspension arm ball joint nut (a): 60 N·m (6.0 kgf-m, 43.5 lbf-ft)

⚠ CAUTION

Never reuse the removed suspension arm ball joint nut.

8) Tighten strut bracket nuts (3) to specified torque.

Tightening torque
Strut bracket nut (b): 90 N·m (9.0 kgf-m, 65.5 lbf-ft)

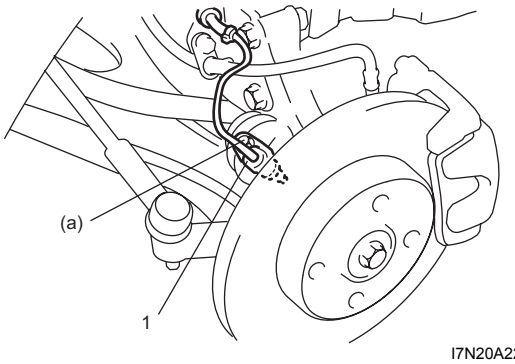


I4RS0B220015-01

F: Vehicle Front

9) Install wheel speed sensor (1).

Tightening torque
Wheel speed sensor mounting bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I7N20A220006-01

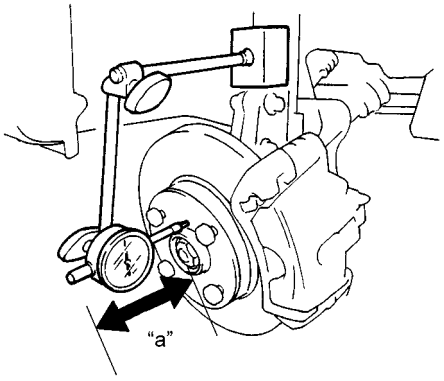
10) Connect tie-rod end to steering knuckle, tighten nut to specified torque referring to “Tie-Rod End Removal and Installation in Section 6C”.
11) Install brake disc and brake caliper.
12) Tighten brake disc screws and caliper carrier bolt to specified torque referring to “Front Brake Disc Removal and Installation in Section 4B”.
13) Depress foot brake pedal and hold it there. Tighten new drive shaft nut to specified torque referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
14) Caulk drive shaft nut.
15) Tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
16) After installing, confirm front wheel alignment.

Front Wheel Hub, Disc, Nut and Bearing Check

S7N20A2206008

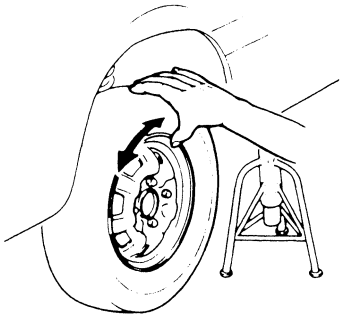
- Inspect each wheel disc for dents, distortion and cracks.
  A disc in badly damaged condition must be replaced.
- Check installation face inside of wheel disc for rust. As rust affects adversely, remove it thoroughly.
- Check tightness of wheel bolts and, if necessary, retighten them to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
- Check wear of wheel bearing. When measuring thrust play, apply a dial gauge to wheel hub as shown in figure.

Front wheel bearing thrust play limit
“a”: 0.1 mm (0.004 in.)



I7RS0A220010-02

- By rotating wheel actually, check wheel bearing for noise and smooth rotation.
  If defective, replace bearing.



I2RH01220011-01

Suspension Arm / Bush Removal and Installation

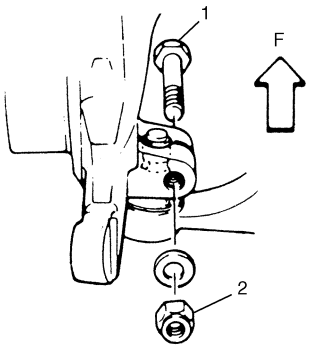
S7N20A2206009

⚠ CAUTION

- **When removing and installing suspension arm, be careful not to damage dust boot of suspension arm joint.**
  Otherwise, grease of suspension arm joint flow out, suspension arm joint may damage.

Removal

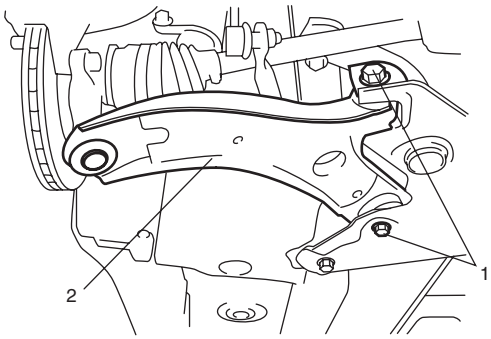
1) Remove suspension arm ball joint bolt (1) and nut (2).



I2RH01220046-01

F: Forward

2) Remove suspension arm bolts (1).
3) Remove suspension arm (2).



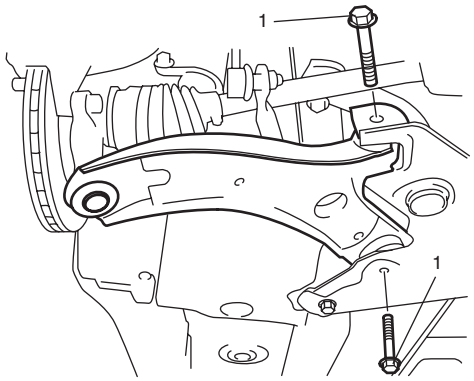
I4RS0B220016-01

Installation

⚠ CAUTION

Suspension arm bolts (front and rear) are pre-coated with friction stabilizer.
Suspension arm ball joint nuts are self-locking nut. Be sure to replace them with new one, or they may loosen.

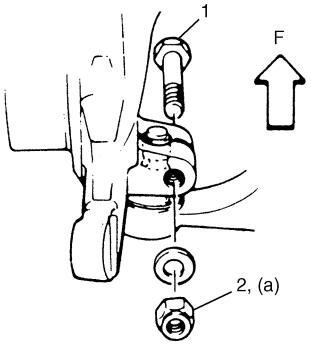
1) Install suspension arm as shown but tighten new suspension arm bolts (1) only temporarily.



I4RS0B220017-01

2) Install suspension arm ball joint to steering knuckle. Align ball stud groove with steering knuckle bolt hole. Then install ball joint bolt (1) from the direction as shown in figure. Tighten suspension arm ball joint nut (2) to specified torque.

Tightening torque
Suspension arm ball joint nut (a): 60 N·m (6.0 kgf-m, 43.5 lbf-ft)

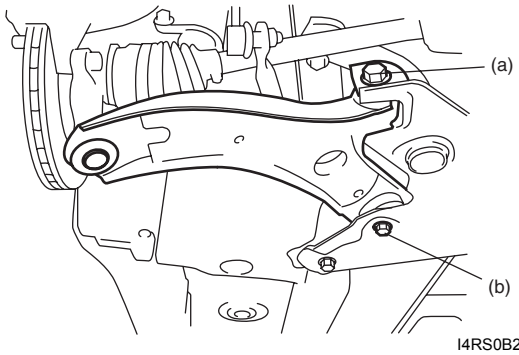


I2RH01220054-01

F: Forward

3) Lower hoist and vehicle in unloaded condition, tighten new suspension arm bolts to specified torque.

Tightening torque
Suspension arm front bolt (a): 95 N·m (9.5 kgf-m, 68.0 lbf-ft)
Suspension arm rear bolt (b): 95 N·m (9.5 kgf-m, 68.0 lbf-ft)



I4RS0B220018-01

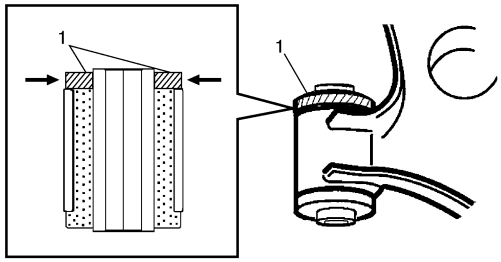
4) Confirm front wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment”.

Suspension Arm Bush Disassembly and Assembly

S7N20A2206010

Disassembly

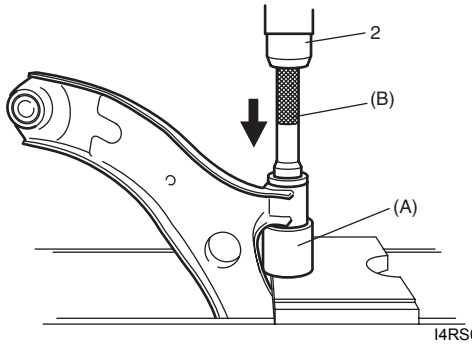
1) Cut off bush flange (rubber) (1) with knife.



I4RS0B220019-01

2) Push out bush by using hydraulic press (2) and special tools.

Special tool
(A): 09943–76310
(B): 09913–75821



I4RS0B220020-01

Assembly

⚠ CAUTION

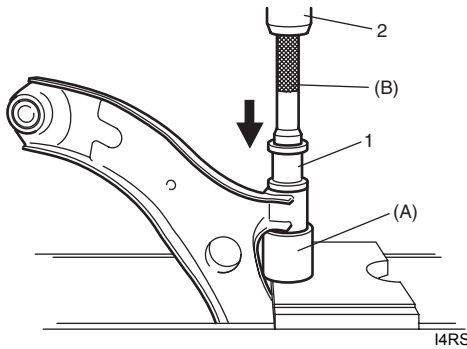
Be sure to use new bush.

1) Front bush
Press-fit front bush (1) by using special tools and press (2).

Special tool
(A): 09943–76310
(B): 09913–75821

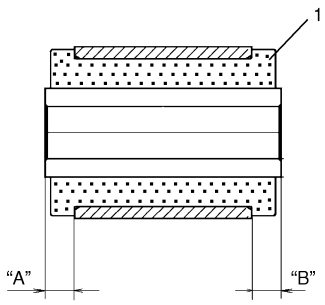
NOTE

- **Before installing bush, apply soap water on its circumference to facilitate bush installation.**



I4RS0B220021-01

2) Press-fit bush (1) so that dimensions “A” and “B” in figure become equal.

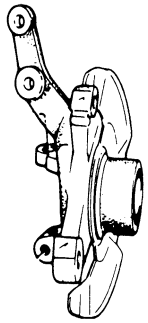


I4RS0A220033-01

Suspension Arm and Steering Knuckle Check

S7N20A2206011

Inspect for cracks, deformation or damage.
If defective, replace.

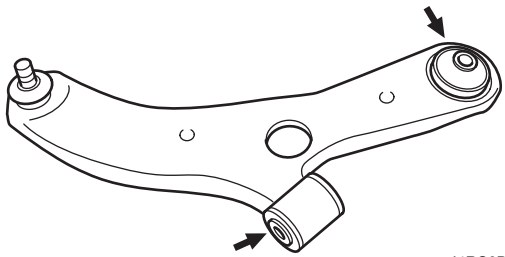


I2RH01220005-01

Suspension Arm Bush Check

S7N20A2206012

Inspect for damage, wear or deterioration.
If defective, replace.



I4RS0B220022-01

Suspension Arm Joint Check

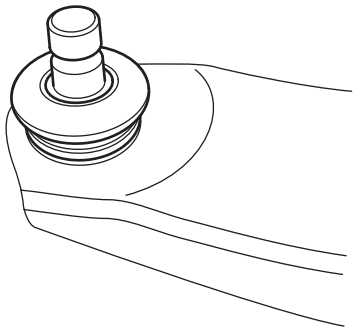
S7N20A2206013

- Check smooth rotation of ball stud.
- Check damages of ball stud.
- Check damages of dust cover.

NOTE

Suspension arm and arm joint cannot be separated.

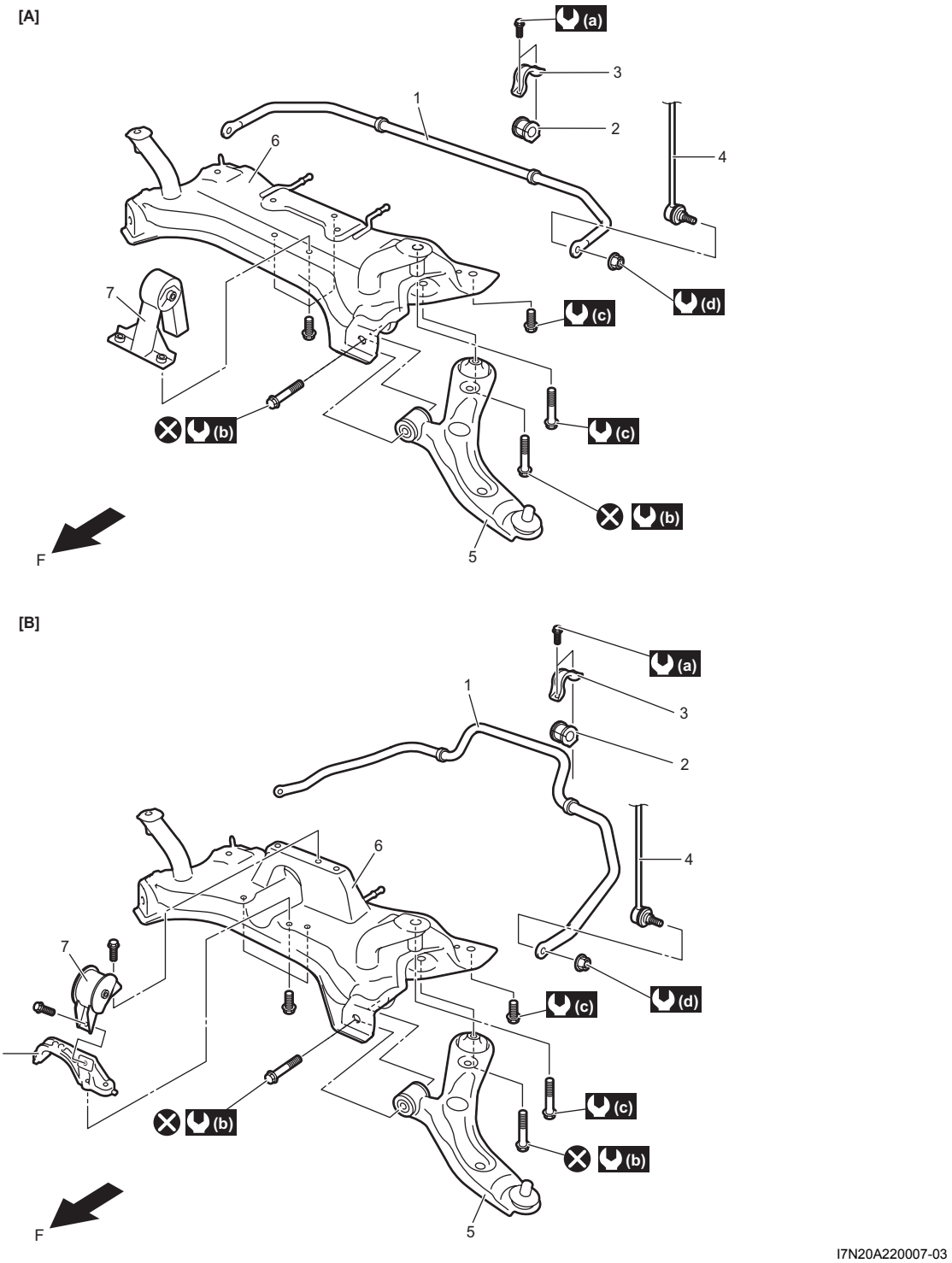
If there is any damage to either parts, suspension arm assembly must be replaced as a complete unit.



I4RS0B220023-01

Front Suspension Frame, Stabilizer Bar and/or Bushes Components

S7N20A2206014



I7N20A220007-03

[A]: Petrol model	4. Stabilizer joint	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
[B]: Diesel model	5. Suspension arm	(b) : 95 N·m (9.7 kgf-m, 70.5 lbf-ft)
1. Stabilizer bar	6. Front suspension frame	(c) : 150 N·m (15.3 kgf-m, 110.0 lbf-ft)
2. Stabilizer bush	7. Engine rear mounting	(d) : 50 N·m (5.1 kgf-m, 37.0 lbf-ft)
3. Stabilizer mounting bracket	8. Engine rear mounting bracket (D13A / Z13DTJ models only)	F: Forward

Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation

S7N20A2206016

Reference: “Front Suspension Frame, Stabilizer Bar and/or Bushes Components”

⚠ WARNING

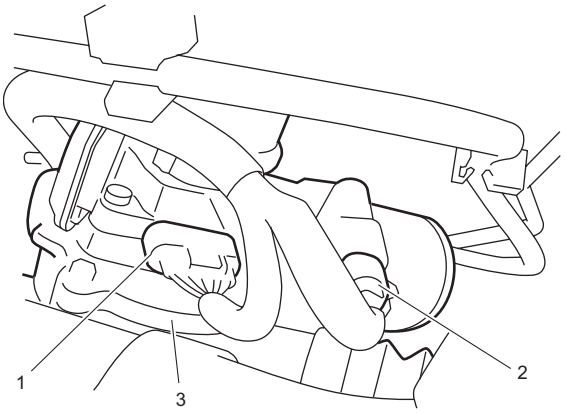
- **Do not touch exhaust system to avoid danger of being burned when it is still hot. Any service on exhaust system should be performed when it is cool.**
- **When removing suspension frame, be sure to apply some supporting equipment (such as mission jack) under it at well-balanced position in the center section so as to prevent from its drop.**

⚠ CAUTION

- **When removing and installing suspension arm, be careful not to damage dust cover of suspension arm joint by drive shaft dust cover and brake dust cover.**

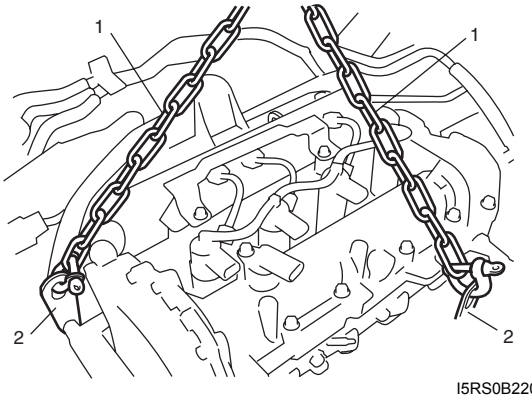
Removal

1) Disconnect negative (–) cable at battery.
2) Petrol model, remove air cleaner assembly referring to “Air Cleaner Components: M13A / M15A / M16A in Section 1D”.
3) Remove hood referring to “Hood Removal and Installation in Section 9J”.
4) Remove cowl top panel referring to “Cowl Top Components in Section 9K”.
5) Remove steering lower shaft from pinion shaft referring to “Steering Lower Shaft Removal and Installation in Section 6B”.
6) Hoist vehicle and remove front wheels (with tires).
7) Remove engine under cover (right and left).
8) Petrol model, remove following exhaust systems referring to “Exhaust System Components: M13A / M15A / M16A in Section 1K”.
   - Exhaust No.1 pipe
   - Exhaust No.2 pipe
   - Exhaust center pipe.
9) Diesel model, remove following exhaust systems referring to “Exhaust System Components: D13A / Z13DTJ in Section 1K” or “DPF® Removal and Installation: D13A / Z13DTJ in Section 1K” (if equipped).
   - Exhaust No.1 pipe
   - DPF (DPF model) or exhaust center pipe (Non-DPF model)
10) Disconnect stabilizer joint from front strut referring to “Front Strut Assembly Removal and Installation”.
11) Disconnect tie-rod end from steering knuckle referring to “Tie-Rod End Removal and Installation in Section 6C”.
12) Remove suspension arm referring to “Suspension Arm / Bush Removal and Installation”.
13) Disconnect torque sensor connector (1) and P/S motor connector (2) from steering gear case (3).



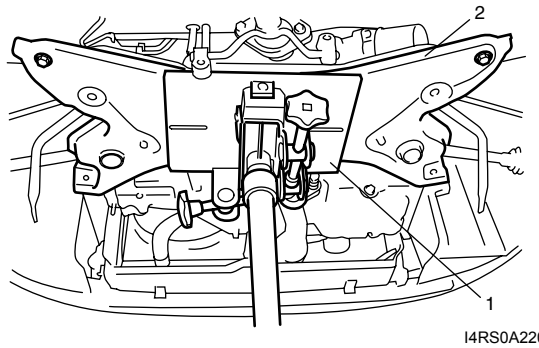
I7N20A220008-01

14) Petrol model, support engine assembly by using chain hoist.
15) Diesel model, support engine assembly according to the flowing procedure.
    a) Remove engine cover from engine assembly.
    b) Remove intercooler outlet pipe referring to “Intercooler Components: D13A / Z13DTJ in Section 1D”.
    c) Disconnect the following connectors, and then remove wire harness from engine.
       - Injector connectors
       - Glow plug connectors
       - CMP sensor connector
    d) Remove oil level gauge and oil level gauge guide.
    e) By using chain hoist (1), support engine assemble with engine hungers (2).



I5RS0B220001-01

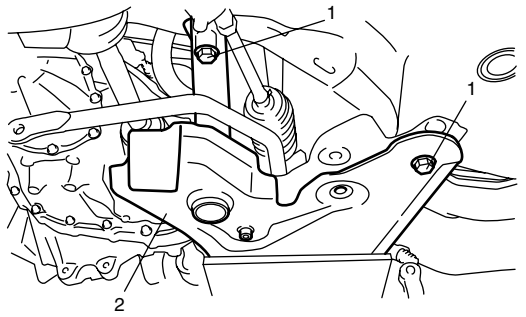
16) Support front suspension frame (2) with mission jack (1).



I4RS0A220042-01

17) Remove engine rear mounting from engine mounting bracket referring to “Engine Mountings Components (For M16A Engine Model): M13A / M15A / M16A in Section 1D”, “Engine Mountings Components (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D” or “Engine Mounting Components: D13A / Z13DTJ in Section 1D”.

18) Remove suspension frame mounting bolts (1), and then lower mission jack and remove suspension frame (2) with stabilizer bar and steering gear case from vehicle body.



I4RS0A220043-01

19) Remove engine rear mounting from front suspension frame.

20) Remove steering gear case from front suspension frame.

21) Remove stabilizer bar and bush from front suspension frame.

Installation

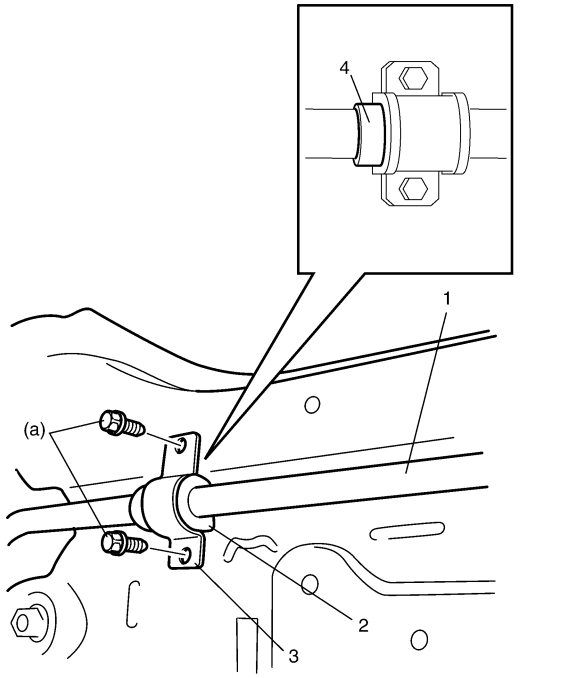
1) Install stabilizer bar (1), stabilizer bush (2) and stabilizer mounting bracket (3) to front suspension frame as shown in figure while ensuring that stabilizer is centered, side-to-side.

NOTE

For correct installation of stabilizer bar, side-to-side, be sure that stopper ring (4) on stabilizer bar aligns with stabilizer bush, both right and left, as shown in figure.

2) Tighten stabilizer bar mounting bracket bolts to specified torque.

Tightening torque
Stabilizer bar mounting bracket bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

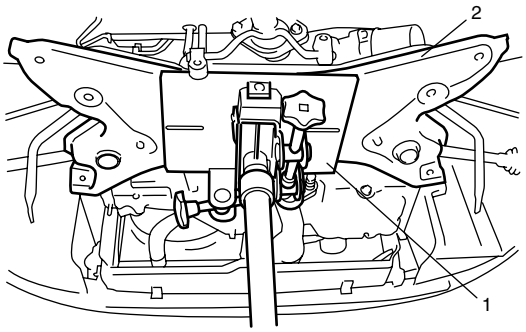


I7N20A220009-01

3) Install steering gear case assembly to front suspension frame referring to “Engine Mountings Components (For M16A Engine Model): M13A / M15A / M16A in Section 1D”, “Engine Mountings Components (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D” or “Engine Mounting Components: D13A / Z13DTJ in Section 1D”.

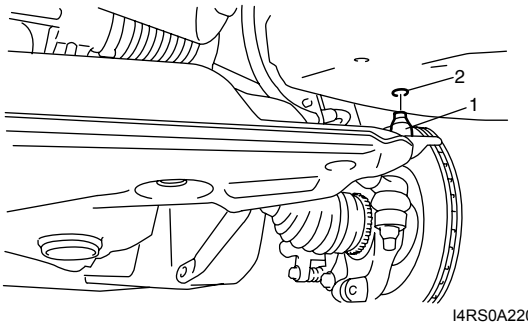
4) Install engine rear mounting to front suspension frame referring to “Front Suspension Frame, Stabilizer Bar and/or Bushes Components”.

5) Support front suspension frame (2) with mission jack (1) and jack up it.



I4RS0A220046-01

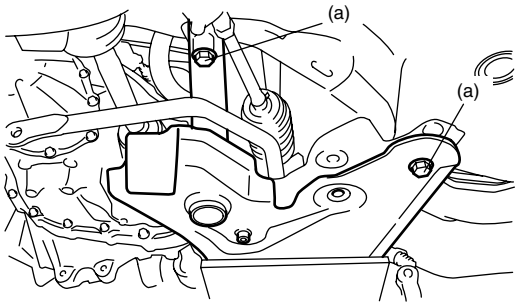
6) Align lugs (1) (right and left) of front suspension frame with whole (2) in vehicle body respectively.



I4RS0A220047-01

7) Install suspension frame mounting bolts (a) to specified torque.

Tightening torque
Suspension frame mounting bolt (a): 150 N·m (15.0 kgf-m, 108.5 lbf-ft)

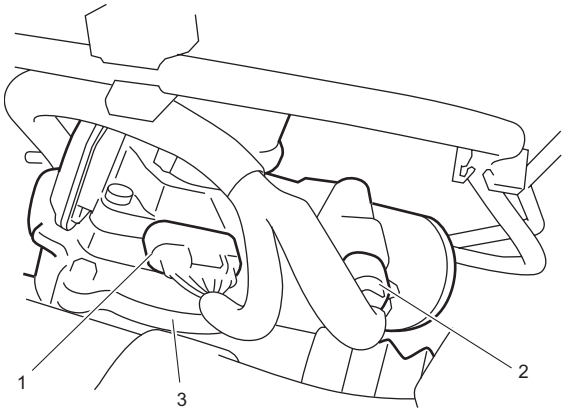


I4RS0A220048-01

8) Connect engine rear mounting to engine rear mounting bracket and tighten bolt referring to “Engine Mountings Components (For M16A Engine Model): M13A / M15A / M16A in Section 1D”, “Engine Mountings Components (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D” or “Engine Mounting Components: D13A / Z13DTJ in Section 1D”.

9) Lower mission jack.

10) Connect torque sensor connector (1) and P/S motor connector (2) to steering gear case (3).



I7N20A220008-01

11) Install suspension arm to front suspension frame. But tighten suspension arm bolts only temporarily.

12) Connect suspension arm joint to steering knuckle referring to “Suspension Arm / Bush Removal and Installation”.

13) Connect tie-rod end to steering knuckle referring to “Tie-Rod End Removal and Installation in Section 6C”.

14) Connect stabilizer joint to front strut referring to “Front Strut Assembly Removal and Installation”.

15) Petrol model, install following exhaust systems referring to “Exhaust System Components: M13A / M15A / M16A in Section 1K”.
- Exhaust No.1 pipe
- Exhaust No.2 pipe
- Exhaust center pipe

16) Diesel model, install following exhaust systems referring to “Exhaust System Components: D13A / Z13DTJ in Section 1K” or “DPF® Removal and Installation: D13A / Z13DTJ in Section 1K” (if equipped).
- Exhaust No.1 pipe
- DPF (DPF model) or exhaust center pipe (Non-DPF model)

17) Install engine under cover (right and left).

18) Install front wheels (with tires) referring to “Wheel (with Tire) Removal and Installation in Section 2D”.

19) Remove chain hoist from engine.

20) Petrol model, Install air cleaner assembly referring to “Air Cleaner Components: M13A / M15A / M16A in Section 1D”.

21) Diesel engine model, according to the following procedure.
   a) install oil with level gauge and oil level gauge guide.
   b) Reverse disconnected electric wires and connectors for connection in removal procedure.
   c) Install intercooler outlet pipe referring to “Intercooler Components: D13A / Z13DTJ in Section 1D”.
   d) Install engine cover to engine assembly referring to step 17) of “Installation” under “Turbocharger Removal and Installation: D13A / Z13DTJ in Section 1D”.

22) Install cowl top panel referring to “Cowl Top Components in Section 9K”.

23) Install hood referring to “Hood Removal and Installation in Section 9J”.

24) Lower hoist and tighten suspension arm bolts to specified torque referring to “Suspension Arm / Bush Removal and Installation”.

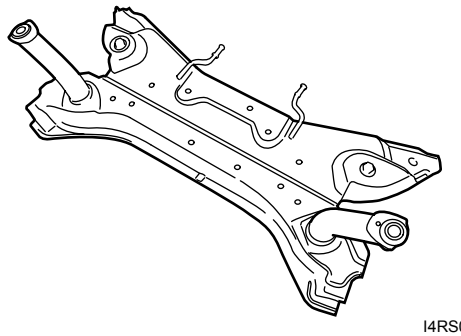
25) Connect negative (–) cable battery.

26) Confirm front wheel alignment referring to “Front Wheel Alignment Inspection and Adjustment”.

Front Suspension Frame Check

S7N20A2206017

Inspect for cracks, deformation or damage.
If defective, replace suspension frame, referring to "Front Suspension Frame" under "Body Dimensions in Section 9K".



I4RS0A220054-01

Front Stabilizer Bar, Bush and/or Joint Check

S7N20A2206018

Stabilizer Bar
Inspect stabilizer bar for damage or deformation.
If defective, replace.

Stabilizer Bush
Inspect stabilizer bush for damage, wear and deterioration.
If defective, replace.

Stabilizer Joint

1) Check stabilizer joint for smooth movement.
2) Check ball stud for damage.
3) Check dust cover for damage and crack.

NOTE

Stabilizer joint cannot be disassembled.

If there is any damage to either parts, stabilizer joint assembly must be replaced as a complete unit.

Front Suspension Fasteners Check

S7N20A2206019

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque, referring to "Front Suspension Construction (Other Than M16A Engine Model)".

Specifications

Tightening Torque Specifications

S7N20A2207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Tie-rod end lock nut	45	4.5	32.5	☞
Strut bracket nut	90	9.0	65.0	☞
Brake hose mounting bolt	25	2.5	18.0	☞
Stabilizer joint nut	50	5.0	36.5	☞
Strut nut	50	5.0	36.5	☞
Strut support lower nut	50	5.0	36.5	☞
Suspension arm ball joint nut	60	6.0	43.5	☞ / ☞
Strut bracket nut	90	9.0	65.5	☞
Wheel speed sensor mounting bolt	11	1.1	8.0	☞
Suspension arm front bolt	95	9.5	68.0	☞
Suspension arm rear bolt	95	9.5	68.0	☞
Stabilizer bar mounting bracket bolt	23	2.3	17.0	☞
Suspension frame mounting bolt	150	15.0	108.5	☞

NOTE

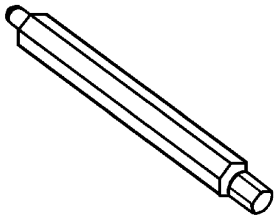
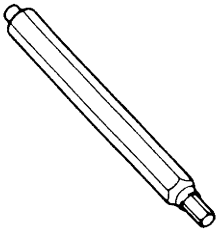
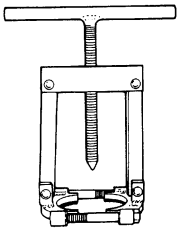
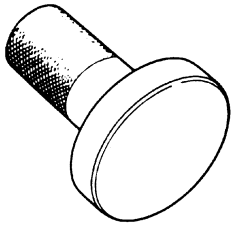
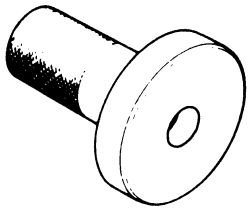
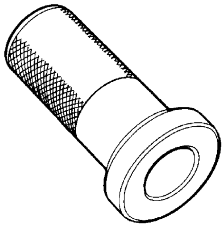
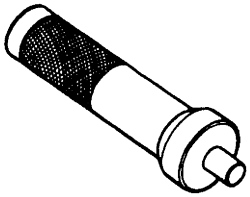
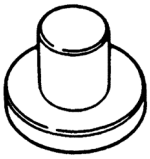
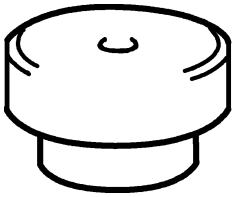
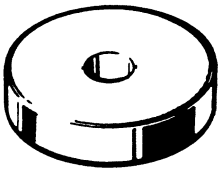
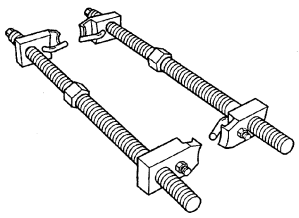
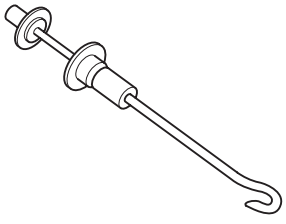
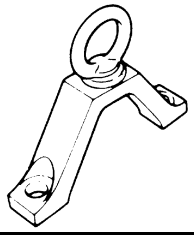
The specified tightening torque is also described in the following.
"Front Suspension Construction (Other Than M16A Engine Model): "
"Front Suspension Construction (M16A Engine Model): "
"Front Strut Assembly Components: "
"Front Wheel Hub and Steering Knuckle Components: "
"Front Suspension Frame, Stabilizer Bar and/or Bushes Components: "

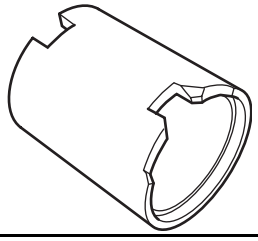
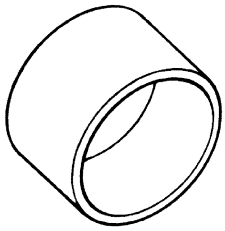
Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information in Section 0A".

Special Tools and Equipment

Special Tool

S7N20A2208001

09900–00411 Hexagon bit socket ☞ / ☞ / ☞ 	09900–00413 Hexagon bit (5 mm) ☞ 
09900–00414 Hexagon bit (6 mm) ☞ / ☞ 	09913–65810 Crankshaft bearing puller ☞ 
09913–75510 Bearing installer ☞ / ☞ 	09913–75520 Bearing installer ☞ 
09913–75810 Bearing installer ☞ 	09913–75821 Bearing installer attachment ☞ / ☞ 
09913–85230 Bearing remover tool ☞ 	09926–37610–003 Bearing remover attachment ☞ 
09926–68310 Differential bevel pinion bearing installer ☞ 	09940–71431 Suspension spring compressor ☞ 
09942–15511 Sliding hammer ☞ 	09943–17912 Wheel hub remover ☞ 

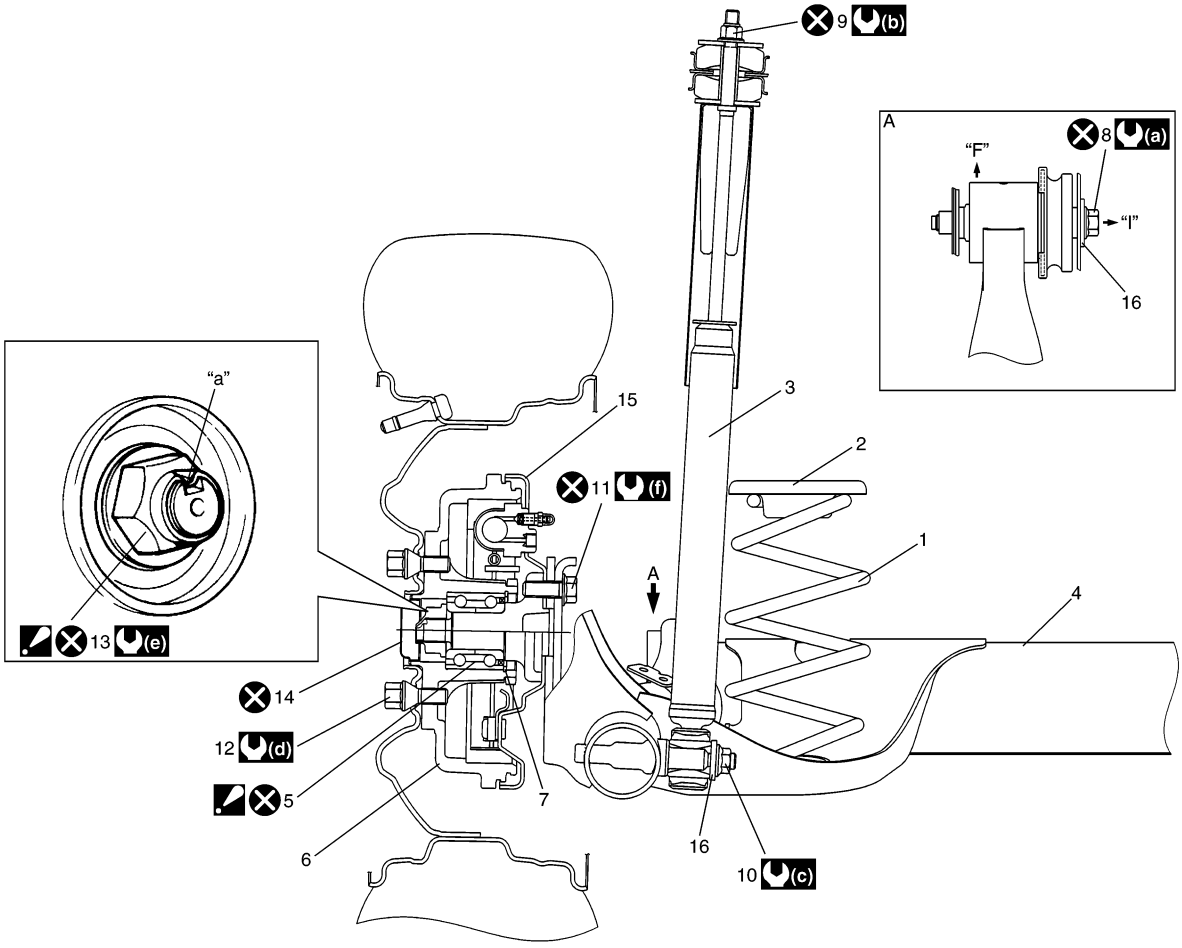
09943–76310 Bush remover ☞ / ☞ 	09951–18210 Oil seal remover & installer No. 2 ☞ 

Rear Suspension

General Description

Rear Suspension Construction (For Drum Brake Type)

S7N20A2301001

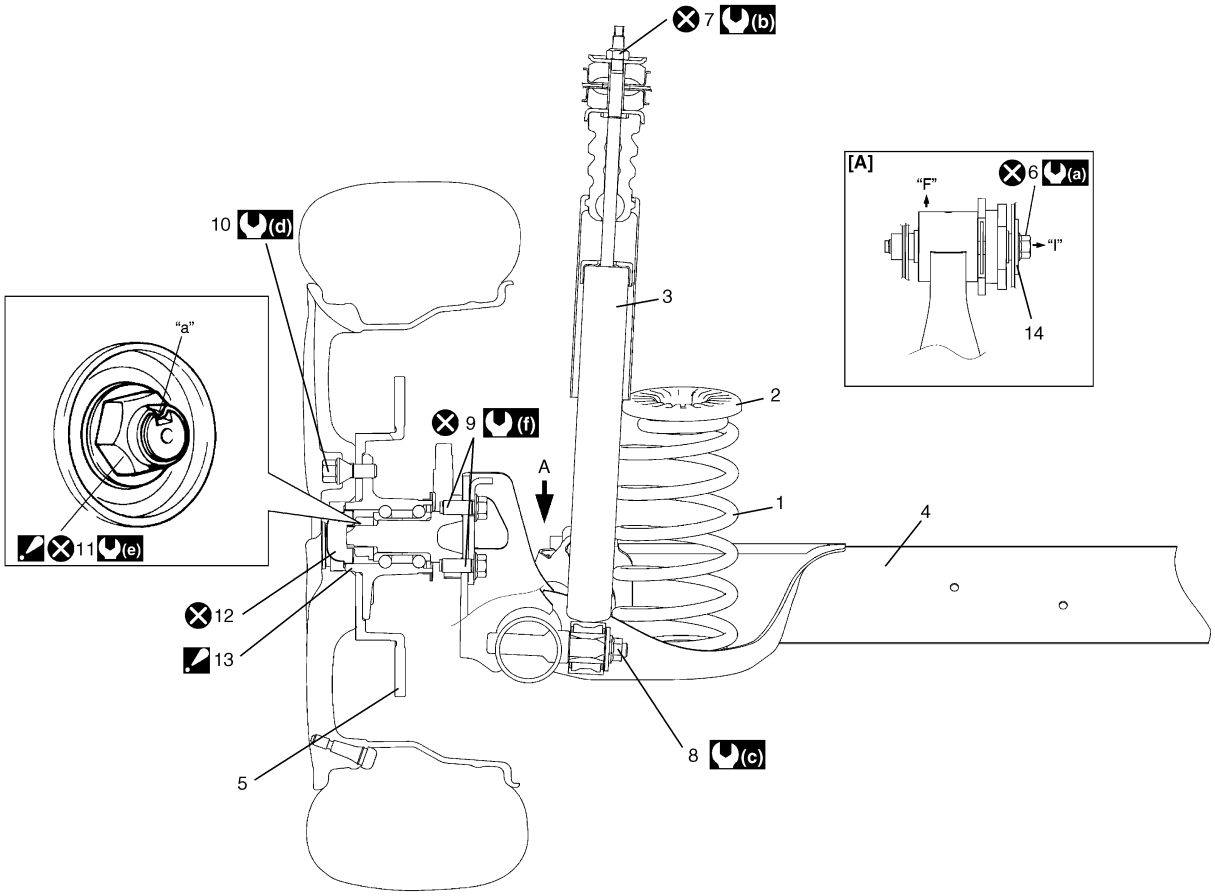


I6RS0B230018-03

[A]: View A	9. Rear shock absorber upper nut	"I": Body inside
1. Rear coil spring	10. Rear shock absorber lower nut	(a) : 73 N·m (7.3 kgf-m, 53.0 lbf-ft)
2. Rear spring upper seat	11. Rear spindle bolt	(b) : 28 N·m (2.8 kgf-m, 20.0 lbf-ft)
3. Rear shock absorber	12. Wheel bolt	(c) : 90 N·m (9.0 kgf-m, 65.0 lbf-ft)
4. Rear axle	13. Rear spindle nut : Caulk spindle nut as shown "a".	(d) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
5. Wheel bearing : Seal side of bearing comes brake back plate side.	14. Spindle cap	(e) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)
6. Brake drum	15. Wheel hub	(f) : 88 N·m (8.8 kgf-m, 64.0 lbf-ft)
7. Circlip	16. Washer	: Do not reuse.
8. Rear trailing arm bolt	"F": Forward	

Rear Suspension Construction (For Disc Brake Type)

S7N20A2301002



I7N20A230012-01

[A]: View A	8. Rear shock absorber lower nut	"I": Body inside
1. Rear coil spring	9. Rear spindle bolt	(a) : 73 N·m (7.3 kgf-m, 53.0 lbf-ft)
2. Rear spring upper seat	10. Wheel bolt	(b) : 28 N·m (2.8 kgf-m, 20.0 lbf-ft)
3. Rear shock absorber	11. Rear spindle nut : Caulk spindle nut as shown "a".	(c) : 90 N·m (9.0 kgf-m, 65.0 lbf-ft)
4. Rear axle	12. Spindle cap	(d) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
5. Brake disc	13. Wheel hub assembly : Never disassemble	(e) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)
6. Rear trailing arm bolt	14. Washer	(f) : 88 N·m (8.8 kgf-m, 64.0 lbf-ft)
7. Rear shock absorber upper nut	"F": Forward	: Do not reuse.

Repair Instructions

Rear Wheel Alignment Inspection

S7N20A2306023

Measure toe and camber referring to “Front Wheel Alignment Inspection and Adjustment in Section 2B”.

NOTE

Rear suspension is not adjustable structure.

Toe (total)
Rear: IN 3.8 ± 3.8 mm (IN 0.15 ± 0.15 in.)

Camber
Rear: –1° ± 1

If measured value is out of specified value, check and repair or replace following items for damage, deformation and crack.

- Rear axle (torsion beam)
- Spindle, wheel hub or wheel bearing
- Vehicle body

Rear Shock Absorber Removal and Installation

S7N20A2306001

Removal

1) Hoist vehicle.
2) Remove tail end member trim and quarter inner trim referring to “Head Lining Removal and Installation in Section 9H”.
3) Support rear axle by using floor jack to prevent it from lowering.
4) Remove absorber lower nut.
5) Remove absorber upper nut. Then remove shock absorber, a pair of upper washers and lower washer.

Installation

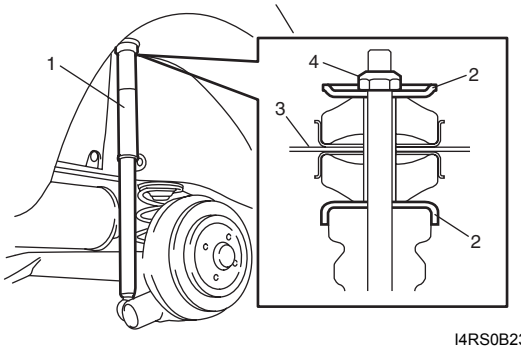
⚠ CAUTION

Use new rear shock absorber upper nut. Otherwise, nut may loosen.

1) Install shock absorber (1), a pair of upper washers (2) and lower washer.
   Tighten new rear shock absorber upper nut (4) and lower nut temporarily at this step.

NOTE

A pair of upper washers (2) are installed as shown in figure.

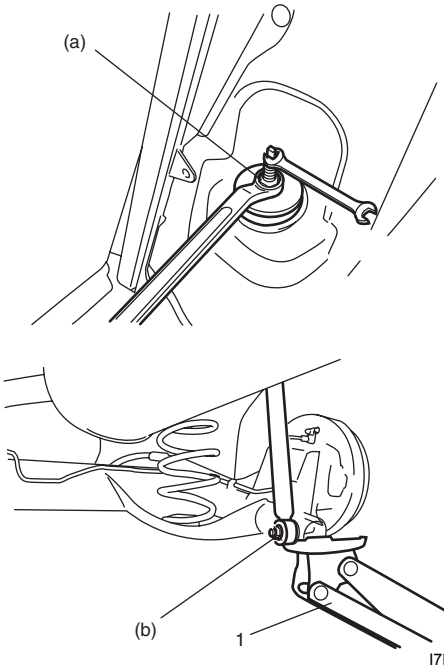


I4RS0B230002-02

3. Body panel

2) Remove floor jack (1) from rear axle and lower hoist.
3) Tighten nuts to specified torque.

Tightening torque
Rear shock absorber upper nut (a): 28 N·m (2.8 kgf-m, 20.0 lbf-ft)
Rear shock absorber lower nut (b): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)



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4) Install tail end member trim and quarter inner trim referring to “Head Lining Removal and Installation in Section 9H”.

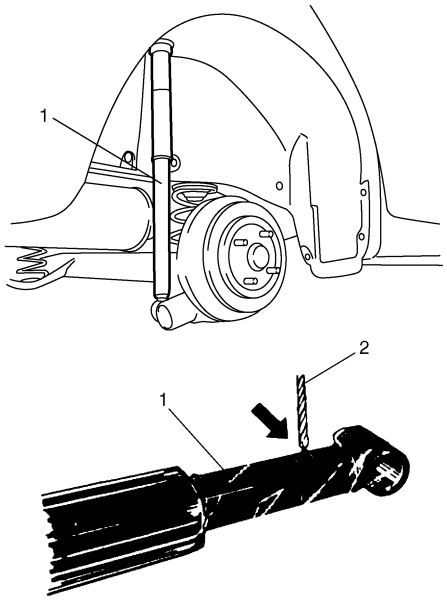
Rear Shock Absorber Inspection

S7N20A2306002

⚠ WARNING

When handling rear shock absorber (1) in which high-pressure gas is sealed, make sure to observe the following precautions.

- **Don't disassemble it.**
- **Don't put it into the fire.**
- **Don't store it where it gets hot.**
- **Before disposing it, be sure to drill a hole (approximately 3 mm (0.12 in.) diameter) (2) in it where indicated by arrow in the figure and let gas and oil out.**
  Be sure to wear eye shield since the gas itself is harmless but the absorber drill hole debris maybe blown out.



I4RS0A230005-01

- Inspect for deformation or damage.
- Inspect bushes for wear or damage.
- Inspect for evidence of oil leakage.

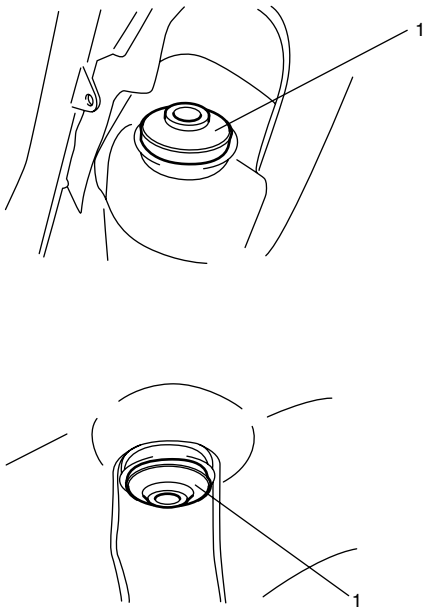
Replace any defective part.

Rear Shock Absorber Bush Removal and Installation

S7N20A2306003

Removal

1) Remove rear shock absorber referring to "Rear Shock Absorber Removal and Installation".
2) Remove rear shock absorber bushes (1).



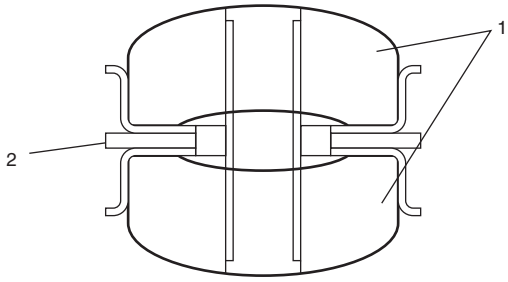
I4RS0A230006-01

Installation

1) Install rear shock absorber bushes (1).

NOTE

For proper installing direction of shock absorber bushes (1), refer to the figure.



I4RS0A230007-01

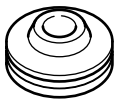
2. Body panel

2) Install rear shock absorber referring to "Rear Shock Absorber Removal and Installation".

Rear Shock Absorber Bush Inspection

S7N20A2306004

Inspect for cracks, deformation or damage. Replace any defective parts.



I4RS0A230008-01

Coil Spring Removal and Installation

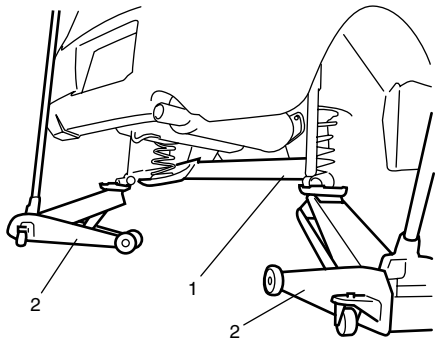
S7N20A2306005

⚠ CAUTION

- **Removal and Installation both coil springs (right and left) at the same time to avoid rear axle twisting and other damage.**
- **Be careful not to let rear axle down too much.**
  It may cause damage to brake flexible hose, wheel speed sensor lead wire and parking brake cable.

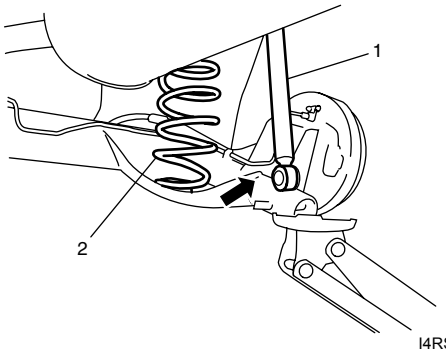
Removal

1) Hoist vehicle and remove rear wheels.
2) Support rear axle (1) by using two floor jacks (2) to prevent it from lowering.



I4RS0A230009-01

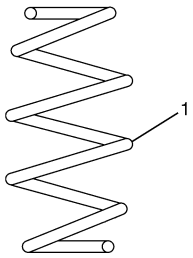
3) Detach shock absorbers (1) lower side (right & left) from rear axle.
4) Lower rear axle gradually as far down as the coil spring (2) can be removed.
5) Remove coil spring (2).

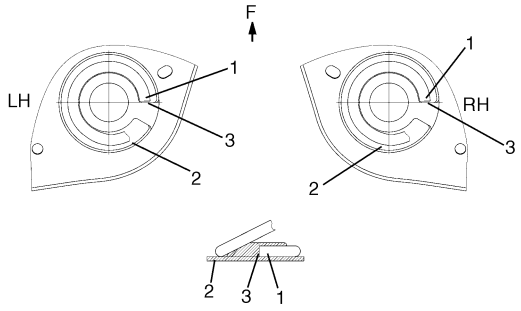


I4RS0A230010-01

Installation

1) Install coil spring (1) on spring seat (2) of rear axle and mate spring open end with stepped part (3) of spring lower seat and raise rear axle.

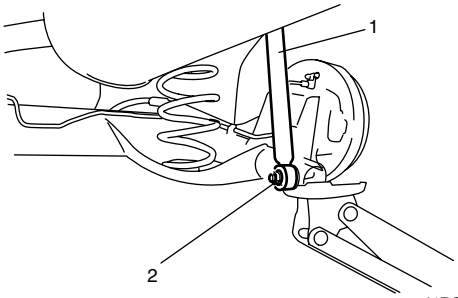




I4RS0A230011-01

F: Vehicle front	RH: Right hand
LH: Left hand	

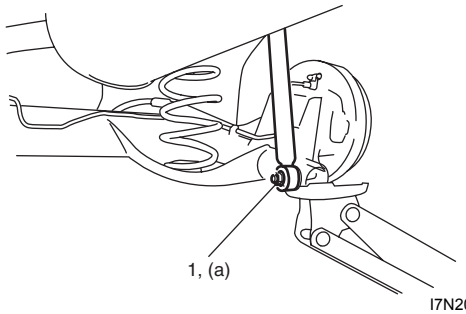
2) Install shock absorbers (1) lower side (right & left) to rear axle.
   Install washers and tighten shock absorber lower nuts (2) temporarily by hand at this step.



I4RS0A230012-01

3) Remove floor jacks from rear axle.
4) Install rear wheels and tighten rear wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
5) Lower hoist and bounce vehicle up and down several times to stabilize suspension.
6) Tighten absorber lower nuts (1) to specified torque.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)

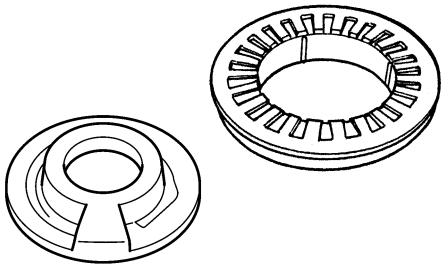


I7N20A230002-01

Spring Upper Seat / Spring Lower Seat Inspection

S7N20A2306006

Inspect for cracks, deformation or damage.
Replace any defective part.



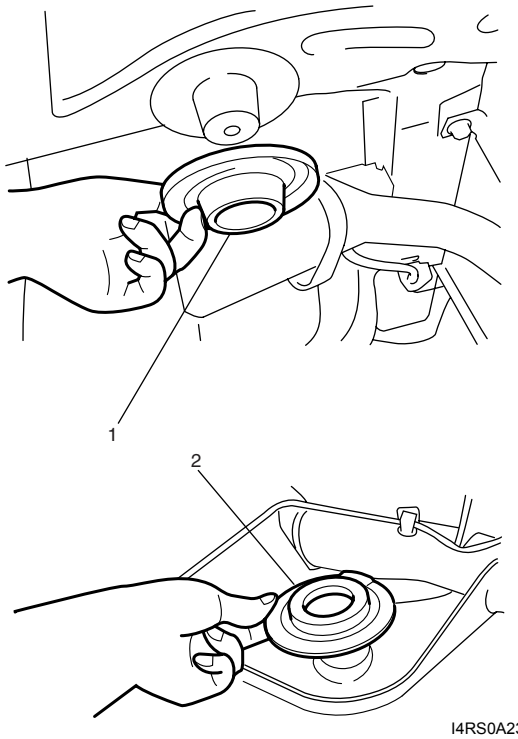
I4RS0A230015-01

Spring Upper Seat and Lower Seat Removal and Installation

S7N20A2306007

Removal

1) Remove coil spring referring to “Coil Spring Removal and Installation”.
2) Remove spring upper seat (1) from vehicle body and lower seat (2) from rear axle.



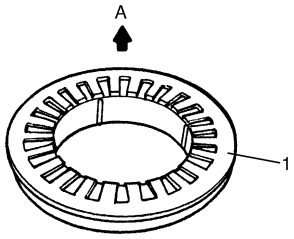
I4RS0A230016-01

Installation

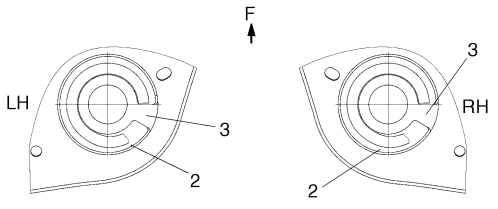
⚠ CAUTION

Install spring upper seat and spring lower seat to specified direction.
Otherwise, noise may occur from coil spring while the vehicle is moving.

1) Install spring upper seat (1) to vehicle body and lower seat (2) to rear axle.



I3RM0A230021-01



I4RS0A230017-01

A: Vehicle body side (Upper side)	LH: Left hand
F: Vehicle front	RH: Right hand
3. Stepped part	

2) Install coil spring referring to “Coil Spring Removal and Installation”.

Rear Axle Removal and Installation (For Drum Brake Type)

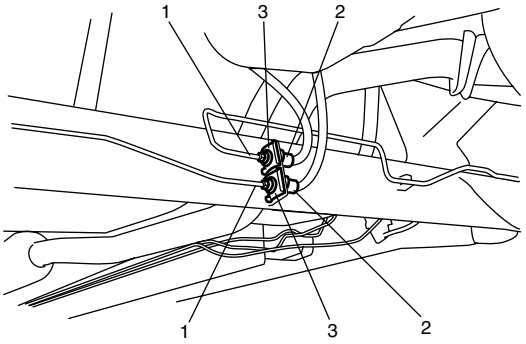
S7N20A2306008

⚠ CAUTION

- **Do not drop brake fluid onto painted surface. Painted surfaces will be damage.**
- **Be careful not to let rear axle down too much.**
  It may cause damage to brake flexible hose, wheel speed sensor lead wire and parking brake cable.
- **Use new rear spindle bolts.**
  Otherwise, nut is loosen.

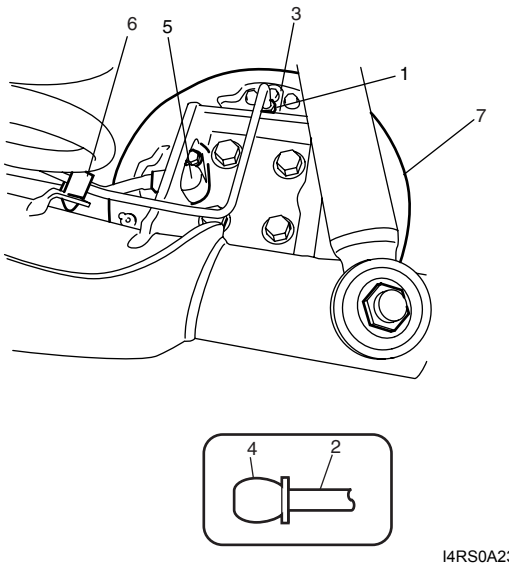
Removal

1) Hoist vehicle and remove rear wheels referring to "Wheel (with Tire) Removal and Installation in Section 2D".
2) Remove rear brake drums (right & left) referring to "Rear Brake Drum Removal and Installation: Drum Brake in Section 4C".
3) Disconnect brake pipes (1) from brake hoses (2) and remove E-rings (3).



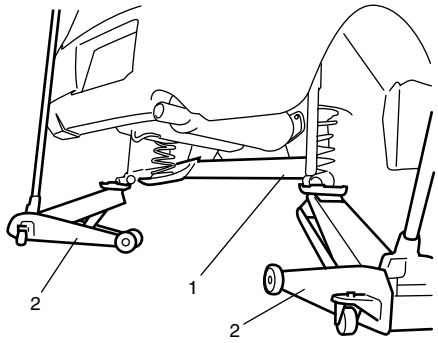
I4RS0A230018-01

4) Disconnect brake pipe flare nuts (1) from wheel cylinders (3) (right & left) and put bleeder plug cap (4) onto pipe (2) to prevent fluid from spilling.
5) Disconnect wheel speed sensors (5) and lead wire clamps (6) (right & left).
6) Remove brake back plates (7) and spindles (right & left) from rear axle and hang removed brake back plate with a wire hook.



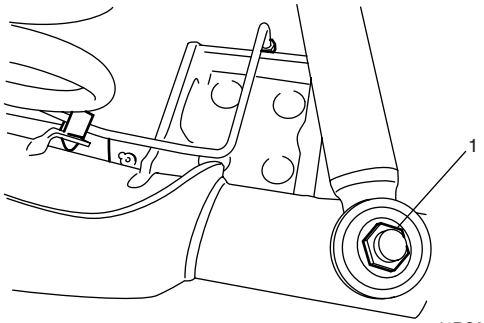
I4RS0A230043-01

7) Support rear axle (1) by using two floor jacks (2).



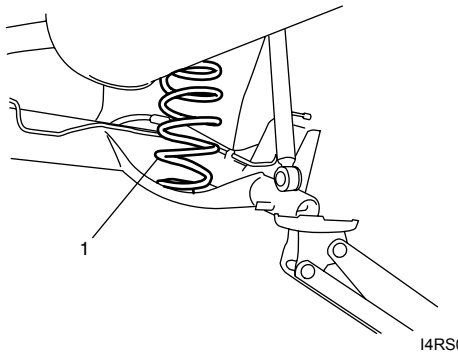
I4RS0A230009-01

8) Remove shock absorber lower washers and nuts (1) (right & left).



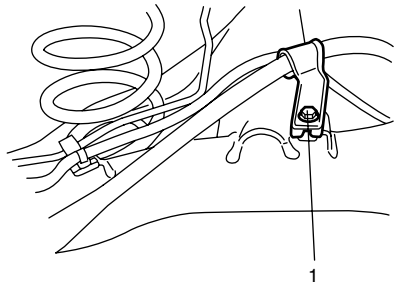
I4RS0A230019-01

9) Lower rear axle gradually as far down as where coil springs (1) (right & left) can be removed.
10) Remove coil springs (1) (right & left).



I4RS0A230020-01

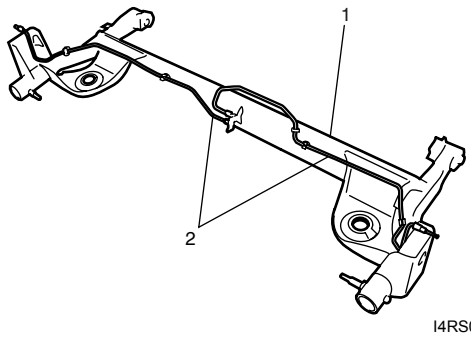
11) Disconnect wheel speed sensor clamp and parking brake cable clamp from rear axle.



I4RS0A230021-01

1. Parking brake cable clamp bolt

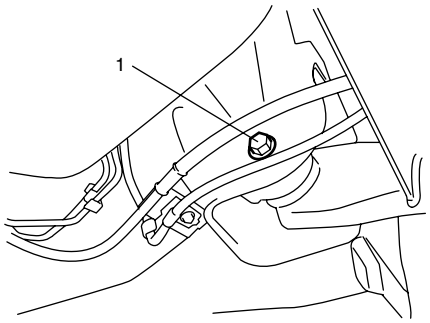
12) While supporting rear axle (1) at both ends (right & left), remove rear trailing arm bolts and then remove rear axle from chassis by lowering floor jack gradually.
13) Remove brake pipes (2) from rear axle (1) if necessary.



I4RS0A230022-01

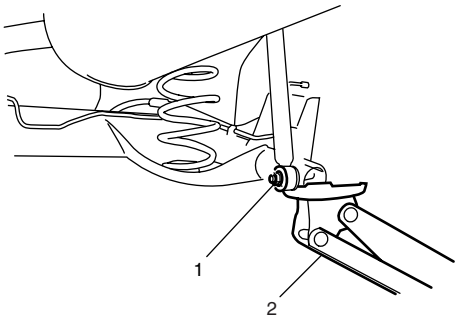
Installation

1) Install brake pipes to rear axle, if removed.
2) Place rear axle on floor jacks.
   Then install trailing arm, washers and new trailing arm bolts (1) (right & left) and tighten bolts temporarily by hand.



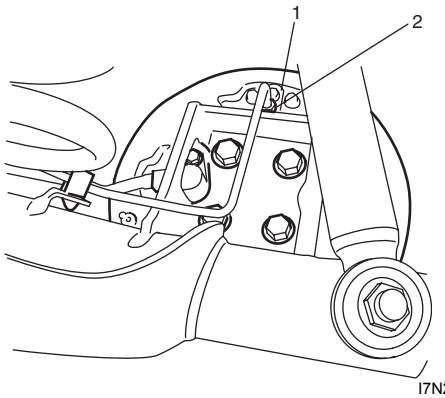
I4RS0A230023-01

3) Install coil springs (right & left) on spring seats of rear axle and then raise rear axle referring to “Coil Spring Removal and Installation”.
4) Install shock absorbers lower side (right & left) and washers, and then manually tighten shock absorber lower nuts (1).
5) Remove floor jacks (2) from rear axle.



I4RS0A230024-01

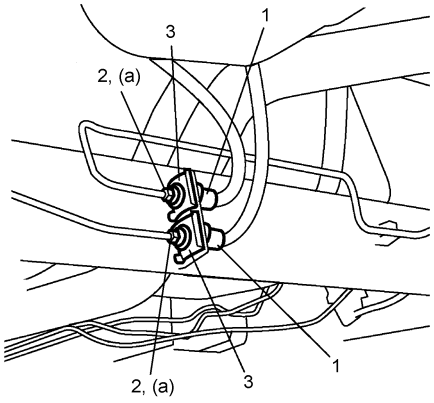
6) Install brake back plates, spindles and new spindle bolts and then tighten spindle bolts to specified torque referring to “Spindle Removal and Installation (For Drum Brake Type)”.
7) Connect wheel speed sensors and lead wire clamps (right & left) referring to “Rear Wheel Speed Sensor Removal and Installation in Section 4E”.
8) Connect brake pipes to wheel cylinders (1) (right & left) and tighten brake pipe flare nuts (2) to specified torque referring to “Wheel Cylinder Removal and Installation: Drum Brake in Section 4C”.



I7N20A230003-01

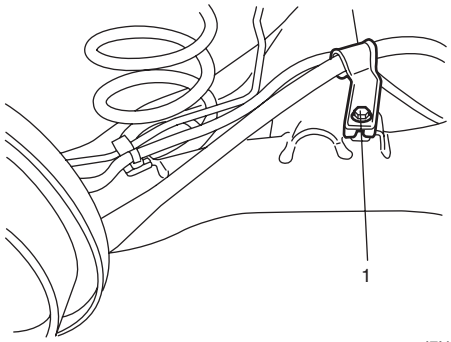
9) Connect brake flexible hoses (1) to bracket on rear axle with E-rings (3) (right & left) and tighten brake pipe flare nuts (2) to specified torque.

Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)



I7N20A230004-03

10) Install wheel speed sensor clamp and parking brake clamp and tighten parking brake clamp bolts (1) to specified torque referring to “Parking Brake Cable Removal and Installation in Section 4D”.



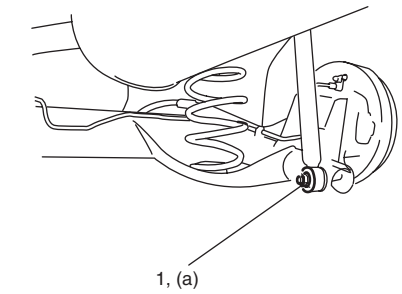
I7N20A230005-01

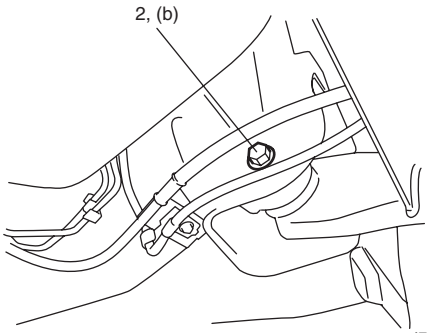
11) Install brake drums (right & left). For details, refer to Steps 2) – 7) of “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”.
12) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see “Air Bleeding of Brake System in Section 4A”.
13) Install rear wheel and tighten rear wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
14) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable. For adjustment, refer to “Parking Brake Inspection and Adjustment in Section 4D”.
15) Lower hoist and bounce vehicle up and down several times to stabilize suspension.
16) Tighten shock absorber lower nuts (1) and rear trailing arm bolts (2) to specified torque.

NOTE

When tightening these nuts and bolts, be sure that vehicle is not on hoist and in unloaded condition.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)
Rear trailing arm bolt (b): 73 N·m (7.3 kgf-m, 53.0 lbf-ft)





I7N20A230006-01

17) Check to ensure that brake drum is free from dragging and proper braking is obtained.
18) Perform brake test (foot brake and parking brake).
19) Check each installed part for fluid leakage.

Rear Axle Removal and Installation (For Disc Brake Type)

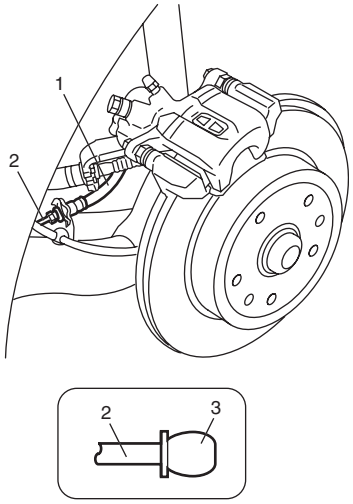
S7N20A2306009

⚠ CAUTION

Do not drop brake fluid onto painted surface. Painted surfaces will be damage.

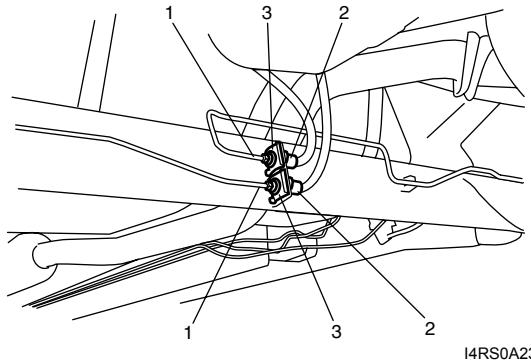
Removal

1) Hoist vehicle and remove rear wheels.
2) Disconnect rear brake caliper flexible hoses (1) (right & left) from brake pipes (2) and put bleeder plug cap (3) onto pipe (2) prevent fluid from spilling.



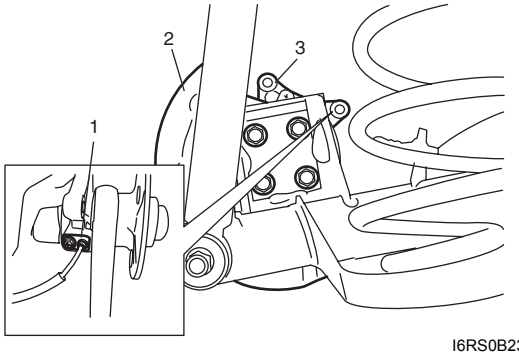
I6RS0B230002-01

3) Remove rear brake caliper assemblies (right & left) and brake discs (right & left). For details, refer to Step 2) to 4) of “Removal” under “Rear Brake Disc Removal and Installation: Disc Brake in Section 4C”.
4) Remove rear wheel hubs (right & left). For details, refer to Step 3) to 5) of “Removal” under “Rear Wheel Hub Removal and Installation (For Disc Brake Type)”.
5) Disconnect brake pipes (1) from brake hoses (2) and remove E-rings (3).



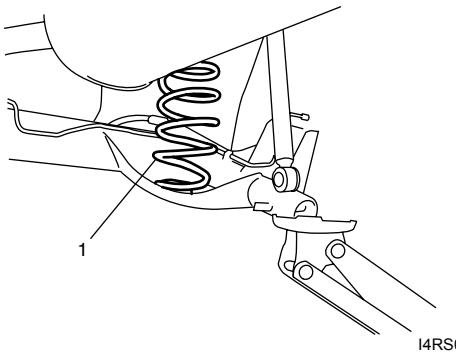
I4RS0A230018-01

6) Disconnect wheel speed sensors (1) and lead wire clamps (right & left).
7) Remove brake disc dust cover (2) and spindles (3) (right & left) from rear axle.



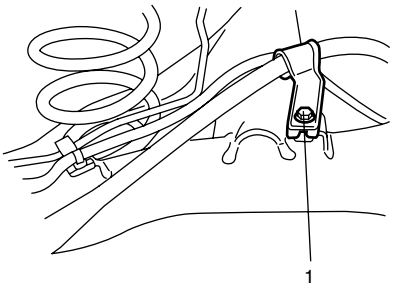
I6RS0B230003-01

8) Remove coil springs (1) (right & left) referring to “Coil Spring Removal and Installation”.



I4RS0A230020-01

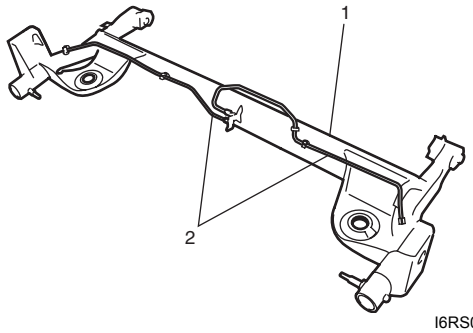
9) Disconnect wheel speed sensor clamp and parking brake cable clamp from rear axle.



I4RS0A230021-01

1. Parking brake cable clamp bolt

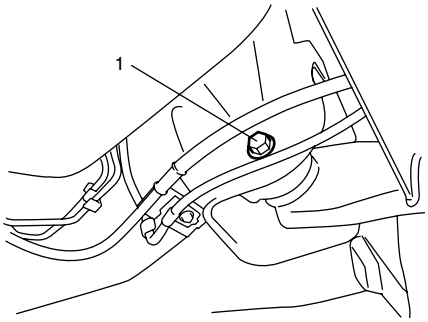
10) While supporting rear axle (1) at both ends (right & left), remove rear trailing arm bolts and then remove rear axle from chassis by lowering floor jack gradually.
11) Remove brake pipes (2) from rear axle (1) if necessary.



I6RS0B230004-01

Installation

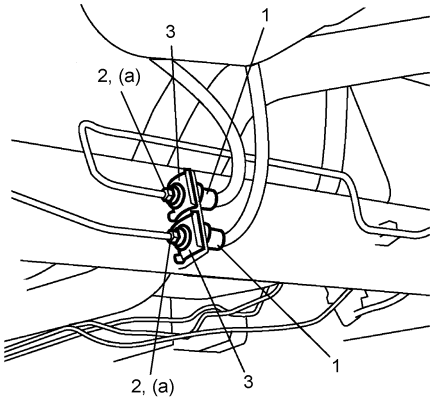
1) Install brake pipes to rear axle, if removed.
2) Place rear axle on floor jacks.
   Then install trailing arm, washers and new trailing arm bolts (1) (right & left) and tighten bolts temporarily by hand.



I4RS0A230023-01

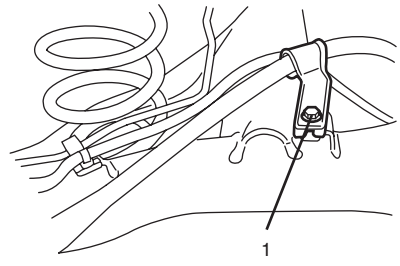
3) Install coil springs (right & left) on spring seats of rear axle referring to “Spring Upper Seat and Lower Seat Removal and Installation” and “Coil Spring Removal and Installation”.
4) Install shock absorbers lower side (right & left) and washers referring to “Rear Shock Absorber Removal and Installation”.
5) Install brake dust covers, spindles and wheel speed sensors (right and left) referring to “Spindle Removal and Installation (For Disc Brake Type)”.
6) Connect wheel speed sensors (1) and lead wire clamps (2) (right & left) referring to “Rear Wheel Speed Sensor Removal and Installation in Section 4E”.
7) Connect brake flexible hoses (1) to bracket on rear axle with E-rings (3) (right & left) and tighten brake pipe flare nuts (2) to specified torque.

   Tightening torque
   Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)



I7N20A230004-03

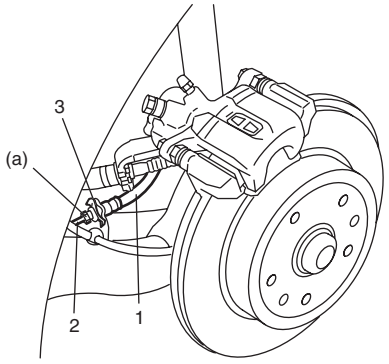
8) Install wheel speed sensor clamp and parking brake clamp and tighten parking brake clamp bolts (1) to specified torque referring to “Parking Brake Cable Removal and Installation in Section 4D”.



I7N20A230007-01

9) Install rear wheel hubs (right & left) referring to “Rear Wheel Hub Removal and Installation (For Disc Brake Type)”.
10) Install brake discs (right & left) and rear brake caliper assemblies (right & left) referring to “Rear Brake Disc Removal and Installation: Disc Brake in Section 4C”.
11) Connect rear brake caliper flexible hoses (1) to brake pipes (2) with E-rings (3) (right & left). Tighten brake pipe flare nuts to specified torque.

Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)



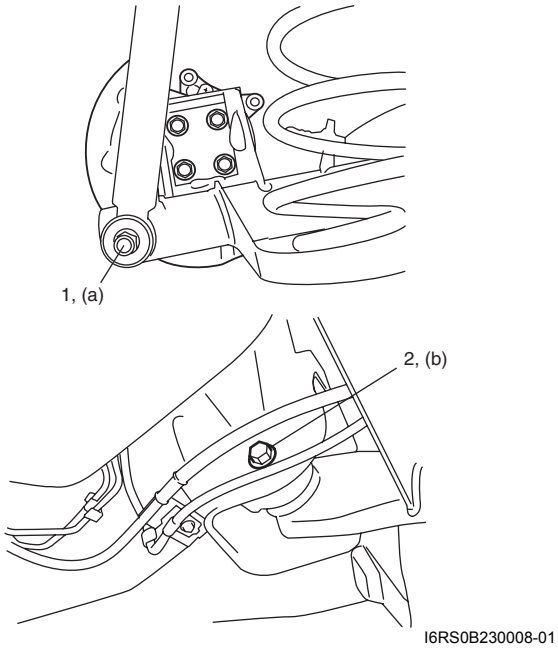
I6RS0B230007-01

12) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see “Air Bleeding of Brake System in Section 4A”.
13) Install rear wheel and tighten rear wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
14) Adjust parking brake cable. For adjustment, refer to “Parking Brake Inspection and Adjustment in Section 4D”.
15) Lower hoist and bounce vehicle up and down several times to stabilize suspension.
16) Tighten shock absorber lower nuts (1) and trailing arm bolts (2) to specified torque.

NOTE

When tightening these nuts and bolts, be sure that vehicle is not on hoist and in unloaded condition.

Tightening torque
Rear shock absorber lower nut (a): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)
Trailing arm bolt (b): 73 N·m (7.3 kgf-m, 53.0 lbf-ft)



I6RS0B230008-01

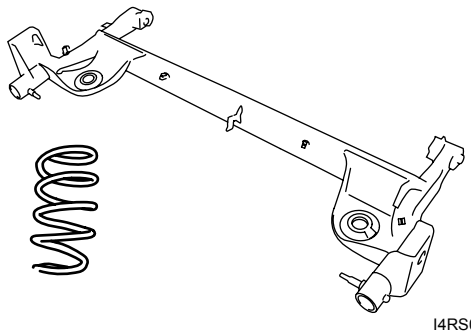
17) Perform brake test (foot brake and parking brake).
18) Check each installed part for fluid leakage.

Trailing Arm, Rear Axle and Coil Spring Inspection

S7N20A2306010

- Inspect for cracks, deformation or damage.
- Inspect bushes for damage, wear or breakage.

Replace any defective part.


I4RS0A230031-01

Rear Axle Bush Inspection

S7N20A2306011

Inspect for cracks, deformation or damage. Replace any defective part.

Wheel Bearing Removal and Installation (For Drum Brake Type)

S7N20A2306012

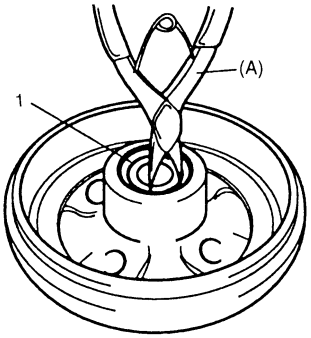
⚠ CAUTION

Never reuse wheel bearing and circlip. Otherwise, abnormal noise and abnormal vibration or any other abnormal condition may occur.

Removal

1) Remove rear brake drum referring to “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”.
2) Remove circlip (1).

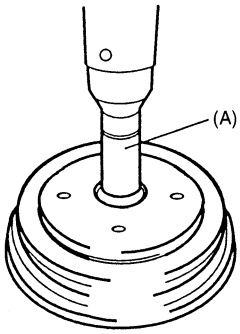
Special tool
(A): 09900–06108



I3RM0A230046-01

3) Remove wheel bearing by using special tool and hydraulic press.

Special tool
(A): 09913–76010



I3RM0A230047-01

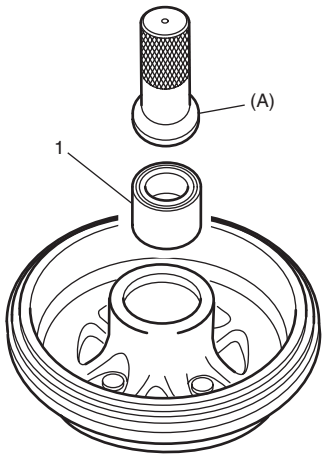
Installation

1) Install new wheel bearing (1) by using special tool and hydraulic press.

NOTE

Seal side of bearing is at brake back plate side.

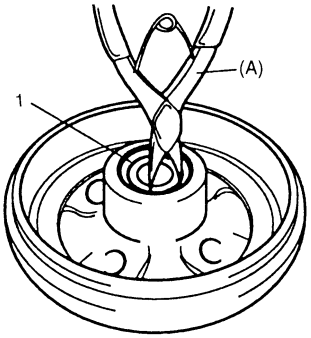
Special tool
(A): 09925–15410



I7N20A230008-01

2) Install new circlip (1).

Special tool
(A): 09900–06108



I3RM0A230046-01

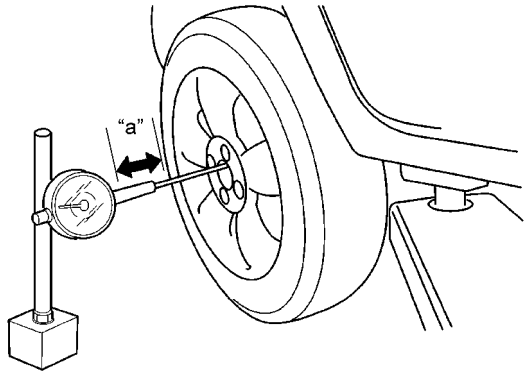
3) Install brake drum and rear wheels, referring to Steps 2) – 10) of “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”.

Rear Wheel Disc, Bolt and Bearing Inspection (For Drum Brake Type)

S7N20A2306013

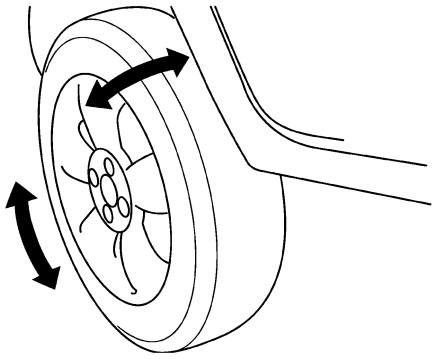
- Check tightness of wheel bolts and, if necessary, retighten to specified torque.
- Check wheel disc deformation, damage, crack and etc.
  Replace defective disc with new one.
- Check installation face inside of wheel disc for rust. As rust affects adversely, remove it thoroughly.
- Check wear of wheel bearings. When measuring thrust play, apply a dial gauge to axle shaft center. When the thrust play exceeds limit, replace bearing.

  Rear wheel bearing thrust play "a"
  Limit: 0.1 mm (0.004 in.)



I7RS0A230002-02

- Check noise and smooth rotation of wheel by rotating wheel. If it is defective, replace bearing.



I3RM0A230050-01

Spindle Removal and Installation (For Drum Brake Type)

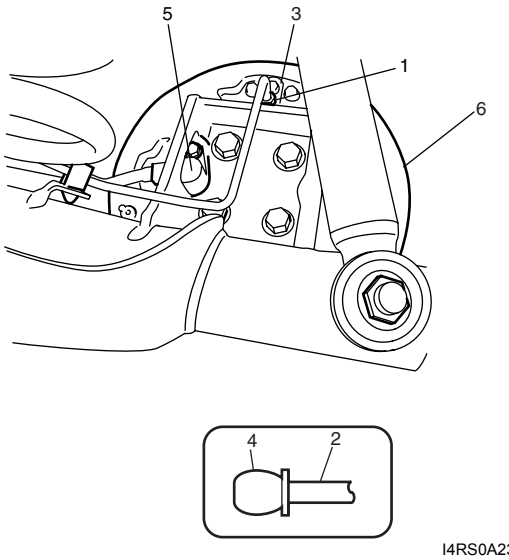
S7N20A2306014

⚠ CAUTION

- **Do not drop brake fluid onto painted surface. Painted surfaces will be damage.**
- **Use new rear spindle bolts. Otherwise, bolts may loosen.**

Removal

1) Remove brake drum referring to "Rear Brake Drum Removal and Installation: Drum Brake in Section 4C".
2) Disconnect brake pipe flare nut (1) from wheel cylinder (3) and put bleeder plug cap (4) onto pipe (2) to prevent fluid from spilling.
3) Disconnect wheel speed sensor (5).
4) Remove brake back plate (6) and spindle from rear axle and hang removed brake back plate with a wire hook.



I4RS0A230040-01

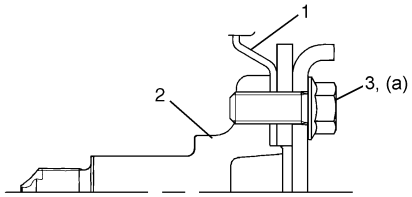
Installation

⚠ CAUTION

Never reuse the removed rear spindle bolts.

1) Install brake back plate (1), spindle (2) and new spindle bolts (3) and then tighten spindle bolts (3) to specified torque.

Tightening torque
Rear spindle bolt (a): 88 N·m (8.8 kgf-m, 64.0 lbf-ft)



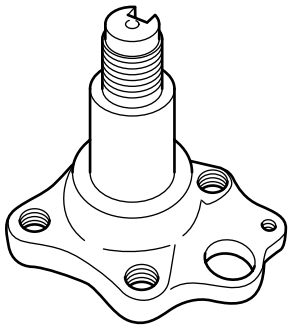
I7N20A230009-01

2) Connect wheel speed sensor and tighten wheel speed sensor bolt to specified torque referring to "Rear Wheel Speed Sensor Removal and Installation in Section 4E".
3) Connect brake pipes to wheel cylinder and tighten brake pipe flare nut to specified torque referring to "Wheel Cylinder Removal and Installation: Drum Brake in Section 4C".
4) Install brake drum referring to Steps 2) – 7) of "Rear Brake Drum Removal and Installation: Drum Brake in Section 4C".
5) Fill reservoir with brake fluid and bleed brake system. For bleeding operation, see "Air Bleeding of Brake System in Section 4A".
6) Install wheel and tighten wheel bolts to specified torque referring to "Wheel (with Tire) Removal and Installation in Section 2D".
7) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable. For adjustment, see "Parking Brake Inspection and Adjustment in Section 4D".
8) Check to ensure that brake drum is free from dragging and proper braking is obtained.
9) Perform brake test (foot brake and parking brake).
10) Check each installed part for fluid leakage.

Spindle Inspection (For Drum Brake Type)

S7N20A2306015

- Inspect for cracks, deformation or damage. Replace any defective part.



I4RS0A230042-01

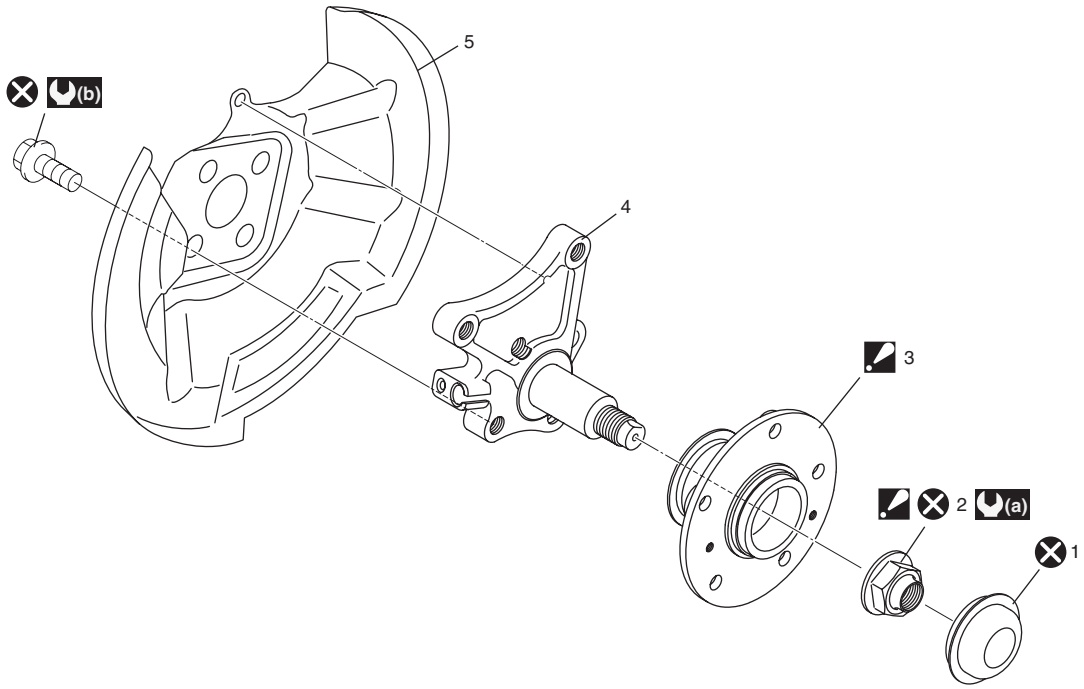
Rear Suspension Fasteners Inspection (For Drum Brake Type)

S7N20A2306016

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque referring to the figure in "Rear Suspension Construction (For Drum Brake Type)".

Rear Wheel Hub Components (For Disc Brake Type)

S7N20A2306017



I7N20A230010-01

1. Spindle cap	4. Spindle	(b) : 88 N·m (8.8 kgf-m, 64.0 lbf-ft)
2. Rear axle nut :Caulk, after Tightening	5. Disc dust cover	: Do not reuse.
3. Rear wheel hub assembly :Never disassemble wheel hub assembly	(a) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)	

Rear Wheel Hub Removal and Installation (For Disc Brake Type)

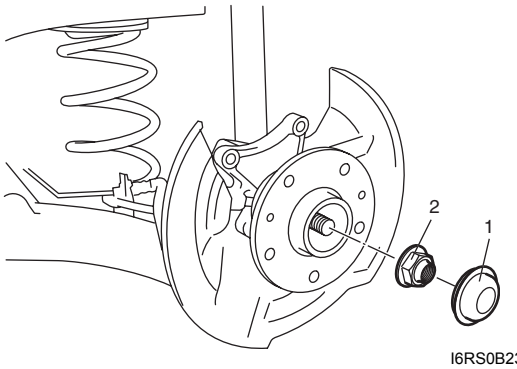
S7N20A2306018

⚠ CAUTION

- **Use new rear axle nut. Otherwise, nut may loosen.**
- **Be careful not to damage the rear axle nut while caulking it. If it is damaged, replace it with new one.**
- **Use new rear spindle bolts. Otherwise, bolts may loosen.**

Removal

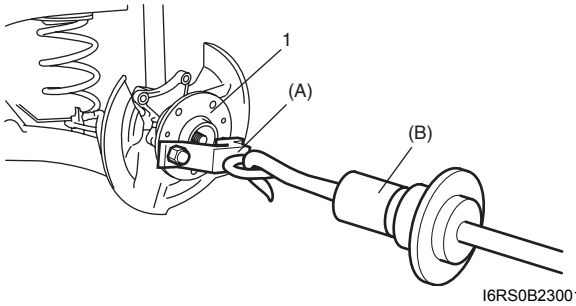
1) Hoist vehicle and remove wheel.
2) Remove rear brake caliper assembly and rear brake disc referring to “Rear Brake Disc Removal and Installation: Disc Brake in Section 4C”.
3) Remove spindle cap (1) by hammering lightly at 3 locations around it so as not to deform or cause damage to seating part of cap.
4) Uncaulk and remove rear axle nut (2).



I6RS0B230010-01

5) Using special tools, draw out rear wheel hub assembly (1).

Special tool
(A): 09943–17912
(B): 09942–15511

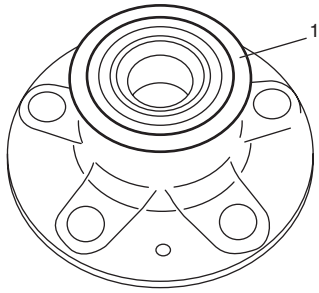


I6RS0B230011-01

Installation

Install rear wheel hub assembly by reversing removal procedure noting the following instructions.

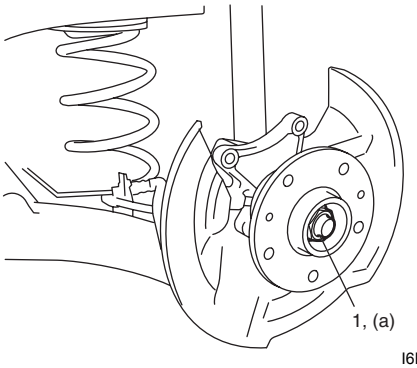
- Never apply grease to encoder (1).



I6RS0B230012-01

- Install new rear axle nut (1) and tighten to specified torque.

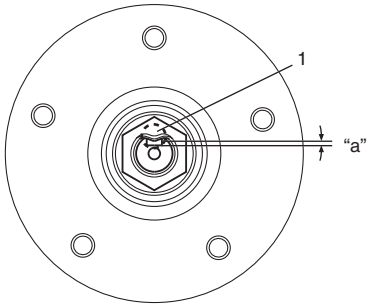
Tightening torque
Rear axle nut (a): 175 N·m (17.5 kgf-m, 126.5 lbf-ft)



I6RS0B230013-01

- Caulk new rear axle nut (1) as shown.

Caulk specification
“a”: 0.5 mm (0.02 in.) or more



I6RS0B230014-01

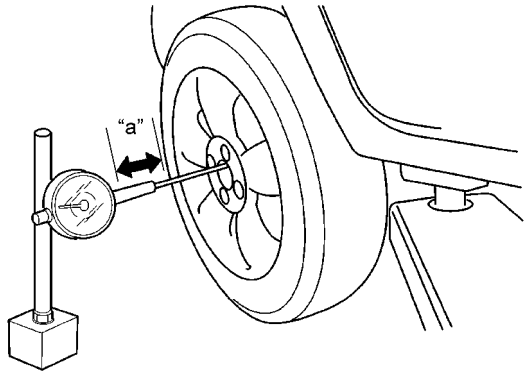
- Install new spindle cap.

Rear Wheel Disc, bolt and Bearing Inspection

S7N20A2306019

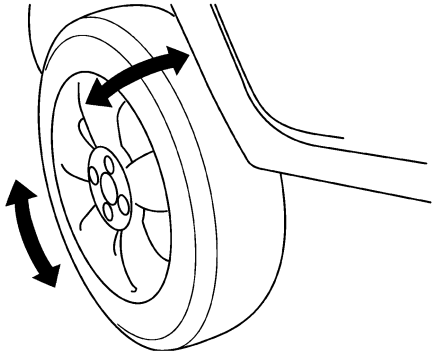
- Check tightness of wheel bolts and, if necessary, retighten to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
- Check wheel disc deformation, damage, crack and etc.
  Replace defective disc with new one.
- Check installation face inside of wheel disc for rust. As rust affects adversely, remove it thoroughly.
- Check wear of wheel bearings. When measuring thrust play, apply a dial gauge to axle shaft center. When the thrust play exceeds limit, replace bearing.

  Thrust play limit
  “a”: 0.1 mm (0.004 in.)



I7RS0A230002-02

- Check noise and smooth rotation of wheel by rotating wheel. If it is defective, replace rear wheel hub assembly.



I3RM0A230050-01

Spindle Removal and Installation (For Disc Brake Type)

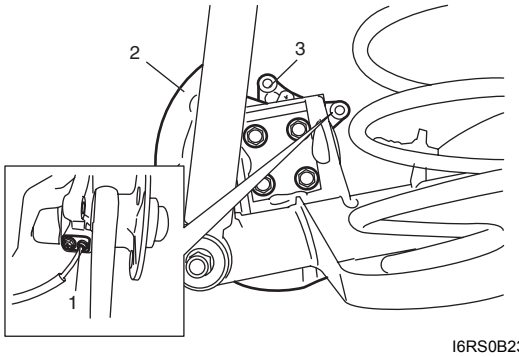
S7N20A2306020

⚠ CAUTION

- **Do not drop brake fluid onto painted surface. Painted surfaces will be damage.**
- **Use new rear spindle bolts. Otherwise, bolts may loosen.**

Removal

1) Remove rear brake caliper assembly and brake disc referring to “Rear Brake Disc Removal and Installation: Disc Brake in Section 4C”.
2) Remove rear wheel hub “Rear Wheel Hub Removal and Installation (For Disc Brake Type)”.
3) Disconnect wheel speed sensor (1).
4) Remove brake disc dust cover (2) and spindle (3) from rear axle.



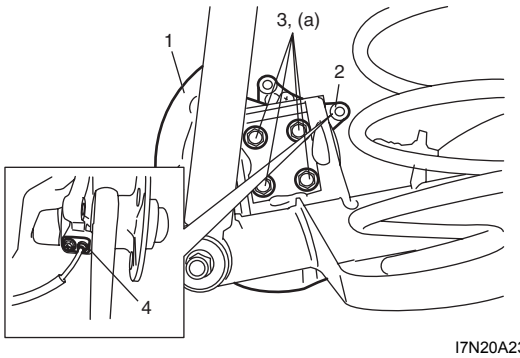
I6RS0B230015-01

Installation

1) Install brake disc dust cover (1), spindle (2) and new spindle bolts (3) and then tighten spindle bolts to specified torque.

   Tightening torque
   Rear spindle bolt (a): 88 N·m (8.8 kgf-m, 64.0 lbf-ft)

2) Connect wheel speed sensor (4) and tighten wheel speed sensor bolt to specified torque referring to “Rear Wheel Speed Sensor Removal and Installation in Section 4E”.



I7N20A230011-01

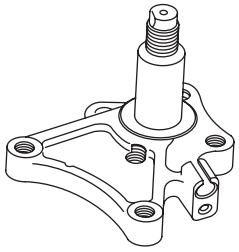
3) Install rear wheel hub referring to “Rear Wheel Hub Removal and Installation (For Disc Brake Type)”.
4) Install brake disc and rear brake caliper assembly referring to “Rear Brake Disc Removal and Installation: Disc Brake in Section 4C”.
5) Install wheel and tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
6) Adjust parking brake cable. For adjustment, see “Parking Brake Inspection and Adjustment in Section 4D”.
7) Perform brake test (foot brake and parking brake).
8) Check each installed part for fluid leakage.

Spindle Inspection (For Disc Brake Type)

S7N20A2306021

- Inspect for cracks, deformation or damage.

Replace any defective part.



I6RS0B230017-01

Rear Suspension Fasteners Inspection

S7N20A2306022

Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque referring to the figure in “Rear Suspension Construction (For Drum Brake Type)”.

Specifications

Tightening Torque Specifications

S7N20A2307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Rear shock absorber upper nut	28	2.8	20.0	☞
Rear shock absorber lower nut	90	9.0	65.0	☞ / ☞ / ☞ / ☞
Brake pipe flare nut	16	1.6	11.5	☞ / ☞ / ☞
Rear trailing arm bolt	73	7.3	53.0	☞
Trailing arm bolt	73	7.3	53.0	☞
Rear spindle bolt	88	8.8	64.0	☞ / ☞
Rear axle nut	175	17.5	126.5	☞

NOTE

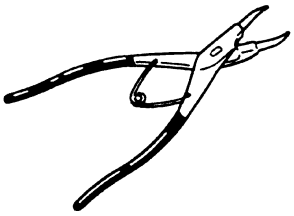
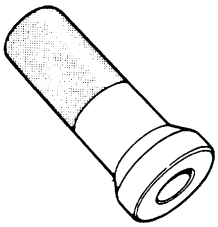
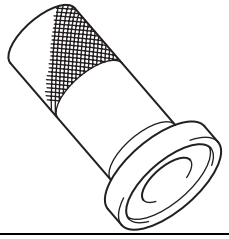
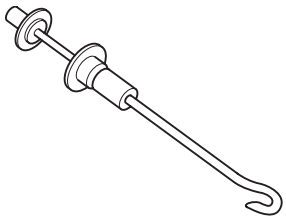
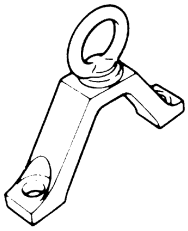
The specified tightening torque is also described in the following.
“Rear Suspension Construction (For Drum Brake Type): ”
“Rear Suspension Construction (For Disc Brake Type): ”
“Rear Wheel Hub Components (For Disc Brake Type): ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A2308001

09900–06108 Snap ring pliers (closing type) ☞ / ☞ 	09913–76010 Bearing installer ☞ 
09925–15410 Oil seal installer ☞ 	09942–15511 Sliding hammer ☞ 
09943–17912 Wheel hub remover ☞ 	

Wheels and Tires

Precautions

Precaution for Emergency Flat Tire Repair Kit

S7N20A2400001

⚠ WARNING

Flat tire repair sealant including in kit is harmful. Be sure to observe the following. Otherwise, your health may be ruined.

- **If swallowed, get medical attention immediately.**
- **Keep out of reach of children.**
- **Select place where there is good ventilation for this work.**
- **If it enters eye or contacts skin, wash thoroughly with water. If anything abnormal still remains, get medical attention immediately.**
- **Do not discard tire containing sealant as it is. Make sure to remove sealant from tire, referring to "Tire Repair for Emergency Repaired-Tire with Sealant".**
- **Dispose of sealant as waste oil.**

⚠ CAUTION

- **When tire repaired with Emergency Flat Tire Repair Kit is brought in, remove flat tire repair sealant from tire and repair flat tire referring to "Tire Repair for Emergency Repaired-Tire with Sealant".**
- **Sealant expiration date is printed on bottle label. if it expires, sealant should be replaced with a new one to ensure emergency flat tire repair.**

General Description

Tires Description

S7N20A2401001

The tire is of tubeless type. The tire is designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressures.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

Tire Placard

The "Tire Placard" is located on the left or right door lock pillar and should be referred to tire information.
The placard lists the maximum load, tire size and cold tire pressure where applicable.

NOTE

Whether rim size and/or maximum load are listed or not depends on regulations of each country.

Inflation of Tires

The pressure recommended for any model is carefully calculated to give a satisfactorily 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. Set to the specifications on the "Tire Placard" located on the left door lock pillar.
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".

Higher than recommended pressure can cause:

- Hard ride
- Tire bruising or carcass damage
- Rapid tread wear at center of tire

Unequal pressure on same axle can cause:

- Uneven braking
- Steering lead
- Reduced handling
- Swerve on acceleration

Lower than recommended pressure can cause:

- Tire squeal on turns
- Hard Steering
- Rapid and uneven wear on the edges of the tread
- Tire rim bruises and rupture
- Tire cord breakage
- High tire temperature
- Reduced handling
- High fuel consumption

Matched Tires and Wheels (Steel Type)

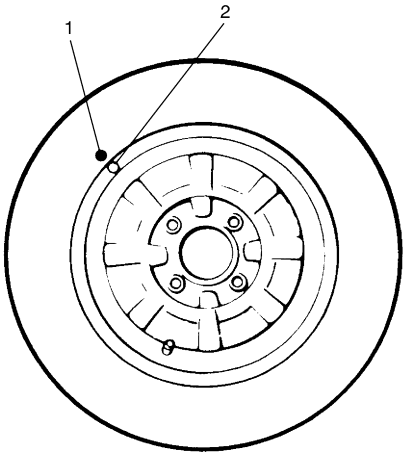
Tires and wheels are match mounted at the assembly plant.

This means that the radially stiffest part of the tire, or "high spot", is matched to the smallest radius or "low spot" of the wheel.

This is done to provide the smoothest possible ride.

The "high spot" of the tire is originally marked by paint dot (1) on the outboard sidewall. This paint dot will eventually wash off the tire.

The "low spot" of the wheel is originally marked by paint dot (2) on the wheel rim-flange. Properly assembled, the wheel rims' paint dot should be aligned with the tires' paint dot as shown in figure.



I2RH01240001-01

Whenever a tire is dismounted from its wheel, it should be remounted so that the tire and wheel are matched. If the tire's paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

Replacement Tires

⚠ WARNING

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.

When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard. Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire 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 necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

The metric term for tire inflation pressure is the kilo pascal (kPa). Tire pressures is usually printed in both kPa and kgf/cm^2 on the "Tire Placard".

Metric tire gauges are available from tool suppliers. The chart, shown the table, converts commonly used inflation pressures from kPa to kgf/cm^2 and psi.

	kPa	kgf/cm^2	psi
Conversion: 1 psi = 6.895 kPa 1 kgf/cm^2 = 98.066 kPa	160	1.6	23
	180	1.8	26
	200	2.0	29
	220	2.2	32
	240	2.4	35
	260	2.6	38
	280	2.8	41
	300	3.0	44

Wheels Description

S7N20A2401002

Wheel Maintenance

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

Replacement Wheels

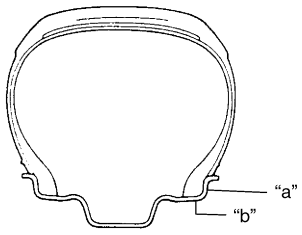
Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, air leak through welds, have elongated bolt holes, if lug wheel bolts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in the following may cause objectional vibrations.

Replacement wheels must be equivalent to the original equipment wheels in load capacity, diameter, rim with offset and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer / odometer calibration, vehicle ground clearance and tire clearance to body and chassis.

How to Measure Wheel Runout
To measure the wheel runout, it is necessary to use an accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement.
Take measurements of both lateral runout “a” and radial runout “b” at both inside and outside of the rim flange. With the dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.
When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

Lateral runout limit “a”
Aluminum wheel: 0.3 mm (0.012 in.)
Steel wheel: 0.9 mm (0.035 in.)

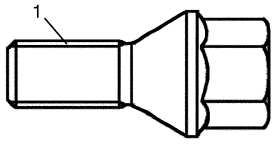
Radial runout limit “b”
Aluminum wheel: 0.3 mm (0.012 in.)
Steel wheel: 0.7 mm (0.028 in.)



I4RS0A240001-01

Metric Lug Bolts and Wheel Studs
All models use metric lug wheel bolts (1).

Metric lug wheel bolt size
M12 x 1.5



I3RM0A240001-01

Irregular and/or Premature Wear Description

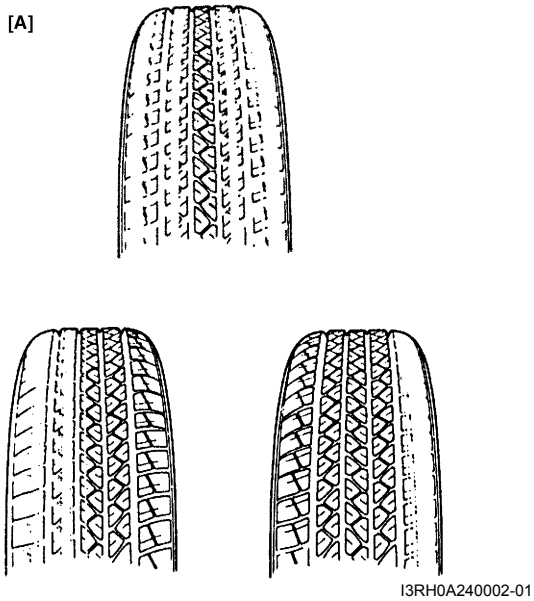
S7N20A2401003

Irregular and premature wear has many causes. Some of them are as follows: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.
If the following conditions are noted, tire rotation is necessary:

- Front tire wear is different from rear’s.
- Uneven wear exists across tread of any tires.
- Both sides of front tire wears are not even.
- Both sides of rear tire wears are not even.
- There is cupping, flat spotting, etc.

A wheel alignment check is necessary if following conditions are noted:

- Both sides of front tire wears are not even.
- Wear is uneven across the tread of any front tire.
- Front tire treads have scuffed appearance with “feather” edges on one side of tread ribs or blocks.



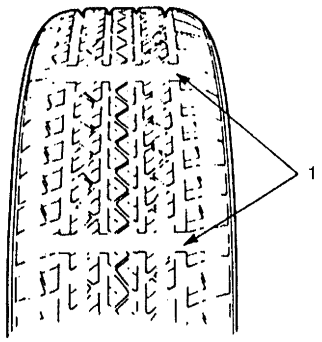
I3RH0A240002-01

[A]:	Hard Cornering, under inflation or lack of tire rotation
[B]:	Incorrect wheel alignment, tire construction not uniform or wheel heavy acceleration

Wear Indicators Description

S7N20A2401004

Original equipment tires have built-in tread wear indicators (1) to show when they need replacement. These indicators (1) will appear as 12 mm (0.47 in) wide bands when the tire tread depth becomes 1.6 mm (0.063 in).
When the indicators (1) appear in 3 or more grooves at 6 locations, tire replacement is recommended.

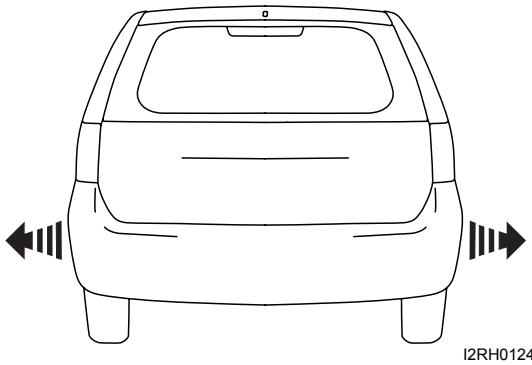


I2RH01240005-01

Radial Tire Waddle Description

S7N20A2401005

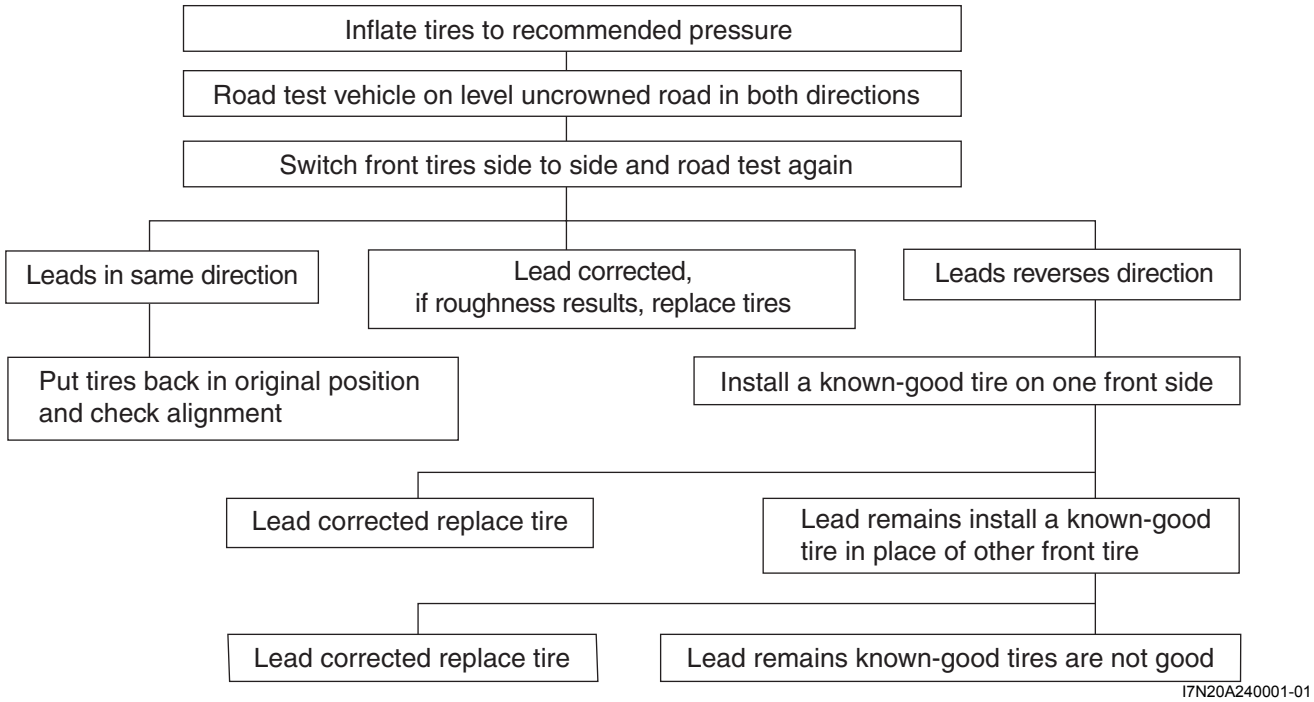
Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at a low speed, 8 to 48 kph (5 to 30 mph).
It is possible to locate the faulty tire by road testing the vehicle. If it is on the rear, the rear end of the vehicle shakes from side to side or “waddles”. To the driver in the seat, it feels as though someone is pushing on the side of vehicle.
If the faulty tire is on the front, waddling is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in vehicle.
Waddle can be quickly diagnosed by using Tire Problem Detector (TPD) and following the equipment manufacture’s recommendations.
If TPD is not available, an alternative method of substituting known-good tire / wheel assemblies can be used as follows, although it takes a longer time.



I2RH01240006-01

1) Ride vehicle to determine whether the front or rear waddles.
2) Install tires and wheels that are known to be good (on similar vehicle) in place of those on waddling end of vehicle. If waddling end cannot be identified, substitute rear ones.
3) Road test again. If improvement is noted, reinstall originals one at a time till waddle causal tire is found. If no improvement is noted, install known-good tires in place of all four. Then reinstall originals in the same manner.

Equipment manufacture’s recommendations



I7N20A240001-01

Radial Tire Lead / Pull Description

S7N20A2401006

"Lead / Pull" is the deviation of the vehicle from a straight path on a level road even with no pressure on the steering wheel.
Lead is usually caused by the following conditions.

- Improper tire and wheel alignment.
- Uneven brake assemblies.
- Tire construction.

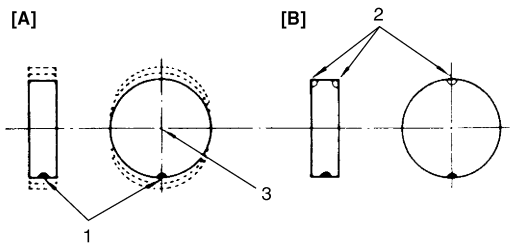
The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire has a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.
The procedure in the figure (Lead Diagnosis) should be used to make sure that wheel alignment is not mistaken for tire lead.

- Part of the lead diagnosis procedure is different from the proper tire rotation pattern currently in the owner and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed.
- Rear tires will not cause lead.

Balancing Wheels Description

S7N20A2401007

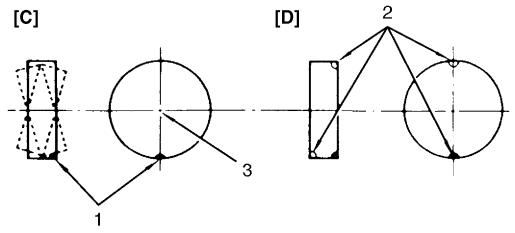
There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in figure, is the equal distribution of weight around the wheel. Wheels that are statically unbalanced cause a bouncing action called tramp. This condition will eventually cause uneven tire wear.



I2RH01240008-01

1. Heavy spot wheel tramp	[A]: Before correction
2. Balance weights addition point	[B]: Corrective weights
3. C/L of spindle	

Dynamic balance, as shown in figure, is the equal distribution of weight on each side of the wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.



I2RH01240009-01

1. Heavy spot wheel shimmy	[C]: Before correction
2. Balance weights addition point	[D]: Corrective weights
3. C/L of spindle	

Repair Instructions

General Balance Procedures

S7N20A2406001

⚠ 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, 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

⚠ WARNING

Wheel spin should be limited to 55 km/h (35 mph) 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

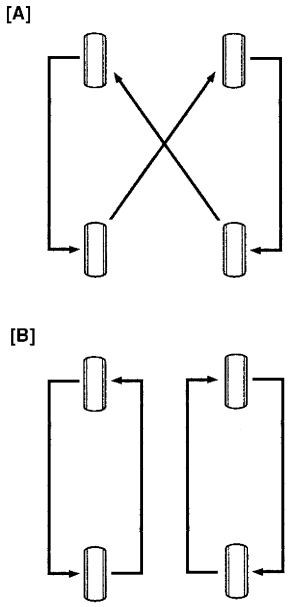
For vehicle equipped with ABS or ESP®, using on-vehicle balancing method with ignition switch ON may set malfunction diagnostic trouble code (DTC) of ABS or ESP® even when system is in good condition.
Never turn ignition switch ON while spinning wheel.

On-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

Tire Rotation

S7N20A2406002

To equalize wear, rotate tires according to figure. Radial tires should be rotated periodically. Set tire pressure.



I6RS0C240002-01

[A]:	Rotation direction is not indicated.
[B]:	Rotation direction is indicated on the side wall of tire.

Wheel (with Tire) Removal and Installation

S7N20A2406003

⚠ WARNING

Do not removal all of the wheel bolts at once, because all the wheels of this vehicle are mounted by the wheel bolts.
Leave a bolt at least not to drop the wheel. Support the wheel and/or tire and then remove the bolt(s) left with the wheel.

⚠ CAUTION

Never use heat to loosen tight wheel because the application of heat to wheel causes the wheel life shorter and the wheel bearing damage.

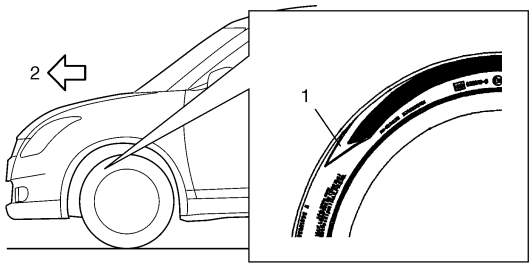
Removal

1) Loosen wheel bolts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Make sure that the vehicle will not fall off by trying to move vehicle body in both ways.
4) Remove wheel bolts except one.
5) Support the wheel and/or tire not to drop the wheel and then remove the bolt left with the wheel.

Installation

⚠ CAUTION

When installing wheel (with tire) which has arrow (1) indicating tire rotation direction on its side, make sure that arrow direction is same as actual tire rotation direction when vehicle is moving forward (2). Otherwise, water drainage performance and straight line vehicle stability will be affected.



I6RS0B240005-01

For installation, reverse removal procedure, noting the following.

- Wheel bolts must be tightened in sequence and to specified torque to avoid bending wheel or brake disc.

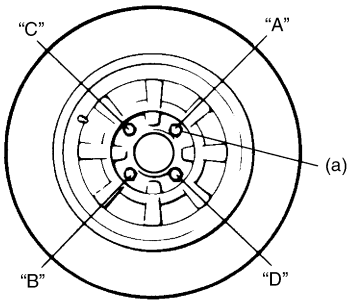
NOTE

Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel bolts to loosen, which can later allow a wheel to come off while vehicle is moving.

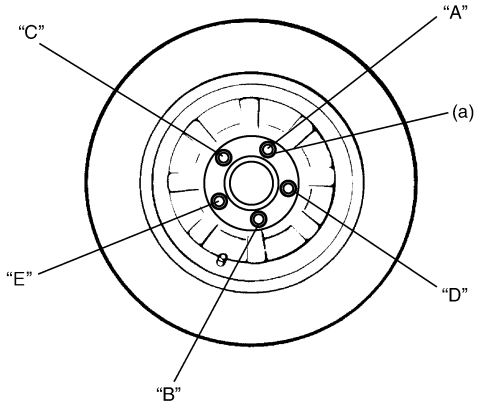
Tightening order
"A" – "B" – "C" – "D" (other than M16A engine model)
"A" – "B" – "C" – "D" – "E" (M16A engine model)

Tightening torque
Wheel bolt (a): 85 N·m (8.5 kgf-m, 61.5 lbf-ft)

[A]



[B]



I6RS0B240002-01

[A]:	Other than M16A engine model
[B]:	For M16A engine model

Tire Mounting and Dismounting

S7N20A2406004

⚠ WARNING

Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury. Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and reinflate. Over inflation may cause bead to break and cause serious personal injury.

⚠ CAUTION

When installing tire which has arrow indicating tire rotation direction to wheel, make sure that this tire rotation direction is same as actual tire rotation direction when vehicle is moving forward. Otherwise, it is not possible to install wheel with tire to vehicle in specified direction.

Use a tire changing machine to mount or dismount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.
Rim bead seats should be cleaned with a wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or dismounting a tire, bead area should be well lubricated with approved tire lubricant.
After mounting, inflate to specified pressure shown on tire placard so that beads are completely seated. Install valve core and inflate to proper pressure.

Tire Repair

S7N20A2406005

There are many different materials and techniques on the market to repair tires. As not all of these work 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.

Tire Repair for Emergency Repaired-Tire with Sealant

S7N20A2406006

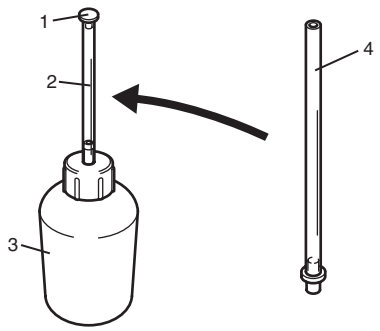
⚠ WARNING

Be sure to observe "Precaution for Emergency Flat Tire Repair Kit". Otherwise, your health may be ruined.

⚠ CAUTION

Be sure to use new valve core. Otherwise, air leak may occur due to sealant attached to valve core.

1) Remove flat tire repair sealant from tire using plug (1), filler hose (2), sealant bottle (3) and extension hose (4) in kit as follows.
   a) Remove plug from filler hose of sealant bottle. Then connect extension hose to tip of filler hose.



I6RS0B240004-01

   b) Remove tire containing flat tire repair sealant from vehicle.
   c) Loosen valve core carefully to release air.

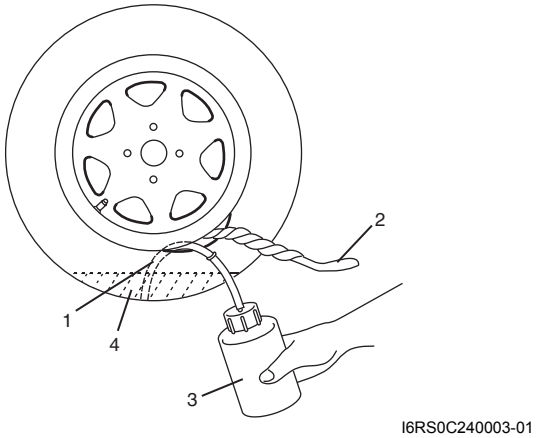
⚠ WARNING

Take care not to make sealant blast out from valve. Otherwise, your health may be ruined.

   d) Remove tire bead inside rim of wheel.
   e) Make a clearance by inserting a tire lever (2) between tire bead and rim, and then insert hose (1) thought clearance as shown in figure.
   f) Press the bottle and suck out sealant (4), using bottle (3) as a pump.

NOTE

To make sealant easy to suck up from tire, set bottle lower than sealant surface.



I6RS0C240003-01

   g) Change hose end position and repeat above step f) until sealant is not sucked out.
   h) Put cap on bottle so that collected sealant does not leak.
2) Check tire if it can be repaired, referring to "Tire Repair". If it cannot be repaired, replace it with new one.
3) Replace valve core of flat tire with new one if tire is reused after repairing.
4) Install tire to rim of wheel, check that there is no air leakage and adjust it to specified pressure shown on tire placard.

Specifications

Wheels and Tires Specifications

S7N20A2407001

Tire size (Standard)
Other than M16A engine model: 165/70R14 81T or 185/60R15 84H
For M16A engine model: 185/60R15 84H, 195/50R16 84V or 195/45R17 81W

Wheel size (Standard)
Other than M16A engine model: 14 x 5 J (for 165/70R14), 15 x 5 1/2 J (for 185/60R15) or 15 x 5 1/2 JJ (for 185/60R15)
For M16A engine model: 16x 6 J (for 195/50R16), 17 x 6 1/2 J (for 195/45R17)

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 came with the vehicle.**

Tightening Torque Specifications

S7N20A2407002

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Wheel bolt	85	8.5	61.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information in Section 0A".

Section 3

Driveline / Axle

CONTENTS

Precautions

Precautions

Precautions for Driveline / Axle

S7N20A3000001

Fastener Caution
Refer to “Fastener Caution in Section 00”.

Drive Shaft / Axle

General Description

Front Drive Shaft Construction

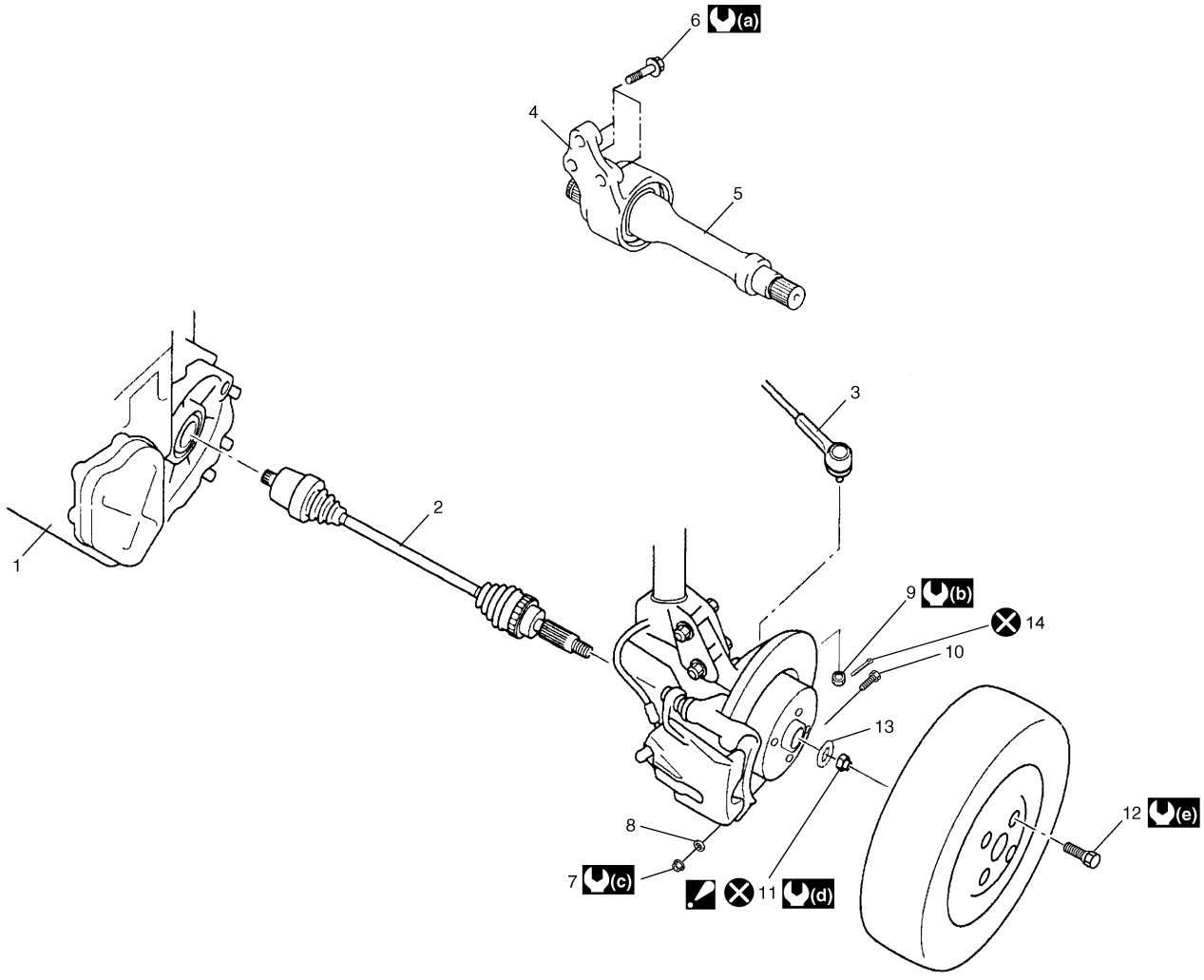
S7N20A3101001

A constant velocity tripod joint or double offset joint (DOJ) is used on the differential side of both right and left side drive shaft assemblies. A constant velocity ball joint is used on the wheel side of both right and left side drive shaft assemblies. The drive shaft can slide through the tripod joint or double offset joint (DOJ) in the extension/contraction direction.

Component Location

Front Drive Shaft Assembly Components Location

S7N20A3103001



I6RS0B310001-03

1. Transaxle	8. Ball stud washer	(a) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft) (for petrol engine model) 25 N·m (2.5 kgf-m, 18.0 lbf-ft) (for diesel engine model)
2. Drive shaft assembly	9. Tie-rod end nut	(b) : 45 N·m (4.5 kgf-m, 32.5 lbf-ft)
3. Tie-rod end	10. Ball stud bolt	(c) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
4. Center bearing support	11. Drive shaft nut : After tightening nut, caulk nut securely.	(d) : 200 N·m (20.0 kgf-m, 145.0 lbf-ft) (for M16A engine model) 175 N·m (17.5 kgf-m, 126.5 lbf-ft) (for except M16A engine model)
5. Center shaft	12. Wheel bolt	(e) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
6. Center bearing support bolts	13. Drive shaft washer	⊗ : Do not reuse.
7. Ball stud nut	14. Cotter pin	

Diagnostic Information and Procedures

Front Drive Shaft Symptom Diagnosis

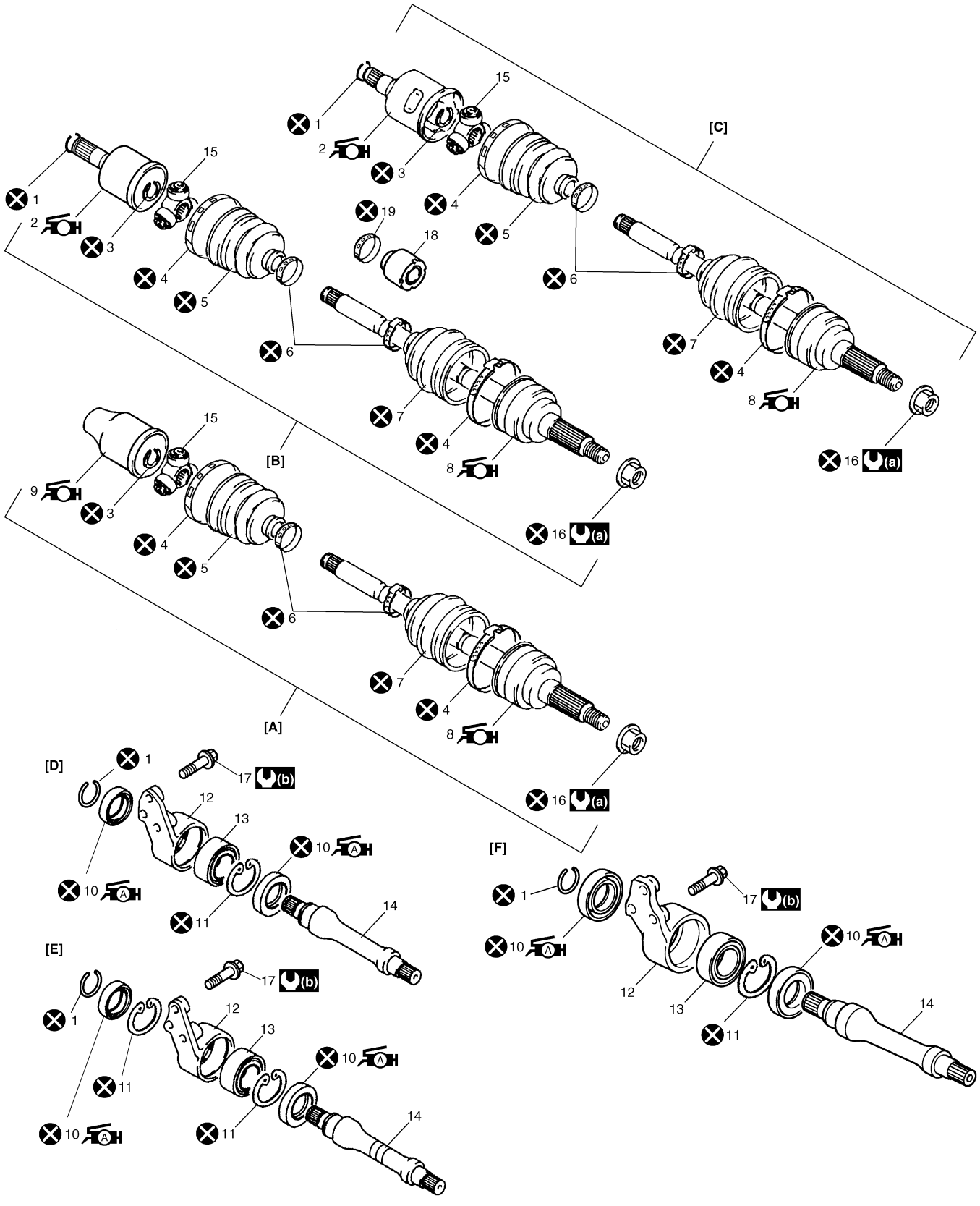
S7N20A3104001

Condition	Possible cause	Correction / Reference Item
Abnormal noise	Worn or breakage of the drive shaft joint	*Replace.*
	Worn or breakage of the center bearing	*Replace.*

Repair Instructions

Front Drive Shaft Components (M13A Engine and M15A Engine Models)

S7N20A3106001



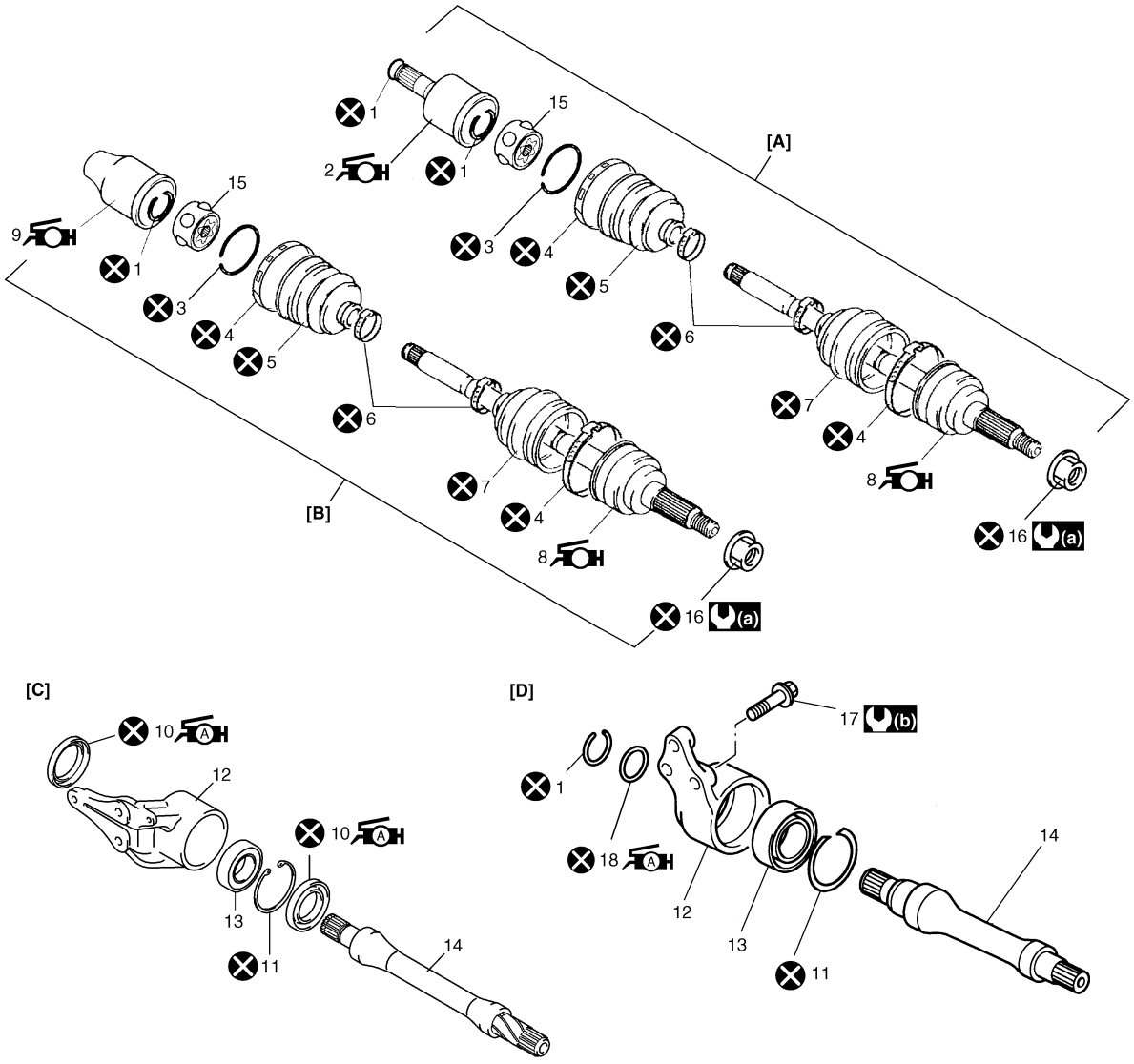
I6RS0B310002-03

[A]: Right side drive shaft assembly (Other than M/T vehicle with M13 engine)	9. Center shaft side joint (Constant velocity tripod joint) : Apply dark gray grease included in spare part to joint.

[B]: Right side drive shaft assembly (M/T vehicle with M13 engine)	10. Oil seal : Apply grease 99000-25011 to oil seal lip.
[C]: Left side drive shaft assembly	11. Center bearing support circlip
[D]: Automated Manual Transaxle vehicle with M13 engine	12. Center bearing support
[E]: M/T vehicle with M15 engine	13. Center bearing
[F]: A/T vehicle with M15 engine	14. Center shaft
1. Circlip	15. Tripod joint spider
2. Differential side joint (Constant velocity tripod joint) : Apply dark gray grease included in spare part to joint.	16. Drive shaft nut
3. Snap ring	17. Center bearing support bolt
4. Boot band (Large)	18. Damper
5. Boot (Differential or center shaft side)	19. Damper band
6. Boot band (Small)	(a) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)
7. Boot (Wheel side)	(b) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
8. Wheel side joint (Constant velocity ball joint) : Apply black grease included in spare part to joint.	: Do not reuse.

Front Drive Shaft Components (M16A Engine and Z13DT Engine Models)

S7N20A3106002



I6RS0B310011-01

[A]: Left side drive shaft assembly	10. Oil seal : Apply grease 99000-25011 to oil seal lip.
[B]: Right side drive shaft assembly	11. Center bearing support circlip
[C]: Z13DT engine model	12. Center bearing support
[D]: M16A engine model	13. Center bearing
1. Circlip	14. Center shaft

2. Differential side joint (Constant velocity DOJ) : Apply dark gray grease included in spare part to joint.	15. Cage
3. Snap ring	16. Drive shaft nut
4. Boot band (Large)	17. O-ring : Apply grease 99000-25011 to all round of O-ring.
5. Boot (Differential or center shaft side)	18. Center bearing support bolt
6. Boot band (Small)	(a) : 200 N·m (20.0 kgf-m, 145.0 lbf-ft) (M16A engine model) 175 N·m (17.5 kgf-m, 126.5 lbf-ft) (Z13DT engine model)
7. Boot (Wheel side)	(b) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
8. Wheel side joint (Constant velocity ball joint) : Apply black grease included in spare part to joint.	: Do not reuse.
9. Center shaft side joint (Constant velocity DOJ) : Apply dark gray grease included in spare part to joint.	

Front Drive Shaft Assembly On-Vehicle Inspection

S7N20A3106003

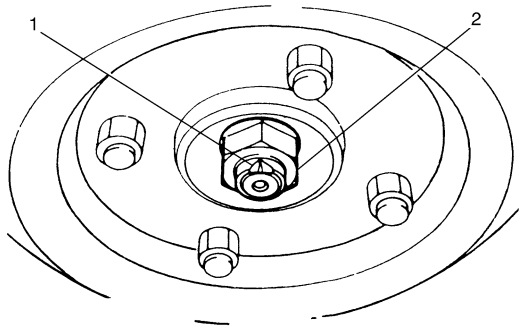
- Check boots for breakage or deterioration.
- Check wheel side joint for rattle or smooth rotation.
- Check differential side (or center shaft side) joint for smooth rotation.
  If any abnormality is found, replace.

Front Drive Shaft Assembly Removal and Installation

S7N20A3106004

Removal

1) Undo caulking (1) and remove drive shaft nut (2).



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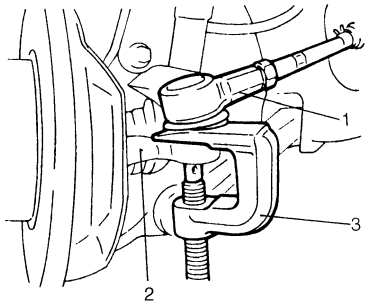
2) Remove wheel.
3) Drain transaxle oil.
4) Disconnect tie-rod end (1) from steering knuckle (2) using puller (3).



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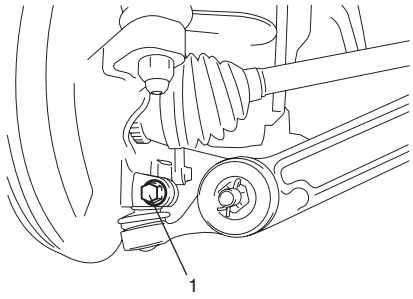
5) Remove stabilizer joint referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
6) Remove brake hose mounting bolt.
7) Remove wheel speed sensor and suspension control arm ball joint bolt (1).



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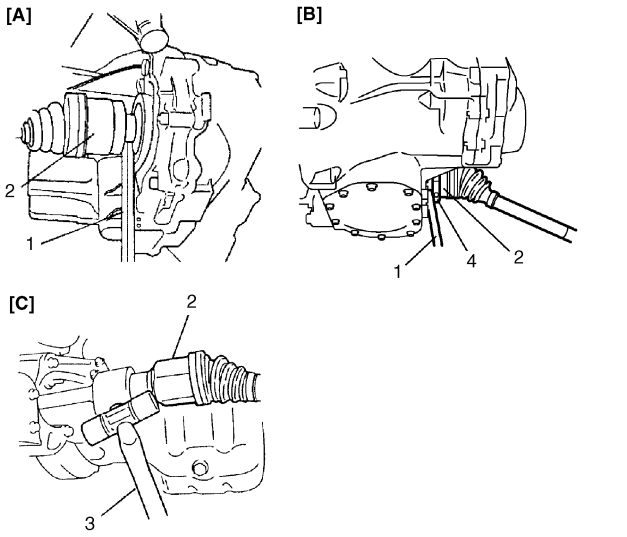
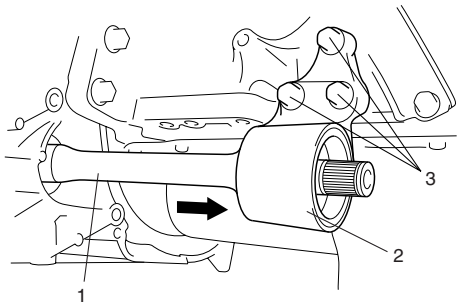
8) Disconnect front suspension control arm ball joint stud from steering knuckle.
9) Pull out drive shaft joint as follows.
   - For differential side of petrol engine model
     Using tire lever (1), pull out drive shaft joint (2) so as to release snap ring fitting of joint spline at differential side.
   - For differential side of diesel engine model
     Install used clamp (4) to drive shaft joint (2) and pull out drive shaft joint from transaxle by using tire lever (1).
   - For center shaft side
     Using plastic hammer (3), drive out drive shaft joint (2) so as to release snap ring fitting of joint spline at center shaft.



I6RS0B310004-01

[A]:	For differential side of petrol engine model
[B]:	For differential side of diesel engine model
[C]:	For center shaft side

10) Remove drive shaft assembly.
11) Remove center bearing support bolts (3) and remove center bearing support (2) with center shaft (1) from differential side gear, if equipped.



I2RH01310007-01

Installation

⚠ CAUTION

- **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 snap ring is seated as it was.**

Install drive shaft assembly by reversing removal procedure and noting the following points.

- Tighten each bolt and nut to the specified torque referring to “Front Drive Shaft Assembly Components Location”.
- Tighten brake hose mounting bolt to specified torque.

  Tightening torque
  Brake hose mounting bolt: 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

- Fill transaxle with oil as specified referring to “Automated Manual Transaxle Oil Change in Section 5D”, “A/T Fluid Change in Section 5A”, “Manual Transaxle Oil Change: M13A Model in Section 5B”, “Manual Transaxle Oil Change: M15A and M16A Model in Section 5B” or “Manual Transaxle Oil Change: D13A and Z13DTJ Model in Section 5B”.
- Check toe setting referring to “Front Wheel Alignment Inspection and Adjustment in Section 2B” and adjust as required.

Front Drive Shaft Disassembly and Assembly

S7N20A3106005

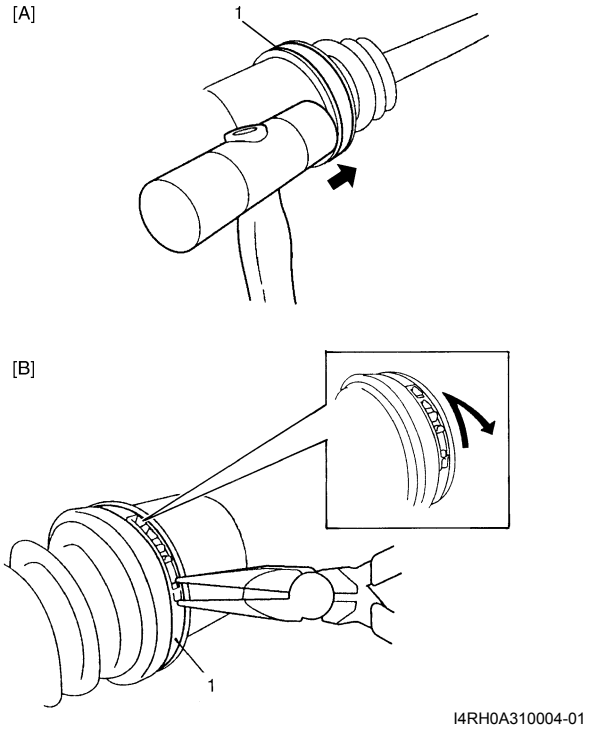
Disassembly

For tripod joint type

⚠ CAUTION

- **Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.**
- **Do not disassemble tripod joint spider. If any malcondition is found in it, replace it as differential side joint assembly.**

1) Remove differential side (or center shaft side) boot big band (1) as follows.
   - For boot big band without joint:
     Remove boot big band by tapping boot and band with plastic hammer. If it is hard to remove boot big band, cut it using a nipper or an iron saw with care not to damage joint housing.
   - For boot big band with joint:
     Draw hooks of boot big band together and remove band.

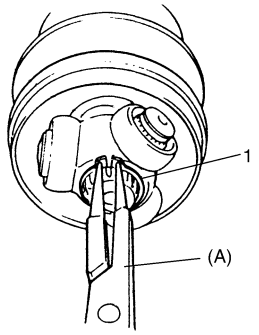


I4RH0A310004-01

[A]:	For boot big band without joint
[B]:	For boot big band with joint

2) Wipe off grease from shaft and take off snap ring (1) using special tool.

Special tool
(A): 09900–06107

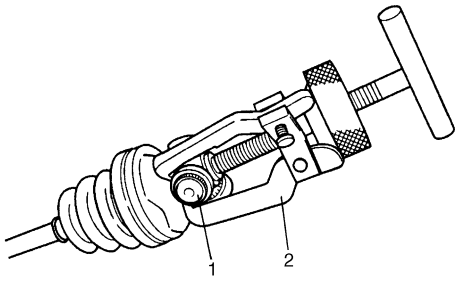


I3RH0A311009-01

3) Remove tripod joint spider (1) using 3 arms puller (2).

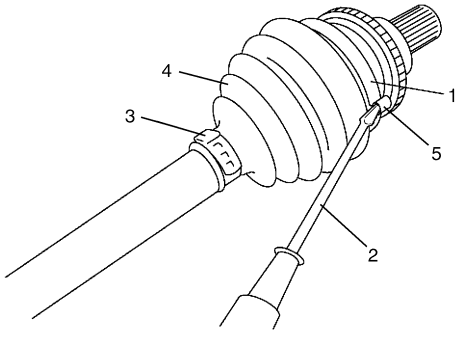
⚠ CAUTION

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

4) Remove boot band as follows.
   a) Remove differential side (or center shaft side) boot small band, and then pull out differential side (or center shaft side) boot from shaft.
   b) Remove damper band, and then pull out damper through shaft, if equipped.
   c) Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



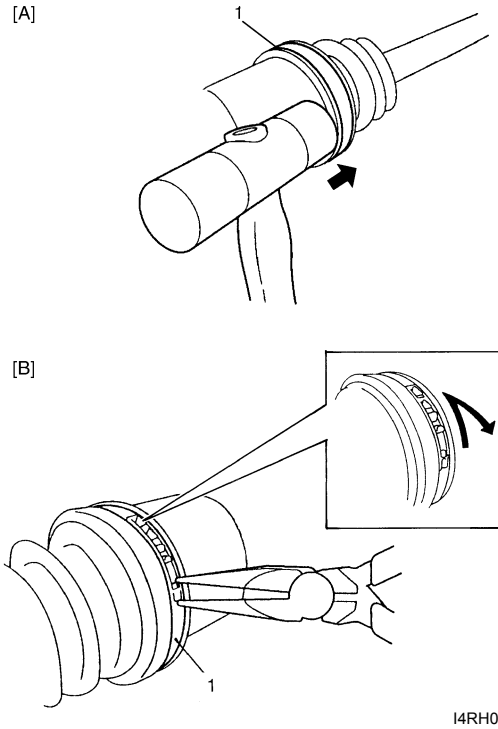
I4RS0A310006-01

For DOJ type

⚠ CAUTION

Disassembly of wheel side joint is not allowed. If any noise or damage exists in it, replace it as assembly.

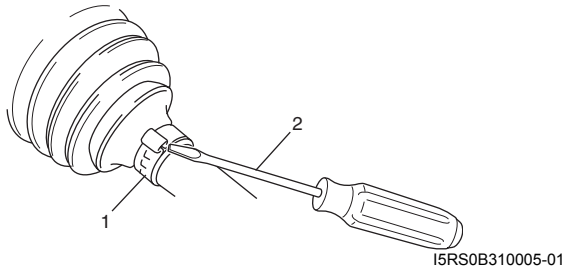
1) Remove differential side (or center shaft side) boot big band (1) as follows.
   - For boot big band without joint:
     Remove boot big band by tapping boot and band with plastic hammer. If it is hard to remove boot big band, cut it using a nipper or an iron saw with care not to damage joint housing.
   - For boot big band with joint:
     Draw hooks of boot big band together and remove band.



I4RH0A310004-01

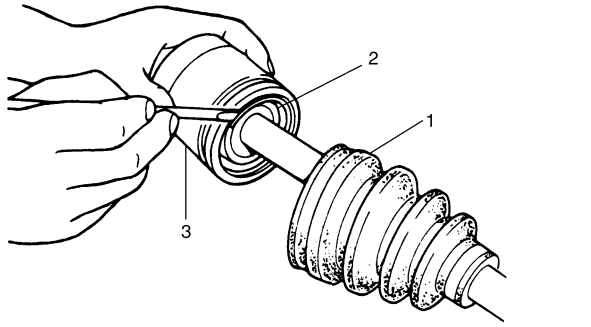
[A]:	For boot big band without joint
[B]:	For boot big band with joint

2) Remove differential side (or center shaft side) boot small band (1) using flat end rod (2) or the like.



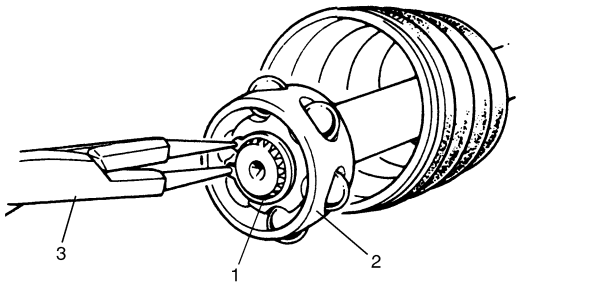
I5RS0B310005-01

3) Side boot (1) toward the center of shaft and remove snap ring (2) from outer race, and then take shaft out of outer race (3).



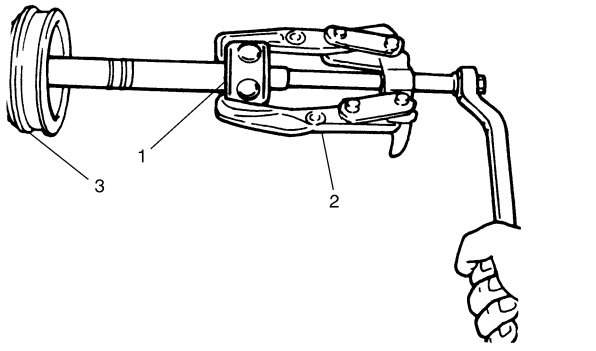
I2RH01310012-01

4) Wipe off grease and remove circlip (1) used to fix cage (2) by using snap ring plier (3).



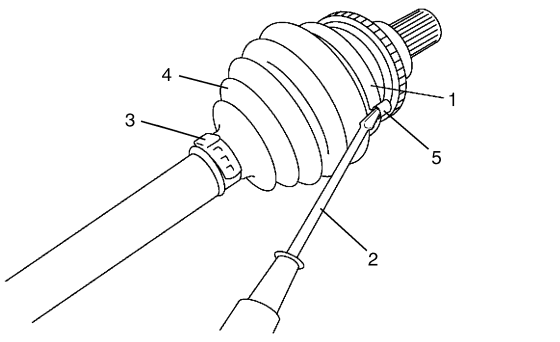
I5RS0B310006-01

5) Draw away cage (1) by using bearing puller (2), and remove boot (3) from shaft.



I2RH01310014-01

6) Pull out differential side (or center shaft side) boot from shaft.
7) Undo caulking (5) of wheel side boot big band (1) and small band (3) using flat end rod (2) or the like, then pull out wheel side boot (4) from shaft.



I4RS0A310006-01

Assembly

For tripod joint type

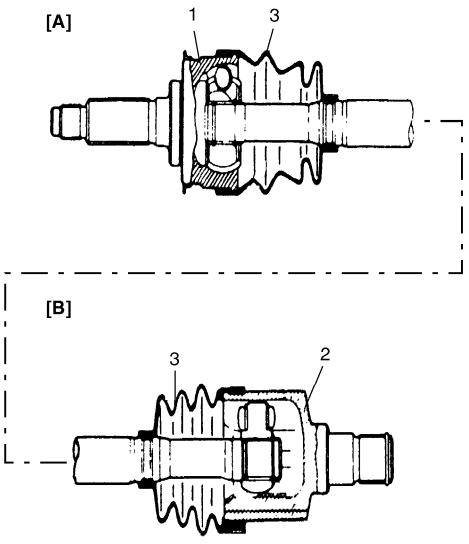
Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly.

Make sure that wheel side joint assembly (1) and tripod joint housing (2) are washed thoroughly and air dried.

Replace boot(s) (3) with new one(s).

⚠ CAUTION

- **Do not wash boots in 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 volume to respective joint referring to the followings for identification of the grease.**



I4RS0A310007-01

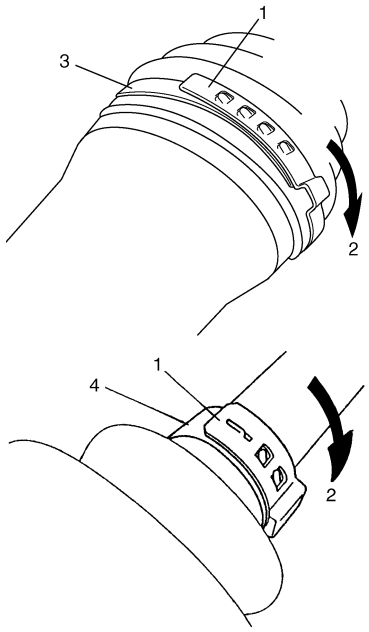
[A]:	Wheel side
[B]:	Differential side (or center shaft side)

1) Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
2) Clean boots with cloth.
3) Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set as a spare parts.

Grease color
: Black

Amount
: 55 – 75 g (1.9 – 2.6 oz)

4) Install wheel side boot on shaft.
5) Fill up boot inside with specified grease.
6) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



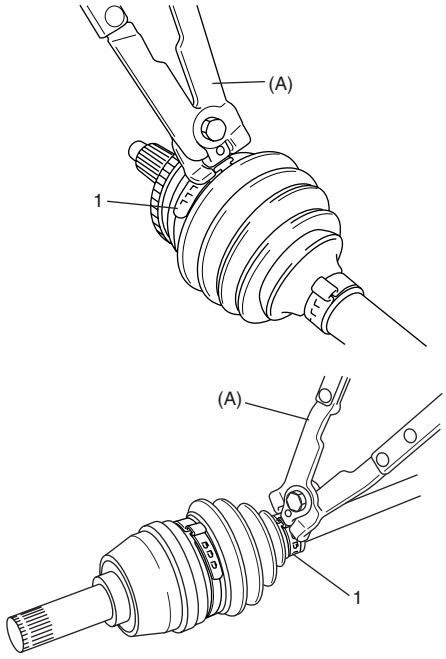
I4RS0A310009-01

7) Fasten boot bands (1) securely using special tool.

⚠ CAUTION

Do not squeeze or distort boot when fastening it with bands.
Distorted boot caused by squeezing air may reduce its durability.

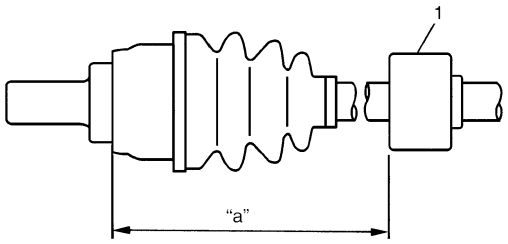
Special tool
(A): 09943–57010



I4RS0A310010-01

8) Install damper (1) on drive shaft according to dimension specified below, if equipped.

Drive shaft damper installing position
"a": 154 – 160 mm (6.1 – 6.3 in.)

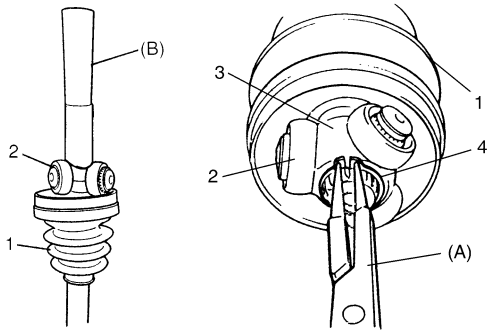


I4RS0B310002-01

9) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot (1) on shaft temporarily, and then apply grease to tripod joint (2). Use specified grease in tube included in spare parts.

10) Install tripod joint spider (3) on shaft using special tool with hammer, directing its chamfered spline toward wheel side, and then fasten it with new snap ring (4).

Special tool
(A): 09900–06107
(B): 09925–98220

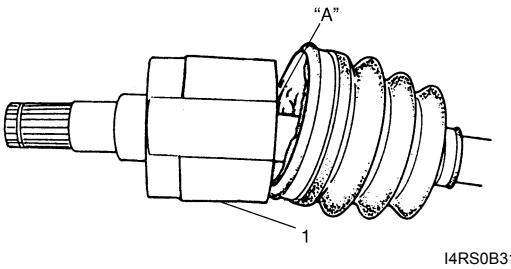


I3RH0A311006-01

11) Apply grease (including in spare parts) to inside of tripod joint housing (1), joint it with tripod joint.

Grease color
"A": Dark gray

Amount
"A": 70 – 90 g (2.5 – 3.2 oz)

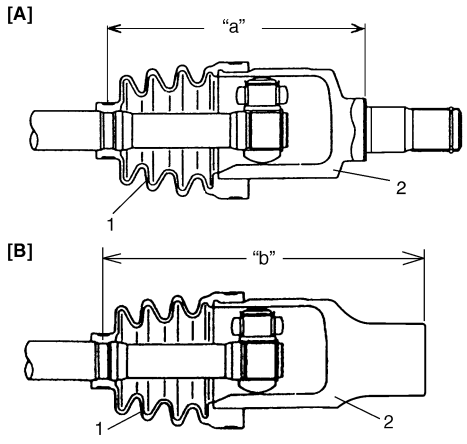


I4RS0B310003-01

12) Fit boot (1) to grooves of shaft and housing (2) adjust length to specification below.

13) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

Drive shaft boot fixing position (distance between housing end and small boot band)
Left side and right side drive shafts (M/T vehicle with M13 engine) "a": 142.0 mm (5.59 in.)
Left side drive shaft (other than M/T vehicle with M13 engine) "a": 152.0 mm (5.98 in.)
Right side drive shaft (other than M/T vehicle with M13 engine) "b": 176.0 mm (6.93 in.)



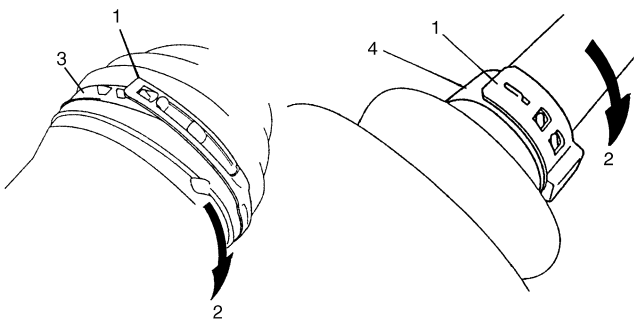
I4RS0B310004-01

[A]:	Drive shaft inserted into differential side
[B]:	Drive shaft inserted into center shaft side

⚠ CAUTION

- **Bend each boot band against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.**

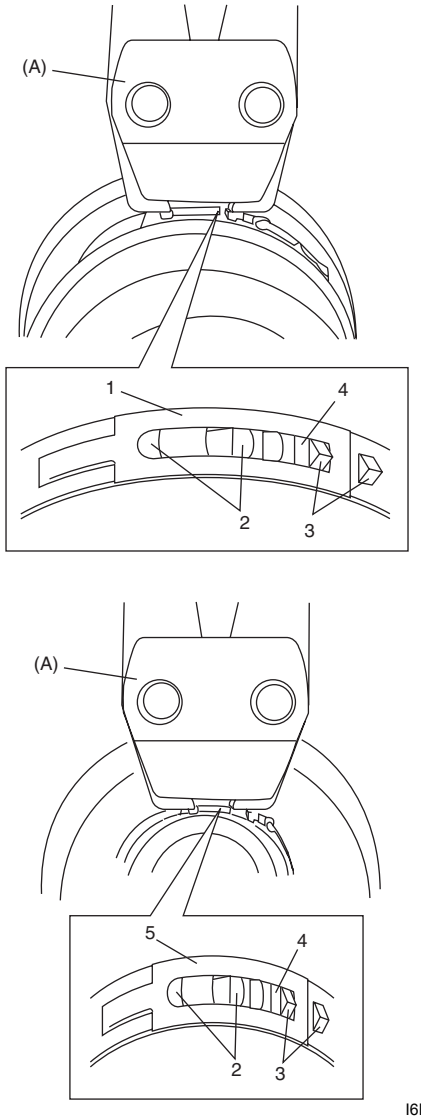
14) Place differential side (or center shaft side) boot new big band (3) and new small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I5JB0A311006-01

15) Fasten differential side (or center shaft side) boot band.
    - For differential side (or center shaft side) boot big band (1) and small band (5).
      Fasten band by drawing hooks (2) with special tool and engage hooks (3) in slot and window (4).

      Special tool
      (A): 09943–57021



I6RS0B310005-02

For DOJ type
Judging from abnormality noted before disassembly and what is found through visual check of components parts after disassembly, prepare replacing parts and proceed to reassembly.
Make sure that wheel side joint assembly and DOJ housing are washed thoroughly and air dried.
Replace boot(s) with new one(s).

⚠ CAUTION

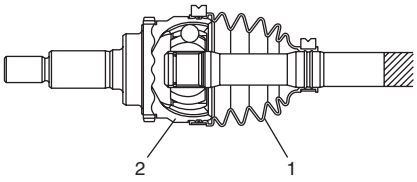
- **Do not wash boots in degreaser such as gasoline or kerosene. etc. Washing in degreaser causes deterioration of boot.**
- **To ensure full performance of joint as designed, be sure to distinguish between two types of grease in repair set and apply specified volume to respective joint referring to the followings for identification of the grease.**

1) Wash disassembled parts (except boots). After washing, dry parts completely by blowing air.
2) Clean boots with cloth.
3) Apply grease to wheel side joint. Use specified grease in tube in wheel side boot set as a spare parts.

   Grease color
   : Black

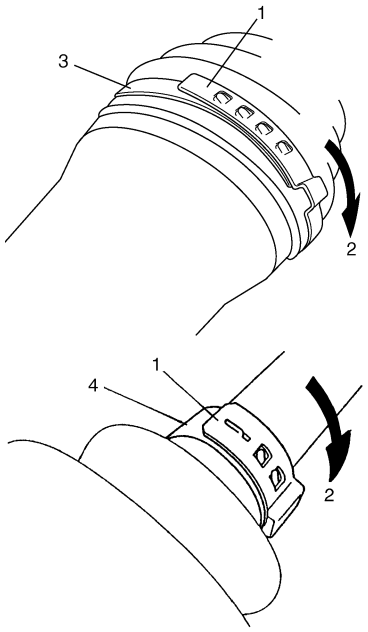
   Amount
   : 55 – 75 g (1.9 – 2.6 oz) (Z13DT engine model)
   : 60 – 80 g (2.1 – 2.8 oz) (M16A engine model)

4) Install wheel side boot on shaft.
5) Fill up boot inside with specified grease.
6) Fit boot (1) to grooves of shaft and housing (2).
7) Insert screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.



I5RS0B310007-01

8) Place new wheel side boot big band (3) and small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



I4RS0A310009-01

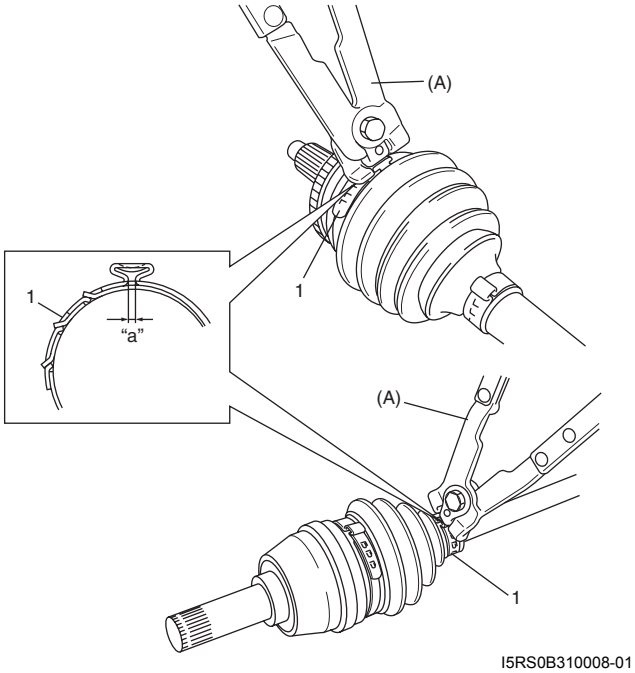
9) Fasten boot bands (1) using special tool as shown in figure.

Distance “a”
: 2.6 ± 1.4 mm (0.102 ± 0.055 in.)

⚠ CAUTION

Do not squeeze or distort boot when fastening it with bands.
Distorted boot caused by squeezing air may reduce its durability.

Special tool
(A): 09943–57010

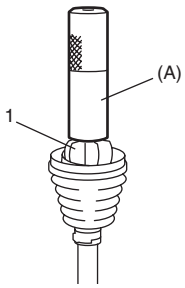


I5RS0B310008-01

10) Set new differential side (or center shaft side) small band and new differential side (or center shaft side) boot on shaft temporarily.

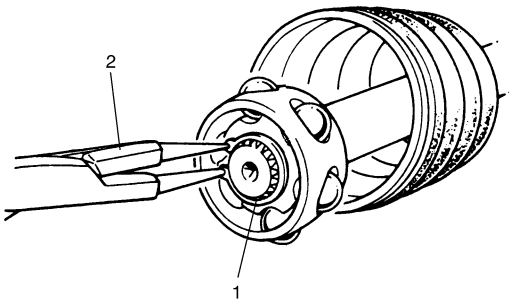
11) Drive in the cage (1) by using special tool.

Special tool
(A): 09913–84510



I5RS0B310009-01

12) Install circlip (1) by using snap ring plier (2).

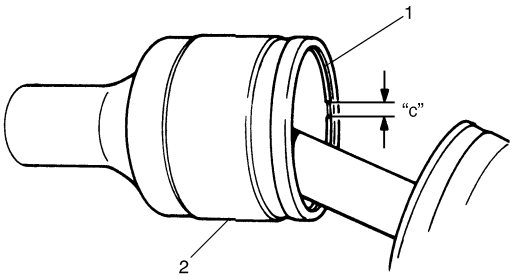


I5RS0B310010-01

13) Apply grease to entire surface of cage. Use specified grease in tube included in spare parts.
14) Insert cage into joint housing (2) and fit snap ring (1) into groove of joint housing (2).

⚠ CAUTION

Position opening of snap ring "c" so that it will not be lined up with a ball.

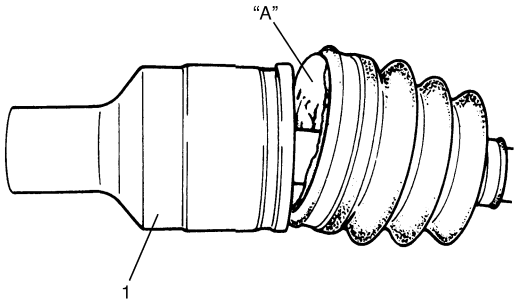


I2RH01310036-01

15) Apply grease (including in spare parts) to inside of joint housing (1).

Grease color
"A": Dark gray

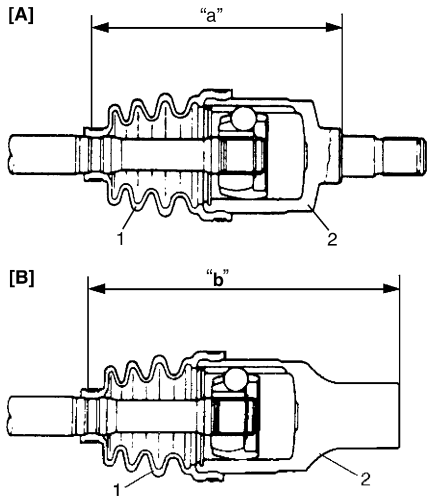
Amount
"A": 85 – 105 g (3.0 – 3.7 oz) (Z13DT engine model)
"A": 70 – 90 g (2.5 – 3.2 oz) (M16A engine model)



I5RS0B310011-02

16) Fit boot (1) to grooves of shaft and housing (2) adjust length to specification below.
17) Inset screw driver into boot and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

Drive shaft boot fixing position (distance between boot end (housing side) and small boot band center)
Left side drive shaft (Z13DT engine) "a": 164.5 mm (6.48 in.)
Left side drive shaft (M16A engine) "a": 170.0 mm (6.69 in.)
Right side drive shaft (Z13DT engine) "b": 197.3 mm (7.77 in.)
Right side drive shaft (M16A engine) "b": 189.0 mm (7.44 in.)



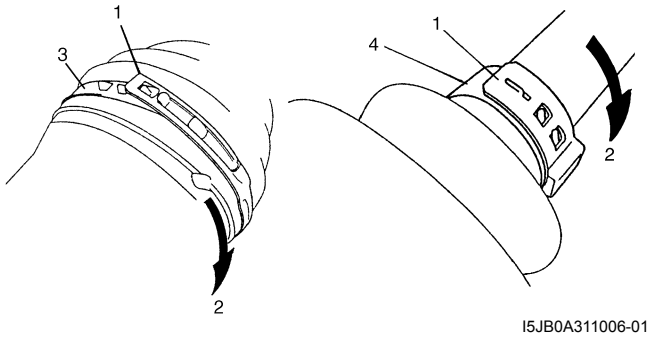
I6RS0B310010-01

[A]:	Drive shaft inserted into differential side
[B]:	Drive shaft inserted into center shaft side

⚠ CAUTION

- **Band each boot band against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands. Distorted boot caused by squeezing air may reduce its durability.**

18) Place differential side boot (or center shaft side) new big band (3) and new small band (4) onto boot putting band outer end (1) against forward rotation (2) as shown in figure.



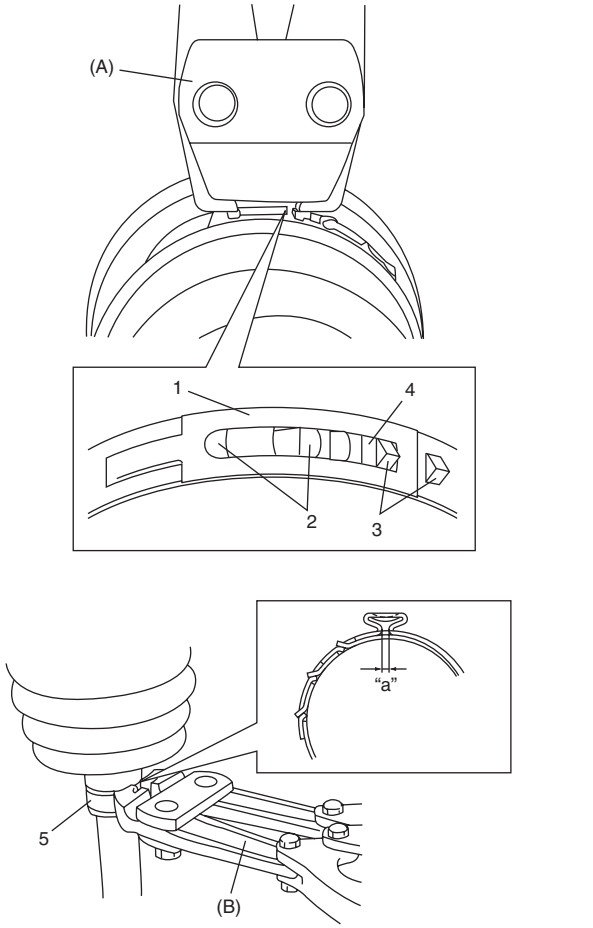
I5JB0A311006-01

19) Fasten differential side (or center shaft side) boot band.
- For differential side (or center shaft side) boot big band
  Fasten band (1) by drawing hooks (2) with special tool and engage hooks (3) in slot and window (4).

  Special tool
  (A): 09943–57021
- For differential side (or center shaft side) boot small band
  Fasten band (5) using special tool as shown in figure.

  Distance “a”
  : 2.6 ± 1.4 mm (0.102 ± 0.055 in.)

  Special tool
  (B): 09943–57010



I5RS0B310013-01

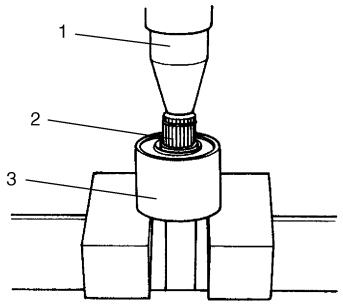
Center Shaft and Center Bearing Support Disassembly and Assembly

S7N20A3106006

Automated Manual Transaxle vehicle with M13 engine and M/T vehicle with M15 engine and Z13DT engine

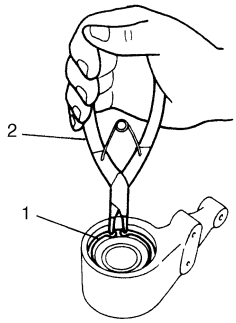
Disassembly

1) Using hydraulic press (1), draw out center shaft (2) from center bearing.
2) Remove oil seals from center bearing support (3).



I3RM0A310012-01

3) Remove bearing support circlip (1) using snap ring pliers (2).

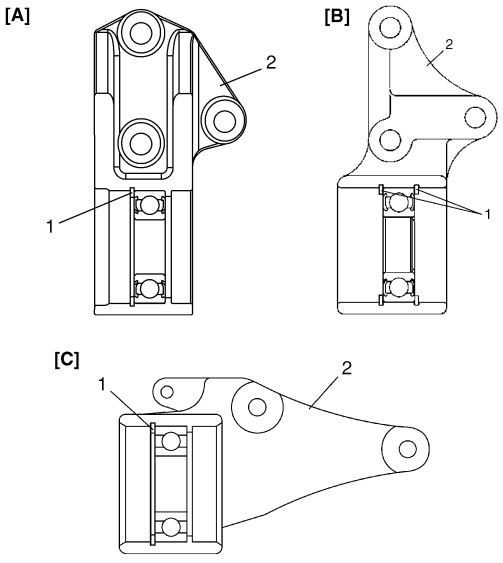


I6RS0B310006-03

4) Remove center bearing from center bearing support.

Assembly

Install center shaft by reversing removal procedure and noting the following points.
- When installing bearing support circlip (1), make sure that if fits in circlip groove in center bearing support (2) securely as shown.



I6RS0B310008-01

[A]:	Automated Manual Transaxle vehicle with M13 engine
[B]:	M/T vehicle with M15 engine
[C]:	Z13DT engine

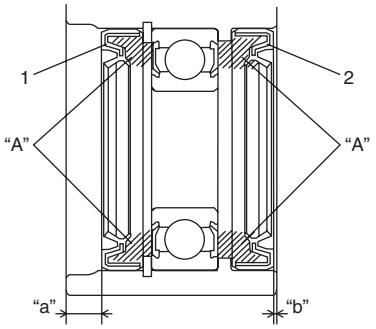
- When installing left oil seal (1) and right oil seal (2) using special tool, use care so that oil seals in proper direction and position as shown in figure.

  Special tool
  : 09925–15410

  Distance
  Automated Manual Transaxle vehicle with M13 engine
  "a": 7 – 8 mm (0.28 – 0.31 in.)
  "b": 0 – 1 mm (0 – 0.04 in.)
  M/T vehicle with M15 engine
  "a": 8 – 9 mm (0.13 – 0.35 in.)
  "b": 2 – 3 mm (0.08 – 0.11 in.)
  Z13DT engine
  "a": 3.5 – 4.5 mm (0.14 – 0.17 in.)
  "b": 3.5 – 4.5 mm (0.14 – 0.17 in.)

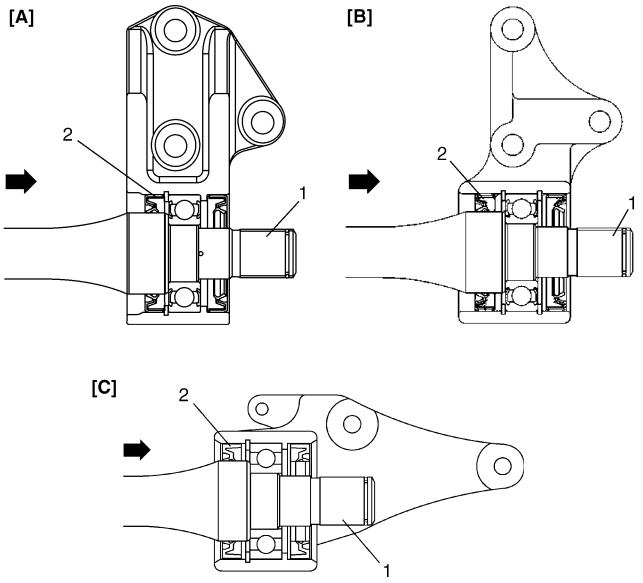
- Be sure to apply grease to oil seal lip and bearing side space indicated in the figure.

  "A": Grease 99000–25011 (SUZUKI Super Grease A)



I4RS0A310014-01

- Press-fit center shaft (1) from left oil seal (2) side.

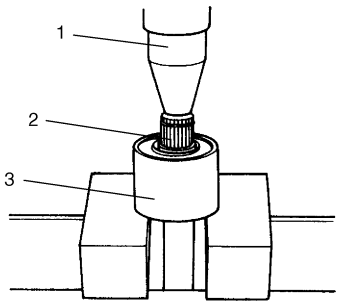


I6RS0B310009-02

[A]:	Automated Manual Transaxle vehicle with M13 engine
[B]:	M/T vehicle with M15 engine
[C]:	Z13DT engine

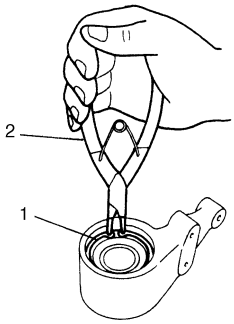
A/T vehicle with M15 engine
Disassembly

1) Remove wheel side oil seal and circlip from center bearing support (3).
2) By using hydraulic press (1), draw out center shaft (2) from center bearing.
3) Remove oil seal from center bearing support (3).



I3RM0A310012-01

4) Remove bearing support circlip (1) using snap ring pliers (2).

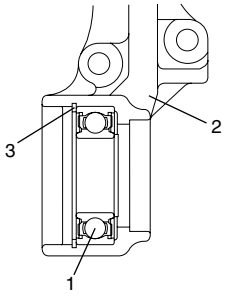


I6RS0B310006-03

5) Remove center bearing from center bearing support.

Assembly

1) Install center bearing (1) to center bearing support (2), and then install circlip (3) into groove of bearing support as shown in figure.

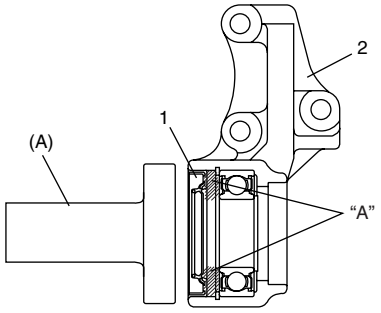


I4RS0A310016-01

2) Install left oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

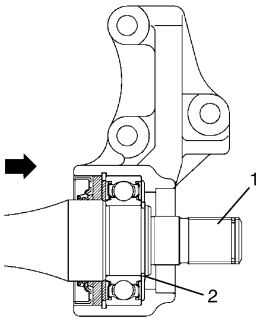
"A": Grease 99000–25011 (SUZUKI Super Grease A)

Special tool
(A): 09913–75510



I4RS0A310017-01

3) Press-fit center shaft (1) from left oil seal side, and then install circlip (2) into groove of center shaft as shown in figure.

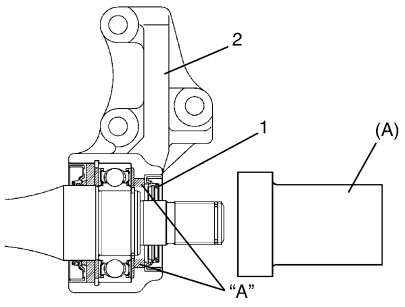


I4RS0A310018-01

4) Install right oil seal (1) to center bearing support (2) until it become flush with bearing support using special tool, and then apply grease to oil seal lip.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

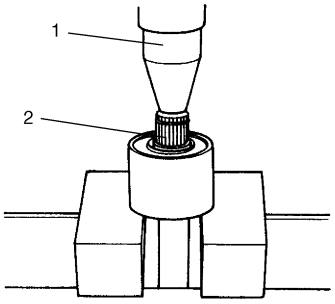
Special tool
(A): 09913–85210



I4RS0A310019-01

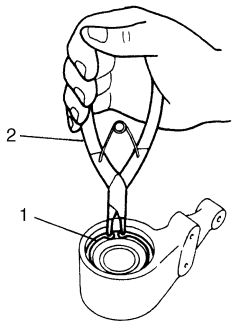
M16A engine
Disassembly

1) Using hydraulic press (1), draw out center shaft (2) from center bearing.



I6RS0A310003-01

2) Remove bearing support circlip (1) using snap ring pliers (2).



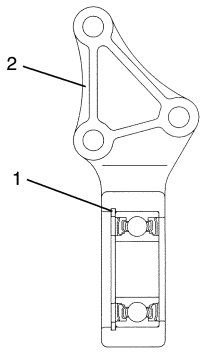
I6RS0A310004-01

3) Remove center bearing from center bearing support.

Assembly

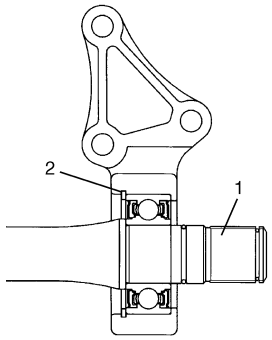
Install center shaft by reversing removal procedure and noting the following points.

- When installing bearing support circlip (1), make sure that if fits in circlip groove in center bearing support (2) securely as shown.



I3RH0A311008-01

- Press-fit center shaft (1) from bearing support circlip (2) side.



I6RS0A310005-01

Front Drive Shaft Inspection

S7N20A3106007

- Check shaft and joint for damage, wear or bend. Replace them as necessary.
- Check retaining ring and snap ring for breakage or deformation. Replace as necessary.
- Check boots for breakage or deterioration.

Specifications

Tightening Torque Specifications

S7N20A3107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake hose mounting bolt	25	2.5	18.0	☞

NOTE

The specified tightening torque is also described in the following.
“Front Drive Shaft Assembly Components Location: ”
“Front Drive Shaft Components (M13A Engine and M15A Engine Models): ”
“Front Drive Shaft Components (M16A Engine and Z13DT Engine Models): ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A3108001

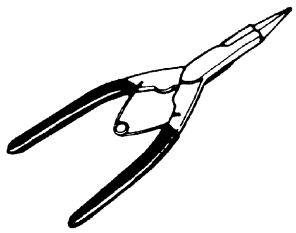
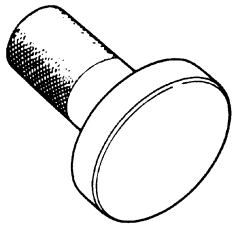
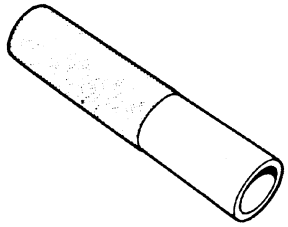
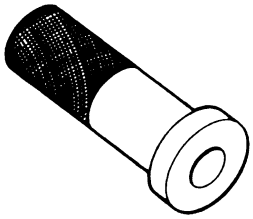
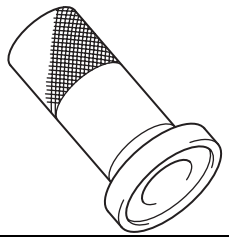
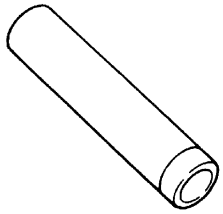
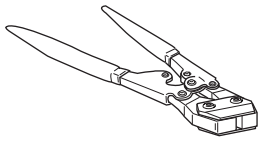
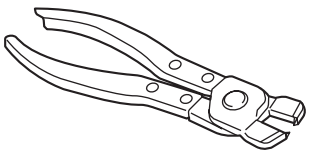
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞ / ☞ / ☞

NOTE

Required service material is also described in the following.
“Front Drive Shaft Components (M13A Engine and M15A Engine Models): ”
“Front Drive Shaft Components (M16A Engine and Z13DT Engine Models): ”

Special Tool

S7N20A3108002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ 	09913–75510 Bearing installer ☞ 
09913–84510 Bearing installer ☞ 	09913–85210 Bearing installer ☞ 
09925–15410 Oil seal installer ☞ 	09925–98220 Bearing installer ☞ 
09943–57010 Band compressor ☞ / ☞ / ☞ 	09943–57021 Pliers, Low-Profile Clamp ☞ / ☞ 

Section 4

Brakes

CONTENTS

Precautions

Precautions

Precautions for Brakes

S7N20A4000001

Suspension Caution
Refer to “Suspension Caution in Section 00”.

Wheels and Tires Caution
Refer to “Wheels and Tires Caution in Section 00”.

Brake Caution
Refer to “Brake Caution in Section 00”.

ESP® System Precautions
Refer to “Precaution for Vehicle Equipped with ESP® System in Section 00”.

General Precautions
Refer to “General Precautions in Section 00”.

Vehicle Lifting Points
Refer to “Vehicle Lifting Points in Section 0A”.

Fastener Caution
Refer to “Fastener Caution in Section 00”.

Fastener Information
Refer to “Fasteners Information in Section 0A”.

Brake Control System and Diagnosis

Precautions

Precautions on Brake

S7N20A4100001

Air Bag Warning
Refer to “Air Bag System Service Warning in Section 00”.

Brakes Diagnosis Note
Refer to “Brakes Diagnosis Note”.

General Description

Brakes Construction

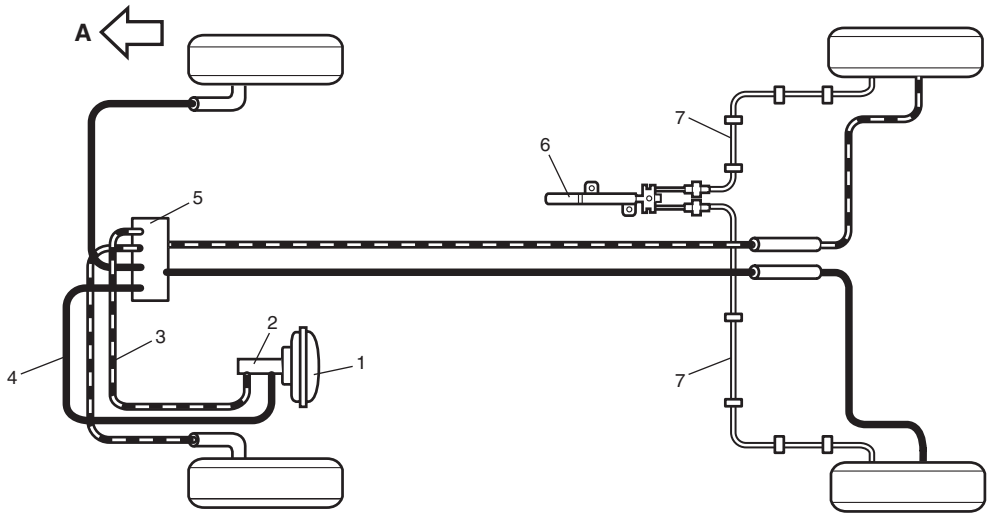
S7N20A4101001

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (other than M16A engine model, two in front and four in rear. And M16A engine model, two in front and two in rear). The master cylinder is a tandem master cylinder. Brake pipes are connected to the master cylinder and they make two independent circuits. One connects front right & rear left brakes and the other connects front left & rear right brakes. In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading / trailing shoes) for the rear brake (M16A engine model, the disc brake type is used for the rear wheel brake.).
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes or pads are used for both parking and foot brakes.

NOTE

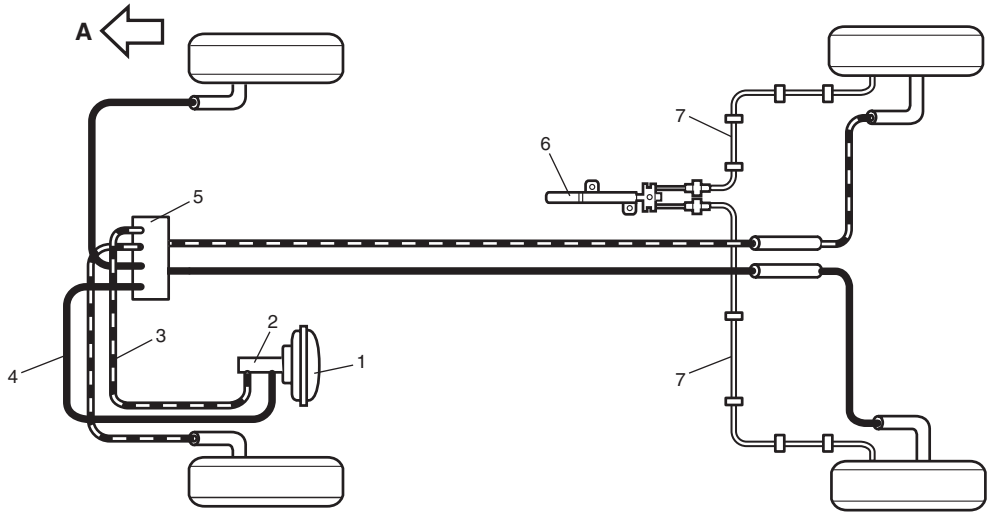
The figure shows LH steering vehicle.

[A]



I6RS0B410001-01

[B]

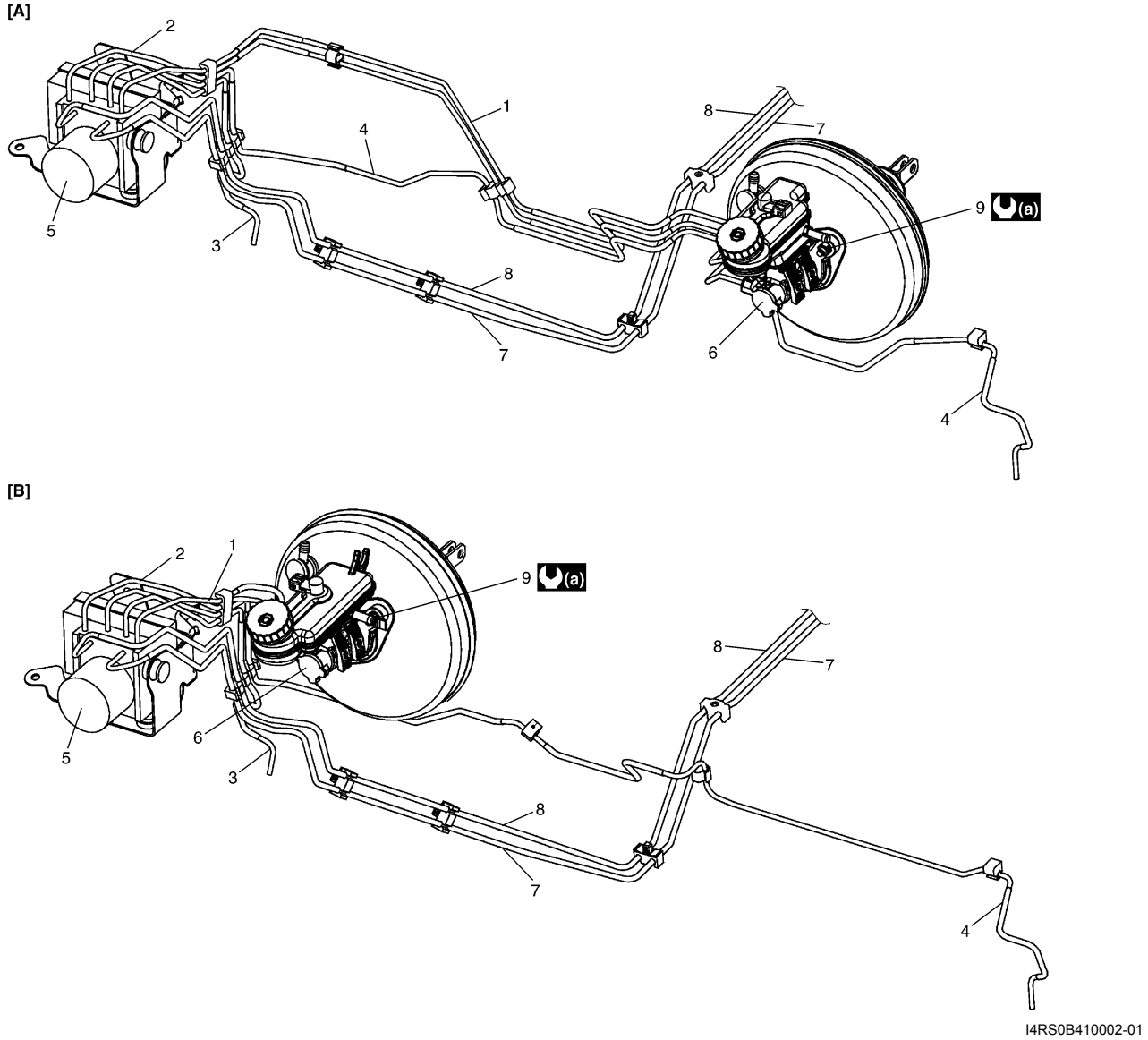


I6RS0B410002-01

[A]: Other than M16A engine model	3. Secondary side	7. Parking brake cable
[B]: M16A engine model	4. Primary side	A: Forward
1. Brake booster	5. ABS or ESP® hydraulic unit / control module assembly	
2. Master cylinder	6. Parking brake lever	

Front Brake Hose / Pipe Construction (Non-ESP® Model)

S7N20A4101002

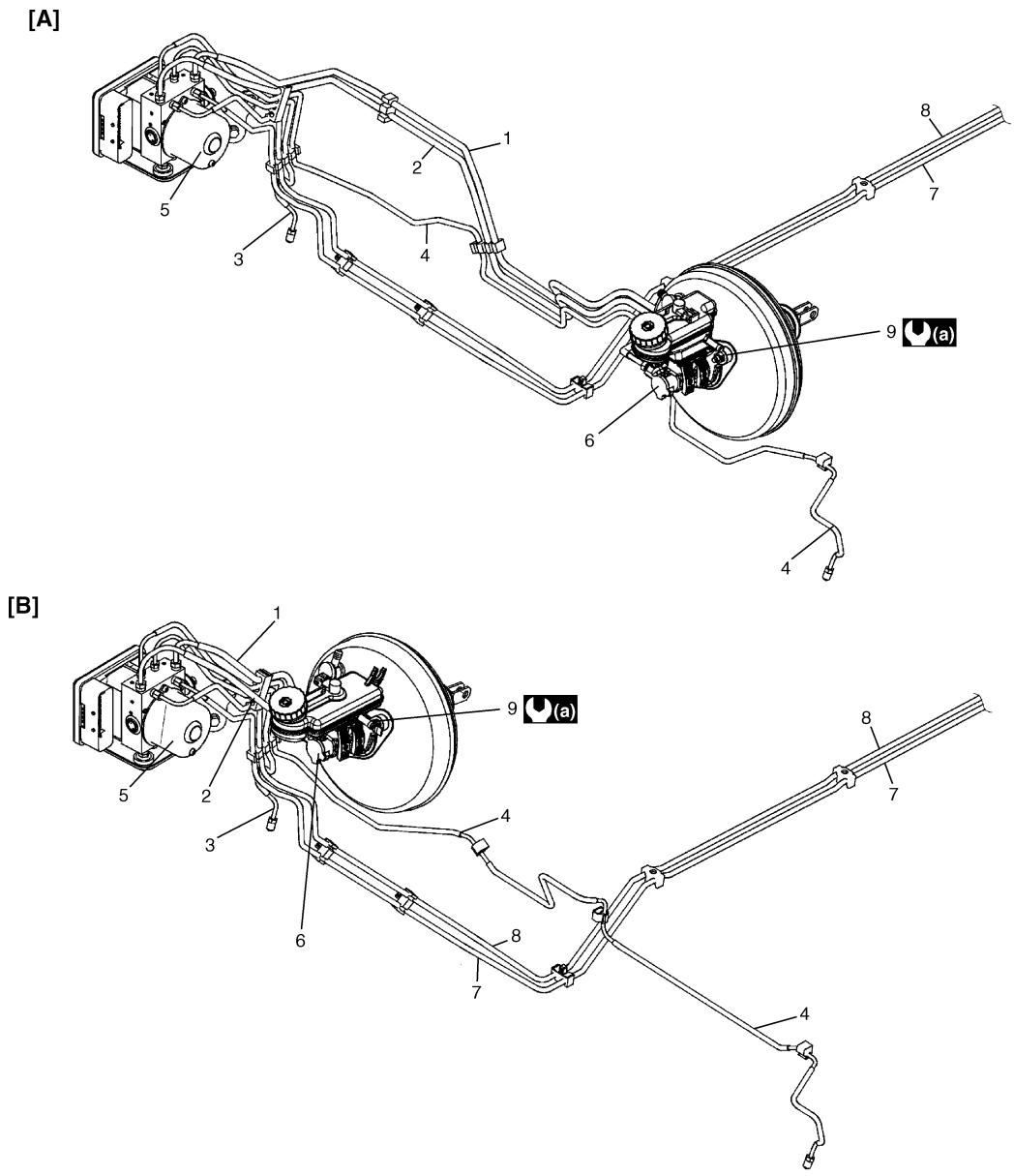


I4RS0B410002-01

[A]: For LH steering vehicle	3. From ABS hydraulic unit to right front brake	7. From ABS hydraulic unit to left rear brake
[B]: For RH steering vehicle	4. From ABS hydraulic unit to left front brake	8. From ABS hydraulic unit to right rear brake
1. From master cylinder primary to ABS hydraulic unit	5. ABS hydraulic unit	9. Master cylinder fixing nut
2. From master cylinder secondary to ABS hydraulic unit	6. Master cylinder	(a): 20 N·m (2.0 kgf-m, 14.5 lbf-ft)

Front Brake Hose / Pipe Construction (ESP® Model)

S7N20A4101003



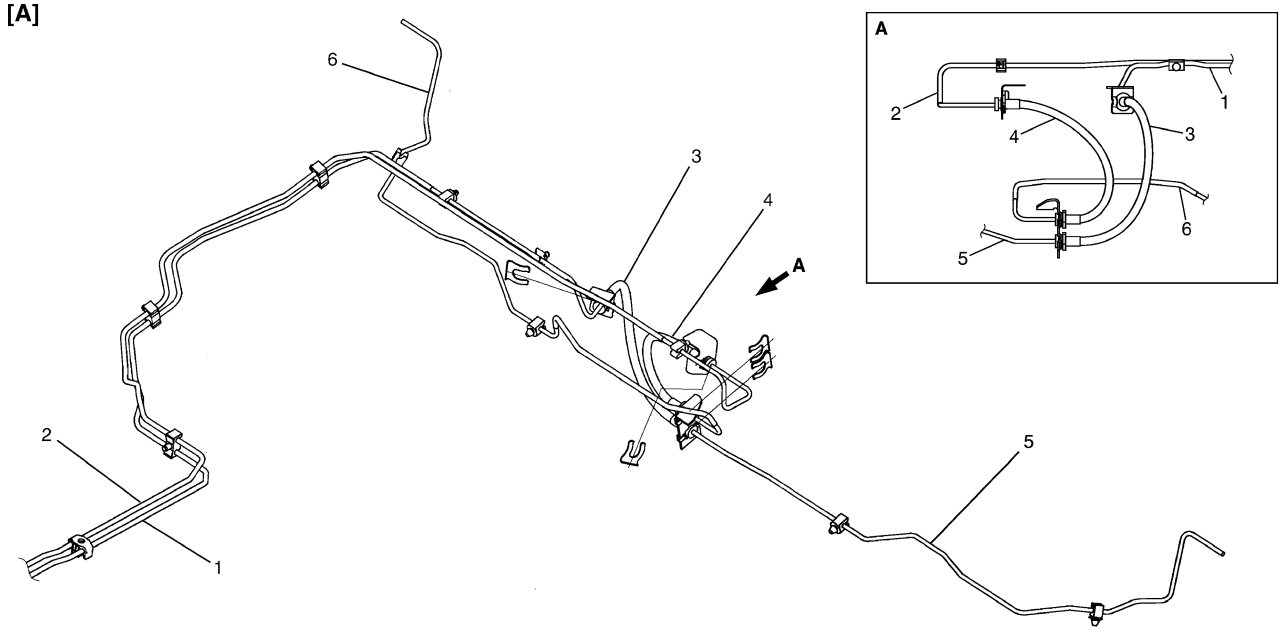
I6RS0B410003-02

[A]: For LH steering vehicle	3. From ESP® hydraulic unit to right front brake	7. From ESP® hydraulic unit to left rear brake
[B]: For RH steering vehicle	4. From ESP® hydraulic unit to left front brake	8. From ESP® hydraulic unit to right rear brake
1. From master cylinder primary to ESP® hydraulic unit	5. ESP® hydraulic unit	9. Master cylinder fixing nut
2. From master cylinder secondary to ESP® hydraulic unit	6. Master cylinder	(a) : 20 N·m (2.0 kgf-m, 14.5 lbf-ft)

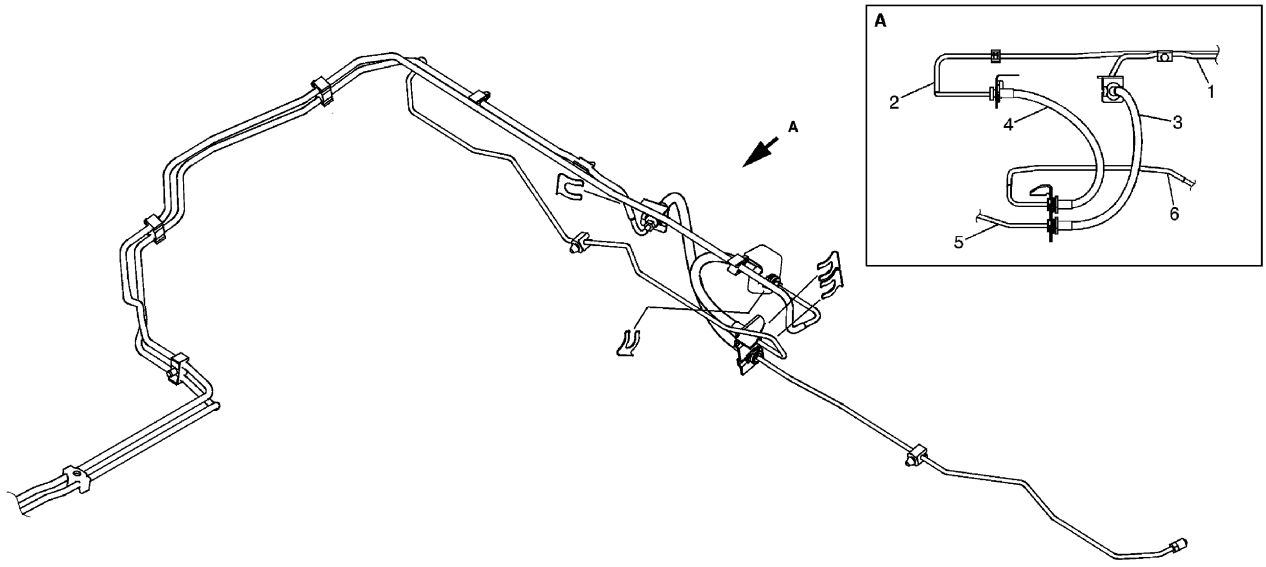
Rear Brake Hose / Pipe Construction

S7N20A4101004

[A]



[B]



I6RS0B410004-01

[A]: Other than M16A engine model	1. To left rear brake hose	4. Right rear brake hose
[B]: M16A engine model	2. To right rear brake hose	5. Left rear brake hose to left brake
A: View A	3. Left rear brake hose	6. Right rear brake hose to right brake

Diagnostic Information and Procedures

Brakes Diagnosis Note

S7N20A4104001

Road Testing Brakes

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications 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 leads to one side or the other without brake application. If it does, check the tire pressure, front wheel alignment and front suspension attachments for looseness. See diagnosis table for other causes.

Brake Fluid Leaks

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. 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

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.
If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels (other than M16A engine model).
If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings.
If excessive fluid is found, replace the pads.
If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If leakage is not found, drain fluid, flush with brake fluid, refill and bleed system.
The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

Brakes Symptom Diagnosis

S7N20A4104002

Condition	Possible cause	Correction / Reference Item
Not enough braking force	Brake oil leakage from brake lines	*Locate leaking point and repair.*
	Brake disc or pads stained with oil	*Clean or replace.*
	Overheated brakes	*Determine cause and repair.*
	Poor contact of shoes on brake drum (other than M16A engine model)	*Repair for proper contact.*
	Brake shoes linings stained with oil or wet with water (other than M16A engine model)	*Replace.*
	Badly worn brake pad linings	*Replace.*
	Defective wheel cylinders (other than M16A engine model)	*Repair or replace.*
	Malfunctioning caliper assembly	*Repair or replace.*
	Air in system	*Bleed system.*
	Malfunctioning ABS (Antilock brake system) or ESP®	*Check system and replace as necessary.*

Condition	Possible cause	Correction / Reference Item
Brake pull (Brakes not working in unison)	Pad linings and/or shoe linings are wet with water or stained with oil in some brakes	*Replace.*
	Drum-to-shoe clearance out of adjustment in some brakes (Malfunctioning auto adjusting mechanism) (other than M16A engine model)	*Check for inoperative auto adjusting mechanism.*
	Disc and/or drum is out of round in some brakes	*Replace.*
	Tires are inflated unequally	*Inflate equally.*
	Malfunction in wheel cylinders (other than M16A engine model)	*Repair or replace.*
	Disturbed front wheel alignment	*Adjust as prescribed.*
	Unmatched tires on 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	*Caliper should slide. Check for stuck or sluggish pistons and proper lubrication of caliper slide pin.*
	Loose suspension parts	*Check all suspension mountings.*
	Loose calipers	*Check and torque bolts to specifications.*
Noise (high pitched squeak without brake applied)	Lining worn out	*Replace linings.*
	Contact wear indicator to brake disc	*Replace pads.*
Excessive pedal travel (Pedal stroke too large)	Partial brake system failure	*Check brake systems and repair as necessary.*
	Insufficient fluid in master cylinder reservoirs	*Check warning light. Bleed system if required. Check for leaks and air in brake system. Fill reservoirs with approved brake fluid.*
	Air in system (soft / spongy pedal)	*Bleed system.*
	Rear brake system not adjusted (malfunctioning auto adjusting mechanism) (other than M16A engine model)	*Adjust rear brakes. Repair auto adjusting mechanism.*
	Bent brake shoes (other than M16A engine model)	*Replace brake shoes.*
	Worn rear brake shoes (other than M16A engine model)	*Replace brake shoes.*
Brake locked	Malfunctioning ABS or ESP®	*Check system referring to "ABS Check in Section 4E" or "Electronic Stability Program Check in Section 4F".*
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	Master cylinder pistons not returning correctly	*Replace 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 (other than M16A engine model)	*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.*

Condition	Possible cause	Correction / Reference Item
Pedal pulsation (Pedal pulsates when depressed for braking)	Damaged or loose wheel bearings	*Replace wheel bearings.*
	Distorted steering knuckle or rear wheel spindle	*Replace knuckle or rear wheel spindle.*
	Excessive disc lateral runout	*Check per instructions. If not within specifications, replace or machine disc.*
	Parallelism between pad and disc not within specifications	*Check per instructions. If not within specifications, replace or machine disc.*
	Rear drums out of round (other than M16A engine model)	*Repair or replace drum as necessary. Check runout.*
Braking noise	Glazed shoe linings, or foreign matters stuck to linings	*Repair or replace shoe linings.*
	Worn or distorted linings	*Replace lining (or pad).*
	Loose front wheel bearings	*Replace wheel bearings.*
	Distorted backing plates or loose mounting bolts	*Replace or retighten securing bolts.*
	Contact wear indicator to brake disc	*Replace pads.*
Brake warning light lights after engine start	Parking brake applied	*Release parking brake and check that brake warning light turns off.*
	Insufficient amount of brake fluid	*Add brake fluid.*
	Brake fluid leaking from brake line	*Investigate leaky point, correct it and add brake fluid.*
	Brake warning light circuit faulty	*Repair circuit.*
	Malfunctioning EBD system	*Check system referring to "EBD Warning Light (Brake Warning Light) Comes ON Steady in Section 4E" or "EBD Warning Light (Brake Warning Light) Comes ON Steady in Section 4F".*
Brake warning light turns on when brake is applied	Brake fluid leaking from brake line	*Investigate leaky point, correct it and add brake fluid.*
	Insufficient amount of brake fluid	*Add brake fluid.*
Brake warning light fails to turn on even when parking brake is applied	Brake warning light circuit faulty	*Replace bulb or repair circuit.*
ABS or ESP® warning light turns on after engine start	Malfunctioning ABS or ESP®	*Check system referring to "ABS Check in Section 4E" or "Electronic Stability Program Check in Section 4F".*
ABS or ESP® warning light turns on when brake is applied	Malfunctioning ABS or ESP®	*Check system referring to "ABS Check in Section 4E" or "Electronic Stability Program Check in Section 4F".*
ABS or ESP® warning light does not turn on for 2 sec. after ignition switch has turned ON	Bulb burnt out	*Replace bulb.*
	Malfunctioning ABS or ESP®	*Check system referring to "ABS Check in Section 4E" or "Electronic Stability Program Check in Section 4F".*
ABS or ESP® warning light flashes	New ABS or ESP® hydraulic unit / control module assembly installed.	*Perform "ABS Hydraulic Unit Operation Check in Section 4E" or "ESP® Hydraulic Unit Operation Check in Section 4F".*

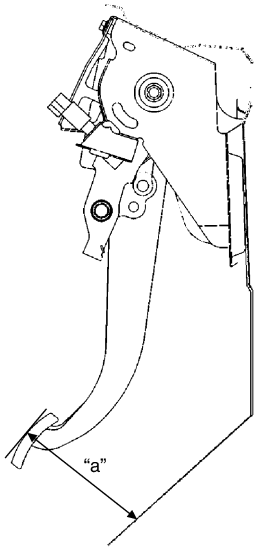
Repair Instructions

Brake Pedal Free Height Inspection

S7N20A4106001

1) Check brake pedal free height. If it is not within specification, check and adjust following item 2) and 6).

Brake pedal free height “a” from floor carpet
130 – 150 mm (5.1 – 5.9 in.)



I4RS0B410004-01

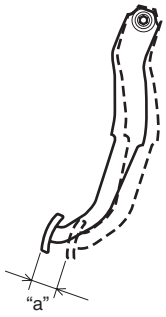
2) Check measurement between booster mounting surface and center of clevis pin hole. When booster push rod clevis has been reinstalled, it is important that the measurement is adjusted (refer to “Brake Booster Inspection”).
3) Check brake light switch position. Adjust it if it is out of specification.
4) Check pedal for dent.
5) Check brake booster for installation.
6) Check brake booster push rod for length.

Brake Pedal Play Inspection

S7N20A4106002

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”
: 1 – 8 mm (0.04 – 0.31 in.)



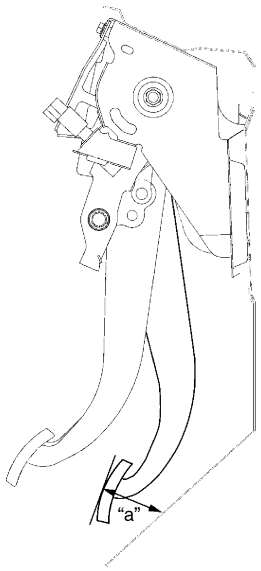
I3RH0A410010-01

Excessive Pedal Travel Inspection

S7N20A4106003

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 300 N (30 kg, 66 lbs) load, measure brake pedal to wall (dash panel silencer) clearance “a”. If clearance “a” is less than specification, the most possible cause is either rear brake shoes are worn out beyond limit (other than M16A engine model) or air is in lines. Should clearance “a” remain less than specification even after replacement of brake shoes (other than M16A engine model) and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters (other than M16A engine model) or booster push rod length out of adjustment.
   - Bleed brake system. Refer to “Air Bleeding of Brake System”.
   - Remove brake drums for adjuster inspection. (Refer to “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”.) If defective, correct or replace (other than M16A engine model).

Brake pedal arm to wall clearance “a”
When pedal depressed at 300 N (30 kg, 66 lbs): over 75 mm (2.95 in.)

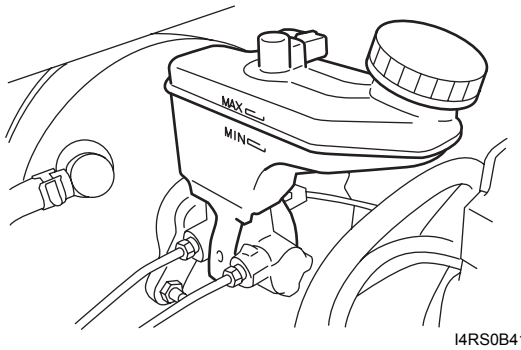


I4RS0B410005-01

Master Cylinder and Brake Fluid Level Inspection

S7N20A4106004

1) Check master cylinder, reservoir and reservoir hose (if equipped) for crack, damage and brake fluid leakage. If any faulty condition exists, correct or replace.
2) Check that brake fluid level is between MAX and MIN marks on reservoir.



I4RS0B410006-01

NOTE

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner’s manual which comes along with that vehicle. Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When brake warning light lights sometimes during driving, replenish fluid to MAX level. When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

⚠ CAUTION

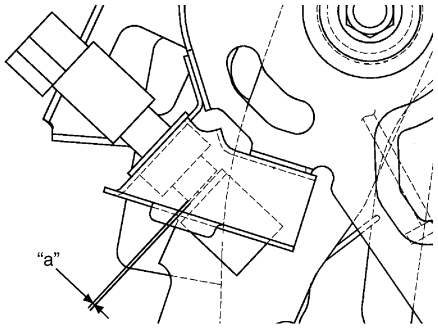
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

Brake Light Switch Adjustment

S7N20A4106005

Adjustment should be made 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 it by turning clockwise.

Clearance between brake pedal and brake light switch
"a": 1.2 – 2.2 mm (0.05 – 0.08 in.)



I4RS0B410007-01

Air Bleeding of Brake System

S7N20A4106006

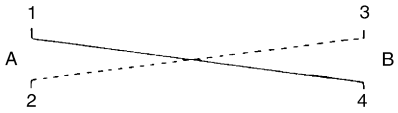
⚠ CAUTION

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.
Hydraulic lines of brake system are based on the diagonal split system. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at all 4 wheel brakes.

NOTE

Perform bleeding operation starting with wheel cylinder or rear brake caliper farthest from master cylinder and then at front caliper of the same brake line. Do the same on the other brake line.

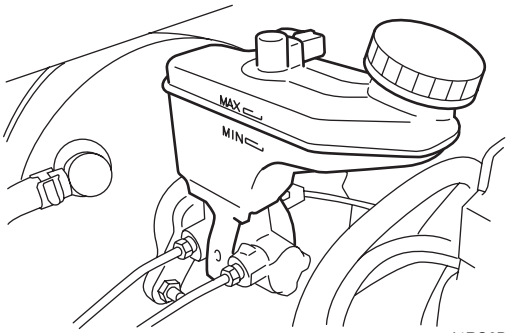


I2RH01410013-01

1. Right front brake caliper	4. Left wheel cylinder or brake caliper
2. Left front brake caliper	A: FRONT
3. Right wheel cylinder or brake caliper	B: REAR

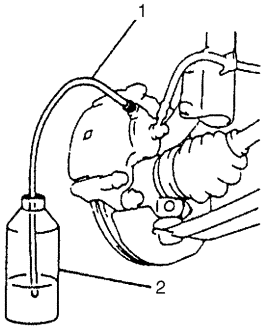
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

Brake fluid specification
: Refer to reservoir cap.



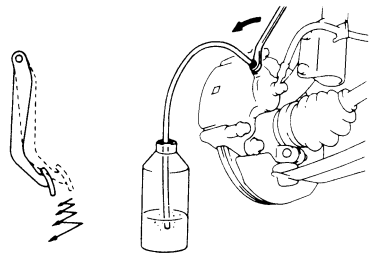
I4RS0B410006-01

2) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



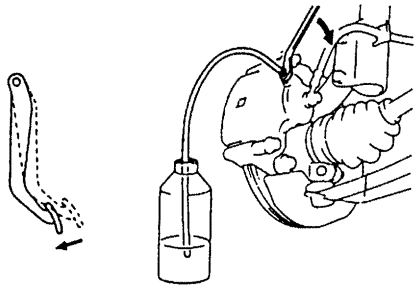
I2RH01410015-01

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.
4) When fluid pressure in cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



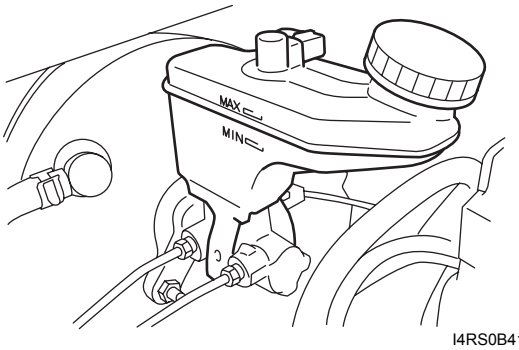
I2RH01410016-01

6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.
Refer to “Front Disc Brake Components in Section 4B”, “Rear Drum Brake Components: Drum Brake in Section 4C” and/or “Rear Disc Brake Components: Disc Brake in Section 4C”.



I2RH01410017-01

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.



I4RS0B410006-01

10) Check brake pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Front Brake Hose / Pipe Removal and Installation

S7N20A4106007

“Front Brake Hose / Pipe Construction (Non-ESP® Model)” or “Front Brake Hose / Pipe Construction (ESP® Model)”

Removal

1) Raise and support vehicle properly. Remove tire and wheel.

NOTE

This operation is not necessary when removing pipes connecting master cylinder.

2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.
3) Drain brake fluid in reservoir.

⚠ CAUTION

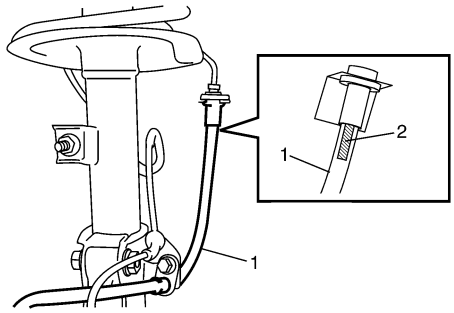
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

4) Remove brake flexible hose or pipe.

Installation

Reverse brake flexible hose removal procedure, noting the following.

- Make sure that steering wheel is in straight-forward position and flexible hose has not twist or kink.
- Check to make sure that flexible hose doesn’t contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir.
- Install the brake hose with the state marking toward outside.



I4RS0B410008-01

- Bleed brake system. Refer to “Air Bleeding of Brake System”.
- Perform brake test and check installed part for fluid leakage.

Rear Brake Hose / Pipe Removal and Installation

S7N20A4106008

Removal

1) Raise and support vehicle properly. Remove tire and wheel.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.
3) Drain brake fluid in reservoir.

⚠ CAUTION

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

4) Remove brake flexible hose or pipe.

Installation

Reverse brake flexible hose removal procedure, noting the following.

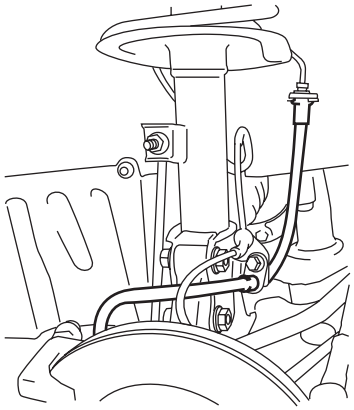
- Fill and maintain brake fluid level in reservoir.
- Bleed brake system. Refer to “Air Bleeding of Brake System”.
- Perform brake test and check each installed part for fluid leakage.
- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to the figure and tighten bolts.
- When installing hose, make sure that it has no twist or kink.

Brake Hose and Pipe Inspection

S7N20A4106009

Hose

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any above conditions are observed on brake hose, it is necessary to replace it.



I4RS0B410009-01

Pipe

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.

Master Cylinder Components

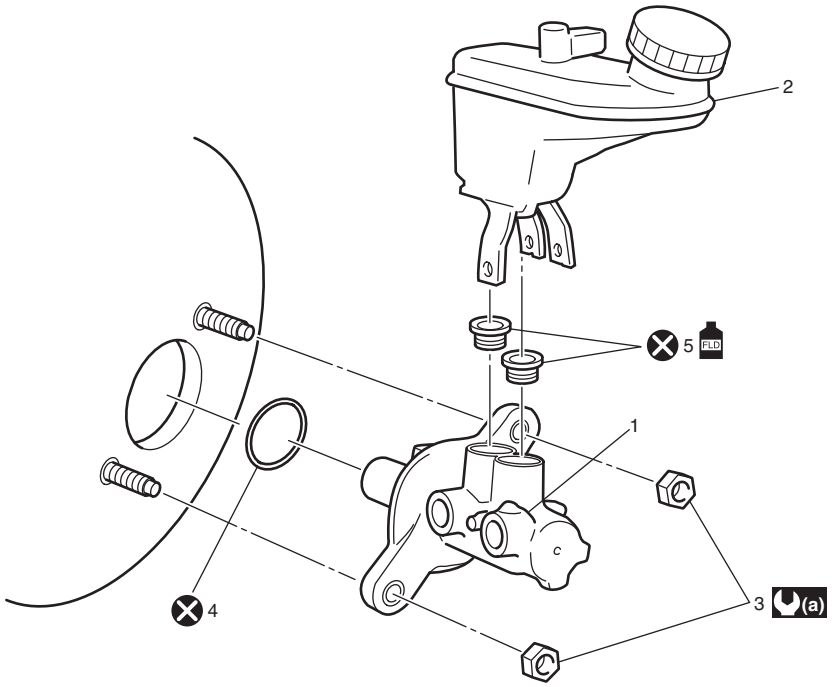
S7N20A4106010

⚠ CAUTION

**Never disassemble master cylinder since the master cylinder is supplied as assembly parts.
If faulty condition is found, replace it with new one.**

NOTE

The figure shows LH steering vehicle.



I4RS0B410010-02

1. Master cylinder	4. O-ring	⊗ : Do not reuse.
2. Reservoir	5. Grommet (FLD) : Apply brake fluid.	
3. Master cylinder fixing nut	(a) : 20 N·m (2.0 kgf-m, 14.5 lbf-ft)	

Master Cylinder Assembly Removal and Installation

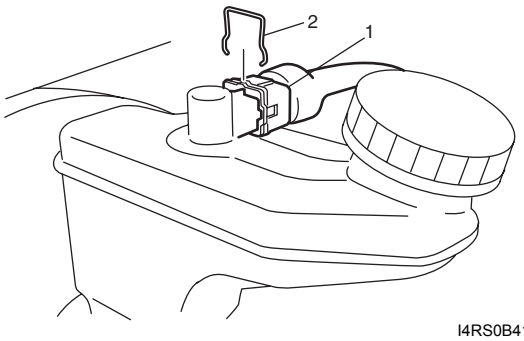
S7N20A4106011

Removal

⚠ CAUTION

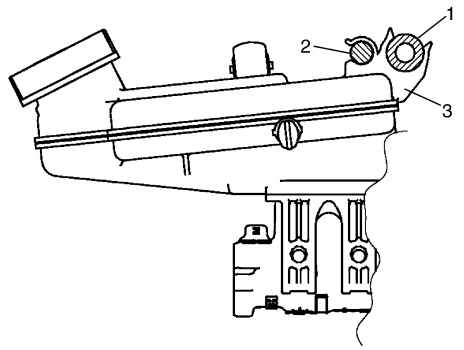
- **Never disassemble master cylinder since the master cylinder is supplied as assembly parts.
  If faulty condition is found, replace it with new one.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.**

1) Clean outside of master cylinder.
2) Remove clip (2) and disconnect fluid level switch coupler (1) on reservoir.



I4RS0B410012-01

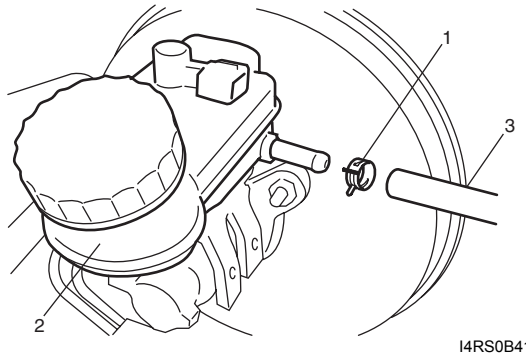
3) For RH steering vehicle:
Remove brake vacuum hose (1) and accelerator cable (2) (if equipped) from reservoir hook (3).



I4RS0B410013-01

4) Drain brake fluid in reservoir.

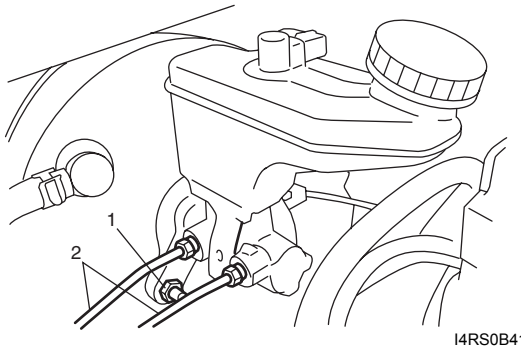
5) For M/T vehicle:
Remove clutch reservoir hose clamp (1) and disconnect clutch reservoir hose (3) from reservoir (2).



I4RS0B410014-03

6) Disconnect brake pipes (2) connected to master cylinder.

7) Remove master cylinder fixing nuts (1).



I4RS0B410015-01

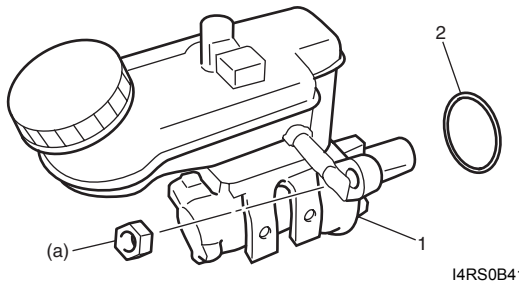
8) Remove master cylinder and O-ring.

Installation

1) Install new O-ring (2) to master cylinder assembly (1).

2) Install master cylinder to booster and tighten master cylinder fixing nuts to specified torque.

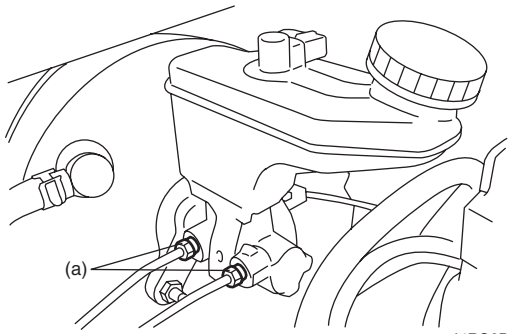
Tightening torque
Master cylinder fixing nut (a): 20 N·m (2.0 kgf-m, 14.5 lbf-ft)



I4RS0B410016-01

3) Connect brake pipe to master cylinder and tighten flare nuts to specified torque.

Tightening torque
Brake pipe flare nut (Non-ESP® model) (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)
Brake pipe flare nut (ESP® model) (a): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)

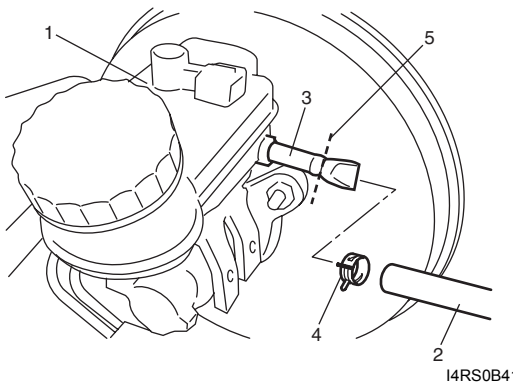


I4RS0B410017-01

4) For M/T vehicle:
Connect clutch reservoir hose to reservoir as follows.

a) When using new reservoir, cut nipple (3) of reservoir as shown in figure.

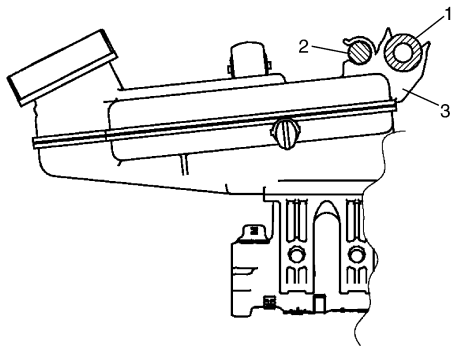
b) Connect clutch reservoir hose (2) to reservoir (1) and install reservoir hose clamp (4).



I4RS0B410018-01

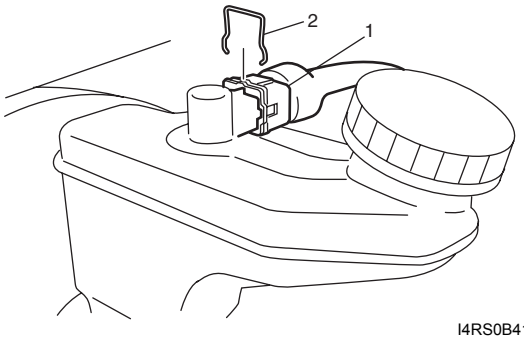
5. Cut line

5) For RH steering vehicle:
Attach brake vacuum hose (1) and accelerator cable (2) (if equipped) to reservoir hook (3).



I4RS0B410013-01

6) Connect fluid level switch connector (1) and install clip (2).



I4RS0B410012-01

7) Fill reservoir with specified brake fluid up to its MAX level.
8) After completing the work, bleed air referring to “Air Bleeding of Brake System” and “Air Bleeding of Clutch System (For Petrol Engine Model) in Section 5C” or “Air Bleeding of Clutch System (For Diesel Model) in Section 5C” for M/T vehicle.
9) Check each installed parts for fluid leakage.
10) Check brake pedal for play referring to “Brake Pedal Play Inspection”.
11) Perform brake test and check fluid leakage.

Master Cylinder Reservoir Removal and Installation

S7N20A4106012

⚠ CAUTION

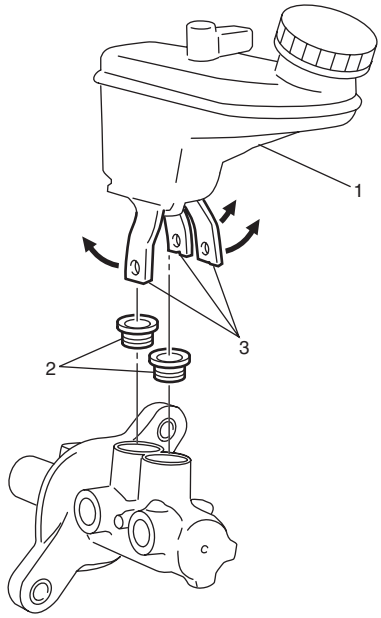
- **Do not remove reservoir from master cylinder to avoid damages before master cylinder is detached from brake booster.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged brake fluid, flush it with water immediately if any fluid is spilled.**

Removal

1) Clean outside of reservoir.
2) Remove master cylinder with reservoir referring to “Master Cylinder Assembly Removal and Installation”.
3) Open reservoir fixation legs (3) and remove reservoir (1) and grommets (2).

⚠ CAUTION

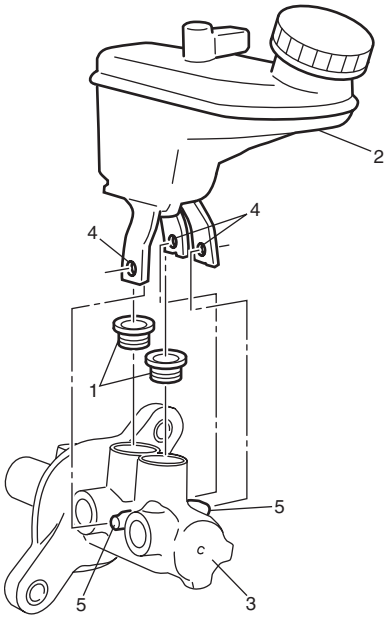
- **Do not use tools to open the reservoir fixation legs to avoid damages.**
- **Do not use cutting tools to remove grommets, to avoid damage on the master cylinder ports.**



I4RS0B410022-01

Installation

1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets (1) to reservoir (2). Grommets must be seated in place.
2) Fit holes (4) of reservoir with lugs (5) of master cylinder and install reservoir (2) to master cylinder (3).



I4RS0B410011-01

3) Install master cylinder with reservoir referring to "Master Cylinder Assembly Removal and Installation".

Master Cylinder Assembly Inspection

S7N20A4106013

Inspect all removed parts for wear or damage, and replace parts if necessary.

⚠ CAUTION

Never disassemble master cylinder since the master cylinder is supplied as assembly parts.
If faulty condition is found, replace it with new one.

NOTE

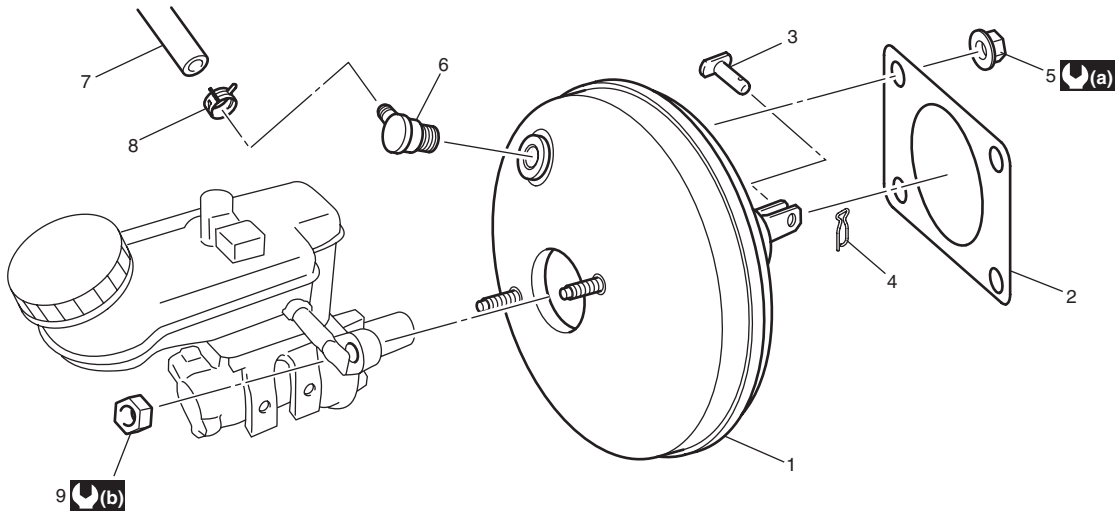
- **Wash disassembled parts with brake fluid.**
- **Do not reuse the removed O-ring.**

Brake Booster Components

S7N20A4106014

⚠ CAUTION

Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



I4RS0B410019-03

1. Brake booster assembly	5. Booster mounting nut	9. Master cylinder fixing nut
2. Gasket	6. Vacuum check valve	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
3. Clevis pin	7. Brake vacuum hose	(b) : 20 N·m (2.0 kgf-m, 14.5 lbf-ft)
4. Clip	8. Hose clamp	

Booster Operation Inspection

S7N20A4106015

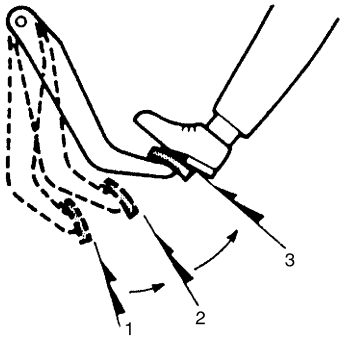
There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE

For this check, make sure that no air is in hydraulic line.

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



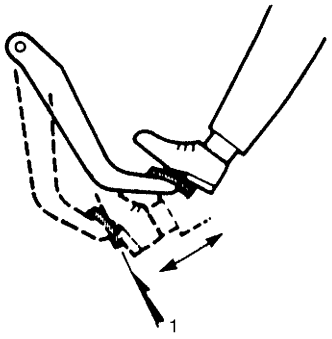
I2RH01410005-01

1. 1st	2. 2nd	3. 3rd

4) If pedal travel doesn't change, air tightness isn't obtained.

NOTE

If defective, inspect vacuum lines and sealing parts, and replace any faulty part. When this has been done, repeat the entire test.

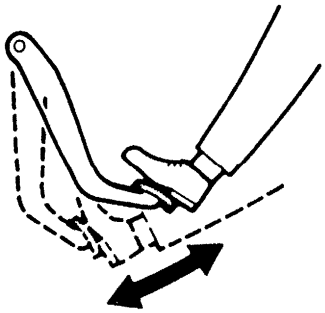


I2RH01410006-01

1. 1st, 2nd, 3rd

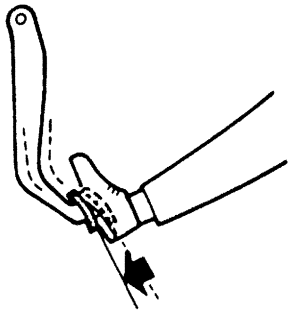
Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.



I2RH01410007-01

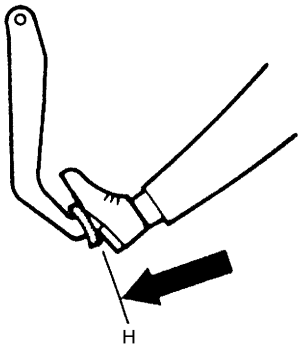
2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



I2RH01410008-01

Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



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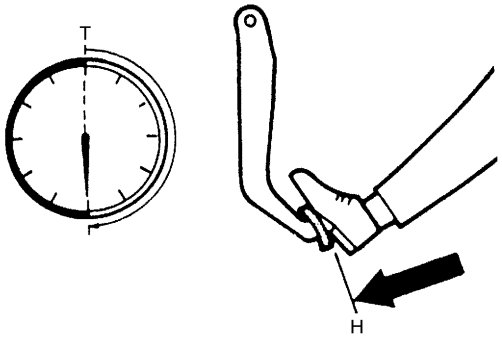
H: Hold

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.



I2RH01410010-01

H:	Hold
T:	30 seconds

Brake Booster Removal and Installation

S7N20A4106016

⚠ CAUTION

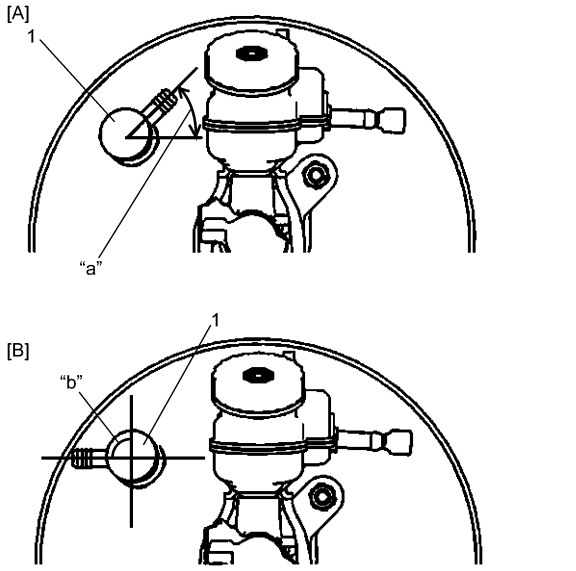
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

Removal

1) For RH steering vehicle:
Recover refrigerant from A/C system by using recovery and recycling equipment referring to "Operation Procedure for Refrigerant Charge: Manual A/C in Section 7B".
2) Remove master cylinder assembly from booster referring to "Master Cylinder Assembly Removal and Installation".
3) Remove cowl top cover and cowl top panel referring to "Cowl Top Components in Section 9K".
4) For RH steering vehicle:
Remove suction hose referring to "Air Flow Diagram of A/C System: Manual A/C in Section 7B".
5) Disconnect vacuum hose from booster referring to "Brake Booster Components".
6) Remove push rod clevis pin and booster mounting nuts and then remove booster.
7) Remove vacuum check valve (1) from brake booster.

Installation

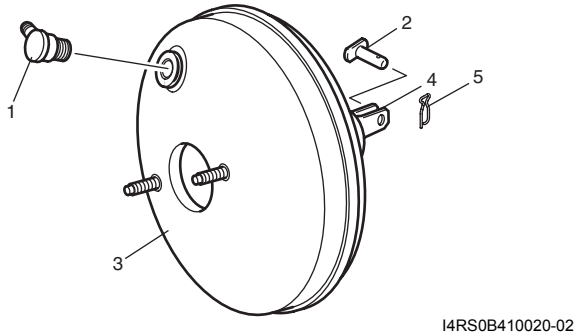
1) Loosen brake pedal bracket mounting bolt.
2) Install vacuum check valve (1) to brake booster as shown in figure.



I7N20A410001-01

[A]: RHD	"a": 45°
[B]: LHD	"b": 90°

3) Install booster (3) to dash panel. Then connect push rod clevis (4) to pedal arm with clevis pin (2) and clip (5).



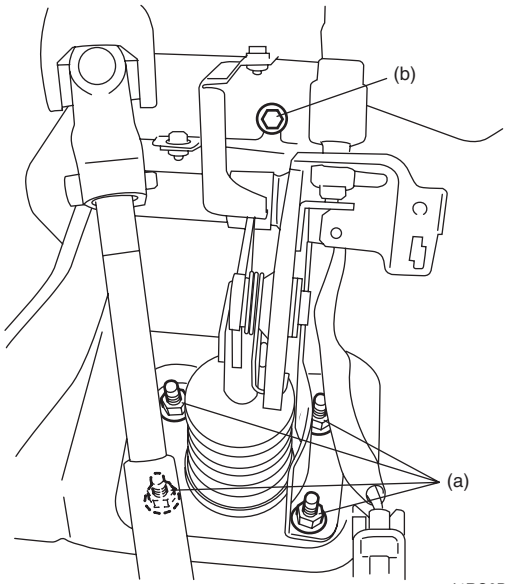
I4RS0B410020-02

4) Tighten booster mounting nuts (a) to specified torque.

Tightening torque
Booster mounting nut (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

5) Tighten brake pedal bracket mounting bolt to specified torque.

Tightening torque
Brake pedal bracket mounting bolt (b): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



I4RS0B410021-02

6) For RH steering vehicle:
Install suction hose referring to “Air Flow Diagram of A/C System: Manual A/C in Section 7B”.

7) For RH steering vehicle:
Install cowl top panel and cowl top cover referring to “Cowl Top Components in Section 9K”.

8) Install master cylinder assembly to booster referring to “Master Cylinder Assembly Removal and Installation”.

9) Fill reservoir with specified brake fluid.

10) Bleed air from brake system.

11) Check pedal height and play referring to “Brake Pedal Free Height Inspection” and “Brake Pedal Play Inspection”.

12) Check each installed part for fluid leakage and perform brake test.

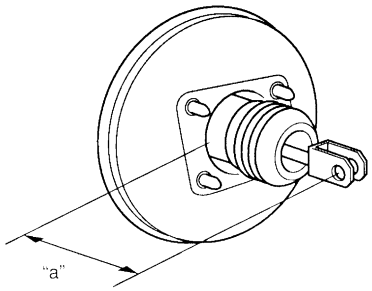
13) For RH steering vehicle:
Evacuate and charge refrigerant by referring to “Evacuating of A/C System” and “Procedure of Charging” under “Operation Procedure for Refrigerant Charge: Manual A/C in Section 7B”.

Brake Booster Inspection

S7N20A4106017

- Check brake booster for damage and operation.
- 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 (4.51 – 4.54 in.)



I3RM0A410056-01

Specifications

Tightening Torque Specifications

S7N20A4107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Master cylinder fixing nut	20	2.0	14.5	☞
Brake pipe flare nut (Non-ESP® model)	16	1.6	11.5	☞
Brake pipe flare nut (ESP® model)	19	1.9	14.0	☞
Booster mounting nut	13	1.3	9.5	☞
Brake pedal bracket mounting bolt	13	1.3	9.5	☞

NOTE

The specified tightening torque is also described in the following.
“Front Brake Hose / Pipe Construction (Non-ESP® Model): ”
“Front Brake Hose / Pipe Construction (ESP® Model): ”
“Master Cylinder Components: ”
“Brake Booster Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A4108001

NOTE

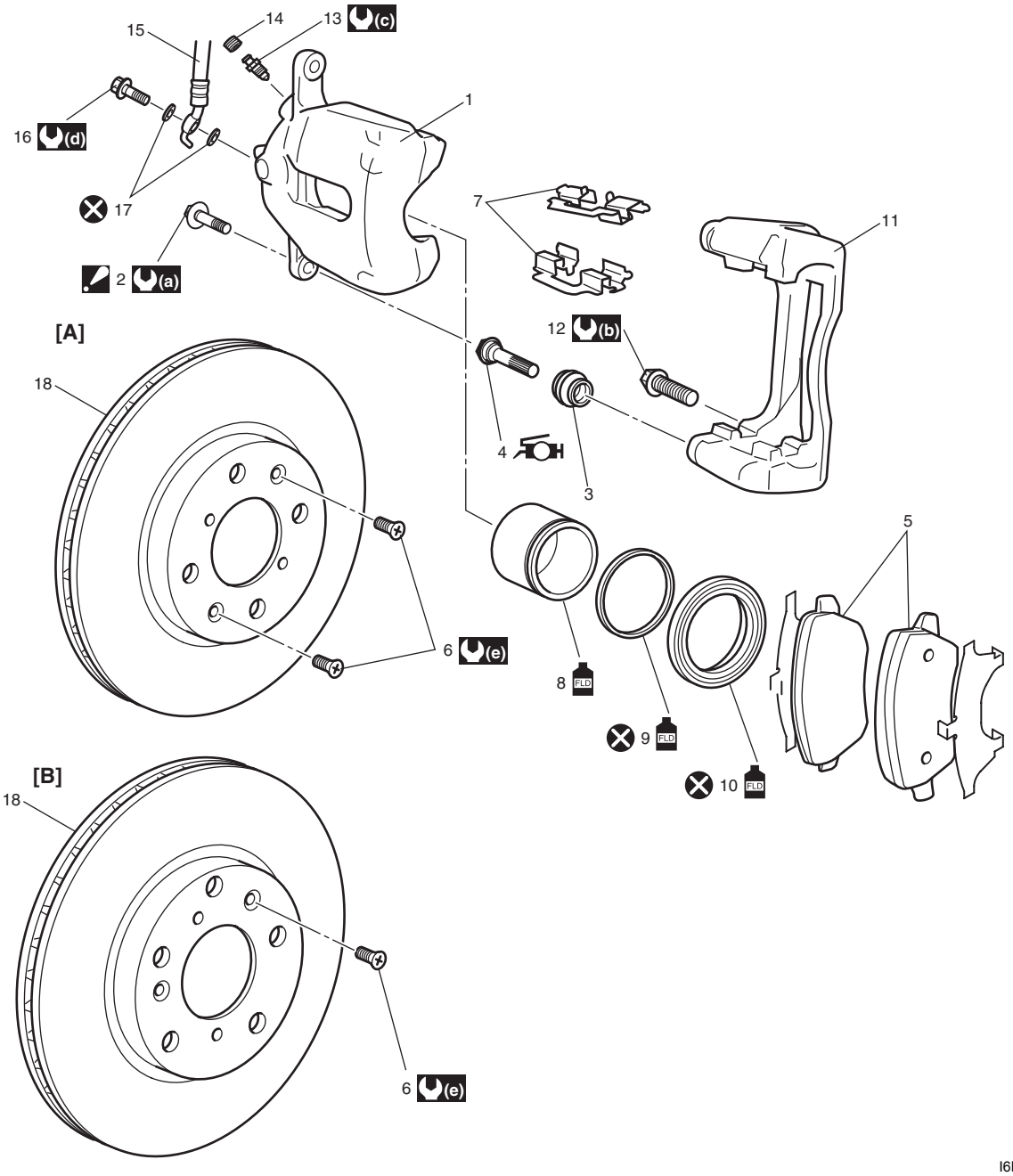
Required service material is also described in the following.
“Master Cylinder Components: ”

Front Brakes

Repair Instructions

Front Disc Brake Components

S7N20A4206001



I6RS0B420001-02

[A]: Other than M16A engine model	8. Disk brake piston: Apply brake fluid to contact surface of cylinder.	17. Hose washer
[B]: For M16A engine model	9. Piston seal: Apply small amount of brake fluid to all around part of piston seal.	18. Brake disc
1. Caliper	10. Cylinder boot: Apply small amount of brake fluid.	(a): 35 N·m (3.5 kgf-m, 25.5 lbf-ft)
2. Caliper pin bolt: If brake pads are replaced, use new caliper pin bolts included in repair kit.	11. Brake caliper carrier	(b): 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
3. Boot	12. Caliper carrier bolt	(c): 9.5 N·m (0.97 kgf-m, 7.0 lbf-ft)
4. Slide pin: Apply rubber grease.	13. Bleeder plug	(d): 30 N·m (3.0 kgf-m, 22.0 lbf-ft)
5. Brake pad	14. Bleeder plug cap	(e): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
6. Disc screw	15. Flexible hose	: Do not reuse.

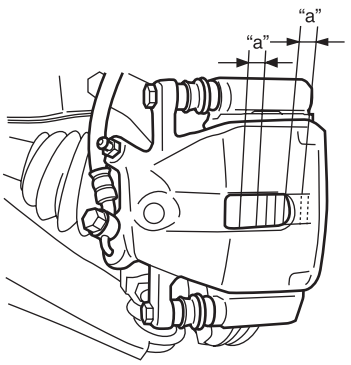
7. Pad spring	16. Flexible hose joint bolt	

Front Disc Brake Pad On-Vehicle Inspection

S7N20A4206002

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end and inspection hole of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness (“a” in figure) is less than limit, all pads must be replaced at the same time.

Front brake pad thickness “a” (lining thickness)
Standard: 11 mm (0.43 in.)
Limit: 2 mm (0.08 in.)



I4RS0B420002-01

Front Disc Brake Pad Removal and Installation

S7N20A4206003

⚠ CAUTION

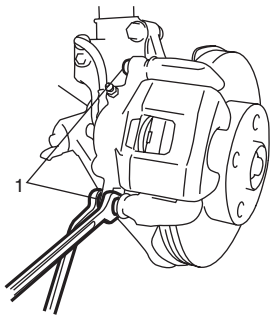
During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

NOTE

When replacing brake pad, replace it both side caliper as the set.

Removal

1) Loosen wheel bolts, lift vehicle and remove wheels referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
2) Remove caliper pin bolts (1).



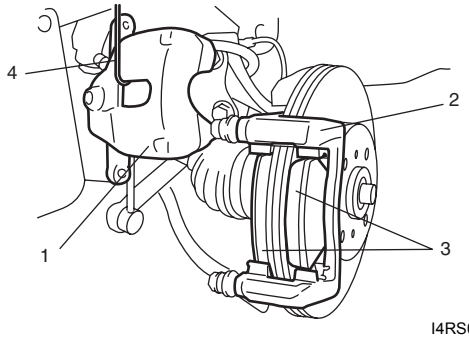
I4RS0B420003-01

3) Remove caliper (1) from caliper carrier (2).

NOTE

Hang removed caliper (1) with a wire hook (4) or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don’t operate brake pedal with brake pads removed.

4) Remove brake pads (3).



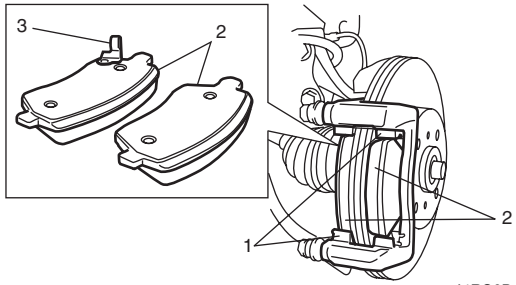
I4RS0B420004-01

Installation

1) Set brake pad springs (1) and install brake pads (2).

NOTE

Install the brake pad with wear indicator (3) to the vehicle center side of front left brake pad.



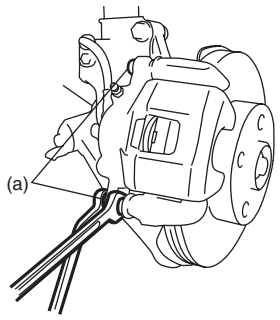
I4RS0B420005-01

2) Install caliper and tighten caliper pin bolts to specified torque.

NOTE

If brake pads are replaced, use new caliper pin bolts included in repair kit.

Tightening torque
Caliper pin bolt (a): 35 N·m (3.5 kgf-m, 25.5 lbf-ft)



I4RS0B420006-01

3) Install wheel with bolts and lower vehicle.
4) Tighten wheel bolts to specified torque referring to "Wheel (with Tire) Removal and Installation in Section 2D".
5) Check brake effectiveness.

Front Disc Brake Pad Inspection

S7N20A4206004

Check pad lining for wear. When the wear exceeds limit, replace with new one.

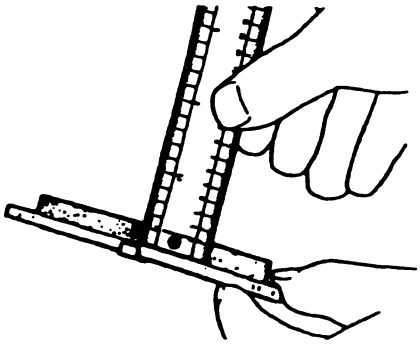
⚠ CAUTION

Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Front brake pad thickness (lining thickness)
Standard: 11 mm (0.43 in.)
Limit: 2 mm (0.08 in.)

NOTE

When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



I2RH01420005-01

Front Disc Brake Caliper Removal and Installation

S7N20A4206005

⚠ CAUTION

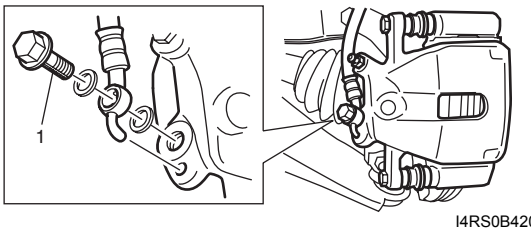
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

Removal

1) Hoist vehicle and remove front wheel.
2) Loosen flexible hose joint bolt (1) a little at caliper.

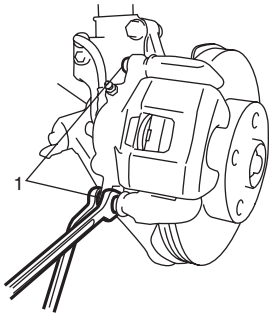
⚠ CAUTION

Be careful not to twist flexible hose while loosening the bolt.



I4RS0B420007-01

3) Remove caliper pin bolts (1).



I4RS0B420003-01

4) Remove caliper from caliper carrier.
5) Disconnect flexible hose from caliper using care not to twist it. As this will allow brake fluid to flow out of flexible hose, have a container ready beforehand.

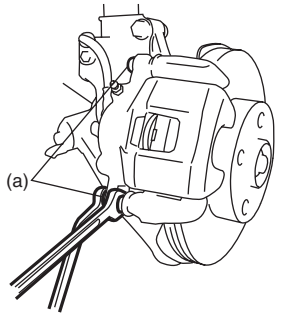
Installation

1) Apply rubber grease to slide pin, then install caliper to caliper carrier.
2) Torque caliper pin bolts to specification.

NOTE

- **Make sure that boots are fit into groove securely.**
- **If brake pads are replaced, use new caliper pin bolts included in repair kit.**

Tightening torque
Caliper pin bolt (a): 35 N·m (3.5 kgf-m, 25.5 lbf-ft)



I4RS0B420006-01

3) Connect caliper to flexible hose.
4) Torque flexible hose joint bolt to specification.

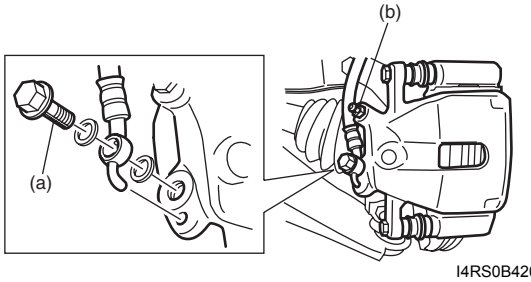
Tightening torque
Flexible hose joint bolt (a): 30 N·m (3.0 kgf-m, 22.0 lbf-ft)

⚠ CAUTION

Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

5) Tighten bleeder plug to specified torque.

Tightening torque
Bleeder plug (b): 9.5 N·m (0.97 kgf-m, 7.0 lbf-ft)



I4RS0B420008-01

6) Lower vehicle.
7) Torque wheel bolts to specifications referring to "Wheel (with Tire) Removal and Installation in Section 2D".
8) After completing the installation, fill reservoir with brake fluid and bleed air from brake system referring to "Air Bleeding of Brake System in Section 4A".
9) Check every installed part for fluid leakage.
10) Perform brake test and check fluid leakage.

Front Disc Brake Caliper Disassembly and Assembly

S7N20A4206006

Disassembly

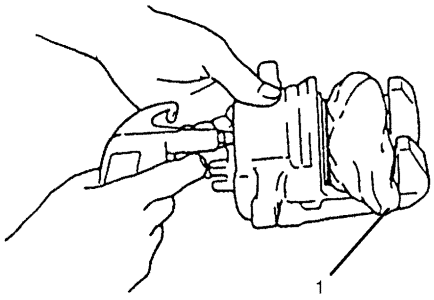
⚠ CAUTION

Clean around caliper with brake fluid before disassembly.

1) Remove disc brake piston with air blown into flexible hose bolt installation hole.

⚠ WARNING

Do not apply too highly compressed air which will cause piston to jump out of cylinder. Place a cloth (1) to prevent piston from damage. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.



I2RH01420011-01

2) Remove cylinder boot.

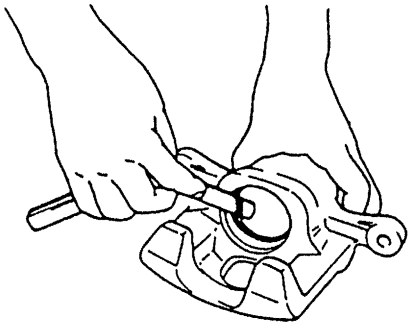
⚠ CAUTION

Be careful not to damage inside (bore side) of cylinder.

3) Remove piston seal using a thin blade like a thickness gauge, etc.

⚠ CAUTION

Be careful not to damage inside (bore side) of cylinder.



I2RH01420013-01

4) Remove bleeder plug and cap from caliper.

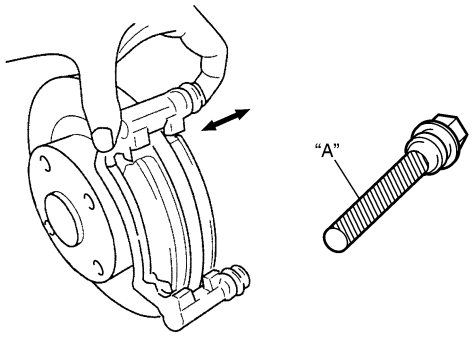
Assembly

Assemble parts in reverse order of disassembly, observing the following instructions.

⚠ CAUTION

- **Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.**
- **Never use other fluid or thinner.**
- **Before installing piston seal or cylinder boot to cylinder, apply brake fluid to them.**
- **Install a new piston seal into groove in cylinder securely making sure that it is not twisted.**
- **Before installing caliper to carrier, install slide pin with rubber grease applied into caliper carrier hole and check for its smooth movement in thrust direction.**
- **After reassembling brake lines, bleed air from them.**

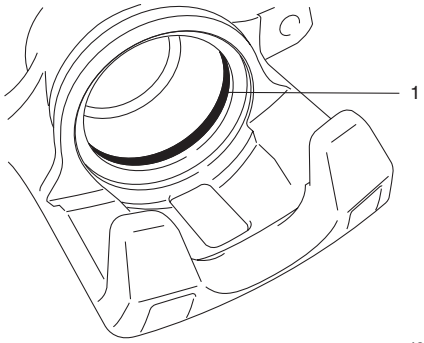
"A": Rubber grease



I4RS0B420009-01

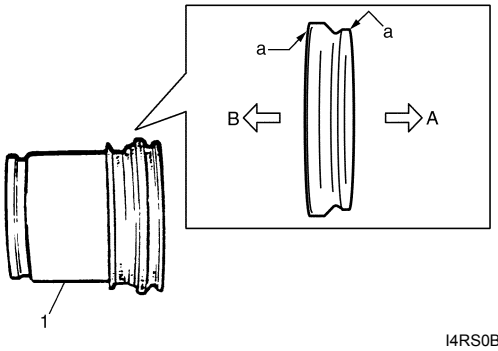
- Install piston seal, boot and piston to caliper referring to the following instructions.

1) Replace with a new piston seal (1) at every overhaul. After applying brake fluid, fit piston seal (1) into groove in cylinder taking care not to twist it.



I2RH01420017-01

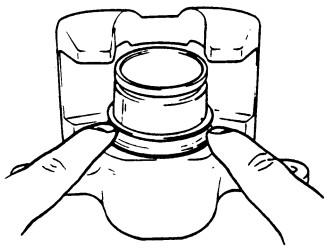
2) Before inserting piston (1) into cylinder, apply brake fluid to new boot (a) and install it onto piston as shown.



I4RS0B420015-01

A:	1 grooved side directed cylinder side
B:	2 grooved side directed pad side

3) Fit boot as it is in figure into boot groove in cylinder with fingers.



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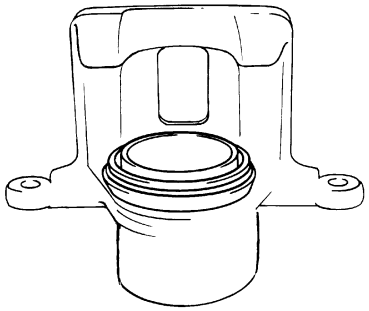
4) Insert piston into cylinder by hand and fit boot in boot groove in piston.

NOTE

Check that boot is fitted in boot groove securely all around piston and cylinder.



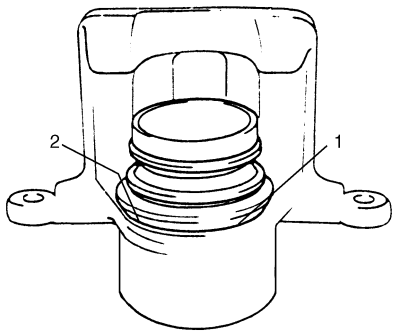
I2RH01420020-01

5) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.

NOTE

Boot's face (1) should be at the same level from cylinder's face (2) all around.

6) Insert piston into cylinder by hand.



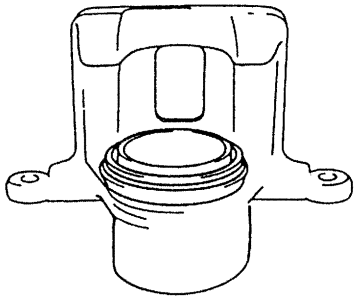
I4RS0A420004-01

Front Disc Brake Caliper Inspection

S7N20A4206007

Pin Boot and Cylinder Boot

Check boots for breakage, crack and damage.
If defective, replace boots.



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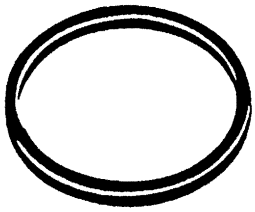
Piston Seal

Excessive or uneven wear of pad lining may indicate unsmooth return of piston.
In such case, replace rubber seal.



I2RH01420015-01

Front Brake Disc Removal and Installation

S7N20A4206008

Removal

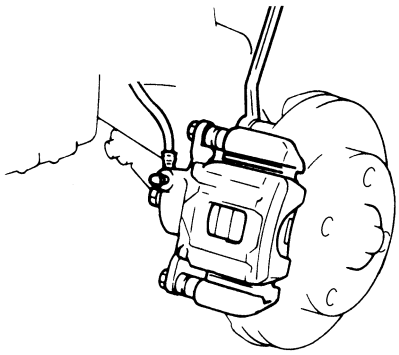
1) Hoist vehicle and remove front wheel.
2) Remove caliper assembly by removing caliper carrier bolts (2 pcs).

⚠ CAUTION

During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

NOTE

Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with brake pads removed.



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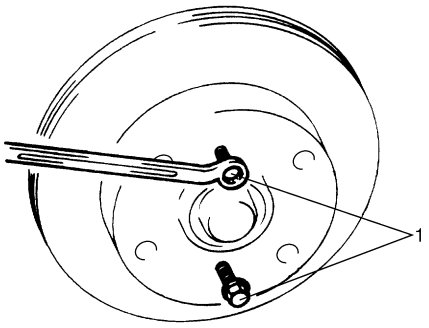
3) Remove brake disc securing screw.
4) Pull brake disc off by using 8 mm bolts (1) (2 pcs).



I4RS0B420011-01

Installation

1) Install disc to wheel hub and tighten disc screw.

Tightening torque
Disc screw (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)

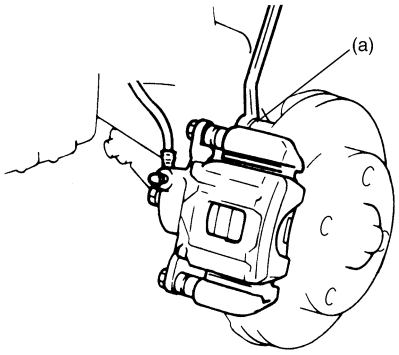
2) Install caliper assembly to steering knuckle.

⚠ CAUTION

Make sure that flexible hose is not twisted when installing caliper assembly. If it is twisted, reinstall it using care not to twist it.

3) Torque caliper carrier bolts to specification.

Tightening torque
Caliper carrier bolt (a): 85 N·m (8.5 kgf-m, 61.5 lbf-ft)



I4RS0B420012-01

4) Torque front wheel bolts to specification referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
5) Perform brake test.

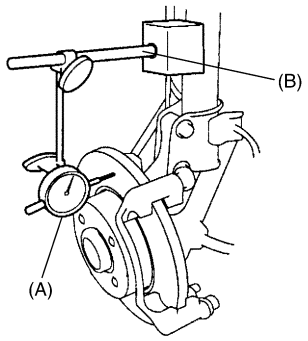
Front Brake Disc Inspection

S7N20A4206009

- Using magnetic stand and with 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 disc deflection
Limit: 0.10 mm (0.004 in.) max.

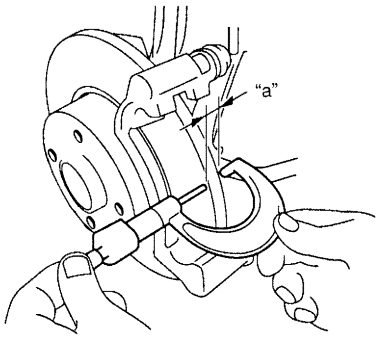
Special tool
(A): 09900–20607
(B): 09900-20701



I4RS0B420013-01

- Using micrometer, measure thickness of brake disc.
  If it is less than limit, replace brake disc.

Front brake disc thickness
Standard: 20.0 mm (0.79 in.)
Limit: 18.0 mm (0.71 in.)



I4RS0B420014-01

Specifications

Tightening Torque Specifications

S7N20A4207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Caliper pin bolt	35	3.5	25.5	☞ / ☞
Flexible hose joint bolt	30	3.0	22.0	☞
Bleeder plug	9.5	0.97	7.0	☞
Disc screw	9	0.9	6.5	☞
Caliper carrier bolt	85	8.5	61.5	☞

NOTE

The specified tightening torque is also described in the following.
“Front Disc Brake Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A4208001

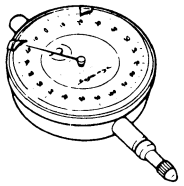
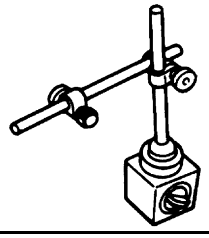
Material	SUZUKI recommended product or Specification		Note
Rubber grease	—	—	☞

NOTE

Required service material is also described in the following.
“Front Disc Brake Components: ”

Special Tool

S7N20A4208002

09900–20607 Dial gauge ☞		09900–20701 Magnetic stand ☞	

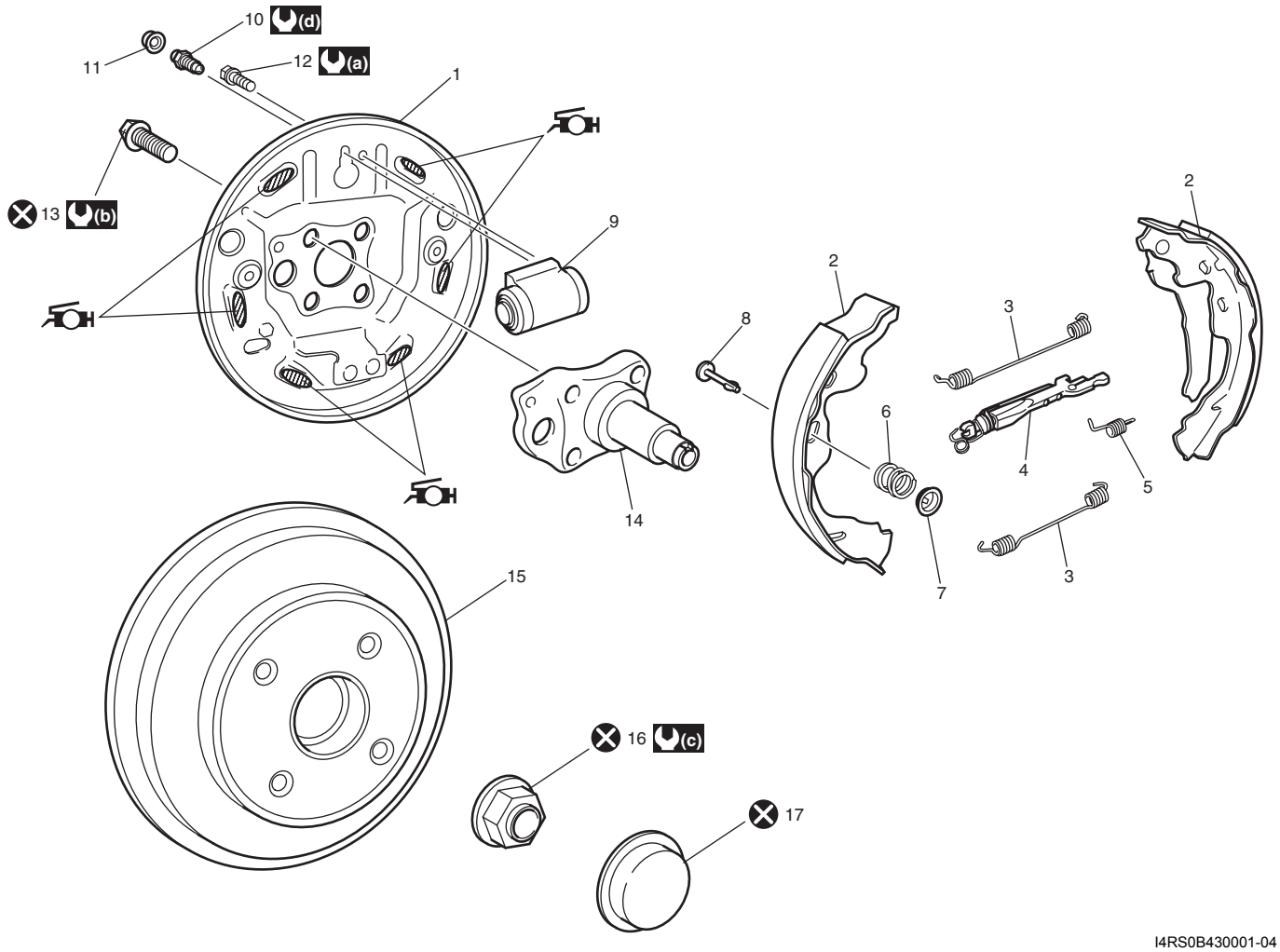
Rear Brakes

Drum Brake

Repair Instructions

Rear Drum Brake Components

S7N20A4316001



I4RS0B430001-04

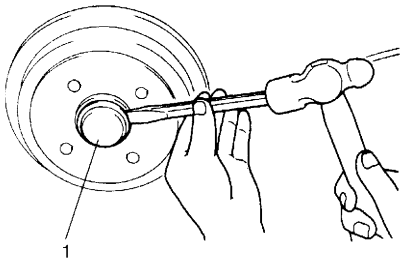
1. Brake back plate : Clean brake back plate apply thin coat of grease (included in brake shoe set) to six surfaces on which shoe rims rest.	9. Wheel cylinder	17. Spindle cap
2. Brake shoe	10. Rear wheel cylinder bleeder plug	(a) : 8 N·m (0.8 kgf-m, 6.0 lbf-ft)
3. Shoe return spring	11. Bleeder plug cap	(b) : 88 N·m (8.8 kgf-m, 64.0 lbf-ft)
4. Brake adjuster (strut)	12. Wheel cylinder mounting bolt	(c) : 175 N·m (17.5 kgf-m, 126.5 lbf-ft)
5. Antirattle spring	13. Spindle bolt	(d) : 7.5 N·m (0.75 kgf-m, 5.5 lbf-ft)
6. Hold down spring	14. Spindle	: Do not reuse.
7. Hold down retainer	15. Brake drum	
8. Shoe hold down pin	16. Spindle nut	

Rear Brake Drum Removal and Installation

S7N20A4316002

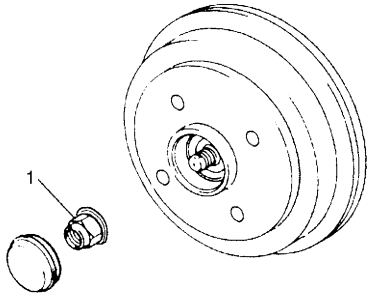
Removal

1) Hoist vehicle and remove rear wheel referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
2) Remove spindle cap (1) as shown (by hammering lightly at 3 locations around it so as not to deform or cause damage to seating part of brake drum).



I4RS0A430002-01

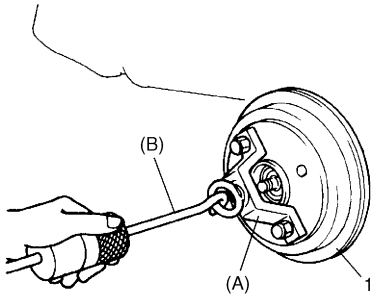
3) Uncaulk spindle nut and remove spindle nut (1).



I4RS0A430003-01

4) Release parking brake lever.
5) Pull rear brake drum (1) off by using special tools.

Special tool
(A): 09943–17912
(B): 09942–15511

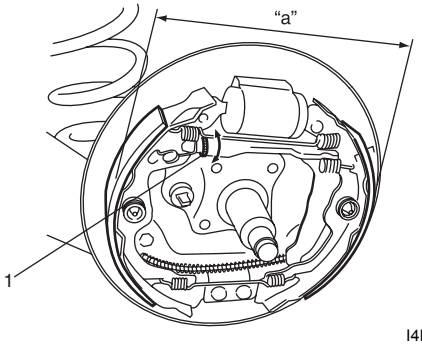


I4RS0A430004-01

6) Remove wheel bearing from brake drum referring to “Wheel Bearing Removal and Installation (For Drum Brake Type) in Section 2C” if necessary.

Installation

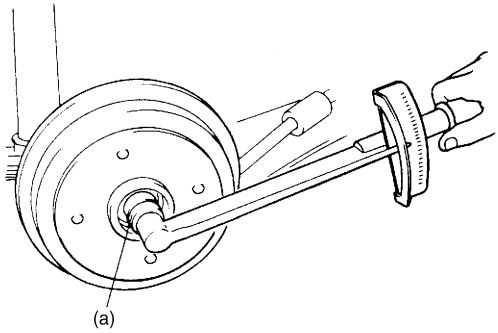
1) Install wheel bearing to brake drum referring to “Wheel Bearing Removal and Installation (For Drum Brake Type) in Section 2C”, if it was removed.
2) Before installing brake drum, check outer diameter “a” of brake shoes. If it is not within specified value, adjust it by turning adjuster (1).
   Brake shoes outer diameter “a” = Measured brake drum inside diameter – 0.5 to 1.0mm (0.02 to 0.04 in.)



I4RS0B430002-01

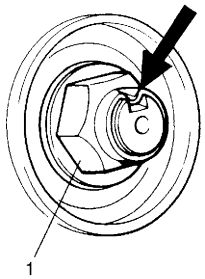
3) Confirm that inside of brake drum and brake shoes are free from dirt and oil. And then install brake drum.
4) Install new spindle nut (a).
5) Tighten spindle nut (a) to specified torque.

Tightening torque
Spindle nut (a): 175 N·m (17.5 kgf-m, 126.5 lbf-ft)



I4RS0A430005-01

6) Calk spindle nut (1).



I4RS0A430007-01

7) Install new spindle cap.

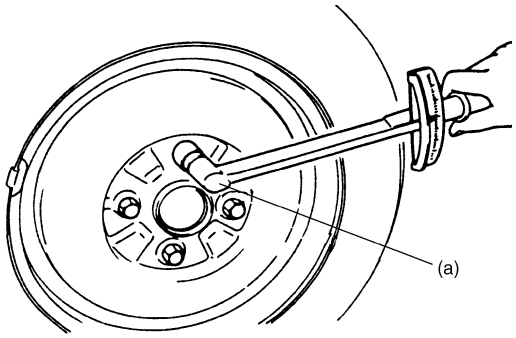
NOTE

- **When installing spindle cap, hammer lightly several locations on the collar of cap until collar comes closely into contact with brake drum.**
- **If fitting part of cap is deformed, damaged or fitted loosely, replace with new one.**

8) Depress brake pedal with about 300 N (30 kg, 66 lbs) load at least 15 – 20 times until adjuster actuator clicking sound from drum brake can not be heard so as to obtain proper drum-to-shoe clearance. Adjust parking brake cable referring to “Parking Brake Inspection and Adjustment in Section 4D”.

9) Install wheel and tighten wheel bolts to specified torque.

Tightening torque
Wheel bolt (a): 85 N·m (8.5 kgf-m, 61.5 lbf-ft)



I2RH01430011-01

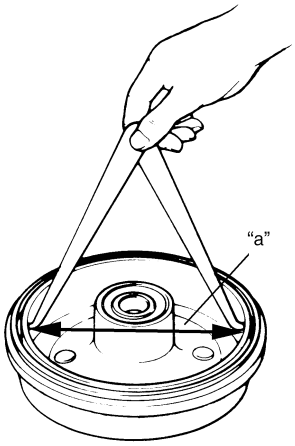
10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Perform brake test (foot brake and parking brake).

Rear Brake Drum and Shoe Inspection

S7N20A4316003

Brake Drum
Inspect brake drum for wear.
If drum inner diameter is exceeds the limit or uneven or stepped wear is excessive, replace the drum.

Rear brake drum inner diameter “a”
Standard: 200 mm (7.87 in.)
Limit: 201 mm (7.91 in.)



I4RS0A430008-01

Cracked, Scored or Grooved Drum
A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum. Smooth up any slight scores. Heavy or extensive scoring will cause excessive brake lining wear and it will probably be necessary to resurface drum braking surface.
If brake linings are slightly worn and drum is grooved, drum should be polished with fine emery cloth in the direction of drum depth but not circumferentially along drum inner.

NOTE

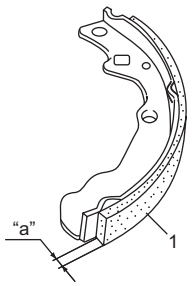
When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.

Brake Shoe
Measure thickness of brake shoe (1). Also, check surface of lining for hardening, excessive wear and oil.

Rear brake shoe lining thickness “a”
Standard: 4.5 mm (0.18 in.)
Limit: 1.0 mm (0.04 in.)

⚠ CAUTION

Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



I7N20A431001-01

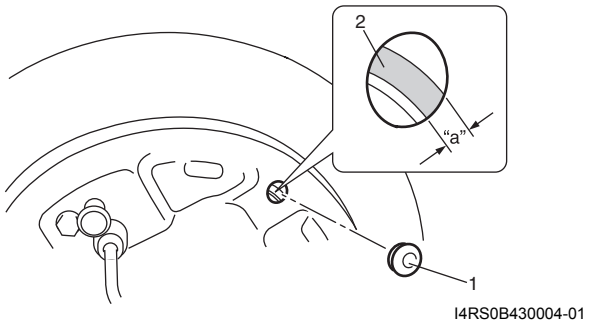
Rear Brake Shoe On-Vehicle Inspection

S7N20A4316004

Inspection should be carried out on the following points after brake pedal travel (pedal to floor panel clearance) check as described in “Excessive Pedal Travel Inspection in Section 4A”, even when it is more than specification.
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 of back plate, visually check for thickness of brake shoe lining (2). If lining thickness is less than specified wear limit, replace all brake shoes with new ones.

Rear brake shoe lining thickness “a”
Standard: 4.5 mm (0.18 in.)
Limit: 1.0 mm (0.04 in.)



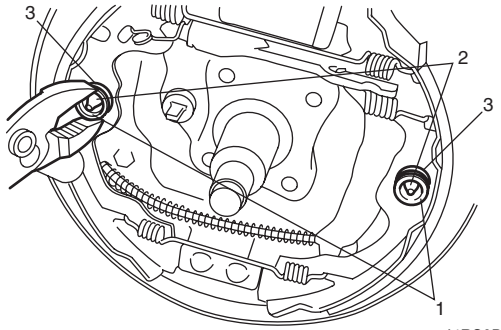
I4RS0B430004-01

Rear Brake Shoe Removal and Installation

S7N20A4316007

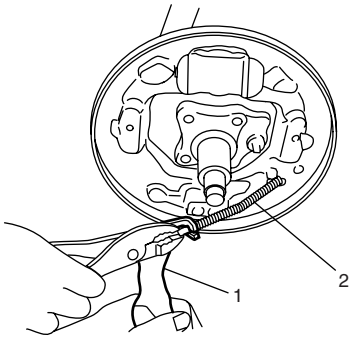
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: Drum Brake”.
2) Push and rotate 90° hold down retainer (1) and remove hold down retainer (1), hold down pin (2) and hold down spring (3).



I4RS0B430005-01

3) Remove return springs, brake shoes and adjuster.
4) Disconnect parking brake shoe lever (1) from parking brake cable (2).

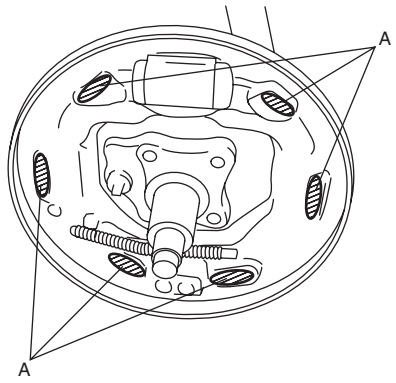


I4RS0A430013-01

Installation

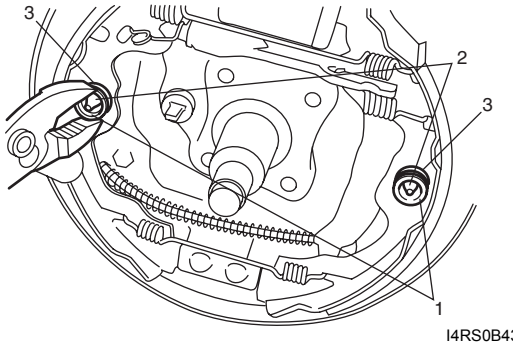
Install parts in reverse order of removal, noting the following.

- Before installing rear brake shoe to brake back plate, clean brake back plate and apply thin coat of grease (included in brake shoe set) to six surface A on which shoe rims rest.



I4RS0B430014-01

- Push and rotate 90° hold down retainer (1) and install hold down retainer (1), hold down pin (2) and hold down spring (3).
- Install brake drum referring to step 2) to 10) of “Rear Brake Drum Removal and Installation: Drum Brake”.



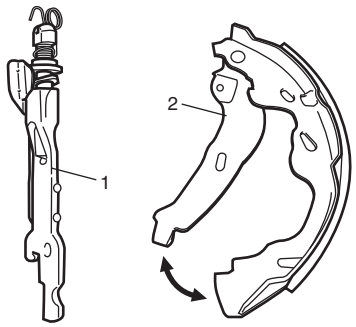
I4RS0B430005-01

Rear Brake Adjuster and Shoe Lever Inspection

S7N20A4316008

- Check ratchet of brake adjuster (1) assembly for wear or damage.
- Check shoe return spring, antirattle spring and shoe hold down spring for damage, corrosion and weakening.
- Check for smooth movement of brake shoe lever (2) along shoe rim.

If any defective or malfunction is found, repair or replace.



I4RS0B430006-01

Wheel Cylinder Removal and Installation

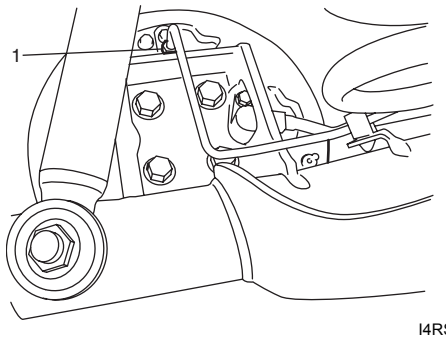
S7N20A4316009

⚠ CAUTION

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

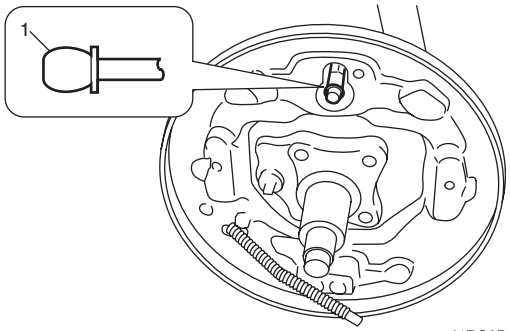
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: Drum Brake”.
2) Remove brake shoe referring to “Rear Brake Shoe Removal and Installation: Drum Brake”.
3) Loosen brake pipe flare nut (1) but only within the extent that fluid does not leak.



I4RS0B430007-01

4) Remove wheel cylinder mounting bolt. Disconnect brake pipe from wheel cylinder and put bleeder plug cap (1) onto pipe to prevent fluid from spilling.



I4RS0B430008-01

Installation

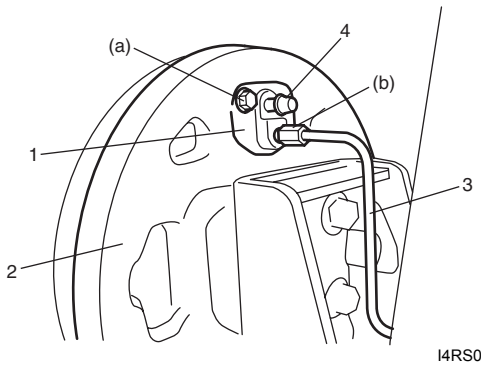
1) Take off bleeder plug cap from brake pipe and connect pipe to wheel cylinder (1) just enough to prevent fluid from leaking.
2) Install wheel cylinder (1) to brake back plate (2), and tighten wheel cylinder mounting bolt to specified torque.

   Tightening torque
   Wheel cylinder mounting bolt (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)

3) Tighten flare nut of brake pipe (3) to specified torque.

   Tightening torque
   Rear brake pipe flare nut (b): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)

4) Install bleeder plug cap (4) taken off from pipe back to bleeder plug.



I4RS0B430009-01

5) Install brake shoes. Refer to “Rear Brake Shoe Removal and Installation: Drum Brake”.
6) Install brake drum. Refer to step 2) to 7) of “Rear Brake Drum Removal and Installation: Drum Brake”.
7) Fill reservoir with brake fluid and bleed brake system. For bleeding operation refer to “Air Bleeding of Brake System in Section 4A”.
   Adjust parking brake cable referring to “Parking Brake Inspection and Adjustment in Section 4D”.
8) Install wheel and tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.

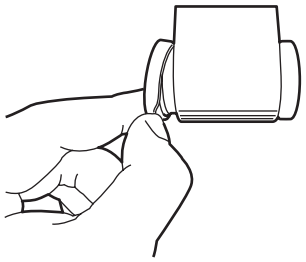
9) Check to ensure that brake drum is free from dragging and proper braking is obtained. Remove vehicle from hoist and perform brake test (foot brake and parking brake).

Wheel Cylinder Inspection

S7N20A4316010

- Inspect wheel cylinder for wear, cracks, corrosion or damage, and check for fluid leakage.
- Inspect boots for breakage, crack and damage.

If any malcondition is found, replace wheel cylinder.



I7N20A431002-01

Brake Back Plate Removal and Installation

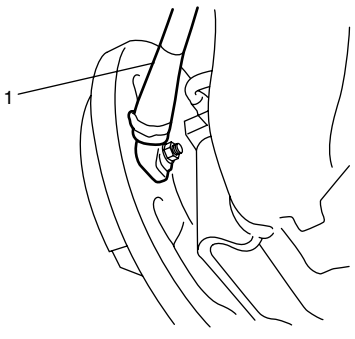
S7N20A4316011

⚠ CAUTION

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.

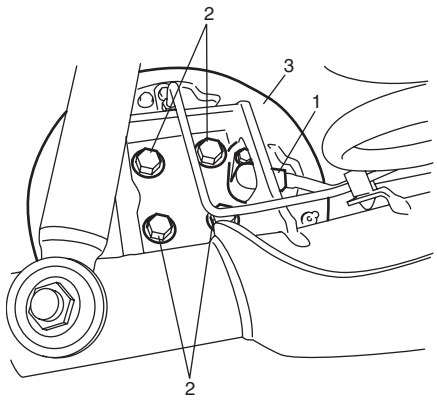
Removal

1) Remove brake drum referring to “Rear Brake Drum Removal and Installation: Drum Brake”.
2) Remove brake shoe referring to “Rear Brake Shoe Removal and Installation: Drum Brake”.
3) Remove wheel cylinder referring to “Wheel Cylinder Removal and Installation: Drum Brake”.
4) Remove parking brake cable (1) from brake back plate.



I4RS0A430020-01

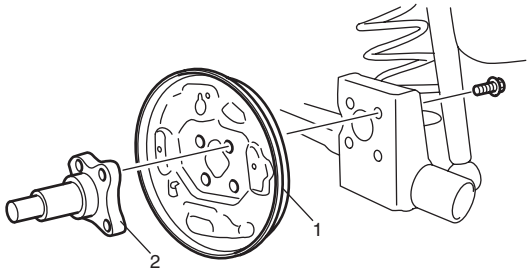
5) Remove rear wheel speed sensor (1) from brake back plate.
6) Remove spindle bolts (2), and remove brake back plate (3) and spindle.



I4RS0B430011-01

Installation

1) Install brake back plate (1) and spindle (2), and tighten new spindle bolts (3) by hand.



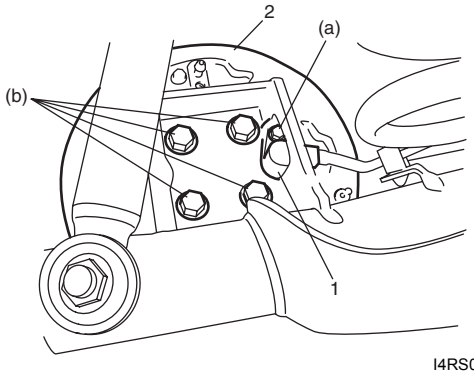
I4RS0B430012-01

2) Install rear wheel speed sensor (1) to brake back plate (2).

Tightening torque
Rear wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

3) Tighten spindle bolts to specified torque.

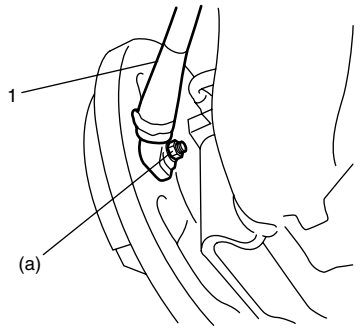
Tightening torque
Spindle bolt (b): 88 N·m (8.8 kgf-m, 64.0 lbf-ft)



I4RS0B430013-01

4) Install parking brake cable (1) to brake back plate

Tightening torque
Parking cable cap nut (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0A430024-01

5) Install wheel cylinder and connect brake pipe flare nut, and then tighten wheel cylinder bolts and flare nut to specified torque referring to “Wheel Cylinder Removal and Installation: Drum Brake”.
6) Install brake shoe referring to “Rear Brake Shoe Removal and Installation: Drum Brake”.
7) Install brake drum referring to step 2) to 7) of “Rear Brake Drum Removal and Installation: Drum Brake”.
8) Fill reservoir with brake fluid and bleed brake system. For bleeding operation refer to “Air Bleeding of Brake System in Section 4A”.
   Adjust parking brake cable referring to “Parking Brake Inspection and Adjustment in Section 4D”.
9) Install wheel and tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Perform brake test (foot brake and parking brake).

Specifications

Tightening Torque Specifications

S7N20A4317001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Spindle nut	175	17.5	126.5	☞
Wheel bolt	85	8.5	61.5	☞
Wheel cylinder mounting bolt	8	0.8	6.0	☞
Rear brake pipe flare nut	16	1.6	11.5	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Spindle bolt	88	8.8	64.0	☞
Parking cable cap nut	10	1.0	7.5	☞

NOTE

The specified tightening torque is also described in the following.
“Rear Drum Brake Components: Drum Brake”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

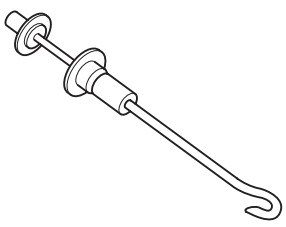
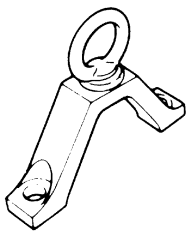
S7N20A4318001

NOTE

Required service material is also described in the following.
“Rear Drum Brake Components: Drum Brake”

Special Tool

S7N20A4318002

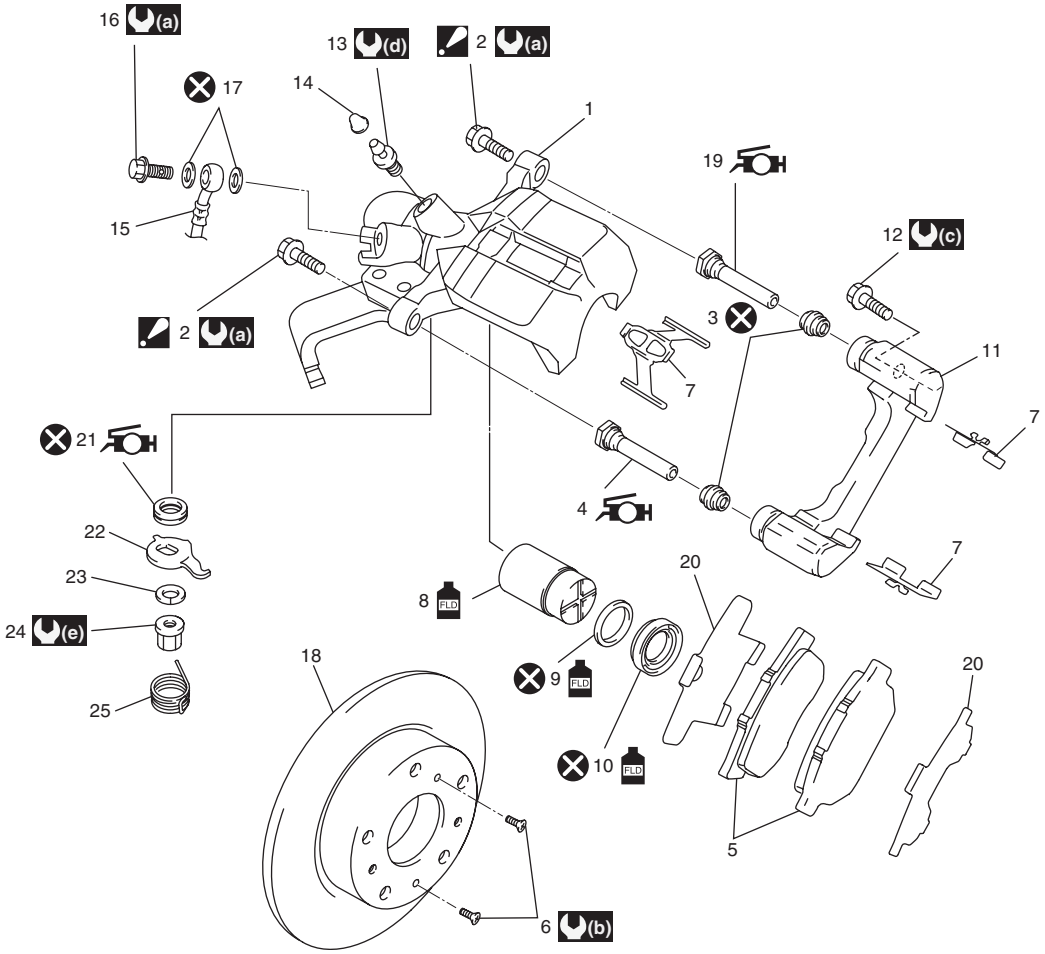
09942–15511 Sliding hammer ☞		09943–17912 Wheel hub remover ☞	

Disc Brake

Repair Instructions

Rear Disc Brake Components

S7N20A4326001



I6RS0B431001-01

1. Caliper	12. Caliper carrier bolt	23. Washer
2. Caliper pin bolt	13. Rear caliper bleeder plug	24. Parking nut
3. Boot	14. Bleeder plug cap	25. Return spring
4. No.1 slide pin : Apply rubber grease.	15. Brake flexible hose	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
5. Brake pad	16. Flexible hose joint bolt	(b) : 8.5 N·m (0.85 kgf-m, 6.5 lbf-ft)
6. Disc screw	17. Hose washer	(c) : 60 N·m (6.0 kgf-m, 43.5 lbf-ft)
7. Pad spring	18. Brake disc	(d) : 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
8. Disk brake piston : Apply brake fluid to contact surface of cylinder.	19. No.2 slide pin : Apply rubber grease.	(e) : 27 N·m (2.7 kgf-m, 19.5 lbf-ft)
9. Piston seal : Apply small amount of brake fluid to all around part of piston seal.	20. Pad shim	: Do not reuse.
10. Cylinder boot : Apply small amount of brake fluid.	21. Shaft cover : Apply rubber grease.	
11. Brake caliper carrier	22. Lever	

Rear Disc Brake Pad Removal and Installation

S7N20A4326002

NOTE

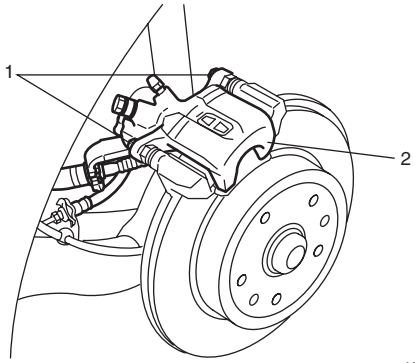
When replacing brake pad, replace it on the right and left as the set.

Removal

1) Hoist vehicle and remove wheel.
2) Release parking brake lever.
3) Remove caliper pin bolts (1).
4) Remove caliper (2) from caliper carrier.

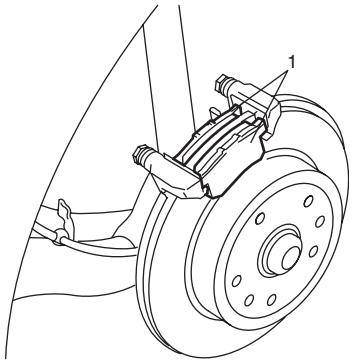
NOTE

Hang removed caliper (2) with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with brake pads removed.



I6RS0B431002-01

5) Remove brake pads (1) and pad springs.



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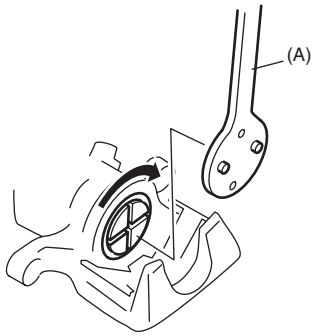
Installation

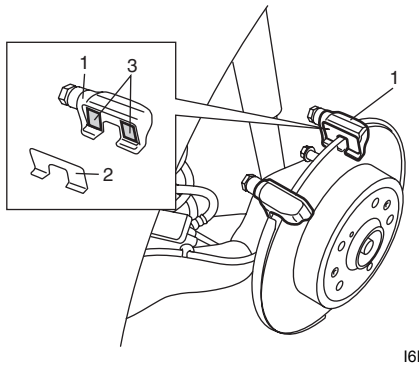
1) Turn brake caliper piston clockwise to obtain clearance between brake disc and pads.

Special tool
(A): 09945–16060



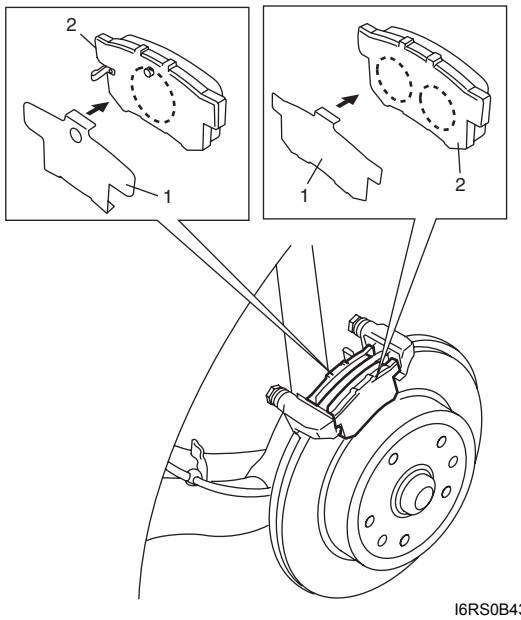
I6RS0B431004-01

2) Clean (and degrease) pad spring installation face (3) of caliper carrier (1).
3) Attach pad springs (2) to caliper carrier (1).



I6RS0B431005-03

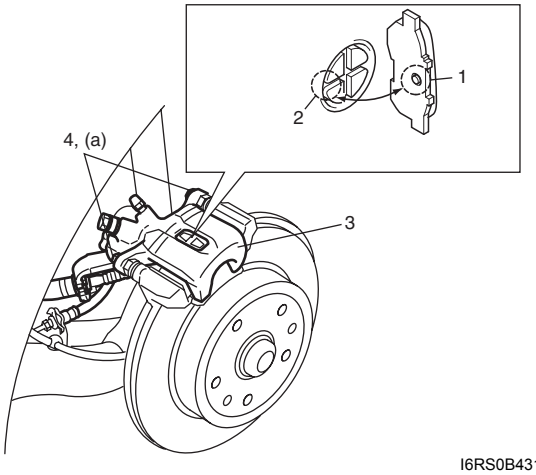
4) Before installing brake pad shims (1), apply small amount of grease (included in spare parts) to mating surfaces of brake pad and pad shim.
5) Set pad shims (1) to brake pads (2).



I6RS0B431006-02

6) With lug (1) of brake pad matched with dent (2) of brake piston, install caliper (3) to caliper carrier.
7) Tighten caliper pin bolts (4) to specified torque.

Tightening torque
Caliper pin bolt (a): 23 N·m (2.3 kgf-m, 17 lbf-ft)



I6RS0B431007-01

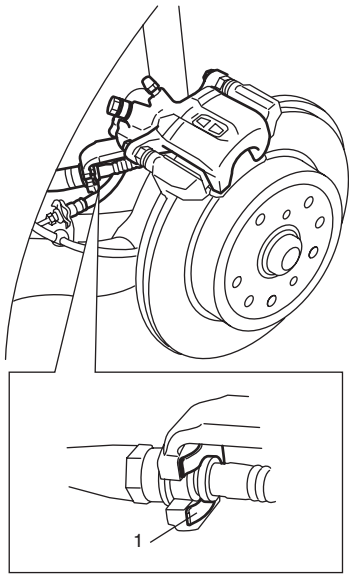
8) Tighten wheel bolts temporarily and lower lift.
9) Tighten wheel bolts to specified torque referring to "Wheel (with Tire) Removal and Installation in Section 2D".
10) After completion of installation, check for brake effectiveness.

Rear Disc Brake Caliper Removal and Installation

S7N20A4326003

Removal

1) Hoist vehicle and remove rear wheel.
2) Release parking brake lever.
3) Remove clip (1).

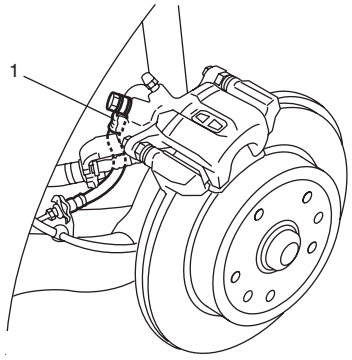


I6RS0B431008-01

4) Disconnect flexible hose (1) from caliper.

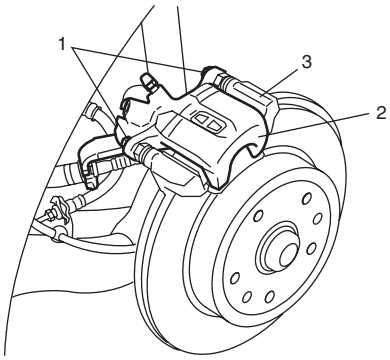
⚠ CAUTION

Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.



I6RS0B431009-01

5) Remove caliper pin bolts (1).
6) Remove caliper (2) from brake caliper carrier (3).



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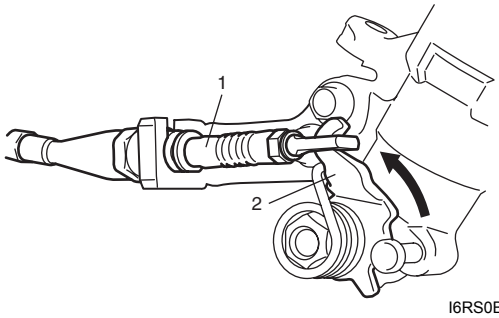
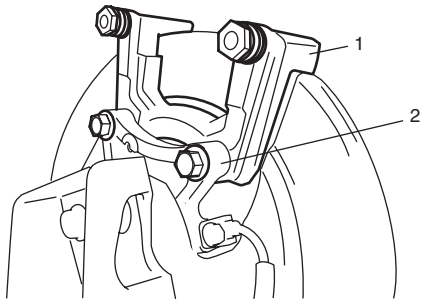
7) Disconnect parking brake cable (1) from lever (2) while rotating lever in direction of arrow.



I6RS0B431011-01

8) Remove brake pads, slide pins and slide pin boots from brake caliper carrier.
9) Remove brake caliper carrier (1) from spindle (2).

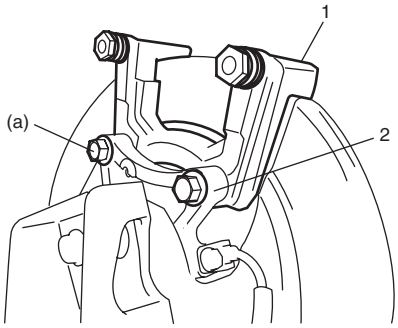


I6RS0B431012-01

Installation

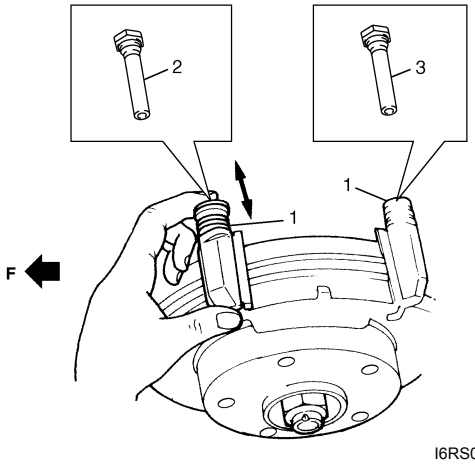
1) Install brake caliper carrier (1) to spindle (2).

Tightening torque
Brake caliper carrier bolt (a): 60 N·m (6.0 kgf-m, 43.5 lbf-ft)



I6RS0B431023-01

2) Install new slide pin boots (1) to brake caliper carrier.
3) Apply rubber grease to slide pins, then install slide pin (2) to front side and slide pin (3) to rear side of brake caliper carrier.



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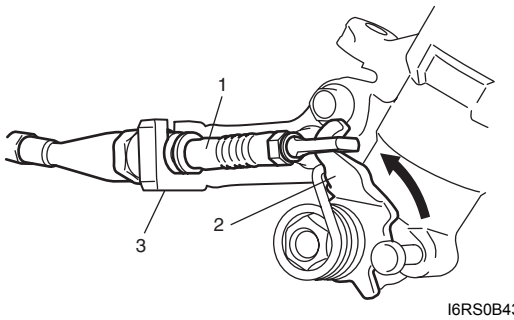
F: Vehicle front

4) Pass parking brake cable (1) through bracket (3) of caliper.
5) Hang parking brake cable on lever (2) while rotating lever in direction of arrow.



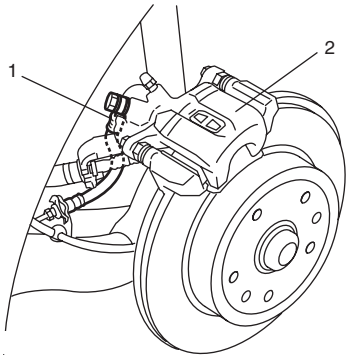
I6RS0B431025-01

6) Install brake pads and caliper referring to “Rear Disc Brake Pad Removal and Installation: Disc Brake”.
7) Connect flexible hose (1) with new washers to caliper (2).

⚠ WARNING

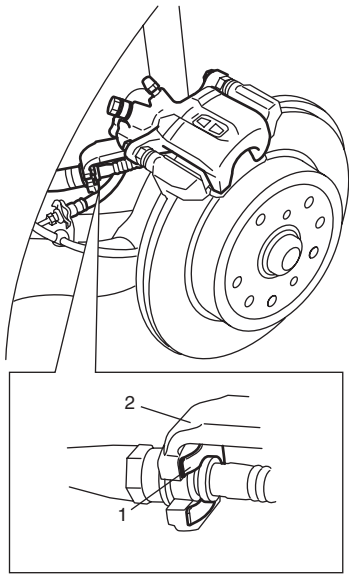
Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

Tightening torque
Flexible hose joint bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I6RS0B431026-01

8) Install brake cable clip (1) securely to bracket (2).



I6RS0B431027-01

9) After reassembling brake lines, bleed air from them referring to “Air Bleeding of Brake System in Section 4A”.
10) Tighten wheel bolts temporarily and lower hoist.
11) Tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
12) Upon completion of installing all parts, fill reservoir tank with specified fluid and bleed brake system of entrapped air.
13) Check to make sure that system is free from fluid leakage.
14) Depress brake pedal with about 300 N (30 kg, 66 lbs) load five times or more so as to obtain proper disc to pad clearance.
15) Check to make sure that parking brake lever stroke is as specified. If not, adjust.
16) Remove vehicle from hoist and perform brake test (foot brake and parking brake).

Rear Disc Brake Pad Inspection

S7N20A4326004

Check pad lining for wear. When wear exceeds limit, replace with new one.

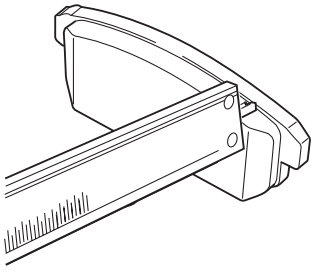
⚠ CAUTION

Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Rear brake pad thickness (lining thickness)
Standard: 9.0 mm (0.354 in.)
Limit: 1.0 mm (0.039 in.)

NOTE

When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.



I6RS0B431034-01

Rear Disc Brake Caliper Disassembly and Assembly

S7N20A4326005

Disassembly

⚠ CAUTION

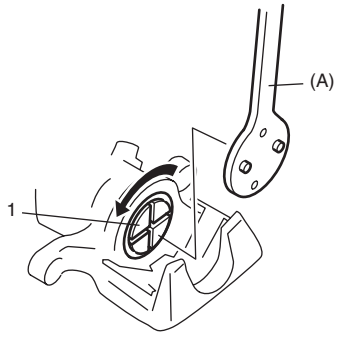
Clean around caliper with brake fluid before disassembly.

1) Remove disc brake piston (1) by turning piston counterclockwise with special tool.

⚠ CAUTION

Be careful not to damage inside (bore side) of cylinder.

Special tool
(A): 09945–16060

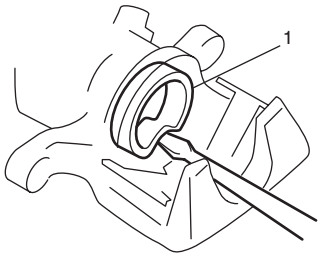


I6RS0B431013-01

2) Remove cylinder boot and piston seal (1).

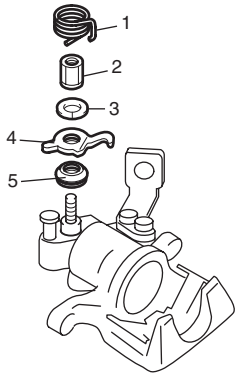
⚠ CAUTION

Be careful not to damage inside (bore side) of cylinder.



I6RS0B431014-01

3) Remove bleeder plug and cap from caliper.
4) Remove return spring (1), parking nut (2), washer (3), lever (4) and shaft cover (5).



I6RS0B431015-01

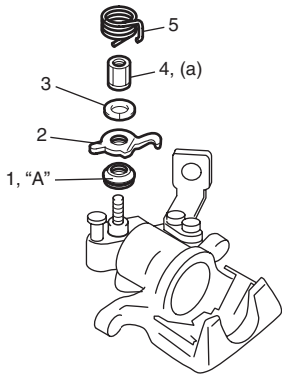
Assembly

⚠ CAUTION

- **Wash each part cleanly before installation in the same fluid as the one used in master cylinder reservoir.**
- **Never use other fluid or thinner.**
- **Before installing caliper to brake caliper carrier, install slide pins with grease applied into carrier hole and check for its smooth movement in thrust direction.**
- **Before installing piston seal to cylinder, apply fluid to them.**
- **Install a piston seal into groove in cylinder securely making sure that it is not twisted.**

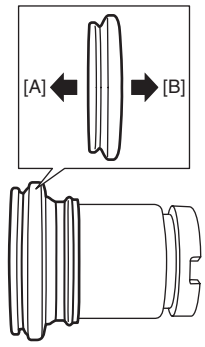
1) Apply grease to inside of new shaft cover (1).
2) Install new shaft cover, lever (2), washer (3), parking nut (4) and return spring (5) to caliper.

Tightening torque
Parking nut (a): 27 N·m (2.7 kgf-m, 19.5 lbf-ft)



I6RS0B431016-01

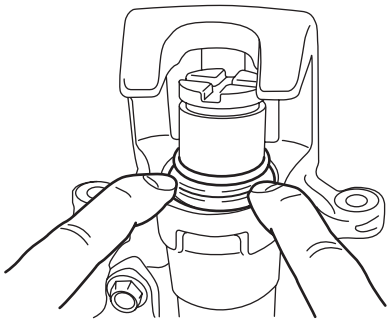
3) Install bleeder plug and cap to caliper.
4) Install new piston seal to caliper.
5) Before inserting piston into cylinder, install new boot onto piston as shown.



I6RS0B431017-01

[A]:	Cylinder side
[B]:	Brake pad side

6) Fit boot as it is in figure into boot groove in cylinder with fingers.



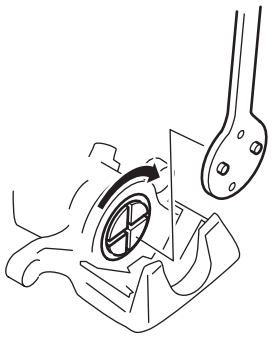
I6RS0B431033-01

7) Turn brake caliper piston clockwise to obtain clearance between brake disc and pads.

NOTE

Check that boot is fitted in boot groove securely all around piston.

Special tool
(A): 09945–16060



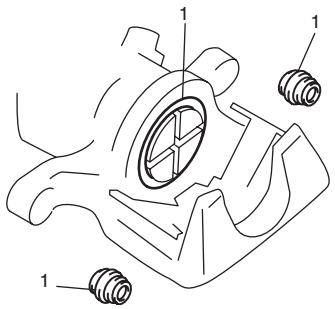
I6RS0B431018-01

Rear Disc Brake Caliper Inspection

S7N20A4326006

Pin Boot and Cylinder Boot

Check boots (1) for breakage, crack and damage.
If defective, replace.



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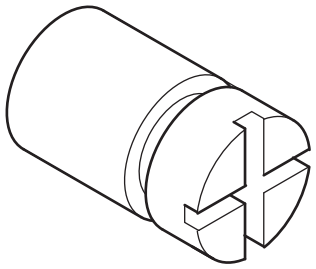
Disc Brake Piston

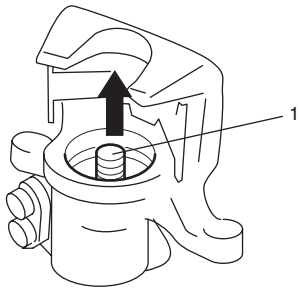
Check all around piston for rust, corrosion and any other damage.
If it is found faulty, replace.



I6RS0B431020-01

Caliper

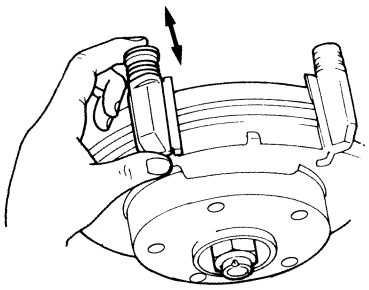
Push in adjusting bolt (1) by hand and move lever to check that adjusting bolt (1) moves smoothly in the arrow direction.
Also, check adjusting bolt (1) for any damage. If it is found faulty, replace.



I6RS0B431021-01

Slide Pin

Check guide pin for smooth movement as shown.
If it is found faulty, correct or replace.
Apply rubber grease to guide pin outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as –40 °C (–40 °F).



I6RS0B431022-01

Rear Brake Disc Removal and Installation

S7N20A4326007

Removal

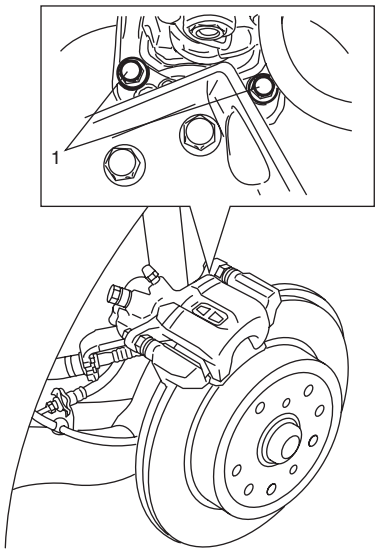
1) Hoist vehicle and remove wheel.
2) Remove caliper assembly by removing caliper carrier bolts (1) (2 pcs).

⚠ CAUTION

During removal, be careful not to damage brake flexible hose and not to depress brake pedal.

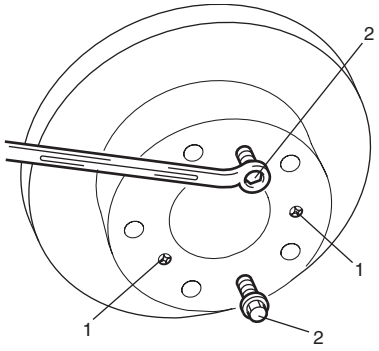
NOTE

Hang removed caliper with a wire hook or the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with brake pads removed.



I6RS0B431028-01

3) Remove brake disc screws (1).
4) Pull brake disc off by using 8 mm bolts (2) (2 pcs).

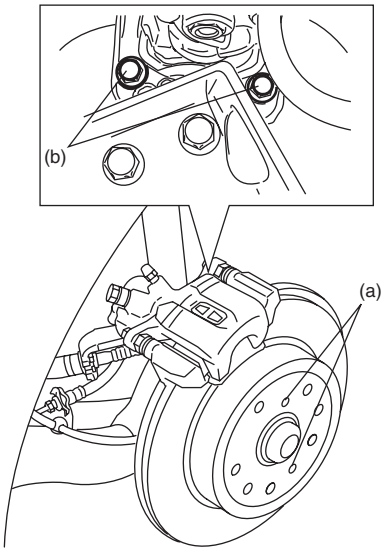


I6RS0B431029-01

Installation
Install in reverse order of removal noting the following.

- Tighten brake disc screws and caliper carrier bolts to specified torque.

  Tightening torque
  Brake disc screws (a): 8.5 N·m (0.85 kgf-m, 6.5 lbf-ft)
  Caliper carrier bolt (b): 60 N·m (6.0 kgf-m, 43.5 lbf-ft)



I6RS0B431030-01

- Tighten wheel bolts to specified torque referring to "Wheel (with Tire) Removal and Installation in Section 2D".
- Upon completion of installation, perform brake test.

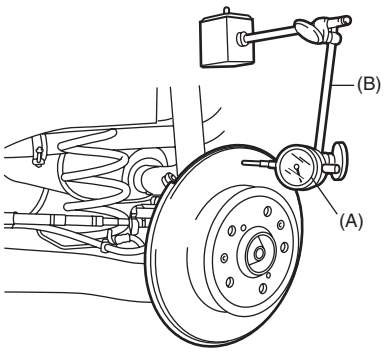
Rear Brake Disc Inspection

S7N20A4326008

- Using magnetic stand and with dial gauge positioned at about 10 mm (0.39 in.) inward from periphery of disc, measure deflection of disc.
  If limit value is exceeded, replace correct or replace.

Rear brake disc deflection
Limit: 0.10 mm (0.004 in.) max.

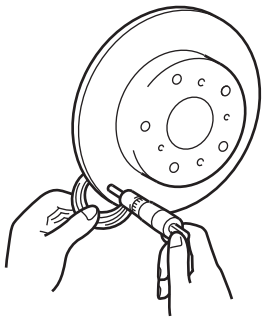
Special tool
(A): 09900–20607
(B): 09900–20701



I6RS0B431031-01

- Using micrometer, measure thickness of brake disc.
  If limit value is exceeded, replace brake disc.

Rear brake disc thickness
Standard: 9 mm (0.354 in.)
Limit: 8 mm (0.315 in.)



I6RS0B431032-01

Specifications

Tightening Torque Specifications

S7N20A4327001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Caliper pin bolt	23	2.3	17	☞
Brake caliper carrier bolt	60	6.0	43.5	☞
Flexible hose joint bolt	23	2.3	17.0	☞
Parking nut	27	2.7	19.5	☞
Brake disc screws	8.5	0.85	6.5	☞
Caliper carrier bolt	60	6.0	43.5	☞

NOTE

The specified tightening torque is also described in the following.
“Rear Disc Brake Components: Disc Brake”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

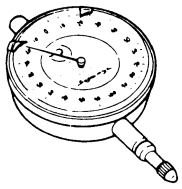
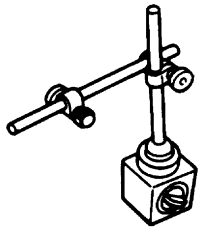
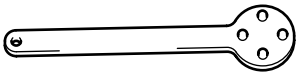
S7N20A4328001

NOTE

Required service material is also described in the following.
“Rear Disc Brake Components: Disc Brake”

Special Tool

S7N20A4328002

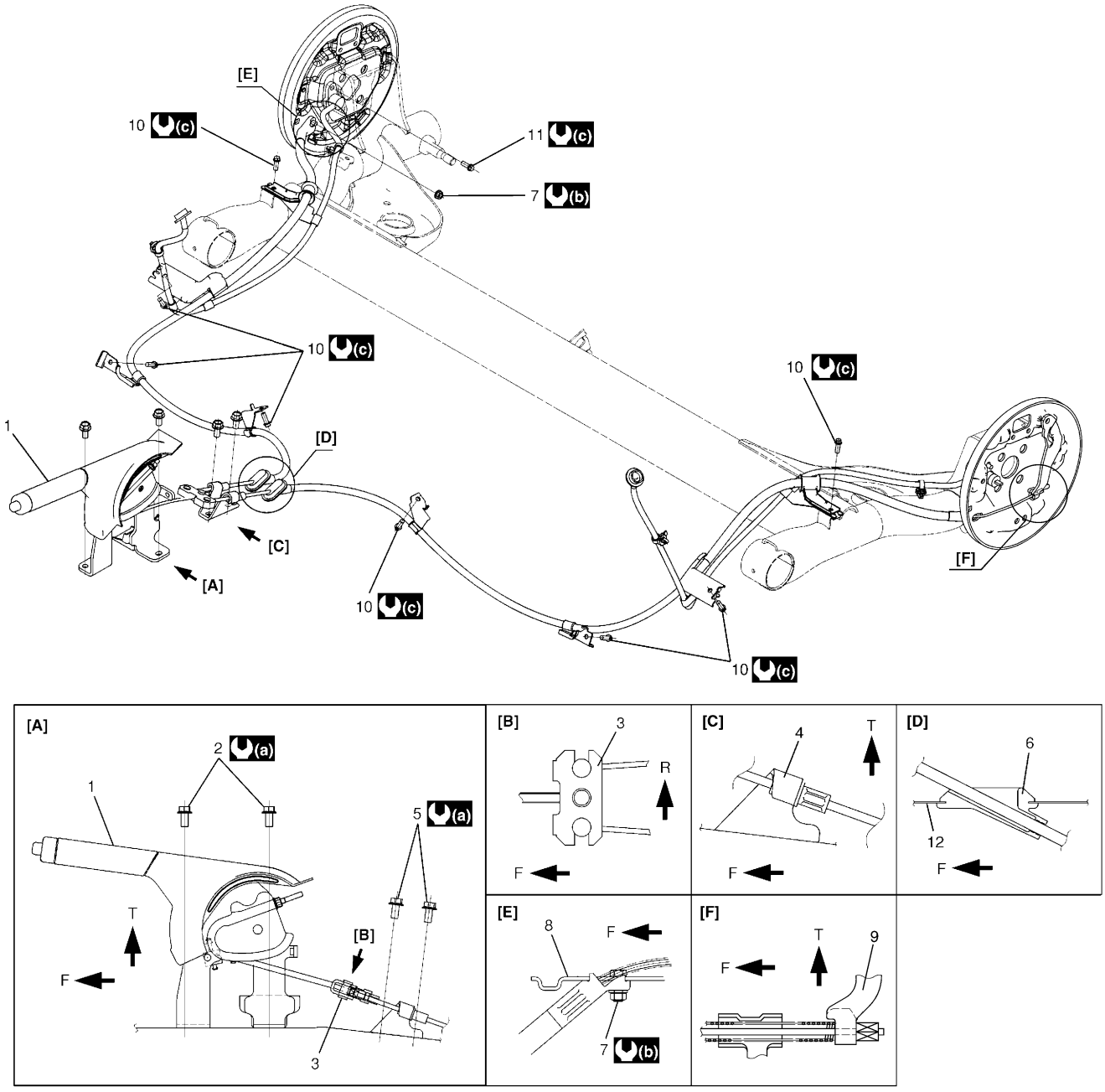
09900–20607 Dial gauge ☞ 	09900–20701 Magnetic stand ☞ 
09945–16060 Piston installer handle ☞ / ☞ / ☞ 	

Parking Brake

General Description

Parking Brake Cable Construction (Other Than M16A Engine Model)

S7N20A4401001

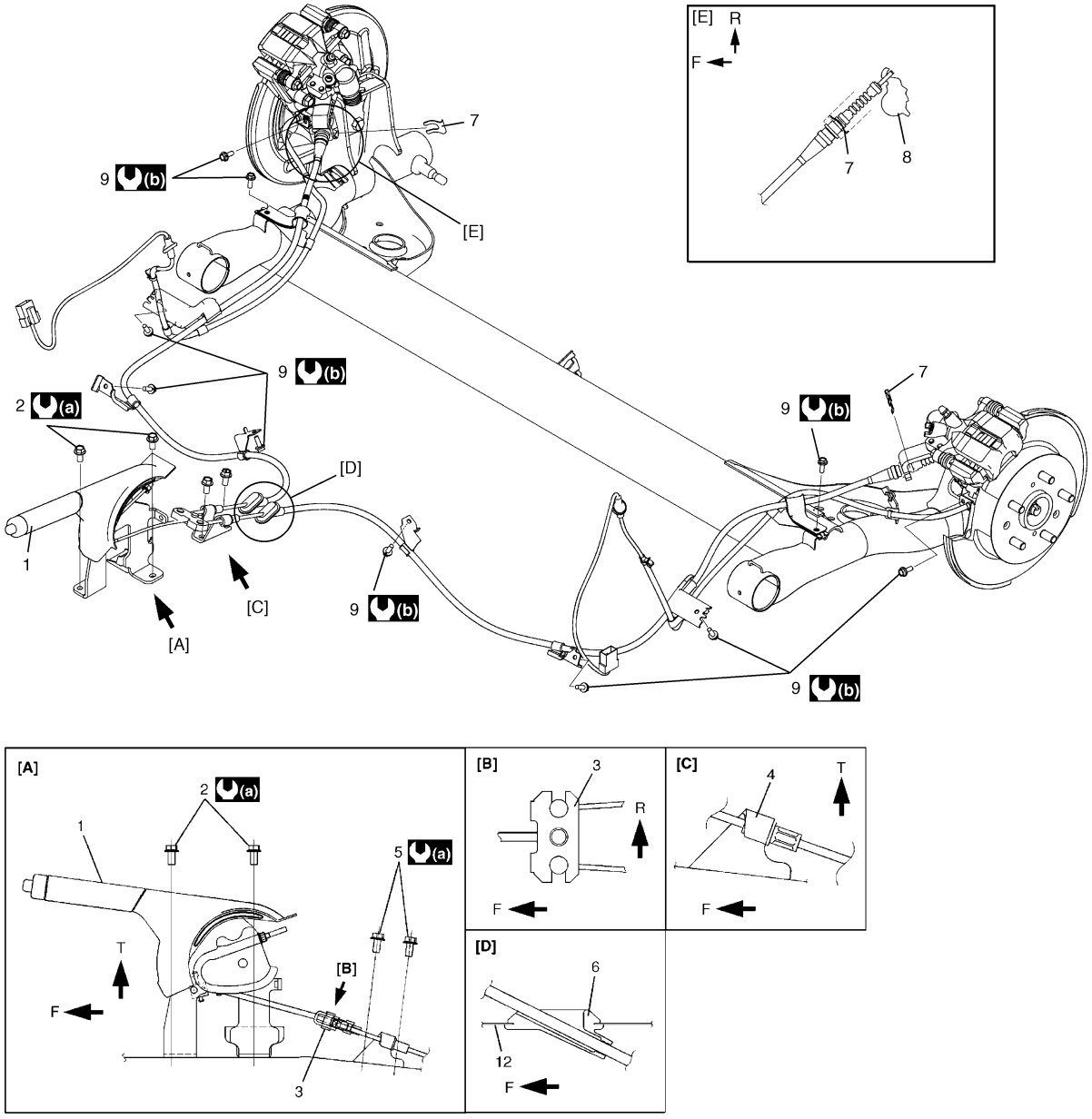


I4RS0B440003-01

T: Top side	4. Parking cable bracket	10. Parking cable clamp bolt	[D]: View [D]
F: Front side	5. Parking cable bracket bolt	11. Rear wheel speed sensor bolt	[E]: View [E]
R: Right side	6. Grommet	12. Vehicle body	[F]: View [F]
1. Parking brake lever assembly	7. Parking cable cap nut	[A]: View [A]	(a) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
2. Parking brake lever bolt	8. Brake back plate	[B]: View [B]	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Equalizer	9. Parking brake shoe lever	[C]: View [C]	(c) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

Parking Brake Cable Construction (M16A Engine Model)

S7N20A4401002



I6RS0B440001-01

T: Top side	3. Equalizer	8. Lever	[C]: View [C]
F: Front side	4. Parking cable bracket	9. Parking cable clamp bolt	[D]: View [D]
R: Right side	5. Parking cable bracket bolt	10. Vehicle body	(a) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
1. Parking brake lever assembly	6. Grommet	[A]: View [A]	(b) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
2. Parking brake lever bolt	7. E-ring	[B]: View [B]	

Repair Instructions

Parking Brake Inspection and Adjustment

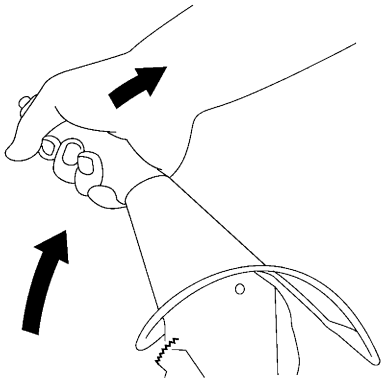
S7N20A4406001

Inspection

Hold center of parking brake lever grip and pull it up with 200 N (20 kg, 44 lbs) force.
With parking brake lever pulled up as shown, count ratchet notches. There should be 4 to 9 notches.
Also, check if both right and left rear wheels are locked firmly.
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button.
One click sound corresponds to one notch.
If number of notches is out of specification, adjust cable referring to adjustment procedure so as to obtain specified parking brake stroke.

NOTE

Check tooth tip of each notch for damage or wear.
If any damage or wear is found, replace parking brake lever.



I4RS0B440002-01

Adjustment

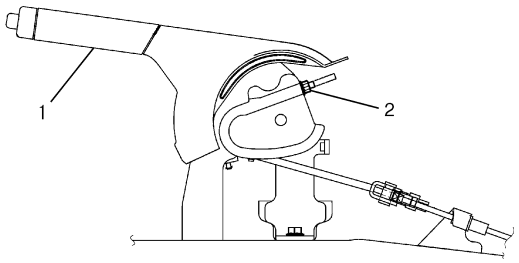
NOTE

Make sure for the following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Start engine and then brake pedal has been depressed at least 15 times with about 160 N (16.0 kg, 35.3 lbs) load.**
- **Parking brake lever (1) has been pulled up a few times with about 200 N (20 kg, 44 lbs) load.**
  If parking brake cable is replaced with new one, pull up parking brake lever a few times with about 500 N·m (50 kg, 110 lbs) force.

Drum brake

After confirming that the conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening adjusting nut (2).



I4RS0A440003-01

NOTE

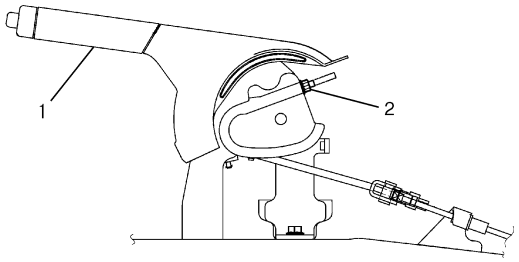
Check brake drum for dragging after adjustment.

Parking brake stroke

When lever is pulled up at 200 N (20 kg, 44 lbs): 4 to 9 notches

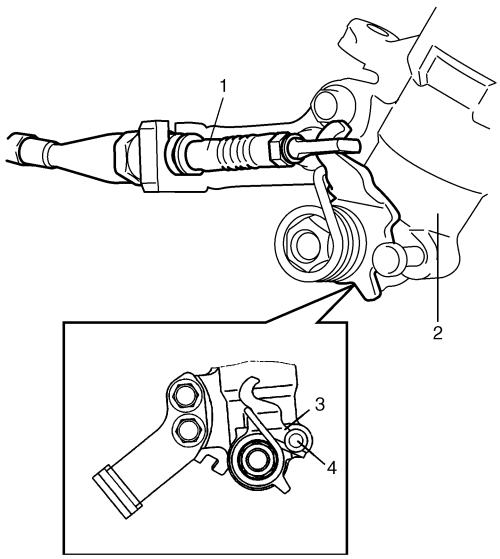
Disc brake

1) Release parking brake lever (1).
2) Loosen parking brake lever adjusting nut (2) fully.



I4RS0A440003-01

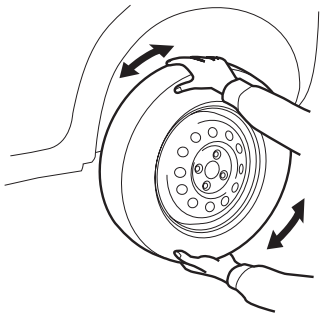
3) Make sure that lever (3) contacts pin (4).



I7RW01440002-01

1. Parking brake cable	2. Brake caliper

4) Pull up parking brake lever 1 notch.
5) Rotate rear wheel by hand and fasten parking lever adjusting nut until dragging rear wheel lightly.



I7RW01440006-01

6) Release parking brake lever and then make sure that there is no drag in rear wheel.
   If there is, repeats go to step 2).
7) Make sure that the number of notch is between 4 and 9 when operating parking brake lever.
8) If the number of notch is not between 4 and 9, replace parking brake cable and/or inspect rear brake caliper.

Parking brake stroke
When lever is pulled up at 200 N (20 kg, 44 lbs): 4 to 9 notches

Parking Brake Cable Removal and Installation

S7N20A4406002

Removal

NOTE

When it is necessary to remove both right and left parking brake cables, repeat below steps 2) to 6) on right and left wheels.

1) Hoist vehicle.
2) Remove wheel.
3) Disconnect parking brake cable from equalizer (parking brake lever) and clamps.
4) Remove brake drum. Refer to “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”. (other than M16A engine model)
5) Disconnect parking brake cable from brake shoe lever referring to “Rear Brake Shoe Removal and Installation: Drum Brake in Section 4C”. (other than M16A engine model)
6) Disconnect parking brake cable from lever referring to “Rear Disc Brake Caliper Removal and Installation: Disc Brake in Section 4C”. (M16A engine model)
7) Remove parking brake cable and parking cable bracket.

Installation

Install it by reversing removal procedure, noting the following points.

- Install clamps properly referring to “Parking Brake Cable Construction (Other Than M16A Engine Model)” or “Parking Brake Cable Construction (M16A Engine Model)”.
- Tighten bolts and nuts to specified torque referring to “Parking Brake Cable Construction (Other Than M16A Engine Model)” or “Parking Brake Cable Construction (M16A Engine Model)”.

  Tightening torque
  Parking brake lever bolt: 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
  Parking cable clamp bolt: 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
  Parking cable bracket bolt: 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

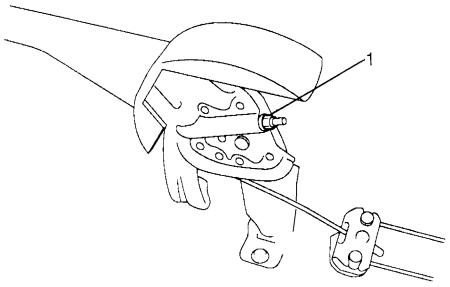
- Adjust parking brake cable. Refer to “Parking Brake Inspection and Adjustment”.
- Check brake drum or disc for dragging and brake system for proper performance. Brake test should be performed.

Parking Brake Lever Removal and Installation

S7N20A4406003

Removal

1) Disconnect negative (–) cable at battery.
2) Remove console box.
3) Block vehicle wheels and release parking brake lever.
4) Disconnect lead wire of parking brake switch at coupler.
5) Loosen parking brake cable adjusting nut (1).

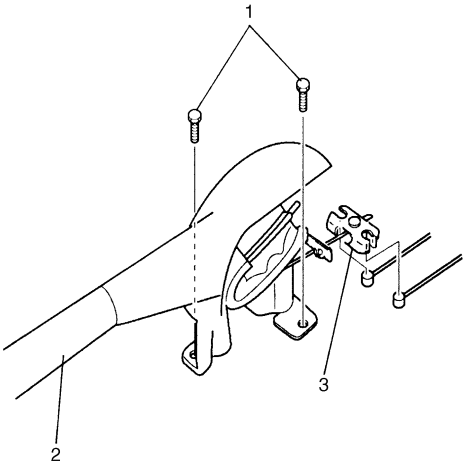


I4RS0A440004-01

6) Remove parking brake lever bolts (1) and then remove parking brake lever assembly (2) with equalizer (3).

NOTE

Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

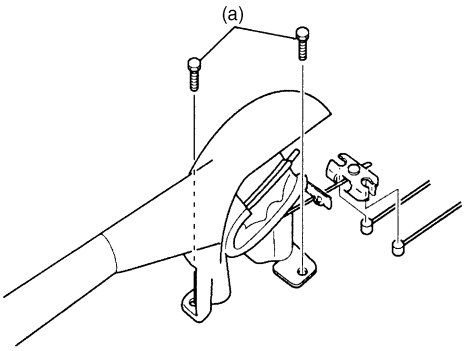


I4RS0A440005-01

Installation

1) Install in reverse order of removal procedure. Check equalizer inclined angle.

Tightening torque
Parking brake lever bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



I4RS0A440006-01

2) After all parts are installed, parking brake lever needs to be adjusted. Refer to "Parking Brake Inspection and Adjustment".
3) Check brake drum or disc for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

Specifications

Tightening Torque Specifications

S7N20A4407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Parking brake lever bolt	25	2.5	18.0	☞ / ☞
Parking cable clamp bolt	11	1.1	8.0	☞
Parking cable bracket bolt	25	2.5	18.0	☞

NOTE

The specified tightening torque is also described in the following.
"Parking Brake Cable Construction (Other Than M16A Engine Model): "
"Parking Brake Cable Construction (M16A Engine Model): "

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information in Section 0A".

ABS

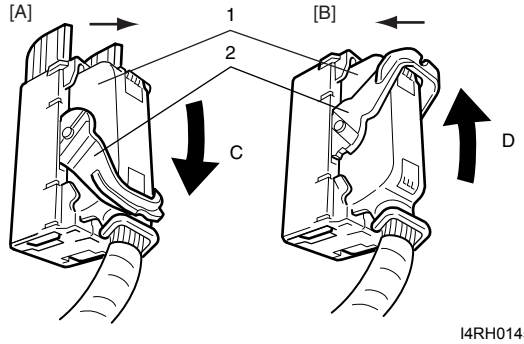
Precautions

Precautions in Diagnosing Troubles

S7N20A4500001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “ABS Check”.

- If the vehicles was operated in any of the following ways, ABS warning lamp may light momentarily but this does not indicate anything abnormal in ABS.
  - The vehicle was driven with parking brake pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to read “Precautions for Electrical Circuit Service in Section 00” before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in “ABS Check”. Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ABS control module during inspection.)
- When disconnecting ABS hydraulic unit / control module connector (1), pull down lock lever (2) of connector.
  When connecting, set the connector on ABS hydraulic unit / control module assembly and pull up the lock lever (2) until it locks.



I4RH01450001-01

[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

- Communication of ECM, BCM, combination meter, data link connector and ABS control module is established by CAN (Control Area Network). Therefore, be sure to read “Precaution for CAN Communication System in Section 00” before inspection and handling CAN communication line.

Precautions in On-Vehicle Service

S7N20A4500002

When connector is connected to ABS hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON. Otherwise, DTC will be set in ABS control module.

Precautions in ABS Hydraulic Unit Operation Check

S7N20A4500003

ABC hydraulic unit / control module assembly function is checked by correct wheel lock / release condition when brake pressure is pressurized / depressurized using SUZUKI scan tool. The hydraulic unit operation check referring to “ABS Hydraulic Unit Operation Check” should be performed to confirm the correct brake pipe connection in the following cases.

- ABS hydraulic unit / control module assembly was replaced.
- Brake pipe and/or hose were replaced.

General Description

ABS Description

S7N20A4501001

The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied.
This ABS has also the following function.
While braking is applied, but before ABS control becomes effective, braking force is distributed between the front and rear so as to prevent the rear wheels from being locked too early for better stability of the vehicle.
The main component parts of this ABS include the following parts in addition to those of the conventional brake system.

- Wheel speed sensor which senses revolution speed of each wheel and outputs its signal.
- ABS warning which lights to inform abnormality when system fails to operate properly.
- ABS hydraulic unit / control module assembly is incorporated ABS control module, ABS hydraulic unit (actuator assembly), solenoid valve power supply driver (transistor), solenoid valve driver (transistor), pump motor driver (transistor).
  - ABS control module which sends operation signal to ABS hydraulic unit to control fluid pressure applied to each wheel cylinder based on signal from each wheel speed sensor so as to prevent wheel from locking.
  - ABS hydraulic unit which operates according to signal from ABS control module to control fluid pressure applied to wheel cylinder of each 4 wheels.
  - Solenoid valve power supply driver (transistor) which supplies power to solenoid valve in ABS hydraulic unit.
  - Solenoid valve driver (transistor) which controls each solenoid valves in ABS hydraulic unit.
  - Pump motor driver (transistor) which supplies power to pump motor in ABS hydraulic unit.

This ABS is equipped with Electronic Brake force Distribution (EBD) system that controls a fluid pressure of rear wheels to best condition, which is the same function as that of proportioning valve, by the signal from wheel sensor independently of change of load due to load capacity and so on. And if the EBD system fails to operate properly, the brake warning light lights to inform abnormality.

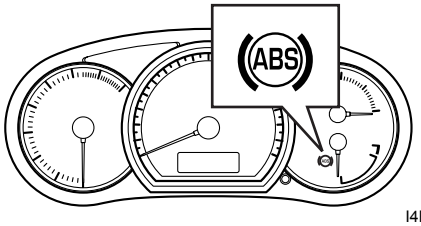
ABS Hydraulic Unit / Control Module Assembly Description

S7N20A4501002

ABS control module is a component of ABS hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the ABS warning light as described.



I4RS0A450001-01

- When ignition switch is turned ON, ABS warning light lights for 2 seconds to check its circuit.
- When no abnormality has been detected (the system is in good condition), ABS warning light turns OFF after 2 seconds.
- When an abnormality in the system is detected, ABS warning light lights and the area where that abnormality lies is stored in the memory of EEPROM in ABS control module.

CAN Communication System Description

S7N20A4501003

Refer to “CAN Communication System Description: M13A / M15A / M16A in Section 1A” or “CAN Communication System Description: D13A / Z13DTJ in Section 1A” for CAN communication system description.
ABS communicates control data with each control module as follows.

ABC Transmission Data

				ECM	Combination meter
ABS control module	Transmit	DATA	Torque request	○	
			Wheel speed signal (front right)	○	
			Wheel speed signal (front left)	○	
			Wheel speed signal (rear right)	○	
			Wheel speed signal (rear left)	○	
			ABS active	○	
			ABS indication on		○
			EBD indication on		○

I6RS0C450001-01

ABS Reception Data

			ECM
ABS control module	DATA Receive	Brake pedal switch signal	○

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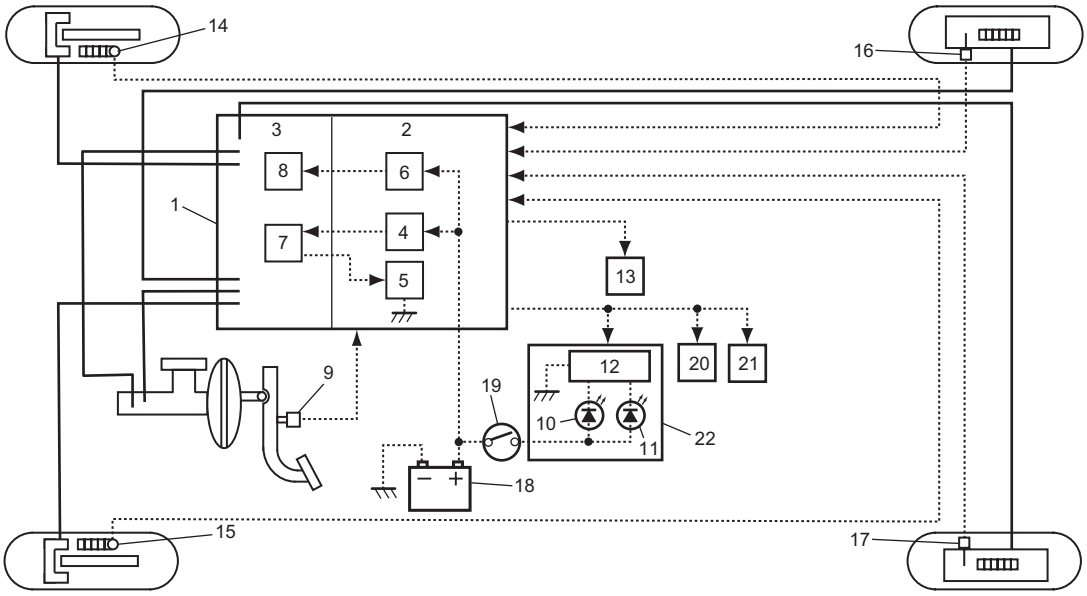
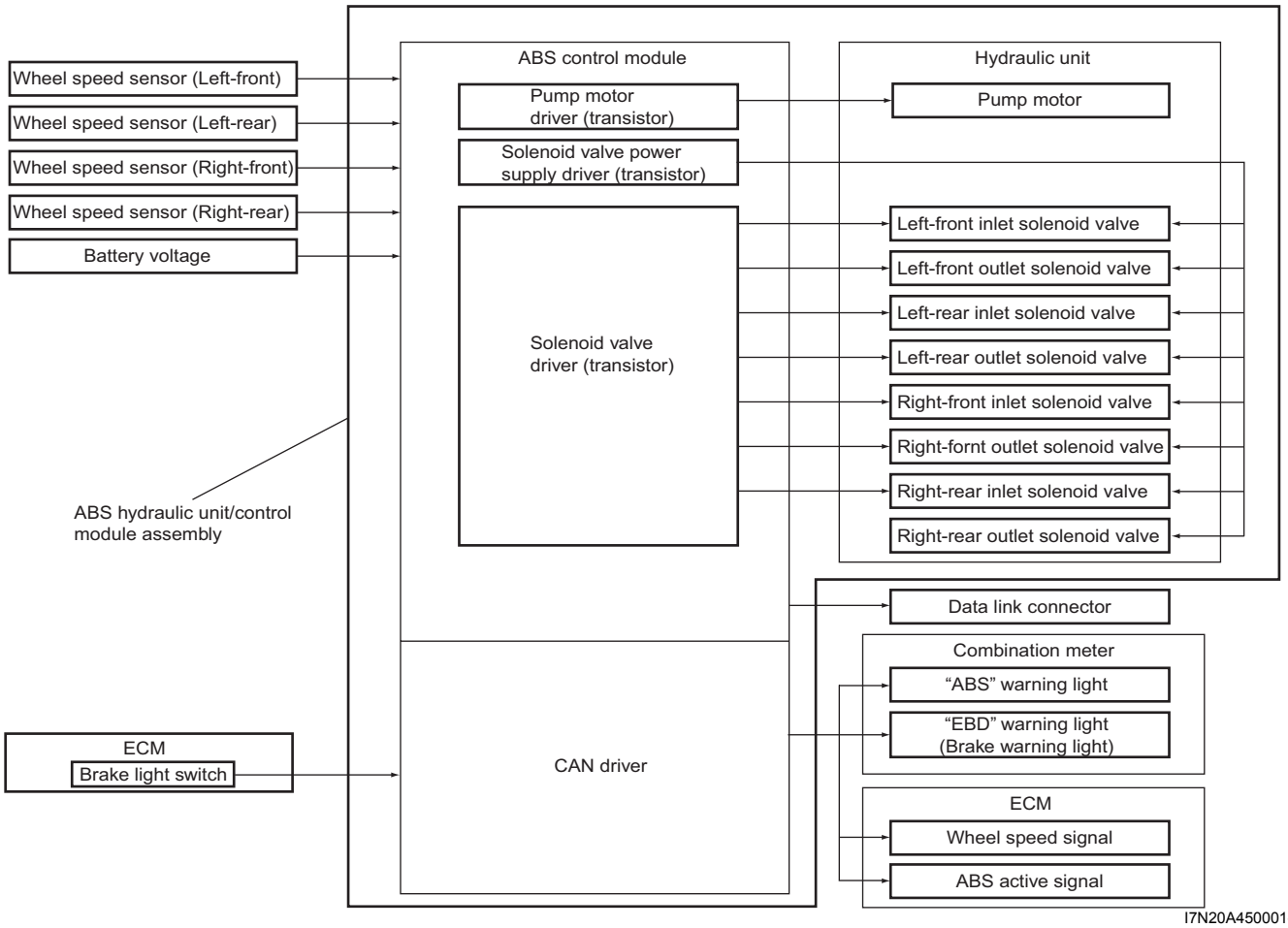
Schematic and Routing Diagram

ABS Schematic

S7N20A4502001





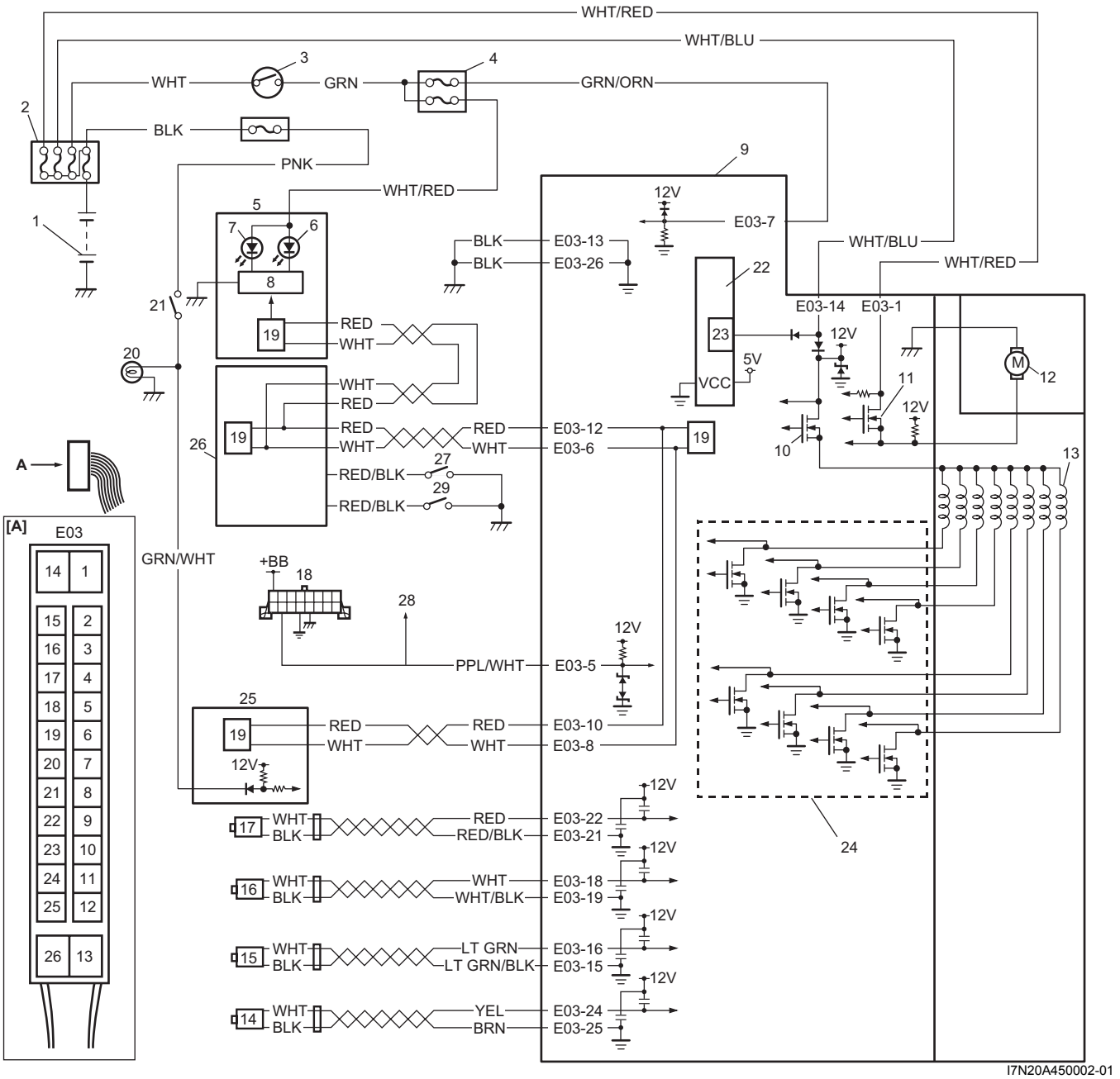
I7N20A450001-02

1. ABS hydraulic unit / control module assembly	9. Brake light switch	17. Wheel speed sensor (Left-rear)
2. ABS control module	10. ABS warning light	18. Battery
3. ABS hydraulic unit	11. EBD warning light (Brake warning light)	19. Ignition switch
4. Solenoid valve power supply driver (transistor)	12. Light driver module	20. BCM
5. Solenoid valve driver (transistor)	13. Data link connector (DLC)	21. ECM

6. Pump motor driver (transistor)	14. Wheel speed sensor (Right-front)	22. Combination meter
7. Solenoid valve	15. Wheel speed sensor (Left-front)	
8. Pump motor	16. Wheel speed sensor (Right-rear)	

ABS Wiring Circuit Diagram

S7N20A4502002



[A]: ABS hydraulic unit / control module connector (View: A)	10. Solenoid valve power supply driver (transistor)	20. Brake light
1. Battery	11. ABS pump motor driver (transistor)	21. Brake light switch
2. Main fuse box	12. Pump motor	22. Power control unit
3. Ignition switch	13. Solenoid valves	23. Internal memory
4. Circuit fuse box	14. Right-rear wheel speed sensor	24. Solenoid valve driver (transistor)
5. Combination meter	15. Left-rear wheel speed sensor	25. ECM
6. ABS warning light	16. Right-front wheel speed sensor	26. BCM
7. EBD warning Light (Brake warning light)	17. Left-front wheel speed sensor	27. Brake fluid level switch
8. Light driver module	18. Data link connector (DLC)	28. To ECM, TCM, SDM and BCM
9. ABS hydraulic unit / control module assembly	19. CAN driver	29. Parking brake switch.

Terminal		Wire color	Circuit
E03	1	WHT/RED	ABS pump motor driver (Transistor)
	2	—	—
	3	—	—
	4	—	—
	5	PPL/WHT	Data link connector
	6	WHT	CAN communication line (low) for BCM
	7	GRN/ORN	Ignition switch
	8	WHT	CAN communication line (low) for ECM
	9	—	—
	10	RED	CAN communication line (high) for ECM
	11	—	—
	12	RED	CAN communication line (high) for BCM
	13	BLK	Ground
	14	WHT/BLU	Solenoid valve power supply driver (Transistor)
	15	LT GRN/BLK	Left–rear wheel speed sensor (–)
	16	LT GRN	Left–rear wheel speed sensor (+)
	17	—	—
	18	WHT	Right–front wheel speed sensor (+)
	19	WHT/BLK	Right–front wheel speed sensor (–)
	20	—	—
	21	RED/BLK	Left–front wheel speed sensor (–)
	22	RED	Left–front wheel speed sensor (+)
	23	—	—
	24	YEL	Right–rear wheel speed sensor (+)
	25	BRN	Right–rear wheel speed sensor (–)
	26	BLK	Ground

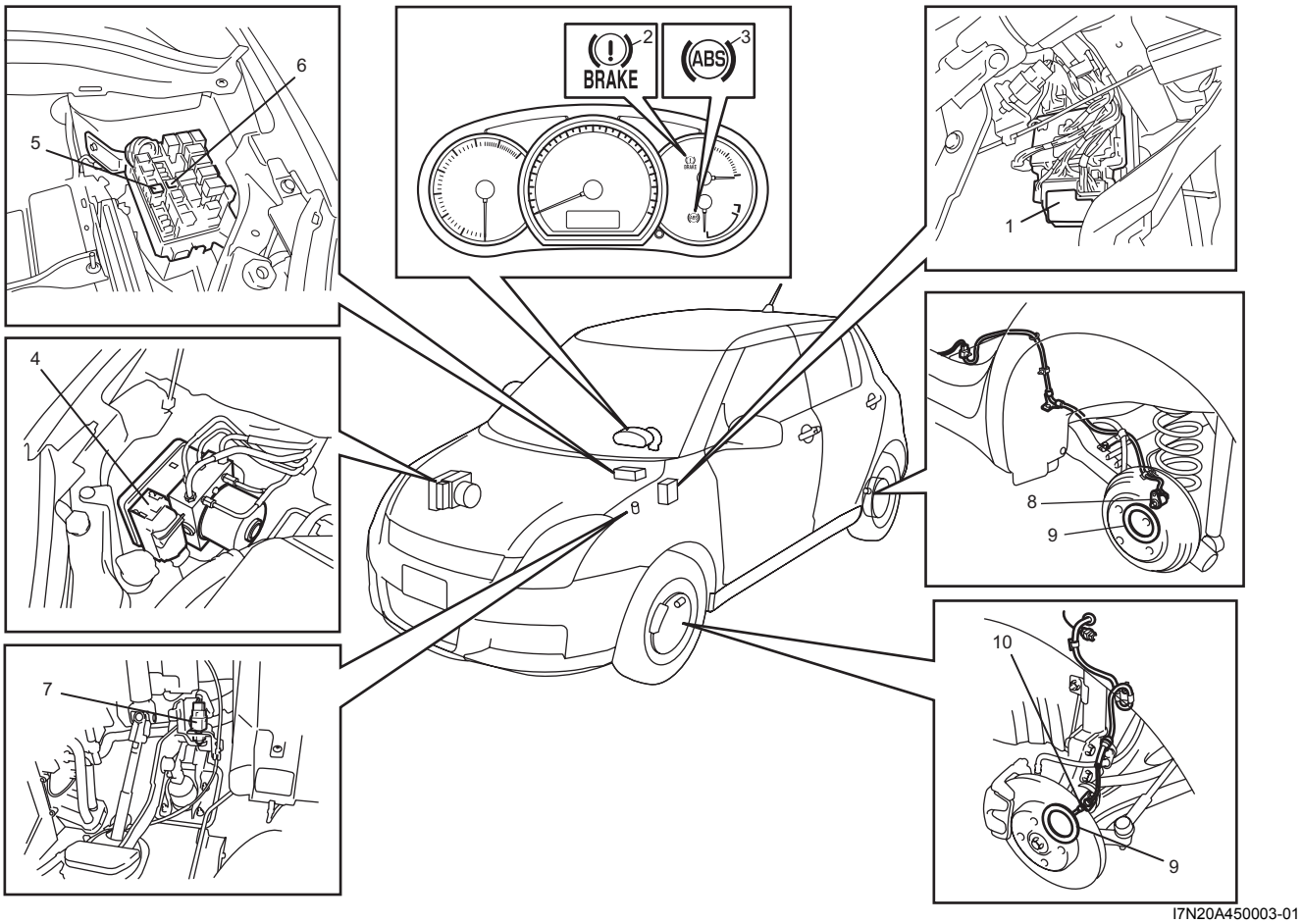
Component Location

ABS Component Location

S7N20A4503001

NOTE

As for the difference of RH steering vehicle and LH steering vehicle, the location of the combination meter, and brake light switch only changes.



I7N20A450003-01

1. ABS fuse	5. ABS motor fuse	9. Encoder
2. EBD warning light (Brake warning light)	6. ABS solenoid fuse	10. Front wheel speed sensor
3. ABS warning light	7. Brake light switch	
4. ABS hydraulic unit / control module	8. Rear wheel speed sensor	

Diagnostic Information and Procedures

ABS Check

S7N20A4504001

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

Step	Action	Yes	No
1	☞ **Malfunction analysis** 1) Perform “Customer complaint analysis: ”. 2) Perform “Problem symptom confirmation: ”. 3) Perform “DTC check, record and clearance: ” and recheck DTC. *Is there any malfunction DTC?*	Go to Step 4.	Go to Step 2.
2	☞ **Driving test** 1) Perform “Step 2: Driving Test: ”. *Is trouble symptom identified?*	Go to Step 3.	Go to Step 6.
3	☞ **DTC check** 1) Perform “DTC Check”. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **ABS check** 1) Inspect and repair referring to applicable DTC flow. *Does trouble recur?*	Go to Step 5.	Go to Step 7.
5	☞ **Brakes diagnosis** 1) Inspect and repair referring to “Brakes Symptom Diagnosis in Section 4A”. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
6	☞ **Check for intermittent problem** 1) Check intermittent troubles referring to “Intermittent and Poor Connection Inspection in Section 00” and related circuit of trouble code recorded in Step 1. *Does trouble recur?*	Go to Step 4.	Go to Step 7.
7	☞ **Final confirmation test** 1) Perform “Step 7: Final Confirmation Test: ”. *Does trouble recur?*	Go to Step 3.	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 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 go off/flashes ● Abnormal noise while vehicle is running: from motor, from valve, other_____ ● Wheel is locked at braking: ● 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 switch ON: ● When starting: at initial start only/at every start/Other_____ ● Vehicle speed: 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)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

I7N20A450004-01

Problem symptom confirmation

Check if what the customer claimed in "Customer Questionnaire" is actually found in the vehicle and if that symptom is found, whether it is identified as a failure. (This step should be shared with the customer if possible.) Check warning lights related to brake system referring to "EBD Warning Light (Brake Warning Light) Check" and "ABS Warning Light Check".

DTC check, record and clearance

Perform "DTC Check" procedure, record it and then clear it referring to "DTC Clearance".
Recheck DTC referring to "DTC Check".
When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ABS Check: " 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 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test

Test drive the vehicle at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of ABS warning light) exists.
If the malfunction DTC is confirmed again at ignition switch ON, driving test as described is not necessary. Proceed to Step 3.

Step 3: DTC Check
Recheck DTC referring to “DTC Check”.

Step 4: ABS Check
According to ABS Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis in Section 4A” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

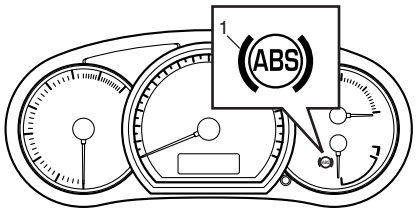
Step 6: Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection in Section 00” and related circuit of trouble code recorded in Step 1 to 3.

Step 7: Final Confirmation Test
Confirm that the problem symptom has gone and the ABS is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance” and perform test driving and confirm that no DTC is indicated.

ABS Warning Light Check

S7N20A4504002

1) Turn ignition switch ON.
2) Check that ABS warning light (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ABS Warning Light Does Not Come ON at Ignition Switch ON” or “ABS Warning Light Comes ON Steady”.



I4RS0A450007-01

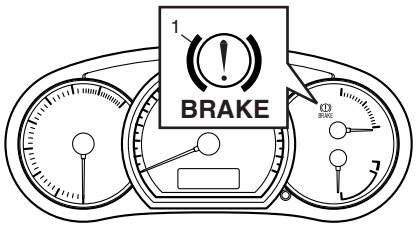
EBD Warning Light (Brake Warning Light) Check

S7N20A4504003

NOTE

Perform this check on a level place.

1) Turn ignition switch ON with parking brake applied.
2) Check that EBD warning light (brake warning light) (1) is turned ON.
3) Release parking brake with ignition switch ON and check that EBD warning light (brake warning light) goes off.
   If it doesn’t go off, go to “EBD Warning Light (Brake Warning Light) Comes ON Steady” or “EBD Warning Light Does Not Come ON at Ignition Switch ON”.



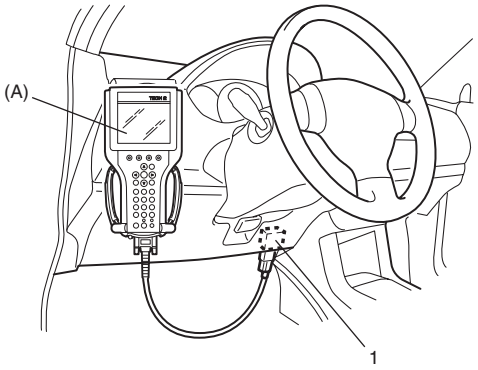
I4RS0A450008-01

DTC Check

S7N20A4504004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (1).

Special tool
(A): SUZUKI scan tool



I4RS0B450003-01

3) Turn ignition switch to ON position.
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 SUZUKI scan tool can not communicate ABS hydraulic unit / control module, perform "Serial Data Link Circuit Check".

5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S7N20A4504005

⚠ CAUTION

Be sure to perform "ABS Check" before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning light	EBD warning light
☞C1021	Right-front wheel speed sensor circuit failure	Wheel speed sensor circuit is opened, shorted to power, ground and/or each other circuit.	○	*1
☞C1022	Right-front wheel speed sensor circuit or sensor ring failure	• Wheel speed is different from other wheel speed (vehicle speed) for more than specified time. • Abnormal wheel speed sensor signal is detected for more than specified time.	○	*1
☞C1025	Left-front wheel speed sensor circuit failure	Wheel speed sensor circuit is opened, shorted to power, ground and/or each other circuit.	○	*1
☞C1026	Left-front wheel speed sensor or sensor ring failure	• Wheel speed is different from other wheel speed (vehicle speed) for more than specified time. • Abnormal wheel speed sensor signal is detected for more than specified time.	○	*1
☞C1031	Right-rear wheel speed sensor circuit failure	Wheel speed sensor circuit is opened, shorted to power, ground and/or each other circuit.	○	*1
☞C1032	Right-rear wheel speed sensor or sensor ring failure	• Wheel speed is different from other wheel speed (vehicle speed) for more than specified time. • Abnormal wheel speed sensor signal is detected for more than specified time.	○	*1
☞C1035	Left-rear wheel speed sensor circuit failure	Wheel speed sensor circuit is opened, shorted to power, ground and/or each other circuit.	○	*1
☞C1036	Left-rear wheel speed sensor or sensor ring failure	• Wheel speed is different from other wheel speed (vehicle speed) for more than specified time. • Abnormal wheel speed sensor signal is detected for more than specified time.	○	*1

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning light	EBD warning light
☞C1041	Right-front inlet solenoid valve circuit failure	• Solenoid valve circuit is opened, shorted to power, ground and/or each valve in ABS hydraulic unit / control module assembly. • Mismatching solenoid output and solenoid monitor is detected.	○	○
☞C1042	Right-front outlet solenoid valve circuit failure		○	○
☞C1045	Left-front inlet solenoid valve circuit failure		○	○
☞C1046	Left-front outlet solenoid valve circuit failure		○	○
☞C1051	Right-rear inlet solenoid valve circuit failure		○	○
☞C1052	Right-rear outlet solenoid valve circuit failure		○	○
☞C1055	Left-rear inlet solenoid valve circuit failure		○	○
☞C1056	Left-rear outlet solenoid valve circuit failure		○	○
☞C1057	Power supply voltage too high / too low	ABS control module power supply voltage is too high.	○	○
		ABS control module power supply voltage is too low.	○	*3
☞C1061	Pump motor and/or motor circuit failure	• Defective pump motor and/or motor power supply voltage is too low. • Pump motor circuit in ABS control module is opened, shorted to power or ground circuit.	○	—
☞C1063	Solenoid valve power supply driver circuit failure	• Solenoid valve power supply driver circuit is opened, shorted to power and ground circuit in ABS control module. • Solenoid valve power supply voltage is too low. • Solenoid valve power supply driver is stuck to ON or OFF position. • Output circuit from control unit is opened or shorted in ABS control module. • Mismatching solenoid output and solenoid monitor is detected.	○	○
☞C1071	ABS control module internal defect	ABS control module internal defect is detected.	○	*2
☞U1073	Control module communication bus off	• Communication is not available with all control modules connected by CAN. • CAN communication line is shorted to power, ground and/or each other circuit.	—	—
☞ U1100	Lost communication with ECM/ PCM	ECM message data is missing from CAN communication.	—	—

NOTE

***1: If two or more wheel speed sensor are defective, EBD warning light are lit.**
***2: It is irregular whether warning lights can be lit by ABS control module.**
***3: if ABS control module power supply voltage is lower than 7.6 V, EBD warning light are lit.**

Fail-Safe Control

S7N20A4504019

When ABS control module detects malfunction, ABS control module performs following control.

- Turn ON warning light.
- Stop only ABS control or both ABS and EBD controls.

DTC Clearance

S7N20A4504006

⚠ WARNING

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure or using SUZUKI scan tool.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch to ON position.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further derails.

NOTE

For DTC C1021, C1022, C1025, C1026, C1031, C1032, C1035, C1036 and C1061, confirm that ABS warning light turns off after performing Step 2 of "Test Driving" under "ABS Check", and then clear the DTCs.

4) Perform "Driving Test" (Step 2 of "ABS Check") and "DTC Check" and confirm that NO DTC is displayed on scan tool.
5) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

Scan Tool Data

S7N20A4504007

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioner (if equipped).
- Apply no load to power steering (if equipped). (Don't turn it)
- Turn OFF all electric loads (except ignition).
- No DTC.
- ABS is not operated. (Normal braking operation)

Scan Tool Data	Standards	Condition
Battery Voltage	10.0 – 16.0 V	—
Pump Motor Driver	0.0 V	—
RF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LF Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
RR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
LR Wheel Speed	0 km/h, 0.0 MPH	Vehicle stop
Brake Switch	ON	Brake pedal depressed
	OFF	Brake pedal released

Scan Tool Data Definition

Battery Volt (V): Battery Voltage is an analog input signal read by the ABS control module. Certain ABS control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

Pump Motor Driver (V): This parameter indicates the operational condition of the pump motor driver (transistor).

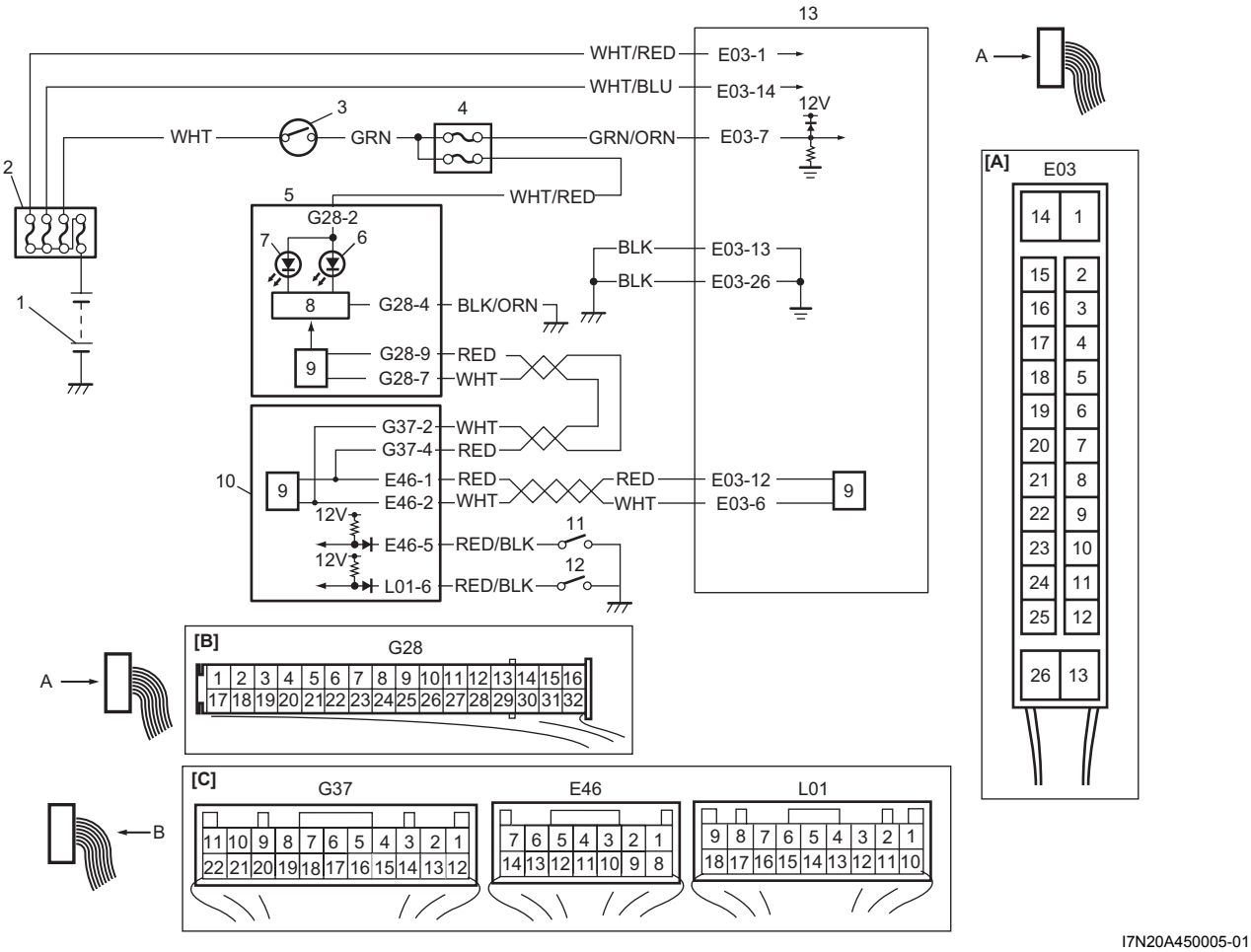
RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LF Wheel Speed (km/h, MPH): Wheel speed is an ABS control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Brake Switch (ON, OFF): This switch signal informs the ABS control module whether the brake is active or not.

ABS Warning Light Does Not Come ON at Ignition Switch ON

S7N20A4504008

Wiring Diagram



I7N20A450005-01

[A]: ABS hydraulic unit / control module connector (View: A)	4. Circuit fuse box	10. BCM
[B]: Combination connector (View: A)	5. Combination meter	11. Brake fluid level switch
[C]: BCM connector (View: B)	6. ABS warning light	12. Parking brake switch
1. Battery	7. EBD warning light (Brake warning light)	13. ABS hydraulic unit / control module assembly
2. Main fuse box	8. Light driver module	
3. Ignition switch	9. CAN driver	

Circuit Description

Operation (ON/OFF) of ABS warning light is controlled by ABS control module through light driver module in combination meter.

If the antilock brake system is in good condition, ABS control module turns ABS warning light ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning light is turned ON continuously by ABS control module. Also, it is turned ON continuously by light driver module when the connector of ABS control module is disconnected.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON position and check DTC. *Is there DTC U1073?*	Go to "DTC U1073: Control Module Communication Bus Off"	Substitute a known-good combination meter and recheck. If ABS warning light remains OFF, substitute a known-good ABS hydraulic unit / control module assembly and recheck.
3	*Is Circuit fuse for combination meter in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	Check CAN communication circuit between combination meter and ABS control module referring to "DTC U1073: Control Module Communication Bus Off". *Is CAN communication circuit in good condition?*	Go to Step 5.	Repair or replace.
5	1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to "WHT/RED" and "BLK/ORN" wire of combination meter connector. 3) If OK, turn ON ignition switch and measure voltage at "WHT/RED" wire of combination meter connector and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	Repair power supply circuit for combination meter.
6	1) Measure resistance between "BLK/ORN" wire of combination meter connector and vehicle body ground. *Is resistance less than 2Ω?*	Replace combination meter.	"BLK/ORN" circuit open or high resistance.

ABS Warning Light Comes ON Steady

S7N20A4504009

Wiring Diagram

Refer to "Wiring Diagram" under "ABS Warning Light Does Not Come ON at Ignition Switch ON".

Circuit Description

Refer to "Circuit Description" under "ABS Warning Light Does Not Come ON at Ignition Switch ON".

Troubleshooting

Step	Action	Yes	No
1	1) Perform diagnostic trouble code check. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	*Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check circuit for short to ground.

Step	Action	Yes	No
3	1) Turn ignition switch to OFF position. 2) Disconnect ABS control module connector. 3) Check for proper connection to ABS control module connector at terminals “E03-7”, “E03-13” and “E03-26”. 4) If OK then turn ignition switch to ON position and measure voltage between terminal “E03-7” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS control module connector at terminals “E03-1” and “E03-14”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E03-1” (“E03-14”) and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and/or “WHT/BLU” circuit open.
5	1) Turn ignition switch to OFF and measure resistance between each terminal of “E03-13” (“E03-26”) and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ABS hydraulic unit / control module open or high resistance.
6	1) Check CAN communication circuit between combination meter and ABS control module referring to “DTC U1073: Control Module Communication Bus Off”. *Is CAN communication circuit in good condition.*	Substitute a known-good combination meter and recheck. If ABS warning light remains ON, substitute a known-good ABS hydraulic unite / control module assembly and recheck.	Repair or replace.

EBD Warning Light (Brake Warning Light) Comes ON Steady

S7N20A4504011

Wiring Diagram

Refer to “Wiring Diagram” under “ABS Warning Light Does Not Come ON at Ignition Switch ON”.

Circuit Description

EBD warning light (brake warning light) is controlled by parking brake switch, brake fluid level switch and ABS hydraulic unit / control module assembly through light driver module in combination meter.

Troubleshooting

Step	Action	Yes	No
1	1) Make sure that: • Parking brake is completely released. • Brake fluid level is upper than the minimum level. *Are the check results OK?*	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	1) Turn ignition switch to ON position. *Does “ABS” warning light come on steady?*	Perform “ABS Warning Light Comes ON Steady”.	Go to Step 3.
3	1) CAN communication circuit between combination meter, ABS control module and BCM referring to “DTC U1073: Control Module Communication Bus Off”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If ABS warning light remains ON, substitute a known-good ABS hydraulic unit / control module assembly and recheck.	Repair or replace.

EBD Warning Light Does Not Come ON at Ignition Switch ON

S7N20A4504020

Wiring Diagram

Refer to “Wiring Diagram” under “ABS Warning Light Does Not Come ON at Ignition Switch ON”.

Circuit Description

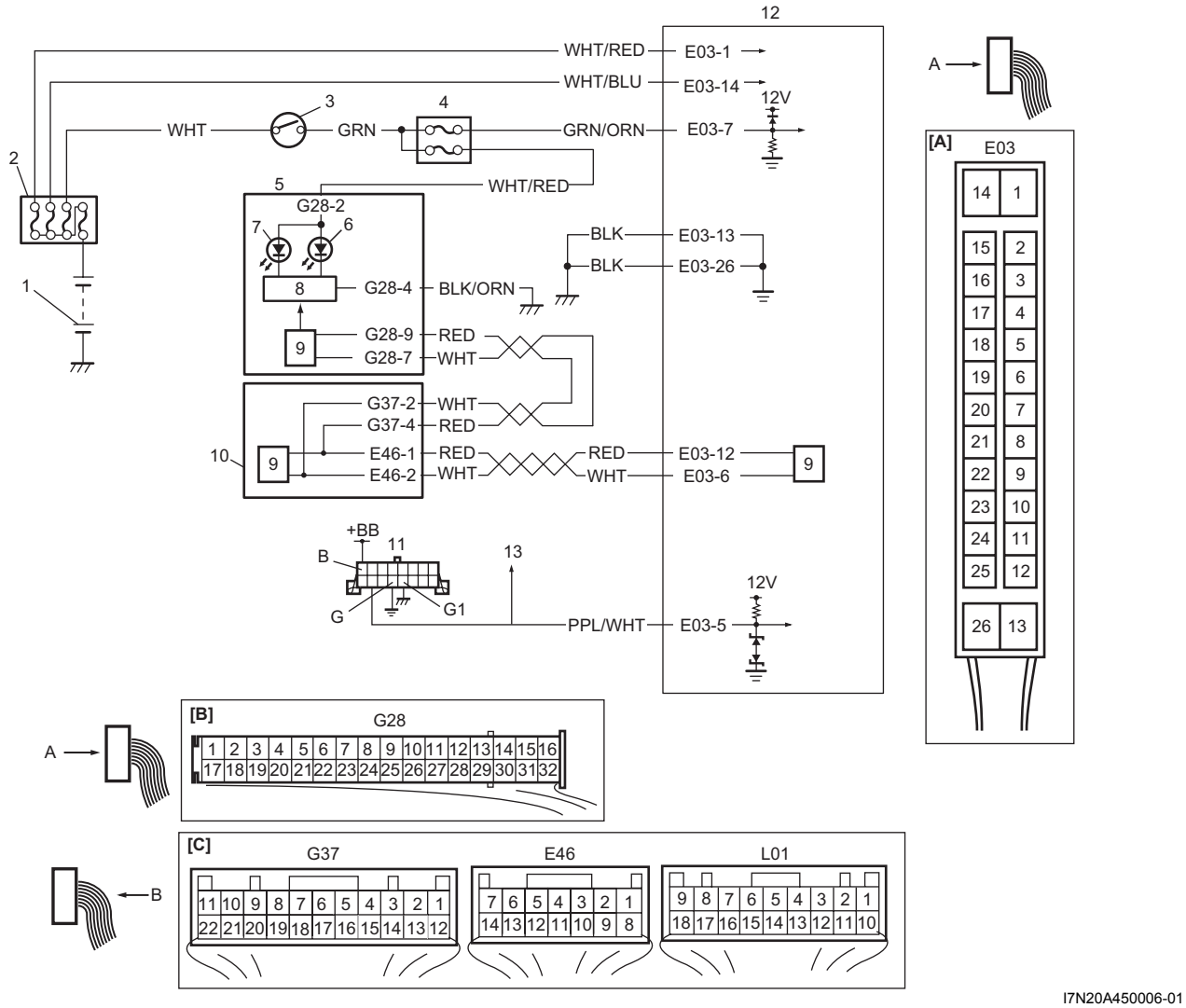
Refer to “Circuit Description” under “ABS Warning Light Does Not Come ON at Ignition Switch ON”.

Troubleshooting

Refer to “Circuit Description” under “ABS Warning Light Does Not Come ON at Ignition Switch ON”.

Serial Data Link Circuit Check

S7N20A4504012

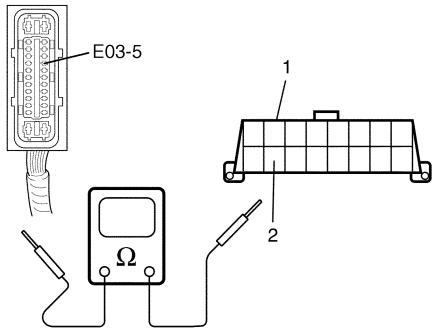


I7N20A450006-01

[A]: ABS control module connector (View: A)	4. Circuit fuse box	10. BCM
[B]: Combination meter connector (View: A)	5. Combination meter	11. Data link connector (DLC)
[C]: BCM connector (View: B)	6. ABS warning light	12. ABS hydraulic unit / control module assembly
1. Battery	7. EBD warning light (brake warning light)	13. To ECM, TCM and SDM
2. Main fuse box	8. Light driver module	
3. Ignition switch	9. CAN driver	

Inspection

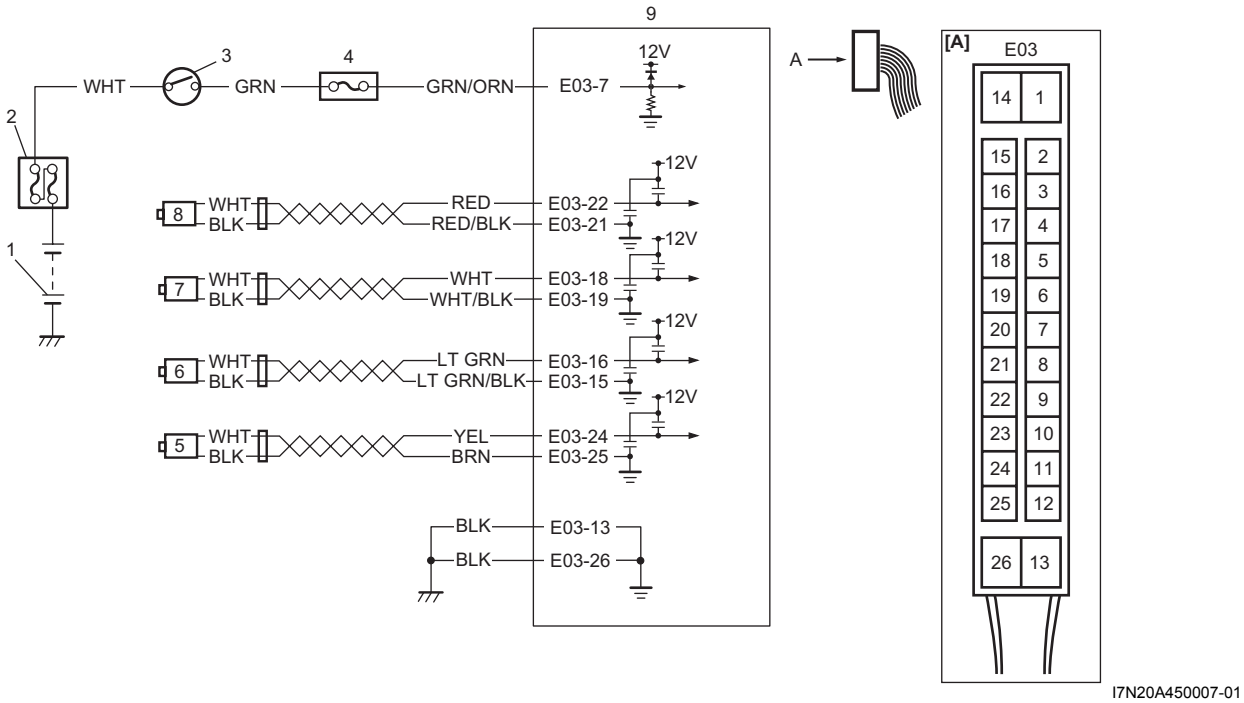
Step	Action	Yes	No
1	1) Turn ignition switch to ON position. *Does ABS warning lamp come ON?*	Go to Step 2.	Go to Step 6.
2	1) Turn ignition switch to OFF position. *Are main fuses for ABS pump motor and ABS solenoid in good condition?*	Go to Step 3.	Replace fuse and check for short.
3	1) Disconnect ABS hydraulic unit / control module connector. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminal “E03-7”. 3) If OK then turn ignition switch to ON position and measure voltage between terminal “E03-7” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” wire circuit open.
4	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-1” and “E03-14”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E03-1”, “E03-14” and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/RED” and/or “WHT/BLU” wire circuit open.
5	1) Turn ignition switch to OFF position. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals “E03-13” and “E03-26”. 3) If OK, measure resistance between each terminal of “E03-13”, “E03-26” and vehicle body ground. *Are resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ABS hydraulic unit / control module open or high resistance.
6	1) Check if communication is possible by trying communication with other controller (ECM, TCM or SDM). *Is it possible to communicate with other controller?*	Go to Step 7.	Repair open in common section of serial data circuit (“PPL/WHT” wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit (“PPL/WHT” wire circuit).
7	1) Turn ignition switch to ON position. 2) Measure voltage between terminal B of data link connector and vehicle body ground. *Is voltage 10 – 12 V?*	Go to step 8.	Terminal B circuit open or shorted to ground.
8	1) Turn ignition switch to OFF position. 2) Measure resistance between the following terminals; • Terminal G of data link connector and vehicle body ground. • Terminal G1 of data link connector and vehicle body ground. *Is each resistance 1Ω or less?*	Go to step 9.	Terminal G and/or G1 circuit open or high resistance.

Step	Action	Yes	No
9	1) Turn ignition switch to OFF position. 2) Check proper connection at “E03-5” (“PPL/WHT” wire) terminal for serial data circuit. 3) If OK, then check resistance between “E03-5” (“PPL/WHT” wire) terminal and “PPL/WHT” wire terminal (2) for serial data circuit in DLC (1). *Is resistance 1 Ω or less?*  I4RS0A450013-02	Substitute a known-good ABS hydraulic unit / control module and recheck.	Repair high resistance or open in “PPL/WHT” wire circuit for anti lock brake system.

DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Sensor Ring

S7N20A4504013

Wiring Diagram



I7N20A450007-01

[A]: ABS control module connector (View: A)	4. Circuit fuse box	8. Left-front wheel speed sensor
1. Battery	5. Right-rear wheel speed sensor	9. ABS hydraulic unit / control module assembly
2. Main fuse box	6. Left-rear wheel speed sensor	
3. Ignition switch	7. Right- front wheel speed sensor	

DTC Detecting Condition

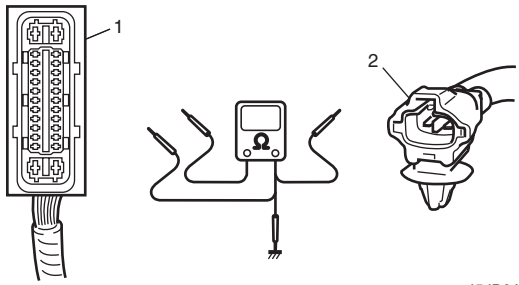
The ABS control module monitors the voltage at the terminal of each sensor while the ignition switch is ON. When the voltage is not within the specified range, an applicable DTC will be set. Also, when no sensor signal is inputted at running, an applicable DTC will be set.

NOTE

When the vehicle was operated in any of the following ways, one of these DTCs may be set even when the sensor is in good condition. If such possibility is suspected, clear DTC once referring to "DTC Clearance" and then performing the driving test as described in Step 2 of "ABS Check", check whether or not any abnormality exists.

- **The vehicle was driven with parking brake pulled.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was turned while the vehicle was jacked up.**
- **The vehicle was stuck.**

DTC Troubleshooting

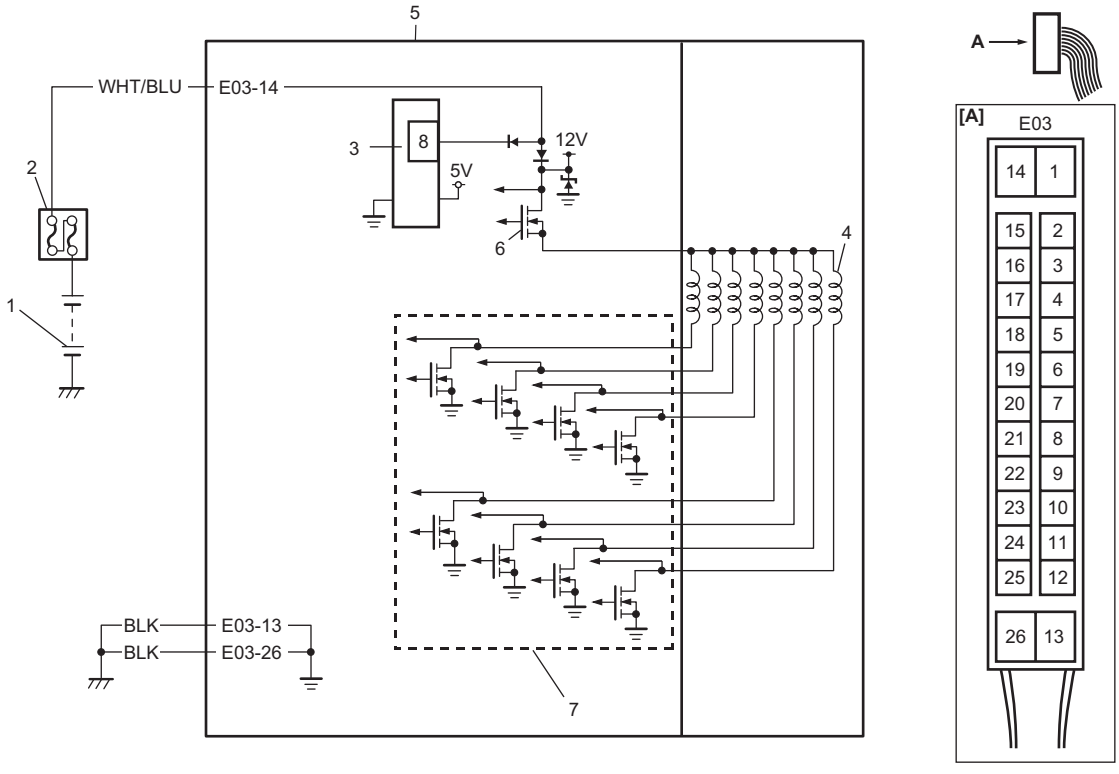
Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	1) Turn ignition switch OFF. 2) Disconnect ABS control module connector. 3) Check for proper connection to ABS control module at each sensor terminal. 4) If OK, then turn ignition switch ON and measure voltage between applicable sensor terminal of module connector and vehicle body ground. *Is it 0 V?*	Go to Step 3.	ABS wheel speed sensor circuit shorted to power.
3	1) Disconnect applicable wheel speed sensor connector with ignition switch OFF. 2) Measure resistance between the following points. • Both ABS control module connector (1) terminals a pair of applicable sensor terminals. This check result should be no continuity. • Between applicable sensor terminal of ABS control module connector and vehicle body ground. This check result should be no continuity. • Between applicable sensor terminal of module connector and corresponding terminal of wheel speed sensor connector (2) in main harness (for front sensor) or floor harness (for rear sensor). This check result should be continuity.  I5JB0A450014-02 *Are each check results OK?*	Go to Step 4.	Circuit open or short to ground.
4	1) Remove applicable wheel speed sensor. 2) Check sensor for damage or foreign material attached. *Is it in good condition?*	Go to Step 5.	Clean, repair or replace.

Step	Action	Yes	No
5	Check front and/or rear encoder for the following (remove front and/or rear drive shaft): • Encoder surface neither crack nor damaged • No foreign material being attached • Encoder not being eccentric • Wheel bearing free from excessive play *Are they in good condition?*	Go to Step 6.	Clean, repair or replace wheel hub assembly.
6	1) Install wheel speed sensor to knuckle. 2) Tighten sensor bolt to specified torque and check that there is no clearance between sensor and knuckle. *Is it OK?*	Go to Step 7.	Replace ABS wheel speed sensor.
7	Refer to “Front Wheel Speed Sensor On-Vehicle Inspection”, check output voltage or waveform. *Is specified voltage and/or waveform obtained?*	Substitute a known-good ABS (ESP®) hydraulic unit / control module assembly and recheck.	Replace sensor and recheck.

DTC C1041 / C1045 / C1051 / C1055, DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit, Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit

S7N20A4504014

Wiring Diagram



I7N20A450008-01

[A]: ABS hydraulic unit / control module assembly connector (View: A)	3. ABS power control module	6. Solenoid valve power supply driver (transistor)
1. Battery	4. Solenoid valve	7. Solenoid valve driver
2. Main fuse box	5. ABS hydraulic unit / control module assembly	8. Internal memory

DTC Detecting Condition
The ABS control module monitors the output from the valve.
When the output of each valve exceeds the specified value compared with the signal sent from ABS control module, this DTC is set.

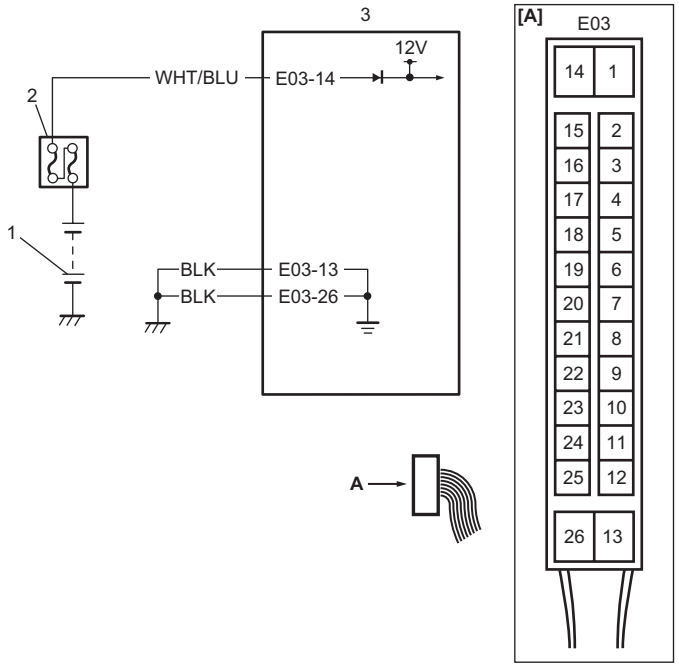
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminal "E03-14". 4) If OK, then measure voltage between terminal "E03-14" of module connector and "E03-26" ("E03-13"). *Is it 10 – 14 V?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	"WHT/BLU" or "BLK" circuit open.

DTC C1057: Power Source Circuit

S7N20A4504015

Wiring Diagram



I7N20A450009-01

[A]: ABS hydraulic unit / control module connector (View: A)	2. Main fuse box
1. Battery	3. ABS hydraulic unit / control module assembly

DTC Detecting Condition
The ABS control module monitors the power source voltage at terminal "E03-14". When the power source voltage becomes extremely high or low while vehicle is running at more than 20 km/h (13 MPH), this DTC will be set. As soon as the power source voltage becomes normal, the ABS warning light will be turned off and the ABS control module will return to normal operation, but the set DTC will be remain.

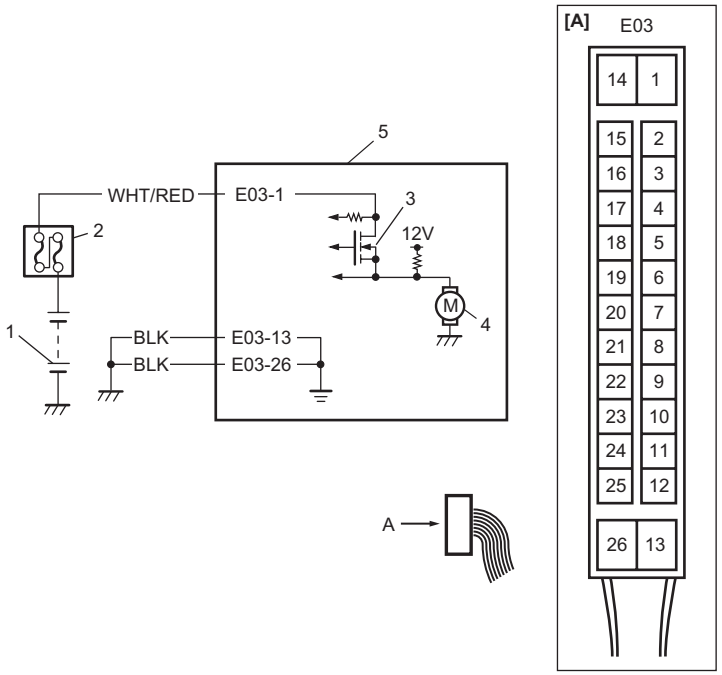
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	1) Disconnect ABS hydraulic unit / control module connector with ignition switch turned OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-14" and "E03-13" ("E03-26"). 3) If OK, then turn ignition switch to ON position and measure voltage between terminals "E03-14" and "E03-13" ("E03-26"). *Is voltage about 9.7 V or more?*	Go to Step 5.	Go to Step 3.
3	1) Turn ignition switch to OFF. 2) Check for proper connection to ABS hydraulic unit / control module connector at terminals "E03-13" and "E03-26". 3) If OK then turn ignition switch to ON and measure resistance between each terminal of "E03-13" ("E03-26") and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 4.	"BLK" wire circuit in open or high resistance.
4	1) Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 9.7 ± 0.3 V or more?*	Imperfect short between "WHT/BLU" wire circuit and body ground.	Check charging system referring to "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J", "Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J" or "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".
5	1) Measure voltage between terminals "E03-14" and "E03-13" ("E03-26") with engine running. *Is voltage 15 V or less?*	Poor connection of "E03-14" and/or "E03-13" ("E03-26") terminals. If the terminals are in good condition, substitute a known-good ABS hydraulic unit / control module and recheck.	Check charging system referring to "Generator Test (Overcharged Battery Check): M13A / M15A / M16A in Section 1J" or "Generator Test (Overcharged Battery Check): D13A / Z13DTJ in Section 1J". If charging system is good condition, substitute a known-good ABS hydraulic unit / control module assembly and recheck.

DTC C1061: ABS Pump Motor and/or Motor Driver Circuit

S7N20A4504016

Wiring Diagram



I7N20A450010-01

[A]: ABS hydraulic unit / control module connector (View: A)	2. Main fuse box	4. ABS pump motor
1. Battery	3. Pump motor driver (transistor)	5. ABS hydraulic unit / control module assembly

DTC Detecting Condition

The ABS control module monitors the voltage at monitor terminal of pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal does not become high / low according to ON/OFF commands to the motor driver (transistor) of the module (does not follow these commands).

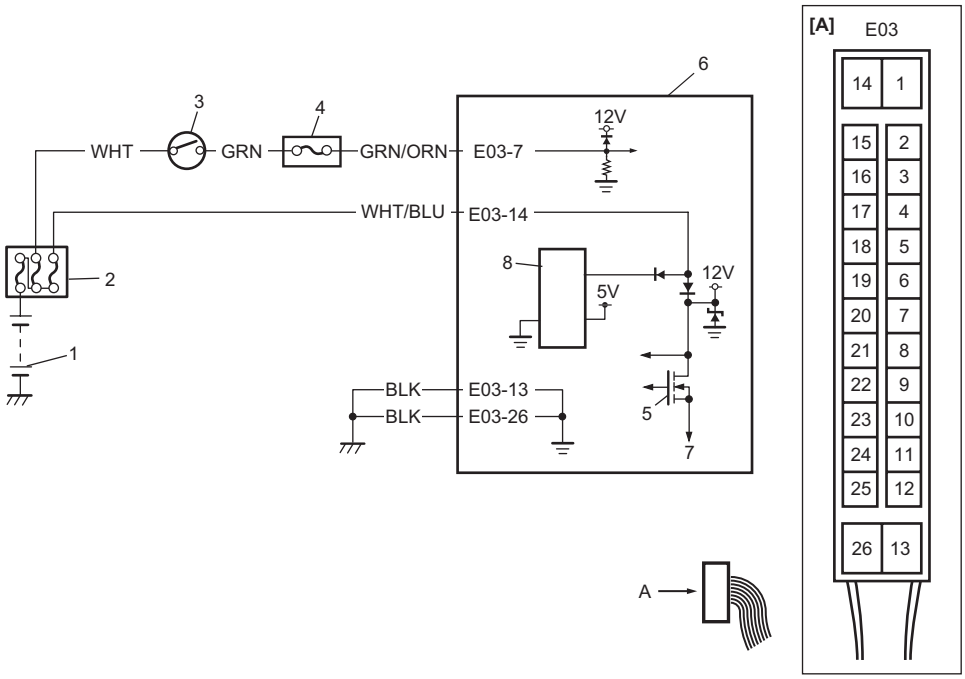
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	1) Turn Ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module connector at terminal "E03-1". 4) If OK, then measure voltage between terminal "E03-1" of module connector and body ground. *Is it 10 – 14 V?*	Go to Step 3.	"WHT/RED" circuit open.
3	Measure resistance between terminal "E03-13" and "E03-26" of ABS hydraulic unit / control module connector and body ground. *Is resistance less than 1 Ω?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	Ground circuit for ABS hydraulic unit / control module open or high resistance.

DTC C1063: Solenoid Valve Power Supply Driver Circuit

S7N20A4504017

Wiring Diagram



I7N20A450011-01

[A]: ABS hydraulic unit / control module connector (View: A)	5. Solenoid valve power supply driver (transistor)
1. Battery	6. ABS hydraulic unit / control module assembly
2. Main fuse box	7. To solenoid valve
3. Ignition switch	8. ABS power control module
4. Circuit fuse box	

DTC Detecting Condition

ABS control module monitors the voltage at the terminal of solenoid circuit constantly with ignition switch turned ON. Also, immediately after ignition switch is turned ON, perform initial check as follows.
Switch solenoid valve power supply driver (transistor) in the order of OFF → ON and check if voltage changes to Low → High. If anything faulty is found in the initial check and when the voltage is low with ignition switch turned ON, this DTC will be set.

DTC Troubleshooting

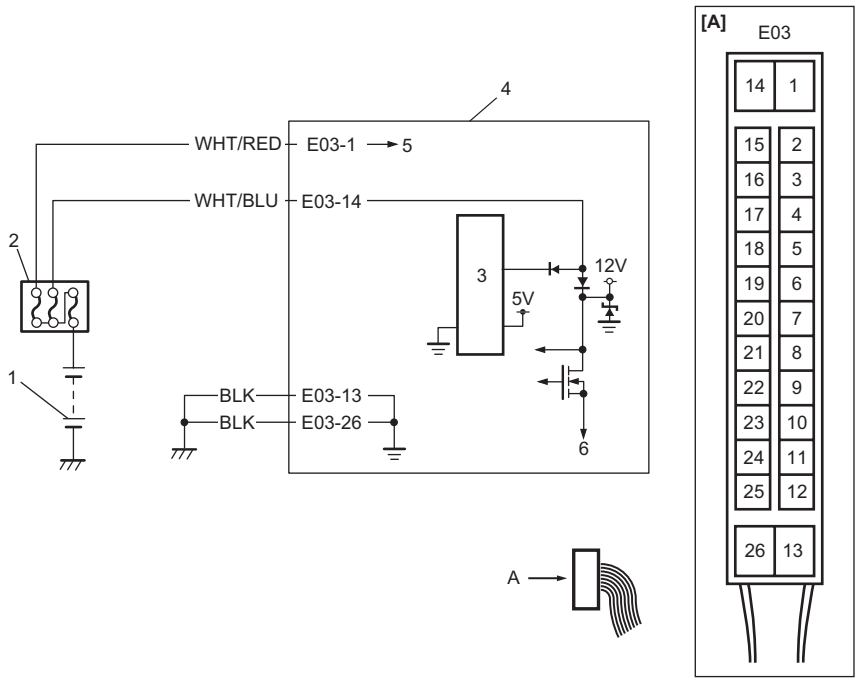
Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	Check battery voltage. *Is it about 11 V or higher?*	Go to Step 3.	Check charging system referring to "Battery Inspection: M13A / M15A / M16A in Section 1J" or "Battery Inspection: D13A / Z13DTJ in Section 1J" and "Generator Description (For 75A Type): M13A / M15A / M16A in Section 1J", "Generator Description (For 80A Type): M13A / M15A / M16A in Section 1J" or "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".

Step	Action	Yes	No
3	Check main fuse for ABS solenoid and its terminal. *Is it in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	1) Turn ignition switch to OFF position. 2) Disconnect ABS hydraulic unit / control module connector. 3) Check for proper connection to ABS hydraulic unit / control module at terminal “E03-14”. 4) If OK, then measure voltage between connector terminal “E03-14” and body ground. *Is it 10 – 14 V?*	Substitute a known-good ABS hydraulic unit / control module assembly and recheck.	“WHT/BLU” circuit imperfect short to ground.

DTC C1071: ABS Control Module

S7N20A4504018

Wiring Diagram



I7N20A450012-01

[A]: ABS hydraulic unit / control module connector (View: A)	3. Power control unit	6. To solenoid valve driver (transistor)
1. Battery	4. ABS hydraulic unit / control module assembly	
2. Main fuse box	5. To pump motor	

DTC Detecting Condition

This DTC will be set when an internal malfunction is detected in the ABS control module.

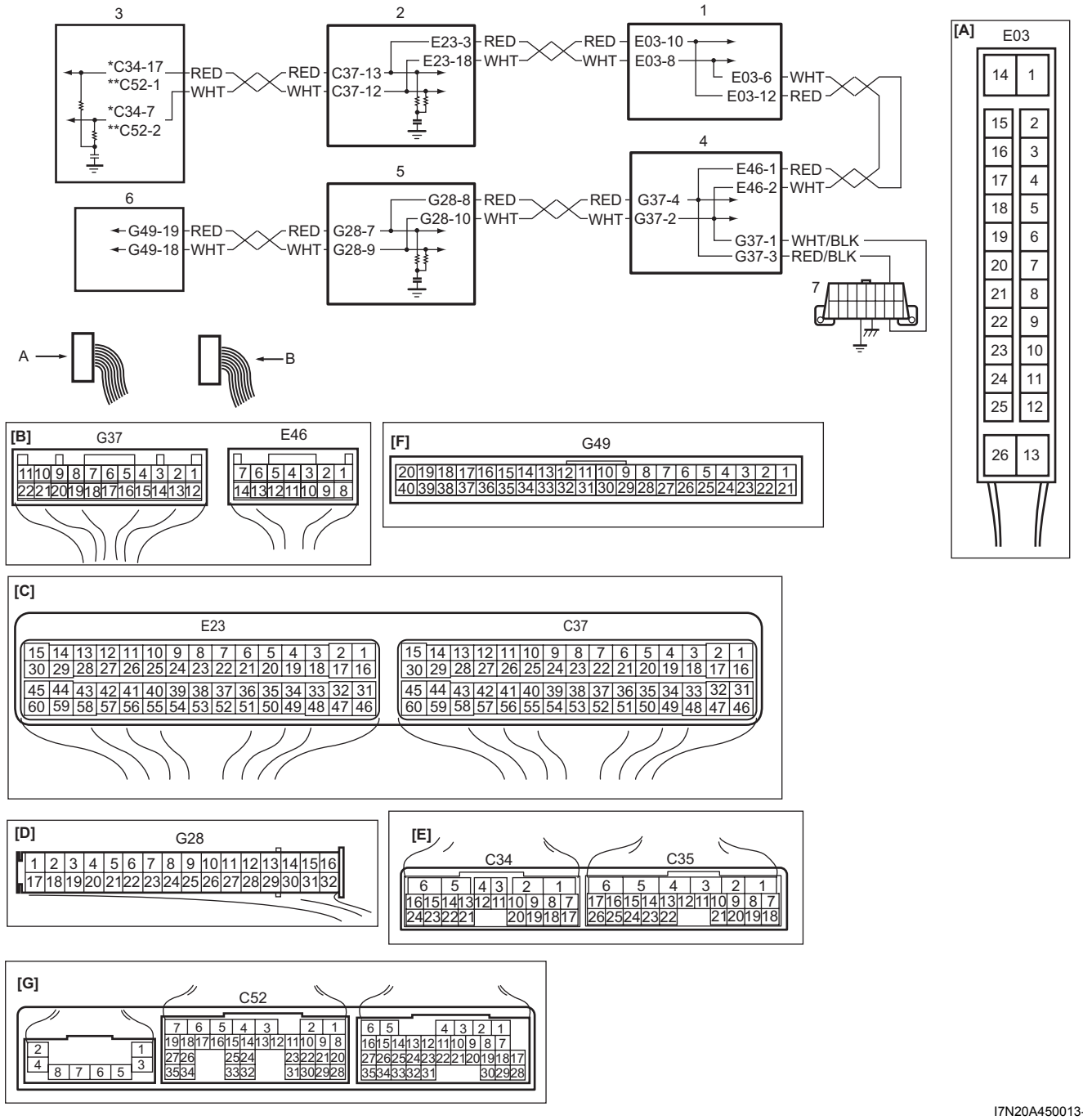
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	Clear all DTCs and check DTC. *Is it DTC C1071?*	Go to Step 3.	Could be a temporary malfunction of the ABS control module.
3	1) Check for proper connection of ABS hydraulic unit / control module connector. 2) If OK, disconnect ABS hydraulic unit / control module connector and check the following. • Voltage "E03-1" terminal: 10 – 14 V • Voltage "E03-14" terminal: 10 – 14 V • Resistance between "E03-13" and body ground: Continuity • Resistance between "E03-26" and body ground: Continuity *Are the check result as specified?*	Replace ABS hydraulic unit / control module assembly.	Repair "WHT/RED", "WHT/BLU" and/or "BLK" circuit and recheck.

DTC U1073: Control Module Communication Bus Off

S7N20A4504021

Wiring Diagram



I7N20A450013-01

[A]: ABS control module connector (View: A)	[F]: Keyless start control module connector (View: B)	4. BCM
[B]: BCM connector (View: B)	[G]: TCM connector (Automated Manual Transaxle model) (View: B)	5. Combination meter
[C]: ECM connector (View: B)	1. ABS hydraulic unit / control module assembly	6. Keyless start control module (if equipped)
[D]: Combination meter connector (View: A)	2. ECM	7. Data link connector (DLC)
[E]: TCM connector (View: B)	3. TCM	

DTC Detecting Condition

Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC. *Is DTC U1073 indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
4	1) Turn ignition switch to OFF position. 2) Connect connector of disconnected control modules communicating by means of CAN. 3) Disconnect connector from any one of control modules other than BCM and ABS control module. 4) Recheck ABS control module for DTC. *Is DTC U1073 detected?*	Disconnected connectors of control modules other than the one whose connector is disconnected in Step 3) one by one and check that DTC U1073 is detected by ABS control module each time connector is disconnected. When DTC U1073 is not detected by ABS module while checking in this way, go to description under "NO" below. If DTC U1073 is detected by ABS control module, go to Step 5.	Check power and ground circuit of control module disconnected in Step 3) circuit is OK, substitute a know-good control module disconnected in Step 3) and recheck.
5	1) Substitute a know-good BCM and recheck ABS control module for DTC. *Is DTC U1073 detected?*	Substitute a know-good ABS control module and recheck.	End.

DTC U1100: Lost Communication with ECM (Reception Error)

S7N20A4504022

Wiring Diagram

Refer to "DTC U1073: Control Module Communication Bus Off".

DTC Detecting Condition

Reception error of communication data for ECM is detected more than specified time continuously.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "ABS Check" performed?*	Go to Step 2.	Go to "ABS Check".
2	1) Check DTC for ABS. *Is DTC U1073 detected?*	Go to "DTC U1073: Control Module Communication Bus Off".	Go to Step 3.
3	1) Check DTC for ECM. *Is DTC P1674 detected?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A in Section 1A".	Go to Step 4.
4	1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ABS. *Is DTC U1100 indicated?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	1) Turn ignition switch to OFF position. 2) Disconnect connectors of ABS control modules and ECM communicating by means of CAN. 3) Check CAN communication circuit between ABS control module and ECM for open, short and high resistance. *Is CAN communication circuit in good condition?*	Go to Step 6.	Repair or replace the CAN communication line.
6	1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair or replace the CAN communication line.
7	1) Turn ignition switch to OFF position. 2) Connect connector of disconnected control modules communicating by means of CAN. 3) Disconnect connector from any one of control modules other than BCM and ABS control module. 4) Recheck ABS control module for DTC *Is DTC U1100 detected?*	Disconnected connectors of control modules other than the one whose connector is disconnected in Step 3) one by one and check that DTC U1100 is detected by ABS control module each time connector is disconnected. When DTC U1100 is not detected by ABS module while checking in this way, go to description under "NO" below. If DTC U1100 is detected by ABS control module, go to Step 8.	Check power and ground circuit of control module disconnected in Step 3) circuit is OK, substitute a know-good control module disconnected in Step 3) and recheck.
8	1) Substitute a know-good BCM and recheck ABS control module for DTC. *Is DTC U1100 detected?*	Substitute a know-good ABS control module and recheck.	End.

Repair Instructions

ABS Hydraulic Unit Operation Check

S7N20A4506001

⚠ CAUTION

Make sure for the following conditions before ABS hydraulic unit operation check. Otherwise, ABS hydraulic unit operation check can not do properly.

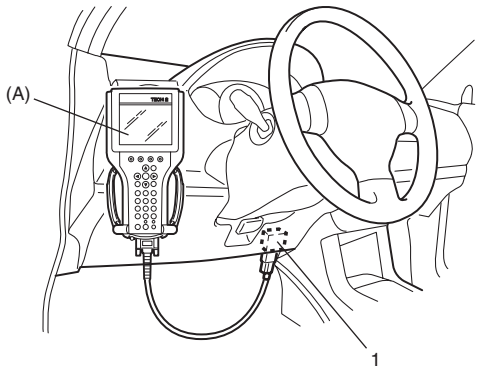
- **No air is trapped in brake system.**
- **Battery voltage is 11 V or more.**
- **Brakes do not drag.**
- **ABS control module has detected no DTC.**

NOTE

- **Operation check must be performed by 2 persons.**
- **When installing new ABS hydraulic unit / control module assembly, ABS warning light may flash at ignition switch is turned ON position. Accordingly perform "Precautions in ABS Hydraulic Unit Operation Check" to stop flashing of ABS warning light.**

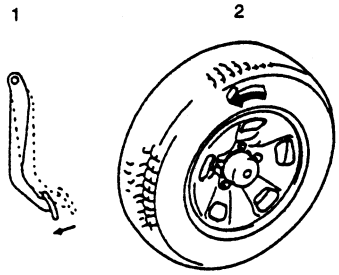
1) Check that basic brake system other than ABS is in good condition.
2) Lift up vehicle.
3) Set transmission to neutral (N range for A/T) and release parking brake.
4) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.
5) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I4RS0B450003-01

6) Turn ignition switch to ON position and select menu to "HYDRAULIC CONTROL TEST" under "miscellaneous test" ("MISC. TEST") mode of SUZUKI scan tool.
7) Perform the following checks with help of another person.
   Brake pedal (1) should be depressed 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 that:
   - Operation sound of solenoid is heard and the wheel turns only about 0.5 sec. (Brake force is depressurized).
   - Operation sound of pump motor is heard and pulsation is felt at brake pedal.



I4RH01450021-01

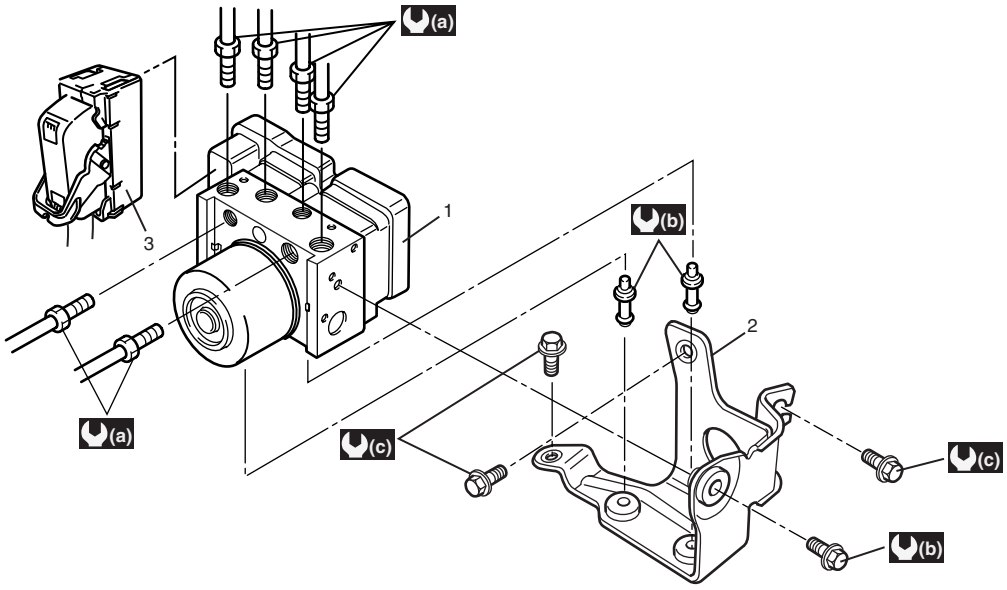
8) Check for all 4-wheels condition respectively. If a faulty condition is found, replace hydraulic unit / control module assembly.
9) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

ABS Hydraulic Unit / Control Module Assembly Components

S7N20A4506002

⚠ CAUTION

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.



I4RS0A450021-01

1. ABS hydraulic unit / control module assembly	3. Connector	(b) : 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
2. Bracket	(a) : 16 N·m (1.6 kgf-m, 11.5 lbf-ft)	(c) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

ABS Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S7N20A4506003

⚠ CAUTION

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.

Check hydraulic unit for fluid leakage.
If any, replace.

ABS Hydraulic Unit / Control Module Assembly Removal and Installation

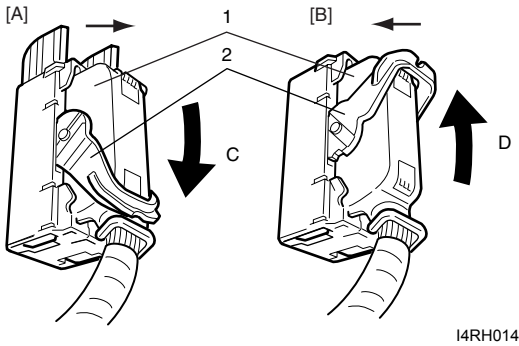
S7N20A4506004

⚠ CAUTION

Never disassemble ABS hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit / control module assembly.

Removal

1) Disconnect negative cable from battery.
2) Disconnect ABS hydraulic unit / control module assembly connector (1) by pull down the lock (2).



I4RH01450001-01

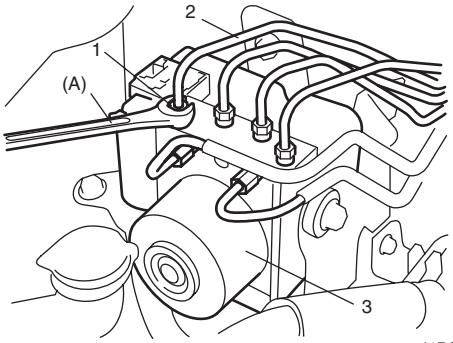
[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

3) Using special tool, loosen flare nuts (1) and disconnect brake pipes (2) from ABS hydraulic unit / control module assembly (3).

Special tool
(A): 09950-78220

NOTE

Put bleeder plug cap or the like onto pipe to prevent fluid from spilling. Do not allow brake fluid to get on painted surfaces.



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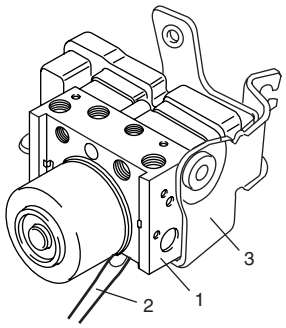
4) Remove ABS hydraulic unit / control module with bracket from vehicle by removing three bracket bolts.

5) Remove bolt and pull out ABS hydraulic unit / control module assembly (1) from bracket (3) using flat end rod or the like (2).

⚠ CAUTION

- **Do not give an impact to hydraulic unit.**
- **Use care not to allow dust to enter hydraulic unit.**
- **Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect its original performance.**

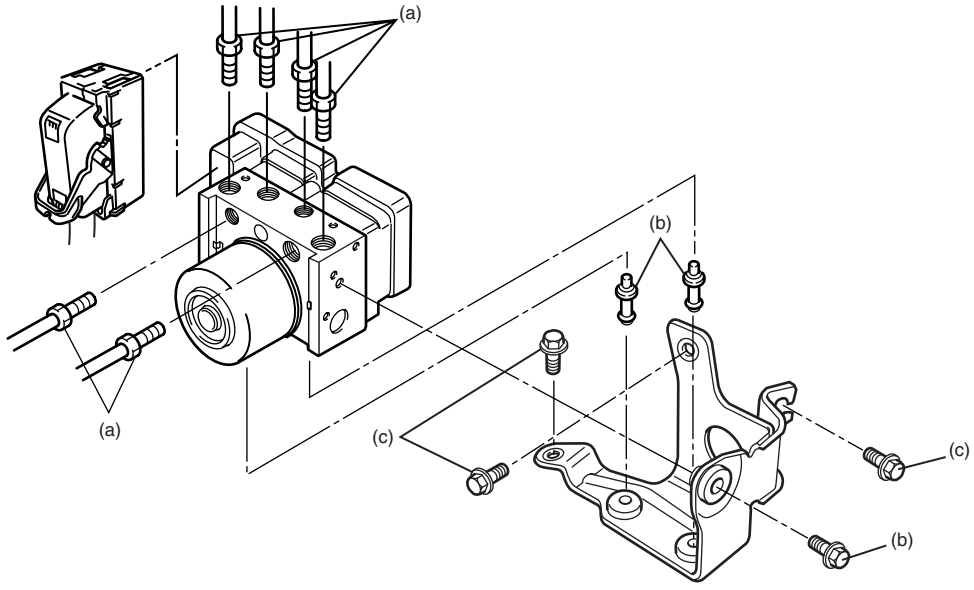


I4RS0A450023-01

Installation

1) Install hydraulic unit / control module assembly by reversing removal procedure.

Tightening torque
Brake pipe flare nut (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)
ABS hydraulic unit / control module assembly bolt (b): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
ABS hydraulic unit / control module assembly bracket bolt (c): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



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2) Bleed air from brake system referring to “Air Bleeding of Brake System in Section 4A”.
3) Check each installed part for fluid leakage and perform “ABS Hydraulic Unit Operation Check”.

NOTE

When installing new ABS hydraulic unit / control module assembly, ABS warning light may flash at ignition switch is turned ON position.
Accordingly preform “ABS Hydraulic Unit Operation Check” to stop flashing of ABS warning light.

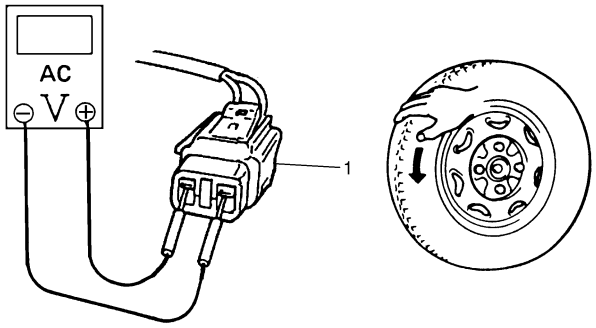
Front Wheel Speed Sensor On-Vehicle Inspection

S7N20A4506005

Output Voltage Inspection

1) Disconnect negative cable from battery.
2) Hoist vehicle a little.
3) Disconnect wheel speed sensor connector.
4) Disconnect wheel speed grommet from vehicle body.
5) Connect voltmeter between connector (1) terminals.
6) While turning wheel by hand at a speed of approximately 1/2 rotation to 1 rotation per second, check AC voltage of sensor.

Output AC voltage at 1/2 to 1 rotation per second
53 mV or more



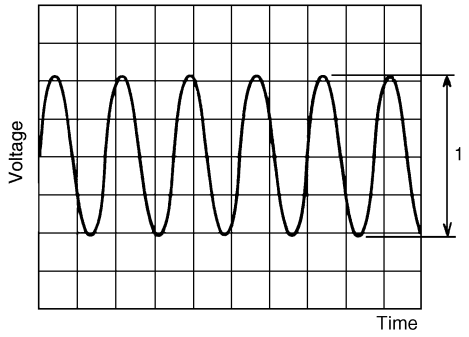
I2RH01450049-01

7) If measured voltage is not as specified, check sensor, encoder and their installation conditions.

Reference

When using oscilloscope for this check, check if peak-to-peak voltage (1) meets specification and waveform is complete.

Peak-to-peak voltage at 1/2 to 1 rotation per second
140 mV or more at 15 Hz



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Front Wheel Speed Sensor Removal and Installation

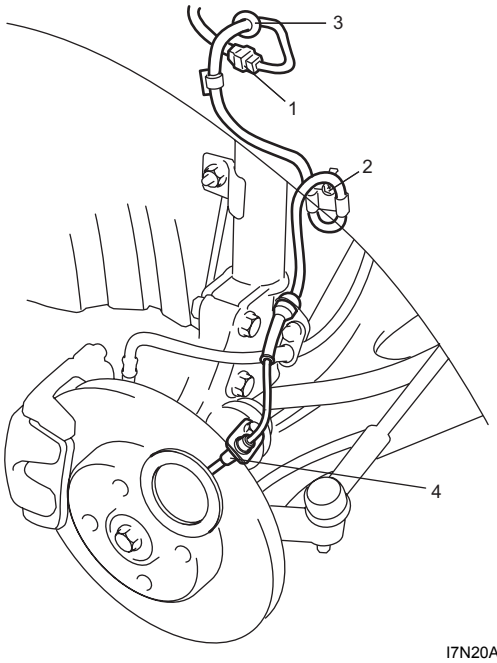
S7N20A4506006

Removal

1) Disconnect negative cable from battery.
2) Disconnect front wheel speed sensor connector (1).
3) Hoist vehicle and remove wheel.
4) Remove harness clamp, clamp bolt (2) and grommet (3).
5) Remove front wheel speed sensor (4) from knuckle.

⚠ CAUTION

- **Do not pull wire harness when removing front wheel speed sensor.**
- **Do not cause damage to surface of front wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



I7N20A450014-01

Installation

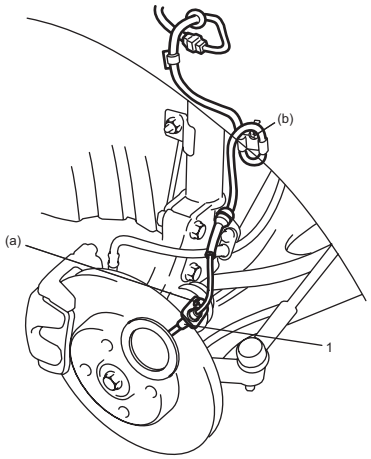
1) Check that no foreign material is attached to sensor (1) and encoder (2).
2) Install it by reversing removal procedure.

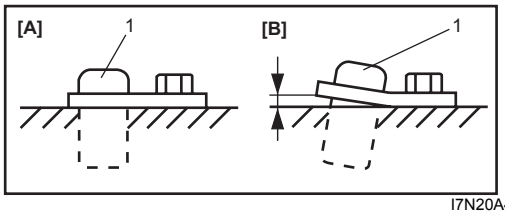
Tightening torque
Front wheel speed sensor bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
Front wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

⚠ CAUTION

Do not pull or twist wire harness more than necessary when installing front wheel speed sensor.

3) Check that there is no clearance between sensor and knuckle.





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[A]: OK
[B]: NG

Front Wheel Speed Sensor Inspection

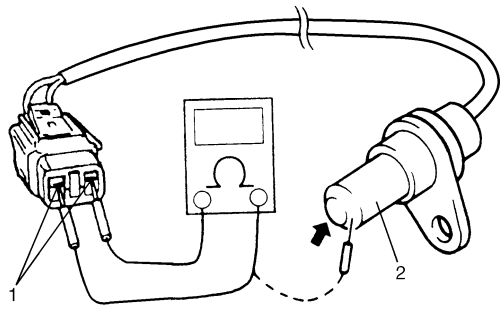
S7N20A4506007

- Check sensor for damage.
- Measure resistance of sensor.

Between both terminals (1) of sensor
1.2 – 1.6 kΩ at 20 °C (68 °F)

Between sensor terminal (1) and sensor body (2)
Infinity (∞)

If the check result is not as specified and any malcondition is found, replace.



I7N20A450016-01

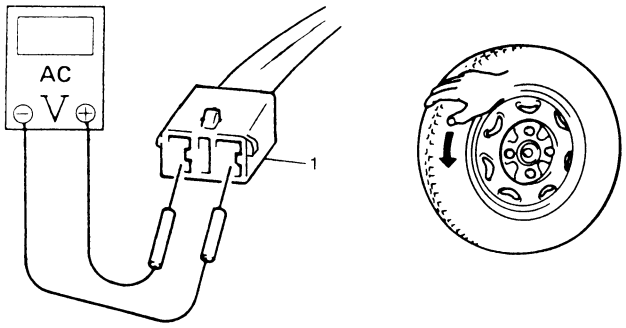
Rear Wheel Speed Sensor On-Vehicle Inspection

S7N20A4506008

Output Voltage Inspection

1) Disconnect negative cable from battery.
2) Disconnect connector from rear wheel speed sensor referring to Step 2) of “Rear Wheel Speed Sensor Removal and Installation”.
3) Hoist vehicle.
4) Connect voltmeter between connector (1) terminals.
5) While turning wheel at a speed of approximately 1/2 to 1 rotation per second, check AC voltage of sensor.

Output AC voltage at 1/2 to 1 rotation per second
53 mV or more

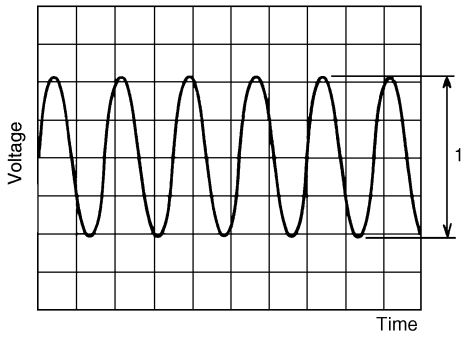


I3RH01450049-01

6) If measured voltage is not as specified, check sensor, ring and their installation conditions.

Reference
When using oscilloscope for this check, check if peak-to-peak voltage (1) meets specification and waveform is complete.

Peak-to-peak voltage at 1/2 to 1 rotation per second
140 mV or more at 15 Hz



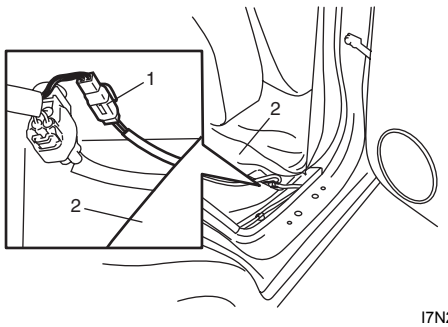
I2RH01450050-01

Rear Wheel Speed Sensor Removal and Installation

S7N20A4506009

Removal

1) Disconnect negative cable from battery.
2) Disconnect rear wheel speed sensor connector.
   - For 5door model:
     a. Remove rear seat cushion.
     b. Turn over floor carpet (2).
   - For 3door model:
     a. Remove quarter inner trim to brake referring to “Floor Carpet Removal and Installation in Section 9H”.
     b. Turn over floor carpet (2).
3) Disconnect connector (1) of wheel speed sensor.



I7N20A450017-01

4) Hoist vehicle.
5) Detach ABS wheel sensor wire harness (1).

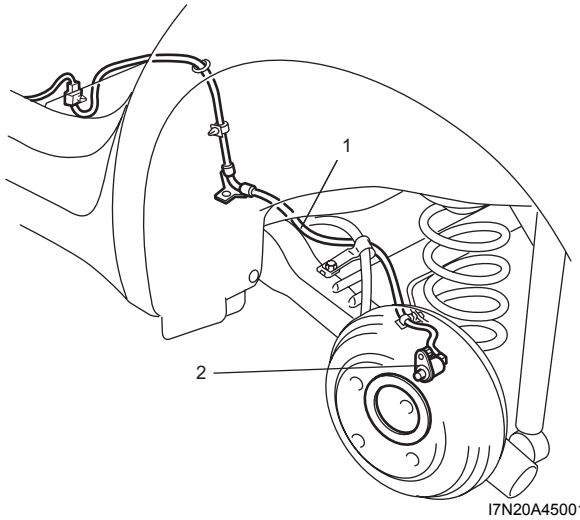
NOTE

Do not detach clip of rear wheel speed sensor connector from vehicle body unless replacement is necessary.

6) Remove rear wheel speed sensor (2) from brake back plate.

⚠ CAUTION

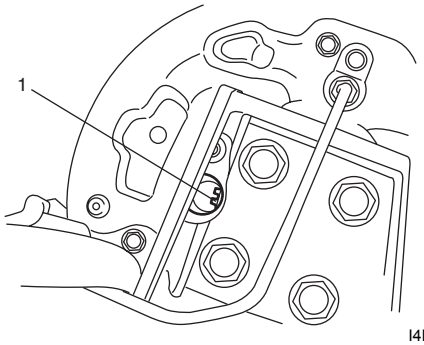
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



I7N20A450018-01

Installation
Reverse removal procedure for installation noting the following.

- Check that no foreign material is attached to sensor and encoder (1).



I4RS0B450009-01

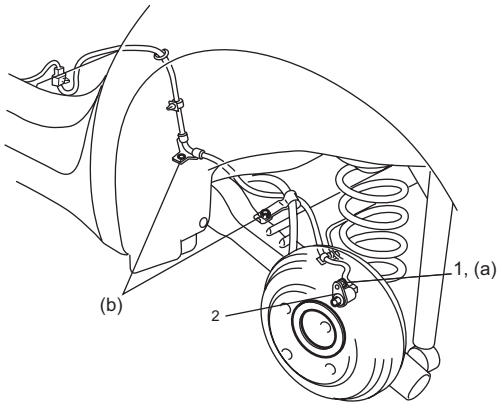
- Be sure to install wheel speed sensor (2) and its bolt at the correct (upper) position as shown in figure. Tighten sensor bolt (1) and harness clamp bolts to specified torque.

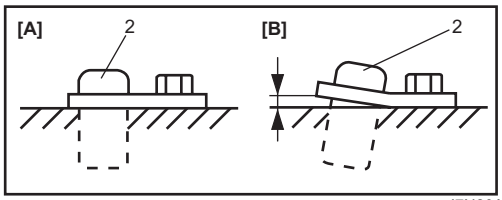
Tightening torque
Rear wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
Rear wheel speed sensor harness clamp bolt (b): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

⚠ CAUTION

Do not pull or twist wire harness more than necessary when installing rear wheel speed sensor.

- Check that there is no clearance between sensor and brake back plate.





I7N20A450019-01

[A]: OK	[B]: NG

Rear Wheel Speed Sensor Inspection

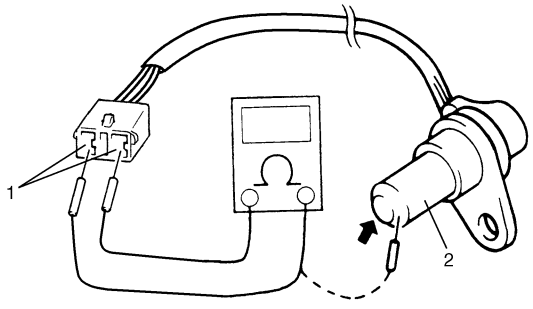
S7N20A4506010

- Check sensor for damage.
- Measure resistance of sensor.

Between both terminals (1) of sensor
1.2 – 1.6 kΩ at 20 °C (68 °F)

Between sensor terminal (1) and sensor body (2)
Infinity (∞)

If the check result is not as specified and any malcondition is found, replace.



I3RH01450052-01

Front Wheel Speed Sensor Encoder Removal and Installation

S7N20A4506016

⚠ CAUTION

Front wheel speed sensor encoder is included in wheel bearing. If front wheel speed sensor encoder needs to be replaced, replace it as a wheel bearing.

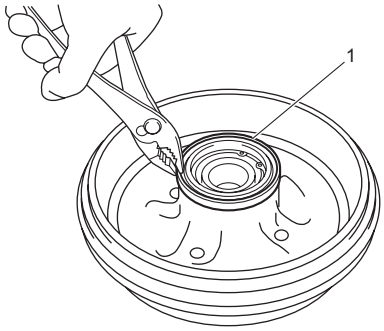
For removal and installation of wheel bearing, referring to “Front Wheel Hub, Steering Knuckle and Wheel Bearing Removal and Installation in Section 2B”.

Rear Wheel Speed Sensor Ring Removal and Installation

S7N20A4506017

Removal

1) Remove rear brake drum referring to “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”.
2) Remove rear wheel speed sensor ring (1) from rear brake drum.

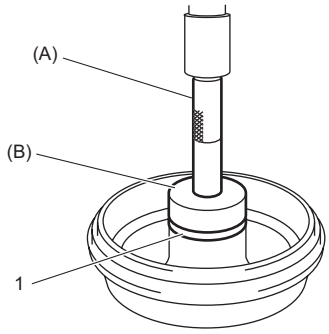


I7N20A450020-01

Installation

1) Install rear wheel speed sensor ring (1) using special tool.

Special tool
(A): 09924–74510
(B): 09952–86310



I7N20A450021-01

2) Install brake drum referring to “Rear Brake Drum Removal and Installation: Drum Brake in Section 4C”.

Front Wheel Speed Sensor Encoder and Rear Wheel Speed Sensor Ring Inspection

S7N20A4506018

- Check sensor encoder or ring for crack, damage or deformation.
- Check that no foreign material is attached.
  If any faulty is found, clean or replace.

Specifications

Tightening Torque Specifications

S7N20A4507001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake pipe flare nut	16	1.6	11.5	☞
ABS hydraulic unit / control module assembly bolt	9	0.9	6.5	☞
ABS hydraulic unit / control module assembly bracket bolt	25	2.5	18.0	☞
Front wheel speed sensor bolt	25	2.5	18.0	☞
Front wheel speed sensor harness clamp bolt	11	1.1	8.0	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Rear wheel speed sensor harness clamp bolt	11	1.1	8.0	☞

NOTE

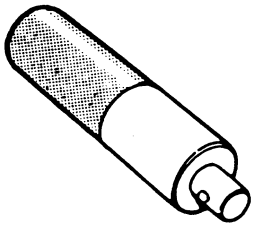
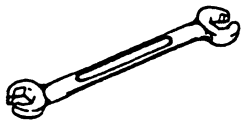
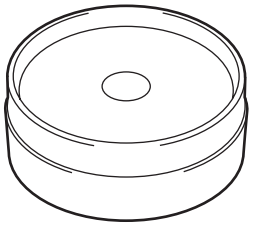
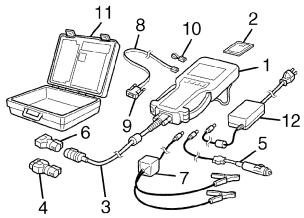
The specified tightening torque is also described in the following.
“ABS Hydraulic Unit / Control Module Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A4508001

09924–74510 Bearing and oil seal handle ☞ 	09950–78220 Flare nut wrench ☞ 
09952–86310 Installer, Sensor Ring (Rear) ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞ 

Electronic Stability Program

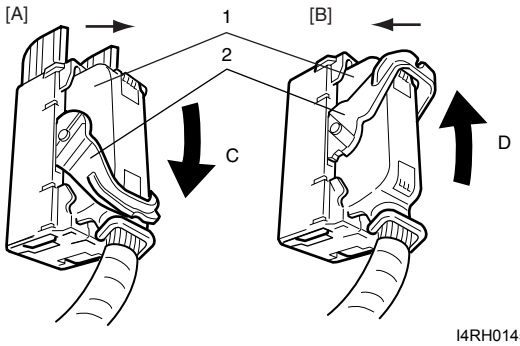
Precautions

Precautions in Diagnosing Troubles

S7N20A4600001

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow “Electronic Stability Program Check”.

- Diagnostic information stored in ESP® control module memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator’s (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- If the vehicles was operated in any of the following ways, ESP® warning light may light momentarily but this does not indicate anything abnormal in ESP®.
  - The vehicle was driven with parking brake pulled.
  - The vehicle was driven with brake dragging.
  - The vehicle was stuck in mud, sand, etc.
  - Wheel spin occurred while driving.
  - Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to use the trouble diagnosis procedure as described in “Electronic Stability Program Check”. Failure to follow it may result in incorrect diagnosis. (Some other diagnosis trouble code may be stored by mistake in the memory of ESP® control module during inspection.)
- When disconnecting ESP® control module connector (1), pull down the lock lever (2) of connector. When connecting, set the connector on ESP® hydraulic unit / control module assembly and pull up the lock lever (2) until it locks.



I4RH01450001-01

[A]: Disconnect	[C]: Pull down to disconnect
[B]: Connect	[D]: Pull up to connect

- Communication of ECM, BCM, ESP® control module, keyless start control module (if equipped), steering angle sensor and combination meter is established by CAN (Controller Area Network). Therefore, be sure to read “Precaution for CAN Communication System in Section 00” before inspection and handling CAN communication line.

Precautions in On-Vehicle Service

S7N20A4600002

When connector is connected to ESP® hydraulic unit / control module assembly, do not disconnect connectors of sensors with ignition switch ON. Otherwise, DTC will be set in ESP® control module.

Precautions in ESP® Hydraulic Unit Operation Check

S7N20A4600003

ESP® hydraulic unit / control module assembly function is checked by correct wheel lock / release condition when brake pressure is pressurized / depressurized using SUZUKI scan tool. The hydraulic unit operation check referring to “ESP® Hydraulic Unit Operation Check” should be performed to confirm the correct brake pipe connection in the following cases.

- ESP® hydraulic unit / control module assembly was replaced.
- Brake pipe and/or hose were replaced.

Precautions in Sensor Calibration

S7N20A4600004

ESP® control module stores calibration points data of yaw rate / G sensor assembly and master cylinder pressure sensor. Steering angle sensor stores calibration point data of itself.
Traction control function and stability control function use these sets of data.
When the following condition is done, calibration should be performed since the original calibration points are deleted.

Sensor	Procedures required calibration
Steering angle sensor	• Power is not supplied to steering angle sensor. (battery and/or fuse is removed.) • Steering angle sensor is replaced. • Power is not supplied to ESP® control module. (battery, fuse and/or connector is removed.) • ESP® hydraulic unit / control module assembly is replaced.
Master cylinder pressure sensor	• ESP® hydraulic unit / control module assembly is replaced.
Yaw rate / G sensor assembly	• Yaw rate / G sensor assembly is replaced. • ESP® hydraulic unit / control module assembly is replaced.

Perform sensor calibration according to “Sensor Calibration”.

Precautions in Speedometer Test or Other Tests

S7N20A4600005

When performing speedometer or other tests using speedometer tester or chassis dynamometer, ESP® function must be deactivated by ESP® OFF switch, TCSS OFF switch or using SUZUKI scan tool to complete the tests correctly. When using SUZUKI scan tool, set to the “MISC. TEST” mode to stop the ESP® function. Refer to SUZUKI scan tool operator's manual for further details.

General Description

Electronic Stability Program Description

S7N20A4601001

Electronic Stability Program (ESP®) is an auxiliary function to enable the vehicle to stabilize while the vehicle is running, stopping or turning
Electronic Stability Program (ESP®) consists of following functions.

NOTE

ESP® is a registered trademark of Daimler Chrysler AG.

- ABS / EBD
  ABS function is that four wheel brake forces are independently varied with referring each wheel slip condition.
  EBD function is that front and rear wheel braking forces are varied with referring loading distribution of the vehicle.
  ABS improves the vehicle stability, controllability and braking performance.
  For the details, refer to “ABS Description in Section 4E”.
- Traction control
  Traction control function is that engine torque is controlled and brake is applied with referring wheel spin condition during vehicle starting and accelerating.
- Stability control
  Stability control function is that engine torque is controlled and brake is applied with referring vehicle condition (over steering, under steering) during cornering.

Other than M16A model

ESP® system is equipped with TCSS OFF switch. When TCSS OFF switch is turned ON under the condition that traction control function is not stopped, ESP® control module stops traction control function. And when TCSS OFF switch is turned ON with stopped traction control function, ESP® control module resumes traction control function.
Traction control function in ESP® can be stopped and resumed by TCSS OFF switch or SUZUKI scan tool. However, traction control function resumes automatically when ignition switch is turned to OFF position once and then to ON position.

M16A model

ESP® system is equipped with ESP® OFF switch. When ESP® switch is turned ON under the condition that traction and stability function are not stopped, ESP® control module stops traction and stability control functions. And when ESP® OFF switch is turned ON with stopped traction and stability control functions, ESP® control module resumes traction and stability control functions.
Traction and stability control functions in ESP® can be stopped and resumed by ESP® OFF switch or SUZUKI scan tool.
However, traction and stability control functions resumes automatically when ignition switch is turned to OFF position once and then to ON position.

NOTE

TCSS stand for traction control support system and means traction control function in ESP®.

ESP® Hydraulic Unit / Control Module Assembly Description

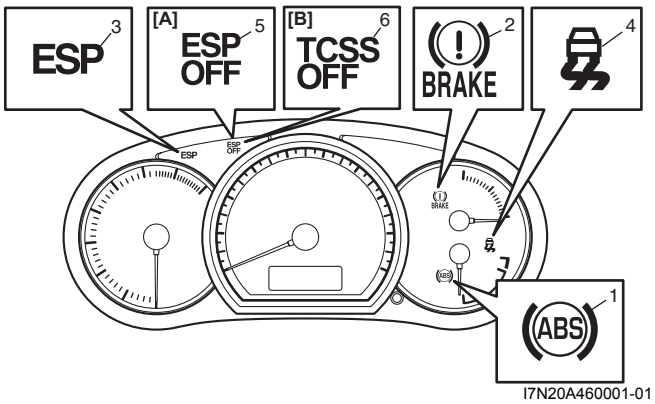
S7N20A4601002

ESP® control module is a component of ESP® hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ESP® control module monitors each input and output signals. When ESP® control module detects any malfunction, some of ABS warning light (1), EBD warning light (brake warning light) (2), ESP® warning light (3), SLIP indicator light (4), ESP® OFF light or TCSS OFF light (6) (5) are turned ON and indicate the abnormality to driver.

- When ignition switch is turned ON, ABS warning light, EBD warning light, ESP® warning light, SLIP indicator light and ESP® OFF light or TCSS OFF light lights for 2 seconds to check its circuit.
- When no abnormality is detected (the system is in good condition), ABS warning light, EBD warning light, ESP® warning light, SLIP indicator light and ESP® OFF light or TCSS OFF light turn OFF after 2 seconds.
- When an abnormality in the system is detected, some of ABS warning light, EBD warning light (brake warning light), ESP® warning light, SLIP indicator light and/or ESP® OFF light or TCSS OFF light are turned ON and the area where that abnormality lies is stored in the memory in ESP® control module.



I7N20A460001-01

[A]: M16A model	6. TCSS OFF light
[B]: Other than M16A model	

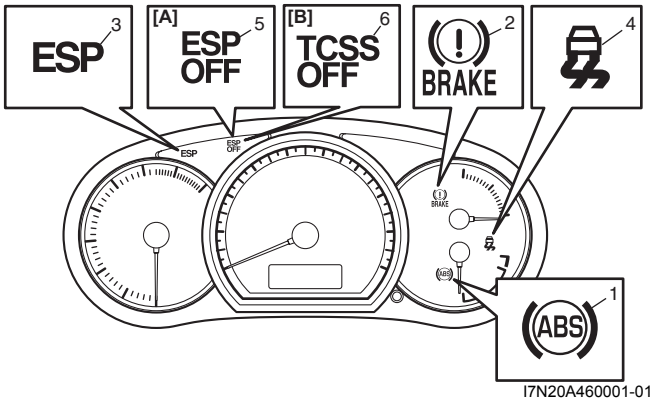
Fail-Safe Mode

If ESP® control module detects a DTC, ESP® control module stops ABS, EBD, traction control and/or stability control corresponding to the trouble area. It is possible to confirm the stopped function by the warning/indicator light in combination meter. Refer to “Warning Light, Indicator Light Description”.

Warning Light, Indicator Light Description

S7N20A4601003

There are five types of warning light and indicator light in instrument cluster, which are controlled by ESP® control module. They give warning / indication to driver by changing the modes light ON / blinking / light OFF.



I7N20A460001-01

[A]: M16A model	2. EBD warning light (brake warning light)	5. ESP® OFF light
[B]: Other than M16A model	3. ABS warning light	6. TCSS OFF light
1. ESP® warning light	4. SLIP indicator light	

The followings are the condition and operation of warning lights and indicator lights.

Warning light / Indicator 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 bake fluid level in reservoir is lower than minimum level, the light turns “ON”. • Parking brake switch is ON, the light turns “ON”.
ESP® warning light	If ESP® systems has abnormality, the light turns “ON”.
SLIP indicator light	• If stability control and traction control is active, the light blinks at 5 Hz. • If Steering angle sensor calibration is incompleted, the light blinks at 1 Hz.

Warning light / Indicator light	Condition and operation
ESP® OFF light (M16A model)	• ESP® OFF light lights up to indicate that ESP® control module stops traction control and stability control if ESP® OFF switch is turned ON. • ESP® OFF light lights up to indicate that ESP® control module stops traction control if brake pad temperature is over 320 °C (608 °F) and any one of wheels is in wheel spin condition.
TCSS OFF light (Other than M16A model)	TCSS OFF light lights up to indicate that ESP® control module stops traction control under any of the following conditions, • If TCSS switch is turned ON. • If brake pad temperature is over 320 °C (608 °F) and any one of wheels is in wheel spin condition.

CAN Communication System Description

S7N20A4601004

Refer to “CAN Communication System Description: M13A / M15A / M16A in Section 1A” or “CAN Communication System Description: D13A / Z13DTJ in Section 1A” for CAN communication system description. ESP® control module communicates control data with each control module as follows.

ESP® Control Module Transmission Data

				ECM	Combination meter	Steering angle sensor
ESP® control module	Transmit	DATA	Torque up request	○		
			Torque down request	○		
			Wheel speed signal (front right)	○		
			Wheel speed signal (front left)	○		
			Wheel speed signal (rear right)	○		
			Wheel speed signal (rear left)	○		
			ESP® system (other than ABS) active	○	○	
			ABS active	○		
			ESP® OFF or TCSS OFF indication ON	○	○	
			ESP® indication ON		○	
			ABS indication on		○	
			EBD indication on		○	
			Steering angle neutral position			○

I7N20A460021-01

ESP® Control Module Reception Data

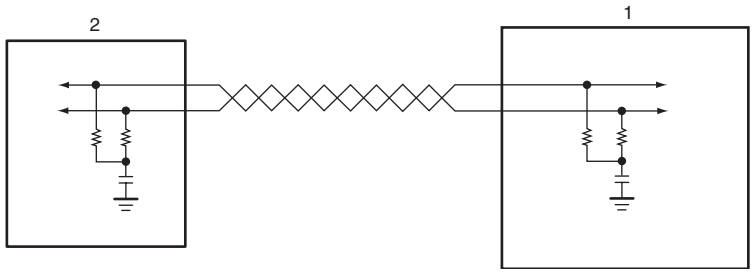
				ECM	BCM	Steering angle sensor
ESP® control module	Receive	DATA	Engine torque signal	○		
			Accelerator pedal position	○		
			Engine speed	○		
			Brake pedal switch signal	○		
			Brake fluid level switch signal		○	
			Parking brake switch signal		○	
			Steering angle signal			○
			Steering angle sensor related malfunction			○

I6RS0B460004-01

CAN Communication System For Electronic Stability Program Description

S7N20A4601005

There is CAN communication system only for ESP® control module (1) and yaw rate / G sensor assembly (2).
This CAN communication system is independent from other control modules.



I6JB01460006-01

ESP® communicates control data with yaw rate / G sensor assembly as follows.

ESP® Transmission Data to Yaw Rate / G Sensor Assembly

- Longitudinal G neutral position
- Lateral G neutral position

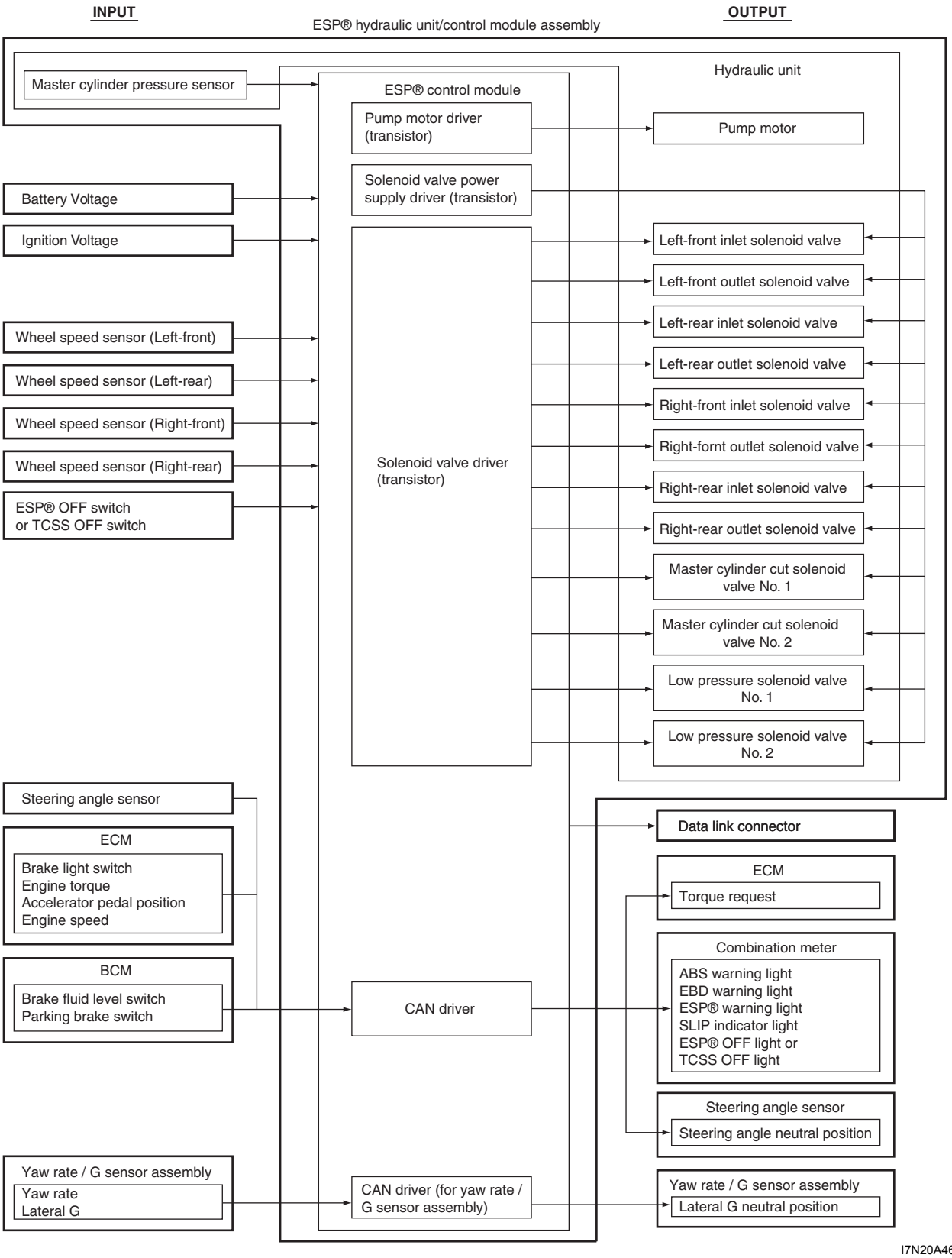
ESP® Reception Data from Yaw Rate / G Sensor Assembly

- Vehicle yaw rate signal
- Vehicle longitudinal G signal
- Vehicle lateral G signal
- Yaw rate / G sensor assembly related malfunction

Schematic and Routing Diagram

ESP® Block Diagram

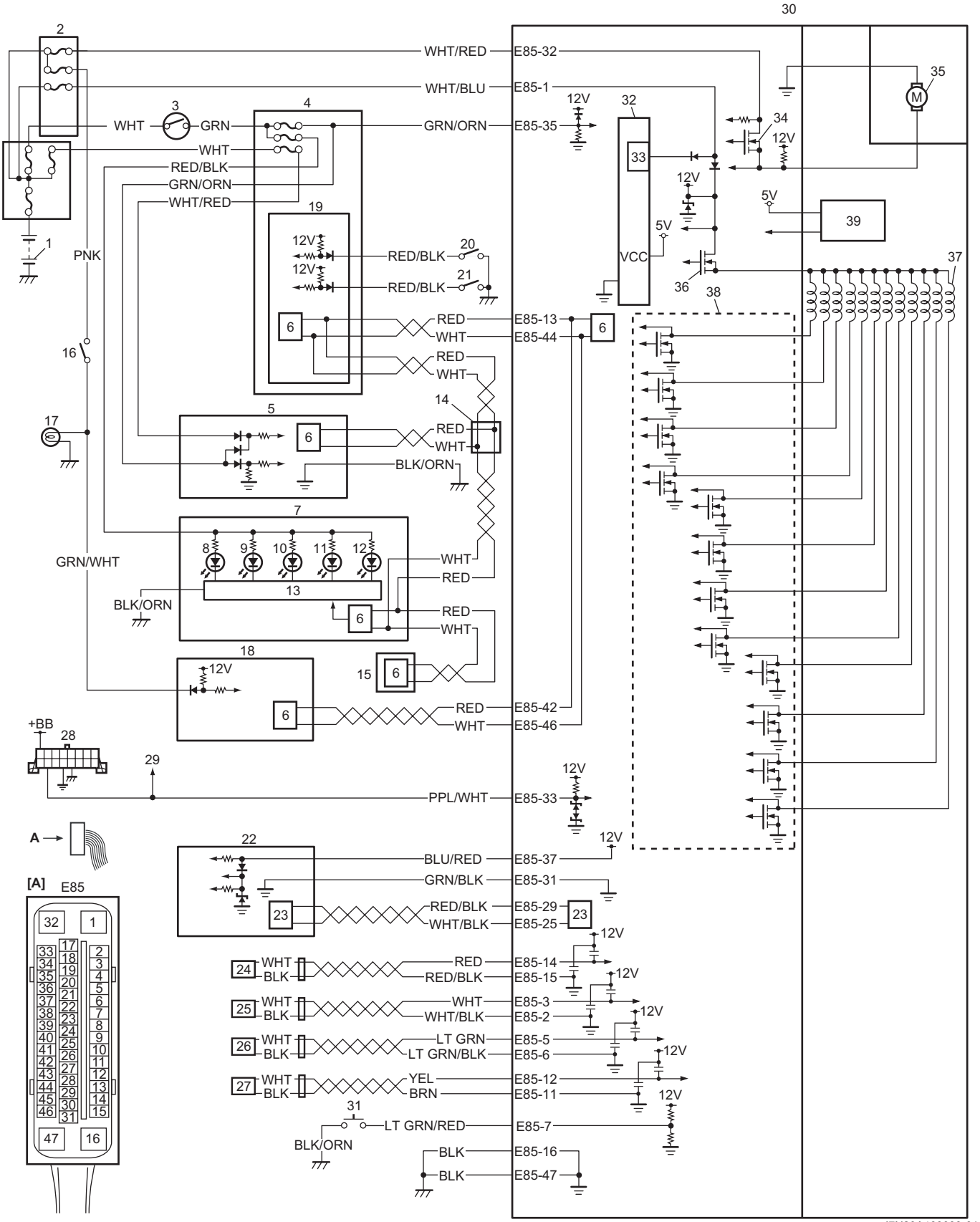
S7N20A4602001



I7N20A460002-03

ESP® Circuit Diagram

S7N20A4602002

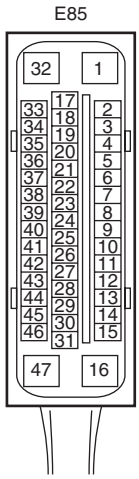


I7N20A460003-01

[A]: ESP® control module connector (View: A)	14. Junction connector	28. Data link connector
1. Battery	15. Keyless start control module	29. To SDM, ECM and P/S control module

2. Main fuse box	16. Brake light switch	30. ESP® hydraulic unit / control module assembly
3. Ignition switch	17. Brake light	31. ESP® OFF switch or TCSS OFF switch
4. Junction block assembly	18. ECM	32. Power control unit
5. Steering angle sensor	19. BCM (included in junction block assembly)	33. Internal memory
6. CAN driver	20. Brake fluid level switch	34. Pump motor driver (transistor)
7. Combination meter	21. Parking brake switch	35. Pump motor
8. SLIP indicator light	22. Yaw rate / G sensor assembly	36. Solenoid valve power supply driver (transistor)
9. ESP® (TCSS) OFF light	23. CAN driver (for yaw rate / G sensor assembly)	37. Solenoid valves
10. ESP® warning light	24. Left-front wheel speed sensor	38. Solenoid valve driver (transistor)
11. ABS warning light	25. Right-front wheel speed sensor	39. Master cylinder pressure sensor
12. EBD warning light (brake warning light)	26. Left-rear wheel speed sensor	
13. Light driver module	27. Right-rear wheel speed sensor	

Terminal Arrangement of ESP® Control Module Connector (Viewed from Terminal Side)



I6RS0B460007-01

Terminal	Circuit	Terminal	Circuit
E85-1	Solenoid valve power supply driver (transistor)	E85-25	CAN communication line (low) for yaw rate / G sensor assembly
E85-2	Right-front wheel speed sensor (–)	E85-26	—
E85-3	Right-front wheel speed sensor (+)	E85-27	—
E85-4	—	E85-28	—
E85-5	Left-rear wheel speed sensor (+)	E85-29	CAN communication line (high) for yaw rate / G sensor assembly
E85-6	Left-rear wheel speed sensor (–)	E85-30	—
E85-7	ESP® OFF switch input (M16A model) or TCSS OFF switch input (other than M16A model)	E85-31	Ground for yaw rate / G sensor assembly
E85-8	—	E85-32	Pump motor driver (transistor)
E85-9	—	E85-33	Data link connector
E85-10	Back up light Input (for M/T model)	E85-34	—
E85-11	Right-rear wheel speed sensor (–)	E85-35	Ignition switch
E85-12	Right-rear wheel speed sensor (+)	E85-36	—
E85-13	CAN communication line (high)	E85-37	Power source for yaw rate / G sensor assembly
E85-14	Left-front wheel speed sensor (+)	E85-38	—
E85-15	Left-front wheel speed sensor (–)	E85-39	—
E85-16	Ground	E85-40	—
E85-17	—	E85-41	—
E85-18	—	E85-42	CAN communication line (high) for ECM
E85-19	—	E85-43	—
E85-20	—	E85-44	CAN communication line (low)
E85-21	—	E85-45	—
E85-22	—	E85-46	CAN communication line (low) for ECM
E85-23	—	E85-47	Ground
E85-24	—		

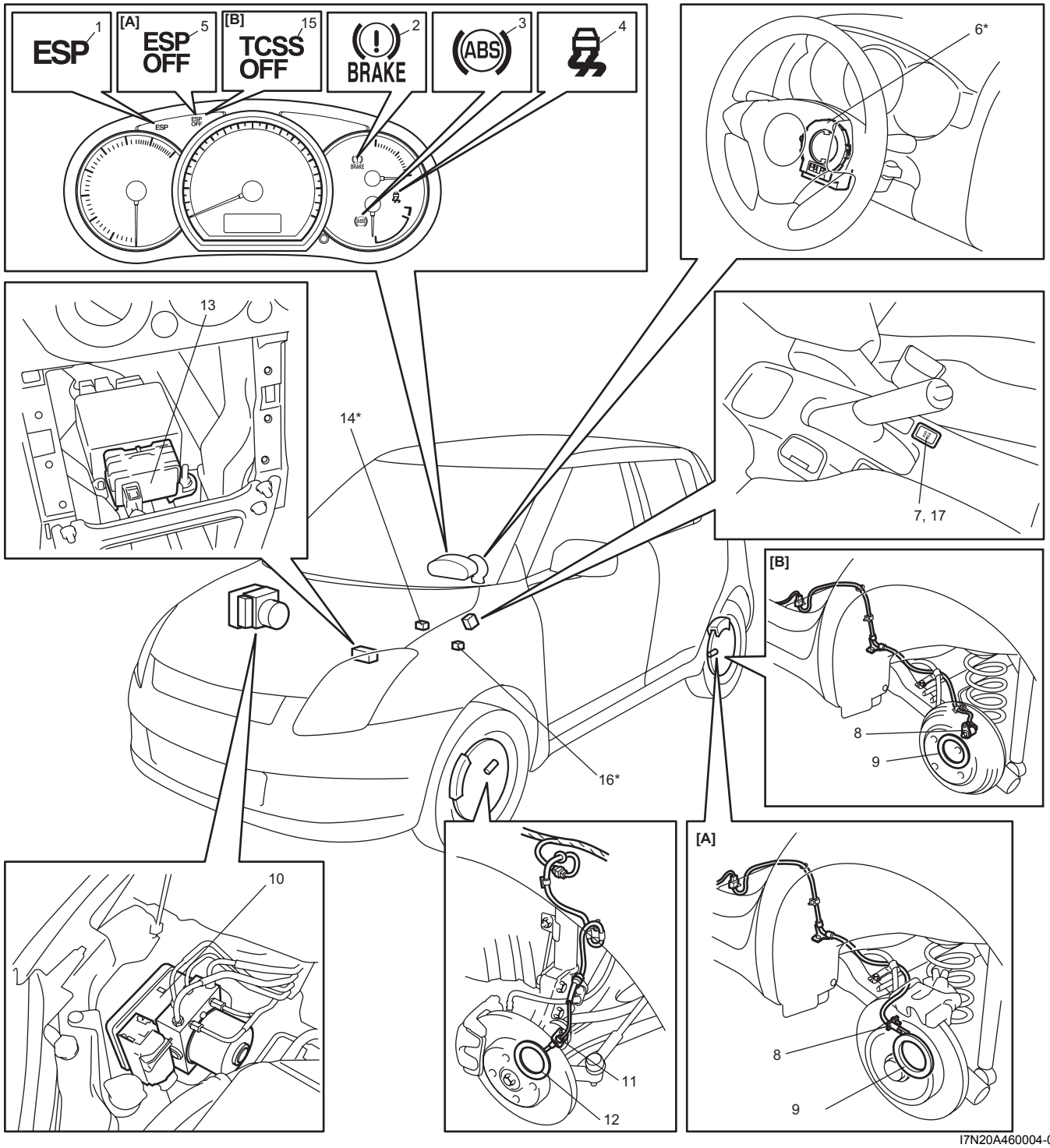
Component Location

ESP® Component Location

S7N20A4603001

NOTE

The figure shows LHD. For RHD, parts with (*) are installed at the opposite side.



I7N20A460004-02

[A]: M16A model	6. Steering angle sensor	13. Yaw rate / G sensor assembly
[B]: Other than M16A model	7. ESP® OFF switch (M16A model)	14. Data link connector
1. ESP® warning light	8. Rear wheel speed sensor	15. TCSS OFF light
2. EBD warning light (brake warning light)	9. Rear wheel encoder	16. Brake light switch
3. ABS warning light	10. ESP® hydraulic unit / control module assembly	17. TCSS OFF switch (Other than M16A model)
4. SLIP indicator light	11. Front wheel speed sensor	

5. ESP® OFF light	12. Front wheel encoder	

Diagnostic Information and Procedures

Electronic Stability Program Check

S7N20A4604001

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

Step	Action	Yes	No
1	☞ **Malfunction analysis** 1) Perform “Customer complaint analysis: ”. 2) Perform “Problem symptom confirmation: ”. 3) Perform “DTC check, record and clearance: ” and recheck DTC. *Is there any malfunction DTC?*	Go to Step 4.	Go to Step 2.
2	☞ **Driving test** 1) Perform “Step 2: Driving Test: ”. *Is trouble symptom identified?*	Go to Step 3.	Go to Step 6.
3	☞ **DTC check** 1) Perform “DTC Check”. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **ESP® check** 1) Inspect and repair referring to applicable DTC flow. *Does trouble recur?*	Go to Step 5.	Go to Step 7.
5	☞ **Brakes diagnosis** 1) Inspect and repair referring to “Brakes Symptom Diagnosis in Section 4A”. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
6	☞ **Intermittent problem check** 1) Check intermittent troubles referring to “Intermittent and Poor Connection Inspection in Section 00” and related circuit of trouble code recorded in Step 1. *Does trouble recur?*	Go to Step 4.	Go to Step 7.
7	☞ **Final confirmation test** 1) Perform “Step 7: Final Confirmation Test: ”. *Does trouble recur?*	Go to Step 3.	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 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	● ESP® warning light abnormal: fails to turn on / fails to turn off ● 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 is skidded 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 switch ON: ● When starting: at initial start only/at every start/Other_____ ● Vehicle speed: 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)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

I7N20A460005-01

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 lights related to brake system referring to "EBD Warning Light (Brake Warning Light) Check", "ABS Warning Light Check" and "ESP® Warning Light Check".

DTC check, record and clearance

Perform "DTC Check" procedure, record it and then clear it referring to "DTC Clearance".
Recheck DTC referring to "DTC Check".
When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to "Step 4: ESP® Check: " to proceed the diagnosis.
When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ESP® control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to "Step 2: Driving Test: " to proceed the diagnosis.

Step 2: Driving Test
Test the vehicle at 40 km/h for more than a minute including left and right turns and check if any trouble symptom (such as ESP® warning light and/or ABS warning light) exists.
If the malfunction DTC is confirmed at ignition switch ON, proceed to Step 3.
If the malfunction DTC is not confirmed at ignition switch ON, proceed to Step 6.

Step 3: DTC Check
Recheck DTC referring to “DTC Check”.

Step 4: ESP® Check
According to ESP® Check for the DTC confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

Step 5: Brakes Diagnosis
Check the parts or system suspected as a possible cause referring to “Brakes Symptom Diagnosis in Section 4A” and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 and 2 and repair or replace faulty parts, if any).

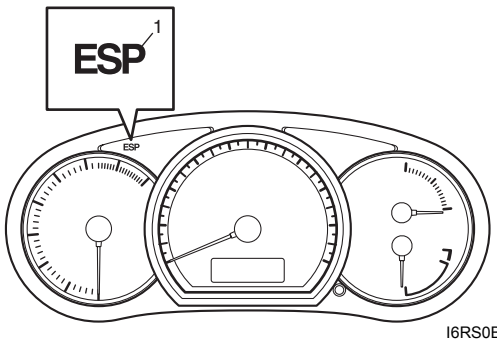
Step 6: Intermittent Problem Check
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection in Section 00” and related circuit of trouble code recorded in Step 1 to 3.

Step 7: Final Confirmation Test
Confirm that the problem symptom has gone and the ESP® is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once referring to “DTC Clearance” and perform test driving and confirm that no DTC is indicated.

ESP® Warning Light Check

S7N20A4604002

1) Turn ignition switch ON.
2) Check that ESP® warning light (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ESP® Warning Light Does Not Come ON at Ignition Switch ON” or “ESP® Warning Light Comes ON Steady”.

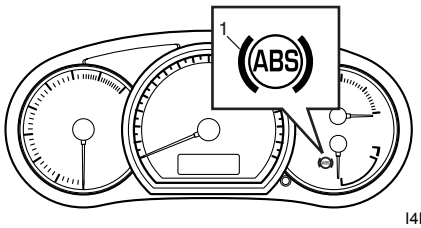


I6RS0B460009-01

ABS Warning Light Check

S7N20A4604003

1) Turn ignition switch ON.
2) Check that ABS warning light (1) comes ON for about 2 seconds and then goes off.
   If any faulty condition is found, advance to “ABS Warning Light Does Not Come ON at Ignition Switch ON” or “ABS Warning Light Comes ON Steady”.



I4RS0A450007-01

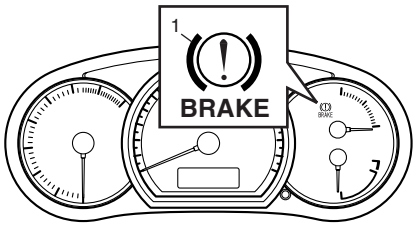
EBD Warning Light (Brake Warning Light) Check

S7N20A4604004

NOTE

Perform this check on a level place.

1) Turn ignition switch ON with parking brake applied.
2) Check that EBD warning light (brake warning light) (1) is turned ON.
3) Release parking brake with ignition switch ON and check that EBD warning light (brake warning light) goes off.
   If it doesn't go off, go to “EBD Warning Light (Brake Warning Light) Comes ON Steady”.



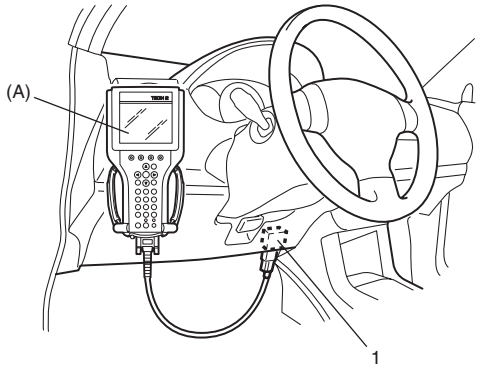
I4RS0A450008-01

DTC Check

S7N20A4604005

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (1).

Special tool
(A): SUZUKI scan tool



I4RS0B450003-01

3) Turn ignition switch to ON position.
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 SUZUKI scan tool can not communicate ESP® control module, perform “Serial Data Link Circuit Check”.

5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.

DTC Table

S7N20A4604006

⚠ CAUTION

Be sure to perform “Electronic Stability Program Check” before starting diagnosis.

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning light	EBD warning light	ESP® warning light
☞ C1016	Brake light switch failure	Vehicle behavior and brake light switch signal is disagreed for specified time.	—	—	—
☞ C1017	Lateral G sensor in yaw rate / G sensor assembly failure	• Lateral G sensor signal is out of specified range. • Vehicle behavior and lateral G sensor signal is disagreed.	—	—	○
☞ C1018	Brake fluid level switch failure	• Brake fluid level is too low. • Input signal of brake fluid level switch to BCM is low level.	—	—	○
☞ C1020	Master cylinder pressure sensor power supply failure	Power supply voltage to master cylinder pressure sensor in ESP® hydraulic unit / control module assembly is out of specification.	—	—	○
☞C1021	Right-front wheel speed sensor circuit failure	Wheel sensor signal is out of specified range.	○	*1	○

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning light	EBD warning light	ESP® warning light
☞ C1022	Right-front wheel speed sensor circuit or encoder failure	Abnormal wheel speed sensor signal is detected.	○	*1	○
☞ C1023	Yaw rate sensor in yaw rate/ G sensor assembly failure	• Yaw rate sensor signal is out of range. • Vehicle behavior and yaw rate signal is disagreed.	—	—	○
☞ C1024	Steering angle sensor circuit failure	• Steering angle sensor internal defect is detected by CPU in steering angle sensor. • Steering angle sensor signal is out of specified range.	—	—	○
☞ C1025	Left-front wheel speed sensor circuit failure	Wheel sensor signal is out of specified range.	○	*1	○
☞ C1026	Left-front wheel speed sensor or sensor ring failure	Abnormal wheel speed sensor signal is detected.	○	*1	○
☞ C1027	ESP® / TCSS OFF switch circuit failure	• ESP® OFF switch or TCSS switch keeps ON for specified time. • ESP® OFF switch or TCSS switch circuit is shorted to ground.	—	—	—
☞ C1028	Master cylinder pressure sensor circuit failure	Input signal voltage from master cylinder pressure sensor in ESP® control module is too high or low.	—	—	○
☞ C1031	Right-rear wheel speed sensor circuit failure	Wheel sensor signal is out of specified range.	○	*1	○
☞ C1032	Right-rear wheel speed sensor or sensor ring failure	Abnormal wheel speed sensor signal is detected.	○	*1	○
☞ C1034	Yaw rate / G sensor assembly power supply failure	Power supply voltage of yaw rate / G sensor assembly is too high when ignition switch OFF. Power supply voltage of yaw rate / G sensor assembly is too low when ignition switch ON.	—	—	○
☞ C1035	Left-rear wheel speed sensor circuit failure	Wheel sensor signal is out of specified range.	○	*1	○
☞ C1036	Left-rear wheel speed sensor or sensor ring failure	Abnormal wheel speed sensor signal is detected.	○	*1	○
☞ C1037	Steering angle sensor power supply failure	Power supply voltage to steering angle sensor is too low.	—	—	○
☞ C1038	Steering angle sensor detect rolling counter failure from ESP® control module	ESP® control module rolling counter failure is detected by steering angle sensor.	—	—	○
☞ C1039	Yaw rate / G sensor assembly internal failure	Yaw rate / G sensor assembly internal failure is detected.	—	—	○
☞ C1040	Stability control function failure	Stability control is active for more than specified time without yaw rate change.	—	—	○

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning light	EBD warning light	ESP® warning light
☞ C1041	Right-front inlet solenoid valve circuit failure	• Solenoid valve circuit is opened, shorted to power, ground and/or each valve in ESP® hydraulic unit / control module assembly. • Mismatching solenoid output and solenoid monitor is detected.	○	○	○
☞ C1042	Right-front outlet solenoid valve circuit failure				
☞ C1043	Master cylinder cut solenoid valve circuit No.1 failure				
☞ C1044	Master cylinder cut solenoid valve circuit No.2 failure				
☞ C1045	Left-front inlet solenoid valve circuit failure				
☞ C1046	Left-front outlet solenoid valve circuit failure				
☞ C1051	Right-rear inlet solenoid valve circuit failure				
☞ C1052	Right-rear outlet solenoid valve circuit failure				
☞ C1053	Low pressure solenoid valve circuit No.1 failure				
☞ C1054	Low pressure solenoid valve circuit No.2 failure				
☞ C1055	Left-rear inlet solenoid valve circuit failure				
☞ C1056	Left-rear outlet solenoid valve circuit failure				
☞ C1057 *2	ESP® control module power supply circuit failure *2	ESP® control module power supply voltage is too high.	○	○	○
		ESP® control module power supply voltage is too low.	○	*4	○
☞ C1061	Pump motor and/or motor circuit failure	• Defective pump motor and/or motor power supply voltage is too low. • Pump motor circuit in ESP® control module is opened, shorted to power or ground circuit.	○	—	○
☞ C1063	Solenoid valve power supply driver circuit failure	• Solenoid valve power supply driver circuit is opened, shorted to power and ground circuit in ESP® control module. • Solenoid valve power supply voltage is too low. • Solenoid valve power supply driver is stuck to ON or OFF position. • Output circuit from control unit is opened or shorted in ESP® control module. • Mismatching solenoid output and solenoid monitor is detected.	○	○	○
☞ C1071	ESP® control module internal defect	ESP® control module internal defect is detected.	○	—	○
☞ C1073	Lost communication with yaw rate / G sensor assembly	CAN line communication error in ESP® control module and yaw rate / G sensor assembly is detected.	—	—	○

DTC (displayed on SUZUKI scan tool)	Diagnostic Items	Detecting condition (DTC will be set when detecting)	ABS warning light	EBD warning light	ESP® warning light
☞ C1075	Steering angle sensor calibration incomplete *3	Missing steering angle sensor calibration point data is detected.	—	—	○
☞ C1076	Master cylinder pressure sensor calibration incomplete	Master cylinder pressure sensor calibration is incompleted.	—	—	○
☞ C1078	Lateral G sensor in yaw rate/ G sensor assembly calibration incomplete	Lateral G sensor in yaw rate / G sensor assembly calibration is incompleted.	—	—	○
☞ C1090	ECM detect rolling counter failure from ESP® control module	ESP® control module rolling counter failure is detected by ECM.	—	—	○
☞ C1091	ECM data in CAN line failure	ECM sent invalid signal to ESP® control module.	—	—	○
☞ C1092	TCN data in CAN line failure	TCM sent invalid signal to ESP® control module.	—	—	○
☞ C1094	Torque request reject status	Reception error of torque control signal with ECM	—	—	○
☞ U1073	Control module communication bus off	Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	—	—	○
☞ U1100	Lost communication with ECM (reception error)	ECM message data is missing from CAN communication.	—	—	○
☞ U1101	Lost communication with TCM (reception error)	TCM message data is missing from CAN communication.	—	—	○
☞ U1126	Lost communication with steering angle sensor module (reception error)	Steering angle sensor message data is missing from CAN communication.	—	—	○
☞ U1140	Lost communication with BCM (reception error)	BCM message data is missing from CAN communication.	—	—	○

NOTE

- **"○" in ABS warning light, EBD warning light and ESP® warning light column of the above table means warning light is lit when DTC is detected.**
- ***1: If two or more wheel speed sensor are defective, ABS warning light, EBD warning light and ESP® warning light are lit and all the control functions are deactivated. If one wheel speed sensor is defective, ABS warning light and ESP® warning light are lit and ABS and traction control / stability control are deactivated.**
- ***2: SLIP indicator light and ESP® OFF light turn ON when power supply circuit voltage is low.**
- ***3: SLIP indicator light flashes continuously at Intervals of 1 Hz.**
- ***4: EBD warning light is lit when power supply circuit voltage is too low.**

DTC Clearance

S7N20A4604007

⚠ WARNING

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure or using SUZUKI scan tool.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch to ON position.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further derails.

NOTE

For DTC C 1021, C1022, C1025, C1026, C1031, C1032, C1035, C1036 and C1061, confirm that ABS warning light turns off after performing Step 2 of "Test Driving" under "Electronic Stability Program Check", and then clear the DTCs.

4) Perform "Driving Test" (Step 2 of "Electronic Stability Program Check") and "DTC Check" and confirm that NO DTC is displayed on scan tool.
5) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector.

Scan Tool Data

S7N20A4604009

The parameter data below are values measured with the scan tool when the normally operating vehicle is under the following conditions. When taking measurements for comparison by using the scan tool, be sure to check that the vehicle is under the following conditions.

- Apply parking brake and block wheels.
- Ignition switch ON.
- Turn OFF air conditioning (if equipped).
- Set the wheel in straight-ahead position and hands off steering wheel.
- Turn OFF all electric loads (except ignition).
- Check that there is no DTC.

Scan Tool Data	Standards	Condition
Battery Voltage	10.0 – 16.0 V	—
Pump Motor Driver	0.0 V	—
RF Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
LF Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
RR Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
LR Wheel Speed	0 km/h, 0.0 MPH	Vehicle is in stationary condition.
Brake Switch	ON	Brake pedal is depressed
	OFF	Brake pedal is released
Master Cyl Press	0 ± 0.8 MPa	Brake pedal is released
G Sensor (lateral)	0 ± 0.1 G	Vehicle is on the level
Yaw rate sensor	0 ± 4 deg/s	Vehicle is on the level
Steering angle Sen	0 ± 3°	Front wheels are in straight-ahead position
Stability control	INACTIVE	Stability control is not working
Traction (brake)	INACTIVE	Brake function by traction control is not working
Traction (Eng)	INACTIVE	Torque control by traction control is not working
ESP® / TCSS OFF Sw state	ON	ESP® / TCSS OFF light in combination meter turn OFF.
	OFF	ESP® / TCSS OFF light in combination meter turn ON.

Scan Tool Data	Standards	Condition
Steering angle sig	Neutral	Front wheels are in straight-ahead position

Scan Tool Data Definition

Battery Volt (V): Battery Voltage is an analog input signal read by the ESP® control module. Certain ESP® control module functions will be modified if the battery voltage falls below or rises above programmed thresholds.

Pump Motor Driver (V): This parameter indicates the operational condition of the pump motor driver (transistor).

RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LR Wheel Speed (km/h, MPH): Wheel speed is ESP® control module internal parameter. It is computed by reference pulses from the wheel speed sensor.

Brake Switch (ON, OFF): This switch signal informs the ESP® control module whether the brake is active or not.

Master Cyl Press (MPa): Brake fluid pressure from brake master cylinder.

G Sensor (lateral) (G): Lateral acceleration is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal.

Yaw rate sensor (Deg/s): Yaw rate sensor is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal.

Steering angle Sen (°): Steering wheel rotation angle is measured by steering angle sensor and output to ESP® control module by pulse signal.

Stability control (ACTIVE, INACTIVE): This indicates stability control in activation / deactivation.

Traction (brake) (ACTIVE, INACTIVE): This indicates brake function of traction control in activation / deactivation.

Traction (eng) (ACTIVE, INACTIVE): This indicates torque control of traction control in activation / deactivation.

ESP® / TCSS OFF Sw State (ON, OFF): State of ESP® / TCSS OFF switch.

Steering angle Sig (Neutral, NONnewtral): This indicates steering wheel angle measured by steering angle sensor is in straight-ahead or not.

Visual Inspection

S7N20A4604042

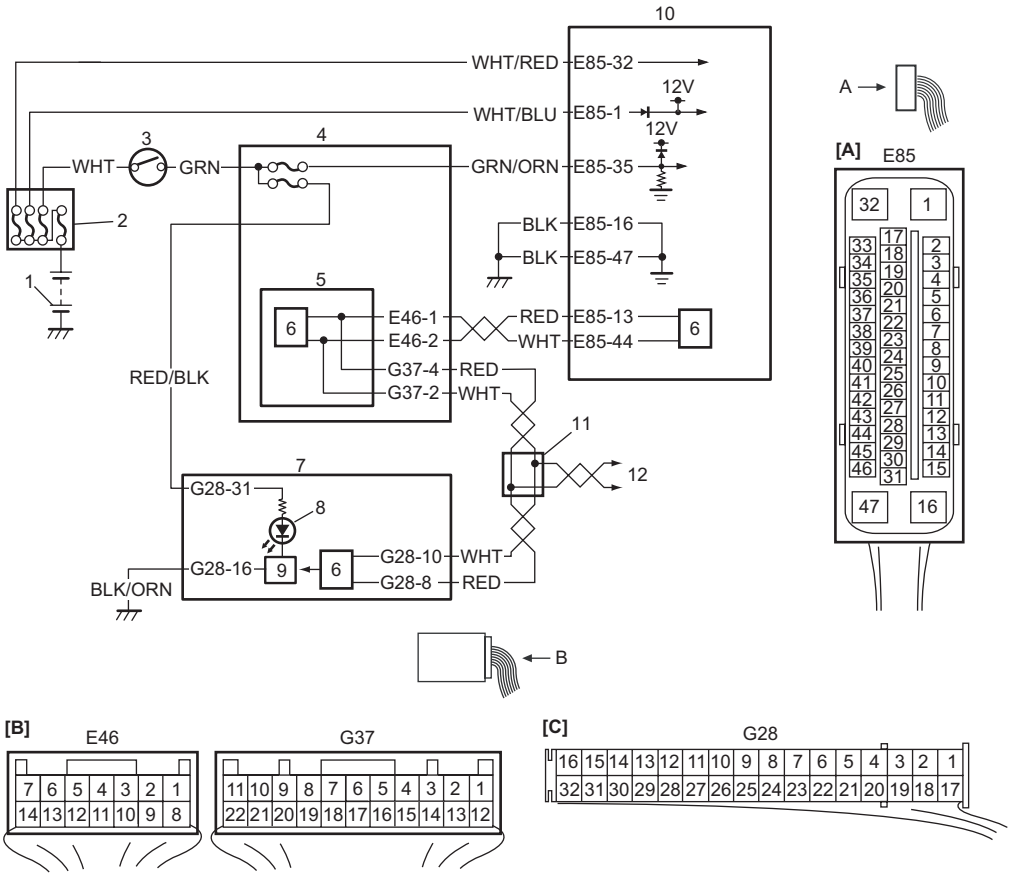
Check the following parts and systems visually.

Inspection Item		Referring section
Battery	Level, leakage	“Battery Description: M13A / M15A / M16A in Section 1J” or “Battery Description: D13A / Z13DTJ in Section 1J”
Connectors of electric wire harness	Disconnection, friction	“Intermittent and Poor Connection Inspection in Section 00”
Fuses	Burning	
Brake fluid	Level, leakage	“Master Cylinder and Brake Fluid Level Inspection in Section 4A”
ABS warning light	Operation	“ABS Warning Light Check” or “EBD Warning Light (Brake Warning Light) Check”
EBD warning light	Operation	
Other parts that can be checked visually		

ESP® Warning Light Does Not Come ON at Ignition Switch ON

S7N20A4604010

Wiring Diagram



I7N20A460006-01

[A]: ESP® control module connector (View: A)	3. Ignition switch	8. ESP® warning light
[B]: BCM connector (View: B)	4. Junction block assembly	9. Light driver module
[C]: Combination meter connector (View: B)	5. BCM (included in junction block assembly)	10. ESP® hydraulic unit / control module assembly
1. Battery	6. CAN driver	11. Junction connector
2. Main fuse box	7. Combination meter	12. To steering angle sensor

Circuit Description

Operation (ON/OFF) of ESP® warning light is controlled by ESP® control module through light driver module in combination meter.

If ESP® system is in good condition, ESP® control module turns ESP® warning light ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ESP® warning light is turned ON continuously by ESP® control module. Also, it is turned ON continuously by light driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Step	Action	Yes	No
1	**Check warning light** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Substitute a known-good combination meter and recheck. If ESP® warning light remains OFF, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Go to Step 2.

Step	Action	Yes	No
2	**Check fuse** *Is Circuit fuse for combination meter in good condition?*	Go to Step 3.	Replace fuse and check for short circuit to ground.
3	**Check combination meter power supply circuit** 1) Remove combination meter with ignition switch turned OFF. 2) Check for proper connection to combination meter connector terminal at “G28-31” and “G28-16”. 3) If OK, turn ON ignition switch and measure voltage between connector terminal “G28-31” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	Repair power supply circuit for combination meter.
4	**Check combination meter ground circuit** 1) Measure resistance between connector terminal “G28-16” and vehicle body ground. *Is resistance less than 2 Ω?*	Replace combination meter.	“BLK/ORN” circuit open or high resistance.

ESP® Warning Light Comes ON Steady

S7N20A4604011

Wiring Diagram

Refer to “Wiring Diagram” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

Circuit Description

Refer to “Circuit Description” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

Troubleshooting

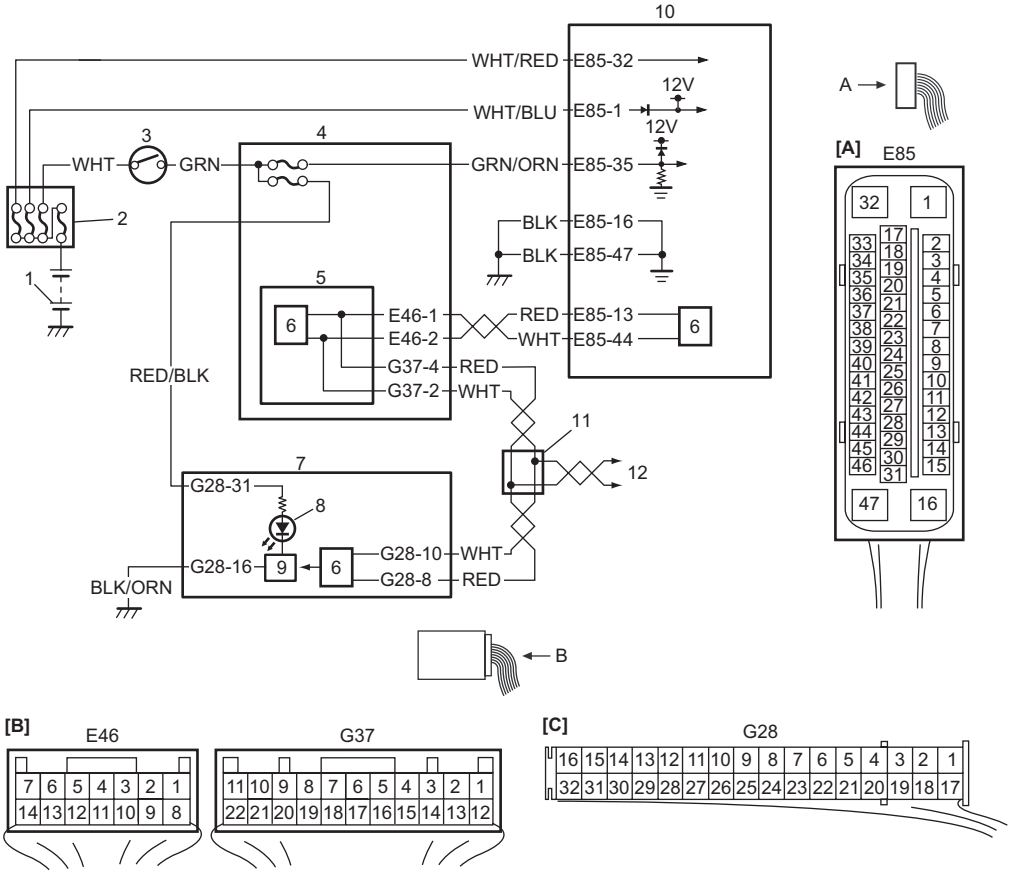
Step	Action	Yes	No
1	**DTC Check for ESP®** 1) Perform diagnostic trouble code check. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**Check fuse** *Are main fuses for good condition?*	Go to Step 3.	Replace fuse and check circuit for short to ground.
3	**Check ESP® control module power supply circuit** 1) Turn ignition switch to OFF. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminals “E85-35”, “E85-16” and “E85-47”. 4) If OK then turn ignition switch to ON position and measure voltage between terminal “E85-35” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“GRN/ORN” circuit open.
4	**Check ESP® control module power supply circuit** 1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals “E85-1” and “E85-32”. 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of “E85-1”, “E85-32” and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	“WHT/BLU” and/or “WHT/RED” circuit open.

Step	Action	Yes	No
5	**Check ESP® control module ground circuit** 1) Turn ignition switch to OFF and measure resistance between each terminal of “E85-16”, “E85-47” and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ESP® control module open or high resistance.
6	**CAN communication circuit check** 1) Check CAN communication circuit between combination meter and ESP® control module referring to “DTC U1073: Control Module Communication Bus Off”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If warning light remains ON, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace.

ABS Warning Light Does Not Come ON at Ignition Switch ON

S7N20A4604012

Wiring Diagram



I7N20A460006-01

[A]: ESP® control module connector (View: A)	3. Ignition switch	8. ABS warning light
[B]: BCM connector (View: B)	4. Junction block assembly	9. Light driver module
[C]: Combination meter connector (View: B)	5. BCM (included in junction block assembly)	10. ESP® hydraulic unit / control module assembly
1. Battery	6. CAN driver	11. Junction connector
2. Main fuse box	7. Combination meter	12. To steering angle sensor

Circuit Description

Operation (ON/OFF) of ABS warning light is controlled by ESP® control module through light driver module in combination meter.

If antilock brake system is in good condition, ESP® control module turns ABS warning light ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF. If an abnormality in the system is detected, ABS warning light is turned ON continuously by ESP® control module. Also, it is turned ON continuously by light driver module when the connector of ESP® control module is disconnected.

Troubleshooting
Refer to “Troubleshooting” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

ABS Warning Light Comes ON Steady

S7N20A4604013

Wiring Diagram
Refer to “Wiring Diagram” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

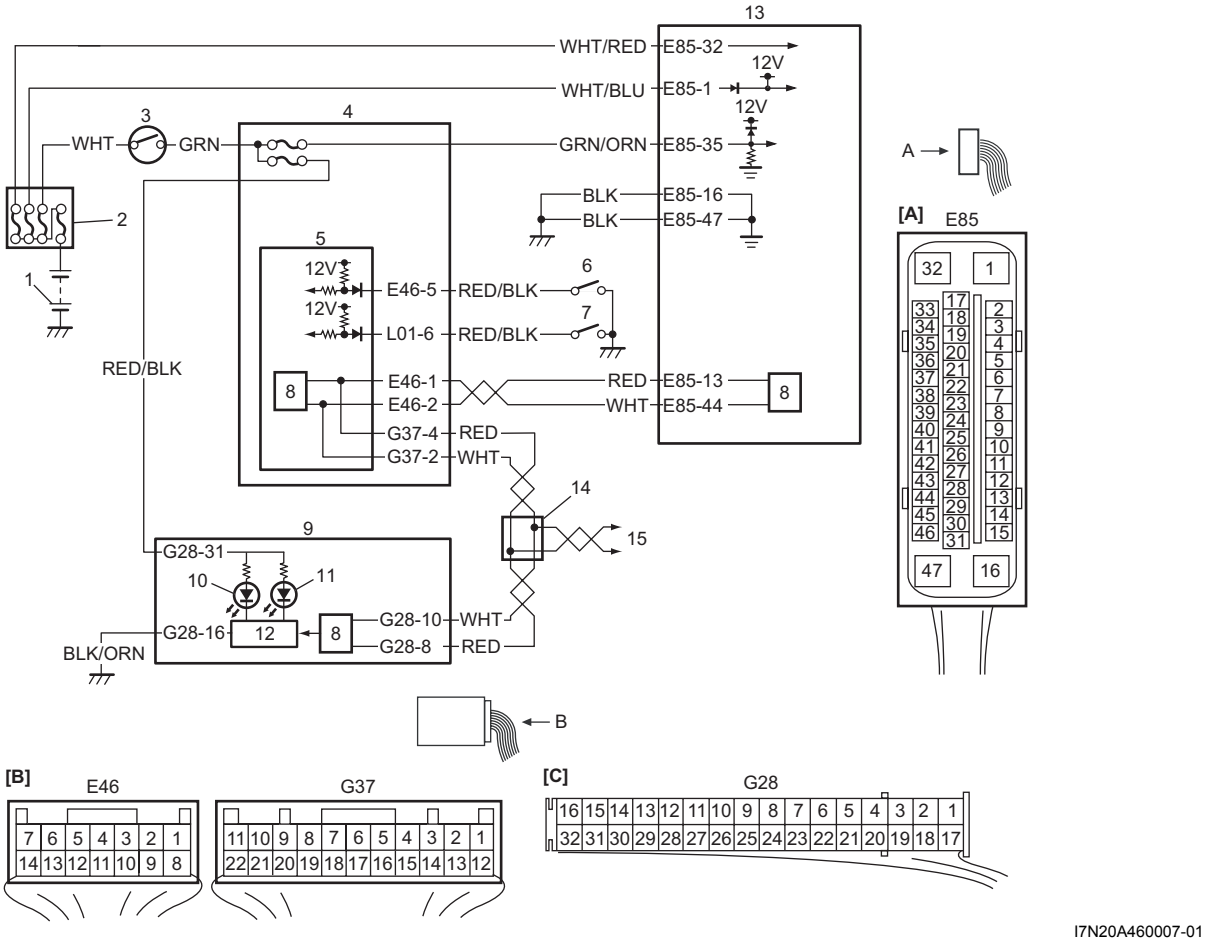
Circuit Description
Refer to “Circuit Description” under “ABS Warning Light Does Not Come ON at Ignition Switch ON”.

Troubleshooting
Refer to “Troubleshooting” under “ESP® Warning Light Comes ON Steady”.

EBD Warning Light (Brake Warning Light) Comes ON Steady

S7N20A4604014

Wiring Diagram



I7N20A460007-01

[A]: ESP® control module connector (View: A)	4. Junction block assembly	10. EBD warning light (brake warning light)
[B]: BCM connector (View: B)	5. BCM (included in junction block assembly)	11. ABS warning light
[C]: Combination meter connector (View: B)	6. Brake fluid level switch	12. Light driver module
1. Battery	7. Parking brake switch	13. ESP® hydraulic unit / control module assembly
2. Main fuse box	8. CAN driver	14. Junction connector
3. Ignition switch	9. Combination meter	15. To steering angle sensor

Circuit Description
EBD warning light (brake warning light) is controlled by ESP® control module and BCM through light driver module in combination meter.
If EBD system is in good condition, ESP® control module turns EBD warning light ON at the ignition switch ON, keeps it ON for 2 seconds and then turns it OFF.
EBD warning light is turned ON continuously at the following conditions.

- EBD system is an abnormality
- Connector of ESP® control module is disconnected
- Parking brake switch is ON
- 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.

Troubleshooting

Step	Action	Yes	No
1	**Check parking brake and brake fluid level** 1) Make sure that: • Parking brake is completely released. • Brake fluid level is upper than the minimum level. *Are the check results OK?*	Go to Step 2.	Release parking brake completely and/or replenish brake fluid.
2	**Check ABS warning light** 1) Turn ignition switch to ON position. *Does ABS warning light come on steady?*	Perform “ABS Warning Light Comes ON Steady”.	Go to Step 3.
3	**Check parking brake switch circuit and brake fluid level switch circuit** 1) Release parking brake completely, and replenish brake fluid. 2) Disconnect BCM connectors with ignition switch turned OFF. 3) Measure resistance between each terminal of “L01-6”, “E46-5” and vehicle body ground. *Are resistance $\infty \Omega$?*	Go to Step 4.	Check each applicable circuit for short to vehicle body ground. If OK, then check parking brake switch and/or brake fluid level switch.
4	**CAN communication circuit check** 1) CAN communication circuit between combination meter, ABS (ESP®) control module and BCM referring to “DTC U1073: Control Module Communication Bus Off”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If EBD warning light remains ON, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace.

EBD Warning Light Does Not Come ON at Ignition Switch ON

S7N20A4604043

Wiring diagram
Refer to “Wiring Diagram” under “EBD Warning Light (Brake Warning Light) Comes ON Steady”.

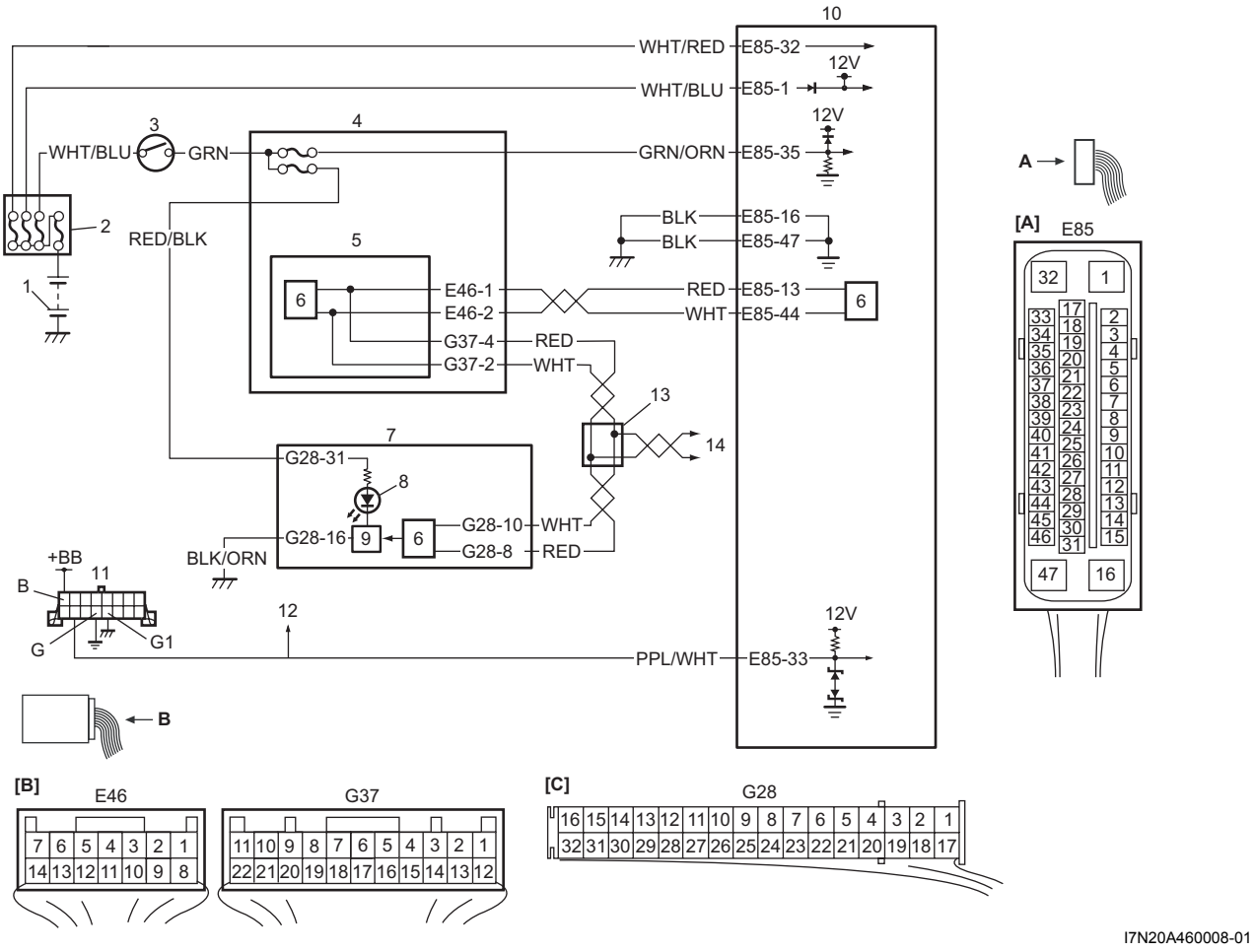
Circuit Description
Refer to “Circuit Description” under “EBD Warning Light (Brake Warning Light) Comes ON Steady”.

Troubleshooting
Refer to “Circuit Description” under “ESP® Warning Light Does Not Come ON at Ignition Switch ON”.

Serial Data Link Circuit Check

S7N20A4604015

Wiring Diagram

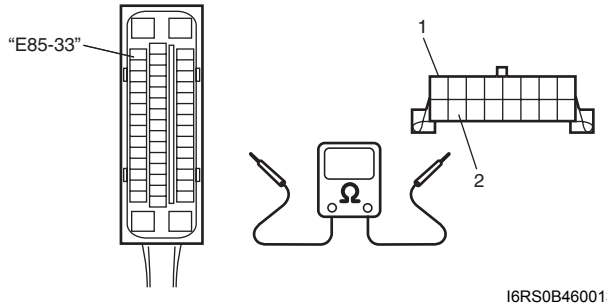


I7N20A460008-01

[A]: ESP® control module connector (View: A)	4. Junction block assembly	10. ESP® hydraulic unit / control module assembly
[B]: BCM connector (View: B)	5. BCM (included in junction block assembly)	11. Data link connector (DLC)
[C]: Combination meter connector (View: B)	6. CAN driver	12. To SDM, ECM and P/S control module
1. Battery	7. Combination meter	13. Junction connector
2. Main fuse box	8. ESP® warning light	14. To steering angle sensor
3. Ignition switch	9. Light driver module	

Inspection

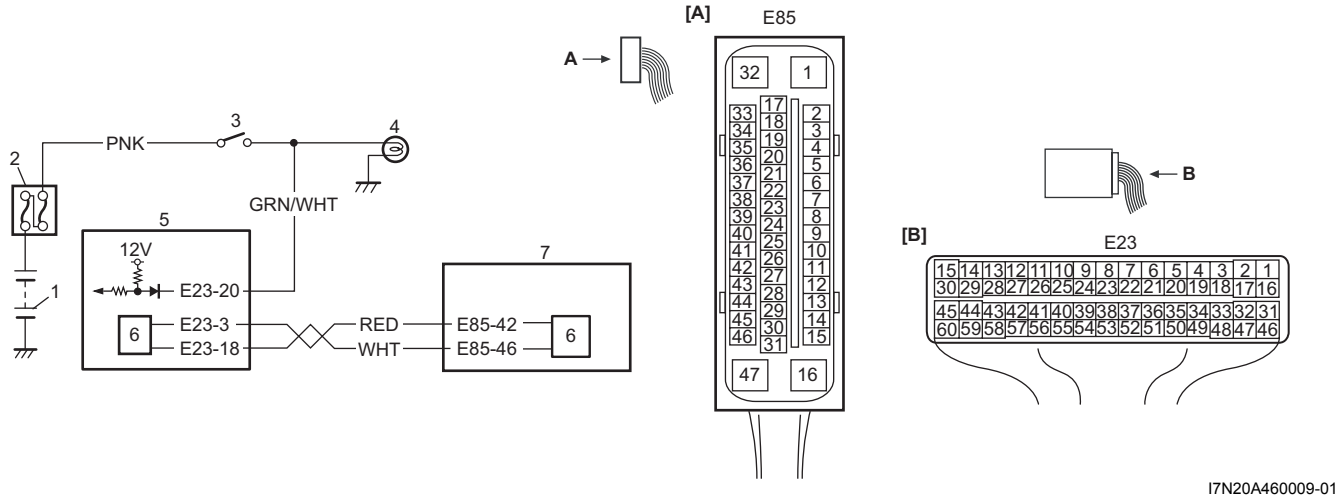
Step	Action	Yes	No
1	**Check ESP® warning light** 1) Turn ignition switch to ON position. *Does ESP® warning light come ON?*	Go to Step 2.	Go to Step 6.
2	**Check fuse** 1) Turn ignition switch to OFF position. *Are main fuses for good condition?*	Go to Step 3.	Replace fuse and check for short.
3	**Check ESP® control module power supply circuit** 1) Disconnect ESP® control module connector. 2) Check for proper connection to ESP® control module connector at terminal "E85-35". 3) If OK then turn ignition switch to ON position and measure voltage between terminal "E85-35" and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	"GRN/ORN" wire circuit open.
4	**Check ESP® control module power supply circuit** 1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals "E85-1" and "E85-32". 3) If OK then turn ignition switch to ON position and measure voltage between each terminal of "E85-1", "E85-32" and vehicle body ground. *Are they 10 – 14 V?*	Go to Step 5.	"WHT/BLU" and/or "WHT/RED" wire circuit open.
5	**Check ESP® control module ground circuit** 1) Turn ignition switch to OFF position. 2) Check for proper connection to ESP® control module connector at terminals "E85-16" and "E85-47". 3) If OK, measure resistance between each terminal of "E85-16", "E85-47" and vehicle body ground. *Are resistance less than 2 Ω?*	Go to Step 6.	Ground circuit for ESP® control module open or high resistance.
6	**Check serial data circuit** 1) Check if communication is possible by trying communication with other controller (ECM, BCM, P/S control module or SDM). *Is it possible to communicate with other controller?*	Go to Step 7.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
7	**Check DLC power supply circuit** 1) Turn ignition switch to ON position. 2) Measure voltage between terminal B of data link connector and vehicle body ground. *Is voltage 10 – 12 V?*	Go to step 8.	Terminal B circuit open or shorted to ground.

Step	Action	Yes	No
8	**Check DLC ground circuit** 1) Turn ignition switch to OFF position. 2) Measure resistance between the following terminals; • Terminal G of data link connector and vehicle body ground. • Terminal G1 of data link connector and vehicle body ground. *Is each resistance 1 Ω or less?*	Go to step 9.	Terminal G and/or G1 circuit open or high resistance.
9	**Check serial data circuit** 1) Turn ignition switch to OFF position. 2) Check proper connection at “E85-33” (“PPL/WHT” wire) terminal for serial data circuit. 3) If OK, then check resistance between “E85-33” (“PPL/WHT” wire) terminal and “PPL/WHT” wire terminal (2) for serial data circuit in DLC (1). *Is resistance 1 Ω or less?*  I6RS0B460013-01	Substitute a known-good ESP® hydraulic unit / control module and recheck.	Check high resistance or open in “PPL/WHT” wire circuit for ESP® system. If circuit is OK, substitute a known-good BCM and recheck.

DTC C1016: Brake Light Switch Circuit Failure

S7N20A4604016

Wiring Diagram



I7N20A460009-01

[A]: ESP® control module connector (View: A)	2. Main fuse box	5. ECM
[B]: ECM connector (View: B)	3. Brake light switch	6. CAN driver
1. Battery	4. Brake light	7. ESP® hydraulic unit control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Vehicle behavior and brake light switch signal is disagreed for specified time.	• Brake light switch circuit • Brake light switch • ECM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is DTC U1073 and/or U1100 detected?*	Go to applicable diag. flow.	Go to Step 3.
3	**Check brake light switch circuit** 1) Check brake light switch and their circuit referring to "Stop (Brake) Lamp Symptom Diagnosis in Section 9B". *Are they in good condition?*	Go to Step 4.	Repair or replace.
4	**Check ECM circuit for brake light switch** 1) Disconnect connectors from ECM. 2) Check for proper connection to "E23-20" wire of ECM connector. 3) If connections are OK, check brake light switch circuit for the following. • Resistance of "GRN/WHT" wire terminal of brake light switch between brake light switch connector and ECM connector is less than 1 Ω (continuity check) • Resistance between "GRN/WHT" wire terminal of brake light switch connector and vehicle body ground is infinity (ground short check) • Voltage of between "GRN/WHT" wire terminal of brake light switch connector and vehicle body ground is 0 V with ignition switch tuned ON (power short check) *Are they in good condition?*	Substitute a known-good ECM and recheck. If DTC C1016 is still detected, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Repair or replace defective wire.

DTC C1017 / C1023: Lateral G Sensor / Yaw Rate Sensor in Yaw Rate / G Sensor Assembly Failure

S7N20A4604017

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1017: Lateral G sensor signal is out of specified range. **C1023:** • Yaw rate sensor signal is out of range. • Vehicle behavior and yaw rate signal is disagreed.	• Yaw rate / G sensor assembly • ESP® control module

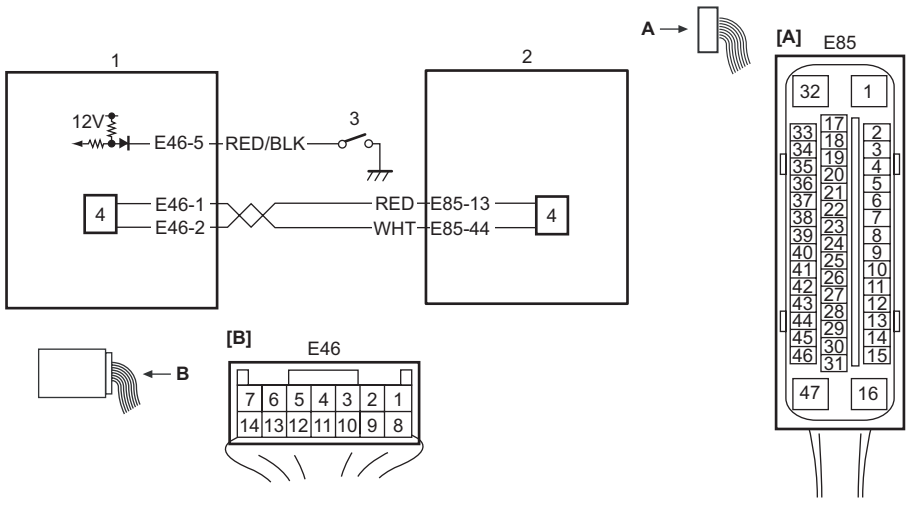
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Are DTC C1034 and/or C1073 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate yaw rate / G sensor assembly referring to "Sensor Calibration". 2) Clear all DTCs and check DTC for ESP®. *Are DTC C1017 and/or C1023 still detected?*	Go to Step 4.	Yaw rate / G sensor assembly calibration is incompleted.
4	**Check yaw rate / G sensor assembly** 1) Check yaw rate / G sensor assembly referring to "Yaw Rate / G Sensor Assembly On-Vehicle Inspection". *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good yaw rate / G sensor assembly and recheck.

DTC C1018: Brake Fluid Level Switch Failure

S7N20A4604018

Wiring Diagram



I7N20A460010-01

[A]: ESP® control module connector (View: A)	1. BCM	3. Brake fluid level switch
[B]: BCM connector (View: B)	2. ESP® hydraulic unit control module assembly	4. CAN driver

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Brake fluid level is too low. • Input signal of brake fluid level switch to BCM is low level.	• Brake fluid level • Brake fluid level switch circuit • Brake fluid level switch • BCM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check brake fluid level** 1) Check brake fluid level in reservoir. *Is brake fluid level upper than the minimum level?*	Go to Step 3.	Replenish brake fluid to reservoir.
3	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is DTC U1073 and/or U1140 detected?*	Go to applicable diag. flow.	Go to Step 3.
4	**Check brake fluid level switch** 1) Turn ignition switch to OFF position. 2) Disconnect brake fluid level switch connector. 3) Check for proper connection at each terminal of brake fluid level switch connector. 4) If OK, then check brake fluid level switch referring to "Brake Fluid Level Switch Inspection in Section 9C". *Is check result OK?*	Go to Step 5.	Replace brake fluid level switch.
5	**Check brake fluid level switch circuit** 1) Disconnect BCM connector. 2) Check for proper connection to BCM connector at "E46-5" terminal. 3) If OK, then check resistance between "E46-5" terminal and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	"RED/BLK" wire circuit is shorted to ground.
6	**Check BCM** 1) Connect brake fluid level switch connector and BCM connector. 2) Check voltage at "E46-5" terminal of BCM referring to "Inspection of BCM and its Circuits in Section 10B". *Is voltage in good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM and recheck.

DTC 1020: Master Cylinder Pressure Sensor Power Supply Failure

S7N20A4604019

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Power supply voltage to master cylinder pressure sensor in ESP® hydraulic unit / control module assembly is out of specification.	• ESP® control module

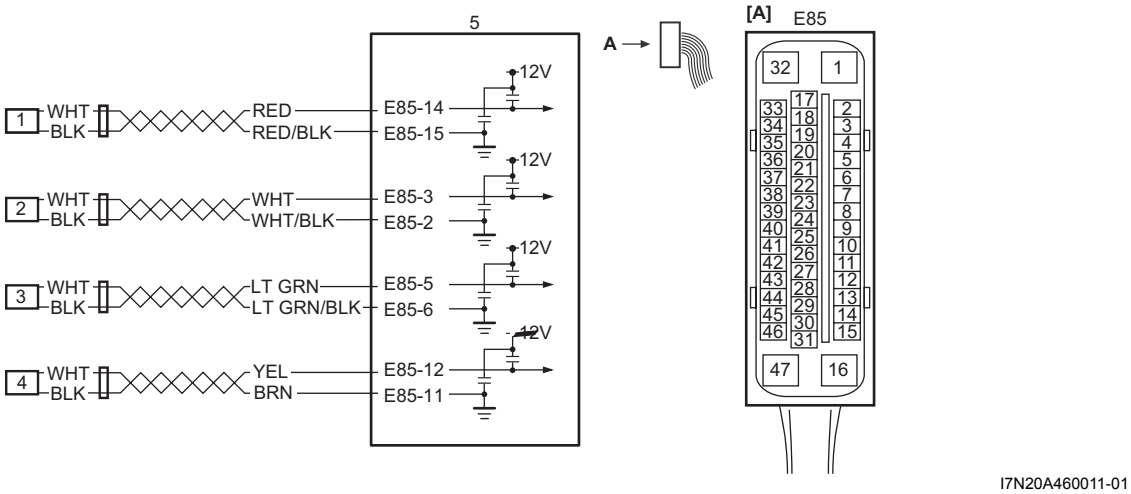
DTC Troubleshooting

1) Turn ignition switch to OFF position.
2) Check for proper connection from harness to ESP® control module.
3) If OK, substitute an ESP® hydraulic unit / control module assembly with correct part number.
4) Recheck system.

DTC C1021, C1022 / C1025, C1026 / C1031, C1032 / C1035, C1036: Right-Front / Left-Front / Right-Rear / Left-Rear Wheel Speed Sensor Circuit or Encoder Failure

S7N20A4604020

Wiring Diagram



I7N20A460011-01

[A]: ESP® control module connector (View: A)	2. Right- front wheel speed sensor	4. Right-rear wheel speed sensor
1. Left-front wheel speed sensor	3. Left-rear wheel speed sensor	5. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

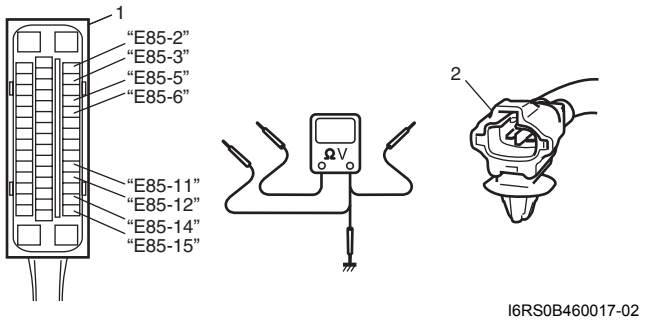
DTC Detecting Condition	Trouble Area
DTC C1021, C1025, C1031, C1035: Wheel sensor signal is out of specified range. **DTC C1022, C1026, C1032, C1036:** Abnormal wheel speed sensor signal is detected.	• Wheel speed sensor • Wheel speed sensor circuit • Wheel encoder • ESP® control module

NOTE

When the vehicle was operated in any of the following ways, one of these DTCs may be set even when the sensor is in good condition. If such possibility is suspected, clear DTC once referring to "DTC Clearance" and then performing the driving test as described in Step 2 of "Electronic Stability Program Check", check whether or not any abnormality exists.

- **The vehicle was driven with parking brake pulled.**
- **Wheel spin occurred while driving.**
- **Wheel(s) was turned while the vehicle was jacked up.**
- **The vehicle was stuck.**

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check wheel speed sensor circuit** 1) Turn ignition switch OFF. 2) Disconnect connector from ESP® control module and applicable wheel speed sensor connector. 3) Check for proper connection of ESP® control module and wheel speed sensor connector. 4) If connections are OK, check wheel speed sensor circuit for the following. • Resistance of both ESP® control module connector (1) terminals a pair of applicable sensor terminals is no continuity (circuit short check) • Resistance of applicable sensor terminal of ESP® control module connector and vehicle body ground is no continuity (ground short check) • Resistance of applicable sensor terminal of ESP® control module connector and corresponding terminal of wheel speed sensor connector (2) in main harness (for front sensor) or floor harness (for rear sensor) is continuity (continuity check) • Voltage of applicable sensor terminal of ESP® control module connector and vehicle body ground is 0 V with ignition switch turned ON (power short check)  I6RS0B460017-02 *Are they in good condition?*	Go to Step 3.	Repair or replace defective circuit.
3	**Check wheel speed sensor** 1) Remove applicable wheel speed sensor. 2) Check sensor for damage or foreign material attached. *Is it in good condition?*	Go to Step 4.	Clean, repair or replace.
4	**Check wheel encoder** 1) Check front and/or rear wheel encoder for the following (remove front drive shaft and/or rear wheel hub assembly): • Encoder surface neither crack nor damaged • No foreign material being attached • Encoder not being eccentric • Wheel bearing free from excessive play *Are they in good condition?*	Go to Step 5.	Clean, repair or replace front wheel bearing and/or rear wheel hub assembly.

Step	Action	Yes	No
5	**Check wheel speed sensor installing condition** 1) Install wheel speed sensor to knuckle. 2) Tighten sensor bolt to specified torque and check that there is no clearance between sensor and knuckle. *Is it OK?*	Go to Step 6.	Replace wheel speed sensor.
6	**Check wheel speed sensor** 1) Refer to “Front / Rear Wheel Speed Sensor On-Vehicle Inspection”, check output voltage or waveform. *Is specified voltage and/or waveform obtained?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace wheel speed sensor and recheck.

DTC C1024: Steering Angle Sensor Circuit Failure

S7N20A4604021

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Steering angle sensor internal defect is detected by CPU in steering angle sensor. • Steering angle sensor signal is out of specified range.	• Steering angle sensor • ESP® control module

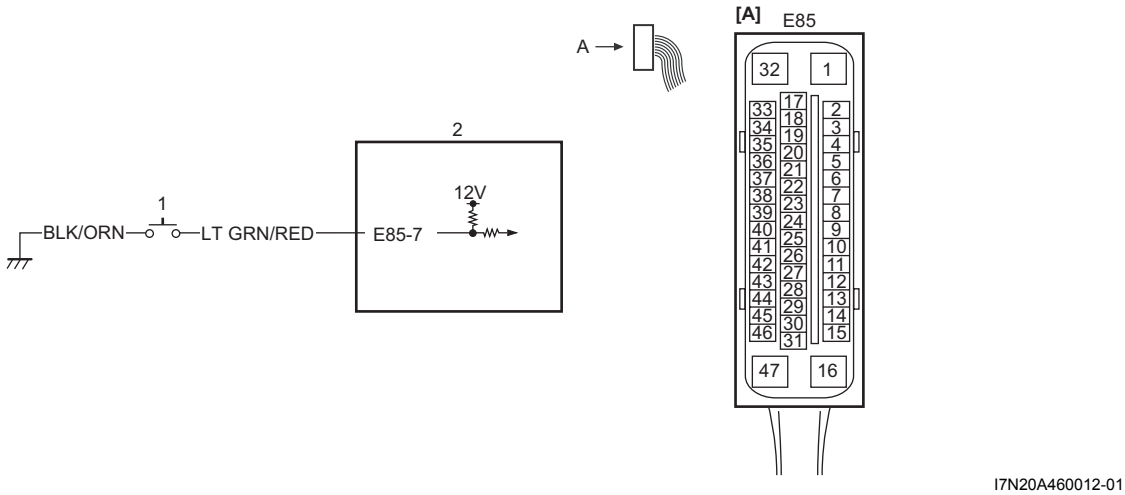
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Are DTC U1073 and/or U1126 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate steering angle sensor referring to “Sensor Calibration”. 2) Clear all DTC(s) and check DTC for ESP®. *Is DTC C1024 still detected?*	Go to Step 4.	Steering angle sensor calibration was incompleted.
4	**Check steering angle sensor** 1) Check steering angle sensor referring to “Steering Angle Sensor On-Vehicle Inspection”. *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Replace steering angle sensor.

DTC C1027: ESP® OFF Switch or TCSS OFF Switch Circuit Failure

S7N20A4604022

Wiring Diagram



I7N20A460012-01

[A]: ESP® control module connector (View: A)	1. ESP® OFF switch or TCSS OFF switch	2. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Mechanical switch failure, failure in switch wiring is shorted to ground.	• ESP® OFF switch or TCSS OFF switch • ESP® OFF switch circuit or TCSS switch circuit • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check ESP® OFF switch or TCSS OFF switch condition** *Is ESP® OFF switch or TCSS OFF switch turned OFF condition?*	Go to Step 3.	ESP® (TCSS) OFF switch turned OFF condition and recheck.
3	**Check ESP® OFF switch or TCSS OFF switch** 1) Turn ignition switch to OFF position. 2) Remove ESP® OFF switch or TCSS OFF switch referring to "ESP® OFF Switch or TCSS OFF Switch Removal and Installation". 3) Check for proper connection at each terminal of ESP® OFF switch or TCSS OFF switch. 4) If OK, then check ESP® OFF switch or TCSS OFF switch referring to "ESP® OFF Switch or TCSS OFF Switch Inspection". *Is it good condition?*	Go to Step 4.	Replace ESP® OFF switch or TCSS OFF switch.
4	**Check ESP® OFF switch or TCSS OFF switch circuit** 1) Disconnect ESP® control module connector. 2) Check for proper connection to ESP® control module connector at "E85-7" terminal. 3) If OK, then check resistance between "E85-7" terminal and vehicle body ground. *Is resistance infinity?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"LT GRN/RED" wire circuit is shorted to ground.

DTC C1028: Master Cylinder Pressure Sensor Circuit Failure

S7N20A4604023

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Input signal voltage from master cylinder pressure sensor in ESP® control module is too high or low.	• Leakage or air in the hydraulic brake system • Clearance between brake pad and disc too high

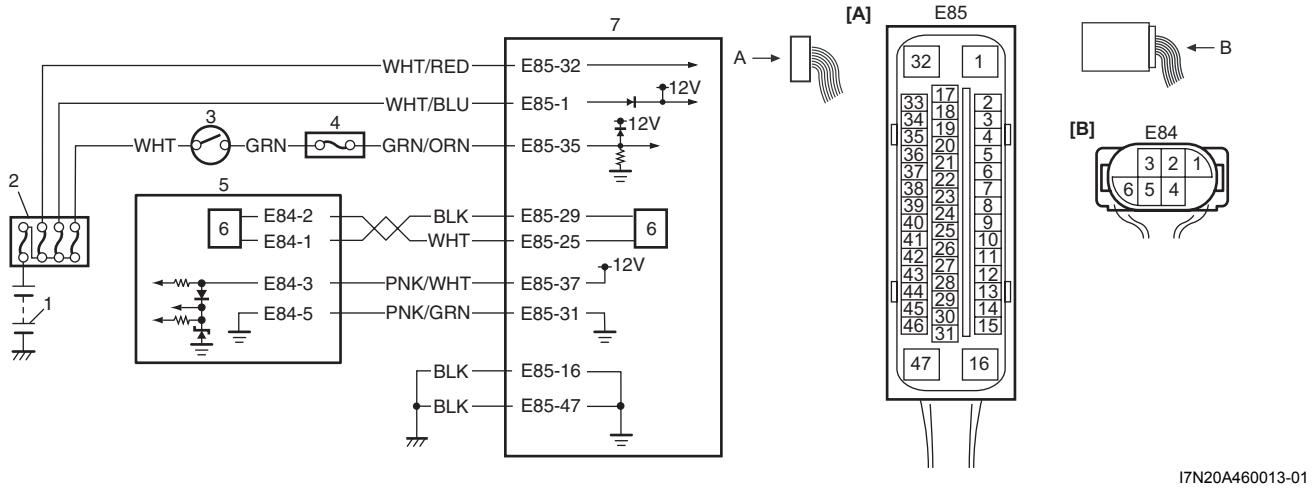
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check brake system** 1) Check brake system as follows. • Leakage or air in the hydraulic brake system • Clearance between brake pad and disc too high *Are they in good condition?*	Go to Step 3.	Repair, replace or adjust.
3	**Check sensor calibration** 1) Calibrate master cylinder pressure sensor referring to "Sensor Calibration". 2) Clear all DTC(s) and recheck DTC. *Is DTC C1028 still detected?*	Substitute a known-good ESP® hydraulic unit / control module assembly recheck.	Master cylinder pressure sensor calibration was incompleted.

DTC C1034: Yaw Rate / G Sensor Assembly Power Supply Failure

S7N20A4604024

Wiring Diagram



I7N20A460013-01

[A]: ESP® control module connector (View: A)	2. Main fuse box	5. Yaw rate / G sensor assembly
[B]: Yaw rate / G sensor assembly connector (View: B)	3. Ignition switch	6. CAN driver
1. Battery	4. Junction block assembly	7. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Power supply voltage of yaw rate / G sensor assembly is too high when ignition switch OFF. • Power supply voltage of yaw rate / G sensor assembly is too low when ignition switch ON.	• Yaw rate / G sensor assembly power supply circuit • ESP® control module power supply circuit • Yaw rate / G sensor assembly • ESP® control module

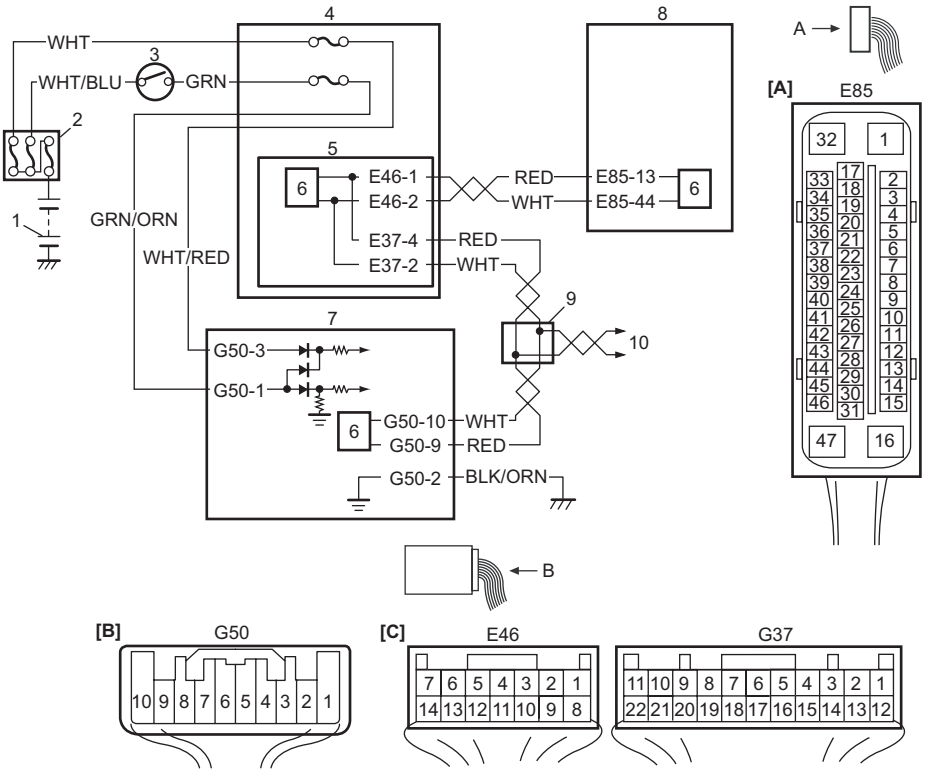
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check yaw rate / G sensor assembly ground circuit** 1) Turn ignition switch to OFF position. 2) Disconnect yaw rate / G sensor assembly connector. 3) Check for proper connection to yaw rate / G sensor assembly connector terminals at "E84-3" and "E84-5". 4) If OK, then measure voltage between connector terminal "E84-3" and vehicle body ground. *Is it 0 V?*	Go to Step 3.	Go to Step 4.
3	**Check yaw rate / G sensor assembly power supply circuit** 1) Measure voltage between connector terminal "E84-3" and "E84-5" with ignition switch turned ON. *Is it 10 – 14 V?*	Substitute a known-good yaw rate / G sensor assembly and recheck.	Go to Step 4.
4	**Check yaw rate / G sensor assembly power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector terminals at "E85-31" and "E85-37". 4) If OK, then measure voltage between connector terminal "E85-37" and vehicle body ground. *Is it 0 V?*	Go to Step 5.	"PNK/WHT" wire circuit is shorted to power circuit.
5	**Check yaw rate / G sensor assembly power supply circuit** 1) Measure resistance between the following points. • Between terminal "E85-37" of module connector and terminal "E84-3" of sensor terminal. • Between terminal "E85-31" of module connector and terminal "E84-5" of sensor terminal. *Are resistance less than 2 Ω?*	Substitute a known-good ESP® hydraulic unit / control module assembly recheck.	"PNK/WHT" and/or "PNK/GRN" wire circuit open or high resistance.

DTC C1037: Steering Angle Sensor Power Supply Failure

S7N20A4604025

Wiring Diagram



I7N20A460014-01

[A]: ESP® control module connector (View: A)	3. Ignition switch	8. ESP® hydraulic unit control module assembly
[B]: Steering angle sensor connector (View: B)	4. Junction block assembly	9. Junction connector
[C]: BCM connector (View: B)	5. BCM (included in junction block assembly)	10. To Combination meter and keyless start control module
1. Battery	6. CAN driver	
2. Main fuse box	7. Steering angle sensor	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Power supply voltage to steering angle sensor is too low.	• Steering angle sensor power supply circuit • Steering angle sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2	Go to "Electronic Stability Program Check".
2	**Check fuse** 1) Check circuit fuses for steering angle sensor and its circuit. *Is it good condition?*	Go to Step 3.	Replace fuse and check for short circuit to ground.

Step	Action	Yes	No
3	**Check steering angle sensor power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect steering angle sensor connector. 3) Check for proper connection to steering angle sensor connector terminals at “G50-1”, “G50-2” and “G50-3”. 4) If OK, then measure voltage between connector terminal “G50-3” and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 4.	“WHT/RED” wire circuit open.
4	**Check steering angle sensor power supply circuit** 1) Measure voltage between connector terminal “G50-1” and vehicle body ground with ignition switch turned ON. *Is it 10 – 14 V?*	Go to Step 5.	“GRN/ORN” wire circuit open.
5	**Check steering angle sensor ground circuit** 1) Turn ignition switch to OFF position. 2) Measure resistance between connector terminal “G50-2” and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 6.	“BLK/ORN” wire circuit open or high resistance.
6	**Check steering angle sensor** 1) Connect steering angle sensor connector. 2) Check steering angle sensor referring to “Steering Angle Sensor On-Vehicle Inspection”. *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good steering angle sensor and recheck.

DTC C1038: Steering Angle Sensor Detect Rolling Counter Failure from ESP® Control Module

S7N20A4604026

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module rolling counter failure is detected by steering angle sensor.	• CAN communication circuit • Steering angle sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC. *Is there any DTC(s) other than C1038 and C1090?*	Go to applicable DTC diag. flow.	Substitute a known-good steering angle sensor and recheck. If DTC C1038 is still detected, substitute a known-good ESP® hydraulic unit control module assembly and recheck.

DTC C1039: Yaw Rate / G Sensor Assembly Internal Failure

S7N20A4604027

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Yaw rate / G sensor assembly internal failure is detected.	• Yaw rate / G sensor assembly • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC. *Are DTC C1034 and/or C1073 detected?*	Go to applicable DTC diag. flow.	Go to step 3.
3	**Check yaw rate / G sensor assembly** 1) Check yaw rate / G sensor assembly referring to "Yaw Rate / G Sensor Assembly On-Vehicle Inspection". *Is it good condition?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Substitute a known-good yaw rate / G sensor assembly and recheck.

DTC C1040: Stability Control Function Failure

S7N20A4604028

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Stability control is active for more than specified time without yaw rate change.	• ESP® control module

DTC Troubleshooting

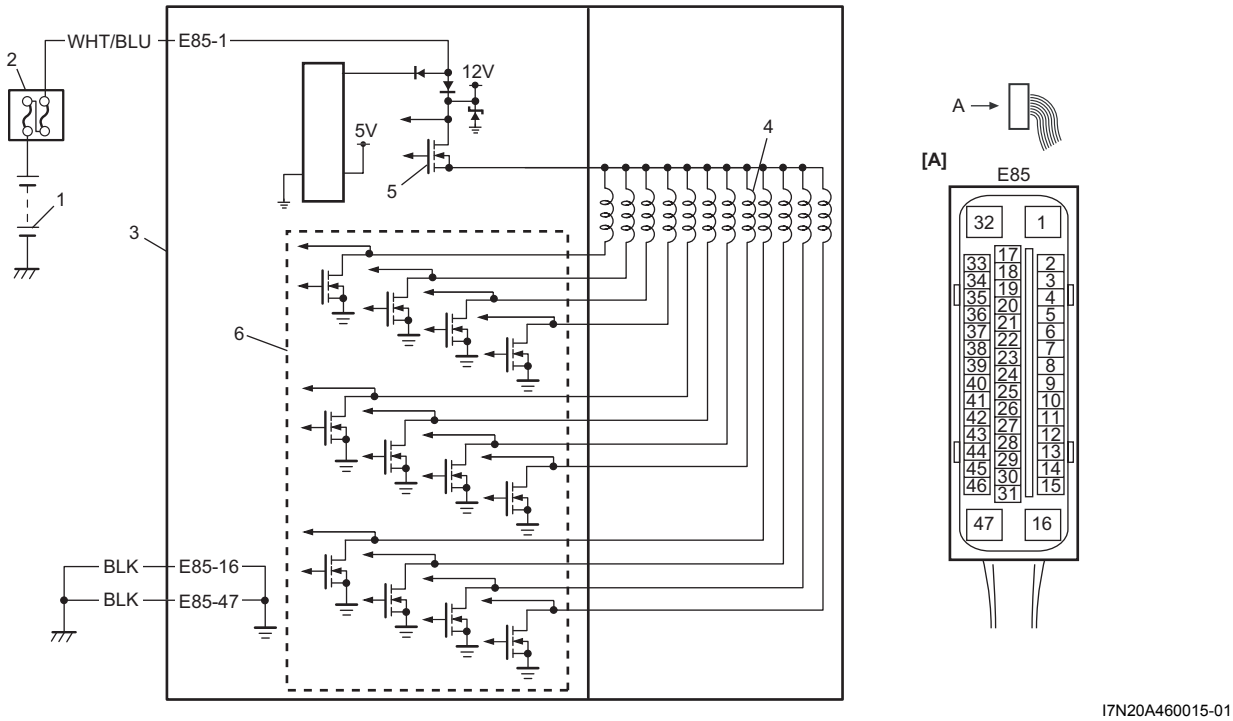
Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check DTC for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1040?*	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1041 / C1042 / C1043 / C1044 / C1045 / C1046 / C1051 / C1052 / C1053 / C1054 / C1055 / C1056: Inlet Solenoid Circuit Failure, Outlet Solenoid Circuit Failure, Master Cylinder Cut Solenoid Circuit Failure, Low Pressure Solenoid Circuit Failure

S7N20A4604029

DTC C1041 / C1045 / C1051 / C1055: Right-Front / Left-Front / Right-Rear / Left-Rear Inlet Solenoid Circuit Failure
DTC C1042 / C1046 / C1052 / C1056: Right-Front / Left-Front / Right-Rear / Left-Rear Outlet Solenoid Circuit Failure
DTC C1043 / C1044: Master Cylinder Cut Solenoid Circuit No. 1 / No. 2 Failure
DTC C1053 / C1054: Low Pressure Solenoid Circuit No. 1 / No. 2 Failure

Wiring Diagram



I7N20A460015-01

[A]: ESP® control module connector (View: A)	3. ESP® hydraulic unit / control module assembly	6. Solenoid valve driver (transistor)
1. Battery	4. Solenoid valve	
2. Main fuse box	5. Solenoid valve power supply driver (transistor)	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1041, C1042, C1043, C1044, C1045, C1046, C1051, C1052, C1053, C1054, C1055, C1056 Mismatching solenoid output and solenoid monitor is detected.	• ESP® control module

DTC Troubleshooting

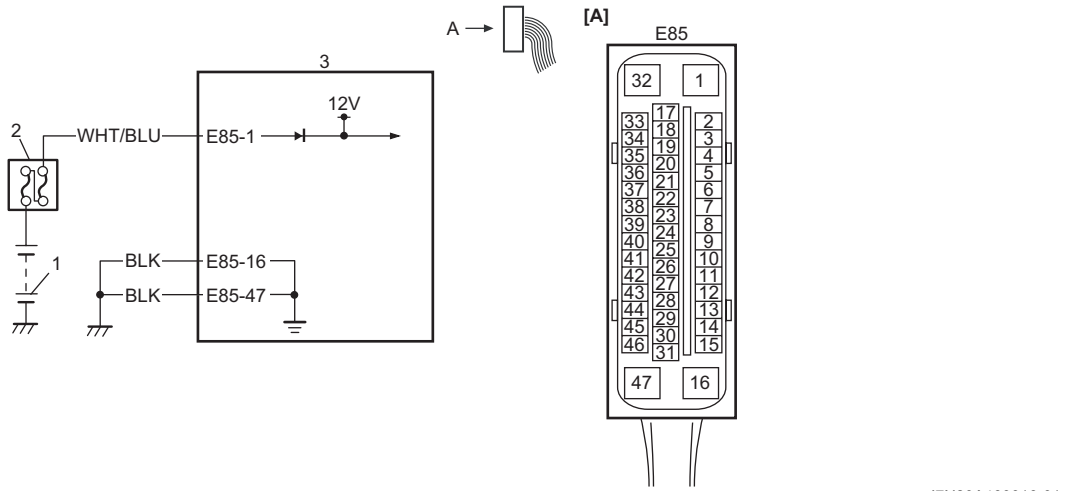
Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".

Step	Action	Yes	No
2	**Check solenoid valve power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminal “E85-1”, “E85-16” and “E85-47”. 4) If OK, then measure voltage between terminal “E85-1” of module connector and “E85-16, E85-47”. *Are they 10 – 14 V?*	Substitute a known-good ESP® hydraulic unit /control module assembly and recheck.	“WHT/BLU” or “BLK” circuit open.

DTC C1057: ESP® Control Module Power Supply Circuit Failure

S7N20A4604030

Wiring Diagram



I7N20A460016-01

[A]: ESP® control module connector (View: A)	2. Main fuse box
1. Battery	3. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• ESP® control module power supply voltage is too high.	• ESP® control module power supply circuit
• ESP® control module power supply voltage is too low.	• ESP® control module

DTC Troubleshooting

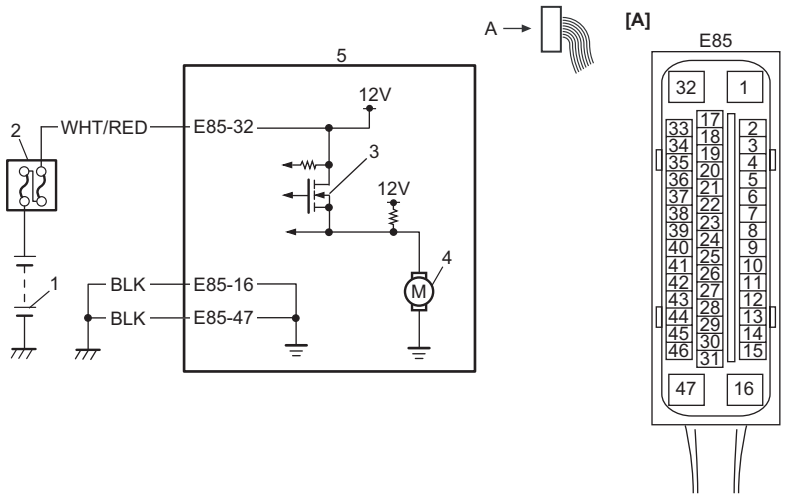
Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	**Check power supply circuit from battery** 1) Disconnect ESP® hydraulic unit / control module connector with ignition switch turned OFF. 2) Check for proper connection to ESP® control module connector at terminals “E83-1” (“E85-16”) and “E85-47”. 3) If OK, then turn ignition switch to ON position and measure voltage between terminals “E85-1” and “E85-16” (“E85-47”). *Are voltage about 9.7 V or more?*	Go to Step 5.	Go to Step 3.

Step	Action	Yes	No
3	**Check ESP® control module ground circuit** 1) Measure resistance between each terminal of “E85-16” (“E85-47”) and vehicle body ground. *Is resistance less than 2 Ω?*	Go to Step 4.	“BLK” wire circuit in open or high resistance.
4	**Check power supply circuit from battery** 1) Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage about 9.7 V or more?*	Imperfect short between “WHT/BLU” wire circuit and vehicle body ground.	Check charging system referring to “Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J”, “Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J” or “Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J”.
5	**Check power supply circuit from battery** 1) Measure voltage between terminals “E85-1” and “E85-16” (“E85- 47") with engine running. *Are voltage 15 V or less?*	Poor connection of “E85-1”, “E85-16” and/or “E85-47” terminals. If the terminals are in good condition, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check charging system referring to “Generator Test (Overcharged Battery Check): M13A / M15A / M16A in Section 1J” or “Generator Test (Overcharged Battery Check): D13A / Z13DTJ in Section 1J”. If charging system is good condition, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1061: Pump Motor and/or Motor Driver Circuit Failure

S7N20A4604031

Wiring Diagram



I7N20A460017-01

[A]: ESP® control module connector (View: A)	2. Main fuse box	4. Pump motor
1. Battery	3. Pump motor driver (transistor)	5. ESP® hydraulic unit / control module assembly

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Defective pump motor and/or motor power supply voltage is too low.	• Pump Motor and/or Motor Driver power supply circuit • ESP® control module

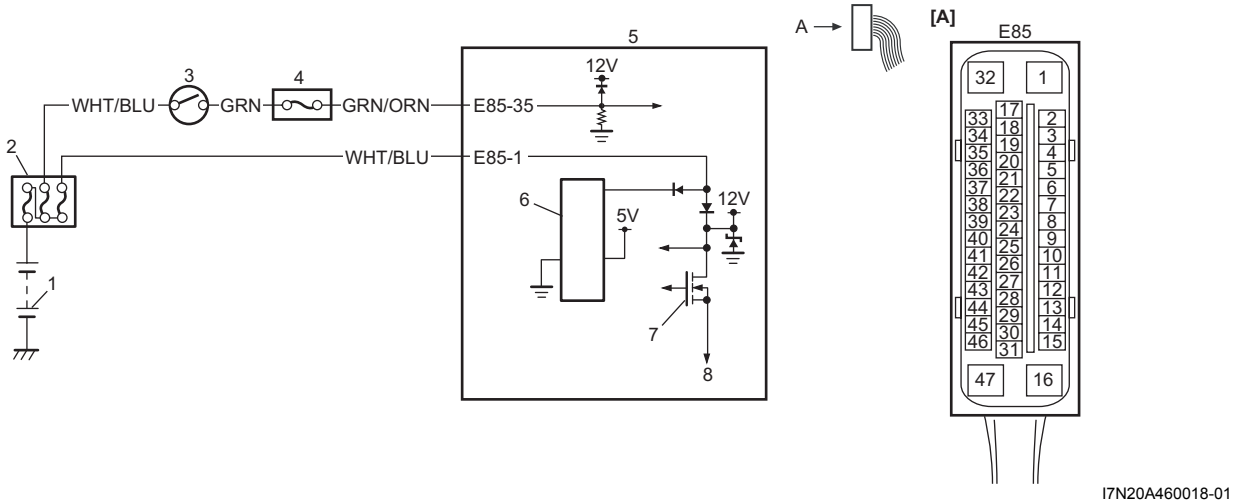
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check ESP® control module power supply circuit** 1) Turn Ignition switch to OFF position. 2) Disconnect ESP® control module connector. 3) Check for proper connection to ESP® control module connector at terminal "E85-32". 4) If OK, then measure voltage between terminal "E85-32" of module connector and body ground. *Is it 10 – 14 V?*	Go to Step 3.	"WHT/RED" circuit open.
3	**Check ESP® control module ground circuit** 1) Measure resistance between terminal "E85-16" and "E85-47" ESP® control module connector and vehicle body ground. *Are resistance less than 1 Ω?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Ground circuit for ESP® control module open or high resistance.

DTC C1063: Solenoid Valve Power Supply Driver Circuit Failure

S7N20A4604032

Wiring Diagram



I7N20A460018-01

[A]: ESP® control module connector (View: A)	3. Ignition switch	6. Power control unit
1. Battery	4. Junction block assembly	7. Solenoid valve power supply driver (transistor)
2. Main fuse box	5. ESP® hydraulic unit / control module assembly	8. To solenoid valve

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
• Mismatching solenoid output and solenoid monitor is detected. • Solenoid valve circuit is shorted to power or ground circuit in ESP® control module	• Solenoid valve power supply circuit • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check power supply circuit from battery** 1) Check battery voltage. *Is it about 11 V or higher?*	Go to Step 3.	Check charging system referring to "Battery Inspection: M13A / M15A / M16A in Section 1J", "Battery Inspection: D13A / Z13DTJ in Section 1J", "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J", "Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J" and "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".
3	**Check fuse** 1) Check main fuse for solenoid and its terminal. *Is it in good condition?*	Go to Step 4.	Replace fuse and check for short circuit to ground.
4	**Check solenoid valve power supply circuit** 1) Turn ignition switch to OFF position. 2) Disconnect control module connector. 3) Check for proper connection to ESP® control module at terminal "E85-1". 4) If OK, then measure voltage between connector terminal "E85-1" and vehicle body ground. *Is it 10 – 14 V?*	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	"WHT/BLU" circuit imperfect short to ground.

DTC 1071: ESP® Control Module Internal Defect

S7N20A4604033

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module internal defect is detected.	• ESP® control module

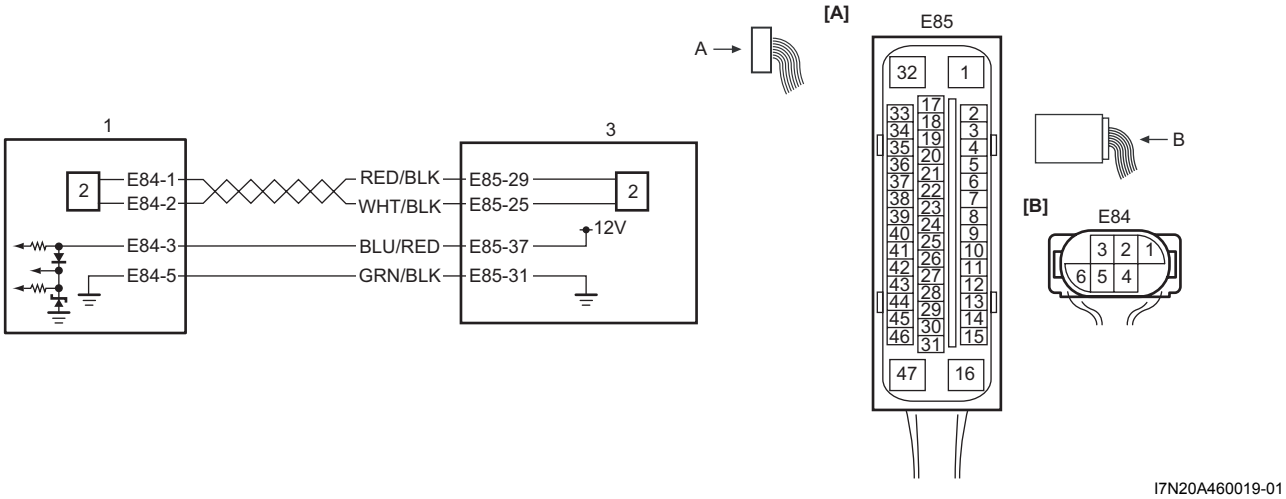
DTC Troubleshooting

1) Turn ignition switch to OFF position.
2) Check for proper connection from harness to ESP® control module.
3) If OK, substitute an ESP® hydraulic unit / control module assembly with correct part number.
4) Recheck system.

DTC C1073: Lost Communication With Yaw Rate / G Sensor Assembly

S7N20A4604034

Wiring Diagram



I7N20A460019-01

[A]: ESP® control module connector (View: A)	1. Yaw rate / G sensor assembly	3. ESP® hydraulic unit control module assembly
[B]: Yaw rate / G sensor assembly connector (View: B)	2. CAN driver (for yaw rate / G sensor assembly)	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
CAN line communication error in ESP® control module and yaw rate / G sensor assembly is detected.	• CAN communication circuit (for yaw rate / G sensor assembly) • Yaw rate / G sensor assembly • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN (for yaw rate / G sensor assembly). 2) Check DTC for ESP®. *Is DTC C1073 detected?*	Go to Step 4.	Check for intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and yaw rate / G sensor assembly. *Is each CAN communication circuit between ESP® control module and yaw rate / G sensor assembly opened, shorted or high resistance?*	Repair or replace the CAN communication line.	Go to Step 5.

Step	Action	Yes	No
4	**Check yaw rate / G sensor assembly** 1) Check yaw rate / G sensor assembly power and ground circuit referring to “DTC Troubleshooting” under “DTC C1034: Yaw Rate / G Sensor Assembly Power Supply Failure”. 2) If OK, then substitute a known-good yaw rate / G sensor assembly. 3) Connect connectors to ESP® control module and yaw rate / G sensor assembly. 4) Clear all DTC(s) and check DTC for ESP®. *Is DTC C1073 still detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Yaw rate / G sensor assembly was malfunction.

DTC C1075 / 1076 / 1078: Steering Angle Sensor / Master Cylinder Pressure Sensor / Lateral G Sensor in Yaw Rate / G Sensor Assembly Calibration Incomplete

S7N20A4604035

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
C1075: Missing steering angle sensor calibration point data is detected.	• Steering angle sensor • Steering angle sensor calibration is incompleted • ESP® control module
C1076: Master cylinder pressure sensor calibration is incompleted.	• Master cylinder pressure sensor • Master cylinder pressure sensor calibration is incompleted • ESP® control module
C1078: Lateral G sensor in yaw rate / G sensor assembly calibration is incompleted.	• Yaw rate / G sensor assembly • Lateral G sensor calibration is incompleted • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1075, C1076 and C1078?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check sensor calibration** 1) Calibrate all sensors referring to “Sensor Calibration”. 2) Clear all DTC(s) and check DTC for ESP®. *Is DTC C1075, C1076 and/or C1078 still detected?*	DTC C1075: Substitute a known-good steering angle sensor and recheck. DTC C1076: Substitute a known-good ESP® hydraulic unit / control module assembly and recheck. DTC C1078: Substitute a known-good yaw rate / G sensor assembly and recheck.	Calibration was incompleted.

DTC C1090: ECM Detect Rolling Counter Failure from ESP® Control Module

S7N20A4604036

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ESP® control module rolling counter failure is detected by ECM.	• CAN communication circuit • ECM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is there any DTC(s) other than C1038 and C1090?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**DTC check for ECM** 1) Check DTC for ECM. *Is DTC P1674 and/or DTC P1685 detected?*	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC C1091 / C1092 / C1094: ECM / TCM Data in CAN Line Failure / Torque Request Reject Status

S7N20A4604037

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
DTC C1091, C1092 ECM / TCM sent invalid signal to ESP® control module. DTC C1094 Reception error of torque control signal with ECM	• Engine control system / A/T system • ECM / TCM • ESP® control module

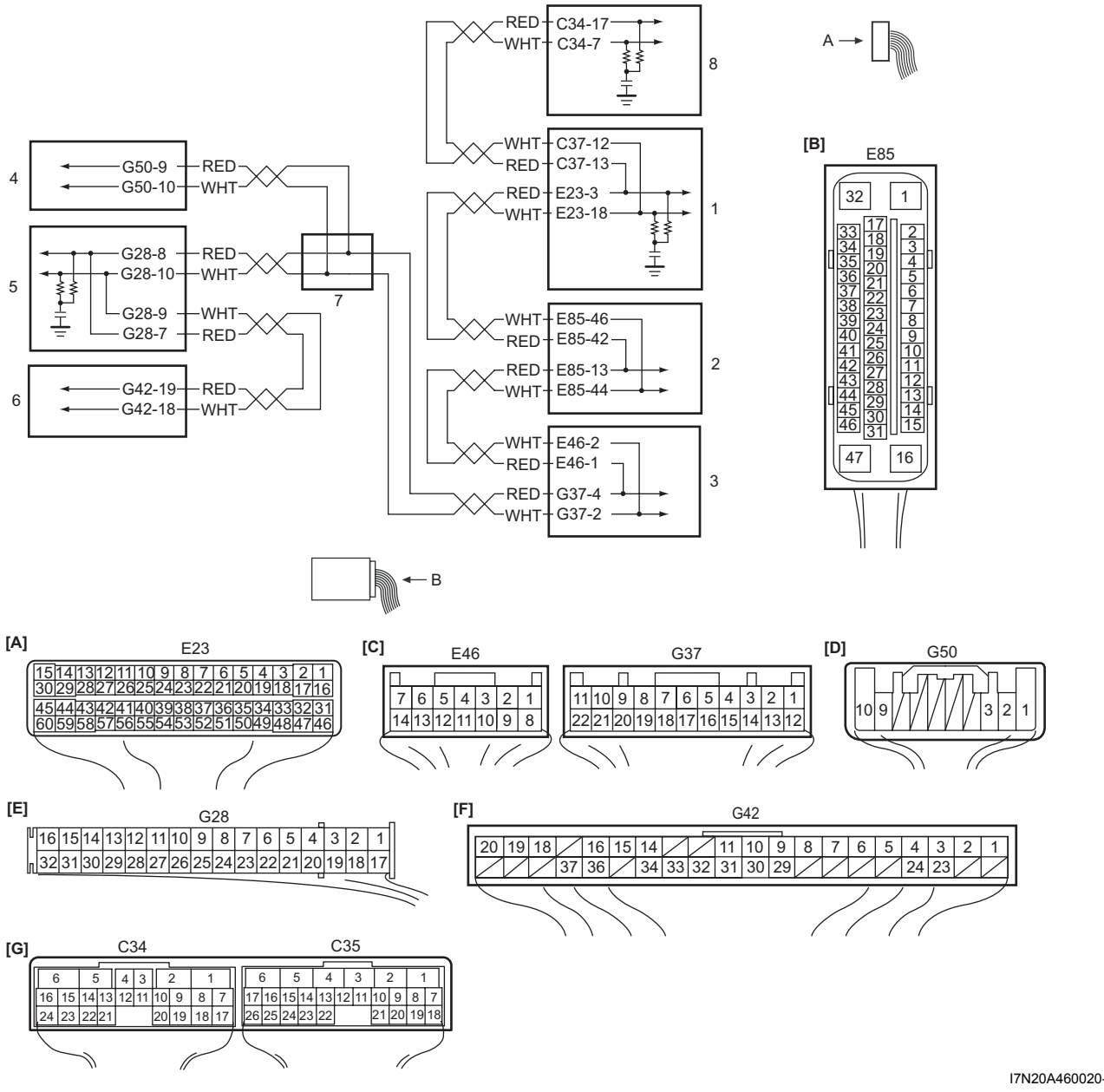
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch ON and check DTC for ESP®. *Is DTC C1090 detected?*	Go to applicable DTC diag. flow.	Go to step 3.
3	**DTC check other control module than ESP®** 1) Check DTC for ECM and/or TCM. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good ESP® hydraulic unit / control module assembly and recheck.

DTC U1073: Control Module Communication Bus Off

S7N20A4604038

Wiring Diagram



I7N20A460020-01

[A]: ECM connector (View: B)	[F]: Keyless start control module connector (View: B)	4. Steering angle sensor
[B]: ESP® control module connector (View: A)	[G]: TCM connector (View: B)	5. Combination meter
[C]: BCM connector (view B)	1. ECM	6. Keyless start control module (if equipped)
[D]: Steering angle sensor connector (View: B)	2. ESP® hydraulic unit / control module assembly	7. Junction connector
[E]: Combination meter connector (View: B)	3. BCM	8. TCM

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	• CAN communication circuit • ECM • ESP® control module • BCM • Steering angle sensor • Combination meter • Keyless start control module (if equipped) • TCM

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC for ESP®. *Is DTC U1073 indicated?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair or replace the CAN communication line.
4	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module (if equipped) • Combination meter • Steering angle sensor • BCM • TCM 3) Recheck DTC for ESP®. *Is DTC U1073 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1100: Lost Communication with ECM (Reception Error)

S7N20A4604039

Wiring Diagram

Refer to "Wiring Diagram" under "DTC U1073: Control Module Communication Bus Off".

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
ECM message data is missing from CAN communication.	• CAN communication circuit • ECM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1100 and DTC U1073 detected together?*	Go to "DTC U1073: Control Module Communication Bus Off".	Go to Step 3.
3	**DTC check for ECM** 1) Check DTC for ECM. *Is DTC P1674 detected?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A in Section 1A".	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ESP®. *Is DTC U1100 detected?*	Go to Step 5.	Check for intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and ECM communicating by means of CAN. 3) Check CAN communication circuit between ESP® control module and ECM for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Repair or replace the CAN communication line.	Go to Step 6.
6	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair or replace the CAN communication line.
7	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module (if equipped) • Combination meter • Steering angle sensor • BCM • TCM 3) Recheck DTC for ESP®. *Is DTC U1100 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1101: Lost Communication with TCM (Reception Error)

S7N20A4604044

Wiring Diagram

Refer to "Wiring Diagram" under "DTC U1073: Control Module Communication Bus Off".

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
TCM message data is mission from CAN communication.	• CAN communication circuit • TCM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Electronic Stability Program Check" performed?*	Go to Step 2.	Go to "Electronic Stability Program Check".
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1100 and DTC U1073 detected together?*	Go to "DTC U1073: Control Module Communication Bus Off".	Go to Step 3.
3	**DTC check for TCM** 1) Check DTC for TCM *Is DTC P1674 detected?*	Go to "DTC P1774: Control Module Communication Bus Off in Section 5A".	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ESP®. *Is DTC U1100 detected?*	Go to Step 5.	Check for intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and TCM communicating by means of CAN. 3) Check CAN communication circuit between ESP® control module and TCM for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Repair or replace the CAN communication line.	Go to Step 6.
6	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair or replace the CAN communication line.
7	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control modules (if equipped) • Combination meter • Steering angle sensor • BCM • TCM 3) Recheck DTC for ESP®. *Is DTC U1100 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1126: Lost Communication with Steering Angle Sensor (Reception Error)

S7N20A4604040

Wiring Diagram

Refer to “Wiring Diagram” under “DTC U1073: Control Module Communication Bus Off”.

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Steering angle sensor message data is missing from CAN communication.	• CAN communication circuit • Steering angle sensor • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1126 and DTC U1073 detected together?*	Go to “DTC U1073: Control Module Communication Bus Off”.	Go to Step 3.
3	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ESP®. *Is DTC U1126 detected?*	Go to Step 4.	Check for intermittent trouble referring to “Intermittent and Poor Connection Inspection in Section 00”.
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module, BCM and steering angle sensor communicating by means of CAN. 3) Check CAN communication circuit for open, short and high resistance. • Between ESP® control module and BCM • Between steering angle sensor and BCM *Is each CAN communication circuit in good condition?*	Repair or replace the CAN communication line.	Go to Step 5.
5	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 4 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 6.	Repair or replace the CAN communication line.

Step	Action	Yes	No
6	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module • Combination meter • Steering angle sensor • BCM • TCM 3) Check DTC for ESP®. *Is DTC U1126 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

DTC U1140: Lost Communication with BCM (Reception Error)

S7N20A4604041

Wiring Diagram

Refer to “Wiring Diagram” under “DTC U1073: Control Module Communication Bus Off”.

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
BCM message data is missing from CAN communication.	• CAN communication circuit • BCM • ESP® control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Electronic Stability Program Check” performed?*	Go to Step 2.	Go to “Electronic Stability Program Check”.
2	**DTC check for ESP®** 1) Check DTC for ESP®. *Is DTC U1140 and DTC U1073 detected together?*	Go to “DTC U1073: Control Module Communication Bus Off”.	Go to Step 3.
3	**DTC check for BCM** 1) Check DTC for BCM. *Is DTC U1073 detected?*	Go to “DTC U1073 (No. 1073): Control Module Communication Bus Off in Section 10B”.	Go to Step 4.
4	**Check each control module connectors** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Check DTC for ESP®. *Is DTC U1140 detected?*	Go to Step 4.	Check for intermittent trouble referring to “Intermittent and Poor Connection Inspection in Section 00”.
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of ESP® control module and BCM communicating by means of CAN. 3) Check CAN communication circuit between ESP® control module and BCM for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Repair or replace the CAN communication line.	Go to Step 6.

Step	Action	Yes	No
6	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair or replace the CAN communication line.
7	**DTC check for ESP®** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect each connector. • ECM • Keyless start control module • Combination meter • Steering angle sensor • BCM • TCM 3) Check DTC for ESP®. *Is DTC U1140 detected?*	Check ESP® control module power and ground circuit. If circuits are OK, substitute a known-good ESP® hydraulic unit / control module assembly and recheck.	Check applicable control module power and ground circuit. If circuit is OK, substitute a known-good applicable control module and recheck.

Repair Instructions

ESP® Hydraulic Unit Operation Check

S7N20A4606001

⚠ CAUTION

Make sure for the following conditions before ABS hydraulic unit operation check. Otherwise, ESP® hydraulic unit operation check can not do properly.

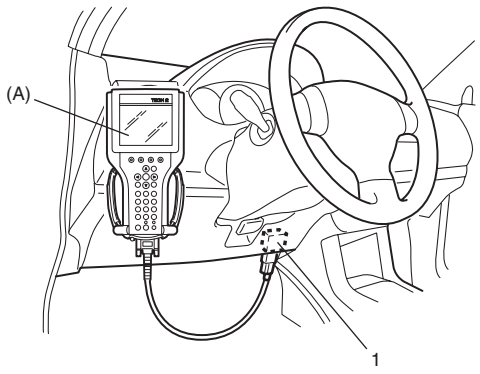
- **No air is trapped in brake system.**
- **Battery voltage is 11 V or more.**
- **Brakes do not drag.**
- **ESP® control module has detected no DTC.**

NOTE

- **Operation check must be performed by 2 persons.**
- **Be sure to perform "Sensor Calibration" before performing hydraulic unit operation check.**

1) Turn ignition switch to OFF position.
2) Hoist vehicle until tire can be rotated.
3) Set transmission to neutral and release parking brake.
4) Turn each wheel gradually by hand to check if braked ragging occurs. If it does, correct.
5) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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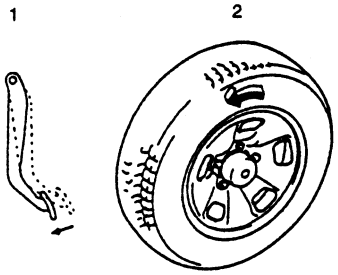
6) Turn ignition switch to ON position and select menu press / depress in “HYDRAULIC CONTROL TEST” under “miscellaneous test” (“MISC. TEST”) mode of SUZUKI scan tool.
Refer to SUZUKI scan tool operator’s manual for further details.
7) Perform the following checks with help of another person.
   - Depressurization 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.
   - Pressurization check
     Step off 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 locks due to brake pressurization.

NOTE

Pressurization / Depressurization by SUZUKI scan tool is available for 0.5 second.



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8) Check for all 4-wheels condition respectively. If a faulty condition is found, replace hydraulic unit / control module assembly.
9) After completing the check DTC, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

Sensor Calibration

S7N20A4606002

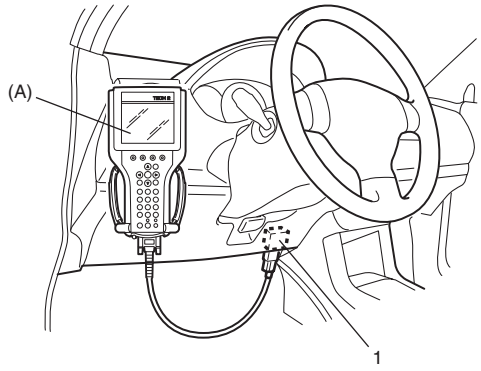
NOTE

- **If any DTC(s) other than C1075, C1076 or C1078 are detected, sensor calibration can not be completed. Repair the detected DTC first.**
- **Steering angle sensor calibration is needed when battery, “DOME” fuse or the steering angle sensor is removed.**
  This sensor calibration can be done with/ without SUZUKI Scan Tool.
  When ESP® control module and/or yaw rate / G sensor assembly is removed, sensor calibration is needed with SUZUKI Scan Tool.

Sensor Calibration (Using SUZUKI Scan Tool)

1) Set steering wheel in straight-ahead position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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3) Turn ignition switch to ON position and confirm that only any of DTC(s) C1075, C1076 and/or C1078 is detected. If any other DTC are detected, repair the detected DTC.
4) Park and level the vehicle with parking brake, stop engine with ignition switch ON, set steering in straight and without stepping on the brake pedal.

⚠ CAUTION

Hold the above condition in Step 4) to calibrate sensor correctly until sensor calibration is completed.

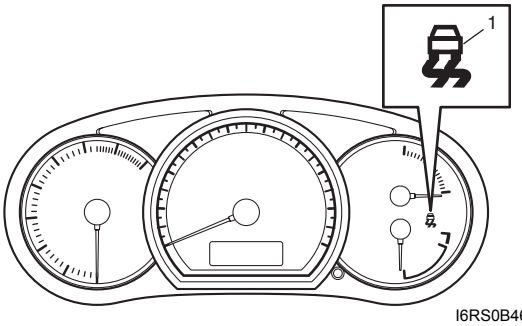
5) Select menu “SENSOR CALIBRATION” under “MISC. TEST” mode of SUZUKI scan tool and calibrate sensor. Refer to scan tool operator's manual for further derails.
6) After completing the calibration, check DTC(s) are not stored in ESP® hydraulic unit / control module. Turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

Steering Angle Sensor Calibration (Not Using SUZUKI Scan Tool)

1) Set steering wheel in straight-ahead position.
2) Connect battery terminals and/or fuse and start engine.

NOTE

When power is not supplied to the steering angle sensor by removing battery or fuse, DTC C1075 is detected and SLIP indicator light (1) flashes.
If DTC other than C1075 is detected, SLIP indicator light flushes and other indicator illuminate. In that case, repair the detected DTC first.



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3) Drive vehicle straight on level ground at 15 km/h (9.5 mph) or above for few seconds without spinning wheels. And confirm that SLIP indicator light is OFF.

ESP® Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

S7N20A4606003

⚠ CAUTION

Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ESP® hydraulic unit / control module assembly.

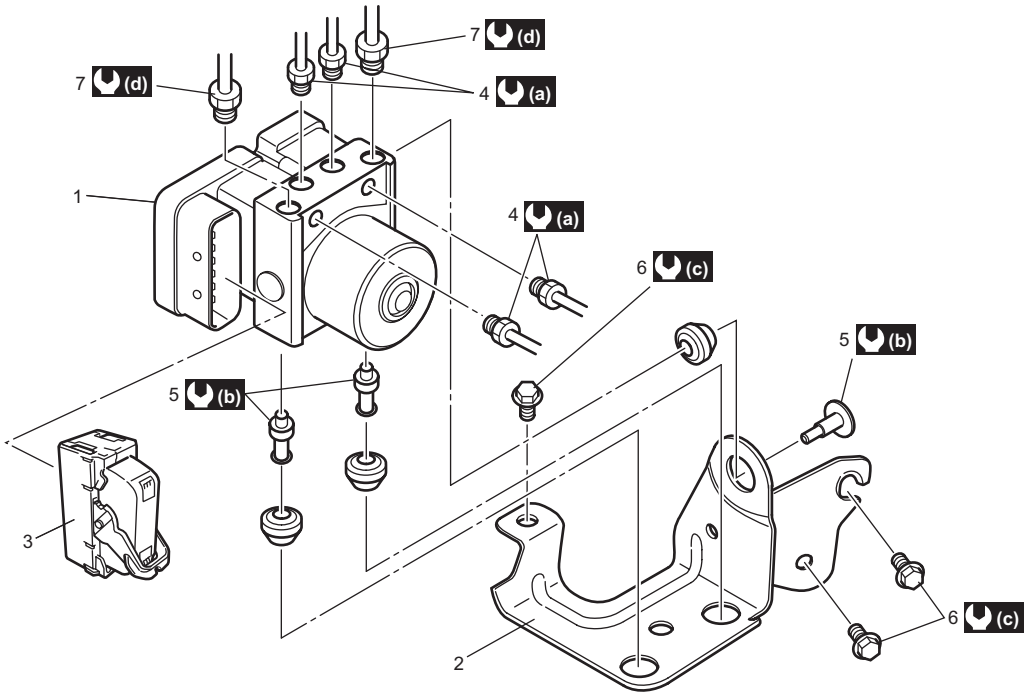
Check hydraulic unit for fluid leakage.
If any, repair or replace.

ESP® Hydraulic Unit / Control Module Assembly Removal and Installation

S7N20A4606004

⚠ CAUTION

- **Use care not to allow dust to enter ESP® hydraulic unit / control module assembly.**
- **Do not place ESP® hydraulic unit / control module assembly on its side or upside down. Handling it in inappropriate way will affect its original performance.**
- **Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ESP® hydraulic unit / control module assembly.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid, flush it with water immediately if any fluid is spilled.**
- **Be sure to tighten fastener to specified torque using torque wrench to avoid damage.**



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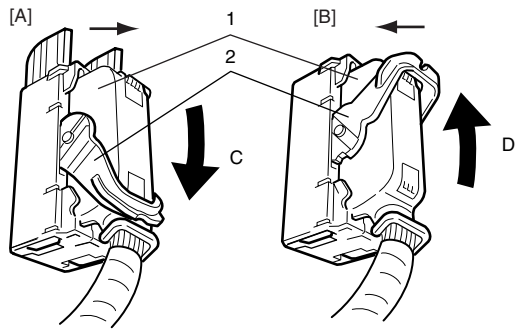
1. ESP® hydraulic unit / control module assembly	5. ESP® hydraulic unit / control module assembly bolt	(b) : 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
2. Bracket	6. ESP® hydraulic unit / control module assembly bracket bolt	(c) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
3. ESP® control module connector	7. Brake pipe flare nut (M12)	(d) : 19 N·m (1.9 kgf-m, 14.0 lbf-ft)
4. Brake pipe flare nut (M10)	(a) : 16 N·m (1.6 kgf-m, 11.5 lbf-ft)	

Removal

1) Disconnect negative (–) cable from battery.
2) Disconnect ESP® control module connector as shown in figure.



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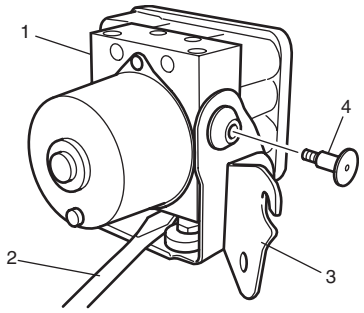
[A]: Disconnect	C: Pull down to disconnect
[B]: Connect	D: Pull up to connect

3) Remove front brake pipe referring to “Front Brake Hose / Pipe Removal and Installation in Section 4A”.
4) Remove ESP® hydraulic unit / control module with bracket from vehicle by removing bracket bolts.
5) Remove bolt (4) and pull out ESP® hydraulic unit / control module assembly (1) from bracket (3) using flat end rod or the like (2).



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Installation

1) Install hydraulic unit / control module assembly and by reversing removal procedure.

   Tightening torque
   Brake pipe flare nut (M10): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)
   Brake pipe flare nut (M12): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)
   ESP® hydraulic unit / control module assembly bolt: 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
   ESP® hydraulic unit / control module assembly bracket bolt: 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

2) Bleed air from brake system referring to "Air Bleeding of Brake System in Section 4A".
3) Check each installed part for fluid leakage.
4) Connect SUZUKI Scan Tool.
5) Turn ignition switch to ON position. And SLIP indicator light flush. (Other than replace with new one) If other than SLIP indicator light lights, check DTC and repair it.
6) Turn ignition switch to ON position. And ESP® warning light, SLIP indicator light, ESP® OFF light (TCSS OFF light), Brake warning light lights and ABS warning light flush. (Replace new one)
7) Check DTC.

   NOTE

   If any DTC(s) other than C1075, C1076 or C1078 are detected, sensor calibration can not be completed. Repair the detected it(s) first.

8) Perform "Sensor Calibration".
9) Perform "ESP® Hydraulic Unit Operation Check".
10) Turn ignition switch to OFF position once and then ON position. In this state, make sure that indicator light and warning light turns off.
11) Check DTC(s) are not stored in hydraulic unit / control module.

Front / Rear Wheel Speed Sensor On-Vehicle Inspection

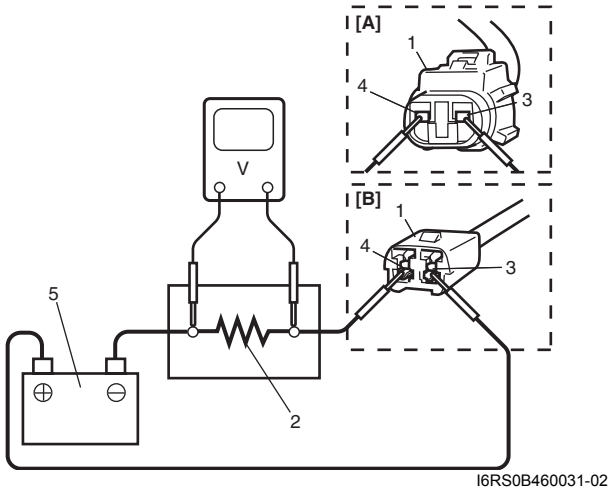
S7N20A4606005

Output Voltage Inspection

1) Disconnect negative (–) cable from battery.
2) Hoist vehicle a little.
3) Disconnect wheel speed sensor connector.
4) Disconnect wheel speed grommet from vehicle body.
5) Set up measuring devices as shown in figure.

⚠ CAUTION

Incorrect voltage and/or wrong connection cause damage to wheel speed sensor.



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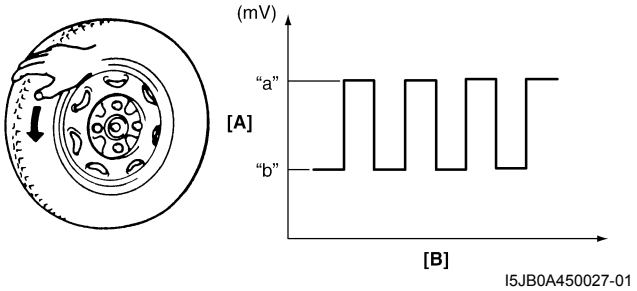
[A]: Front wheel speed sensor	3. "WHT" wire terminal
[B]: Rear wheel speed sensor	4. "BLK" wire terminal
1. Wheel speed sensor connector	5. Power supply (12 V)
2. Resistance (115Ω)	

6) Measure voltage at resistance without wheel rotation.
   If voltage is out of specification, check sensor, mating encoder and their installation conditions.

   Voltage at the resistance (115 Ω) without wheel rotation
   680 to 960 mV

7) Measure voltage at resistance with wheel rotation and confirm voltage alternately changes between high and low voltages.
If voltage does not change with wheel rotation, check sensor, mating encoder and their installation conditions.

Voltage at the resistance (115 Ω) with wheel rotation
High voltage "a": 1360 to 1930 mV
Low voltage "b": 680 to 960 mV



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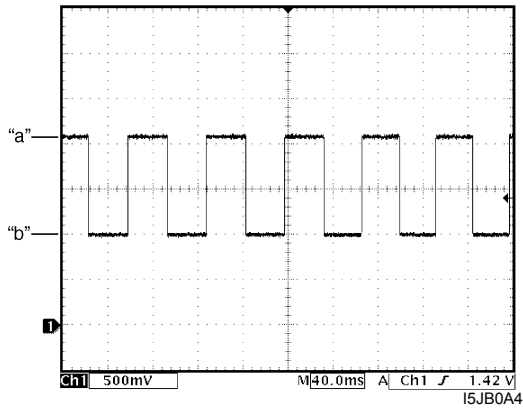
[A]: Voltage	[B]: Time

Reference
When using oscilloscope for this check, check if peak-to-peak voltage and waveform meet specification.

Peak-to-peak Voltage at the resistance (115 Ω) with wheel rotation
High voltage "a": 1360 to 1930 mV
Low voltage "b": 680 to 960 mV



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Front Wheel Speed Sensor Removal and Installation

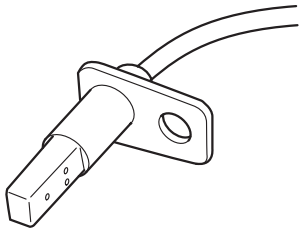
S7N20A4606006

Refer to "Front Wheel Speed Sensor Removal and Installation in Section 4E".

Front Wheel Speed Sensor Inspection

S7N20A4606007

Check sensor for damage.
If any malcondition is found, replace.



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Rear Wheel Speed Sensor Removal and Installation

S7N20A4606008

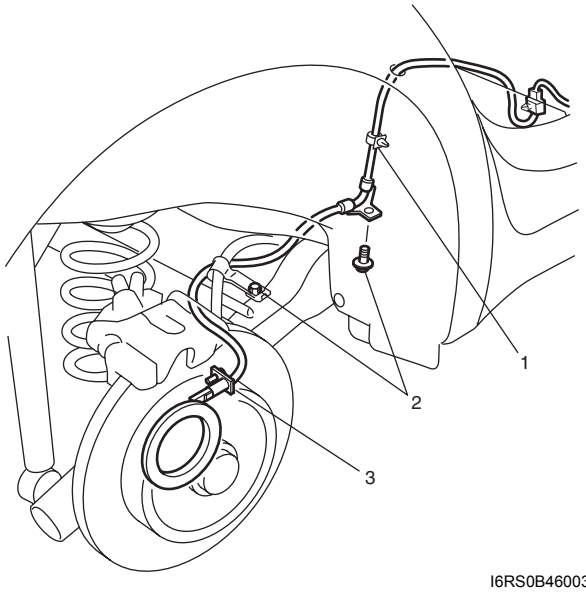
Drum Brake
Refer to "Rear Wheel Speed Sensor Removal and Installation in Section 4E".

Disc Brake
Removal

1) Disconnect negative (–) cable from battery.
2) Remove quarter inner trim to brake referring to "Floor Carpet Removal and Installation in Section 9H".
3) Turn over floor carpet and disconnect connector of wheel speed sensor.
4) Hoist vehicle and remove wheel.
5) Remove harness clamp (1) and clamp bolts (2).
6) Remove rear wheel speed sensor (3) from knuckle.

⚠ CAUTION

- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



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Installation
Reverse removal procedure for installation noting the following.

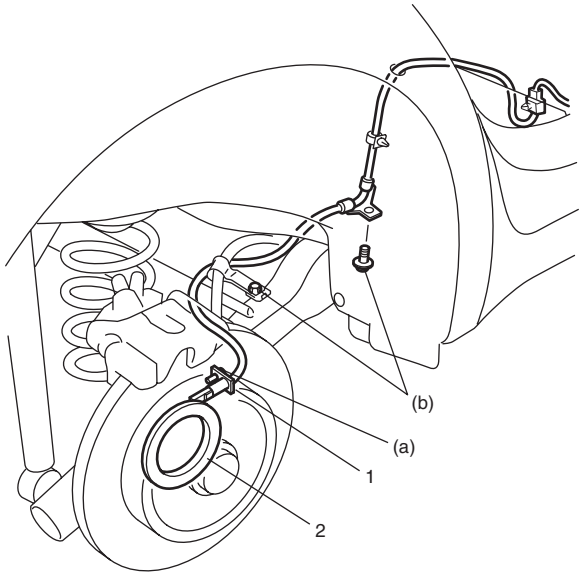
- Check that no foreign material is attached to sensor(1) and mating encoder (2).
- Be sure to install wheel speed sensor (1) and its bolt at the correct position as shown in figure.
  Tighten sensor bolt and harness clamp bolts to specified torque.

  Tightening torque
  Rear wheel speed sensor bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
  Rear wheel speed sensor harness clamp bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

  ⚠ CAUTION

  Do not pull or twist wire harness more than necessary when installing rear wheel speed sensor.

- Check that there is no clearance between sensor and brake back plate.



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[A]: OK	[B]: NG

Rear Wheel Speed Sensor Inspection

S7N20A4606009

Refer to “Front Wheel Speed Sensor Inspection” since rear wheel speed sensor is the same as front wheel speed sensor.

Front Wheel Speed Sensor Encoder On-Vehicle Inspection

S7N20A4606010

Refer to “Front Wheel Speed Sensor Encoder and Rear Wheel Speed Sensor Ring Inspection in Section 4E”.

Front Wheel Speed Sensor Encoder Removal and Installation

S7N20A4606011

Refer to “Front Wheel Speed Sensor Encoder Removal and Installation in Section 4E”.

Rear Wheel Speed Sensor Ring On-Vehicle Inspection

S7N20A4606012

Refer to “Front Wheel Speed Sensor Encoder and Rear Wheel Speed Sensor Ring Inspection in Section 4E”.

Rear Wheel Speed Sensor Ring Removal and Installation

S7N20A4606013

⚠ CAUTION

Rear wheel speed sensor ring is included in rear wheel hub assembly. If rear wheel speed sensor ring needs to replaced, replace it as a rear wheel hub assembly.

Drum Brake
Refer to “Rear Wheel Speed Sensor Ring Removal and Installation in Section 4E”.

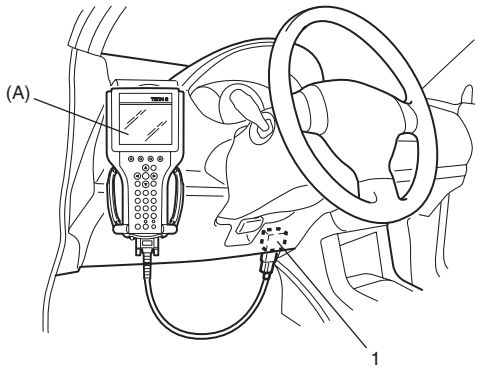
Disc Brake
For removal and installation of front wheel hub assembly, referring to “Rear Wheel Hub Removal and Installation (For Disc Brake Type) in Section 2C”.

Master Cylinder Pressure Sensor On-Vehicle Inspection

S7N20A4606014

1) Calibrate yaw rate / G sensor assembly referring to “Sensor Calibration”.
2) Check that basic brake system other than ESP® refer to “Brakes Diagnosis Note in Section 4A”.
3) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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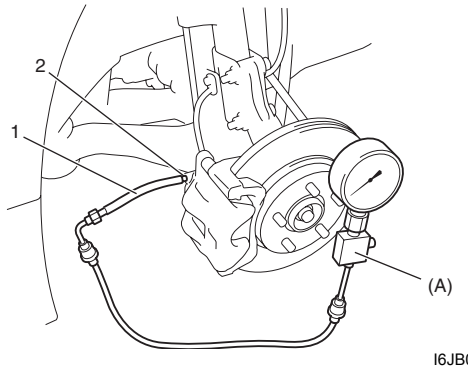
4) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
5) When brake pedal is released, check “Master Cyl Press” under “DATA LIST” of SUZUKI scan tool.
If pressure is out of specification, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification
Brake pedal released: 0 ± 0.8 MPa (0 ± 8 kg/cm², 0 ± 113 psi)

6) Hoist vehicle and remove right-side front wheel.
7) Connect special tool with rubber hose (1) to Front brake caliper bleeder plug (2).

Special tool
(A): 09956–02311



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8) When bleeder plug loosen and depress brake pedal to make special tool gauge reading 10 MPa (100 kg/cm², 1422 psi), check “Master Cyl Press” under “DATA LIST” of SUZUKI scan tool.
If pressure displayed on SUZUKI scan tool is out of specification, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification
Brake pedal depressed 10 MPa (100 kg/cm², 1422 psi): 10 ± 1.2 MPa (100 ± 12 kg/cm², 1422 ± 170 psi)

9) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.
10) Tighten bleeder plug and bleed air from brake system, referring to “Air Bleeding of Brake System in Section 4A”.

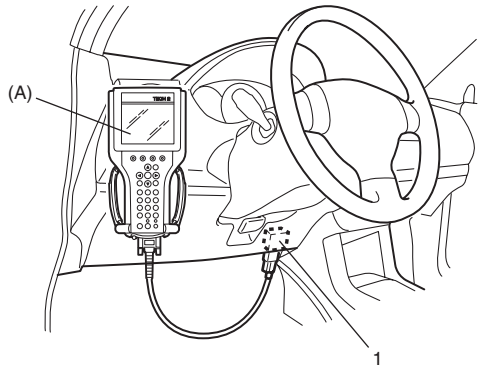
Yaw Rate / G Sensor Assembly On-Vehicle Inspection

S7N20A4606015

Lateral G Inspection

1) Calibrate yaw rate / G sensor assembly referring to “Sensor Calibration”.
2) Park and level the vehicle with parking brake and fix wheels with chokes.
3) Check yaw rate / G sensor assembly installation condition.
4) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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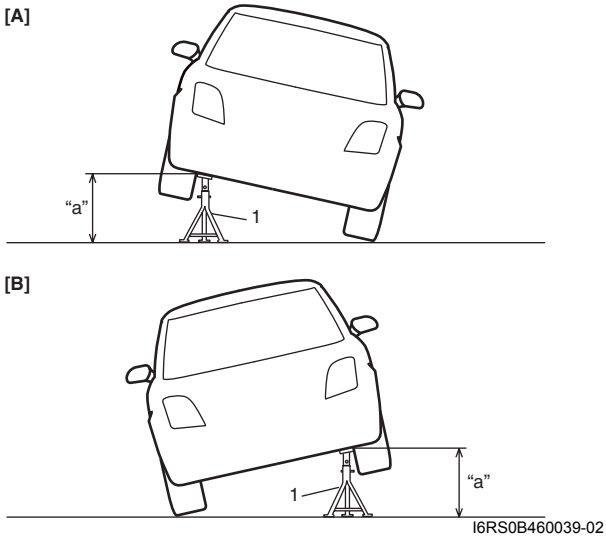
5) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
6) Check “G Sensor (lateral)” under “DATA LIST” of SUZUKI scan tool in the following vehicle conditions.
   - Level condition
   - Right-up condition
   - Left-up condition

   If Lateral G condition is out of specification, replace yaw rate / G sensor assembly.

Lateral G specification

Vehicle condition	G Sensor (lateral)
Level condition	**0 ± 0.1 G**
Right -up condition	**0.1 ± 0.1 G**
Left-up condition	**–0.1 ± 0.1 G**



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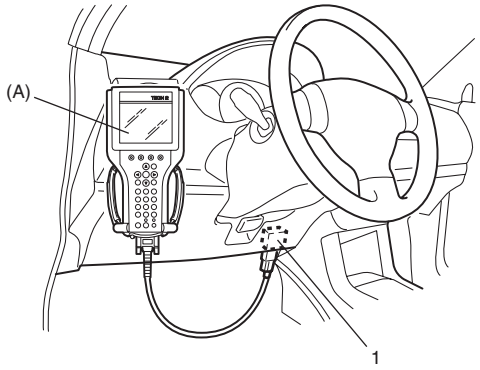
[A]: Right-up condition	“a”: Approx 350 mm (13.78 in.)
[B]: Left-up condition	1. Safety stand

Yaw Rate Inspection

1) Calibrate yaw rate / G sensor assembly referring to “Sensor Calibration”.
2) Check yaw rate / G sensor assembly installation condition.
3) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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4) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool. Refer to scan tool operator's manual for further derails.
5) Check “Yaw rate sensor” under “DATA LIST” of SUZUKI scan tool in the following vehicle conditions.
   - Parking condition
   - Drive vehicle in right turning condition with steering wheel fully turned
   - Drive vehicle in left turning condition with steering wheel fully turned

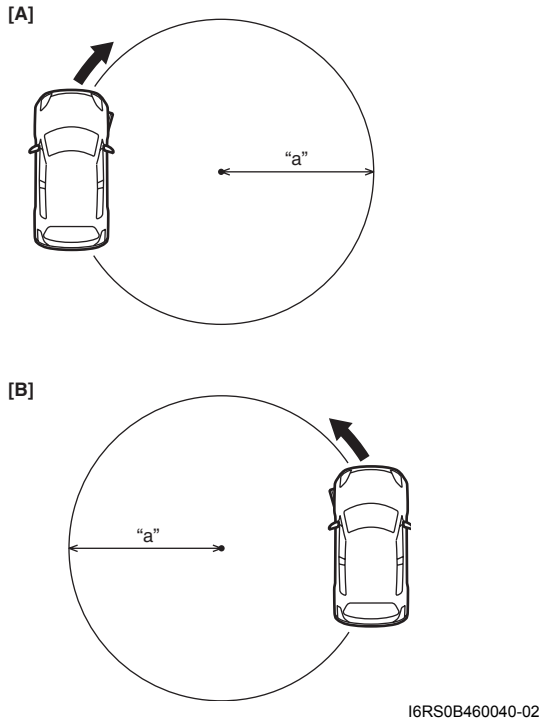
   If yaw rate condition is out of specification, replace yaw rate / G sensor assembly.

Yaw rate specification

Vehicle condition	Yaw rate
Parking	**0 ± 4 deg/s**
Right turning	**30 ± 4 deg/s**
Left turning	**–30 ± 4 deg/s**

NOTE

- **Drive the vehicle on level ground and at 10 km/h (6.2 mph).**
- **Minimum turning radius is 5.3 m (17.4 ft).**



I6RS0B460040-02

[A]: Right turning	“a”: Approx 5.3 m (17.4 ft.)
[B]: Left turning	

Yaw Rate / G Sensor Assembly Removal and Installation

S7N20A4606016

⚠ CAUTION

- **When yaw rate / G sensor assembly is replaced, ESP® control module needs zero calibration. Perform zero calibration by SUZUKI scan tool referring to “Sensor Calibration”.**
- **Regarding yaw rate / G sensor assembly removal/installation, confirm specified torque and never use impact wrench to avoid damage.**
- **When handling the yaw rate / G sensor assembly, be careful not to drop it or apply an impact to it.**
  If an excessive impact was applied, never attempt disassembly or repair but replace it with a new one.

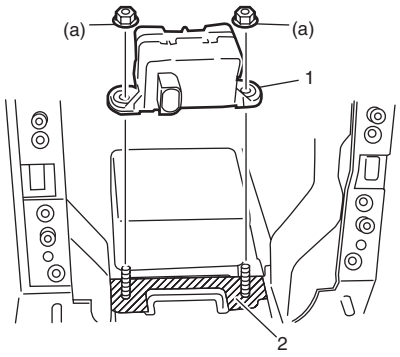
Removal

1) Disconnect negative (–) cable at battery.
2) Remove front console box referring to “Console Box Components in Section 9H”.
3) Disconnect connector from yaw rate / G sensor assembly.
4) Remove yaw rate / G sensor assembly from sensor bracket.

Installation

1) Before installing yaw rate / G sensor assembly (1), check installing condition as follows.
   - Deformations around sensor installation area (2) (in sensor bracket).
   - Foreign matters on mating surface between sensor and sensor bracket.
2) Install yaw rate / G sensor assembly (1) to floor panel.

   Tightening torque
   Yaw rate / G sensor assembly nut (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)



I6RS0B460041-02

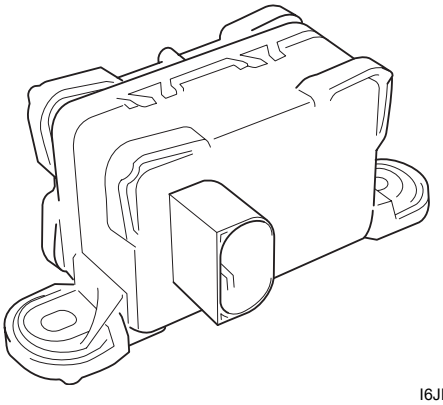
3) Connect connector to yaw rate / G sensor assembly.
4) Install console box referring to “Console Box Components in Section 9H”.
5) Connect negative (–) cable to battery.
6) After completing installation, calibrate yaw rate / G sensor assembly referring to “Sensor Calibration”.

Yaw Rate / G Sensor Inspection

S7N20A4606017

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

If it is found faulty, replace yaw rate / G sensor assembly.



I6JB01460031-01

Steering Angle Sensor On-Vehicle Inspection

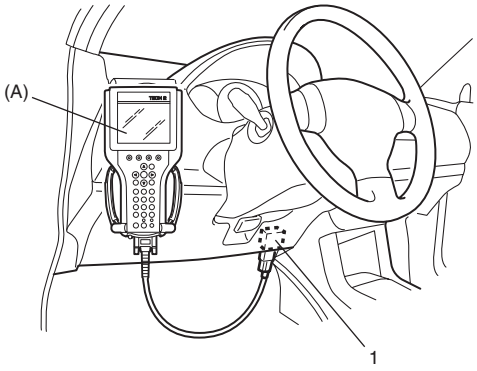
S7N20A4606018

⚠ CAUTION

Before each inspection, confirm steering angle sensor calibration is completed.
If calibration is incompleted, calibrate sensor referring to “Sensor Calibration”.

1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



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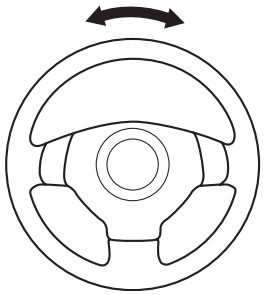
2) Turn ignition switch to ON position and select menu “DATA LIST” mode of SUZUKI scan tool.
Refer to scan tool operator's manual for further derails.
3) Check “Steering angle Sen” under “DATA LIST” of SUZUKI scan tool in the following steering wheel conditions.
   - Front wheels in straight-ahead position
   - Rotate steering wheel a round in clockwise (counter clockwise) from straight-ahead position

   If steering angle condition is out of specification, replace steering angle sensor.

Steering angle Specification

Vehicle condition	Steering angle
Front wheels in straight-ahead position	**0 ± 3°**
Rotate steering wheel a round in clockwise	**360 ± 3°**
Rotate steering wheel a round in counterclockwise	**–360 ± 3°**



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Steering Angle Sensor Removal and Installation

S7N20A4606019

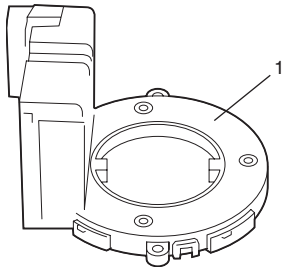
Refer to “Steering Angle Sensor Removal and Installation in Section 6B”.

Steering Angle Sensor Inspection

S7N20A4606020

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

If it is found faulty, replace steering angle sensor (1).



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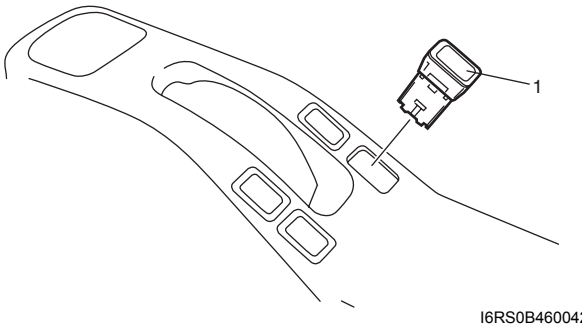
ESP® OFF Switch or TCSS OFF Switch Removal and Installation

S7N20A4606021

Removal

1) Disconnect negative (–) cable at battery.
2) Remove rear console box referring to “Console Box Components in Section 9H”.
3) Disconnect ESP® OFF switch or TCSS OFF switch connector.
4) Remove ESP® OFF switch or TCSS OFF switch (1) from rear console box (2).



I6RS0B460042-02

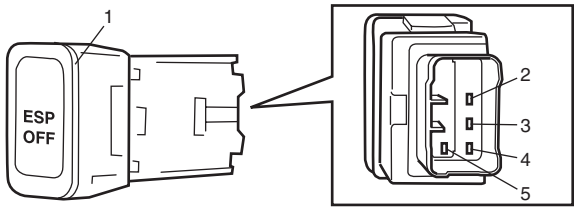
Installation

Reverse removal procedure.

ESP® OFF Switch or TCSS OFF Switch Inspection

S7N20A4606022

Check for continuity between terminals at each switch position.
If check result is not as specified, replace ESP® (TCSS) OFF switch (1) or TCSS OFF switch.



	2	3	4	5
[A]			○	○
[B]	○	○	○	○

I6RS0B460043-02

[A]: Free	[B]: Push

Specifications

Tightening Torque Specifications

S7N20A4607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake pipe flare nut	16	1.6	11.5	☞
Brake pipe flare nut	19	1.9	14.0	☞
ESP® hydraulic unit / control module assembly bolt	9	0.9	6.5	☞
ESP® hydraulic unit / control module assembly bracket bolt	25	2.5	18.0	☞
Rear wheel speed sensor bolt	11	1.1	8.0	☞
Rear wheel speed sensor harness clamp bolt	11	1.1	8.0	☞
Yaw rate / G sensor assembly nut	8	0.8	6.0	☞

NOTE

The specified tightening torque is also described in the following.
“ESP® Hydraulic Unit / Control Module Assembly Removal and Installation: ”

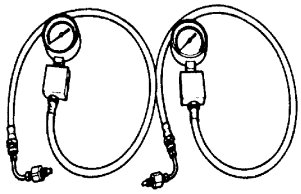
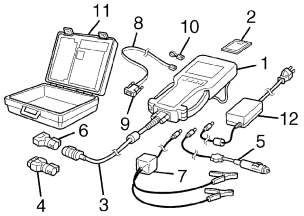
Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A4608001

09956–02311 Brake pressure gauge ☞		SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞	

Section 5

Transmission / Transaxle

CONTENTS

Precautions

Precautions

Precautions on Transmission / Transaxle

S7N20A5000001

Air Bag Warning
Refer to “Air Bag System Service Warning in Section 00”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble in Section 5A”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble in Section 5D”.

Precautions for Disassembly and Reassembly
Refer to “Precautions for Disassembly and Reassembly in Section 5A”.

Precaution for CAN Communication System
Refer to “Precaution for CAN Communication System in Section 00”.

Precautions for Electrical Circuit Service
Refer to “Precautions for Electrical Circuit Service in Section 00”.

Automatic Transmission/Transaxle

Precautions

Precautions in Diagnosing Trouble

S7N20A5100001

- Do not disconnect couplers from TCM, battery cable from battery, TCM ground wire harness from engine or main fuse before checking the diagnostic information (DTC, freeze frame data, etc.) stored in TCM memory. Such disconnection will clear memorized information in TCM memory.
- Diagnostic information stored in TCM memory can be cleared as well as checked by using SUZUKI scan tool or generic scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
  It is indistinguishable which module turns on MIL because not only ECM but also TCM turns on MIL. Therefore, check both ECM and TCM for DTC when MIL lights on.
  When checking TCM for DTC, keep in mind that DTC is displayed on the scan tool as follows depending on the scan tool used.
  - SUZUKI scan tool displays DTC detected by TCM.
  - Generic scan tool displays DTC detected by each of ECM and TCM simultaneously.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00" before inspection and observe what is written there.
- TCM and/or ECM replacement
  - When substituting a known-good TCM and/or ECM, check that all relays and actuators have resistance of specified value.
    Neglecting this check may result in damage to good TCM and/or ECM.
- Communication of ECUs, ECM, TCM and BCM is established by CAN (Controller Area Network). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00".

Precautions for Disassembly and Reassembly

S7N20A5100002

When repairing automatic transaxle, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.
Then whether overhaul should be done or not is determined. If the transaxle is disassembled without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.
As the automatic transaxle consists of high precision component, the following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Disassembling valve body assembly is prohibited essentially. However, a few parts can be disassembled. When disassembling valve body component parts, confirm whether their parts are allowed to disassemble or not referring to "Valve Body Assembly Disassembly and Reassembly".
- When component part of forward clutch, direct clutch, 2nd brake and/or O/D and 2nd coast brake, namely clutch disc, brake disc, retaining plate and/or separator plate, have been replaced, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized referring to "Learning Control Initialization".
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during dismounting and remounting.
- Select a clean place free from dust and dirt for overhauling.
- Place a rubber mat on the work bench to protect parts from damage.
- Work gloves or shop cloth should not be used. (Use a nylon cloth or a paper towel.)
- When separating the case joint, do not pry with a screwdriver or such but tap with a plastic hammer lightly.
- Make sure to wash dirt off from the transaxle so that no such dirt will enter the transaxle during disassembly and reassembly.
- Wash the disassembled parts in ATF (Automatic Transaxle Fluid) or kerosene (using care not to allow ATF or kerosene to get on your face, etc.) and confirm that each fluid passage is not clogged by blowing air into it. But use kerosene to wash the discs, resin washers and rubber parts.
- Replace each gasket, oil seal and O-ring with a new one.

- Apply ATF to sliding or rotating parts before reassembly.

⚠ CAUTION

- **Keep component parts in group for each subassembly and avoid mixing them up.**
- **Clean all parts with cleaning solvent thoroughly and air dry them.**
- **Use kerosene or automatic transaxle fluid as cleaning solvent.**
- **Do not use wiping cloths or rags to clean or dry parts.**
- **All oil passages should be blown out and checked to make sure that they are not obstructed.**
- **Keep face and eyes away from solvent spray while air blowing parts.**
- **Check mating surface for irregularities and remove them, if any, and clean it again.**
- **Soak new clutch discs and brake discs in transaxle fluid for at least 2 hours before assembly.**
- **Replace all gaskets and O-ring with new ones.**
- **Apply automatic transaxle fluid to all O-rings.**
- **When installing seal ring, be careful so that it is not expanded excessively, extruded or caught.**
- **Replace oil seals that are removed and apply grease to their lips.**
- **Before installing, be sure to apply automatic transaxle fluid to sliding, rolling and thrusting surface of all component part. Also after installation, make sure to check each part for proper operation.**
- **Always use torque wrench when tightening bolts.**

- A new discs should be soaked in ATF at least 2 hours before use.

Part Inspection and Correction Table

Part	Inspect for	Correction
Casted part, machined part	Small flaw, burr	Remove with oil stone.
	Deep or grooved flaw	Replace part.
	Clogged fluid passage	Clean with air or wire.
	Flaw on installing surface, residual gasket	Remove with oil stone or replace part.
	Crack	Replace part.
Bearing	Unsmooth rotation	Replace.
	Streak, pitting, flaw, crack	Replace.
Bushing, thrust washer	Flaw, burr, wear, burning	Replace.
Oil seal, gasket	Flawed or hardened seal ring	Replace.
	Worn seal ring on its periphery or side	Replace.
	Piston seal ring, oil seal, gasket, etc.	Replace.
Gear	Flaw, burr	Replace.
	Worn gear tooth	Replace.
Splined part	Burr, flaw, torsion	Correct with oil stone or replace.
Snap ring	Wear, flaw, distortion	Replace.
	No interference	Replace.
Thread	Burr	Replace.
	Damage	Replace.
Spring	Settling, sign of burning	Replace.
Friction plate	Wear, burning, distortion, damaged claw	Replace.
Separator plate, retaining plate	Wear, burning, distortion, damaged claw	Replace.
Sealing surface (where lip contacts)	Flaw, rough surface, stepped wear, foreign material	Replace.

General Description

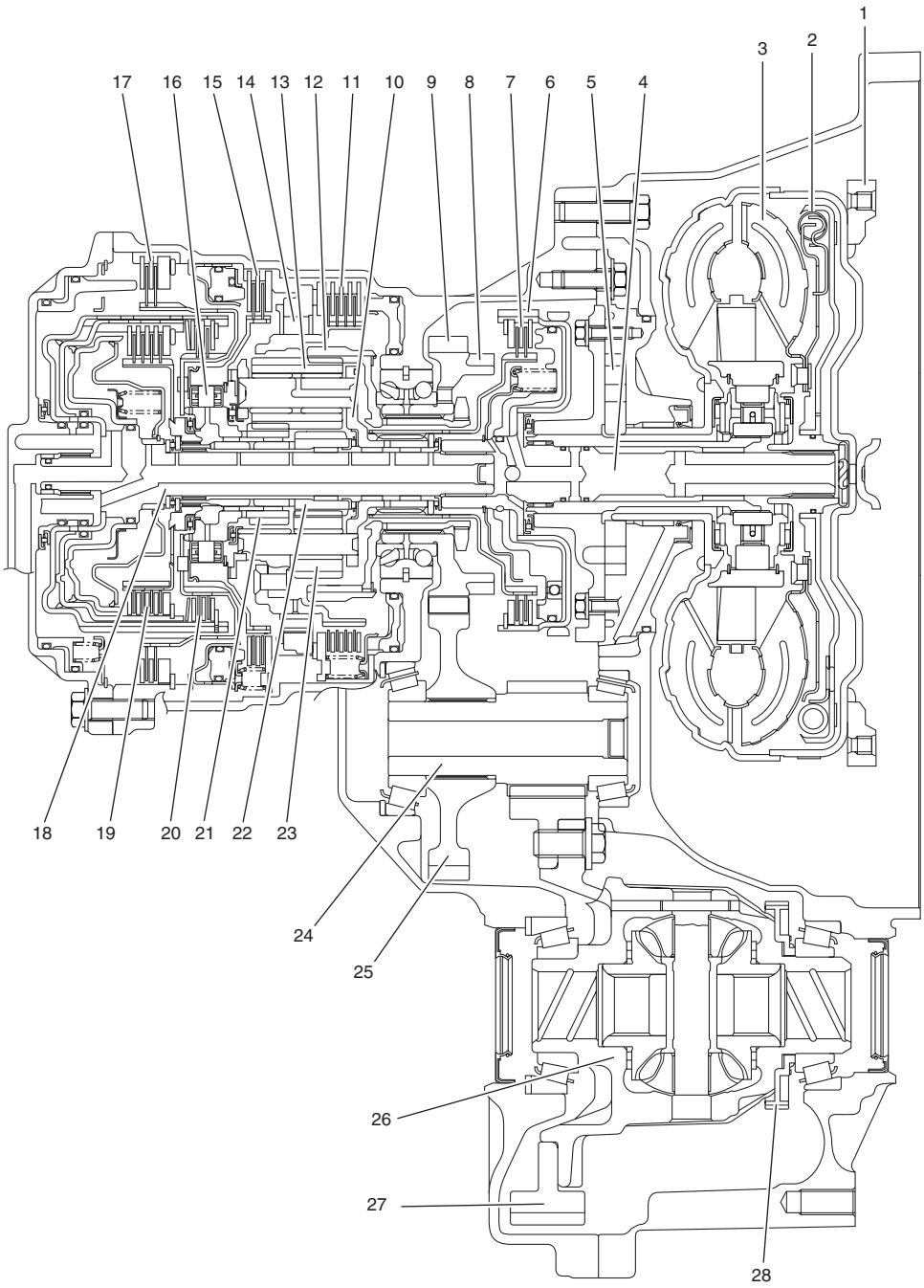
A/T Description

S7N20A5101001

This automatic transaxle is electronic control full automatic transaxle with forward 3-speed plus overdrive (O/D) and reverse 1-speed.
The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an automatically controlled lock-up mechanism.
The gear change device consists of a ravigneau type planetary gear unit, 3 multiple disc type clutches, 3 multiple disc type brakes and 2 one-way clutches.
The hydraulic pressure control device consists of a valve body assembly, pressure control solenoid valve (linear solenoid), 2 shift solenoid valves, TCC pressure control solenoid valve (linear solenoid) and a timing solenoid valve.
Optimum line pressure complying with engine torque is produced by the pressure control solenoid valve in dependence upon control signal from transmission control module (TCM). This makes it possible to control the line pressure with high accuracy in accordance with the engine power and running conditions to achieve smooth shifting characteristics and high efficiency.
A clutch-to-clutch control system is provided for shifting between 3rd gear and 4th gear. This clutch-to-clutch control system is made to function optimally, so that hydraulic pressure controls such as shown below are conducted.

- When upshifting from 3rd gear to 4th gear, to adjust the drain hydraulic pressure at releasing the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When downshifting from 4th gear to 3rd gear, to adjust the line pressure applied to the forward clutch at engaging the forward clutch, a timing solenoid valve is used to switch a hydraulic passage with an orifice to another during shifting.
- When upshifting from 3rd gear to 4th gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at releasing the forward clutch, the learning control is processed to compensate the switching timing of the timing solenoid at every shifting.
- When downshifting from 4th gear to 3rd gear with engine throttle opened, to optimize the line pressure applied to the forward clutch at engaging the forward clutch, the learning control is processed to compensate the line pressure at every shifting.

Employing the ravigneau type planetary gear unit and this clutch-to-clutch control system greatly simplifies the construction to make possible a lightweight and compact transaxle.
A line pressure learning control is conducted to provide optimum shifting time at every upshifting with engine throttle opened. If long upshifting time is detected, the subsequent line pressure applied during upshifting is intensified. On the contrary, if short upshifting time is detected, the subsequent line pressure applied during upshifting is weakened.
Slip controlled lock-up function
Even at a lower speed than when the TCC gets engaged completely, control over the TCC pressure control solenoid works to cause the TCC to slip (be engaged slightly), thereby improving the transmission efficiency. While such slip control is being executed, the oil pressure applied to the TCC is controlled by the TCC pressure control solenoid so that the difference between the engine speed and the input shaft speed becomes close to the specified value.
Also, during deceleration, the TCC is made to slip (be engaged slightly) to raise the engine speed and enlarge the fuel cut operation range so that better fuel consumption is achieved.
Due to this reason, it is absolutely necessary for the automatic transmission to use ATF suitable for slip control. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.



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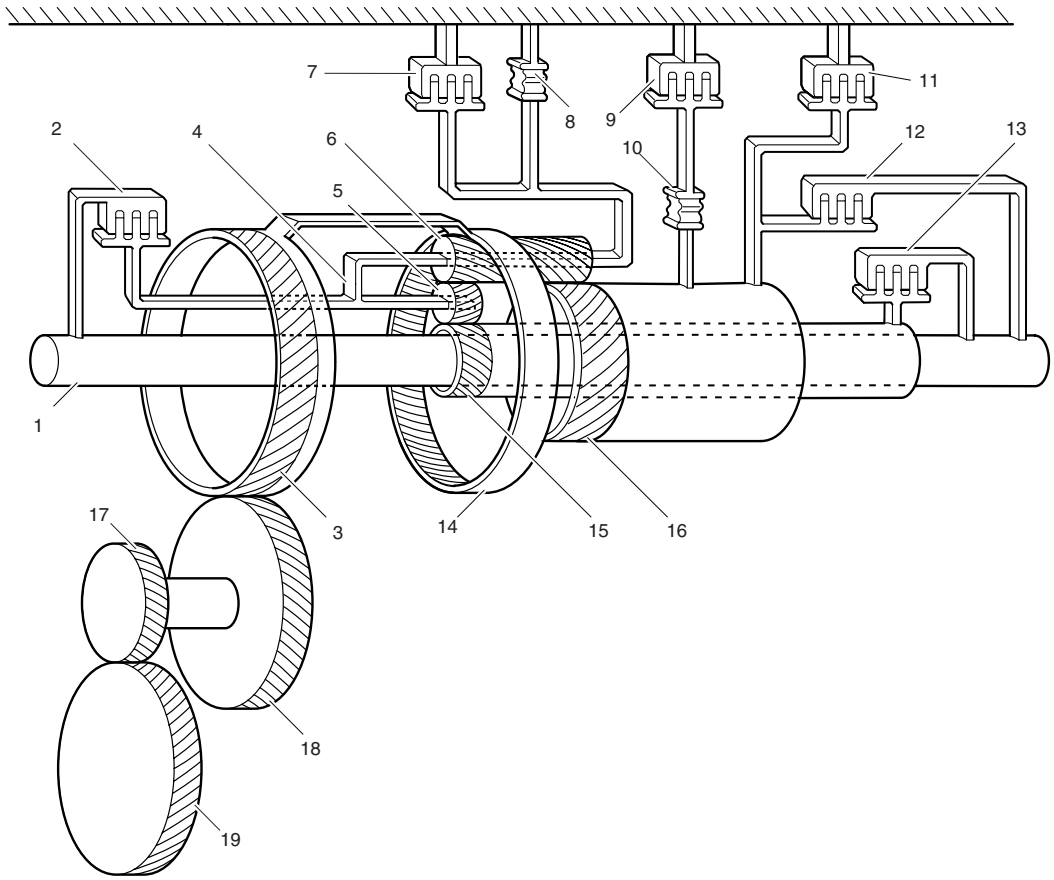
1. Drive plate	11. 1st and reverse brake	21. Rear sun gear
2. Torque converter clutch (TCC)	12. Ring gear	22. Front sun gear
3. Torque converter	13. Long planet pinion	23. Short planet pinion
4. Input shaft	14. One-way No.2 clutch	24. Countershaft
5. Oil pump	15. 2nd brake	25. Reduction driven gear
6. Direct clutch drum (double as sensor rotor for input shaft speed sensor)	16. One-way No.1 clutch	26. Differential case assembly
7. Direct clutch	17. O/D and 2nd coast brake	27. Final gear
8. Parking lock gear	18. Intermediate shaft	28. Output shaft speed sensor (VSS) drive gear
9. Reduction drive gear	19. Forward clutch	
10. Planet carrier	20. Reverse clutch	

Specifications

Item			Specifications	
Torque converter	Type Stall torque ratio		3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism) 1.9 – 2.1	
Oil pump	Type Drive system		Internal involute gear type oil pump (non crescent type) Engine driven	
Gear change device	Type		Forward 4-step, reverse 1-step planetary gear type	
	Shift position		“P” range	Gear in neutral, output shaft fixed, engine start
			“R” range	Reverse
			“N” range	Gear in neutral, engine start
			“D” range	Forward 1st ↔ 2nd ↔ 3rd ↔ 4th automatic gear change
			“3” range	Forward 1st ↔ 2nd ↔ 3rd ← 4th automatic gear change
			“2” range	Forward 1st ↔ 2nd ← 3rd automatic gear change
			“L” range	Forward 1st ← 2nd ← 3rd reduction, and fixed at 1st gear
	Gear ratio	1st	2.875	Number of teeth Front sun gear: 24 Rear sun gear: 30 Long planet pinion: 20 Short planet pinion: 19 Ring gear: 69
		2nd	1.568	
		3rd	1.000	
		4th (overdrive gear)	0.697	
		Reverse (reverse gear)	2.300	
	Control elements		Wet type multiple-disc clutch... 3 sets Wet type multiple-disc brake... 3 sets One-way clutch... 2 sets	
	Reduction gear ratio		1.023	
	Final gear reduction ratio		4.052	
Lubrication	Lubrication system		Force feed system by oil pump	
Cooling	Cooling system		Radiator assisted cooling (water-cooled)	
Fluid used			SUZUKI ATF 3317 or Mobil ATF 3309	

Clutch / Brake / Planetary Gear Function of Automatic Transaxle

S7N20A5101002



I4RS0A510001-01

1. Input shaft and intermediate shaft	8. One-way No.2 clutch	15. Front sun gear
2. Direct clutch	9. 2nd brake	16. Rear sun gear
3. Reduction drive gear	10. One-way No.1 clutch	17. Final drive gear
4. Planet carrier	11. O/D and 2nd coast brake	18. Reduction driven gear
5. Short planet pinion	12. Reverse clutch	19. Final driven gear
6. Long planet pinion	13. Forward clutch	
7. 1st and reverse brake	14. Ring gear	

Functions

Part name	Function
Forward clutch	Meshes intermediate shaft and front sun gear
Direct clutch	Meshes input shaft and planet carrier
Reverse clutch	Meshes intermediate shaft and rear sun gear
O/D and 2nd coast brake	Fixes rear sun gear
2nd brake	Fixes rear sun gear
1st and reverse brake	Fixes planet carrier
One-way No.1 clutch	Prevents rear sun gear from turning counterclockwise
One-way No.2 clutch	Prevents planet carrier from turning counterclockwise

Table of Component Operation

S7N20A5101003

Selector position	Gear position	Part					
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No.2)	TCC solenoid valve	Forward clutch	Direct clutch	Reverse clutch
P	Parking	○	○	×	×	×	×
R	Reverse	○	○	×	×	×	○
N	Neutral	○	○	×	×	×	×
D	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
	3rd	×	×	△	○	○	×
	4th	×	○	△	×	○	×
2	1st	○	○	×	○	×	×
	2nd	○	×	×	○	×	×
L	1st	○	○	×	○	×	×

Selector position	Gear position	Part				
		O/D and 2nd coast brake	2nd brake	1st and reverse brake	One-way No.1 clutch	One-way No.2 clutch
P	Parking	×	×	×	×	×
R	Reverse	×	×	○	×	×
N	Neutral	×	×	×	×	×
D	1st	×	×	×	×	○
	2nd	×	○	×	○	×
	3rd	×	○	×	×	×
	4th	○	○	×	×	×
2	1st	×	×	×	×	○
	2nd	○	○	×	○	×
L	1st	×	×	○	×	○

○: ON
×: OFF
△: ON only when TCC is operating

A/T Diagnosis General Description

S7N20A5101004

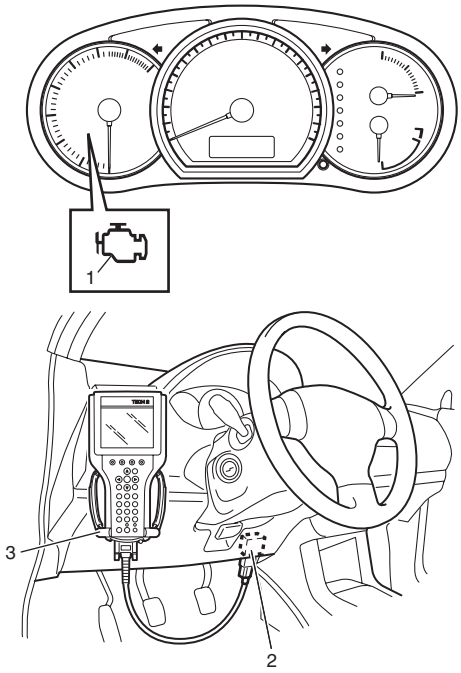
This vehicle is equipped with an electronic transaxle control system, which controls the automatic shift up and shift down timing, TCC operation, etc. suitably to vehicle driving conditions.
TCM has an On-Board Diagnosis System which detects a malfunction in this system.
When diagnosing a trouble in transaxle including this system, be sure to have full understanding of the outline of “On-Board Diagnostic System Description” and each item in “Precautions in Diagnosing Trouble” and execute diagnosis according to “A/T System Check” to obtain correct result smoothly.

On-Board Diagnostic System Description

S7N20A5101005

For automatic transaxle control system, TCM has the following functions.

- When TCM detects a malfunction in A/T control system, TCM desire turning on malfunction indicator lamp (MIL) (1) and stores malfunction DTC in TCM memory.
- It is possible to communicate with TCM through data link connector (DLC) (2) by using scan tool (3). (Diagnostic information can be checked and erased by using 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.

2 Driving Cycles Detection Logic

The malfunction detected in the first driving cycle is stored in TCM memory (in the form of pending DTC and freeze frame data) but the malfunction indicator lamp (MIL) does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

Pending DTC

Pending DTC means a DTC detected and stored temporarily at 1 driving cycle of the DTC which is detected in the 2 driving cycle detection logic.

CAN Communication System Description

S7N20A5101006

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. Communication of ECM, TCM, BCM and combination meter, is established by CAN. But, in communication between TCM and combination meter, data is transmitted only from TCM to combination meter. (Combination meter does not transmit data to TCM.) TCM transmission data is as follows.

TCM Transmission Data

				ECM	BCM	Combination Meter
TCM	Transmit	DATA	Torque down iginition delay request	○		
			Coast slip control signal	○		
			Vehicle speed pulse	○		
			TCM data validity	○		
			Transmission emissions related malfunction active			○
			Transmission gear selector position	○	○	○
			Transmission actual gear	○		

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TCM Reception Data

				ECM	BCM
TCM	Receive	DATA	Engine torque driver request	○	
			Engine speed	○	
			4th gear inhibit	○	
			Torque converter clutch control inhibit	○	
			Lock up/ slip control inhibit signal	○	
			Throttle position	○	
			Engine coolant temperature	○	
			Brake pedal switch active	○	
			"3" position switch active		○
			Stand by to engage air conditioning compressor clutch	○	

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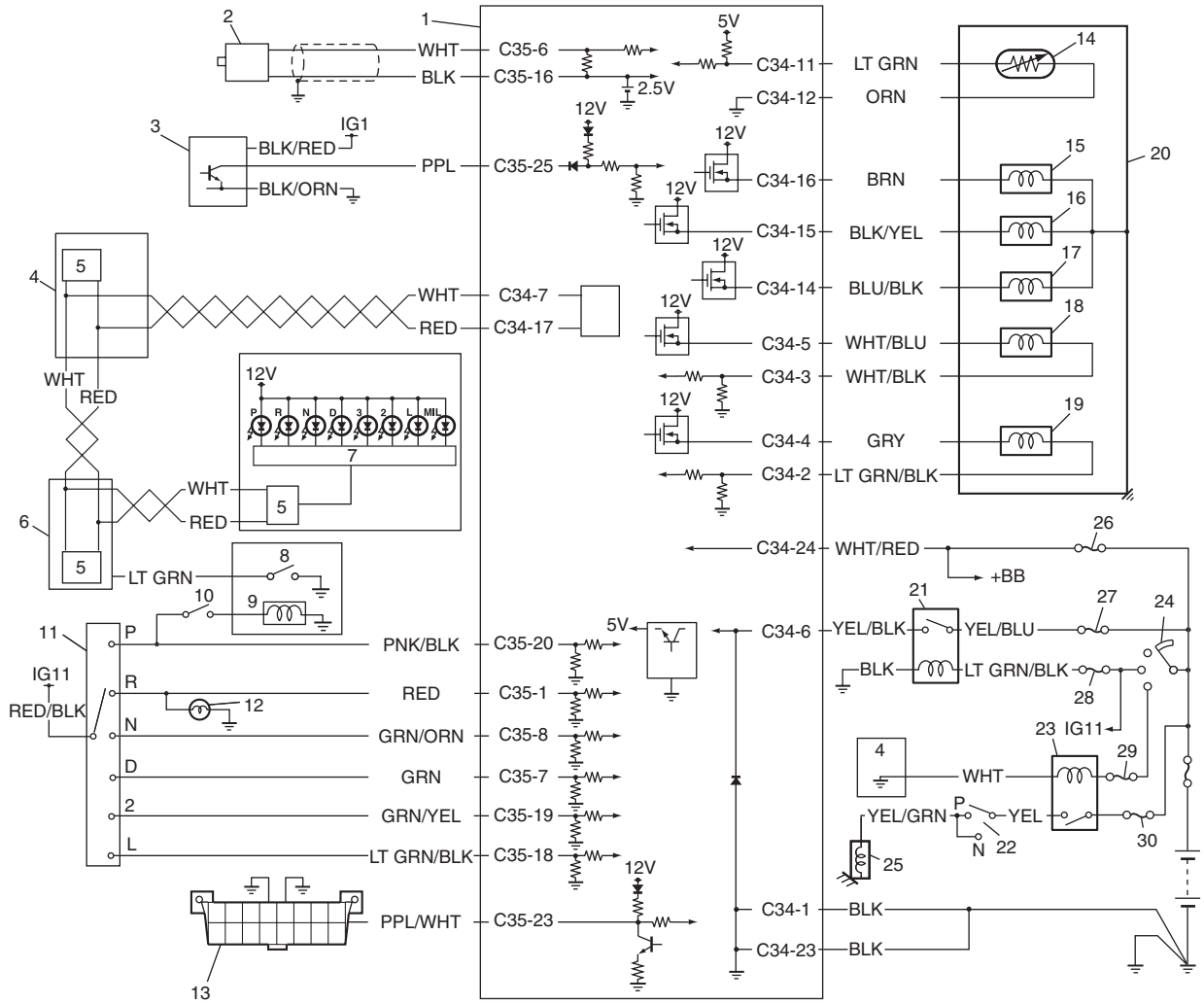
Schematic and Routing Diagram

Transmission Control Module (TCM) Wiring Diagram

S7N20A5102001



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1. TCM	12. Backup lamp	23. Starter motor relay
2. Input shaft speed sensor	13. Data link connector DLC	24. Ignition switch
3. Output shaft speed sensor / VSS	14. Transmission fluid temperature sensor	25. Starter motor
4. ECM	15. Shift solenoid valve-A (No.1)	26. “DOME” fuse
5. CAN driver	16. Shift solenoid valve-B (No.2)	27. “AT ETM” fuse
6. BCM	17. Timing solenoid valve	28. “IG SIG” fuse
7. Meter driver	18. TCC lock-up pressure control solenoid valve	29. “ST SIG” fuse
8. “3” position switch	19. Pressure control solenoid valve	30. “ST MOT” fuse
9. Shift lock solenoid	20. A/T	[A]: Terminal arrangement of TCM connector (viewed from harness side)
10. Brake light switch	21. A/T relay	
11. Transmission range sensor	22. Inhibitor switch (including transmission range sensor)	

Operation of Shift Solenoid Valves, Timing Solenoid Valve and TCC Solenoid Valve

Selector position	Gear position	Solenoid				Condition
		Shift solenoid valve-A (No.1)	Shift solenoid valve-B (No. 2)	Timing solenoid valve	TCC solenoid valve	
P	Parking	○	○	×	×	
R	Reverse	○	○	×	×	When vehicle is traveling forwards in less than 9 km/h, 6 mile/h vehicle speed
		○	○	○	×	When vehicle is traveling forwards in 9 km/h, 6 mile/h or more vehicle speed
	(Reverse)	×	×	×	×	When fail-safe function is operating
N	Neutral	○	○	×	×	
D	Neutral → 1st	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	1st	○	○	×	×	
	2nd	○	×	×	×	
	3rd	×	×	×	△	
	3rd ↔ 4th	—	—	○	—	Timing solenoid is turned ON for about 0.5 sec. while on gear shifting
	4th	×	○	×	△	
	(3rd)	×	×	×	×	When fail-safe function is operating
2	1st	○	○	×	×	
	2nd	○	×	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating
L	1st	○	○	×	×	
	(3rd)	×	×	×	×	When fail-safe function is operating

○: ON (Turn power ON)
×: OFF (Turn power OFF)
△: ON only when TCC is operating

	Valve status	
	Turn power ON	Turn power OFF
Shift solenoid valve-A (No.1)	Close	Open
Shift solenoid valve-B (No.2)	Close	Open
Timing solenoid	Open	Close
TCC (lock-up) pressure control solenoid	Close	Open

Automatic Gear Shift Table

S7N20A5102002

Automatic gear shift schedule is shown in the following table. Test-drive the vehicle on a flat road in the D position.

1.Shift Point in D, 3 and/or 2 position

	Throttle opening (%)	Shift	Vehicle speed km/h (mph)	Remark
UP shift	Over 85%	1st → 2nd	47 – 52 (29 – 32)	
		2nd → 3rd	95 – 100 (59 – 62)	
		3rd → 4th	152 – 157 (94 – 98)	
	50%	1st → 2nd	15 – 20 (9 – 12)	
		2nd → 3rd	46 – 51 (29 – 32)	
		3rd → 4th	86 – 91 (53 – 57)	
	10%	1st → 2nd	10 – 15 (6 – 9)	
		2nd → 3rd	29 – 34 (18 – 21)	
		3rd → 4th	43 – 48 (27 – 30)	
DOWN shift	Over 90%	4th → 3rd	137 – 142 (85 – 88)	
		3rd → 2nd	83 – 88 (52 – 55)	
		2nd → 1st	33 – 38 (21 – 24)	
	50%	4th → 3rd	64 – 69 (40 – 43)	
		3rd → 2nd	31 – 36 (19 – 22)	
		2nd → 1st	8 – 13 (5 – 8)	
	0%	4th → 3rd	28 – 33 (17 – 21)	
		3rd → 2nd	17 – 22 (11 – 14)	
		2nd → 1st	8 – 13 (5 – 8)	

2. Lock-up point in D and/or 3 position

	Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
3rd gear lock-up	ON	Over 80%	152 – 157 (94 – 98)	
		50%	86 – 91 (53 – 57)	
	OFF	Over 90%	108 – 113 (67 – 70)	
		50%	55 – 60 (34 – 37)	
4th gear lock-up	ON	Over 80%	255 (158)	Except throttle opening shift from low to high at vehicle speed 148 km/h (92 mph) or more with Lock-up ON condition.
		55%	118 – 123 (73 – 76)	
	OFF	Over 95%	146 – 151 (91 – 94)	
		50%	96 – 101 (60 – 63)	

3. Slip lock-up point in D and/or 3 position

	Slip Lock-up clutch status	Throttle opening (%)	Vehicle speed km/h (mph)	Remark
2nd gear	Slip ON	15%	19 – 24 (12 – 15)	• D, 3 range
	Slip OFF	15%	18 – 23 (11 – 14)	• Without lock-up condition
3rd gear	Slip ON	15%	30 – 35 (19 – 22)	• D, 3 range
	Slip OFF	15%	28 – 33 (17 – 21)	• Without lock-up condition
4th gear	Slip ON	15%	44 – 49 (27 – 30)	• D range
	Slip OFF	15%	41 – 46 (25 – 29)	• Without lock-up condition

Component Location

Electronic Shift Control System Components Location

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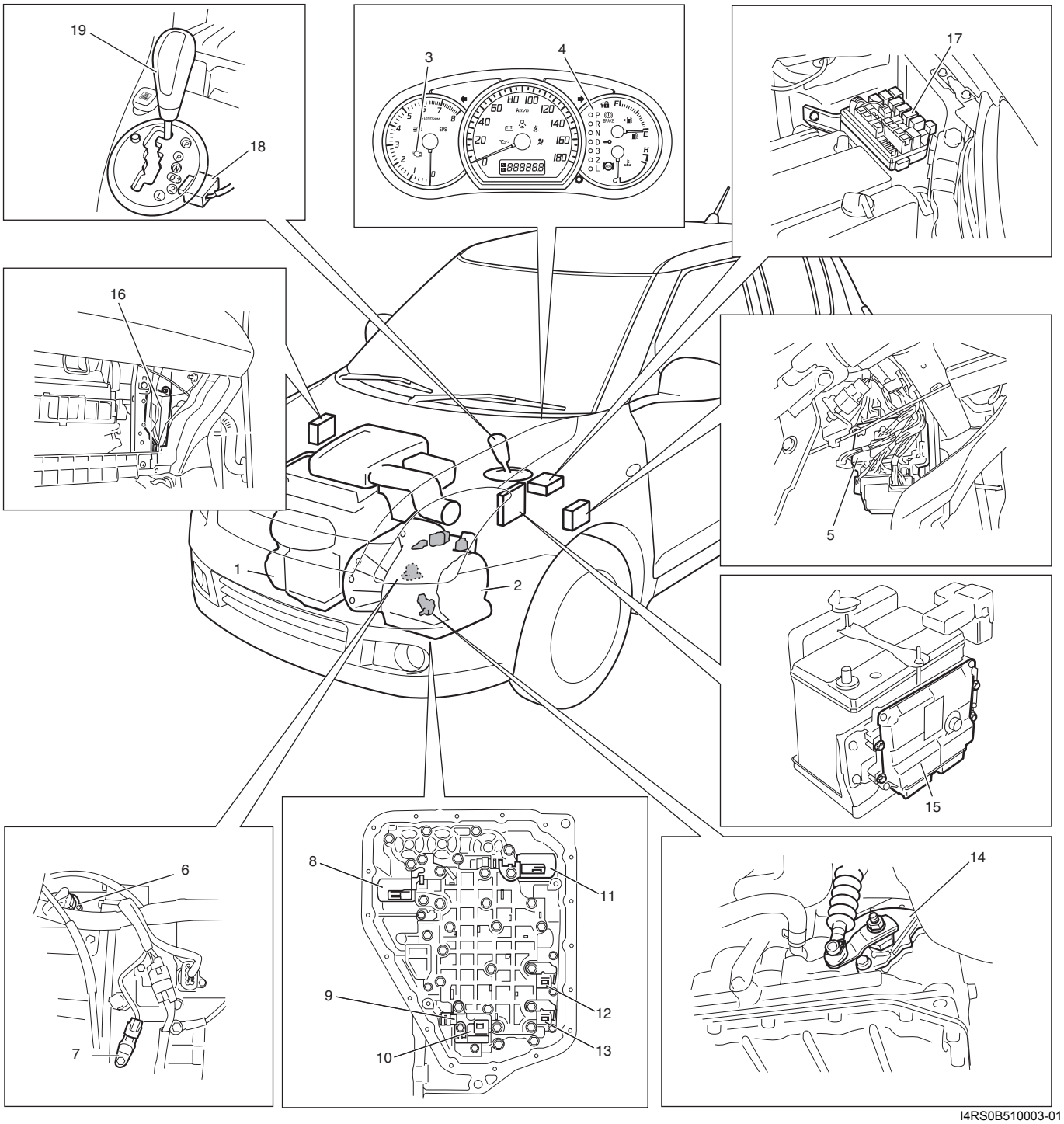

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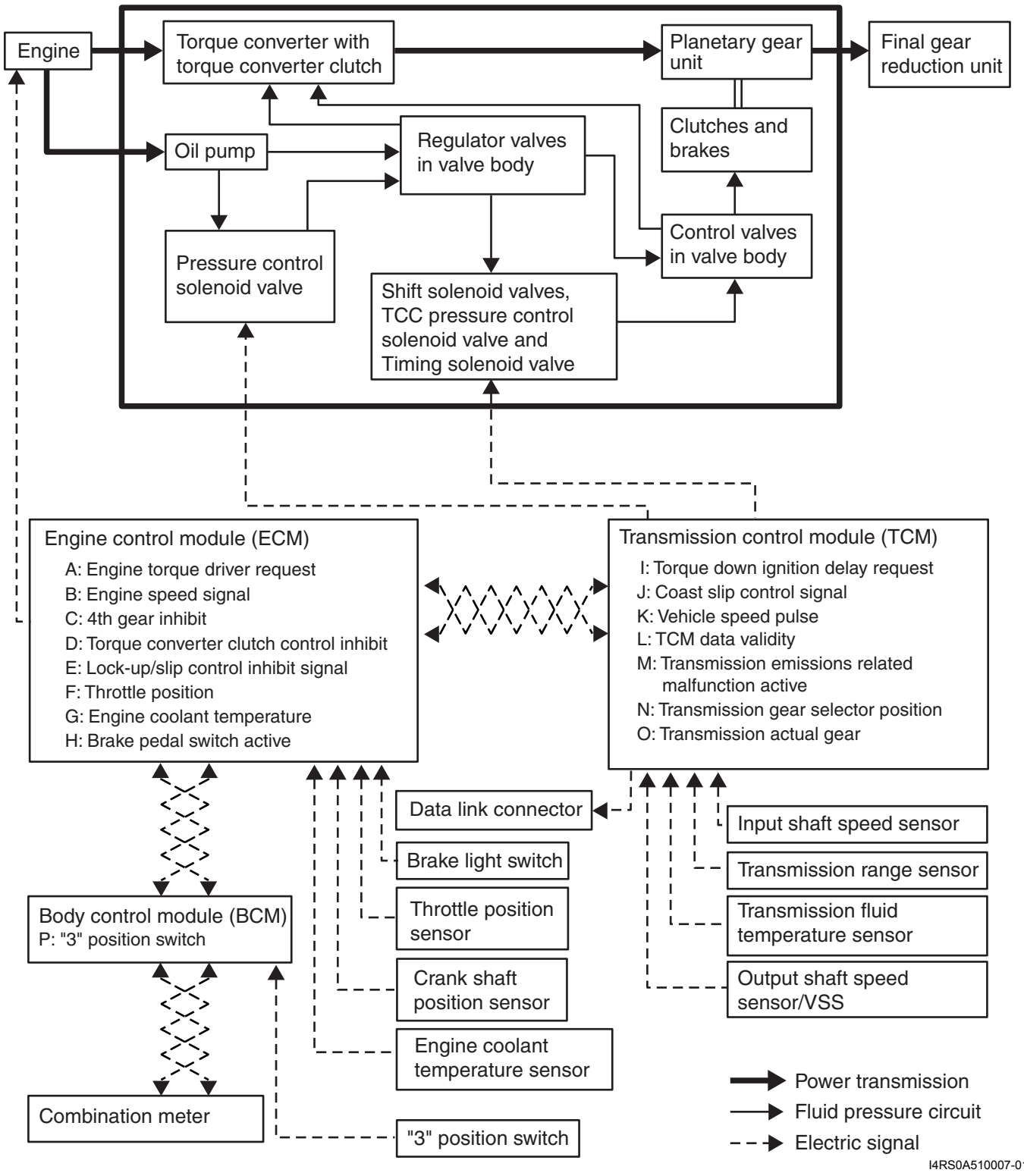
1. Engine	8. TCC pressure control solenoid valve	15. ECM
2. Transaxle	9. Transmission fluid temperature sensor	16. TCM
3. MIL	10. Timing solenoid valve	17. AT relay
4. Shift position indicator lamp	11. Pressure control solenoid valve	18. “3” position switch
5. Junction block assembly (included in BCM)	12. Shift solenoid valve-B (No.2)	19. Select lever
6. Output shaft speed sensor (VSS)	13. Shift solenoid valve-A (No.1)	
7. Input shaft speed sensor	14. Transmission range sensor	


Engine
Torque converter with torque converter clutch
Planetary gear unit
Final gear reduction unit
Clutches and brakes
Oil pump
Regulator valves in valve body
Control valves in valve body
Pressure control solenoid valve
Shift solenoid valves, TCC pressure control solenoid valve and Timing solenoid valve
Engine control module (ECM)
A: Engine torque driver request
B: Engine speed signal
C: 4th gear inhibit
D: Torque converter clutch control inhibit
E: Lock-up/slip control inhibit signal
F: Throttle position
G: Engine coolant temperature
H: Brake pedal switch active
Transmission control module (TCM)
I: Torque down ignition delay request
J: Coast slip control signal
K: Vehicle speed pulse
L: TCM data validity
M: Transmission emissions related malfunction active
N: Transmission gear selector position
O: Transmission actual gear
Data link connector
Brake light switch
Throttle position sensor
Crank shaft position sensor
Engine coolant temperature sensor
Input shaft speed sensor
Transmission range sensor
Transmission fluid temperature sensor
Output shaft speed sensor/VSS
Body control module (BCM)
P: "3" position switch
Combination meter
"3" position switch
Power transmission
Fluid pressure circuit
Electric signal
I4RS0A510007-01

Diagnostic Information and Procedures

A/T System Check

S7N20A5104001

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

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *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. *Is there any DTC(s)?*	Print DTC or write them down and clear them by referring to “DTC Clearance”. Go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC referring to “DTC Check”. *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 referring to “DTC Check”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **A/T basic check and A/T symptom diagnosis** 1) Check and repair according to “A/T Basic Check” and “A/T Symptom Diagnosis”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
10	☞ **Check for intermittent problems** 1) Check for intermittent problems. *Is there any faulty condition?*	Repair or replace malfunction part(s). Go to Step 11.	Go to Step 11.
11	☞ **Final confirmation test** 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 such as 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.

Customer problem inspection form (Example)

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

PROBLEM SYMPTOMS
☐ Vehicle does not move (R, D, 2, L or any range)
☐ No upshift automatically (☐ 1st to 2nd ☐ 2nd to 3rd ☐ 3rd to 4th (O/D) ☐ 2 range ☐ D range)
☐ No downshift automatically (☐ 3rd to 2nd ☐ 2nd to 1st ☐ 4th (O/D) to 3rd ☐ 2 range ☐ D range)
☐ No gear change manually (☐ 1st ↔ 3rd ☐ 3rd ↔ 4th)
☐ TCC no lock-up ☐ TCC no lock-up off
☐ Automatic shift point too high or too low
☐ Excessive gear change shock (1st/2nd/3rd/4th (O/D)/Reverse)
☐ No kickdown
☐ Transmission slipping in (1st/2nd/3rd/4th (O/D)/Reverse)
☐ 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) O/D cut switch (☐ ON/ ☐ OFF)
Vehicle condition	☐ At stop/ ☐ During driving (☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Braking) ☐ Right hand corner ☐ Left hand corner ☐ Vehicle speed (km/h mile/h) ☐ Other _____

"O/D OFF" lamp	☐ Blink ☐ 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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NOTE

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

Step 2. DTC / Freeze Frame Data Check, Record and Clearance
First, referring to “DTC Check”, check DTC and pending DTC. If DTC exists, print or write down DTC and freeze frame data and then clear malfunction DTC(s) by referring to “DTC Clearance”. Malfunction DTC indicates malfunction in the system but it is not possible to know from it whether the malfunction is occurring now or it occurred in the past and normal condition has been restored. In order to know that, check symptom in question according to Step 5 and then recheck DTC according to Step 6.
Diagnosing a trouble based on the DTC in this step only or failure to clear the DTC in this step may result in an faulty diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting which is otherwise unnecessary.

Step 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 and automatic transaxle referring to “Visual Inspection”.

Step 5. Trouble Symptom Confirmation
Check trouble symptoms based on information obtained in “Step 1. Customer Complaint Analysis: ” and “Step 2. DTC / Freeze Frame Data Check, Record and Clearance: ”.
Also, reconfirm DTC according to “DTC Confirmation Procedure” described in each DTC flow.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data
Refer to “DTC Check” for checking procedure.

Step 8. A/T Basic Check and A/T Symptom Diagnosis
Perform basic check of A/T according to “A/T Basic Check” first. When the end of the flow has been reached, check the parts of the system suspected as a possible cause referring to “A/T Symptom Diagnosis” and based on symptoms appearing on the vehicle (symptoms obtained through steps of customer complaint analysis, trouble symptom confirmation and/or A/T basic check) and repair or replace faulty parts, if any.

Step 9. Troubleshooting for DTC
Based on the DTC indicated in Step 6 / 7 and referring to “applicable DTC flow”, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, TCM or other part and repair or replace faulty parts.

Step 10. Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g. wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection in Section 00” and related circuit of DTC recorded in Step 2.

Step 11. Final Confirmation Test
Confirm that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and check to ensure that no malfunction DTC is indicated.

Visual Inspection

S7N20A5104002

Visually check the following parts and systems.

Inspection item	Referring
• A/T fluid ----- level, leakage, color	"Automatic Transaxle Fluid Level Inspection in Section 0B"
• A/T fluid hoses ----- disconnection, looseness, deterioration	"A/T Fluid Cooler Hoses Replacement"
• A/T select cable ----- installation	"Select Cable Removal and Installation"
• Engine oil ----- level, leakage	"Engine Oil and Filter Change (Petrol Engine) in Section 0B"
• Engine coolant ----- level, leakage	"Engine Coolant Change (Petrol Engine) in Section 0B"
• Engine mountings ----- play, looseness, damage	"Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D"
• Suspension ----- play, looseness	"Suspension, Wheels and Tires Symptom Diagnosis in Section 2A"
• Drive shafts ----- damage	"Front Drive Shaft Assembly On-Vehicle Inspection in Section 3A"
• Battery ----- indicator condition, corrosion of terminal	"Battery Inspection: M13A / M15A / M16A in Section 1J"
• Connectors of electric wire harness ----- disconnection, friction	"Electronic Shift Control System Components Location"
• Fuses ----- burning	
• Parts ----- installation, damage	
• Bolts ----- looseness	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible.	
• Malfunction indicator lamp ----- Operation	"Malfunction Indicator Lamp (MIL) Check"
• Charge warning lamp ----- Operation	"Generator Symptom Diagnosis: M13A / M15A / M16A in Section 1J"
• Engine oil pressure warning lamp ----- Operation	"Oil Pressure Warning Light Symptom Diagnosis in Section 9C"
• Engine coolant temp. meter ----- Operation	"Engine Coolant Temperature (ECT) Meter Symptom Diagnosis in Section 9C"
• Other parts that can be checked visually	

Malfunction Indicator Lamp (MIL) Check

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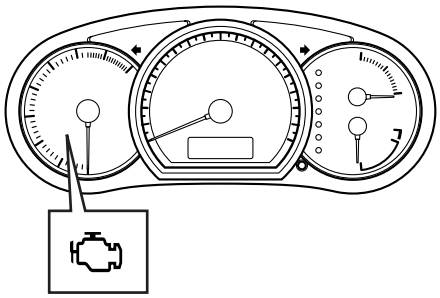
Refer to the same item in "Malfunction Indicator Lamp (MIL) Check: M13A / M15A / M16A in Section 1A" for checking procedure.



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DTC Table

S7N20A5104004

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ △P0602	Control module programming error	Data programming error.	*1
☞ P0705	Transmission range sensor circuit malfunction (PRNDL input)	Multiple signals are inputted simultaneously.	1 driving cycle
☞ P0707	Transmission range sensor circuit low	No sensor signal is inputted.	2 driving cycles
☞ P0711	Transmission fluid temperature sensor “A” circuit range / performance	Transmission temperature sensor signal is no change for specified time continuously.	2 driving cycles
☞ P0712	Transmission fluid temperature sensor circuit low	Sensor output voltage is too low.	1 driving cycle
☞ P0713	Transmission fluid temperature sensor circuit high	Sensor output voltage is too high.	1 driving cycle
☞ P0717	Input / Turbine speed sensor circuit no signal	No sensor signal is detected although output speed sensor signal is inputted.	1 driving cycle
☞ P0722	Output speed sensor circuit no signal	No sensor signal is inputted although input speed sensor signal is inputted.	1 driving cycle
☞ P0741	Torque converter clutch circuit performance or stuck off	Difference in revolution between engine and input shaft is too large although TCM is commanding TCC solenoid to turn ON.	2 driving cycles
☞ P0742	Torque converter clutch circuit stuck on	Difference in revolution between engine and input shaft is too small although TCM is commanding TCC solenoid to turn OFF.	2 driving cycles
☞ P0751	Shift solenoid-A (No.1) performance or stuck off	Actual gear position is 3rd gear although TCM command is for 2nd gear.	2 driving cycles
☞ P0752	Shift solenoid-A (No.1) stuck on	Actual gear position is 2nd gear although TCM command is for 3rd gear.	2 driving cycles
☞ P0756	Shift solenoid-B (No.2) performance or stuck off	Actual gear position is 3rd gear although TCM command is for 4th gear.	2 driving cycles
☞ P0757	Shift solenoid-B (No.2) stuck on	Actual gear position is 4th gear although TCM command is for 3rd gear.	2 driving cycles
☞ P0787	Shift / Timing solenoid control circuit low	Voltage of timing solenoid terminal is low although TCM is commanding timing solenoid to turn ON.	1 driving cycle
☞ P0788	Shift / Timing solenoid control circuit high	Voltage of timing solenoid terminal is high although TCM is commanding timing solenoid to turn OFF.	1 driving cycle
☞ P0961	Pressure control solenoid “A” control circuit range / performance	Difference between target current and monitor current of control solenoid valve circuit is more than specification.	1 driving cycle
☞ P0962	Pressure control solenoid control circuit low	No electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0963	Pressure control solenoid control circuit high	Too much electric flow is detected on pressure control solenoid circuit.	1 driving cycle
☞ P0973	Shift solenoid-A (No.1) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0974	Shift solenoid-A (No.1) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P0976	Shift solenoid-B (No.2) control circuit low	Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON.	1 driving cycle
☞ P0977	Shift solenoid-B (No.2) control circuit high	Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF.	1 driving cycle
☞ P1702	Internal control module memory check sum error	Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle when MIL lighted
☞ P1703	CAN invalid data - from other ECU(s)	TCM receives malfunction signal of throttle position, engine coolant temperature, engine revolution and engine torque from ECM.	*1
☞ △P1723	Range select switch malfunction	“3” position switch ON signal is inputted although transmission range switch signal is inputted P, R, N or L. range.	*1
☞ P1774	Control module communication bus off	Transmitting and receiving error detected to TCM for specified time continuously.	1 driving cycle
☞ P1777	TCM lost communication with ECM (Reception error)	Receiving error from ECM detected to TCM for specified time continuously.	1 driving cycle
☞ P1778	TCM lost communication with BCM (Reception error)	Receiving error from BCM detected to TCM for specified time continuously.	*1
☞ △P1878	Torque converter clutch shudder	Variation in the output revolution speed of the specified amplitude and specified cycle is detected under slip lock-up condition.	*1
☞ P2762	Torque converter clutch pressure control solenoid control circuit range / performance	Difference between target current and monitor current of TCC solenoid valve circuit is more than specification.	1 driving cycle
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	Too much electric flow is detected on TCC solenoid circuit.	1 driving cycle
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	No electric flow is detected on TCC solenoid circuit.	1 driving cycle

NOTE

- ***1: TCM does not desire turning on malfunction indicator lamp to ECM but DTC is stored in TCM memory. This item can not be read in detail by generic scan tool.**
- **With the OBD generic scan tool, DTC No. with delta (△) mark in the above table can not be read.**

DTC Check

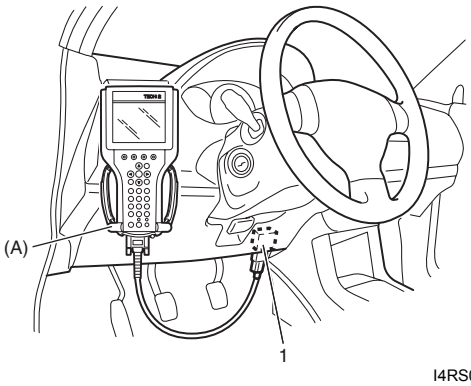
S7N20A5104005

NOTE

The MIL is turned on when the ECM and/or TCM detect malfunction(s). Each control module stores diagnostic information as the diagnostic trouble code (DTC) in its memory and outputs the DTC to the scan tool. Therefore, check both of the control modules for any DTC with the scan tool because the DTC stored in ECM and TCM is not read and displayed at a time. However, each of the control modules needs not to be checked with the generic scan tool because the DTC stored in ECM and TCM is read and displayed at a time. In case using generic scan tool, refer to "DTC Table: M13A / M15A / M16A in Section 1A".

1) Turn ignition switch to OFF position.
2) Connect scan tool to data link connector (DLC) (1).

Special tool
(A): SUZUKI scan tool



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3) Turn ignition switch ON.
4) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print it down. Refer to scan tool operator's manual for further details.
   If communication between scan tool and TCM is not possible, check if scan tool is communicable by connecting it to TCM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.

DTC Clearance

S7N20A5104006

⚠ WARNING

When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure.

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for "DTC Check".
2) Turn ignition switch ON.
3) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector (DLC).

NOTE

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

- **When power to TCM is cut off (by disconnecting battery cable, removing fuse or disconnecting TCM connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

Fail-Safe Table

S7N20A5104007

This function is provided by the safe mechanism that assures safe driveability even when the solenoid valve, sensor or its circuit fails. The following table shows the fail-safe function for each fail condition of sensor, solenoid or its circuit.

DTC No.	Trouble area	Fail-safe operation
☞ P0705	Transmission range sensor circuit malfunction (PRNDL input)	• Selected range is set in priority order shown below. D> 2> L> R> N> P • Slip controlled lock-up function is inhibited to operate. • Learning control is inhibited.
☞ P0707	Transmission range sensor circuit low	• Selected range is assumed to be “D” range. • Slip controlled lock-up function is inhibited to operate. • Learning control is inhibited.
☞ P0712 ☞ P0713	Transmission fluid temperature sensor circuit low	• A/T fluid temperature is assumed to be 200 °C (392 °F). • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0717	Input / Turbine speed sensor circuit no signal	• Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0722	Output speed sensor circuit no signal	• Vehicle speed which is calculated by input shaft speed sensor signal is used for gear shifting control instead of vehicle speed calculated by output shaft speed sensor (VSS) signal. • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P0787	Shift / Timing solenoid Control Circuit Low	• Power supply for all solenoid valves is cut. • Gear position is fixed in 3rd gear. • Line pressure control at gear shifting is inhibited. • Look-up function is inhibited to operate.
☞ P0788	Shift / Timing solenoid Control Circuit High	
☞ P0962	Pressure control solenoid control circuit low	
☞ P0963	Pressure control solenoid control circuit high	
☞ P0973	Shift solenoid-A (No.1) control circuit low	
☞ P0974	Shift solenoid-A (No.1) control circuit high	
☞ P0976	Shift solenoid-B (No.2) control circuit low	
☞ P0977	Shift solenoid-B (No.2) control circuit high	
☞ P0961	Pressure control solenoid “A” control circuit range / performance	
☞ P1702	Internal control module memory check sum error	• Power supply for all solenoid valves is cut. • Gear position is fixed in 3rd gear. • Line pressure control at gear shifting is inhibited. • Lock-up function is inhibited to operate.

DTC No.	Trouble area	Fail-safe operation
☞ P1703	CAN invalid data - TCM	In case of throttle position signal malfunction: • Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Garage shift control is inhibited. • Learning control is inhibited. In case of engine coolant temperature signal malfunction: • Slip controlled lock-up function is inhibited to operate. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be normal operating temperature, and controls of overdrive and lock-up is released from inhibition. In case of engine revolution signal malfunction: • Upshifting to 4th gear is inhibited. • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Garage shift control is inhibited. • Learning control is inhibited. In case of engine torque signal malfunction: • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Learning control is inhibited.
☞ P1723	Range select switch malfunction	“3” position switch is assumed to be OFF.
☞ P1774	Control module communication bus off	• Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Engine revolution is assumed to be 0 RPM. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.

DTC No.	Trouble area	Fail-safe operation
☞ P1777	TCM lost communication with ECM (Reception error)	• Throttle opening used for line pressure control is assumed to be 100%. • Throttle opening used for gear shifting control is assumed to be 0%. • Engine revolution is assumed to be 0 RPM. • After 15 minutes pass from detecting malfunction, engine coolant temperature is assumed to be 90 °C (194 °F). • Lock-up function is inhibited to operate. • Line pressure control at gear shifting is inhibited. • Torque reducing request to ECM (torque reduction control) is inhibited. • Upshifting to 4th gear is inhibited. • Garage shift control is inhibited. • Learning control is inhibited.
☞ P1778	TCM lost communication with BCM (Reception error)	"3" position switch is assumed to be OFF.
☞ P1878	Torque converter clutch shudder	Slip controlled lock-up function is inhibited to operate.
☞ P2762	Torque converter clutch pressure control solenoid control circuit range / performance	• Lock-up function is inhibited to operate. • Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F). • Vehicle speed is slower than 15 km/h (9 mile/h), gear position is fixed in 1st gear for prevention of engine stall.
☞ P2763	Torque converter clutch pressure control solenoid control circuit high	
☞ P2764	Torque converter clutch pressure control solenoid control circuit low	• Lock-up function is inhibited to operate. • Upshifting to 4th gear is inhibited when A/T fluid temperature is more than 150 °C (302 °F).

Scan Tool Data

S7N20A5104008

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 automatic transaxle or actuator is not operating (in the condition) as indicated by the scan tool.

NOTE

The following scan tool data related to automatic transaxle can be checked only by communicating with TCM.

Scan tool data	Vehicle condition		Normal condition / reference values
☞ GEAR POSITION	Ignition switch ON	Selector lever is in "P" position	P or N
		Selector lever is in "R" position	R
		Selector lever is in "N" position	P or N
		Selector lever is in "D" position	1
		Selector lever is in "3" position	1
		Selector lever is in "2" position	1
		Selector lever is in "L" position	1
☞ ENGINE SPEED	At engine idle speed		Engine idle speed is displayed
☞ INPUT SHAFT REVOLUTION	Ignition switch ON and engine stop		0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)		2300 RPM (displayed in increments of 50 rpm)
☞ OUTPUT SHAFT REVOLUTION	At vehicle stop		0 RPM
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear ("3" range)		2300 RPM (displayed in increments of 50 rpm)

Scan tool data	Vehicle condition		Normal condition / reference values
☞ BATTERY VOLTAGE	Ignition switch ON and engine stop		Battery voltage is displayed (8 – 16 V)
☞ ATF TEMPERATURE	After driving at 60 km/h (37.5 mile/h) for 15 minutes or more, and A/T fluid temperature around sensor reaches 70 – 80 °C (158 – 176 °F)		70 – 80 °C (158 – 176 °F)
☞ SHIFT SOLENOID-A COMMAND	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		OFF
☞ SHIFT SOLENOID-A MONITOR	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		OFF
☞ SHIFT SOLENOID-B COMMAND	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		OFF
☞ SHIFT SOLENOID-B MONITOR	At vehicle stop		ON
	At 60 km/h (37.5 mile/h) constant speed, 20% or less throttle opening and 3rd gear (“3” range)		OFF
☞ TIMING SOLENOID COMMAND	Ignition switch ON and selector lever is in “N” range		OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting “N” to “D”		ON
☞ TIMING SOLENOID MONITOR	Ignition switch ON and selector lever is in “N” range		OFF
	For about 0.5 sec. while on gear shifting between 3rd and 4th or gear shifting “N” to “D”		ON
☞ TCC SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear		0%
☞ PRESSURE CONTROL SOLENOID	At vehicle stop, closed throttle, engine idle speed and 1st gear		0%
☞ VEHICLE SPEED	At vehicle stop		0 km/h, 0 MPH
☞ O/D OFF SWITCH	Ignition switch ON	Shift selector lever to “3” or “2” range	ON
		Shift selector lever to other above range	OFF
☞ TRANSAXLE RANGE	Ignition switch ON	Selector lever is in “P” position	P
		Selector lever is in “R” position	R
		Selector lever is in “N” position	N
		Selector lever is in “D” position	D
		Selector lever is in “3” position	D
		Selector lever is in “2” position	2
		Selector lever is in “L” position	L
☞ D RANGE SIGNAL	Ignition switch ON	Selector lever is in “P” position	OFF
		Selector lever is in “R” position	ON
		Selector lever is in “N” position	OFF
		Selector lever is in “D” position	ON
		Selector lever is in “3” position	ON
		Selector lever is in “2” position	ON
		Selector lever is in “L” position	ON
☞ THROTTLE POSITION	Ignition switch ON	Accelerator pedal is depressed	0 – 100% (Varies depending on depressed value)
		Accelerator pedal is released	0%
☞ BRAKE SWITCH	Ignition switch ON	Brake pedal is depressed	ON
		Brake pedal is released	OFF
☞ TORQUE REDUCTION SIGNAL	While on gear upshifting with 25% or more throttle opening		ON
	Under condition of not shifting gear		OFF
☞ ENGINE COOLANT TEMPERATURE	Ignition switch ON		Engine coolant temperature is displayed
☞ AIR CONDITIONER SIGNAL	Ignition switch ON and air conditioner switch OFF		OFF

Scan tool data	Vehicle condition	Normal condition / reference values
☞ ENGINE TORQUE SIGNAL	Ignition switch ON and engine stop	0 N·m
☞ SLIP RPM	Engine running at idle speed and selector lever is in "P" range	0 RPM
	Engine running, vehicle stop and selector lever is in "D" range	Engine speed is displayed
☞ MIL REQUEST	Ignition switch ON	OFF
☞ FUEL CUT FLAG	Ignition switch ON	OFF

Scan Tool Data Definitions:

GEAR POSITION
Current gear position computed by throttle position coming from ECM and vehicle speed.

ENGINE SPEED (RPM)
Engine speed computed by reference pulses from crankshaft position sensor.

INPUT SHAFT REVOLUTION (RPM)
Input shaft revolution computed by reference pulses coming from input shaft speed sensor on transaxle case.

OUTPUT SHAFT REVOLUTION (RPM)
Output shaft revolution computed by reference pulses coming from output shaft speed sensor (VSS) on transaxle case.

BATTERY VOLTAGE (V)
Battery voltage read by TCM as analog input signal by TCM.

ATF TEMPERATURE (°C, °F)
ATF temperature decided by signal from transmission fluid temperature sensor installed on valve body.

SHIFT SOLENOID-A COMMAND
ON: ON command being outputted to shift solenoid valve-A (No.1)
OFF: ON command not being outputted to shift solenoid valve-A (No.1)

SHIFT SOLENOID-A MONITOR
ON: Electricity being passed to shift solenoid valve-A (No.1)
OFF: Electricity not being passed to shift solenoid valve-A (No.1)

SHIFT SOLENOID-B COMMAND
ON: ON command being outputted to shift solenoid valve-B (No.2)
OFF: ON command not being outputted to shift solenoid valve-B (No.2)

SHIFT SOLENOID-B MONITOR
ON: Electricity being passed to shift solenoid valve-B (No.2)
OFF: Electricity not being passed to shift solenoid valve-B (No.2)

TIMING SOLENOID COMMAND
ON: ON command being outputted to timing solenoid valve
OFF: ON command not being outputted to timing solenoid valve

TIMING SOLENOID MONITOR
ON: Electricity being passed to timing solenoid valve
OFF: Electricity not being passed to timing solenoid valve

TCC SOLENOID
Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

PRESSURE CONTROL SOLENOID
Electric current value ratio between electric current value being outputted from TCM to solenoid and maximum value can be outputted by TCM.

VEHICLE SPEED (KPH/MPH)
Vehicle speed computed by reference pulse signals coming from vehicle speed sensor on transaxle case.

O/D OFF SWITCH ("3" position switch)
Inputted signal from "3" position switch in selector lever assembly.
ON: Shift selector lever to "3" or "2" range
OFF: Shift selector lever to other above range

TRANSAXLE RANGE
Transaxle range detected by signal fed from transmission range sensor.

D RANGE SIGNAL
ON: Signal which TCM require ECM to increase idle speed
OFF: Signal which TCM does not require ECM to increase idle speed

THROTTLE POSITION (%)
Throttle opening ratio computed by duty signal from ECM.

BRAKE SWITCH
Inputted signal from brake light switch on pedal bracket.
ON: Brake pedal depressed
OFF: Brake pedal released

TORQUE REDUCTION SIGNAL
ON: Signal which TCM require ECM to reduce output torque at shifting gear
OFF: Signal which TCM does not require ECM to reduce output torque

ENGINE COOLANT TEMPERATURE (°C, °F)
Engine coolant temperature computed by duty signal from ECM.

AIR CONDITIONER SIGNAL
ON: Signal which inform that air conditioner compressor is turned ON.
OFF: Signal which inform that air conditioner compressor is not turned ON.

ENGINE TORQUE SIGNAL (N·m)
Engine torque computed by duty pulse signal outputted from ECM.

SLIP RPM (RPM)
This parameter indicates slipping rotation in the torque converter (difference between input shaft rotation and engine rotation)

MIL REQUEST
ON: Signal which TCM requires combination meter to turn on malfunction indicator lamp.
OFF: Signal which TCM does not require combination meter to turn on malfunction indicator lamp.

FUEL CUT FLAG
ON: Signal which inform that fuel cut is operating.
OFF: Signal which inform that fuel cut is not operating.

A/T Basic Check

S7N20A5104009

This check is important for troubleshooting when TCM has detected no DTC and no abnormality has been noted in "Visual Inspection". Follow the flow carefully.

Step	Action	Yes	No
1	*Was "A/T System Check" preformed?*	Go to Step 2.	Go to "A/T System Check".
2	Perform "Road Test". *Is it OK?*	Go to Step 3.	Proceed to "Troubleshooting" in "Road Test".
3	Perform "Manual Road Test". *Is it OK?*	Go to Step 4.	Proceed to "Troubleshooting" in "Manual Road Test".
4	Perform "Engine Brake Test". *Is it OK?*	Go to Step 5.	Proceed to "Troubleshooting" in "Engine Brake Test".
5	Perform "Stall Test". *Is it OK?*	Go to Step 6.	Proceed to "Troubleshooting" in "Stall Test".
6	Perform "Time Lag Test". *Is it OK?*	Go to Step 7.	Proceed to "Troubleshooting" in "Time Lag Test".
7	Perform "Line Pressure Test". *Is it OK?*	Go to Step 8.	Proceed to "Troubleshooting" in "Line Pressure Test".
8	Proceed to "Trouble Diagnosis 1" in "A/T Symptom Diagnosis". *Is trouble identified?*	Repair or replace faulty parts.	Go to Step 9.
9	Proceed to "Trouble Diagnosis 2" in "A/T Symptom Diagnosis". *Is trouble identified?*	Repair or replace faulty parts.	Proceed to "Trouble Diagnosis 3" in "A/T Symptom Diagnosis".

Road Test

S7N20A5104010

This test is to check if upshift, downshift and lock-up take place at specified speeds while actually driving vehicle on a level road.

⚠ WARNING

- **Carry out test in very little traffic area to prevent an accident.**
- **Test requires 2 persons, a driver and a tester.**

1) Warm up engine.
2) With engine running at idle, shift selector lever “D” range.
3) Accelerate vehicle speed by depressing accelerator pedal gradually.
4) While driving in “D” range, check if gear shift and lock-up occur properly as shown in “Automatic Gear Shift Table”.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	*Replace valve body assembly.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Seized or broken planetary gear	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Damaged drive plate	*Inspect. If NG, replace.*
	Faulty torque converter	*Replace.*
No gear shift as 3rd gear	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
1 → 2 upshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
2 → 3 upshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty direct clutch	*Inspect.IfNG,replace.*

Condition	Possible cause	Correction / Reference Item
3 → 4 upshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of crankshaft position sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Gear shift point is incorrect	Abnormal engine condition	*Inspect and repair engine.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
O/D → 3 downshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty forward clutch	*Inspect. If NG, replace.*
3 → 2 downshift fails to occur	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
2 → 1 downshift fails to occur	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*

Condition	Possible cause	Correction / Reference Item
TCC (lock-up) function pressure control does not operate	Malfunction of TCC pressure control solenoid valve	*Inspect. If NG, replace.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of brake light switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Faulty torque converter	*Replace.*

Manual Road Test

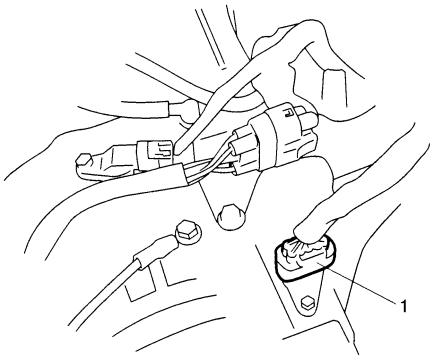
S7N20A5104011

This test checks the gears being used in “L”, “2” “3” or “D” range when driven with unoperated gear shift control system. Test drive vehicle on a level road.

NOTE

Before this test, check DTC.

1) With select lever in “P”, start engine and warm it up.
2) After warming up engine, turn ignition switch OFF and disconnect valve body harness connector (1).



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3) With select lever in “L” range, start vehicle and check that 3rd gear is being used referring to the following table.

Vehicle speed per 1000 rpm in engine speed

Gear position	Vehicle speed
1st	**9.2 km/h (5.7 mile/h)**
2nd	**16.8 km/h (10.4 mile/h)**
3rd	**26.4 km/h (16.4 mile/h)**
4th	**37.9 km/h (23.6 mile/h)**
Reverse	**11.7 km/h (7.3 mile/h)**

4) While vehicle is running, shift select lever to “2” range and check that 3rd gear is being used.
5) While vehicle is running, shift select lever to “3” or “D” range and check that 3rd gear is being used.
6) After the checks, stop vehicle then turn ignition switch OFF, and connect valve body harness connector.
7) Clear DTC.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Operated gear is not correct	Faulty valve body component	*Replace valve body assembly.*
	Faulty clutch or brake	*Inspect clutch and brake. If any parts are faulty, replace them.*

Engine Brake Test

S7N20A5104012

⚠ WARNING

Before test, make sure that there is no vehicle behind so as to prevent rear-end collision.

1) While driving vehicle in 3rd gear of “D” range, shift select lever down to “2” range and check if engine brake operates.
2) In the same way as in Step 1), check engine brake for operation when select lever is shifted down to “L” range.
3) Engine brake should operate in the test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Failure to operate when shifted down to “2” range	Faulty valve body component	*Replace valve body assembly.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Failure to operate when shifted down to “L” range	Faulty valve body component	*Replace valve body assembly.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*

Stall Test

S7N20A5104013

This test is to check overall performance of automatic transaxle and engine by measuring stall speed at “D” and “R” ranges. Be sure to perform this test only when transaxle fluid is at normal operating temperature and its level is between FULL and LOW marks.

⚠ CAUTION

- **Do not run engine at stall more than 5 seconds continuously, or fluid temperature may rise excessively high.**
- **After performing stall test, be sure to leave engine running at idle for longer than 1 minute before another stall test.**

1) Apply parking brake and block wheels.
2) Install tachometer.
3) Start engine with select lever shifted to “P” range.
4) Depress brake pedal fully.
5) Shift select lever to “D” range and depress accelerator pedal fully while watching tachometer. Read engine rpm quickly when it has become constant (stall speed).
6) Release accelerator pedal immediately after stall speed is checked.
7) In the same way, check stall speed in “R” range.
8) Stall speed should be within the following specification.

Engine stall speed
Standard: 2,250 – 2,550 rpm

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Lower than standard level in both “D” and “R” range	Engine output torque failure	*Inspect and repair engine.*
	Faulty one-way clutch of torque converter	*Replace torque converter.*
Higher than standard level in “D” range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Slippery forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from “D” range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Condition	Possible cause	Correction / Reference Item
Higher than standard level in "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Slippery reverse clutch	*Inspect. If NG, replace.*
	Slippery 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Higher than standard level in both "D" and "R" range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Leakage from both "D" and "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Time Lag Test

S7N20A5104014

This test is to check conditions of clutch, brake and fluid pressure. "Time lag" means time elapsed since select lever is shifted with engine idling till shock is felt.

1) With chocks placed before and behind front and rear wheels respectively, depress brake pedal.
2) Start engine.
3) With stop watch ready, shift select lever from "N" to "D" range and measure time from that moment till shock is felt.
4) Similarly measure time lag by shifting select lever from "N" to "R" range.

Gear shifting time lag
"N" → "D": Less than 0.7 sec.
"N" → "R": Less than 1.2 sec.

NOTE

- **When repeating this test, be sure to wait at least one minute after select lever is shifted back to "N" range.**
- **Engine should be warmed up fully for this test.**
- **Repeat test 3 times and take average of those data for final time lag data.**

Troubleshooting

Condition	Possible cause	Correction / Reference Item
"N" → "D" time lag exceeds specification	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Condition	Possible cause	Correction / Reference Item
"N" → "R" time lag exceeds specification	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*

Line Pressure Test

S7N20A5104015

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line. Line pressure test requires the following conditions.

- Automatic fluid is at normal operating temperature (70 – 80 °C / 158 – 176 °F).
- Fluid is replenished to proper level (between FULL and LOW on dipstick).
- Air conditioner switch is turned OFF.

1) Apply parking brake securely and place chocks against wheels.
2) Remove fluid pressure check hole plug bolt.
3) Attach oil pressure gauge to fluid pressure check hole in transaxle case.

Special tool
(A): 09925-37811-001

⚠ CAUTION

After attaching oil pressure gauge, check that no fluid leakage exists.

4) Depress foot brake fully, run engine at idle and stall then check fluid pressure in "D" or "R" range.

⚠ CAUTION

- **Do not continue running engine at stall speed longer than 5 seconds.**
- **After performing line pressure test, be sure to leave engine running at idle for longer than one minute before performing another line pressure test.**

Automatic transaxle line pressure

	"D" range	"R" range
At idle speed	**3.6 – 4.0 kg/cm^2, 51 – 57 psi**	**5.8 – 6.7 kg/cm^2, 82 – 95 psi**
At stall speed	**12.3 – 13.4 kg/cm^2, 175 – 191 psi**	**16.2 – 18.6 kg/cm^2, 230 – 264 psi**

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Higher than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Lower than standard level in each range	Malfunction of pressure control solenoid valve (Low line pressure)	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty oil pump	*Inspect. If NG, replace.*
	Leakage from both "D" and "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Lower than standard level only in "D" range	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Lower than standard level only in "R" range	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*

"P" Range Test

S7N20A5104016

1) Stop vehicle on a slope of 5 degrees or more, shift select lever to "P" range and at the same time apply parking brake.
2) After stopping engine, depress brake pedal and release parking brake.
3) Then, release brake pedal gradually and check that vehicle remains stationary.
4) Depress brake pedal and shift select lever to "N" range.
5) Then, release brake pedal gradually and check that vehicle moves.

⚠ WARNING

Before test, make sure no one is around vehicle or down on a slope and keep watchful for safety during test.

Troubleshooting

Condition	Possible cause	Correction / Reference Item
Vehicle moves at "P" range or remains stationary at "N" range	Defective parking lock pawl or spring	*Inspect. If NG, repair.*

A/T Symptom Diagnosis

S7N20A5104017

Trouble Diagnosis 1
Electrical repair

Condition	Possible cause	Correction / Reference Item
Excessive shift shock	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty only when N → D or 3 ↔ 4 shifting	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	Crankshaft position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit: M13A / M15A / M16A in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
No gear shift as 3rd gear	Shift solenoid valve-A and/or -B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Poor 1 → 2 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 2 → 3 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, shortandintermittent.If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	Engine coolant temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	Crankshaft position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0335: Crankshaft Position (CKP) Sensor Circuit: M13A / M15A / M16A in Section 1A". If NG, repair.*
	"3" position switch circuit faulty	*Refer to "No Gear Shift to 4th gear".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 4 → 3 shift	Shift solenoid valve-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Timing solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	"3" position switch circuit faulty	*Refer to "No Gear Shift to 4th gear".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 2 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Poor 2 → 1 shift	Shift solenoid valve-A circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Incorrect gear shift point	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	TCC pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Shift solenoid valve-A and/or-B circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Output shaft speed sensor (VSS) circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Input shaft speed sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission range sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	CAN communication circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Throttle position sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0122: Throttle Position Sensor (Main) Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0123: Throttle Position Sensor (Main) Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	Engine coolant temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent referring to "DTC P0117: Engine Coolant Temperature Circuit Low: M13A / M15A / M16A in Section 1A" and/or "DTC P0118: Engine Coolant Temperature Circuit High: M13A / M15A / M16A in Section 1A". If NG, repair.*
	Brake light switch circuit faulty	*Refer to "No Lock-Up Occurs".*
	TCM	*Substitute a known-good TCM and recheck.*
	ECM	*Substitute a known-good ECM and recheck.*
Higher or lower stall speed	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Excessive "N" → "D" or "N" → "R" time lag	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	Transmission fluid temperature sensor circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*
Higher or lower line pressure	Pressure control solenoid valve circuit faulty	*Inspect circuit for open, short and intermittent. If NG, repair.*
	TCM	*Substitute a known-good TCM and recheck.*

Trouble Diagnosis 2
On-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty valve body component	*Replace valve body assembly.*
Excessive shift shock	Engine abnormal condition	*Inspect and repair engine.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve only when N → D or 3 ↔ 4 shifting	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Malfunction of brake light switch except N → D or N → R shifting	*Inspect referring to "Stop (Brake) Lamp Switch Inspection in Section 9B". If NG, replace.*
	Malfunction of crankshaft position sensor	*Inspect referring to "Crankshaft Position (CKP) Sensor Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 1 → 2 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 2 → 3 shift	Malfunction of shift solenoid valve-A	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect.IfNG,replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*

Condition	Possible cause	Correction / Reference Item
Poor 3 → 4 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of "3" position switch	*Inspect. If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 4 → 3 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of timing solenoid valve	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of "3" position off switch	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 3 → 2 shift	Malfunction of shift solenoid valve-A	*Inspect.IfNG,replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Poor 2 → 1 shift	Malfunction of shift solenoid valve-B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Incorrect shift point	Engine abnormal condition	*Inspect and repair engine.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*

Condition	Possible cause	Correction / Reference Item
Non operate TCC (lock-up) system	Malfunction of TCC solenoid valve	*Inspect. If NG, replace.*
	Malfunction of shift solenoid valve-A and/or -B	*Inspect. If NG, replace.*
	Malfunction of output shaft speed sensor (VSS)	*Inspect. If NG, replace.*
	Malfunction of input shaft speed sensor	*Inspect. If NG, replace.*
	Malfunction of transmission range sensor	*Inspect. If NG, replace.*
	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Malfunction of pressure control solenoid valve	*Inspect. If NG, replace valve body assembly.*
	Malfunction of throttle position sensor	*Inspect referring to "Electric Throttle Body Assembly On-Vehicle Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Malfunction of engine coolant temperature sensor	*Inspect referring to "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C". If NG, replace.*
	Malfunction of brake light switch	*Inspect referring to "Stop (Brake) Lamp Switch Inspection in Section 9B". If NG, replace.*
	Faulty valve body component	*Replace valve body assembly.*
Excessive "N" → "D" or "N" → "R" time lag	Malfunction of transmission fluid temperature sensor	*Inspect. If NG, replace.*
	Pressure control solenoid valve circuit faulty	*Inspect. If NG, replace valve body assembly.*
	Clogged oil strainer	*Replace.*
	Faulty valve body component	*Replace valve body assembly.*

Trouble Diagnosis 3
Off-vehicle repair

Condition	Possible cause	Correction / Reference Item
Unable to run in all range	Faulty oil pump	*Inspect. If NG, replace.*
	Seized or broken planetary gear	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Damaged drive plate	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Faulty torque converter	*Replace.*
Excessive "N" → "D" shift shock	Faulty forward clutch	*Inspect. If NG, replace.*
Excessive "N" → "R" shift shock	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
Poor 1 → 2 shift, excessive shock or slippage	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
Poor 2 → 3 shift, excessive shock or slippage	Faulty direct clutch	*Inspect. If NG, replace.*
Poor 3 ↔ O/D shift, excessive shock or slippage	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Poor 3 → 2 shift, excessive shock or slippage	Faulty direct clutch	*Inspect. If NG, replace.*
	Faulty one-way No.1 clutch	*Inspect. If NG, replace.*
Poor 2 → 1 shift, excessive shock or slippage	Faulty 2nd brake	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
Non operate TCC (lock-up) system	Faulty torque converter	*Replace.*
Excessive "N" → "D" time lag	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty forward clutch	*Inspect. If NG, replace.*
	Faulty one-way No.2 clutch	*Inspect. If NG, replace.*
	Leakage from "D" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Excessive "N" → "R" time lag	Faulty oil pump	*Inspect. If NG, replace.*
	Faulty reverse clutch	*Inspect. If NG, replace.*
	Faulty 1st and reverse brake	*Inspect. If NG, replace.*
	Leakage from "R" range fluid pressure circuit	*Overhaul or replace valve body assembly.*
Poor engine brake in downshift to "2" range	Faulty O/D and 2nd coast brake	*Inspect. If NG, replace.*
Poor engine brake in downshift to "L" range	Faulty 1st and reverse brake	*Inspect. If NG, replace.*

No Gear Shift to 4th gear

S7N20A5104018

System Description
TCM does not shift to 4th gear under any of the following condition.

- "3" position switch is turned ON.
- Engine coolant temperature is less than 50 °C (122 °F).
- A/T fluid temperature is less than 20 °C (68 °F).
- A/T fluid temperature is more than 130 °C (266 °F) while TCM is detecting P2762, P2763 and P2764.
- TCM detects the following DTCs.
  P0712 / P0713 / P0717 / P0722 / P0787 / P0788 / P0961 / P0962 / P0963 / P0973 / P0974 / P0976 / P0977 / P1702 / P1703 / P1774 / P1777

Troubleshooting

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check DTC** *Is DTC P0712, P0713, P0717, P0722, P0785, P0961, P0962, P0963, P0973, P0974, P0976, P0977, P1702, P1703, P1774 and/or P1777 detected?*	Perform DTC flow to repair and retry.	Go to Step 3.
3	1) Perform running test under the following conditions and measure voltage between terminal "C34-16" of TCM connector and ground, terminal "C34-15" of TCM connector and ground. • Engine coolant temperature is in normal operating temperature. • Select lever is in "D" range. • Drive vehicle with 4th gear condition referring to "Automatic Gear Shift Table". **Voltage between TCM connector and ground** **Between terminal "C34-16" of TCM connector and ground: 0 – 1 V** **Between terminal "C34-15" of TCM connector and ground: 9 – 14 V** *Do results satisfy the value?*	Faulty shift solenoid valve, circuit or transaxle.	"BRN" circuit shorted to power circuit or open, or "BLK/YEL" circuit shorted to ground. If wire is OK, go to Step 4.
4	**"3" position switch signal inspection** 1) With ignition switch ON, check voltage between terminal "L01-8" of BCM connector and ground. **"3" position switch signal specification** **Shift select lever to "3" or "2" range: 8 – 14 V** **Shift select lever to other above range: 0 – 1 V** *Is result as specified?*	Substitute a known-good TCM and recheck.	Faulty "3" position switch or its circuit. If OK, substitute a know-good TCM and recheck.

No Lock-Up Occurs

S7N20A5104019

System Description

TCM turns TCC solenoid OFF under any of the following conditions.

- Brake light switch is turned ON (Brake pedal is depressed).
- Transmission fluid temperature is less than 60 °C (140 °F).
- Throttle opening is as much as 0%.
- TCM detects the following DTCs.
  P0705 / P0707 / P0712 / P0713 / P0717 / P0722 / P0787 / P0788 / P0961 / P0962 / P0963 / P0973 / P0974/ P0976 / P0977 / P1702 / P1703 / P1774 / P1777 / P2762 / P2763 / P2764

Troubleshooting

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check DTC** *Is DTC P0705, P0707, P0712, P0713, P0717, P0722, P0787, P0788, P0961, P0962, P0963, P0973, P0974, P0976, P0977, P1702, P1703, P1774, P1777, P2762, P2763 and/or P2764 detected?*	Perform DTC flow to repair and retry.	Go to Step 3.
3	**Brake light switch signal inspection** 1) With ignition switch ON, check voltage between terminal "E23-20" of ECM connector and ground. **Brake light switch signal specification** **Brake pedal is released: 0 – 1 V** **Brake pedal is depressed: 8 – 14 V** *Is result as specified?*	Substitute a known-good TCM and recheck.	Mis-adjusted brake light switch, faulty brake light switch. If OK, substitute a known-good TCM and recheck.

DTC P0602: Control Module Programming Error

S7N20A5104047

System Description

Internal control module is installed in ECM.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Data programming error (1 driving cycle detection logic)	TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it at idle if possible.
4) Check DTC.

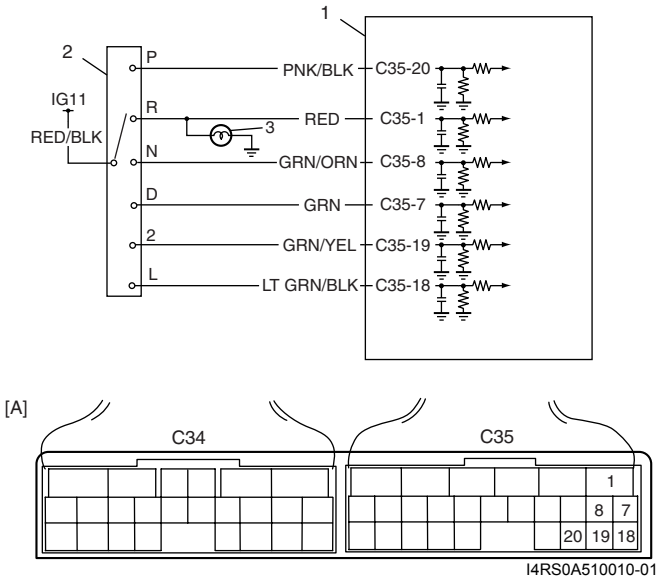
DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Clear DTC referring to "DTC Clearance". 2) Turn ignition switch to OFF position. 3) Turn ignition switch to ON position and check DTC. *Is DTC P0602 still indicated?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
2	**TCM reprogramming check** *Was reprogramming of TCM executed?*	Execute reprogramming of TCM correctly once again.	Go to Step 3.
3	**TCM power ground circuit check** 1) Check TCM power supply circuit and ground circuit referring to "TCM Power and Ground Circuit Check". *Are check results OK?*	Substitute a known-good TCM and recheck.	Repair TCM power or ground circuit.

DTC P0705: Transmission Range Sensor Circuit Malfunction

S7N20A5104020

Wiring Diagram



1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Multiple or more signals are inputted simultaneously for 12 seconds.	• Select cable maladjusted • Transmission range sensor (switch) maladjusted • Transmission range sensor (switch) or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM memory by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Keep engine running at idle speed for 25 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 4.
3	**Check transmission range sensor (switch) circuit for operation** Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (“P”, “R”, “N”, “D”, “2” or “L”) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 5.

Step	Action	Yes	No
4	**Check transmission range sensor (switch) circuit for operation** Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals “C35-1”, “C35-7”, “C35-8”, “C35-18”, “C35-19” and “C35-20” respectively with select lever shifted to each range. Taking terminal “C35-19” as an example, is battery voltage indicated only when select lever is shifted to “2” range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. *Are check results satisfactory?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 5.
5	1) Check select cable for adjustment referring to “Select Cable Adjustment”. *Is it adjusted correctly?*	Go to Step 6.	Adjust.
6	**Check transmission range sensor for installation position** 1) Shift select lever to “N” range. 2) Check that “N” reference line on sensor and needle direction shaped on lock washer are aligned. *Are they aligned?*	Go to Step 7.	Adjust.
7	1) Check transmission range sensor (switch) referring to “Transmission Range Sensor (Shift Switch) Inspection and Adjustment”. *Are check results satisfactory?*	“RED/BLK”, “PNK/BLK”, “RED”, “GRN/ORN”, “GRN”, “GRN/YEL” or “LT GRN/BLK” circuit shorted to power circuit or shorted each other. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

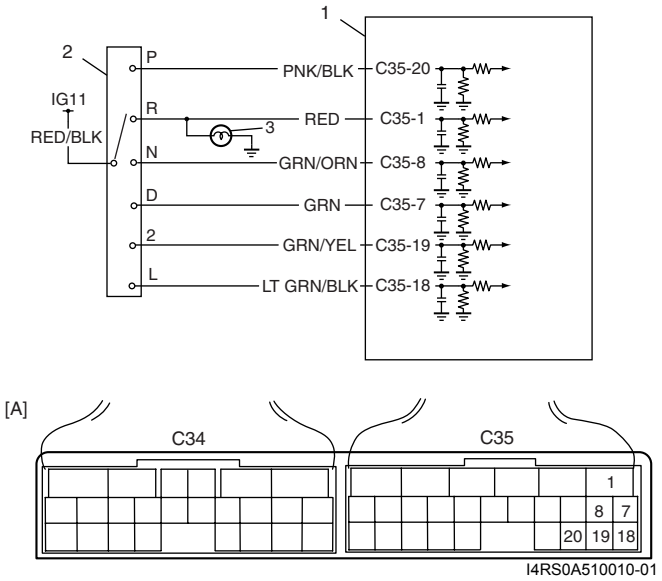
Table for Step 4

		Terminal					
		C35-20	**C35-1**	**C35-8**	**C35-7**	**C35-19**	**C35-18**
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0707: Transmission Range Sensor Circuit Low

S7N20A5104021

Wiring Diagram



1. TCM	3. Backup lamp
2. Transmission range sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission range switch signal (P, R, N, D, 2, or L) is not inputted for more than 32 seconds when vehicle speed is faster than 30 km/h (19 mile/h) and engine speed is faster than 1500 rpm.	• Select cable maladjusted • Transmission range sensor (switch) maladjusted • Transmission range sensor (switch) or its circuit malfunction • TCM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM memory by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed to 40 km/h (25 mile/h) or more for 1 minutes.
5) Stop vehicle and turn ignition switch OFF.
6) Repeat Step 3) to 4) one time.
7) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	*Do you have SUZUKI scan tool?*	Go to Step 3.	Go to Step 4.

Step	Action	Yes	No
3	**Check transmission range sensor (switch) circuit for operation** Check by using SUZUKI scan tool: 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (P, R, N, D, 2 or L) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 5.
4	**Check transmission range sensor (switch) circuit for operation** Check by not using SUZUKI scan tool: 1) Turn ignition switch ON. 2) Check voltage at terminals "C35-1", "C35-7", "C35-8", "C35-18", "C35-19" and "C35-20" respectively with select lever shifted to each range. Taking terminal "C35-19" as an example, is battery voltage indicated only when select lever is shifted to "2" range and 0 V for other ranges as shown in the following table. Check voltage at other terminals likewise, referring to the following table. *Are check results satisfactory?*	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 5.
5	1) Check select cable for adjustment referring to "Select Cable Adjustment". *Is it adjusted correctly?*	Go to Step 6.	Adjust.
6	**Check transmission range sensor for installation position** 1) Shift select lever to "N" range. 2) Check that "N" reference line on sensor and needle direction shaped on lock washer are aligned. *Are they aligned?*	Go to Step 7.	Adjust.
7	1) Check transmission range sensor (switch) referring to "Transmission Range Sensor (Shift Switch) Inspection and Adjustment". *Are check results satisfactory?*	"RED/BLK", "PNK/BLK", "RED", "GRN/ORN", "GRN", "GRN/YEL" or "LT GRN/BLK" circuit open or short to ground. If wires and connections are OK, substitute a know-good TCM and recheck.	Replace transmission range sensor.

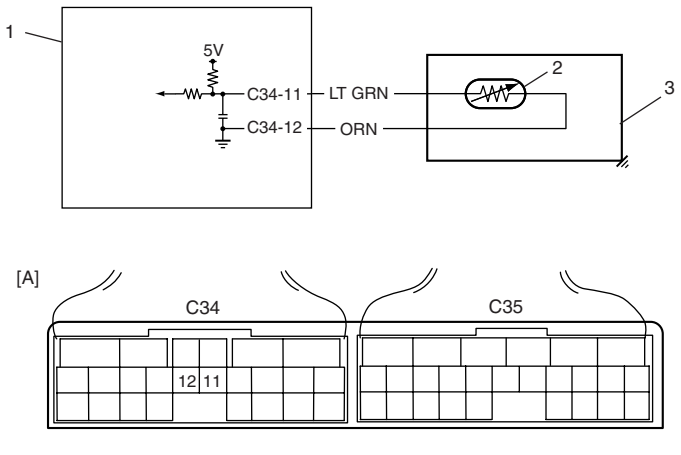
Table for Step 4

		Terminal					
		C35-20	**C35-1**	**C35-8**	**C35-7**	**C35-19**	**C35-18**
Select lever position	P	8 – 14 V	0 V	0 V	0 V	0 V	0 V
	R	0 V	8 – 14 V	0 V	0 V	0 V	0 V
	N	0 V	0 V	8 – 14 V	0 V	0 V	0 V
	D or 3	0 V	0 V	0 V	8 – 14 V	0 V	0 V
	2	0 V	0 V	0 V	0 V	8 – 14 V	0 V
	L	0 V	0 V	0 V	0 V	0 V	8 – 14 V

DTC P0711: Transmission Fluid Temperature Sensor “A” Circuit Range / Performance

S7N20A5104048

Wiring Diagram



I4RS0A510011-01

1. TCM	3. A/T
2. Transmission fluid temperature sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission temperature sensor signal is no change and less than 20 °C (68 °F) while vehicle is running at 40 km/h (25 mile/h) or more in vehicle speed for 10 minutes or more.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Start vehicle and increase vehicle speed to 40 km/h (25 mile/h) for 10 minutes or more.
5) Stop vehicle and check DTC.

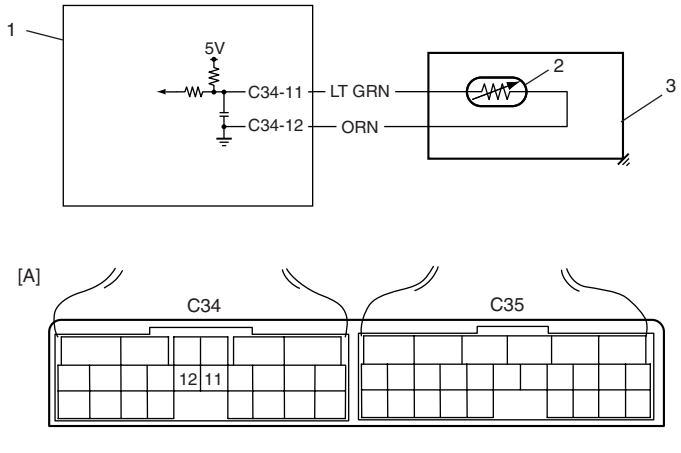
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to “Transmission Fluid Temperature Sensor Inspection”. *Are check results OK?*	Go to Step 3.	Replace transmission fluid temperature sensor.
3	**Check for transmission fluid temperature sensor circuit** 1) Turn ignition switch to OFF position. 2) Disconnect valve body harness connector and TCM connectors. 3) Check for proper connection to TCM at terminals “C34-11” and “C34-12”. If connection is OK, check circuit for open, short and high resistance for the following circuit. • Between “C34-11” terminal of TCM connector and “LT GRN” terminal of valve body harness connector. • Between “C34-12” terminal of TCM connector and “ORN” terminal of valve body harness connector. *Are they in good condition?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Repair “LT GRN” and/or “ORN” circuit.

DTC P0712: Transmission Fluid Temperature Sensor Circuit Low

S7N20A5104022

Wiring Diagram



I4RS0A510011-01

1. TCM	3. A/T
2. Transmission fluid temperature sensor	4. Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission temperature sensor terminal voltage is less than specified value for 5 minutes or more after turning ignition switch ON.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Keep engine running at idle speed for 10 minutes or more.
4) Stop vehicle and check DTC.

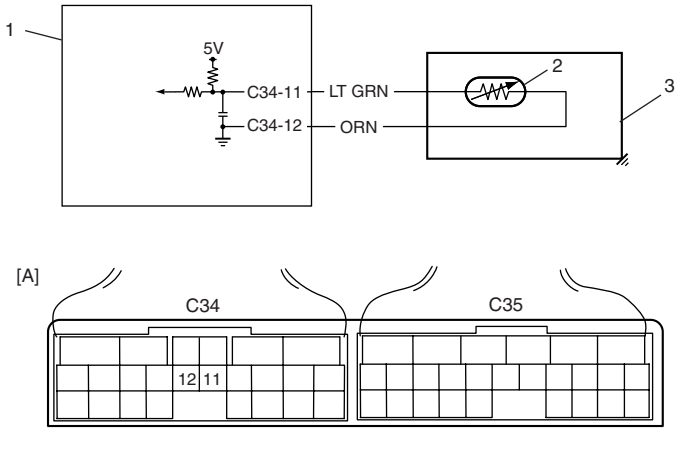
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check transmission fluid temperature circuit for ground short** 1) Check continuity between terminal "C34-11" of disconnected harness side TCM connector and ground. *Is continuity indicated?*	"LT GRN" circuit shorted to ground.	Go to Step 3.
3	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to "Transmission Fluid Temperature Sensor Inspection". *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0713: Transmission Fluid Temperature Sensor Circuit High

S7N20A5104023

Wiring Diagram



I4RS0A510011-01

1. TCM	3. A/T
2. Transmission fluid temperature sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission fluid temperature sensor terminal voltage is more than specified value and sensor variation is less than specified value evan though engine was running in “R”, “D”, “3”, “2” or “L” range for 15 minutes after starting engine.	• Transmission fluid temperature sensor or its circuit malfunction • TCM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Start vehicle and increase vehicle speed to about 40 km/h (25 mile/h) for 20 minutes or more.
4) Stop vehicle and check DTC.

DTC Troubleshooting

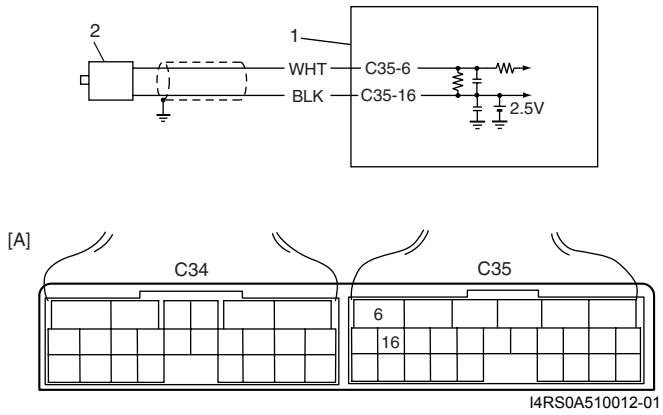
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	**Check transmission fluid temperature circuit for open** 1) Turn ignition switch OFF. 2) Disconnect TCM connectors from TCM. 3) Check for proper connection to transmission fluid temperature sensor at terminals “C34-11” and “C34-12”. 4) If OK, check continuity between terminals “C34-11” and “C34-12” of disconnected harness side TCM connector. *Is continuity indicated?*	Go to Step 3.	“LT GRN” or “ORN” circuit open.

Step	Action	Yes	No
3	**Check transmission fluid temperature circuit for IG short** 1) Cool down A/T fluid temperature under ambient temperature. 2) Connect TCM connectors to TCM with ignition switch OFF. 3) Turn ignition switch ON. 4) Measure voltage between terminal “C34-11” of TCM connector and ground. *Is it 4.6 V or more?*	“LT GRN” circuit shorted to power circuit. If circuit is OK, go to Step 4.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.
4	**Inspect transmission fluid temperature sensor** 1) Inspect transmission fluid temperature sensor referring to “Transmission Fluid Temperature Sensor Inspection”. *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace transmission fluid temperature sensor.

DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction

S7N20A5104024

Wiring Diagram



1. TCM	2. Input shaft speed sensor	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No input shaft speed sensor signal is detected although output shaft speed sensor signals are detected.	• Input shaft speed sensor or its circuit malfunction • Improper input shaft speed sensor installation • Damaged direct clutch drum • Foreign material attachment to sensor or drum • TCM

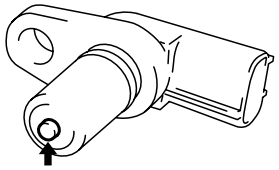
DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Shift selector lever to “D” range and drive vehicle at 50 km/h (31 mile/h) or more with 3rd gear at least for 5 minutes.
4) Stop vehicle and check DTC.

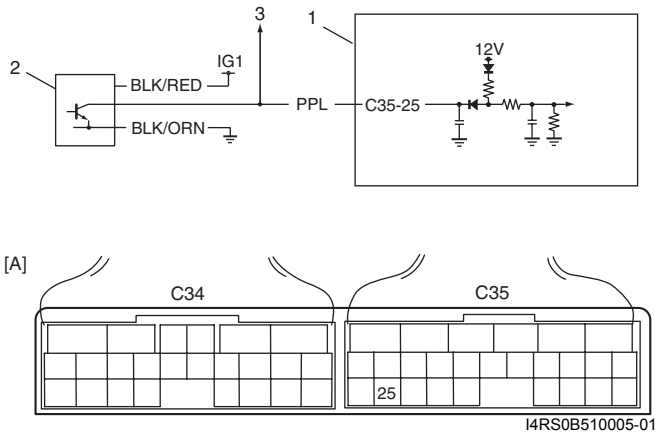
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	**Check input shaft speed sensor circuit** 1) Disconnect TCM connectors with ignition switch OFF. 2) Check for proper connection to input shaft speed sensor at “C35-6” and “C35-16” terminals. 3) If OK, check resistance of sensor circuit. **Input shaft speed sensor specification** **Between terminals “C35-6” and “C35-16”: 560 – 680 Ω at 20 °C (68 °F)** **Between terminal “C35-6” / “C35-16” and ground: No continuity** *Are check result satisfactory?*	Go to Step 4.	Go to Step 3.
3	**Inspect input shaft speed sensor** 1) Inspect input shaft speed sensor referring to “Input Shaft Speed Sensor Inspection”. *Is result satisfactory?*	“WHT” or “BLK” circuit open or short.	Replace input shaft speed sensor.
4	**Check visually input shaft speed sensor and direct clutch drum for the following** • No damage • No foreign material attached • Correct installation  I2RH0B510020-01 *Are they in good condition?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Clean, repair or replace.

DTC P0722: Output Speed Sensor (VSS) Circuit No Signal

S7N20A5104025

Wiring Diagram



1. TCM	3. To ECM
2. Output shaft speed sensor (VSS)	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No output shaft speed sensor signal is detected although input shaft speed sensor signals are detected while vehicle is running at 5 km/h (3 mile/h) or more in vehicle speed with “D”, “2” or “L” range.	• Output shaft speed sensor or its circuit malfunction • Damaged sensor gear (driven gear) • Damaged output shaft speed sensor (VSS) drive gear • TCM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory and start engine.
3) Shift selector lever to “D” range and drive vehicle at 50 km/h (31 mile/h) or more vehicle speed at least for 3 minutes.
4) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	**Check output shaft speed sensor (VSS) power circuit** 1) Turn ignition switch OFF. 2) Disconnect output shaft speed sensor connector. 3) Turn ignition switch ON. 4) Measure voltage between “BLK/RED” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is it 10 – 14 V?*	Go to Step 3.	“BLK/RED” wire open or shorted to ground.

Step	Action	Yes	No
3	**Check output shaft speed sensor (VSS) ground circuit** 1) Turn ignition switch OFF. 2) Check continuity between “BLK/ORN” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is continuity indicated?*	Go to Step 4.	“BLK/ORN” wire open.
4	**Check output shaft speed sensor (VSS) signal circuit for short** 1) Disconnect TCM connectors. 2) Check continuity between “PPL” wire terminal of disconnected output shaft speed sensor harness side connector and ground. *Is continuity indicated?*	“PPL” wire shorted to ground.	Go to Step 5.
5	**Check output shaft speed sensor (VSS) signal circuit for open** 1) Check continuity between “PPL” wire terminal of disconnected output shaft speed sensor harness side connector and terminal “C35-25” of disconnected harness side TCM connector. *Is continuity indicated?*	Go to Step 6.	“PPL” wire open.
6	**Inspect output shaft speed sensor (VSS)** 1) Inspect output shaft speed sensor referring to “Output Shaft Speed Sensor (VSS) Inspection”. *Is check result satisfactory?*	Go to Step 7.	Replace output shaft speed sensor (VSS).
7	**Check output shaft speed sensor (VSS) gears visually** 1) Check output shaft speed sensor gears for the followings. • No damage in drive gear on differential case • No damage in driven gear in output shaft speed sensor *Is result satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace drive gear and/or driven gear of output shaft speed sensor.

DTC P0741 / P0742: TCC Circuit Performance or Stuck OFF / TCC Circuit Stuck ON

S7N20A5104026

DTC Detecting Condition and Trouble Area

DTC P0741

DTC detecting condition	Trouble area
When driving vehicle with 3rd or 4th gear in “D” range, difference in revolution between engine and A/T input (input shaft speed) is larger than specification although TCM commanded TCC solenoid to turn ON.	• Mechanical malfunction of TCC solenoid valve • Malfunction of valve body assembly • Fluid passage clogged or leaking • Torque converter clutch malfunction

DTC P0742

DTC detecting condition	Trouble area
When driving vehicle with 2nd, 3rd or 4th gear in “D” range, difference in revolution between engine and A/T input (input shaft speed) is smaller than specification although TCM commanded TCC solenoid to turn OFF.	• Mechanical malfunction of TCC solenoid valve • Malfunction of valve body assembly • Fluid passage clogged or leaking • Torque converter clutch malfunction

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and warm it up to normal operating temperature.
4) Shift select lever to “N” and “D” range for each 10 seconds.
5) Drive vehicle with 4th gear in “D” range and lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table”.
6) Shift select lever to “3” range.
7) Drive vehicle with 2nd or 3rd gear in “3” range, 15 – 20% throttle opening and at vehicle speed of 25 – 40 km/h (16 – 25 mile/h).
8) Stop vehicle and turn ignition switch OFF.
9) Repeat Step 3) to 7) one time.
10) Stop vehicle and check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	1) Check TCC solenoid valve for operation referring to “Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection”. *Are they in good condition?*	Clean fluid passage or replace valve body assembly.	Replace TCC solenoid valve.

DTC P0751 / P0752 / P0756 / P0757: Shift Solenoid Malfunction

S7N20A5104027

DTC P0751: Shift Solenoid-A (No.1) Performance or Stuck OFF
DTC P0752: Shift Solenoid-A (No.1) Stuck ON
DTC P0756: Shift Solenoid-B (No.2) Performance or Stuck OFF
DTC P0757: Shift Solenoid-B (No.2) Stuck ON

DTC Detecting Condition and Trouble Area

DTC P0751

DTC detecting condition	Trouble area
3rd gear ratio is detected although TCM command is for 2nd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-A (No.1) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0752

DTC detecting condition	Trouble area
2nd gear ratio is detected although TCM command is for 3rd gear while vehicle running at 15 km/h (10 mile/h) or more in “D” range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-A (No.1) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0756

DTC detecting condition	Trouble area
3rd gear ratio is detected although TCM command is for 4th gear while vehicle running at 15 km/h (10 mile/h) or more in "D" range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-B (No.2) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC P0757

DTC detecting condition	Trouble area
4th gear ratio is detected although TCM command is for 3rd gear while vehicle running at 15 km/h (10 mile/h) or more in "D" range after engine being warmed up.	• Mechanical malfunction of shift solenoid valve-B (No.2) • Malfunction of valve body assembly • Fluid passage clogged or leaking • Mechanical malfunction of automatic transaxle (clutch, brake or gear etc.)

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and warm it up to normal operating temperature.
4) Shift select lever to "N" and "D" range for 10 seconds.
5) Start vehicle and increase vehicle speed to 65 km/h (40 mile/h) with throttle position 10% or more.
6) Stop vehicle and turn ignition switch OFF.
7) Repeat Step 3) to 5) one time.
8) Stop vehicle and check DTC.

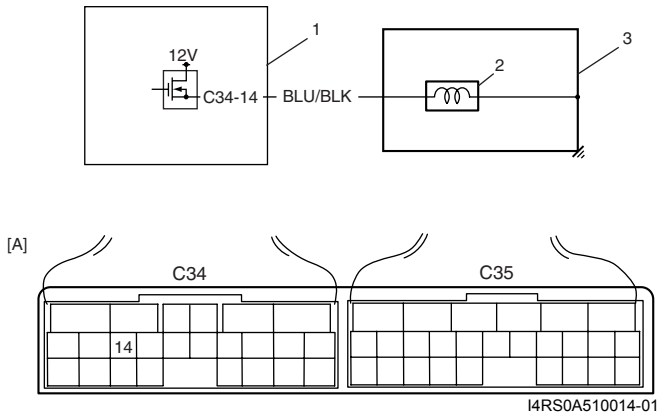
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	1) Check shift solenoid valve-A (No.1) or -B (No.2) for operation referring to "Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection". *Are they in good condition?*	Clean fluid passage or replace valve body assembly.	Replace shift solenoid valve-A or -B.

DTC P0787: Shift / Timing Solenoid Control Circuit Low

S7N20A5104028

Wiring Diagram



1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

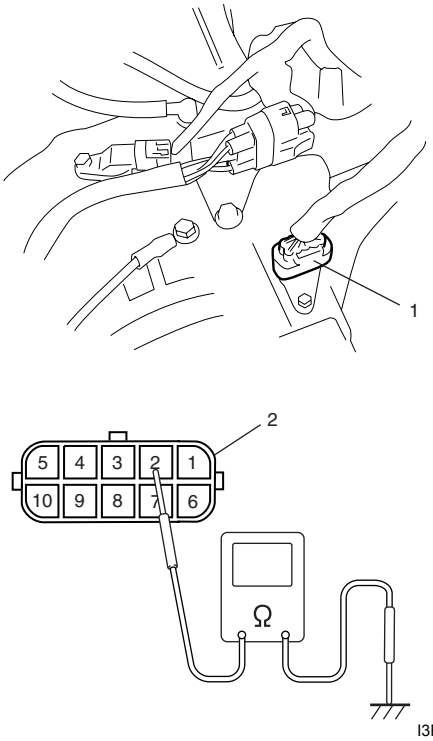
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is low although TCM is commanding timing solenoid valve to turn ON.	• Timing solenoid valve circuit shorted to ground • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “N” range.
4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
5) Check DTC.

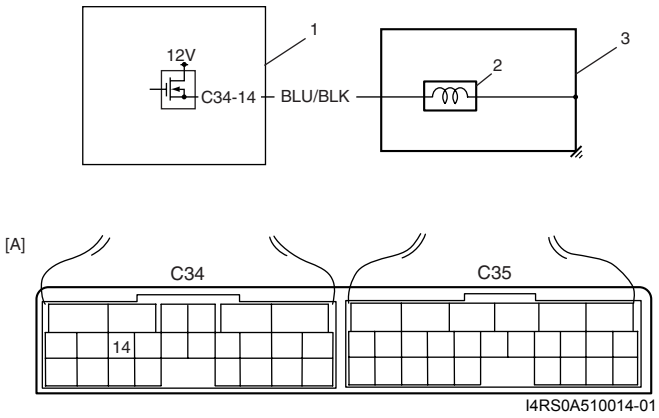
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check timing solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at "BLU/BLK" circuit. 4) Check resistance of solenoid valve. **<u>Timing solenoid valve resistance</u>** **Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)**  I3RM0B510018-01 *Is check result satisfactory?*	Go to Step 3.	Replace timing solenoid valve or lead wire.
3	**Check timing solenoid valve circuit for ground short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Measure resistance between terminal "C34-14" of disconnected harness side TCM connector and ground. *Is it 11 – 15 Ω at 20 °C (68 °F)?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM and recheck.	"WHT/GRN" circuit shorted to ground.

DTC P0788: Shift / Timing Solenoid Control Circuit High

S7N20A5104029

Wiring Diagram



1. TCM	3. A/T
2. Timing solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

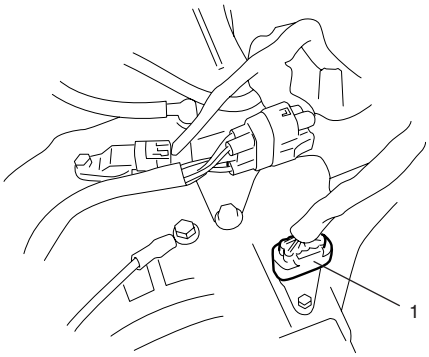
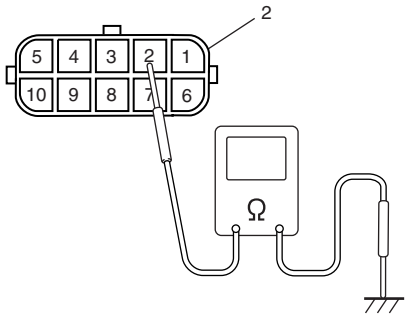
DTC detecting condition	Trouble area
Voltage of timing solenoid valve TCM terminal is high although TCM is commanding timing solenoid valve to turn OFF.	• Timing solenoid valve circuit open or shorted to power circuit • Timing solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “N” range.
4) Repeat shifting select lever from “N” range to “D” range and vice versa for 3 times.
5) Check DTC.

DTC Troubleshooting

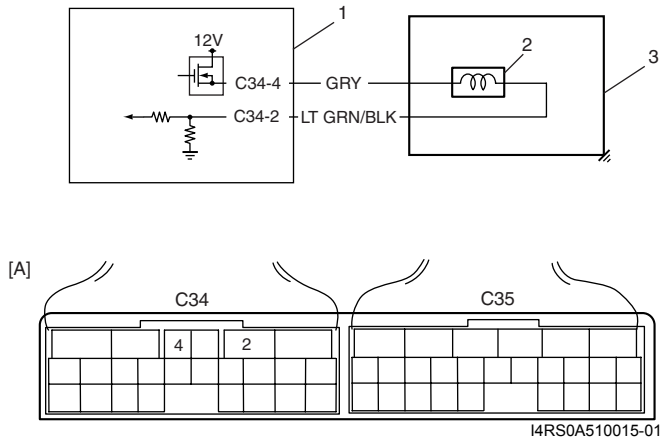
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	**Check timing solenoid valve circuit for IG short** 1) Disconnect TCM connectors. 2) Turn ignition switch ON and measure voltage between terminal “C34-14” of harness side TCM connector and ground. *Is it 0 – 1 V?*	Go to Step 3.	“BLU/BLK” circuit shorted to power circuit.
3	**Check timing solenoid valve circuit for open** 1) Measure resistance between terminal “C34-14” of disconnected harness side TCM connector and ground. *Is it 11 – 15 Ω at 20 °C (68 °F)?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Go to Step 4.

Step	Action	Yes	No
4	**Check timing solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on transaxle. 3) Check for proper connection to solenoid valve at “BLU/BLK” circuit. 4) Check resistance of solenoid valve. **Timing solenoid valve resistance** **Between terminal of transaxle side valve body harness connector and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510018-01 *Is check result satisfactory?*	“BLU/BLK” circuit open.	Replace timing solenoid valve or lead wire.

DTC P0961: Pressure Control Solenoid “A” Control Circuit Range / Performance

S7N20A5104049

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

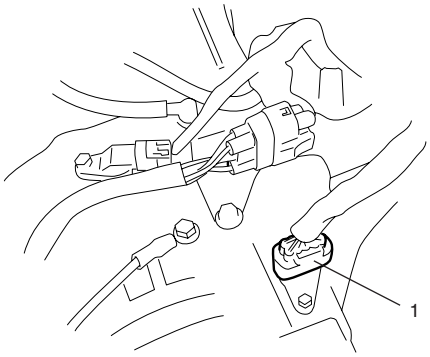
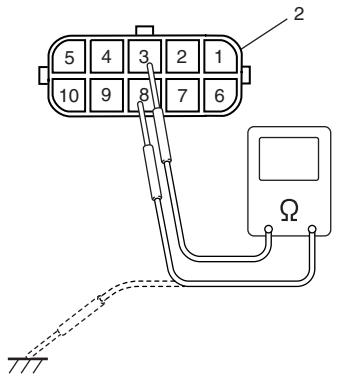
DTC detecting condition	Trouble area
Difference between target current of control solenoid valve circuit and monitor current of control solenoid valve circuit is more than specification.	• Malfunction of pressure control solenoid valve or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 30 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

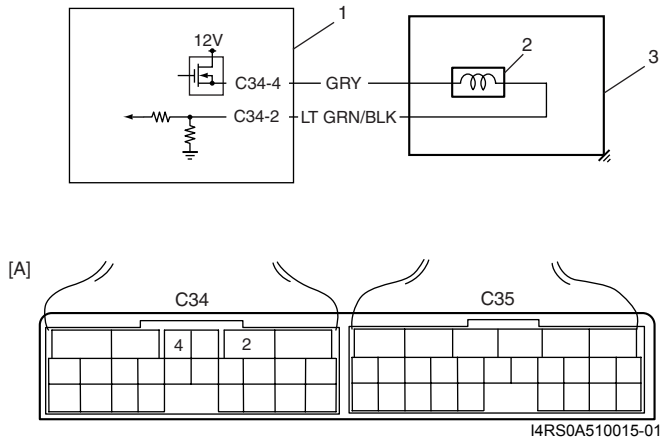
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.

Step	Action	Yes	No
2	**Check pressure control solenoid valve resistance** 1) Turn ignition switch to OFF position. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to terminal of valve body harness connector at “GRY” and “LT GRN/BLK” circuit. 4) Check resistance of pressure control solenoid valve. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and transaxle: Infinity**   I3RM0B510020-01 *Is check results satisfactory?*	Go to Step 3.	Replace pressure control solenoid valve or valve body harness.
3	**Check for pressure control solenoid valve circuit** 1) Disconnect TCM connectors. 2) Disconnect valve body harness connector and TCM connectors. 3) Check for proper connection to TCM at terminals “C34-2” and “C34-4”. If connection is OK, check circuit for open, short, and high resistance for the following circuit. • Between “C34-2” terminal of TCM connector and “LT GRN/BLK” terminal of valve body harness connector. • Between “C34-4” terminal of TCM connector and “GRY” terminal of valve body harness connector. *Are they in good condition?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Repair “LT GRN/BLK” and/or “GRY” circuit.

DTC P0962: Pressure Control Solenoid Control Circuit Low

S7N20A5104030

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

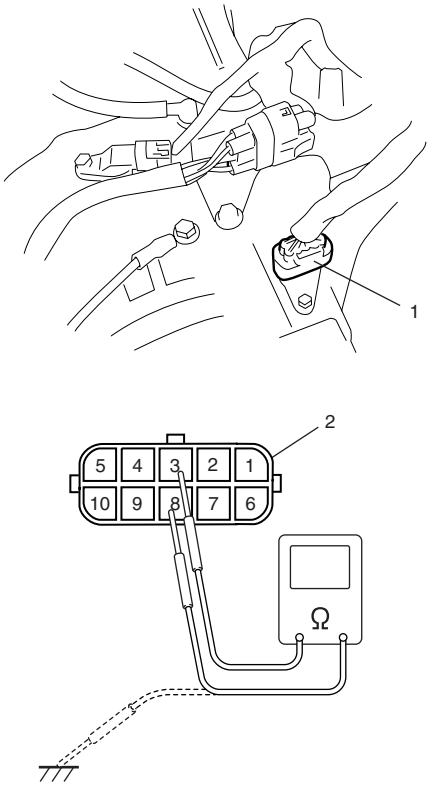
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too low comparing with TCM command value.	• Pressure control solenoid valve circuit open or shorted to ground • Malfunction of pressure control solenoid valve • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 30 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

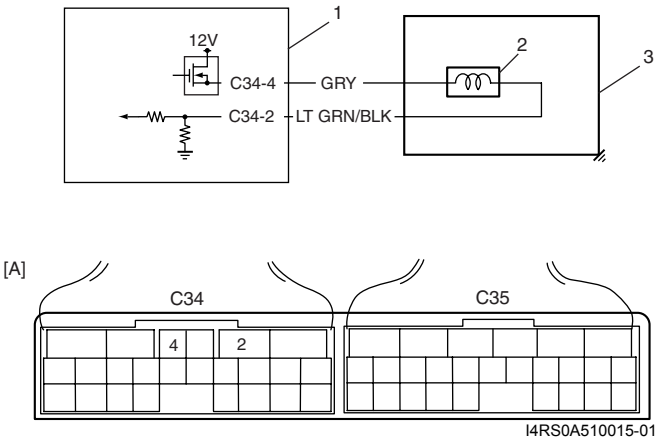
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and Transaxle: Infinity**  I3RM0B510020-01 *Is check results satisfactory?*	Go to Step 3.	Replace pressure control solenoid valve or valve body harness.
3	**Check pressure control solenoid valve circuit for ground short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminals "C34-2" and "C34-4". If connection is OK, check continuity between terminal "C34-4" of disconnected harness side TCM connector and ground. *Is continuity indicated?*	"GRY" or "LT GRN/BLK" circuit shorted to ground.	Go to Step 4.

Step	Action	Yes	No
4	**Check pressure control solenoid valve circuit for open** 1) Check resistance continuity between terminals “C34-2” and “C34-4” of disconnected harness side TCM connector. *Is it infinite?*	“GRY” or “LT GRN/BLK” circuit open.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.

DTC P0963: Pressure Control Solenoid Control Circuit High

S7N20A5104031

Wiring Diagram



1. TCM	3. A/T
2. Pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

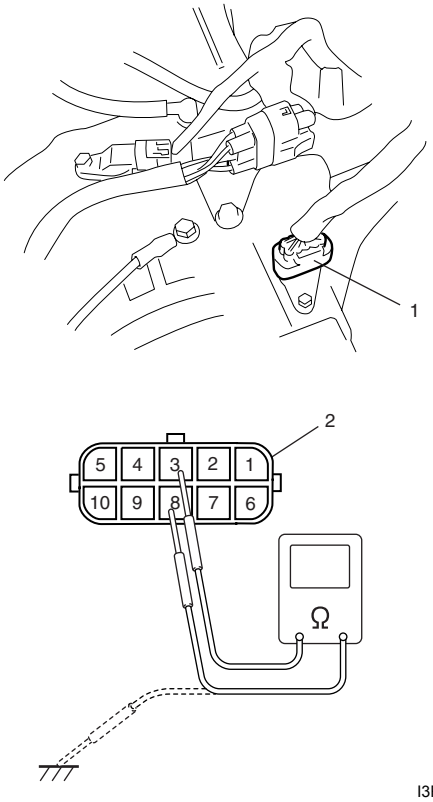
DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Pressure control solenoid valve output voltage is too high comparing with TCM command value.	• Pressure control solenoid valve circuit shorted to power circuit • Pressure control solenoid valve malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 10 seconds or more.
5) Check DTC.

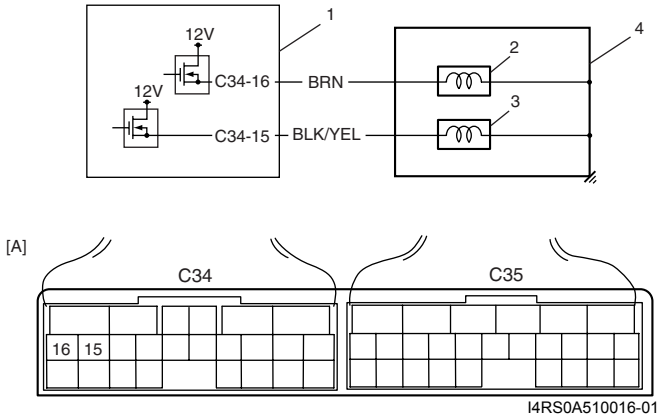
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check pressure control solenoid circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C34-2" and "C34-4". 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C34-4" of disconnected harness side TCM connector and ground. *Is it 0 – 2 V?*	Go to Step 3.	"BRN/YEL" or "LT GRN" circuit shorted to power circuit.
3	**Check pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "GRY" and "LT GRN/BLK" circuit. 4) Check resistance of pressure control solenoid. **Pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle valve body harness connector and transaxle: Infinity**  *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM and recheck.	Replace pressure control solenoid valve or valve body harness.

DTC P0973 / P0976: Shift Solenoid-A (No.1) Control Circuit Low / Shift Solenoid-B (No.2) Control Circuit Low

S7N20A5104032

Wiring Diagram



1. TCM	3. Shift solenoid valve-B (No.2)
2. Shift solenoid valve-A (No.1)	[A]: Terminal arrangement of TCM connector (Viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is low although TCM is commanding shift solenoid to turn ON	• Shift solenoid valve circuit shorted to ground • Malfunction of shift solenoid valve • TCM

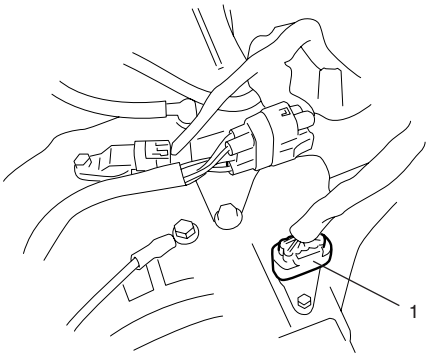
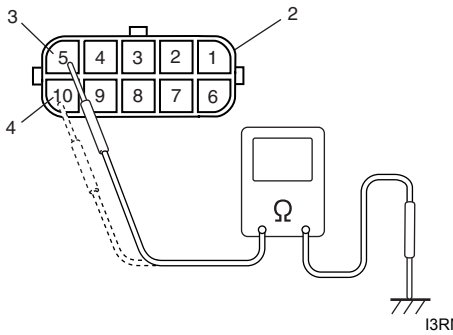
DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine shift select lever to “D” range.
4) Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
5) Decrease vehicle speed and stop vehicle.
6) Check DTC.

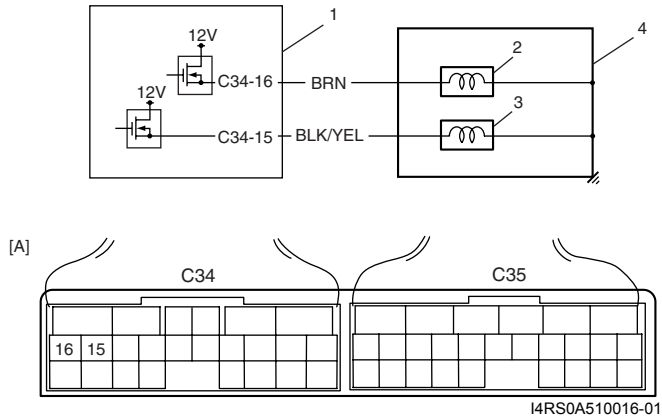
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automatic Transaxle Diagnostic Flow Table" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check shift solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transmission. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. **Shift solenoid valve resistance** **Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F)** **Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510022-01 *Is check results satisfactory?*	Go to Step 3.	Replace applicable shift solenoid valve or valve body harness.
3	**Check shift solenoid valve circuit for ground short** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)). 3) If connection is OK, check continuity between terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. *Is continuity indicated?*	DTC P0973: "BRN" circuit shorted to ground. DTC P0976: "BLK/YEL" circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM and recheck.

DTC P0974 / P0977: Shift Solenoid-A (No.1) / Shift Solenoid-B (No.2) Control Circuit High

S7N20A5104033

Wiring Diagram



1. TCM	3. Shift solenoid valve-B (No.2)	[A]: Terminal arrangement of TCM connector (viewed from harness side)
2. Shift solenoid valve-A (No.1)	4. A/T	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of shift solenoid valve TCM terminal is high although TCM is commanding shift solenoid to turn OFF	• Shift solenoid valve circuit open or shorted to power circuit • Malfunction of shift solenoid valve • TCM

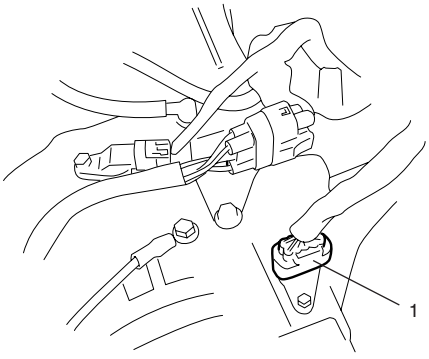
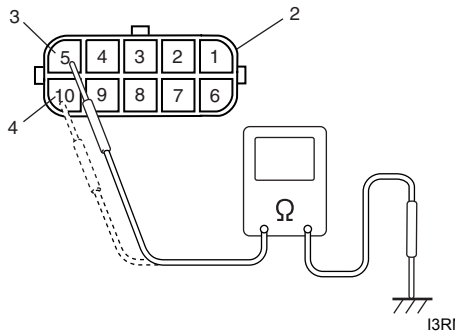
DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed until gear position reaches 3rd or 4th gear.
5) Decrease vehicle speed and stop vehicle.
6) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check shift solenoid valve circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)). 4) If connection is OK, turn ignition switch ON and measure voltage between terminal "C34-16" (for shift solenoid valve-A (No.1)) or "C34-15" (for shift solenoid valve-B (No.2)) of disconnected harness side TCM connector and ground. *Is it 0 – 2 V?*	Go to Step 3.	DTC P0974: "BRN" circuit shorted to power circuit. DTC P0977: "BLK/YEL" circuit shorted to power circuit.
3	**Check shift solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at "BRN" (for shift solenoid valve-A (No.1)) or "BLK/YEL" (for shift solenoid valve-B (No.2)) circuit. Check resistance of solenoid valve. **Shift solenoid valve resistance** **Between shift solenoid valve-A (No.1) terminal (3) and transaxle: 11 – 15 Ω at 20 °C (68 °F)** **Between shift solenoid valve-B (No.2) terminal (4) and transaxle: 11 – 15 Ω at 20 °C (68 °F)**   I3RM0B510022-01 *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM and recheck.	Replace applicable shift solenoid valve or valve body harness.

DTC P1702: Internal Control Module Memory Check Sum Error

S7N20A5104034

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Calculation of current data stored in TCM is not correct comparing with pre-stored checking data in TCM.	TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTC in TCM memory.
3) After 10 seconds passed from turning ignition switch ON, check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC P1702 detected after performing "DTC Confirmation Procedure"?*	Faulty TCM. Replace TCM.	Could be a temporary malfunction of TCM.

DTC P1703: Can Invalid Data - TCM

S7N20A5104035

DTC Detecting Condition and Trouble Area

When abnormality either on the gear shift control signal from ECM is detected by TCM, TCM sets DTC P1703.

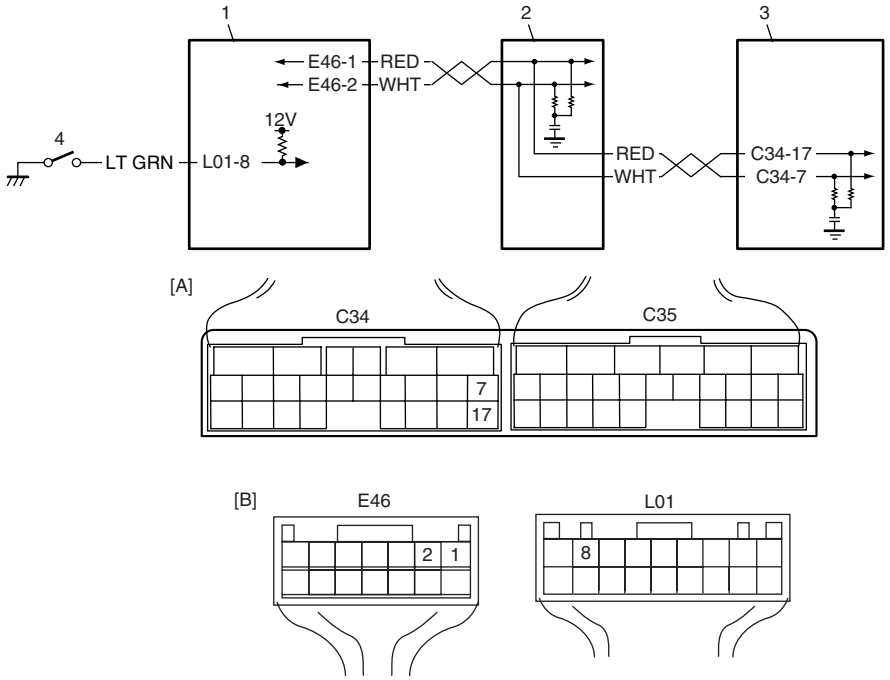
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**DTC check** 1) Check DTC of ECM referring to "DTC Check: M13A / M15A / M16A in Section 1A". *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good TCM and recheck. If OK, substitute a known-good ECM and recheck.

DTC P1723: Range Select Switch Malfunction

S7N20A5104036

Wiring Diagram



I4RS0A510017-01

1. BCM	3. TCM	[A]: TCM connector (viewed from harness side)
2. ECM	4. "3" position switch	[B]: BCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
"3" position switch ON signal is inputted although transmission range switch signal is inputted P, R, N or L. range.	• "3" position switch or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool and turn ignition switch ON.
3) Shift selector lever to each of "L", "2", "3", "D", "N", "R" and "P" ranges for 20 seconds each.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

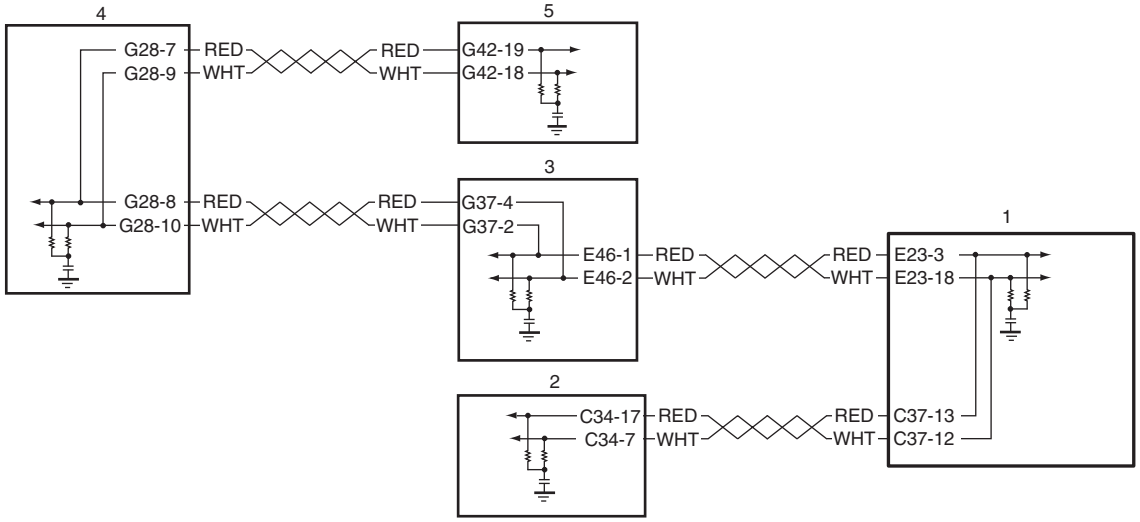
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**"3" position switch circuit for operation** 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check "3" position switch signal on scan tool data display when shifting select lever to each range. *Does indicate "3" position switch (O/D OFF switch) condition OFF when shifting select lever to "P", "R", "N" and "L" range?*	Substitute a known-good TCM and recheck.	Go to Step 3.

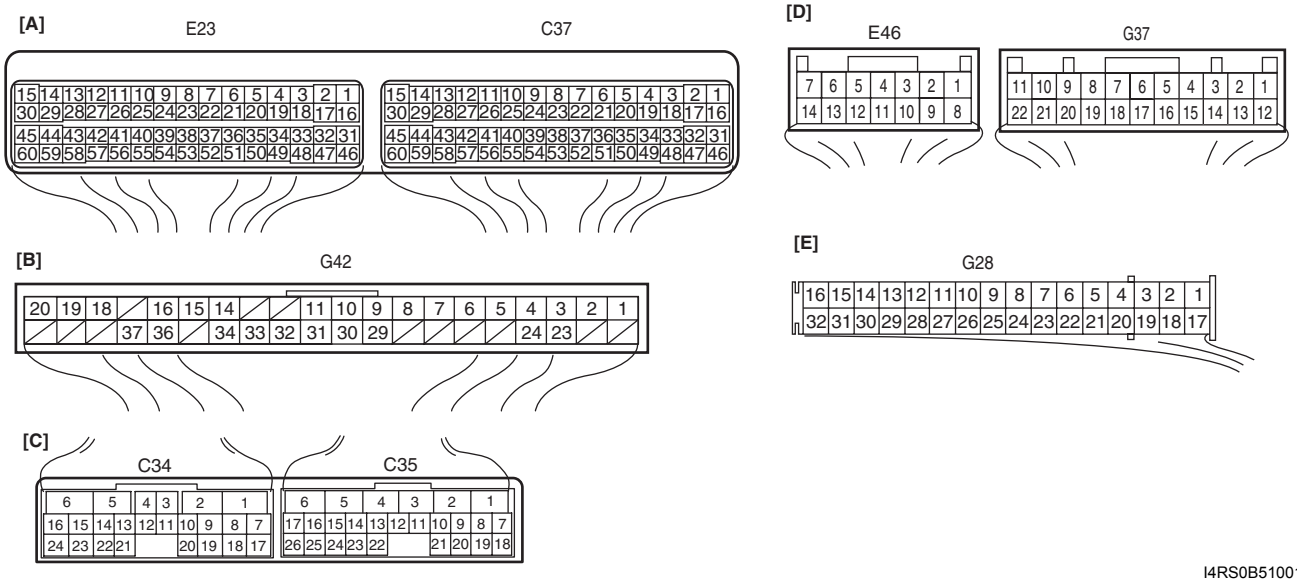
Step	Action	Yes	No
3	**“3” position switch signal inspection** With ignition switch ON, check voltage between “L01-8” terminal of BCM coupler and ground. **“3” position switch specifications** **Shift selector lever to “3” or “2” range: Battery voltage** **Shift selector lever to other above range: 0 V** *Is the result as specified?*	Substitute a known-good BCM and recheck.	Go to Step 4.
4	**Check “3” position switch operation** *Is it in good condition?*	“LT GRN” wire shorted to ground.	Replace “3” position switch.

DTC P1774: Control Module Communication Bus Off

S7N20A5104037

Wiring Diagram





I4RS0B510010-01

1. ECM	[A]: Terminal arrangement of ECM connector (viewed from harness side)
2. TCM	[B]: Terminal arrangement of Keyless start control module connector (viewed from harness side)
3. BCM	[C]: Terminal arrangement of TCM connector (viewed from harness side)
4. Combination meter	[D]: Terminal arrangement of BCM connector (viewed from harness side)
5. Keyless start control module (if equipped)	[E]: Terminal arrangement of combination meter connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously.	• ECM • BCM • TCM • Combination meter • Keyless start control module (if equipped) • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM and BCM. *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1777, P1778 in TCM, DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31, No.33 in keyless start control module)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check ECM, TCM, BCM, combination meter keyless start control module (if equipped) connectors** 1) Check for proper connection at each ECM, TCM, BCM and combination meter connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1774?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check". *Is it in good condition?*	Go to Step 5.	Repair TCM power and/or ground circuits.
5	**Check DTC in BCM, ECM and keyless start control module (if equipped) (bus off)** 1) Check DTC(s) in ECM, BCM and keyless start control module (if equipped). *Is there DTC(s) P1674 in ECM, U1073 in BCM and/or DTC No.33 in keyless start control module (if equipped)?*	Go to Step 6.	Go to Step 7.

Step	Action	Yes	No
6	**Check DTC in BCM, ECM and keyless start control module (if equipped)** 1) Disconnect connectors from TCM with ignition switch turned OFF. 2) Check DTC(s) for ECM, BCM and keyless start control module (if equipped). *Is there DTC(s) P1674 in ECM, U1073 in BCM and/or DTC No.33 in keyless start control module (if equipped)?*	Go to Step 7.	Substitute a known-good TCM and recheck.
7	**Check DTC in TCM** **NOTE** **If vehicle is not equipped keyless start control module, go to Step 8.** 1) Connect connector to TCM and disconnect connector from keyless start control module. 2) Check DTC in TCM. *Is DTC P1774?*	Go to Step 8.	Check keyless start control module power and ground circuit. If circuit id OK, substitute a known-good keyless start control module and recheck.
8	**Check DTC in TCM** 1) Connect connectors to TCM and disconnect connectors from combination meter with ignition switch turned OFF. 2) Check DTC in TCM. *Is there DTC 1774?*	Go to Step 9.	Substitute a known-good combination meter and recheck.
9	**Check DTC in TCM** 1) Disconnect connector from ECM with ignition switch turned OFF. 2) Check DTC in TCM. *Is there DTC 1774?*	Go to Step 10.	Substitute a known-good ECM and recheck.
10	**Check CAN communication line circuit insulation** 1) Disconnect connectors from ECM, BCM, TCM, combination meter and keyless start control module (if equipped) with ignition switch OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector • Between “G37-4” and “G37-2” terminals of BCM connector • Between “G42-19” and “G42-18” terminals of keyless start control module (if equipped) *Is each resistance infinity?*	Go to Step 11.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

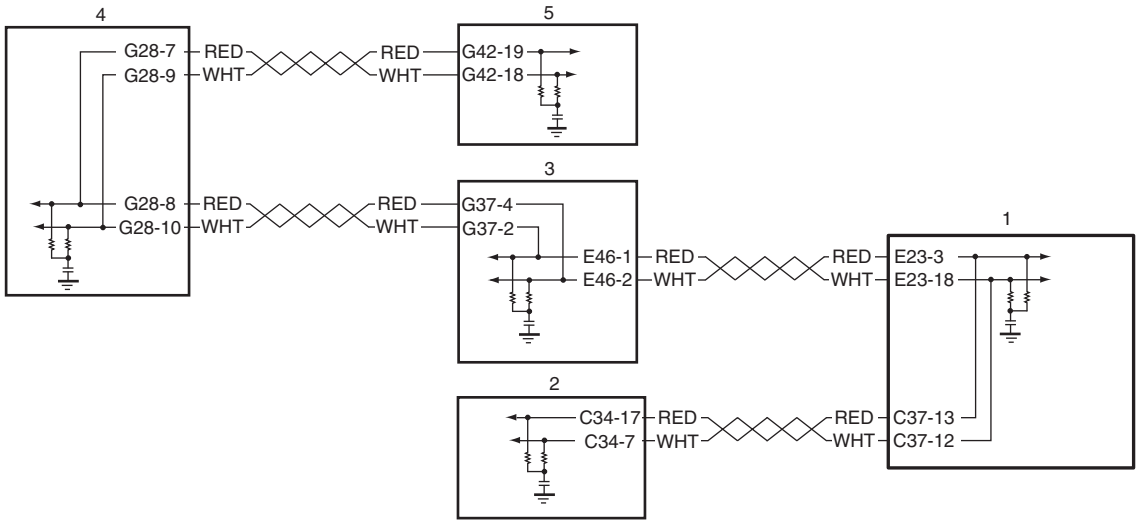
Step	Action	Yes	No
11	**Check CAN communication line circuit continuity** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and “E46-1” terminal of BCM connector • Between “E23-18” terminal of ECM connector and “E46-2” terminal of BCM connector • Between “C37-13” terminal of ECM connector and “C34-17” terminal of TCM connector • Between “C37-12” terminal of ECM connector and “C34-7” terminal of TCM connector • Between “G37-4” terminal of BCM connector and “G28-8” terminal of combination meter connector • Between “G37-2” terminal of BCM connector and “G28-10” terminal of combination meter connector • Between “G28-8” terminal of BCM connector and “G42-19” terminal of keyless start control module (if equipped) • Between “G28-10” terminal of BCM connector and “G42-18” terminal of keyless start control module (if equipped) *Is each resistance below 1 Ω?*	Go to Step 12.	Repair open or high resistance of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
12	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground • Between “G42-19” terminal of keyless start control module (if equipped) connector and vehicle body ground • Between “G42-18” terminal of keyless start control module (if equipped) connector and vehicle body ground *Is each resistance infinity?*	Go to Step 13.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

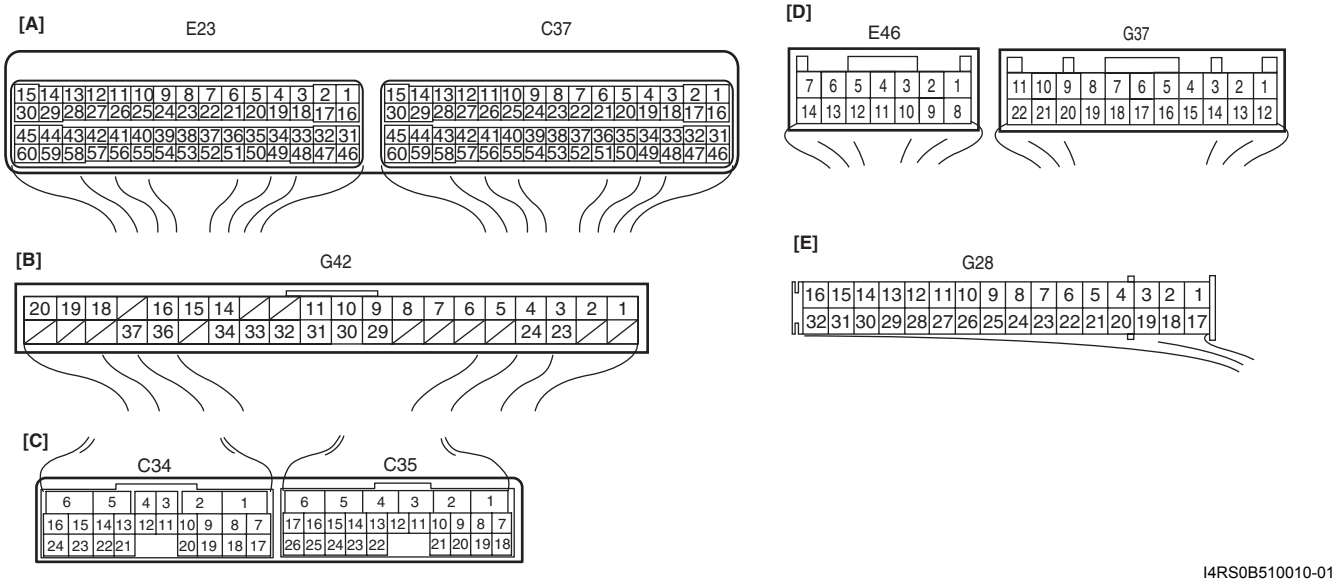
Step	Action	Yes	No
13	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground • Between “G37-4” terminal of BCM connector and vehicle body ground • Between “G37-2” terminal of BCM connector and vehicle body ground • Between “G42-19” terminal of keyless start control module (if equipped) connector and vehicle body ground • Between “G42-18” terminal of keyless start control module (if equipped) connector and vehicle body ground *Is each voltage 0 – 1 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck. If DTC is still detected, substitute a known-good ECM and recheck.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.

DTC P1777: TCM Lost Communication with ECM (Reception Error)

S7N20A5104039

Wiring Diagram





I4RS0B510010-01

1. ECM	[A]: Terminal arrangement of ECM connector (viewed from harness side)
2. TCM	[B]: Terminal arrangement of Keyless start control module connector (viewed from harness side)
3. BCM	[C]: Terminal arrangement of TCM connector (viewed from harness side)
4. Combination meter	[D]: Terminal arrangement of BCM connector (viewed from harness side)
5. Keyless start control module (if equipped)	[E]: Terminal arrangement of combination meter connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ECM is detected more than specified time continuously.	• ECM • TCM • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

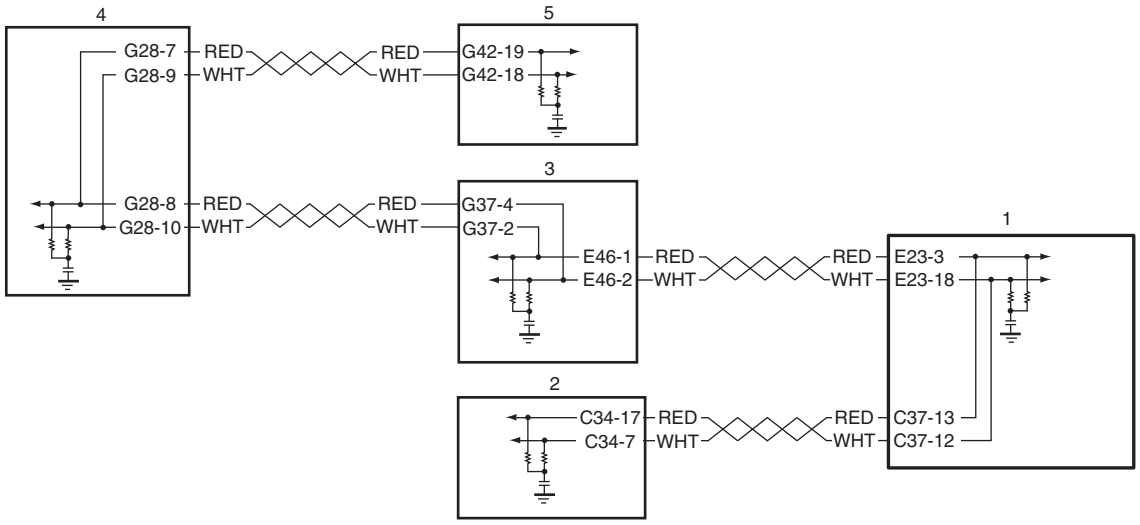
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM, BCM and keyless start control module (if equipped). *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1777, P1778 in TCM, DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31, No.33 in keyless start control module)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off".	Go to Step 4.
4	**Check ECM and TCM connectors** 1) Check for proper connection at each ECM and TCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1777?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC in ECM** 1) Check DTC P1674 in ECM. *Is it indicated?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A in Section 1A".	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from ECM and TCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C37-13" terminal of ECM connector and "C34-17" terminal of TCM connector • Between "C37-12" terminal of ECM connector and "C34-7" terminal of TCM connector *Is each resistance below 1 Ω?*	Go to Step 8.	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".
8	**Check CAN communication line circuit insulation** 1) Measure resistance between "C34-17" and "C34-7" terminals of TCM connector. *Is resistance infinity?*	Go to Step 9.	Repair insulation of CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".

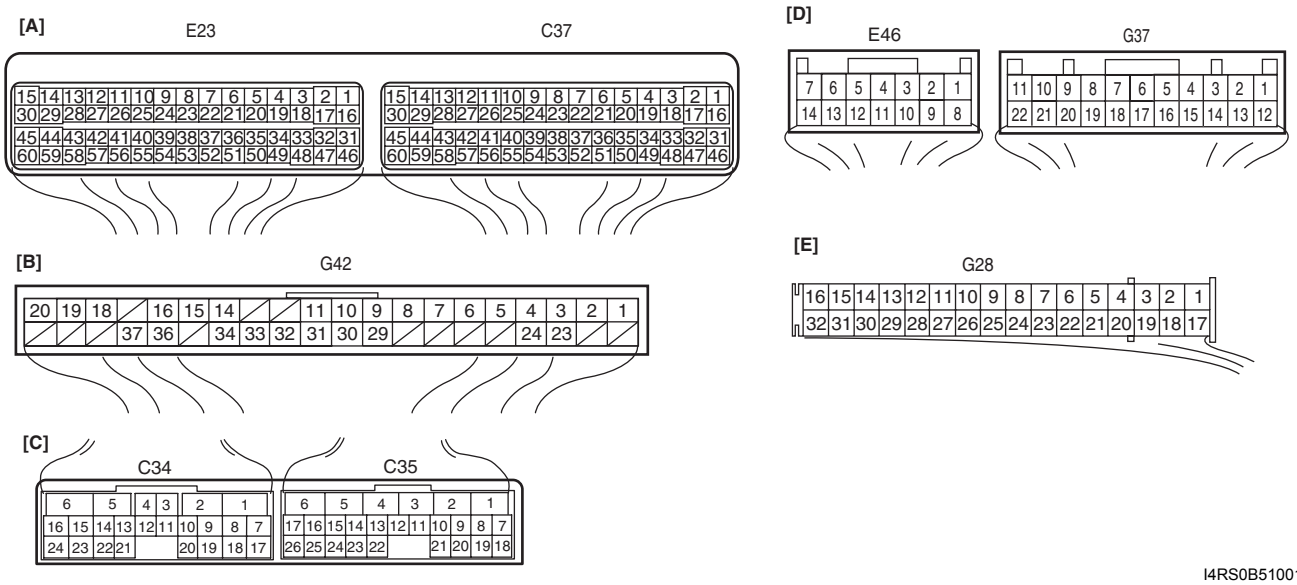
Step	Action	Yes	No
9	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 10.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
10	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “C34-17” terminal of TCM connector and vehicle body ground • Between “C34-7” terminal of TCM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 11.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
11	**Check DTC in BCM** 1) Connect connectors to ECM and TCM with ignition switch turned OFF. 2) Check DTC U1100 in BCM. *Is it indicated?*	Substitute a known-good ECM and recheck.	Go to Step 12.
12	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Substitute a known-good TCM and recheck.	Substitute a known-good ECM and recheck.

DTC P1778: TCM Lost Communication with BCM (Reception Error)

S7N20A5104040

Wiring Diagram





I4RS0B510010-01

1. ECM	[A]: Terminal arrangement of ECM connector (viewed from harness side)
2. TCM	[B]: Terminal arrangement of Keyless start control module connector (viewed from harness side)
3. BCM	[C]: Terminal arrangement of TCM connector (viewed from harness side)
4. Combination meter	[D]: Terminal arrangement of BCM connector (viewed from harness side)
5. Keyless start control module (if equipped)	[E]: Terminal arrangement of combination meter connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected more than specified time continuously.	• ECM • TCM • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in ECM, TCM, BCM and keyless start control module (if equipped). *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1777, P1778 in TCM, DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31, No.33 in keyless start control module)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM for CAN communication error** 1) Check DTC in TCM. *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off".	Go to Step 4.
4	**Check ECM, TCM and BCM connectors** 1) Check for proper connection at each ECM, TCM and BCM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM for DTC with engine running. *Is there DTC P1778?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**Check TCM power and ground circuit** 1) Check for TCM power and ground circuit referring to "TCM Power and Ground Circuit Check". *Is it in good condition?*	Go to Step 6.	Repair TCM power and/or ground circuits.
6	**Check DTC in BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off in Section 10B".	Go to Step 7.
7	**Check CAN communication line circuit continuity** 1) Disconnect connectors from TCM and BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "C34-17" terminal of TCM connector and "E46-1" terminal of BCM connector • Between "C34-7" terminal of TCM connector and "E46-2" terminal of BCM connector *Is each resistance below 1 Ω?*	Go to Step 9.	Go to Step 8.
8	**Check ECM internal circuit** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between "E23-3" and "C37-13" terminals of ECM connector • Between "E23-18" and "C37-12" terminals of ECM connector *Is resistance below 1 Ω?*	Repair open or high resistance CAN communication line circuit referring to "Precaution for CAN Communication System in Section 00".	Substitute a known-good ECM and recheck.

Step	Action	Yes	No
9	**Check CAN communication line circuit insulation** 1) Disconnect connectors from BCM with ignition switch turned OFF. 2) Measure resistance at the following connector terminals. • Between “E23-3” and “E23-18” terminals of ECM connector • Between “C37-13” and “C37-12” terminals of ECM connector *Is resistance infinity?*	Go to Step 10.	Repair insulation of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
10	**Check CAN communication line circuit ground short** 1) Measure resistance at the following connector terminals. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each resistance infinity?*	Go to Step 11.	Repair shorted to ground of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
11	**Check CAN communication line circuit power supply short** 1) Measure voltage at the following connector terminals with ignition switch turned ON. • Between “E23-3” terminal of ECM connector and vehicle body ground • Between “E23-18” terminal of ECM connector and vehicle body ground • Between “C37-13” terminal of ECM connector and vehicle body ground • Between “C37-12” terminal of ECM connector and vehicle body ground *Is each voltage 0 – 1 V?*	Go to Step 12.	Repair shorted to power supply of CAN communication line circuit referring to “Precaution for CAN Communication System in Section 00”.
12	**Check DTC for ECM** 1) Connect connectors to ECM and BCM with ignition switch turned OFF. 2) Check DTC P1678 for ECM. *Is it indicated?*	Substitute a known-good BCM and recheck.	Substitute a known-good TCM and recheck.

DTC P1878: Torque Converter Clutch Shudder

S7N20A5104041

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
The acceleration slip control function stops when the variation in the output revolution speed of the specified amplitude and specified cycle is detected within a specified period of time. When the specified variation is not detected after the acceleration slip control stops.	• Mismatching ATF • Torque converter clutch malfunction • Valve body

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle with 3rd or 4th gear in “D” range and slip controlled lock-up ON for 20 seconds or longer referring to “Automatic Gear Shift Table”.
5) Stop vehicle.
6) Check DTC, pending DTC and freeze-frame data.

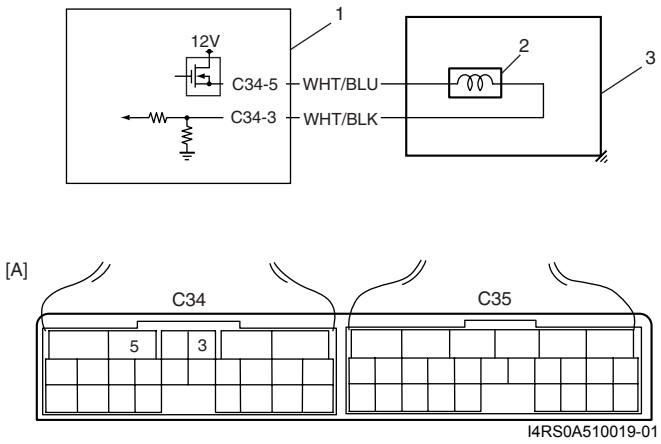
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.
2	Change A/T fluid referring to “A/T Fluid Change”. Check DTC after performing “DTC Confirmation Procedure”. *Is DTC P1878 still indicated?*	Faulty torque converter clutch. Replace torque converter.	System is in good condition.

DTC P2762: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit Range / Performance

S7N20A5104050

Wiring Diagram



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1. TCM	3. A/T
2. TCC lock-up pressure control solenoid valve	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

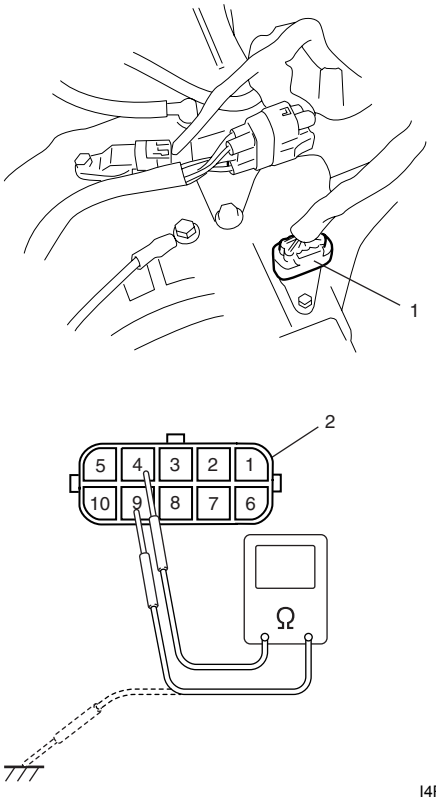
DTC detecting condition	Trouble area
Difference between target current of TCC lock-up pressure control solenoid valve circuit and monitor current of TCC lock-up pressure control solenoid valve circuit is more than specification.	• TCC lock-up pressure control solenoid valve or its circuit malfunction • TCM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed for 30 seconds or more.
5) Stop vehicle and check DTC.

DTC Troubleshooting

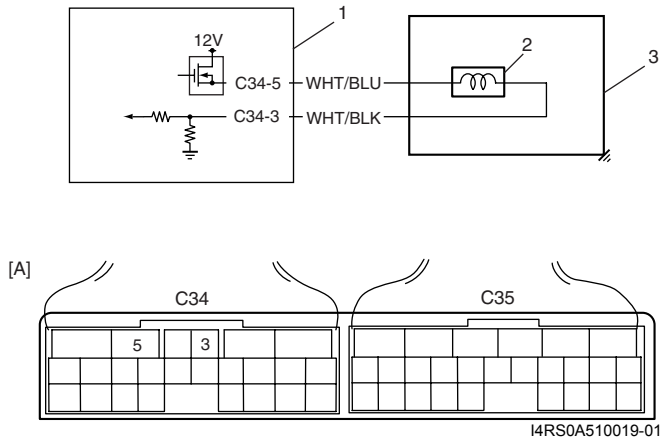
Step	Action	Yes	No
1	*Was "A/T System Check" performed?*	Go to Step 2.	Go to "A/T System Check".

Step	Action	Yes	No
2	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch to OFF position. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to terminal at “WHT/BLU” and “WHT/BLK” circuit. 4) Check resistance of TCC lock-up pressure control solenoid valve. **TCC lock-up pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle valve body harness connector and transaxle: Infinity**  I4RS0A510020-01 *Is check results satisfactory?*	Go to Step 3.	Replace TCC lock-up pressure control solenoid valve or valve body harness.
3	**Check for TCC lock-up pressure control solenoid valve circuit** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals “C34-3” and “C34-5”. If connection is OK, check circuit for open, short and high resistance for the following circuit. • Between “C34-3” terminal of TCM connector and “WHT/BLK” terminal of valve body harness connector. • Between “C34-5” terminal of TCM connector and “WHT/BLU” terminal of valve body harness connector. *Are they in good condition?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Repair “WHT/BLU” and/or “WHT/BLK” circuit.

DTC P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High

S7N20A5104042

Wiring Diagram



1. TCC lock-up pressure control solenoid valve	3. A/T
2. TCM	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is high although TCM is commanding TCC lock-up pressure control solenoid to turn OFF.	• TCC lock-up pressure control solenoid valve circuit shorted to ground • Malfunction of TCC lock-up pressure control solenoid valve • TCM

DTC Confirmation Procedure

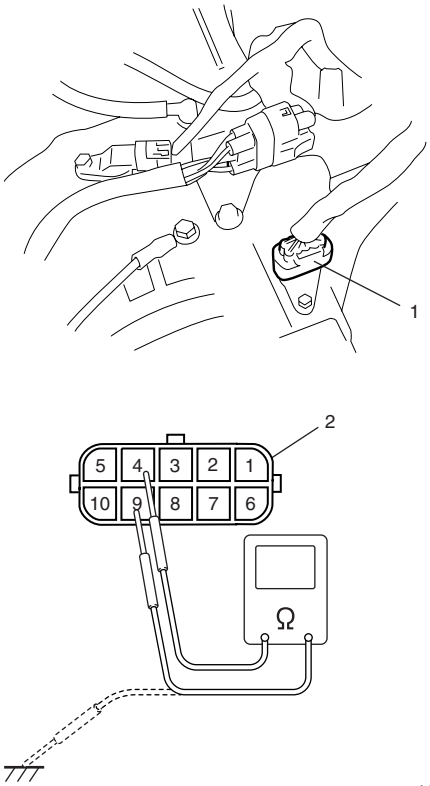
⚠ WARNING

- **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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 10 seconds or more.
5) Check DTC.

DTC Troubleshooting

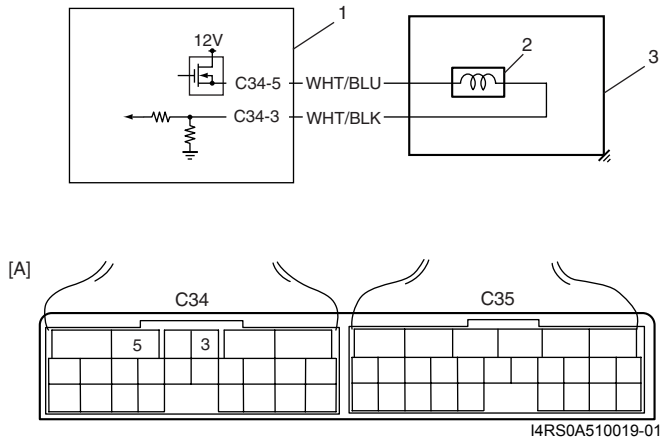
Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.

Step	Action	Yes	No
2	**Check TCC solenoid valve circuit for IG short** 1) Connect valve body harness connector. 2) Disconnect TCM connectors. 3) Check for proper connection to TCM at terminal “C34-3” and “C34-5”. 4) If connection is OK, turn ignition switch ON and measure voltage between terminal “C34-3” of disconnected harness side TCM connector and ground between terminal “C34-5” of disconnected harness side TCM connector and ground. *Are voltage 1 V or less?*	Go to Step 3.	“WHT/BLU” or “WHT/BLK” circuit shorted to power circuit.
3	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at “WHT/BLU” and “WHT/BLK” circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. **TCC lock-up pressure control solenoid valve resistance** **Between terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between terminals of transaxle side valve body harness connector and transaxle: Infinity**  I4RS0A510020-01 *Is check results satisfactory?*	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.	Replace TCC lock-up pressure control solenoid valve or lead wire.

DTC P2764: Torque Converter Clutch (TCC) Circuit Pressure Control Solenoid Control Circuit Low

S7N20A5104043

Wiring Diagram



1. TCC pressure control solenoid valve	3. A/T
2. TCM	[A]: Terminal arrangement of TCM connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage of TCC lock-up pressure control solenoid valve TCM terminal is low although TCM is commanding TCC lock-up pressure control solenoid to turn ON.	• TCC lock-up pressure control solenoid valve circuit shorted to ground • Malfunction of TCC lock-up pressure control solenoid valve • TCM

DTC Confirmation Procedure

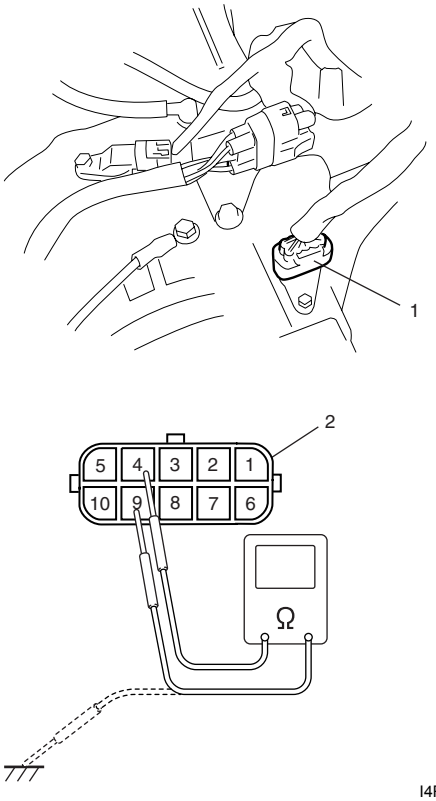
⚠ WARNING

- **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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC in TCM memory.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 20 seconds or more.
5) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “A/T System Check” performed?*	Go to Step 2.	Go to “A/T System Check”.

Step	Action	Yes	No
2	**Check TCC lock-up pressure control solenoid valve resistance** 1) Turn ignition switch OFF. 2) Disconnect valve body harness connector (1), (2) on automatic transaxle. 3) Check for proper connection to solenoid at “WHT/BLU” and “WHT/BLK” circuits. 4) Check resistance of TCC lock-up pressure control solenoid valve. **<u>TCC lock-up pressure control solenoid valve resistance</u>** **Between shift terminals of transaxle side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)** **Between shift terminals of transaxle side valve body harness connector and transaxle: Infinity**  I4RS0A510020-01 *Is check results satisfactory?*	Go to Step 3.	Replace TCC lock-up pressure control solenoid valve or lead wire.
3	**Check TCC lock-up pressure control solenoid valve circuit for ground short** 1) Disconnect TCM connectors. 2) Check for proper connection to TCM at terminals “C34-3” and “C34-5”. 3) If connection is OK, check continuity between terminal “C34-5” of disconnected harness side TCM connector and ground, between terminal “C34-3” of disconnected harness side TCM connector and ground. *Are continuity indicated?*	“WHT/BLU” or “WHT/BLK” circuit shorted to ground.	Intermittent trouble or faulty TCM. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM and recheck.

Inspection of TCM and Its Circuits

S7N20A5104044

TCM and its circuits can be checked at TCM wiring connectors by measuring voltage, pulse signal and resistance.

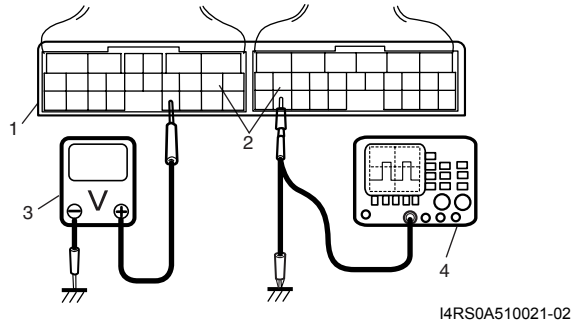
⚠ CAUTION

TCM cannot be checked by itself, it is strictly prohibited to connect voltmeter or ohmmeter to TCM with connector disconnected from it.

1) Remove TCM (1) from vehicle referring to “Transmission Control Module (TCM) Removal and Installation”.
2) Connect TCM connectors (2) to TCM.
3) Check voltage and/or pulse signal at each terminal of connectors connected using voltmeter (3) and oscilloscope (4).

NOTE

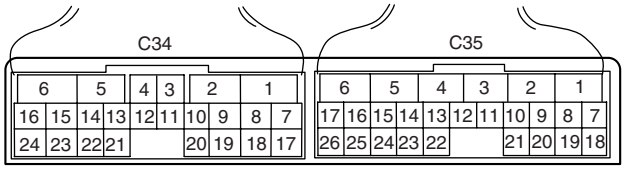
- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk(*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**



I4RS0A510021-02

3. Body ground

Terminal arrangement of TCM coupler (Viewed from harness side)



I4RS0A510022-01

Connector “C34”

Terminal	Wire color	Circuit	Standard voltage	Condition
1	BLK	Ground	0 – 1 V	Ignition switch ON
2	LT GRN/ BLK	Pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
3	WHT/BLK	TCC pressure control solenoid valve (–)	0.6 – 1.0 V	Ignition switch ON
4	GRY	Pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No. 1: ”)	Engine running at idling. (Output signal is duty pulse. Duty ratio varies depending on throttle valve opening.)

Terminal	Wire color	Circuit	Standard voltage	Condition
5	WHT/BLU	TCC pressure control solenoid valve (+)	*0 – 0.6 V ↑↓ 10 – 14 V (“Reference waveform No. 2: ”)	Engine running at idling. (Output signal is duty pulse. Duty ratio varies depending on torque converter clutch operating condition.)
6	YEL/BLK	Power source	10 – 14 V	Ignition switch ON
7	WHT	CAN communication line (Low)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (“Reference waveform No. 3: ”)	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.))
8	—	—	—	—
9	—	—	—	—
10	—	—	—	—
11	LT GRN	Transmission fluid temperature sensor (+)	2.9 – 3.1 V	Ignition switch ON, fluid temperature is 20 °C (68 °F)
			0.3 – 0.5 V	Ignition switch ON, fluid temperature is 100 °C (212 °F)
12	ORN	Transmission fluid temperature sensor (–)	0 – 1 V	Ignition switch ON
13	—	—	—	—
14	BLU/BLK	Timing solenoid valve	0 – 1 V	Ignition switch ON
15	BLK/YEL	Shift solenoid valve-B (No.2)	9 – 14 V	Ignition switch ON, select lever in “P” range
16	BRN	Shift solenoid valve-A (No.1)	9 – 14 V	Ignition switch ON, select lever in “P” range
17	RED	CAN communication line (High)	*2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (“Reference waveform No. 3: ”)	Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.)
18	—	—	—	—
19	—	—	—	—
20	—	—	—	—
21	—	—	—	—
22	—	—	—	—
23	BLK	Ground	0 – 1 V	Ignition switch ON
24	WHT/RED	Power source for back-up	10 – 14 V	Constantly

Connector “C35”

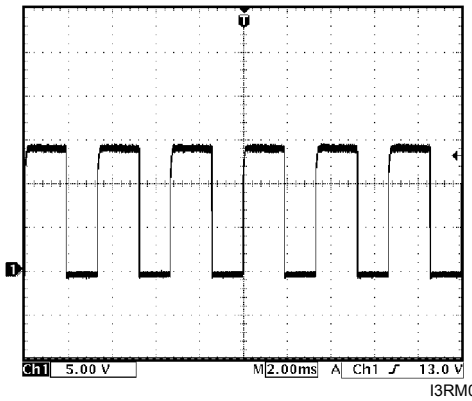
Terminal	Wire color	Circuit	Standard voltage	Condition
1	RED	Transmission range sensor (“R” range)	8 – 14 V	Ignition switch ON, selector lever at “R” range
			0 – 1 V	Ignition switch ON, selector lever at other than “R” range
2	—	—	—	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	WHT	Input shaft speed sensor (+)	2 – 3 V	Ignition switch turned ON, engine stops.
			*(“Reference waveform No. 4: ”)	While engine running. (Output signal is waveform. Waveform frequency varies depending on output shaft speed. (16 pulses are generated par 1 input shaft revolution.))

Terminal	Wire color	Circuit	Standard voltage	Condition
7	GRN	Transmission range sensor (“D” range)	8 – 14 V	Ignition switch ON, selector lever at “D” range
			0 – 1 V	Ignition switch ON, selector lever at other than “D” range
8	GRN/ORN	Transmission range sensor (“N” range)	8 – 14 V	Ignition switch ON, selector lever at “N” range
			0 – 1 V	Ignition switch ON, selector lever at other than “N” range
9	—	—	—	—
10	—	—	—	—
11	—	—	—	—
12	—	—	—	—
13	—	—	—	—
14	—	—	—	—
15	—	—	—	—
16	BLK	Input shaft speed sensor (–)	2 – 3 V	Ignition switch ON, engine at stop
17	—	—	—	—
18	LT GRN/ BLK	Transmission range sensor (“L” range)	8 – 14 V	Ignition switch ON, selector lever at “L” range
			0 – 1 V	Ignition switch ON, selector lever at other than “L” range
19	GRN/YEL	Transmission range sensor (“2” range)	8 – 14 V	Ignition switch ON, selector lever at “2” range
			0 – 1 V	Ignition switch ON, selector lever at other than “2” range
20	PNK/BLK	Transmission range sensor (“P” range)	8 – 14 V	Ignition switch ON, selector lever at “P” range
			0 – 1 V	Ignition switch ON, selector lever at other than “P” range
21	—	—	—	—
22	—	—	—	—
23	PPL/WHT	Data link connector	8 – 14 V	Ignition switch ON
24	—	—	—	—
25	PPL	Output shaft speed sensor (VSS)	8 – 14 V	Ignition switch ON
			*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No. 5: ”)	Vehicle running. (Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (8190 pulses are generated par 60 km/h, 37.5 mile/h)
26	—	—	—	—

Reference waveform No. 1

Pressure control solenoid valve signal at engine idling.

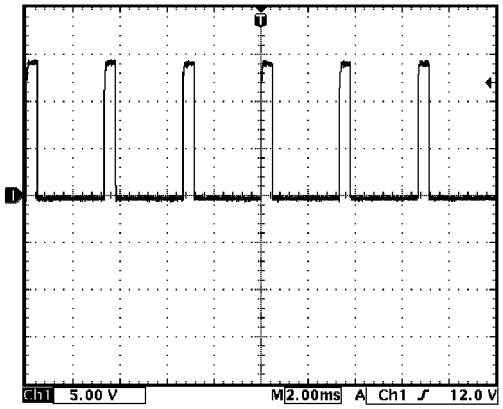
Measurement terminal	CH1: “C34-4” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 20 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510029-01

Reference waveform No. 2
TCC pressure control solenoid valve signal at engine idling.

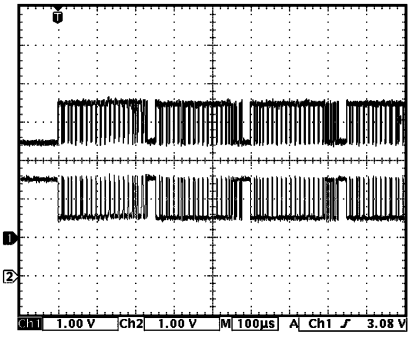
Measurement terminal	CH1: “C34-5” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV Time: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range



I4RS0A510024-01

Reference waveform No. 3
CAN communication line (High & Low) signal at engine idling.

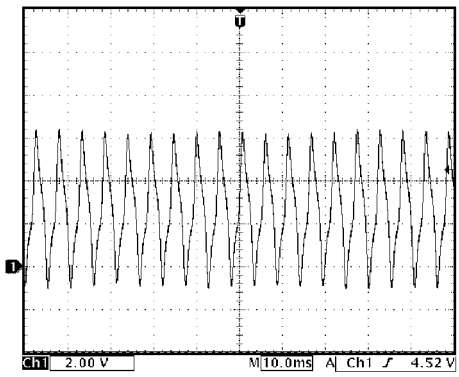
Measurement terminal	CH1: “C34-7” to “C34-1” CH2: “C34-17” to “C34-1”
Oscilloscope setting	CH1: 1 V/DIV TIME: 100 μs/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510030-01

Reference waveform No. 4
Input shaft speed sensor signal at engine idling.

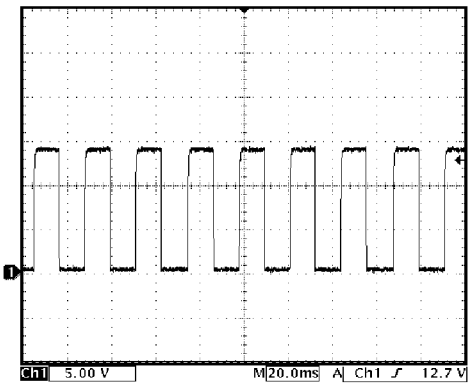
Measurement terminal	CH1: “C35-6” to “C34-1”
Oscilloscope setting	CH1: 2 V/DIV TIME: 10 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “P” range.



I3RM0B510027-01

Reference waveform No. 5
Output shaft speed sensor (VSS) signal at vehicle speed 60 km/h (37 mile/h).

Measurement terminal	CH1: “C35-25” to “C34-1”
Oscilloscope setting	CH1: 5 V/DIV TIME: 2 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Drive vehicle at 60 km/h (37 mile/h).

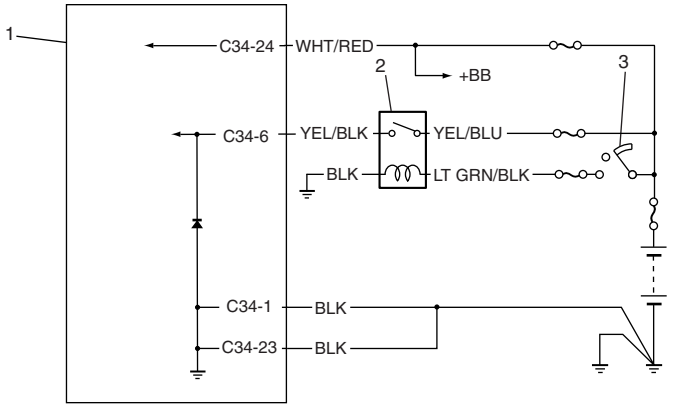


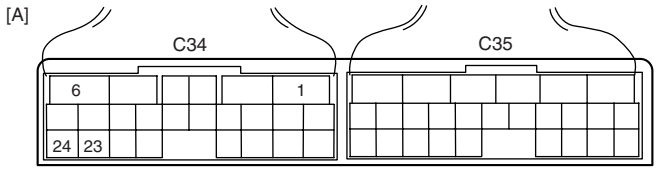
I3RM0B510028-01

TCM Power and Ground Circuit Check

S7N20A5104045

Wiring Diagram





I4RS0A510023-01

1. TCM	3. Ignition switch
2. A/T relay	[A]: Terminal arrangement of TCM connector (viewed from harness side)

Troubleshooting

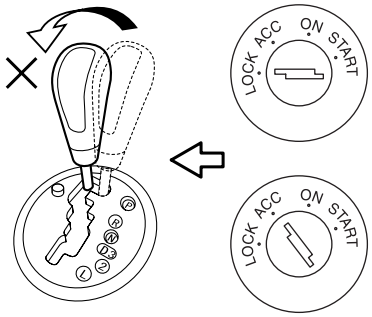
Step	Action	Yes	No
1	**Check TCM back-up power circuit** 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at “C34-24” terminal. 3) If OK, check voltage at terminal “C34-24” of disconnected TCM connector. *Is it 10 – 14 V?*	Go to Step 2.	“WHT/RED” circuit open or shorted to ground.
2	**Check TCM power circuit** 1) Disconnect TCM connector with ignition switch OFF. 2) Check for proper connection to TCM at “C34-6” terminal. 3) If OK, turn ignition switch ON and check voltage at terminal “C34-6” of disconnected TCM connector. *Is it 10 – 14 V?*	Go to Step 4.	Go to Step 3.
3	**Check A/T relay operation** 1) Check A/T relay operation referring to “A/T Relay Inspection”. *Is check result satisfactory?*	“YEL/BLK”, “YEL/BLU”, “LT GRN/BLK” or “BLK” circuit for power supply open.	Replace A/T relay.

Step	Action	Yes	No
4	**Check TCM ground circuit** 1) Turn ignition switch OFF. 2) With TCM connectors disconnected, check for proper connection to TCM at “C34-1” / “C34-23” terminal. 3) If OK, check resistance between “C34-1” / “C34-23” terminal of disconnected TCM connector and body ground. *Is continuity indicated?*	TCM power and ground circuits are in good condition.	“BLK” circuit for TCM ground open.

Brake Interlock System Inspection

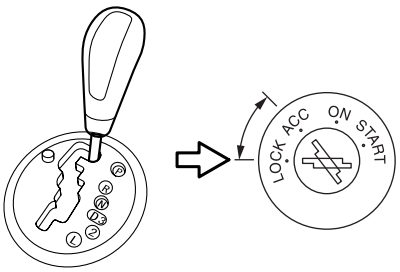
S7N20A5104046

1) Check that selector lever cannot be moved to any other range from “P” range position when ignition switch key is at ACC position, at LOCK position or it is removed from keyhole of ignition switch, or brake pedal is not depressed.



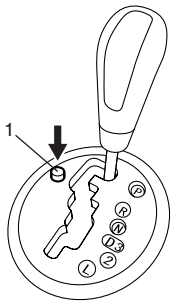
I4RS0A510047-01

2) Shift selector lever to “P” range position, release knob button and check for the following.
   - Ignition key can be turned between LOCK and ACC positions back and forth and also it can be removed from ignition switch.



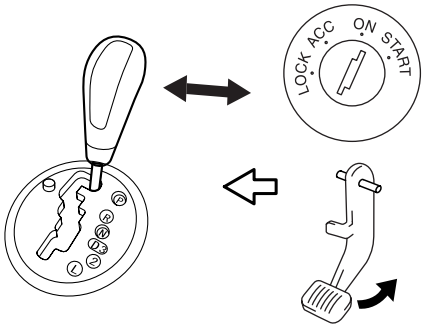
I4RS0A510048-01

   - With shift lock solenoid release button (1) pushed and ignition key turned to ACC position, selector lever can be shifted from “P” range position to any other range.
   - With shift lock solenoid release button (1) pushed and ignition key turned to LOCK position, selector lever can not be shifted from “P” range position to any other range.



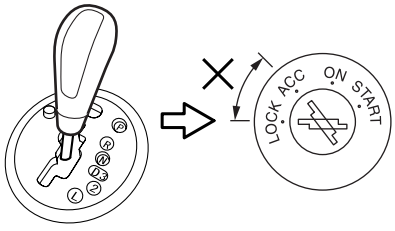
I4RS0A510049-01

   - When ignition switch is turned ON and brake pedal is depressed, selector lever can be shifted from “P” range position to any other range.



I4RS0A510050-01

3) With ignition lever shifted to any position other than “P” range, check that ignition key cannot be turned LOCK position and it cannot be removed from ignition switch unless it is at LOCK position.



I4RS0A510051-01

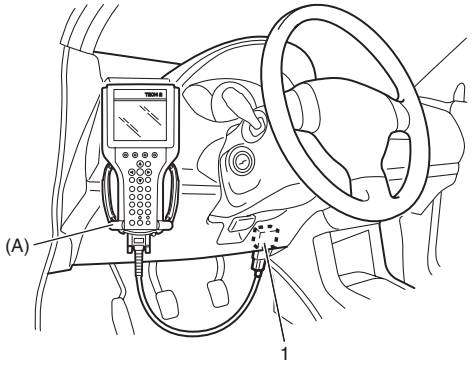
Repair Instructions

Learning Control Initialization

S7N20A5106001

1) Connect san tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I4RS0B510004-01

2) Start engine and shift selector lever to “P” range.
3) Select “Misc Test” mode on scan tool.
4) Perform “AT learned initialize” on scan tool.

A/T Fluid Level Check

S7N20A5106002

⚠ CAUTION

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

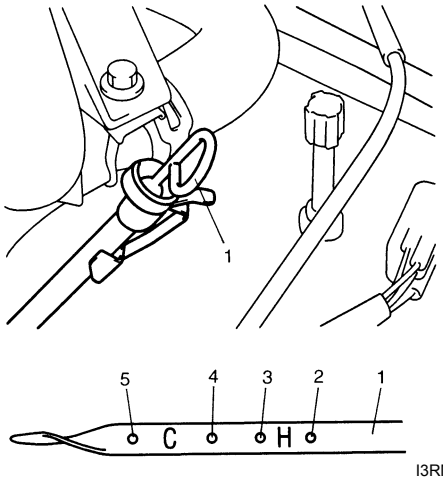
Level Check at Normal Operating (Hot) Temperature – Hot Check

1) Stop vehicle and place it level.
2) Apply parking brake and place chocks against wheels.
3) With selector at “P” position, start engine.
4) Warm up engine till fluid temperature reaches normal operating temperature (70 – 80 °C / 158 – 176 °F). As a guide to check fluid temperature, warm up engine to normal operating.
5) Keep engine idling and shift selector slowly to “L” and back to “P” position.
6) With engine idling, pull out fluid level gauge, wipe it off with a clean cloth and put it back into place.
7) Pull out fluid level gauge (1) again and check fluid level indicated on it. The lowest fluid level should be between FULL HOT (2) and LOW HOT (3). If it is below LOW HOT, add SUZUKI ATF 3317 or Mobil ATF 3309 up to FULL HOT.

Automatic transaxle fluid
SUZUKI ATF 3317 or Mobil ATF 3309

NOTE

- **Do not race engine while checking fluid level, even after the engine start.**
- **Do not overfill. Overfilling can cause foaming and loss of fluid through breather. Then slippage and transaxle failure can result.**
- **Bringing the level from LOW HOT to FULL HOT requires 0.4 liters (0.85 / 0.70 US/Imp. pt).**
- **If vehicle was driven under high load such as pulling a trailer, fluid level should be checked about half an hour after it is stopped.**



I3RM0B510032-01

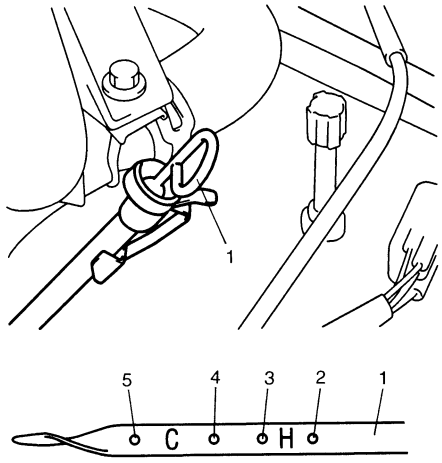
4. “FULL COLD” mark	5. “LOW COLD” mark

Level Check at Room (Cold) Temperature – Cold Check

Fluid level can be checked temporarily at room (cold) temperature which correspond to 20 – 30 °C (68 – 86 °F). This level check is considered to be preparation before performing level check under normal operating (hot) temperature. Checking procedure itself is the same as that described in “Level Check at Normal Operating (Hot) Temperature – Hot Check: ”. If fluid level is between “FULL COLD” (4) and “LOW COLD” (5), proceed to test drive. And when fluid temperature has reached normal operating temperature, check fluid level again and adjust it as necessary.

⚠ CAUTION

Fluid level check at room (cold) temperature is recommended only for preparation of level check under normal (hot) operating condition.
Failure to perform fluid level check under normal (hot) operating temperature may result in damage to transaxle.



I3RM0B510032-01

1. Fluid level gauge	3. “LOW HOT” mark
2. “FULL HOT” mark	

A/T Fluid Change

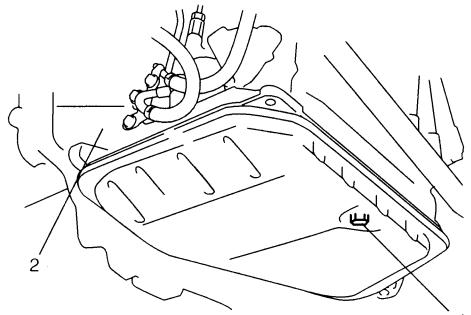
S7N20A5106003

⚠ CAUTION

Do not use any fluid other than the specified ATF. Use of any fluid other than the specified ATF may cause juddering or some other faulty condition to occur.

1) Lift up vehicle.
2) When engine is cool, remove drain plug (1) from transaxle housing (2) and drain A/T fluid.
3) Install drain plug (1).

Tightening torque
A/T fluid drain plug (a): 17 N·m (1.7 kgf-m, 12.5 lbf-ft)

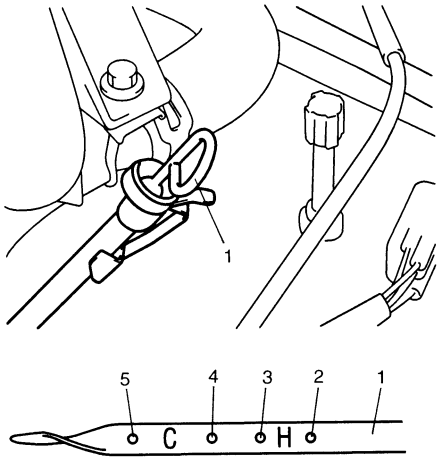


I3RM0B510033-01

4) Lower vehicle and pour proper amount of SUZUKI ATF 3317 or Mobil ATF 3309.
5) Check fluid level referring to “A/T Fluid Level Check”.

Automatic transaxle fluid specification
: SUZUKI ATF 3317 or Mobil ATF 3309

Automatic transaxle fluid capacity
When draining from drain plug hole: 3.3 liters (6.97 / 5.81 US/Imp. pt.)
When overhauling: 5.6 liters (11.83 / 9.86 US/Imp. pt.)

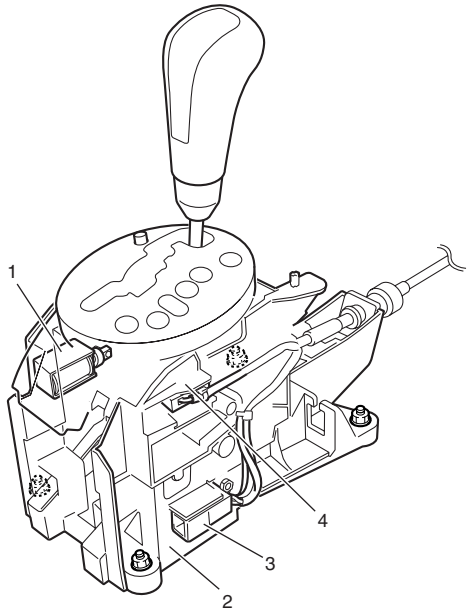


I3RM0B510032-01

1. Fluid level gauge	4. “FULL COLD” mark
2. “FULL HOT” mark	5. “LOW COLD” mark
3. “LOW HOT” mark	

Selector Lever Components

S7N20A5106004



I4RS0A510052-01

1. Shift lock solenoid	3. Connector
2. Selector lever assembly	4. “3” position switch

Select Lever Assembly Installation

S7N20A5106005

Note the following when installing select lever assembly:

- After installing select lever assembly, adjust select cable referring to “Select Cable Adjustment”.

Select Lever Knob Installation

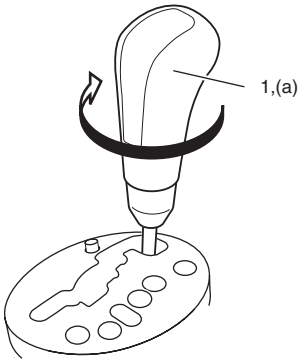
S7N20A5106006

Screw select lever knob onto select lever by specified numbers of rotation below.

Rotation numbers for select lever knob installation
(a): 11 – 12 rotations

⚠ CAUTION

When installing select lever knob, do not turn more than specified numbers of rotation. Otherwise select lever knob is damaged.



I4RS0B510006-01

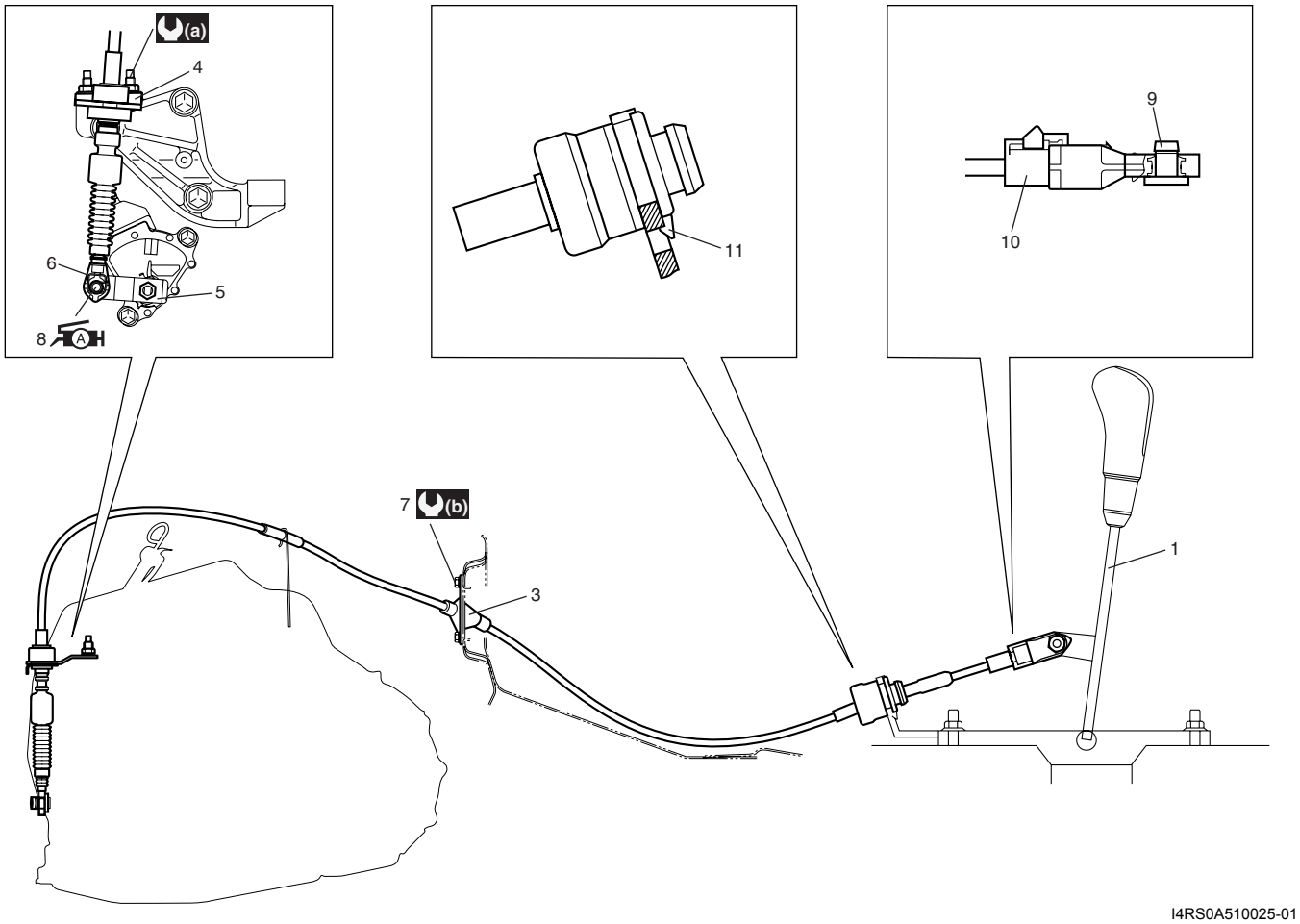
Selector Lever Inspection

S7N20A5106007

Check select lever for smooth and clear-cut movement individually. If a malfunction is found, replace select lever assembly.

Select Cable Components

S7N20A5106008



I4RS0A510025-01

1. Selector lever assembly	6. Clip	11. Lock
2. Select cable	7. Select cable retainer bolt	(a): 23 N·m (2.0 kgf-m, 17.0 lbf-ft)
3. Select cable retainer	8. Manual select lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	(b): 5.0 N·m (0.55 kgf-m, 4.0 lbf-ft)
4. Cable bracket	9. Selector lever pin : Apply lithium grease 99000-25010 to all around pin (0.15 g)	: Tightening torque
5. Manual select lever	10. Adjuster case	

Select Cable Removal and Installation

S7N20A5106009

Removal

1) Remove parking brake lever cover.
2) Remove console box.
3) Disconnect select cable from selector lever and then detach from bracket.
4) Remove clip and disconnect select cable from manual select lever.
5) Remove select cable retainer from dash panel.

Installation

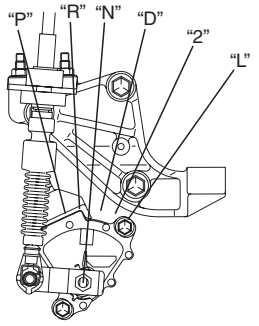
Install select cable by reversing removal procedure.
The important steps in installation are as follows.

- Apply grease to pin and cable joint.
- Tighten bolts to specified torque referring to “Select Cable Components”.
- Adjusting procedure is as follows. Refer to “Select Cable Adjustment”.

Select Cable Adjustment

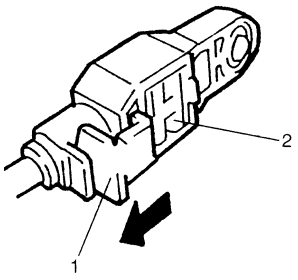
S7N20A5106010

1) Shift manual shift lever to “N” range (transmission range sensor “N” range).



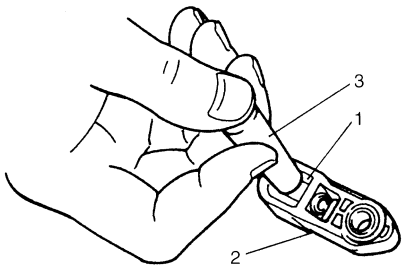
I3RM0B510036-01

2) Remove adjuster (cable end) from selector lever pin of selector lever assembly.
3) Release lock plate (1) which restrict moving of cable end holder (2).



I2RH01510046-01

4) Push cable end holder (1) out from eye-end (2) using an appropriate tool (3) to disengage cable.

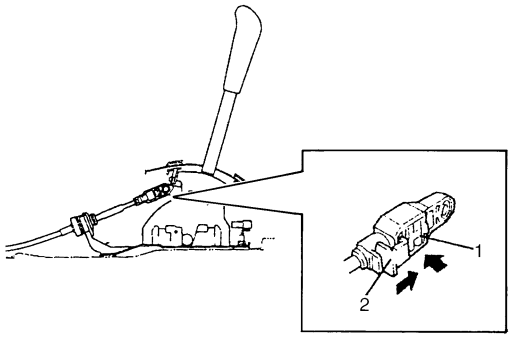


I2RH01510047-01

5) Shift selector lever to “N” position.
6) Apply grease to selector lever pin and install adjuster (cable end) to it.

: Grease 99000–25010 (SUZUKI Super Grease A)

7) With both selector lever and transmission range sensor kept each “N” position, drive cable end holder (1) in until it locks cable.
8) Slide lock plate (2) to secure cable end holder in position.



I3RM0B510037-01

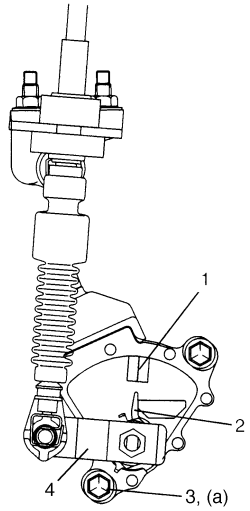
9) After select cable was installed, check for the following.
   - Push vehicle with selector lever shifted to “P” range. Vehicle should not move.
   - Vehicle can not be driven in “N” range.
   - Vehicle can be driven in “D”, “3”, “2” and “L” ranges.
   - Vehicle can be backed in “R” range.

Transmission Range Sensor (Shift Switch) Inspection and Adjustment

S7N20A5106011

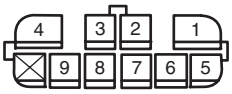
1) Shift manual select lever (4) to “N” range.
2) Check that needle direction shaped on lock washer (2) and “N” reference line (1) on transmission range sensor are aligned. If not, loosen sensor bolts (3) and align them.

Tightening torque
Transmission range sensor bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)



I3RM0B510038-01

3) Check that engine starts in “N” and “P” ranges but it doesn’t start in “D”, “2”, “L” or “R” range. Also, check that back-up lamp lights in “R” range.
If faulty condition cannot be corrected by adjustment, disconnect transmission range sensor connector and check that continuity exists as shown by moving manual select lever.



Sensor Position	Terminal No.								
	1	2	3	4	5	6	7	8	9
P	○			○			○		○
R							○	○	
N	○			○	○		○		
D			○				○		
2						○	○		
L		○					○		

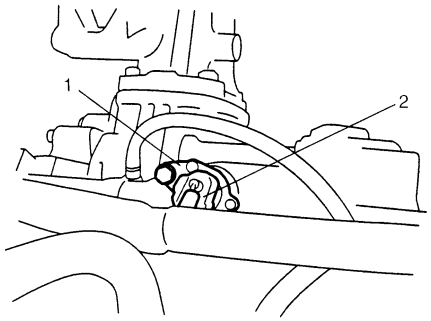
I3RM0B510039-01

Output Shaft Speed Sensor (VSS) Removal and Installation

S7N20A5106012

Removal

1) Disconnect negative cable at battery.
2) Disconnect output shaft speed sensor connector (2).
3) Remove output shaft speed sensor (VSS) (1) by removing its bolt.



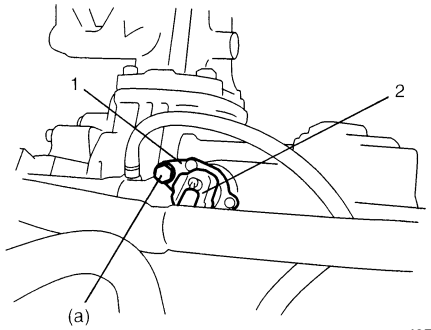
I3RM0B510040-01

Installation

1) Apply A/T fluid to output shaft speed sensor O-ring.
2) Install output shaft speed sensor (VSS) (1) to A/T case and tighten bolt to specified torque.

   Tightening torque
   Output shaft speed sensor (VSS) bolt (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

3) Connect output shaft speed sensor connector (2) to output shaft speed sensor (VSS) (1).



I3RM0B510041-01

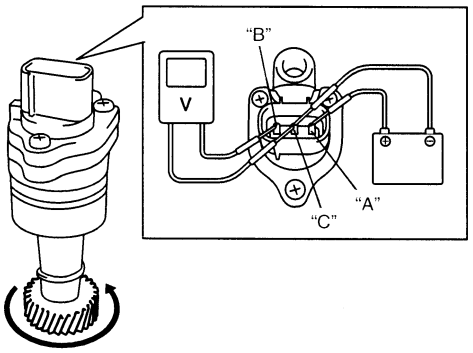
4) Connect negative cable to battery.

Output Shaft Speed Sensor (VSS) Inspection

S7N20A5106013

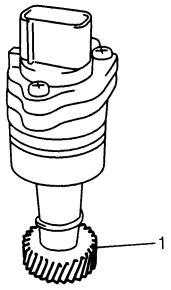
1) Connect positive cable of 12 volt battery to “A” terminal of sensor and ground cable to “C” terminal. Then using voltmeter, check voltage between “B” terminal and “C” terminal with output shaft speed sensor (VSS) driven gear rotated.
   If measured voltage (pulse signal) is not as specified, replace sensor.

   Output shaft speed sensor (VSS) output voltage
   Pulse signal of alternating 0 – 1 V and 10 – 14 V



I2RH0B510045-01

2) Check output shaft speed sensor (VSS) driven gear (1) for wear.
   Replace if necessary.



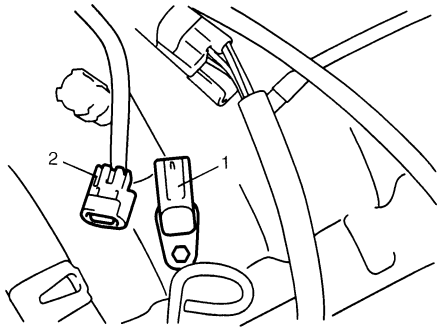
I2RH0B510046-01

Input Shaft Speed Sensor Removal and Installation

S7N20A5106014

Removal

1) Disconnect negative cable at battery.
2) Disconnect input shaft speed sensor connector (2).
3) Remove input shaft speed sensor (1) by removing its bolt.



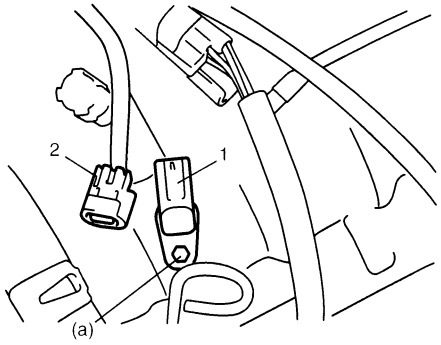
I2RH0B510047-01

Installation

1) Apply A/T fluid to input shaft speed sensor O-ring.
2) Install input shaft speed sensor (1) to A/T case and tighten bolt to specified torque.

Tightening torque
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)

3) Connect input shaft speed sensor connector (2) to input shaft speed sensor (1).



I2RH0B510048-01

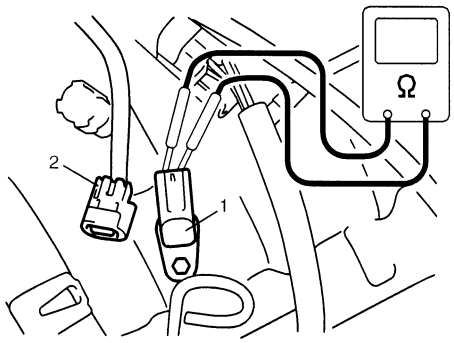
4) Connect negative cable to battery.

Input Shaft Speed Sensor Inspection

S7N20A5106015

1) Disconnect negative cable at battery.
2) Disconnect input shaft speed sensor connector (2).
3) Check resistance between input shaft speed sensor (1) terminals.

Input shaft speed sensor resistance
Standard: 560 – 680 Ω at 20 °C (68 °F)



I2RH0B510049-01

Transmission Fluid Temperature Sensor Removal and Installation

S7N20A5106016

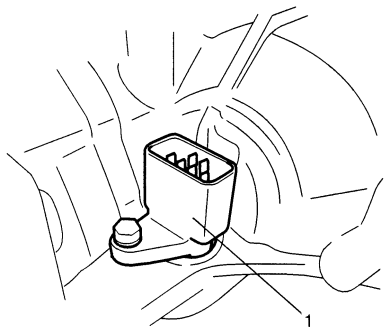
Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) With engine is cool, remove drain plug and drain A/T fluid.
4) Install drain plug. Refer to “A/T Fluid Change”.
5) Remove A/T oil pan.
6) Remove oil strainer assembly.
7) Remove valve body assembly referring to “Automatic Transaxle Unit Disassembly”.

⚠ CAUTION

When pulling solenoid wire harness out of transaxle case, take care not to damage transmission fluid temperature sensor at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.

8) Remove solenoid wire harness (1).

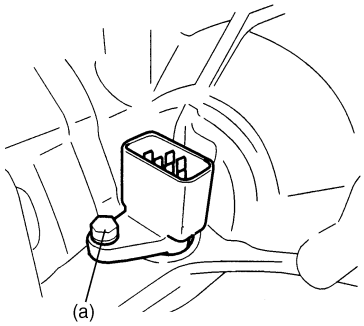


I2RH0B510050-01

Installation
Reverse removal procedure to install solenoid wire harness and valve body assembly noting the following points.

- For details of valve body assembly and their connectors installation, refer to “Automatic Transaxle Unit Assembly”.
- For details of A/T oil pan installation, refer to “Automatic Transaxle Unit Assembly”. Use new oil pan gasket.
- Tighten valve body harness connector bolt to specified torque.

Tightening torque
Valve body harness connector bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)



I2RH0B510051-01

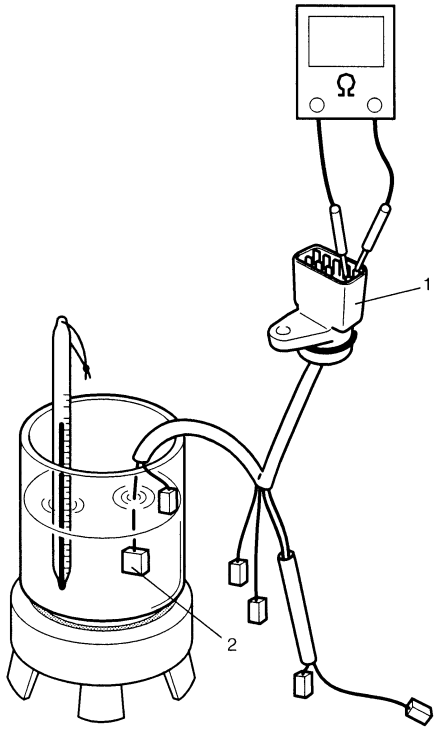
- Pour A/T fluid and check fluid level according to procedure described in “A/T Fluid Change”.
- Check for fluid leakage after warming up A/T.

Transmission Fluid Temperature Sensor Inspection

S7N20A5106017

Warm up transmission fluid temperature sensor (2). Check resistance between terminals of valve body harness connector (1). Thus make sure its resistance decrease as its temperature increase.

Transmission fluid temperature sensor resistance
10 °C (50 °F): 5.8 – 7.1 kΩ
110 °C (230 °F): 231 – 263 Ω
145 °C (293 °F): 105 – 117 Ω



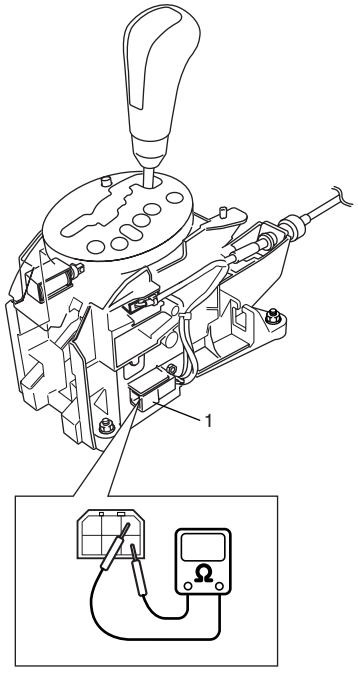
I2RH0B510052-01

“3” Position Switch Inspection

S7N20A5106018

1) Remove console box referring to “Console Box Components in Section 9H”.
2) Disconnect “3” position switch connector (1).
3) Check continuity between “3” position switch terminals.

“3” position switch specification
Shift selector lever to “3” or “2” range: Continuity
Shift other above range: No continuity



I4RS0A510026-01

Solenoid Valves (Shift Solenoid Valves and Timing Solenoid Valve) Removal and Installation

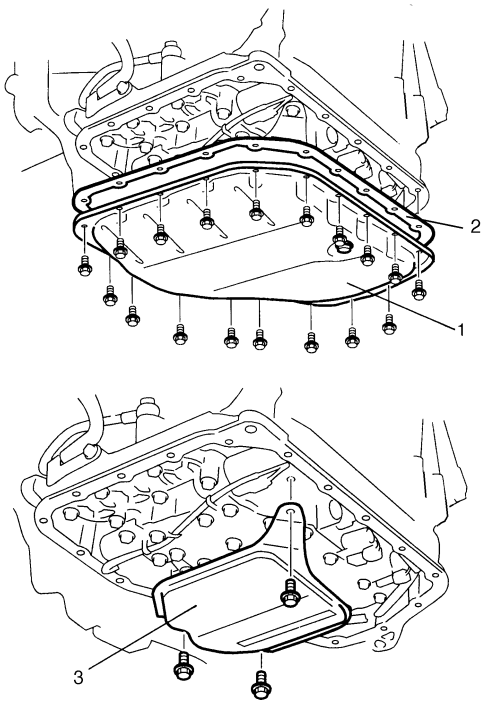
S7N20A5106019

Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) Remove drain plug and drain A/T fluid.
4) Install drain plug.

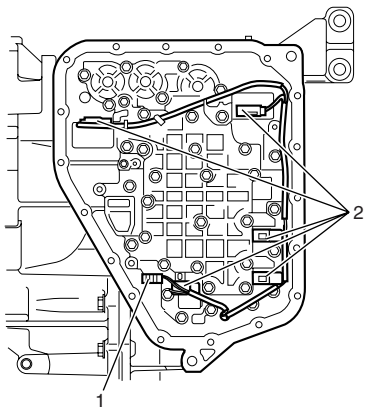
Tightening torque
A/T fluid drain plug: 17 N·m (1.7 kgf-m, 12.5 lbf-ft)

5) Remove A/T oil pan (1) and oil pan gasket (2).
6) Remove oil strainer assembly (3).



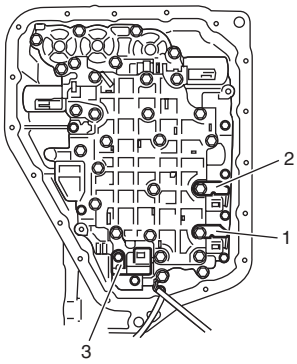
I2RH0B510054-01

7) Remove transmission fluid temperature sensor (1) from sensor clamp.
8) Disconnect solenoid connectors (2).



I4RS0A510027-01

9) Remove shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3) by removing bolts.

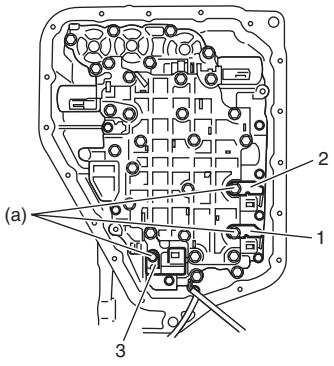


I4RS0A510028-01

Installation

1) Install shift solenoid valve-A (No.1) (1), shift solenoid valve-B (No.2) (2) and timing solenoid valve (3).

Tightening torque
Shift solenoid bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

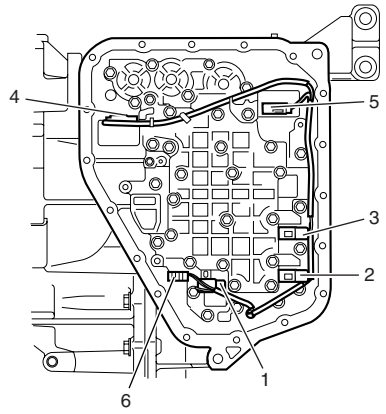


I4RS0A510029-01

2) Connect solenoid connectors identifying their installing positions by wire color.

Solenoid coupler	Wire color
Shift solenoid valve-A (No.1) (2)	White
Shift solenoid valve-B (No.2) (3)	Black
Timing solenoid valve (1)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Green / Gray

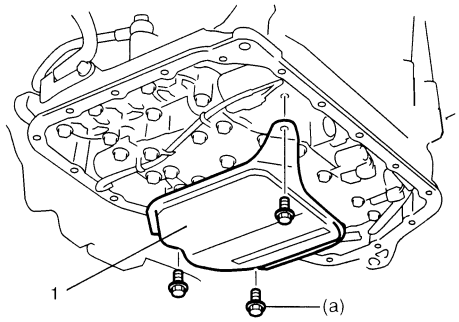
3) Install transmission fluid sensor (6) and sensor wire to clamp.



I4RS0A510030-01

4) Install oil strainer assembly (1).

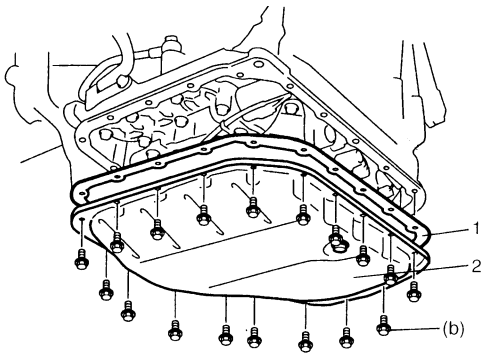
Tightening torque
Oil strainer bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I2RH0B510059-01

5) Install new oil pan gasket (1) and oil pan (2).
6) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque
Oil pan bolt (b): 7.0 N·m (0.7 kgf-m, 5.0 lbf-ft)



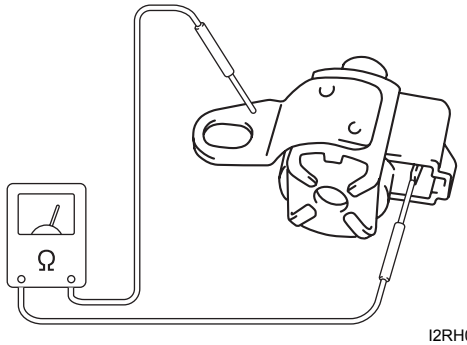
I2RH0B510060-01

Solenoid Valves (Shift Solenoid Valves, and Timing Solenoid Valve) Inspection

S7N20A5106020

Resistance Check
Check shift solenoid valves and timing solenoid valve.

Shift solenoid valves and timing solenoid valve resistance
Standard: 11 – 15 Ω at 20 °C (68 °F)



I2RH0B510061-01

Operation Check
Shift solenoid valve-A (No.1) and -B (No.2)

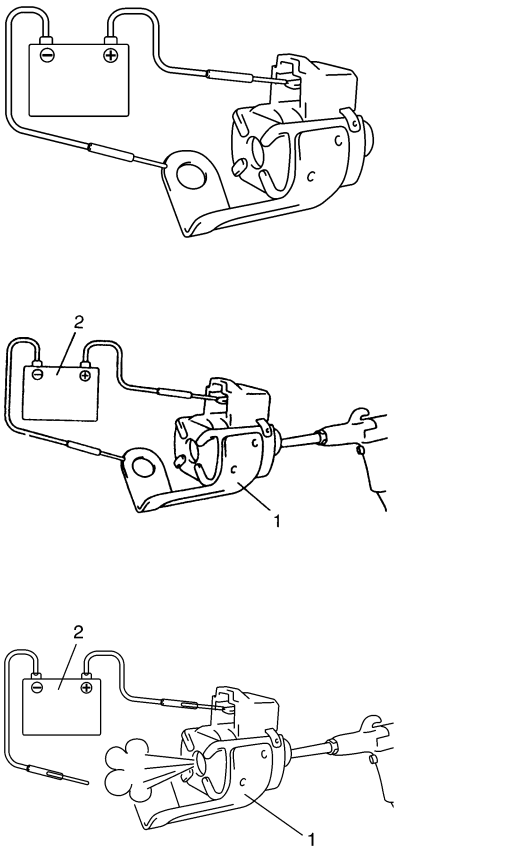
⚠ CAUTION

- **Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.**
- **Be very careful as dust etc. does not enter when solenoid valves are inspected.**

- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
- When solenoid valve (1) is connected to battery (2), confirm that solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.
- When solenoid valve (1) is not connected to battery (2), confirm that solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510062-01

Timing solenoid valve

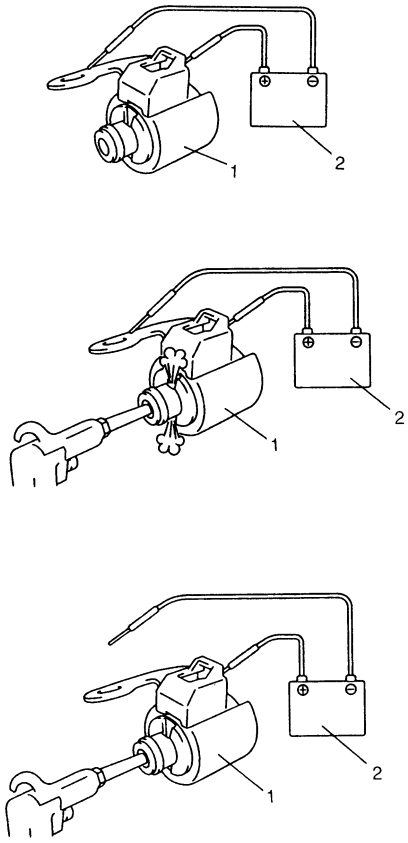
⚠ CAUTION

- **Do not insert air gun against strainer installed on inlet of solenoid valve too deeply, when blowing air into solenoid valve. If not, the strainer will be damaged.**
- **Be very careful as dust etc. does not enter when solenoid valves are inspected.**

- Check that solenoid valve (1) actuate with click sound when battery voltage is conducted.
- When timing solenoid valve (1) is connected to battery (2), confirm that timing solenoid valve is open condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.
- When timing solenoid valve (1) is not connected to battery (2), confirm that timing solenoid valve is close condition by blowing air (50 – 200 kPa, 0.5 – 2.0 kg/cm^2, 7 – 28.5 psi) into solenoid valve as shown in figure.

NOTE

Do not fail to inspect with air to prevent mistaken checking because return spring for valve is not installed into solenoid valve.



I2RH0B510063-01

Pressure Control Solenoid Valves (Pressure Control Solenoid and TCC Pressure Control Solenoid) Removal and Installation

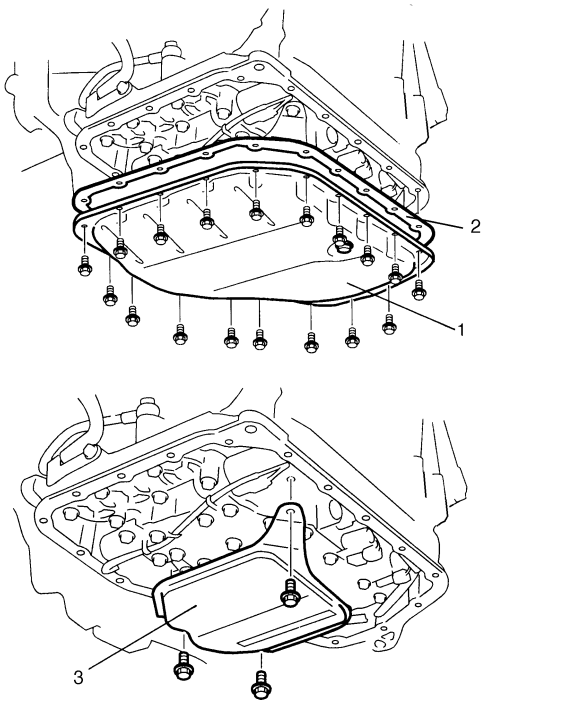
S7N20A5106021

Removal

1) Disconnect negative cable at battery.
2) Lift up vehicle.
3) Remove drain plug and drain A/T fluid.
4) Install drain plug.

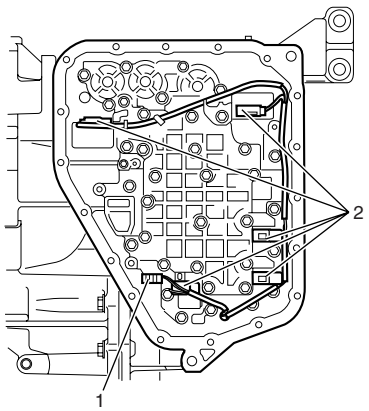
Tightening torque
A/T fluid drain plug: 17 N·m (1.7 kgf-m, 12.5 lbf-ft)

5) Remove A/T oil pan (1) and oil pan gasket (2).
6) Remove oil strainer assembly (3).



I2RH0B510054-01

7) Remove transmission fluid temperature sensor (1) from sensor clamp.
8) Disconnect solenoid connectors (2).



I4RS0A510027-01

9) Remove valve body assembly referring to "Automatic Transaxle Unit Disassembly".
10) Remove pressure control solenoid valve and TCC pressure control solenoid valve referring to "Valve Body Assembly Disassembly and Reassembly".

Installation

Reverse removal procedure to install pressure control solenoid valve and valve body assembly noting the following points.

- For detail of pressure control solenoid valve and TCC pressure control solenoid valve installation, refer to "Valve Body Assembly Disassembly and Reassembly".
- For detail of valve body assembly installation, refer to "Automatic Transaxle Unit Assembly".
- For detail of installing wire harness for solenoid valves and sensor, refer to "Automatic Transaxle Unit Assembly". Use new O-rings.
- For detail of A/T oil pan and oil strainer assembly installation, refer to "Automatic Transaxle Unit Assembly". Use new oil pan gasket.
- Pour A/T fluid and check fluid level according to procedure described in "A/T Fluid Change".
- Check for fluid leakage after warming up A/T.

Pressure Control Solenoid Valve Inspection

S7N20A5106022

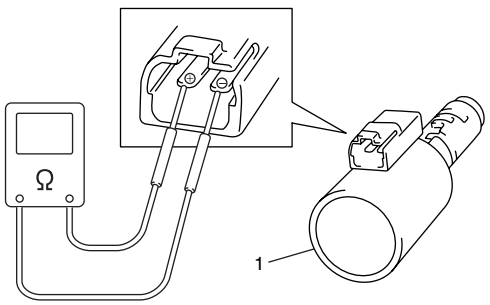
⚠ CAUTION

- **Be very careful as dust etc. does enter when pressure control solenoid valves are inspected.**

Resistance Check

Measure resistance between pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) (1) terminals.

Pressure control solenoid valve and TCC pressure control solenoid valve resistance
Standard: 5.0 – 5.6 Ω at 20 °C (68 °F)



I2RH01510071-01

Operation Check

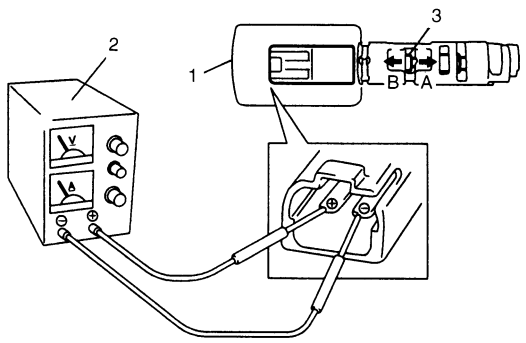
Check pressure control solenoid valves (Pressure control solenoid and TCC pressure control solenoid) operation in the either manner of the following.

Using regulated DC power supply

1) Connect pressure control solenoid valve (1) with regulated DC power supply (2) as shown in figure.
2) Turn regulated DC power supply switch ON and increase voltage of power supply keeping current within 1.0 A.
3) Check for gradual movement of valve (3) in the direction of arrow “A” as voltage is increased.
4) Check movement of valve (3) in the direction of arrow “B” as voltage is decreased.
5) Turn power supply switch OFF.

⚠ CAUTION

Do not pass current 1.0 A or more, or pressure control solenoid is burned out.



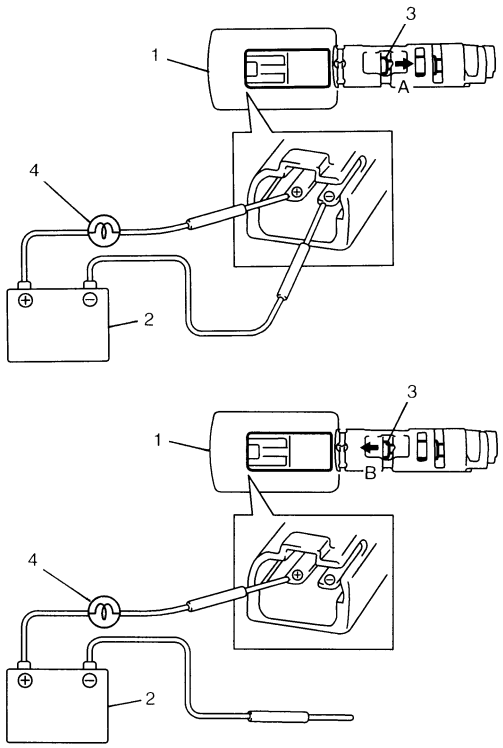
I2RH0B510064-01

Not using regulated DC power supply

1) Connect pressure control solenoid valve (1) to battery (2) setting 21 W bulb (4) on the way as shown in figure.
2) Check for movement of valve (3) in the direction of arrow “A”.
3) Disconnect pressure control solenoid valve (1) from battery (2) and check movement of valve (3) in the direction of arrow “B” as shown in figure.

⚠ CAUTION

Set 21 W bulb on the way, or pressure control solenoid valve is burned out.



I4RS0A510031-01

Transmission Control Module (TCM) Removal and Installation

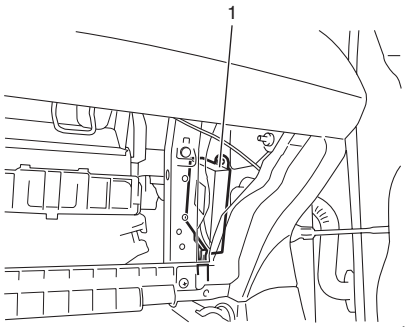
S7N20A5106023

⚠ CAUTION

- **TCM and ECM consists of highly precise parts, therefore when handling it, be careful not to expose to excessive shock.**
- **When replacing TCM with used one, all learned contents, which have been stored in TCM memory by executing learning control, should be initialized after replacement.**

Removal

1) Disconnect negative cable at battery.
2) If the vehicle is equipped with air bag system, disable air bag system. Refer to “Disabling Air Bag System in Section 8B”.
3) Disconnect connectors from TCM (1).
4) Remove TCM by removing its bolts.



I4RS0B510007-01

Installation

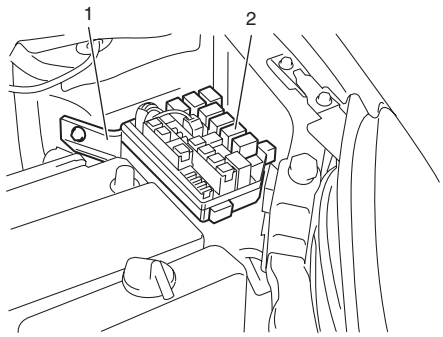
Reverse removal procedure noting the following.

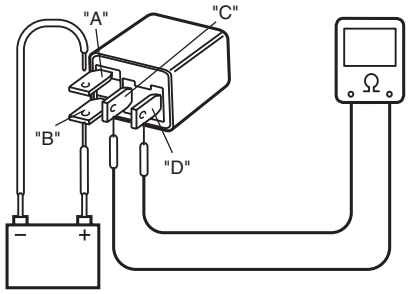
- Connect TCM connectors securely.
- If the vehicle is equipped with air bag system, be sure to enable air bag system after TCM is back in place. Refer to “Enabling Air Bag System in Section 8B”.

A/T Relay Inspection

S7N20A5106024

1) Disconnect negative cable at battery.
2) Remove A/T relay (2) from fuse and relay box (1).
3) Check that there is no continuity between terminal “C” and “D”.
   If continuity is indicated, replace A/T relay.
4) Connect battery positive (+) terminal to terminal “A” of A/T relay and battery negative (–) terminal to terminal “B” of A/T relay.
   Check continuity between terminal “C” and “D” of A/T relay.
   If continuity does not indicated, replace A/T relay.



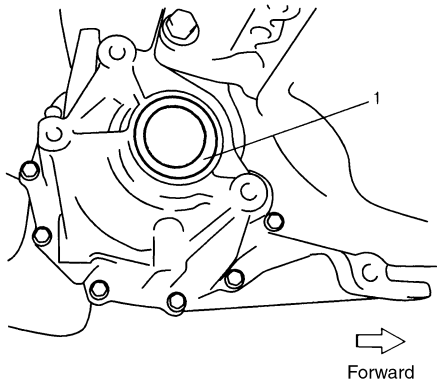


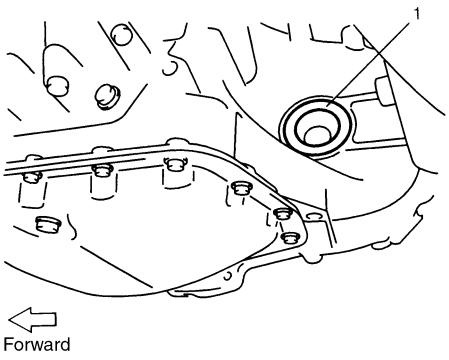
I4RS0B510008-01

Differential Side Oil Seal Replacement

S7N20A5106025

1) Lift up vehicle and drain automatic transaxle fluid.
2) Remove drive shaft joints from differential gear of transaxle. Refer to “Front Drive Shaft Assembly Removal and Installation in Section 3A” for procedure to disconnect drive shaft joints.
   For differential side oil seal removal, it is not necessary to remove drive shafts from steering knuckle.
3) Remove differential side oil seal (1) by using screwdriver or the like.





I2RH0B510067-01

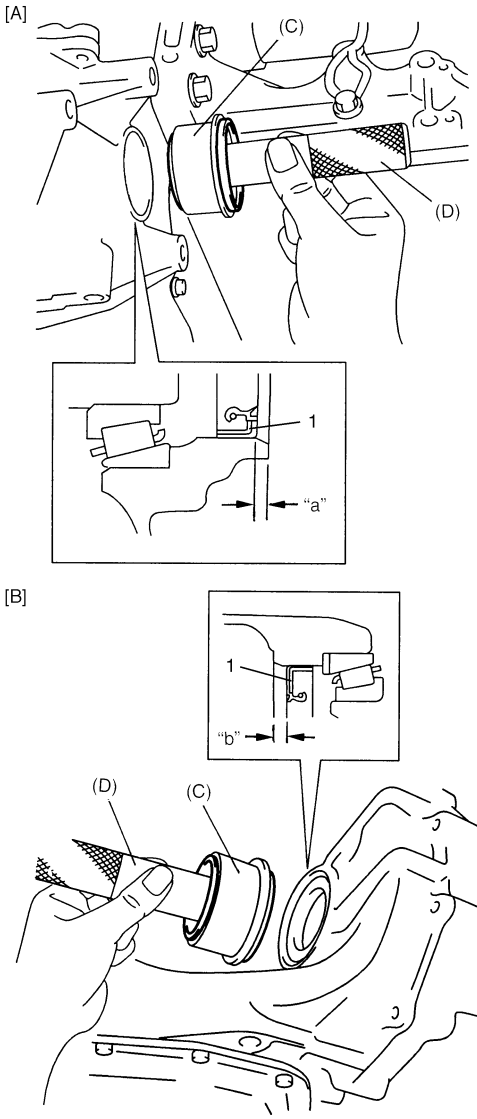
4) Apply grease to new differential side oil seal lips.

   : Grease 99000–25030 (SUZUKI Super Grease C)

5) Install new differential side oil seals (1) by using special tool.

   Special tool
   (C): 09944–88220
   (D): 09924–74510

   Differential side oil seal installing depth
   Right side “a”: 2.6 – 3.6 mm (0.10 – 0.14 in.)
   Left side “b”: 3.8 – 4.8 mm (0.15 – 0.19 in.)



I2RH0B510068-01

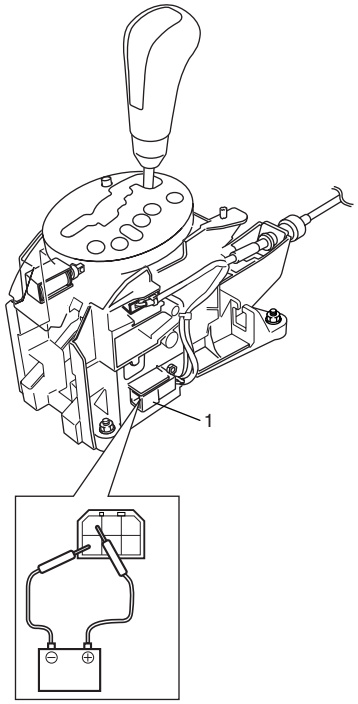
[A]: Right side	[B]: Left side

6) Install drive shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
7) Pour A/T fluid referring to “A/T Fluid Change”.

Shift Lock Solenoid Inspection

S7N20A5106026

Check that shift lock solenoid (1) actuate when battery voltage is conducted.

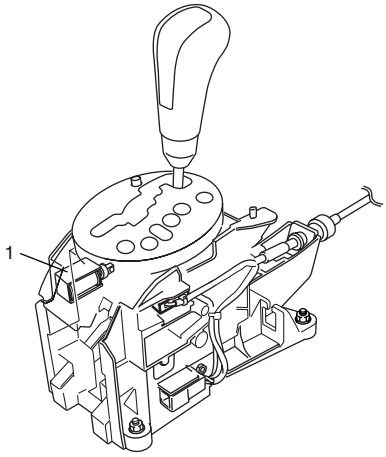


I4RS0A510034-01

Shift Lock Solenoid Replacement

S7N20A5106027

1) Remove console box referring to “Console Box Components in Section 9H”.
2) Replace shift lock solenoid (1) using flat head or like.
3) Install covers as they were.



I4RS0A510053-01

Key Interlock Cable Removal and Installation

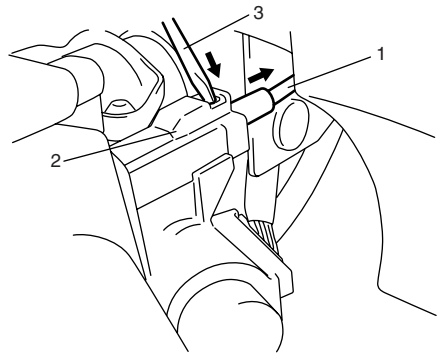
S7N20A5106028

NOTE

Don't bend interlock cable excessively when removing and installing it, or system will not operate correctly.

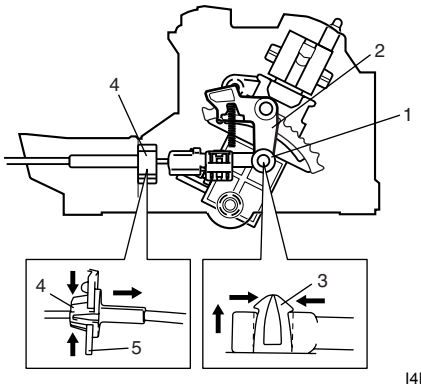
Removal

1) If the vehicle is equipped with air bag system, disconnect negative cable at battery and disable air bag system, referring to "Disabling Air Bag System in Section 8B".
2) Remove steering column cover.
3) Turn ignition switch to ACC position.
4) Pull out key interlock cable (1) from key cylinder cover (2) while pressing checkhook with slotted screwdriver (3) or the like.



I2RH01510083-01

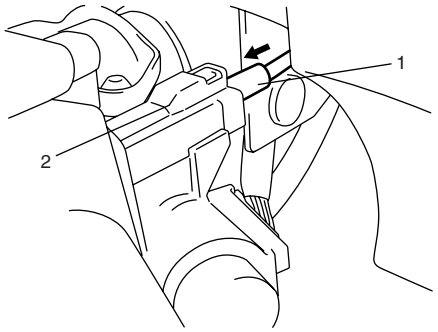
5) Turn ignition switch to LOCK position.
6) Remove parking brake cover and console box.
7) Detach cable end (1) from interlock cam (2) while pressing claws (3) of interlock cam boss.
   At this time, be careful not to cause damage to its claws.
   Detach cable casing cap (4) from selector bracket (5) while pressing checkhook.
8) Remove interlock cable.



I4RS0A510054-01

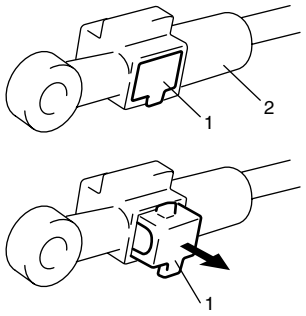
Installation

1) Lay interlock cable to its original cabling route.
2) Turn ignition switch to ACC position.
3) Insert cable casing cap (1) into key cylinder cover (2) securely.



I2RH01510085-01

4) Pull out lock button (1) of selector side cable end (2).



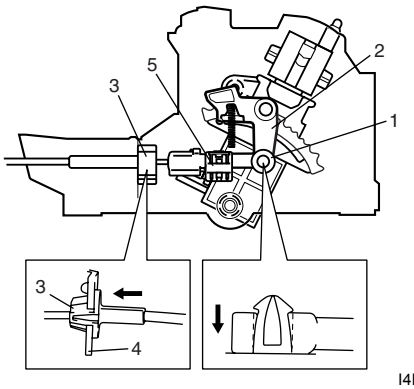
I2RH01510086-01

5) Shift selector lever to "N" position.

NOTE

If selector lever is in "P" position, shift selector lever referring to "Selector Lever Inspection".

6) Install cable casing cap (3) to selector bracket (4).
7) Connect cable end (1) to interlock cam (2) with ignition switch turned to ACC position.
8) Drive lock button (5) in cable end until it locks cable expansion and contraction.



I4RS0A510055-01

9) With selector lever set at "P" position, turn ignition key to ACC position and then check for the following conditions.
   - With knob button released, ignition key can be turned from ACC position to LOCK position.
   - With knob button pressed, ignition key cannot be turned from ACC position to LOCK position.
10) Install steering column cover.

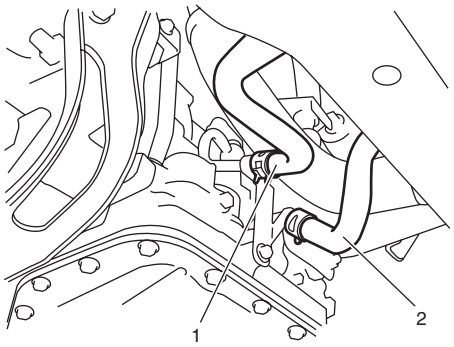
11) If the vehicle is equipped with air bag system, connect negative cable at battery and enable air bag system, referring to “Enabling Air Bag System in Section 8B”.

A/T Fluid Cooler Hoses Replacement

S7N20A5106029

The rubber hoses for the A/T fluid cooler should be checked at specified interval. If replacing them, be sure to note the following.

- to replace clamps at the same time
- to insert hose as far as its limit mark
- to clamp clamps securely

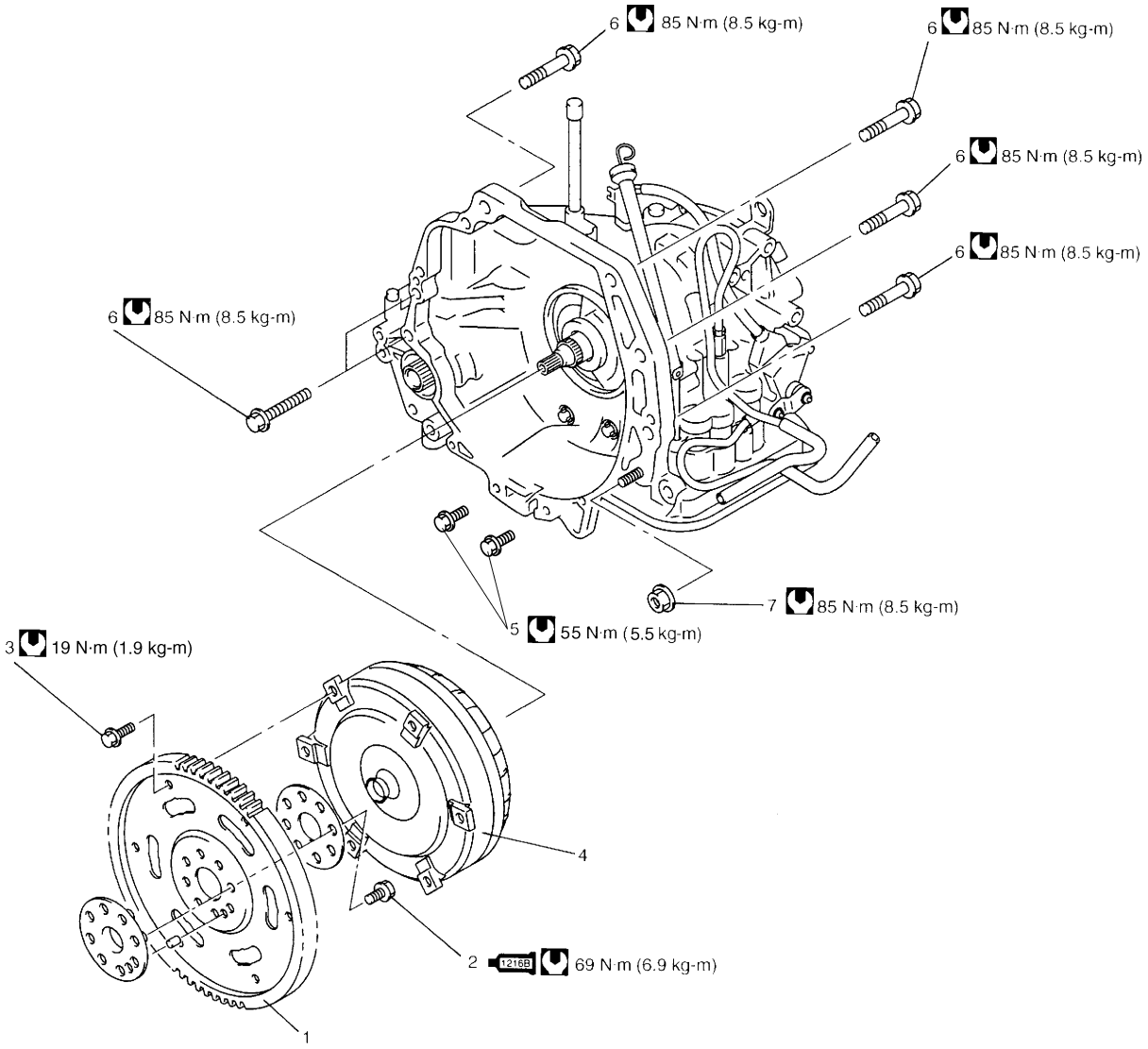


I4RS0A510057-01

1.	Inlet hose (Outlet from A/T fluid cooler)
2.	Outlet hose (Inlet to A/T fluid cooler)

Automatic Transaxle Unit Components

S7N20A5106030



I4RS0B510009-01

	1. Drive plate		5. Transaxle stiffener bolt
1216B	2. Drive plate bolt : Apply sealant 99000-31230 to thread.		6. Transaxle and engine fastening bolt
	3. Drive plate to torque converter bolt		7. Transaxle and engine fastening nut
	4. Torque converter		: Tightening torque

Automatic Transaxle Unit Dismounting and Remounting

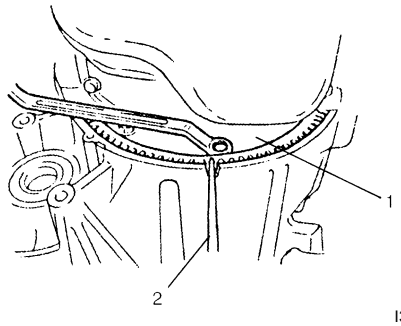
S7N20A5106031

Dismounting

1) Take down transaxle with engine. For its procedure, refer to “Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D”.
2) Remove transaxle housing lower plates (1).

I4RS0A150004-01

3) Remove drive plate to torque converter bolts (1) engage flat head rod or the like (2) with drive plate ring gear.



I3RM0B510047-01

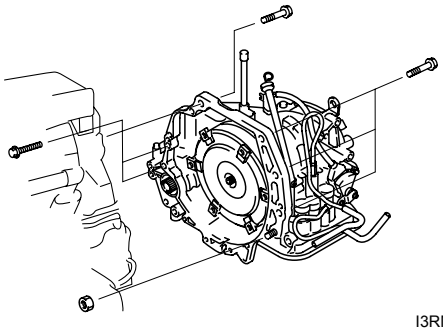
4) Remove starting motor.
5) Remove bolts and nut fastening engine and transaxle, then detach transaxle from engine.

⚠ WARNING

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

NOTE

When detaching transaxle from engine, move it in parallel with crankshaft and use care so as not to apply excessive force to drive plate and torque converter.



I3RM0B510049-01

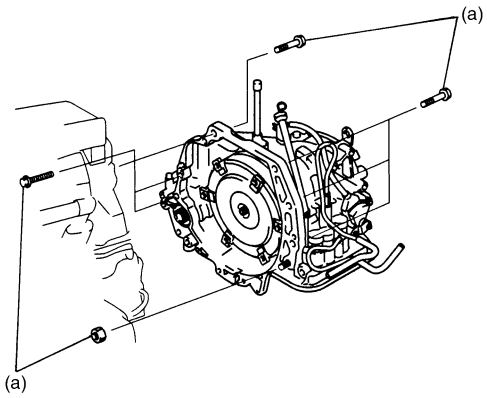
Remounting

1) Make sure that torque converter is installed correctly to transaxle.
   Refer to “Automatic Transaxle Unit Assembly”.
2) Attach transaxle to engine.

⚠ WARNING

Be sure to keep transaxle with torque converter horizontal or facing up throughout the work. Should it be tilted with torque converter down, converter may fall off and cause personal injury.

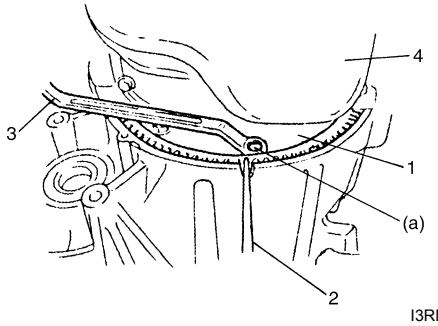
Tightening torque
Transaxle and engine fastening bolt and nut (a): 85 N·m (8.5 kgf-m, 61.5 lbf-ft)



I3RM0B510050-01

3) Tighten drive plate to torque converter bolts. Align bolt hole of drive plate and torque converter then tighten bolts through torque converter housing lower plate opening.
   Lock drive plate (1) by engaging flat head rod or the like (2) with drive plate gear.

Tightening torque
Drive plate to torque converter bolt (a): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)

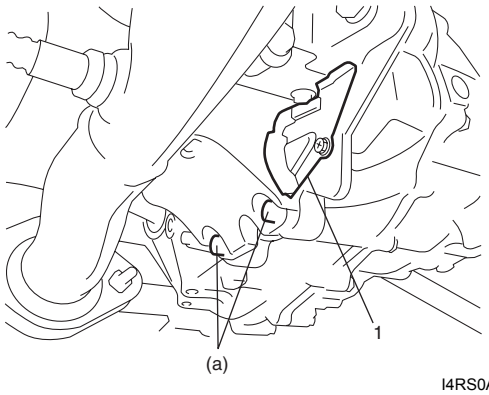


I3RM0B510051-01

3. Wrench	4. Engine oil pan

4) Tighten transaxle stiffener bolts to specified torque.
5) Install transaxle housing lower plates (1).

Tightening torque
Transaxle stiffener bolt (a): 55 N·m (5.5 kgf-m, 40 lbf-ft)



I4RS0A510056-01

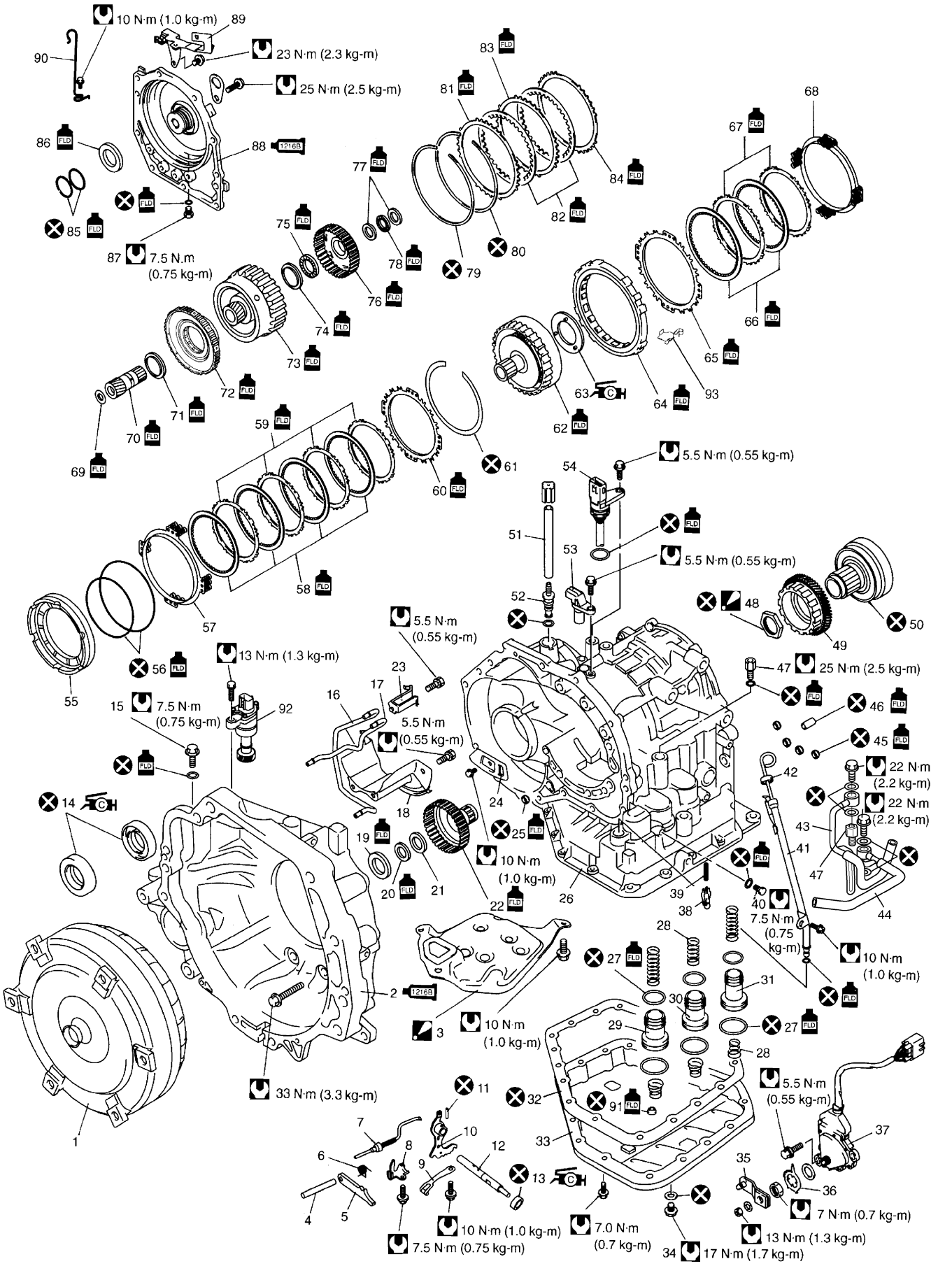
6) Install starter motor.

Tightening torque
Starter motor bolt and nut: 50 N·m (5.0 kgf-m, 36.5 lbf-ft)

7) Remount engine with transaxle assembly to vehicle. Refer to “Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D” for its procedure.

Automatic Transaxle Assembly Components

S7N20A5106032



I3RM0B510053-01

1. Torque converter	33. Oil pan	65. 2nd brake retaining plate
1216B 2. Torque converter housing : Apply sealant 99000-31230 to mating surface to transaxle case.	34. A/T fluid drain plug	66. 2nd brake disc
3. Oil strainer assembly : Replace oil strainer when overhauling.	35. Manual select lever	67. 2nd brake separator plate
4. Parking lock pawl shaft	36. Lock washer	68. 2nd brake return spring subassembly
5. Parking lock pawl	37. Transmission range sensor	69. Front sun gear thrust bearing race
6. Parking lock pawl return spring	38. Cooler check valve	70. Front planetary sun gear
7. Parking lock pawl rod	39. Spring	71. Planetary gear thrust bearing
8. Parking lock pawl bracket	40. Transaxle case plug	72. One-way clutch No.1 assembly
9. Manual detent spring	41. Fluid filler tube	73. Rear planetary sun gear subassembly
10. Manual valve lever	42. Fluid level gauge	74. Rear sun gear thrust bearing race
11. Manual valve lever pin	43. Fluid cooler inlet pipe	75. Rear sun gear thrust bearing
12. Manual shift shaft	44. Fluid cooler outlet pipe	76. Forward clutch hub
C 13. Manual shift shaft oil seal : Apply grease 99000-25030 to oil seal lip.	45. 2nd brake gasket	77. Intermediate shaft thrust bearing race
C 14. Differential side oil seal : Apply grease 99000-25030 to oil seal lip.	46. Brake drum gasket	78. Intermediate shaft thrust bearing
15. Torque converter housing plug	47. Pipe union	79. 2nd brake piston snap ring
16. Lubrication LH tube	48. Reduction drive gear nut : After tightening nut so as rotational torque of reduction drive gear to be in specified value, caulk nut securely.	80. O/D and 2nd coast brake retaining plate snap ring
17. Lubrication RH tube	49. Reduction drive gear	81. O/D and 2nd coast brake retaining plate
18. Fluid reservoir RH plate	50. Planetary ring gear subassembly	82. O/D and 2nd coast brake disc
19. Input shaft front thrust bearing	51. Breather hose	83. O/D and 2nd coast brake separator plate
20. Input shaft rear thrust bearing	52. Breather union	84. O/D and 2nd coast brake rear plate
21. Input shaft rear thrust bearing race	53. Input shaft speed sensor	85. Rear cover seal ring
22. Direct clutch hub	54. Valve body harness	86. Reverse clutch drum thrust bearing
23. Lubrication tube clamp	55. 1st and reverse brake piston	87. Rear cover plug
24. Fluid reservoir LH plate	56. O-ring	1216B 88. Transaxle rear cover : Apply sealant 99000-31230 to mating surface.
25. Governor apply No.2 gasket	57. 1st and reverse brake return spring subassembly	89. Harness bracket
26. Automatic transaxle case	58. 1st and reverse brake disc	90. Select cable clamp
27. Accumulator piston O-ring	59. 1st and reverse brake separator plate	91. Governor apply No.1 gasket
28. Accumulator spring	60. 1st and reverse brake retaining plate	92. Output shaft speed sensor (VSS)
29. C2 accumulator piston	61. 1st and reverse brake snap ring	93. One-way clutch outer race retainer
30. C1 accumulator piston	62. Planetary gear assembly	: Do not reuse.
31. B1 accumulator piston	C 63. Planetary carrier thrust washer : Apply grease 99000-25030 to slide contact face.	FLD : Apply automatic transaxle fluid.
32. Oil pan gasket	64. One-way clutch No.2 assembly	: Tightening torque

Automatic Transaxle Unit Disassembly

S7N20A5106033

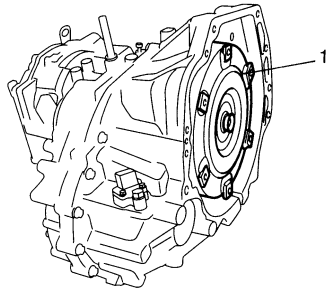
⚠ CAUTION

- **Thoroughly clean transaxle exterior before overhauling it.**
- **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.**

1) Remove torque converter (1).

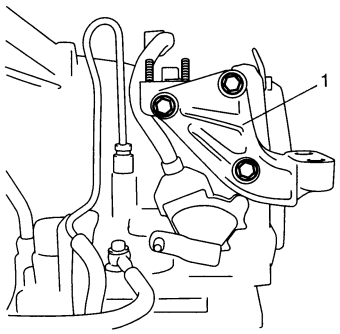
⚠ CAUTION

Remove torque converter as much straight as possible. Leaning it may cause to damage oil seal lip.



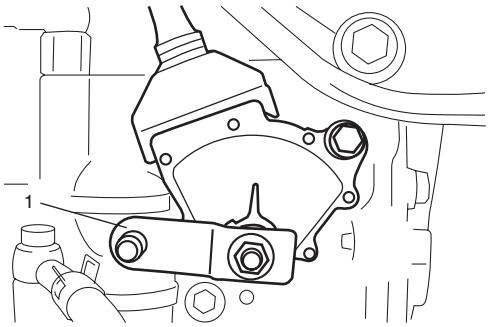
I2RH0B510078-01

2) Remove engine mounting LH bracket (1).



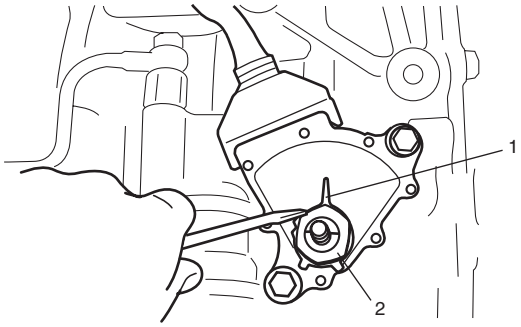
I3RM0B510054-01

3) Remove manual select lever (1).



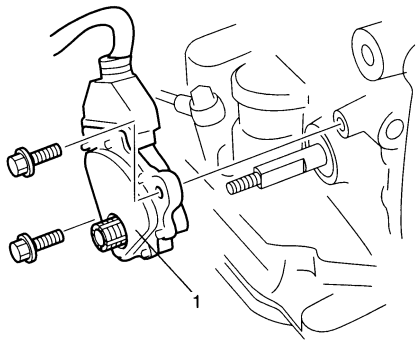
I3RM0B510055-01

4) Uncaulk lock washer (1), then remove lock nut (2) and lock washer.



I3RM0B510056-01

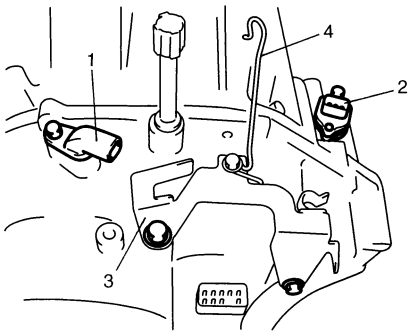
5) Remove transmission range sensor (1).



I3RM0B510057-01

6) Remove output shaft speed sensor (VSS) (2) and input shaft speed sensor (1).

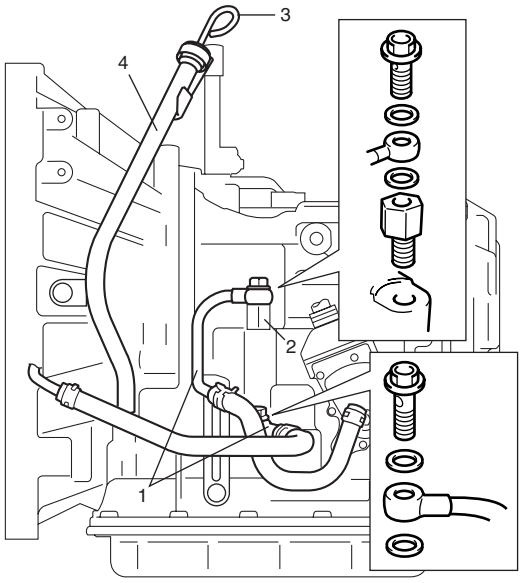
7) Remove harness bracket (3) and select cable clamp (4).



I3RM0B510058-01

8) Remove fluid cooler pipes (1) and pipe union (2).

9) Remove fluid level gauge (3) and fluid filler tube (4).

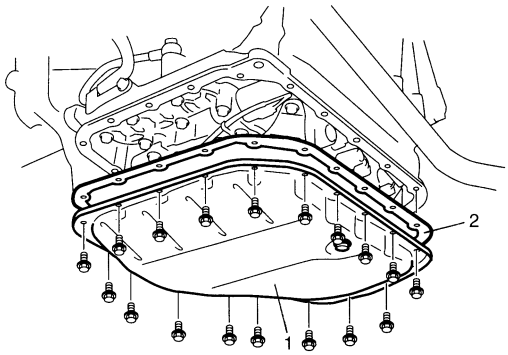


I3RM0B510059-01

10) Remove oil pan (1) and oil pan gasket (2).

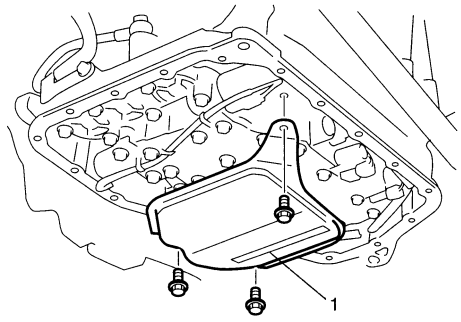
NOTE

- **For removal of oil pan, do not turn transaxle over as this will contaminate valve body with foreign materials in bottom of oil pan.**
- **When removing oil pan, tap around it lightly with plastic hammer. Do not force it off by using screwdriver or the like.**



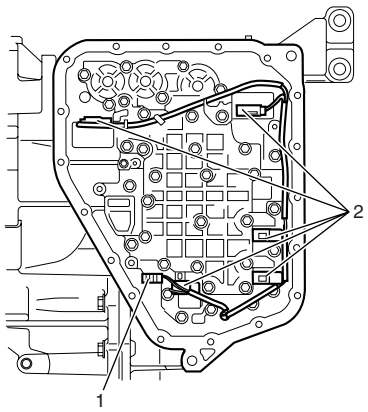
I2RH0B510086-01

11) Remove oil strainer assembly (1).



I2RH0B510087-01

12) Disconnect connectors (2) from solenoid valves and transmission fluid temperature sensor (1).



I4RS0A510027-01

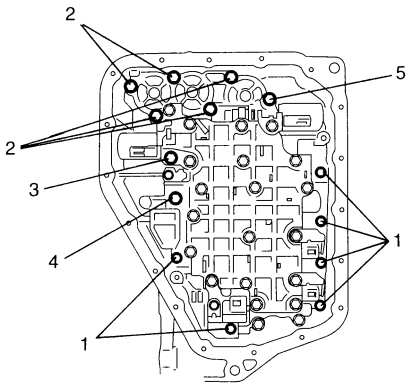
13) Remove valve body assembly bolts.

⚠ CAUTION

Be careful not to let manual valve fall off when removing valve body assembly.

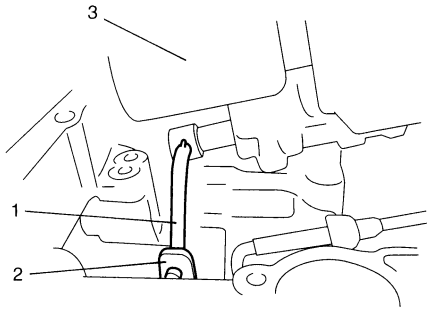
NOTE

There are five kinds of bolts (bolts A (1), B (2), C (3), D (4) and E (5)) fixing valve body assembly.



I2RH0B510089-01

14) Remove manual valve rod (1) from manual valve lever (2), then remove valve body assembly (3).

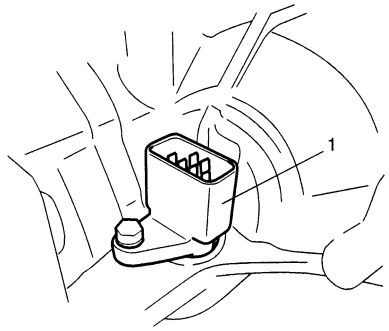


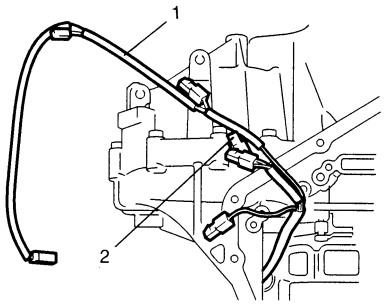
I2RH0B510090-01

15) Remove valve body harness (1).

⚠ CAUTION

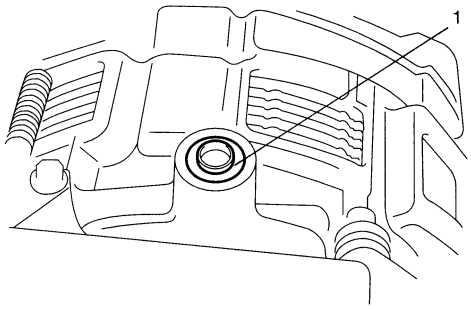
When pulling valve body harness out of transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow exit of case.
Careless sensor treatment might cause sensor malfunction.





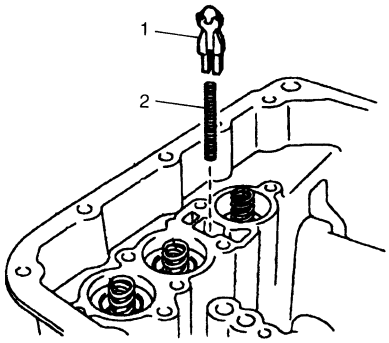
I2RH0B510091-01

16) Remove governor apply No.1 gasket (1).



I2RH0B510092-01

17) Remove cooler check valve (1) and spring (2).

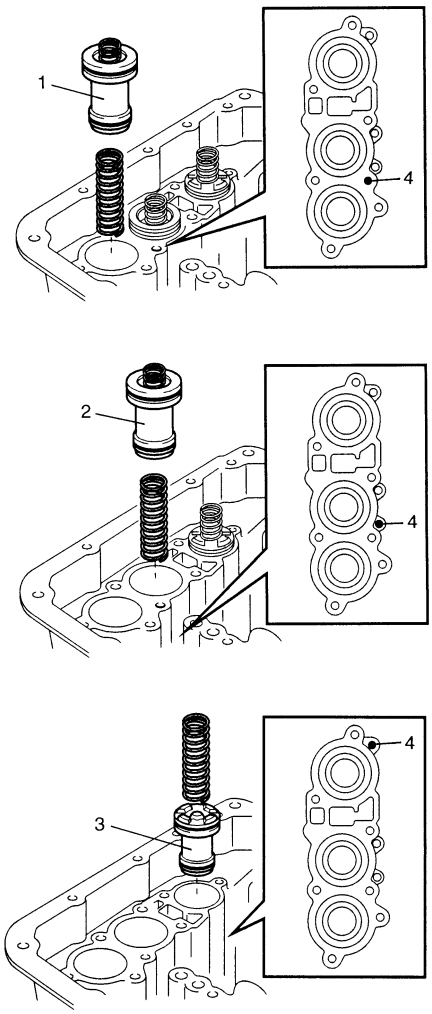


I2RH0B510093-01

18) Remove accumulator pistons and springs.
To remove C2 (1), C1 (2) and B1 (3) accumulator pistons and springs, position rag on pistons to catch each piston. To remove pistons, force low-pressure compressed air (1 kg/cm^2, 15 psi, 100 kPa, max) into hole (4) as shown in figure, and pop each piston into rag.

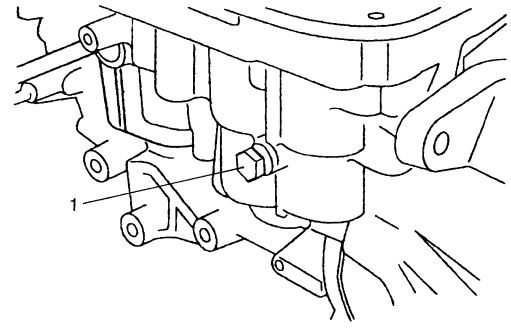
NOTE

Do not push accumulator pistons with fingers or anything before removing them. Pushing them may cause compressed fluid in accumulator to spew out of hole and get to your face and clothes.



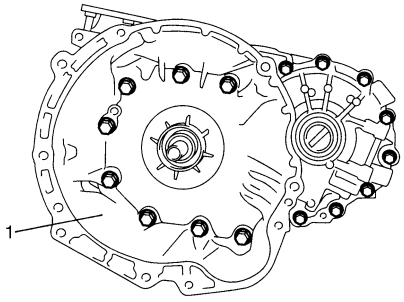
I2RH0B510094-01

19) Remove transaxle case plug (1).



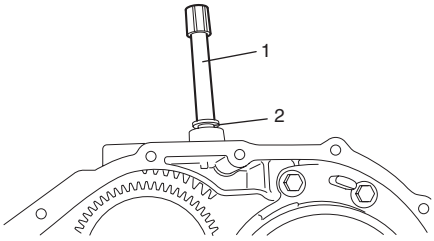
I2RH0B510095-01

20) Remove torque converter housing bolts.
21) Remove torque converter housing (1) while tapping around it lightly with plastic hammer.



I3RM0B510060-01

22) Remove breather hose (1).
23) Remove breather union (2).



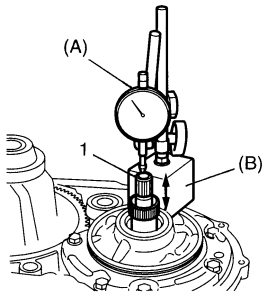
I2RH0B510097-01

24) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.
When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the list below and replace it.

Special tool
(A): 09900–20607
(B): 09900-20701

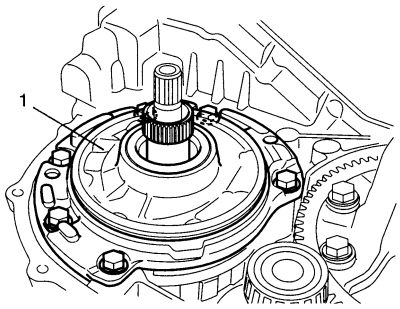
Input shaft thrust play
0.3 – 0.9 mm (0.012 – 0.035 in.)

Available input shaft front thrust bearing thickness
: 0.8, 1.4 mm (0.032, 0.055 in.)



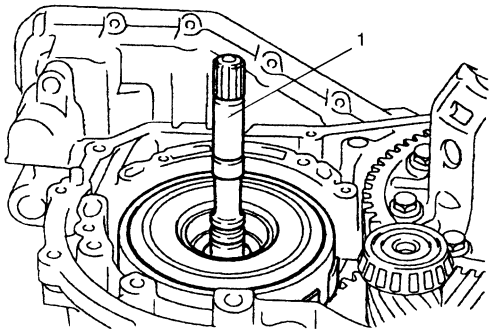
I2RH0B510098-01

25) Remove oil pump assembly (1).



I2RH0B510099-01

26) Remove direct clutch assembly (1).

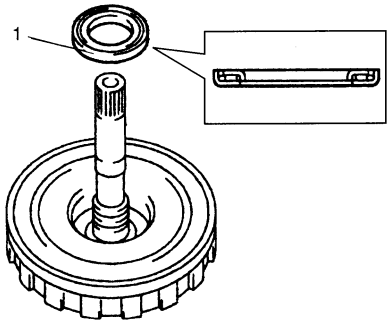


I2RH0B510100-01

27) Remove input shaft front thrust bearing (1).

NOTE

If input shaft front thrust bearing is not found, it may have been taken out with oil pump assembly.

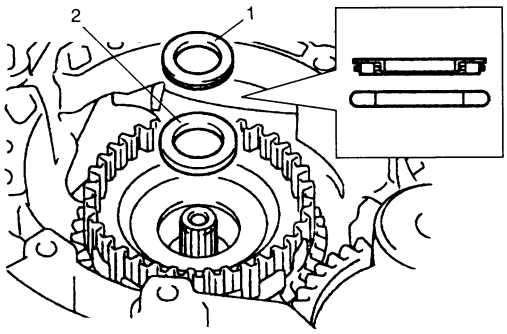


I2RH0B510101-01

28) Remove input shaft rear thrust bearing (1) and thrust bearing race (2).

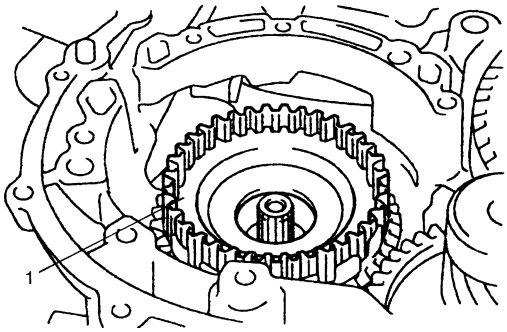
NOTE

If input shaft rear thrust bearing is not found, it may have been taken out with direct clutch assembly.



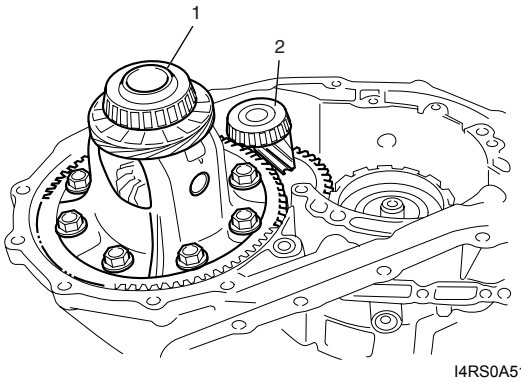
I2RH0B510102-01

29) Remove direct clutch hub (1).



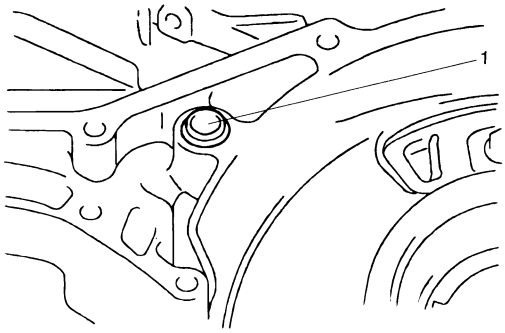
I2RH0B510103-01

30) Remove differential assembly (1) and countershaft assembly (2).



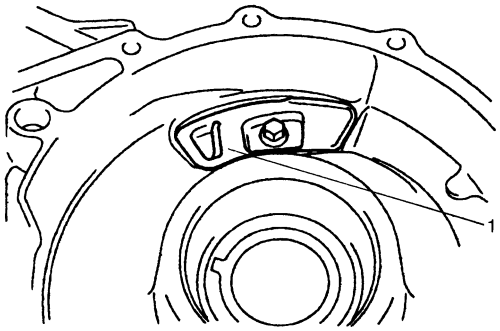
I4RS0A510036-01

31) Remove governor apply No.2 gasket (1).



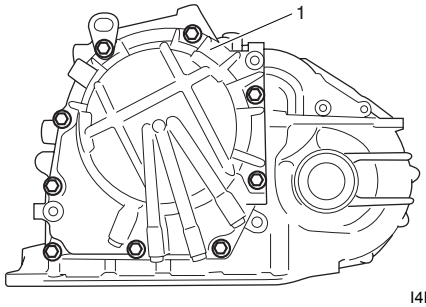
I2RH0B510105-01

32) Remove fluid reservoir LH plate (1).



I2RH0B510106-01

33) Turn over transaxle and remove rear cover assembly (1).

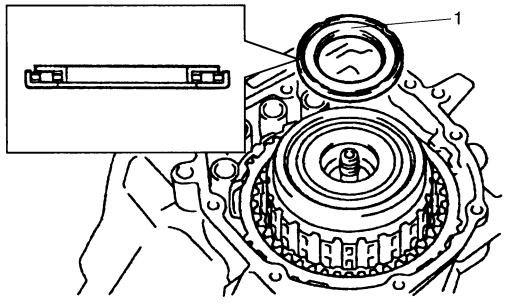


I4RS0A510037-01

34) Remove reverse clutch drum thrust bearing (1).

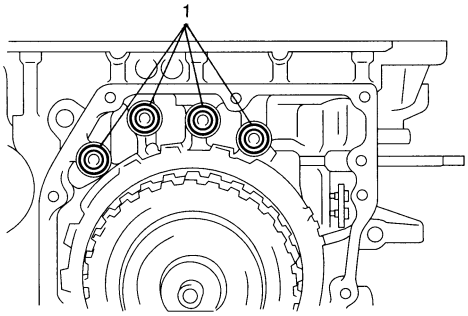
NOTE

If reverse clutch drum thrust bearing is not found, it may have been taken out with rear cover assembly.



I2RH0B510108-01

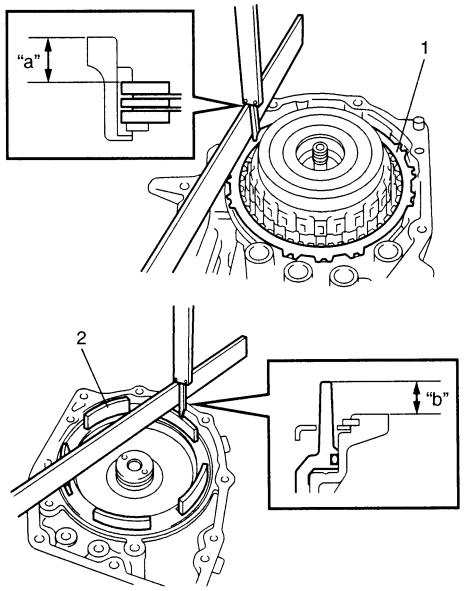
35) Remove 2nd brake gasket (1).



I2RH0B510109-01

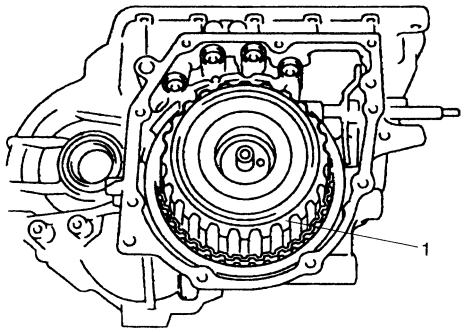
36) Measure O/D and 2nd coast brake piston stroke. If piston stroke exceeds specification, inspect and replace plates and discs.
- Measure dimension “a” from mating surface of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions “a” and “b”.
- Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)



I2RH0B510110-01

37) Remove forward and reverse clutch assembly (1).

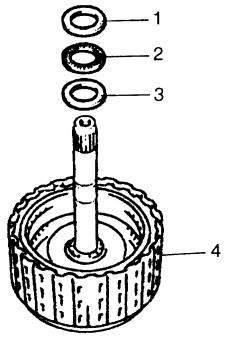


I2RH0B510111-01

38) Remove intermediate shaft thrust bearing front race (1), thrust bearing (2) and rear race (3) from forward and reverse clutch assembly (4).

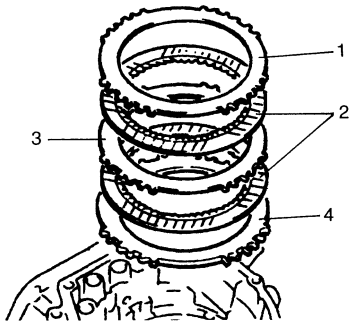
NOTE

If intermediate shaft thrust bearing and/or races are not found on forward and reverse clutch assembly, they may have been left in transaxle.



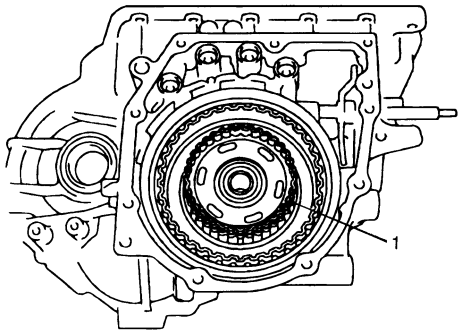
I2RH0B510112-01

39) Remove O/D and 2nd coast brake rear plate (1), discs (2), separator plate (3) and retaining plate (4).



I2RH0B510113-01

40) Remove forward clutch hub (1).

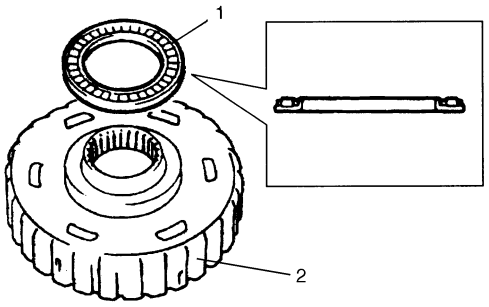


I2RH0B510114-01

41) Remove rear sun gear thrust bearing (1) from forward clutch hub (2).

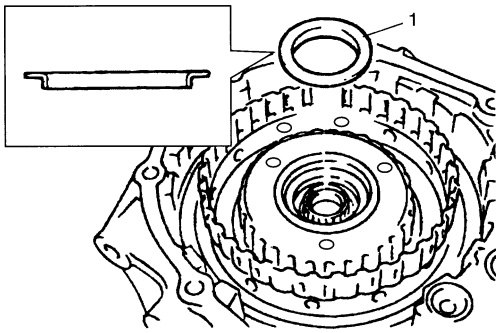
NOTE

If rear sun gear thrust bearing is not found on forward clutch hub, it may have been left in transaxle.



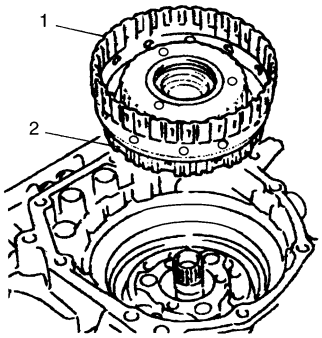
I2RH0B510115-01

42) Remove rear sun gear thrust bearing race (1).



I2RH0B510116-01

43) Remove rear planetary sun gear subassembly (1) and one-way clutch No.1 assembly (2).



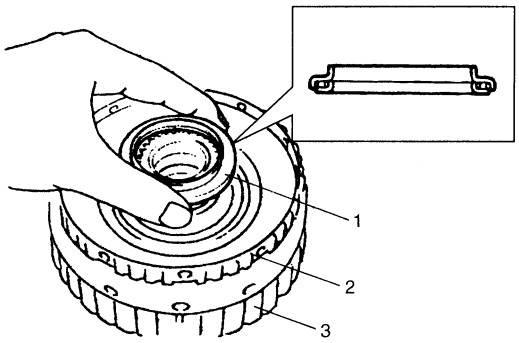
I2RH0B510117-01

44) Remove planetary gear thrust bearing (1).

NOTE

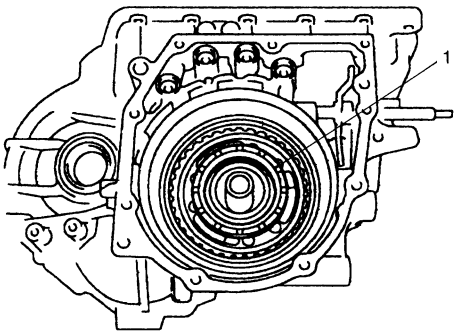
If planetary gear thrust bearing is not found on one-way clutch No.1 assembly, it may have been left in transaxle.

45) Remove one-way clutch No.1 assembly (2) from rear planetary sun gear subassembly (3).



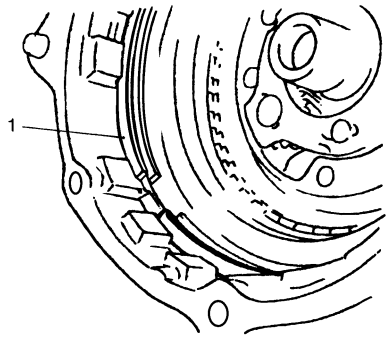
I2RH0B510118-01

46) Remove planetary carrier thrust washer (1).



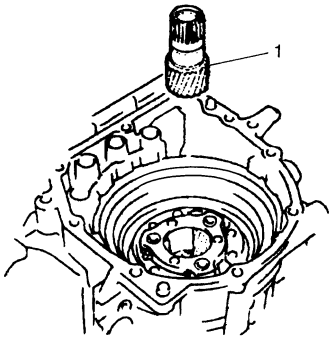
I2RH0B510119-01

47) Remove O/D and 2nd coast brake retaining plate snap ring (1).



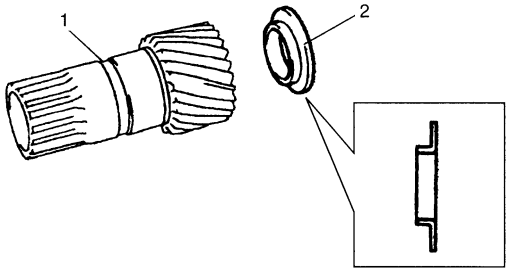
I2RH0B510120-01

48) Remove front planetary sun gear (1).



I2RH0B510121-01

49) Remove front sun gear thrust bearing race (2) from front planetary sun gear (1).



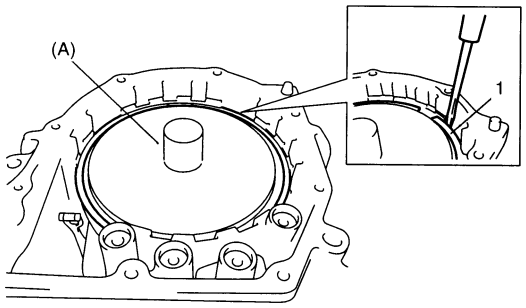
I2RH0B510122-01

50) Using special tool and hydraulic press, remove 2nd brake piston snap ring (1).

⚠ CAUTION

Do not press 2nd brake piston assembly in over 0.4 mm (0.016 in.).
Excessive compression may cause damage to piston assembly, return spring, plates and/ or discs.

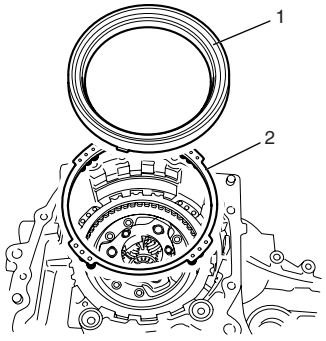
Special tool
(A): 09926–96050



I2RH0B510124-01

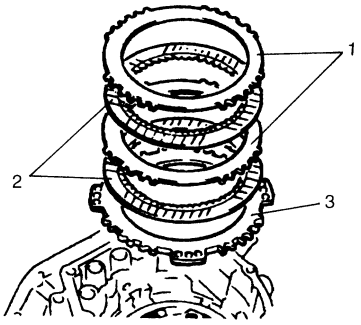
51) Remove 2nd brake piston assembly (1).

52) Remove 2nd brake return spring subassembly (2).



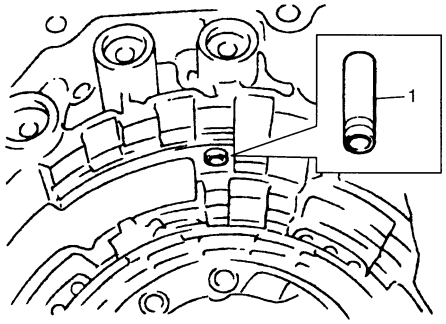
I4RS0A510038-01

53) Remove 2nd brake separator plates (1), discs (2) and retaining plate (3).



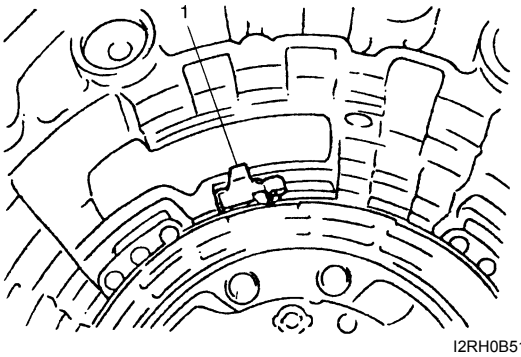
I2RH0B510127-01

54) Remove brake drum gasket (1).



I2RH0B510128-01

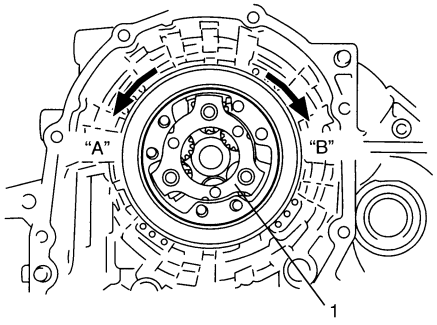
55) Remove one-way clutch outer race retainer (1).



I2RH0B510129-01

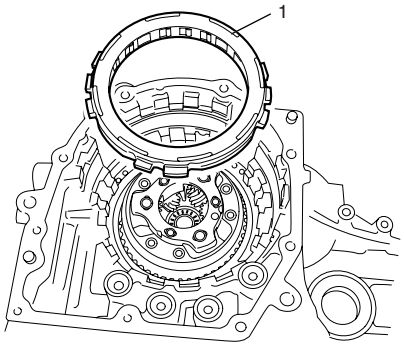
56) Check one-way clutch No.2 as follows.

- Ensure planetary carrier (1) rotates only in counterclockwise direction “A”, never in clockwise direction “B”.
- If the planetary carrier rotates both ways or does not rotate either way, one-way clutch No.2 assembly will need to be replaced with new one-way clutch No.2 assembly.



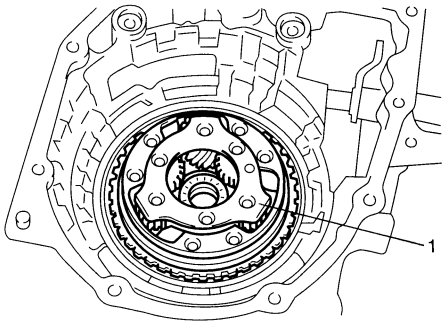
I2RH0B510130-01

57) Remove one-way clutch No.2 assembly (1).



I4RS0A510039-01

58) Remove planetary gear assembly (1).



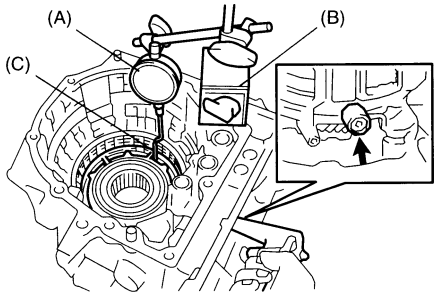
I2RH0B510132-01

59) Measure 1st and reverse brake piston stroke.
If piston stroke exceeds specified value, disassemble, inspect and replace discs and plates.

- Using special tool, measure 1st and reserve brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) is blown through oil hole.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

1st and reverse brake piston stroke
Standard: 0.79 – 1.49 mm (0.031 – 0.059 in.)



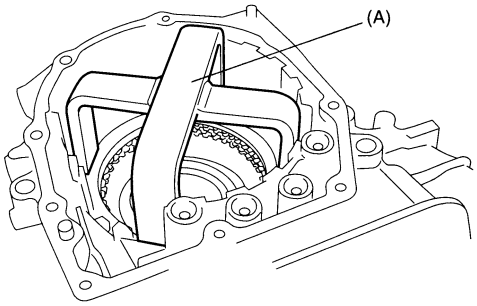
I2RH0B510133-01

60) Remove snap ring while the 1st and reverse brake piston return springs are compressed using special tool and hydraulic press.

⚠ CAUTION

Do not press 1st and reverse brake return spring subassembly in over 0.8 mm (0.031 in.).
Excessive compression may cause damage to return spring subassembly, discs, plates and/or piston.

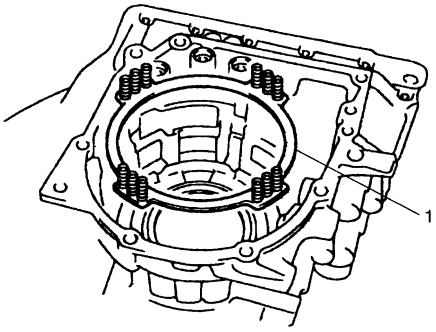
Special tool
(A): 09926–97620



I2RH0B510134-01

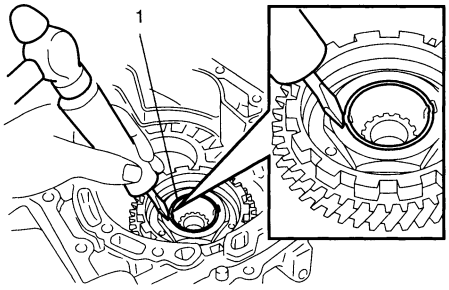
61) Remove 1st and reverse brake retaining plate, discs and separator plates.

62) Remove 1st and reverse brake return spring subassembly (1).



I2RH0B510135-01

63) Turn over transaxle and uncaulk reduction drive gear nut (1).

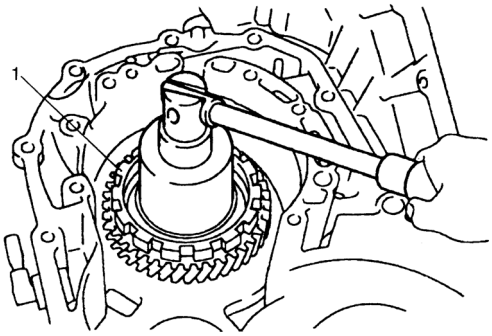


I2RH0B510136-01

64) Secure reduction drive gear (1) with parking lock pawl, then remove reduction drive gear nut.

⚠ CAUTION

- **It is recommended that this operation should be carried out on rubber mat to prevent damaging transaxle case.**
- **Never reuse removed nut.**



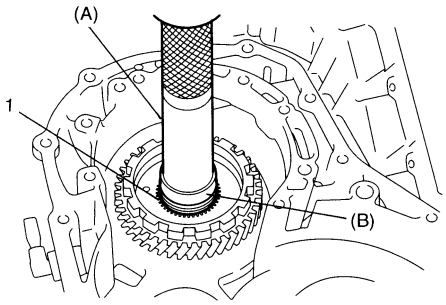
I2RH0B510137-02

65) Using special tools and hydraulic press, remove planetary ring gear subassembly (1).

⚠ CAUTION

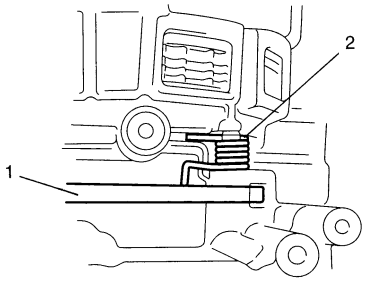
Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.

Special tool
(A): 09913–84510
(B): 09923–78210



I2RH0B510138-01

66) Remove parking lock pawl shaft, then spring (2) and parking lock pawl (1).



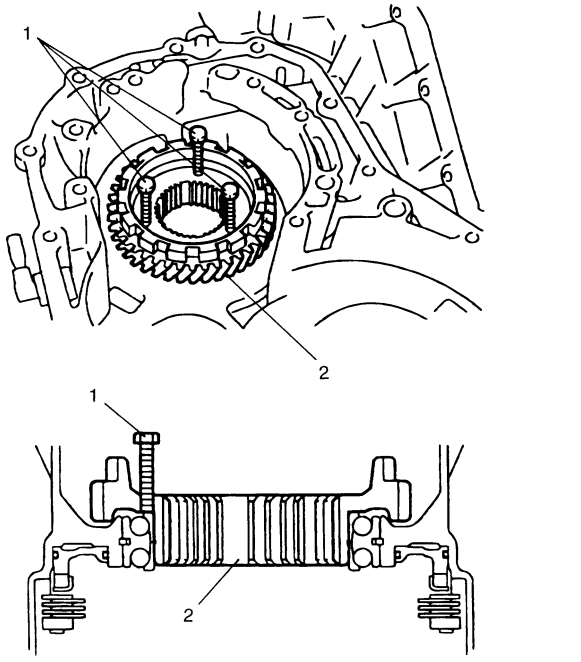
I2RH0B510139-01

67) Screwing 3 bolts (1), remove reduction drive gear (2).

⚠ CAUTION

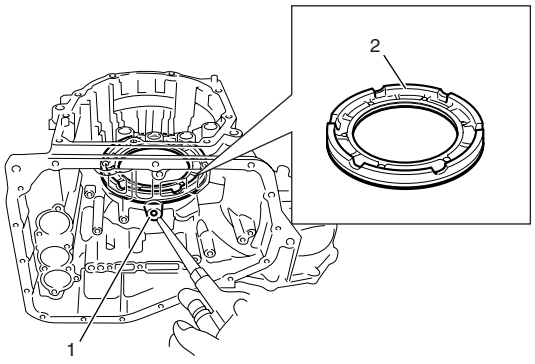
Screw 3 bolts into reduction drive gear uniformly, or reduction drive gear, bearing and transaxle case may be damaged.

Bolt length
30 mm (1.20 in.)



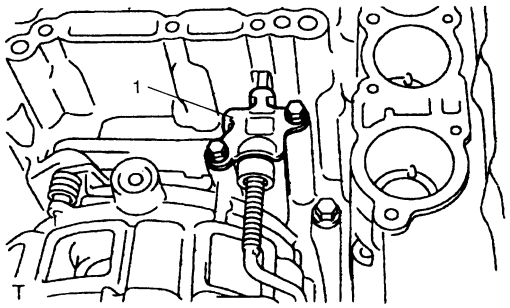
I2RH0B510140-01

68) Blowing compressed air from oil hole (1) of oil pump, remove 1st and reverse brake piston (2).



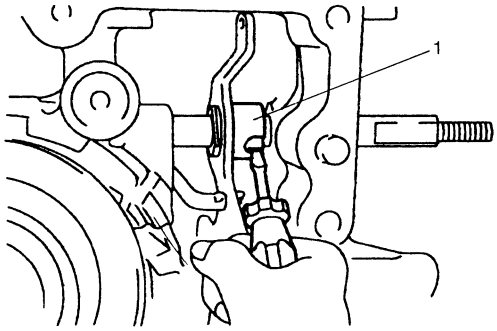
I4RS0A510040-01

69) Remove parking lock pawl bracket (1).



I2RH0B510142-01

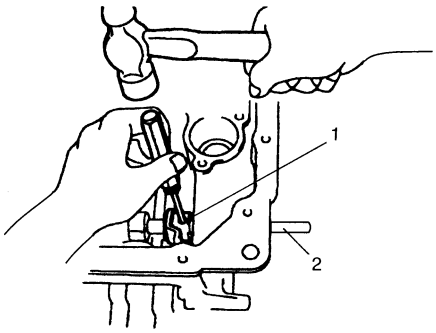
70) With slotted screwdriver, cut and unfold manual valve lever spacer (1) and proceed to remove manual valve lever spacer.



I2RH0B510143-01

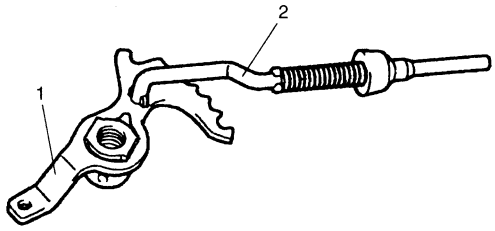
71) Using spring pin remover with 3 mm (0.12 in.) in diameter and hammer, drive out manual valve lever pin (1).

72) Remove manual shift shaft (2).



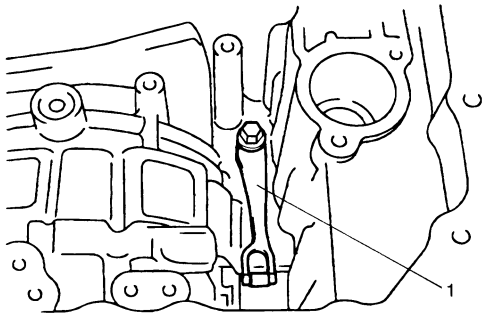
I2RH0B510144-01

73) Remove parking lock pawl rod (2) from manual valve lever (1).



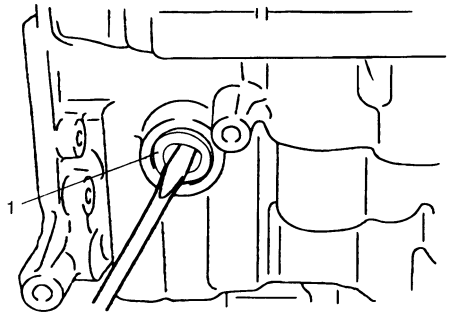
I2RH0B510145-01

74) Remove manual detent spring (1).



I2RH0B510146-01

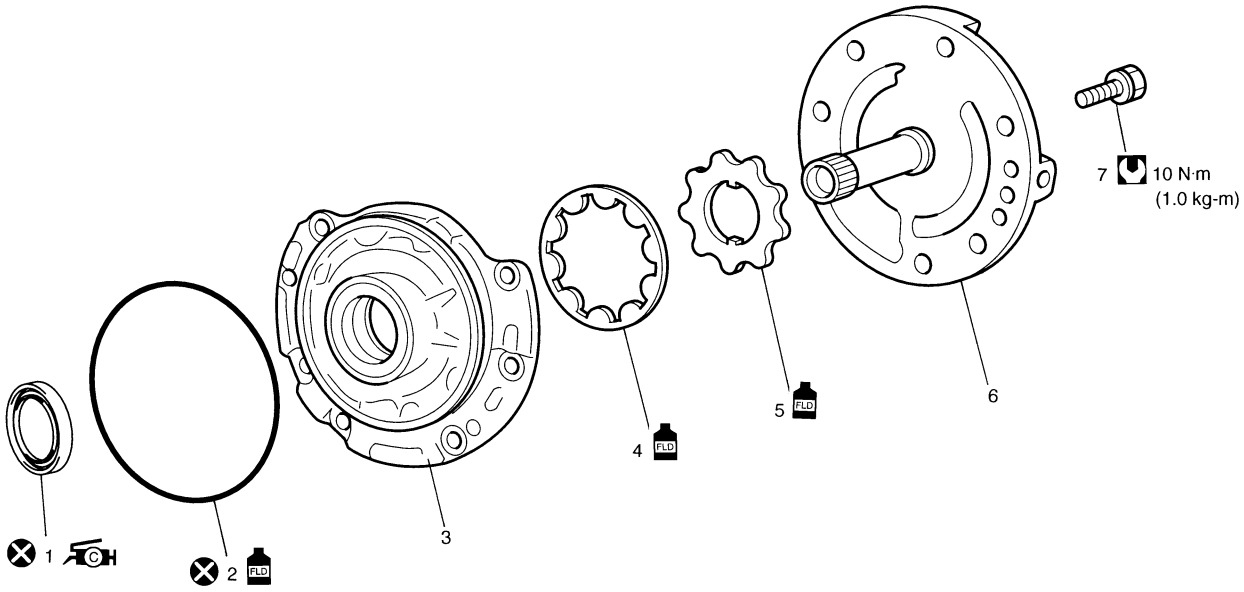
75) Remove manual shift shaft oil seal (1).



I2RH0B510147-01

Oil Pump Assembly Components

S7N20A5106034



I2RH0B510148-01

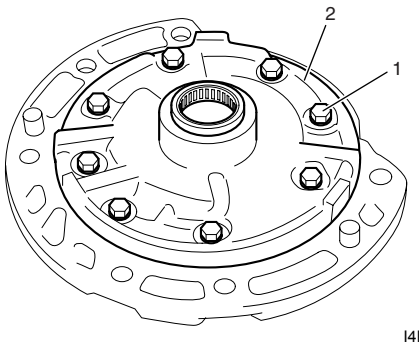
1. Oil seal : Apply grease 99000-25030 to oil seal lip.	5. Oil pump drive gear	: Apply automatic transaxle fluid.
2. O-ring	6. Stator shaft assembly	: Tightening torque
3. Oil pump body	7. Oil pump subassembly bolts	: Do not reuse.
4. Oil pump driven gear		

Oil Pump Assembly Disassembly and Reassembly

S7N20A5106035

Disassembly

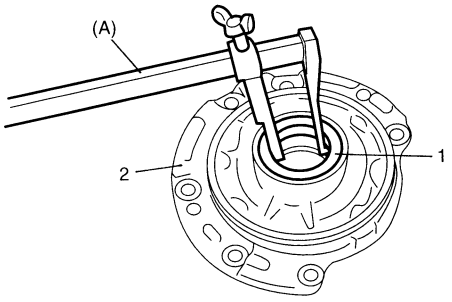
1) Remove O-ring from pump body.
2) Remove 8 oil pump subassembly bolts (1) and stator shaft assembly (2).



I4RS0A510041-01

3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



I2RH0B510150-01

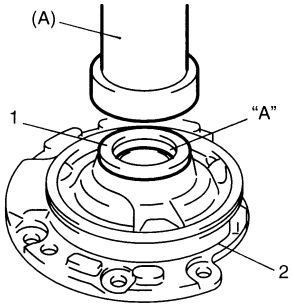
2. Oil pump body

Reassembly

1) Install new oil pump body oil seal (1).
Use special tool and hammer to install it, and then apply grease to its lip portion.

Special tool
(A): 09913–85210

"A": Grease 99000–25030 (SUZUKI Super Grease C)



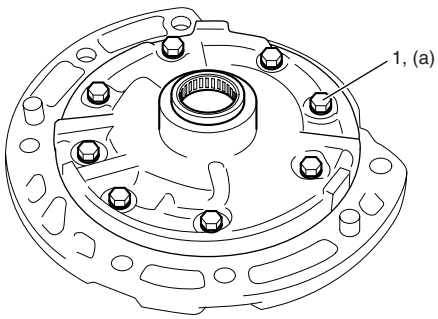
I2RH0B510151-01

2. Oil pump body

2) Install driven gear and drive gear to oil pump body after applying A/T fluid.

3) Install stator shaft assembly to oil pump body and tighten 8 pump subassembly bolts (1) to specification.

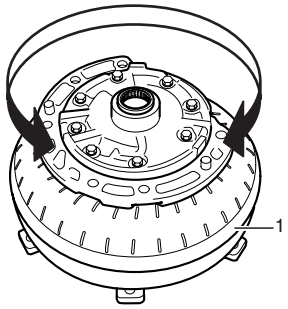
Tightening torque
Oil pump subassembly bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0A510042-01

4) After applying A/T fluid to new O-ring, install it to oil pump body.

5) Check drive gear for smooth rotation by using torque converter (1).



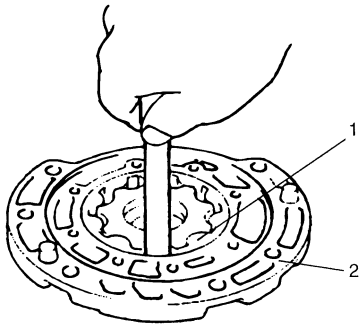
I4RS0A510043-01

Oil Pump Assembly Inspection

S7N20A5106036

1) Check body clearance of driven gear (1).
Push driven gear to one side of oil pump body (2). Using a feeler gauge, measure clearance between driven gear and body. If clearance exceeds its standard value, replace oil pump assembly.

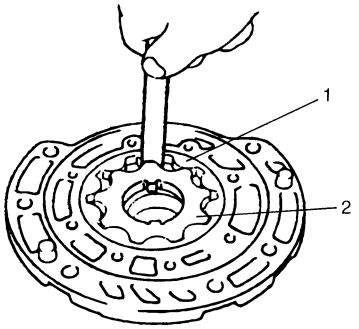
Clearance between oil pump driven gear and oil pump body
Standard: 0.10 – 0.17 mm (0.0039 – 0.0067 in.)



I2RH0B510154-01

2) Check tip clearance of both drive and driven gears. Using a feeler gauge, measure clearance between drive and driven gear tips. If clearance exceeds its standard value, replace oil pump assembly.

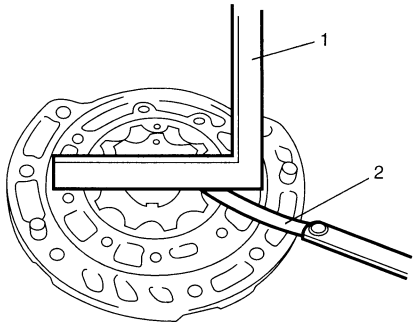
Tip clearance between oil pump drive gear and oil pump driven gear
Standard: 0.07 – 0.15 mm (0.0028 – 0.0059 in.)



I2RH0B510155-01

3) Check side clearance of both gears.
Using a straightedge (1) and a feeler gauge (2), measure side clearance between gears and pump body.
If clearance exceeds its standard value, replace oil pump assembly.

Side clearance between gears and oil pump body
Standard: 0.02 – 0.05 mm (0.0008 – 0.0019 in.)

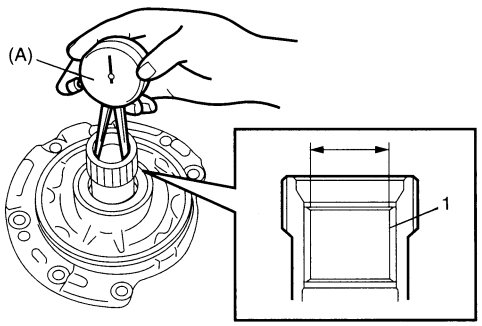


I2RH0B510156-01

4) Using special tool, measure stator shaft bush (1) bore.
If measured stator shaft bush bore is out of specifications, replace oil pump assembly with new one.

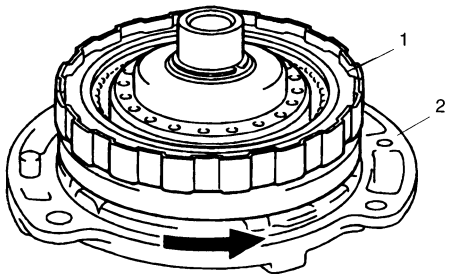
Special tool
(A): 09900–20605

Stator shaft bush bore
Standard: 18.424 – 18.450 mm (0.7254 – 0.7264 in.)



I2RH0B510157-01

5) Install direct clutch assembly (1) to stator shaft assembly (2), then ensure that direct clutch assembly turns smoothly.
If unsmooth rotation or noise are found in oil pump assembly, replace oil pump assembly with new one. This check should also be done to input shaft assembly and replace input shaft assembly if necessary.

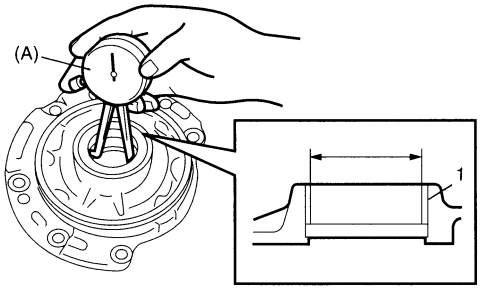


I2RH0B510158-01

6) Using special tool, measure oil pump body bush bore.
If measured oil pump body bush (1) bore is out of specifications, replace oil pump assembly with new one. Torque converter also needs to be checked. Replace torque converter, if necessary.

Special tool
(A): 09900–20605

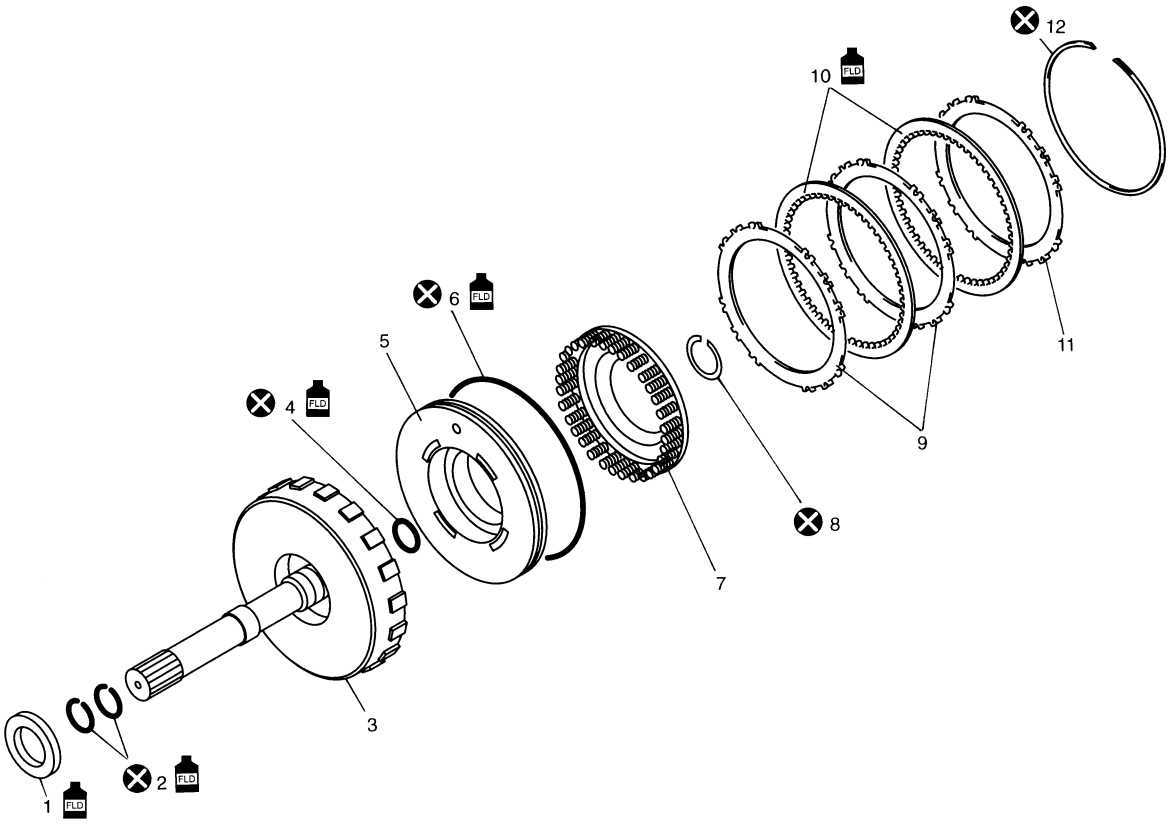
Oil pump body bush bore
Standard: 38.113 – 38.138 mm (1.5005 – 1.5015 in.)



I2RH0B510159-01

Direct Clutch Assembly Components

S7N20A5106037



I2RH0B510160-01

1. Input shaft front thrust bearing	6. Outer O-ring	11. Direct clutch retaining plate
2. Input shaft seal ring	7. Direct clutch return spring subassembly	12. Plate snap ring
3. Input shaft subassembly	8. Shaft snap ring	FLD : Apply automatic transaxle fluid.
4. Inner O-ring	9. Direct clutch separator plate	⊗ : Do not reuse.
5. Direct clutch piston	10. Direct clutch disc	

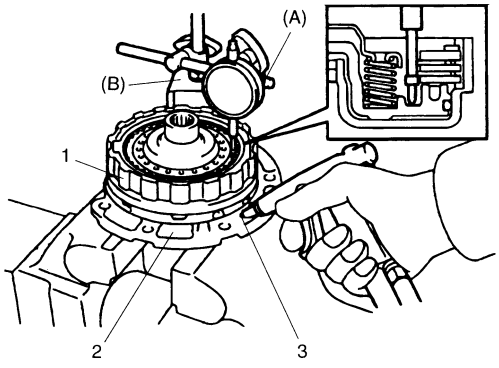
Direct Clutch Assembly Preliminary Check

S7N20A5106038

Install direct clutch assembly (1) to oil pump assembly (2) blow in air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (3) of oil pump assembly with special tool attached on upper surface of direct clutch piston, and measure piston stroke of direct clutch.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701

Direct clutch piston stroke
0.4 – 0.7 mm (0.016 – 0.027 in.)



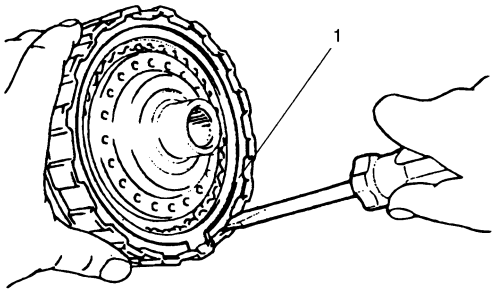
I2RH0B510161-01

Direct Clutch Assembly Disassembly and Reassembly

S7N20A5106039

Disassembly

1) Remove plate snap ring (1) then remove direct clutch retaining plate, discs and separator plates.



I2RH0B510162-01

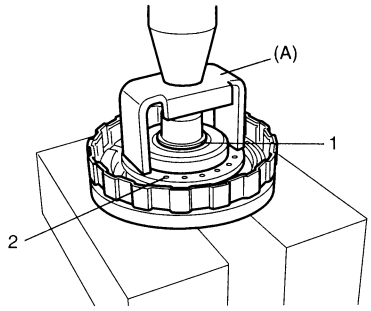
2) Using special tool and hydraulic press, remove shaft snap ring (1).

Special tool
(A): 09926–98310

⚠ CAUTION

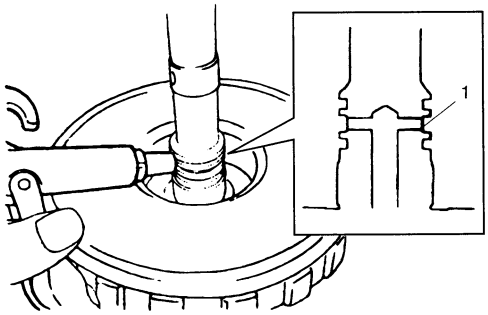
Do not press direct clutch return spring subassembly in over 0.7 mm (0.027 in.). Excessive compression may cause damage to direct clutch return spring subassembly and/or piston.

3) Remove direct clutch return spring assembly (2).



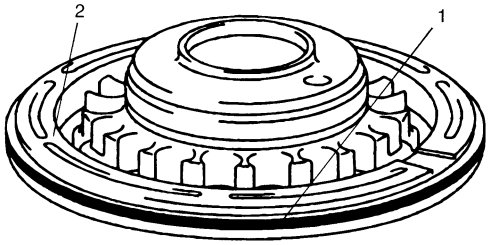
I2RH0B510163-01

4) Using a finger to block oil hole (1), apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to opposite hole, which will assist in removal of the clutch piston.



I2RH0B510164-01

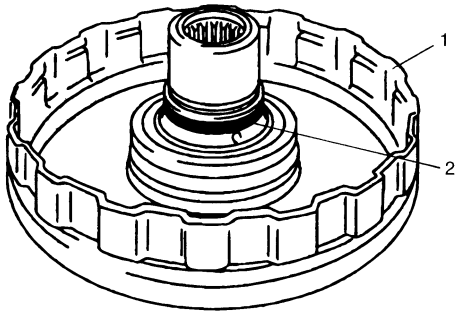
5) Remove outer O-ring (1).



I2RH0B510165-01

2. Direct clutch piston

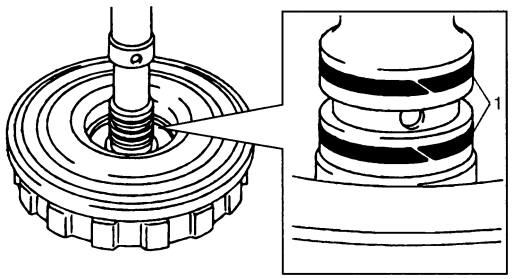
6) Remove inner O-ring (2).



I2RH0B510166-01

1. Input shaft subassembly

7) Remove input shaft seal rings (1).



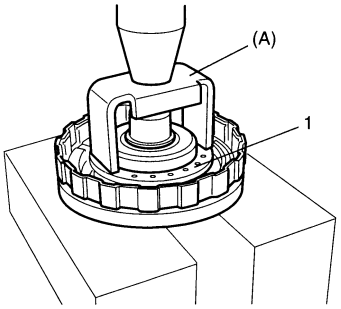
I2RH0B510167-01

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

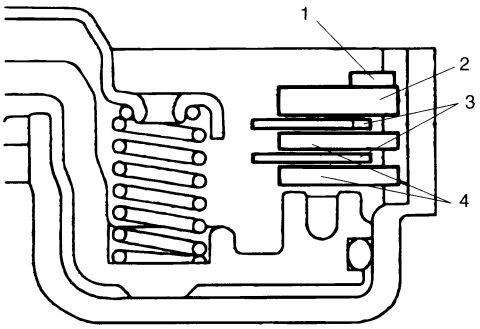
- Use new seal ring and O-ring. Apply A/T fluid before installation.
- Do not damage direct clutch return spring subassembly (1) and piston by pressing in direct clutch return spring subassembly passing through its original installing position over 0.7 mm (0.027 in.).

  Special tool
  (A): 09926–98310



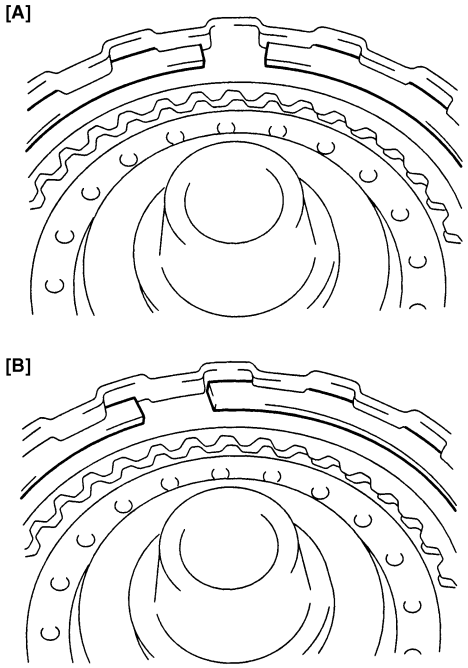
I2RH0B510168-01

- Apply A/T fluid to direct clutch separator plates (4), discs (3) and retaining plate (2).
- Install direct clutch separator plates (4), discs (3), retaining plate (2) and snap ring (1) to input shaft subassembly.



I2RH0B510169-01

- Install plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510170-01

[A]: Correct	[B]: Incorrect

- After assembly, measure direct clutch piston stroke.

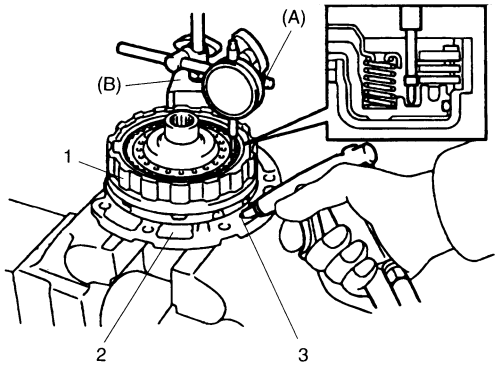
  Special tool
  (A): 09900–20607
  (B): 09900–20701

  Direct clutch piston stroke
  0.4 – 0.7 mm (0.016 – 0.027 in.)

  When piston stroke is out of specification, select direct clutch retaining plate with suitable thickness from among the following table and replace it.

  Available direct clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
2.8 mm (0.110 in.)	4



I2RH0B510171-01

1. Direct clutch assembly	3. Oil hole
2. Oil pump assembly	

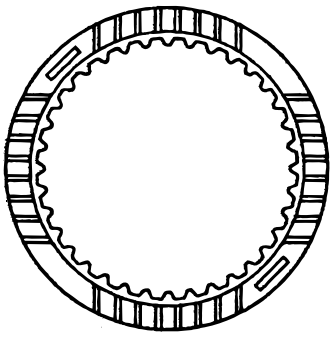
Direct Clutch Assembly Inspection

S7N20A5106040

Clutch Discs, Plates and Retaining Plate
Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE

- **If disc lining is exfoliated, discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



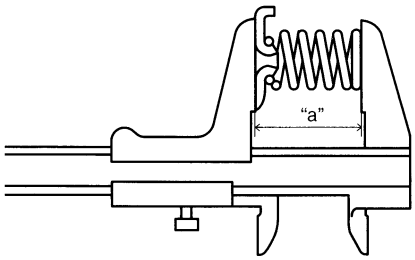
I2RH0B510172-01

Direct Clutch Return Spring Subassembly
Measure free length of direct clutch return spring.

Direct clutch return spring free length
"a": 36.04 mm (1.419 in.)

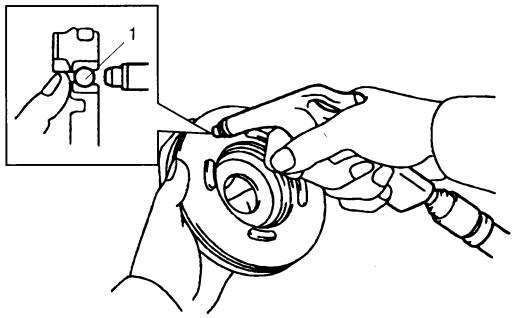
NOTE

Do not apply excessive force when measuring spring free length. Perform measurement at several points.



I2RH0B510173-01

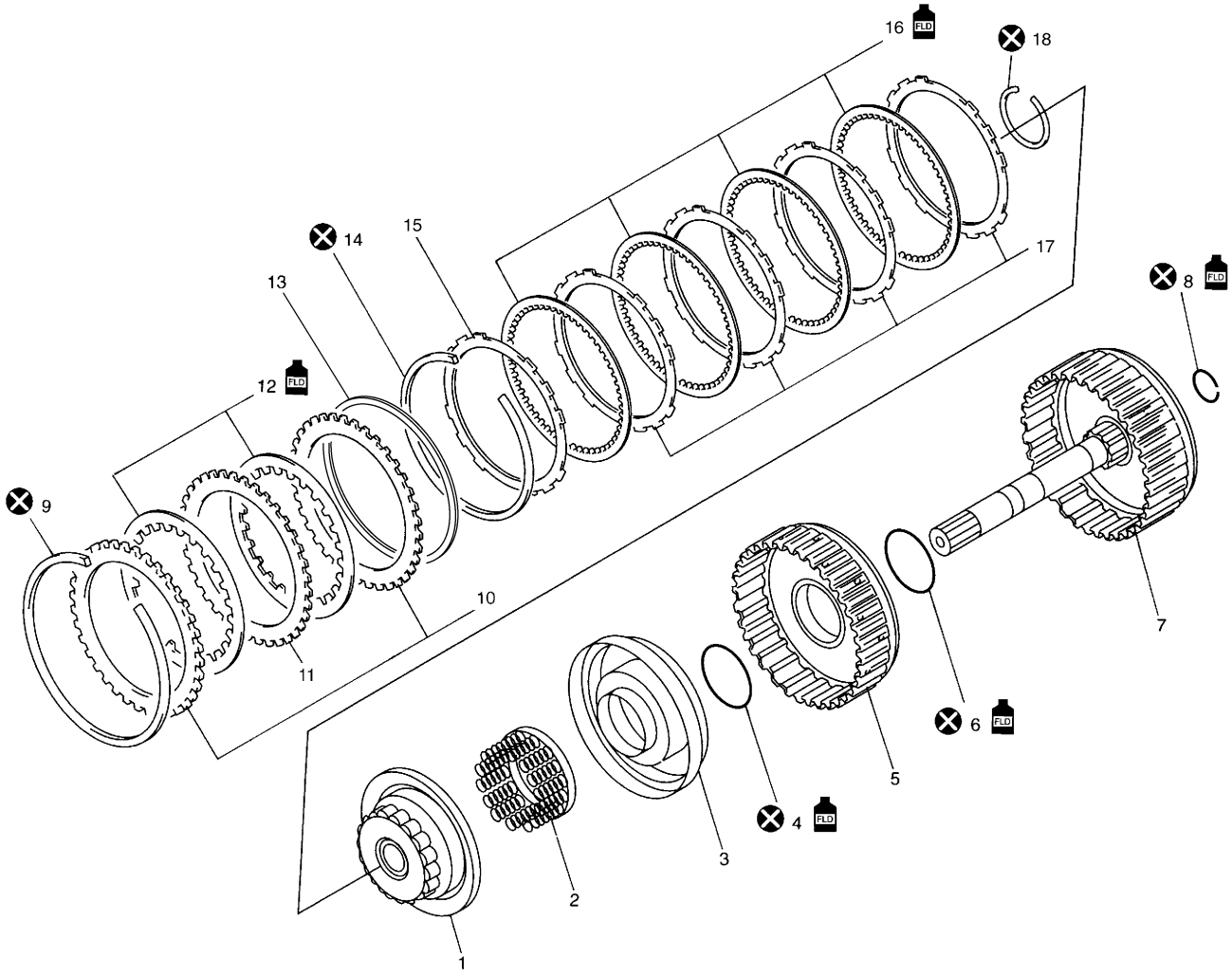
Direct Clutch Piston
Shake direct clutch piston lightly and check that check ball (1) is not stuck.
Blow in low pressure air (Max. 100 kPa, 1 kg/cm^2, 15 psi) to check ball to check that there is no leakage.



I2RH0B510174-01

Forward and Reverse Clutch Assembly Components

S7N20A5106041



I3RM0B510061-01

1. Forward clutch balancer	8. Intermediate shaft seal ring	15. Forward clutch retaining plate
2. Forward clutch return spring subassembly	9. Reverse clutch plate snap ring	16. Forward clutch disc
3. Forward clutch piston	10. Reverse clutch retaining plate	17. Forward clutch separator plate
4. Forward clutch piston O-ring	11. Reverse clutch separator plate	18. Balancer snap ring
5. Forward clutch drum	12. Reverse clutch disc	FLD : Apply automatic transaxle fluid.
6. Forward clutch drum O-ring	13. Reverse clutch cushion plate	⊗ : Do not reuse.
7. Intermediate shaft subassembly	14. Forward clutch plate snap ring	

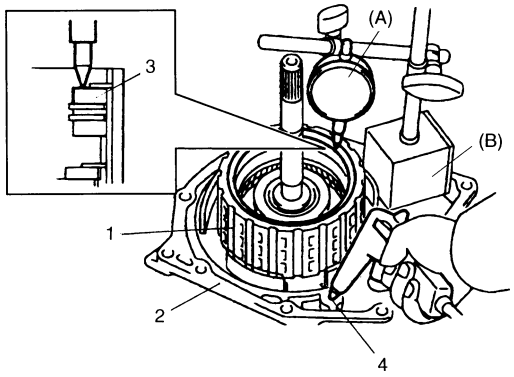
Forward and Reverse Clutch Assembly Preliminary Check

S7N20A5106042

1) Install forward and reverse clutch assembly (1) to transaxle rear cover (2), blow in compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (4) of transaxle rear cover with the special tool attached on the upper surface of reverse clutch retaining plate (3), and measure reverse clutch piston stroke.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701

Reverse clutch piston stroke
1.20 – 1.60 mm (0.047 – 0.063 in.)

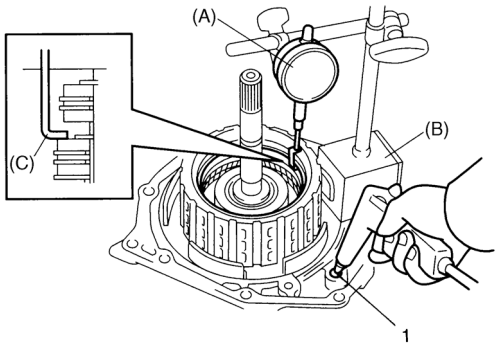


I2RH0B510176-01

2) Blow compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) through oil hole (1) of transaxle rear cover with the special tool attached on the upper surface of forward clutch retaining plate, and measure forward clutch piston stroke.
If piston stroke exceeds specified value, disassemble, inspect and replace inner parts.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

Forward clutch piston stroke
1.30 – 1.50 mm (0.051 – 0.059 in.)



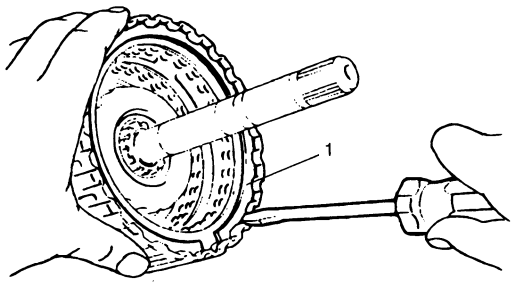
I2RH0B510177-02

Forward and Reverse Clutch Assembly Disassembly and Reassembly

S7N20A5106043

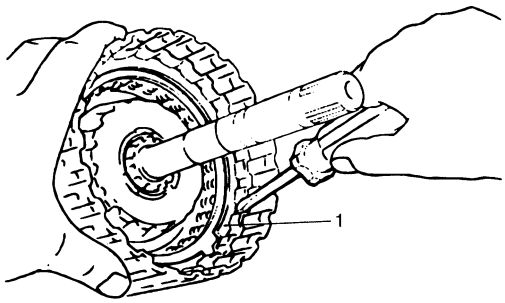
Disassembly

1) Remove reverse clutch plate snap ring (1) and take out reverse clutch retaining plate, discs, separator plates and clutch cushion plate from intermediate shaft subassembly.



I2RH0B510178-01

2) Remove forward clutch plate snap ring (1) and take out forward clutch retaining plate, discs and separator plates from forward clutch drum.



I2RH0B510179-01

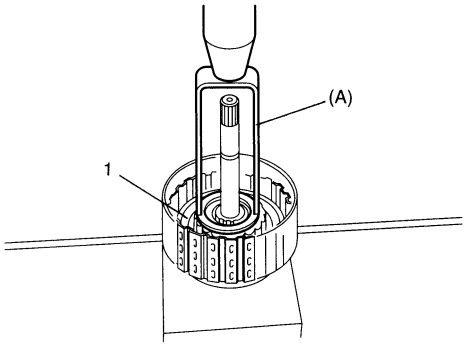
3) Remove balancer snap ring by using special tool and hydraulic press.

Special tool
(A): 09926–97610

⚠ CAUTION

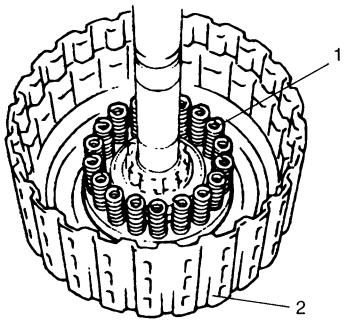
Do not press forward clutch return spring subassembly in over 1.5 mm (0.059 in.). Excessive compression may cause damage to return spring subassembly and/or balancer.

4) Remove forward clutch balancer (1).



I2RH0B510180-01

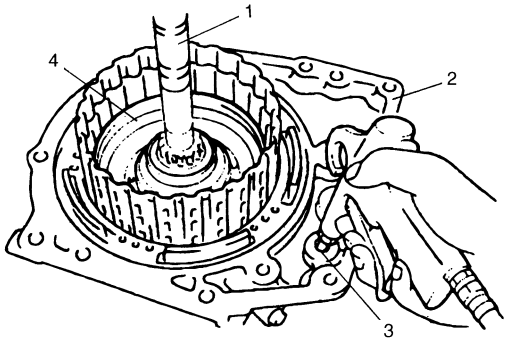
5) Remove forward clutch return spring subassembly (1).



I2RH0B510181-01

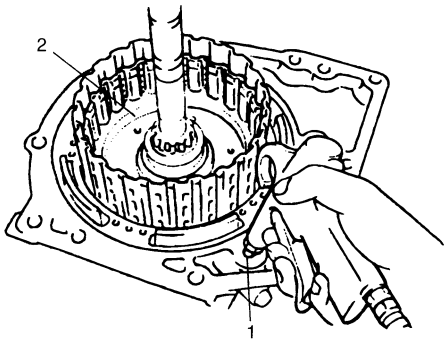
2. Intermediate shaft subassembly

6) Install intermediate shaft subassembly (1) to transaxle rear cover (2). Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (3) of transaxle rear cover to remove forward clutch piston (4).



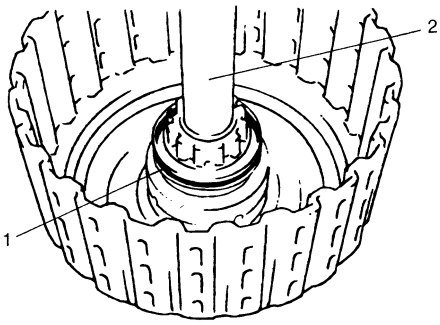
I2RH0B510182-01

7) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (1) of transaxle rear cover to remove forward clutch drum (2).



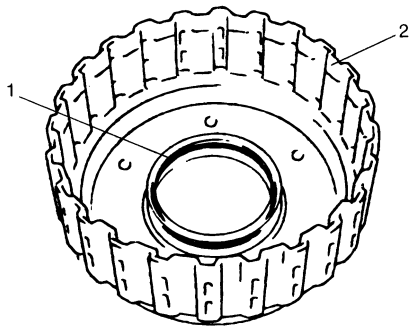
I2RH0B510183-01

8) Remove forward clutch piston O-ring (1) from intermediate shaft subassembly (2).



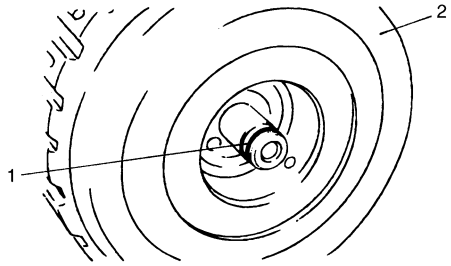
I2RH0B510184-01

9) Remove forward clutch drum O-ring (1) from forward clutch drum (2).



I2RH0B510185-01

10) Remove intermediate shaft seal ring (1) from intermediate shaft subassembly (2).



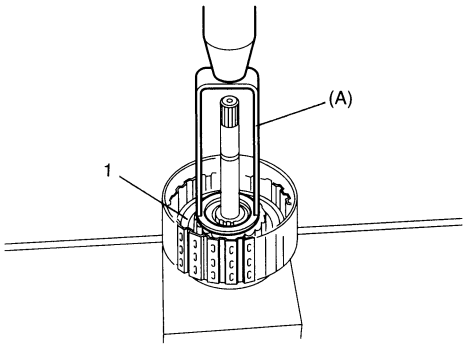
I2RH0B510186-01

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

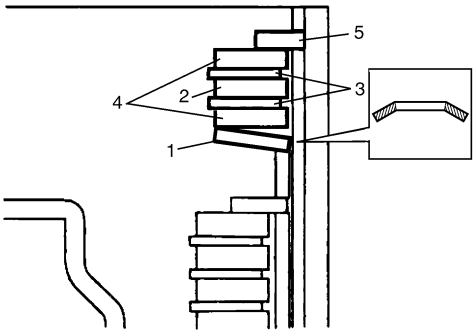
- Before assembling, apply automatic transaxle fluid to component parts.
- Replace O-rings and seal ring with new ones.
- Do not damage forward clutch return spring subassembly and balancer (1) by pressing forward clutch return spring subassembly passing through its original installing position over 1.5 mm (0.059 in.).

Special tool
(A): 09926–97610



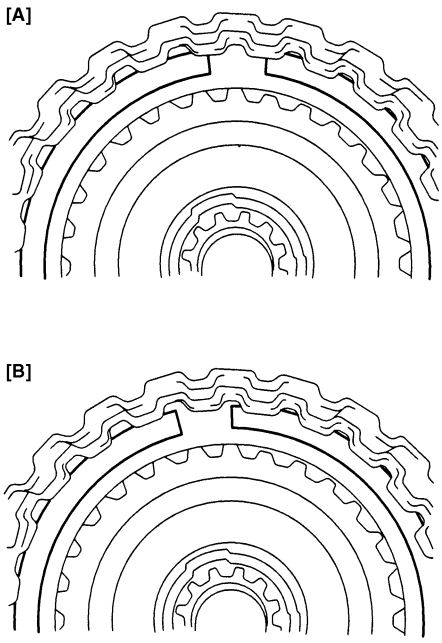
I2RH0B510180-01

- Apply A/T fluid to forward clutch separator plates (1), discs (2) and retaining plate (3).
- Install forward clutch separator plates (1), discs (2) and retaining plate (3), then snap ring (4) to forward clutch drum.



I3RM0B510062-01

- Install forward clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510188-01

[A]: Correct	[B]: Incorrect

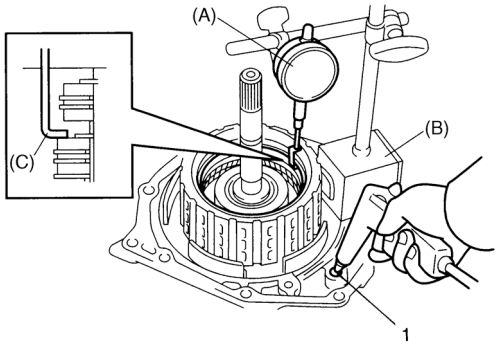
- Measure forward clutch piston stroke in the same manner as “Forward and Reverse Clutch Assembly Preliminary Check”.
  When piston stroke is out of specification, select forward clutch retaining plate with proper thickness from among the following table and replace it.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

Forward clutch piston stroke
1.30 – 1.50 mm (0.051 – 0.059 in.)

Available forward clutch retaining plate thickness

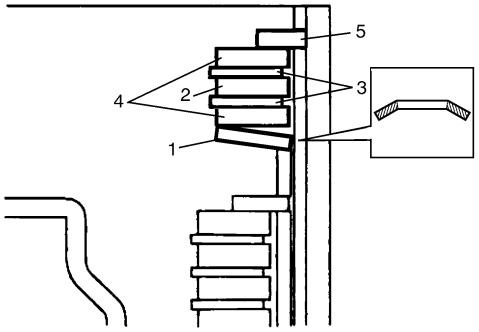
Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.1 mm (0.122 in.)	5
3.2 mm (0.126 in.)	2
3.3 mm (0.130 in.)	6
3.4 mm (0.134 in.)	3
3.5 mm (0.138 in.)	7
3.6 mm (0.142 in.)	4



I2RH0B510177-02

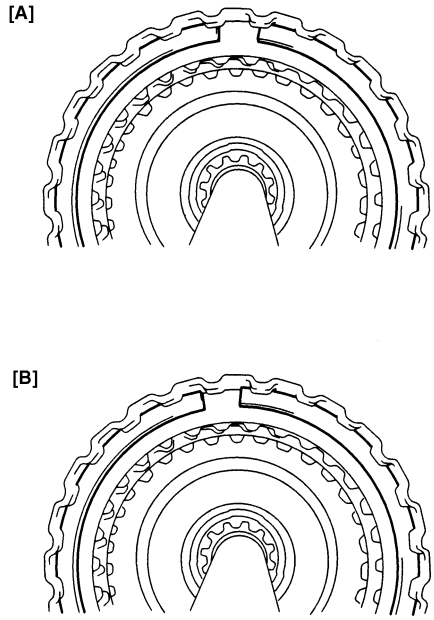
1. Oil hole

- Install reverse clutch cushion plate (1) in correct direction as shown in figure.
- Apply A/T fluid to reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3) and retaining plate (4).
- Install reverse clutch cushion plate (1), reverse clutch separator plate (2), discs (3), retaining plate (4) and then snap ring (5) to intermediate shaft subassembly.



I3RM0B510062-01

- Install reverse clutch plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



I2RH0B510190-01

[A]: Correct	[B]: Incorrect

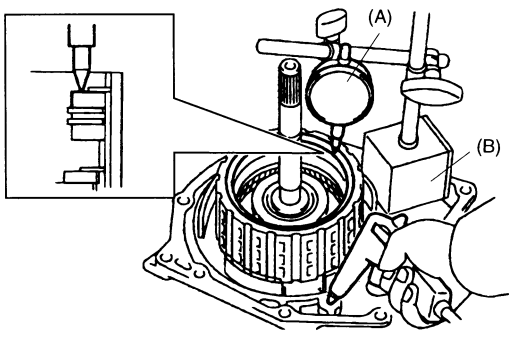
- Measure reverse clutch piston stroke in the same manner as “Forward and Reverse Clutch Assembly Preliminary Check”.
  When piston stroke is out of specification, select reverse clutch retaining plate with proper thickness from among the following table and replace it.

Special tool
(A): 09900–20607
(B): 09900–20701

Reverse clutch piston stroke
1.20 – 1.60 mm (0.047 – 0.063 in.)

Available reverse clutch retaining plate thickness

Thickness	Identification mark
3.0 mm (0.118 in.)	1
3.2 mm (0.126 in.)	2
3.4 mm (0.134 in.)	3
3.6 mm (0.142 in.)	4



I2RH0B510191-01

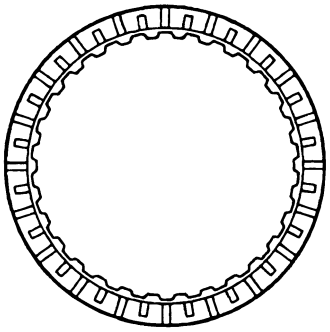
Forward and Reverse Clutch Assembly Inspection

S7N20A5106044

Clutch, Discs, Separator Plates and Retaining Plate
Check that sliding surfaces of discs, separator plates and retaining plate are not worn hard or burnt. If necessary, replace.

NOTE

- **If disc lining is exfoliated or discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



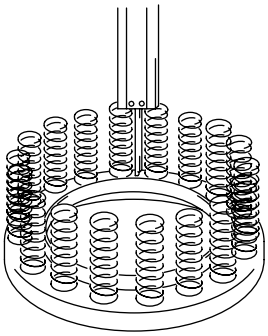
I2RH0B510192-01

Forward Clutch Return Spring Subassembly
Measure free length of forward clutch return spring.

Forward clutch return spring free length
23.04 mm (0.907 in.)

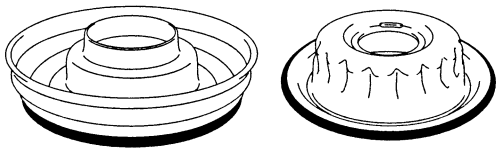
NOTE

Do not apply excessive force when measuring spring free length. Perform measurement at several points.



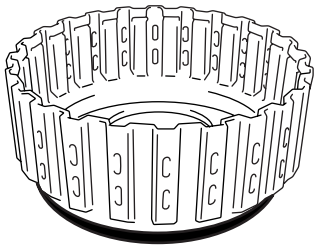
I2RH0B510193-01

Forward Clutch Piston Lip and Forward Clutch Balancer Lip
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510194-01

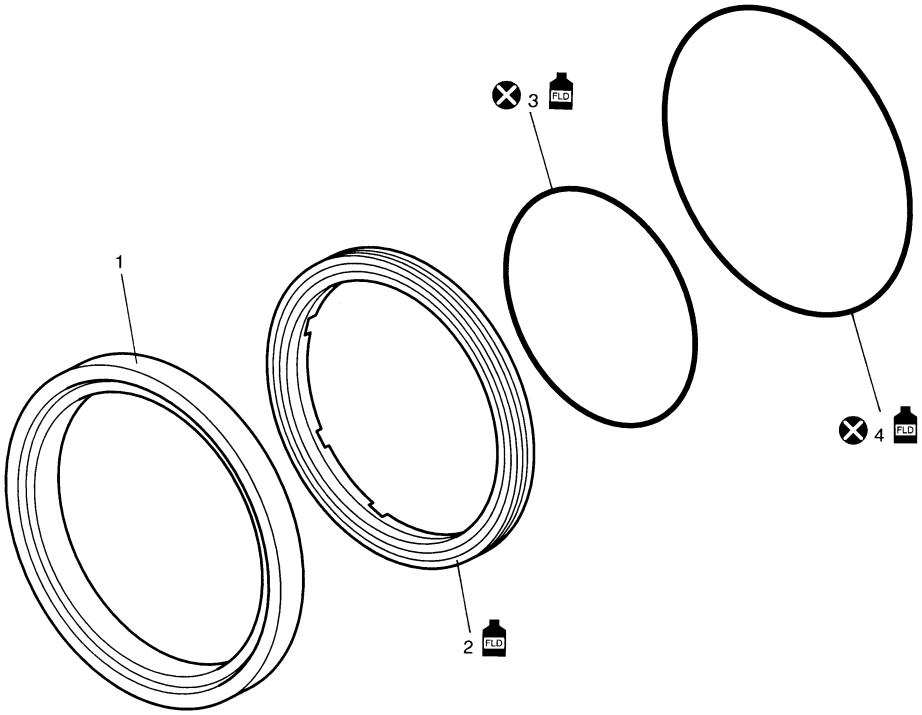
Forward Clutch Drum Lip
Check each lip for wear, deformation, cut and/or hardening. If necessary, replace.



I2RH0B510195-01

2nd Brake Piston Assembly Components

S7N20A5106045



I2RH0B510196-01

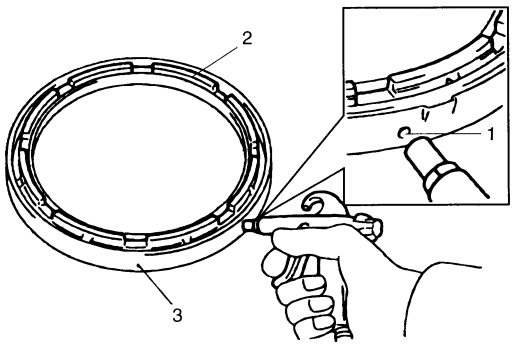
1. 2nd brake cylinder	4. Outer O-ring
2. 2nd brake piston	FLD : Apply automatic transaxle fluid.
3. Inner O-ring	: Do not reuse.

2nd Brake Piston Assembly Disassembly and Reassembly

S7N20A5106046

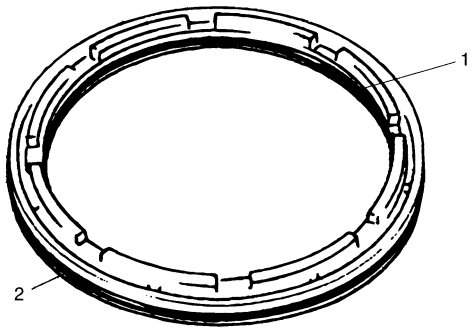
Disassembly

1) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (1) of 2nd brake cylinder (3) to remove 2nd brake piston (2).



I2RH0B510197-01

2) Remove inner O-ring (1) and outer O-ring (2).

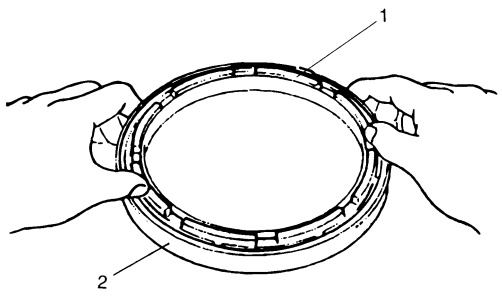


I2RH0B510198-01

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

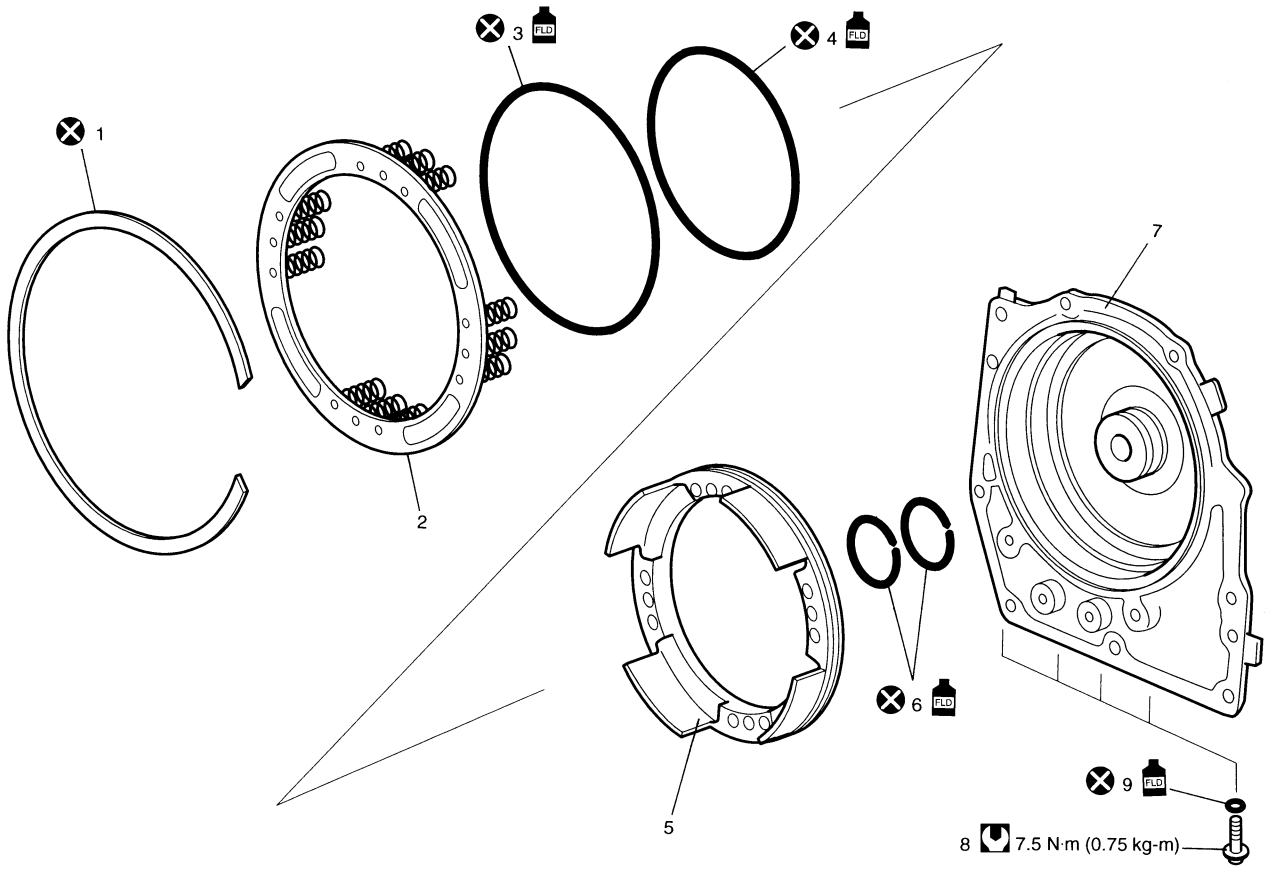
- Use new O-rings. Apply A/T fluid to the O-rings, before installation.
- Install 2nd brake piston (1) to which A/T fluid is applied to 2nd brake cylinder (2).
  Do not damage O-ring when installing 2nd brake piston.



I2RH0B510199-01

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components

S7N20A5106047



I2RH0B510200-01

1. Snap ring	5. O/D and 2nd coast brake piston	9. Rear cover plug O-ring
2. O/D and 2nd coast brake return spring subassembly	6. Rear cover seal ring	FLD : Apply automatic transaxle fluid.
3. O/D and 2nd coast brake piston front O-ring	7. Transaxle rear cover	⊗ : Do not reuse.
4. O/D and 2nd coast brake piston rear O-ring	8. Rear cover plug	: Tightening torque

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Disassembly and Reassembly

S7N20A5106048

Disassembly

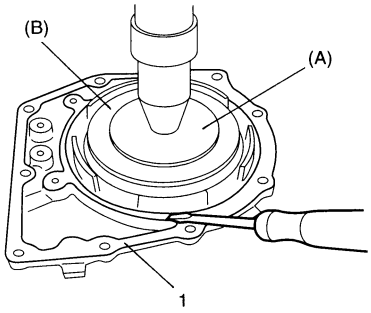
1) Remove snap ring by using special tools and hydraulic press.

Special tool
(A): 09926–96030
(B): 09946–06710

⚠ CAUTION

Do not press O/D and 2nd coast brake return spring subassembly in over 1.0 mm (0.039 in.).
Excessive compression may cause damage to O/D and 2nd coast brake return spring subassembly and/or piston.

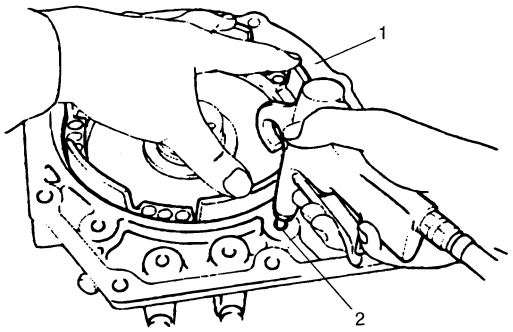
2) Remove O/D and 2nd coast brake return spring assembly.



I2RH0B510201-01

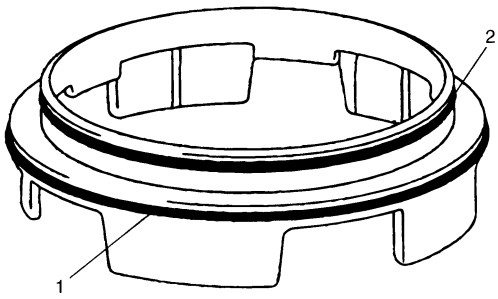
1. Transaxle rear cover

3) Apply compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) to oil hole (2) of transaxle rear cover (1) to remove O/D and 2nd coast brake piston.



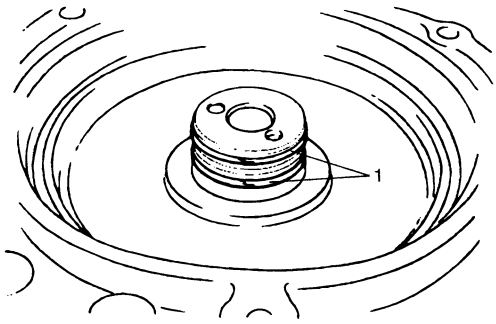
I2RH0B510202-01

4) Remove O/D and 2nd coast brake piston front O-ring (1) and rear O-ring (2).



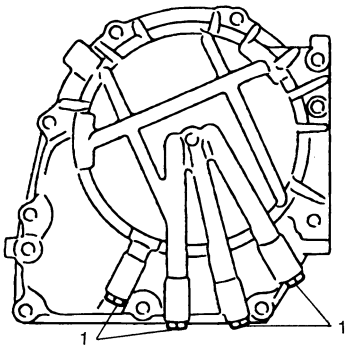
I2RH0B510203-01

5) Remove rear cover seal rings (1).



I2RH0B510204-01

6) Remove rear cover plugs (1).



I2RH0B510205-01

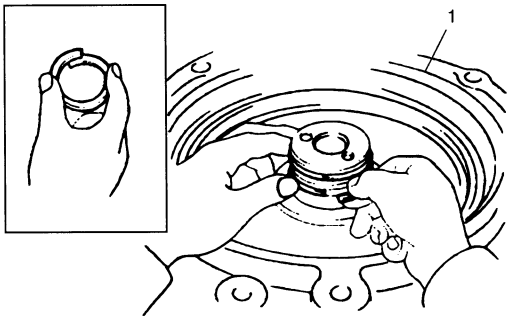
Reassembly

Reverse disassembly procedure for assembly, noting the following points.

- Use new seal rings and O-rings. Apply A/T fluid to seal rings and O-rings before installation.
- Tighten rear cover plugs to specified torque.

  Tightening torque
  Rear cover plug: 7.5 N·m (0.75 kgf-m, 5.5 lbf-ft)

- Before installing rear cover seal ring, apply A/T fluid to ring.
  First, tighten seal ring to 5 mm (0.197 in.), then install seal ring.
- Do not open rear cover seal ring too wide to attach.

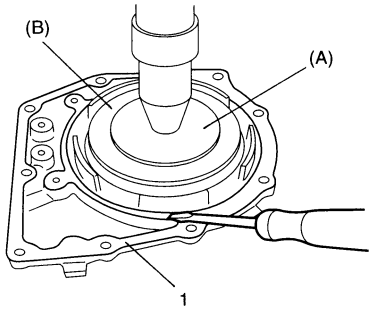


I2RH0B510206-01

1. Transaxle rear cover

- Do not damage O/D and 2nd coast brake return spring subassembly and piston by pressing in O/D and 2nd coast brake return spring subassembly passing through its original installing position over 1.0 mm (0.039 in.).

Special tool
(A): 09926–96030
(B): 09946–06710



I2RH0B510201-01

1. Transaxle rear cover	

Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Inspection

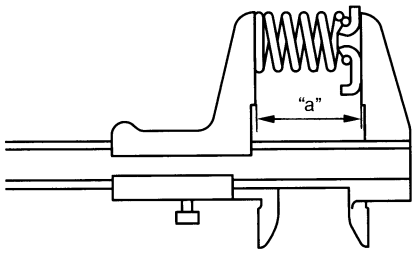
S7N20A5106049

O/D and 2nd Coast Brake Return Spring Subassembly
Measure free length of O/D and 2nd coast brake return spring.

Free length of O/D and 2nd coast brake return spring
"a": 18.99 mm (0.748 in.)

NOTE

- **Do not apply excessive force when measuring spring free length.**
- **Perform measurement at several points.**

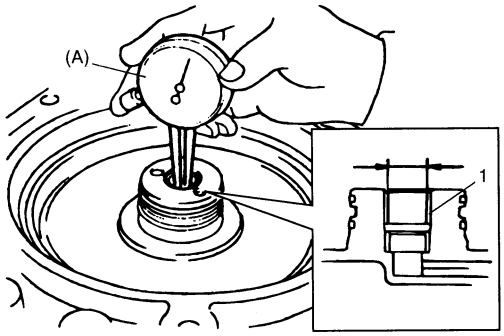


I2RH0B510207-01

Transaxle Rear Cover Bush
Measure transaxle rear cover bush bore by using special tool.
If measured transaxle rear cover bush bore is out of specifications, replace transaxle rear cover with new one. In replacement, intermediate shaft subassembly also needs to be checked. Replace intermediate shaft subassembly, if necessary.

Special tool
(A): 09900–20605

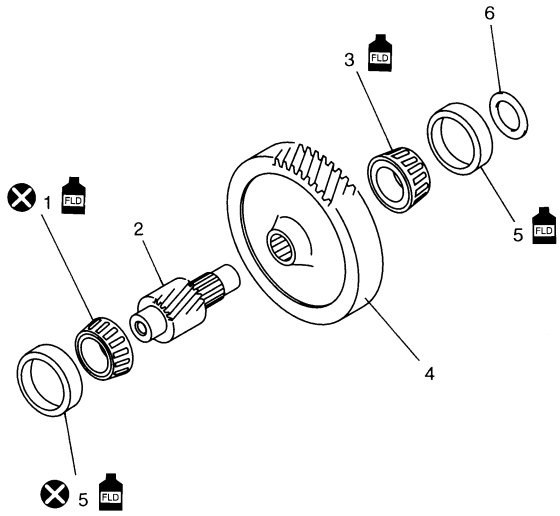
Transaxle rear cover bush bore
Standard: 13.94 – 13.96 mm (0.549 – 0.550 in.)



I2RH0B510208-01

Countershaft Assembly Components

S7N20A5106050



I2RH0B510209-01

1. Countershaft RH bearing	5. Bearing cap
2. Countershaft	6. Countershaft bearing shim
3. Countershaft LH bearing	FLD : Apply automatic transaxle fluid.
4. Reduction driven gear	⊗ : Do not reuse.

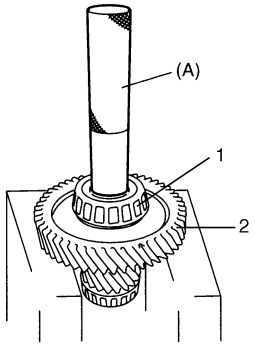
Countershaft Assembly Disassembly and Reassembly

S7N20A5106051

Disassembly

1) Remove countershaft LH bearing (1) and reduction driven gear (2) at once by using special tool and hydraulic press.

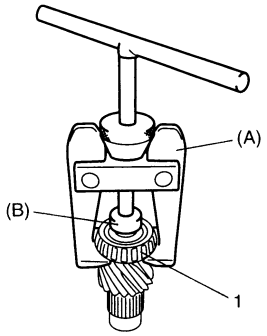
Special tool
(A): 09925–98221



I2RH0B510210-01

2) Remove countershaft RH bearing (1) by using special tools.

Special tool
(A): 09913–61510
(B): 09926–58010



I2RH0B510211-01

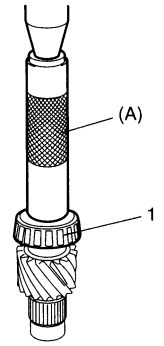
Reassembly

1) Install new countershaft RH bearing (1) by using special tool and hydraulic press.

Special tool
(A): 09913–84510

NOTE

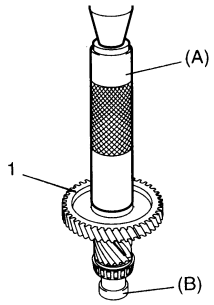
Replace countershaft RH bearing together with bearing cup as a set.



I2RH0B510212-01

2) Install reduction driven gear (1) with special tools and hydraulic press.

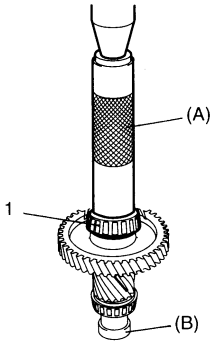
Special tool
(A): 09913–84510
(B): 09925–88210



I2RH0B510213-01

3) Install countershaft LH bearing (1) with special tools and hydraulic press.

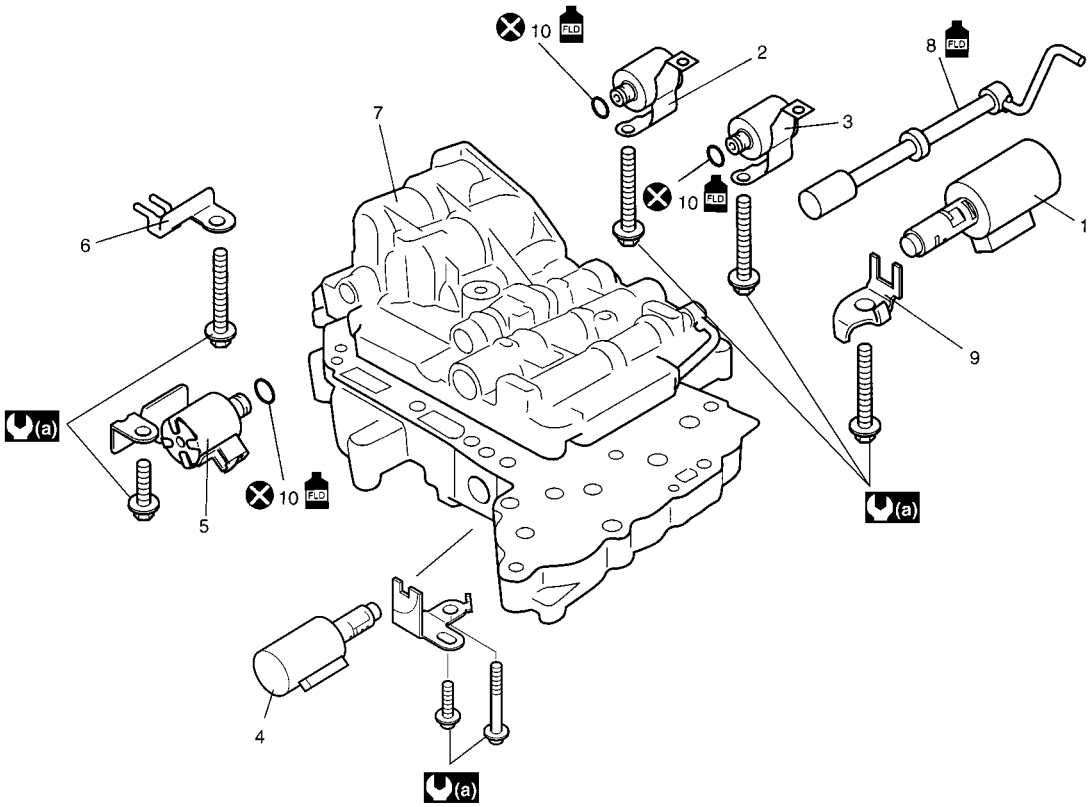
Special tool
(A): 09913–84510
(B): 09925–88210



I2RH0B510214-01

Valve Body Assembly Components

S7N20A5106052



I4RS0A510044-01

1. Pressure control solenoid valve	6. Temperature sensor clamp	FLD : Apply automatic transaxle fluid.
2. Shift solenoid valve-A (No.1)	7. Valve body assembly	: Tightening torque
3. Shift solenoid valve-B (No.2)	8. Manual valve	: Do not reuse.
4. TCC pressure control solenoid valve	9. Solenoid lock plate	
5. Timing solenoid valve	10. O-ring	

Valve Body Assembly Disassembly and Reassembly

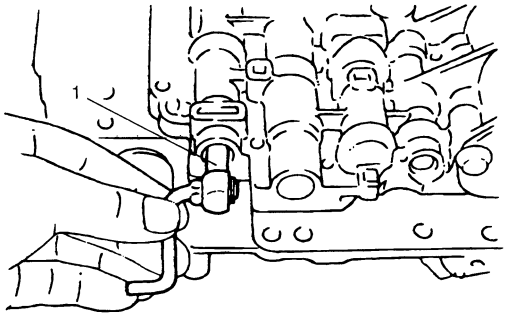
S7N20A5106053

⚠ CAUTION

When replacing pressure control solenoid valve and/or TCC pressure control solenoid valve, it is strictly required to replace it together with valve body assembly as a set. Replacing pressure control solenoid valve and/or TCC pressure control solenoid valve independently may cause excessive shift shock.

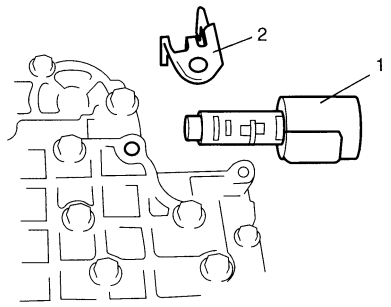
Disassembly

1) Pull out manual valve (1).



I2RH0B510216-01

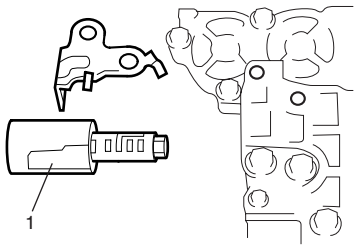
2) Remove pressure control solenoid valve (1).



I2RH0B510217-01

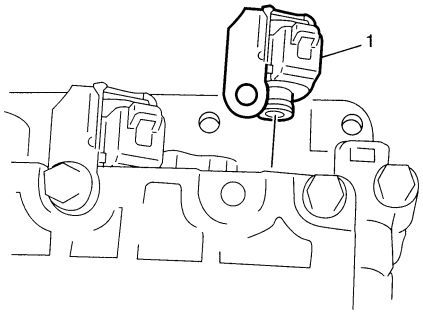
2. Solenoid lock plate

3) Remove TCC pressure control solenoid valve (1).



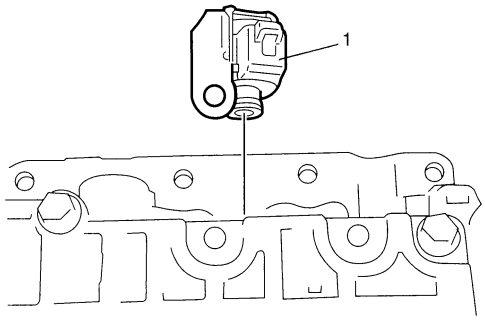
I4RS0A510045-01

4) Remove shift solenoid valve-A (1).



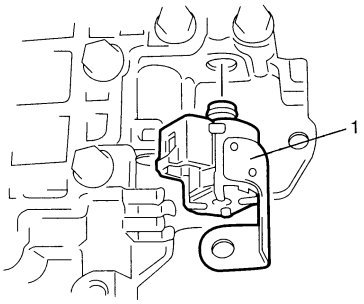
I2RH0B510219-01

5) Remove shift solenoid valve-B (1).



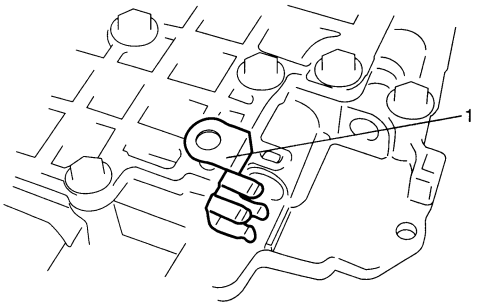
I2RH0B510220-01

6) Remove timing solenoid valve (1).



I2RH0B510221-01

7) Remove temperature sensor clamp (1).



I2RH0B510222-01

Reassembly

Reverse disassembly procedure for assembly, noting the following points.

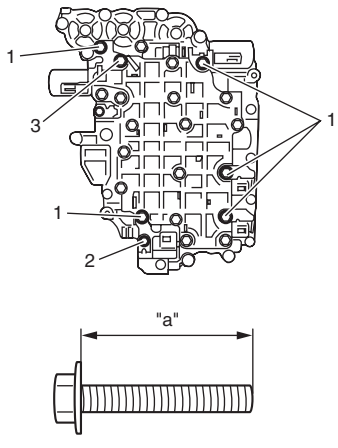
- Shift solenoid valve-A and -B are identical
- After applying A/T fluid to new O-rings, fit them to solenoid valves, then install solenoid valves to valve body.
- Tighten solenoid valve bolts to specified torque

Tightening torque

Solenoid valve bolt (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

Solenoid valve bolt specification

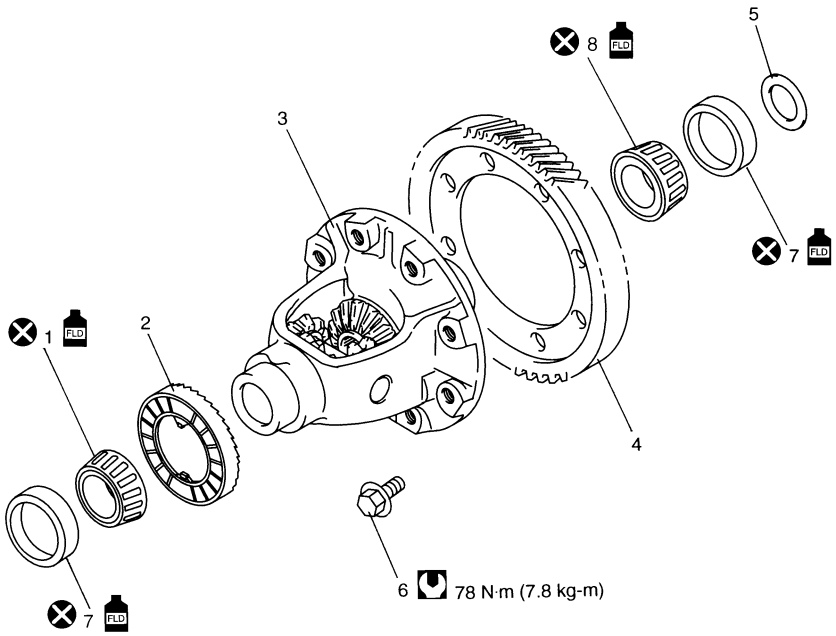
Bolt	Length “a”	Pieces
A (1)	49 mm (1.93 in.)	5
B (2)	20 mm (0.79 in.)	1
C (3)	60 mm (2.36 in.)	1



I4RS0A510046-01

Differential Assembly Components

S7N20A5106054



I2RH0B510224-01

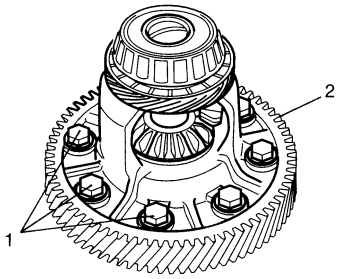
1. Differential side RH bearing	5. Side bearing shim	FLD : Apply automatic transaxle fluid.
2. Output shaft speed sensor (VSS) drive gear	6. Final gear bolt	: Tightening torque
3. Differential case subassembly	7. Side bearing cup	: Do not reuse.
4. Final gear	8. Differential side LH bearing	

Differential Assembly Disassembly and Reassembly

S7N20A5106055

Disassembly

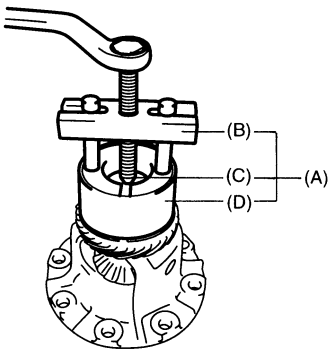
1) Remove final gear bolts (1), and then final gear (2).



I2RH0B510225-01

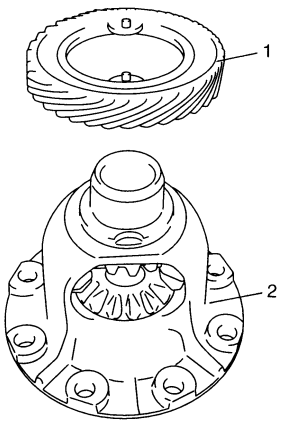
2) Remove differential side RH bearing by using special tools.

Special tool
(A): 09926–37610
(B): 09926–37610–001
(C): 09926–37610–003
(D): 09926–37610–002



I2RH0B510226-01

3) Remove output shaft speed sensor (VSS) drive gear (1).

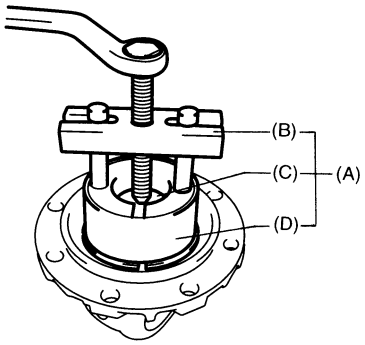


I2RH0B510227-01

2. Differential case subassembly

4) Remove differential side LH bearing by using special tools.

Special tool
(A): 09926–37610
(B): 09926–37610–001
(C): 09926–37610–003
(D): 09926–37610–002



I2RH0B510228-01

Reassembly

⚠ WARNING

- **When taking warmed final driven gear out of vessel, use tongs or the like. Taking out it with bare hand will cause severe burn.**
- **While installing warmed final driven gear, use oven glove such as leather glove. Picking up it with bare hand may cause burn.**

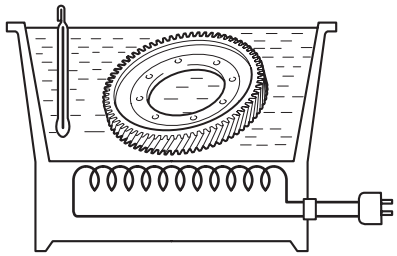
⚠ CAUTION

Do not leave final driven gear in boiling water for longer than 5 min. Overheating the gear may cause strength reduction of gear.

1) Put final driven gear in water vessel, heat and remove when it boils, then remove moisture.

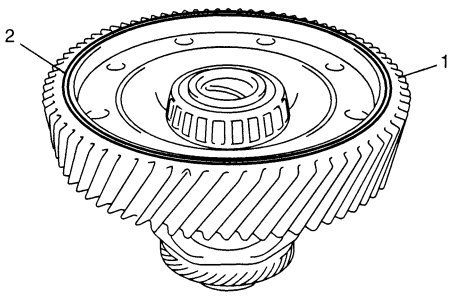
NOTE

After removing moisture on final driven gear, install final driven gear to differential case as quickly as possible.



I2RH0B510229-01

2) As shown in figure, facing groove (2) side upward, install final driven gear (1) to differential case.



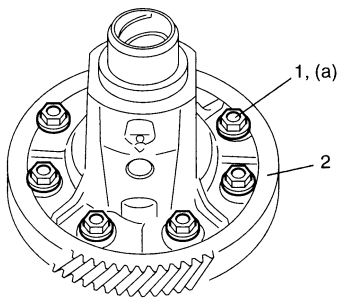
I2RH0B510230-01

3) Tighten final gear bolts (1) to specified torque.

NOTE

To avoid rust, apply A/T fluid to final driven gear after installation.

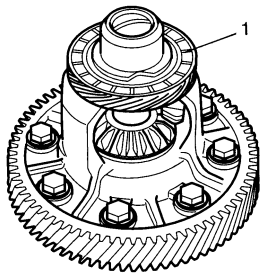
Tightening torque
Final gear bolt (a): 78 N·m (7.8 kgf-m, 56.5 lbf-ft)



I2RH0B510231-01

2. Final driven gear

4) After applying A/T fluid to output shaft speed sensor (VSS) drive gear (1), install output shaft speed sensor drive gear.



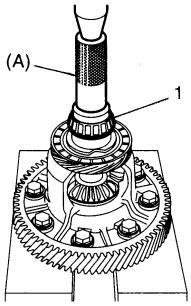
I2RH0B510232-01

5) Install new differential side RH bearing (1) by using special tool and hydraulic press.

NOTE

Replace differential side RH bearing together with bearing cup as a set.

Special tool
(A): 09913–70123



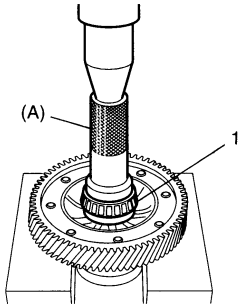
I2RH0B510233-01

6) Install new differential side LH bearing (1) by using special tool and hydraulic press.

NOTE

Replace differential side LH bearing together with bearing cup as a set.

Special tool
(A): 09913–70123



I2RH0B510234-01

Differential Assembly Inspection

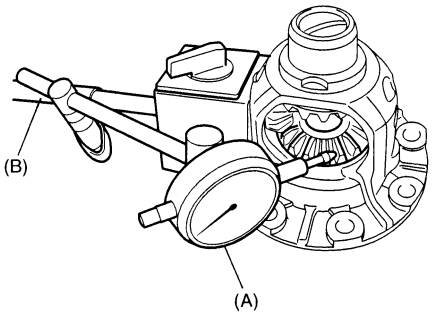
S7N20A5106056

1) Hold differential case subassembly with soft jawed vice and set special tools as shown.

Special tool
(A): 09900–20607
(B): 09900–20701

2) Measure differential gear thrust play.

Differential gear thrust play
Standard: 0.06 – 0.22 mm (0.002 – 0.009 in.)



I2RH0B510235-01

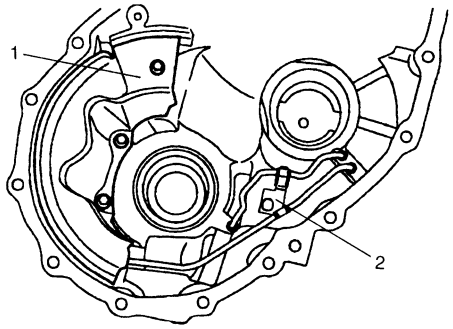
3) If thrust play is out of specification, replace differential case subassembly.

Torque Converter Housing Disassembly and Reassembly

S7N20A5106057

Disassembly

1) Remove fluid reservoir RH plate (1) and lubrication tube clamp (2).

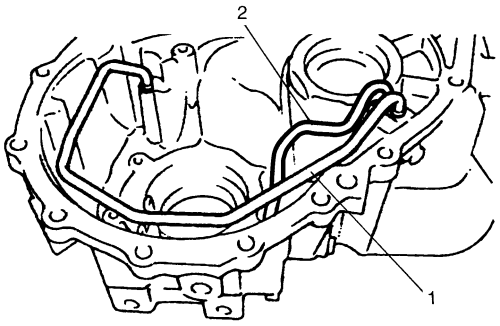


I2RH0B510236-01

2) Remove lubrication LH tube (1) and RH tube (2).

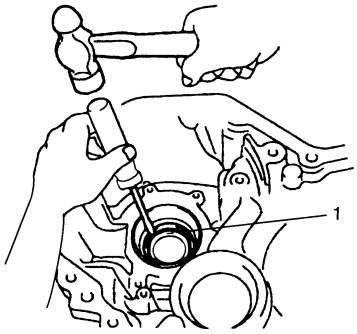
NOTE

Do not bend lubrication tube with excessive force.



I2RH0B510237-01

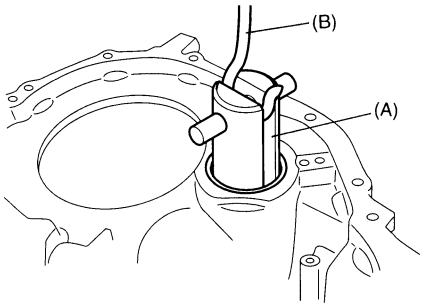
3) Remove differential side oil seal (1).



I2RH0B510238-01

4) Remove countershaft RH bearing cup by using special tools.

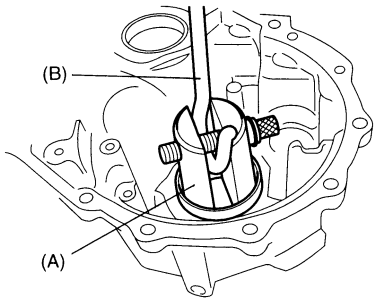
Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510239-01

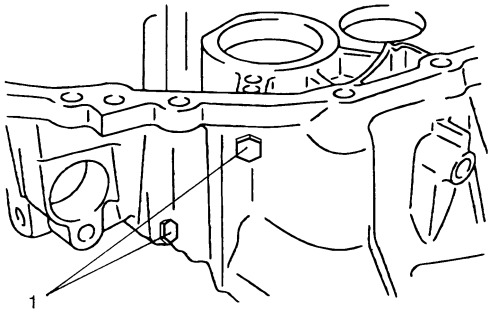
5) Remove differential side RH bearing cup by using special tools.

Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510240-01

6) Remove torque converter case plugs (1).

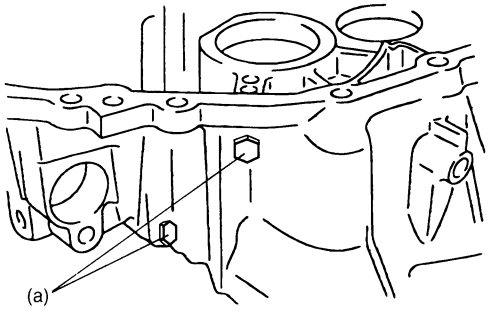


I2RH0B510241-01

Reassembly

1) After applying A/T fluid to new O-rings, fit them to housing plugs. Finally install plugs to torque converter housing.

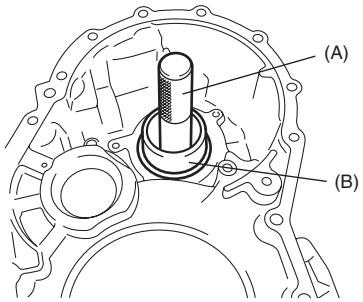
Tightening torque
Torque converter housing plug (a): 7.5 N·m (0.75 kgf-m, 5.5 lbf-ft)



I2RH0B510242-01

2) Using special tools, assemble differential side RH bearing cup.

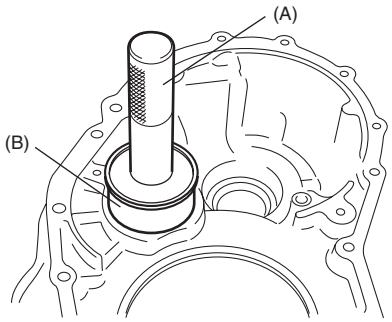
Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510063-01

3) Using special tool, install countershaft RH bearing cup.

Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510064-01

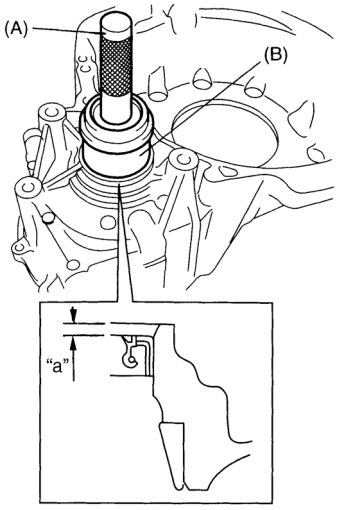
4) Using special tools, install new differential side oil seal to torque converter housing.

Special tool
(A): 09924–74510
(B): 09944–88220

Differential side oil seal installing depth
"a": 2.6 – 3.6 mm (0.10 – 0.14 in.)

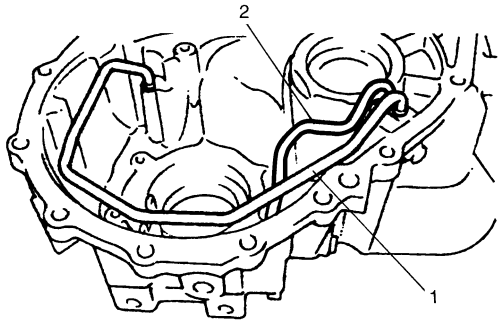
5) Apply grease to oil seal lip.

: Grease 99000–25030 (SUZUKI Super Grease C)



I2RH0B510245-02

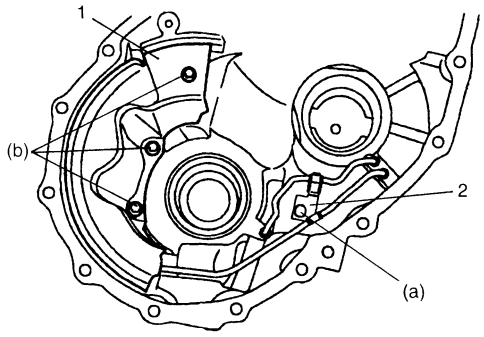
6) Install lubrication LH tube (1) and RH tube (2).



I2RH0B510237-01

7) Install fluid reservoir RH plate (1) and lubrication tube clamp (2).

Tightening torque
Lubrication tube clamp bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)
Fluid reservoir RH plate bolt (b): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)



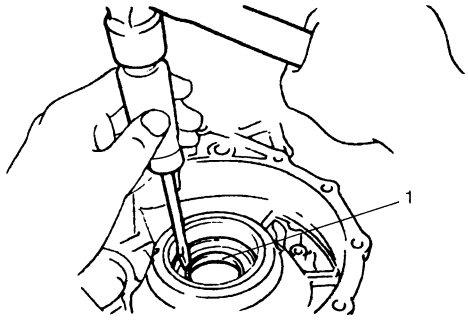
I2RH0B510246-01

Transaxle Case Disassembly and Reassembly

S7N20A5106058

Disassembly

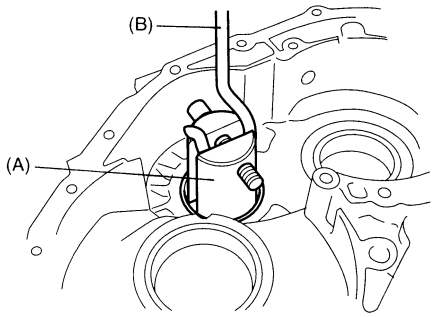
1) Remove differential side oil seal (1).



I2RH0B510247-01

2) Remove countershaft LH bearing cup and shim with special tools.

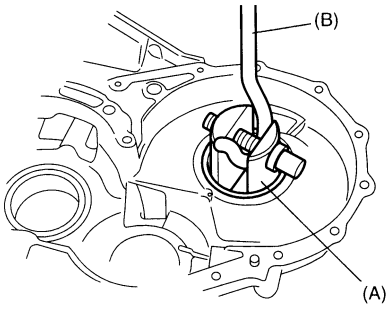
Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510248-01

3) Remove differential side LH bearing cup and shim with special tools.

Special tool
(A): 09944–96011
(B): 09942–15511



I2RH0B510249-01

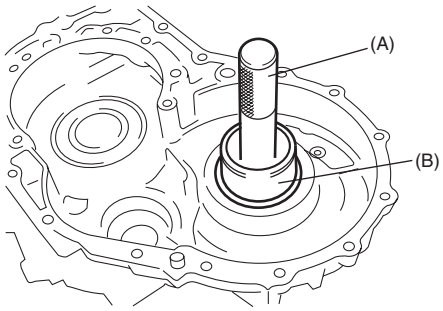
Reassembly

1) Using special tools, assemble shim and differential side LH bearing cup.

NOTE

Use shim with same thickness as the removed one.

Special tool
(A): 09924–74510
(B): 09944–88220



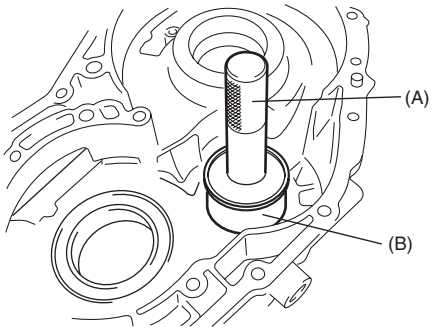
I3RM0B510065-01

2) Using special tools, assemble shim and countershaft LH bearing cup.

NOTE

Use shim with same thickness as the removed one.

Special tool
(A): 09924–74510
(B): 09944–88220



I3RM0B510066-01

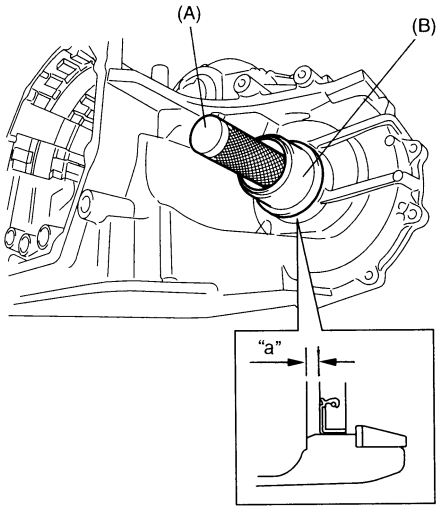
3) Install new differential side oil seal to transaxle case by using special tools.

Special tool
(A): 09924–74510
(B): 09944–88220

Differential side oil seal installing depth
"a": 3.8 – 4.8 mm (0.15 – 0.19 in.)

4) Apply grease to oil seal lip.

: Grease 99000–25030 (SUZUKI Super Grease C)



I2RH0B510252-01

Automatic Transaxle Unit Inspection and Adjustment

S7N20A5106059

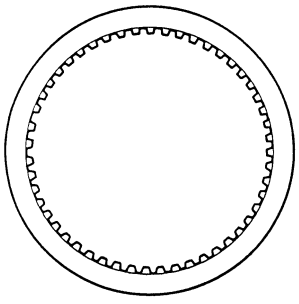
Inspection

Brake discs

Dry and inspect them for pitting, burn flaking, significant wear, glazing, cracking, charring and chips or metal particles imbedded in lining.
If discs show any of the above conditions, replacement is required.

NOTE

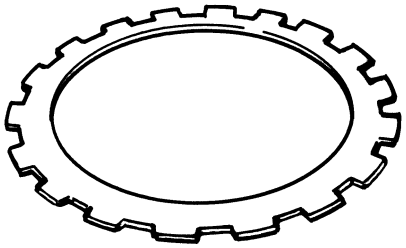
- **If disc lining is exfoliated or discolored, replace all discs.**
- **Before assembling new discs, soak them in A/T fluid for at least two hours.**



I2RH01510147-01

Brake separator plates and retaining plates

Dry plates and check for discoloration. If plate surface is smooth and even color smear is indicated, plate should be reused. If severe heat spot discoloration or surface scuffing is indicated, plate must be replaced.



I2RH0B510253-01

Brake return spring subassembly

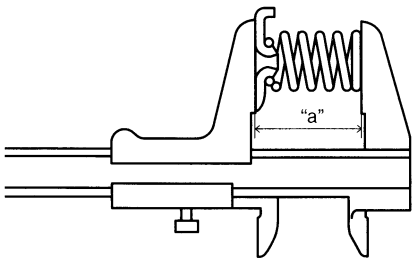
Measure brake return springs.
Evidence of extreme heat or burning in the area of clutch may have caused springs to take heat set and would require their replacement.

Free length of 1st & reverse brake return spring
"a": 21.71 mm (0.855 in.)

Free length of 2nd brake return spring
"a": 15.85 mm (0.624 in.)

NOTE

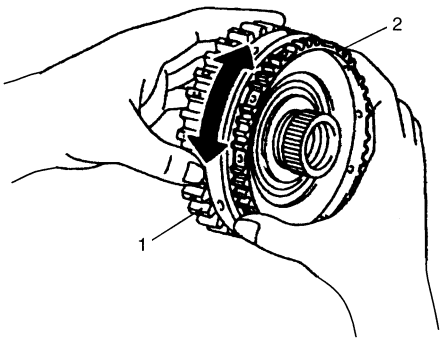
- **Do not apply excessive force when measuring spring free length.**
- **Perform measurement at several points.**



I2RH0B510173-01

One-way clutch No.1 assembly

1) Install one-way clutch No.1 assembly (2) to rear planetary sun gear subassembly (1).
2) Securing rear planetary sun gear subassembly, ensure that one-way clutch No.1 assembly rotates only in one direction.
   If the one-way clutch rotates in both directions or it does not rotate in either direction, replace it with new one.



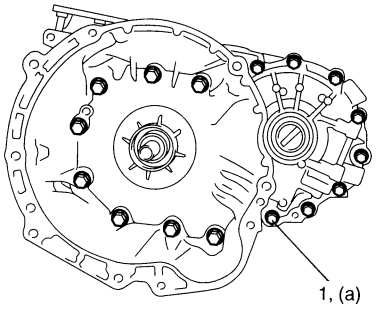
I2RH0B510254-01

Adjustment

Differential side bearing preload

1) After applying A/T fluid to differential assembly, fit it to transaxle case.
2) Install torque converter housing to transaxle case, then tighten bolts (1) to specified torque.

Tightening torque
Torque converter housing bolt (a): 33 N·m (3.3 kgf-m, 24.0 lbf-ft)

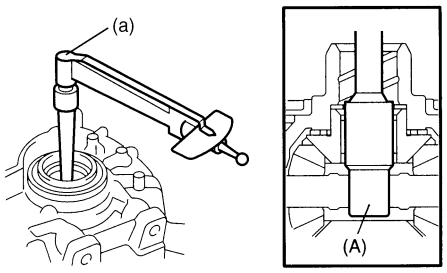


I2RH0B510255-01

3) Measure bearing preload (a) by using a special tool.

Special tool
(A): 09928–06050

Differential side bearing preload (a) measured as starting torque
In the case of new bearing: 0.78 – 1.37 N·m (7.9 – 13.9 kg-cm, 0.58 – 1.01 lbf-ft)
In the case of reused bearing: 0.39 – 0.69 N·m (3.9 – 6.9 kg-cm, 0.29 – 0.51 lbf-ft)



I2RH0B510256-01

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust differential side bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.80 mm (0.070 in.)	A
1.85 mm (0.072 in.)	B
1.90 mm (0.074 in.)	C
1.95 mm (0.076 in.)	D
2.00 mm (0.078 in.)	E
2.05 mm (0.080 in.)	F
2.08 mm (0.081 in.)	G
2.11 mm (0.083 in.)	H
2.14 mm (0.084 in.)	J
2.17 mm (0.085 in.)	K
2.20 mm (0.087 in.)	L
2.23 mm (0.088 in.)	M
2.26 mm (0.089 in.)	N
2.29 mm (0.090 in.)	P
2.32 mm (0.091 in.)	Q
2.35 mm (0.092 in.)	R
2.40 mm (0.094 in.)	S
2.45 mm (0.096 in.)	T
2.50 mm (0.098 in.)	U
2.55 mm (0.100 in.)	V
2.60 mm (0.102 in.)	W
2.65 mm (0.104 in.)	X
2.70 mm (0.106 in.)	Y

NOTE

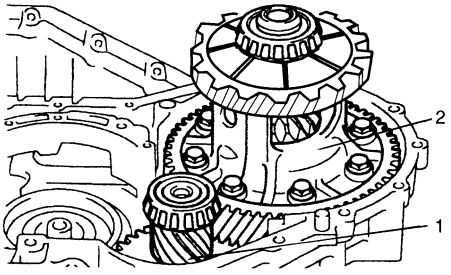
Record measured differential side bearing, because it is necessary to adjust countershaft bearing preload.

5) Remove differential assembly.

Countershaft bearing preload

1) After applying A/T fluid to countershaft assembly (1) and differential assembly (2), fit them.
2) Install torque converter housing to transaxle case, then tighten bolts to specified torque.

Tightening torque
Torque converter housing bolt: 33 N·m (3.3 kgf-m, 24.0 lbf-ft)



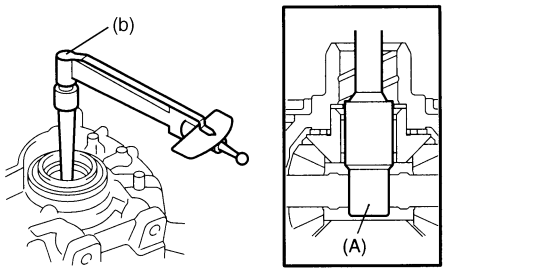
I2RH0B510257-01

3) Measure bearing preload (b) by using special tool.

Special tool
(A): 09928–06050

Countershaft bearing preload	=	(b) – Differential side bearing preload (a)

Countershaft bearing preload (b) measured as starting torque
In the case of new bearing: 0.33 – 0.76 N·m (3.3 – 7.6 kg-cm, 0.24 – 0.55 lbf-ft)
In the case of reused bearing: 0.17 – 0.38 N·m (1.7 – 3.8 kg-cm, 0.12 – 0.28 lbf-ft)



I3RM0B510067-01

4) If bearing preload is out of specification, select shim with suitable thickness from among the list below and replace it. Then adjust countershaft bearing preload within specification.

Available shim thickness

Thickness	Identification mark
1.70 (0.066 in.)	1
1.75 (0.068 in.)	2
1.80 (0.070 in.)	3
1.85 (0.072 in.)	4
1.90 (0.074 in.)	5
1.93 (0.075 in.)	6
1.96 (0.077 in.)	7
1.99 (0.078 in.)	A
2.02 (0.079 in.)	B
2.05 (0.080 in.)	C
2.08 (0.081 in.)	D
2.11 (0.083 in.)	E
2.14 (0.084 in.)	F
2.17 (0.085 in.)	G
2.20 (0.086 in.)	H
2.25 (0.088 in.)	K
2.30 (0.090 in.)	L
2.35 (0.092 in.)	M
2.40 (0.094 in.)	N
2.45 (0.096 in.)	P
2.50 (0.098 in.)	Q
2.55 (0.100 in.)	R
2.60 (0.102 in.)	S
2.65 (0.104 in.)	U
2.70 (0.106 in.)	W

5) Remove differential assembly and countershaft assembly.

Automatic Transaxle Unit Assembly

S7N20A5106060

⚠ CAUTION

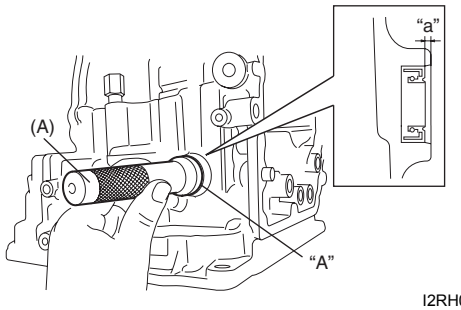
- **Automatic transaxle consists of highly precise parts. As even flaw in small part may cause oil leakage or decrease in function, check each part carefully before installation.**
- **Clean all parts with compressed air. Never use wiping cloths or rags.**
- **Before assembling new clutch or brake discs, soak them in automatic transaxle fluid for at least 2 hours.**
- **Be sure to use new gaskets and O-rings.**
- **Lubricate O-rings with automatic transaxle fluid.**
- **Apply automatic transaxle fluid on sliding or rotating surfaces of the parts before assembly.**
- **Use Suzuki Super Grease "C" to retain parts in place.**
- **Be sure to install thrust bearings and races in correct direction and position.**
- **Make sure that snap ring ends are not aligned with one of cutouts and are installed in groove correctly.**
- **Do not use adhesive cements on gaskets and similar parts.**
- **Be sure to torque each bolt and nut to specification.**

1) Install new manual shift shaft oil seal to transaxle case.
Use special tool and hammer to install it, and then apply grease to its lip.

Special tool
(A): 09925–98210

"A": Grease 99000–25030 (SUZUKI Super Grease C)

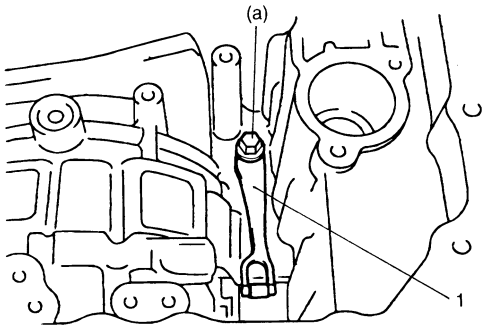
Manual shift shaft oil seal installing depth
"a": 0.75 – 1.25 mm (0.03 – 0.05 in.)



I2RH0B510258-01

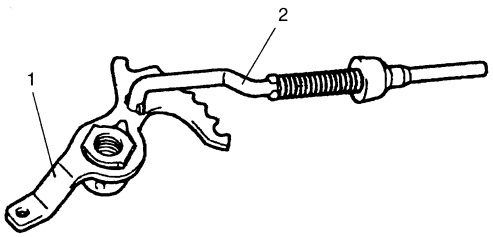
2) Install manual detent spring (1) to transaxle case and tighten manual detent spring bolt to specified torque.

Tightening torque
Manual detent spring bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I2RH0B510259-01

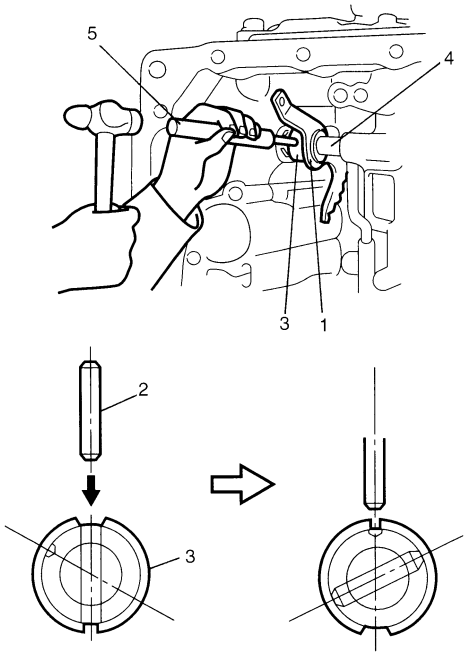
3) Install parking lock pawl rod (2) to manual valve lever (1).



I2RH0B510260-01

4) After applying A/T fluid to new manual valve lever (1), install new manual shift shaft (4), new spacer (3) and manual valve lever to transaxle case.

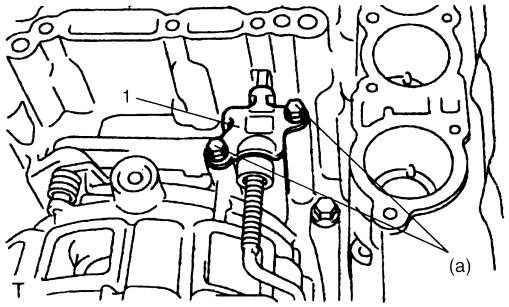
5) After installing manual valve lever pin (2) by using spring pin remover with 3 mm (0.12 in.) in diameter (5) and hammer, turn spacer to set the position as shown in figure. Then caulk spacer with a punch.



I2RH0B510261-01

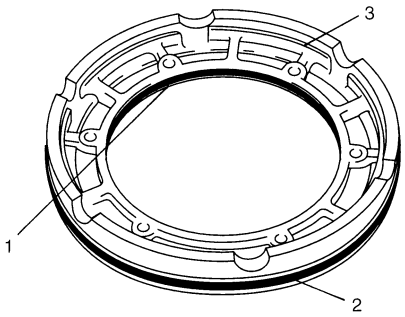
6) Install parking lock pawl bracket (1) to transaxle case.

Tightening torque
Parking lock pawl bracket bolt (a): 7.5 N·m (0.75 kgf-m, 5.5 lbf-ft)



I2RH0B510262-01

7) After applying A/T fluid to new O-rings, install them to 1st and reverse brake piston (3).



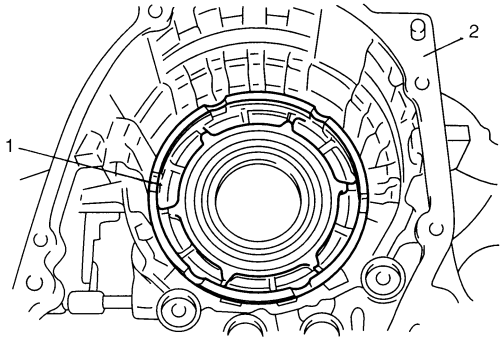
I2RH0B510263-01

1. Inner O-ring	2. Outer O-ring

8) Install 1st and reverse brake piston (1) to transaxle case (2).

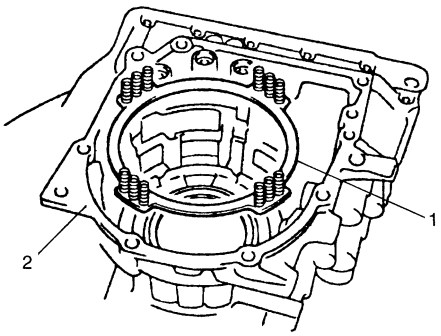
NOTE

Be careful not to damage O-ring when installing 1st and reverse brake piston.



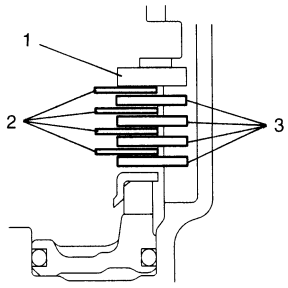
I2RH0B510264-01

9) Install 1st and reverse brake return spring subassembly (1) to transaxle case (2).



I2RH0B510265-01

10) Apply A/T fluid to 1st and reverse brake discs (2), separator plates (3) and retaining plate (1), then install them to transaxle case.



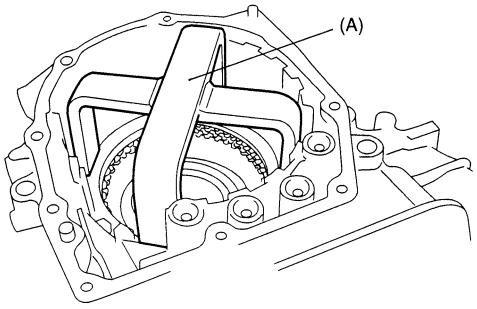
I2RH0B510266-01

11) Compress 1st and reverse brake return spring using special tool and hydraulic press, then attach snap ring.

⚠ CAUTION

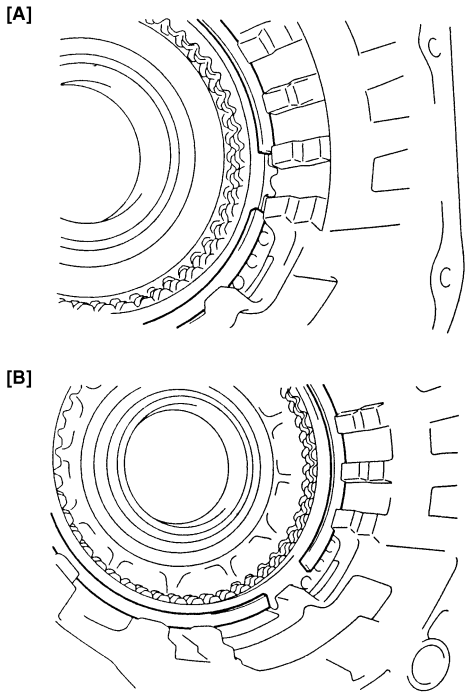
Do not damage 1st and reverse brake return spring subassembly discs, plates and piston by pressing in 1st and reverse brake return spring subassembly passing through its original installing position over 0.8 mm (0.031 in.).

Special tool
(A): 09926–97620



I2RH0B510267-01

12) Install 1st and reverse brake plate snap ring so that its both ends would be positioned in correct locations as shown in figure.



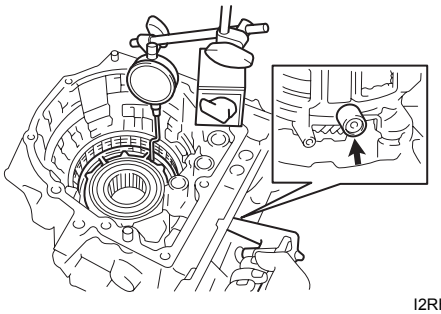
I2RH0B510268-01

[A]: Correct	[B]: Incorrect

13) Using special tools, measure 1st and reverse brake piston stroke when compressed air (400 – 800 kPa, 4 – 8 kg/cm^2, 57 – 113 psi) is brown through oil hole.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06020

1st and reverse brake piston stroke
Standard: 0.791 – 1.489 mm (0.0311 – 0.0586 in.)



I2RH0B510269-01

14) Install reduction drive gear (1) to transaxle case (3) by using special tools and hydraulic press.

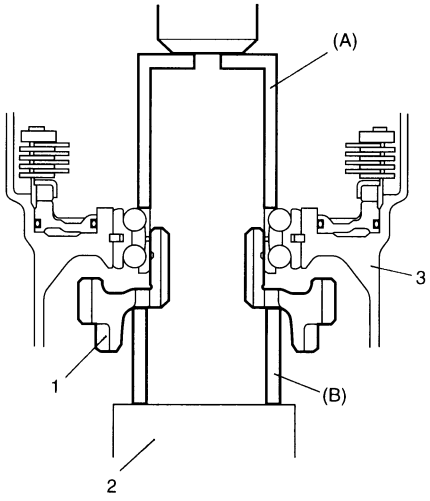
⚠ CAUTION

- **Do not use transaxle case as groundwork to press fit reduction drive gear.**
- **Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.**

NOTE

When replacing reduction drive gear, replace it together with reduction driven gear as a set.

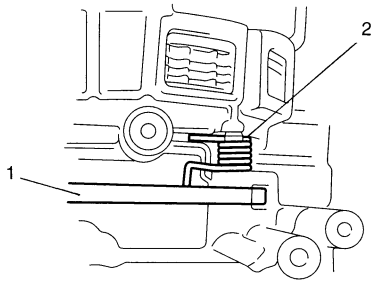
Special tool
(A): 09951–18210
(B): 09944–78210



I2RH0B510270-01

2. Stand that can slightly lift transaxle case.

15) Install parking lock pawl (1) and spring (2). Apply A/T fluid to parking lock pawl shaft, then insert it into transaxle case.



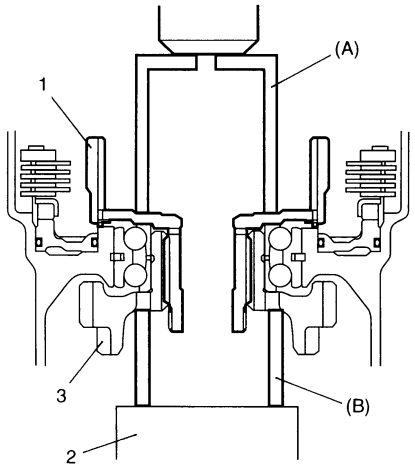
I2RH0B510271-01

16) Install new planetary ring gear subassembly (1) to reduction drive gear (3) by using special tools and hydraulic press.

⚠ CAUTION

- **Do not reuse planetary ring gear subassembly. Otherwise it may cause damage to planetary gear unit and/or reduction gears.**
- **Do not use transaxle case as groundwork to press fit planetary ring gear subassembly.**
- **Do not give load more than 20 kN (2000 kg, 4410 lb) with hydraulic press. Otherwise, it may result in damaging reduction drive gear bearing.**

Special tool
(A): 09951–18210
(B): 09944–78210



I2RH0B510272-01

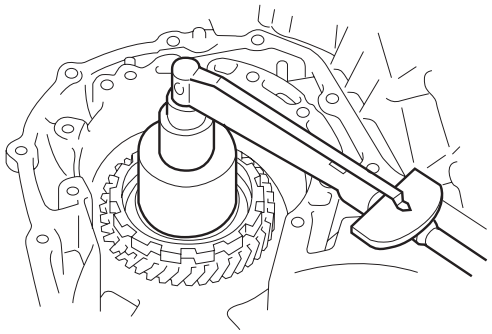
2. Stand that can slightly lift transaxle case.

17) Using a small torque wrench, while turning to counter drive gear 100 rpm and measure the preload.

⚠ CAUTION

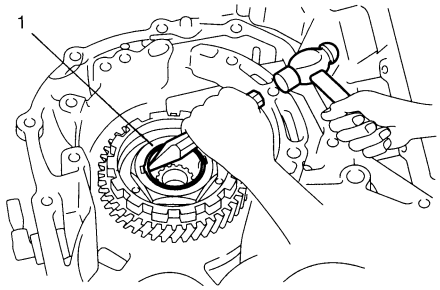
- **Do not tighten nut over the specifications so that reduction drive gear nut would not be broken.**
- **Carry out this procedure on rubber mat in order not to damage transaxle case.**

Reduction drive gear bearing preload measured as starting torque
Standard: 0.05 – 0.35 N·m (0.5 – 3.5 kg-cm, 0.036 – 0.253 lbf-ft)



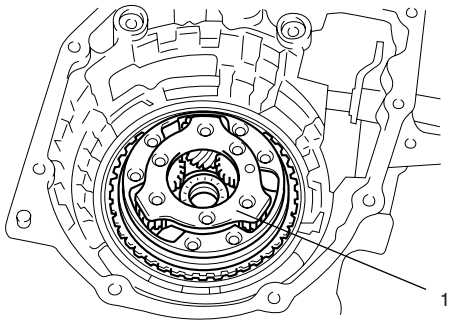
I2RH0B510273-01

18) Caulk reduction drive gear nut (1).



I2RH0B510274-01

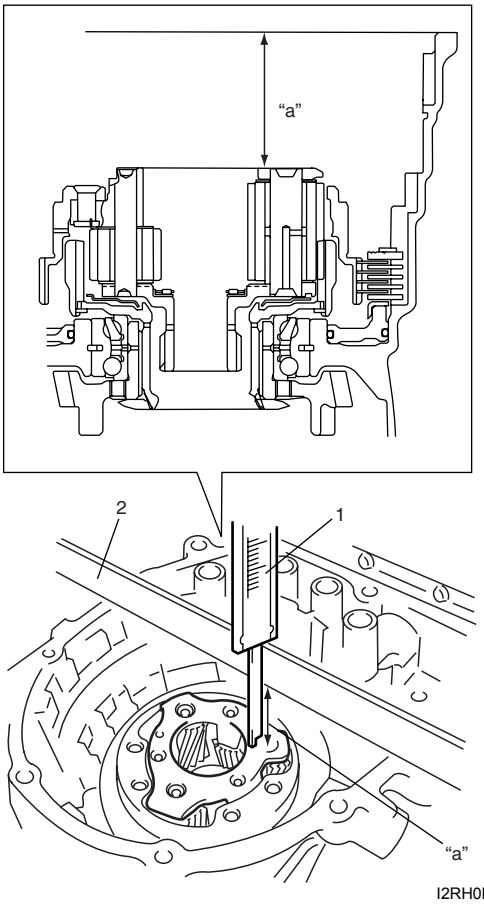
19) Apply A/T fluid to planetary gear assembly (1), then fit it to planetary ring gear assembly.



I2RH0B510275-01

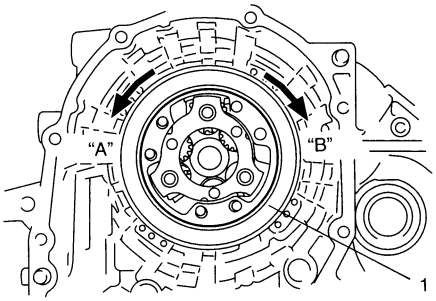
20) Check for correct installation of planetary gear assembly as follows.
Measure the distance “a” by using micrometer caliper (1) and straightedge (2). If measured value is out of specification, remove planetary gear assembly and reinstall it properly.

Distance between planetary gear assembly and mating surface of transaxle case
“a”: More than 49.9 m (1.965 in.)



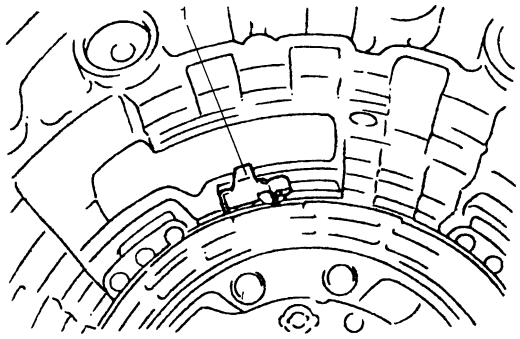
I2RH0B510276-01

21) Apply A/T fluid to one-way clutch No.2 assembly (1), then install it to planetary gear assembly. After that, ensure that planetary carrier rotates only in counterclockwise direction “A”, not in clockwise direction “B”.



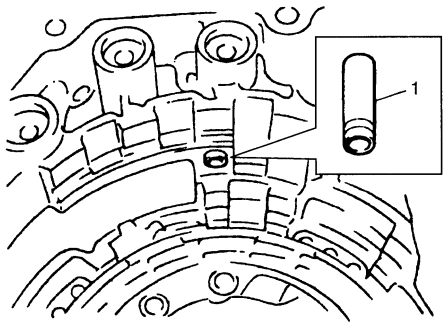
I2RH0B510277-01

22) Install one-way clutch outer race retainer (1).



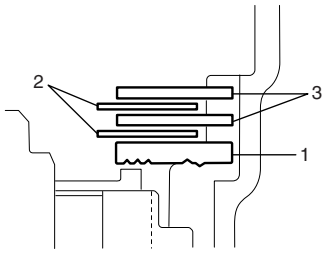
I2RH0B510278-01

23) Apply A/T fluid to new brake drum gasket (1), then install it to transaxle case.



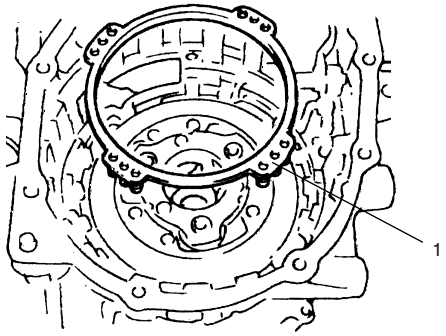
I2RH0B510279-01

24) Apply A/T fluid to 2nd brake retaining plate (1), discs (2) and separator plates (3), then install them to transaxle case.



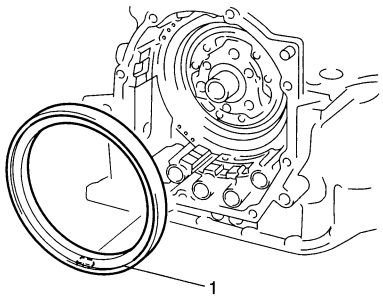
I2RH0B510280-01

25) Install 2nd brake return spring subassembly (1) to transaxle case.



I2RH0B510281-01

26) Apply A/T fluid to 2nd brake piston assembly (1), and align the projection of 2nd brake piston assembly with the groove of transaxle case, then put together.



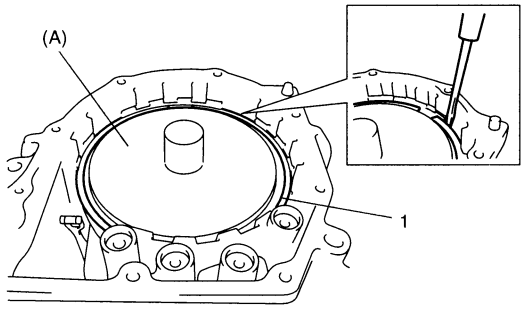
I2RH0B510282-01

27) Install 2nd brake piston snap ring (1) by using special tool and hydraulic press.

⚠ CAUTION

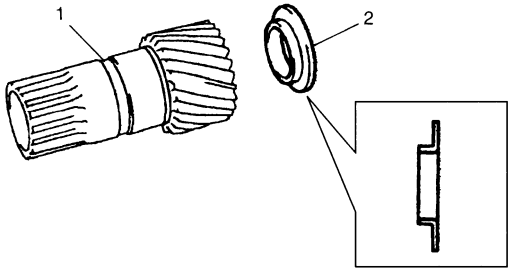
Do not damage 2nd brake piston assembly, return spring subassembly, plates and discs by pressing in 2nd brake assembly passing through its original installing position over 0.4 mm (0.016 in.).

Special tool
(A): 09926–96050



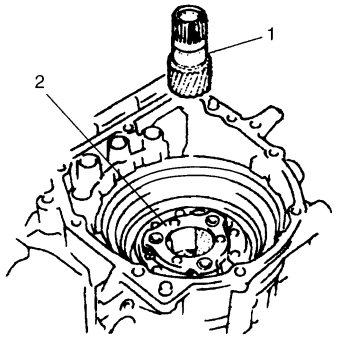
I2RH0B510283-01

28) After applying A/T fluid to front sun gear thrust bearing race (2), install it to front planetary sun gear (1).



I2RH0B510285-01

29) Apply A/T fluid to front planetary sun gear (1) and install it to planetary gear assembly (2).

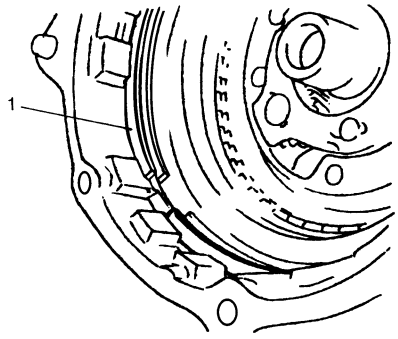


I2RH0B510286-01

30) Install O/D and 2nd coast brake retaining plate snap ring (1).

⚠ CAUTION

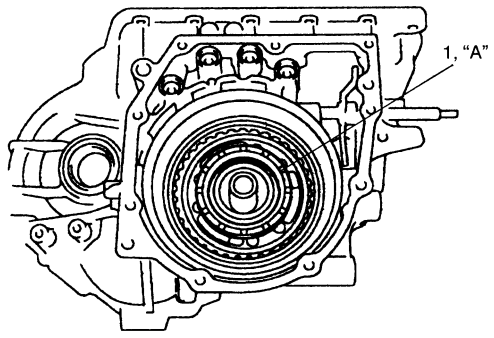
Be sure to install O/D and 2nd coast brake retaining plate snap ring correctly in groove of transaxle case.



I2RH0B510287-01

31) After applying grease to slide contact face of planetary carrier thrust washer (1), install it to planetary gear assembly.

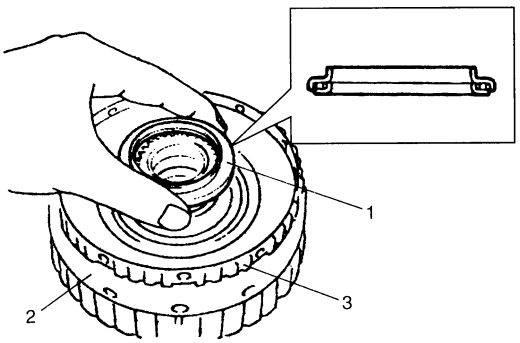
"A": Grease 99000–25030 (SUZUKI Super Grease C)



I2RH0B510288-01

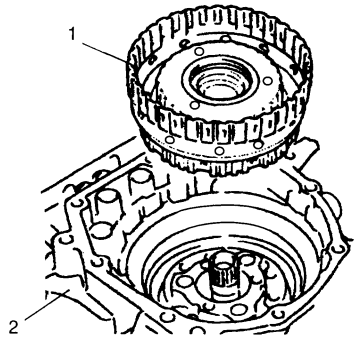
32) Apply A/T fluid to one-way clutch No.1 assembly (3) and install one-way clutch No.1 assembly (3) to rear planetary sun gear subassembly (2).

33) Apply A/T fluid to planetary gear thrust bearing (1), then install it to one-way clutch No.1 assembly (3).



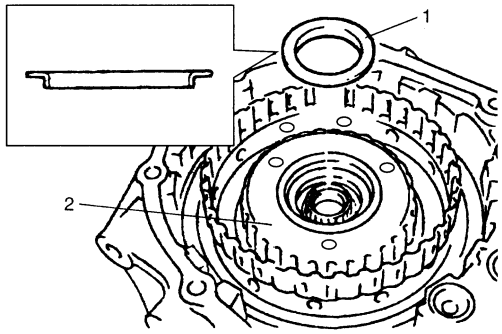
I2RH0B510289-01

34) After applying A/T fluid to rear planetary sun gear subassembly and one-way clutch No.1 assembly (1), install them in transaxle case (2).



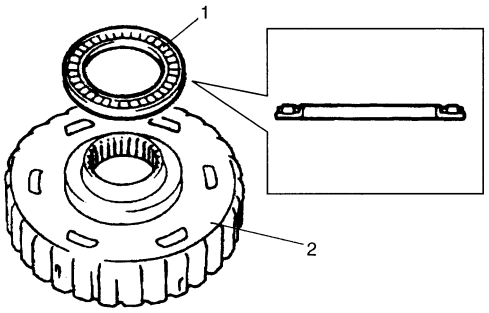
I2RH0B510290-01

35) After applying A/T fluid to rear sun gear thrust bearing race (1), install it to rear planetary sun gear (2).



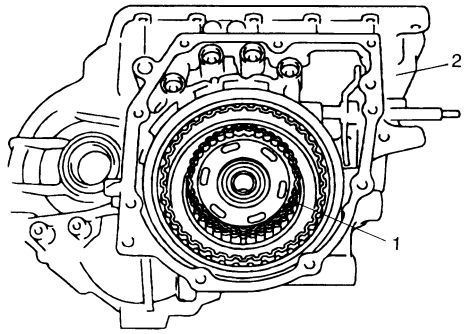
I2RH0B510291-01

36) After applying A/T fluid to rear sun gear thrust bearing (1), install it to forward clutch hub (2).



I2RH0B510292-01

37) After applying A/T fluid to forward clutch hub (1), install it in transaxle case (2).

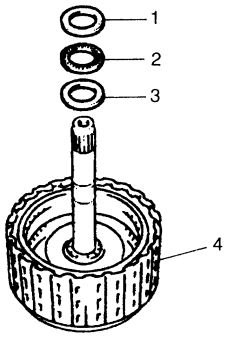


I2RH0B510293-01

38) After applying A/T fluid to intermediate shaft thrust bearing rear race (3), thrust bearing (2) and front race (1), install them to forward and reverse clutch assembly (4).

Bearing race dimension

	Front race	Rear race
Outside diameter	**30.6 mm (1.20 in.)**	**28.2 mm (1.11 in.)**
Thickness	**2.0 mm (0.08 in.)**	**2.0 mm (0.08 in.)**

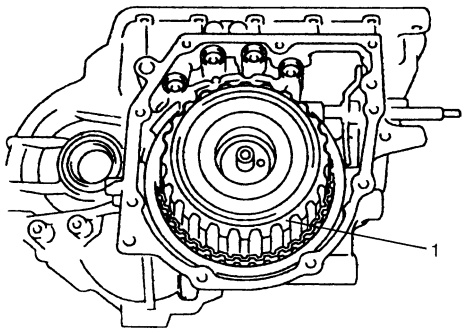


I2RH0B510294-01

39) Apply A/T fluid to forward and reverse clutch assembly (1).
Install forward and reverse clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hubs.

NOTE

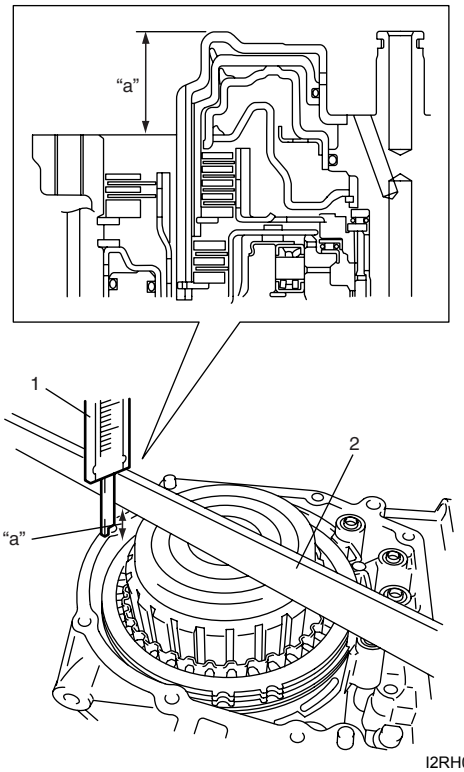
Before installation, align teeth of forward and reverse clutch discs to facilitate installation.



I2RH0B510295-01

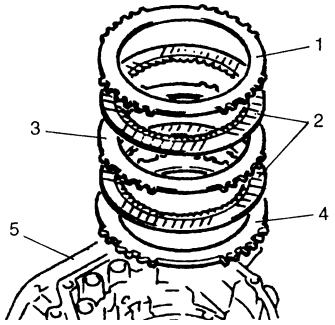
40) Check for correct installation of forward and reverse clutch assembly as follows.
Measure distance “a” by using micrometer caliper (1) and straightedge (2). If out of specification, remove forward and reverse clutch assembly, forward clutch hub, rear planetary sun gear subassembly and one-way clutch No.1 assembly, and reinstall them properly.

Distance between forward and reverse clutch assembly and mating surface of transaxle case “a”: 27.1 – 29.4 mm (1.067 – 1.157 in.)



I2RH0B510296-01

41) After applying A/T fluid to O/D and 2nd coast brake retaining plate (4), separator plate (3), discs (2) and rear plate (1), install them to transaxle case (5).



I2RH0B510297-01

42) Measure O/D and 2nd coast brake piston stroke.

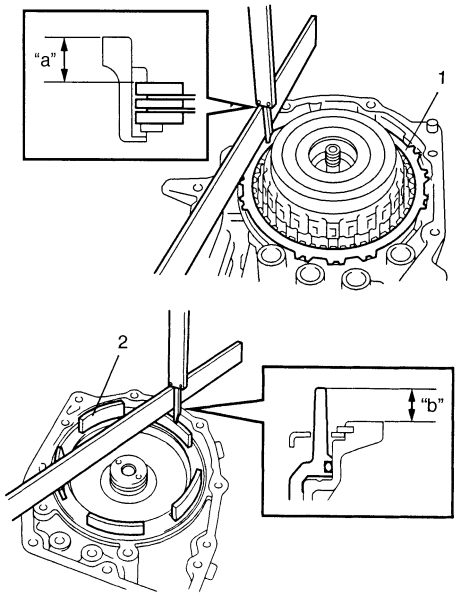
- Measure dimension “a” from end face of transaxle case to O/D and 2nd coast brake rear plate (1) using straightedge and micrometer caliper.
- Measure dimension “b” from O/D and 2nd coast brake piston (2) to rear cover assembly mating surface using straightedge and micrometer caliper.
- Calculate piston stroke from measured value of dimensions “a” and “b”.
- Piston stroke = “a” – “b”

O/D and 2nd coast brake piston stroke
Standard: 0.65 – 1.05 mm (0.026 – 0.041 in.)

When piston stroke is out of specification, select O/D and 2nd coast brake rear plate with proper thickness from among the following table and replace it.

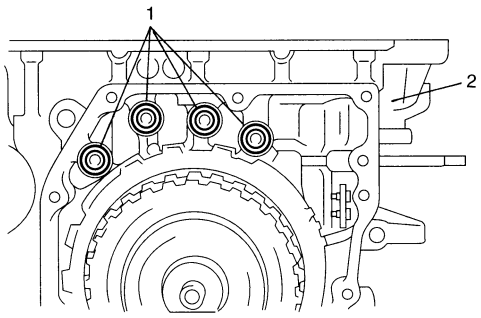
Available O/D and 2nd coast brake rear plate thickness

Thickness	Identification mark
1.8 mm (0.071 in.)	1
2.0 mm (0.079 in.)	2
2.2 mm (0.087 in.)	3
2.4 mm (0.094 in.)	4
2.6 mm (0.102 in.)	5



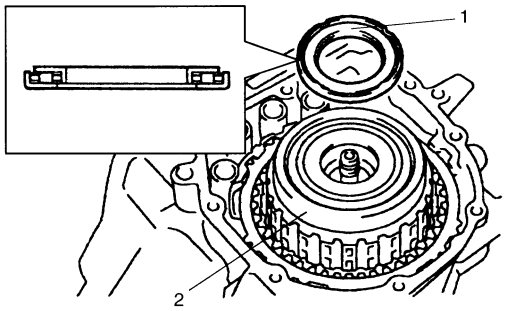
I2RH0B510298-01

43) After applying A/T fluid to new 2nd brake gaskets (1), install them to transaxle case (2).



I2RH0B510299-01

44) After applying A/T fluid to reverse clutch drum thrust bearing (1), install it to forward and reverse clutch assembly (2).

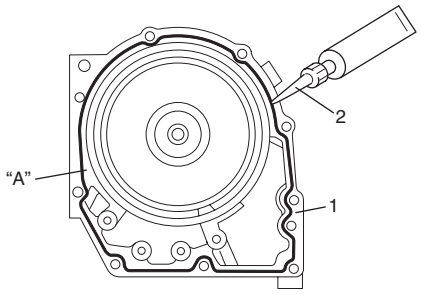


I2RH0B510300-01

45) Remove sealant attached to mating surface of transaxle rear cover (1) completely.

46) Apply sealant to mating surface of transaxle rear cover (1) by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

"A": Sealant 99000–31230 (SUZUKI Bond No.1216B)



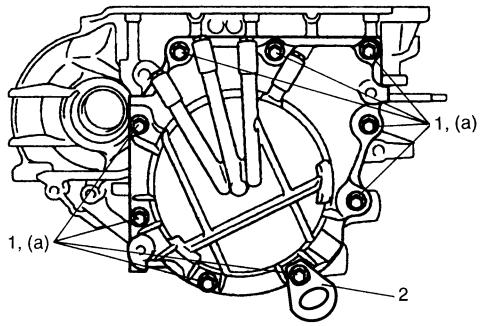
I2RH0B510301-01

47) Install transaxle rear cover assembly on transaxle case.

48) Install hook (2) to location shown in figure.

49) Tighten rear cover bolts (1).

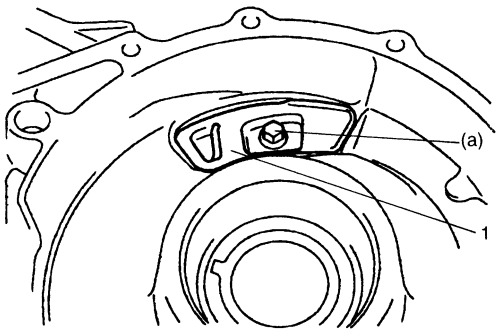
Tightening torque
Rear cover bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



I3RM0B510068-01

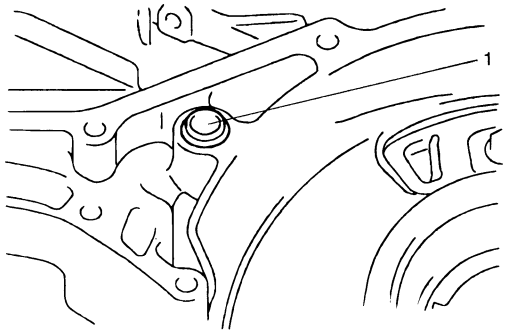
50) Install fluid reservoir LH plate (1).

Tightening torque
Fluid reservoir LH plate bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



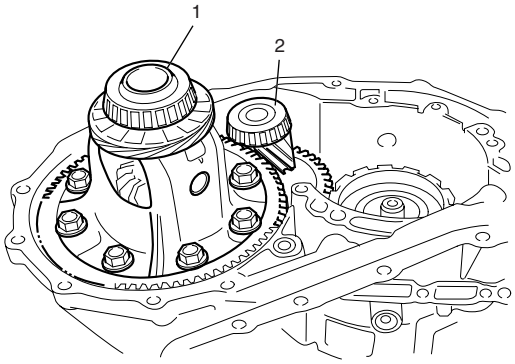
I2RH0B510303-01

51) After applying A/T fluid to new governor apply No.2 gasket (1), install it to transaxle case.



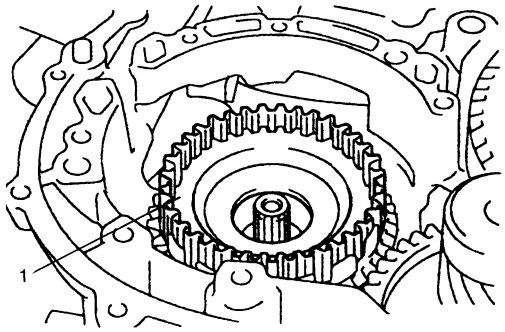
I2RH0B510304-01

52) After applying A/T fluid to differential assembly (1) and countershaft assembly (2), install them to transaxle case.



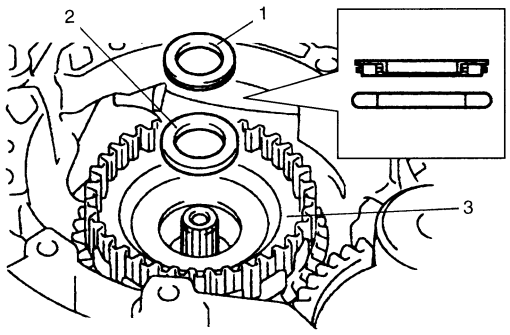
I4RS0A510036-01

53) After applying A/T fluid to direct clutch hub (1), install it to planetary gear assembly.



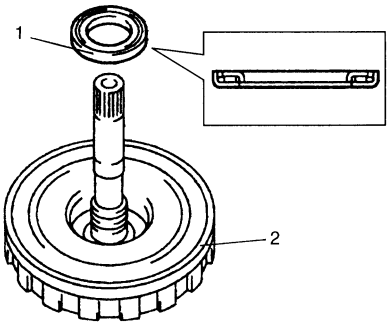
I2RH0B510306-01

54) After applying A/T fluid to input shaft rear thrust bearing (1) and thrust bearing race (2), install them into direct clutch hub (3).



I2RH0B510307-01

55) After applying A/T fluid to input shaft front thrust bearing (1), install it to direct clutch assembly (2).

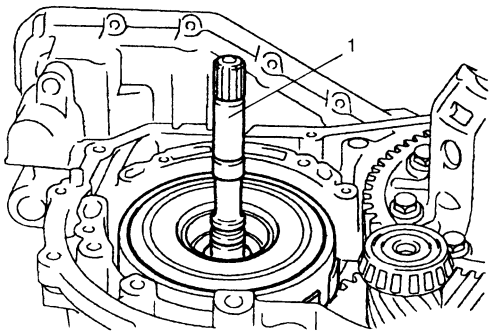


I2RH0B510308-01

56) Apply A/T fluid to direct clutch assembly (1). Install direct clutch assembly while rotating clockwise and counterclockwise frequently to fit clutch discs to mating hub.

NOTE

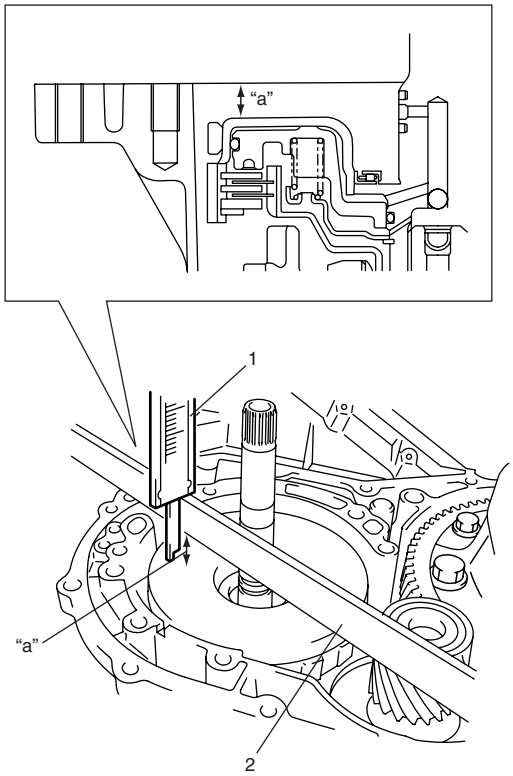
Before installation, align teeth of direct clutch discs to facilitate installation.



I2RH0B510309-01

57) Check for correct installation of direct clutch assembly as follows.
Measure distance “a” by using micrometer caliper (1) and straightedge (2). If out of specification, remove direct clutch assembly, direct clutch hub and reinstall them properly.

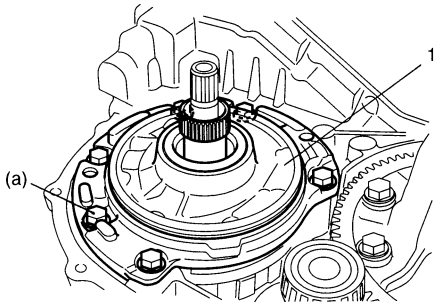
Distance between direct clutch assembly and mating surface of transaxle case
“a”: 10.5 – 11.3 mm (0.413 – 0.445 in.)



I2RH0B510310-01

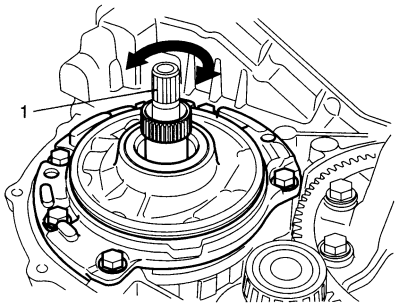
58) Install oil pump assembly (1) to transaxle case.

Tightening torque
Oil pump assembly bolt (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)



I2RH0B510311-01

59) Make sure that input shaft (1) turns smoothly.



I2RH0B510312-01

60) Measure input shaft thrust play.
Apply dial gauge onto input shaft end (1) and measure thrust play of input shaft.

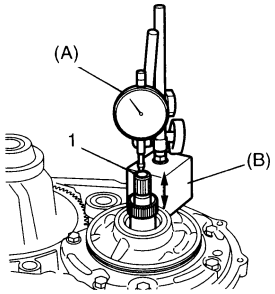
Special tool
(A): 09900–20607
(B): 09900–20701

Input shaft thrust play
0.3 – 0.9 mm (0.012 – 0.035 in.)

When input shaft thrust play is out of specification, select input shaft front thrust bearing with proper thickness from among the following table and replace it.

Available input shaft front thrust bearing thickness

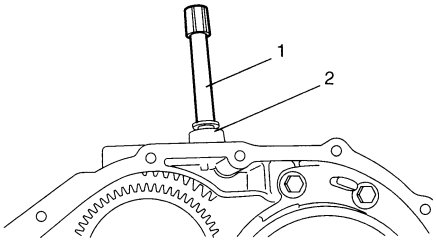
Thickness	Outside diameter	Inside diameter
3.45 mm (0.14 in.)	48.5 mm (1.90 in.)	32.9 mm (1.30 in.)
4.05 mm (0.16 in.)	48.5 mm (1.90 in.)	32.5 mm (1.28 in.)



I2RH0B510313-01

61) After applying A/T fluid to new O-ring, fit it to breather union (2). Then install breather union to transaxle case.

62) Install breather hose (1).

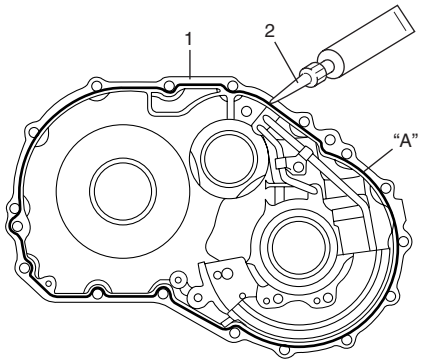


I2RH0B510314-01

63) Wipe off and clean mating surface between transaxle case (1) and torque converter housing.

64) Apply sealant to torque converter housing by using a nozzle (2) as shown in figure by such amount that its section is 1.2 mm (0.047 in.) in diameter.

"A": Sealant 99000–31230 (SUZUKI Bond No.1216B)



I2RH0B510315-01

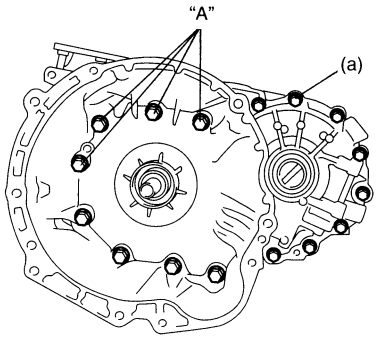
65) Install torque converter housing to transaxle case, tighten bolts to specified torque.

⚠ CAUTION

Apply sealant to threads of four bolts shown in figure before tightening.

"A": Sealant 99000–31230 (SUZUKI Bond No.1216B)

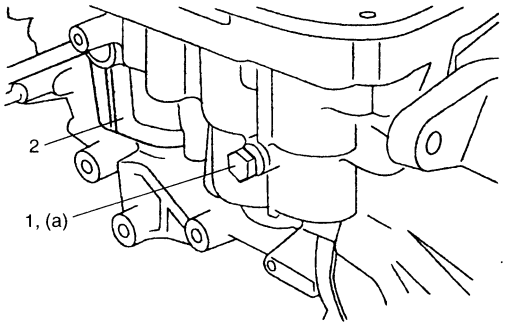
Tightening torque
Torque converter housing bolt (a): 33 N·m (3.3 kgf-m, 24.0 lbf-ft)



I3RM0B510069-01

66) After applying A/T fluid to new O-ring, fit it to transaxle case plug (1). Then install the transaxle case plug to transaxle case (2).

Tightening torque
Transaxle case plug (a): 7.5 N·m (0.75 kgf-m, 5.5 lbf-ft)



I2RH0B510317-01

67) Install new O-rings to each accumulator piston and apply A/T fluid to them.

Accumulator O-ring dimension

O-ring name	Inside diameter	Section diameter
Large B1 accumulator O-ring (2) Large C1 accumulator O-ring (2) Large C2 accumulator O-ring (2) – Above three O-rings are same.	29.4 mm (1.16 in.)	2.6 mm (0.10 in.)
Small B1 accumulator O-ring (4)	19.7 mm (0.78 in.)	2.6 mm (0.10 in.)
Small C1 accumulator O-ring (6) Small C2 accumulator O-ring (6) – Above two O-rings are same.	21.8 mm (0.86 in.)	2.6 mm (0.10 in.)

NOTE

Make sure that O-rings are not twisted or caught when installing.

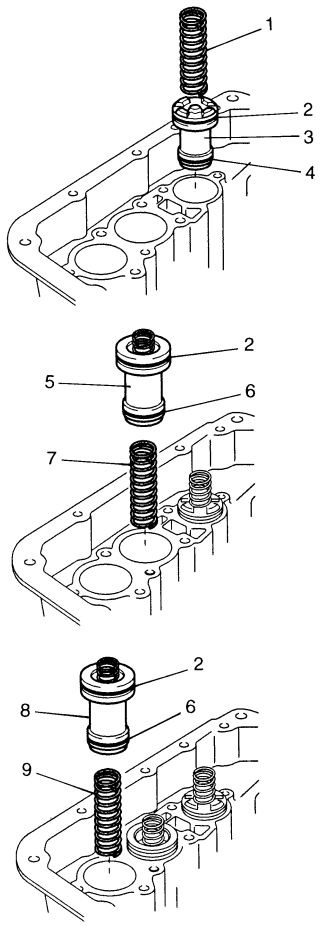
68) Install B1, C1, C2 accumulator pistons and springs.

Accumulator piston identification

Piston name	Identification as embossed letters on piston
B1 accumulator piston (3)	SB-1
C1 accumulator piston (5)	S2C-1
C2 accumulator piston (8)	S2C-2

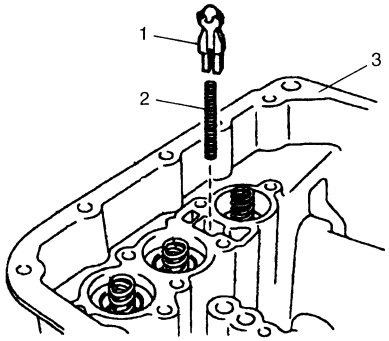
Accumulator spring identification

Spring name	Color of identification paint
B1 accumulator No.2 spring (1)	Pink
C1 accumulator No.2 spring (7)	Light blue
C2 accumulator No.2 spring (9)	Yellow



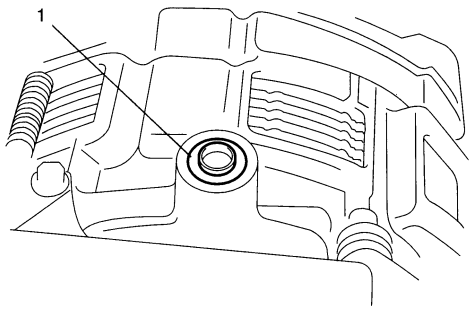
I2RH0B510318-01

69) After applying A/T fluid to cooler check valve (1) and spring (2), install them to transaxle case (3).



I2RH0B510319-01

70) After applying A/T fluid to new governor apply No.1 gasket (1), install it to transaxle case.



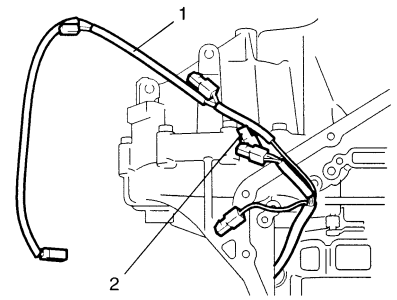
I2RH0B510320-01

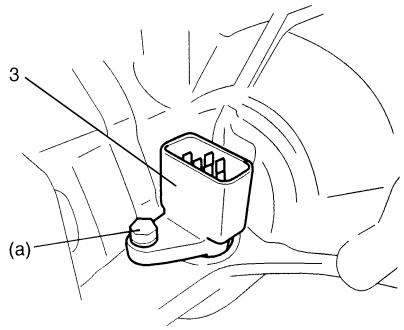
71) After applying A/T fluid to new O-ring, fit it to valve body harness connector (3), then install valve body harness to transaxle case.

⚠ CAUTION

When put valve body harness (1) into transaxle case, take care not to damage transmission fluid temperature sensor (2) at narrow entrance of case.
Careless sensor treatment might cause sensor malfunction.

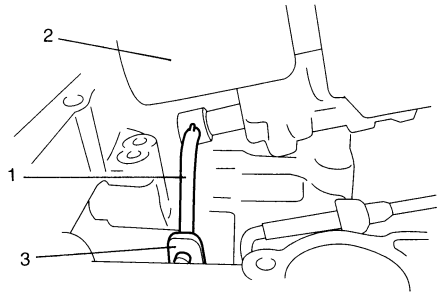
Tightening torque
Valve body harness connector bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)





I2RH0B510321-01

72) Install manual valve rod (1) to manual valve lever (3) and then install valve body assembly (2) to transaxle case.



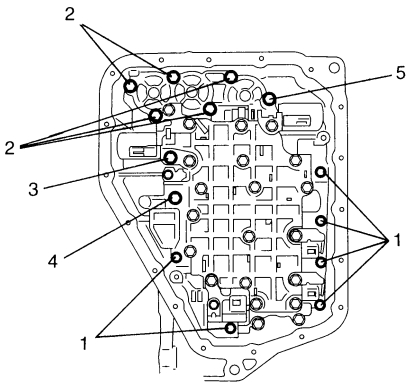
I2RH0B510322-01

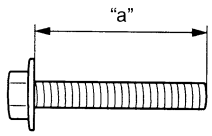
73) Tighten valve body bolts to specified torque.

Tightening torque
Valve body bolt: 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

Valve body bolt length

Bolt	Length “a”	Pieces
A (1)	20 mm (0.79 in.)	6
B (2)	28 mm (1.10 in.)	5
C (3)	49 mm (1.93 in.)	1
D (4)	36 mm (1.42 in.)	1
E (5)	40 mm (1.58 in.)	1



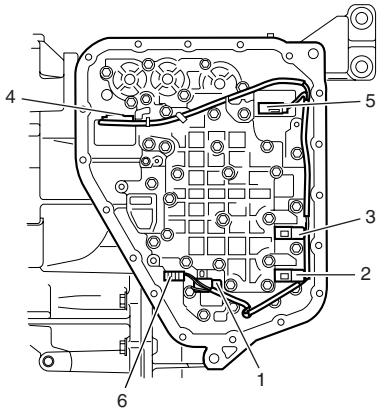


I2RH0B510323-01

74) Connect solenoid connectors to solenoid valves identifying their installing positions by wire colors, and install transmission fluid temperature sensor to its clamp.

Solenoid valve coupler specification

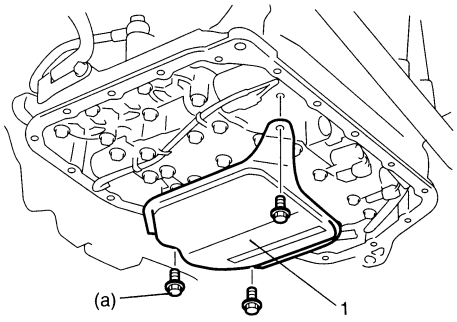
Solenoid valve coupler	Wire color
Shift solenoid valve-A (1)	White
Shift solenoid valve-B (2)	Black
Timing solenoid valve (3)	Yellow
TCC pressure control solenoid valve (4)	Light green / Brown
Pressure control solenoid valve (5)	Gray / Green
Transmission fluid temperature sensor (6)	Orange



I4RS0A510030-01

75) Install oil strainer assembly (1).

Tightening torque
Oil strainer bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

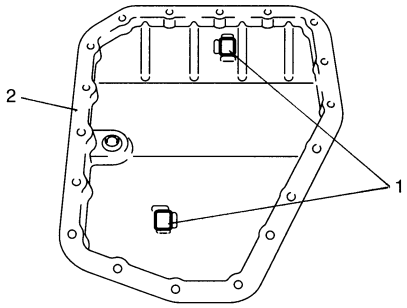


I2RH0B510325-01

76) Install oil cleaner magnets (1) in oil pan (2).

NOTE

If metal particles are attached to the magnets, clean them before installing.

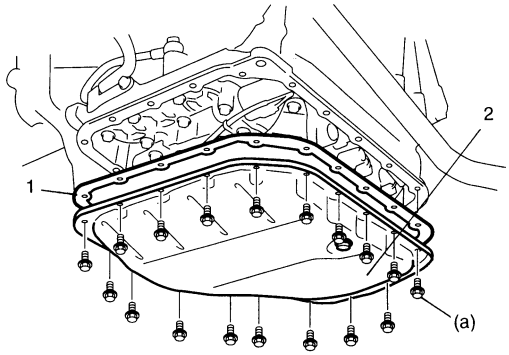


I2RH0B510326-01

77) Install new oil pan gasket (1) between transaxle case and oil pan (2).

78) Tighten oil pan bolts to specified torque diagonally and little by little.

Tightening torque
Oil pan bolt (a): 7.0 N·m (0.7 kgf-m, 5.0 lbf-ft)



I2RH0B510327-01

79) After applying A/T fluid to new O-rings, fit it to fluid inlet union (1). Then install fluid outlet union to transaxle case.

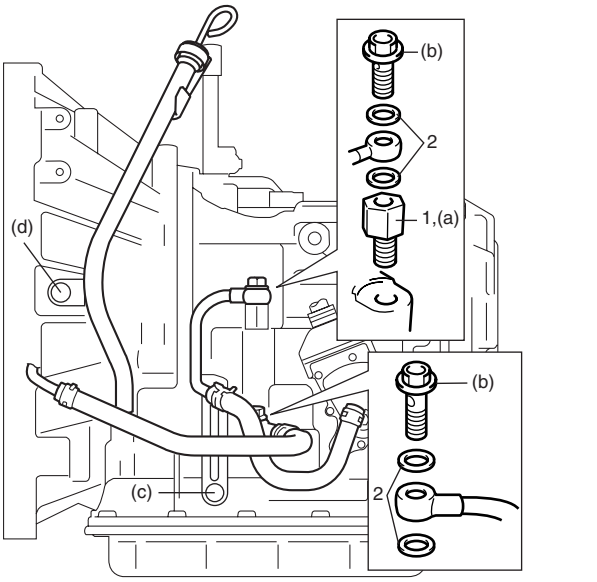
Tightening torque
Fluid outlet union (a): 25 N·m (2.5 kgf-m, 18.0 lbf-ft)

80) Install new gaskets (2) and then install fluid cooler pipes.

Tightening torque
Fluid cooler pipe union bolt (b): 22 N·m (2.2 kgf-m, 16.0 lbf-ft)
Fluid cooler pipe bracket bolt (c): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

81) After applying A/T fluid to new O-ring, fit it to fluid filler tube. Then install fluid filler tube to transaxle case.

Tightening torque
Fluid filler tube bolt (d): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



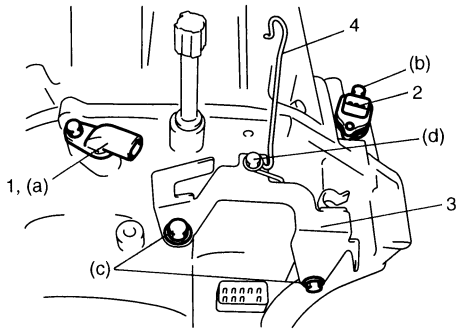
I3RM0B510070-01

82) Apply A/T fluid to O-rings of each sensor and install input shaft speed sensor (1) and output shaft speed sensor (VSS) (2).

Tightening torque
Input shaft speed sensor bolt (a): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)
Output shaft speed sensor (VSS) bolt (b): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

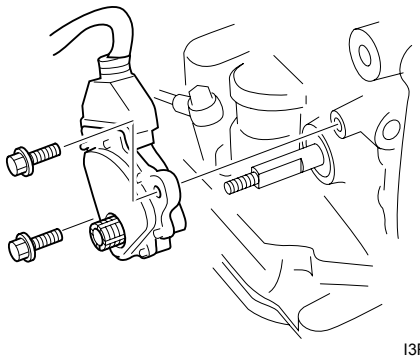
83) Install harness bracket (3) and select cable clamp (4).

Tightening torque
Harness bracket bolt (c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
Select cable clamp bolt (d): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I3RM0B510071-01

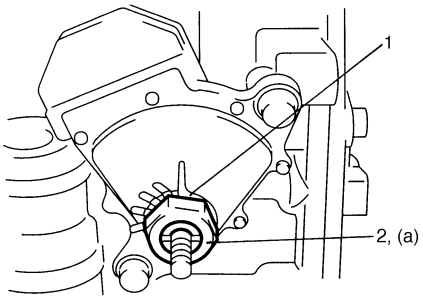
84) Install transmission range sensor to transaxle case, tighten bolts temporarily at this step.



I3RM0B510072-01

85) Install lock washer (1) and tighten lock nut (2) to specified torque.

Tightening torque
Transmission range sensor lock nut (a): 7 N·m (0.7 kgf-m, 5.0 lbf-ft)



I3RM0B510073-01

86) Install manual select lever (1) temporarily at this step.

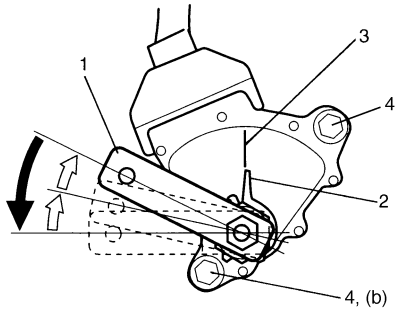
87) After shifting manual select lever counterclockwise fully, select “N” range position by bringing it back 2 notches clockwise.

88) Remove manual select lever (1) at this step.

89) Loosen sensor bolts (4) and align needle direction shaped on lock washer (2) with “N” reference line (3) on transmission range sensor by moving sensor in rotative direction.

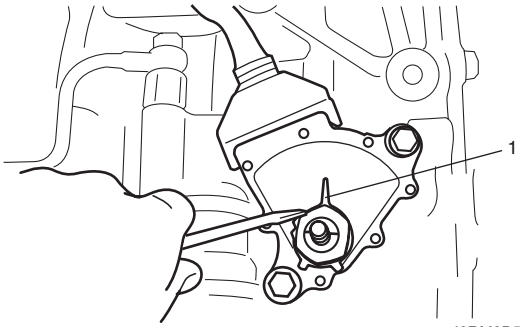
90) Tighten sensor bolts to specified torque.

Tightening torque
Transmission range sensor bolt (b): 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)



I3RM0B510074-01

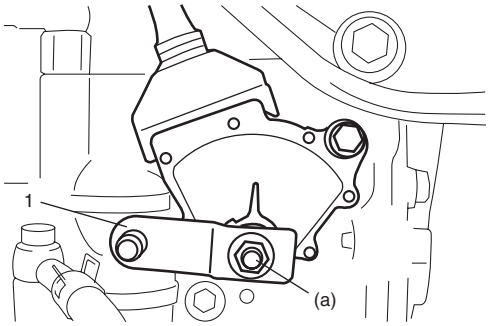
91) Bend dents of lock washer (1) in order to prevent displacement of lock washer.



I3RM0B510075-01

92) Install manual select lever (1).

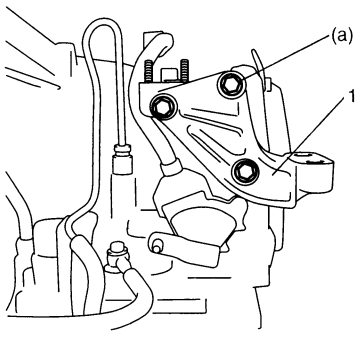
Tightening torque
Manual select lever nut (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



I3RM0B510076-01

93) Install engine mounting LH bracket (1).

Tightening torque
Engine mounting LH bracket bolt (a): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)



I3RM0B510077-01

94) Install torque converter (3) noting the following points.

⚠ CAUTION

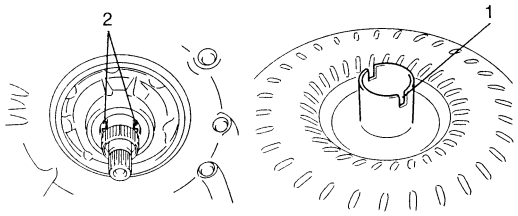
- **Before installing converter, make sure that its pump hub portion is free from nicks, burrs or damage which may cause oil seal to leak.**
- **Be very careful not to drop converter on oil pump gear. Damage in gear, should it occur, may cause a critical trouble.**

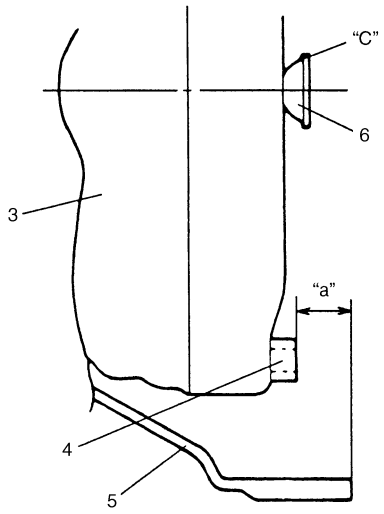
- Install torque converter aligning grooves (1) of torque converter and projection (2) of oil pump drive gear.
- Install torque converter, using care not to damage oil seal of oil pump.
- After installing torque converter, check that distance “a” is within specification.

Torque converter installing position
“a”: More than 19.9 mm (0.783 in.)

- Check torque converter for smooth rotation.
- Apply grease around cup (6) at the center of torque converter.

“C”: Grease 99000–25010 (SUZUKI Super Grease A)





I2RH0B510337-01

4.	Flange nut
5.	Torque converter housing

Specifications

Tightening Torque Specifications

S7N20A5107001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
A/T fluid drain plug	17	1.7	12.5	☞ / ☞ / ☞
Transmission range sensor bolt	5.5	0.55	4.0	☞ / ☞
Output shaft speed sensor (VSS) bolt	13	1.3	9.5	☞ / ☞
Input shaft speed sensor bolt	5.5	0.55	4.0	☞ / ☞
Valve body harness connector bolt	5.5	0.55	4.0	☞ / ☞
Shift solenoid bolt	11	1.1	8.0	☞
Oil strainer bolt	10	1.0	7.5	☞ / ☞
Oil pan bolt	7.0	0.7	5.0	☞ / ☞
Transaxle and engine fastening bolt and nut	85	8.5	61.5	☞
Drive plate to torque converter bolt	19	1.9	14.0	☞
Transaxle stiffener bolt	55	5.5	40	☞
Starter motor bolt and nut	50	5.0	36.5	☞
Oil pump subassembly bolt	10	1.0	7.5	☞
Rear cover plug	7.5	0.75	5.5	☞
Solenoid valve bolt	11	1.1	8.0	☞
Final gear bolt	78	7.8	56.5	☞
Torque converter housing plug	7.5	0.75	5.5	☞
Lubrication tube clamp bolt	5.5	0.55	4.0	☞
Fluid reservoir RH plate bolt	5.5	0.55	4.0	☞
Torque converter housing bolt	33	3.3	24.0	☞ / ☞ / ☞
Manual detent spring bolt	10	1.0	7.5	☞
Parking lock pawl bracket bolt	7.5	0.75	5.5	☞
Rear cover bolt	25	2.5	18.0	☞
Fluid reservoir LH plate bolt	10	1.0	7.5	☞
Oil pump assembly bolt	25	2.5	18.0	☞
Transaxle case plug	7.5	0.75	5.5	☞
Valve body bolt	11	1.1	8.0	☞
Fluid outlet union	25	2.5	18.0	☞
Fluid cooler pipe union bolt	22	2.2	16.0	☞
Fluid cooler pipe bracket bolt	10	1.0	7.5	☞
Fluid filler tube bolt	10	1.0	7.5	☞
Harness bracket bolt	23	2.3	17.0	☞
Select cable clamp bolt	10	1.0	7.5	☞
Transmission range sensor lock nut	7	0.7	5.0	☞
Manual select lever nut	13	1.3	9.5	☞
Engine mounting LH bracket bolt	55	5.5	40.0	☞

NOTE

The specified tightening torque is also described in the following.
“Select Cable Components: ”
“Automatic Transaxle Unit Components: ”
“Automatic Transaxle Assembly Components: ”
“Oil Pump Assembly Components: ”
“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components: ”
“Valve Body Assembly Components: ”
“Differential Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A5108001

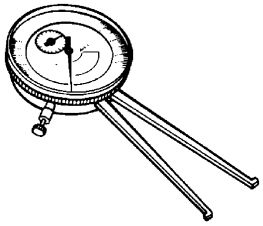
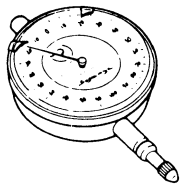
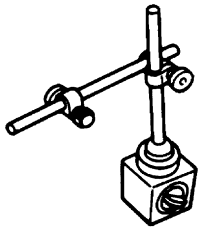
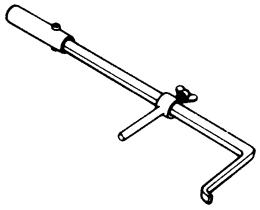
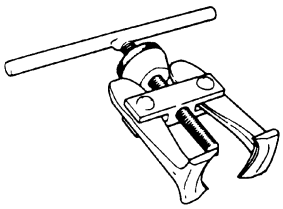
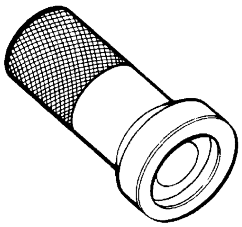
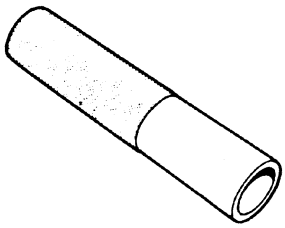
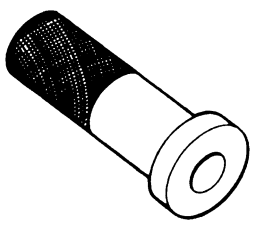
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞
	SUZUKI Super Grease C	P/No.: 99000–25030	☞ / ☞ / ☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1216B	P/No.: 99000–31230	☞ / ☞ / ☞

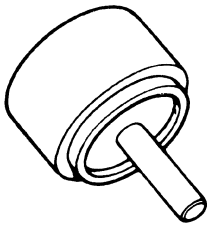
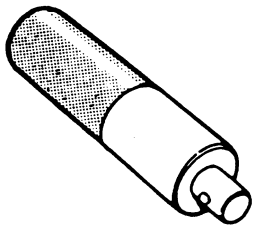
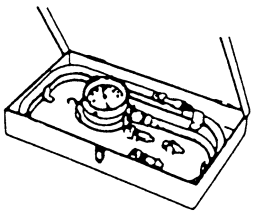
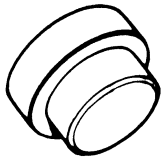
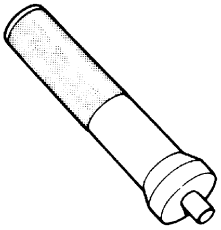
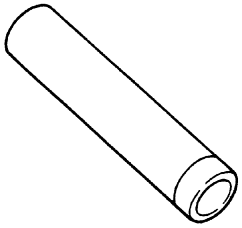
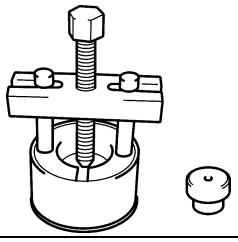
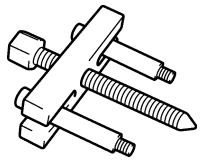
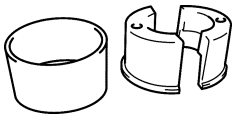
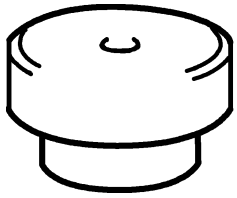
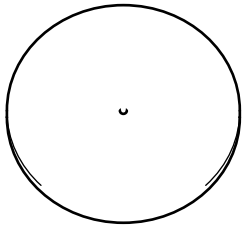
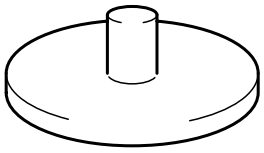
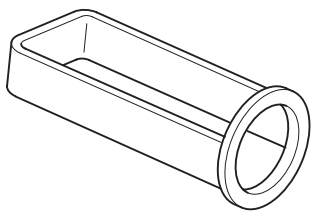
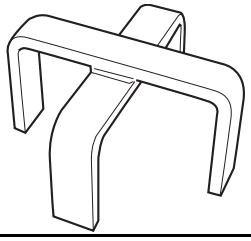
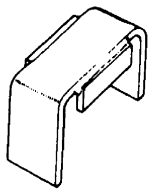
NOTE

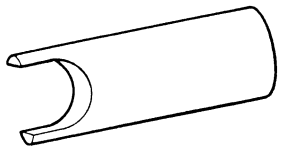
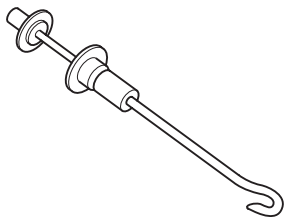
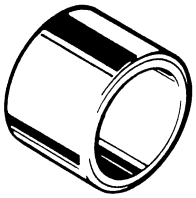
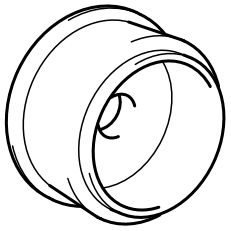
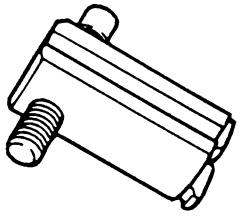
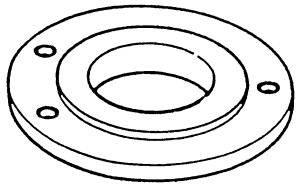
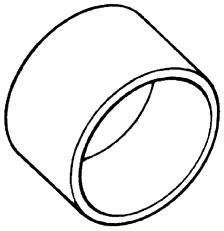
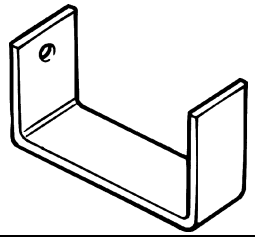
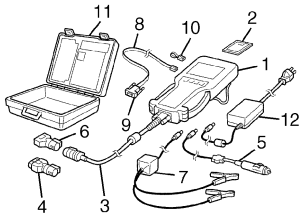
Required service material is also described in the following.
“Select Cable Components: ”
“Automatic Transaxle Unit Components: ”
“Automatic Transaxle Assembly Components: ”
“Oil Pump Assembly Components: ”
“Direct Clutch Assembly Components: ”
“Forward and Reverse Clutch Assembly Components: ”
“2nd Brake Piston Assembly Components: ”
“Transaxle Rear Cover (O/D and 2nd Coast Brake Piston) Assembly Components: ”
“Countershaft Assembly Components: ”
“Valve Body Assembly Components: ”
“Differential Assembly Components: ”

Special Tool

S7N20A5108002

09900–20605 Dial calipers (1/100 mm, 10-34 mm) ☞ / ☞ / ☞		09900–20607 Dial gauge ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞	
09900–20701 Magnetic stand ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞		09913–50121 Oil seal remover ☞	
09913–61510 Bearing puller ☞		09913–70123 Bearing installing tool ☞ / ☞	
09913–84510 Bearing installer ☞ / ☞ / ☞ / ☞		09913–85210 Bearing installer ☞	

09923–78210 Bearing installer ☞ 	09924–74510 Bearing and oil seal handle ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09925–37811–001 Oil pressure gauge ☞ 	09925–88210 Bearing puller attachment ☞ / ☞ 
09925–98210 Input shaft bearing installer ☞ 	09925–98221 Bearing installer ☞ 
09926–37610 Bearing remover ☞ / ☞ 	09926–37610–001 Bearing puller ☞ / ☞ 
09926–37610–002 Bearing puller attachment ☞ / ☞ 	09926–37610–003 Bearing remover attachment ☞ / ☞ 
09926–58010 Bearing remover attachment ☞ 	09926–96030 Clutch spring compressor No.7 ☞ / ☞ 
09926–96050 Brake piston compressor ☞ / ☞ 	09926–97610 Spring compressor ☞ / ☞ 
09926–97620 Spring compressor ☞ / ☞ 	09926–98310 Clutch spring compressor ☞ / ☞ 

09928–06050 Differential preload adapter ☞ / ☞ 	09942–15511 Sliding hammer ☞ / ☞ / ☞ / ☞ 
09944–78210 Bearing installer support ☞ / ☞ 	09944–88220 Oil seal installer ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 
09944–96011 Bearing outer race remover ☞ / ☞ / ☞ / ☞ 	09946–06710 Transfer bearing dummy ☞ / ☞ 
09951–18210 Oil seal remover & installer No. 2 ☞ / ☞ 	09952–06020 Dial gauge plate No.2 ☞ / ☞ / ☞ / ☞ 
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞ 	

Manual Transmission/Transaxle

M13A Model

General Description

Manual Transaxle Construction and Servicing

S7N20A5211001

The transaxle provides five forward speeds and one reverse speed by means of three synchromeshs 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 done 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.

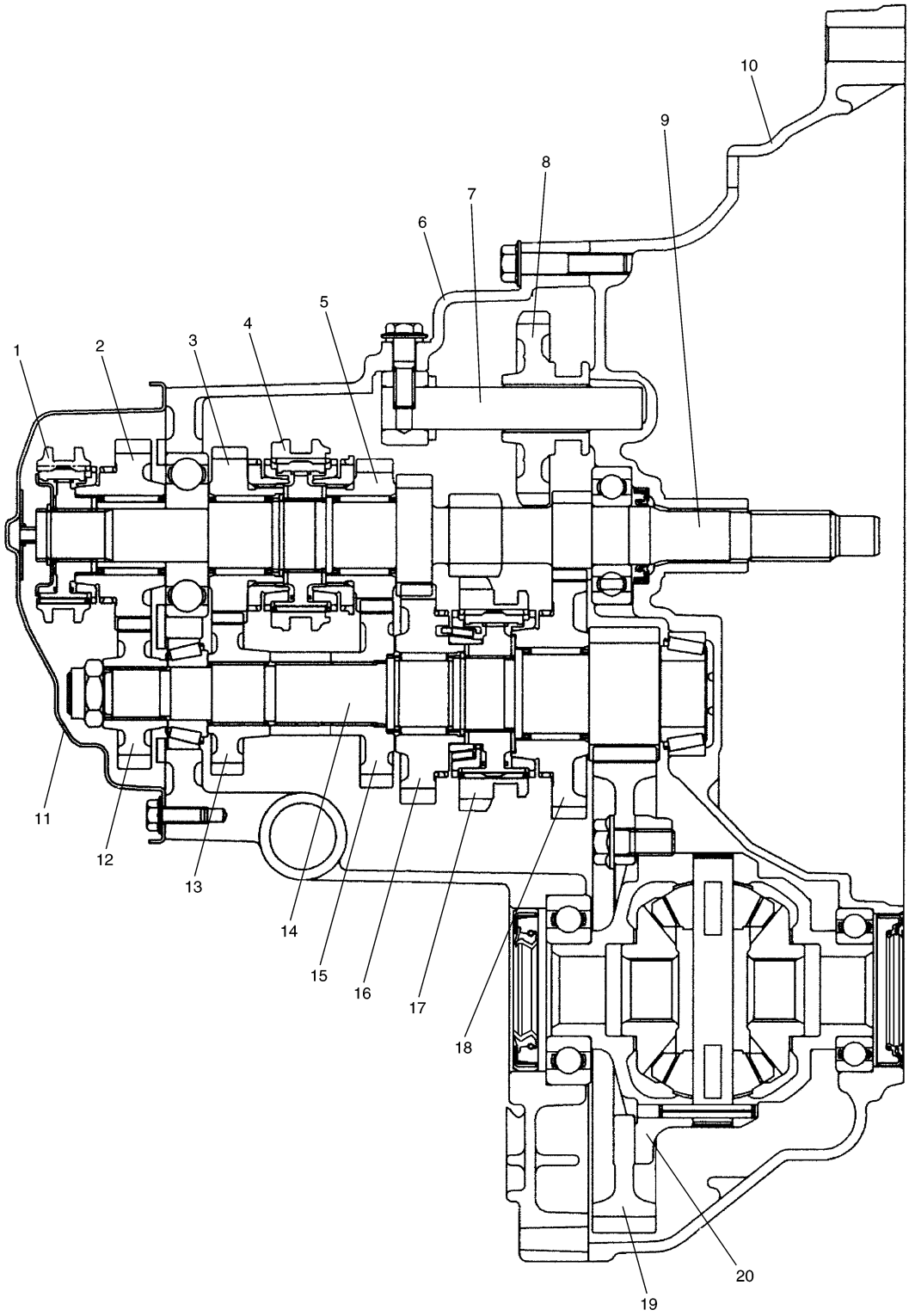
To prevent the cracking noise from the reverse gear when shifting transaxle gear into the reverse gear, the reverse shift braking device is used.

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.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of countershaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



I7N20A521001-01

1. 5th speed sleeve & hub	8. Reverse idler gear	15. Countershaft 3rd gear
2. Input shaft 5th gear	9. Input shaft	16. Countershaft 2nd gear
3. Input shaft 4th gear	10. Right case	17. Low speed synchronizer sleeve & hub
4. High speed synchronizer sleeve & hub	11. Side cover	18. Countershaft 1st gear
5. Input shaft 3rd gear	12. Countershaft 5th gear	19. Final gear
6. Left case	13. Countershaft 4th gear	20. Differential case
7. Reverse gear shaft	14. Countershaft	

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

S7N20A5214001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Worn shift fork shaft	*Replace.*
	Worn shift fork or synchronizer sleeve	*Replace.*
	Weak or damaged locating springs	*Replace.*
	Worn bearings on input shaft or countershaft	*Replace.*
	Worn chamfered tooth on sleeve and gear	*Replace sleeve and gear.*
Hard shifting	Maladjusted gear select control cable	*Adjust.*
	Inadequate or insufficient lubricant	*Replenish.*
	Improper clutch pedal free travel	*Replace clutch master cylinder or clutch pedal arm.*
	Distorted or broken clutch disc	*Replace.*
	Damaged clutch pressure plate	*Replace clutch cover.*
	Worn synchronizer ring	*Replace.*
	Worn chamfered tooth on sleeve or gear	*Replace sleeve or gear.*
	Worn gear shift / select control cables joint	*Replace.*
	Distorted shift shaft	*Replace.*
	Worn gear shift / select control cables	*Replace.*
Noise	Inadequate or insufficient lubricant	*Replenish.*
	Damaged or worn bearing(s)	*Replace.*
	Damaged or worn gear(s)	*Replace.*
	Damaged or worn synchronizer parts	*Replace.*

Repair Instructions

Manual Transaxle Oil Change

S7N20A5216001

1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check oil level and leakage. If leakage exists, correct it.

NOTE

Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage.

3) Remove oil filler plug (2).
4) Remove drain plug (1), and drain old oil.
5) Apply sealant to thread of drain plug (1), and tighten it to specified torque.

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

Tightening torque
Transaxle oil drain plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

6) Pour new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE

It is highly recommended to use API GL-4 75W-90 gear oil.

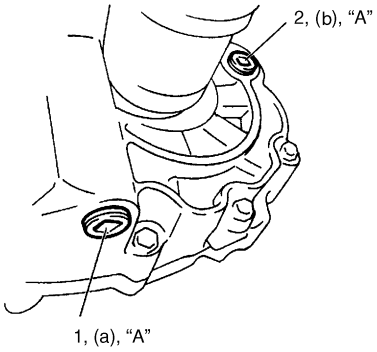
Transaxle oil specification
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

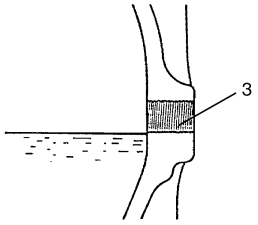
Manual transaxle oil capacity
Reference: 2.2 liters (4.8/3.9 US/Imp. pt)

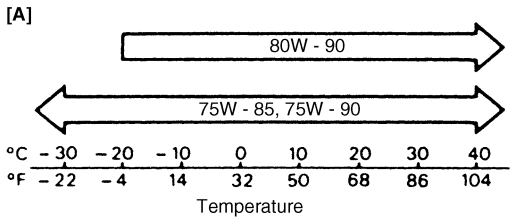
7) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

"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)







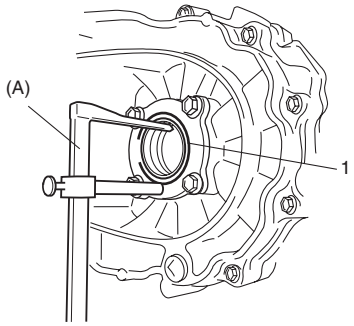
I4RS0B521002-01

Differential Side Oil Seal Replacement

S7N20A5216002

1) Lift up vehicle and drain transaxle oil.
2) Remove front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".
3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



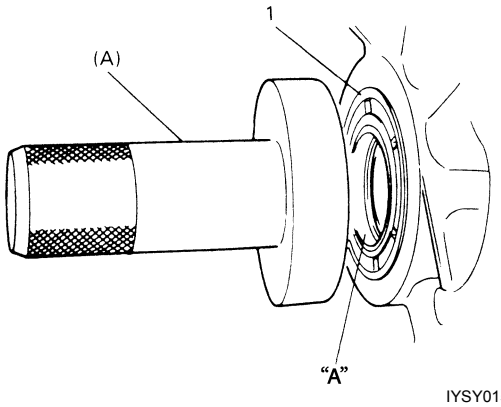
I4RH01520003-01

4) Install oil seal (1) facing its spring side inward. Use special tool and hammer for installation.

Special tool
(A): 09913–75510

5) Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.

"A": Grease 99000–25010 (SUZUKI Super Grease A)

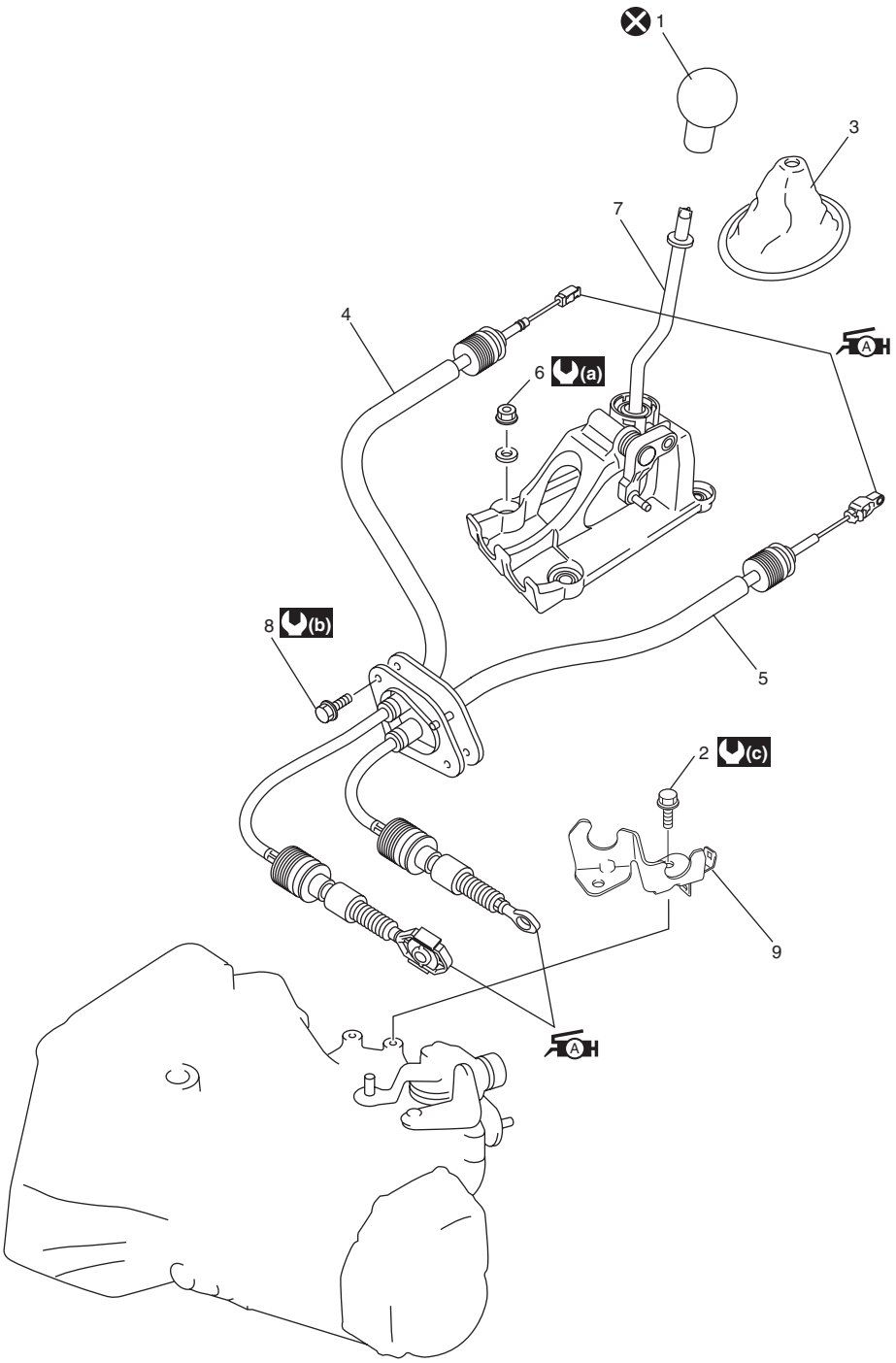


IYSY01520005-01

6) Insert front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".
7) Fill transaxle oil as specified referring to "Manual Transaxle Oil Change: M13A Model", and make sure that oil has been sealed with oil seal.

Gear Shift Control Lever and Cable Components

S7N20A5216003



I4RS0B521003-01

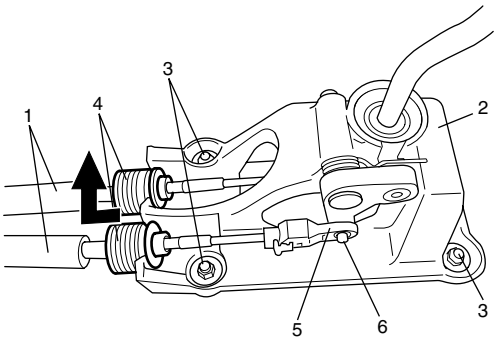
1. Gear shift control lever knob	6. Gear shift control lever assembly mounting nut	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
2. Cable bracket bolt	7. Gear shift control lever assembly	(c) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
3. Gear shift lever boot	8. Cable grommet bolt	: Do not reuse.
4. Gear shift control cable : Apply grease 99000-25010 to cable end.	9. Cable bracket	
5. Gear select control cable : Apply grease 99000-25010 to cable end.	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)	

Gear Shift Control Lever and Cable Removal and Installation

S7N20A5216004

Removal

1) Remove console box.
2) Disconnect cable ends (5) from pivot (6) of gear shift control lever assembly.
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) as shown in figure.
4) Remove gear shift control lever assembly mounting nuts (3) and gear shift lever assembly from floor panel.
5) Disconnect gear shift and select control cables from transaxle.
6) Remove cable grommet bolt, and then remove gear shift and select control cables from floor panel.



I4RS0A520003-01

Installation

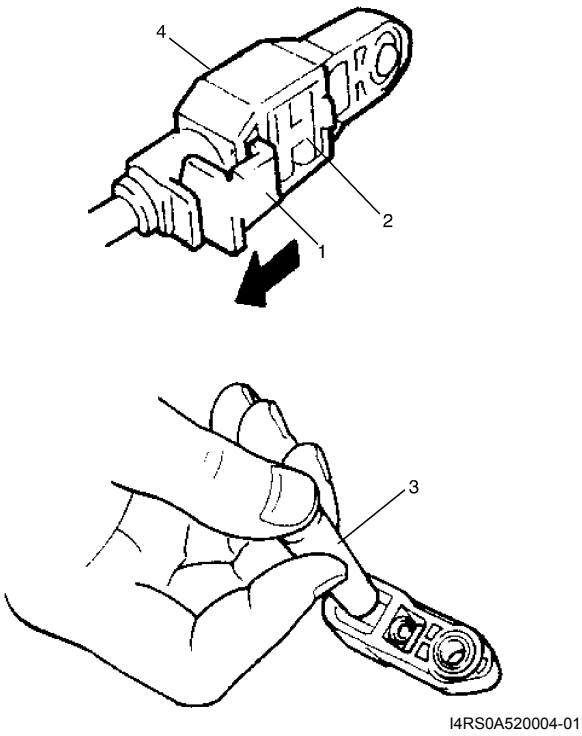
Reverse removal procedure for installation nothing the following.

- Tighten each bolts and nuts to specified torque referring to “Gear Shift Control Lever and Cable Components: M13A Model”.
- Adjust gear select control cable referring to “Gear Select Control Cable Adjustment: M13A Model”.

Gear Select Control Cable Adjustment

S7N20A5216005

1) Release lock plate (1) which restricts moving of cable end holder (2).
2) Push cable end holder (2) out from adjuster (4) using appropriate tool (3) to disengage cable.



I4RS0A520004-01

3) Apply grease to pin (5) of gear shift control lever, and then install adjuster (1) into pin of gear shift control lever securely.

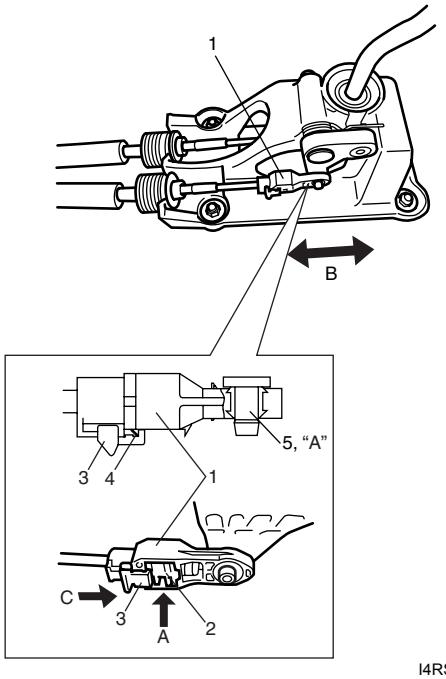
“A”: Grease 99000–25010 (SUZUKI Super Grease A)

4) Push cable end holder (2) in the direction of A.

NOTE

At this time, do not apply force in the cable operation direction B to adjuster.

5) Slide lock plate (3) in the direction of C, until it gets over the claw (4) of cable end holder.



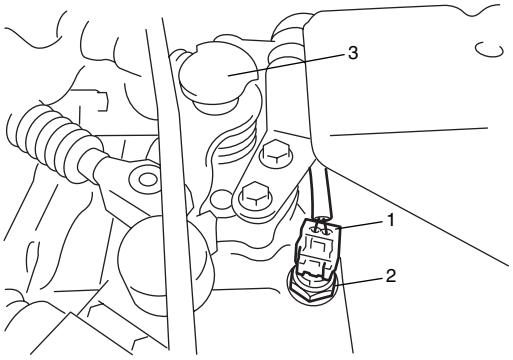
I4RS0A520005-01

Back Up Light Switch Removal and Installation

S7N20A5216007

Removal

1) Remove battery and tray with coolant reservoir.
2) Disconnect back up light switch coupler (1).
3) Remove back up light switch (2).



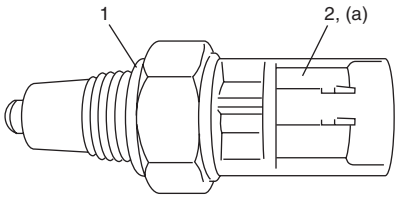
I4RS0A520010-01

3. Gear shift and select shaft assembly

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

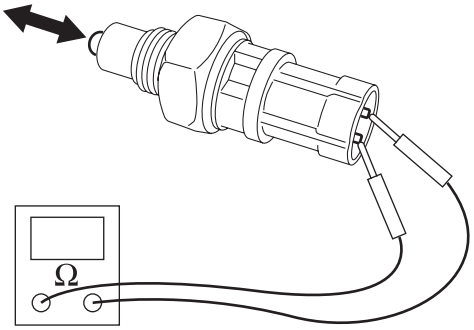
2) Connect back up light switch coupler.
3) Install battery and tray, and then install coolant reservoir to battery tray.

Back Up Light Switch Inspection

S7N20A5216008

Check back up light switch for function using ohmmeter.

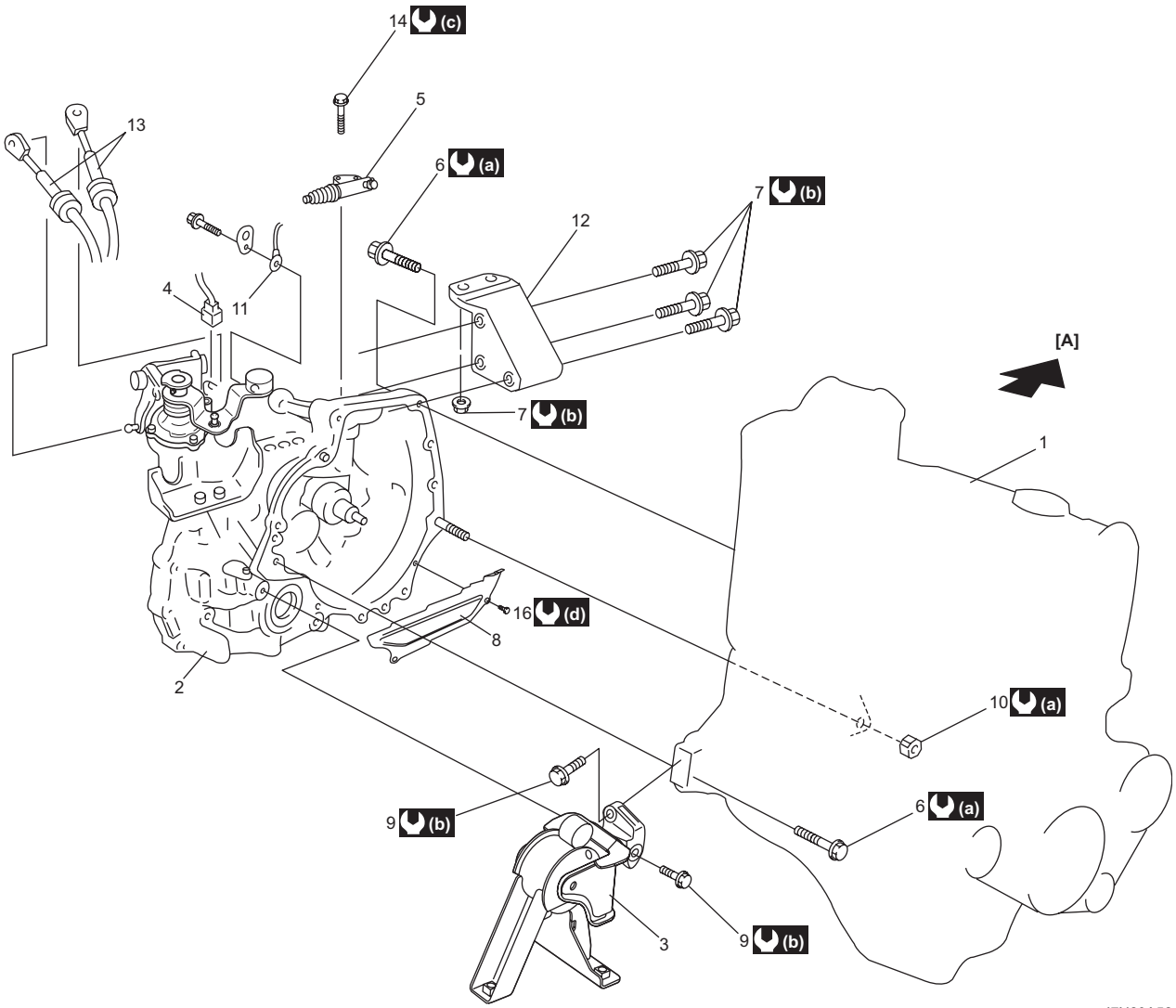
Back up light switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



I4RS0A520011-01

Manual Transaxle Unit Components

S7N20A5216009



I7N20A521002-01

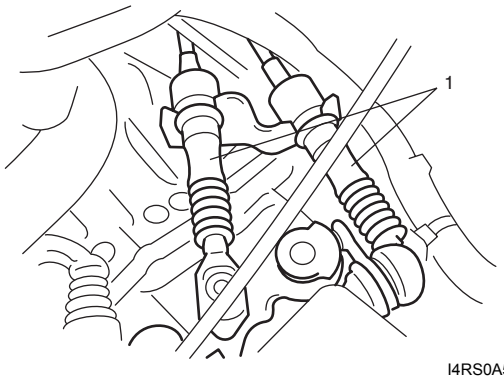
[A]: Forward	7. Engine left mounting bracket bolt and nuts	14. Clutch operating cylinder bolt
1. Engine	8. Clutch housing lower plate	(a): 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
2. Transaxle	9. Engine rear mounting bracket bolts	(b): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
3. Engine rear mounting and bracket	10. Transaxle to engine nut	(c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
4. Back up light switch connector	11. Ground cable	(d): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
5. Clutch operating cylinder	12. Engine left mounting bracket	
6. Transaxle to engine bolt	13. Gear shift & select control cables	

Manual Transaxle Unit Dismounting and Remounting

S7N20A5216010

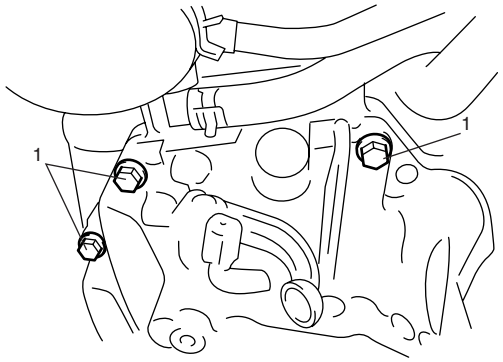
Dismounting

1) Drain coolant.
2) Remove coolant reservoir with reservoir hose.
3) Remove battery and tray.
4) Remove air cleaner case and resonator.
5) Disconnect gear shift and gear select control cables (1) from transaxle.



I4RS0A520006-01

6) Disconnect back up light switch coupler and undo wiring harness clamps.
7) Remove ground cable from transaxle.
8) Remove clutch operating cylinder with fluid hose from transaxle.
9) Remove water inlet No.2 pipe from transaxle.
10) Remove starting motor referring to “Starting Motor Dismounting and Remounting: M13A / M15A / M16A in Section 1I”.
11) Remove transaxle to engine bolts (1) of upper side.

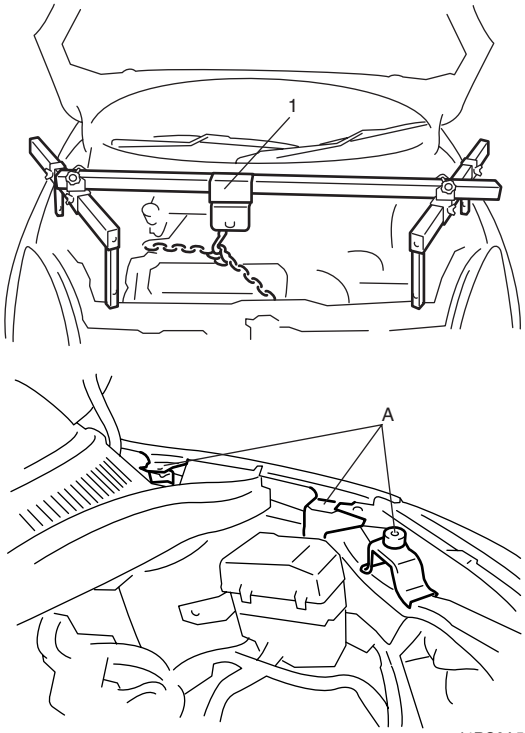


I4RS0A520018-01

12) Support engine using supporting device (1).

⚠ CAUTION

Do not apply supporting device to projection part A. If do so, it may be deformed.

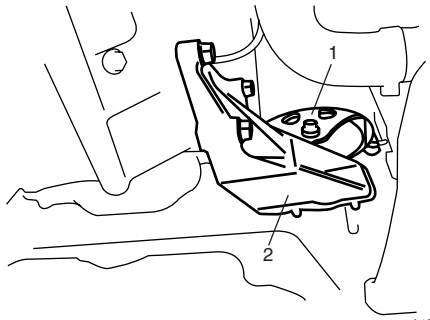


I4RS0A520019-01

13) Remove front drive shafts and center shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
14) Remove exhaust No.2 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.
15) Remove clutch housing lower plate (1).

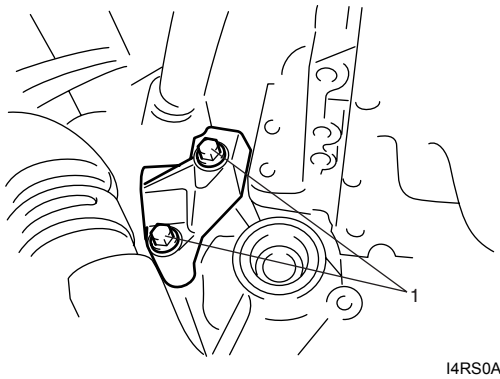
I4RS0A520020-01

16) Remove engine under covers.
17) Support transaxle with transmission jack.
18) Remove transaxle to engine bolts and nut of lower side.
19) Remove engine left mounting (1) with bracket (2).



I4RS0A520021-01

20) Remove engine rear mounting bracket bolts (1).



I4RS0A520022-01

21) Remove other attached parts from transaxle, if any.
22) Pull transaxle so as to disconnect input shaft from clutch disc, and then lower it.

Remounting

⚠ CAUTION

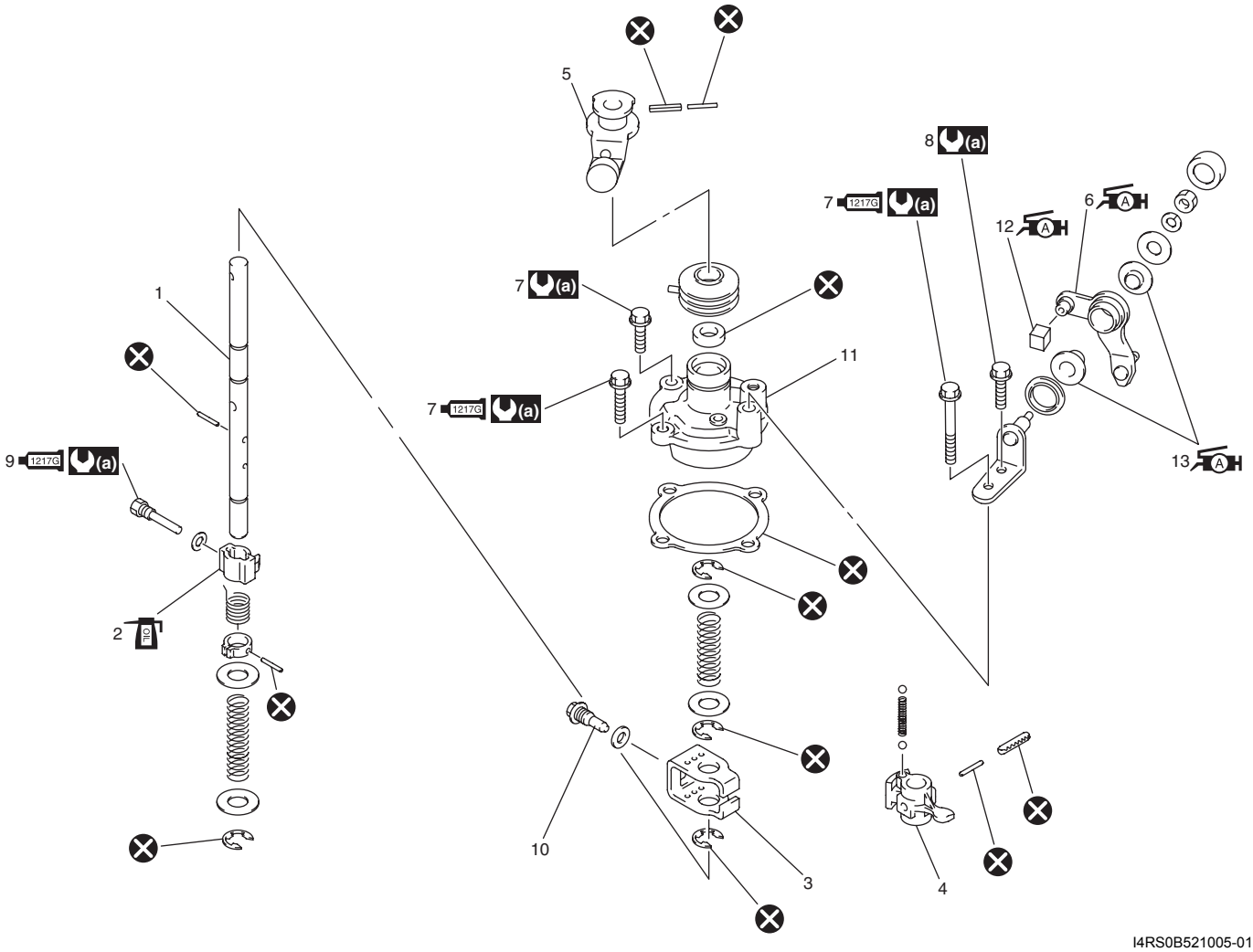
- **Care should be taken not to scratch oil seal lip with drive shaft while raising transaxle.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

Reverse dismounting procedure for remounting noting the following.

- Tighten each bolts and nuts to specified torque referring to “Manual Transaxle Unit Components: M13A Model”.
- Set each clamp for wiring securely.
- Fill transaxle oil referring to “Manual Transaxle Oil Change: M13A Model”.
- Connect battery and check function of engine, clutch and transaxle.

Gear Shift and Select Shaft Assembly Components

S7N20A5216011



I4RS0B521005-01

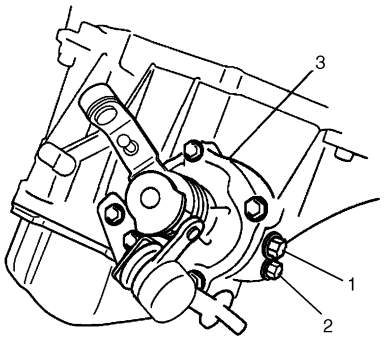
1. Gear shift & select shaft	9. 5th to reverse interlock guide bolt : Apply sealant 99000-31260 to bolt thread.
2. 5th & reverse gear shift cam	10. Gear shift interlock bolt : Apply sealant 99000-31260 to bolt thread.
3. Gear shift interlock plate	11. Guide case
4. Gear shift & select lever	12. Select lever shaft bush : Apply grease 99000-25010 to whole area of bush.
5. Shift cable lever	13. Select lever boss : Apply grease 99000-25010 to internal and external diameter.
6. Select cable lever : Apply grease 99000-25010 to sliding surface.	: 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
7. Gear shift guide case bolt : Apply sealant 99000-31260 to bolt thread.	: Do not reuse.
8. Select lever bracket bolt	: Apply transaxle oil.

Gear Shift and Select Shaft Assembly Removal and Installation

S7N20A5216012

Removal

1) Remove gear shift interlock bolt (1) and 5th to reverse interlock guide bolt (2) from transaxle case.
2) Remove gear shift & select shaft assembly (3).



I4RS0B521006-01

Installation

1) Apply grease to select lever shaft bush and select lever boss, and install gear shift and select shaft assembly with new gasket into transaxle.

   "A": Grease 99000–25010 (SUZUKI Super Grease A)

2) Apply sealant to gear shift guide case bolts (1). Tighten gear shift guide case bolts with select lever bracket to specified torque.

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

   Tightening torque
   Gear shift guide case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

3) Tighten select lever bracket bolt (2).

   Tightening torque
   Select lever bracket bolt (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

4) Install washer and gear shift interlock bolt (3) to which sealant have been applied and then tighten it to specified torque.

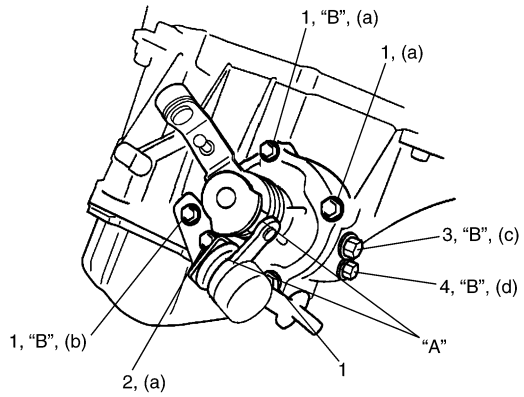
   "B": Sealant 99000–31260 (SUZUKI Bond No.1217G)

   Tightening torque
   Gear shift interlock bolt (c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

5) Install washer and 5th to reverse interlock guide bolt (4) to which sealant have been applied and then tighten it to specified torque.

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

   Tightening torque
   5th to reverse interlock guide bolt (d): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I4RS0B521007-01

Gear Shift and Select Shaft Disassembly and Assembly

S7N20A5216013

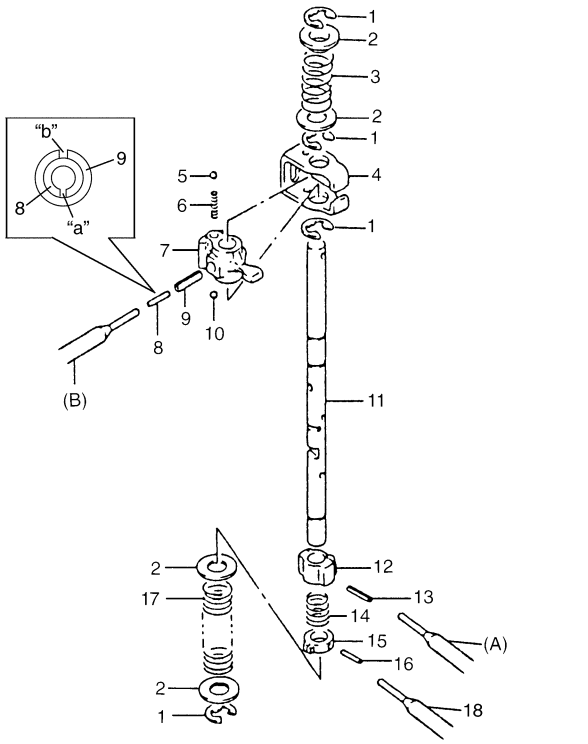
1) Push pins out using 2.8 – 3.0 mm (0.11 – 0.12 in.) commercially available spring pin remover and specified spring pin removers as shown below.

Special tool
(A): 09922–85811 4.5 mm
(B): 09925–78210 6.0 mm

2) Inspect component parts for wear, distortion or damage. If any detect is found, replace detective part with new one.

NOTE

- **Set new gear shift & select lever inner pin (8) and outer pin (9) facing each gap (“a”, “b”) in the opposite direction as shown in figure.**
- **When driving in pins, prevent shaft from being bent by supporting it with wood block.**
- **Assemble 5th & reverse gear shift cam with its pit and pin aligned.**
- **Make sure to select an appropriate spring by identifying the painted colors to keep gear shifting performance as designed.**
  - **Low speed select spring – Orange**
  - **Reverse select spring – Pink**

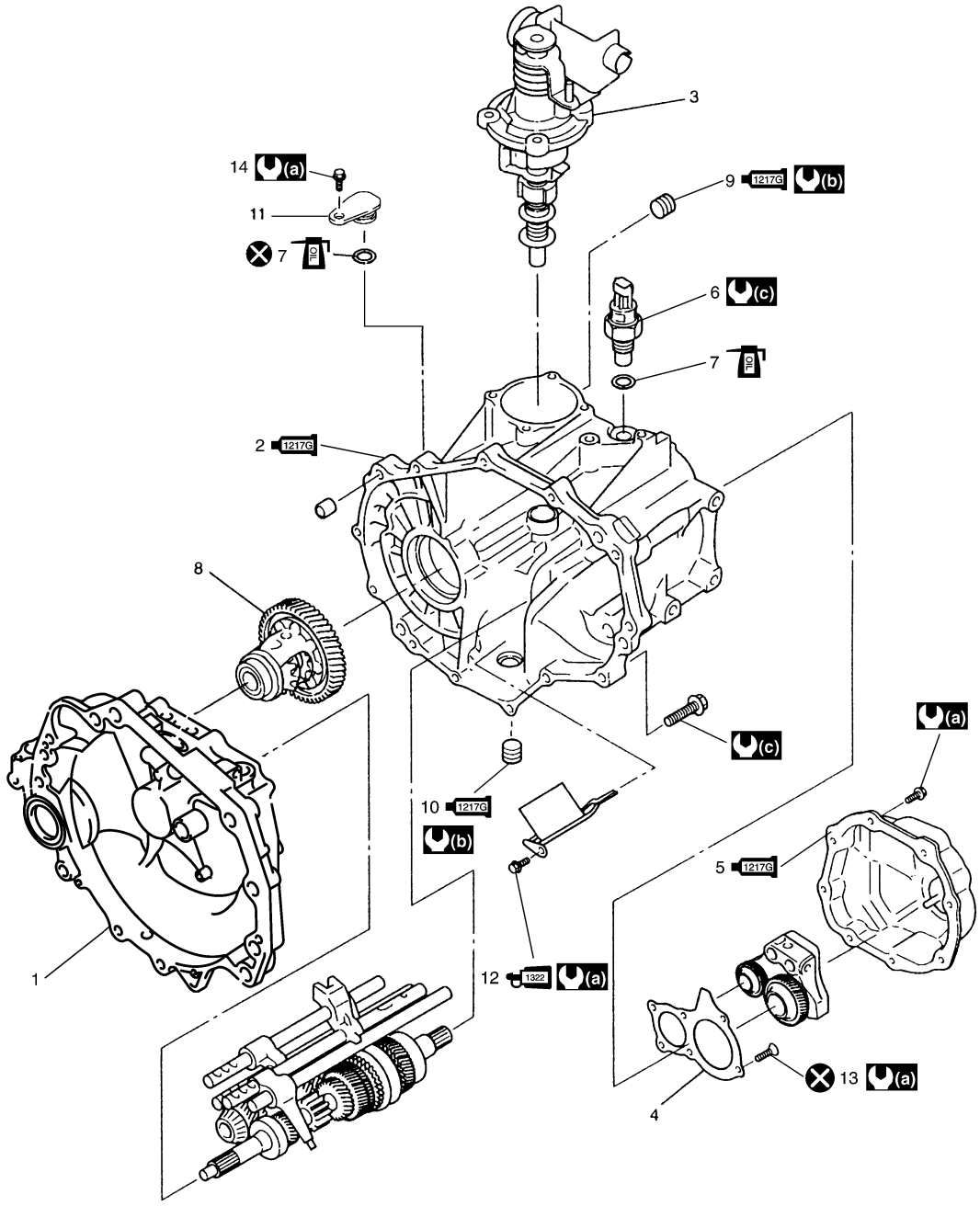


I4RS0A520026-01

1. E-ring	10. Ball
2. Washer	11. Gear shift & select shaft
3. Reverse select spring	12. 5th & reverse gear shift cam
4. Gear shift interlock plate	13. 5th & reverse gear shift cam guide pin
5. Ball	14. Cam guide return spring
6. Gear shift interlock spring	15. 5th & reverse gear shift cam guide
7. Gear shift & select lever	16. Gear shift cam guide pin
8. Inner pin	17. Low speed select spring
9. Outer pin	18. Spring pin remover

Manual Transaxle Assembly Components

S7N20A5216014



I7N20A521003-01

1. Transaxle right case	11. Sensor cap
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and right case.	1322 12. Oil gutter bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
3. Gear shift and select shaft assembly	13. Left case plate screw and bolts
4. Transaxle left case plate	14. Sensor cap bolt
1217G 5. Transaxle side cover : Apply sealant 99000-31260 to mating surface of side cover and left case.	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
6. Back up light switch	(b) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
7. O-ring :Apply transaxle oil to O-ring	(c) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
8. Differential assembly	: Do not reuse.
1217G 9. Oil level/filler plug : Apply sealant 99000-31260 to all around thread part of plug.	
1217G 10. Oil drain plug : Apply sealant 99000-31260 to all around thread part of plug.	

Fifth Gear Disassembly and Assembly

S7N20A5216015

Disassembly

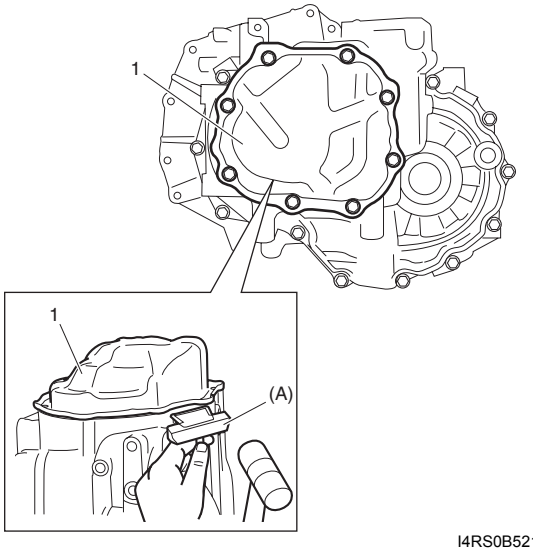
1) Remove bolts.
2) Cut sealant using special tool and hammer.

⚠ CAUTION

Care should be taken not to distort side cover when it is removed from left case.

Special tool
(A): 09921–96510

3) Remove side cover (1).



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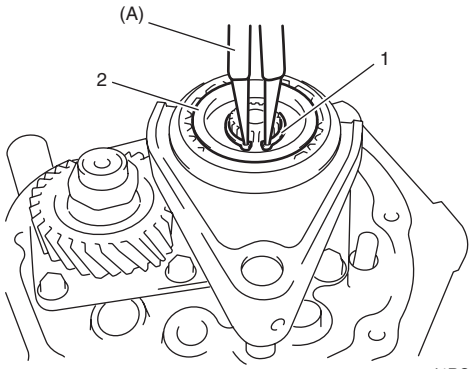
4) Using special tool, remove circlip (1) and then hub plate (2).

Special tool
(A): 09900–06107

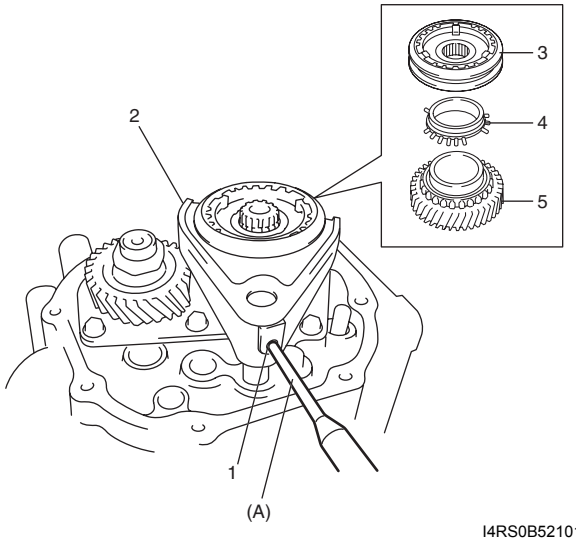


I4RS0B521010-01

5) Drive out spring pin (1) using special tool and hammer.

Special tool
(A): 09922–85811

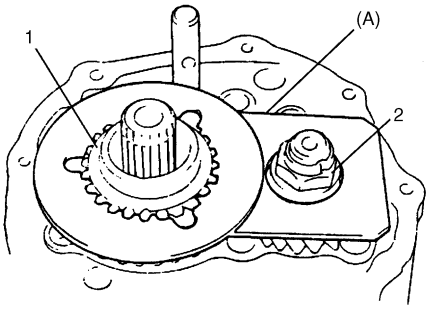
6) Remove gear shift fork (2), synchronizer sleeve & hub assembly (3), synchronizer ring (4) and input shaft 5th gear (5) all together. Use gear puller for removal if spline fitting of hub is tight.



I4RS0B521011-01

7) Unfasten caulking of countershaft nut (2), install input shaft 5th gear (1) and special tool to stop rotation of shafts, and then remove countershaft nut (2).

Special tool
(A): 09927–76010



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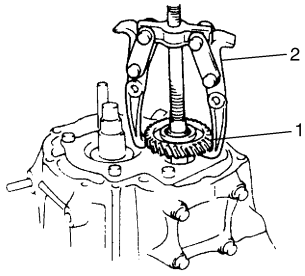
8) Remove special tool, input shaft 5th gear, needle bearing and then countershaft 5th gear (1). Gear puller (2) would be necessary if spline fitting of countershaft 5th gear is tight.



I4RS0A520041-01

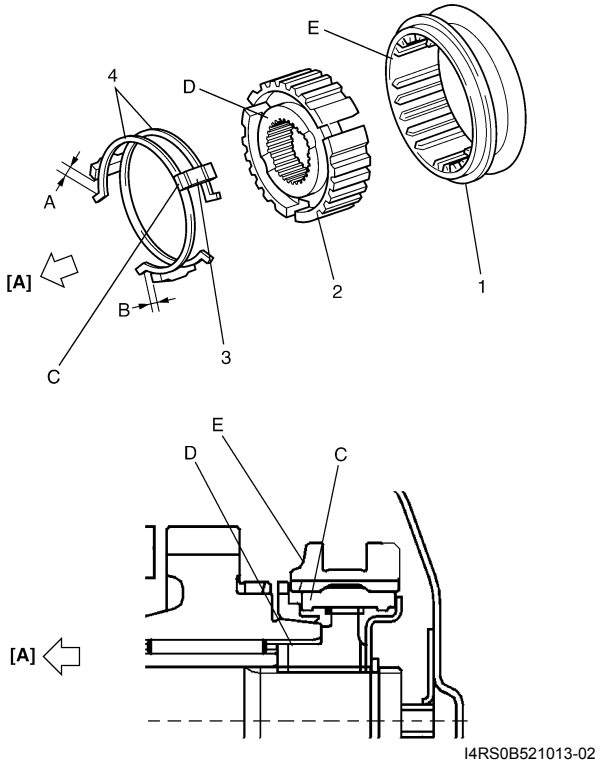
Assembly

1) Fit 5th speed synchronizer sleeve (1) to hub (2), insert 3 keys (3) in it and then set springs (4) as shown in the figure.

NOTE

Short side C of key, long flange D of hub and chamfered side E of sleeve should face inward (5th gear side).

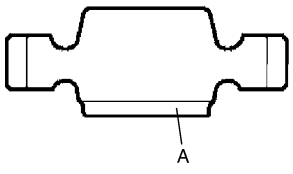
Synchronizer key installation position
A = B



I4RS0B521013-02

[A]: 5th gear side

2) Install 5th gear (1) to countershaft facing machined boss A inward.



I4RS0B521014-01

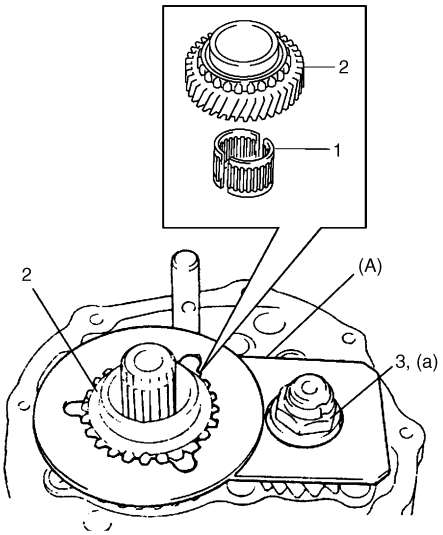
A: Machined boss (Inside)

3) Install needle bearing (1) to input shaft, apply oil then install input shaft 5th gear (2) and special tool to stop shaft rotation.

Special tool
(A): 09927–76010

4) Tighten new countershaft nut (3) to specified torque, and caulk countershaft nut securely.

Tightening torque
Countershaft nut (a): 70 N·m (7.0 kgf-m, 51.0 lbf-ft)

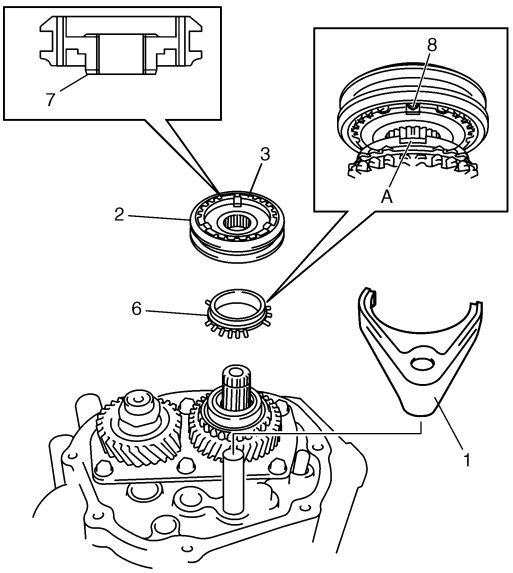


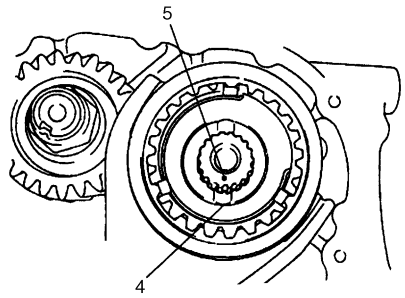
I4RS0B521015-01

5) Remove special tool.
6) Install synchronizer ring (6).
7) Fit 5th gear shift fork (1) to synchronizer sleeve (2) and hub (3) assembly and install them into input shaft and gear shift shaft aligning oil groove (4) with matching mark (5) on input shaft.

NOTE

- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys (8) in sleeve & hub assembly**
- **Check free rotation of 5th gear after press-fitting sleeve & hub assembly.**



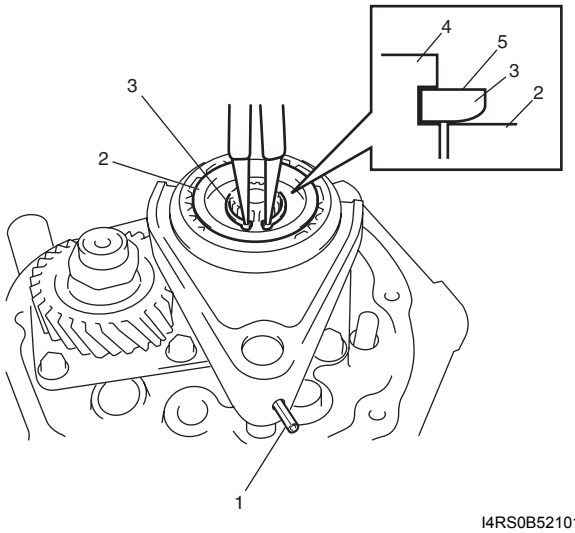


I4RS0B521016-02

A: Key slots	7. Long flange

8) Drive in new spring pin (1).
9) Fit hub plate (2) and, using special tool, install new circlip (3) to input shaft (4) in specified direction as shown in the figure.

Special tool
: 09900–06107



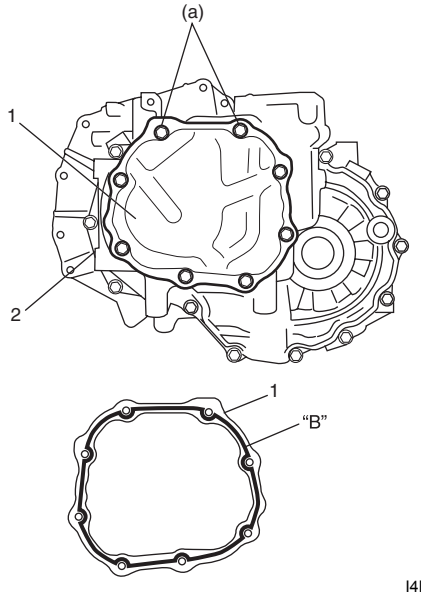
I4RS0B521017-02

5. Polished surface

10) Clean mating surface of both left case (2) and side cover (1), apply sealant to side cover (1) as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, mate it with left case and then tighten bolts to specified torque.

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

Tightening torque
Side cover bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



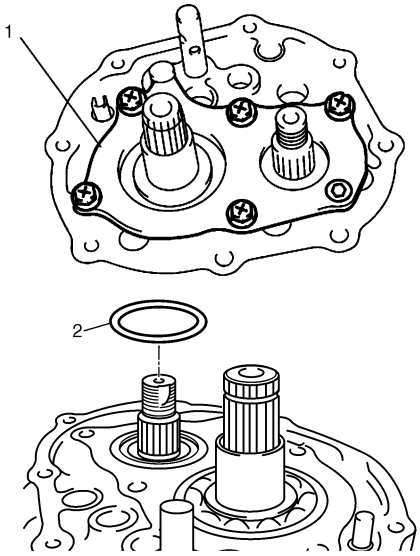
I4RS0B521018-01

Manual Transaxle Assembly Disassembly and Reassembly

S7N20A5216016

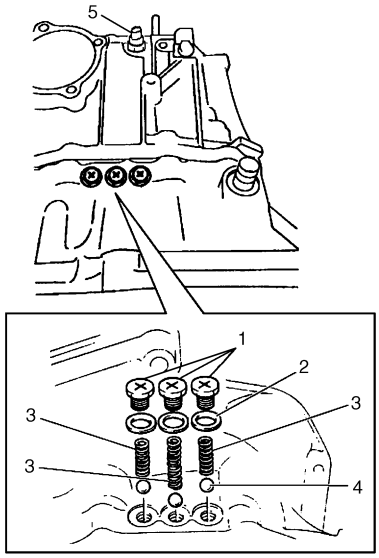
Disassembly

1) Remove gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: M13A Model”.
2) Remove fifth gear referring to “Fifth Gear Disassembly and Assembly: M13A Model”.
3) Remove left case plate (1) and bearing set shim (2).



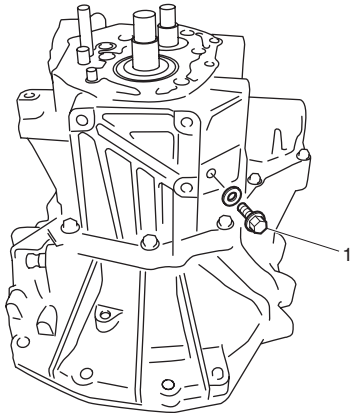
I4RS0B521019-01

4) Remove gear shift locating bolts (1) with washers (2), then take out locating springs (3) and steel balls (4).
5) Remove back up light switch (5).



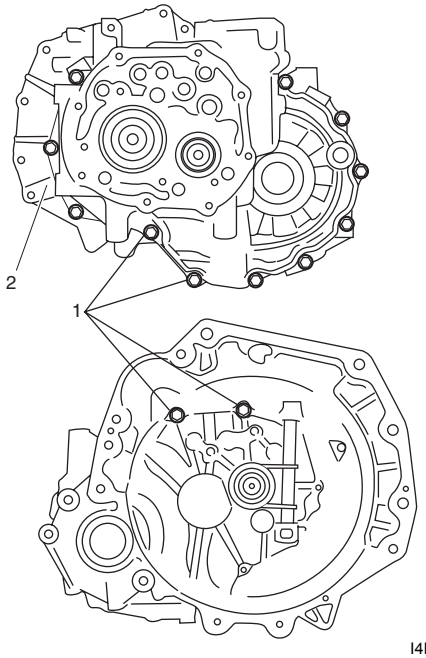
I4RS0B521020-01

6) Remove reverse shaft bolt (1) with washer.



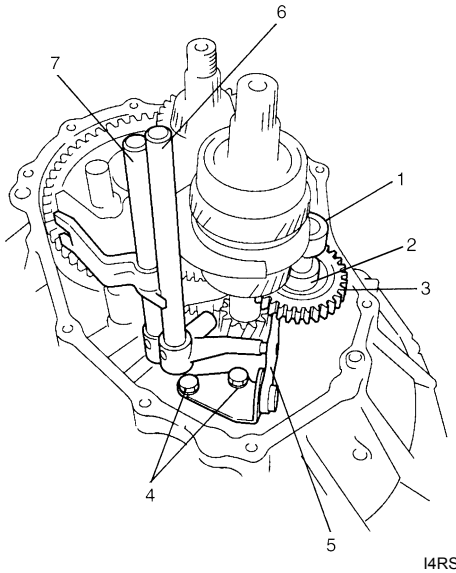
I4RS0B521021-01

7) Remove case bolts (1) from outside and another bolts from clutch housing side.
8) Tapping left case flanges with plastic hammer, remove left case (2).



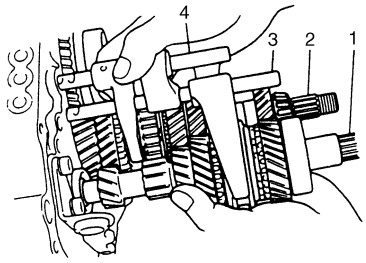
I4RS0B521022-01

9) Remove reverse gear shift lever bolts (4) and reverse gear shift lever (5).
10) Pull out reverse gear shaft (1) with washer (2), then take off reverse idler gear (3).
11) Pull out 5th & reverse gear shift guide shaft (6) together with 5th & reverse gear shift shaft (7).



I4RS0A520033-01

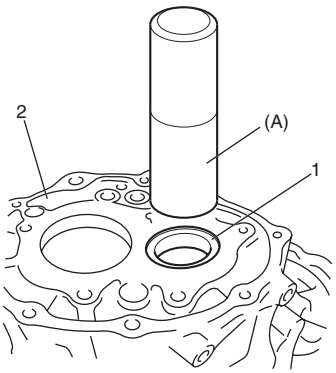
12) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly (1), countershaft assembly (2), high speed gear shift shaft (3) and low speed gear shift shaft (4) all at once.



I2RH01520035-01

13) Remove countershaft left bearing outer race (1) from left case (2) using special tool.

Special tool
(A): 09913–84510



I4RS0B521023-01

14) Remove differential gear assembly from right case.

Installation

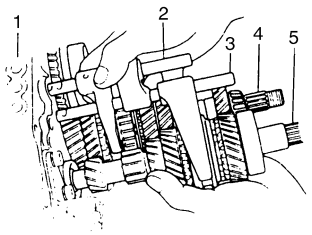
1) Install differential assembly into right case.
2) Join input shaft assembly (5), countershaft assembly (4), low speed gear shift shaft (2) and high speed gear shift shaft (3) assemblies all together, then install them into right case (1).

⚠ CAUTION

Take care not to damage oil seal lip by input shaft, or oil leakage may take place.

NOTE

- **Input shaft right bearing on shaft can be installed into right case tapping shaft with plastic hammer.**
- **Check to make sure that countershaft is engaged with final gear while installing.**



I2RH01520080-01

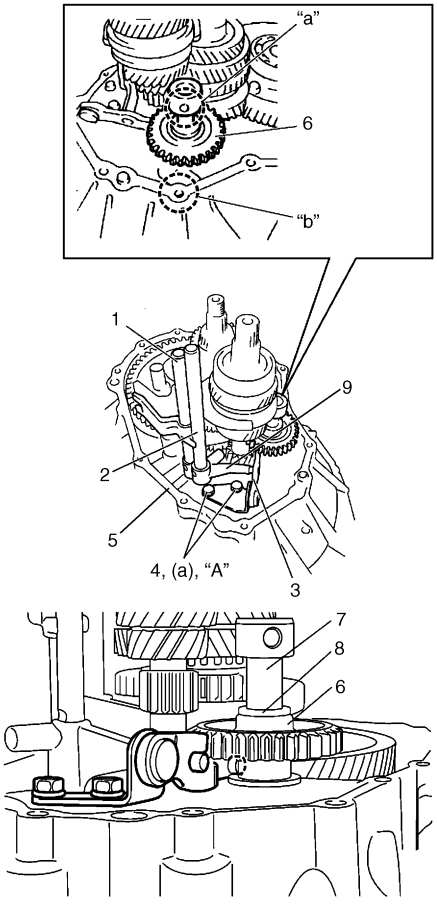
3) Install 5th & reverse gear shift shaft (1) with 5th & reverse gear shift guide shaft (2) into right case (5). Reverse gear shift arm (9) has to be joined with reverse gear shift lever (3) at the same time.
4) Make reverse idler gear (6) with reverse gear shift lever (3), insert reverse gear shaft (7) and washer (8) into case (5) through idler gear and then align “a” in shaft with “b” in case.
5) Fasten reverse gear shift lever bolts (4) after applying thread lock cement.

“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Reverse gear shift lever bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

NOTE

- **Make sure that washer (8) has been installed in shaft at above the gear.**
- **Check to confirm that reverse gear shift lever end has clearance “a” to idler gear groove.**



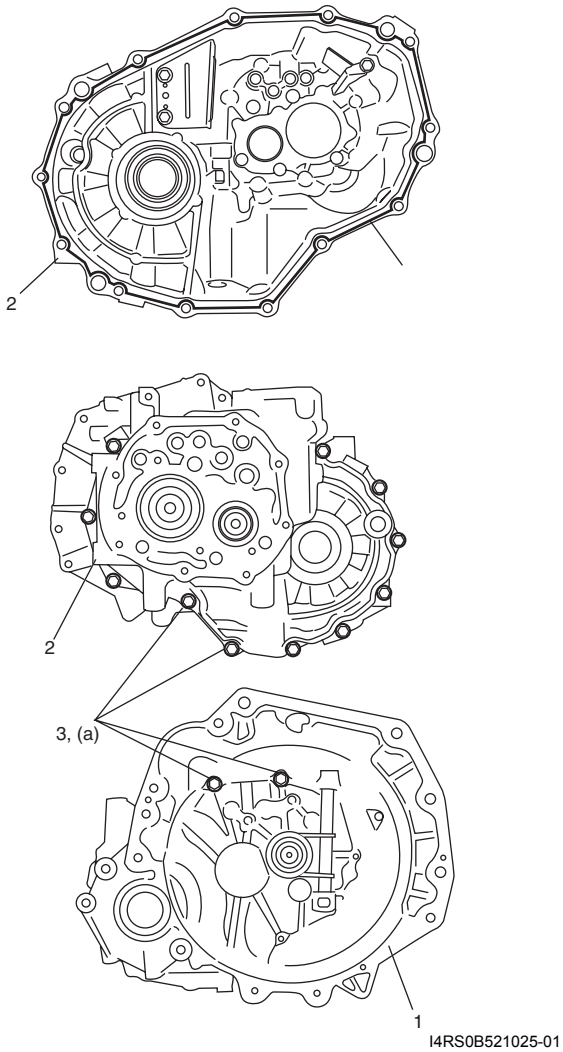
I4RS0B521024-03

6) Clean mating surfaces of both right and left cases, apply sealant to left case (2) as shown in the figure by such amount that its section is 1.5 mm (0.059 in.) in diameter then mate it with right case (1).

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

7) Tighten case bolts (3) from outside tighten another case bolts from clutch housing side to specified torque.

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

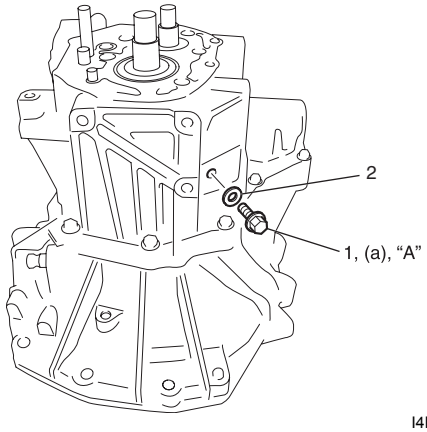


I4RS0B521025-01

8) Install reverse shaft bolt (1) to which thread lock cement has been applied, with aluminum washer (2) and tighten it to specified torque.

"A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

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

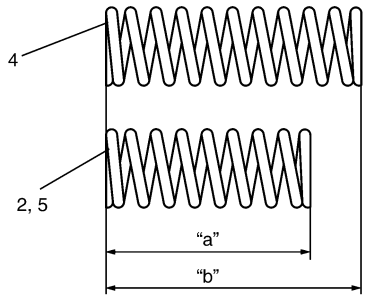


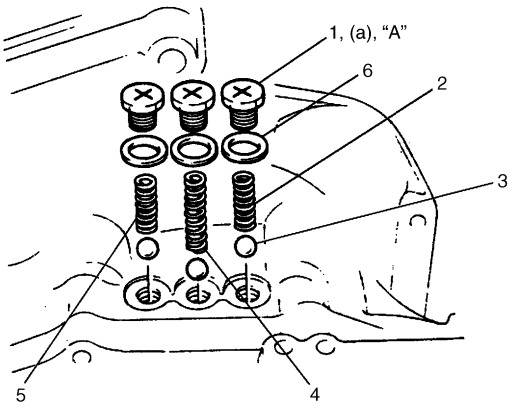
I4RS0B521026-01

9) Install steel balls (3), locating springs (2, 4 and 5) and washer (6) for respective gear shift shaft and tighten bolts (1) to which sealant has been applied.

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

Tightening torque
Gear shift locating bolt (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)

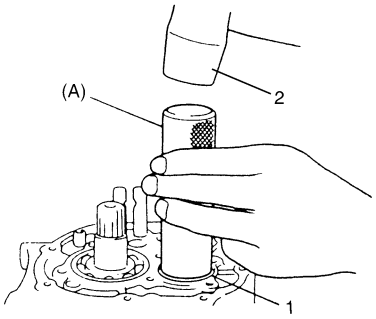




I4RS0B521027-01

10) To seat countershaft left bearing outer race (1) to bearing cone, and tap countershaft left bearing outer race (1) using special tool and plastic hammer (2).

Special tool
(A): 09913–84510

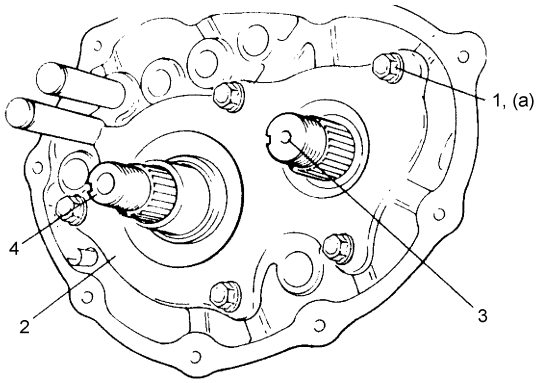


I3RM0A520030-01

11) Select countershaft 5th gear shim as follows.
   a) Put the thickest shim as spare part on bearing outer race, and install left case plate (2).
   b) Tighten used bolts (1) to specified torque.

      Tightening torque
      Left case plate bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

   c) Turn countershaft (3) 10 time or more.



I7V20A522024-01

4. Input shaft

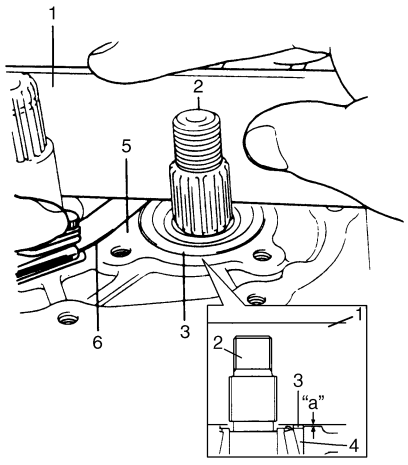
   d) Remove left case plate and shim, and then put used shim (3) on bearing outer race (4) temporarily.
   e) Place straight edge (1) over shim and compress it by hand through straight edge, and then measure "a" by using feeler gauge (6). If clearance "a" is out of specification, repeat step a) to d).

      Clearance between case surface (5) and straight edge
      "a": 0.18 – 0.22 mm (0.0071 – 0.0086 in.)

f) Select suitable shim which adjusts clearance “a” to specification and put it on bearing outer race.

NOTE

Insert 0.20 mm (0.008 in.) feeler to know whether or not a shim fulfills specification quickly.



I7V20A521022-01

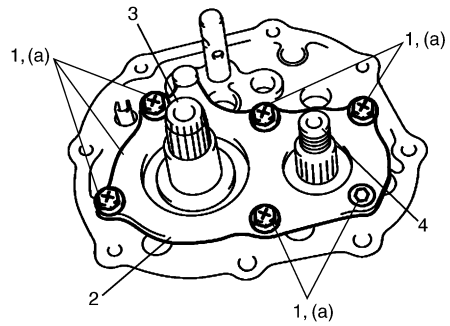
2. Countershaft

12) Install left case plate (2) and tighten new bolts (1) to specified torque.

NOTE

After tightening bolts, make sure that countershaft (4) can be rotated by hand with certain load.

Tightening torque
Left case plate bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I7V20A521023-01

3. Input shaft

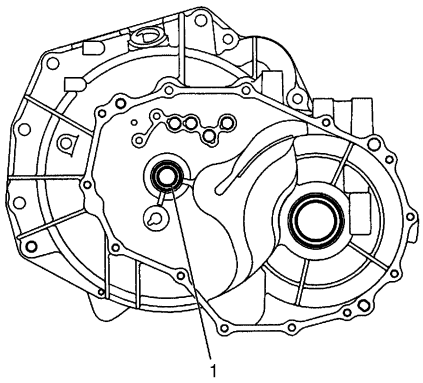
13) Install fifth gear referring to “Fifth Gear Disassembly and Assembly: M13A Model”.
14) Install gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: M13A Model”.
15) Install back up light switch referring to “Back Up Light Switch Removal and Installation: M13A Model”.
16) Check input shaft for rotation in each gear position.
17) Also confirm continuity of back up light switch in reverse position using ohmmeter.

Transaxle Right Case Disassembly and Assembly

S7N20A5216017

Disassembly

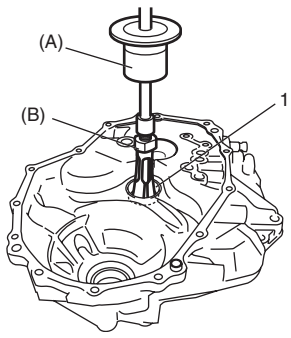
1) Remove gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: M13A Model”.
2) Remove input shaft oil seal (1), if necessary.



I4RS0B521029-01

3) Pull out countershaft right bearing outer race (1) using special tools, if necessary.

Special tool
(A): 09930–30104
(B): 09941–64511



I4RS0B521030-01

4) Replace differential side oil seal from right case referring to “Differential Side Oil Seal Replacement: M13A Model” if necessary.

Assembly

NOTE

Before installation, wash each part and apply specified transaxle oil to sliding faces of bearing and gear.

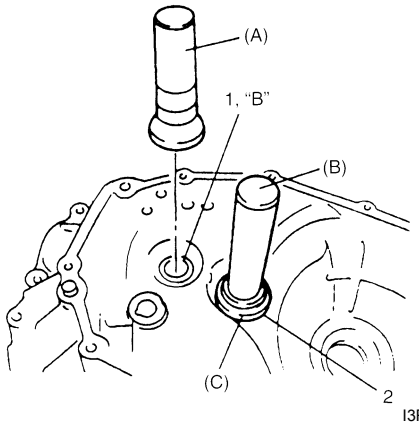
1) Install differential side oil seal into right case referring to “Differential Side Oil Seal Replacement: M13A Model” if removed.
2) If input shaft oil seal (1) has been removed, install it with its spring side facing upward. Use special tool and hammer for installation and apply grease to oil seal lip.

   “B”: Grease 99000–25010 (SUZUKI Super Grease A)

   Special tool
   (A): 09913–75810

3) If countershaft right bearing outer race (2) has been removed, install it using special tools and hammer.

   Special tool
   (B): 09924–74510
   (C): 09925–68210



I3RM0A520047-01

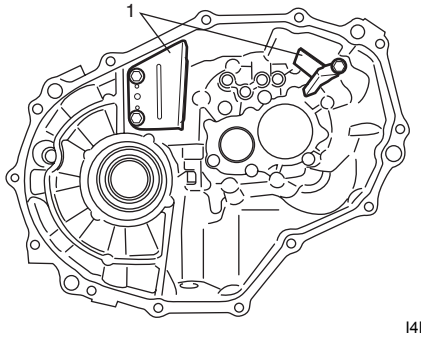
4) Install gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: M13A Model”.

Transaxle Left Case Disassembly and Assembly

S7N20A5216018

Disassembly

1) Replace differential side oil seal from left case referring to “Differential Side Oil Seal Replacement: M13A Model”, if necessary.
2) Remove input oil gutters (1) from left case, if necessary.



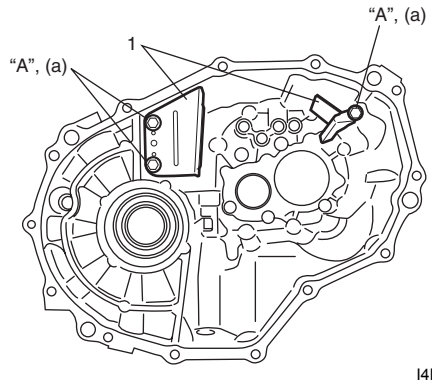
I4RS0B521031-01

Assembly

1) If input oil gutters (1) has been removed, install it with bolt to which thread lock cement has been applied.

   “A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

   Tightening torque
   Oil gutter bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

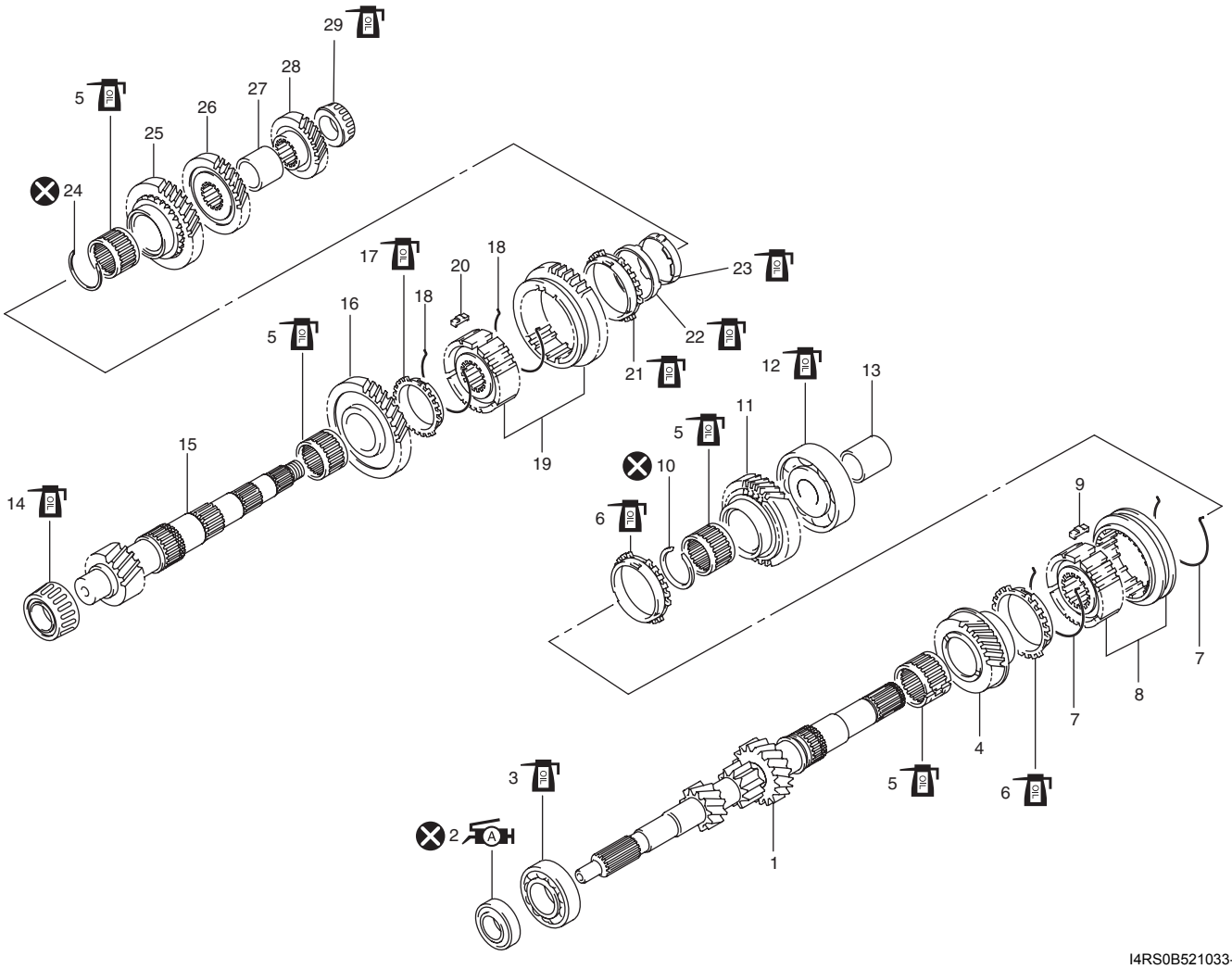


I4RS0B521032-01

2) If differential side oil seal is removed, install it to left case referring to “Differential Side Oil Seal Replacement: M13A Model”.

Input Shaft and Countershaft Components

S7N20A5216019



I4RS0B521033-02

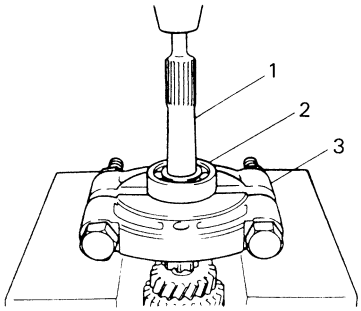
1. Input shaft	12. Input shaft left bearing	23. 2nd gear synchronizer inner ring
2. Oil seal : Apply grease 99000-25010 to oil seal lip.	13. 5th gear spacer	24. Circlip
3. Input shaft right bearing	14. Countershaft right bearing	25. Countershaft 2nd gear
4. Input shaft 3rd gear	15. Countershaft	26. Countershaft 3rd gear
5. Needle bearing	16. Countershaft 1st gear	27. 3rd & 4th gear spacer
6. High speed synchronizer ring	17. 1st gear synchronizer ring	28. Countershaft 4th gear
7. High speed synchronizer spring	18. Low speed synchronizer spring	29. Countershaft left bearing
8. High speed synchronizer sleeve & hub	19. Low speed synchronizer sleeve & hub	: Do not reuse.
9. High speed synchronizer key	20. Low speed synchronizer key	: Apply transaxle oil.
10. Circlip	21. 2nd gear synchronizer outer ring	
11. Input shaft 4th gear	22. 2nd gear synchronizer center cone	

Input Shaft Assembly Disassembly and Reassembly

S7N20A5216020

Disassembly

1) Remove input shaft right bearing (2) from input shaft (1) using bearing puller (3) and hydraulic press.

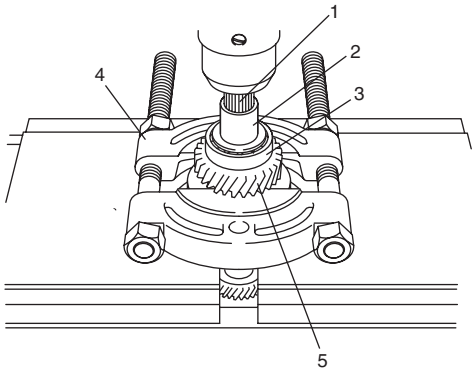


IYSY01521048-01

2) Drive out 5th gear spacer (2), left bearing (3) and 4th gear (5) from input shaft (1) using bearing puller (4) and hydraulic press.

⚠ CAUTION

To avoid gear tooth from being damaged, support it at flat side of bearing puller.

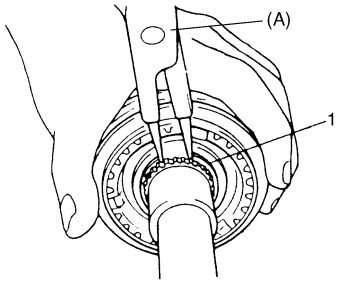


I4RS0B521034-02

3) Take out needle bearing and high speed synchronizer ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107

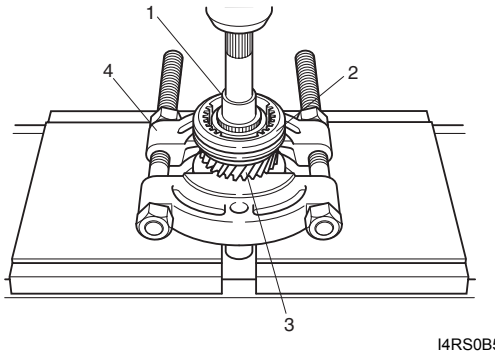


I2RH01520046-01

5) Drive out high speed synchronizer sleeve & hub assembly (2) together with 3rd gear (3) from input shaft (1) using bearing puller (4) and hydraulic press.

⚠ CAUTION

Make sure to use flat side of bearing puller to avoid causing damage to 3rd gear tooth.



I4RS0B521035-01

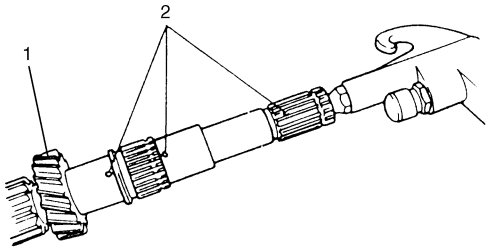
6) Take out 3rd gear needle bearing from shaft.

7) Disassemble high speed synchronizer sleeve & hub assembly.

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.

2) To ensure lubrication of input shaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



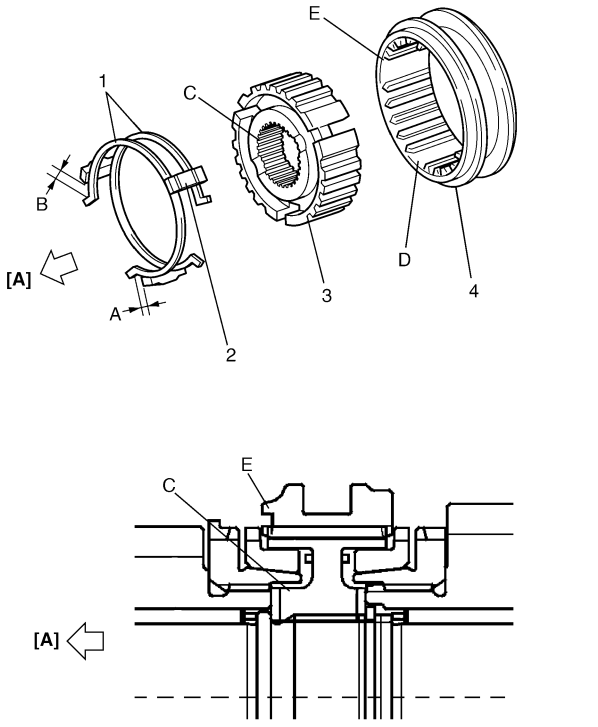
I2RH01520049-01

3) Fit high speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.**

Synchronizer key installation position
A = B

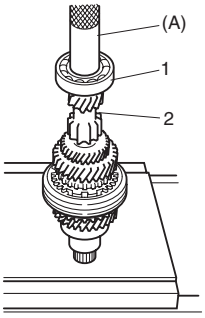


I4RS0B521036-01

[A]: 3rd gear side	D: Key way
C: Long flange	E: Projecting end

4) Drive in right bearing (1) to input shaft (2) using special tool and hydraulic press.

Special tool
(A): 09913–80113



I4RS0B521037-01

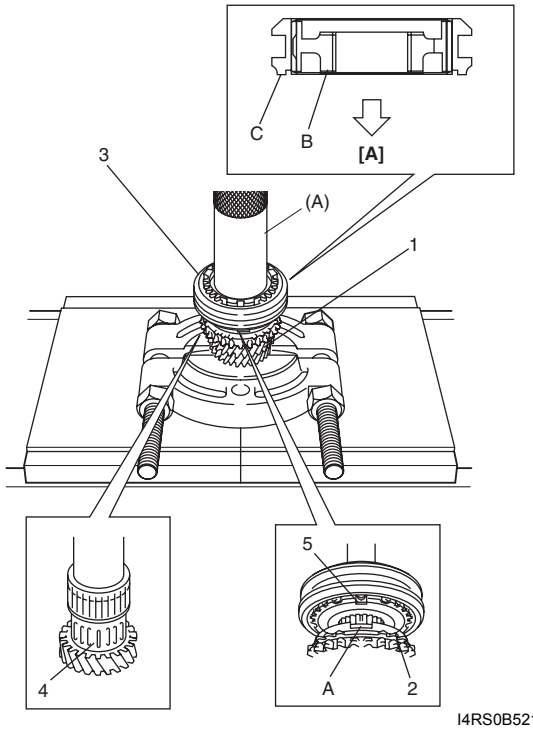
5) Install 3rd gear needle bearing (4), apply oil to it, then install 3rd gear (1) and synchronizer ring (2).

6) Drive in high speed synchronizer sleeve & hub assembly (3) using special tool and hammer, facing long flange side of hub to 3rd gear.

NOTE

- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys (5) in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**
- **Synchronizer rings for 3rd and 4th are identical.**

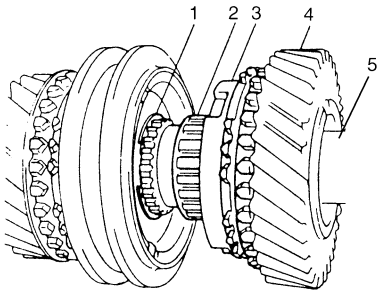
Special tool
(B): 09913–84510



I4RS0B521038-01

[A]: 3rd gear side	B: Long flange
A: Key slots	C: Projecting end

7) Install circlip (1) and confirm that circlip is installed in groove securely. Install needle bearing (2) of apply oil to it and then install synchronizer ring (3) and 4th gear (4).

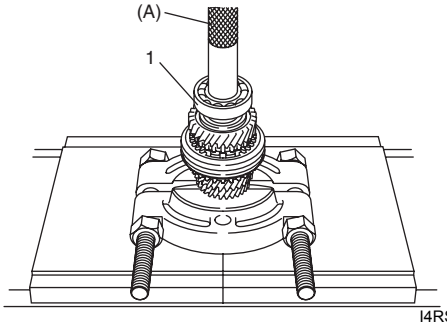


I2RH01520052-01

5. Input shaft

8) Press-fit left bearing (1) using special tool and hydraulic press.

Special tool
(A): 09925–98221



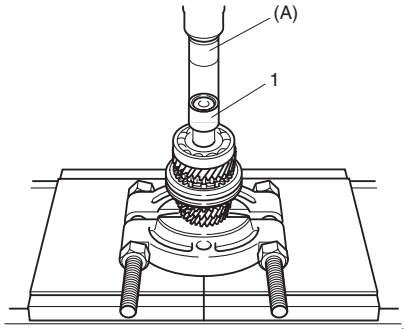
I4RS0B521039-01

9) Using the same special tool at Step 8), drive in 5th gear spacer (1).

⚠ CAUTION

To prevent 5th gear spacer from being distorted because of excessive compression, do not press-fit it with left bearing at once.

Special tool
(A): 09925–98221



I4RS0B521040-01

Countershaft Assembly Disassembly and Reassembly

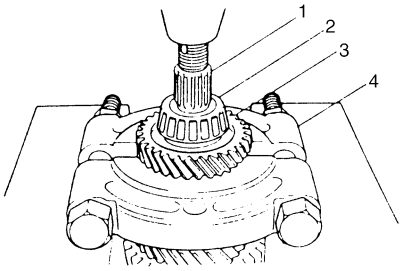
S7N20A5216021

Disassembly

1) Drive out left bearing cone (2) with 4th gear (3) from countershaft (1) using bearing puller (4) and hydraulic press.

⚠ CAUTION

- **Use bearing puller and hydraulic press that will bear at least 5 ton (11,000 lb) safely.**
- **To avoid tooth damage, support 4th gear at flat side of bearing puller.**

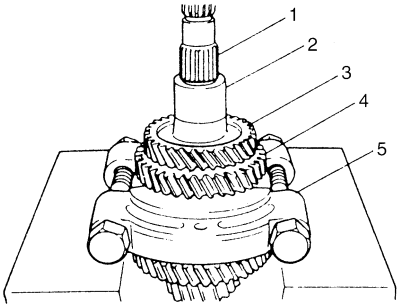


I2RH01520054-01

2) Apply bearing puller (5) to 2nd gear (4) and drive out 3rd & 4th gear spacer (2) and 3rd gear (3) together with 2nd gear from countershaft (1) using hydraulic press. Take out needle bearing from countershaft.

⚠ CAUTION

- **If compression exceeds 5 ton (11,000 lb), release compression once, reset bearing puller support and then continue press work again.**
- **To avoid gear tooth from being damaged, support it at flat side of bearing puller.**

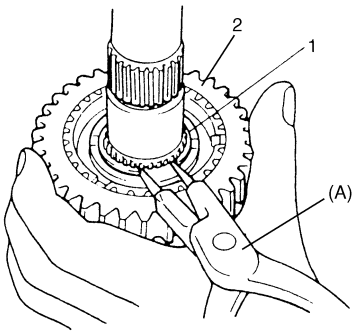


I2RH01520055-01

3) Take out 2nd gear synchronizer outer ring, center cone and inner ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107



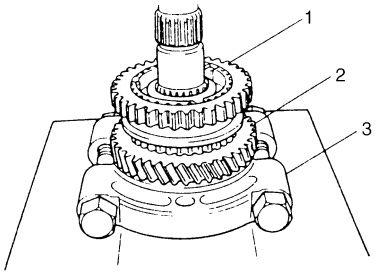
I2RH01520056-01

2. Low speed synchronizer sleeve

5) Apply bearing puller (3) to 1st gear (2) and drive out low speed synchronizer sleeve & hub assembly (1) with 1st gear using hydraulic press.

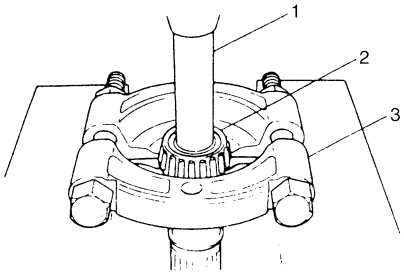
⚠ CAUTION

To avoid gear tooth from being damaged, support it at flat side of bearing puller.



I2RH01520057-01

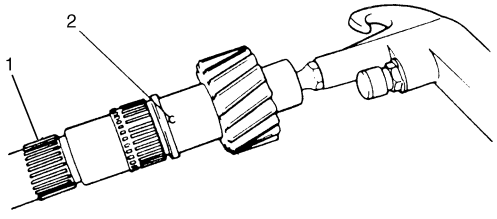
6) Disassemble low speed synchronizer sleeve & hub assembly.
7) Take out 1st gear needle bearing from shaft.
8) Remove right bearing cone (2) using bearing puller (3), metal stick (1) and hydraulic press.



I2RH01520058-01

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) To ensure lubrication of countershaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



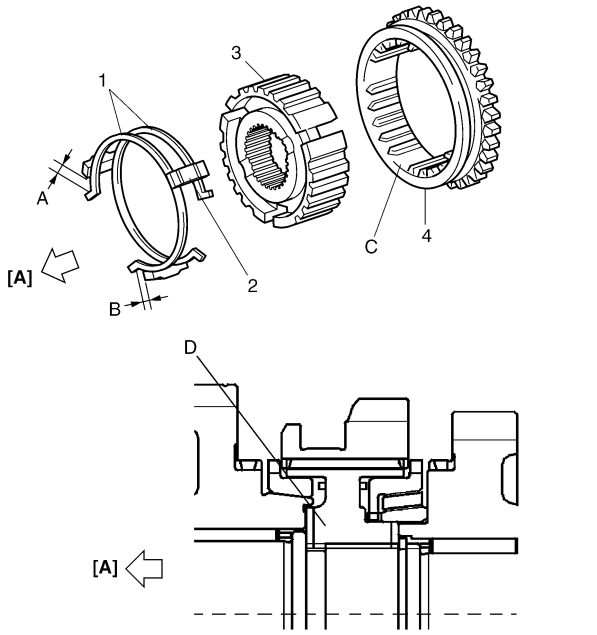
I2RH01520060-01

3) Fit low speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.**

Synchronizer key installation position
A = B

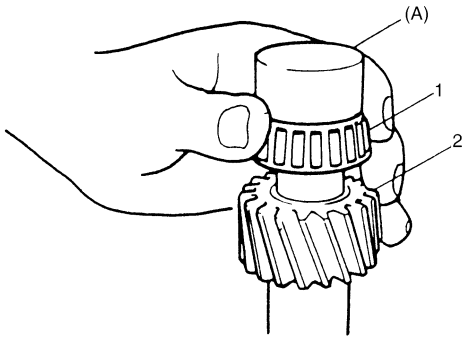


I4RS0B521041-01

[A]: 1st gear side	D: Short flange
C: Key way	

4) Install right bearing cone (1) to countershaft (2) using special tool and hydraulic press.

Special tool
(A): 09923–78210



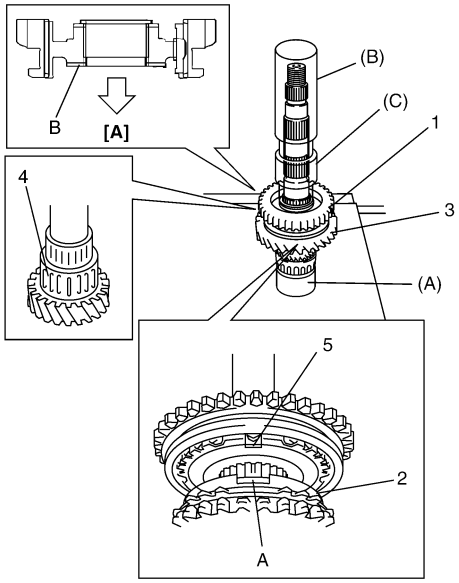
I2RH01520062-01

5) Install needle bearing (4), apply oil to it, then install 1st gear and 1st gear synchronizer ring.
6) Drive in low speed synchronizer sleeve & hub assembly (1) using special tools and hydraulic press.

NOTE

- **Support shaft with special tool as shown in the figure so that retainer of bearing cone (4) will be free from compression.**
- **Make sure that synchronizer ring (2) key slots are aligned with keys (5) while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st gear (3) after press-fitting sleeve & hub assembly.**

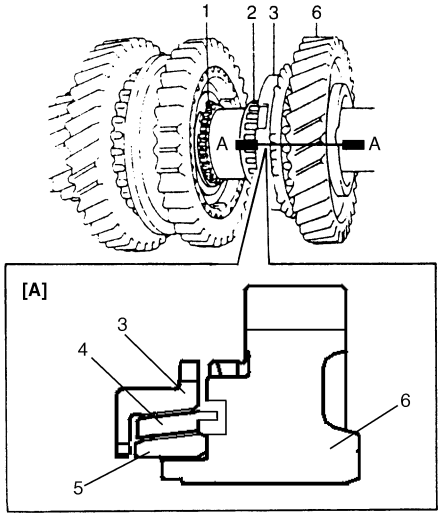
Special tool
(A): 09923–78210
(B): 09925–18011
(C): 09940–53111



I4RS0B521042-01

[A]: 1st gear side	B: Short flange
A: Key slots	

7) Install new circlip (1) and confirm that circlip is installed in groove securely.

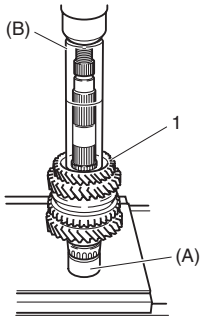


I4RS0B521043-01

[A]: Section A – A

8) Press-fit 3rd gear (1) using special tools and hydraulic press.

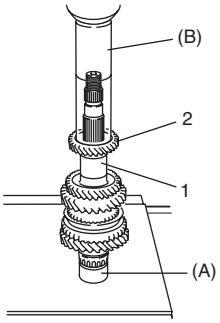
Special tool
(A): 09923–78210
(B): 09913–84510



I4RS0B521044-01

9) Press-fit spacer (1) and 4th gear (2) using special tools and hydraulic press.

Special tool
(A): 09923–78210
(B): 09913–84510



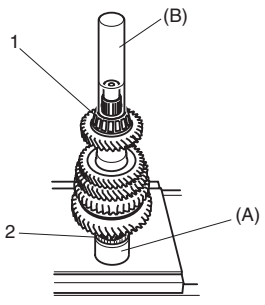
I4RS0B521045-01

10) Install left bearing cone (1) using special tools and hydraulic press.

NOTE

For protection of right bearing cone (2), always support shaft with special tool as shown in the figure.

Special tool
(A): 09923–78210
(B): 09925–98221



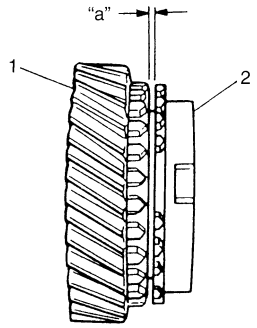
I4RS0B521046-01

Synchronizer Parts Inspection

S7N20A5216022

Check clearance “a” between synchronizer ring (2) and gear (1), each chamfered tooth of gear, synchronizer ring and sleeve, then determine parts replacement.

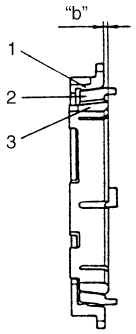
Clearance “a” between synchronizer ring and gear
Standard: 0.7 – 1.0 mm (0.028 – 0.039 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520048-01

Put the 2nd gear synchronizer outer ring (1), inner ring (3) and the cone (2) together and then measure the step difference between the outer ring and the inner ring. And also check each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

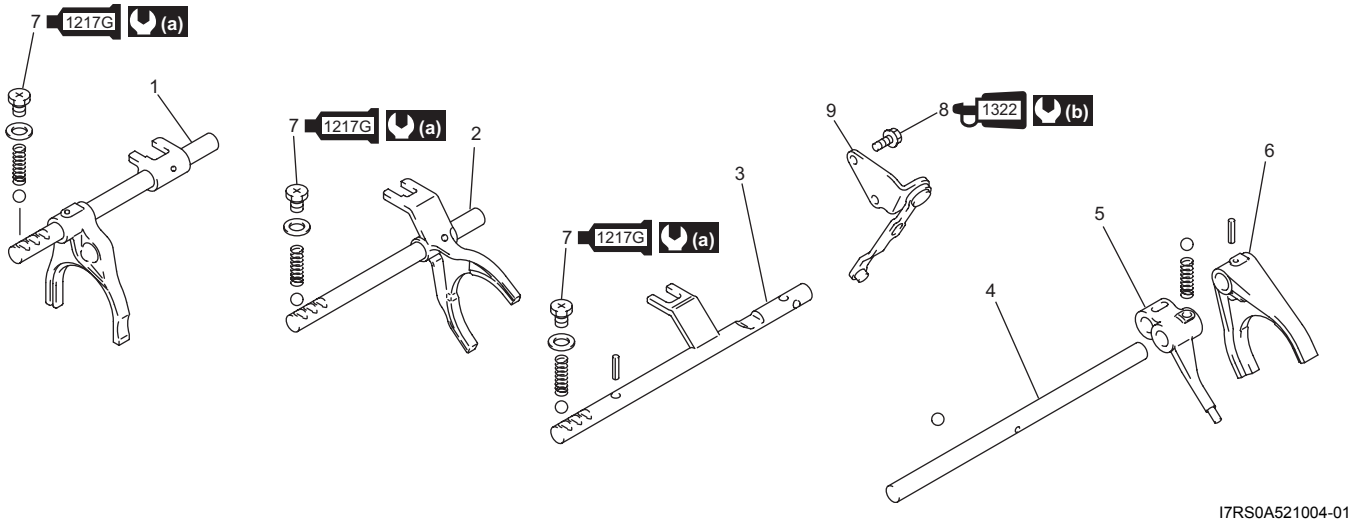
Difference “b” between synchronizer outer ring and inner ring
Standard: 0.7 – 1.0 mm (0.028 – 0.039 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520059-01

Gear Shift Shaft Components

S7N20A5216023



I7RS0A521004-01

1. Low speed gear shift shaft	5. Reverse gear shift arm	9. Reverse gear shift lever
2. High speed gear shift shaft	6. 5th gear shift fork	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
3. 5th & reverse gear shift shaft	1217G 7. Gear shift locating bolt : Apply sealant 99000-31260 to bolt thread.	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
4. 5th & reverse gear shift guide shaft	1322 8. Reverse gear shift lever bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	

5th and Reverse Gear Shift Shafts Disassembly and Assembly

S7N20A5216024

Disassembly

Disassemble component parts using special tool and hammer.

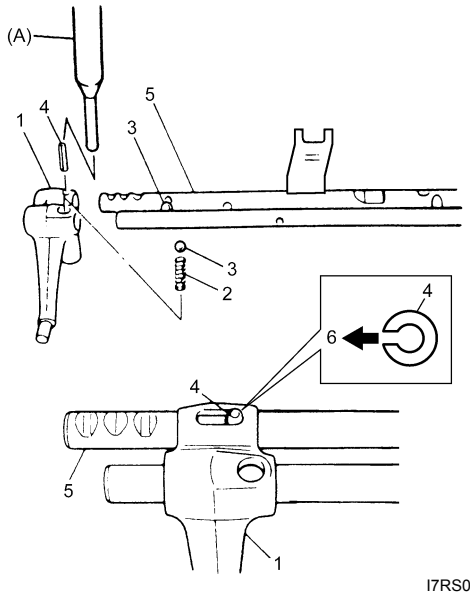
Special tool
(A): 09922–85811

Assembly

Replace or correct parts as required and assemble shafts making sure that component parts are in proper order as shown.

NOTE

- **Distinguish reverse gear shift arm spring (Blue) (2) from low speed locating spring.**
- **Install 2 steel balls (3) in reverse gear shift arm (1) without fail.**
- **Confirm slit of spring pin (4) is directed 5th gear side (6), and then drive in spring pin (4) to 5th & reverse gear shift shaft (5).**



I7RS0A521005-01

Gear Shift Shaft and Fork Inspection

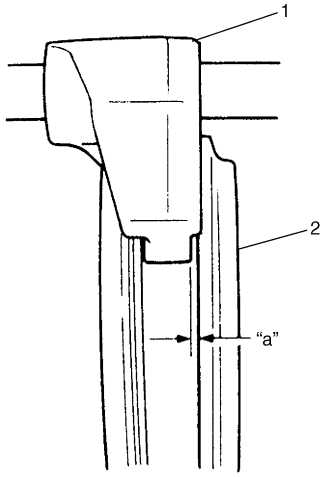
S7N20A5216025

Using feeler gauge, check clearance between fork (1) and sleeve (2) and replace those parts if it exceeds limit.

NOTE

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

Clearance “a” between fork and sleeve
Service limit “a”: 1.0 mm (0.039 in.)

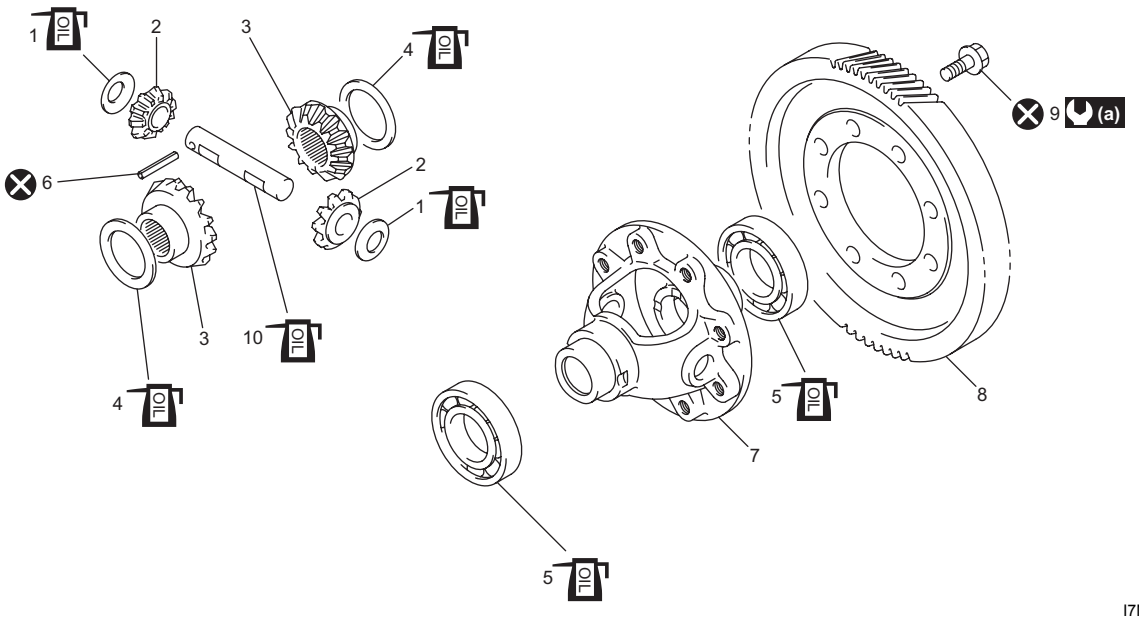


I2RH01520068-01

Insert each gear shift shaft into case and check that it moves smoothly. If it doesn’t, correct using oilstone, reamer or the like.

Differential Components

S7N20A5216026



I7N20A521004-01

1. Differential pinion washer	8. Final gear
2. Differential side pinion gear	9. Final gear bolt
3. Differential side gear	10. Differential pinion shaft
4. Side gear washer	(a) : 90 N·m (9.0 kgf-m, 65.0 lbf-ft)
5. Differential side bearing	: Do not reuse.
6. Differential pinion shaft pin	OIL : Apply transaxle oil.
7. Differential case	

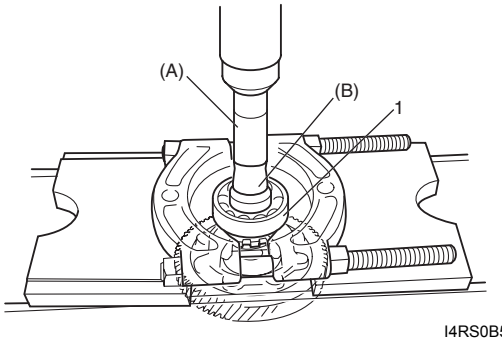
Differential Disassembly and Assembly

S7N20A5216027

Disassembly

1) Using special tools and hydraulic press, remove right bearing (1).

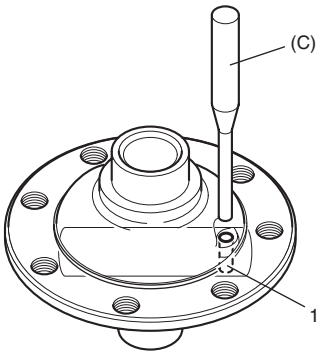
Special tool
(A): 09924–74510
(B): 09924–74590



I4RS0B521049-01

2) Remove left bearing in the same manner at Step 1).
3) Support differential case with soft jawed vise and remove final gear bolts then take out final gear.
4) Using special tool and hammer, drive out differential pinion shaft pin (1) and then disassemble component parts.

Special tool
(C): 09922–85811



I4RS0B521051-01

Assembly

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 all parts are clean.

1) Assemble differential gear and measure thrust play of differential gear as follows.

Special tool
(A): 09900–20607
(B): 09900–20701

Differential gear thrust play
0.03 – 0.31 mm (0.001 – 0.012 in.)

Left side

1. Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to top surface of gear (2).
2. Using 2 screwdrivers (1), move gear up and down and read movement of dial gauge pointer.

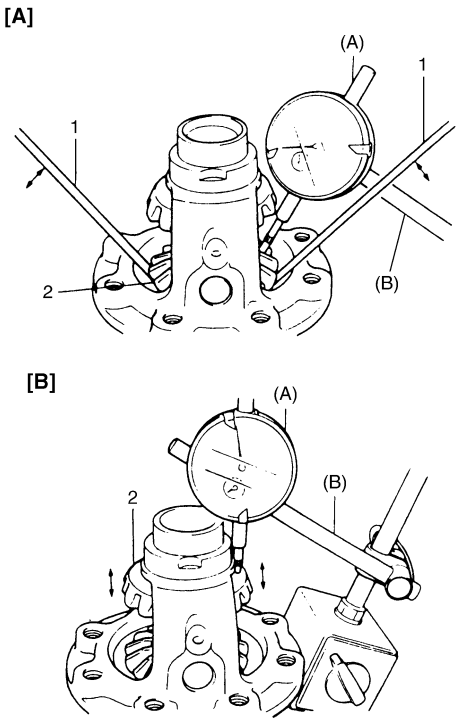
Right side

1. Using similar procedure to the left side, set dial gauge tip to gear (2) shoulder.
2. Move gear up and down by hand and read dial gauge.

2) If thrust play is out of specification, select suitable thrust washer from among the following available size, install it and check again that specified gear play is obtained.

Available thrust washer thickness

0.90 mm (0.035 in.)	**1.05 mm (0.041 in.)**
0.95 mm (0.037 in.)	**1.10 mm (0.043 in.)**
1.00 mm (0.039 in.)	**1.15 mm (0.045 in.)**



I3RH0A520083-01

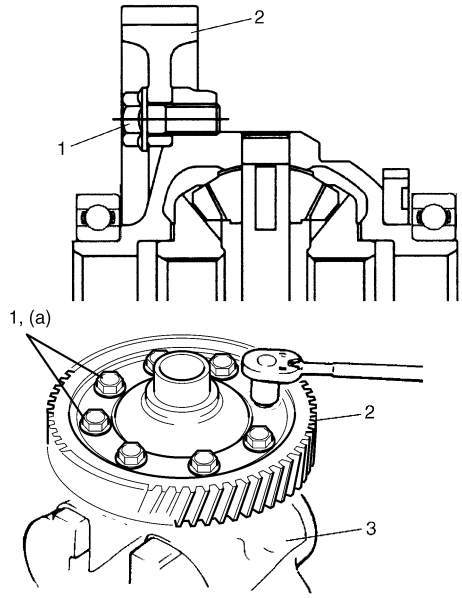
[A]: Left side	[B]: Right side

3) Hold differential assembly with soft jawed vise (3), install final gear (2) as shown in the figure and then tighten new bolts (1) to specified torque.

⚠ CAUTION

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

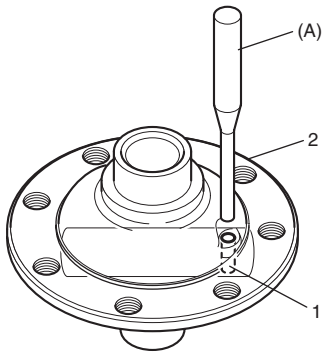
Tightening torque
Final gear bolt (a): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)



I4RS0B521052-01

4) Using special tool and hammer, drive in new differential pinion shaft pin (1) till the depth from differential case (2) surface is about 1 mm (0.04 in.).

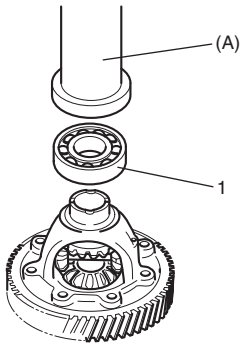
Special tool
(A): 09922–85811



I4RS0B521053-01

5) Press-fit bearings (1) using special tools and copper hydraulic press.

Special tool
(A): 09913–76010



I7N20A521005-01

Specifications

Tightening Torque Specifications

S7N20A5217001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Transaxle oil drain plug	21	2.1	15.5	☞
Transaxle oil level / filler plug	21	2.1	15.5	☞
Back up light switch	23	2.3	17.0	☞
Gear shift guide case bolt	23	2.3	17.0	☞
Select lever bracket bolt	23	2.3	17.0	☞
Gear shift interlock bolt	23	2.3	17.0	☞
5th to reverse interlock guide bolt	23	2.3	17.0	☞
Countershaft nut	70	7.0	51.0	☞
Side cover bolt	10	1.0	7.5	☞
Reverse gear shift lever bolt	23	2.3	17.0	☞
Transaxle case bolt	23	2.3	17.0	☞
Reverse shaft bolt	23	2.3	17.0	☞
Gear shift locating bolt	13	1.3	9.5	☞
Left case plate bolt	23	2.3	17.0	☞
Left case plate bolt	10	1.0	7.5	☞
Oil gutter bolt	10	1.0	7.5	☞
Final gear bolt	90	9.0	65.0	☞

NOTE

The specified tightening torque is also described in the following.
“Gear Shift Control Lever and Cable Components: M13A Model”
“Manual Transaxle Unit Components: M13A Model”
“Gear Shift and Select Shaft Assembly Components: M13A Model”
“Manual Transaxle Assembly Components: M13A Model”
“Gear Shift Shaft Components: M13A Model”
“Differential Components: M13A Model”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A5218001

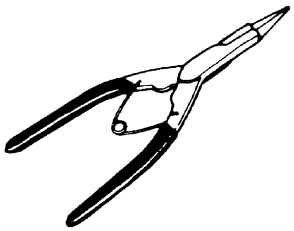
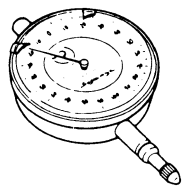
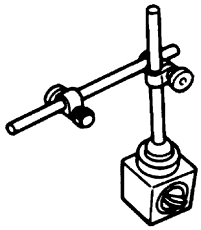
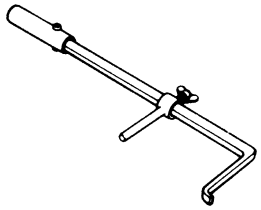
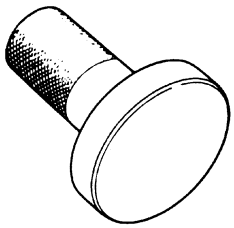
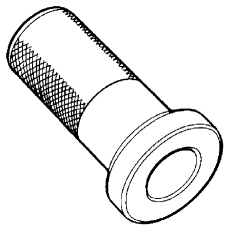
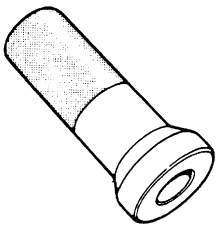
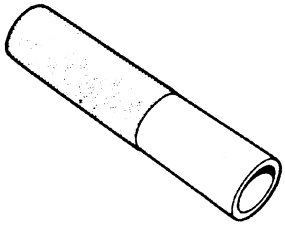
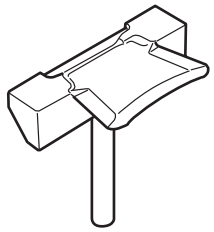
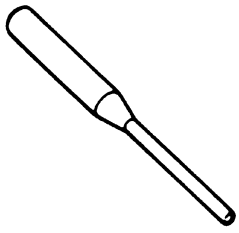
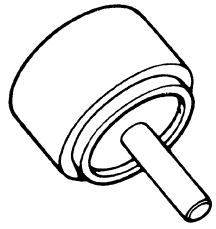
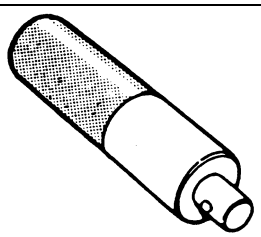
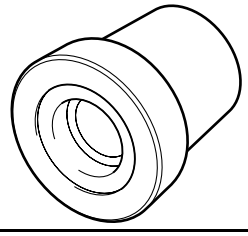
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞ / ☞ / ☞

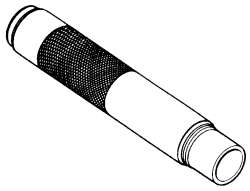
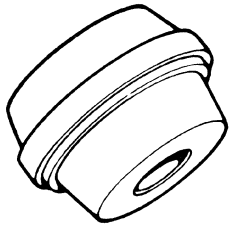
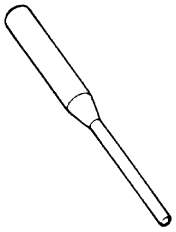
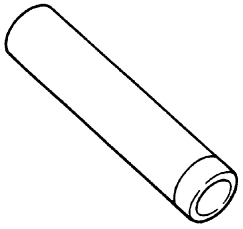
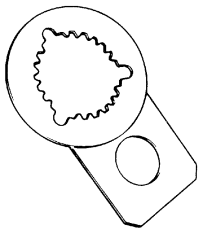
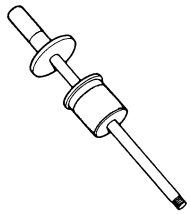
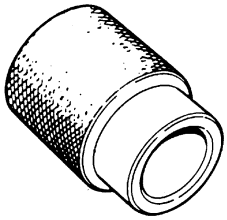
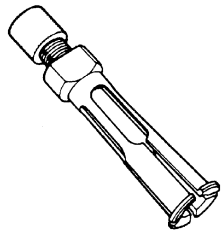
NOTE

Required service material is also described in the following.
“Gear Shift Control Lever and Cable Components: M13A Model”
“Gear Shift and Select Shaft Assembly Components: M13A Model”
“Manual Transaxle Assembly Components: M13A Model”
“Input Shaft and Countershaft Components: M13A Model”
“Gear Shift Shaft Components: M13A Model”
“Differential Components: M13A Model”

Special Tool

S7N20A5218002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞ 	09900–20607 Dial gauge ☞ 
09900–20701 Magnetic stand ☞ 	09913–50121 Oil seal remover ☞ 
09913–75510 Bearing installer ☞ 	09913–75810 Bearing installer ☞ 
09913–76010 Bearing installer ☞ 	09913–80113 Bearing installer ☞ 
09913–84510 Bearing installer ☞ / ☞ / ☞ / ☞ / ☞ 	09921–96510 Oil pan seal cutter ☞ 
09922–85811 Spring pin remover (4.5 mm) ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 	09923–78210 Bearing installer ☞ / ☞ / ☞ / ☞ / ☞ 
09924–74510 Bearing and oil seal handle ☞ / ☞ 	09924–74590 Input shaft oil seal installer attachment ☞ 

09925–18011 Transmission gear, bush and bearing installer ☞ 	09925–68210 Bearing outer race installer ☞ 
09925–78210 Spring pin remover (6 mm) ☞ 	09925–98221 Bearing installer ☞ / ☞ / ☞ 
09927–76010 Gear holder ☞ / ☞ 	09930–30104 Sliding shaft ☞ 
09940–53111 Differential side bearing installer ☞ 	09941–64511 Bearing and oil seal remover (30 mm Min.) ☞ 

M15A and M16A Model

General Description

Manual Transaxle Construction and Servicing

S7N20A5221001

The transaxle provides five forward speeds and one reverse speed by means of three synchromeshs 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 done 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.

To prevent the cracking noise from the reverse gear when shifting transaxle gear into the reverse gear, the reverse shift braking device is used.

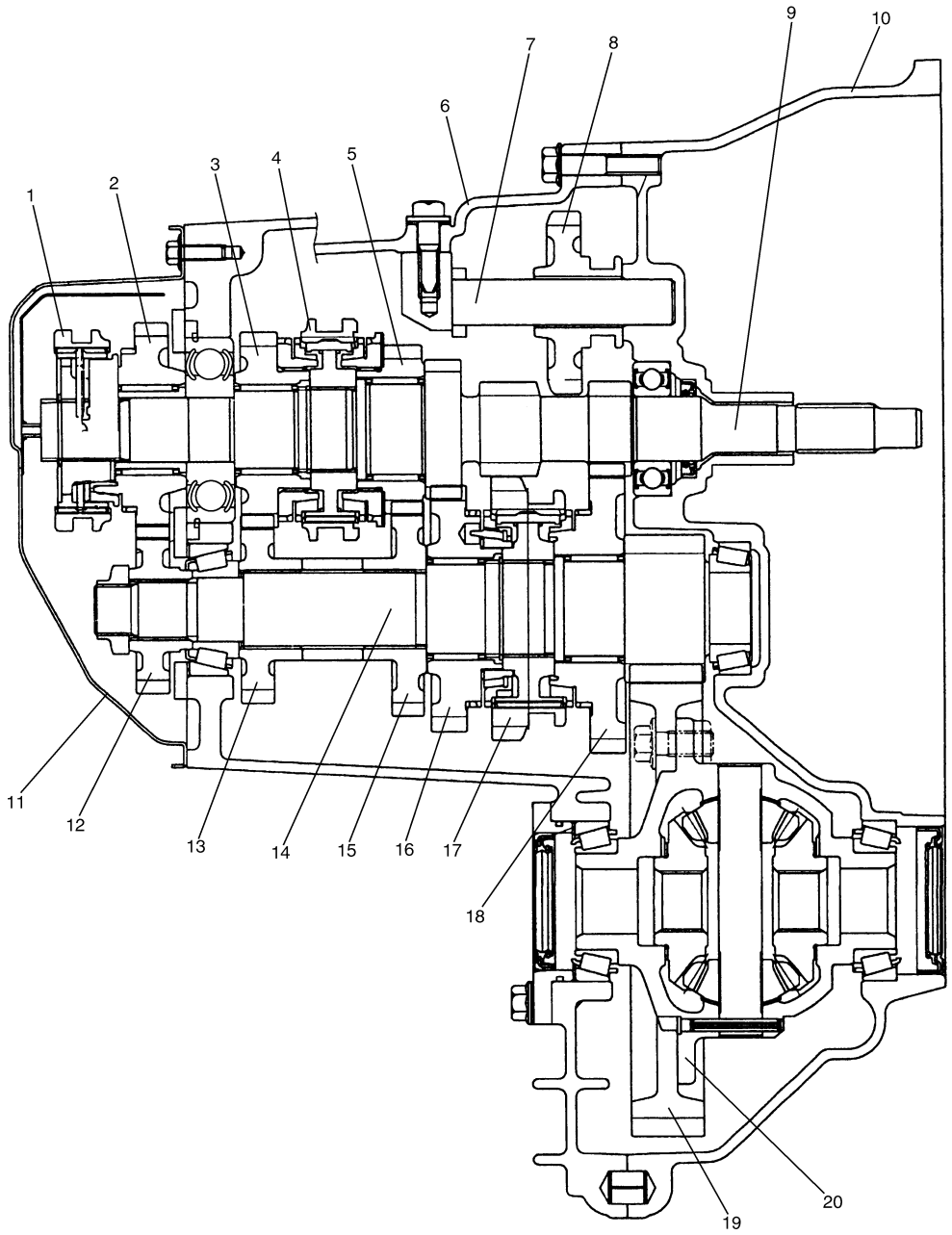
The device utilizes the 5th synchromesh, which is the lever synchro type, to apply the brake on the input shaft rotation.

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.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of countershaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



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1. 5th speed sleeve & hub	8. Reverse idler gear	15. Countershaft 3rd gear
2. Input shaft 5th gear	9. Input shaft	16. Countershaft 2nd gear
3. Input shaft 4th gear	10. Right case	17. Low speed synchronizer sleeve & hub
4. High speed synchronizer sleeve & hub	11. Side cover	18. Countershaft 1st gear
5. Input shaft 3rd gear	12. Countershaft 5th gear	19. Final gear
6. Left case	13. Countershaft 4th gear	20. Differential case
7. Reverse gear shaft	14. Countershaft	

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

S7N20A5224001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Worn shift fork shaft	*Replace.*
	Worn shift fork or synchronizer sleeve	*Replace.*
	Weak or damaged locating springs	*Replace.*
	Worn bearings on input shaft or countershaft	*Replace.*
	Worn chamfered tooth on sleeve and gear	*Replace sleeve and gear.*
Hard shifting	Maladjusted gear select control cable	*Adjust.*
	Inadequate or insufficient lubricant	*Replenish.*
	Improper clutch pedal free travel	*Replace clutch master cylinder or clutch pedal arm.*
	Distorted or broken clutch disc	*Replace.*
	Damaged clutch pressure plate	*Replace clutch cover.*
	Worn synchronizer ring	*Replace.*
	Worn chamfered tooth on sleeve or gear	*Replace sleeve or gear.*
	Worn gear shift / select control cables joint	*Replace.*
	Distorted shift shaft	*Replace.*
	Worn gear shift / select control cables	*Replace.*
Noise	Inadequate or insufficient lubricant	*Replenish.*
	Damaged or worn bearing(s)	*Replace.*
	Damaged or worn gear(s)	*Replace.*
	Damaged or worn synchronizer parts	*Replace.*

Repair Instructions

Manual Transaxle Oil Change

S7N20A5226001

1) Before changing or inspecting oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check oil level and leakage. If leakage exists, correct it.

NOTE

Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage.

3) Remove oil filler plug (2).
4) Remove drain plug (1), and drain old oil.
5) Apply sealant to thread of drain plug (1), and tighten it to specified torque.

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

Tightening torque
Transaxle oil drain plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

6) Pour new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE

It is highly recommended to use API GL-4 75W-90 gear oil.

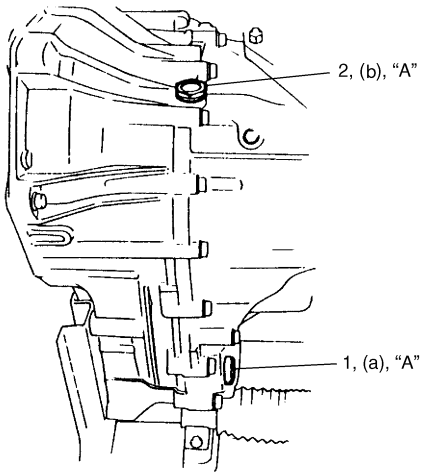
Transaxle oil specification
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

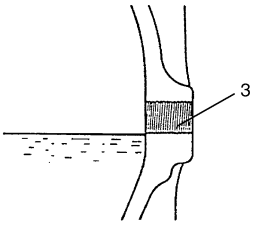
Manual transaxle oil capacity
Reference: 2.2 liters (4.8/3.9 US/Imp. pt)

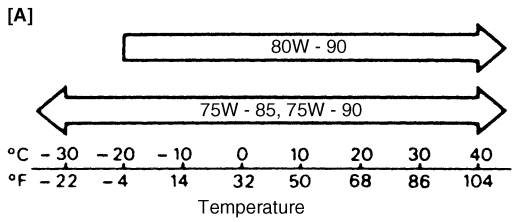
7) Apply sealant to thread of level / filler plug, and then tighten it to specified torque.

"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)







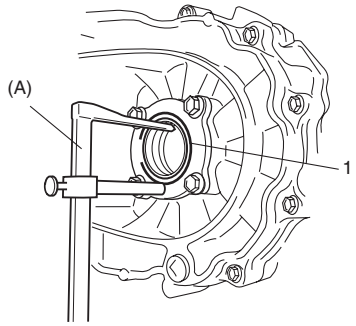
I4RS0A520001-01

Differential Side Oil Seal Replacement

S7N20A5226002

1) Lift up vehicle and drain transaxle oil.
2) Remove front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".
3) Remove oil seal (1) using special tool.

Special tool
(A): 09913–50121



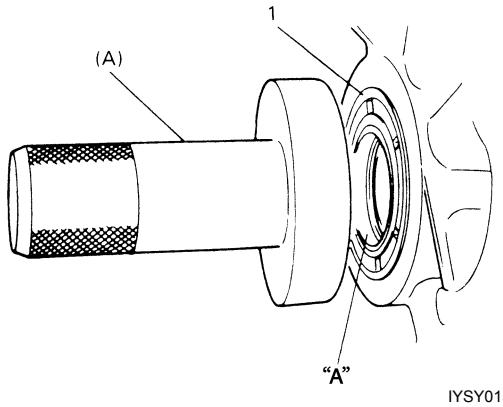
I4RH01520003-01

4) Install oil seal (1) facing its spring side inward. Use special tool and hammer for installation.

Special tool
(A): 09913–85210

5) Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.

"A": Grease 99000–25011 (SUZUKI Super Grease A)



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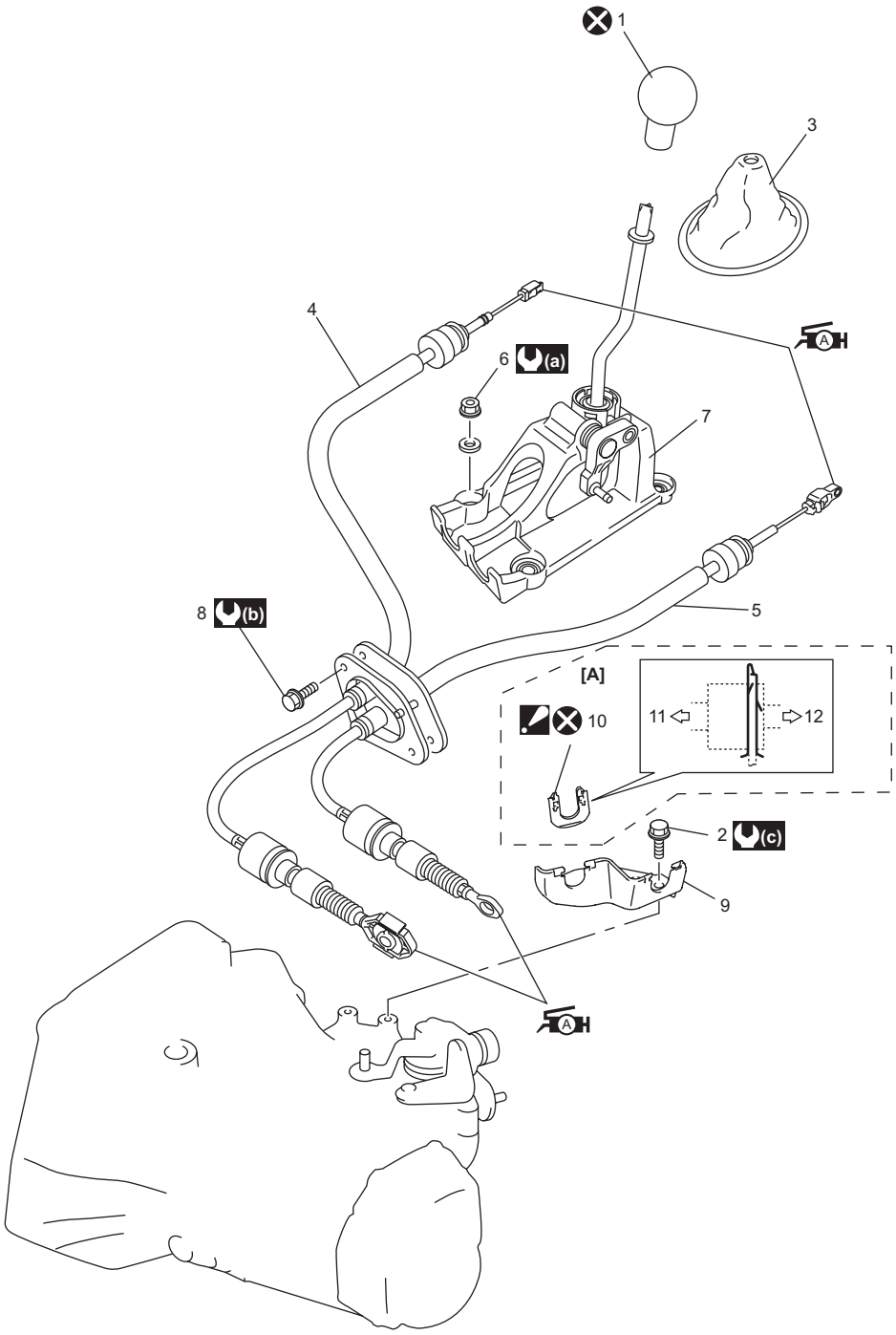
6) Insert front drive shaft and/or center shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".
7) Fill transaxle oil as specified referring to "Manual Transaxle Oil Change: M15A and M16A Model", and make sure that oil has been sealed with oil seal.

Gear Shift Control Lever and Cable Components

S7N20A5226003



I7N20A522001-02

[A]: M16A model only	6. Gear shift control lever assembly mounting nut	12. To bracket
1. Gear shift control lever knob	7. Gear shift control lever assembly	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
2. Cable bracket bolt	8. Cable grommet bolt	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Gear shift lever boot	9. Cable bracket	(c) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
4. Gear shift control cable : Apply grease 99000-25011 to cable end.	10. Clip Be sure to direct claw of clip to bracket side as shown in figure.	: Do not reuse.
5. Gear select control cable : Apply grease 99000-25011 to cable end.	11. To gear shift control lever assembly	

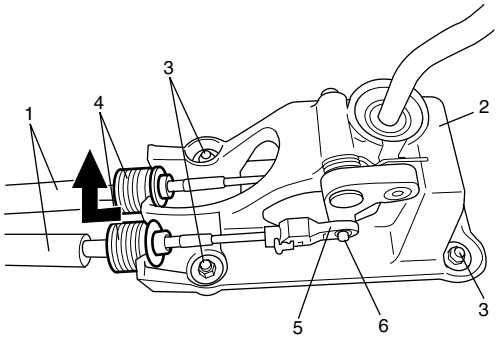
Gear Shift Control Lever and Cable Removal and Installation

S7N20A5226004

Removal

M15A model

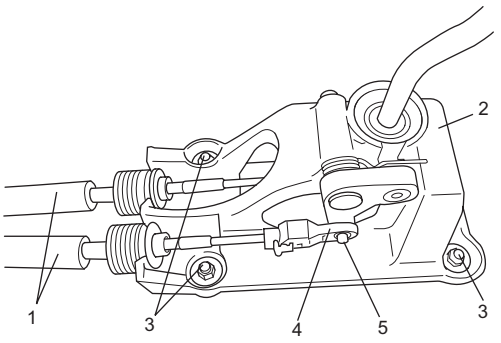
1) Remove console box.
2) Disconnect cable ends (5) from pivot (6) of gear shift control lever assembly.
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) as shown in figure.
4) Remove gear shift control lever assembly mounting nuts (3) and gear shift lever assembly from floor panel.
5) Disconnect gear shift and select control cables from transaxle.
6) Remove cable grommet bolt, and then remove gear shift and select control cables from floor panel.



I4RS0A520003-01

M16A model

1) Remove console box.
2) Disconnect cable ends (4) from pivot (5) of gear shift control lever assembly.
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2).
4) Remove gear shift lever assembly from floor panel by loosening nuts (3).



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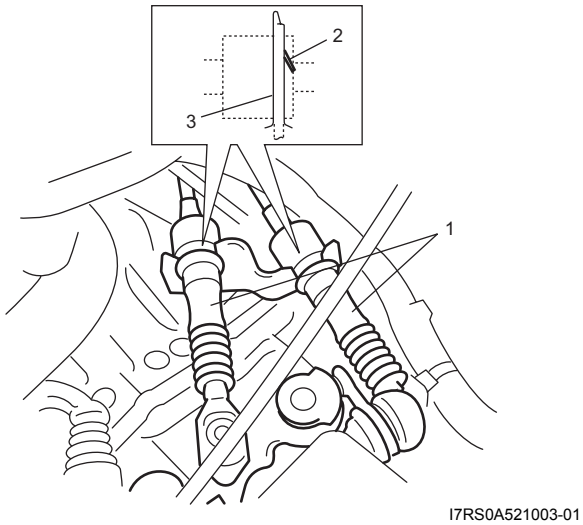
5) Disconnect gear shift and select control cables (1) from cable bracket while pressing claws (2) of clip (3).



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6) Remove cable grommet bolt, and then remove gear shift and select control cables from floor panel.

Installation

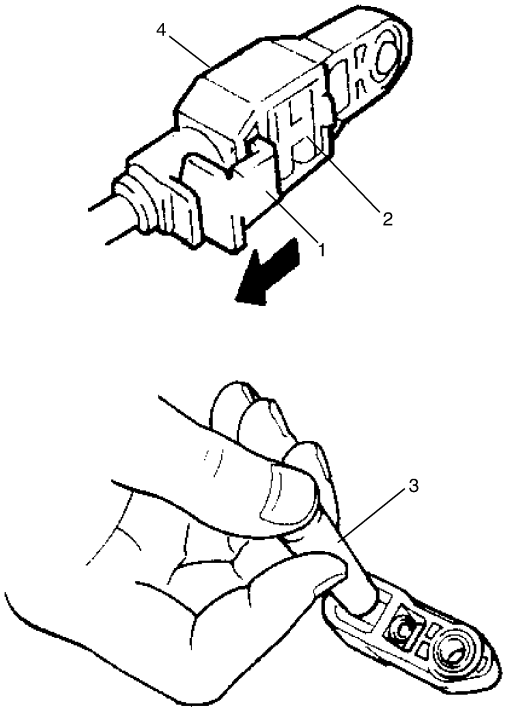
Reverse removal procedure for installation nothing the following.

- Tighten each bolts and nuts to specified torque referring to “Gear Shift Control Lever and Cable Components: M15A and M16A Model”.
- Adjust gear select control cable referring to “Gear Select Control Cable Adjustment: M15A and M16A Model”.

Gear Select Control Cable Adjustment

S7N20A5226005

1) Release lock plate (1) which restricts moving of cable end holder (2).
2) Push cable end holder (2) out from adjuster (4) using appropriate tool (3) to disengage cable.



I4RS0A520004-01

3) Apply grease to pin (5) of gear shift control lever, and then install adjuster (1) into pin of gear shift control lever securely.

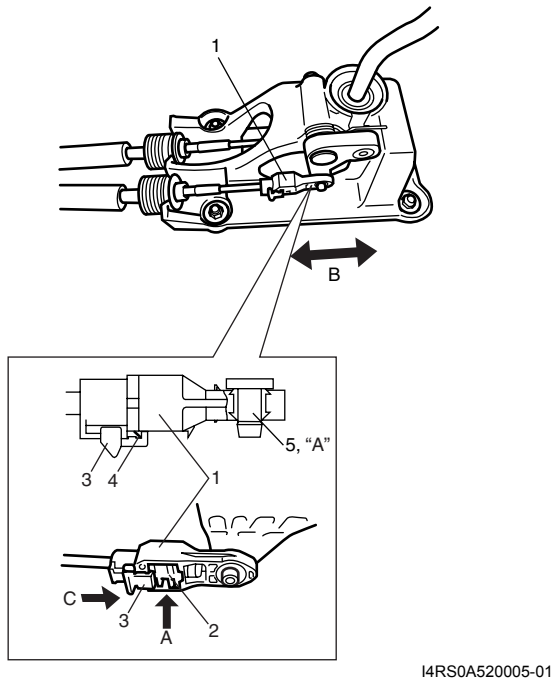
"A": Grease 99000–25011 (SUZUKI Super Grease A)

4) Push cable end holder (2) in the direction of A.

NOTE

At this time, do not apply force in the cable operation direction B to adjuster.

5) Slide lock plate (3) in the direction of C, until it gets over the claw (4) of cable end holder.



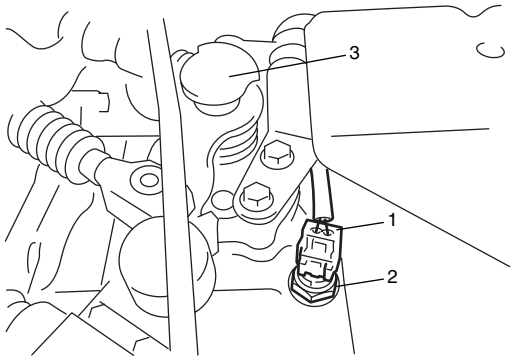
I4RS0A520005-01

Back Up Light Switch Removal and Installation

S7N20A5226007

Removal

1) Remove battery and tray with coolant reservoir.
2) Disconnect back up light switch coupler (1).
3) Remove back up light switch (2).



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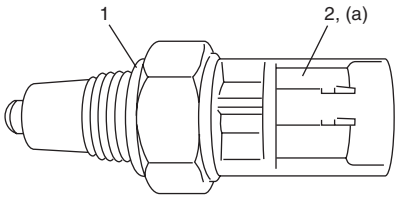
3. Gear shift and select shaft assembly

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

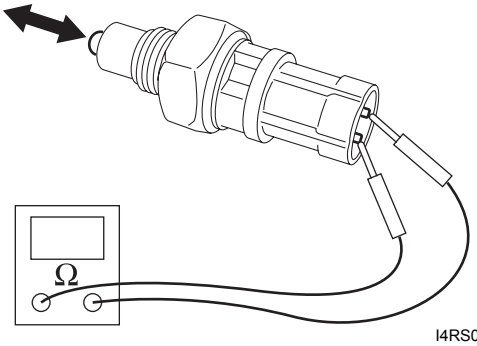
2) Connect back up light switch coupler.
3) Install battery and tray, and then install coolant reservoir to battery tray.

Back Up Light Switch Inspection

S7N20A5226008

Check back up light switch for function using ohmmeter.

Back up light switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



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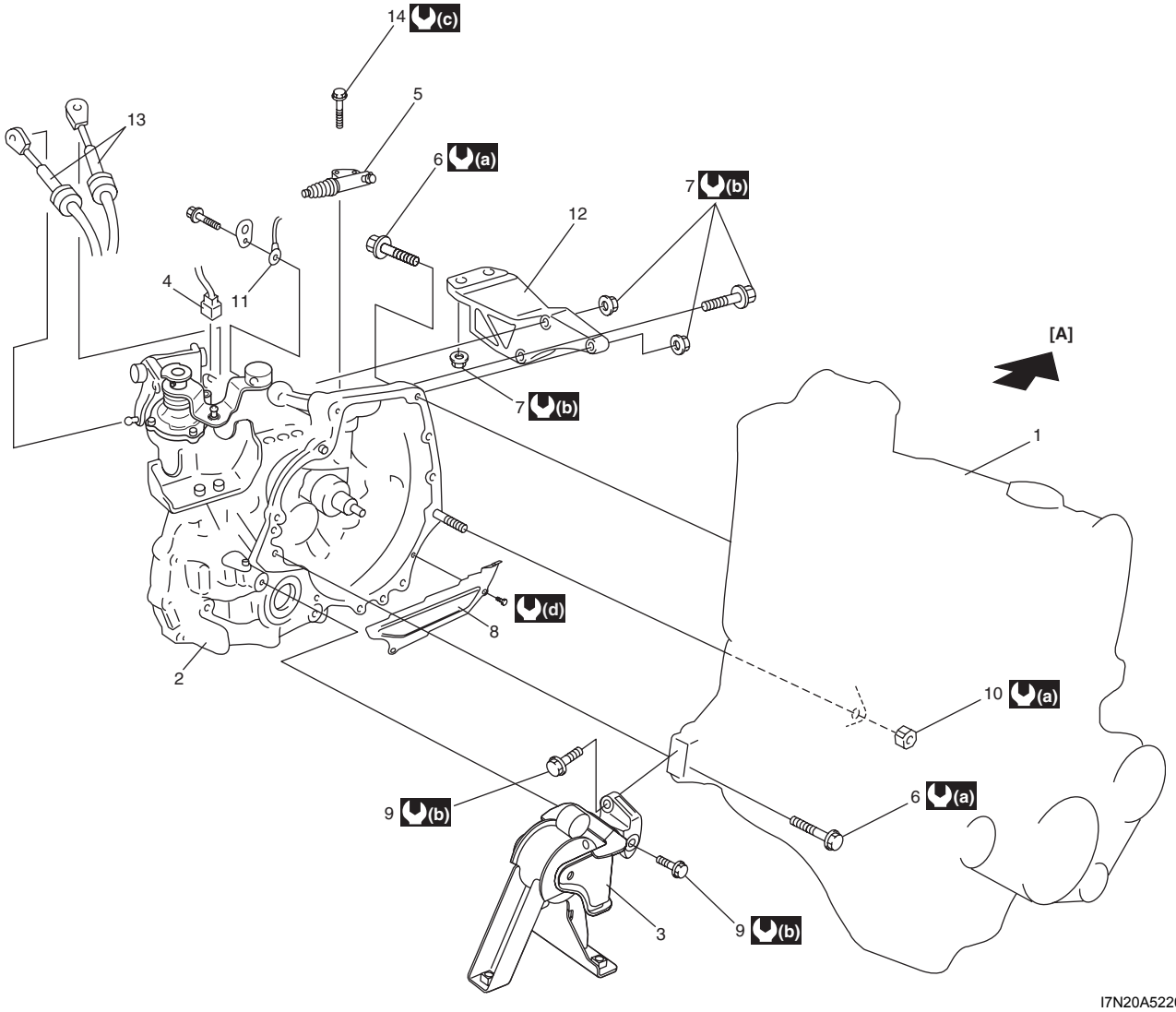
Manual Transaxle Unit Components

S7N20A5226009



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[A]: Forward	7. Engine left mounting bracket bolt and nuts	14. Clutch operating cylinder bolt
1. Engine	8. Clutch housing lower plate	(a) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
2. Transaxle	9. Engine rear mounting bracket bolts	(b) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
3. Engine rear mounting and bracket	10. Transaxle to engine nut	(c) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

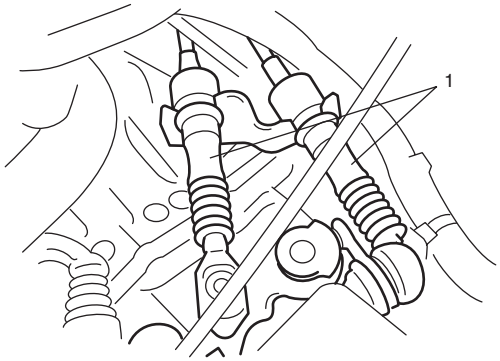
4. Back up light switch connector	11. Ground cable	: 11 N·m (1.1 kgf-m, 8.0 lbf-ft)
5. Clutch operating cylinder	12. Engine left mounting bracket	
6. Transaxle to engine bolt	13. Gear shift & select control cables	

Manual Transaxle Unit Dismounting and Remounting

S7N20A5226010

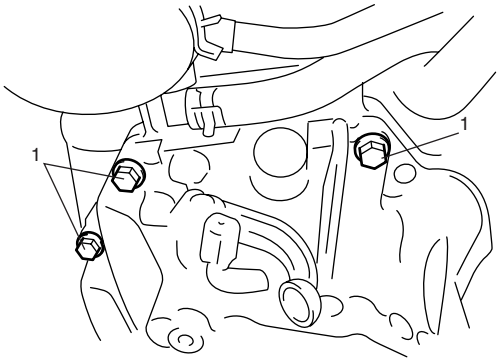
Dismounting

1) Drain coolant.
2) Remove coolant reservoir with reservoir hose.
3) Remove battery and tray.
4) Remove air cleaner case and resonator.
5) Disconnect gear shift and gear select control cables (1) from transaxle.



I4RS0A520006-01

6) Disconnect back up light switch coupler and undo wiring harness clamps.
7) Remove ground cable from transaxle.
8) Remove clutch operating cylinder with fluid hose from transaxle.
9) Remove water inlet No.2 pipe from transaxle.
10) Remove starting motor referring to “Starting Motor Dismounting and Remounting: M13A / M15A / M16A in Section 1I”.
11) Remove transaxle to engine bolts (1) of upper side.

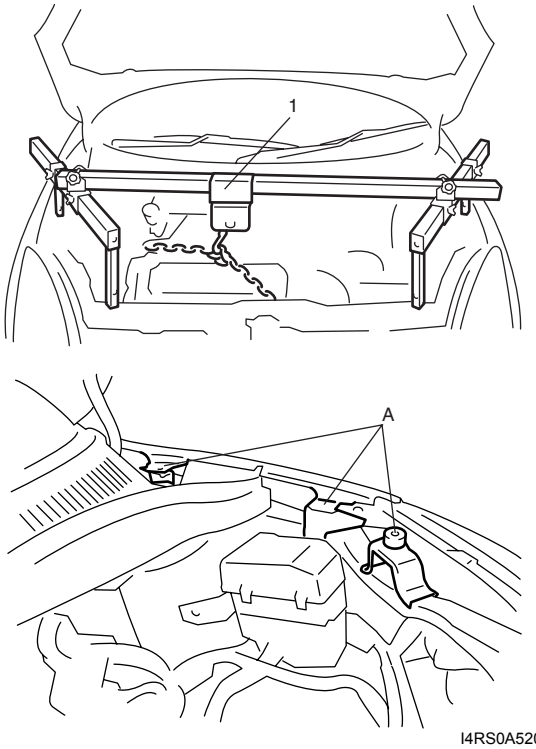


I4RS0A520018-01

12) Support engine using supporting device (1).

⚠ CAUTION

Do not apply supporting device to projection part A. If do so, it may be deformed.

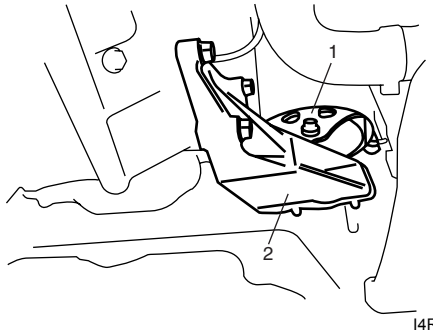


I4RS0A520019-01

13) Remove front drive shafts and center shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
14) Remove exhaust No.2 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.
15) Remove clutch housing lower plate (1).

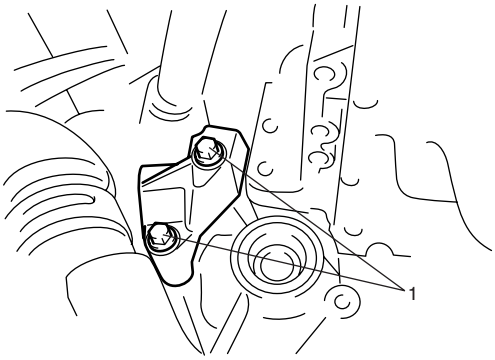
I4RS0A520020-01

16) Remove engine under covers.
17) Support transaxle with transmission jack.
18) Remove transaxle to engine bolts and nut of lower side.
19) Remove engine left mounting (1) with bracket (2).



I4RS0A520021-01

20) Remove engine rear mounting bracket bolts (1).



I4RS0A520022-01

21) Remove other attached parts from transaxle, if any.
22) Pull transaxle so as to disconnect input shaft from clutch disc, and then lower it.

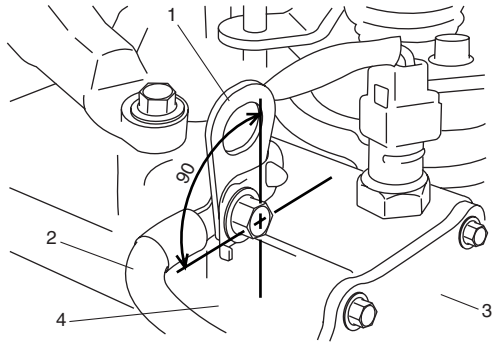
Remounting

⚠ CAUTION

- **Care should be taken not to scratch oil seal lip with drive shaft while raising transaxle.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

Reverse dismounting procedure for remounting noting the following.

- Tighten each bolts and nuts to specified torque referring to “Manual Transaxle Unit Components: M15A and M16A Model”.
- Set each clamp for wiring securely.
- Fill transaxle oil referring to “Manual Transaxle Oil Change: M15A and M16A Model”.
- Install hook (1) and ground cable (2) at specified position as shown in figure.



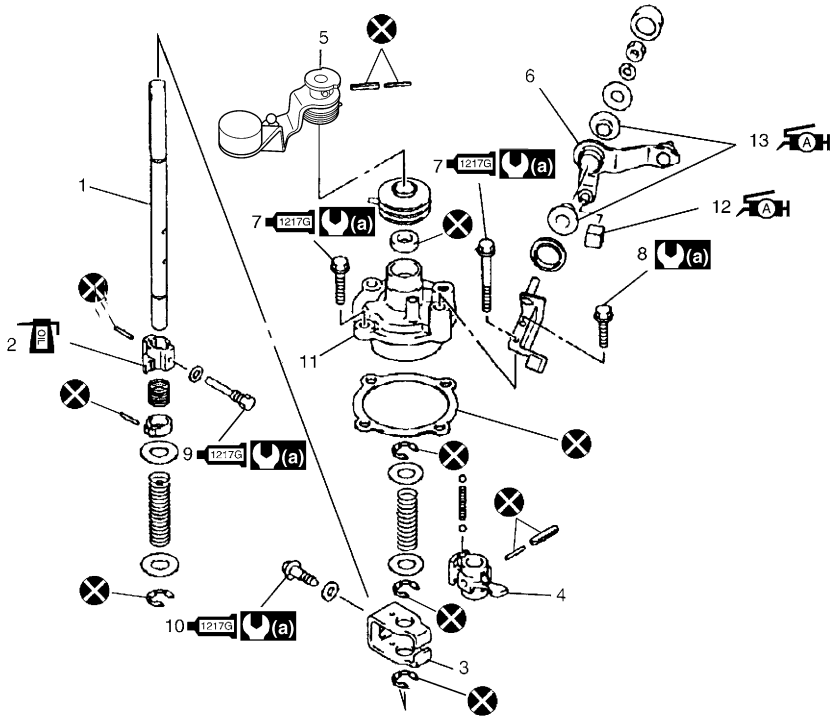
I4RS0A520023-01

3. Transaxle side cover
4. Transaxle left case

- Connect battery and check function of engine, clutch and transaxle.

Gear Shift and Select Shaft Assembly Components

S7N20A5226011



I4RS0B522001-01

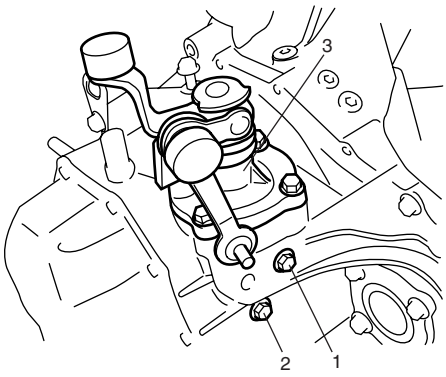
1. Gear shift & select shaft	7. Gear shift guide case bolt : Apply sealant 99000-31260 to bolt thread.	13. Select lever boss : Apply grease 99000-25011 to internal and external diameter.
2. 5th & reverse gear shift cam	8. Select lever bracket bolt	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
3. Gear shift interlock plate	9. 5th to reverse interlock guide bolt : Apply sealant 99000-31260 to bolt thread.	: Do not reuse.
4. Gear shift & select lever	10. Gear shift interlock bolt : Apply sealant 99000-31260 to bolt thread.	: Apply transaxle oil.
5. Shift cable lever	11. Guide case	
6. Select cable lever	12. Select lever shaft bush : Apply grease 99000-25011 to whole area of bush.	

Gear Shift and Select Shaft Assembly Removal and Installation

S7N20A5226012

Removal

1) Remove gear shift interlock bolt (1) and 5th to reverse interlock guide bolt (2) from transaxle case.
2) Remove gear shift & select shaft assembly (3).



I4RS0A520024-01

Installation

1) Apply grease to select lever shaft bush and select lever boss, and install gear shift and select shaft assembly with new gasket into transaxle.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

2) Apply sealant to gear shift guide case bolts (1). Tighten gear shift guide case bolts to specified torque.

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

Tightening torque
Gear shift guide case bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

3) Tighten select lever bracket bolt with select lever bracket to specified torque.

Tightening torque
Select lever bracket bolt: 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

4) Install washer and gear shift interlock bolt (2) to which sealant have been applied and then tighten it to specified torque.

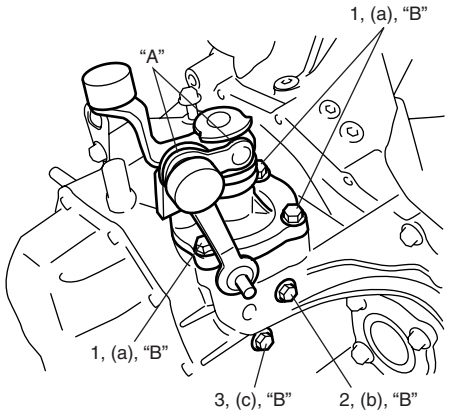
"B": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Tightening torque
Gear shift interlock bolt (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

5) Install washer and 5th to reverse interlock guide bolt (3) to which sealant have been applied and then tighten it to specified torque.

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

Tightening torque
5th to reverse interlock guide bolt (c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I4RS0A520025-01

Gear Shift and Select Shaft Disassembly and Assembly

S7N20A5226013

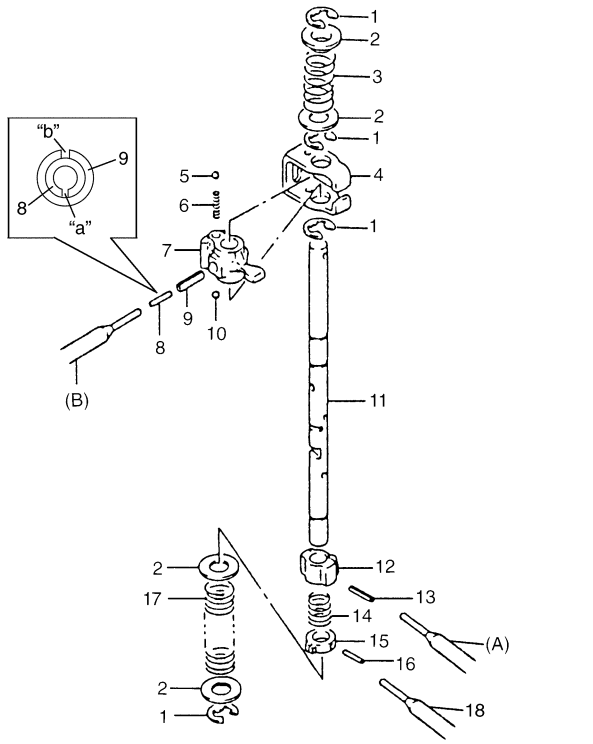
1) Push pins out using 2.8 – 3.0 mm (0.11 – 0.12 in.) commercially available spring pin remover and specified spring pin removers as shown below.

Special tool
(A): 09922–85811 4.5 mm
(B): 09925–78210 6.0 mm

2) Inspect component parts for wear, distortion or damage. If any detect is found, replace detective part with new one.

NOTE

- **Set new gear shift & select lever inner pin (8) and outer pin (9) facing each gap ("a", "b") in the opposite direction as shown in figure.**
- **When driving in pins, prevent shaft from being bent by supporting it with wood block.**
- **Assemble 5th & reverse gear shift cam with its pit and pin aligned.**
- **Make sure to select an appropriate spring by identifying the painted colors to keep gear shifting performance as designed.**
  - **– Low speed select spring – Light blue**
  - **– Reverse select spring – Pink**

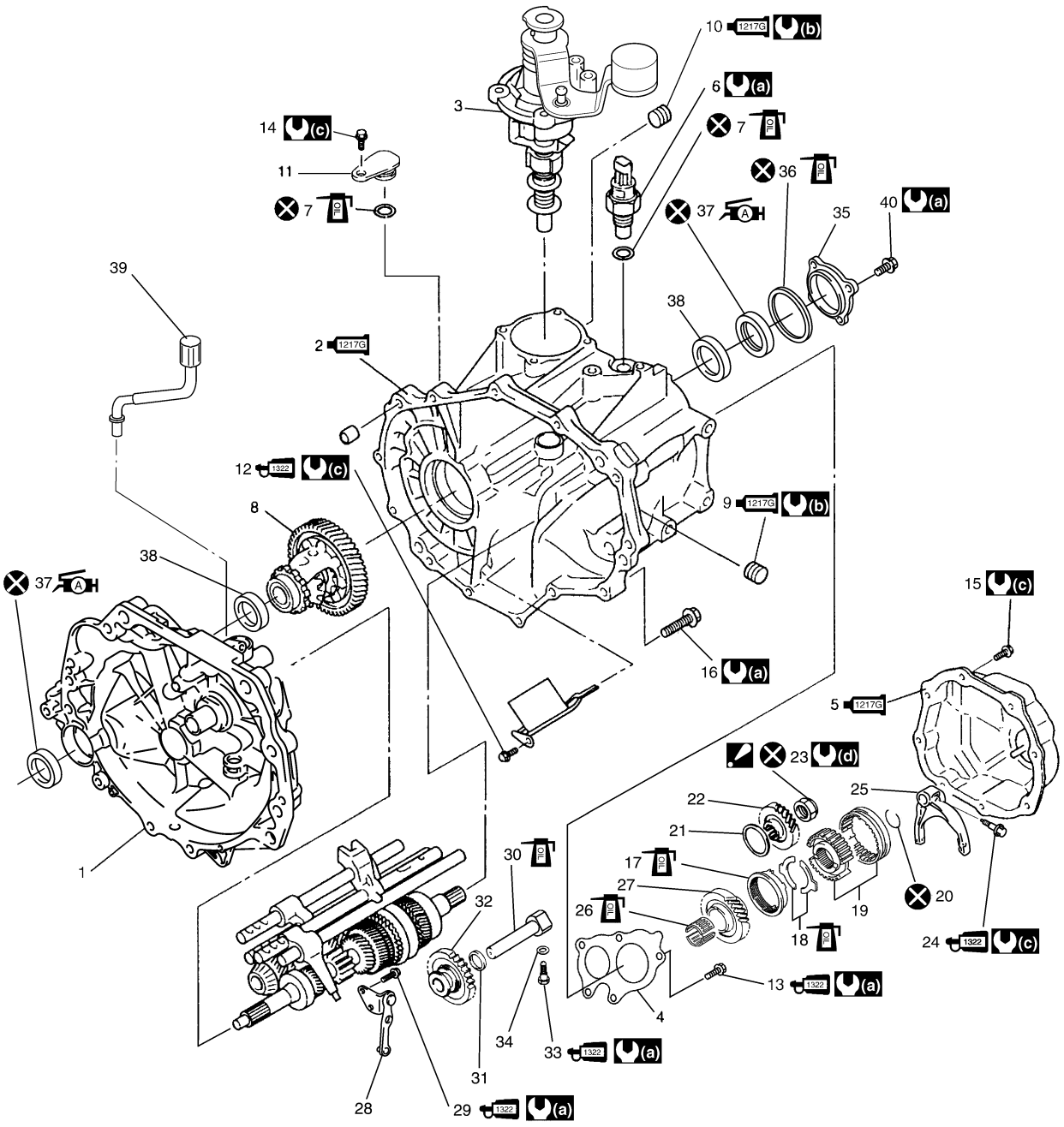


I4RS0A520026-01

1. E-ring	10. Ball
2. Washer	11. Gear shift & select shaft
3. Reverse select spring	12. 5th & reverse gear shift cam
4. Gear shift interlock plate	13. 5th & reverse gear shift cam guide pin
5. Ball	14. Cam guide return spring
6. Gear shift interlock spring	15. 5th & reverse gear shift cam guide
7. Gear shift & select lever	16. Gear shift cam guide pin
8. Inner pin	17. Low speed select spring
9. Outer pin	18. Spring pin remover

Manual Transaxle Assembly Components

S7N20A5226014



I6RS0C520005-01

1. Transaxle right case	25. 5th gear shift fork
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and right case.	26. Needle bearing
3. Gear shift and select shaft assembly	27. Input shaft 5th gear
4. Transaxle left case plate	28. Reverse gear shift lever
1217G 5. Transaxle side cover : Apply sealant 99000-31260 to mating surface of side cover and left case.	1322 29. Reverse gear shift lever bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
6. Back up light switch	30. Reverse gear shaft
7. O-ring	31. Washer
8. Differential assembly	32. Reverse idler gear
1217G 9. Oil level/filler plug : Apply sealant 99000-31260 to all around thread part of plug.	1322 33. Reverse shaft bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
1217G 10. Oil drain plug : Apply sealant 99000-31260 to all around thread part of plug.	34. Washer
11. Sensor cap	35. Side bearing retainer

1322 12. Oil gutter bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	36. O-ring
1322 13. Left case plate bolts : Apply thread lock 99000-32110 to all around thread part of bolt.	A 37. Oil seal : Apply grease 99000-25011 to oil seal lip.
14. Sensor cap bolt	38. Outer race
15. Side cover bolts	39. Breather hose
16. Transaxle case bolts	40. Side bearing retainer bolt
17. 5th speed synchronizer ring	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
18. 5th speed synchronizer lever	(b) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
19. 5th speed synchronizer sleeve & hub	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
20. Circlip	(d) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)
21. Bearing set shim	(e) : 100 N·m (10.0 kgf-m, 72.5 lbf-ft)
22. Countershaft 5th gear	: Do not reuse.
23. Countershaft nut : After tightening nut to specified torque, caulk nut securely.	: Apply transaxle oil.
1322 24. Shift fork bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	

Fifth Gear Disassembly and Assembly

S7N20A5226015

Disassembly

1) Remove 9 bolts and take off transaxle side cover (1).

⚠ CAUTION

Care should be taken not to distort side cover when it is removed from left case.

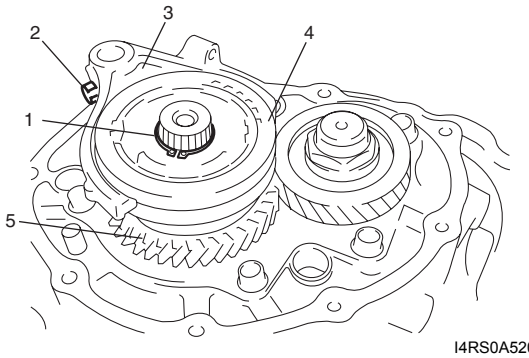
I4RS0A520027-01

2) Using special tool, remove circlip (1).

Special tool
: 09900–06107

3) Remove 5th shift fork bolt (2).

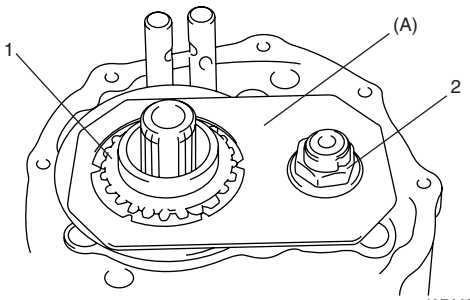
4) Remove gear shift fork (3), synchronizer sleeve & hub assembly (4), synchronizer levers, synchronizer ring and input shaft 5th gear (5) all together. Use gear puller for removal if spline fitting of hub is tight.



I4RS0A520028-01

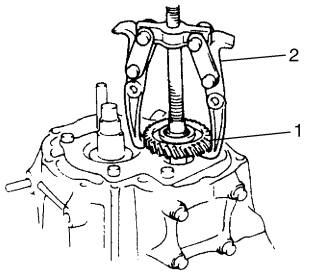
5) Unfasten caulking of countershaft nut (2), install input shaft 5th gear (1) and special tool to stop rotation of shafts, and then remove countershaft nut (2).

Special tool
(A): 09927–76060



I3RM0B521014-01

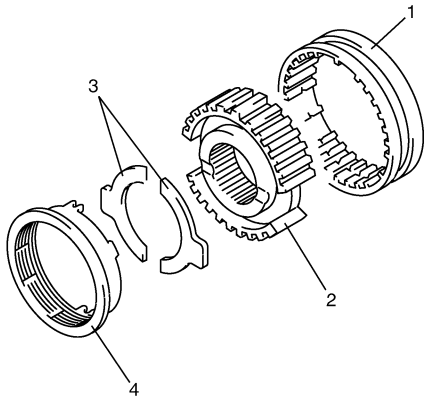
6) Remove input shaft 5th gear, needle bearing and then countershaft 5th gear (1). Gear puller (2) would be necessary if spline fitting of countershaft 5th gear is tight.



I4RS0A520041-01

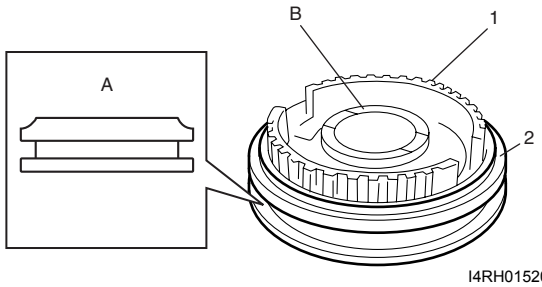
Assembly

1) Assemble 5th speed synchronizer sleeve (1), hub (2), 5th speed synchronizer levers (3) and synchronizer ring (4) as follows.



I4RH01520054-01

a) Install hub (1) to 5th speed synchronizer sleeves (2) in specified direction as shown in the figure.



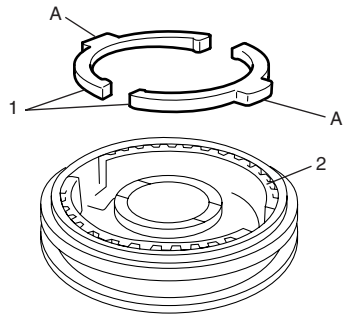
I4RH01520048-01

A: Chamfered side	B: Long boss

b) Fit 5th speed synchronizer levers (1) to hub (2) as shown in the figure.

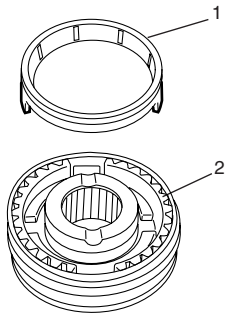
NOTE

Align protrusion A of 5th speed synchronizer levers (1) with groove of hub (2).



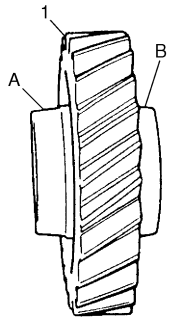
I4RH01520049-01

c) Install synchronizer ring (1) to hub (2) as shown in the figure.



I4RH01520055-01

2) Install 5th gear (1) to countershaft facing machined boss A inward.



I2RH01520088-01

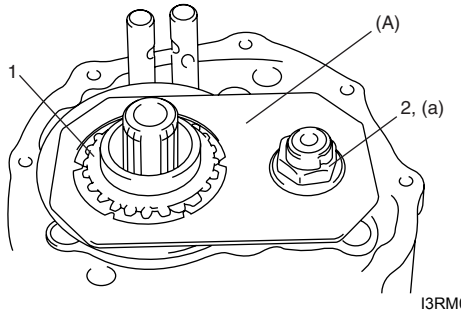
A: Machined boss (Inside)
B: No machining (Outside)

3) Install needle bearing of separated steel cage type to input shaft, apply oil then install input shaft 5th gear (1) and special tool to stop shaft rotation.

Special tool
(A): 09927–76060

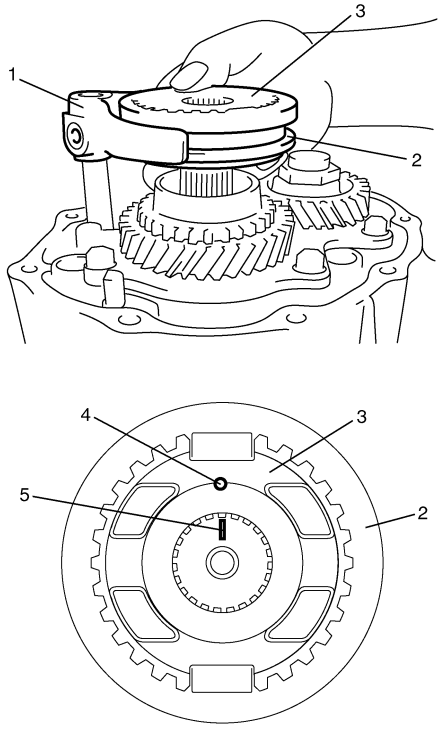
4) Tighten new countershaft nut (2) to specified torque, and caulk countershaft nut securely.

Tightening torque
Countershaft nut (a): 100 N·m (10.0 kgf-m, 72.5 lbf-ft)



I3RM0B521016-01

5) Fit 5th gear shift fork (1) to synchronizer sleeve (2) and hub (3) assembly and install them into input shaft and gear shift shaft aligning punch mark (4) with matching mark (5) on input shaft.



I4RS0A520029-01

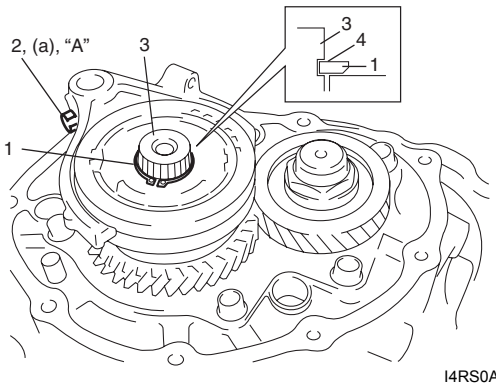
6) Tighten shift fork bolt (2) to which thread lock cement has been applied.

"A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Shift fork bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

7) Using special tool, install new circlip (1) to input shaft (3) in specified direction as shown in the figure.

Special tool
: 09900–06107



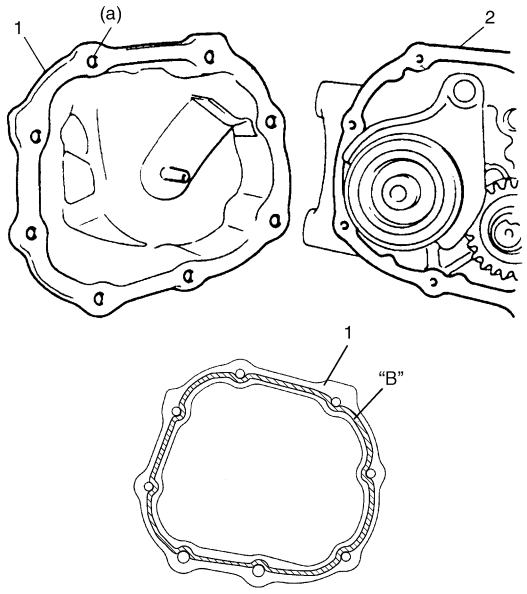
I4RS0A520030-01

4. Polished surface

8) Clean mating surface of both left case (2) and side cover (1), apply sealant to side cover (1) as shown in figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, mate it with left case and then tighten bolts to specified torque.

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

Tightening torque
Side cover bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0A520031-01

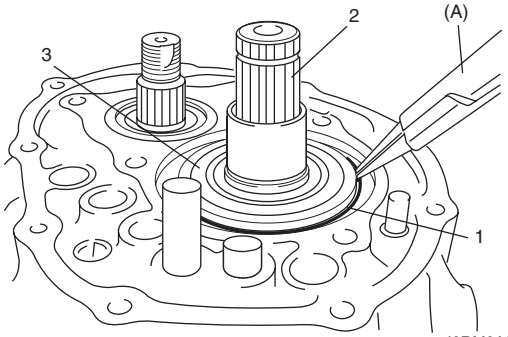
Manual Transaxle Assembly Disassembly and Reassembly

S7N20A5226016

Disassembly

1) Remove gear shift and select shaft assembly referring to “Gear Shift and Select Shaft Assembly Removal and Installation: M15A and M16A Model”.
2) Remove fifth gear referring to “Fifth Gear Disassembly and Assembly: M15A and M16A Model”.
3) Remove left case plate.
4) Remove snap ring (1) using special tool.

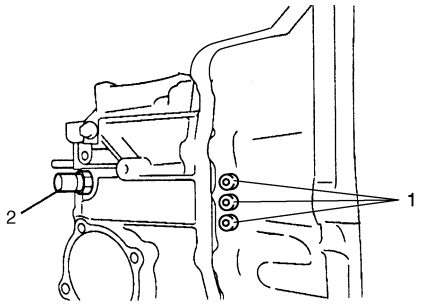
Special tool
(A): 09900–06107



I3RM0A520037-01

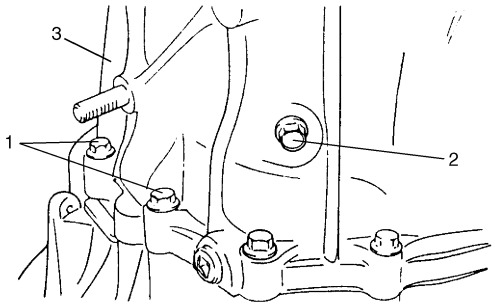
2.	Input shaft
3.	Input shaft left bearing

5) Remove gear shift locating bolts (1) with washers, then take out locating springs and steel balls.
6) Remove back up light switch (2).



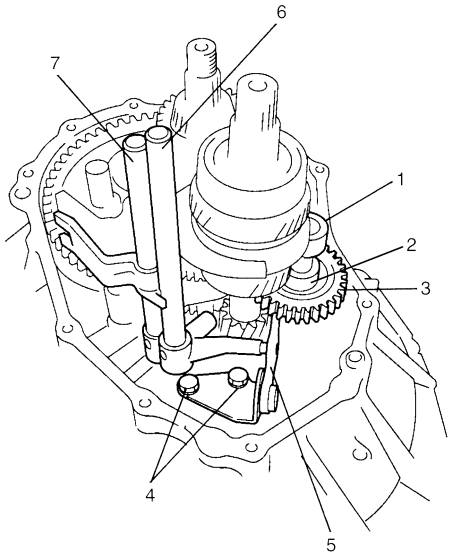
I2RH01520032-01

7) Remove reverse shaft bolt (2) with washer.
8) Remove case bolts (1) from outside and another bolts from clutch housing side.
9) Tapping left case flanges with plastic hammer, remove left case (3).



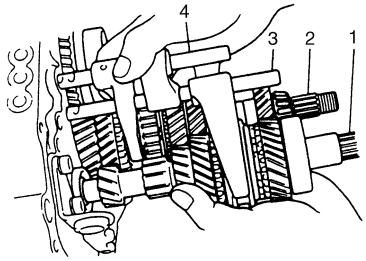
I4RS0A520032-01

10) Pull out reverse gear shaft (1) with washer (2), then take off reverse idler gear (3).
11) Remove reverse gear shift lever bolts (4) and reverse gear shift lever (5).
12) Pull out 5th & reverse gear shift guide shaft (6) together with 5th & reverse gear shift shaft (7).



I4RS0A520033-01

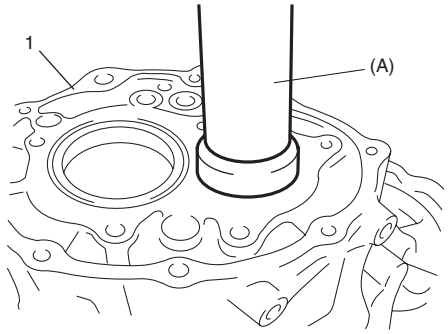
13) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly (1), countershaft assembly (2), high speed gear shift shaft (3) and low speed gear shift shaft (4) all at once.



I2RH01520035-01

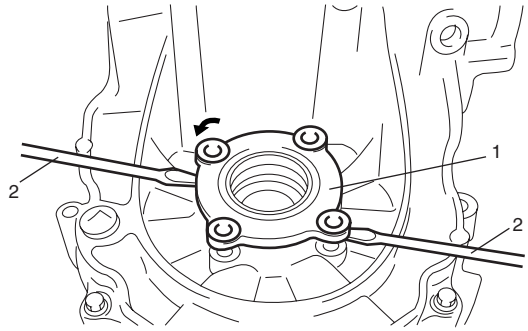
14) Remove countershaft left bearing outer race from left case (1) using special tool.

Special tool
(A): 09913–70123



I4RH01520021-01

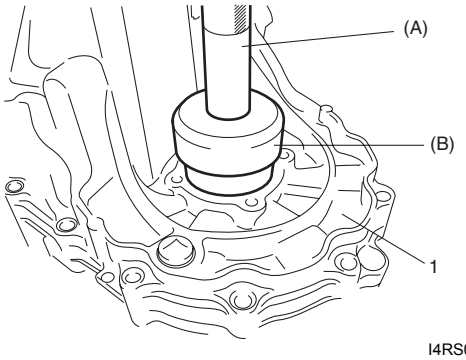
15) Remove side bearing retainer bolts.
16) Turn side bearing retainer (1) counterclockwise until it stops, and remove side bearing retainer using 2 flat end rods (2) or the like.
17) Remove O-ring from side bearing retainer.



I4RS0A520034-01

18) Remove differential bearing shim.
19) Remove differential side bearing outer race from left case (1) using special tools.

Special tool
(A): 09924–74510
(B): 09926–27610



I4RS0A520035-01

20) Remove differential gear assembly from right case.

Installation

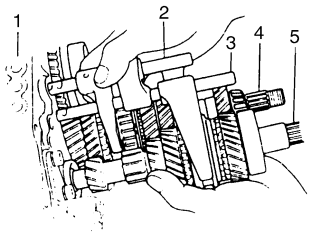
1) Install differential assembly into right case.
2) Join input shaft assembly (5), countershaft assembly (4), low speed gear shift shaft (2) and high speed gear shift shaft (3) assemblies all together, then install them into right case (1).

⚠ CAUTION

Take care not to damage oil seal lip by input shaft, or oil leakage may take place.

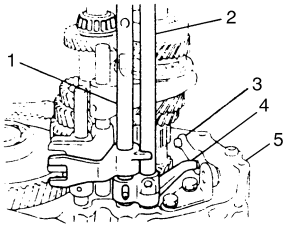
NOTE

- **Input shaft right bearing on shaft can be installed into right case tapping shaft with plastic hammer.**
- **Check to make sure that countershaft is engaged with final gear while installing.**



I2RH01520080-01

3) Install 5th & reverse gear shift shaft (1) with 5th & reverse gear shift guide shaft (2) into right case (5). Reverse gear shift arm (4) has to be joined with reverse gear shift lever (3) at the same time.



I2RH01520081-01

4) Make reverse idler gear (1) with reverse gear shift lever (2), insert reverse gear shaft (3) into case (4) through idler gear and then align “A” in shaft with “B” in case.
5) Fasten reverse gear shift lever bolts after applying thread lock cement.

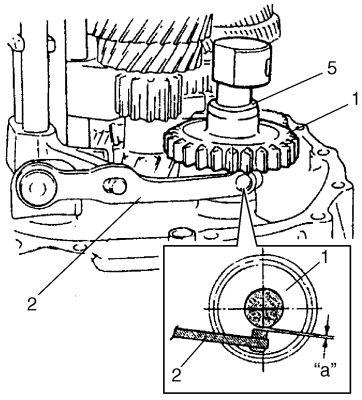
: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

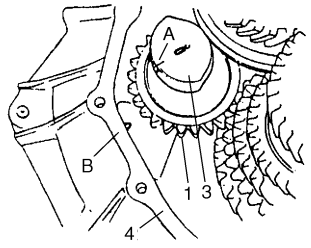
Tightening torque
Reverse gear shift lever bolt: 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

NOTE

- **Make sure that washer (5) has been installed in shaft at above the gear.**
- **Check to confirm that reverse gear shift lever end has clearance “a” to idler gear groove.**

Distance between lever and idler gear shaft
“a”: 0.5 – 1.0 mm (0.02 – 0.04 in.)





I4RS0A520036-01

6) Clean mating surfaces of both right and left cases, apply sealant to right case (2) as shown in the figure by such amount that its section is 1.5 mm (0.059 in.) in diameter then mate it with left case (1).

“B”: Sealant 99000–31260 (SUZUKI Bond No.1217G)

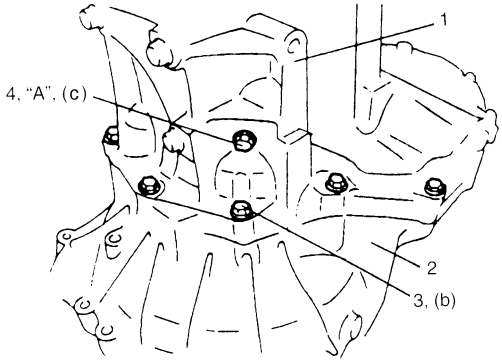
7) Install reverse shaft bolt (4) to which thread lock cement has been applied, with aluminum washer and tighten it to specified torque.

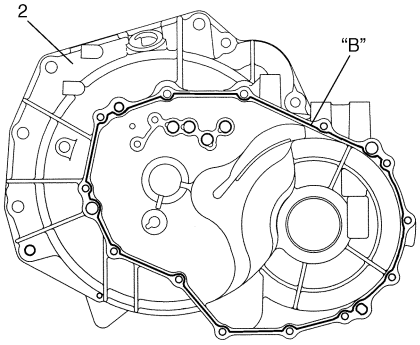
“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Reverse shaft bolt (c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

8) Tighten case bolts (3) from outside tighten another case bolts from clutch housing side to specified torque.

Tightening torque
Transaxle case bolt (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)





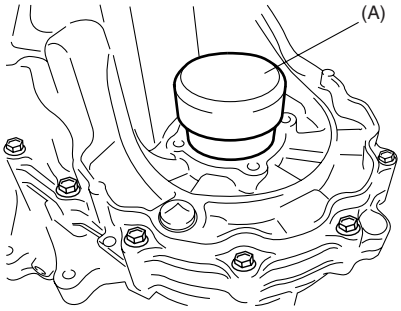
I3RM0A520043-01

9) Install side bearing retainer as follows.
   a) Install differential side bearing outer race to left case and then tap and accustom outer race using special tool and plastic hammer.

⚠ CAUTION

Do not drive in a race with hammer.
Driving it may cause to damage bearing.

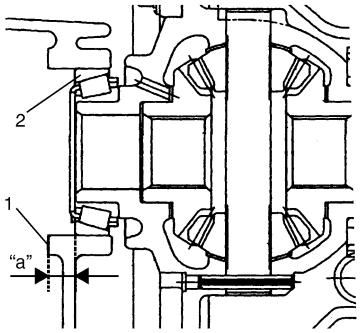
Special tool
(A): 09926–27610



I4RH01520053-01

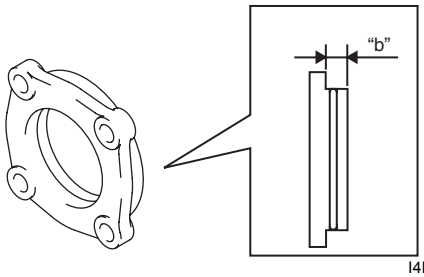
b) Select a shim of differential side bearing as follows.

i) Measure depth “a” from left case (1) face to side bearing outer race (2) using depth gauge.



I4RS0A520037-01

ii) Measure height “b” of side bearing retainer with depth gauge.



I4RS0A520038-01

iii) Calculate clearance a – b, and select differential shim according to the following table.

Bearing shim specification

Clearance “a” – “b”	Thickness of bearing shim to be installed
0.636 – 0.665 mm (0.0250 – 0.0261 in.)	0.75 mm (0.030 in.)
0.666 – 0.695 mm (0.0262 – 0.0273 in.)	0.78 mm (0.031 in.)
0.696 – 0.725 mm (0.0274 – 0.0285 in.)	0.81 mm (0.032 in.)
0.726 – 0.755 mm (0.0286 – 0.0297 in.)	0.84 mm (0.033 in.)
0.756 – 0.785 mm (0.0298 – 0.0309 in.)	0.87 mm (0.034 in.)
0.786 – 0.815 mm (0.0310 – 0.0320 in.)	0.90 mm (0.035 in.)
0.816 – 0.845 mm (0.0321 – 0.0332 in.)	0.93 mm (0.037 in.)
0.846 – 0.875 mm (0.0333 – 0.0344 in.)	0.96 mm (0.038 in.)
0.876 – 0.905 mm (0.0345 – 0.0356 in.)	0.99 mm (0.039 in.)
0.906 – 0.935 mm (0.0357 – 0.0368 in.)	1.02 mm (0.040 in.)
0.936 – 0.965 mm (0.0369 – 0.0379 in.)	1.05 mm (0.041 in.)
0.966 – 0.995 mm (0.0380 – 0.0391 in.)	1.08 mm (0.043 in.)
0.996 – 1.025 mm (0.0392 – 0.0403 in.)	1.11 mm (0.044 in.)
1.026 – 1.055 mm (0.0404 – 0.0415 in.)	1.14 mm (0.045 in.)
1.056 – 1.085 mm (0.0416 – 0.0427 in.)	1.17 mm (0.046 in.)
1.086 – 1.115 mm (0.0428 – 0.0438 in.)	1.20 mm (0.047 in.)
1.116 – 1.145 mm (0.0439 – 0.0450 in.)	1.23 mm (0.048 in.)
1.146 – 1.175 mm (0.0451 – 0.0462 in.)	1.26 mm (0.050 in.)
1.176 – 1.205 mm (0.0463 – 0.0474 in.)	1.29 mm (0.051 in.)
1.206 – 1.235 mm (0.0475 – 0.0486 in.)	1.32 mm (0.052 in.)
1.236 – 1.265 mm (0.0487 – 0.0498 in.)	1.35 mm (0.053 in.)
1.266 – 1.295 mm (0.0499 – 0.0509 in.)	1.38 mm (0.054 in.)
1.296 – 1.325 mm (0.0510 – 0.0521 in.)	1.41 mm (0.056 in.)

c) Install differential side bearing shim to left case (4).

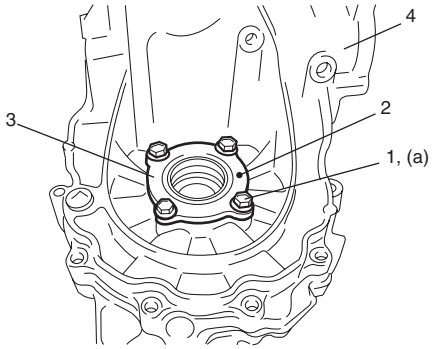
d) Apply oil to new O-ring of side bearing retainer (3), and install side bearing retainer with new O-ring to left case.

e) Tighten side bearing retainer bolts (1) to specified torque.

NOTE

Install side bearing retainer with its punch mark (2) facing upward.

Tightening torque
Side bearing retainer bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I4RS0A520039-01

10) Check locating springs (2, 4 and 5) for deterioration and replace with new one as necessary.

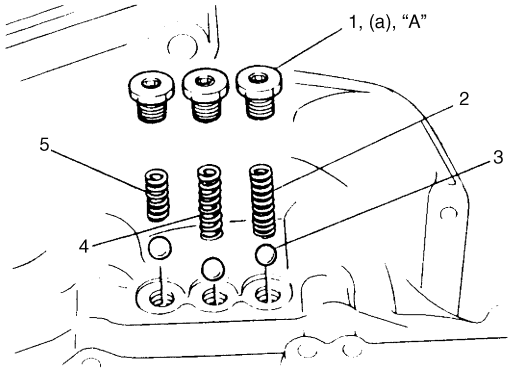
Locating spring

Locating spring free length	Standard	Service limit
Low speed (2)	53.1 mm (2.091 in.)	50.5 mm (1.988 in.)
High speed (4)	45.9 mm (1.807 in.)	44.0 mm (1.732 in.)
5th & reverse (5)	29.9 mm (1.777 in.)	28.5 mm (1.122 in.)

11) Install steel balls (3) and locating springs (2, 4 and 5) for respective gear shift shaft and tighten bolts (1) to which sealant has been applied.

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

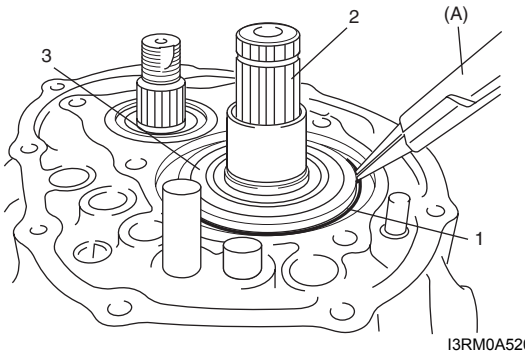
Tightening torque
Gear shift locating bolt (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



I2RH01520084-01

12) Install new snap ring (1) using special tool.

Special tool
(A): 09900–06107

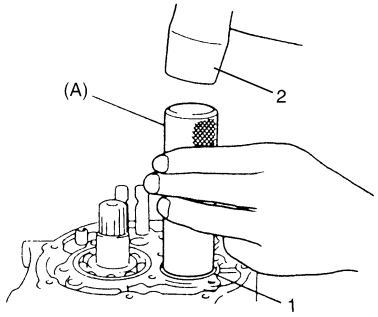


I3RM0A520037-01

2. Input shaft
3. Input shaft left bearing

13) To seat countershaft left bearing outer race (1) to bearing cone, and tap countershaft left bearing outer race (1) using special tool and plastic hammer (2).

Special tool
(A): 09913–70123



I3RM0A520030-01

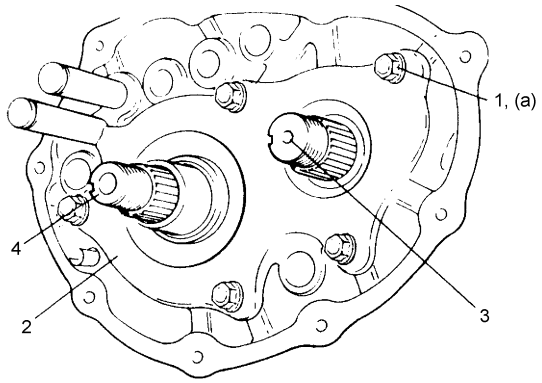
14) Select countershaft 5th gear shim as follows.

a) Put the thickest shim as spare part on bearing outer race and install left case plate (2).

b) Tighten used bolts (1) to specified torque.

Tightening torque
Left case plate bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

c) Turn countershaft (3) 10 time or more.



I7V20A522024-01

4. Input shaft

d) Remove left case plate and shim, and then put used shim (3) on bearing outer race (4) temporarily.

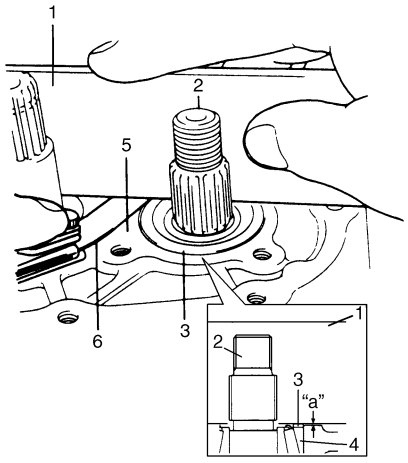
e) Place straight edge (1) over shim and compress it by hand through straight edge, and then measure "a" by using feeler gauge (6). If clearance "a" is out of specification, repeat step a) to d).

Clearance between case surface (5) and straightedge
"a": 0.08 – 0.12 mm (0.0032 – 0.0047 in.)

f) Select suitable shim which adjusts clearance "a" to specification and put it on bearing outer race.

NOTE

Insert 0.10 mm (0.0039 in.) feeler to know whether or not a shim fulfills specification quickly.



I7V20A521022-01

2. Countershaft

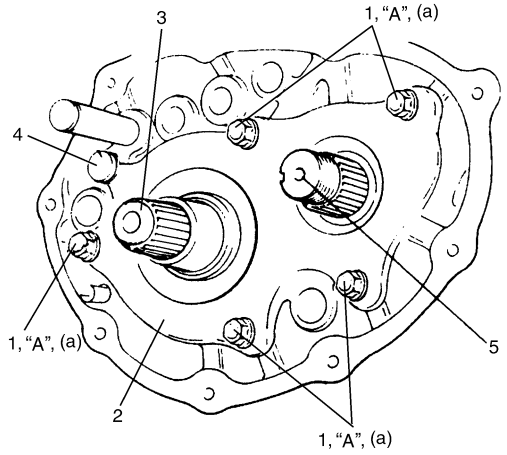
15) Install left case plate (2) and tighten new bolts (1) to specified torque.

NOTE

After tightening bolts, make sure that countershaft (5) can be rotated by hand feeling certain load.

"A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Left case plate bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I4RS0A520042-01

3. Input shaft

16) Install fifth gear referring to "Fifth Gear Disassembly and Assembly: M15A and M16A Model".
17) Install gear shift and select shaft assembly referring to "Gear Shift and Select Shaft Assembly Removal and Installation: M15A and M16A Model".
18) Install back up lamp switch referring to "Back Up Light Switch Removal and Installation: M15A and M16A Model".
19) Check input shaft for rotation in each gear position.
20) Also confirm continuity of back up lamp switch in reverse position using ohmmeter.

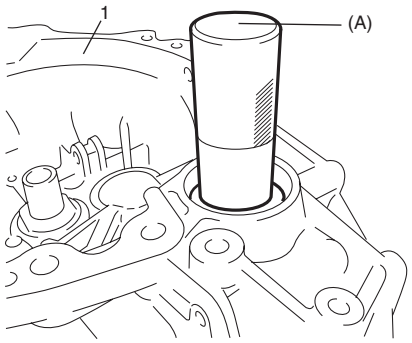
Transaxle Right Case Disassembly and Assembly

S7N20A5226017

Disassembly

1) Remove gear shift shaft, input shaft assembly and countershaft assembly referring to "Manual Transaxle Assembly Disassembly and Reassembly: M15A and M16A Model".
2) Remove differential side bearing outer race from right case (1) using special tool.

Special tool
(A): 09925–15410



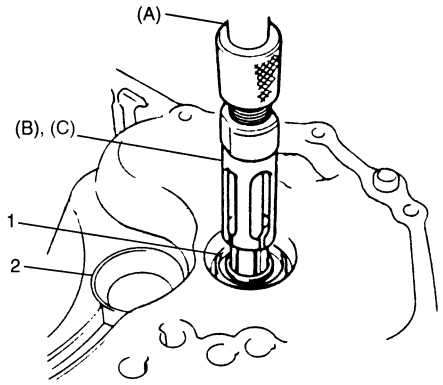
I3RM0B521021-01

3) Remove input shaft oil seal (1) using special tools, if necessary.

Special tool
(A): 09930–30104
(B): 09923–74510

4) Pull out countershaft right bearing outer race (2) using special tools, if necessary.

Special tool
(A): 09930–30104
(C): 09941–64511



I4RS0A520040-01

5) Replace differential side oil seal from right case referring to “Differential Side Oil Seal Replacement: M15A and M16A Model” if necessary.

Assembly

NOTE

Before installation, wash each part and apply specified transaxle oil to sliding faces of bearing and gear.

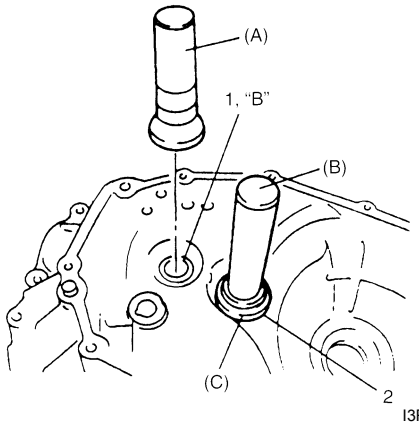
1) Install differential side oil seal into right case referring to “Differential Side Oil Seal Replacement: M15A and M16A Model” if removed.
2) If input shaft oil seal (1) has been removed, install it with its spring side facing upward. Use special tool and hammer for installation and apply grease to oil seal lip.

“B”: Grease 99000–25010 (SUZUKI Super Grease A)

Special tool
(A): 09913–84510

3) If countershaft right bearing outer race (2) has been removed, install it using special tools and hammer.

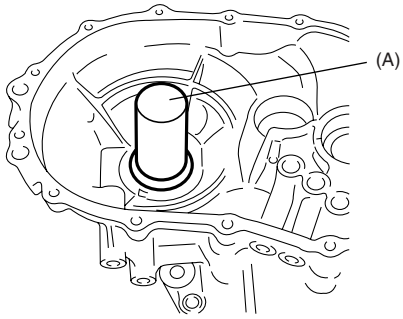
Special tool
(B): 09925–98210
(C): 09924–84510–004



I3RM0A520047-01

4) Install differential side bearing outer race to right case using special tool and hammer.

Special tool
(A): 09913–85210



I4RH01520027-01

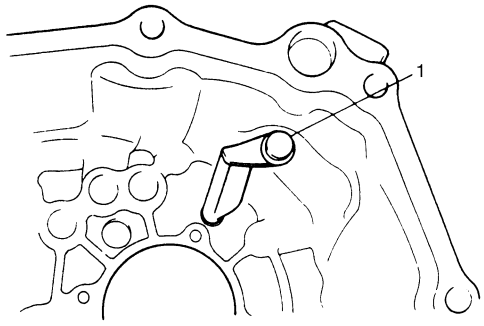
5) Install gear shift shaft, input shaft assembly and countershaft assembly referring to “Manual Transaxle Assembly Disassembly and Reassembly: M15A and M16A Model”.

Transaxle Left Case Disassembly and Assembly

S7N20A5226018

Disassembly

1) Replace differential side oil seal from left case referring to “Differential Side Oil Seal Replacement: M15A and M16A Model”, if necessary.
2) Remove input oil gutter (1) from left case, if necessary.



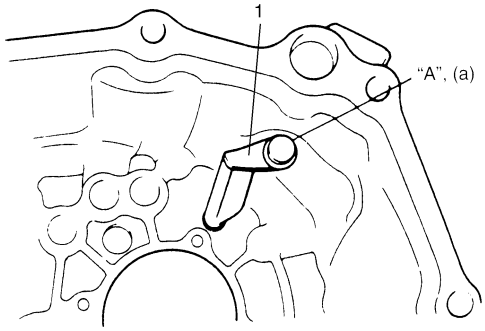
I4RH01520028-01

Assembly

1) If input oil gutter (1) has been removed, install it with bolt to which thread lock cement has been applied.

“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Oil gutter bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

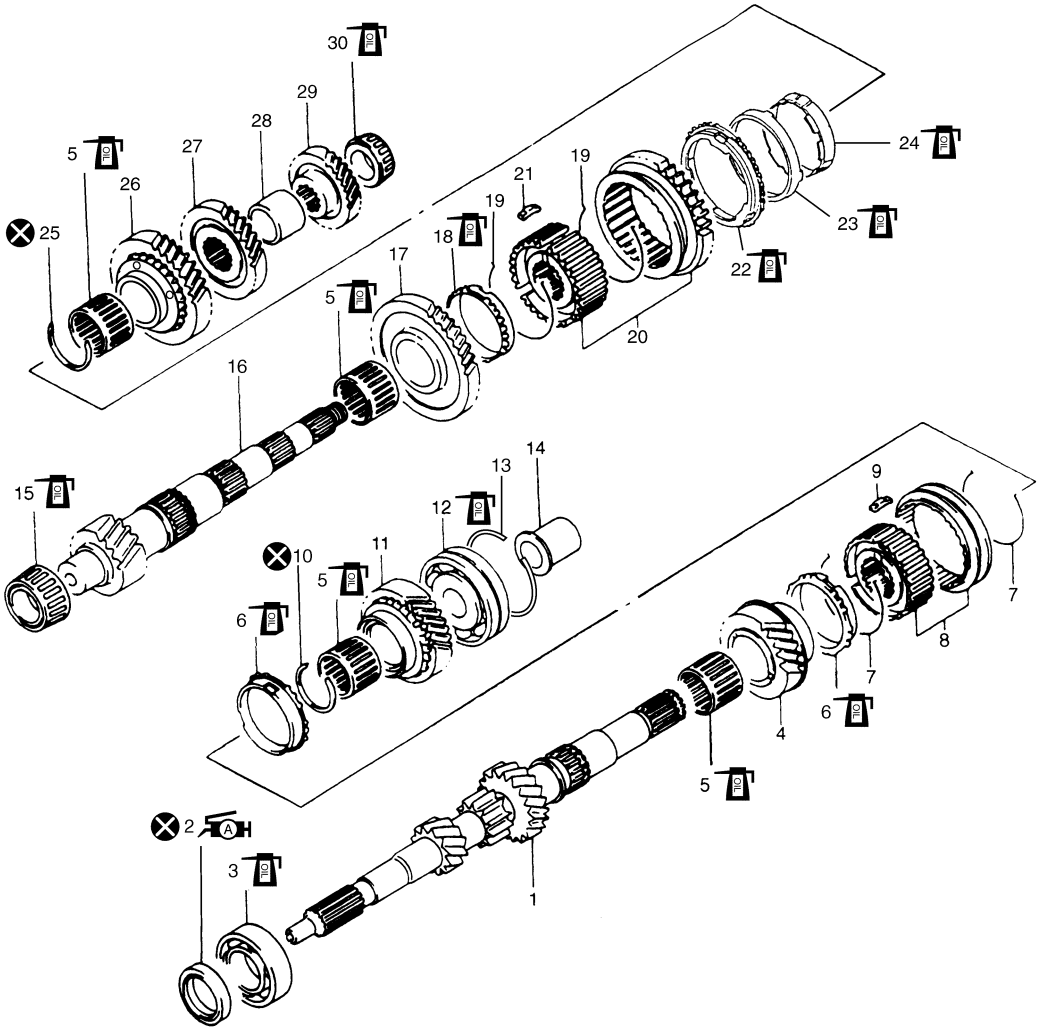


I3RM0A520048-01

2) If differential side oil seal is removed, install it to left case referring to “Differential Side Oil Seal Replacement: M15A and M16A Model”.

Input Shaft and Countershaft Components

S7N20A5226019



I3RM0B521010-01

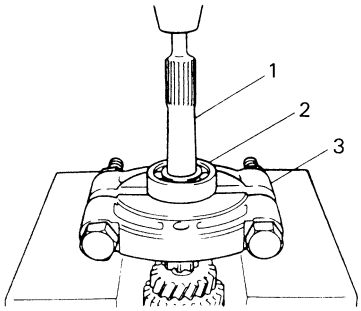
1. Input shaft	12. Input shaft left bearing	23. 2nd gear synchronizer center cone
2. Oil seal : Apply grease 99000-25011 to oil seal lip.	13. Circlip	24. 2nd gear synchronizer inner ring
3. Input shaft right bearing	14. 5th gear spacer	25. Circlip
4. Input shaft 3rd gear	15. Countershaft right bearing	26. Countershaft 2nd gear
5. Needle bearing (resin cage type)	16. Countershaft	27. Countershaft 3rd gear
6. High speed synchronizer ring	17. Countershaft 1st gear	28. 3rd & 4th gear spacer
7. High speed synchronizer spring	18. 1st gear synchronizer ring	29. Countershaft 4th gear
8. High speed synchronizer sleeve & hub	19. Low speed synchronizer spring	30. Countershaft left bearing
9. High speed synchronizer key	20. Low speed synchronizer sleeve & hub	: Do not reuse.
10. Circlip	21. Low speed synchronizer key	: Apply transaxle oil.
11. Input shaft 4th gear	22. 2nd gear synchronizer outer ring	

Input Shaft Assembly Disassembly and Reassembly

S7N20A5226020

Disassembly

1) Remove input shaft right bearing (2) from input shaft (1) using bearing puller (3) and hydraulic press.

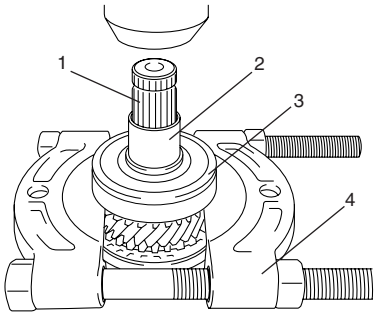


IYSY01521048-01

2) Drive out 5th gear spacer (2) and left bearing (3) from input shaft (1) using bearing puller (4) and hydraulic press.

⚠ CAUTION

To avoid gear tooth from being damaged, support it at flat side of bearing puller.

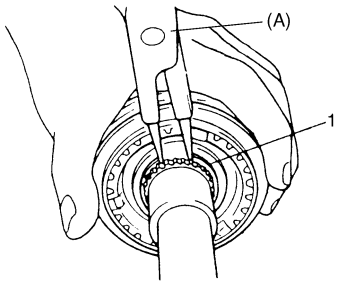


I4RH01520030-01

3) Take out 4th gear, 4th gear needle bearing of resin cage type and high speed synchronizer ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107

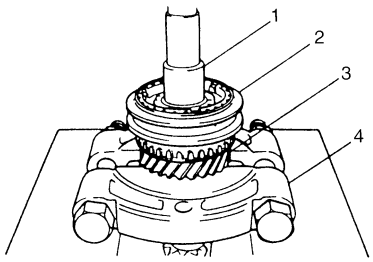


I2RH01520046-01

5) Drive out high speed synchronizer sleeve & hub assembly (2) together with 3rd gear (3) from input shaft (1) using bearing puller (4) and hydraulic press.

⚠ CAUTION

Make sure to use flat side of bearing puller to avoid causing damage to 3rd gear tooth.



I2RH01520097-01

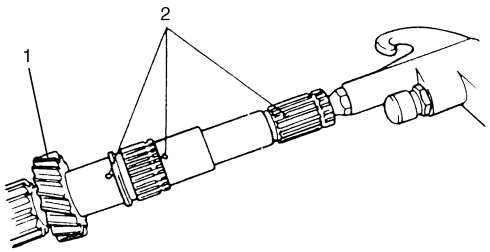
6) Take out 3rd gear needle bearing of resin cage type from shaft.

7) Disassemble high speed synchronizer sleeve & hub assembly.

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.

2) To ensure lubrication of input shaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



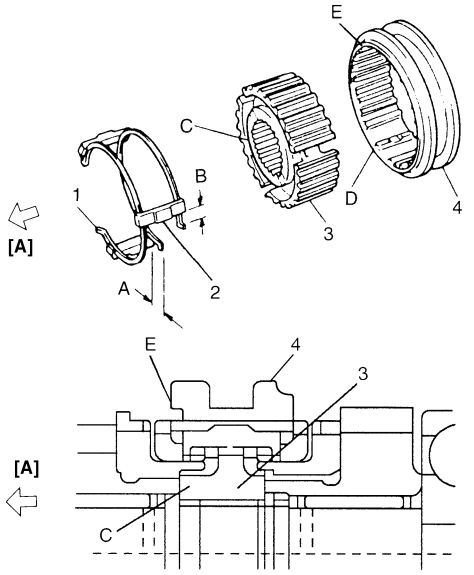
I2RH01520049-01

3) Fit high speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.**

Synchronizer key installation position
A = B

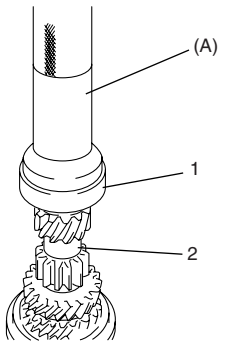


I3RM0B521022-01

[A]: 3rd gear side	D: Key way
C: Long flange	E: Projecting end

4) Drive in right bearing (1) to input shaft (2) using special tool and hammer.

Special tool
(A): 09951–16080



I4RH01520031-01

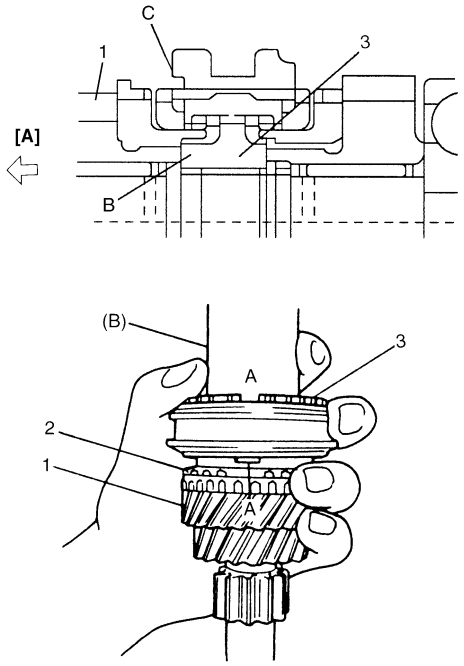
5) Install 3rd gear needle bearing of resin cage type, apply oil to it, then install 3rd gear (1) and synchronizer ring (2).

6) Drive in high speed synchronizer sleeve & hub assembly (3) using special tool and hammer, facing long flange side of hub to 3rd gear.

NOTE

- **While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**
- **Synchronizer rings for 3rd and 4th are identical.**

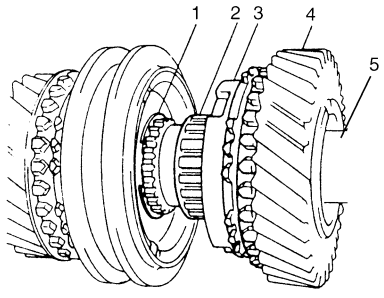
Special tool
(B): 09913–84510



I3RM0B521023-01

[A]: 3rd gear side	B: Long flange
A: Key way	C: Projecting end

7) Install circlip (1) and confirm that circlip is installed in groove securely. Install needle bearing (2) of resin cage type, apply oil to it and then install synchronizer ring (3) and 4th gear (4).



I2RH01520052-01

5. Input shaft

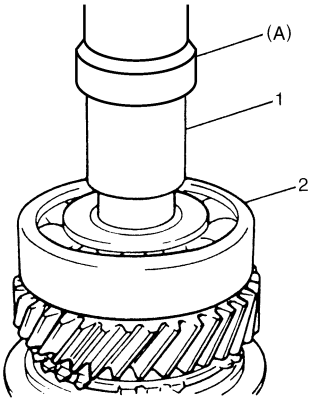
8) Press-fit left bearing (2) using special tool and hammer.

Special tool
(A): 09913–70123

9) Using the same special tool at Step 8), drive in 5th gear spacer (1).

⚠ CAUTION

To prevent 5th gear spacer from being distorted because of excessive compression, do not press-fit it with left bearing at once.



I4RH01520032-01

Countershaft Assembly Disassembly and Reassembly

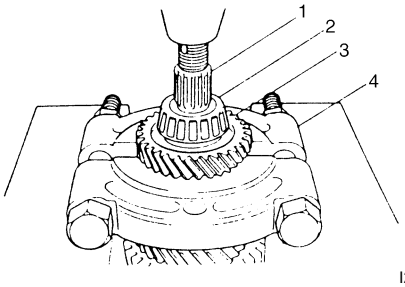
S7N20A5226021

Disassembly

1) Drive out left bearing cone (2) with 4th gear (3) from countershaft (1) using bearing puller (4) and hydraulic press.

⚠ CAUTION

- **Use bearing puller and hydraulic press that will bear at least 5 ton (11,000 lb) safely.**
- **To avoid tooth damage, support 4th gear at flat side of bearing puller.**

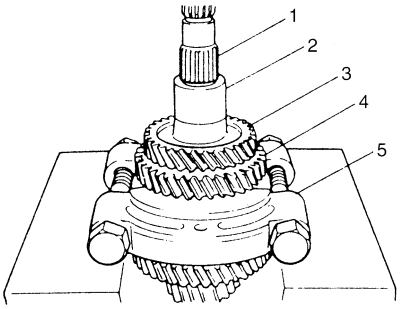


I2RH01520054-01

2) Apply bearing puller (5) to 2nd gear (4) and drive out 3rd & 4th gear spacer (2) and 3rd gear (3) together with 2nd gear from countershaft (1) using hydraulic press. Take out needle bearing of resin cage type from countershaft.

⚠ CAUTION

- **If compression exceeds 5 ton (11,000 lb), release compression once, reset bearing puller support and then continue press work again.**
- **To avoid gear tooth from being damaged, support it at flat side of bearing puller.**

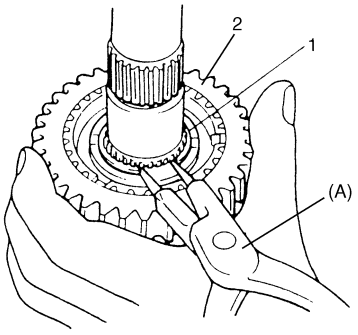


I2RH01520055-01

3) Take out 2nd gear synchronizer outer ring, center cone and inner ring.

4) Using special tool, remove circlip (1).

Special tool
(A): 09900–06107



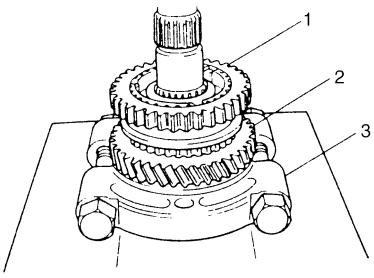
I2RH01520056-01

2. Low speed synchronizer sleeve

5) Apply bearing puller (3) to 1st gear (2) and drive out low speed synchronizer sleeve & hub assembly (1) with 1st gear using hydraulic press.

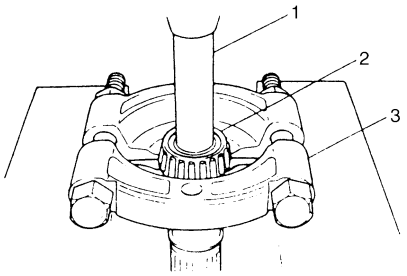
⚠ CAUTION

To avoid gear tooth from being damaged, support it at flat side of bearing puller.



I2RH01520057-01

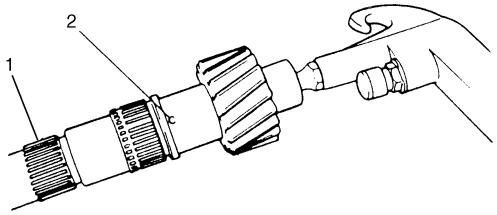
6) Disassemble low speed synchronizer sleeve & hub assembly.
7) Take out 1st gear needle bearing of resin cage type from shaft.
8) Remove right bearing cone (2) using bearing puller (3), metal stick (1) and hydraulic press.



I2RH01520058-01

Assembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) To ensure lubrication of countershaft (1), air blow oil holes (2) and make sure that they are free from any obstruction.



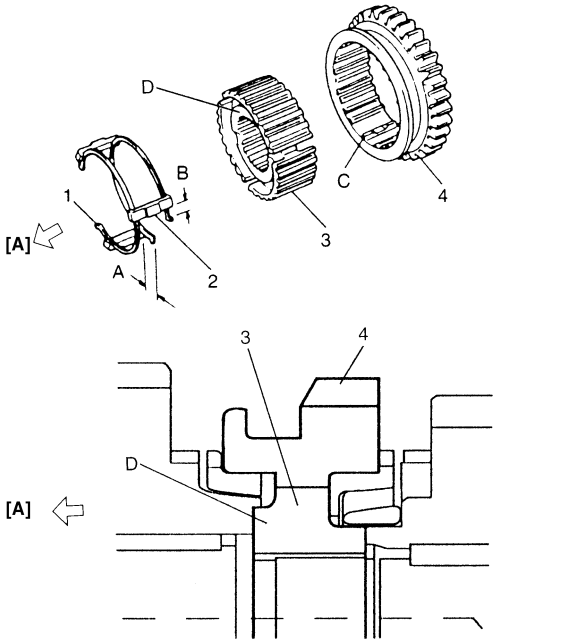
I2RH01520060-01

3) Fit low speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) as shown in the figure.

NOTE

- **No specific direction is assigned to each key but it is assigned as sleeve & hub assembly.**
- **Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.**

Synchronizer key installation position
A = B

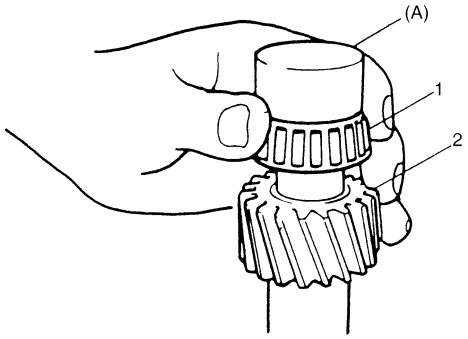


I3RM0A520051-01

[A]: 1st gear side	D: Short flange
C: Key way	

4) Install right bearing cone (1) to countershaft (2) using special tool and hammer.

Special tool
(A): 09923–78210



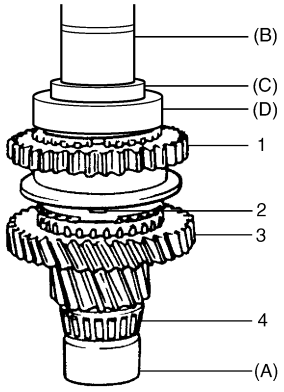
I2RH01520062-01

5) Install needle bearing of resin cage type, apply oil to it, then install 1st gear and 1st gear synchronizer ring.
6) Drive in low speed synchronizer sleeve & hub assembly (1) using special tools and hammer.

NOTE

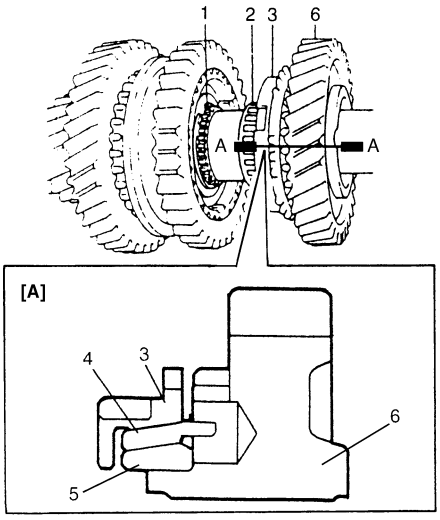
- **Support shaft with special tool as shown in the figure so that retainer of bearing cone (4) will be free from compression.**
- **Make sure that synchronizer ring (2) key slots are aligned with keys while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st gear (3) after press-fitting sleeve & hub assembly.**

Special tool
(A): 09923–78210
(B): 09940–51710
(C): 09924–07730
(D): 09924–07710



I4RH01520057-01

7) Install circlip (1) and confirm that circlip is installed in groove securely.
Install needle bearing (2) of separated steel cage type, apply oil to bearing.
With synchronizer outer ring (3), center cone (4) and inner ring (5) put together and installed to 2nd gear (6) as shown in the figure.



I2RH01520064-01

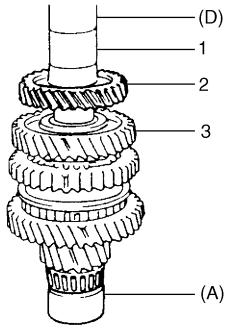
[A]: Section A – A

8) Press-fit 3rd gear (2) and spacer (1) using special tools and hydraulic press.

⚠ CAUTION

Press-fit spacer (1) and 3rd gear (2) first, and then 4th gear later separately so that countershaft will not be compressed excessively.

Special tool
(A): 09923–78210
(D): 09913–84510



I2RH01520065-01

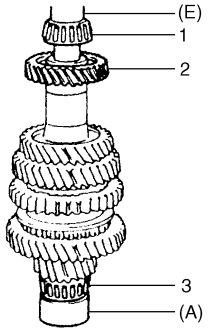
3. 2nd gear

9) Press-fit 4th gear (2) using the same procedure as Step 8).
10) Install left bearing cone (1) using special tools and hammer.

NOTE

For protection of right bearing cone (3), always support shaft with special tool as shown in the figure.

Special tool
(A): 09923–78210
(E): 09913–80113



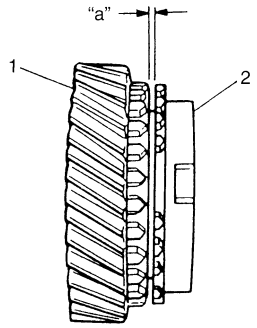
I2RH01520066-01

Synchronizer Parts Inspection

S7N20A5226022

Check clearance “a” between synchronizer ring (2) and gear (1), each chamfered tooth of gear, synchronizer ring and sleeve, then determine parts replacement.

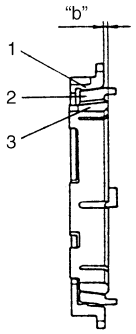
Clearance “a” between synchronizer ring and gear
Standard: 1.0 – 1.3 mm (0.039 – 0.051 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520048-01

Put the 2nd gear synchronizer outer ring (1), inner ring (3) and the cone (2) together and then measure the step difference between the outer ring and the inner ring. And also check each chamfered tooth of gear and synchronizer ring and replace with new one, if necessary. Also, check gear tooth.

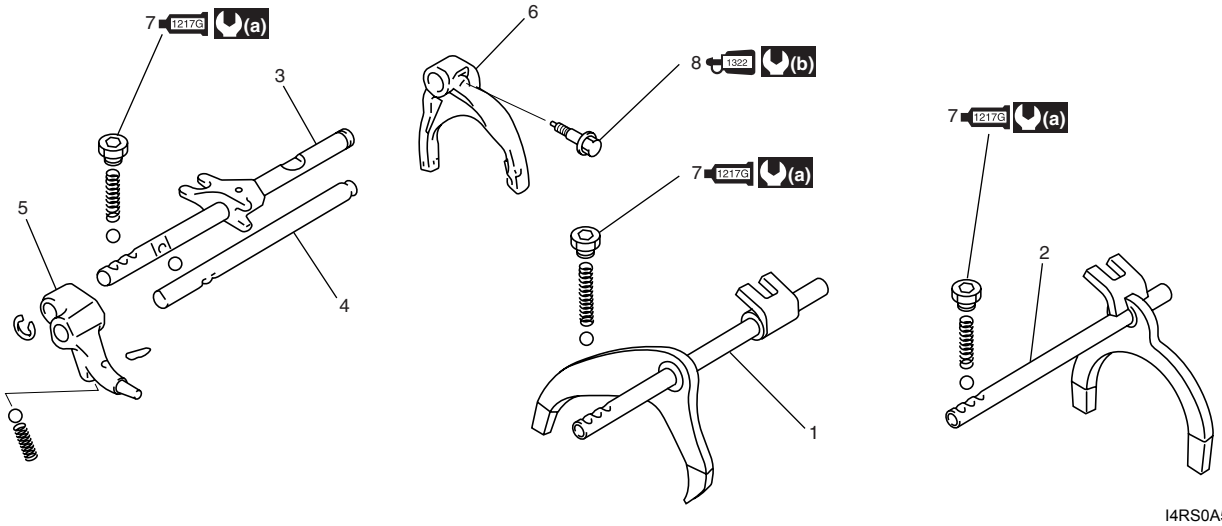
Difference “b” between synchronizer outer ring and inner ring
Standard: 1.0 – 1.3 mm (0.039 – 0.051 in.)
Service limit: 0.5 mm (0.019 in.)



I2RH01520059-01

Gear Shift Shaft Components

S7N20A5226023



I4RS0A520015-01

1. Low speed gear shift shaft	5. Reverse gear shift arm	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
2. High speed gear shift shaft	6. 5th gear shift fork	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. 5th & reverse gear shift shaft	1217G 7. Gear shift locating bolt : Apply sealant 99000-31260 to bolt thread.	
4. 5th & reverse gear shift guide shaft	1322 8. Shift fork bolt : Apply thread lock 99000-32110 to bolt thread.	

5th and Reverse Gear Shift Shafts Disassembly and Assembly

S7N20A5226024

Disassembly

Disassemble component parts using special tool and hammer.

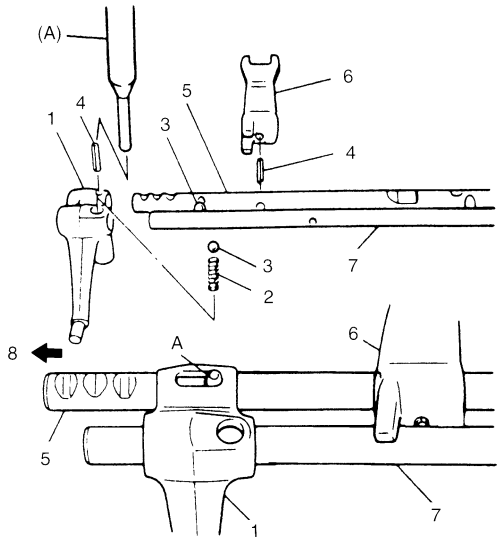
Special tool
(A): 09922–85811

Assembly

Replace or correct parts as required and assemble shafts making sure that component parts are in proper order as shown.

NOTE

- **Distinguish reverse gear shift arm spring (Blue) (2) from low speed locating spring (Yellow).**
- **Install 2 steel balls (3) in reverse gear shift arm (1) without fail.**
- **Drive in spring pin for reverse gear shift arm facing slit A toward 5th gear side.**



I3RM0A520053-01

A:	Face pin slit toward 5th gear side
4.	Spring pin
5.	5th & reverse gear shift shaft
6.	5th & reverse gear shift yoke
7.	5th & reverse gear shift guide shaft
8.	5th gear side

Gear Shift Shaft and Fork Inspection

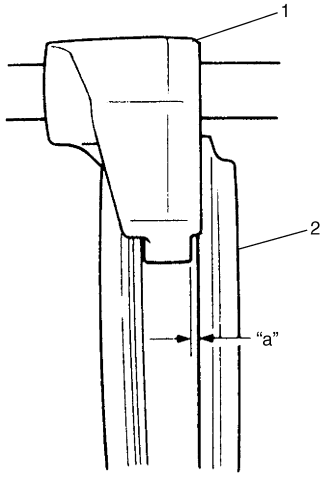
S7N20A5226025

Using feeler gauge, check clearance between fork (1) and sleeve (2) and replace those parts if it exceeds limit.

NOTE

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

Clearance “a” between fork and sleeve
Service limit “a”: 1.0 mm (0.039 in.)

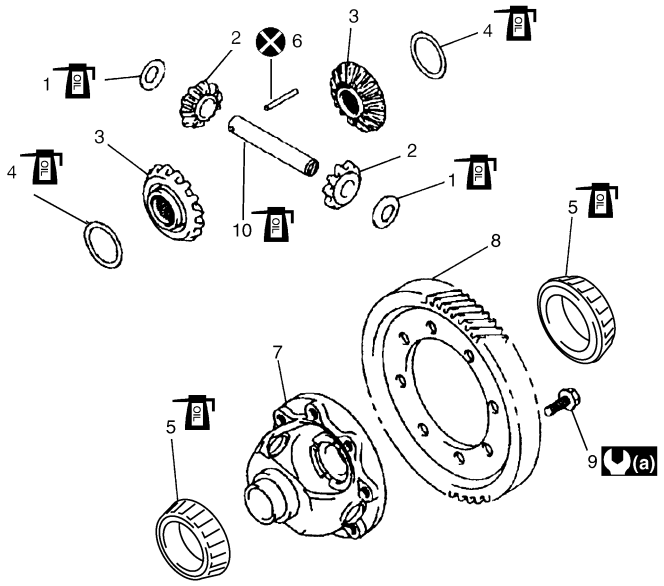


I2RH01520068-01

Insert each gear shift shaft into case and check that it moves smoothly. If it doesn’t, correct using oilstone, reamer or the like.

Differential Components

S7N20A5226026



I6RS0C520007-01

1.	Differential pinion washer
2.	Differential side pinion gear
3.	Differential side gear
4.	Side gear washer
5.	Differential side bearing
6.	Differential pinion shaft pin
7.	Differential case
8.	Final gear
9.	Final gear bolt
10.	Differential pinion shaft
(a) :	90 N·m (9.0 kgf-m, 65.0 lbf-ft)
:	Do not reuse.
:	Apply transaxle oil.

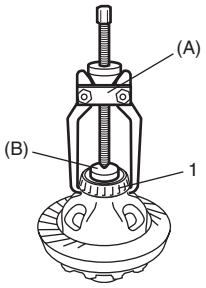
Differential Disassembly and Assembly

S7N20A5226027

Disassembly

1) Using special tools, remove right bearing (1).

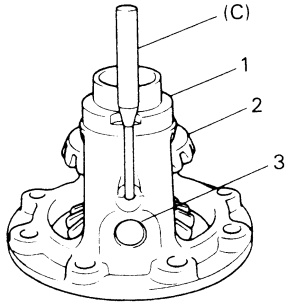
Special tool
(A): 09913–60910
(B): 09925–88210



I5JB0A321013-02

2) Remove left bearing in the same manner at Step 1).
3) Support differential case with soft jawed vise and remove final gear bolts then take out final gear.
4) Using special tool and hammer, drive out differential pinion shaft pin and then disassemble component parts.

Special tool
(C): 09922–85811



IYSY01521077-01

1.	Differential case
2.	Differential gear
3.	Differential pinion shaft

Assembly

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 all parts are clean.

1) Assemble differential gear and measure thrust play of differential gear as follows.

Special tool
(A): 09900–20607
(B): 09900–20701

Differential gear thrust play
0.03 – 0.31 mm (0.001 – 0.012 in.)

Left side

1. Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to top surface of gear (2).
2. Using 2 screwdrivers (1), move gear up and down and read movement of dial gauge pointer.

Right side

1. Using similar procedure to the left side, set dial gauge tip to gear (2) shoulder.
2. Move gear up and down by hand and read dial gauge.

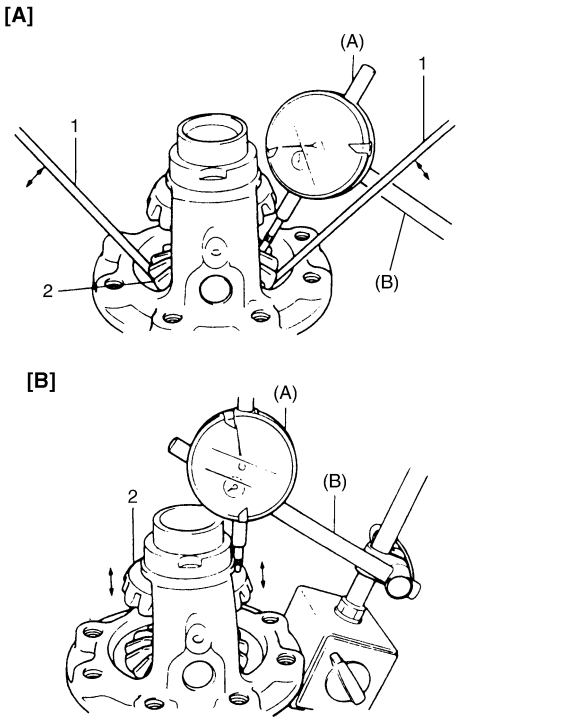
2) If thrust play is out of specification, select suitable thrust washer from among the following available size, install it and check again that specified gear play is obtained.

Available thrust washer thickness

***1 0.85 mm (0.033 in.)**	**1.05 mm (0.041 in.)**
0.90 mm (0.035 in.)	**1.10 mm (0.043 in.)**
0.95 mm (0.037 in.)	**1.15 mm (0.045 in.)**
1.00 mm (0.039 in.)	***2 1.20 mm (0.047 in.)**

NOTE

***1: M16A engine model only.**
***2: M15A engine model only.**



I3RH0A520083-01

[A]: Left side	[B]: Right side

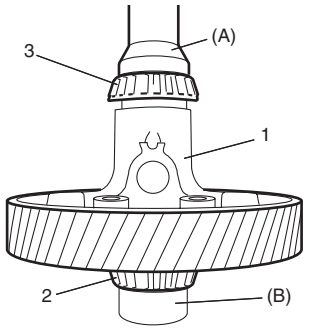
3) Drive in new differential pinion shaft pin (2) till the depth from differential case (3) surface is about 1 mm (0.04 in.).

4) Press-fit left bearing (2) using special tools and copper hammer.

Special tool
(A): 09913–76010

5) Support differential assembly (1) as illustrated so as to left bearing is floating, and then press-fit right bearing (3) using special tools.

Special tool
(A): 09913–76010
(B): 09951–16060



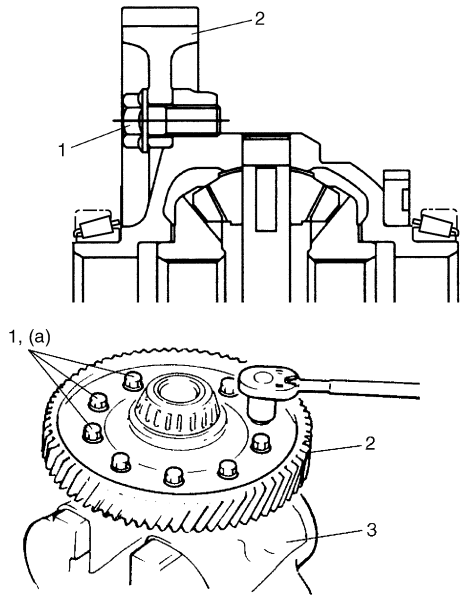
I6RS0C520008-01

6) Hold differential assembly with soft jawed vise (3), install final gear (2) as shown in the figure and then tighten bolts (1) to specified torque.

⚠ CAUTION

Use of any other bolts than specified ones is prohibited.

Tightening torque
Final gear bolt (a): 90 N·m (9.0 kgf-m, 65.0 lbf-ft)



I4RS0A520043-01

Specifications

Tightening Torque Specifications

S7N20A5227001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Transaxle oil drain plug	21	2.1	15.5	☞
Transaxle oil level / filler plug	21	2.1	15.5	☞
Back up light switch	23	2.3	17.0	☞
Gear shift guide case bolt	23	2.3	17.0	☞
Select lever bracket bolt	23	2.3	17.0	☞
Gear shift interlock bolt	23	2.3	17.0	☞
5th to reverse interlock guide bolt	23	2.3	17.0	☞
Countershaft nut	100	10.0	72.5	☞
Shift fork bolt	10	1.0	7.5	☞
Side cover bolt	10	1.0	7.5	☞
Reverse gear shift lever bolt	23	2.3	17.0	☞
Reverse shaft bolt	23	2.3	17.0	☞
Transaxle case bolt	23	2.3	17.0	☞
Side bearing retainer bolt	23	2.3	17.0	☞
Gear shift locating bolt	13	1.3	9.5	☞
Left case plate bolt	23	2.3	17.0	☞ / ☞
Oil gutter bolt	10	1.0	7.5	☞
Final gear bolt	90	9.0	65.0	☞

NOTE

The specified tightening torque is also described in the following.
“Gear Shift Control Lever and Cable Components: M15A and M16A Model”
“Manual Transaxle Unit Components: M15A and M16A Model”
“Gear Shift and Select Shaft Assembly Components: M15A and M16A Model”
“Manual Transaxle Assembly Components: M15A and M16A Model”
“Gear Shift Shaft Components: M15A and M16A Model”
“Differential Components: M15A and M16A Model”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A5228001

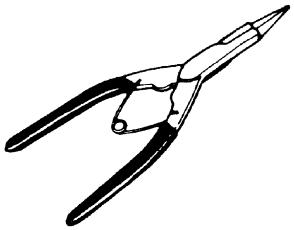
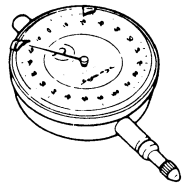
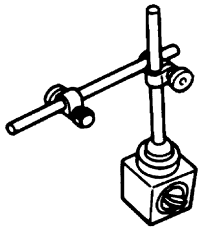
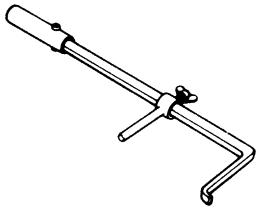
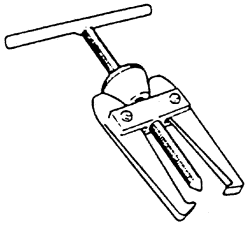
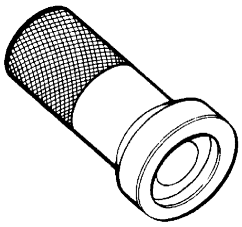
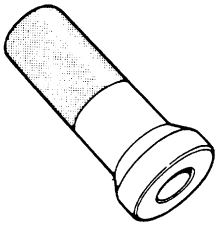
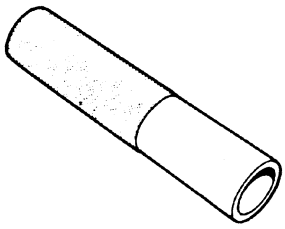
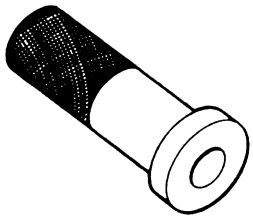
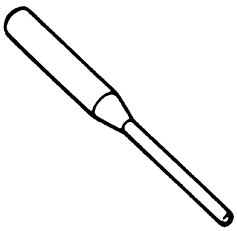
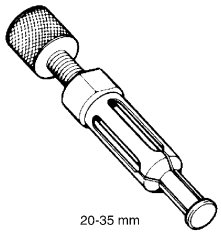
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞
	SUZUKI Super Grease A	P/No.: 99000–25011	☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞ / ☞ / ☞ / ☞ / ☞

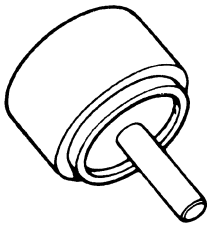
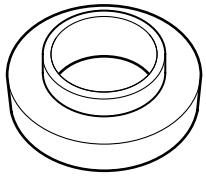
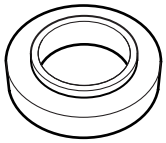
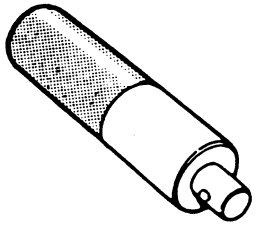
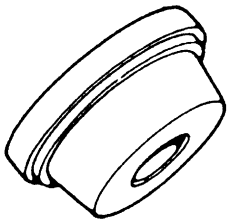
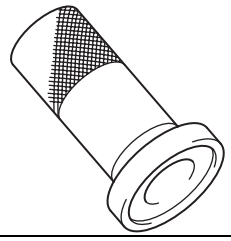
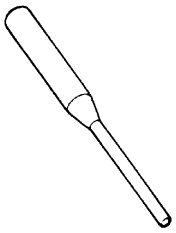
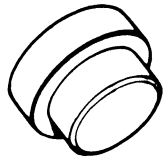
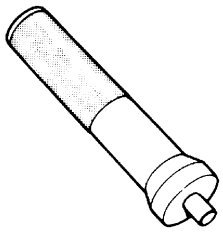
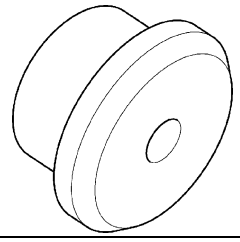
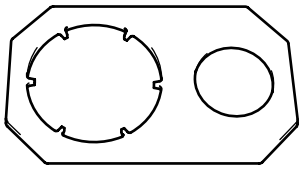
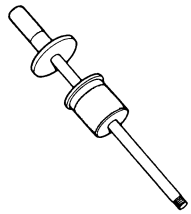
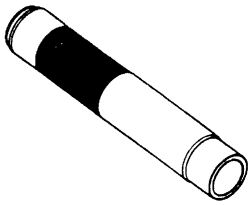
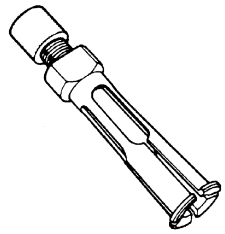
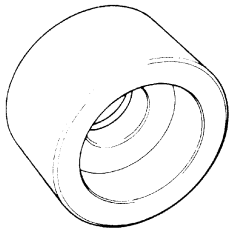
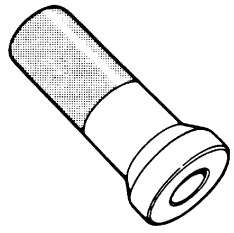
NOTE

Required service material is also described in the following.
“Gear Shift Control Lever and Cable Components: M15A and M16A Model”
“Gear Shift and Select Shaft Assembly Components: M15A and M16A Model”
“Manual Transaxle Assembly Components: M15A and M16A Model”
“Input Shaft and Countershaft Components: M15A and M16A Model”
“Gear Shift Shaft Components: M15A and M16A Model”
“Differential Components: M15A and M16A Model”

Special Tool

S7N20A5228002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 	09900–20607 Dial gauge ☞ 
09900–20701 Magnetic stand ☞ 	09913–50121 Oil seal remover ☞ 
09913–60910 Bearing and gear puller (40-60mm) ☞ 	09913–70123 Bearing installing tool ☞ / ☞ / ☞ 
09913–76010 Bearing installer ☞ / ☞ 	09913–80113 Bearing installer ☞ 
09913–84510 Bearing installer ☞ / ☞ / ☞ 	09913–85210 Bearing installer ☞ / ☞ 
09922–85811 Spring pin remover (4.5 mm) ☞ / ☞ / ☞ 	09923–74510 Bearing puller (20-35 mm) ☞ 

09923–78210 Bearing installer ☞ / ☞ / ☞ / ☞ 	09924–07710 Synchronizer hub installer ☞ 
09924–07730 Bearing installer ☞ 	09924–74510 Bearing and oil seal handle ☞ 
09924–84510–004 Bearing installer attachment ☞ 	09925–15410 Oil seal installer ☞ 
09925–78210 Spring pin remover (6 mm) ☞ 	09925–88210 Bearing puller attachment ☞ 
09925–98210 Input shaft bearing installer ☞ 	09926–27610 Oil seal installer ☞ / ☞ 
09927–76060 Gear holder ☞ / ☞ 	09930–30104 Sliding shaft ☞ / ☞ 
09940–51710 Bearing installer ☞ 	09941–64511 Bearing and oil seal remover (30 mm Min.) ☞ 
09951–16060 Control arm bush remover ☞ 	09951–16080 Bearing installer ☞ 

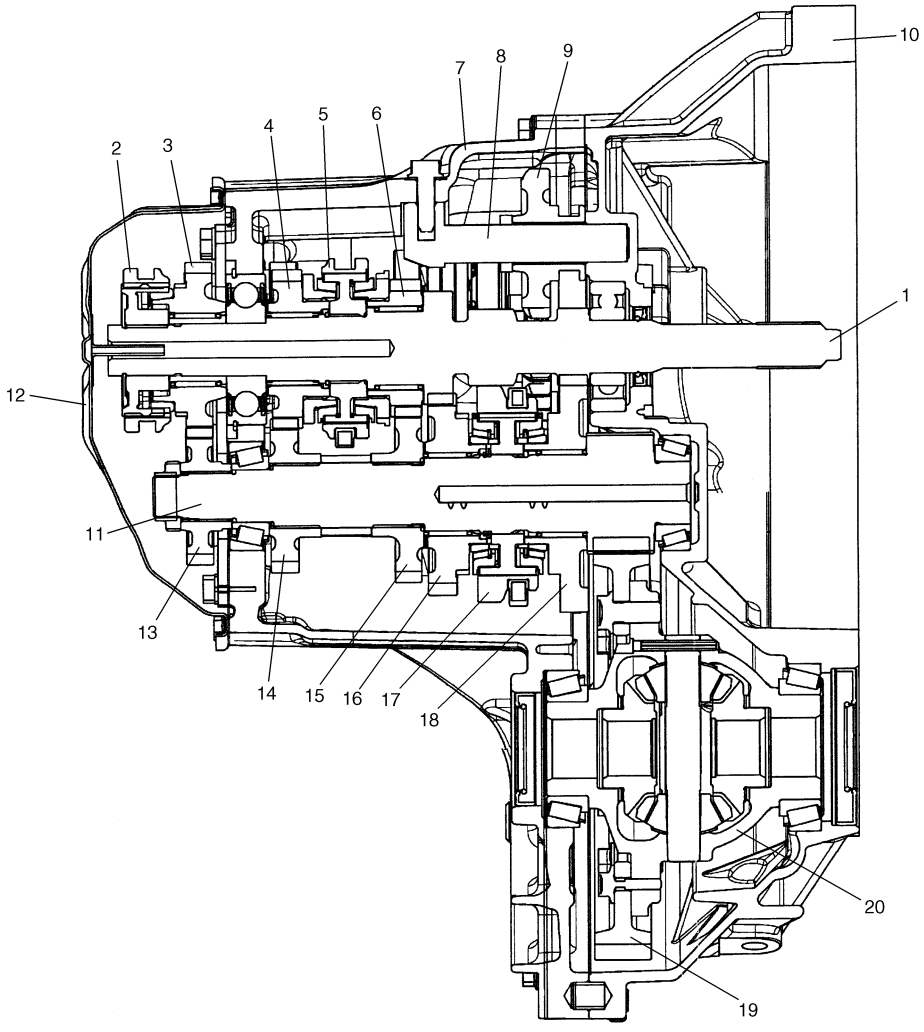
D13A and Z13DTJ Model

General Description

Manual Transaxle Construction

S7N20A5231001

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 sleeve & hub is mounted on countershaft and engaged with countershaft 1st gear or 2nd gear, while the high speed sleeve & hub is done on input shaft and engaged with input shaft 3rd gear or 4th gear. The 5th speed sleeve & hub on input shaft is engaged with input shaft 5th gear mounted on the input shaft.
To prevent the cracking noise from the reverse gear when shifting transaxle gear into the reverse gear, the reverse shift braking device is used.
The device utilizes the 5th synchromesh, which is the lever synchro type, to apply the brake on the input shaft rotation.
The double cone synchronizing mechanism is provided to 1st and 2nd gear synchromesh device for high performance of shifting to 1st and 2nd gear.
For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transaxle case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.
Further, care must be taken to adjust preload of countershaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.



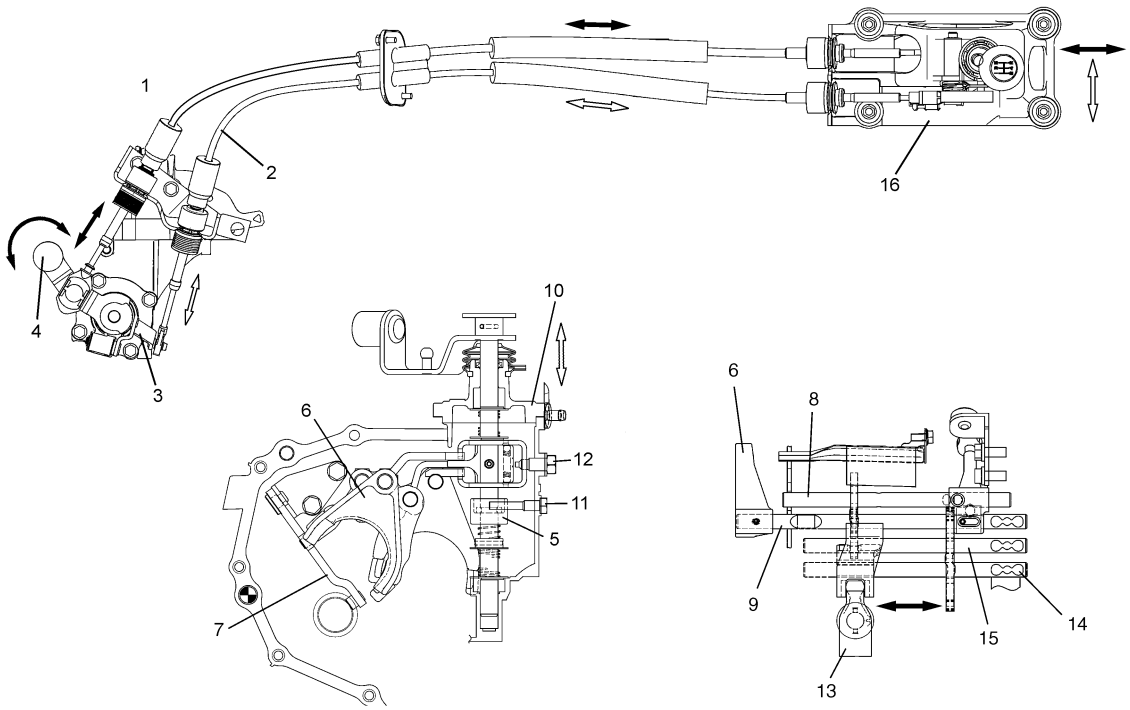
I7V20A522001-01

1. Input shaft	6. Input shaft 3rd gear	11. Countershaft	16. Countershaft 2nd gear
2. 5th speed sleeve & hub	7. Left case	12. Side cover	17. Low speed sleeve & hub
3. Input shaft 5th gear	8. Reverse gear shaft	13. Countershaft 5th gear	18. Countershaft 1st gear

4. Input shaft 4th gear	9. Reverse idler gear	14. Countershaft 4th gear	19. Final gear
5. High speed sleeve & hub	10. Right case	15. Countershaft 3rd gear	20. Differential case

Gear Shift Mechanism

The gear shifting control system consists of the following main parts. Movement of gear shift control lever is transmitted to gear shift & select shaft through gear shift and gear select cables.

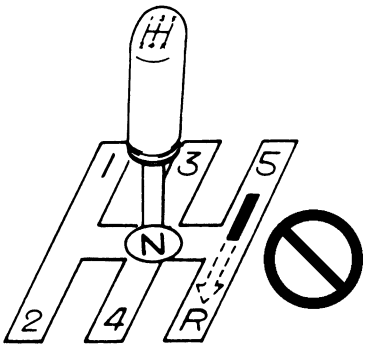


I7N20A523001-01

1. Gear shift control cable	7. Reverse gear shift lever	13. Gear shift & select lever
2. Gear select control cable	8. 5th & reverse gear shift guide shaft	14. Low speed gear shift shaft
3. Select cable lever	9. 5th & reverse gear shift shaft	15. High speed gear shift shaft
4. Shift cable lever	10. Gear shift & select shaft assembly	16. Gear shift control lever assembly
5. 5th & reverse gear shift cam	11. 5th to reverse interlock guide bolt	
6. 5th gear shift fork	12. Gear shift interlock bolt	

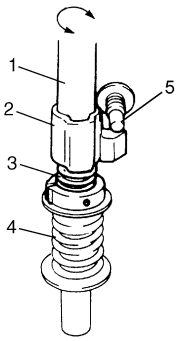
5th & Reverse Gear Shift Cam

5th & reverse gear shift cam, cam guide return spring and 5th to reverse interlock guide bolt are provided to prevent the gear from being directly shifted from 5th to reverse.



I2RH01520003-02

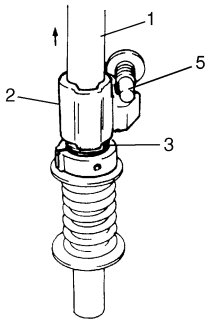
1) When shift lever is at neutral position between 3rd and 4th gear, shift cam (2) is under 5th to reverse interlock guide bolt (5) and can turn freely clockwise (to 3rd gear) and counterclockwise (to 4th gear).



I7N20A523002-01

1.	Shift & select shaft
3.	Return spring (expanded)
4.	Reverse select spring (expanded)

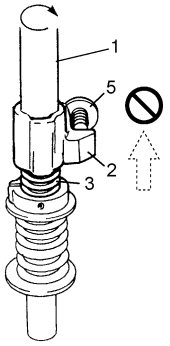
2) When shift lever is shifted toward the right from neutral position, shift and select shaft (1) moves up but shift cam (2) is restricted by 5th to reverse interlock guide bolt (5) and return spring is contracted.



I7N20A523003-01

3.	Reverse select spring (contracted)

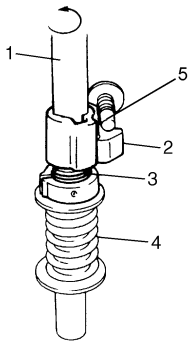
3) When shift lever is shifted to 5th gear, shift & select shaft (1) turns clockwise letting shift cam (2) off from 5th to reverse interlock guide bolt (5) and pushed up by return spring. In this state, movement of shift cam is restricted by 5th to reverse interlock guide bolt (5) and therefore, gear shift to reverse is not attainable.



I7N20A523004-01

3.	Reverse select spring (expanded)

4) When shift lever is shifted from neutral position between 5th gear and reverse gear to reverse gear, shift cam (2) turns counterclockwise to attain reverse gear.



I7N20A523005-01

1.	Shift & select shaft
3.	Return spring (contracted)
4.	Reverse select spring (contracted)
5.	5th to reverse interlock guide bolt

Diagnostic Information and Procedures

Manual Transaxle Symptom Diagnosis

S7N20A5234001

Condition	Possible cause	Correction / Reference Item
Gears slipping out of mesh	Worn shift fork shaft	*Replace shift fork shaft referring to "Manual Transaxle Assembly Components: D13A and Z13DTJ Model"*
	Worn shift fork or synchronizer sleeve	*Replace shift fork or synchronizer sleeve referring to "Manual Transaxle Assembly Components: D13A and Z13DTJ Model", "Fifth Gear Disassembly and Reassembly: D13A and Z13DTJ Model", "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Weak or damaged locating springs	*Replace locating spring referring to "Manual Transaxle Assembly Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Worn bearings on input shaft or countershaft	*Replace input shaft bearing or countershaft bearing referring to "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Worn chamfered tooth on sleeve and gear	*Replace synchronizer sleeve and gear referring to "Fifth Gear Disassembly and Reassembly: D13A and Z13DTJ Model", "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*

Condition	Possible cause	Correction / Reference Item
Hard shifting	Inadequate lubricant	*Replenish*
	Improper clutch pedal free travel	*Replace clutch pedal arm or clutch master cylinder referring to "Clutch Pedal Inspection in Section 5C" and/or "Clutch Master Cylinder Removal and Installation in Section 5C"*
	Distorted or broken clutch disc	*Replace clutch disc referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C"*
	Damaged clutch pressure plate	*Replace clutch cover referring to "Clutch Cover, Clutch Disc and Flywheel Removal and Installation in Section 5C"*
	Worn synchronizer ring	*Replace synchronizer ring referring to "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Worn chamfered tooth on sleeve or gear	*Replace synchronizer sleeve and gear referring to "Fifth Gear Disassembly and Reassembly: D13A and Z13DTJ Model", "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Worn gear shift control shaft joint bush	*Replace gear shift control shaft joint bush referring to "Gear Shift and Select Shaft Assembly Components: D13A and Z13DTJ Model"*
	Distorted shift shaft	*Replace shift shaft referring to "Gear Shift Shaft Components: D13A and Z13DTJ Model"*
	Broken gear shift / select control cables	*Replace gear shift and select cable referring to "Gear Shift Control Lever and Cable Removal and Installation: D13A and Z13DTJ Model"*
Noise	Inadequate or insufficient lubricant	*Replenish*
	Damaged or worn bearing(s)	*Replace bearing referring to "Fifth Gear Disassembly and Reassembly: D13A and Z13DTJ Model", "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Damaged or worn gear(s)	*Replace gear referring to "Fifth Gear Disassembly and Reassembly: D13A and Z13DTJ Model", "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*
	Damaged or worn synchronizer parts	*Replace synchronizer parts referring to "Fifth Gear Disassembly and Reassembly: D13A and Z13DTJ Model", "Input Shaft Disassembly and Reassembly: D13A and Z13DTJ Model" and/or "Countershaft Disassembly and Reassembly: D13A and Z13DTJ Model"*

Repair Instructions

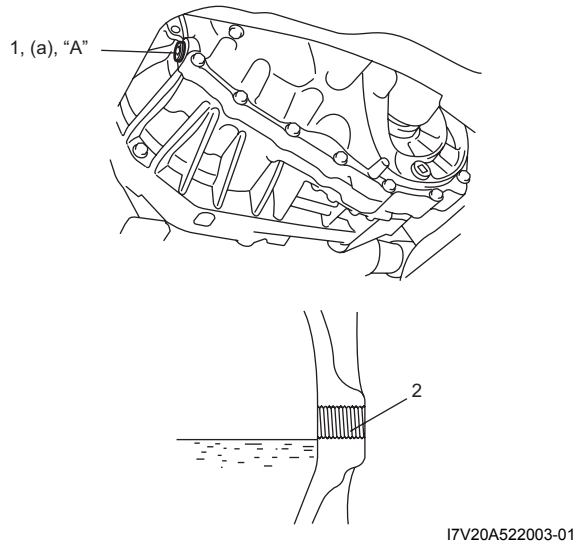
Manual Transaxle Oil Level Check

S7N20A5236001

1) Lift up vehicle and check oil leakage. Repair leaky point, if any.
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 excessive dirty or insufficient, change oil or replenish 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)



Manual Transaxle Oil Change

S7N20A5236002

1) Before changing oil, be sure to stop engine and lift vehicle horizontally.
2) With vehicle lifted up, check leakage.
   If leakage exists, correct it.
3) Remove oil level / filler plug (2).
4) Remove drain plug (1), and drain old oil.
5) Apply sealant to thread of drain plug (1), and tighten it to specified torque.

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

   Tightening torque
   Transaxle oil drain plug (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

6) Replenish new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE

It is highly recommended to use API GL-4 75W-90 gear oil.

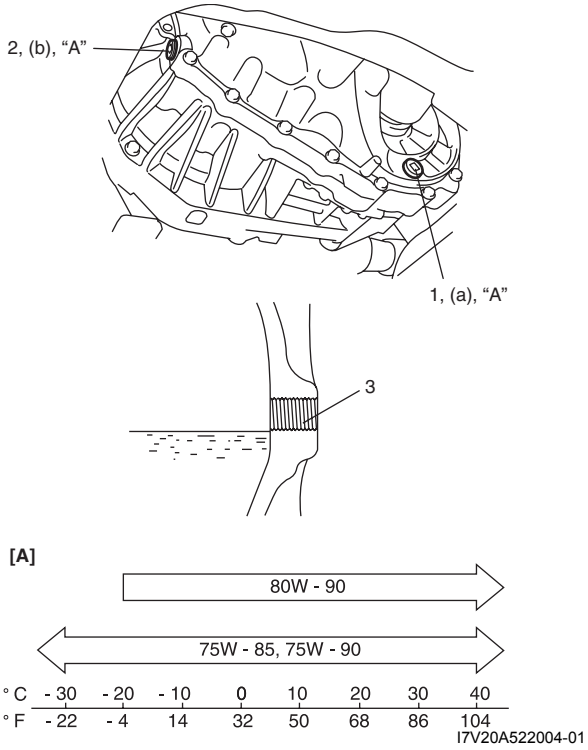
Transaxle oil specification
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

Transaxle oil capacity (Reference)
: 2.6 liters (5.5/4.6 US/Imp. pt.)

7) 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)



Differential Side Oil Seal Replacement

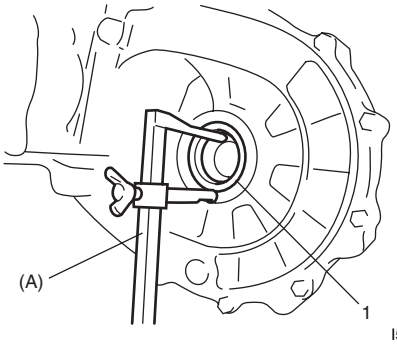
S7N20A5236003

Left side

1) Lift up vehicle and drain transaxle oil.
2) Remove left drive shaft assembly referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".

3) Remove oil seal (1) by using special tool.

Special tool
(A): 09913–50121



I5RW0A520006-02

4) Install new oil seal (1) using special tool.

NOTE

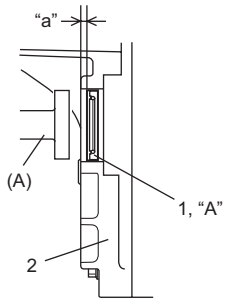
- **Be sure to install oil seal face spring side inward.**
- **Be sure to install oil seal to surface of left case (2) in parallel.**

Special tool
(A): 09913–75510

Distance between case surface and oil seal
"a": 0 – 1.0 mm (0 – 0.04 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)



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6) Insert left drive shaft assembly referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".

7) Replenish transaxle oil referring to "Manual Transaxle Oil Change: D13A and Z13DTJ Model".

Right side

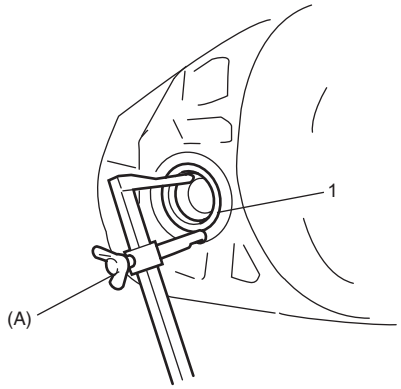
1) Remove engine with transaxle referring to "Timing Chain Cover and Timing Chain Components: D13A / Z13DTJ in Section 1D".

2) Remove drive shaft and center shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".

3) Remove rear engine mounting bracket.

4) Remove oil seal (1) by using special tool.

Special tool
(A): 09913–50121



I7N20A523006-01

5) Install new oil seal (1) using special tool.

NOTE

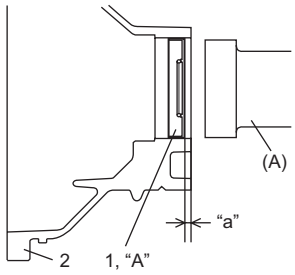
- **Be sure to install oil seal face spring side inward.**
- **Be sure to install oil seal to surface of right case (2) in parallel.**

Special tool
(A): 09913–75520

Distance between case surface and oil seal
"a": 0 – 1.0 mm (0 – 0.04 in.)

6) Apply grease to oil seal lip and check drive shaft where oil seal contacts for smoothness.

"A": Grease 99000–25011 (SUZUKI Super Grease A)



I7V20A522034-01

7) Install rear engine mounting bracket referring to "Engine Mounting Components: D13A / Z13DTJ in Section 1D".

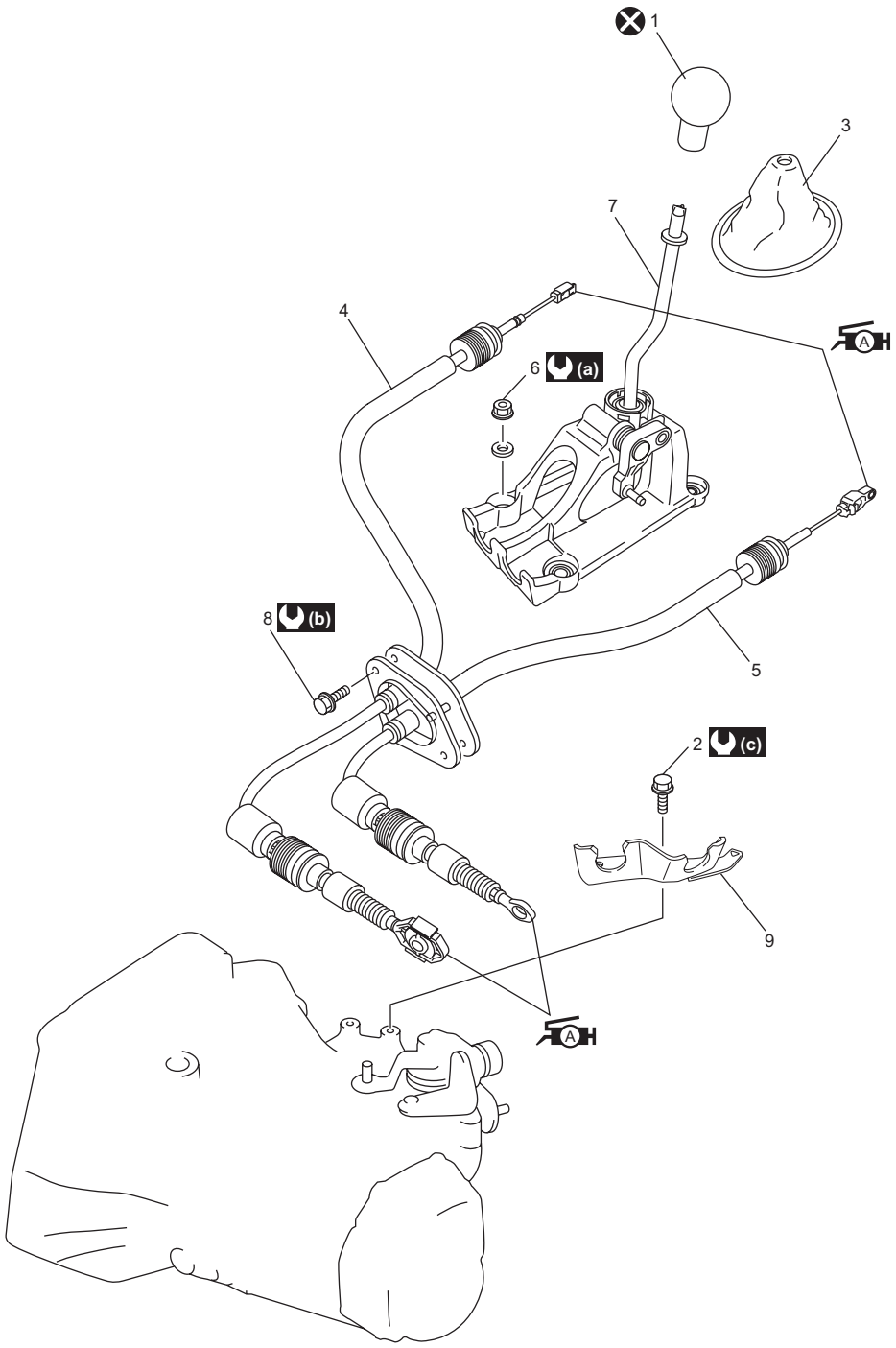
8) Install drive shaft and center shaft referring to "Front Drive Shaft Assembly Removal and Installation in Section 3A".

9) Install engine with transaxle referring to "Timing Chain Cover and Timing Chain Components: D13A / Z13DTJ in Section 1D".

10) Replenish transaxle oil referring to "Manual Transaxle Oil Change: D13A and Z13DTJ Model".

Gear Shift Control Lever and Cable Components

S7N20A5236004



I7N20A523007-01

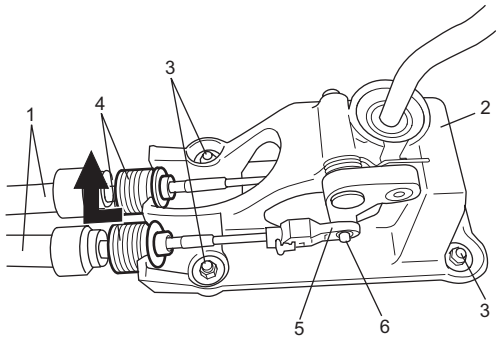
1. Gear shift control lever knob	8. Cable grommet bolt
2. Cable bracket bolt	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
4. Gear shift control cable : Apply grease 99000-25011 to cable end.	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
5. Gear select control cable : Apply grease 99000-25011 to cable end.	(c) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
6. Gear shift control lever assembly mounting nut	: Do not reuse.
7. Gear shift control lever assembly	

Gear Shift Control Lever and Cable Removal and Installation

S7N20A5236005

Removal

1) Remove console box.
2) Disconnect cable ends (5) from pivot (6) of gear shift control lever assembly by removing clip.
3) Disconnect gear shift and select control cables (1) from gear shift control lever assembly (2) while pulling quick joint (4) to arrow direction as shown in figure.
4) Remove gear shift control lever assembly mounting nuts (3) and gear shift control lever assembly from floor panel.



I7N20A523008-01

5) Disconnect gear shift and select control cables from transaxle.
6) Remove cable grommet bolt, and then remove gear shift and select control cables from floor panel.

Installation

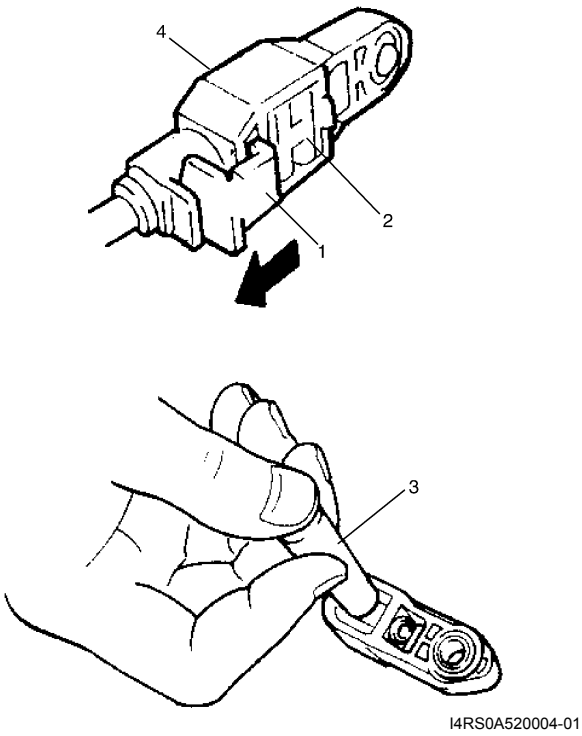
Reverse removal procedure for installation noting the following.

- Tighten each bolts and nuts to specified torque referring to “Gear Shift Control Lever and Cable Components: D13A and Z13DTJ Model”.
- Adjust gear select control cable referring to “Gear Select Control Cable Adjustment: D13A and Z13DTJ Model”.

Gear Select Control Cable Adjustment

S7N20A5236006

1) Release lock plate (1) which restricts moving of cable end holder (2).
2) Push cable end holder (2) out from adjuster (4) using appropriate tool (3) to disengage cable.



I4RS0A520004-01

3) Apply grease to pin (5) of gear shift control lever, and then install adjuster (1) into pin of gear shift control lever securely.

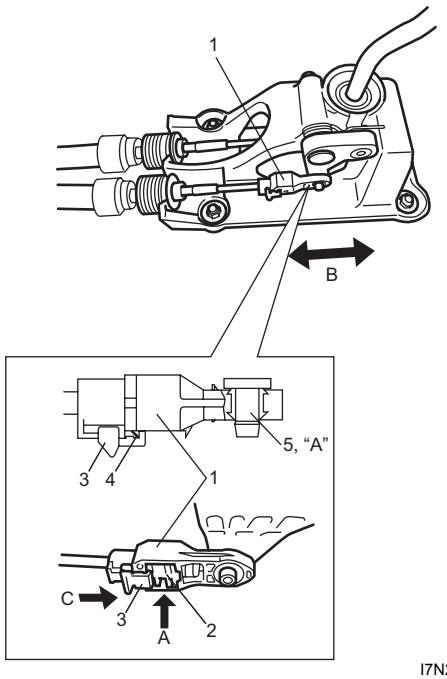
“A”: Grease 99000–25011 (SUZUKI Super Grease A)

4) Push cable end holder (2) in direction A.

NOTE

Do not apply force to adjuster in cable operation direction B.

5) Slide lock plate (3) in direction C, until it gets over the claw (4) of cable end holder.



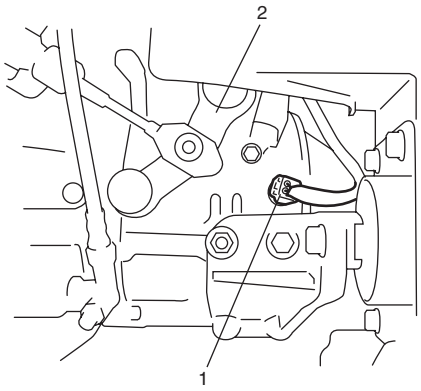
I7N20A523009-01

Back Up Light Switch Removal and Installation

S7N20A5236007

Removal

1) Remove battery and tray.
2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Disconnect back up light switch connector (1).
4) Remove back up light switch.



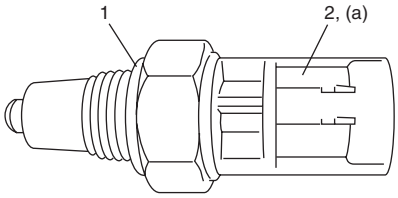
I5RW0A520009-01

2. Gear shift and select shaft assembly

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

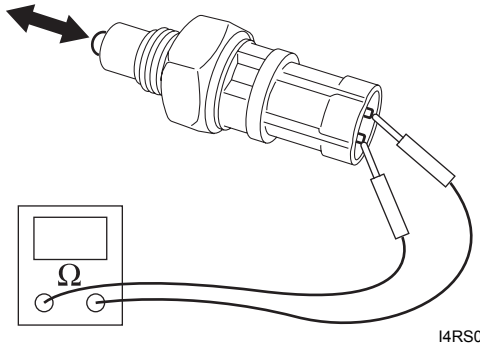
2) Connect back up light switch connector.
3) Install air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
4) Install battery and tray.

Back Up Light Switch Inspection

S7N20A5236008

Check back up light switch for function using ohmmeter. If faulty condition is found, replace back up light switch referring to “Back Up Light Switch Removal and Installation: D13A and Z13DTJ Model”.

Back up light switch specification
Switch ON (Push): Continuity
Switch OFF (Release): No continuity



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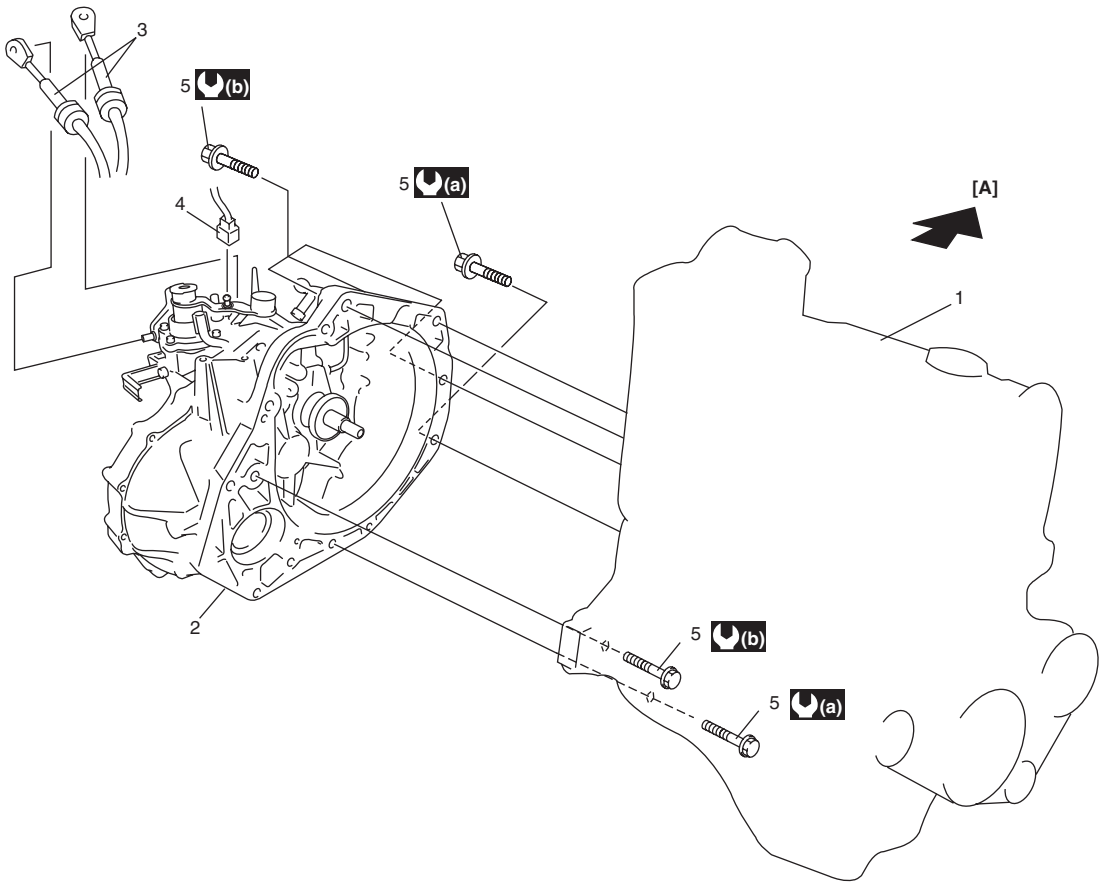
Manual Transaxle Unit Components

S7N20A5236009



I6RS0E520021-02

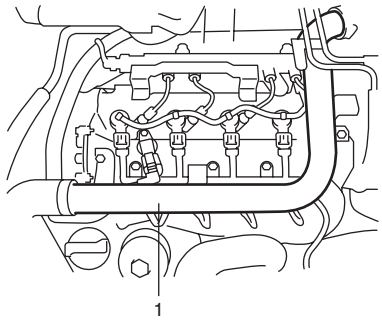
[A]: Forward	3. Gear shift control cables	(a) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
1. Engine	4. Buck up light switch connector	(b) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
2. Transaxle	5. Transaxle to engine bolt	

Manual Transaxle Unit Dismounting and Remounting

S7N20A5236010

Dismounting

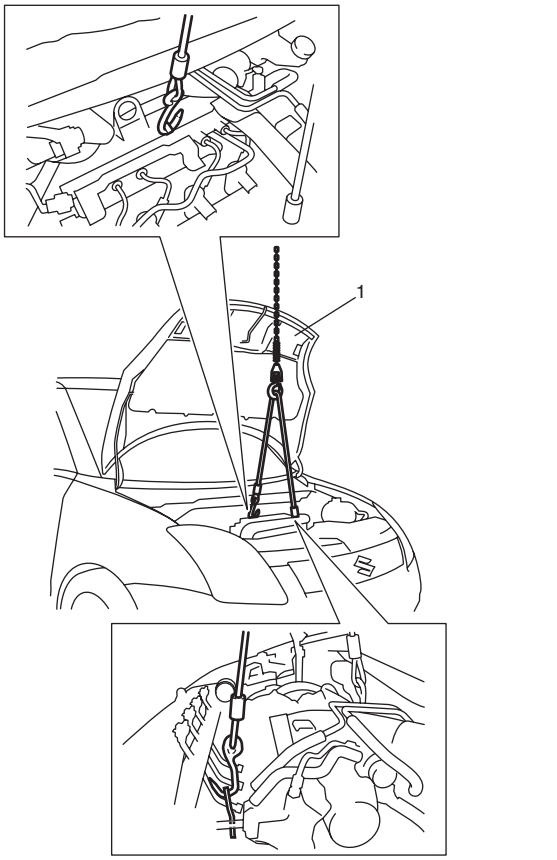
1) Remove battery and battery tray.
2) Remove air cleaner case and resonator.
3) Remove clutch fluid pipe referring to “Clutch Fluid Pipe Removal and Installation in Section 5C”.
4) Disconnect shift and select cables from transaxle and then remove its bracket on transaxle.
5) Undo back up light connector and wiring harness clamp.
6) Support engine as follows.
   a) Remove inter cooler pipe (1).



I6RS0E520024-01

b) Remove food (1) if necessary.

c) Support engine by lifting device as shown in figure.



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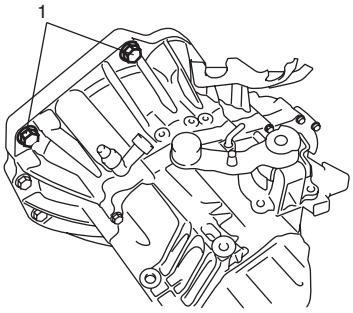
7) Remove transaxle to engine bolts (1). (upper side)



I6RS0E520030-01

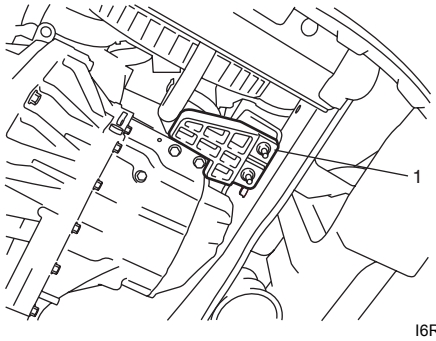
8) Drain transaxle oil.

9) Remove front drive shafts and center shift referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.

10) Remove exhaust pipe No. 1 and No. 2 referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.

11) Support transaxle with transmission jack.

12) Remove engine left mounting with bracket (1).



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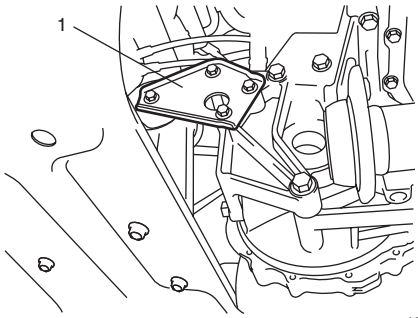
13) Remove engine rear mounting bracket (1).



I6RS0E520035-02

14) Remove transaxle to engine bolts. (lower side)

15) Remove other attached parts from transaxle, if any.

16) Pull transaxle out so as to disconnect input shaft from clutch disc and then lower it.

Remounting

⚠ CAUTION

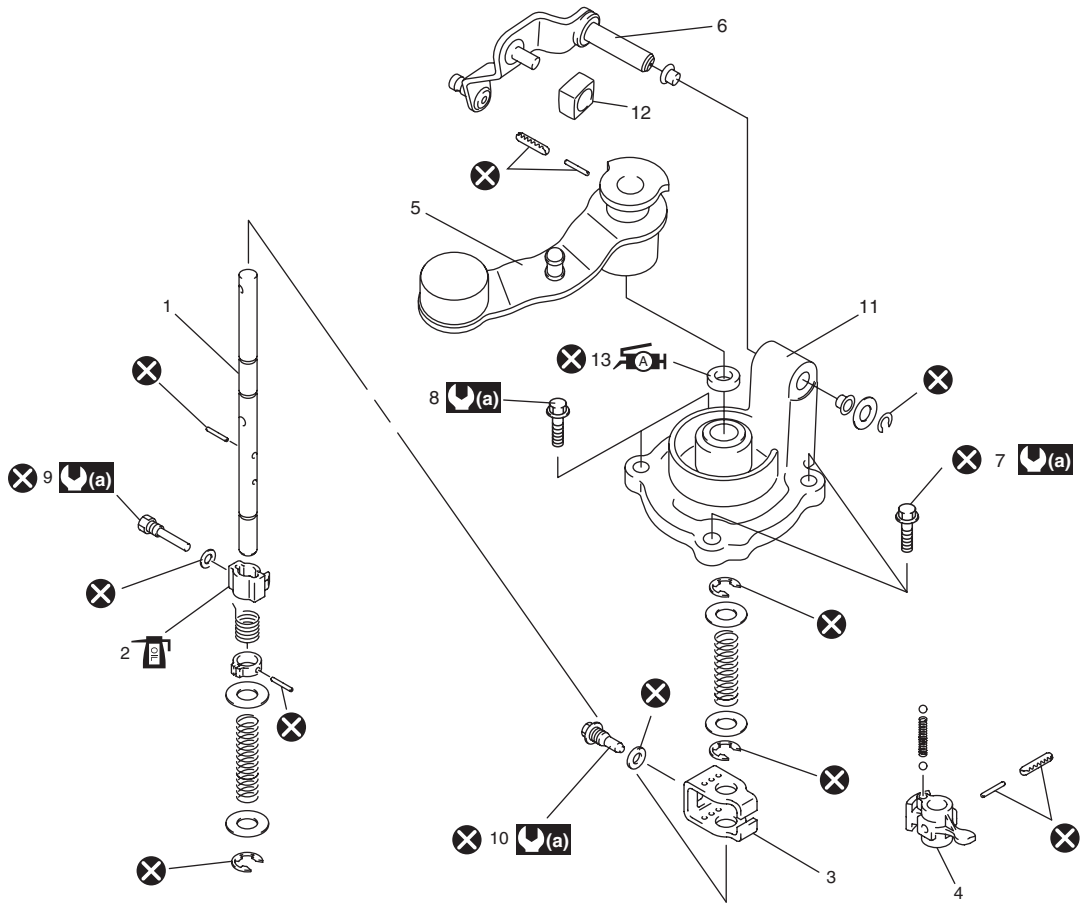
- **Care should be taken not to scratch oil seal lip with drive shaft while raising transaxle.**
- **Do not hit drive shaft joint with hammer when installing it into differential gear.**

For remounting, reverse dismounting procedure noting the following.

- Tighten each bolts and nuts to specified torque referring to “Manual Transaxle Unit Components: D13A and Z13DTJ Model” and “Engine Mounting Components: D13A / Z13DTJ in Section 1D”.
- Install clutch fluid pipe referring to “Clutch Fluid Pipe Removal and Installation in Section 5C”.
- Install exhaust pipe No. 1 and No. 2 referring to “Exhaust Pipe and Muffler Removal and Installation: D13A / Z13DTJ in Section 1K”.
- Set each clamp for wiring securely.
- Install front drive shafts and center shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
- Fill transaxle with oil as specified referring to “Manual Transaxle Oil Change: D13A and Z13DTJ Model”.
- Connect battery and check function of engine, Clutch and transaxle.

Gear Shift and Select Shaft Assembly Components

S7N20A5236011



I7N20A523010-01

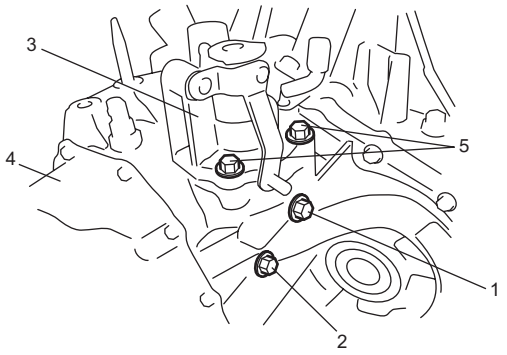
1. Gear shift & select shaft	7. Gear shift guide case bolt No.1	13. Oil seal : Apply grease 99000-25011 to oil seal lip.
2. 5th & reverse gear shift cam	8. Gear shift guide case bolt No.2	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
3. Gear shift interlock plate	9. 5th to reverse interlock guide bolt	: Do not reuse.
4. Gear shift & select lever	10. Gear shift interlock bolt	: Apply transaxle oil.
5. Shift cable lever	11. Guide case	
6. Select cable lever	12. Select lever bush	

Gear Shift and Select Shaft Assembly Removal and Installation

S7N20A5236012

Removal

1) Remove battery and tray.
2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Disconnect gear shift and gear select control cables from transaxle.
4) Remove gear shift interlock bolt (1) and 5th to reverse interlock guide bolt (2) from transaxle case.
5) Remove gear shift guide case bolts (5) and gear shift & select shaft assembly (3).



I7N20A523011-01

4. Transaxle side cover

Installation

⚠ CAUTION

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

1) Clean mating surface of guide case (1) and left case (5), apply sealant to left case as shown in figure, mate guide case with left case.

   “B”: Sealant 99000–31260 (SUZUKI Bond No.1217G)

   Sealant amount for left case
   “a”: 1.5 mm (0.059 in.)

2) Install new guide case bolts No.1 (6) and guide case bolts No.2 (2), and tighten them to specified torque.

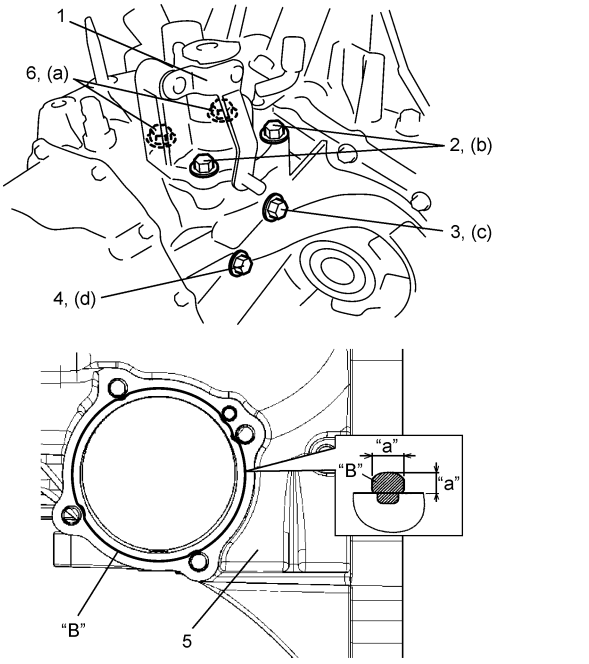
   Tightening torque
   Guide case bolt No.1 (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
   Guide case bolt No.2 (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

3) Install new washer and new gear shift interlock bolt (3), and then tighten it to specified torque.

   Tightening torque
   Gear shift interlock bolt (c): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

4) Install new washer and new 5th to reverse interlock guide bolt (4) and then tighten it to specified torque.

   Tightening torque
   5th to reverse interlock guide bolt (d): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



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5) Connect gear shift and battery gear select control cables to transaxle.
6) Install air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
7) Install battery and battery tray.
8) Check input shaft for rotation in each gear position.

Gear Shift and Select Shaft Assembly Disassembly and Reassembly

S7N20A5236013

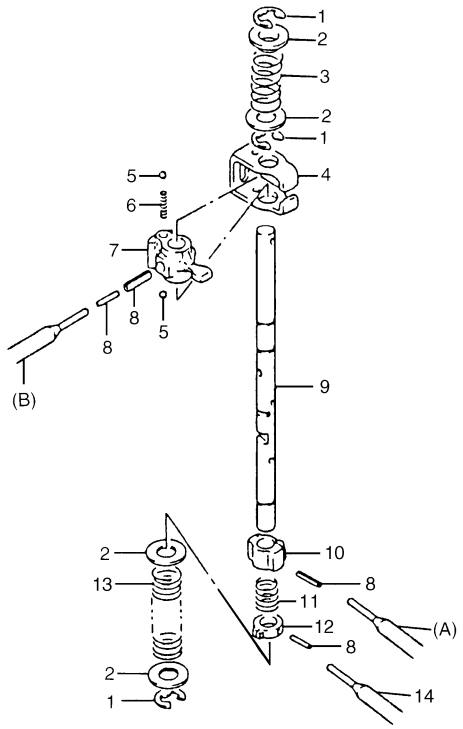
1) Push out spring pins special tool as shown in figure.

Special tool
(A): 09922–85811 4.5 mm
(B): 09925–78210 6.0 mm

2) Inspect component parts for wear, distortion or damage. If any detect is found, replace detective part with new one.

NOTE

- **When driving into spring pin, be sure to support gear shift & select shaft with wood block in order to prevent shaft from bent.**
- **Assemble 5th & reverse gear shift cam with its pit and spring pin aligned.**
- **Make sure to select an appropriate spring by identifying the painted colors to keep gear shifting performance as designed.**
  - **1st & 2nd select spring: No paint**
  - **Reverse select spring: Pink**



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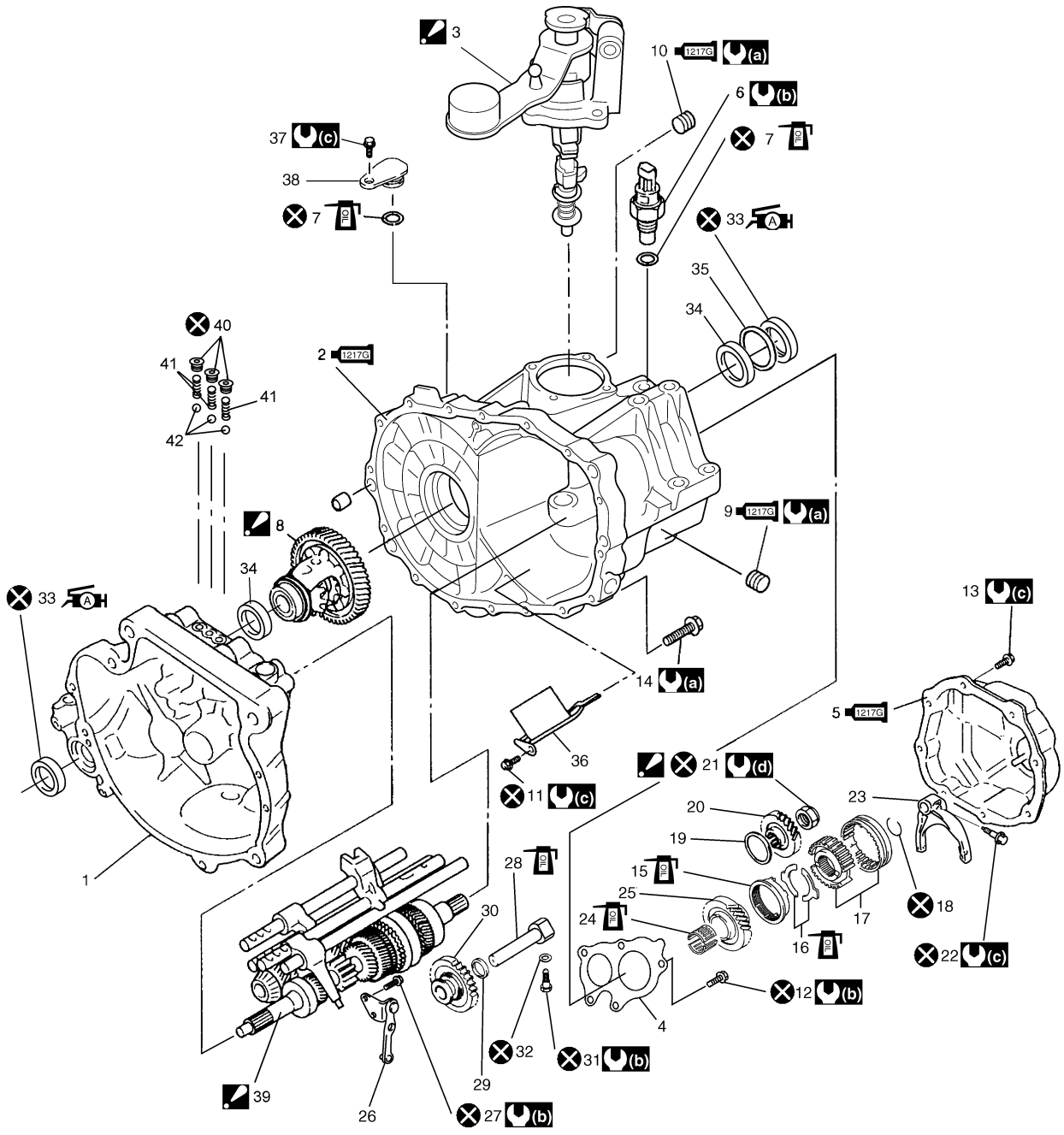
1. E-ring	8. Spring pin
2. Washer	9. Gear shift & select shaft
3. Reverse select spring	10. 5th & reverse gear shift cam
4. Gear shift interlock plate	11. Cam guide return spring
5. Ball	12. 5th & reverse gear shift cam guide
6. Gear shift interlock spring	13. 1st & 2nd select spring
7. Gear shift & select lever	14. Spring pin remover (2.8 – 3.0 mm (0.11 – 0.12 in.))

Manual Transaxle Assembly Components

S7N20A5236014



I7N20A523012-01

1. Transaxle right case	25. Input shaft 5th gear
1217G 2. Transaxle left case : Apply sealant 99000-31260 to mating surface of left case and right case.	26. Reverse gear shift lever
3. Gear shift and select shaft assembly : For details, refer to “Gear Shift and Select Shaft Assembly Removal and Installation: D13A and Z13DTJ Model”.	27. Reverse gear shift lever bolt
4. Transaxle left case plate	28. Reverse gear shaft
1217G 5. Transaxle side cover : Apply sealant 99000-31260 to mating surface of side cover and left case.	29. Washer
6. Back up light switch	30. Reverse idler gear
7. O-ring	31. Reverse shaft bolt
8. Differential assembly : For details, refer to “Differential Disassembly and Reassembly: D13A and Z13DTJ Model”.	32. Washer
1217G 9. Oil level / filler plug : Apply sealant 99000-31260 to all around thread part of plug.	A/H 33. Oil seal : Apply grease 99000-25011 to oil seal lip.

1217G	10.	Oil drain plug : Apply sealant 99000-31260 to all around thread part.	34. Outer race
	11.	Oil gutter bolt	35. Shim
	12.	Left case plate bolt	36. Oil gutter
	13.	Side cover bolt	37. Sensor cap bolt
	14.	Transaxle case bolt	38. Sensor cap
	15.	5th speed synchronizer ring	39. Input shaft & countershaft assembly : For details, refer to "Input Shaft and Countershaft Components: D13A and Z13DTJ Model".
	16.	5th speed synchronizer lever	40. Gear shift locating bolt
	17.	5th speed sleeve & hub	41. Locating spring
	18.	Circlip	42. Steel ball
	19.	Bearing set shim	(a) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
	20.	Countershaft 5th gear	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
	21.	Countershaft nut : After tightening, caulk nut securely.	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
	22.	Shift fork bolt	(d) : 100 N·m (10.2 kgf-m, 74.0 lbf-ft)
	23.	5th gear shift fork	: Do not reuse.
	24.	Needle bearing	: Apply transaxle oil.

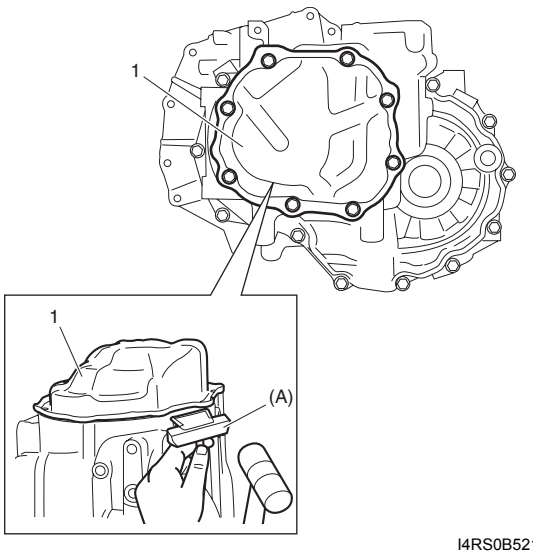
Fifth Gear Disassembly and Reassembly

S7N20A5236015

Disassembly

1) Remove cover bolts and take off transaxle side cover (1) using special tool.

Special tool
(A): 09921–96510



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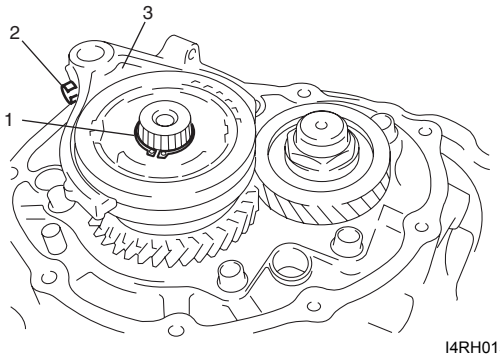
⚠ CAUTION

Be sure not to distort side cover when it is removed from left case.

2) Using snap ring pliers, remove circlip (1).
3) Remove shift fork shaft bolt (2).
4) Remove gear shift fork (3) and 5th gear all together. Use gear puller for removal if spline fitting of hub is tight.



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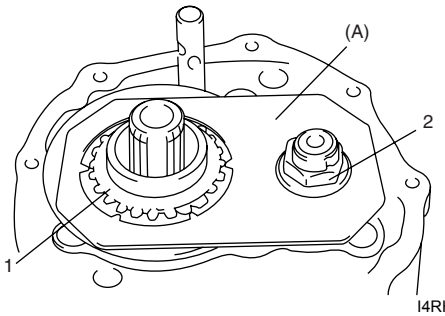
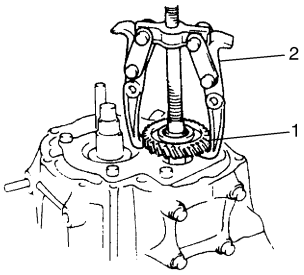
5) Unfasten caulking of countershaft nut (2), install input shaft 5th gear (1) and special tool to stop rotation of shafts, and then remove countershaft nut (2).

Special tool
(A): 09927–76060



I4RH01520016-01

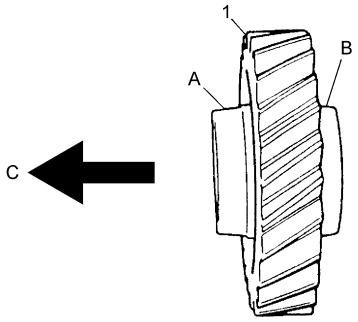
6) Remove input shaft 5th gear, needle bearing and then countershaft 5th gear (1). Gear puller (2) would be necessary if spline fitting of countershaft 5th gear is tight.



I4RH01520017-01

Reassembly

1) Install countershaft 5th gear (1) to countershaft as show in figure.



I7V20A522014-01

A:	Long flange (Inside)
B:	Short flange (Outside)
C:	Countershaft side

2) Apply transaxle oil to needle bearing (3), and install it to input shaft.

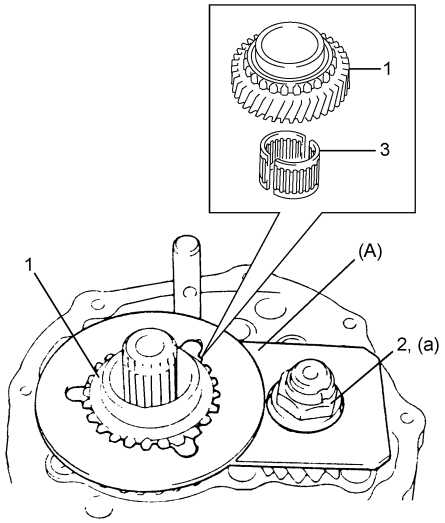
3) Install input shaft 5th gear (1) to input shaft.

4) Install special tool in order to stop shaft rotation.

Special tool
(A): 09927–76060

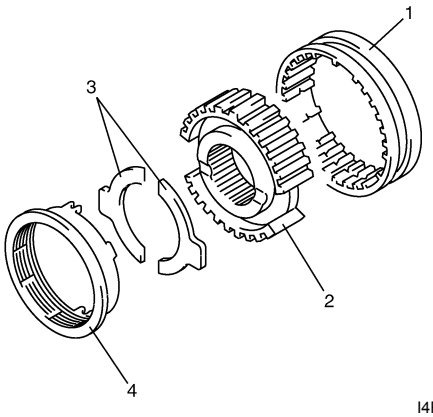
5) Tighten new countershaft nut (2) to specified torque, and caulk nut securely.

Tightening torque
Countershaft nut (a): 100 N·m (10.2 kgf-m, 74.0 lbf-ft)



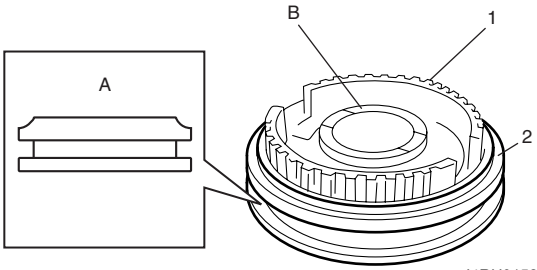
I7V20A522015-01

6) Assemble 5th speed synchronizer sleeve (1), hub (2), 5th speed synchronizer levers (3) and synchronizer ring (4) as follows.



I4RH01520054-01

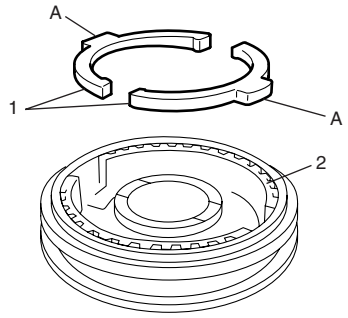
a) Install hub (1) to 5th speed synchronizer sleeve (2) in specified direction as shown in figure.



I4RH01520048-01

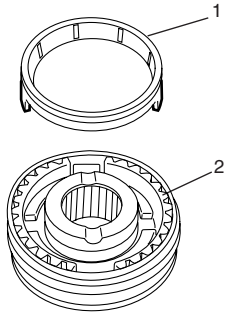
A:	Chamfered side
B:	Long boss

b) Fit 5th speed synchronizer levers (1) to hub (2) by aligning protrusion “A” of 5th speed synchronizer levers (1) with groove of hub (2).



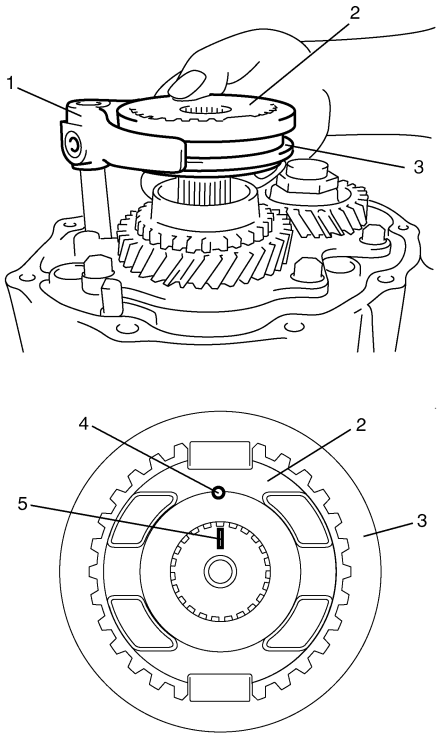
I4RH01520049-01

c) Install synchronizer ring (1) to hub (2) in specified direction as shown in figure.



I4RH01520055-01

7) Fit 5th gear shift fork (1) to sleeve (3) and hub (2) assembly, and install them into input shaft and gear shift shaft by aligning punch mark (4) with matching mark (5) on input shaft.

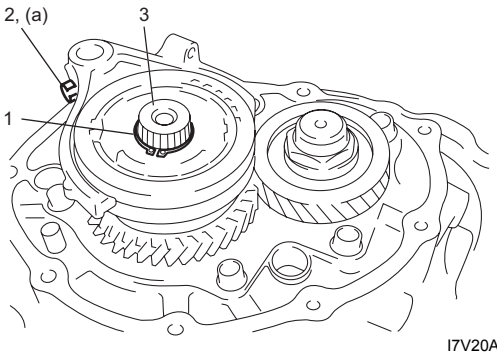


I3RH0A520080-01

8) Tighten new shift fork shaft bolt (2) to specified torque.

Tightening torque
Shift fork shaft bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

9) Using snap ring pliers, install new circlip (1) to input shaft (3).



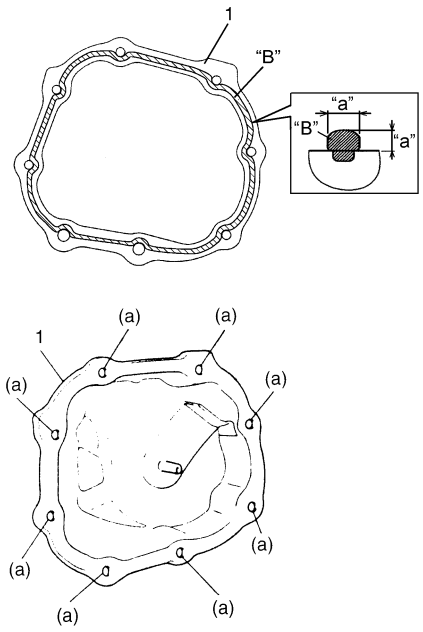
I7V20A522016-01

10) Clean mating surface of both left case and side cover (1), apply sealant to side cover as shown in figure, mate it with left case, and then tighten side cover bolts with specified torque.

“B”: Sealant 99000–31260 (SUZUKI Bond No.1217G)

<u>Sealant amount for side cover</u>
“a”: 1.5 mm (0.059 in.)

Tightening torque
Side cover bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



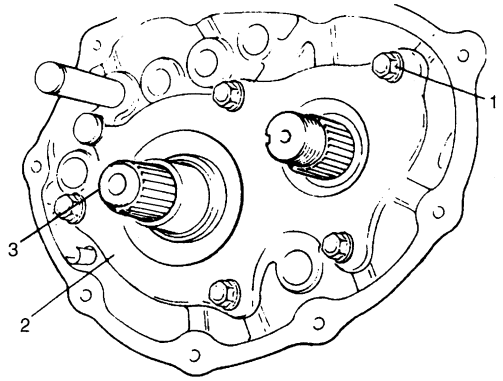
I7V20A522017-01

Manual Transaxle Assembly Disassembly and Reassembly

S7N20A5236016

Disassembly

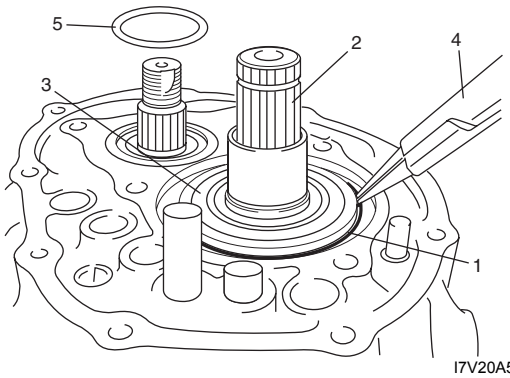
1) Remove left case plate bolts (1), and take off left case plate (2).



I4RH01520018-01

3. Input shaft

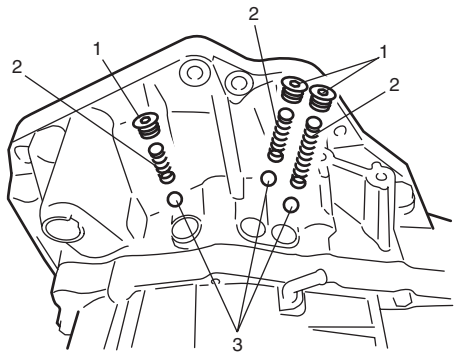
2) Remove bearing set shim (5).
3) Remove snap ring (1) using snap ring pliers (4).



I7V20A522018-01

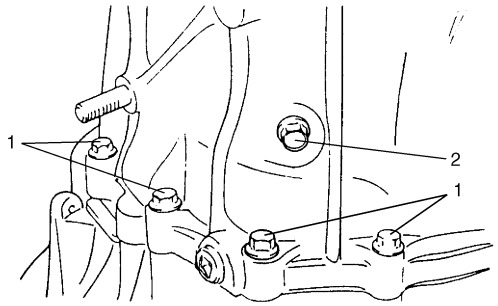
2. Input shaft
3. Input shaft left bearing

4) Remove gear shift locating bolts (1), then take out locating springs (2) and steel balls (3).



I7V20A522019-01

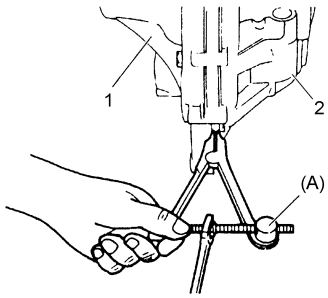
5) Remove reverse shaft bolt (2) with washer.
6) Remove transaxle case bolts (1).



I4RH01520020-01

7) Separate left case (1) from right case (2) using special tool.

Special tool
(A): 09912–34510

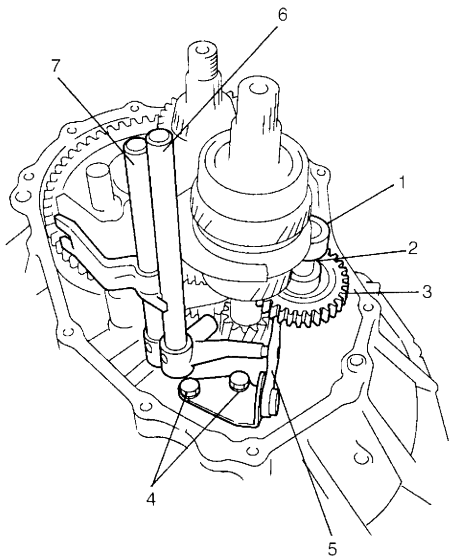


I7V20A522020-01

8) Pull out reverse gear shaft (1) with washer (2), then take off reverse idler gear (3).
9) Remove reverse gear shift lever bolts (4) and reverse gear shift lever (5).
10) Pull out 5th & reverse gear shift guide shaft (6) together with 5th & reverse gear shift shaft (7).

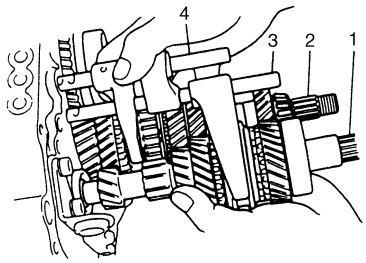
NOTE

When removing 5th & reverse gear shift shaft (7) and guide shaft (6), push up high speed gear shift shaft and shift it to 4th in order to facilitate removal of 5th & reverse shift shaft.



I3RH0A520012-01

11) By tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly (1), countershaft assembly (2), high speed gear shift shaft (3) and low speed gear shift shaft (4) all at once.



I2RH01520035-01

12) Remove countershaft left bearing outer race from left case.
13) Remove differential assembly from right case.

Reassembly

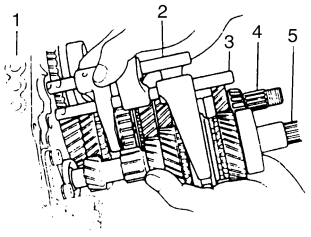
⚠ CAUTION

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

1) Install differential assembly into right case.
2) Join input shaft (5), countershaft (4), low speed gear shift shaft (2) and high speed gear shift shaft (3) assemblies all together, then install them into right case (1).

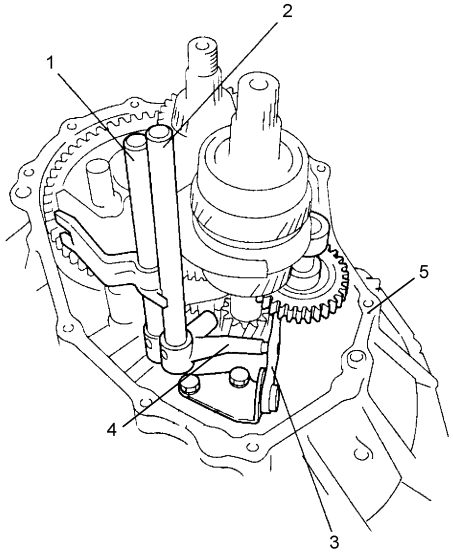
NOTE

- **Be sure not to damage oil seal by input shaft spline while installing.**
- **Make sure that countershaft is engaged with final gear.**



I2RH01520080-01

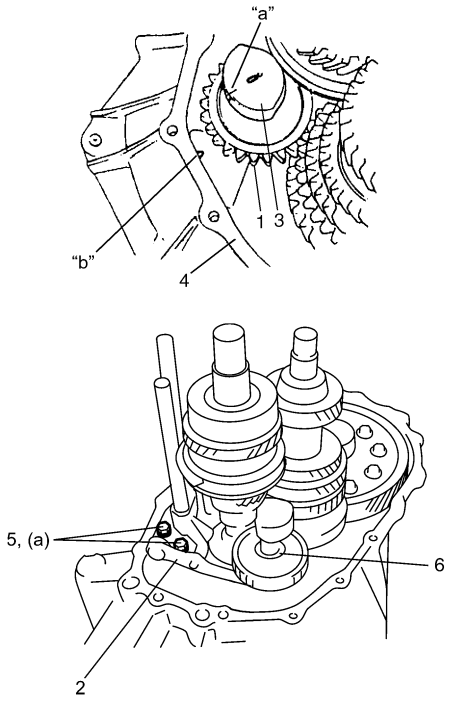
3) Install 5th & reverse gear shift shaft (1) with 5th & reverse gear shift guide shaft (2) into right case (5). Reverse gear shift arm (4) has to be joined with reverse gear shift lever (3) at the same time.



I7N20A523013-01

4) Make reverse idler gear (1) with reverse gear shift lever (2), insert reverse gear shaft (3) and washer (6) into case (4) through idler gear and then align bolt hole “a” on shaft with notch “b” on case.
5) Tighten new reverse gear shift lever bolts (5) to specified torque.

Tightening torque
Reverse gear shift lever bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I7V20A522021-01

6) Clean mating surfaces of both right and left cases, apply sealant to left case (2) as shown in figure, then mate it with right case (1).

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

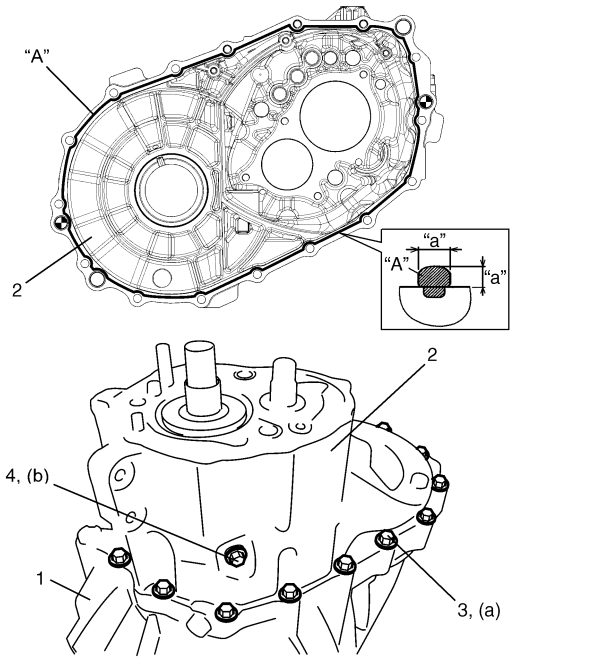
Sealant amount for left case
"a": 1.5 mm (0.059 in.)

7) Tighten case bolts (3) to specified torque.

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

8) Install new reverse shaft bolt (4), with new aluminum washer and tighten it to specified torque.

Tightening torque
Reverse shaft bolt (b): 21 N·m (21 kgf-m, 15.5 lbf-ft)



I7V20A522022-01

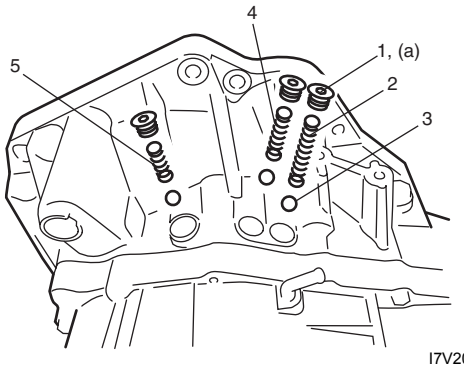
9) Check locating springs (2, 4 and 5) for deterioration and replace with new ones if necessary.

Locating spring free length

Locating spring	Standard	Service limit
Low speed (2)	53.1 mm (2.09 in.)	47.8 mm (1.88 in.)
High speed (4)	45.9 mm (1.81 in.)	41.4 mm (1.63 in.)
5th & reverse (5)	29.9 mm (1.18 in.)	27.0 mm (1.06 in.)

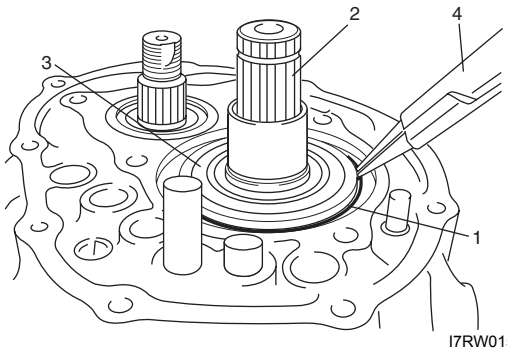
10) Install steel balls (3) and locating springs (2, 4 and 5) for respective gear shift shaft and tighten new bolts (1) to specified torque.

Tightening torque
Gear shift locating bolt (a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)



I7V20A522023-01

11) Install new snap ring (1) using snap ring pliers (4).

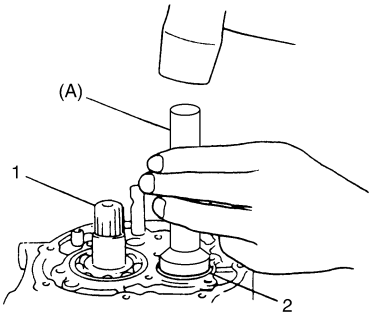


I7RW01520006-01

2.	Input shaft
3.	Input shaft left bearing

12) To seat countershaft left bearing outer race (2) to bearing cone, tap cup by using special tool and plastic hammer.

Special tool
(A): 09913–70123

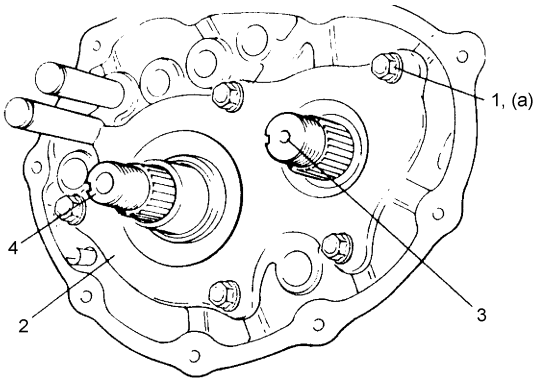


I5RW0A520025-01

1. Input shaft

13) Select countershaft 5th gear shim as follows.
   a) Put the thickest shim as spare part on bearing outer race and install left case plate (2).
   b) Tighten used bolts (1) to specified torque.
   c) Turn countershaft (3) 10 time or more.

Tightening torque
Left case plate bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I7V20A522024-01

4. Input shaft

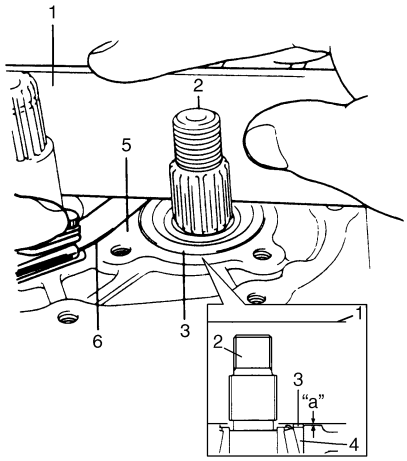
   d) Remove left case plate and shim, and then put used shim (3) on bearing outer race (4) temporarily.
   e) Place straight edge (1) over shim and compress it by hand through straight edge, and then measure “a” by using feeler gauge (6). If clearance “a” is out of specification, repeat step a) to c).

Clearance between case surface (5) and straightedge
“a”: 0.18 – 0.22 mm (0.0071 – 0.0087 in.)

   f) Select suitable shim which adjusts clearance “a” to specification and put it on bearing outer race.

NOTE

Insert 0.2 mm (0.008 in.) feeler to know whether or not a shim fulfills specification quickly.



I7V20A522025-01

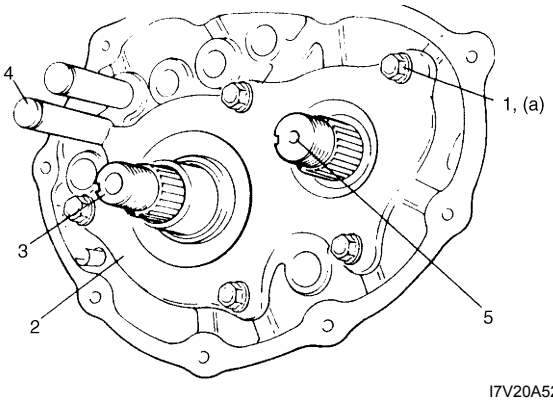
2. Countershaft

14) Place left case plate (2) inserting its end in groove of shift guide shaft (4), and then tighten new bolts (1) to specified torque.

NOTE

After tightening bolts, make sure that countershaft can be rotated by hand with feeling certain load.

Tightening torque
Left case plate bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I7V20A522026-01

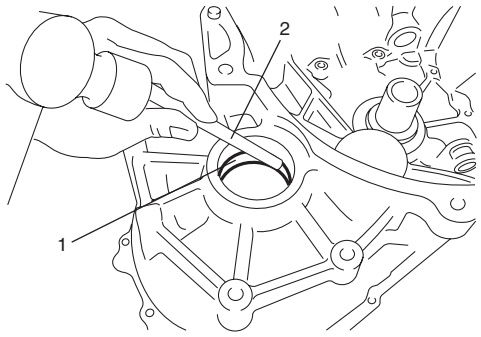
3. Input shaft
5. Countershaft

Transaxle Right Case Disassembly and Reassembly

S7N20A5236017

Disassembly

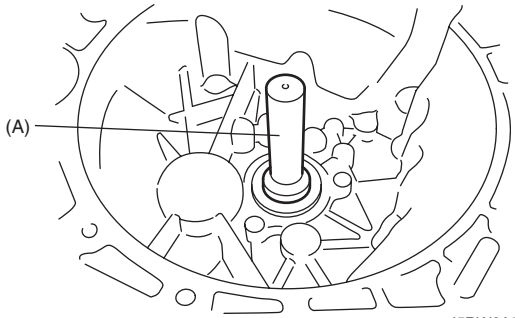
1) Remove differential side oil seal from right case referring to “Differential Side Oil Seal Replacement: D13A and Z13DTJ Model”, if necessary.
2) Remove differential side bearing outer race (1) using brass bar (2), if necessary.



I4RH01520024-01

3) Remove input shaft oil seal by using special tool, if necessary.

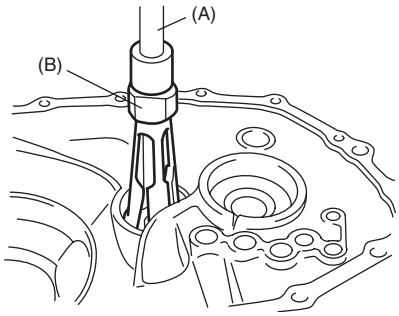
Special tool
(A): 09913–75830



I5RW0A520026-01

4) Pull out countershaft right bearing outer race by using special tools, if necessary.

Special tool
(A): 09930–30104
(B): 09941–64511



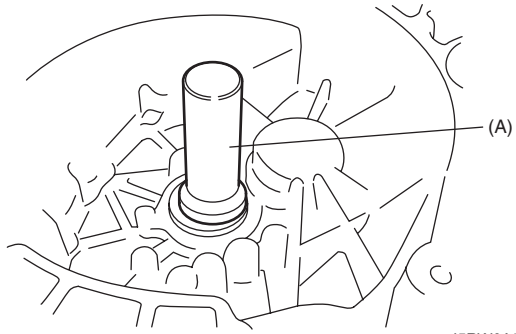
I5RW0A520027-01

Reassembly

1) Install input shaft oil seal facing its spring side upward until it becomes flush with case surface. Use special tool and hammer for installation and apply grease to oil seal lip.

: Grease 99000–25011 (SUZUKI Super Grease A)

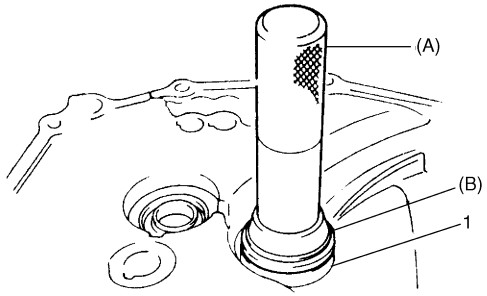
Special tool
(A): 09913–76010



I5RW0A520028-01

2) Install countershaft right bearing outer race (1) by using special tools and hammer.

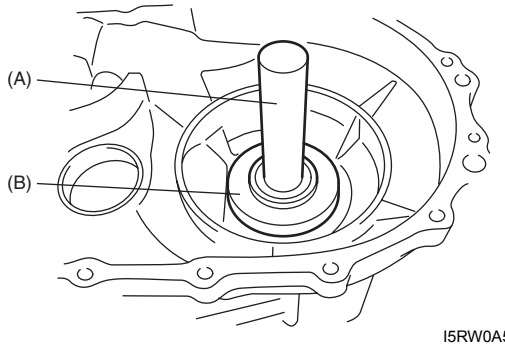
Special tool
(A): 09913–75821
(B): 09924–84510–004



I5RW0A520029-02

3) Install differential side bearing outer race by using special tool and hammer.

Special tool
(A): 09924–74510
(B): 09925–14520



I5RW0A520030-01

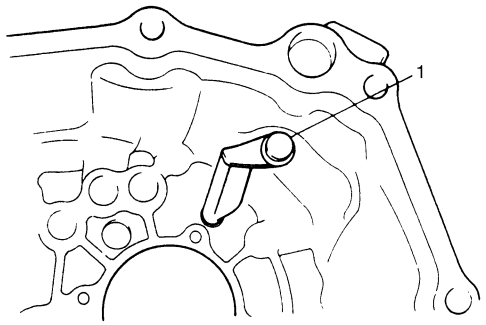
4) Install differential side oil seal referring to “Differential Side Oil Seal Replacement: D13A and Z13DTJ Model”, if removed.

Transaxle Left Case Disassembly and Reassembly

S7N20A5236018

Disassembly

1) Removal oil gutter (1), if necessary.

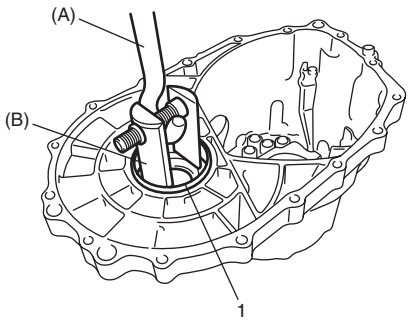


I4RH01520028-01

2) Remove differential side oil seal referring to "Differential Side Oil Seal Replacement: D13A and Z13DTJ Model".

3) Remove differential side bearing outer race (1) using special tools, and then remove shim.

Special tool
(A): 09942–15511
(B): 09944–96011

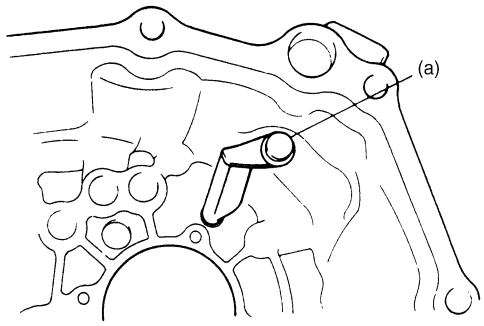


I5RW0A520031-01

Reassembly

1) If oil gutter has been removed, tighten new bolt to specified torque.

Tightening torque
Oil gutter bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I7V20A522027-01

2) Select differential side shim as follows.

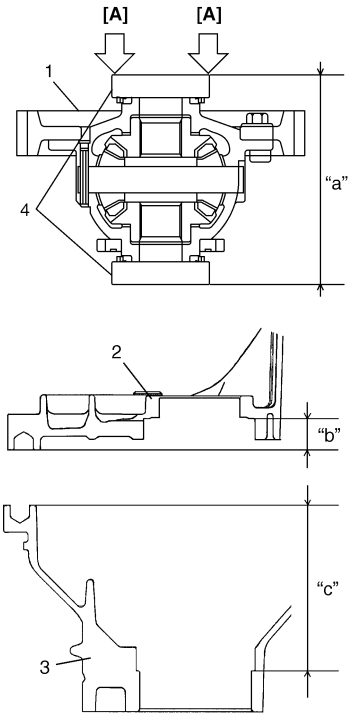
a) Keep pressing outer race (4) with the power of 35 N (3.6 kgf, 7.9 lbf) by hand and turn differential case 10 times or more.

b) Measure distance "a" of differential assembly (1).

c) Measure depth "b" of left case (2) and "c" of right case (3).

d) Calculate shim thickness by formula below.

Shim thickness = Depth "b" + Depth "c" – Distance "a"



I7RW01520013-01

[A]: Press 35 N (3.5 kgf, 7.9 lbf)

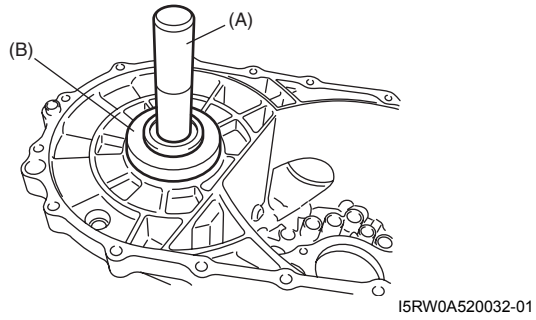
3) Select shim closest to calculated shim thickness from the following available sizes.

Available shim thickness

Calculated shim thickness	Select shim
0.800 – 0.839 mm (0.03149 – 0.03303 in.)	1.00 mm (0.0394 in.)
0.840 – 0.879 mm (0.03307 – 0.03461 in.)	1.04 mm (0.0409 in.)
0.880 – 0.919 mm (0.03465 – 0.03618 in.)	1.08 mm (0.0425 in.)
0.920 – 0.959 mm (0.03622 – 0.03776 in.)	1.12 mm (0.0441 in.)
0.960 – 0.999 mm (0.03780 – 0.03933 in.)	1.16 mm (0.0457 in.)
1.000 – 1.039 mm (0.03937 – 0.04091 in.)	1.20 mm (0.0472 in.)
1.040 – 1.079 mm (0.04094 – 0.04248 in.)	1.24 mm (0.0488 in.)
1.080 – 1.119 mm (0.04252 – 0.04406 in.)	1.28 mm (0.0504 in.)
1.120 – 1.159 mm (0.04409 – 0.04563 in.)	1.32 mm (0.0520 in.)
1.160 – 1.199 mm (0.04567 – 0.04720 in.)	1.36 mm (0.0535 in.)
1.200 – 1.239 mm (0.04724 – 0.04878 in.)	1.40 mm (0.0551 in.)
1.240 – 1.279 mm (0.04882 – 0.05035 in.)	1.44 mm (0.0567 in.)
1.280 – 1.319 mm (0.05039 – 0.05193 in.)	1.48 mm (0.0583 in.)
1.320 – 1.359 mm (0.05197 – 0.05350 in.)	1.52 mm (0.0598 in.)
1.360 – 1.399 mm (0.05354 – 0.05508 in.)	1.56 mm (0.0614 in.)
1.400 – 1.439 mm (0.05512 – 0.05665 in.)	1.60 mm (0.0630 in.)
1.440 – 1.479 mm (0.05669 – 0.05823 in.)	1.64 mm (0.0646 in.)
1.480 – 1.529 mm (0.05827 – 0.06020 in.)	1.68 mm (0.0661 in.)

4) Put shim, and then install differential side bearing outer race using special tools.

Special tool
(A): 09924–74510
(B): 09925–14520

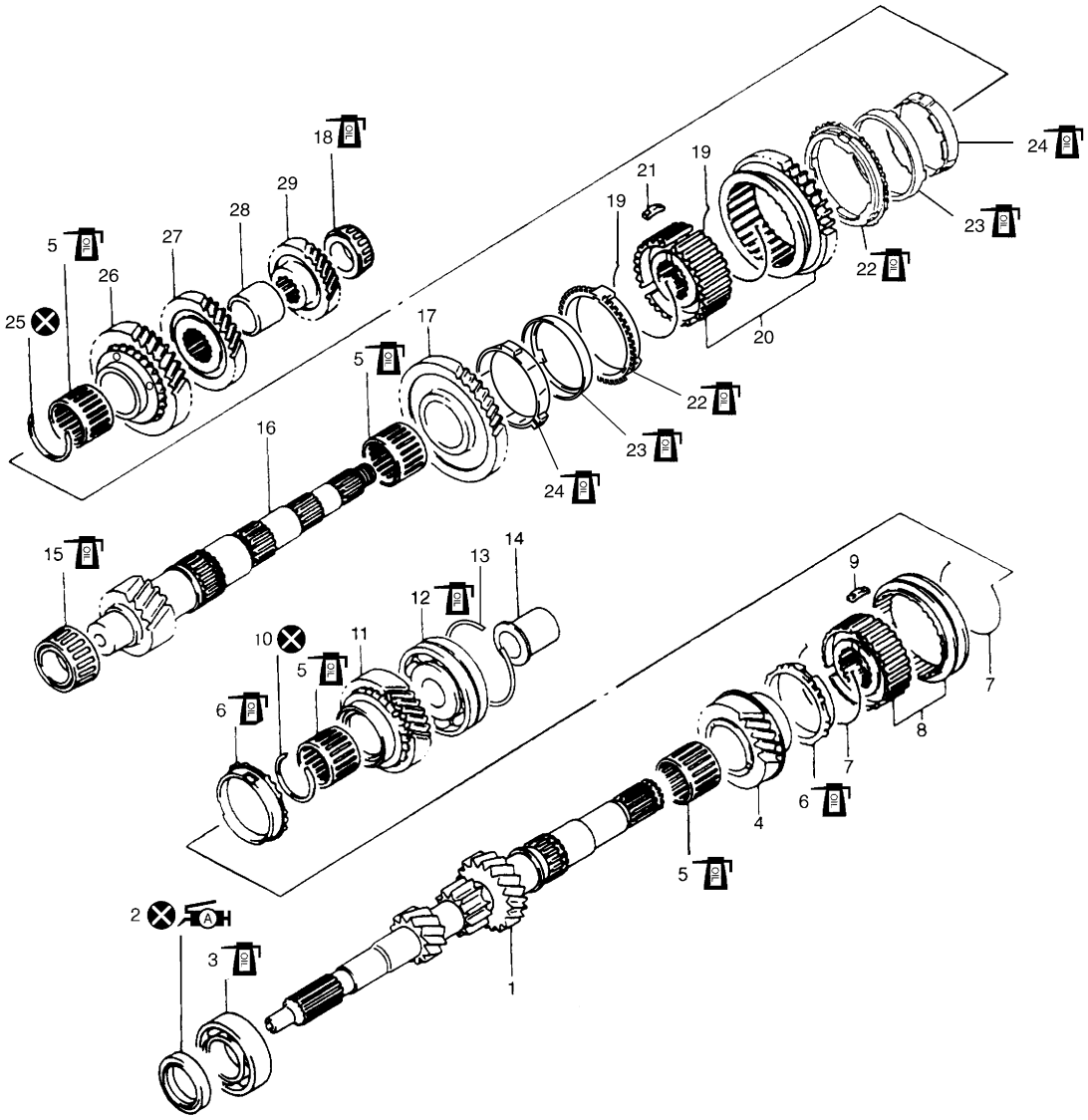


I5RW0A520032-01

5) Install oil seal referring to “Differential Side Oil Seal Replacement: D13A and Z13DTJ Model”.

Input Shaft and Countershaft Components

S7N20A5236019



I6RS0E520008-01

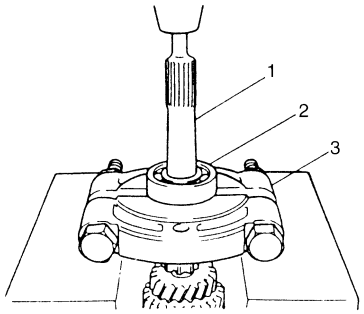
1. Input shaft	12. Input shaft left bearing	23. 2nd gear synchronizer center cone
2. Oil seal : Apply grease 99000-25011 to oil seal lip.	13. Circlip	24. 2nd gear synchronizer inner ring
3. Input shaft right bearing	14. 5th gear spacer	25. Circlip
4. Input shaft 3rd gear	15. Countershaft right bearing	26. Countershaft 2nd gear
5. Needle bearing	16. Countershaft	27. Countershaft 3rd gear
6. High speed synchronizer ring	17. Countershaft 1st gear	28. 3rd & 4th gear spacer
7. High speed synchronizer spring	18. Countershaft left bearing	29. Countershaft 4th gear
8. High speed synchronizer sleeve & hub	19. Low speed synchronizer spring	: Do not reuse.
9. High speed synchronizer key	20. Low speed synchronizer sleeve & hub	: Apply transaxle oil.
10. Circlip	21. Low speed synchronizer key	
11. Input shaft 4th gear	22. 2nd gear synchronizer outer ring	

Input Shaft Disassembly and Reassembly

S7N20A5236020

Disassembly

1) Remove input shaft right bearing (2) from input shaft (1) using bearing puller (3) and hydraulic press.

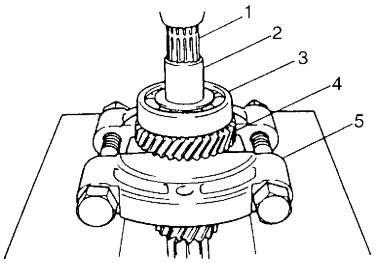


I4RH01520029-01

2) Drive out 5th gear spacer (2), left bearing (3) and 4th gear (4) all at once using puller (5) and hydraulic press.

⚠ CAUTION

To avoid gear teeth from damage, support it at flat side of bearing puller.

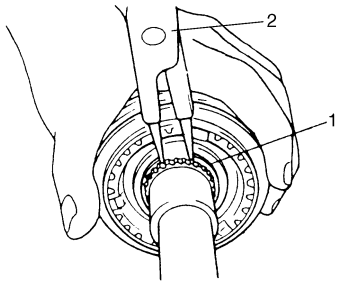


I3RH0A520018-01

1. Input shaft

3) Take out 4th gear needle bearing and high speed synchronizer ring.

4) Using snap ring pliers (2), remove circlip (1).

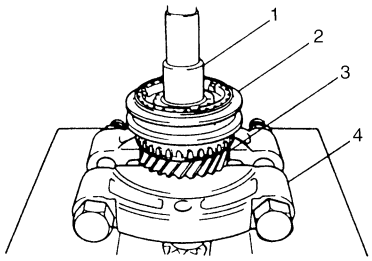


I7RW01520007-01

5) Drive out high speed synchronizer sleeve & hub assembly (2) together with 3rd gear (3) by using puller (4) and hydraulic press.

⚠ CAUTION

To avoid gear teeth from damage, support it at flat side of bearing puller.



I2RH01520097-01

1. Input shaft

6) Take out 3rd gear needle bearing from input shaft.

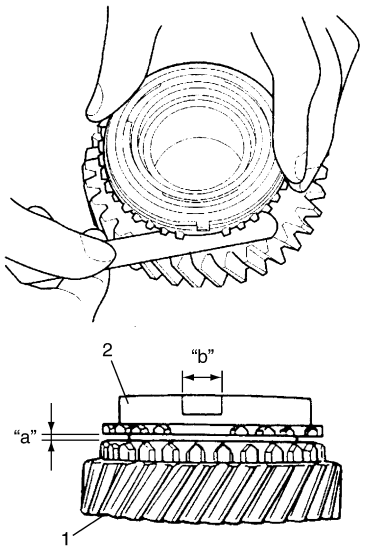
7) Disassemble synchronizer sleeve & hub assembly.

Reassembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones if necessary.
2) Check clearance “a” between synchronizer ring (2) and gear (1), key slot width “b” in synchronizer ring and replace with new one, if necessary. Also, check gear teeth.

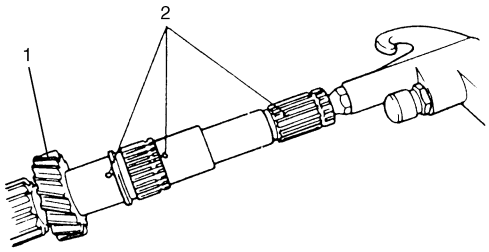
Clearance “a” between synchronizer ring and gear
Standard: 1.0 – 1.4 mm (0.040 – 0.055 in.)
Service limit: 0.5 mm (0.020 in.)

Key slot width “b”
Standard: 10.0 – 10.2 mm (0.394 – 0.402 in.)
Limit: 10.45 mm (0.4114 in.)



I5JB0A520054-01

3) To ensure lubrication of input shaft (1), blow air to oil holes (2) as shown in figure and make sure that they are free from any obstruction.



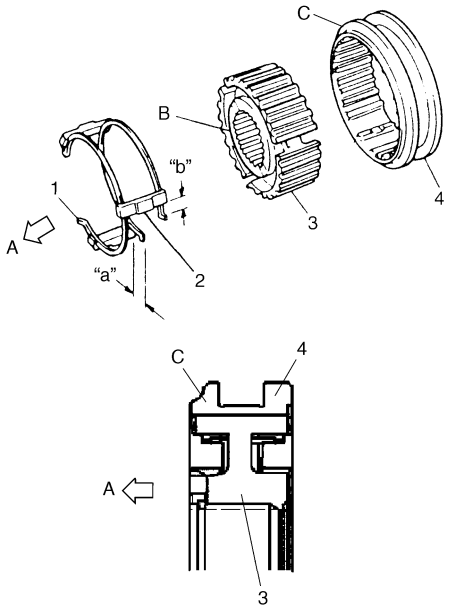
I2RH01520049-01

4) Fit high speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs at specified position (1) as shown in figure.

NOTE

- **No specific direction is assigned to each key.**
- **High speed synchronizer sleeve, hub, keys and springs are smaller than low speed ones.**

Synchronizer key installation position
“a” = “b”

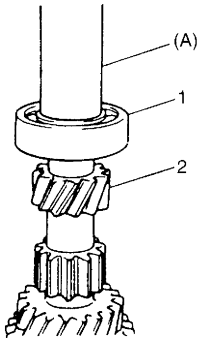


I7N20A523014-01

A:	4th gear side
B:	Short flange side
C:	Projecting end

5) Drive in right bering (1) to input shaft (2) using special tool and hydraulic press.

Special tool
(A): 09913–80113



I3RH0A520019-01

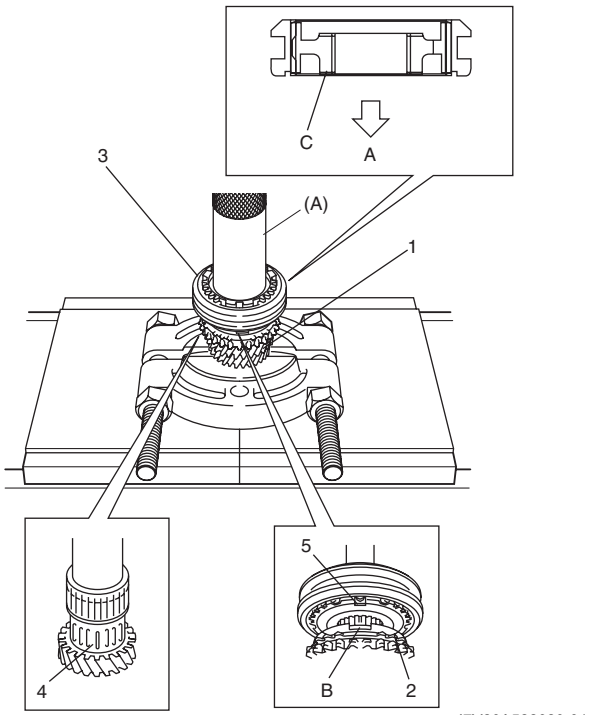
6) Install 3rd gear needle bearing (4), apply oil to it, then install 3rd gear (1) and synchronizer ring (2).

7) Drive in high speed sleeve & hub assembly (3) by using special tool and hydraulic press.

NOTE

- **Make sure that synchronizer ring key slots are aligned with keys (5) in sleeve & hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.**

Special tool
(A): 09913–84510

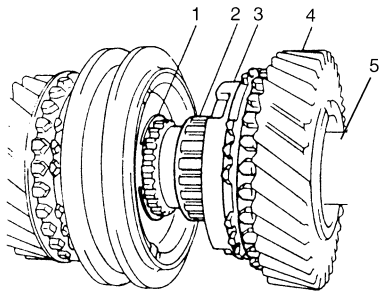


I7V20A522029-01

A:	3rd gear side
B:	Key way
C:	Long flange

8) Install new circlip (1) to groove securely.

9) Install needle bearing (2), apply oil to it and then synchronizer ring (3) and 4th gear.



I2RH01520052-01

5.	Input shaft

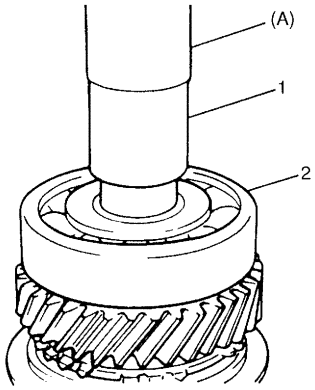
10) Press-fit left bearing (2) by using special tool and hydraulic press.

Special tool
(A): 09913–80113

11) Using the same special tool at step 10), drive in 5th gear spacer (1).

⚠ CAUTION

To prevent 5th gear spacer (1) from being distorted by excessive compression, do not press-fit it with left bearing (2) at once.



I3RH0A520020-01

Countershaft Disassembly and Reassembly

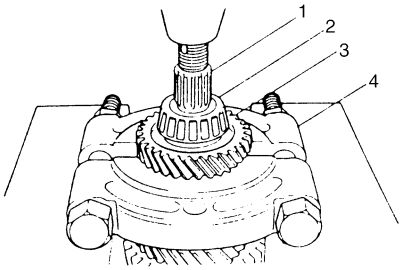
S7N20A5236021

Disassembly

1) Drive out left bearing cone (2) with 4th gear (3) by using puller (4) and hydraulic press.

⚠ CAUTION

To avoid gear teeth damage, support 4th gear (3) at flat side of puller.



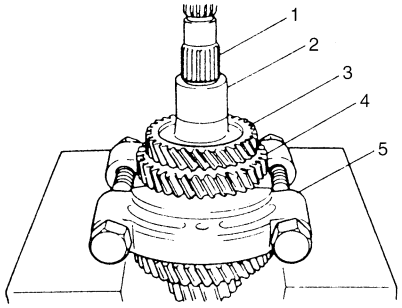
I2RH01520054-01

1.	Countershaft

2) Apply puller (5) to 2nd gear (4), and drive out 3rd & 4th gear spacer (2) and 3rd gear (3) together with 2nd gear by using hydraulic press. Needle bearing would come out with 2nd gear.

⚠ CAUTION

To avoid gear teeth from damage, be sure to support it at flat side of bearing puller.

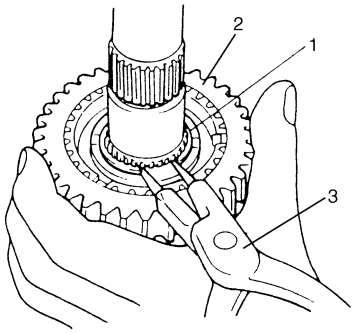


I2RH01520055-01

1. Countershaft

3) Take out 2nd synchronizer outer ring, center cone and inner ring.

4) Using snap ring pliers (3), remove circlip (1).



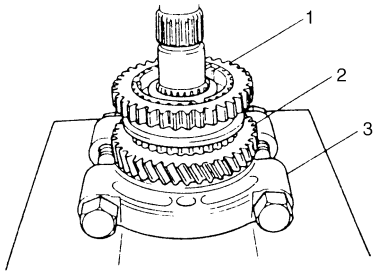
I7RW01520008-01

2. Low speed synchronizer sleeve

5) Apply puller (3) to 1st gear (2) and drive out low speed synchronizer sleeve & hub assembly (1) with 1st gear by using hydraulic press.

⚠ CAUTION

To avoid gear teeth from damage, support it at flat side of bearing puller.



I2RH01520057-01

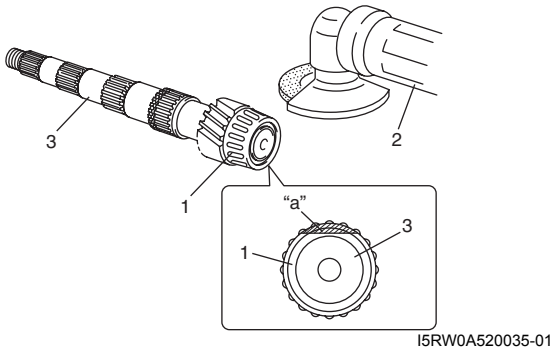
6) Disassemble synchronizer sleeve & hub assembly.

7) Take out 1st gear needle bearing from shaft.

8) In order to remove right bearing (1) from countershaft, grind with a grinder (2) one part “a” of right bearing (1) as illustrated till it becomes thin.

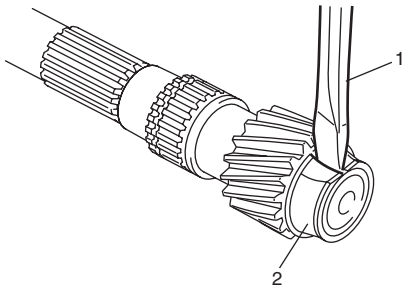
⚠ CAUTION

Be careful not to grind countershaft (3).



I5RW0A520035-01

9) Break right bearing (2) at thin point with a chisel (1) and it can be removed.



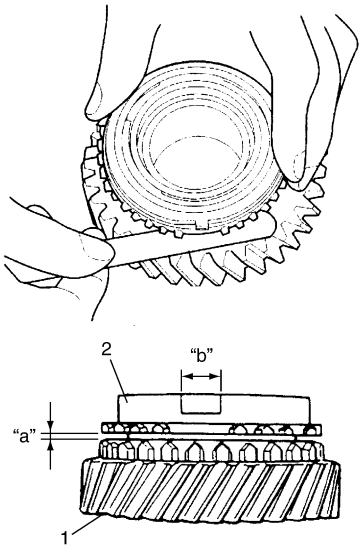
I5RW0A520036-01

Reassembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new one if necessary.
2) Check clearance “a” between synchronizer ring (2) and gear (1), key slot width “b” in synchronizer ring and replace with new one, if necessary. Also, check gear teeth.

Clearance “a” between synchronizer ring and gear
Standard: 1.0 – 1.4 mm (0.040 – 0.055 in.)
Service limit: 0.5 mm (0.020 in.)

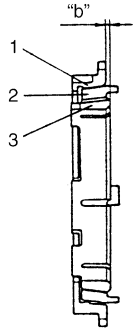
Key slot width “b”
Standard: 10.0 – 10.2 mm (0.394 – 0.402 in.)
Limit: 10.45 mm (0.4114 in.)



I5JB0A520079-01

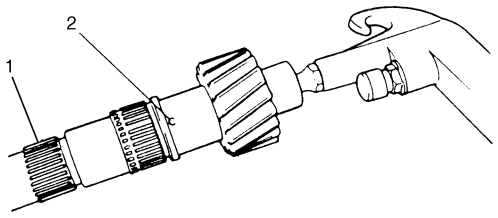
3) Put the synchronizer outer ring (1), inner ring (3) and center cone (2) together, and then measure step difference between outer ring and inner ring and replace with new one, if necessary. Also, check gear teeth.

Difference between synchronizer outer ring and inner ring (2nd)
Standard “b”: 0.95 – 1.25 mm (0.0374 – 0.0492 in.)
Service limit “b”: 0.5 mm (0.0196 in.)



I2RH01520059-01

4) To ensure lubrication of countershaft (1), blow air to oil holes (2) as shown in figure and make sure that they are free from any obstruction.



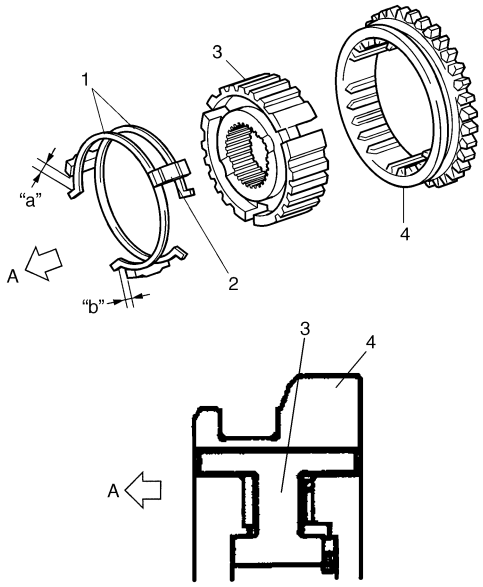
I2RH01520060-01

5) Fit low speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it and then set springs (1) at specified position as shown in figure.

NOTE

- **No specific direction is assigned to each key.**
- **Low speed synchronizer keys and springs are larger than high speed ones.**

Synchronizer key installation position
“a” = “b”

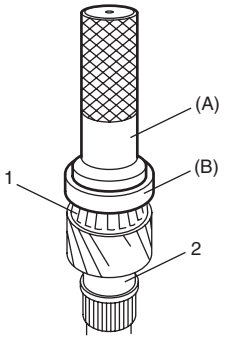


I7N20A523015-01

A: 1st gear side

6) Install right bearing cone (1) to counter shaft (2) by using special tools and hydraulic press.

Special tool
(A): 09913–76010
(B): 09924–07720



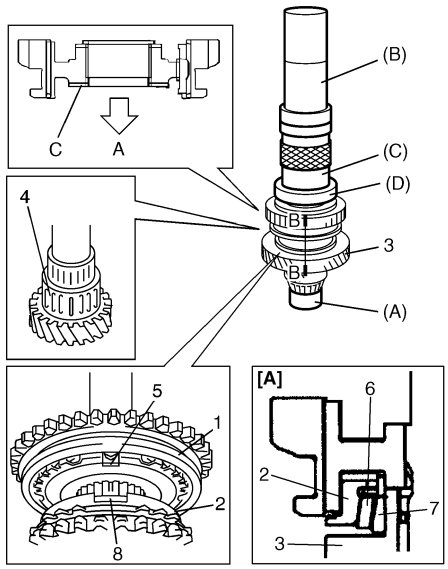
I5RW0A520038-01

7) Install needle bearing (4), apply oil to it, then install 1st gear (3).
8) Install synchronizer outer ring (2), center cone (6) and inner ring (7) put together as shown in figure.
9) Drive in low speed sleeve & hub assembly (1) by using special tools and hammer.

NOTE

- **Support shaft with special tool as shown in figure so that retainer of bearing cone will be free from compression.**
- **Make sure that synchronizer ring key slots (8) are aligned with keys (5) while press-fitting sleeve & hub assembly.**
- **Check free rotation of 1st gear (3) after press-fitting sleeve & hub assembly.**

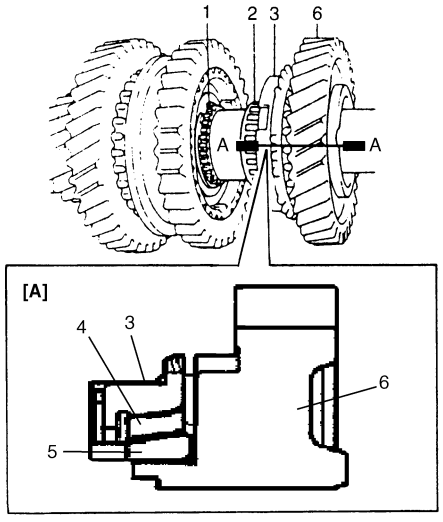
Special tool
(A): 09923–78210
(B): 09913–85210
(C): 09940–54910
(D): 09924–07710



I7V20A522031-01

[A]:	Section B – B
A:	1st gear side
C:	Short flange

10) Install new circlip (1) to groove securely.
11) Install needle bearing (2) and apply oil to needle bearing.
12) Install 2nd gear (6) with synchronizer outer ring (3), center cone (4) and inner ring (5) put together as shown in figure.



I5RW0A520040-01

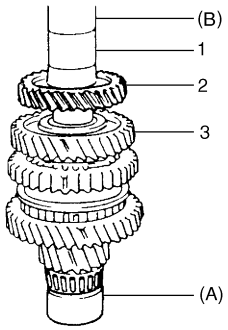
[A]:	Section A – A

13) Press-fit 3rd gear (2) and spacer (1) by using special tools and hydraulic press.

NOTE

It is recommended to press-fit spacer and 3rd gear first, and then 4th gear later separately so that countershaft will not be compressed excessively.

Special tool
(A): 09923–78210
(B): 09913–85210



I4RH01520036-01

3. 2nd gear	

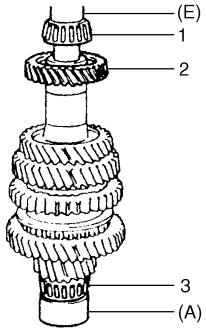
14) Press-fit 4th gear (2) by using the same procedure at step 11).

15) Install left bearing cone (1) by using special tool and hydraulic press.

NOTE

For protection of bearing cone (3), be sure to support shaft with special tool as shown in figure.

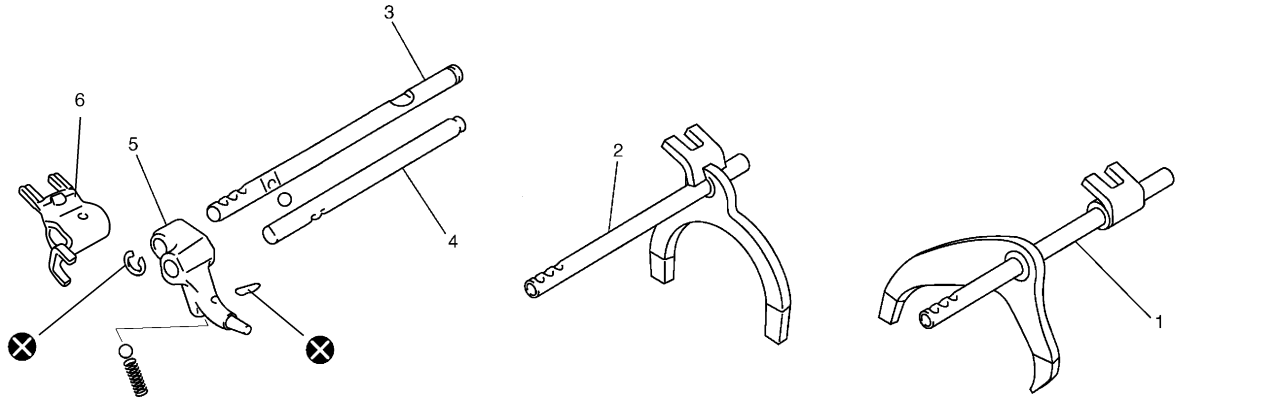
Special tool
(A): 09923–78210
(E): 09913–80113



I2RH01520066-01

Gear Shift Shaft Components

S7N20A5236022



I7N20A523016-01

1. Low speed gear shift shaft	4. 5th & reverse gear shift guide shaft	⊗ : Do not reuse.
2. High speed gear shift shaft	5. Reverse gear shift arm	
3. 5th & reverse gear shift shaft	6. 5th & reverse gear shift yoke	

5th and Reverse Gear Shift Shafts Disassembly and Reassembly

S7N20A5236023

Disassembly

Disassemble component parts by using special tool and hammer.

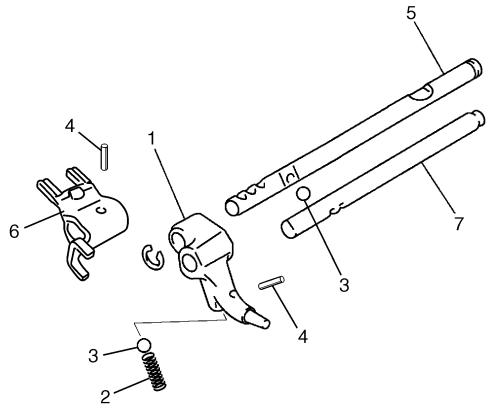
Special tool
: 09922–85811

Reassembly

Reverse disassembly procedure noting the following.

NOTE

Install 2 steel balls (3) in reverse gear shift arm (1) without fail.



I5RW0A520042-01

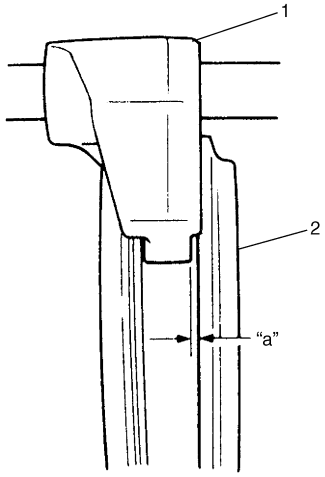
2. Spring	6. 5th & reverse gear shift yoke
4. Spring pin	7. 5th & reverse gear shift guide shaft
5. 5th & reverse gear shift shaft	

Gear Shift Shaft and Fork Inspection

S7N20A5236024

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: 1.0 mm (0.039 in.)



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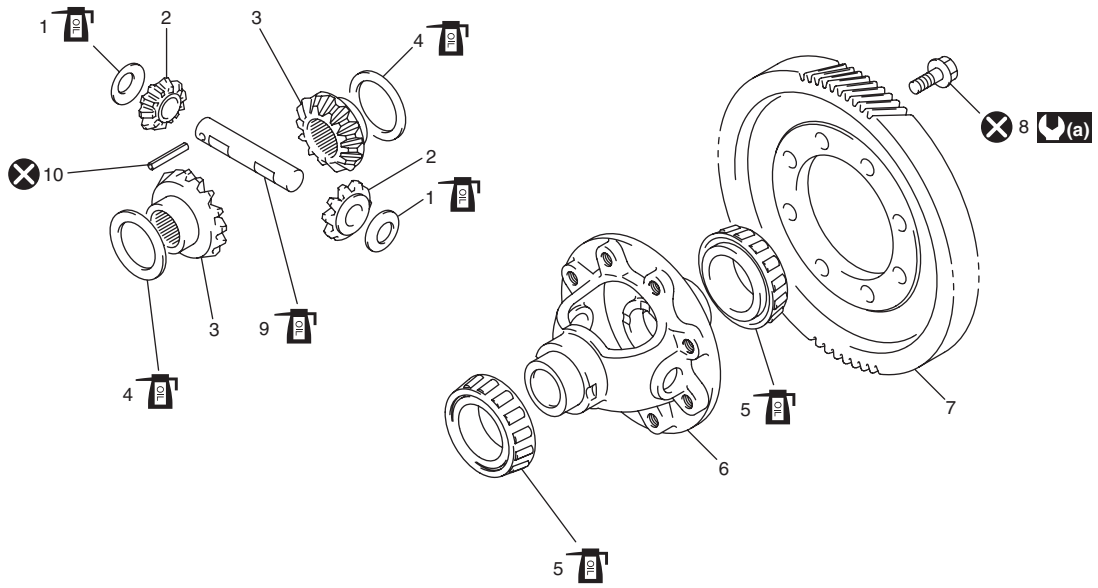
2) Insert each gear shift shaft into case and check that it moves smoothly. If it doesn’t, correct by using oilstone, reamer or the like.

Differential Components

S7N20A5236025



I7V20A522033-01

1. Differential pinion washer	6. Differential case	(a) : 90 N·m (9.2 kgf-m, 66.5 lbf-ft)
2. Differential pinion	7. Final gear	: Do not reuse.
3. Differential side gear	8. Final gear bolt	: Apply transaxle oil.
4. Side gear washer	9. Differential pinion shaft	
5. Differential side bearing	10. Differential pinion shaft pin	

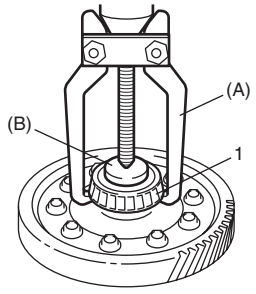
Differential Disassembly and Reassembly

S7N20A5236026

Disassembly

1) Using special tool, remove left bearing (1).

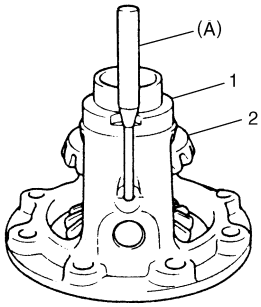
Special tool
(A): 09913–65135
(B): 09913–85230



I6RS0E520012-01

2) Remove right bearing in the same manner at step 1).
3) Support differential case (1) with soft jawed vise, and remove final gear bolts then take out final gear.
4) Drive out differential pinion shaft pin by using special tool and hammer, and then disassemble components parts.

Special tool
(A): 09922–85811



I6RS0E520013-01

2. Differential side gear

Reassembly

1) Install differential pinion, side gear and pinion shaft to differential case, and measure back rash and thrust play of differential side gear using special tools as follows.
If measured value is out of specification, select suitable side gear washer from available size, and check again.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06010

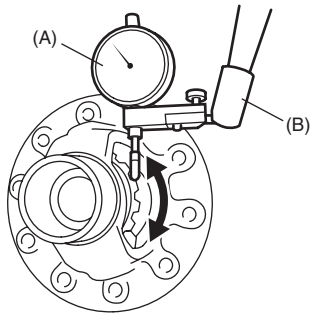
a) Differential side gear backlash [A]
- Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to side gear as shown in figure.
- Fixing differential pinion, turn side gear back and forth and read dial gauge.

Differential side gear backlash
0.10 – 0.15 mm (0.0039 – 0.0059 in.)

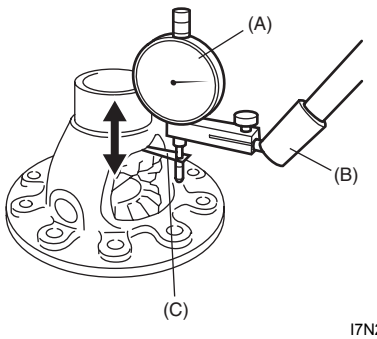
b) Differential side gear thrust play [B]
- Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to side gear as shown in figure.
- Move side gear up and down by hand and read dial gauge.

Differential side gear thrust play
0.03 – 0.30 mm (0.001 – 0.012 in.)

[A]



[B]

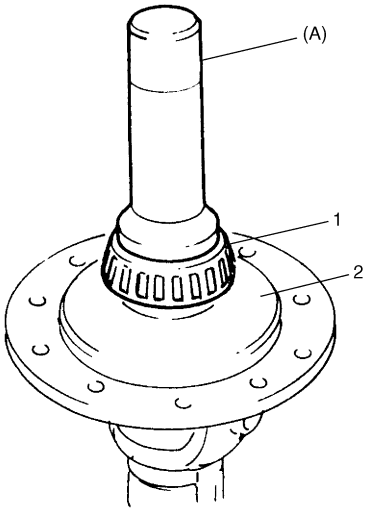


I7N20A523017-01

2) Drive in new differential pinion shaft pin from right side till the depth from differential case surface is about 1.2 mm (0.047 in.).

3) Press-fit left bearing (1) by using special tool and hydraulic press.

Special tool
(A): 09951–16080

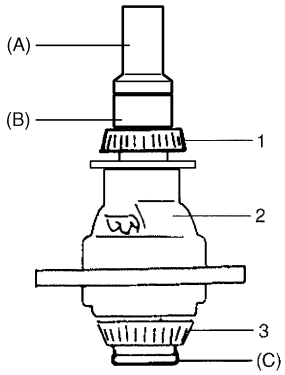


I2RH01520074-01

2. Differential case

4) Press-fit right bearing (1) by using special tools and hydraulic press.

Special tool
(A): 09925–15410
(B): 09940–54910
(C): 09913–85230



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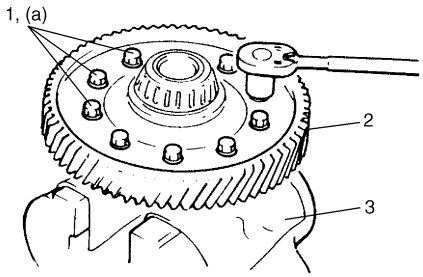
2. Differential case
3. Differential side left bearing

5) Hold differential assembly with soft jawed vise (3), install final gear (2) and then tighten new final gear bolts (1).

⚠ CAUTION

Do not reuse final gear bolt. Otherwise, bolt may loosen.

Tightening torque
Final gear bolt (a): 90 N·m (9.2 kgf-m, 66.5 lbf-ft)



I5RW0A520049-01

Specifications

Tightening Torque Specifications

S7N20A5237001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Transaxle oil level / filler plug	21	2.1	15.5	☞ / ☞
Transaxle oil drain plug	21	2.1	15.5	☞
Back up light switch	23	2.3	17.0	☞
Guide case bolt No.1 (a)	23	2.3	17.0	☞
Guide case bolt No.2	23	2.3	17.0	☞
Gear shift interlock bolt	23	2.3	17.0	☞
5th to reverse interlock guide bolt	23	2.3	17.0	☞
Countershaft nut	100	10.2	74.0	☞
Shift fork shaft bolt	10	1.0	7.5	☞
Side cover bolt	10	1.0	7.5	☞
Reverse gear shift lever bolt	23	2.3	17.0	☞
Transaxle case bolt	23	2.3	17.0	☞
Reverse shaft bolt	21	21	15.5	☞
Gear shift locating bolt	13	1.3	9.5	☞
Left case plate bolt	23	2.3	17.0	☞ / ☞
Oil gutter bolt	10	1.0	7.5	☞
Final gear bolt	90	9.2	66.5	☞

NOTE

The specified tightening torque is also described in the following.
“Gear Shift Control Lever and Cable Components: D13A and Z13DTJ Model”
“Manual Transaxle Unit Components: D13A and Z13DTJ Model”
“Gear Shift and Select Shaft Assembly Components: D13A and Z13DTJ Model”
“Manual Transaxle Assembly Components: D13A and Z13DTJ Model”
“Differential Components: D13A and Z13DTJ Model”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A5238001

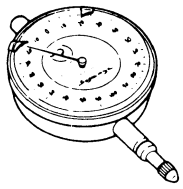
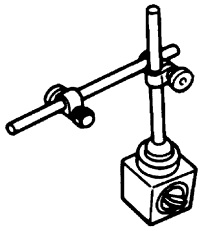
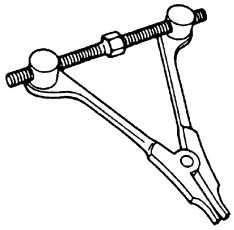
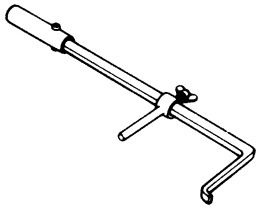
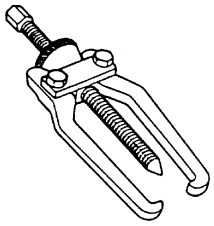
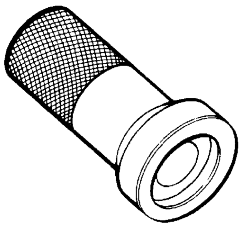
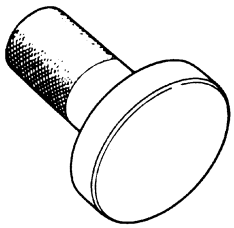
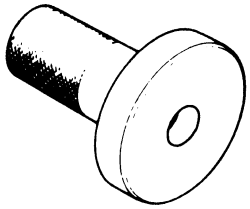
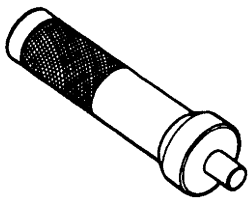
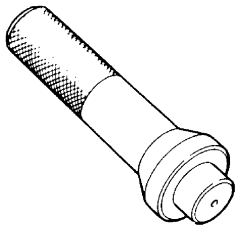
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞ / ☞ / ☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞ / ☞ / ☞ / ☞ / ☞

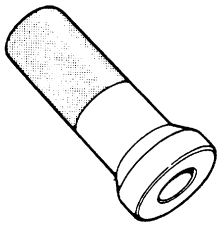
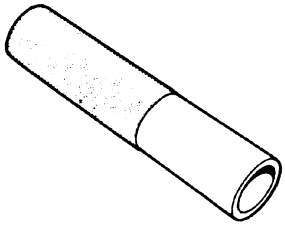
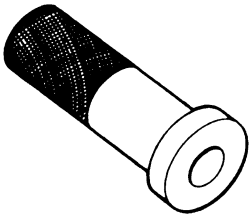
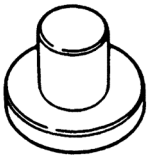
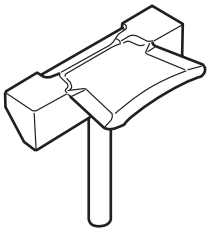
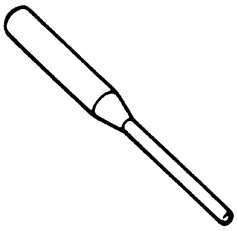
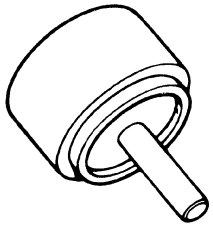
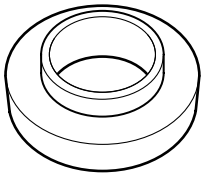
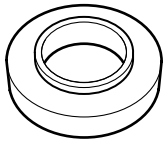
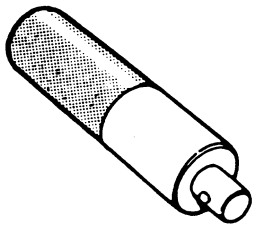
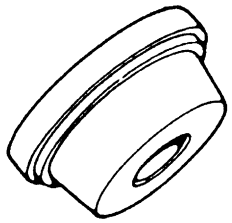
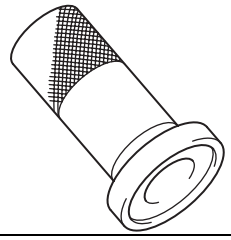
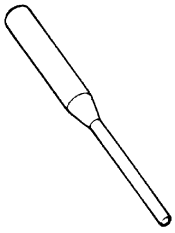
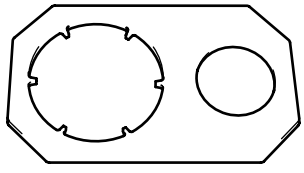
NOTE

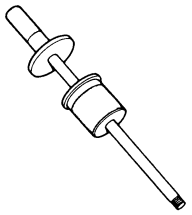
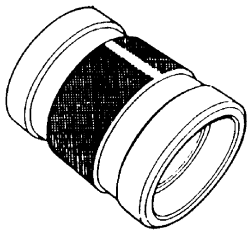
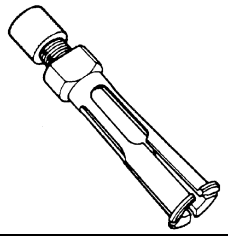
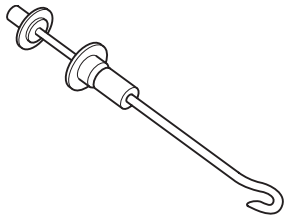
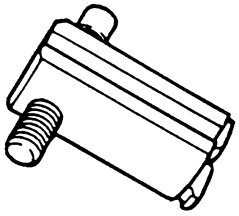
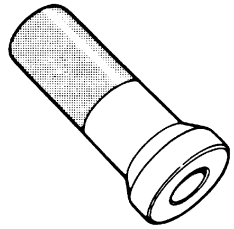
Required service material is also described in the following.
“Gear Shift Control Lever and Cable Components: D13A and Z13DTJ Model”
“Gear Shift and Select Shaft Assembly Components: D13A and Z13DTJ Model”
“Manual Transaxle Assembly Components: D13A and Z13DTJ Model”
“Input Shaft and Countershaft Components: D13A and Z13DTJ Model”
“Differential Components: D13A and Z13DTJ Model”

Special Tool

S7N20A5238002

09900–20607 Dial gauge ☞ 	09900–20701 Magnetic stand ☞ 
09912–34510 Case separator ☞ 	09913–50121 Oil seal remover ☞ / ☞ 
09913–65135 Bearing puller ☞ 	09913–70123 Bearing installing tool ☞ 
09913–75510 Bearing installer ☞ 	09913–75520 Bearing installer ☞ 
09913–75821 Bearing installer attachment ☞ 	09913–75830 Steering pinion bush installer ☞ 

09913–76010 Bearing installer ☞ / ☞ 	09913–80113 Bearing installer ☞ / ☞ / ☞ 
09913–84510 Bearing installer ☞ 	09913–85210 Bearing installer ☞ / ☞ 
09913–85230 Bearing remover tool ☞ / ☞ 	09921–96510 Oil pan seal cutter ☞ 
09922–85811 Spring pin remover (4.5 mm) ☞ / ☞ / ☞ 	09923–78210 Bearing installer ☞ / ☞ / ☞ 
09924–07710 Synchronizer hub installer ☞ 	09924–07720 Synchronizer hub installer ☞ 
09924–74510 Bearing and oil seal handle ☞ / ☞ 	09924–84510–004 Bearing installer attachment ☞ 
09925–14520 Bearing and oil seal installer (80 x 50 mm) ☞ / ☞ 	09925–15410 Oil seal installer ☞ 
09925–78210 Spring pin remover (6 mm) ☞ 	09927–76060 Gear holder ☞ / ☞ 

09930–30104 Sliding shaft ☞ 	09940–54910 Front fork oil seal install driver ☞ / ☞ 
09941–64511 Bearing and oil seal remover (30 mm Min.) ☞ 	09942–15511 Sliding hammer ☞ 
09944–96011 Bearing outer race remover ☞ 	09951–16080 Bearing installer ☞ 
09952–06010 Dial gauge plate No.1 ☞ 	

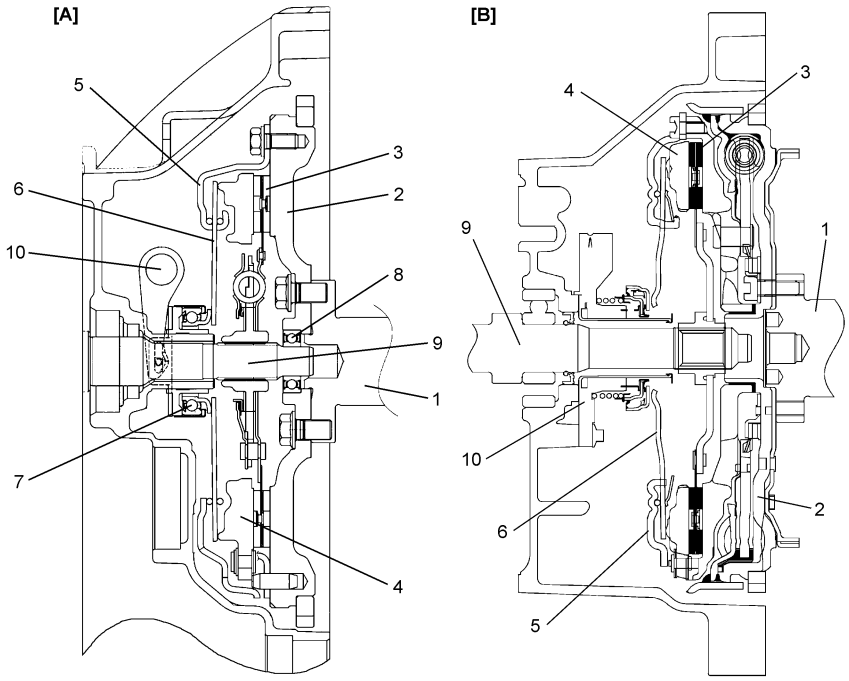
Clutch

General Description

Clutch Construction

S7N20A5301001

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 four torsional coil springs (petrol model), is positioned on the transaxle input shaft with an involute spline fit.
The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge part of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing (incorporated in clutch operating cylinder for diesel engine model) is held back. This is the engaged condition of the clutch.
Depressing the clutch pedal causes the release bearing (incorporated in clutch operating cylinder for diesel engine model) to advance 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 the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transaxle input shaft. Clutch fluid is supplied from brake fluid reservoir. Clutch fluid level can be checked by brake fluid level of brake fluid reservoir.
Flywheel of diesel model is of dual mass type.



I7N20A530001-02

[A]: For petrol engine model	4. Pressure plate	9. Input shaft
[B]: For diesel engine model	5. Clutch cover	10. Release shaft
1. Crankshaft	6. Diaphragm spring	11. Operating cylinder assembly
2. Flywheel	7. Release bearing	
3. Clutch disc	8. Input shaft bearing	

Diagnostic Information and Procedures

Clutch System Symptom Diagnosis

S7N20A5304001

Condition	Possible cause	Correction / Reference Item
Slipping	Improper clutch pedal free travel	*Replace master cylinder or clutch pedal arm.*
	Worn or oily clutch disc facing	*Replace disc.*
	Warped disc, pressure plate or flywheel surface	*Replace disc, clutch cover or flywheel.*
	Weakened diaphragm spring	*Replace clutch cover.*
	Master cylinder piston or seal cup not returning	*Replace master cylinder.*
Dragging clutch	Improper clutch pedal free travel	*Replace master cylinder or clutch pedal arm.*
	Weakened diaphragm spring, or worn spring tip	*Replace clutch cover.*
	Rusted input shaft splines	*Lubricate.*
	Damaged or worn splines of transaxle input shaft	*Replace input shaft.*
	Excessively wobbly clutch disc	*Replace disc.*
	Clutch facings broken or dirty with oil	*Replace disc.*
	Fluid leakage	*Repair or replace.*
Clutch vibration	Glazed (glass-like) clutch facings	*Repair or replace disc.*
	Clutch facings dirty with oil	*Replace disc.*
	Release bearing slides unsmoothly on input shaft bearing retainer	*Lubricate or replace input shaft bearing retainer.*
	Wobbly clutch disc, or poor facing contact	*Replace disc.*
	Weakened torsion springs in clutch disc	*Replace disc.*
	Clutch disc rivets loose	*Replace disc.*
	Distorted pressure plate or flywheel surface	*Replace clutch cover or flywheel.*
	Weakened engine mounting	*Replace engine mounting.*
	Loosened engine mounting bolt or nut	*Retighten engine mounting bolt or nut.*
Noisy clutch	Worn or broken release bearing	*Replace release bearing.*
	Input shaft front bearing worn down	*Replace input shaft bearing.*
	Excessive rattle of clutch disc hub	*Replace disc.*
	Cracked clutch disc	*Replace disc.*
	Pressure plate and diaphragm spring rattling	*Replace clutch cover.*
Grabbing clutch	Clutch disc facings soaked with oil	*Replace disc.*
	Clutch disc facings excessively worn	*Replace disc.*
	Rivet heads showing out of facing	*Replace disc.*
	Weakened torsion springs	*Replace disc.*

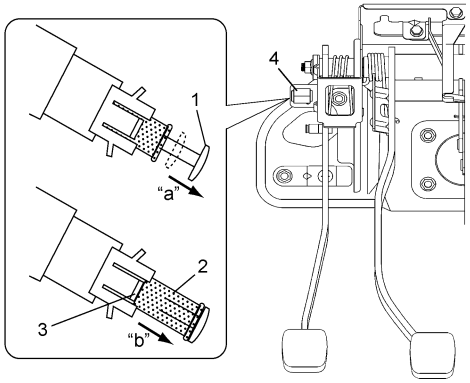
Repair Instructions

Clutch Pedal Position (CPP) Switch Removal and Installation (Diesel Model)

S7N20A5306019

Removal

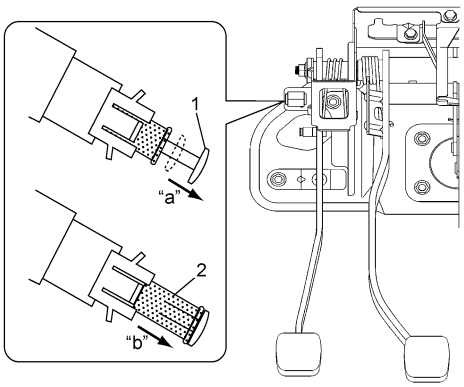
1) Disconnect connector of CPP switch (4) with ignition switch OFF.
2) Depress clutch pedal, and then pull out switch slider (1) of CPP switch in the direction of arrow “a” in figure.
   Then, pull out adjuster (2) in the direction of arrow “b” in figure.
3) Remove CPP switch with pressing its pin (3) to inside.



I7N20A530002-01

Installation

1) Pull out switch slider (1) of CPP switch in the direction of arrow “a” in figure.
   Then, pull out adjuster (2) in the direction of arrow “b” in figure.
2) Install CPP switch.
3) Adjustment of CPP switch is unnecessary.
   When clutch pedal is released, adjust the suitable distance automatically.
4) Connect connector to CPP switch securely.



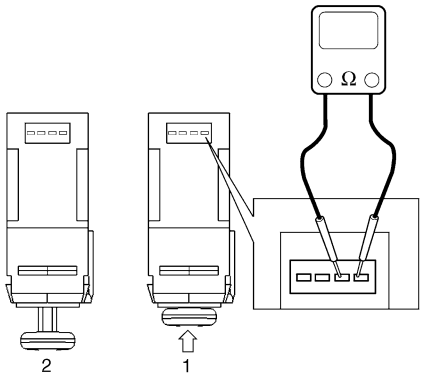
I7N20A530003-01

Clutch Pedal Position (CPP) Switch Inspection (Diesel Model)

S7N20A5306020

Check for resistance between terminals under each condition below. If check result is not satisfactory, replace.

CPP switch resistance
When switch shaft is pushed (1): Continuity
When switch shaft is free (2): No continuity



I5RW0B530011-01

Clutch Pedal Inspection

S7N20A5306001

Cylinder Push Rod Play “A”

1) Press clutch pedal (1) gradually with finger, stop when slight increase of resistance is felt and measure how much pedal has moved (push rod play) as represented by “A” as shown.

   Push rod play
   “A”: Max. 3 mm (0.12 in.)

2) If “A” is not within specification, replace master cylinder (3) or pedal arm (2).

Clutch Pedal Free Travel “B”

1) Depress clutch pedal (1), stop the moment clutch resistance is felt, and measure how much pedal has moved (clutch pedal free travel) as represented by “B” in the figure.

   Clutch pedal free travel “B”
   : 2 – 8 mm (0.08 – 0.31 in.)

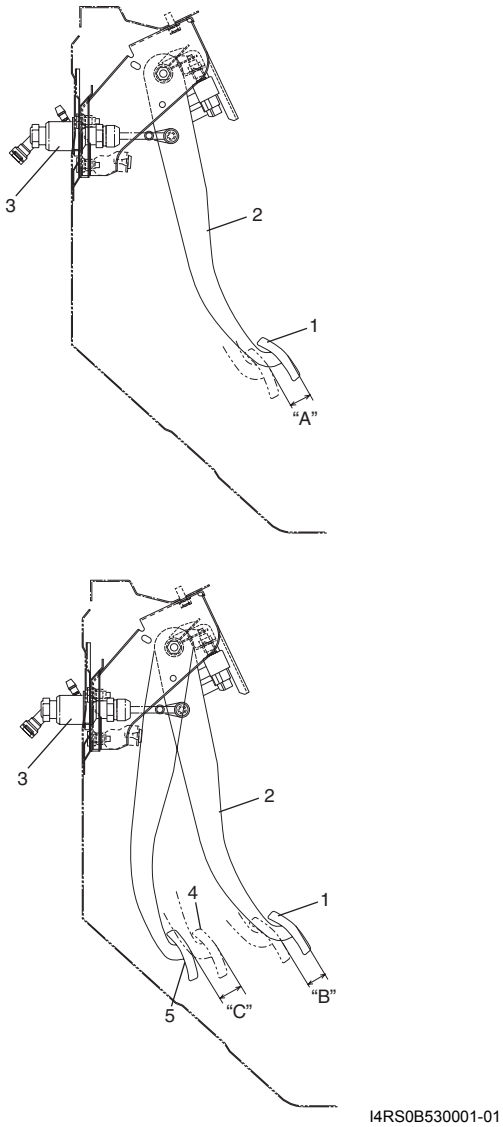
2) If “B” is not within specification, check pedal arm (2) and master cylinder (3) and replace defective part.

Clutch Release Margin "C"

1) Pull up parking brake fully and block wheels.
2) Start engine and keep engine at idle with neutral gear position.
3) Without clutch pedal (1) depressed, slightly push the shift lever to reverse position until transaxle emits gear contact noise. Do not shift the lever to reverse position.
4) With emitting gear contact noise, be slow to depress clutch pedal (1), and at gear contact noise died position (release point) stop depressing.
5) Measure distance between release point (4) and full stroke point (5) on clutch pedal (1) which is shown by "C" in the figure.

   Clutch release margin
   "C": 25 – 55 mm (0.98 – 2.17 in.)

6) If "C" is not within specification, it is possible that air is trapped in this system. If suspected so, bleed air referring to "Air Bleeding of Clutch System (For Petrol Engine Model)" or "Air Bleeding of Clutch System (For Diesel Model)". Upon completion of above inspection, start engine and check clutch for proper operation.



I4RS0B530001-01

Clutch Fluid Level Inspection

S7N20A5306002

Refer to "Master Cylinder and Brake Fluid Level Inspection in Section 4A".

Clutch fluid specification
: Refer to reservoir cap.

Air Bleeding of Clutch System (For Petrol Engine Model)

S7N20A5306003

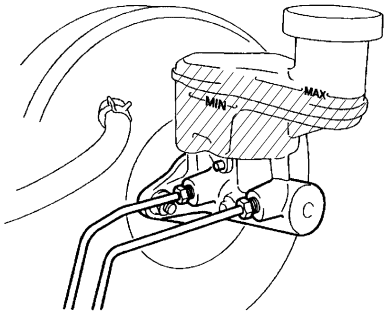
⚠ CAUTION

Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

Bleeding operation is necessary to remove air whenever it entered hydraulic clutch system.

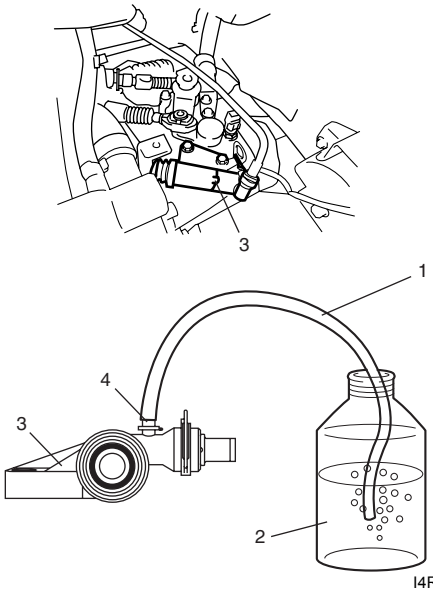
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.

Clutch fluid specification
: Refer to reservoir cap.



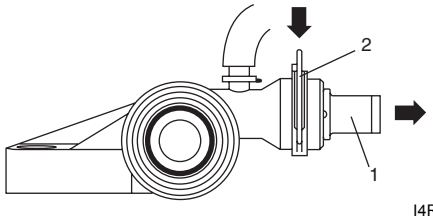
I4RS0A530023-01

2) Remove bleeder plug cap from clutch operating cylinder (3). Attach a vinyl tube (1) to bleeder plug (4), and insert the other end into container (2).



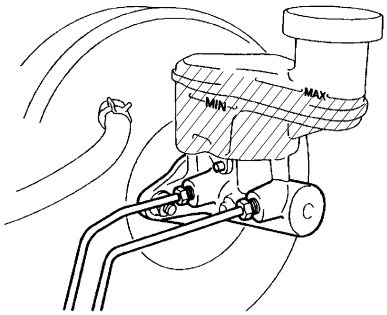
I4RS0A530003-01

3) Depress clutch pedal several times, and then release clutch pedal, push snap ring (2) and pull pipe connector (1) one notch.



I4RS0A530004-01

4) When fluid pressure in cylinder is almost depleted, push pipe connector.
5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold clutch pedal, push pipe connector, and pull snap ring.
7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9) Replenish fluid into reservoir up to specified level.



I4RS0A530023-01

10) Check clutch pedal for sponginess. If found spongy, repeat entire procedure of bleeding.

Air Bleeding of Clutch System (For Diesel Model)

S7N20A5306004

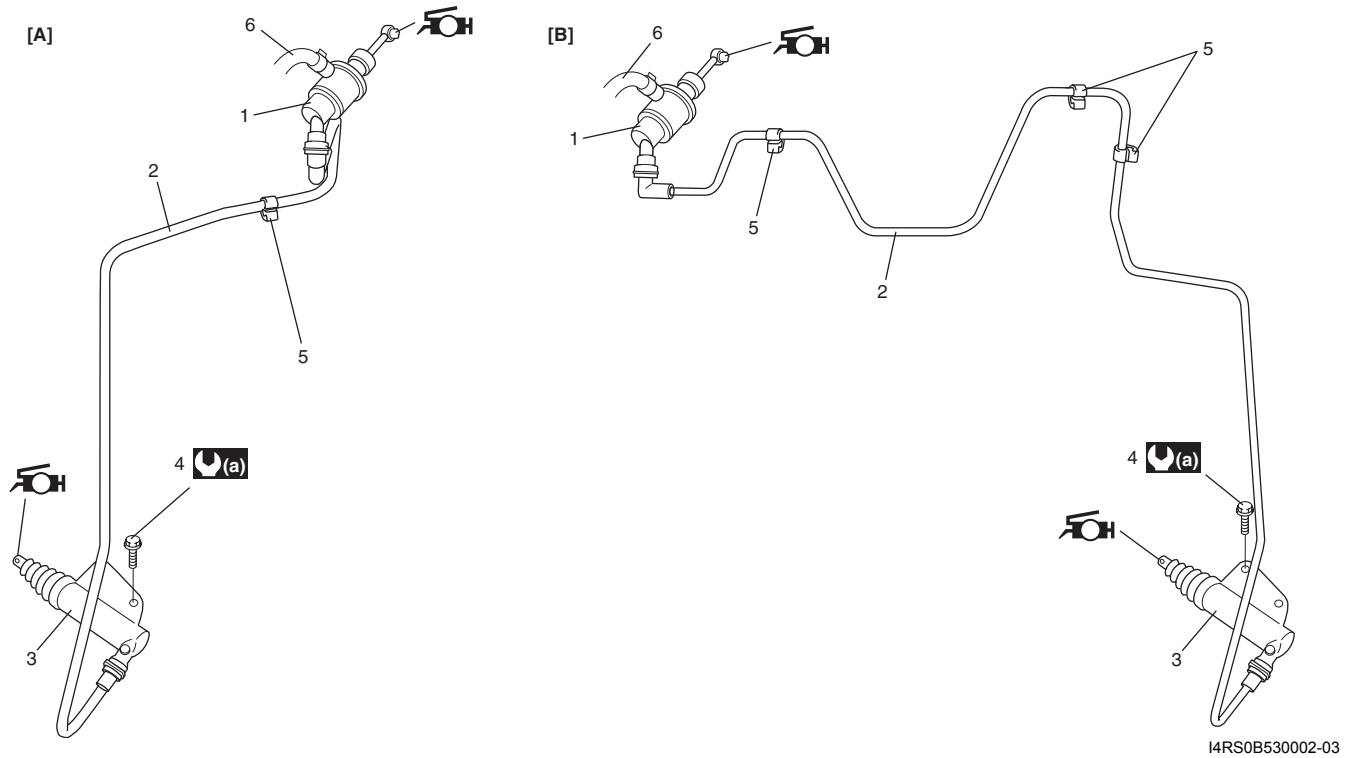
⚠ CAUTION

When operating the pedal stroke for air bleeding of clutch system, after releasing the clutch pedal, be sure to wait 1 second or more before depressing it again. Otherwise, the oil seal of operating cylinder will be damaged, resulting in oil leakage.

Bleed air from clutch system.
Refer to “Air Bleeding of Brake System in Section 4A”.

Clutch Fluid Pipe and Hose Components (For Petrol Engine Model)

S7N20A5306005

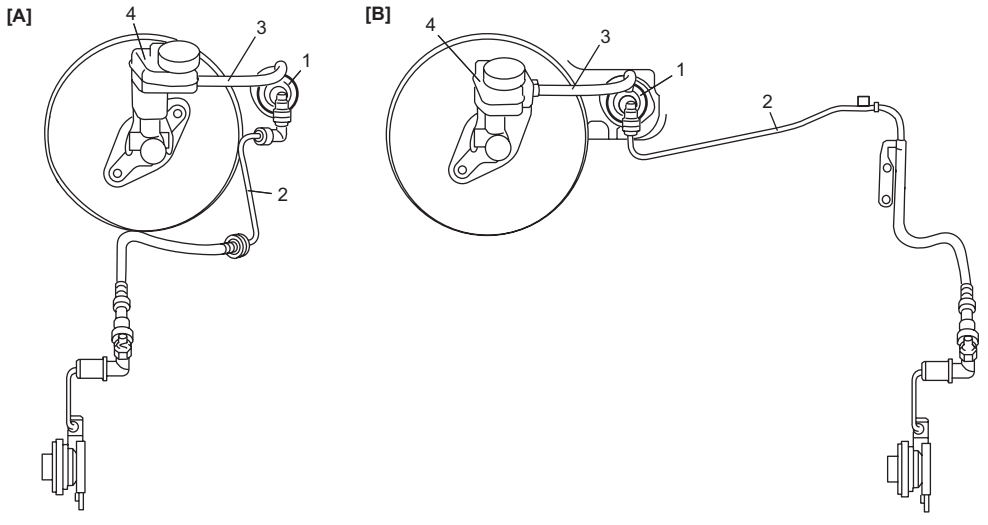


I4RS0B530002-03

[A]: LH steering vehicle	4. Operating cylinder bolt
[B]: RH steering vehicle	5. Clamp
1. Master cylinder : Apply grease 99000-25100 to push rod end.	6. Clutch reservoir hose
2. Pipe	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
3. Operating cylinder : Apply grease 99000-25100 to rod tip.	

Clutch Fluid Pipe and Hose Location (For Diesel Engine Model)

S7N20A5306006



I7N20A530004-02

[A]: LHD	2. Clutch fluid pipe
[B]: RHD	3. Clutch reservoir hose
1. Master cylinder	4. Brake master cylinder reservoir

Clutch Fluid Pipe Removal and Installation

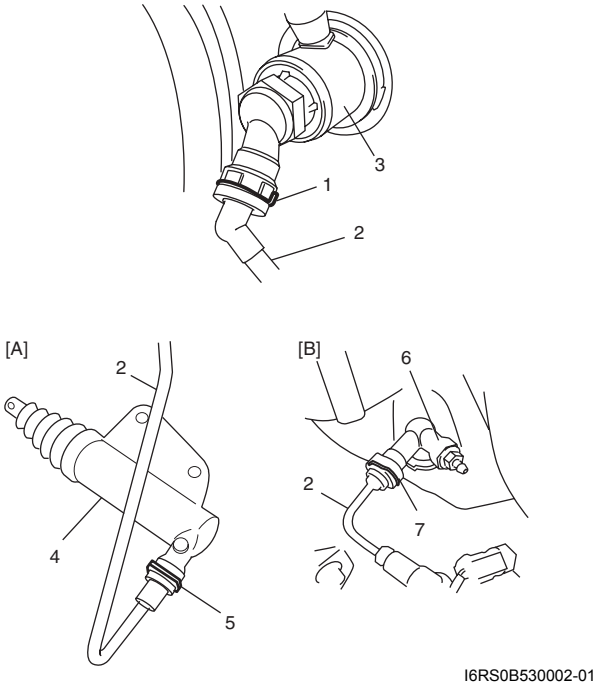
S7N20A5306007

Removal

⚠ CAUTION

Do not allow fluid to get on painted surface. It may cause painted surface damage.

1) Remove dust and dirt from each joint of pipe to be disconnected and clean around brake master cylinder reservoir cap.
2) Take out fluid with syringe or such from brake master cylinder reservoir.
3) Pull clamp (1) of clutch master cylinder (3) and push clamp (5) of clutch operating cylinder (4) (for petrol engine model) or pull clamp (7) of fluid pipe joint (6) (for diesel engine model), and then disconnect clutch fluid pipe (2).



I6RS0B530002-01

[A]: For petrol engine model
[B]: For diesel engine model

Installation

Reverse removal procedure for installation noting the following.

⚠ CAUTION

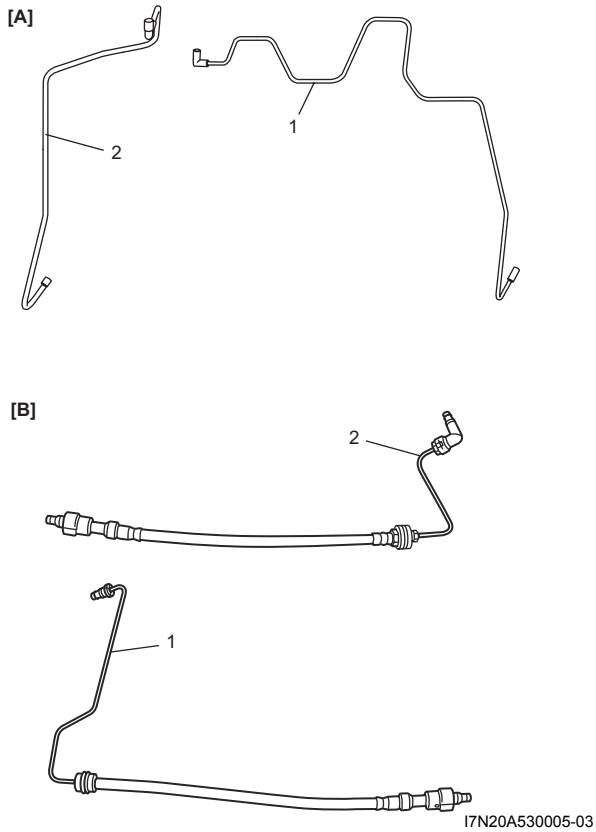
- **Do not allow fluid to get on painted surface.**
- **Do not allow pipe to contact hard against vehicle body or other parts.**

- Install each clamp securely.
- After installation, check clutch pedal free travel and bleed air from system referring to “Clutch Pedal Inspection” and “Air Bleeding of Clutch System (For Petrol Engine Model)” or “Air Bleeding of Clutch System (For Diesel Model)”.
- Check fluid leakage.
- Add fluid to MAX level of reservoir.

Clutch Fluid Pipe Inspection

S7N20A5306008

Check pipe for dent, kink, crack, dirt and dust. Replace if check result is not satisfactory.



I7N20A530005-03

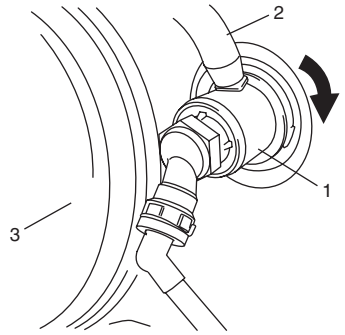
[A]: For petrol engine model
[B]: For diesel engine model
1. LH steering vehicle
2. RH steering vehicle

Clutch Master Cylinder Removal and Installation

S7N20A5306009

Removal

1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
2) Disconnect clutch fluid pipe from clutch master cylinder (1) referring to “Clutch Fluid Pipe Removal and Installation”.
3) Disconnect clutch reservoir hose (2).
4) Remove push rod from clutch pedal.
5) Turn clutch master cylinder (1) clockwise as shown in figure, and then remove it.



I4RS0B530005-01

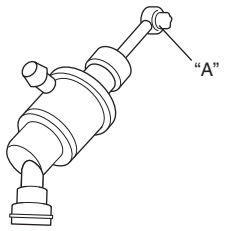
3. Brake booster

Installation

Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

“A”: Grease 99000–25100 (SUZUKI Silicone Grease)



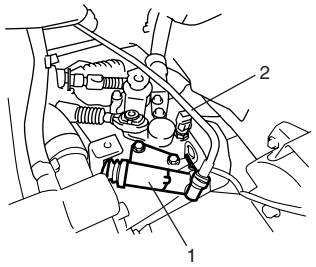
I4RS0B530006-01

Clutch Operating Cylinder Removal and Installation (For Petrol Engine Model)

S7N20A5306010

Removal

1) Clean around brake master cylinder reservoir cap and take out fluid with syringe or such from brake master cylinder reservoir.
2) Disconnect clutch fluid pipe (2) from operating cylinder referring to “Clutch Fluid Pipe Removal and Installation”.
3) Remove clutch operating cylinder (1).



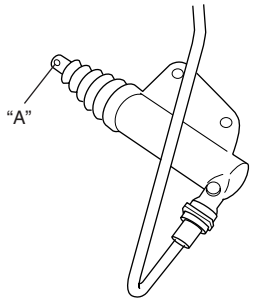
I4RS0A530010-01

Installation

Reverse removal procedure for installation noting the following.

- Apply grease to push rod tip.

  “A”: Grease 99000–25100 (SUZUKI Silicone Grease)



I4RS0A530011-01

- Tighten clutch operating cylinder bolt to specified torque.

  Tightening torque
  Clutch operating cylinder bolt: 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

Clutch Operating Cylinder Assembly Removal and Installation (For Diesel Engine Model)

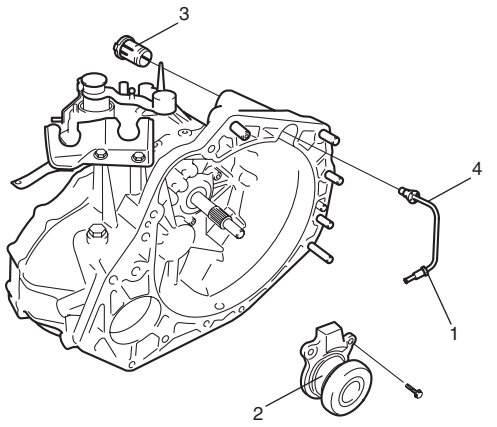
S7N20A5306011

⚠ CAUTION

- **Do not allow fluid to get on painted surfaces. It may cause painted surface damage.**
- **Do not disassemble clutch operating cylinder assembly.**

Removal

1) Clean around reservoir cap of brake master cylinder and take out fluid with syringe or such.
2) Dismount transaxle assembly referring to “Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B”.
3) Loosen clutch fluid pipe flare nut (1) of clutch operating cylinder assembly (2).
4) Remove clutch pipe joint sleeve (3) from transaxle and then remove clutch fluid pipe (4).
5) Remove clutch operating cylinder assembly from transaxle.



I5RW0A530008-01

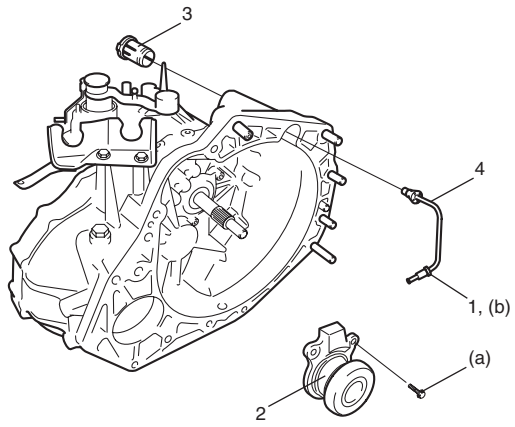
Installation

1) Install clutch operating cylinder assembly (2) to transaxle. Tighten new mounting bolts to specified torque.

   Tightening torque
   Clutch operating cylinder assembly mounting bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

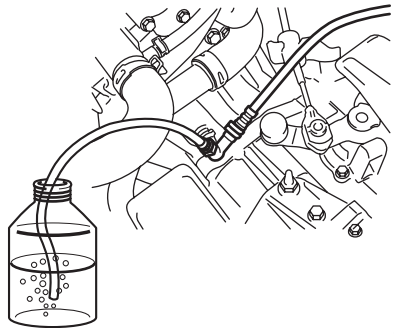
2) Connect clutch fluid pipe (4) to clutch operating cylinder assembly temporarily.
3) Install clutch pipe joint sleeve (3) to transaxle securely and then tighten clutch fluid pipe flare nut (1) to specified torque.

   Tightening torque
   Clutch fluid pipe flare nut (b): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)



I5RW0A530009-01

4) Remount transaxle assembly referring to “Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B”.
5) Fill reservoir with specified brake fluid and check for fluid leakage.
6) Bleed air from system and check clutch pedal free travel. Refer to “Air Bleeding of Clutch System (For Diesel Model)” and “Clutch Pedal Inspection”.



I5RW0A530010-01

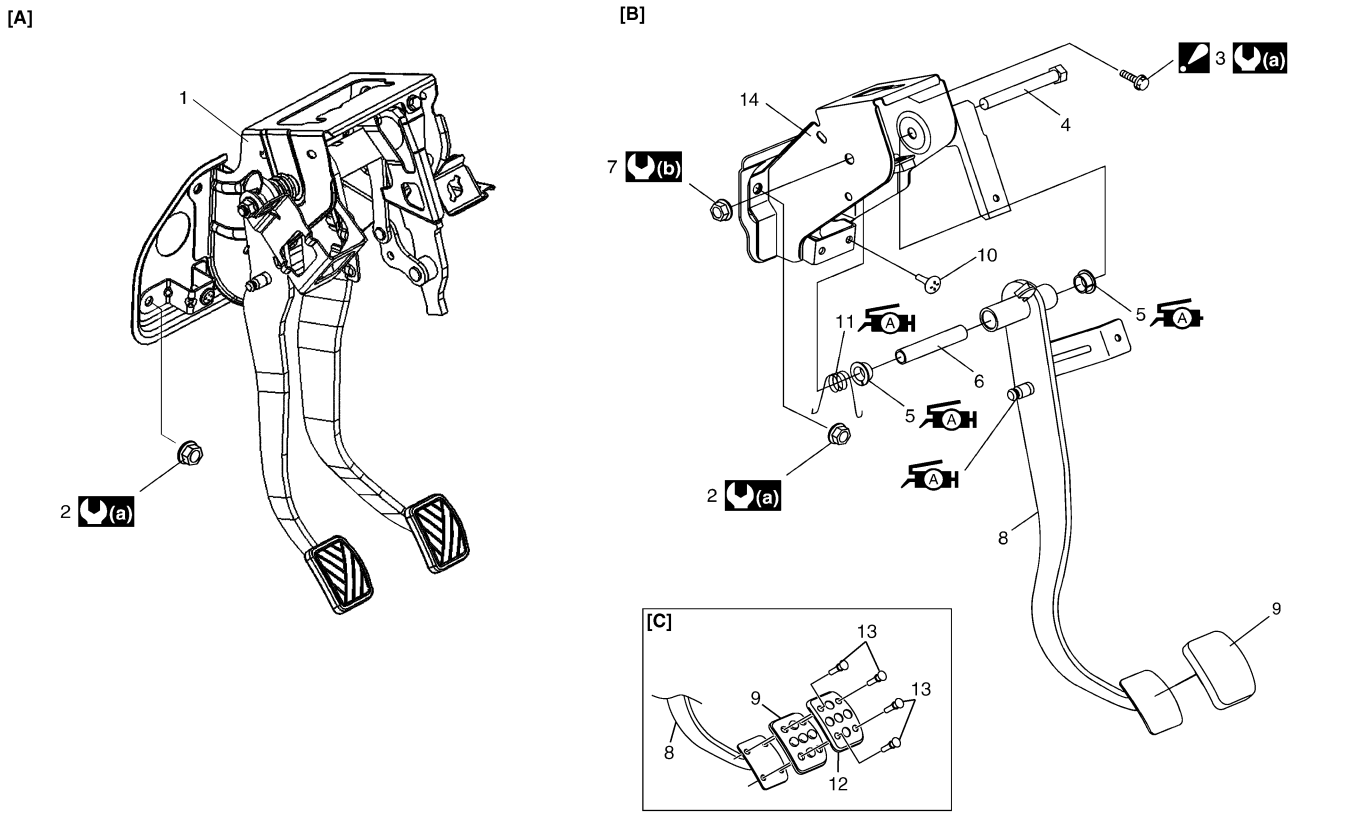
Clutch Operating Cylinder Assembly Inspection

S7N20A5306012

Check clutch fluid leakage, spring for damage and bearing for smooth rotation. If malfunction is found, replace clutch operating cylinder assembly.

Clutch Pedal and Clutch Pedal Bracket Components

S7N20A5306013

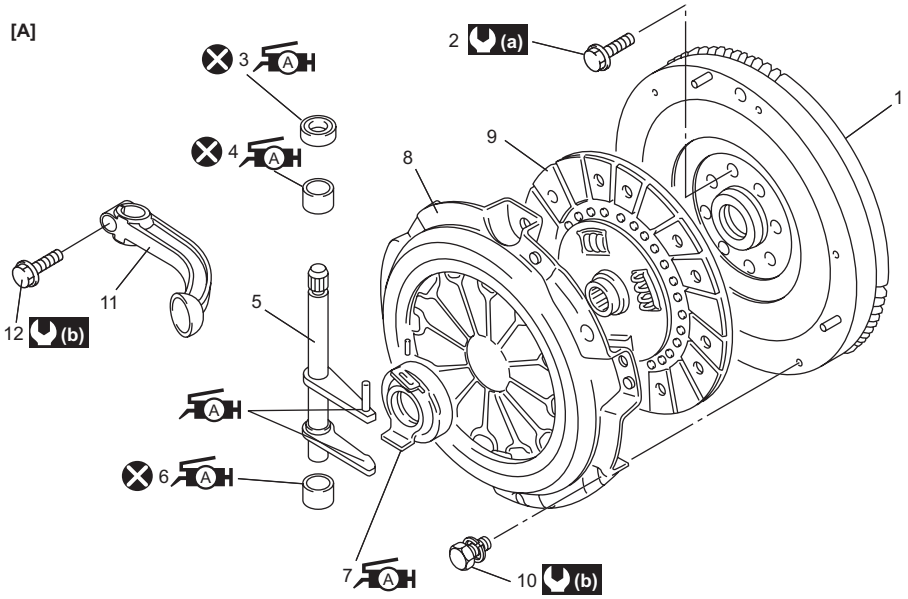


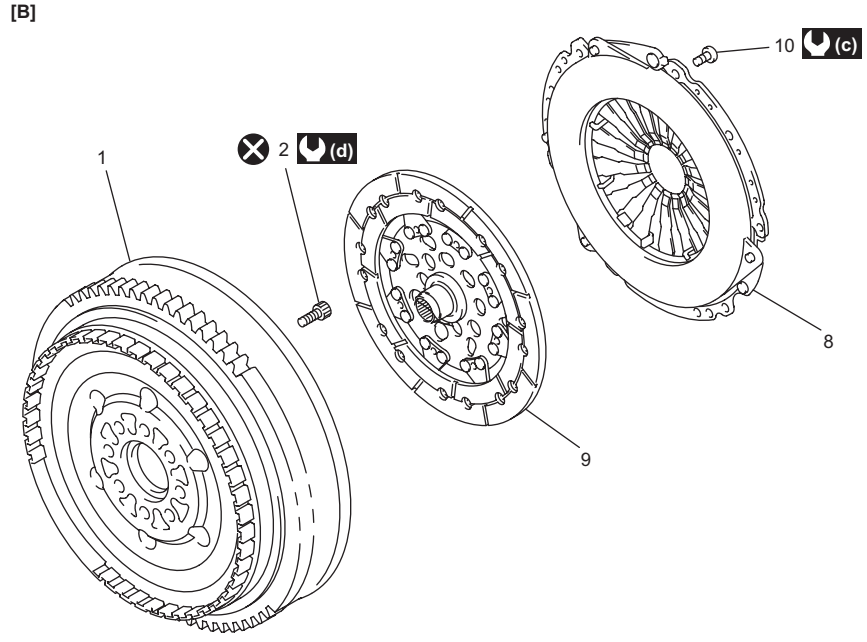
I6RS0B530004-04

[A]: LH steering vehicle	8. Clutch pedal : Apply grease 99000-25011 to outside surface of pin.
[B]: RH steering vehicle	9. Pedal pad
[C]: For M16 engine model	10. Cushion
1. Clutch & brake pedal assembly	11. Return spring : Apply grease 99000-25011 to inside of spring.
2. Pedal bracket nut	12. Pedal cover plate
3. Pedal bracket bolt : Pedal bracket bolt must be tighten after pedal bracket nut.	13. Pedal plate cushion
4. Pedal shaft bolt	14. Clutch pedal bracket
5. Pedal bush : Apply grease 9900-25011 to outside of bush.	(a) : 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
6. Pedal shaft spacer	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
7. Pedal shaft nut	

Clutch Cover, Clutch Disc and Flywheel Components

S7N20A5306014





I7N20A530006-01

[A]: For petrol engine model	9. Clutch disc
[B]: For diesel engine model	10. Clutch cover bolt
1. Flywheel	11. Release arm
2. Flywheel bolt	12. Release arm bolt
3. Clutch release shaft seal : Apply grease 99000-25011 to seal lip.	(a) : 70 N·m (7.0 kgf-m, 51.0 lbf-ft)
4. Clutch release shaft No.2 bush : Apply grease 99000-25011 to bush inside.	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
5. Clutch release shaft : Apply grease 99000-25011 to the end of release shaft arm.	(c) : 15 N·m (1.5 kgf-m, 11.0 lbf-ft)
6. Clutch release shaft No.1 bush : Apply grease 99000-25011 to bush inside.	(d) : 44 N·m (4.5 kgf-m, 32.5 lbf-ft)
7. Release bearing : Apply grease 99000-25011 to joint of bearing and release shaft and also bearing inside.	Do not reuse.
8. Clutch cover	

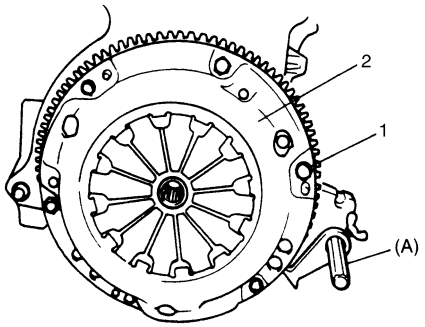
Clutch Cover, Clutch Disc and Flywheel Removal and Installation

S7N20A5306015

Removal

1) Dismount manual transaxle assembly referring to “Manual Transaxle Unit Dismounting and Remounting: M13A Model in Section 5B”, “Manual Transaxle Unit Dismounting and Remounting: M15A and M16A Model in Section 5B” or “Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B”.
2) Hold flywheel with special tool and remove clutch cover bolts (1), clutch cover (2) and clutch disc.

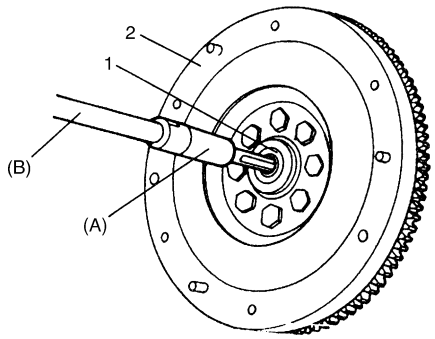
Special tool
(A): 09924–17811



I4RS0A530014-01

3) Pull out input shaft bearing (1) from flywheel (2), use the following special tool if necessary (for petrol engine model).

Special tool
(A): 09921–26020 (for petrol engine model)
(B): 09930–30104 (for petrol engine model)



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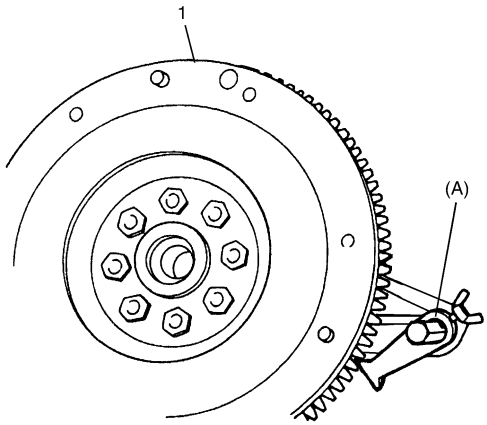
4) Remove flywheel (1) from crankshaft using special tool.

Special tool
(A): 09924–17811



I4RS0A530015-02

Installation

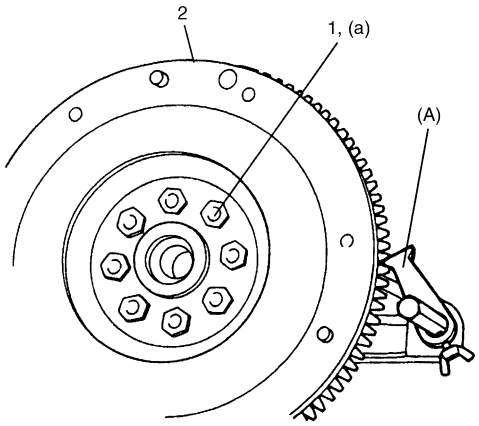
NOTE

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

1) Install flywheel to crankshaft as follows.
   - Petrol engine model
     a. Install flywheel (2) to crankshaft and tighten bolts (1) to specification.

Special tool
(A): 09924–17811

Tightening torque
Flywheel bolt (for petrol engine model)
(a): 70 N·m (7.0 kgf-m, 51.0 lbf-ft)



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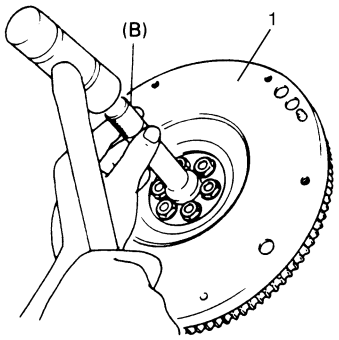
b. Using special tool, install input shaft bearing to flywheel (1).

Special tool
(B): 09925–98210



I4RS0A530016-01

- Diesel engine model

a. Install dowel pin (1) to crankshaft (2), if removed.

NOTE

Be sure to install knock pin to ϕ 6.75 mm (0.266 in.) hole of crankshaft.

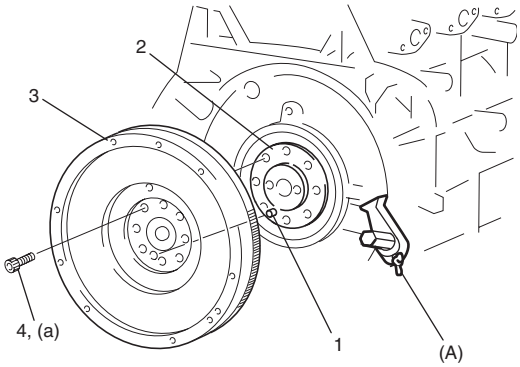
b. Tighten new flywheel mounting bolts (4) by hand.

c. Lock flywheel (3) using special tool.

Special tool
(A): 09924–17811

d. Tighten new flywheel bolts to specified torque.

Tightening torque
Flywheel bolt (diesel model) (a): 44 N·m (4.5 kgf-m, 32.5 lbf-ft)



I6RS0E530022-01

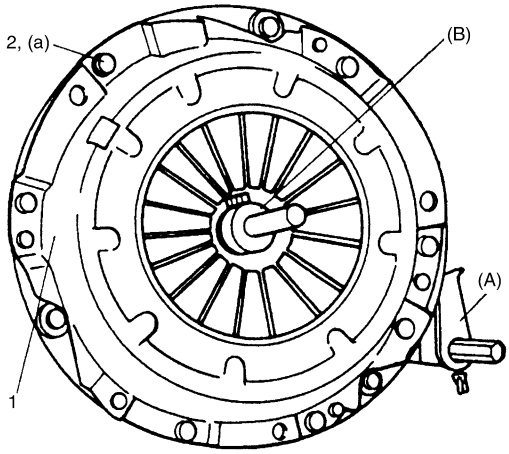
2) Aligning clutch disc to flywheel center using special tool, install clutch cover (1) and bolts (2). Then tighten bolts (2) to specification.

NOTE

- **While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**

Special tool
(A): 09924–17811
(B): 09923–36320

Tightening torque
Clutch cover bolt (for petrol engine model) (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
Clutch cover bolt (for diesel engine model) (a): 15 N·m (1.5 kgf-m, 11.0 lbf-ft)



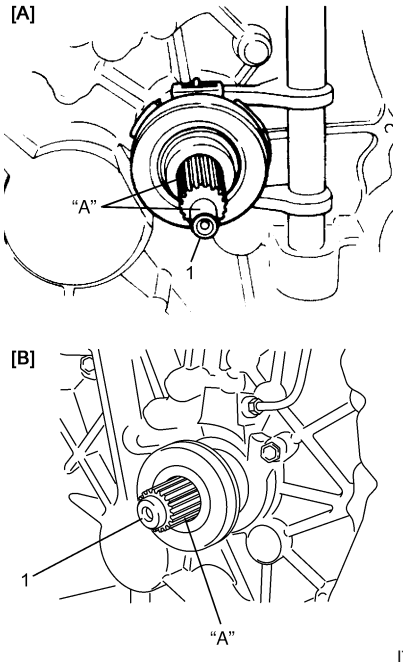
I4RS0A530017-01

3) Slightly apply grease to input shaft (1), then join manual transaxle assembly with engine referring to "Manual Transaxle Unit Dismounting and Remounting: M13A Model in Section 5B", "Manual Transaxle Unit Dismounting and Remounting: M15A and M16A Model in Section 5B" or "Manual Transaxle Unit Dismounting and Remounting: D13A and Z13DTJ Model in Section 5B".

"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.



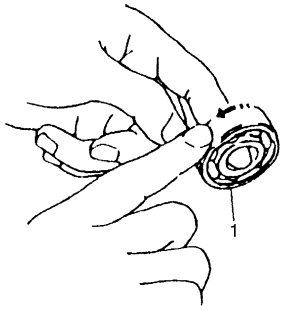
I7N20A530007-01

[A]:	For petrol engine model
[B]:	For diesel engine model

Clutch Cover, Clutch Disc and Flywheel Inspection

S7N20A5306016

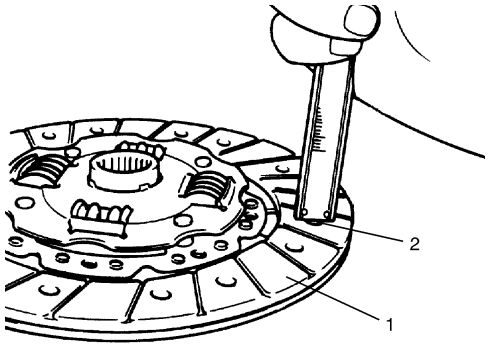
Input Shaft Bearing (For Petrol Engine Model)
Check bearing (1) for smooth rotation and replace it if abnormality is found.



I3RM0A530014-01

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 assembly (1).

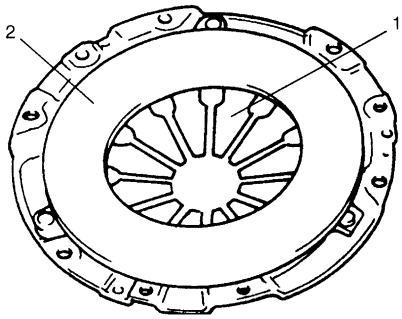
Rivet head depth
Standard: 1.65 – 2.25 mm (0.06 – 0.09 in.) (Petrol model)
Standard: 1.1 mm (0.043 in.) (Diesel model)
Limit: 0.5 mm (0.02 in.)



I4RS0A530019-01

Clutch Cover

1) Check diaphragm spring (1) for abnormal wear or damage.
2) Inspect pressure plate (2) for wear or heat spots.
3) If abnormality is found, replace clutch cover. Do not disassemble it into diaphragm spring and pressure plate.



I3RM0A530015-01

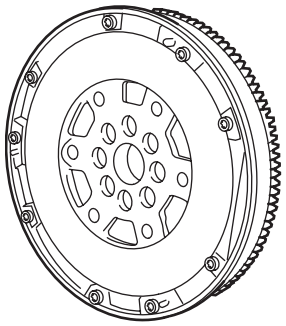
Flywheel

Petrol model

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.

Diesel model

- Check gear for crack or wear.
  If malcondition is found, replace flywheel.
- Check surface for damage or excessively wear.
  If malcondition is found, replace flywheel.



I3RB0A143041-01

Clutch Release System Removal and Installation (For Petrol Engine Model)

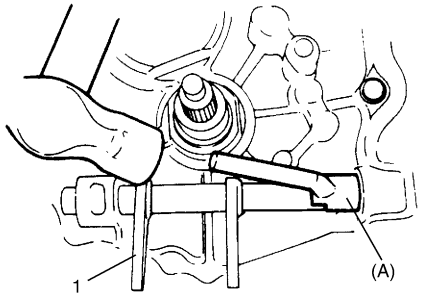
S7N20A5306017

Removal

1) Remove release arm by loosening its bolt.
2) Take out release bearing by turning release shaft (1).
3) Drive out No.2 bush using special tool and hammer. Release shaft seal will also be pushed out.

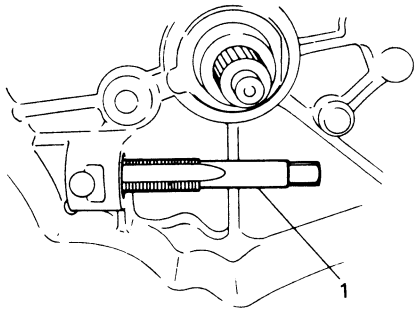
   Special tool
   (A): 09922–46010

4) Remove release shaft (1).



I4RS0A530020-01

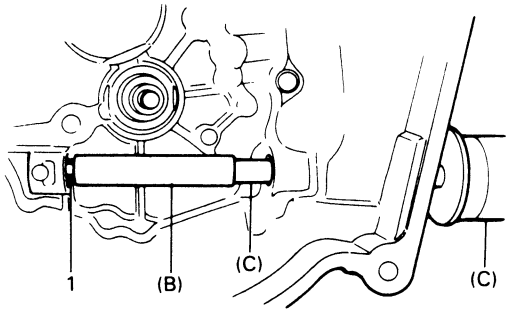
5) Install tap (M16 X 1.5) (1) to clutch release shaft No.1 bush.



IYSY01531016-01

6) Pull No.1 bush out using tap (1) and special tools.

   Special tool
   (B): 09923–46020
   (C): 09930–30104



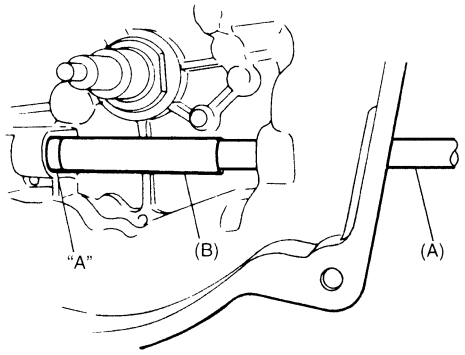
IYSY01531017-01

Installation

1) Drive in a new No.1 bush using special tools and hammer, and then apply grease to bush inside.

   Special tool
   (A): 09943–88211
   (B): 09923–46030

   "A": Grease 99000–25011 (SUZUKI Super Grease A)



I3RM0A530016-01

2) Install release shaft.
3) Apply grease to No.2 bush (1) inside and press-fit it using the same special tool as in removal.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

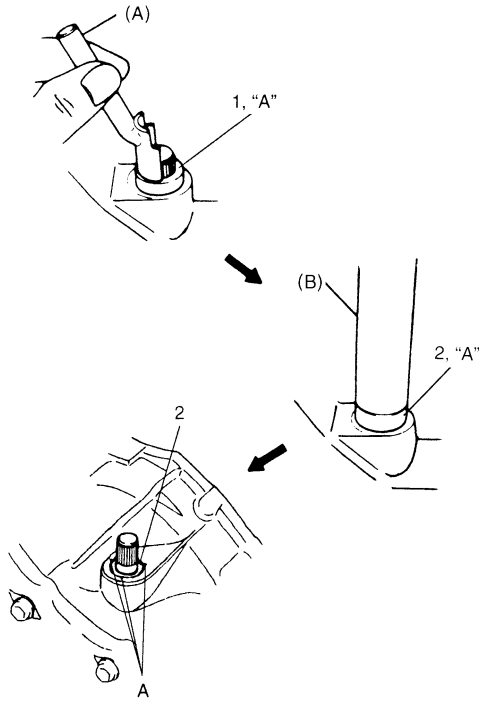
Special tool
(A): 09922–46010

4) Coat 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): 09925–98221

5) Caulk seal at A using caulking tool and hammer.



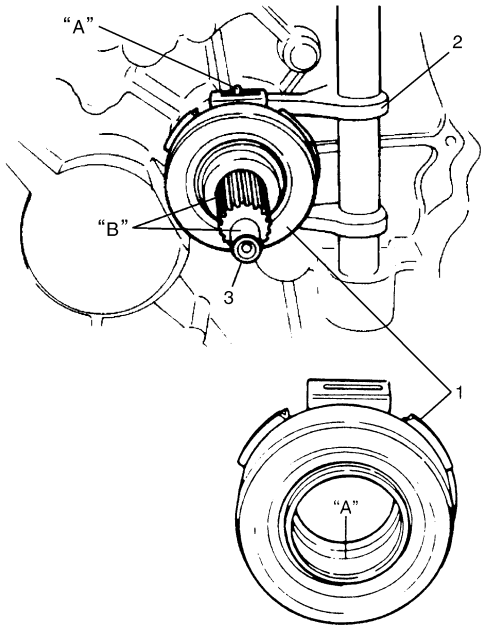
I3RM0A530017-01

6) Apply grease to release bearing inside and release shaft (2), then set release bearing (1).

"A": Grease 99000–25011 (SUZUKI Super Grease A)

7) Apply small amount of grease to input shaft (3) spline (0.3 g (0.01 oz)) and front end (0.15 g (0.005 oz)) as well.

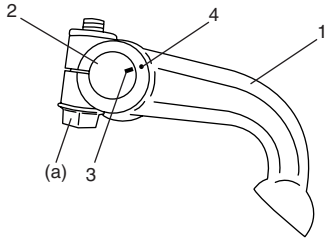
"B": Grease 99000–25210 (SUZUKI Super Grease I)



I4RS0A530021-01

8) Set release arm (1) to release shaft (2) aligning punch mark (4) of release arm and punch mark (3) of release shaft, then tighten bolt to specified torque.

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



I4RS0A530022-01

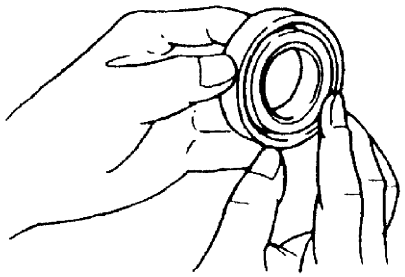
Clutch Release System Inspection (For Petrol Engine Model)

S7N20A5306018

Clutch Release Bearing
Check clutch release bearing for smooth rotation. If abnormality is found, replace it.

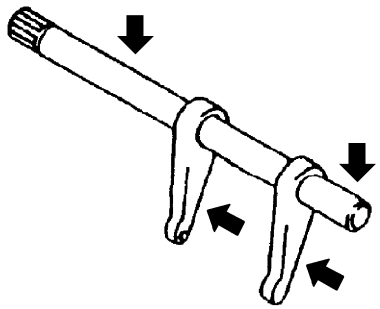
⚠ CAUTION

Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.



I3RM0A530020-01

Clutch Release Shaft
Check clutch release shaft and its pin for deflection or damage.
If abnormality is found, replace it.



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Specifications

Tightening Torque Specifications

S7N20A5307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Clutch operating cylinder bolt	23	2.3	17.0	☞
Clutch operating cylinder assembly mounting bolt	10	1.0	7.5	☞
Clutch fluid pipe flare nut	16	1.6	11.5	☞
Flywheel bolt (for petrol engine model)	70	7.0	51.0	☞
Flywheel bolt (diesel model)	44	4.5	32.5	☞
Clutch cover bolt (for petrol engine model)	23	2.3	17.0	☞
Clutch cover bolt (for diesel engine model)	15	1.5	11.0	☞
Release lever bolt	23	2.3	17.0	☞

NOTE

The specified tightening torque is also described in the following.
“Clutch Fluid Pipe and Hose Components (For Petrol Engine Model): ”
“Clutch Pedal and Clutch Pedal Bracket Components: ”
“Clutch Cover, Clutch Disc and Flywheel Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A5308001

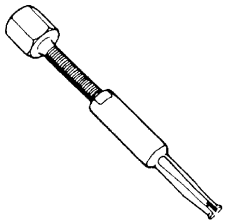
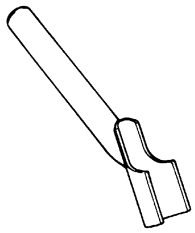
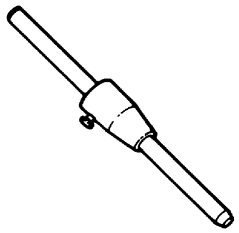
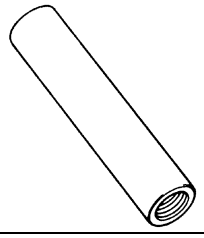
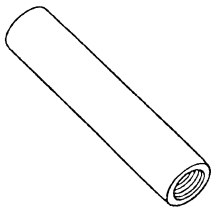
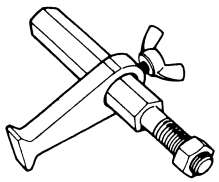
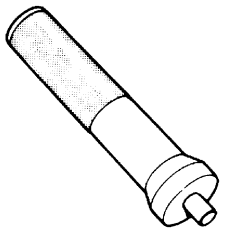
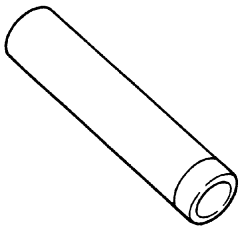
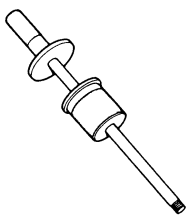
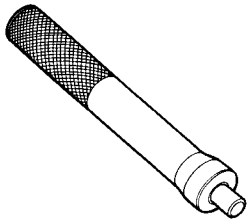
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞ / ☞ / ☞ / ☞
	SUZUKI Silicone Grease	P/No.: 99000–25100	☞ / ☞
	SUZUKI Super Grease I	P/No.: 99000–25210	☞ / ☞

NOTE

Required service material is also described in the following.
"Clutch Fluid Pipe and Hose Components (For Petrol Engine Model): "
"Clutch Pedal and Clutch Pedal Bracket Components: "
"Clutch Cover, Clutch Disc and Flywheel Components: "

Special Tool

S7N20A5308002

09921–26020 Bearing remover ☞ 	09922–46010 Clutch bush remover ☞ / ☞ 
09923–36320 Clutch center guide (15 mm) ☞ 	09923–46020 Joint pipe ☞ 
09923–46030 Joint pipe ☞ 	09924–17811 Flywheel holder ☞ / ☞ / ☞ / ☞ / ☞ 
09925–98210 Input shall bearing installer ☞ 	09925–98221 Bearing installer ☞ 
09930–30104 Sliding shaft ☞ / ☞ 	09943–88211 Pinion bearing installer ☞ 

Automated Manual Transaxle

Precautions

Precautions in Diagnosing Trouble

S7N20A5400001

- Don’t disconnect couplers from TCM (Automated Manual Transaxle), battery cable from battery, TCM (Automated Manual Transaxle) ground wire harness from engine or main fuse before checking the diagnosis information stored in TCM (Automated Manual Transaxle) memory.
  Such disconnection will clear memorized information in TCM (Automated Manual Transaxle) memory.
- Using scan tool the diagnostic information stored in TCM (Automated Manual Transaxle) memory can be checked and cleared as well. Before its use, be sure to read Operator’s (instruction) Manual supplied with it carefully to have good understanding of its functions and usage.
- Be sure to read “Precautions for Electrical Circuit Service in Section 00” before inspection and observe what is written there.
- TCM (Automated Manual Transaxle) and/or ECM replacement
  – When substituting a known-good TCM (Automated Manual Transaxle) and/or ECM, check that all relays and actuators have resistance of specified value.
    Neglecting this check may result in damage to good TCM (Automated Manual Transaxle) and/or ECM.
- Communication of ECUs, ECM, TCM (Automated Manual Transaxle) and BCM is established by means of CAN (Controller Area Network). Therefore, handle CAN communication line with care referring to “Precaution for CAN Communication System in Section 00”.

General Description

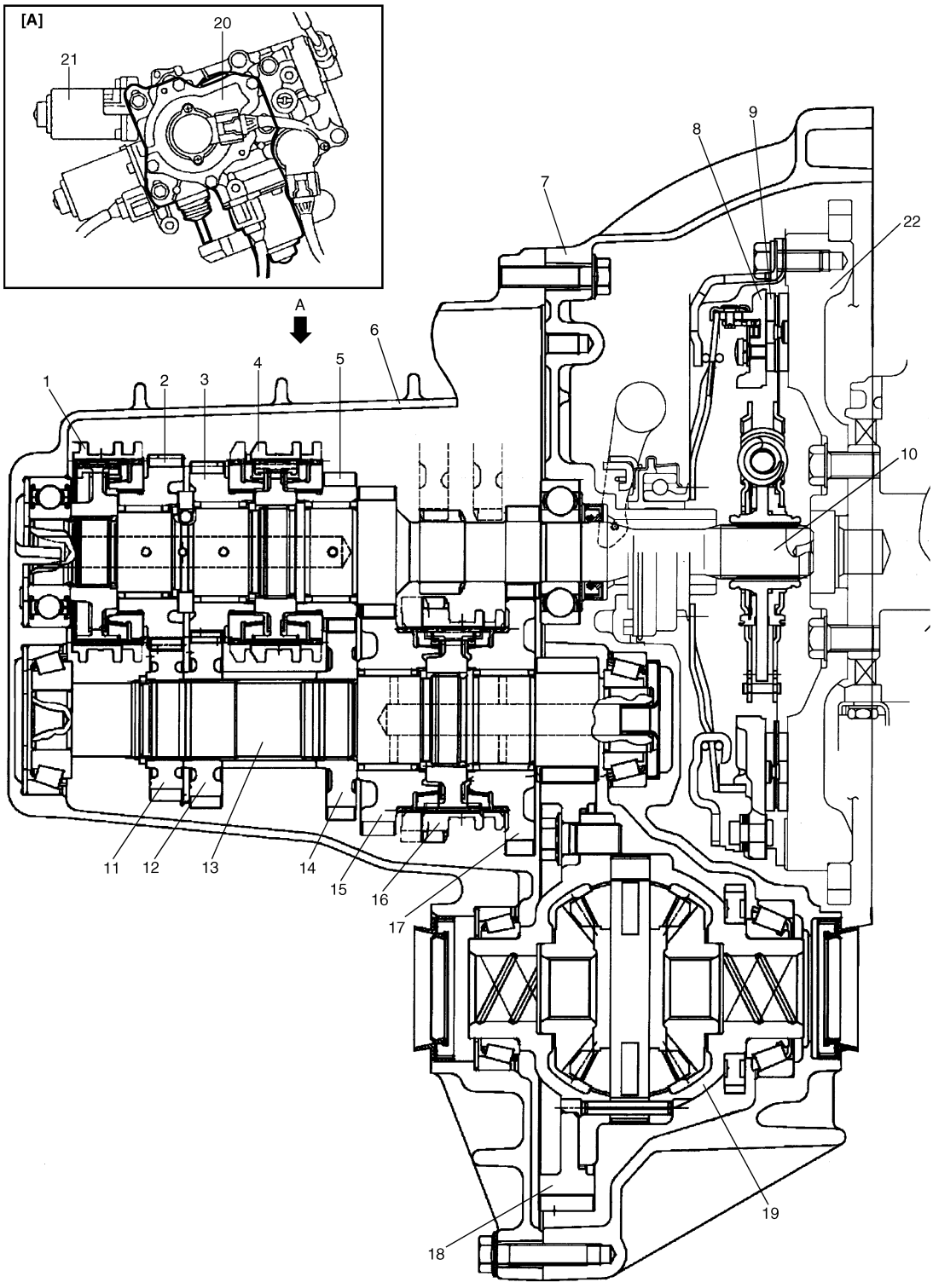
Automated Manual Transaxle Description

S7N20A5401001

Automated Manual Transaxle is a transaxle developed with a shift and select actuator added to the conventional manual transaxle and a load control clutch cover and clutch actuator added to the clutch disc. TCM (Automated Manual Transaxle) controls clutch engagement / disengagement and gear change electrically.
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.
When the shift lever is operated, TCM (Automated Manual Transaxle) controls the clutch actuator and shift and select actuator based on the information inputted in it. The clutch actuator causes the clutch to engage / disengage by moving the release arm and shift and select actuator changes gears using the shift fork.
The system to control clutch engagement / disengagement and gear change of the transaxle consists of the shift selector, actuators, sensors, switches and TCM (Automated Manual Transaxle) and has following functions.

- Automated Manual Transaxle has two drive modes (drive (D) mode and manual (M) mode) and the drive (D) mode also has two modes of normal mode and economy mode. In the normal mode, gear change is executed at the standard gear change timing while in the economy mode, shift-up is executed at a little earlier timing.
- If the target gear is not engaged when the shift lever is operated, attempt for shift change is repeated some times. If the gear fails to be engaged even then, the gear position before shifting is restored. (N position when previous shifting position is R)
- The engine is allowed to start only when the brake is applied and the gear position is at N to prevent a jumping start.
- ECM controlling the electric throttle body and CAN communication together control so that gear change is available with the accelerator pedal depressed just like the automatic transmission and creeping is available with accelerator and brake in the OFF state.
- Just like the conventional manual transaxle, it is possible to park the vehicle while the gear is engaged by turning off the ignition switch with the gear at R, 1st or 2nd position
- In order to obtain control functions of the clutch and transaxle, Automated Manual Transaxle has a function to check conditions of the clutch and manual transaxle and learning necessary values for optimum gear change. As removal or replacement of the clutch actuator or replacement of TCM (Automated Manual Transaxle) causes the learned values to be deviated, such deviation should be avoided. Therefore, it is necessary to clear the learned value in the past using the scan tool when removing and replacing these parts and make TCM (Automated Manual Transaxle) learning necessary values again for optimum control of the clutch and transaxle.

Parts	Procedure	
TCM	Before removing	1. Clutch position control 2. TCM initialization
Clutch actuator		
Clutch stroke sensor		
Shift and select actuator		
Shift stroke sensor		
Select stroke sensor		
Automated Manual Transaxle assembly	After install	1. Calibration of Automated Manual Transaxle control system 2. Calibration of clutch control system
Clutch disc and clutch cover		
Clutch release bearing		
Clutch release fork		
Clutch release shaft		
Flywheel		
Crank shaft		



I4RS0B540170-02

[A]: View A	8. Clutch cover	16. Low speed synchronizer Sleeve and hub
1. 5th speed synchronizer sleeve and hub	9. Clutch disc	17. Countershaft 1st gear
2. Input shaft 5th gear	10. Input shaft	18. Final gear
3. Input shaft 4th gear	11. Countershaft 5th gear	19. Differential case
4. High speed synchronizer sleeve and hub	12. Countershaft 4th gear	20. Clutch actuator assembly
5. Countershaft 3rd gear	13. Countershaft	21. Shift and select actuator assembly
6. Left case	14. Countershaft 3rd gear	22. Flywheel
7. Right case	15. Countershaft 2nd gear	

Warning buzzer operation

The TCM sounds the warning buzzer in TCM at the following each condition.

Condition	Buzzer operation		
	ON (ms)	OFF (ms)	Time
Shift selector is at R	260	—	1
When engine is over-revved after shift down	66	66	2
Impossibility of parking with gear (when transaxle gears are not engaged though shift selector is shifted to D, M or R)	600	600	Continuously
Creeping drive for 60 seconds or more			
Clutch system temperature is higher than specified temperature	100	100	

The TCM outputs operation signal of the warning buzzer to BCM at the following each condition, and the warning buzzer incorporated in the BCM sounds.

Condition	Buzzer operation		
	ON (ms)	OFF (ms)	Time
Ignition switch is at OFF position and TCM back up power circuit is open	375	225	Continuously
TCM malfunction			
The driver side door is open, the shift selector is shifted to D, M or R and the ignition switch is at ON position			
CAN line is open			

Function of Automated Manual Transaxle Control System Component

S7N20A5401002

Part name	Function
Neutral start switch	Detects whether transaxle is at N position or not.
Clutch stroke sensor	Detects clutch actuator motor position.
Clutch actuator motor	Operated the clutch release arm.
Clutch actuator	• Consists of clutch actuator motor and clutch stroke sensor. • Clutch to disengage and engage.
Shift stroke sensor and Select stroke sensor	Detects whether shift actuator motor position.
Shift actuator motor and select actuator motor	Shifts Automated Manual Transaxle shift position by operate shift fork shaft.
Shift and select actuator	Consists of shift actuator motor, select actuator motor, shift stroke sensor and select stroke sensor.
TCM (Automated Manual Transaxle)	• Controls gear shift and clutch operation. • Diagnoses Automated Manual Transaxle control system components.

Input / Output Signal Table of Automated Manual Transaxle Control

		Output signal			
		Clutch actuator	Shift and Select actuator	Automated Manual Transaxle warning lamp	Buzzer
Input signal	Shift selector	○	○	○	○
	Output shaft speed sensor (VSS)	○	○		
	Input shaft speed sensor	○	○		
	Stop (Brake) lamp switch	○	○		
	TCM (Automated Manual Transaxle)			○	

Automatic Gear Shift Table

S7N20A5401003

Automatic gear shift schedule is shown in the following table. Test-drive the vehicle on a flat road in the D position.

1. Shift Point in D position and ECO mode

	Throttle opening (%)	Shift	Vehicle speed km/h (mph)	Remark
UP shift	Over 90%	1st → 2nd	40 – 45 (25 – 28)	There is no sudden change in accelerator opening. Hard brake is not being applied.
		2nd → 3rd	81 – 86 (50 – 53)	
		3rd → 4th	119 – 121 (74 – 75)	
		4th → 5th	152 – 157 (94 – 98)	
	50%	1st → 2nd	31 – 36 (19 – 22)	
		2nd → 3rd	56 – 61 (35 – 38)	
		3rd → 4th	80 – 85 (50 – 53)	
		4th → 5th	111 – 116 (69 – 72)	
	0 – 10%	1st → 2nd	16 – 21 (10 – 13)	
		2nd → 3rd	26 – 31 (16 – 19)	
		3rd → 4th	34 – 39 (21 – 24)	
		4th → 5th	47 – 52 (29 – 21)	
DOWN shift	95 – 100%	5th → 4th	139 – 144 (86 – 89)	There is no sudden change in accelerator opening. Hard brake is not being applied.
		4th → 3rd	103 – 108 (64 – 67)	
		3rd → 2nd	70 – 75 (43 – 47)	
		2nd → 1st	25 – 32 (16 – 20)	
	75%	5th → 4th	86 – 91 (53 – 57)	
		4th → 3rd	48 – 53 (30 – 33)	
		3rd → 2nd	27 – 32 (17 – 20)	
		2nd → 1st	13 – 18 (8 – 11)	
	0 – 40%	5th → 4th	38 – 43 (24 – 27)	
		4th → 3rd	31 – 35 (19 – 22)	
		3rd → 2nd	23 – 28 (14 – 17)	
		2nd → 1st	13 – 18 (8 – 11)	

2. Shift Point in D position and Normal mode

	Throttle opening (%)	Shift	Vehicle speed km/h (mph)	Remark
UP shift	Over 90%	1st → 2nd	40 – 45 (25 – 28)	There is no sudden change in accelerator opening. Hard brake is not being applied.
		2nd → 3rd	81 – 86 (50 – 53)	
		3rd → 4th	119 – 121 (74 – 75)	
		4th → 5th	152 – 157 (94 – 98)	
	50%	1st → 2nd	36 – 41 (22 – 25)	
		2nd → 3rd	69 – 74 (43 – 46)	
		3rd → 4th	97 – 102 (60 – 63)	
		4th → 5th	123 – 128 (76 – 80)	
	0 – 10%	1st → 2nd	16 – 21 (10 – 13)	
		2nd → 3rd	43 – 48 (26 – 30)	
		3rd → 4th	69 – 74 (43 – 46)	
		4th → 5th	98 – 103 (61 – 64)	
DOWN shift	95 – 100%	5th → 4th	139 – 144 (86 – 89)	There is no sudden change in accelerator opening. Hard brake is not being applied.
		4th → 3rd	103 – 108 (64 – 67)	
		3rd → 2nd	70 – 75 (43 – 47)	
		2nd → 1st	25 – 32 (16 – 20)	
	75%	5th → 4th	100 – 105 (62 – 65)	
		4th → 3rd	72 – 77 (45 – 48)	
		3rd → 2nd	38 – 43 (24 – 27)	
		2nd → 1st	13 – 18 (8 – 11)	
	0 – 40%	5th → 4th	84 – 89 (52 – 55)	
		4th → 3rd	62 – 67 (39 – 42)	
		3rd → 2nd	33 – 38 (21 – 24)	
		2nd → 1st	13 – 18 (8 – 11)	

NOTE

The gear change is done at the shift point different from the above while any of the following control functions is working. Bear this in mind when performing inspection.

Shift hold control when accelerator is quickly closed
When the accelerator is closed during acceleration, up-shift usually takes place in many cases because the gear change point for acceleration 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 the position in use 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, unneeded up-shift is avoided. This makes it possible to use the engine brake effectively on the down-hill slope and to use the suitable gear on the up-hill slope.
Coast down control when brake is applied
With this control function, 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 function, down-shift takes place after the accelerator pedal is depressed) is eliminated for smooth acceleration.

Automated Manual Transaxle Diagnosis General Description

S7N20A5401004

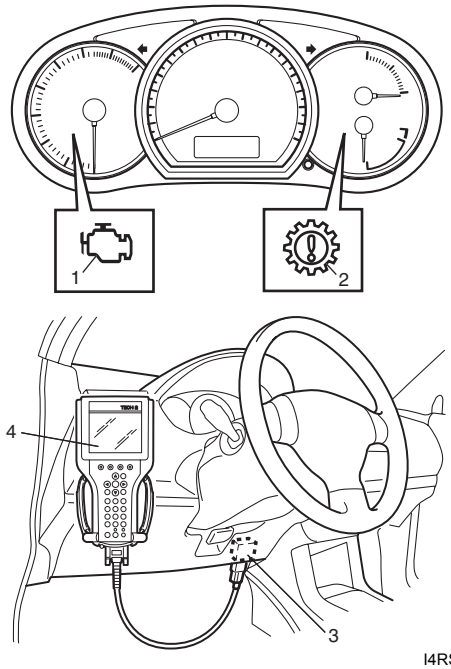
This vehicle is equipped with an electronic transaxle control system, which controls the automatic shift up and shift down timing, clutch operation, etc. suitably to vehicle driving conditions.
TCM (Automated Manual Transaxle) has an On-Board Diagnosis System which detects a malfunction in this system.
When diagnosing a trouble in transaxle control including this system, be sure to have full understanding of the outline of “On-Board Diagnostic System Description” and each item in “Precautions in Diagnosing Trouble” and execute diagnosis according to “Automated Manual Transaxle System Check” to obtain correct result smoothly.

On-Board Diagnostic System Description

S7N20A5401005

For Automated Manual Transaxle control system, TCM (Automated Manual Transaxle) has the following functions.

- When TCM (Automated Manual Transaxle) detects a malfunction in Automated Manual Transaxle control system, TCM (Automated Manual Transaxle) desire turning on malfunction indicator lamp (MIL) (1) and/or Automated Manual Transaxle warning lamp (2) and stores malfunction DTC in TCM (Automated Manual Transaxle) memory.
- It is possible to communicate with TCM (Automated Manual Transaxle) through data link connector (DLC) (3) by using scan tool (4). (Diagnostic information can be checked and erased by using 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

S7N20A5401006

CAN communication system uses the serial communication in which data is transmitted at a high speed. It uses a twisted pair of two communication lines for the high-speed data transmission. As one of its characteristics, multiple control modules can communicate simultaneously. In addition, it has a functionality to detect a communication error automatically. Each module reads necessary data from the received data and transmits data. Communication of ECM, TCM (Automated Manual Transaxle), BCM, combination meter and keyless start control module, is established by CAN. TCM (Automated Manual Transaxle) transmission data is as follows.

TCM (Automated Manual Transaxle) Transmission Data

				ECM	BCM	Combination Meter
TCM	Transmit	DATA	Actual gear position	○		
			ECO mode	○		○
			Automated Manual Transaxle mode			○
			Automated Manual Transaxle gear poistion			○
			Gear parking indication flashing off request			○
			Buzzer for Automated Manual Transaxle on request		○	
			Transmission malfunction indication on			○
			Transmission emissions related malfunction active			○

I4RS0B540172-06

TCM (Automated Manual Transaxle) Reception Data

				ECM
TCM	Receive	DATA	Vehicle speed	○
			Engine speed	○
			Accelerator pedal position	○
			Throttle position	○
			Engine coolant temperature	○
			Intake air temperature	○

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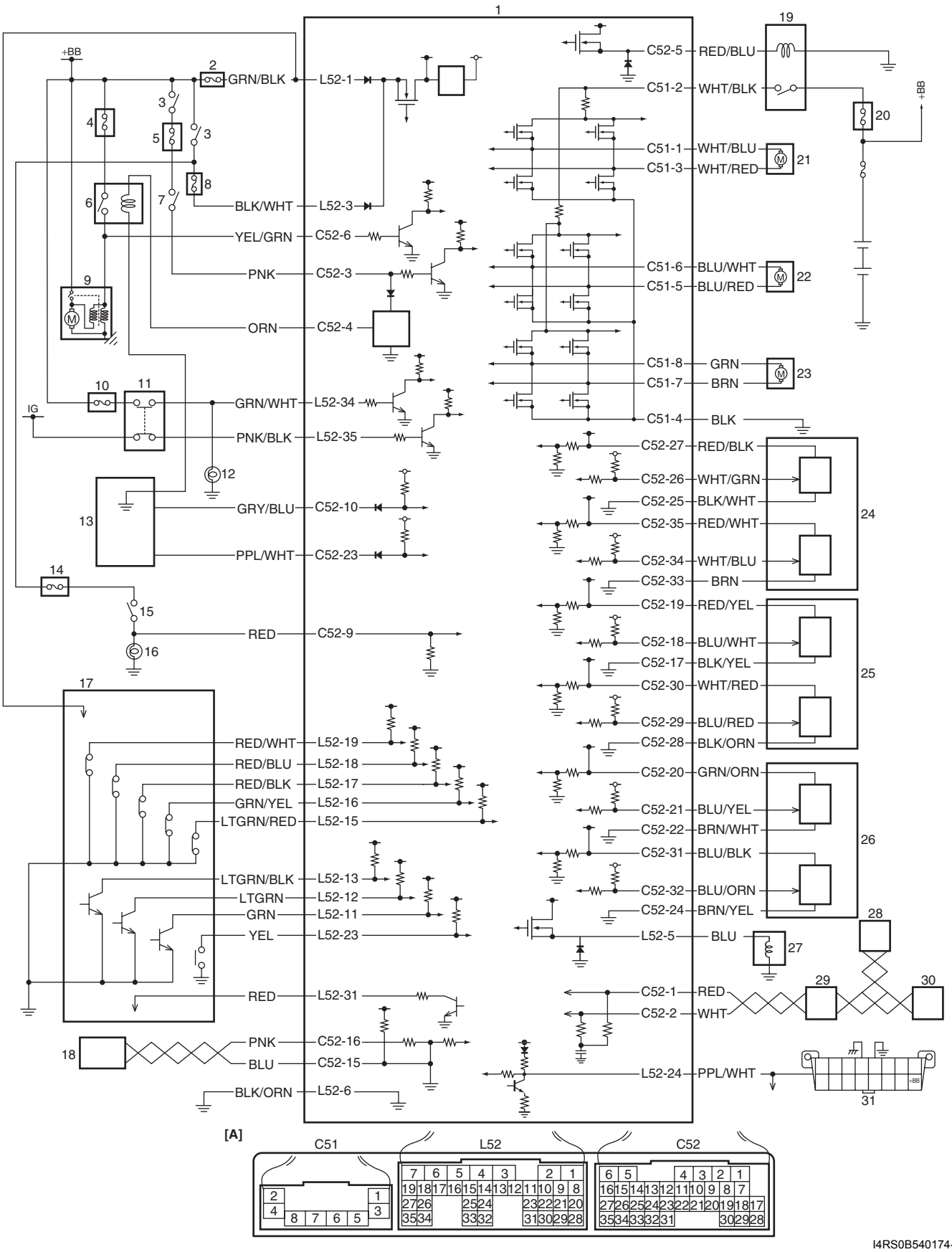
Schematic and Routing Diagram

TCM (Automated Manual Transaxle) Wiring Diagram

S7N20A5402001



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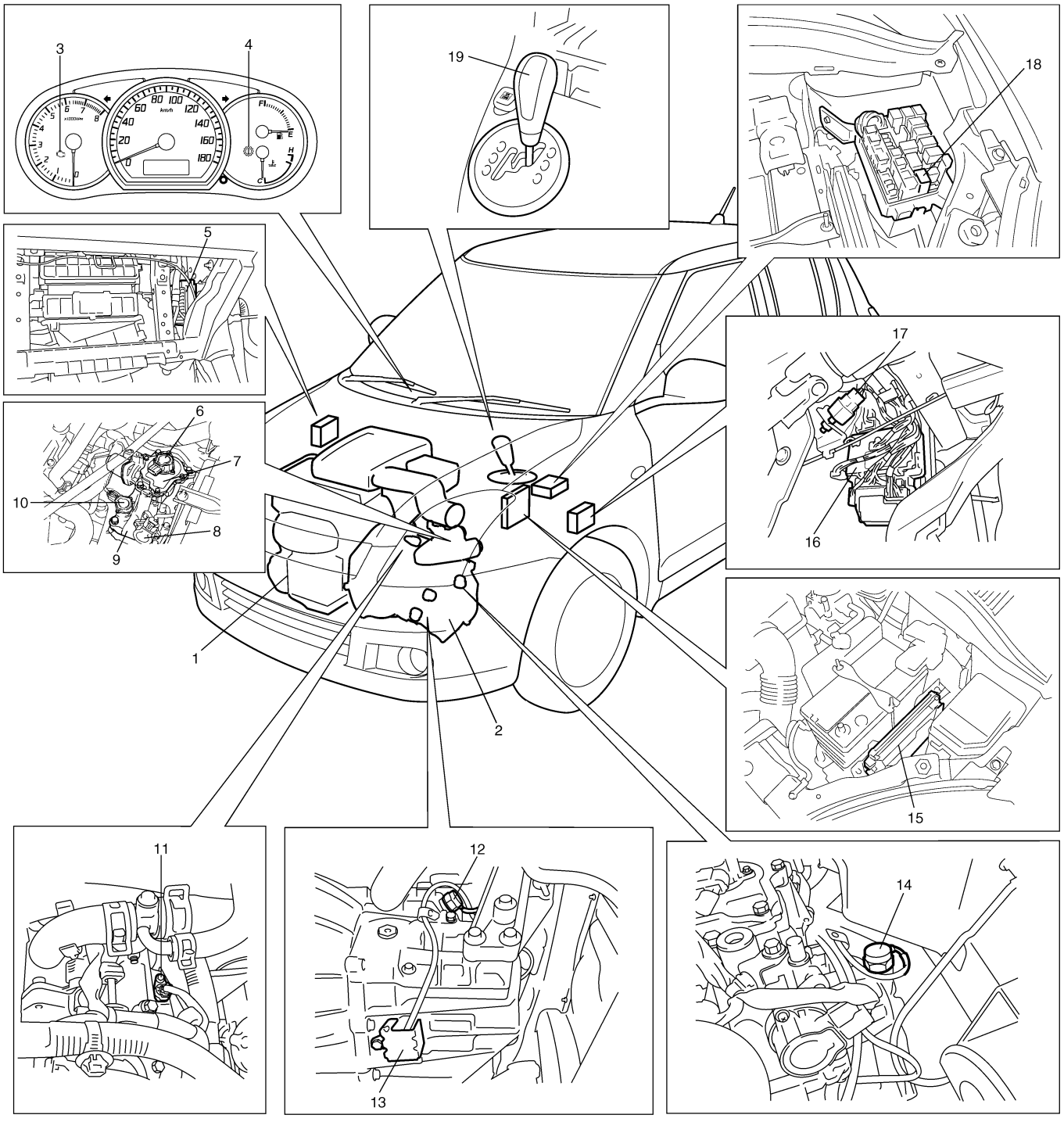
1. TCM (Automated Manual Transaxle)	17. Shift selector
2. “Automated Manual Transaxle” fuse	18. Input shaft speed sensor
3. Ignition switch	19. Motor relay
4. “ST MOT” fuse	20. “Automated Manual Transaxle” fuse
5. “ST SIG” fuse	21. Shift motor in shift and select actuator
6. Starter relay	22. Select motor in shift and select actuator
7. Neutral start switch	23. Clutch motor in clutch actuator
8. “IG SIG” fuse	24. Clutch stroke sensor
9. Starter motor	25. Shift stroke sensor
10. “STOP LAMP” fuse	26. Select stroke sensor
11. Stop lamp switch	27. Shift lock solenoid
12. Stop lamp	28. Combination meter
13. ECM	29. ECM
14. “BACK” fuse	30. BCM
15. Back up lamp switch	31. Data link connector
16. Back up lamp	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

Component Location

Electronic Shift Control System Components Location

S7N20A5403001



I4RS0B540175-04

1. Engine	8. Select stroke sensor	15. ECM
2. Automated Manual Transaxle	9. Shift and select actuator	16. BCM (included in Junction block assembly)
3. Malfunction indicator lamp (MIL)	10. Shift stroke sensor	17. Stop (Brake) lamp switch
4. Automated Manual Transaxle warning lamp	11. Output shaft speed sensor (VSS)	18. Motor relay
5. TCM (Automated Manual Transaxle)	12. Neutral start switch	19. Shift selector
6. Clutch stroke sensor	13. Input shaft speed sensor	
7. Clutch actuator	14. Back up lamp switch	

Diagnostic Information and Procedures

Automated Manual Transaxle System Check

S7N20A5404001

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

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *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. *Is there any DTC(s)?*	Print DTC or write them down and clear them by referring to “DTC Clearance”. Go to Step 3.	Go to Step 4.
3	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 5.
4	☞ **Visual inspection** 1) Perform visual inspection. *Is there any faulty condition?*	Repair or replace malfunction part. Go to Step 11.	Go to Step 8.
5	☞ **Trouble symptom confirmation** 1) Confirm trouble symptom. *Is trouble symptom identified?*	Go to Step 6.	Go to Step 7.
6	☞ **Rechecking and record of DTC / freeze frame data** 1) Recheck for DTC referring to “DTC Check”. *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 referring to “DTC Check”. *Is there any DTC(s)?*	Go to Step 9.	Go to Step 10.
8	☞ **Automated Manual Transaxle symptom diagnosis** 1) Check and repair according to “Automated Manual Transaxle Symptom Diagnosis”. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
9	☞ **Troubleshooting for DTC** 1) Check and repair according to applicable DTC flow. *Are check and repair complete?*	Go to Step 11.	Check and repair malfunction part(s). Go to Step 11.
10	☞ **Check for intermittent problems** 1) Check for intermittent problems. *Is there any faulty condition?*	Repair or replace malfunction part(s). Go to Step 11.	Go to Step 11.
11	☞ **Final confirmation test** 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 such as 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.

Customer problem inspection 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	☐ Fair ☐ Cloudy ☐ Rain ☐ Always ☐ Other _____
Temperature	(°F/ °C) ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Always
Frequency	☐ Always ☐ Sometimes (times/ day, month) ☐ Only once ☐ Under certain condition
Read	☐ 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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NOTE

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

Step 2. DTC / Freeze Frame Data Check, Record and Clearance
First, referring to “DTC Check”, check DTC and pending DTC. If DTC exists, print or write down DTC and freeze frame data and then clear malfunction DTC(s) by referring to “DTC Clearance”. Malfunction DTC indicates malfunction in the system but it is not possible to know from it whether the malfunction is occurring now or it occurred in the past and normal condition has been restored. In order to know that, check symptom in question according to Step 5 and then recheck DTC according to Step 6.
Diagnosing a trouble based on the DTC in this step only or failure to clear the DTC in this step may result in an faulty diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting which is otherwise unnecessary.

Step 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 and Automated Manual Transaxle referring to “Visual Inspection”.

Step 5. Trouble Symptom Confirmation
Check trouble symptoms based on information obtained in “Step 1. Customer Complaint Analysis: ” and “Step 2. DTC / Freeze Frame Data Check, Record and Clearance: ”.
Also, reconfirm DTC according to “DTC Confirmation Procedure” described in each DTC flow.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data
Refer to “DTC Check” 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”.

Step 9. Troubleshooting for DTC
Based on the DTC indicated in Step 6 / 7 and referring to “applicable DTC flow”, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, TCM (Automated Manual Transaxle) or other part and repair or replace faulty parts.

Step 10. Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g. wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection in Section 00” and related circuit of DTC recorded in Step 2.

Step 11. Final Confirmation Test
Confirm that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and check to ensure that no malfunction DTC is indicated.

Visual Inspection

S7N20A5404002

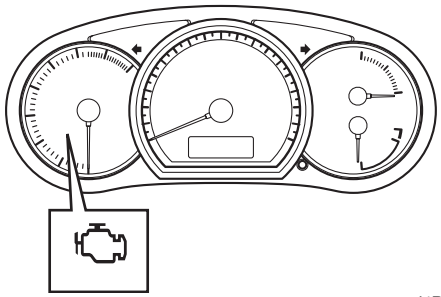
Visually check the following parts and systems.

Inspection item	Referring
• Automated Manual Transaxle gear oil ----- level, leakage	“Automated Manual Transaxle Oil Change”
• Engine mountings ----- play, looseness, damage	“Engine Assembly Removal and Installation (For Other Than M16A Engine Model): M13A / M15A / M16A in Section 1D”
• Suspension ----- play, looseness	“Suspension, Wheels and Tires Symptom Diagnosis in Section 2A”
• Drive shafts ----- damage	“Front Drive Shaft Assembly On-Vehicle Inspection in Section 3A”
• Battery ----- indicator condition, corrosion of terminal	“Battery Inspection: M13A / M15A / M16A in Section 1J”
• Connectors of electric wire harness ----- disconnection, friction	“Electronic Shift Control System Components Location”
• 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 lamp ----- Operation	“Automated Manual Transaxle Warning Lamp Check”
• Malfunction indicator lamp ----- Operation	“Malfunction Indicator Lamp (MIL) Check”
• Charge warning lamp ----- Operation	“Generator Symptom Diagnosis: M13A / M15A / M16A in Section 1J”
• Other parts that can be checked visually	

Malfunction Indicator Lamp (MIL) Check

S7N20A5404003

Refer to the same item in “Malfunction Indicator Lamp (MIL) Check: M13A / M15A / M16A in Section 1A” for checking procedure.



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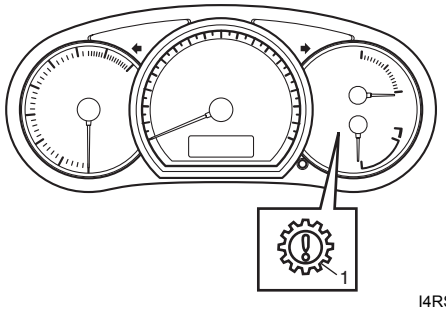
Automated Manual Transaxle Warning Lamp Check

S7N20A5404004

1) Turn ignition switch to ON position and check that Automated Manual Transaxle warning lamp (1) turns on for about 5 seconds and then turns off.
2) If lamp does not light up or remains ON, proceed to “Automated Manual Transaxle Warning Lamp Does Not Come ON at Ignition Switch ON” or “Automated Manual Transaxle Warning Lamp Remains ON at Ignition Switch ON”.



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DTC Table

S7N20A5404005

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Automated Manual Transaxle warning lamp	MIL	Driving cycle when MIL lighted
☞ P0705	Transmission range sensor circuit malfunction	Different switch combination from specification is detected.	○		1 driving cycle
☞ P0717	Input / turbine speed sensor “A” circuit	Output shaft speed is 1000 rpm or more, input shaft speed is less than specification.	○		1 driving cycle
☞ P0722	Output speed sensor circuit	Input shaft speed is 1650 rpm or more, vehicle speed is less than specification.	○		1 driving cycle
☞ P0727	Engine speed input circuit	Difference of engine rpm computed from pulse inputted from CKP and backup engine rpm which received by CAN communication is more than specification.	○		1 driving cycle
☞ *P0807	Clutch position sensor circuit low	Output voltage of stroke sensor is less than specification.	○	○	1 driving cycle
☞ *P0808	Clutch position sensor circuit high	Output voltage of stroke sensor is more than specification.	○	○	1 driving cycle
☞ P0810	Clutch position control error	Difference of target clutch position and actual clutch position is 0.3 mm or more, current is more than specification.	○		1 driving cycle
☞ P0902	Clutch actuator circuit low	Clutch motor voltage is more than specification or less than specification.	○		1 driving cycle
☞ P0903	Clutch actuator circuit high	• When current is supplied to clutch motor, detected current is less than specification. • When no current is supplied to clutch motor, abnormal voltage is detected.	○		1 driving cycle
☞ *P0906	Gate select position circuit low	Output voltage of stroke sensor is less than specification.	○	○	1 driving cycle
☞ *P0907	Gate select position circuit high	Output voltage of stroke sensor is more than specification.	○	○	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Automated Manual Transaxle warning lamp	MIL	Driving cycle when MIL lighted
☞ P0909	Gate select control error	Difference of target select position and actual select position is 0.3 mm or more, current is more than specification.	○		1 driving cycle
☞ P0912	Gate select actuator circuit low	Select motor voltage is more than specification or less than specification.	○		1 driving cycle
☞ P0913	Gate select actuator circuit high	• When current is supplied to select motor, detected current is less than specification. • When no current is supplied to select motor, abnormal voltage is detected.	○		1 driving cycle
☞ *P0916	Gear shift position circuit low	Output voltage of stroke sensor is less than specification.	○	○	1 driving cycle
☞ *P0917	Gear shift position circuit high	Output voltage of stroke sensor is more than specification.	○	○	1 driving cycle
☞ P0919	Gear shift position control error	Difference between target shift position and actual shift position is 0.3 mm or more, current is more than specification.	○		1 driving cycle
☞ P1703	CAN invalid data - TCM (Automated Manual Transaxle)	Abnormal signal from ECM is received.			1 driving cycle
☞ *P1774	Control module communication bus off	Transmission error of communication data for TCM (Automated Manual Transaxle) is detected more than 7 times at more than specified error counts continuously.	○	○	1 driving cycle
☞ *P1777	TCM (Automated Manual Transaxle) lost communication with ECM	Reception error of communication data for ECM is detected more than specified time continuously.	○	○	1 driving cycle
☞ P1778	TCM (Automated Manual Transaxle) lost communication with BCM	Reception error of communication data for BCM is detected more than specified time continuously.	○		1 driving cycle
☞ *P1840	TCM (Automated Manual Transaxle) system voltage	TCM (Automated Manual Transaxle) input voltage is less than specification.	○	○	1 driving cycle
☞ P1841	CPU malfunction	CPU of TCM (Automated Manual Transaxle) malfunction.	○		1 driving cycle
☞ P1842	TCM (Automated Manual Transaxle) internal module keep alive memory error	EEPROM error	○		1 driving cycle
☞ P1843	Brake switch “A/B” error	Two brake switches detect ON simultaneously.	○		1 driving cycle
☞ P1845	Warning buzzer circuit malfunction	Buzzer operation voltage 3 V or less	○		1 driving cycle
☞ P1846	Reverse input circuit no signal	When shift and select stroke sensor is “R”, back up lamp switch detects OFF.	○		1 driving cycle
☞ P1847	Reverse input circuit short	When signal from shift and select stroke sensor is except for “R”, back up lamp switch is ON.	○		1 driving cycle
☞ P1848	Motor relay circuit low	Motor power voltage is less than specification even though motor relay drive request is sent.	○		1 driving cycle
☞ P1849	Motor relay circuit high	Motor power voltage is more than specification even though motor relay is turned off.	○		1 driving cycle
☞ *P1856	Clutch position sensor “B” circuit low	Output voltage of stroke sensor is less than specification.	○	○	1 driving cycle

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Automated Manual Transaxle warning lamp	MIL	Driving cycle when MIL lighted
☞ *P1857	Clutch position sensor “B” circuit high	Output voltage of stroke sensor is more than specification.	○	○	1 driving cycle
☞ *P1858	Gate select position “B” circuit low	Output voltage of stroke sensor is less than specification.	○	○	1 driving cycle
☞ *P1859	Gate select position “B” circuit high	Output voltage of stroke sensor is more than specification.	○	○	1 driving cycle
☞ P1880	Gear shift actuator circuit low	Shift motor voltage is more than specification or less than specification.	○		1 driving cycle
☞ P1881	Gear shift actuator circuit high	• When current is supplied to shift motor, detected voltage is less than specified value. • When no current is supplied to shift motor, abnormal voltage is detected.	○		1 driving cycle
☞ *P1882	Gear shift position circuit “B” low	Output voltage of stroke sensor is less than specification.	○	○	1 driving cycle
☞ *P1883	Gear shift position circuit “B” high	Output voltage of stroke sensor is more than specification.	○	○	1 driving cycle
☞ P1900	Clutch position sensor “A/B” correlation	Difference of stroke value of clutch stroke sensors “A” and “B” is more than specification.	○		1 driving cycle
☞ P1901	Gear shift position sensor “A/B” correlation	Difference of stroke value of shift stroke sensors “A” and “B” is more than specification.	○		1 driving cycle
☞ P1960	Gate select position sensor “A/B” correlation	Difference of stroke value of select stroke sensors “A” and “B” is more than specification.	○		1 driving cycle

NOTE

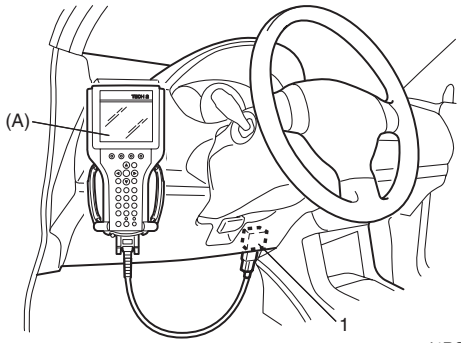
With the generic scan tool, only asterisk(*) marked DTCs can be read.

DTC Check

S7N20A5404006

1) Turn ignition switch to OFF position.
2) Connect scan tool to data link connector (DLC) (1).

Special tool
(A): SUZUKI scan tool



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3) Turn ignition switch ON.
4) Read DTC, and freeze frame data according to instructions displayed on scan tool and print it down. Refer to scan tool operator’s manual for further details.
   If communication between scan tool and TCM (Automated Manual Transaxle) is not possible, check if scan tool is communicable by connecting it to TCM (Automated Manual Transaxle) in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector (DLC) and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector (DLC).

DTC Clearance

S7N20A5404007

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure.

1) Connect SUZUKI scan tool to data link connector (DLC) in the same manner as when making this connection for “DTC Check”.
2) Turn ignition switch ON.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator’s manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect scan tool from data link connector (DLC).

NOTE

DTC and freeze frame data stored in TCM (Automated Manual Transaxle) memory are also cleared in the following cases. Be careful not to clear them before keeping their record.

- **When power to TCM (Automated Manual Transaxle) is cut off (by disconnecting battery cable, removing fuse or disconnecting TCM (Automated Manual Transaxle) connectors).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

Fail-Safe Table

S7N20A5404008

This function is provided by the safe mechanism that assures safe driveability even when the actuator, sensor or its circuit fails. The following table shows the fail-safe function for each fail condition of sensor, actuator or its circuit.

DTC No.	Trouble area	Fail-safe operation
☞ P0705	Transmission range sensor circuit malfunction	• Power supply for clutch and shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then gear position is fixed to N range.
☞ P0717	Input / turbine speed sensor “A” circuit	After the vehicle stops, and then upshifting to 2nd gear or more is inhibited.
☞ P0722	Output speed sensor circuit	• Vehicle speed which is calculated by input shaft speed sensor signal is used for gear shifting control instead of vehicle speed calculated by output shaft speed sensor (VSS) signal. • After the vehicle stops, and then upshifting to 2nd gear or more is inhibited.
☞ P0727	Engine speed input circuit	Convert the engine revolution signal into the CAN communication signal.
☞ P0807	Clutch position sensor circuit low	In case that either one of two circuits in sensor is malfunction: • Gear change is inhibited of 4th and 5th. In case that two circuit in sensor is malfunction: • Power supply for clutch motor is cut. • Gear change is inhibited. • After the vehicle stops, and then gear position is fixed to N range.
☞ P0808	Clutch position sensor circuit high	
☞ P0810	Clutch position control error	• Power supply for clutch motor is cut. • Gear change is inhibited. • After the vehicle stops, and then gear position is fixed to N range.
☞ P0902	Clutch actuator circuit low	
☞ P0903	Clutch actuator circuit high	
☞ P0906	Gate select position circuit low	In case that either one of two circuits in sensor is malfunction: • Gear change is inhibited of 4th and 5th. In case that two circuit in sensor is malfunction: • Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P0907	Gate select position circuit high	

DTC No.	Trouble area	Fail-safe operation
☞ P0909	Gate select control error	• Power supply for clutch motor is cut. • Gear change is inhibited. • After the vehicle stops, and then gear position is fixed to N range.
☞ P0912	Gate select actuator circuit low	
☞ P0913	Gate select actuator circuit high	
☞ P0916	Gear shift position circuit low	In case that either one of two circuits in sensor is malfunction: • Gear change is inhibited of 4th and 5th. In case that two circuit in sensor is malfunction: • Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P0917	Gear shift position circuit high	
☞ P0919	Gear shift position control error	• Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P1703	CAN invalid data - TCM (Automated Manual Transaxle)	In case of throttle position signal malfunction: • Throttle opening used for Automated Manual Transaxle control is assumed to be 100%. In case of engine revolution signal malfunction: • Gear change is inhibited. • Clutch is fixed with clutch united.
☞ P1777	TCM (Automated Manual Transaxle) lost communication with ECM	• Gear change is inhibited. • After the vehicle stops, and then shift change is inhibited to only R and 1st gear.
☞ P1842	TCM (Automated Manual Transaxle) internal module keep alive memory error	• Power supply for clutch motor and shift and select motor is cut. • Gear change is inhibited.
☞ P1848	Motor relay circuit low	• Power supply for clutch motor and shift and select motor is cut. • Gear change is inhibited.
☞ P1856	Clutch position sensor “B” circuit low	In case that either one of two circuits in sensor is malfunction: • Gear change is inhibited of 4th and 5th. In case that two circuit in sensor is malfunction: • Power supply for clutch motor is cut. • Gear change is inhibited. • After the vehicle stops, and then gear position is fixed to N range.
☞ P1857	Clutch position sensor “B” circuit high	
☞ P1858	Gate select position “B” circuit low	In case that either one of two circuits in sensor is malfunction: • Gear change is inhibited of 4th and 5th. In case that two circuit in sensor is malfunction: • Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P1859	Gate select position “B” circuit high	
☞ P1880	Gear shift actuator circuit low	• Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P1881	Gear shift actuator circuit high	
☞ P1882	Gear shift position circuit “B” low	In case that either one of two circuits in sensor is malfunction: • Gear change is inhibited of 4th and 5th. In case that two circuit in sensor is malfunction: • Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P1883	Gear shift position circuit “B” high	

DTC No.	Trouble area	Fail-safe operation
☞ P1900	Clutch position sensor “A/B” correlation	• Power supply for clutch motor is cut. • Gear change is inhibited. • After the vehicle stops, and then gear position is fixed to N range.
☞ P1901	Gear shift position sensor “A/B” correlation	• Power supply for shift motor and select motor is cut. • Gear change is inhibited. • After the vehicle stops, and then clutch is fixed at declutch.
☞ P1960	Gate select position sensor “A/B” correlation	

Scan Tool Data

S7N20A5404009

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 (Automated Manual Transaxle) and output from TCM (Automated Manual Transaxle) 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

- **The following scan tool data related to Automated Manual Transaxle can be checked only by communicating with TCM (Automated Manual Transaxle).**
- **With the generic scan tool, data in the following table can not be read.**

Scan tool data	Vehicle condition		Normal condition / reference values
☞ Coolant Temp	Ignition switch ON		Engine coolant temperature is display
☞ Engine speed	At engine idle speed		Engine idle speed is displayed
☞ Input shaft Rev	Ignition switch ON and engine stop		0 RPM
	Engine running with clutch engaging condition		Engine speed is displayed (displayed in increments of 50 rpm)
☞ Vehicle speed	At vehicle stop		0 km/h, 0 MPH
☞ Pedal position	Ignition switch ON	Accelerator pedal is depressed	0 – 100% (varies depending on depressed value)
		Accelerator pedal is released	0%
☞ Current gear Pos	Ignition switch ON, selector lever is in N position		N
☞ Target gear Pos	Ignition switch ON, selector lever is in N position		N
☞ Shift lever position	Ignition switch ON	Selector lever is in “R” position	R
		Selector lever is in “N” position	N
		Selector lever is in “D” position	D
		Selector lever is in “M” position	D
		Selector lever is in “–” position	–
		Selector lever is in “+” position	+
☞ Cold condition	Ignition switch ON		10 seconds after engine starts, either low one the engine coolant temperature or intake air temperature is displayed
☞ Clutch actuator Pos	Ignition switch turned ON with clutch engagement condition		Approx. 43 mm
	Ignition switch turned ON with partial clutch engagement condition		Approx. 30 mm
	Ignition switch turned ON with clutch disengagement condition		Approx. 26 mm
☞ Gear shift position	Ignition switch turned ON and gear position at 1st, 3rd or 5th		Approx. 10 mm
	Ignition switch turned ON and gear position at Neutral		Approx. 20 mm
	Ignition switch turned ON and gear position at 2nd, 4th or Reverse		Approx. 30 mm

Scan tool data	Vehicle condition	Normal condition / reference values
☞ Gate select position	Ignition switch turned ON and gear position at 5th or Reverse	Approx. 23 mm
	Ignition switch turned ON and gear position at 3rd or 4th	Approx. 16 mm
	Ignition switch turned ON and gear position at 1st or 2nd	Approx. 9 mm
☞ Clutch actuator Cur	Ignition switch ON, selector lever is in N position	0 A
☞ Gear shift motor Cur	Ignition switch ON, selector lever is in N position	0 A
☞ Gate select motor Cu	Ignition switch ON, selector lever is in N position	0 A
☞ Reverse Sw	Ignition switch ON, gear position at other than reverse gear	OFF
	Ignition switch ON, gear position at reverse gear	ON
☞ Brake switch 1	Ignition switch ON, brake pedal is depressed	ON
	Ignition switch ON, brake pedal is released	OFF
☞ Brake switch 2	Ignition switch ON, brake pedal is depressed	OFF
	Ignition switch ON, brake pedal is released	ON
☞ Stopper point learn	Ignition switch ON	Complete
☞ T/M learn	Ignition switch ON	Complete
☞ Stand by point learn	Ignition switch ON	Complete
☞ T/M up lock	Ignition switch ON	NOT DETECTED

Scan Tool Data Definitions

Coolant Temp (°C, °F)
Engine coolant temperature sent from ECM on CAN communication line.

Engine speed (RPM)
Engine speed sent from ECM on CAN communication line.

Input shaft Rev (Input shaft revolution, RPM)
Input shaft revolution computed by reference pulses coming from input shaft speed sensor on transaxle case.

Vehicle speed (km/h, MPH)
Vehicle speed sent from ECM on CAN communication line.

Pedal position (Accelerator pedal position, %)
Accelerator pedal opening ratio sent from ECM on CAN communication line.

Current gear Pos ("N"/"1"/"2"/"3"/"4"/"5"/"R")
Current gear position detected by gear shift position and gate select position.

Target gear Pos ("N"/"1"/"2"/"3"/"4"/"5"/"R")
Desired gear position from TCM (Automated Manual Transaxle).

Shift lever position ("R"/"N"/"D"/"M"/"–"/"+")
Select lever position detected by signal fed from select lever assembly.

Cold condition (°C, °F)
This parameter indicates the presumed temperature of transaxle oil.

Clutch actuator Pos (Clutch actuator position, mm)
This parameter indicates the position of the clutch actuator.

Gear shift actuator Pos (Gear shift actuator position, mm)
This parameter indicates the position of the gear shift actuator.

Gate select actuator Pos (Gate select actuator position, mm)
This parameter indicates the position of the gate select actuator.

Clutch actuator Cur (Clutch actuator current, A)
This parameter indicates electric current value of clutch actuator circuit. Positive value of clutch actuator current means the operation current value to the direction where the actuator declutches.

Gear shift motor Cur (Gear shift motor current, A)
This parameter indicates current value of gear shift actuator circuit. Positive value of gear shift actuator current means the operation current value to the direction of 2nd, 4th and reverse gear.

Gate select motor Cu (Gate select motor current, A)
This parameter indicates current value of gate select actuator circuit. Positive value of gate select actuator current means the operation current value to the direction of 5th and reverse gear.

Reverse Sw (Reverse switch, ON/OFF)
This parameter indicates the state of the reverse switch on transaxle case.

Brake switch 1 (ON/OFF)
Inputted signal from brake light switch.
ON: Brake pedal depressed
OFF: Brake pedal released

Brake switch 2 (ON/OFF)
ON: Brake pedal released
OFF: Brake pedal depressed

Stopper point learn (Complete, Incomplete, Fail)
This parameter indicates the state of initialization for the clutch control.

T/M learn (Complete, Incomplete, Fail)
This parameter indicates the state of initialization for the gear change control.

Stand by point learn (Complete, Incomplete, Fail)
This parameter indicates the state of initialization for the clutch control.

T/M up lock (NOT DETECTED, DETECTED)
This parameter indicates the state of gear shift up lock.

Automated Manual Transaxle Symptom Diagnosis

S7N20A5404010

Diagnose Automated Manual Transaxle assembly after performing the Automated Manual Transaxle control system check described in “Automated Manual Transaxle System Check”.

Condition	Possible Cause	Correction / Reference Item
Automated Manual Transaxle gear shift control system does not operate (Automated Manual Transaxle warning lamp does not operate)	Shift selector faulty	Check shift selector referring to “Shift Selector Inspection”.
	Clutch stroke sensor faulty	Check clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”.
	Clutch actuator faulty	Check clutch actuator referring to “Clutch Actuator Inspection”.
	Shift stroke sensor and select stroke sensor faulty	Check shift stroke sensor and select stroke sensor referring to “Shift Stroke Sensor and Select Stroke Sensor Inspection”.
	Shift and select actuator faulty	Check shift and select actuator referring to “Shift and Select Actuator Inspection”.
	VSS faulty	Check VSS referring to “DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: M13A / M15A / M16A in Section 1A”.
	Wiring or grounding faulty	Repair as necessary.
	TCM (Automated Manual Transaxle) faulty	Check TCM (Automated Manual Transaxle) referring to “Inspection of TCM (Automated Manual Transaxle) and Its Circuits”.

Condition	Possible Cause	Correction / Reference Item
Automated Manual Transaxle gear shift control system refuses to operate (Automated Manual Transaxle warning lamp to light and then Automated Manual Transaxle does not shifts)	Clutch stroke sensor faulty	Check clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”.
	Clutch actuator faulty	Check clutch actuator referring to “Clutch Actuator Inspection”.
	Shift stroke sensor and select stroke sensor faulty	Check shift stroke sensor and select stroke sensor referring to “Shift Stroke Sensor and Select Stroke Sensor Inspection”.
	Shift and select actuator faulty	Check shift and select actuator referring to “Shift and Select Actuator Inspection”.
	Weakened or broken synchronizer spring	Check synchronizer spring referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Distorted shift shaft or shift fork	Check shift fork referring to “Gear Shift Shaft Inspection”.
	Worn chamfered tooth on sleeve or gear	Check chamfered tooth and gear referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Distorted shift shaft	Check shift shaft referring to “Gear Shift Shaft Inspection”.
	Wiring or grounding faulty	Repair as necessary.
	TCM (Automated Manual Transaxle) faulty	Check TCM (Automated Manual Transaxle) referring to “Inspection of TCM (Automated Manual Transaxle) and Its Circuits”.
Engine dose not starting (Engine does not cranking)	Shift selector faulty	Check shift selector referring to “Shift Selector Inspection”.
	Stop (Brake) lamp switch faulty	Check stop (brake) lamp switch referring to “Stop (Brake) Lamp Switch Inspection in Section 9B” or “Brake Light Switch Adjustment in Section 4A”.
	Starting motor control relay faulty	Check starting motor control relay circuit referring to “Starting Motor Control Relay Circuit Check”.
	Starting motor faulty	Check starting motor referring to “Starting Motor Inspection: M13A / M15A / M16A in Section 1I”.
	Wiring or grounding faulty	Repair as necessary.
	ECM faulty	Check ECM referring to “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”.
	TCM (Automated Manual Transaxle) faulty	Check TCM (Automated Manual Transaxle) referring to “Inspection of TCM (Automated Manual Transaxle) and Its Circuits”.

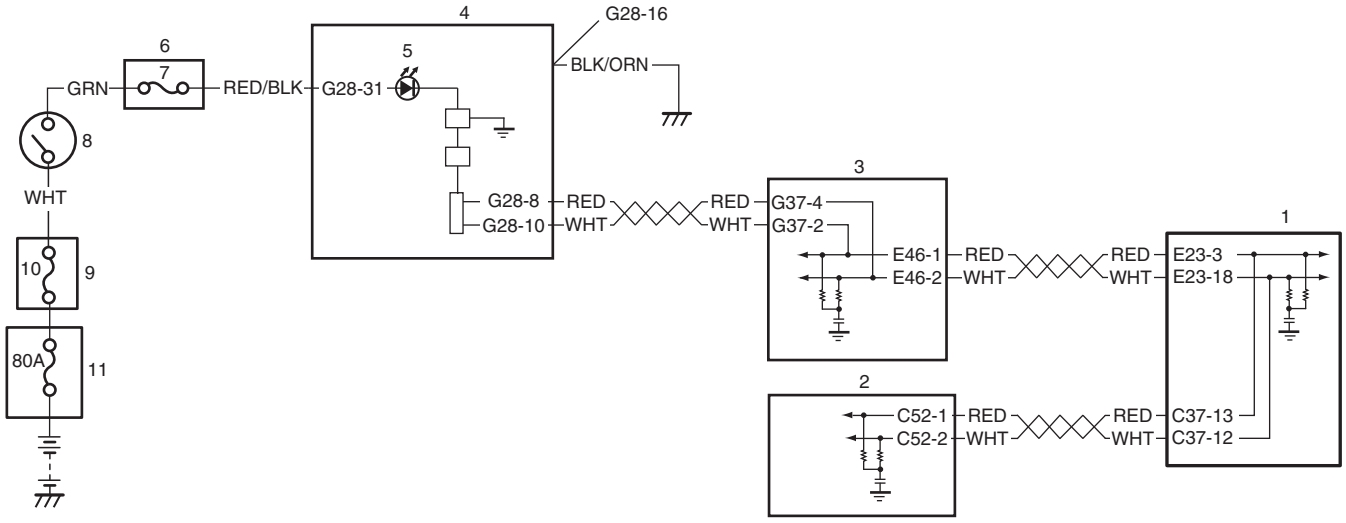
Condition	Possible Cause	Correction / Reference Item
Gear slipping out of mesh	Worn shift fork shaft	Check shift fork shaft referring to “Gear Shift Shaft Inspection”.
	Worn shift fork or synchronizer sleeve	Check shift fork or synchronizer sleeve referring to “Gear Shift Shaft Inspection”.
	Worn bearings on input shaft or countershaft	Check bearing referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Worn chamfered tooth on sleeve or gear	Check chamfered tooth and gear referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Missing or disengagement of circlip(s)	Check circlip(s) referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
Gears refusing to disengage	Weakened or broken synchronizer spring	Check synchronizer spring referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Distorted shift shaft or shift fork	Check shift fork referring to “Gear Shift Shaft Inspection”.
Noise	Inadequate or insufficient lubricant	Replenish.
	Damaged or worn bearing(s)	Check bearing(s) referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Damaged or worn gear(s)	Check gear(s) referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Damaged or worn synchronizer ring	Check synchronizer ring referring to “Input Shaft Assembly Inspection” and/or “Countershaft Assembly Inspection”.
	Damaged or worn chamfered tooth on sleeve or gear	Check sleeve referring to “Gear Shift Shaft Inspection”.
	Worn or broken release bearing	Check release bearing referring to “Clutch Inspection”.
	Input shaft front bearing worn down	Check input shaft bearing referring to “Input Shaft Assembly Inspection”.
	Excessive rattle of clutch disc hub	Check clutch disc referring to “Clutch Inspection”.
	Cracked clutch disc	Check clutch disc referring to “Clutch Inspection”.
	Pressure plate and diaphragm spring rattling	Check clutch cover referring to “Clutch Inspection”.

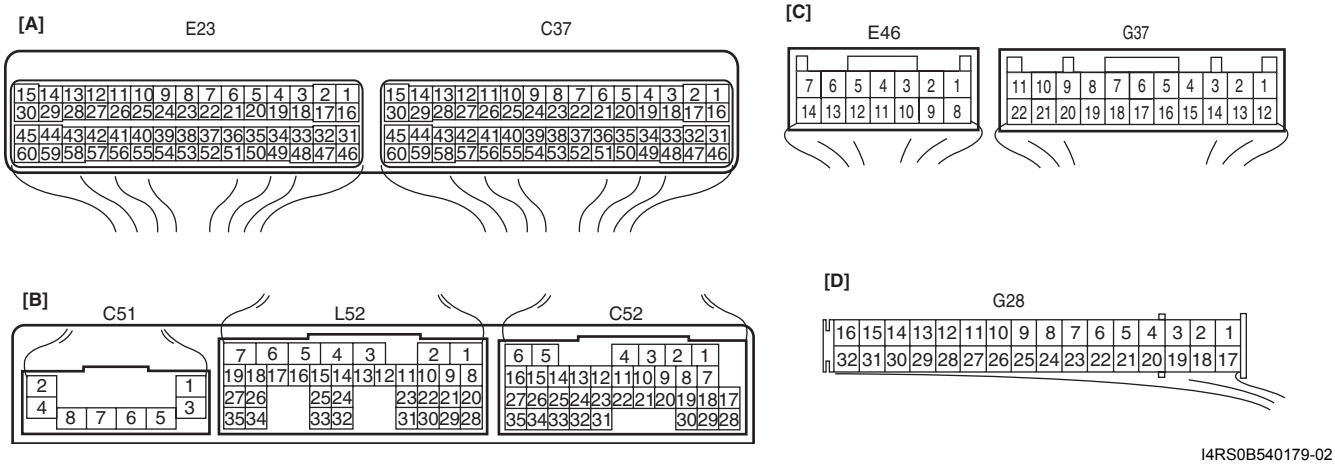
Condition	Possible Cause	Correction / Reference Item
Slipping clutch	Clutch stroke sensor faulty	Check clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”.
	Clutch actuator faulty	Check clutch actuator referring to “Clutch Actuator Inspection”.
	Worn or oily clutch disc facing	Check clutch disc referring to “Clutch Inspection”.
	Warped disc, pressure plate or flywheel surface	Check clutch disc, clutch cover or flywheel referring to “Clutch Inspection” or “Flywheel Inspection: M13A / M15A / M16A in Section 1D”.
	Weakened diaphragm spring	Check clutch cover referring to “Clutch Inspection”.
	Wiring or grounding faulty	Repair as necessary.
	TCM (Automated Manual Transaxle) faulty	Check TCM (Automated Manual Transaxle) referring to “Inspection of TCM (Automated Manual Transaxle) and Its Circuits”.
Dragging clutch	Clutch stroke sensor faulty	Check clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”.
	Clutch actuator faulty	Check clutch actuator referring to “Clutch Actuator Inspection”.
	Weakened diaphragm spring, or worn spring tip	Check clutch cover referring to “Clutch Inspection”.
	Rusted input shaft splines	Lubricate input shaft splines.
	Excessively wobbly clutch disc	Check clutch disc referring to “Clutch Inspection”.
	Clutch facings broken or dirty with oil	Check clutch disc and clutch cover referring to “Clutch Inspection”.
	Wiring or grounding faulty	Repair as necessary.
	TCM (Automated Manual Transaxle) faulty	Check TCM (Automated Manual Transaxle) referring to “Inspection of TCM (Automated Manual Transaxle) and Its Circuits”.
Clutch vibration	Glazed (glass-like) clutch facings	Check clutch disc referring to “Clutch Inspection”.
	Clutch facings dirty with oil	Check clutch disc referring to “Clutch Inspection”.
	Release bearing slides unsmoothly on input shaft bearing retainer	Lubricate or replace input shaft bearing retainer.
	Wobbly clutch disc, or poor facing contact	Check clutch disc referring to “Clutch Inspection”.
	Weakened torsion springs in clutch disc	Check clutch disc referring to “Clutch Inspection”.
	Clutch disc rivets loose	Check clutch disc referring to “Clutch Inspection”.
	Distorted pressure plate or flywheel surface	Check clutch disc or flywheel referring to “Clutch Inspection” or “Flywheel Inspection: M13A / M15A / M16A in Section 1D”.
Grabbing clutch	Clutch disc facings soaked with oil	Check clutch disc referring to “Clutch Inspection”.
	Clutch disc facings excessively worn	Check clutch disc referring to “Clutch Inspection”.
	Rivet heads showing out of facing	Check clutch disc referring to “Clutch Inspection”.
	Weakened torsion springs	Check clutch disc referring to “Clutch Inspection”.

Automated Manual Transaxle Warning Lamp Does Not Come ON at Ignition Switch ON

S7N20A5404011

Wiring Diagram





I4RS0B540179-02

[A]: Terminal arrangement of ECM connector (viewed from harness side)	2. TCM (Automated Manual Transaxle)	7. "METER" fuse
[B]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)	3. BCM	8. Ignition switch
[C]: Terminal arrangement of BCM connector (viewed from harness side)	4. Combination meter	9. Relay box
[D]: Terminal arrangement of combination meter connector (viewed from harness side)	5. Automated Manual Transaxle warning lamp	10. "IG ACC" fuse
1. ECM	6. Junction block assembly	11. Main fuse box

Circuit Description

Automated Manual Transaxle warning lamp operates according to the signal from TCM (Automated Manual Transaxle) through ECM and BCM. If the Automated Manual Transaxle control system is in good condition, Automated Manual Transaxle warning lamp ON is turned at the turn ignition switch ON, keeps it ON for 5 seconds and then turned OFF. If an abnormality is detected in the system, Automated Manual Transaxle warning lamp remains ON.

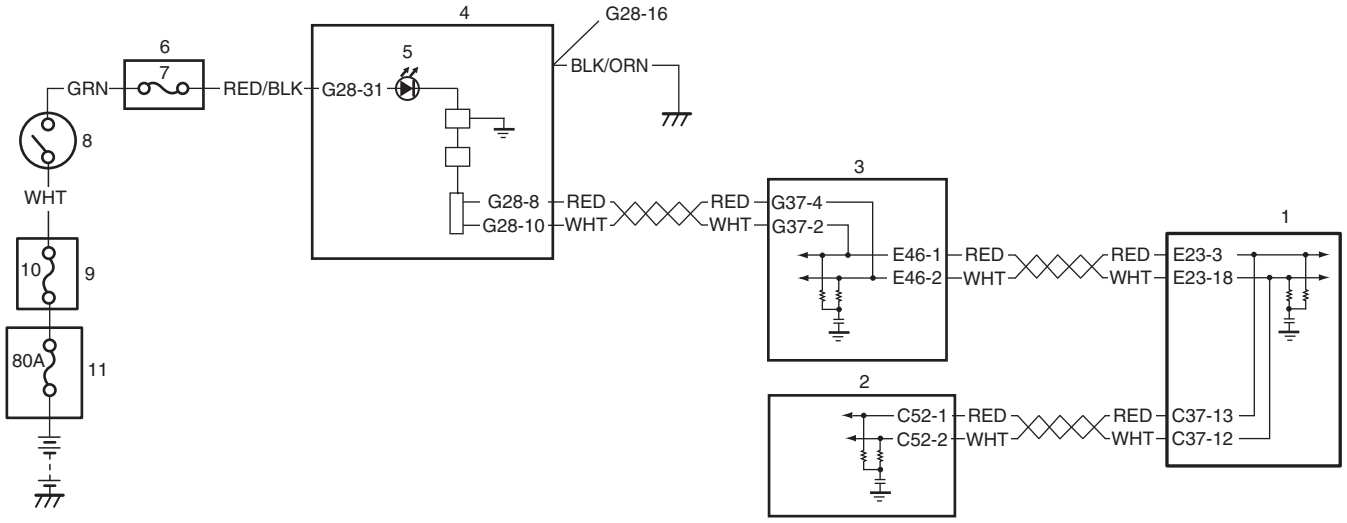
Troubleshooting

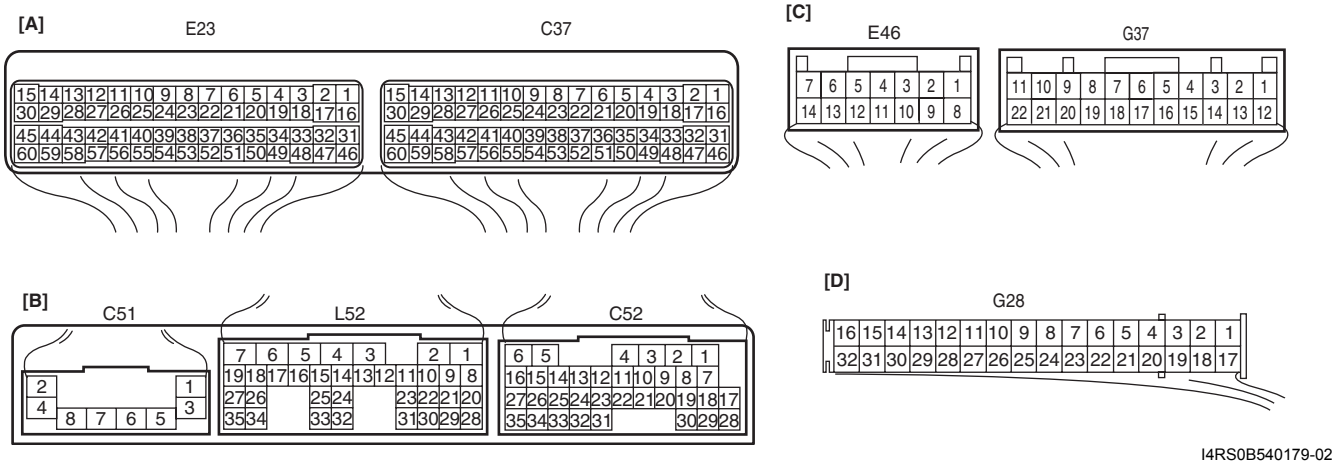
Step	Action	Yes	No
1	**Automated Manual Transaxle warning indicator power supply check** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ignition switch to ON and check DTC. *Is there DTC(s) P1774, P1777 and/or P1778?*	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If Automated Manual Transaxle warning indicator still remains off, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
3	**"METER" fuse check** 1) Turn ignition switch to OFF position. 2) Check for fuse blown at "METER" fuse in junction block assembly. *Is "METER" fuse in good condition?*	Go to Step 4.	Replace "METER" fuse and check for short.
4	**CAN communication circuit check** 1) Check CAN communication circuit between combination meter and TCM (Automated Manual Transaxle) referring to "DTC P1774: Control Module Communication Bus Off". *Is CAN communication circuit in good condition?*	Go to Step 5.	Repair or replace.
5	**Combination meter power supply check** 1) Remove combination meter referring to "Combination Meter Removal and Installation in Section 9C". 2) Check for proper connection to combination meter connector at "G28-31" and "G28-16" terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at "G28-31" terminal and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	"RED/BLK" wire in open circuit.
6	**Combination meter circuit check** 1) Turn ignition switch to OFF position. 2) Measure resistance between "G28-16" terminal of combination meter connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good combination meter and recheck. If Automated Manual Transaxle warning indicator still remains off, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	"BLK/ORN" wire open or high resistance circuit.

Automated Manual Transaxle Warning Lamp Remains ON at Ignition Switch ON

S7N20A5404012

Wiring Diagram





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[A]: Terminal arrangement of ECM connector (viewed from harness side)	2. TCM (Automated Manual Transaxle)	7. "METER" fuse
[B]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)	3. BCM	8. Ignition switch
[C]: Terminal arrangement of BCM connector (viewed from harness side)	4. Combination meter	9. Relay box
[D]: Terminal arrangement of combination meter connector (viewed from harness side)	5. Automated Manual Transaxle warning lamp	10 "IG ACC" fuse
1. ECM	6. Junction block assembly	11. Main fuse box

Circuit Description

Automated Manual Transaxle warning lamp operates according to the signal from TCM (Automated Manual Transaxle) through ECM and BCM. If the Automated Manual Transaxle control system is in good condition, Automated Manual Transaxle warning lamp ON is turned at the turn ignition switch ON, keeps it ON for 5 seconds and then turned OFF. If an abnormality is detected in the system, Automated Manual Transaxle warning lamp remains ON.

Troubleshooting

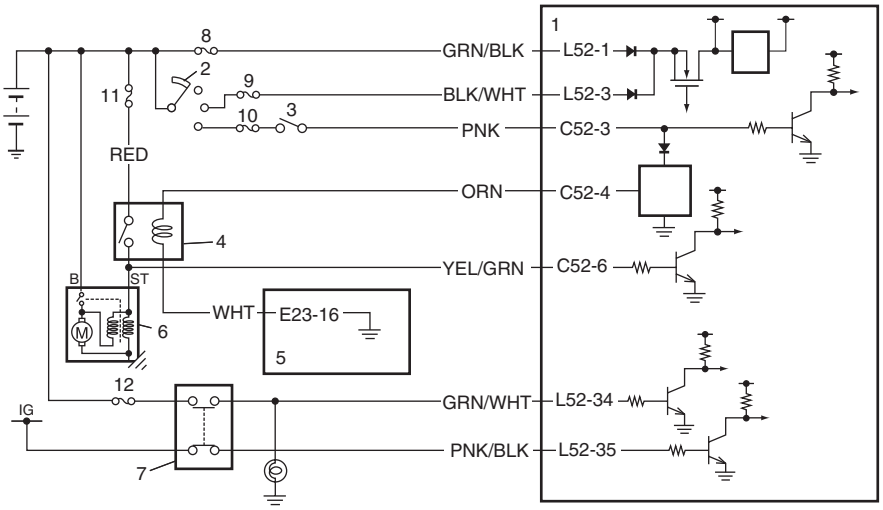
Step	Action	Yes	No
1	**Check DTC** 1) Check DTC referring to "DTC Check". *Is there any DTC(s)?*	Perform DTC flow to repair and retry.	Go to Step 2.

Step	Action	Yes	No
2	**CAN communication circuit check** 1) Check CAN communication circuit between combination meter and TCM (Automated Manual Transaxle) referring to “DTC P1774: Control Module Communication Bus Off”. *Is CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If Automated Manual Transaxle warning indicator still remains off, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Repair or replace.

Starting Motor Control Relay Circuit Check

S7N20A5404013

Wiring Diagram



I4RS0B540180-02

1. TCM (Automated Manual Transaxle)	5. ECM	9. IG SIG fuse
2. Ignition switch	6. Starting motor	10. ST SIG fuse
3. Neutral switch	7. Stop lamp switch	11. ST MON fuse
4. Starting motor control relay	8. Automated Manual Transaxle fuse	12. STOP LAMP fuse

Troubleshooting

Step	Action	Yes	No
1	**Circuit fuse check** 1) Check “ST SIG” fuse and “ST MON” fuse for fuse blown. *Are “ST SIG” fuse and “ST MON” fuse in good condition?*	Go to Step 2.	Replace fuse(s) and check for short in circuits connected to their fuse.
2	**Starting motor control relay drive signal check** 1) Disconnect starting motor control relay from relay box with ignition switch turned OFF. 2) Check for proper connection to starting motor control relay at each terminals. 3) If OK, measure voltage between “ORN” wire terminal of starting motor control relay connector and body ground with ignition switch turning to start position. *Is voltage 10 – 14 V?*	Go to Step 3.	Go to Step 7.
3	**Starting motor control relay power supply check** 1) Measure voltage between “RED” wire terminal of starting motor control relay connector and body ground. *Is voltage 10 – 14 V?*	Go to Step 4.	“RED” wire open circuit.

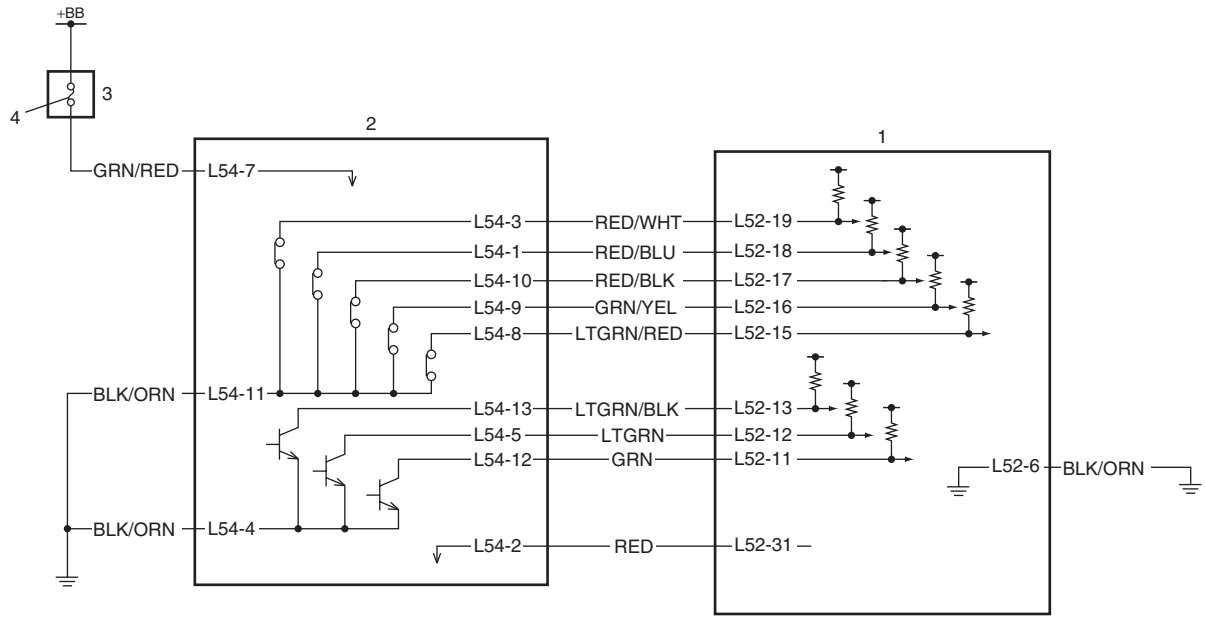
Step	Action	Yes	No
4	**Starting motor control relay check** 1) Check starting motor control relay referring to “Main Relay, Fuel Pump Relay, Starting Motor Control Relay and Throttle Actuator Control Relay Inspection: M13A / M15A / M16A in Section 1C”. *Is relay in good condition?*	Go to Step 5.	Replace relay.
5	**Starting motor control relay signal check** 1) Connect starting motor control relay to relay box. 2) Disconnect ECM connector with ignition switch OFF. 3) Measure voltage between “E23-16” terminal of disconnected ECM connector and body ground with ignition switch turning to start position. *Is voltage 10 – 14 V?*	Go to Step 6.	“WHT” wire open circuit.
6	**Starting motor wire circuit check** 1) Disconnect magnetic switch lead wire from starting motor. 2) Measure voltage between “YEL/GRN” terminal of disconnected magnetic switch lead wire and body ground with ignition switch turning to start position. *Is voltage 10 – 14 V?*	Faulty starting motor or power supply circuit.	“YEL/GRN” wire open circuit or shorted to ground circuit.
7	**Starting motor control relay signal circuit check** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-4” terminal. 3) Measure resistance between “C52-4” terminal of disconnected TCM (Automated Manual Transaxle) connector and body ground. *Is resistance 1 Ω or less?*	“ORN” wire shorted to ground circuit.	Go to Step 8.
8	**Starting motor control relay signal circuit check** 1) Measure resistance between “C52-4” terminal of disconnected TCM (Automated Manual Transaxle) connector and “ORN” wire terminal of starting motor control relay connector. *Is resistance 1 Ω or less?*	Go to Step 9.	“ORN” wire open circuit.
9	**Start position signal check** 1) Turn ignition switch to ON position and select shift selector N position. 2) Measure voltage between “C52-3” terminal of disconnected TCM (Automated Manual Transaxle) connector and body ground with ignition switch turning to start position. *Is voltage 10 – 14 V?*	Go to Step 12.	Go to Step 10.
10	**Neutral start switch check** 1) Check neutral switch referring to “Neutral Start Switch Inspection”. *Is neutral switch in good condition?*	Go to Step 11.	Replace neutral switch.

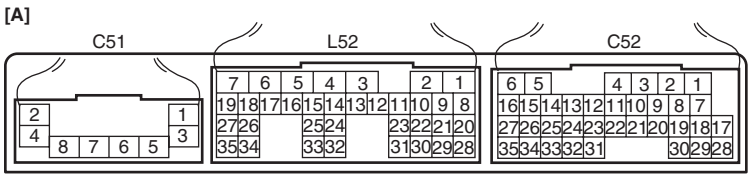
Step	Action	Yes	No
11	**Ignition switch check** 1) Check ignition switch referring to “Ignition Switch Inspection in Section 9C”. *Is ignition switch in good condition?*	Start position signal circuit open or shorted to ground.	Replace ignition switch.
12	**Stop lamp switch signal check** 1) Check for DTC in TCM (Automated Manual Transaxle). *Is DTC P1843 indicated?*	Go to DTC P1843 diagnostic flow.	Substitute a known-good TCM (Automated Manual Transaxle) and recheck.

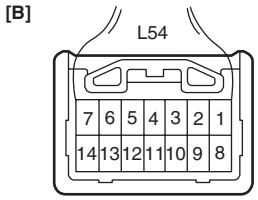
DTC P0705: Transmission Range Sensor Circuit Malfunction

S7N20A5404014

Wiring Diagram







I4RS0B540181-02

1. TCM (Automated Manual Transaxle)	4. Automated Manual Transaxle fuse
2. Shift selector	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
3. Junction block assembly	[B]: Terminal arrangement of shift selector connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Shift switch combination different from specification is detected among 8 combinations.	• Shift position sensor • Shift position sensor circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “R” range and keep its position for 1 minute. Similarly shift select lever to “N”, “D”, “M”, “+” and “–” ranges.
3) Check DTC.

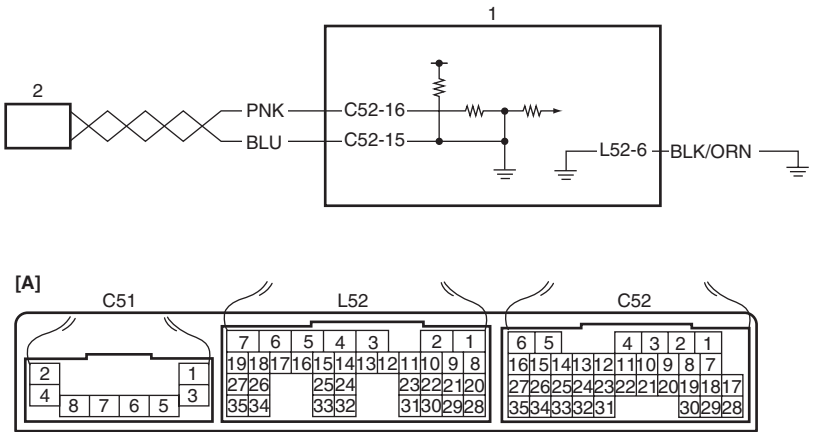
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check transmission range sensor (switch) circuit** 1) Connect SUZUKI scan tool to DLC with ignition switch OFF. 2) Turn ignition switch ON and check transmission range signal (“R”, “N”, “D”, “M”, “+” or “–”) on display when shifting select lever to each range. *Is applicable range indicated?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 3.
3	**Check shift position sensor** 1) Check shift position sensor referring to “Shift Selector Inspection”. *Is sensor normal?*	Go to Step 4.	Replace shift selector assembly.
4	**Check shift selector power circuit** 1) Disconnect shift selector connector with ignition switch OFF. 2) Check for proper connection to shift selector connector at “L54-7” and “L54-2”. 3) If connection is OK, measure resistance between ground and terminal “L54-7” / “L54-2” of shift selector connector (harness side). *Is it voltage 10 – 14 V?*	Go to Step 5.	“GRN/RED” and/or “RED” circuit open or short.
5	**Check shift selector ground circuit** 1) Check for proper connection to shift selector connector at “L54-11” and “L54-4”. 2) If connection is OK, measure resistance between ground and “L54-11” / “L54-4”. *Is resistance below 1Ω?*	“RED/WHT”, “RED/BLU”, “RED/BLK”, “GRN/YEL”, “LTGRN/RED”, “LTGRN/BLK”, “LTGRN” or “GRN” circuit open circuit, shorted to ground circuit or shorted each other. if wires and connections are OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	“BLK/ORN” and/or “BLK/ORN” circuit open.

DTC P0717: Input / Turbine Speed Sensor Circuit Malfunction

S7N20A5404015

Wiring Diagram



I4RS0B540182-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Input shaft speed sensor	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
TCM (Automated Manual Transaxle) detects the following conditions simultaneously. • Output shaft speed is 1000 rpm or more • Input shaft speed is 175 rpm or less for 4 seconds. • Gear is engaged	• Input shaft speed sensor circuit • Input shaft speed sensor • TCM (Automated Manual Transaxle)

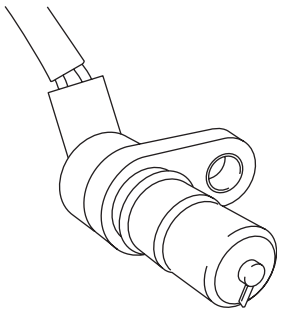
DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Clear DTC using scan tool and start engine.
2) Increase vehicle speed to 40 km/h for 1 min.
3) Check DTC.

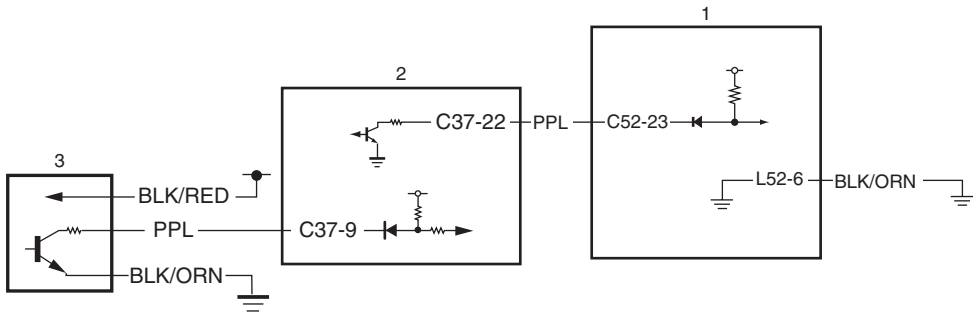
DTC Troubleshooting

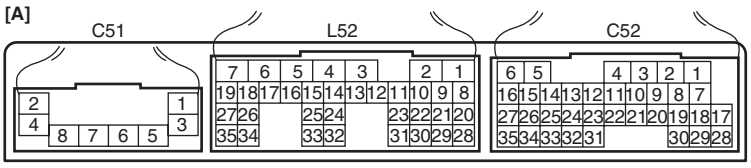
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check input shaft speed sensor circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to input shaft speed sensor at "C52-15" and "C52-16" terminals. 3) If OK, check resistance of sensor circuit. **Input shaft speed sensor specification** **Between terminals "C52-15" and "C52-16": 560 – 680 Ω at 20 °C (68 °F)** **Between terminal "C52-15" / "C52-16" and ground: No continuity** *Is check result satisfactory?*	Go to Step 4.	Go to Step 3.
3	**Inspect input shaft speed sensor** 1) Inspect input shaft speed sensor referring to "Input Shaft Speed Sensor Inspection". *Is input shaft speed sensor in good condition?*	"PNK" and/or "BLU" circuit open or short.	Replace input shaft speed sensor.
4	**Check visually input shaft speed sensor for the following** • No damage • No foreign material attached • Correct installation  I4RS0B540183-01 *Is sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Clean, repair or replace.

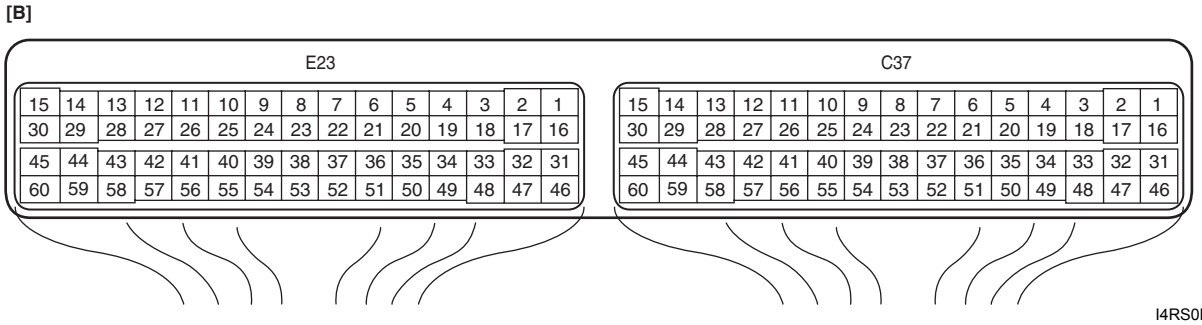
DTC P0722: Output Speed Sensor Circuit

S7N20A5404016

Wiring Diagram







I4RS0B540184-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. ECM	[B]: Terminal arrangement of ECM connector (viewed from harness side)
3. VSS	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
TCM (Automated Manual Transaxle) detects the following conditions simultaneously for 4 seconds or more while vehicle running. • Input shaft speed sensor signal: more than 1,650 rpm • Vehicle speed sensor signal: less than 13 km/h (8 mph) • Gear is engaged • 4 seconds or more	• Vehicle speed sensor circuit • Vehicle speed sensor • Vehicle speed sensor signal circuit • TCM (Automated Manual Transaxle) • ECM

DTC Confirmation Procedure

⚠ 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.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Clear DTC using scan tool.
2) Drive vehicle with 1st gear at 20 km/h (12.4 mph) or more vehicle speed at least for 3 minutes.
3) Check DTC.

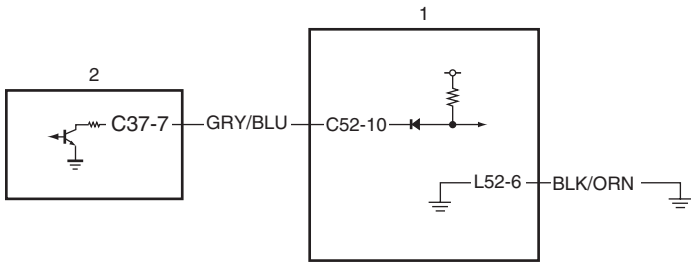
DTC Troubleshooting

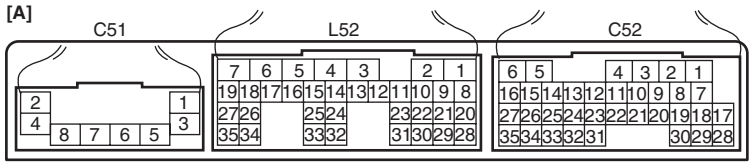
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check vehicle speed sensor signal circuit** 1) Disconnect ECM connector with ignition switch OFF. 2) Check for proper connection to ECM at "C37-22". 3) If connection is OK, measure voltage between ground and terminal "C37-22" of ECM connector (harness side). *Is it 4 – 5 V?*	Go to Step 3.	"PPL/WHT" wire open or short.
3	**Check vehicle speed sensor circuit** 1) Check VSS referring to "DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: M13A / M15A / M16A in Section 1A". *Is check result satisfactory.*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Repair as necessary.

DTC P0727: Engine Speed Input Circuit

S7N20A5404017

Wiring Diagram





I4RS0B540185-02

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
400 rpm or more difference is detected for 1 second between engine speed from CAN line and “C52-10” terminal.	• Crank shaft position sensor • Engine speed signal circuit • ECM • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Start engine and run it for 1 min.
3) Check DTC.

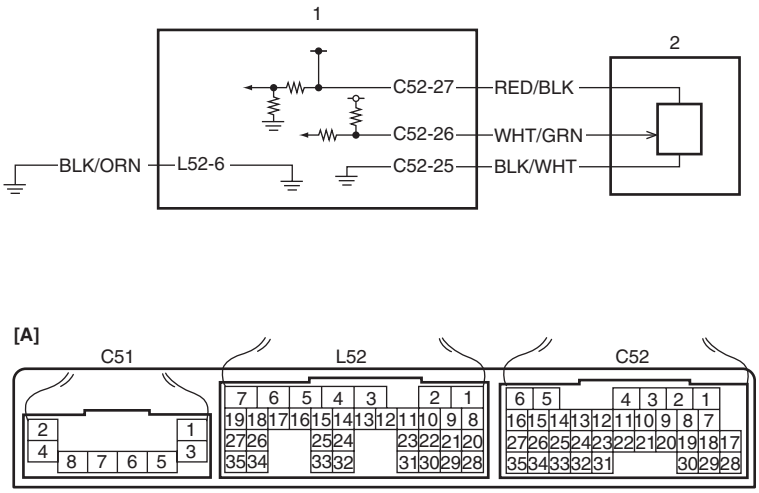
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check engine speed signal circuit** 1) Disconnect ECM connector with ignition switch OFF. 2) Check for proper connection to “C52-10” terminal of TCM (Automated Manual Transaxle). 3) If connection is OK, measure voltage between ground and terminal “C52-10” of TCM (Automated Manual Transaxle) connector (harness side). *Is it 4 – 5 V?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	“GRY/BLU” wire open or short.

DTC P0807: Clutch Position Sensor Circuit Low

S7N20A5404018

Wiring Diagram



I4RS0B540186-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Clutch stroke sensor “A”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Clutch stroke sensor “A” voltage is 0.2 V or less for 0.5 seconds.	• Clutch stroke sensor “A” • Clutch stroke sensor circuit “A” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

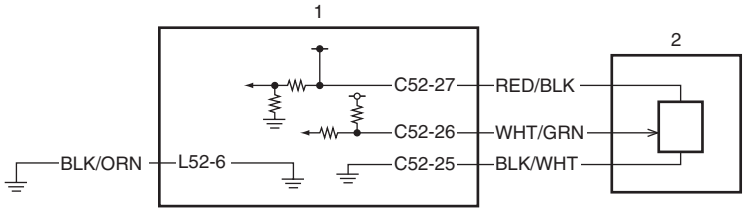
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check clutch stroke sensor circuit for shorted to ground** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-26”. 3) If connection is OK, check continuity between ground and terminal “C52-26” of TCM (Automated Manual Transaxle) connector (harness side). *Is continuity indicated?*	“WHT/GRN” circuit shorted to ground.	Go to Step 3.

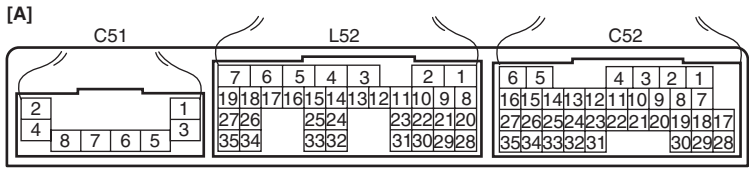
Step	Action	Yes	No
3	**Check clutch stroke sensor power circuit** 1) Connect TCM (Automated Manual Transaxle) connector and disconnect clutch stroke sensor connector with ignition switch OFF. 2) Check for proper connection to clutch stroke sensor "RED/BLK" circuit. 3) If connection is OK, measure voltage between ground and terminal "RED/BLK" of clutch stroke sensor connector (harness side). *Is it 4 – 5 V?*	Go to Step 4.	"RED/BLK" circuit open or shorted to ground. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
4	**Inspect clutch stroke sensor** 1) Inspect clutch stroke sensor referring to "Clutch Stroke Sensor Inspection". *Is clutch stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace clutch stroke sensor.

DTC P0808: Clutch Position Sensor Circuit High

S7N20A5404019

Wiring Diagram





I4RS0B540186-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Clutch stroke sensor "A"	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Clutch stroke sensor "A" voltage is 4.8 V or more for 0.5 seconds.	• Clutch stroke sensor "A" • Clutch stroke sensor circuit "A" • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to "D" range.
3) Check DTC.

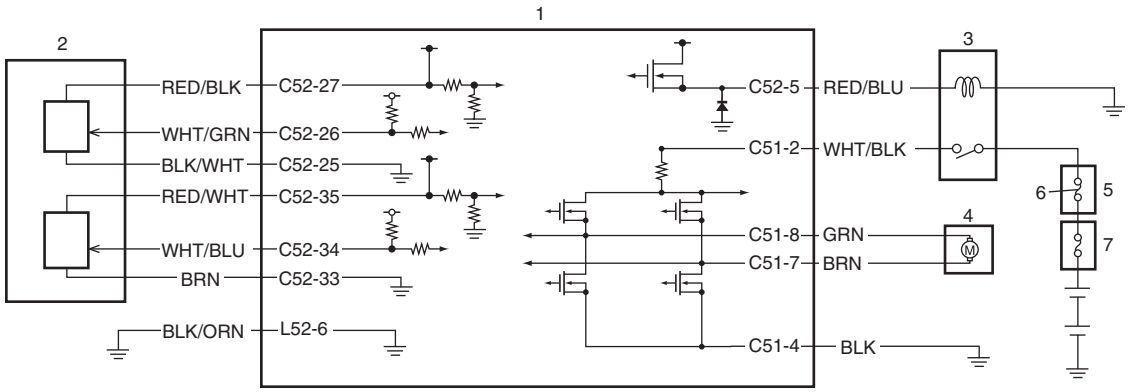
DTC Troubleshooting

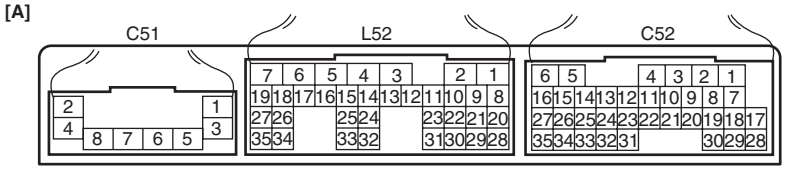
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check clutch stroke sensor circuit for shorted to power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "C52-26". 3) If connection is OK, turn ignition switch ON and measure voltage between ground and terminal "C52-26" of TCM (Automated Manual Transaxle) connector (harness side). *Is it 0 – 1 V?*	Go to Step 3.	"WHT/GRN" circuit shorted to power circuit.
3	**Check clutch stroke sensor circuit for shorted to ground** 1) Disconnect clutch stroke sensor connector with ignition switch OFF. 2) Check for proper connection to clutch stroke sensor at "C52-26". 3) If connection is OK, measure resistance between terminal "WHT/GRN" of clutch stroke sensor connector (harness side) and terminal "C52-26" of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 4.	"WHT/GRN" circuit open or high resistance circuit.
4	**Check clutch stroke sensor ground circuit** 1) Connect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Measure resistance between terminal "BLK/WHT" of clutch stroke sensor connector (harness side) and ground. *Is resistance below 5 Ω?*	Go to Step 5.	"BLK/WHT" circuit open.
5	**Inspect clutch stroke sensor** 1) Inspect clutch stroke sensor referring to "Clutch Stroke Sensor Inspection". *Is clutch stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace clutch stroke sensor.

DTC P0810: Clutch Position Control Error

S7N20A5404020

Wiring Diagram





I4RS0B540187-03

1. TCM (Automated Manual Transaxle)	5. Relay box
2. Clutch stroke sensor	6. Automated Manual Transaxle fuse
3. Motor relay	7. Main fuse box
4. Clutch motor	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
TCM (Automated Manual Transaxle) detects the following conditions simultaneously. • Clutch motor current is 20 A or more for 2.0 seconds. • The difference between the target clutch position and the actual clutch position is 0.3 mm (0.0118 in.) or more. • The amount of clutch stroke movement is 125 mm (4.92 in.) / sec. or less.	• Clutch actuator assembly (Clutch motor and clutch stroke sensor) • Clutch stroke sensor circuit • Clutch motor circuit • Clutch disc and clutch cover • Clutch release fork • Clutch release shaft • Clutch release bearing • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

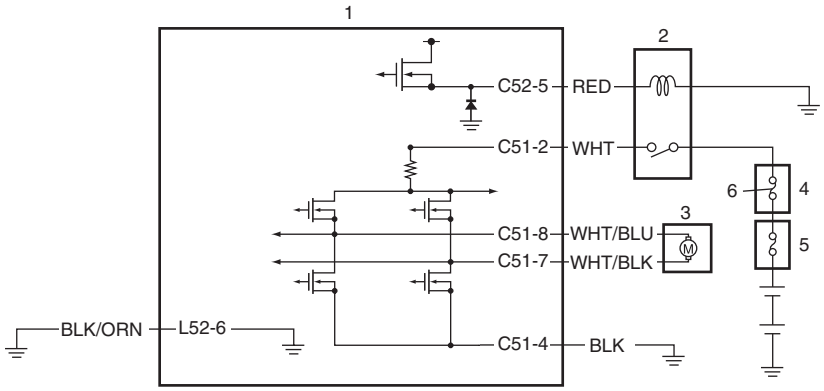
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check clutch actuator operation** 1) Connect scan tool to DLC with ignition switch OFF. 2) Perform active test of "Clutch Clamp Position Control" in "Misc Test" menu using scan tool. *Does clutch actuator operate?*	Go to Step 3.	Go to Step 6.
3	**Inspect clutch stroke sensor** 1) Inspect clutch stroke sensor referring to "Clutch Stroke Sensor Inspection". *Is clutch stroke sensor in good condition?*	Go to Step 4.	Replace clutch stroke sensor.
4	**Check clutch stroke sensor circuit resistance** 1) Disconnect TCM (Automated Manual Transaxle) connector and clutch stroke sensor connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "RED/BLK", "WHT/GRN", "BLK/WHT", "RED/WHT", "WHT/BLU" and "BRN". 3) If connection is OK, measure resistance "RED/BLK", "WHT/GRN", "BLK/WHT", "RED/WHT", "WHT/BLU" and "BRN" wire harnesses between sensor connector and TCM (Automated Manual Transaxle) connector. *Is each resistance below 1 Ω?*	Go to Step 5.	Repair harness.
5	**Check clutch stroke sensor circuit for shorted to ground** 1) Measure resistance "RED/BLK", "WHT/GRN", "BLK/WHT", "RED/WHT", "WHT/BLU" and "BRN" wire harnesses between ground and TCM (Automated Manual Transaxle) connector. *Is each resistance 10 kΩ or more?*	Go to Step 6.	Repair harness.
6	**Check clutch motor circuit resistance** 1) Check for proper connection to clutch motor connector at "C51-8" and "C51-7". 2) If connection is OK, measure resistance of clutch motor circuit. **Clutch motor specification** **Between terminals "GRN" and "BRN": 0.1 – 100 Ω** **Between terminal "GRN" / "BRN" and ground: No continuity** *Is resistance as specified?*	Go to Step 8.	Go to Step 7.
7	**Inspect clutch motor** 1) Inspect clutch motor referring to "Clutch Actuator Inspection". *Is clutch motor in good condition?*	"GRN" and/or "BRN" circuit open or short.	Replace clutch actuator.

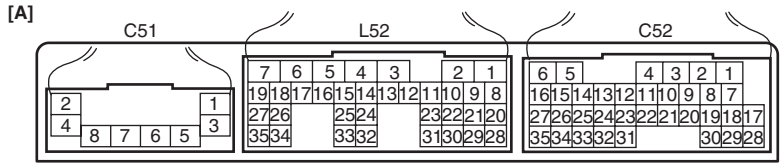
Step	Action	Yes	No
8	**Check clutch motor circuit** 1) Connect TCM (Automated Manual Transaxle) connectors and clutch stroke sensor connector with ignition switch OFF. 2) Turn ON ignition switch, measure voltage between "C51-8" wire terminal and "C51-7" wire terminal of TCM (Automated Manual Transaxle) connector, when operating clutch motor. *Is it 10 – 14 V?*	Inspect clutch system referring to "Clutch Inspection".	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P0902 / P0903: Clutch Actuator Circuit Low / High

S7N20A5404021

Wiring Diagram





I4RS0B540188-02

1. TCM (Automated Manual Transaxle)	5. Main fuse box
2. Motor relay	6. Automated Manual Transaxle fuse
3. Clutch motor	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Relay box	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0902: Clutch motor voltage is 0.5 V or lower for 0.5 second or 14 V or higher. **P0903:** TCM detects either of the following conditions. • While current is supplied to clutch motor, 1 A or lower current is detected for 0.5 second while specified current value is 5 A or higher. • While no current is supplied to clutch motor, abnormal voltage is applied to clutch motor terminal for 0.5 second or more.	• Clutch motor circuit • Clutch actuator assembly (clutch motor) • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

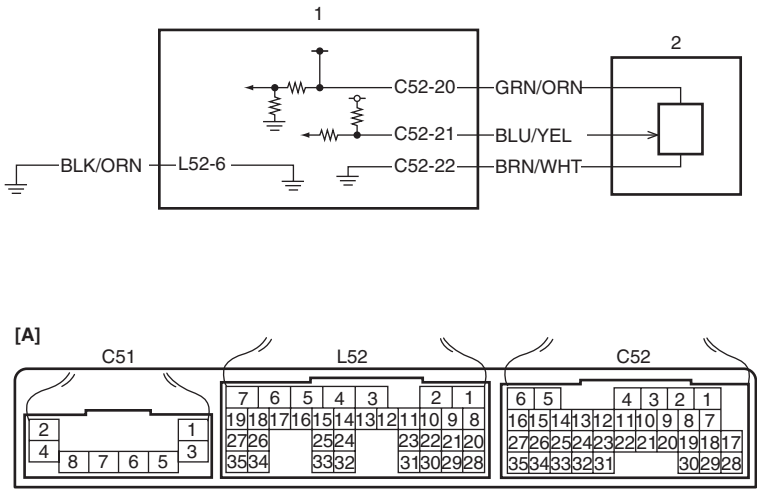
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check clutch motor circuit resistance** 1) Disconnect TCM (Automated Manual Transaxle) connectors with ignition switch OFF. 2) Check for proper connection to clutch motor connector at “C51-8” and “C51-7”. 3) If connection is OK, measure resistance of clutch motor circuit. **Clutch motor resistance specification** **Between terminals “C51-8” and “C51-7”: 0.1 – 100 Ω** **Between terminal “C51-8” / “C51-7” and ground: No continuity** *Is resistance as specified?*	Go to Step 3.	“GRN” and/or “BRN” circuit open or short.
3	**Check clutch motor circuit for shorted to power circuit** 1) Turn ON ignition switch, measure voltage between ground and terminal “C51-8” / “C51-7” of TCM (Automated Manual Transaxle) connector (harness side). *Are they 0 – 1 V?*	“GRN” / “BRN” circuit shorted to power circuit.	Go to Step 4.
4	**Check clutch motor ground circuit** 1) Check for proper connection to clutch motor connector at “C51-4”. 2) If connection is OK, measure resistance between ground and terminal “C51-4” of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 5.	“BLK” circuit open.
5	**Inspect clutch motor** 1) Inspect clutch motor referring to “Clutch Actuator Inspection”. *Is clutch motor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace clutch actuator assembly.

DTC P0906: Gate Select Position Circuit Low

S7N20A5404022

Wiring Diagram



I4RS0B540189-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Select stroke sensor “A”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Select stroke sensor “A” voltage is 0.2 V or less for 0.5 seconds.	• Select stroke sensor “A” • Select stroke sensor circuit “A” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

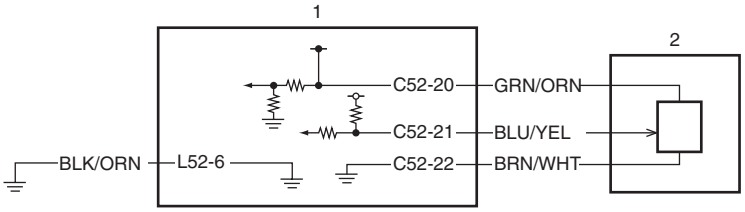
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check select stroke sensor circuit for shorted to ground** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-21”. 3) If connection is OK, check continuity between ground and terminal “C52-21” of TCM (Automated Manual Transaxle) connector (harness side). *Is continuity indicated?*	“BLU/YEL” circuit shorted to ground.	Go to Step 3.

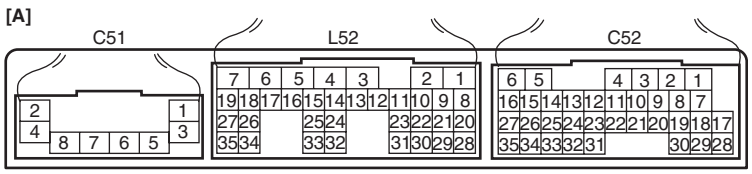
Step	Action	Yes	No
3	**Check select stroke sensor power circuit** 1) Connect TCM (Automated Manual Transaxle) connector and disconnect select stroke sensor connector with ignition switch OFF. 2) Check for proper connection to select stroke sensor "GRN/ORN" circuit. 3) If connection is OK, measure voltage between ground and terminal "GRN/ORN" of select stroke sensor connector (harness side). *Is it 4 – 5 V?*	Go to Step 4.	"GRN/ORN" circuit open or shorted to ground. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
4	**Inspect select stroke sensor** 1) Inspect select stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is select stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace select stroke sensor.

DTC P0907: Gate Select Position Circuit High

S7N20A5404023

Wiring Diagram





I4RS0B540189-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Select stroke sensor "A"	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Select stroke sensor "A" voltage is 4.8 V or more for 0.5 seconds.	• Select stroke sensor "A" • Select stroke sensor circuit "A" • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to "D" range.
3) Check DTC.

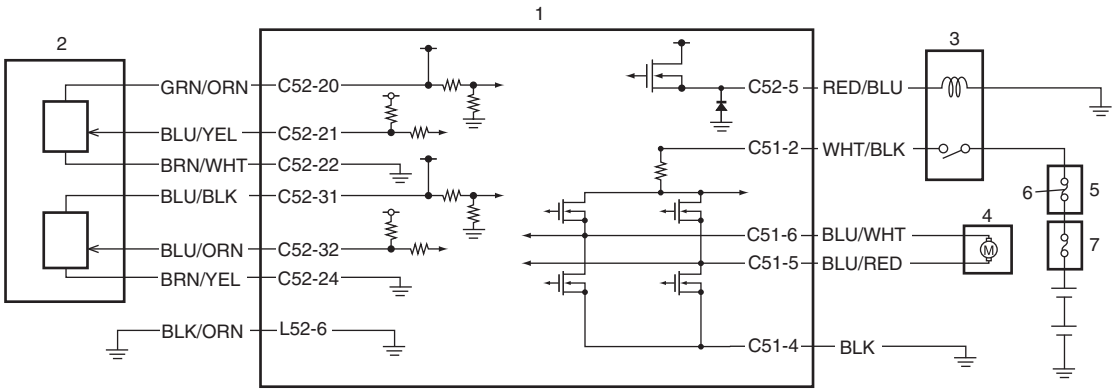
DTC Troubleshooting

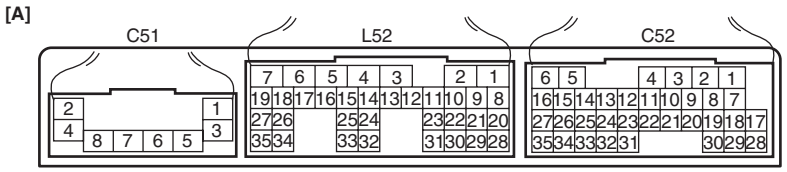
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check select stroke sensor circuit for shorted to power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "C52-21". 3) If connection is OK, turn ignition switch ON and measure voltage between ground and terminal "C52-21" of TCM (Automated Manual Transaxle) connector (harness side). *Is it 0 – 1 V?*	Go to Step 3.	"BLU/YEL" circuit shorted to power circuit.
3	**Check select stroke sensor circuit for shorted to ground** 1) Disconnect select stroke sensor connector with ignition switch OFF. 2) Check for proper connection to select stroke sensor at "C52-21". 3) If connection is OK, measure resistance between terminal "BLU/YEL" of select stroke sensor connector (harness side) and terminal "C52-21" of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 4.	"BLU/YEL" circuit open or high resistance circuit.
4	**Check select stroke sensor ground circuit** 1) Connect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Measure resistance between terminal "BRN/WHT" of select stroke sensor connector (harness side) and ground. *Is resistance below 5 Ω?*	Go to Step 5.	"BRN/WHT" circuit open.
5	**Inspect select stroke sensor** 1) Inspect select stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is select stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace select stroke sensor.

DTC P0909: Gate Select Control Error

S7N20A5404024

Wiring Diagram





I4RS0B540190-03

1. TCM (Automated Manual Transaxle)	5. Relay box
2. Select stroke sensor	6. Automated Manual Transaxle fuse
3. Motor relay	7. Main fuse box
4. Select motor	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
TCM (Automated Manual Transaxle) detects the following conditions simultaneously. • Select motor current is 20 A or more for 2.0 seconds. • The difference between the target select position and the actual select position is 0.3 mm (0.0118 in.) or more. • The amount of select stroke movement is 125 mm (4.92 in.) / sec. or less.	• Shift and select actuator assembly (Select motor and select stroke sensor) • Select stroke sensor circuit • Select motor circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

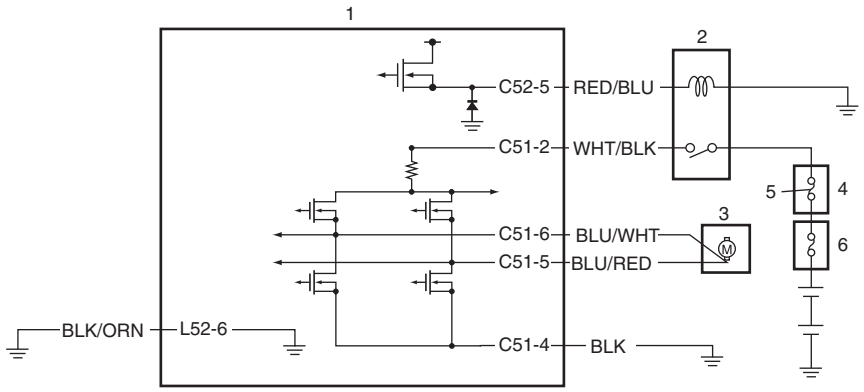
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check shift and select actuator operation** 1) Connect scan tool to DLC with ignition switch OFF. 2) Perform active test of “Shift Control” in “Misc Test” menu using scan tool. *Does shift and select actuator operate?*	Go to Step 3.	Go to Step 6.

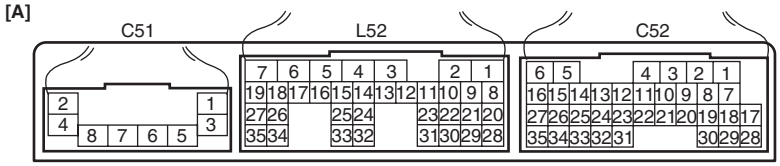
Step	Action	Yes	No
3	**Inspect select stroke sensor** 1) Inspect select stroke sensor referring to “Shift Stroke Sensor and Select Stroke Sensor Inspection”. *Is select stroke sensor in good condition?*	Go to Step 4.	Replace select stroke sensor.
4	**Check select stroke sensor circuit resistance** 1) Disconnect TCM (Automated Manual Transaxle) connector and select stroke sensor connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “GRN/ORN”, “BLU/YEL”, “BRN/WHT”, “BLU/BLK”, “BLU/ORN” and “BRN/YEL”. 3) If connection is OK, measure resistance “GRN/ORN”, “BLU/YEL”, “BRN/WHT”, “BLU/BLK”, “BLU/ORN” and “BRN/YEL” wire harnesses between sensor connector and TCM (Automated Manual Transaxle) connector. *Is each resistance below 1 Ω?*	Go to Step 5.	Repair harness.
5	**Check select stroke sensor circuit for shorted to ground** 1) Measure resistance “GRN/ORN”, “BLU/YEL”, “BRN/WHT”, “BLU/BLK”, “BLU/ORN” and “BRN/YEL” wire harnesses between ground and TCM (Automated Manual Transaxle) connector. *Is each resistance 10 kΩ or more?*	Go to Step 6.	Repair harness.
6	**Check select motor circuit resistance** 1) Check for proper connection to select motor connector at “C51-6” and “C51-5”. 2) If connection is OK, measure resistance of select motor circuit. **Select motor specification** **Between terminals “BLU/WHT” and “BLU/RED”: 0.1 – 100 Ω** **Between terminal “BLU/WHT” / “BLU/RED” and ground: No continuity** *Is resistance as specified?*	Go to Step 8.	Go to Step 7.
7	**Inspect select motor** 1) Inspect select motor referring to “Shift and Select Actuator Inspection”. *Is select motor in good condition?*	“BLU/WHT” and/or “BLU/RED” circuit open or short.	Replace shift and select actuator.
8	**Check select motor circuit** 1) Connect TCM (Automated Manual Transaxle) connectors and select stroke sensor connector with ignition switch OFF. 2) Turn ON ignition switch, measure voltage between terminal “C51-6” and “C51-5” of TCM (Automated Manual Transaxle) connector, when operating select motor. *Is it 10 – 14 V?*	Inspect gear shift shaft referring to “Gear Shift Shaft Inspection”.	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P0912 / P0913: Gate Select Actuator Circuit Low / High

S7N20A5404025

Wiring Diagram





I4RS0B540191-05

1. TCM (Automated Manual Transaxle)	5. Automated Manual Transaxle fuse
2. Motor relay	6. Main fuse box
3. Select motor	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Relay box	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P0912: Select motor voltage is 0.5 V or lower for 0.5 second or 14 V or higher. **P0913:** TCM detects either of the following conditions. • While current is supplied to select motor, 1 A or lower current is detected for 0.5 second while specified current value is 5 A or higher. • While no current is supplied to select motor, abnormal voltage is applied to select motor terminal for 0.5 second or more.	• Select motor circuit • Shift and select actuator assembly (select motor) • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

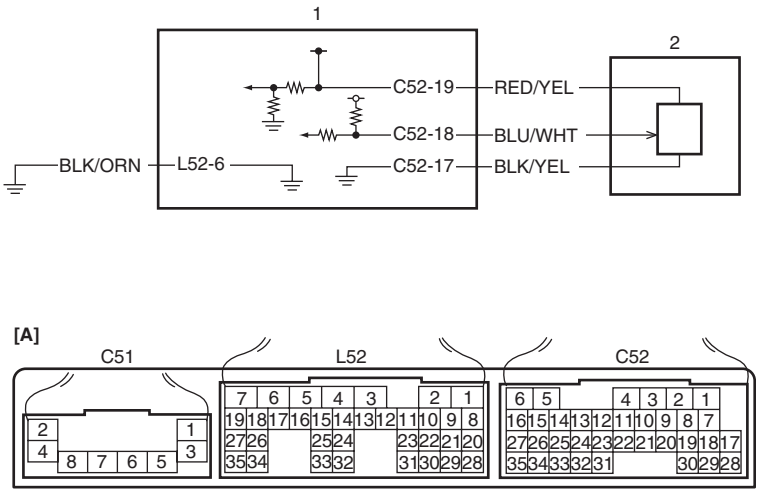
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check select motor circuit resistance** 1) Disconnect TCM (Automated Manual Transaxle) connectors with ignition switch OFF. 2) Check for proper connection to select motor connector at "C51-6" and "C51-5". 3) If connection is OK, measure resistance of select motor circuit. **Select motor specification** **Between terminals "C51-6" and "C51-5": 0.1 – 100 Ω** **Between terminal "C51-6" / "C51-5" and ground: No continuity** *Is resistance as specified?*	Go to Step 3.	"BLU/WHT" and/or "BLU/RED" circuit open or short.
3	**Check select motor circuit for shorted to power circuit** 1) Turn ON ignition switch, measure voltage between ground and terminal "C51-6" / "C51-5" of TCM (Automated Manual Transaxle) connector (harness side). *Are they 0 – 1 V?*	"BLU/WHT" / "BLU/RED" circuit shorted to power circuit.	Go to Step 4.
4	**Check select motor ground circuit** 1) Check for proper connection to select motor connector at "C51-4". 2) If connection is OK, measure resistance between ground and terminal "C51-4" of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 5.	"BLK" circuit open.
5	**Inspect select motor** 1) Inspect select motor referring to "Shift and Select Actuator Inspection". *Is select motor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift and select actuator assembly.

DTC P0916: Gear Shift Position Circuit Low

S7N20A5404026

Wiring Diagram



I4RS0B540192-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Shift stroke sensor “A”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Shift stroke sensor “A” voltage is 0.2 V or less for 0.5 seconds.	• Shift stroke sensor “A” • Shift stroke sensor circuit “A” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

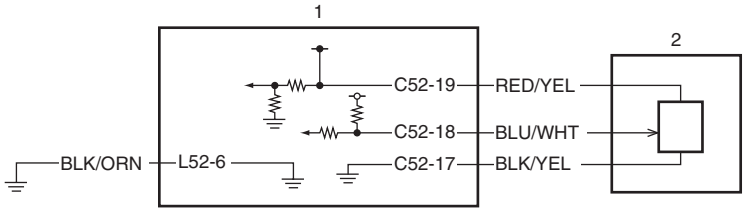
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check shift stroke sensor circuit for shorted to ground** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-18”. 3) If connection is OK, check continuity between ground and terminal “C52-18” of TCM (Automated Manual Transaxle) connector (harness side). *Is continuity indicated?*	“BLU/WHT” circuit shorted to ground.	Go to Step 3.

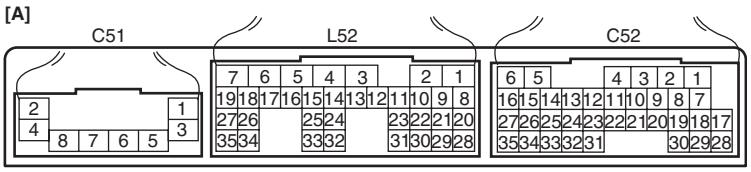
Step	Action	Yes	No
3	**Check shift stroke sensor power circuit** 1) Connect TCM (Automated Manual Transaxle) connector and disconnect shift stroke sensor connector with ignition switch OFF. 2) Check for proper connection to shift stroke sensor “RED/YEL” circuit. 3) If connection is OK, measure voltage between ground and terminal “RED/YEL” of shift stroke sensor connector (harness side). *Is it 4 – 5 V?*	Go to Step 4.	“RED/YEL” circuit open or shorted to ground. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
4	**Inspect shift stroke sensor** 1) Inspect shift stroke sensor referring to “Shift Stroke Sensor and Select Stroke Sensor Inspection”. *Is shift stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift stroke sensor.

DTC P0917: Gear Shift Position Circuit High

S7N20A5404027

Wiring Diagram





I4RS0B540192-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Shift stroke sensor “A”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Shift stroke sensor “A” voltage is 4.8 V or more for 0.5 seconds.	• Shift stroke sensor “A” • Shift stroke sensor circuit “A” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

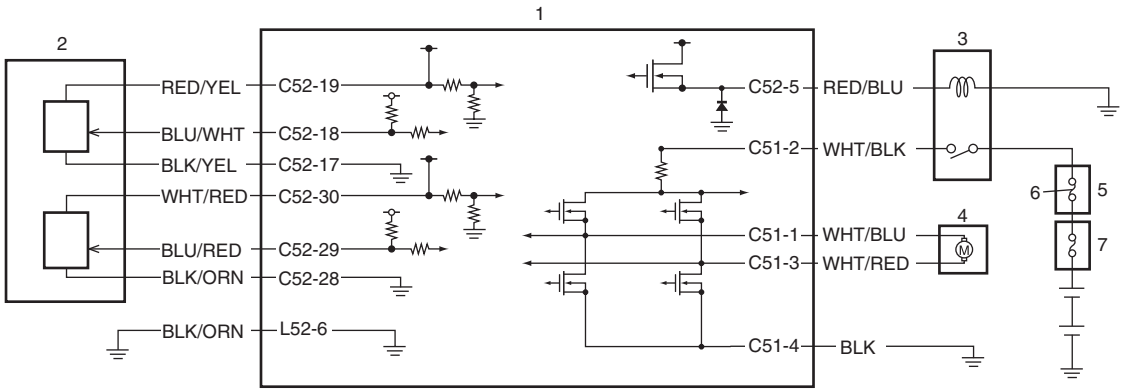
DTC Troubleshooting

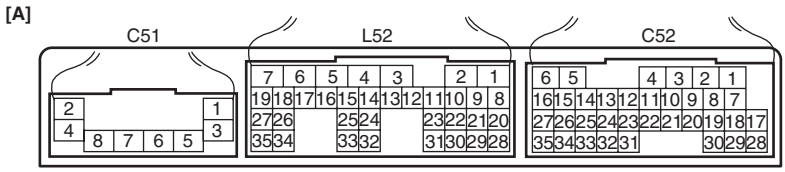
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check shift stroke sensor circuit for shorted to power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "C52-18". 3) If connection is OK, turn ignition switch ON and measure voltage between ground and terminal "C52-18" of TCM (Automated Manual Transaxle) connector (harness side). *Is it 0 – 1 V?*	Go to Step 3.	"BLU/WHT" circuit shorted to power circuit.
3	**Check shift stroke sensor circuit for shorted to ground** 1) Disconnect shift stroke sensor connector with ignition switch OFF. 2) Check for proper connection to shift stroke sensor at "C52-18". 3) If connection is OK, turn ignition switch ON and measure resistance between terminal "BLU/WHT" of shift stroke sensor connector (harness side) and terminal "C52-18" of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 4.	"BLU/WHT" circuit open or high resistance circuit.
4	**Check shift stroke sensor ground circuit** 1) Connect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Measure resistance between terminal "BLK/YEL" of shift stroke sensor connector (harness side) and ground. *Is resistance below 5 Ω?*	Go to Step 5.	"BLK/YEL" circuit open.
5	**Inspect shift stroke sensor** 1) Inspect shift stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is shift stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift stroke sensor.

DTC P0919: Gear Shift Position Control Error

S7N20A5404028

Wiring Diagram





I4RS0B540193-03

1. TCM (Automated Manual Transaxle)	5. Relay box
2. Shift stroke sensor	6. Automated Manual Transaxle fuse
3. Motor relay	7. Main fuse box
4. Shift motor	[A]. Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
TCM (Automated Manual Transaxle) detects the following conditions simultaneously. • Shift motor current is 32 A or more for 2.0 seconds. • The difference between the target shift position and the actual shift position is 0.3 mm (0.0118 in.) or more. • The amount of shift stroke movement is 125 mm (4.92 in.) / sec. or less.	• Shift and select actuator assembly (Shift motor and shift stroke sensor) • Shift stroke sensor circuit • Shift motor circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

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".
2	**Check shift and select actuator operation** 1) Connect scan tool to DLC with ignition switch OFF. 2) Perform active test of "Shift Control" in "Misc Test" menu using scan tool. *Dose shift and select actuator operate?*	Go to Step 3.	Go to Step 6.
3	**Inspect shift stroke sensor** 1) Inspect shift stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is shift stroke sensor in good condition?*	Go to Step 4.	Replace shift stroke sensor.
4	**Check shift stroke sensor circuit resistance** 1) Disconnect TCM (Automated Manual Transaxle) connector and shift stroke sensor connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "RED/YEL", "BLU/WHT", "BLK/YEL", "WHT/RED", "BLU/RED" and "BLK/ORN". 3) If connection is OK, measure resistance "RED/YEL", "BLU/WHT", "BLK/YEL", "WHT/RED", "BLU/RED" and "BLK/ORN" wire harnesses between sensor connector and TCM (Automated Manual Transaxle) connector. *Is each resistance below 1 Ω?*	Go to Step 5.	Replace harness.
5	**Check shift stroke sensor circuit for shorted to ground** 1) Measure resistance "RED/YEL", "BLU/WHT", "BLK/YEL", "WHT/RED", "BLU/RED" and "BLK/ORN" wire harnesses between ground and TCM (Automated Manual Transaxle) connector. *Is each resistance 10 kΩ or more?*	Go to Step 6.	Replace harness.
6	**Check shift motor circuit resistance** 1) Check for proper connection to shift motor connector at "C51-1" and "C51-3". 2) If connection is OK, measure resistance of shift motor circuit. **Shift motor specification** **Between terminals "WHT/BLU" and "WHT/RED": 0.1 – 100 Ω** **Between terminal "WHT/BLU" / "WHT/RED" and ground: No continuity** *Is resistance as specified?*	Go to Step 8.	Go to Step 7.
7	**Inspect shift motor** 1) Inspect shift motor referring to "Shift and Select Actuator Inspection". *Is shift motor in good condition?*	"WHT/BLU" and/or "WHT/RED" circuit open or short.	Replace shift and select actuator.

Step	Action	Yes	No
8	**Check shift motor circuit** 1) Connect TCM (Automated Manual Transaxle) connectors and shift stroke sensor connector with ignition switch OFF. 2) Turn ON ignition switch, measure voltage between terminal “C51-1” and “C51-3” of TCM (Automated Manual Transaxle) connector, when operating shift motor. *Is it 10 – 14 V?*	Inspect gear shift shaft referring to “Gear Shift Shaft Inspection”.	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P1703: CAN Invalid Data – Automated Manual Transaxle Control

S7N20A5404029

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
When TCM (Automated Manual Transaxle) receives a trouble signal from ECM.	• TCM (Automated Manual Transaxle) • ECM

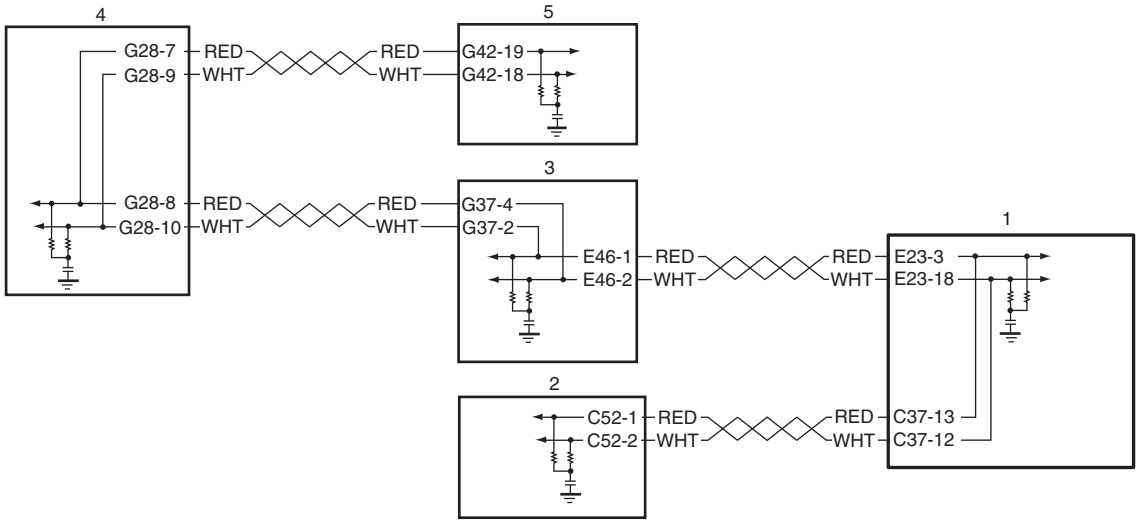
DTC Troubleshooting

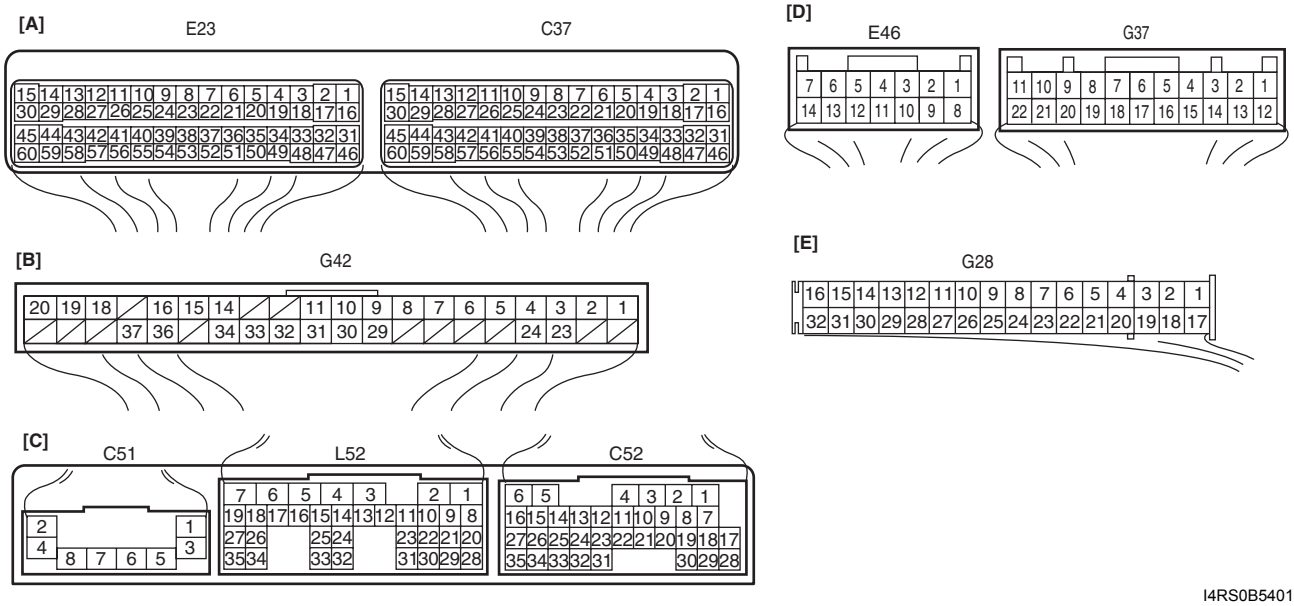
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**DTC check** 1) Check DTC of ECM referring to “DTC Check: M13A / M15A / M16A in Section 1A”. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good TCM (Automated Manual Transaxle) and recheck. If OK, substitute a known-good ECM and recheck.

DTC P1774: Control Module Communication Bus Off

S7N20A5404030

Wiring Diagram





I4RS0B540194-01

1. ECM	[A]: Terminal arrangement of ECM connector (viewed from harness side)
2. TCM (Automated Manual Transaxle)	[B]: Terminal arrangement of keyless start control module connector (viewed from harness side)
3. BCM	[C]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Combination meter	[D]: Terminal arrangement of BCM connector (viewed from harness side)
5. Keyless start control module (if equipped)	[E]: Terminal arrangement of combination meter connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error of communication data for TCM (Automated Manual Transaxle) is detected more than 7 times at more than specified error counts continuously.	• ECM • BCM • TCM (Automated Manual Transaxle) • Combination meter • Keyless start control module (if equipped) • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM (Automated Manual Transaxle) and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

Troubleshooting

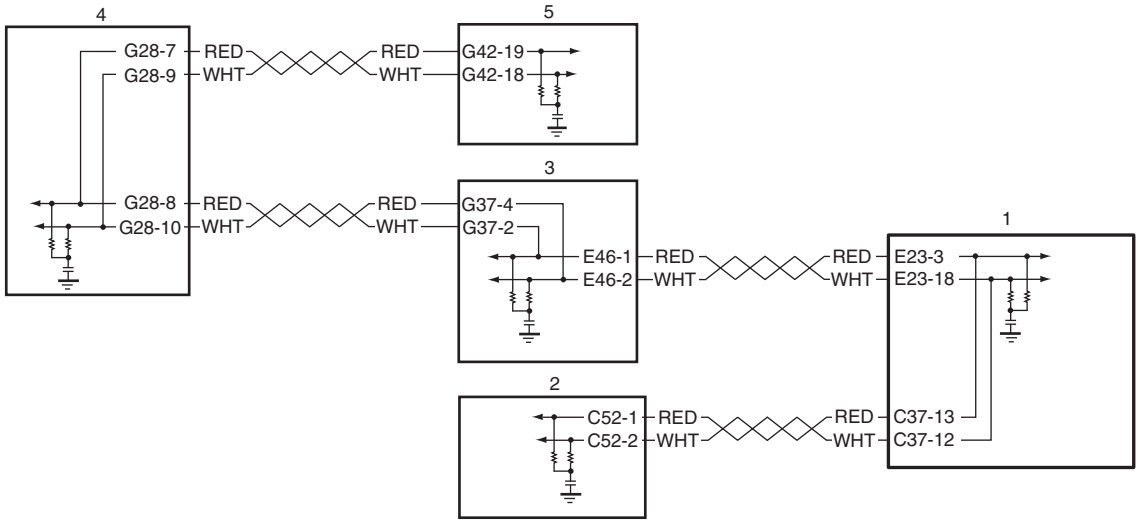
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2	Go to "Automated Manual Transaxle System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in TCM (Automated Manual Transaxle), ECM, BCM and keyless control module (if equipped). *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1777, P1778 in TCM (Automated Manual Transaxle), DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31, No.33 in keyless start control module)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check ECM, TCM (Automated Manual Transaxle), BCM, combination meter, keyless start control module (if equipped) connectors** 1) Check for proper connection at each TCM (Automated Manual Transaxle), ECM, BCM, combination meter and keyless start control module (if equipped) connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM (Automated Manual Transaxle) for DTC with engine running. *Is there DTC P1774?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**Check TCM (Automated Manual Transaxle) power and ground circuit** 1) Check for TCM (Automated Manual Transaxle) power and ground circuit referring to "TCM (Automated Manual Transaxle) Power and Ground Circuit Check". *Is it in good condition?*	Go to Step 5.	Repair TCM (Automated Manual Transaxle) power and/or ground circuits.
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control module for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 6.	Repair circuit.

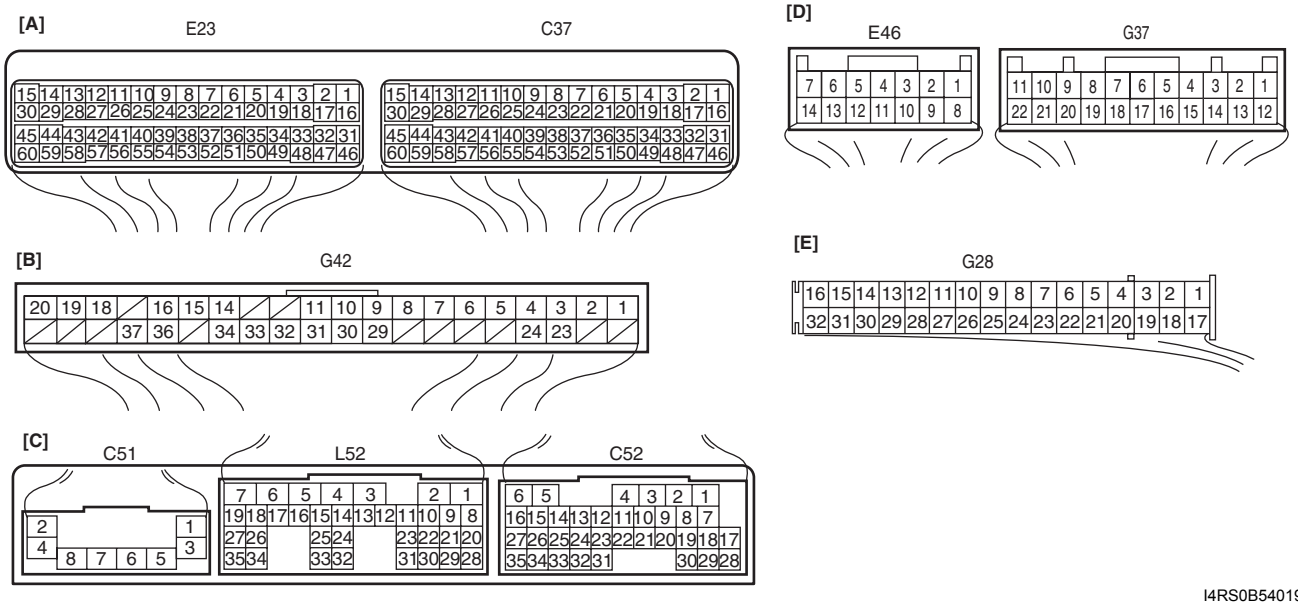
Step	Action	Yes	No
6	**Check DTC in TCM (Automated Manual Transaxle)** **NOTE** **If vehicle is not equipped keyless start control module, go to Step 7.** 1) Turn ignition switch to OFF position. 2) Connect connector to combination meter, BCM, ECM and TCM (Automated Manual Transaxle). 3) Check DTC in TCM (Automated Manual Transaxle). *Is there DTC P1774?*	Go to Step 7.	Check keyless control module power and ground circuit. If circuit is OK, substitute a known-good keyless start control module and recheck.
7	**Check DTC in TCM (Automated Manual Transaxle)** 1) Turn ignition switch to OFF position. 2) Disconnect connector from combination meter. 3) Check DTC in TCM (Automated Manual Transaxle). *Is there DTC P1774?*	Go to Step 8.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.
8	**Check DTC in ECM and BCM** 1) Turn ignition switch to OFF position. 2) Disconnect connector from TCM (Automated Manual Transaxle). 3) Check DTC in ECM and BCM. *Is there DTC(s) P1674 in ECM and/or U1073 in BCM?*	Go to Step 8.	Substitute a known-good TCM (Automated Manual Transaxle) and recheck.
9	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Disconnect connector from ECM. 3) Check DTC in BCM. *Is there DTC U1073?*	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM and recheck.	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.

DTC P1777: TCM (Automated Manual Transaxle) Lost Communication with ECM (Reception Error)

S7N20A5404031

Wiring Diagram





I4RS0B540194-01

1. ECM	[A]: Terminal arrangement of ECM connector (viewed from harness side)
2. TCM (Automated Manual Transaxle)	[B]: Terminal arrangement of keyless start control module connector (viewed from harness side)
3. BCM	[C]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Combination meter	[D]: Terminal arrangement of BCM connector (viewed from harness side)
5. Keyless start control module (if equipped)	[E]: Terminal arrangement of combination meter connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for ECM is detected more than specified time continuously.	• ECM • TCM (Automated Manual Transaxle) • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM (Automated Manual Transaxle) and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

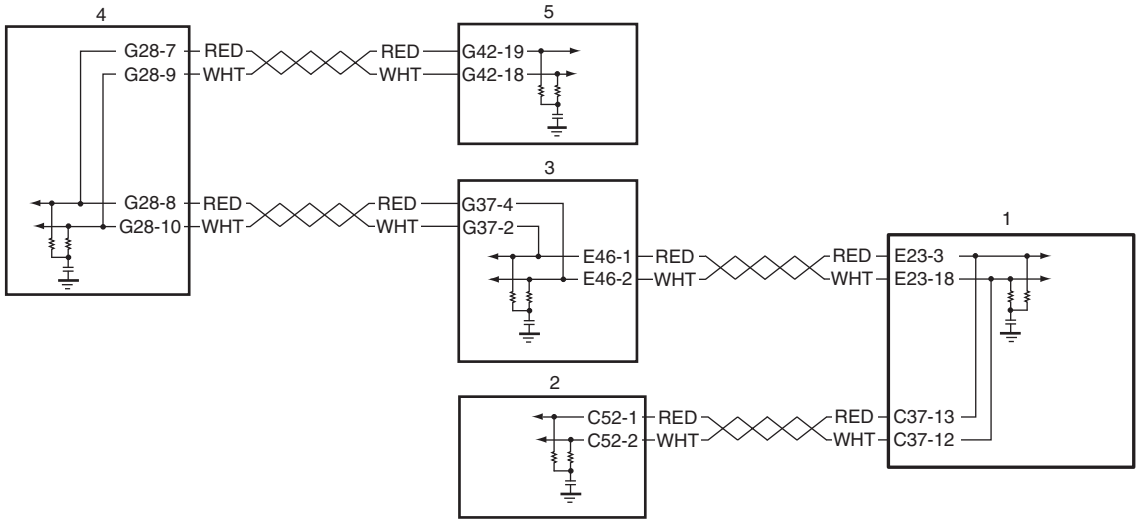
Troubleshooting

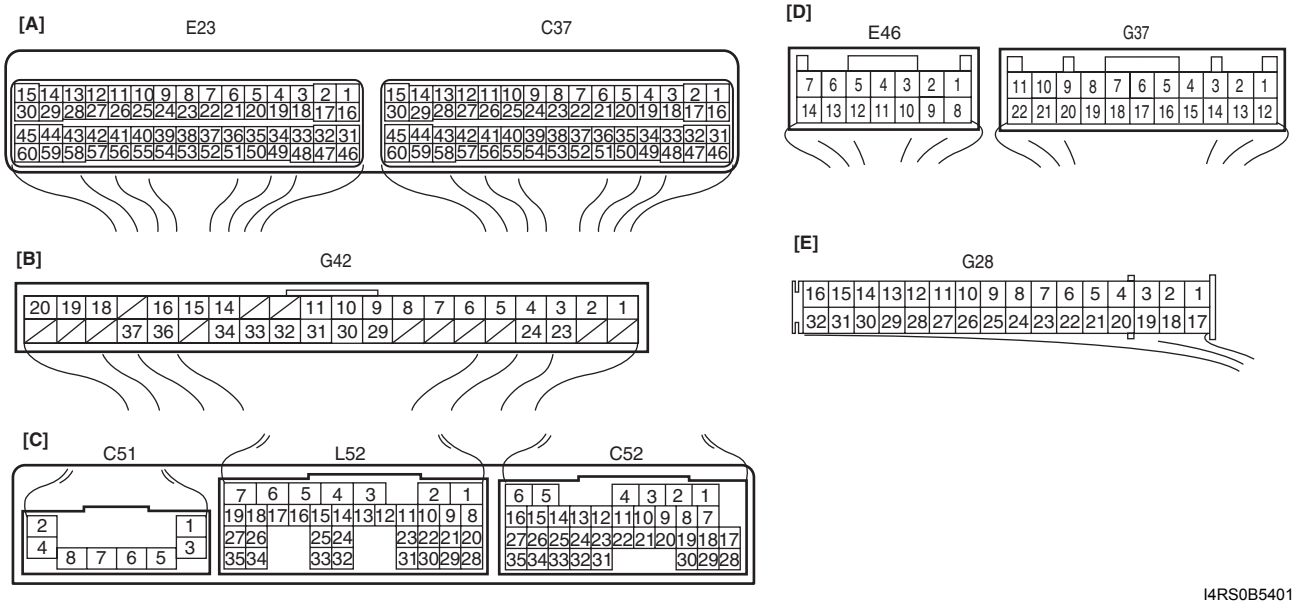
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in TCM (Automated Manual Transaxle), ECM, BCM and keyless control module (if equipped). *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1777, P1778 in TCM (Automated Manual Transaxle), DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31, No.33 in keyless start control module)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM (Automated Manual Transaxle) for CAN communication error** 1) Check DTC in TCM (Automated Manual Transaxle). *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off".	Go to Step 4.
4	**Check TCM (Automated Manual Transaxle) and ECM connectors** 1) Check for proper connection at each TCM (Automated Manual Transaxle) and ECM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck TCM (Automated Manual Transaxle) for DTC with engine running. *Is there DTC P1777?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**Check TCM (Automated Manual Transaxle) power and ground circuit** 1) Check for TCM (Automated Manual Transaxle) power and ground circuit referring to "TCM (Automated Manual Transaxle) Power and Ground Circuit Check". *Is it in good condition?*	Go to Step 6.	Repair TCM (Automated Manual Transaxle) power and/or ground circuits.
6	**Check DTC in ECM** 1) Check DTC P1674 in ECM. *Is it indicated?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A in Section 1A".	Go to Step 7.
7	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control module for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 8.	Repair circuit.
8	**Check DTC in BCM** 1) Turn ignition switch to OFF position. 2) Connect connector to BCM, ECM and TCM (Automated Manual Transaxle). 3) Check DTC in BCM. *Is there DTC U1100?*	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P1778: TCM (Automated Manual Transaxle) Lost Communication with BCM (Reception Error)

S7N20A5404032

Wiring Diagram





I4RS0B540194-01

1. ECM	[A]: Terminal arrangement of ECM connector (viewed from harness side)
2. TCM (Automated Manual Transaxle)	[B]: Terminal arrangement of keyless start control module connector (viewed from harness side)
3. BCM	[C]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Combination meter	[D]: Terminal arrangement of BCM connector (viewed from harness side)
5. Keyless start control module (if equipped)	[E]: Terminal arrangement of combination meter connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Reception error of communication data for BCM is detected more than specified time continuously.	• ECM • TCM (Automated Manual Transaxle) • BCM • CAN circuit

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM (Automated Manual Transaxle) and ECM memories by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC, pending DTC and freeze-frame data.

Troubleshooting

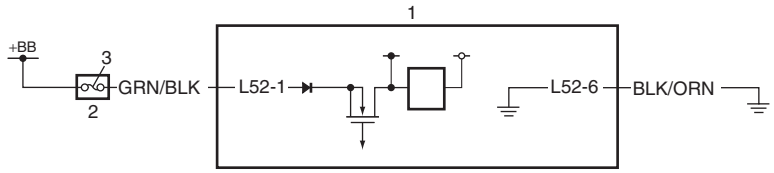
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC in TCM (Automated Manual Transaxle), ECM, BCM and keyless control module (if equipped). *Is there any DTC(s) (other than DTC P1674, P1675, P1676, P1678 in ECM, DTC P1774, P1777, P1778 in TCM (Automated Manual Transaxle), DTC U1073, U1001, U1100, U1101 in BCM and DTC No.31, No.33 in keyless start control module)?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Check TCM (Automated Manual Transaxle) for CAN communication error** 1) Check DTC in TCM (Automated Manual Transaxle). *Is there DTC P1774?*	Go to "DTC P1774: Control Module Communication Bus Off".	Go to Step 4.
4	**Check TCM (Automated Manual Transaxle) and ECM connectors** 1) Check for proper connection at each TCM (Automated Manual Transaxle) and ECM connector terminals with ignition switch turned OFF. 2) If connections are OK, recheck DTC for TCM (Automated Manual Transaxle) with engine running. *Is there DTC P1777?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**Check TCM (Automated Manual Transaxle) power and ground circuit** 1) Check for TCM (Automated Manual Transaxle) power and ground circuit referring to "TCM (Automated Manual Transaxle) Power and Ground Circuit Check". *Is it in good condition?*	Go to Step 6.	Repair TCM (Automated Manual Transaxle) power and/or ground circuits.
6	**Check DTC in BCM** 1) Check DTC U1073 in BCM. *Is it indicated?*	Go to "DTC P1774: Control Module Communication Bus Off".	Go to Step 7.
7	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control module for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 8.	Repair circuit.

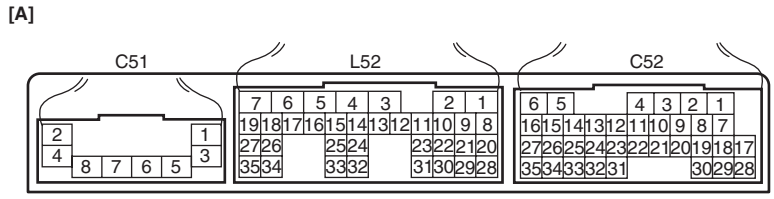
Step	Action	Yes	No
8	**Check ECM internal circuit** 1) Measure resistance at the following connector terminals. • Between “E23-3” and “C37-13” terminals of ECM connector • Between “E23-18” and “C37-12” terminals of ECM connector *Is resistance below 1 Ω?*	Go to Step 9.	Substitute a known-good ECM and recheck.
9	**Check DTC in ECM** 1) Turn ignition switch to OFF position. 2) Connect connector to BCM and ECM. 3) Check DTC in ECM. *Is there DTC P1678?*	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM and recheck.	Substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P1840: TCM (Automated Manual Transaxle) System Voltage

S7N20A5404033

Wiring Diagram





I4RS0B540195-03

1. TCM (Automated Manual Transaxle)	3. Automated Manual Transaxle fuse
2. Junction block assembly	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
“L52–1” terminal input voltage is 4.0 V or less for 0.5 seconds or more.	• Power source circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Start engine, after 10 seconds, check DTC.

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”.
2	**Circuit fuse check** 1) Check for “Automated Manual Transaxle” fuse in junction block assembly with ignition switch turned OFF. *Is “Automated Manual Transaxle” fuse in good condition?*	Go to Step 3.	Check for short in circuits connected to this fuse.

Step	Action	Yes	No
3	**Check TCM (Automated Manual Transaxle) power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at terminal “L52-1”. 3) If connection is OK, measure voltage between terminal “L52-1” and “L52-6” of TCM (Automated Manual Transaxle) connector (harness side). *Is it 10 – 14 V?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	“GRN/BLK” and/or “BLK/ORN” wire open or short.

DTC P1841 / P1842: CPU Malfunction / TCM (Automated Manual Transaxle) Internal Module Keep Alive Memory Error

S7N20A5404034

DTC Detecting Condition and Trouble Area

DTC detecting conditiona	Trouble area
P1841: CPU malfunction. P1842: EEPROM error.	• TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) After 10 seconds passed from turning ignition switch ON, check DTC.

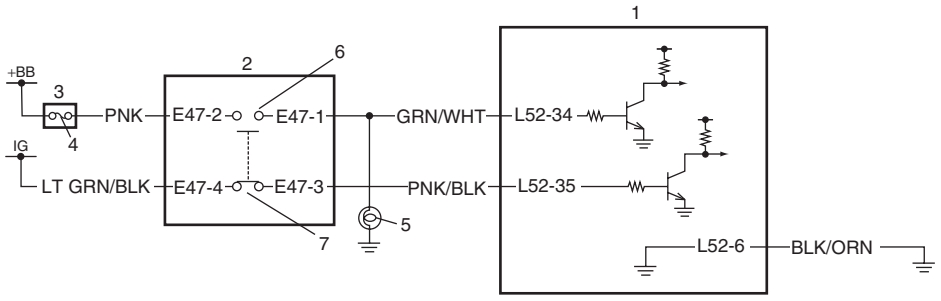
DTC Troubleshooting

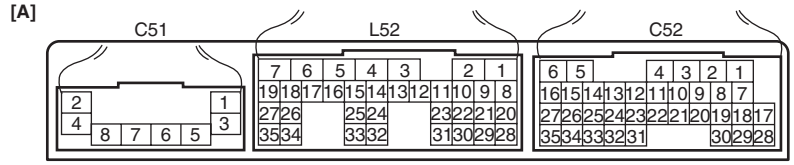
Substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P1843: Brake Switch “A/B” Error

S7N20A5404035

Wiring Diagram





I4RS0B540196-03

1. TCM (Automated Manual Transaxle)	5. Stop lamp
2. Stop lamp switch	6. Switch “A”
3. Junction block assembly	7. Switch “B”
4. STOP LAMP fuse	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
When ignition switch is turned on, both of 2 brake switches are turned off for 1 second or longer.	• Stop lamp switch circuit • Stop lamp switch • STOP LAMP fuse • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) After 10 seconds passed from turning ignition switch ON, check DTC.

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".
2	**Circuit fuse check** 1) Check for "STOP LAMP" fuse in relay box with ignition switch turned OFF. *Is "STOP LAMP" fuse in good condition?*	Go to Step 3.	Check for short in circuits connected to this fuse.
3	**Check stop lamp switch circuit** 1) Disconnect stop lamp switch connector with ignition switch turned OFF. 2) Check for proper connection to stop lamp switch at "E47-2" and "E47-4". 3) If connection is OK, turn ignition switch ON and measure voltage between terminal "E47-2" / "E47-4" of stop lamp switch connector (harness side) and ground. *Is it 10 – 14 V?*	Go to Step 4.	"PNK" and/or "LT GRN/BLK" circuit open or short.
4	**Inspect stop lamp switch** 1) Inspect stop lamp switch referring to "Stop (Brake) Lamp Switch Inspection in Section 9B". *Is stop lamp switch in good condition?*	Go to Step 5.	Replace stop lamp switch.
5	**Check TCM (Automated Manual Transaxle) circuit** 1) Connect stop lamp switch connector and disconnect TCM (Automated Manual Transaxle) connector with ignition switch turned OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "L52-34" and "L52-35". 3) If connection is OK, turn ignition switch ON and measure voltage of TCM (Automated Manual Transaxle) circuit. **<u>Brake pedal released</u>** **Between terminal "L52-34" and ground: 0 – 1 V** **Between terminal "L52-35" and ground: 10 – 14 V** **<u>Brake pedal depressed</u>** **Between terminal "L52-34" and ground: 10 – 14 V** **Between terminal "L52-35" and ground: 0 – 1 V** *Is voltage as specified?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	"GRN/WHT" and/or "PNK/BLK" wire open or short.

DTC P1845: Warning Buzzer Circuit Malfunction

S7N20A5404036

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
TCM (Automated Manual Transaxle) detects all following conditions for 5 seconds or more. • Buzzer output signal OFF • Buzzer operation voltage 3 V or less	• TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) After 10 seconds passed from turning ignition switch ON, check DTC.

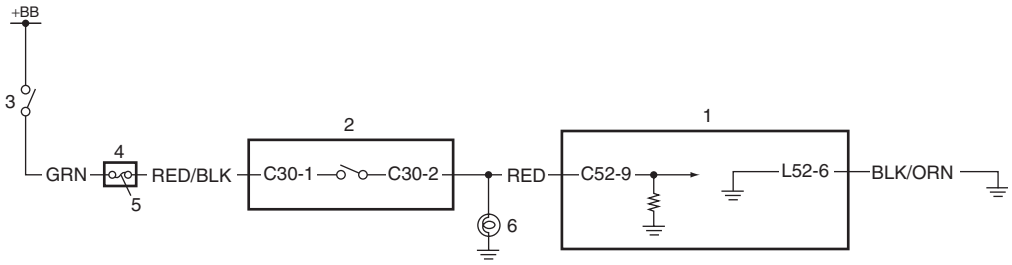
DTC Troubleshooting

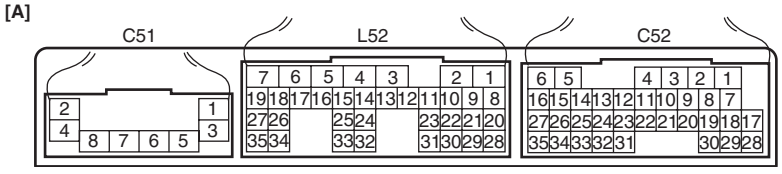
Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check DTC** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check DTC for TCM (Automated Manual Transaxle). *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good TCM (Automated Manual Transaxle) and recheck.

DTC P1846: Reverse Input Circuit No Signal

S7N20A5404037

Wiring Diagram





I4RS0B540197-03

1. TCM (Automated Manual Transaxle)	5. BACK fuse
2. Back up lamp switch	6. Back up lamp
3. Ignition switch	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Junction block assembly	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
When signal from shift and select stroke sensor is “R”, back up lamp switch remains OFF for 0.5 second.	• Back up lamp switch • Back up lamp switch circuit • TCM (Automated Manual Transaxle) • BACK fuse

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “R” range.
3) Check DTC.

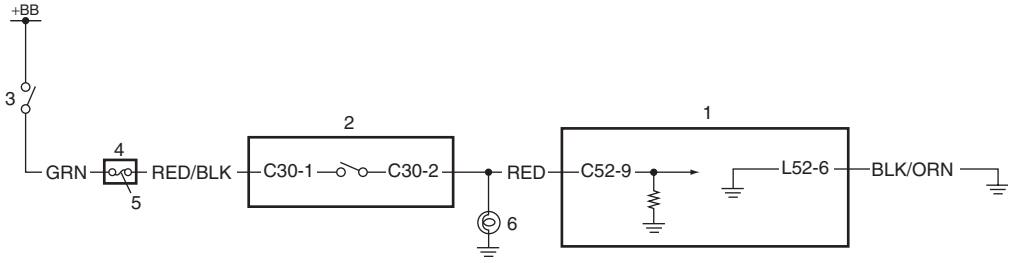
DTC Troubleshooting

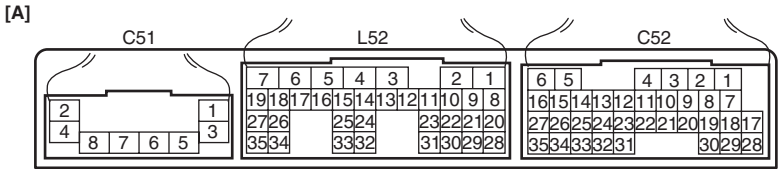
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check stop lamp** *Dose stop lamp light?*	Go to Step 5.	Go to Step 3.
3	**Circuit fuse check** 1) Check for “BACK” fuse in junction block with ignition switch turned OFF. *Is “BACK” fuse in good condition?*	Go to Step 4.	Check for short in circuits connected to this fuse.
4	**Check back up lamp switch circuit** 1) Disconnect back up lamp switch connector with ignition switch turned OFF. 2) Check for proper connection to back up lamp switch at “C30-1”. 3) If connection is OK, measure voltage between terminal “C30-1” of back up lamp switch connector (harness side) and ground. *Is it 10 – 14 V?*	Go to Step 5.	“GRN” and/or “RED/BLK” wire open or short.
5	**Inspect back up lamp switch** 1) Inspect back up lamp switch referring to “Back Up Lamp Switch Inspection”. *Is back up lamp switch in good condition?*	Go to Step 6.	Replace back up lamp switch.
6	**Check back up lamp switch signal circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch turned OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-9” and back up lamp switch at “C30-2”. 3) If connection is OK, measure resistance between terminal “C30-2” of back up lamp switch connector (harness side) and “C52-9” of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 1 Ω?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	“RED” wire open or short.

DTC P1847: Reverse Input Circuit Short

S7N20A5404038

Wiring Diagram





I4RS0B540197-03

1. TCM (Automated Manual Transaxle)	5. BACK fuse
2. Back up lamp switch	6. Back up lamp
3. Ignition switch	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Junction block assembly	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
When signal from shift and select stroke sensor was except for “R”, back up lamp switch remained ON for 0.5 second.	• Back up lamp switch • Back up lamp switch circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

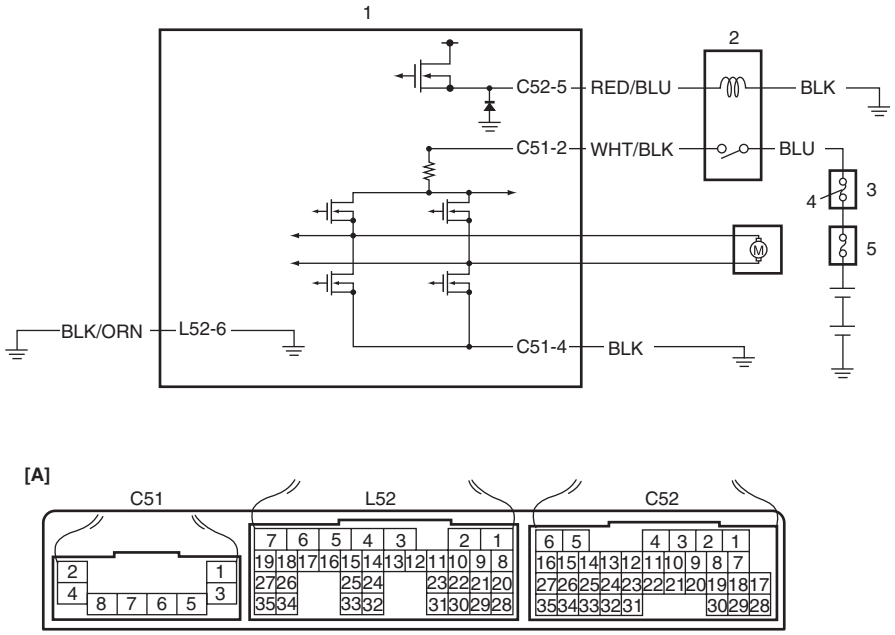
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check back up lamp switch signal circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at terminal “C52-9”. 3) If connection is OK, measure voltage between terminal “C52-9” of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is it 0 – 1 V?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Go to Step 3.

Step	Action	Yes	No
3	**Inspect back up lamp switch** 1) Inspect back up lamp switch referring to “Back Up Lamp Switch Inspection”. *Is back up lamp switch in good condition?*	“RED” circuit shorted to power circuit.	Replace back up lamp switch.

DTC P1848: Motor Relay Circuit Low

S7N20A5404039

Wiring Diagram



I4RS0B540198-05

1. TCM (Automated Manual Transaxle)	4. Automated Manual Transaxle fuse
2. Motor relay	5. Main fuse box
3. Relay box	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage at “C51-2” terminal is 6.29 V or lower for 0.5 second or longer even though motor relay drive request is output.	• Automated Manual Transaxle fuse • Motor relay • Motor relay circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

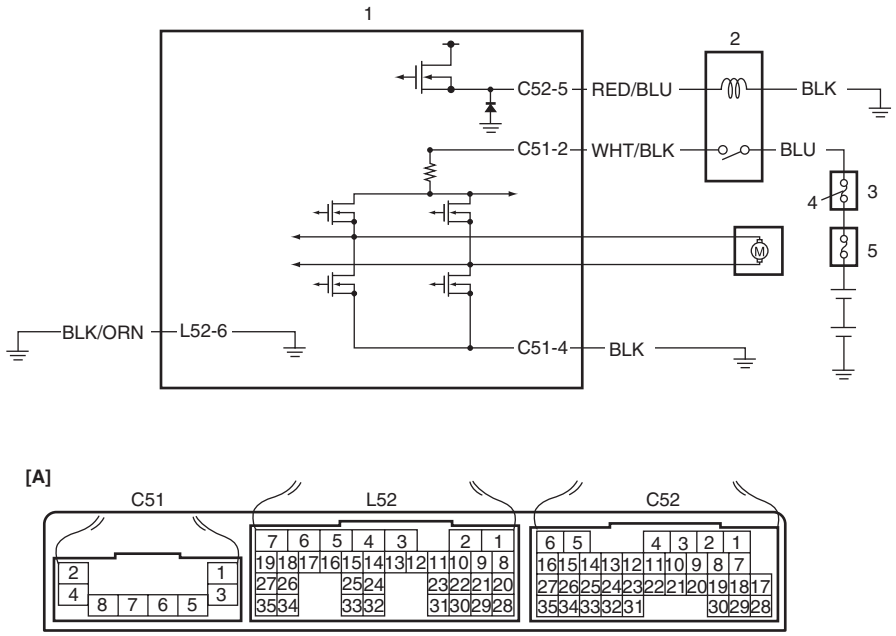
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Circuit fuse check** 1) Check for "Automated Manual Transaxle" fuse in relay box with ignition switch turned OFF. *Is "Automated Manual Transaxle" fuse in good condition?*	Go to Step 3.	Check for short in circuits connected to this fuse.
3	**Motor relay check** 1) Check motor relay referring to "Motor Relay Inspection". *Is it in good condition?*	Go to Step 4.	Replace motor relay.
4	**Check Motor relay power circuit** 1) Disconnect motor relay in relay box with ignition switch OFF. 2) Check for proper connection to motor relay at "WHT/BLK", "BLU", "RED/BLU" and "BLK". 3) If connection is OK, measure voltage between terminal "BLU" of motor relay and ground. *Is it 10 – 14 V?*	Go to Step 5.	"BLU" wire open or short.
5	**Check TCM (Automated Manual Transaxle) circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "C51-2". 3) If connection is OK, measure resistance between terminal "C51-2" of TCM (Automated Manual Transaxle) connector (harness side) and "WHT/BLK" of motor relay. *Is continuity indicated?*	Go to Step 6.	"WHT/BLK" wire open or short.
6	**Check Motor relay circuit for open** 1) Connect motor relay to relay box with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at terminal "C52-5". 3) If connection is OK, measure resistance between terminal "C52-5" of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is resistance infinity?*	"RED/BLU" and/or "BLK" circuit open.	Go to Step 7.
7	**Check Motor relay circuit for shorted to ground** 1) Measure resistance between terminal "C52-5" of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is resistance 120 – 160 Ω?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	"RED/BLU" circuit shorted to ground.

DTC P1849: Motor Relay Circuit High

S7N20A5404040

Wiring Diagram



I4RS0B540198-05

1. TCM (Automated Manual Transaxle)	4. Automated Manual Transaxle fuse
2. Motor relay	5. Main fuse box
3. Relay box	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Voltage at “C51-2” terminal is 6.29 V or higher for 1 second even though motor relay is turned off.	• Motor relay • Motor relay circuit • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

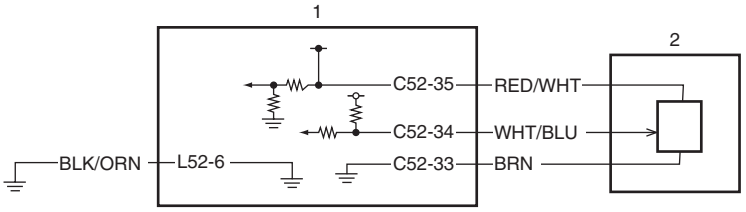
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Motor relay check** 1) Check motor relay referring to “Motor Relay Inspection”. *Is it in good condition?*	Go to Step 3.	Replace motor relay.
3	**Check Motor relay circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-5”. 3) If connection is OK, measure voltage between terminal “C52-5” of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is it 0 – 1 V?*	Go to Step 4.	“RED/BLU” circuit shorted to power circuit.

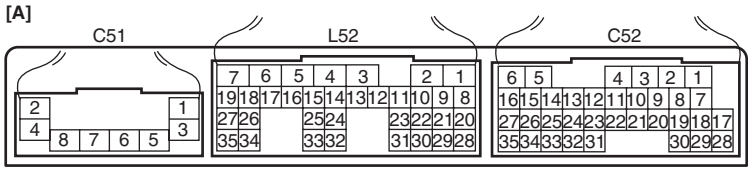
Step	Action	Yes	No
4	**Check Motor relay circuit** 1) Measure voltage between terminal “C51-2” of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is it 0 – 1 V?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	“WHT/BLK” wire shorted to power circuit.

DTC P1856: Clutch Position Sensor Circuit “B” Low

S7N20A5404041

Wiring Diagram





I4RS0B540199-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Clutch stroke sensor “B”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Clutch stroke sensor “B” voltage is 0.2 V or less for 0.5 sec.	• Clutch stroke sensor “B” • Clutch stroke sensor circuit “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

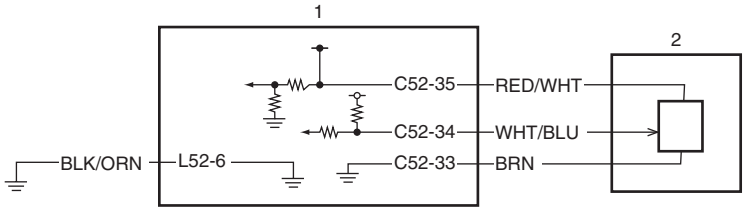
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.

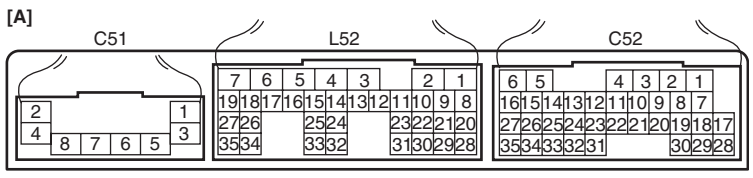
Step	Action	Yes	No
2	**Check clutch stroke sensor circuit for shorted to ground** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-34”. 3) If connection is OK, check continuity between ground and terminal “C52-34” of TCM (Automated Manual Transaxle) connector (harness side). *Is continuity indicated?*	“WHT/BLU” circuit shorted to ground.	Go to Step 3.
3	**Check clutch stroke sensor power circuit** 1) Connect TCM (Automated Manual Transaxle) connector and disconnect clutch stroke sensor connector with ignition switch OFF. 2) Check for proper connection to clutch stroke sensor “RED/WHT” circuit. 3) If connection is OK, measure voltage between ground and terminal “RED/WHT” of clutch stroke sensor connector (harness side). *Is it 4 – 5 V?*	Go to Step 4.	“RED/WHT” circuit open or shorted to ground. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
4	**Inspect clutch stroke sensor** 1) Inspect clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”. *Is clutch stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace clutch stroke sensor.

DTC P1857: Clutch Position Sensor Circuit “B” High

S7N20A5404042

Wiring Diagram





I4RS0B540199-01

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Clutch stroke sensor “B”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Clutch stroke sensor “B” voltage is 4.8 V or more for 0.5 sec.	• Clutch stroke sensor “B” • Clutch stroke sensor circuit “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

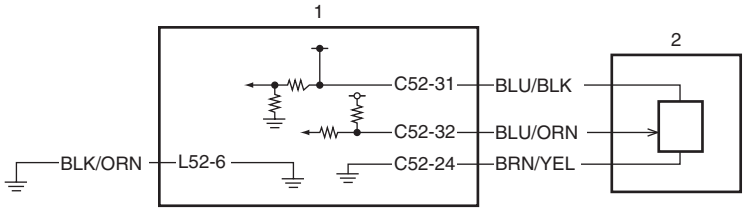
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check clutch stroke sensor circuit for shorted to power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-34”. 3) If connection is OK, turn ignition switch ON and measure voltage between ground and terminal “C52-34” of TCM (Automated Manual Transaxle) connector (harness side). *Is it 0 – 1 V?*	Go to Step 3.	“WHT/BLU” circuit shorted to power circuit.
3	**Check clutch stroke sensor circuit for shorted to ground** 1) Disconnect clutch stroke sensor connector with ignition switch OFF. 2) Check for proper connection to clutch stroke sensor at “C52-34”. 3) If connection is OK, measure resistance between terminal “WHT/BLU” of clutch stroke sensor connector (harness side) and terminal “C52-34” of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 4.	“WHT/BLU” circuit open or high resistance circuit.
4	**Check clutch stroke sensor ground circuit** 1) Connect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Measure resistance between terminal “BRN” of clutch stroke sensor connector (harness side) and ground. *Is resistance below 5 Ω?*	Go to Step 5.	“BRN” circuit open.

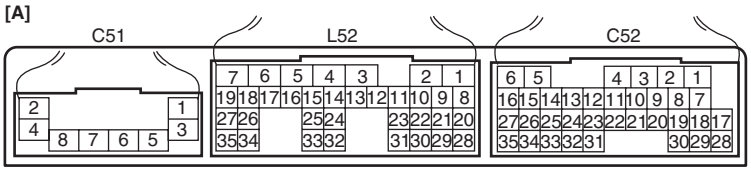
Step	Action	Yes	No
5	**Inspect clutch stroke sensor** 1) Inspect clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”. *Is clutch stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace clutch stroke sensor.

DTC P1858: Gate Select Position Circuit “B” Low

S7N20A5404043

Wiring Diagram





I4RS0B540200-02

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Select stroke sensor “B”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Select stroke sensor “B” voltage is 0.2 V or less for 0.5 sec.	• Select stroke sensor “B” • Select stroke sensor circuit “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

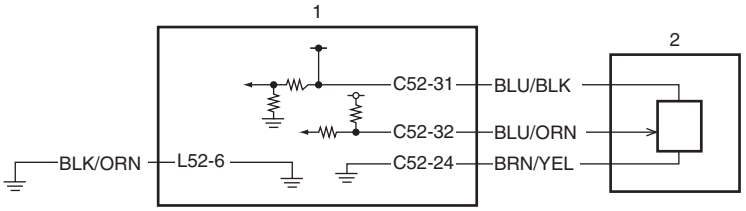
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.

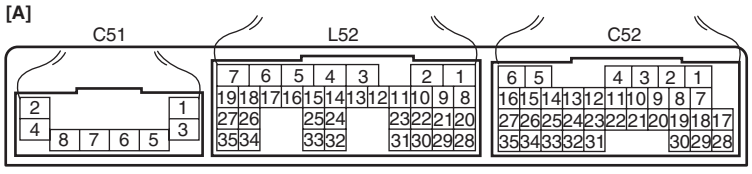
Step	Action	Yes	No
2	**Check select stroke sensor circuit for shorted to ground** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "C52-32". 3) If connection is OK, check continuity between ground and terminal "C52-32" of TCM (Automated Manual Transaxle) connector (harness side). *Is continuity indicated?*	"BLU/ORN" circuit shorted to ground.	Go to Step 3.
3	**Check select stroke sensor power circuit** 1) Connect TCM (Automated Manual Transaxle) connector and disconnect select stroke sensor connector with ignition switch OFF. 2) Check for proper connection to select stroke sensor "BLU/BLK" circuit. 3) If connection is OK, measure voltage between ground and terminal "BLU/BLK" of select stroke sensor connector (harness side). *Is it 4 – 5 V?*	Go to Step 4.	"BLU/BLK" circuit open or shorted to ground. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
4	**Inspect select stroke sensor** 1) Inspect select stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is select stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace select stroke sensor.

DTC P1859: Gate Select Position Circuit "B" High

S7N20A5404044

Wiring Diagram





I4RS0B540200-02

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Select stroke sensor "B"	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Select stroke sensor “B” voltage is 4.8 V or more for 0.5 sec.	• Select stroke sensor “B” • Select stroke sensor circuit “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

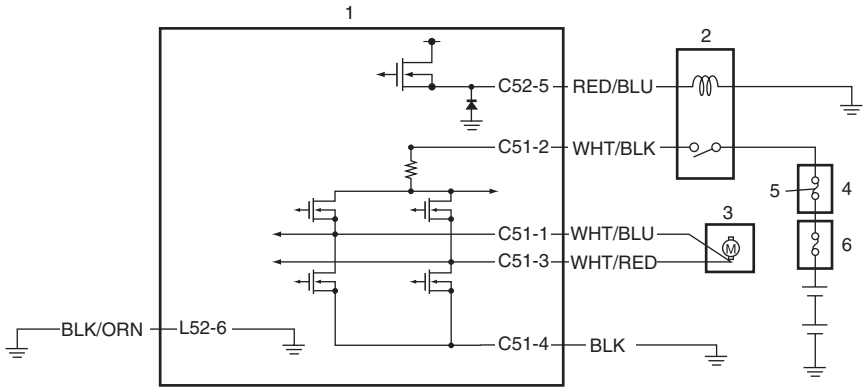
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check select stroke sensor circuit for shorted to power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-32”. 3) If connection is OK, turn ignition switch ON and measure voltage between ground and terminal “C52-32” of TCM (Automated Manual Transaxle) connector (harness side). *Is it 0 – 1 V?*	Go to Step 3.	“BLU/ORN” circuit shorted to power circuit.
3	**Check select stroke sensor circuit for shorted to ground** 1) Disconnect select stroke sensor connector with ignition switch OFF. 2) Check for proper connection to select stroke sensor at “C52-32”. 3) If connection is OK, and measure resistance between terminal “BLU/ORN” of disconnected harness side select stroke sensor connector and terminal “C52-32” of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 4.	“BLU/ORN” circuit open or high resistance circuit.
4	**Check select stroke sensor ground circuit** 1) Connect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Measure resistance between terminal “BRN/YEL” of select stroke sensor connector (harness side) and ground. *Is resistance below 5 Ω?*	Go to Step 5.	“BRN/YEL” circuit open.

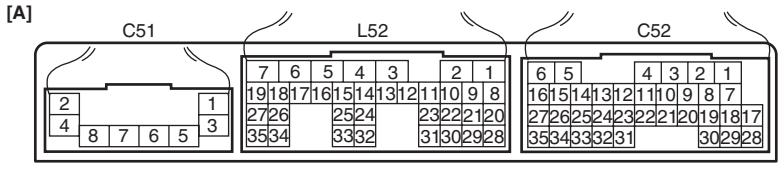
Step	Action	Yes	No
5	**Inspect select stroke sensor** 1) Inspect select stroke sensor referring to “Shift Stroke Sensor and Select Stroke Sensor Inspection”. *Is select stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace select stroke sensor.

DTC P1880 / P1881: Gear Shift Actuator Circuit Low / High

S7N20A5404045

Wiring Diagram





I4RS0B540201-03

1. TCM (Automated Manual Transaxle)	5. Automated Manual Transaxle fuse
2. Motor relay	6. Main fuse box
3. Shift motor	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
4. Relay box	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
P1880: Shift motor voltage is 0.5 V or lower for 0.5 second or 14 V or higher. **P1881:** TCM detects either of the following conditions. • While current is supplied to shift motor, 1 A or lower current is detected for 0.5 second while specified current value is 5 A or higher. • While no current is supplied to shift motor, abnormal voltage is applied to shift motor terminal for 0.5 second or more.	• Shift motor circuit • Shift and select actuator assembly (shift motor) • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

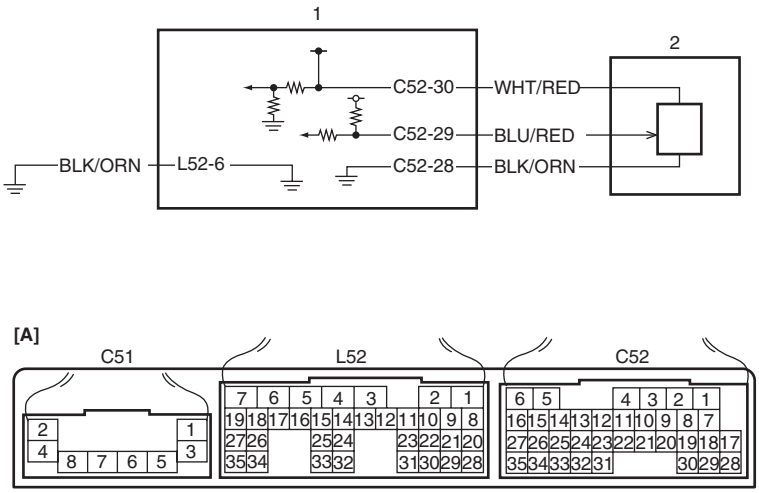
DTC Troubleshooting

Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check shift motor circuit resistance** 1) Disconnect TCM (Automated Manual Transaxle) connectors with ignition switch OFF. 2) Check for proper connection to shift motor connector at “C51-1” and “C51-3”. 3) If connection is OK, measure resistance of shift motor circuit. **Shift motor specification** **Between terminals “C51-1” and “C51-3”: 0.1 – 100 Ω** **Between terminal “C51-1” / “C51-3” and ground: No continuity** *Is resistance as specified?*	Go to Step 3.	“WHT/BLU” and/or “WHT/RED” circuit open or short.
3	**Check shift motor circuit for shorted to power circuit** 1) Turn ON ignition switch, measure voltage between ground and “C51-1” / “C51-3” wire terminal of TCM (Automated Manual Transaxle) connector (harness side). *Are they 0 – 1 V?*	“WHT/BLU” / “WHT/RED” circuit shorted to power circuit.	Go to Step 4.
4	**Check shift motor ground circuit** 1) Check for proper connection to shift motor connector at “C51-4”. 2) If connection is OK, measure resistance between ground and “C51-4” of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 5.	“BLK” circuit open.
5	**Inspect shift motor** 1) Inspect shift motor referring to “Shift and Select Actuator Inspection”. *Is shift motor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift and select actuator assembly.

DTC P1882: Gear Shift Position Circuit “B” Low

S7N20A5404046

Wiring Diagram



I4RS0B540202-03

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Shift stroke sensor “B”	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Shift stroke sensor “B” voltage is 0.2 V or more for 0.5 sec.	• Shift stroke sensor “B” • Shift stroke sensor circuit “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

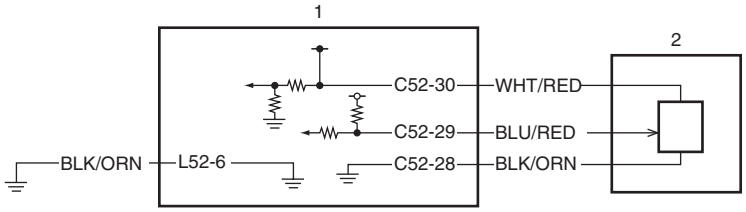
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Check shift stroke sensor circuit for shorted to ground** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “C52-29”. 3) If connection is OK, check continuity between ground and terminal “C52-29” of TCM (Automated Manual Transaxle) connector (harness side). *Is continuity indicated?*	“BLU/RED” circuit shorted to ground	Go to Step 3.

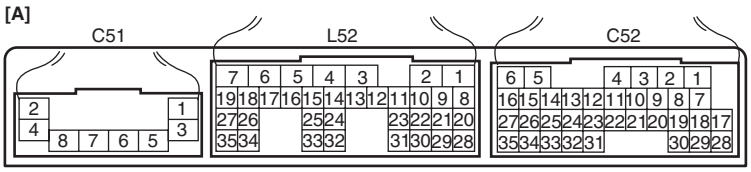
Step	Action	Yes	No
3	**Check shift stroke sensor power circuit** 1) Connect TCM (Automated Manual Transaxle) connector and disconnect shift stroke sensor connector with ignition switch OFF. 2) Check for proper connection to shift stroke sensor "WHT/RED" circuit. 3) If connection is OK, measure voltage between ground and terminal "WHT/RED" of shift stroke sensor connector (harness side). *Is it 4 – 5 V?*	Go to Step 4.	"WHT/RED" circuit open or shorted to ground. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.
4	**Inspect shift stroke sensor** 1) Inspect shift stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is shift stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift stroke sensor.

DTC P1883: Gear Shift Position Circuit "B" High

S7N20A5404047

Wiring Diagram





I4RS0B540202-03

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Shift stroke sensor "B"	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Clutch stroke sensor "B" voltage is 4.8 V or more for 0.5 sec.	• Clutch stroke sensor "B" • Clutch stroke sensor circuit "B" • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to "D" range.
3) Check DTC.

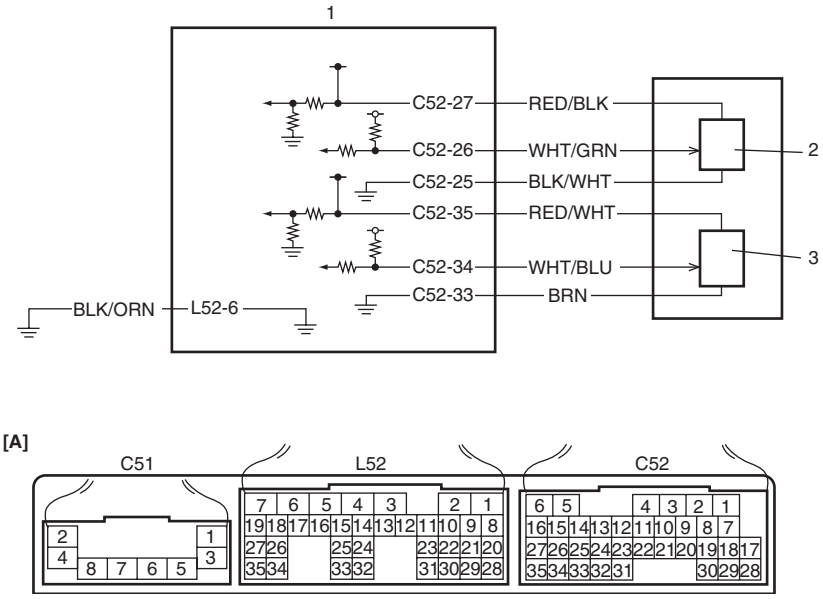
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Check shift stroke sensor circuit for shorted to power circuit** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "C52-29". 3) If connection is OK, turn ignition switch ON and measure voltage between ground and terminal "C52-29" of TCM (Automated Manual Transaxle) connector (harness side). *Is it 0 – 1 V?*	Go to Step 3.	"BLU/RED" circuit shorted to power circuit.
3	**Check shift stroke sensor circuit for shorted to ground** 1) Disconnect shift stroke sensor connector with ignition switch OFF. 2) Check for proper connection to shift stroke sensor at "C52-29". 3) If connection is OK, and measure resistance between terminal "BLU/RED" of shift stroke sensor connector (harness side) and terminal "C52-29" of TCM (Automated Manual Transaxle) connector (harness side). *Is resistance below 5 Ω?*	Go to Step 4.	"BLU/RED" circuit open or high resistance circuit.
4	**Check shift stroke sensor ground circuit** 1) Connect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Measure resistance between terminal "BLK/ORN" of shift stroke sensor connector (harness side) and ground. *Is resistance below 5 Ω?*	Go to Step 5.	"BLK/ORN" circuit open.
5	**Inspect shift stroke sensor** 1) Inspect shift stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is shift stroke sensor in good condition?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift stroke sensor.

DTC P1900: Clutch Position Sensor “A/B” Correlation

S7N20A5404048

Wiring Diagram



I4RS0B540203-02

1. TCM (Automated Manual Transaxle)	3. Clutch stroke sensor “B”
2. Clutch stroke sensor “A”	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference in stroke value of clutch stroke sensors “A” and “B” is 2 mm or more for 1 second.	• Clutch stroke sensor “A” and/or “B” • Clutch stroke sensor circuit “A” and/or “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

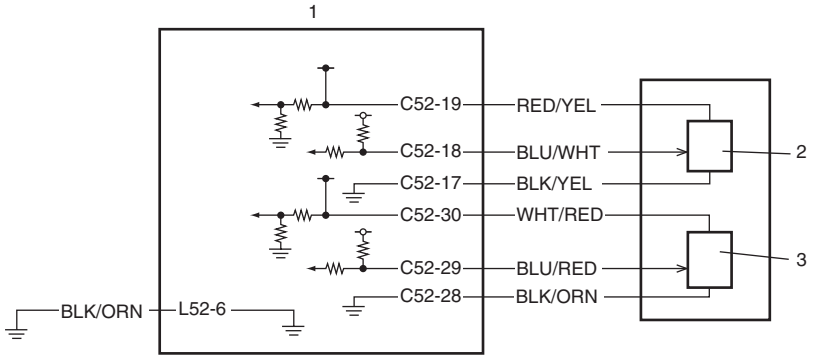
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.
2	**Inspect clutch stroke sensor** 1) Inspect clutch stroke sensor referring to “Clutch Stroke Sensor Inspection”. *Is clutch stroke sensor in good condition?*	Go to Step 3.	Replace clutch stroke sensor.

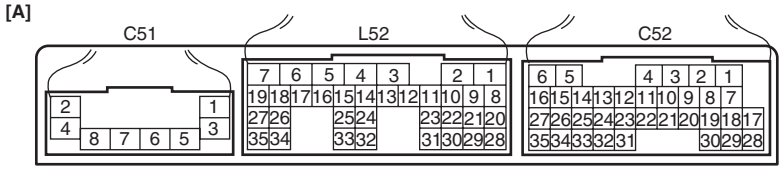
Step	Action	Yes	No
3	**Check clutch stroke sensor resistance** 1) Disconnect TCM (Automated Manual Transaxle) connector and clutch stroke sensor connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “RED/BLK”, “WHT/GRN”, “BLK/WHT”, “RED/WHT”, “WHT/BLU” and “BRN”. 3) If connection is OK, measure resistance “RED/BLK”, “WHT/GRN”, “BLK/WHT”, “RED/WHT”, “WHT/BLU” and “BRN” wire harnesses between sensor connector and TCM (Automated Manual Transaxle) connector. *Is each resistance below 1 Ω?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace clutch stroke sensor.

DTC P1901: Gear Shift Position Sensor “A/B” Correlation

S7N20A5404049

Wiring Diagram





I4RS0B540204-03

1. TCM (Automated Manual Transaxle)	3. Shift stroke sensor “B”
2. Shift stroke sensor “A”	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference in stroke value of shift stroke sensors “A” and “B” is 2 mm or more for 1 second.	• Shift stroke sensor “A” and/or “B” • Shift stroke sensor circuit “A” and/or “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

DTC Troubleshooting

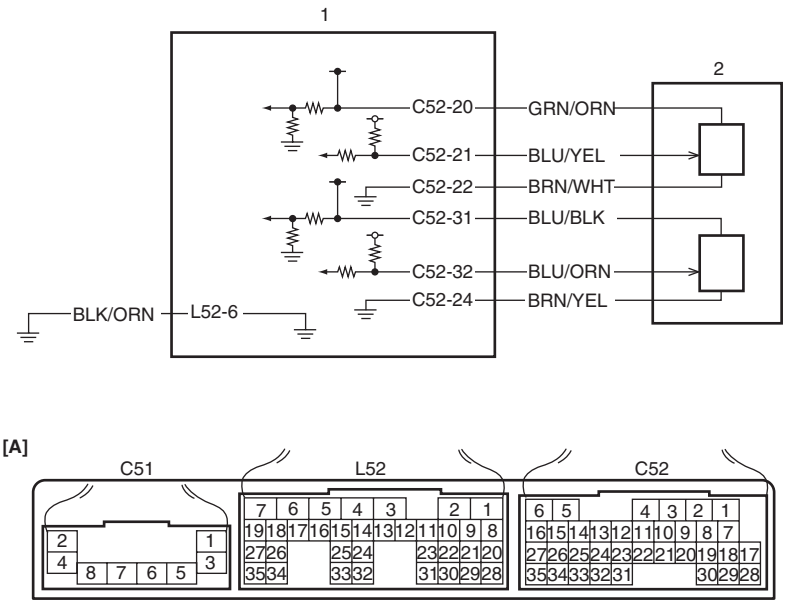
Step	Action	Yes	No
1	*Was “Automated Manual Transaxle System Check” performed?*	Go to Step 2.	Go to “Automated Manual Transaxle System Check”.

Step	Action	Yes	No
2	**Inspect shift stroke sensor** 1) Inspect shift stroke sensor referring to “Shift Stroke Sensor and Select Stroke Sensor Inspection”. *Is shift stroke sensor in good condition?*	Go to Step 3.	Replace shift stroke sensor.
3	**Check shift stroke sensor resistance** 1) Disconnect TCM (Automated Manual Transaxle) connector and shift stroke sensor connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at “RED/YEL”, “BLU/WHT”, “BLK/YEL”, “WHT/RED”, “BLU/RED” and “BLK/ORN”. 3) If connection is OK, measure resistance “RED/YEL”, “BLU/WHT”, “BLK/YEL”, “WHT/RED”, “BLU/RED” and “BLK/ORN” wire harnesses between sensor connector and TCM (Automated Manual Transaxle) connector. *Is each resistance below 1 Ω?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”. If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace shift stroke sensor.

DTC P1960: Gate Select Position Sensor “A/B” Correlation

S7N20A5404050

Wiring Diagram



I4RS0B540205-03

1. TCM (Automated Manual Transaxle)	[A]: Terminal arrangement of TCM (Automated Manual Transaxle) connector (viewed from harness side)
2. Select stroke sensor	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Difference in stroke value of select stroke sensors “A” and “B” is 2 mm or more for 1 second.	• Select stroke sensor “A” and/or “B” • Select stroke sensor circuit “A” and/or “B” • TCM (Automated Manual Transaxle)

DTC Confirmation Procedure

1) Clear DTC using scan tool.
2) Shift select lever to “D” range.
3) Check DTC.

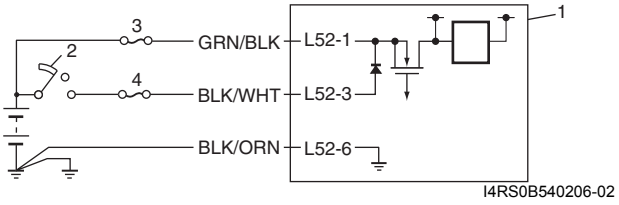
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "Automated Manual Transaxle System Check" performed?*	Go to Step 2.	Go to "Automated Manual Transaxle System Check".
2	**Inspect select stroke sensor** 1) Inspect select stroke sensor referring to "Shift Stroke Sensor and Select Stroke Sensor Inspection". *Is select stroke sensor in good condition?*	Go to Step 3.	Replace select stroke sensor.
3	**Check select stroke sensor resistance** 1) Disconnect TCM (Automated Manual Transaxle) connector and select stroke sensor connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "GRN/ORN", "BLU/YEL", "BRN/WHT", "BLU/BLK", "BLU/ORN" and "BRN/YEL". 3) If connection is OK, measure resistance "GRN/ORN", "BLU/YEL", "BRN/WHT", "BLU/BLK", "BLU/ORN" and "BRN/YEL" wire harnesses between sensor connector and TCM (Automated Manual Transaxle) connector. *Is each resistance below 1 Ω?*	Intermittent trouble or faulty TCM (Automated Manual Transaxle). Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good TCM (Automated Manual Transaxle) and recheck.	Replace select stroke sensor.

TCM (Automated Manual Transaxle) Power and Ground Circuit Check

S7N20A5404051

Wiring Diagram



I4RS0B540206-02

1. TCM (Automated Manual Transaxle)	3. Automated Manual Transaxle fuse
2. Ignition switch	4. IG SIG fuse

Troubleshooting

Step	Action	Yes	No
1	**Circuit fuse check** 1) Disconnect TCM (Automated Manual Transaxle) connector with ignition switch OFF. 2) Check for proper connection to TCM (Automated Manual Transaxle) at "L52-1", "L52-3" and "L52-6" terminals. 3) If OK, check "Automated Manual Transaxle" fuse and "IG SIG" fuse for fuse blown. *Are "Automated Manual Transaxle" fuse and "IG SIG" fuse in good condition?*	Go to Step 2.	Replace fuse(s) and check for short in circuits connected to their fuse.
2	**Check power supply circuit** 1) Turn ignition switch to ON position. 2) Measure voltage between terminal "L52-1" of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is voltage 10 – 14 V?*	Go to Step 3.	"GRN/BLK" circuit open or shorted to ground.

Step	Action	Yes	No
3	**Check ignition signal** 1) Turn ignition switch to ON position. 2) Measure voltage between terminal “L52-3” of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is voltage 10 – 14 V?*	Go to Step 5.	Go to Step 4.
4	**Check ignition switch** 1) Check ignition switch referring to “Ignition Switch Inspection in Section 9C”. *Is ignition switch in good condition?*	“BLK/WHT” circuit open or shorted to ground.	Replace ignition switch
5	**Check TCM (Automated Manual Transaxle) ground circuit** 1) Measure resistance between terminal “L52-6” of TCM (Automated Manual Transaxle) connector (harness side) and ground. *Is resistance 1 Ω or less?*	Substitute a known-good TCM (Automated Manual Transaxle) and recheck.	“BLK/ORN” circuit open.

Inspection of TCM (Automated Manual Transaxle) and Its Circuits

S7N20A5404052

TCM (Automated Manual Transaxle) and its circuits can be checked at TCM (Automated Manual Transaxle) wiring connectors by measuring voltage, pulse signal and resistance.

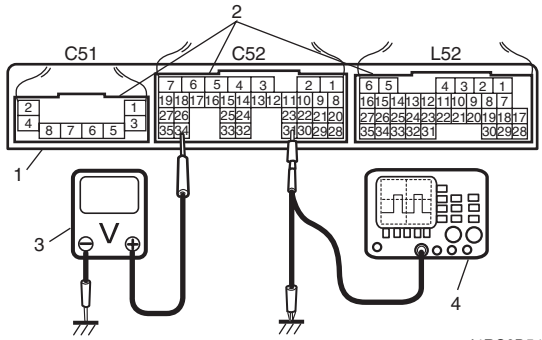
⚠ CAUTION

TCM (Automated Manual Transaxle) cannot be checked by itself, it is strictly prohibited to connect voltmeter or ohmmeter to TCM (Automated Manual Transaxle) with connector disconnected from it.

1) Remove TCM (Automated Manual Transaxle) (1) from vehicle referring to “Transmission Control Module (TCM) Removal and Installation”.
2) Connect TCM (Automated Manual Transaxle) connectors (2) to TCM (Automated Manual Transaxle).
3) Check voltage and/or pulse signal at each terminal of connectors connected, using voltmeter (3) and oscilloscope (4).

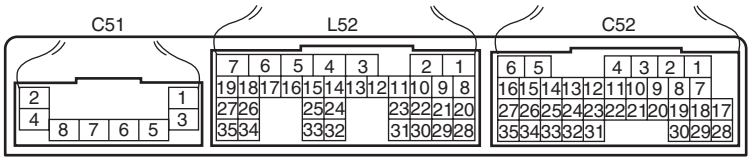
NOTE

- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk (*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**



I4RS0B540207-01

Terminal arrangement of TCM (Automated Manual Transaxle) coupler (Viewed from harness side)



I4RS0B540208-02

Connector "C51"

Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
1	WHT/BLU	Shift motor control 1	6 – 8 V	Ignition switch turned ON	Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.
			*0 – 0.6 V↑↓10 – 14 V ("1. Reference Waveform No. 1: ")	Ignition switch turned ON, shift selector lever "N" to "D" position.	
2	WHT/BLK	Motor main relay	8 – 14 V	Ignition switch turned ON	—
3	WHT/RED	Shift motor control 2	6 – 8 V	Ignition switch turned ON	—
			*0 – 0.6 V↑↓10 – 14 V ("1. Reference Waveform No. 1: ")	Ignition switch turned ON, shift selector lever "N" to "D" position.	Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.
4	BLK	Motor power ground	0 – 1 V	Ignition switch turned ON	—
5	BLU/RED	Select motor control 2	6 – 8 V	Ignition switch turned ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("2. Reference Waveform No. 2: ")	Ignition switch turned ON, shift selector lever "N" to "R" position.	Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.
6	BLU/WHT	Select motor control 1	6 – 8 V	Ignition switch turned ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("2. Reference Waveform No. 2: ")	Ignition switch turned ON, shift selector lever "N" to "R" position.	Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.
7	BRN	Clutch motor control 2	6 – 8 V	Ignition switch turned ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("3. Reference Waveform No. 3: ")	Ignition switch turned ON, operate clutch engagement condition to disengagement condition.	Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.
8	GRN	Clutch motor control 1	6 – 8 V	Ignition switch turned ON	—
			*0 – 0.6 V ↑↓ 10 – 14 V ("3. Reference Waveform No. 3: ")	Ignition switch turned ON, actuate clutch engagement to disengagement	Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.

Connector “C52”

Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
1	RED	CAN communication line (High)	*2.5 – 4.5 V (“4. Reference Waveform No. 4: ”)	Ignition switch turned ON with engine stop.	CAN communication line signal is pulse. Pulse signal is displayed with a regular frequency varies depending on engine condition.
2	WHT	CAN communication line (Low)	*0.5 – 2.5 V (“4. Reference Waveform No. 4: ”)	Ignition switch turned ON with engine stop.	CAN communication line signal is pulse. Pulse signal is displayed with a regular frequency varies depending on engine condition.
3	PNK	Neutral switch	0 – 1 V	Ignition switch turned ON	—
			8 – 14 V	Ignition switch turned to start position with gear position at neutral.	—
4	ORN	Starter relay control	0 – 1 V	Ignition switch turned ON	—
			8 – 14 V	Ignition switch turned to start position with gear position at neutral.	—
5	RED/BLU	Motor main relay control	8 – 14 V	Ignition switch turned ON	—
6	YEL/GRN	Starter signal	0 – 1 V	Ignition switch turned ON	—
			8 – 14 V	Ignition switch turned to start position with gear position at neutral.	—
7	—	—	—	—	—
8	—	—	—	—	—
9	RED	Reverse signal	0 – 1 V	Ignition switch ON, selector lever at other than “R” range	—
			8 – 14 V	Ignition switch ON, selector lever at “R” range	—
10	GRY/BLU	Engine revolution signal	4.5 – 5.5 V	Ignition switch turned ON with engine stop.	—
			*0 – 0.6 V ↑↓ 4.5 – 5.5 V (“5. Reference Waveform No. 5: ”)	Engine running at idling with after warming up.	Sensor signal is pulse. Pulse frequency varies depending on engine speed. (12 pulses are generated par 1 crankshaft revolution.)
11	—	—	—	—	—
12	—	—	—	—	—
13	—	—	—	—	—
14	—	—	—	—	—
15	BLU	Input shaft speed sensor (–)	0 – 1 V	Ignition switch turned ON	—
16	PNK	Input shaft speed sensor (+)	* (“6. Reference Waveform No. 6: ”)	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (44 pulses are generated par 1 input shaft revolution.)

Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
17	BLK/YEL	Shift stroke sensor ground 1	0 – 1 V	Ignition switch turned ON	—
18	BLU/WHT	Shift stroke sensor signal 1	1.4 – 1.6 V	Ignition switch turned ON and gear position at 1st, 3rd or 5th	—
			2.4 – 2.6 V	Ignition switch turned ON and gear position at Neutral	—
			3.8 – 4.0 V	Ignition switch turned ON and gear position at 2nd, 4th or Reverse	—
19	RED/YEL	Shift stroke sensor power 1	4.7 – 5.3 V	Ignition switch turned ON	—
20	GRN/ORN	Select stroke sensor power 1	4.7 – 5.3 V	Ignition switch turned ON	—
21	BLU/YEL	Select stroke sensor signal 1	1.4 – 1.6 V	Ignition switch turned ON and gear position at 5th or Reverse	—
			2.4 – 2.6 V	Ignition switch turned ON and gear position at 3rd or 4th	—
			3.5 – 3.7 V	Ignition switch turned ON and gear position at 1st or 2nd	—
22	BRN/WHT	Select stroke sensor ground 1	0 – 1 V	Ignition switch turned ON	—
23	PPL/WHT	Vehicle speed signal	4.5 – 5.5 V	Ignition switch turned ON with vehicle stop.	—
			*0 – 0.6 V ↑↓ 4.5 – 5.5 V (“7. Reference Waveform No. 7: ”)	Vehicle running.	Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (2548 pulses are generated par min. at 60 km/h, 37.5 mph.)
24	BRN/YEL	Select stroke sensor ground 2	0 – 1 V	Ignition switch turned ON	—
25	BLK/WHT	Clutch stroke sensor ground 1	0 – 1 V	Ignition switch turned ON	—
26	WHT/GRN	Clutch stroke sensor signal 1	1.1 – 1.3 V	Ignition switch turned ON with clutch engagement condition	—
			1.9 – 2.1 V	Ignition switch turned ON with partial clutch engagement condition	—
			2.5 – 2.7 V	Ignition switch turned ON with clutch disengagement condition	—
27	RED/BLK	Clutch stroke sensor power 1	4.7 – 5.3 V	Ignition switch turned ON	—
28	BLK/ORN	Shift stroke sensor ground 2	0 – 1 V	Ignition switch turned ON	—

Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
29	BLU/RED	Shift stroke sensor signal 2	1.4 – 1.6 V	Ignition switch turned ON and gear position at 1st, 3rd or 5th	—
			2.4 – 2.6 V	Ignition switch turned ON and gear position at Neutral	—
			3.8 – 4.0 V	Ignition switch turned ON and gear position at 2nd, 4th or Reverse	—
30	WHT/RED	Shift stroke sensor power 2	4.7 – 5.3 V	Ignition switch turned ON	—
31	BLU/BLK	Select stroke sensor power 2	4.7 – 5.3 V	Ignition switch turned ON	—
32	BLU/ORN	Select stroke sensor signal 2	1.4 – 1.6 V	Ignition switch turned ON and gear position at 5th or Reverse	—
			2.4 – 2.6 V	Ignition switch turned ON and gear position at 3rd or 4th	—
			3.5 – 3.7 V	Ignition switch turned ON and gear position at 1st or 2nd	—
33	BRN	Clutch stroke sensor ground 2	0 – 1 V	Ignition switch turned ON	—
34	WHT/BLU	Clutch stroke sensor signal 2	1.1 – 1.3 V	Ignition switch turned ON with clutch engagement condition	—
			1.9 – 2.1 V	Ignition switch turned ON with partial clutch engagement condition	—
			2.5 – 2.7 V	Ignition switch turned ON with clutch disengagement condition	—
35	RED/WHT	Clutch stroke sensor power 2	4.7 – 5.3 V	Ignition switch turned ON	—

Connector “L52”

Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
1	GRN/BLK	Main power supply	8 – 16 V	Constantly	—
2	—	—	—	—	—
3	BLK/WHT	Ignition switch	8 – 16 V	Ignition switch turned ON	—
4	—	—	—	—	—
5	BLU	Shift lock solenoid	0 – 1 V	Ignition switch turned ON and selector lever locked	—
			8 – 14 V	Ignition switch turned ON and selector lever unlocked	—
6	BLK/ORN	Ground	0 – 1 V	Ignition switch turned ON	—
7	—	—	—	—	—
8	—	—	—	—	—
9	—	—	—	—	—
10	—	—	—	—	—

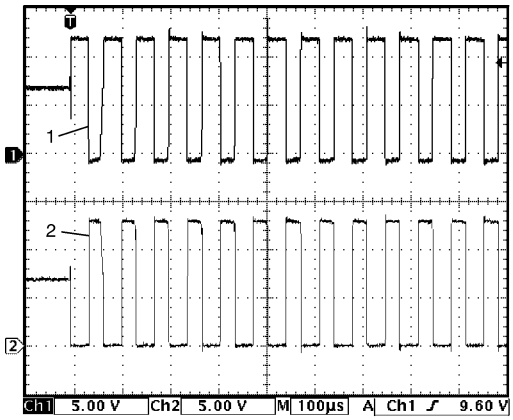
Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
11	GRN	Shift position sensor 3	0 – 1 V	Ignition switch ON, selector lever at other than “N” and “R” range	—
			8 – 14 V	Ignition switch ON, selector lever at “N” or “R” range	—
12	LT GRN	Shift position sensor 2	0 – 1 V	Ignition switch ON, selector lever at other than “N” range	—
			8 – 14 V	Ignition switch ON, selector lever at “N” range	—
13	LT GRN/ BLK	Shift position sensor 1	0 – 1 V	Ignition switch ON, selector lever at other than “R” range	—
			8 – 14 V	Ignition switch ON, selector lever at “R” range	—
14	—	—	—	—	—
15	LT GRN/ RED	Shift switch 5	0 – 1 V	Ignition switch ON, selector lever at other than “+” range	—
			8 – 14 V	Ignition switch ON, selector lever at “+” range	—
16	GRN/YEL	Shift switch 4	0 – 1 V	Ignition switch ON, selector lever at other than “–” range	—
			8 – 14 V	Ignition switch ON, selector lever at “–” range	—
17	RED/BLK	Shift switch 3	0 – 1 V	Ignition switch ON, selector lever at “–”, “+” or “M” range	—
			8 – 14 V	Ignition switch ON, selector lever at other than above range	—
18	RED/BLU	Shift switch 2	0 – 1 V	Ignition switch ON, selector lever at other than “R” range	—
			8 – 14 V	Ignition switch ON, selector lever at “R” range	—
19	RED/WHT	Shift switch 1	0 – 1 V	Ignition switch ON, selector lever at “R” or “N” range	—
			8 – 14 V	Ignition switch ON, selector lever at other than “R” and “N” range	—
20	—	—	—	—	—
21	—	—	—	—	—
22	—	—	—	—	—
23	YEL	Shift mode switch	0 – 1 V	ECO mode switch pressed	—
			8 – 14 V	ECO mode switch released	—
24	PPL/WHT	Data link connector	8 – 14 V	Ignition switch turned ON	—

Terminal number	Wire color	Circuit	Normal voltage	Condition	Remark
25	—	—	—	—	—
26	—	—	—	—	—
27	—	—	—	—	—
28	—	—	—	—	—
29	—	—	—	—	—
30	—	—	—	—	—
31	RED	Select switch sensor power	8 – 14 V	Ignition switch turned ON	—
32	—	—	—	—	—
33	—	—	—	—	—
34	GRN/WHT	Stop lamp signal	0 – 1 V	Brake pedal released	—
			8 – 14 V	Brake pedal depressed	—
35	PNK/BLK	Stop lamp switch	0 – 1 V	Ignition switch turned ON, brake pedal depressed	—
			8 – 14 V	Ignition switch turned ON, brake pedal released	—

1. Reference Waveform No. 1

Gear shift motor control 1 and 2 signal at ignition switch turned ON

Measurement terminal	CH1: C51-1 to C51-4 CH2: C51-3 to C51-4
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 100 μs/DIV
Measurement condition	Ignition switch turned ON, shift selector lever “N” to “D” range



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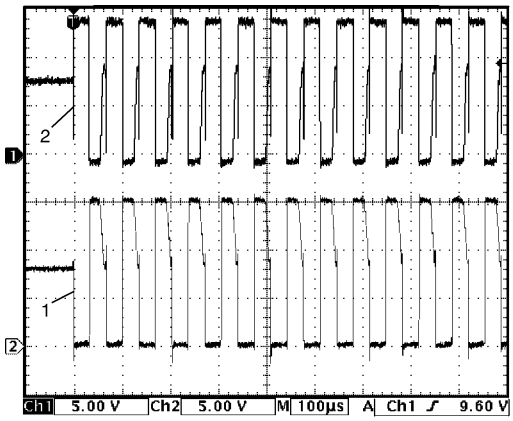
1. Gear shift motor control 1
2. Gear shift motor control 2

2. Reference Waveform No. 2

Gate select motor control 1 and 2 signal at ignition switch turned ON

Measurement terminal	CH1: C51-5 to C51-4 CH2: C51-6 to C51-4
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 100 μs/DIV
Measurement condition	Ignition switch turned ON, shift selector lever “N” to “R” range



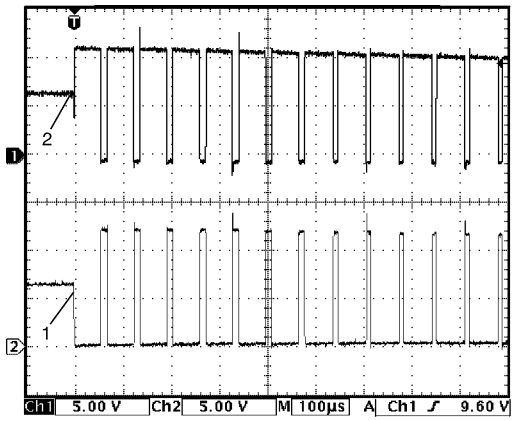
I4RS0B540210-01

1. Gate select motor control 2
2. Gate select motor control 1

3. Reference Waveform No. 3

Clutch motor control 1 and 2 signal at ignition switch turned ON

Measurement terminal	CH1: C51-7 to C51-4 CH2: C51-8 to C51-4
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 100 μs/DIV
Measurement condition	Ignition switch turned ON, actuate clutch engagement to disengagement



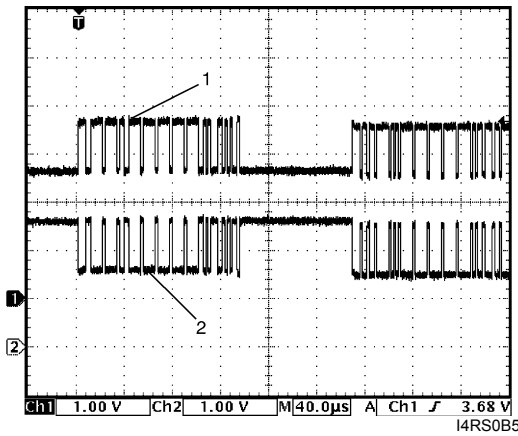
I4RS0B540211-01

1.	Clutch motor control 2
2.	Clutch motor control 1

4. Reference Waveform No. 4

CAN communication line signal from ECM at ignition switch turned ON

Measurement terminal	CH1: C52-1 to L52-6 CH2: C52-2 to L52-6
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1 V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch turned ON (Depending on engine condition)



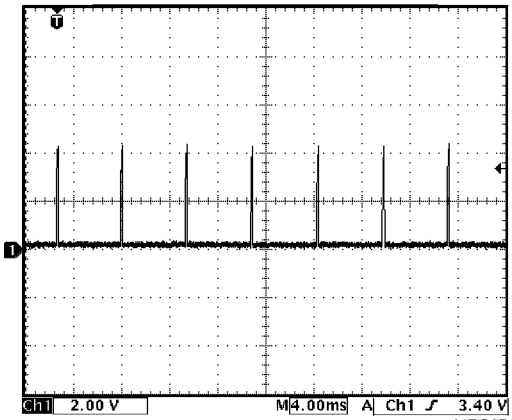
I4RS0B540212-01

1.	CAN communication line signal (High)
2.	CAN communication line signal (Low)

5. Reference Waveform No. 5

Engine revolution signal

Measurement terminal	CH1: C52-10 to L52-6
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	• After warmed up to normal operating temperature • Engine at specified idle speed with “N” range

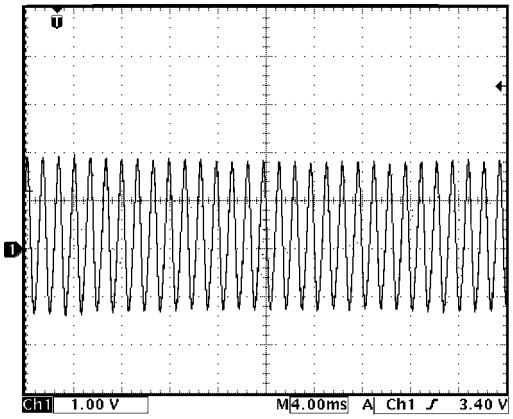


I4RS0B540213-01

6. Reference Waveform No. 6

Input shaft speed sensor signal

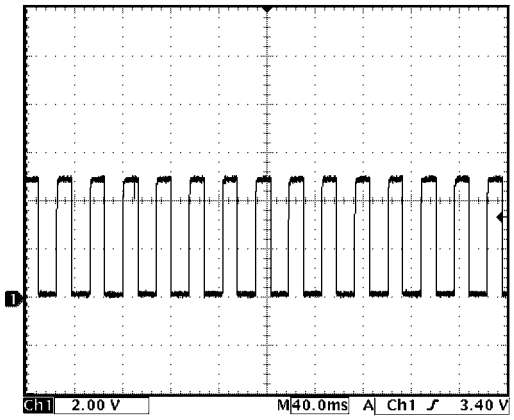
Measurement terminal	CH1: C52-16 to L52-6
Oscilloscope setting	CH1: 1 V/DIV TIME: 4 ms/DIV
Measurement condition	Engine speed at 2000 rpm



I4RS0B540214-01

7. Reference Waveform No. 7
VSS signal at 45 km/h (28 mph)

Measurement terminal	CH1: C52-23 to L52-6
Oscilloscope setting	CH1: 2 V/DIV TIME: 40 ms/DIV
Measurement condition	Drive vehicle at 45 km/h (28 mph)



I4RS0B540215-01

Repair Instructions

TCM (Automated Manual Transaxle) Initialization

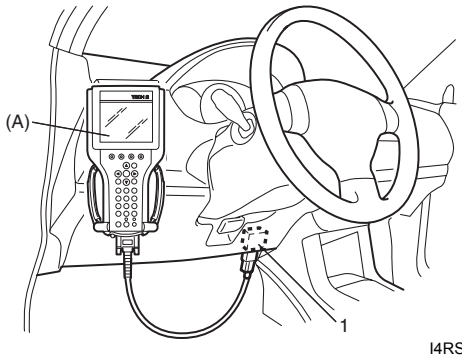
S7N20A5406001

NOTE

This work is necessary to learn TCM again.

1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I4RS0B540178-01

2) Perform “Initialize Clutch and Transmission” in “Misc Test” menu on scan tool.
3) Ignition OFF and wait for 10 seconds.

Clutch Position Control

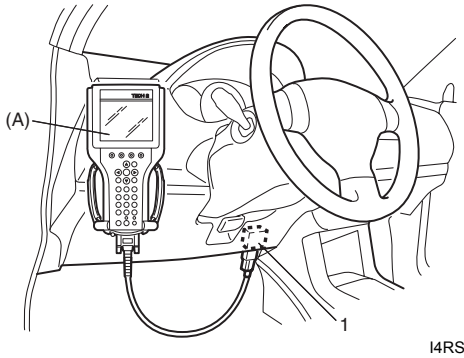
S7N20A5406002

NOTE

Be sure to perform this work before starting “Clutch Actuator Removal and Installation”.

1) Connect scan tool to DLC (1) with ignition switch OFF.

Special tool
(A): SUZUKI scan tool



I4RS0B540178-01

2) Perform “Clutch Clamp Position Control” in “Misc Test” menu on scan tool.

Automated Manual Transaxle Oil Change

S7N20A5406003

NOTE

Whenever vehicle is hoisted for any service work other than oil change, check for oil leakage.

1) Before changing or inspecting oil, be sure to stop engine and lift up vehicle horizontally.
2) With vehicle lifted up, check oil leakage. If leakage exists, correct or repair it.
3) Remove oil level / filler plug (2).
4) Remove drain plug (1), and drain oil.
5) Tighten oil drain plug with new gasket to specified torque.

Tightening torque
Oil drain plug (a): 39 N·m (3.9 kgf-m, 28.5 lbf-ft)

6) Pour new specified oil until oil level reaches bottom of oil filler plug hole (3) as shown in figure.

NOTE

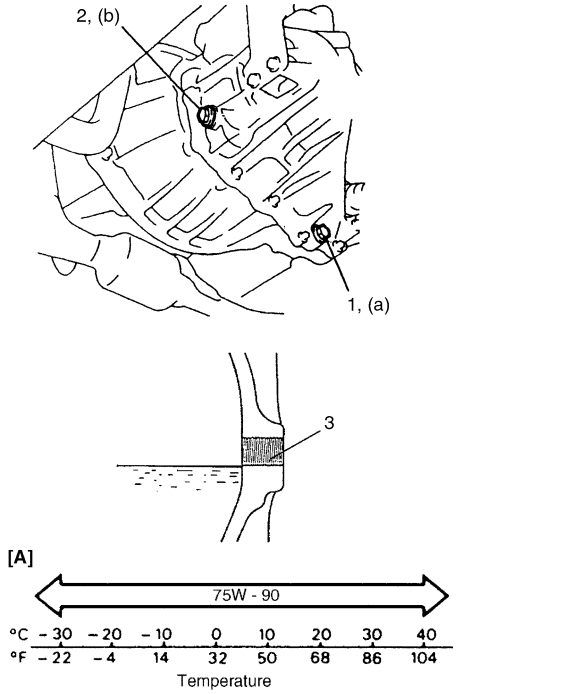
It is highly recommended to use API GL-4 75W-90 gear oil.

Transaxle oil specification
: API GL-4 (For SAE classification, refer to viscosity chart [A] in figure.)

Automated manual transaxle oil capacity
Reference: 1.75 liters (3.7/3.1 US/Imp. pt)

7) Tighten oil level / filler plug with new gasket to specified torque.

Tightening torque
Oil level / filler plug (a): 39 N·m (3.9 kgf-m, 28.5 lbf-ft)



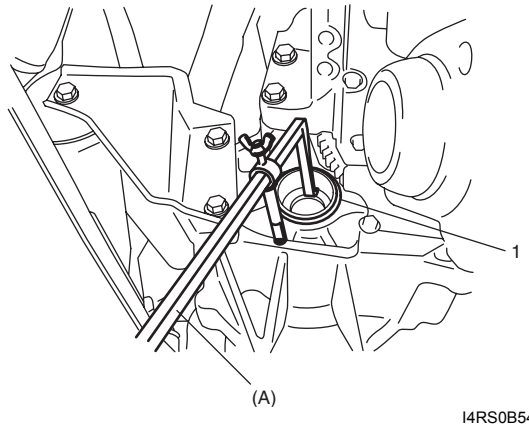
I4RS0B540217-01

Differential Side Oil Seal Replacement

S7N20A5406004

1) Drain transaxle oil.
2) Remove drive shaft assembly referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
3) Remove oil seals (1) using special tool.

Special tool
(A): 09913–50121



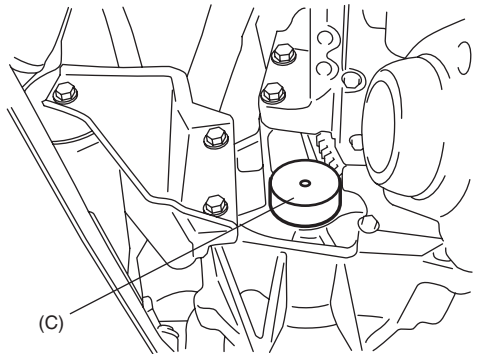
I4RS0B540218-01

4) Install a new oil seal (1) until it becomes flush with case surface using special tool and hammer.

NOTE

When installing oil seal, face its spring side inward.

Special tool
: 09913–70123 left side
: 09951–16090 left side
(C): 09951–46010 right side



I4RS0B540219-01

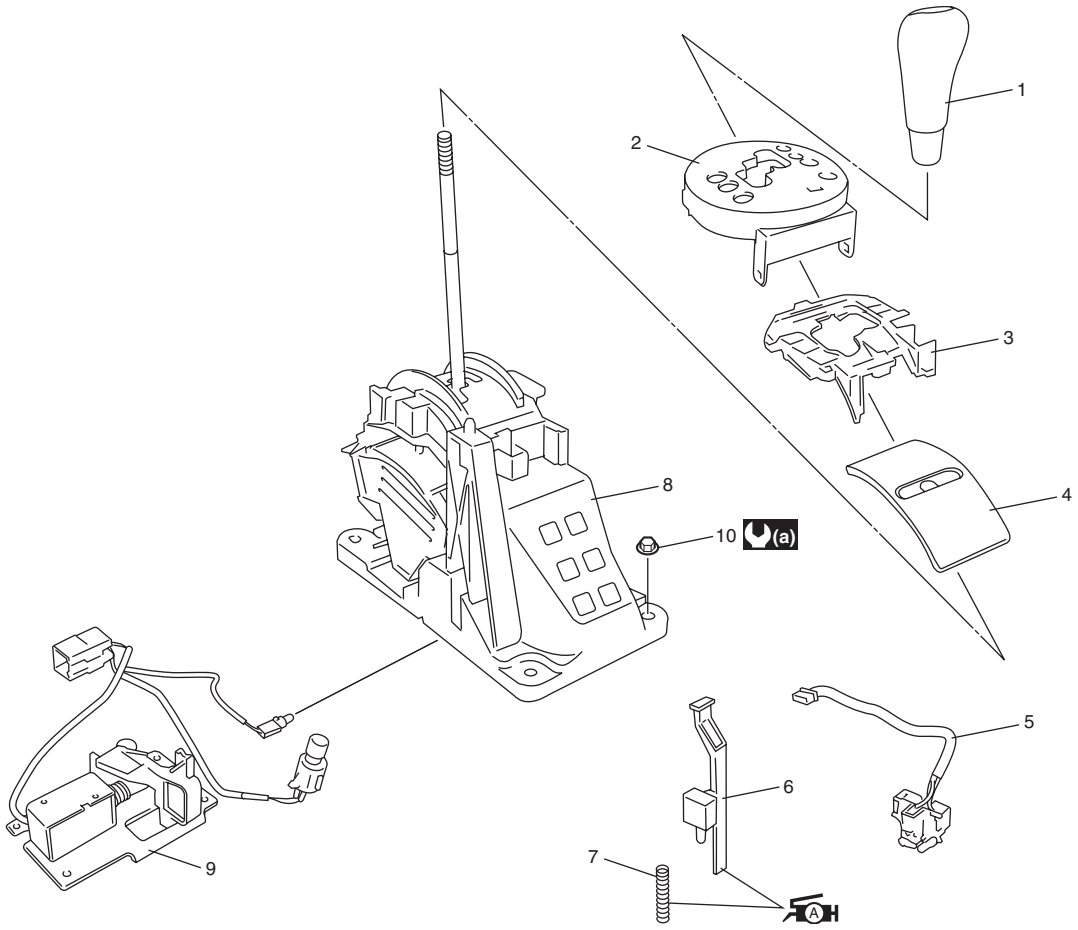
5) Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.

: Grease 99000–25010 (SUZUKI Super Grease A)

6) Install drive shaft assembly referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
7) Fill transaxle oil referring to “Automated Manual Transaxle Oil Change”, and make sure that oil seal has been sealed with oil seal.

Shift Selector Components

S7N20A5406005



I4RS0B540001-01

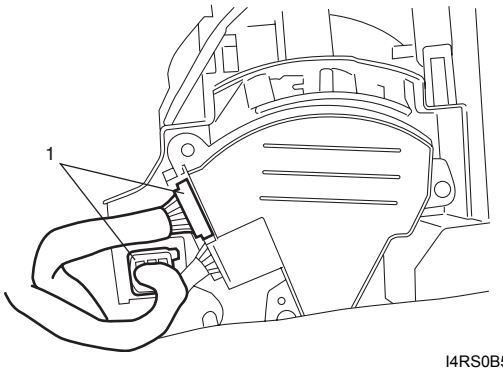
1. Shift selector knob	5. Manual mode switch	9. Shift lock solenoid assembly
2. Shift selector indicator	6. Shift lock button : Apply grease 99000-25010.	10. Shift selector nut
3. Light guide plate	7. Spring : Apply grease 99000-25010.	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
4. Slide cover	8. Shift selector	

Shift Selector Assembly Removal and Installation

S7N20A5406006

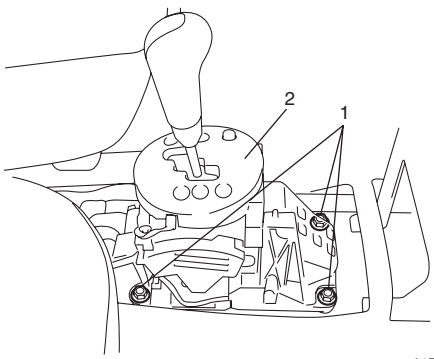
Removal

1) Shift select lever to neutral position.
2) Disconnect negative cable at battery.
3) Remove console box.
4) Disconnect 2 connectors (1) from shift selector.



I4RS0B540002-03

5) Remove shift selector nuts (1) and shift selector assembly (2).



I4RS0B540004-02

Installation
Reverse removal procedure for installation noting the following.

- Tighten shift selector mounting nuts to specified torque.

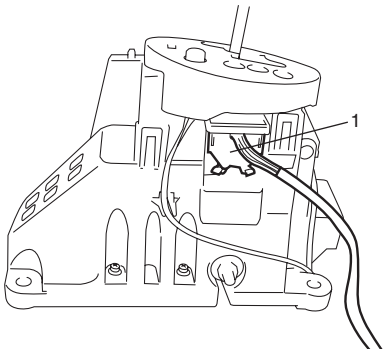
Tightening torque
Shift selector mounting nut: 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

Shift Selector Assembly Disassembly and Reassembly

S7N20A5406007

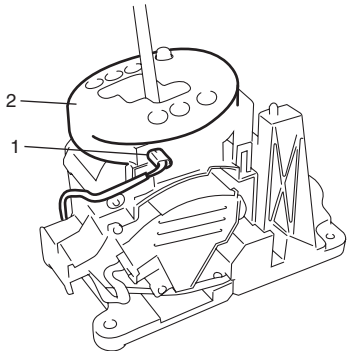
Disassembly

1) Remove shift selector knob.
2) Disconnect manual mode switch connector, and then remove manual mode switch assembly (1).



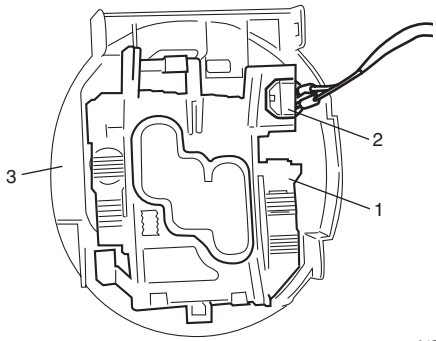
I4RS0B540003-01

3) Remove shift selector illumination lamp (1).
4) Remove shift selector indicator (2).



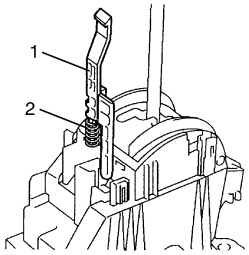
I4RS0B540005-01

5) Remove light guide plate (1) and mode select switch (2) from shift selector indicator (3).
6) Remove slide cover assembly.



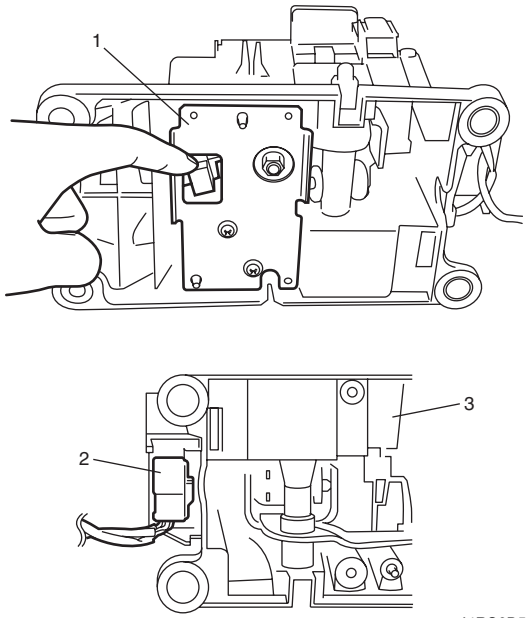
I4RS0B540006-01

7) Remove shift lock button (1) and spring (2).



I4RS0B540008-01

8) Remove shift lock solenoid assembly (1), and then remove connector (2) from shift selector (3).

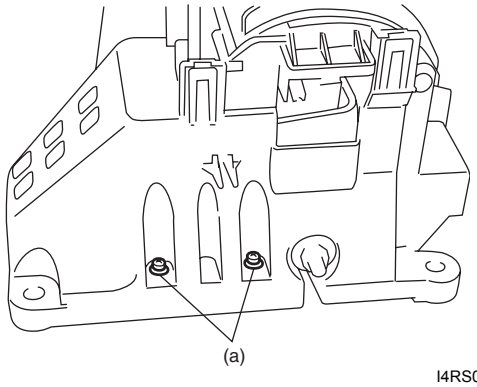


I4RS0B540009-01

Installation

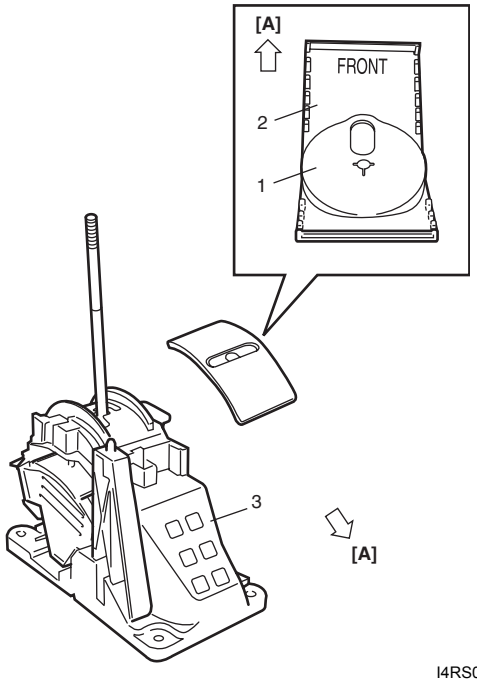
1) Connect connector to shift selector, and then install shift lock solenoid assembly.

Tightening torque
Shift lock solenoid screw (a): 1.5 N·m (0.15 kgf-m, 1.0 lbf-ft)



I4RS0B540007-02

2) Install lower slide cover (1) to upper slide cover (2), and then install them to shift selector (3).

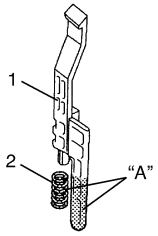


I4RS0B540010-03

[A]: Front side

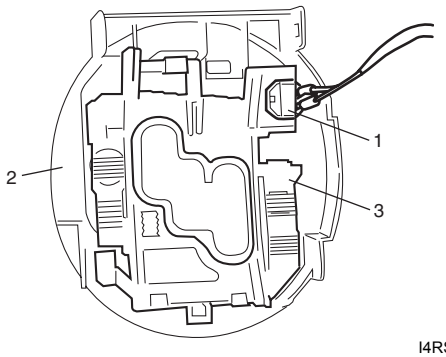
3) Apply grease to shift lock button (1) and spring (2), and then install them.

"A": Grease 99000–25010 (SUZUKI Super Grease A)



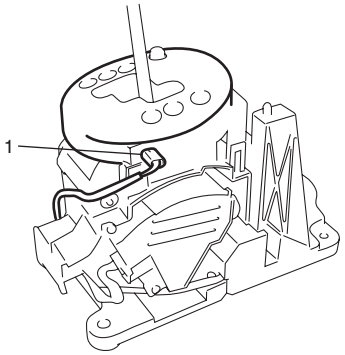
I4RS0B540011-01

4) Install mode select switch (1) and light guide plate (3) to shift selector indicator (2), and then install light guide plate and shift selector indicator assembly to shift selector.



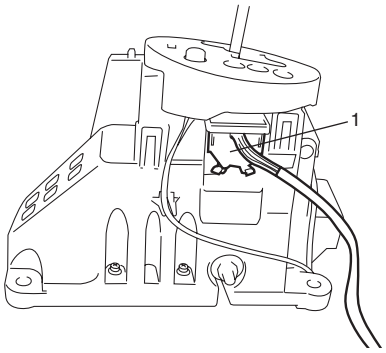
I4RS0B540012-01

5) Install shift selector illumination lamp (1).



I4RS0B540013-01

6) Install manual mode switch assembly (1).



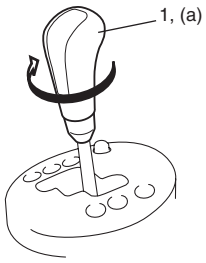
I4RS0B540003-01

⚠ CAUTION

When installing shift selector knob, do not turn more than specified numbers of rotation. Otherwise shift selector knob is damaged.

7) Screw shift selector knob (1) onto shift selector by specified numbers of rotation below.

Rotation numbers for shift selector knob installation
(a): 11 – 12 rotations



I4RS0B540014-01

Shift Selector Inspection

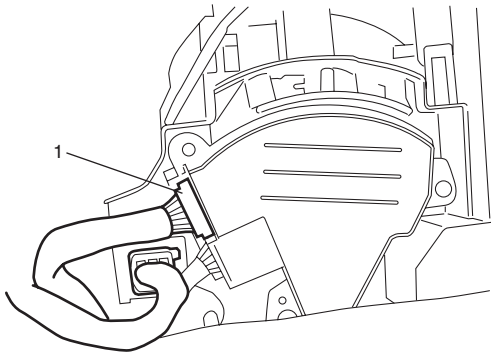
S7N20A5406008

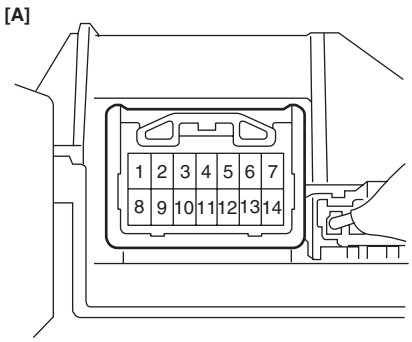
Position Switch

1) Disconnect shift selector position sensor connector (1).
2) Check resistance between each terminal of each shift position, reference to the following table.
If continuity is not as specified, replace shift selector assembly.

Shift position	Terminal No.					
	5	7	11	12	13	14
R	○		○		○	○
N	○	○	○		○	○
D		○	○		○	○
+		○	○	○	○	
M		○	○	○	○	○
–		○	○	○		○

I4RS0B540015-01





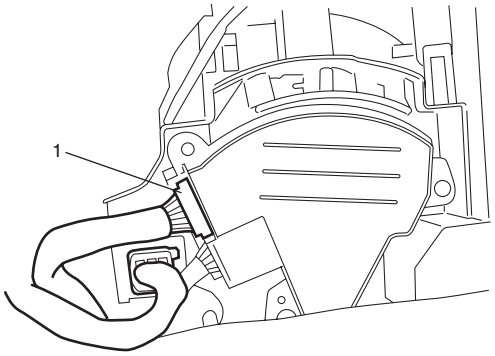
I4RS0B540016-01

[A]: Connector of shift selector

Position Sensor

Check voltage between terminal No.4 of shift selector connector and each terminal of each shift position, reference to the following table.
If voltage is not as specified, replace shift selector assembly.

Shift position	Terminal No.				
	9	3	10	6	1
R	0 V	10 – 14 V	10 – 14 V	0 V	10 – 14 V
N	10 – 14 V	0 V	10 – 14 V	0 V	10 – 14 V
D	10 – 14 V	10 – 14 V	0 V	0 V	10 – 14 V
+	10 – 14 V	10 – 14 V	0 V	0 V	10 – 14 V
M	10 – 14 V	10 – 14 V	0 V	0 V	10 – 14 V
–	10 – 14 V	10 – 14 V	0 V	0 V	10 – 14 V



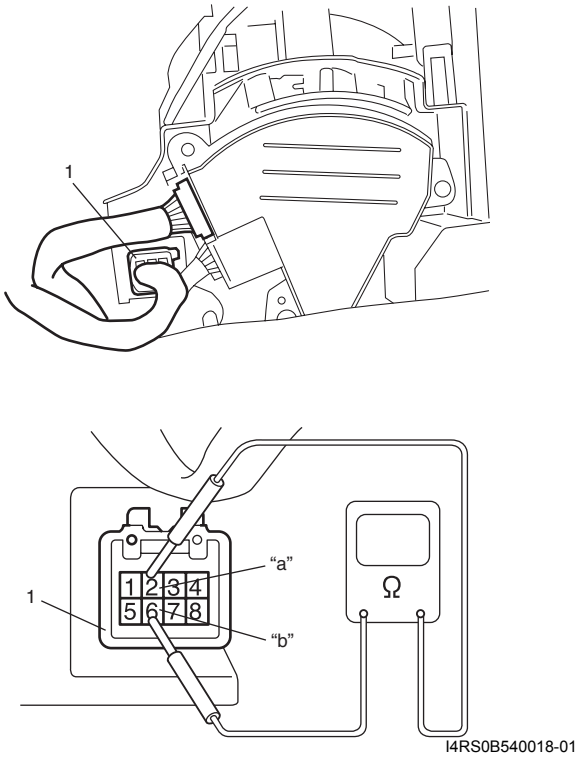
I4RS0B540017-03

1.	Connector of shift selector
[A]:	Viewed from harness side

Shift Lock Solenoid

1) Disconnect shift selector illumination lump connector (1).
2) Check resistance between terminals “a” and “b” of shift lock solenoid.
   If resistance is out of specification, replace shift lock solenoid assembly.

   Resistance
   30 – 35 Ω at 20 °C (68 °F)

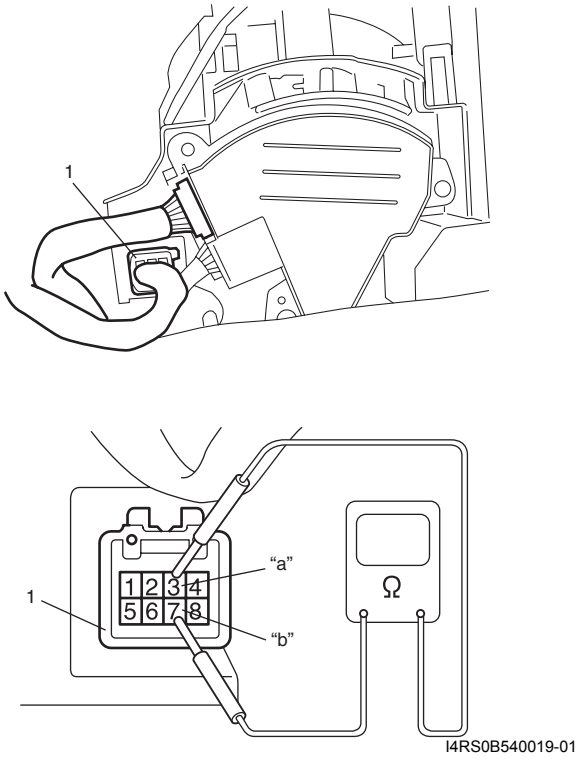


I4RS0B540018-01

Mode Switch

1) Disconnect shift selector illumination lump connector (1).
2) Check mode switch as follows.
   If abnormality is found, replace it.

   Check continuity between “a” and “b” terminals of mode switch
   Mode switch button released: No continuity
   Mode switch button kept pushing: Continuity



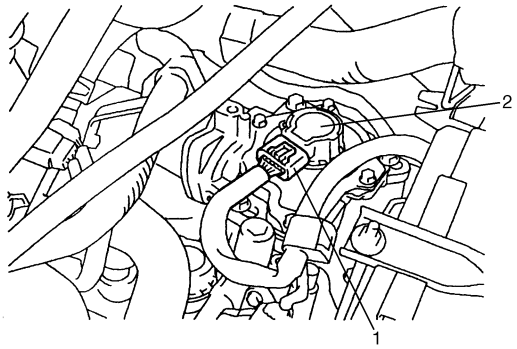
I4RS0B540019-01

Clutch Stroke Sensor Removal and Installation

S7N20A5406009

Removal

1) Shift select lever to neutral position.
2) Initialize TCM (Automated Manual Transaxle) referring to “TCM (Automated Manual Transaxle) Initialization”.
3) Disconnect negative cable at battery.
4) Disconnect clutch stroke sensor connector (1).
5) Remove 2 clutch stroke sensor screw and remove clutch stroke sensor (2) from clutch actuator.



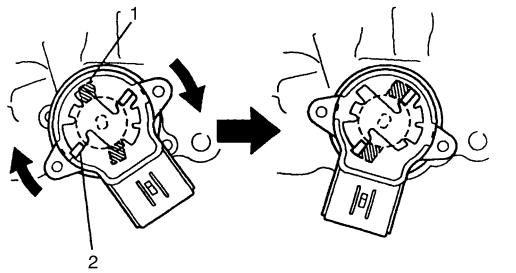
I4RS0B540020-02

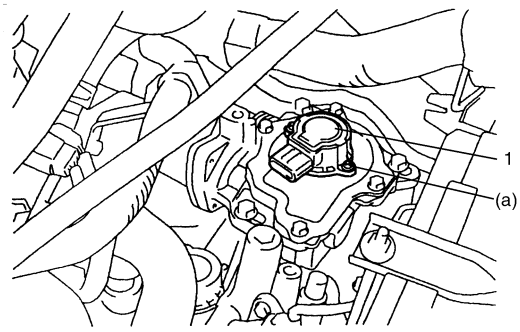
6) Remove O-ring from clutch stroke sensor.

Installation

1) Apply grease to new O-ring, then install it on clutch stroke sensor.
2) Set stroke sensor so that sensor arm (1) (sensor side) and sensor arm (2) (actuator side) are in position as shown in figure.
3) Turn stroke sensor clockwise and fix it with 2 screw.

Tightening torque
Clutch stroke sensor screw (a): 2 N·m (0.2 kgf-m, 1.5 lbf-ft)





I4RS0B540021-02

4) Connect clutch stroke sensor connector.
5) Connect negative cable at battery.
6) Calibration of TCM (Automated Manual Transaxle), according to the following procedures.
   a) Ignition ON and wait 40 seconds.
   b) Start engine and wait for 10 seconds.
   c) Ignition OFF and wait 10 seconds.

Clutch Stroke Sensor Inspection

S7N20A5406010

⚠ CAUTION

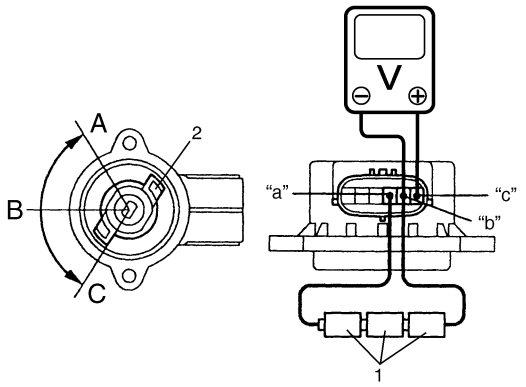
- **Do not apply more than 6 V, otherwise it may break.**
- **Do not drop clutch stroke sensor. If it is dropped, replace it with a new one.**

Check clutch stroke sensor as follows.
If voltage is not as specified in step 3) and/or 5), replace clutch stroke sensor.

1) Connect 3 dry batteries of 1.5 V in series.
2) Connect battery (+) to “a”, (–) to “b”.
3) Measure voltage between “b” and “c” terminals of clutch stroke sensor while moving sensor arm (2).

Sensor output voltage specification

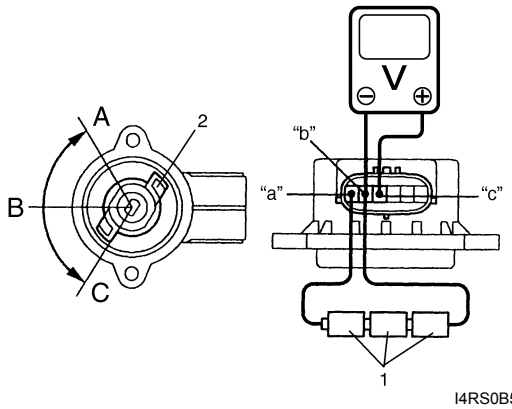
Reference: Voltage (Power source voltage at 4.5 V)	
Sensor angle (degree)	**Terminal (“b” – “c”) output voltage**
A (55°)	**4.05 V**
B (0°)	**2.25 V**
C (–55°)	**0.45 V**



I4RS0B540022-01

1. Dry battery

4) Connect battery (+) to “a”, (–) to “b”.
5) Measure voltage between “b” and “c” terminals of clutch stroke sensor when moving sensor arm. Confirmed of measured voltage is specified value in step 3).



I4RS0B540023-01

Clutch Actuator Removal and Installation

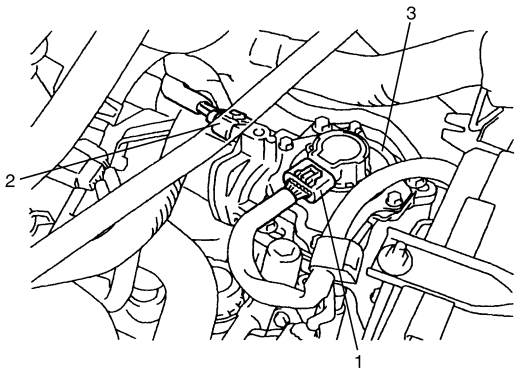
S7N20A5406011

⚠ CAUTION

Do not disassemble clutch actuator of except clutch stroke sensor. If any malfunction is found, replace it as assembly.

Removal

1) Shift select lever to neutral position.
2) Force clutch to operate referring to “Clutch Position Control”.
3) Initialize TCM (Automated Manual Transaxle) referring to “TCM (Automated Manual Transaxle) Initialization”.
4) Disconnect negative cable at battery.
5) Disconnect clutch motor connector (2) and clutch stroke sensor connector (1).
6) Remove clutch actuator (3).

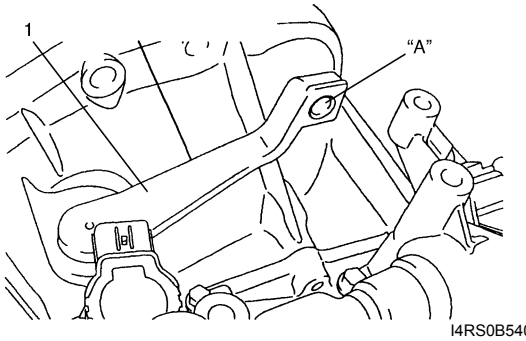


I4RS0B540024-01

Installation

1) When replacing clutch actuator, set it to clutch clamp position according to following procedure before installing it.
   a) Connect clutch stroke sensor connector and motor connector to clutch actuator.
   b) Connect negative cable at battery.
   c) Force clutch to operate referring to “Clutch Position Control”.
   d) Disconnect negative cable at battery.
   e) Disconnect clutch stroke sensor connector and motor connector.
2) Apply grease to clutch release lever (1).

   “A”: Grease 99000–25010 (SUZUKI Super Grease A)

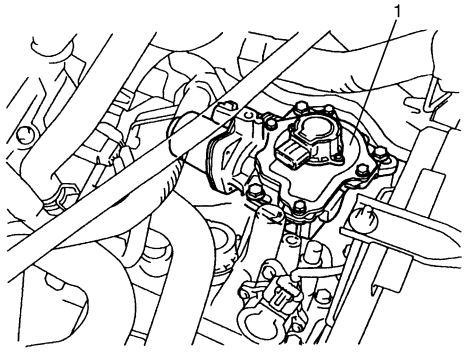


I4RS0B540025-01

3) Install clutch actuator (1) on transaxle as follows.
   a) Set clutch actuator (1) on transaxle and tighten 3 bolts temporarily.

⚠ CAUTION

Do not apply any load to rod of clutch actuator as it may cause malfunction.

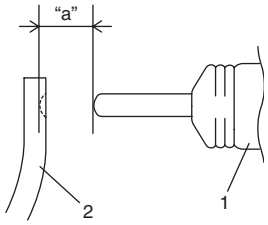


I4RS0B540026-01

b) Fit tip end of clutch actuator rod in hole in release lever (2) so that clearance “a” becomes zero.

NOTE

Do not apply load when they contact.

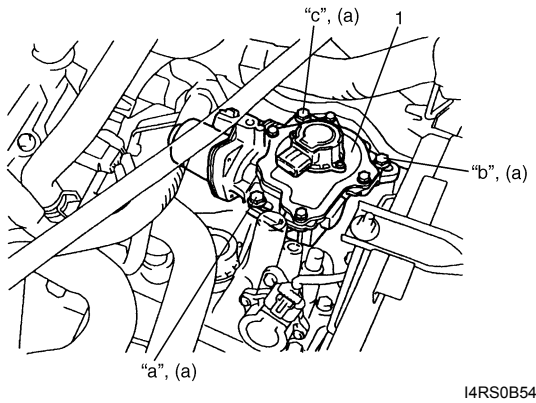


I4RS0B540027-01

c) Tighten clutch actuator bolts by hand while holding clutch actuator (1) at that position in step b).

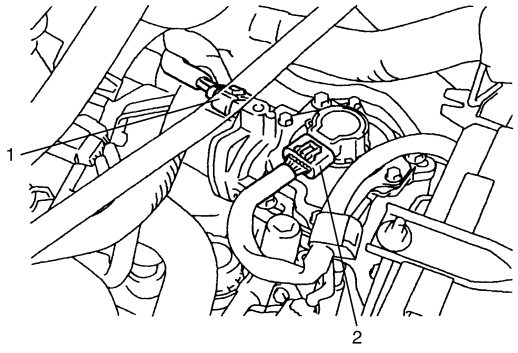
d) Tighten clutch actuator bolts to specified torque in order of “a”, “b” and “c” as shown in figure.

Tightening torque
Clutch actuator bolt (a): 15 N·m (1.5 kgf-m, 11.0 lbf-ft)



I4RS0B540028-02

4) Connect clutch motor connector (1) and clutch stroke sensor connector (2).



I4RS0B540029-01

5) Connect negative cable at battery.

6) Make TCM (Automated Manual Transaxle) learning according to following procedure.

a) Turn ON ignition switch and wait for 40 seconds.

b) Start engine and wait for 10 seconds.

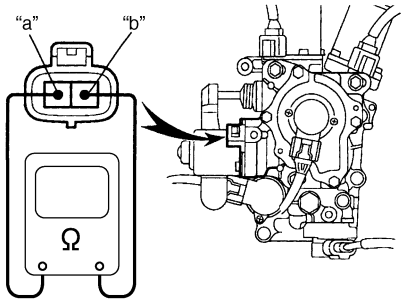
c) Turn OFF ignition switch and wait for 10 seconds.

Clutch Actuator Inspection

S7N20A5406012

Measure resistance between “a” terminal and “b” terminal of clutch motor.
If measured resistance is out of specification, replace clutch actuator.

Clutch motor resistance
0.1 – 100 Ω



I4RS0B540030-01

Shift and Select Stroke Sensor Removal and Installation

S7N20A5406013

Removal

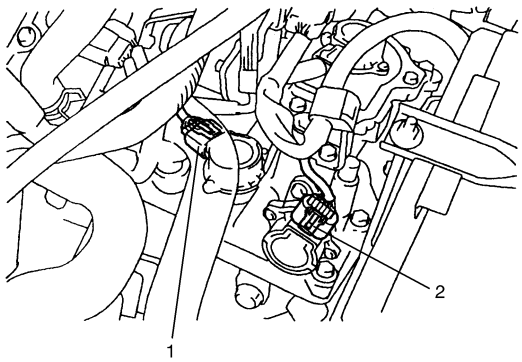
1) Shift neutral position.

2) Initialize TCM (Automated Manual Transaxle) referring to “TCM (Automated Manual Transaxle) Initialization”.

3) Disconnect negative cable at battery.

4) Disconnect shift stroke sensor connector (1) and/or select stroke sensor connector (2).

5) Remove 2 shift stroke sensor screw and/or 2 select stroke sensor screw and remove shift and/or select stroke sensor from shift and select actuator.



I4RS0B540031-01

6) Remove O-ring from shift and/or select stroke sensors.

Installation

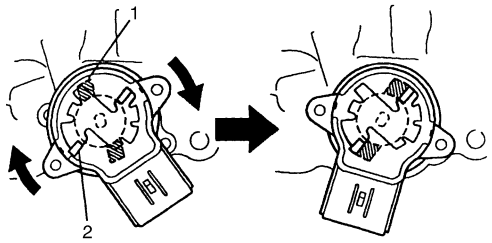
1) Apply grease to new O-ring, and then install them on shift and/or select stroke sensor.

   : Grease 99000–25010 (SUZUKI Super Grease A)

2) Set shift and/or select stroke sensor so that sensor arm (1) (sensor side) and sensor arm (2) (actuator side) are in position as shown in figure.

3) Turn stroke sensor clockwise and fix it with 2 screw.

   Tightening torque
   Shift stroke sensor screw: 2 N·m (0.2 kgf-m, 1.5 lbf-ft)
   Select stroke sensor screw: 2 N·m (0.2 kgf-m, 1.5 lbf-ft)



I4RS0B540032-01

4) Connect shift and/or select stroke sensor connector.

5) Connect negative cable at battery.

6) Make TCM (Automated Manual Transaxle) learning according to following procedure.

   a) Ignition ON and wait 40 seconds.

   b) Start engine and wait for 10 seconds.

   c) Ignition OFF and wait 10 seconds.

Shift Stroke Sensor and Select Stroke Sensor Inspection

S7N20A5406014

Check shift stroke sensor and select stroke sensor as follows.
If voltage is not as specified in step 3) and/or 5), replace stroke sensor.

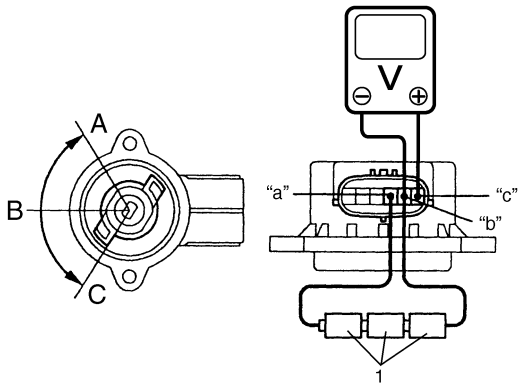
1) Connect 3 dry batteries of 1.5 V in series.

2) Connect battery (+) to “a”, (–) to “b”.

3) Measure voltage between “b” and “c” terminals of shift stroke sensor and select stroke sensor while moving sensor arm.

Sensor output voltage specification

Reference: Voltage (Power source voltage at 4.5 V)	
Sensor angle (degree)	**Terminal (“b” – “c”) output voltage**
A (55°)	**4.05 V**
B (0°)	**2.25 V**
C (–55°)	**0.45 V**

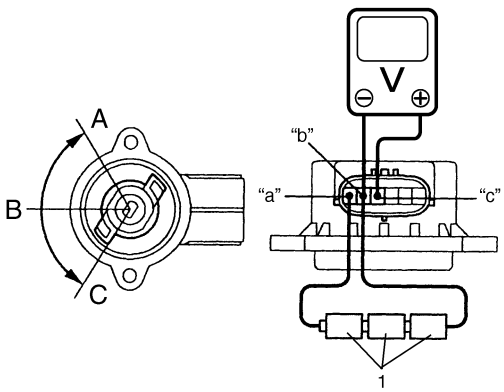


I4RS0B540033-01

1. Dry battery

4) Connect battery (+) to “a”, (–) to “b”.

5) Measure voltage between “b” and “c” terminals of shift stroke sensor and select stroke sensor when moving sensor arm.
   Confirmed of measured voltage is specified value in step 3).



I4RS0B540034-01

1. Dry battery

Shift and Select Actuator Removal and Installation

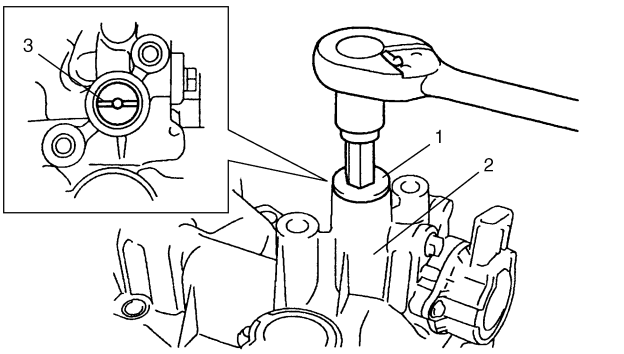
S7N20A5406015

⚠ CAUTION

Do not disassemble shift and select actuator of except shift stroke sensor and select stroke sensor. If any malfunction is found, replace it as assembly.

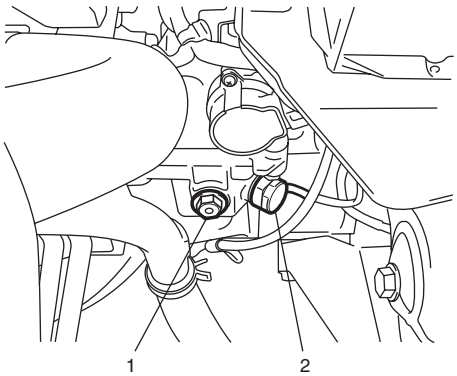
Removal

1) Remove clutch actuator referring to “Clutch Actuator Removal and Installation”.
2) Remove plug (1) from shift and select actuator (2).
3) Check that slit (3) in shift and select shaft is at position as shown in figure. If not, set slit at position as shown by turning shift and select shaft.



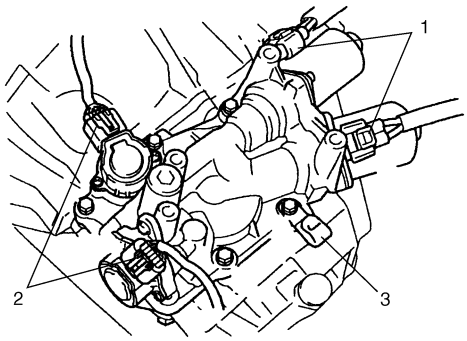
I4RS0B540035-02

4) Remove lock ball (1) from transaxle.
5) Remove neutral start switch (2).



I4RS0B540036-01

6) Disconnect 2 motor connectors (1) and 2 stroke sensor connectors (2).
7) Remove shift and select actuator bolts and wire harness clamp (3).
8) Remove shift and select actuator tapping it with plastic hammer.

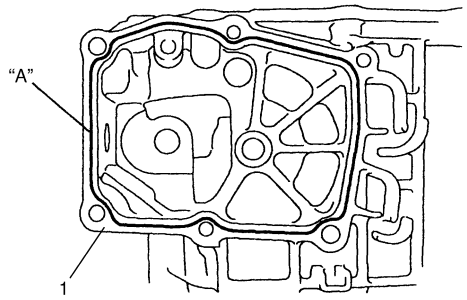


I4RS0B540037-01

Installation

1) Clean mating surface of both transaxle case (1) and shift and select actuator, apply sealant to transaxle case as shown in the figure by such amount that its section 1.5 mm (0.059 in.) in diameter then mate shift and select actuator with transaxle case.

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



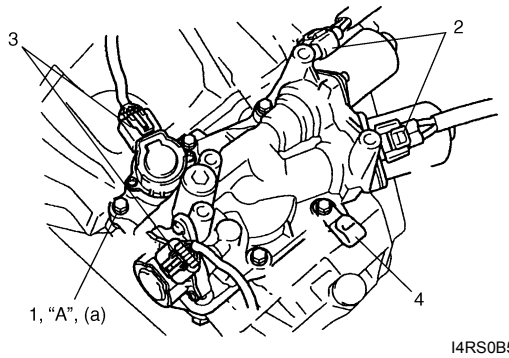
I4RS0B540038-01

2) Tighten shift and select actuator bolts (1) to which thread lock cement has been applied.

“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Shift and select actuator bolt (a): 18 N·m (1.8 kgf-m, 13.0 lbf-ft)

3) Connect 2 motor connectors (2) and 2 stroke sensor connectors (3).



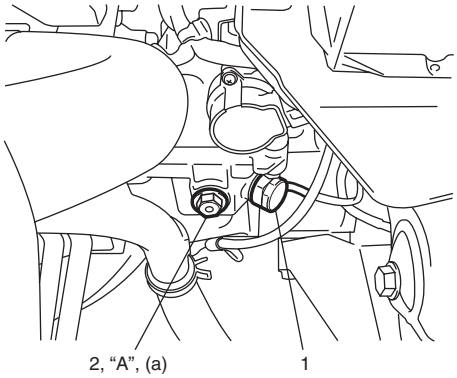
I4RS0B540039-01

4. Wire clamp

4) Install neutral start switch (1) referring to “Neutral Start Switch Removal and Installation”.
5) Tighten lock ball (2) to which thread lock cement has been applied.

“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Lock ball (a): 37 N·m (3.7 kgf-m, 27.0 lbf-ft)

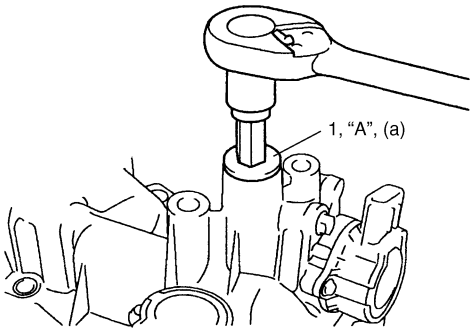


I4RS0B540040-01

6) Tighten plug (1) to which thread lock cement has been applied.

“A”: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque
Plug (a): 30 N·m (3.0 kgf-m, 22.0 lbf-ft)



I4RS0B540041-02

7) Install clutch actuator referring to “Clutch Actuator Removal and Installation”.
8) Connect negative cable at battery.

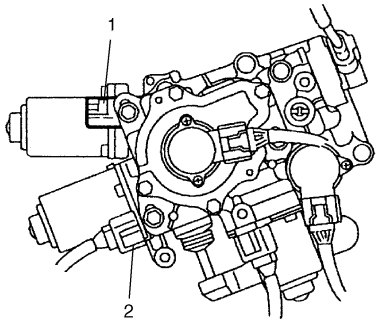
Shift and Select Actuator Inspection

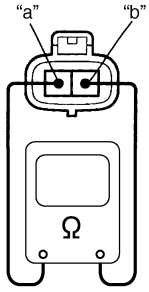
S7N20A5406016

1) Measure each resistance between “a” and “b” terminals of shift motor (1) and select motor (2). If measured resistance is out of specification, replace shift and select actuator.

Shift motor resistance
0.1 – 100 Ω

Select motor resistance
0.1 – 100 Ω





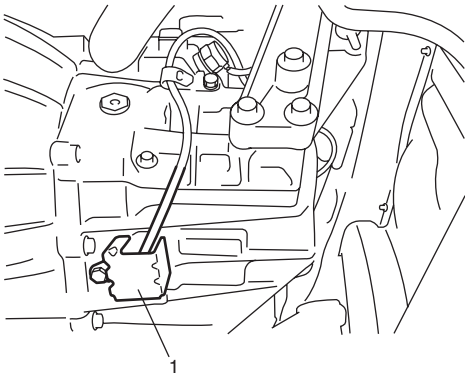
I4RS0B540042-03

Input Shift Speed Sensor Removal and Installation

S7N20A5406017

Removal

1) Disconnect negative cable from battery.
2) Disconnect input shaft speed sensor connector.
3) Drain transaxle oil.
4) Remove protector (1) and input shaft speed sensor.

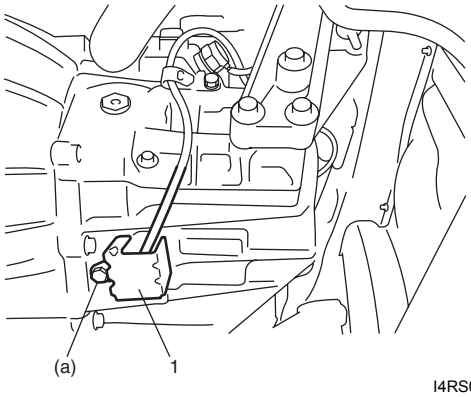


I4RS0B540043-01

Installation

1) Check that input shaft speed sensor is free from any metal particles and damage.
2) Apply oil to new O-ring, and then install it on input shaft speed sensor.
3) Install input shaft speed sensor and protector (1).

Tightening torque
Protector bolt (a): 18 N·m (1.8 kgf-m, 13.0 lbf-ft)
Input shaft speed sensor bolt (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)



I4RS0B540044-01

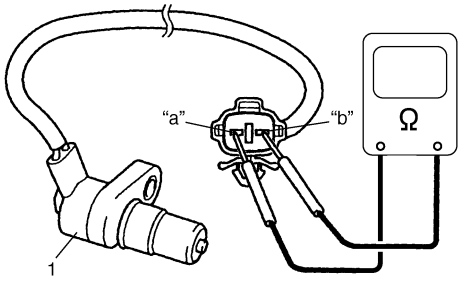
4) Fill transaxle oil referring to “Automated Manual Transaxle Oil Change”.
5) Connect input shaft speed sensor connector.
6) Connect negative cable to battery.

Input Shaft Speed Sensor Inspection

S7N20A5406018

Measure resistance between “a” and “b” terminals of input shaft speed sensor (1).
If measured resistance is out of specification, replace input shaft speed sensor.

Revolution sensor resistance
560 – 680 Ω at 20 °C (68 °F)



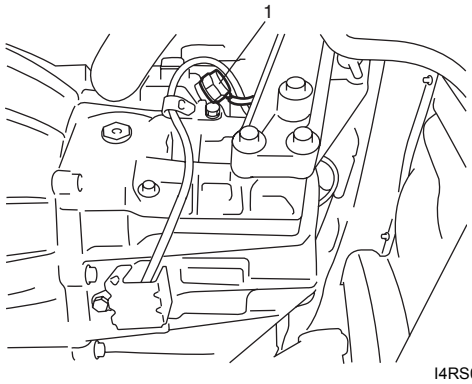
I4RS0B540220-01

Neutral Start Switch Removal and Installation

S7N20A5406019

Removal

1) Disconnect negative cable at battery.
2) Disconnect neutral start switch connector.
3) Remove neutral start switch (1).

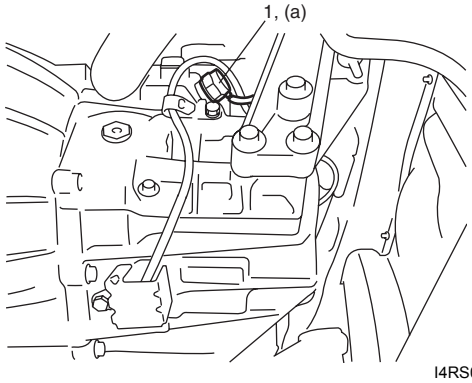


I4RS0B540045-01

Installation

1) Install neutral start switch (1) with new gasket.

Tightening torque
Neutral start switch (a): 39 N·m (3.9 kgf-m, 28.5 lbf-ft)



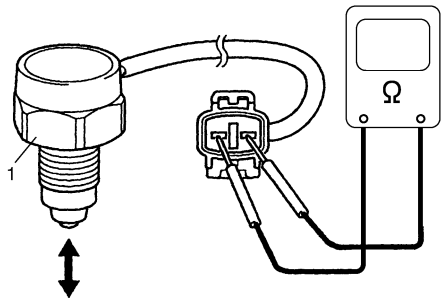
I4RS0B540046-02

2) Connect neutral start switch connector.
3) Connect negative cable at battery.

Neutral Start Switch Inspection

S7N20A5406020

Check neutral start switch (1) for function using ohmmeter.
If malfunction is found, replace neutral start switch.
Switch ON (Push): No continuity
Switch OFF (Release): Continuity



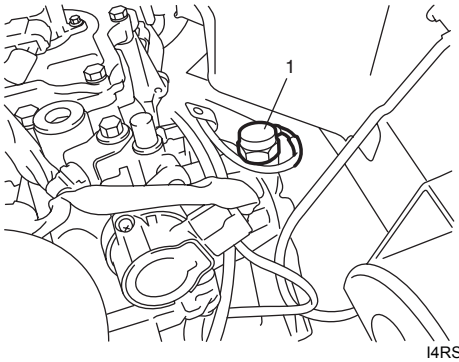
I4RS0B540047-01

Back Up Lamp Switch Removal and Installation

S7N20A5406021

Removal

1) Disconnect negative cable at battery.
2) Disconnect back up lamp switch connector.
3) Remove back up lamp switch (1).

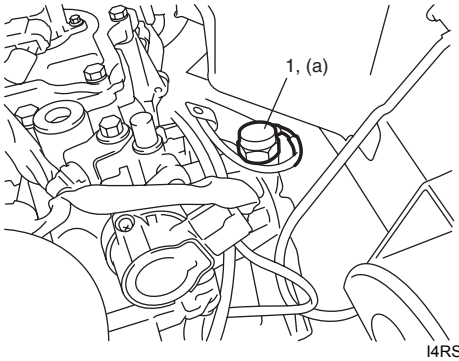


I4RS0B540048-01

Installation

1) Install back up lamp switch (1) with new gasket.

Tightening torque
Back up lamp switch (a): 40 N·m (4.0 kgf-m, 29.0 lbf-ft)



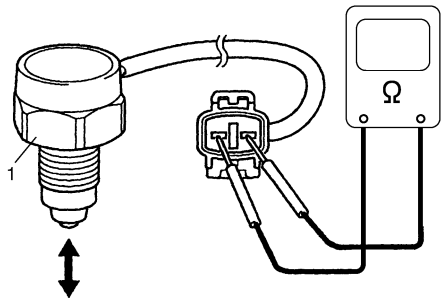
I4RS0B540049-01

2) Connect neutral start switch connector.
3) Connect negative cable at battery.

Back Up Lamp Switch Inspection

S7N20A5406022

Check back up lamp switch (1) for function using ohmmeter.
If malfunction is found, replace back up lamp switch.
Switch ON (Push): No continuity
Switch OFF (Release): Continuity



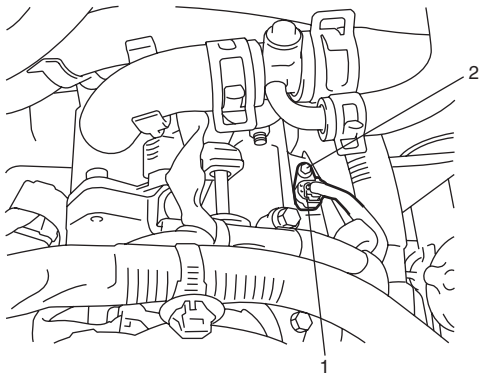
I4RS0B540047-01

Output Shaft Speed Sensor (VSS) Removal and Installation

S7N20A5406023

Removal

1) Disconnect negative cable at battery.
2) Disconnect output shaft speed sensor (VSS) connector (1).
3) Remove output shaft speed sensor (VSS) (2).

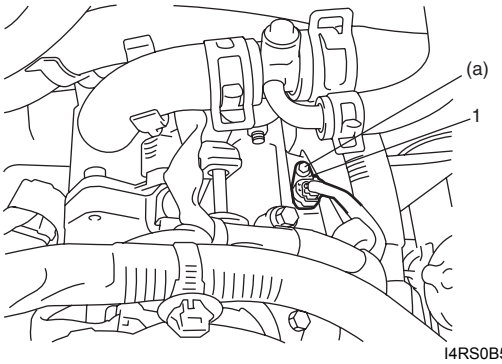


I4RS0B540050-01

Installation

1) Apply oil to new O-ring, and then install it on output shaft speed sensor (VSS).
2) Install output shaft speed sensor (VSS) (1).

Tightening torque
Output shaft speed sensor (VSS) bolt (a): 5 N·m (0.5 kgf-m, 4.0 lbf-ft)



I4RS0B540051-01

3) Connect output shaft speed sensor (VSS) connector.
4) Connect negative cable at battery.

Transmission Control Module (TCM) Removal and Installation

S7N20A5406024

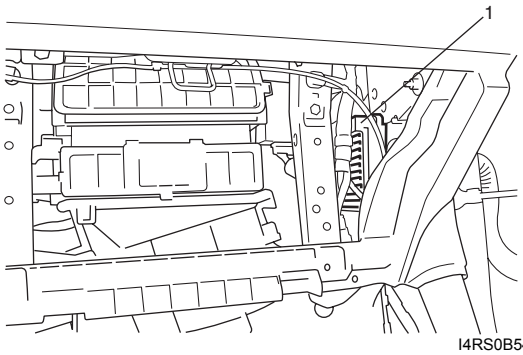
⚠ CAUTION

TCM and ECM consists of highly precise parts, therefore when handling it, be careful not to expose to excessive shock.

Removal

Initialize TCM referring to “TCM (Automated Manual Transaxle) Initialization”.

1) Disconnect negative cable at battery.
2) If the vehicle is equipped with air bag system, disable air bag system. Refer to “Disabling Air Bag System in Section 8B”.
3) Disconnect connectors from TCM (1).
4) Remove TCM by removing its nuts.



I4RS0B540223-01

Installation

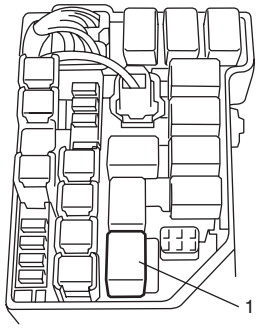
Reverse removal procedure noting the following.

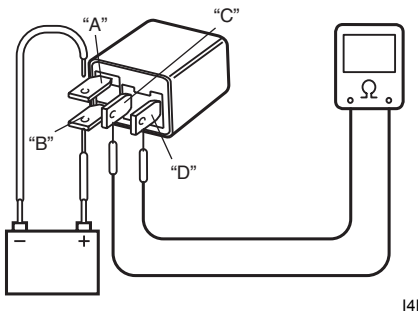
- Connect TCM connectors securely.
- If the vehicle is equipped with air bag system, be sure to enable air bag system after TCM is back in place. Refer to “Enabling Air Bag System in Section 8B”.
- Make TCM learning according to following procedure.
  a. Turn ON ignition switch and wait for 40 seconds.
  b. Start engine and wait for 10 seconds.
  c. Turn OFF ignition switch and wait for 10 seconds.

Motor Relay Inspection

S7N20A5406025

1) Disconnect negative cable at battery.
2) Remove motor relay (1) from fuse and relay box.
3) Check that there is no continuity between terminal “C” and “D”.
   If continuity is indicated, replace motor relay.
4) Connect battery positive (+) terminal to terminal “A” of motor relay and battery negative (–) terminal to terminal “B” of motor relay.
   Check continuity between terminal “C” and “D” of motor relay.
   If continuity does not indicated, replace motor relay.

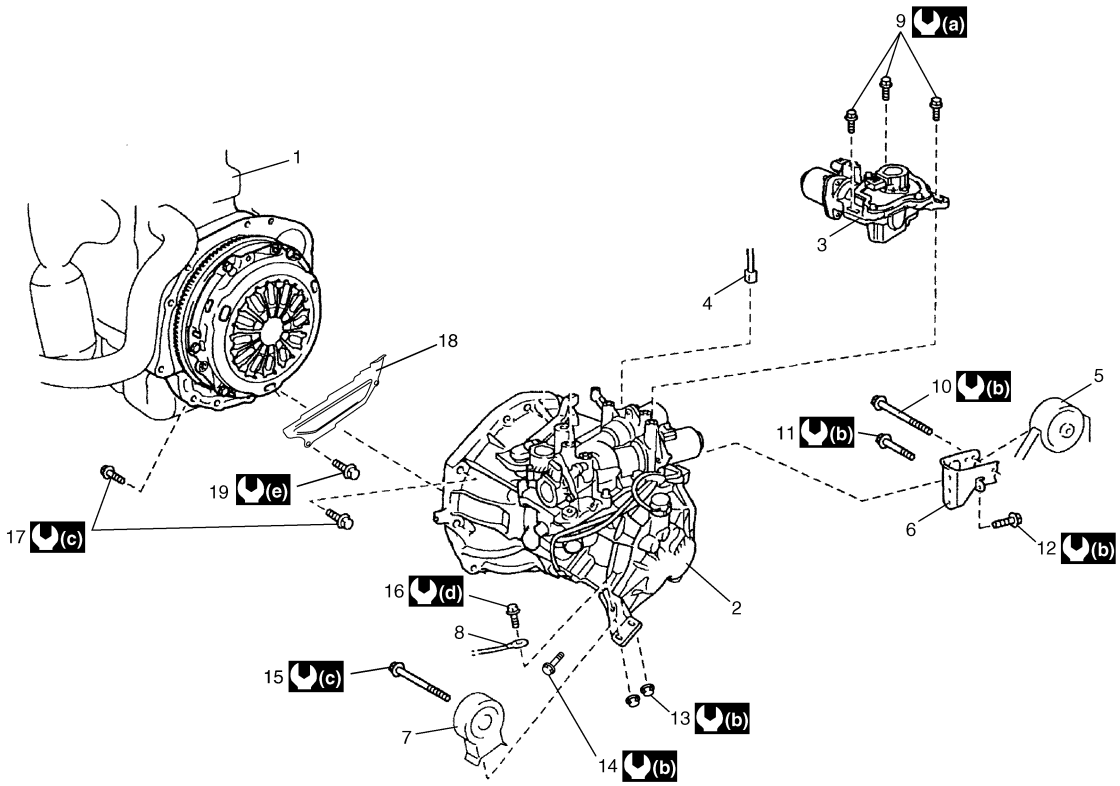




I4RS0B540052-01

Automated Manual Transaxle Unit Components

S7N20A5406026



I4RS0B540053-04

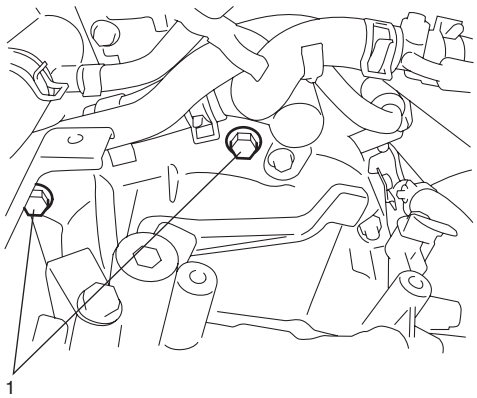
1. Engine	9. Clutch actuator bolt	17. Transaxle to engine bolt
2. Automated Manual Transaxle	10. Engine rear mounting bolt	18. Clutch housing lower plate
3. Clutch actuator	11. Engine rear mounting bracket bolt No.1	19. Clutch housing lower plate bolt
4. Output shaft speed sensor (VSS) connector	12. Engine rear mounting bracket bolt No.2	(a) : 15 N·m (1.5 kgf-m, 11.0 lbf-ft)
5. Engine rear mounting	13. Engine left mounting nut	(b) : 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
6. Engine rear mounting bracket	14. Engine left mounting bracket bolt	(c) : 85 N·m (8.5 kgf-m, 61.5 lbf-ft)
7. Engine left mounting	15. Engine left mounting bolt	(d) : 25 N·m (2.5 kgf-m, 18.0 lbf-ft)
8. Ground cable	16. Ground cable bolt	(e) : 11 N·m (1.1 kgf-m, 8.0 lbf-ft)

Automated Manual Transaxle Unit Dismounting and Remounting

S7N20A5406027

Dismounting

1) Force clutch to operate referring to “Clutch Position Control”.
2) Drain coolant.
3) Remove coolant reservoir with reservoir hose.
4) Remove battery and tray.
5) Remove air cleaner case and resonator.
6) Remove clutch actuator referring to “Clutch Actuator Removal and Installation”.
7) Disconnect electric connectors below.
   - Shift and selector motor connectors
   - Shift and select stroke sensor connectors
   - Neutral start switch
   - Input shaft speed sensor connector
   - Back up lamp switch connector
   - VSS connector
8) Remove ground cable from engine left mounting bracket.
9) Remove water inlet No.2 pipe from transaxle.
10) Remove starting motor referring to “Starting Motor Dismounting and Remounting: M13A / M15A / M16A in Section 1I”.
11) Remove transaxle to engine bolts (1) or upper side.

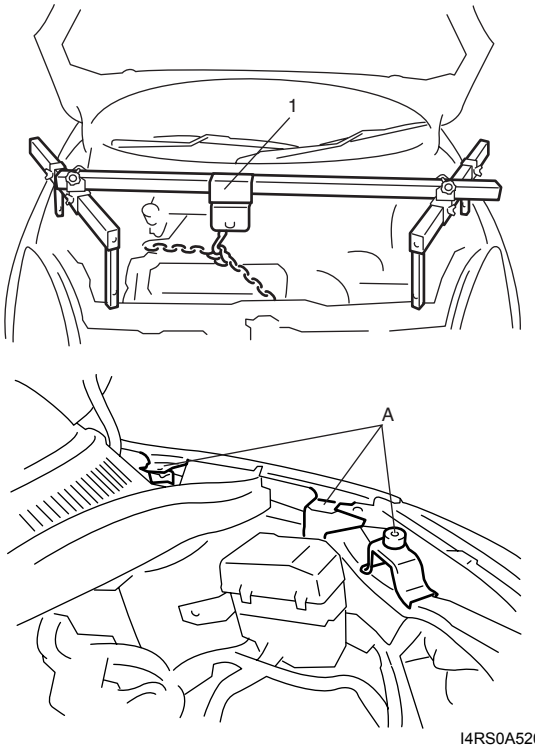


I4RS0B540054-01

12) Remove wiper blade referring to “Windshield Wiper Removal and Installation in Section 9D”.
13) Remove cowl top cover referring to “Cowl Top Components in Section 9K”.
14) Support engine using supporting device (1).

⚠ CAUTION

Do not apply supporting device to projection part A. If do so, it may be deformed.

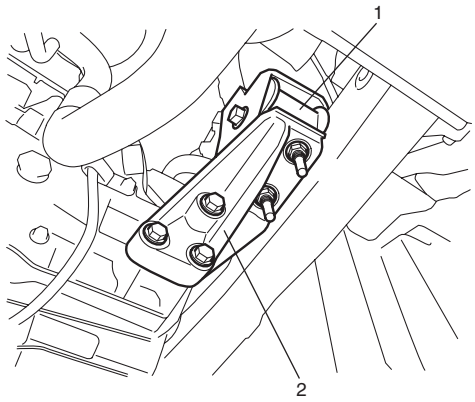


I4RS0A520019-01

15) Remove front drive shafts and center shaft referring to “Front Drive Shaft Assembly Removal and Installation in Section 3A”.
16) Remove exhaust No.2 pipe referring to “Exhaust Pipe and Muffler Removal and Installation: M13A / M15A / M16A in Section 1K”.
17) Remove clutch housing lower plate (1).

I4RS0A520020-01

18) Support transaxle with transmission jack.
19) Remove transaxle to engine bolts and nut of lower side.
20) Remove engine left mounting (1) with bracket (2).



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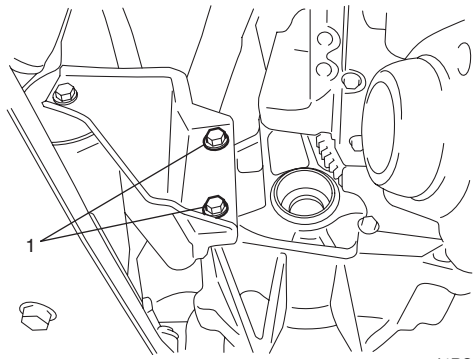
21) Remove engine rear mounting bracket bolts (1).



I4RS0B540056-01

22) Remove other attached parts from transaxle, if any.
23) Pull transaxle so as to disconnect input shaft from clutch disc, and then lower it.

Remounting

⚠ CAUTION

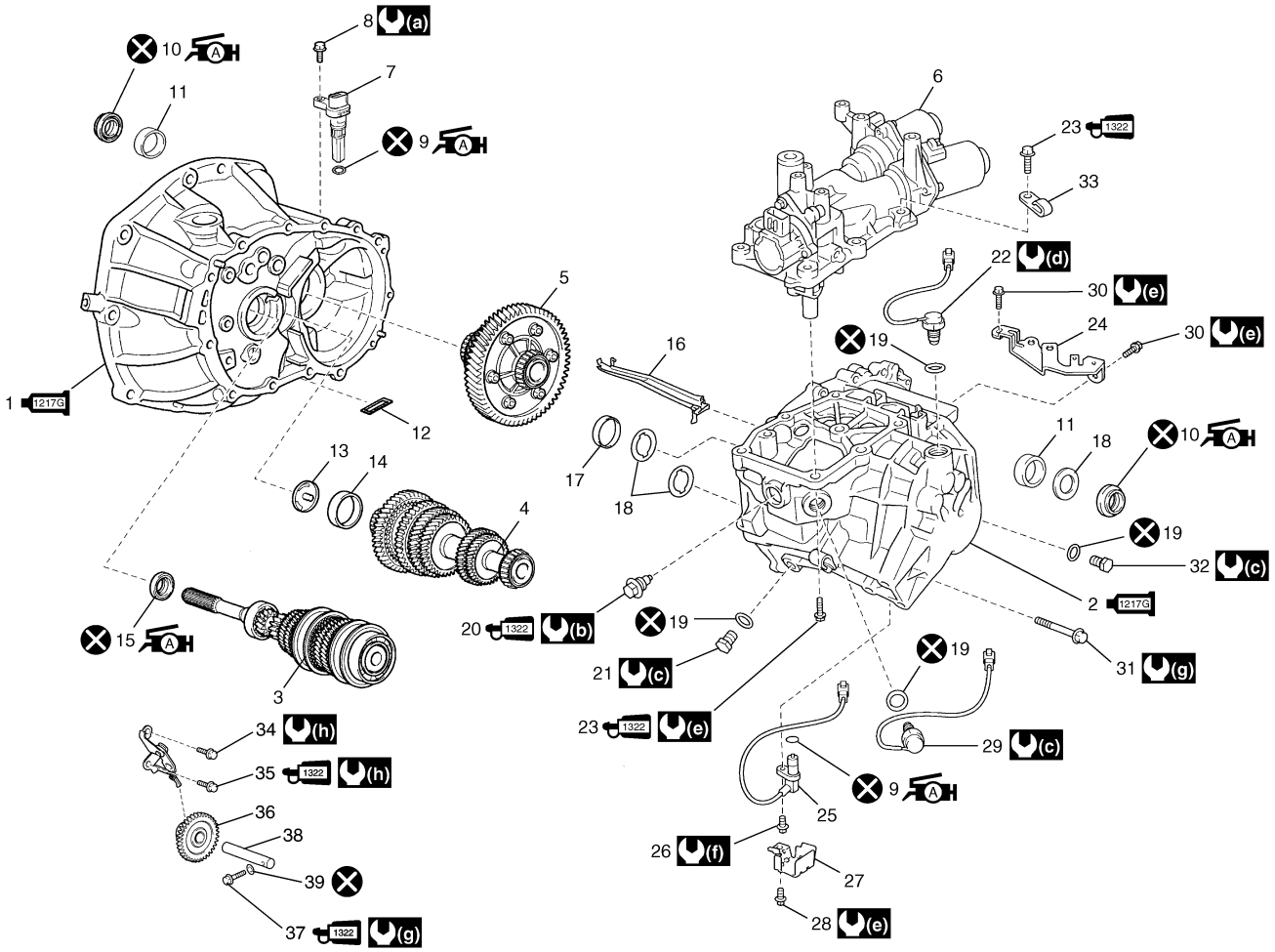
- **Care should be taken not to scratch oil seal lip with drive shaft while raising transaxle.**
- **Do not hit shaft joint with hammer when installing it into differential gear.**

Reverse dismounting procedure for remounting noting the following.

- Tighten each bolts and nuts to specified torque referring to “Automated Manual Transaxle Unit Components”.
- Set each clamp for wiring securely.
- Fill transaxle oil referring to “Automated Manual Transaxle Oil Change”.
- Refill cooling system with coolant referring to “Cooling System Flush and Refill: M13A / M15A / M16A in Section 1F”.
- Connect battery and check function of engine, clutch and transaxle.

Automated Manual Transaxle Assembly Components

S7N20A5406028



I4RS0B540057-03

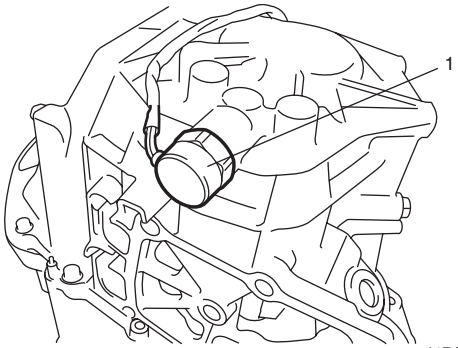
1217G 1. Right case : Apply sealant 99000-31260 to mating surface of right case.	17. Countershaft left bearing outer race	33. Wire clamp
1217G 2. Left case : Apply sealant 99000-31260 to mating surface of left case.	18. Shim	34. Reverse gear shift lever bolt No.1
3. Input shaft assembly	19. Gasket	35. Reverse gear shift lever bolt No.2 : Apply thread lock 99000-32110 to all around thread part of bolt.
4. Countershaft assembly	1322 20. Lock ball : Apply thread lock 99000-32110 to all around thread part of bolt.	36. Reverse idler gear
5. Differential assembly	21. Oil level / filler plug	37. Reverse shaft bolt
6. Shift and select actuator	22. Back up lamp switch	38. Reverse shaft
7. Output shaft speed sensor (VSS)	1322 23. Shift and select actuator bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	39. Gasket
8. Output shaft speed sensor (VSS) bolt	24. Wire harness clamp bracket	(a) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)
A/H 9. O-ring : Apply grease 99000-25010.	25. Input shaft speed sensor	(b) : 37 N·m (3.7 kgf-m, 27.0 lbf-ft)
A/H 10. Oil seal : Apply grease 99000-25010 to oil seal lip.	26. Input shaft speed sensor bolt	(c) : 39 N·m (3.9 kgf-m, 28.5 lbf-ft)
11. Outer race	27. Protector	(d) : 40 N·m (4.0 kgf-m, 29.0 lbf-ft)
12. Magnet	28. Protector bolt	(e) : 18 N·m (1.8 kgf-m, 13.0 lbf-ft)
13. Countershaft cover	29. Neutral start switch	(f) : 8 N·m (0.8 kgf-m, 6.0 lbf-ft)
14. Countershaft right bearing outer race	30. Wire harness clamp bracket bolt	(g) : 29 N·m (2.9 kgf-m, 21.0 lbf-ft)
A/H 15. Input shaft oil seal : Apply grease 99000-25010 to oil seal lip.	31. Transaxle case bolt	(h) : 17 N·m (1.7 kgf-m, 13.0 lbf-ft)
16. Oil gutter	32. Oil drain plug	: Do not reuse.

Automated Manual Transaxle Assembly Disassembly and Reassembly

S7N20A5406029

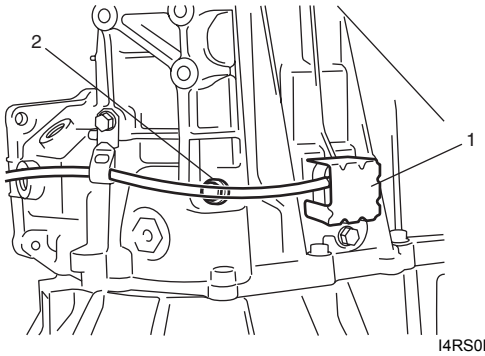
Disassembly

1) Remove clutch release bearing, release shaft and release fork from right case referring to “Clutch Release System Component Removal and Installation”.
2) Remove shift and select actuator referring to “Shift and Select Actuator Removal and Installation”.
3) Remove back up lamp switch (1) with gasket.



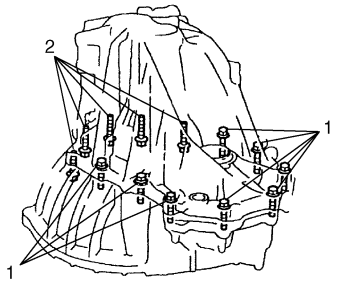
I4RS0B540058-01

4) Remove protector (1) and input shaft speed sensor.
5) Remove reverse shaft bolt (2) with gasket.



I4RS0B540059-01

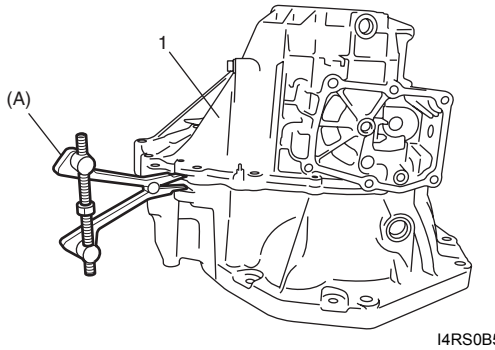
6) Remove transaxle case bolts (1) from outside and another bolts (2) from clutch housing side.



I4RS0B540062-02

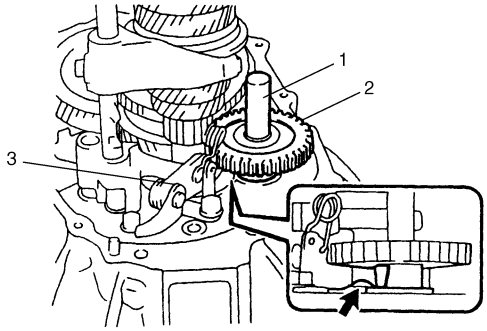
7) Remove left case (1) using special tool.

Special tool
(A): 09912–34510



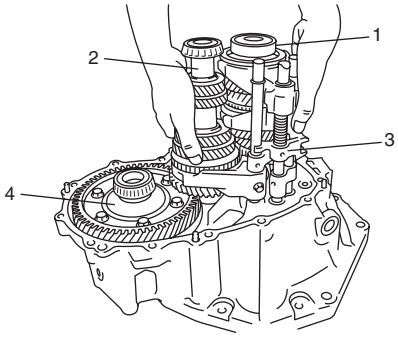
I4RS0B540060-01

8) Pull out reverse shaft (1), and then take out reverse idler gear (2).
9) Remove reverse gear shift lever (3).
10) Remove magnet from right case.



I4RS0B540061-01

11) Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly (1), countershaft assembly (2) and gear shift shaft assembly (3) all at once.
12) Take out differential assembly (4).



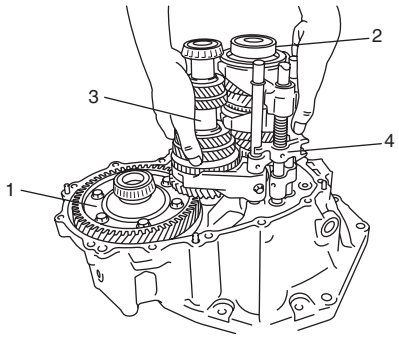
I4RS0B540063-01

Installation

1) Install differential case assembly (1).
2) Join input shaft assembly (2), countershaft assembly (3) and gear shift shaft assembly (4) all together, and then install them into right case so as not to damage oil seal by input shaft spline.

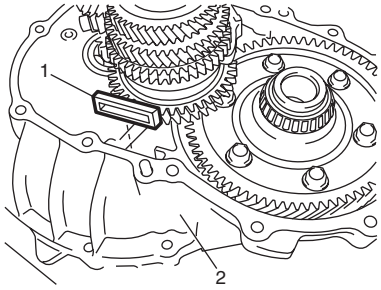
NOTE

- **Input shaft right bearing on shaft can be installed into right case by tapping shaft with plastic hammer.**
- **Make sure that countershaft is engaged with final gear while installing.**



I4RS0B540064-01

3) Install magnet (1) to right case (2).

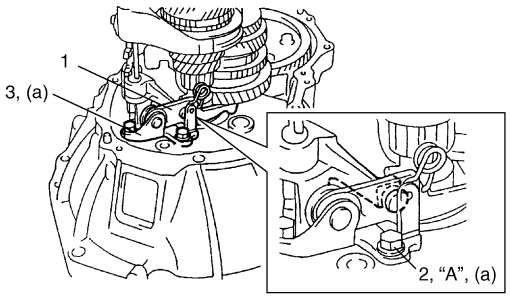


I4RS0B540224-01

4) Set reverse gear shift lever (1) as shown in figure. Apply thread lock cement, only reverse gear shift lever bolt No.2 (2), and then tighten reverse gear shift lever bolt No.1 (3) and No.2 to specified torque.

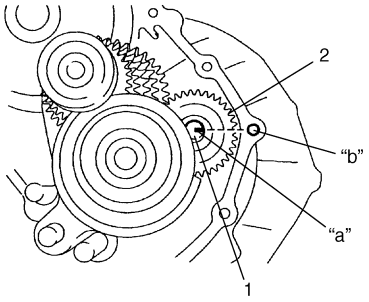
Tightening torque
Reverse gear shift lever bolt No.1 and No.2 (a): 17 N·m (1.7 kgf-m, 13.0 lbf-ft)

"A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)



I4RS0B540065-02

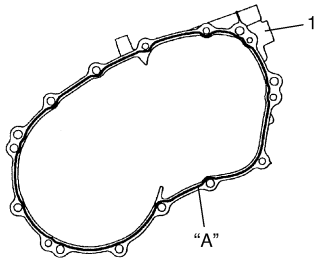
5) Install reverse shaft (1) and reverse idler gear (2), and then align "a" in shaft with "b" in case as shown in figure.



I4RS0B540066-01

6) Clean mating surfaces of both right and left cases, apply sealant to right case (1) as shown in the figure by such amount that its section is 1.5 mm (0.059 in.) in diameter, and then mate it with left case.

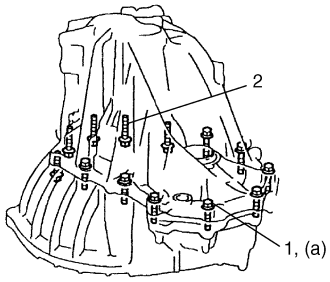
"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)



I4RS0B540067-01

7) Tighten case bolts (1) from outside and another case bolts from clutch housing side to specified torque.

Tightening torque
Transaxle case bolt (a): 29 N·m (2.9 kgf-m, 21.0 lbf-ft)



I4RS0B540068-02

2. Long bolt

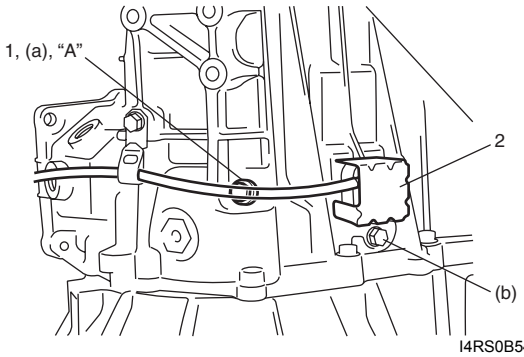
8) Apply thread lock to thread of reverse shaft bolt (1) and tighten it with new gasket to specified torque.

Tightening torque
Reverse shaft bolt (a): 29 N·m (2.9 kgf-m, 21.0 lbf-ft)

"A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

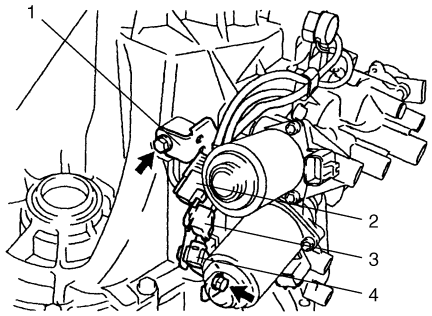
9) Install new O-ring to input shaft sped sensor.
10) Install input shaft speed sensor and protector (2).

Tightening torque
Input shaft speed sensor bolt: 8 N·m (0.8 kgf-m, 6.0 lbf-ft)
Protector bolt (a): 18 N·m (1.8 kgf-m, 13.0 lbf-ft)



I4RS0B540069-01

11) Install shift and select actuator referring to "Shift and Select Actuator Removal and Installation".
12) Connect 3 connectors to wire harness clamp bracket, and then install wire harness clamp bracket (1).



I4RS0B540070-01

2.	Back up lamp switch connector
3.	Input shaft speed sensor connector
4.	Neutral start switch connector

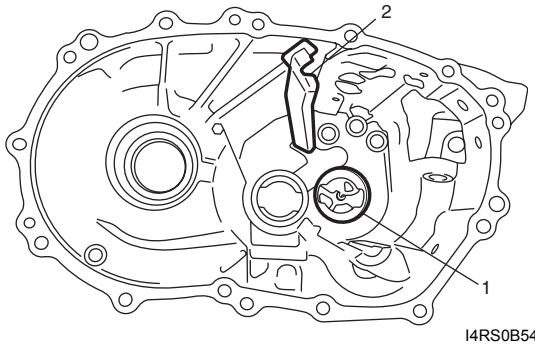
13) Install clutch release bearing, release shaft and release fork to right case referring to "Clutch Release System Component Removal and Installation".

Left Case Assembly Disassembly and Reassembly

S7N20A5406030

Disassembly

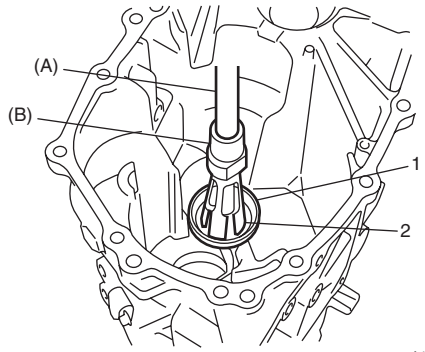
1) Remove shim (1) and oil gutter (2).



I4RS0B540071-01

2) Remove countershaft left bearing outer race (1) and shim (2) using special tools.

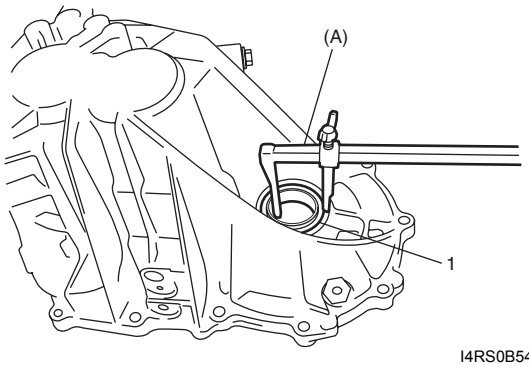
Special tool
(A): 09930–30104
(B): 09941–64511



I4RS0B540072-02

3) Remove differential side oil seal (1) using special tool.

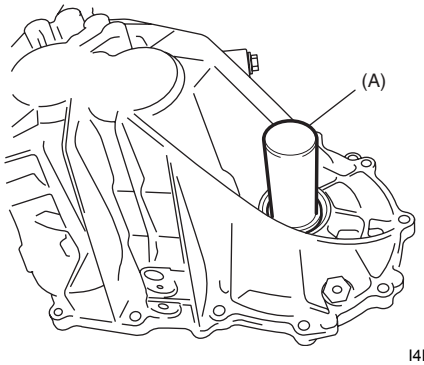
Special tool
(A): 09913–50121



I4RS0B540073-01

4) Remove differential side bearing outer race and shim using special tool.

Special tool
(A): 09913–70123

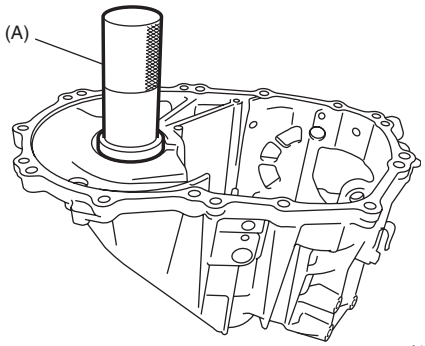


I4RS0B540074-01

Reassembly

1) Install differential side bearing outer race using special tool.

Special tool
(A): 09913–85210

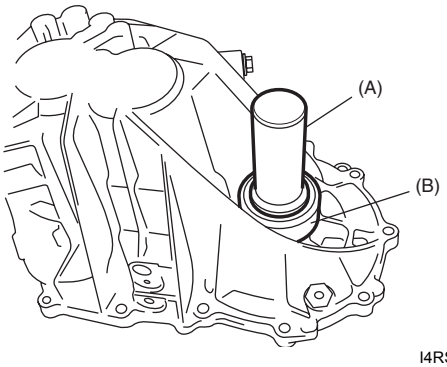


I4RS0B540221-01

2) Install differential side oil seal using special tools and apply grease to oil seal lip.

Special tool
(A): 09913–70123
(B): 09951–16090

: Grease 99000–25010 (SUZUKI Super Grease A)

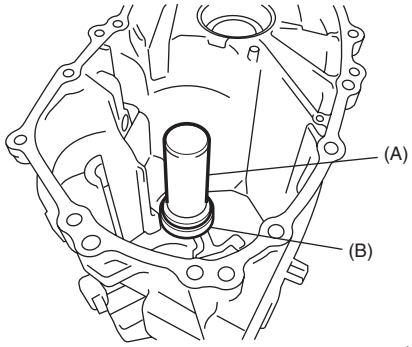


I4RS0B540075-01

3) Select countershaft left bearing shim referring to “Countershaft Tapered Roller Bearing Preload Adjustment”.

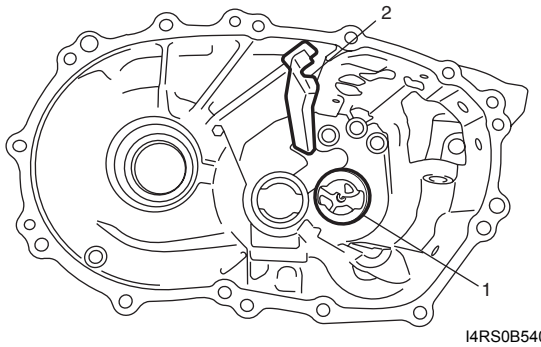
4) Install countershaft left bearing outer race and shim using special tools.

Special tool
(A): 09913–70123
(B): 09924–07720



I4RS0B540076-01

5) Install shim (1) and oil gutter (2).



I4RS0B540071-01

Countershaft Tapered Roller Bearing Preload Adjustment

S7N20A5406031

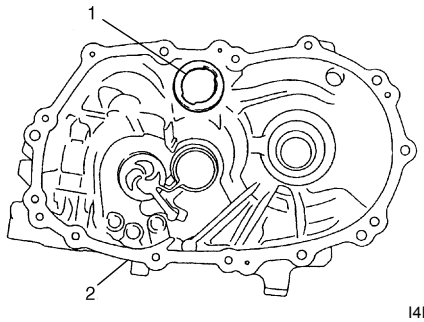
NOTE

Perform differential left side bearing preload adjustment referring to "Differential Left Side Bearing Preload Adjustment", after replace Differential side bearing, right case and left case.

1) Install countershaft and differential case assembly to right case.
2) Install shim (1) to left case (2).

NOTE

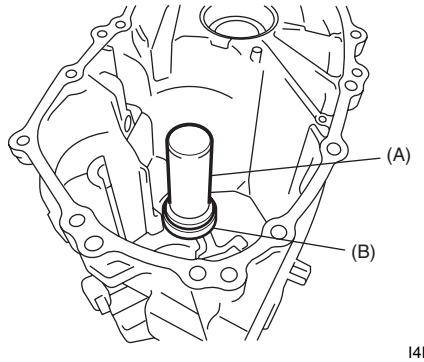
When reusing countershaft left bearing, first install shim of same thickness as original shim. If installing new countershaft left bearing, first select and install shim of lesser thickness than original shim.



I4RS0B540077-02

3) Install countershaft left bearing outer race using special tools.

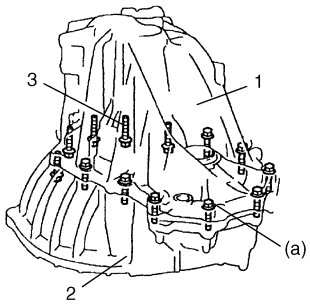
Special tool
(A): 09913–70123
(B): 09924–07720



I4RS0B540078-01

4) Install left case (1) to right case (2) with case bolts.

Tightening torque
Transaxle case bolt (a): 29 N·m (2.9 kgf-m, 21.0 lbf-ft)

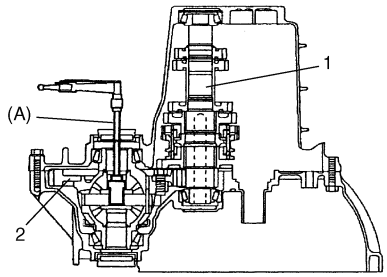


I4RS0B540079-02

3. Long bolt

5) Turn countershaft (1) and differential case (2) right and left 2 or 3 times to allow bearing to settle using special tool and torque wrench.
6) Measure preload using special tool and torque wrench and record preload (at starting) as [a].

Special tool
(A): 09928–06050



I4RS0B540080-01

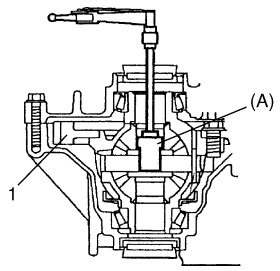
7) Remove left case and countershaft assembly, and then install left case to right case with transaxle case bolts.

Tightening torque
Transaxle case bolt: 29 N·m (2.9 kgf-m, 21.0 lbf-ft)

8) Turn differential case (1) right and left 2 or 3 times to allow bearing to settle using special tool and torque wrench.

Special tool
(A): 09928–06050

9) Measure preload using special tool and torque wrench, and record preload (at starting) as [b].



I4RS0B540081-01

10) Using formula below, calculate countershaft bearing preload. If calculated preload is not within specification, select shim that will ensure that value is within specification from table below.
[a]: Bearing preload of countershaft bearing and differential bearing measured with step 6)
[b]: Bearing preload of differential bearing measured with step 9)
Countershaft tapper roller bearing preload (at starting) = Preload [a] – Preload [b]

Preload (at starting) for new left bearing
3.1 – 6.2 N·m (0.3 – 0.6 kg-cm, 2.5 – 4.5 lbf-ft)

Preload for reused left bearing
1.9 – 3.9 N·m (0.2 – 0.4 kg-cm, 1.5 – 3.0 lbf-ft)

NOTE

- **Preload will change by about 1.2 N·m (0.1 kgf-m, 1.0 lbf-ft) corresponding to change of 0.05 mm (0.0020 in.) in shim thickness.**
- **To make preload larger, use thicker shim.**

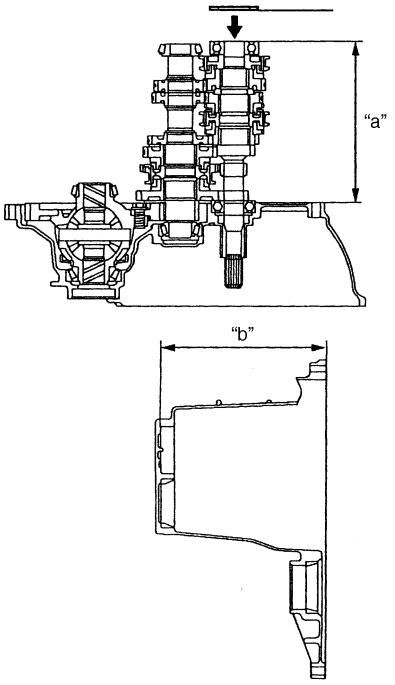
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.55 (0.0610)	J	1.95 (0.0768)
B	1.60 (0.0630)	K	2.00 (0.0787)
C	1.65 (0.0650)	L	2.05 (0.0807)
D	1.70 (0.0669)	M	2.10 (0.0827)
E	1.75 (0.0689)	N	2.15 (0.0846)
F	1.80 (0.0709)	P	2.20 (0.0866)
G	1.85 (0.0728)	Q	2.25 (0.0886)
H	1.90 (0.0748)	—	—

11) Remove left case and differential case assembly.

Input Shaft Bearing Shim Adjustment

S7N20A5406032

1) Measure dimension “a” and “b” using vernier caliper.



I4RS0B540082-01

2) Select shim that will ensure that value is within specification.

Shim thickness:
0 ≤ “b” – “a” – (Shim thickness) ≤ 0.1 mm (0.0039 in.)

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
F	1.80 (0.0709)	N	2.15 (0.0846)
G	1.85 (0.0728)	P	2.20 (0.0866)
H	1.90 (0.0748)	Q	2.25 (0.0886)
J	1.95 (0.0768)	R	2.30 (0.0906)
K	2.00 (0.0787)	S	2.35 (0.0925)
L	2.05 (0.0807)	T	2.40 (0.0945)
M	2.10 (0.0827)	—	—

Differential Left Side Bearing Preload Adjustment

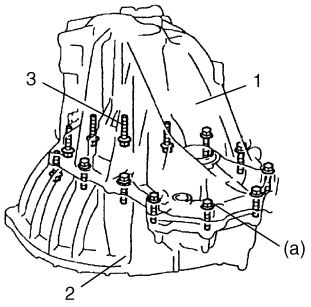
S7N20A5406033

NOTE

Perform this work when replacing differential side bearing, right case or left case.

1) Install differential case assembly to right case.
2) Install left case (1) to right case (2) with case bolts.

Tightening torque
Transaxle case bolt (a): 29 N·m (2.9 kgf-m, 21.0 lbf-ft)



I4RS0B540079-02

3. Long bolt

3) Turn differential gear (1) right and left 2 or 3 times to allow bearing to settle using special tool and torque wrench.
4) Measure preload using special tool and torque wrench.

Special tool
(A): 09928–06050

5) If preload is not within specification, select shim that will ensure that value is within specification from table below.

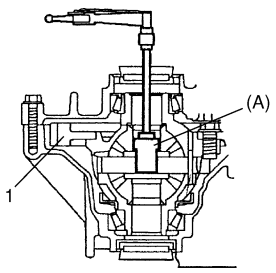
Preload (at starting) for new left bearing
0.8 – 1.6 N·m (8 – 16 kg-cm, 6.0 – 11.5 lbf-ft)

Preload (at starting) for reused left bearing
0.5 – 1.0 N·m (5 – 10 kg-cm, 4.0 – 7.5 lbf-ft)

NOTE

Preload will change by about 0.6 – 0.7 N·m (6 – 7 kg-cm, 0.45 – 0.51 lbf-ft) corresponding to change of 0.05 mm (0.0020 in.) in shim thickness.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	1.20 (0.0472)	H	1.55 (0.0610)
B	1.25 (0.0492)	J	1.60 (0.0630)
C	1.30 (0.0512)	K	1.65 (0.0650)
D	1.35 (0.0531)	L	1.70 (0.0669)
E	1.40 (0.0551)	M	1.75 (0.0689)
F	1.45 (0.0571)	N	1.80 (0.0709)
G	1.50 (0.0591)	—	—



I4RS0B540081-01

6) Remove left case and differential case assembly.

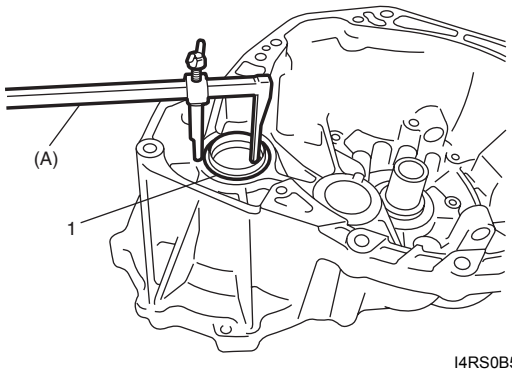
Right Case Assembly Disassembly and Reassembly

S7N20A5406034

Disassembly

1) Remove differential side oil seal (1) using special tool.

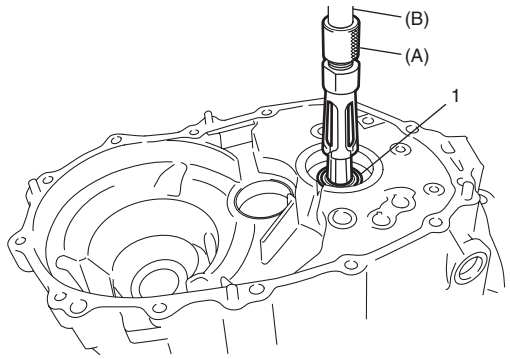
Special tool
(A): 09913–50121



I4RS0B540083-01

2) Remove input shaft oil seal (1) using special tools.

Special tool
(A): 09923–74510
(B): 09930–30104

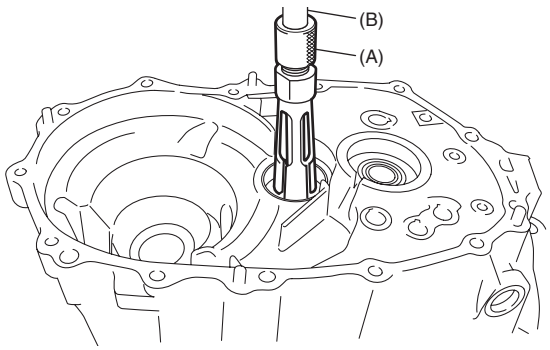


I4RS0B540084-01

3) Remove countershaft right bearing outer race using special tools.

Special tool
(A): 09923–74510
(B): 09930–30104

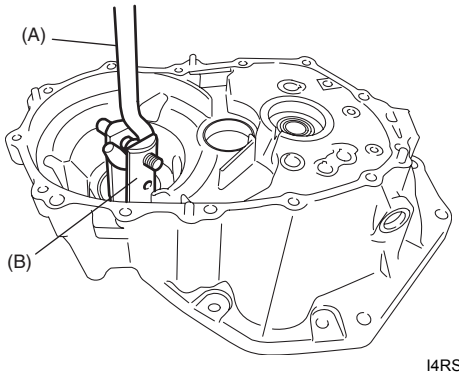
4) Remove countershaft cover.



I4RS0B540085-01

5) Remove differential side bearing outer race using special tools.

Special tool
(A): 09942–15511
(B): 09944–96011

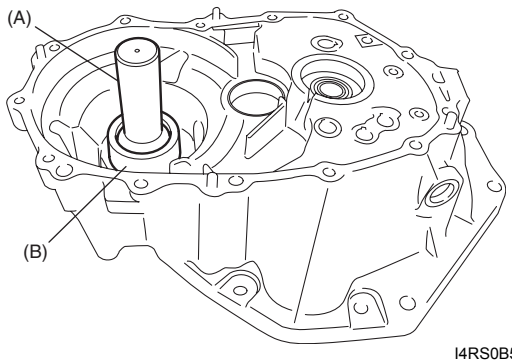


I4RS0B540086-01

Reassembly

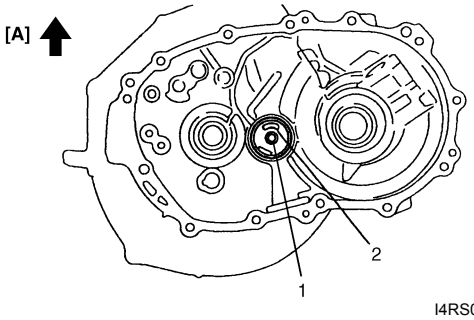
1) Install differential side bearing outer race using special tools.

Special tool
(A): 09913–76010
(B): 09951–46010



I4RS0B540087-01

2) Install countershaft cover (1) as shown in figure.

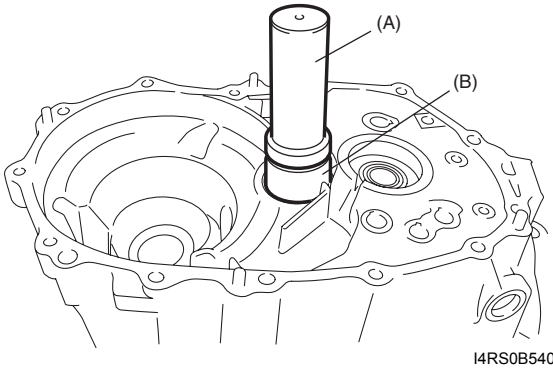


I4RS0B540088-03

[A]:	Upper side
2.	Lubrication hole

3) Install countershaft outer race using special tools.

Special tool
(A): 09913–70123
(B): 09951–16030



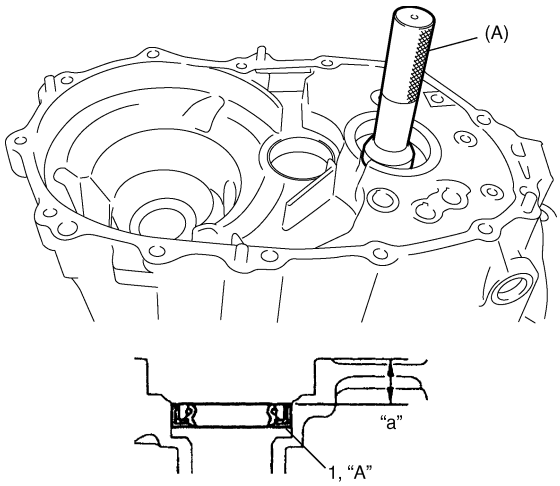
I4RS0B540222-01

4) Press-fit input shaft oil seal (1) to position shown in figure using special tool and apply grease to oil seal lip.

Special tool
(A): 09913–75830

"A": Grease 99000–25010 (SUZUKI Super Grease A)

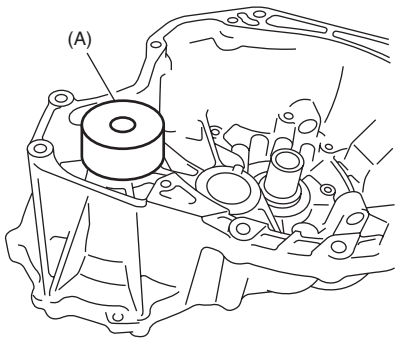
Installation position oil seal
"a": 14.9 – 15.5 mm (0.58 – 0.61 in.)



I4RS0B540089-01

5) Install differential side oil seal using special tool.

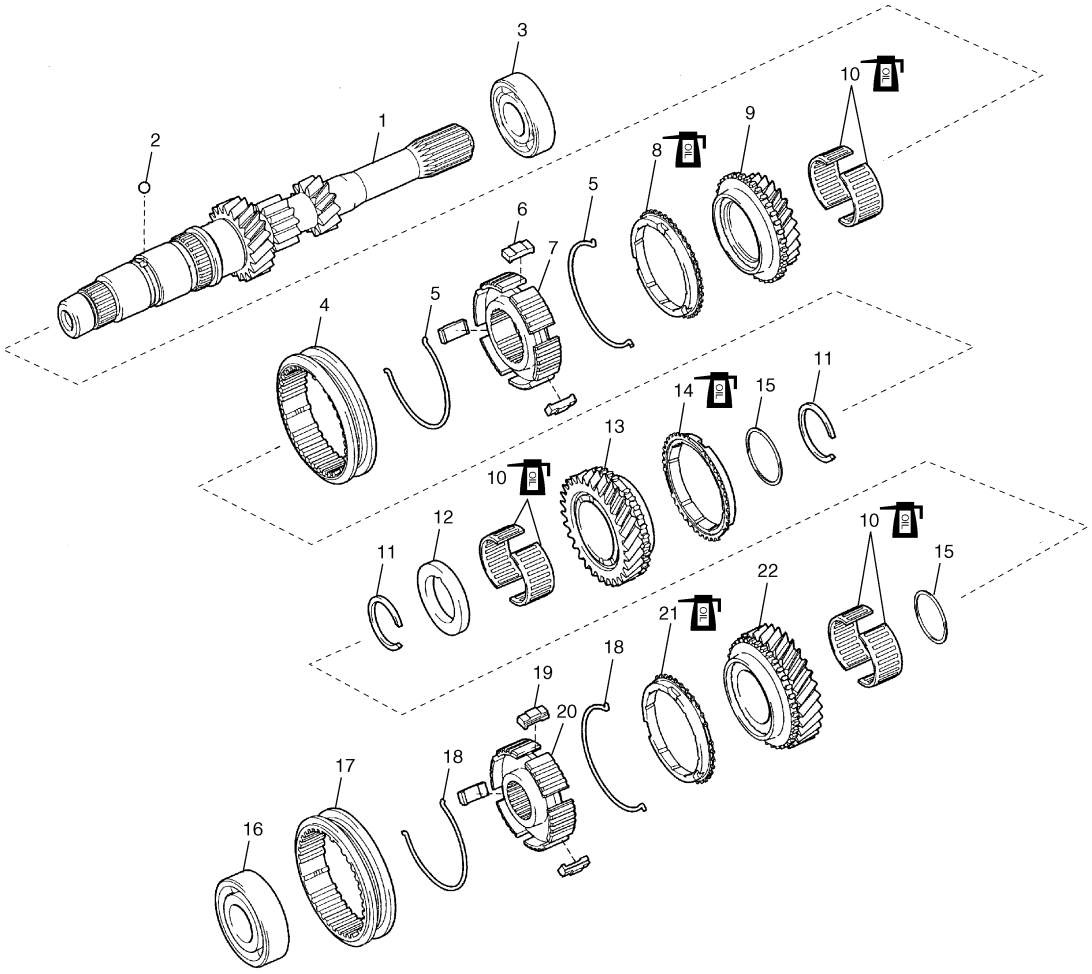
Special tool
(A): 09951–46010



I4RS0B540090-02

Input Shaft Assembly Components

S7N20A5406035



I4RS0B540091-02

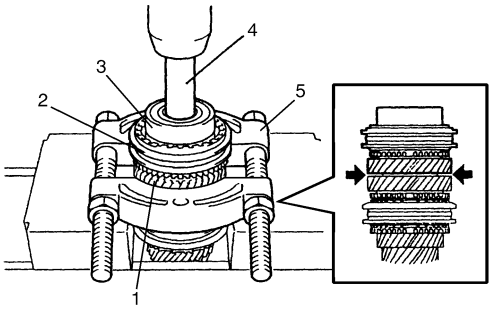
1. Input shaft	9. 3rd gear	17. 5th speed synchronizer sleeve
2. Steel ball	10. Needle bearing	18. 5th speed synchronizer spring
3. Input shaft right bearing	11. Snap ring	19. 5th speed synchronizer key
4. High speed synchronizer sleeve	12. 5th gear thrust washer	20. 5th speed synchronizer hub
5. High speed synchronizer spring	13. 4th gear	21. 5th gear synchronizer ring
6. High speed synchronizer key	14. 4th gear synchronizer ring	22. 5th gear
7. High speed synchronizer hub	15. Spacer	: Apply transaxle oil.
8. 3rd gear synchronizer ring	16. Input shaft left bearing	

Input Shaft Assembly Disassembly and Reassembly

S7N20A5406036

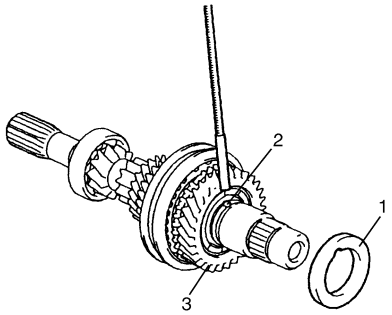
Disassembly

1) Remove 5th gear (1), 5th speed synchronizer sleeve and hub assembly (2), synchronizer ring and input shaft left bearing (3) all together using bearing puller (5), metal stick (4) and hydraulic press.



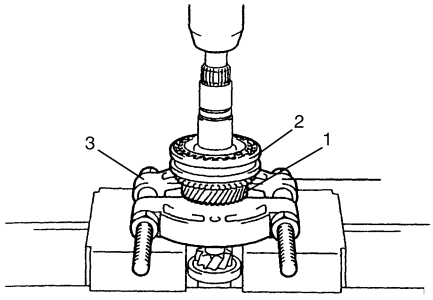
I4RS0B540092-01

2) Remove needle bearing and spacer.
3) Remove snap ring.
4) Remove 5th gear thrust washer (1) and steel ball (2).
5) Remove 4th gear (3), synchronizer ring, 4th gear needle bearing and spacer.
6) Remove snap ring.



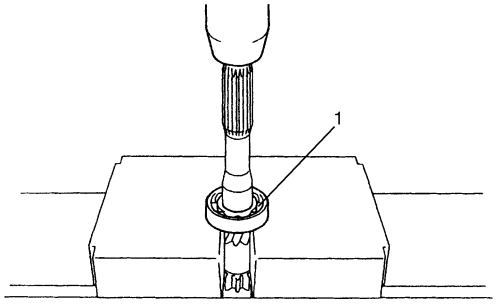
I4RS0B540093-01

7) Remove 3rd gear (1), synchronizer ring and high speed synchronizer sleeve and hub assembly (2) all at once using bearing puller (3), metal stick and hydraulic press.



I4RS0B540094-01

8) Remove needle bearing.
9) Remove input shaft right bearing (1) using hydraulic press.

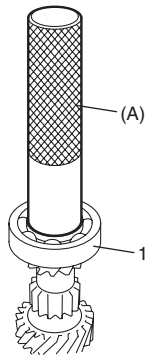


I4RS0B540095-01

Reassembly

1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2) Press-fit input shaft right bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913–80113

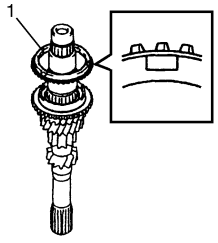


I4RS0B540096-01

3) Install needle bearing, 3rd gear and synchronizer ring (1).

NOTE

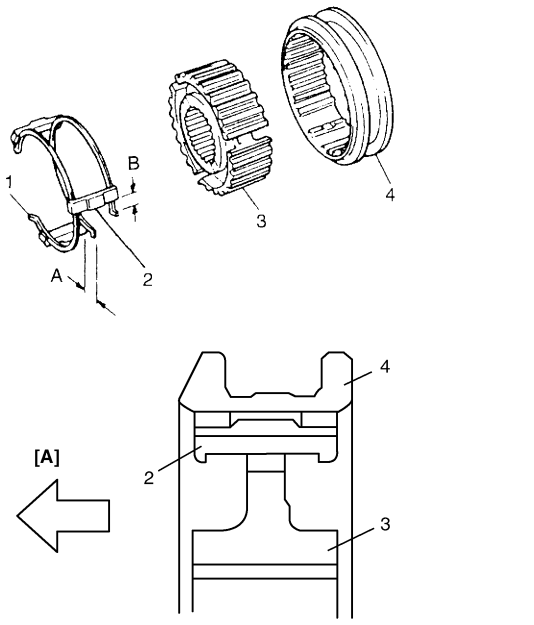
Distinguish synchronizer ring for 3rd gear from other rings by teeth as shown in figure.



I4RS0B540097-02

4) Fit high speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it, and then set spring (1) as shown in figure.

Synchronizer key installation position
A = B



I4RS0B540098-01

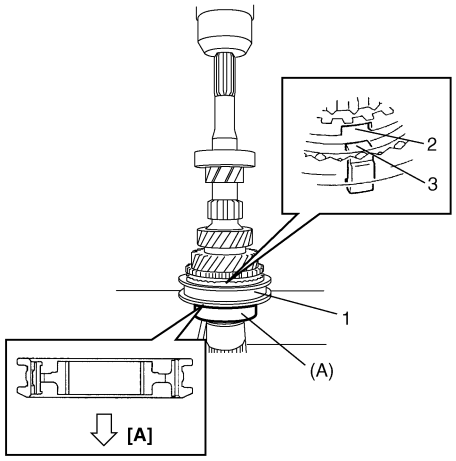
[A]: 4th gear side

5) Install high speed synchronizer sleeve and hub assembly (1) to input shaft using special tool and hydraulic press as shown in figure.

NOTE

- **While press-fitting sleeve and hub assembly, make sure that synchronizer ring key slots (2) are aligned with keys (3) in sleeve and hub assembly.**
- **Check free rotation of 3rd gear after press-fitting sleeve and hub assembly.**

Special tool
(A): 09924–07730

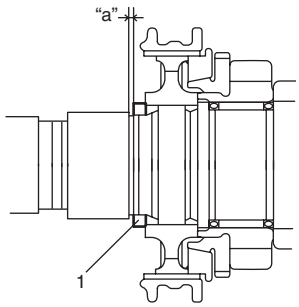


I4RS0B540099-02

[A]: 4th gear side

6) Select a snap ring (1) from the table below, and install it so that snap ring-to-groove clearance “a” may become 0.1 mm or less.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.28 (0.0898)	D	2.46 (0.0969)
B	2.34 (0.0921)	E	2.52 (0.0992)
C	2.40 (0.0945)	F	2.58 (0.1016)

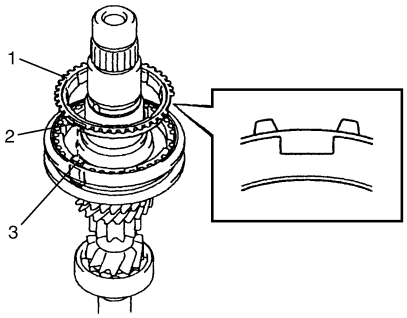


I4RS0B540100-01

7) Install spacer and needle bearing.
8) Install synchronizer ring (1) and 4th gear.

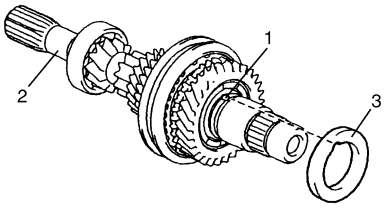
NOTE

- **Distinguish synchronizer ring for 4th gear from other rings by teeth as shown in figure.**
- **Make sure that synchronizer ring key slots (2) are aligned with keys (3) in sleeve and hub assembly.**



I4RS0B540101-01

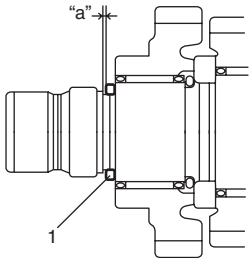
9) Install steel ball (1) to input shaft (2), and then install 5th gear thrust washer (3) to input shaft aligning its slot with steel ball.



I4RS0B540102-01

10) Select a snap ring (1) from the table below, and install it so that snap ring-to-groove clearance “a” may become 0.1 mm or less.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.28 (0.0898)	D	2.46 (0.0969)
B	2.34 (0.0921)	E	2.52 (0.0992)
C	2.40 (0.0945)	F	2.58 (0.1016)

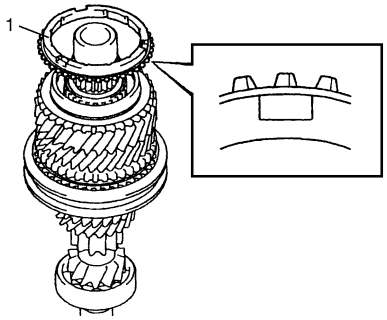


I4RS0B540103-01

11) Install spacer, needle bearing, 5th gear and synchronizer ring (1).

NOTE

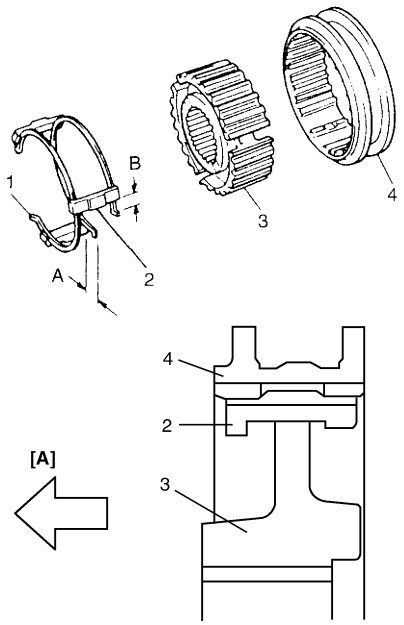
Distinguish synchronizer ring for 5th gear by teeth on synchronizer ring.



I4RS0B540104-01

12) Fit 5th speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it, and then set spring (1) as shown in figure.

Synchronizer key installation position
A = B



I4RS0B540105-01

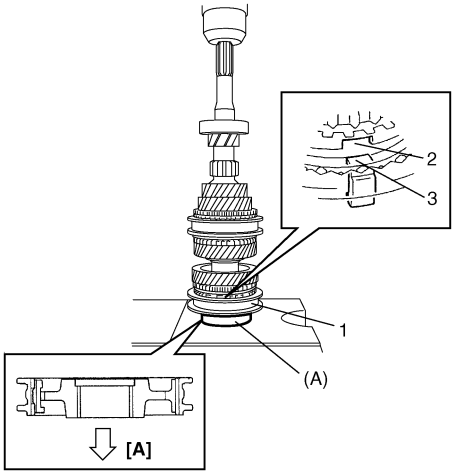
[A]: Input shaft left bearing side

13) Install 5th speed synchronizer sleeve and hub assembly (1) using special tool and hydraulic press as shown in figure.

NOTE

- **While press-fitting sleeve and hub assembly, make sure that synchronizer ring key slots (2) are aligned with keys (3) in sleeve and hub assembly.**
- **Check free rotation of 5th gear after press-fitting sleeve and hub assembly.**

Special tool
(A): 09924–07720

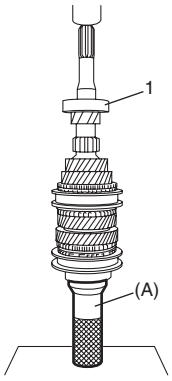


I4RS0B540106-02

[A]: Input shaft left bearing side

14) Install input shaft left bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913–76010



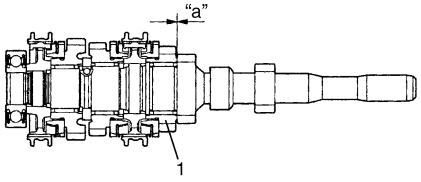
I4RS0B540107-01

Input Shaft Assembly Inspection

S7N20A5406037

3rd Gear Thrust Clearance
Using feeler gauge, check 3rd gear thrust clearance. If clearance is out of specification, replace 3rd gear.

3rd gear thrust clearance "a"
Standard:
0.10 – 0.35 mm (0.0039 – 0.0138 in.)
Limit:
0.35 mm (0.0138 in.)



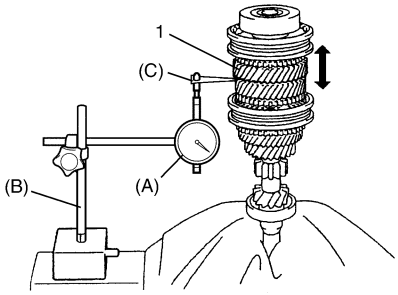
I4RS0B540108-01

1. 3rd gear

5th Gear Thrust Clearance
Using dial gauge, check 5th gear (1) thrust clearance. If clearance out of specification, replace 5th gear or 5th gear thrust washer.

Special tool
(A): 09900–20607
(B): 09900–20701
(C): 09952–06010

5th gear thrust clearance
Standard:
0.10 – 0.50 mm (0.0039 – 0.0197 in.)
Limit:
0.50 mm (0.0197 in.)

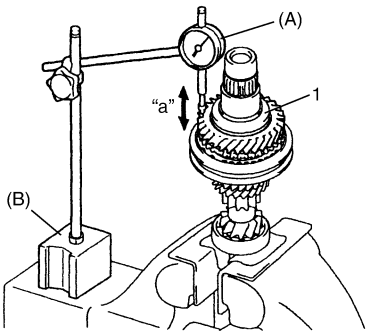


I4RS0B540109-01

4th Gear Thrust Clearance
Using special tools, check 4th gear (1) thrust clearance. If clearance is out of specification, replace 4th gear or 5th gear thrust washer.

Special tool
(A): 09900–20607
(B): 09900–20701

4th gear thrust clearance “a”
Standard:
0.10 – 0.55 mm (0.0039 – 0.0217 in.)
Limit:
0.55 mm (0.0217 in.)

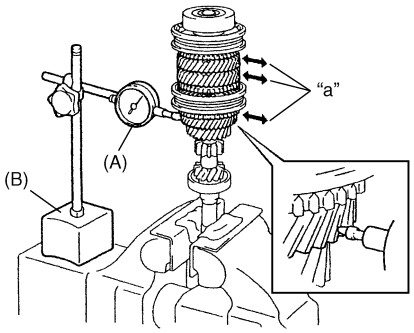


I4RS0B540110-01

3rd, 4th and 5th Gear Radial Clearance
Using special tools, check radial clearance between each gear and shaft.
If clearance is out of specification, replace gear, needle roller bearing or input shaft.

Special tool
(A): 09900–20607
(B): 09900–20701

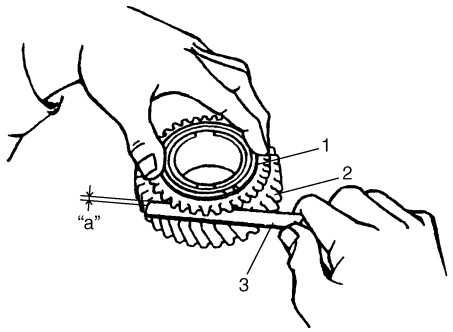
Radial clearance of 3rd, 4th or 5th gear “a”
Standard:
0.015 – 0.058 mm (0.0006 – 0.0023 in.)
Limit:
0.058 mm (0.0023 in.)



I4RS0B540111-01

Synchronizer Parts
Check clearance “a” between ring (1) and gear (2) using feeler gauge (3), each chamfered tooth of gear, synchronizer ring and synchronizer sleeve, then determine parts replacement.

Clearance between synchronizer ring and gear
Service limit “a”: 0.8 mm (0.031 in.)

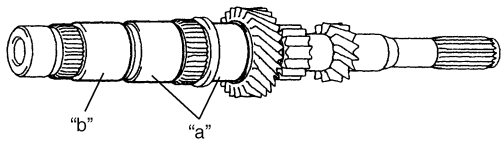


I4RS0B540112-01

Input Shaft
1) Check input shaft for wear or damage.
2) Using micrometer, measure outer diameter of input shaft journal surface. If outer diameter is less than limit, replace input shaft.

Outer diameter “a”
Limit: 33.985 mm (1.3380 in.)

Outer diameter “b”
Limit: 30.985 mm (1.2199 in.)

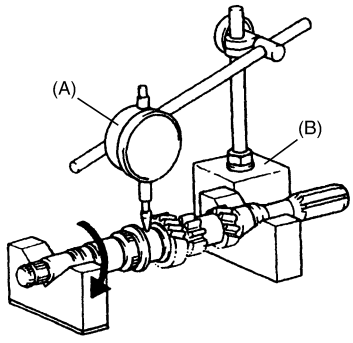


I4RS0B540113-01

3) Using special tools, check input shaft runout. If runout is exceeds maximum, replace input shaft.

Special tool
(A): 09900–20607
(B): 09900–20701

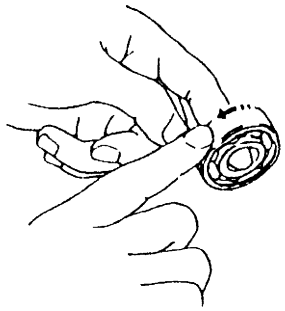
Input shaft runout
Limit: 0.03 mm (0.0012 in.)



I4RS0B540114-01

Input Shaft Bearing

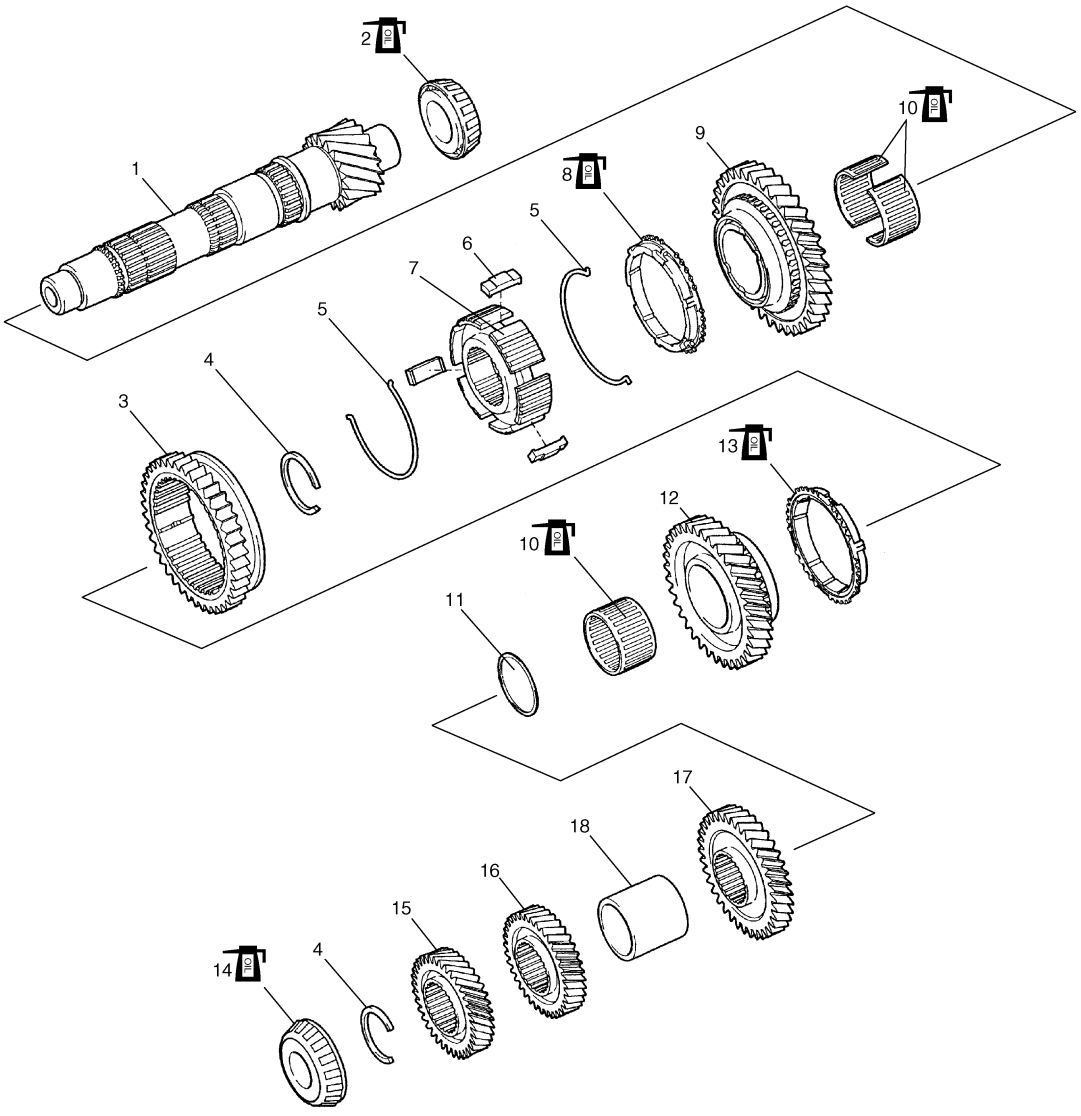
Check bearing for smooth rotation and replace it if abnormality is found.



I4RS0B540225-01

Countershaft Components

S7N20A5406038



I4RS0B540115-01

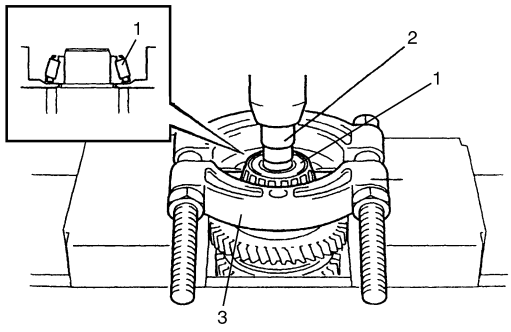
1. Countershaft	8. 1st gear synchronizer ring	15. 5th driven gear
2. Countershaft right bearing	9. 1st gear	16. 4th driven gear
3. Low speed synchronizer sleeve	10. Needle bearing	17. 3rd driven gear
4. Snap ring	11. Spacer	18. 3rd and 4th gear spacer
5. Low speed synchronizer spring	12. 2nd gear	: Apply transaxle oil.
6. Low speed synchronizer key	13. 2nd gear synchronizer ring	
7. Low speed synchronizer hub	14. Countershaft left bearing	

Countershaft Assembly Disassembly and Reassembly

S7N20A5406039

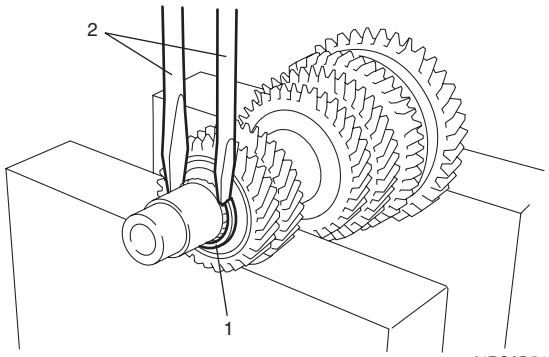
Disassembly

1) Remove countershaft right bearing (1) using metal stick (2), bearing puller (3) and hydraulic press, and left bearing in the same manor.



I4RS0B540116-01

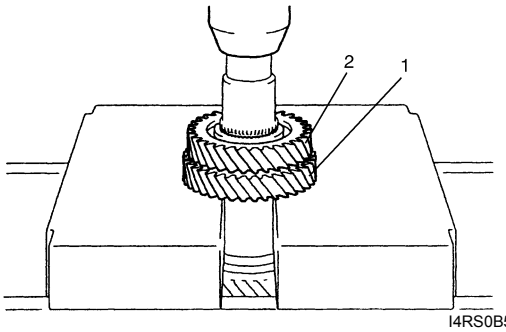
2) Remove snap ring (1) using 2 flat end rod (2) or the like.



I4RS0B540117-01

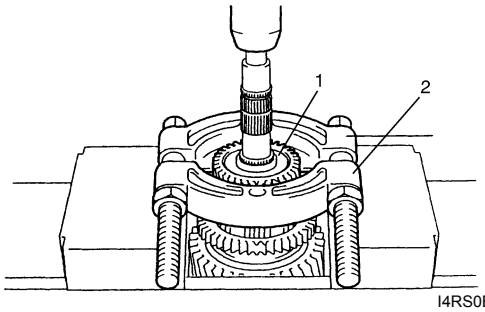
3) Remove 4th (1) and 5th (2) driven gears using hydraulic press.

4) Remove 3rd and 4th gear spacer.



I4RS0B540118-01

5) Remove 3rd driven gear (1) using bearing puller (2) and hydraulic press.

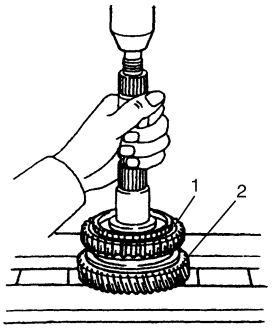


I4RS0B540119-01

6) Remove 2nd gear, needle bearing, synchronizer ring and spacer.

7) Remove snap ring.

8) Remove low speed synchronizer sleeve and hub assembly (1) and 1st gear (2) using bearing puller and hydraulic press.



I4RS0B540120-01

9) Remove needle bearing.

Reassembly

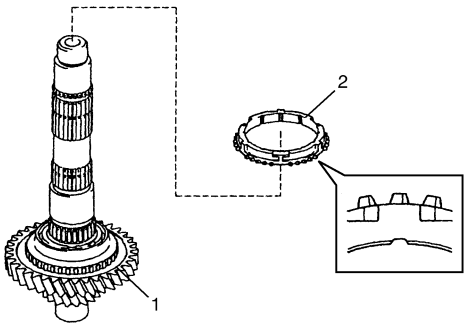
1) Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.

2) Install needle bearing.

3) Install 1st gear (1) and synchronizer ring (2).

NOTE

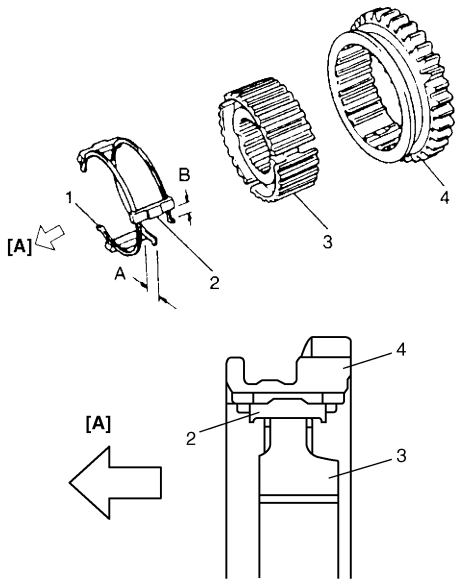
Distinguish synchronizer ring for 1st gear from other rings by teeth as shown in figure.



I4RS0B540121-01

4) Fit low speed synchronizer sleeve (4) to hub (3), insert 3 keys (2) in it, and then set spring (1) as shown in figure.

Synchronizer key installation position
A = B



I4RS0B540122-01

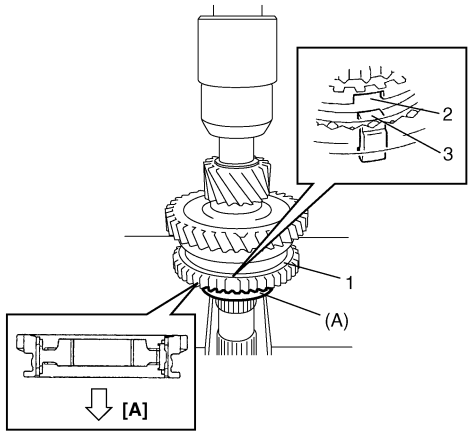
[A]: 2nd gear side

5) Install low speed synchronizer sleeve and hub assembly (1) to countershaft using special tool and hydraulic press as shown in figure.

NOTE

- **While press-fitting sleeve and hub assembly, make sure that synchronizer ring key slots (2) are aligned with keys (3) in sleeve and hub assembly.**
- **Check free rotation of 1st gear after press-fitting sleeve and hub assembly.**

Special tool
(A): 09924–07730

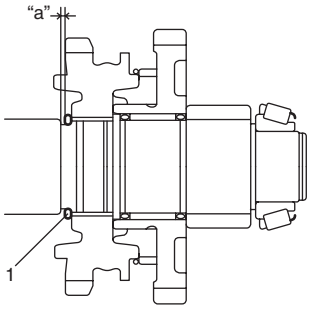


I4RS0B540123-01

[A]: 2nd gear side

6) Select a snap ring (1) from the table below, and install it so that snap ring-to-groove clearance “a” may become 0.1 mm or less.

Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.28 (0.0898)	D	2.46 (0.0969)
B	2.34 (0.0921)	E	2.52 (0.0992)
C	2.40 (0.0945)	F	2.58 (0.1016)

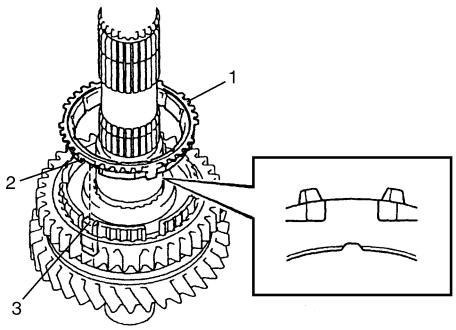


I4RS0B540124-01

7) Install spacer and needle bearing.
8) Install synchronizer ring (1) and 2nd gear.

NOTE

- **Distinguish synchronizer ring for 2nd from other rings gear by teeth as shown in figure.**
- **Make sure that synchronizer ring key slots (2) are aligned with keys (3) in sleeve and hub assembly.**

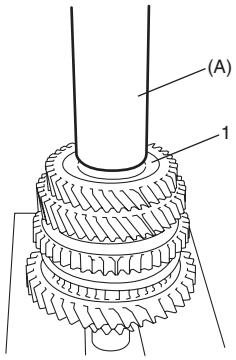


I4RS0B540125-01

9) Install 3rd driven gear (1) using special tool and hydraulic press as shown in figure.

Special tool
(A): 09940–51710

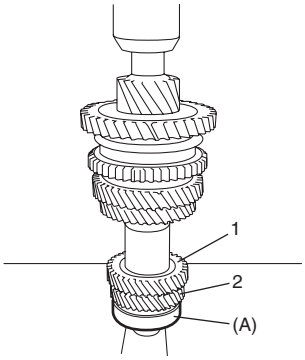
10) Install 3rd and 4th spacer.



I4RS0B540126-01

11) Install 4th (1) and 5th (2) driven gear using special tool and hydraulic press as shown in figure.

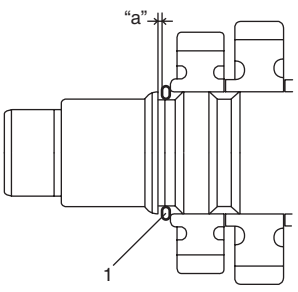
Special tool
(A): 09924–07720



I4RS0B540127-01

12) Select a snap ring (1) from the table below, and install it so that snap ring-to-groove clearance “a” may become 0.1 mm or less.

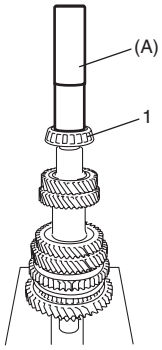
Mark	Thickness mm (in.)	Mark	Thickness mm (in.)
A	2.22 (0.0874)	F	2.52 (0.0992)
B	2.28 (0.0898)	G	2.58 (0.1016)
C	2.34 (0.0921)	H	2.64 (0.1039)
D	2.40 (0.0945)	J	2.70 (0.1063)
E	2.46 (0.0969)	—	—



I4RS0B540128-01

13) Install countershaft left bearing (1) using special tool and hydraulic press.

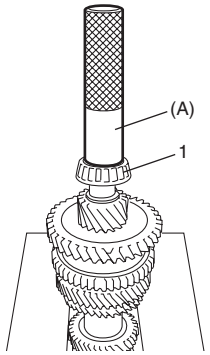
Special tool
(A): 09913–80113



I4RS0B540129-01

14) Install countershaft right bearing (1) using special tool and hydraulic press.

Special tool
(A): 09913–80113



I4RS0B540130-01

Countershaft Assembly Inspection

S7N20A5406040

1st Gear Thrust Clearance

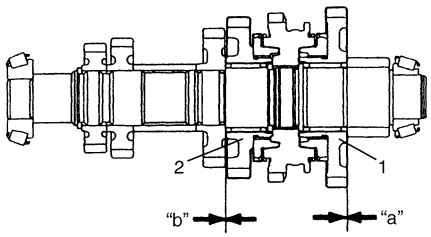
Using feeler gauge, check 1st gear thrust clearance.
If clearance is out of specification, replace 1st gear.

1st gear thrust clearance “a”
Standard:
0.10 – 0.35 mm (0.0039 – 0.0138 in.)
Limit:
0.35 mm (0.0138 in.)

2nd Gear Thrust Clearance

Using feeler gauge, check clearance 2nd gear thrust clearance.
If clearance is out of specification, replace 2nd gear.

2nd gear thrust clearance “b”
Standard:
0.10 – 0.50 mm (0.0039 – 0.0197 in.)
Limit:
0.50 mm (0.0197 in.)



I4RS0B540131-01

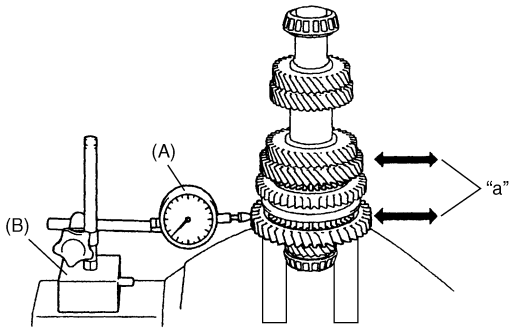
1. 1st gear
2. 2nd gear

1st and 2nd Gear Radial Clearance

Using special tool, check radial clearance between each gear and shaft.
If clearance is out of specification, replace gear, needle roller bearing or countershaft.

Special tool
(A): 09900–20607
(B): 09900–20701

Radial clearance “a”
Standard:
0.015 – 0.056 mm (0.0006 – 0.0022 in.)
Limit:
0.056 mm (0.0022 in.)

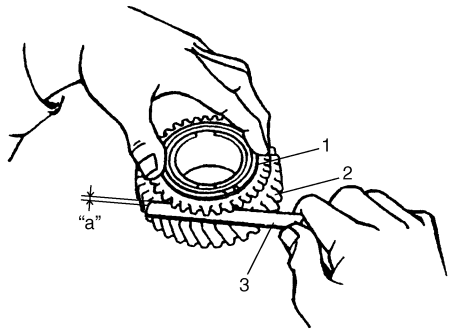


I4RS0B540132-01

Synchronizer Parts

Check clearance “a” between ring (1) and gear (2) using feeler gauge (3), each chamfered tooth of gear, synchronizer ring and synchronizer sleeve, then determine parts replacement.

Clearance between synchronizer ring and gear
Service limit “a”: 0.8 mm (0.031 in.)

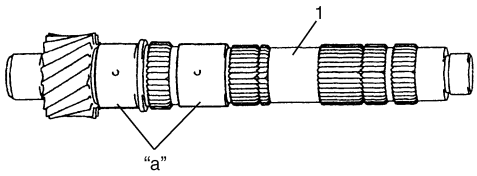


I4RS0B540112-01

Countershaft

1) Check countershaft (1) for wear or damage.
2) Using micrometer, measure outer diameter of countershaft journal surface. If outer diameter is less than limit, replace countershaft.

   Outer diameter “a”
   Limit: 33.985 mm (1.3380 in.)

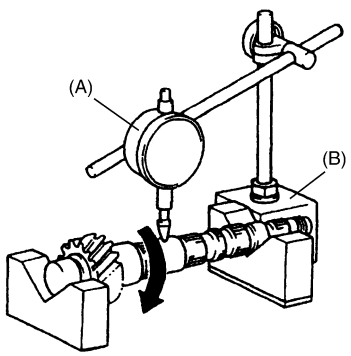


I4RS0B540133-01

3) Using special tools, check countershaft runout. If runout is exceeds limit, replace countershaft.

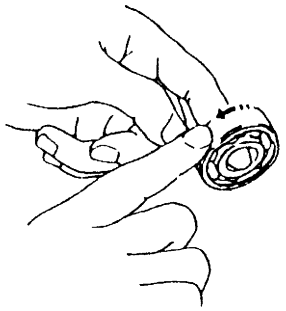
   Special tool
   (A): 09900–20607
   (B): 09900–20701

   Countershaft runout
   Limit: 0.03 mm (0.0012 in.)



I4RS0B540134-01

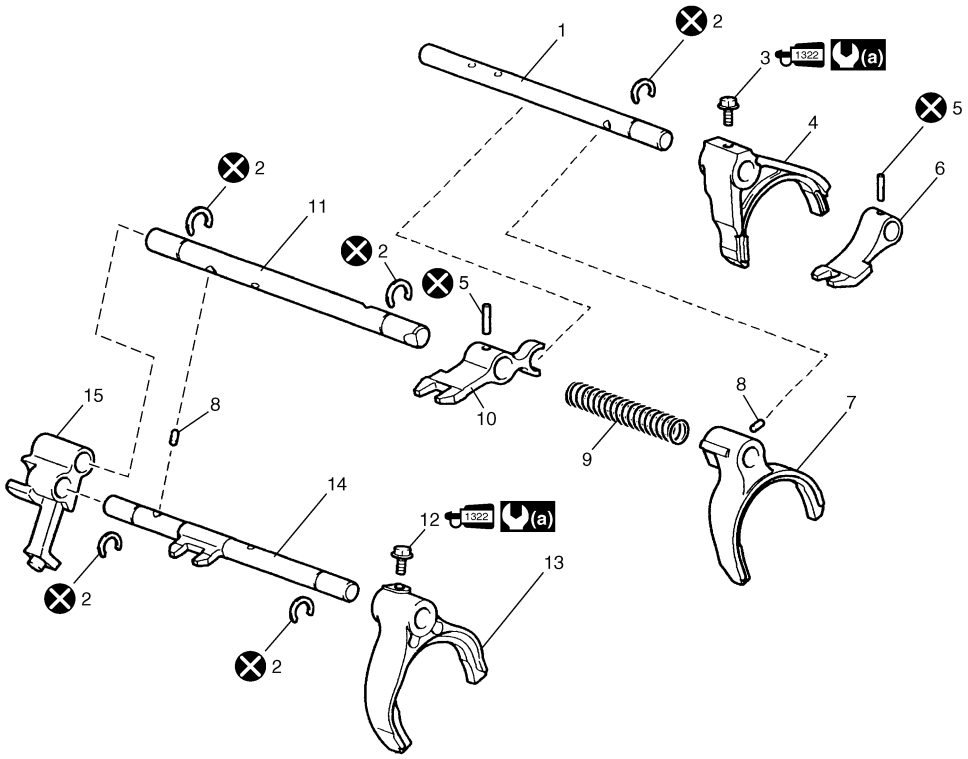
Countershaft Bearing
Check bearing for smooth rotation and replace it if abnormality is found.



I4RS0B540225-01

Gear Shift Shaft Components

S7N20A5406041



I4RS0B540135-04

1. Low speed gear shift shaft	10. 5th gear shift head
2. Snap ring	11. 5th gear shift shaft
1322 3. Low speed gear shift fork bolt : Apply thread lock 99000-32110 to all around thread part of bolt.	1322 12. High speed gear shift fork bolt : Apply thread lock 99000-32110 to all around thread part of bolt.
4. Low speed gear shift fork	13. High speed gear shift fork bolt
5. Spring pin	14. High speed gear shift shaft
6. Low speed gear shift head	15. Reverse gear shift arm
7. 5th gear shift fork	(a) : 16 N·m (1.6 kgf-m, 11.5 lbf-ft)
8. Straight pin	: Do not reuse.
9. Spring	

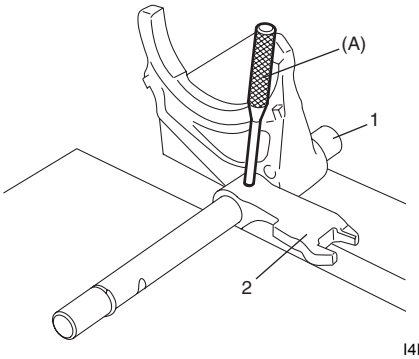
Gear Shift Shaft Disassembly and Reassembly

S7N20A5406042

Disassembly

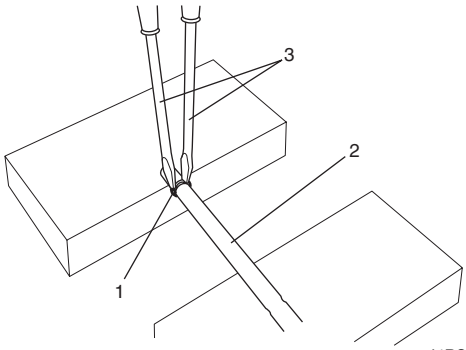
1) Remove low speed gear shift fork bolt, and then pull out fork.
2) Remove spring pin from low speed gear shift shaft (1) using special tool, and then pull out low speed gear shift head (2).

Special tool
(A): 09922–89810



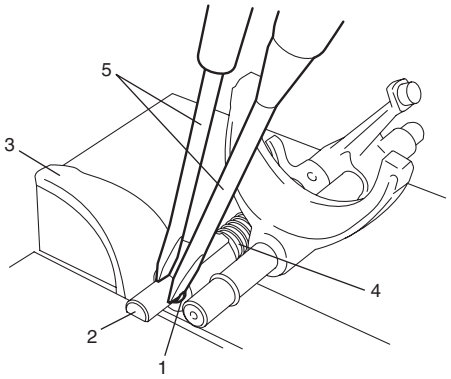
I4RS0B540136-01

3) Remove snap ring (1) from low speed gear shift shaft (2) using flat end rod (3) or the like.



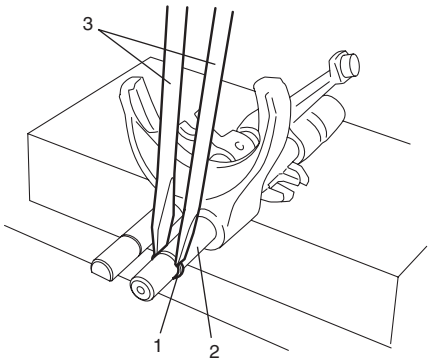
I4RS0B540137-01

4) Remove straight pin from 5th gear shift fork.
5) Remove snap ring (1) from 5th gear shift shaft (2) using flat end rod (5) or the like, and then pull out 5th gear shift fork (3) and spring (4).



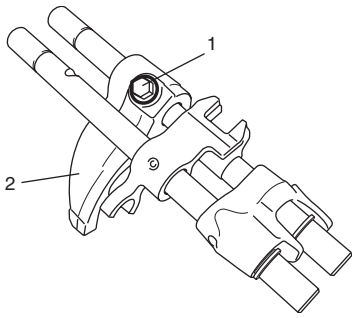
I4RS0B540138-01

6) Remove snap ring (1) from high speed gear shift shaft (2) using flat end rod (3) or the like.



I4RS0B540139-01

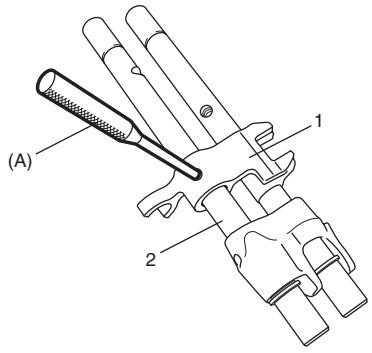
7) Remove high speed gear shift fork bolt (1), and then pull out fork (2).



I4RS0B540140-01

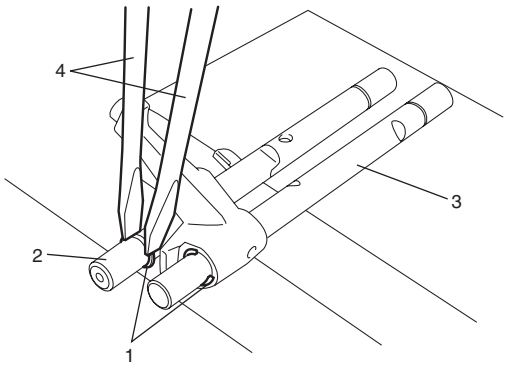
8) Remove spring pin from 5th gear shift shaft (2) using special tool, and then pull out 5th gear shift head (1).

Special tool
(A): 09922–89810



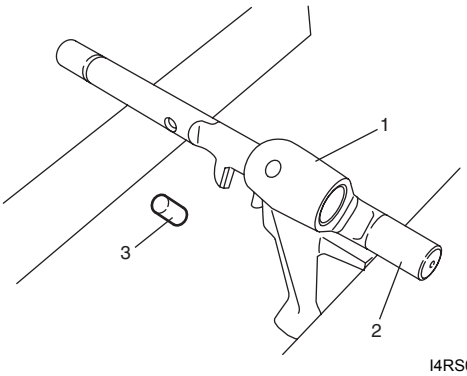
I4RS0B540141-01

9) Remove snap rings (1) from 5th gear shift shaft (2) and high speed gear shift shaft (3) using flat end rod (4) or the like, and then pull out 5th gear shift shaft.



I4RS0B540142-01

10) Remove straight pin (3) from reverse gear shift arm (1), and then pull out high speed gear shift shaft (2).



I4RS0B540143-01

Reassembly

Reverse disassembly procedure for reassembly noting the following.

- Apply thread lock cement to fork bolt, then tighten with the specified torque.

: Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque

Low speed gear shift fork bolt: 16 N·m (1.6 kgf-m, 11.5 lbf-ft)

High speed gear shift fork bolt: 16 N·m (1.6 kgf-m, 11.5 lbf-ft)

- Install component parts in a correct direction and position referring to “Gear Shift Shaft Components”.

Gear Shift Shaft Inspection

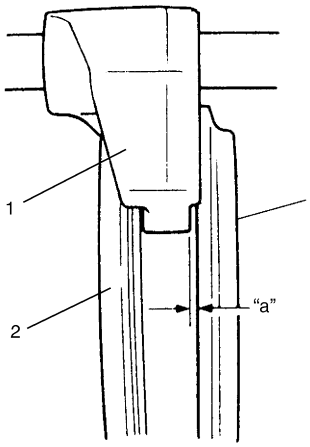
S7N20A5406043

Using feeler gauge, check clearance between each fork (1) and sleeve (2).

If clearance exceeds limit, replace fork or sleeve.

Clearance “a” between fork and sleeve

Service limit: 0.35 mm

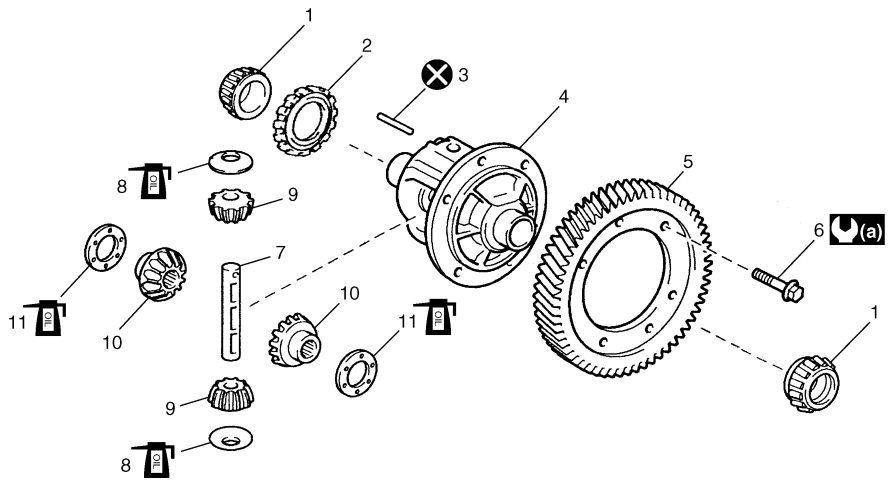


I4RS0B540144-02

Inspect component parts for wear, distortion or damage. If any detect is found, replace detective part with new one.

Differential Components

S7N20A5406044



I4RS0B540145-01

1. Differential side bearing	6. Final gear bolt	11. Side gear washer
2. Speed sensor ring	7. Differential pinion shaft	(a) : 124 N·m (12.4 kgf-m, 90.0 lbf-ft)
3. Differential pinion shaft pin	8. Differential pinion gear washer	: Do not reuse.
4. Differential case	9. Differential pinion gear	: Apply transaxle oil.
5. Final gear	10. Differential side gear	

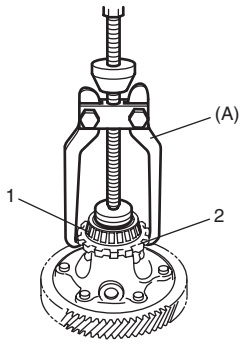
Differential Assembly Disassembly and Reassembly

S7N20A5406045

Disassembly

1) Remove left side bearing (1) and speed sensor ring (2) using special tool.

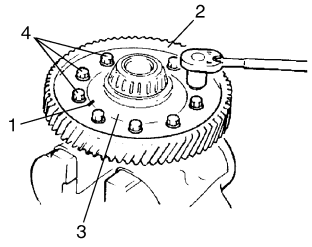
Special tool
(A): 09913–65135



I4RS0B540146-01

2) Give match mark (1) on final gear (2) and differential case (3).

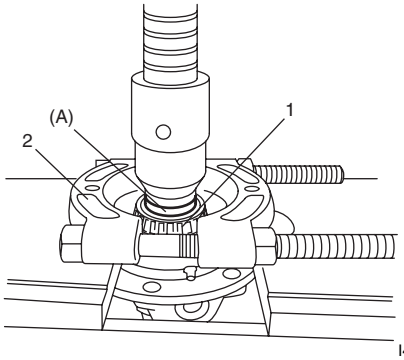
3) Support differential case with soft jawed vise and remove final gear bolts (4) then take out final gear.



I4RS0B540147-01

4) Remove right side bearing (1) using special tool, bearing puller (2) and press.

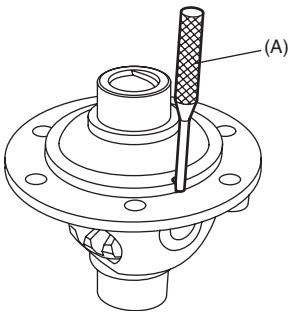
Special tool
(A): 09913–85230



I4RS0B540148-01

5) Using special tool and hammer, drive out differential pinion shaft pin and then disassemble component parts.

Special tool
(A): 09922–89810



I4RS0B540149-01

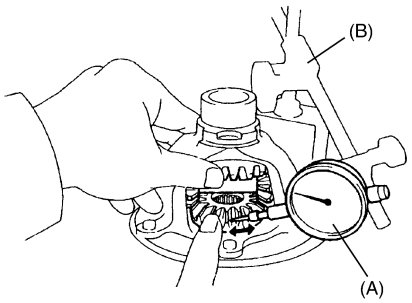
Reassembly

1) Install side gear washers, side gears, pinion gears, pinion gear washers and pinion shaft in differential case.
2) Measure backlash using special tools while holding one pinion gear toward differential case.
   If backlash is not specification, select suitable side gear washer from among the following available size, install it and check again that specified gear play is obtained.

   Special tool
   (A): 09900–20607
   (B): 09900–20701

   Side gear backlash
   Standard: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

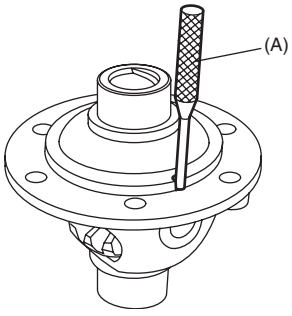
Thickness mm (in.)	Thickness mm (in.)
0.50 (0.0197)	0.75 (0.0295)
0.55 (0.0217)	0.80 (0.0315)
0.60 (0.0236)	0.85 (0.0335)
0.65 (0.0256)	0.90 (0.0354)
0.70 (0.0276)	0.95 (0.0374)



I4RS0B540150-01

3) Install differential pinion shaft pin using special tool.

   Special tool
   (A): 09922–89810



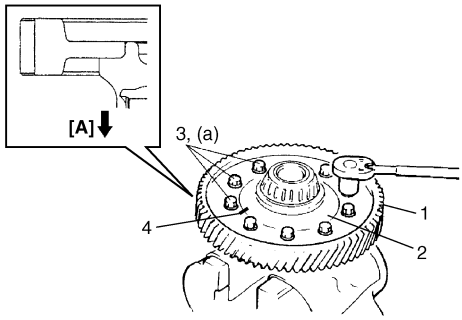
I4RS0B540149-01

4) Install final gear (1) to differential case (2) as shown in the figure and hold differential assembly with soft jawed vise, and then tighten bolts (3) to specified torque.

   NOTE

   Align match mark (4) on final gear and differential case.

   Tightening torque
   Final gear bolt (a): 124 N·m (12.4 kgf-m, 90.0 lbf-ft)

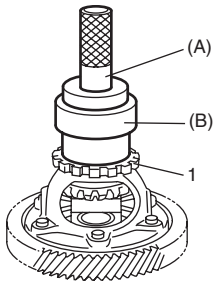


I4RS0B540151-01

[A]: Differential case side

5) Install speed sensor ring (1) using special tool.

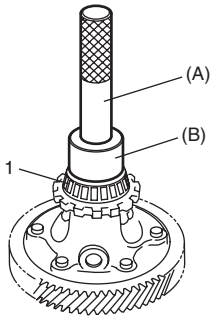
   Special tool
   (A): 09913–75510
   (B): 09944–77030



I4RS0B540152-02

6) Install right side (1) bearing using special tools.

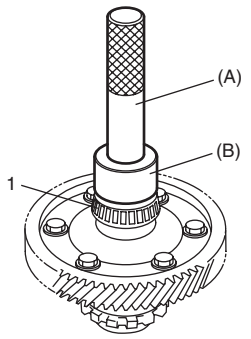
   Special tool
   (A): 09924–74510
   (B): 09925–16310



I4RS0B540153-01

7) Install left side bearing (1) using special tools.

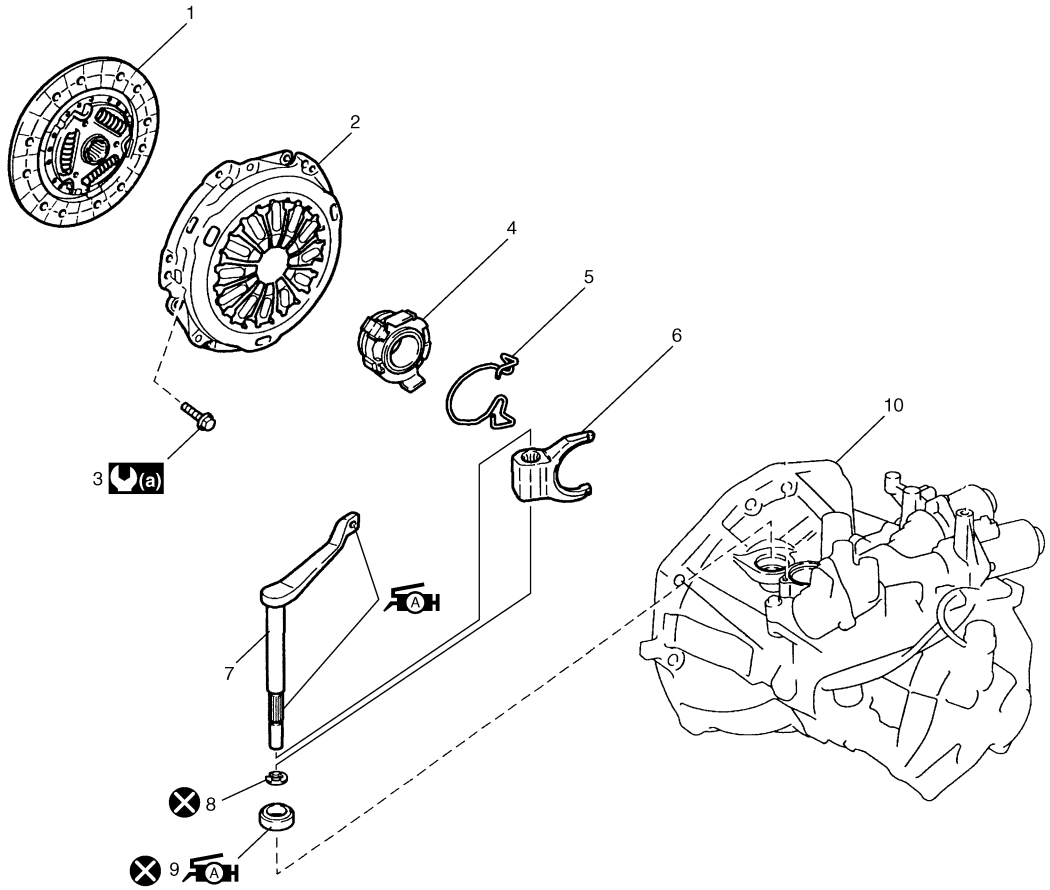
Special tool
(A): 09924–74510
(B): 09925–16310



I4RS0B540154-01

Clutch Cover and Clutch Disc Components

S7N20A5406046



I4RS0B540155-01

1. Clutch disc	5. Clip	9. Oil seal : Apply grease 99000-25010 to oil seal lip.
2. Clutch cover	6. Release fork : Apply grease 99000-25010 to end of release fork arm.	10. Automated Manual Transaxle
3. Clutch cover bolt	7. Release shaft : Apply grease 99000-25010 to spline of release shaft and dent part of release shaft.	: 19 N·m (1.9 kgf-m, 14.0 lbf-ft)
4. Release bearing	8. E-ring	: Do not reuse.

Clutch Cover and Clutch Disc Removal and Installation

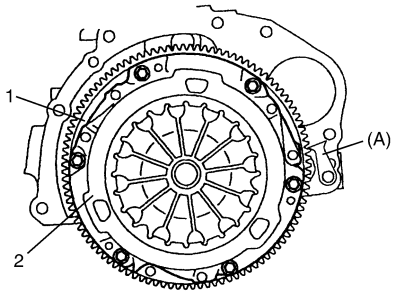
S7N20A5406047

⚠ CAUTION

Always replace clutch cover and clutch disc as a set, otherwise clutch cannot be disengaged and it becomes impossible to run.

1) Dismount transaxle referring to “Automated Manual Transaxle Unit Dismounting and Remounting”.
2) Hold flywheel (1) stationary with special tool and remove clutch cover bolts, clutch cover (2) and clutch disc.

Special tool
(A): 09924–17811



I4RS0B540156-02

Installation

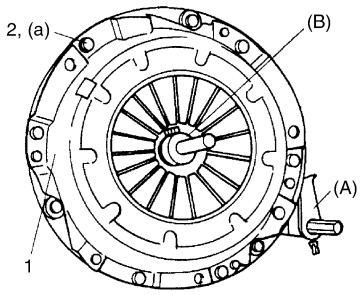
1) Align clutch disc with flywheel center using special tool, and install clutch cover (1) and bolts (2). Then tighten bolts to specification.

NOTE

- **While tightening clutch cover bolts, compress clutch disc with special tool (clutch center guide) by hand so that disc is centered.**
- **Tighten clutch cover bolts little by little evenly in diagonal order.**

Special tool
(A): 09924–17811
(B): 09923–36340

Tightening torque
Clutch cover bolt (a): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)



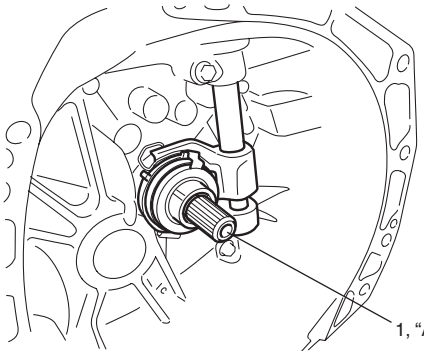
I4RS0B540157-01

2) Slightly apply grease to input shaft (1), then join transaxle assembly with engine referring to “Automated Manual Transaxle Unit Dismounting and Remounting”.

“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 spline mesh.



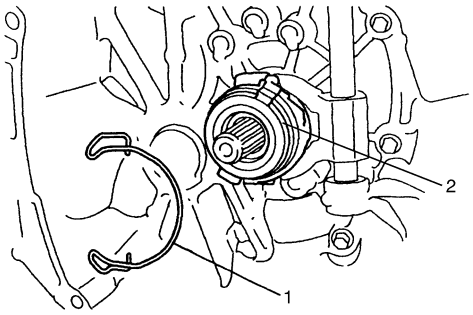
I4RS0B540159-01

Clutch Release System Component Removal and Installation

S7N20A5406048

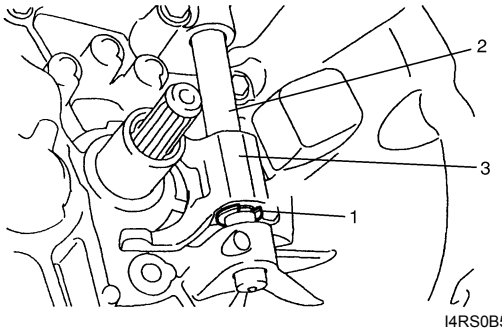
Removal

1) Remove clip (1) from release bearing (2).
2) Remove release bearing.



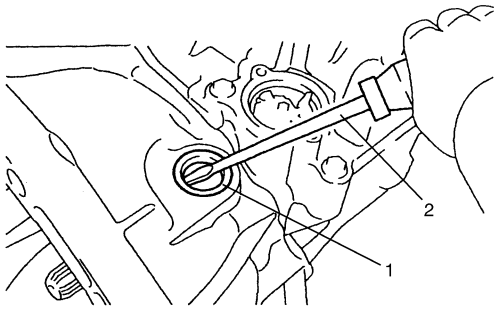
I4RS0B540158-01

3) Remove E-ring (1) from release shaft (2), and then remove release shaft and fork (3).



I4RS0B540160-01

4) Remove release shaft oil seal (1) using flat end rod (2) or the like.



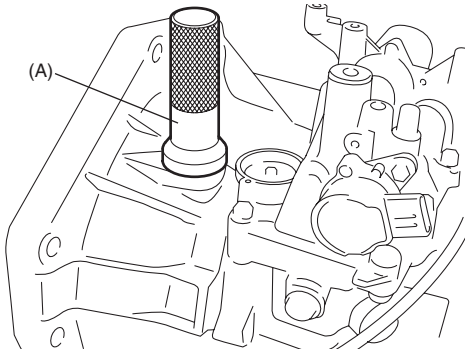
I4RS0B540161-01

Installation

1) Coat grease to release shaft oil seal, and then install it till it is flush with case surface. Use special tool for this installation and face seal lip downward (inside).

: Grease 99000–25010 (SUZUKI Super Grease A)

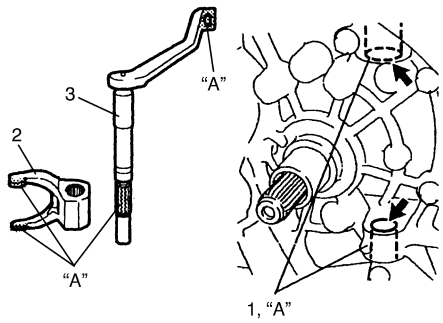
Special tool
(A): 09913–76010



I4RS0B540162-01

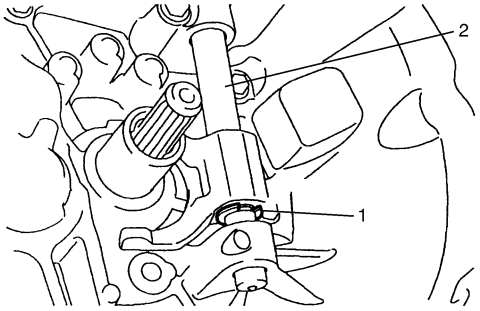
2) Apply grease to bush inside (1), release fork (2) and release shaft (3), and then Install release fork and shaft.

"A": Grease 99000–25010 (SUZUKI Super Grease A)



I4RS0B540163-01

3) Install E-ring (1) to release shaft (2).

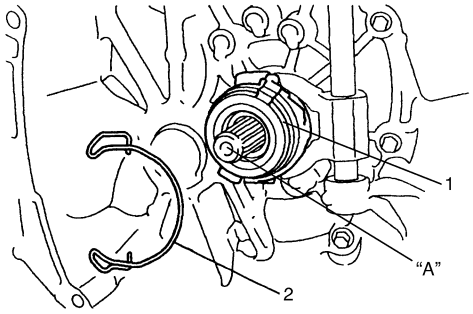


I4RS0B540164-01

4) Install release bearing (1) and clip (2).

5) Apply grease to input shaft spline and front end.

"A": Grease 99000–25210 (SUZUKI Super Grease I)



I4RS0B540165-01

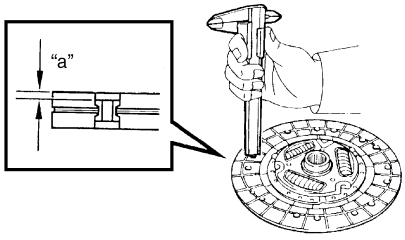
Clutch Inspection

S7N20A5406049

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, replace clutch disc assembly.

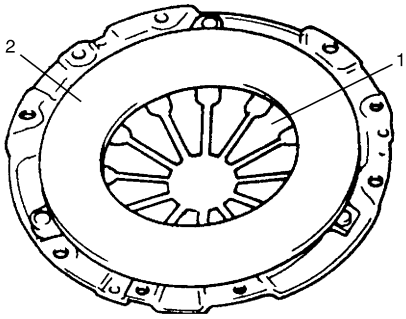
Rivet head depth "a"
Limit: 0.3 mm (0.012 in.)



I4RS0B540166-03

Clutch Cover

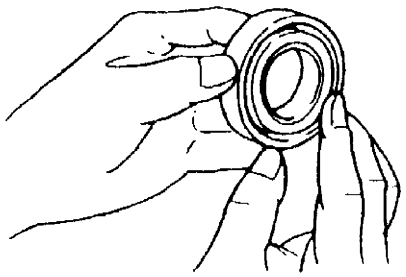
1) Check diaphragm spring (1) for abnormal wear or damage.
2) Inspect pressure plate (2) for wear or heat spots.
3) If abnormality is found, replace clutch cover. Do not disassemble it into diaphragm spring and pressure plate.



I4RS0B540167-01

Release Bearing

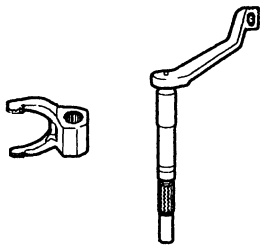
Check clutch release bearing for smooth rotation. If abnormality is found, replace it.



I4RS0B540168-01

Clutch Release Shaft and Release Fork

Check clutch release shaft and release fork for deflection or damage.
If abnormality is found, replace it.



I4RS0B540169-01

Specifications

Tightening Torque Specifications

S7N20A5407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Oil drain plug	39	3.9	28.5	☞
Oil level / filler plug	39	3.9	28.5	☞
Shift selector mounting nut	23	2.3	17.0	☞
Shift lock solenoid screw	1.5	0.15	1.0	☞
Clutch stroke sensor screw	2	0.2	1.5	☞
Clutch actuator bolt	15	1.5	11.0	☞
Shift stroke sensor screw	2	0.2	1.5	☞
Select stroke sensor screw	2	0.2	1.5	☞
Shift and select actuator bolt	18	1.8	13.0	☞
Lock ball	37	3.7	27.0	☞
Plug	30	3.0	22.0	☞
Protector bolt	18	1.8	13.0	☞ / ☞
Input shaft speed sensor bolt	8	0.8	6.0	☞ / ☞
Neutral start switch	39	3.9	28.5	☞
Back up lamp switch	40	4.0	29.0	☞
Output shaft speed sensor (VSS) bolt	5	0.5	4.0	☞
Reverse gear shift lever bolt No.1 and No.2	17	1.7	13.0	☞
Transaxle case bolt	29	2.9	21.0	☞ / ☞ / ☞ / ☞
Reverse shaft bolt	29	2.9	21.0	☞
Low speed gear shift fork bolt	16	1.6	11.5	☞
High speed gear shift fork bolt	16	1.6	11.5	☞
Final gear bolt	124	12.4	90.0	☞
Clutch cover bolt	19	1.9	14.0	☞

NOTE

The specified tightening torque is also described in the following.
“Shift Selector Components: ”
“Automated Manual Transaxle Unit Components: ”
“Automated Manual Transaxle Assembly Components: ”
“Gear Shift Shaft Components: ”
“Differential Components: ”
“Clutch Cover and Clutch Disc Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A5408001

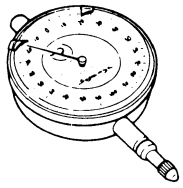
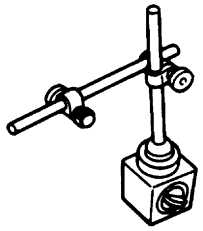
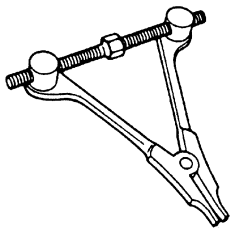
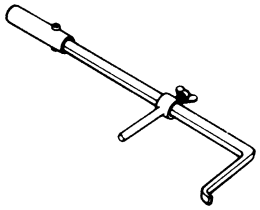
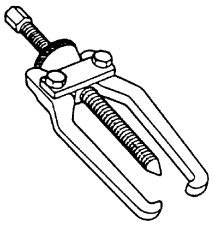
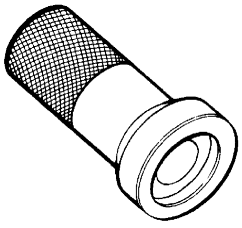
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞
	SUZUKI Super Grease I	P/No.: 99000–25210	☞ / ☞
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ / ☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞ / ☞ / ☞ / ☞ / ☞ / ☞

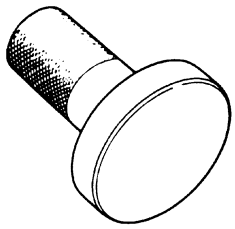
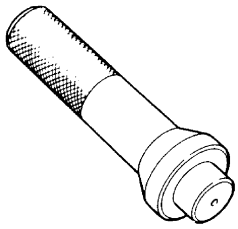
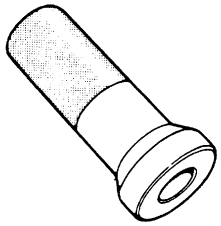
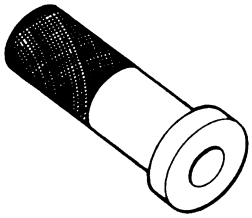
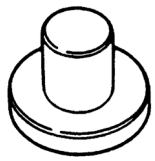
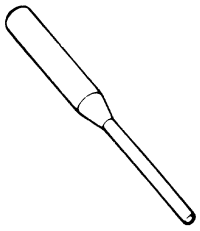
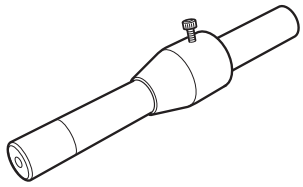
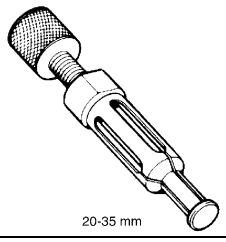
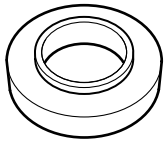
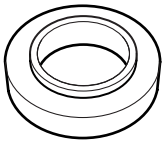
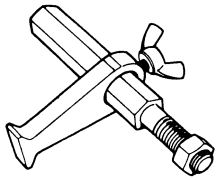
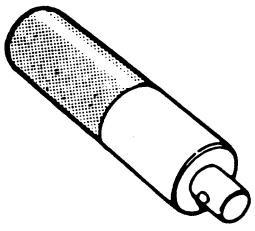
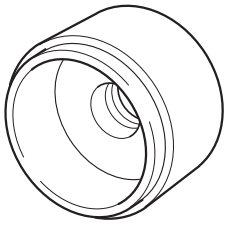
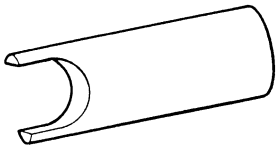
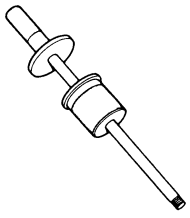
NOTE

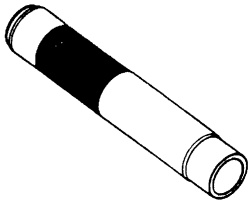
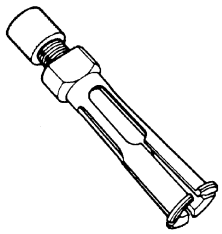
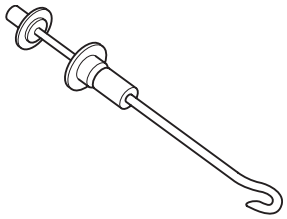
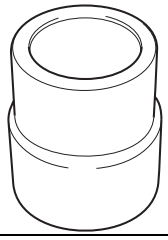
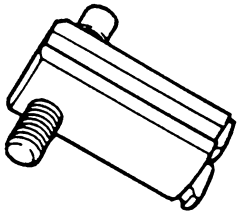
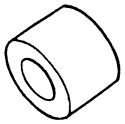
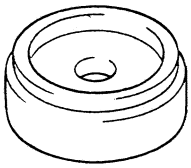
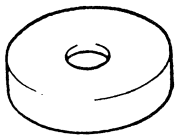
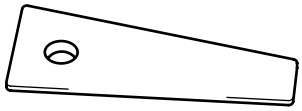
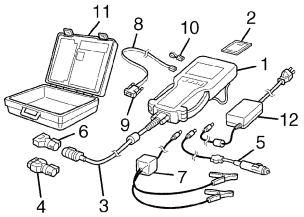
Required service material is also described in the following.
“Shift Selector Components: ”
“Automated Manual Transaxle Assembly Components: ”
“Input Shaft Assembly Components: ”
“Countershaft Components: ”
“Gear Shift Shaft Components: ”
“Differential Components: ”
“Clutch Cover and Clutch Disc Components: ”

Special Tool

S7N20A5408002

09900–20607 Dial gauge ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞		09900–20701 Magnetic stand ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞	
09912–34510 Case separator ☞		09913–50121 Oil seal remover ☞ / ☞ / ☞	
09913–65135 Bearing puller ☞		09913–70123 Bearing installing tool ☞ / ☞ / ☞ / ☞ / ☞ / ☞	

09913–75510 Bearing installer ☞ 	09913–75830 Steering pinion bush installer ☞ 
09913–76010 Bearing installer ☞ / ☞ / ☞ 	09913–80113 Bearing installer ☞ / ☞ / ☞ 
09913–85210 Bearing installer ☞ 	09913–85230 Bearing remover tool ☞ 
09922–89810 Shifter lock pin remover (3.5 mm) ☞ / ☞ / ☞ / ☞ 	09923–36340 Clutch center guide ☞ 
09923–74510 Bearing puller (20-35 mm) ☞ / ☞ 	09924–07720 Synchronizer hub installer ☞ / ☞ / ☞ / ☞ 
09924–07730 Bearing installer ☞ / ☞ 	09924–17811 Flywheel holder ☞ / ☞ 
09924–74510 Bearing and oil seal handle ☞ / ☞ 	09925–16310 Bearing installer ☞ / ☞ 
09928–06050 Differential preload adapter ☞ / ☞ / ☞ 	09930–30104 Sliding shaft ☞ / ☞ / ☞ 

09940–51710 Bearing installer ☞ 	09941–64511 Bearing and oil seal remover (30 mm Min.) ☞ 
09942–15511 Sliding hammer ☞ 	09944–77030 Installer support, BRG/cover ☞ 
09944–96011 Bearing outer race remover ☞ 	09951–16030 Bush remover ☞ 
09951–16090 Oil seal installer ☞ / ☞ 	09951–46010 Drive shaft oil seal installer ☞ / ☞ / ☞ 
09952–06010 Dial gauge plate No.1 ☞ 	SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞ / ☞ 

Section 6

Steering

CONTENTS

Precautions

Precautions

Precautions on Steering

S7N20A6000001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

Air Bag System Service Warning
Refer to “Air Bag System Service Warning in Section 00”.

Precautions for Steering Diagnosis
Refer to “Precautions for Steering Diagnosis in Section 6A”.

Service Precautions of Steering Wheel and Column
Refer to “Service Precautions of Steering Wheel and Column in Section 6B”.

P/S System Note
Refer to “Steering System Note in Section 6C”.

Steering General Diagnosis

Precautions

Precautions for Steering Diagnosis

S7N20A6100001

Since the problems in steering involve several systems, they must all be considered when diagnosing a complaint. To avoid using the wrong symptom, always road test the vehicle first. Proceed with the following preliminary inspection and correct any defects which are found.

1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist 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, loosen and/or rough wheel bearings.

Diagnostic Information and Procedures

Steering Symptom Diagnosis

S7N20A6104001

Condition	Possible cause	Correction / Reference Item
Hard steering	Tire not adequately inflated	*Inflate tires to proper pressure.*
	Malfunction of power steering system	*Check and correct.*
	Bind in tie-rod end ball studs or lower ball joints	*Replace tie-rod end or front suspension arm.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Bind in steering column	*Repair or replace steering column.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Too much play in steering	Wheel bearings worn	*Replace wheel bearing.*
	Loose steering gear case bolts	*Tighten gear case bolts.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
	Worn steering shaft joints	*Replace joint.*
	Worn tie-rod ends or tie-rod inside ball joints	*Replace tie-rod end or tie-rod.*
	Worn lower ball joints	*Replace front suspension control arm.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Poor return ability	Bind in tie-rod end ball studs	*Replace tie-rod end.*
	Bind in ball joints	*Replace front suspension arm.*
	Bind in steering column	*Repair or replace steering column.*
	Disturbed front end alignment	*Check and adjust front end alignment.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
	Tires not adequately inflated	*Adjust tire pressure.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
Rack and pinion noise (Rattle or chuckle)	Loose steering gear case bolts	*Tighten steering gear case bolts.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*
Wander or poor steering stability	Mismatched or uneven tires	*Replace or inflate tires to proper pressure.*
	Loosen ball joints and tie-rod ends	*Replace suspension arm or tie-rod end.*
	Faulty struts or mountings	*Replace strut or repair mounting.*
	Loose stabilizer bar	*Tighten or replace stabilizer bar or bush.*
	Broken or sagging springs	*Replace spring.*
	Rack and pinion adjustment	*Check and adjustment rack and pinion torque.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Faulty steering gear case assembly	*Replace steering gear case assembly.*

Condition	Possible cause	Correction / Reference Item
Erratic steering when braking	Worn wheel bearings	*Replace wheel bearing.*
	Broken or sagging springs	*Replace coil spring.*
	Wheel tires are inflated unequally	*Inflate tires to proper pressure.*
	Disturbed front wheel alignment	*Check and adjust front wheel alignment.*
	Brakes not working in unison	*Check and repair brake system.*
	Leaking wheel cylinder or caliper	*Repair or replace wheel cylinder or caliper.*
	Warped discs	*Replace brake disc.*
	Badly worn brake linings	*Replace brake shoe lining.*
	Drum is out of round in some brakes	*Replace brake drum.*
	Defective wheel cylinders	*Replace or repair wheel cylinder.*

Steering Wheel and Column

Precautions

Service Precautions of Steering Wheel and Column

S7N20A6200001

For service precautions, refer to “Precautions on Service and Diagnosis of Air Bag System in Section 8B”.

Service and Diagnosis
For diagnosis and servicing, refer to “Precautions on Service and Diagnosis of Air Bag System in Section 8B”.

Disabling Air Bag System
For disabling air bag system, refer to “Disabling Air Bag System in Section 8B”.

Enabling Air Bag System
For enabling air bag system, refer to “Enabling Air Bag System in Section 8B”.

Handling and Storage
For handling and storage, refer to “Precautions on Handling and Storage of Air Bag System Components in Section 8B”.

Disposal
For disposal, refer to “Precautions on Disposal of Air Bag and Seat Belt Pretensioner in Section 8B”.

General Description

Steering Wheel and Column Construction

S7N20A6201001

This double tube type steering column has the following three important features in addition to the steering function:

- The column is energy absorbing, designed to compress in a front-end collision.
- The ignition switch and lock are mounted conveniently on this column.
- With the column mounted lock, 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 column assembly 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 plastic shear pins which maintain 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 on Service and Diagnosis of Air Bag System in Section 8B”.

Diagnostic Information and Procedures

Checking Steering Column for Accident Damage

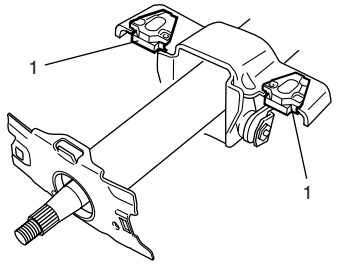
S7N20A6204001

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.

Checking Procedure

1) Check that two capsules (1) are attached to steering column bracket securely. If found loose, replace steering column assembly.



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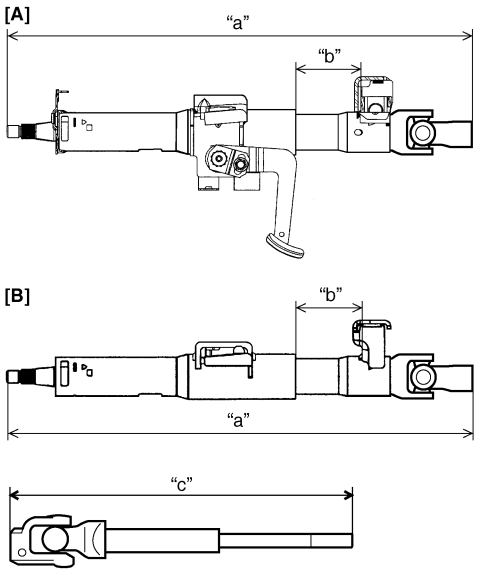
2) Take measurement “a”, “b” and “c” as shown.
If it is shorter than specified length, replace steering column assembly with new one.

Power steering column length
“a”: 459 ± 2 mm (18.1 ± 0.08 in.)
“b”:
64.1 ± 1 mm (2.5 ± 0.03 in.) (Vehicle equipped with tilt steering column only)
65.6 ± 1 mm (2.6 ± 0.03 in.) (Vehicle equipped without tilt steering column)
“c”: 306.7 ± 1 mm (12.0 ± 0.03 in.)



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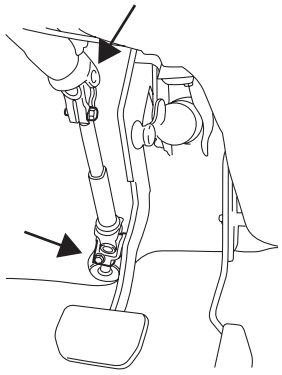
[A]:	Vehicle equipped with tilt steering column
[B]:	Vehicle equipped without tilt steering column

3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
If anything is found faulty, replace as lower shaft assembly or steering column assembly.



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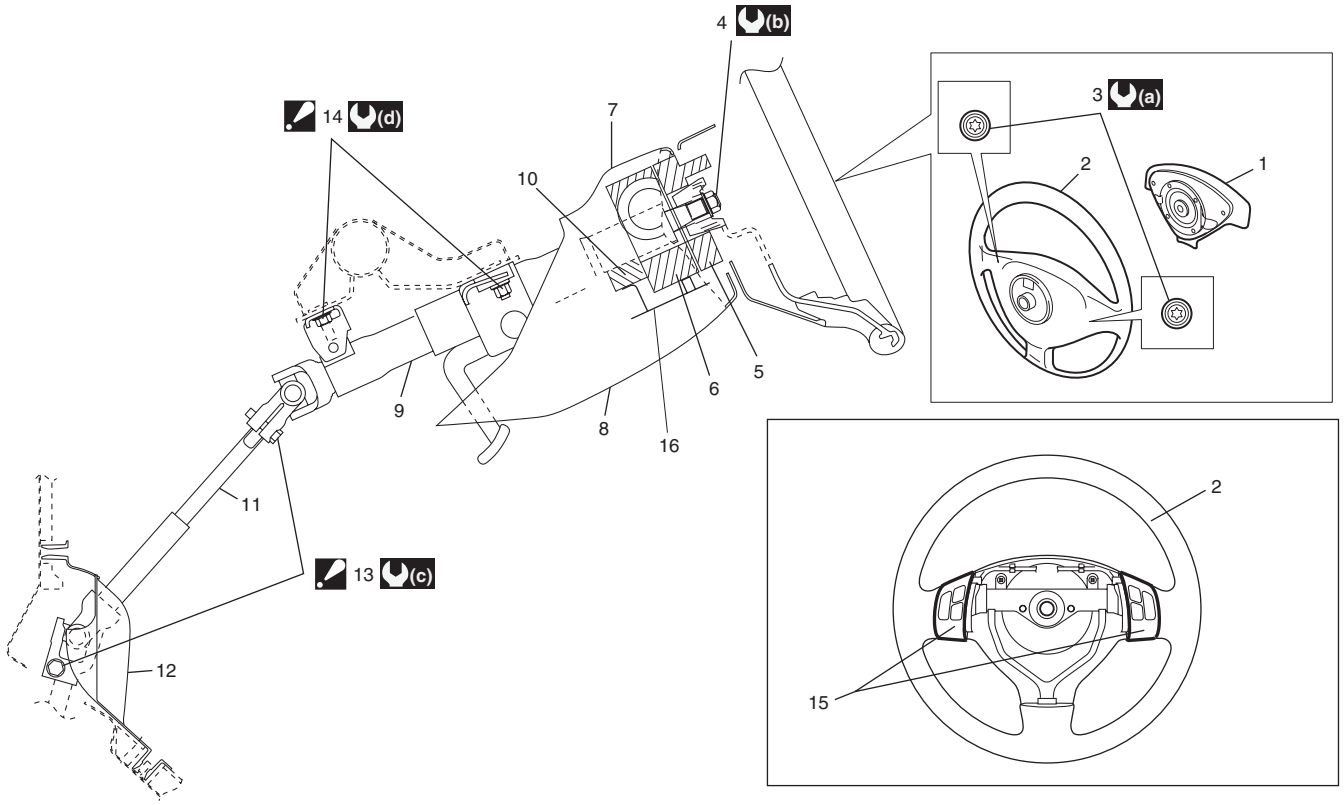
4) Check steering shaft for smooth rotation.
If found defective, replace as steering column assembly.

5) Check steering shaft and steering column for bend, cracks or deformation.
If found defective, replace.

Repair Instructions

Steering Wheel and Column Components

S7N20A6206001



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1. Driver air bag (inflator) module	8. Steering column lower cover	15. Audio control switch (if equipped)
2. Steering wheel	9. Steering column	16. Knee protector plate
3. Driver air bag (inflator) module mounting bolt	10. Steering lock assembly (ignition switch)	(a) : 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
4. Steering wheel nut	11. Steering lower shaft	(b) : 33 N·m (3.3 kgf-m, 24 lbf-ft)
5. Contact coil cable assembly with steering angle sensor (if equipped)	12. Steering joint cover	(c) : 25 N·m (2.5 kgf-m, 18 lbf-ft)
6. Wiper switch and lighting switch	13. Upper and lower joint bolt : After tightening lower joint bolt, tighten upper joint bolt.	(d) : 14 N·m (1.4 kgf-m, 10.5 lbf-ft)
7. Steering column upper cover	14. Steering column mounting nut : After tightening lower nut, tighten upper nut.	

Steering Wheel Removal and Installation

S7N20A6206002

⚠ CAUTION

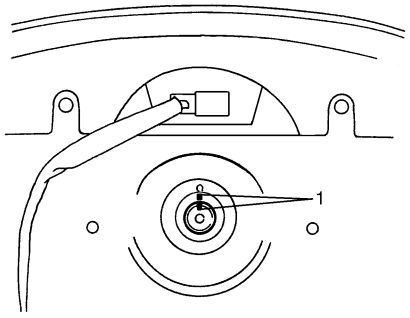
Do not turn the contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively) with steering wheel removed, or coil will break.

Removal

⚠ CAUTION

Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove driver air bag (inflator) module from steering wheel. Refer to “Driver Air Bag (Inflator) Module Removal and Installation in Section 8B”.
4) Disconnect horn connector and audio control switch connector, if equipped.
5) Remove steering shaft nut and then make alignment marks (1) on steering wheel and shaft for a guide during reinstallation.



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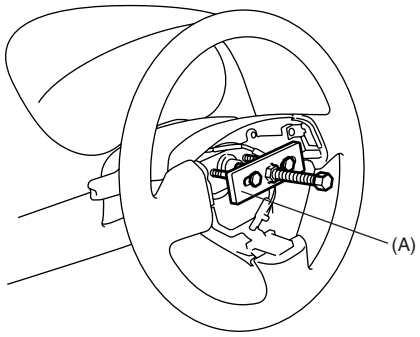
6) Remove steering wheel using special tool.

Special tool
(A): 09944–36011



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Installation

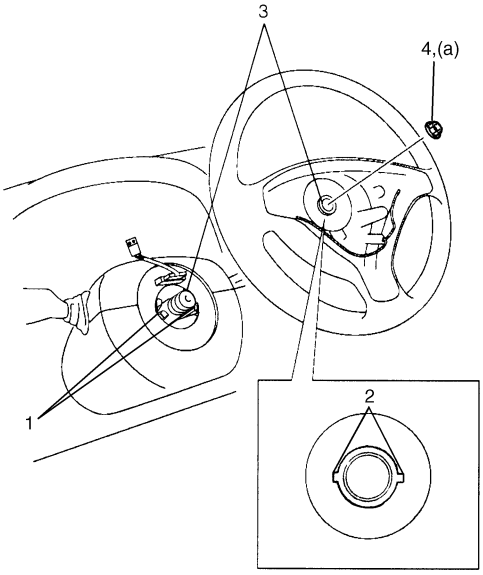
1) Check that vehicle’s front tires are at straight-ahead position and contact coil is centered. If contact coil is turned after removing steering wheel, center contact coil referring to “Centering Contact Coil Cable Assembly”.

⚠ CAUTION

These two conditions are prerequisite for installation of steering wheel. If steering wheel has been installed without these conditions, contact coil will break when steering wheel is turned.

2) Install steering wheel to steering shaft with 2 grooves (1) on contact coil fitted in 2 lugs (2) in the back of steering wheel and also aligning marks (3) on steering wheel and steering shaft.
3) Tighten steering shaft nut (4) to specified torque.

Tightening torque
Steering shaft nut (a): 33 N·m (3.3 kgf-m, 24.0 lbf-ft)



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4) Connect horn connector and audio control switch connector, if necessary.
5) Install driver air bag (inflator) module to steering wheel. Refer to “Driver Air Bag (Inflator) Module Removal and Installation in Section 8B”.
6) Connect negative (–) battery cable.
7) Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Contact Coil Cable Assembly Removal and Installation

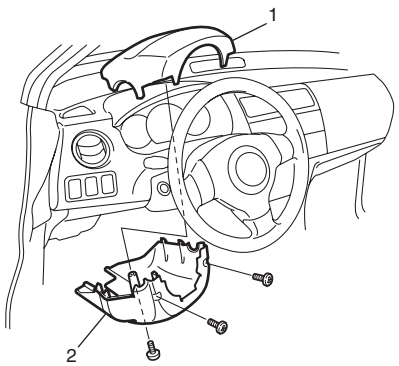
S7N20A6206003

⚠ CAUTION

Do not turn contact coil more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

Removal

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove steering wheel from steering column referring to “Steering Wheel Removal and Installation”.
4) Remove steering column lower cover (2) and upper cover (1).



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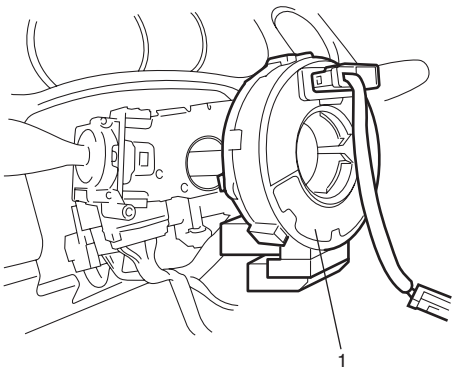
5) Remove contact coil cable assembly with steering angle sensor (if equipped) (1) from steering column.



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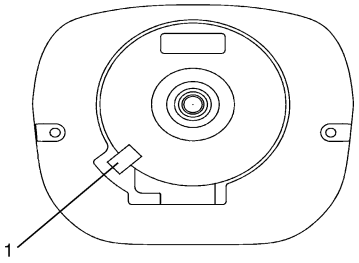
6) Separate steering angle sensor from contact coil cable assembly referring to “Steering Angle Sensor Removal and Installation”.

Installation

1) Check to make sure that vehicle’s front tires are set at straight-ahead position and then ignition switch is at LOCK position.
2) Install steering angle sensor to contact coil cable assembly referring to “Steering Angle Sensor Removal and Installation”.
3) Install contact coil cable assembly (1) to steering column securely.

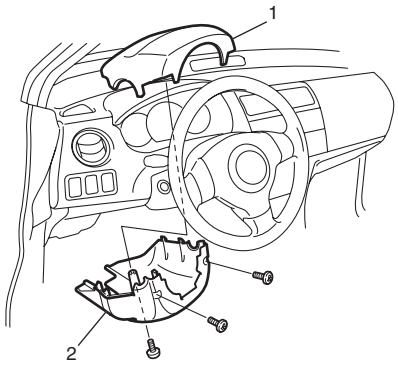
NOTE

New contact coil cable assembly is supplied with contact coil set and held at its center position with a lock pin (1). Remove this lock pin after installing contact coil cable assembly to steering column.



I4RS0A620010-01

4) Install steering column upper cover (1) and lower cover (2).



I4RS0B620002-04

5) Install steering wheel to steering column. Refer to “Steering Wheel Removal and Installation”.
6) Connect battery negative (–) cable.
7) Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

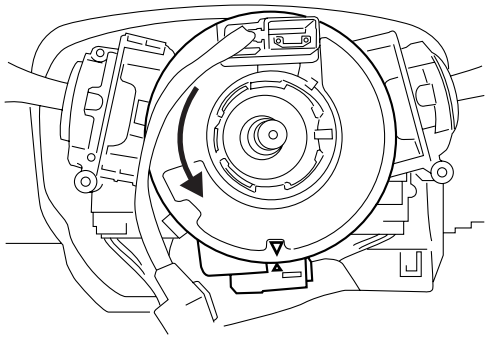
Centering Contact Coil Cable Assembly

S7N20A6206004

1) Check that vehicle's wheels (front tires) are set at straight-ahead position.
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.

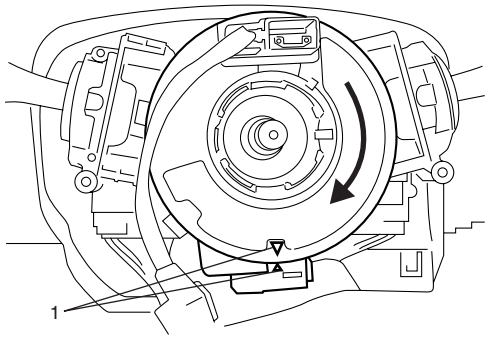
NOTE

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.



I4RS0A620012-01

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).

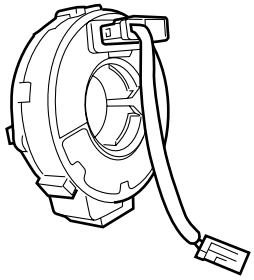


I4RS0A620013-01

Contact Coil Cable Assembly Inspection

S7N20A6206005

Check contact coil cable assembly wire harness for any signs of scorching, melting or other damage.
If it is damaged, replace.



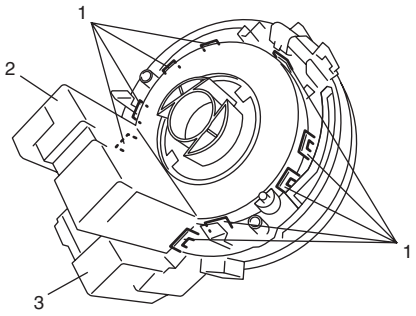
I4RS0A620014-01

Steering Angle Sensor Removal and Installation

S7N20A6206006

Removal

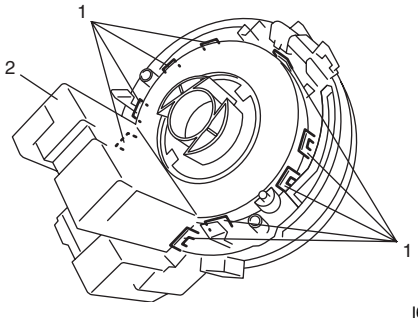
1) Remove steering wheel and contact coil cable assembly. Refer to "Steering Wheel Removal and Installation" and "Contact Coil Cable Assembly Removal and Installation".
2) Remove steering angle sensor (2) from contact coil cable assembly (3) while opening fitting parts (1) of contact coil cable assembly.



I6JB01620003-01

Installation

1) Install steering angle sensor (2) by fitting engagement parts (1) of contact coil cable assembly to claws of steering angle sensor as shown in figure.



I6JB01620004-01

2) Install contact coil cable assembly and steering wheel. Refer to "Contact Coil Cable Assembly Removal and Installation" and "Steering Wheel Removal and Installation".

Steering Angle Sensor Inspection

S7N20A6206007

Refer to “Steering Angle Sensor Inspection in Section 4F”.

Steering Column Removal and Installation

S7N20A6206008

⚠ CAUTION

Once the steering column is removed from the vehicle, the column is extremely susceptible to damage.

- **Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length.**
- **Leaning on the column assembly could cause it to bend or deform.**

Any of the damage could impair the column’s collapsible design.
Steering column mounting nuts should not be loosened with steering shaft joint upper side bolt tightened as this could cause damage to shaft joint bearing.

NOTE

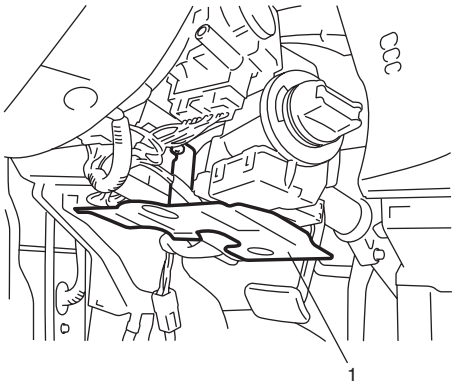
When servicing steering column or any column-mounted component, remove steering wheel. But when removing steering column simply to gain access to instrument panel components, leave steering wheel installed on steering column.

Removal

⚠ WARNING

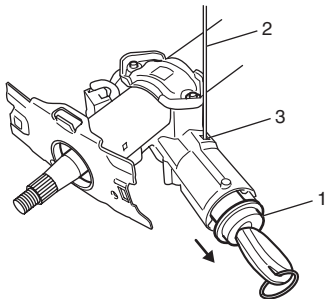
Never rest a steering column assembly on the steering wheel with the air bag (inflator) module face down and column vertical. Otherwise, personal injury may result.

1) Disconnect negative (–) battery cable at battery terminal.
2) Disable air bag system. Refer to “Disabling Air Bag System in Section 8B”.
3) Remove steering wheel and contact coil cable assembly referring to “Steering Wheel Removal and Installation” and “Contact Coil Cable Assembly Removal and Installation”.
4) Remove knee protector plate (1) from steering column.



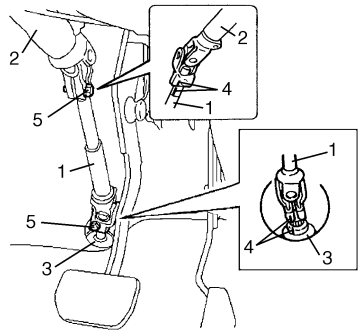
I4RS0B620003-02

5) Detach lighting switch and wiper switch from steering column.
6) Remove immobilizer control module from steering column, referring to “Immobilizer Control Module (ICM) Removal and Installation: Petrol Model in Section 10C” and “Immobilizer Control Module Removal and Installation: Diesel Model in Section 10C”. (if equipped)
7) For vehicle without keyless start system, remove ignition switch cylinder assembly (1) as follows.
   a) Turn ignition switch key to ACC position.
   b) Insert 2 mm (0.078 in.) rod (2) through hole (3) and push ignition switch cylinder lock.



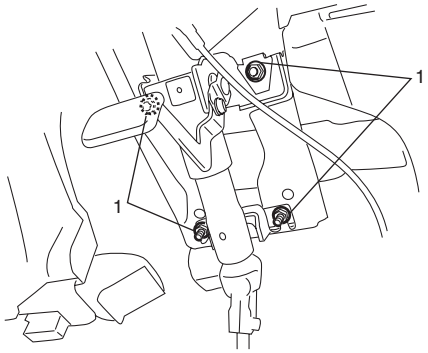
I4RS0B620004-02

8) Detach steering lock assembly from steering column referring to “Steering Lock Assembly (Ignition Switch) Removal and Installation”.
9) Remove steering column hole cover.
10) Remove steering joint cover.
11) Make alignment marks (4) on lower shaft (1) and shaft joint of steering column (2) and lower shaft (1) and pinion shaft (3) for a guide during reinstallation.
12) Remove lower shaft joint bolts (5).
13) Remove steering lower shaft (1).



I4RS0A620016-01

14) Remove steering column mounting nuts (1).



I4RS0A620017-01

15) Remove steering column from vehicle.

Installation

⚠ CAUTION

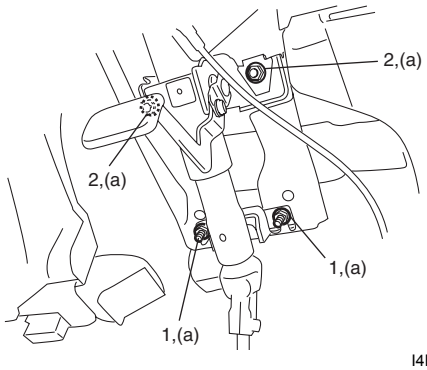
After tightening steering column mounting nuts, shaft joint bolts should be tightened. Wrong tightening order could cause a damage to shaft joint.

1) Be sure that front wheels are in straight.
2) Install steering column assembly to lower and upper brackets. Tighten steering column lower nuts (1) first and then upper nuts (2) to specifications as given below.

Tightening torque
Steering column nut (a): 14 N·m (1.4 kgf-m, 10.5 lbf-ft)

NOTE

After installing tilt steering column, make sure that steering column moves backwards and forwards smoothly and stops when tilt lever is fixed.



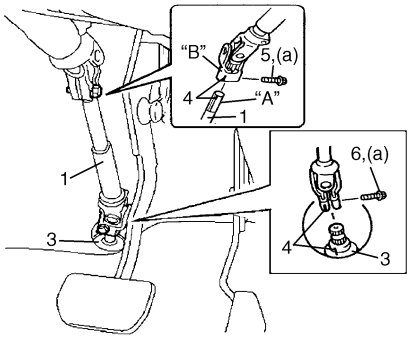
I4RS0B620009-02

3) Align flat part “A” of steering lower shaft (1) with bolt hole “B” of shaft joint (2) of column as shown. Then insert lower shaft into shaft joint of steering column with matching marks (4).
4) Insert lower shaft (1) into pinion shaft (3) with matching marks (4).
5) Tighten joint bolt (pinion shaft side) (6) to specified torque first and then joint bolt (steering column side) (5) to specified torque.

⚠ CAUTION

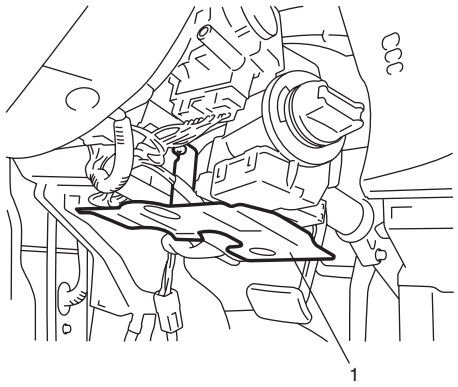
After tightening column nuts, tighten steering shaft upper joint bolt. Otherwise shaft joint bearing is damaged.

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



I4RS0A620019-01

6) Install steering joint cover.
7) Install steering lock assembly to steering column referring to “Steering Lock Assembly (Ignition Switch) Removal and Installation”.
8) For vehicle without keyless start system, install ignition switch cylinder assembly as follows, if removed.
   a) Turn ignition key of ignition switch cylinder assembly to ACC position.
   b) In this state, push ignition switch cylinder assembly into steering column till it clicks.
9) Install immobilizer control module from steering column, referring to “Immobilizer Control Module (ICM) Removal and Installation: Petrol Model in Section 10C” and “Immobilizer Control Module Removal and Installation: Diesel Model in Section 10C”. (if equipped)
10) Install lighting switch and wiper switch to steering column.
11) Install knee protector plate (1) to steering column.



I4RS0B620003-02

12) Install contact coil cable assembly and steering wheel referring to “Contact Coil Cable Assembly Removal and Installation” and “Steering Wheel Removal and Installation”.
13) Install steering column hole cover.
14) Connect negative (–) battery cable.
15) Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Steering Column Inspection

S7N20A6206009

Check steering column for damage and operation referring to “Checking Steering Column for Accident Damage”.

Steering Lock Assembly (Ignition Switch) Removal and Installation

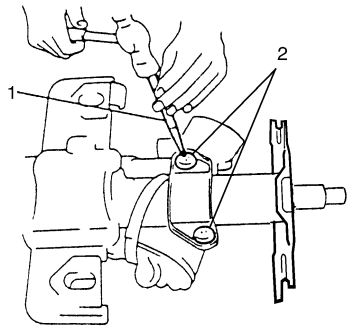
S7N20A6206010

Removal

1) Remove steering column. Refer to “Steering Column Removal and Installation”.
2) Using center punch (1), loosen and remove steering lock mounting bolts (2).

NOTE

Use care not to damage aluminum part of steering lock body with center punch.

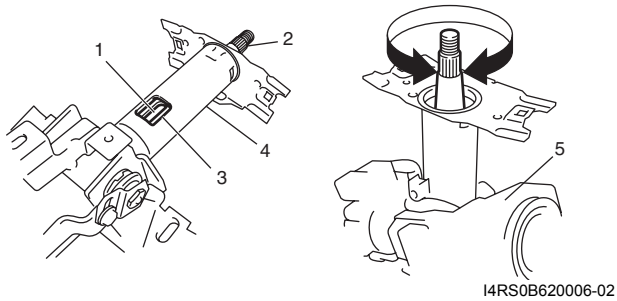


I4RS0B620005-02

3) Turn ignition key to “ACC” or “ON” position and remove steering lock assembly from steering column.

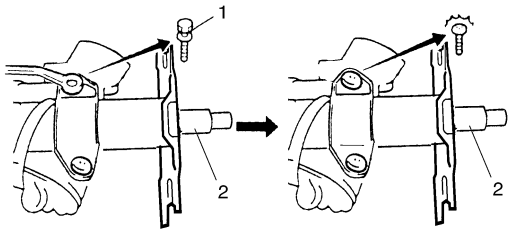
Installation

1) Position oblong hole (1) of steering shaft (2) in the center of hole (3) in column (4).
2) Turn ignition key to “ACC” or “ON” position and install steering lock assembly (5) onto column (4).
3) Now turn ignition key to “LOCK” position and pull it out.
4) Align hub on lock with oblong hole (1) of steering shaft (2) and rotate shaft to assure that steering shaft is locked.



I4RS0B620006-02

5) Tighten new bolts (1) until head of each bolt is broken off.
6) Turn ignition key to “ACC” or “ON” position and check to be sure that steering shaft (2) rotates smoothly. Also check for lock operation.



I4RS0B620007-02

7) Install steering column. Refer to “Steering Column Removal and Installation”.

Steering Lower Shaft Removal and Installation

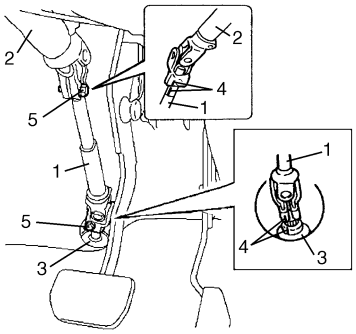
S7N20A6206011

⚠ CAUTION

Never turn steering wheel while steering lower shaft is removed.
Should it have been turned and contact coil have got out of its centered position, it needs to be centered again. Also, turning steering wheel more than about two and a half turns will break contact coil.

Removal

1) Turn steering wheel so that vehicle's front tires are at straight-ahead position.
2) Turn ignition switch to LOCK position and remove key.
3) Remove steering joint cover.
4) Make alignment marks (4) on lower shaft (1) and shaft joint of steering column (2) and lower shaft (1) and pinion shaft (3) for a guide during reinstallation.
5) Remove lower shaft joint bolts (5).
6) Remove steering lower shaft (1).

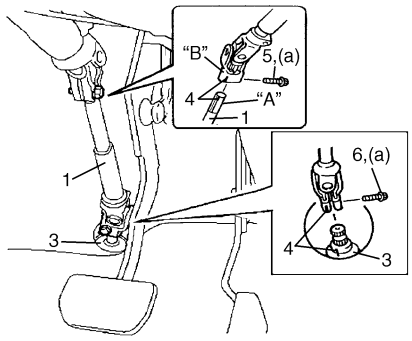


I4RS0A620020-01

Installation

1) Be sure that front wheels are in straight forward state.
2) Align flat part "A" of steering lower shaft (1) with bolt hole "B" of shaft joint (2) of column as shown. Then insert lower shaft into shaft joint of steering column with matching marks (4).
3) Insert lower shaft (1) into pinion shaft (3) with matching marks (4).
4) Tighten joint bolt (pinion shaft side) (6) to specified torque first and then joint bolt (steering column side) (5) to specified torque.

Tightening torque
Steering shaft joint bolt (a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)



I4RS0A620021-01

Specifications

Tightening Torque Specifications

S7N20A6207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Steering shaft nut	33	3.3	24.0	☞
Steering column nut	14	1.4	10.5	☞
Steering shaft joint bolt	25	2.5	18.5	☞ / ☞

NOTE

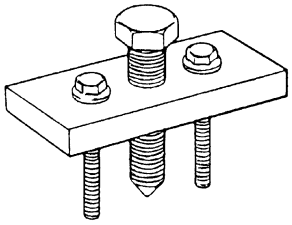
The specified tightening torque is also described in the following.
"Steering Wheel and Column Components: "

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information in Section 0A".

Special Tools and Equipment

Special Tool

S7N20A6208001

09944–36011 Steering wheel remover ☞		

Power Assisted Steering System

Precautions

Steering System Note

S7N20A6300001

NOTE

All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts 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.

Precautions in Diagnosing Troubles

S7N20A6300002

- Take a note of DTC indicated on the SUZUKI scan tool.
- Before inspection, be sure to read “Precautions for Electrical Circuit Service in Section 00” and understand what is written there.
- DTC C1122 (engine speed signal failure) is indicated when ignition switch is at ON position and engine is not running, but it means there is nothing abnormal if indication changes to a normal one when engine is started.
- 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”.

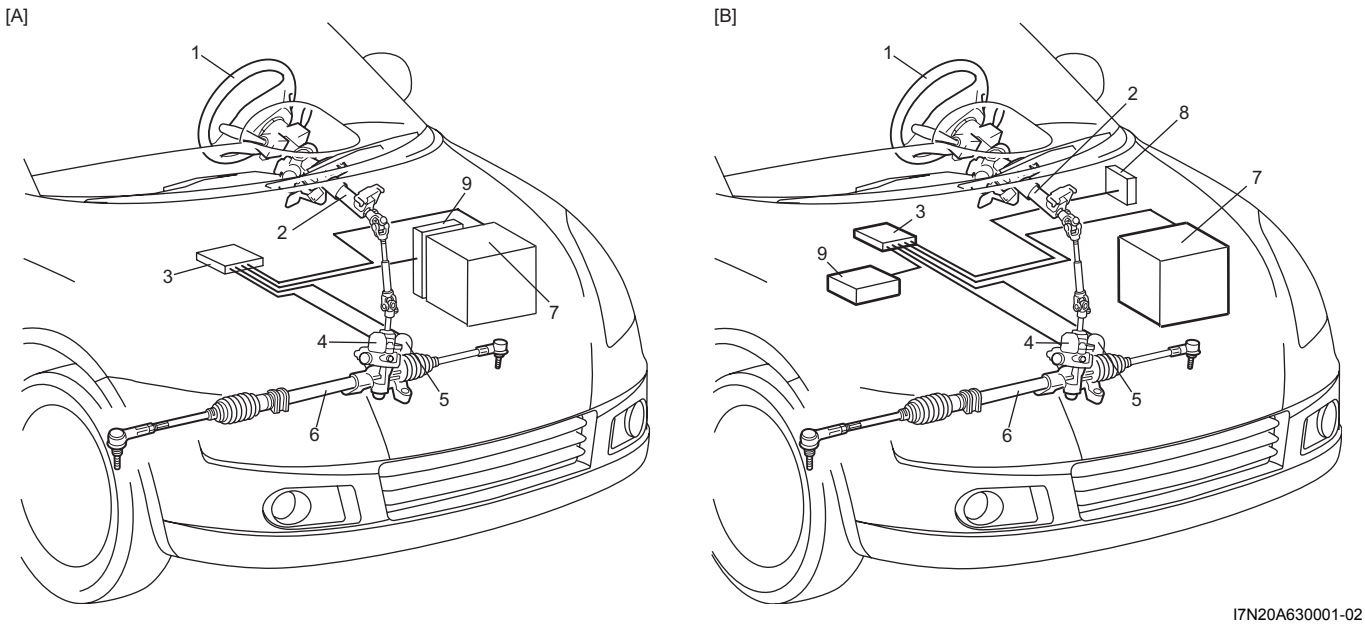
General Description

P/S System Description

S7N20A6301001

This power steering (P/S) system consists of a P/S control module (3), a torque sensor (4), a motor (5). In this system, the P/S control module determines the level and direction of the assist force for the steering wheel (1) according to the signals from the torque sensor and the vehicle speed signal from ECM (for petrol engine model) or BCM (for diesel engine model). The P/S control module runs the motor so as to assist the operation of the steering wheel.
The P/S control module diagnoses troubles which may occur in the area including the following components when the ignition switch is ON and the engine is running. When the P/S control module detects any malfunction, it stops the motor operation.

- Torque sensor
- Engine speed signal
- P/S motor
- P/S control module power supply
- P/S control module



I7N20A630001-02

[A]: For petrol engine model	2. Steering column	7. Battery	9. ECM
[B]: For diesel engine model	6. Steering gear case assembly	8. BCM	

EPS Diagnosis General Description

S7N20A6301002

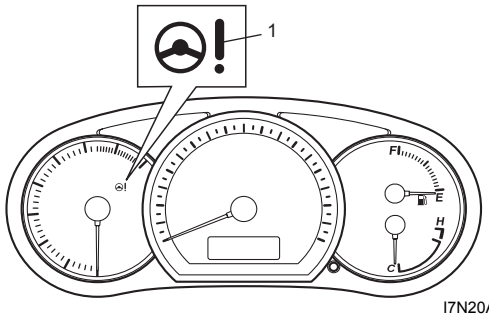
The P/S system in this vehicle is controlled by the P/S control module. The P/S control module has an on-board diagnostic system which detects a malfunction in this system. When diagnosing troubles, be sure to have full understanding of the outline of “On-Board Diagnostic System Description” and each item in “Precautions in Diagnosing Troubles”, and then execute diagnosis according to “EPS System Check”.

On-Board Diagnostic System Description

S7N20A6301003

The P/S control module performs the on-board diagnosis (self-diagnosis) on the system and operates the “EPS” warning lamp (1) as follows.

- The “EPS” warning lamp 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 “EPS” warning lamp is operated properly.
- If the areas monitored by the P/S control module is free from any trouble after the engine start (while engine is running), the “EPS” warning lamp turns OFF.
- When the P/S control module detects a trouble which has occurred in the monitored areas the “EPS” warning lamp comes ON while the engine is running to warn the driver of such occurrence of the trouble and at the same time it stores the exact trouble area in memory inside of the P/S control module.



I7N20A630002-01

Driving Cycle

A “Driving Cycle” consists of engine startup and engine shutoff.

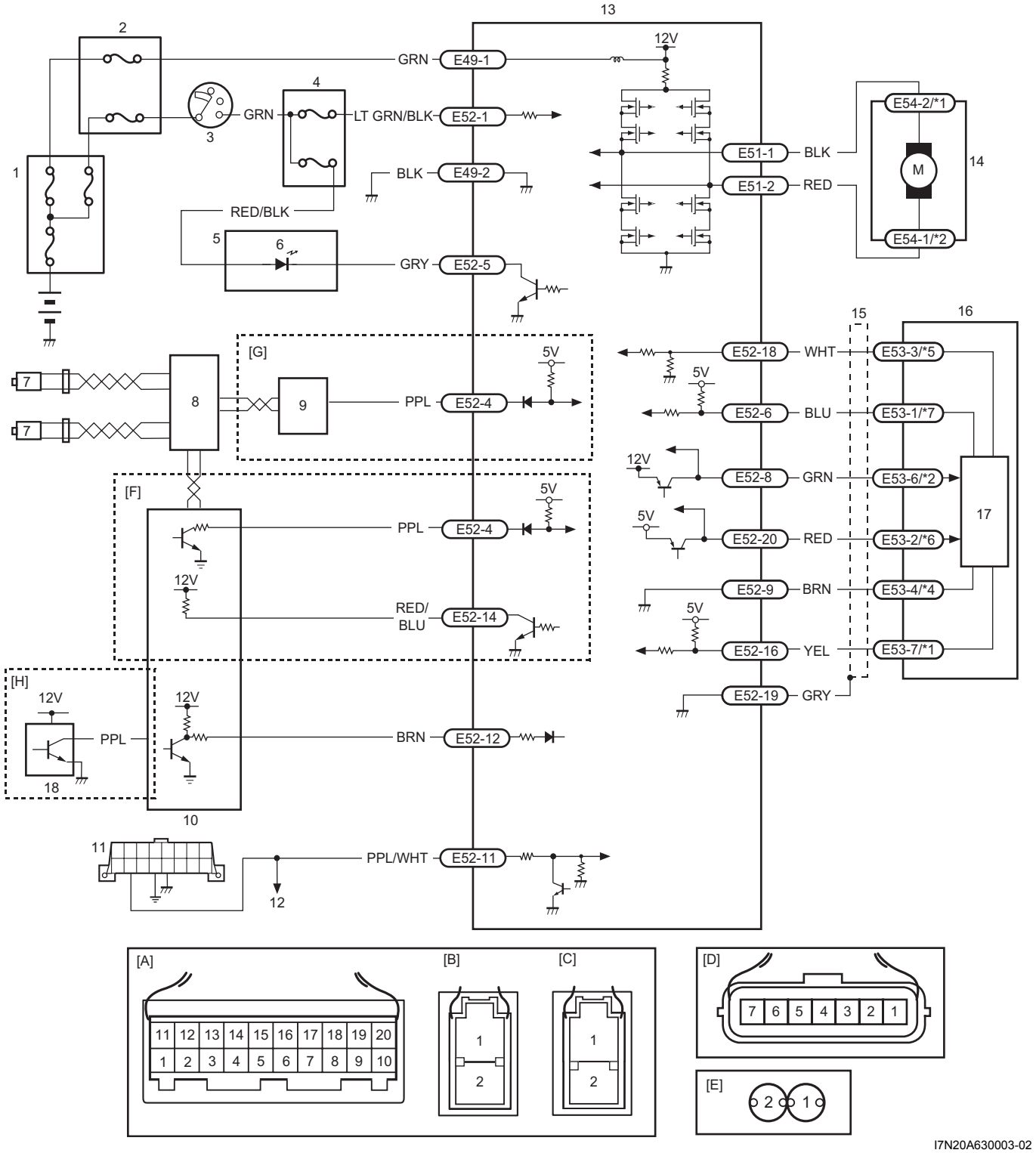
3 Driving Cycles Detection Logic

The malfunction detected in the first and second driving cycle is stored in P/S control module memory (in the form of pending DTC) but the “EPS” warning lamp does not light at these time. It lights up at the third detection of same malfunction also in the next driving cycle.

Schematic and Routing Diagram

EPS System Wiring Circuit Diagram

S7N20A6302001



I7N20A630003-02

[A]: Connector “E52” (viewed from harness side)	2. Individual circuit fuse box No.1	11. Date link connector (DLC)
[B]: Connector “E49” (viewed from harness side)	3. Ignition switch	12. To ECM, BCM, Air bag SDM and ABS or ESP® control module assembly
[C]: Connector “E51” (viewed from harness side)	4. Junction block assembly	13. P/S control module
[D]: Connector “E53” (viewed from harness side)	5. Combination meter	14. P/S motor
[E]: Connector “E54” (viewed from harness side)	6. “EPS” warning light	15. Shield
[F]: Petrol engine model	7. Front (left/right) wheel speed sensor	16. Torque sensor
[G]: Diesel engine model	8. ABS / ESP® control module	17. Torque sensor amplifier

[H]: Automated manual transaxle model	9. BCM	18. VSS
1. Main fuse box	10. ECM	*: RHD model

Terminal Arrangement of P/S Control Module Coupler (Viewed from Harness Side)

Terminal	Circuit	Terminal	Circuit
E49-1	Power supply for internal memory and EPS motor	E52-9	Ground for torque sensors
E49-2	Ground	E52-10	—
E51-1	Motor output 1	E52-11	Serial communication for data link connector
E51-2	Motor output 2	E52-12	Engine speed signal
E52-1	Main power supply for P/S control module	E52-13	—
E52-2	—	E52-14	P/S operation signal (idle up signal) (for petrol engine models)
E52-3	—	E52-15	—
E52-4	Vehicle speed signal	E52-16	Torque sensor failure signal
E52-5	“EPS” warning light	E52-17	—
E52-6	Torque sensor signal (Sub)	E52-18	Torque sensor signal (Main)
E52-7	—	E52-19	Ground for shield
E52-8	12 V power supply for torque sensor	E52-20	5 V power supply for torque sensor

Diagnostic Information and Procedures

EPS System Check

S7N20A6304001

⚠ WARNING

Carry out test drive in light traffic area to prevent an accident.

Step	Action	Yes	No
1	1) Record details of the problem. For your record, use of a questionnaire form will facilitate collecting information for proper analysis and diagnosis. 2) Check if the problem described in “Customer questionnaire” occurs actually in the vehicle. (This step should be performed with the customer if possible.) 3) Check for operation of the “EPS” warning lamp referring to ““EPS” Warning Lamp Check”. 4) Check for DTC referring to “DTC Check”, and then record DTC(s). 5) Clear DTC if any DTC exists referring to “DTC Clearance”, and then recheck for DTC. *Is any DTC still detected?*	Go to Step 2.	Go to Step 3.
2	1) Inspect and repair applicable DTC referring to “DTC Table”. 2) Clear DTC referring to “DTC Clearance”. *Does the trouble recur?*	Go to Step 3.	Go to Step 4.

Step	Action	Yes	No
3	1) Carryout test drive and turn the steering wheel fully to the right and left at the stopped vehicle. Check if any trouble exists. See WARNING. 2) Inspect and repair basic parts referring to “Steering Symptom Diagnosis in Section 6A”. 3) If the trouble cannot be repaired in Step 3-2), inspect and repair referring to “P/S System Symptom Diagnosis”. *Does the trouble recur?*	Go to Step 5.	Go to Step 4.
4	1) Confirm if the problem is solved 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 and perform the test drive in Step 3-1), and then confirm that no DTC is indicated. *Is any malfunction DTC detected?*	Go to Step 5.	END.
5	1) Check for DTC referring to “DTC Check”. *Is any DTC detected?*	Go to Step 2.	Go to Step 3.

NOTE

- **As execution of “DTC Clearance” will clear all DTCs, be sure to record all DTCs before service.**
- **DTC C1122 is indicated when ignition switch is at ON position and engine is not running, it means that nothing is abnormal.**
- **Current DTC and history DTC can be identified by condition of the “EPS” warning lamp. “EPS” warning lamp operates as follows.**

	Current DTC is set. (Abnormality exists at present.)	**Only history DTC is set. (Faulty condition occurred once in the past, but normal condition is detected at present.)**	**Current and history DTC exist.**
“EPS” warning lamp after engine started	Remains ON.	Turns OFF.	Remains ON.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

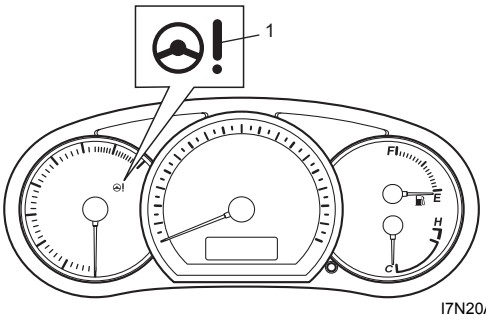
Problem Symptoms	• Steering wheel feels heavy • Vehicle pulls to one side during straight driving • Poor recovery from turns • Too much play in steering • Abnormal noise while vehicle is running: from motor, from rack and pinion, other _____ • Other _____
Frequency of Occurrence	• Continuous/Intermittent (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: Normal code/malfunction code ( ) • Second check after driving test: Normal code/malfunction code ( )

I3RM0A630005-01

"EPS" Warning Lamp Check

S7N20A6304002

1) Turn ignition switch to ON position (without engine running) and check if the "EPS" warning lamp (1) lights up. If the lamp dose not light up, go to ""EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stops" of the diagnostic flows.
2) Start engine and check if the "EPS" warning lamp turns OFF. If the lamp comes OFF, the P/S system is in good condition.



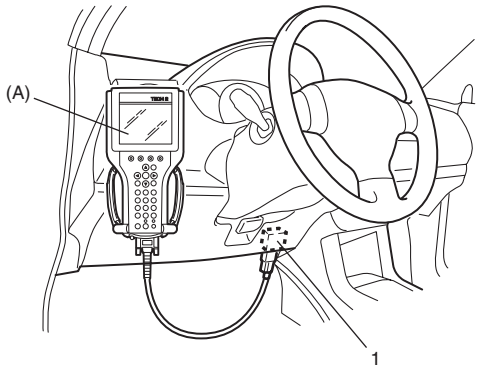
I7N20A630002-01

DTC Check

S7N20A6304003

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0B450003-01

3) Turn ignition switch to ON position.
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 the vehicle can not be established, perform "Serial Data Link Circuit Check".

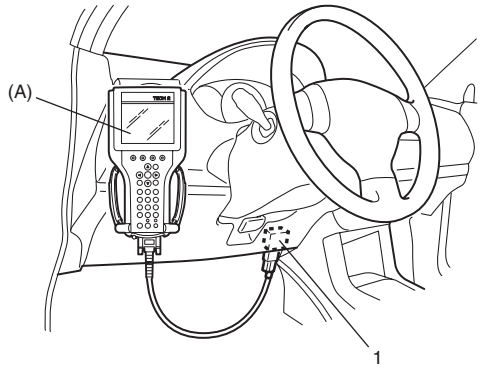
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Clearance

S7N20A6304004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0B450003-01

3) Turn ignition switch to ON position.
4) Erase DTC according to the instructions displayed on SUZUKI scan tool. For further details, refer to operator's manual for SUZUKI scan tool.
5) After completing the clearance, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Table

S7N20A6304005

⚠ CAUTION

Be sure to perform the "EPS System Check" before starting troubleshooting corresponding to each DTC.

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle	"EPS" warning light
No CODES	Normal	—	—	—
☞ C1113	Steering torque sensor (Main and Sub) circuit correlation	Voltage difference between torque sensor main signal and sub signal is more than 0.6 V for 1 second continuously	1 driving cycle	Light up
☞ C1114	Steering torque sensor reference power supply circuit	Circuit voltage of torque sensor 5 V power supply is more than 5.7 V or less than 4.3 V for 1 second continuously	1 driving cycle	Light up
☞ C1117	Steering torque sensor failure signal circuit low	Torque sensor failure signal circuit voltage is less than 1.7 V when ignition switch turned ON	1 driving cycle	Light up
☞ C1118	Steering torque sensor failure signal circuit high	Torque sensor failure signal circuit voltage is more than 3.7 V for 1 second continuously	1 driving cycle	Light up
☞ C1119	Steering torque sensor power supply circuit	Circuit voltage of torque sensor 12 V power supply is less than 7.5 V for 1 second continuously	1 driving cycle	Light up
☞ C1121 (for petrol engine model) / ☞ C1121 (for diesel engine model)	No vehicle speed signal (60 seconds or more)	Vehicle speed signal is 0 km/h even though engine speed is more than 4000 rpm for more than 60 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h even though engine speed is more than 2500 rpm for more than 60 seconds continuously (after elapse of 5 min for engine start).	1 driving cycle	Does not light up
☞ C1122	Engine speed signal	Engine speed signal is less than 220 rpm for more than 0.8 seconds. or Engine speed signal is less than 220 rpm for more than 20 seconds continuously even though vehicle speed signal is more than 50 km/h.	1 driving cycle	Light up
☞ C1123 (for petrol engine model) / ☞ C1123 (for diesel engine model)	No vehicle speed signal (30 seconds or more)	Vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 4000 rpm for more than 30 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 2500 rpm for more than 30 seconds continuously (after elapse of 5 min for engine start).	3 driving cycles	Light up

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)	Driving cycle	"EPS" warning light
☞ C1124 (for petrol engine model) / ☞ C1124 (for diesel engine model)	Vehicle speed performance (Impossible deceleration)	Vehicle speed signal is less than 5 km/h for more than 5 seconds continuously with more than specified deceleration speed (–20 m/s^2) from over 20 km/h.	1 driving cycle	Does not light up
☞ C1141	P/S motor circuit voltage	Voltage between both motor drive circuits is more than 8.5 V or less than 0.2 V for 0.5 seconds continuously while motor is not drive.	1 driving cycle	Light up
☞ C1142	P/S motor circuit range / performance	Measured motor drive current is more than 10 A as compared with target motor drive current.	1 driving cycle	Light up
☞ C1143	P/S motor circuit current too high	Measured motor drive current is more than 50 A.	1 driving cycle	Light up
☞ C1145	P/S motor circuit current too low	Measured motor drive current is less than 2 A continuously for more than 3 seconds even though target motor drive current is more than 4 A. or Measured motor drive current is less than 0.8 A for total 1 second even though motor control duty is more than 90% while target motor drive current is less than 8 A.	1 driving cycle	Light up
☞ C1153	P/S control module power supply circuit failure	Power supply voltage of P/S control module is less than 9 V for 5 seconds continuously	1 driving cycle	Light up
☞ C1155	P/S control module internal failure	Internal circuit or memory is faulty. or Power supply voltage of P/S control module exceeded 17.5 V.	1 driving cycle	Light up

Scan Tool Data

S7N20A6304023

NOTE

When P/S motor is cold condition (that is, armature coil of P/S motor is not heated), normal condition with asterisk (*) mark in the following table is displayed on scan tool.

Scan tool data	Vehicle condition		Normal condition
☞ Battery Voltage	Ignition switch ON		10 – 14 V
☞ TQS Power Supply			10 – 14 V
☞ TQS Main Torque	Engine running at idle speed	Steering wheel at fully turned to left	–9.4 – 0 N·m
		Steering wheel at free	0 N·m
		Steering wheel at fully turned to right	0 – 9.4 N·m
☞ TQS Sub Torque	Engine running at idle speed	Steering wheel at fully turned to left	–9.4 – 0 N·m
		Steering wheel at free	0 N·m
		Steering wheel at fully turned to right	0 – 9.4 N·m
☞ Assist Torque	Engine running at idle speed	Steering wheel at fully turned to left	–9.4 – 0 N·m
		Steering wheel at free	0 N·m
		Steering wheel at fully turned to right	0 – 9.4 N·m
☞ Motor Control	Engine running at idle speed	Steering wheel at free	0 A
		Steering wheel at fully turned to left or right	*35 – 45 A
☞ Motor Monitor	Engine running at idle speed	Steering wheel at free	0 A
		Steering wheel at fully turned to left or right	*35 – 45 A
☞ Vehicle Speed	Engine running and vehicle at stop		0 km/h
☞ Engine Speed	Engine running at idle speed after warming up		Specified engine idle speed
☞ Motor Volt	Engine running at idle speed	Steering wheel at free	0.8 – 1 V
		Steering wheel at fully turned to right	About 5 V
☞ Ignition switch	Ignition switch ON		ON

Scan Tool Data Definitions

Battery Voltage
This parameter indicates battery positive voltage.

TQS Power Supply (Torque Sensor Power Supply, V)
This parameter indicates the power supply voltage which the P/S control module supplies to the torque sensor.

TQS Main Torque (Torque Sensor Main Torque, N·m)
The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the main torque sensor is one of these.

TQS Sub Torque (Torque Sensor Sub Torque, N·m)
The torque sensor is installed to detect the steering force and the steering direction. It consists of two potentiometers and the sub-torque sensor is one of these. Its output characteristics are compared with those of the main torque sensor.

Assist Torque (N·m)
This parameter is an internal parameter of the P/S control module. It is obtained by computing the torque sensor input signal.

Motor Control (Motor Control Current, A)
Based on the input signal, the P/S control module determines the assist amount and controls the current to the motor suitable for that assist amount. This parameter indicates that control value.

Motor Monitor (Motor Monitor Current, A)
This parameter indicates the actually measured value of the current flowing to the motor. The motor circuit condition is diagnosed by comparing this parameter with “Motor Control” parameter described previously.

Vehicle Speed (km/h, MPH)
Vehicle speed signal is fed from ECM or BCM. P/S control module determines the amount of power assist based on this vehicle speed signal and the torque sensor signal.

Engine Speed (rpm)
Engine speed signal is fed from the ECM so that it can be used for trouble diagnosis of the electric power steering system.

Motor Volt (V)
This parameter indicates the voltage between motor terminals.

Ignition switch (ON, OFF)
This parameter indicates the condition of the power supply through the ignition switch.

P/S System Symptom Diagnosis

S7N20A6304007

This section describes trouble diagnosis of the P/S system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnostic function). When no malfunction is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those steering basic parts as described in “Steering Symptom Diagnosis in Section 6A” 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	Steering wheel installed improperly (twisted)	*Install steering wheel correctly.*
NOTE	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection”.*
Perform “Steering Force Check” before diagnosis.	Poor performance of motor	*Check motor referring to “Motor Assembly Inspection”.*
	Steering gear case assembly faulty	*Replace.*
	Poor performance of VSS (for petrol engine model)	*Check VSS referring to “DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: M13A / M15A / M16A in Section 1A”.*
	Poor performance of vehicle speed signal from ABS control module (right-front wheel speed sensor) (for diesel engine model)	*Check vehicle speed signal circuit referring to “DTC C1121 / C1123 / C1124: VSS Circuit Failure (For Diesel Engine Model)”.*
Vehicle pulls to one side during straight driving	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection”.*
Poor recovery after turns	Poor performance of torque sensor	*Check torque sensor referring to “Torque Sensor Inspection”.*
	Steering column faulty	*Replace.*

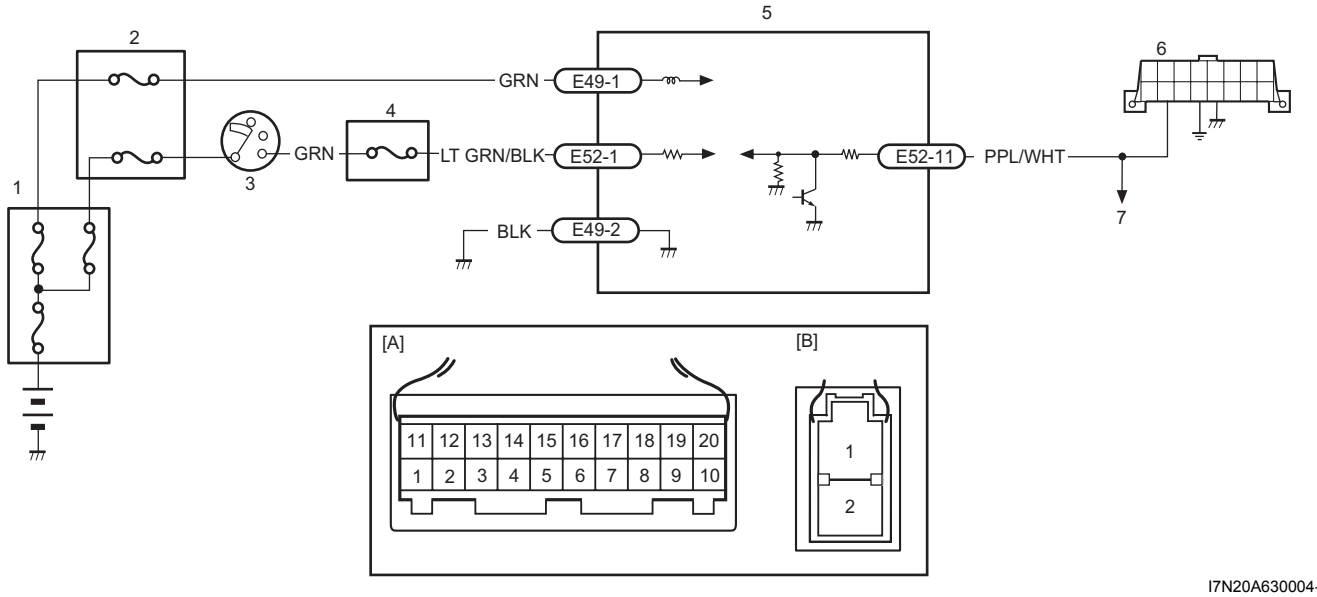
Serial Data Link Circuit Check

S7N20A6304008

⚠ CAUTION

Be sure to perform “EPS System Check” before starting “Troubleshooting”.

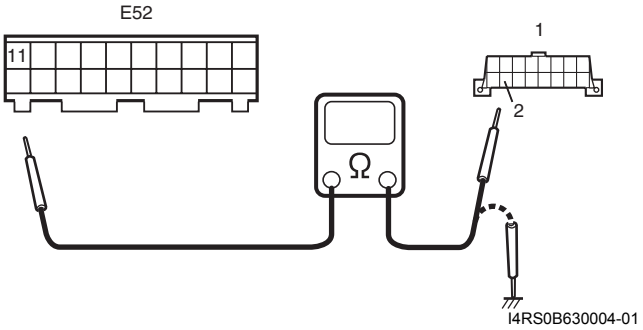
Wiring Diagram



I7N20A630004-01

[A]: Connector “E52” (viewed from harness side)	2. Individual circuit fuse box No.1	5. P/S control module
[B]: Connector “E49” (viewed from harness side)	3. Ignition switch	6. Date link connector (DLC)
1. Main fuse box	4. Junction block assembly	7. To ECM, BCM, Air bag SDM control module and ABS or ESP® control module assembly

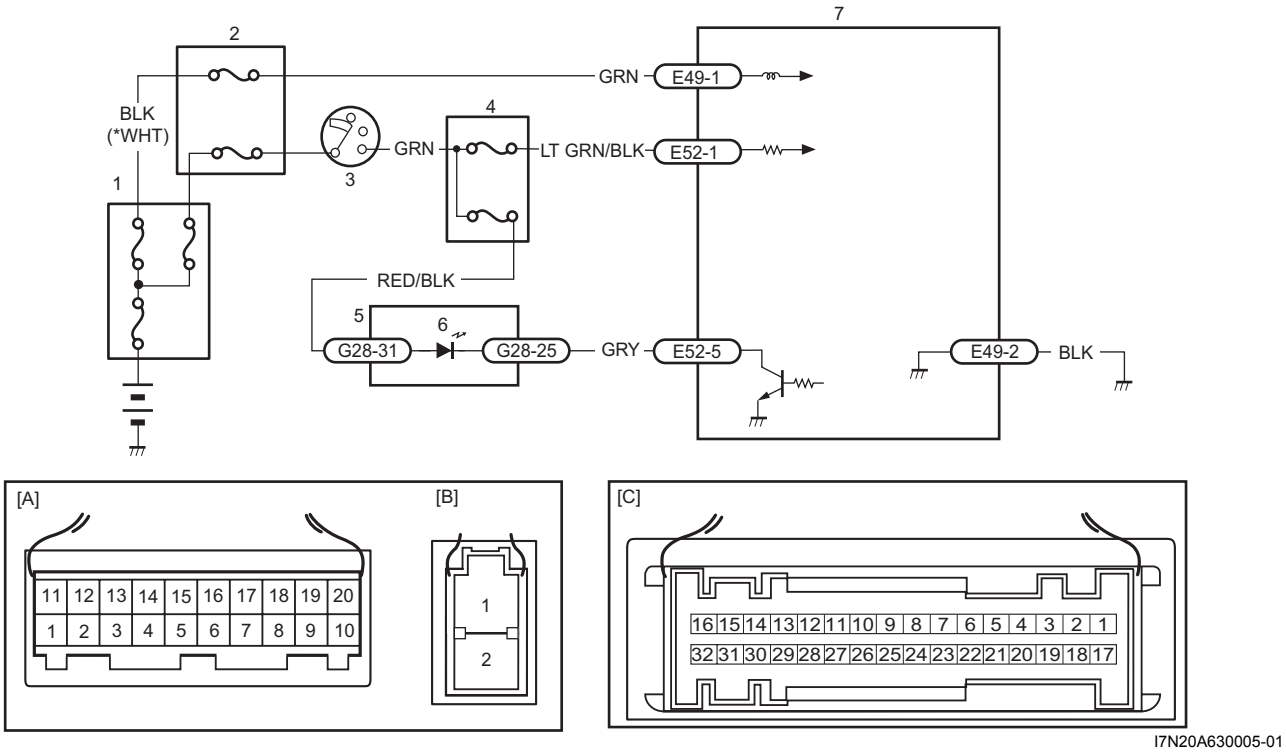
Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	1) Make sure that SUZUKI scan tool is free from malfunction and that correct program card (software) for P/S system is used. 2) Turn ignition switch to OFF position. 3) Check proper connection of SUZUKI scan tool to DLC. *Is connection in good condition?*	Go to Step 3.	Connect SUZUKI scan tool to DLC properly.
3	1) Check if communication is possible by making communication with other controllers (ECM, BCM, ABS (or ESP® control module assembly) (if equipped) or SDM) or other vehicles. *Is it possible to communicate with the other controllers?*	Go to Step 4.	Repair open in common section of serial data circuit ("PPL/WHT" wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit ("PPL/WHT" wire circuit).
4	1) Check for proper connection to P/S control module at "E49-1" terminal. 2) If OK, check for voltage between "E49-1" ("GRN" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 5.	"BLK" or "GRN" wire circuit open or short to ground.
5	1) Check for proper connection to the P/S control module at "E52-1" terminal. 2) If OK, check for voltage between "E52-1" ("LT GRN/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 6.	"LT GRN/BLK" wire circuit open or short to ground.
6	1) With ignition switch at OFF position, disconnect "E52" connector from P/S control module. 2) Check proper connection at "E52-11" ("PPL/WHT" wire) terminal (2) for serial data circuit. 3) If OK, then check for high resistance, open or short to power circuit or ground in "PPL/WHT" wire circuit for P/S system.  *Is check result in good condition?*	Substitute a known-good P/S control module and recheck.	Repair "PPL/WHT" wire circuit for P/S system.

“EPS” Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stops

S7N20A6304009

Wiring Diagram



I7N20A630005-01

[A]: Connector “E52” (viewed from harness side)	2. Individual circuit fuse box No.1	6. “EPS” warning lamp
[B]: Connector “E49” (viewed from harness side)	3. Ignition switch	7. P/S control module
[C]: Connector “G28” (viewed from harness side)	4. Junction block assembly	*: Diesel model
1. Main fuse box	5. Combination meter	

Circuit Description

Operation (ON/OFF) of “EPS” warning lamp is controlled by P/S control module through combination meter.
If the P/S system is in good condition, P/S control module turns “EPS” warning lamp ON at the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, “EPS” warning lamp is turned ON continuously by P/S control module. If P/S control module is disconnected, “EPS” warning lamp is not turned ON.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch ON. *Do the other warning lamps come on?*	Go to Step 2.	“GRN”, “RED/BLK” wire circuit or circuit fuse for combination meter open or short to ground.
2	1) Turn ignition switch OFF. 2) Remove and inspect circuit fuse for P/S control module. *Is fuse in good condition?*	Reinstall fuse, and then go to Step 3.	Check “GRN” wire circuit for short to ground. If OK, replace fuse.
3	1) With ignition switch OFF, disconnect P/S control module connector (“E49”). 2) Check for proper connection to the P/S control module at “E49-2” terminal. 3) Measure resistance between “E49-2” (“BLK” wire) terminal and body ground. *Is it infinite (∞)?*	“BLK” wire circuit open.	Go to Step 4.

Step	Action	Yes	No
4	1) Check for proper connection to P/S control module at "E49-1" terminal. 2) If OK, check for voltage between "E49-1" ("GRN" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 5.	"BLK or WHT" or "GRN" wire circuit open or short to ground.
5	1) Check for proper connection to the P/S control module at "E52-1" terminal. 2) If OK, check voltage between "E52-1" ("LT GRN/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 6.	"LT GRN/BLK" wire circuit open or short to ground.
6	1) Remove combination meter and disconnect combination meter connector ("G28") with ignition switch turned OFF. 2) Check for proper connection to the combination meter at "G28-31" terminal. 3) If OK, check voltage between "G28-31" ("RED/BLK" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Go to Step 7.	"RED/BLK" wire circuit open or short to ground.
7	1) Check for proper connection to the combination meter at "G28-25" terminal and P/S control module at "E52-5" terminal. 2) Measure resistance between the combination meter at "G28-25" terminal and the P/S control module at "E52-5" terminal. *Is it infinite (∞)?*	"GRY" wire circuit open.	Connect combination meter connector ("G28") with ignition switch turned OFF. Go to Step 8.
8	1) Check for voltage between "E52-5" ("GRY" wire) terminal and body ground with ignition switch ON. *Is it 10 – 14 V?*	Replace the P/S control module.	Replace the combination meter.

"EPS" Warning Lamp Comes ON Steady and Engine Start

S7N20A6304010

Wiring Diagram

Refer to ""EPS" Warning Lamp Does Not Come ON at Ignition Switch ON but Engine Stops".

Circuit Description

Operation (ON/OFF) of "EPS" warning lamp is controlled by P/S control module through combination meter.
If the P/S system is in good condition, P/S control module turns "EPS" warning lamp ON at the ignition switch ON, and then turns it OFF at the engine start. If an abnormality in the system is detected, "EPS" warning lamp is turned ON continuously by P/S control module. If P/S control module is disconnected, "EPS" warning lamp is not turned ON.

Troubleshooting

Step	Action	Yes	No
1	1) Perform DTC check. *Is there any DTC (NO CODES on SUZUKI scan tool)?*	Go to Step 5 of "EPS System Check".	Go to Step 2.
2	1) With ignition switch OFF, disconnect P/S control module connector ("E52"). 2) Check for proper connection to the P/S control module at "E52-5" terminal. 3) If OK then ignition switch ON. *Does EPS warning lamp turn on?*	Go to Step 3.	Replace the P/S control module.

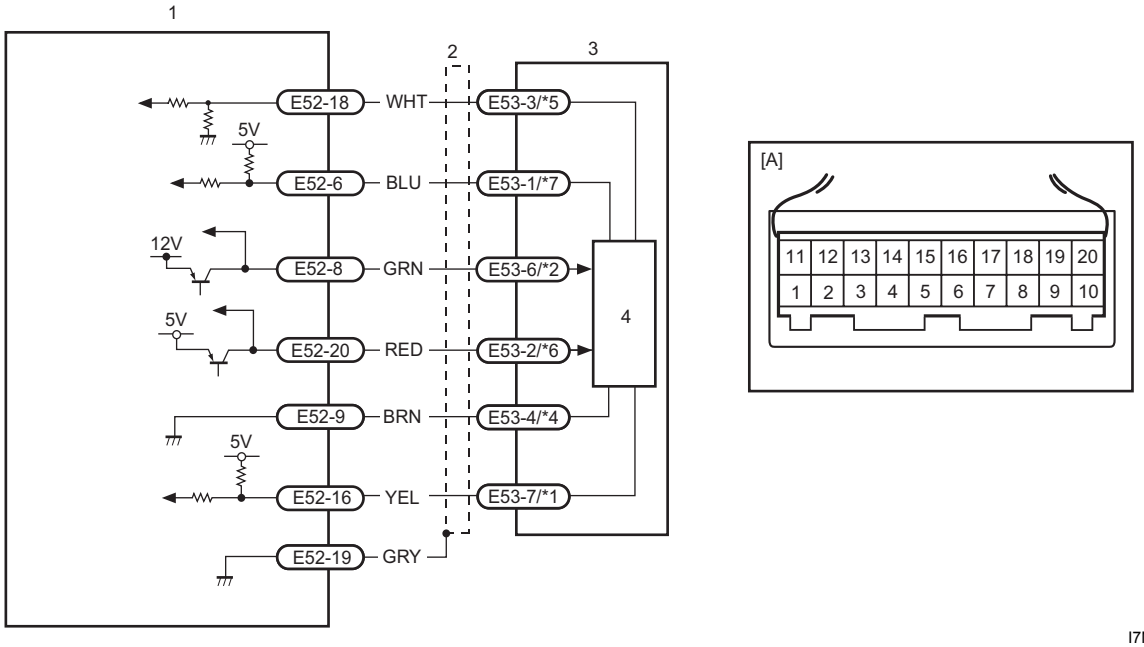
Step	Action	Yes	No
3	1) Remove combination meter and disconnect combination meter connector (“G28”) with ignition switch turned OFF. 2) Check for proper connection to combination meter at “G28-25” terminal. 3) If OK, then check for short to ground in “GRY” wire. *Is it in good condition?*	Replace the combination meter.	Repair “GRY” wire circuit.

DTC C1113 / C1117 / C1118: Torque Sensor Circuit Failure

S7N20A6304011

DTC C1113: Steering Torque Sensor (Main and Sub) Circuit Correlation
DTC C1117: Steering Torque Sensor Failure Signal Circuit Low
DTC C1118: Steering Torque Sensor Failure Signal Circuit High

Wiring Diagram



I7N20A630006-01

[A]: Connector “E52” (viewed from harness side)	2. Shield	4. Torque sensor amplifier
1. P/S control module	3. Torque sensor	*: RHD model

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1113: Voltage difference between torque sensor main signal and sub signal is more than 0.6 V for 1 second continuously (1 driving cycle detection logic) **DTC C1117:** Torque sensor failure signal circuit voltage is less than 1.7 V when ignition switch turned ON (1 driving cycle detection logic) **DTC C1118:** Torque sensor failure signal circuit voltage is more than 3.7 V for 1 second continuously (1 driving cycle detection logic)	• Torque sensor signal circuit • Torque sensor • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	*Is DTC C1114 and/or DTC C1119 indicated together?*	Go to "DTC C1114: Steering Torque Sensor Reference Power Supply Circuit" and/or "DTC C1119: Steering Torque Sensor Power Supply Circuit".	Go to Step 3.
3	1) Check P/S control module connector ("E52") for proper connection. 2) If OK, then check for high resistance, open or short to power circuit or ground in "WHT", "BLU" and "YEL" wire circuit for P/S control module to torque sensor. *Is check result in good condition?*	Go to Step 4.	Repair "WHT", "BLU" and/or "YEL" wire circuit for P/S control module to torque sensor.
4	1) Check torque sensor and its circuit referring to "Torque Sensor Inspection". *Is torque sensor in good condition?*	Substitute a known-good P/S control module, and then recheck.	Replace the steering gear case assembly, and then recheck.

DTC C1114: Steering Torque Sensor Reference Power Supply Circuit

S7N20A6304012

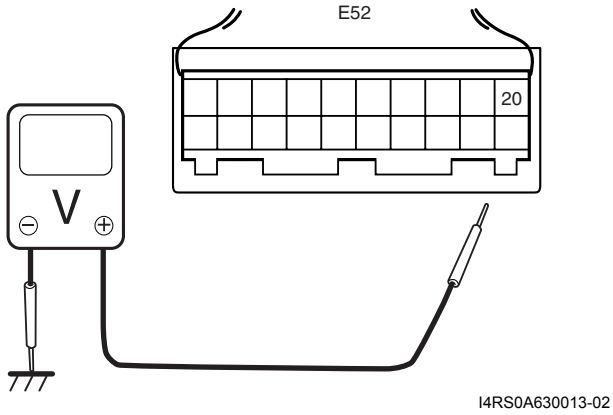
Wiring Diagram

Refer to "DTC C1113 / C1117 / C1118: Torque Sensor Circuit Failure".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Circuit voltage of torque sensor 5 V power supply is more than 5.7 V or less than 4.3 V for 1 second continuously (1 driving cycle detection logic)	• Torque sensor circuit • Torque sensor • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	*Is DTC C1153 and/or DTC C1155 indicated together?*	Go to "DTC C1153: P/S Control Module Power Supply Circuit Failure" and/or "DTC C1155: P/S Control Module Internal Failure".	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector ("E52") for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between "E52-20" ("RED" wire) terminal and body ground with connector ("E52") connected to the P/S control module.  I4RS0A630013-02 *Is it about 5 V?*	Check intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00".	Go to Step 4.
4	1) Disconnect torque sensor connector with ignition switch turned to OFF position. 2) Check torque sensor connector for proper connection. 3) Check for voltage between "RED" wire terminal and body ground. *Is it about 5 V?*	Replace the steering gear case assembly, and then recheck.	Short to ground or power circuit in "RED" wire circuit. If wire is OK, substitute a known-good P/S control module and recheck.

DTC C1119: Steering Torque Sensor Power Supply Circuit

S7N20A6304013

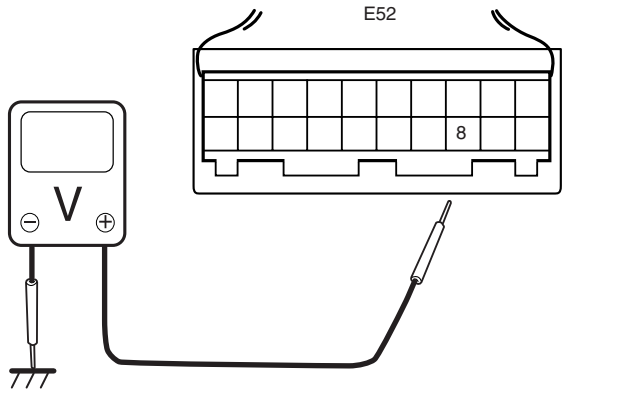
Wiring Diagram

Refer to “DTC C1113 / C1117 / C1118: Torque Sensor Circuit Failure”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Circuit voltage of torque sensor 12 V power supply is less than 7.5 V for 1 second continuously (1 driving cycle detection logic)	• Torque sensor circuit • Torque sensor • P/S control module

DTC Troubleshooting

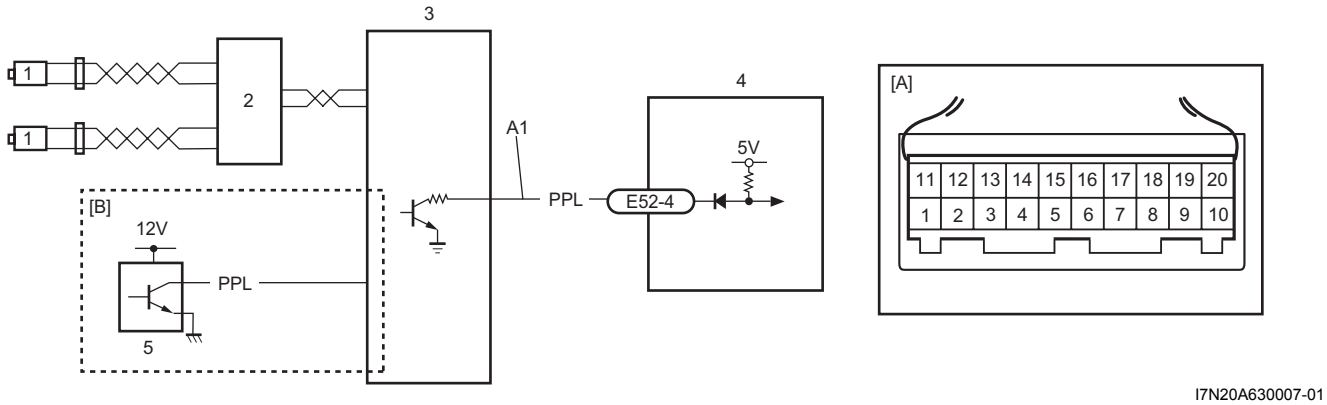
Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check”.
2	*Is DTC C1153, too?*	Go to “DTC C1153: P/S Control Module Power Supply Circuit Failure”.	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector (“E52”) for proper connection. 3) If OK, turn ignition switch ON. 4) Check for voltage between “E52-8” (“GRN” wire) terminal and body ground with connector (“E52”) connected to the P/S control module.  I4RS0A630021-02 *Is it about 12 V?*	Go to Step 4.	Repair high resistance, open or short to power circuit or ground in 12 V power supply (“GRN” wire) circuit.
4	1) Disconnect torque sensor connector with ignition switch turned to OFF position. 2) Check torque sensor connector for proper connection. 3) Check for voltage between “GRN” wire terminal and body ground. *Is it about 12 V?*	Replace the steering gear case assembly, and recheck.	Short to ground in “GRN” wire circuit. If wire is OK, substitute a known-good P/S control module and recheck.

DTC C1121 / C1123 / C1124: VSS Circuit Failure (For Petrol Engine Models)

S7N20A6304014

DTC C1121: No Vehicle Speed Signal (60 Seconds or More) (For Petrol Engine Models)
DTC C1123: No Vehicle Speed Signal (30 Seconds or More) (For Petrol Engine Models)
DTC C1124: Vehicle Speed Performance (Abnormal Deceleration) (For Petrol Engine Models)

Wiring Diagram



I7N20A630007-01

[A]: Connector “E52” (viewed from harness side)	1. Front (left and right) wheel speed sensor	4. P/S control module
[B]: Automated manual transaxle model	2. ABS / ESP® control module	5. VSS
A1. Vehicle speed signal circuit	3. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1121: Vehicle speed signal is 0 km/h even though engine speed is more than 4000 rpm for more than 60 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h even though engine speed is more than 2500 rpm for more than 60 seconds continuously (after elapse of 5 min for engine start). (1 driving cycle detection logic) **DTC C1123:** Vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 4000 rpm for more than 30 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 2500 rpm for more than 30 seconds continuously (after elapse of 5 min for engine start). (3 driving cycle detection logic) **DTC C1124:** Vehicle speed signal is less than 5 km/h for more than 5 seconds continuously with more than specified deceleration speed (–20 m/s^2) from over 20 km/h. (1 driving cycle detection logic)	• VSS signal circuit • Wheel speed sensor • ABS / ESP® control module (if equipped) • ECM • P/S control module

DTC Troubleshooting

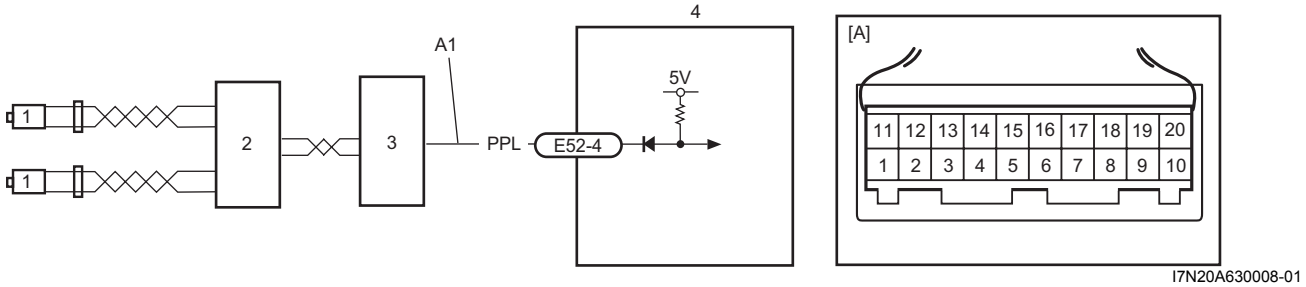
Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	**DTC check** 1) DTC Check for ECM and ABS / ESP® referring to "DTC Check: M13A / M15A / M16A in Section 1A", "DTC Check in Section 4E" or "DTC Check in Section 4F". *Is there any DTC detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Vehicle speed signal output check** 1) Check ECM for vehicle speed signal output referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A". *Is vehicle speed signal output in good condition?*	Substitute a known-good ECM and recheck.	Go to Step 4.
4	**Vehicle speed signal circuit check** 1) With ignition switch turned OFF, disconnect P/S control module connector "E52". 2) Check for proper terminal connection to P/S control module connector and ECM connector. 3) If connections are OK, check that "Vehicle speed signal circuit" is as following. • Insulation resistance of "A1" wire harness is infinity between its terminal and other terminals at ECM and P/S control module connector. • Wiring resistance of "A1" wire is less than 1 Ω. • Insulation resistance of "A1" wire between its circuit and vehicle body ground is infinity • Circuit voltage between "A1" wire circuit and ground circuit is 0 – 1 V with ignition switch turned ON. *Is circuit in good condition?*	Replace P/S control module.	Repair or replace defective circuit.

DTC C1121 / C1123 / C1124: VSS Circuit Failure (For Diesel Engine Model)

S7N20A6304015

DTC C1121: No Vehicle Speed Signal (60 Seconds or More) (For Diesel Engine Model)
DTC C1123: No Vehicle Speed Signal (30 Seconds or More) (For Diesel Engine Model)
DTC C1124: Vehicle Speed Performance (Abnormal Deceleration) (For Diesel Engine Model)

Wiring Diagram



I7N20A630008-01

[A]: Connector "E52" (viewed from harness side)	1. Front (left and right) wheel speed sensor	3. BCM
A1. Vehicle speed signal circuit	2. ABS / ESP® control module	4. P/S control module

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1121: Vehicle speed signal is 0 km/h even though engine speed is more than 4000 rpm for more than 60 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h even though engine speed is more than 2500 rpm for more than 60 seconds continuously (after elapse of 5 min for engine start). (1 driving cycle detection logic) **DTC C1123:** Vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 4000 rpm for more than 30 seconds continuously (before elapse of 5 min from engine start) or vehicle speed signal is 0 km/h with continuously more than 3 driving cycles even though engine speed is more than 2500 rpm for more than 30 seconds continuously (after elapse of 5 min for engine start). (3 driving cycle detection logic) **DTC C1124:** Vehicle speed signal is less than 5 km/h for more than 5 seconds continuously with more than specified deceleration speed (–20 m/s^2) from over 20 km/h. (1 driving cycle detection logic)	• High resistance, open or short in vehicle speed signal circuit • Wheel speed sensor • ABS / ESP® control module • BCM • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	**DTC check** DTC Check for BCM and ABS / ESP® referring to "DTC Check in Section 10B", "DTC Check in Section 4E" or "DTC Check in Section 4F". *Is there any DTC detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Vehicle speed signal output check** Check BCM for vehicle speed signal output referring to "Inspection of BCM and its Circuits in Section 10B". *Is vehicle speed signal output in good condition?*	Substitute a known-good BCM and recheck.	Go to Step 4.
4	**Vehicle speed signal circuit check** 1) With ignition switch turned OFF, disconnect P/S control module connector "E52". 2) Check for proper terminal connection to P/S control module connector and BCM connector. 3) If connections are OK, check that "Vehicle speed signal circuit" is as following. • Insulation resistance of "A1" wire harness is infinity between its terminal and other terminals at BCM and P/S control module connector. • Wiring resistance of "A1" wire is less than 1 Ω. • Insulation resistance of "A1" wire between its circuit and vehicle body ground is infinity • Circuit voltage between "A1" wire circuit and ground circuit is 0 – 1 V with ignition switch turned ON. *Is circuit in good condition?*	Replace P/S control module.	Repair or replace defective circuit.

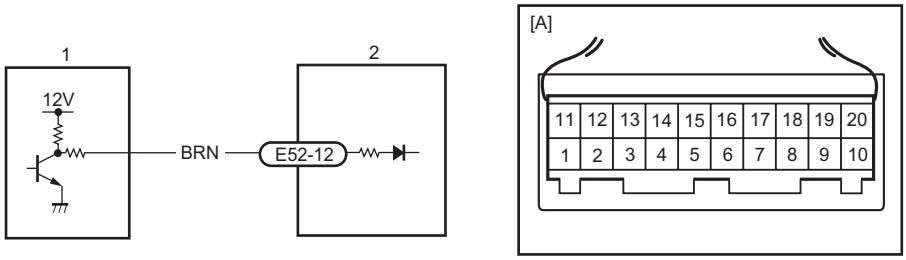
DTC C1122: Engine Speed Signal

S7N20A6304016

NOTE

DTC C1122 (engine speed signal failure) is indicated when ignition switch is at ON position and engine is not running, but means there is nothing abnormal if indication changes to a normal one when engine is started.

Wiring Diagram



I7N20A630009-01

[A]: Connector “E52” (viewed from harness side)	2. P/S control module
1. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Engine speed signal is less than 220 rpm for more than 0.8 seconds. or Engine speed signal is less than 220 rpm for more than 20 seconds continuously even though vehicle speed signal is more than 50 km/h. (1 driving cycle detection logic)	• Engine speed signal circuit • ECM • P/S control module • Vehicle speed signal circuit

DTC Troubleshooting

Step	Action	Yes	No
1	*Was “EPS System Check” performed?*	Go to Step 2.	Go to “EPS System Check”.
2	1) Clear DTC(s) referring to “DTC Clearance”. 2) Run engine at idle speed. 3) Check if any DTC is detected referring to “DTC Check”. *Is DTC C1122 still detected?*	Go to Step 3.	Check intermittent trouble referring to “Intermittent and Poor Connection Inspection in Section 00”.
3	DTC Check for ECM referring to “DTC Check: M13A / M15A / M16A in Section 1A” (for petrol engine models) or “DTC Check: D13A / Z13DTJ in Section 1A” (for diesel engine model). *Is DTC P0340 detected?*	Go to “DTC P0340: Camshaft Position (CMP) Sensor Circuit: M13A / M15A / M16A in Section 1A” (for petrol engine models) or “DTC P0340:: D13A / Z13DTJ in Section 1A” (for diesel model).	Go to Step 4.
4	**Engine speed circuit signal check** 1) Check for proper connection to the P/S control module and ECM at each “BRN” wire terminal (engine speed signal circuit). 2) If they are OK, check for high resistance, open or short to power circuit or ground in “BRN” wire circuit. *Is check result in good condition?*	Go to Step 5.	Repair “BRN” wire circuit.

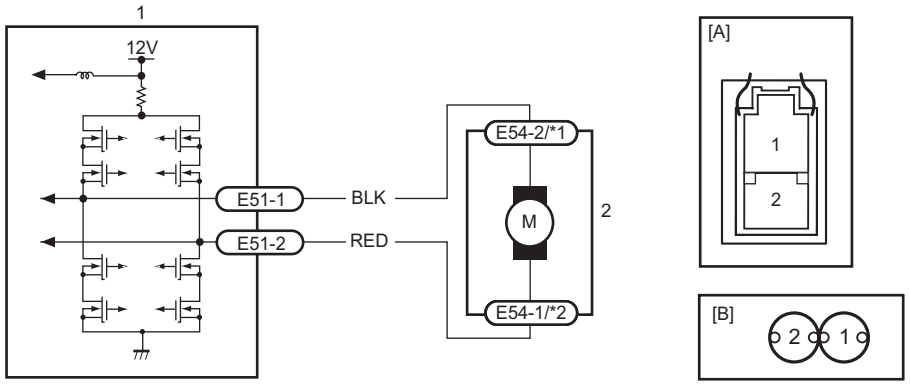
Step	Action	Yes	No
5	**Vehicle speed signal circuit check** 1) Check vehicle speed signal (“E52-4” terminal circuit signal) referring to “Inspection of P/S Control Module and Its Circuits”. *Is it OK?*	Substitute a known-good P/S control module and recheck.	Repair vehicle speed signal (PPL wire) circuit for short to other circuit referring to “EPS System Wiring Circuit Diagram”. If its circuit is OK, substitute a known-good ECM and recheck.

DTC C1141 / C1142 / C1143 / C1145: Motor Circuit Failure

S7N20A6304017

DTC C1141: P/S Motor Circuit Voltage
DTC C1142: P/S Motor Circuit Range / Performance
DTC C1143: P/S Motor Circuit Current Too High
DTC C1145: P/S Motor Circuit Current Too Low

Wiring Diagram



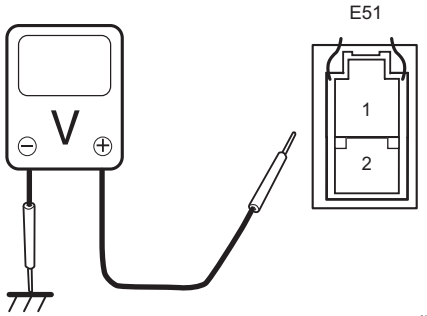
I7N20A630010-01

[A]: Connector “E51” (viewed from harness side)	1. P/S control module	*: RHD model
[B]: Connector “E54” (viewed from harness side)	2. P/S motor	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
DTC C1141: Voltage between both motor drive circuits is more than 8.5 V or less than 0.2 V for 0.5 seconds continuously while motor is not drive. (1 driving cycle detection logic) **DTC C1142:** Measured motor drive current is more than 10 A as compared with target motor drive current. (1 driving cycle detection logic) **DTC C1143:** Measured motor drive current is more than 50 A. (1 driving cycle detection logic) **DTC C1145:** Measured motor drive current is less than 2 A continuously for more than 3 seconds even though target motor drive current is more than 4 A. or Measured motor drive current is less than 0.8 A for total 1 second even though motor control duty is more than 90% while target motor drive current is less than 8 A. (1 driving cycle detection logic)	• P/S motor circuit • P/S motor • P/S control module

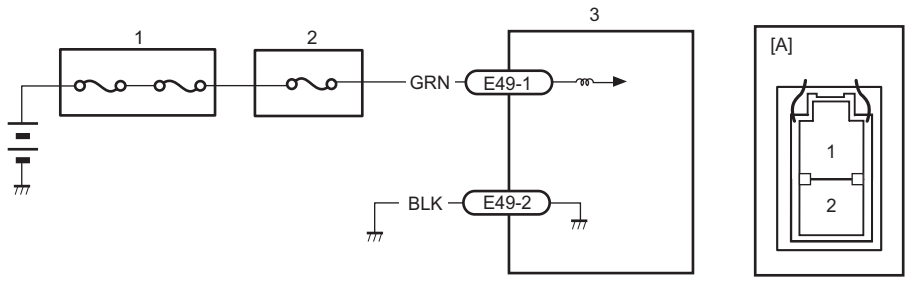
DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	*Is DTC C1153 and/or DTC C1155 indicated together?*	Go to "DTC C1153: P/S Control Module Power Supply Circuit Failure" and/or "DTC C1155: P/S Control Module Internal Failure".	Go to Step 3.
3	1) Remove console box. 2) Check P/S control module connector ("E51") for proper connection. 3) If OK, start engine. 4) Check for voltage between "E51-1" ("BLK" wire) terminal and body ground and "E51-2" ("RED" wire) terminal and body ground with connector ("E51") connected to the P/S control module.  I7N20A630011-01 *Are they 5 – 7 V with steering wheel at straight position?*	Go to Step 4.	Repair poor connection, high resistance, open or short to power circuit or ground in "E51-1" ("BLK" wire) or "E51-2" ("RED" wire) circuit and recheck.
4	1) Check motor and its circuit referring to "Motor Assembly Inspection". *Is motor in good condition?*	Substitute a known-good P/S control module, and recheck.	Replace the steering gear case assembly.

DTC C1153: P/S Control Module Power Supply Circuit Failure

S7N20A6304018

Wiring Diagram



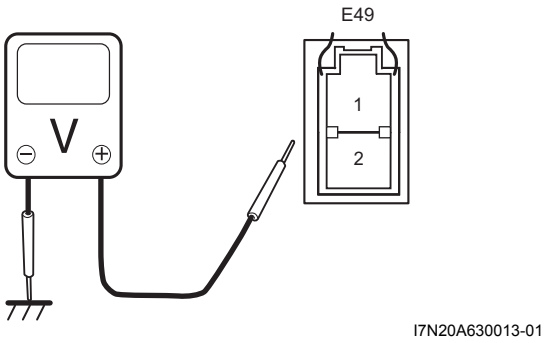
I7N20A630012-01

[A]: Connector "E49" (viewed from harness side)	2. Individual circuit fuse box No.1
1. Main fuse box	3. P/S control module

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Power supply voltage of P/S control module is less than 9 V for 5 seconds continuously (1 driving cycle detection logic)	• P/S control module power supply circuit • Undercharged Battery • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	1) Check circuit fuse for P/S control module. 2) If OK, measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 10 V or more?*	Go to Step 3.	Check charging system referring to "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J" and "Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J" and "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".
3	1) With ignition switch OFF, disconnect P/S control module connector ("E49"). 2) Check for proper connection to the P/S control module at "E49-2" ("BLK" wire) terminal. 3) If OK, then check for high resistance, open or short to power circuit in "BLK" wire circuit. *Is check result in good condition?*	Go to Step 4.	Repair "BLK" wire circuit.
4	1) Remove steering column hole cover with turn ignition switch OFF. 2) Check for proper connection to the P/S control module at "E49-1" ("GRN" wire) terminal. 3) Connect P/S control module connector. 4) If OK, check voltage between "E49-1" terminal and body ground with engine running.  I7N20A630013-01 *Is voltage 10 V or more?*	Check for intermittent trouble referring to "Intermittent and Poor Connection Inspection in Section 00". If OK, substitute a known-good P/S control module, and recheck.	Repair poor connection or high resistance in "E49-1" ("GRN" wire) circuit.

DTC C1155: P/S Control Module Internal Failure

S7N20A6304019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Internal circuit or memory is faulty. or Power supply voltage of P/S control module exceeded 17.5 V. (1 driving cycle detection logic)	• Overcharged Battery • P/S control module

DTC Troubleshooting

Step	Action	Yes	No
1	*Was "EPS System Check" performed?*	Go to Step 2.	Go to "EPS System Check".
2	Measure voltage between positive battery terminal and vehicle body ground with engine running. *Is voltage 15.5 V or less?*	Substitute a known-good P/S control module, and recheck.	Check charging system referring to "Generator Test (Overcharged Battery Check): M13A / M15A / M16A in Section 1J" and "Generator Test (Overcharged Battery Check): D13A / Z13DTJ in Section 1J".

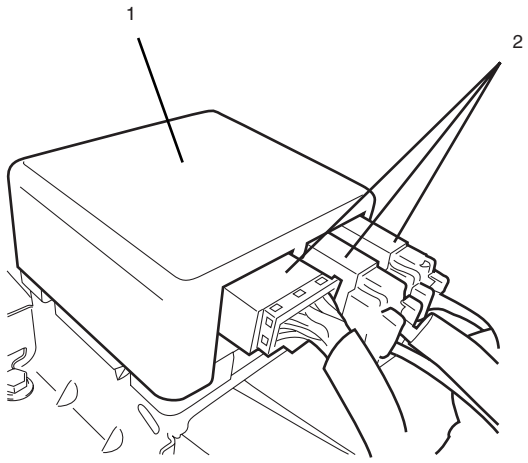
Inspection of P/S Control Module and Its Circuits

S7N20A6304020

The P/S control module (1) and its circuits can be checked at the P/S control module wiring couplers (2) by measuring voltage and resistance.

⚠ CAUTION

P/S control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to the P/S control module with connectors disconnected from the P/S control module.



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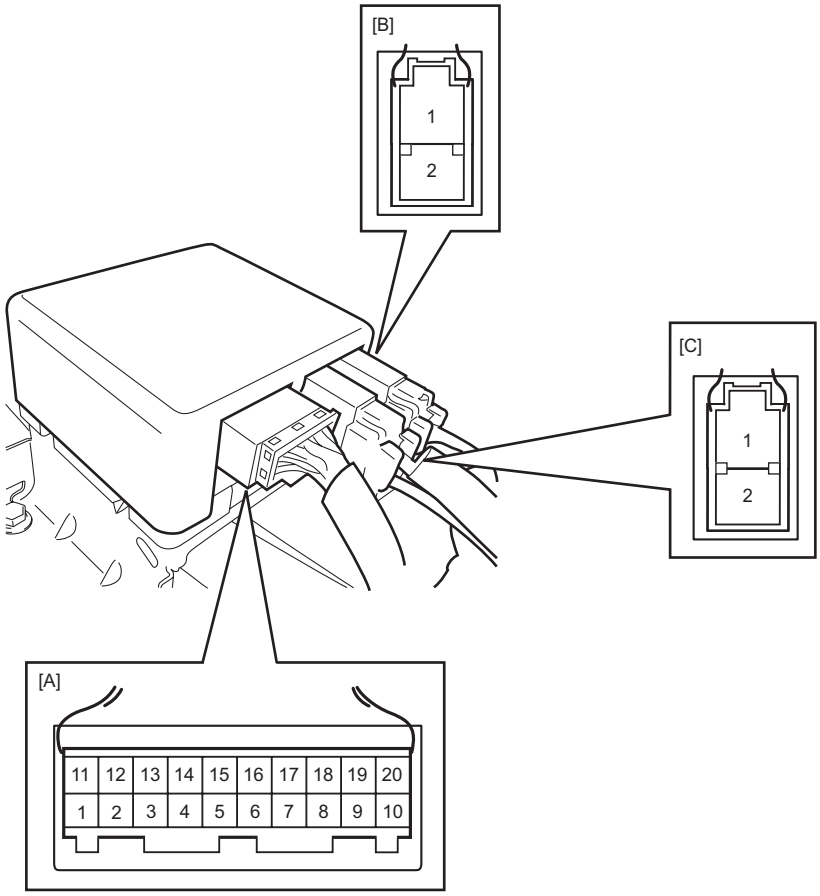
Voltage Check

1) Remove console box.
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 11 V or more when ignition switch is ON.
***: The voltage of this circuit may not be checked by voltmeter. If so, use oscilloscope.**



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[A]:	Connector “E52” (viewed from harness side)
[B]:	Connector “E51” (viewed from harness side)
[C]:	Connector “E49” (viewed from harness side)

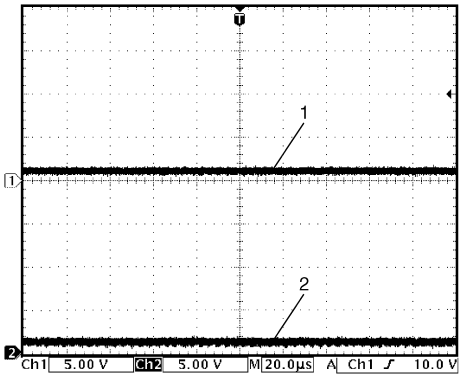
Terminal	Wire color	Circuit	Normal voltage	Remarks
E49-1	GRN	Power supply for internal memory and EPS motor	10 – 14 V	—
E49-2	BLK	Ground	—	—
E51-1	BLK	Motor output 1	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.1: ”, “Reference waveform No.2: ”and “Reference waveform No.3: ”)	• Engine idling and steering wheel at straight position • Voltage between “E51-1” and vehicle body ground
E51-2	RED	Motor output 2	*0 – 1 V ↑↓ 10 – 14 V (“Reference waveform No.1: ”, “Reference waveform No.2: ”and “Reference waveform No.3: ”)	• Engine idling and steering wheel at straight position • Voltage between “E51-2” and vehicle body ground
E52-1	LT GRN/BLK	Main power supply for P/S control module	10 – 14 V	Ignition switch ON
E52-2	—	—	—	—
E52-3	—	—	—	—
E52-4	PPL	Vehicle speed signal	*0 – 1 V ↑↓ 8 – 14 V (“Reference waveform No.8” under “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A” (for petrol engine model)) or (“Reference waveform No.9” under “Inspection of BCM and its Circuits in Section 10B” (for diesel engine model))	• Ignition switch ON • Front left tire turned quickly with right tire locked
E52-5	GRY	“EPS” warning light	0 V	Ignition switch ON
			10 – 14 V	Engine idling
E52-6	BLU	Torque sensor (Sub)	About 0 – 2.5 V	• Steering wheel with left turn • Out put voltage varies linearly depending on steering force
			About 2.5 V	Steering wheel at free
			About 2.5 – 6 V	• Steering wheel with right turn • Out put voltage varies linearly depending on steering force
E52-7	—	—	—	—
E52-8	GRN	12 V power supply for torque sensor	About 12 V	• Ignition switch ON • Check voltage between “E52-8” and “E52-9” terminals
E52-9	BRN	Torque sensor (GND)	0 V	—

Terminal	Wire color	Circuit	Normal voltage	Remarks
E52-10	—	—	—	—
E52-11	PPL/WHT	Data link connector	—	—
E52-12	BRN	Engine speed signal	*0 – 1 V ↑↓ 8 – 14 V (“Reference waveform No.26 and No.27” under “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A” (for petrol engine models)) 0 – 1 V ↑↓ 6 – 10 V (“Reference waveform No.7” under “ECM and Its Circuits Voltage Value (for Reference): D13A / Z13DTJ in Section 1A” (for diesel engine model))	Engine idling
E52-13	—	—	—	—
E52-14	RED/BLU	P/S operation signal (idle up signal) (for petrol engine models)	About 12 V	Ignition switch ON
			0 – 1 V	Engine idling and turned steering wheel to the right or left until it stops
E52-15	—	—	—	—
E52-16	YEL	Torque sensor failure signal	0 V	Ignition switch ON
E52-17	—	—	—	—
E52-18	WHT	Torque sensor (Main)	About 0 – 2.5 V	• Steering wheel with left turn • Out put voltage varies linearly depending on steering force
			About 2.5 V	Steering wheel at free
			About 2.5 – 6 V	• Steering wheel with right turn • Out put voltage varies linearly depending on steering force
E52-19	GRY	Shield (GND)	—	—
E52-20	RED	5 V power supply for torque sensor	About 5 V	• Ignition switch ON • Check voltage between “E52-20” and “E52-9” terminals

Reference waveform No.1

Motor output signal 1(1), Motor output signal 2(2), with engine idling

Measurement terminal	CH1: “E51-1” to vehicle body ground CH2: “E51-2” to vehicle body ground
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 μs/DIV
Measurement condition	• Engine is idling and steering wheel at straight position



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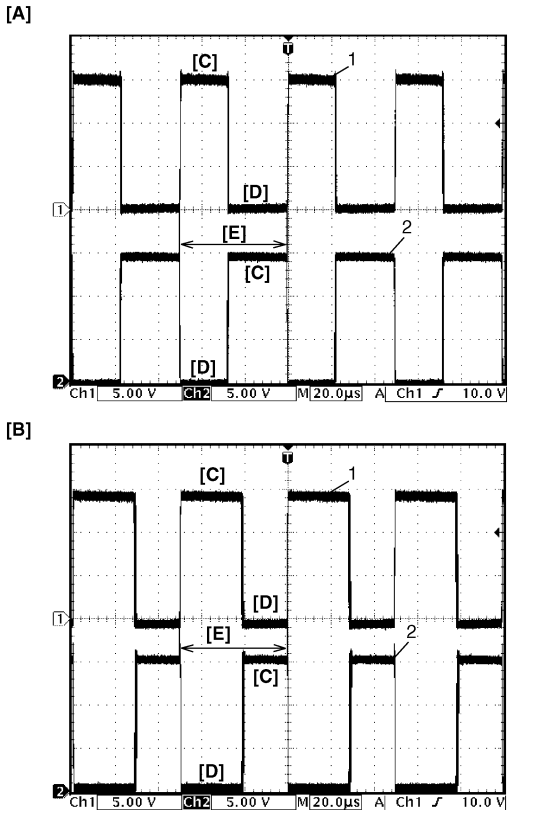
Reference waveform No.2

Motor output signal 1(1), Motor output signal 2(2), with engine idling

Measurement terminal	CH1: “E51-1” to vehicle body ground CH2: “E51-2” to vehicle body ground
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 μs/DIV
Measurement condition	• Engine is idling and steering wheel is turned to left or right at turning speed of 90° /sec



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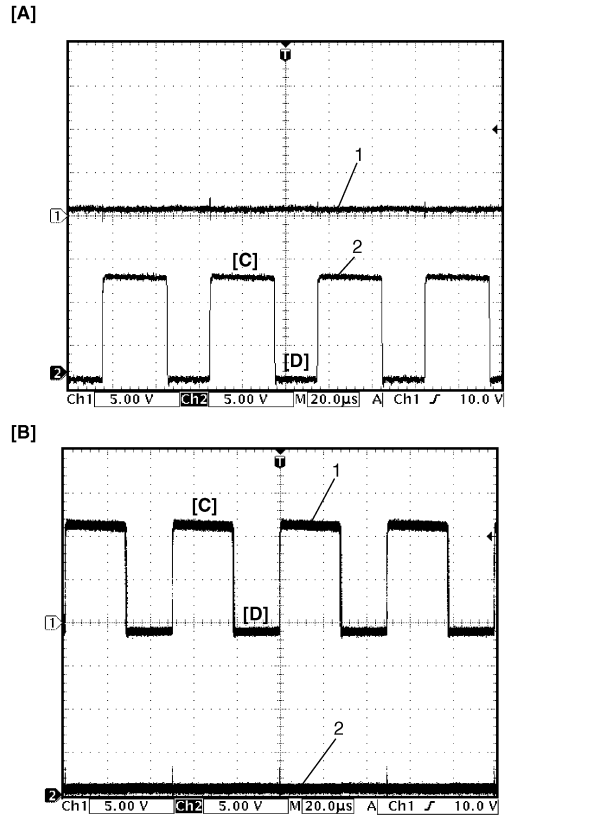
[A]:	Steering wheel is turned left at turning speed of 90° /sec
[B]:	Steering wheel is turned right at turning speed of 90° /sec
[C]:	12 V ON
[D]:	GND ON
[E]:	1 duty cycle

Reference waveform No.3
Motor output signal 1(1), Motor output signal 2(2), with engine idling

Measurement terminal	CH1: "E51-1" to vehicle body ground CH2: "E51-2" to vehicle body ground
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5 V/DIV TIME: 20 μs/DIV
Measurement condition	• Engine is idling and steering wheel is kept fully turned to left or right until it stops



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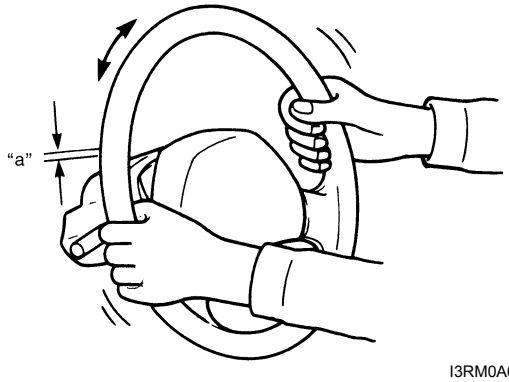
[A]:	Steering wheel is kept fully turned left until it stops
[B]:	Steering wheel is kept fully turned right until it stops
[C]:	12 V ON
[D]:	GND ON

Steering Wheel Play Check

S7N20A6304021

- Check steering wheel for looseness or rattle by moving it in its shaft direction and lateral direction. If found defective, repair or replace.
- Check steering wheel for play, holding vehicle in straight forward condition on the ground with engine stopped.
  If steering wheel play is not within specification, inspect as follows and replace if found defective.
- Tie-rod end ball stud for wear (Ball stud should move when more than 0.2 N·m (2 kg-cm, 0.44 lbf-ft) torque is applied.)
- Lower ball 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 – 1.18 in.)



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Steering Force Check

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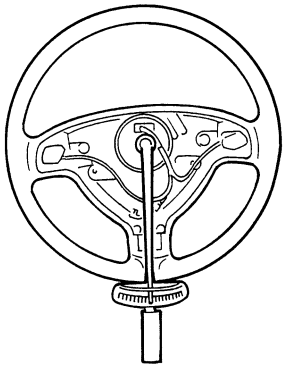
1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check if tire inflation pressure is as specified referring to the tire placard.
3) Remove driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation in Section 8B".
4) Start engine.
5) With engine idling, measure steering force by turning torque wrench.

   Steering force
   : Less than 6.4 N·m (0.64 kgf-m, 4.6 lbf-ft)



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6) Install driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation in Section 8B".

Repair Instructions

Steering Gear Case Assembly Components

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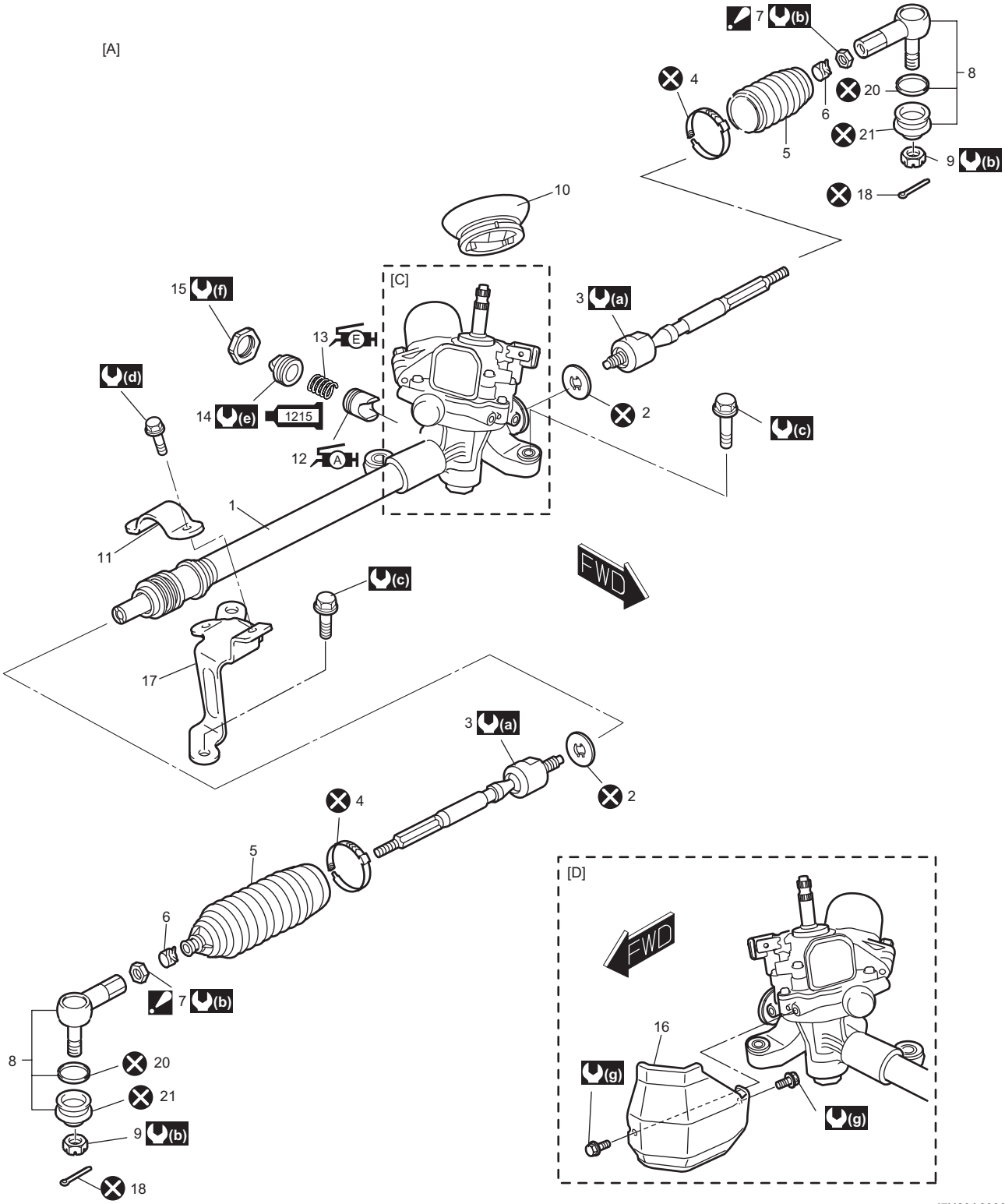

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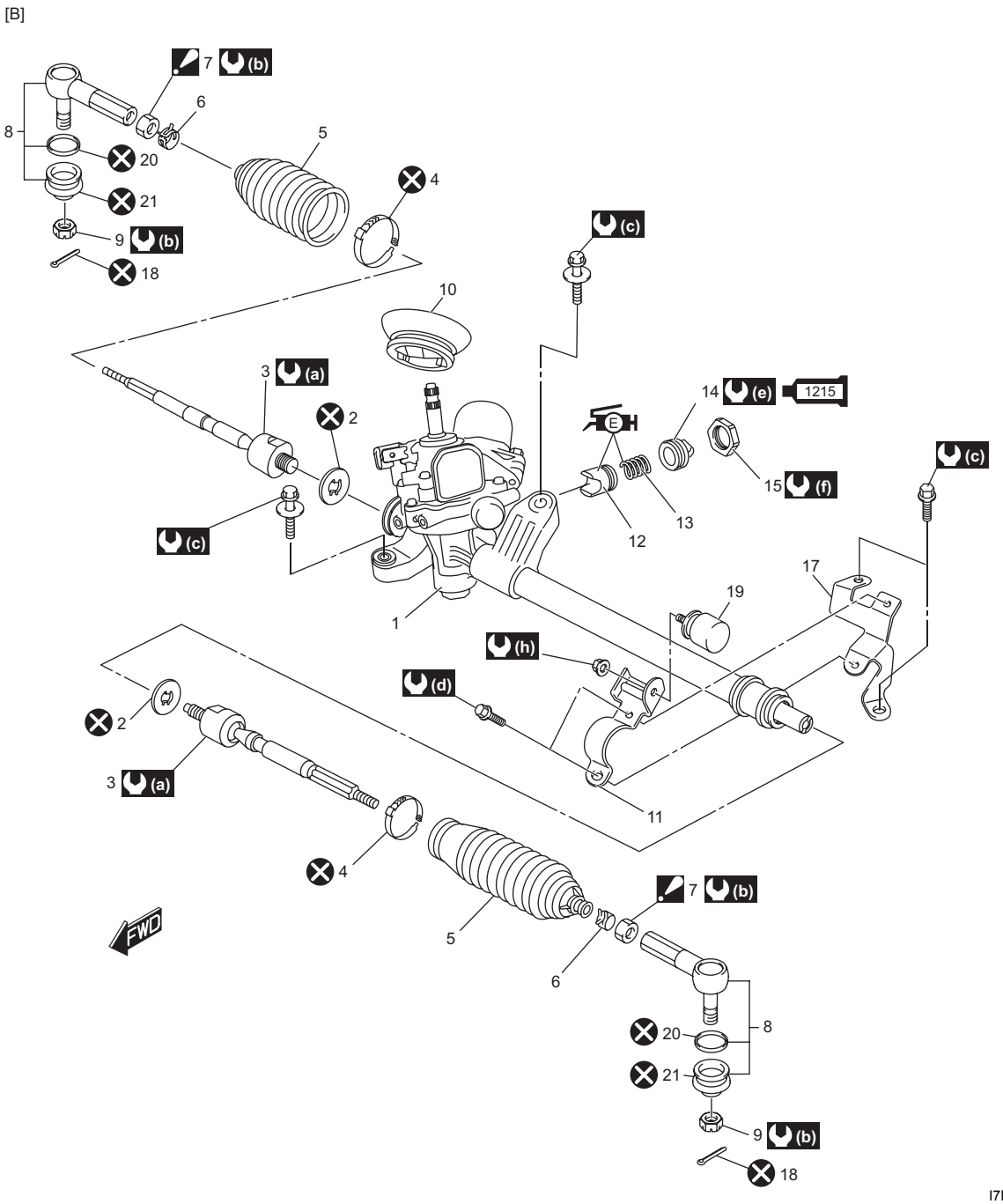


I7N20A630016-02

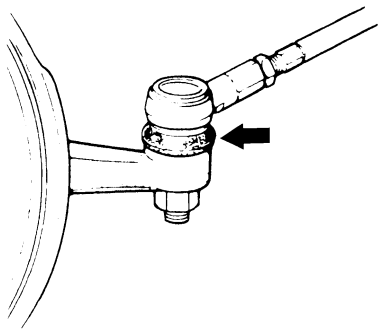
[A]: Petrol engine model	9. Tie-rod end nut	21. Boot
[B]: Diesel engine model	10. Steering gear case grommet	(a): 93 N·m (9.3 kgf-m, 67.5 lbf-ft)
[C]: LHD model	11. Gear rack side No.1 bracket	(b): 45 N·m (4.5 kgf-m, 32.5 lbf-ft) : Refer to "Tie-Rod End Removal and Installation".
[D]: RHD model	12. Steering rack plunger : Apply grease 99000-25050 to rack plunger.	(c): 55 N·m (5.5 kgf-m, 40.0 lbf-ft)
1. Steering gear case	13. Steering rack plunger spring : Apply grease 99000-25050 to spring end.	(d): 40 N·m (4.0 kgf-m, 29.0 lbf-ft)
2. Tie-rod lock washer	14. Steering rack damper screw : Apply thread lock 99000-31110 to all around thread part of rack damper screw.	(e): Refer to "Steering Rack Plunger Removal and Installation".
3. Tie-rod	15. Steering rack damper lock nut	(f): 64 N·m (6.4 kgf-m, 46.5 lbf-ft) : Refer to "Steering Rack Plunger Removal and Installation".
4. Band	16. Heat insulator	(g): 9.5 N·m (0.95 kgf-m, 7.0 lbf-ft)
5. Boot	17. Gear rack side No.2 bracket	(h): 26 N·m (2.7 kgf-m, 19.5 lbf-ft)
6. Rack boot clip	18. Cotter pin	: Do not reuse.

7. Tie-rod end lock nut : Refer to “Tie-Rod End Removal and Installation”.	19. Damper	
8. Tie-rod end	20. Clip	

Tie-Rod End Boot On-Vehicle Inspection

S7N20A6306002

Inspect each boot for tear. If even a small tear is noted, replace it with a new one.



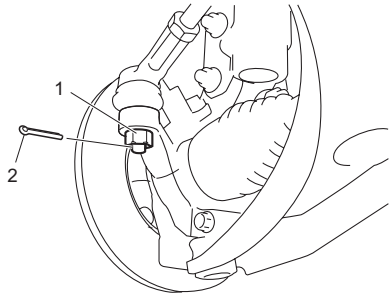
I3RM0A630024-01

Tie-Rod End Removal and Installation

S7N20A6306003

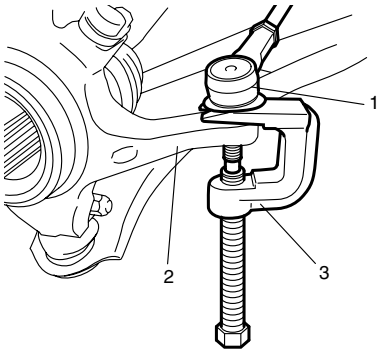
Removal

1) Hoist vehicle, and then remove wheel referring to “Wheel (with Tire) Removal and Installation in Section 2D”.
2) Remove cotter pin (2) and tie-rod end nut (1) from steering knuckle.



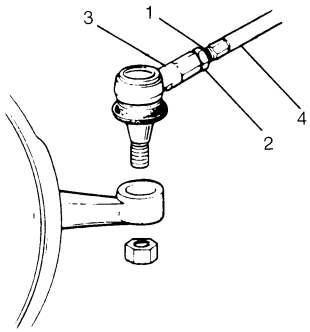
I7RS0A630016-01

3) Disconnect tie-rod end (1) from knuckle (2) using puller (3).



I4RS0A630040-01

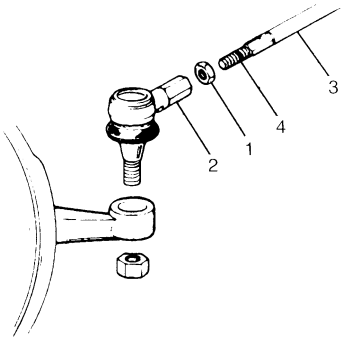
4) For ease of adjustment after installation, make marking (1) of tie-rod end lock nut (2) position on tie-rod end thread. Then, loosen lock nut and remove tie-rod end (3) from tie-rod (4).



I4RS0A630041-01

Installation

1) Install tie-rod end lock nut (1) and tie-rod end (2) to tie-rod (3). Align lock nut with mark (4) on tie-rod thread.



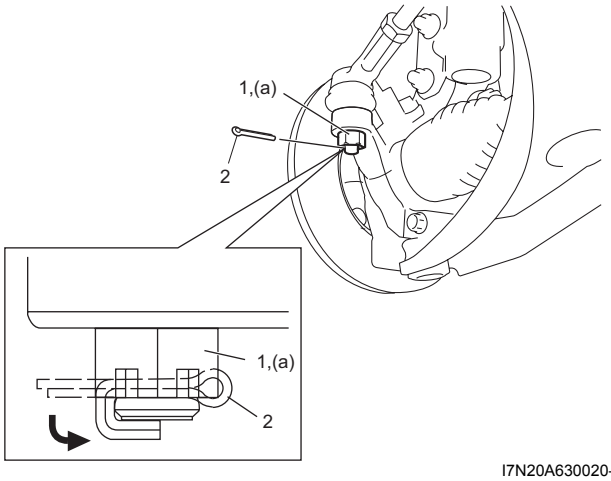
I4RS0A630042-01

2) Connect tie-rod end to knuckle. Tighten tie-rod end nut (1) to specified torque.
3) Bend new cotter pin (2).

NOTE

- **After tightening tie-rod end nut to specified torque, match next first slot of nut with hole of tie-rod end for insertion of cotter pin (rotation angle 60° max).**
- **Insert cotter pin fully as shown in figure. (Long arm should be upper side.) After inserting cotter pin, Bend cotter pin as shown in figure.**

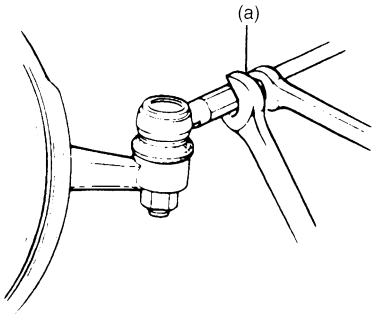
Tightening torque
Tie-rod end nut (a): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)



I7N20A630020-01

4) Inspect for proper toe referring to “Front Wheel Alignment Inspection and Adjustment in Section 2B”.
5) After confirming proper toe, tighten tie-rod end lock nut to specified torque.

Tightening torque
Tie-rod end lock nut (a): 45 N·m (4.5 kgf-m, 32.5 lbf-ft)



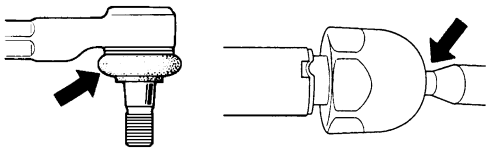
I3RM0A630030-01

6) Tighten wheel bolts to specified torque referring to “Wheel (with Tire) Removal and Installation in Section 2D”.

Tie-Rod End Inspection

S7N20A6306004

- Inspect for play in ball joint.
- Inspect for play in rack end ball joint.
  In either case, if found defective, replace.

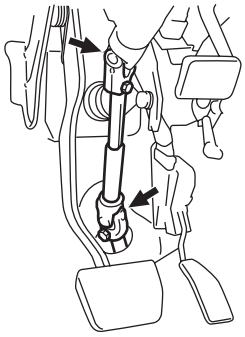


I4RS0A630043-01

Steering Shaft Joint On-Vehicle Inspection

S7N20A6306005

Check shaft joint for wear, breakage and any other damage and replace if any defect exists.



I4RS0B630012-01

Steering Gear Case Assembly Removal and Installation

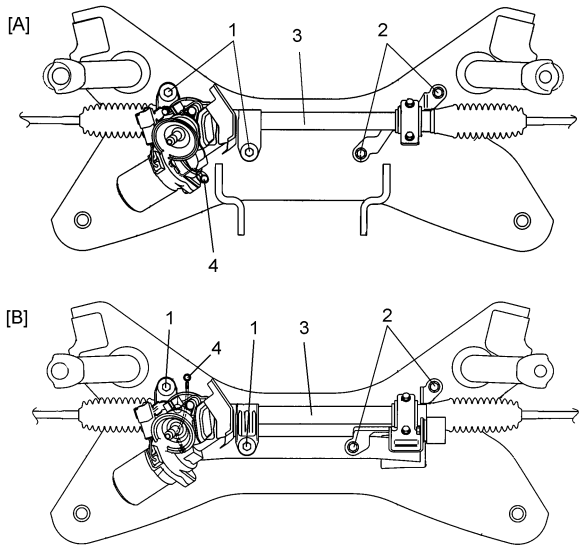
S7N20A6306006

Removal

⚠ CAUTION

Be sure to set front wheels (tires) in straight direction and remove ignition key from key cylinder before performing the following steps; otherwise, contact coil of air bag system may get damaged.

1) Remove front suspension frame with steering gear case assembly referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.
2) Remove steering gear case mounting No.1 bolts (1), No.2 bolts (2), and earth cable mounting bolt (4), then remove gear case (3) from front suspension frame.



I7N20A630022-01

[A]:	Petrol model
[B]:	Diesel model

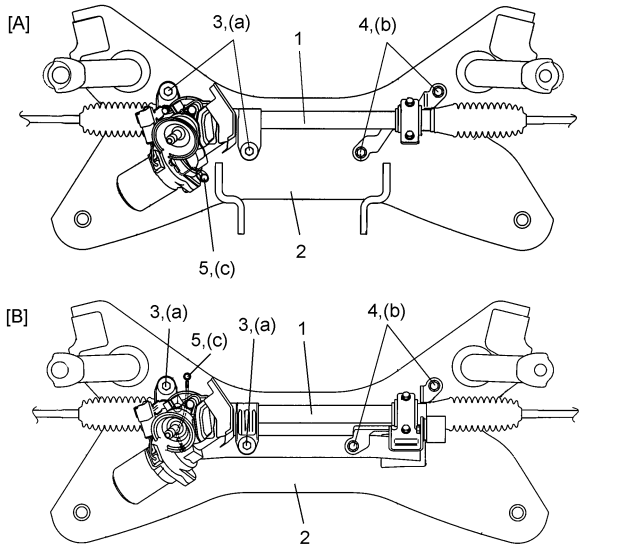
Installation

1) Mount steering gear case (1) to front suspension frame (2) and tighten gear case mounting No.1 bolts (3) and No.2 bolts (4) to specified torque.

Tightening torque
Steering gear case mounting No.1 bolt (a): 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
Steering gear case mounting No.2 bolt (b): 40 N·m (4.1 kgf-m, 29.5 lbf-ft)

2) Tighten earth cable mounting bolt (5).

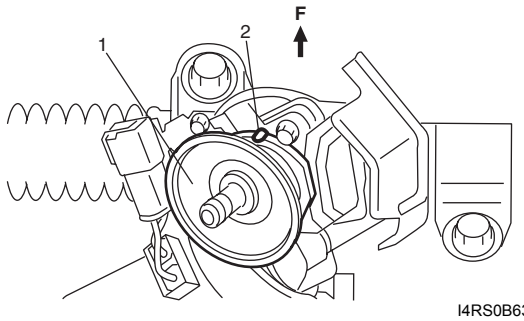
Tightening torque
Earth cable mounting bolt (C): 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)



I7N20A630023-01

[A]:	Petrol model
[B]:	Diesel model

3) Install grommet (1) so that projection (2) orients vehicle forward.



I4RS0B630018-01

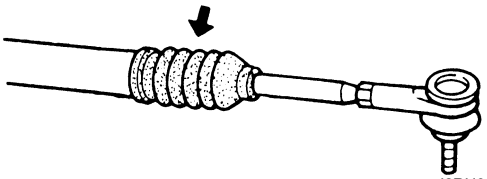
F:	Vehicle forward

4) Install front suspension frame with steering gear case assembly referring to “Front Suspension Frame, Stabilizer Bar and/or Bush Removal and Installation in Section 2B”.

Steering Rack Boot Inspection

S7N20A6306007

Hoist vehicle.
Inspect each boot for tear. A torn boot allows entry of dust and water which can cause wear to steering rack and pinion to produce noise as well as rust to result in malfunction of steering system.
If even a small tear is noted, replace with new one.
Also, check each boot for dent. If there is a dent, keep boot in most compressed state for some seconds to correct dent.
Boots should be visually inspected for any damage, dent and tear during every periodical inspection at specified intervals and whenever vehicle is hoisted for any other purpose.



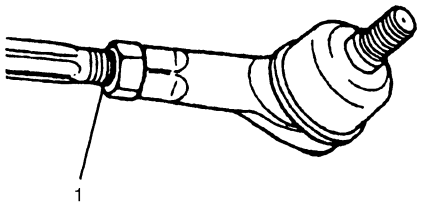
I2RH01630012-01

Tie-Rod / Rack Boot Removal and Installation

S7N20A6306008

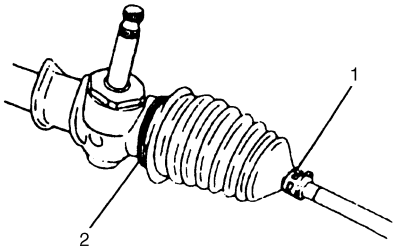
Removal

1) Remove steering gear case assembly referring to “Steering Gear Case Assembly Removal and Installation”.
2) For ease of adjustment after installation, make marking (1) of tie-rod end lock nut position of tie-rod thread.



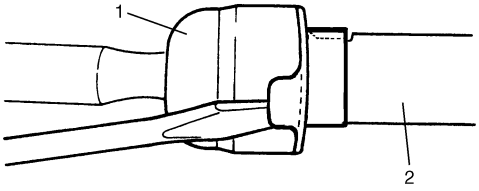
I4RS0A630044-01

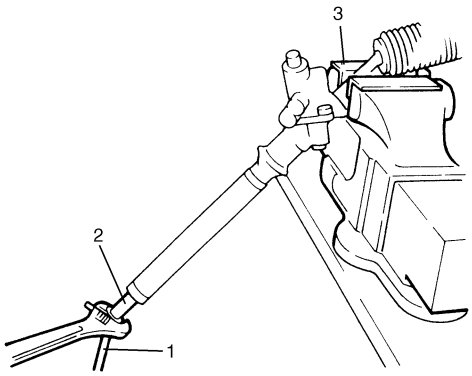
3) Loosen tie-rod end lock nut and remove tie-rod end.
4) Remove boot band (2) and clip (1).
5) Remove boot from tie-rod.



IYSQ01630034-01

6) Unbend bent part of tie-rod lock washer (1).
7) Hold rack with soft jawed vise (3) and remove tie-rod from rack (2).



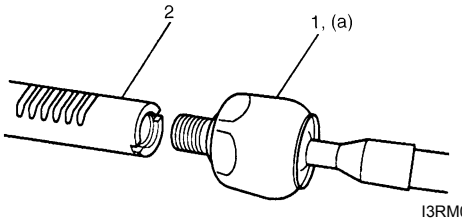


I4RS0A630033-01

Installation

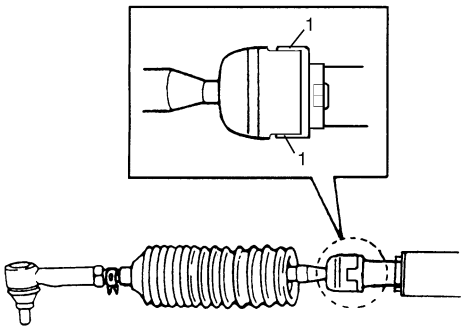
1) Install tie-rod (1) and tie-rod lock washer to rack (2).
2) Hold rack with soft jawed vise and tighten tie-rod to specified torque.

Tightening torque
Tie-rod (a): 93 N·m (9.3 kgf-m, 67.5 lbf-ft)



I3RM0A630048-01

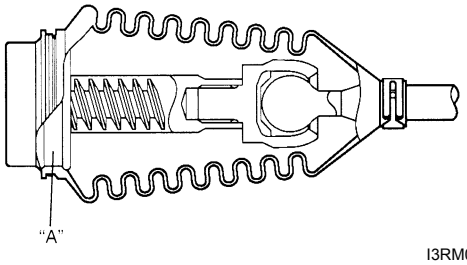
3) Bend lock washer at 2 places (1) as shown in figure.



I4RS0A630035-01

4) Apply sealant to gear case groove “A” indicated in the figure. Position boot properly in grooves of gear case (or rack side mount) and tie-rod.
After this, check to ensure that boot is free from twist and dent.

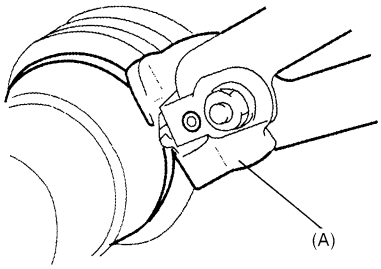
“A”: Silicone sealant 99000–31120 (Silicone sealant)



I3RM0A630050-01

5) Fasten boot with new band and clip securely.

Special tool
(A): 09943–55010

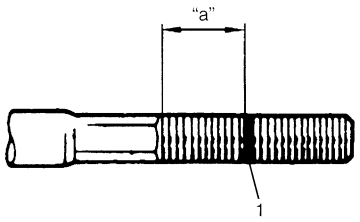


I3RM0A630051-01

6) Install tie-rod end lock nut and tie-rod end to tie-rod. Position lock nut to marking (1) made in removal.

NOTE

When tie-rod was replaced, measure length “a” on removed tie-rod and use it on new replacement tie-rod so as to position lock nut properly.



I3RM0A630052-01

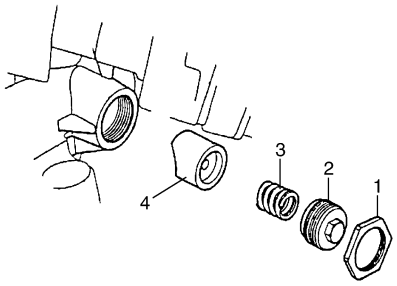
7) Install steering gear case assembly referring to “Steering Gear Case Assembly Removal and Installation”.

Steering Rack Plunger Removal and Installation

S7N20A6306009

Removal

1) Remove gear case assembly referring to “Steering Gear Case Assembly Removal and Installation”.
2) Loosen lock nut (1) with holding damper screw (2).
3) Remove lock nut (1), rack damper screw (2), rack plunger spring (3) and rack plunger (4).



I4RS0A630045-01

Installation

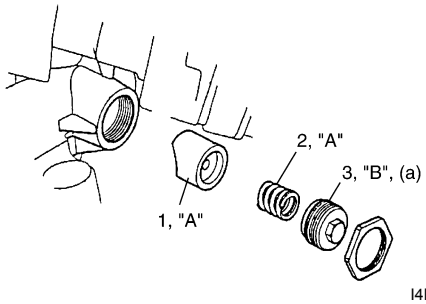
1) Apply grease lightly to sliding part of plunger (1) against rack.

“A”: Grease 99000–25050 (SUZUKI Super Grease E)

2) Install plunger and spring (2) as shown.
3) Apply thread lock cement to rack damper screw (3) and tighten them as follows.
   a) Tighten damper screw to 25 N·m (2.5 kgf-m, 18.0 lbf-ft).
   b) Loosen damper screw until 180°.
   c) Retighten damper screw to 3.9 N·m (0.39 kgf-m, 3.0 lbf-ft).
   d) After tightening rack damper screw to specified torque, turn it back by 7 ± 3° or less.

“B”: Sealant 99000–31110 (SUZUKI Bond No.1215)

Tightening torque
Rack damper screw (a): Tighten 25 N·m (2.5 kgf-m, 18.0 lbf-ft) and loosen 180° and then tighten 3.9 N·m (0.39 kgf-m, 3.0 lbf-ft) and turn it back by 7 ± 3° or less by the specified procedure.

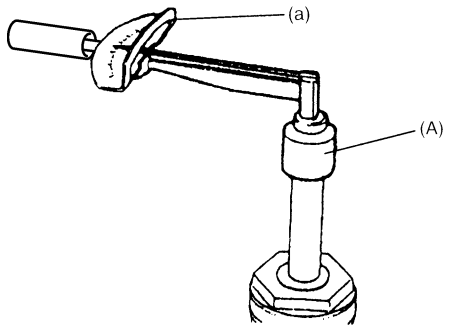


I4RS0A630046-01

4) Pinion rotation torque should be checked with rack position centered.
Also, check if rack as a whole moves smoothly.

Special tool
(A): 09944–18310

Tightening torque
Rotation torquer of pinion (a): 2.0 N·m (0.2 kgf-m, 1.5 lbf-ft)



I3RM0A630055-02

5) After adjustment, tighten lock nut to specified torque with holding damper screw at the position.

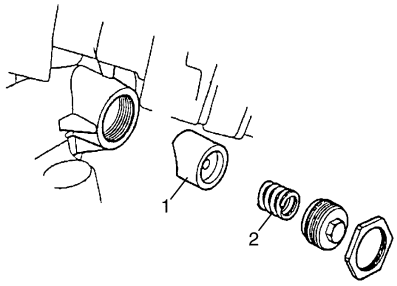
Tightening torque
Rack damper screw lock nut (a): 64 N·m (6.4 kgf-m, 46.5 lbf-ft)

6) Install gear case assembly referring to “Steering Gear Case Assembly Removal and Installation”.

Steering Rack Plunger Inspection

S7N20A6306010

- Inspect rack plunger (1) for wear or damage.
- Inspect rack plunger spring (2) for deterioration.



I4RS0A630047-01

P/S Control Module Removal and Installation

S7N20A6306011

Removal

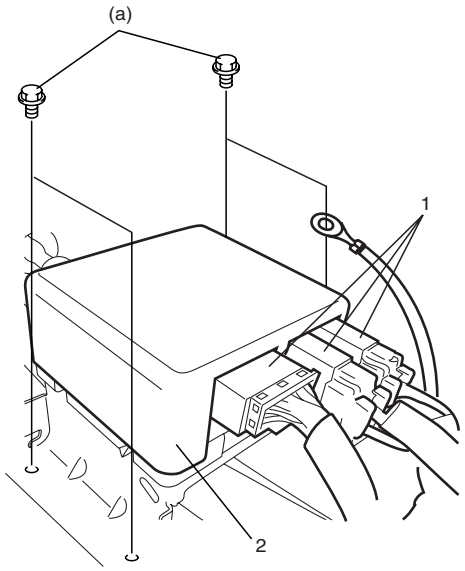
1) Disconnect negative cable at battery.
2) Remove console box.
3) Disconnect connectors (1) from P/S control module.
4) Remove P/S control module (2) from floor panel.

Installation

Reverse removal procedure for installation noting the following.

- Tighten P/S control module screw to the specified torque.

Tightening torque
P/S control module mounting bolt (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)



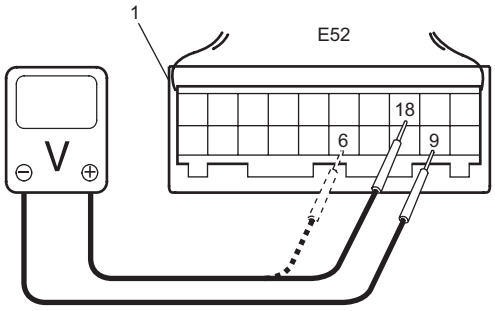
I4RS0A630036-01

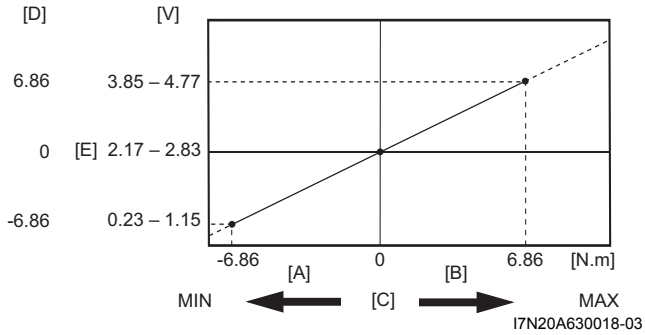
Torque Sensor Inspection

S7N20A6306012

1) Remove console box.
2) With ignition switch turned OFF, connect scan tool to DLC or connect voltage tester between “E52-18” – “E52-9” (main sensor) or “E52-6” – “E52-9” (sub sensor) with connected connector to P/S control module.
3) Set torque wrench to steering wheel referring to “Steering Force Check” for checking steering force.
4) Turn ON ignition switch without engine running and select scan tool “Data list” mode due to check of “TQS Main Torque”, “TQS Sub Torque” and “Assist Torque” display on scan tool when steering wheel turned left and right (if used).
5) Check that characteristic of torque sensor is as follows when steering wheel is turned left and right.
   - Torque sensor (main and sub) output voltage or scan tool data is within specified value at following graph.
   - Torque sensor (main and sub) output voltage or scan tool data vary linearly as following graph.
   - Torque sensor (main and sub) output voltage varies more than about 1.7 V from sensor neutral voltage with steering-force (left and right) at 6.86N-m.

If characteristic of torque sensor is out of specified, check P/S control module and its circuit.
If they are OK, replace steering gear case assembly.





[A]:	Steering force at left turn
[B]:	Steering force at right turn
[C]:	Steering wheel at free
[D]:	"TQS Main Torque", "TQS Sub Torque" and "Assist Torque" in "Data List" displayed on scan tool
[E]:	Sensor neutral voltage

Motor Assembly Inspection

S7N20A6306013

1) Remove console box.
2) Disconnect motor connector ("E51") from P/S control module with ignition switch OFF.
3) Check for resistance between terminals of motor connector ("E51").
If check result is not as specified, replace steering gear case assembly.

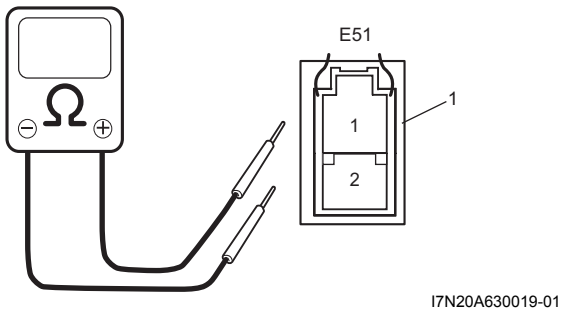
Motor circuit resistance

"E51-1" and "E51-2" (For motor)	**About 1 Ω**

4) Check for continuity between terminal of motor connector ("E51") and body ground.
If check result is not as specified, replace steering gear case assembly.

Motor circuit resistance

"E51-2" and body ground	**No continuity**

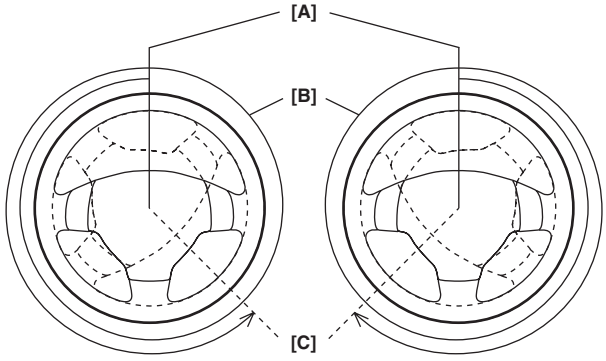


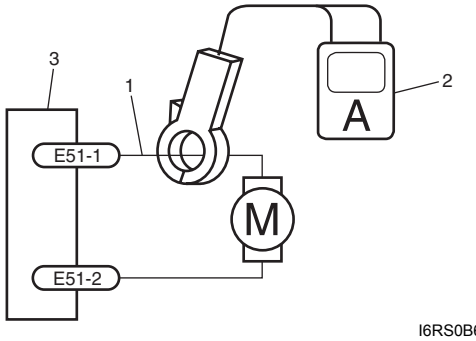
1. Connector "E51" (viewed from harness side)

5) Hoist vehicle.
6) Connect "E51" connector to P/S control module with ignition switch OFF position.
7) Using ammeter (2), check that P/S motor (1) current is as following table with idling engine. If check result is not satisfactory, check P/S control module referring to "Inspection of P/S Control Module and Its Circuits". If OK, replace steering gear case assembly.

Motor current at hoisted vehicle

Condition	When steering wheel is left at straight position: [A]	When steering wheel is turned left or right by turning speed with 90° /sec: [B]	When steering wheel is kept fully turned left or right until it stops.: [C]
Motor current	**Approx. 0 A**	**Approx. 2 – 4 A**	**Approx. 30 – 45 A**





Specifications

Tightening Torque Specifications

S7N20A6307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Tie-rod end nut	45	4.6	33.5	☞
Tie-rod end lock nut	45	4.5	32.5	☞
Steering gear case mounting No.1 bolt	55	5.6	40.5	☞
Steering gear case mounting No.2 bolt	40	4.1	29.5	☞
Earth cable mounting bolt	4.5	0.46	3.5	☞
Tie-rod	93	9.3	67.5	☞
Rack damper screw	Tighten 25 N·m (2.5 kgf-m, 18.0 lbf-ft) and loosen 180° and then tighten 3.9 N·m (0.39 kgf-m, 3.0 lbf-ft) and turn it back by 7 ± 3° or less by the specified procedure.			☞
Rotation torquer of pinion	2.0	0.2	1.5	☞
Rack damper screw lock nut	64	6.4	46.5	☞
P/S control module mounting bolt	9	0.9	6.5	☞

NOTE

The specified tightening torque is also described in the following.
“Steering Gear Case Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A6308001

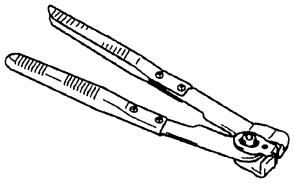
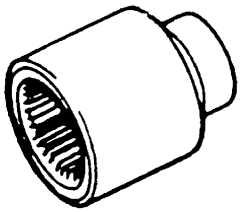
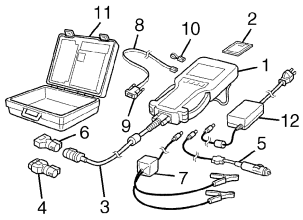
Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease E	P/No.: 99000–25050	☞
Sealant	SUZUKI Bond No.1215	P/No.: 99000–31110	☞
Silicone sealant	Silicone sealant	P/No.: 99000–31120	☞

NOTE

Required service material is also described in the following.
“Steering Gear Case Assembly Components: ”

Special Tool

S7N20A6308002

09943–55010 Boot clamp plier ☞		09944–18310 Pinion torque checking socket ☞	
SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 loop back connector, 11. Storage case, 12.☞ / ☞			

Section 7

HVAC

CONTENTS

Precautions

Precautions

Precautions on HVAC

S7N20A7000001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

A/C System Caution
Refer to “A/C System Caution: Manual A/C in Section 7B” and “A/C System Caution: Auto A/C in Section 7B”.

Precautions on Servicing A/C System
Refer to “Precautions on Servicing A/C System: Manual A/C in Section 7B” and “Precautions on Servicing A/C System: Auto A/C in Section 7B”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble: Auto A/C in Section 7B”.

Heater and Ventilation

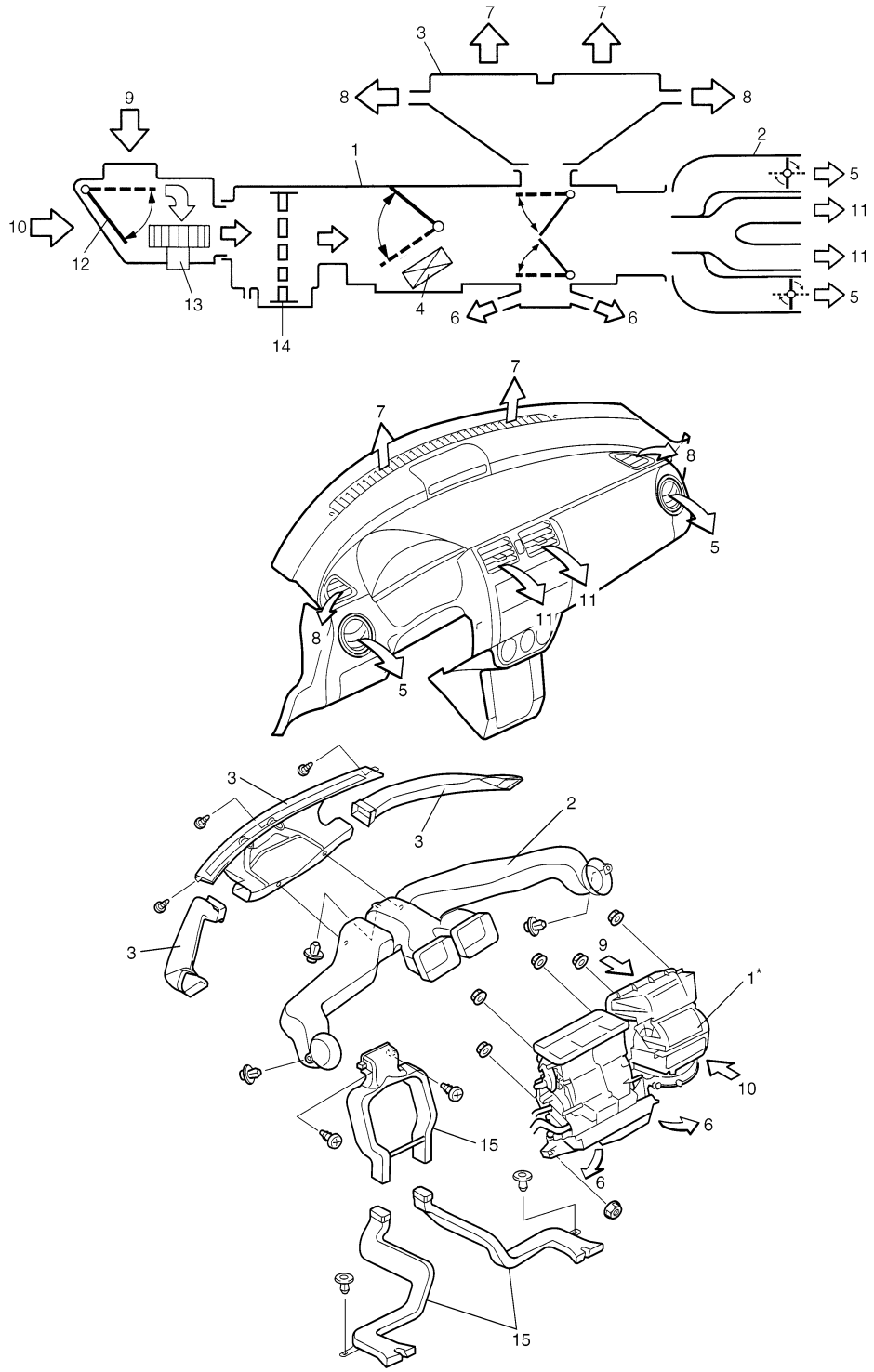
General Description

Heater and Ventilation Construction

S7N20A7101001

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I7N20A710001-01

1. HVAC unit	5. Side ventilation air	9. Fresh air	13. Blower motor
2. Ventilator duct	6. Foot air	10. Recirculation air	14. Resistance board
3. Defroster nozzle	7. Front defroster air	11. Center ventilation air	15. Rear duct (if equipped)
4. Heater core	8. Side defroster air	12. Air intake door	

Additional Heater System Description (If Equipped)

S7N20A7101002

System Description

Additional heater system consists of additional heater controller, additional heater assembly and three additional heater relays.
Each function is as follows

- Additional heater controller and additional heater relay:
  Additional heater controller operates the additional heater assembly through the additional heater relays. It decides operating the additional heater assembly based on the seat heater switch signal, the blower motor signal, the combination switch signal and the vehicle condition data (engine speed, ECT, etc) from BCM.
- Additional heater assembly:
  Additional heater assembly is electrothermal heater. It is installed to heater hose and makes engine coolant temperature increased also, it is applied electric load to engine.

Operation Description

The diesel engine increases the coolant temperature slowly compared with the petrol engine.
Therefore, the heater system that uses heat of engine coolant cannot be warmed up the passenger room sufficiently in the short time.
Additional heater system works when the engine coolant temperature is low after the engine is started.
It makes the increasing coolant temperature and the electric load applied to the engine larger, although within the specified electric load range, so that the engine is warmed up in a shorter time.
The additional heater works under following conditions:

- 20 seconds after engine is started
- Engine speed is 700 rpm or more
- Battery voltage is 12 V or more
- Blower motor is turned on
- Outside air temperature is 10 °C (50 °F) or less
- Engine coolant temperature is 72 °C (161.6 °F) or less

On-Board Diagnostic System Description (Additional Heater)

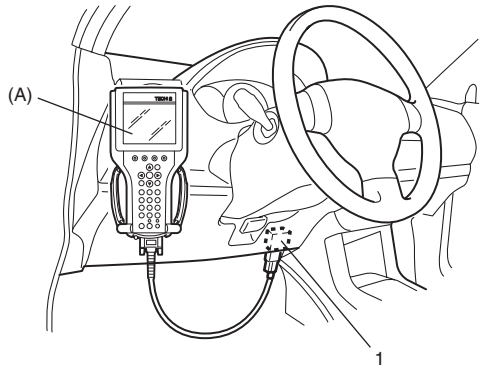
S7N20A7101003

Additional heater controller detects malfunctions, which may occur in the following area.

- Additional heater relay
- Back-up power supply for additional heater controller
- Serial communication line of BCM
- CAN communication line
- Engine speed signal data
- Vehicle speed signal data
- Ignition power supply voltage data
- Engine coolant temperature signal data
- Outside air temperature signal data

Additional heater controller monitors conditions of the system and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory in additional heater controller.
DTC can be checked by SUZUKI scan tool connected to DLC (1).

Special tool
(A): SUZUKI scan tool

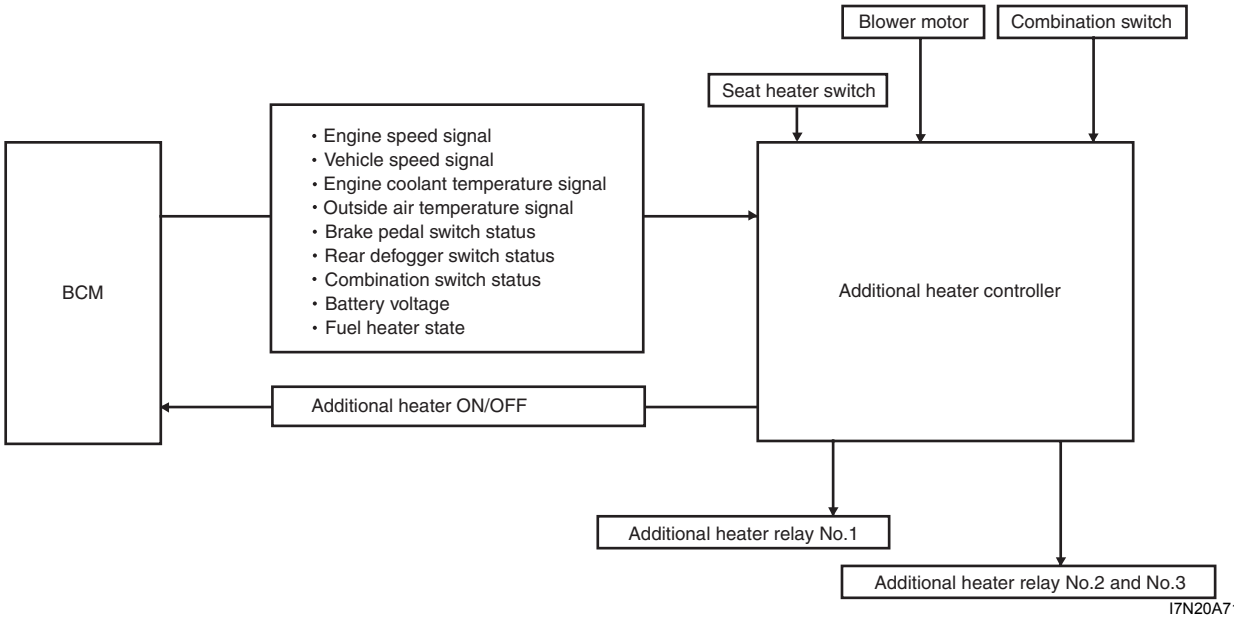


I5RS0B710005-01

Schematic and Routing Diagram

Additional Heater System Electronic Input / Output Diagram (If Equipped)

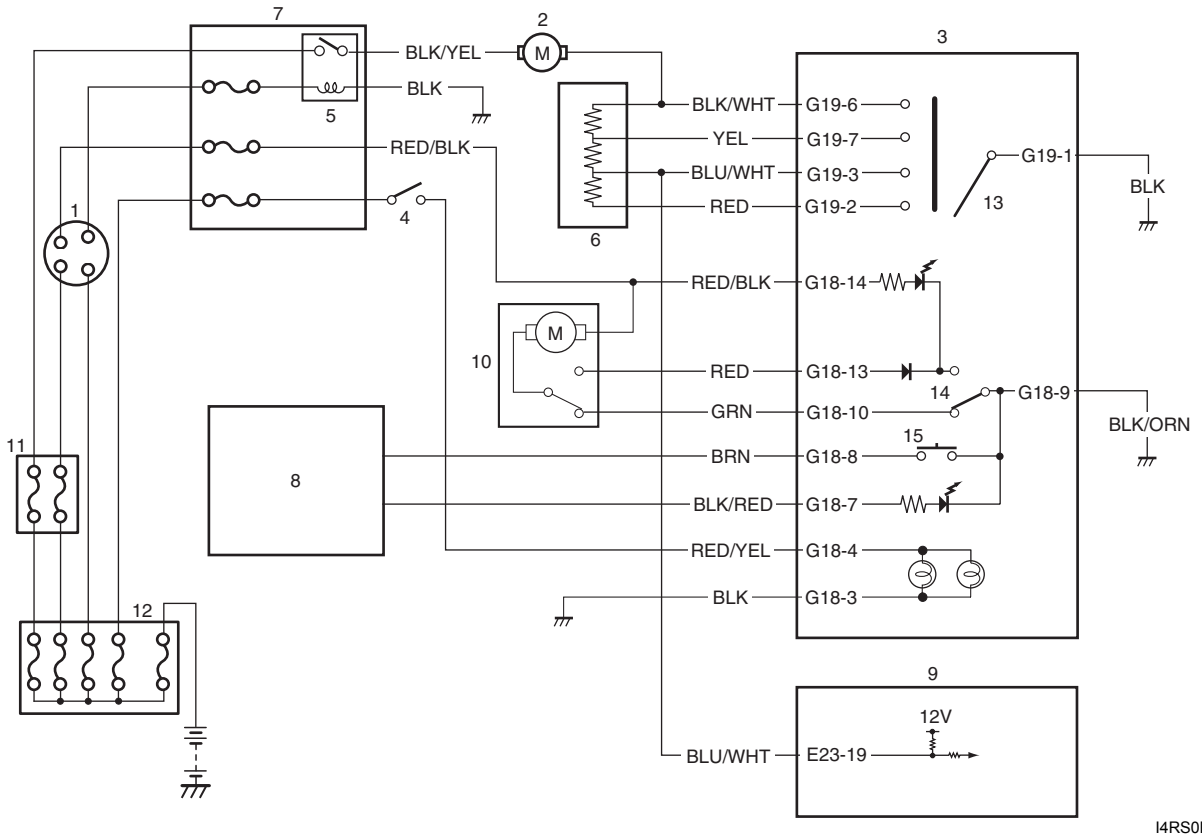
S7N20A7102001



I7N20A710015-01

Heater and Ventilation Wiring Circuit Diagram (Petrol Engine Model)

S7N20A7102002

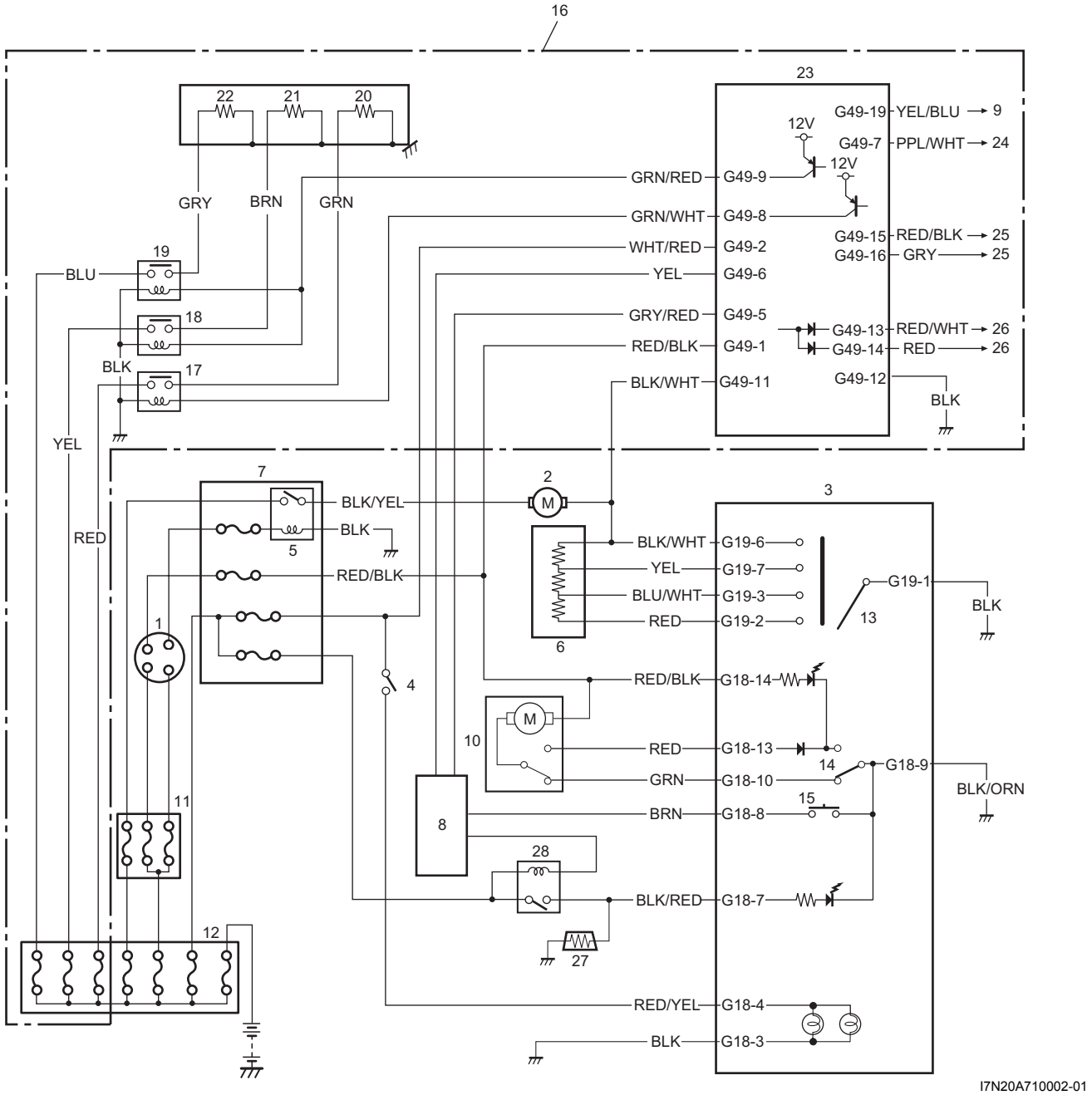


I4RS0B710002-01

1. Ignition switch	5. Blower motor relay	9. ECM	13. Blower speed selector
2. Blower motor	6. Blower motor resistor	10. Air intake control actuator	14. Air intake selector
3. HVAC control unit	7. Junction block assembly	11. Relay box	15. Rear defogger switch
4. Lighting switch	8. BCM	12. Battery fuse box	

Heater and Ventilation Wiring Circuit Diagram (Diesel Engine Model)

S7N20A7102003



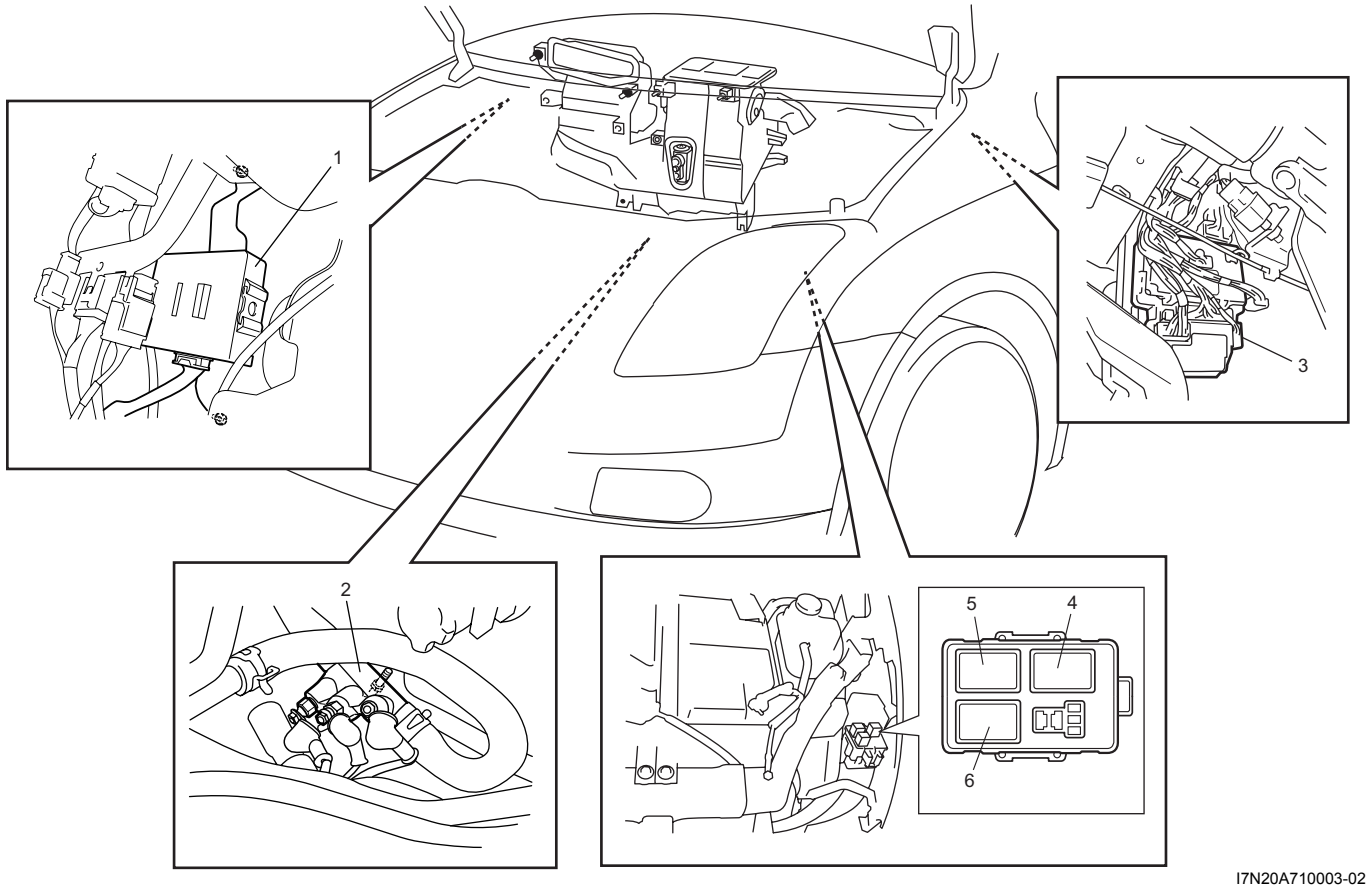
I7N20A710002-01

1. Ignition switch	11. Relay box	21. Additional heater No.2
2. Blower motor	12. Battery fuse box	22. Additional heater No.3
3. HVAC control module	13. Blower speed selector	23. Additional heater controller
4. Lighting switch	14. Air intake selector	24. To DLC
5. Blower motor relay	15. Rear defogger switch	25. To seat heater switch
6. Blower motor resistor	16. Additional heater system circuit (if equipped)	26. To lighting switch
7. Junction block assembly	17. Additional heater relay No.1	27. Rear defogger
8. BCM	18. Additional heater relay No.2	28. Rear defogger relay
9. To fuel heater relay	19. Additional heater relay No.3	
10. Air intake control actuator	20. Additional heater No.1	

Component Location

Additional Heater System Components Location (If Equipped)

S7N20A7103001



I7N20A710003-02

1. Additional heater controller	3. BCM (included in junction block assembly)	5. Additional heater relay No.2
2. Additional heater assembly	4. Additional heater relay No.1	6. Additional heater relay No.3

Diagnostic Information and Procedures

Heater and Ventilation Symptom Diagnosis

S7N20A7104001

Condition	Possible cause	Correction / Reference Item
Blower motor does not operate with blower speed selector ON.	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor relay faulty	*Check blower motor relay referring to "Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection".*
	Blower motor resistor faulty	*Check blower motor resistor referring to "Blower Motor Resistor Inspection".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection".*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection".*
	Wiring or grounding faulty	*Repair as necessary.*

Condition	Possible cause	Correction / Reference Item
Incorrect temperature output	Temperature control cable broken or bent (manual A/C)	*Check temperature control cable.*
	Temperature control lever faulty (manual A/C)	*Check temperature control lever.*
	Incorrect installation of temperature control cable (manual A/C)	*Check position and adjust it as necessary.*
	Temperature control door assembly broken	*Repair temperature control door assembly.*
	Air ducts clogged	*Repair air ducts.*
	Heater core leaked or clogged	*Replace heater core.*
	Heater hoses leaked or clogged	*Replace heater hoses.*
	Thermostat assembly faulty	*Replace thermostat assembly.*
Air outlet port does not change or does not agree with airflow selector's position even if airflow selector is changed.	Airflow control cable broken or bent (manual A/C)	*Check airflow control cable.*
	Airflow control lever faulty (manual A/C)	*Check airflow control lever.*
	Incorrect installation of airflow control cable (manual A/C)	*Check position and adjust it as necessary.*
	Airflow control door assembly broken	*Repair airflow control door assembly.*
	Air ducts leaked or clogged	*Repair air ducts.*
Air intake door does not change even if air intake mode is changed.	Air intake door broken	*Repair air intake door.*
	Air intake control actuator faulty	*Check air intake control actuator referring to "Air Intake Control Actuator Inspection".*
	Air intake selector faulty	*Check air intake selector referring to "Air Intake Selector Inspection".*
	Wiring or grounding faulty	*Repair as necessary.*
Heating performance is poor (for additional heater system)	Fuse blown	*Check related fuses and check for short circuit to ground.*
	Additional heater relays faulty	*Check additional heater relays referring to "Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection".*
	Additional heater assembly faulty	*Check additional heater assembly referring to "Additional Heater Assembly On-Vehicle Inspection (If Equipped)".*
	Additional heater controller faulty	*Check additional heater controller referring to "Inspection of Additional Heater Controller and Its Circuit (If Equipped)".*
	Wiring or grounding faulty	*Repair as necessary.*

DTC Check (Additional Heater)

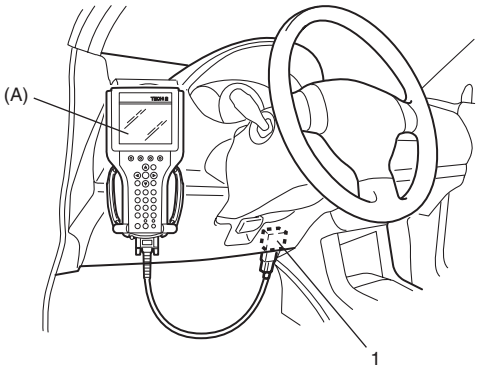
S7N20A7104002

NOTE

When checking DTC after connecting battery cable, be sure to turn ignition switch from OFF to ON and from ON to OFF at least once, or DTC B1541 will be detected.

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to DLC (1).

Special tool
(A): SUZUKI scan tool



I5RS0B710005-01

3) Turn ignition switch to ON position.
4) Check DTC with SUZUKI scan tool and print them or write them down. Refer to SUZUKI scan tool operator's manual for further details.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

DTC Clearance (Additional Heater)

S7N20A7104003

1) Connect SUZUKI scan tool to DLC in the same manner as when making this connection for DTC check.
2) Turn ignition switch to ON position and engine stops.
3) Erase DTC with SUZUKI scan tool. Refer to SUZUKI scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnect SUZUKI scan tool from DLC.

DTC Table (Additional Heater)

S7N20A7104004

NOTE

- **History DTC is such DTC which additional heater controller saves in its memory when it detects current DTC for 60 seconds or more continuously.**
- **DTC B1541 is displayed as a current DTC only when a current malfunction is detected and no history DTC is displayed.**
- **When additional heater controller detects DTC B1536 and B1537, display the DTC both current DTC and history DTC at the same time.**

DTC No.	Detecting item	Detecting condition (DTC will set when detecting)
☞ B1536	Additional heater relay No.1 output malfunction	Output voltage of additional heater relay No.1 is lower than specified value continuously.
☞ B1537	Additional heater relay No.2 and No.3 output malfunction	Output voltage of additional heater relay No.2 and/or No.3 is lower than specified value continuously.
☞ B1541	Additional heater controller back-up power supply malfunction	Back-up power supply voltage is lower than specified value continuously.
☞ B1551	Serial communication circuit malfunction	Serial communication signal is higher than or lower than specified value for specified time continuously.
☞ B1552	Serial communication data malfunction	Error data received from BCM continuously.
☞ B1553	CAN communication circuit malfunction	Error code received from BCM continuously.
☞ B1556	Engine speed data malfunction	Error code received from BCM continuously.
☞ B1557	Vehicle speed data malfunction	Error code received from BCM continuously.
☞ B1559	Ignition power supply voltage data malfunction	Error code received from BCM continuously.
☞ B1561	Engine coolant temperature data malfunction	Error code received from BCM continuously.
☞ B1562	Outside air temperature data malfunction	Error code received from BCM continuously.

Scan Tool Data (Additional Heater)

S7N20A7104005

As the data values given in the following are standard values estimated on the basis of values obtained from the normally operation vehicles by using a scan tool, use them as reference values. Even when the vehicles are in good condition, there may be cases where the checked values do not fall within each specifies data range. Therefore, judgement as abnormal should not be made by checking with these data alone.

Scan Tool Data	Condition	Normal Condition / Reference Value
☞ COOLANT TEMP	At specified idle speed after warming up.	80 °C – 100 °C (176 °F – 212 °F)
☞ OUTSIDE AIR TEMP	Reference value is relative to outside air temperature.	–23.3 °C – 65.95 °C (–9.94 °F – 150.71 °F)
☞ ADDITIONAL HT1	Additional heater No.1 is ON	ON
	Additional heater No.1 is OFF	OFF
☞ ADDITIONAL HT2	Additional heater No.2 and No.3 are ON	ON
	Additional heater No.2 and No.3 are OFF	OFF
☞ ENGINE SPEED	Engine running at idle after warmed up engine	800 RPM
☞ VEHICLE SPEED	At stop.	0 km/h (0 mph)
☞ BATTERY VOLTAGE	Ignition switch ON / engine at stop	10 – 14 V

Scan Tool Data Definitions

COOLANT TEMP (ENGINE COOLANT TEMPERATURE): Engine coolant temperature signal from BCM

OUTSIDE AIR TEMP (OUTSIDE AIR TEMPERATURE): Outside air temperature detected by outside air temperature sensor installed in front bumper member

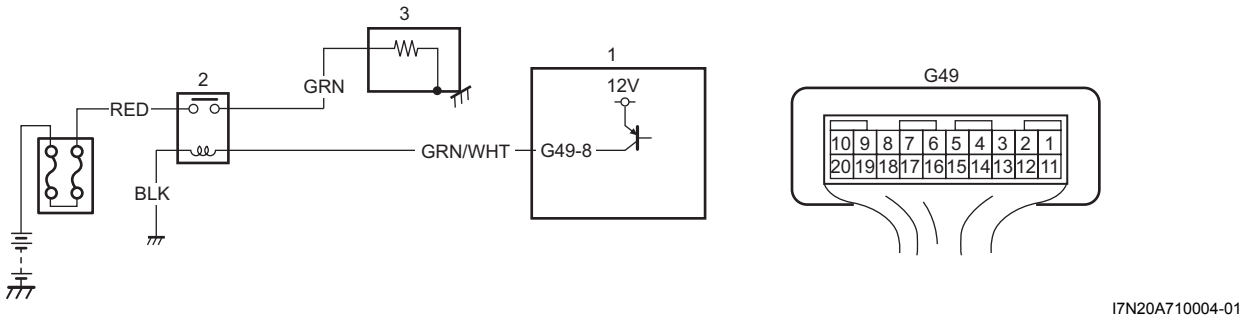
ADDITIONAL HT1 (ADDITIONAL HEATER RELAY No.1 OUTPUT SIGNAL, ON or OFF): This parameter indicates the state of additional heater relay No.1

ADDITIONAL HT2 (ADDITIONAL HEATER RELAY No.2 and No.3 OUTPUT SIGNAL, ON or OFF): This parameter indicates the state of additional heater relay No.2 and No.3
ENGINE SPEED: It is computed based on pulse signal from BCM
VEHICLE SPEED: It is computed based on pulse signal from wheel speed sensor (right front)
BATTERY VOLTAGE: This parameter indicates battery positive voltage input

DTC B1536: Additional Heater Relay No.1 Output Malfunction

S7N20A7104006

Wiring Diagram



I7N20A710004-01

1. Additional heater controller	2. Additional heater relay No.1	3. Additional heater No.1

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Output voltage of additional heater relay No.1 is lower than specified value continuously.	• Additional heater relay No.1 output circuit • Additional heater relay No.1 • Additional heater controller

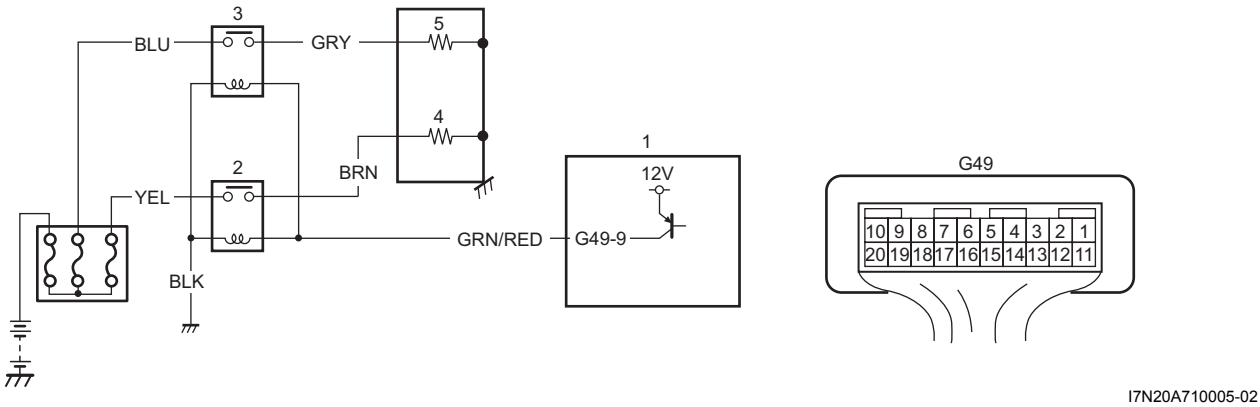
DTC Troubleshooting

Step	Action	Yes	No
1	**Additional heater relay No. 1 check** 1) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”. 2) Remove left side headlight housing referring to “Headlight Housing Removal and Installation in Section 9B”. 3) Check additional heater relay No.1 referring to “Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection”. *Is it in good condition?*	Go to Step 2.	Replace additional heater relay No.1.
2	**Wire harness check** 1) Turn OFF ignition switch. 2) Disconnect additional heater controller connector referring to “Additional Heater Controller Removal and Installation (If Equipped)”. 3) Check for proper connection to additional heater relay No.1 connector at “GRN/WHT” wire terminal and additional heater controller connector at “G49-8” terminal. 4) If OK, measure resistance between “G49-8” terminal of additional heater controller connector and vehicle body ground. *Is resistance infinity?*	Substitute a known-good additional heater controller and recheck.	“GRN/WHT” wire shorted to ground circuit.

DTC B1537: Additional Heater Relay No.2 and No.3 Output Malfunction

S7N20A7104007

Wiring Diagram



I7N20A710005-02

1. Additional heater controller	3. Additional heater relay No.3	5. Additional heater No.3
2. Additional heater relay No.2	4. Additional heater No.2	

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Output voltage of additional heater relay No.2 and/or No.3 is lower than specified value continuously.	• Additional heater relay No.2 and/or No.3 output circuit • Additional heater relay No.2 and/or No.3 • Additional heater controller

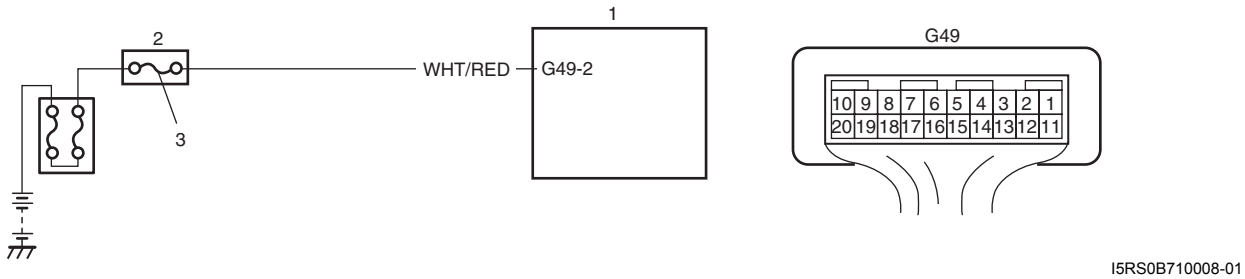
DTC Troubleshooting

Step	Action	Yes	No
1	**Additional heater relay No.2 and No.3 check** 1) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”. 2) Remove left side headlight housing referring to “Headlight Housing Removal and Installation in Section 9B”. 3) Check additional heater relay No.2 and No.3 referring to “Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection”. *Is it in good condition?*	Go to Step 2.	Replace additional heater relay No.2 and/or No.3.
2	**Wire harness check** 1) Turn OFF ignition switch. 2) Disconnect additional heater controller connector referring to “Additional Heater Controller Removal and Installation (If Equipped)”. 3) Check for proper connection to additional heater relay No.2 and No.3 connectors at “GRN/RED” wire terminal and additional heater controller connector at “G49-9” terminal. 4) If OK, measure resistance between “G49-9” terminal of additional heater controller connector and vehicle body ground. *Is resistance infinity?*	Substitute a known-good additional heater controller and recheck.	“GRN/RED” wire shorted to ground circuit.

DTC B1541: Additional Heater Controller Back-Up Power Supply Malfunction

S7N20A7104008

Wiring Diagram



I5RS0B710008-01

1. Additional heater controller	2. Junction block assembly	3. Circuit fuse

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Back-up power supply voltage is lower than specified value continuously.	• Battery voltage supply circuit • Additional heater controller

NOTE

When checking DTC after connecting battery cable, be sure to turn ignition switch from OFF to ON and from ON to OFF at least once, or DTC B1541 will be detected.

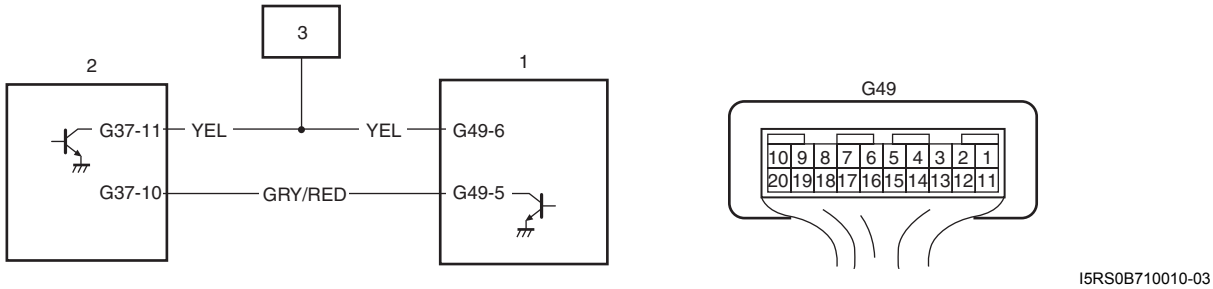
DTC Troubleshooting

Step	Action	Yes	No
1	**Battery voltage supply circuit check** 1) Turn OFF ignition switch. 2) Disconnect additional heater controller connector referring to “Additional Heater Controller Removal and Installation (If Equipped)”. 3) Check for proper connection to additional heater controller connector at “G49-2” terminal. 4) If OK, measure voltage between “G49-2” terminal of additional heater controller connector and vehicle body ground. *Is voltage 10 – 14 V?*	Additional heater controller faulty.	Circuit fuse blown and/or “WHT/RED” wire circuit open or short.

DTC B1551: Serial Communication Circuit Malfunction

S7N20A7104010

Wiring Diagram



I5RS0B710010-03

1. Additional heater controller	2. BCM	3. Information display

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Serial communication signal is higher than or lower than specified value for specified time continuously.	• Serial communication line of BCM • BCM (included in junction block assembly) • Information display • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**Wire harness check** 1) Turn OFF ignition switch. 2) Disconnect connectors from BCM and additional heater controller. 3) Measure resistance between “G37-11” terminal of BCM connector and “G49-6” terminal of additional heater controller connector. *Is resistance below 5 Ω?*	Go to Step 2.	“YEL” wire open or high resistance circuit.
2	**Wire harness check** 1) Measure resistance between “G49-6” terminal of additional heater controller connector and vehicle body ground. *Is resistance infinity?*	Go to Step 3.	“YEL” wire shorted to ground circuit.
3	**Wire harness check** 1) Measure voltage between “G49-6” terminal of additional heater controller connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 4.	“YEL” wire shorted to other circuit.
4	**Serial communication signal check** 1) Connect connectors to BCM and additional heater controller. 2) Using oscilloscope, check that serial communication signal is outputted referring to “Reference waveform No.6” of “Inspection of BCM and its Circuits in Section 10B”. *Is serial communication signal outputted at “G37-11” terminal of BCM connector?*	Additional heater controller faulty.	BCM (included in junction block assembly) faulty.

DTC B1552: Serial Communication Data Malfunction

S7N20A7104011

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error data from BCM continuously.	• BCM (included in junction block assembly) • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**Serial communication signal data check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check “Engine Speed”, “Vehicle Speed”, “Coolant Temp”, “Battery Voltage” and “Outside Air Temp” varies displayed on scan tool. *Are values of engine speed, vehicle speed, coolant temperature, battery voltage and outside air temperature within specified ranges indicated in “Scan Tool Data (Additional Heater)”?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 2.
2	**Serial communication signal check** 1) Using oscilloscope, check that serial communication signal is outputted referring to “Reference waveform No.6” of “Inspection of BCM and its Circuits in Section 10B”. *Is serial communication signal outputted at “G37-11” terminal of BCM connector?*	Additional heater controller faulty.	BCM (included in junction block assembly) faulty.

DTC B1553: CAN Communication Circuit Malfunction

S7N20A7104012

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error code from BCM continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. *Are there DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good BCM and recheck.

DTC B1556: Engine Speed Data Malfunction

S7N20A7104013

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error code from BCM continuously.	• Engine speed signal from BCM • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. *Are there DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good additional heater controller.

DTC B1557: Vehicle Speed Data Malfunction

S7N20A7104014

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error code from BCM continuously.	• Vehicle speed signal from BCM • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. *Are there DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good additional heater controller.

DTC B1559: Ignition Power Supply Voltage Data Malfunction

S7N20A7104015

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error code from BCM continuously.	• Power supply circuit signal from BCM • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check BCM for DTC. *Is there DTC?*	Go to applicable DTC diag. flow.	Substitute a known-good additional heater controller.

DTC B1561: Engine Coolant Temperature Data Malfunction

S7N20A7104016

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error code from BCM continuously.	• Engine coolant temperature signal • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. *Are there DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good additional heater controller and recheck.

DTC B1562: Outside Air Temperature Data Malfunction

S7N20A7104017

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Additional heater controller receives error code from BCM continuously.	• Outside air temperature sensor circuit • Outside air temperature sensor • Additional heater controller

DTC Troubleshooting

Step	Action	Yes	No
1	**Information display check** 1) Check whether outside air temperature is displayed of information display. *Is display correct?*	Substitute a known-good additional heater controller and recheck.	Go to Step 2.
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check BCM for DTC. *Are there DTC B1141 or B1142?*	Go to applicable DTC diag. flow.	Substitute a known-good additional heater controller and recheck.

Inspection of Additional Heater Controller and Its Circuit (If Equipped)

S7N20A7104018

Additional heater controller and its circuits can be checked at additional heater controller wiring couplers by measuring voltage.

⚠ CAUTION

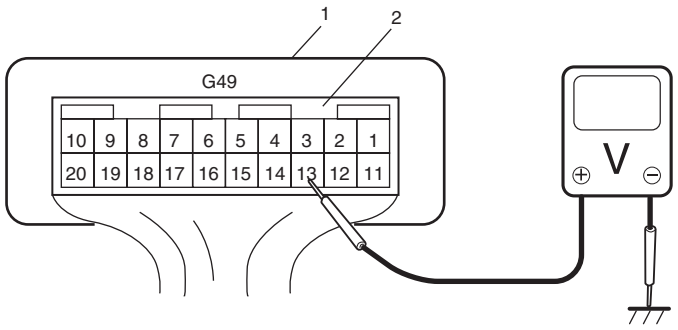
Additional heater controller can not be checked by itself. It is strictly prohibited to connect voltmeter to additional heater controller with connector disconnected from it.

Voltage Check

1) Remove additional heater controller referring to “Additional Heater Controller Removal and Installation (If Equipped)”.
2) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.



I5RS0B710011-01

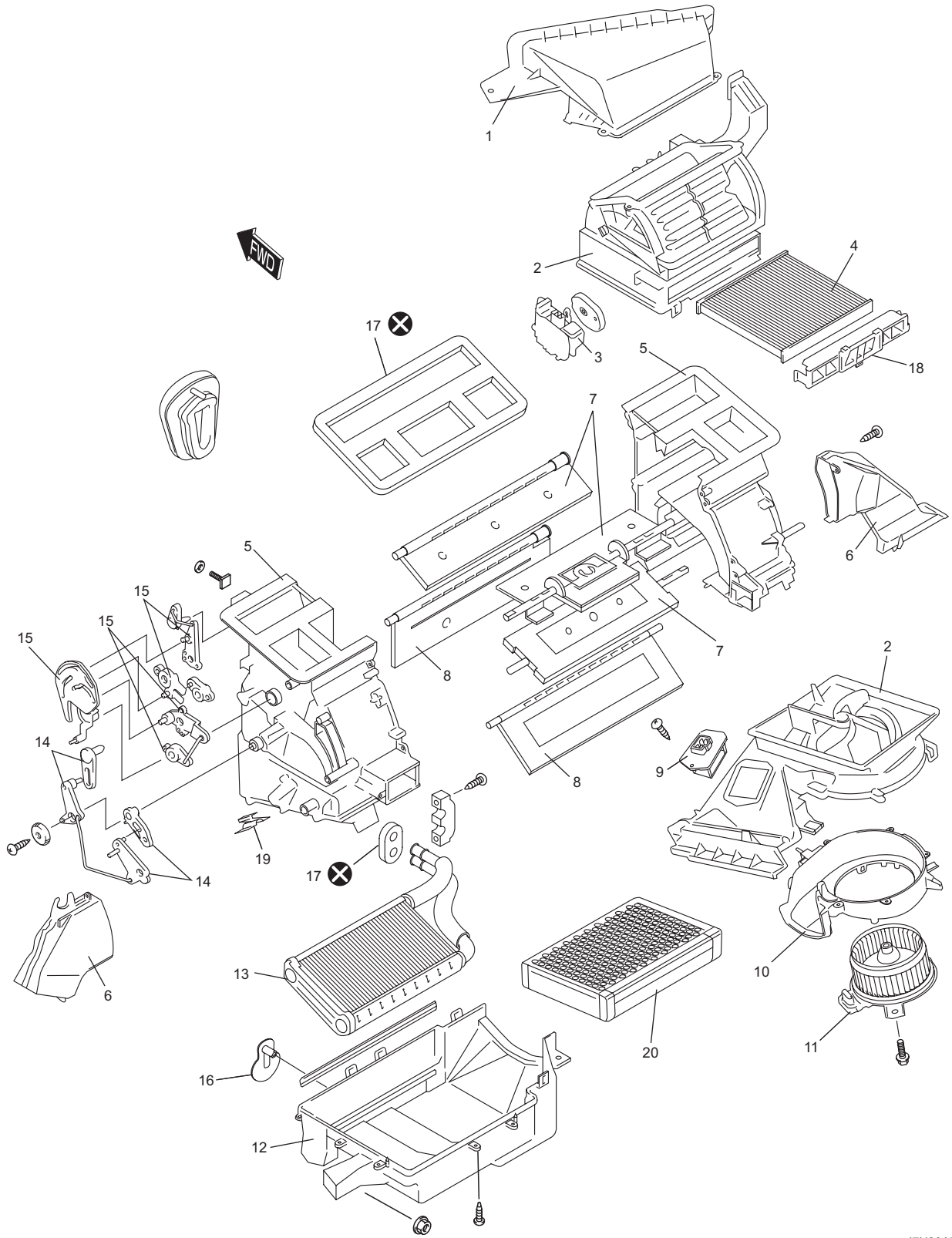
1. Additional heater controller	2. Additional heater controller connector (viewed from harness side)

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G49-1	RED/BLK	Electric power source	10 – 14 V	Ignition switch turned ON
G49-2	WHT/RED	Electric power source for back-up	10 – 14 V	Constantly
G49-3	—	—	—	—
G49-4	—	—	—	—
G49-5	GRY/RED	Serial communication line (output) of BCM	Refer to “Inspection of BCM and its Circuits in Section 10B”.	
G49-6	YEL	Serial communication line (input) of BCM		
G49-7	PPL/WHT	Serial communication line of DLC	10 – 14 V	Ignition switch turned ON
G49-8	GRN/WHT	Additional heater relay No.1 output signal	10 – 14 V	Additional heater No.1 ON
G49-9	GRN/RED	Additional heater relay No.2 and No.3 output signal	10 – 14 V	Additional heater No.2 and No.3 ON
G49-10	—	—	—	—
G49-11	BLK/WHT	Blower motor input (–)	0 – 2 V	Ignition switch turned ON, blower speed selector between 1st and 4th position
G49-12	BLK	Ground for additional heater controller	—	—
G49-13	RED/WHT	Lighting switch input (low beam)	10 – 14 V	Ignition switch turned ON, lighting switch OFF position
			0 – 1 V	Ignition switch turned ON, lighting switch ON (low beam) position
G49-14	RED	Lighting switch input (high beam)	10 – 14 V	Ignition switch turned ON, lighting switch OFF position
			0 – 1 V	Ignition switch turned ON, lighting switch ON (high beam) position
G49-15	RED/BLK	Driver’s seat heater input	10 – 14 V	Ignition switch turned ON, driver’s seat heater switch ON position
G49-16	GRY	Passenger seat heater input	10 – 14 V	Ignition switch turned ON, passenger seat heater switch ON position
G49-17	—	—	—	—
G49-18	—	—	—	—
G49-19	YEL/BLU	Fuel heater relay input	10 – 14 V	Ignition switch turned ON, fuel heater OFF
G49-20	—	—	—	—

Repair Instructions

HVAC Unit Components

S7N20A7106001



I7N20A710006-01

1. Fresh air inlet duct	7. Airflow control door assembly	13. Heater core	19. Cable lock clamp
2. Blower upper case	8. Temperature control door assembly	14. Temperature control lever	20. Air resistance board
3. Air intake control actuator	9. Blower motor resistor	15. Airflow control lever	⊗ : Do not reuse.
4. Air filter (if equipped)	10. Blower lower case	16. Drain hose	
5. Heater unit upper case	11. Blower motor	17. Packing	

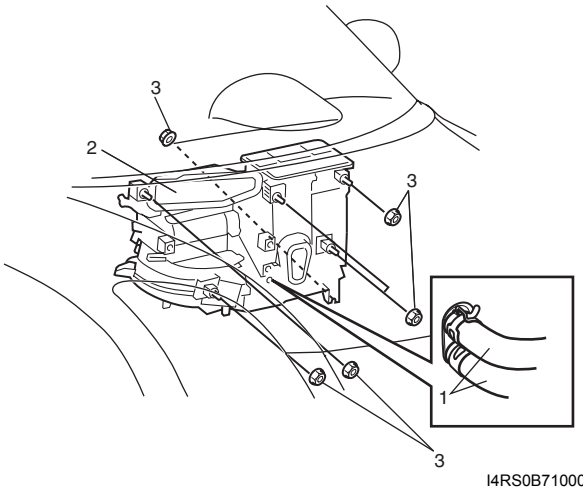
6. Foot duct	12. Heater unit lower case	18. Filter cover	

HVAC Unit Removal and Installation

S7N20A7106002

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove cowl top panel from vehicle body referring to “Cowl Top Components in Section 9K”.
4) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
5) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation in Section 9C”.
6) Remove nuts (3).
7) Remove HVAC unit from vehicle body.



I4RS0B710004-01

Installation

Reverse removal procedure noting the following instructions.

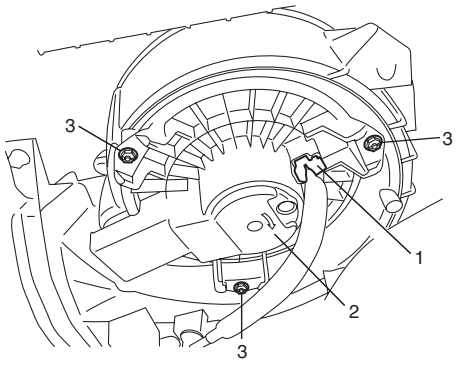
- Be careful not to catch any cable and wiring harness in inappropriate position.
- Adjust control cables of HVAC control unit referring to “HVAC Control Unit Removal and Installation”.
- Fill engine coolant to radiator.
- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Blower Motor Removal and Installation

S7N20A7106003

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Disconnect connector (1) from blower motor (2).
4) Remove blower motor from HVAC unit by removing screws (3).



I4RS0B710005-01

Installation

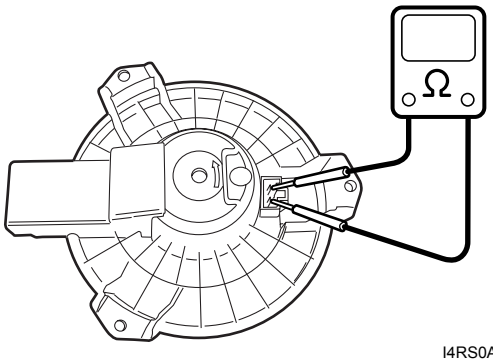
Reverse removal procedure noting the following instruction.

- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Blower Motor Inspection

S7N20A7106004

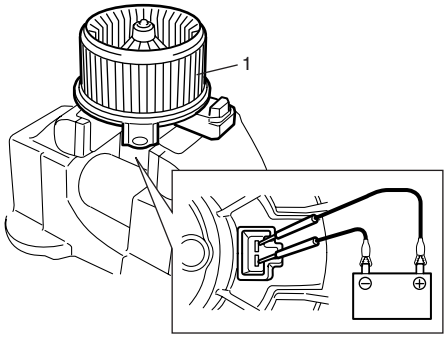
- Check for continuity between two terminals as shown. If there is no continuity, replace blower motor.



I4RS0A710006-01

- 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 if ammeter indicates the specified current. If measured current is out of specification, replace blower motor.

  Blower motor specified current at 12 V
  16 A maximum



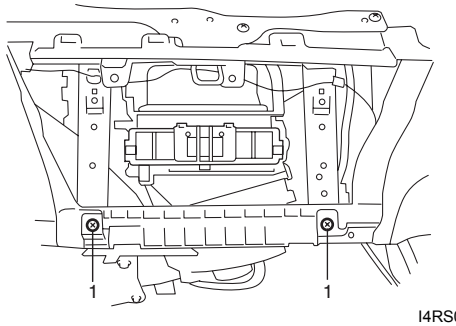
I4RS0A710007-01

Blower Motor Resistor Removal and Installation

S7N20A7106005

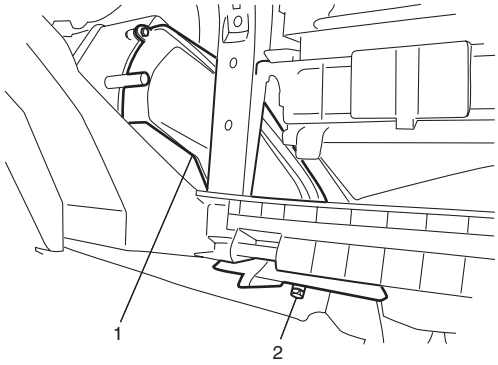
Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove glove box from instrument panel.
4) Remove bolts (1) from instrument panel.



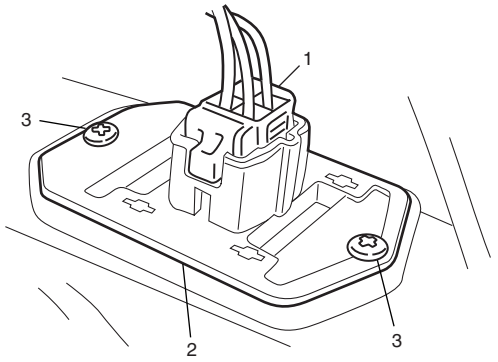
I4RS0B710006-01

5) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0B710007-01

6) Remove connector (1) from blower motor resistor (2), and then remove blower motor resistor from HVAC unit by removing screws (3).



I4RS0A710010-01

Installation

Reverse removal procedure noting the following instruction.

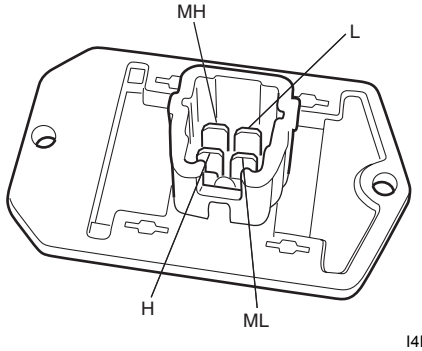
- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Blower Motor Resistor Inspection

S7N20A7106006

Measure each terminal-to-terminal resistance. If measured resistance is out of specification, replace blower motor resistor.

Blower motor resistor resistance
Petrol engine model
“H” – “MH”: Approximately 0.6 Ω at 20 – 25 °C (68 – 77 °F)
“MH” – “ML”: Approximately 1.6 Ω at 20 – 25 °C (68 – 77 °F)
“ML” – “L”: Approximately 3.4 Ω at 20 – 25 °C (68 – 77 °F)
Diesel engine model
“H” – “MH”: Approximately 0.5 Ω at 20 – 25 °C (68 – 77 °F)
“MH” – “ML”: Approximately 1.0 Ω at 20 – 25 °C (68 – 77 °F)
“ML” – “L”: Approximately 3.4 Ω at 20 – 25 °C (68 – 77 °F)



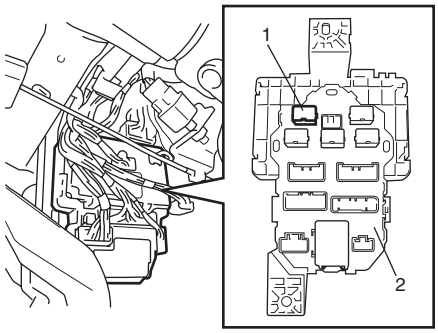
I4RS0B710024-01

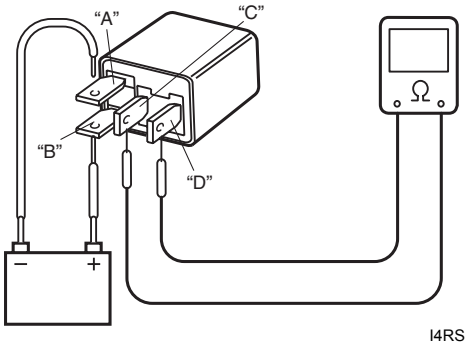
Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection

S7N20A7106007

Blower Motor Relay

1) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B”.
2) Disconnect blower motor relay (1) from junction block assembly (2).
3) Check that there is no continuity between terminal “C” and “D”. If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal “B” of relay. Connect battery negative (-) terminal “A” of relay.
   Check continuity between terminal “C” and “D”.
   If there is no continuity when relay is connected to the battery, replace relay.

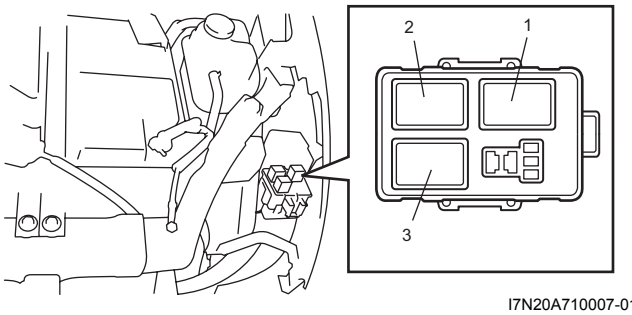




I4RS0B710008-01

Additional Heater Relay

1) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
2) Remove left side headlight housing referring to “Headlight Housing Removal and Installation in Section 9B”.
3) Remove additional heater relay No.1 (1), No.2 (2) and/or No.3 (3) from relay box.
4) Structure of additional heater relay is the same as that of blower motor relay. Check operation using the same procedure as that for blower motor relay. If found defective, replace relay.



I7N20A710007-01

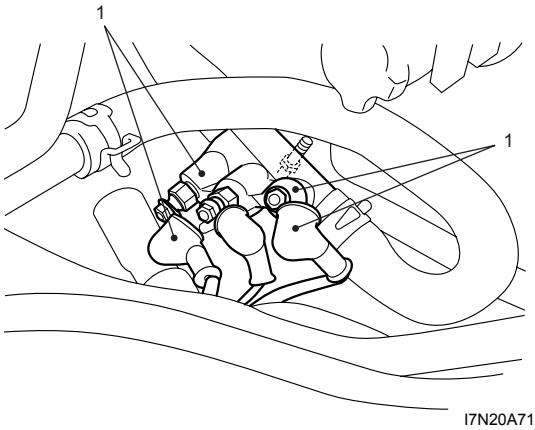
Additional Heater Assembly On-Vehicle Inspection (If Equipped)

S7N20A7106023

1) Remove battery and battery tray.
2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Disconnect wires from additional heater terminals.

NOTE

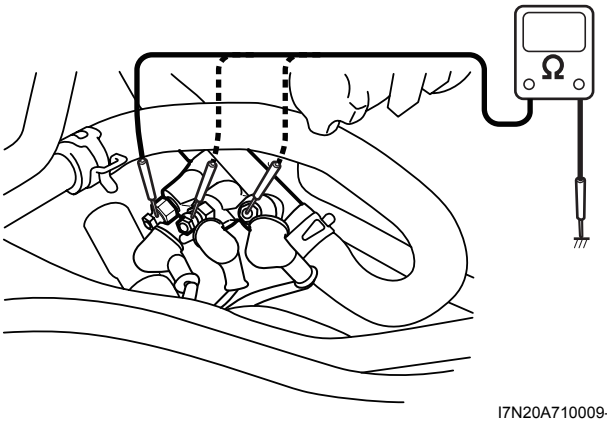
Make alignment marks (1) on wires and additional heater body for a guide during reinstallation, if necessary.



I7N20A710008-01

4) Check resistance between each terminal of additional heater assembly and vehicle body ground. If resistance is out of specification, replace additional heater assembly with new one.

Additional heater terminal resistance
0.55 – 0.65 Ω at 20 °C (68 °F)



I7N20A710009-01

Additional Heater Assembly Removal and Installation (If Equipped)

S7N20A7106024

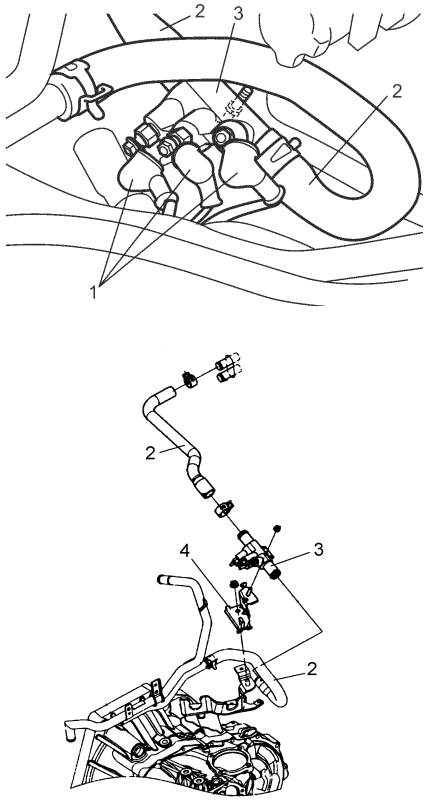
Removal

1) Remove battery and battery tray.
2) Remove air cleaner assembly referring to “Air Cleaner Assembly Removal and Installation: D13A / Z13DTJ in Section 1D”.
3) Drain engine coolant referring to “Cooling System Draining: D13A / Z13DTJ in Section 1F”.
4) Disconnect additional heater wires (1) and heater hoses (2) from additional heater assembly (3).

NOTE

Make alignment marks on wires and additional heater body for a guide during reinstallation, if necessary.

5) Remove additional heater assembly (3) from its bracket (4).



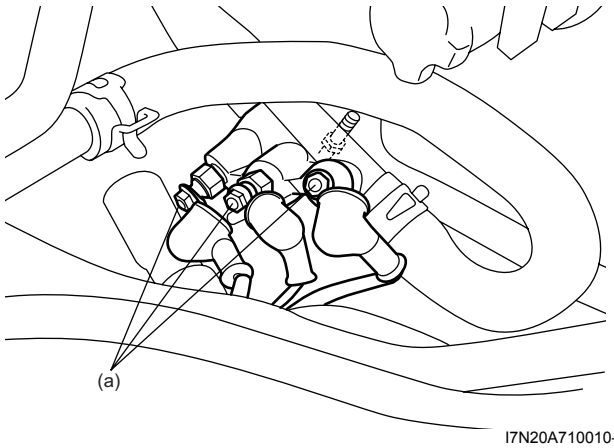
I7N20A710012-01

Installation

Reverse the removal procedure for installation noting the followings.

- Tighten additional heater wire nuts to specified torque.

Tightening torque
Additional heater wire nut (a): 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)



I7N20A710010-01

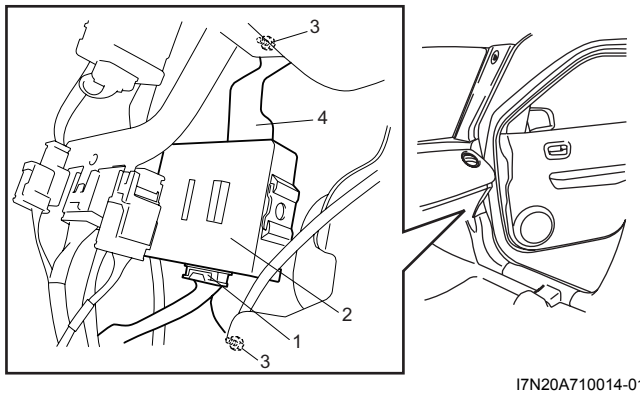
- Fill engine coolant referring to step 13) to 20) of “Cooling System Refill: D13A / Z13DTJ in Section 1F”.

Additional Heater Controller Removal and Installation (If Equipped)

S7N20A7106025

Removal

1) Disconnect negative (–) cable from battery.
2) Remove glove box from instrument panel.
3) Disconnect connector (1) from additional heater controller (2).
4) Remove nuts (3), and then remove additional heater controller (2) with bracket (4).



I7N20A710014-01

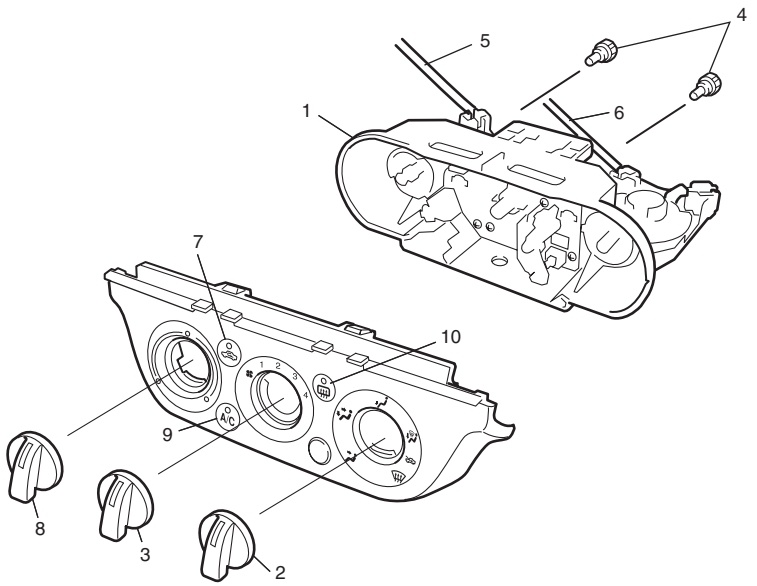
5) Detach additional heater controller from bracket.

Installation

Reverse removal procedure for installation.

HVAC Control Unit Components

S7N20A7106013



I4RS0B710009-01

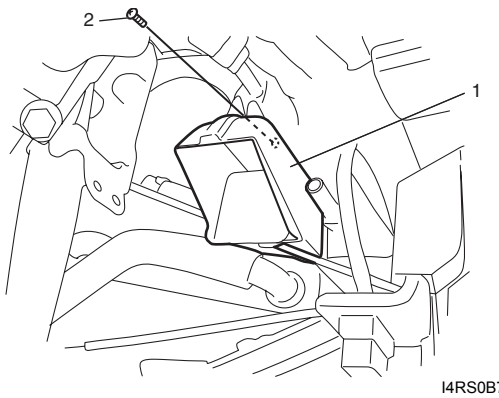
1. Heater control body assembly	4. Bulb	7. Air intake switch	10. Rear defogger switch
2. Airflow selector	5. Temperature control cable	8. Temperature selector	
3. Blower speed selector	6. Airflow control cable	9. A/C switch (if equipped)	

HVAC Control Unit Removal and Installation

S7N20A7106014

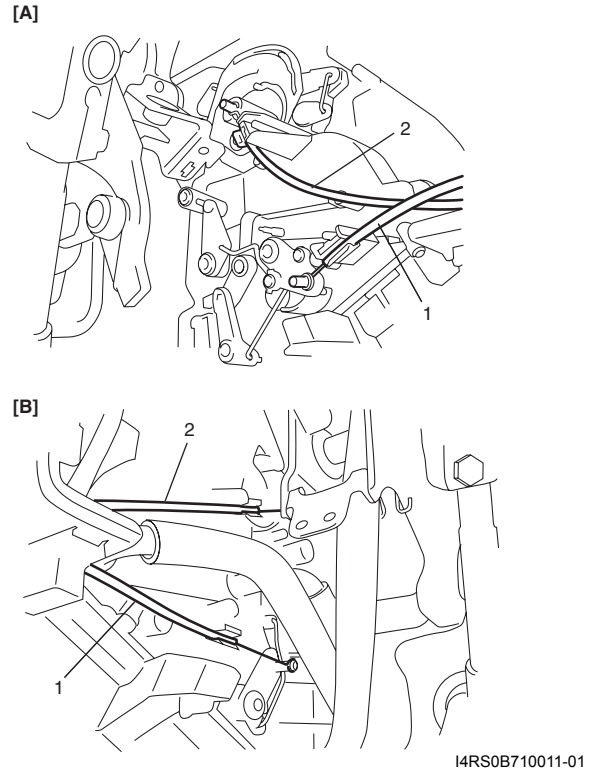
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Audio Unit Removal and Installation in Section 9C”.
5) Remove foot duct (1) from HVAC unit by removing screw (2).



I4RS0B710010-01

6) Disconnect temperature control cable (1) and airflow control cable (2) from HVAC unit.



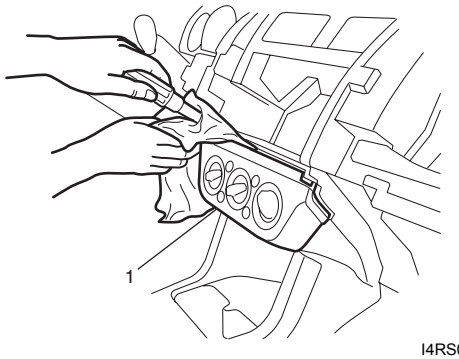
I4RS0B710011-01

[A]:	LH steering vehicle
[B]:	RH steering vehicle

7) Remove two connectors from HVAC control unit.
8) Remove HVAC control unit (1) from instrument panel.

NOTE

Be careful not to damage HVAC control unit and instrument panel by using rag.

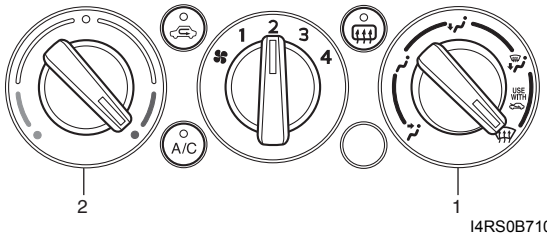


I4RS0B710012-01

Installation

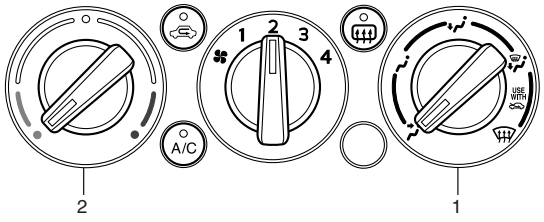
Reverse removal procedure noting the following instructions.

- Connect temperature control cable and airflow control cable of HVAC control unit to links of HVAC unit.
  a. For LH steering vehicle, set airflow selector (1) to "DEF" position and temperature selector (2) to "MAX HOT" position.



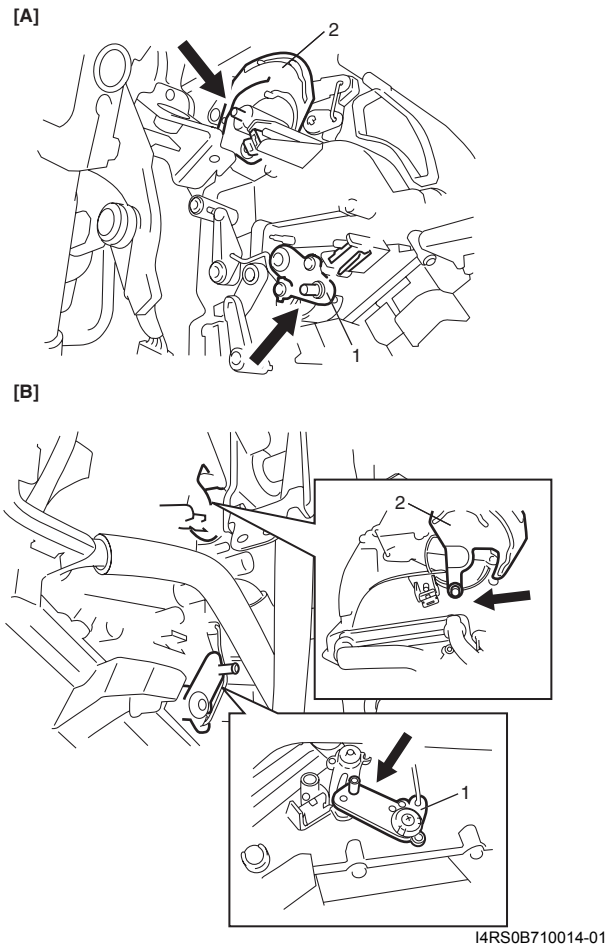
I4RS0B710013-01

For RH steering vehicle, set airflow selector (1) to "VENT" position and temperature selector (2) to "MAX COOL" position.



I4RS0A710016-01

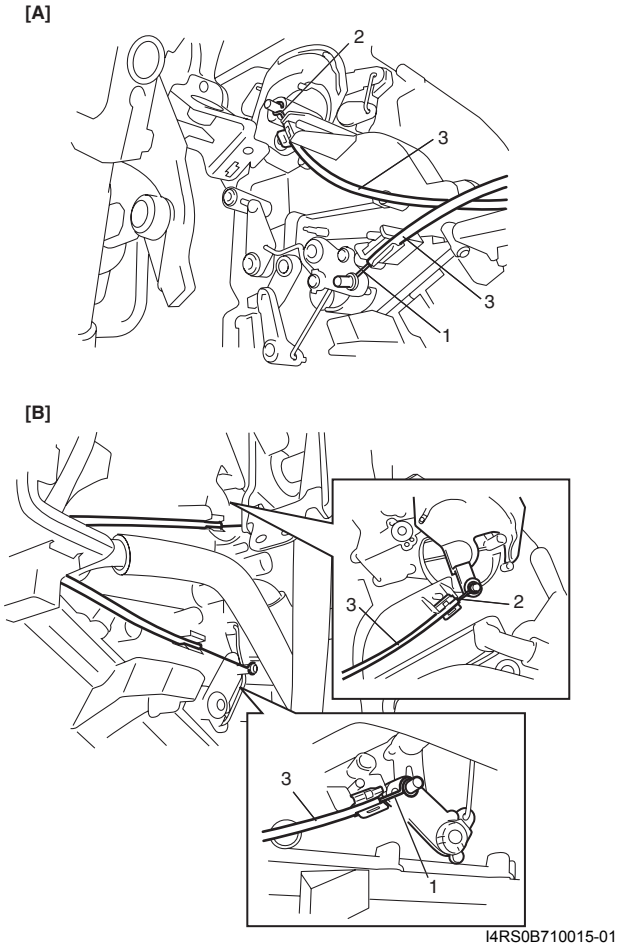
b. Move temperature control lever (1) and airflow control plate (2) fully to the arrow direction.



I4RS0B710014-01

[A]:	LH steering vehicle
[B]:	RH steering vehicle

c. Fix temperature control inner cable (1) to pin of temperature control lever and air flow control inner cable (2) to pin of airflow control plate, and then fix each outer cable (3) to each cable lock clamp.



I4RS0B710015-01

[A]:	LH steering vehicle
[B]:	RH steering vehicle

NOTE

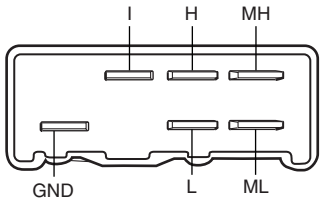
After installing control cables, make sure that control lever and plate move smoothly and stop at proper position.

- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.
- Make sure that airflow outlet changes correctly as airflow selector is changed.

Blower Speed Selector Inspection

S7N20A7106015

Check blower speed selector for each terminal to terminal continuity. If check result does not meet the following conditions, replace HVAC control unit.



Position \ Terminal	GND	I	L	ML	MH	H
OFF	○					
1	○	○	○			
2	○	○		○		
3	○	○			○	
4	○	○				○

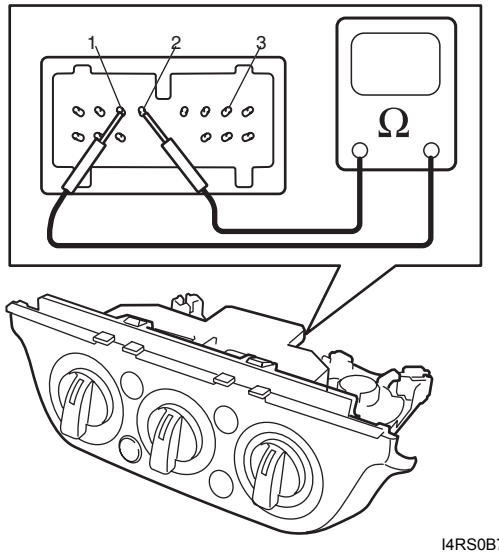
I4RS0A710019-01

Air Intake Selector Inspection

S7N20A7106016

- Check that there is continuity between terminal (1) and terminal (2) when air intake selector is at fresh position.
- Check that there is no continuity between terminal (1) and terminal (2) and there is continuity between terminal (1) and terminal (3) when air intake selector is at recirculation position.

If check result does not meet the above conditions, replace HVAC control unit.



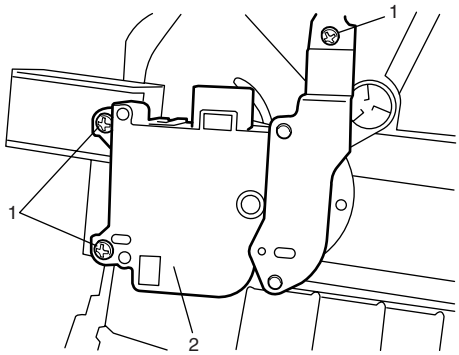
I4RS0B710016-01

Air Intake Control Actuator Removal and Installation

S7N20A7106017

Removal

1) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation in Section 9C”.
2) Remove screws (1).
3) Remove air intake control actuator (2) from HVAC unit.

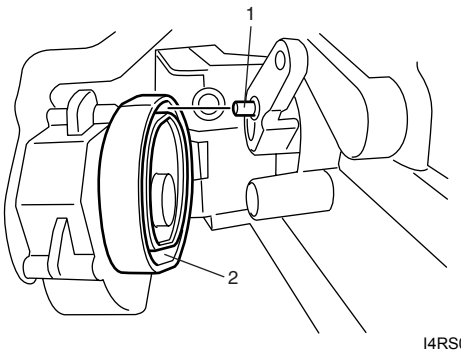


I4RS0A710021-01

Installation

Reverse removal procedure noting the following instruction.

- Be sure to insert the linkage pin (1) into the groove (2) of air intake control actuator.



I4RS0A710022-01

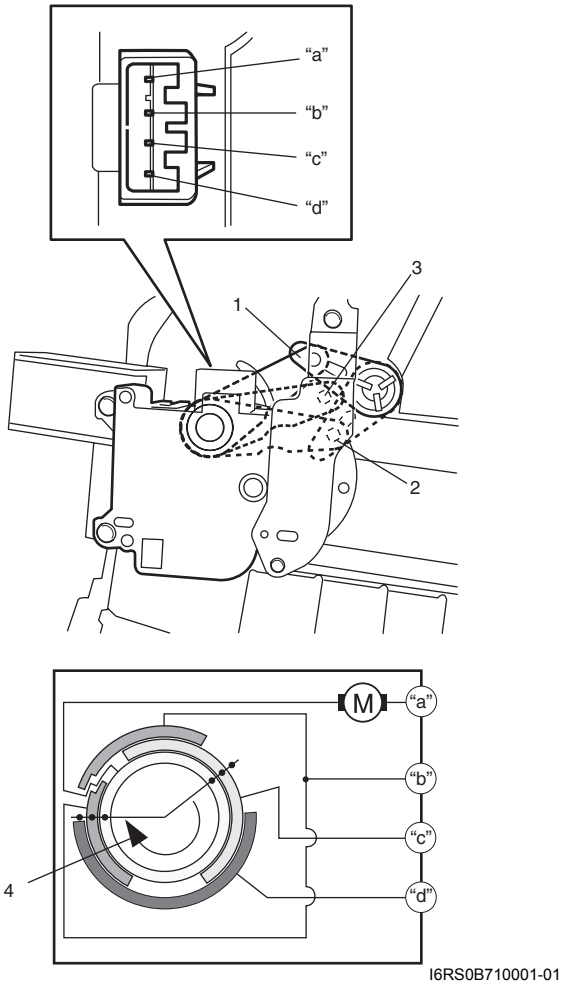
Air Intake Control Actuator Inspection

S7N20A7106018

Check air intake control actuator as follows:

1) Using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to “c” terminal. And, check if air intake selector link operates smoothly and it stops at fresh position (1).
2) Using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to “d” terminal. And, check if air intake selector link operates smoothly and it stops at recirculation position (2).
3) For auto A/C model, using service wire, connect battery positive terminal to “a” terminal and battery negative terminal to “b” terminal. And, check air intake selector link operates smoothly and it stops at mix position (3).

If malfunction is found, replace air intake control actuator.



I6RS0B710001-01

4. Motor rotation direction

Center Ventilation Louver Removal and Installation

S7N20A7106019

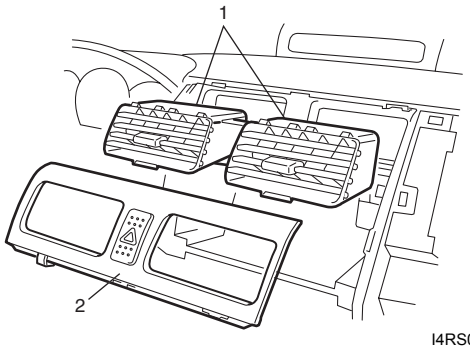
Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Audio Unit Removal and Installation in Section 9C”.
5) Remove center ventilation louver (1) with garnish (2) from instrument panel, and then disconnect connector from hazard switch.

NOTE

Garnish is fitted to instrument panel with six clips. When removing garnish from instrument panel, be careful not to break them.

6) Separate center ventilation louver and garnish.



I4RS0B710017-01

Installation

Reverse removal procedure.

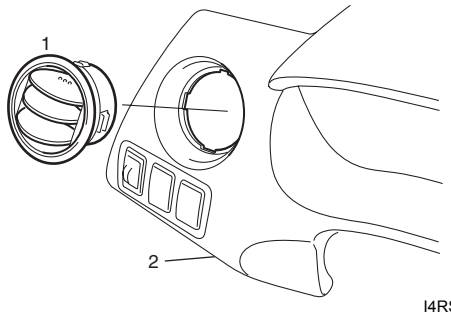
Side Ventilation Louver Removal and Installation

S7N20A7106020

Driver side ventilation louver

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove steering column hole cover from instrument panel.
4) Remove combination meter cluster panel from instrument panel, and then disconnect connectors from front fog lamp switch, illumination cancel switch and headlight leveling switch (if equipped) of combination meter cluster panel.
5) Separate driver side ventilation louver (1) and combination meter cluster (2).

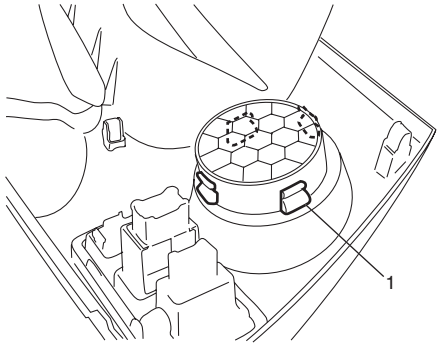


I4RS0B710018-01

Installation

Reverse removal procedure noting the following instruction.

- Driver side ventilation louver is fitted to combination meter cluster panel with four clips (1). When installing driver side ventilation louver to combination meter cluster panel, position the smallest clip to the top.

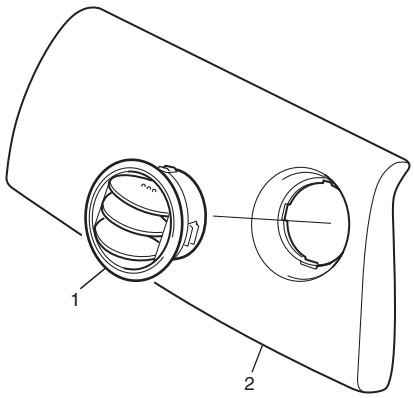


I4RS0B710019-01

Passenger side ventilation louver

Removal

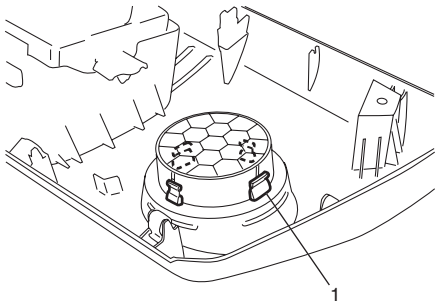
1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove glove box from instrument panel.
4) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation in Section 8B”.
5) Separate passenger side ventilation louver (1) and passenger air bag module (2).



I4RS0B710020-01

Installation
Reverse removal procedure noting the following instruction.

- Passenger side ventilation louver is fitted to passenger air bag module with four clips (1). When installing passenger side ventilation louver to passenger air bag module, position the smallest clip to the top.



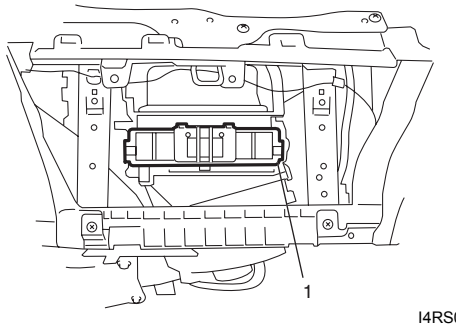
I4RS0B710021-01

Air Filter (If Equipped) Removal and Installation

S7N20A7106021

Removal

1) Remove glove box from instrument panel.
2) Remove air filter cover (1) from HVAC unit.

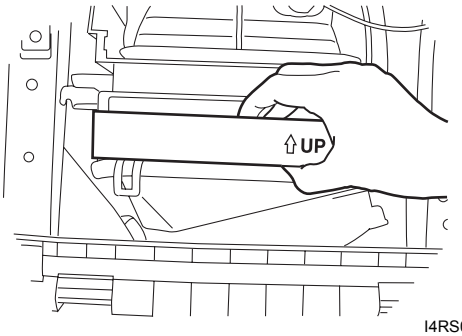


I4RS0B710022-01

3) Pull out air filter from HVAC unit.

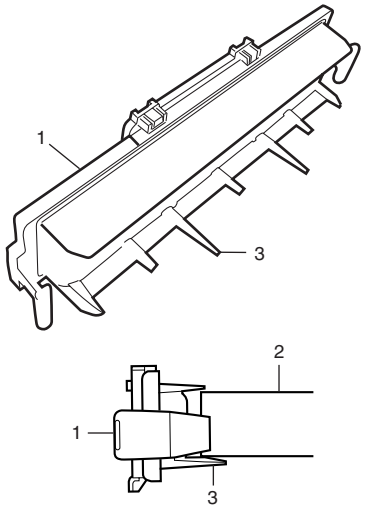
Installation
Reverse removal procedure noting the following instructions.

- Position air filter by directing its arrow mark to the upward.



I4RS0B710023-01

- Fit air filter cover (1) to HVAC unit so as not to stick air filter (2) by air filter cover's claw (3). Otherwise, air filter is deformed and loses its functionality.

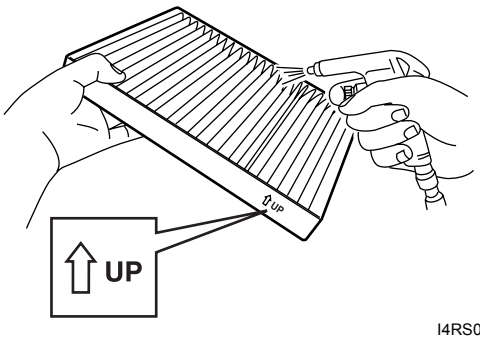


I4RS0A710031-01

Air Filter Cleaning (If Equipped)

S7N20A7106022

Blow compressed air to the air outlet side of air filter.



I4RS0A710032-01

Specifications

Tightening Torque Specifications

S7N20A7107001

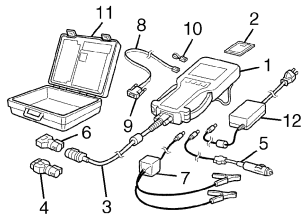
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Additional heater wire nut	4.5	0.46	3.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Special Tool

S7N20A7108001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞		

Air Conditioning System

Manual A/C

Precautions

A/C System Caution

S7N20A7210001

⚠ CAUTION

The air conditioning system of this vehicle uses refrigerant HFC-134a (R-134a).
None of refrigerant, compressor oil and component parts is interchangeable between two types of A/C: one using refrigerant HFC-134a (R-134a) and the other using refrigerant CFC-12 (R-12).
Be sure to check which refrigerant is used before any service work including inspection and maintenance. For identification between these two types, refer to "Refrigerant Type Identification: Manual A/C".
When replenishing or changing refrigerant and compressor oil and when replacing parts, make sure that the material or the part to be used is appropriate to the A/C installed in the vehicle being serviced. Use of incorrect one will result in leakage of refrigerant, damage in parts or other faulty condition.

Precautions on Servicing A/C System

S7N20A7210002

⚠ WARNING

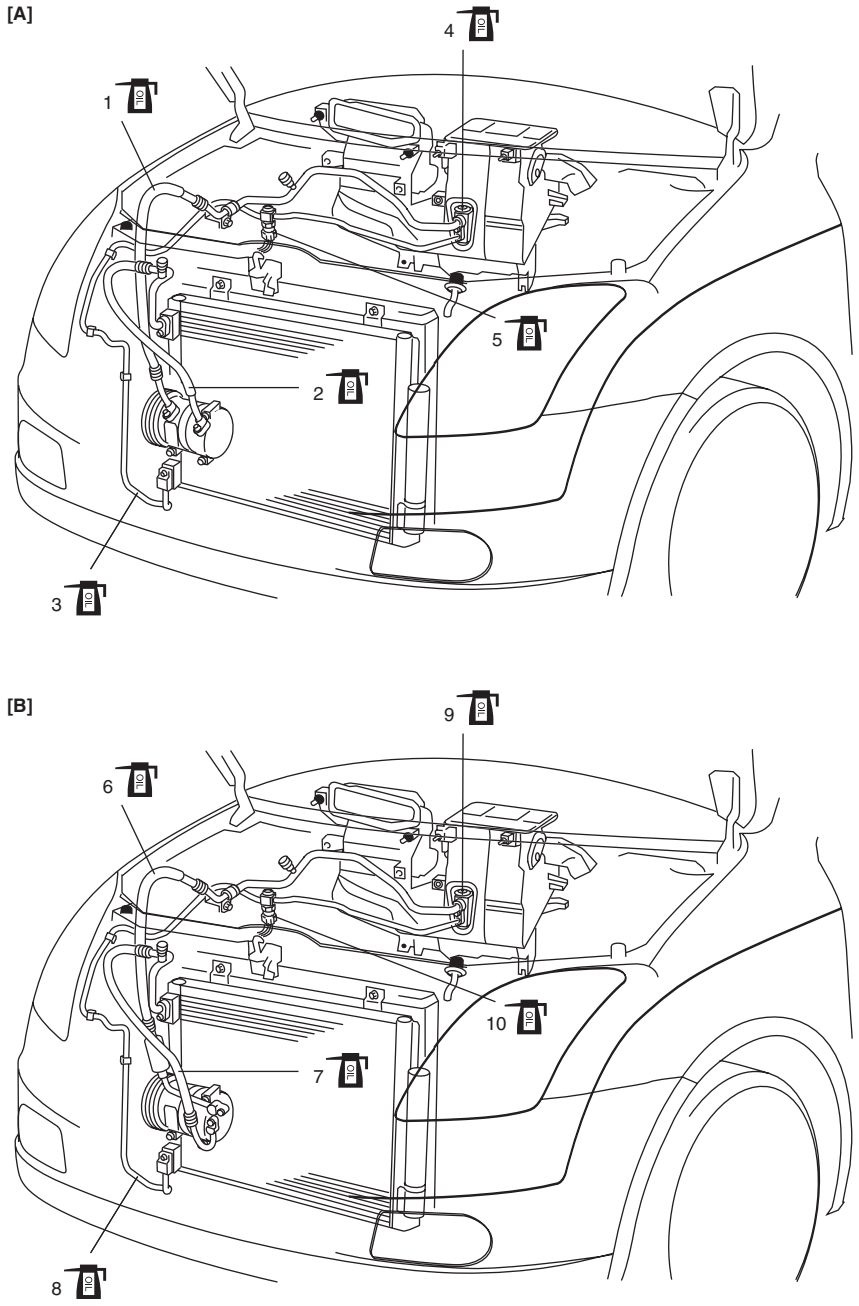
Should refrigerant HFC-134a (R-134a) is exposed to your eye(s), consult a doctor immediately.

- **Do not use your hand to rub affected eye(s). Instead, use fresh cold water to splash it over affected area to thus gradually raise its temperature above the freezing point.**
- **Obtain proper treatment as soon as possible from a doctor or eye specialist. Should liquid refrigerant HFC-134a (R-134a) is exposed to your skin, such affected part should be treated in the same manner as when skin is frostbitten or frozen.**

Handling Refrigerant HFC-134a (R-134a)

- Always wear goggles to protect your eyes.
- Avoid direct contact to liquid refrigerant.
- Do not heat refrigerant container higher than 40 °C (104 °F).
- Do not discharge refrigerant into atmosphere.
- Do not expose bright metals to liquid refrigerant. Refrigerant combined with moisture is corrosive and tarnishes surfaces of bright metals including chrome.

Refrigerant Line



I6RS0B721001-01

[A]: Petrol engine model	5. A/C refrigerant pressure sensor : Apply compressor oil 99000-99095-00A (refrigerant oil) to O-ring.
[B]: Diesel engine model	6. Suction hose : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.
1. Suction hose : Apply compressor oil 99000-99095-00A (refrigerant oil) to O-ring.	7. Discharge hose : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.
2. Discharge hose : Apply compressor oil 99000-99095-00A (refrigerant oil) to O-ring.	8. Liquid pipe : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.
3. Liquid pipe : Apply compressor oil 99000-99095-00A (refrigerant oil) to O-ring.	9. Expansion valve : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.
4. Expansion valve : Apply compressor oil 99000-99095-00A (refrigerant oil) to O-ring.	10. A/C refrigerant pressure sensor : Apply compressor oil 99000-990C5-00A (refrigerant oil) to O-ring.

- Never use heat for bending pipes. When bending a pipe, try to make its bending angle as smooth as possible.
- Keep internal parts of air conditioning free from moisture and dirt. When disconnecting any line from system, install a blind plug or cap to the fitting immediately.
- When connecting hoses and pipes, apply a few drops of compressor oil (refrigerant oil) to O-ring.
- When tightening or loosening a fitting, use two wrenches, one for turning and the other for support.
- When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.
- Check local governmental regulations regarding working with refrigerator systems and its tooling.
- Route drain hose so that drained water does not make any contact to vehicle components.
- If pipes or hoses are replaced, replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: Manual A/C”.

Refrigerant Recovery
When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

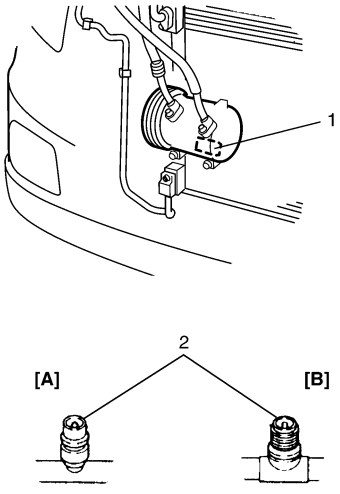
Refrigerant Charge
After performing compressor oil replenishment and evacuation, charge a proper amount of refrigerant to A/C system referring to “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.

General Description

Refrigerant Type Identification

S7N20A7211001

Whether the A/C system in the vehicle uses HFC-134a (R-134a) or CFC-12 (R-12) is indicated on label (1) on the compressor. Also, it can be checked by the shape of the service (charge) valve (2).



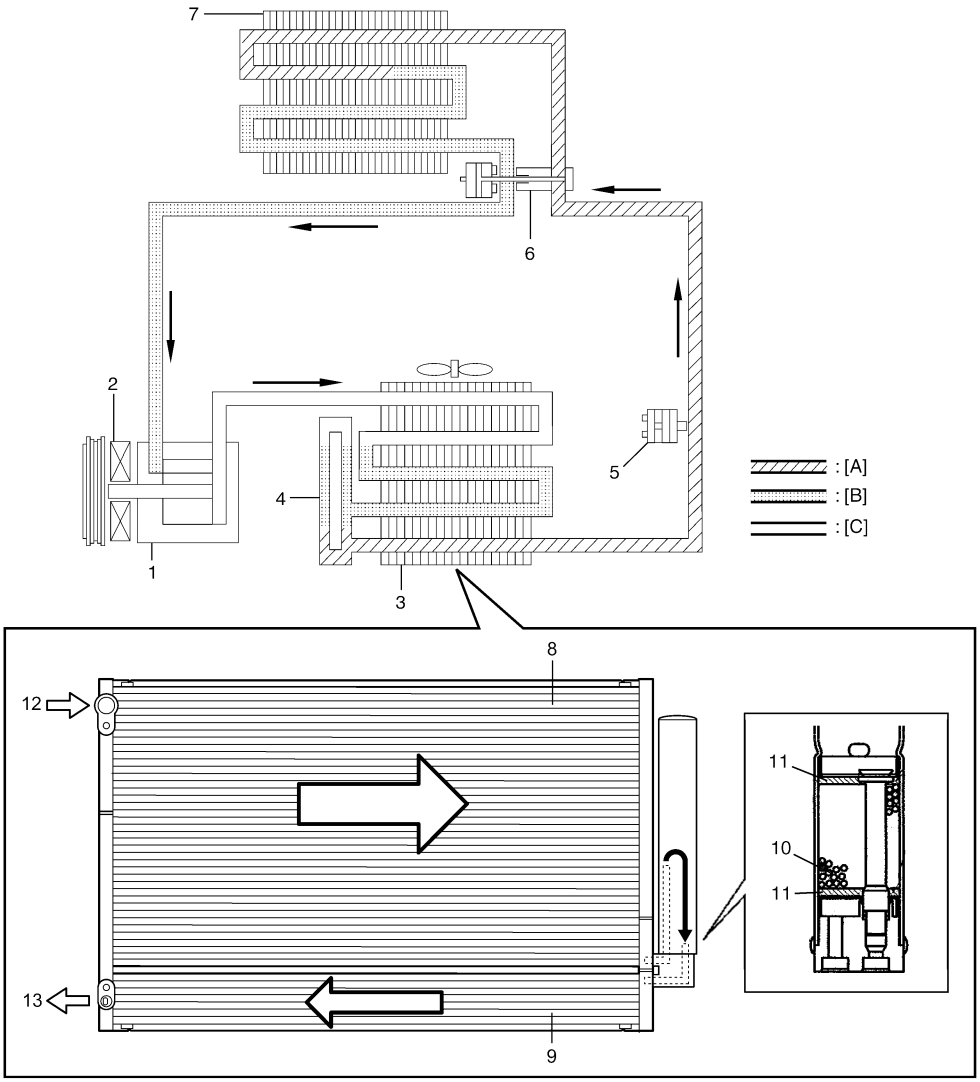
I4RS0A720002-01

[A]: HFC-134a (R-134a)
[B]: CFC-12 (R-12)

Sub-Cool A/C System Description

S7N20A7211002

In the sub-cool A/C system (condenser integrated with 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 those. 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.



I7RS0A721001-01

[A]: Liquid	2. Magnet clutch	6. Expansion valve	10. Desiccant
[B]: Vapor	3. Condenser	7. A/C evaporator	11. Filter
[C]: Superheated vapor	4. Receiver/dryer (Modulator)	8. Condensation part	12. Vapor refrigerant
1. Compressor	5. Refrigerant pressure sensor	9. Sub-cooler part	13. Liquid refrigerant

A/C Operation Description

S7N20A7211003

ECM controls the radiator fan relay and the compressor relay by following signals.

- ON/OFF signal of A/C switch
- A/C refrigerant pressure sensor
- Evaporator thermistor (evaporator temperature sensor)
- ECT sensor

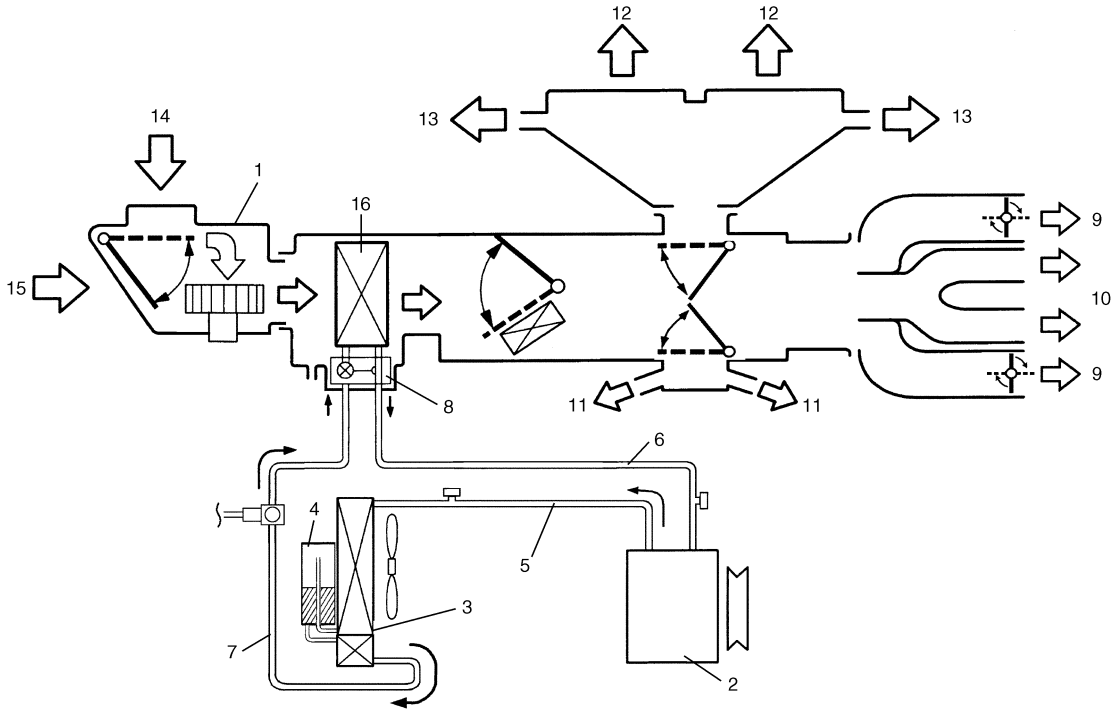
NOTE

The signal of A/C switch is fed from BCM to ECM using CAN communication system. For CAN communication system, refer to "CAN Communication System Description: M13A / M15A / M16A in Section 1A" or "CAN Communication System Description: D13A / Z13DTJ in Section 1A".

Schematic and Routing Diagram

Air Flow Diagram of A/C System

S7N20A7212001

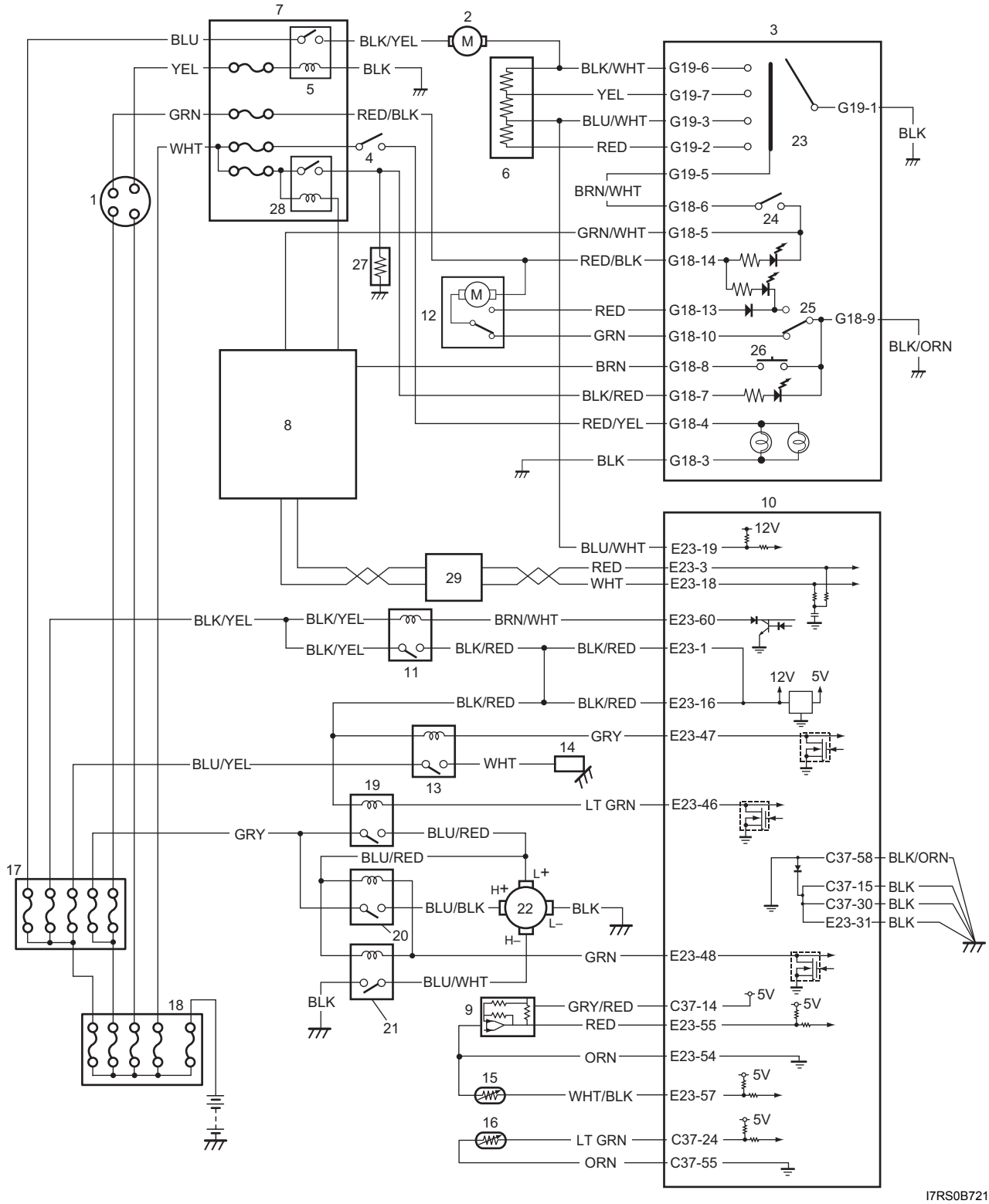


I4RS0A720003-01

1. HVAC unit	5. Discharge hose	9. Side ventilation air	13. Side defroster air
2. Compressor	6. Suction hose	10. Center ventilation air	14. Fresh air
3. Condenser assembly	7. Liquid pipe	11. Foot air	15. Recirculation air
4. Receiver/dryer (Modulator)	8. Expansion valve	12. Front defroster air	16. Evaporator

A/C System Wiring Diagram (Petrol Engine Model)

S7N20A7212002



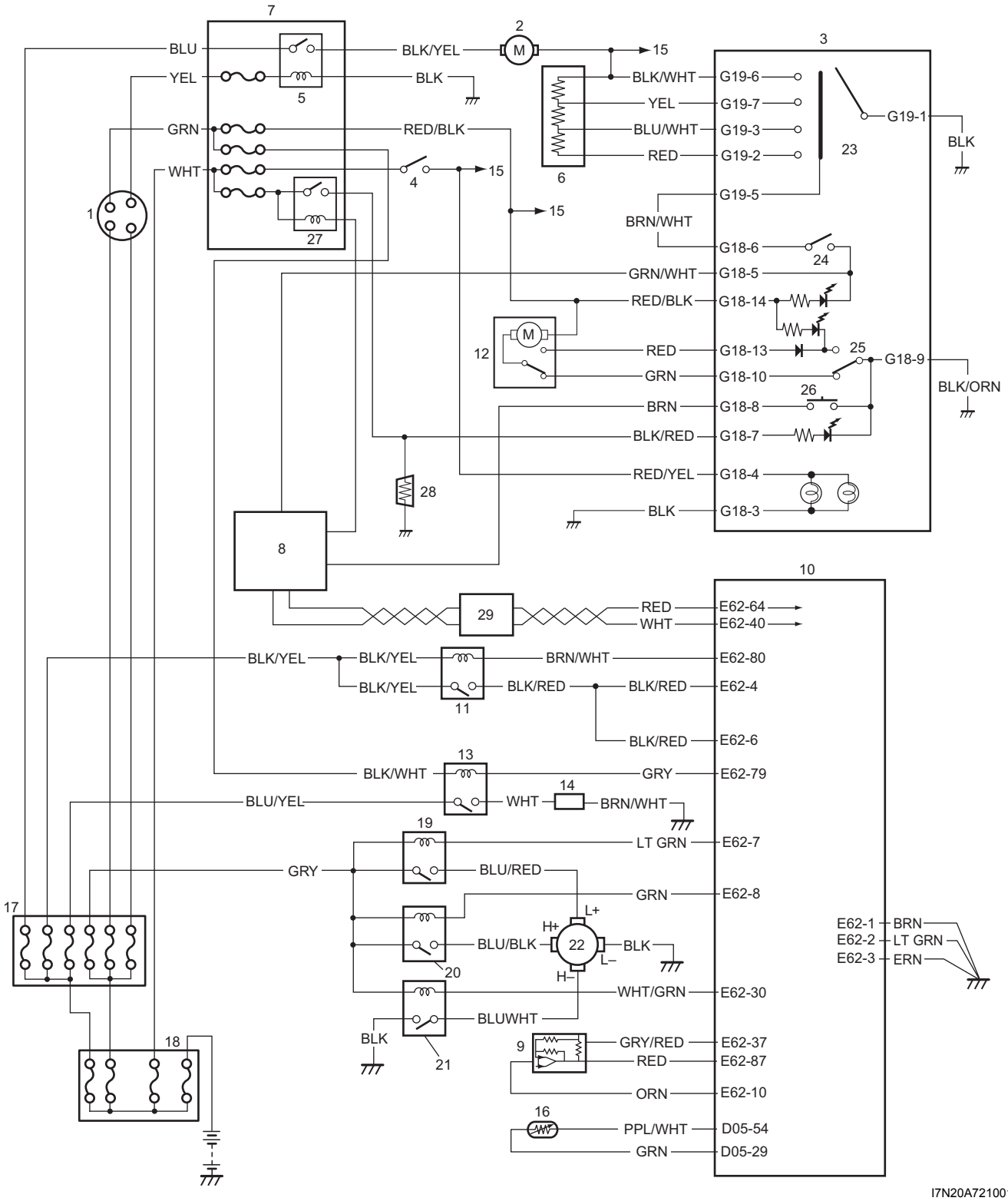
I7RS0B721001-03

1. Ignition switch	9. A/C refrigerant pressure sensor	17. Individual circuit fuse box (No.1)	25. Air intake selector
2. Blower motor	10. ECM	18. Main fuse box	26. Rear defogger switch
3. HVAC control unit	11. Main relay	19. Radiator cooling fan relay No.1	27. Rear defogger
4. Lighting switch	12. Air intake control actuator	20. Radiator cooling fan relay No.2	28. Rear defogger relay
5. Blower motor relay	13. Compressor relay	21. Radiator cooling fan relay No.3	29. ABS / ESP® control model
6. Blower motor resistor	14. Compressor	22. Radiator cooling fan motor	

7. Junction block assembly	15. Evaporator thermistor (evaporator temperature sensor)	23. Blower speed selector	
8. BCM	16. ECT sensor	24. A/C switch	

A/C System Wiring Diagram (Diesel Engine Model)

S7N20A7212003



I7N20A721001-03

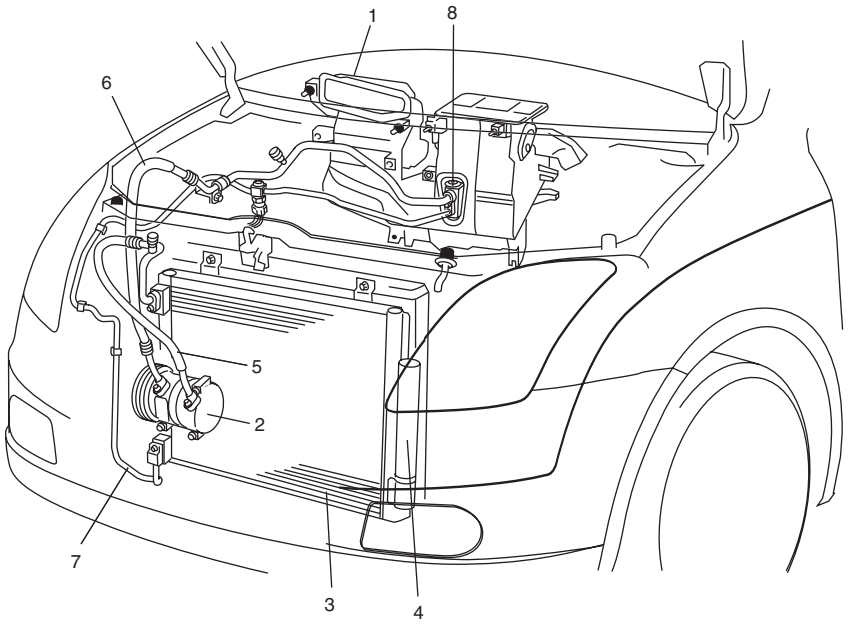
1. Ignition switch	11. Main relay	21. Radiator cooling fan relay No.3
2. Blower motor	12. Air intake control actuator	22. Radiator cooling fan motor
3. HVAC control unit	13. Compressor relay	23. Blower speed selector

4. Lighting switch (non-additional heater system model)	14. Compressor	24. A/C switch
5. Blower motor relay	15. To additional heater controller (if equipped)	25. Air intake selector
6. Blower motor resistor	16. ECT sensor	26. Rear defogger switch
7. Junction block assembly	17. Individual circuit fuse box (No.1)	27. Rear defogger relay
8. BCM	18. Main fuse box	28. Rear defogger
9. A/C refrigerant pressure sensor	19. Radiator cooling fan relay No.1	29. ABS / ESP® control module
10. ECM	20. Radiator cooling fan relay No.2	

Component Location

Major Components of A/C System

S7N20A7213001



I4RS0B720002-01

1. HVAC unit	5. Discharge hose
2. Compressor	6. Suction hose
3. Condenser assembly	7. Liquid pipe
4. Receiver/dryer (Modulator)	8. Expansion valve

Diagnostic Information and Procedures

A/C System Symptom Diagnosis

S7N20A7214001

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C system does not operate)	No refrigerant	*Perform recovery, evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	A/C switch faulty	*Check A/C switch referring to "A/C Switch Inspection: Manual A/C".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection in Section 7A".*
	Evaporator thermistor (Evaporator temperature sensor) faulty	*Check evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	A/C refrigerant pressure sensor faulty	*Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual A/C" (petrol engine model). Replace A/C refrigerant pressure sensor (diesel engine model).*
	Wiring or grounding faulty	*Repair as necessary.*
	ECM faulty	*Check ECM referring to "A/C System Inspection at ECM: Manual A/C" (petrol engine model). Replace ECM (diesel engine model).*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual A/C" or "Magnet Clutch Inspection (Diesel Engine Model): Manual A/C".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
	Compressor relay faulty	*Check compressor relay referring to "Compressor Relay Inspection: Manual A/C".*
	BCM faulty	*Check BCM referring to "Inspection of BCM and its Circuits in Section 10B".*
No cool air comes out (radiator cooling fan motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Wiring or grounding faulty	*Repair as necessary.*
	Radiator cooling fan motor relay faulty	*Check radiator cooling fan motor relay referring to "Radiator Cooling Fan Relay Inspection: M13A / M15A / M16A in Section 1F" or "Radiator Cooling Fan Assembly Removal and Installation: D13A / Z13DTJ in Section 1F".*
	Radiator cooling fan motor faulty	*Check radiator cooling fan motor referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: M13A / M15A / M16A in Section 1F" (petrol engine model) or "Radiator Cooling Fan Assembly On-Vehicle Inspection: D13A / Z13DTJ in Section 1F" (diesel engine model).*
	ECM and/or its circuit faulty	*Check ECM and/or its circuit referring to "A/C System Inspection at ECM: Manual A/C".*

Condition	Possible cause	Correction / Reference Item
No cool air comes out (blower motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor relay faulty	*Check blower motor relay referring to "Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection in Section 7A".*
	Blower motor resistor faulty	*Check blower motor resistor referring to "Blower Motor Resistor Inspection in Section 7A".*
	Blower speed selector faulty	*Check blower speed selector referring to "Blower Speed Selector Inspection in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection in Section 7A".*
Cool air does not come out or insufficient cooling (A/C system normal operation)	Insufficient or excessive charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: Manual A/C".*
	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: Manual A/C" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	Evaporator thermistor (Evaporator temperature sensor) faulty	*Check evaporator thermistor (Evaporator temperature sensor) referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: Manual A/C".*
	Desiccant clogged	*Replace receiver/dryer.*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual A/C" or "Magnet Clutch Inspection (Diesel Engine Model): Manual A/C".*
	Compressor faulty	*Check compressor.*
	Air in A/C system	*Replace receiver/dryer, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Heater and ventilation system faulty	*Check HVAC unit.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection in Section 7A".*
	Excessive compressor oil in A/C system	*Drain excessive compressor oil from A/C system circuit and compressor.*
Cool air does not come out only intermittently	Wiring connection faulty	*Repair as necessary.*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: Manual A/C".*
	Excessive moisture in A/C system	*Replace receiver/dryer, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual A/C" or "Magnet Clutch Inspection (Diesel Engine Model): Manual A/C".*
	Excessive amount of refrigerant	*Check the amount of refrigerant.*

Condition	Possible cause	Correction / Reference Item
Cool air comes out only at high speed	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: Manual A/C".*
	Insufficient charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Air in A/C system	*Replace receiver/dryer, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
Cool air does not come out only at high speed	Excessive amount of refrigerant	*Check the amount of refrigerant.*
	A/C evaporator frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: Manual A/C" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
Insufficient airflow of cooled air	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator thermistor (evaporator temperature sensor) referring to "Evaporator Inspection: Manual A/C" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*

Abnormal Noise Symptom Diagnosis of A/C System

S7N20A7214002

Abnormal Noise from Compressor

Condition	Possible cause	Correction / Reference Item
During compressor operation, a rumbling noise is heard proportional to engine revolutions	Inadequate clearance in scroll area	*Replace compressor.*
A loud noise is heard at a certain rpm, disproportionately to engine revolution	Loose or faulty compressor drive belt	*Adjust drive belt tension or replace drive belt.*
	Loose compressor mounting bolts	*Retighten mounting bolts.*
A loud rattle is heard at low engine rpm	Loose compressor clutch plate bolt or nut	*Retighten clutch plate bolt or nut.* *Replace compressor if it was operated in this condition for a long time.*

Abnormal Noise from Magnetic Clutch

Condition	Possible cause	Correction / Reference Item
A rumbling noise is heard when compressor is not in operation	Worn or damaged bearings	*Replace magnet clutch assembly.*
A chattering noise is heard when compressor is in operation	Faulty magnet clutch clearance (excessive clearance)	*Adjust magnet clutch clearance.*
	Worn magnet clutch friction surface	*Replace magnet clutch assembly.*
	Compressor oil leaked from shaft seal, contaminating the friction surface	*Replace compressor body assembly.*

Abnormal Noise from Tubing

Condition	Possible cause	Correction / Reference Item
A droning noise is heard from inside of the vehicle, but not particularly noticeable in engine compartment	Faulty tubing clamps	*Reposition clamps or increase the 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 silencer between condenser assembly bracket and body.*

Abnormal Noise from Crankshaft Pulley

Condition	Possible cause	Correction / Reference Item
A 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 A/C Evaporator

Condition	Possible cause	Correction / Reference Item
Whistling sound is heard from A/C evaporator	Depending on the combination of the interior / exterior temperatures, engine rpm and refrigerant pressure, the refrigerant flowing out of the expansion valve may, under certain conditions, make a whistling sound	*At times, slightly decreasing refrigerant volume may stop this noise.* *Inspect expansion valve and replace if faulty.*

Abnormal Noise from Blower Motor

Condition	Possible cause	Correction / Reference Item
Blower motor emits a 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 make sure that the screen at fresh air inlet is intact.*

A/C System Performance Inspection

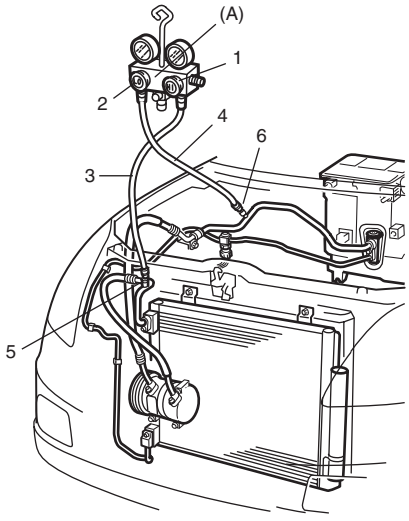
S7N20A7214003

1) Confirm 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.
   - Air filter in HVAC unit is not clogged with dirt and dust.
   - Battery voltage is about 12 V.
   - Radiator cooling fan operates normally.
2) Make sure that high pressure valve (1) and low pressure valve (2) of manifold gauge are firmly closed.

   Special tool
   (A): 09990–06020
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).
4) Bleed the air in charging hoses (3) and (4) by loosening their nuts respectively utilizing the refrigerant pressure. When a hissing sound is heard, immediately tighten nut.

⚠ CAUTION

Do not connect high and low pressure charging hoses in reverse.



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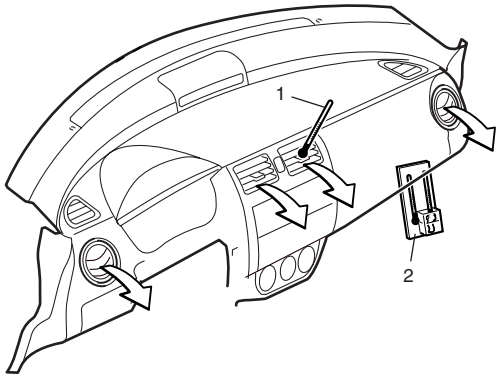
5) Warm up engine to the normal operating temperature and keep it at the specified idle speed.
6) Turn A/C switch ON, set blower speed selector at maximum speed position, temperature selector at maximum cold position, airflow selector at face position, and air intake switch at recirculation position. (Confirm that A/C compressor and condenser fans are working.)
7) Wait for ten minutes to stabilize the A/C operation.
8) Open front windows, front doors and engine hood.
9) With about 20 mm (0.8 in.) of dry bulb thermometer (1) put right in front of center ventilation louver and a wet and dry bulb thermometer (2) near air inlet of HVAC unit.



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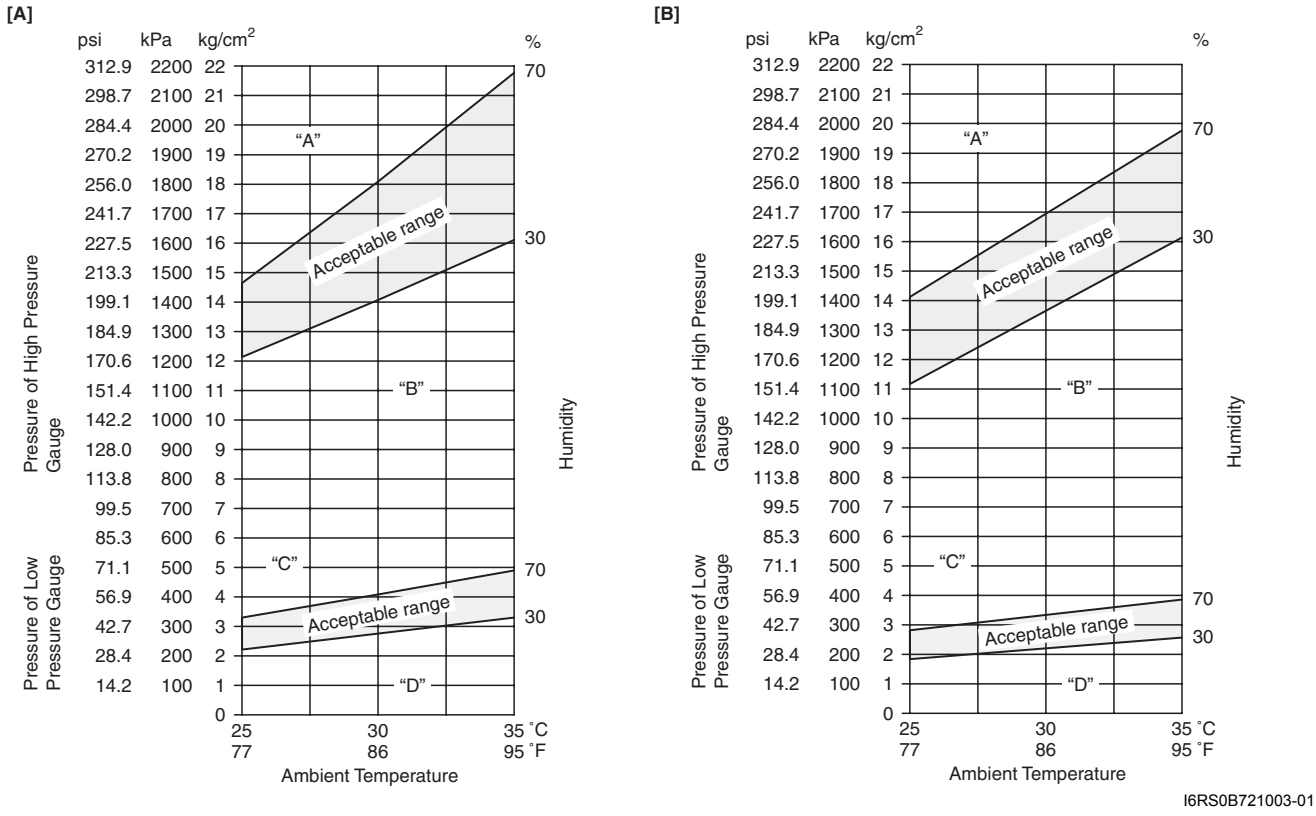
10) Check for each pressure of low side and high side if it is within shaded range of graph. If each gauge reading is out of specified pressure, correct defective part referring to the following table.

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)
Petrol engine model
Pressure on high pressure gauge (HI): 1420 – 1830 kPa (14.2 – 18.3 kg/cm²)
Pressure on low pressure gauge (LO): 270 – 420 kPa (2.7 – 4.2 kg/cm²)
Diesel engine model
Pressure on high pressure gauge (HI): 1370 – 1690 kPa (13.7 – 16.9 kg/cm²)
Pressure on low pressure gauge (LO): 230 – 340 kPa (2.3 – 3.4 kg/cm²)



[A]: Petrol engine model	[B]: Diesel engine model

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.
	Compressor malfunction (Insufficient oil etc.)	Check compressor.
	Engine overheat	Check engine cooling system referring to "Engine Cooling Symptom Diagnosis: M13A / M15A / M16A in Section 1F" or "Engine Cooling Symptom Diagnosis: D13A / Z13DTJ in Section 1F".

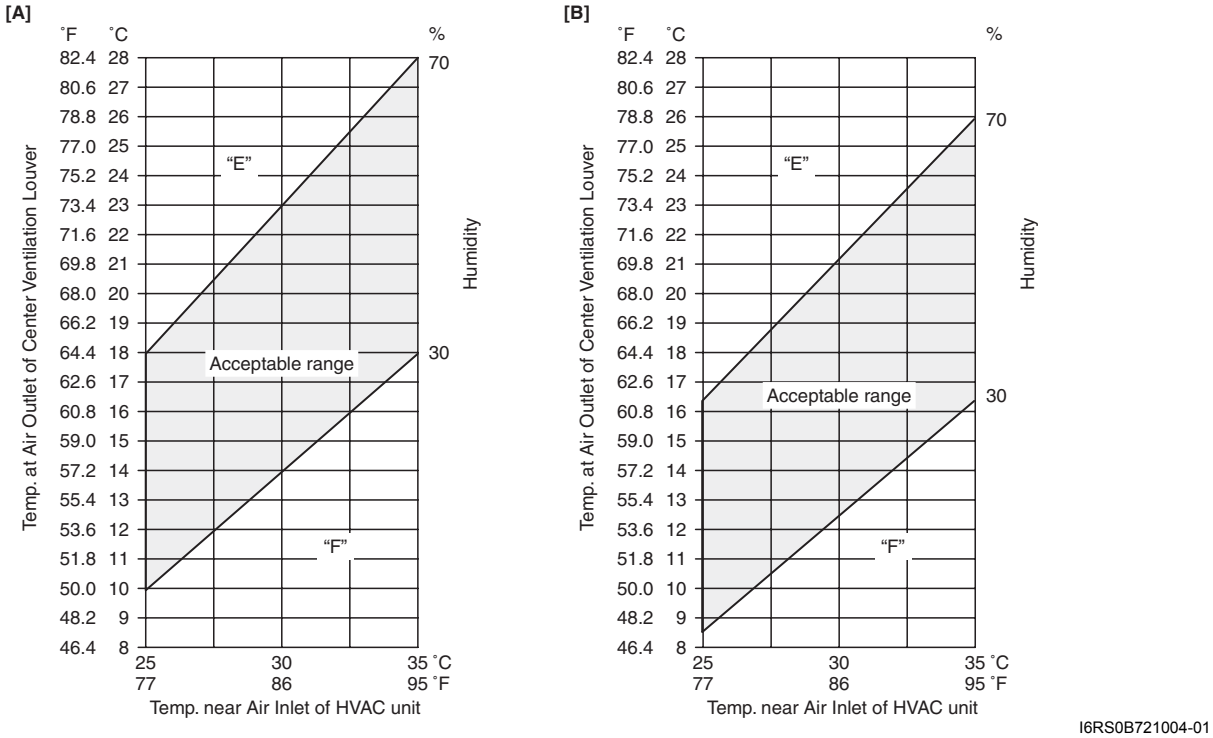
Condition	Possible cause	Correction
Pressure is lower than acceptable range (“B” area)	Insufficient refrigerant (Insufficient charge or leakage)	Check for leakage, repair if necessary and recharge.
	Expansion valve malfunction (valve opens too wide)	Check expansion valve.
	Compressor malfunction (Insufficient compression)	Check 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.
	Compressor malfunction (Insufficient compression)	Check 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.

11) Check inlet port temperature-to-outlet port temperature relationship using the graph. 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.

12) If crossing point is out of acceptable range, diagnose trouble referring to the following table.



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[A]: Petrol engine model	[B]: Diesel engine model

Thermometer at center duct

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 A/C 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.
	Compressor malfunction	Check compressor.
Crossing point is lower than acceptable range (“F” area)	Insufficient air volume from center duct (Heater blower malfunction)	Check blower motor and fan.
	Compressor malfunction	Check compressor.

NOTE

If ambient temperature is approximately 30 °C (86 °F), it is possible to diagnose A/C system in detail referring to the following table.

Condition			Possible cause	Correction
Manifold gauge	MPa (kg/cm^2) (psi)	Detail		
Lo	Hi			
Petrol engine model 0.27 – 0.42 (2.7 – 4.2) (38 – 59) Diesel engine model 0.23 – 0.34 (2.3 – 3.4) (34 – 49)	Petrol engine model 1.42 – 1.83 (14.2 – 18.3) (202 – 260) Diesel engine model 1.37 – 1.69 (13.7 – 16.9) (202 – 248)	Normal condition	—	—
Negative pressure	0.5 – 0.6 (5 – 6) (71.2 – 85.3)	The low pressure side reads a negative pressure, and the high pressure side reads an extremely low pressure. Presence of frost around tubing to and from receiver/dryer and expansion valve.	Dust particles or water droplets are either stuck or frozen inside expansion valve, preventing the refrigerant from flowing.	Clean expansion valve. Replace it if it cannot be cleaned. Replace receiver/dryer. Evacuate the A/C system and recharge with fresh refrigerant.
Normal: Petrol engine model 0.27 – 0.42 (2.7 – 4.2) (38 – 59) Diesel engine model 0.23 – 0.34 (2.3 – 3.4) (34 – 49) ↑ ↓ Abnormal: Negative pressure	Normal: Petrol engine model 1.42 – 1.83 (14.2 – 18.3) (202 – 260) Diesel engine model 1.37 – 1.69 (13.7 – 16.9) (202 – 248) ↑ ↓ Abnormal: 0.7 – 1.0 (7 – 10) (100 – 142)	During A/C operation, the low pressure side sometimes indicates negative pressure, and sometimes normal pressure. Also high pressure side reading fluctuates between the abnormal and normal pressure.	Expansion valve is frozen due to moisture in the system, and temporarily shuts off the refrigeration cycle.	Replace expansion valve. Replace receiver/dryer. Evacuate A/C system and recharge with fresh refrigerant.

Condition		Detail	Possible cause	Correction
Manifold gauge	MPa (kg/cm^2) (psi)			
Lo	Hi			
0.05 – 0.15 (0.5 – 1.5) (4.2 – 21.3)	0.7 – 1.0 (7 – 10) (100 – 142)	Both low and high pressure sides indicate low readings. Output air is slightly cold.	Insufficient refrigerant in system (Refrigerant leaking).	Using leak detector, check for leaks and repair as necessary. Recharge refrigerant to a specified amount. If the pressure reading is almost 0 when the manifold gauges are attached, check for any leaks, repair them, and evacuate the system.
0.4 – 0.6 (4 – 6) (56.9 – 85.3)		Pressure on low pressure side is high. Pressure on high pressure side is low. Both pressure becoming equal right after A/C is turned OFF.	Internal leak in compressor.	Inspect compressor and repair or replace as necessary.
0.40 – 0.45 (4.0 – 4.5) (57 – 64)	2.0 – 2.5 (20 – 25) (285 – 355)	High pressure reading on both low and high pressure sides.	Overcharged A/C system. Faulty condenser cooling operation. Faulty radiator cooling fan operation.	Adjust refrigerant to specified amount. Clean condenser. Inspect and repair radiator cooling fan.
		High pressure reading on both low and high pressure sides. Low pressure side tubing is not cold when touched.	Presence of air in A/C system (Improperly evacuated).	Replace receiver/dryer. Inspect quantity of compressor oil and presence of contaminants in oil. Evacuate system and recharge with fresh refrigerant.
0.45 – 0.55 (4.5 – 5.5) (64 – 78)		High pressure reading on both low and high pressure sides. 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 Inspection at ECM

S7N20A7214004

“Precautions of ECM Circuit Inspection: M13A / M15A / M16A in Section 1A”

Voltage Check

ECM and its circuits can be checked by measuring voltage with special tool connected.

⚠ CAUTION

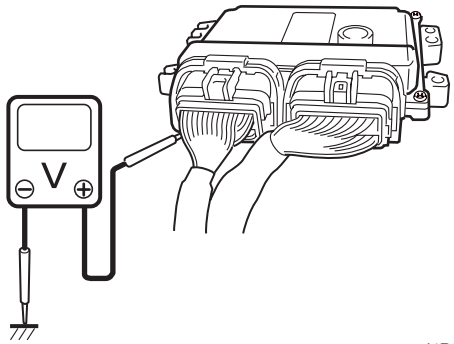
- **ECM connectors are waterproofed. Each terminal of the ECM connectors is sealed up with the grommet. Therefore, do not measure circuit voltage and resistance by inserting the tester’s probe into the sealed terminal at the harness side. Or, ECM and its circuits may be damaged by water.**
- **ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from ECM.**

1) Remove ECM from its bracket referring to “Engine Control Module (ECM) Removal and Installation: M13A / M15A / M16A in Section 1C”.
2) Connect special tool between ECM and ECM connectors securely.

3) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that the battery voltage is 11 V or more when ignition switch is ON position.



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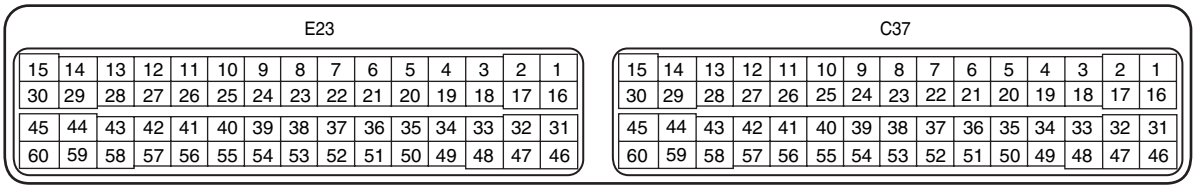
Terminal arrangement of ECM coupler (Viewed from harness side)



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ECM Voltage Values Table for Relation of A/C Control

Terminal	Wire Color	Circuit	Normal Value	Condition
C37-14	GRY/RED	Output of 5 V power source	4.5 – 5.5 V	Ignition switch turned ON
C37-15	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.
C37-24	LT GRN	Engine coolant temp. (ECT) sensor signal	3.3 – 3.8 V	Ignition switch turned ON, ECT at 0 °C (32 °F)
			1.38 – 1.72 V	Ignition switch turned ON, ECT at 50 °C (122 °F)
C37-30	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.
C37-55	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
C37-58	BLK/ORN	Ground for ECM	Below 0.3 V	Ignition switch turned ON
E23-1	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON
E23-3	RED	CAN (high) communication line (active high signal) for BCM and combination meter	Refer to “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”.	
E23-16	BLK/RED	Main power supply	10 – 14 V	Ignition switch turned ON
E23-18	WHT	CAN (low) communication line (active low signal) for BCM and combination meter	Refer to “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”.	
E23-19	BLU/WHT	Electric load signal for blower motor	10 – 14 V	Ignition switch turned ON, blower fan selector at OFF position
			0 – 2 V	Ignition switch turned ON, blower fan selector at 2nd speed position or more
E23-31	BLK	Ground for ECM	Below 0.3 V	Ignition switch turned ON.

Terminal	Wire Color	Circuit	Normal Value	Condition
E23-46	LT GRN	Radiator fan relay No.1 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 95 °C (203 ° F), or A/C refrigerant pressure: below 600 kPa (87 psi).
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 97.5 °C (207.5 °F) or higher, or A/C refrigerant pressure: 1100 kPa (159.5 psi) or higher.
E23-47	GRY	A/C compressor relay output	10 – 14 V	Engine running, A/C request signal high input
			0 – 1 V	Engine running, A/C request signal low input
E23-48	GRN	Radiator fan relay No.2 and No.3 output	10 – 14 V	Ignition switch turned ON, engine coolant temp.: below 100 °C (212 °F), or A/C refrigerant pressure: below 1200 kPa (174 psi).
			0 – 2 V	Ignition switch turned ON, engine coolant temp.: 102.5 °C (216.5 °F) or higher, or A/C refrigerant pressure: 1500 kPa (217.5 psi) or higher.
E23-54	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
E23-55	RED	A/C refrigerant pressure sensor signal	1.46 – 1.71 V	Engine running, A/C refrigerant pressure at 0.8 MPa (8.0 kg/cm^2)(A/C refrigerant pressure measured by manifold gauge)
			2.55 – 2.80 V	Engine running, A/C refrigerant pressure at 1.6 MPa (16.0 kg/cm^2)(A/C refrigerant pressure measured by manifold gauge)
E23-57	WHT/BLK	Evaporator thermistor (evaporator temperature sensor) signal	3.45 – 3.65 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 0 °C (32 °F)
			2.55 – 2.85 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 15 °C (59 °F)
			1.7 – 2.1 V	Ignition switch turned ON, evaporator thermistor (evaporator temperature sensor) at 30 °C (86 °F)
E23-60	BRN/WHT	Main power supply relay output	10 – 14 V	Ignition switch turned OFF
			0 – 2 V	Ignition switch turned ON

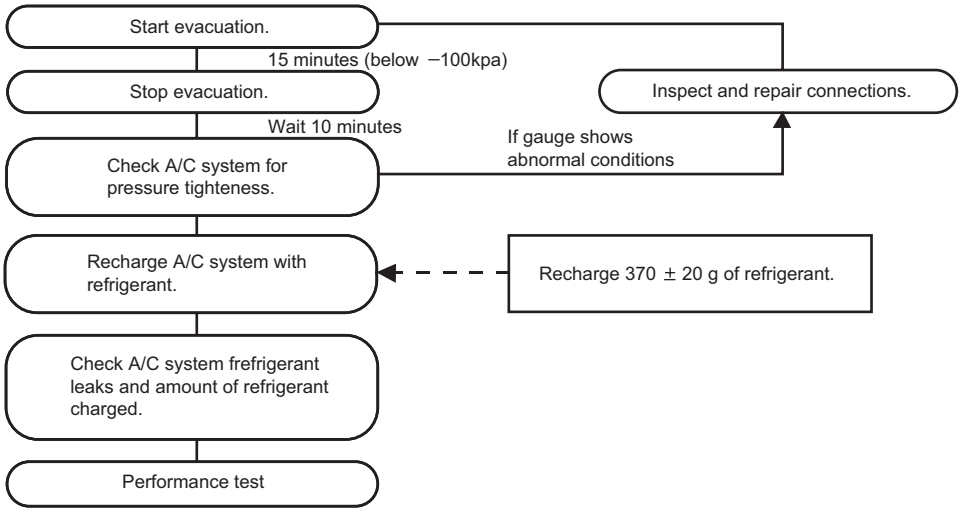
Repair Instructions

Operation Procedure for Refrigerant Charge

S7N20A7216001

⚠ WARNING

- **Your eyes should not be exposed to refrigerant (liquid).**
  Any liquid HFC-134a (R-134a) escaping by accident shows a temperature as low as approximately – 6 °C (21.2 °F) below freezing point. Should liquid HFC-134a (R-134a) is exposed to your eyes, it may cause a serious injury. To protect your eyes from such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) is exposed to your eyes, consult a doctor immediately.
  - **Do not use your hand to rub the affected eye(s). Instead, use fresh cold water to splash it over the affected area to gradually raise temperature of such area above freezing point.**
  - **Obtain proper treatment as soon as possible from a doctor or eye specialist.**
- **Should the liquid refrigerant HFC-134a (R-134a) is exposed to your skin, the affected area should be treated in the same manner as when skin is frostbitten or frozen.**
- **Do not handle refrigerant near any place where welding or steam cleaning is performed.**
- **Refrigerant should be kept in a cold and dark place. It should never be stored in any place where temperature is high, e.g. where exposed to direct sun light, close to fire or inside vehicle (including trunk room).**
- **Avoid breathing fume produced when HFC-134a (R-134a) is burned. Such fume may be hazardous to your health.**



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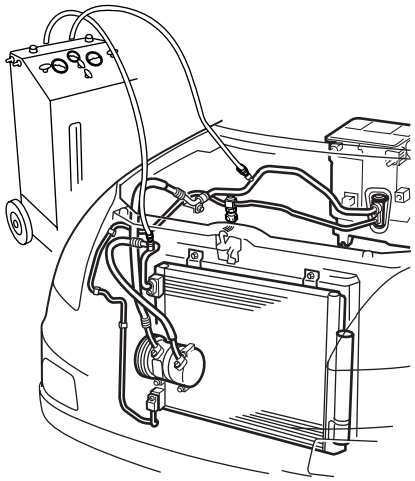
Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment because discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

NOTE

- **After recovering refrigerant from system, the amount of removed compressor oil must be measured for replenishing compressor oil.**
- **When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.**



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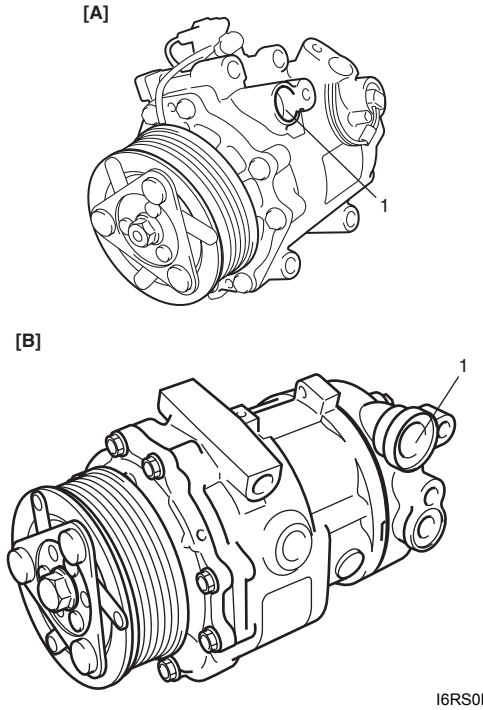
Replenishing Compressor Oil
It is necessary to replenish specified amount of compressor oil to compressor from compressor suction side hole (1) before evacuating and charging refrigerant.



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[A]: Petrol engine model
[B]: Diesel engine model

When charging refrigerant only
When charging refrigerant without replacing any component, replenish the same amount of measured oil when recovering refrigerant (if not measure, replenish 30 cm^3 (30 cc) oil).

When replacing compressor

⚠ CAUTION

Be sure to use specified compressor oil or an equivalent compressor oil.

Compressor oil is sealed in each new compressor by the amount required for A/C system. Therefore, when using a new compressor, drain the calculated amount of oil from it.
"C" = "A" – "B"
"C": Amount of oil to be drained
"A": Amount of oil in a new compressor
"B": Amount of oil in removed compressor

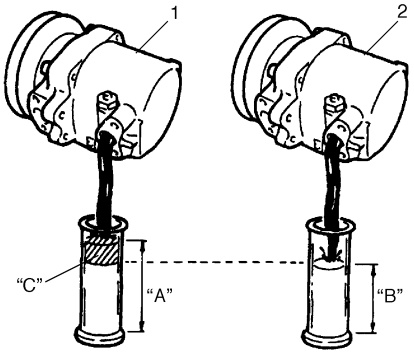
NOTE

Compressor assembly supplied from factory is filled up with the following amount of oil.

Petrol engine model

: Compressor oil 99000–99095–00A (MITSUBISHI S10X)

Oil amount in compressor
50 ± 10 cm^3 (50 ± 10 cc, 3.05 ± 0.61 in^3)



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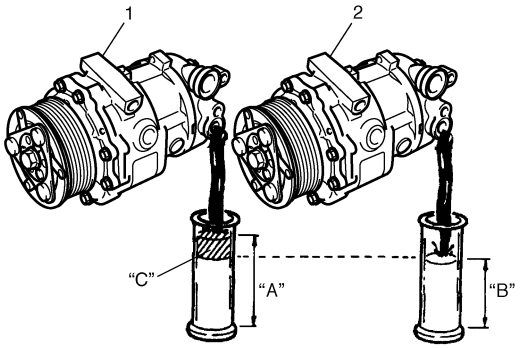
1. New compressor
2. Removed compressor

Diesel engine model

: Compressor oil 99000–990C5–00A (Compressor oil (SP10))

Oil amount in compressor
100 cm^3 (100 cc, 6.1 in^3)



I5RS0B720006-01

1. New compressor
2. Removed compressor

When replacing other parts
Replenish the following amount of oil to compressor.

Petrol engine model

Amount of compressor oil to be replenished
Evaporator: 15 cm^3 (15 cc, 0.92 in^3)
Condenser: 10 cm^3 (10 cc, 0.61 in^3)
Receiver/dryer: 10 cm^3 (10 cc, 0.61 in^3)
Hoses: 5 cm^3 (5 cc, 0.31 in^3) each
Pipes: 5 cm^3 (5 cc, 0.31 in^3) each

Diesel engine model

Amount of compressor oil to be replenished
Evaporator: 25 cm^3 (25 cc, 1.53 in^3)
Condenser: 15 cm^3 (15 cc, 0.92 in^3)
Receiver/dryer: 20 cm^3 (20 cc, 1.22 in^3)
Hoses: 10 cm^3 (10 cc, 0.61 in^3) each
Pipes: 10 cm^3 (10 cc, 0.61 in^3) each

Evacuation

⚠ CAUTION

Do not evacuate before recovering refrigerant in A/C system.

NOTE

Once air conditioning system circuit is opened (exposed) to atmospheric air, system must be evacuated by using a vacuum pump. The A/C system should be attached with a manifold gauge set, and should be evacuated for approximately 15 minutes.

1) Connect high charging hose (1) and low charging hose (2) of manifold gauge set respectively as follows:
   High charging hose → High pressure charging valve (4) on condenser outlet pipe
   Low charging hose → Low pressure charging valve (5) on suction pipe

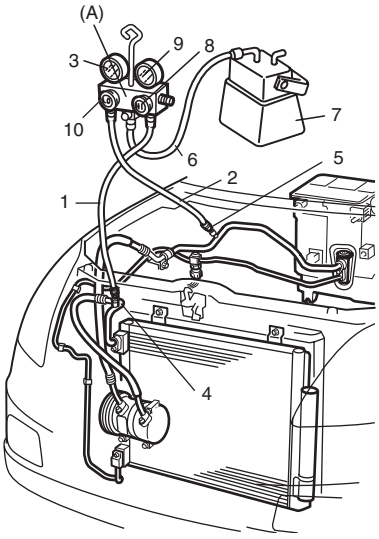
   Special tool
   (A): 09990–06020

2) Attach center charging hose (6) of manifold gauge set to vacuum pump (7).
3) Operate vacuum pump, and then open discharge side valve (Hi) (8) of manifold gauge set.
   If there is no blockage in the system, there will be an indication on high pressure gauge (9).
   In this case, open the other side valve (Lo) (10) of the set and repair the system.
4) Approximately 10 minutes later, low pressure gauge (3) should show a vacuum lower than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi) providing no leakage exists.

NOTE

- **If the system does not show a vacuum below –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi), close both valves, stop vacuum pump and watch movement of low pressure gauge.**
- **Increase in the gauge reading suggests existence 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) Evacuation should be carried out for a total of at least 15 minutes.
6) Continue evacuation until low pressure gauge indicates a vacuum less than –100 kPa (–1.0 kg/cm^2, –760 mmHg, –14.7 psi), and then close both valves.
7) 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 Leaks

After completing the evacuation, close manifold gauge high pressure valve and low pressure valve and wait 10 minutes. Verify that low pressure gauge reading has not changed.

⚠ CAUTION

If the gauge reading moves closer to "0", there is a leak somewhere. Inspect the tubing connections and make necessary corrections. And then, evacuate system once again and make sure that there are no leaks.

Charge

⚠ CAUTION

- **Because the sight glass is not used for this A/C system, do not perform an additional charge to the A/C system. To charge the proper amount of refrigerant, recover and evacuate the A/C system first. And then, charge the proper amount of refrigerant into the A/C system.**
- **Always charge refrigerant through low pressure side of A/C system after the initial charge is performed from the high pressure side with the engine stopped.**
- **Never charge refrigerant through high pressure side of A/C system with engine running.**
- **Do not charge refrigerant while compressor is hot.**
- **When installing tap valve to refrigerant container to make a hole there through, carefully follow directions given by manufacturer.**
- **A pressure gauge should always be used before and during refrigerant charge.**
- **The refrigerant container should be emptied of refrigerant when discarding it.**
- **The refrigerant container should not be heated up to 40 °C (104 °F) or over.**
- **Refrigerant container should not be reversed in direction during refrigerant charge. Reversing in direction causes liquid refrigerant to enter compressor, causing troubles, such as compression of liquid refrigerant and the like.**

NOTE

The air conditioning system contains HFC-134a (R-134a).
Described here is a method to charge the air conditioning system with refrigerant from the refrigerant service container.
When charging refrigerant recovered by using the refrigerant and recycling equipment (when recycling refrigerant), follow the procedure described in the equipment manufacturer's instruction manual.

The initial charge of the A/C system is performed through the high pressure side with the engine stopped. And next, this method must be followed by charging from the low pressure side with the engine running.

1) Check if hoses are routed properly after evacuating the system.
2) Connect low charging hose (1) and high charging hose (2) of the manifold gauge set in position. Then, open refrigerant container valve (4) to purge the charging line.

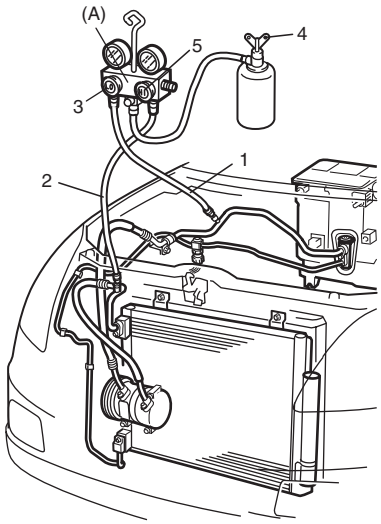
   Special tool
   (A): 09990–06020

3) Open the high pressure side valve (5) and charge refrigerant to system.
4) After a while, open the low pressure side valve (3) and close the high pressure side valve.

⚠ WARNING

Make sure that high pressure side valve is closed securely.

5) Start engine and keep engine speed at 1500 r/min, and then operate A/C system.
6) Charge A/C system with refrigerant in vapor state. At this time, refrigerant container should be held upright.



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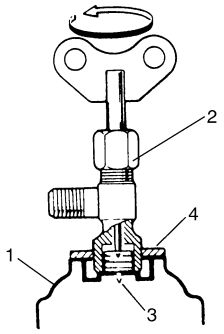
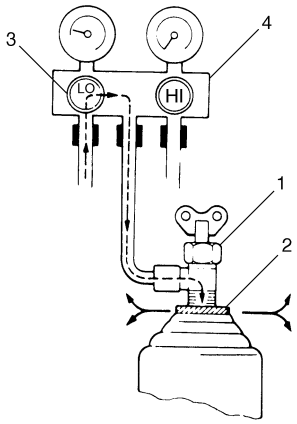
7) When refrigerant container (1) is emptied, use the following procedure to replace it with a new refrigerant container.
   a) Close low pressure valve.
   b) Replace empty container with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (2), use the following procedure for replacement.
      i) Retract needle (3) and remove refrigerant container tap valve by loosening its plate nut (4).
      ii) Install the refrigerant container tap valve to a new refrigerant container.



I2RH01720018-01

   c) Purge any air existing in center charging hose. When using refrigerant container tap valve, use the following procedure to purge air.
      i) Once 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.



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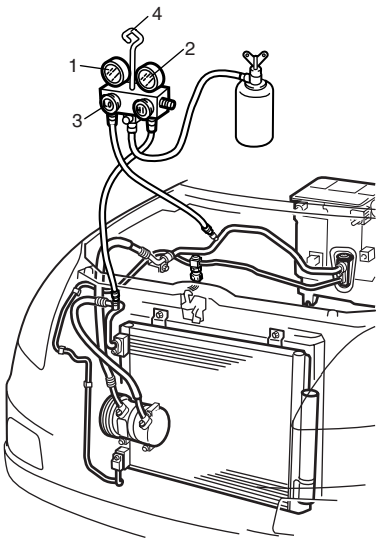
8) After the system has been charged with specified amount (370 ± 20 g) of refrigerant or when low pressure gauge (1) and high pressure gauge (2) have indicated the following specified value, close low pressure side valve (3) on manifold gauge set (4).

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	**Petrol engine model** **1420 – 1830 kPa** **14.2 – 18.3 kg/cm²** **202 – 260 psi** **Diesel engine model** **1370 – 1690 kPa** **13.7 – 16.9 kg/cm²** **195 – 240 psi**
Pressure on low pressure gauge	**Petrol engine model** **270 – 420 kPa** **2.7 – 4.2 kg/cm²** **38 – 59 psi** **Diesel engine model** **230 – 340 kPa** **2.3 – 3.4 kg/cm²** **33 – 48 psi**



I4RS0A720016-01

Removal of Manifold Gauge Set

⚠ WARNING

High pressure side is under high pressure. Therefore, be careful not to get injured especially on your eyes and skin.

For the A/C system charged with the specified amount of refrigerant, remove manifold gauge set as follows:

1) Close low pressure side valve of manifold gauge set. (The high pressure side valve is closed continuously during the process of charging.)
2) Close refrigerant container valve.
3) Stop engine.
4) Using shop rag, remove charging hoses from service valves. This operation must be performed quickly.
5) Put caps on service valves.

Check A/C System for Refrigerant Leaks

Whenever a refrigerant leak is suspected in the system or any service operation has been performed which may result in malfunction of lines and connections, it is advisable to check for leaks.
Common sense should be used during refrigerant leak 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.

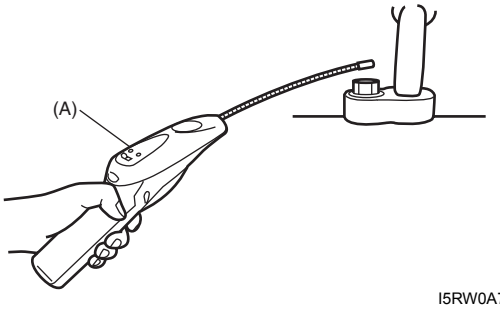
Liquid leak detector

⚠ WARNING

- **To prevent explosions and fires, make sure that there are no flammables in the vicinity.**
- **When the refrigerant exposed to fire, it turns into a poisonous gas (phosgene). Do not inhale this gas.**

There is a number of fittings and places throughout the A/C system where a liquid leak detector solution may be used to pinpoint refrigerant leaks.
By merely applying the solution to the area in question with a swab, such as attached to the cap of a vial, bubbles will form within seconds if there is a leak.
For confined areas, such as sections of the evaporator and condenser, an electronic (refrigerant) leak detector is more practical for determining leaks.

Special tool
(A): 09990–86012



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Condenser Assembly On-Vehicle Inspection

S7N20A7216002

Check the followings.

- Clog of condenser fins
  If any clog is found, condenser fins should be washed with water and should be dried 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

S7N20A7216003

⚠ CAUTION

Do not damage condenser fins. If condenser fin is bent, straighten it by using flat head screwdriver or pair of pliers.

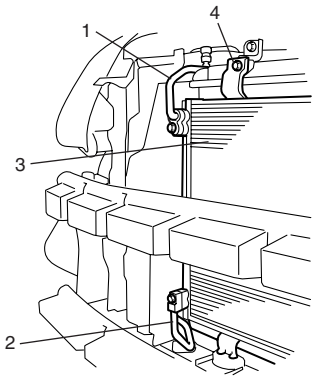
Removal

1) Recover refrigerant from A/C system referring to “Operation Procedure for Refrigerant Charge: Manual A/C”.

NOTE

The amount of removed compressor oil must be measured for replenishing compressor oil.

2) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Disconnect discharge hose (1) and liquid pipe (2) from condenser assembly (3).
4) Remove condenser assembly mounting bolts (4).



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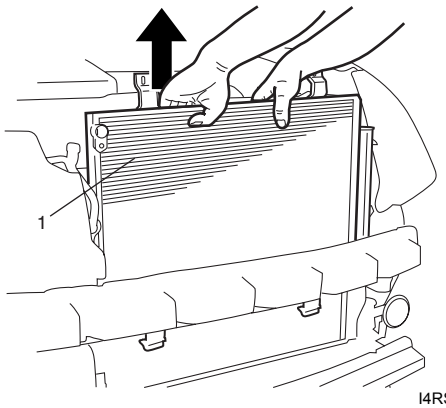
5) Remove condenser assembly (1) as shown.



I4RS0A720018-01

Installation

Reverse the removal procedure to install condenser noting the following instructions.

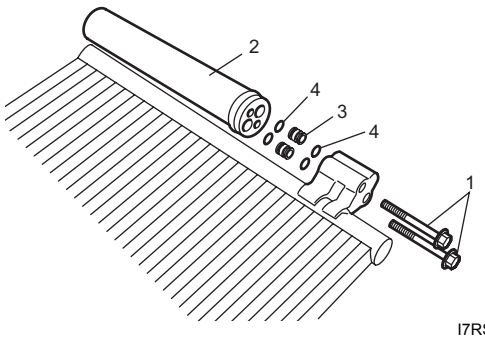
- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.

Receiver/Dryer Removal and Installation

S7N20A7216031

Removal

1) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
2) Remove receiver/dryer bolt (1), and then remove receiver/dryer (2) from condenser.
3) Remove joints (3) and O-rings (4).



I7RS0A721008-01

Installation

Reverse removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Use new receiver/dryer and O-ring.
- Do not remove plug from receiver unit just before installing it condenser
- Apply compressor oil to O-ring.

  Petrol engine model: Compressor oil 99000–99095–00A (MITSUBISHI S10X)
  Diesel engine model: Compressor oil 99000–990C5–00A (Compressor oil (SP10))

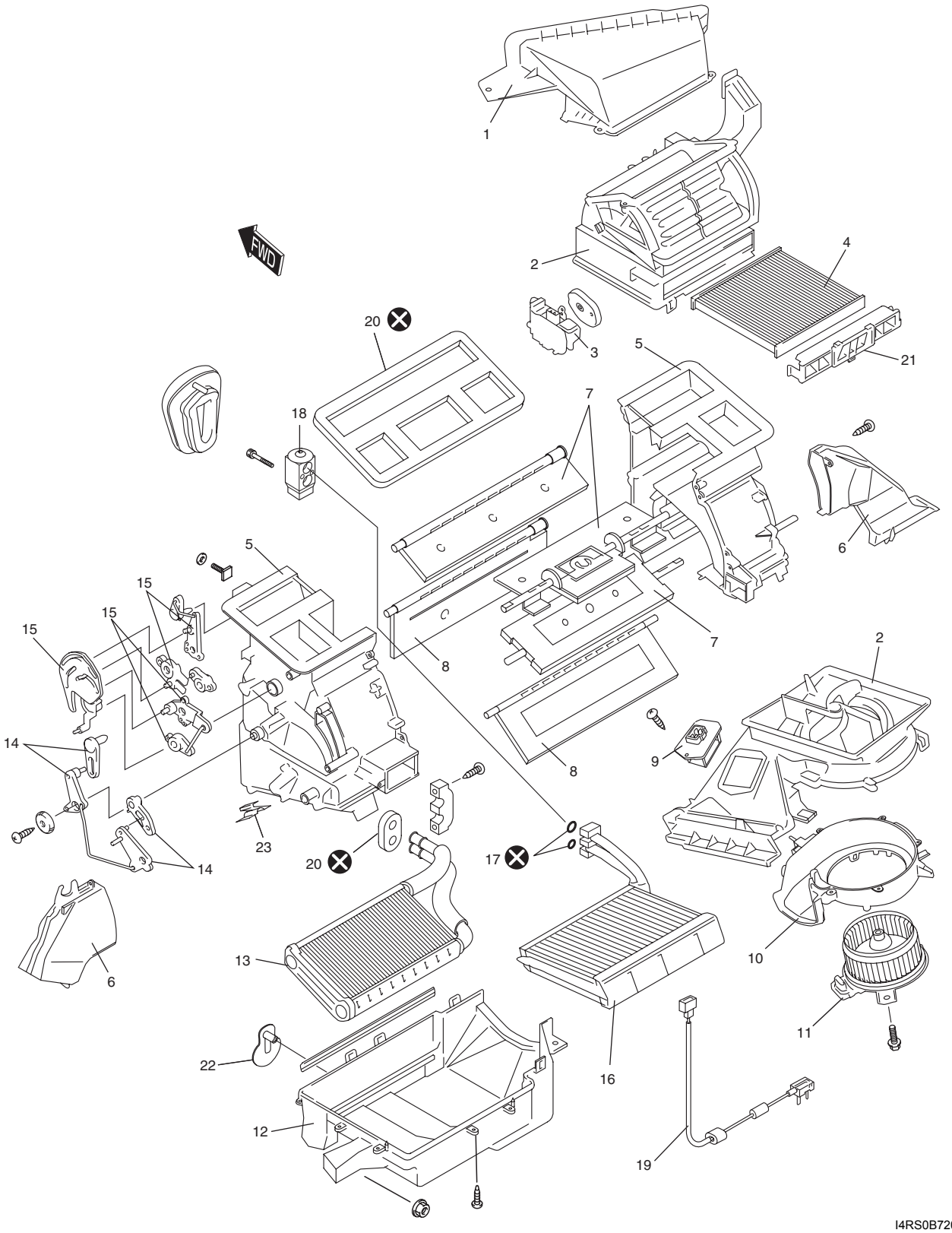
- Tighten receiver/dryer bolts to the specified torque.

  Tightening torque
  Receiver/dryer bolt: 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.

HVAC Unit Components

S7N20A7216005



I4RS0B720008-01

1. Fresh air inlet duct	7. Airflow control door assembly	13. Heater core	19. Evaporator thermistor (evaporator temperature sensor)
2. Blower upper case	8. Temperature control door assembly	14. Temperature control lever	20. Packing
3. Air intake control actuator	9. Blower motor resistor	15. Airflow control lever	21. Filter cover (if equipped)
4. Air filter (if equipped)	10. Blower lower case	16. Evaporator	22. Drain hose
5. Heater unit upper case	11. Blower motor	17. O-ring	23. Cable lock clamp

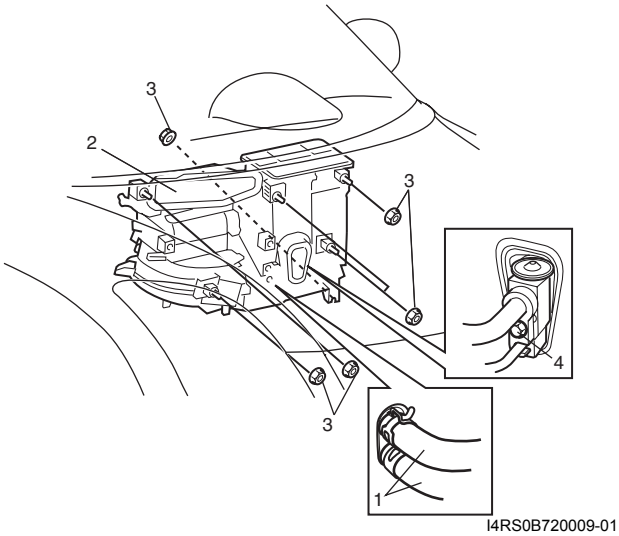
6. Foot duct	12. Heater unit lower case	18. Expansion valve	⊗ : Do not reuse.

HVAC Unit Removal and Installation

S7N20A7216006

Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Recover refrigerant from A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
4) Remove cowl top panel referring to “Cowl Top Components in Section 9K”.
5) Drain engine coolant, and then disconnect heater hoses (1) from HVAC unit (2).
6) Remove instrument panel from vehicle body referring to “Instrument Panel Removal and Installation in Section 9C”.
7) Loosen suction hose and liquid pipe bolt (4).
8) Remove nuts (3).
9) Remove HVAC unit from vehicle body.

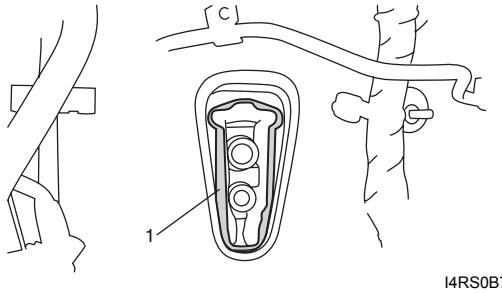


I4RS0B720009-01

Installation

Reverse removal procedure noting the following instructions.

- Replenish specified amount of compressor oil to compressor suction side referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Install the padding (1) to the installation hole uniformly.



I4RS0B720010-01

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Adjust control cables referring to “HVAC Control Unit Removal and Installation in Section 7A”.
- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Evaporator Inspection

S7N20A7216007

Check the followings.

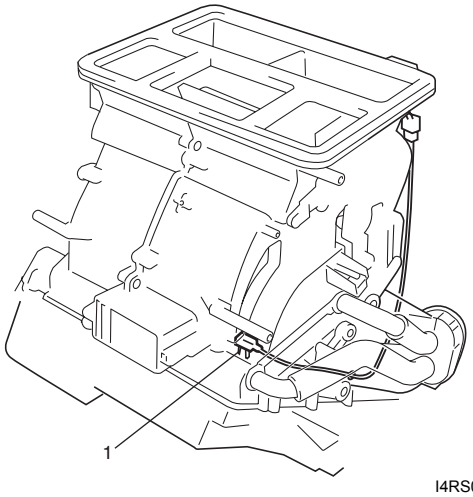
- Clog of A/C evaporator fins.
  If any clogs are found, A/C evaporator fins should be washed with water, and then should be dried with compressed air.
- A/C evaporator fins for leakage and breakage.
  If any defects are found, repair or replace A/C evaporator.
- A/C evaporator fittings for leakage.
  If any defects are found, repair or replace A/C evaporator.

Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation

S7N20A7216008

Removal

1) Disconnect negative (–) cable from battery.
2) Remove HVAC unit from vehicle body referring to "HVAC Unit Removal and Installation: Manual A/C".
3) Remove evaporator thermistor (evaporator temperature sensor) (1) from evaporator by disassembling HVAC unit.

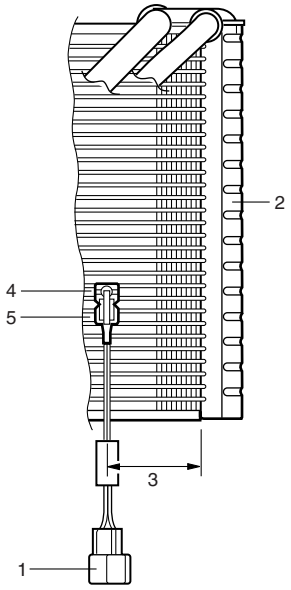


I4RS0B720011-01

Installation

Reverse the removal procedure noting the following instruction.

- Install evaporator thermistor (evaporator temperature sensor) (1) onto evaporator (2) as shown.



I4RS0A720053-01

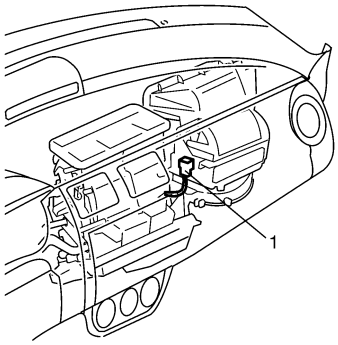
3.	50 ± 5 mm (2 ± 0.2 in.)
4.	Sensor part fixed to 10th fin from the bottom
5.	Holding part fixed to 8th fin from the bottom

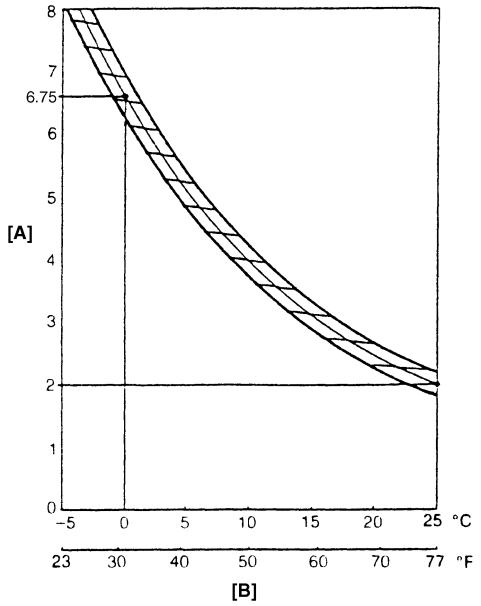
Evaporator Thermistor (Evaporator Temperature Sensor) Inspection

S7N20A7216009

Check resistance between terminals of evaporator thermistor (1).
If check results are as not specified, replace evaporator thermistor.

Evaporator thermistor resistance
0 °C (32 °F): 6.6 – 6.9 kΩ
25 °C (77 °F): 1.9 – 2.3 kΩ





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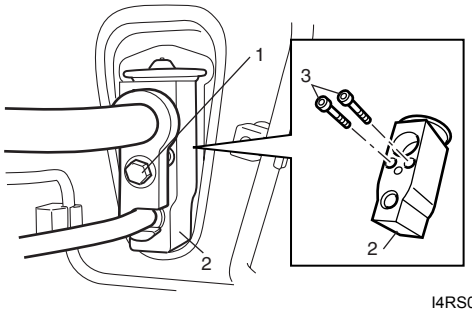
[A]:	Resistance (kΩ)
[B]:	Temperature

Expansion Valve Removal and Installation

S7N20A7216010

Removal

1) Recover refrigerant from the A/C system with recovery and recycling equipment referring to "Recovery" in "Operation Procedure for Refrigerant Charge: Manual A/C".
2) Loosen a bolt (1) and remove pipes from expansion valve (2).
3) Loosen bolts (3) and remove expansion valve.



I4RS0A720028-01

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: Manual A/C".

Tightening torque
Expansion valve mount bolt: 3.5 N·m (0.35 kgf-m, 2.5 lbf-ft)

Expansion Valve Inspection

S7N20A7216011

Refer to "A/C System Performance Inspection: Manual A/C".

A/C Refrigerant Pressure Sensor and Its Circuit Inspection

S7N20A7216012

1) Disconnect A/C refrigerant pressure sensor connector.
2) Turn ignition switch to ON position.
3) Check if voltage between "RED" wire terminal and "ORN" wire terminal of A/C refrigerant pressure sensor connector is 4.75 V to 5.25 V.
   If not, check A/C refrigerant pressure sensor circuit.
4) Connect A/C refrigerant pressure sensor connector with ignition switch turned OFF.
5) Connect manifold gauge set to the charging valves.
6) Check A/C refrigerant pressure sensor voltage of ECM connector referring to "A/C System Inspection at ECM: Manual A/C".
   If voltage is not as specified below, replace A/C refrigerant pressure sensor.

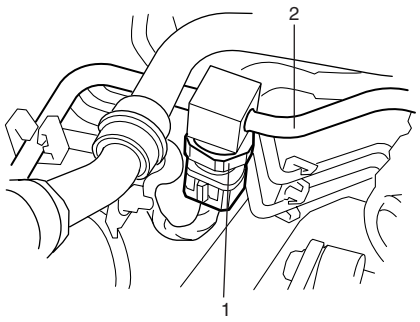
A/C refrigerant pressure sensor voltage specifications (A/C refrigerant pressure measured by manifold gauge)
0.8 MPa (8.0 kg/cm^2, 116 psi): 1.46 – 1.71 V
1.4 MPa (14 kg/cm^2, 203 psi): 2.28 – 2.53 V
1.6 MPa (16 kg/cm^2, 232 psi): 2.55 – 2.80 V
1.8 MPa (18 kg/cm^2, 261 psi): 2.82 – 3.03 V

A/C Refrigerant Pressure Sensor Removal and Installation

S7N20A7216013

Removal

1) Recover refrigerant from the A/C system with the recovery and recycling equipment referring to "Recovery" in "Operation Procedure for Refrigerant Charge: Manual A/C".
2) Disconnect negative (–) cable from battery.
3) Disconnect A/C refrigerant pressure sensor connector.
4) Remove A/C refrigerant pressure sensor (1) from liquid pipe (2).



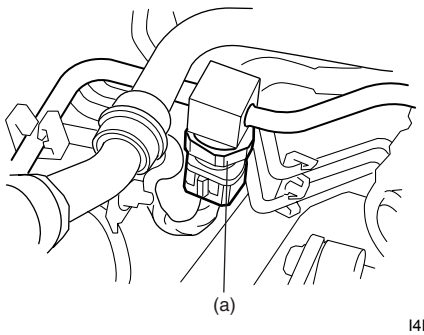
I4RS0A720029-01

Installation

Reverse removal procedure noting the following instructions.

- Apply compressor oil to O-ring of A/C refrigerant pressure sensor.
- Tighten A/C refrigerant pressure sensor to specified torque.

Tightening torque
A/C refrigerant pressure sensor (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I4RS0A720031-01

- Evacuate and charge the A/C system referring to "Evacuation" and "Charge" in "Operation Procedure for Refrigerant Charge: Manual A/C".

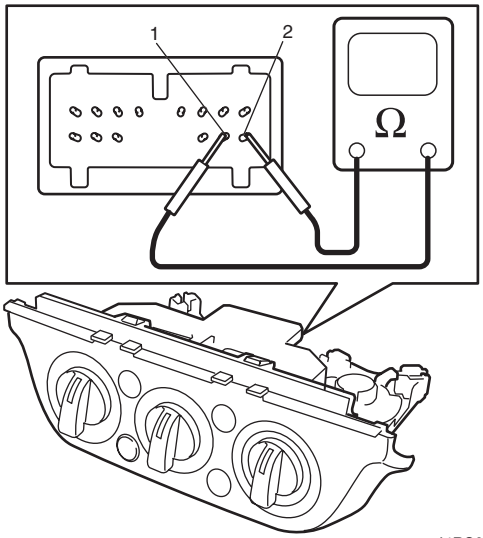
A/C Switch Inspection

S7N20A7216014

"HVAC Control Unit Removal and Installation in Section 7A"

- Check that there is continuity between terminal (1) and terminal (2) when A/C switch is at ON position.
- Check that there is no continuity between terminal (1) and terminal (2) when A/C switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.



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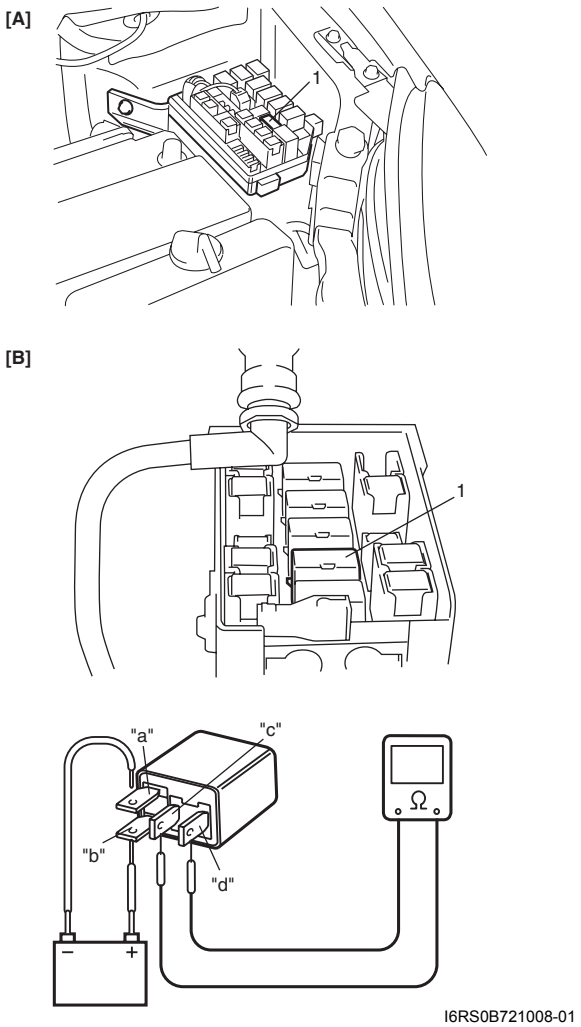
Compressor Relay Inspection

S7N20A7216015

1) Disconnect negative (–) cable from battery.
2) Remove compressor relay (1) from main fuse box.
3) Check that there is no continuity between terminal "c" and "d". If there is continuity, replace relay.
4) Connect battery positive (+) terminal to terminal "b" of relay and battery negative (–) terminal to terminal "a" of relay, and then check continuity between terminal "c" and "d". If there is no continuity, replace relay.



I6RS0B721008-01

[A]:	Petrol engine model
[B]:	Diesel engine model

Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model)

S7N20A7216016

Inspection

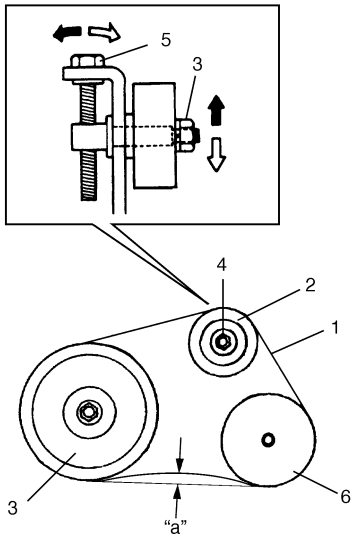
- Check compressor drive belt (1) for wear, crack, deformation and cleanliness. If any defect is found, replace the belt with new one referring to "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C".
- Check compressor drive belt tension by measuring how much it deflects when pushed intermediate point between magnet clutch pulley (6) 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 – 8mm (0.28 – 0.31 in.)

New compressor drive belt tension "a"
: 6 – 7mm (0.24 – 0.28 in.)

Adjustment

1) Loosen tension pulley nut (4).
2) Adjust belt tension by tighten or loosen tension pulley adjusting bolt (5).
3) Tighten tension pulley nut.
4) Rotate the crankshaft pulley 360°, and then recheck belt tension.



I4RS0A720033-01

2. Tension pulley

Compressor Drive Belt Inspection and Adjustment (Diesel Engine Model)

S7N20A7216017

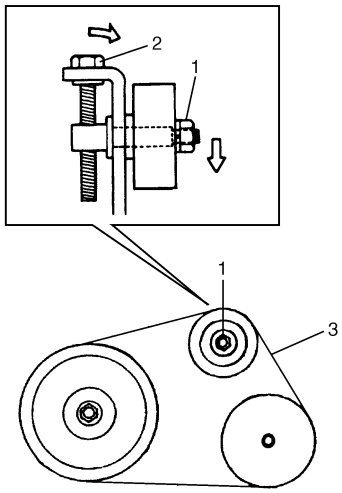
Refer to "Accessory Drive Belt Removal and Installation: D13A / Z13DTJ in Section 1F".

Compressor Drive Belt Removal and Installation (Petrol Engine Model)

S7N20A7216018

Removal

1) Loosen tension pulley nut (1).
2) Loosen belt tension by loosening tension pulley adjusting bolt (2).
3) Remove compressor drive belt (3).



I4RS0A720034-01

Installation

Reverse removal procedure noting the following instruction.

- Adjust belt tension referring to "Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C".

Compressor Drive Belt Removal and Installation (Diesel Engine Model)

S7N20A7216019

Refer to "Accessory Drive Belt Tensioner Removal and Installation: D13A / Z13DTJ in Section 1F".

Compressor Assembly Removal and Installation (Petrol Engine Model)

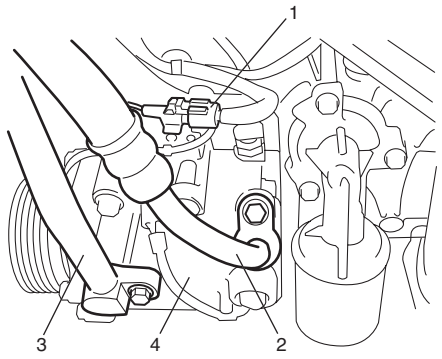
S7N20A7216020

Removal

1) Run engine at idle speed with A/C ON for 10 minutes.
2) Stop the engine.
3) Disconnect negative (-) cable from battery.
4) Recover refrigerant from the A/C system with recovery and recycling equipment referring to "Recovery" in "Operation Procedure for Refrigerant Charge: Manual A/C".
5) Remove compressor drive belt referring to "Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C".
6) Remove right side engine under cover.
7) Disconnect magnet clutch lead wire coupler (1).
8) Disconnect discharge hose (2) and suction hose (3) from compressor (4).

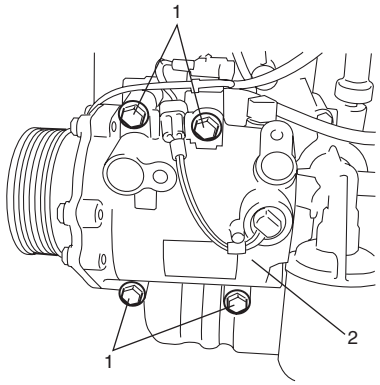
NOTE

Cap open fittings immediately to keep moisture out of the system.



I4RS0B720015-01

9) Remove compressor mounting bolts (1), and then remove compressor (2) from its bracket.



I4RS0B720016-01

Installation

Reverse removal procedure noting the following instructions.

- If compressor is replaced, pour new compressor oil referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Adjust drive belt tension referring to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C”.

Compressor Assembly Removal and Installation (Diesel Engine Model)

S7N20A7216021

NOTE

Never disassemble compressor assembly. Disassembly will spoil its original performance. If faulty condition is found, replace compressor assembly.

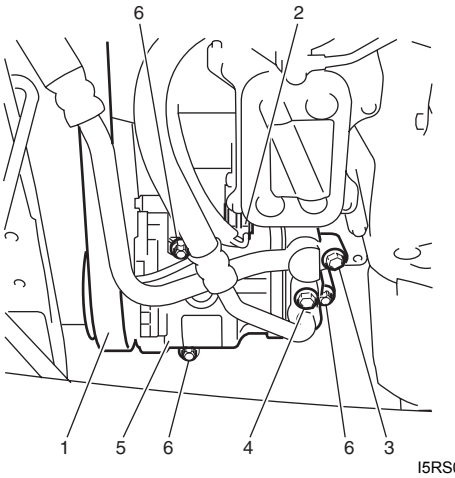
Removal

1) Run engine at idle speed with A/C ON for 10 minutes.
2) Stop the engine.
3) Disconnect negative (–) cable from battery.
4) Recover refrigerant from the A/C system with recovery and recycling equipment referring to “Recovery” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
5) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
6) Remove intercooler referring to “Intercooler Removal and Installation: D13A / Z13DTJ in Section 1D”.
7) Remove compressor drive belt (1) referring to “Compressor Drive Belt Removal and Installation (Diesel Engine Model): Manual A/C”.
8) Remove right side engine under cover.
9) Disconnect magnet clutch lead wire coupler (2).
10) Disconnect discharge hose (4) and suction hose (3) from compressor (5).

NOTE

Cap open fittings immediately to keep moisture out of the system.

11) Remove compressor mounting bolts (6), and then remove compressor (5) from its bracket.



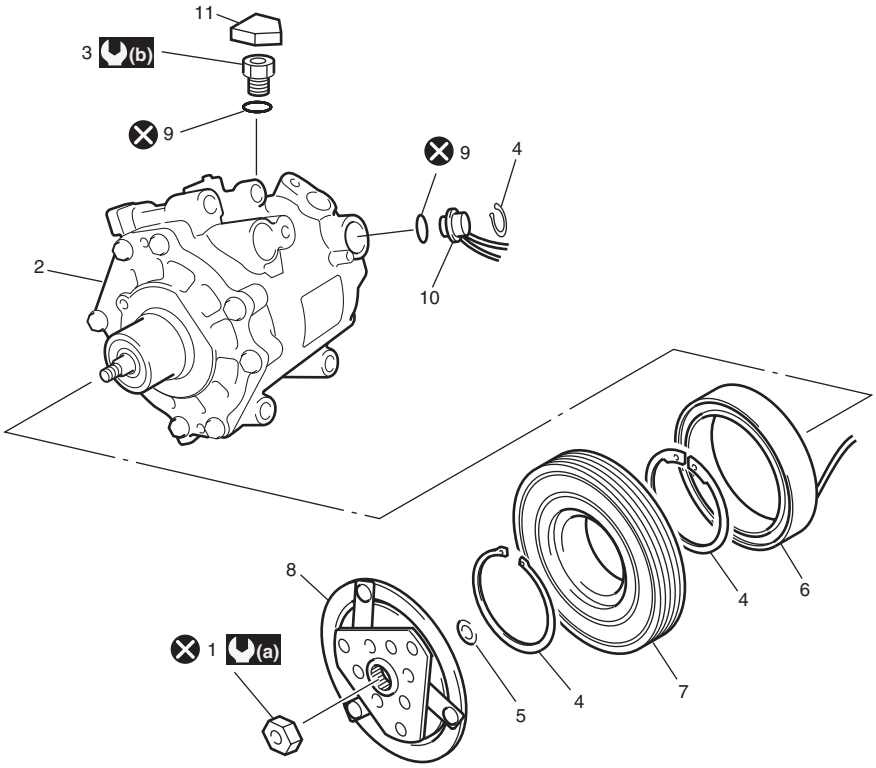
I5RS0B720011-01

Installation
Reverse removal procedure noting the following instructions.

- If compressor is replaced, pour new compressor oil referring to “Replenishing Compressor Oil” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.
- Adjust drive belt tension referring to “Compressor Drive Belt Inspection and Adjustment (Diesel Engine Model): Manual A/C”.

Compressor Assembly Components

S7N20A7216022



I4RS0B720017-01

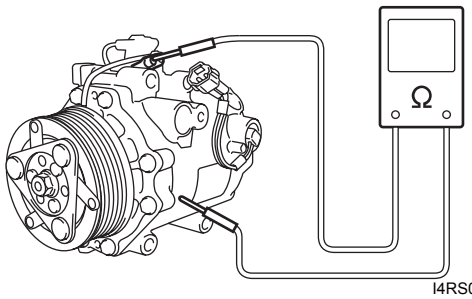
1. Armature plate nut	5. Shim	9. O-ring	: Do not reuse.
2. Compressor	6. Magnet clutch coil	10. Thermal switch	(a) : 16 N·m (1.6 kgf-m, 11.5 lbf-ft)
3. Relief valve	7. Magnet clutch pulley	11. Cap	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
4. Circlip	8. Armature plate		

Magnet Clutch Inspection (Petrol Engine Model)

S7N20A7216023

- 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 for resistance at 20 °C (68 °F). If the measured resistance does out of specification, replace magnet clutch assembly.

Magnet clutch coil resistance
Standard: 4.0 – 4.4 Ω



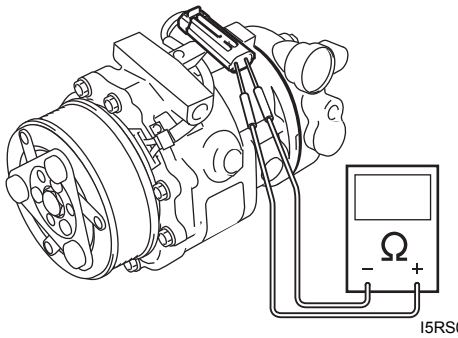
I4RS0B720018-01

Magnet Clutch Inspection (Diesel Engine Model)

S7N20A7216024

- 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 for resistance at 20 °C (68 °F). If the measured resistance does out of specification, replace compressor assembly.

Magnet clutch coil resistance
Standard: Approximately 3.7 Ω



I5RS0B720012-01

Magnet Clutch Removal and Installation

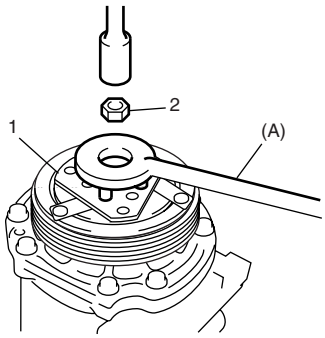
S7N20A7216025

Removal

1) Remove compressor from vehicle referring to "Compressor Assembly Removal and Installation (Petrol Engine Model): Manual A/C".
2) Fix armature plate (1) with special tool and remove armature plate nut (2).

Special tool
(A): 09920–55810

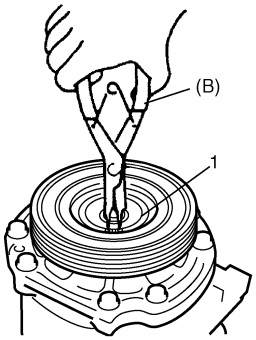
3) Remove armature plate (1).



I3RM0A720042-01

4) Remove shims from shaft.
5) Remove circlip (1) using special tool.

Special tool
(B): 09900–06107

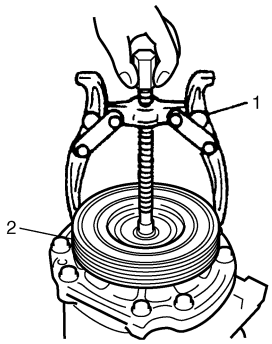


I4RS0B720019-01

6) Remove magnet clutch pulley (2).

NOTE

- **If it is difficult to remove magnet clutch pulley by hand, use puller (1).**
- **Do not damage magnet clutch pulley when using puller.**

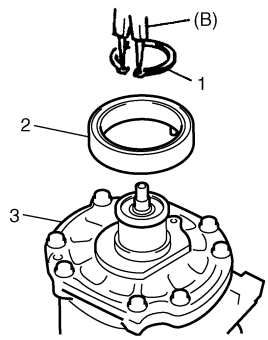


I3RM0A720044-01

7) Remove magnet clutch lead wire clamp and disconnect magnet clutch lead wire coupler.
8) Remove circlip (1) by using special tool.

Special tool
(B): 09900–06107

9) Remove magnet clutch coil (2) from compressor (3).

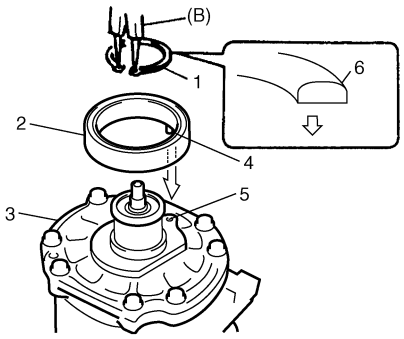


I3RM0A720045-01

Installation

1) Install magnet clutch coil (2) fitting protrusion (4) of magnet clutch coil onto hole (5) of compressor (3).
2) Install circlip (1) directing chamfer side (6) upward.

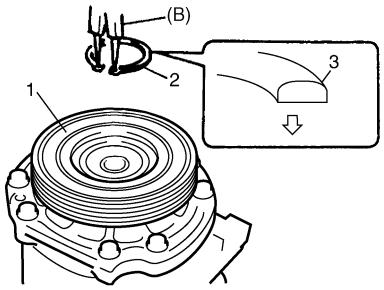
Special tool
(B): 09900–06107



I3RM0A720046-01

3) Install magnet clutch lead wire clamp and connect magnet clutch lead wire coupler.
4) Install magnet clutch pulley (1).
5) Install circlip (2) directing chamfer side (3) upward.

Special tool
(B): 09900–06107

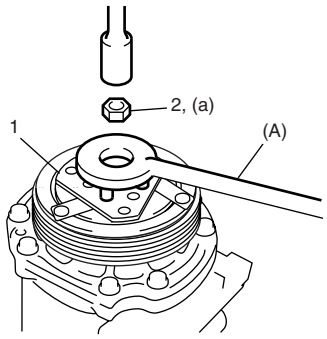


I4RS0B720020-01

6) Tighten new armature plate nut to specified torque.

Tightening torque
Armature plate nut (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)

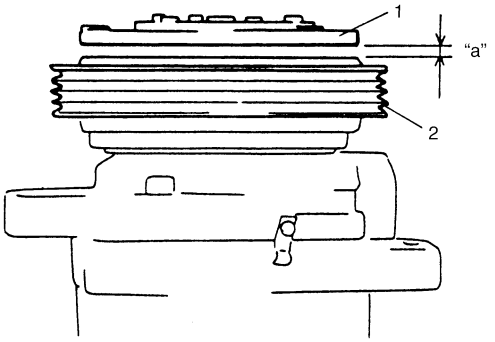
Special tool
(A): 09920–55810



I3RM0A720047-01

7) Check clearance between armature plate (1) and magnet clutch pulley.

Standard clearance between armature plate and magnet clutch pulley
"a": 0.25 – 0.50 mm (0.010 – 0.019 in.)



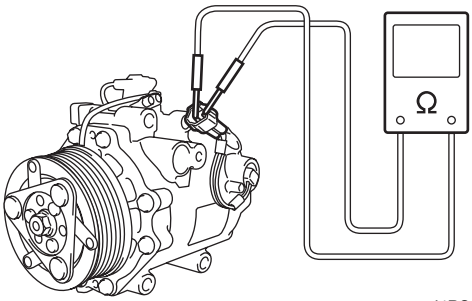
IYSQ01720079-01

Thermal Switch Inspection

S7N20A7216026

Measured thermal switch for resistance at 20 °C (68 °F)

Thermal switch resistance
Standard: 55 mΩ (DC 1.5 V, 100 mA)



I4RS0B720021-01

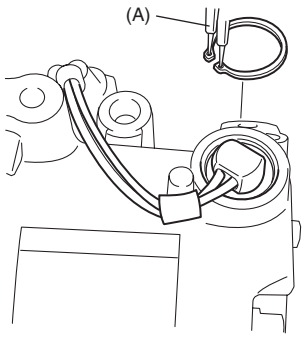
Thermal Switch Removal and Installation

S7N20A7216027

Removal

1) Remove compressor from engine referring to "Compressor Assembly Removal and Installation (Petrol Engine Model): Manual A/C".
2) Removal circlip using special tool.

Special tool
(A): 09900–06107



I4RS0B720022-01

3) Remove thermal switch and O-ring.

Installation
Reverse removal procedure noting the following instructions.

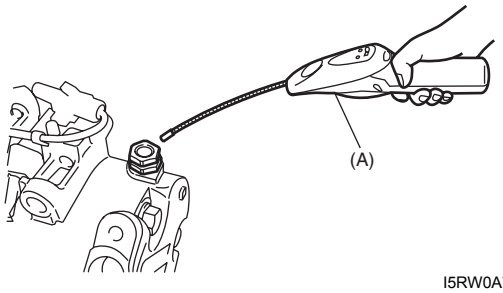
- Use new O-ring.
- Apply compressor oil to O-ring.
- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.

Relief Valve Inspection (Petrol Engine Model)

S7N20A7216028

By using special tool, check is there is refrigerant leakage.
If there is refrigerant leakage, replace the relief valve.

Special tool
(A): 09990–86012



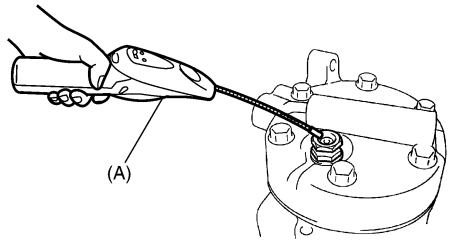
I5RW0A721055-01

Relief Valve Inspection (Diesel Engine Model)

S7N20A7216029

By using special tool, check if there is refrigerant leakage.
If there is refrigerant leakage, replace the compressor assembly.

Special tool
(A): 09990–86012



I6RS0B721009-01

Relief valve Removal and Installation

S7N20A7216030

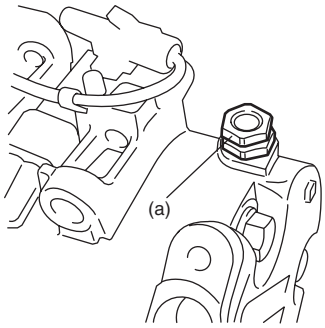
Removal

1) Remove compressor from vehicle referring to “Compressor Assembly Removal and Installation (Petrol Engine Model): Manual A/C”.
2) Remove cap, relief valve and O-ring.

Installation
Reverse removal procedure noting the following instructions.

- Use new O-ring.
- Apply compressor oil to O-ring.
- Tighten relive valve to the specified torque.

Tightening torque
Relief valve (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0B720024-01

- Evacuate and charge the A/C system referring to “Evacuation” and “Charge” in “Operation Procedure for Refrigerant Charge: Manual A/C”.

Specifications

Tightening Torque Specifications

S7N20A7217001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Receiver/dryer bolt	10	1.0	7.5	☞
Expansion valve mount bolt	3.5	0.35	2.5	☞
A/C refrigerant pressure sensor	11	1.1	8.0	☞
Armature plate nut	16	1.6	11.5	☞
Relief valve	10	1.0	7.5	☞

NOTE

The specified tightening torque is also described in the following.
“Compressor Assembly Components: Manual A/C”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A7218001

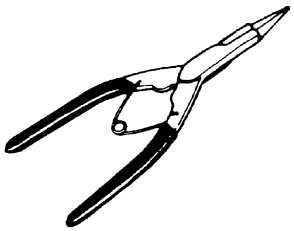
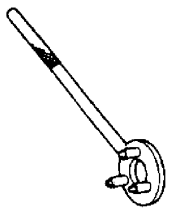
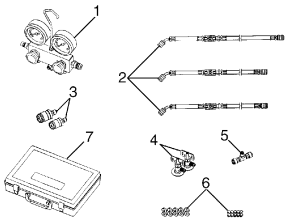
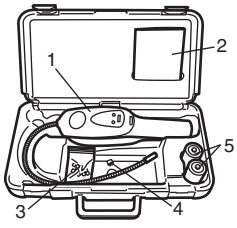
Material	SUZUKI recommended product or Specification		Note
Compressor oil	MITSUBISHI S10X	P/No.: 99000–99095–00A	☞ / ☞
	Compressor oil (SP10)	P/No.: 99000–990C5–00A	☞ / ☞

NOTE

Required service material is also described in the following.
“Precautions on Servicing A/C System: Manual A/C”

Special Tool

S7N20A7218002

09900–06107 Snap ring pliers (opening type) ☞ / ☞ / ☞ / ☞ / ☞		09920–55810 Armature plate spanner ☞ / ☞	
09990–06020 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☞ / ☞ / ☞		09990–86012 Gas leak detector This kit includes following items. 1. Gas leak detector, 2. Instruction manual, 3. Filter, 4. Sensor, 5. Dri-sell battery (size D)☞ / ☞ / ☞	

Auto A/C

Precautions

A/C System Caution

S7N20A7220001

Refer to “A/C System Caution: Manual A/C”.

Precautions in Diagnosing Trouble

S7N20A7220002

- Do not disconnect couplers from HVAC control module, battery cable from battery, HVAC control module ground wire harness from body or main fuse before confirming diagnostic information (diagnostic trouble code) stored in HVAC control module memory.
- Diagnostic information (diagnostic trouble code) stored in HVAC control module can be checked by display of HVAC control module. Also, it can be checked by using SUZUKI scan tool. Before checking diagnostic information (diagnostic trouble code), read this manual and operator's manual for SUZUKI scan tool to know how to read diagnostic information (diagnostic trouble code).
- When trouble is diagnosed using diagnostic information (diagnostic trouble code) on display of HVAC control module, keep in your mind that each diagnostic information (diagnostic trouble code) has priority, and only diagnostic information (diagnostic trouble code) which has the highest priority is indicated. Therefore, after troubleshooting the malfunction, make sure if there exists any other diagnostic information (diagnostic trouble code).
- Be sure to read “Precautions for Electrical Circuit Service in Section 00” before inspection.

Precautions on Servicing A/C System

S7N20A7220003

Refer to “Precautions on Servicing A/C System: Manual A/C”.

General Description

Auto A/C System Description

S7N20A7221001

The automatic type air conditioning system (auto A/C) is provided with the function to automatically control the inside air temperature, fan speed, air flow outlet direction and air intake position by HVAC control module in addition to functions of the manual type air conditioning system (manual A/C). Once the inside air temperature is set using the temperature selector, HVAC control module automatically controls the inside air temperature at the constant level at all times based on the inside air temperature, outside air temperature, amount of sunlight and engine coolant temperature detected respectively by the inside air temperature sensor, outside air temperature sensor, sunload sensor and ECT sensor. At this time, “FULL AUTO A/C” appears on the display of HVAC control module.
With the air intake selector pushed in the above state, it is possible to select any position of the air intake actuator. Then, “FULL AUTO A/C” on the display changes to “AUTO A/C”.
Refer to “Electronic Control System Location: Auto A/C”.

HVAC Control Module Operation Description

S7N20A7221002

Temperature Control

HVAC control module calculates the target temperature control door position based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor and controls the temperature control actuator so that the current position of the temperature control door matches its target position.

Fan Speed Control

HVAC control module calculates the target blower fan speed based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor, compares it with the current blower fan speed inputted from the blower motor controller to control the current blower fan speed to the target level.

Air Flow Outlet Control

HVAC control module calculates the target temperature control door position based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor. Using thus obtained target temperature control door position, it further calculates the target air flow control door position and controls the air flow control actuator so that the current air flow control door position becomes the target position.

Air Intake Position Control

HVAC control module determines the air intake position based on signals from the temperature selector, inside air temperature sensor, outside air temperature sensor and sunload sensor and controls the air intake actuator.

Refrigerant Type Identification

S7N20A7221003

Refer to “Refrigerant Type Identification: Manual A/C”.

Sub-Cool A/C System Description

S7N20A7221004

Refer to “Sub-Cool A/C System Description: Manual A/C”.

A/C Operation Description

S7N20A7221005

Refer to “A/C Operation Description: Manual A/C”.

On-Board Diagnostic System Description

S7N20A7221006

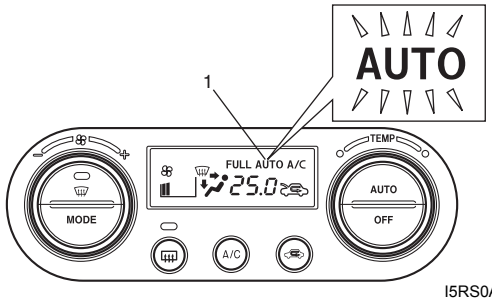
NOTE

The diagnostic information as diagnostic trouble code (DTC) can be known by using SUZUKI scan tool. For further details, refer to “DTC Check: Auto A/C”.

HVAC control module detects malfunctions, which may occur in the following area.

- Outside air temperature sensor
- Inside air temperature sensor
- Evaporator temperature sensor
- Sunload sensor
- ECT sensor
- Temperature control actuator of HVAC unit
- Air flow control actuator of HVAC unit
- A/C refrigerant pressure sensor
- HVAC control module
- VSS
- Serial Communication line
- CAN communication line

When HVAC control module detects malfunction, the “AUTO” indicator lamp (1) flashes to warn and the diagnostic trouble code (DTC) is stored in the memory of the module. When diagnosing trouble, the DTC can be checked according to “DTC Check: Auto A/C”.



I5RS0A722003-01

Schematic and Routing Diagram

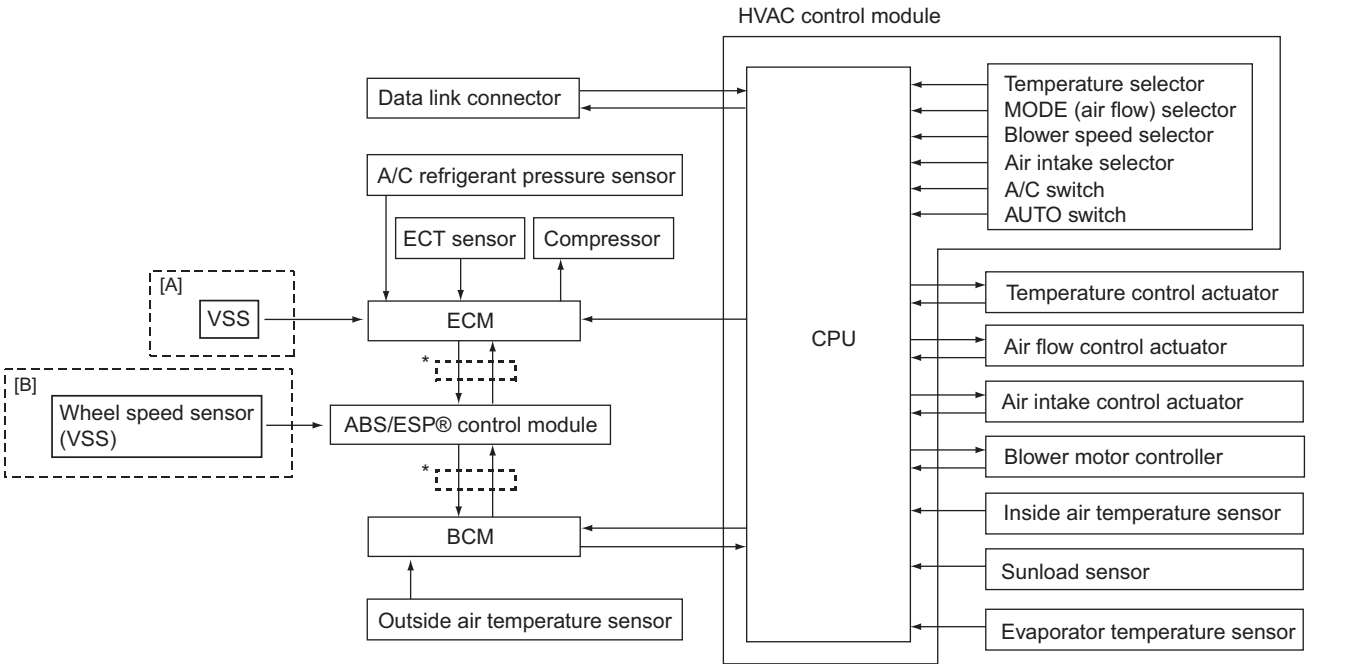
Air Flow Diagram of A/C System

S7N20A7222001

Refer to “Air Flow Diagram of A/C System: Manual A/C”.

Auto A/C Electronic Control Input / Output Diagram

S7N20A7222002

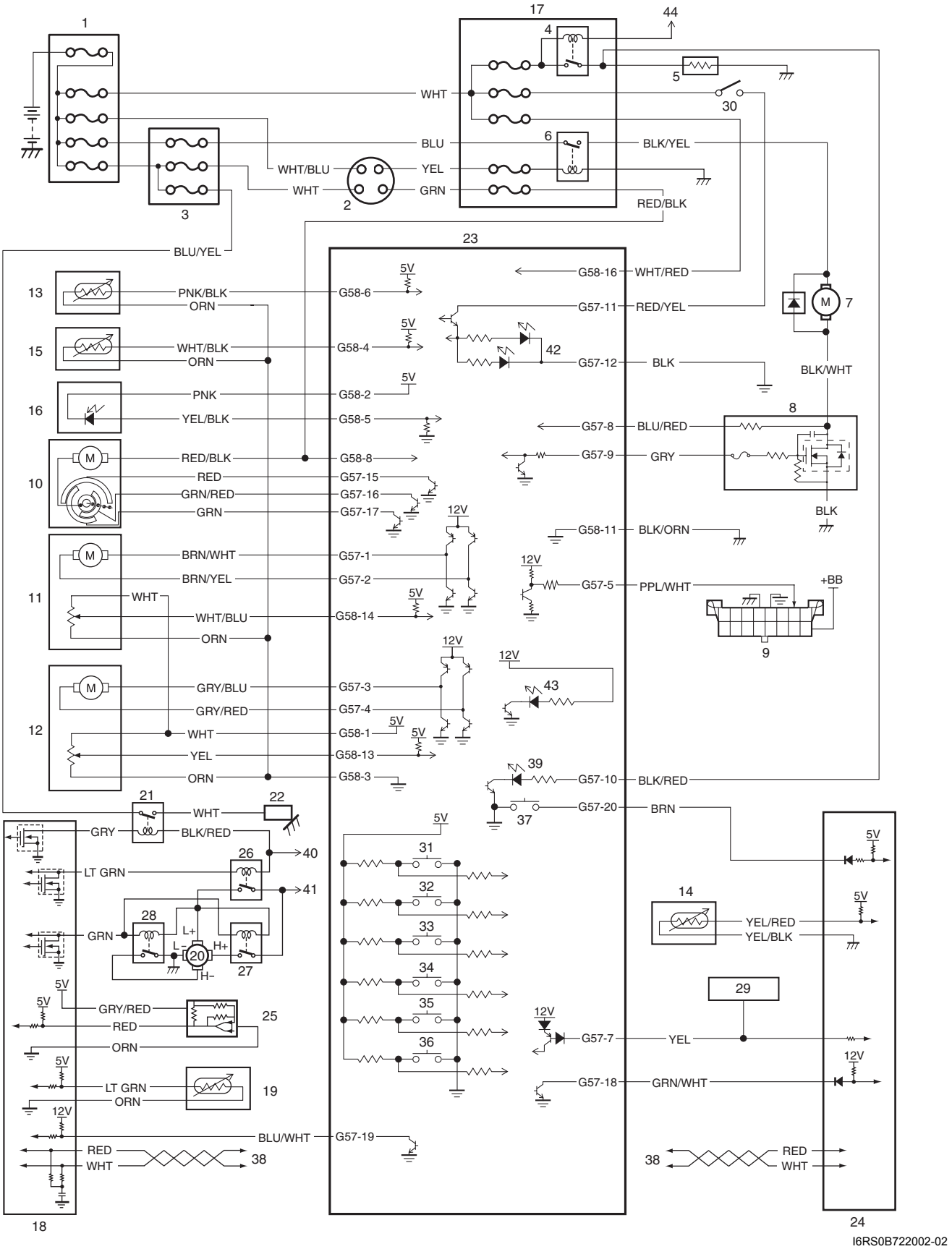


I7N20A722001-03

*:	CAN communication
[A]:	Automated manual transaxle model
[B]:	Other than automated manual transaxle model

A/C System Wiring Diagram

S7N20A7222003



I6RS0B722002-02

1. Main fuse box	12. Temperature control actuator	23. HVAC control module	34. Defroster switch
2. Ignition switch	13. Inside air temperature sensor	24. BCM	35. AUTO switch
3. Individual circuit fuse box No.1 box	14. Outside air temperature sensor	25. A/C refrigerant pressure sensor	36. OFF switch

4. Rear defogger relay	15. Evaporator temperature sensor	26. Radiator cooling fan relay No.1	37. Rear defogger switch
5. Rear defogger	16. Sunload sensor	27. Radiator cooling fan relay No.2	38. To ABS / ESP® control module
6. Blower motor relay	17. Junction block assembly	28. Radiator cooling fan relay No.3	39. Rear defogger indicator
7. Blower motor	18. ECM	29. Information display	40. To main relay
8. Blower motor controller	19. ECT sensor	30. Lighting switch	41. To main fuse
9. DLC	20. Radiator cooling fan motor	31. A/C switch	42. Back-light
10. Air intake actuator	21. Compressor relay	32. MODE (air flow) selector	43. Defroster indicator
11. Air flow control actuator	22. Compressor	33. Air intake selector	44. To BCM

Component Location

Major Components of A/C System

S7N20A7223001

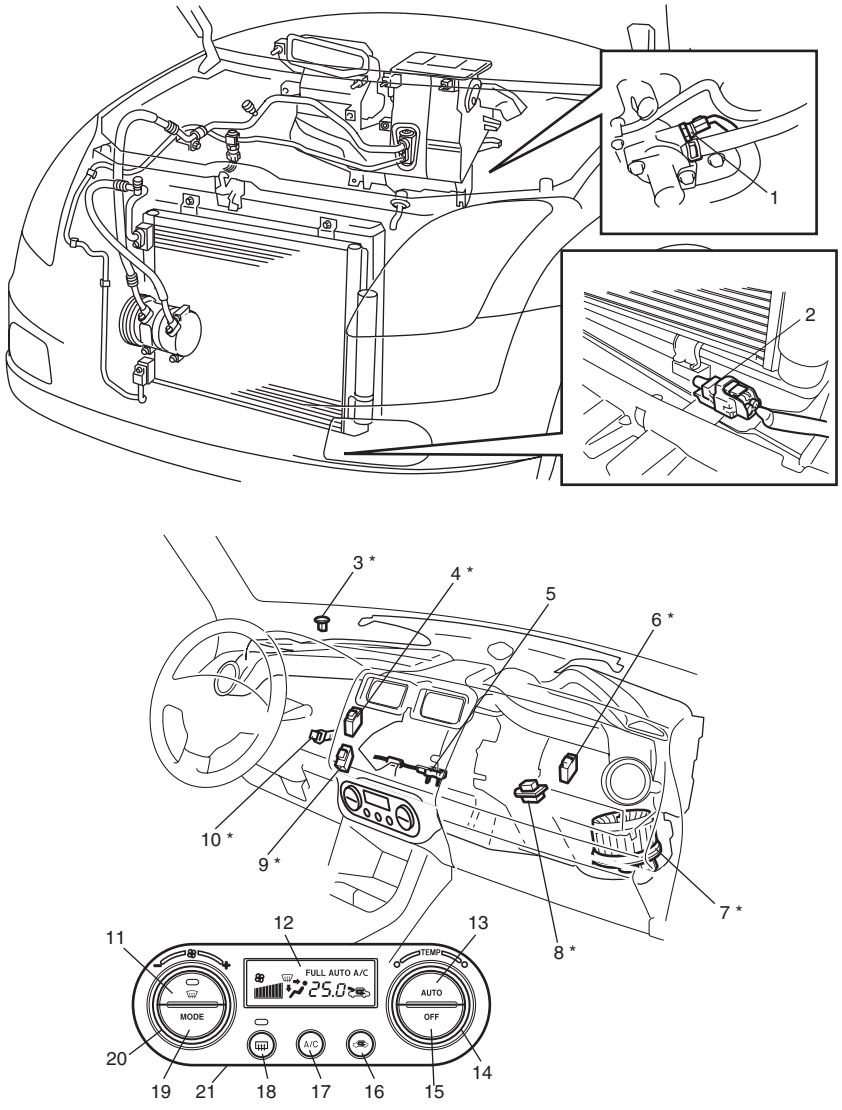
Refer to “Major Components of A/C System: Manual A/C”.

Electronic Control System Location

S7N20A7223002

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



I5RS0C722001-01

1. ECT sensor	7. Blower motor	13. AUTO switch	19. MODE (air flow) selector
2. Outside air temperature sensor	8. Blower motor controller	14. Temperature selector	20. Blower speed selector
3. Sunload sensor	9. Temperature control actuator	15. OFF switch	21. HVAC control module
4. Air flow control actuator	10. Inside air temperature sensor	16. Air intake selector	
5. Evaporator temperature sensor	11. Defroster switch	17. A/C switch	
6. Air intake actuator	12. Display	18. Rear defogger switch	

Diagnostic Information and Procedures

A/C System Symptom Diagnosis

S7N20A7224001

Condition	Possible cause	Correction / Reference Item
No cool air comes out (A/C system does not operate)	No refrigerant	*Perform recovery, evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	A/C switch faulty	*Check A/C switch referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	Evaporator temperature sensor faulty	*Check evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	A/C refrigerant pressure sensor faulty	*Check A/C refrigerant pressure sensor referring to "A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual A/C" (petrol engine model). Replace A/C refrigerant pressure sensor (diesel engine model).*
	Wiring or grounding faulty	*Repair as necessary.*
	ECT sensor faulty	*Check ECT sensor referring to "Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C" or "Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C".*
	ECM faulty	*Check ECM referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A" (petrol engine model) or "ECM and Its Circuits Voltage Value (for Reference): D13A / Z13DTJ in Section 1A" (diesel engine model).*
	HVAC control module faulty	*Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual A/C" or "Magnet Clutch Inspection (Diesel Engine Model): Manual A/C".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
	Compressor relay faulty	*Check compressor relay referring to "Compressor Relay Inspection: Manual A/C".*
	Temperature selector, blower speed selector, and/or air flow selector faulty	*Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	BCM faulty	*Check BCM referring to "Inspection of BCM and its Circuits in Section 10B".*

Condition	Possible cause	Correction / Reference Item
No cool air comes out (radiator cooling fan motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Wiring or grounding faulty	*Repair as necessary.*
	Radiator cooling fan motor relay faulty	*Check radiator cooling fan motor relay referring to "Radiator Cooling Fan Relay Inspection: M13A / M15A / M16A in Section 1F" or "Radiator Cooling Fan Relay Inspection: D13A / Z13DTJ in Section 1F".*
	Radiator cooling fan motor faulty	*Check radiator cooling fan motor referring to "Radiator Cooling Fan Motor On-Vehicle Inspection: M13A / M15A / M16A in Section 1F" (petrol engine model) or "Radiator Cooling Fan Assembly On-Vehicle Inspection: D13A / Z13DTJ in Section 1F" (diesel engine model).*
	ECM faulty	*Check ECM referring to "A/C System Inspection at ECM: Auto A/C".*
	HVAC control module faulty	*Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
No cool air comes out (blower motor does not operate)	Fuse blown	*Check related fuses, and then check for short circuit to ground.*
	Blower motor controller faulty	*Check blower motor controller referring to "Blower Motor Controller Inspection: Auto A/C".*
	Blower speed selector faulty	*Check blower speed selector referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	HVAC control module faulty	*Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	Wiring or grounding faulty	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection in Section 7A".*
	Blower motor relay faulty	*Check blower motor relay referring to "Blower Motor Relay and Additional Heater Relay (If Equipped) Inspection in Section 7A".*

Condition	Possible cause	Correction / Reference Item
Cool air does not come out or insufficient cooling (A/C system normal operation)	Insufficient or excessive charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: Manual A/C".*
	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator temperature sensor referring to "Evaporator Inspection: Manual A/C" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	Evaporator temperature sensor faulty	*Check evaporator temperature sensor referring to "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: Manual A/C".*
	Desiccant clogged	*Check receiver/dryer.*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual A/C" or "Magnet Clutch Inspection (Diesel Engine Model): Manual A/C".*
	Compressor faulty	*Check compressor.*
	Air in A/C system	*Replace desiccant, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Heater and ventilation system faulty	*Check HVAC unit.*
	Temperature selector faulty	*Check temperature selector referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	HVAC control module faulty	*Check HVAC control module referring to "Inspection of HVAC Control Module and Its Circuit: Auto A/C".*
	Temperature control actuator faulty	*Check temperature control actuator referring to "Temperature Control Actuator Inspection: Auto A/C".*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection in Section 7A".*
	Excessive compressor oil in A/C system	*Drain excessive compressor oil from A/C system circuit and compressor.*
Cool air does not come out only intermittently	Wiring connection faulty	*Repair as necessary.*
	Expansion valve faulty	*Check expansion valve referring to "Expansion Valve Inspection: Manual A/C".*
	Excessive moisture in A/C system	*Replace receiver/dryer, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Magnet clutch faulty	*Check magnet clutch referring to "Magnet Clutch Inspection (Petrol Engine Model): Manual A/C" or "Magnet Clutch Inspection (Diesel Engine Model): Manual A/C".*
	Excessive amount of refrigerant	*Check the amount of refrigerant.*

Condition	Possible cause	Correction / Reference Item
Cool air comes out only at high speed	Condenser clogged	*Check condenser referring to "Condenser Assembly On-Vehicle Inspection: Manual A/C".*
	Insufficient charge of refrigerant	*Check the amount of refrigerant and system for leaks.*
	Air in A/C system	*Replace receiver/dryer, and then perform evacuation and charge referring to "Operation Procedure for Refrigerant Charge: Manual A/C".*
	Compressor drive belt loosened or broken	*Adjust or replace drive belt.*
	Compressor faulty	*Check compressor.*
Cool air does not come out only at high speed	Excessive amount of refrigerant	*Check the amount of refrigerant.*
	A/C evaporator frosted	*Check A/C evaporator and evaporator temperature sensor referring to "Evaporator Inspection: Manual A/C" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
Insufficient air flow of cooled air	A/C evaporator clogged or frosted	*Check A/C evaporator and evaporator temperature sensor referring to "Evaporator Inspection: Manual A/C" and "Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C".*
	Air leaking from HVAC unit or air duct	*Repair as necessary.*
	Blower motor faulty	*Check blower motor referring to "Blower Motor Inspection in Section 7A".*
	Wiring or grounding faulty	*Repair as necessary.*

Abnormal Noise Symptom Diagnosis of A/C System

S7N20A7224002

Refer to "Abnormal Noise Symptom Diagnosis of A/C System: Manual A/C".

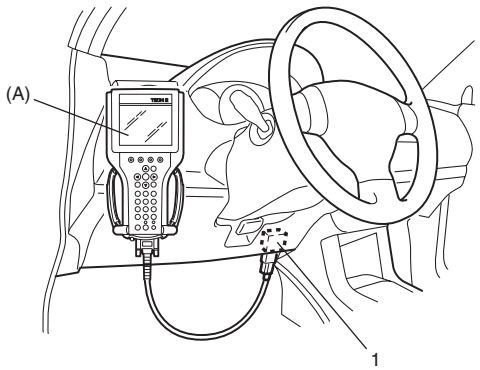
DTC Check

S7N20A7224003

Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



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3) Light over sunload sensor vertically with an incandescent lamp of approximately 100 W apart from about 100 mm (3.94 in.).

NOTE

If sunload sensor is not lighted over with an incandescent lamp, DTC B1504 is detected even though there is not any malfunction.

4) Turn ignition switch to ON position.
5) Read DTC displayed on SUZUKI scan tool.

NOTE

To know how to use SUZUKI scan tool, refer to operator's manual for SUZUKI scan tool.

6) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC).

Without Using SUZUKI Scan Tool
Current DTC mode

1) Light over sunload sensor vertically with an incandescent lamp of approximately 100 W apart from about 100 mm (3.94 in.).

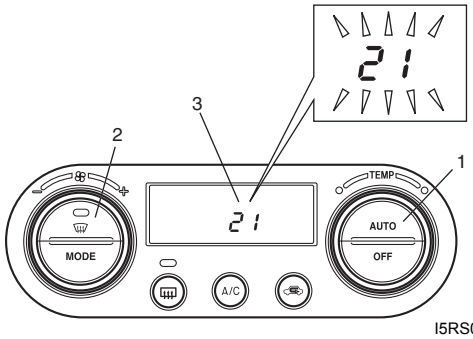
NOTE

If sunload sensor is not lighted over with an incandescent lamp, DTC B1504 is detected as current DTC even though there is not any malfunction.

2) Start engine.
3) Wait for 20 seconds or more after engine started and set temperature selector to 25 °C (77 °F).
4) Push AUTO switch (1) and defroster switch (2) at the same time.
5) Check DTC (3).

NOTE

- **DTC flashes for 15 seconds. After that, the normal display is restored. To have DTC displayed again, repeat the procedure from Step 4.**
- **When more than two DTCs are detected, only DTC having the highest priority is indicated. Therefore, after troubleshooting the malfunction, DTC check has to be performed again to see if any other DTC(s) is detected.**



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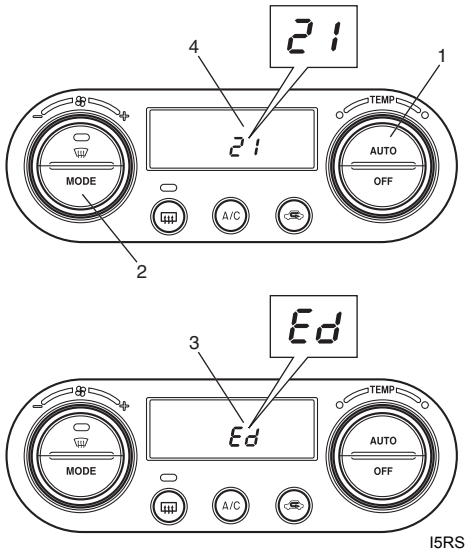
History DTC mode

1) Turn ignition switch to ON position.
2) Set temperature selector to 25 °C (77 °F).
3) Push AUTO switch (1) and MODE (air flow) selector (2) at the same time.
4) Check DTC (4).

NOTE

Each DTC item is displayed (lights up) for 4 seconds.
When HVAC control module detects 2 or more DTC items, each one is displayed once starting from the one of higher priority order. After all DTC items being detected have been displayed, "Ed" (3) appears on display of HVAC control module and normal display is restored. "Ed" means that all DTC items have been displayed.



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DTC Clearance

S7N20A7224004

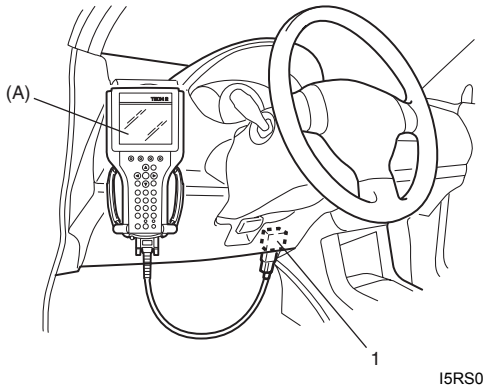
NOTE

Only history DTC(s) can be cleared. Current DTC(s) can not be cleared unless the problem(s) is fixed.

Using SUZUKI Scan tool

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located on underside of instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I5RS0A722005-01

3) Light over sunload sensor vertically with an incandescent lamp approximately 100 W apart from about 100 mm (3.94 in.).

NOTE

If sunload sensor is not lighted over with an incandescent lamp, DTC B1504 is detected as current DTC even though there is not any malfunction.

4) Turn ignition switch to ON position.
5) Erase DTC according to instructions displayed on SUZUKI scan tool.

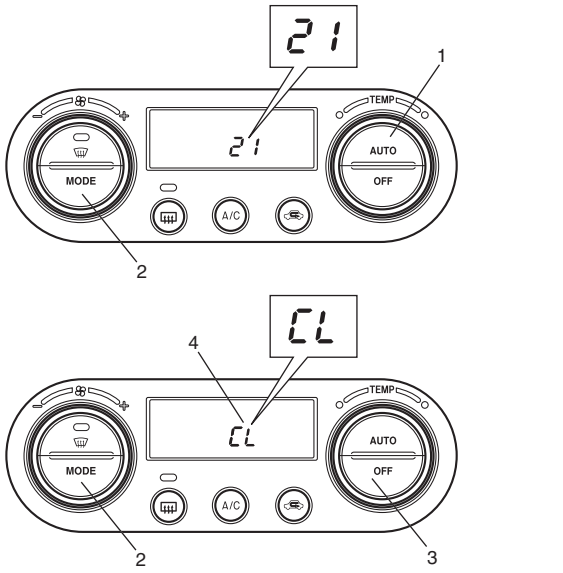
NOTE

To know how to use SUZUKI scan tool, refer to operator's manual for SUZUKI scan tool.

6) After completing the clearance, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Not Using SUZUKI Scan Tool

1) Turn ignition switch to ON position.
2) Set temperature selector to 25 °C (77 °F).
3) Push AUTO switch (1) and MODE (air flow) selector (2) at the same time to have history DTC displayed.
4) Push MODE (air flow) selector (2) and OFF switch (3) at the same time while history DTC is displayed.
5) Check that "CL" (4) appears on display. "CL" means that DTC has been cleared.



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DTC Table

S7N20A7224005

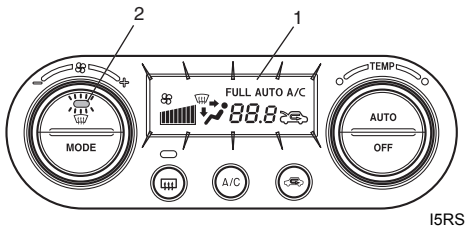
⚠ CAUTION

Be sure to perform "Air Conditioning System Check: Auto A/C" before starting diagnosis.

DTC No. (displayed on SUZUKI scan tool)	DTC (indicated on display of HVAC control module)	Priority of display (current DTC)	Priority of display (history DTC)	Diagnosis		"AUTO" indicator lamp
☞ B1502	21	1	1	Inside air temperature sensor and/or its circuit malfunction	Open	Flashed
	22	2	2		Short	
☞ B1503	31	3	3	Evaporator temperature sensor and/or its circuit malfunction	Open	Flashed
	32	4	4		Short	
☞ B1504	41	21	—	Sunload sensor and/or its circuit malfunction	Open	—
	42	5	5		Short	Flashed
☞ B1511	61	6	6	Temperature control actuator (position sensor) and/or its circuit malfunction	Open	Flashed
	62	7	7		Short	
☞ B1512	71	8	8	Air flow control actuator (position sensor) and/or its circuit malfunction	Open	Flashed
	72	9	9		Short	
☞ B1513	63	10	10	Temperature control actuator and/or its circuit malfunction		Flashed
☞ B1514	73	11	11	Air flow control actuator and/or its circuit malfunction		Flashed
☞ B1541	E1	12	—	HVAC control module back-up power supply malfunction		—
☞ B1546	d5	22	—	A/C refrigerant pressure malfunction		—
☞ B1551	91	13	12	Serial communication circuit malfunction	Open	Flashed
	92	14	13		Short	
☞ B1552	94	15	14	Serial communication signal malfunction		Flashed
☞ B1553	A4	16	15	CAN communication signal malfunction		Flashed
☞ B1557	b4	19	16	Vehicle speed sensor signal malfunction		—
☞ B1561	54	17	17	Engine coolant temperature sensor signal malfunction		Flashed
☞ B1562	14	18	18	Outside air temperature sensor signal malfunction		Flashed
☞ B1563	d4	20	19	A/C refrigerant pressure sensor signal malfunction		—
—	See NOTE below (current DTC)	—	—	Normal		—
	00 (history DTC)					

NOTE

When no current DTC is detected, all contents displayed on display (1) of HVAC control module and defroster indicator (2) flash at the same time.



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Fail-Safe Table

S7N20A7224006

When any of the following malfunctions (DTCs) is detected, fail-safe mode is activated.
However, when HVAC control module detects normal operation of A/C system, fail-safe mode is cancelled.

DTC No.	Trouble Area	Fail-Safe Operation
☞ B1502	Inside air temperature sensor and/or its circuit	HVAC control module controls actuators assuming that inside air temperature is 25 °C (77 °F).
☞ B1503	A/C evaporator temperature sensor and its circuit	• HVAC control module turns off A/C switch signal. • HVAC control module controls actuators assuming that evaporator temperature is 0 °C (32 °F).
☞ B1504	Sunload sensor and/or its circuit	HVAC control module controls actuators assuming that amount of sunlight is 0 W/m^2.
☞ B1551	Serial communication circuit	HVAC control module controls actuators assuming that outside air temperature is 20 °C (68 °F), engine coolant temperature is 80 °C (176 °F), and vehicle speed is 40 km/h (25 mph).
☞ B1552	Serial communication circuit	
☞ B1553	CAN communication circuit	
☞ B1557	Vehicle speed sensor and/or its circuit	HVAC control module controls actuators assuming that vehicle speed is 40 km/h (25 mph).
☞ B1561	Engine coolant temperature sensor and/or its circuit	HVAC control module controls actuators assuming that engine coolant temperature is 80 °C (176 °F).
☞ B1562	Outside air temperature sensor and/or its circuit	HVAC control module controls actuators assuming that outside air temperature is 20 °C (68 °F).

Scan Tool Data

S7N20A7224007

As the data values given in the following are standard values estimated on the basis of values obtained from the normally operation vehicles by using a scan tool, use them as reference values. Even when the vehicles are in good condition, there may be cases where the checked values do not fall within each specifies data range. Therefore, judgement as abnormal should not be made by checking with these data alone.

Scan Tool Data	Condition	Normal Condition / Reference Value
☞ TEMP CONT SWITCH	Each reference value is relative to the position of temperature selector of HVAC control module.	Max Cool, 15 °C (59 °C) – 29 °C (84 °F), Max Hot
☞ CABIN TEMPERATURE	Reference value is relative to in-car temperature.	–6.5 °C – 57.25 °C (20.3 °F – 135.05 °F)
☞ OUTSIDE AIR TEMP	Reference value is relative to outside air temperature.	–23.3 °C – 65.95 °C (–9.94 °F – 150.71 °F)
☞ EVAPORATOR TEMP	Reference value is relative to temperature of evaporator.	–29.7 °C – 59.55 °C (–21.46 °F – 139.19 °F)
☞ COOLANT TEMP	At specified idle speed after warming up.	80 °C – 100 °C (176 °F – 212 °F)
☞ SUN LOAD	Reference value depends on the situation.	0 W/m^2 – 4447.8 W/m^2
☞MODE CONT SWITCH	Each reference value is relative to the position of air flow selector of HVAC control module.	AUTO, FACE, B/L, FOOT, D/F, DER
☞ FAN CONT SWITCH	Each reference value is relative to the position of blower speed selector of HVAC control module.	AUTO, OFF, 1st, 2nd – 7th, 8th
☞ FAN DESIRED VOLT	Reference value is relative to the position of blower speed selector of HVAC control module.	0 – 16.0 V
☞ AIR MIX POS SEN	Reference value is relative to the position of temperature selector of HVAC control module.	about 2.0 V (Max Hot)
		about 4.0 V (Max Cool)
☞MODE POS SENSOR	Reference value is relative to the position of air flow selector of HVAC control module.	about 1.6 V (DEF)
		about 4.0 V (VENT)
☞ A/C CONT SIG	A/C system is ON.	ON
	A/C system is OFF.	OFF
☞ BLOWER LOAD SIG	Position of blower speed selector is 1st position or more.	ON
	Position of blower speed selector is OFF position.	OFF
☞ AIR INTAKE MODE	Fresh air (FRE) mode is activated.	FRE
	Recirculation air (REC) mode is activated.	REC
	AUTO mode is activated.	AUTO

Scan Tool Data	Condition		Normal Condition / Reference Value
☞ REFRIGERANT PRESSURE	Engine running.	A/C ON (A/C is operating) at ambient temperature: 30 °C (86 °F)	1420 – 1830 kPa (petrol engine model), 1370 – 1690 kPa (diesel engine model) For more details, refer to pressure of high pressure gauge under “A/C System Performance Inspection: Manual A/C”
		A/C OFF (A/C is not operating) at ambient temperature: 30 °C (86 °F) and engine coolant temperature: 90 ° – 100 °C	600 – 1000 kPa After longer than 10 min from A/C switch turned off
☞ A/C COMP CLUTCH	Engine running.	A/C switch and blower motor switch turned ON	ON
		A/C switch and/or blower motor switch turned OFF	OFF
☞ DFR INDICATOR	Defroster indicator lamp is lighted.		ON
	Defroster indicator lamp is not lighted.		OFF
☞ VEHICLE SPEED	At stop.		OFF
			0 km/h (0 mph)

Scan Tool Data Definitions

TEMP CONT SWITCH (TEMPERATURE SELECTOR): Position of temperature control selector of HVAC control module

CABIN TEMPERATURE: In-car temperature detected by inside air temperature sensor installed in HVAC control module

OUTSIDE AIR TEMP (OUTSIDE AIR TEMPERATURE): Outside air temperature detected by outside air temperature sensor installed in front bumper member

EVAPORATOR TEMP (EVAPORATOR TEMPERATURE): Temperature of air passed through evaporator

COOLANT TEMP (ENGINE COOLANT TEMPERATURE): Engine coolant temperature detected by engine coolant temperature sensor

SUN LOAD: Amount of sunlight detected by sunload sensor installed on the driver side on the dashboard

MODE CONT SWITCH (MODE (AIR FLOW) SELECTOR): Position of air flow selector of HVAC control module

FAN CONT SWITCH (BLOWER SPEED SELECTOR): Position of blower speed selector of HVAC control module

FAN DESIRED VOLT: Voltage for blower motor

AIR MIX POS SEN (TEMPERATURE CONTROL ACTUATOR POSITION SENSOR): Input signal from position sensor in temperature control actuator

MODE POS SENSOR (AIR FLOW CONTROL ACTUATOR POSITION SENSOR): Input signal from position sensor in air flow control actuator

A/C CONT SIG (A/C SWITCH SIGNAL, ON or OFF): State of A/C switch

BLOWER LOAD SIG (BLOWER FAN LOAD SIGNAL, ON or OFF): ON: Position of blower speed selector is 1st position or more / OFF: Position of blower speed selector is OFF position.

AIR INTAKE MODE (AUTO, FRE or REC): State of air intake mode

REFRIGERANT PRESSURE (A/C REFRIGERANT ABSOLUTE PRESSURE): This parameter indicates A/C refrigerant absolute pressure calculated by ECM

A/C COMP CLUTCH (A/C COMPRESSOR MAGNET CLUTCH, ON or OFF): This parameter indicates the state of the A/C switch

DFR INDICATOR (DEFROSTER INDICATOR LAMP, ON or OFF): State of defroster indicator lamp

VEHICLE SPEED: It is computed based on pulse signals from wheel speed sensor or vehicle speed sensor

Air Conditioning System Check

S7N20A7224008

Step	Action	Yes	No
1	**Customer complaint analysis** 1) Perform ☞"Customer complaint analysis". *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	**Visual inspection** 1) Perform ☞"Visual inspection". *Is there any faulty condition?*	Repair or replace malfunction part.	Go to Step 3.
3	**DTC check** 1) Perform ☞"DTC check". *Is there any DTC code?*	Go to Step 4.	Go to Step 5.
4	**Troubleshooting malfunction** 1) Perform ☞ "Troubleshooting malfunction". *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 7.	Go to Step 5.
5	**Perform A/C system symptom diagnosis** 1) Inspect and repair referring to "A/C System Symptom Diagnosis: Auto A/C". *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 7.	Go to Step 6.
6	**Check for intermittent problem** 1) Check for intermittent troubles referring to "Intermittent and Poor Connection Inspection in Section 00". *Is there any faulty condition?*	Repair or replace malfunction part, and go to Step 7.	Go to Step 7.
7	**Final confirmation test** 1) Perform ☞ "Final confirmation test". *Is there any malfunction code?*	Go to Step 4.	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 from is a standard sample. It should be modified according to conditions characteristic of each market.

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 referring to "Visual Inspection: Auto A/C".

Step 3. DTC check

Check DTC referring to "DTC Check: Auto A/C".

Step 4. Troubleshooting malfunction

Based on the DTC, perform an applicable DTC diagnostic flow and locate the cause of the trouble, namely in a sensor, wire harness, connector, actuator, HVAC control module or other part and repair faulty parts.

Step 5. A/C system symptom diagnosis

Check any part or system suspected to be a possible cause referring to "A/C System Symptom Diagnosis: Auto A/C".

Step 6. Check for intermittent problem

Check any part where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent and Poor Connection Inspection in Section 00" and related circuit of trouble cord recorded.

Step 7. Final confirmation test
Confirm if the problem symptom is troubleshoot and the A/C system is free from any abnormal conditions. If there existed DTC, clear the DTC. Then, check if the DTC is still detected and if there is any other DTC.

Visual Inspection

S7N20A7224009

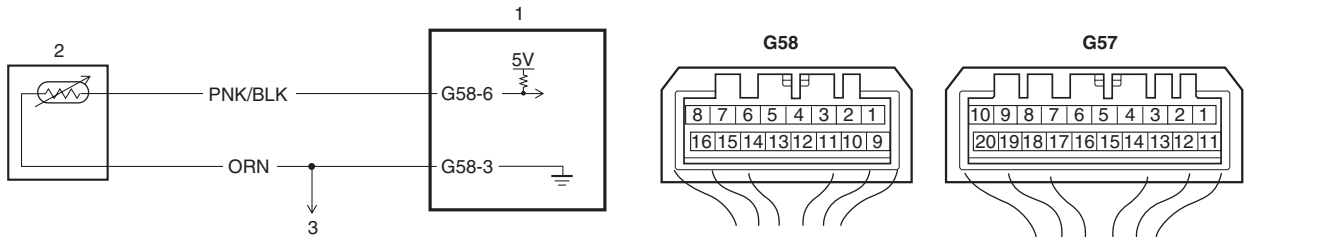
Check visually the following parts and systems.

Inspection item	Correction
• Refrigerant ---- leakage and amount • A/C pipe or hose ---- disconnection, looseness and deterioration • A/C compressor drive belt ---- looseness and damage • Battery ---- fluid level and corrosion of terminal • Connectors of electric wire harness ---- disconnection and friction • Fuses ---- burning • Parts ---- installation and damage • Other parts that can be checked visually	Refer to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C”.

DTC B1502: Inside Air Temperature Sensor and/or Its Circuit Malfunction

S7N20A7224010

Wiring Diagram



I6RS0A722003-01

1. HVAC control module	2. Inside air temperature sensor	3. To other sensors

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Inside air temperature sensor signal voltage is higher than or lower than specified value for specified time continuously.	• Inside air temperature sensor circuit • Inside air temperature sensor • HVAC control module

DTC Troubleshooting

NOTE

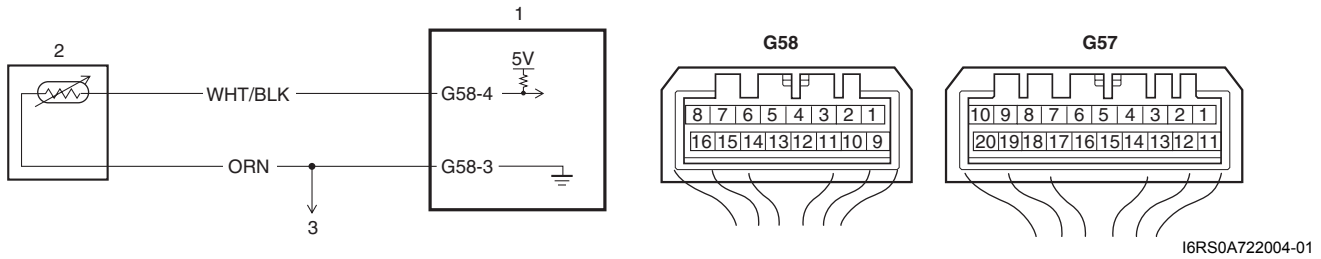
When DTC B1503, B1513 and B1514 are indicated together, it is possible that "ORN" wire circuit open.

Step	Action	Yes	No
1	**Inside air temperature sensor signal circuit check** 1) Disconnect inside air temperature sensor connector. 2) Check for proper connection to inside air temperature sensor at "PNK/BLK" and "ORN" wire terminals. 3) If OK, measure voltage between "PNK/BLK" wire terminal of inside air temperature sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 2.
2	**Inside air temperature sensor signal circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-6" and "G58-3" terminals. 3) If OK, measure resistance between "PNK/BLK" wire terminal of inside air temperature sensor connector and "G58-6" terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 3.	"PNK/BLK" wire open or high resistance circuit.
3	**Inside air temperature sensor signal circuit check** 1) Measure resistance between "PNK/BLK" wire terminal of inside air temperature sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	"PNK/BLK" wire shorted to ground circuit.
4	**Inside air temperature sensor signal circuit check** 1) Measure voltage between "PNK/BLK" wire terminal of inside air temperature sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	"PNK/BLK" wire shorted to other circuit.
5	**Inside air temperature sensor ground circuit check** 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between "ORN" wire terminal of inside air temperature sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 7.	Go to Step 6.
6	**Inside air temperature sensor ground circuit check** 1) Measure resistance between "G58-3" terminal of HVAC control module connector and vehicle body ground. *Is resistance below 5 Ω?*	"ORN" wire open or high resistance circuit.	HVAC control module faulty.
7	**Inside air temperature sensor check** 1) Check inside air temperature sensor referring to "Inside Air Temperature Sensor Inspection: Auto A/C". *Is it in good condition?*	HVAC control module faulty.	Inside air temperature sensor faulty.

DTC B1503: A/C Evaporator Air Temperature Sensor and/or Its Circuit Malfunction

S7N20A7224011

Wiring Diagram



I6RS0A722004-01

1. HVAC control module	2. Evaporator temperature sensor	3. To other sensors

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Evaporator temperature sensor signal voltage is higher than or lower than specified value for specified time continuously.	• Evaporator temperature sensor circuit • Evaporator temperature sensor • HVAC control module

DTC Troubleshooting

NOTE

When DTC B1502, B1513 and B1514 are indicated together, it is possible that "ORN" wire circuit open.

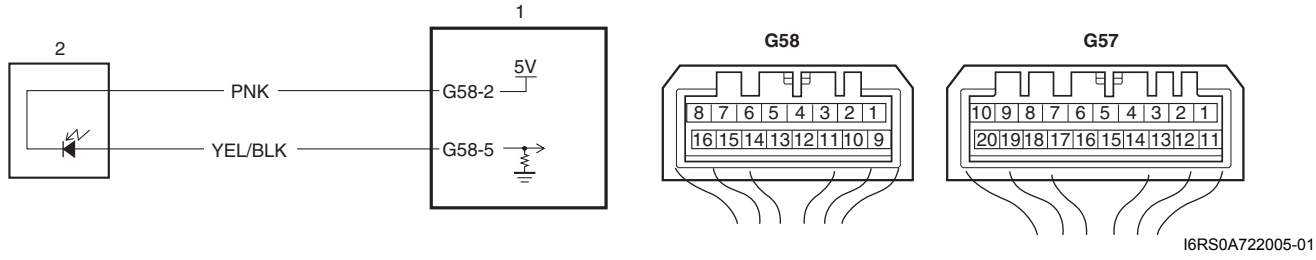
Step	Action	Yes	No
1	**Evaporator temperature sensor signal circuit check** 1) Disconnect evaporator temperature sensor connector. 2) Check for proper connection to evaporator temperature sensor at "WHT/BLK" and "ORN" wire terminals. 3) If OK, measure voltage between "WHT/BLK" wire terminal of evaporator temperature sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 2.
2	**Evaporator temperature sensor signal circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at "G58-4" and "G58-3" terminals. 3) If OK, measure resistance between "WHT/BLK" wire terminal of evaporator temperature sensor connector and "G58-4" terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 3.	"WHT/BLK" wire open or high resistance circuit.
3	**Evaporator temperature sensor signal circuit check** 1) Measure resistance between "WHT/BLK" wire terminal of evaporator temperature sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	"WHT/BLK" wire shorted to ground circuit.
4	**Evaporator temperature sensor signal circuit check** 1) Measure voltage between "WHT/BLK" wire terminal of evaporator temperature sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	"WHT/BLK" wire shorted to other circuit.

Step	Action	Yes	No
5	**Evaporator temperature sensor ground circuit check** 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between “ORN” wire terminal of evaporator temperature sensor connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 7.	Go to Step 6.
6	**Evaporator temperature sensor ground circuit check** 1) Measure resistance between “G58-3” terminal of HVAC control module connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire open or high resistance circuit.	HVAC control module faulty.
7	**Evaporator temperature sensor check** 1) Check evaporator temperature sensor referring to “Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C”. *Is it in good condition?*	HVAC control module faulty.	Evaporator temperature sensor faulty.

DTC B1504: Sunload Sensor and/or Its Circuit Malfunction

S7N20A7224012

Wiring Diagram



I6RS0A722005-01

1. HVAC control module	2. Sunload sensor

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Sunload sensor signal voltage is higher than or lower than specified value for specified time continuously.	• Sunload sensor circuit • Sunload sensor • HVAC control module

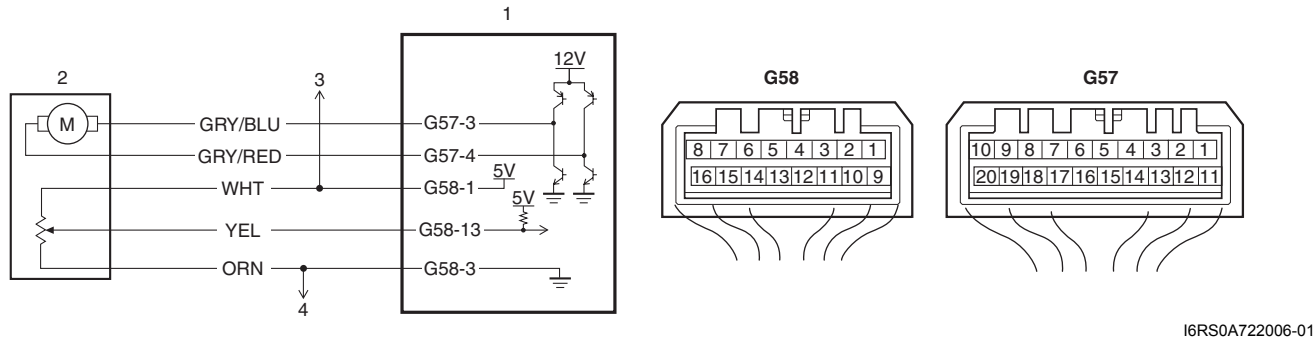
DTC Troubleshooting

Step	Action	Yes	No
1	**Sunload sensor power supply circuit check** 1) Disconnect sunload sensor connector. 2) Check for proper connection to sunload sensor at “PNK” and “YEL/BLK” wire terminals. 3) If OK, measure voltage between “PNK” wire terminal of sunload sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 5.	Go to Step 2.
2	**Sunload sensor power supply circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G58-2” and “G58-5” terminals. 3) If OK, measure resistance between “PNK” wire terminal of sunload sensor connector and “G58-2” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 3.	“PNK” wire open or high resistance circuit.
3	**Sunload sensor power supply circuit check** 1) Measure resistance between “PNK” wire terminal of sunload sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	“PNK” wire shorted to ground circuit.
4	**Sunload sensor power supply circuit check** 1) Measure voltage between “PNK” wire terminal of sunload sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	“PNK” wire shorted to other circuit.
5	**Sunload sensor signal circuit check** 1) Disconnect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between “YEL/BLK” wire terminal of sunload sensor connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	“YEL/BLK” wire shorted to ground circuit.
6	**Sunload sensor signal circuit check** 1) Measure resistance between “G58-5” terminal of HVAC control module connector and “YEL/BLK” wire terminal of sunload sensor connector. *Is resistance below 5 Ω?*	Go to Step 7.	“YEL/BLK” wire open or high resistance circuit.
7	**Sunload sensor signal circuit check** 1) Measure voltage between “YEL/BLK” wire terminal of sunload sensor connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 8.	“YEL/BLK” wire shorted to other circuit.
8	**Sunload sensor check** 1) Check sunload sensor referring to “Sunload Sensor Inspection: Auto A/C”. *Is it in good condition?*	HVAC control module faulty.	Sunload sensor faulty.

DTC B1511: Temperature Control Actuator (Position Sensor) and/or Its Circuit Malfunction

S7N20A7224013

Wiring Diagram



I6RS0A722006-01

1. HVAC control module	2. Temperature control actuator	3. To air flow control actuator	4. To other sensors

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Temperature control actuator position sensor signal voltage is higher than or lower than specified value for specified time continuously.	• Temperature control actuator circuit • Temperature control actuator • HVAC control module

DTC Troubleshooting

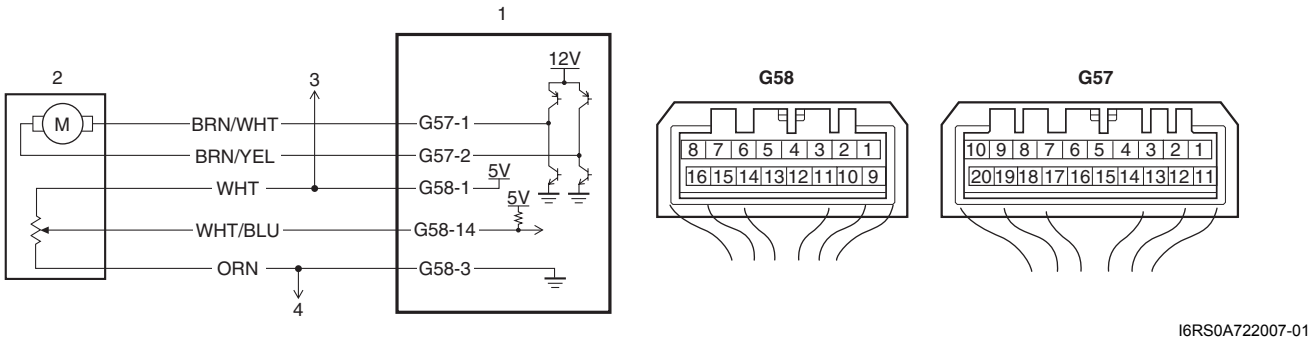
Step	Action	Yes	No
1	**Position sensor power supply circuit check** 1) Disconnect temperature control actuator connector. 2) Check for proper connection to temperature control actuator at “WHT”, “YEL” and “ORN” wire terminals. 3) If OK, measure voltage between “WHT” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 2.
2	**Position sensor power supply circuit check** 1) Disconnect air flow control actuator connector with ignition switch turned OFF. 2) Measure voltage between “WHT” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Air flow control actuator faulty.	Go to Step 3.
3	**Position sensor power supply circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G58-1”, “G58-3” and “G58-13” terminals. 3) If OK, measure resistance between “WHT” wire terminal of temperature control actuator connector and “G58-1” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 4.	“WHT” wire open or high resistance circuit.
4	**Position sensor power supply circuit check** 1) Measure resistance between “WHT” wire terminal of temperature control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	“WHT” wire shorted to ground circuit.

Step	Action	Yes	No
5	**Position sensor power supply circuit check** 1) Measure voltage between “WHT” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 6.	“WHT” wire shorted to other circuit.
6	**Position sensor signal circuit check** 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure voltage between “YEL” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 10.	Go to Step 7.
7	**Position sensor signal circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Measure resistance between “YEL” wire terminal of temperature control actuator connector and “G58-13” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 8.	“YEL” wire open or high resistance circuit.
8	**Position sensor signal circuit check** 1) Measure resistance between “YEL” wire terminal of temperature control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 9.	“YEL” wire shorted to ground circuit.
9	**Position sensor signal circuit check** 1) Measure voltage between “YEL” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 10.	“YEL” wire shorted to other circuit.
10	**Position sensor ground circuit check** 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between “ORN” wire terminal of temperature control actuator connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 12.	Go to Step 11.
11	**Position sensor ground circuit check** 1) Measure resistance between “G58-3” terminal of HVAC control module connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire open or high resistance circuit.	HVAC control module faulty.
12	**Temperature control actuator check** 1) Check temperature control actuator referring to “Temperature Control Actuator Inspection: Auto A/C”. *Is it in good condition?*	HVAC control module faulty.	Temperature control actuator faulty.

DTC B1512: Air flow Control Actuator (Position Sensor) and/or Its Circuit Malfunction

S7N20A7224014

Wiring Diagram



I6RS0A722007-01

1. HVAC control module	2. Air flow control actuator	3. To temperature control actuator	4. To other sensors

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Air flow control actuator position sensor signal voltage is higher than or lower than specified value for specified time continuously.	• Air flow control actuator circuit • Air flow control actuator • HVAC control module

DTC Troubleshooting

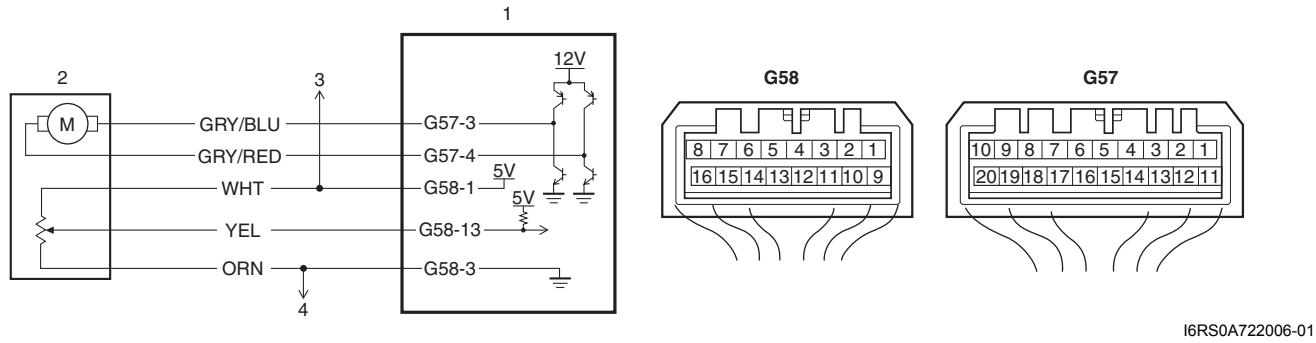
Step	Action	Yes	No
1	**Position sensor power supply circuit check** 1) Disconnect air flow control actuator connector. 2) Check for proper connection to air flow control actuator at “WHT”, “WHT/BLU” and “ORN” wire terminals. 3) If OK, measure voltage between “WHT” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 6.	Go to Step 2.
2	**Position sensor power supply circuit check** 1) Disconnect temperature control actuator connector with ignition switch turned OFF. 2) Measure voltage between “WHT” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Temperature control actuator faulty.	Go to Step 3.
3	**Position sensor power supply circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G58-1”, “G58-3” and “G58-14” terminals. 3) If OK, measure resistance between “WHT” wire terminal of air flow control actuator connector and “G58-1” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 4.	“WHT” wire open or high resistance circuit.
4	**Position sensor power supply circuit check** 1) Measure resistance between “WHT” wire terminal of air flow control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 5.	“WHT” wire shorted to ground circuit.

Step	Action	Yes	No
5	**Position sensor power supply circuit check** 1) Measure voltage between “WHT” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 6.	“WHT” wire shorted to other circuit.
6	**Position sensor signal circuit check** 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure voltage between “WHT/BLU” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 4 – 6 V?*	Go to Step 10.	Go to Step 7.
7	**Position sensor signal circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Measure resistance between “WHT/BLU” wire terminal of air flow control actuator connector and “G58-14” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 8.	“WHT/BLU” wire open or high resistance circuit.
8	**Position sensor signal circuit check** 1) Measure resistance between “WHT/BLU” wire terminal of air flow control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 9.	“WHT/BLU” wire shorted to ground circuit.
9	**Position sensor signal circuit check** 1) Measure voltage between “WHT/BLU” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 10.	“WHT/BLU” wire shorted to other circuit.
10	**Position sensor ground circuit check** 1) Connect HVAC control module connector with ignition switch turned OFF. 2) Measure resistance between “ORN” wire terminal of air flow control actuator connector and vehicle body ground. *Is resistance below 5 Ω?*	Go to Step 12.	Go to Step 11.
11	**Position sensor ground circuit check** 1) Measure resistance between “G58-3” terminal of HVAC control module connector and vehicle body ground. *Is resistance below 5 Ω?*	“ORN” wire open or high resistance circuit.	HVAC control module faulty.
12	**Air flow control actuator check** 1) Check air flow control actuator referring to “Air Flow Control Actuator Inspection: Auto A/C”. *Is it in good condition?*	HVAC control module faulty.	Air flow control actuator faulty.

DTC B1513: Temperature Control Actuator and/or Its Circuit Malfunction

S7N20A7224015

Wiring Diagram



I6RS0A722006-01

1. HVAC control module	2. Temperature control actuator	3. To air flow control actuator	4. To other sensors

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Difference between target opening and actual opening is higher than specified value even though temperature control actuator has operated for 16 seconds.	• Temperature control actuator circuit • Temperature control linkage • Temperature control actuator • HVAC unit • HVAC control module

DTC Troubleshooting

NOTE

- **When DTC B1502, B1503 and B1514 are indicated together, it is possible that "ORN" wire circuit open.**
- **When DTC B1514 is indicated together, it is possible that "WHT" wire circuit open.**

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. *Is there DTC B1511?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**Visual check** 1) Check if there is any obstruction in operating range of actuator linkage and if actuator linkage operates smoothly. *Is it in good condition?*	Go to Step 3.	Obstruction in operating range of actuator linkage, actuator linkage faulty and/or internal fault of HVAC unit.
3	**Wire harness check** 1) Disconnect connector from temperature control actuator with ignition switch turned OFF. 2) Check for proper connection to temperature control actuator connector at "GRY/BLU" and "GRY/RED" wire terminals. 3) If OK, measure voltage between "GRY/BLU" wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON when temperature selector is operation to COOL direction. *Is voltage 10 – 14 V?*	Go to Step 7.	Go to Step 4.

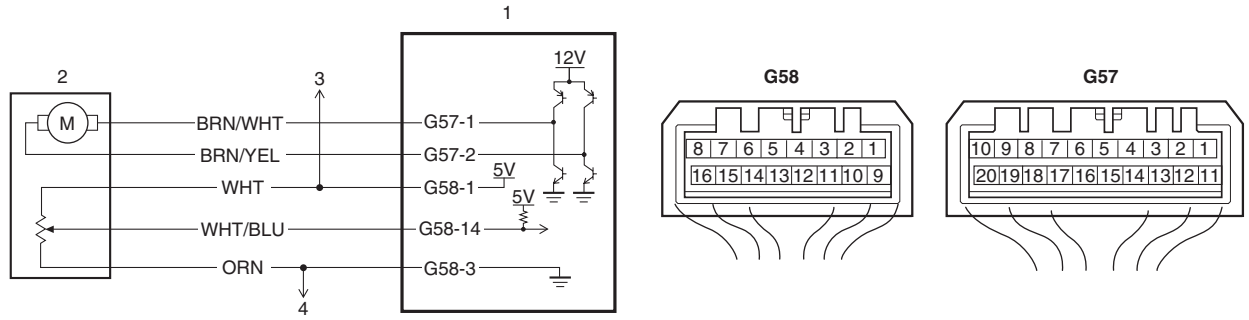
Step	Action	Yes	No
4	**Wire harness check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G57-3” and “G57-4” terminals. 3) If OK, measure resistance between “GRY/BLU” wire terminal of temperature control actuator connector and “G57-3” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 5.	“GRY/BLU” wire open or high resistance circuit.
5	**Wire harness check** 1) Measure resistance between “GRY/BLU” wire terminal of temperature control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	“GRY/BLU” wire shorted to ground circuit.
6	**Wire harness check** 1) Measure voltage between “GRY/BLU” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	“GRY/BLU” wire shorted to other circuit.
7	**Wire harness check** 1) Connect connector to HVAC control module with ignition switch turned OFF. 2) Measure voltage between “GRY/RED” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON when temperature selector is operation to HOT direction. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 8.
8	**Wire harness check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G57-3” and “G57-4” terminals. 3) If OK, measure resistance between “GRY/RED” wire terminal of temperature control actuator connector and “G57-4” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 9.	“GRY/RED” wire open or high resistance circuit.
9	**Wire harness check** 1) Measure resistance between “GRY/RED” wire terminal of temperature control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 10.	“GRY/RED” wire shorted to ground circuit.
10	**Wire harness check** 1) Measure voltage between “GRY/RED” wire terminal of temperature control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 11.	“GRY/RED” wire shorted to other circuit.

Step	Action	Yes	No
11	**Position sensor circuit check** 1) Check temperature control actuator position sensor circuit referring to Step 1 to Step 5 and Step 10 to Step 11 of "DTC B1511: Temperature Control Actuator (Position Sensor) and/or Its Circuit Malfunction: Auto A/C". *Is it in good condition?*	Go to Step 12.	Repair circuit.
12	**Temperature control actuator check** 1) Check temperature control actuator referring to "Temperature Control Actuator Inspection: Auto A/C". *Is it in good condition?*	HVAC control module faulty.	Temperature control actuator faulty.

DTC B1514: Air Flow Control Actuator and/or Its Circuit Malfunction

S7N20A7224016

Wiring Diagram



I6RS0A722007-01

1. HVAC control module	2. Air flow control actuator	3. To temperature control actuator	4. To other sensors

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Difference between target opening and actual opening is higher than specified value even though air flow control actuator has operated for 16 seconds.	• Air flow control actuator circuit • Air flow control linkage • Air flow control actuator • HVAC unit • HVAC control module

DTC Troubleshooting

NOTE

- **When DTC B1502, B1503 and B1513 are indicated together, it is possible that "ORN" wire circuit open.**
- **When DTC B1513 is indicated together, it is possible that "WHT" wire circuit open.**

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. *Is there DTC B1512?*	Go to applicable DTC diag. flow.	Go to Step 2.

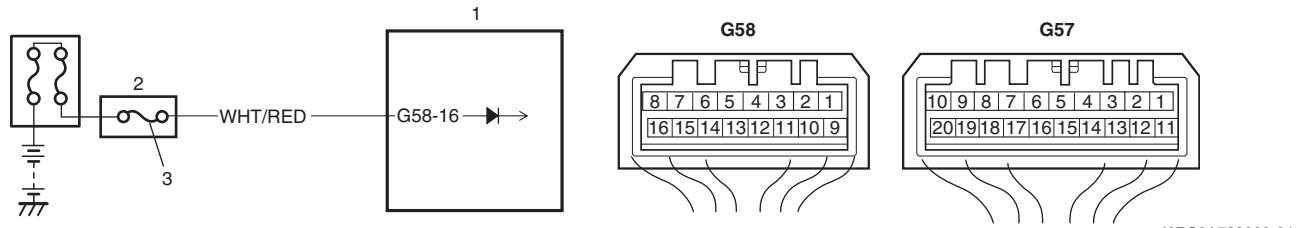
Step	Action	Yes	No
2	**Visual check** 1) Check if there is any obstruction in operating range of actuator linkage and if actuator linkage operates smoothly. *Is it in good condition?*	Go to Step 3.	Obstruction in operating range of actuator linkage, actuator linkage faulty and/or internal fault of HVAC unit.
3	**Wire harness check** 1) Disconnect connector from air flow control actuator with ignition switch turned OFF. 2) Check for proper connection to air flow control actuator connector at “BRN/WHT” and “BRN/YEL” wire terminals. 3) If OK, measure voltage between “BRN/WHT” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON when air flow selector is operation to DEF direction. *Is voltage 10 – 14 V?*	Go to Step 7.	Go to Step 4.
4	**Wire harness check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G57-1” and “G57-2” terminals. 3) If OK, measure resistance between “BRN/WHT” wire terminal of air flow control actuator connector and “G57-1” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 5.	“BRN/WHT” wire open or high resistance circuit.
5	**Wire harness check** 1) Measure resistance between “BRN/WHT” wire terminal of air flow control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 6.	“BRN/WHT” wire shorted to ground circuit.
6	**Wire harness check** 1) Measure voltage between “BRN/WHT” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 7.	“BRN/WHT” wire shorted to other circuit.
7	**Wire harness check** 1) Connect connector to HVAC control module with ignition switch turned OFF. 2) Measure voltage between “BRN/YEL” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON when air flow selector is operation to FACE direction. *Is voltage 10 – 14 V?*	Go to Step 11.	Go to Step 8.
8	**Wire harness check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G57-1” and “G57-2” terminals. 3) If OK, measure resistance between “BRN/YEL” wire terminal of air flow control actuator connector and “G57-2” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 9.	“BRN/YEL” wire open or high resistance circuit.

Step	Action	Yes	No
9	**Wire harness check** 1) Measure resistance between “BRN/YEL” wire terminal of air flow control actuator connector and vehicle body ground. *Is resistance infinity?*	Go to Step 10.	“BRN/YEL” wire shorted to ground circuit.
10	**Wire harness check** 1) Measure voltage between “BRN/YEL” wire terminal of air flow control actuator connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 11.	“BRN/YEL” wire shorted to other circuit.
11	**Position sensor circuit check** 1) Check air flow control actuator position sensor circuit referring to Step 1 to Step 5 and Step 10 to Step 11 of “DTC B1512: Air flow Control Actuator (Position Sensor) and/or Its Circuit Malfunction: Auto A/C”. *Is it in good condition?*	Go to Step 12.	Repair circuit.
12	**Air flow control actuator check** 1) Check air flow control actuator referring to “Air Flow Control Actuator Inspection: Auto A/C”. *Is it in good condition?*	HVAC control module faulty.	Air flow control actuator faulty.

DTC B1541: HVAC Control Module Back-Up Power Supply Malfunction

S7N20A7224017

Wiring Diagram



I6RS0A722008-01

1. HVAC control module	2. Junction block assembly	3. Circuit fuse

DTC Detecting Condition and Trouble Area

DTC Detecting Condition	Trouble Area
Back-up power supply voltage is lower than specified value continuously.	• Battery voltage supply circuit • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Turn ON ignition switch for 20 sec. or more. 2) Ignition switch turned OFF and connect scan tool to DLC. 3) Turn ON ignition switch and check DTC. *Is there DTC B1541?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.

Step	Action	Yes	No
2	**Battery voltage supply circuit check** 1) Disconnect connector from HVAC control module with ignition switch turned OFF. 2) Check for proper connection to HVAC control module connector at “G58-16” terminal. 3) If OK, measure voltage between “G58-16” terminal of HVAC control module connector and vehicle body ground. *Is voltage 10 – 14 V?*	HVAC control module faulty.	Circuit fuse blown and/ or “WHT/RED” wire circuit open or short.

DTC B1546: A/C Refrigerant Pressure Malfunction

S7N20A7224018

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
A/C refrigerant pressure sensor signal voltage is lower than specified value even though outside air temperature is higher than specified value for specified time continuously.	• Insufficient of refrigerant • A/C refrigerant pressure sensor • Outside air temperature sensor • HVAC control module

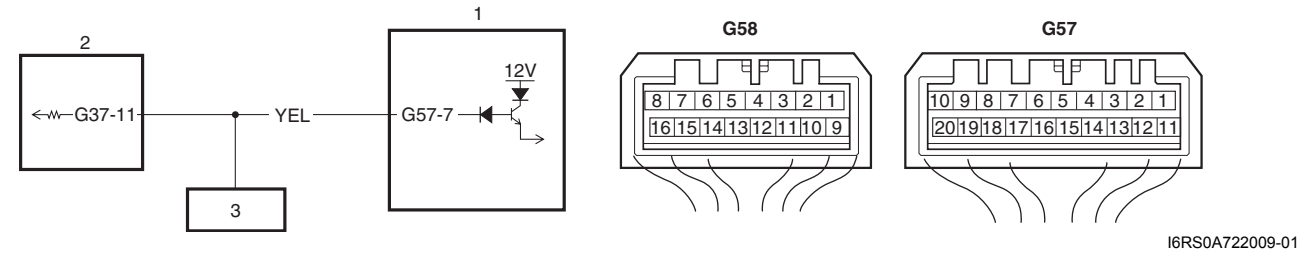
DTC Troubleshooting

Step	Action	Yes	No
1	**A/C refrigerant pressure and outside air temperature check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check “Refrigerant Pressure” and “Outside Air Temp” varies displayed on scan tool. *Are values of A/C refrigerant pressure sensor and outside air temperature within specified ranges indicated in “Scan Tool Data: Auto A/C”?*	Go to Step 2.	Check the amount of refrigerant and system for leaks.
2	**A/C system performance check** 1) Check A/C system performance referring to “A/C System Performance Inspection: Manual A/C”. *Is check result satisfactory?*	Go to Step 3.	Repair or replace defective part.
3	**A/C refrigerant pressure sensor check** 1) Check A/C refrigerant pressure sensor referring to “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual A/C”. *Is check result satisfactory?*	Go to Step 4.	A/C refrigerant pressure sensor faulty.
4	**Outside air temperature sensor check** 1) Check outside air temperature sensor referring to “Outside Air Temperature Sensor Inspection (If Equipped) in Section 9C”. *Is check result satisfactory?*	HVAC control module faulty.	Outside air temperature sensor faulty.

DTC B1551: Serial Communication Circuit Malfunction

S7N20A7224019

Wiring Diagram



I6RS0A722009-01

1. HVAC control module	2. BCM	3. Information display

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Serial communication signal is higher than or lower than specified value for specified time continuously.	• Serial communication line of BCM • BCM (included in junction block assembly) • Information display • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Disconnect connector from information display. 3) Turn ignition switch ON and check DTC. *Is there DTC B1551?*	Go to Step 2.	Information display faulty.
2	**Wire harness check** 1) Disconnect connectors from BCM and HVAC control module. 2) Measure resistance between “G37-11” terminal of BCM connector and “G57-7” terminal of HVAC control module connector. *Is resistance below 5 Ω?*	Go to Step 3.	“YEL” wire open or high resistance circuit.
3	**Wire harness check** 1) Measure resistance between “G57-7” terminal of HVAC control module connector and vehicle body ground. *Is resistance infinity?*	Go to Step 4.	“YEL” wire shorted to ground circuit.
4	**Wire harness check** 1) Measure voltage between “G57-7” terminal of HVAC control module connector and vehicle body ground with ignition switch turned ON. *Is voltage 0 V?*	Go to Step 5.	“YEL” wire shorted to other circuit.

Step	Action	Yes	No
5	**Serial communication signal check** 1) Connect connectors to BCM and HVAC control module. 2) Using oscilloscope, check that serial communication signal is outputted referring to “Reference waveform No.8” of “Inspection of BCM and its Circuits in Section 10B”. *Is serial communication signal outputted at “G37-11” terminal of BCM connector?*	HVAC control module faulty.	BCM (included in junction block assembly) faulty.

DTC B1552: Serial Communication Signal Malfunction

S7N20A7224020

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Data received by HVAC control module from BCM is erroneous continuously.	• BCM (included in junction block assembly) • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**Serial communication signal data check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Start engine and select “DATA LIST” mode on scan tool. 3) Check “Refrigerant Pressure”, “Vehicle Speed”, “Coolant Temp” and “Outside Air Temp” varies displayed on scan tool. *Are values of A/C refrigerant pressure sensor, vehicle speed, coolant temperature and outside air temperature within specified ranges indicated in “Scan Tool Data: Auto A/C”?*	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.	Go to Step 2.
2	**Serial communication signal check** 1) Connect connectors to BCM and HVAC control module. 2) Using oscilloscope, check that serial communication signal is outputted referring to “Reference waveform No.8” of “Inspection of BCM and its Circuits in Section 10B”. *Is serial communication signal outputted at “G37-11” terminal of BCM connector?*	HVAC control module faulty.	BCM (included in junction block assembly) faulty.

DTC B1553: CAN Communication Signal Malfunction

S7N20A7224021

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM and BCM for DTC. *Is there DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1557: Vehicle Speed Sensor Signal Malfunction

S7N20A7224022

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• Vehicle speed signal circuit • VSS (automated manual transaxle model) or wheel speed sensor (other than automated manual transaxle model) • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM for DTC. *Is there DTC P0500?*	Go to “DTC P0500: Vehicle Speed Sensor (VSS) Malfunction: M13A / M15A / M16A in Section 1A” or “DTC P0500:: D13A / Z13DTJ in Section 1A”.	Substitute a known-good HVAC control module and recheck.

DTC B1561: Engine Coolant Temperature Sensor Signal Malfunction

S7N20A7224023

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• ECT sensor circuit • ECT sensor • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM for DTC. *Are there DTC P0116, P0117 or P0118?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1562: Outside Air Temperature Sensor Signal Malfunction

S7N20A7224024

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• Outside air temperature sensor circuit • Outside air temperature sensor • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check BCM for DTC. *Are there DTC B1141 or B1142?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

DTC B1563: A/C Refrigerant Pressure Sensor Signal Malfunction

S7N20A7224025

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
HVAC control module receives error code from BCM continuously.	• A/C refrigerant pressure sensor circuit • A/C refrigerant pressure sensor • HVAC control module

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Check ECM for DTC. *Are there DTC P0532 or P0533?*	Go to applicable DTC diag. flow.	Substitute a known-good HVAC control module and recheck.

Inspection of HVAC Control Module and Its Circuit

S7N20A7224026

HVAC control module and its circuits can be checked at HVAC control module wiring couplers by measuring voltage.

⚠ CAUTION

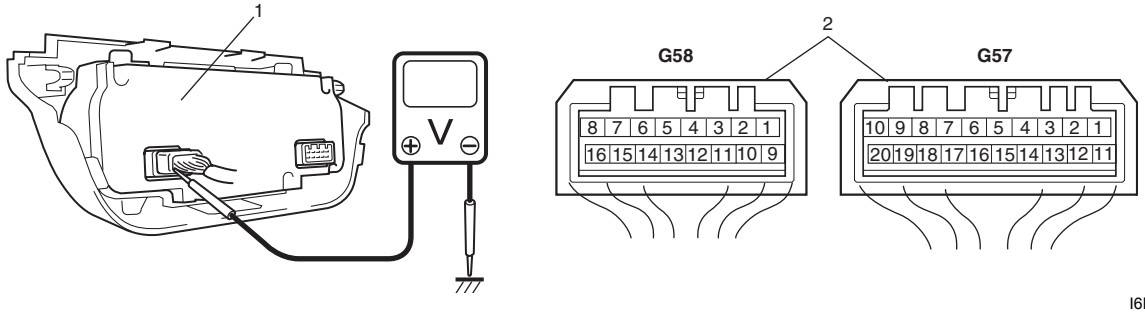
HVAC control module can not be checked by itself. It is strictly prohibited to connect voltmeter to HVAC control module with couplers disconnected from it.

Voltage Check

1) Remove HVAC control module referring to “HVAC Control Module Removal and Installation: Auto A/C”.
2) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.



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1. HVAC control module	2. HVAC control module connector (viewed from harness side)

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G57-1	BRN/WHT	Air flow control actuator (DEF)	10 – 14 V	Ignition switch turned ON, air flow control actuator is working in operation from VENT to DEF position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-2	BRN/YEL	Air flow control actuator (FACE)	10 – 14 V	Ignition switch turned ON, air flow control actuator is working in operation from DEF to VENT position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-3	GRY/BLU	Temperature control actuator (COOL)	10 – 14 V	Ignition switch turned ON, temperature control actuator is working in operation from HOT to COOL position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-4	GRY/RED	Temperature control actuator (HOT)	10 – 14 V	Ignition switch turned ON, temperature control actuator is working in operation from COOL to HOT position
			0 – 1 V	Ignition switch turned ON, except the above condition
G57-5	PPL/WHT	Serial communication line of data link connector	10 – 14 V	Ignition switch turned ON
G57-6	—	—	—	—
G57-7	YEL	Serial communication line of BCM	Refer to “Inspection of BCM and its Circuits in Section 10B”	

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G57-8	BLU/RED	Blower motor control voltage feedback	10 – 14 V	Ignition switch turned ON, blower speed selector OFF
			About 8.5 V	Ignition switch turned ON, blower speed selector 1st position
			About 6.5 V	Ignition switch turned ON, blower speed selector 2nd position
			About 5.5 V	Ignition switch turned ON, blower speed selector 3rd position
			About 4.0 V	Ignition switch turned ON, blower speed selector 4th position
			About 3.0 V	Ignition switch turned ON, blower speed selector 5th position
			About 2.0 V	Ignition switch turned ON, blower speed selector 6th position
			About 1.0 V	Ignition switch turned ON, blower speed selector 7th position
			Below 1.0 V	Ignition switch turned ON, blower speed selector HIGH position
G57-9	GRY	Blower motor controller	0 – 1 V	Ignition switch turned ON, blower speed selector OFF position
			2 – 3 V	Ignition switch turned ON, blower speed selector between 1st and HIGH position
G57-10	BLK/RED	Rear defogger indicator	0 – 1 V	Ignition switch turned ON, rear defogger switch OFF
			10 – 14 V	Ignition switch turned ON, rear defogger switch ON
G57-11	RED/YEL	Illumination switch	0 – 1 V	Ignition switch turned ON, lighting switch OFF position
			10 – 14 V	Ignition switch turned ON, lighting switch ON position
G57-12	BLK	Illumination ground	0 – 1 V	Full-time
G57-13	—	—	—	—
G57-14	—	—	—	—
G57-15	RED	Air intake actuator (RECIRCULATION AIR)	0 – 1 V	Ignition switch turned ON, air intake selector ON (RECIRCULATION) position
			10 – 14 V	Ignition switch turned ON, air intake selector OFF (FRESH) position
G57-16	GRN/RED	Air intake actuator (MIX AIR)		
G57-17	GRN	Air intake actuator (FRESH AIR)	0 – 1 V	Ignition switch turned ON, air intake selector OFF (FRESH) position
			10 – 14 V	Ignition switch turned ON, air intake selector ON (RECIRCULATION) position
G57-18	GRN/WHT	A/C switch signal	Refer to “Inspection of BCM and its Circuits in Section 10B”	
G57-19	BLU/WHT	Electric load signal for blower motor	10 – 14 V	Ignition switch turned ON, blower speed selector OFF or between 1st and 5th position
			0 – 2 V	Ignition switch turned ON, blower speed selector between 6th and HIGH position
G57-20	BRN	Rear defogger switch	0 – 1 V	Ignition switch turned ON, rear defogger switch ON (rear defogger switch is kept in push) position
			4 – 6 V	Ignition switch turned ON, rear defogger switch OFF position

Terminal	Wire Color	Circuit	Normal Voltage	Condition
G58-1	WHT	Output of 5 V power source for air flow control actuator position sensor and temperature control actuator position sensor	4 – 6 V	Ignition switch turned ON
G58-2	PNK	Output of 5 V power source for sunload sensor	4 – 6 V	Ignition switch turned ON
G58-3	ORN	Ground for sensors	Below 0.3 V	Ignition switch turned ON
G58-4	WHT/BLK	Evaporator temperature sensor signal	3.45 – 3.65 V	Ignition switch turned ON, evaporator temperature 0 °C (32 °F)
			2.55 – 2.85 V	Ignition switch turned ON, evaporator temperature 15 °C (59 °F)
			1.7 – 2.1 V	Ignition switch turned ON, evaporator temperature 30 °C (86 °F)
G58-5	YEL/BLK	Sunload sensor signal		
G58-6	PNK/BLK	Inside air temperature sensor signal	About 2.0 V	Ignition switch turned ON, room temperature 25 °C (77 °F)
			About 2.8 V	Ignition switch turned ON, room temperature 0 °C (32 °F)
G58-7	—	—	—	—
G58-8	RED/BLK	Electric power source	10 – 14 V	Ignition switch turned ON
G58-9	—	—	—	—
G58-10	—	—	—	—
G58-11	BLK/ORN	Ground for HVAC control module	Below 0.3 V	Ignition switch turned ON
G58-12	—	—	—	—
G58-13	YEL	Temperature control actuator position sensor signal	About 4.0 V	Ignition switch turned ON, temperature selector MAX COOL position
			About 2.0 V	Ignition switch turned ON, temperature selector MAX HOT position
G58-14	WHT/BLU	Air flow control actuator position sensor signal	About 4.0 V	Ignition switch turned ON, air flow selector VENT position
			About 1.6 V	Ignition switch ON, air flow selector DEF position
G58-15	—	—	—	—
G58-16	WHT/RED	Electric power source for back-up	10 – 14 V	Full-time

A/C System Performance Inspection

S7N20A7224027

Refer to “A/C System Performance Inspection: Manual A/C”.

A/C System Inspection at ECM

S7N20A7224028

When checking voltage at ECM terminals related to A/C system, refer to “Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A”.

Repair Instructions

Operation Procedure for Refrigerant Charge

S7N20A7226001

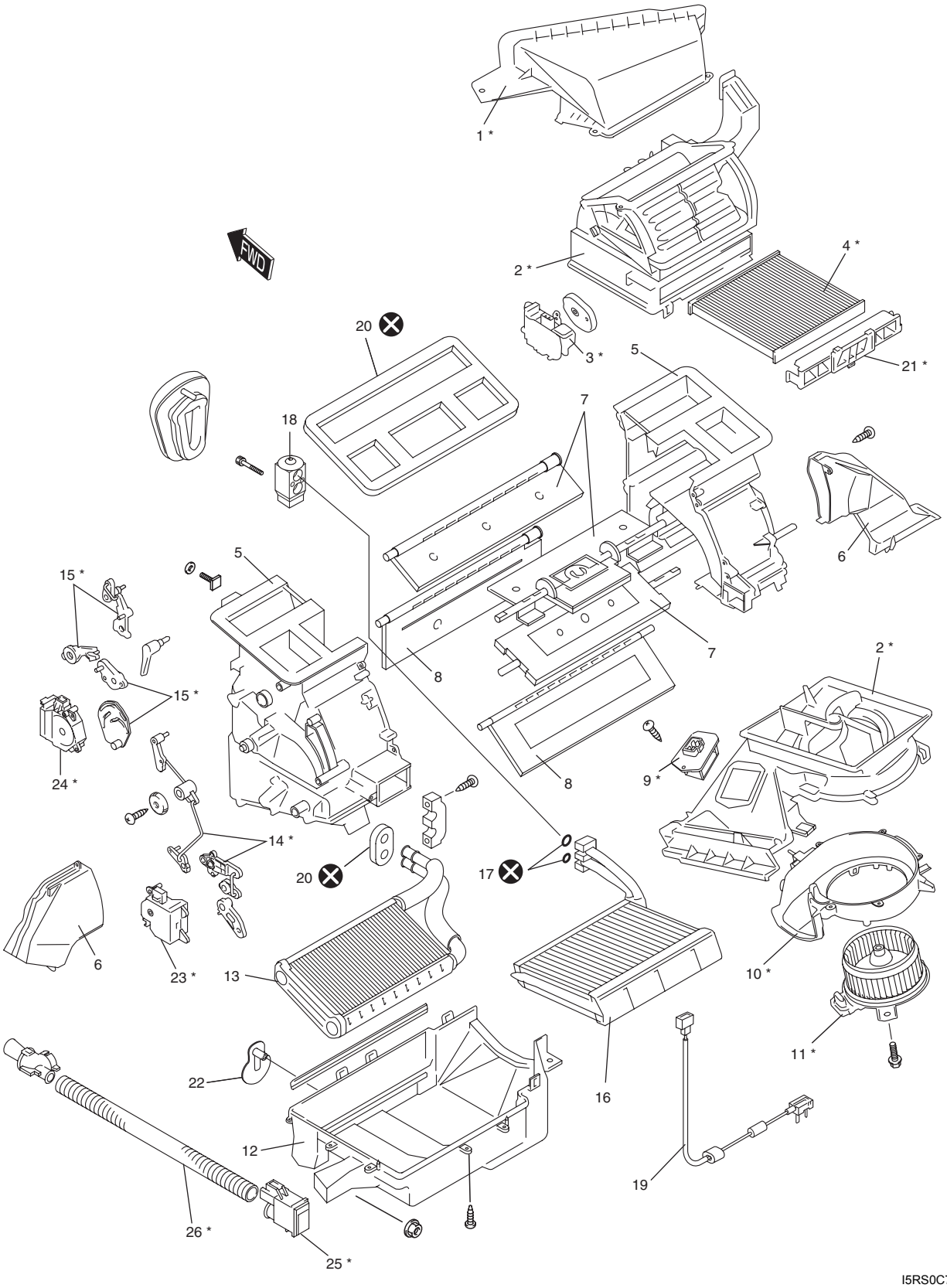
Refer to “Operation Procedure for Refrigerant Charge: Manual A/C”.

HVAC Unit Components

S7N20A7226002

NOTE

The figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



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1. Fresh air inlet duct	8. Temperature control door assembly	15. Air flow control links	22. Drain hose

2. Blower upper case	9. Blower motor controller	16. Evaporator	23. Temperature control actuator
3. Air intake control actuator	10. Blower lower case	17. O-ring	24. Air flow control actuator
4. Air filter (if equipped)	11. Blower motor	18. Expansion valve	25. Inside air temperature sensor
5. Heater unit upper case	12. Heater unit lower case	19. Evaporator temperature sensor	26. Aspirator hose
6. Foot duct	13. Heater core	20. Packing	⊗ : Do not reuse.
7. Air flow control door assembly	14. Temperature control links	21. Filter cover	

HVAC Unit Removal and Installation

S7N20A7226003

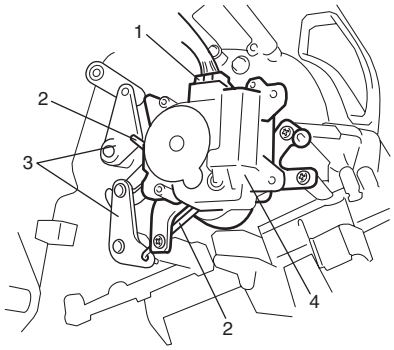
Refer to “HVAC Unit Removal and Installation: Manual A/C”.

Temperature Control Actuator Removal and Installation

S7N20A7226004

Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover from instrument panel.
3) Remove foot duct from HVAC unit.
4) Disconnect temperature control actuator connector (1).
5) Detach temperature control actuator rods (2) from linkage (3).
6) Remove temperature control actuator (4) from HVAC unit.



I5RS0A722020-02

Installation

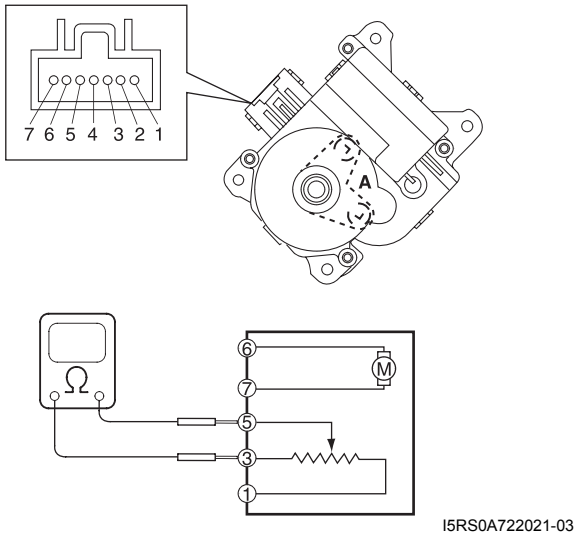
Reverse removal procedure.

Temperature Control Actuator Inspection

S7N20A7226005

1) Remove temperature control actuator from HVAC unit referring to “Temperature Control Actuator Removal and Installation: Auto A/C”.
2) Connect connector to temperature control actuator.
3) Set temperature selector of HVAC control module to MAX HOT position with ignition switch ON, and make sure if the position of actuator lever is MAX HOT position (A).
4) Turn ignition switch OFF, and then disconnect connector from temperature control actuator.
5) Measure resistance between terminal “3” and “5”.

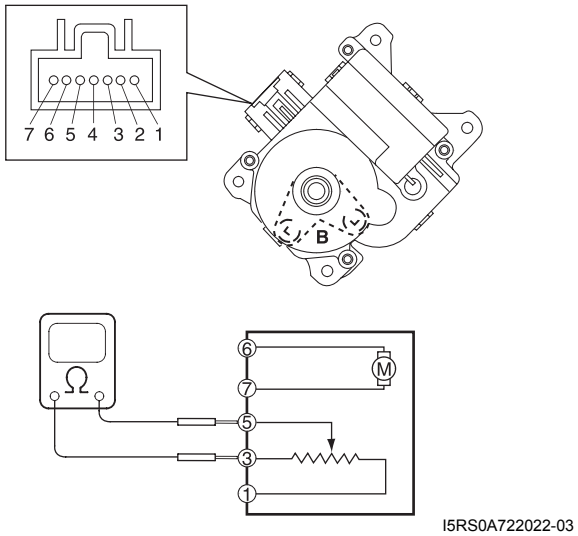
Temperature control actuator resistance between terminal “3” and “5” (MAX HOT position)
Approximately 2.5 kΩ at 25°C (77°F)



I5RS0A722021-03

6) Connect connector to temperature control actuator.
7) Set temperature selector of HVAC control module to MAX COOL position with ignition switch ON, and make sure if the position of actuator lever is MAX COOL position (B).
8) Turn ignition switch OFF, and then disconnect connector from temperature control actuator.
9) Measure resistance between terminal “3” and “5”

Temperature control actuator resistance between terminal “3” and “5” (MAX COOL position)
Approximately 4.8 kΩ at 25°C (77°F)



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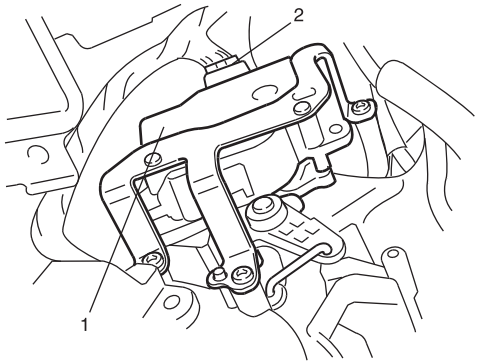
If check result is not satisfactory, replace the actuator with new one.

Air Flow Control Actuator Removal and Installation

S7N20A7226006

Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover from instrument panel.
3) Remove foot duct from HVAC unit.
4) Disconnect air flow control actuator connector (2).
5) Remove air flow control actuator (1) from HVAC unit, and then detach air flow actuator rod from linkage.



I5RS0A722023-03

Installation

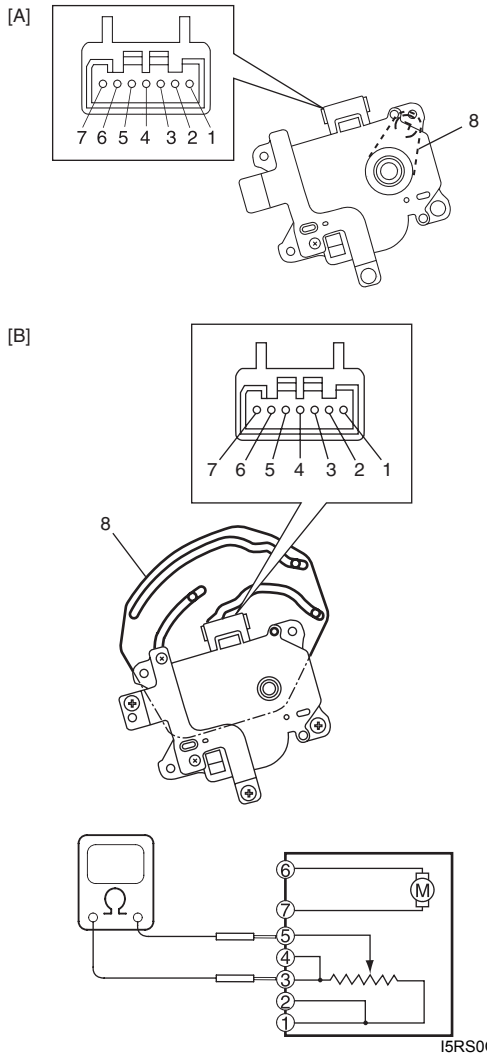
Reverse removal procedure.

Air Flow Control Actuator Inspection

S7N20A7226007

1) Remove air flow control actuator from HVAC unit referring to “Air Flow Control Actuator Removal and Installation: Auto A/C”.
2) Connect actuator connector to the actuator.
3) Set air flow selector of HVAC control module to DEF position with ignition switch ON, and make sure if the position of actuator lever is DEF position (8).
4) Turn ignition switch OFF, and then disconnect connector from air flow control actuator.
5) Measure resistance between terminal “3” and “5”

Air flow control actuator resistance between terminal “3” and “5” (DEF position)
Approximately 4.8 kΩ at 25 °C (77 °F)

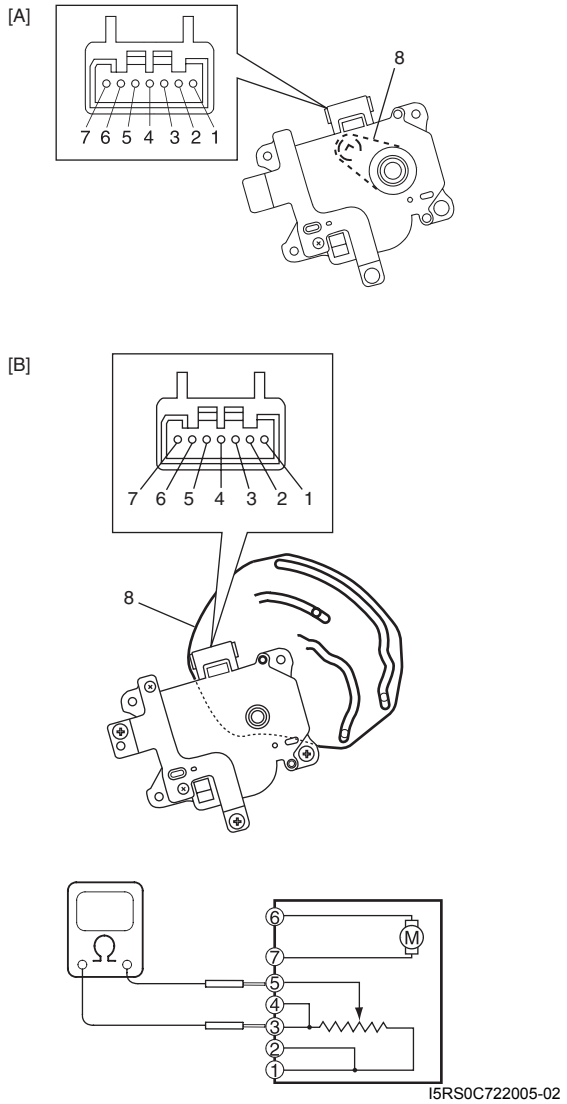


I5RS0C722004-01

[A]: LH steering vehicle	[B]: RH steering vehicle

6) Connect connector to air flow control actuator.
7) Set air flow selector of HVAC control module to VENT position with ignition switch ON, and make sure if the position of actuator lever is VENT position (8).
8) Turn ignition switch OFF, and then disconnect connector from air flow control actuator.
9) Measure resistance between terminal “3” and “5”.

Air flow control actuator resistance between terminal “3” and “5” (VENT position)
Approximately 2.0 kΩ at 25 °C (77 °F)



I5RS0C722005-02

[A]: LH steering vehicle	[B]: RH steering vehicle

If check result is not satisfactory, replace the actuator with new one.

Air Intake Control Actuator Removal and Installation

S7N20A7226008

Refer to “Air Intake Control Actuator Removal and Installation in Section 7A”.

Air Intake Control Actuator Inspection

S7N20A7226009

Refer to “Air Intake Control Actuator Inspection in Section 7A”.

Actuator Linkage Inspection

S7N20A7226010

- Check if each actuator linkage operates smoothly.
- Check actuator rod for bend.
- Check each actuator linkage for breakage.
- Make sure if there is not any obstruction in operating range of actuator linkage.
  If any malfunction is found, repair or replace faulty part(s).

Blower Motor Controller Removal and Installation

S7N20A7226011

Refer to “Blower Motor Resistor Removal and Installation in Section 7A”.

Blower Motor Controller Inspection

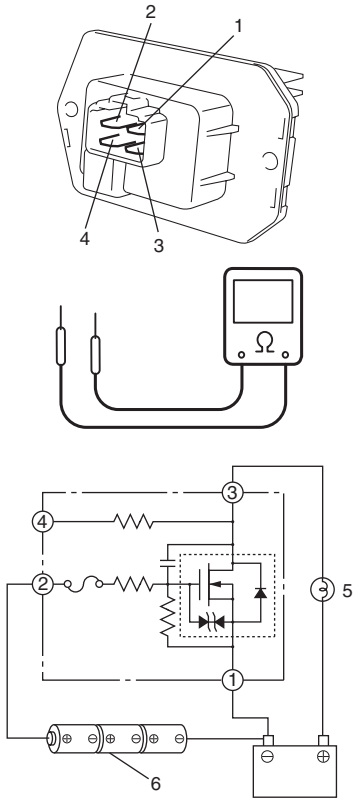
S7N20A7226012

1) Check internal circuit of controller for resistance as follows.
   a) Measure resistance between “1” terminal and “2” terminal of blower motor controller.

      Blower motor controller resistance
      “1” – “2”: approximately 10 kΩ at 25°C (77°F)

      If resistance does not meet above specification, replace blower motor controller.
   b) Using ohmmeter, connect its positive terminal to “3” terminal of blower motor controller and negative terminal to “1” terminal of blower motor controller and check that there is no continuity.

2) Check controller for operation as follows.
   a) Using bulb (3.4 W) (5) and service wire, connect battery positive terminal to “3” terminal of blower motor controller as shown figure.
   b) Using service wire, connect battery negative terminal to “1” terminal of blower motor controller.
   c) Arrange 3 new 1.5 V batteries (6) in series (check that total voltage is 4.5 – 5.0 V) and connect its positive terminal to “2” terminal of blower motor controller and negative terminal to “1” terminal of blower motor controller.
   Then, check that bulb lights. If bulb does not light under the above conditions, replace blower motor controller.



I5RS0A722026-01

HVAC Control Module Removal and Installation

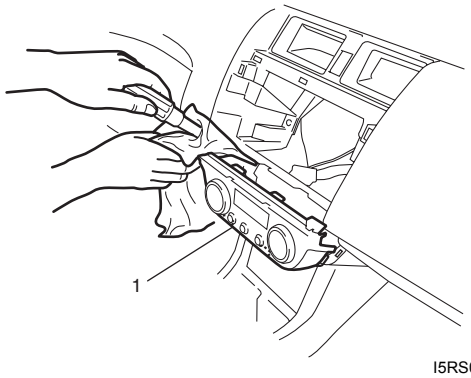
S7N20A7226013

Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove passenger air bag module from instrument panel referring to “Passenger Air Bag (Inflator) Module Removal and Installation in Section 8B”.
4) Remove radio assembly from instrument panel referring to “Audio Unit Removal and Installation in Section 9C”.
5) Remove two connectors from HVAC control module.
6) Remove HVAC control module (1) from instrument panel.

NOTE

Be careful not to damage HVAC control module and instrument panel by using rag.



I5RS0A722030-01

Installation

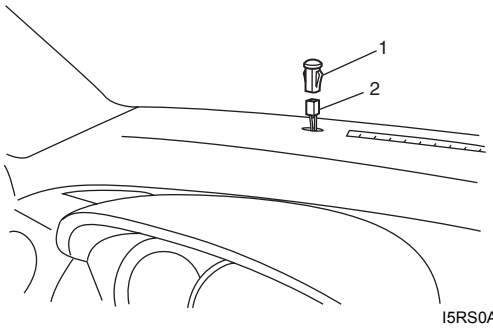
Reverse removal procedure noting the following instructions.
Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Sunload Sensor Removal and Installation

S7N20A7226014

Removal

1) Disconnect negative (–) cable at battery.
2) Remove combination meter referring to “Combination Meter Removal and Installation in Section 9C”.
3) Remove sunload sensor (1) from instrument panel by depressing tab and pushing sensor upward from underneath.
4) Disconnect sunload sensor connector (2).



I5RS0A722027-01

Installation

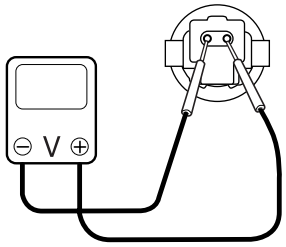
Reverse removal procedure.

Sunload Sensor Inspection

S7N20A7226015

1) Light over sunload sensor vertically with an incandescent lamp of approximately 100 W. The distance between sunload sensor and lamp should be approximately 100 mm (3.94 in.).
2) Measure voltage between terminals of sunload sensor as shown.
   If check result is not satisfactory, replace sunload sensor with new one.

   Sunload sensor voltage specification
   0.4 V or more



I4RH01722036-01

Outside Air Temperature Sensor Removal and Installation

S7N20A7226016

Refer to “Outside Air Temperature Sensor Removal and Installation (If Equipped) in Section 9C”.

Outside Air Temperature Sensor Inspection

S7N20A7226017

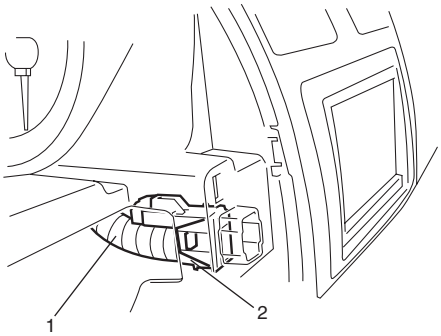
Refer to “Outside Air Temperature Sensor Inspection (If Equipped) in Section 9C”.

Inside Air Temperature Sensor Removal and Installation

S7N20A7226018

Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover.
3) Remove connector and aspirator hose (1) from inside air temperature sensor (2).
4) Remove inside air temperature sensor from instrument panel while releasing lock of both sides of inside air temperature sensor.



I5RS0A722028-01

Installation

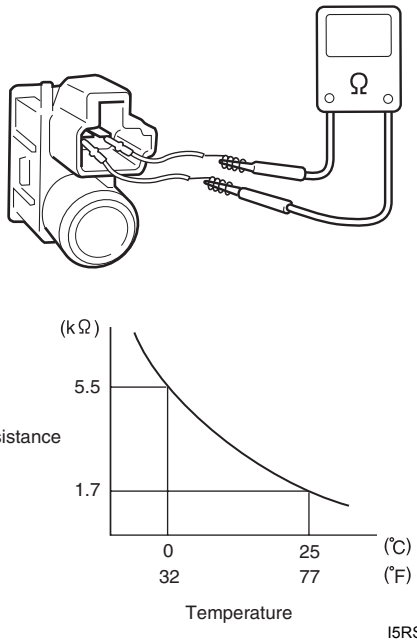
Reverse removal procedure.

Inside Air Temperature Sensor Inspection

S7N20A7226019

Measure resistance between each connector terminal with an ohmmeter.
If resistance is incorrect, replace inside air temperature sensor with new one.

Inside air temperature sensor resistance
1.7 kΩ ± 0.085 kΩ at 25 °C (77 °F)



I5RS0A722029-01

Condenser Assembly On-Vehicle Inspection

S7N20A7226020

Refer to “Condenser Assembly On-Vehicle Inspection: Manual A/C”.

Condenser Assembly Removal and Installation

S7N20A7226021

Refer to “Condenser Assembly Removal and Installation: Manual A/C”.

Receiver/Dryer Removal and Installation

S7N20A7226022

Refer to “Receiver/Dryer Removal and Installation: Manual A/C”.

Evaporator Inspection

S7N20A7226023

Refer to “Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C”.

Evaporator Temperature Sensor Removal and Installation

S7N20A7226024

Refer to “Evaporator Thermistor (Evaporator Temperature Sensor) Removal and Installation: Manual A/C”.

Evaporator Temperature Sensor Inspection

S7N20A7226025

Refer to “Evaporator Thermistor (Evaporator Temperature Sensor) Inspection: Manual A/C”.

Expansion Valve Removal and Installation

S7N20A7226026

Refer to “Expansion Valve Removal and Installation: Manual A/C”.

Expansion Valve Inspection

S7N20A7226027

Refer to “Expansion Valve Inspection: Manual A/C”.

A/C Refrigerant Pressure Sensor and Its Circuit Inspection

S7N20A7226028

Refer to “A/C Refrigerant Pressure Sensor and Its Circuit Inspection: Manual A/C”.

A/C Refrigerant Pressure Sensor Removal and Installation

S7N20A7226029

Refer to “A/C Refrigerant Pressure Sensor Removal and Installation: Manual A/C”.

Compressor Relay Inspection

S7N20A7226030

Refer to “Compressor Relay Inspection: Manual A/C”.

Compressor Drive Belt Inspection and Adjustment

S7N20A7226031

Refer to “Compressor Drive Belt Inspection and Adjustment (Petrol Engine Model): Manual A/C” or “Compressor Drive Belt Inspection and Adjustment (Diesel Engine Model): Manual A/C”.

Compressor Drive Belt Removal and Installation

S7N20A7226032

Refer to “Compressor Drive Belt Removal and Installation (Petrol Engine Model): Manual A/C” or “Compressor Drive Belt Removal and Installation (Diesel Engine Model): Manual A/C”.

Compressor Assembly Removal and Installation

S7N20A7226033

Refer to “Compressor Assembly Removal and Installation (Petrol Engine Model): Manual A/C” or “Compressor Assembly Removal and Installation (Diesel Engine Model): Manual A/C”.

Compressor Assembly Components

S7N20A7226034

Refer to “Compressor Assembly Components: Manual A/C”.

Magnet Clutch Removal and Installation

S7N20A7226035

Refer to “Magnet Clutch Removal and Installation: Manual A/C”.

Magnet Clutch Inspection

S7N20A7226036

Refer to “Magnet Clutch Inspection (Petrol Engine Model): Manual A/C” or “Magnet Clutch Inspection (Diesel Engine Model): Manual A/C”.

Thermal Switch Inspection

S7N20A7226037

Refer to “Thermal Switch Inspection: Manual A/C”.

Thermal Switch Removal and Installation

S7N20A7226038

Refer to “Thermal Switch Removal and Installation: Manual A/C”.

Relief Valve Inspection

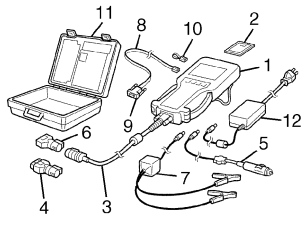
S7N20A7226039

Refer to “Relief Valve Inspection (Petrol Engine Model): Manual A/C” or “Relief Valve Inspection (Diesel Engine Model): Manual A/C”.

Special Tools and Equipment

Special Tool

S7N20A7228001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞		

Section 8

Restraint

CONTENTS

Precautions

Precautions

Precautions on Restraint

S7N20A8000001

Air Bag System Service Warning
Refer to “Air Bag System Service Warning in Section 00”.

Fastener Caution
Refer to “Fastener Caution in Section 00”.

Precautions on Service and Diagnosis of Seat Belt
Refer to “Precautions on Service and Diagnosis of Seat Belt in Section 8A”.

Precautions on Service and Diagnosis of Air Bag System
Refer to “Precautions on Service and Diagnosis of Air Bag System in Section 8B”.

Precautions on Handling and Storage of Air Bag Components
Refer to “Precautions on Handling and Storage of Air Bag System Components in Section 8B”.

Precautions on Disposal of Air Bag and Seat Belt Pretensioner
Refer to “Precautions on Disposal of Air Bag and Seat Belt Pretensioner in Section 8B”.

Seat Belts

Precautions

Precautions on Service and Diagnosis of Seat Belt

S7N20A8100001

⚠ WARNING

If replacing seat belt is necessary, replace buckle and seat belt assembly together as a set. This is for the reason of ensuring locking of tongue plate with buckle. If these parts are replaced individually, such a locking condition may become unreliable. For this reason, SUZUKI will supply only the spare buckle and seat belt assembly in a set part.

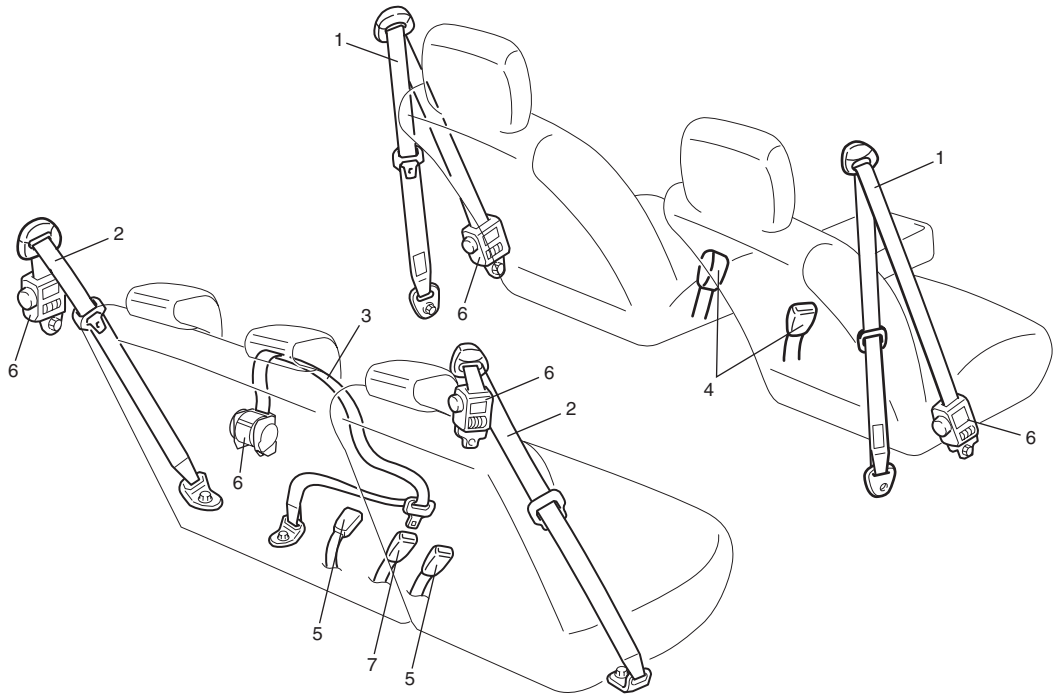
Before servicing or replacing seat belts, refer to the following precautionary items.

- Seat belts should be normal relative to strap retractor and buckle portions.
- Keep sharp edges and damaging objects away from belts.
- Avoid bending or damaging any portion of belt buckle or latch plate.
- Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
- When installing a seat belt anchor bolt, it should be tightened by hand at first to prevent cross-threading and then to specified torque.
- Do not attempt any repairs on retractor mechanisms or retractor covers. Replace defective assemblies with new replacement parts.
- Keep belts dry and clean at all times.
- If there exist any parts in question, replace such parts.
- Replace belts whose webbing is cut or otherwise damaged.
- Do not put anything into trim panel opening which seat belt webbing passes through.

General Description

Seat Belt Construction

S7N20A8101001



I4RS0A810001-02

1. Front seat belt assembly (with ELR and pretensioner)	4. Buckle for front seat belt assembly	7. Buckle for rear center seat belt
2. Rear seat belt assembly (with A-ELR or ELR)	5. Buckle for rear seat belt assembly	
3. Rear center seat belt (with A-ELR or ELR)	6. Retractor assembly	

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 with A-ELR
The automatic and emergency locking retractor (A-ELR) works as an Emergency Locking Retractor (ELR) till its webbing is pulled all the way out and then on as an Automatic Locking Retractor (ALR) till it is retracted fully.
ALR: Automatically locks when the webbing is pulled out from the retractor and allowed to retract even a little. Then the webbing can not be pulled out any further, unless it is wound all the way back into the retractor, which releases the lock and allows the webbing to be pulled out.

Seat Belt with ELR and Pretensioner
The seat belt with ELR and a pretensioner has a pretensioner mechanism which operates in linkage with the air bag in addition to the described ELR.
The pretensioner is incorporated in retractor assembly and controlled by SDM as one of air bag system components. It will be activated at the same time as the driver and passenger air bag module when an impact at the front of vehicle exceeds the specified value.
When servicing seat belt (retractor assembly) with pretensioner, be sure to observe all WARNINGS and CAUTIONS and "Precautions on Service and Diagnosis of Air Bag System in Section 8B".

⚠ CAUTION

Do not reuse the seat belt pretensioner (retractor assembly) that has activated. Replace it with a new seat belt assembly and buckle together as a set. For checking procedure of its activation, refer to "Repair and Inspection Required after Accident in Section 8B".

Seat Belt Remainder
When driver's seat belt is unfastened (under the following conditions), seat belt reminder light and warning buzzer inform that driver's seat belt is unfastened. Seat belt reminder light located in combination meter and warning buzzer located inside BCM operate as follows:

- Seat belt reminder light comes on when driver's seat belt is unfastened while ignition key switch is at ON position.
- If vehicle speed exceeds 15 km/h with seat belt unfastened, warning buzzer operates for approximately 95 seconds and seat belt reminder light flashes synchronously with buzzer. When warning buzzer stops operating, seat belt reminder light is turned on.
- If driver's seat belt state is changed from "fastened" to "unfastened" while vehicle speed is above 15 km/h, warning buzzer operates for approximately 95 seconds and seat belt reminder light flashes synchronously with buzzer. When warning buzzer stops operating, seat belt reminder light is turned on.

Diagnostic Information and Procedures

Repair and Inspection Required after Accident

S7N20A8104001

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".

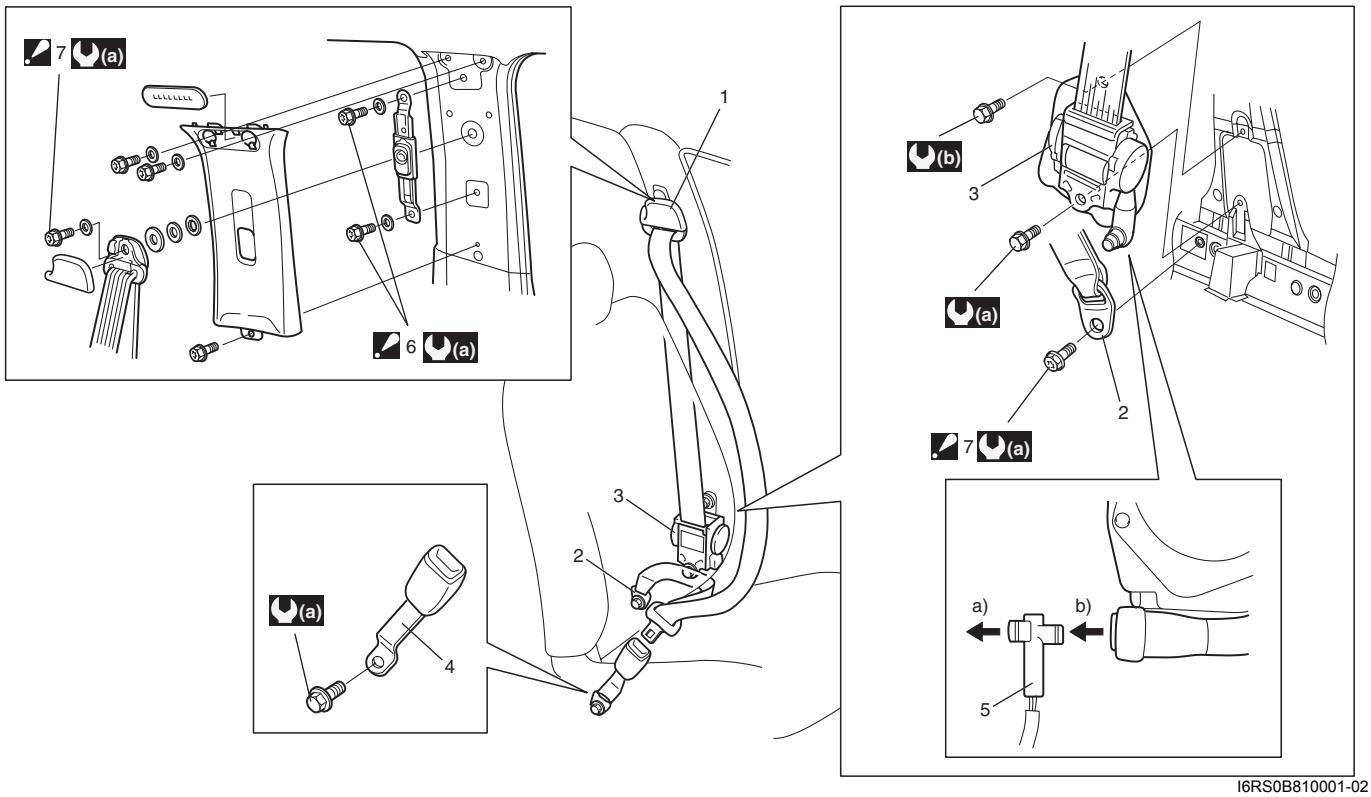
Repair Instructions

Front Seat Belt Components

S7N20A8106001

⚠ WARNING

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Seat Belt" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**



I6RS0B810001-02

1. Upper anchor	4. Buckle	7. Anchor bolt : Tighten upper bolt first, then tighten lower bolt.
2. Lower anchor	5. Yellow connector (for seat belt pretensioner)	(a) : 35 N·m (3.5 kgf-m, 25.5 lbf-ft)
3. Retractor assembly	6. Shoulder adjuster mounting bolt : Tighten upper bolt first, then tighten lower bolt.	(b) : 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)

Front Seat Belt Removal and Installation

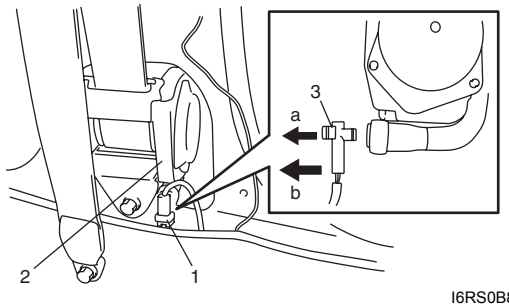
S7N20A8106002

⚠ WARNING

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Seat Belt" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**

Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System in Section 8B".
3) Remove center pillar lower trim.
4) Disconnect Yellow connector (1) from seat belt pretensioner (2).
   a) Release locking of lock button (3).
   b) After unlocked, disconnect to connector.



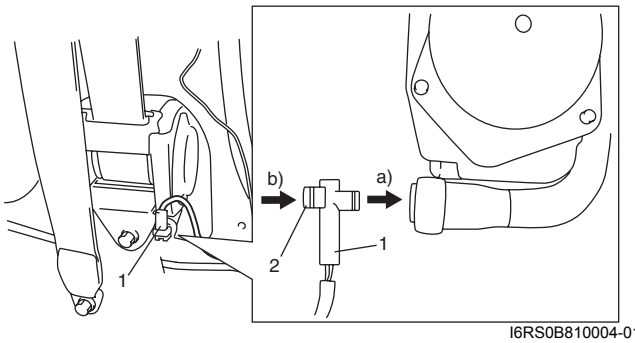
I6RS0B810003-01

5) Remove front seat belts from the vehicle.

Installation

Install in reverse order of removal, noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16-20 UNF). Under no circumstances should any different sized or metric screw threads be used.
- Connect Yellow connector (1) to seat belt pretensioner securely.
  a. Connect connector.
  b. Lock connector with lock slider (2).



I6RS0B810004-01

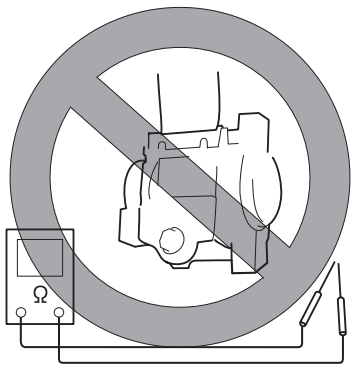
- Enable air bag system. Refer to “Enabling Air Bag System in Section 8B”.

Front Seat Belt Inspection

S7N20A8106003

⚠ WARNING

- **Never attempt to disassemble or repair the seat belt pretensioner (retractor assembly). If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Seat Belt”, before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner when necessary.**
- **Never measure resistance of pretensioner or disassemble it. Otherwise, personal injury may result.**



I2RH01810004-01

⚠ CAUTION

If seat belt pretensioner (retractor assembly) was dropped from a height of 30 cm (1 ft) or more, it should be replaced.

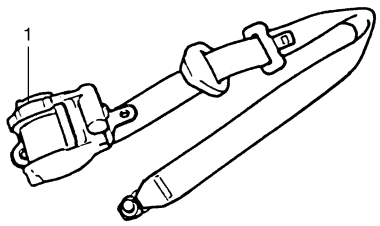
Seat belts and attaching parts can affect the vital components and systems of a vehicle.
Therefore, they should be inspected carefully and replaced with genuine parts only.

Seat Belt

- The seat belt webbing or strap should be free from damage.

Retractor Assembly (with Seat Belt Pretensioner)

1) Let the seat belt retract fully to confirm its easy retraction.
   - The retractor assembly should lock webbing when pulled quickly.
   - The front seat belt retractor assembly (1) should pass the inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
2) Check retractor assembly (1) with seat belt pretensioner appearance visually for following symptoms and if any one of them is applicable, replace it with a new one as an assembly.
   - Pretensioner has activated.
   - There is a crack in seat belt pretensioner (retractor assembly).
   - Seat belt pretensioner (retractor assembly) is damaged or a strong impact (e.g., dropping) was applied to it.



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Anchor Bolt

- Anchor bolts should be torqued to specification.

Belt Latch

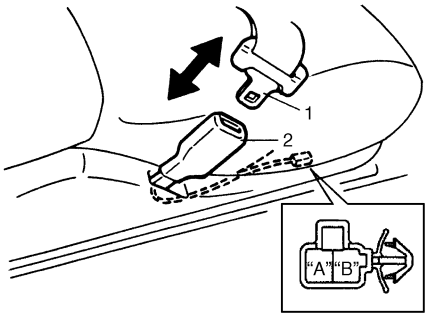
- It should be secure when latched.

Seat Belt Switch

Check driver side seat belt switch for continuity by using ohmmeter.

Seat belt switch specification

Without inserted buckle tongue to buckle catch:
Terminal "A" and "B": Continuity
With inserted buckle tongue to buckle catch:
Terminal "A" and "B": No continuity



I4RS0B810001-01

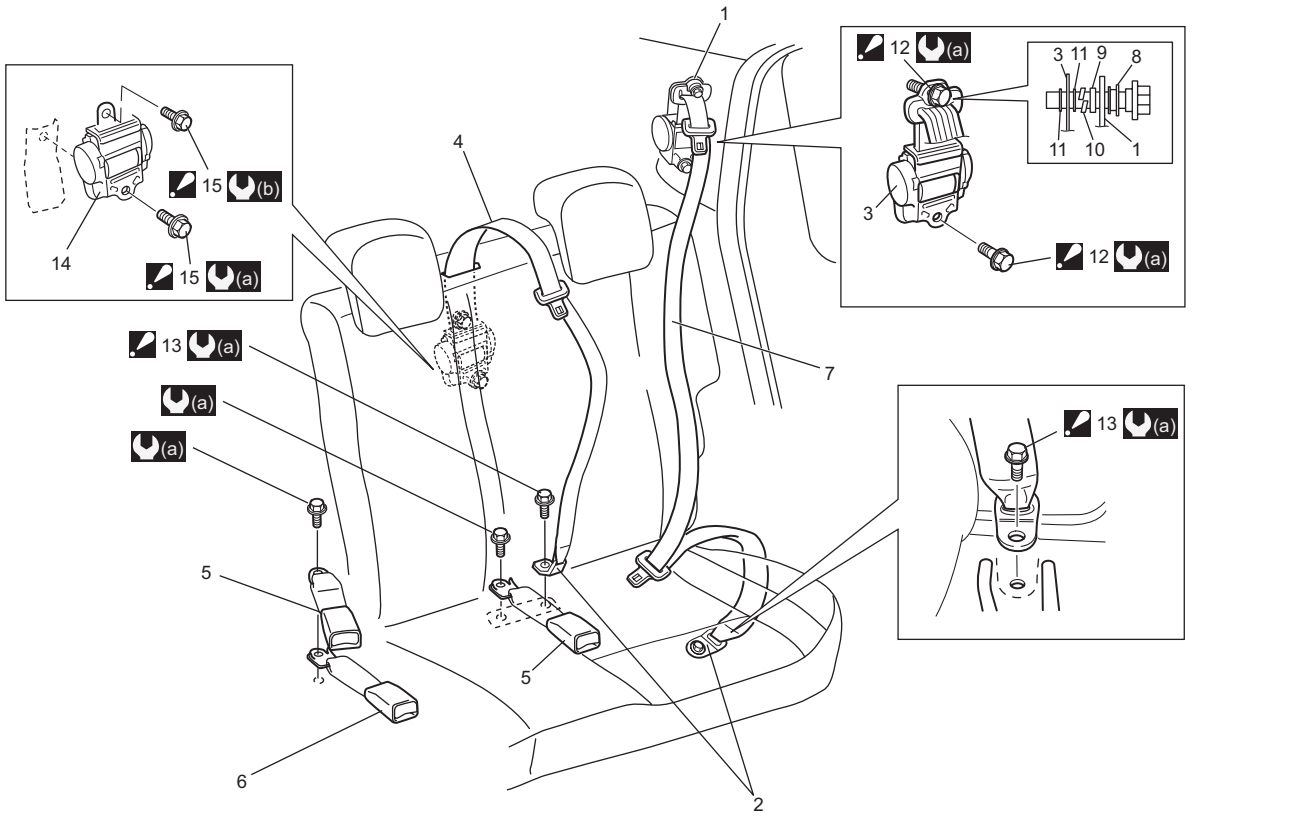
1.	Buckle tongue
2.	Buckle catch

Rear Seat Belt Components

S7N20A8106004

⚠ WARNING

Be sure to read "Precautions on Service and Diagnosis of Seat Belt" before starting to work and observe every precaution during work.



I7N20A810001-01

1. Upper anchor	7. Rear seat belt	13. Anchor bolt : Tighten retractor mounting bolts first, then tighten anchor bolt.
2. Lower anchor	8. Bush	14. Center retractor assembly
3. Side retractor assembly	9. Spacer	15. Center retractor mounting bolt : Tighten lower bolt first, then tighten upper bolt.
4. Rear center seat belt (if equipped)	10. Spring washer	(a) : 43 N·m (4.4 kgf-m, 32.0 lbf-ft)
5. Buckle for rear seat belt	11. Washer	(b) : 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)
6. Buckle for rear center seat belt (if equipped)	12. Side retractor mounting bolt] : Tighten upper bolt first, then tighten lower bolt.	

Rear Seat Belt Removal and Installation

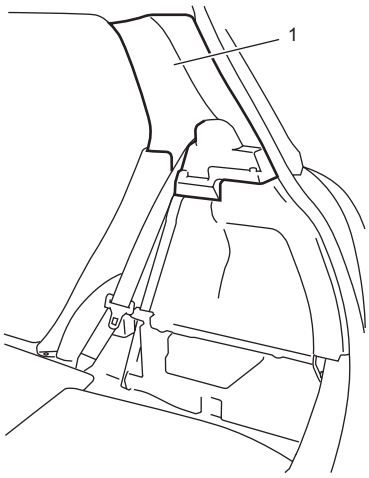
S7N20A8106005

⚠ WARNING

Be sure to read "Precautions on Service and Diagnosis of Seat Belt" before starting to work and observe every precaution during work.

Removal

1) Remove rear seat referring to "Rear Seat Removal and Installation in Section 9G".
2) Remove quarter inner upper trim (1) referring to "Head Lining Removal and Installation in Section 9H".



I7N20A810002-01

3) Remove rear seat belt referring to "Rear Seat Belt Components".

Installation

Reverse removal procedure for installation noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16-20 UNF). Under no circumstances should any different sized or metric screw threads be used.

Rear Seat Belt Inspection

S7N20A8106006

⚠ WARNING

Be sure to read "Precautions on Service and Diagnosis of Seat Belt" before starting to work and observe every precaution during work.

- Check the rear seat belt in the same way as "Front Seat Belt Inspection".
- As to seat belts with A-ELR, check them as follows.
  - With vehicle at stop, pull seat belt all the way out, let it retract a little and try to pull it. It should not be pulled out, that is, it should be locked where retracted.
  - Let seat belt retract to its original state. Next, pull it half way out, let it retract a little and try to pull it again. It should be pulled out smoothly, that is it should not be locked at this time.

Specifications

Tightening Torque Specifications

S7N20A8107001

NOTE

The specified tightening torque is also described in the following.
"Front Seat Belt Components: "
"Rear Seat Belt Components: "

Reference:

For the tightening torque of fastener not specified in this section, refer to "Fasteners Information in Section 0A".

Air Bag System

Precautions

Precautions on Service and Diagnosis of Air Bag System

S7N20A8200001

⚠ WARNING

- **If the air bag system and another vehicle system both need repair, SUZUKI recommends that the air bag system be repaired first, to help avoid unintended air bag system activation.**
- **Do not modify the steering wheel, dashboard, both front seat or any other on or around air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **Be sure to follow the procedures described in this section. Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.**

- WARNING / CAUTION labels are attached on each part of air bag system components (SDM, air bag (inflator) modules and seat belt pretensioners). Be sure to follow the instructions.
- Many of service procedures require disconnection of “A/BAG” fuse and air bag (inflator) module(s) (driver, passenger, side of both sides and curtain of both sides) from initiator circuit to avoid an accidental deployment.
- Do not apply power to the air bag system unless all components are connected or a diagnostic flow requests it, as this will set a DTC.
- The “Air Bag Diagnostic System Check” must be the starting point of any air bag diagnostics. The “Air Bag Diagnostic System Check” will verify proper “AIR BAG” warning lamp operation and will lead you to the correct flow to diagnose any air bag malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacements.
- Never use air bag component parts from another vehicle.
- If the vehicle will be exposed to temperatures over 93 °C (200 °F) (for example, during a paint baking process), remove the air bag system components beforehand to avoid component damage or unintended system activation.
- When handling the air bag (inflator) modules (driver, passenger, side of both sides and curtain of both sides), seat belt pretensioners (driver and passenger), SDM, forward-sensor or side-sensor, be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., SDM, forward-sensor and side-sensor are dropped, air bag (inflator) module is dropped from a height of 90 cm (3 ft) or more, seat belt pretensioner (retractor assembly) is dropped from a height of 30 cm (1 ft) or more), never attempt disassembly or repair but replace it with a new one.
- When using electric welding, be sure to disconnect air bag (inflator) module connectors (driver, passenger, side of both sides and curtain of both sides) and seat belt pretensioner connectors (driver and passenger) respectively.
- When applying paint around the air bag system related parts, use care so that the harness or connector will not be exposed to the paint mist.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.

⚠ WARNING

When performing service on or around air bag system components or air bag wiring, follow the procedures listed in “Disabling Air Bag System” to temporarily disable the air bag system.
Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.

Precautions on Handling and Storage of Air Bag System Components

S7N20A8200002

SDM

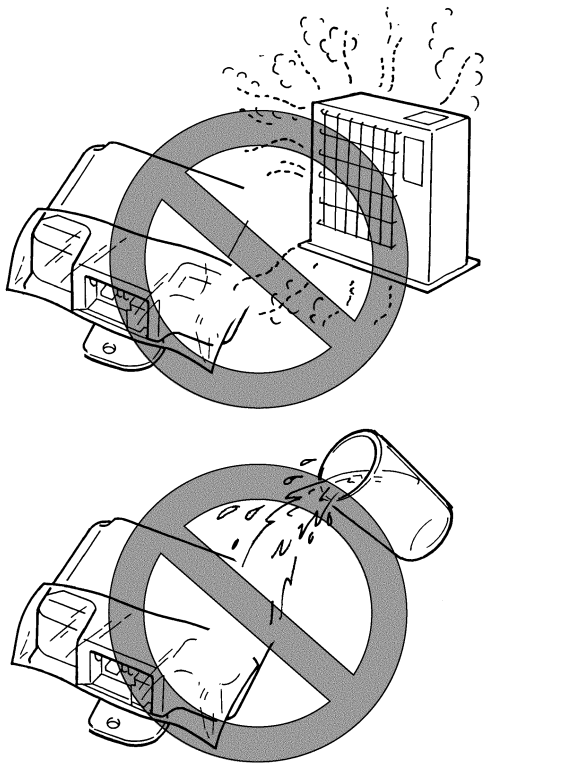
⚠ WARNING

Never power up air bag system when SDM is not rigidly attached to the vehicle. Otherwise, personal injury may result.

⚠ CAUTION

After detecting one time of such collision as to meet deployment conditions, SDM must not be used. Refer to “Air Bag Diagnostic System Check” when checking SDM.

- Never attempt disassembly of SDM.
- When storing SDM, select a place where neither high temperature nor high humidity is anticipated and oil, water and dust are kept off.



I5RH01820001-01

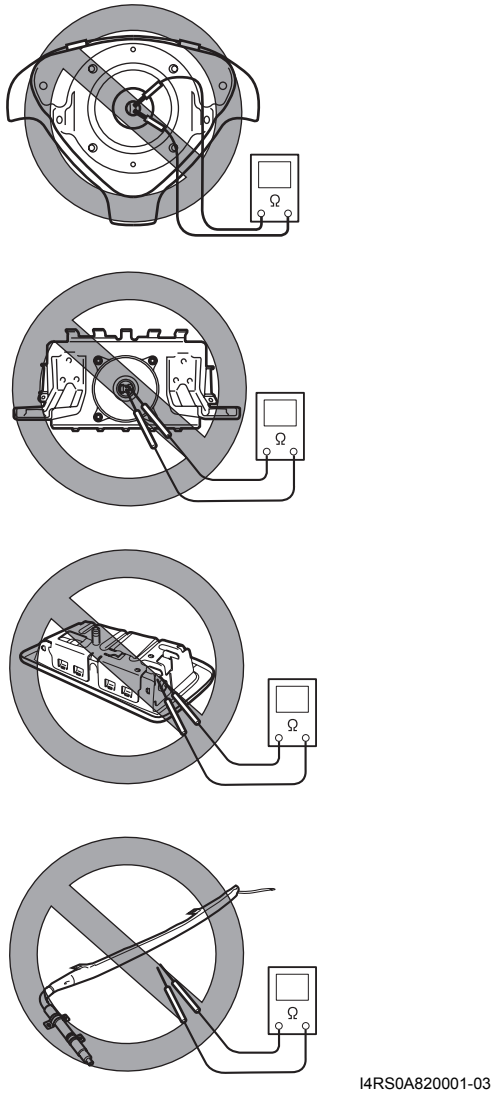
- If SDM has been dropped, replace it with a new one.
- If SDM installation part of floor was damaged, repair that part completely before reinstallation.
- All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointed toward the front of the vehicle to ensure proper operation of the air bag system.

Live (Undeployed) Air Bag (Inflator) Modules

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) modules.
The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.

⚠ WARNING

Never attempt to measure the resistance of the air bag (inflator) modules (driver, passenger and side of both sides and curtain of both sides). It is very dangerous as the electric current from the tester may deploy the air bag.



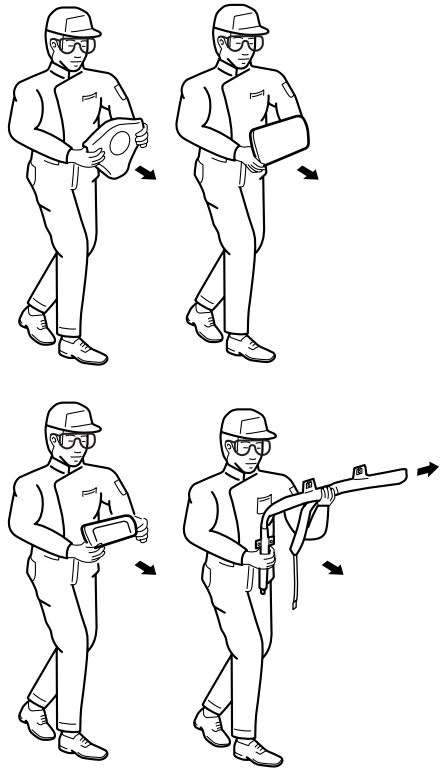
I4RS0A820001-03

- Never attempt disassembly of the air bag (inflator) modules.
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (undeployed) air bag (inflator) module, be sure to deploy it before discarding it.
- When grease, cleaning agent, oil, water, etc., got on the air bag (inflator) modules (driver, passenger, side of both sides and curtain of both sides), wipe it off immediately with a dry cloth.
- If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced with a new one as an assembly.

⚠ WARNING

- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an accidental deployment, the bag will then deploy with minimal chance of injury. Never carry the air bag (inflator) module by the wires or connector on the underside of the module.**

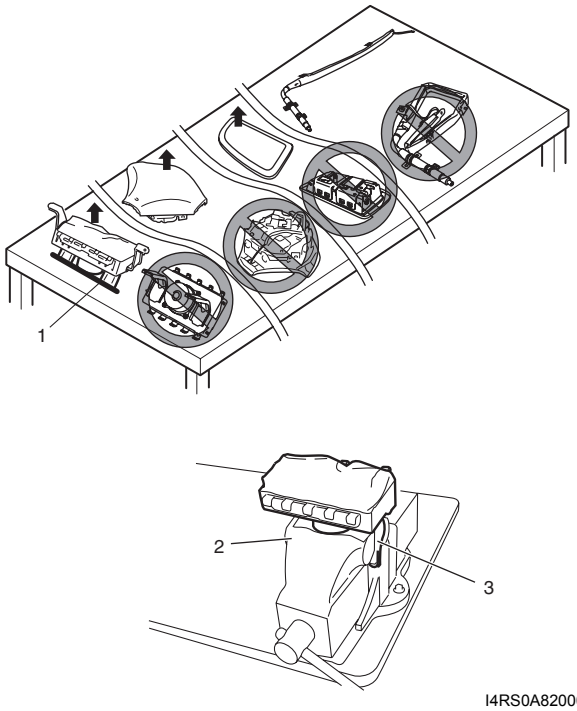
Otherwise, personal injury may result.



I4RS0A820002-01

⚠ WARNING

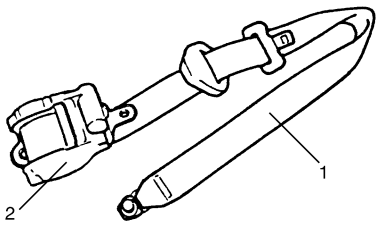
When placing a live air bag (inflator) module on bench or other surface, always face the bag up, away from the surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3).
It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules.
This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.
Otherwise, personal injury may result.



I4RS0A820003-02

Live (Inactivated) Seat Belt Pretensioner

Special care is necessary when handling and storing a live (inactivated) seat belt pretensioners.
Also, when the seat belt pretensioners activate, gas is generated and the seat belt (1) is retracted into the retractor assembly (2) quickly.
Note, therefore, that if they activate accidentally, the seat belt pretensioners and other object(s) around them may be thrown through the air.



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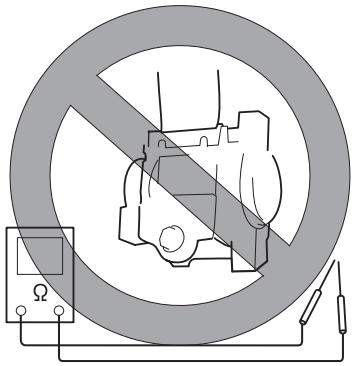
⚠ WARNING

Never attempt to measure the resistance of the seat belt pretensioners. It is very dangerous as the electric current from the tester may activate pretensioner.



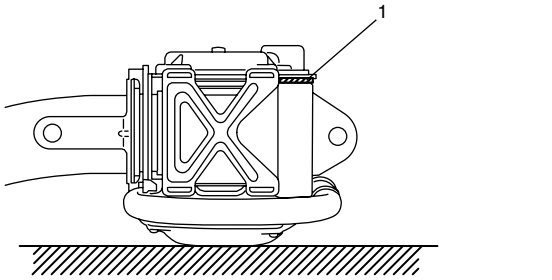
I2RH01820047-01

- Never attempt to disassemble the seat belt pretensioners (retractor assembly).
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (inactivated) seat belt pretensioner, be sure to activate it before discarding it.
- When grease, cleaning agent oil, water, etc., got on the seat belt pretensioners (retractor assembly), wipe it off immediately with a dry cloth.
- If seat belt pretensioner was dropped from a height of 30 cm (1 ft) or more, it should be replaced with a new one as an assembly.

⚠ WARNING

- **For handling and storage of a live seat belt pretensioner, select a place where the ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry the seat belt pretensioner by webbing.**
- **When placing a live seat belt pretensioner on the workbench or other surface, be sure not to lay it with its exhaust hole (1) provided side facing down. It is also prohibited to put something on its face with an exhaust hole (1) or to put a seat belt pretensioner on top of another.**

Otherwise, personal injury may result.



I2RH01820048-01

Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner

⚠ WARNING

- **The air bag (inflator) module and seat belt pretensioner immediately after deployment/activation is very hot. Wait for at least 30 minutes to cool it off before proceeding the work.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and to activate seat belt pretensioner.**
- **After an air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, gloves and safety glasses should be worn.**
- **Wash your hands with mild soap and water after completing the work.**

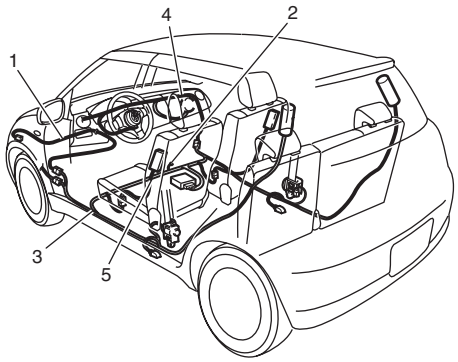
Refer to the procedure described under “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal” for disposal.

Air Bag Wire Harness and Connector

Air bag wire harness is included in main harness (1), instrument panel harness (4), floor harness (3) and seat harness (5). Air bag wire harness can be identified easily as the part of connector side wire harness is covered with a yellow protection tube. Be very careful when handling it.

- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- When installing it, be careful so that the air bag wire harness is not caught or does not interfere with other parts.

- Make sure air bag system grounding point (2) is clean and ground is securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.



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Precautions on Disposal of Air Bag and Seat Belt Pretensioner

S7N20A8200003

Do not dispose of the live (undeployed) air bag (inflator) modules and the live (inactivated) seat belt pretensioners.
When disposal is necessary, be sure to deploy / activate the air bag and seat belt pretensioner according to deployment / activation procedure described in “Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal”.

⚠ WARNING

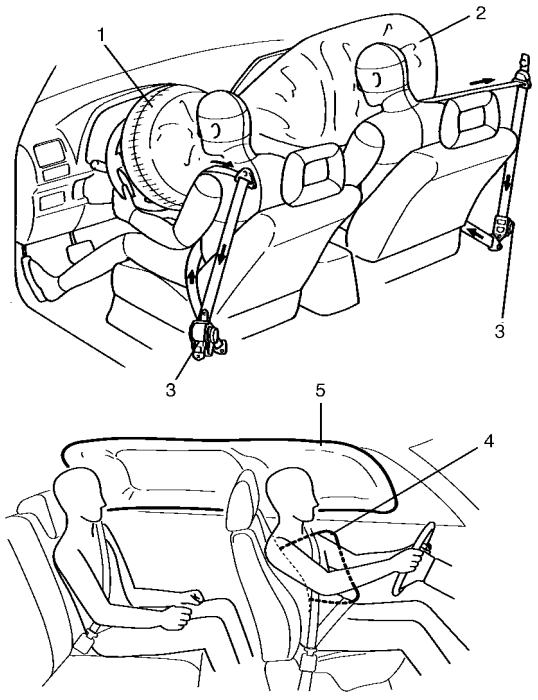
Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which could cause personal injury. Undeployed air bag (inflator) module and inactivated seat belt pretensioner must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module and inactivated seat belt pretensioner contain substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

General Description

Air Bag System Construction

S7N20A8201001

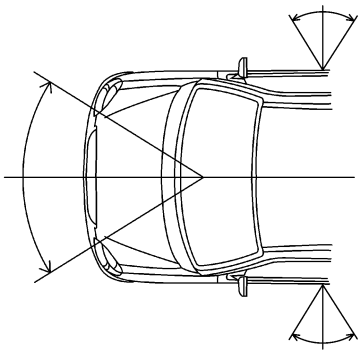
With the air bag system which includes front air bags, side curtain-air bag and side-air bags for both the driver’s and passenger’s sides as well as the seat belt pretensioners, the sag of the seat belt is taken up (for seat belt with pretensioner), the driver air bag (inflator) module is deployed from 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.
Side-air bag (inflator) module is deployed from the side of the seat back in occurrence of a sideward collision with an impact larger than a certain set value.
Side curtain-air bag (inflator) module is deployed from the roof side in occurrence of a sideward collision with an impact larger than a certain set value.



I4RS0B820002-02

1. Driver air bag	4. Side-air bag
2. Passenger air bag	5. Side curtain-air bag
3. Seat belt pretensioner	

The air bag system is designed to activate only in severe frontal and sideward collisions. 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

S7N20A8201002

INPUT \ OUTPUT		Driver air bag, Passenger air bag, Seat belt with pretensioner (LH) and Seat belt with pretensioner (RH)	Driver side-air bag and Driver side curtain-air bag	Passenger side-air bag and Passenger side curtain-air bag
Signal from sensor	Sensor in SDM and forward-sensor	○	—	—
	Driver side-sensor	—	○	—
	Passenger side-sensor	—	—	○

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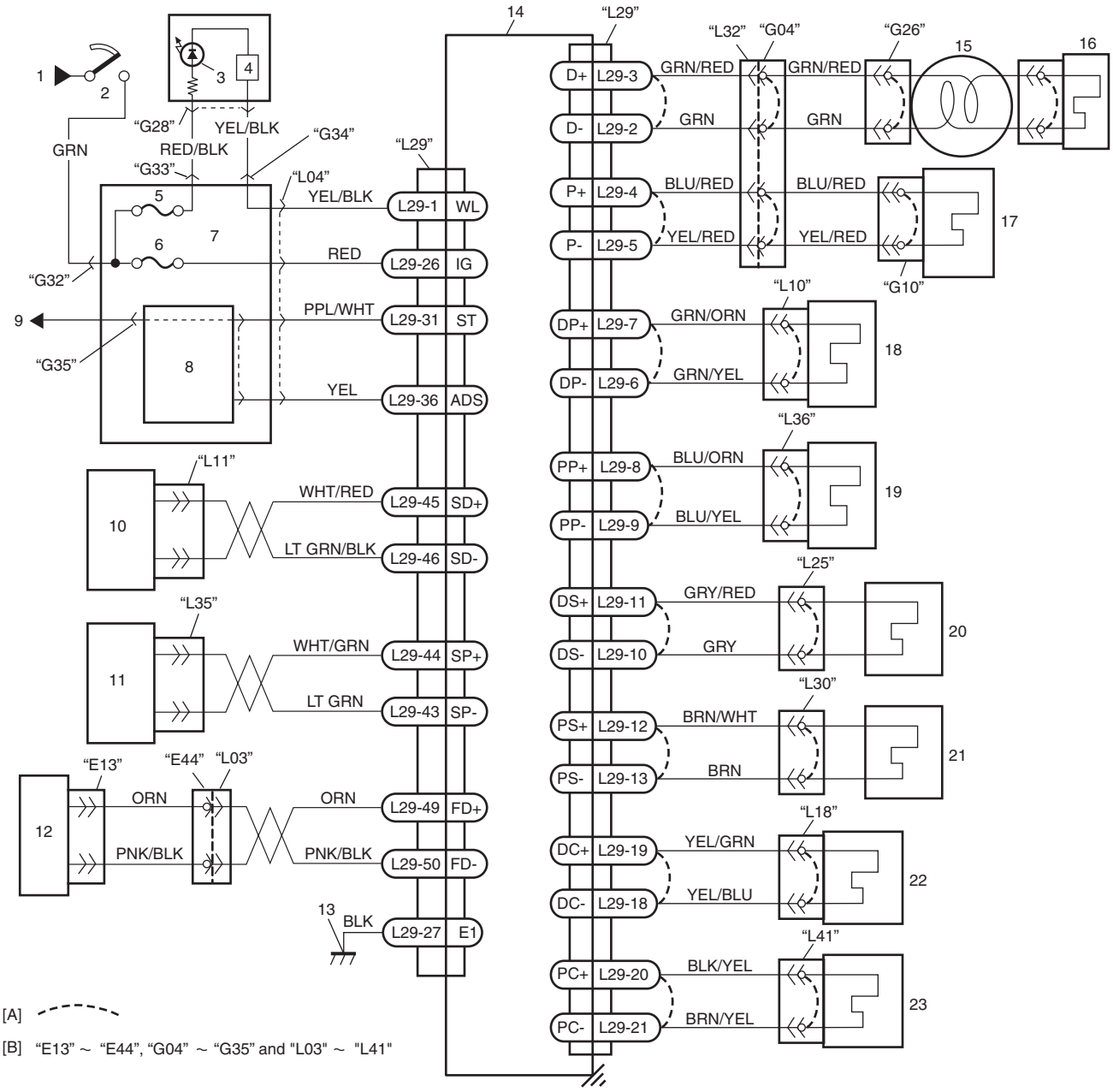
Schematic and Routing Diagram

Air Bag System Wiring Circuit Diagram

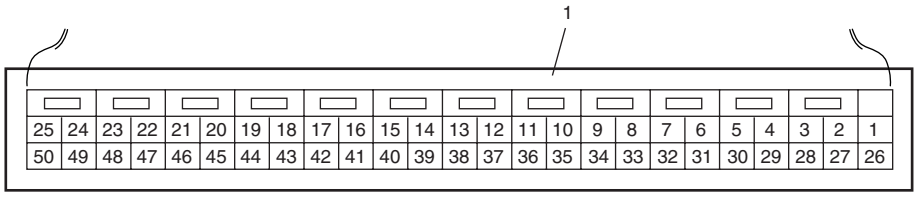
S7N20A8202001



I4RS0B820003-01

[A]: Shorting bar	8. BCM	17. Passenger air bag (inflator) module
[B]: Connector	9. To data link connector (DLC)	18. Driver seat belt pretensioner
1. To battery	10. Driver side-sensor (if equipped)	19. Passenger seat belt pretensioner
2. Ignition switch	11. Passenger side-sensor (if equipped)	20. Driver side-air bag (inflator) module (if equipped)
3. "AIR BAG" warning lamp	12. Forward-sensor	21. Passenger side-air bag (inflator) module (if equipped)
4. Lamp driver	13. Ground for air bag system	22. Driver side curtain-air bag (inflator) module (if equipped)
5. "IG SIG" fuse	14. SDM	23. Passenger side curtain-air bag (inflator) module (if equipped)
6. "A/BAG" fuse	15. Contact coil	
7. Junction block assembly	16. Driver air bag (inflator) module	

Terminal arrangement of SDM (viewed from harness side)



I5RH01820003-01

1. SDM Connector “L29”

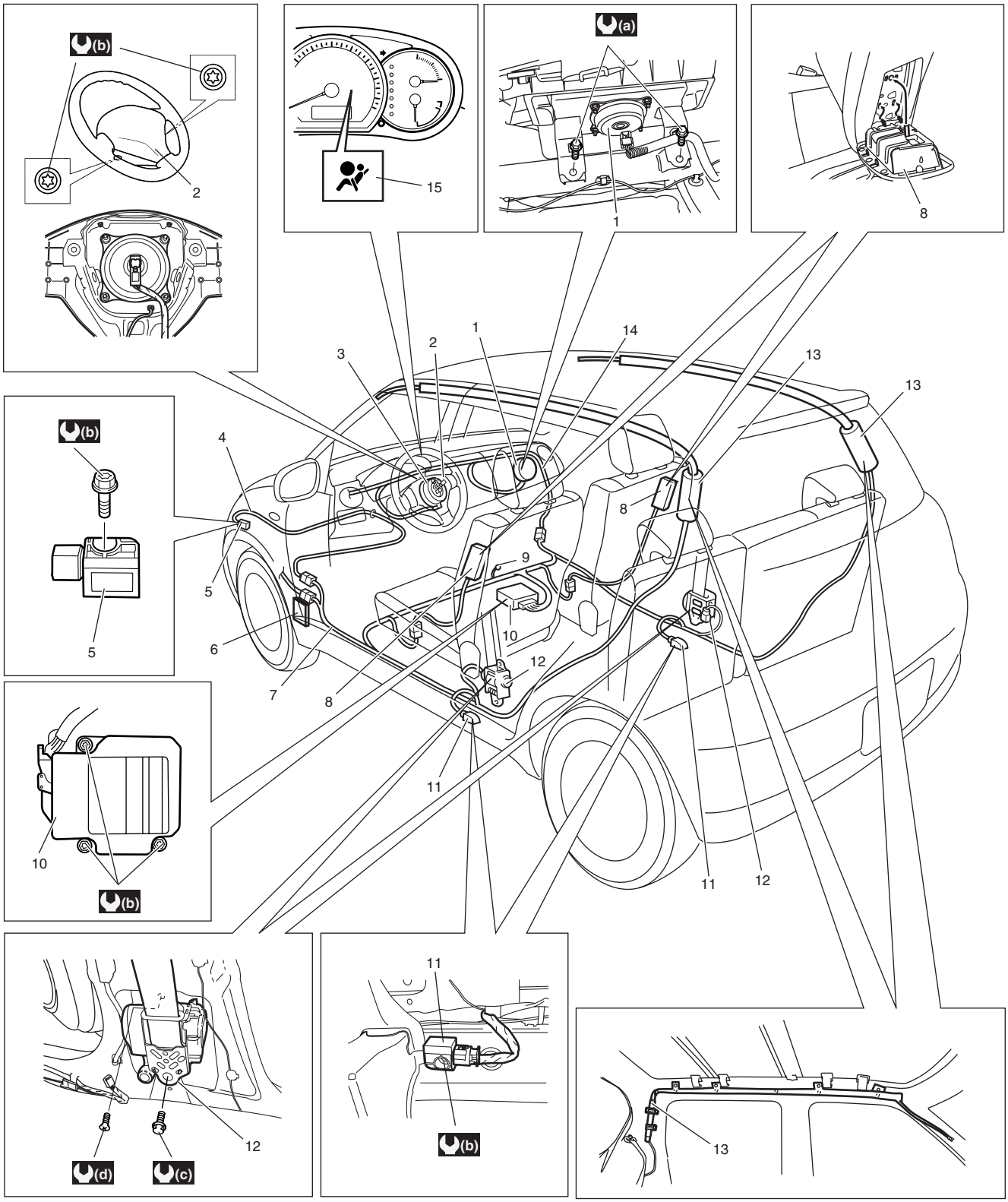
Connector “L29” (SDM connector)

Terminal	Terminal symbol	Circuit	Terminal	Terminal symbol	Circuit
L29-1	WL	“AIR BAG” warning lamp	L29-26	IG	Ignition switch (power source)
L29-2	D1–	Driver air bag (–)	L29-27	E1	Ground
L29-3	D1+	Driver air bag (+)	L29-28	—	—
L29-4	P1+	Passenger air bag (+)	L29-29	—	—
L29-5	P1–	Passenger air bag (–)	L29-30	—	—
L29-6	DP–	Driver seat belt pretensioner (–)	L29-31	ST	DLC
L29-7	DP+	Driver seat belt pretensioner (+)	L29-32	—	—
L29-8	PP+	Passenger seat belt pretensioner (+)	L29-33	—	—
L29-9	PP–	Passenger seat belt pretensioner (–)	L29-34	—	—
L29-10	DS–	Driver side-air bag (–) (If equipped)	L29-35	—	—
L29-11	DS+	Driver side-air bag (+) (If equipped)	L29-36	ADS	Air bag deployed signal for BCM
L29-12	PS+	Passenger side-air bag (+) (If equipped)	L29-37	—	—
L29-13	PS–	Passenger side-air bag (–) (If equipped)	L29-38	—	—
L29-14	—	—	L29-39	—	—
L29-15	—	—	L29-40	—	—
L29-16	—	—	L29-41	—	—
L29-17	—	—	L29-42	—	—
L29-18	DS–	Driver side curtain-air bag (–)	L29-43	SP–	Passenger side-sensor (–)
L29-19	DS+	Driver side curtain-air bag (+)	L29-44	SP+	Passenger side-sensor (+)
L29-20	PS+	Passenger side curtain-air bag (+)	L29-45	SD+	Driver side-sensor (+)
L29-21	PS–	Passenger side curtain-air bag (–)	L29-46	SD–	Driver side-sensor (–)
L29-22	—	—	L29-47	—	—
L29-23	—	—	L29-48	—	—
L29-24	—	—	L29-49	FD+	Forward-sensor (+)
L29-25	—	—	L29-50	FD–	Forward-sensor (–)

Component Location

Air Bag System Components, Wiring and Connectors Location

S7N20A8203001



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1. Passenger air bag (inflator) module	8. Side-air bag (inflator) module (if equipped)	15. “AIR BAG” warning lamp
2. Driver air bag (inflator) module	9. Ground for air bag system	(a) : 23 N·m (2.3 kgf-m, 16.5 lbf-ft)
3. Contact coil assembly	10. SDM	(b) : 9 N·m (0.9 kgf-m, 6.5 lbf-ft)
4. Air bag harness in main harness	11. side-sensor (if equipped)	(c) : 35 N·m (3.5 kgf-m, 25.5 lbf-ft)
5. Forward-sensor	12. Seat belt pretensioner	(d) : 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft)

6. “A/BAG” fuse in junction block assembly (including BCM)	13. Side curtain-air bag (inflator) module (if equipped)	
7. Air bag harness in floor harness	14. Air bag harness in instrument panel harness	

Diagnostic Information and Procedures

Air Bag Diagnostic System Check

S7N20A8204001

⚠ WARNING

To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester.
Instructions in this manual must be followed carefully, otherwise personal injury may result.

⚠ CAUTION

The order in which DTCs are diagnosed is very important. Failure to diagnose the DTCs in the order specified may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.

The diagnostic procedures used are designed to find and repair air bag system malfunctions.

To get the best results, it is important to use the diagnostic flow and follow the sequence in the following.

1) Perform the “Air Bag Diagnostic System Check Flow”.
(The “Air Bag Diagnostic System Check Flow” must be the starting point of any air bag system diagnosis. The “Air Bag Diagnostic System Check Flow” checks for proper “AIR BAG” warning lamp operation through “AIR BAG” warning lamp and whether air bag DTCs exist.)
2) Refer to the proper diagnostic flow as directed by the “Air Bag Diagnostic System Check Flow”.
(The “Air Bag Diagnostic System Check Flow” will lead you to the correct flow to diagnose any air bag system malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.)
3) Repeat the “Air Bag Diagnostic System Check Flow” after any repair or diagnostic procedures have been performed.
(Performing the “Air Bag Diagnostic System Check Flow” after all repair or diagnostic procedures will ensure that the repair has been made correctly and that no other malfunctions exist.)

Air Bag Diagnostic System Check Flow

S7N20A8204002

Flow test description
Step 1: Check that “AIR BAG” warning lamp lights.
Step 2: Check that “AIR BAG” warning lamp lights.
Step 3: Check that “AIR BAG” warning lamp flashes 6 times after ignition switch is turned ON.
Step 4: Check that history codes are in SDM memory.
Step 5: Check that current code is in SDM memory.

Step	Action	Yes	No
1	1) Make sure that battery voltage is about 11 V or higher. 2) Note “AIR BAG” warning lamp as ignition switch is turned ON. *Does “AIR BAG” warning lamp come ON when ignition switch is turned ON?*	Go to Step 2.	Proceed to ““AIR BAG” Warning Lamp Does Not Come ON”.
2	*Does “AIR BAG” warning lamp come ON steady?*	Proceed to ““AIR BAG” Warning Lamp Comes ON Steady”.	Go to Step 3.
3	*Does “AIR BAG” warning lamp turn OFF, after flashing 6 times?*	“AIR BAG” warning lamp circuit is in good condition. Go to Step 4.	“AIR BAG” warning lamp circuit is in good condition. Go to Step 5.

Step	Action	Yes	No
4	1) Check DTC using SUZUKI scan tool referring to “DTC Check”. *Is “NO CODES” displayed on SUZUKI scan tool?*	Air bag system is in good condition.	An intermittent trouble has occurred at some place. Check the connector harness, etc. related to the sensed DTC. Refer to “Inspection of Intermittent and Poor Connections”. Then clear DTC (referring to “DTC Clearance”.) and repeat this flow.
5	Check DTC using SUZUKI scan tool, referring to “DTC Check”. *Is “NO CODES” displayed on SUZUKI scan tool?*	Substitute a known-good SDM and recheck.	Check and repair according to flow corresponding to that DTC.

DTC Table

S7N20A8204003

SDM DTC

DTC	Diagnosis		
—	Normal		—
☞ B1013	SDM	SDM fault	Diagnose trouble according to diagnostic flow corresponding to each code No.
☞ B1014		“AIR BAG” warning lamp circuit failure	
☞ B1016	Power source voltage	Too high	
☞ B1017		Too low	
☞ B1021	SDM	Front air bag module exploded	
☞ B1024		Driver side-air bag module exploded	
☞ B1025		Passenger side-air bag module exploded	
☞ B1026		Pretensioner activated	
☞ B1027		Reusable number exceeded	
☞ B1031	Driver air bag circuit	Resistance high	
☞ B1032		Resistance low	
☞ B1033		Short to ground	
☞ B1034		Short to power circuit	

DTC	Diagnosis		
☞ B1041	Passenger air bag circuit	Resistance high	
☞ B1042		Resistance low	
☞ B1043		Short to ground	
☞ B1044		Short to power circuit	
☞ B1051	Driver pretensioner circuit	Resistance high	
☞ B1052		Resistance low	
☞ B1053		Short to ground	
☞ B1054		Short to power circuit	
☞ B1055	Passenger pretensioner circuit	Resistance high	
☞ B1056		Resistance low	
☞ B1057		Short to ground	
☞ B1058		Short to power circuit	
☞ B1061	Driver side-air bag	Resistance high	
☞ B1062		Resistance low	
☞ B1063		Short to ground	
☞ B1064		Short to power circuit	
☞ B1065	Passenger side-air bag	Resistance high	
☞ B1066		Resistance low	
☞ B1067		Short to ground	
☞ B1068		Short to power circuit	
☞ B1071	Forward-sensor circuit	Performance problem	
☞ B1072		Communication error	
☞ B1073		Short to ground	
☞ B1074		Short to power circuit or open	

DTC	Diagnosis		
☞ B1081	Driver side-sensor	Performance problem	
☞ B1082		Communication error	
☞ B1083		Short to ground	
☞ B1084		Short to power circuit or open	
☞ B1085		Wrong assembly	
☞ B1091	Passenger side-sensor	Performance problem	
☞ B1092		Communication error	
☞ B1093		Short to ground	
☞ B1094		Short to power circuit or open	
☞ B1095		Wrong assembly	
☞ B1361	Driver side curtain-air bag circuit	Resistance high	
☞ B1362		Resistance low	
☞ B1363		Short to ground	
☞ B1364		Short to power circuit	
☞ B1365	Passenger side curtain-air bag circuit	Resistance high	
☞ B1366		Resistance low	
☞ B1367		Short to ground	
☞ B1368		Short to power circuit	

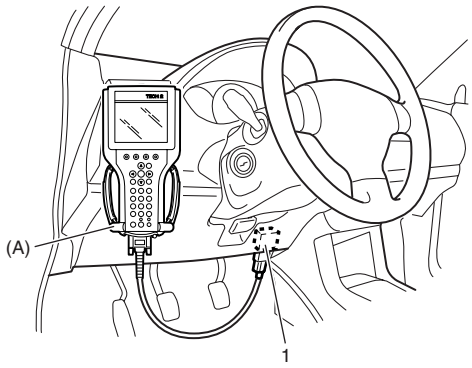
DTC Check

S7N20A8204004

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) located on underside of instrument panel at driver's seat side.

   Special tool
   (A): SUZUKI scan tool

3) Turn ignition switch to ON position.
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 SDM is not possible, check if scan tool is communicable by connecting it to SDM in another vehicle. If communication is possible in this case, scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC) (1).



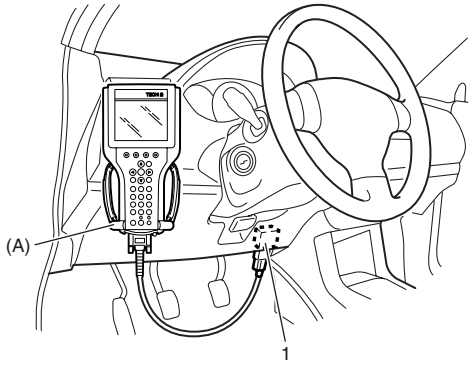
I4RS0B820005-01

DTC Clearance

S7N20A8204005

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) in the same manner as when making this connection for DTC check.

   Special tool
   (A): SUZUKI scan tool



I4RS0B820005-01

3) Turn ignition switch to ON position.
4) Erase DTC according to instructions displayed on SUZUKI scan tool. Refer to SUZUKI scan tool operator's manual for further details.
5) After completing the clearance, perform "DTC Check" and confirm that normal DTC (NO CODES) is displayed and not malfunction DTC.
6) Turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

NOTE

If DTC B1013, DTC B1021 or DTC B1027 is stored in SDM, it is not possible to clear DTC.

Scan Tool Data

S7N20A8204006

Data list of SDM

Scan Tool Data	Normal Condition / Reference Value
Battery voltage	10 – 14 V
Back up volt	27.0 – 33.0 V
System ID	4ch or 8ch
Driv A/B Ini Res	2.1 – 3.8 ohm
Pass A/B Ini Res	1.8 – 2.8 ohm
Driv Preten Ini Res	1.8 – 2.9 ohm
Pass Preten Ini Res	1.8 – 2.9 ohm
Driv Sidebag Ini Res	1.8 – 2.6 ohm
Pass Sidebag Ini Res	1.8 – 2.6 ohm
Driv curtain Ini Res	1.8 – 2.8 ohm
Pass curtain Ini Res	1.8 – 2.8 ohm

Scan Tool Data Definition

Back Up Volt (V): This parameter indicates the capacity of the backup condenser installed to maintain the ignition current (as much as possible) even when the power supply to SDM that ignites the inflator is shut off.

Battery Voltage (V): Battery voltage is an analog input signal read by SDM.

System ID (4ch/8ch): This parameter indicates the number of initiator circuits.

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.

Driv Preten Ini Res (Driver pretensioner initiator resistance) (ohm): This parameter indicates the resistance of the driver seat belt pretensioner initiator circuit.

Pass Preten Ini Res (Passenger pretensioner initiator resistance) (ohm): This parameter indicates the resistance of the passenger seat belt pretensioner initiator circuit.

Driv Sidebag Ini Res (Driver side-air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver side-air bag initiator circuit.

Pass Sidebag Ini Res (Passenger side-air bag initiator resistance) (ohm): This parameter indicates the resistance of the Passenger side-air bag initiator circuit.

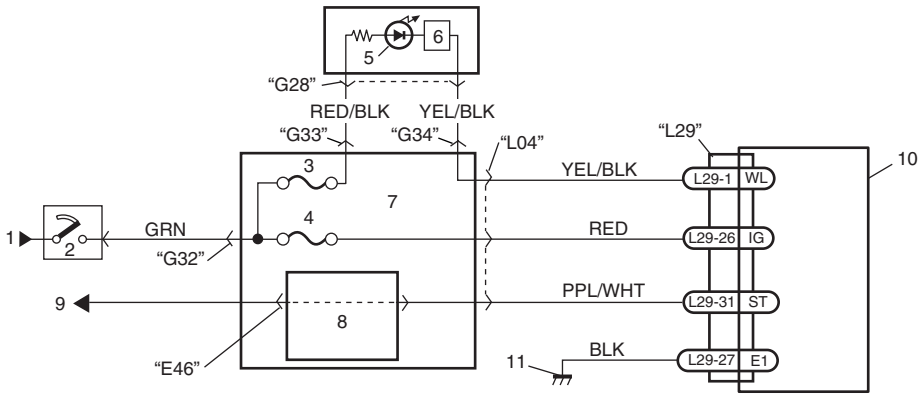
Driv curtain Ini Res (Driver side curtain-air bag initiator resistance) (ohm): This parameter indicates the resistance of the driver side curtain-air bag initiator circuit.

Pass curtain Ini Res (Passenger side curtain-air bag initiator resistance) (ohm): This parameter indicates the resistance of the passenger side curtain-air bag initiator circuit.

"AIR BAG" Warning Lamp Comes ON Steady

S7N20A8204007

Wiring Diagram



I4RS0B820006-01

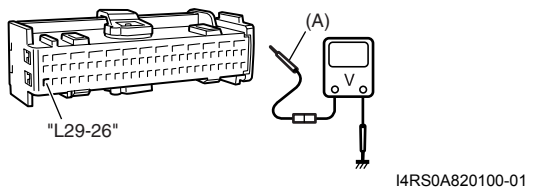
1. From main fuse	5. "AIR BAG" warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. "IG SIG" fuse	7. Junction block assembly	11. Ground for air bag system
4. "AIR BAG" fuse	8. BCM	

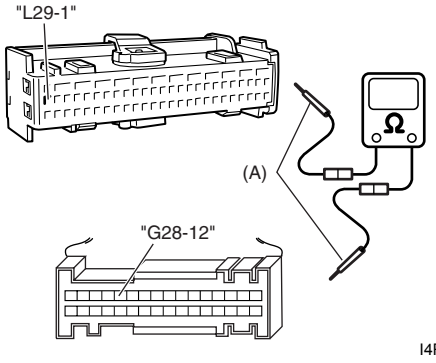
⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description
Step 1: Check for "AIR BAG" fuse blown.
Step 2, 3: Check for loose connection between junction block assembly connector and junction block assembly.
Step 4: Check for loose connection between SDM connector and SDM.
Step 5: Check for SDM power supply circuit.
Step 6: Check for short circuit between "AIR BAG" warning lamp circuit and ground.

Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. 2) Remove and inspect "AIR BAG" fuse. *Is fuse good?*	Go to Step 2.	"RED" wire short to ground. After repair, replace "AIR BAG" fuse.
2	1) Check for loose connection of junction block assembly connector "L04". *Is it connected securely?*	Go to Step 3.	Correct connector "L04" securely.
3	1) Check for loose connection of junction block assembly connector "G34". *Is it connected securely?*	Go to Step 4.	Correct connector "G34" securely.
4	1) Check for loose connection of SDM connector "L29". *Is it connected securely?*	Go to Step 5.	Correct connector "L29" securely.
5	1) Disconnect SDM connector "L29". 2) Check proper connection to SDM at terminal "L29-26". 3) If OK, then check voltage between "L29-26" terminal of SDM connector and body ground with ignition switch ON. **Special tool** **(A): 09932-76010**  I4RS0A820100-01 *Is it 8 V or more?*	Go to Step 6.	"RED" wire (between "AIR BAG" fuse and SDM connector) open or "GRN" wire (between ignition switch and "AIR BAG" fuse) open or short to ground.

Step	Action	Yes	No
6	1) Disconnect combination meter connector “G28” referring to “Combination Meter Removal and Installation in Section 9C”. 2) Check proper connection to combination meter at “YEL/BLK” terminal for “AIR BAG” warning lamp and to SDM at terminal “L29-1”. 3) If OK, then check resistance between “YEL/BLK” wire terminal of combination meter connector “G28” and “L29-1” terminal of SDM connector. **Special tool** **(A): 09932-76010**  *Is resistance 1 Ω or less?*	Substitute a known-good SDM and recheck. If “AIR BAG” warning lamp remain lighting, replace combination meter.	“YEL/BLK” wire (between combination meter and SDM connector) open or short to ground.

NOTE

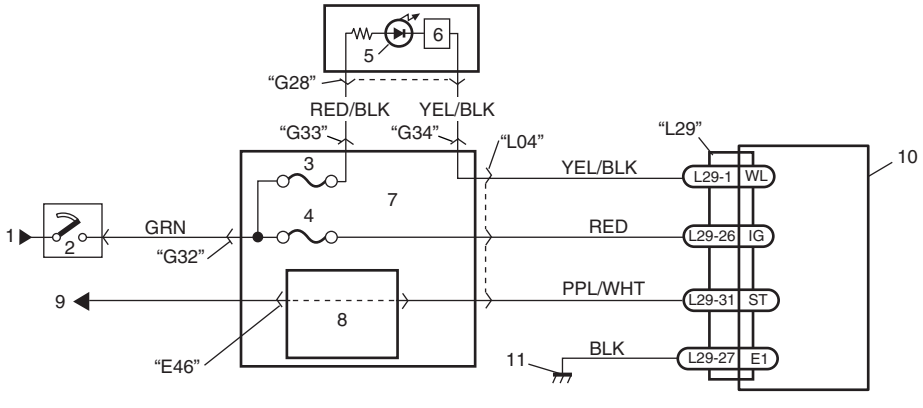
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

“AIR BAG” Warning Lamp Does Not Come ON

S7N20A8204008

Wiring Diagram



1. From main fuse	5. “AIR BAG” warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. “IG SIG” fuse	7. Junction block assembly	11. Ground for air bag system
4. “AIR BAG” fuse	8. BCM	

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description
Step 1: Check combination meter power feed circuit.
Step 2: Check "AIR BAG" warning lamp circuit.

Troubleshooting

Step	Action	Yes	No
1	1) Set parking brake. 2) Note combination meter when ignition switch is turned ON. *Does the "BRAKE" indicator (warning lamp) come ON?*	Go to Step 2.	Check and correct the following possible cause. • Open circuit in "GRN" or "RED/BLK" wire. • Short circuit between "GRN" or "RED/BLK" and ground. • "METER" fuse blown.
2	1) Disconnect SDM connector "L29". 2) Note combination meter when ignition switch is turned ON. *Does the "AIR BAG" warning lamp come ON?*	Substitute a known-good SDM and recheck.	"YEL/BLK" circuit shorted to power circuit. If OK, replace combination meter.

NOTE

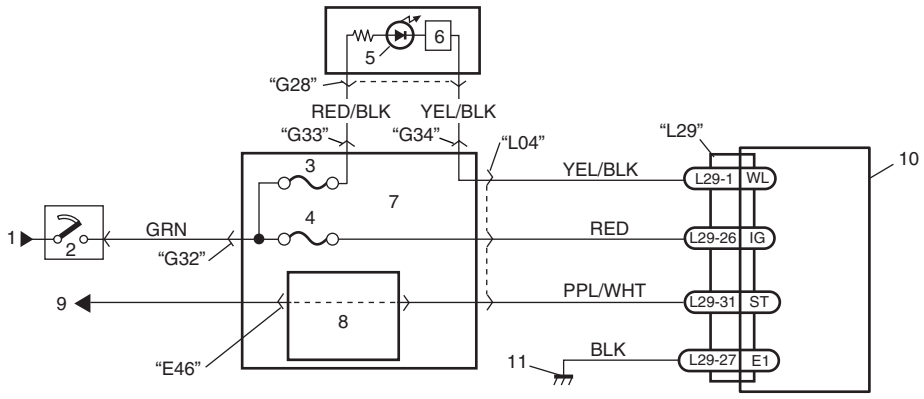
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

"AIR BAG" Warning Lamp Flashes

S7N20A8204009

Wiring Diagram



I4RS0B820006-01

1. From main fuse	5. "AIR BAG" warning lamp in combination meter	9. To DLC
2. Ignition switch	6. Lamp driver	10. SDM
3. "IG SIG" fuse	7. Junction block assembly	11. Ground for air bag system
4. "AIR BAG" fuse	8. BCM	

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

Flow Test Description
Check for short circuit between diagnosis switch circuit and ground.

Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Check "L29-34" terminal of SDM. *Is it shorted to ground terminal or harness?*	Clean up terminal.	Substitute a know-good SDM and recheck.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1013: SDM fault

S7N20A8204010

DTC Will Set when
An internal SDM fault is detected by SDM.

NOTE

DTC B1013 can never be cleared once it has been set.

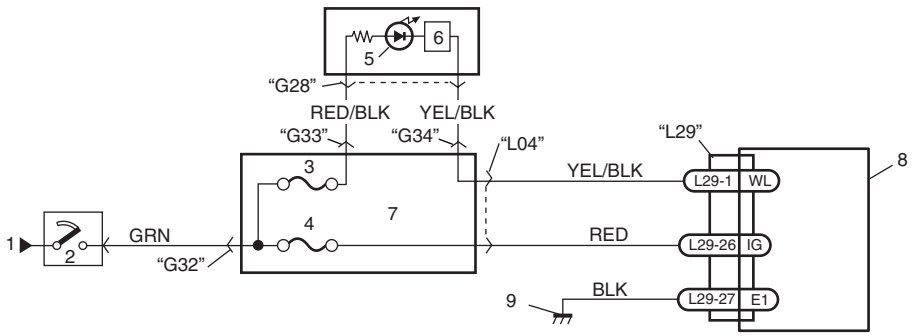
DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace SDM.
3) Repeat "Air Bag Diagnostic System Check".

DTC B1014: "AIR BAG" Warning Lamp Circuit Failure

S7N20A8204011

Wiring Diagram



I4RS0B820007-01

1. From main fuse	4. "A/BAG" fuse	7. Junction block assembly
2. Ignition switch	5. "AIR BAG" warning lamp in combination meter	8. SDM
3. "IG SIG" fuse	6. Lamp driver	9. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when

The voltage at the "AIR BAG" warning lamp circuit terminal "L29-1" does not match the commanded state of the warning lamp driver for specified time.

Flow Test Description

Step 1: This test rechecks "AIR BAG" warning lamp operation.
Step 2: This test rechecks whether an abnormality is in SDM.

DTC Troubleshooting

Step	Action	Yes	No
1	1) This DTC is set when there is a trouble in "AIR BAG" warning lamp circuit. Failure to properly perform "Air Bag Diagnostic System Check" may also result in misdiagnosis. Therefore, check "AIR BAG" warning lamp circuit again according to "Air Bag Diagnostic System Check". *Is "AIR BAG" warning lamp circuit in good condition?*	Go to Step 2.	Repair "AIR BAG" warning lamp circuit.
2	1) Clear DTC referring to "DTC Clearance". 2) Check DTC referring to "DTC Check". *Is DTC B1014 set?*	Substitute a known-good SDM and recheck.	Recheck air bag system referring to "Air Bag Diagnostic System Check".

NOTE

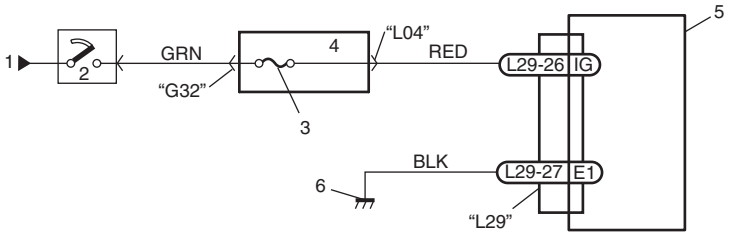
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1016: Power Source Voltage High

S7N20A8204012

Wiring Diagram



I4RS0A820011-01

1. From main fuse	3. "A/BAG" fuse	5. SDM
2. Ignition switch	4. Junction block assembly	6. Ground for air bag system

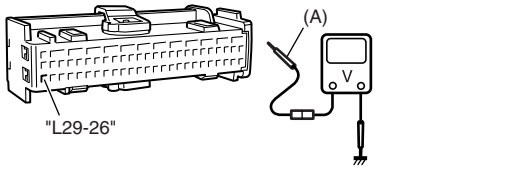
⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The power source voltage to SDM is above an approx. 21 V for specified time.

Flow Test Description
Step 1: Check if voltage applied to SDM is within normal range.
Step 2: Check if DTC B1016 still exists.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect SDM connector. 2) Check proper connection to SDM at "L29-26" terminal. 3) If OK, turn ignition switch ON and then check voltage between "L29-26" terminal on SDM connector and body ground. **Special tool** **(A): 09932-76010**  I4RS0A820100-01 *Is voltage 14 V or less?*	Go to Step 2.	Check charging system and repair as necessary referring to "Generator Test (Overcharged Battery Check): M13A / M15A / M16A in Section 1J" and "Generator Test (Overcharged Battery Check): D13A / Z13DTJ in Section 1J".
2	1) With ignition switch OFF, reconnect SDM connector. *With ignition switch ON, is DTC B1016 indicated?*	Substitute a known-good SDM and recheck.	Intermittent trouble. Check for intermittent trouble referring to "Inspection of Intermittent and Poor Connections" If OK, substitute a known-good SDM and recheck.

NOTE

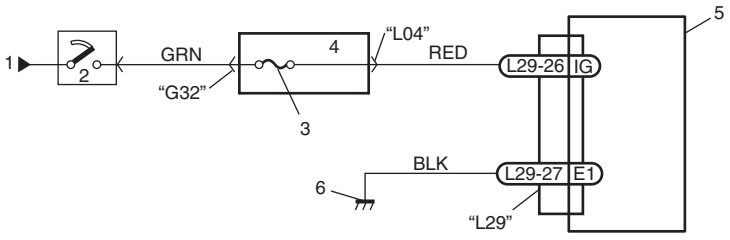
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1017: Power Source Voltage Low

S7N20A8204013

Wiring Diagram



I4RS0A820011-01

1. From main fuse	3. "A/BAG" fuse	5. SDM
2. Ignition switch	4. Junction block assembly	6. Ground for air bag system

⚠ CAUTION

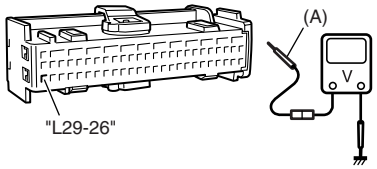
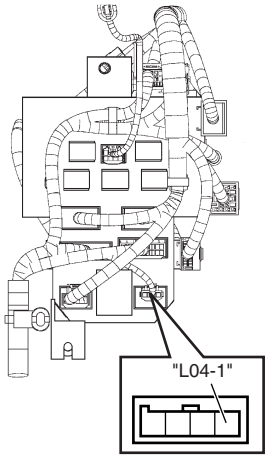
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The power source voltage is below an approx. 8 V for specified time.

Flow Test Description
Step 1: Check if voltage on battery is within normal range.
Step 2: Check if voltage applied to SDM is within normal range.
Step 3: Check if voltage applied to "L04" connector is within normal range.
Step 4: Check if DTC B1017 still exists.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Measure voltage on battery. *Is voltage 11 V or more?*	Go to Step 2.	Check charging system and repair as necessary referring to "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J" and "Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J" and "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector. 2) Check proper connection to SDM at “L29-26” terminal. 3) If OK, turn ignition switch ON and then check voltage between “L29-26” terminal on SDM connector and body ground. **Special tool** **(A): 09932-76010**  I4RS0A820100-01 *Is voltage 8 V or more?*	Go to Step 4.	Go to Step 3.
3	1) With ignition switch OFF, disconnect on connector “L04” junction block assembly. 2) Check proper connection at “L04-1” terminal. 3) If OK, turn ignition switch ON and then check voltage between “L04-1” terminal and body ground.  I4RS0A820012-01 *Is voltage 8 V or more?*	Go to Step 4.	Check circuit from battery to “L04” connector and charging system.
4	1) With ignition switch OFF, reconnect SDM connector. *With ignition switch ON, does DTC B1017 exist?*	Substitute a known-good SDM and recheck.	Check charging system and repair as necessary referring to “Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J” and “Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J” and “Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J”.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1021: Front Air Bag Module Deployed

S7N20A8204014

DTC Will Set when

The SDM detects a frontal crash of sufficient force to warrant activation of the air bag system. (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1021 has been set although air bag has not been deployed.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE

Before executing items in this flow, be sure to perform "Air Bag Diagnostic System Check".

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has air bag deployed?*	Replace components and perform inspections as directed in "Repair and Inspection Required after Accident".	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in "Repair and Inspection Required after Accident".	Substitute a known-good SDM and recheck.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to "DTC Clearance in Section 10B"**

DTC B1024 / B1025: Side-Air Bag (Driver / Passenger) Deployed

S7N20A8204015

DTC Will Set when

The SDM detects a sideward crash (driver or passenger side) of sufficient force to warrant activation of the side-air bag system (driver or passenger). (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1024 or B1025 has been set although side-air bag has not been deployed.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE

Before executing items in this flow, be sure to perform "Air Bag Diagnostic System Check".

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has air bag deployed?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident”.	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident”.	Substitute a known-good SDM and recheck.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to “DTC Clearance in Section 10B”**

DTC B1026: Pretensioner Activated

S7N20A8204016

DTC Will Set when

The SDM detects a frontal crash of sufficient force to warrant activation of the pretensioner. (SDM outputs a deployment command.)

Flow Test Description

Step 1: Check that DTC B1026 has been set although pretensioner has not been activated.
Step 2: Check that DTC has been set due to failure of SDM.

NOTE

Before executing items in this flow, be sure to perform “Air Bag Diagnostic System Check”.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch OFF. *Has pretensioner activated?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident”.	Go to Step 2.
2	1) Inspect front of vehicle and undercarriage for signs of impact. *Are there signs of impact?*	Replace components and perform inspections as directed in “Repair and Inspection Required after Accident”.	Substitute a known-good SDM and recheck.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**
- **Clear DTCs of BCM referring to “DTC Clearance in Section 10B”**

DTC B1027: Reusable Number Exceeded

S7N20A8204017

DTC Will Set when

The SDM has not been replaced though the side-air bag developed several times in the past.

NOTE

DTC B1027 can never be cleared once it has been set.

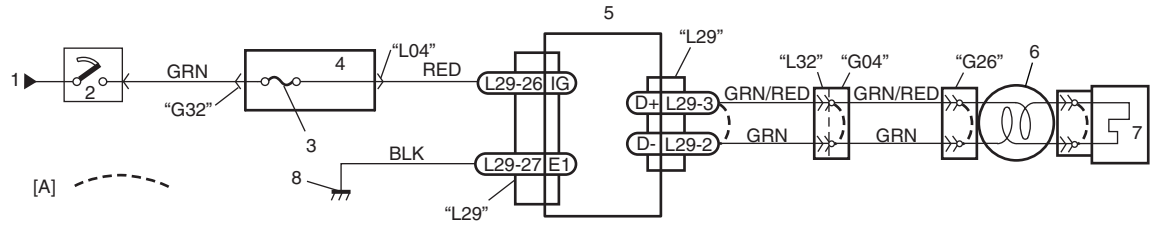
DTC Trouble shooting

1) Turn ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check”.

DTC B1031: Driver Air Bag Initiator Circuit Resistance High

S7N20A8204018

Wiring Diagram



I4RS0B820008-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform “Air Bag Diagnostic System Check” before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to “Inspection of Intermittent and Poor Connections”.**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

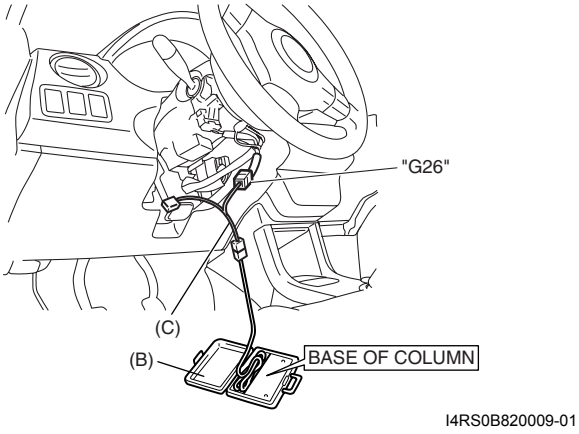
DTC Will Set when

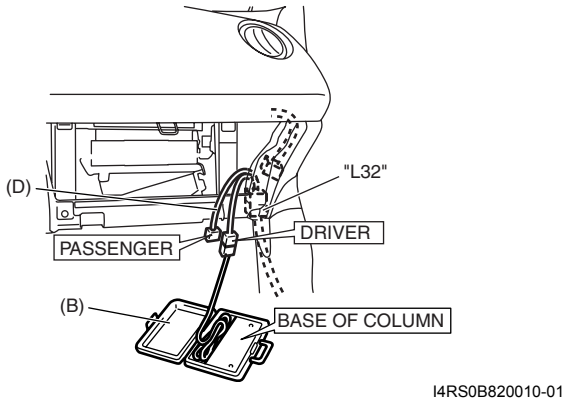
The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is above a specified value for specified time.

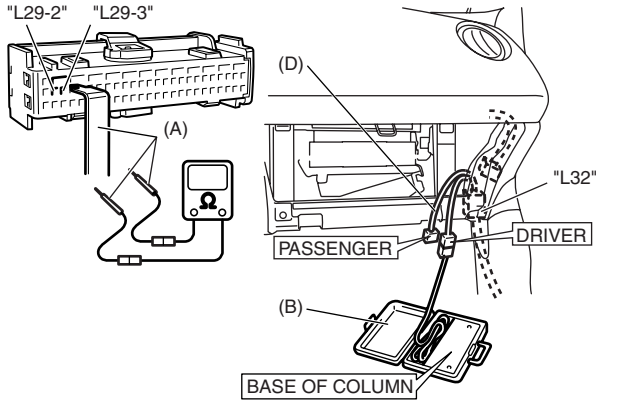
Flow Test Description

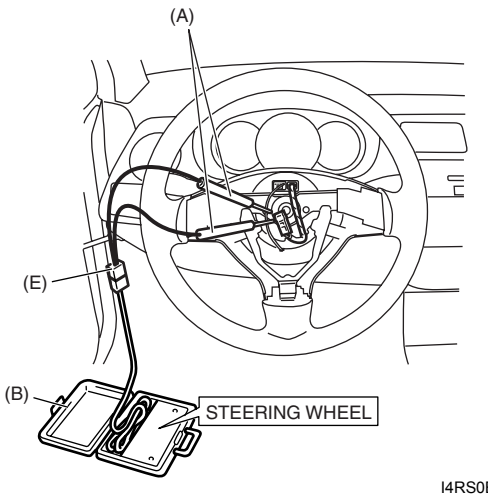
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0B820009-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1031 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0B820010-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1031 indicated?*	Go to Step 3.	High resistance or open wire in “GRN/RED” or “GRN” circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-2” and “L29-3”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-2” and “L29-3” terminals with connected special tools (B) and (D). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0B820011-02 *Is resistance 3.85 Ω or less?*	Substitute a known-good SDM and recheck.	High resistance or open wire in “GRN/RED” or “GRN” circuit in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from "G26" connector and then reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering wheel referring to "Driver Air Bag (Inflator) Module Removal and Installation". 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0B820012-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1031 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to "Contact Coil Cable Assembly Removal and Installation in Section 6B".	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation".

NOTE

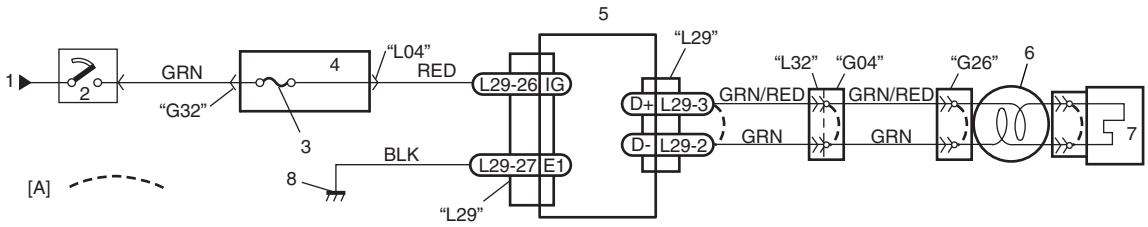
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1032: Driver Air Bag Initiator Circuit Resistance Low

S7N20A8204019

Wiring Diagram



I4RS0B820008-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	5. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

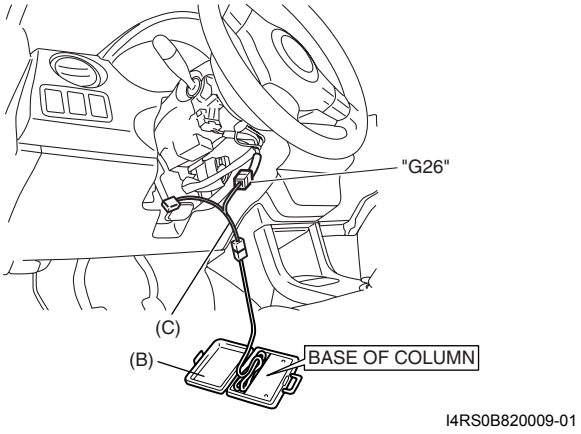
DTC Will Set when

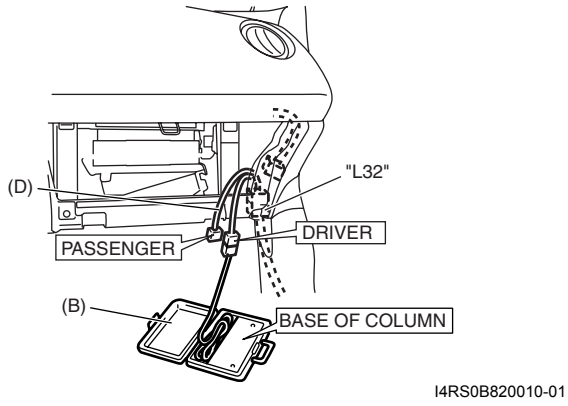
The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is below a specified value for specified time.

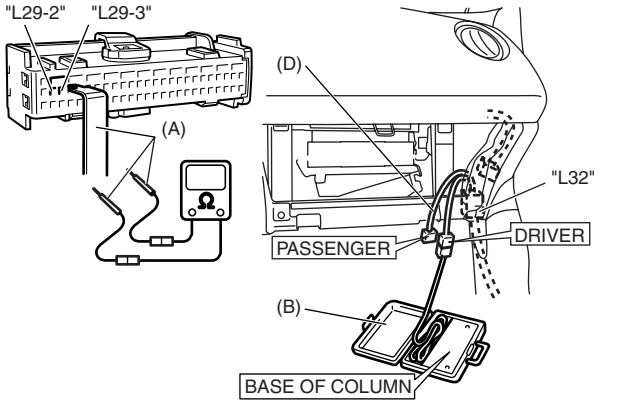
Flow Test Description

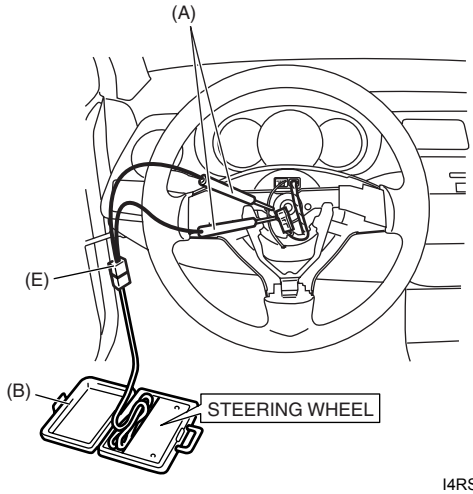
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0B820009-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1032 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0B820010-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1032 indicated?*	Go to Step 3.	“GRN/RED” circuit shorted to “GRN” circuit, “GRN/RED” circuit or “GRN” circuit shorted to other circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-2” and “L29-3”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-2” and “L29-3” terminals with connected special tool (B) and (D). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0B820011-02 *Is resistance 2.1 Ω or more?*	Substitute a known-good SDM and recheck.	“GRN/RED” circuit shorted to “GRN” circuit, “GRN/RED” circuit or “GRN” circuit shorted to other circuit in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to “Driver Air Bag (Inflator) Module Removal and Installation”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0B820012-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1032 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation”.

NOTE

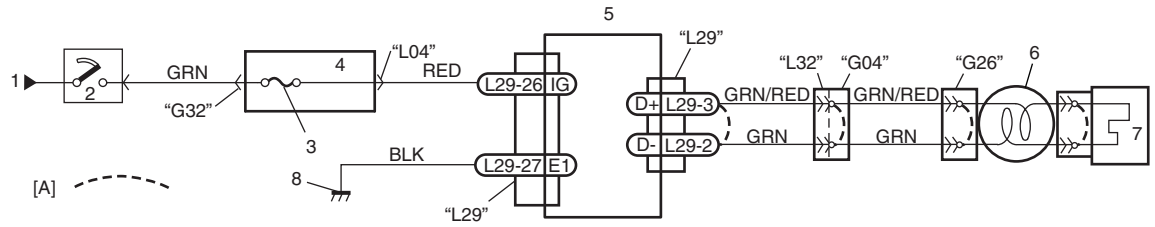
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1033: Driver Air Bag Initiator Circuit Short to Ground

S7N20A8204020

Wiring Diagram



I4RS0B820008-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

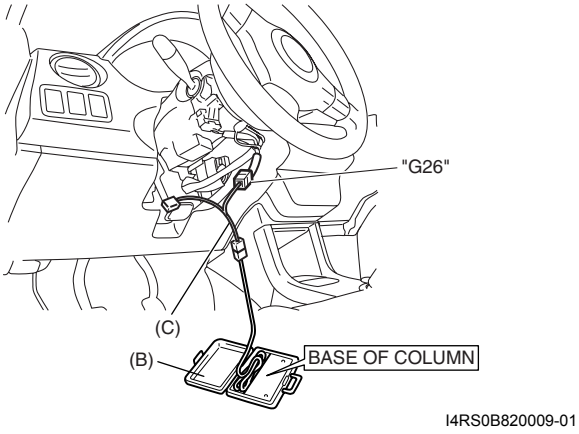
DTC Will Set when

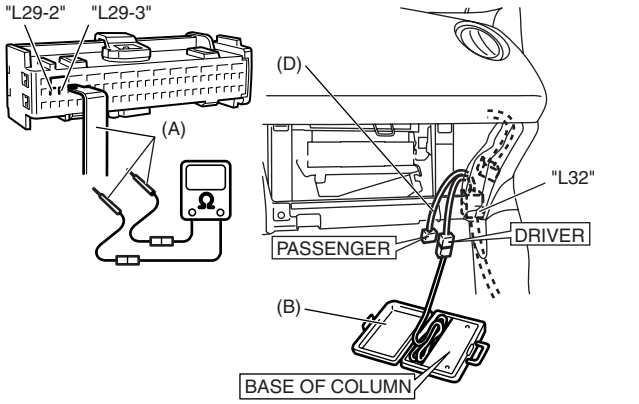
The voltage measured at driver air bag initiator circuit is below a specified value for specified time.

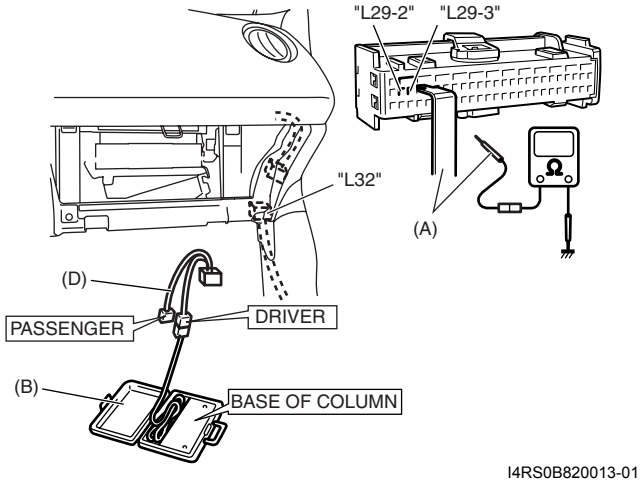
Flow Test Description

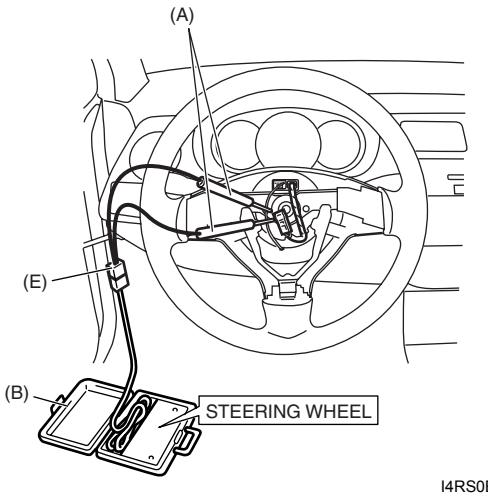
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit. (in instrument panel and floor harness)
Step 3: Check driver air bag (inflator) module initiator circuit. (in floor harness)
Step 4: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0B820009-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1033 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0B820011-02 4) Check SDM DTC. **NOTE** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1033 indicated?*	Go to Step 3.	“GRN/RED” circuit or “GRN” circuit shorted to ground in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (D) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-2” terminal and body ground and between “L29-3” terminal and body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–78340**  I4RS0B820013-01 *Are resistances infinity?*	Substitute a known-good SDM and recheck.	“GRN/RED” circuit or “GRN” circuit shorted to ground in floor harness.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from "G26" connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to "Driver Air Bag (Inflator) Module Removal and Installation". 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module connector. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0B820012-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1033 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to "Contact Coil Cable Assembly Removal and Installation in Section 6B".	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation".

NOTE

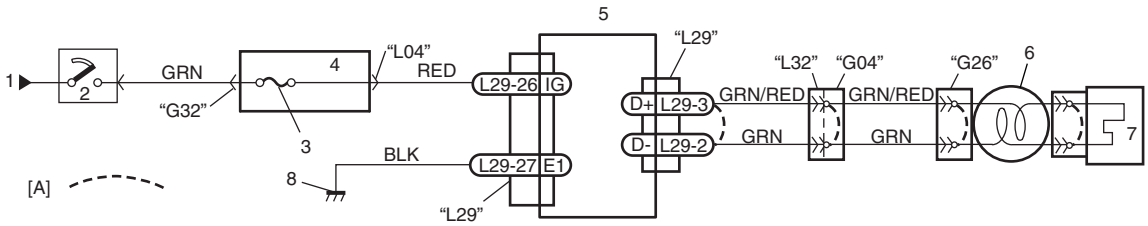
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1034: Driver Air Bag Initiator Circuit Short to Power Circuit

S7N20A8204021

Wiring Diagram



I4RS0B820008-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Contact coil assembly
1. From main fuse	4. Junction block assembly	7. Driver air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

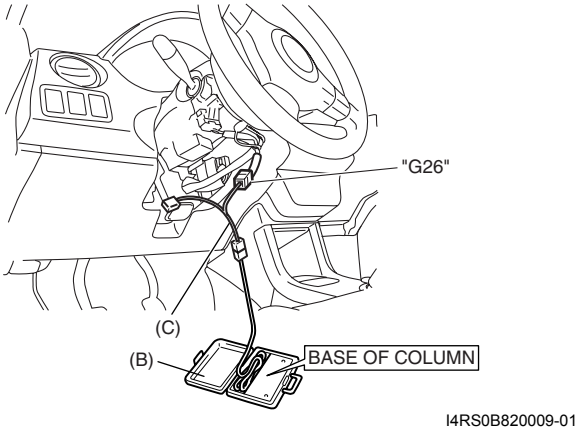
DTC Will Set when

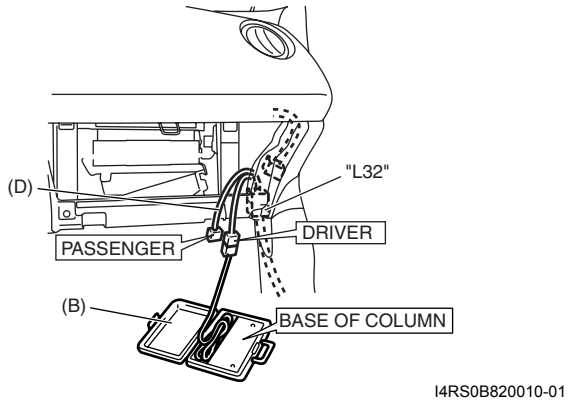
The voltage measured at driver air bag initiator circuit is above a specified value for specified time.

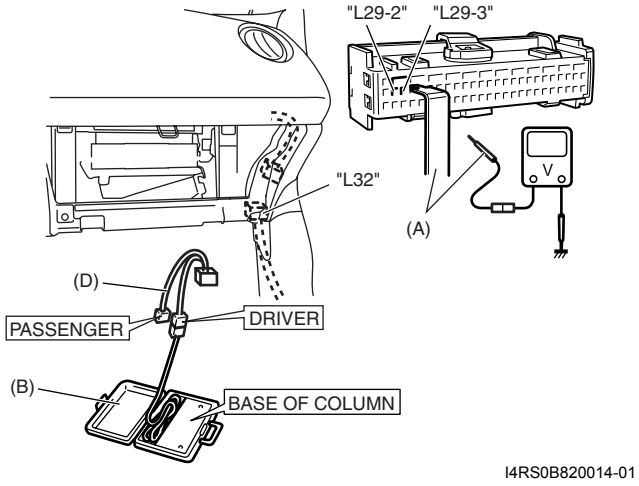
Flow Test Description

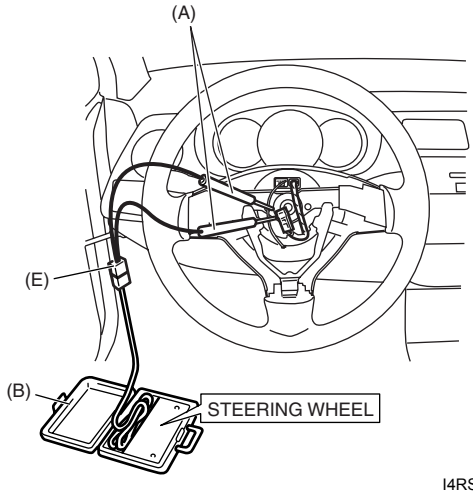
Step 1: Check whether malfunction is in contact coil and driver air bag (inflator) module or the others.
Step 2: Check driver air bag (inflator) module initiator circuit.
Step 3: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect contact coil connector located under of the steering column. 2) Check proper connection to contact coil at terminal in “G26” connector. 3) If OK, then connect special tools (B) and (C) to “G26” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–78340**  I4RS0B820009-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1034 indicated?*	Go to Step 2.	Go to Step 4.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-1” and “L32-2”. 3) If OK, then connect special tools (B) and (D) to “L32” connector. **Special tool** **(B): 09932–75010** **(D): 09932–77320**  I4RS0B820010-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1041 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1034 indicated?*	Go to Step 3.	“GRN/RED” circuit or “GRN” circuit shorted to power supply circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (D) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage from “L29-2” terminal to body ground and between “L29-3” terminal to body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(D): 09932–77320**  I4RS0B820014-01 *With ignition switch ON, is each measured value 1 V or less?*	Substitute a known-good SDM and recheck.	“GRN/RED” circuit or “GRN” circuit shorted to power supply circuit.

Step	Action	Yes	No
4	1) With ignition switch OFF, disconnect special tools (B) and (C) from “G26” connector and reconnect contact coil connector located under of the steering column. 2) Remove driver air bag (inflator) module from steering column referring to “Driver Air Bag (Inflator) Module Removal and Installation”. 3) Check proper connection to driver air bag (inflator) module connector. 4) If OK, then connect special tools (A), (B) and (E) to driver air bag (inflator) module. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78340** **(E): 09932-78310**  I4RS0B820012-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1034 indicated?*	Turn ignition switch OFF. Replace contact coil assembly referring to “Contact Coil Cable Assembly Removal and Installation in Section 6B”.	Turn ignition switch OFF. Replace driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation”.

NOTE

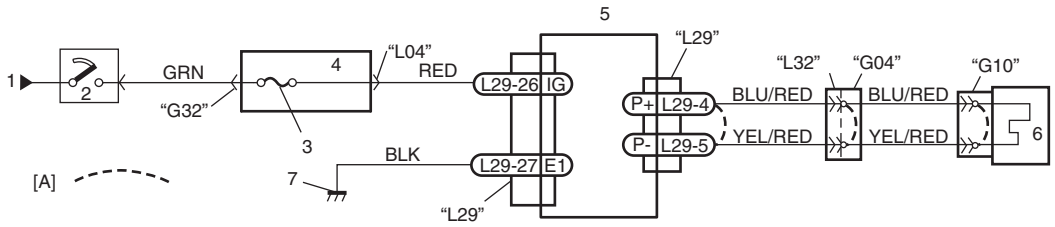
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1041: Passenger Air Bag Initiator Circuit Resistance High

S7N20A8204022

Wiring Diagram



I4RS0B820015-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

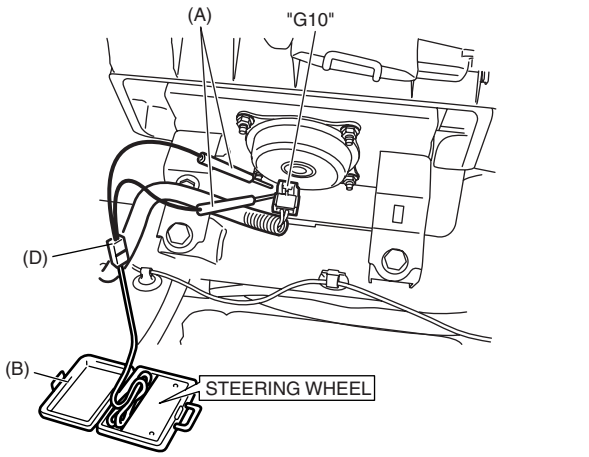
DTC Will Set when

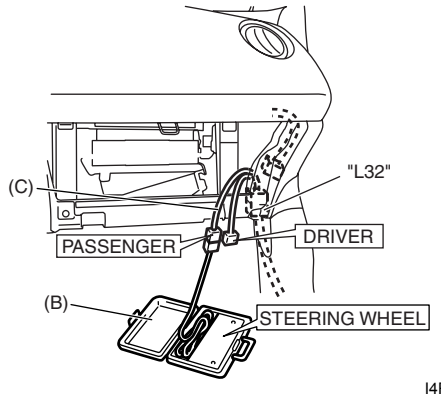
The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is above a specified value for specified time.

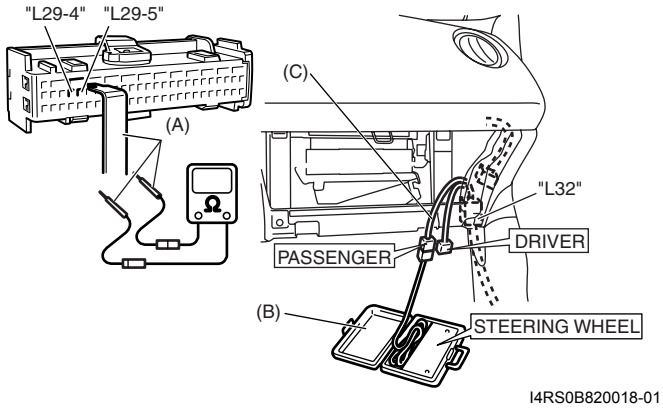
Flow Test Description

Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in “G10” connector. 3) If OK, then connect special tools (A), (B) and (D) to “G10” connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0B820016-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1041 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module Removal and Installation”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820017-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1041 indicated?*	Go to Step 3.	High resistance or open wire “BLU/RED” or “YEL/RED” circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Check proper connection to SDM at terminals "L29-4" and "L29-5". 3) If OK, release shorting bar in SDM connector inserting release too (1) included in special tool (A). 4) Measure resistance between "L29-4" and "L29-5" terminals with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820018-01 *Is resistance 2.82 Ω or less?*	Substitute a known-good SDM and recheck.	High resistance or open wire in "BLU/RED" or "YEL/RED" circuit in floor harness.

NOTE

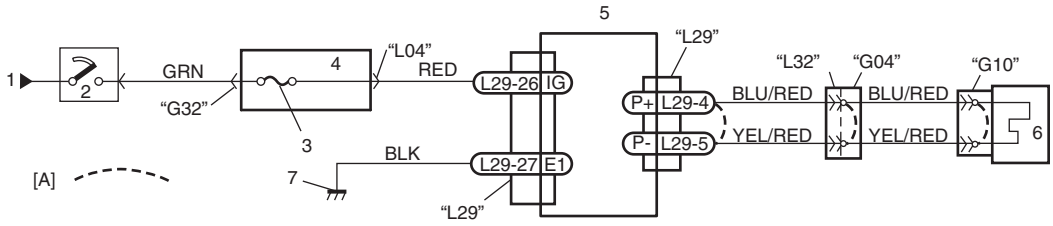
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1042: Passenger Air Bag Initiator Circuit Resistance Low

S7N20A8204023

Wiring Diagram



I4RS0B820015-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

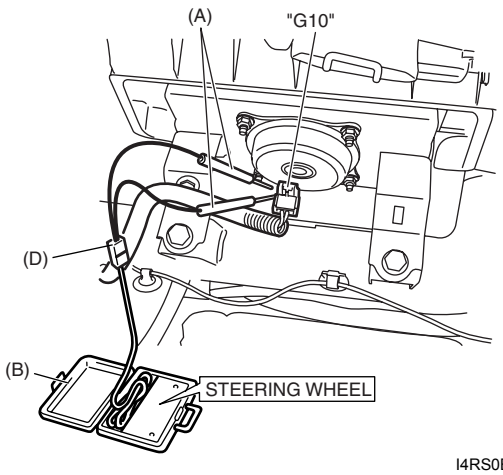
⚠ CAUTION

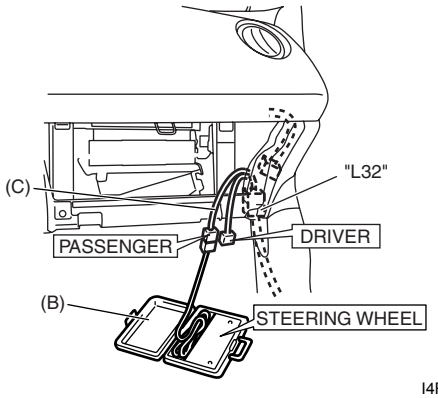
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

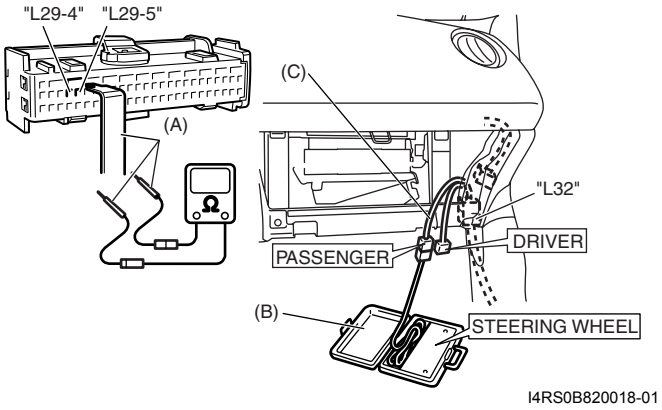
DTC Will Set when
The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is below a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in "G10" connector. 3) If OK, then connect special tools (A), (B) and (D) to "G10" connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0B820016-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1042 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to "Passenger Air Bag (Inflator) Module Removal and Installation".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820017-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1042 indicated?*	Go to Step 3.	“BLU/RED” circuit shorted to “YEL/RED” circuit, “BLU/RED” circuit or “YEL/RED” circuit shorted to other circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-4” and “L29-5”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-4” and “L29-5” terminals with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820018-01 *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	“BLU/RED” circuit shorted to “YEL/RED” circuit, “BLU/RED” circuit or “YEL/RED” circuit shorted to other circuit in floor harness.

NOTE

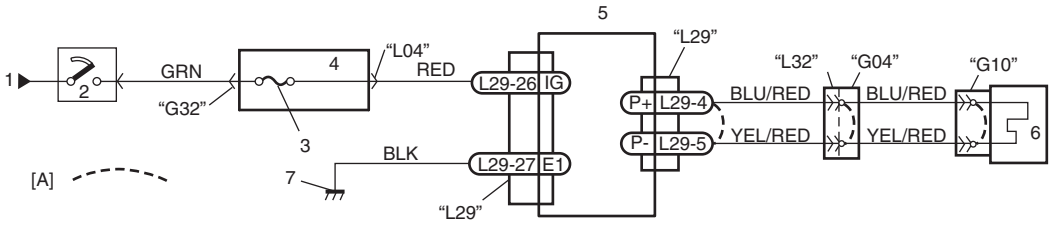
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1043: Passenger Air Bag Initiator Circuit Short to Ground

S7N20A8204024

Wiring Diagram



I4RS0B820015-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

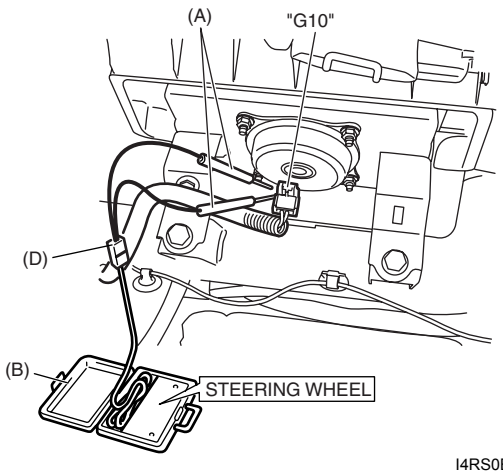
⚠ CAUTION

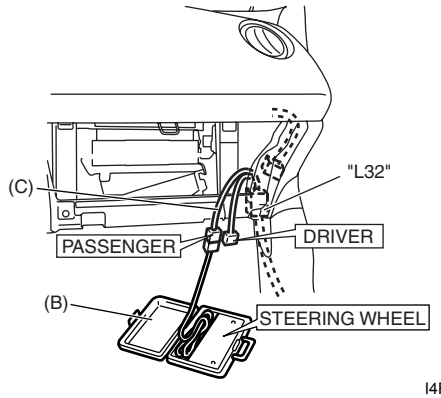
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

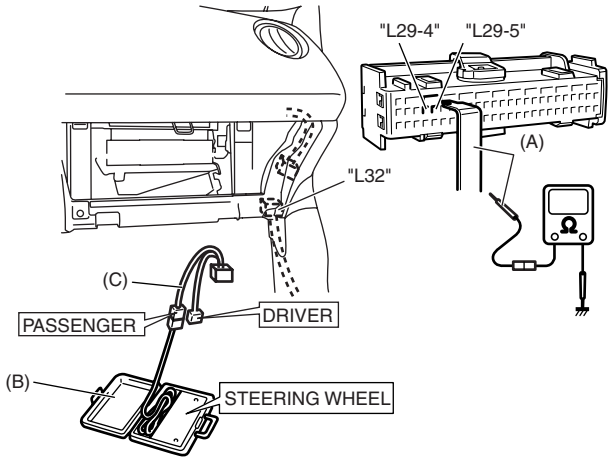
DTC Will Set when
The voltage measured at passenger air bag (initiator) circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in "G10" connector. 3) If OK, then connect special tools (A), (B) and (D) to "G10" connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0B820016-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1043 indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to "Passenger Air Bag (Inflator) Module Removal and Installation".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820017-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1043 indicated?*	Go to Step 3.	“BLU/RED” or “YEL/RED” circuit shorted to ground in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-4” terminal and body ground and between “L29-5” terminal and body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820019-01 *Is resistance infinity?*	Substitute a known-good SDM and recheck.	“BLU/RED” or “YEL/RED” circuit shorted to ground in floor harness.

NOTE

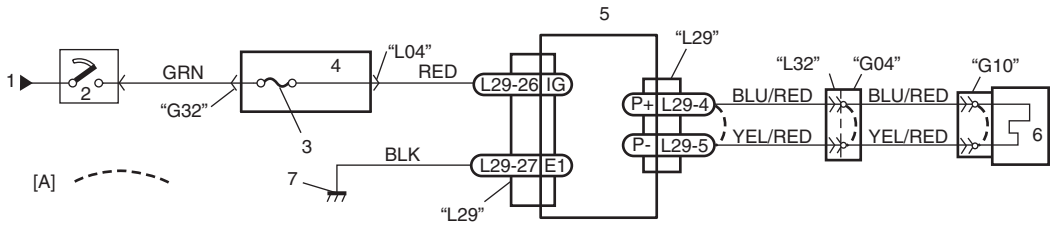
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1044: Passenger Air Bag Initiator Circuit Short to Power Circuit

S7N20A8204025

Wiring Diagram



I4RS0B820015-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Passenger air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	

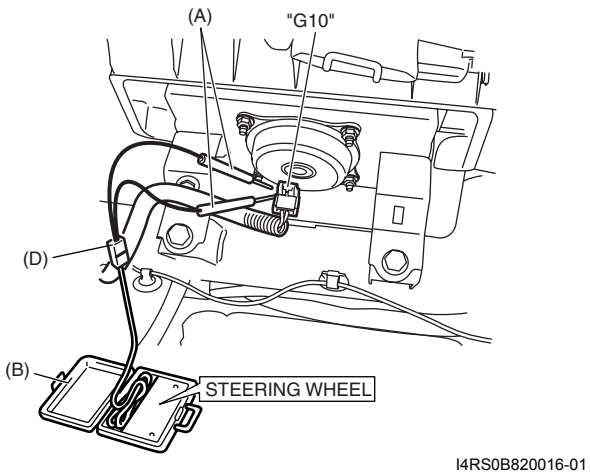
⚠ CAUTION

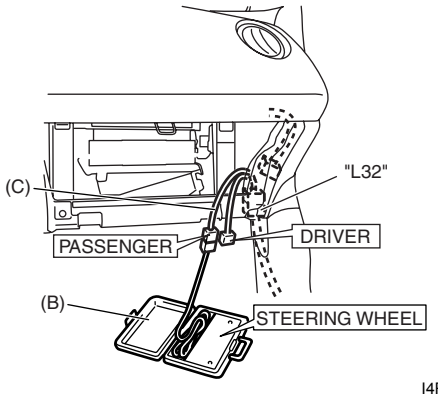
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

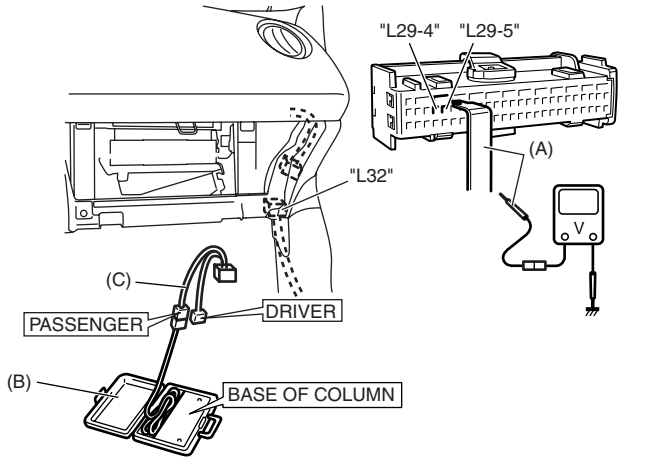
DTC Will Set when
The voltage measured at passenger air bag (initiator) circuit is above a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in passenger air bag (inflator) module.
Step 2: Check passenger air bag (inflator) module initiator circuit. (in instrument panel harness)
Step 3: Check passenger air bag (inflator) module initiator circuit. (in floor harness)

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector. 2) Check proper connection to passenger air bag (inflator) module at terminals in "G10" connector. 3) If OK, then connect special tools (A), (B) and (D) to "G10" connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(D): 09932–78310**  I4RS0B820016-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1044 indicated?*	Go to Step 3.	Turn ignition switch OFF. Replace passenger air bag (inflator) module referring to "Passenger Air Bag (Inflator) Module Removal and Installation".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect “L32” connector located near the glove box. 2) Check proper connection to floor harness connector at terminal “L32-3” and “L32-4”. 3) If OK, then connect special tools (B) and (C) to “L32” connector disconnected in Step 1). **Special tool** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820017-01 4) Check SDM DTC. **NOTE** **At this time, DTC B1031 may be output, but it is not related to this check.** *With ignition switch ON, is DTC B1044 indicated?*	Go to Step 3.	“BLU/RED” or “YEL/RED” circuit shorted to power supply circuit in instrument panel harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) from “L32” connector and SDM connector “L29” from SDM respectively. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage from “L29-4” terminal to body ground and from “L29-5” terminal to body ground. **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–77320**  I4RS0B820020-01 *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	“BLU/RED” or “YEL/RED” circuit shorted to power supply circuit in floor harness.

NOTE

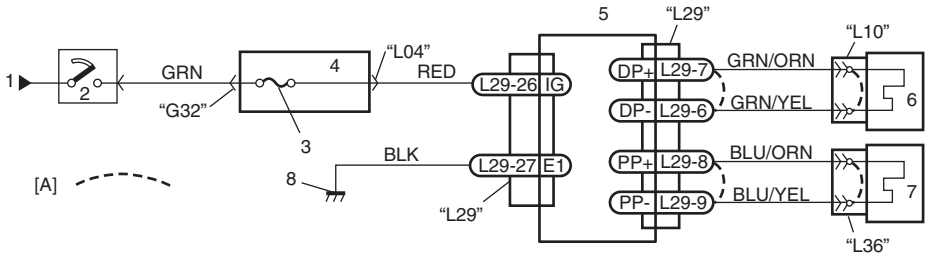
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1051 / B1055: Driver / Passenger Pretensioner Initiator Circuit Resistance High

S7N20A8204026

Wiring Diagram



I4RS0B820021-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

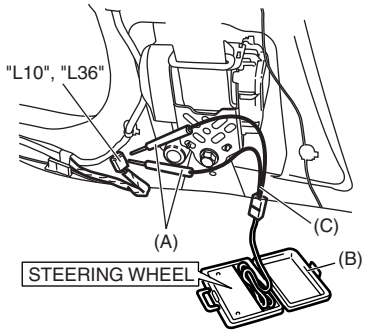
⚠ CAUTION

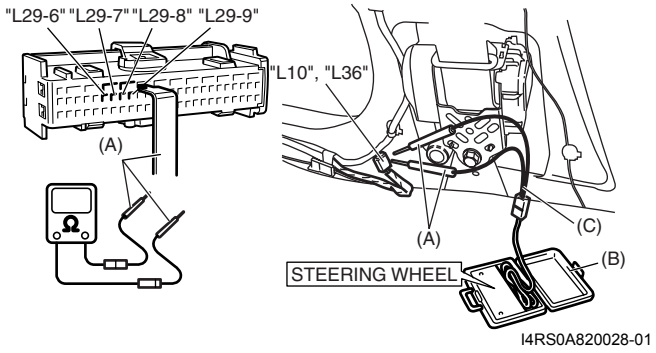
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The resistance of driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector "L10" or "L36" (1). 2) Check proper connection to seat belt pretensioner at terminals in "L10" or "L36" connector. 3) If OK, then connect special tools (A), (B) and (C) to "L10" or "L36" connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1051 or B1055 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to "Front Seat Belt Removal and Installation in Section 8A".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "29". 2) Check proper connection to SDM at terminals in "L29-6" and "L29-7" (for DTC B1051) or "L29-8" and "L29-9" (for DTC B1055). 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between "L29-6" and "L29-7" terminals (for DTC B1051) or "L29-8" and "L29-9" terminals (for DTC B1055) with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78310**  *Is resistance 2.91 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1051: High resistance or open wire in "GRN/ORN" or "GRN/YEL" circuit. DTC B1055: High resistance or open wire in "BLU/ORN" or "BLU/YEL" circuit.

NOTE

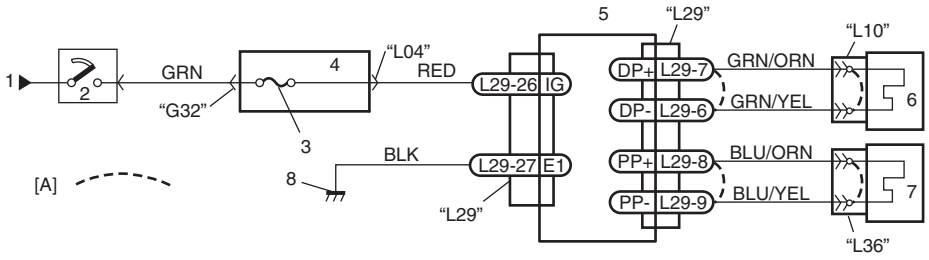
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1052 / B1056: Driver / Passenger Pretensioner Initiator Circuit Resistance Low

S7N20A8204027

Wiring Diagram



I4RS0B820021-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

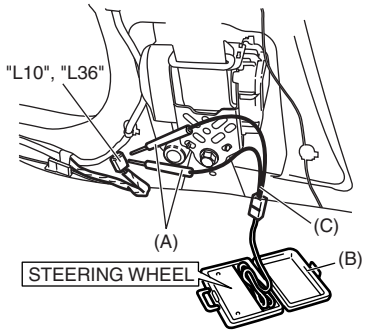
⚠ CAUTION

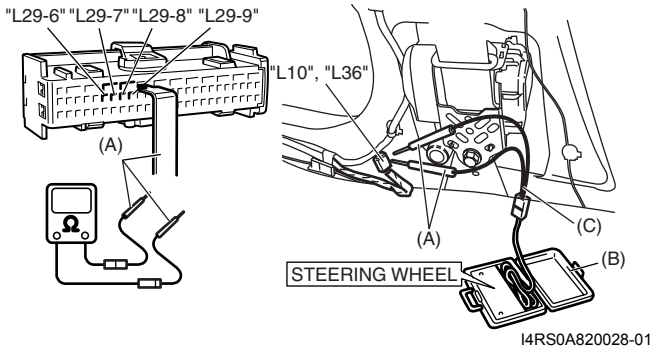
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The resistance of driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector "L10" or "L36" (1). 2) Check proper connection to seat belt pretensioner at terminals in "L10" or "L36" connector. 3) If OK, then connect special tools (A), (B) and (C) to "L10" or "L36" connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1052 or B1056 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to "Front Seat Belt Removal and Installation in Section 8A".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "29". 2) Check proper connection to SDM at terminals in "L29-6" and "L29-7" (for DTC B1052) or "L29-8" and "L29-9" (for DTC B1056). 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) If OK, then measure resistance between "L29-6" and "L29-7" terminals (for DTC B1052) or "L29-8" and "L29-9" terminals (for DTC B1056) with connected special tools (B) and (C). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932–78310**  I4RS0A820028-01 *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1052: "GRN/ORN" circuit shorted to "GRN/YEL" circuit, "GRN/ORN" circuit or "GRN/YEL" circuit shorted to other circuit. DTC B1056: "BLU/ORN" circuit shorted to "BLU/YEL" circuit, "BLU/ORN" circuit or "BLU/YEL" circuit shorted to other circuit.

NOTE

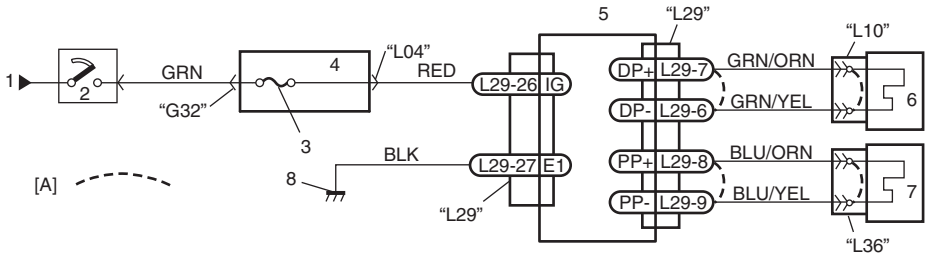
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1053 / B1057: Driver / Passenger Pretensioner Initiator Circuit Short to Ground

S7N20A8204028

Wiring Diagram



I4RS0B820021-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

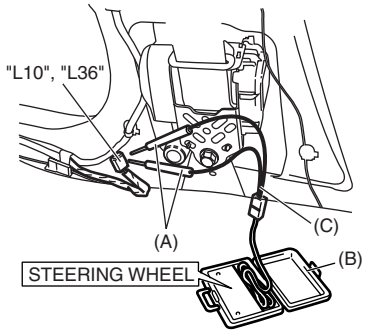
⚠ CAUTION

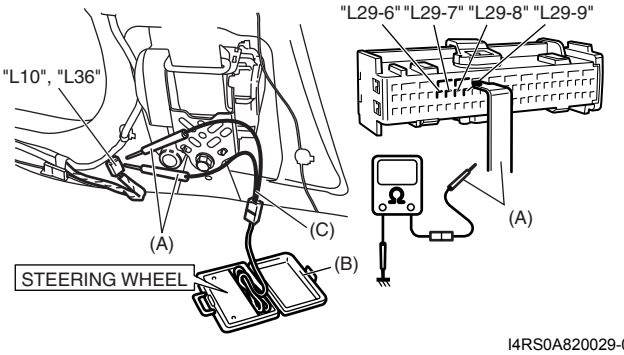
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage measured at driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector "L10" or "L36" (1). 2) Check proper connection to seat belt pretensioner at terminals in "L10" or "L36" connector. 3) If OK, then connect special tools (A), (B) and (C) to "L10" or "L36" connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1053 or B1057 still indicated?*	Go to Step 2.	Ignition switch OFF. Replace seat belt pretensioner referring to "Front Seat Belt Removal and Installation in Section 8A".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools (A), (B) and (C) and SDM connector. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-6” and body ground, and between “L29-7” and body ground (for DTC B1053) or between “L29-8” and body ground, and between “L29-9” and body ground (for DTC B1057). **Special tool** **(A): 09932-76010**  I4RS0A820029-01 *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1053: “GRN/ORN” circuit or “GRN/YEL” circuit shorted to ground. DTC B1057: “BLU/ORN” circuit or “BLU/YEL” circuit shorted to ground.

NOTE

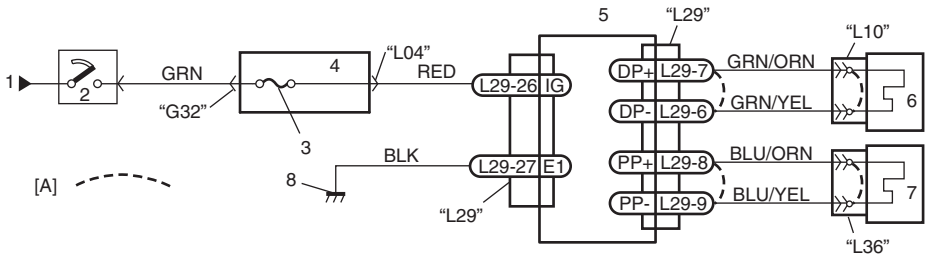
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1054 / B1058: Driver / Passenger Pretensioner Initiator Circuit Short to Power Circuit

S7N20A8204029

Wiring Diagram



I4RS0B820021-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver seat belt pretensioner
1. From main fuse	4. Junction block assembly	7. Passenger seat belt pretensioner
2. Ignition switch	5. SDM	8. Ground for air bag system

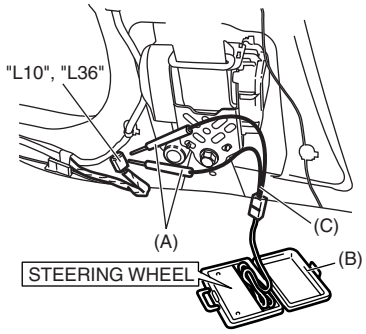
⚠ CAUTION

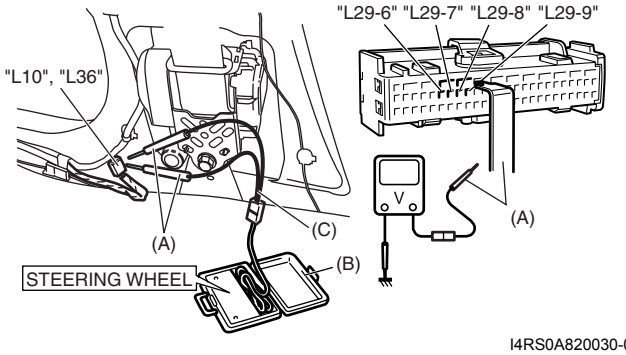
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage measured at driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

Flow Test Description
Step 1: Check if malfunction is in seat belt pretensioner.
Step 2: Check seat belt pretensioner initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove center pillar lower trim of driver or passenger side and disconnect seat belt pretensioner connector "L10" and "L36" (1). 2) Check proper connection to seat belt pretensioner at terminals in "L10" or "L36" connector. 3) If OK, then connect special tools (A), (B) and (C) to "L10" or "L36" connector disconnected in Step 1). **Special tool** **(A): 09932-76010** **(B): 09932-75010** **(C): 09932-78310**  I4RS0A820027-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1054 or B1058 still indicated?*	Go to Step 2.	Turn ignition switch OFF. Replace seat belt pretensioner referring to "Front Seat Belt Removal and Installation in Section 8A".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools (A), (B) and (C) and SDM connector. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-6” and body ground, and between “L29-7” and body ground (for DTC B1054) or between “L29-8” and body ground, and between “L29-9” and body ground (for DTC B1058). **Special tool** **(A): 09932-76010**  I4RS0A820030-01 *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1054: “GRN/ORN” circuit or “GRN/YEL” circuit shorted to power supply circuit. DTC B1058: “BLU/ORN” circuit or “BLU/YEL” circuit shorted to power supply circuit.

NOTE

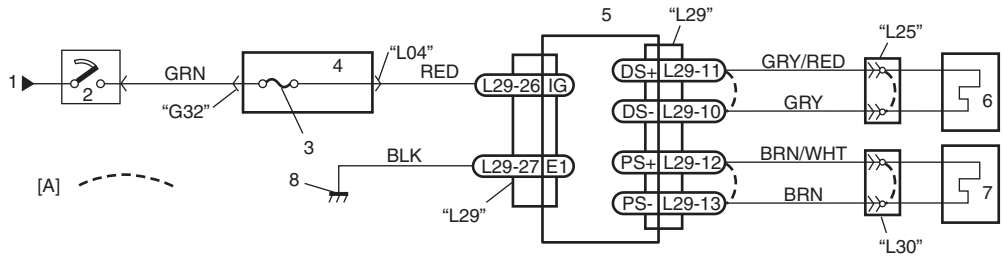
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1061 / B1065: Driver / Passenger Side-Air Bag Initiator Circuit Resistance High

S7N20A8204030

Wiring Diagram



I4RS0B820022-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

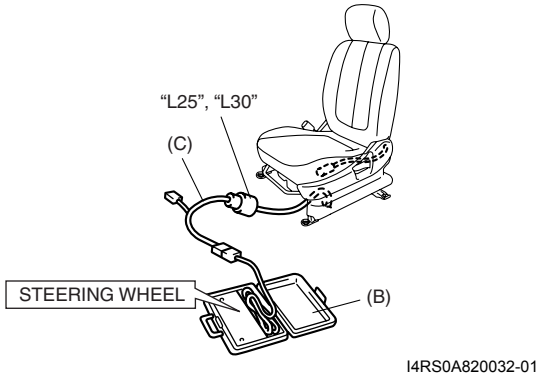
⚠ CAUTION

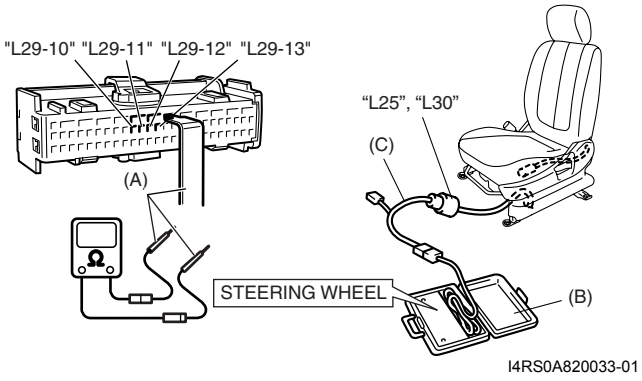
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

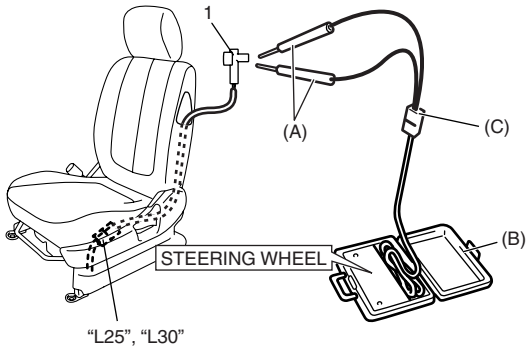
DTC Will Set when
The combined resistance of the side-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is above a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in "L25" or "L30" connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1). **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1061 or B1065 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-10” and “L29-11” or “L29-12” and “L29-13”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-10” and “L29-11” terminals (for DTC B1061) or “L29-12” and “L29-13” terminals (for DTC B1065) with connected special tool (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  *Is resistance 2.62 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1061: Repair high resistance or open in “GRY/RED” or “GRY” wire circuit in floor harness. DTC B1065: Repair high resistance or open in “BRN/WHT” or “BRN” wire circuit in floor harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1061 or B1065 still indicated?*	DTC B1061: Repair high resistance or open in “GRY/RED” or “GRY” wire circuit in seat harness. DTC B1065: Repair high resistance or open in “BRN/WHT” or “BRN” wire circuit in seat harness.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation”.

NOTE

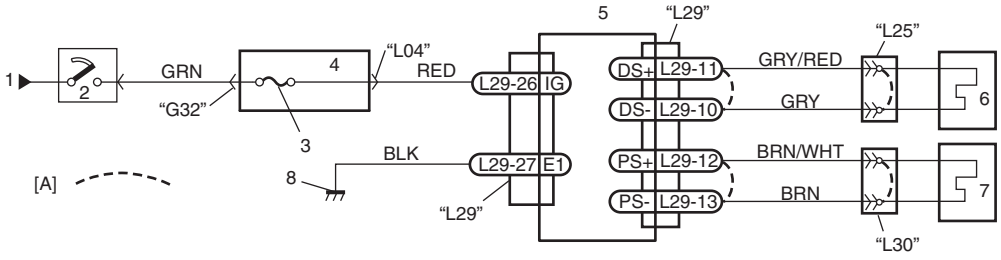
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1062 / B1066: Driver / Passenger Side-Air Bag Initiator Circuit Resistance Low

S7N20A8204031

Wiring Diagram



I4RS0B820022-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

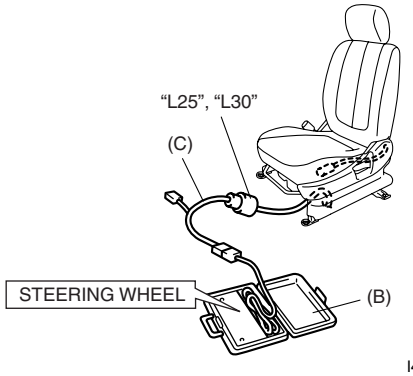
DTC Will Set when

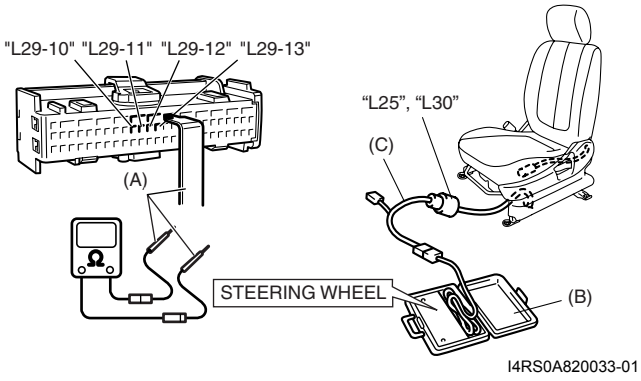
The combined resistance of the side-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is below a specified value for specified time.

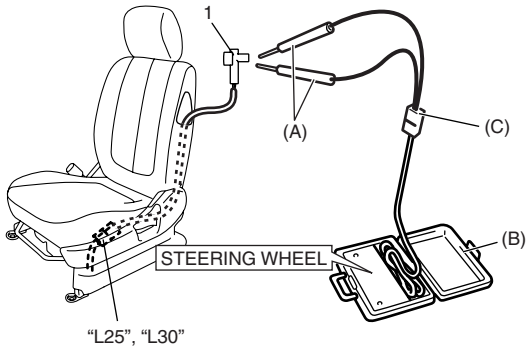
Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in "L25" or "L30" connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1062 or B1066 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Check proper connection to SDM at terminals “L29-10” and “L29-11” or “L29-12” and “L29-13”. 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between “L29-10” and “L29-11” terminals (for DTC B1062) or “L29-12” and “L29-13” terminals (for DTC B1066) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1062: Repair short from “GRY/RED” wire circuit to “GRY” wire circuit or from “GRY/RED” or “GRY” wire circuit to other wire circuit in floor harness. DTC B1066: Repair short from “BRN/WHT” wire circuit to “BRN” wire circuit or from “BRN/WHT” or “BRN” wire circuit to other wire circuit in floor harness.

Step	Action	Yes	No
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1062 or B1066 still indicated?*	DTC B1062: Repair short from “GRY/RED” wire circuit to “GRY” wire circuit in seat harness or from “GRY/RED” or “GRY” wire circuit to other wire circuit. DTC B1066: Repair short from “BRN/WHT” wire circuit to “BRN” wire circuit in seat harness or from “BRN/WHT” or “BRN” wire circuit to other wire circuit.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation”.

NOTE

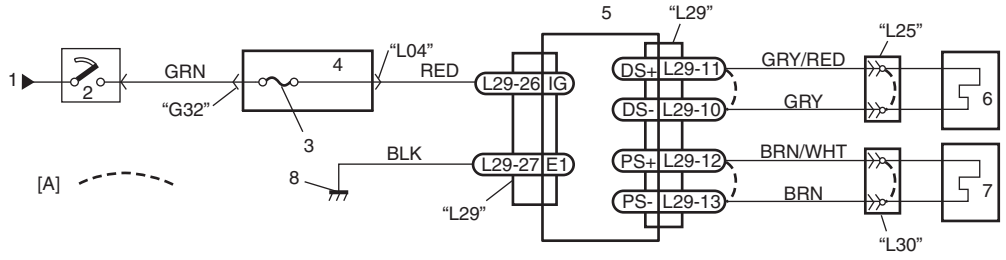
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1063 / B1067: Driver / Passenger Side-Air Bag Initiator Circuit Short to Ground

S7N20A8204032

Wiring Diagram



I4RS0B820022-01

[A]: Shorting bar	3. “A/BAG” fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

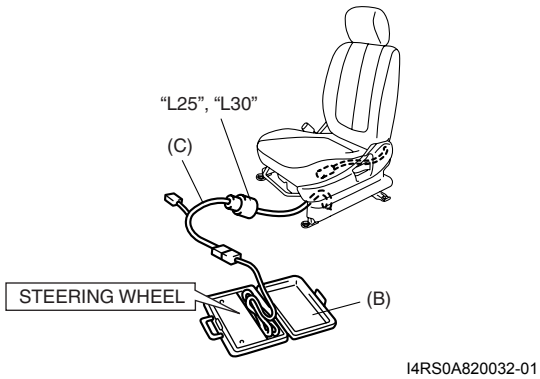
⚠ CAUTION

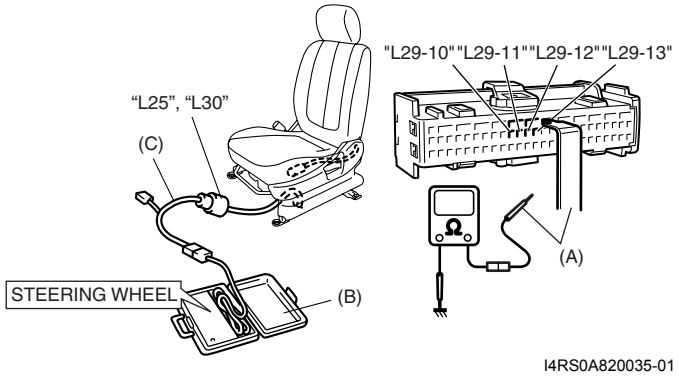
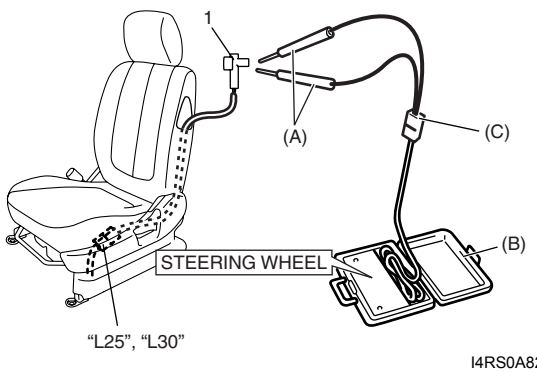
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage measured at side-air bag (driver or passenger) initiator circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in "L25" or "L30" connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1063 or B1067 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools and SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between “L29-10” and body ground, and between “L29-11” and body ground (for DTC B1063) or “L29-12” and body ground, and between “L29-13” and body ground (for DTC B1067) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820035-01 *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1063: Repair short from “GRY/RED” or “GRY” wire circuit to ground in floor harness. DTC B1067: Repair short from “BRN/WHT” or “BRN” wire circuit to ground in floor harness.
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1063 or B1067 still indicated?*	DTC B1063: Repair short from “GRY/RED” or “GRY” wire circuit to ground in seat harness. DTC B1067: Repair short from “BRN/WHT” or “BRN” wire circuit to ground in seat harness.	Replace side-air bag (inflator) module referring to “Side-Air Bag (Inflator) Module Removal and Installation”.

NOTE

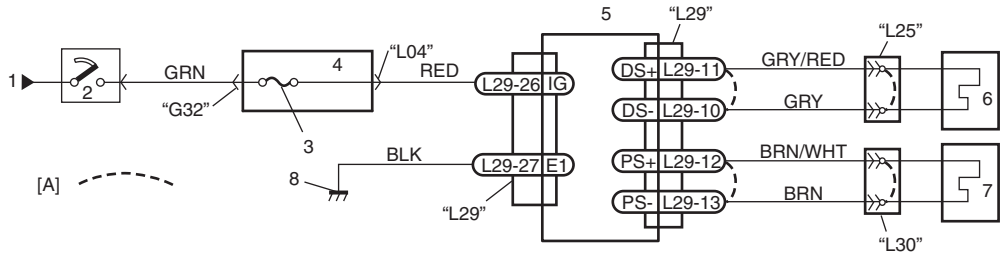
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1064 / B1068: Driver / Passenger Side-Air Bag Initiator Circuit Short to Power Circuit

S7N20A8204033

Wiring Diagram



I4RS0B820022-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

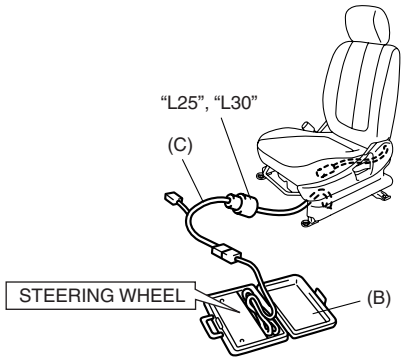
DTC Will Set when

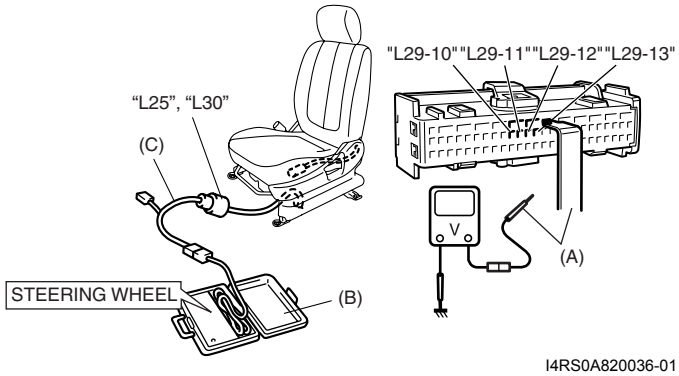
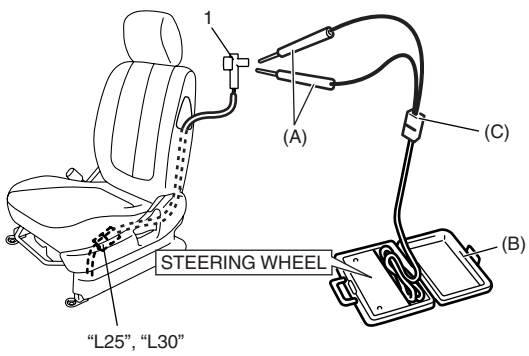
The voltage measured at side-air bag (driver or passenger) initiator circuit is above a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side-air bag (inflator) module.
Step 2: Check side-air bag initiator circuit in floor harness.
Step 3: Check side-air bag initiator circuit in seat harness.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, disconnect side-air bag (inflator) module connector under front seat cushion. 2) Check proper connection to driver or passenger side-air bag (inflator) module at terminals in “L25” or “L30” connector. 3) If OK, then connect special tools (B) and (C) to side-air bag (inflator) module connector disconnected at the Step 1. **Special tool** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820032-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1064 or B1068 still indicated?*	Go to Step 2.	Go to Step 3.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect special tools (B), (C) and SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-10” and body ground, and between “L29-11” and ground (for DTC B1064) or “L29-12” and body ground, and between “L29-13” and body ground (for DTC B1068) with connected special tools (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78340**  I4RS0A820036-01 *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1064: Repair short from “GRY/RED” or “GRY” wire circuit to power circuit in floor harness. DTC B1068: Repair short from “BRN/WHT” or “BRN” wire circuit to power circuit in floor harness.
3	1) With ignition switch OFF, disconnect special tools (B) and (C) then reconnect connector “L25” or “L30”. 2) Disconnect side-air bag (inflator) module connector (1) from side-air bag (inflator) module. 3) Check proper connection to side-air bag (inflator) module at terminal in connector. 4) If OK, then connect special tools (A), (B) and (C) to side-air bag (inflator) connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820034-01 5) Check SDM DTC. *With ignition switch ON, is DTC B1064 or B1068 still indicated?*	DTC B1064: Repair short from “GRY/RED” or “GRY” wire circuit to power circuit in seat harness. DTC B1068: Repair short from “BRN/WHT” or “BRN” wire circuit to power circuit in seat harness.	Replace side-air bag (inflator) module referring to“Side-Air Bag (Inflator) Module Removal and Installation”.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1071: Forward-Sensor Performance Problem

S7N20A8204034

DTC Will Set when

SDM receives internal fault signal or wrong ID (Part No.) signal from forward-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace forward-sensor referring to "Forward-Sensor Removal and Installation".
3) Repeat "Air Bag Diagnostic System Check".

DTC B1072: Forward-Sensor Communication Error

S7N20A8204035

DTC Will Set when

Forward-sensor abnormal signal is detected by SDM.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace forward-sensor referring to "Forward-Sensor Removal and Installation".
3) Repeat "Air Bag Diagnostic System Check".

NOTE

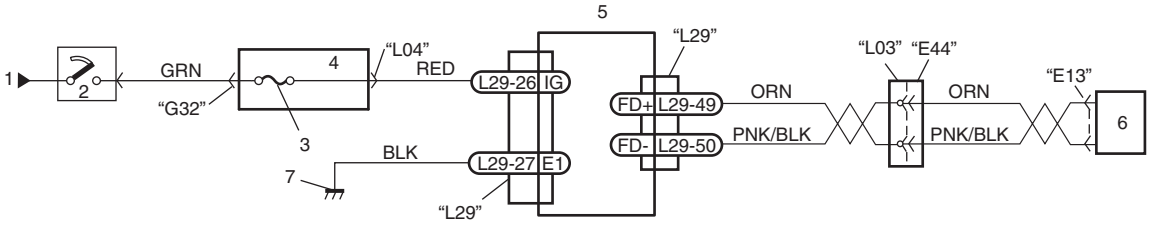
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1073: Forward-Sensor Circuit Short to Ground

S7N20A8204036

Wiring Diagram



I4RS0B820023-01

1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	
3. "A/BAG" fuse	6. Forward-sensor	

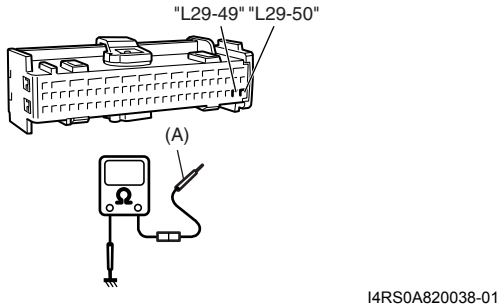
⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
Forward-sensor abnormal signal is detected by SDM.

Flow Test Description
Step 1: Check for short circuit between forward-sensor circuit and ground.
Step 2: Check if malfunction is in forward-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect forward-sensor connector "E13". 2) Disconnect SDM connector "L29". 3) Check proper connection to SDM connector at terminals "L29-49" and "L29-50" or terminals. 4) Measure resistance between "L29-49" terminal and body ground, "L29-50" terminal and body ground. **Special tool** **(A): 09932–76010**  *Is each measured resistance infinity?*	Go to Step 3.	"ORN" circuit or "PNK/BLK" circuit shorted to ground.
2	1) Check forward-sensor referring to "Forward-Sensor Inspection". *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace forward-sensor referring to "Forward-Sensor Removal and Installation". If DTC still exists, substitute a known-good SDM and recheck.

NOTE

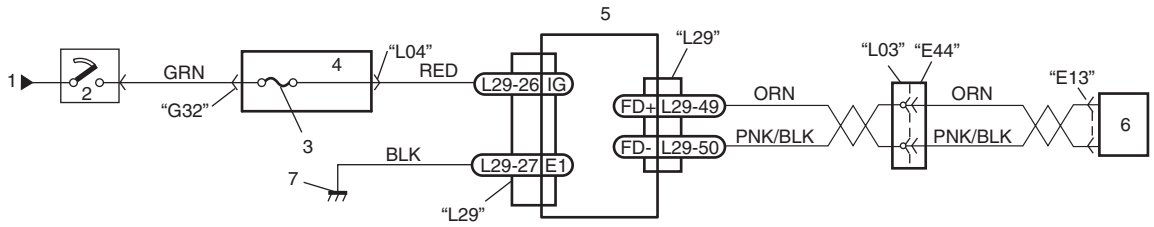
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1074: Forward-Sensor Circuit Short to Power Circuit or Open

S7N20A8204037

Wiring Diagram



I4RS0B820023-01

1. From main fuse	4. Junction block assembly	7. Ground for air bag system
2. Ignition switch	5. SDM	
3. "A/BAG" fuse	6. Forward-sensor	

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

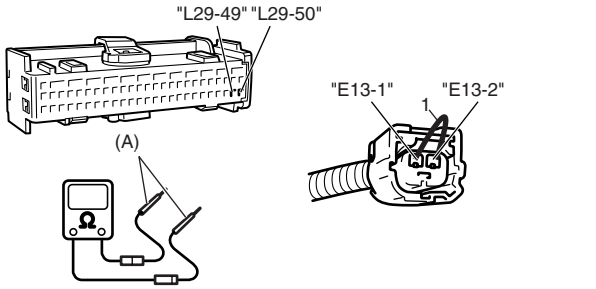
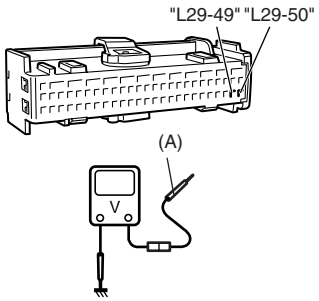
DTC Will Set when

Forward-sensor abnormal signal is detected by SDM.

Flow Test Description

Step 1: Check for open circuit in forward-sensor circuit.
Step 2: Check for short circuit between forward-sensor circuit and ground.
Step 3: Check for short circuit between forward-sensor circuit and power supply circuit.
Step 4: Check if malfunction is in forward-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect forward-sensor connector “E13”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-49” and “L29-50” or terminals. 4) Check proper connection to forward-sensor connector at terminals “E13-1” and “E13-2”. 5) Using service wire (1), connect “E13-1” terminal and “E13-2” terminal of forward-sensor connector. 6) Measure resistance between terminals “L29-49” and “L29-50” of SDM connector. **Special tool** **(A): 09932-76010**  I4RS0A820039-01 *Is each measured resistance 1 Ω or less?*	Go to Step 2.	High resistance or open wire in “ORN” circuit or “PNK/BLK” circuit.
2	1) Disconnect service wire from “E13” connector. 2) Measure voltage between “L29-49” terminal and body ground, “L29-50” terminal and body ground.  I4RS0A820040-01 *With ignition switch ON, is each measured value 1 V or less?*	Go to Step 3.	“ORN” circuit or “PNK/BLK” circuit shorted to power supply circuit.
3	1) Check forward-sensor referring to “Forward-Sensor Inspection”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace forward-sensor referring to “Forward-Sensor Removal and Installation”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1081 / B1091: Driver / Passenger Side-Sensor Performance Problem

S7N20A8204038

DTC Will Set when

SDM receives internal fault signal from side-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation".
3) Repeat "Air Bag Diagnostic System Check".

DTC B1082 / B1092: Driver / Passenger Side-Sensor Communication Error

S7N20A8204039

DTC Will Set when

Side-sensor abnormal signal is detected by SDM.

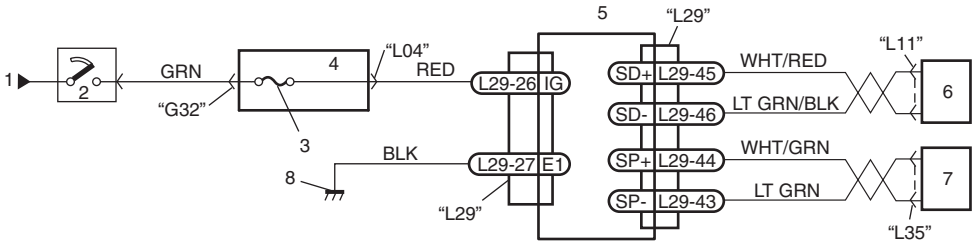
DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation".
3) Repeat "Air Bag Diagnostic System Check".

DTC B1083 / B1093: Driver / Passenger Side-Sensor Circuit Short to Ground

S7N20A8204040

Wiring Diagram



I4RS0B820024-01

1. From main fuse	4. Junction block assembly	7. Passenger side-sensor
2. Ignition switch	5. SDM	8. Ground for air bag system
3. "A/BAG" fuse	6. Driver side-sensor	

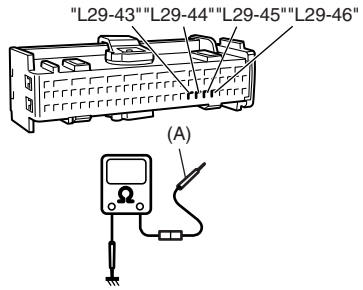
⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The resistance measured between side-sensor circuit and ground circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check for short circuit between side-sensor circuit and ground.
Step 2: Check if malfunction is in side-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect side-sensor connector “L11” or “L35”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-45” and “L29-46” or terminals “L29-43” and “L29-44”. 4) Measure resistance between “L29-45” terminal and body ground, “L29-46” terminal and body ground, or “L29-43” terminal and body ground, “L29-44” terminal and body ground. **Special tool** **(A): 09932–76010**  I4RS0A820042-01 *Is each measured resistance infinity?*	Go to Step 3.	DTC B1083: “WHT/RED” circuit or “LT GRN/BLK” circuit shorted to ground. DTC B1093: “WHT/GRN” circuit or “LT GRN” circuit shorted to ground.
2	1) Check side-sensor referring to “Side-Sensor Inspection”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace side-sensor referring to “Side-Sensor Removal and Installation”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE

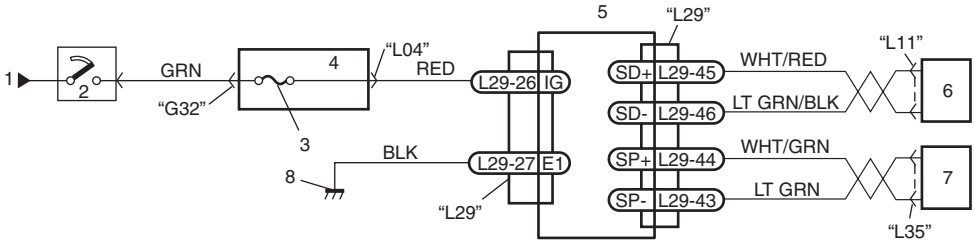
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

DTC B1084 / B1094: Driver / Passenger Side-Sensor Circuit Short to Power Circuit or Open

S7N20A8204041

Wiring Diagram



I4RS0B820024-01

1. From main fuse	4. Junction block assembly	7. Passenger side-sensor
2. Ignition switch	5. SDM	8. Ground for air bag system
3. "A/BAG" fuse	6. Driver side-sensor	

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

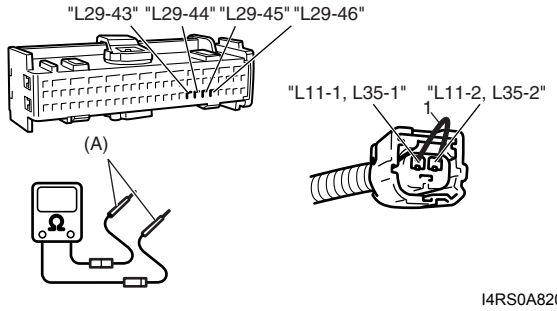
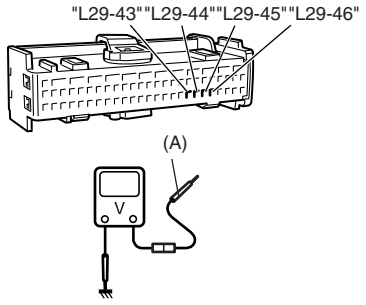
DTC Will Set when

The resistance measured between side-sensor circuit and power source circuit is below a specified value for specified time.

Flow Test Description

Step 1: Check for open circuit in side-sensor circuit.
Step 2: Check for short circuit between side-sensor circuit and power supply circuit.
Step 3: Check if malfunction is in side-sensor.

DTC Troubleshooting

Step	Action	Yes	No
1	1) Disconnect side-sensor connector “L11” or “L35”. 2) Disconnect SDM connector “L29”. 3) Check proper connection to SDM connector at terminals “L29-45” and “L29-46” or terminals “L29-43” and “L29-44”. 4) Check proper connection to side-sensor connector at terminals “L11-1” and “L11-2” or terminals “L35-1” and “35-2”. 5) Using service wire (1), connect “L11-1” terminal and “L11-2” terminal of driver side-sensor connector or “L35-1” terminal and “L35-2” terminal of passenger side-sensor connector. 6) Measure resistance between terminals “L29-45” and “L29-46” or between “L29-43” and “L29-44” of SDM connector. **Special tool** **(A): 09932–76010**  I4RS0A820043-01 *Is each measured resistance 1 Ω or less?*	Go to Step 2.	DTC B1084: High resistance or open wire in “WHT/RED” circuit or “LT GRN/BLK” circuit. DTC B1094: High resistance or open wire in “WHT/GRN” circuit or “LT GRN” circuit.
2	1) Disconnect service wire from “L11” or “L35” connector. 2) Measure voltage between “L29-45” terminal and body ground, “L29-46” terminal and body ground or “L29-43” terminal and body ground, “L29-44” terminal and body ground.  I4RS0A820044-01 *With ignition switch ON, is each measured value 1 V or less?*	Go to Step 3.	DTC B1084: “WHT/RED” circuit or “LT GRN/BLK” circuit shorted to power supply circuit. DTC B1094: “WHT/GRN” circuit or “LT GRN” circuit shorted to power supply circuit.
3	1) Check side-sensor referring to “Side-Sensor Inspection”. *Is it in good condition?*	Substitute a known-good SDM and recheck.	Replace side-sensor referring to “Side-Sensor Removal and Installation”. If DTC still exists, substitute a known-good SDM and recheck.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1085 / B1095: Wrong Side-Sensor (Driver Side / Passenger) ID

S7N20A8204042

DTC Will Set when

SDM receives wrong ID (Part No.) signal from side-sensor.

DTC Troubleshooting

1) Turn ignition switch OFF.
2) Replace driver or passenger side-sensor referring to "Side-Sensor Removal and Installation".
3) Repeat "Air Bag Diagnostic System Check".

NOTE

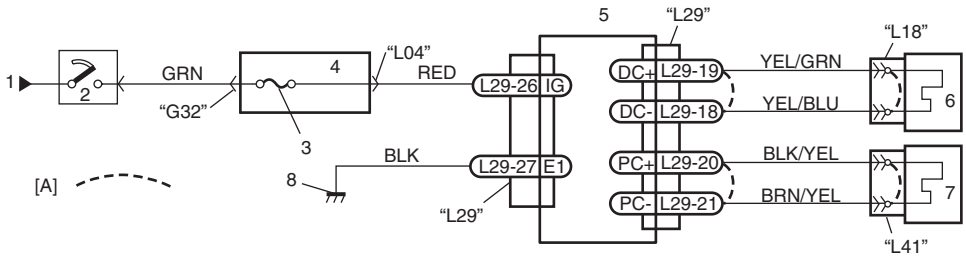
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components and ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1361 / B1365: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance High

S7N20A8204043

Wiring Diagram



I4RS0B820025-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

⚠ CAUTION

- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

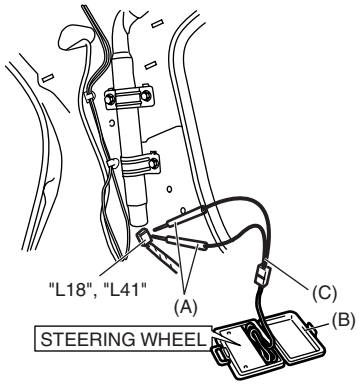
DTC Will Set when

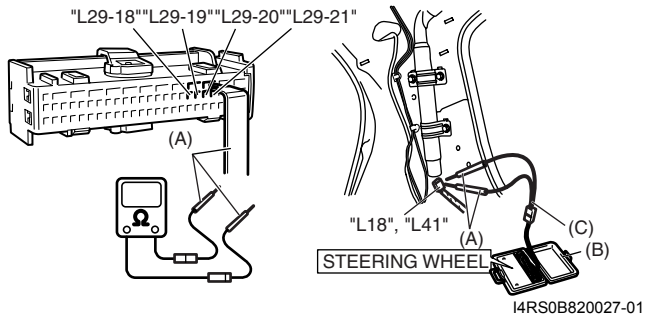
The combined resistance of the side curtain-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is above a specified value for specified time.

Flow Test Description

Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in “L18” or “L41” connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820026-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1361 or B1365 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to “Side Curtain-Air Bag (Inflator) Module Removal and Installation”.

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Check proper connection to SDM at terminals "L29-18" and "L29-19" or "L29-20" and "L29-21". 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between "L29-18" and "L29-19" terminals (for DTC B1361) or "L29-20" and "L29-21" terminals (for DTC B1365) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820027-01 *Is resistance 2.82 Ω or less?*	Substitute a known-good SDM and recheck.	DTC B1361: Repair high resistance or open in "YEL/GRN" or "YEL/BLU" wire circuit. DTC B1365: Repair high resistance or open in "BLK/YEL" or "BRN/YEL" wire circuit.

NOTE

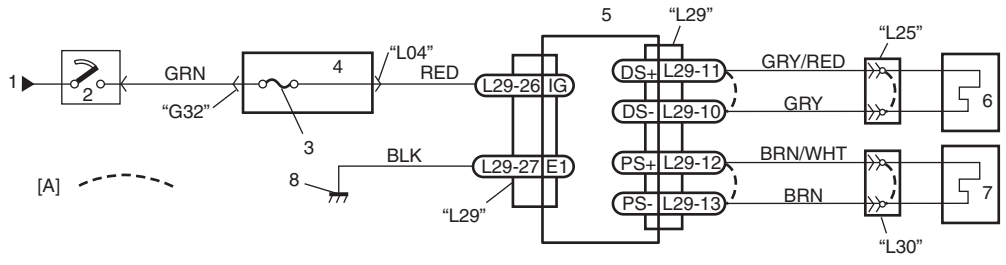
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1362 / B1366: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Resistance Low

S7N20A8204044

Wiring Diagram



I4RS0B820022-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

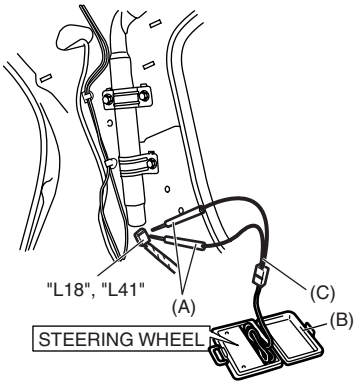
⚠ CAUTION

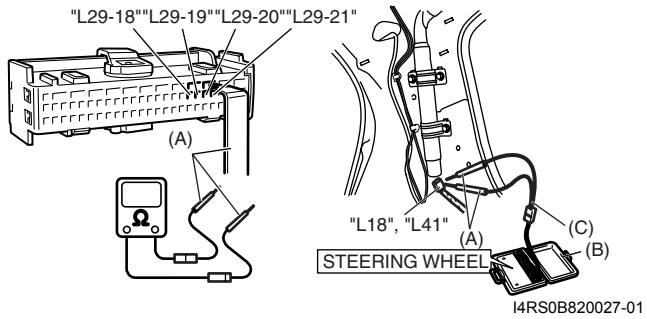
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The combined resistance of the side curtain-air bag (inflator) module (driver or passenger), harness wiring and connector terminal contact is below a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in "L18" or "L41" connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820026-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1362 or B1366 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to "Side Curtain-Air Bag (Inflator) Module Removal and Installation".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Check proper connection to SDM at terminals "L29-18" and "L29-19" or "L29-20" and "L29-21". 3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 4) Measure resistance between "L29-18" and "L29-19" terminals (for DTC B1362) or "L29-20" and "L29-21" terminals (for DTC B1366) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820027-01 *Is resistance 1.8 Ω or more?*	Substitute a known-good SDM and recheck.	DTC B1362: Repair short from "YEL/GRN" wire circuit to "YEL/BLU" wire circuit or from "YEL/GRN" or "YEL/BLU" wire circuit to other wire circuit. DTC B1366: Repair short from "BLK/YEL" wire circuit to "BRN/YEL" wire circuit or from "BLK/YEL" or "BRN/YEL" wire circuit to other wire circuit.

NOTE

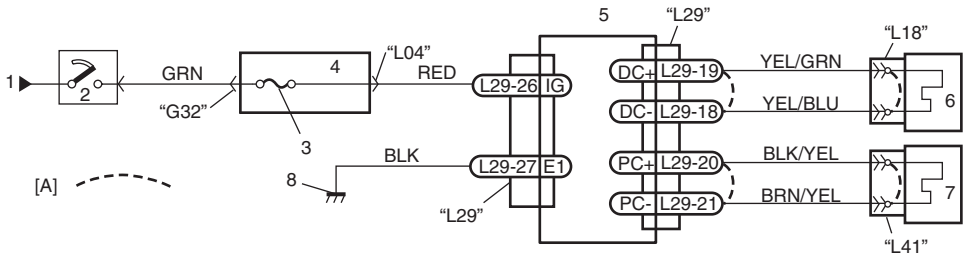
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1363 / B1367: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Ground

S7N20A8204045

Wiring Diagram



I4RS0B820025-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

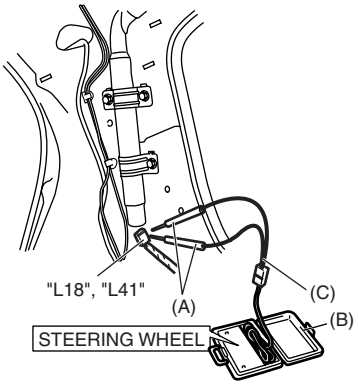
⚠ CAUTION

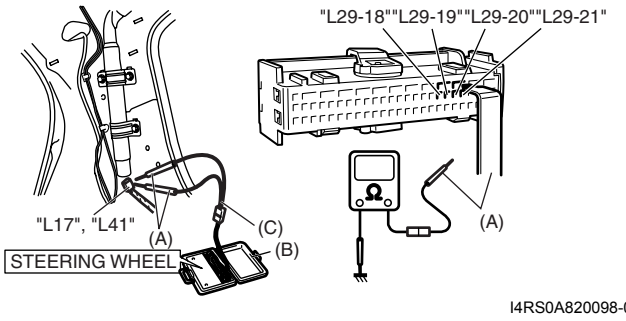
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage measured at side curtain-air bag (driver or passenger) initiator circuit is below a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side-air bag (inflator) module at terminals in "L18" or "L41" connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820026-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1363 or B1367 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to "Side Curtain-Air Bag (Inflator) Module Removal and Installation".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector "L29". 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure resistance between "L29-18" and body ground, and between "L29-19" and body ground (for DTC B1363) or "L29-20" and body ground, and between "L29-21" and body ground (for DTC B1367) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0A820098-01 *Is resistance infinity?*	Substitute a known-good SDM and recheck.	DTC B1363: Repair short from "YEL/GRN" or "YEL/BLU" wire circuit to ground. DTC B1367: Repair short from "BLK/YEL" or "BRN/YEL" wire circuit to ground.

NOTE

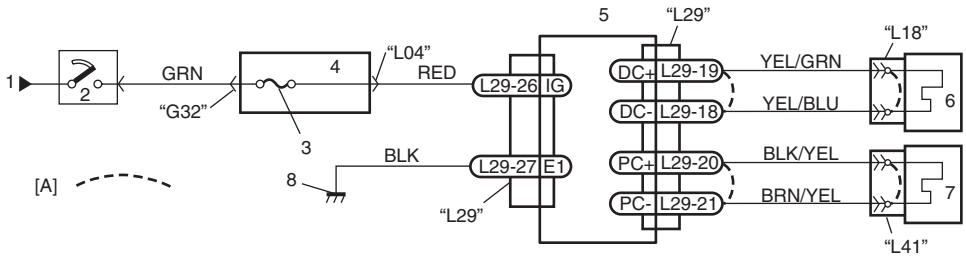
Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to "DTC Clearance", if any.**
- **Repeat "Air Bag Diagnostic System Check" to confirm that the trouble has been corrected.**

DTC B1364 / B1368: Driver / Passenger Side Curtain-Air Bag Initiator Circuit Short to Power Circuit

S7N20A8204046

Wiring Diagram



I4RS0B820025-01

[A]: Shorting bar	3. "A/BAG" fuse	6. Driver side curtain-air bag (inflator) module
1. From main fuse	4. Junction block assembly	7. Passenger side curtain-air bag (inflator) module
2. Ignition switch	5. SDM	8. Ground for air bag system

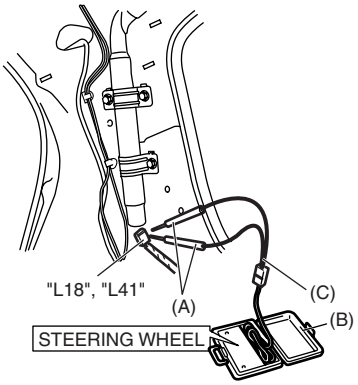
⚠ CAUTION

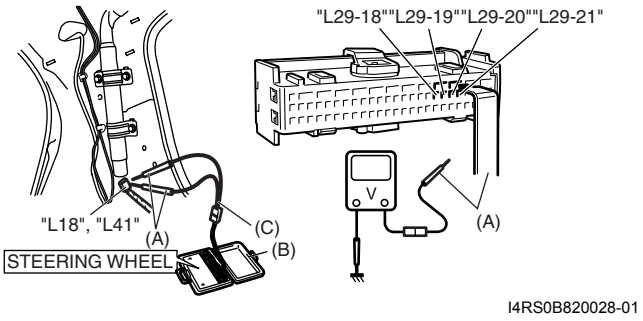
- **Be sure to perform "Air Bag Diagnostic System Check" before starting diagnosis according to flow.**
- **When measurement of resistance or voltage is required in this flow, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Inspection of Intermittent and Poor Connections".**
- **If there is open circuit in the air bag wire harness, connector or terminal is found damaged, replace the wire harness, connector and terminal as an assembly.**

DTC Will Set when
The voltage measured at side curtain-air bag (driver or passenger) initiator circuit is above a specified value for specified time.

Flow Test Description
Step 1: Check whether malfunction is in side curtain-air bag (inflator) module.
Step 2: Check side curtain-air bag initiator circuit.

DTC Troubleshooting

Step	Action	Yes	No
1	1) With ignition switch OFF, remove rear side upper trim of driver or passenger side and disconnect side curtain-air bag (inflator) module connector. 2) Check proper connection to side curtain-air bag (inflator) module at terminals in "L18" or "L41" connector. 3) If OK, then connect special tools (A), (B) and (C) to side curtain-air bag (inflator) module connector. **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820026-01 4) Check SDM DTC. *With ignition switch ON, is DTC B1364 or B1368 still indicated?*	Go to Step 2.	Replace side curtain-air bag (inflator) module referring to "Side Curtain-Air Bag (Inflator) Module Removal and Installation".

Step	Action	Yes	No
2	1) With ignition switch OFF, disconnect SDM connector “L29”. 2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A). 3) Measure voltage between “L29-18” and body ground, and between “L29-19” and ground (for DTC B1364) or “L29-20” and body ground, and between “L29-21” and body ground (for DTC B1368) with connected special tools (A), (B) and (C). **Special tool** **(A): 09932–76010** **(B): 09932–75010** **(C): 09932–78310**  I4RS0B820028-01 *With ignition switch ON, is voltage 1 V or less?*	Substitute a known-good SDM and recheck.	DTC B1064: Repair short from “YEL/GRN” or “YEL/BLU” wire circuit to power circuit. DTC B1068: Repair short from “BLK/YEL” or “BRN/YEL” wire circuit to power circuit.

NOTE

Upon completion of inspection and repair work, perform the following items.

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear DTCs referring to “DTC Clearance”, if any.**
- **Repeat “Air Bag Diagnostic System Check” to confirm that the trouble has been corrected.**

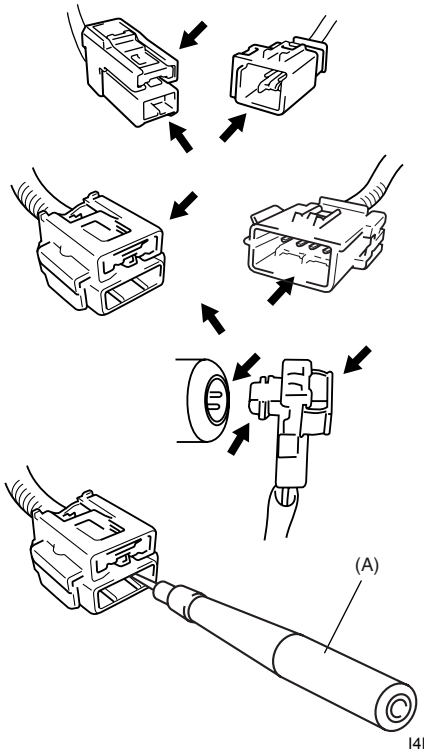
Inspection of Intermittent and Poor Connections

S7N20A8204047

Most intermittents are caused by faulty electrical connections or wiring. When a check for proper connection is requested in a diagnostic flow, perform careful check of suspect circuits.
If any abnormality is found, repair or replace as a wire harness assembly.

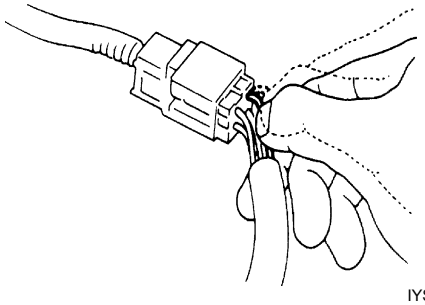
- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the like is prohibited.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension by using the corresponding mating terminal included in the connector test adapter kit (special tool).
  If contact tension is not enough, reform the terminal to increase contact tension or replace it.

  Special tool
  (A): 09932-76010 Connector test adapter kit



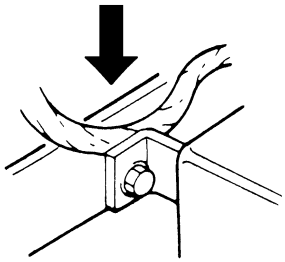
I4RS0A820045-01

- Poor terminal-to-wire connection.
  Check each wire harness in problem circuits for poor connection by shaking it by hand lightly. If any abnormal condition is found, change the wire harness assembly or component parts with new ones.



IYSQ01010028-01

- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wire broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are intact, resistance could be far too high.



IYSQ01820025-01

Repair and Inspection Required after Accident

S7N20A8204048

⚠ CAUTION

- **All air bag system components, including the electrical harness (component mounting points), must be inspected after an accident. If any components are damaged or bent, they must be replaced even if air bag system activation did not occur.**
- **Never use air bag system parts from another vehicle.**
- **Do not attempt to service the parts below. Service of these parts is by replacement only.**
  - **– Driver / Passenger air bag (inflator) modules**
  - **– Driver / Passenger side-air bag (inflator) modules**
  - **– Driver / Passenger side curtain-air bag (inflator) modules**
  - **– Driver / Passenger seat belt pretensioners**
  - **– Forward-sensor**
  - **– Driver / Passenger side-sensors**
  - **– SDM**
  - **– Contact coil and combination switch assembly**
  - **– Air bag wire harness in main harness, instrument panel harness and floor harness.**
- **Proper operation of the sensors and air bag system requires that any repairs to the vehicle structure return it to its original production configuration.**

⚠ CAUTION

After detecting one time of such collision as to meet deployment conditions, the SDM must not be used.
Refer to "Air Bag Diagnostic System Check" when checking the SDM.

Accident with Deployment / Activation – Component Replacement

When driver and passenger air bags are deployed, the following components must be replaced.

- Driver and passenger air bag (inflator) modules
- Driver and passenger seat belt pretensioners
- SDM after detecting such collision as to meet deployment conditions
- Forward-sensor
- Instrument panel

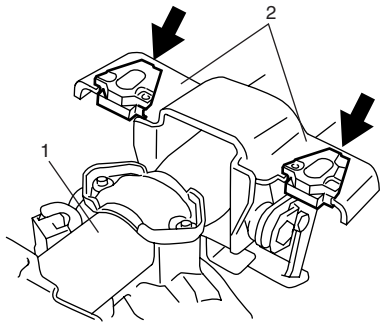
When side-air bag and side curtain-air bag are deployed, the following components must be replaced.

- Deployed side-air bag (inflator) module
- Deployed side curtain-air bag (inflator) module
- Side-sensor
- SDM

Accident with or without Deployment / Activation – Component Inspections

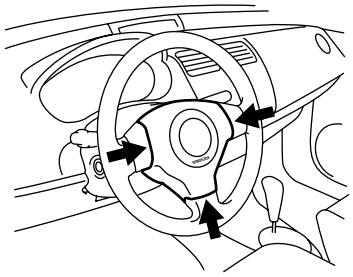
Certain air bag and restraint system components must be inspected after any crash, whether the air bag system activated or not. If any faulty condition is found in the following checks, replace faulty part.
Those components are:

- Steering column (1) and shaft joints
  - – Check for length, damage and bend according to "Checking Steering Column for Accident Damage in Section 6B".
- Steering column bracket (2) and capsules
  - – Check for damage and bent.



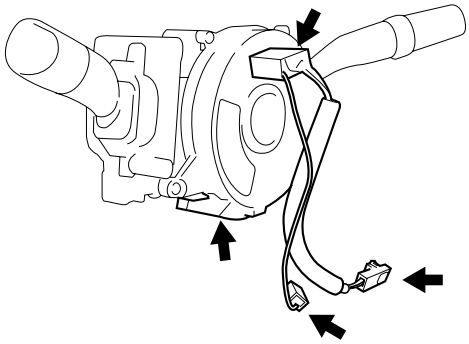
I4RS0A820046-01

- Steering wheel and driver air bag (inflator) module
  - Check for damage or air bag (inflator) module fitness.
  - Check trim cover (pad surface) for cracks.
  - Check wire harness and connector for damage or tightness.



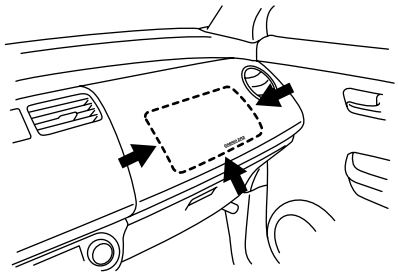
I4RS0B820029-01

- Contact coil and combination switch assembly
  - Check wire harness and connectors for damage or tightness.
  - Check contact coil case for damage.



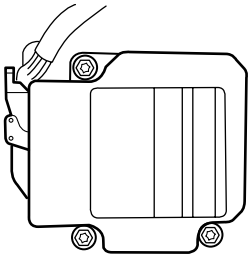
I4RS0A820048-01

- Instrument panel member and reinforcement
  - Check for any distortion, bending, cracking or other damage.
  - Check instrument panel for cracks or deformities.
- Passenger air bag (inflator) module
  - Check for dents, cracks, damage or fitness.
  - Check harness and connector for damage or tightness.



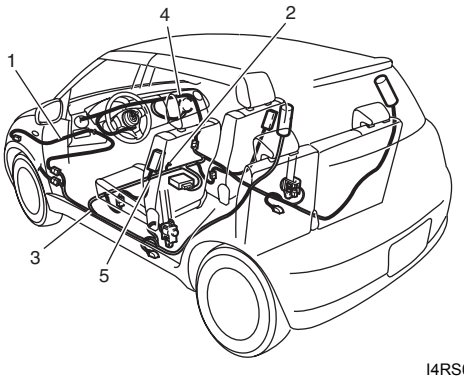
I4RS0B820030-01

- SDM
  - Check for external damage such as deformation, scratch, crack, peeled paint, etc.
  - Check SDM for a cause in itself preventing its proper installation. (There is a gap between SDM and SDM plate, or it cannot be fixed securely.)
  - Check connector or lead wire of SDM for scorching, melting or damage.
  - Check SDM connector and terminals for tightness.
  - Check if SDM sets a DTC and is judged as malfunctioning according to the diagnostic flow.



I5RH01820092-01

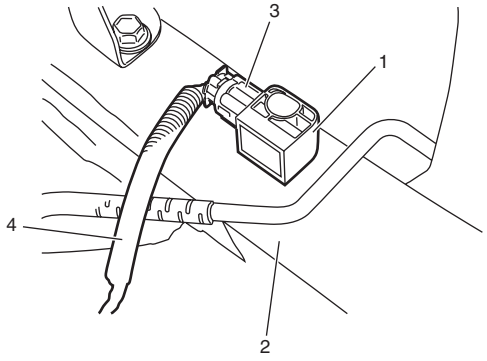
- Air bag wire harness and connections
  - Check for damages, deformities or poor connections.
    Refer to “Inspection of Intermittent and Poor Connections”.
  - Check wire harness clamps for tightness.
  - For air bag harness including in instrument panel harness replacement, refer to “Passenger Air Bag (Inflator) Module Repair Harness Installation”.



I4RS0B820001-01

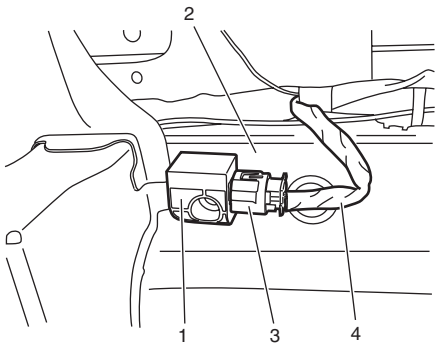
1. Main harness	4. Instrument panel harness
2. Grounding point	5. Seat harness
3. Floor harness	

- Forward-sensor
  - Check sensor (1) and front panel (2) for damage, bend or rust.
  - Check connector (3) or lead wire (4) of forward-sensor for scorching, melting or damage.



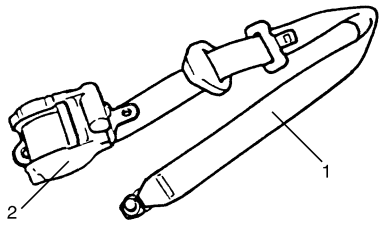
I4RS0A820050-01

- Side-sensor
  - Check sensor (1) and under body (2) for dents, cracks, deformation or rust.
  - Check sensor connector (sensor side and harness side) (3) or sensor lead wire (4) for damage, crack, scorching or melting.



I4RS0A820051-01

- Seat belt pretensioner
  - Check for dents, cracks, damage or fitness
  - Check harness and connector for damage or tightness.



I3JA01820043-01

1.	Seat belt
2.	Retractor assembly

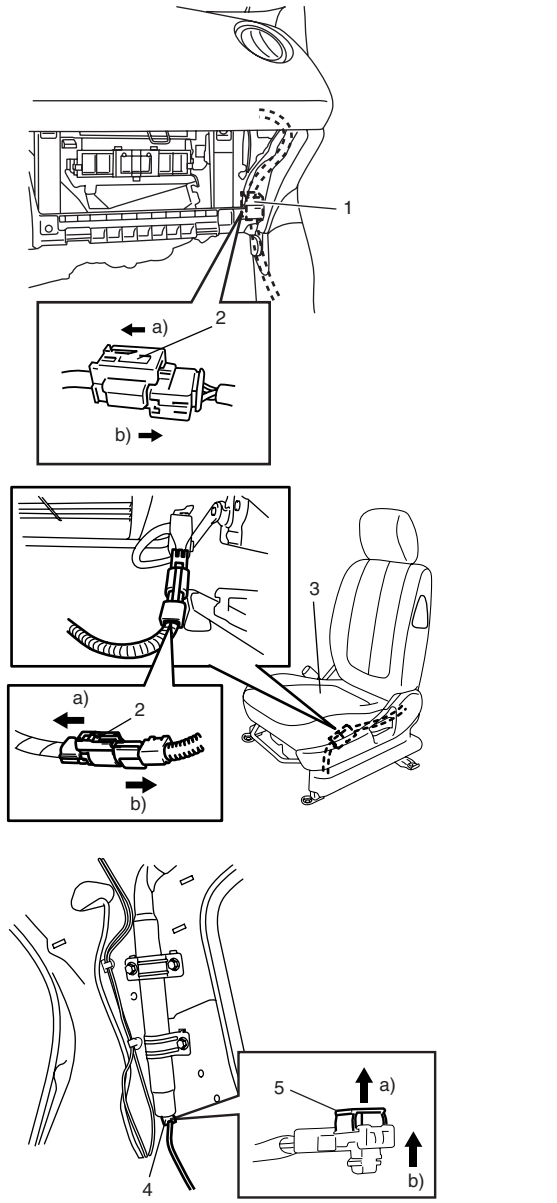
- Seat belts and mounting points
  - Refer to “Front Seat Belt Components in Section 8A”.
- “AIR BAG” warning lamp
  - After vehicle is completely repaired, perform “Air Bag Diagnostic System Check”.
- Side-air bag (inflator) module
  - Check for dents, cracks, damage or fitness.
  - Check trim cover for cracks or deformities.
  - Check wire harness and connector for damage or tightness.
- Side curtain-air bag (inflator) module
  - Check for dents, cracks, damage or fitness.
  - Check harness wire harness and connector for damage or tightness.
  - Check headlining for cracks or deformation.

Repair Instructions

Disabling Air Bag System

S7N20A8206001

1) Turn steering wheel so that vehicle’s wheels (front tires) are pointing straight ahead.
2) Disconnect negative (–) cable at battery.
3) Turn ignition switch to “LOCK” position and remove key.
4) Remove “A/BAG” fuse from fuse box.
5) Pull out glove box while pushing its stopper from both right and left sides and disconnect yellow connector (1) for driver and passenger air bags as follows.
   a) Release locking of lock slider (2).
   b) After unlocked, disconnect connector.
6) If equipped with side-air bag (inflator) module, disconnect yellow connector of side-air bag (inflator) module under front seat cushion (3).
   a) Release locking of lock slider.
   b) After unlocked, disconnect connector.
7) If equipped with side curtain-air bag (inflator) module, remove quarter inner trim and disconnect black connector (4) of side curtain-air bag (inflator) module.
   a) Unlock button (5).
   b) With lock button unlocked, disconnect connector.



I4RS0B820031-01

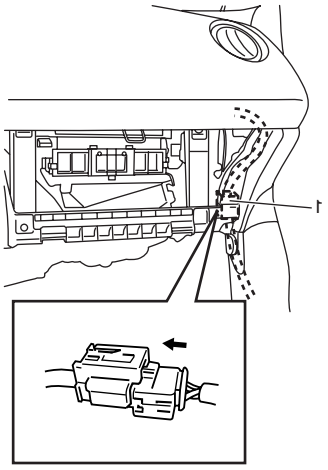
NOTE

With "A/BAG" fuse removed and ignition switch ON, "AIR BAG" warning lamp will be ON.
This is normal operation and does not indicate air bag system malfunction.

Enabling Air Bag System

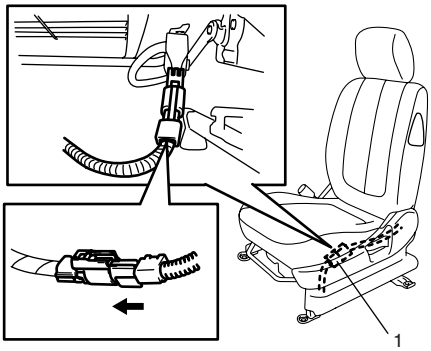
S7N20A8206002

1) Confirm that battery negative (–) cable is disconnected.
2) Turn ignition switch to "LOCK" position and remove key.
3) Connect yellow connector (1) of passenger air bag (inflator) module by pushing connector till click is heard from it.



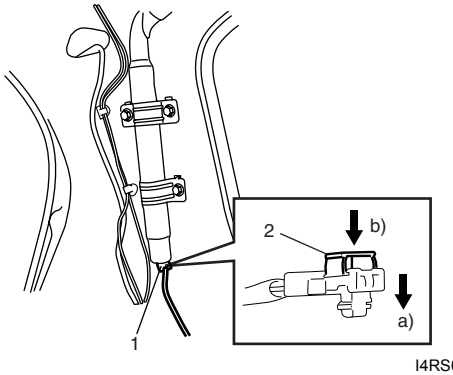
I4RS0B820032-01

4) Install glove box.
5) If equipped with side-air bag (inflator) module, connect yellow connector (1) of side-air bag (inflator) module by pushing connector till click is heard from it.



I4RS0A820054-01

6) If equipped with side curtain-air bag (inflator) module, connect black connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820055-01

7) Install "A/BAG" fuse to fuse box.
8) Connect negative (–) cable at battery.
9) Turn ignition switch to ON position and verify that "AIR BAG" warning lamp flashes 6 times and then turns OFF. If it does not operate as described, perform "Air Bag Diagnostic System Check".

SDM Removal and Installation

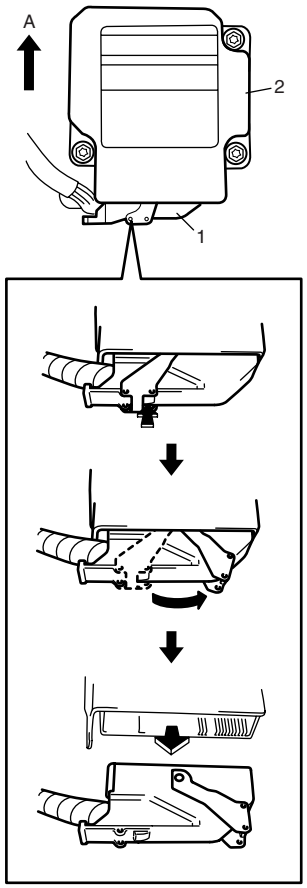
S7N20A8206003

⚠ WARNING

During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read "Precautions on Service and Diagnosis of Air Bag System" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.

Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System".
3) Remove center console box referring to "Console Box Components in Section 9H".
4) Disconnect SDM connector (1) from SDM (2).
5) Remove SDM (2) from vehicle.



I4RS0A820056-01

A: Forward

Installation

1) Check that none of the following faulty conditions exists.
   - Bend, scratch, deformity in vehicle body where SDM is mounted.
   - Foreign matter or rust on mating surface of vehicle body where SDM is mounted.
2) Install SDM (2) to vehicle.

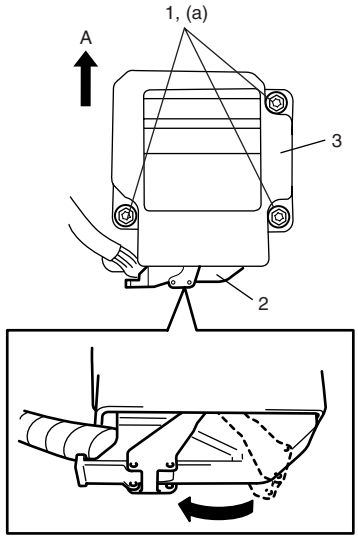
⚠ CAUTION

Ensure that arrow on the SDM is pointing toward the front of the vehicle.

3) Tighten SDM bolts (1) to specified torque.

Tightening torque
SDM bolt (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)

4) Connect SDM connector (2) to SDM (3) securely.



I4RS0A820107-01

A: Forward

5) Install center console box upper cover.
6) Enable air bag system referring to "Enabling Air Bag System".
7) Connect negative cable at battery.

SDM Inspection

S7N20A8206004

⚠ WARNING

During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read "Precautions on Service and Diagnosis of Air Bag System" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.

⚠ CAUTION

- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM has been dropped, it should be replaced.**

If any faulty condition is found in the following checks, replace.

- Check SDM and SDM plate for dents, cracks or deformation.
- Check SDM connector for damage, cracks or lock mechanism.
- Check SDM terminal for bend, corrosion or rust.

Driver Air Bag (Inflator) Module Removal and Installation

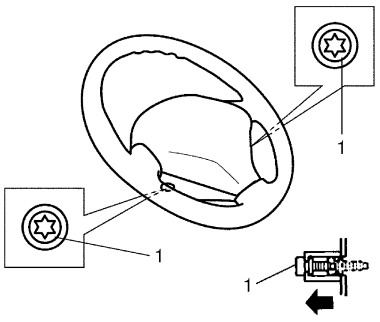
S7N20A8206005

⚠ WARNING

When handling an air bag (inflator) module, be sure to read "Precautions on Handling and Storage of Air Bag System Components" and observe each instruction. Failure to follow them could cause a damage to the air bag (inflator) module or result in personal injury.

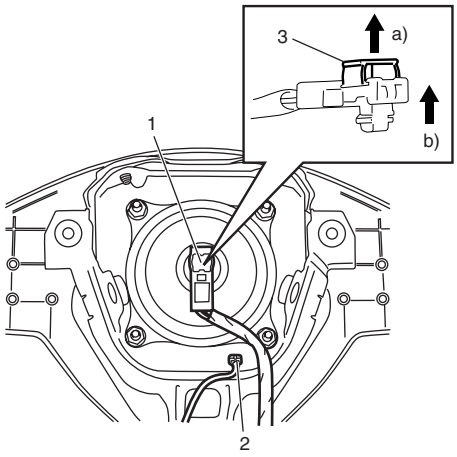
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System".
3) Loosen driver air bag (inflator) module mounting bolts (1) till it turns freely, pull them out and fix them to bolt clamps.



I3JA01820031-01

4) Remove air bag (inflator) module from steering wheel.
5) Disconnect driver air bag (inflator) module connector (1) of driver air bag (inflator) module and horn connector (2) as shown in figure.
   a) Unlock lock button (3).
   b) With lock button unlocked, disconnect connector.



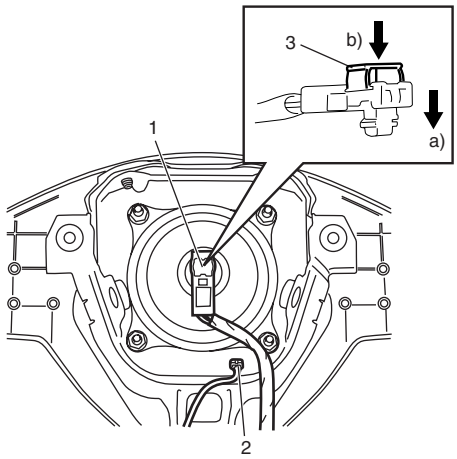
I4RS0A820057-01

⚠ WARNING

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) module. Observe "Precautions on Handling and Storage of Air Bag System Components". Otherwise, personal injury may result.

Installation

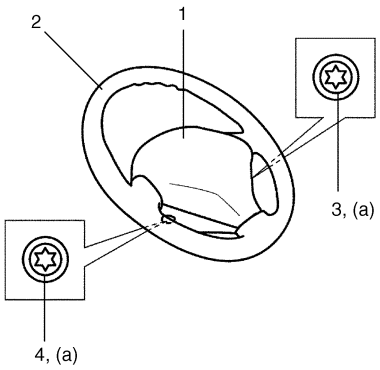
1) Connect horn connector (1) securely.
2) Connect driver air bag (inflator) module connector (2) to driver air bag (inflator) module (3) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button.



I4RS0A820058-01

3) Install driver air bag (inflator) module (1) to steering wheel (2), taking care so that no part of wire harness is caught between them.
4) Make sure that clearance between module (1) and steering wheel (2) is uniform all the way.
5) Tighten driver air bag (inflator) module mounting bolt (left side) (3) to specified torque first and then driver air bag (inflator) module mounting bolt (right side) (4) to specified torque.

Tightening torque
Driver air bag (inflator) module mounting bolt (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)



I5RH01820103-01

6) Enable air bag system. Refer to “Enabling Air Bag System”.
7) Connect negative cable at battery.

Driver Air Bag (Inflator) Module Inspection

S7N20A8206006

⚠ WARNING

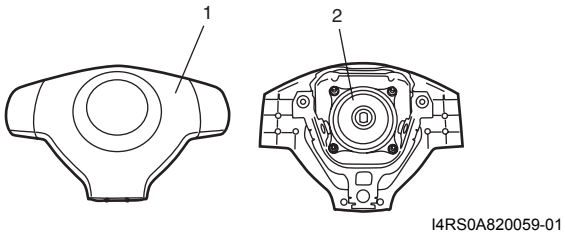
Never disassemble air bag (inflator) module or measure its resistance. Otherwise, personal injury may result.

⚠ CAUTION

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module visually and if any of the following is found, replace it with a new one.

- Air bag being deployed
- Trim cover (pad surface) (1) being cracked
- Inflator case (2) being damaged or having been exposed to strong impact (dropped)
- Bend or deformity of air bag (inflator) module bracket.



I4RS0A820059-01

Passenger Air Bag (Inflator) Module Removal and Installation

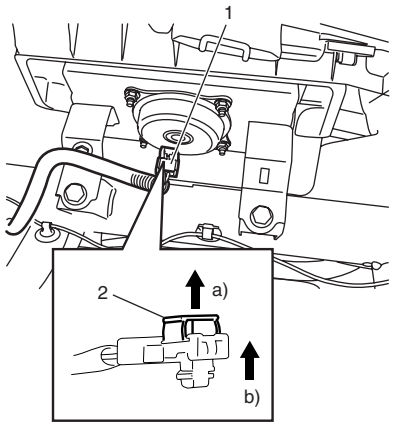
S7N20A8206007

⚠ WARNING

- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System”, “Precautions on Handling and Storage of Air Bag System Components” and “Precautions on Disposal of Air Bag and Seat Belt Pretensioner” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

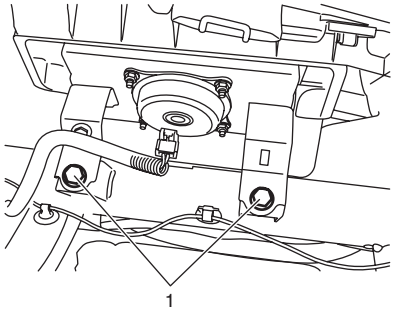
Removal

1) Disable air bag system. Refer to “Disabling Air Bag System”.
2) Disconnect passenger air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



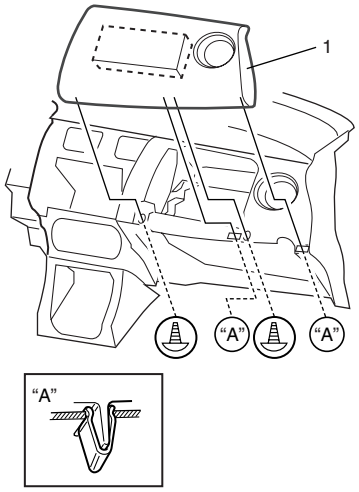
I4RS0B820033-01

3) Remove passenger air bag (inflator) module attaching bolts (1).



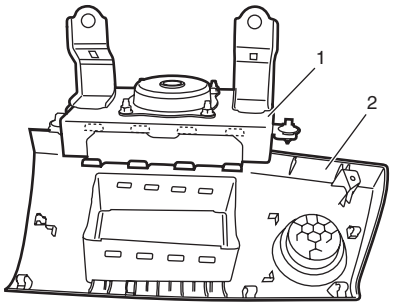
I4RS0B820034-01

4) Remove passenger air bag (inflator) module with air bag hole cover (1) from instrument panel as shown.



I4RS0B820035-01

5) Remove passenger air bag (inflator) module (1) from air bag hole cover (2).



I4RS0B820036-01

⚠ WARNING

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live passenger air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing, place it on the workbench with a slit facing down or use the workbench vise to hold it securely at its lower mounting bracket. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components" for handling and storing it.**

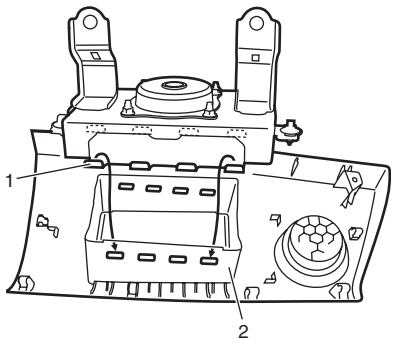
Otherwise, personal injury may result.

Installation

1) Install passenger air bag (inflator) module to air bag hole cover (2).

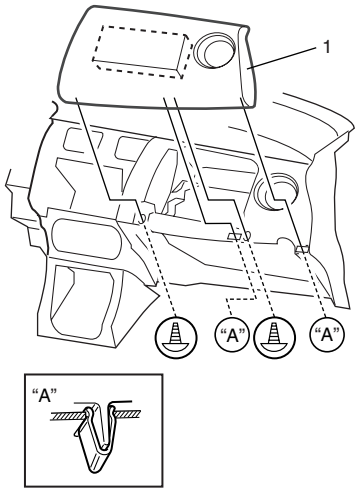
⚠ CAUTION

Confirm claw (1) of passenger air bag (inflator) module hangs in air bag hole cover (2).



I4RS0B820043-01

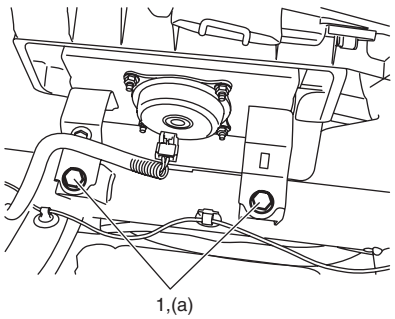
2) Install passenger air bag (inflator) module with air bag hole cover (1) to instrument panel as shown.



I4RS0B820035-01

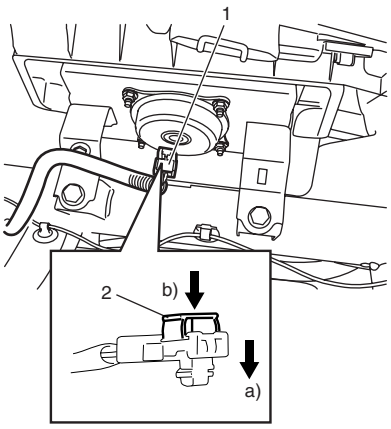
3) Tighten passenger air bag (inflator) module attaching bolts (1) to specified torque.

Tightening torque
Passenger air bag (inflator) module attaching bolt (a): 23 N·m (2.3 kgf-m, 16.5 lbf-ft)



I4RS0B820037-01

4) Connect passenger air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0B820038-01

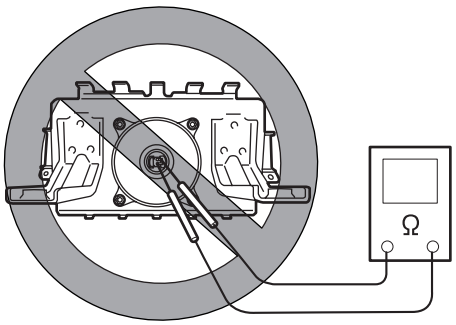
5) Enable air bag system. Refer to “Enabling Air Bag System”.

Passenger Air Bag (Inflator) Module Inspection

S7N20A8206008

⚠ WARNING

- **Never measure resistance of passenger air bag (inflator) module or disassemble it. Otherwise personal injury may result.**
- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System”, “Precautions on Handling and Storage of Air Bag System Components” and “Precautions on Disposal of Air Bag and Seat Belt Pretensioner” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I3RH0A820071-01

⚠ CAUTION

If air bag (Inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Bend or deformity of air bag (inflator) module bracket.

Side-Air Bag (Inflator) Module Removal and Installation

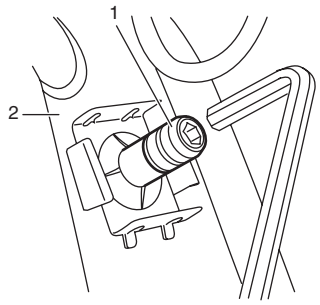
S7N20A8206009

⚠ WARNING

- **Never attempt to disassemble or repair the side-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System”, “Precautions on Handling and Storage of Air Bag System Components” and “Precautions on Disposal of Air Bag and Seat Belt Pretensioner” before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

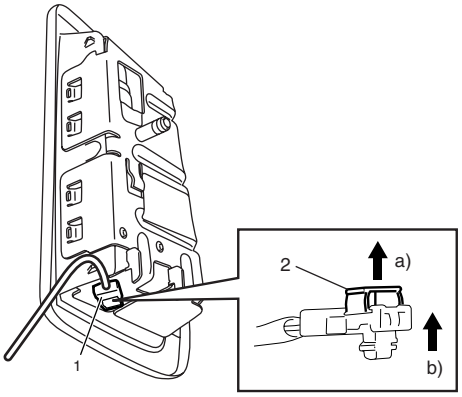
Removal

1) Disable air bag system. Refer to “Disabling Air Bag System”.
2) Roll up the seat surface of the seat back.
3) Remove sleeve lock nut (1) from seat back (2).



I4RS0A820067-01

4) Remove side-air bag (inflator) module from seat back.
5) Disconnect side-air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



I4RS0A820068-01

⚠ WARNING

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live side-air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components" for handling and storing it.**

Otherwise, personal injury may result.

⚠ CAUTION

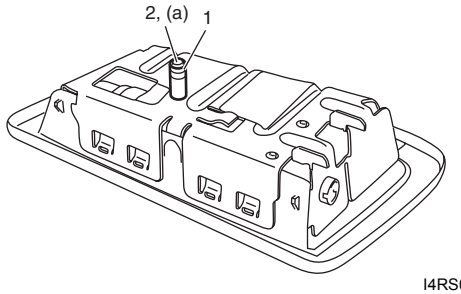
Do not damage the sleeve. Otherwise, the side-air bag cannot be correctly installed to seat back.

Installation

1) Confirm sleeve (1) is surely installed in side-air bag (inflator) module.
2) Tighten sleeve lock nut (2) to specified torque.

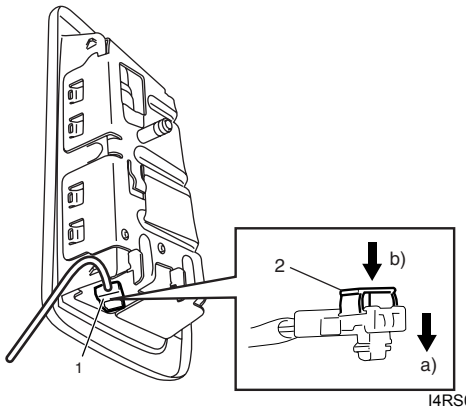
   Tightening torque
   Sleeve lock nut (a): 2.5 N·m (0.25 kgf-m, 2 lbf-ft)

3) Install new clip to seat back.



I4RS0A820073-02

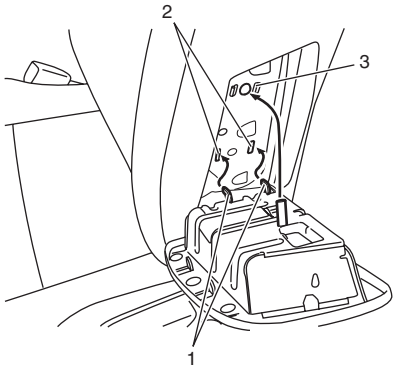
4) Connect side-air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820070-01

5) Insert claw (1) of side-air bag (inflator) module on installation hole (2).
6) Push side-air bag (inflator) module into clip (3) with specified force.

   <u>Side-air bag (inflator) module installation force</u>
   Pushing force: 180 N



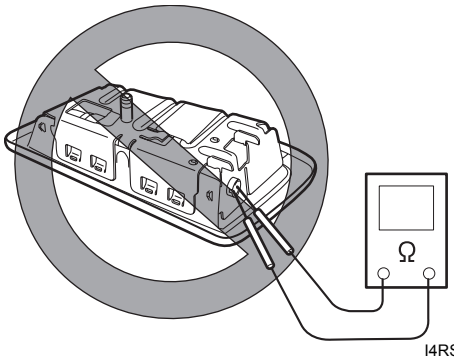
I4RS0A820074-02

Side-Air Bag (Inflator) Inspection

S7N20A8206010

⚠ WARNING

- **Never attempt to disassemble or repair the side-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I4RS0A820075-02

⚠ CAUTION

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- There is a crack in trim cover (pad surface).
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact was applied to it.
- Bend or deformity of air bag (inflator) module bracket.

Side Curtain-Air Bag (Inflator) Module Removal and Installation

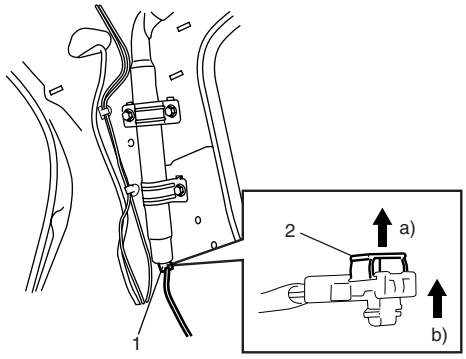
S7N20A8206011

⚠ WARNING

- **Never attempt to disassemble or repair the side curtain-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System", "Precautions on Handling and Storage of Air Bag System Components" and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

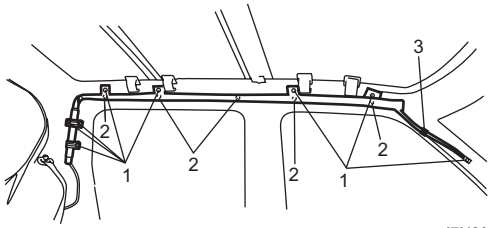
Removal

1) Disable air bag system. Refer to "Disabling Air Bag System".
2) Remove head lining referring to "Head Lining Removal and Installation in Section 9H".
3) Disconnect side curtain-air bag (inflator) module connector (1) as shown in figure.
   a) Unlock lock button (2).
   b) With lock button unlocked, disconnect connector.



I4RS0A820077-01

4) Remove side curtain-air bag (inflator) module fixing bolts (1), clips (2) and double sided tape (3).



I7N20A820001-01

5) Remove side curtain-air bag (inflator) module.

⚠ WARNING

- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you.**
  Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.
- **As the live curtain air bag (inflator) module must be kept with its bag facing up while being stored or left standing. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Precautions on Handling and Storage of Air Bag System Components" for handling and storing it.**

Otherwise, personal injury may result.

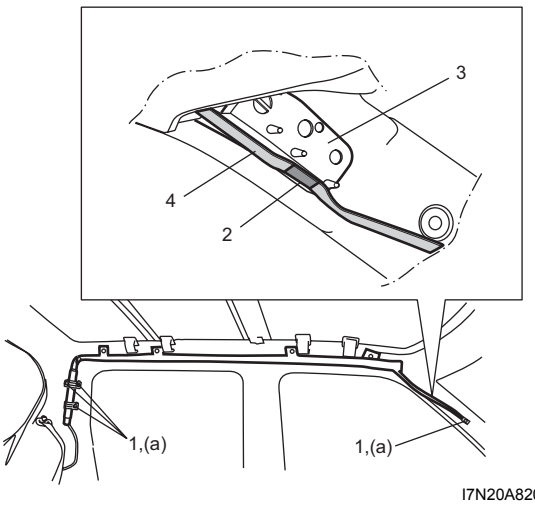
Installation

⚠ WARNING

Do not install side curtain-air bag (inflator) module while twisted or bended. Otherwise, side curtain-air bag (inflator) module may not deploy and injury may result.

1) Install side curtain-air bag (inflator) module with clips, new bolts and double sided tape (2).
2) Tighten side curtain-air bag (inflator) module attaching bolts (1) to specified torque.

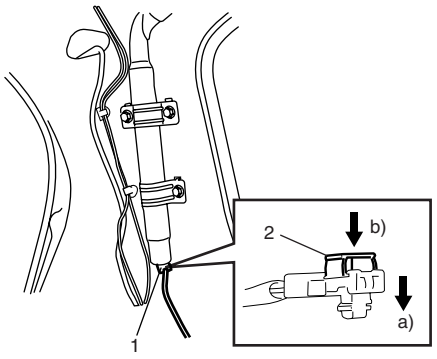
Tightening torque
Side curtain-air bag (inflator) module attaching bolts (a): 11 N·m (1.1 kgf-m, 8.0 lbf-ft)



I7N20A820002-01

3. Head lining holder	4. Strap

3) Connect side curtain-air bag (inflator) module connector (1) securely as shown in figure.
   a) Connect connector.
   b) Lock connector with lock button (2).



I4RS0A820055-01

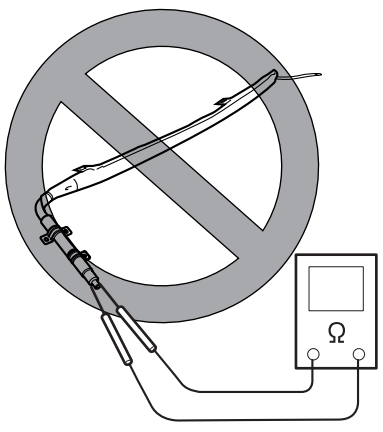
4) Install head lining referring to "Head Lining Removal and Installation in Section 9H".
5) Enable air bag system. Refer to "Enabling Air Bag System".

Side Curtain-Air Bag (Inflator) Module Inspection

S7N20A8206012

⚠ WARNING

- **Never measure resistance of side curtain-air bag (inflator) module or disassemble it. Otherwise personal injury may result.**
- **Never attempt to disassemble or repair the side curtain-air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read "Precautions on Service and Diagnosis of Air Bag System", "Precautions on Handling and Storage of Air Bag System Components" and "Precautions on Disposal of Air Bag and Seat Belt Pretensioner" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



I4RS0A820078-03

⚠ CAUTION

If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for the following symptoms and if any one of them is found, replace with a new one.

- Air bag has deployed.
- Inflator case being damaged or having been exposed to strong impact (dropped).

Forward-Sensor Removal and Installation

S7N20A8206013

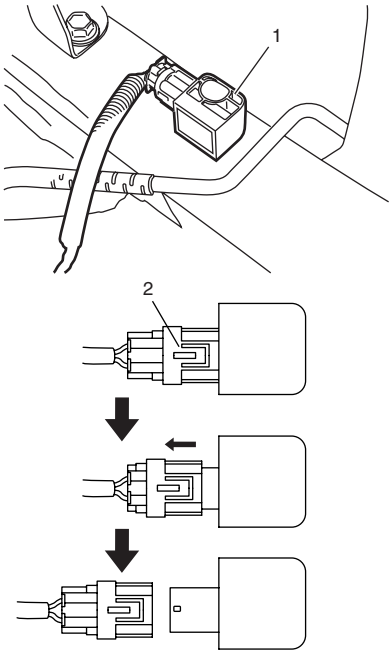
⚠ WARNING

During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

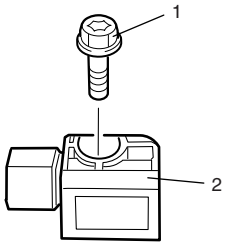
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System”.
3) Disconnect forward-sensor connector sliding connector outer (2) as shown.



I4RS0A820079-01

4) Remove forward-sensor bolt (1) and forward-sensor (2).



I5RH01820119-01

Installation

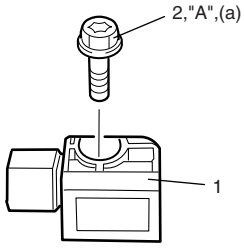
⚠ CAUTION

Proper operation of forward-sensor requires sensor be rigidly attached to vehicle structure and that the arrow on sensor be pointing toward the front of the vehicle.

1) Check that none of the following faulty conditions exists.
   - Bend, deformity or rust of front panel.
   - Foreign matter on mating surface of sensor.
2) Apply thread lock cement to mounting bolts thread. Install forward-sensor (1) on front panel and tighten mounting bolt (2) to specified torque.

   “A”: Thread lock cement 99000–32100 (Thread Lock Cement 1305)

   Tightening torque
   Forward-sensor mounting bolt (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)



I5RH01820120-01

3) Connect forward-sensor connector by pushing connector till click is heard from it.
4) Connect negative cable at battery.
5) Enable air bag system referring to “Enabling Air Bag System”.

Forward-Sensor Inspection

S7N20A8206014

⚠ WARNING

During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

⚠ CAUTION

- **Never disassemble forward-sensor.**
- **Sensor should be replaced when it was dropped from a height of 90 cm (3 ft) or more.**

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage or crack.
- Check connector terminals for bend, corrosion or rust.

Side-Sensor Removal and Installation

S7N20A8206015

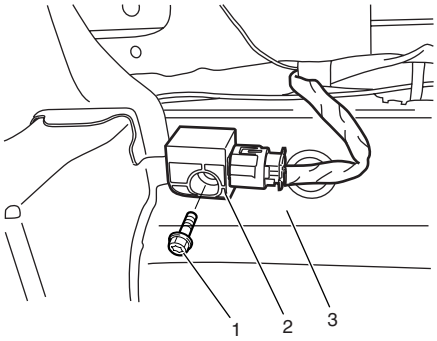
⚠ WARNING

During service procedures, be very careful when handling a sensor.

- **Never strike or jar a sensor.**
- **A sensor bolt must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

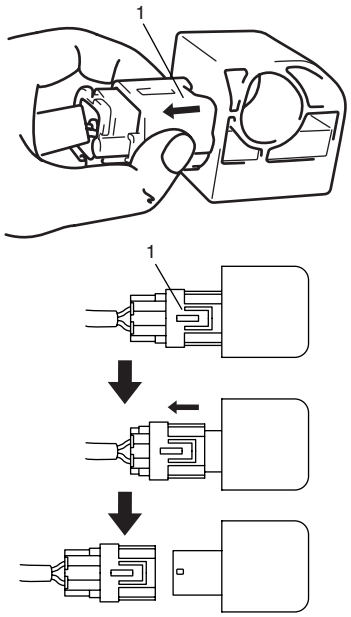
Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to “Disabling Air Bag System”.
3) Remove center pillar lower trim and side sill scuff.
4) Turn up floor carpet at front seat side.
5) Remove side-sensor bolt (1), and side-sensor (2) from under body (3).



I4RS0A820080-01

6) Disconnect side-sensor connector sliding connector outer (1) as shown.



I4RS0A820109-01

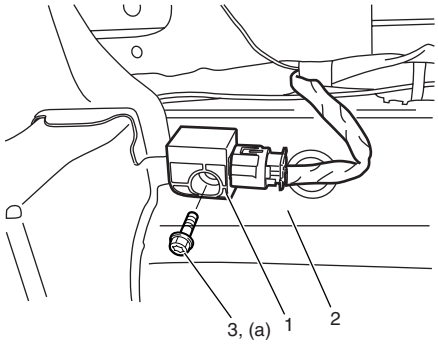
Installation

⚠ CAUTION

Proper operation of side-sensor requires sensor be rigidly attached to specified position.

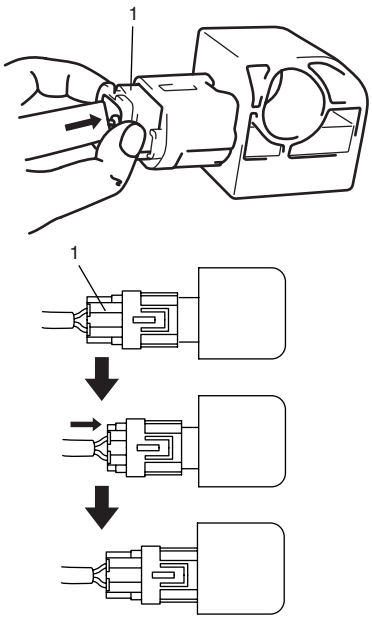
1) Check that none of following faulty conditions exists.
   - Bend, deformity or rust of under body.
   - Foreign matter on mating surface of sensor.
2) Install side-sensor (1) on under body (2) and tighten side-sensor bolt (3) to specified torque.

Tightening torque
Side-sensor bolt (a): 9 N·m (0.9 kgf-m, 6.5 lbf-ft)



I4RS0A820081-01

3) Connect side-sensor connector pushing connector inner (1) as shown.



I4RS0A820106-01

4) Connect negative cable at battery.
5) Enable air bag system. Refer to “Enabling Air Bag System”.

Side-Sensor Inspection

S7N20A8206016

⚠ WARNING

During service procedures, be very careful when handling a sensor.

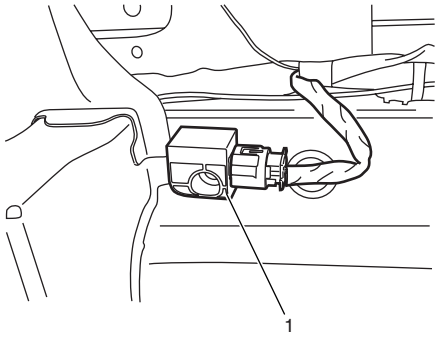
- **Never strike or jar a sensor.**
- **A sensor and mounting bracket bolts must be carefully torqued to assure proper operation. Under loose connection, it could cause improper operation of the air bag system.**

⚠ CAUTION

- **Never disassemble side-sensor.**
- **Sensor should be replaced when it was dropped from a height of 90 cm (3 ft) or more.**

- Check sensor (1) for dents, crack, deformation.
- Check sensor connector (sensor side and harness side), lock mechanism or sensor lead wire for damage, crack, scorching or melting.
- Check connector terminals for bent, corrosion or rust.

If any faulty condition is found in above checks, replace.

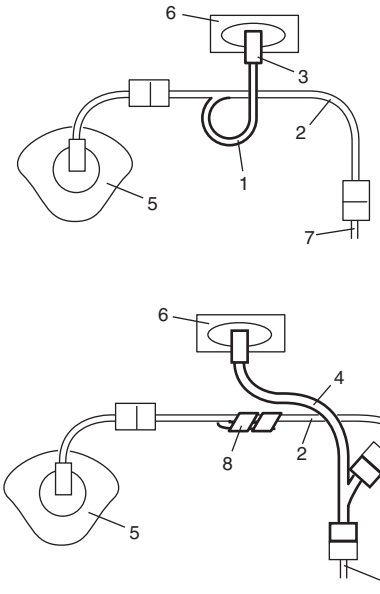


I4RS0A820082-01

Passenger Air Bag (Inflator) Module Repair Harness Installation

S7N20A8206017

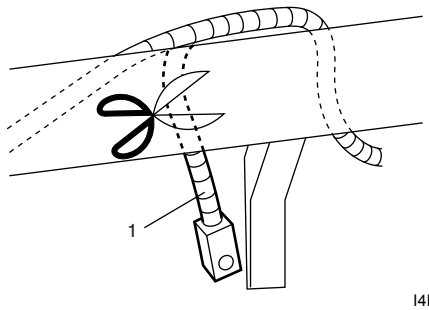
Replace passenger air bag (inflator) module repair harness (4) according to the following procedure when the harness (1) connected with passenger air bag (inflator) module of the air bag harness included in instrument panel harness (2) and passenger air bag (inflator) module connector (3) is damaged.



I4RS0B820039-01

5. Driver air bag (inflator) module	7. Floor harness
6. Passenger air bag (inflator) module	8. Vinyl tape

1) Disable air bag system. Refer to “Disabling Air Bag System”.
2) Disconnect “L32” connector from floor harness located near the glove box.
3) Cut off passenger air bag (inflator) module harness (1) included in instrument panel harness (2) as shown, and then fasten it to instrument panel harness with vinyl tape for avoiding interference with other parts.



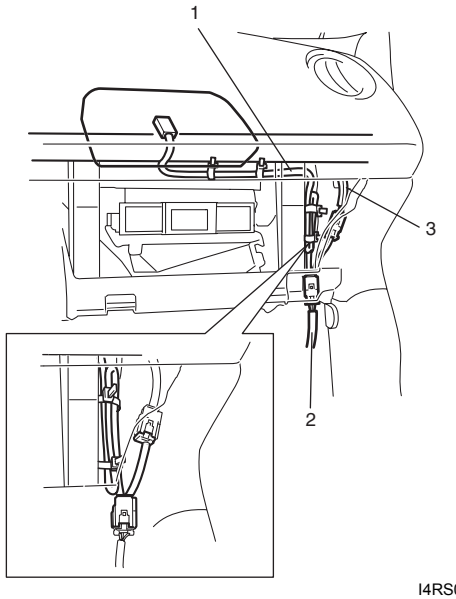
I4RS0A820083-01

4) Install passenger air bag (inflator) module repair harness (1) to floor harness (2), instrument panel harness (3) and passenger air bag (inflator) module.

⚠ CAUTION

To avoid interference with other parts, fasten the repair harness to instrument wire harness with a clamp or vinyl tape as shown in figure.

5) Connect each connector securely till click is heard.



I4RS0B820040-01

Air Bag (Inflator) Module and Seat Belt Pretensioner Disposal

S7N20A8206018

⚠ WARNING

Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which may cause personal injury. Do not dispose of live (undeployed) air bag (inflator) modules and seat belt pretensioners. Because undeployed air bag (inflator) module / inactivated seat belt pretensioner must not be disposed of through normal refuse channels. Undeployed air bag (inflator) module and inactivated seat belt pretensioner contain substances that can cause severe illness or personal injury if sealed container is damaged during disposal.

Air bag (inflator) module / seat belt pretensioner can be deployed / activated inside or outside of vehicle. Deployment / Activation method used depends upon final disposition of vehicle. Review the following instructions in order to determine which will work best in a given situation.
Deployment / Activation Outside of Vehicle: When you intend to return the vehicle to service, deploy the air bag (inflator) module(s) and/or activate seat belt pretensioner(s) outside of the vehicle.
Deployment / Activation Inside of Vehicle: When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag module(s) and/or activate seat belt pretensioner(s) installed on vehicle.

⚠ WARNING

The following precautions must be observed for this work. Failure to observe any of them may result in personal injury.

- **Procedure should be followed strictly as described here.**
- **Be sure to read “Precautions on Service and Diagnosis of Air Bag System” beforehand.**
- **To avoid accidental deployment / activation, this work should be performed by no more than one person.**
- **Since smoke is produced when air bag (inflator) module is deployed and pretensioner is activated, select well-ventilated area.**

- **Air bag (inflator) module and seat belt pretensioner will immediately deploy / activate when 12 volts vehicle battery is connected to it. Wear safety glasses throughout this entire deployment / activation and disposal procedure.**
- **Wear suitable ear protection when deploying air bag (inflator) module / activating seat belt pretensioner. Also, advise those who are in area close to deployment / activation site to wear suitable ear protection.**
- **Do not deploy / activate two or more air bag system components (air bag (inflator) modules and seat belt pretensioners) at the same time.**
- **Never connect deployment harness to any 12 volts vehicle battery before connecting deployment harness to air bag (inflator) module and seat belt pretensioner. Deployment harness shall remain shorted and not be connected to 12 volts vehicle battery till you are ready to deploy air bag (inflator) module or activate seat belt pretensioner.**

Deployment / Activation Outside of Vehicle

When you intend to return the vehicle to service, deploy the air bag (inflator) module(s) or activate seat belt pretensioner(s) outside of the vehicle.

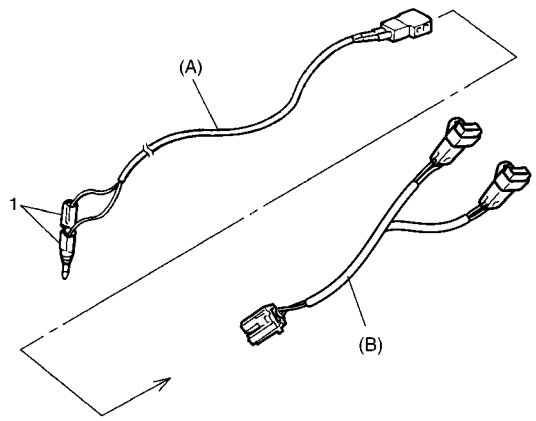
1) Turn ignition switch to LOCK position and remove key.
2) Wear safety glasses during this deployment / activation procedure.
3) Check that there is no open, short or damage in special tools (deployment harness (A) and adapter cable (B)). If any faulty is found, do not use it and be sure to use new special tool.

   Special tool
   (A): 09932-75031
   (B): 09932–76510

4) Short two deployment harness leads (1) together by fully seating one banana plug into the other.

⚠ WARNING

Deployment harness (A) shall remain shorted and not be connected to 12 volts vehicle battery till you are ready to deploy air bag module or activate seat belt pretensioner.



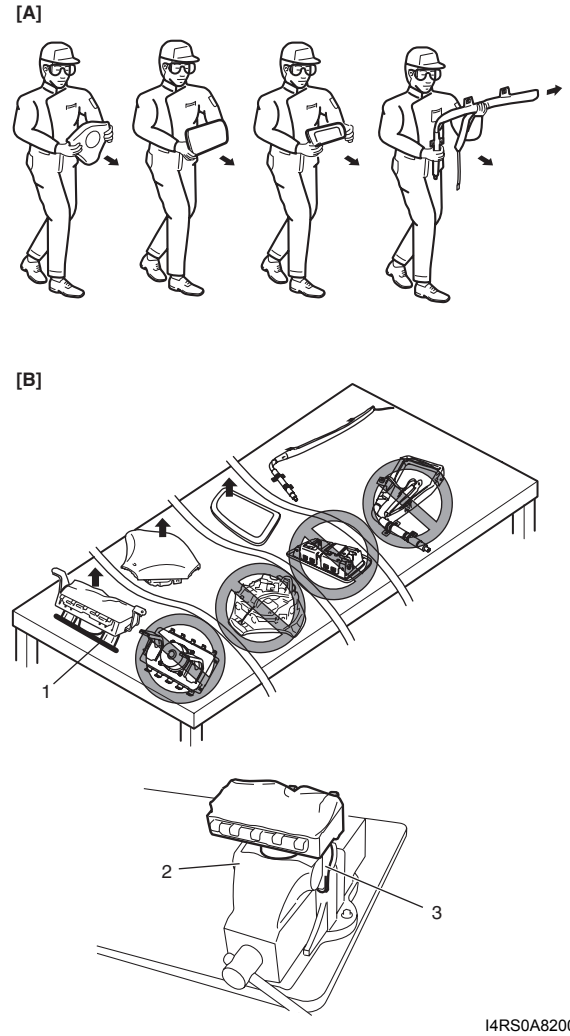
I4RS0A820084-01

5) Remove air bag (inflator) module(s) or seat belt pretensioner(s) from vehicle referring to “Driver Air Bag (Inflator) Module Removal and Installation”, “Passenger Air Bag (Inflator) Module Removal and Installation”or “Front Seat Belt Removal and Installation in Section 8A”.

⚠ WARNING

- **For handing and storage of live air bag (inflator) module, select place where ambient temperature below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Always carry live air bag (inflator) module with trim cover away from you.**
- **When storing live air bag (inflator) module or when leaving live air bag (inflator) module unattended on bench or other surface, always face trim cover up and away from surface. As the live passenger air bag (inflator) module must be placed with its bag (trim cover) facing up, place it on the workbench with a slit (1) or use the workbench vise (2) to hold it securely at its lower mounting bracket (3). It is also prohibited to place anything on top of the trim cover and stack air bag (inflator) modules. This is necessary so that free space is provided to allow air bag (inflator) module to expand in the unlikely event of accidental deployment.**

Failure to follow procedures may result in personal injury.



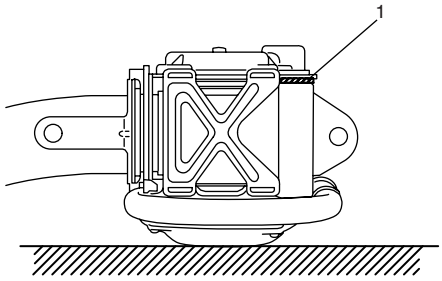
I4RS0A820086-02

[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.
2.	Lower mounting bracket
3.	Workbench vise

⚠ WARNING

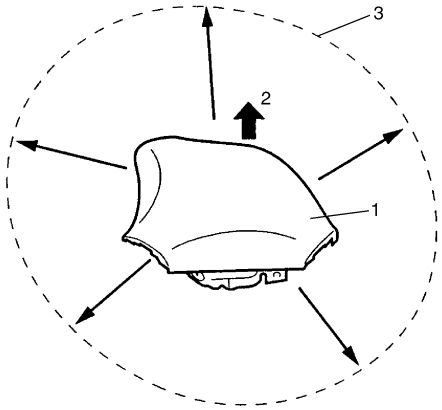
- **For handling and storage of seat belt pretensioner, select place where ambient temperature is below 65 °C (150 °F), without high humidity and away from electric noise.**
- **Never carry seat belt pretensioner by webbing.**
- **When placing seat belt pretensioner on workbench or other surface, be sure to lay it with its exhaust hole (1) side facing up. It is also prohibited to put something on seat belt pretensioner.**

Otherwise, personal injury may result.



I4JA01822118-01

6) Set air bag (inflator) module or seat belt pretensioner as follows.
   - For driver air bag (inflator) module
     a. Clear space (3) on ground about 185 cm (6 ft) in diameter where driver air bag (inflator) module (1) is set for deployment. Paved, 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. Ensure no loose or flammable object exists within deployment area.
     b. Place driver air bag (inflator) module (1) with its vinyl trim cover facing up (2) on ground in step a.



I3JA01820036-01

   - For passenger air bag (inflator) module
     a. Clear space (3) on ground about 185 cm (6 ft) in diameter where passenger air bag (inflator) module (1) is set for deployment. Paved, 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. Ensure no loose or flammable object exists within deployment area.
     b. Place deployment fixture (A) on ground in step a.

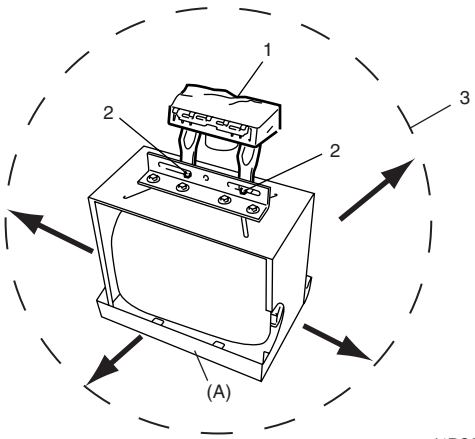
Special tool
(A): 09932-75041

c. Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

d. Attach passenger air bag (inflator) module (1) in deployment fixture (A) securely using M8 bolt (2).

⚠ CAUTION

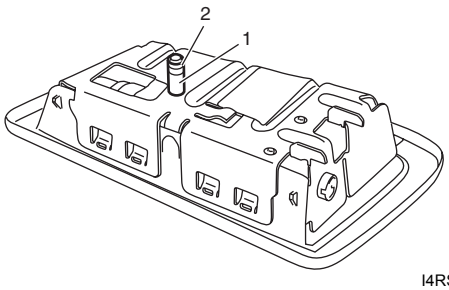
Be sure to use M8 size and 7T strength bolt for fixing passenger air bag (inflator) module (1) to deployment fixture (A).



I4RS0A820087-01

- For side-air bag (inflator) module

a. Remove sleeve (1) and sleeve lock nut (2), if equipped.



I4RS0A820088-01

b. Clear space (3) on ground about 185 cm (6 ft) in diameter where side-air bag (inflator) module for deployment. Paved, outdoor location where there is no activity is preferred. If outdoor location is not available, space on shop floor where there is no activity and provide sufficient ventilation. Ensure no loose or flammable objects are within deployment area.

c. Place deployment fixture (A) on ground.

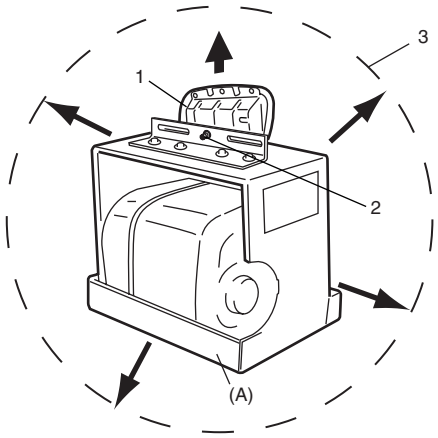
Special tool
(A): 09932–75041

d. Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

e. Attach side-air bag (inflator) module (1) in deployment fixture using mounting attachment, sleeve lock nut and washer (2).

NOTE

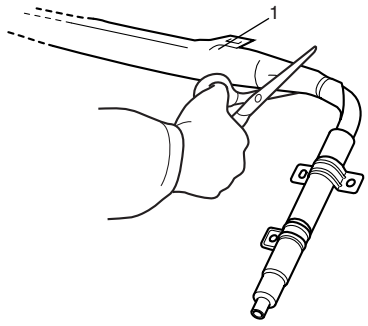
Make sure that deploying direction faces as shown in figure against mounting attachment.



I4RS0A820089-01

- For side curtain-air bag (inflator) module

a. Cut off bag (1) of side curtain-air bag (inflator) module.



I4RS0A820090-01

b. Tie side curtain-air bag inflator (1) to tire (3) with wire harness (2) as shown.

Wire harness specifications
Stripped wire harness section 1.25 mm² (0.0019 in.²) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

⚠ CAUTION

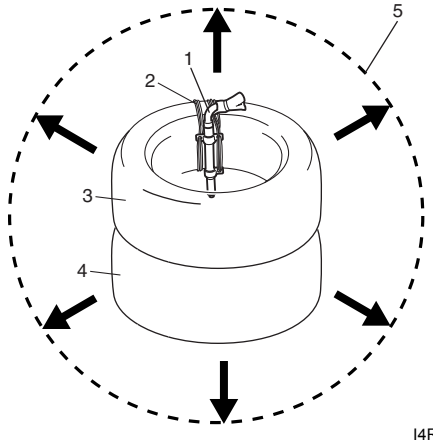
Make sure that wire harness is tight. It is very dangerous if looseness in wire harness results in side curtain-air bag inflator flying off due to shock from inflator deploying.

NOTE

Wind wire harness (2) around at least 3 times.

c. Clear space (5) on ground about 185 cm (6 ft) in diameter where side curtain-air bag (inflator) module (1) is set for deployment. Paved, 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. Ensure no loose or flammable object exists within activation area.

d. Pile tire with side curtain-air bag (inflator) module on tire (4).



I4RS0A820091-01

- For seat belt pretensioner

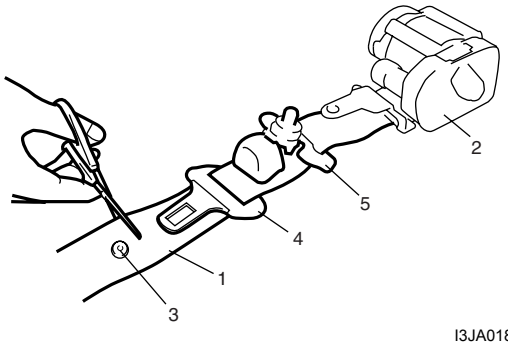
a. Cut webbing (1) at tongue plate stopper (3) of seat belt pretensioner (2) side as shown.

NOTE

Hold seat belt pretensioner (2) vertically in the same condition as it is installed. Otherwise, webbing can't be pulled out.

b. Remove tongue plate (4) and shoulder anchor (5) from webbing.

c. Tie webbing (1) tightly at 10 cm (3.9 in.) from cutting edge as shown.



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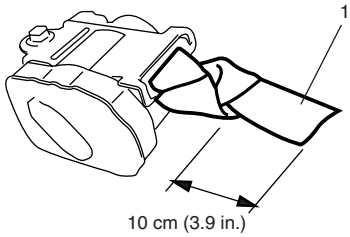


I4RS0A820104-01

d. Tie seat belt pretensioner (2) with wire harness (3) to wheel-installed tire (4) as shown.

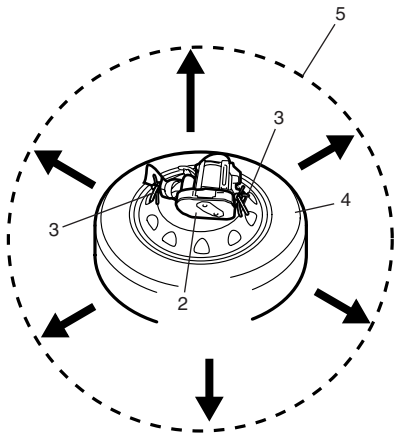
Wire harness specifications
Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE

Wind wire harness (3) around at least 3 times.

e. Clear space (5) on ground about 185 cm (6 ft) in diameter where seat belt pretensioner (2) is to be activated. Paved, 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. Ensure no loose or flammable object exists within activation area.

f. Place wheel-installed tire (4) with seat belt pretensioner (2) on ground in step e.



I4RS0A820105-01

1. Webbing

7) Stretch deployment harness (A) from air bag (inflator) module or seat belt pretensioner to its full length 10 m (33 ft).

Special tool
(A): 09932-75031

8) Place 12 volts vehicle battery (1) near the shorted end of deployment harness (A).

9) Check that area around air bag (inflator) module or seat belt pretensioner is clear of all people and loose or flammable objects.

10) Connect adapter cable (B) as follows.

Special tool
(B): 09932–76510

- For driver air bag (inflator) module [A]
  Check that driver air bag (inflator) module is placed with its vinyl trim cover facing up, and connect adapter cable (B) to driver air bag (inflator) module.
- For passenger air bag (inflator) module [B]
  Check that passenger air bag (inflator) module is firmly and properly secured on deployment fixture (special tool), and connect adapter cable (B) to passenger air bag (inflator) module.
- For side-air bag (inflator) module [C]
  Verify that side-air bag (inflator) module is firmly and properly on deployment fixture (special tool), and connect adapter cable (B) to side-air bag (inflator) module.
- For side curtain-air bag (inflator) module [D]
  a. Connect adapter cable (B) to side curtain-air bag (inflator) module.
  b. Pile 2 tires (2) and wheel-installed tire (3) on top of tire with side curtain-air bag (inflator) (4), and tie them with wire harness (5) as shown.

  Wire harness specifications
  Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE

Wind wire harness (5) around at least 2 times.

- For seat belt pretensioner [E]
  a. Connect adapter cable (B) to seat belt pretensioner.
  b. Pile 2 wheel-installed tires (3) on top of tire with seat belt pretensioner (6), and tie them with wire harness (5) as shown.

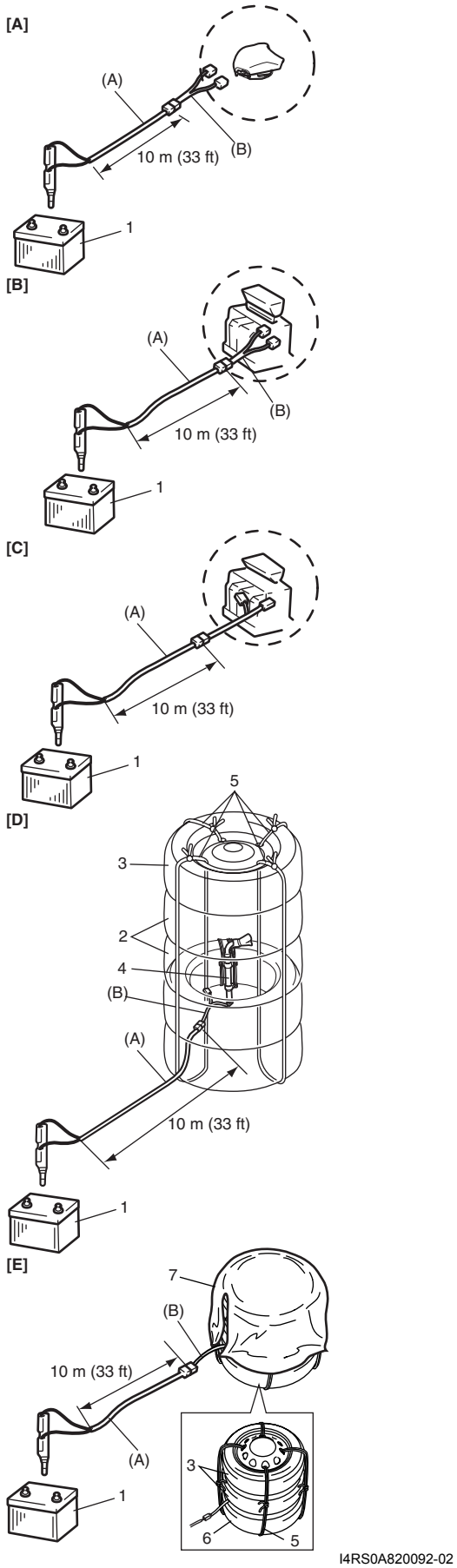
  Wire harness specifications
  Stripped wire harness section 1.25 mm^2 (0.0019 in.^{2}) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)

NOTE

Wind wire harness (5) around at least 2 times.

  c. Drape blanket (7) over those tires.

11) Connect adapter cable (B) to deployment harness (A) connector and lock connectors with lock lever.



I4RS0A820092-02

12) Notify all people in immediate area that you intend to deploy / activate air bag (inflator) module or seat belt pretensioner.

NOTE

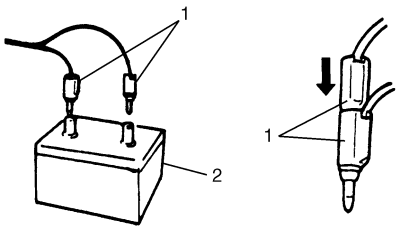
- **When air bag (inflator) module deploys and seat belt pretensioner activates, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioner and suitable ear protection should be 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 byproducts of chemical reaction.**

⚠ WARNING

- **Do not place deployed air bag (inflator) module and activated seat belt pretensioner near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and activated seat belt pretensioner.**
- **Wait for about 30 minutes before touching any metal surface of air bag (inflator) module or seat belt pretensioner module. Disregarding these precautions may cause fire or personal injury.**

Failure to follow procedures may result in fire or personal injury.

13) Separate two banana plugs (1) on deployment harness.
14) Connect deployment harness to 12 volts vehicle battery (2). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioner.
15) Disconnect deployment harness from 12 volts vehicle battery (2) and short two deployment harness leads together by fully seating one banana plug into the other.



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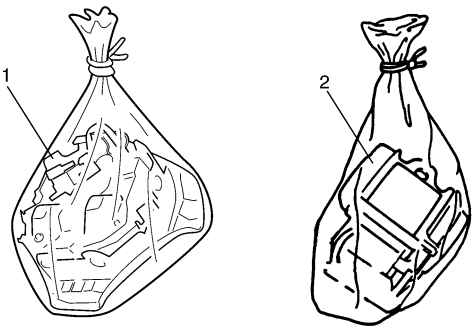
16) In the unlikely event that air bag (inflator) module or seat belt pretensioner did not deploy / activate after following these procedures, proceed immediately with Step 22) through 25). If air bag (inflator) module or seat belt pretensioner did deploy or activate, proceed with Steps 18) through 21).
17) Put on pair of shop gloves to protect your hands from possible irritation and heat when handling deployed air bag (inflator) module or activated seat belt pretensioner.
18) Disconnect adapter cable (special tool) from air bag (inflator) module or seat belt pretensioner as soon as possible. This will prevent adapter cable (special tool) from damage due to possible contact with hot air bag (inflator) module or hot seat belt pretensioner.
19) Check adapter cable as follows.
    - For air bag (inflator) module
      Be sure to check air bag (inflator) module adapter cable (special tool) for damage after deployment and replace it with new adapter cable (special tool), if it is damaged.
    - For seat belt pretensioner
      Be sure to check seat belt pretensioner adapter cable (special tool) for damage after seat belt pretensioner is activated. Replace it with spare connector (special tool) or new adapter, if necessary.
20) Dispose of deployed air bag (inflator) module (1) or activated seat belt pretensioner (2) through normal refuse channels after it has cooled for at least 30 minutes and tightly seal air bag (inflator) module (1) or seat belt pretensioner (2) in strong vinyl bag. Refer to “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal” for details.



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21) Wash your hands with mild soap and water afterward.

NOTE

Remaining steps are to be followed in the unlikely event that air bag (inflator) module did not deploy or seat belt pretensioner did not activate.

22) Ensure that deployment harness has been disconnected from 12 volts vehicle battery and that its two banana plugs have been shorted together by fully seating one banana plug into the other.
23) Disconnect deployment harness and adapter cable from air bag (inflator) module or seat belt pretensioner.
24) Temporarily store undeployed air bag (inflator) module referring to “Precautions on Service and Diagnosis of Air Bag System” for details.
25) Contact your local distributor for further assistance.

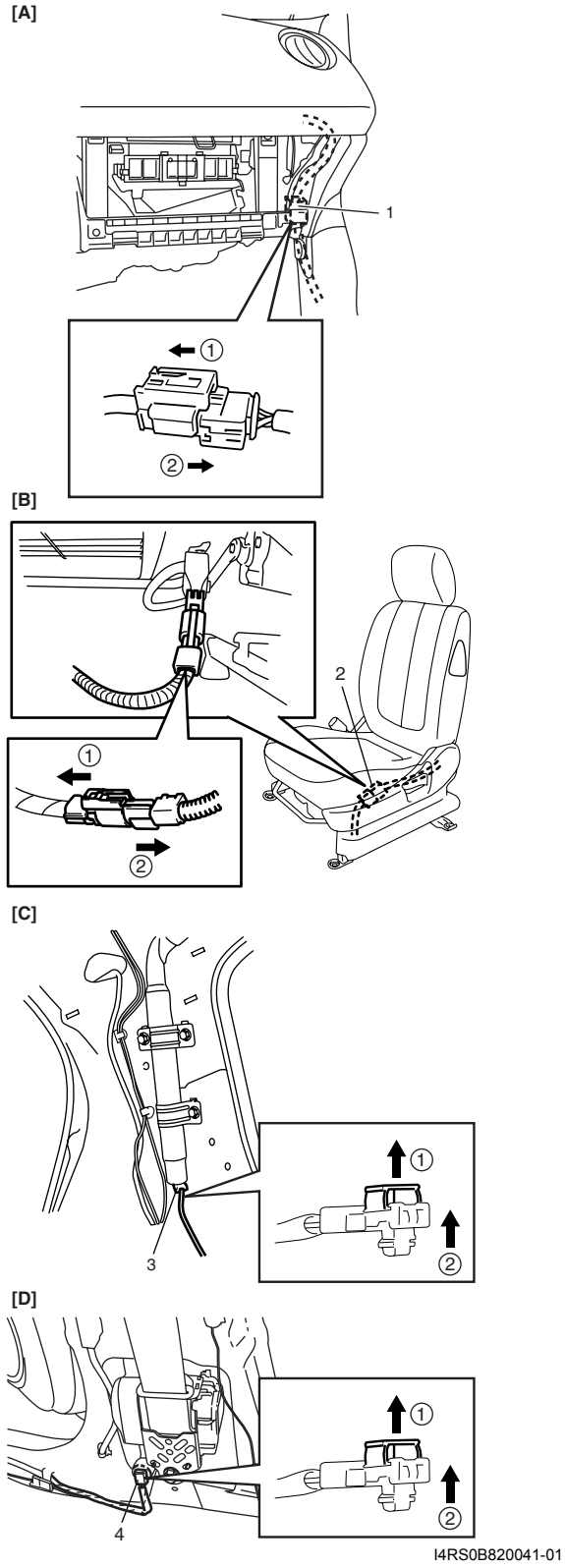
Deployment / Activation Inside of Vehicle

When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag modules and/or activate seat belt pretensioners installed on vehicle.

NOTE

If equipped with the seat belt pretensioners, activate both side of seat belt pretensioners at the same time when using special tool (C).

1) Turn ignition switch to LOCK position, remove key and put on safety glasses.
2) Remove all loose objects from front seats and instrument panel.
3) Disconnect air bag (inflator) module or seat belt pretensioner connector as follows.
   - For driver and passenger air bag (inflator) module [A]
     Remove glove box from instrument panel and disconnect driver and passenger air bag (inflator) module connector (1).
   - For side-air bag (inflator) module [B]
     Disconnect side-air bag (inflator) module connectors (2) under front seat cushion.
   - For side curtain-air bag (inflator) module [C]
     Remove rear pillar trim and disconnect side curtain-air bag (inflator) module connectors (3).
   - For seat belt pretensioners (right and left) [D]
     Remove both side (driver and passenger side) center pillar lower trim and disconnect seat belt pretensioner connectors (4).
4) Confirm that each air bag (inflator) module and/or seat belt pretensioners is securely mounted.



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5) Check that there is no open, short or damage in special tools (deployment harness (A), adapter cable (B) and (C)). If any faulty condition is found, do not use it and be sure to use new special tool. And connect adapter cable (B), (C) or (D) to deployment harness (A) and lock connectors with lock slider.

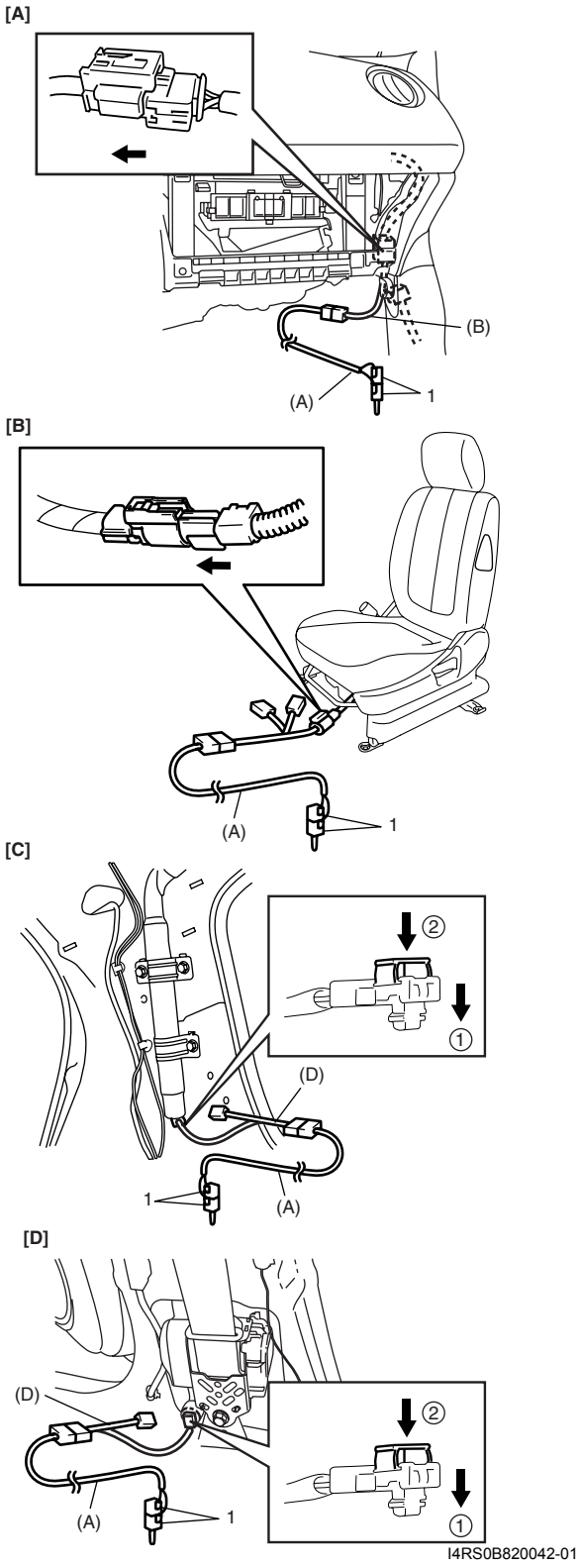
Special tool
(A): 09932-75031
(B): 09932–77310
(C): 09932–78332
(D): 09932–76510

6) Short two deployment harness leads together by fully seating one banana plug into the other.

⚠ WARNING

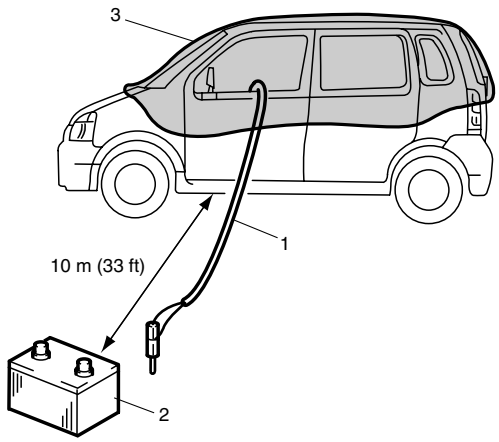
Deployment harness (A) shall remain shorted and not be connected to 12 volts vehicle battery until you are ready to deploy air bag (inflator) module or activate seat belt pretensioner.

7) Connect adapter cable (B) or (C) in series with deployment harness (A) to air bag (inflator) module or seat belt pretensioner as follows.
   - For driver and passenger air bag (inflator) module [A]
     Connect adapter cable (B) in series with deployment harness (A) and push adapter cable (B) connector to air bag (inflator) module connector till click can be heard.
   - For side-air bag (inflator) module [B]
     Connect adapter cable (C) in series with deployment harness (A) and push adapter cable (C) connector to side bag (inflator) module connector till click can be heard.
   - For side curtain-air bag (inflator) module [C]
     Connect adapter cable (D) in series with deployment harness (A) to curtain bag (inflator) module and lock connector with lock part.
   - For seat belt pretensioners [D]
     Connect adapter cable (D) in series with deployment harness (A) to seat belt pretensioner and lock connector with lock part.



I4RS0B820042-01

8) Route deployment harness (1) out of vehicle.
9) Check that inside of vehicle and area surrounding vehicle are clear of all people and loose or flammable objects.
10) Stretch deployment harness (1) to its full length 10 m (33 ft).
11) Place 12 volts vehicle battery (2) near shorted end of deployment harness (1).
12) Completely cover windshield area and front door window openings with drop cloth, a blanket or any similar item. This reduces possibility of injury due to possible fragmentation of vehicle's glass or interior.



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13) Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioners.

NOTE

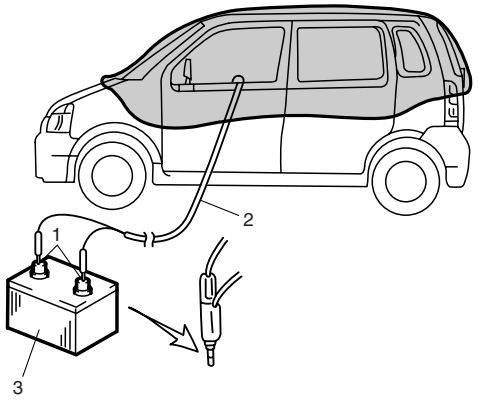
- **When air bag (inflator) module deploys or seat belt pretensioners activate, rapid gas expansion will create substantial report. Wear suitable ear protection. Notify all people in immediate area that you intend to deploy air bag (inflator) module or to activate seat belt pretensioner and suitable ear protection should be worn.**
- **After air bag (inflator) module has been deployed, surface of air bag may contain powdery residue. This powder consists primarily of cornstarch (used to lubricate air bag (inflator) module as it inflates) and by-products of chemical reaction.**

⚠ WARNING

- **Do not place deployed air bag (inflator) module and activated seat belt pretensioners near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module and activated seat belt pretensioners.**
- **Wait for about 30 minutes before touching any metal surface of air bag (inflater) module or seat belt pretensioner modules. Disregarding these precautions may cause fire or personal injury.**

Failure to follow procedures may result in fire or personal injury.

14) Separate two banana plugs (1) on deployment harness (2).
15) Connect deployment harness (2) to 12 volts vehicle battery (3). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioners.
16) Disconnect deployment harness (2) from 12 volts vehicle battery (3) and short two deployment harness leads together by fully seating one banana plug into the other.



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17) Repeat Steps 3) through 16) to deploy / activate air bag (inflator) modules and seat belt pretensioners which has not been deployed / activated, if any.
18) In the unlikely event that air bag (inflator) module and seat belt pretensioners after following these procedures, proceed immediately with Step 24) through 26). If air bag (inflator) module and seat belt pretensioners did deploy / activate, proceed with Steps 19) through 23).
19) Carefully remove drop cloth from vehicle and clean off any fragments or discard it entirely.
20) Put on pair of shop gloves to protect your hands from possible irritation and heat when handling deployed air bag (inflator) module and activated seat belt pretensioners.

21) Disconnect adapter cable (special tool) from air bag (inflator) module or seat belt pretensioner as soon as possible. This will prevent adapter cable (special tool) from damage due to possible contact with hot air bag (inflator) module or hot seat belt pretensioner.
22) Check adapter cable connector as follows. Adapter cable connector (special tool) is designed to be reused. However it should be inspected for damage after deployment and replaced if necessary.
23) With air bag (inflator) modules deployed and seat belt pretensioners activated, vehicle may be scrapped in the same manner as non-air bag system / seat belt pretensioner equipped vehicle.

NOTE

Remaining steps are to be followed in the unlikely event that air bag (inflator) module did not deploy or seat belt pretensioner did not activate.

24) Remove undeployed air bag (inflator) module(s) and/or inactivated seat belt pretensioner(s) from vehicle. For driver air bag (inflator) module, refer to “Driver Air Bag (Inflator) Module Removal and Installation”. For passenger air bag (inflator) module, refer to “Passenger Air Bag (Inflator) Module Removal and Installation”. For seat belt pretensioner, refer to “Front Seat Belt Removal and Installation in Section 8A”.
25) Temporarily store undeployed air bag (inflator) module referring to “Precautions on Service and Diagnosis of Air Bag System” for details.
26) Contact your local distributor for further assistance.

Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal

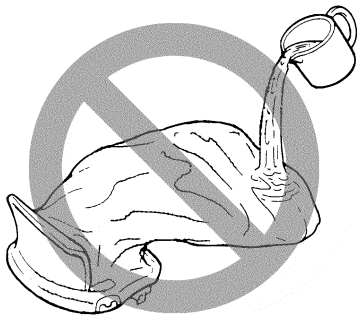
S7N20A8206019

⚠ WARNING

Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which may cause personal injury. The undeployed air bag (inflator) module and the inactivated seat belt pretensioner must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module and the inactivated seat belt pretensioner contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

Deployed air bag (inflator) module and the activated seat belt pretensioner can be disposed of through normal refuse channels just like any other parts. For their disposal, however, the following points should be noted.

- The air bag (inflator) module and the seat belt pretensioner immediately after deployment / activation is very hot. Wait for 30 minutes to cool it off before handling it.
- Never apply water, oil, etc. to deployed air bag (inflator) module and the activated seat belt pretensioner to cool it off and be careful so that water, oil etc. does not get on the deployed air bag (inflator) module and the activated seat belt pretensioner.



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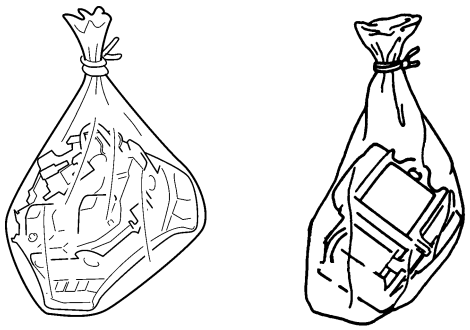
- After the air bag (inflator) module has been deployed, the surface of the air bag may contain a powdery residue. This powder consists primarily of cornstarch (used to lubricate the bag as it inflates) and by-products of the chemical reaction. As with many service procedures, you should wear gloves and safety glasses.
- When disposing of the deployed air bag (inflator) module and the activated seat belt pretensioner, be sure to seal it in a vinyl bag.



I3JA01820119-01

- When air bag (inflator) module and seat belt pretensioner have been deployed / activated inside the vehicle which is going to be scrapped, leave them as installed to the vehicle.
- Be sure to wash your hands with mild soap and water after handling them.

Specifications

Tightening Torque Specifications

S7N20A8207001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
SDM bolt	9	0.9	6.5	☞
Driver air bag (inflator) module mounting bolt	9	0.9	6.5	☞
Passenger air bag (inflator) module attaching bolt	23	2.3	16.5	☞
Sleeve lock nut	2.5	0.25	2	☞
Side curtain-air bag (inflator) module attaching bolts	11	1.1	8.0	☞
Forward-sensor mounting bolt	9	0.9	6.5	☞
Side-sensor bolt	9	0.9	6.5	☞

NOTE

The specified tightening torque is also described in the following.
“Air Bag System Components, Wiring and Connectors Location: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Use of Special Tools

S7N20A8208001

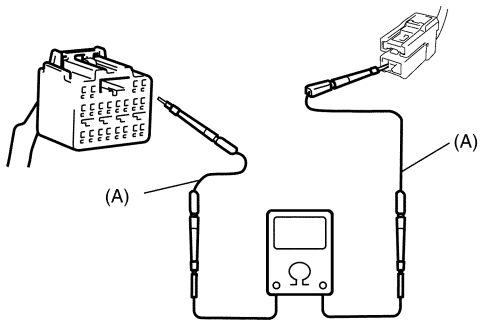
⚠ WARNING

To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified. Do not use a non-powered probe type tester.
Instructions must be followed carefully, otherwise personal injury may result.

You should be familiar with the tools listed under the heading “Special Tool”. You should be able to measure voltage and resistance. You should be familiar with proper use of a scan tool such as Air Bag Driver / Passenger Load Tool, Connector Test Adapter Kit and the Digital Multimeter.

Special tool
(A): 09932-76010 Connector Test Adapter Kit

This must be used whenever a diagnostic procedure requests checking or probing a terminal.
Using the appropriate adapter in the special tool will ensure that no damage to the terminal will occur from the multimeter probe, such as spreading or bending.



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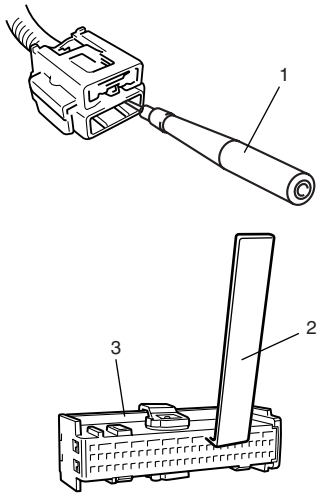
The adapter (1) will also give an idea of whether or not contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact. An SDM short bar release tool (2) is included in the connector test adapter kit. Inserting it into the SDM connector (3) will releases the shorting bar.



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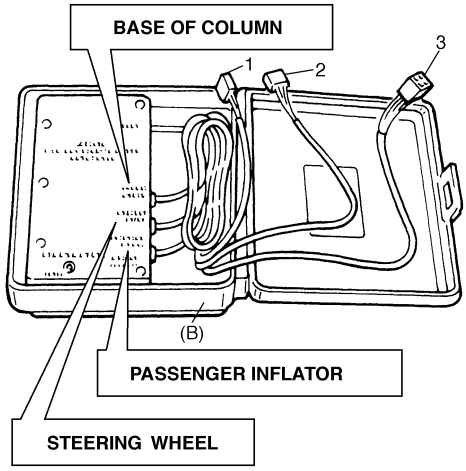
Special tool
(B): 09932-75010 Air bag driver / passenger load tool

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.
No more than two connectors are used at any time.
One of connectors ("STEERING WHEEL") is used to substitute the load of the followings.

- Driver air bag (inflator) module when it is connected at the top of the column to the contact coil assembly.
- Passenger air bag (inflator) module when it is connected to the air bag harness connector in instrument panel harness for passenger air bag (inflator) module.
- Each of driver and passenger seat belt pretensioners when it is connected to air bag harness connector in instrument panel harness for driver and passenger seat belt pretensioners.
- Side-air bag (inflator) module when it is connected to the floor harness connector for side-air bag (inflator) module.
- Side curtain-air bag (inflator) module when it is connected to the floor harness connector for side curtain-air bag (inflator) module.

Another connector ("BASE OF COLUMN") is used to substitute the load of the driver air bag (inflator) module and the contact coil assembly when it is connected at the base of the column to the air bag wire harness.
The third connector ("PASSENGER INFLATOR") is not used.
By substituting the resistance of the load tool when called for, a determination can be made as to whether an inflator circuit component is causing system malfunction and which component is causing the malfunction.
The load tool should be used only when specifically called for in the diagnostic procedures.



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1.	Connector for contact coil and driver air bag (inflator) module (Located near the base of the steering column)
2.	Connector for driver, passenger air bag (inflator) module, side-air bag (inflator) module and driver and passenger seat belt pretensioners
3.	Not used

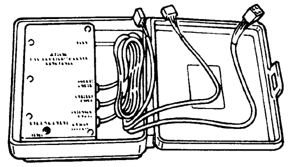
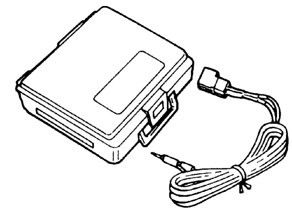
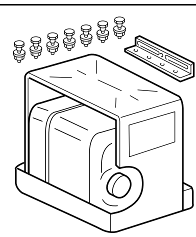
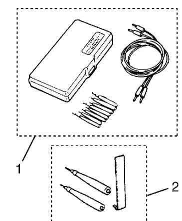
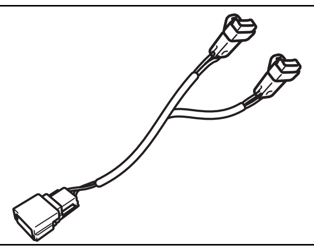
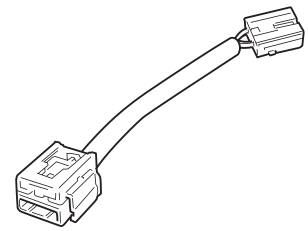
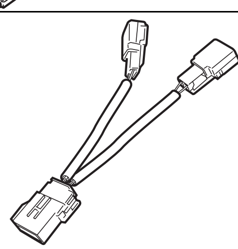
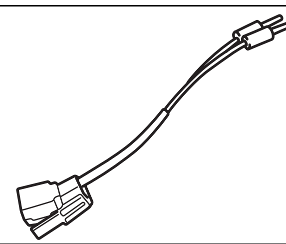
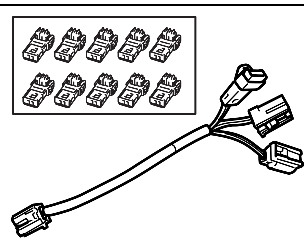
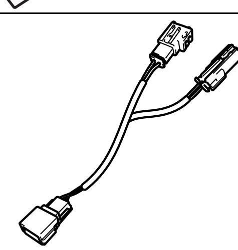
Recommended Service Material

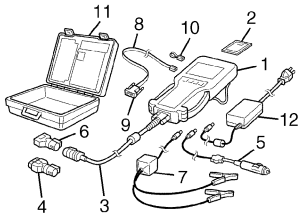
S7N20A8208002

Material	SUZUKI recommended product or Specification		Note
Thread lock cement	Thread Lock Cement 1305	P/No.: 99000–32100	☞

Special Tool

S7N20A8208003

09932–75010 Air bag load tool ☞ / ☞ 	09932–75031 Air bag deployment harness ☞ / ☞ / ☞ 
09932–75041 Passenger air bag (inflator) module deployment fixture ☞ / ☞ 	09932–76010 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)☞ / ☞ 
09932–76510 Deployment adapter cable ☞ / ☞ / ☞ 	09932–77310 Deployment adapter cable 4P ☞ 
09932–77320 Diagnosis adapter cable 4P ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 	09932–78310 Adapter cable ☞ / ☞ 
09932–78332 Deployment adapter cable ☞ 	09932–78340 Deployment adapter cable ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ / ☞ 

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞		

Section 9

Body, Cab and Accessories

CONTENTS

Precautions

Precautions

Precautions on Body, Cab and Accessories

S7N20A9000001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

Fastener Caution
Refer to “Fastener Caution in Section 00”.

Precautions for Body Service
Refer to “Precautions for Body Service”.

Fastener Caution for Body Service:
Refer to “Fastener Caution for Body Service”.

Cautions in Body Electrical System Servicing
Refer to “Cautions in Body Electrical System Servicing in Section 9A”.

Precautions for Wiring System
Refer to “Precautions for Wiring System in Section 9A”.

Precautions for Body Service

S7N20A9000002

⚠ WARNING

For vehicles equipped with a Supplemental Restraint (Air Bag) System:
When servicing vehicle body, if shock may be applied to air bag system component parts, remove those parts beforehand.

Fastener Caution for Body Service

S7N20A9000003

⚠ CAUTION

- **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 of with an equivalent part if replacement become necessary.**
- **Do not use a replacement part of lesser quality or substitute a 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

S7N20A9100001

When performing works related to electric systems, observe the cautions described in “Precautions for Electrical Circuit Service in Section 00” for the purpose of protection of electrical parts and prevention of a fire from occurrence.

Precautions for Wiring System

S7N20A9100002

⚠ WARNING

(For the vehicles with the Supplemental Restraint System (Air Bags) and/or the Seat Belt Pretensioner System)
Service on or around the air bag system / Seat belt pretensioner system components or their wiring must be performed only by an authorized SUZUKI dealer. Observe all the warnings of the “Air Bag System” and disable the systems before performing the service. Failure to follow the Warnings could result in unintended activation of the systems or could render the systems inoperative. Either of these two conditions may result in severe injury.

⚠ CAUTION

To prevent damage to the electrical/ electronic parts (especially computers or semi-conductors) or to prevent fire:

- When disconnecting the battery terminals, be sure to 1: turn off the ignition switch and all other switches, 2: disconnect the negative (–) terminal wire and then 3: disconnect the positive (+) terminal wire. Connect the wires in the reverse order of disconnecting.
- When disconnecting the connectors, be sure to unlock the connector lock (if equipped) and then pull the connector shells to detach them. Do not pull the wires.
- Connect the connectors by holding the connector shells. Make sure they are securely locked.
- Install the wiring harness securely without any slack.
- When installing parts, make sure the wiring harness is not interfered with or pinched by them.
- Avoid routing the wiring harness near or around a sharp corner or edge of the vehicle body or parts as much as possible. If necessary, protect the wiring harness by winding tape or the like around on it.
- When replacing a fuse, make sure to use the specified capacity fuse. Using a fuse with a larger capacity can cause damage to the electrical parts or a fire.
- Do not handle electrical/ electronic parts (computer, relay, etc.) roughly or drop them.
- Do not expose electrical/ electronic parts to high temperature (Approximately 80 °C (176 °F) or higher) or water.
- Be sure to insert the tester probe (or, if necessary, an appropriate needle or wire designed for the inspection work) into the back side (wiring harness side) of the connector for inspection not to damage or deform the terminal of the connector.

General Description

Abbreviations

S7N20A9101001

Abbreviation	Full term	Abbreviation	Full term
2WD	2 Wheel Drive Vehicles	ILL	Illumination
4WD	4 Wheel Drive Vehicles	IND	Indicator
A/B	Air Bag	INT	Intermittent
A/C	Air conditioning	ISC	Idle speed control
A/LEV	Auto leveling	J/B	Junction block
A/T	Automatic transaxle	J/C	Joint connector
ACC	Accessory	KLS	Keyless Start System
BCM	Body control module	L	Left
CAN	Controller Area Network	LED	Light Emitting Diode
CKP	Crank shaft position	LHD	Left Hand Drive Vehicle
CMP	Cam shaft position	LO	Low
COMB	Combination	MAP	Manifold absolute pressure
DLC	Data link connector	M/T	Manual transaxle
DPF	Diesel Particulate Filter	OCV	Oil control valve
DRL	Daytime running light	O/D	Over drive
DSL	Diesel engine	OCV	Oil control valve
ECM	Engine control module	P/N	Power Normal
ECT	Engine coolant temperature	P/S	Power steering
EGR	Exhaust gas recirculation	PSP	Power steering pressure
ELCM	EVAP leak check module	R	Right
ESP®	Electronic Stability Program	RHD	Right Hand Drive Vehicle
EVAP	Evaporative	SDM	Sensing and diagnostic module
FWD	Forward	ST	Starter
HI	High	TCC	Torque converter clutch
HID	High intensity discharge	TCSS	Traction Control Support System
HLC	Head light cleaner	TCM	Transmission control module
IAC	Idle air control	TPMS	Tire Pressure Monitoring System
IAT	Intake air temperature	VIM	Valiable Intake Manifold
ICM	Immobilizer control module	VSS	Vehicle speed sensor
IF EQPD	If equipped	VSV	Vacuum switching valve
IG	Ignition	5 dr	5 door
IG COIL	Ignition coil		

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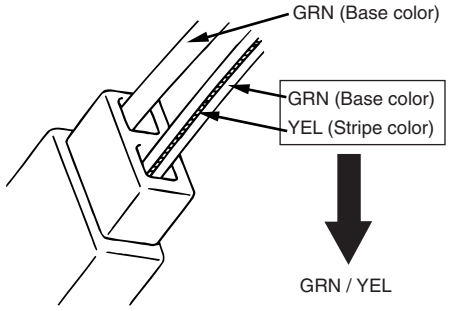
Wire / Connector Color Symbols

S7N20A9101002

Symbol	Wire / connector Color	Symbol	Wire / connector Color
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	Purple
LT GRN	Light green	N	Natural



I2RH01910941-01

Symbols and Marks

S7N20A9101003

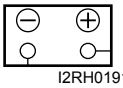
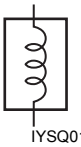
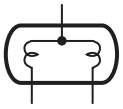
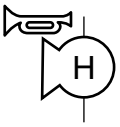
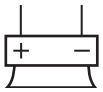
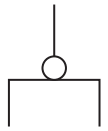
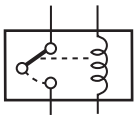
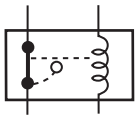
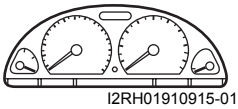
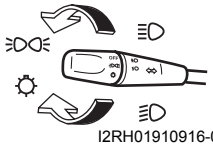
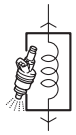
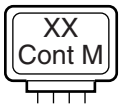
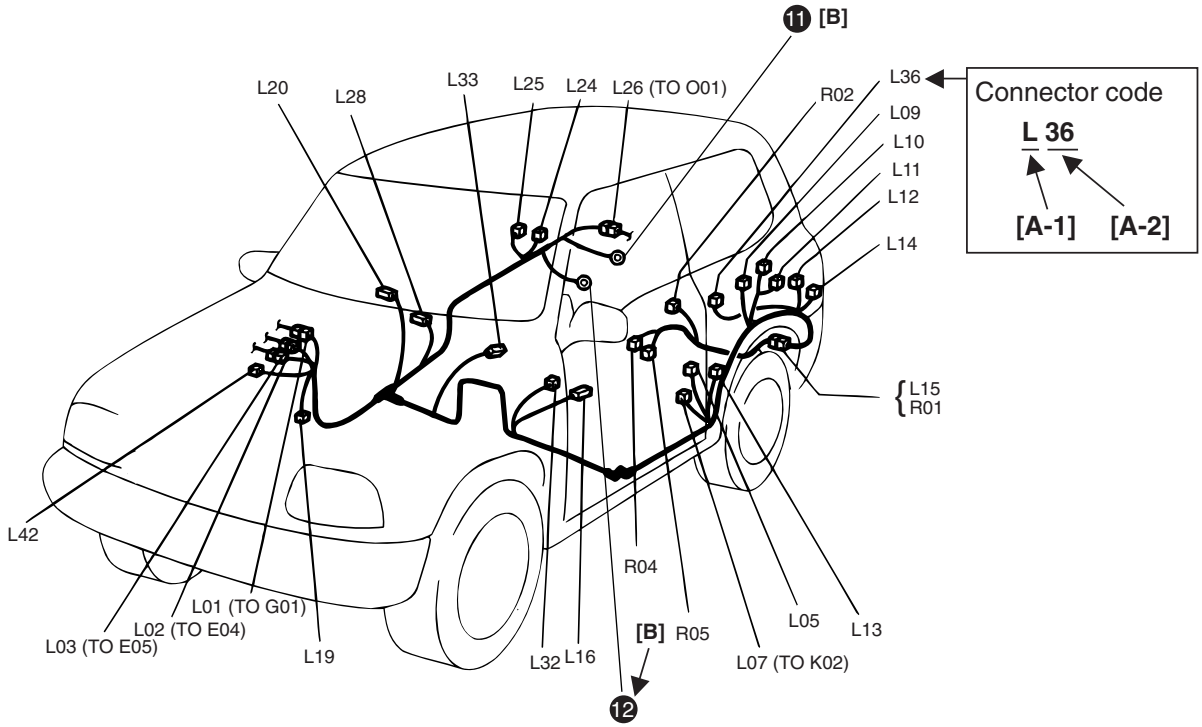
Battery	Ground		Normal fuse	Slow blow fuse
 I2RH01910910-01	 IYSQ01910915-01	 IYSQ01910916-01	 IYSQ01910917-01	 IYSQ01910918-01
Circuit breaker	Coil, Solenoid	Heater	Bulb	
 IYSQ01910919-01	 IYSQ01910920-01	 IYSQ01910921-01	 IYSQ01910922-01	 IYSQ01910923-01
Cigarette lighter	Motor	Pump	Horn	Speaker
 IYSQ01910924-01	 IYSQ01910925-01	 IYSQ01910926-01	 I2RH01910911-01	 I5JB0B910995-02
Buzzer	Chime	Condenser	Thermistor	Reed switch
 IYSQ01910929-01	 IYSQ01910930-01	 IYSQ01910931-01	 IYSQ01910932-01	 IYSQ01910933-01
Resistance	Variable resistance		Transistor	
 IYSQ01910934-01	 IYSQ01910935-01	 IYSQ01910936-01	 IYSQ01910937-01 NPN	 IYSQ01910938-01 PNP

Photo transistor	Diode	Zener diode	Light emitting diode	Photo diode
 IYSQ01910939-01	 IYSQ01910940-01	 IYSQ01910941-01	 IYSQ01910942-01	 IYSQ01910943-01
Piezoelectric element	Harness		Ring terminal	Connector
 IYSQ01910944-01	 IYSQ01910945-01 Connected	 IYSQ01910946-01 Not connected	 IYSQ01910947-01	 IYSQ01910948-01
Relay		Switch		
 IYSQ01910949-01 Normal open	 IYSQ01910950-01 Normal closed	 IYSQ01910951-01 Open switch	 IYSQ01910952-01 Closed switch	
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 fan	Fuel pump	Fuel injector	XX control module	Windshield wiper
 I2RH01910922-01	 I3JA01910908-01	 I2RH01910924-01	 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	 I4JA01910903-01	

How to Read Connector Layout Diagram

S7N20A9101004

[A-1]: Harness symbol and corresponding harness name
A: Battery harness
B: A/C harness
C: Engine harness
D: Injector harness
E: Main harness, Oil pressure switch wire, Console wire
G: Instrument panel harness
J: Side door wire (Power window)
K: Interior light harness, Rear speaker wire, Roof wire
L: Floor harness, G sensor wire (Fuel pump harness)
M: Rear bumper harness
O: Rear end door harness
Q: Air bag/Pretensioner harness
R: (Fuel pump wire)
[A-2]: Connector Number
[B]: Ground point No.

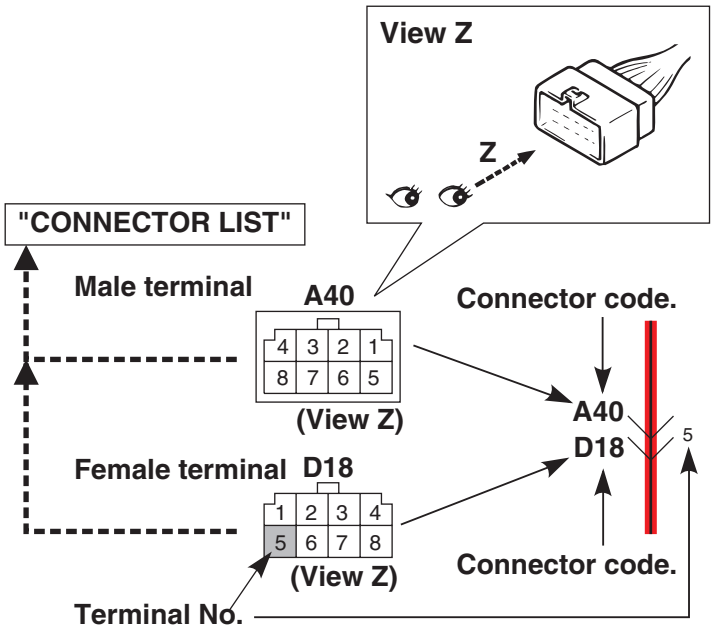


I2RH01910901-01

How to Read Connector Codes and Terminal Nos.

S7N20A9101005

1) Connector code/Terminal No./Terminal layout
   - The connector shape and terminal layout shown in this manual are those when viewed from “Z” in the illustration.
     Refer to “List of Connectors”.

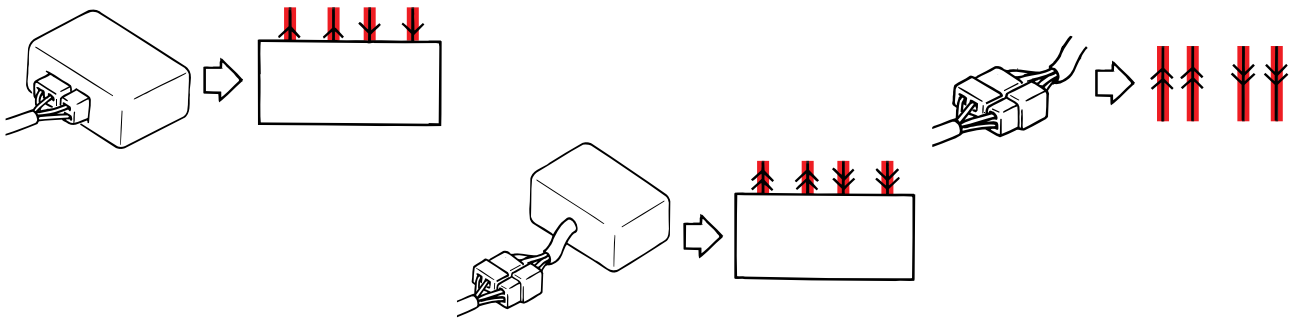


I5RS0A910901-01

NOTE

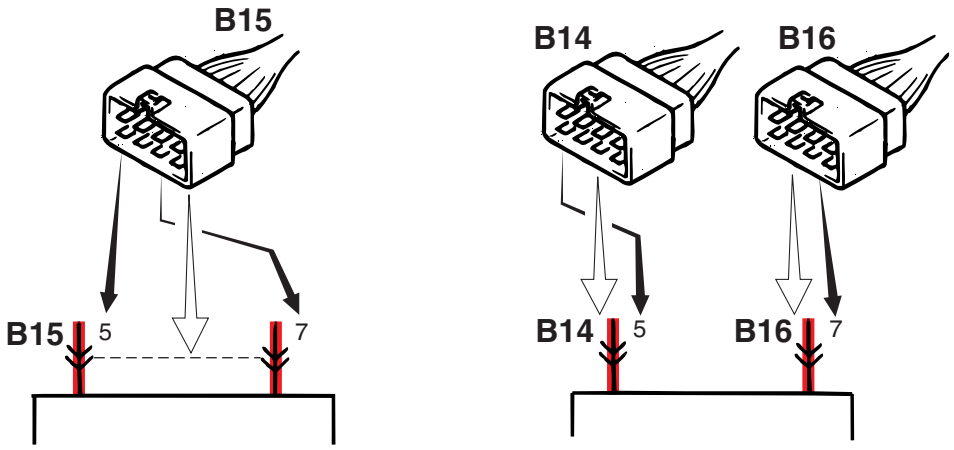
Molded terminal numbers that are different from the above can be found on some connectors in rare cases.
These molded numbers are not applied in this manual.

2) Connector type



I2RH01910903-01

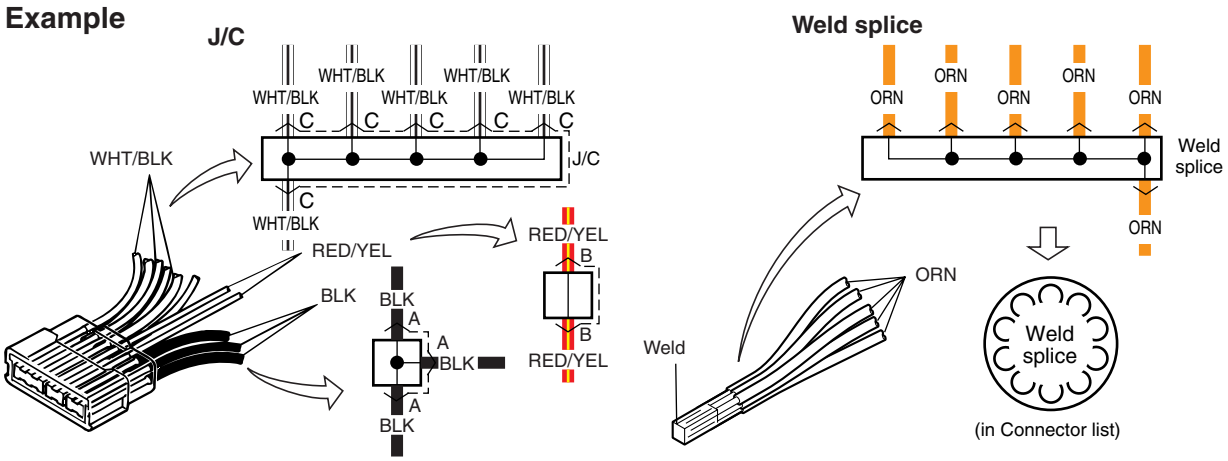
3) Terminals in one connector (Broken line) (B15)/Terminals in different connectors (B14, B16)



I2RH01910904-01

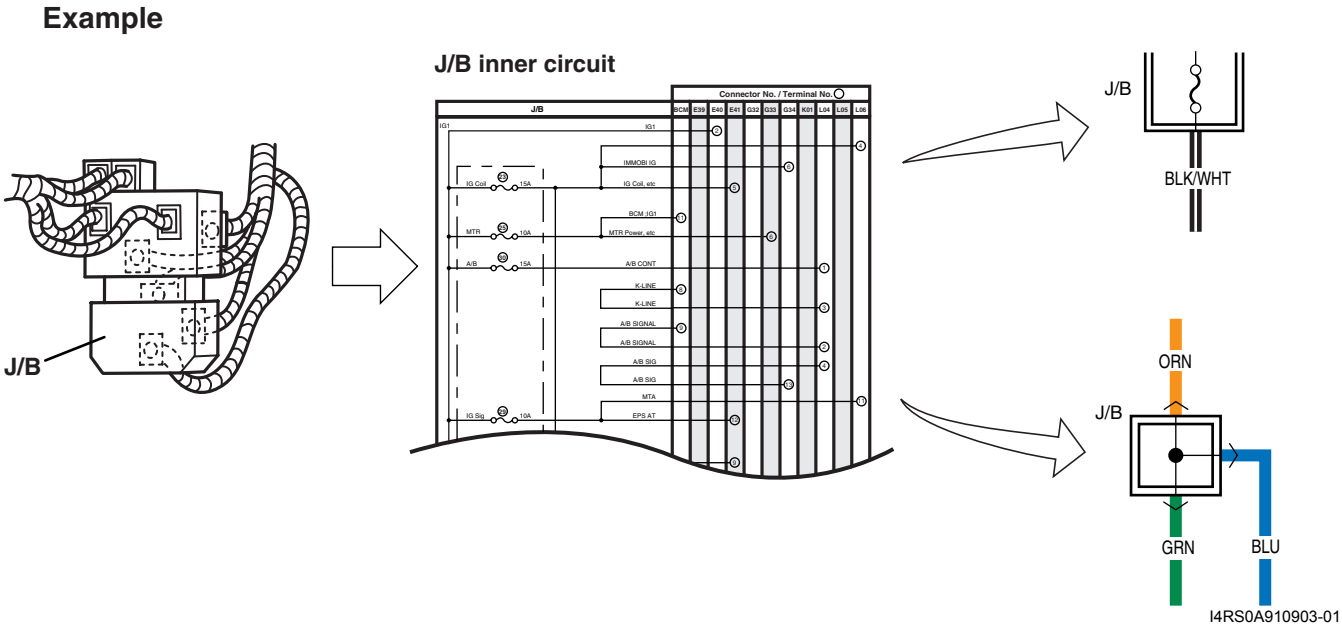
4) Joint connector (J/C)

- The joint connector (J/C) connects several different wires with the same wire color at one place instead of connecting them by welding or caulking one by one. It is not an ordinary connector but a part of the continuous wire in the harness.



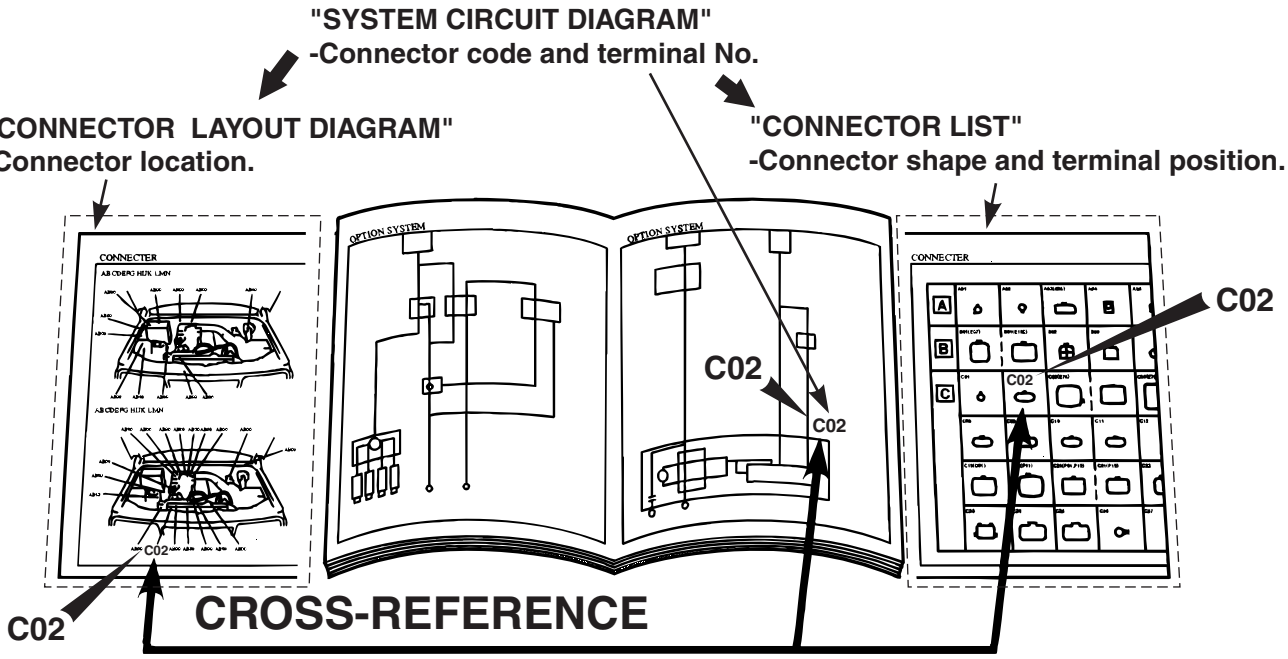
I4RS0A910902-01

5) Junction block (J/B)



I4RS0A910903-01

6) Connector location, shape and terminal No.
Refer to “Connector Layout Diagram”.
Refer to “System Circuit Diagram”.
Refer to “List of Connectors”.

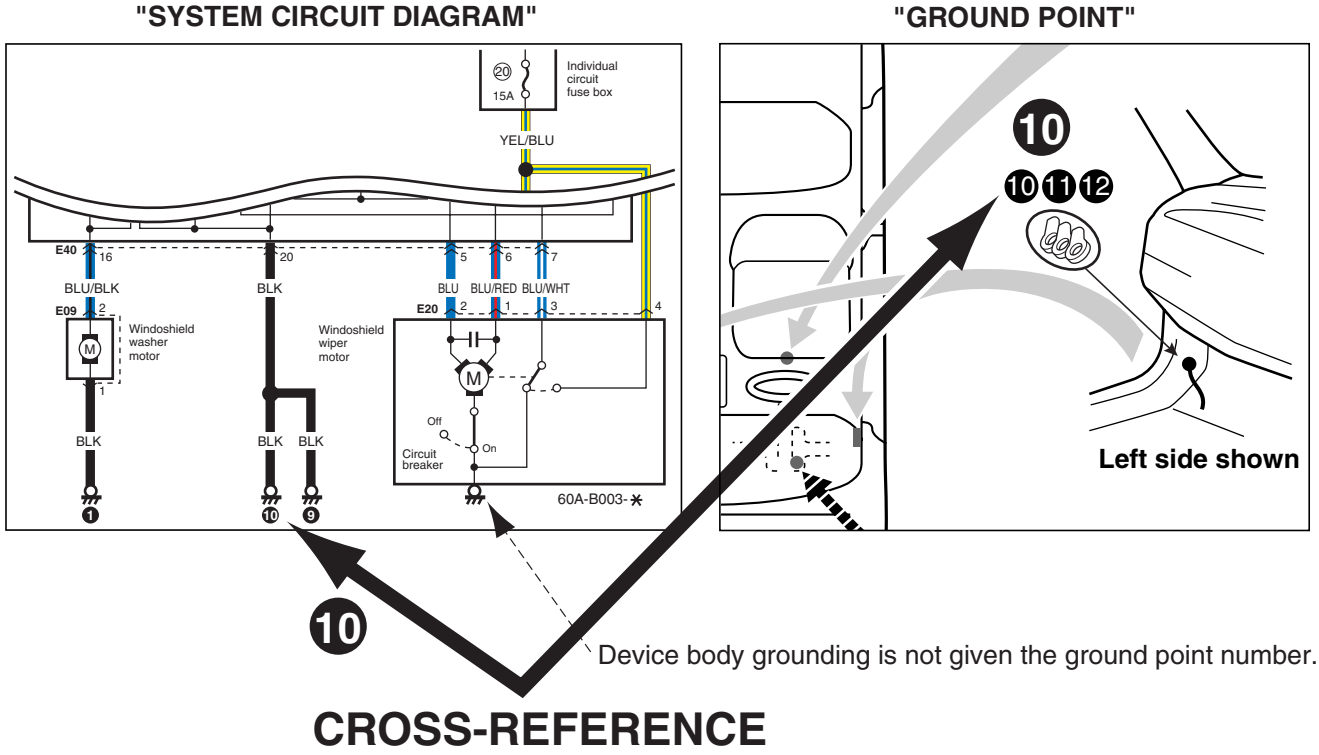


I2RH01910906-01

How to Read Ground Point

S7N20A9101006

Refer to “System Circuit Diagram”.
Refer to “Ground (earth) Point”.

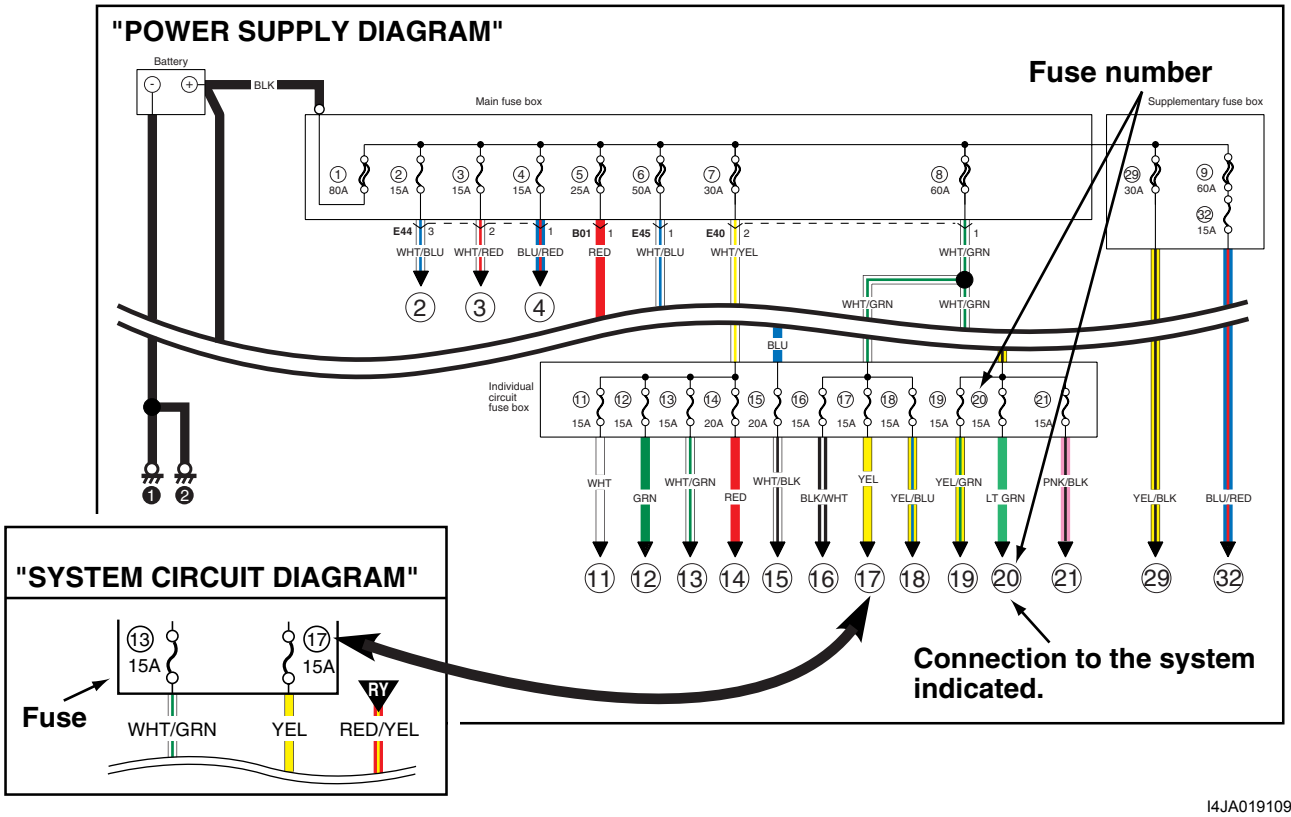


I4JA01910985-01

How to Read Power Supply Diagram

S7N20A9101007

Refer to “Power Supply Diagram (Petrol)”.
Refer to “System Circuit Diagram”.



I4JA01910986-01

How to Read System Circuit Diagram

S7N20A9101008

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

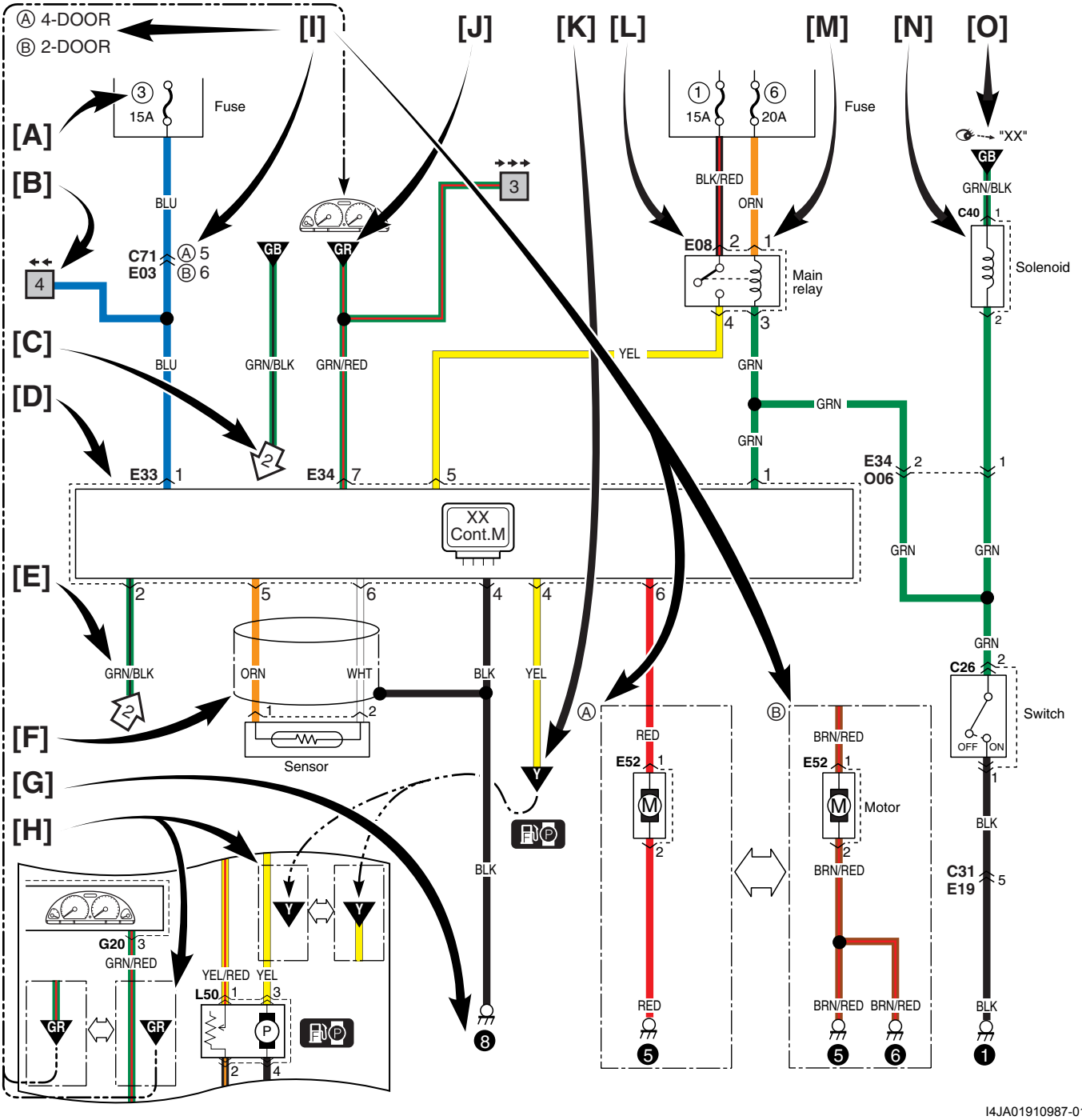
This means “Jump to the page directed with the arrow(s) by their number.
(For example:” Two arrows directing left” means” Jump to two pages before”.)
You will find the same symbol with the arrows directing opposite in the referenced page. The circuit continues between the symbols.

[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



I4JA01910987-01

Connector Layout Diagram

Connector Layout Diagram

S7N20A910A001

Refer to “Engine Compartment”.
Refer to “Instrument Panel”.
Refer to “Door, Roof”.
Refer to “Floor”.
Refer to “Rear”.
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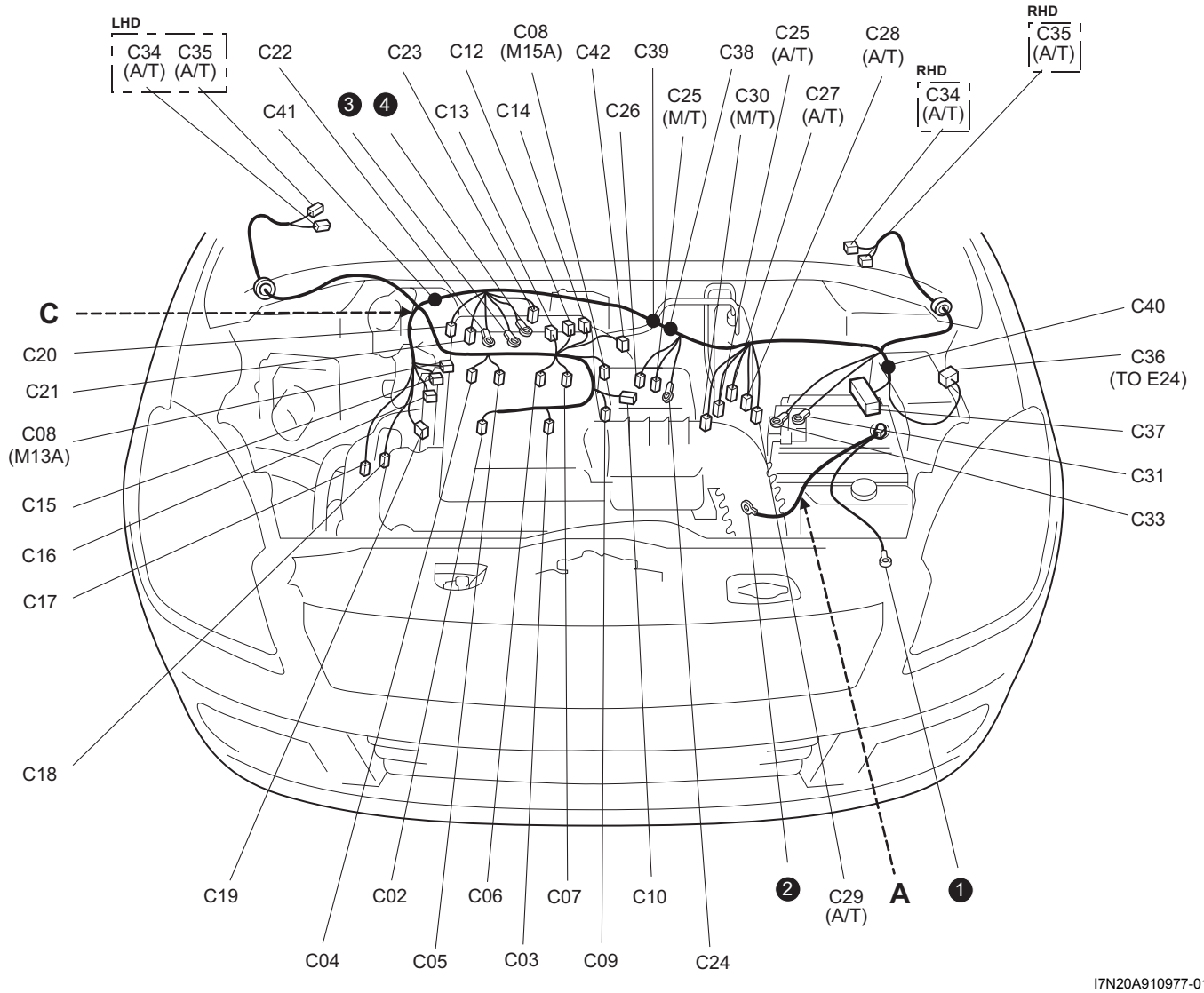
Engine Compartment

S7N20A910A002

A: Battery cable / C: Engine harness (M13A, M15A)



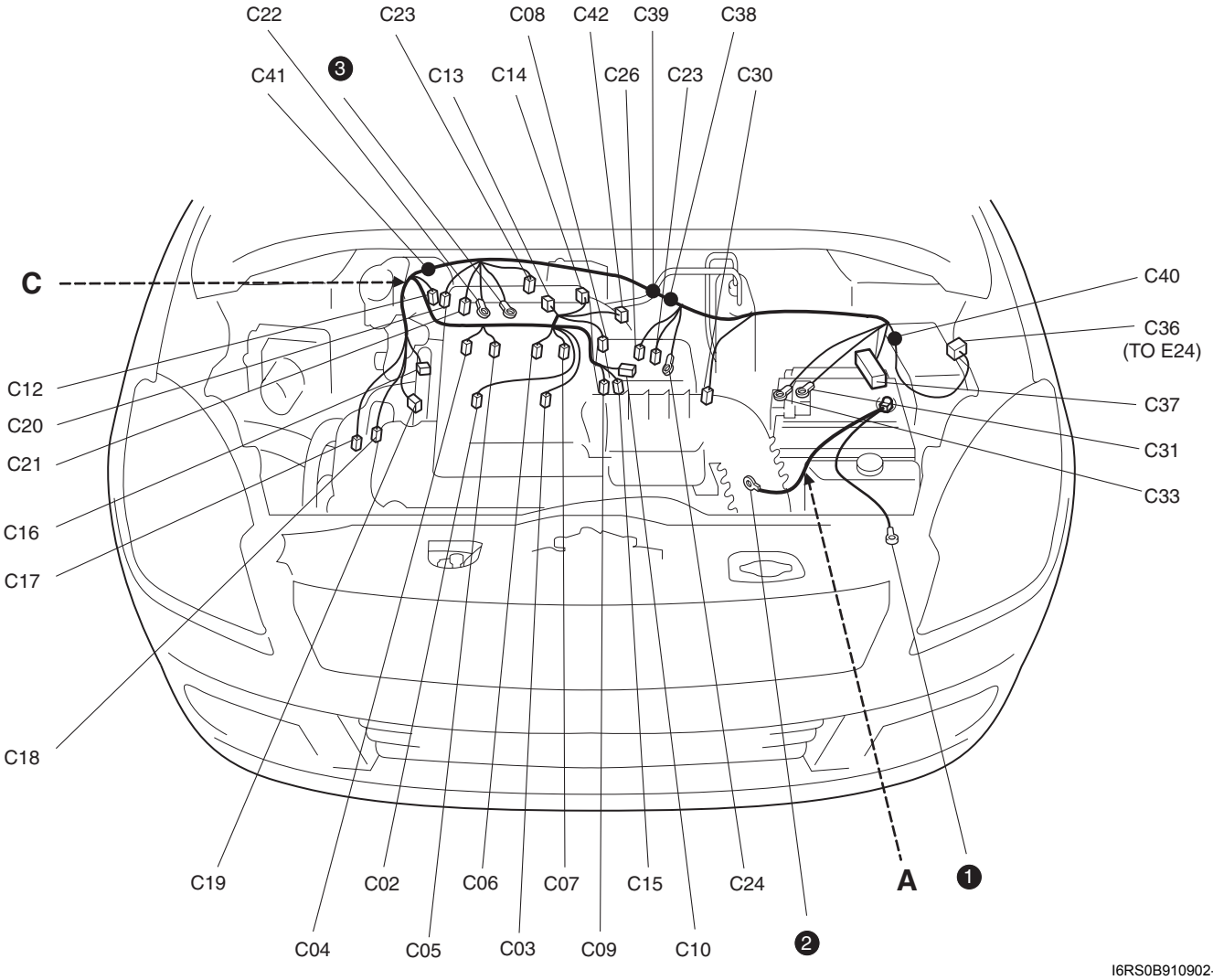
I7N20A910977-01

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C02/GRY	IG Coil #1	C23/BLK	Starting motor #1
C03/GRY	IG Coil #2	C24/-	Starting motor #2
C04/GRY	Fuel injector #1	C25/GRY	VSS
C05/GRY	Fuel injector #2	C26/GRY	Knock sensor
C06/GRY	Fuel injector #3	C27/BLU (A/T)	Input sensor
C07/GRY	Injector #4	C28/GRY (A/T)	Trans axle range sensor

No./Color	Connective position	No./Color	Connective position
C08/BLK or GRY	CMP sensor	C29/GRY (A/T)	Shift solenoid
C09/GRN	ECT sensor	C30/BLK (M/T)	Back-up light switch
C10/GRY	EGR stepper motor	C31/-	Main fuse box
C12/BLK	MAP sensor	C33/-	Main fuse box
C13/BLK	MAF sensor	C34/N (A/T)	TCM
C14/BLK	EVAP canister purge valve	C35/N (A/T)	TCM
C15/GRY	Heated oxygen sensor #1	C36/N	Main harness (To E24)
C16/GRN	Heated oxygen sensor #2	C37/GRY	ECM
C17/BLK	A/C compressor	C38/-	Weld splice
C18/N	Engine oil pressure sensor	C39/-	Weld splice
C19/BLU	VVT solenoid	C40/-	Weld splice
C20/GRY	CKP sensor	C41/-	Weld splice
C21/GRY	Generator #1	C42/BLK	Electric position body
C22/-	Generator #2		

A: Battery cable / C: Engine harness (M16A)



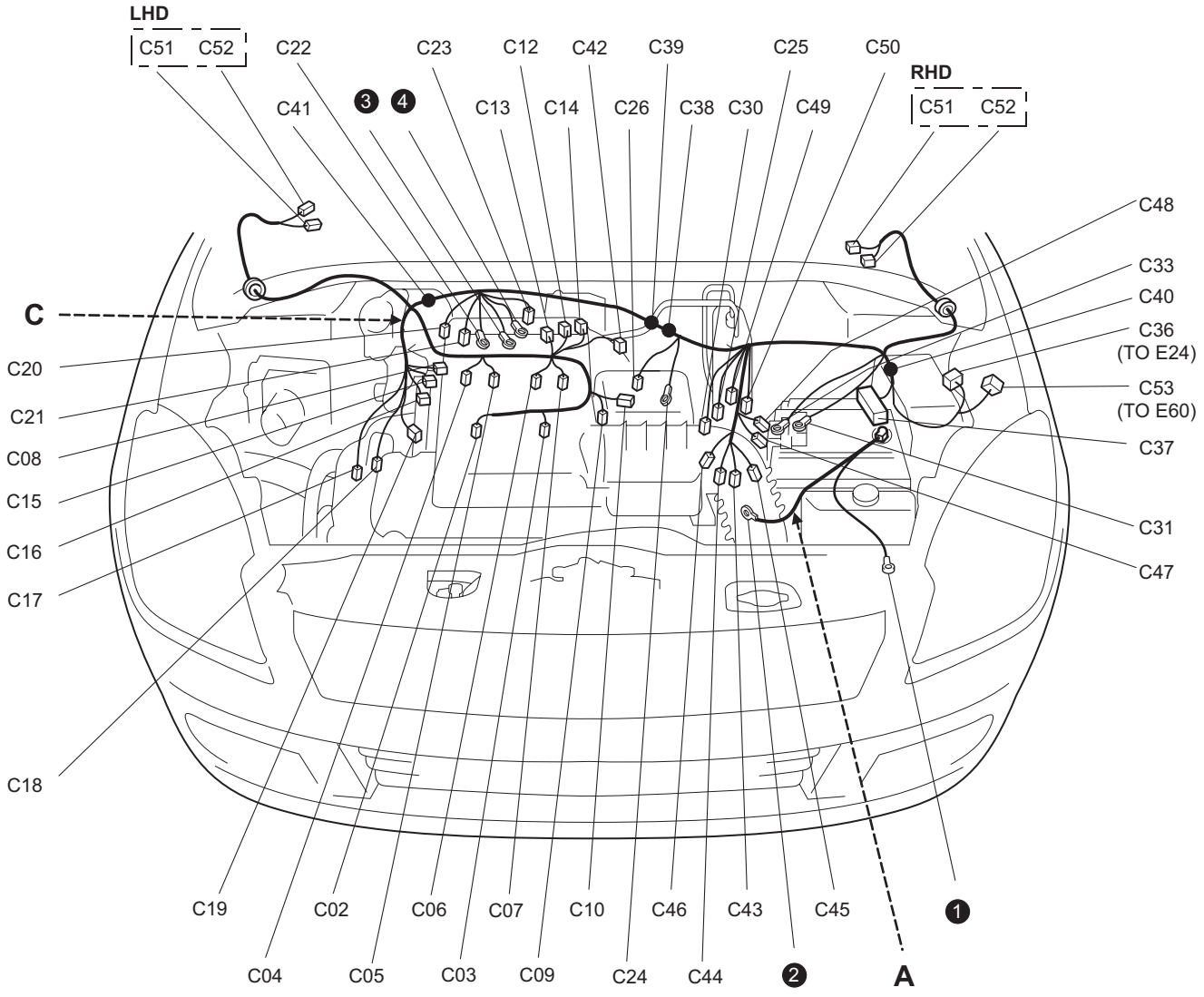
I6RS0B910902-01

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C02/GRY	IG Coil #1	C20/GRY	CKP sensor
C03/GRY	IG Coil #2	C21/BLK	Generator #1
C04/GRY	Fuel injector #1	C22/-	Generator #2
C05/GRY	Fuel injector #2	C23/BLK	Starting motor #1

No./Color	Connective position	No./Color	Connective position
C06/GRY	Fuel injector #3	C24/-	Starting motor #2
C07/GRY	Fuel injector #4	C26/GRY	Knock sensor
C08/BLK	CMP sensor	C30/BLK	Back-up light switch
C09/GRN	ECT sensor	C31/-	Main fuse box
C10/GRY	EGR stepper motor	C33/-	Main fuse box
C12/BLK	MAP sensor	C36/N	Main harness (To E24)
C13/BLK	MAF sensor	C37/GRY	ECM
C14/BLK	EVAP canister purge valve	C38/-	Weld splice
C15/BLK	Heated oxygen sensor #1	C39/-	Weld splice
C16/GRN	Heated oxygen sensor #2	C40/-	Weld splice
C17/BLK	A/C compressor	C41/-	Weld splice
C18/GRY	Engine oil pressure sensor	C42/BLK	Electric position body
C19/BLU	VVT solenoid		

A: Battery cable / C: Engine harness (Automated Manual Transaxle)



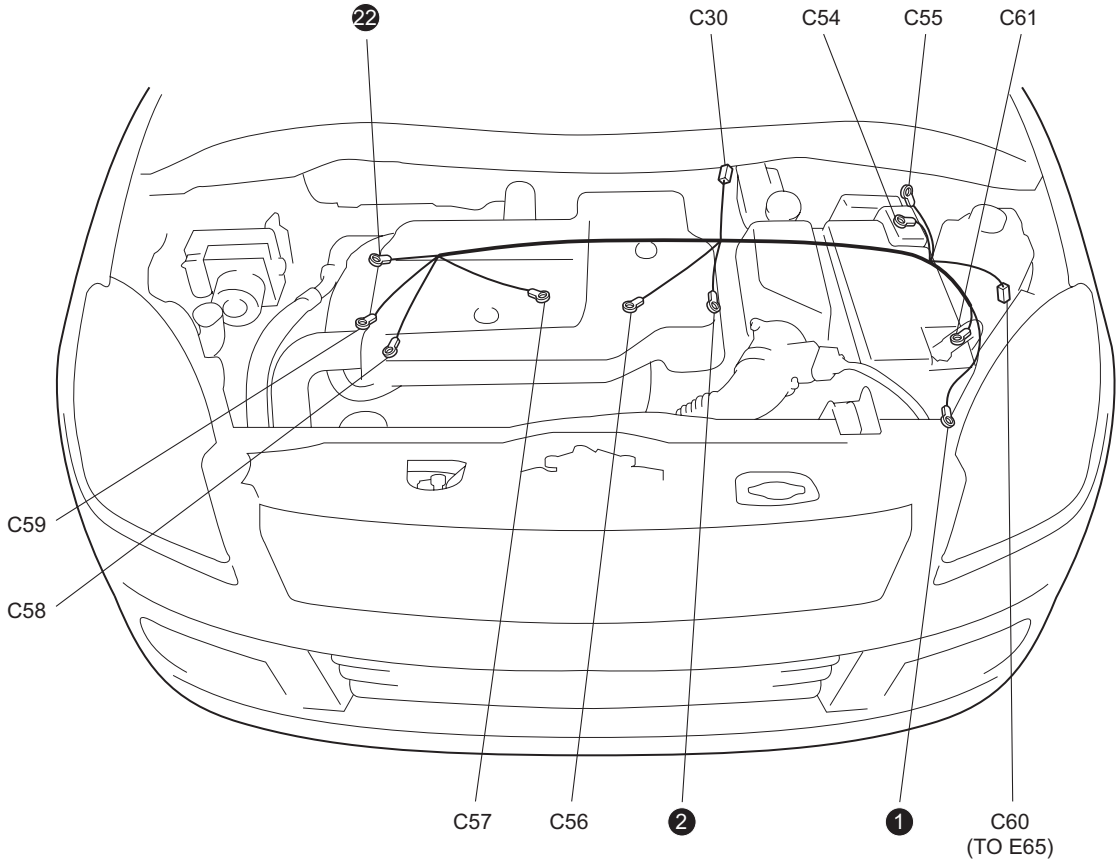
I7N20A910984-01

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C02/GRY	IG Coil #1	C26/GRY	Knock sensor
C03/GRY	IG Coil #2	C30/GRY	Back-up light switch
C04/GRY	Fuel injector #1	C31/-	Main fuse box
C05/GRY	Fuel injector #2	C33/-	Main fuse box
C06/GRY	Fuel injector #3	C36/N	Main harness (To E24)

No./Color	Connective position	No./Color	Connective position
C07/GRY	Fuel injector #4	C37/GRY	ECM
C08/GRY	CMP sensor	C38/-	Weld splice
C09/GRN	ECT sensor	C39/-	Weld splice
C10/GRY	EGR stepper motor	C40/-	Weld splice
C12/BLK	MAP sensor	C41/-	Weld splice
C13/BLK	MAF sensor	C42/BLK	Electric position body
C14/BLK	EVAP canister purge valve	C43/BLK	Select stroke sensor
C15/GRY	Heated oxygen sensor #1	C44/BLK	Shift stroke sensor
C16/GRN	Heated oxygen sensor #2	C45/BLK	Clutch stroke sensor
C17/BLK	A/C compressor	C46/GRY	Clutch motor
C18/N	Engine oil pressure sensor	C47/GRY	Shift motor
C20/GRY	CKP sensor	C48/GRY	Select motor
C21/GRY	Generator #1	C49/BLK	Neutral switch
C22/-	Generator #2	C50/N	Rotation sensor
C23/BLK	Starting motor #1	C51/GRY	Automated Manual Transaxle control module
C24/-	Starting motor #2	C52/N	Automated Manual Transaxle control module
C25/GRY	VSS	C53/N	Main harness (To E60)

C: Engine harness (DSL)

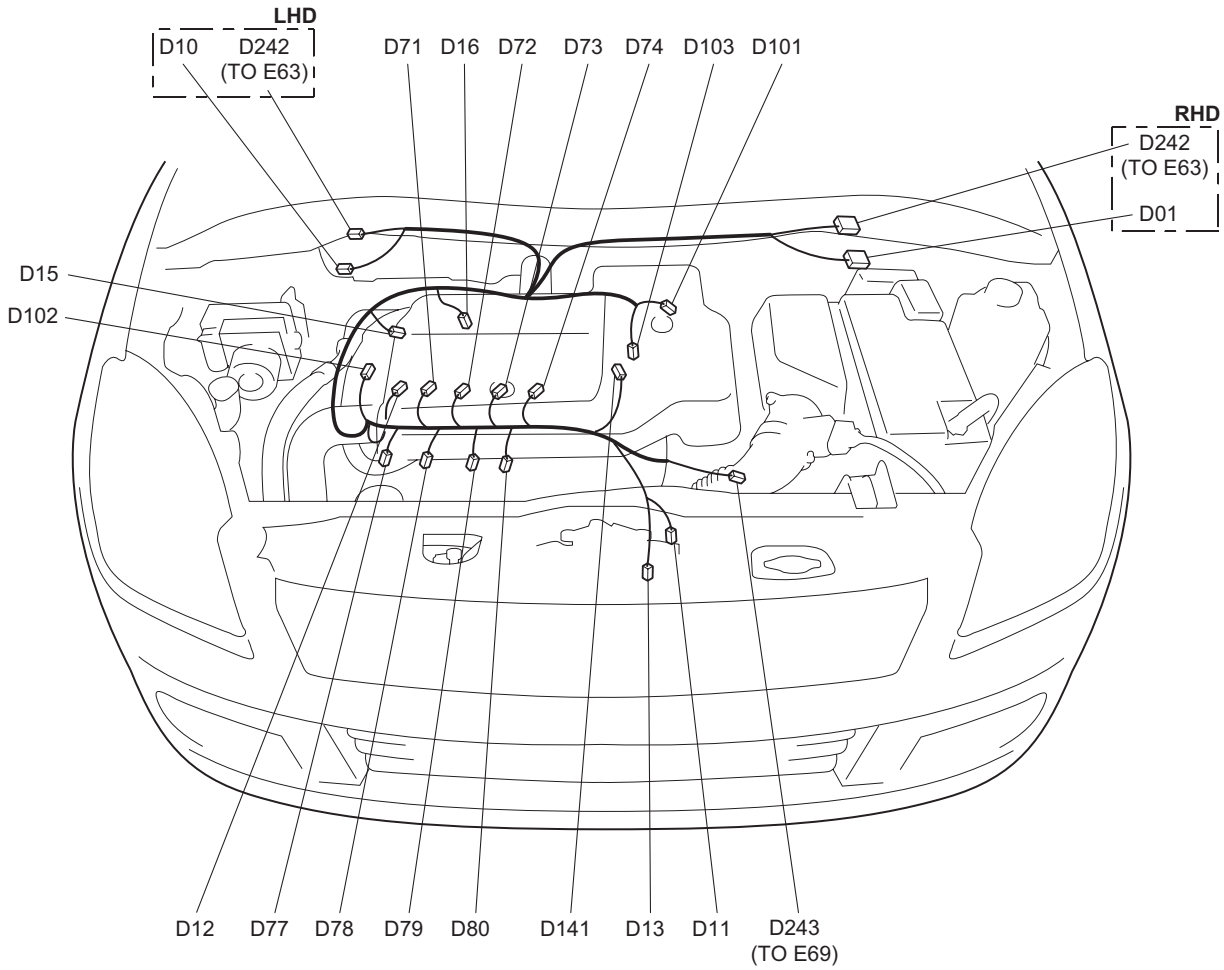


I7N20A910901-02

C: Engine harness

No./Color	Connective position	No./Color	Connective position
C30/BLK	Back-up light switch	C58/-	Generator
C54/-	Main fuse box	C59/-	Generator
C55/-	Main fuse box	C60/GRY	Main harness (To E65)
C56/-	Starting motor	C61/-	Battery (-)
C57/-	Starting motor		

D: Injector harness (DSL)

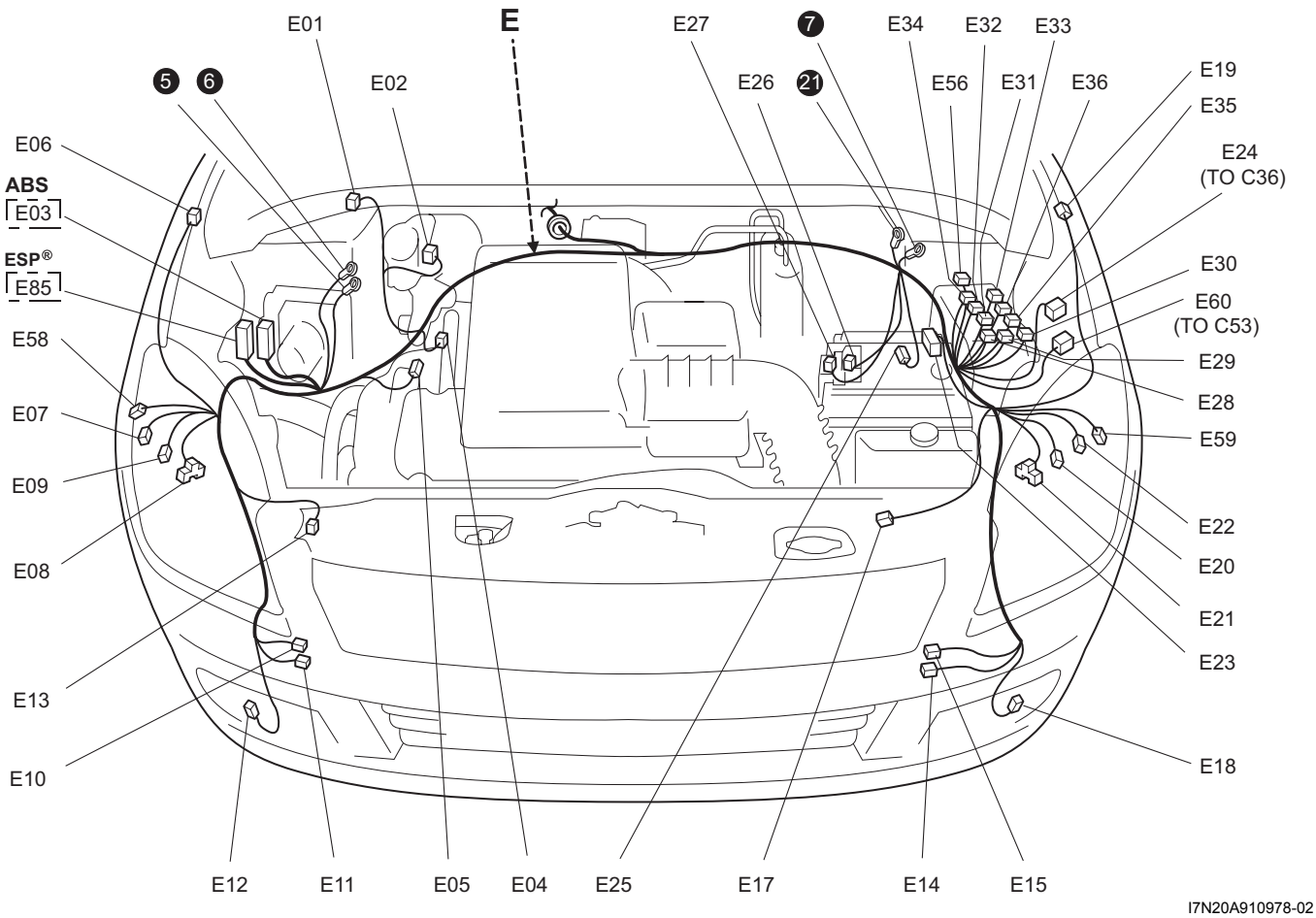


I7N20A910902-02

D: Injector harness

No./Color	Connective position	No./Color	Connective position
D01/BLK	ECM	D77/BLK	Glow plug #1
D11/BLK	CKP sensor	D78/BLK	Glow plug #2
D12/GRY	CMP sensor	D79/BLK	Glow plug #3
D13/GRN	ECT sensor	D80/BLK	Glow plug #4
D15/GRN	Fuel pressure sensor	D101/GRY	EGR valve
D16/BLK	Boost pressure sensor	D102/GRY	A/C compressor
D71/BLK	Fuel injector #1	D103/BLK	Fuel pressure regulator valve
D72/BLK	Fuel injector #2	D141/BLK	Engine oil pressure switch
D73/BLK	Fuel injector #3	D242/BLK	Main harness (To E63)
D74/BLK	Fuel injector #4	D243/BLK	Main harness (To E69)

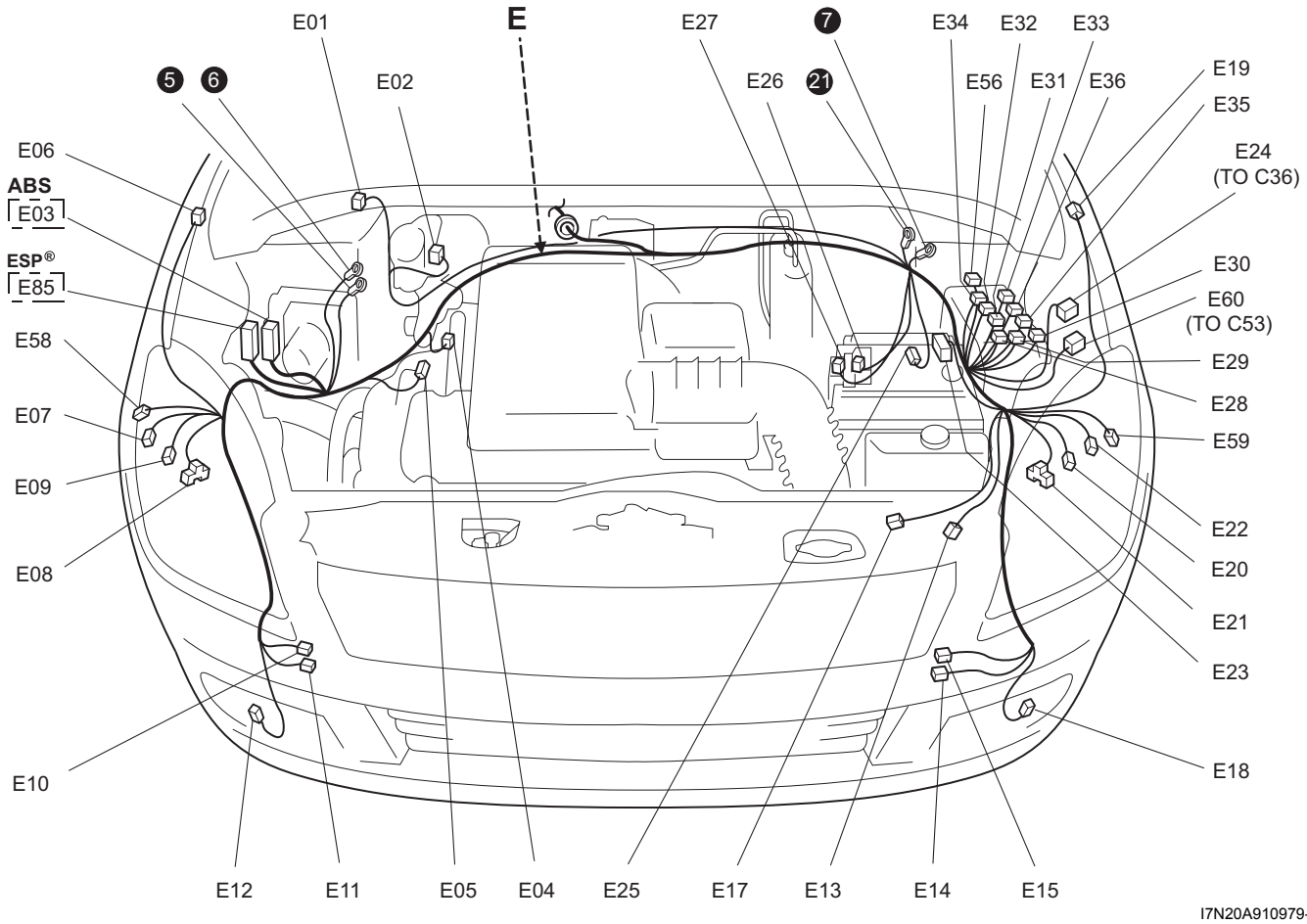
E: Main harness (RHD) (Petrol)



E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E22/N	Front position light (L)
E02/BRN	Brake fluid level switch	E23/GRY	ECM
E03/BLK (ABS)	ABS control module	E24/N	Engine Harness (To C36)
E04/BLK	A/C refrigerant pressure sensor	E25/BLK	Wheel speed sensor (FL)
E05/BLK	Wheel speed sensor (FR)	E26/GRY	Main fuse box
E06/N	Side turn signal light (R)	E27/BRN	Main fuse box
E07/N	Front position light (R)	E28/BLK	Radiator fan relay #1
E08/BLK	Head light (R)	E29/BLK	Radiator fan relay #2
E09/GRY	Front turn signal light (R)	E30/BLK	Radiator fan relay #3
E10/GRN	Rear washer motor	E31/BLK	Starting motor relay
E11/BLU	Windshield washer motor	E32/BLK	Main relay
E12/BLK	Front fog light (R)	E33/BLK	A/T relay or Automated Manual Transaxle relay
E13/YEL	Forward sensor	E34/BLK	Front fog light relay
E14/BLK	Outside air temperature sensor	E35/BLK	Fuel pump relay
E15/BLK	Horn	E36/BLK	A/C compressor relay
E17/BLK	Radiator fan motor	E56/BLK	Throttle actuator control relay
E18/BLK	Front fog light (L)	E58/GRY	Headlight beam leveling actuator (R)
E19/N	Side turn signal light (L)	E59/GRY	Headlight beam leveling actuator (L)
E20/GRY	Front turn signal light (L)	E60/N	Engine harness (To C53)
E21/BLK	Head light (L)	E85/BLK (ESP®)	ESP® control module

E: Main harness (LHD) (Petrol)



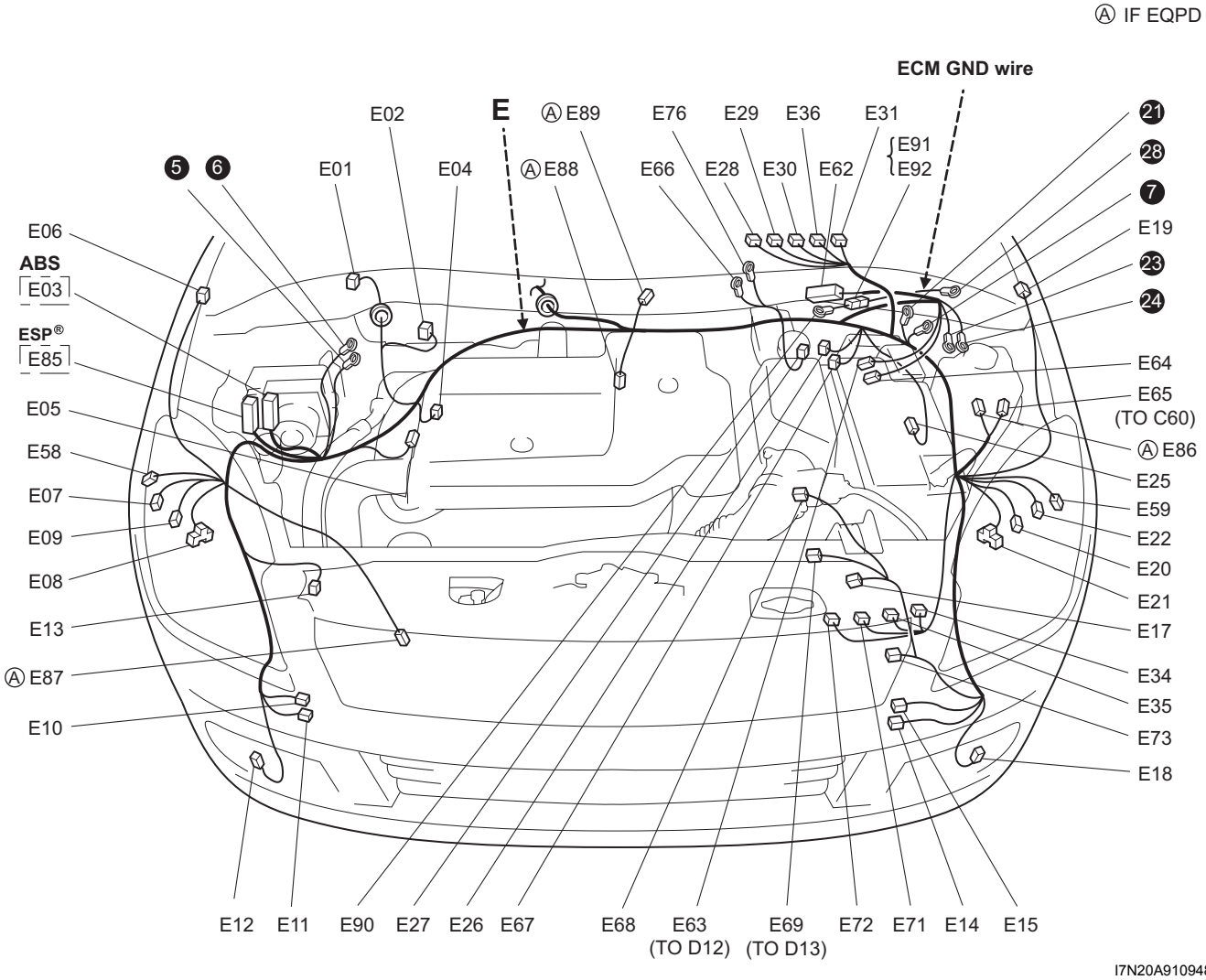
I7N20A910979-02

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E22/N	Front position light (L)
E02/BRN	Brake fluid level switch	E23/GRY	ECM
E03/BLK (ABS)	ABS control module	E24/N	Engine Harness (To C36)
E04/BLK	A/C refrigerant pressure sensor	E25/BLK	Wheel speed sensor (FL)
E05/BLK	Wheel speed sensor (FR)	E26/GRY	Main fuse box
E06/N	Side turn signal light (R)	E27/BRN	Main fuse box
E07/N	Front position light (R)	E28/BLK	Radiator fan relay #1
E08/BLK	Head light (R)	E29/BLK	Radiator fan relay #2
E09/GRY	Front turn signal light (R)	E30/BLK	Radiator fan relay #3
E10/GRN	Rear washer motor	E31/BLK	Starting motor relay
E11/BLU	Windshield washer motor	E32/BLK	Main relay
E12/BLK	Front fog light (R)	E33/BLK	A/T relay or Automated Manual Transaxle relay
E13/YEL	Forward sensor	E34/BLK	Front fog light relay
E14/BLK	Outside air temperature sensor	E35/BLK	Fuel pump relay
E15/BLK	Horn	E36/BLK	A/C compressor relay
E17/BLK	Radiator fan motor	E56/BLK	Throttle actuator control relay
E18/BLK	Front fog light (L)	E58/GRY	Headlight beam leveling actuator (R)
E19/N	Side turn signal light (L)	E59/GRY	Headlight beam leveling actuator (L)
E20/GRY	Front turn signal light (L)	E60/N	Engine harness (To C53)
E21/BLK	Head light (L)	E85/BLK (ESP®)	ESP® control module

E: Main harness, ECM GND wire (RHD) (DSL)

S7N20A910A003



I7N20A910948-04

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E29/BLK	Radiator fan relay #2
E02/BRN	Brake fluid level switch	E30/BLK	Radiator fan relay #3
E03/BLK (ABS)	ABS control module	E31/BLK	Starting motor relay
E04/BLK	A/C refrigerant pressure sensor	E34/BLK	Front fog light relay
E05/BLK	Wheel speed sensor (FR)	E35/BLK	Fuel pump relay
E06/N	Side turn signal light (R)	E36/BLK	A/C compressor relay
E07/N	Front position light (R)	E58/GRY	Headlight beam leveling actuator (R)
E08/BLK	Head light (R)	E59/GRY	Headlight beam leveling actuator (L)
E09/GRY	Front turn signal light (R)	E62/BLK	ECM
E10/GRN	Rear washer motor	E63/BLK	Injector harness (To D12)
E11/BLU	Windshield washer motor	E64/GRN	Fuel heater with fuel temperature sensor
E12/BLK	Front fog light (R)	E65/GRY	Engine harness (To C60)
E13/YEL	Forward sensor	E66/-	Individual circuit fuse box
E14/BLK	Outside air temperature sensor	E67/GRY	Main fuse box
E15/BLK	Horn	E68/BLK	MAF and IAT sensor
E17/BLK	Radiator fan motor	E69/BLK	Injector harness (To D13)
E18/BLK	Front fog light (L)	E71/BLK	Fuel heating relay
E19/N	Side turn signal light (L)	E72/BLU	Main relay
E20/GRY	Front turn signal light (L)	E73/BLK	Glow control module
E21/BLK	Head light (L)	E76/-	Individual circuit fuse box

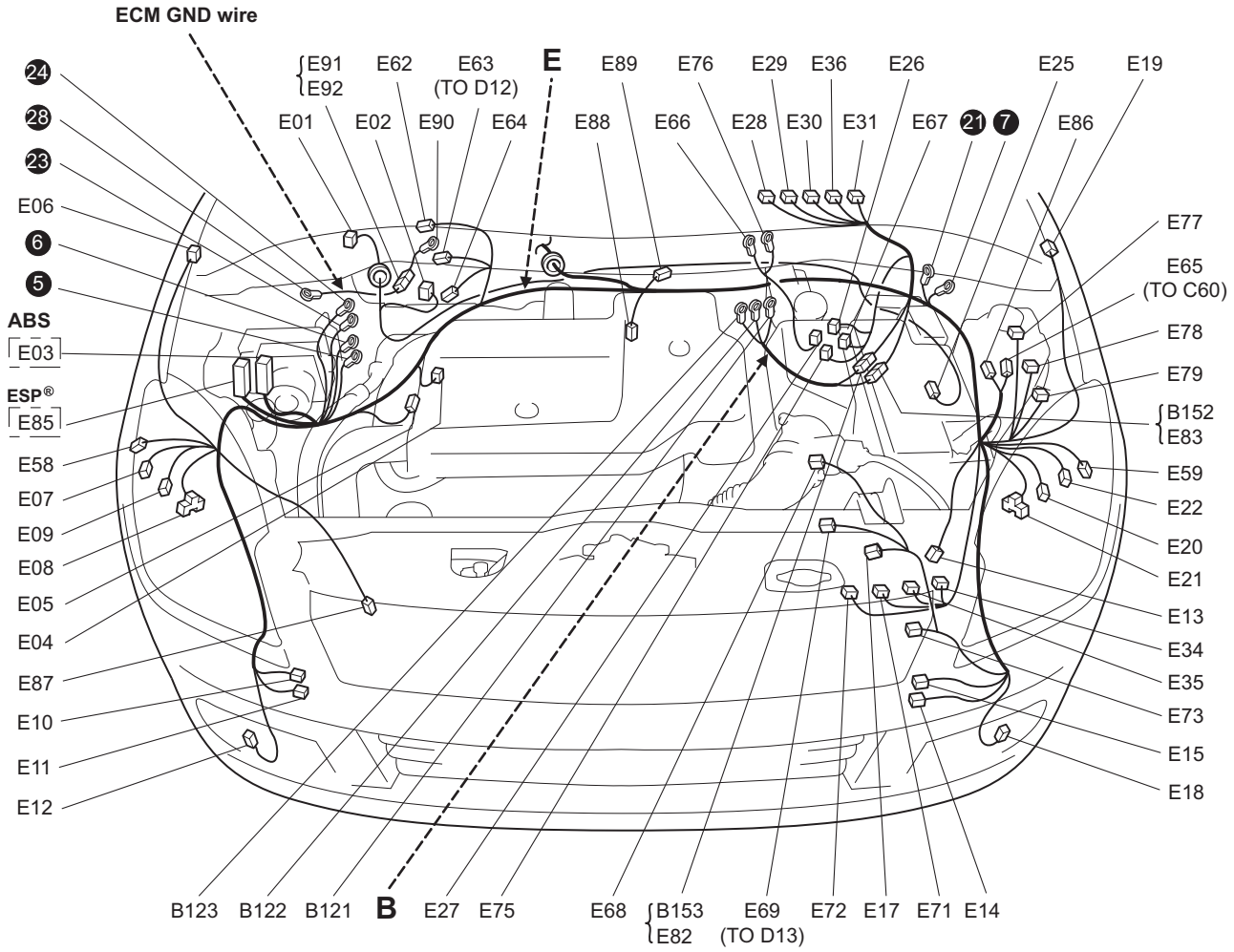
No./Color	Connective position	No./Color	Connective position
E22/N	Front position light (L)	E85/BLK (ESP®)	ESP® control module
E25/BLK	Wheel speed sensor (FL)	E86/BLK (IF EQPD)	Boost pressure control solenoid valve
E26/GRY	Main fuse box	E87/BLK (IF EQPD)	A/F sensor
E27/BRN	Main fuse box	E88/BLK (IF EQPD)	EGT sensor
E28/BLK	Radiator fan relay #1	E89/BLK (IF EQPD)	DPF® differential pressure sensor

E: ECM GND wire

No./Color	Connective position	No./Color	Connective position
E90/-	ECM	E92/-	ECM GND wire (To E91)
E91/-	ECM GND wire (To E92)		

B: WTP wire / E: Main harness, ECM GND wire (LHD) (DSL)

S7N20A910A004



I7N20A910903-05

B: WTP wire

No./Color	Connective position	No./Color	Connective position
B121/-	WTP heater #1	B152/GRY	Main harness (To E83)
B122/-	WTP heater #2	B153/GRY	Main harness (To E82)
B123/-	WTP heater #3		

E: Main harness

No./Color	Connective position	No./Color	Connective position
E01/GRY	Windshield wiper motor	E34/BLK	Front fog light relay
E02/BRN	Brake fluid level switch	E35/BLK	Fuel pump relay
E03/BLK (ABS)	ABS control module	E36/BLK	A/C compressor relay
E04/BLK	A/C refrigerant pressure sensor	E58/GRY	Headlight beam leveling actuator (R)
E05/BLK	Wheel speed sensor (FR)	E59/GRY	Headlight beam leveling actuator (L)
E06/N	Side turn signal light (R)	E62/BLK	ECM
E07/N	Front position light (R)	E63/BLK	Injector harness (To D12)
E08/BLK	Head light (R)	E64/GRN	Fuel heater with fuel temperature sensor
E09/GRY	Front turn signal light (R)	E65/GRY	Engine harness (To C60)
E10/GRN	Rear washer motor	E66/-	Individual circuit fuse box
E11/BLU	Windshield washer motor	E67/GRY	Main fuse box
E12/BLK	Front fog light (R)	E68/BLK	MAF and IAT sensor
E13/YEL	Forward sensor	E69/BLK	Injector harness (To D13)
E14/BLK	Outside air temperature sensor	E71/BLK	Fuel heating relay
E15/BLK	Horn	E72/BLU	Main relay
E17/BLK	Radiator fan motor	E73/BLK	Glow control module
E18/BLK	Front fog light (L)	E75/GRY	Main fuse box
E19/N	Side turn signal light (L)	E76/-	Individual circuit fuse box
E20/GRY	Front turn signal light (L)	E77/BLK	WTP relay #1
E21/BLK	Head light (L)	E78/BLK	WTP relay #2
E22/N	Front position light (L)	E79/BLK	WTP relay #3
E25/BLK	Wheel speed sensor (FL)	E82/GRY	WTP wire (To B153)
E26/N	Main fuse box	E83/GRY	WTP wire (To B152)
E27/BRN	Main fuse box	E85/BLK (ESP®)	ESP® control module
E28/BLK	Radiator fan relay #1	E86/BLK	Boost pressure control solenoid valve
E29/BLK	Radiator fan relay #2	E87/BLK	A/F sensor
E30/BLK	Radiator fan relay #3	E88/BLK	EGT sensor
E31/BLK	Starting motor relay	E89/BLK	DPF® differential pressure sensor

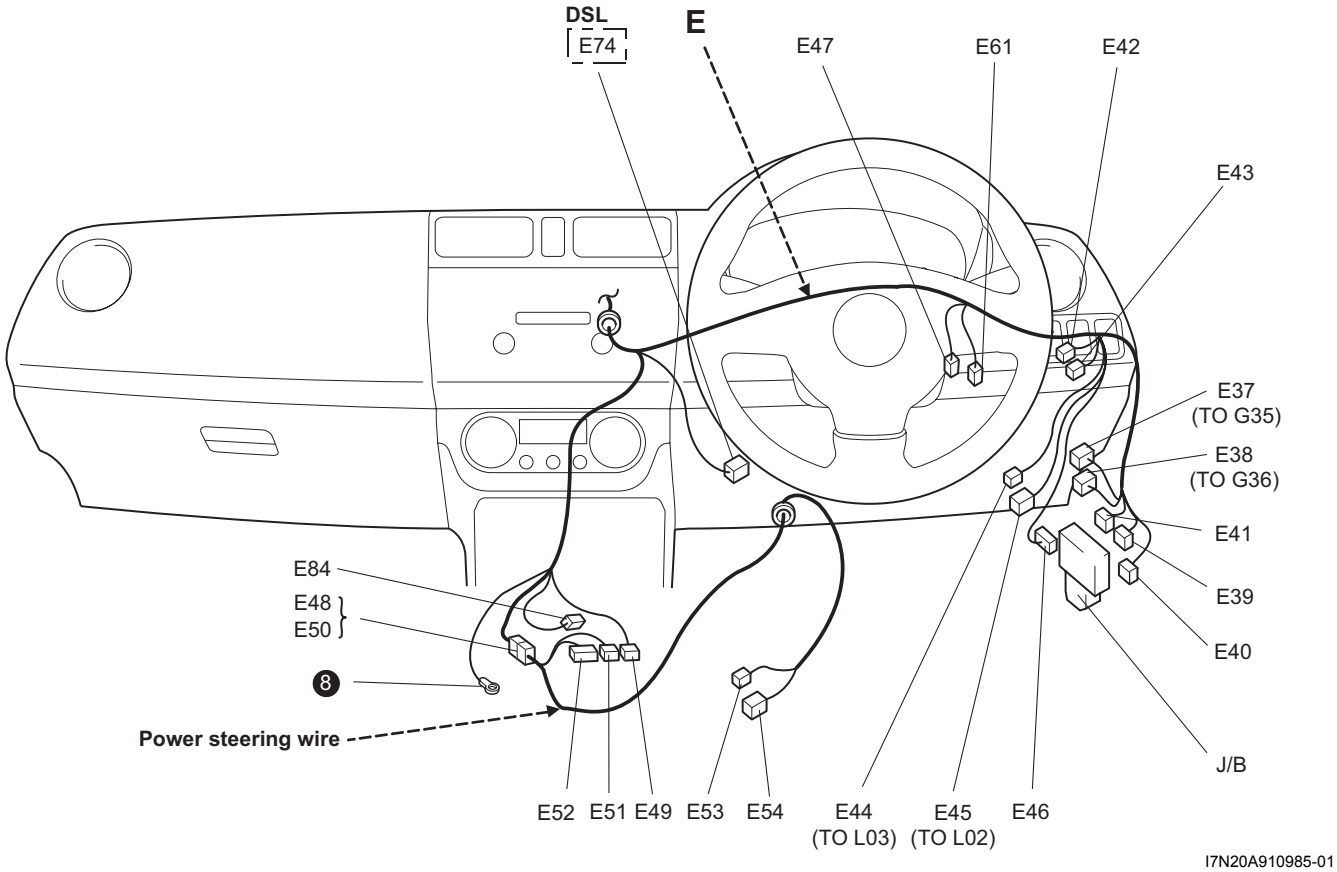
E: ECM GND wire

No./Color	Connective position	No./Color	Connective position
E90/-	ECM	E92/BLK	ECM GND wire (To E91)
E91/BLK	ECM GND wire (To E92)		

Instrument Panel

S7N20A910A005

E: Main harness, Power steering wire (RHD)



I7N20A910985-01

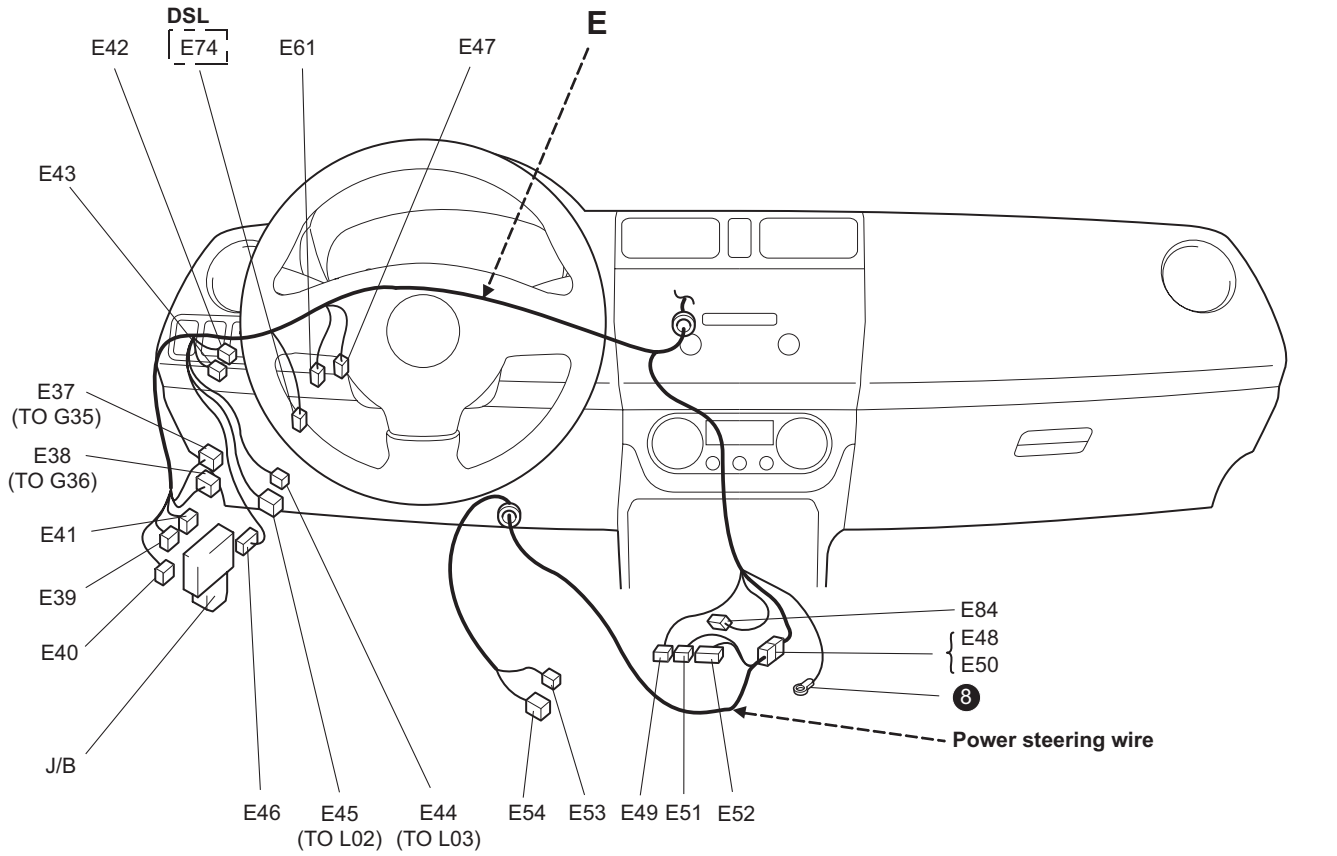
E: Main harness

No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E45/N	Floor harness (To L02)
E38/N	Instrument panel harness (To G36)	E46/BLU	BCM
E39/BRN	J/B	E47/N	Brake light switch
E40/N	J/B	E48/BLU	Power steering wire (To E50)
E41/N	J/B	E49/BLK	P/S control module
E42/N	J/C	E61/BLK	APP (Acceleration pedal position) sensor
E43/N	J/C	E74/BRN (DSL)	CPP (Clutch pedal position) switch
E44/YEL	Floor harness (To L03)	E84/BLK (IF EQPD)	YAW/G sensor

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

E: Main harness, Power steering wire (LHD)



I7N20A910904-03

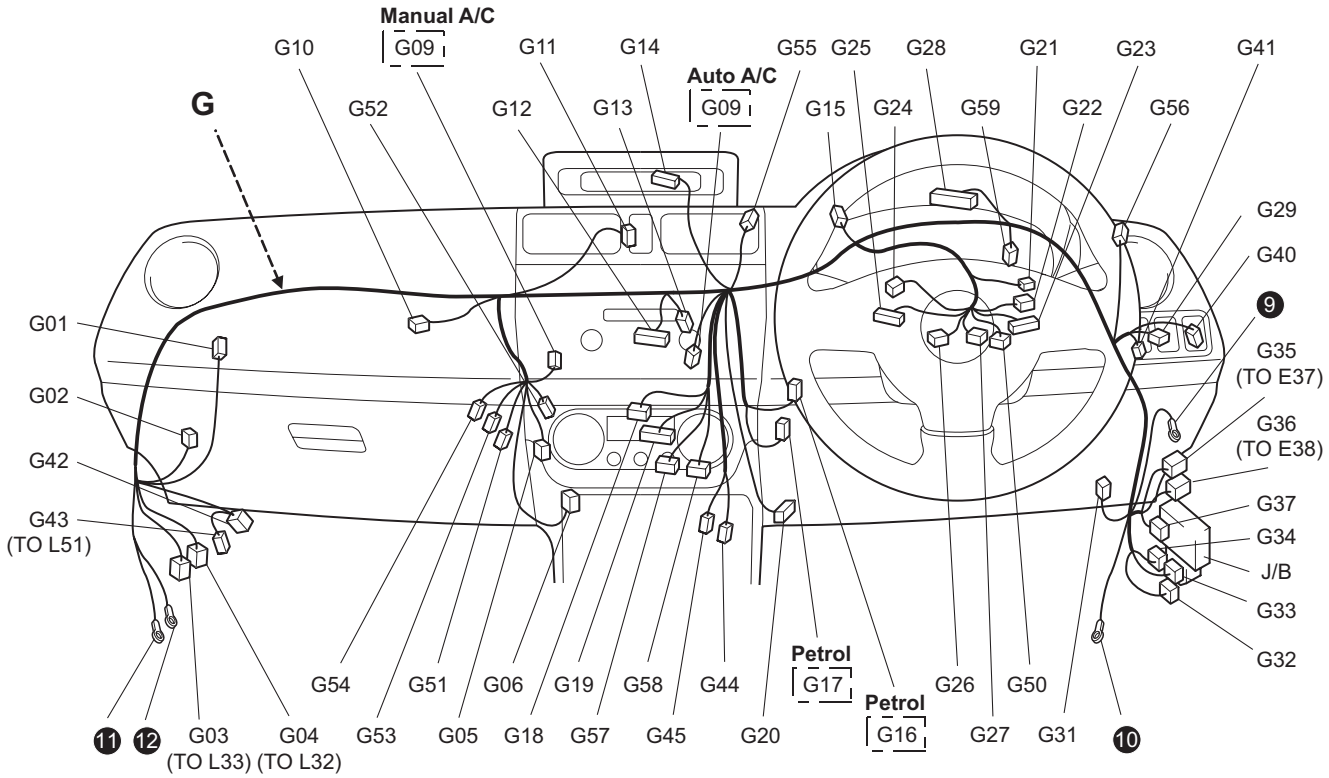
E: Main harness

No./Color	Connective position	No./Color	Connective position
E37/GRY	Instrument panel harness (To G35)	E45/N	Floor harness (To L02)
E38/N	Instrument panel harness (To G36)	E46/BLU	BCM
E39/BRN	J/B	E47/N	Brake light switch
E40/N	J/B	E48/BLU	Power steering wire (To E50)
E41/N	J/B	E49/BLK	P/S control module
E42/N	J/C	E61/BLK	APP (Acceleration pedal position) sensor
E43/N	J/C	E74/BRN (DSL)	CPP (Clutch pedal position) switch
E44/YEL	Floor harness (To L03)	E84/BLK (IF EQPD)	YAW/G sensor

E: Power steering wire

No./Color	Connective position	No./Color	Connective position
E50/BLU	Main harness (To E48)	E53/BLK	P/S torque sensor
E51/BLU	P/S control module	E54/GRY	P/S motor
E52/BLK	P/S control module		

G: Instrument panel harness (RHD)



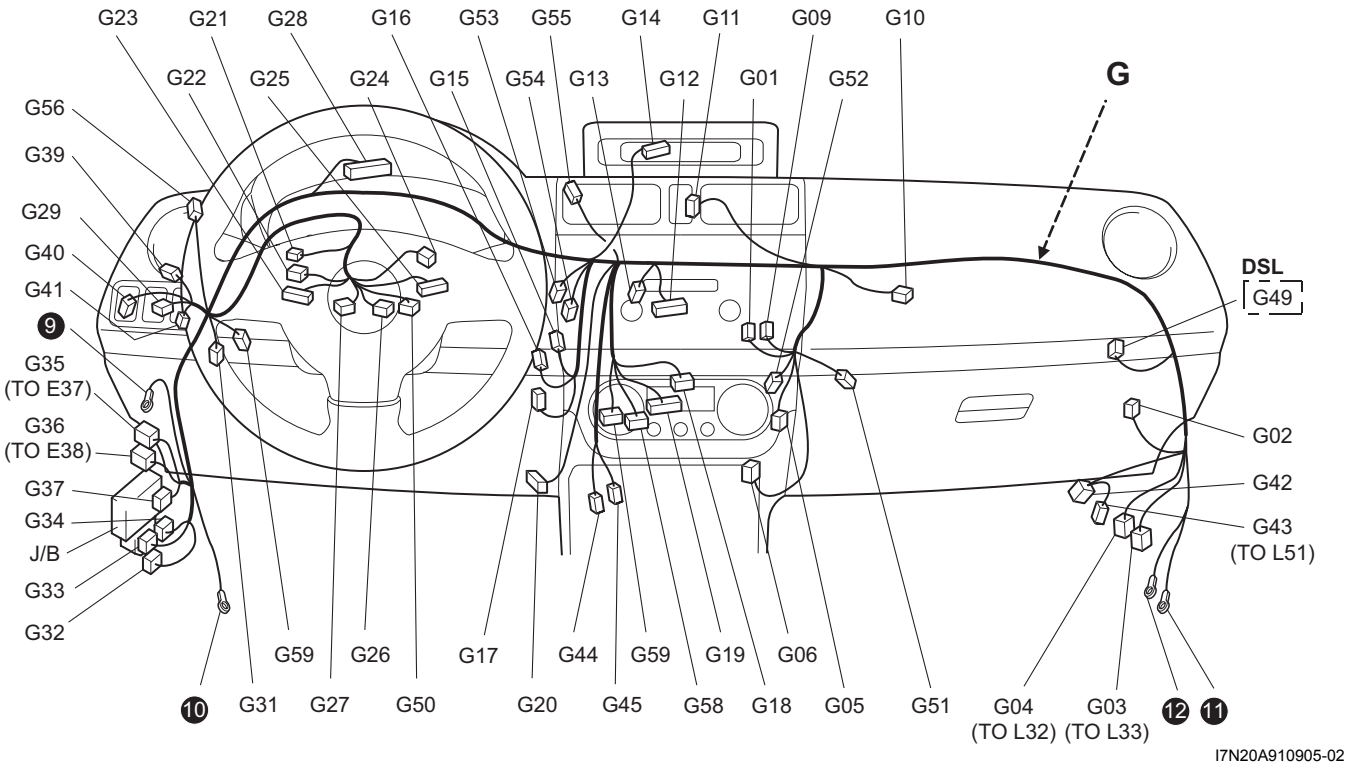
I7N20A910980-02

G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/GRN	Air intake control actuator	G28/GRY	COMB meter
G02/N	Keyless receiver	G29/GRN	Front fog light switch
G03/N	Floor harness (To L33)	G31/N	J/C
G04/YEL	Floor harness (To L32)	G32/N	J/B
G05/N	Blower motor	G33/N	J/B
G06/N	Blower motor resister	G34/N	J/B
G09/N	Evaporator temperature sensor	G35/GRY	Main harness (To E37)
G10/BLK	Passenger inflator	G36/N	Main harness (To E38)
G11/N	Hazard switch	G37/BLU	BCM
G12/BLU	Audio	G40/N	Headlight leveling switch
G13/N	Navigation	G41/GRY (IF EQPD)	ILL cancel switch
G14/GRN	Multi information display	G42/N	KLS control module
G15/GRY	J/C	G43/GRY	Floor harness (To L51)
G16/BLU (Petrol)	J/C	G44/BLK	Cigar lighter
G17/N (Petrol)	J/C	G45/BLK	Cigar lighter ILL
G18/GRN	HVAC control unit	G50/N (IF EQPD)	Steering angle sensor
G19/BRN	Blower speed selector	G51/N (IF EQPD)	Blower motor controller
G20/BLK	DLC	G52/BLK (IF EQPD)	Diode
G21/N	IG switch	G53/GRN (IF EQPD)	Air flow control actuator
G22/N	Main switch (Key switch)	G54/N (IF EQPD)	Temperature control actuator
G23/BLK	COMB switch	G55/N (IF EQPD)	Inside air temperature sensor

No./Color	Connective position	No./Color	Connective position
G24/BLK	ICM	G56/N (IF EQPD)	Sunload sensor
G25/N	COMB switch	G57/GRY (IF EQPD)	HVAC control module
G26/YEL	Driver inflator	G58/GRY (IF EQPD)	HVAC control module
G27/N	COMB switch	G59/N (IF EQPD)	J/C

G: Instrument panel harness (LHD)



G: Instrument panel harness

No./Color	Connective position	No./Color	Connective position
G01/GRN	Air intake control actuator	G29/GRN	Front fog light switch
G02/N	Keyless receiver	G31/N	J/C
G03/N	Floor harness (To L33)	G32/N	J/B
G04/YEL	Floor harness (To L32)	G33/N	J/B
G05/N	Blower motor	G34/N	J/B
G06/N	Blower motor resister	G35/GRY	Main harness (To E37)
G09/N	Evaporator temperature sensor	G36/N	Main harness (To E38)
G10/YEL	Passenger inflator	G37/BLU	BCM
G11/N	Hazard switch	G39/N	DRL controller
G12/BLU	Audio	G40/N	Headlight leveling switch
G13/N	Navigation	G41/GRY	ILL cancel switch
G14/GRN	Multi information display	G42/N	KLS control module
G15/GRY	J/C	G43/GRY	Floor harness (To L51)
G16/BLU	J/C	G44/BLK	Cigar lighter
G17/N	J/C	G45/BLK (IF EQPD)	Cigar lighter ILL
G18/GRN	HVAC control unit	G49/N (DSL)	WTP control module
G19/BRN	Blower speed selector	G50/N (IF EQPD)	Steering angle sensor
G20/BLK	DLC	G51/N (IF EQPD)	Blower motor controller
G21/N	IG switch	G52/BLK (IF EQPD)	Diode
G22/N	Main switch (Key switch)	G53/GRN (IF EQPD)	Air flow control actuator
G23/BLK	COMB switch	G54/N (IF EQPD)	Temperature control actuator
G24/BLK	ICM	G55/N (IF EQPD)	Inside air temperature sensor
G25/N	COMB switch	G56/N (IF EQPD)	Sunload sensor
G26/YEL	Driver inflator	G57/GRY (IF EQPD)	HVAC control module
G27/N	COMB switch	G58/GRY (IF EQPD)	HVAC control module
G28/GRY	COMB meter	G59/N (IF EQPD)	J/C

Door, Roof

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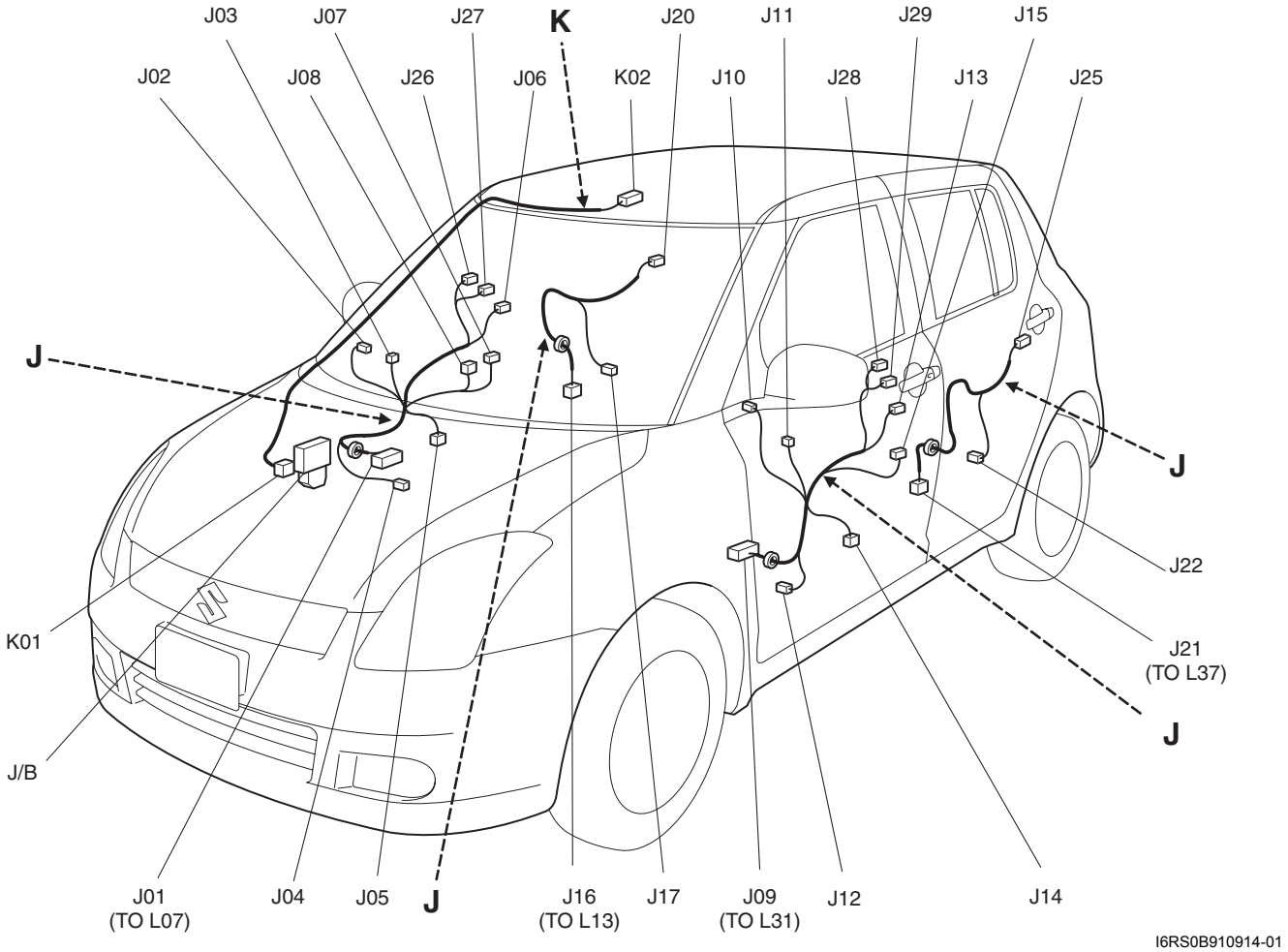
J: Front and rear door wire, rear door joint wire / K: Roof wire (RHD)



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J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L07)	J06/N	Front door lock switch (Driver side)
J02/BLK	Tweeter (Driver side)	J07/N	Power mirror switch (Driver side)
J03/N	Power mirror motor (Driver side)	J08/BLU	Power window main switch
J04/N	Front speaker (Driver side)	J26/N	Door antenna (Driver side)
J05/GRY	Front power window motor (Driver side)	J27/N	Request switch (Driver side)

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J14/GRY	Front power window motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J15/N	Power window sub switch
J11/N	Power mirror motor (Passenger side)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (Passenger side)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)		

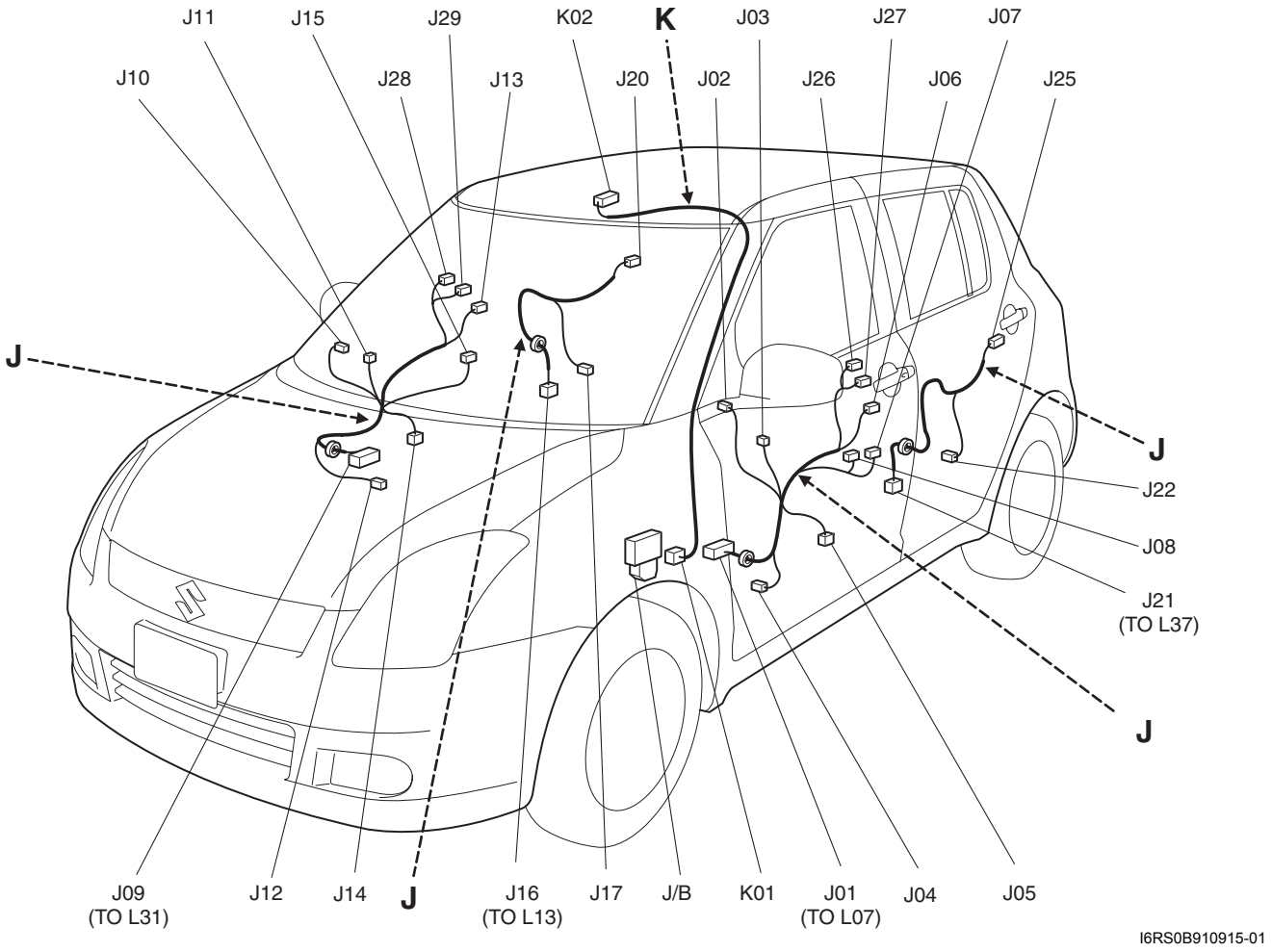
J: Rear door wire (IF EQPD)

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

J: Front and rear door wire, rear door joint wire / K: Roof wire (LHD)



J: Front door wire (Drive side)

No./Color	Connective position	No./Color	Connective position
J01/N	Floor harness (To L07)	J06/N	Front door lock switch (Driver side)
J02/BLK	Tweeter (Driver side)	J07/N	Power mirror switch (Driver side)
J03/N	Power mirror motor (Driver side)	J08/BLU	Power window main switch
J04/N	Front speaker (Driver side)	J26/N	Door antenna (Driver side)
J05/GRY	Front power window motor (Driver side)	J27/N	Request switch (Driver side)

J: Front door wire (Passenger side)

No./Color	Connective position	No./Color	Connective position
J09/N	Floor harness (To L03)	J14/GRY	Front power window motor (Passenger side)
J10/BLK	Tweeter (Passenger side)	J15/N	Power window sub switch
J11/N	Power mirror motor (Passenger side)	J28/N	Door antenna (Passenger side)
J12/N	Front speaker (Passenger side)	J29/N	Request switch (Passenger side)
J13/N	Front door lock motor (Passenger side)		

J: Rear door wire

No./Color	Connective position	No./Color	Connective position
J16/N	Floor harness (To L13)	J21/N	Floor harness (To L37)
J17/N	Rear speaker (R)	J22/N	Rear speaker (L)
J20/N	Rear door lock motor (R)	J25/N	Rear door lock motor (L)

K: Roof wire

No./Color	Connective position	No./Color	Connective position
K01/N	J/B	K02/GRY	Interior light

Floor

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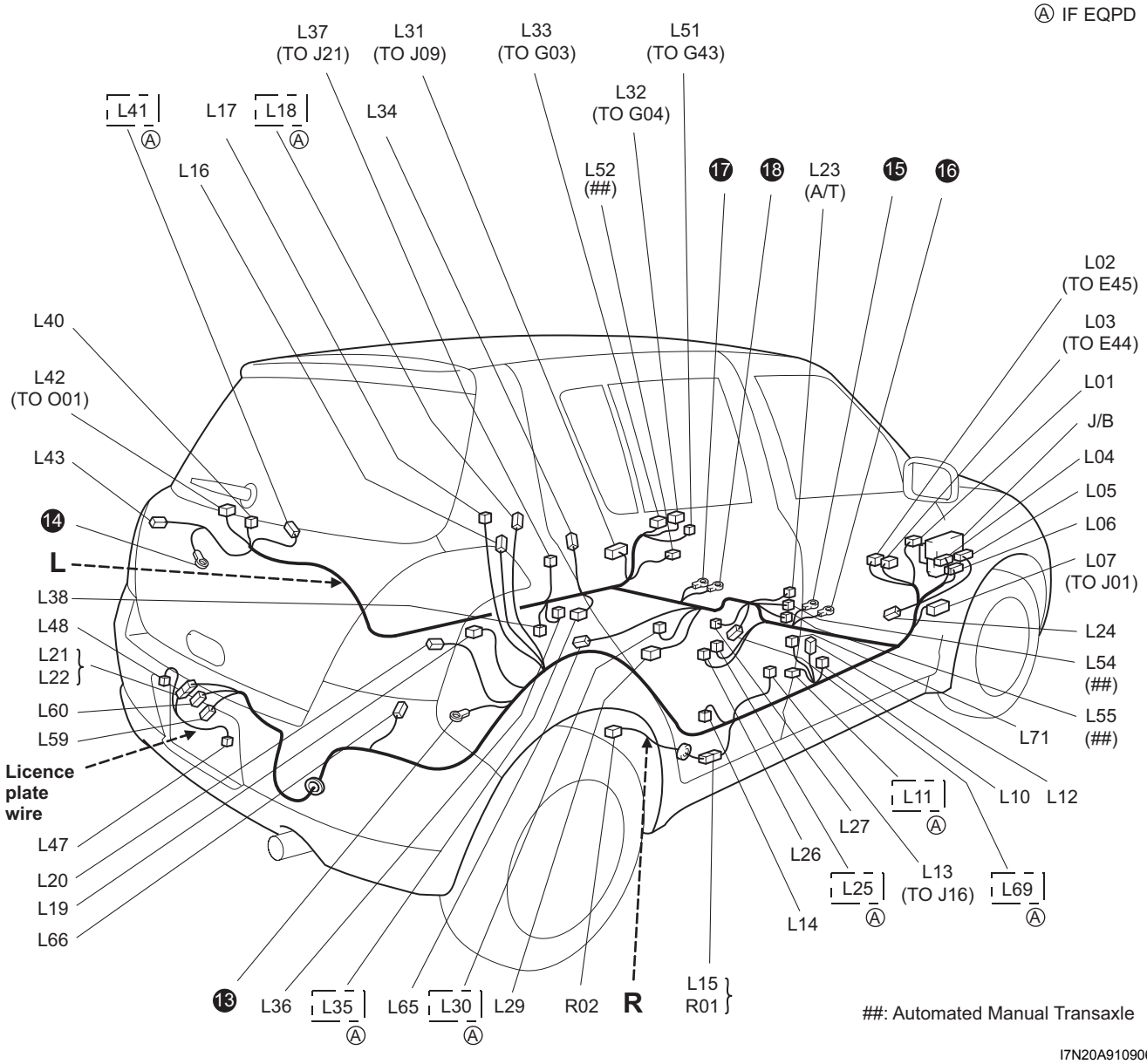
L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (RHD, 5dr)



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L02/N	Main harness (To E45)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L03/YEL	Main harness (To E44)	L31/N	Front door wire (Passenger side) (To J09)
L04/YEL	J/B	L32/YEL	Instrument panel harness (To G04)
L05/N	J/B	L33/N	Instrument panel harness (To G03)
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L35/N (IF EQPD)	Passenger side-sensor
L10/BLK	Pretensioner (Driver side)	L36/BLK	Pretensioner (Passenger side)
L11/N (IF EQPD)	Driver side-sensor	L37/N	Rear door wire (L) (To J21)
L12/N	Front door switch (Driver side)	L38/N	Wheel speed sensor (RL)
L13/N (IF EQPD)	Rear door wire (R) (To J16)	L40/N (IF EQPD)	Rear door switch (L)
L14/N	Wheel speed sensor (RR)	L41/BLK (IF EQPD)	Side curtain air-bag (L)
L15/GRY	Fuel pump wire (To R01)	L42/N	Rear end door wire (To O01)
L16/N (IF EQPD)	Rear door switch (R)	L43/N	Rear combination light (L)
L17/N	High mounted stop light	L51/GRY	Instrument panel harness (To G43)
L18/BLK (IF EQPD)	Side curtain air-bag (R)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L19/GRY	Luggage compartment light	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L20/N	Rear combination light (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever assy
L21/N (IF EQPD)	License plate wire (To L22)	L59/GRY	Rear end antenna
L23/N (A/T)	A/T shift lever assy	L60/GRY (IF EQPD)	Rear fog light
L24/GRY	J/C	L65/BRN	Inside antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L66/BRN	Luggage antenna
L26/N	Seat belt switch	L69/BLU (IF EQPD)	TCSS off switch
L27/BLK	Parking brake switch	L71/BLU	J/C
L29/PNK	A/B SDM		

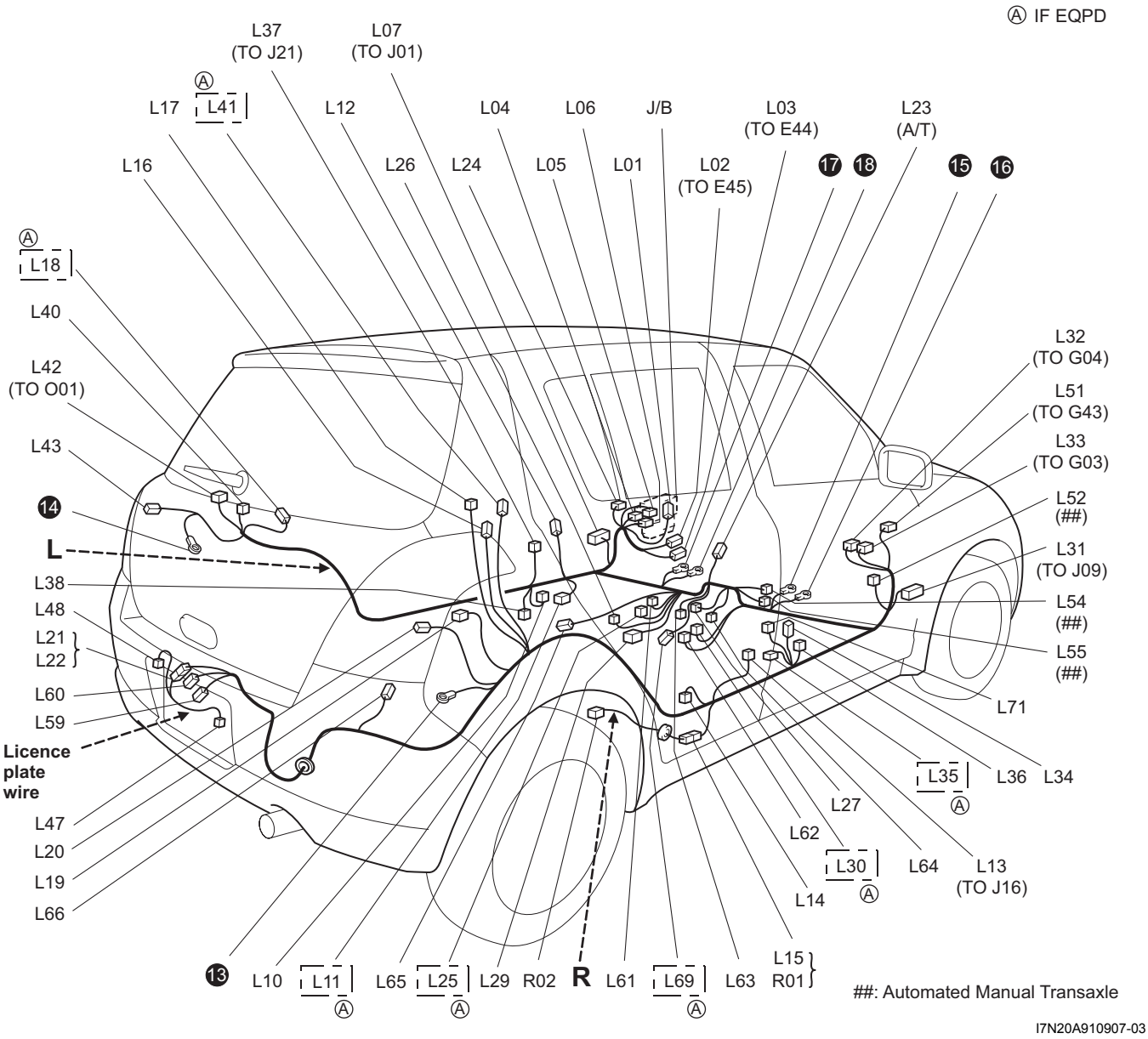
L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N (IF EQPD)	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (LHD, 5dr)



L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L31/N	Front door wire (Passenger side) (To J09)
L02/N	Main harness (To E45)	L32/YEL	Instrument panel harness (To G04)
L03/YEL	Main harness (To E44)	L33/N	Instrument panel harness (To G03)
L04/YEL	J/B	L34/N	Front door switch (Passenger side)
L05/N	J/B	L35/N (IF EQPD)	Passenger side-sensor
L06/N	J/B	L36/BLK	Pretensioner (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L37/N	Rear door wire (L) (To J21)
L10/BLK	Pretensioner (Driver side)	L38/N	Wheel speed sensor (RL)
L11/N (IF EQPD)	Driver side-sensor	L40/N (IF EQPD)	Rear door switch (L)
L12/N	Front door switch (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (L)
L13/N	Rear door wire (R) (To J16)	L42/N	Rear end door wire (To O01)
L14/N	Wheel speed sensor (RR)	L43/N	Rear combination light (L)
L15/GRY	Fuel pump wire (To R01)	L51/GRY	Instrument panel harness (To G43)
L16/N (IF EQPD)	Rear door switch (R)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L17/N	High mounted stop light	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L18/BLK (IF EQPD)	Side curtain air-bag (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever assy
L19/GRY	Luggage compartment light	L59/GRY	Rear end antenna
L20/N	Rear combination light (R)	L60/GRY (IF EQPD)	Rear fog light
L21/N	License plate wire (To L22)	L61/N	Seat heater (Driver side) and seat belt switch
L23/N (A/T)	A/T shift lever assy	L62/N	Seat heater (Passenger side)
L24/GRY	J/C	L63/YEL	Seat heater switch (Driver side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L64/GRN	Seat heater switch (Passenger side)
L26/N	Seat belt switch	L65/BRN	Inside antenna
L27/BLK	Parking brake switch	L66/BRN	Luggage antenna
L29/PNK	A/B SDM	L69/BLU (IF EQPD)	TCSS off switch
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM	L71/BLU	J/C
L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)		

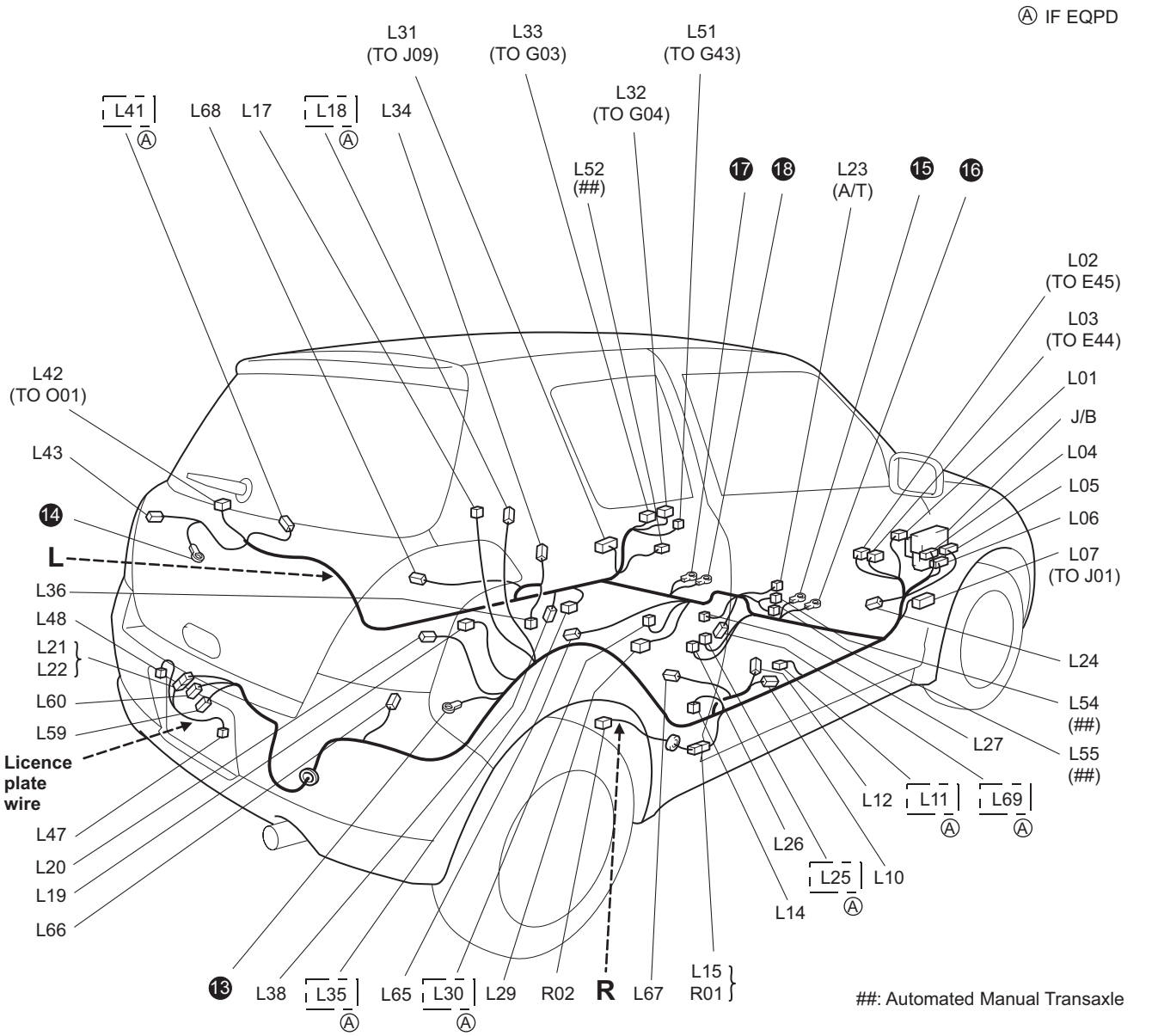
L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (NORMAL RHD, 3dr)



I7N20A910908-02

L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM
L02/N	Main harness (To E45)	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L03/YEL	Main harness (To E44)	L31/N	Front door wire (Passenger side) (To J09)
L04/YEL	J/B	L32/YEL	Instrument panel harness (To G04)
L05/N	J/B	L33/N	Instrument panel harness (To G03)
L06/N	J/B	L34/N	Front door switch (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L35/N (IF EQPD)	Passenger side-sensor
L10/BLK	Pretensioner (Driver side)	L36/BLK	Pretensioner (Passenger side)
L11/N (IF EQPD)	Driver side-sensor	L38/N	Wheel speed sensor (RL)
L12/N	Front door switch (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L14/N	Wheel speed sensor (RR)	L42/N	Rear end door wire (To O01)
L15/GRY	Fuel pump wire (To R01)	L43/N	Rear combination light (L)
L17/N	High mounted stop light	L51/GRY	Instrument panel harness (To G43)
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L19/GRY	Luggage compartment light	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L20/N	Rear combination light (R)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever assy
L21/N	License plate wire (To L22)	L59/GRY	Rear end antenna
L23/N (A/T)	A/T shift lever assy	L60/GRY (IF EQPD)	Rear fog light
L24/GRY	J/C	L65/BRN	Inside antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L66/BRN	Luggage antenna
L26/N	Seat belt switch	L67/N	Rear speaker (R)
L27/BLK	Parking brake switch	L68/N	Rear speaker (L)
L29/PNK	A/B SDM	L69/BLU (IF EQPD)	TCSS off switch

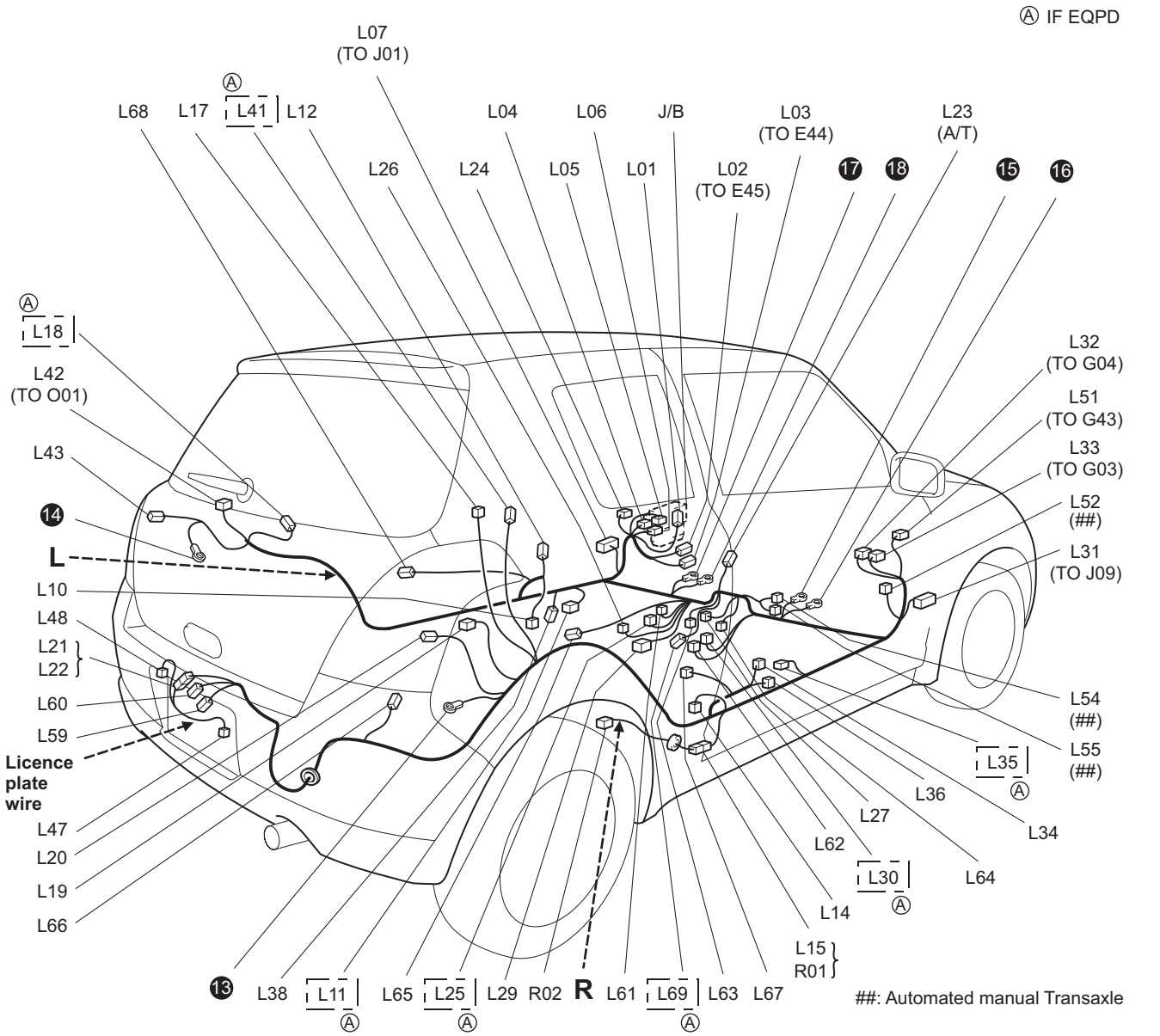
L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness, ACC socket wire, License plate wire / R: Fuel pump wire (NORMAL LHD, 3dr)



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L31/N	Front door wire (Passenger side) (To J09)
L02/N	Main harness (To E45)	L32/YEL	Instrument panel harness (To G04)
L03/YEL	Main harness (To E44)	L33/N	Instrument panel harness (To G03)
L04/YEL	J/B	L34/N	Front door switch (Passenger side)
L05/N	J/B	L35/N (IF EQPD)	Passenger side-sensor
L06/N	J/B	L36/BLK	Pretensioner (Passenger side)
L07/N	Front door wire (Driver side) (To J01)	L38/N	Wheel speed sensor (RL)
L10/BLK	Pretensioner (Driver side)	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L11/N (IF EQPD)	Driver side-sensor	L42/N	Rear end door wire (To O01)
L12/N	Front door switch (Driver side)	L43/N	Rear combination light (L)
L14/N	Wheel speed sensor (RR)	L51/GRY	Instrument panel harness (To G43)
L15/GRY	Fuel pump wire (To R01)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L17/N	High mounted stop light	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever assy
L19/GRY	Luggage compartment light	L59/GRY	Rear end antenna
L20/N	Rear combination light (R)	L60/GRY	Rear fog light
L21/N	License plate wire (To L22)	L61/N	Seat heater (Driver side) and seat belt switch
L23/N (A/T)	A/T shift lever assy	L62/N	Seat heater (Passenger side)
L24/GRY	J/C	L63/YEL	Seat heater switch (Driver side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L64/GRN	Seat heater switch (Passenger side)
L26/N	Seat belt switch	L65/BRN	Inside antenna
L27/BLK	Parking brake switch	L66/BRN	Luggage antenna
L29/PNK	A/B SDM	L67/N	Rear speaker (R)
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM	L68/N	Rear speaker (L)
L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)	L69/BLU (IF EQPD)	TCSS off switch

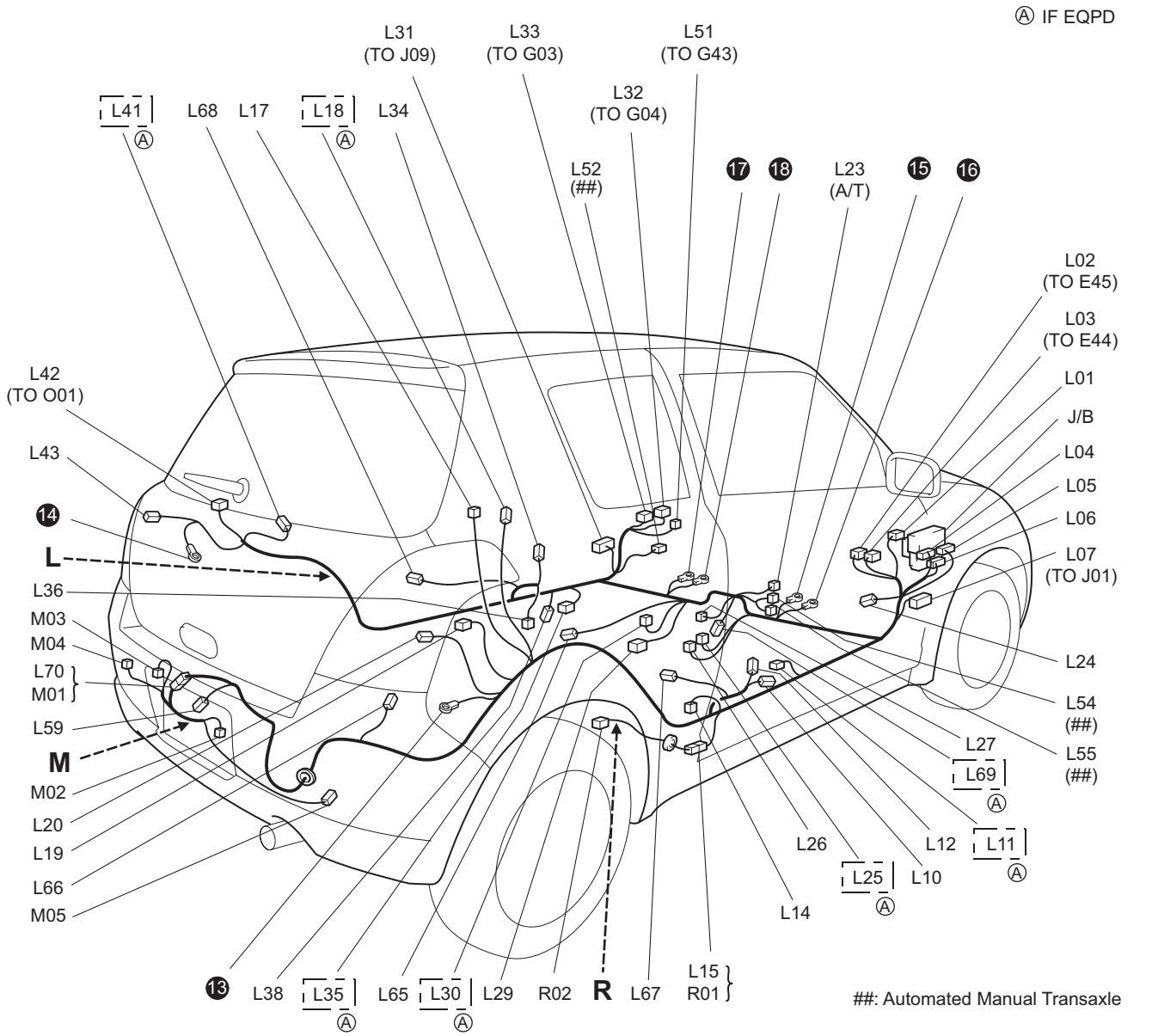
L: License plate wire

No./Color	Connective position	No./Color	Connective position
L22/N	Floor harness (To L21)	L48/N	License plate light #2
L47/N	License plate light #1		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness, ACC socket wire / M: Rear bumper wire / R: Fuel pump wire (SPORT RHD, 3dr)



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)
L02/N	Main harness (To E45)	L31/N	Front door wire (Passenger side) (To J09)
L03/YEL	Main harness (To E44)	L32/YEL	Instrument panel harness (To G04)
L04/YEL	J/B	L33/N	Instrument panel harness (To G03)
L05/N	J/B	L34/N	Front door switch (Passenger side)
L06/N	J/B	L35/N (IF EQPD)	Passenger side-sensor
L07/N	Front door wire (Driver side) (To J01)	L36/BLK	Pretensioner (Passenger side)
L10/BLK	Pretensioner (Driver side)	L38/N	Wheel speed sensor (RL)
L11/N (IF EQPD)	Driver side-sensor	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L12/N	Front door switch (Driver side)	L42/N	Rear end door wire (To O01)
L14/N	Wheel speed sensor (RR)	L43/N	Rear combination light (L)
L15/GRY	Fuel pump wire (To R01)	L51/GRY	Instrument panel harness (To G43)
L17/N	High mounted stop light	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L19/GRY	Luggage compartment light	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever assy
L20/N	Rear combination light (R)	L59/GRY	Rear end antenna
L23/N (A/T)	A/T shift lever assy	L65/BRN	Inside antenna
L24/GRY	J/C	L66/BRN	Luggage antenna
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L67/N	Rear speaker (R)
L26/N	Seat belt switch	L68/N	Rear speaker (L)
L27/BLK	Parking brake switch	L69/BRN (IF EQPD)	ESP® off switch
L29/PNK	A/B SDM	L70/GRY	Rear bumper wire (To M01)
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM		

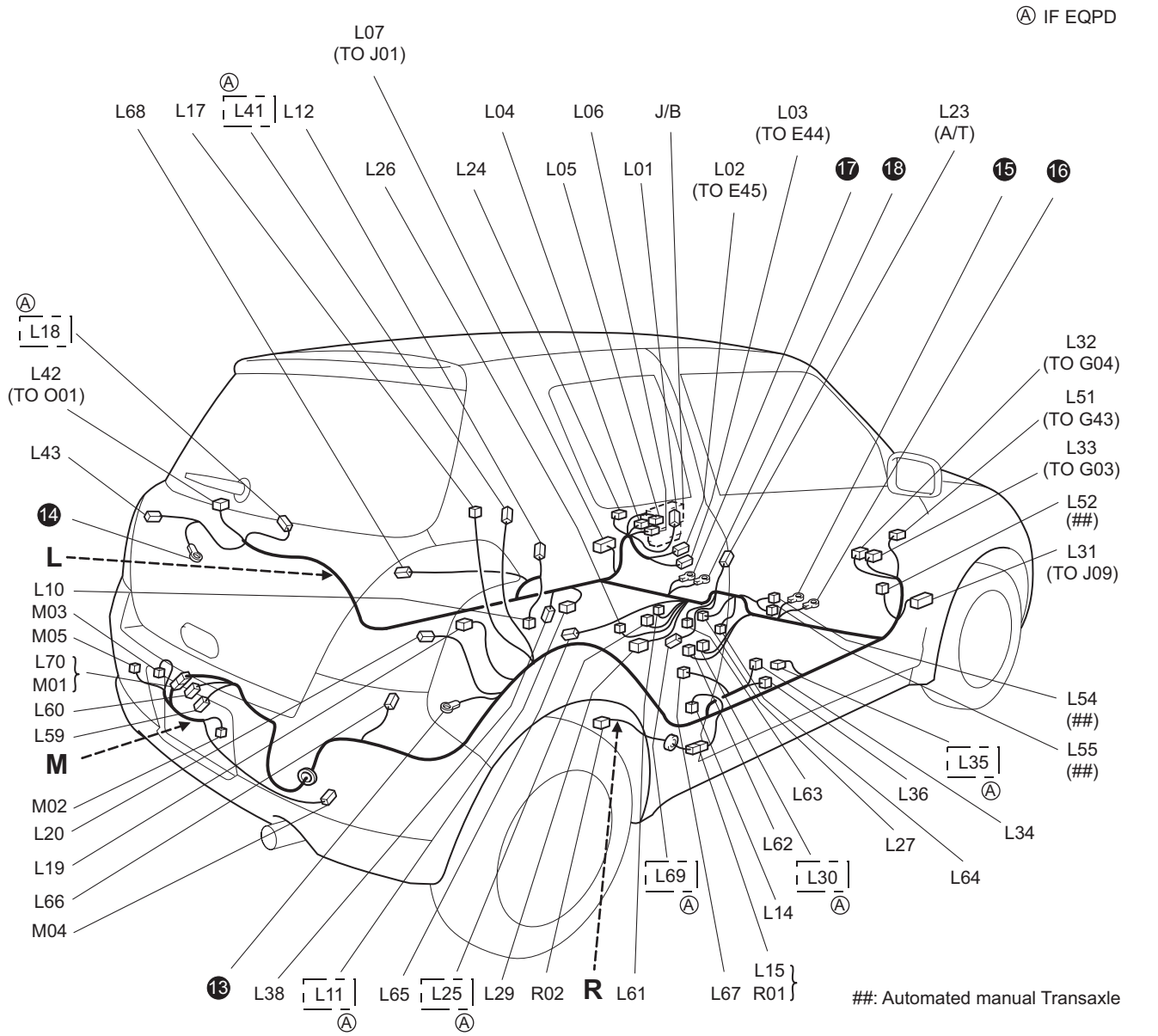
M: Rear bumper wire

No./Color	Connective position	No./Color	Connective position
M01/GRY	Floor harness (To L70)	M04/N	Back-up light
M02/N	License plate light (R)	M05/N	Rear fog light
M03/N	License plate light (L)		

R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

L: Floor harness, ACC socket wire / M: Rear bumper wire / R: Fuel pump wire (SPORT LHD, 3dr)



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L: Floor harness

No./Color	Connective position	No./Color	Connective position
L01/BLU	BCM	L32/YEL	Instrument panel harness (To G04)
L02/N	Main harness (To E45)	L33/N	Instrument panel harness (To G03)
L03/YEL	Main harness (To E44)	L34/N	Front door switch (Passenger side)
L04/YEL	J/B	L35/N (IF EQPD)	Passenger side-sensor
L05/N	J/B	L36/BLK	Pretensioner (Passenger side)
L06/N	J/B	L38/N	Wheel speed sensor (RL)
L07/N	Front door wire (Driver side) (To J01)	L41/BLK (IF EQPD)	Side curtain air-bag (Passenger side)
L10/BLK	Pretensioner (Driver side)	L42/N	Rear end door wire (To O01)
L11/N (IF EQPD)	Driver side-sensor	L43/N	Rear combination light (L)
L12/N	Front door switch (Driver side)	L51/GRY	Instrument panel harness (To G43)
L14/N	Wheel speed sensor (RR)	L52/N (Automated Manual Transaxle)	Automated Manual Transaxle control module
L15/GRY	Fuel pump wire (To R01)	L54/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever switch
L17/N	High mounted stop light	L55/N (Automated Manual Transaxle)	Automated Manual Transaxle shift lever assy
L18/BLK (IF EQPD)	Side curtain air-bag (Driver side)	L59/GRY	Rear end antenna
L19/GRY	Luggage compartment light	L61/N	Seat heater (Driver side) and seat belt switch
L20/N	Rear combination light (R)	L62/N	Seat heater (Passenger side)
L23/N (A/T)	A/T shift lever assy	L63/YEL	Seat heater switch (Driver side)
L24/GRY	J/C	L64/GRN	Seat heater switch (Passenger side)
L25/YEL (IF EQPD)	Side air-bag inflator (Driver side)	L65/BRN	Inside antenna
L26/N	Seat belt switch	L66/BRN	Luggage antenna
L27/BLK	Parking brake switch	L67/N	Rear speaker (R)
L29/PNK	A/B SDM	L68/N	Rear speaker (L)
L29/BRN (With Side A/B, Curtain A/B System)	A/B SDM	L69/BRN (IF EQPD)	ESP® off switch
L30/YEL (IF EQPD)	Side air-bag inflator (Passenger side)	L70/GRY	Rear bumper wire (To M01)
L31/N	Front door wire (Passenger side) (To J09)		

M: Rear bumper wire

No./Color	Connective position	No./Color	Connective position
M01/GRY	Floor harness (To L70)	M04/N	Back-up light
M02/N	License plate light (R)	M05/N	Rear fog light
M03/N	License plate light (L)		

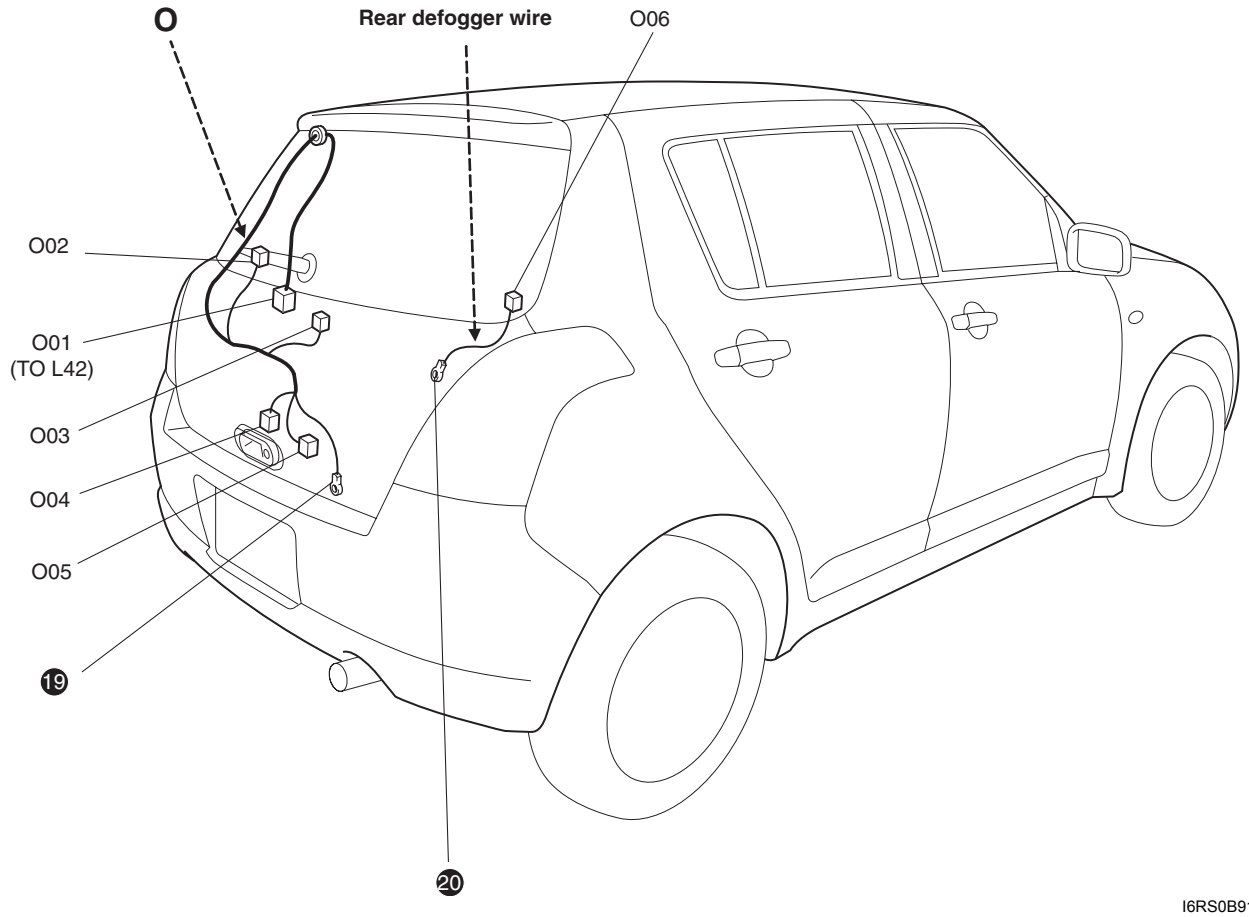
R: Fuel pump wire

No./Color	Connective position	No./Color	Connective position
R01/GRY	Floor harness (To L15)	R02/ORN	Fuel pump and gauge

Rear

S7N20A910A008

O: Rear end door harness, Rear defogger wire



I6RS0B910920-01

O: Rear end door harness

No./Color	Connective position	No./Color	Connective position
O01/N	Floor harness (To L42)	O04/N	Rear end door lock solenoid
O02/BLK	Rear defogger (+)	O05/GRN	Rear end door lock switch
O03/N	Rear wiper motor		

O: Rear defogger wire

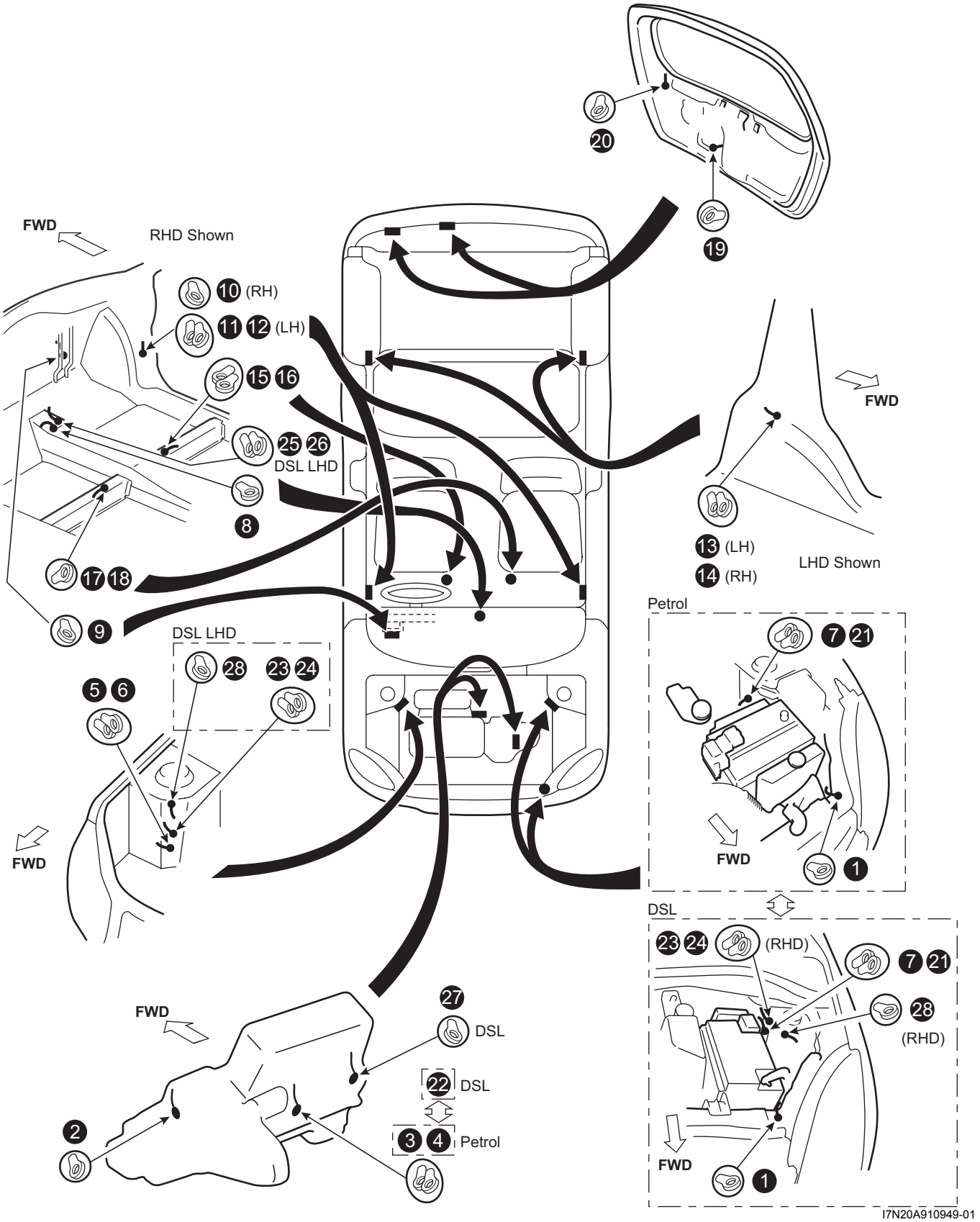
No./Color	Connective position	No./Color	Connective position
O06/BLK	Rear defogger (–)		

Ground Point

Ground (earth) Point

S7N20A910C001

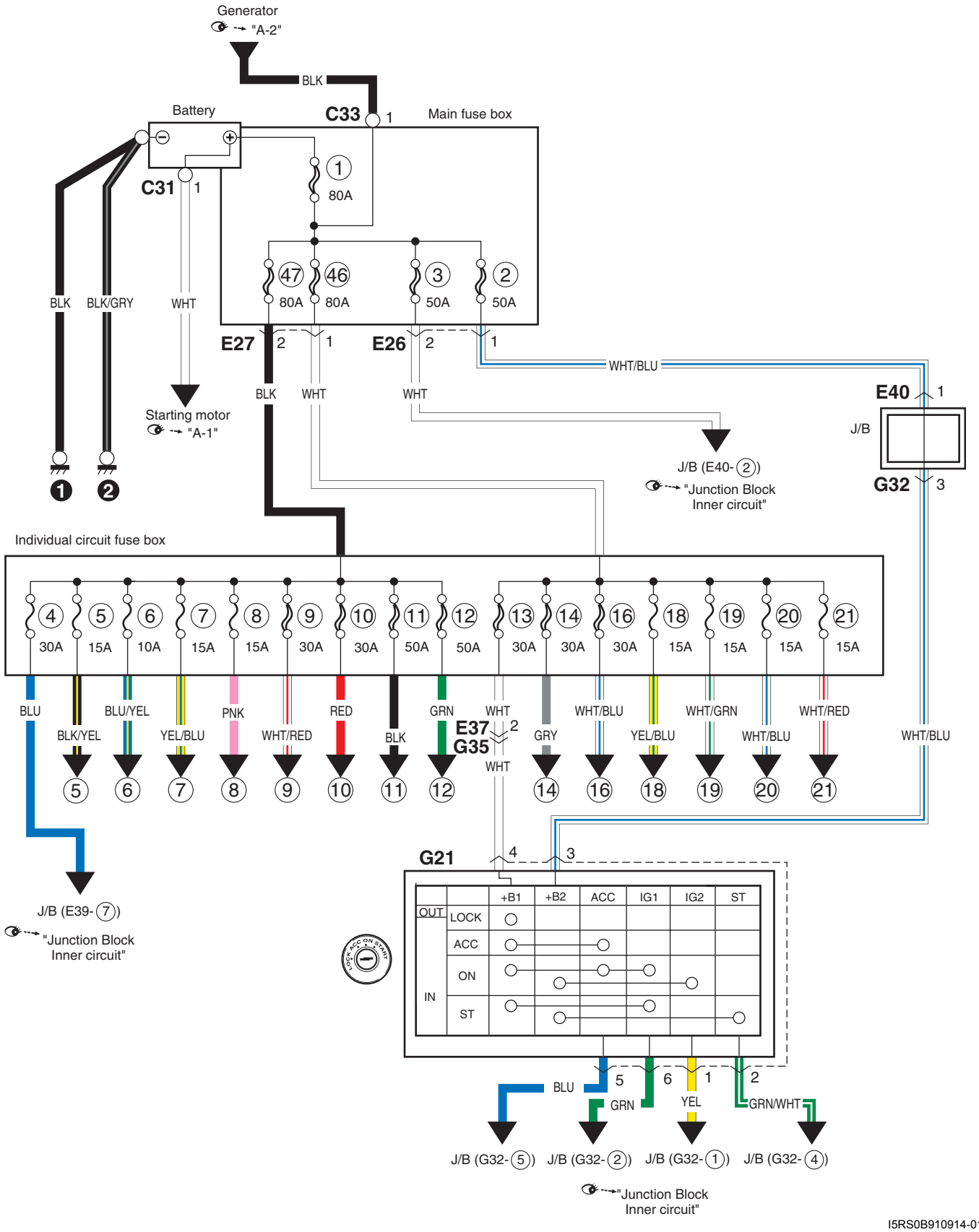
Refer to “Connector Layout Diagram”.



Power Supply Diagram

Power Supply Diagram (Petrol)

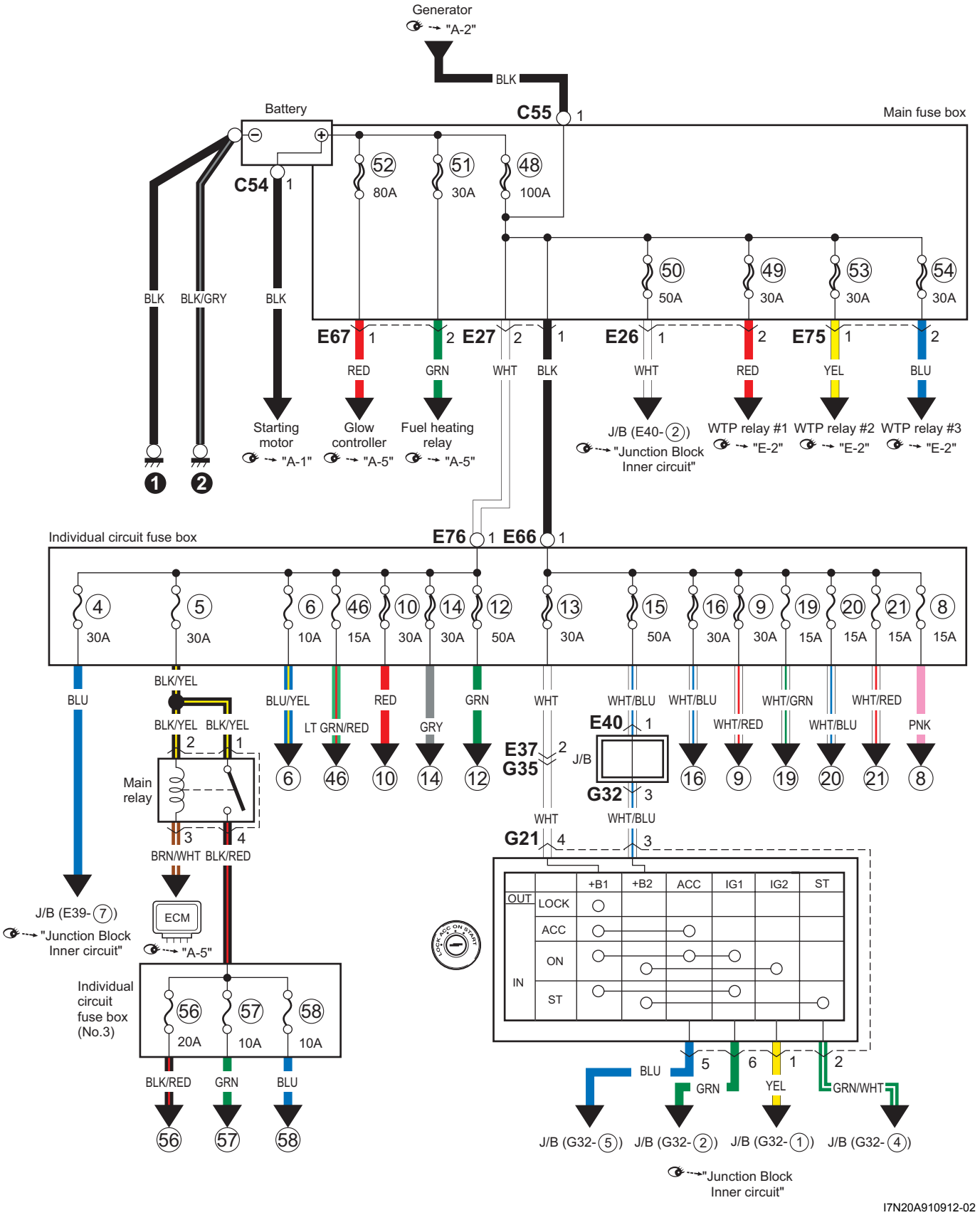
S7N20A910D001



I5RS0B910914-01

Power Supply Diagram (DSL)

S7N20A910D002



I7N20A910912-02

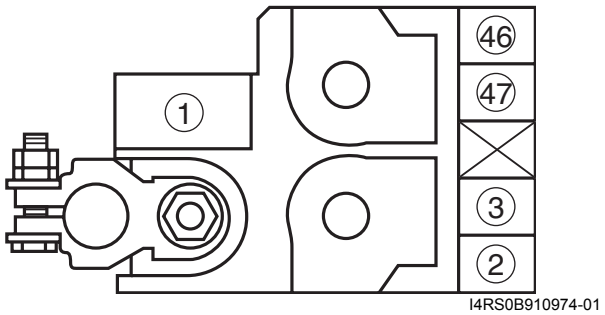
Fuses and the Protected Parts

S7N20A910D003

The chart below describes what parts each fuse protects.

Fuses in Main Fuse Box (Petrol)

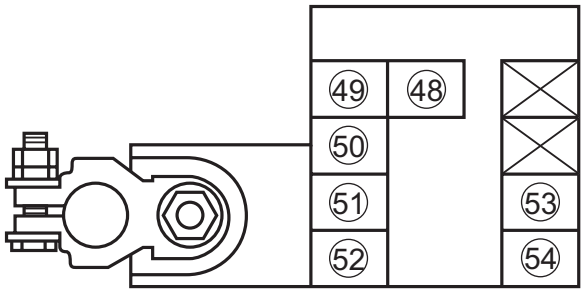
S7N20A910D004



I4RS0B910974-01

Fuses in Main Fuse Box (DSL)

S7N20A910D005

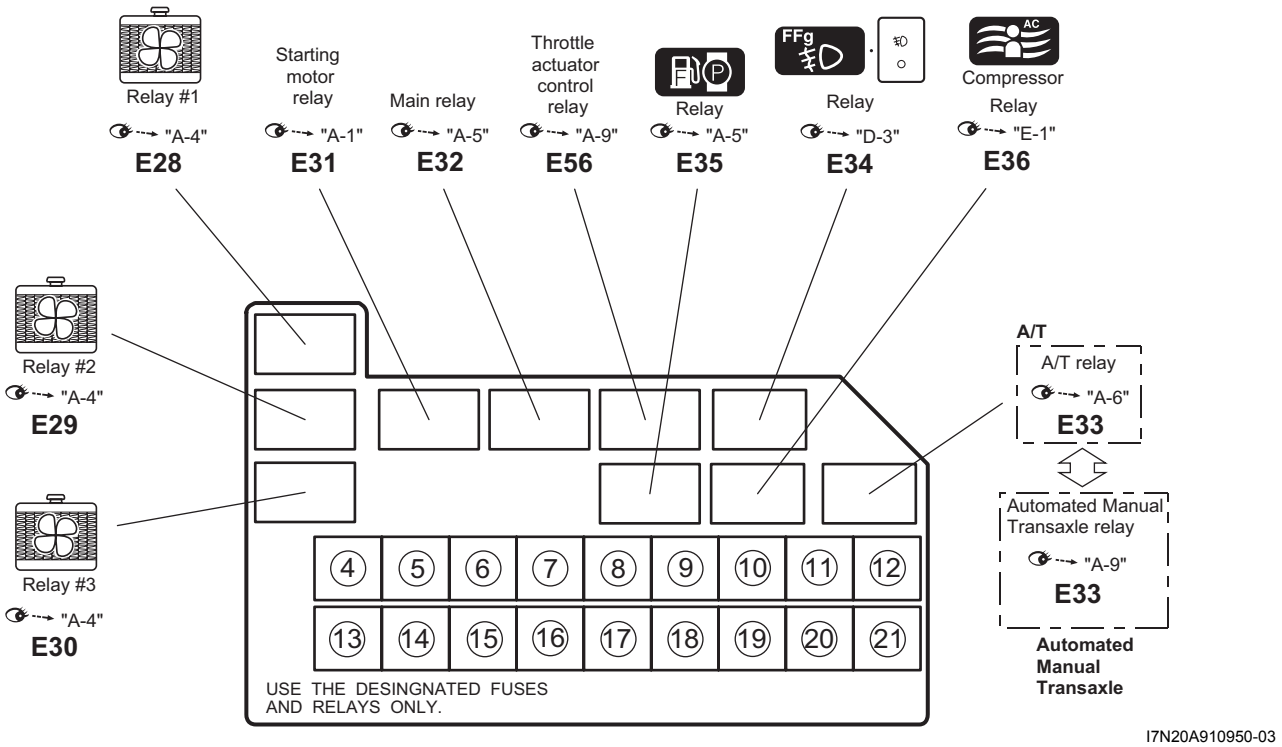


I7N20A910981-01

No.	Fuse	Protected circuit
①	80 A	All electric circuit
		Battery
		Generator
②	50 A	LAMP
③	50 A	IG switch
		Supplementary fuse box No.2 (In J/B)
㊻	80 A	Individual circuit fuse box
㊼	80 A	Individual circuit fuse box
㊽	100 A	All electric circuit
		Battery
		Generator
㊾	30 A	WTP relay
㊿	50 A	Supplementary fuse box No.2 (In J/B)
(51)	30 A	Fuel heating relay
(52)	80 A	Glow controller
(53)	30 A	WTP relay
(54)	30 A	WTP relay

Individual Circuit Fuse Box No. 1 (Petrol)

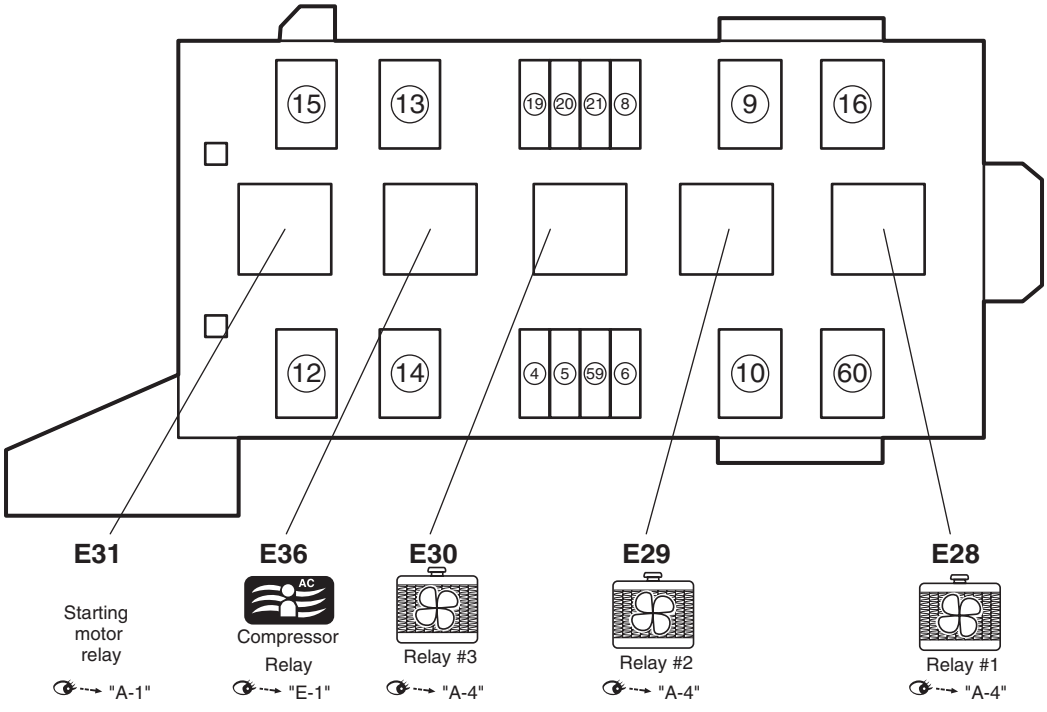
S7N20A910D006



I7N20A910950-03

Individual Circuit Fuse Box No. 1 (DSL)

S7N20A910D007



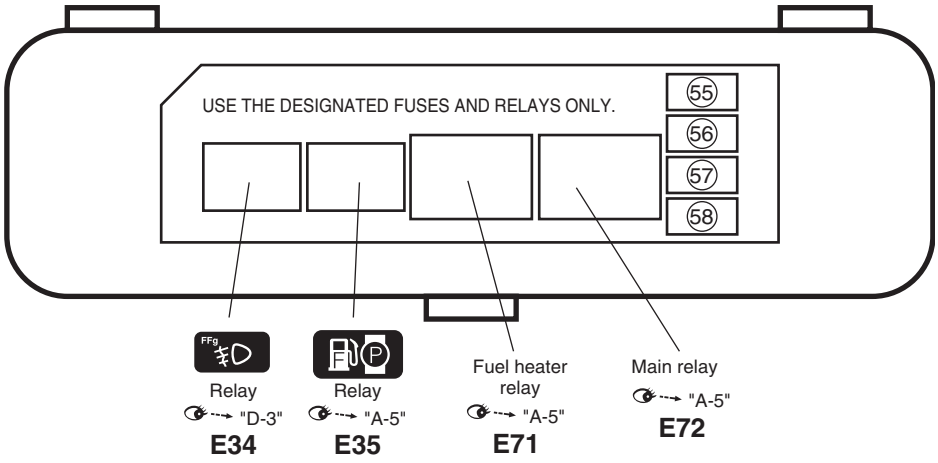
I5RS0B910917-02

No.	Fuse	Description on the cover	Protected circuit
④	30 A	HTR FAN	Blower motor relay
⑤	15 A (Petrol), 20 A (DSL)	FI	Main relay
⑥	10 A	A/C CPRSR	A/C compressor relay
⑦	15 A	AT	A/T relay
⑧	15 A	STOP LAMP	Brake light switch
⑨	30 A	ABS MOT	ABS control module
			ESP® control module
⑩	30 A	ST MOT	Starting motor relay
⑪	50 A	MTA	Automated Manual Transaxle relay
⑫	50 A	EPS	Power steering control module
⑬	30 A	IG ACC	IG switch
⑭	30 A	RDTR FAN	Radiator fan relay #1
			Radiator fan relay #2
			Radiator fan relay #3
⑮	50 A (DSL)	IG	IG switch
⑯	30 A	ABS SOL	ABS control module
			ESP® control module
⑰	BLANK	BLANK	BLANK
⑱	15 A	THR MOT	Throttle actuator control relay
⑲	15 A	FR FOG	Front fog light relay
⑳	15 A	H/L L	Headlight (L)
㉑	15 A	H/L R	Headlight (R)
㊾	15 A	FUEL PUMP	Fuel pump relay
㊿	BLANK	BLANK	BLANK

“MTA” is shown on the fuse box cover for the Automated Manual Transaxle.

Individual Circuit Fuse Box No. 3 (DSL)

S7N20A910D008

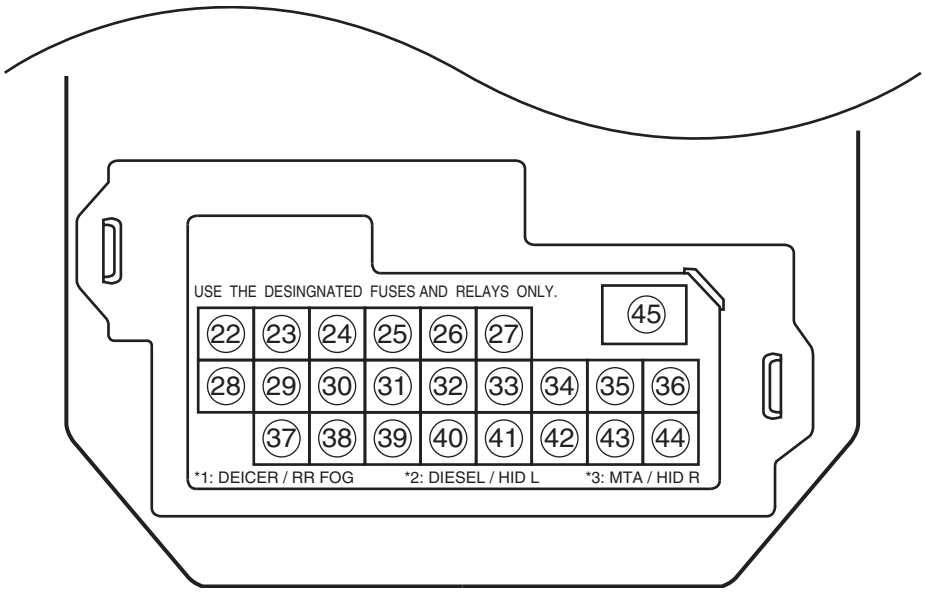


I5RS0B910918-01

No.	Fuse	Description on the cover	Protected circuit
㊺	BLANK	BLANK	BLANK
㊻	20 A	FI	ECM
㊼	10 A	FI-2	ECM
㊽	10 A	FI-3	EGR valve
			Boost pressure control solenoid valve

Individual Circuit Fuse Box No. 2 (In J/B)

S7N20A910D009



I5RS0B910919-02

No.	Fuse	Description on the cover	Protected circuit
㉒	BLANK	BLANK	BLANK
㉓	15 A	IG COIL	ECM
			Fuel pump relay
			Generator
			Heated oxygen relay #1
			Heated oxygen relay #2
			ICM
			IG coil #1
			IG coil #2
			Glow control module
			Fuel heating relay
			CPP switch
			A/C compressor relay
			MAF and IAT sensor
㉔	10 A	BACK	Back-up light switch (M/T)
			Air intake control actuator
			HVAC control unit
			HVAC control module
			Transaxle range sensor (A/T)
			Headlight beam leveling actuator (L)
			Headlight beam leveling actuator (R)
			Headlight leveling switch
			KLS control module
			WTP control module
㉕	10 A	MTR	BCM
			COMB meter
			Flasher relay
㉖	15 A	ACC 1	BCM
			Power mirror switch
㉗	15 A	ACC 2	Cigar lighter
			Audio
			Multi information display
			KLS control module

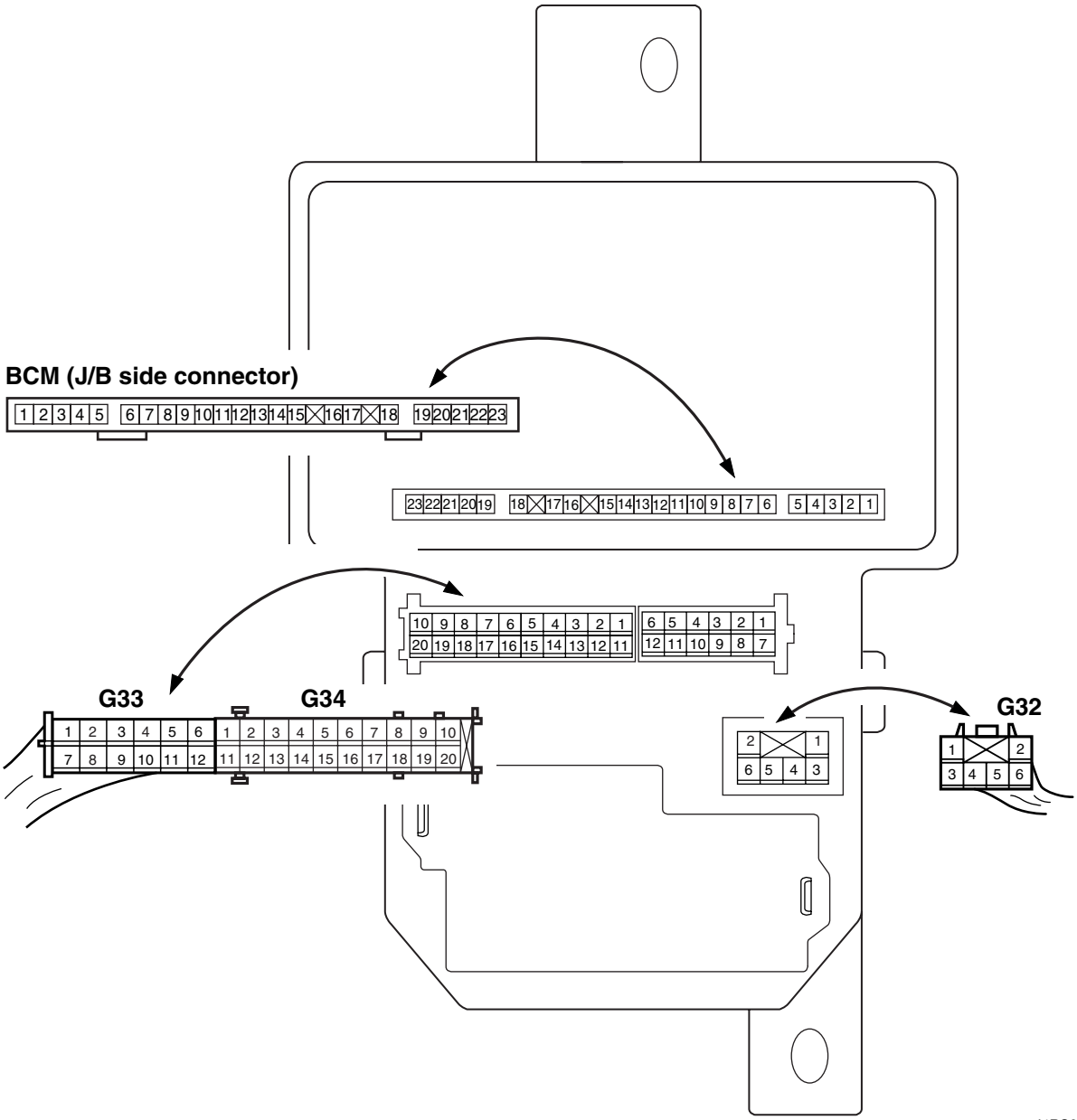
No.	Fuse	Description on the cover	Protected circuit
㉘	15 A	WIP	COMB switch
			Rear washer motor
			Rear wiper motor
			Rear wiper relay
			Windshield washer motor
			Windshield wiper motor
			DRL controller
㉙	10 A	IG1 SIG	A/T relay (A/T)
			Power steering control module
			Automated Manual Transaxle control module
			Brake light switch
㉚	15 A	A/B	A/B SDM
㉛	10 A	ABS	ABS control module
			ESP® control module
			Steering angle sensor
㉜	10 A	TAIL	COMB switch
㉝	BLANK	BLANK	BLANK
㉞	20 A	D/L	BCM
㉟	10 A	(*2 DIESEL / HID L)	ECM
			ICM
㊱	10 A	ST SIG	Starting motor relay
			Neutral switch
㊲	15 A	S/H	Seat heater switch (Driver side)
			Seat heater switch (Passenger side)
㊳	10 A	IG2 SIG	Blower motor relay
㊴	15 A	(*1 DEICER / RR FOG)	Rear fog light switch
㊵	15 A	RADIO	Audio
			BCM
			COMB meter
			DLC
			ECM
			Interior light
			Luggage compartment light
			Main switch (Key switch)
			Multi information display
			TCM
			KLS control module
			Steering angle sensor
㊶	20 A	RR DEF	Rear defogger relay
㊷	15 A	HAZ-HORN	Horn relay
			Flasher relay
㊸	10 A	(*3 MTA / HID R)	Automated Manual Transaxle control module
			Automated Manual Transaxle shift lever switch
㊹	20 A	P/WT	BLANK
㊺	30 A	P/W	Front power window main switch
			Front power window sub switch
			Rear power window sub switch (R)
			Rear power window sub switch (L)

“MTA” is shown on the fuse box cover for the Automated Manual Transaxle.

Junction Block (J/B) Connector / Fuse Layout

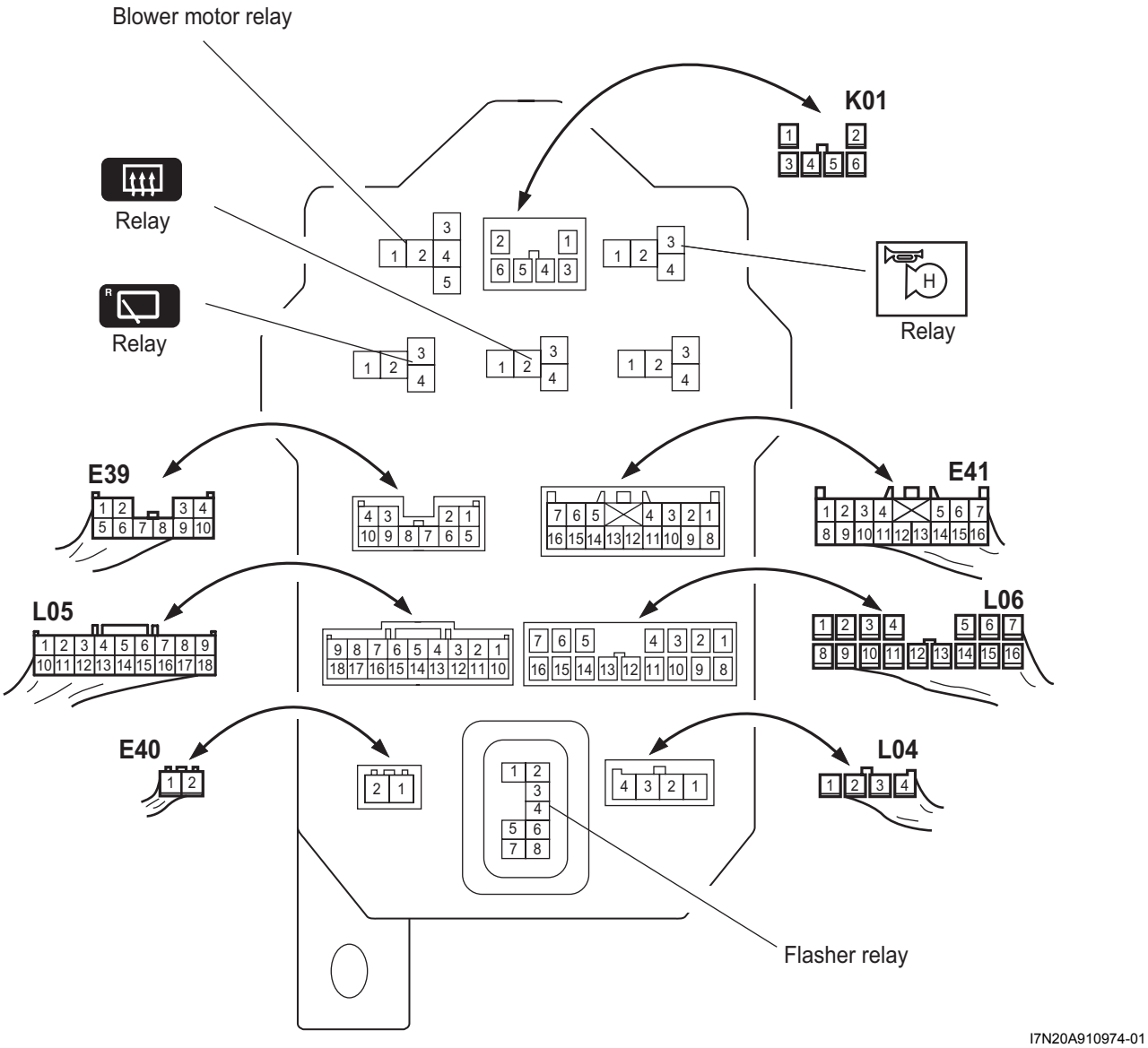
S7N20A910D010

BCM side



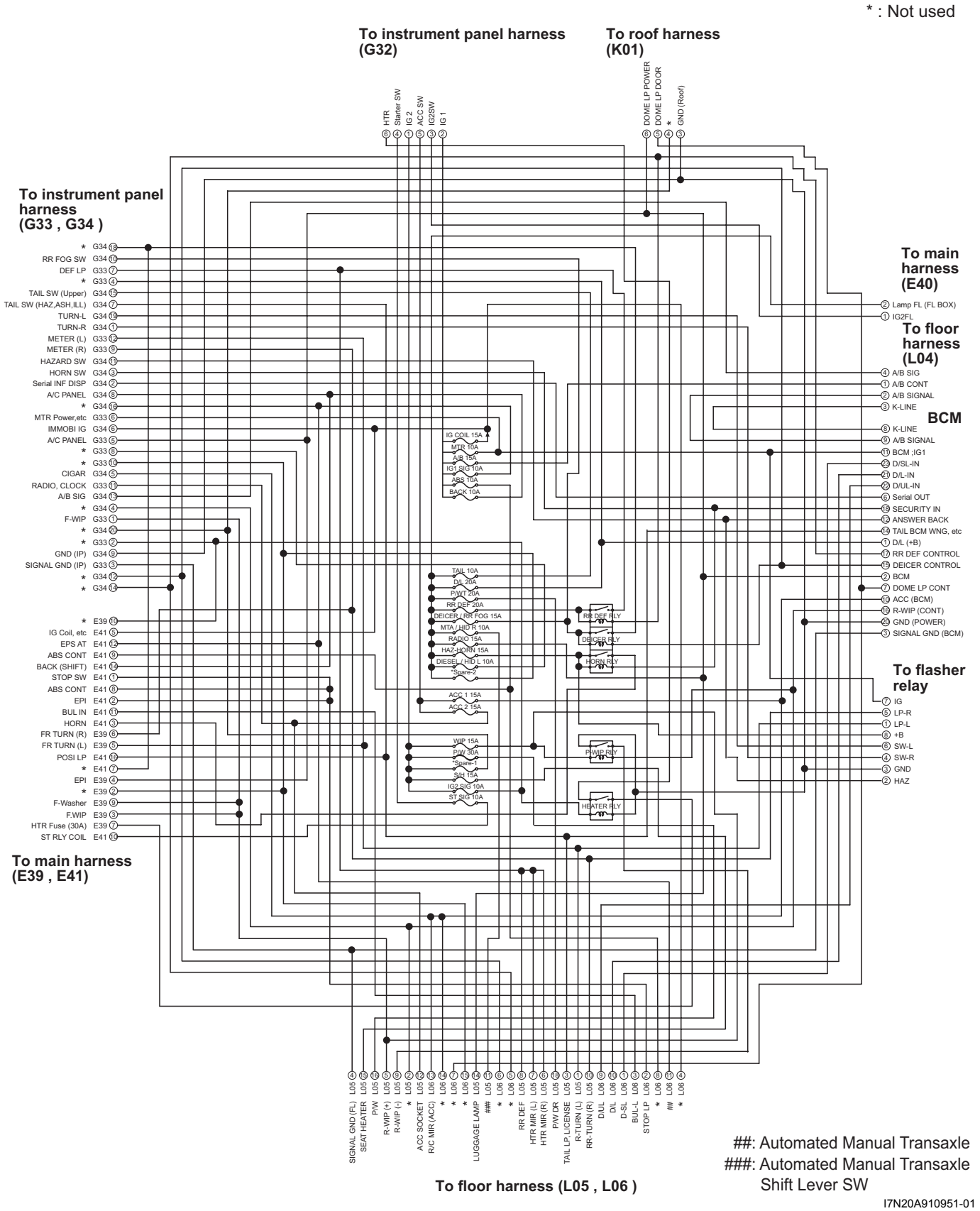
I4RS0A910908-01

Fuse side


Blower motor relay
K01
Relay
Relay
Relay
E39
E41
L05
L06
E40
L04
Flasher relay
I7N20A910974-01

Junction Block Inner Circuit (Overview)

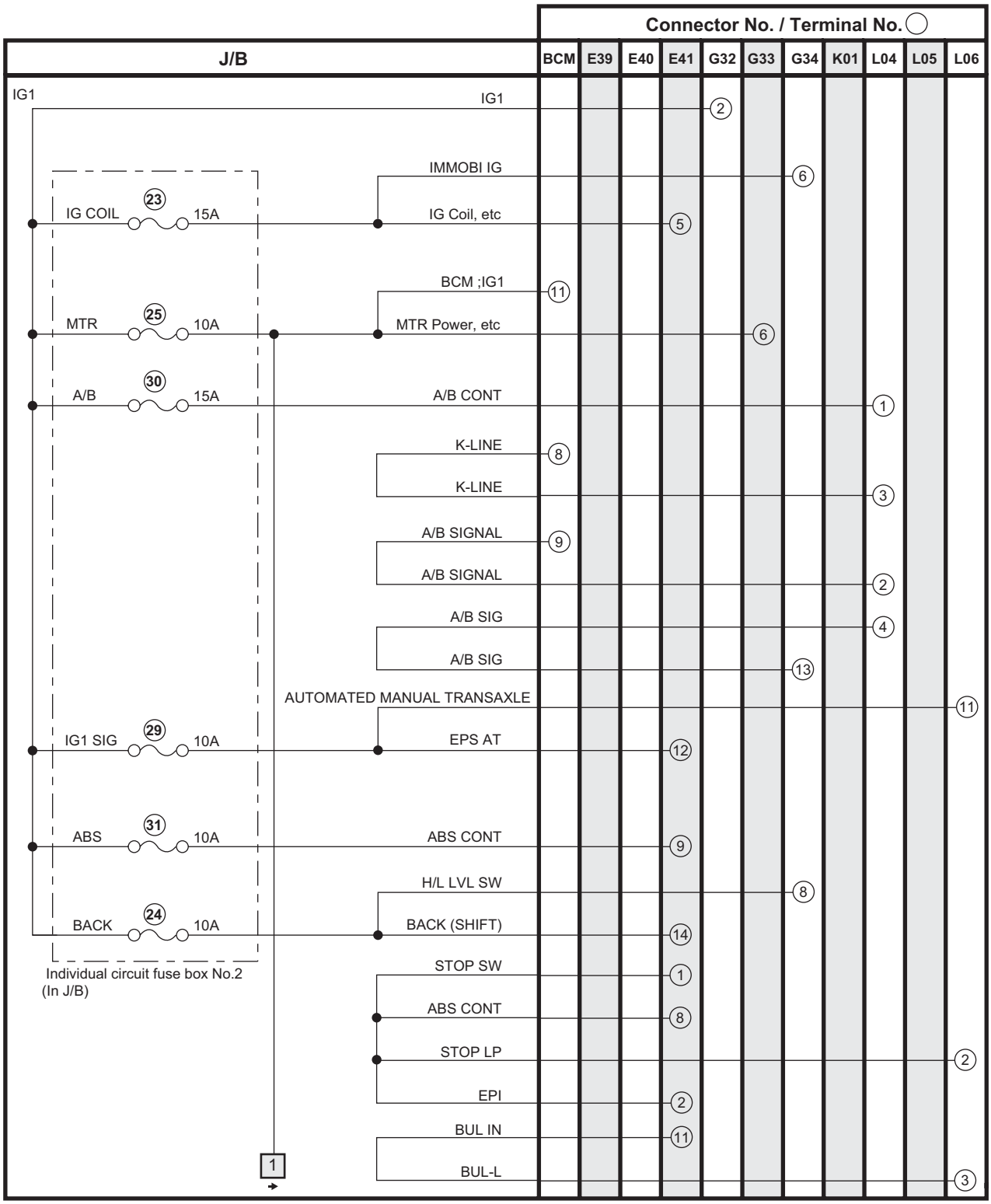
S7N20A910D011



I7N20A910951-01

Junction Block Inner Circuit (Detail)

S7N20A910D012



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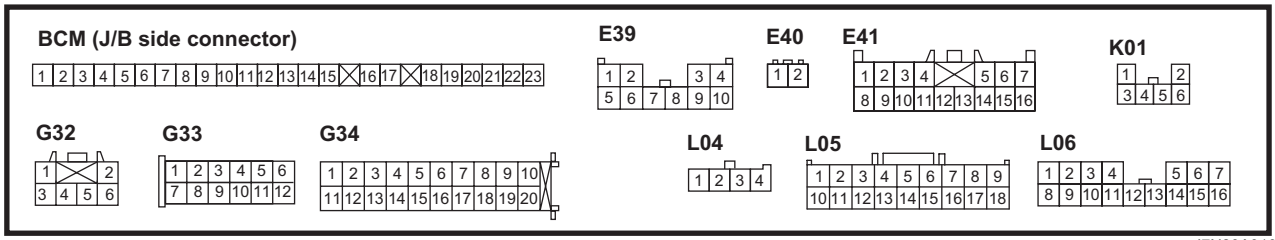

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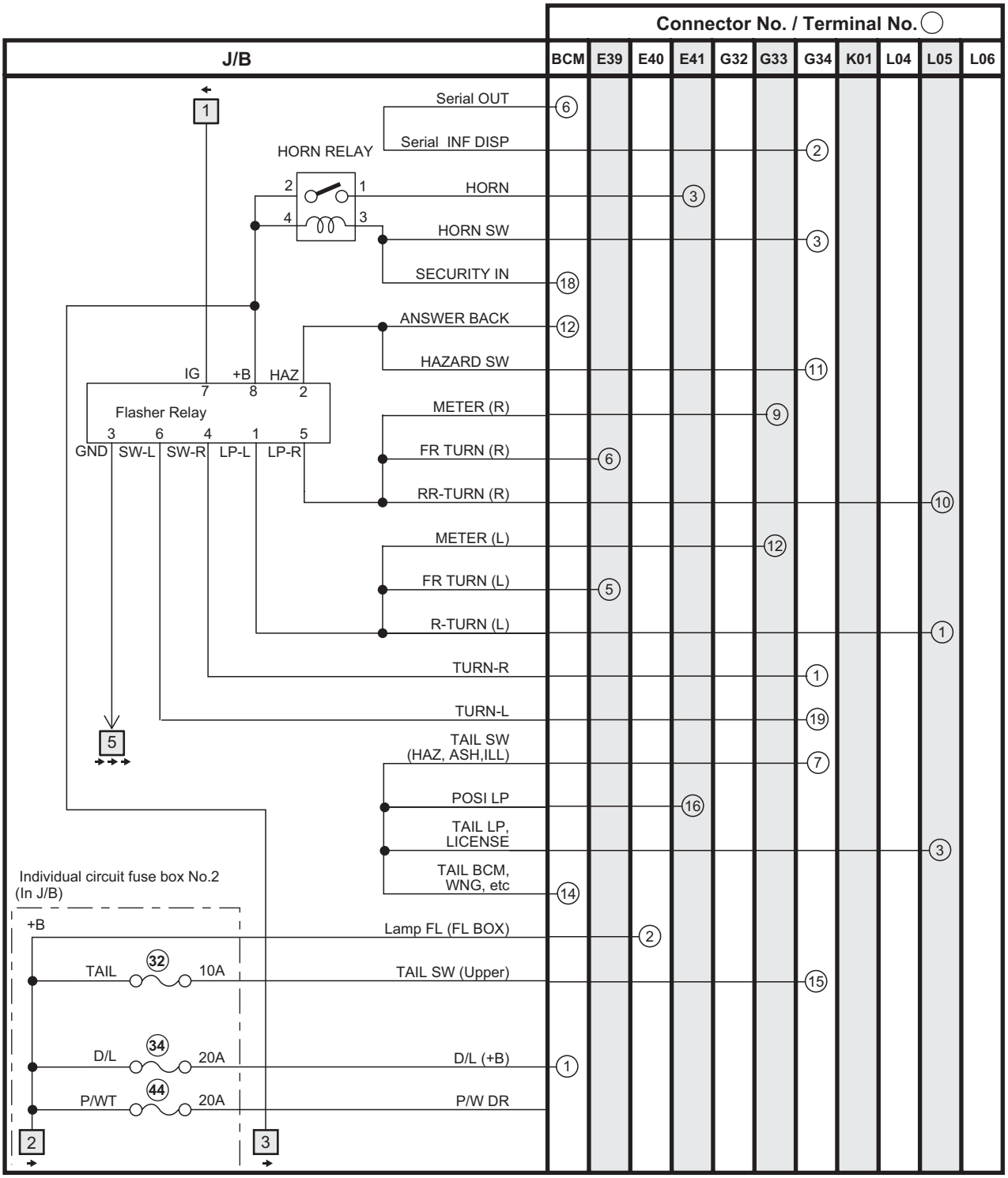

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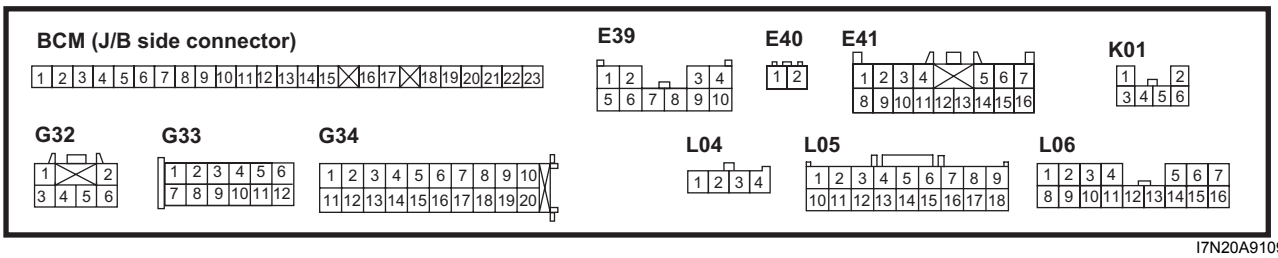

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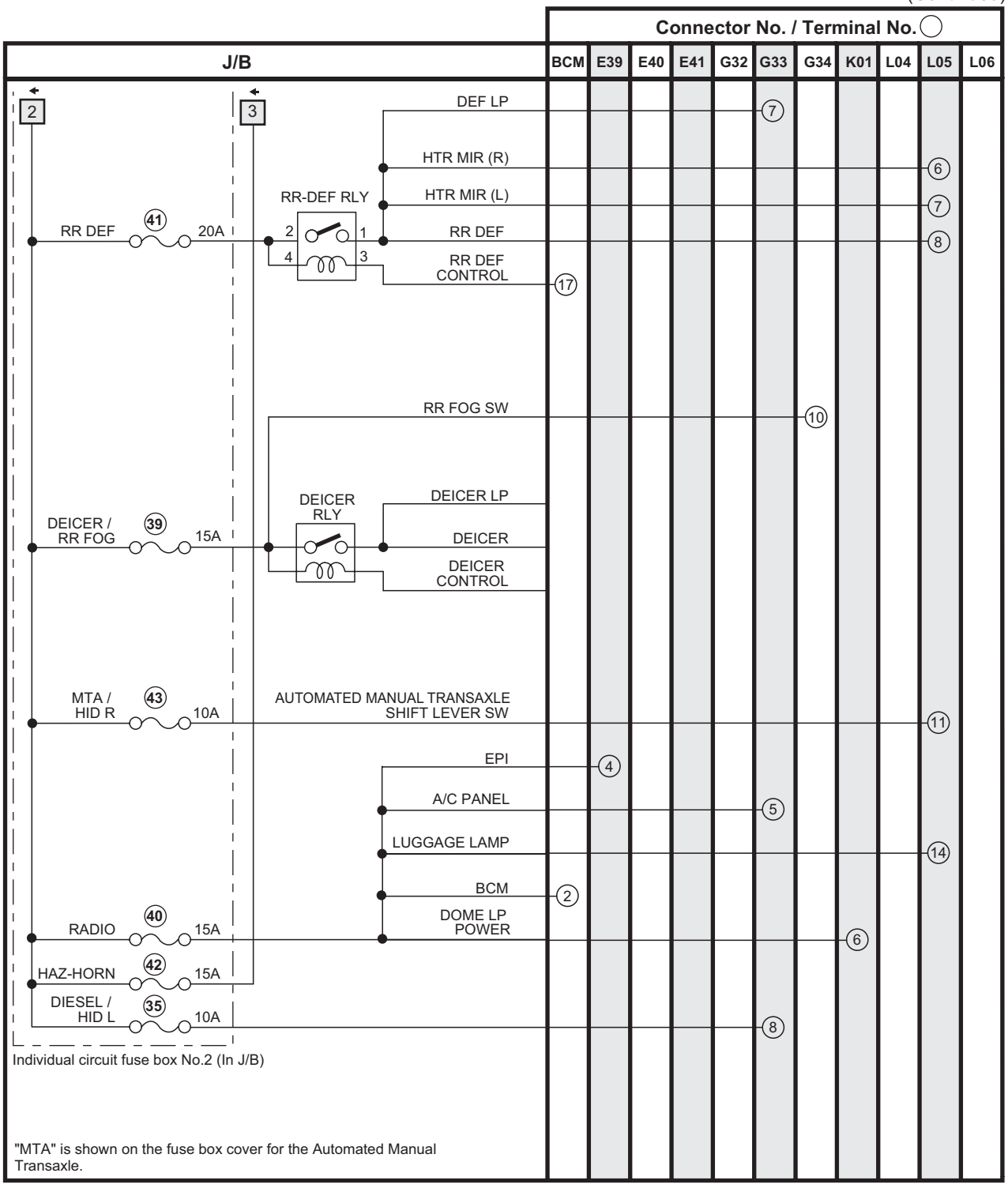

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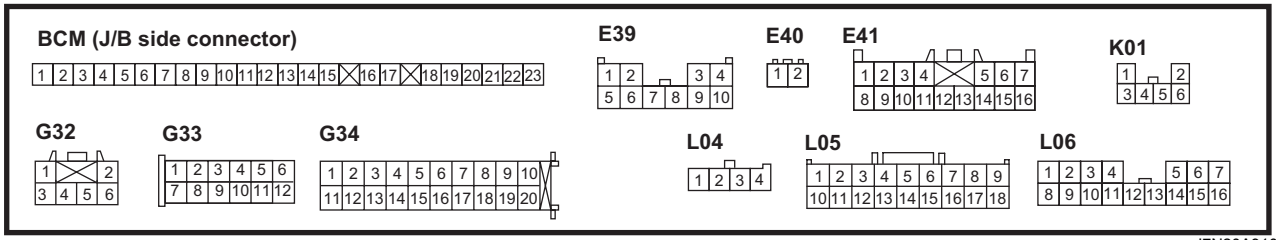

I7N20A910976-01

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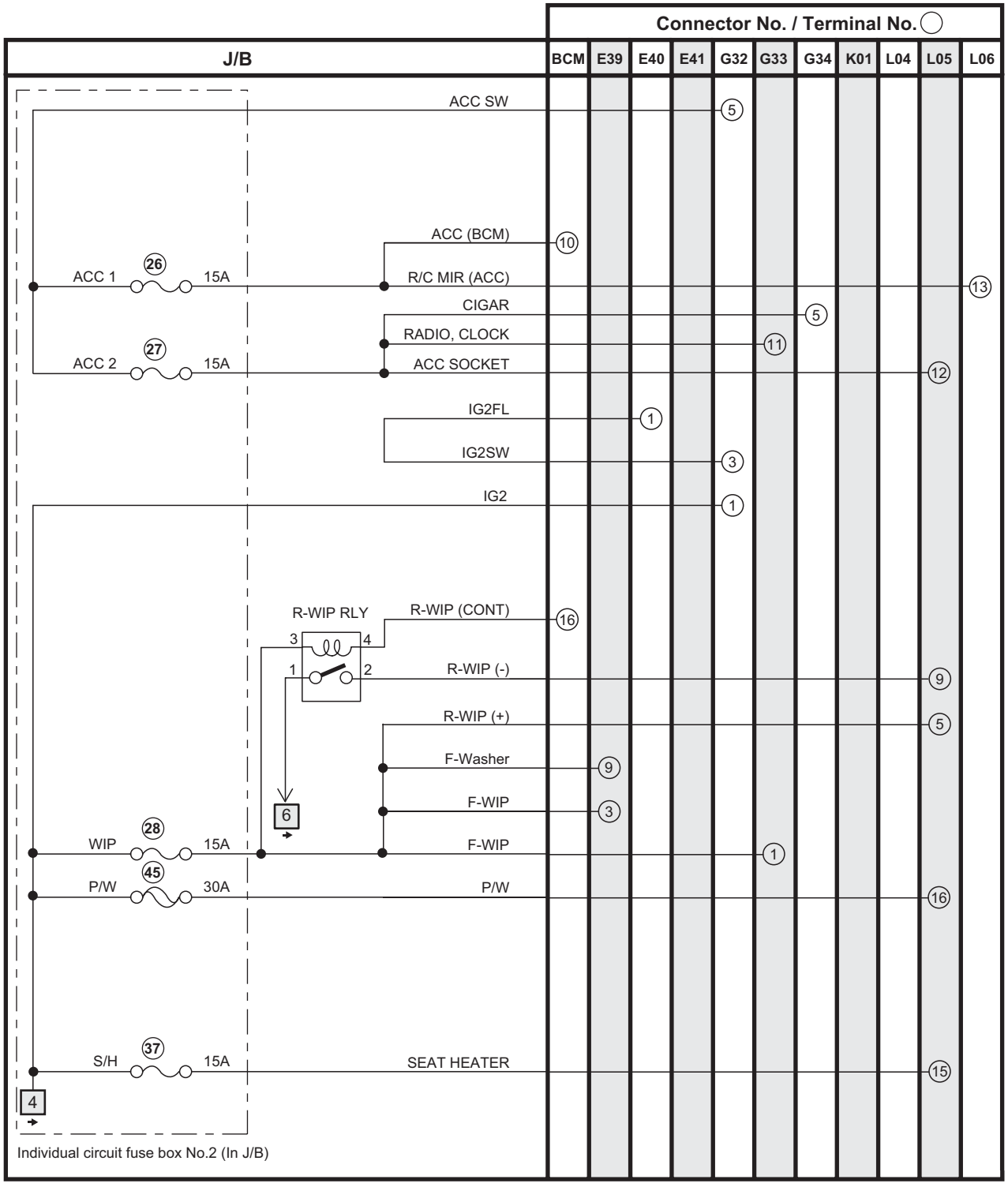

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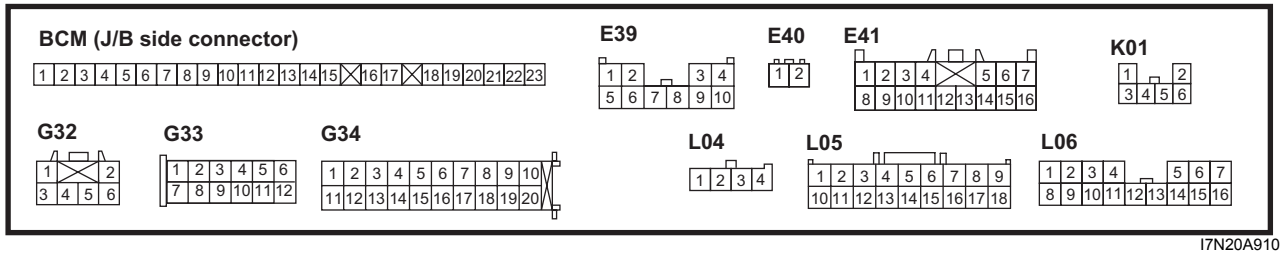

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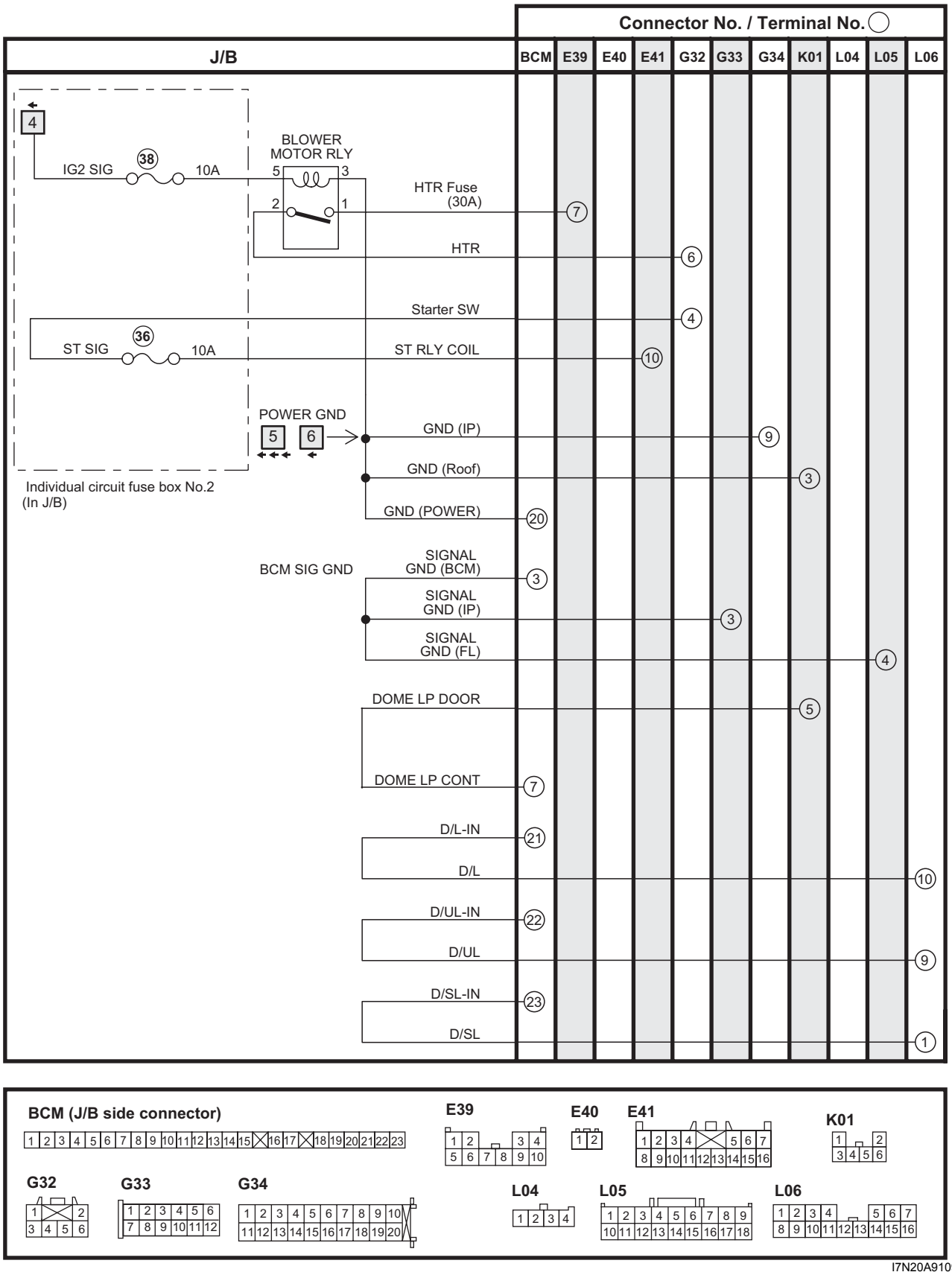

I7N20A910954-02

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System Circuit Diagram

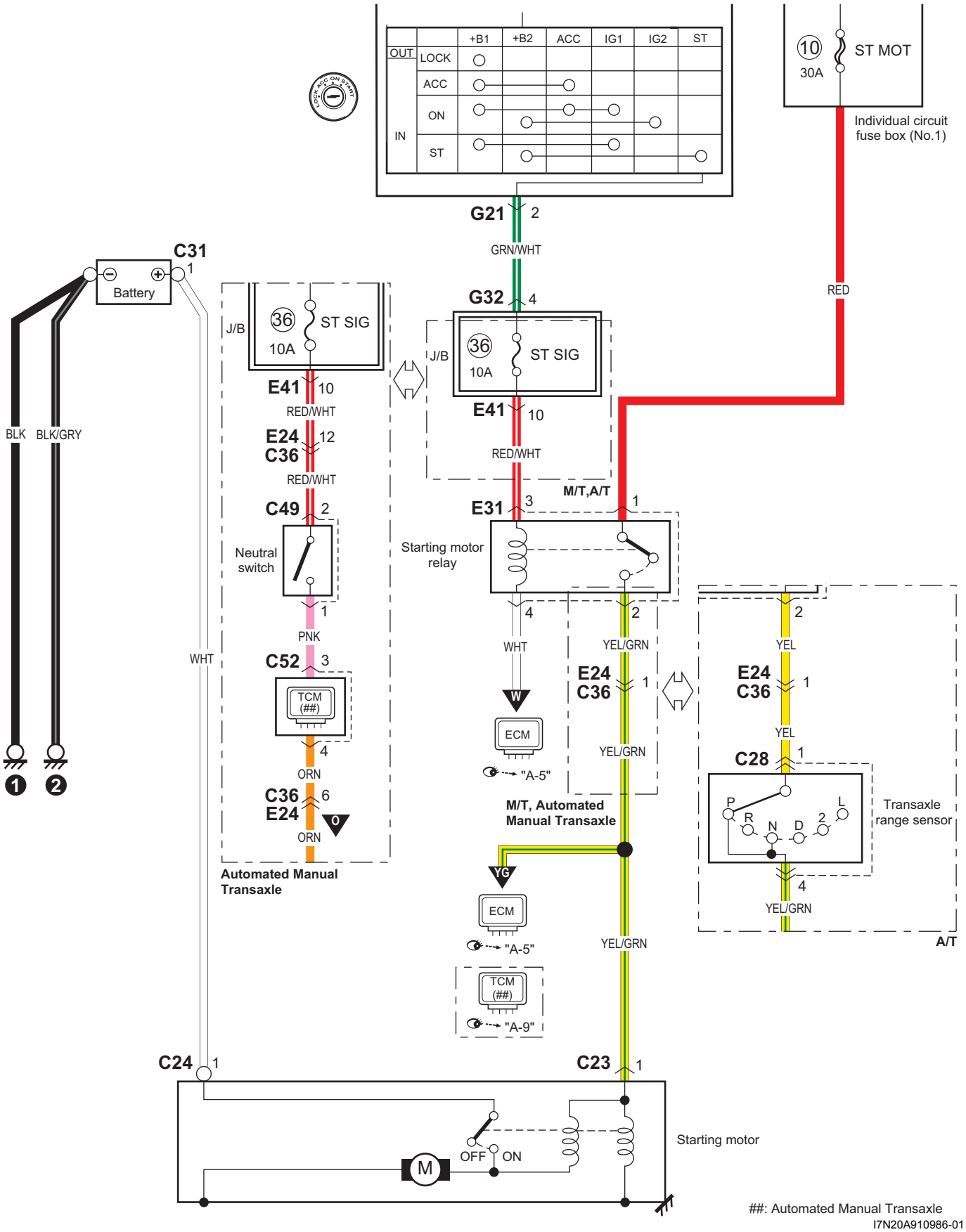
System Circuit Diagram

S7N20A910E001

Refer to “A-1 Cranking System Circuit Diagram (Petrol)”.
Refer to “A-1 Cranking System Circuit Diagram (DSL)”.
Refer to “A-2 Charging System Circuit Diagram (Petrol)”.
Refer to “A-2 Charging System Circuit Diagram (DSL)”.
Refer to “A-3 Ignition System Circuit Diagram (Petrol)”.
Refer to “A-4 Cooling System Circuit Diagram (Petrol)”.
Refer to “A-4 Cooling System Circuit Diagram (DSL)”.
Refer to “A-5 Engine and A/C Control System Circuit Diagram (Petrol)”.
Refer to “A-5 Engine and A/C Control System (DSL)”.
Refer to “A-6 A/T Control System Circuit Diagram”.
Refer to “A-7 Immobilizer System Circuit Diagram (Petrol)”.
Refer to “A-7 Immobilizer System Circuit Diagram (DSL)”.
Refer to “A-8 Body Control System Circuit Diagram”.
Refer to “A-9 Automated Manual Transaxle Control System Circuit Diagram (Petrol)”
Refer to “B-1 Windshield Wiper and Washer Circuit Diagram”.
Refer to “B-2 Rear Wiper and Washer Circuit Diagram”.
Refer to “B-3 Rear Defogger Circuit Diagram”.
Refer to “B-4 Power Window Circuit Diagram”.
Refer to “B-5 Power Door Lock Circuit Diagram”.
Refer to “B-6 Power Mirror Circuit Diagram”.
Refer to “B-7 Horn Circuit Diagram”.
Refer to “B-8 Seat Heater Circuit Diagram”
Refer to “B-9 Keyless Start System Circuit Diagram”
Refer to “C-1 Combination Meter Circuit Diagram (Meter)”.
Refer to “C-2 Combination Meter Circuit Diagram (Indicator)”.
Refer to “C-3 Combination Meter Circuit Diagram (Warning Light)”.
Refer to “D-1 Headlight System Circuit Diagram”.
Refer to “D-2 Position, Tail and Licence Plate Light System Circuit Diagram”.
Refer to “D-3 Front Fog Light System Circuit Diagram”.
Refer to “D-4 Illumination Light System Circuit Diagram”.
Refer to “D-5 Interior Light System Circuit Diagram”.
Refer to “D-6 Turn Signal and Hazard Warning Light System Circuit Diagram”.
Refer to “D-7 Brake Light System Circuit Diagram”.
Refer to “D-8 Back-Up Light System Circuit Diagram”.
Refer to “D-9 Headlight Beam Leveling System Circuit Diagram”
Refer to “D-10 Rear Fog Light Circuit Diagram”
Refer to “E-1 Heater System Circuit Diagram”.
Refer to “E-2 Auto A/C System Circuit Diagram”.
Refer to “E-3 WTP Heater Circuit Diagram (DSL)”.
Refer to “F-1 Air-Bag System Circuit Diagram”.
Refer to “F-2 Anti-Lock Brake System Circuit Diagram”.
Refer to “F-3 Electronic Stability Program System Circuit Diagram”.
Refer to “F-4 Power Steering System Circuit Diagram”.
Refer to “G-1 Audio System Circuit Diagram”.
Refer to “G-2 Multi Information Display / Accessory Socket System Circuit Diagram”.
Refer to “G-4 Navigation System Circuit Diagram”

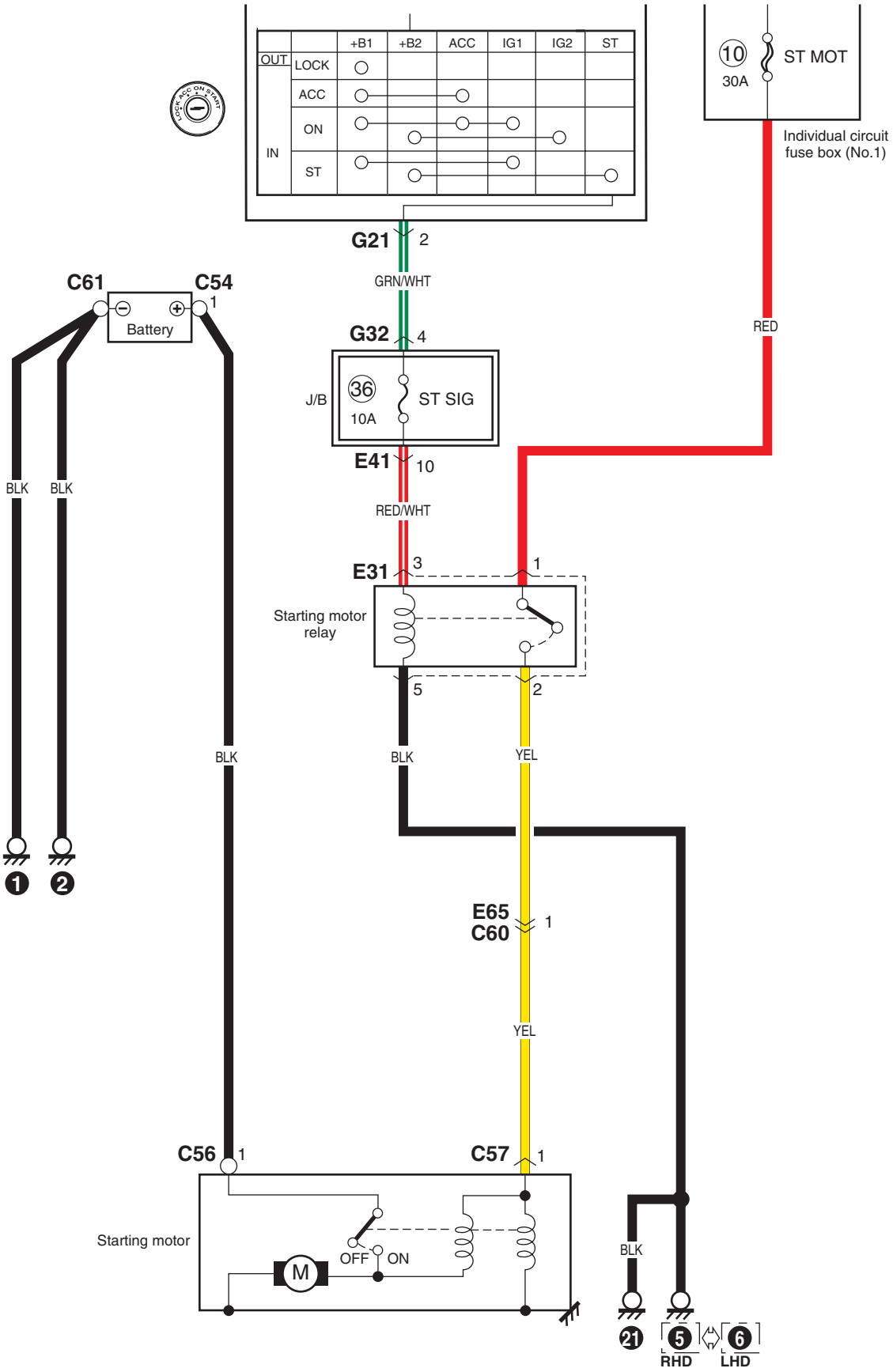
A-1 Cranking System Circuit Diagram (Petrol)

S7N20A910E002



A-1 Cranking System Circuit Diagram (DSL)

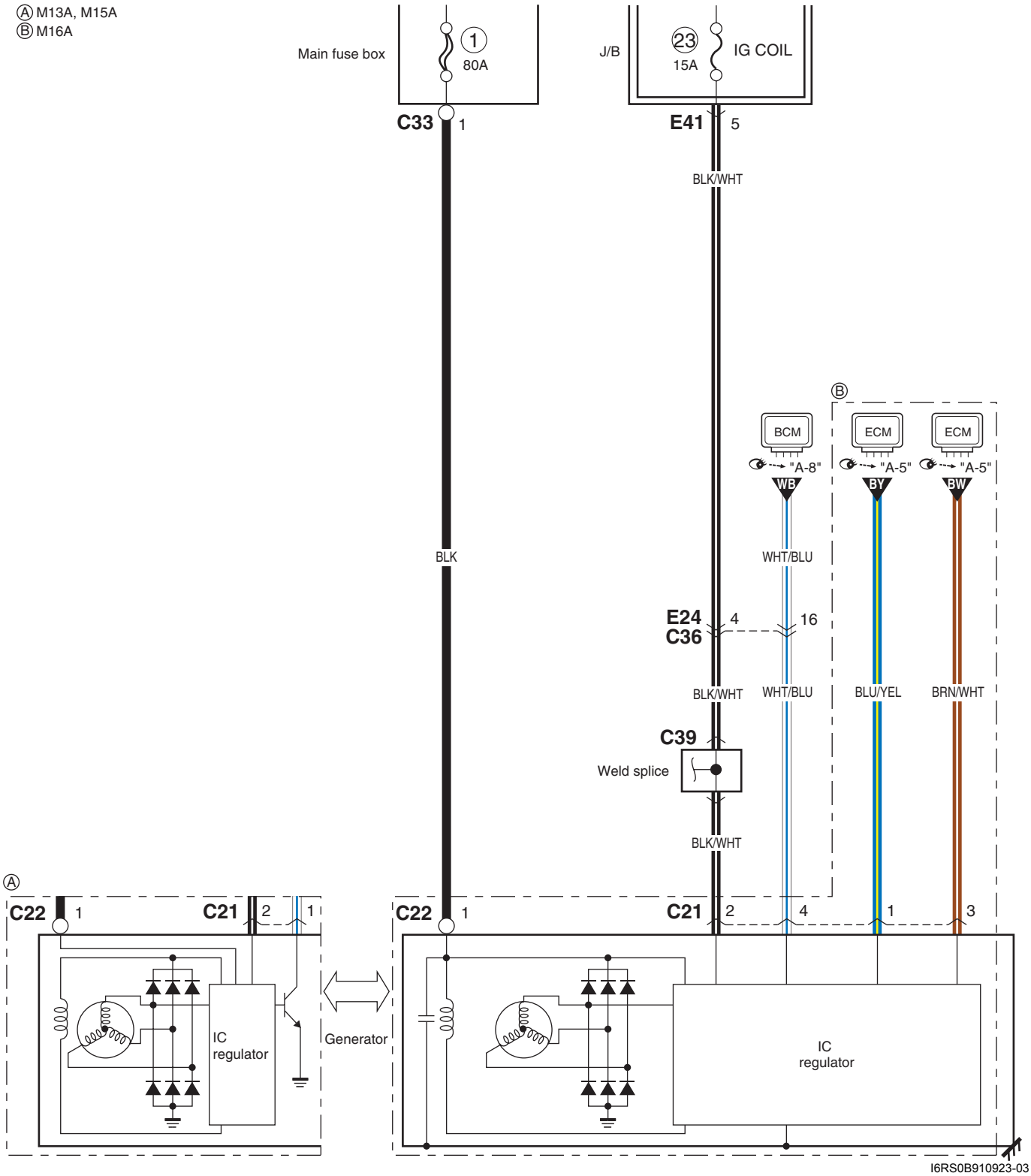
S7N20A910E003



I6RS0B910922-01

A-2 Charging System Circuit Diagram (Petrol)

S7N20A910E004



A-2 Charging System Circuit Diagram (DSL)

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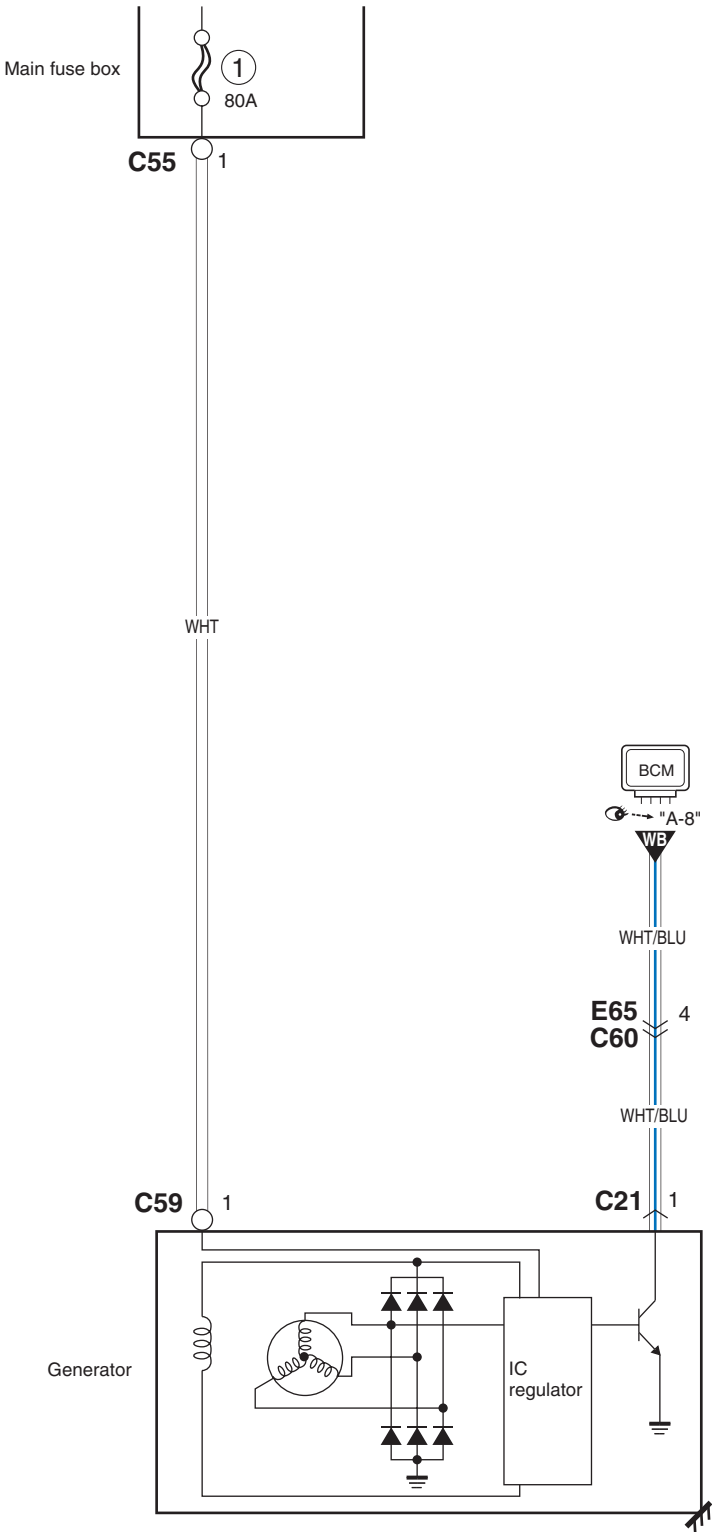
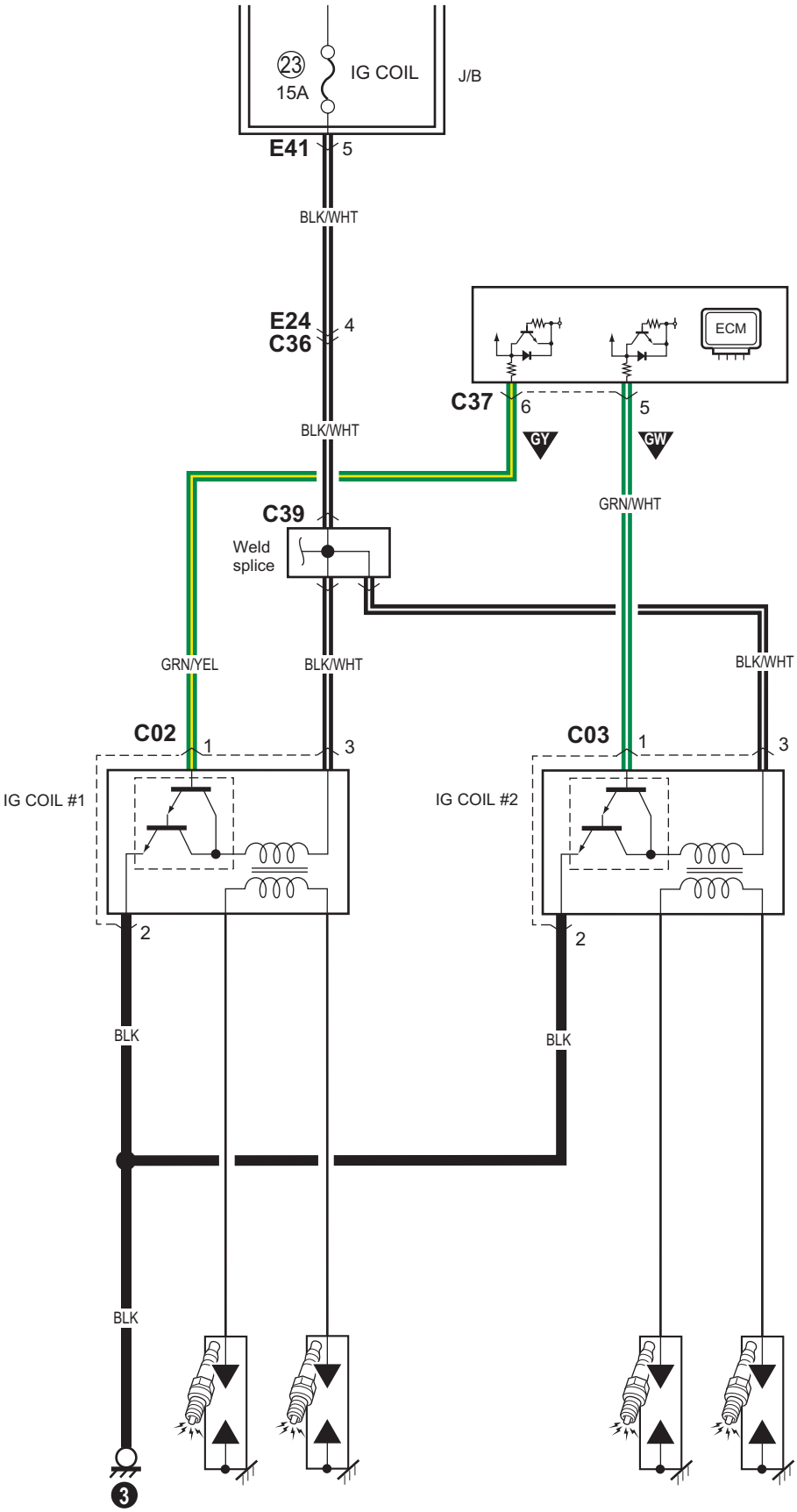


I5RS0B910923-02

A-3 Ignition System Circuit Diagram (Petrol)

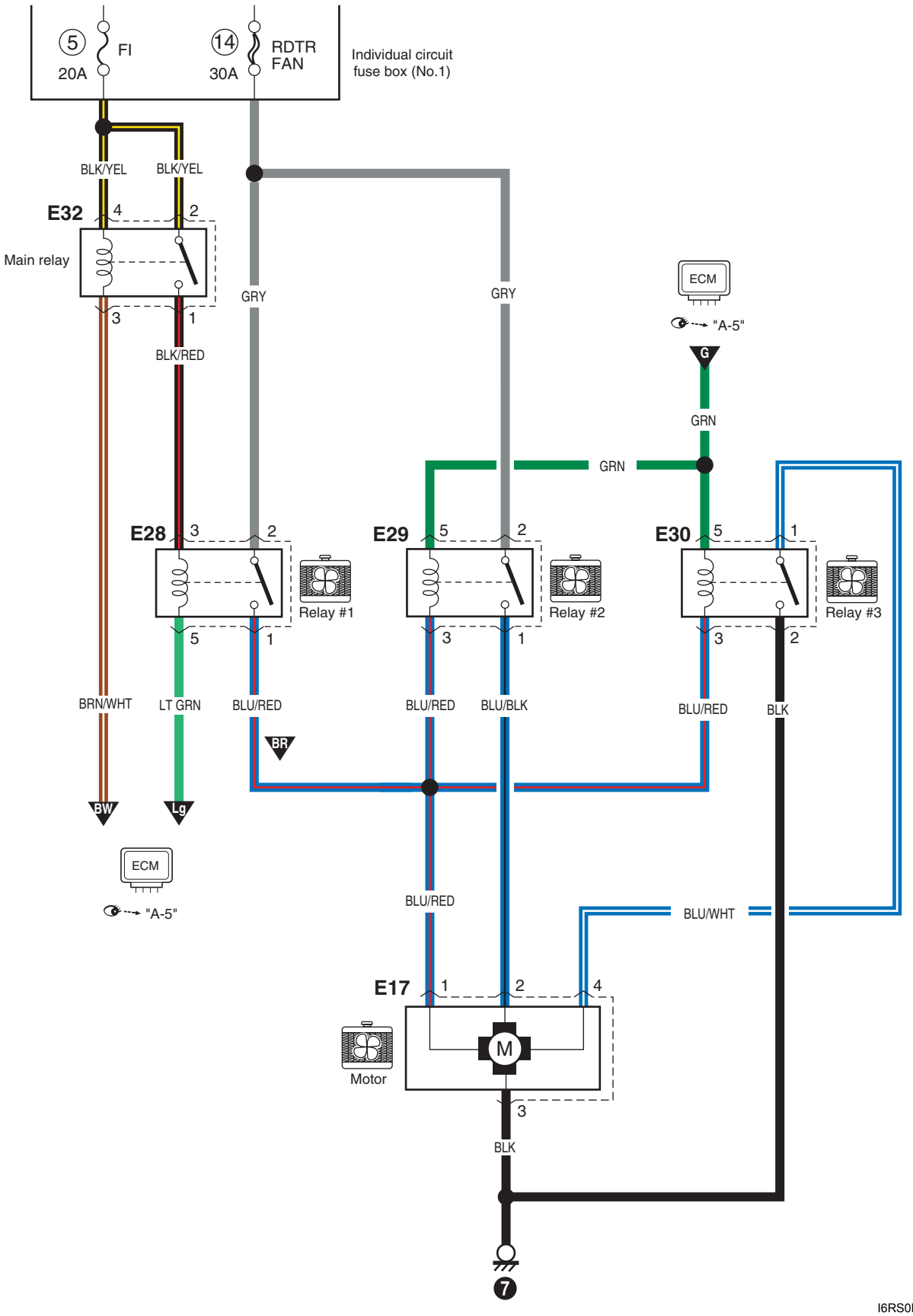
S7N20A910E006



I7N20A910955-01

A-4 Cooling System Circuit Diagram (Petrol)

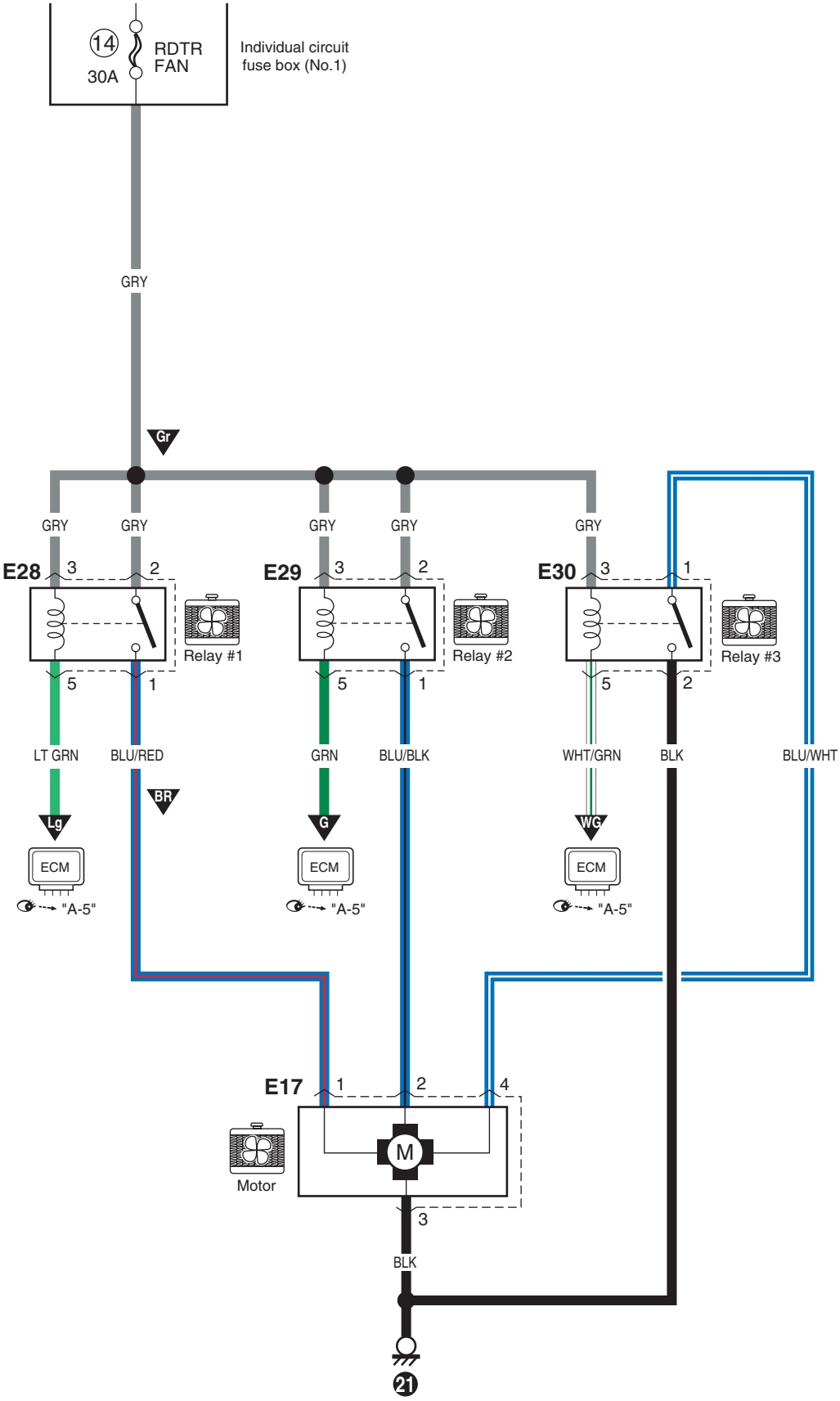
S7N20A910E007



I6RS0B910925-01

A-4 Cooling System Circuit Diagram (DSL)

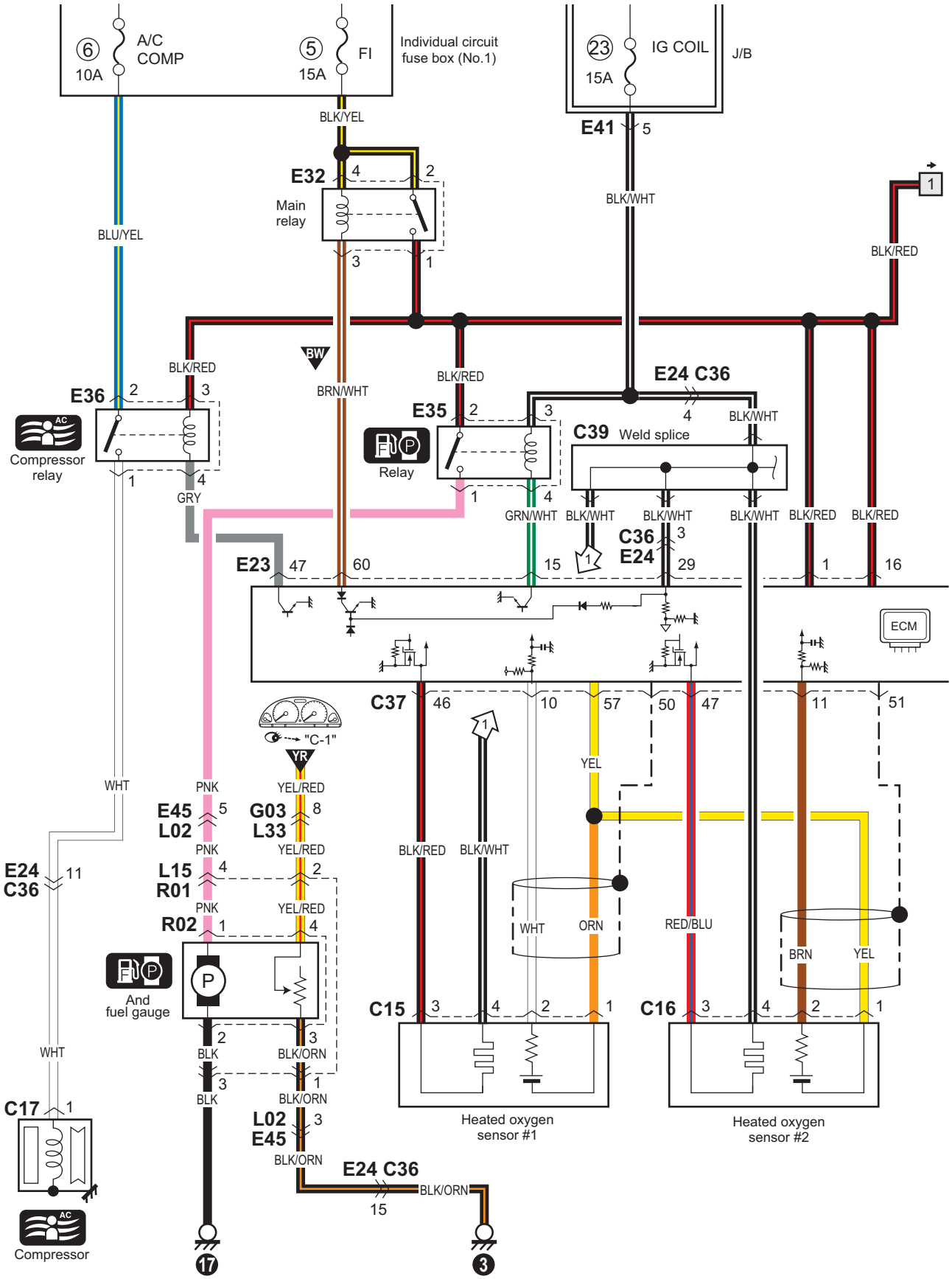
S7N20A910E008



I6RS0B910926-01

A-5 Engine and A/C Control System Circuit Diagram (Petrol)

S7N20A910E009



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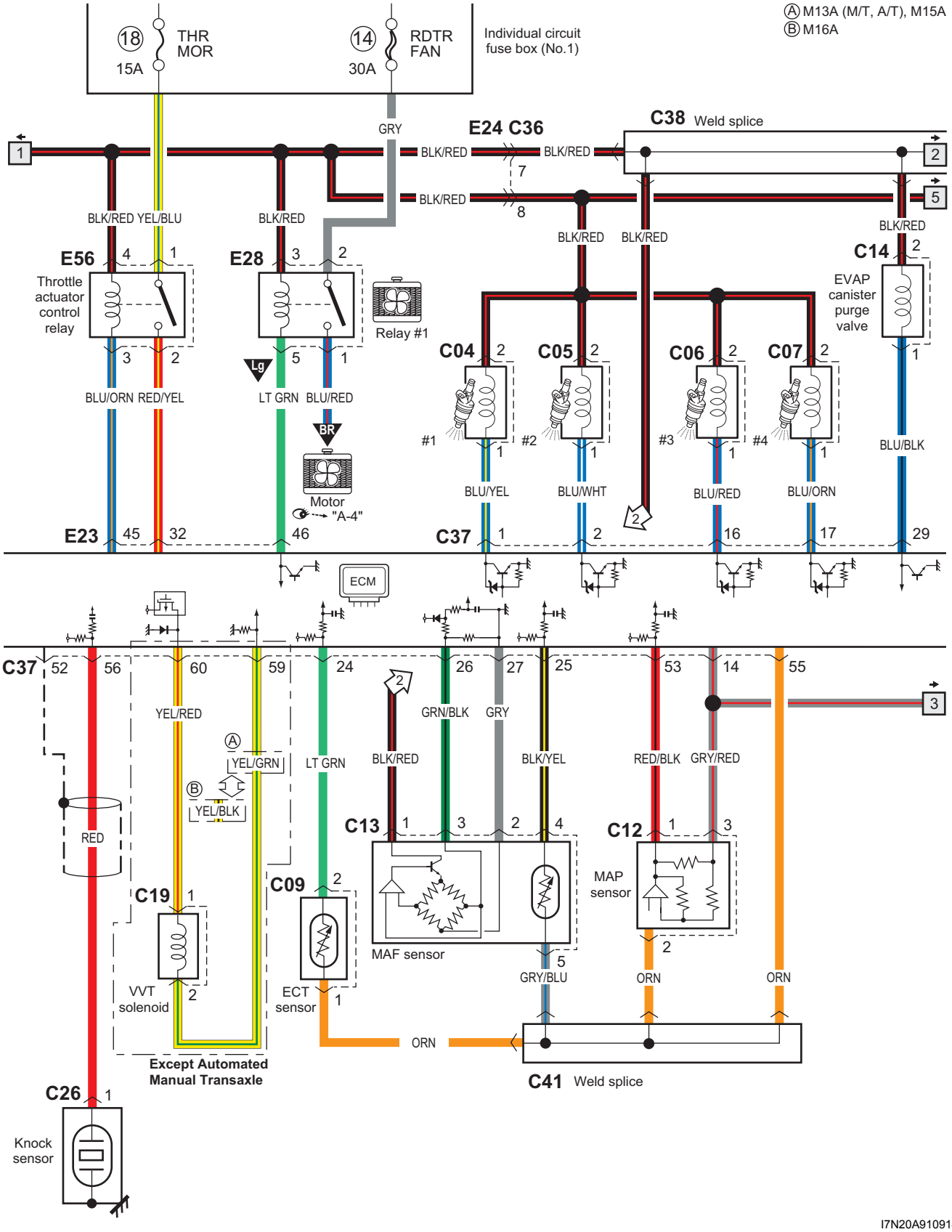
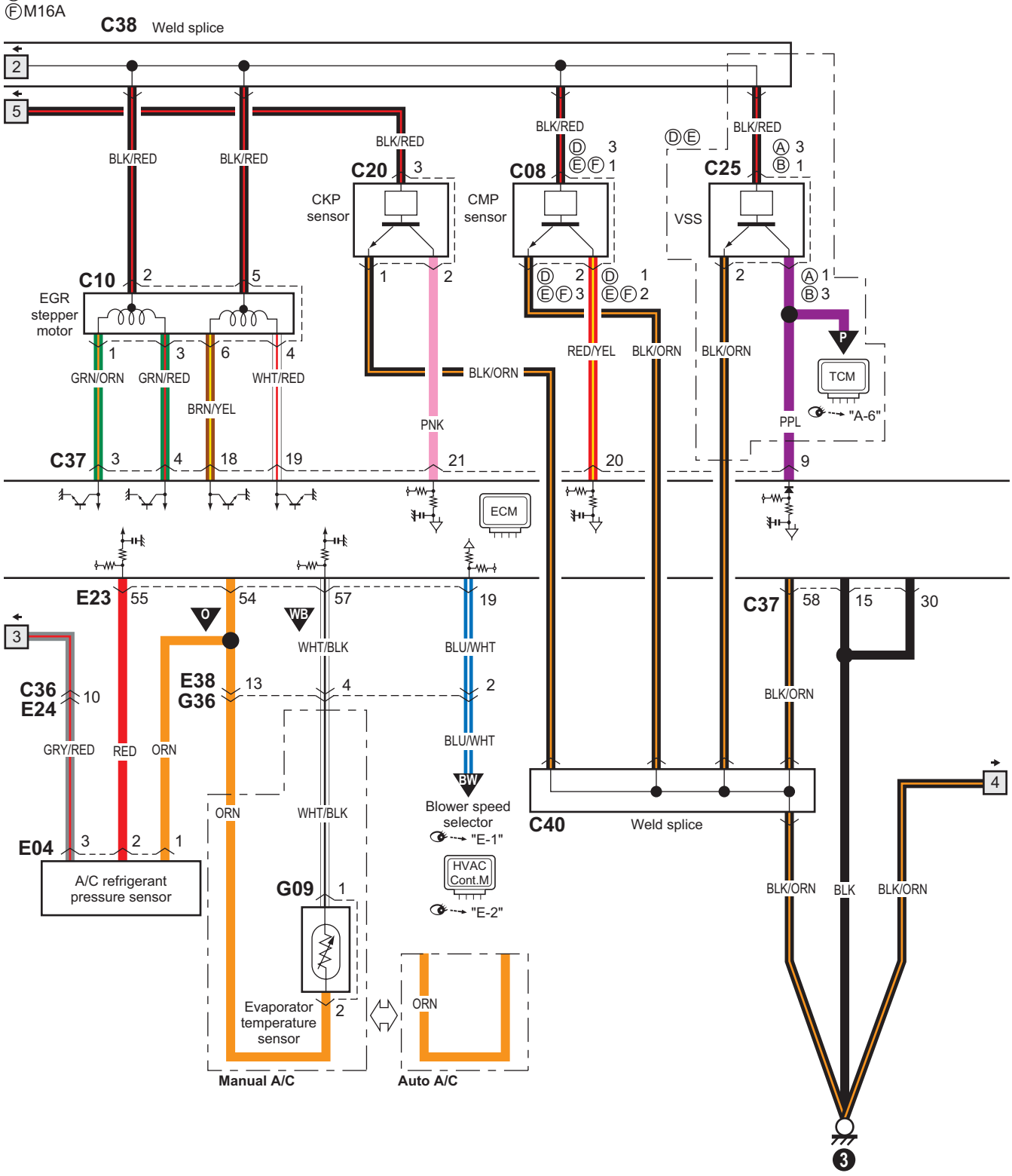


I7N20A910914-03

Ⓐ M/T
Ⓑ A/T
Ⓒ Automated Manual Transaxle
Ⓓ M13A
Ⓔ M15A
Ⓕ M16A



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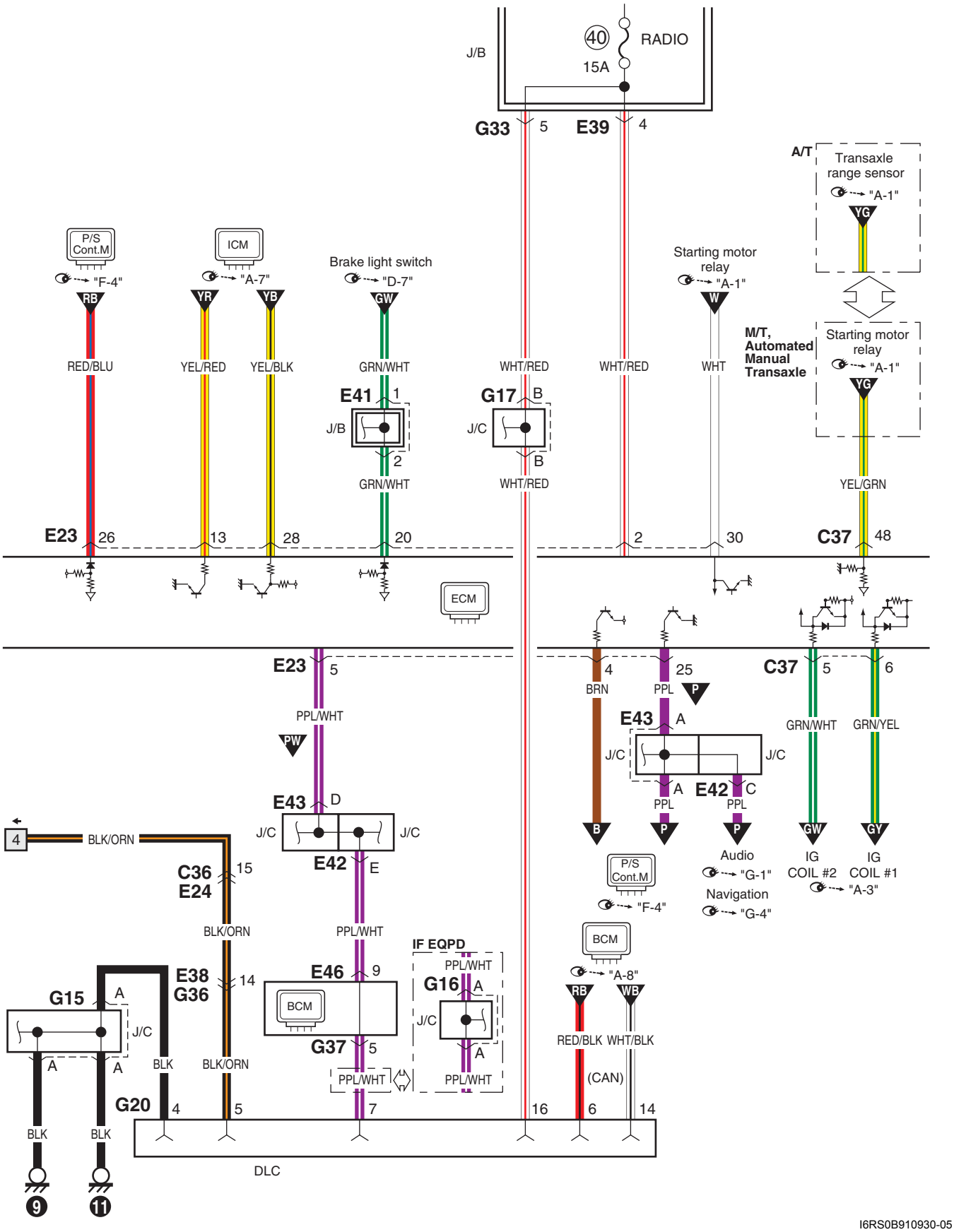

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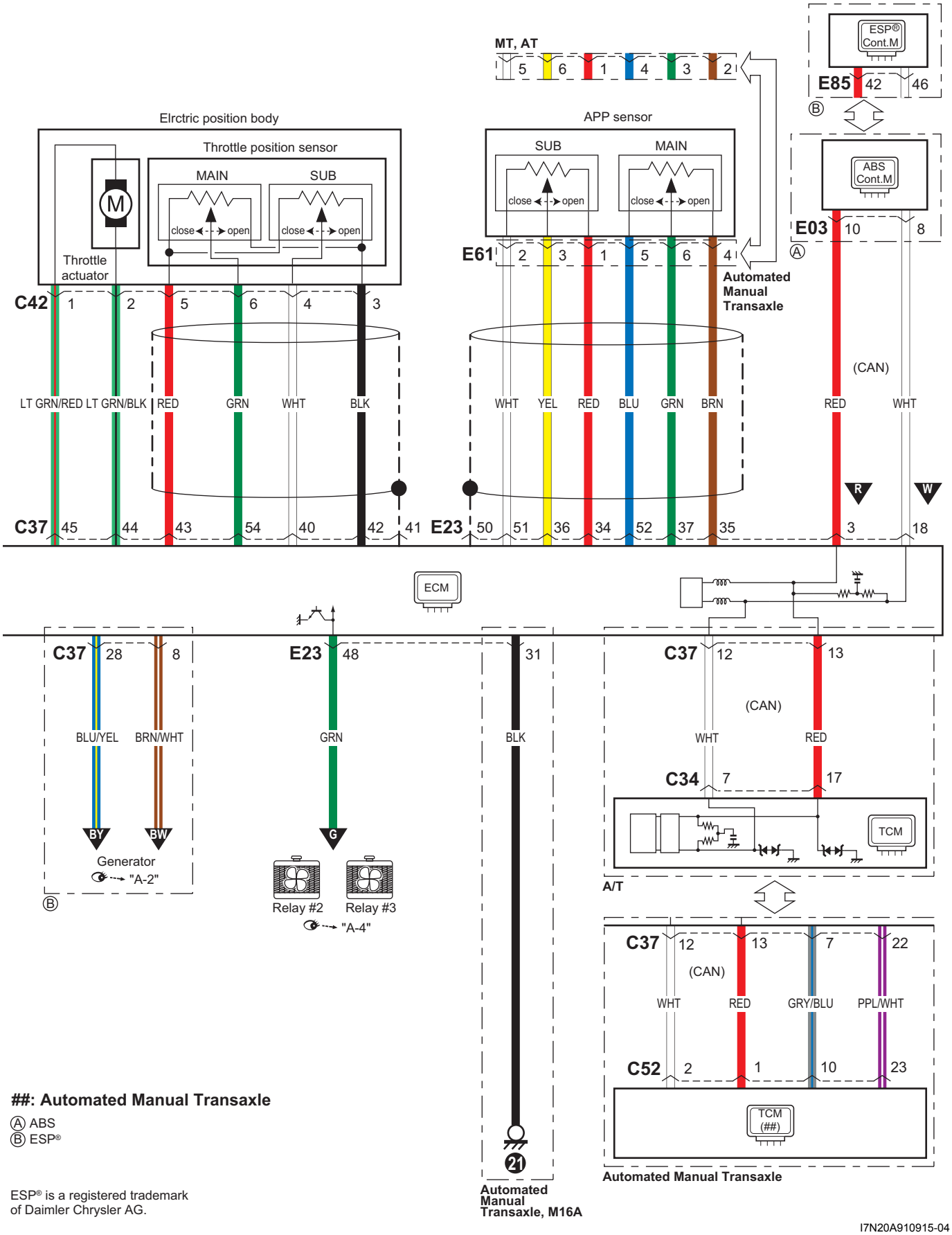


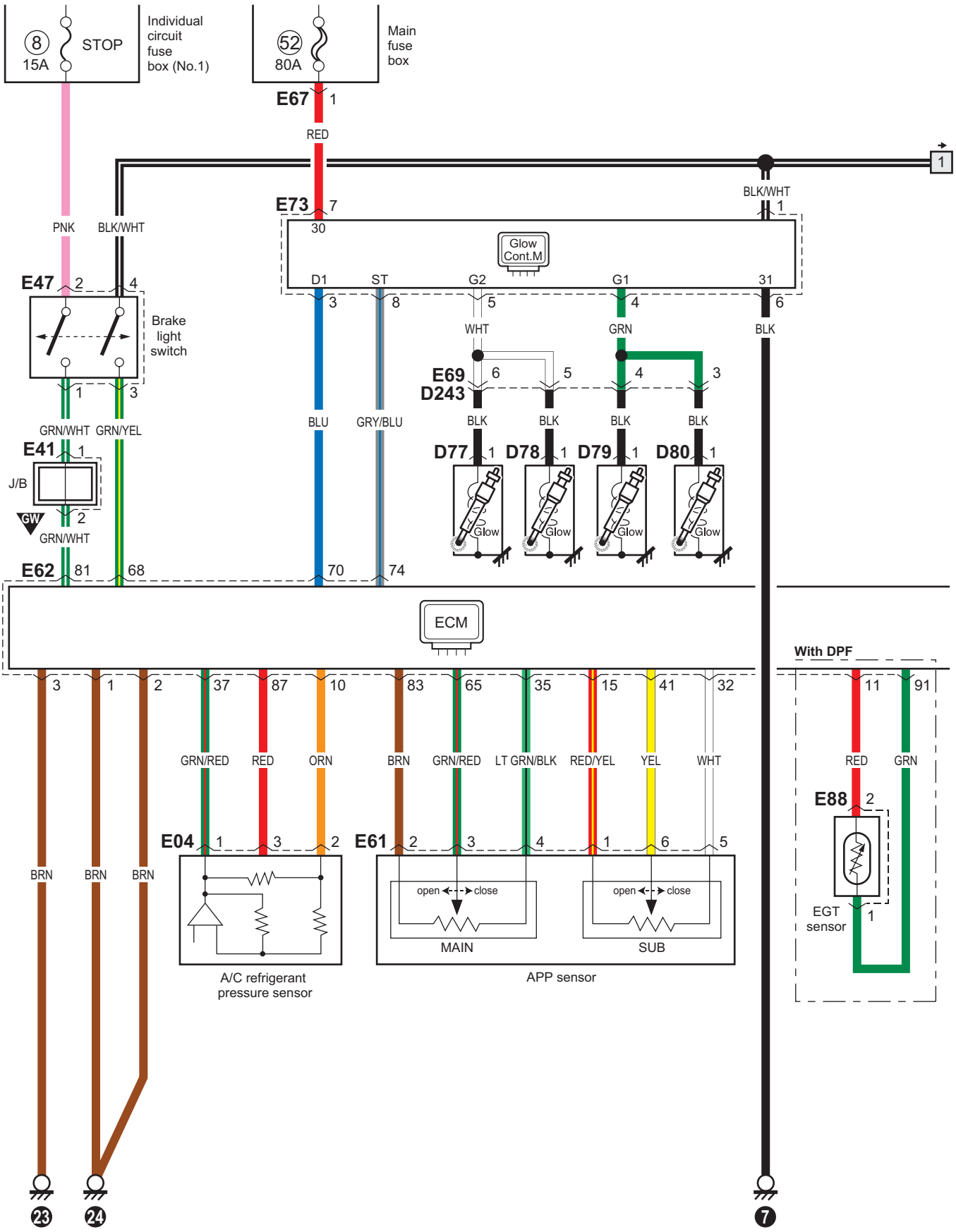
##: Automated Manual Transaxle

Ⓐ ABS
Ⓑ ESP®

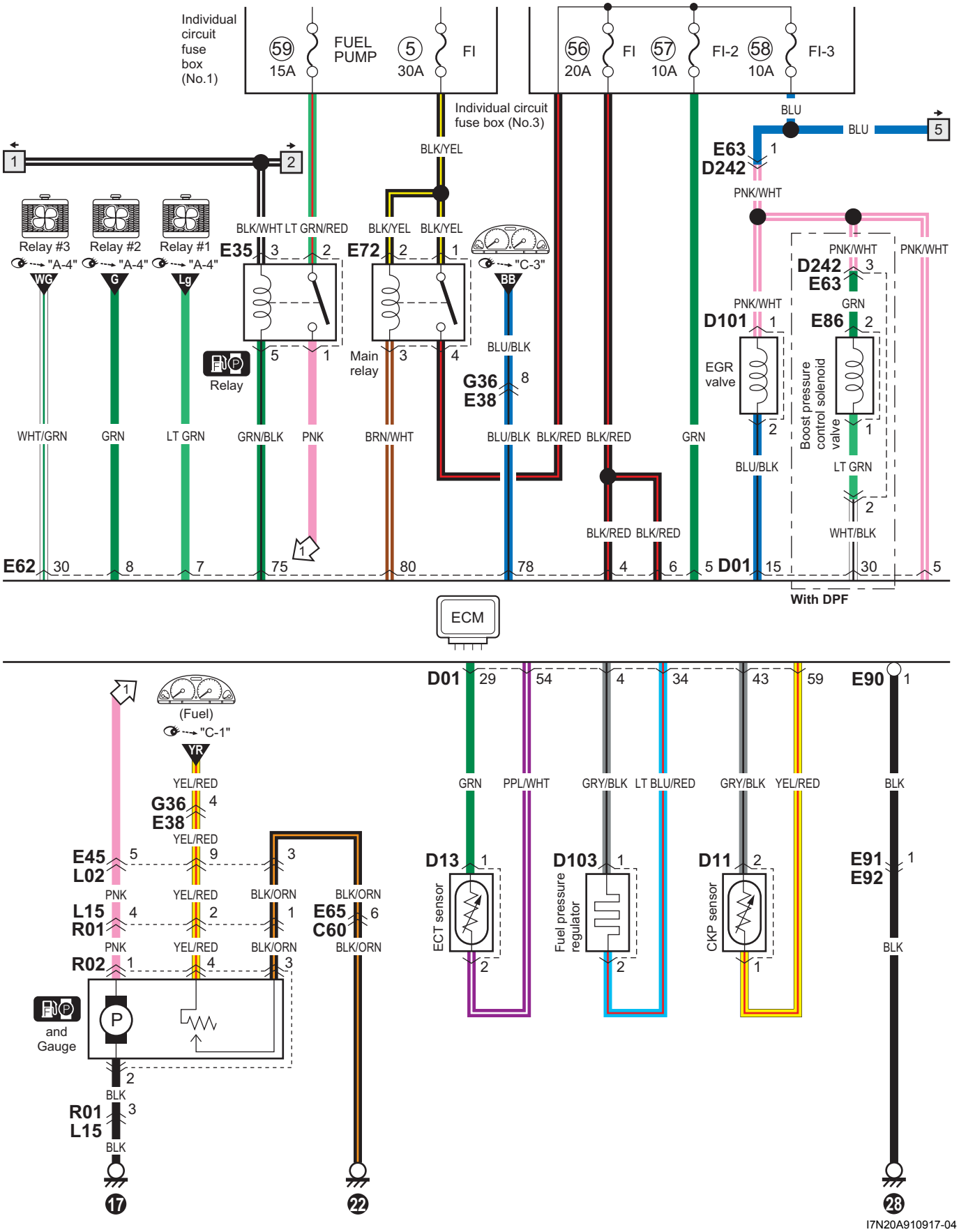
I7N20A910915-04

A-5 Engine and A/C Control System (DSL)

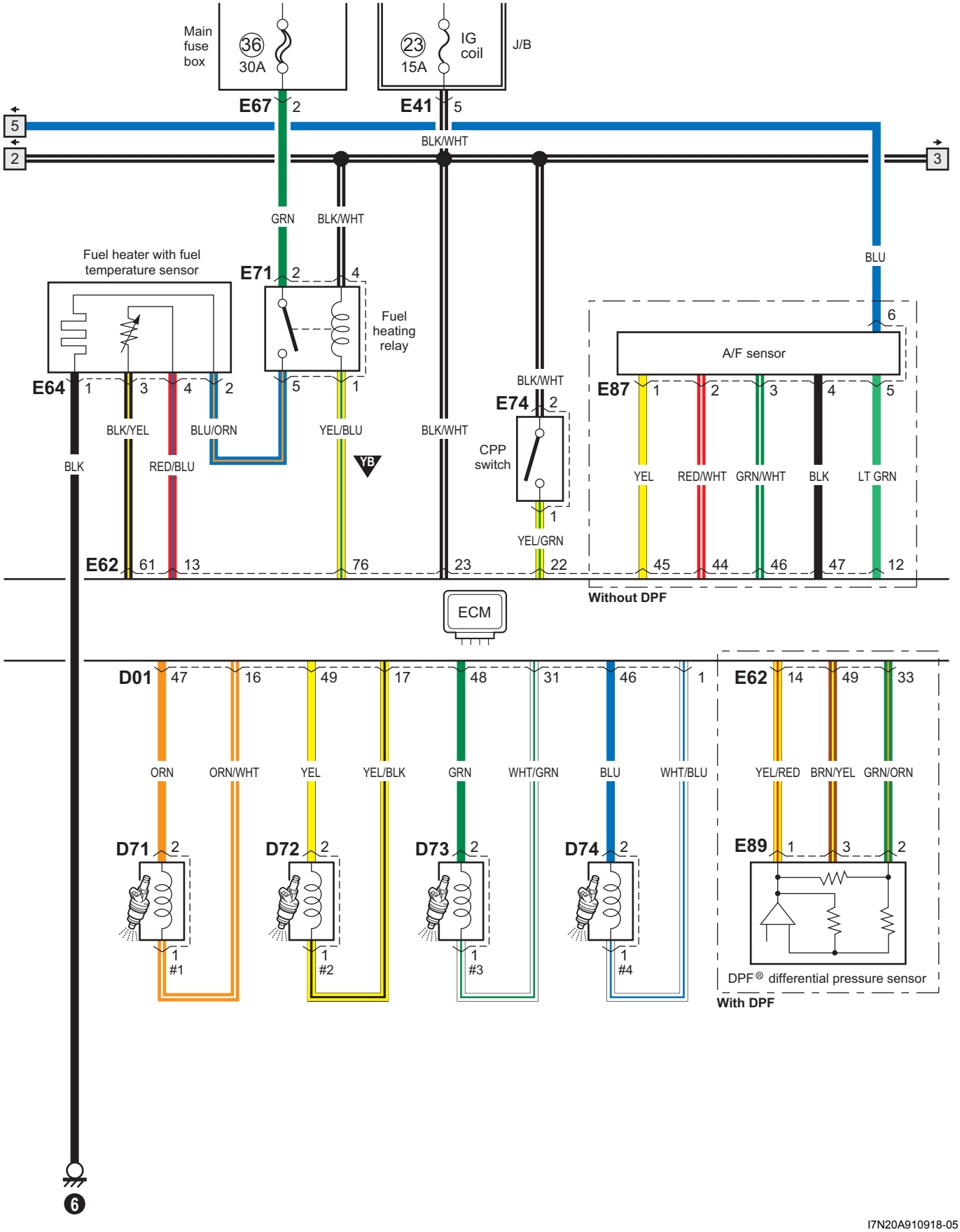
S7N20A910E010



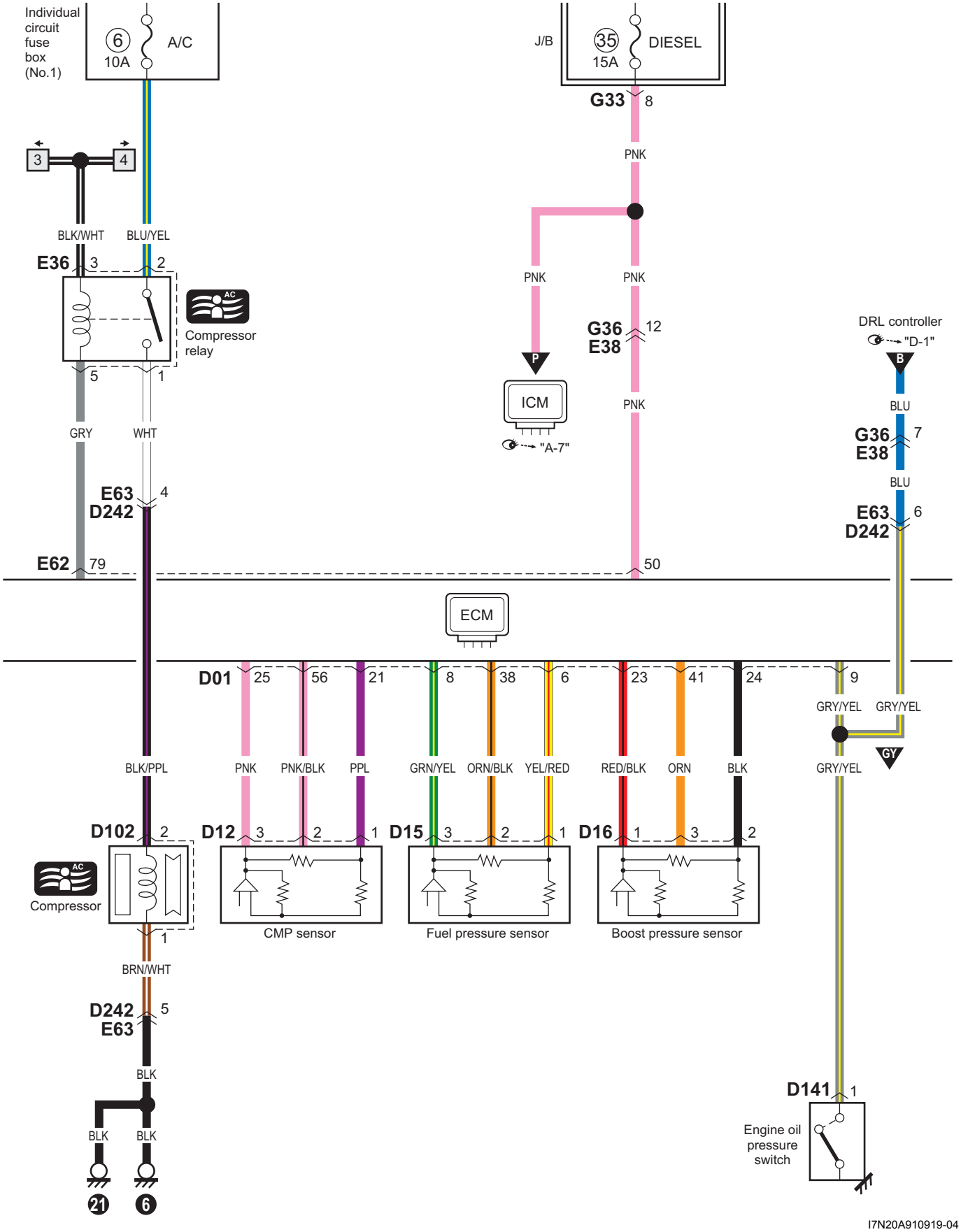
I7N20A910916-03



I7N20A910917-04

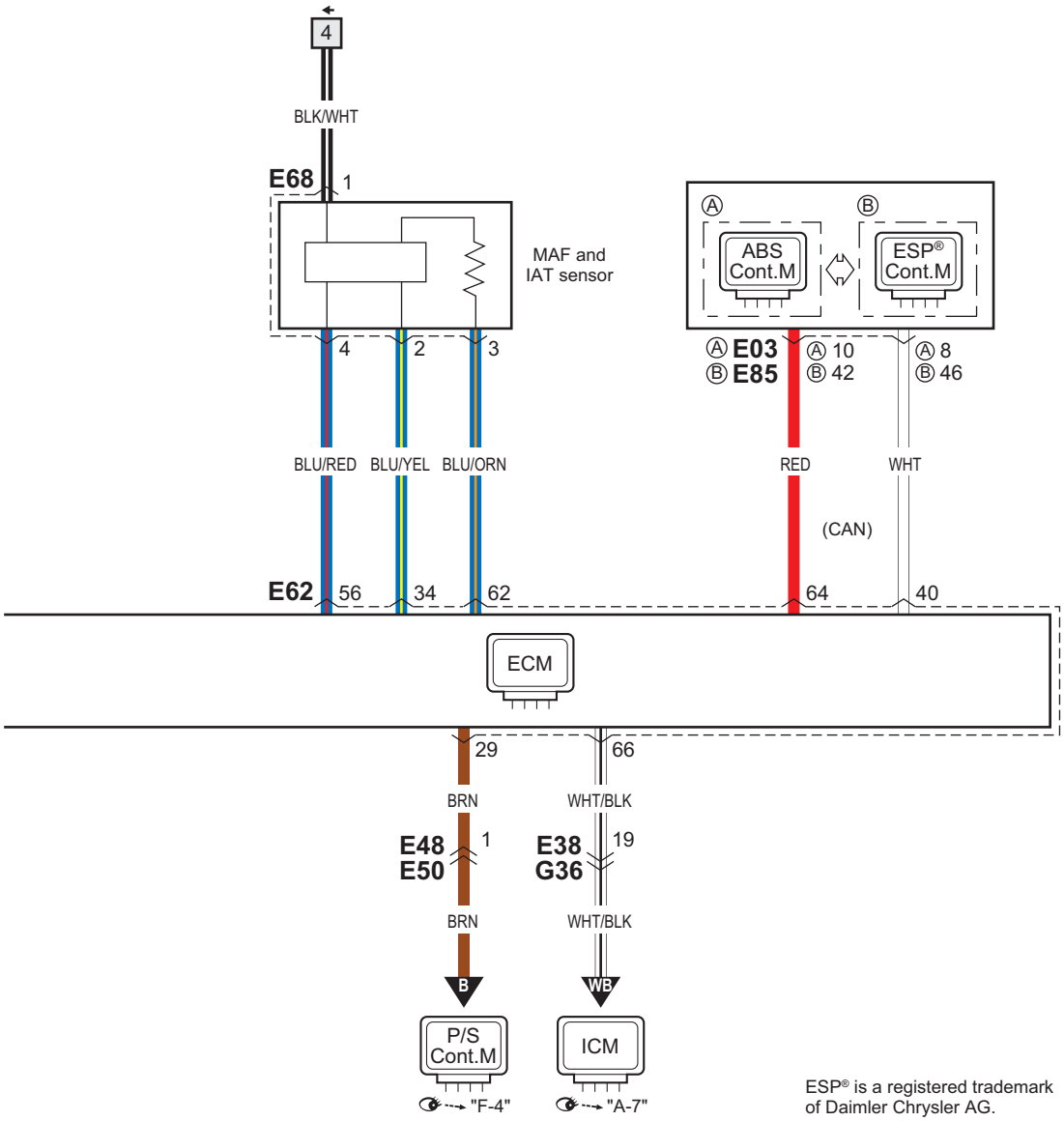


I7N20A910918-05



I7N20A910919-04

Ⓐ ABS
Ⓑ ESP®



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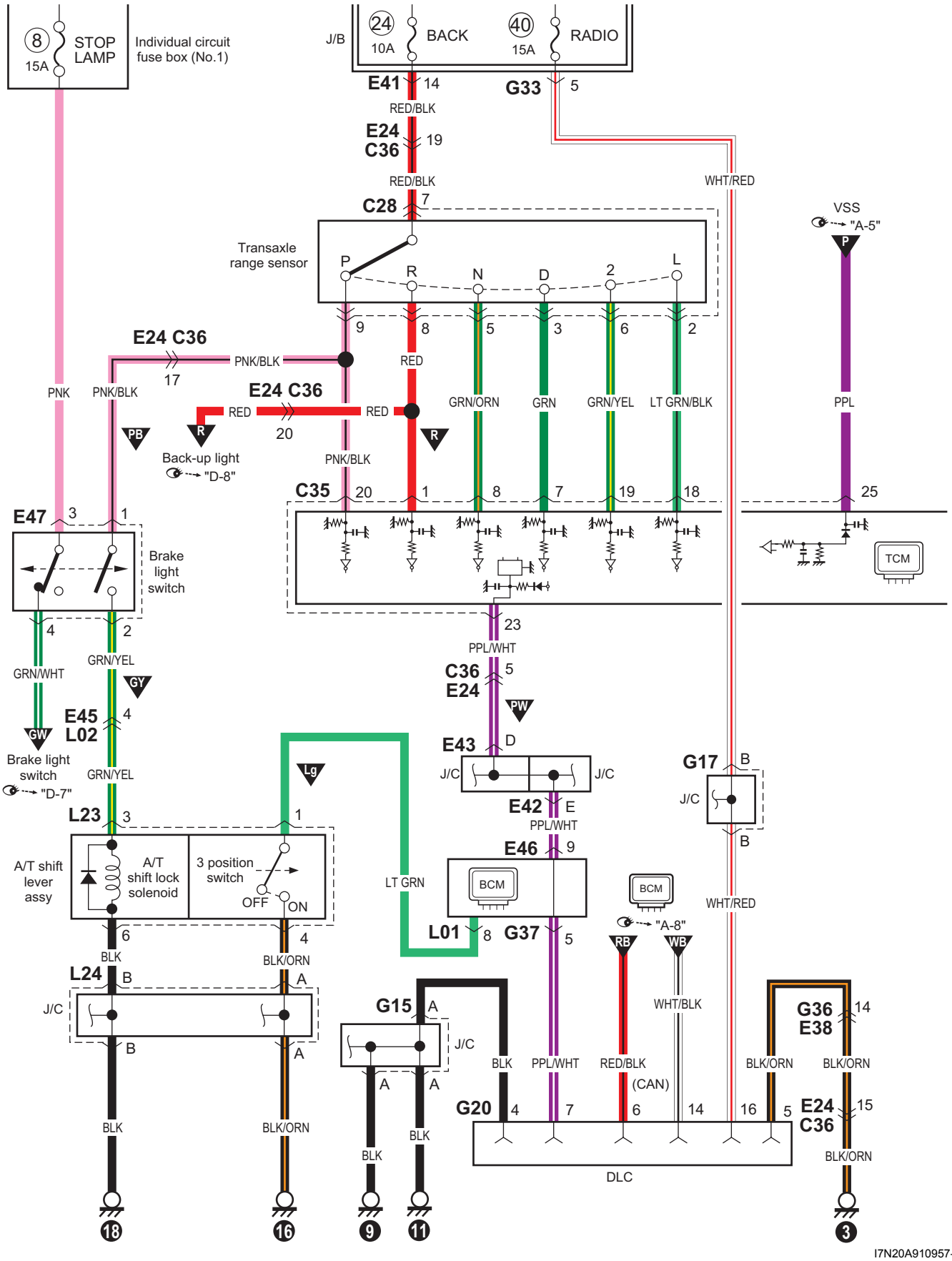
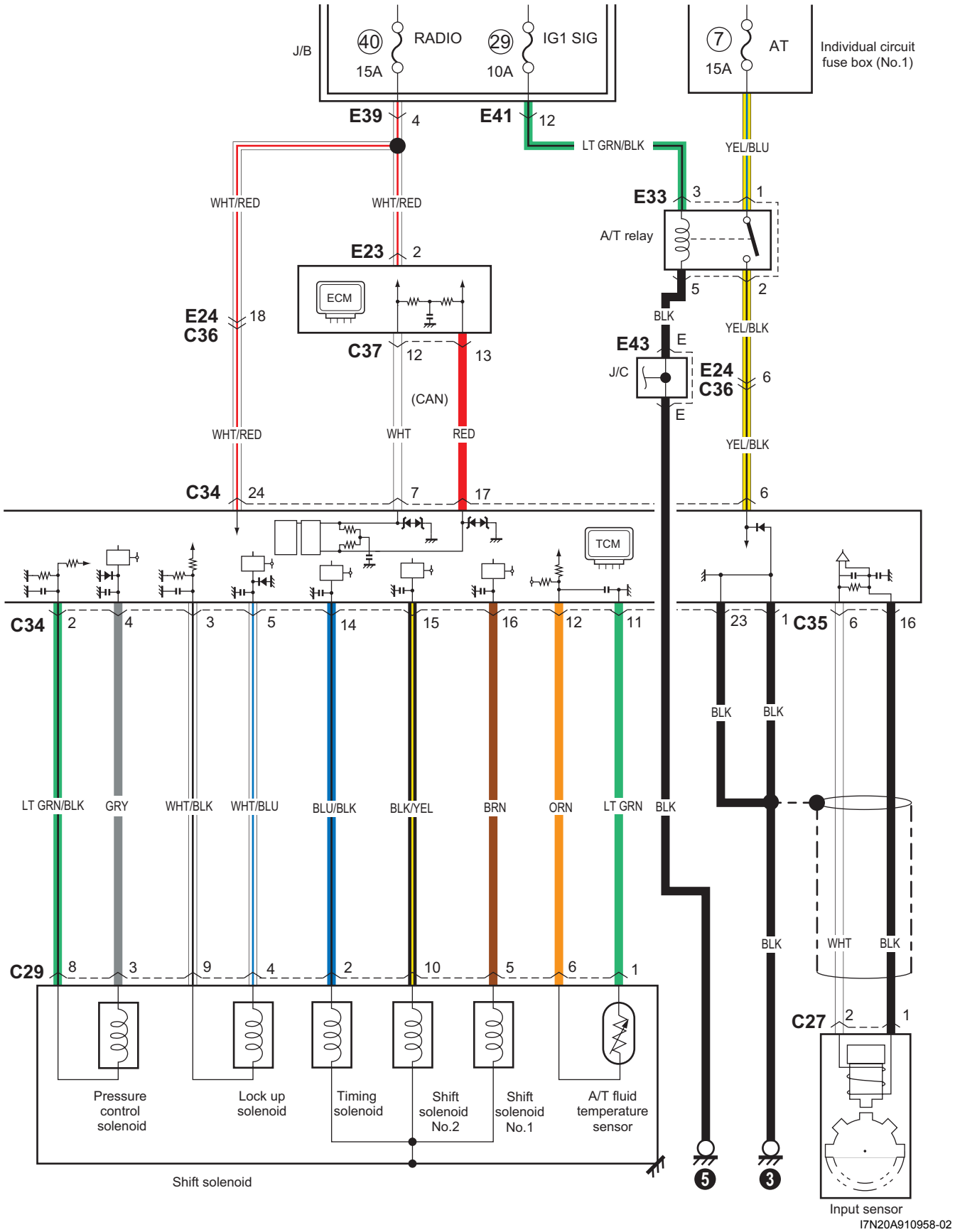
I7N20A910920-04

A-6 A/T Control System Circuit Diagram

S7N20A910E011

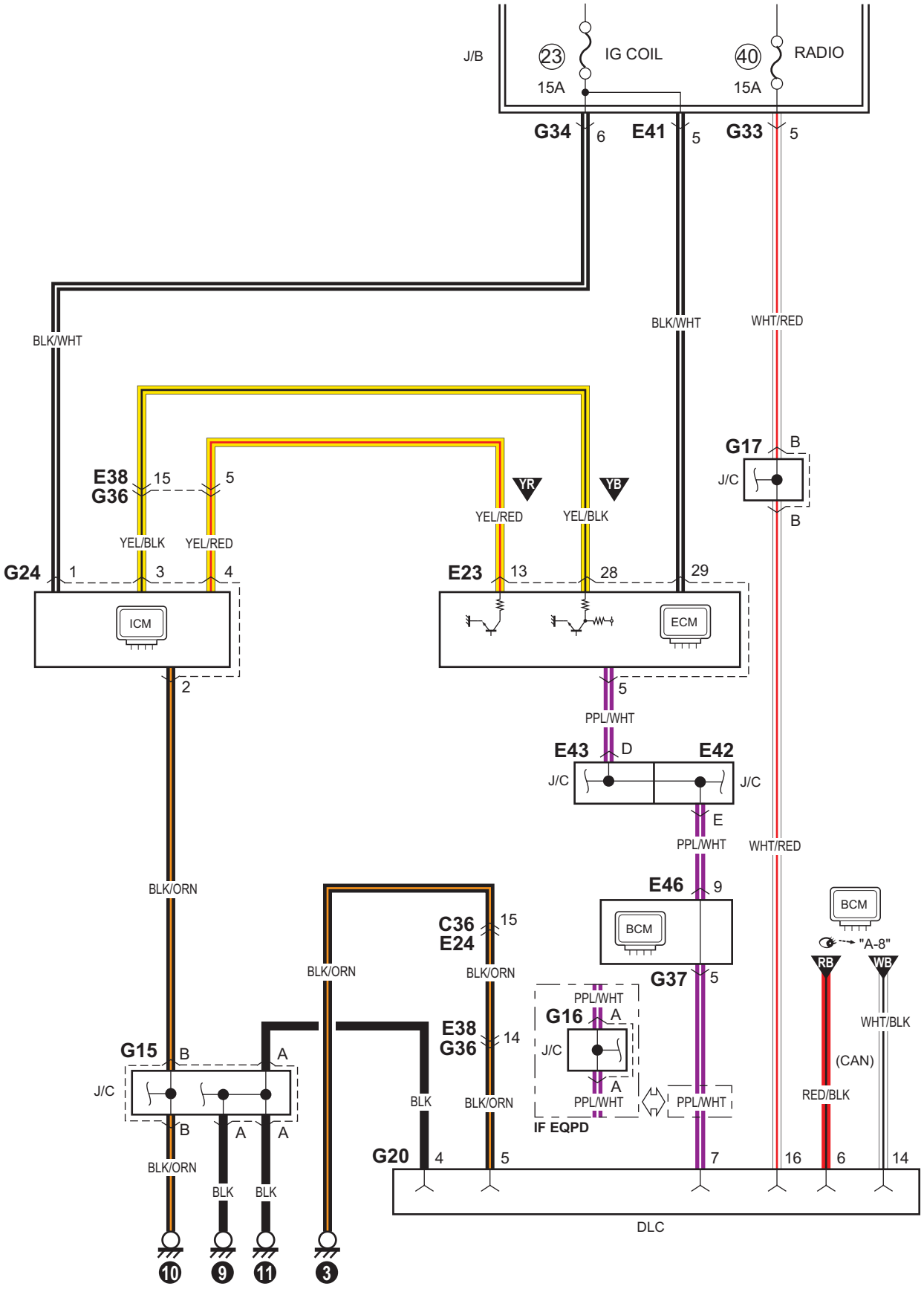


I7N20A910957-01


J/B
40
RADIO
15A
29
IG1 SIG
10A
7
AT
15A
Individual circuit fuse box (No.1)
E39
4
E41
12
LT GRN/BLK
YEL/BLU
WHT/RED
WHT/RED
E33
3
1
A/T relay
E23
2
ECM
E24
C36
18
C37
12
13
(CAN)
5
2
BLK
YEL/BLK
E43
E
J/C
E24
C36
6
E
WHT/RED
WHT
RED
YEL/BLK
C34
24
7
17
6
TCM
C34
2
4
3
5
14
15
16
12
11
C35
23
1
6
16
LT GRN/BLK
GRY
WHT/BLK
WHT/BLU
BLU/BLK
BLK/YEL
BRN
ORN
LT GRN
BLK
BLK
BLK
BLK
WHT
BLK
C29
8
3
9
4
2
10
5
6
1
C27
2
1
Pressure control solenoid
Lock up solenoid
Timing solenoid
Shift solenoid No.2
Shift solenoid No.1
A/T fluid temperature sensor
Shift solenoid
5
3
Input sensor
I7N20A910958-02

A-7 Immobilizer System Circuit Diagram (Petrol)

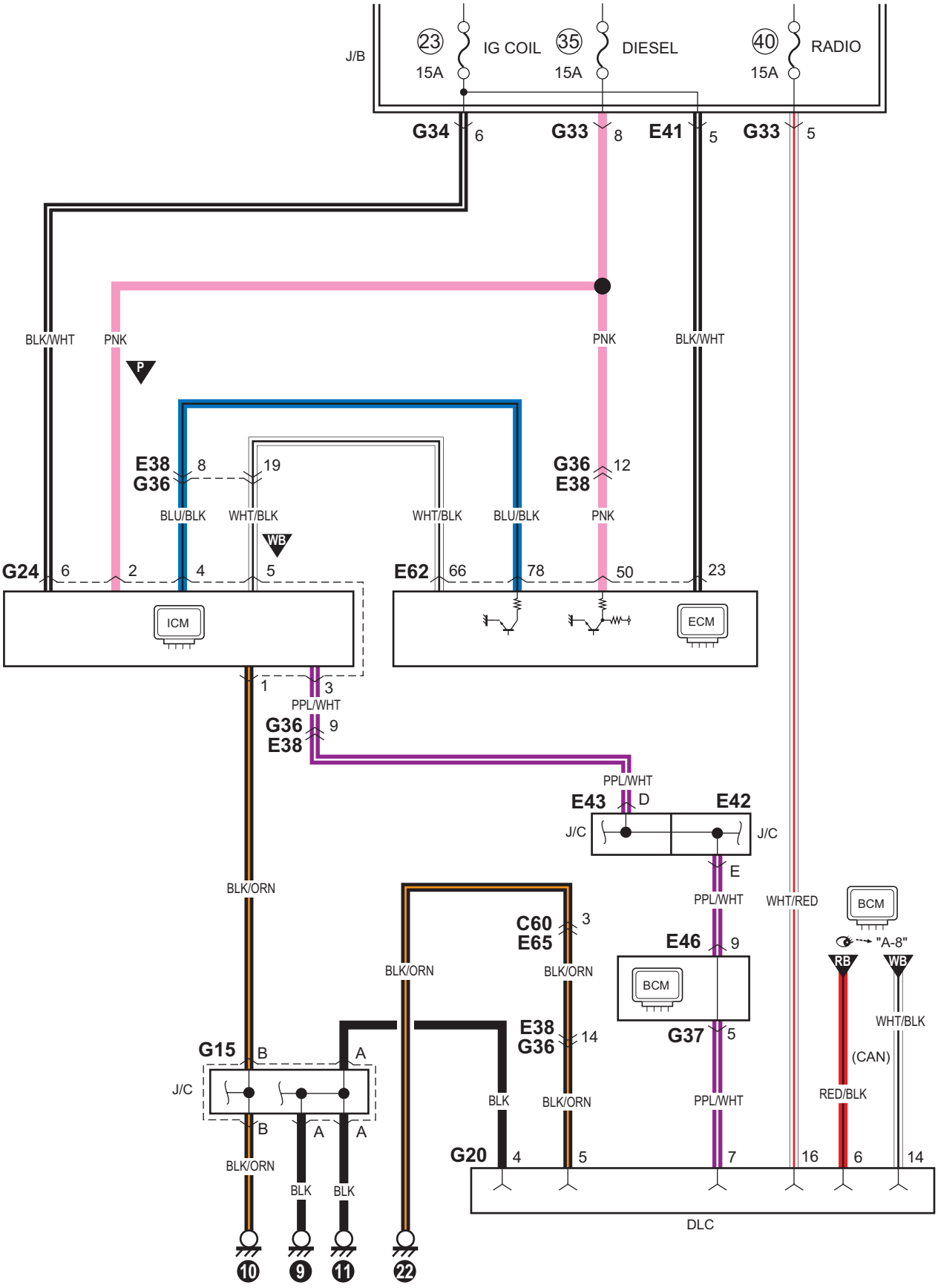
S7N20A910E012



I7N20A910921-01

A-7 Immobilizer System Circuit Diagram (DSL)

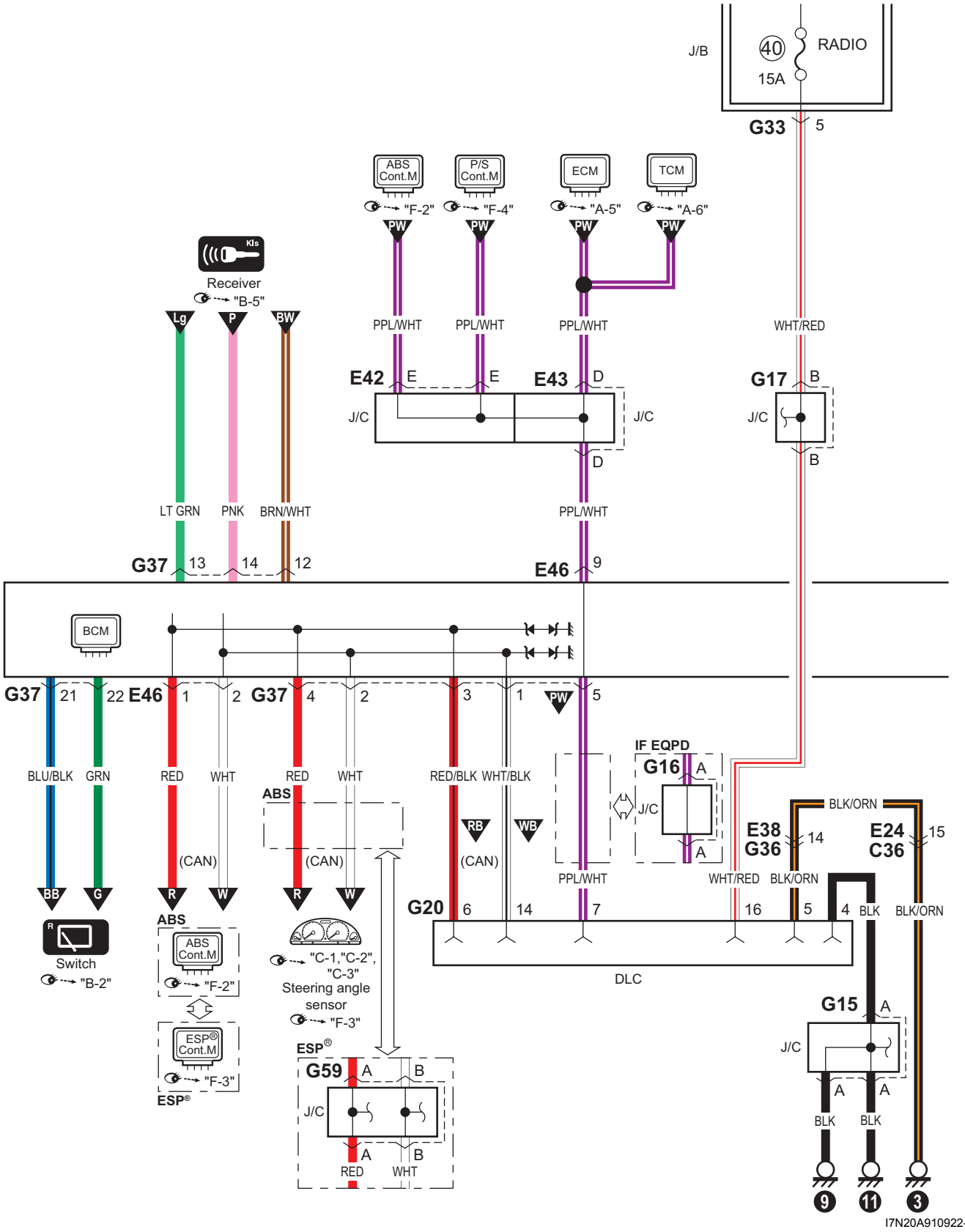
S7N20A910E013



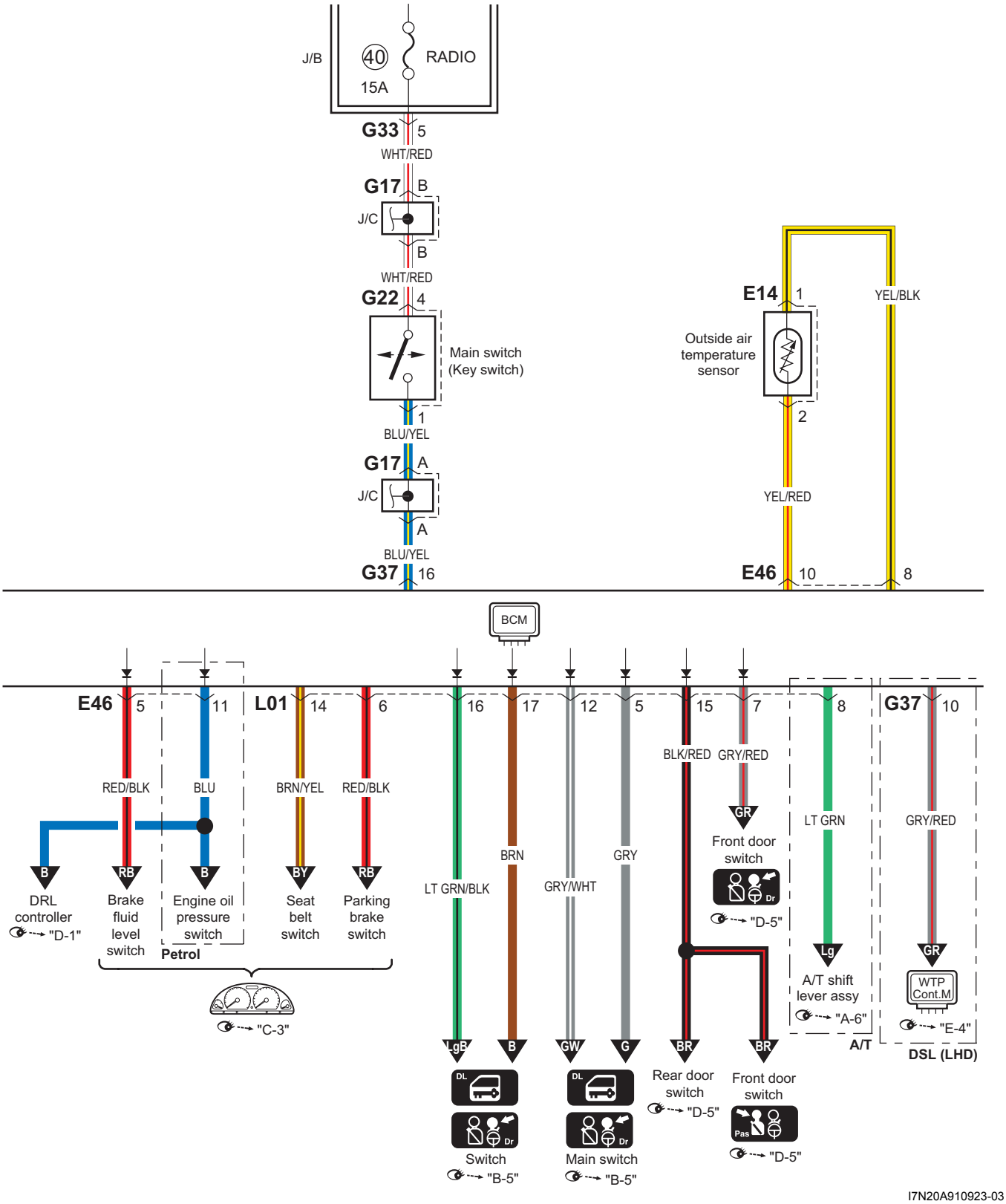
I7N20A910959-01

A-8 Body Control System Circuit Diagram

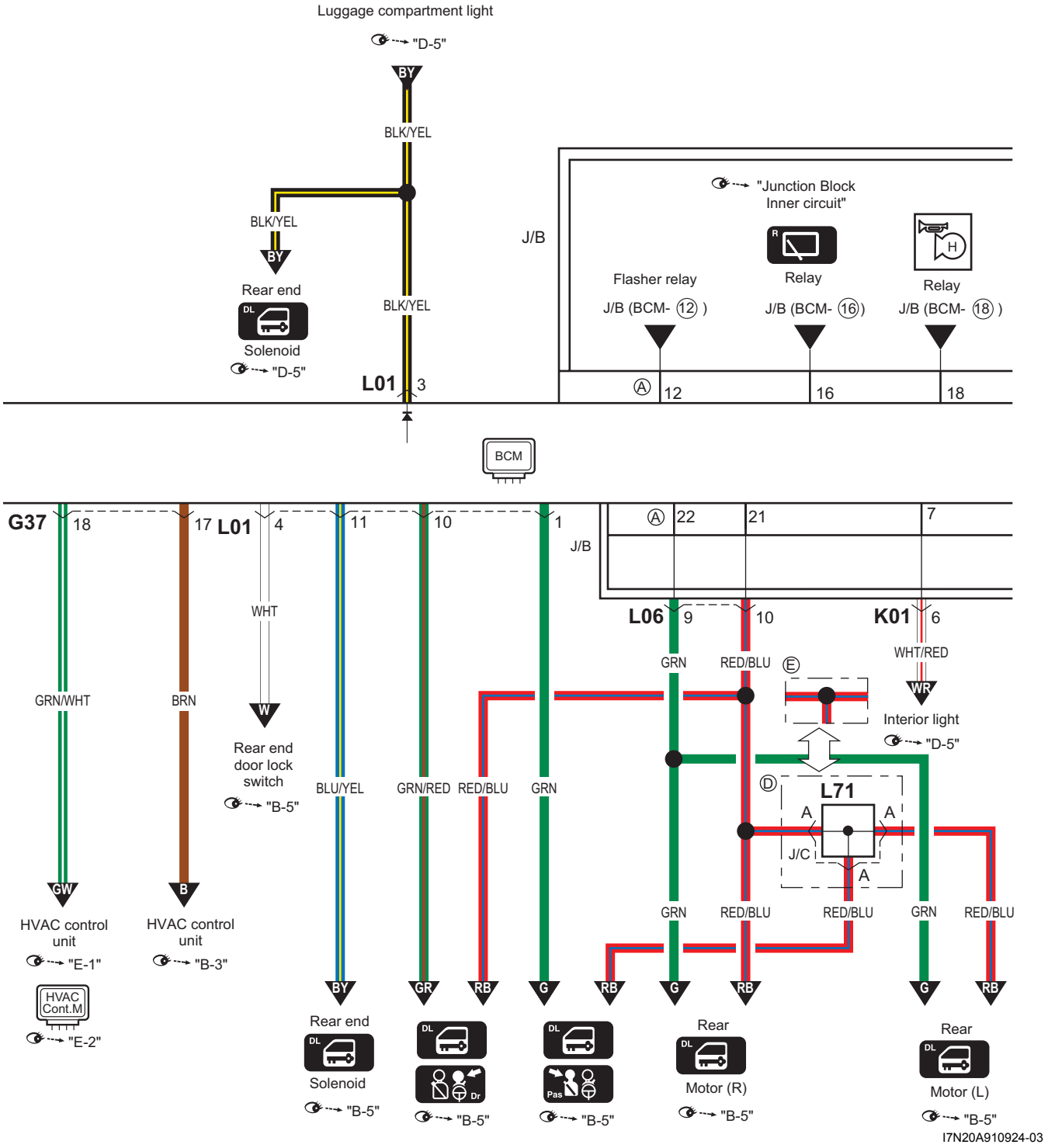
S7N20A910E014



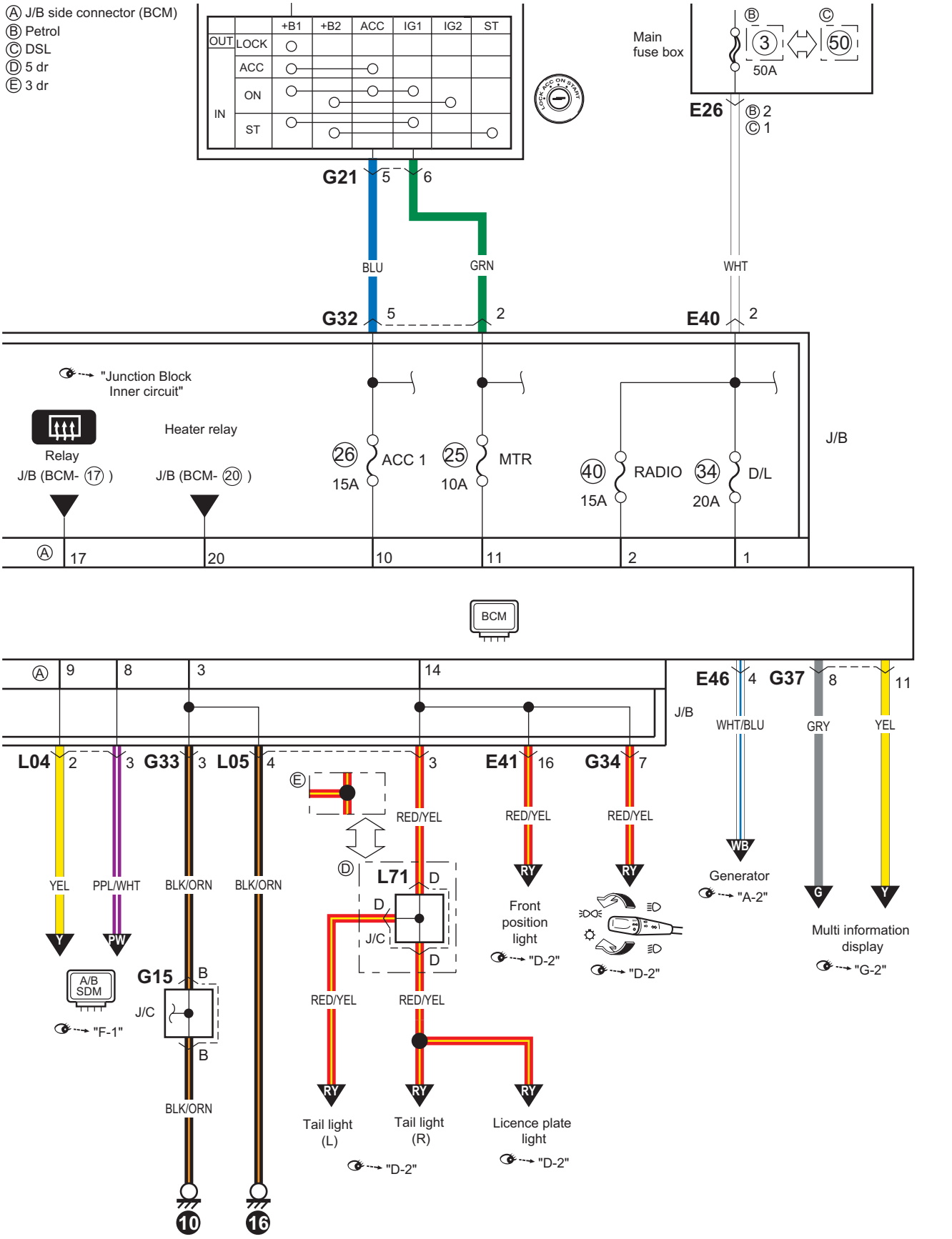
I7N20A910922-02


J/B
40
15A
RADIO
G33
5
WHT/RED
G17
B
J/C
B
WHT/RED
G22
4
Main switch
(Key switch)
1
BLU/YEL
G17
A
J/C
A
BLU/YEL
G37
16
E14
1
YEL/BLK
Outside air
temperature
sensor
2
YEL/RED
E46
10
8
BCM
E46
5
11
L01
14
6
16
17
12
5
15
7
8
G37
10
RED/BLK
BLU
BRN/YEL
RED/BLK
LT GRN/BLK
BRN
GRY/WHT
GRY
BLK/RED
GRY/RED
LT GRN
GRY/RED
B
RB
B
BY
RB
GR
Lg
GR
DRL
controller
"D-1"
Brake
fluid
level
switch
Engine oil
pressure
switch
Petrol
Seat
belt
switch
Parking
brake
switch
"C-3"
Front door
switch
Dr
"D-5"
A/T shift
lever assy
"A-6"
WTP
Cont.M
"E-4"
A/T
DSL (LHD)
LgB
B
GW
G
BR
BR
DL
DL
Dr
Dr
Switch
"B-5"
Main switch
"B-5"
Rear door
switch
"D-5"
Front door
switch
Pas
"D-5"
I7N20A910923-03

Ⓐ J/B side connector (BCM)
Ⓑ Petrol
Ⓒ DSL
Ⓓ 5 dr
Ⓔ 3 dr

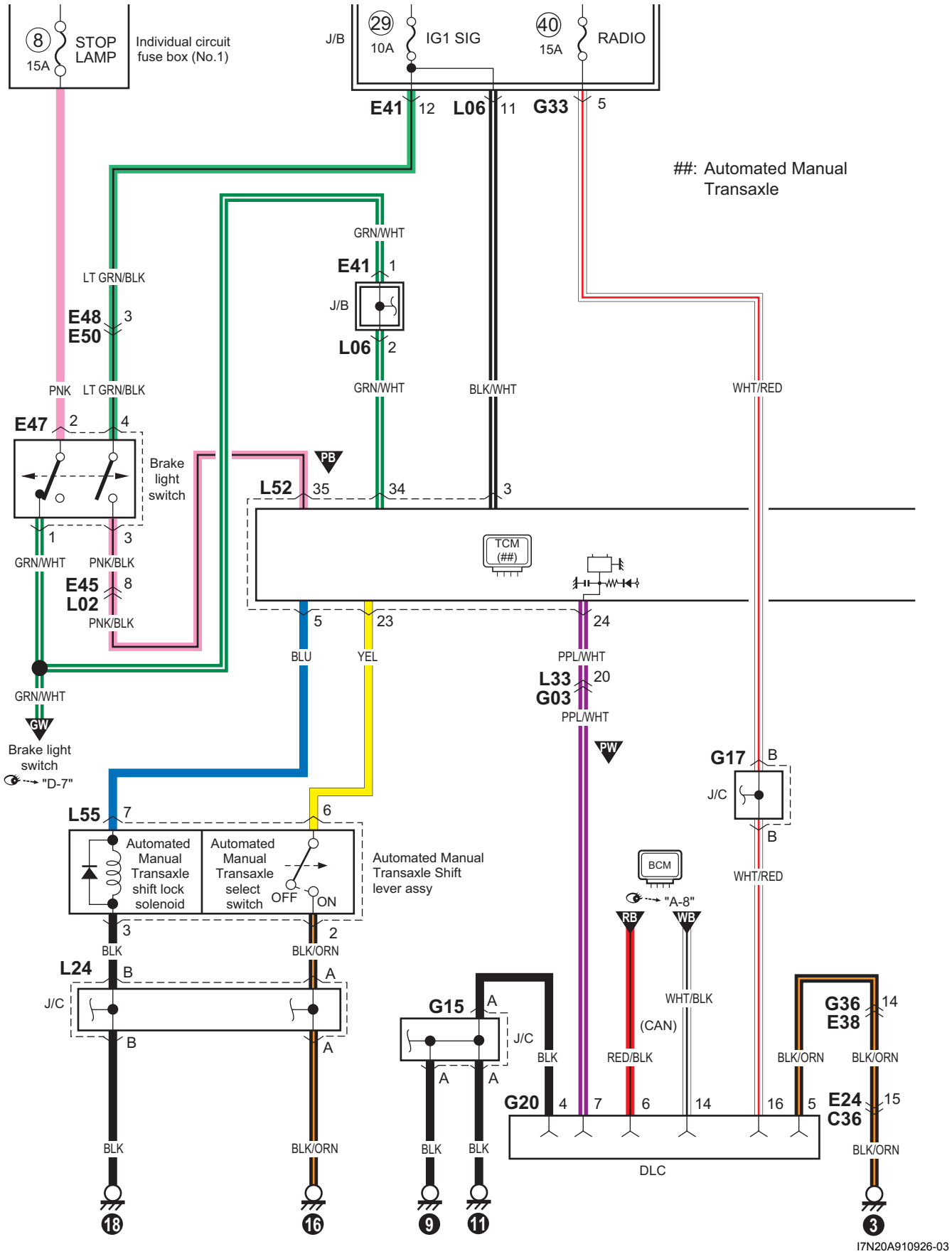


I7N20A910924-03

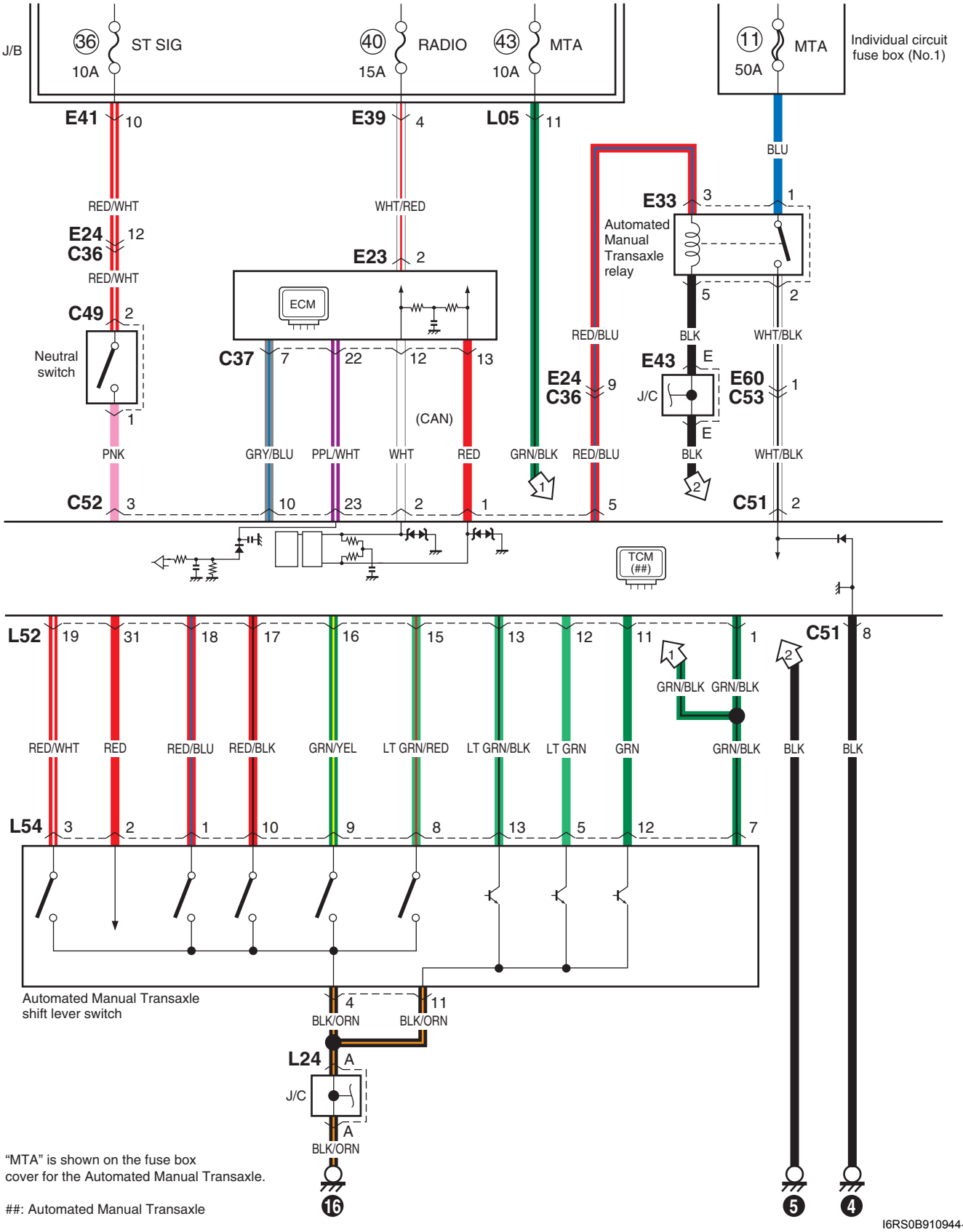

Ⓐ J/B side connector (BCM)
Ⓑ Petrol
Ⓒ DSL
Ⓓ 5 dr
Ⓔ 3 dr
OUT
IN
LOCK
ACC
ON
ST
+B1
+B2
ACC
IG1
IG2
ST
Main fuse box
50A
E26
G21
G32
E40
BLU
GRN
WHT
"Junction Block Inner circuit"
Relay
J/B (BCM- 17)
Heater relay
J/B (BCM- 20)
26 ACC 1 15A
25 MTR 10A
40 RADIO 15A
34 D/L 20A
J/B
BCM
L04
G33
L05
L71
E41
G34
E46
G37
YEL
PPL/WHT
BLK/ORN
RED/YEL
WHT/BLU
GRY
A/B SDM
"F-1"
G15
J/C
Tail light (L)
Tail light (R)
Licence plate light
Front position light
"D-2"
Generator
"A-2"
Multi information display
"G-2"
I7N20A910925-03

A-9 Automated Manual Transaxle Control System Circuit Diagram (Petrol)

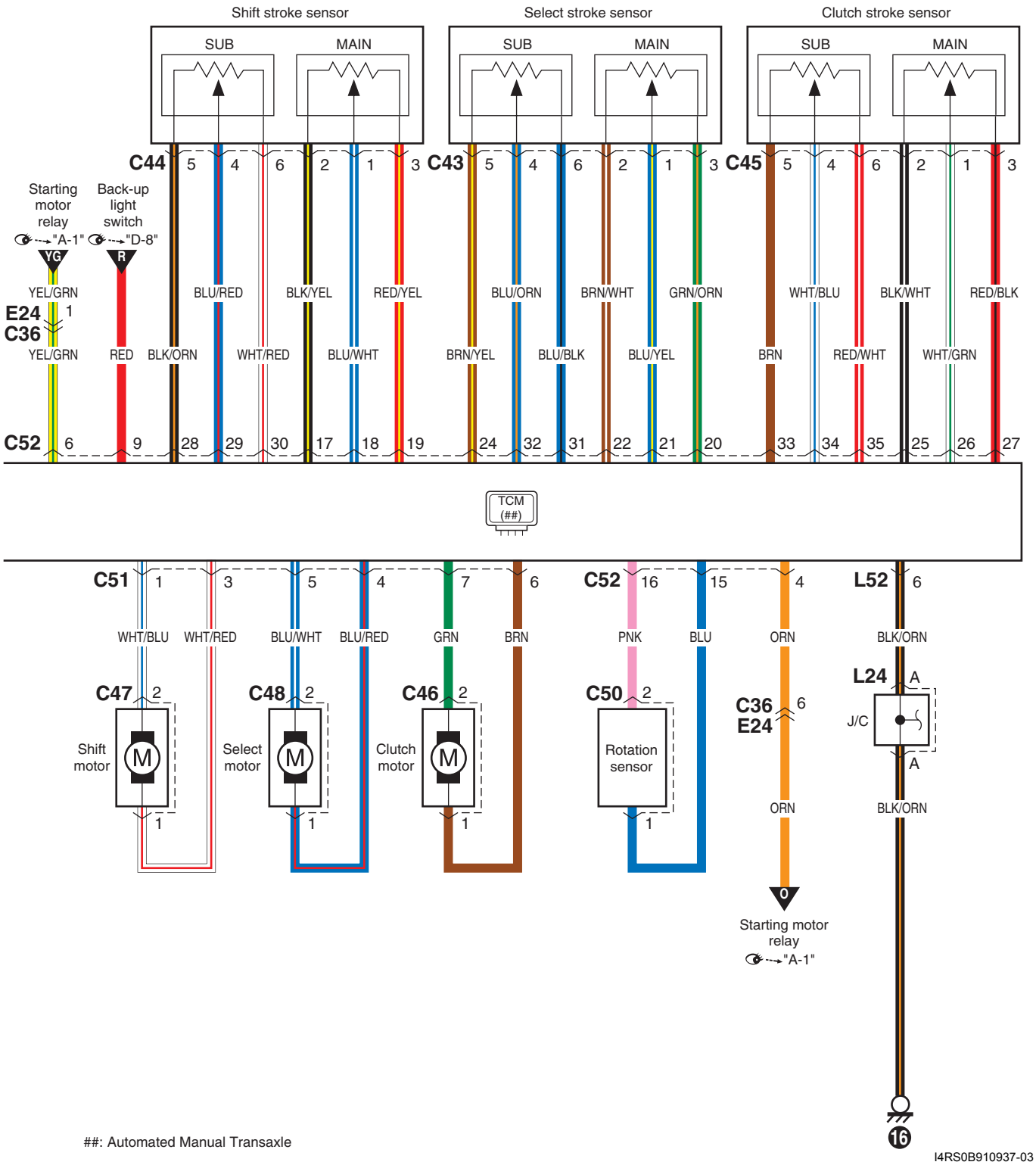
S7N20A910E015



I7N20A910926-03



I6RS0B910944-01

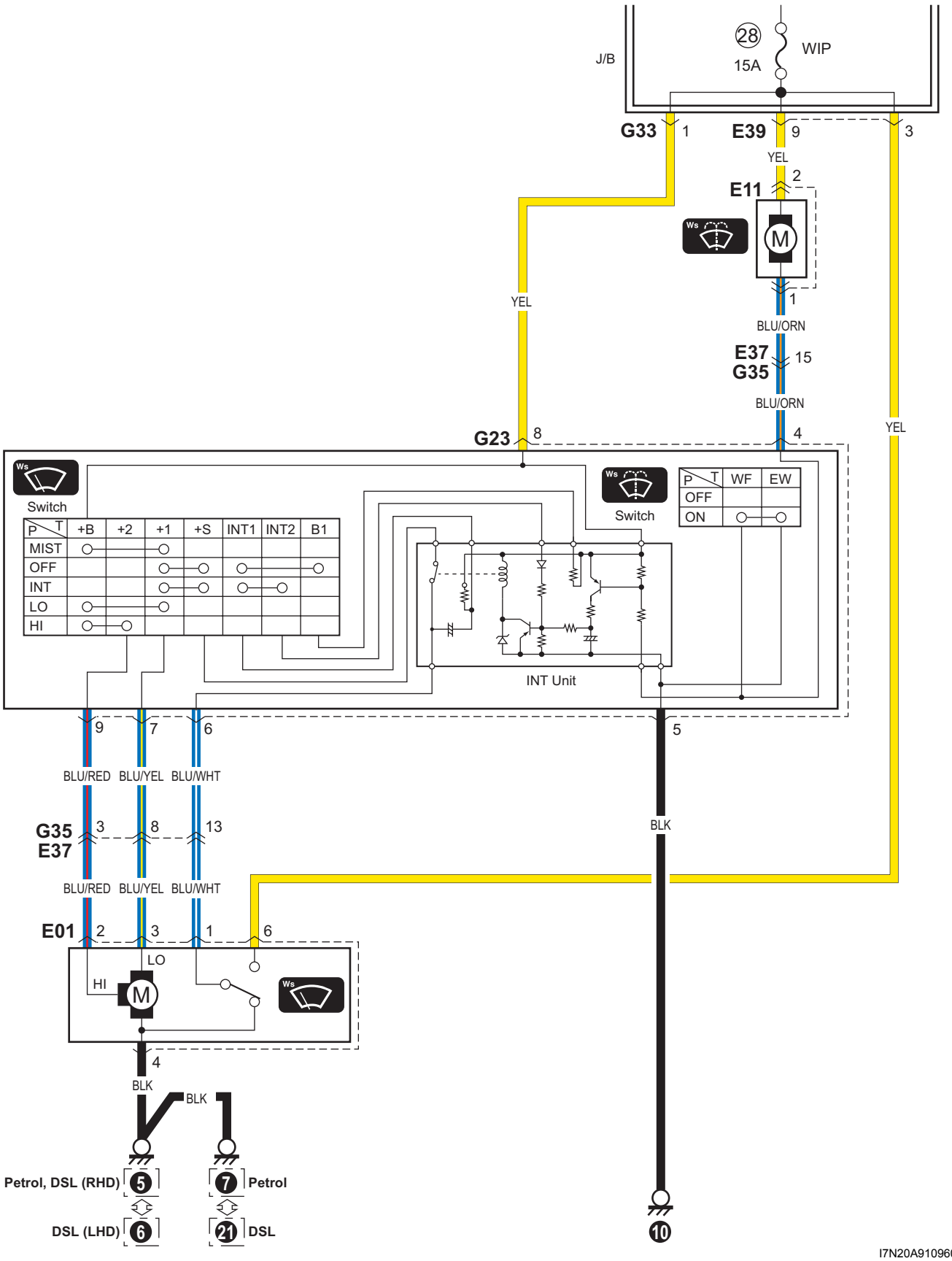


##: Automated Manual Transaxle

I4RS0B910937-03

B-1 Windshield Wiper and Washer Circuit Diagram

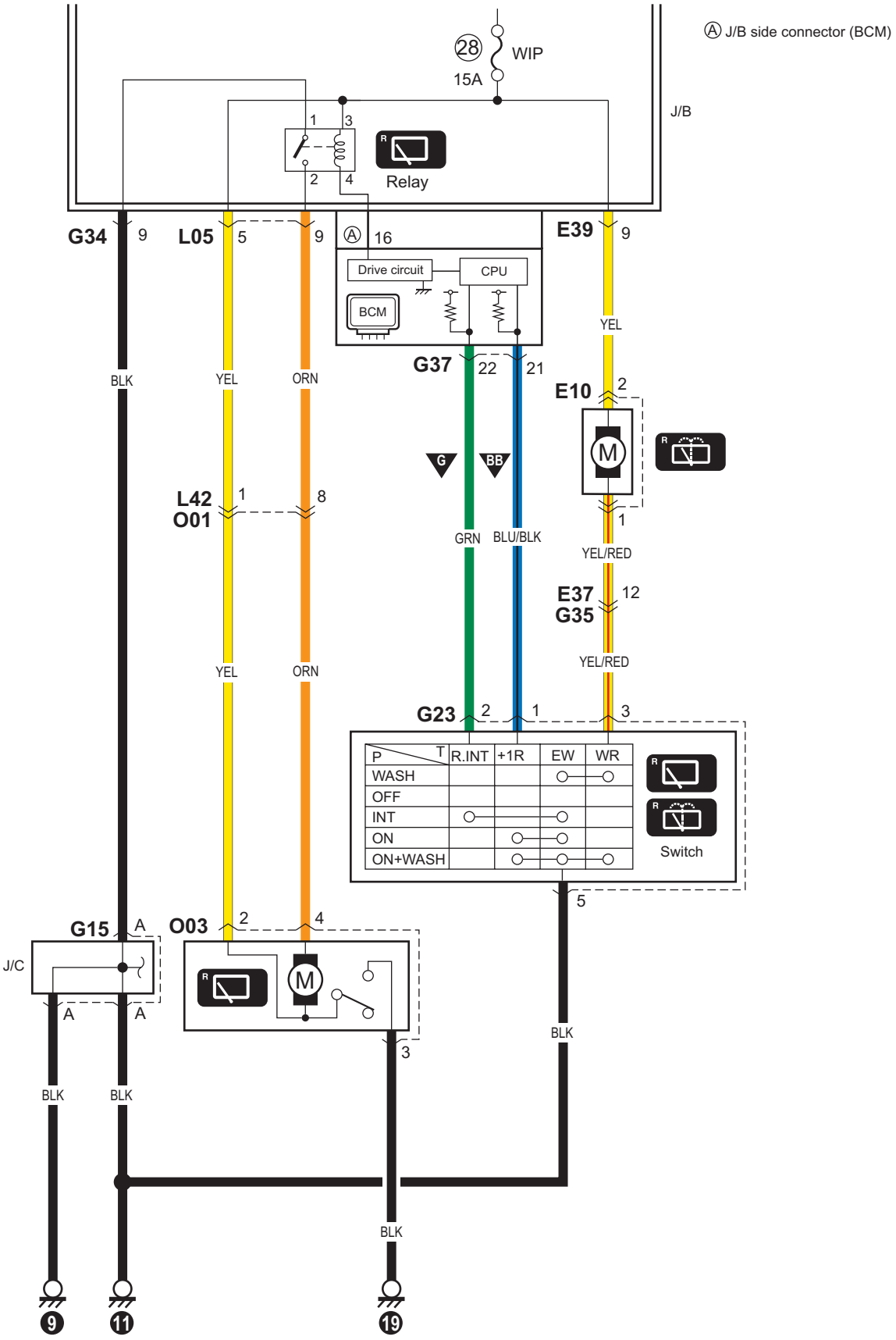
S7N20A910E016



I7N20A910960-01

B-2 Rear Wiper and Washer Circuit Diagram

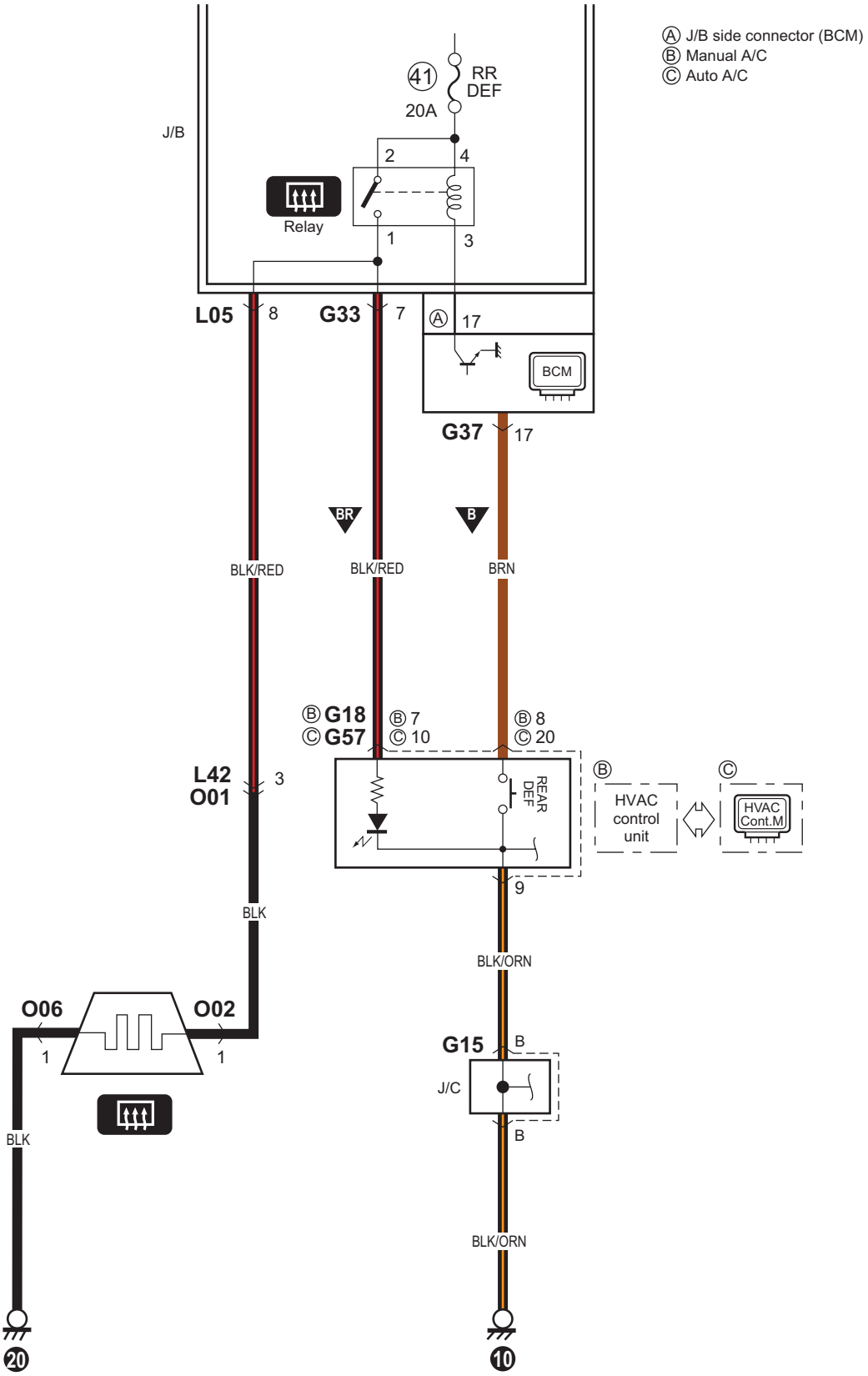
S7N20A910E017



I7N20A910961-01

B-3 Rear Defogger Circuit Diagram

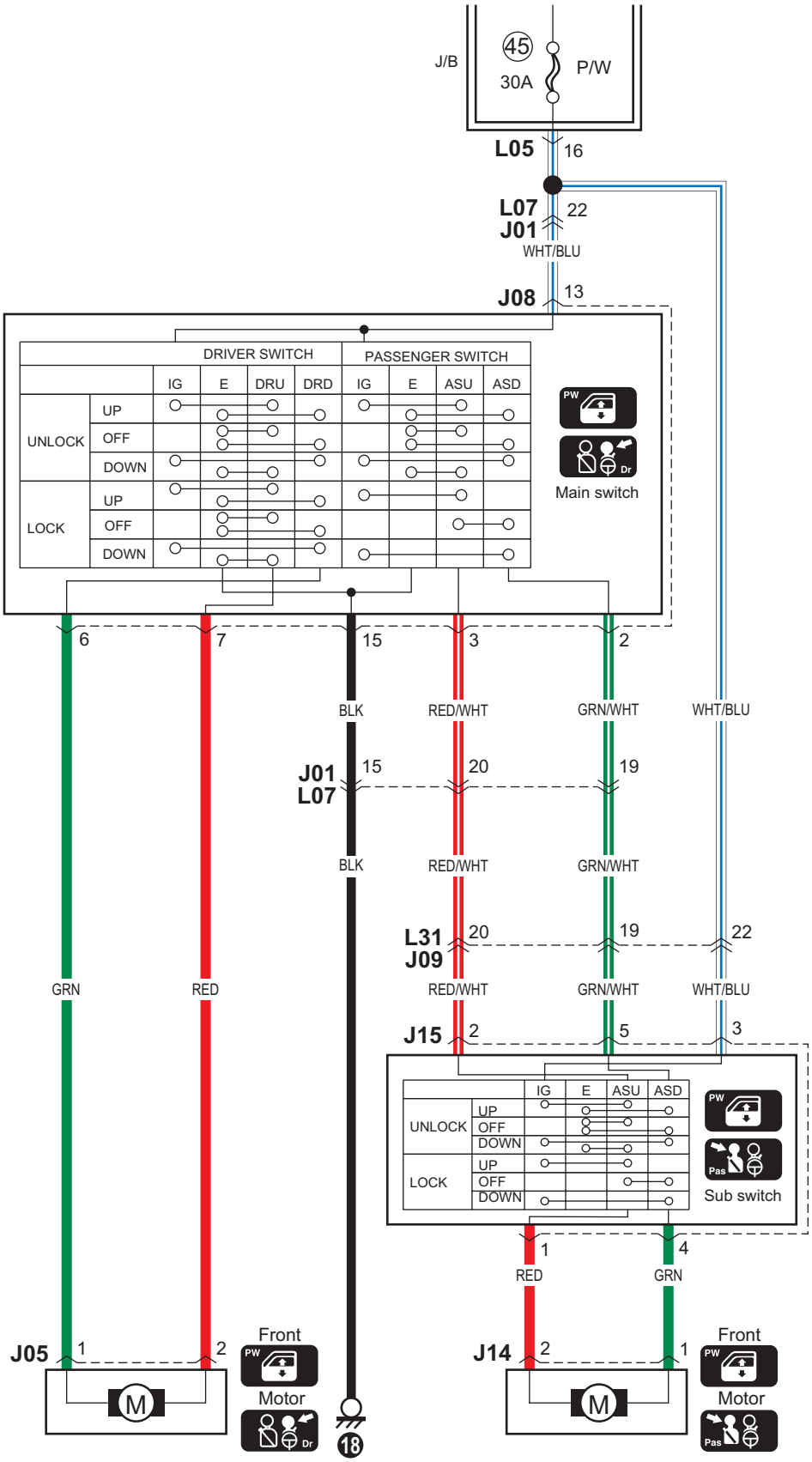
S7N20A910E018



I7N20A910962-02

B-4 Power Window Circuit Diagram

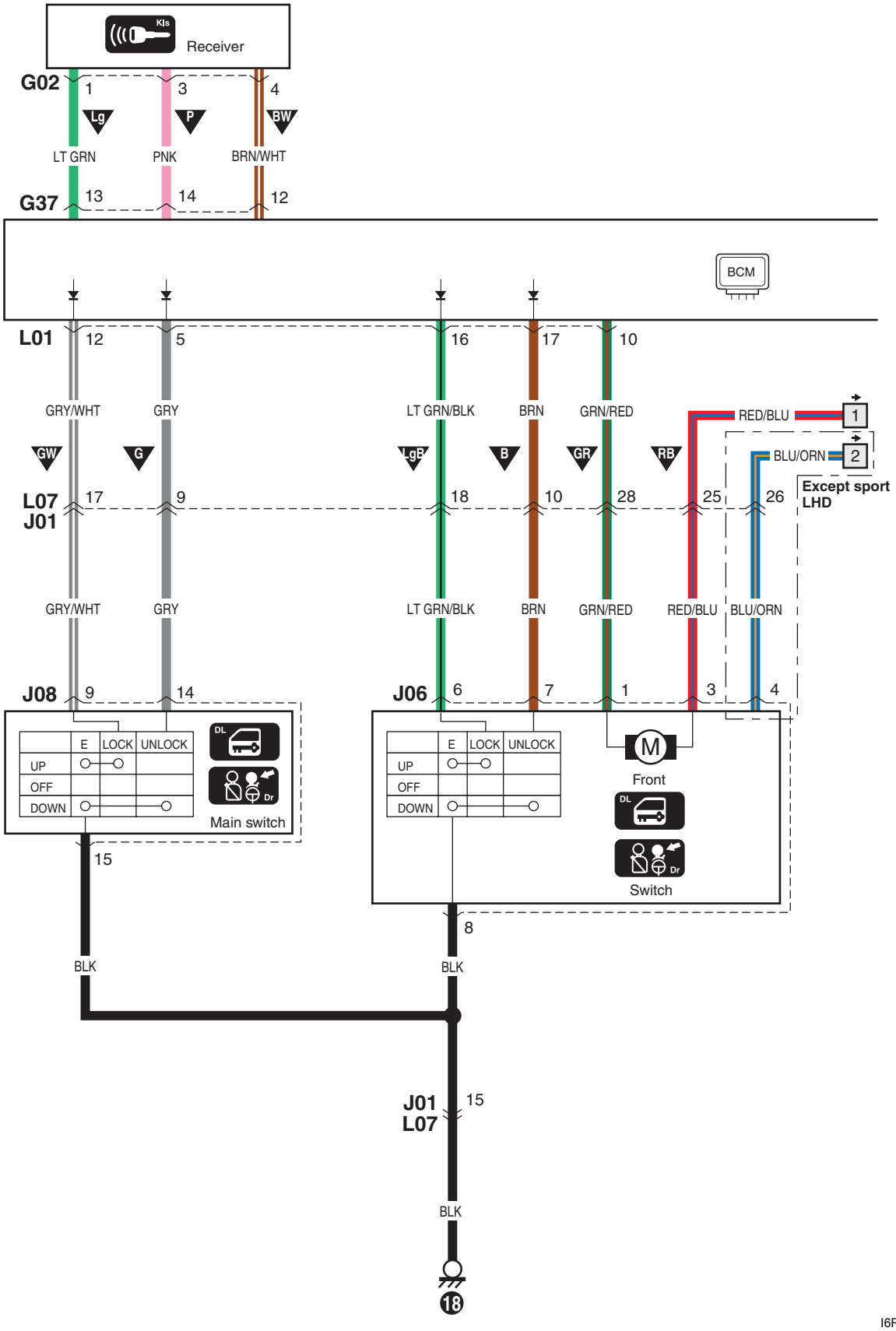
S7N20A910E019



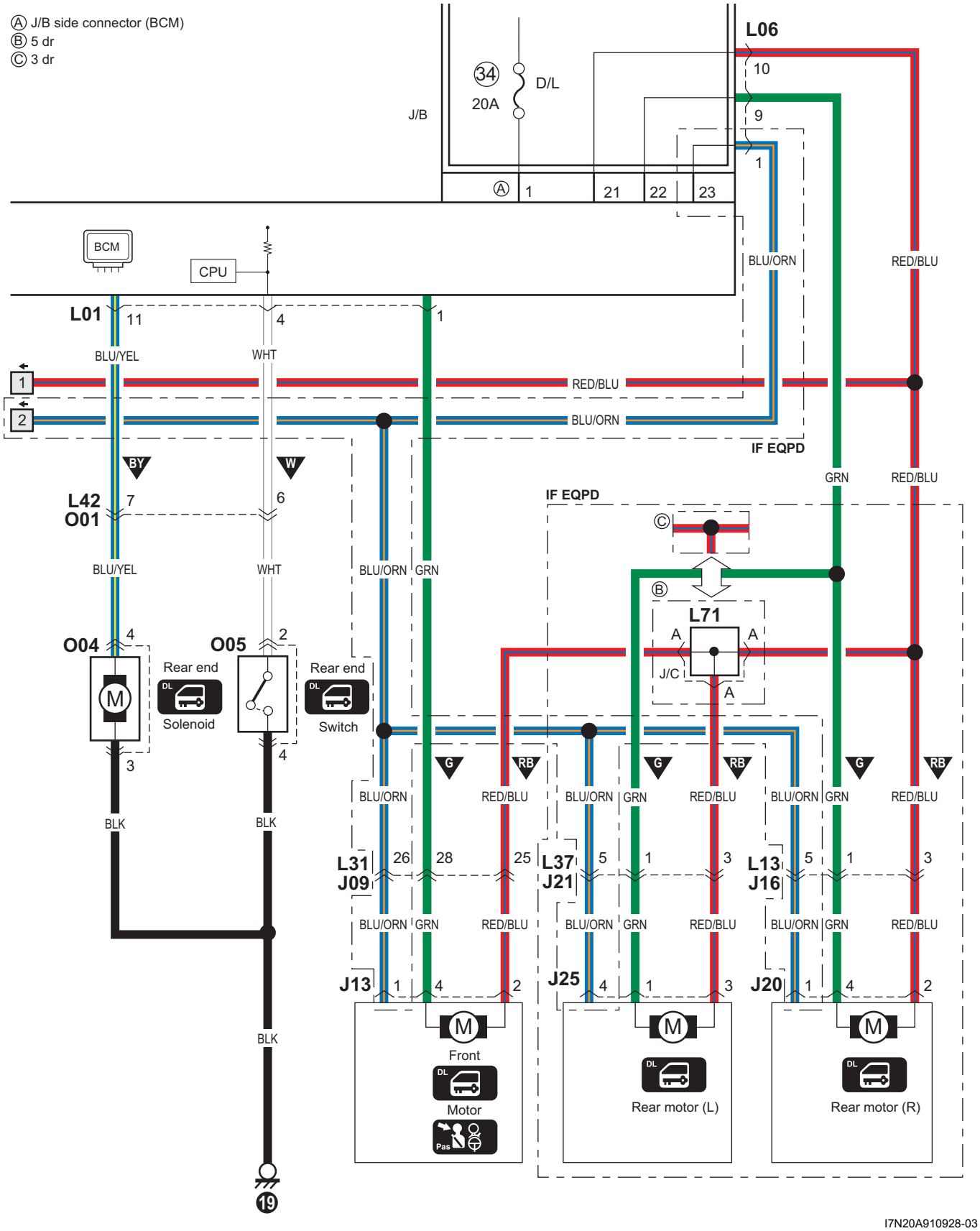
I7N20A910927-01

B-5 Power Door Lock Circuit Diagram

S7N20A910E020



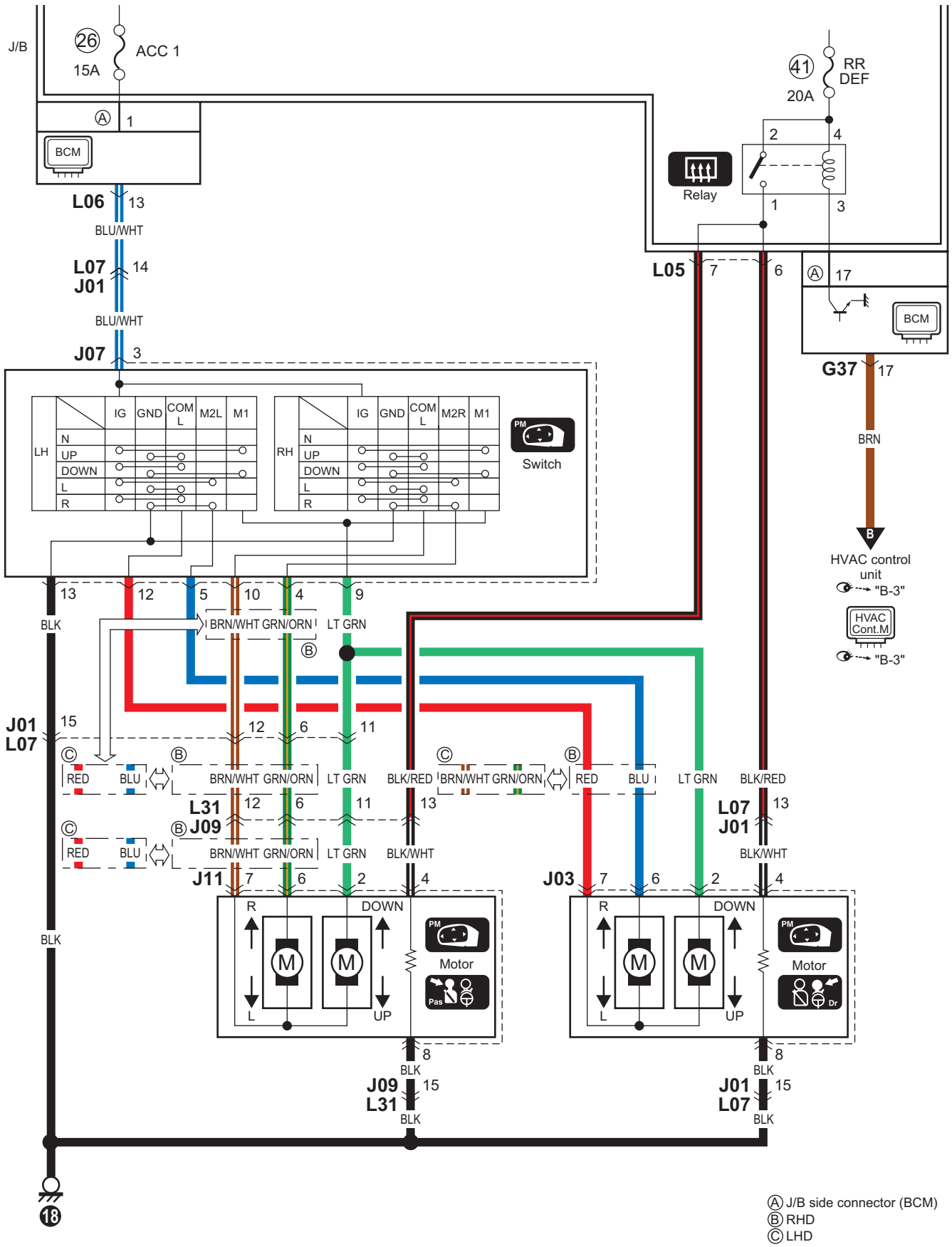
I6RS0B910946-02



I7N20A910928-03

B-6 Power Mirror Circuit Diagram

S7N20A910E021

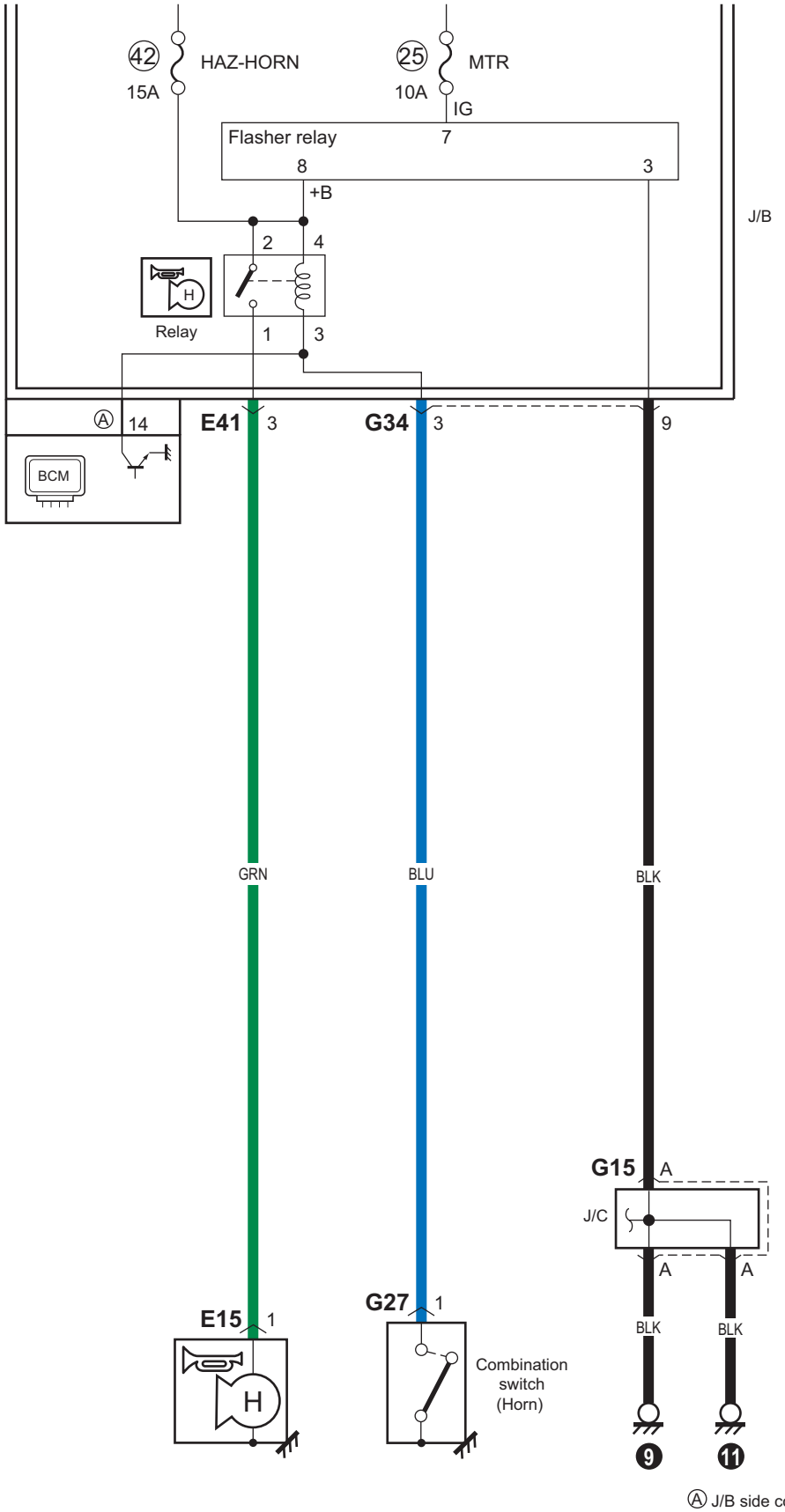


Ⓐ J/B side connector (BCM)
Ⓑ RHD
Ⓒ LHD

I7N20A910963-02

B-7 Horn Circuit Diagram

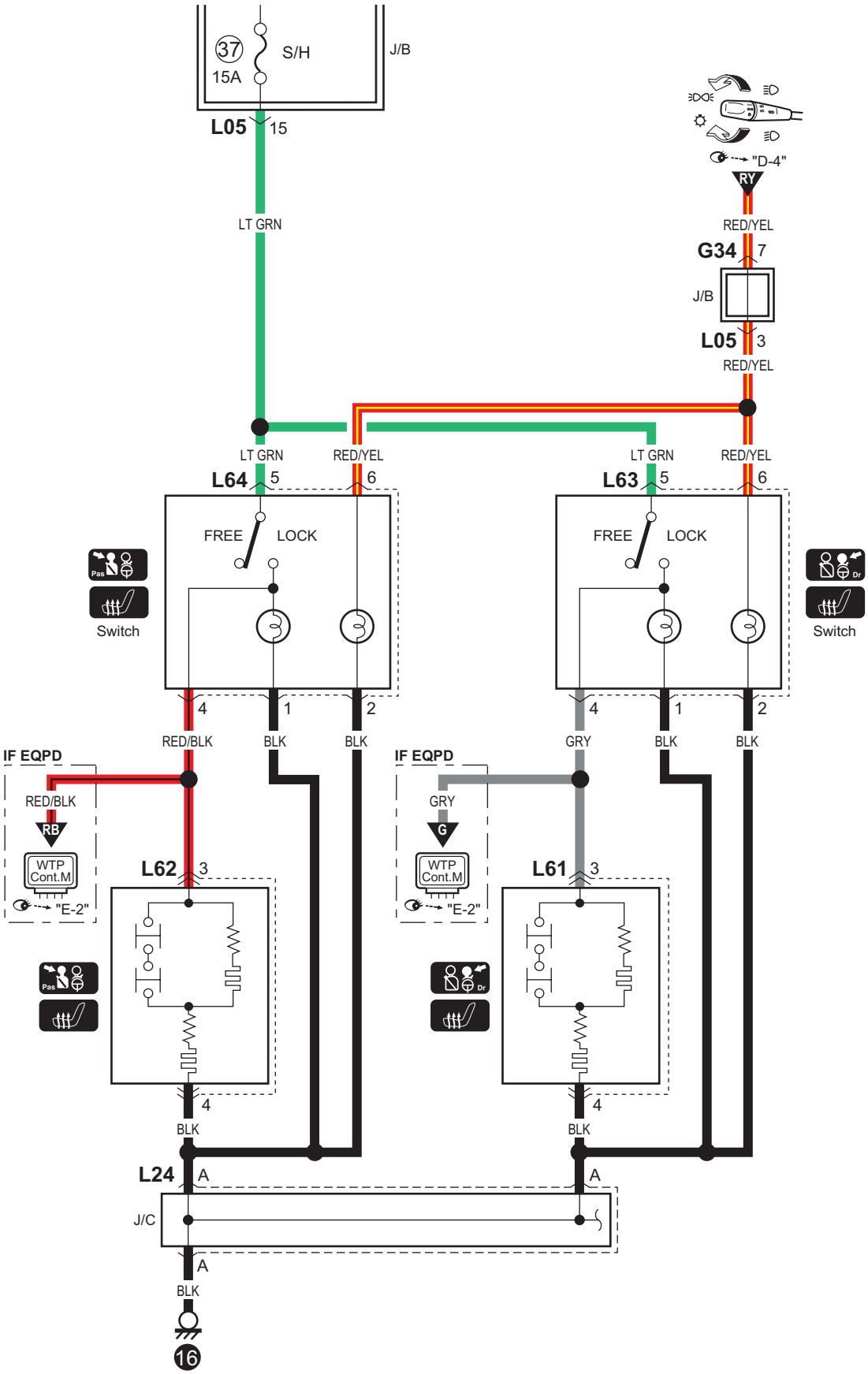
S7N20A910E022



I7N20A910964-01

B-8 Seat Heater Circuit Diagram

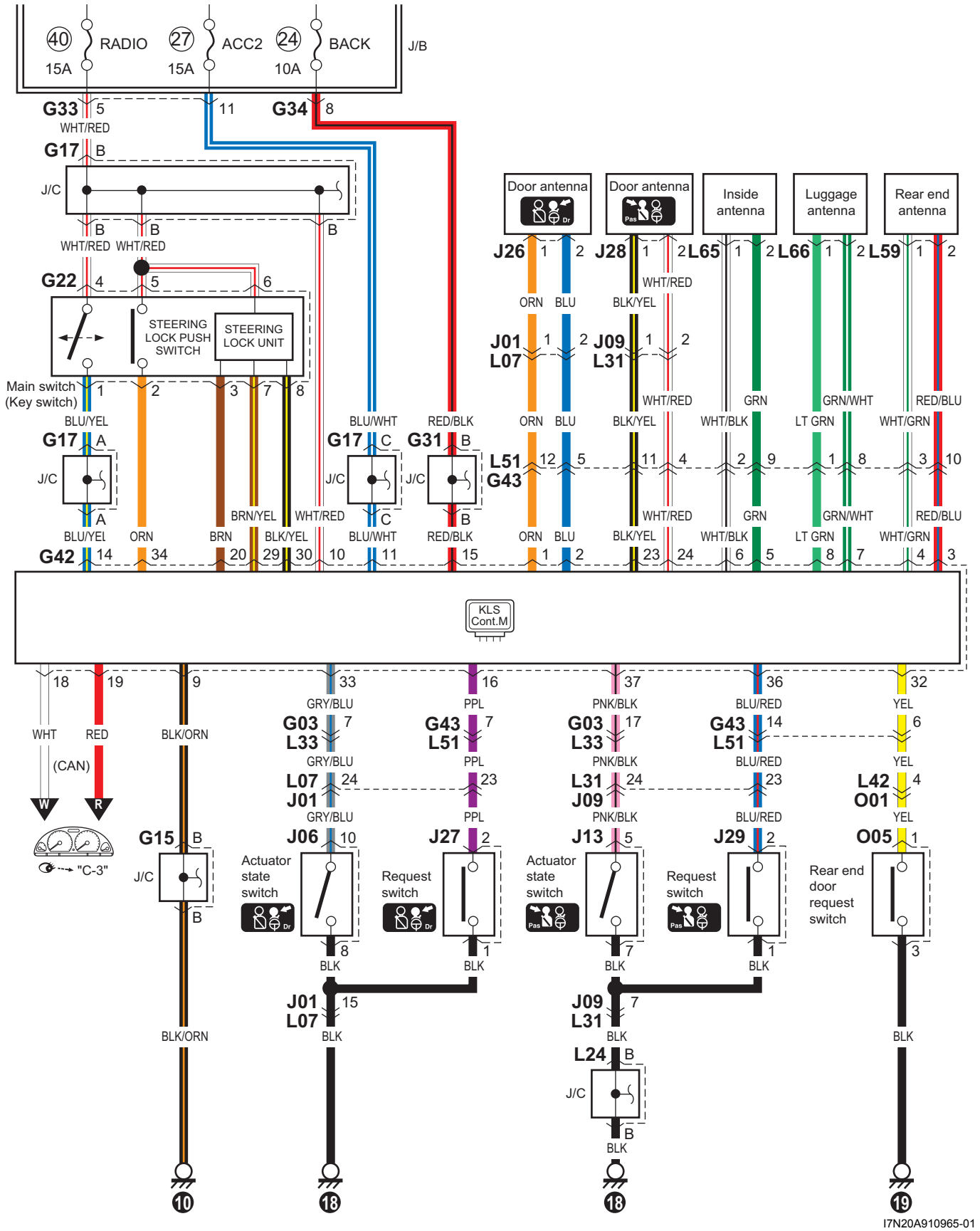
S7N20A910E023



I7N20A910929-03

B-9 Keyless Start System Circuit Diagram

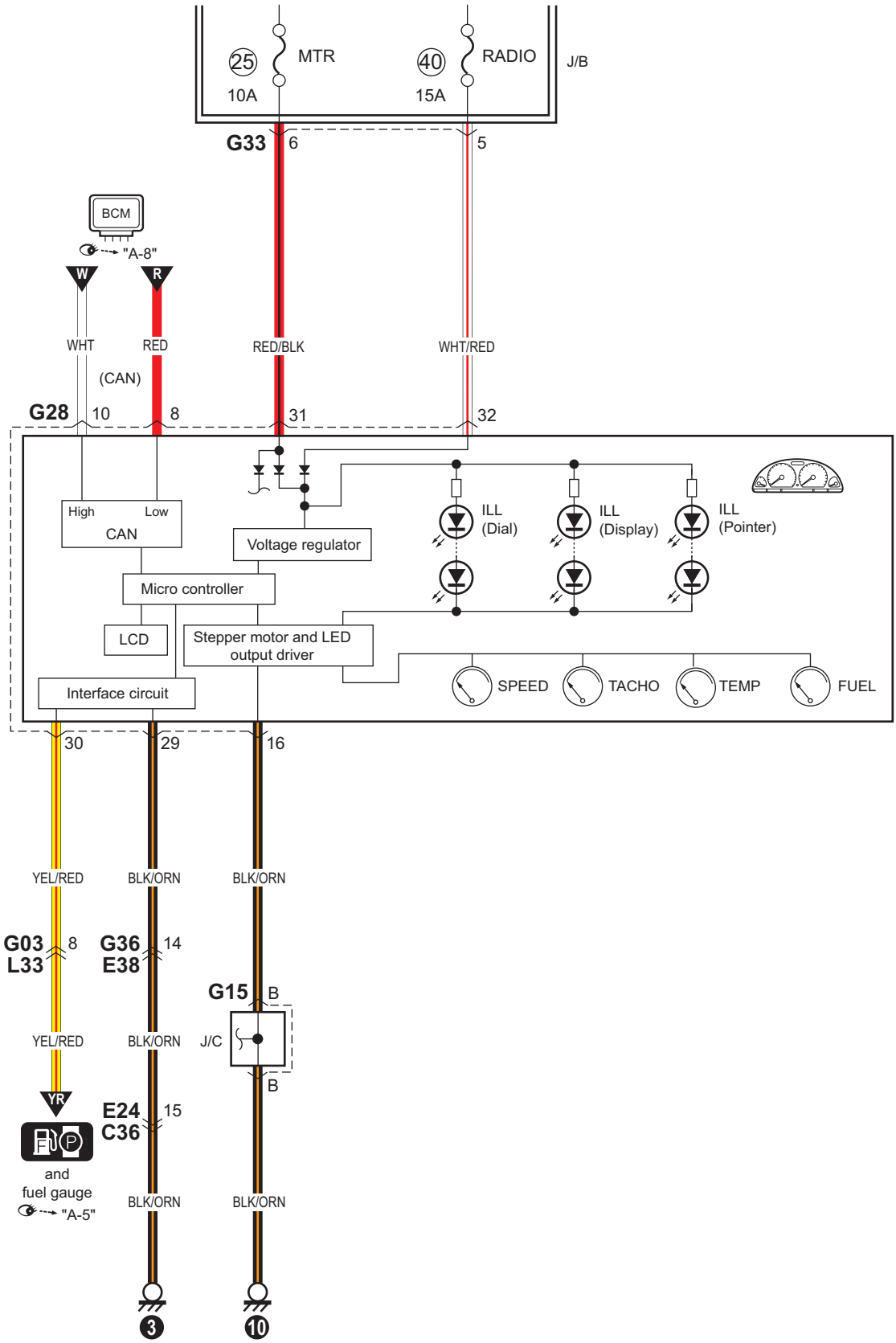
S7N20A910E024



I7N20A910965-01

C-1 Combination Meter Circuit Diagram (Meter)

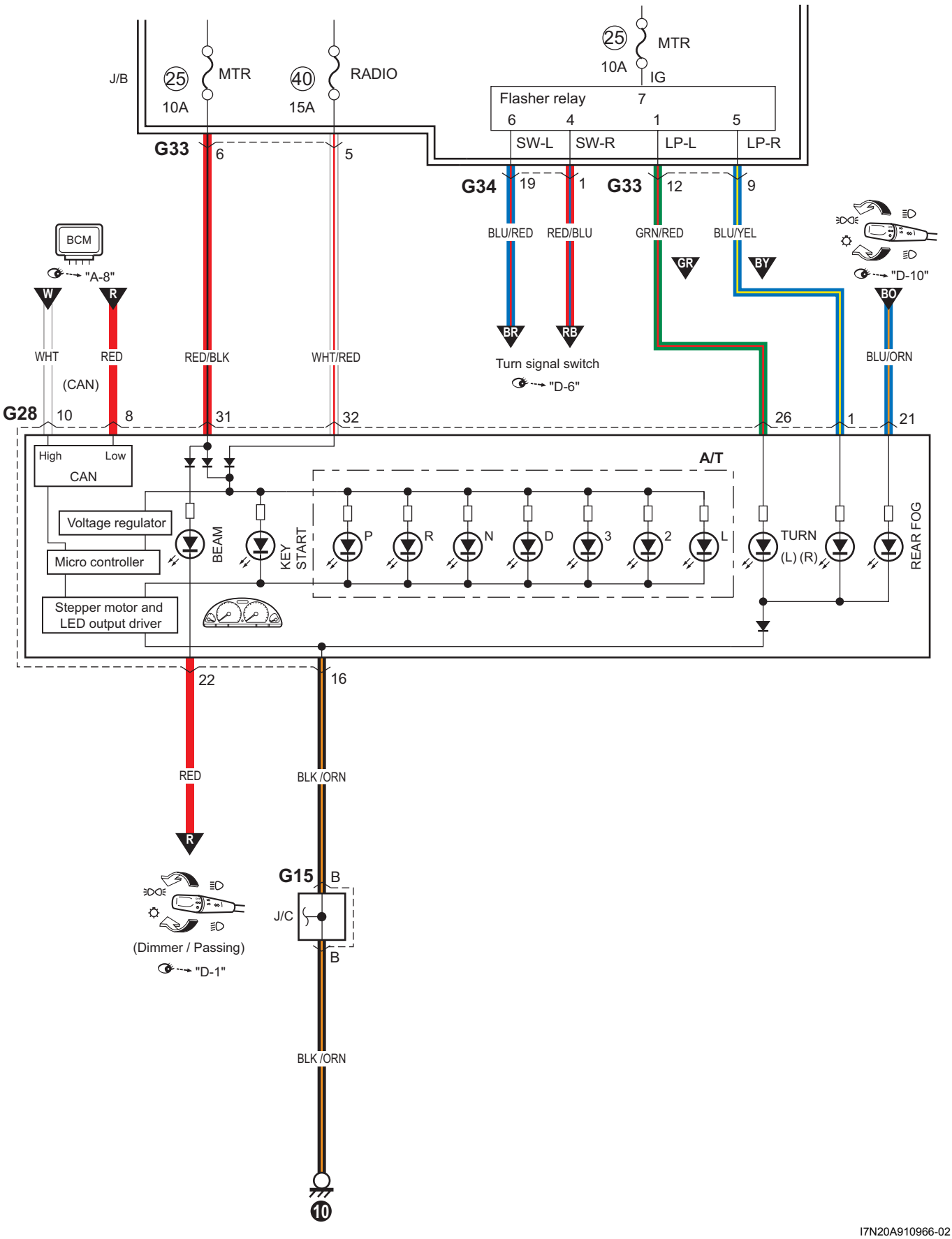
S7N20A910E025



I7N20A910930-02

C-2 Combination Meter Circuit Diagram (Indicator)

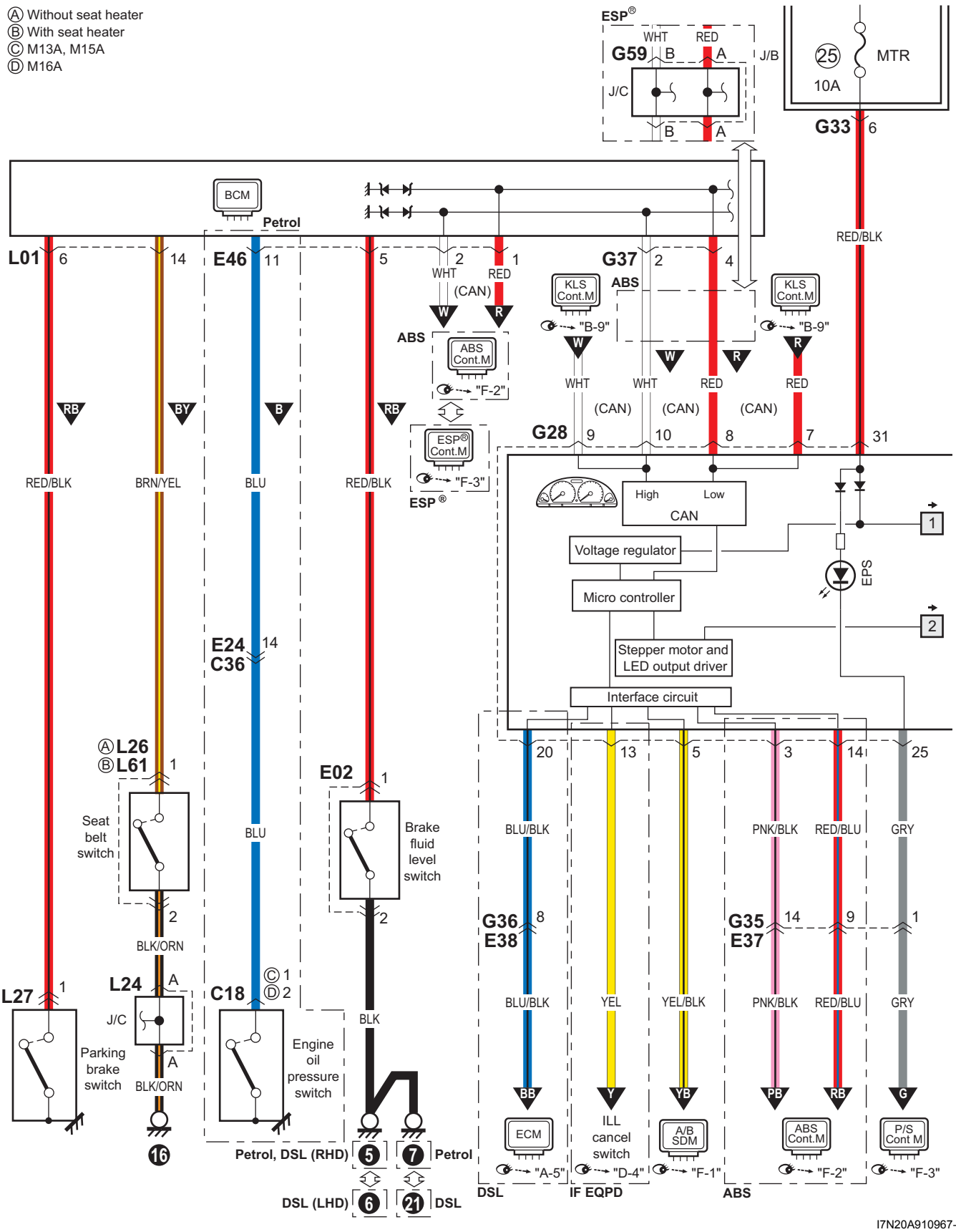
S7N20A910E026



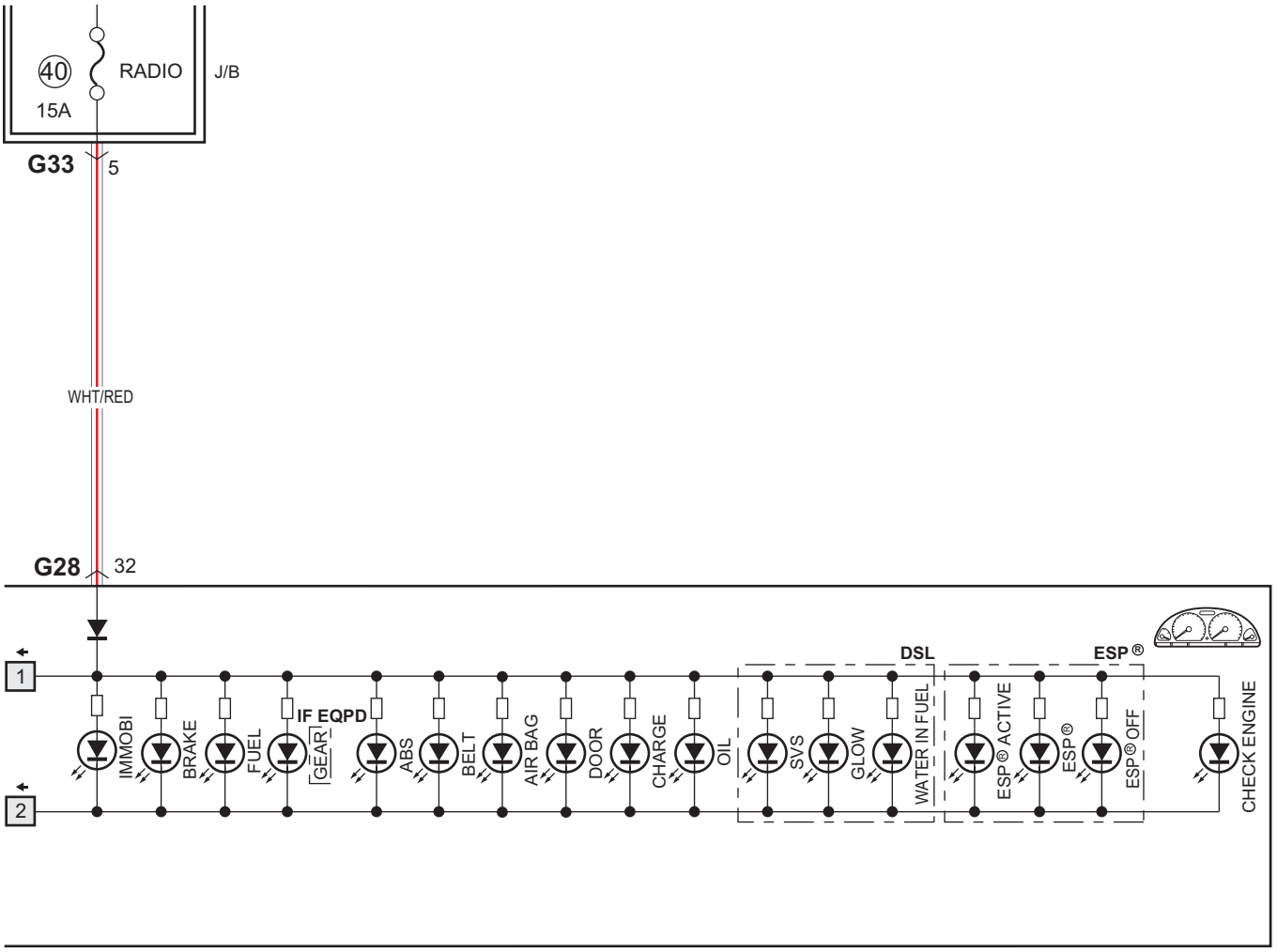
I7N20A910966-02

C-3 Combination Meter Circuit Diagram (Warning Light)

S7N20A910E027



I7N20A910967-03



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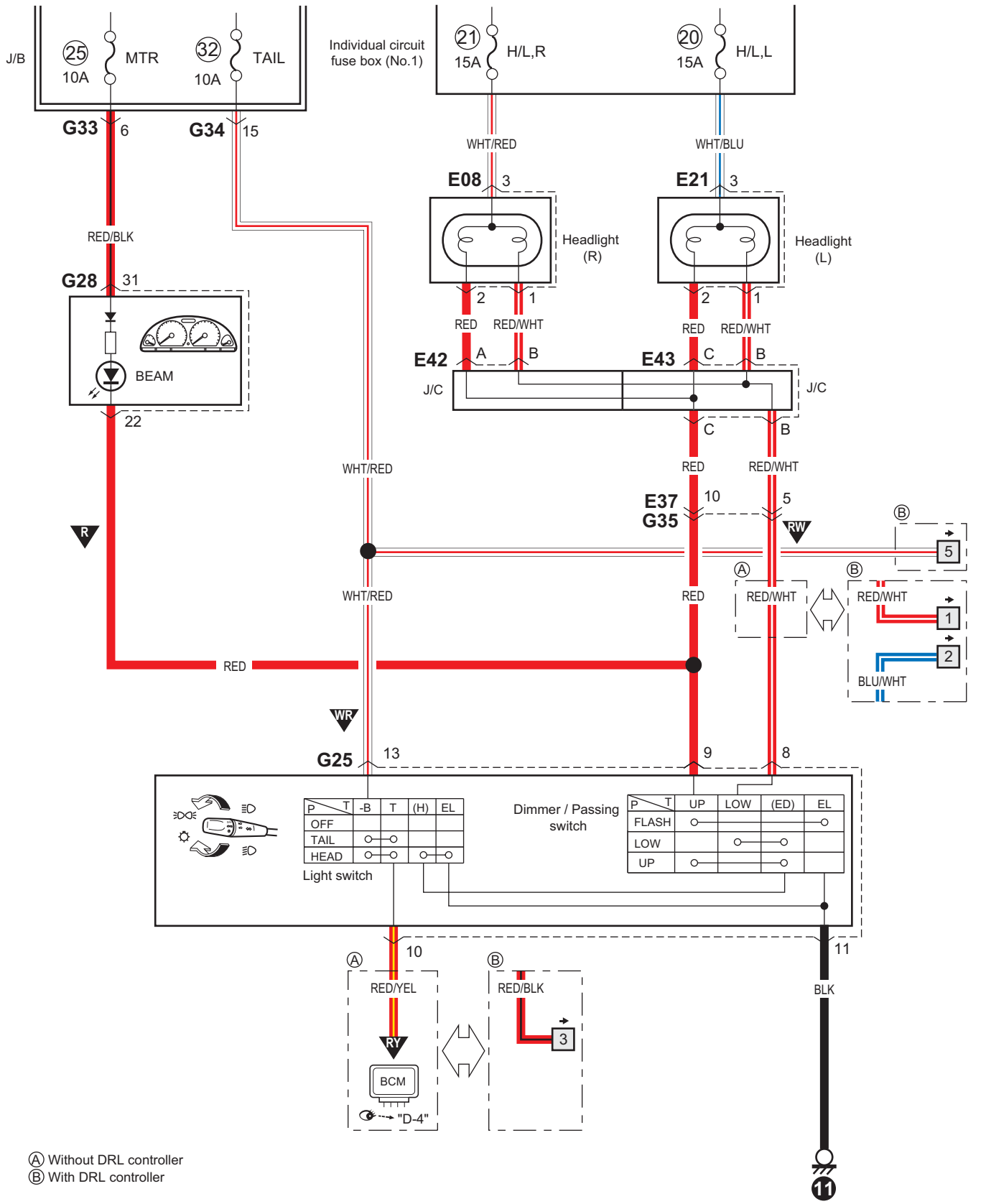
I7N20A910982-01

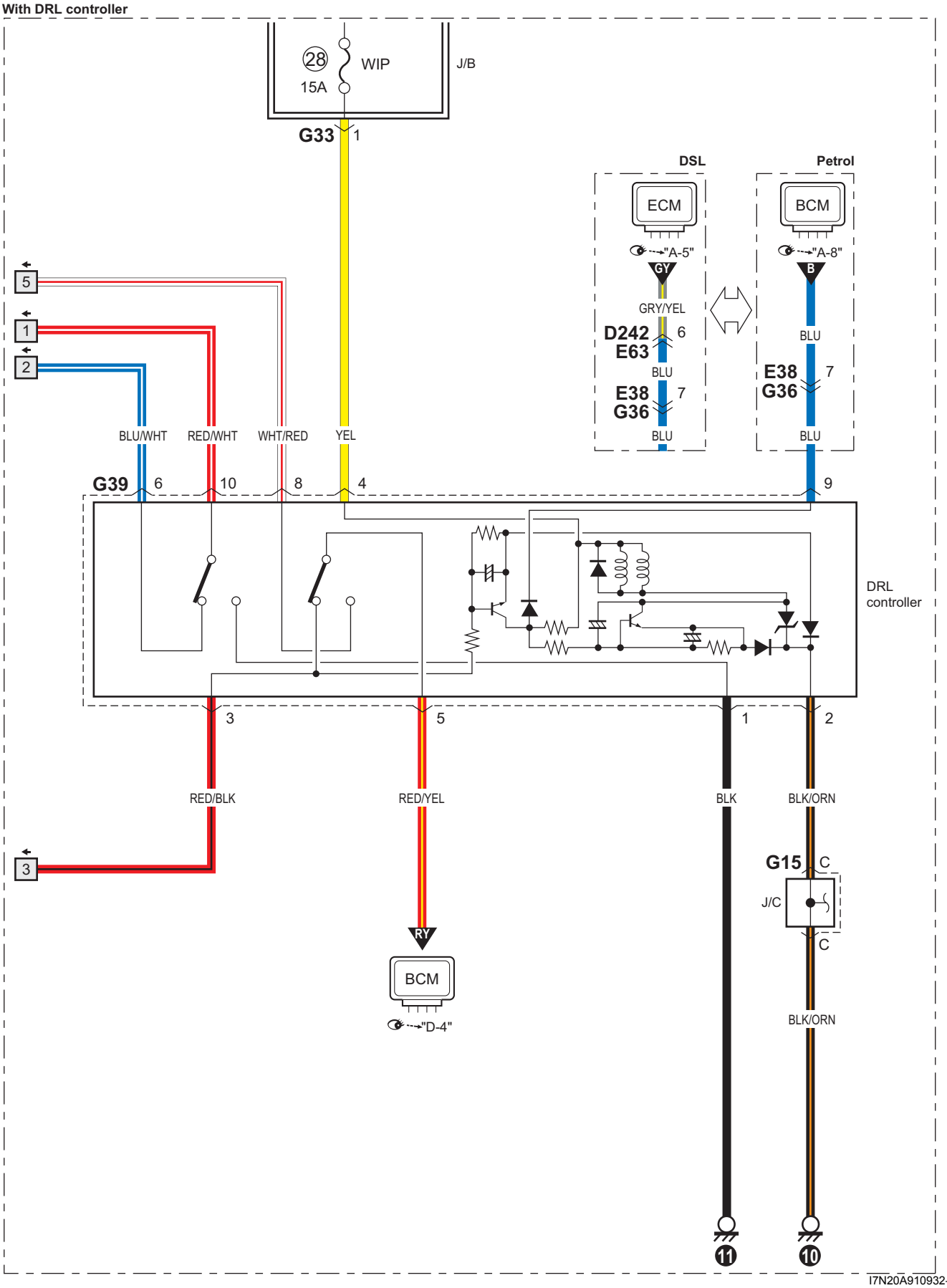
D-1 Headlight System Circuit Diagram

S7N20A910E028



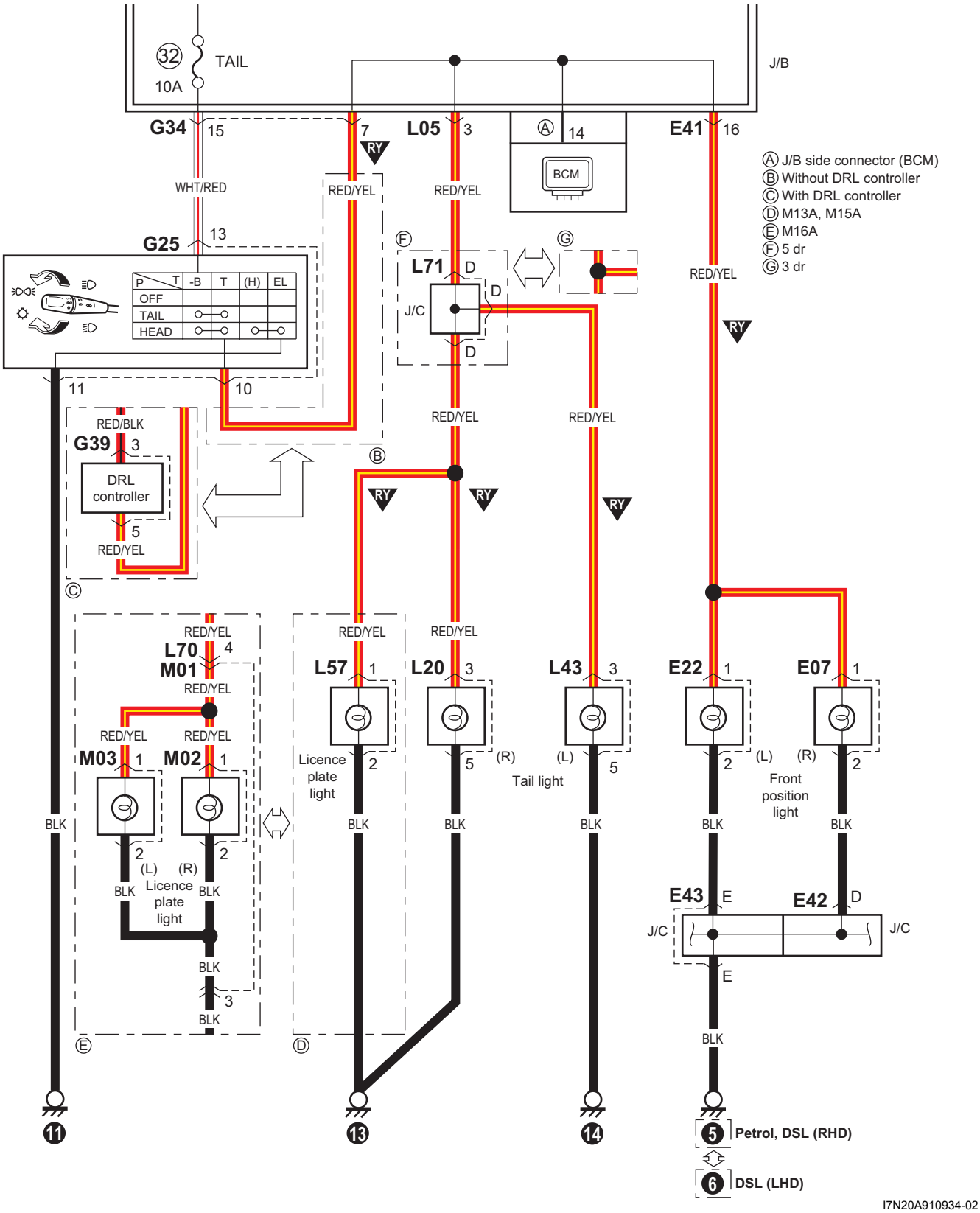
Ⓐ Without DRL controller
Ⓑ With DRL controller

I7N20A910931-02


With DRL controller
28
15A
WIP
J/B
G33
1
DSL
Petrol
ECM
BCM
"A-5"
"A-8"
GY
GRY/YEL
D242
E63
6
BLU
E38
G36
7
B
BLU
5
1
2
BLU/WHT
RED/WHT
WHT/RED
YEL
G39
6
10
8
4
9
DRL
controller
3
5
1
2
RED/BLK
RED/YEL
BLK
BLK/ORN
3
G15
C
J/C
RY
BCM
"D-4"
BLK/ORN
11
10
I7N20A910932-02

D-2 Position, Tail and Licence Plate Light System Circuit Diagram

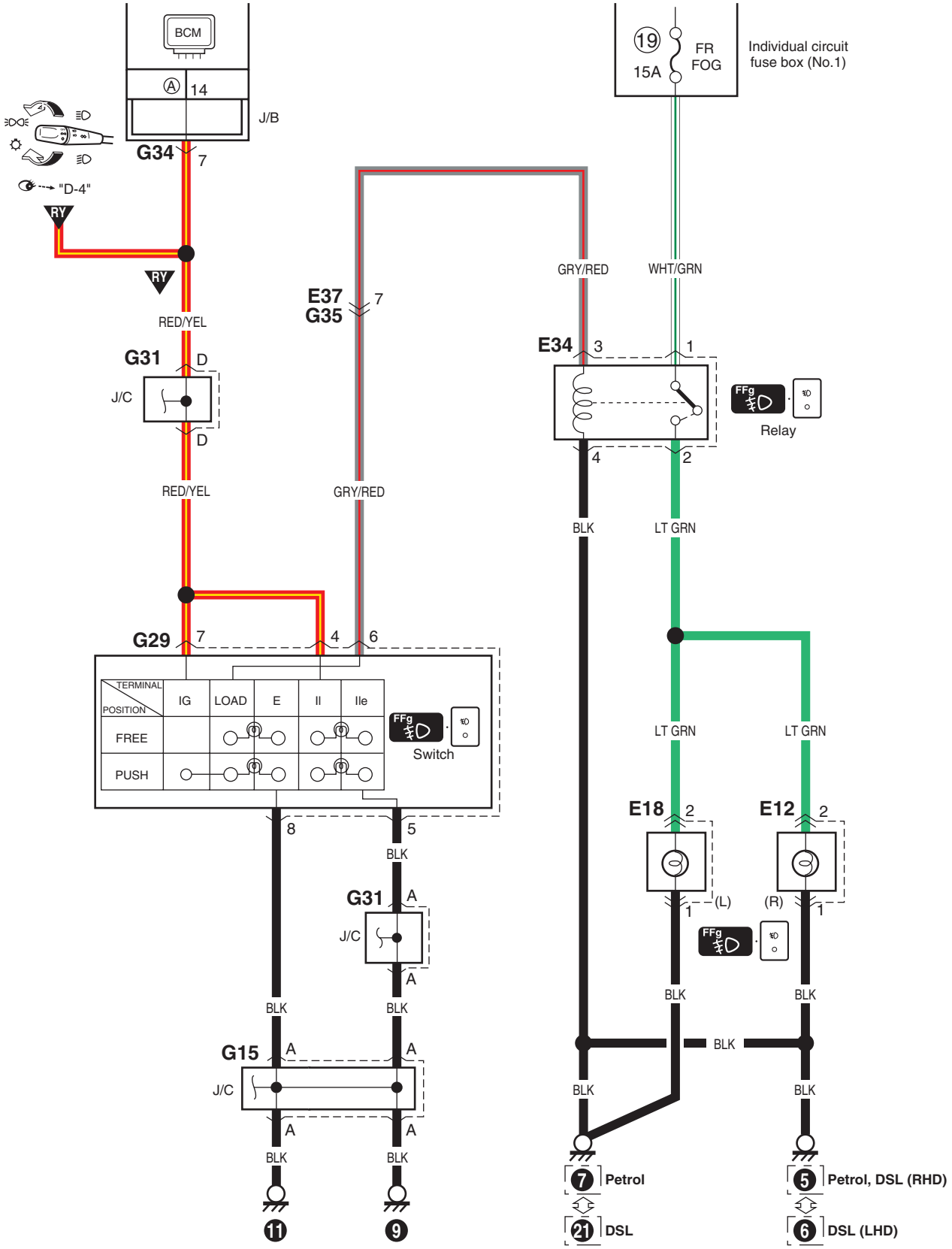
S7N20A910E029



I7N20A910934-02

D-3 Front Fog Light System Circuit Diagram

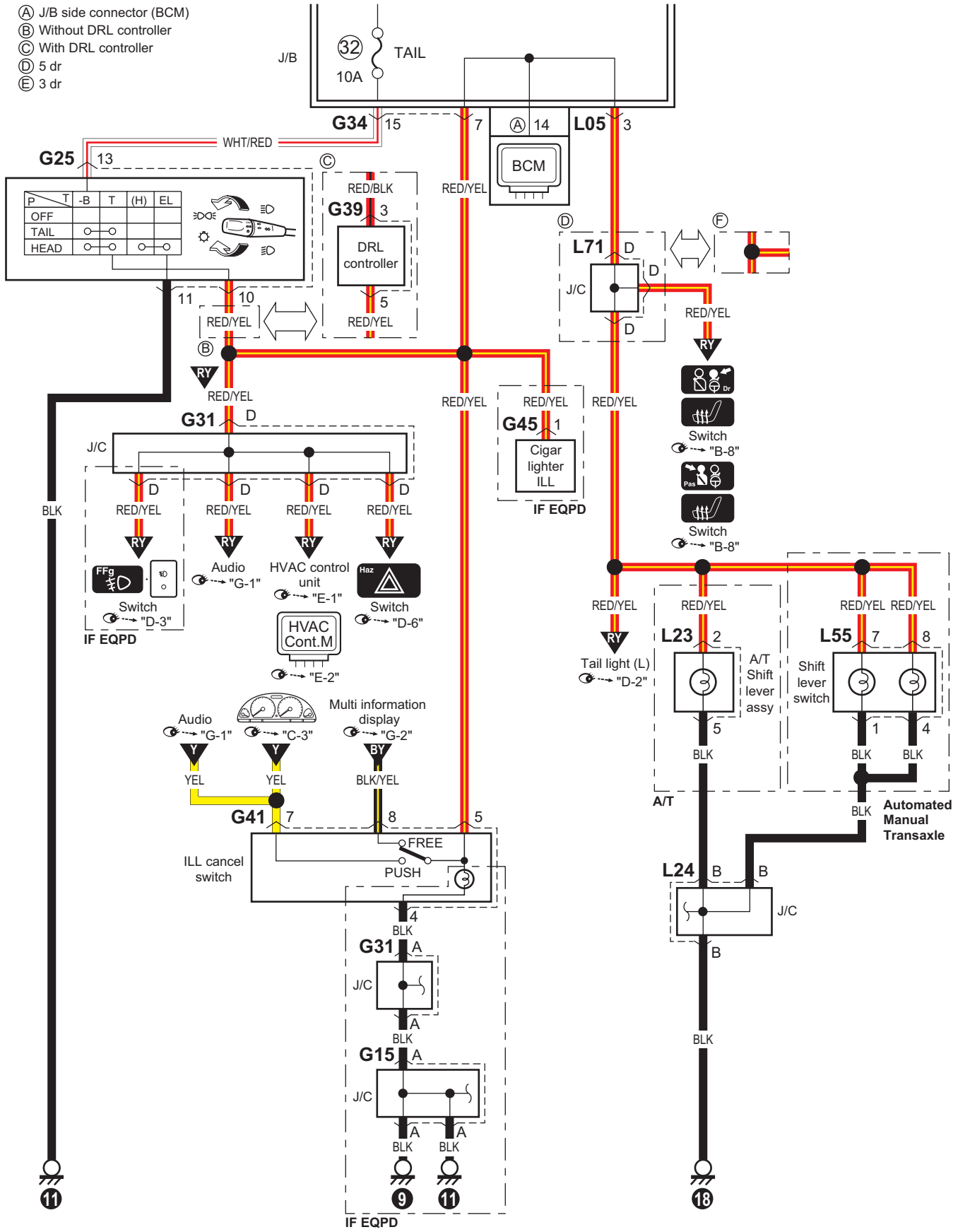
S7N20A910E030



I5RS0B910951-01

D-4 Illumination Light System Circuit Diagram

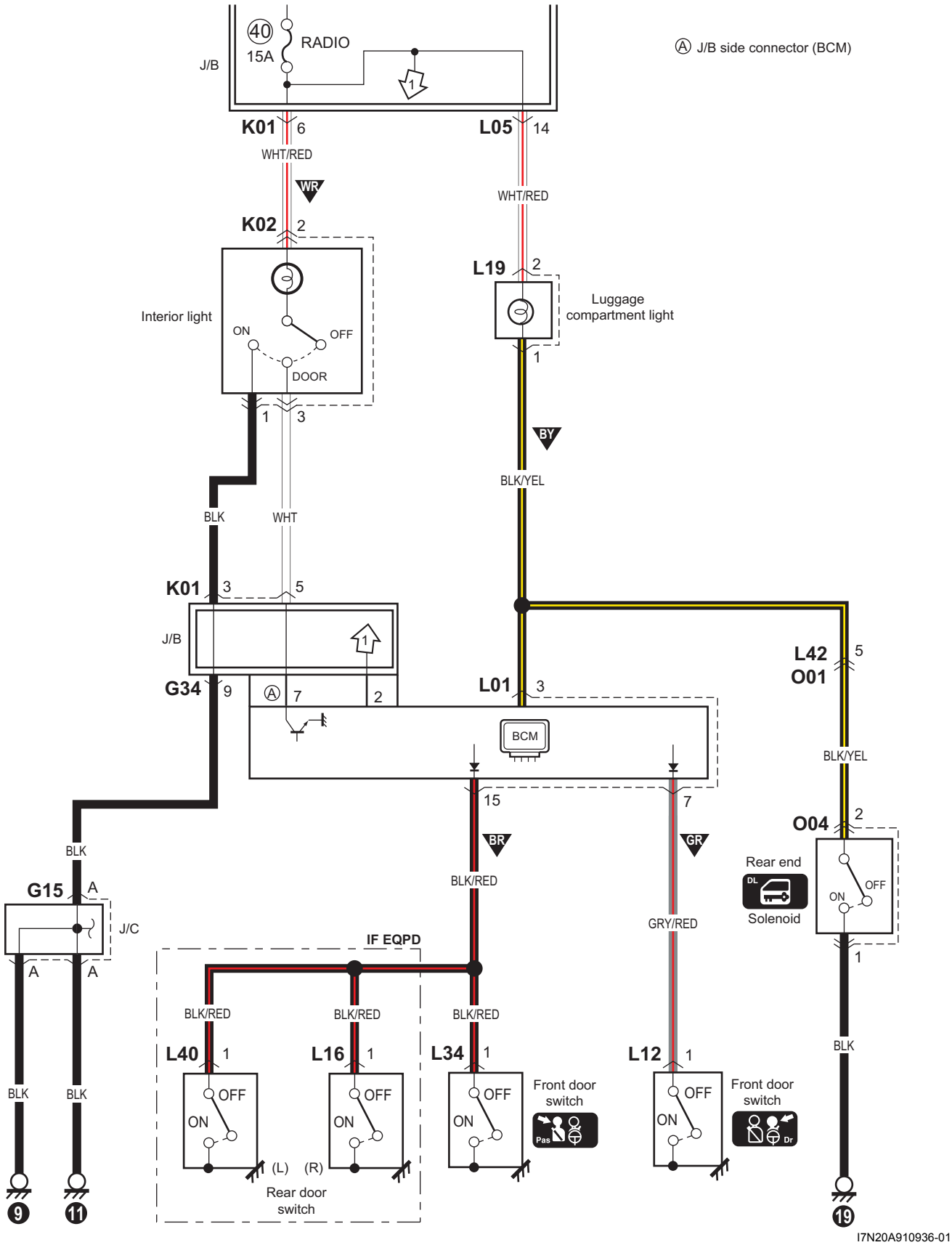
S7N20A910E031



I7N20A910935-03

D-5 Interior Light System Circuit Diagram

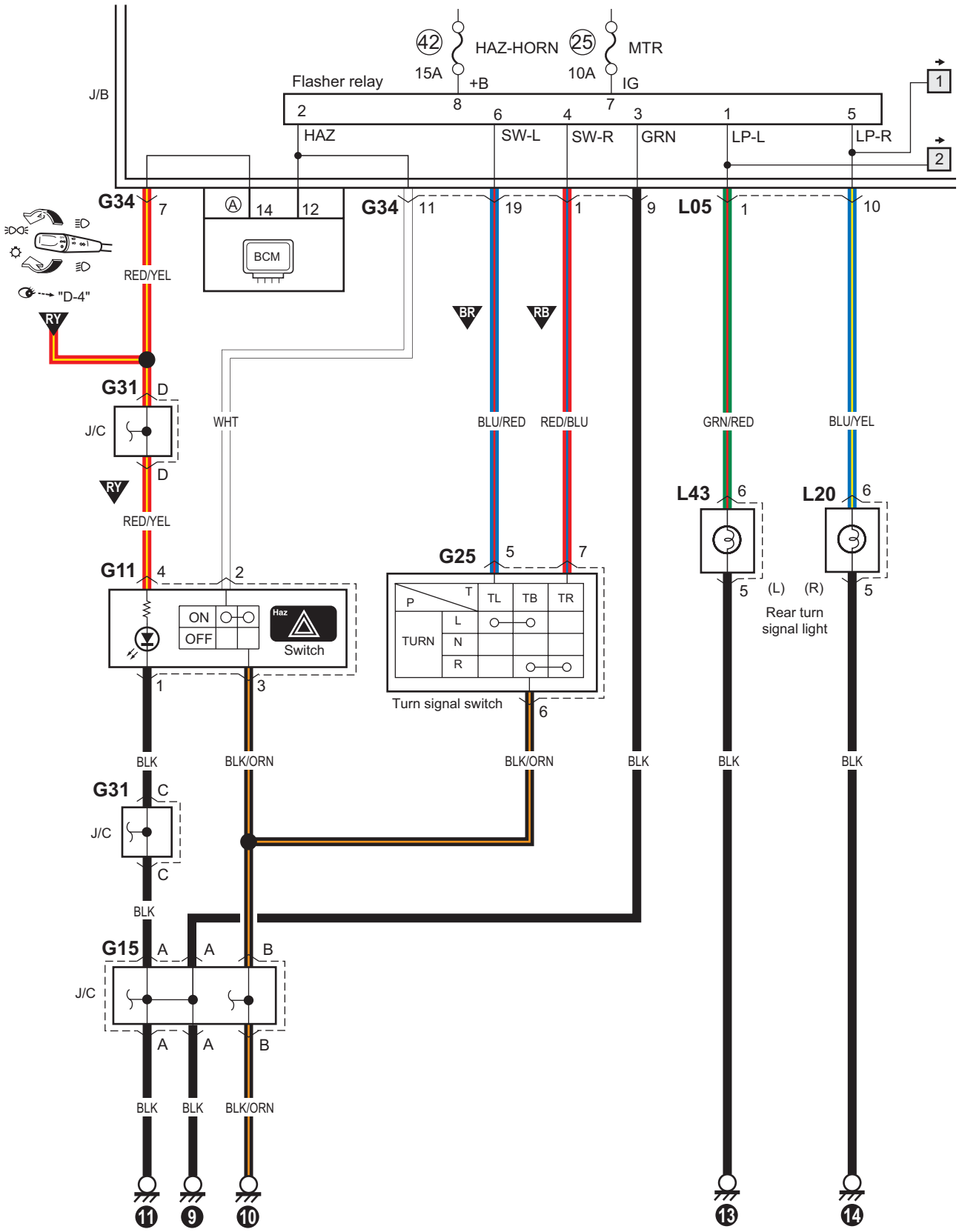
S7N20A910E032



I7N20A910936-01

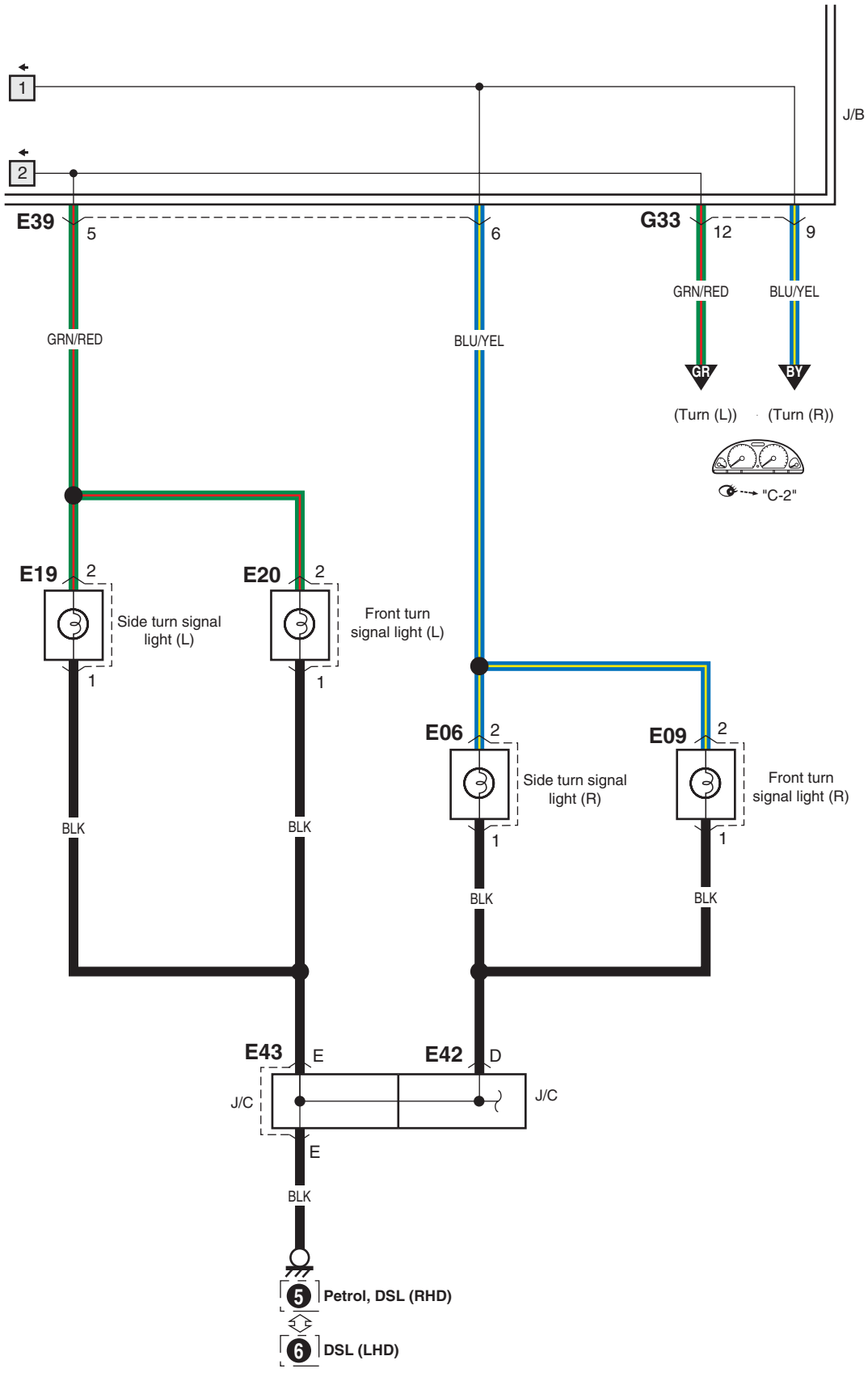
D-6 Turn Signal and Hazard Warning Light System Circuit Diagram

S7N20A910E033



Ⓐ J/B side connector (BCM)

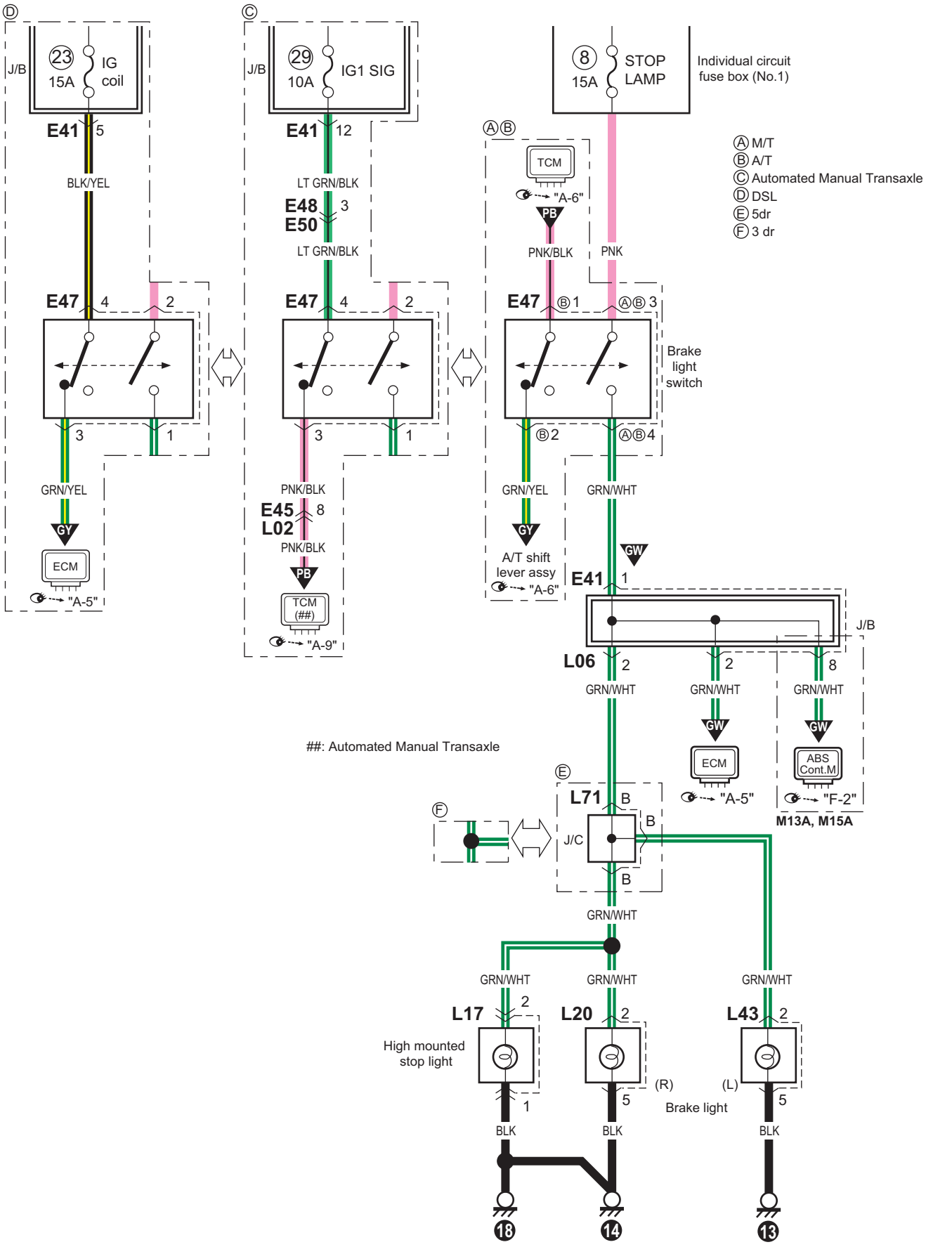
I7N20A910968-01



I5RS0B910953-01

D-7 Brake Light System Circuit Diagram

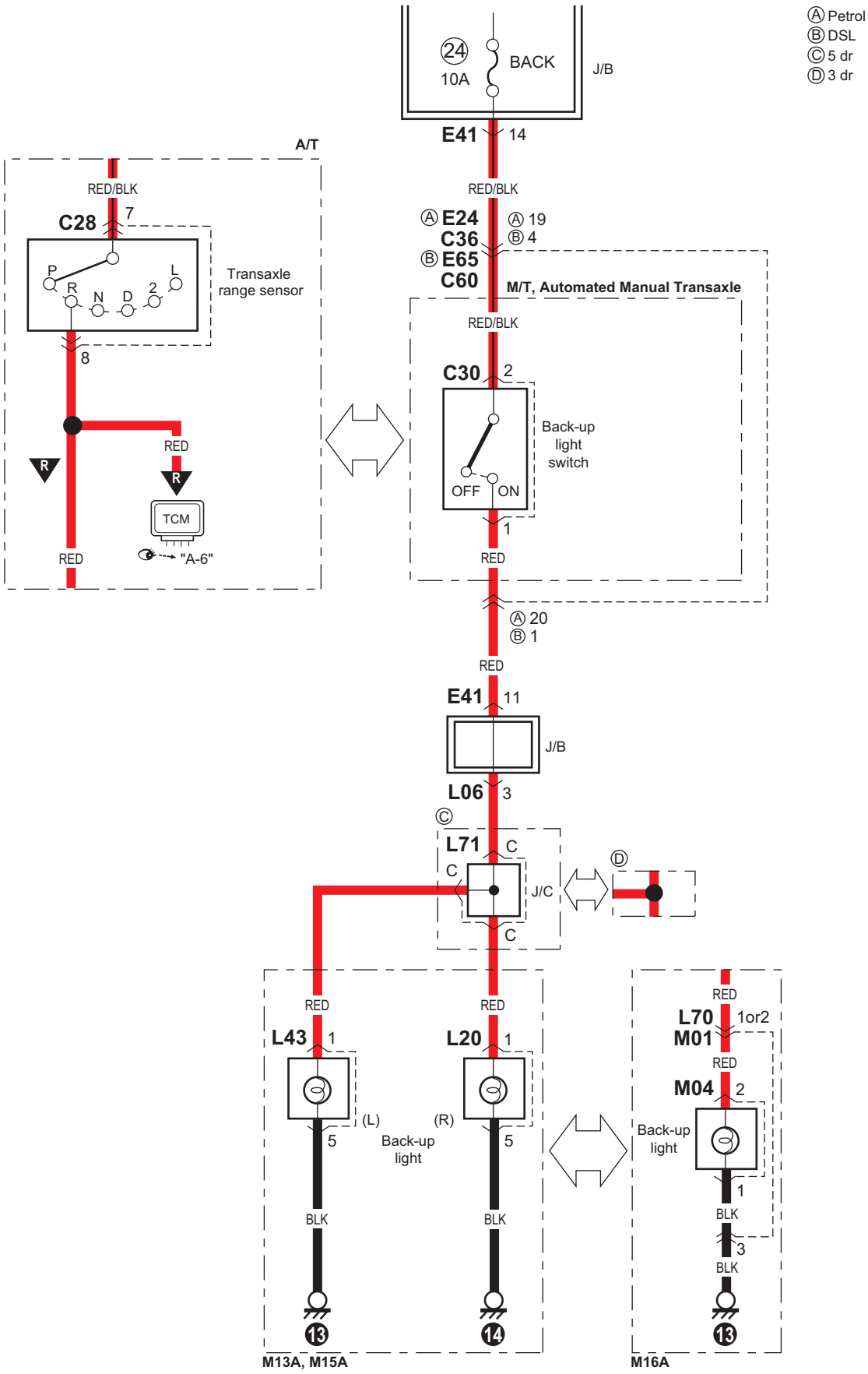
S7N20A910E034



I7N20A910937-04

D-8 Back-Up Light System Circuit Diagram

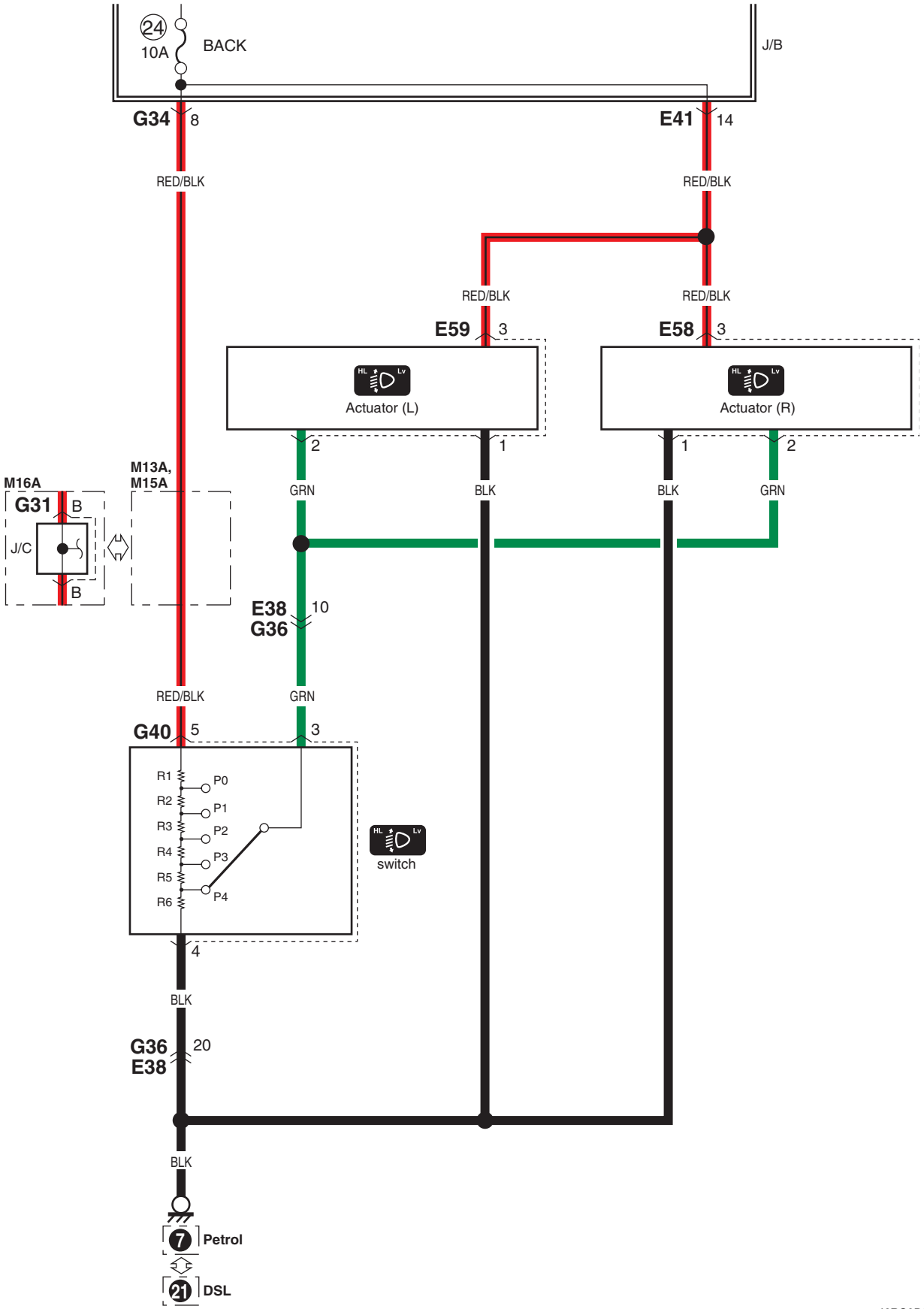
S7N20A910E035



I7N20A910938-04

D-9 Headlight Beam Leveling System Circuit Diagram

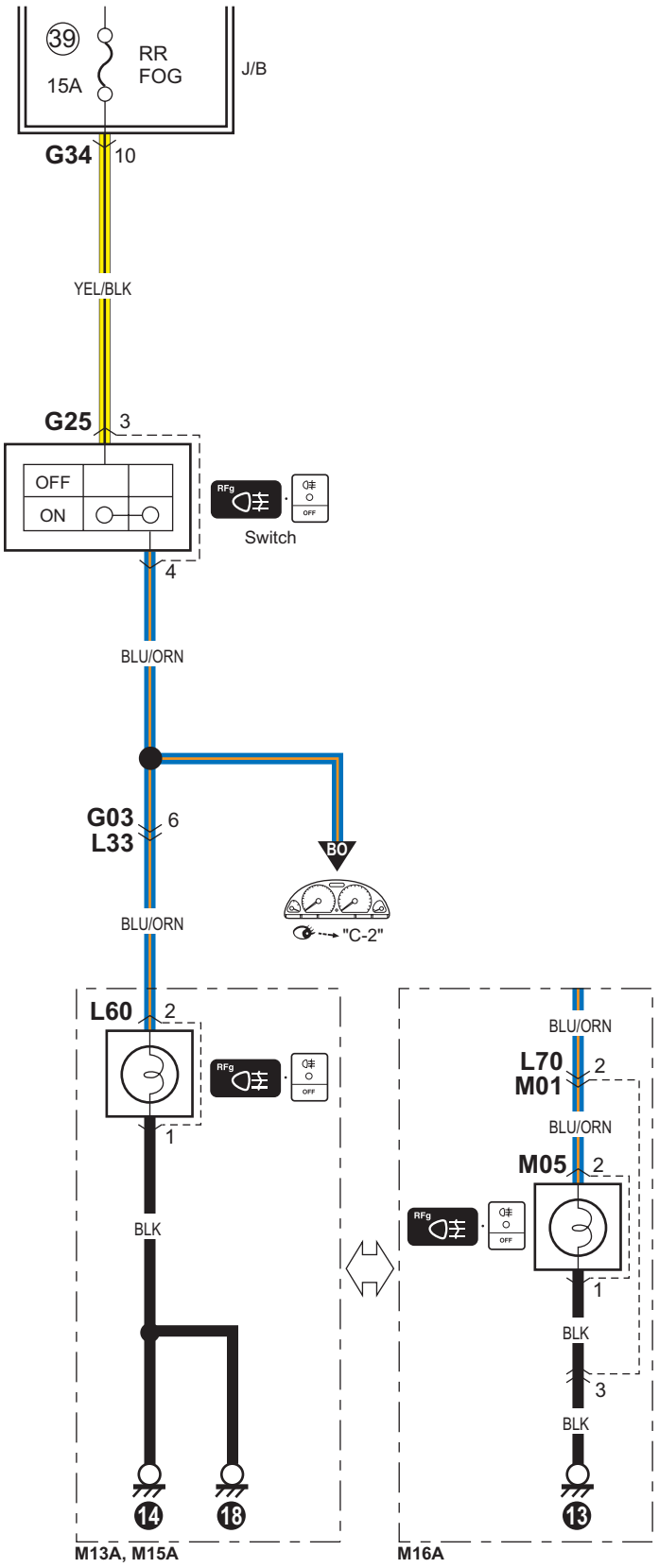
S7N20A910E036



I6RS0B910957-01

D-10 Rear Fog Light Circuit Diagram

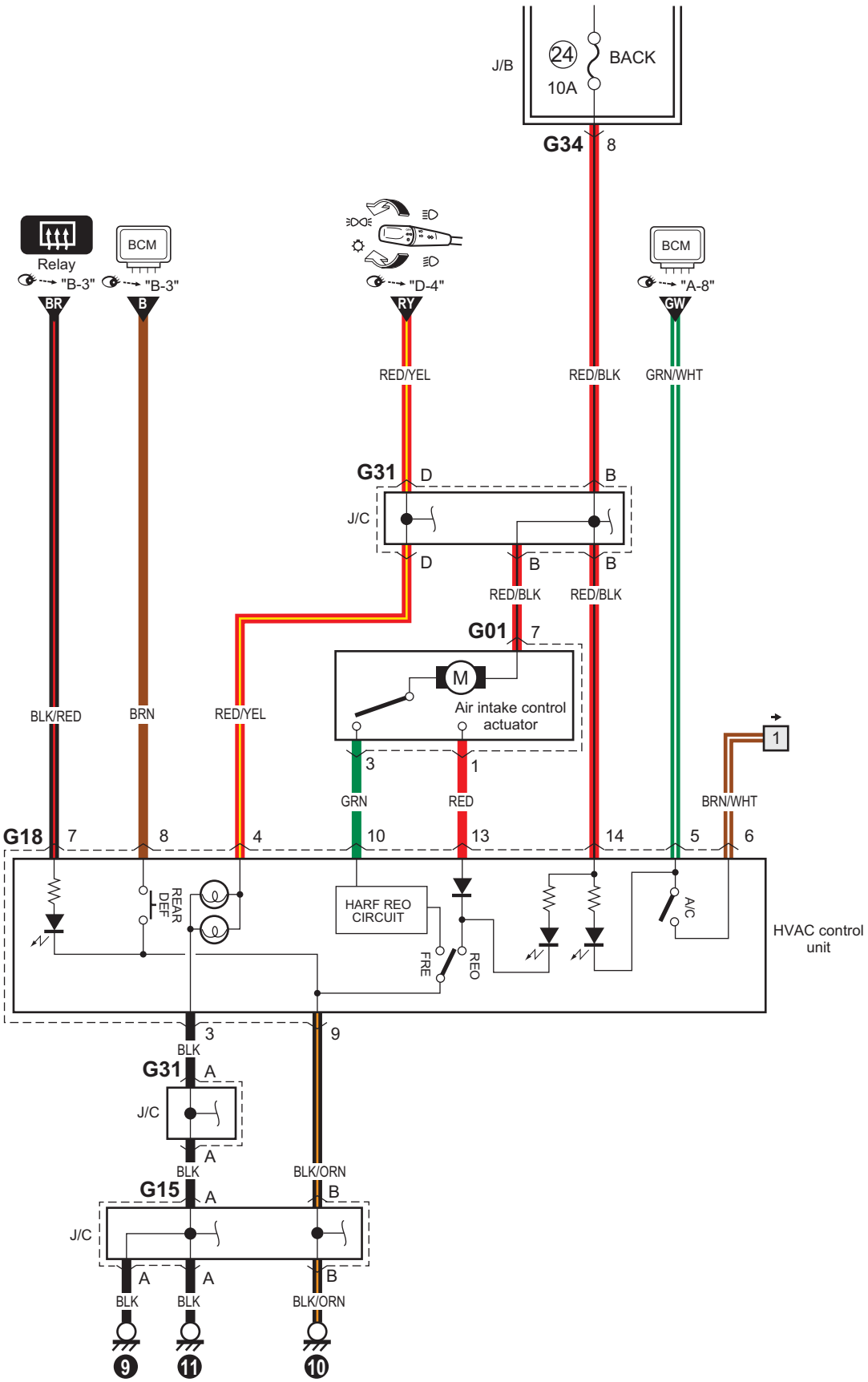
S7N20A910E037



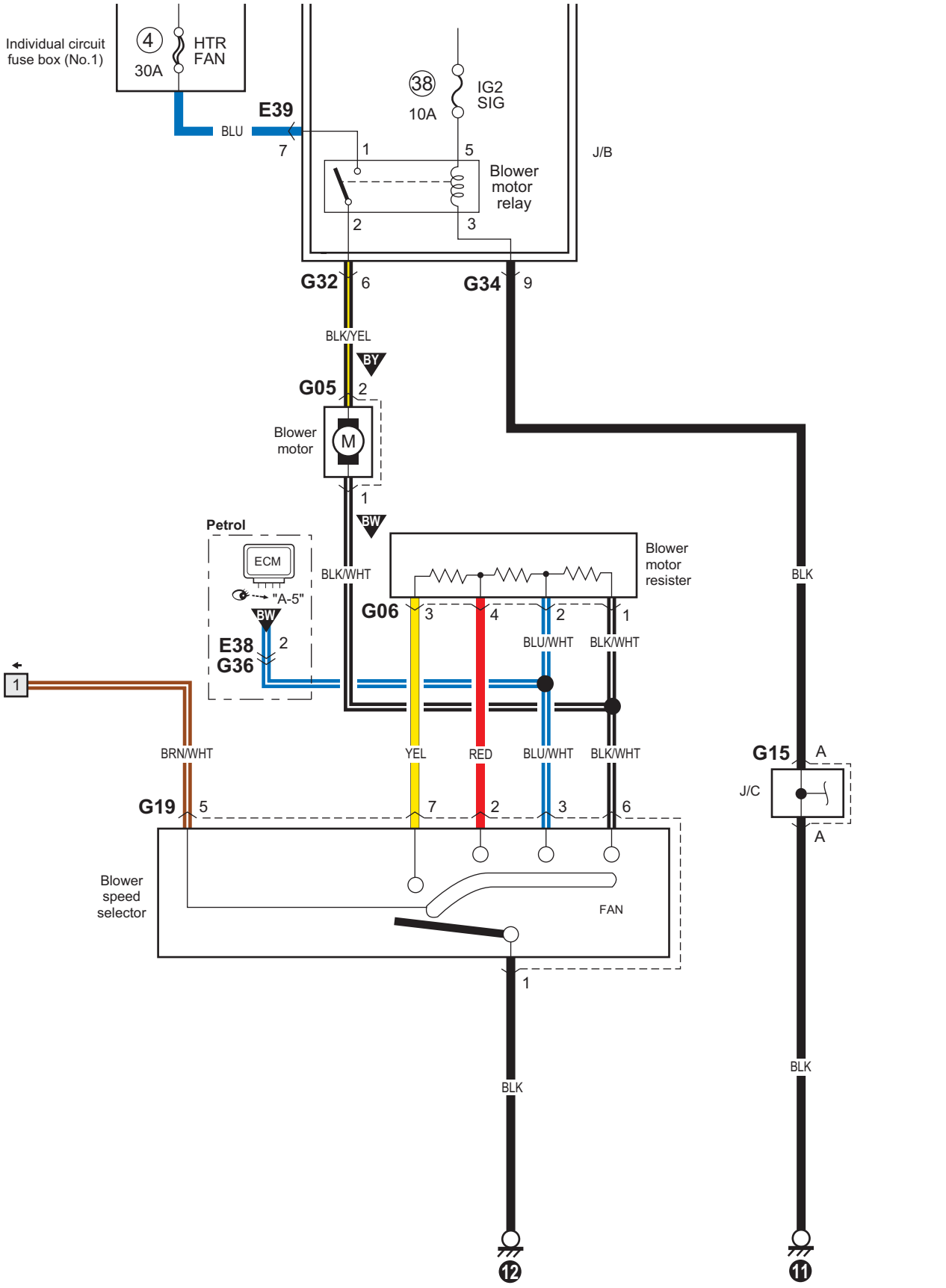
I7N20A910983-01

E-1 Heater System Circuit Diagram

S7N20A910E038

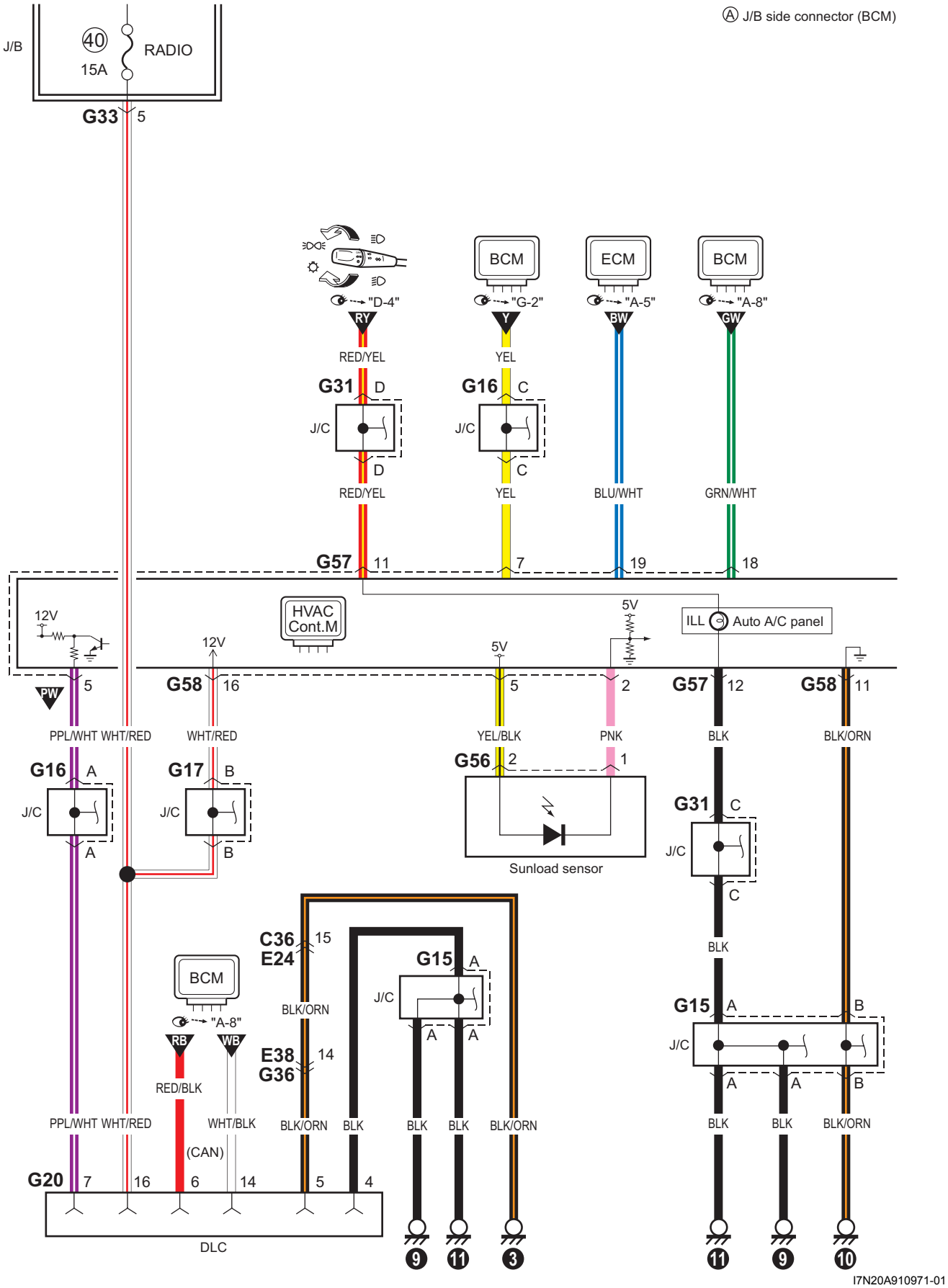


I7N20A910969-01

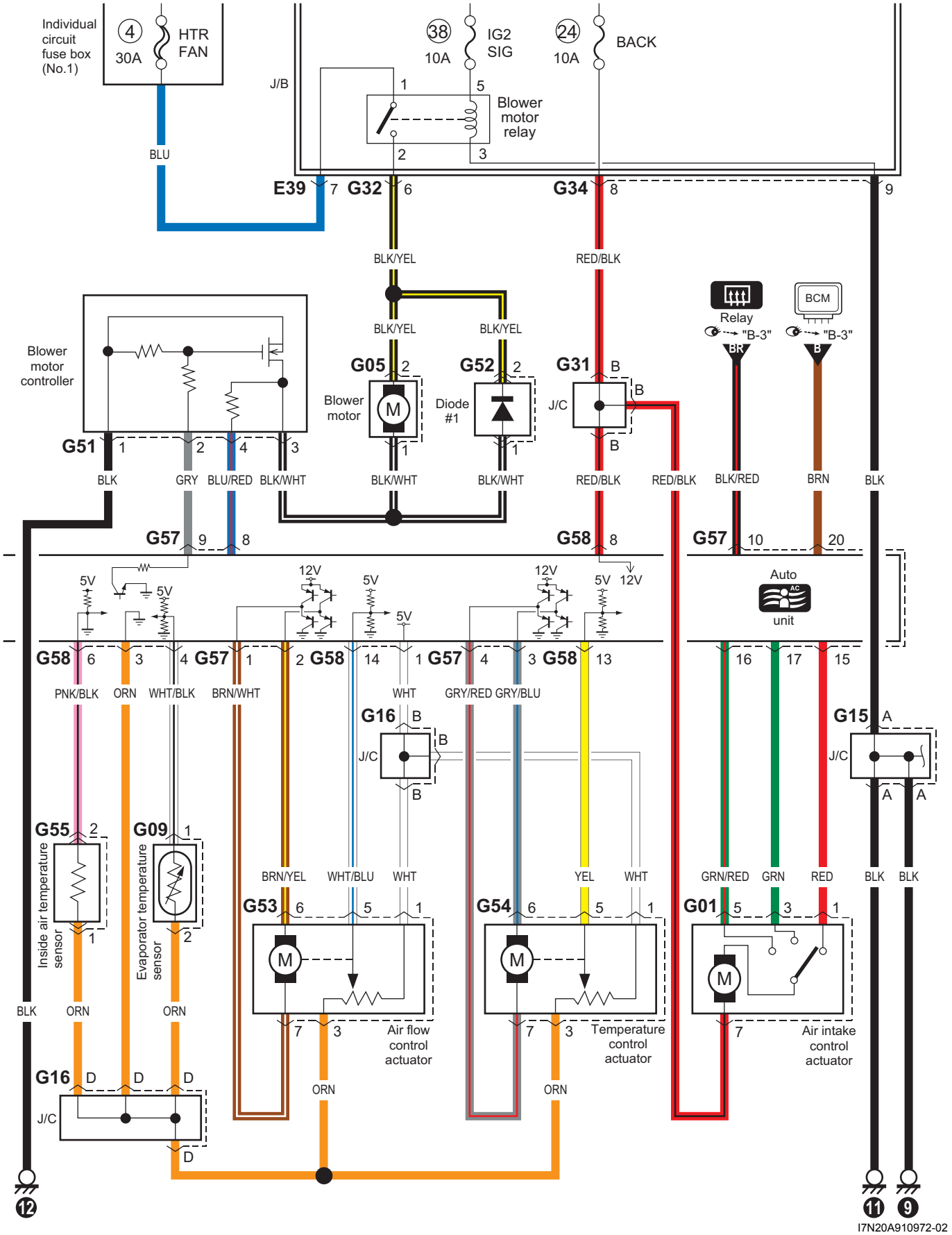

Individual circuit fuse box (No.1)
4
30A
HTR FAN
BLU
E39
7
38
10A
IG2 SIG
1
5
2
3
Blower motor relay
J/B
G32
6
G34
9
BLK/YEL
BY
G05
2
Blower motor
M
1
BW
Petrol
ECM
"A-5"
BW
E38
G36
2
BLK/WHT
Blower motor resister
G06
3
4
2
1
BLU/WHT
BLK/WHT
BLK
1
BRN/WHT
YEL
RED
BLU/WHT
BLK/WHT
G15
A
J/C
A
G19
5
7
2
3
6
Blower speed selector
FAN
1
BLK
BLK
12
11
I7N20A910970-01

E-2 Auto A/C System Circuit Diagram

S7N20A910E039

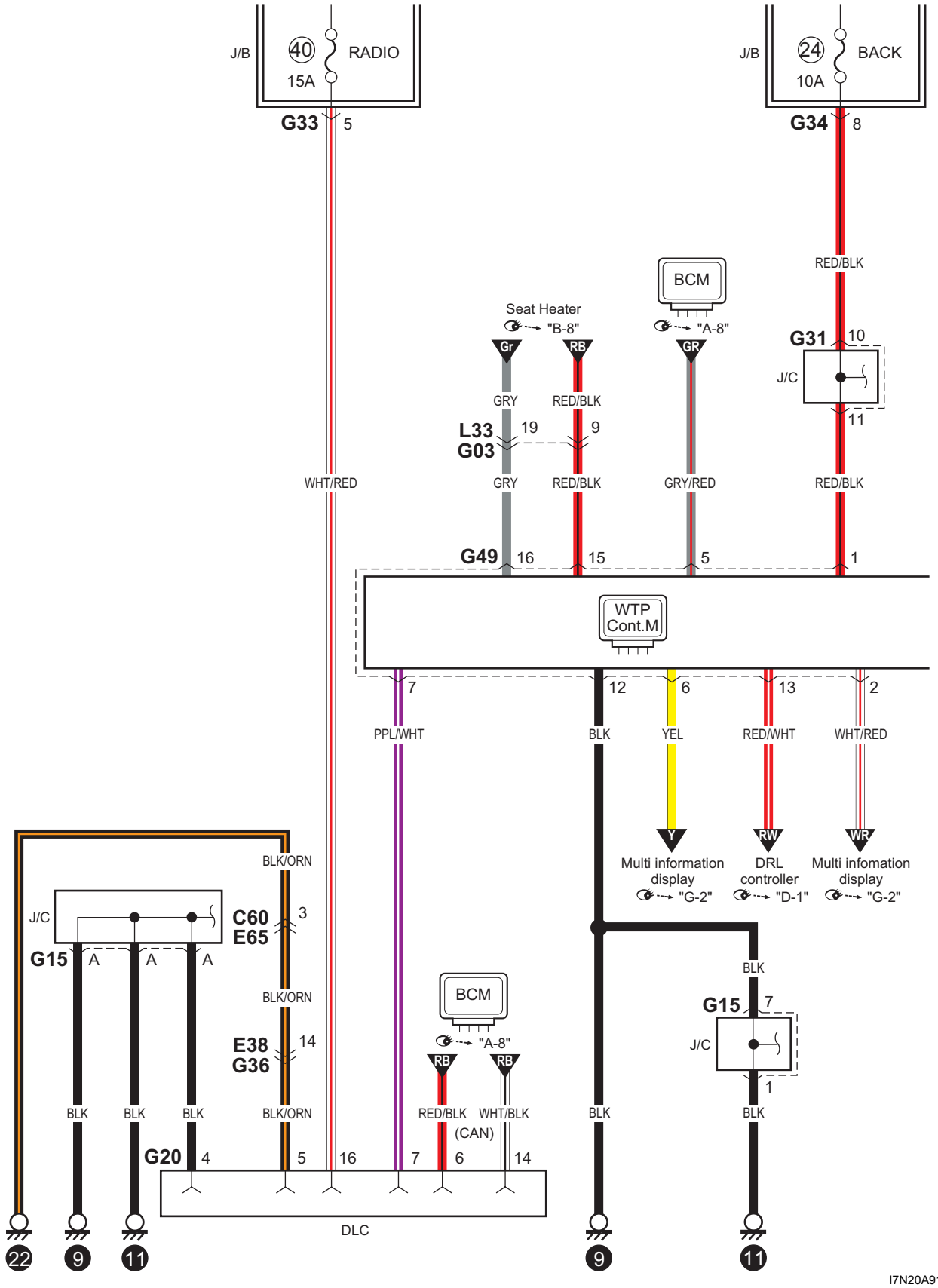


I7N20A910971-01

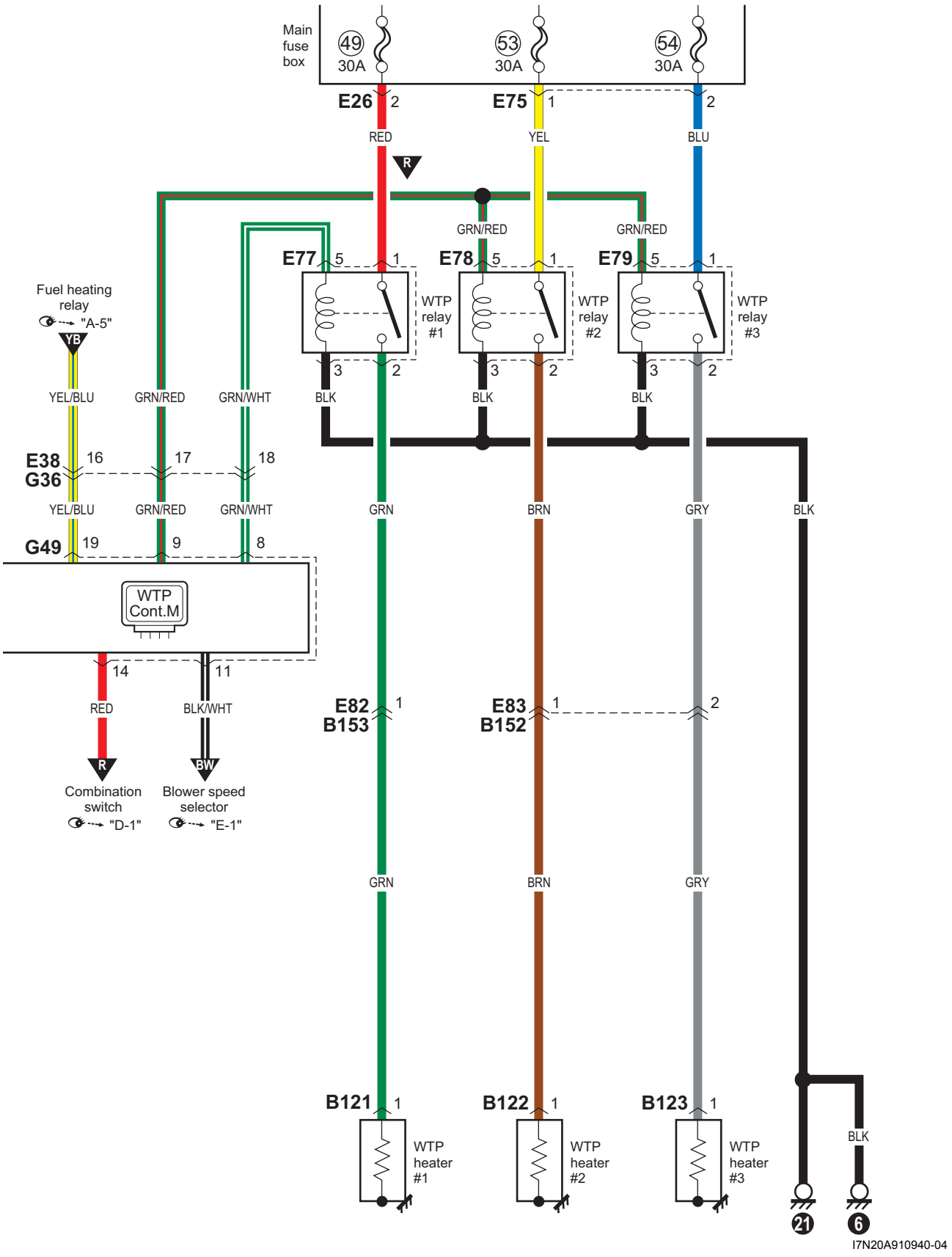

Individual circuit fuse box (No.1)
4
30A
HTR FAN
BLU
J/B
38
10A
IG2 SIG
24
10A
BACK
1
5
2
3
Blower motor relay
E39 7
G32 6
G34 8
9
BLK/YEL
RED/BLK
Blower motor controller
BLK/YEL
BLK/YEL
G05 2
G52 2
G31 B
Blower motor
M
Diode #1
J/C
B
B
Relay
"B-3"
BR
BCM
"B-3"
B
G51 1 2 4 3
1
1
BLK
GRY
BLU/RED
BLK/WHT
BLK/WHT
BLK/WHT
RED/BLK
RED/BLK
BLK/RED
BRN
BLK
G57 9 8
G58 8
G57 10 20
Auto
AC
unit
5V
5V
12V
5V
5V
12V
5V
12V
G58 6 3 4
G57 1
2 G58 14
1 G57 4
3 G58 13
16 17 15
PNK/BLK
ORN
WHT/BLK
BRN/WHT
WHT
GRY/RED
GRY/BLU
G16 B
J/C
B
G15 A
J/C
A
A
G55 2
G09 1
Inside air temperature sensor
Evaporator temperature sensor
1
2
BRN/YEL
WHT/BLU
WHT
YEL
WHT
GRN/RED
GRN
RED
BLK
BLK
G53 6 5 1
G54 6 5 1
G01 5 3 1
M
M
M
7 3
7 3
7
Air flow control actuator
Temperature control actuator
Air intake control actuator
BLK
ORN
ORN
ORN
G16 D D D
J/C
D
ORN
ORN
12
11
9
I7N20A910972-02

E-3 WTP Heater Circuit Diagram (DSL)

S7N20A910E040

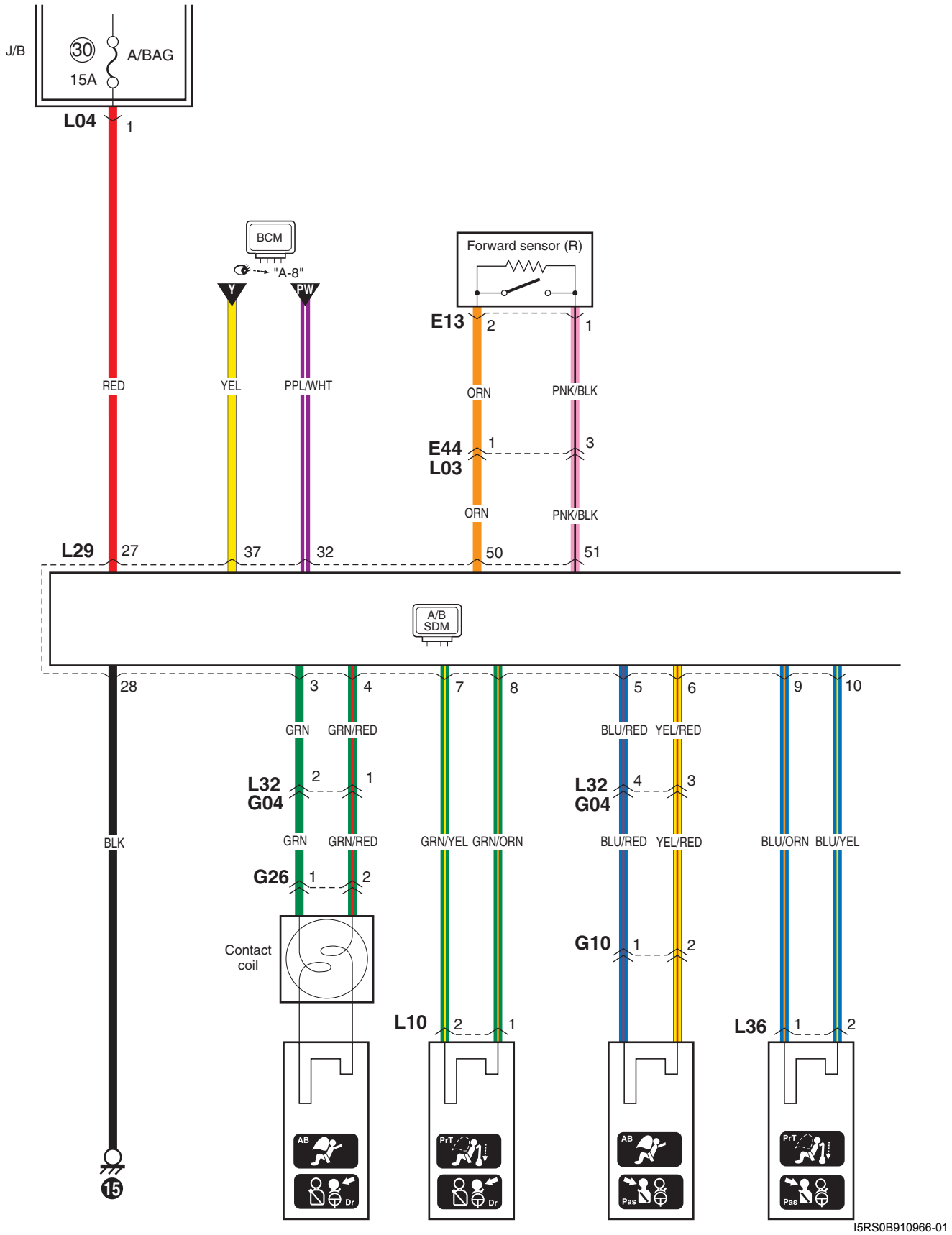


I7N20A910939-03

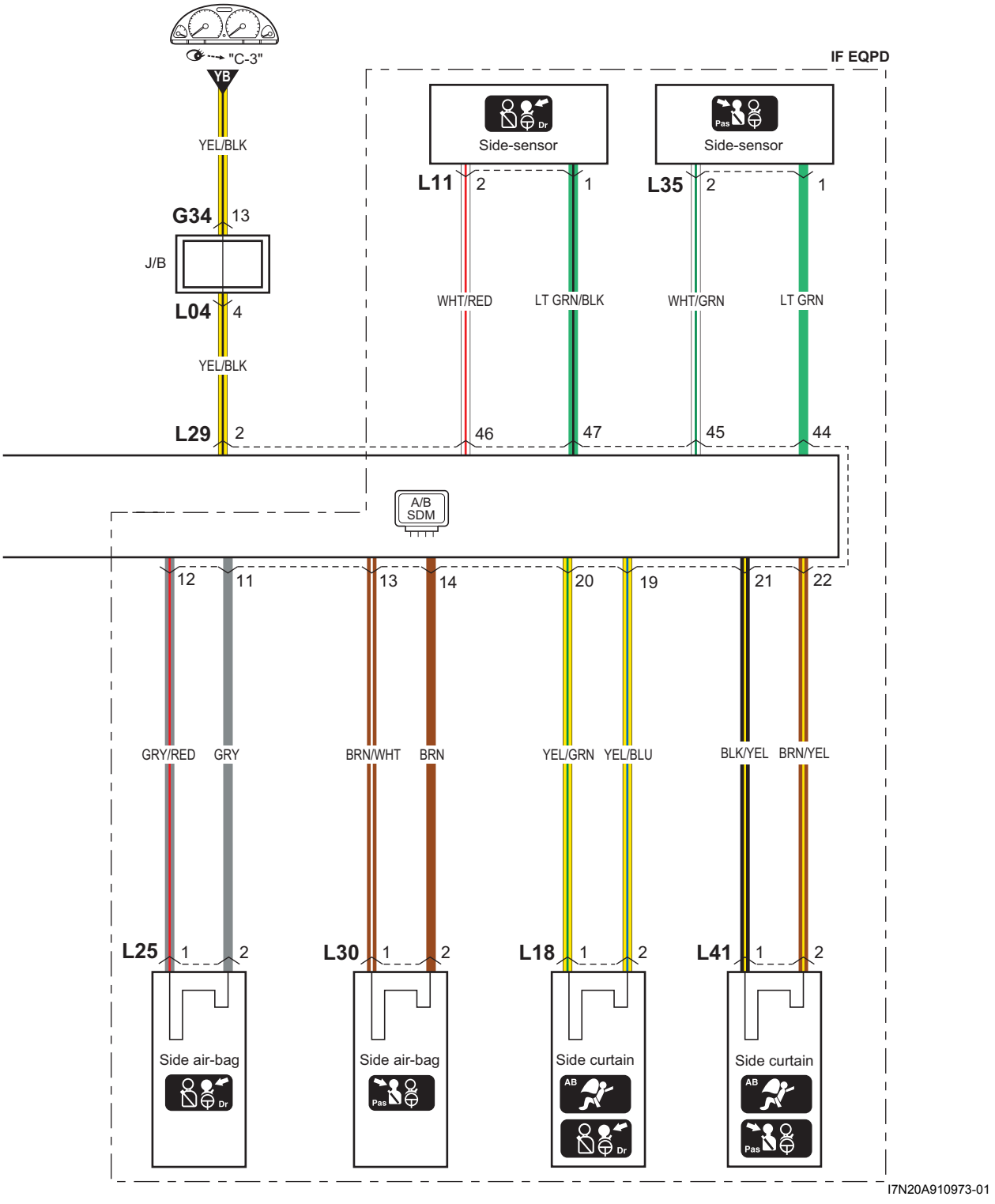

Main fuse box
49 30A
53 30A
54 30A
E26 2
E75 1
2
RED
YEL
BLU
R
GRN/RED
GRN/RED
E77 5 1
E78 5 1
E79 5 1
WTP relay #1
WTP relay #2
WTP relay #3
3 2
BLK
BLK
BLK
Fuel heating relay
"A-5"
YB
YEL/BLU
GRN/RED
GRN/WHT
E38 16
G36
17
18
YEL/BLU
GRN/RED
GRN/WHT
G49 19
9
8
WTP Cont.M
14
11
RED
BLK/WHT
R
BW
Combination switch
"D-1"
Blower speed selector
"E-1"
GRN
BRN
GRY
BLK
E82 1
B153
E83 1
B152
2
GRN
BRN
GRY
B121 1
B122 1
B123 1
WTP heater #1
WTP heater #2
WTP heater #3
BLK
21
6
I7N20A910940-04

F-1 Air-Bag System Circuit Diagram

S7N20A910E041

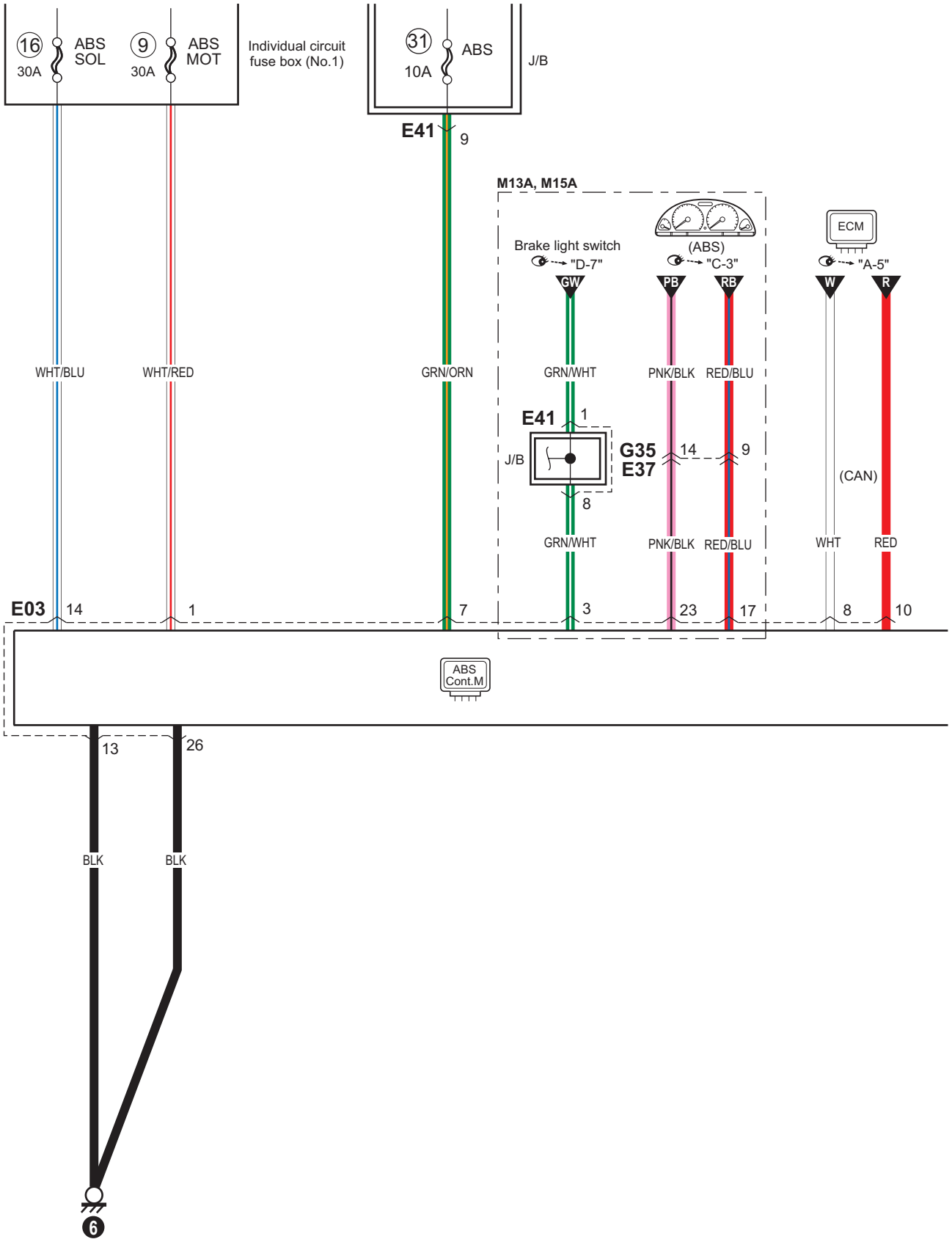


I5RS0B910966-01

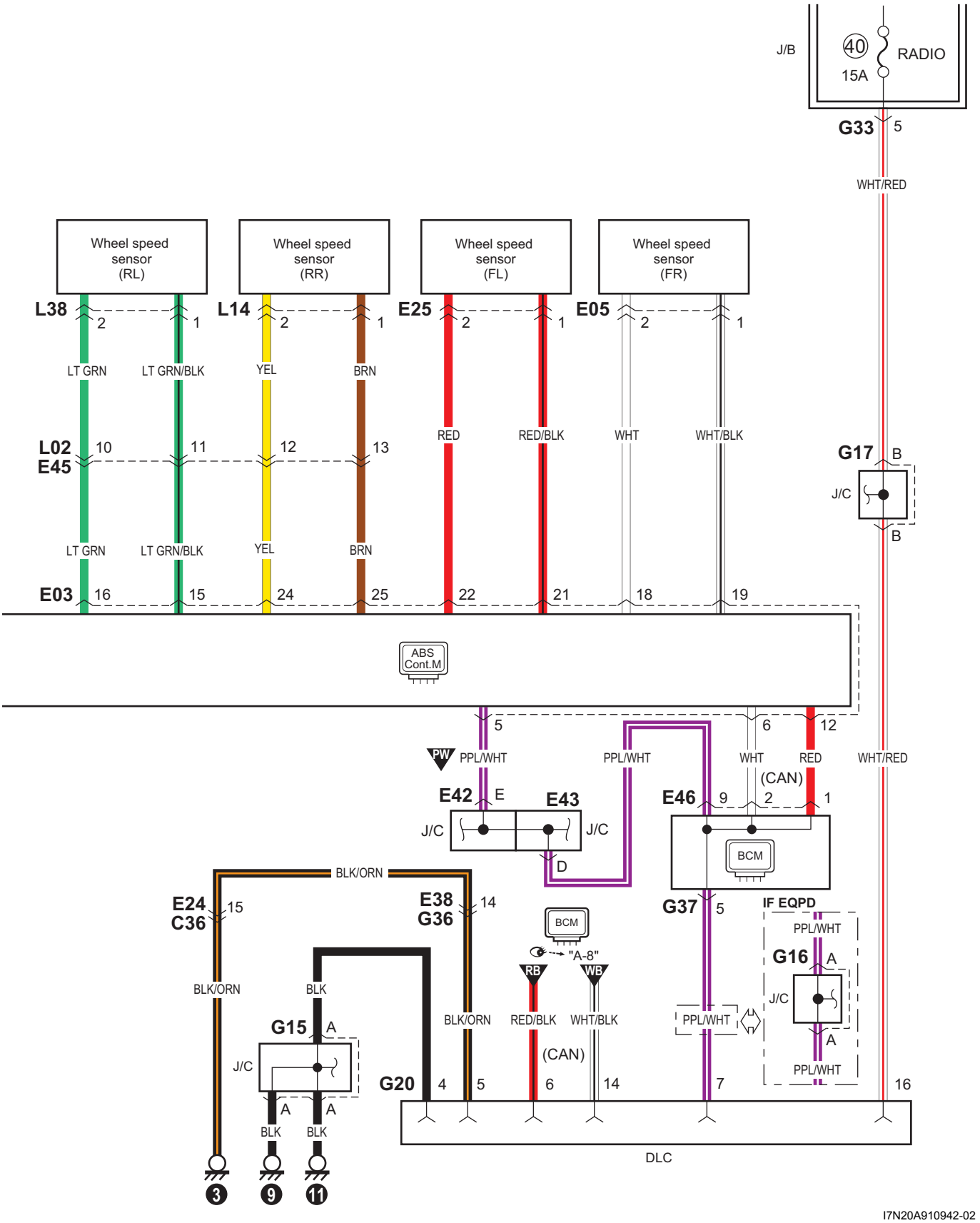

"C-3"
YB
YEL/BLK
G34
13
J/B
L04
4
YEL/BLK
L29
2
IF EQPD
Side-sensor
Side-sensor
L11
2
1
L35
2
1
WHT/RED
LT GRN/BLK
WHT/GRN
LT GRN
46
47
45
44
A/B
SDM
12
11
13
14
20
19
21
22
GRY/RED
GRY
BRN/WHT
BRN
YEL/GRN
YEL/BLU
BLK/YEL
BRN/YEL
L25
1
2
L30
1
2
L18
1
2
L41
1
2
Side air-bag
Side air-bag
Side curtain
Side curtain
I7N20A910973-01

F-2 Anti-Lock Brake System Circuit Diagram

S7N20A910E042



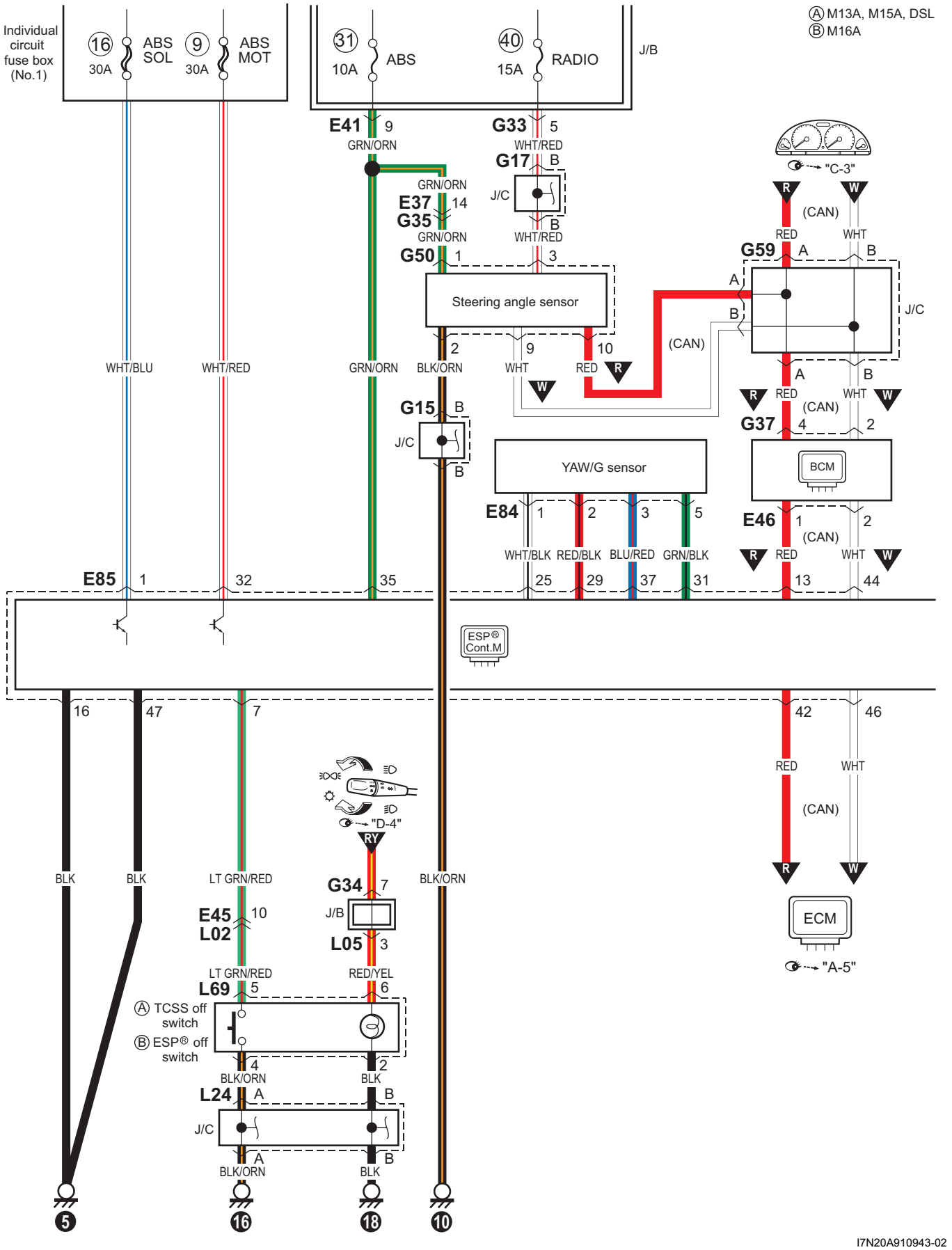
I7N20A910941-02



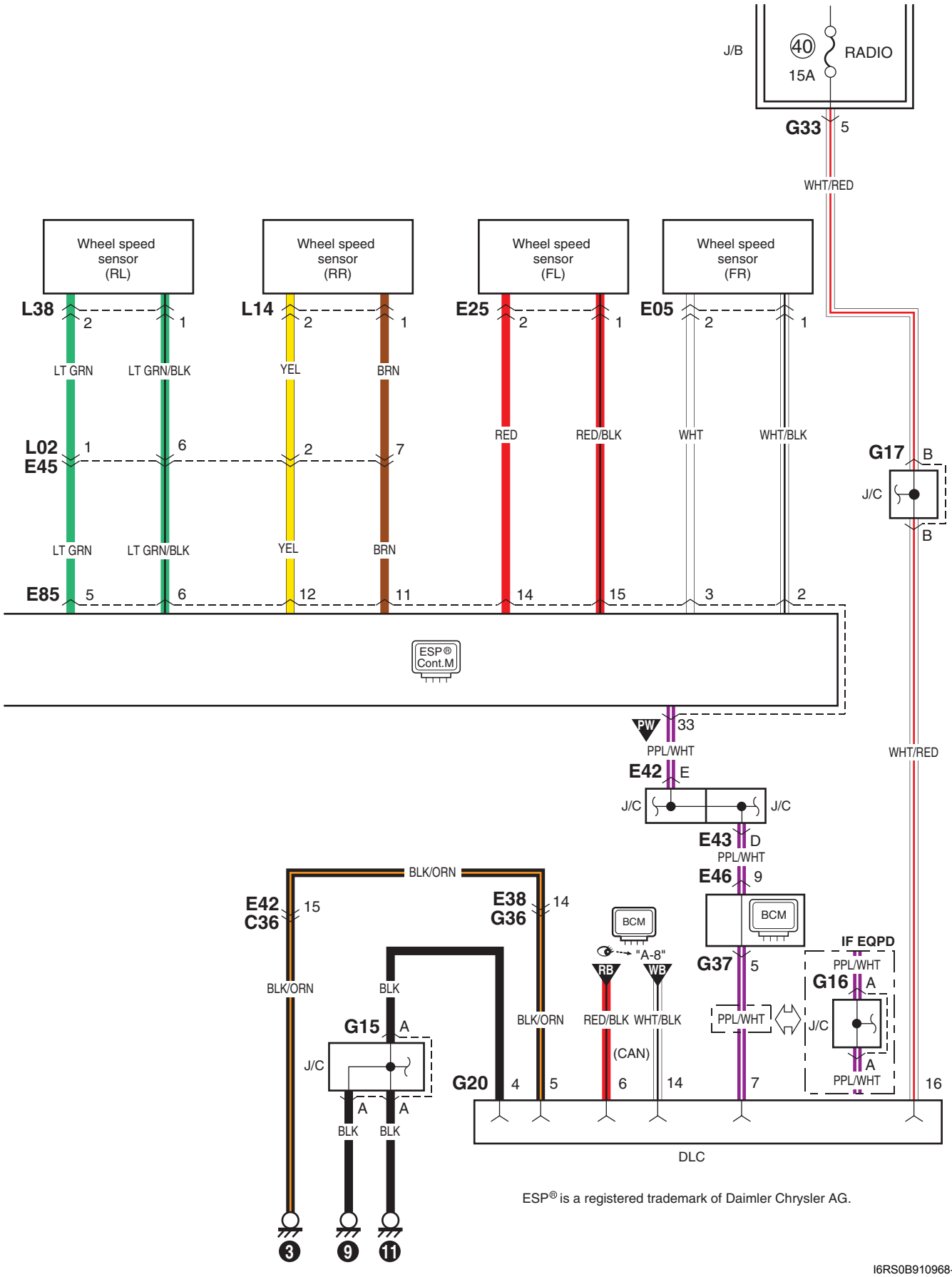
I7N20A910942-02

F-3 Electronic Stability Program System Circuit Diagram

S7N20A910E043



I7N20A910943-02



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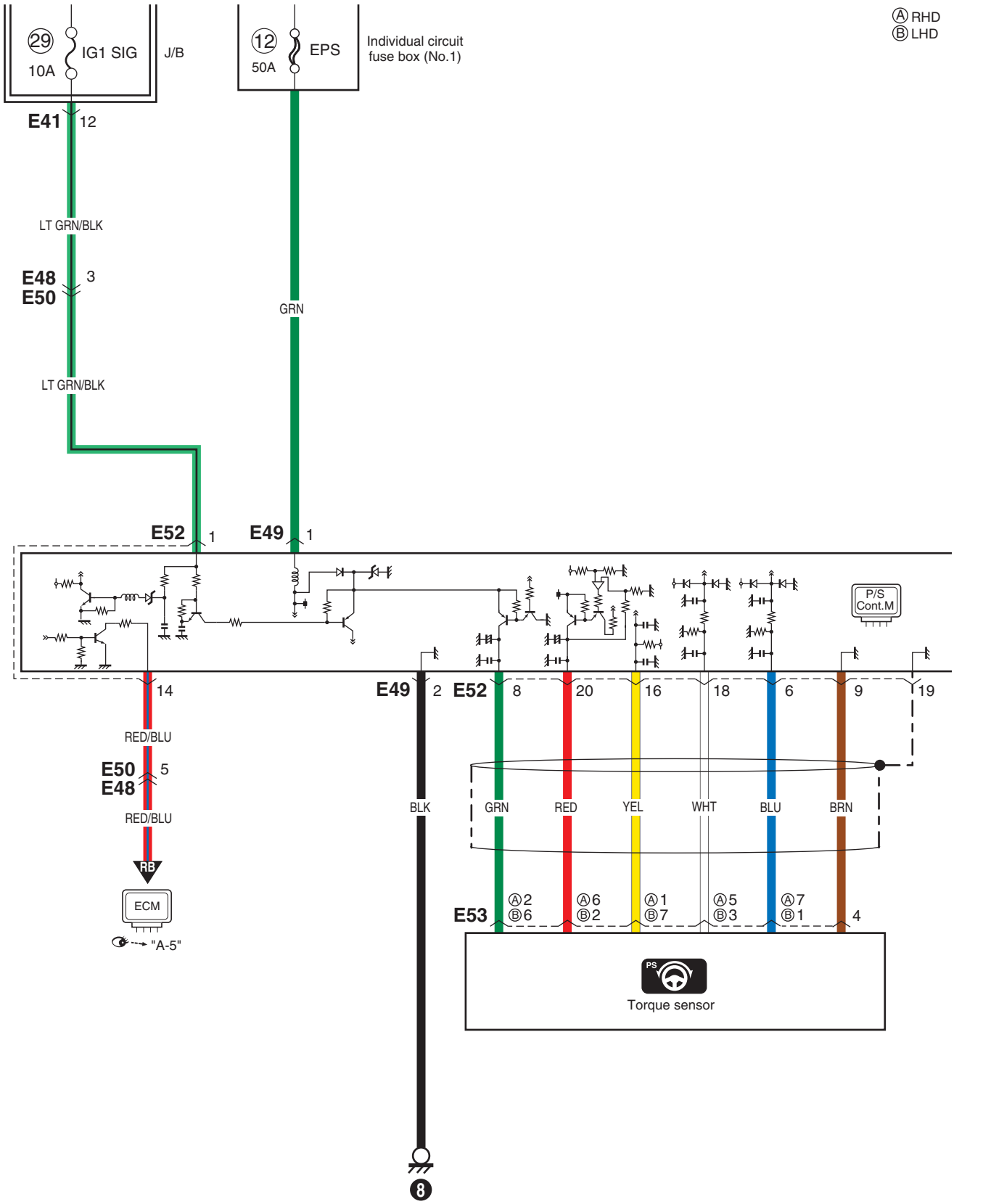
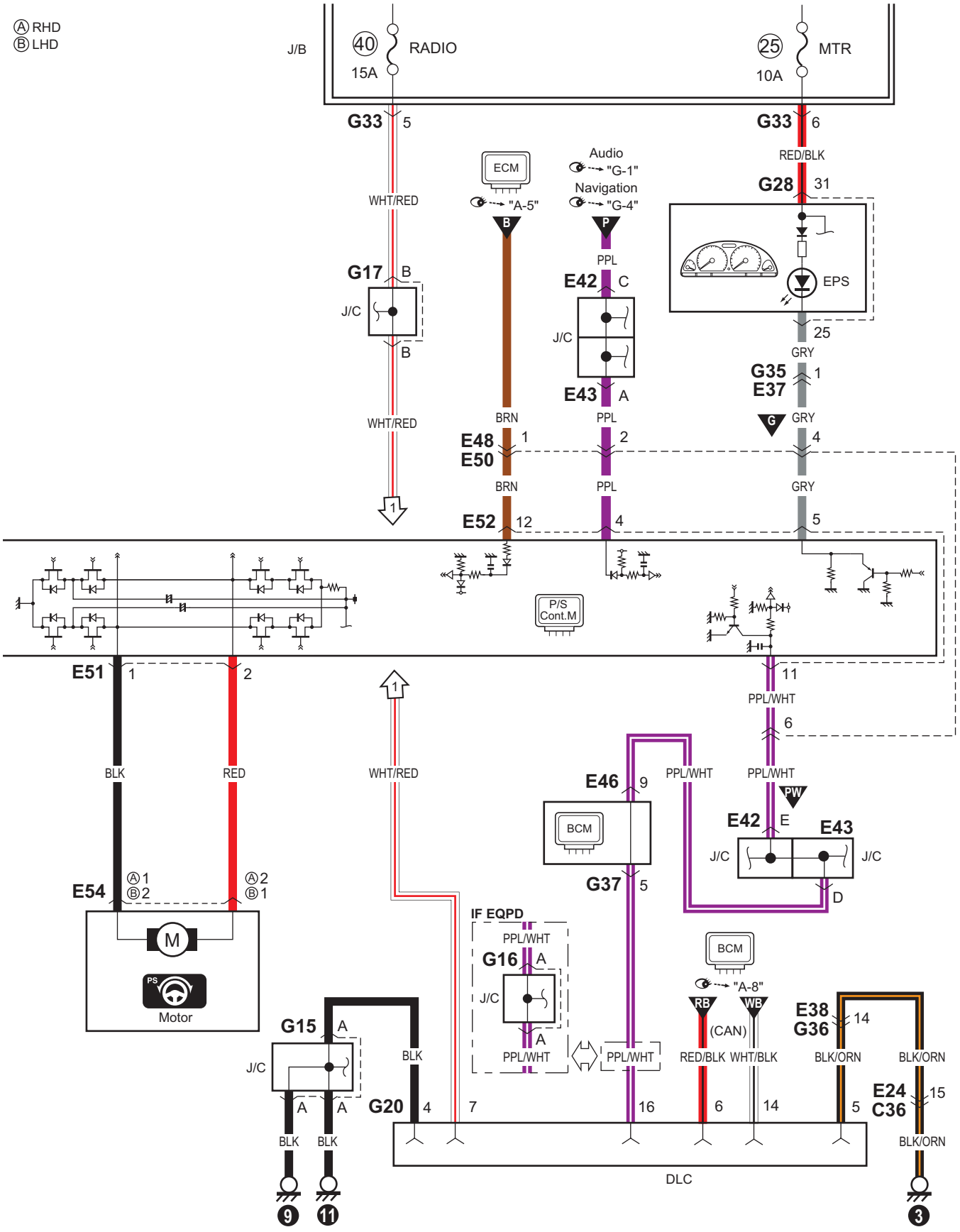
I6RS0B910968-04

F-4 Power Steering System Circuit Diagram

S7N20A910E044

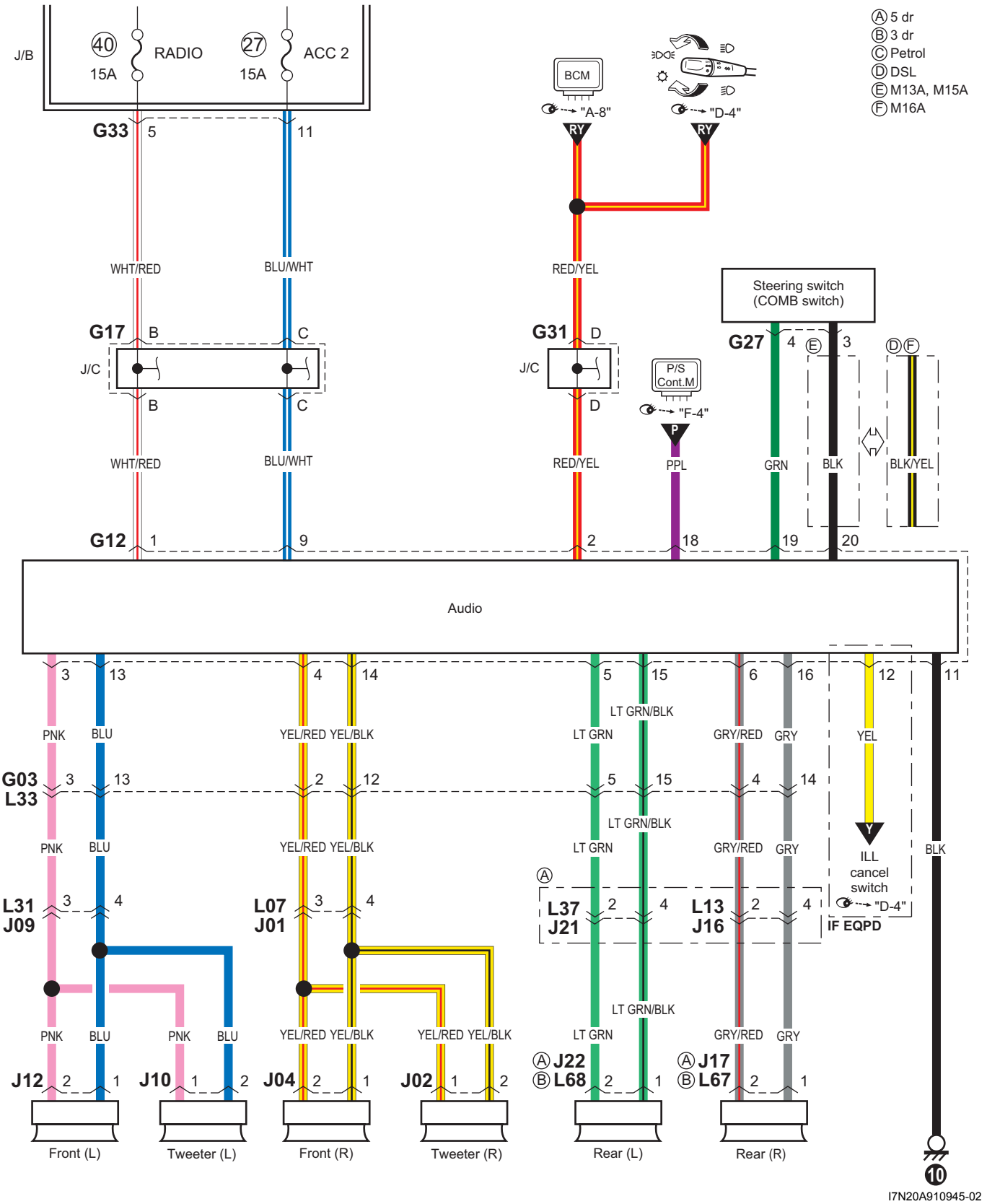


I4RS0B910965-02


Ⓐ RHD
Ⓑ LHD
J/B
40
RADIO
15A
25
MTR
10A
G33 5
G33 6
RED/BLK
WHT/RED
ECM
"A-5"
Audio
"G-1"
Navigation
"G-4"
G28 31
EPS
G17 B
J/C
B
PPL
E42 C
J/C
E43 A
25
GRY
G35 1
E37
G GRY 4
BRN
PPL
GRY
E48 1
E50
2
BRN
PPL
GRY
E52 12
4
5
P/S Cont.M
E51 1
2
11
PPL/WHT
6
BLK
RED
WHT/RED
E46 9
PPL/WHT
PPL/WHT
PW
E42 E
E43
J/C
J/C
D
BCM
G37 5
E54 Ⓐ1 Ⓑ2
Ⓐ2 Ⓑ1
M
PS
Motor
IF EQPD
PPL/WHT
G16 A
J/C
A
PPL/WHT
PPL/WHT
BCM
"A-8"
RB
WB
(CAN)
RED/BLK
WHT/BLK
E38 14
G36
BLK/ORN
BLK/ORN
G15 A
J/C
A A
BLK
BLK
G20 4
7
16
6
14
5
E24 15
C36
BLK/ORN
DLC
9
11
3
I7N20A910944-02

G-1 Audio System Circuit Diagram

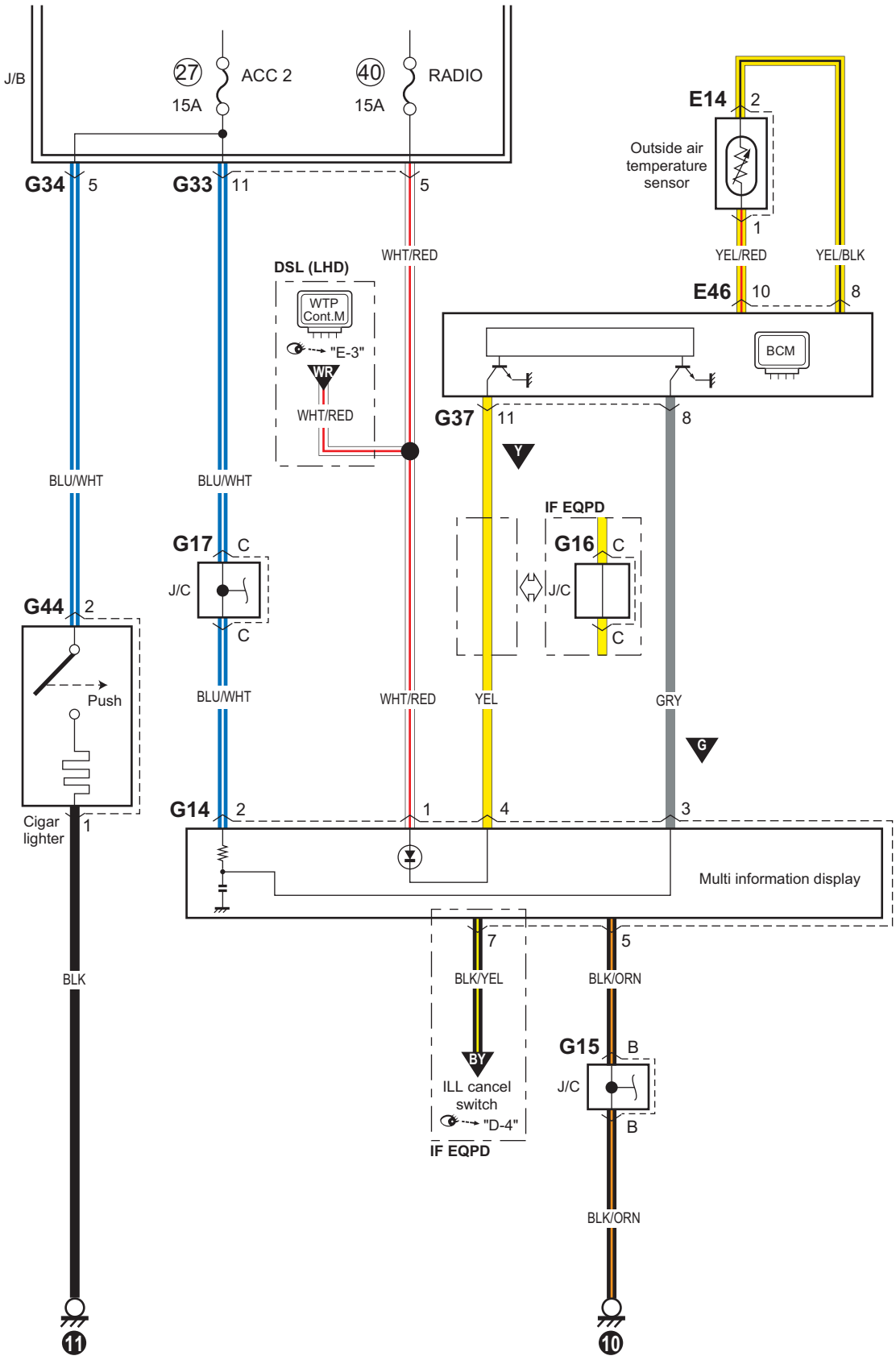
S7N20A910E045



I7N20A910945-02

G-2 Multi Information Display / Accessory Socket System Circuit Diagram

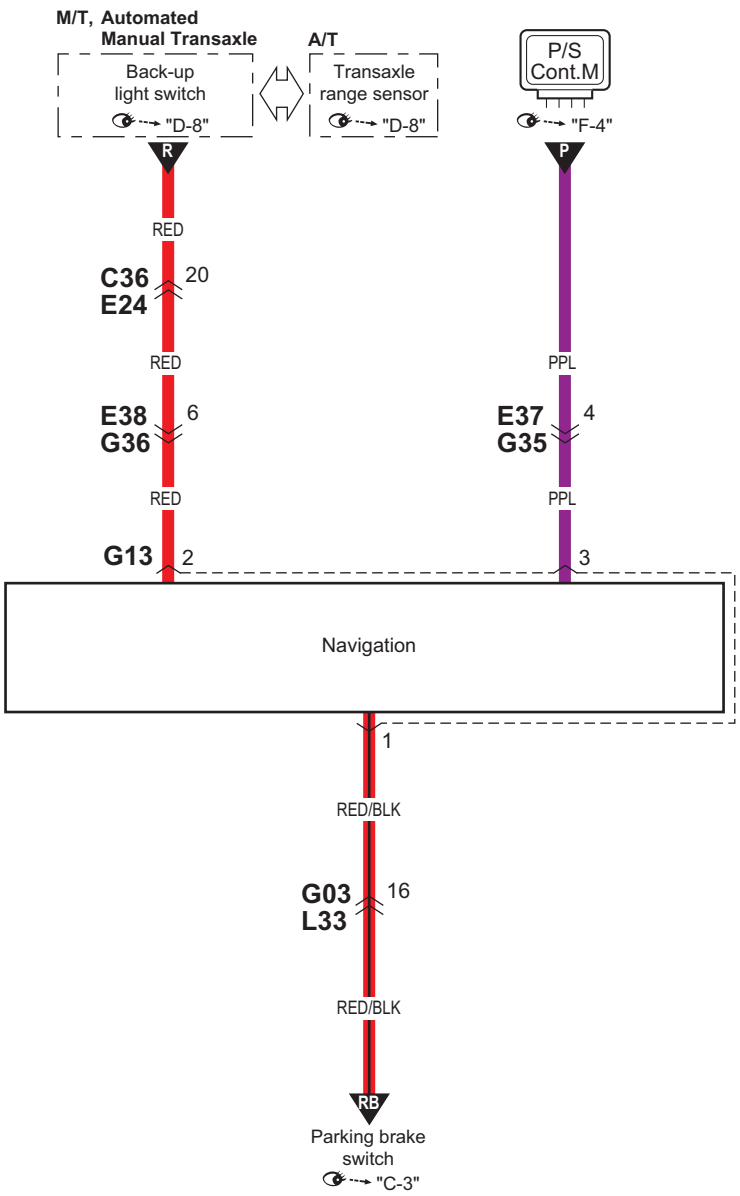
S7N20A910E046



I7N20A910946-03

G-4 Navigation System Circuit Diagram

S7N20A910E047



I7N20A910947-01

List of Connector

List of Connectors

S7N20A910F001

Refer to “B Connector”.
Refer to “C Connector”.
Refer to “D Connector (DSL)”.
Refer to “E Connector”.
Refer to “G Connector”.
Refer to “J Connector”.
Refer to “K Connector”.
Refer to “L Connector”.
Refer to “M Connector (SPORT)”.
Refer to “O Connector”.
Refer to “R Connector”.

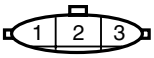
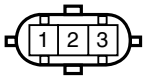
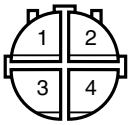
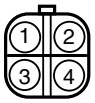
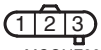
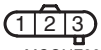
B Connector

S7N20A910F012

B121	B122	B123	B152 (TO E83)	B153 (TO E82)
 MCONF010057-03	 MCONF010057-03	 MCONF010057-03	 MCONM020061-01	 MCONM010035-01

C Connector

S7N20A910F002

C01	C02	C03	C04	C05	C06
 MCONF030051-01 M13A, M15A	 MCONF030055-01	 MCONF030055-01	 MCONF020065-01	 MCONF020065-01	 MCONF020065-01
C07	**C08**	**C08**	**C09**	**C10**	**C11**
 MCONF020065-01	 MCONF030016-01 M15A, M16A	 MCONF030052-01 M13A	 MCONF020057-01	 MCONF060018-01	 MCONF030062-01 M13A, M15A
C12	**C13**	**C14**	**C15**	**C16**	**C17**
 MCONF030084-01	 MCONF050025-01	 MCONF020156-01	 MCONF040008-01	 MCONF040024-01	 MCONF010076-01
C18	**C18**	**C19**	**C20**	**C21**	**C21**
 MCONF010027-01 M13A, M15A	 MCONF020240-01 M16A	 MCONM020042-01	 MCONF030052-01	 MCONF020194-01 M13A, M15A	 MCONF040127-01 M16A
C22	**C23**	**C24**	**C25**	**C26**	**C27**
 MCONF010057-03	 MCONF010019-01	 MCONF010077-03	 MCONF030052-01 M13A, M15A	 MCONF010054-01	 MCONF020064-01 A/T

C28

MCONF100053-01

A/T

C29

MCONF100048-01

A/T

C30

MCONF020156-01

M/T

C30

MCONF020186-01

Automated Manual Transaxle

C31

MCONF010078-01

C33

MCONF010047-01

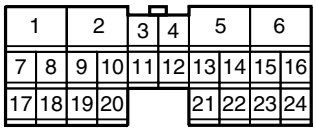
M13A, M15A

C33

MCONF010082-01

M16A

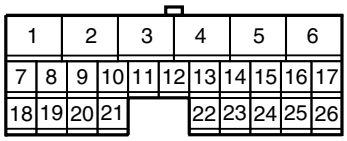
C34



MCONF240011-01

A/T

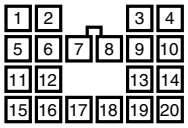
C35



MCONF260014-01

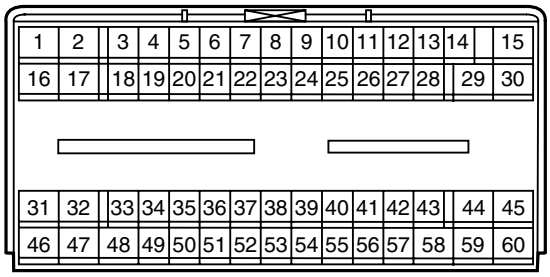
A/T

C36 (TO E24)



MCONF200011-01

C37



MCONF600002-01

C38

MCONN000002-01

C39

MCONN000002-01

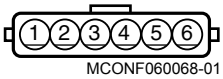
C40

MCONN000002-01

C41

MCONN000002-01

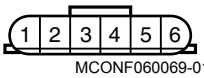
C42



MCONF060068-01

M16A, Automated Manual Transaxle

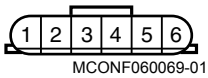
C43



MCONF060069-01

Automated Manual Transaxle

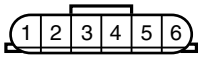
C44



MCONF060069-01

Automated Manual Transaxle

C45



MCONF060069-01

Automated Manual Transaxle

C46

MCONF020226-01

Automated Manual Transaxle

C47

MCONF020226-01

Automated Manual Transaxle

C49

MCONF020060-01

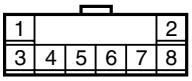
Automated Manual Transaxle

C50

MCONF020227-01

Automated Manual Transaxle

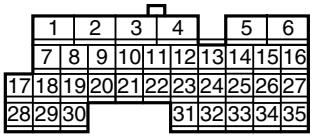
C51



MCONF080034-01

Automated Manual Transaxle

C52



MCONF350004-01

Automated Manual Transaxle

C53 (TO E60)

MCONF010081-01

Automated Manual Transaxle

C54

MCONM010019-03

DSL

C55

MCONF010074-01

DSL

C56

MCONF010072-03

DSL

C57

MCONF010074-01

DSL

C58

MCONF010074-01

DSL

C59

MCONF010057-03

DSL

C60 (TO E65)

MCONM060029-02

DSL

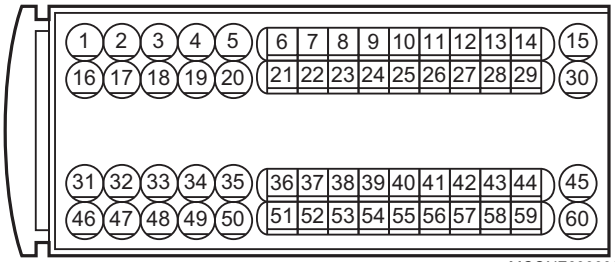
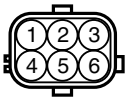
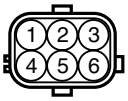
C61

MCONF010070-02

DSL

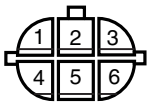
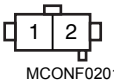
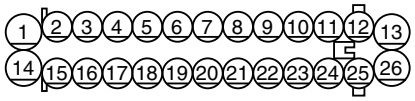
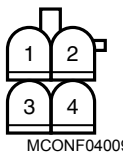
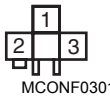
D Connector (DSL)

S7N20A910F003

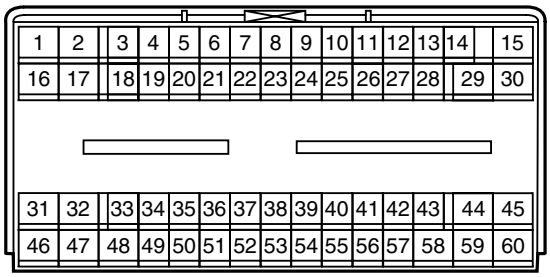
D01  MCONF600006-01			D11  MCONF020256-01	D12  MCONF030144-01	D13  MCONF020111-01
D15  MCONF030122-01	D16  MCONF030122-01	D71  MCONF020334-01	D72  MCONF020334-01	D73  MCONF020334-01	D74  MCONF020334-01
D77  MCONM010040-01	D78  MCONM010040-01	D79  MCONM010040-01	D80  MCONM010040-01	D101  MCONF020336-01	D102  MCONF020335-01
D103  MCONF020334-01	D141  MCONF010049-01	D242 (TO E63)  MCONF060056-01	D243 (TO E69)  MCONF060056-01		

E Connector

S7N20A910F004

E01  MCONF060062-01	E02  MCONF020184-01	E03  MCONF260011-01 ABS	E04  MCONF030062-01 Petrol	E04  MCONF030097-01 DSL	
E05  MCONM020043-01	E06  MCONF020196-01	E07  MCONF020013-01	E08  MCONF030101-01	E09  MCONF020197-01	E10  MCONF020008-01
E11  MCONF020008-01	E12  MCONF020198-01	E13  MCONF020199-01	E14  MCONF020200-01	E15  MCONF010079-01	E17  MCONF040094-01
E18  MCONF020198-01	E19  MCONF020196-01	E20  MCONF020197-01	E21  MCONF030101-01	E22  MCONF020013-01	

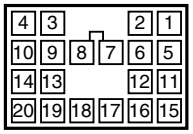
E23



MCONF600003-01

Petrol

E24 (TO C36)



MCONM200005-01

Petrol

E25

MCONM020043-01

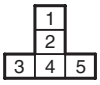
E26

MCONF020148-01

E27

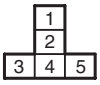
MCONF020169-01

E28



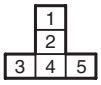
MCONF050015-01

E29



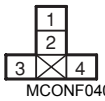
MCONF050015-01

E30



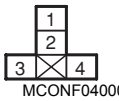
MCONF050015-01

E31



MCONF040004-01

E32



MCONF040004-01

Petrol

E33

MCONF040004-01

Petrol

E34

MCONF040004-01

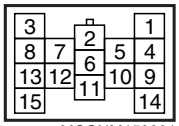
E35

MCONF040004-01

E36

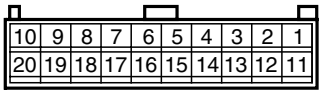
MCONF040004-01

E37 (TO G35)



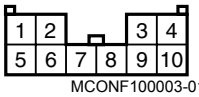
MCONM150001-01

E38 (TO G36)



MCONM200008-01

E39

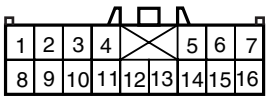


MCONF100003-01

E40

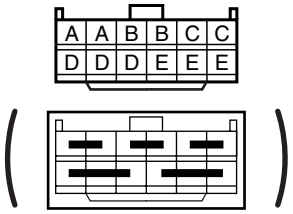
MCONF020202-01

E41



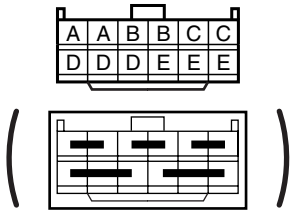
MCONF160034-01

E42



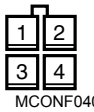
MCONF120027-01

E43



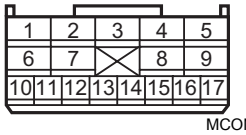
MCONF120027-01

E44 (TO L03)



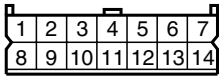
MCONF040095-01

E45 (TO L02)



MCONF170009-01

E46



MCONF140012-01

E47

MCONF040016-01

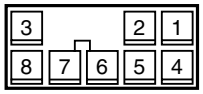
M/T, A/T

E47

MCONF040045-01

Automated Manual Transaxle, DSL

E48 (TO E50)

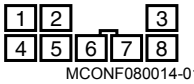


MCONM080012-01

E49

MCONF020203-01

E50 (TO E48)

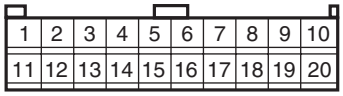


MCONF080014-01

E51

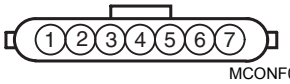
MCONF020204-01

E52



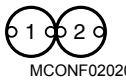
MCONF200021-01

E53



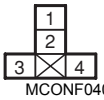
MCONF070015-01

E54



MCONF020205-01

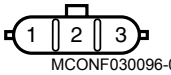
E56



MCONF040004-01

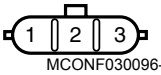
Petrol

E58



MCONF030096-01

E59



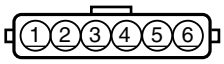
MCONF030096-01

E60 (TO C53)

MCONM010032-02

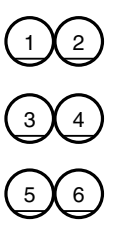
Petrol

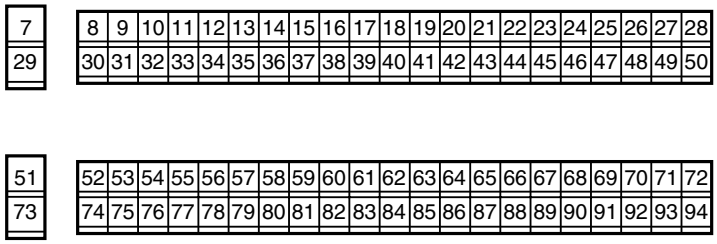
E61



MCONF060068-01

E62





MCONF940001-01

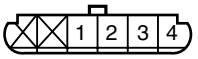
DSL

E63 (TO D242)

MCONM060024-01

DSL

E64



MCONF040085-01

DSL

E65 (TO C60)

MCONF060066-02

DSL

E66

MCONF010074-01

DSL

E67

MCONF020204-01

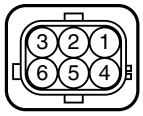
DSL

E68

MCONF040110-01

DSL

E69 (TO D243)



MCONM060024-01

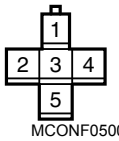
DSL

E70

MCONF020181-01

DSL

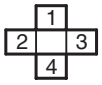
E71



MCONF050029-01

DSL

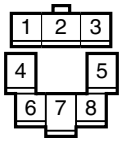
E72



MCONF040007-01

DSL

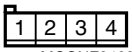
E73



MCONF080023-01

DSL

E74



MCONF040084-01

DSL

E75

MCONF020148-01

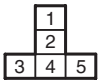
DSL

E76

MCONF010074-01

DSL

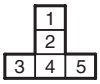
E77



MCONF050015-01

DSL

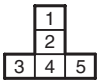
E78



MCONF050015-01

DSL

E79



MCONF050015-01

DSL

E82 (TO B153)

MCONF010091-01

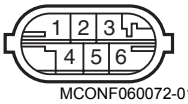
DSL

E83 (TO B152)

MCONF020269-01

DSL

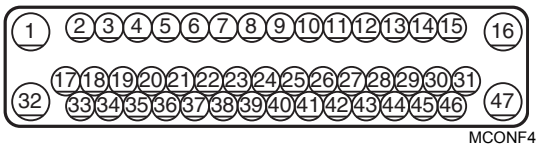
E84



MCONF060072-01

IF EQPD

E85



MCONF470001-01

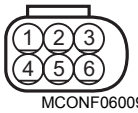
ESP®

E86

MCONF020240-01

DSL

E87



MCONF060092-01

DSL

E88

MCONF020334-01

DSL

E89

MCONF030122-01

DSL

E90

MCONF010046-01

DSL

E91 (TO E92)

MCONM010032-02

DSL

E92 (TO E91)

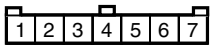
MCONF010081-01

DSL

G Connector

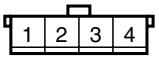
S7N20A910F005

G01



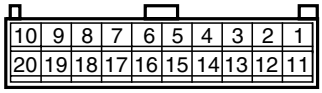
MCONF070001-01

G02



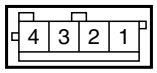
MCONF040096-01

G03 (TO L33)



MCONM200008-01

G04 (TO L32)



MCONM040015-01

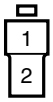
G05

MCONF020206-01

G06

MCONF040097-01

G09



MCONF020112-01

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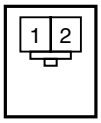

MCONF020207-01

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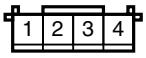

MCONF040098-01

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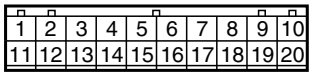

MCONF200014-01

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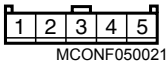
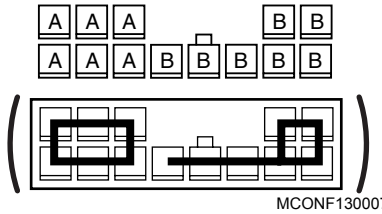


MCONF050021-01

G14

MCONF070004-01

G15



MCONF130007-01

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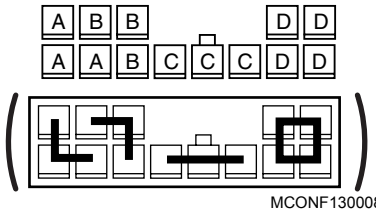

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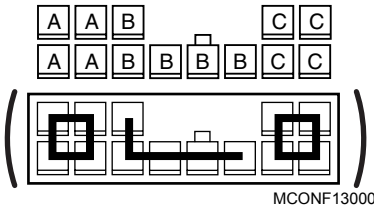

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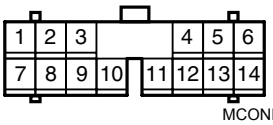

MCONF140018-01

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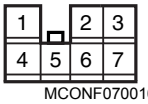

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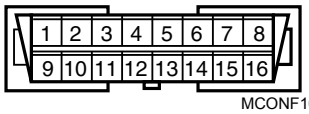

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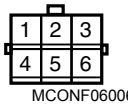

MCONF060063-01

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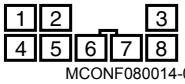

MCONF080014-01

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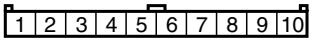

MCONF100038-01

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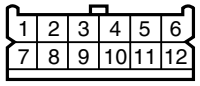

MCONF120026-01

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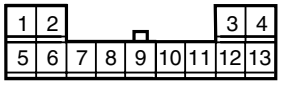


MCONF130010-01

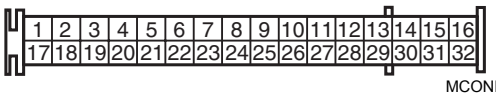
G26

MCONF020212-01

G27

MCONF050021-01

G28



MCONF320005-01

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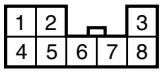

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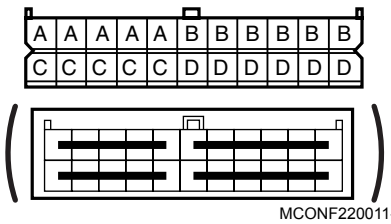

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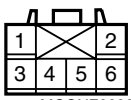

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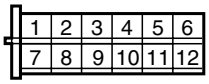

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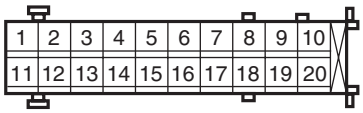
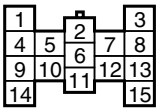


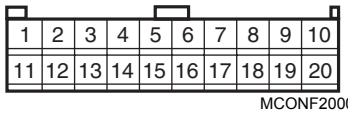
MCONF200020-01

G35 (TO E37)



MCONF150002-01

G36 (TO E38)



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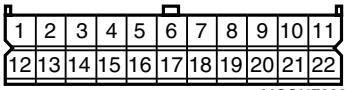

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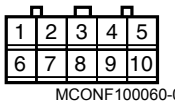

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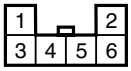

MCONF060025-01

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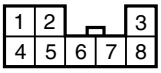

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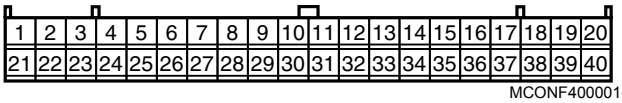
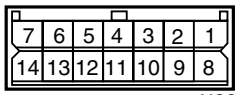


MCONF400001-01

G43 (TO L51)



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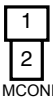


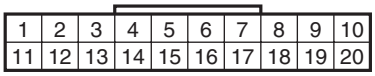
MCONF020005-01

G45

MCONF010060-01

IF EQPD

G49



MCONF200015-01

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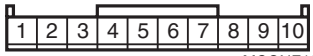
G50



MCONF100064-01

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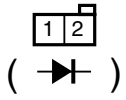
G51

MCONF040009-01

IF EQPD

G52



MCONF020105-01

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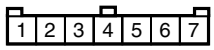

MCONF070001-01

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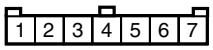
G54



MCONF070001-01

IF EQPD

G55

MCONF020151-01

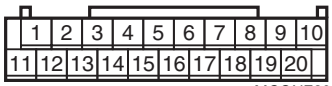
IF EQPD

G56

MCONF020148-01

IF EQPD

G57



MCONF200023-01

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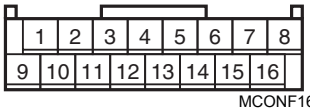
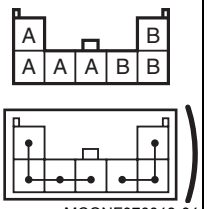
G58



MCONF160009-01

IF EQPD

G59



MCONF070019-01

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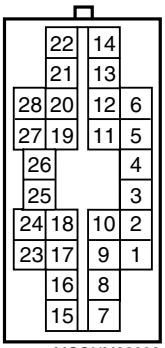
J Connector

S7N20A910F006

J01 (TO L07)

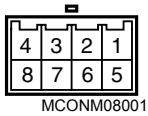


MCONM280004-01

J02

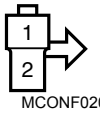
MCONF020134-01

J03



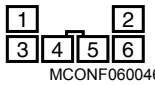
MCONM080010-01

J04



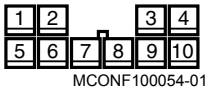
MCONF020009-01

J05



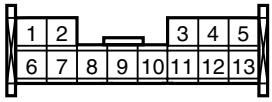
MCONF060046-01

J06



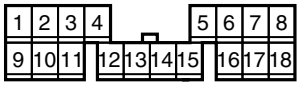
MCONF100054-01

J07



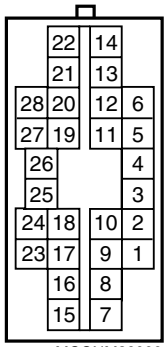
MCONF130011-01

J08



MCONF180011-01

J09 (TO L31)

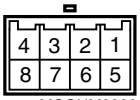


MCONM280004-01

J10

MCONF020134-01

J11



MCONM080010-01

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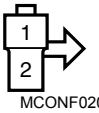
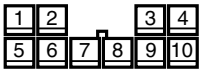


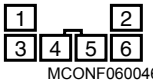
MCONF020009-01

J13



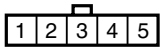
MCONF100054-01

J14



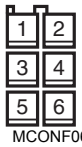
MCONF060046-01

J15



MCONF050001-01

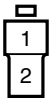
J16 (TO L13)



MCONF060070-01

IF EQPD

J17



MCONF020112-01

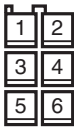
IF EQPD

J20

MCONF100055-01

IF EQPD

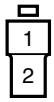
J21 (TO L37)



MCONF060070-01

IF EQPD

J22



MCONF020112-01

IF EQPD

J25

MCONF100055-01

IF EQPD

J26

MCONM020018-01

J27

MCONM020016-01

J28

MCONM020018-01

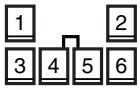
J29

MCONM020016-01

K Connector

S7N20A910F007

K01



MCONF060065-01

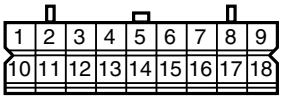
K02

MCONF030102-01

L Connector

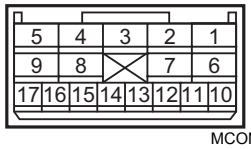
S7N20A910F008

L01



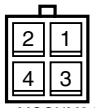
MCONF180012-01

L02 (TO E45)



MCONM170002-01

L03 (TO E44)

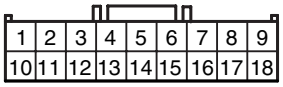


MCONM040022-01

L04

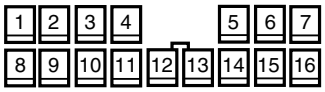
MCONF040033-01

L05



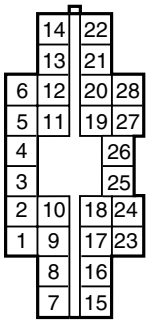
MCONF180013-01

L06



MCONF160014-01

L07 (TO J01)



MCONF280006-01

L10

MCONF020209-01

L11

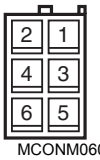
MCONF020210-01

IF EQPD

L12

MCONF010060-01

L13 (TO J16)



MCONM060032-01

IF EQPD

L14

MCONM020044-01

L15 (TO R01)

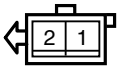
MCONF040123-01

L16

MCONF010060-01

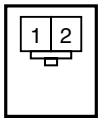
IF EQPD

L17



MCONM020045-01

L18



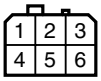
MCONF020207-01

IF EQPD

L19

MCONF020211-01

L20



MCONF060044-01

L21 (TO L22)

MCONF020060-01

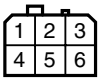
IF EQPD

L22 (TO L21)

MCONM020043-01

IF EQPD

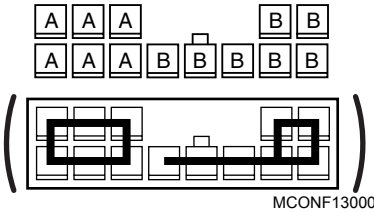
L23



MCONF060044-01

A/T

L24



MCONF130007-01

L25

MCONF020212-01

IF EQPD

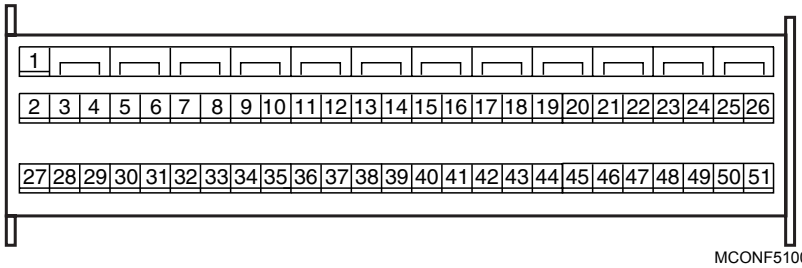
L26

MCONF020151-01

L27

MCONF010030-01

L29



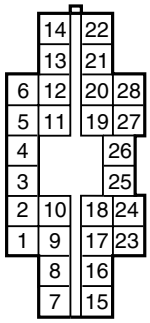
MCONF510002-01

L30

MCONF020212-01

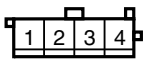
IF EQPD

L31 (TO J09)



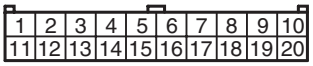
MCONF280006-01

L32 (TO G04)



MCONF040099-01

L33 (TO G03)



MCONF200003-01

L34

MCONF010060-01

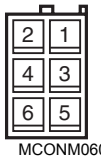
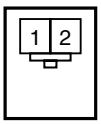
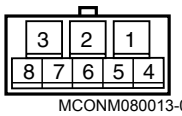
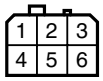
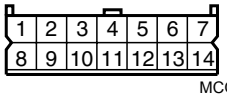
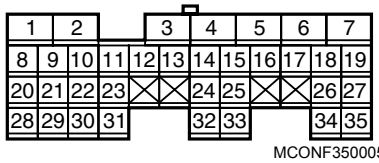
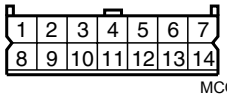
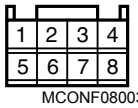
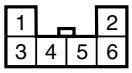
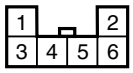
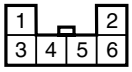
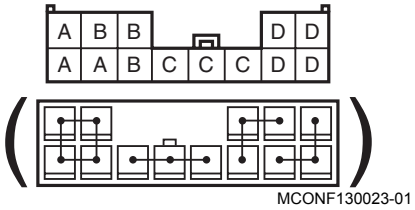
L35

MCONF020210-01

IF EQPD

L36

MCONF020209-01

L37 (TO J21)  MCONM060032-01 IF EQPD	L38  MCONM020044-01	L40  MCONF010060-01 IF EQPD	L41  MCONF020207-01 IF EQPD	L42 (TO O01)  MCONM080013-01	L43  MCONF060044-01
L47  MCONF020013-01	L48  MCONF020013-01	L51 (TO G43)  MCONF140012-01		L52  MCONF350005-01 Automated Manual Transaxle	
L54  MCONF140012-01 Automated Manual Transaxle		L55  MCONF080035-01 Automated Manual Transaxle	L59  MCONF020197-01	L60  MCONF020060-01 IF EQPD	L61  MCONF040095-01
L62  MCONF040095-01	L63  MCONF060025-01	L64  MCONF060025-01	L65  MCONF020228-01	L66  MCONF020228-01	L67  MCONF020008-01
L68  MCONF020008-01	L69  MCONF060025-01 IF EQPD	L70 (TO M01)  MCONM040027-01 SPORT	L71  MCONF130023-01 IF EQPD		

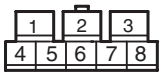
M Connector (SPORT)

S7N20A910F009

M01 (TO L70)  MCONF040123-01	M02  MCONF020013-01	M03  MCONF020013-01	M04  MCONF020277-01	M05  MCONF020277-01

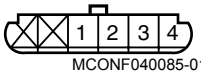
O Connector

S7N20A910F010

O01 (TO L42)	O02	O03	O04	O05	O06
 MCONF080027-01	 MCONF010061-01	 MCONF040012-01	 MCONF040095-01	 MCONF040095-01	 MCONF010061-01

R Connector

S7N20A910F011

R01 (TO L15)	R02
 MCONM040027-01	 MCONF040085-01

Lighting Systems

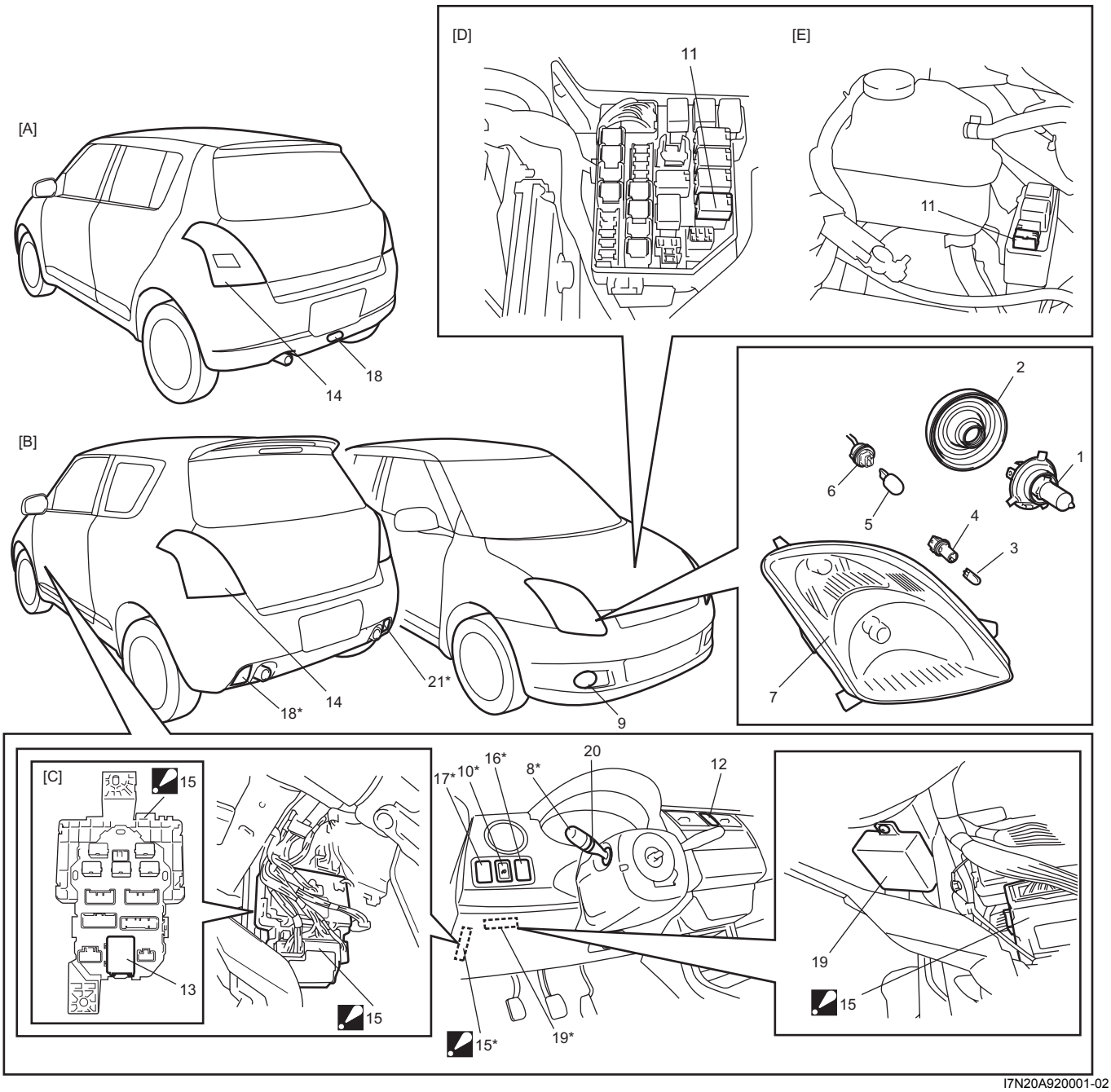
Component Location

Lighting System Components Location

S7N20A9203001

NOTE

Below figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the opposite side.



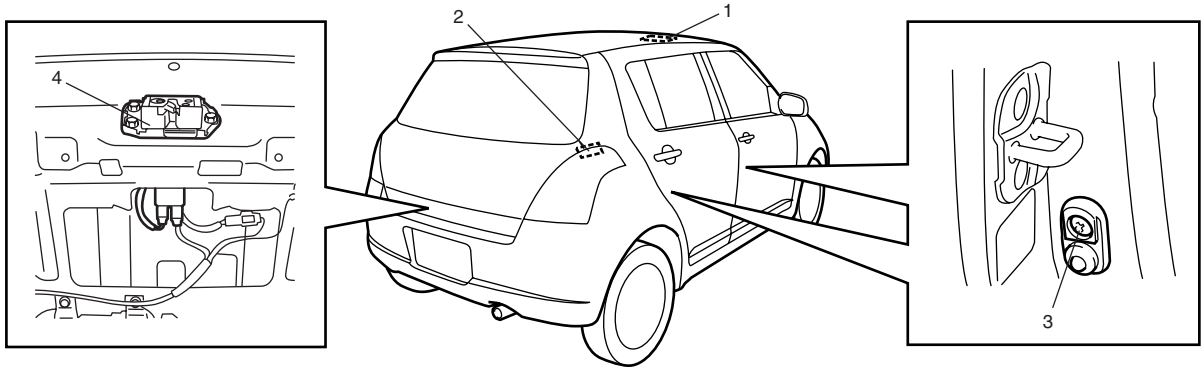
I7N20A920001-02

[A]: Type A	5. Turn signal light bulb	14. Rear combination light
[B]: Type B	6. Turn signal light bulb socket	15. BCM (included in junction block assembly : BCM cannot be removed from junction block.
[C]: Junction block assembly viewed from relay side	7. Headlight unit	16. Illumination cancel switch (if equipped)
[D]: Petrol engine model	8. Lighting switch	17. Headlight leveling switch (if equipped)
[E]: Diesel engine model	9. Front fog light (if equipped)	18. Rear fog light

1. Headlight bulb	10. Front fog light switch (if equipped)	19. DRL controller (if equipped)
2. Socket cover	11. Front fog light relay (if equipped)	20. Rear fog light switch
3. Clearance light bulb	12. Hazard warning switch	21. Back-up light
4. Clearance light bulb socket	13. Turn signal / hazard warning relay	

Interior Light System Location

S7N20A9203002



I4RS0A920002-01

1. Dome light	3. Door switches (both sides)
2. Luggage compartment light (if equipped)	4. Rear end door switch (included in lock assembly)

Diagnostic Information and Procedures

Headlight Symptom Diagnosis

S7N20A9204001

Condition	Possible cause	Correction / Reference Item
Headlights do not light up	Bulbs blown	*Replace bulbs.*
	Lighting or dimmer switch faulty	*Check headlight switch referring to "Headlight Switch (in Lighting Switch) Inspection".*
	Headlight R and L fuses blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
Only one headlight does not light up	Bulb blown	*Replace bulb.*
	Headlight R or L fuse blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
Only one beam ("Hi" or "Lo") does not light	Bulb blown	*Replace bulb.*
	Lighting or dimmer switch faulty	*Check headlight switch referring to "Headlight Switch (in Lighting Switch) Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	DRL controller (if equipped) faulty	*Check system referring to "Inspection of DRL Controller and Its Circuits (If Equipped)".*

DRL System Symptom Diagnosis (If Equipped)

S7N20A9204002

Condition	Possible cause	Correction / Reference Item
Headlight does not light when lighting switch is in OFF position and engine is running	Lighting switch faulty	*Check lighting switch referring to "Headlight Switch (in Lighting Switch) Inspection".*
	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection in Section 9C".*
	DRL controller faulty	*Check lighting switch referring to "Inspection of DRL Controller and Its Circuits (If Equipped)".*
	Wiring or grounding faulty	*Repair circuit.*
Headlight lights even if engine stop and lighting switch is OFF position	Lighting switch faulty	*Check system referring to "Headlight Switch (in Lighting Switch) Inspection".*
	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection in Section 9C".*
	DRL controller faulty	*Check system referring to "Inspection of DRL Controller and Its Circuits (If Equipped)".*
	Wiring or grounding faulty	*Repair circuit.*

Headlight Leveling Symptom Diagnosis (If Equipped)

S7N20A9204003

Condition	Possible cause	Correction / Reference Item
Neither headlight moves	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Headlight leveling switch faulty	*Check headlight leveling switch referring to "Headlight Levering Switch (If Equipped) Inspection".*
	Supply voltage too low	*Check charging system referring to "Generator Test (Undercharged Battery Check) (For 75A Type): M13A / M15A / M16A in Section 1J", "Generator Test (Undercharged Battery Check) (For 80A Type): M13A / M15A / M16A in Section 1J" or "Generator Test (Undercharged Battery Check): D13A / Z13DTJ in Section 1J".*
	Wiring or grounding faulty	*Repair circuit.*
Only one headlight does not move	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Headlight leveling actuator faulty	*Check actuator referring to "Headlight Leveling Actuator Inspection (If Equipped)".*
	Headlight housing deformed	*Replace headlight housing.*
	Wiring or grounding faulty	*Repair circuit.*

Turn Signal and Hazard Warning Light Symptom Diagnosis

S7N20A9204004

Condition	Possible cause	Correction / Reference Item
Flash rate high or one side only flashes	Bulb blown on "flash rate high"-side	*Replace bulb.*
	Incorrect bulb	*Replace bulb.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection".*
	Open circuit or high resistance existing either; between turn signal switch and non lighting bulb, or between hazard warning switch and non lighting bulb	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*

Condition	Possible cause	Correction / Reference Item
No flashing ***NOTE*** • ***Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".*** • ***Check each part in the order from the top of the following list.***	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection".*
	Turn signal light switch faulty	*Check turn signal light switch referring to "Turn Signal Light Switch (in Lighting Switch) Inspection".*
	Hazard warning switch faulty	*Check hazard warning switch referring to "Hazard Warning Switch Inspection".*
	Open circuit or high resistance existing between battery and switch	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Flash rate low	Supply voltage low	*Check charging system.*
	Turn signal / hazard warning relay faulty	*Check turn signal / hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection".*

Clearance, Tail and License Plate Light Symptom Diagnosis

S7N20A9204005

Condition	Possible cause	Correction / Reference Item
All lights do not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Lighting and dimmer switch of combination switch faulty	*Check lighting and dimmer switch referring to "Headlight Switch (in Lighting Switch) Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
Some lights do not light up	Bulb(s) blown	*Replace bulb(s).*
	Wiring or grounding faulty	*Repair circuit.*

Back-Up Light Symptom Diagnosis

S7N20A9204006

Condition	Possible cause	Correction / Reference Item
Back-up lights do not light up	Bulb(s) blown	*Replace bulb(s).*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Back-up light switch (M/T and Automated Manual Transaxle models) or transmission range sensor (A/T model) faulty	*Check back-up light switch or transmission range sensor referring to "Back Up Light Switch Inspection: M13A Model in Section 5B", "Back Up Light Switch Inspection: M15A and M16A Model in Section 5B", "Back Up Light Switch Inspection: D13A and Z13DTJ Model in Section 5B", "Back Up Lamp Switch Inspection in Section 5D" or "Transmission Range Sensor (Shift Switch) Inspection and Adjustment in Section 5A".*
	Wiring or grounding faulty	*Repair circuit.*

Condition	Possible cause	Correction / Reference Item
Back-up lights stay on	Back-up light switch (M/T and Automated Manual Transaxle models) or transmission range sensor (A/T model) faulty	*Check back-up light switch or transmission range sensor referring to "Back Up Light Switch Inspection: M13A Model in Section 5B", "Back Up Light Switch Inspection: M15A and M16A Model in Section 5B", "Back Up Light Switch Inspection: D13A and Z13DTJ Model in Section 5B", "Back Up Lamp Switch Inspection in Section 5D" or "Transmission Range Sensor (Shift Switch) Inspection and Adjustment in Section 5A".*

Stop (Brake) Lamp Symptom Diagnosis

S7N20A9204007

Condition	Possible cause	Correction / Reference Item
Stop (brake) lamp do not light up	Bulb(s) blown	*Replace bulb(s).*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Stop (brake) lamp switch faulty	*Check stop (brake) lamp switch referring to "Stop (Brake) Lamp Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
Stop (brake) lamp stay on	Stop (brake) lamp switch faulty	*Check or adjust stop (brake) lamp switch referring to "Stop (Brake) Lamp Switch Inspection" or "Brake Light Switch Adjustment in Section 4A".*

Front Fog Light (If Equipped) Symptom Diagnosis

S7N20A9204008

Condition	Possible cause	Correction / Reference Item
Only one light does not light	Bulb blown	*Replace bulb.*
	Wiring or grounding faulty	*Repair circuit.*
Front fog lights do not light	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Bulb blown	*Replace bulb.*
	Front fog light switch faulty	*Check front fog light switch referring to "Front Fog Light Switch Inspection (If Equipped)".*
	Front fog light relay faulty	*Check front fog light relay referring to "Front Fog Light Relay Inspection (If Equipped)".*
	Wiring or grounding faulty	*Repair circuit.*

Rear Fog Light (If Equipped) Symptom Diagnosis

S7N20A9204009

Condition	Possible cause	Correction / Reference Item
Rear fog light do not light	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Bulb blown	*Replace bulb.*
	Rear fog light switch faulty	*Check rear fog light switch referring to "Rear Fog Light Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*

Illumination Cancel System (If Equipped) Symptom Diagnosis

S7N20A9204010

Condition	Possible cause	Correction / Reference Item
Illumination cancel do not normal operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Illumination cancel switch faulty	*Check illumination cancel switch referring to "Illumination Cancel Switch (If Equipped) Inspection".*
	Combination meter and/or information display (clock) faulty	*Replace combination meter and/or information display (clock).*
	Wiring or grounding faulty	*Repair circuit.*

Interior Light Symptom Diagnosis

S7N20A9204011

NOTE

- **Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Dome light does not light up	Bulb blown	*Replace bulb.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Dome light switch faulty	*Check dome light switch.*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection in Section 9C".*
	Wiring or grounding	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Luggage compartment light (if equipped) does not light up	Bulb blown	*Replace bulb.*
	Back door switch faulty	*Check switch referring to "Rear End Door Switch Inspection in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*

DRL Operation Inspection (If Equipped)

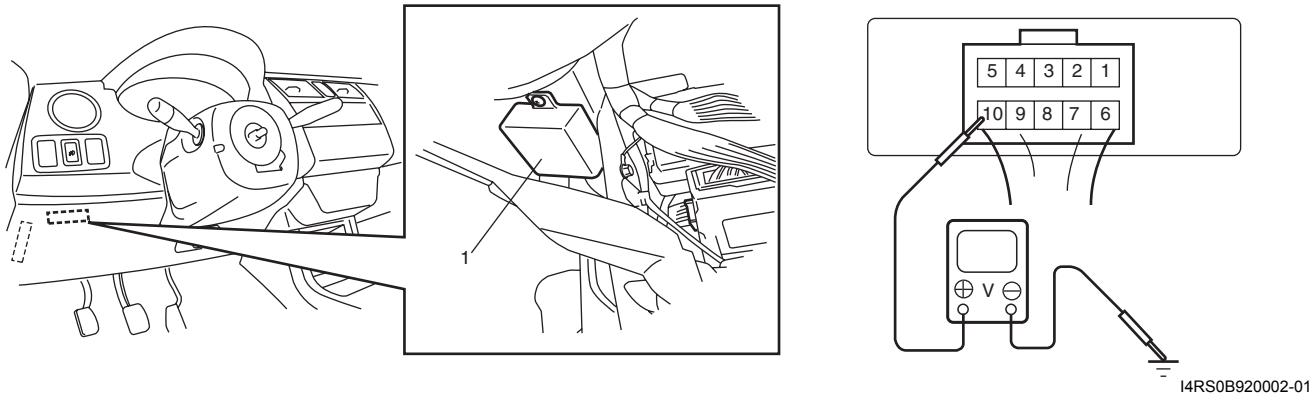
S7N20A9204012

1) Confirm that lighting switch is in OFF position.
2) Confirm that dimmer and passing switch is in low beam position.
3) Check DRL for operation as follows.
   a) Turn ignition switch to ON position and check headlights remain OFF.
   b) Start engine and run it at idle speed. Check headlights turn ON at low beam.
   c) Switch dimmer and passing switch to high beam position and check headlights remain tuning ON at low beam.
4) If check result is not as satisfied, go to "Inspection of DRL Controller and Its Circuits (If Equipped)".

Inspection of DRL Controller and Its Circuits (If Equipped)

S7N20A9204013

1) Confirm that lighting switch is in good condition referring to "Headlight Switch (in Lighting Switch) Inspection".
2) Confirm that oil pressure switch is in good condition referring to "Oil Pressure Switch Inspection in Section 9C".
3) Remove DRL controller (1) from steering support member.
4) Connect connector to DRL controller.
5) Check that the voltage between the following terminals and vehicle body ground are specifications under each condition.
6) Check that voltage between the following terminals and body ground are as specification under each condition.
   If measuring voltage is not within specification, check applicable circuit for open or short. If circuits are normal, replace DRL controller.
   If measuring voltage is within specification, DRL controller and its circuits are good condition.



[A]: DRL controller connector viewed from harness side

Terminal	Circuit	Specification	Condition
1	To clearance lamp	0 – 1 V	Engine is at stop and lighting switch is at OFF position.
		10 – 14 V	Engine is at running and lighting switch is at OFF position.
2	To ignition switch	0 – 1 V	Ignition switch is at OFF position.
		10 – 14 V	Ignition switch is at ON position.
3	To lighting switch (CLEARANCE)	0 – 1 V	Lighting switch is at OFF position.
		10 – 14 V	Lighting switch is at CLEARANCE position or HEAD position.
4	Ground	0 – 1 V	—
5	Ground	0 – 1 V	—
6	To head lamp	0 – 1 V	• Lighting switch is at HEAD position and dimmer switch is at LOW position. • Engine is running and lighting switch is at OFF position.
		10 – 14 V	Lighting switch is at HEAD position and dimmer switch is at HI position.
7	To oil pressure switch	8 – 10 V	Engine is at running (Oil pressure warning lamp is turned OFF).
		0 – 1 V	Engine is at stop.
8	Main fuse	10 – 14 V	—
9	To lighting switch (HEAD)	6 – 8 V	• Engine is at running and lighting switch is at OFF position. • Engine is running and lighting switch is CLEARANCE position.
		0 – 1 V	• Engine is at running and dimmer switch is at HEAD position. • Engine is at stop.
10	To lighting switch (LOW)	0 – 1 V	• Engine is at running and lightening switch is at OFF position. • Lighting switch is at HEAD position and dimmer switch is at LOW position.
		10 – 14 V	Lighting switch is at HEAD position and dimmer switch is at HI position.

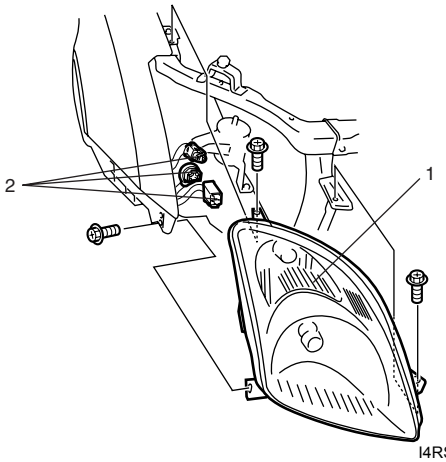
Repair Instructions

Headlight Housing Removal and Installation

S7N20A9206001

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper. Refer to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Remove headlight mounting bolts.
4) Detach headlight housing (1) from vehicle.
5) Disconnect couplers (2) from headlight housing (1).

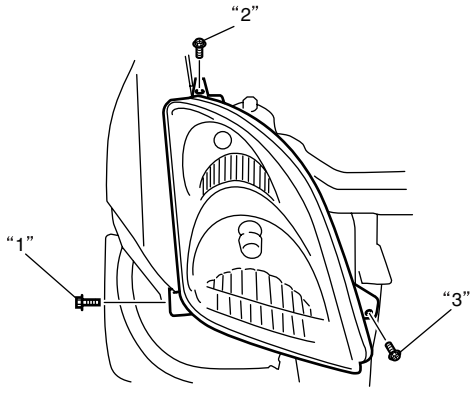


I4RS0A920003-01

Installation

Reverse removal procedure noting the following.

- Install headlight mounting bolts, and then tighten headlight mounting bolts (“1” – “3”) according to numerical order as shown in figure.



I4RS0A920004-01

- After installation, be sure to inspect and adjust aiming referring to “Headlight Aiming Adjustment with Screen”.

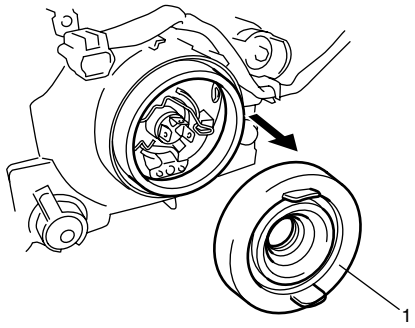
Headlight Bulb Replacement

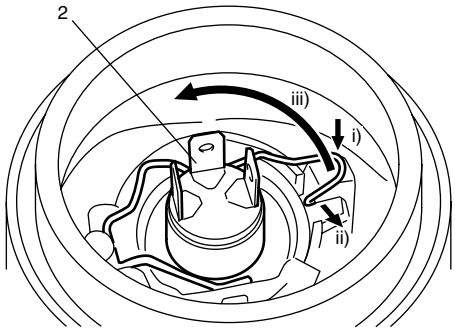
S7N20A9206002

⚠ WARNING

- **To avoid danger of being burned, don’t touch when the bulb is hot.**
- **Don’t touch glass surface of bulb, to avoid deteriorate as the case may be unclear when bulb light on at dirty condition.**

1) Disconnect negative (–) cable at battery.
2) Disconnect coupler from bulb.
3) Remove socket cover (1).
4) Replace bulb (2) and assemble all removed parts.





I4RS0A920005-01

Headlight Aiming Adjustment with Screen

S7N20A9206003

NOTE

- **Unless otherwise obligated by local regulations, adjust headlight aiming according to the following procedure.**
- **After replacing headlight housing, be sure to adjust aiming.**
- **When inspecting and adjusting headlight with leveling system, make sure to 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 (32.8 ft.)

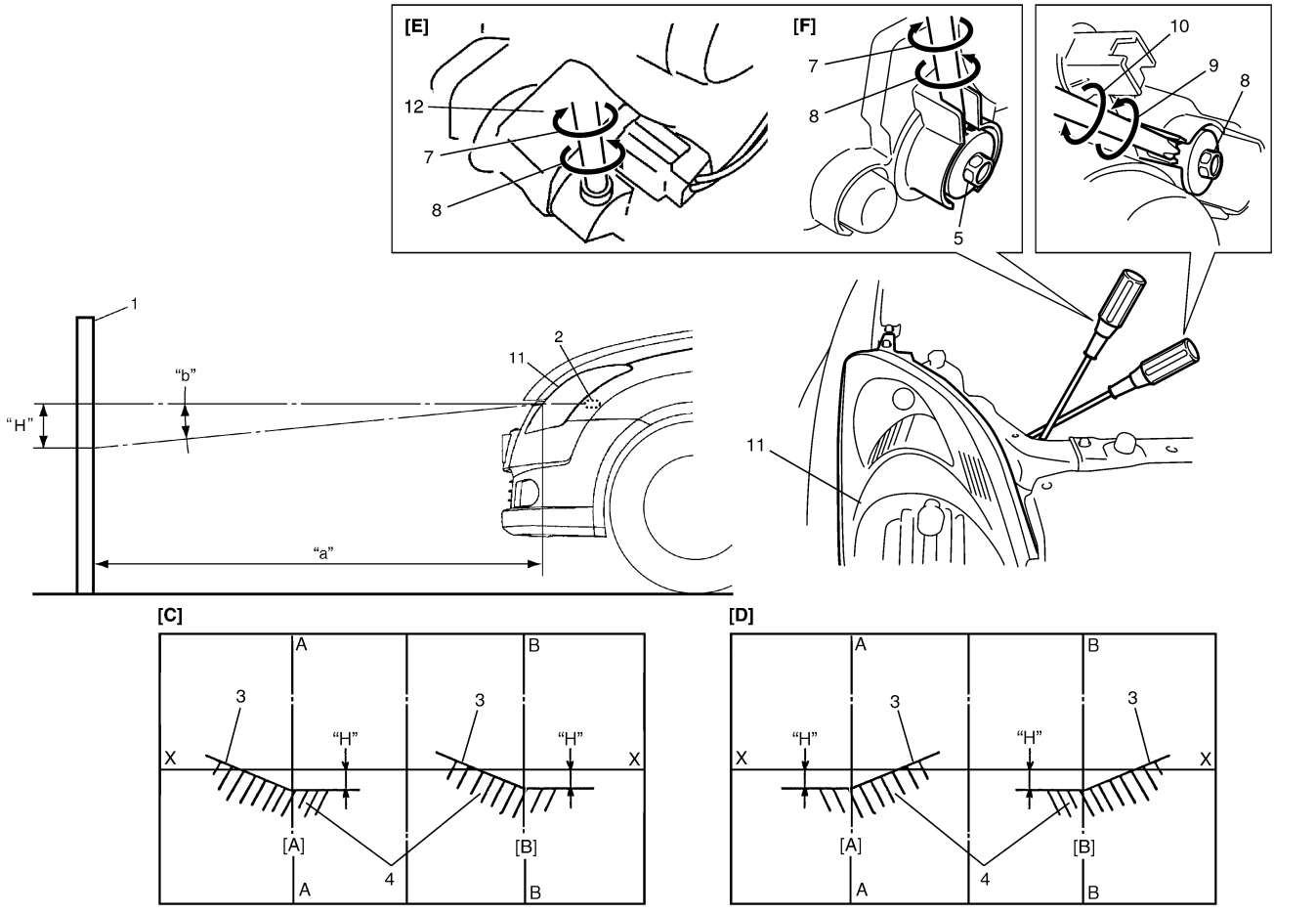
   - Adjust air pressure of all tires to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a driver aboard.

   Driver’s weight
   75 kg (165 lb)

2) Check to see if hot spot (high intensity zone) of each low beam axis falls as shown in figure.

   Hot spot specification
   Angle “b”: 0.75° (Specification)
   Calculated distance “H”: Approx. 130 mm (5.15 in.)

3) Align headlight aiming to specification by adjusting aiming gear if it is not set properly.



I4RS0B920003-01

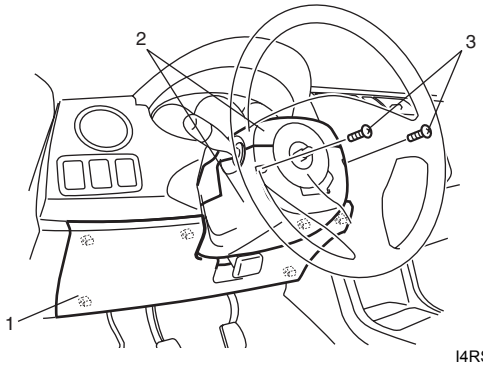
2. Headlight bulb	9. Turning (for right adjustment)	[A]: Left headlight
3. Cut line (bounding line)	10. Turning (for left adjustment)	[B]: Right headlight
4. Hot spot	11. Headlight housing	[C]: RH steering vehicle shown
5. Aiming gear (for up / down adjustment)	12. Headlight leveling actuator	[D]: LH steering vehicle shown
6. Turning (for up adjustment)	X-X: Horizontal center line of headlight bulbs	[E]: With leveling system
7. Turning (for down adjustment)	A-A: Vertical center line of left headlight bulb	[F]: Without leveling system
8. Aiming gear (for right / left adjustment)	B-B: Vertical center line of right headlight bulb	

Headlight Switch (in Lighting Switch) Removal and Installation

S7N20A9206004

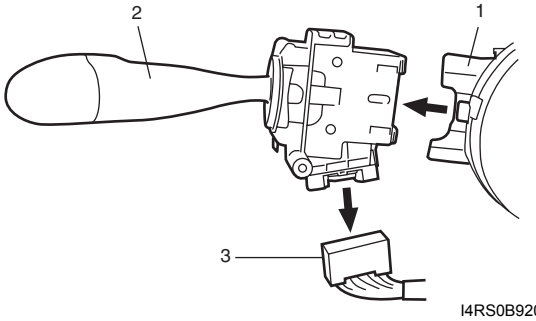
Removal

1) Disconnect negative cable at battery.
2) Remove steering column hole cover (1).
3) Remove steering column covers (2).
   Turn steering wheel to access steering column cover screws (3).



I4RS0B920004-02

4) Remove lighting switch (1) from combination switch assembly (2) and disconnect its coupler (3).



I4RS0B920005-01

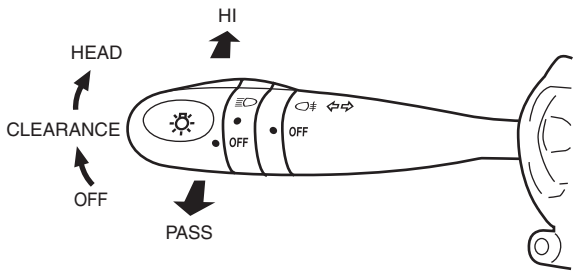
Installation

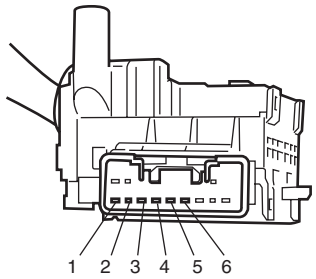
Reverse removal procedure for installation.

Headlight Switch (in Lighting Switch) Inspection

S7N20A9206005

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.





Shaft condition \ Terminal		1	4	2	3	5	6
OFF	LOW						
	PASS				○	○	
	HI						
CLEARANCE	LOW	○	○				
	PASS	○	○		○	○	
	HI	○	○				
HEAD	LOW	○	○	○	○		○
	PASS	○	○	○	○	○	
	HI	○	○	○	○	○	

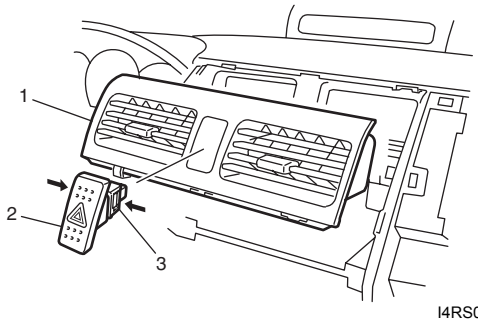
I4RS0B920006-01

Hazard Warning Switch Removal and Installation

S7N20A9206006

Removal

1) Disconnect negative (–) cable at battery.
2) Remove center ventilation louver (1) referring to “Center Ventilation Louver Removal and Installation in Section 7A”.
3) Disconnect coupler, and then remove hazard warning switch (2) from center ventilation louver (1) while releasing the locks (3).



I4RS0B920007-01

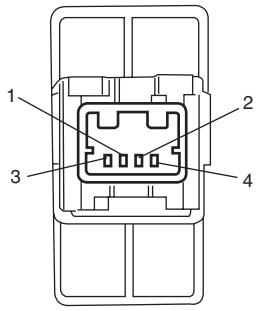
Installation

Reverse removal procedure for installation.

Hazard Warning Switch Inspection

S7N20A9206007

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Shaft condition \ Terminal	1	2	3	4
OFF			○ W ▷ ○	
ON	○	○	○ W ▷ ○	

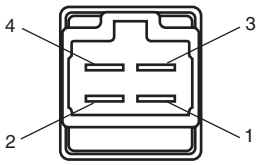
I4RS0A920011-02

Stop (Brake) Lamp Switch Inspection

S7N20A9206008

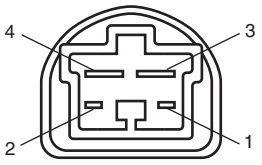
Check stop (brake) lamp switch for continuity between terminals at each switch position.
If check result is not as specified, replace switch.

[A]



Shaft condition \ Terminal	1	2	3	4
FREE	○	○	○	○
PUSH				

[B]



Shaft condition \ Terminal	1	2	3	4
FREE			○	○
PUSH	○	○		

I4RS0B920008-01

[A]: M/T or A/T model	[B]: Automated Manual Transaxle model

Turn Signal Light Switch (in Lighting Switch) Removal and Installation

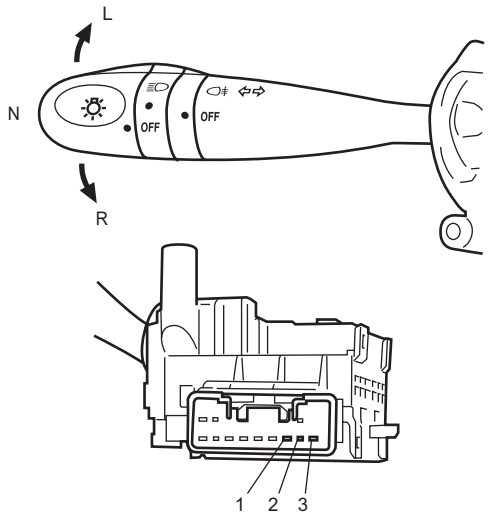
S7N20A9206009

For removal and Installation, refer to “Headlight Switch (in Lighting Switch) Removal and Installation”.

Turn Signal Light Switch (in Lighting Switch) Inspection

S7N20A9206010

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Turn signal SW \ Terminal	1	2	3
L		○	○
N			
R	○	○	

I7N20A920002-01

Turn Signal and Hazard Warning Relay Removal and Installation

S7N20A9206011

Removal

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B”.
3) Remove turn signal and hazard warning relay.

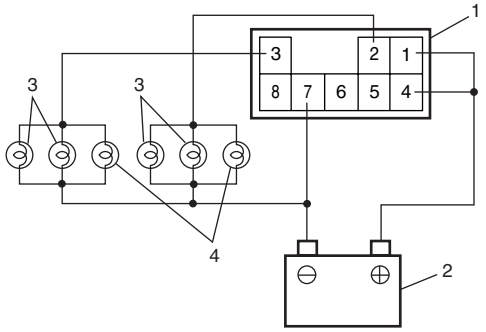
Installation

Reverse removal procedure for installation.

Turn Signal and Hazard Warning Relay Inspection

S7N20A9206012

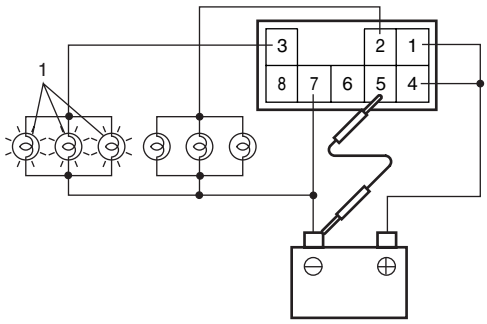
1) Connect turn signal and hazard warning relay (1), battery (2) and six test bulbs ((12V, 21W) (3) and 12 V, 5W (4)) as shown.



I4RS0A920014-01

2) Check turn L circuit
Connect terminal “5” and battery negative (–) terminal by a jumper wire.
Check left side bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

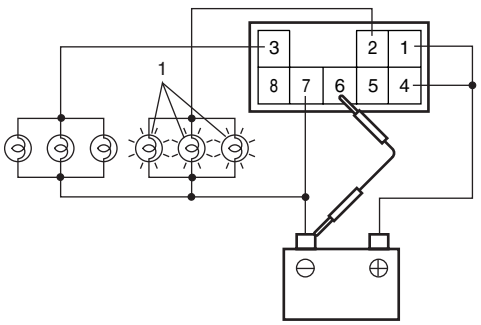
Reference flashing cycle
60 – 120 cycle/minute



I4RS0A920015-01

3) Check turn R circuit
Connect terminal “6” and battery negative (–) terminal by a jumper wire.
Check right side bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

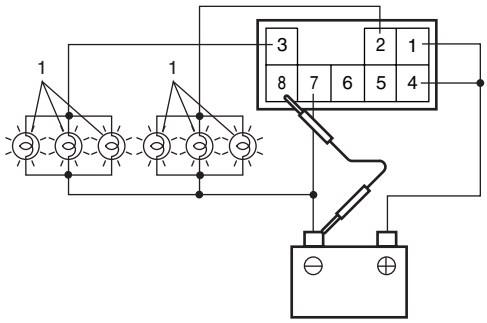
Reference flashing cycle
60 – 120 cycle/minute



I4RS0A920016-01

4) Check Hazard ON circuit
Connect terminal “8” and battery negative (–) terminal by a jumper wire.
Check all bulbs (1) for flashing cycle.
If check result is not as specified, replace turn signal and hazard warning relay.

Reference flashing cycle
60 – 120 cycle/minute



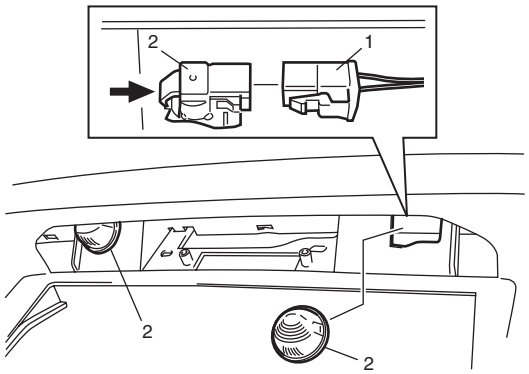
I4RS0A920017-01

License Lamp Assembly Removal and Installation

S7N20A9206013

Removal

1) Disconnect negative (–) cable at battery.
2) Remove rear bumper. Refer to “Front Bumper and Rear Bumper Components in Section 9K”
3) Disconnect coupler (1) from license lamp assembly (2).
4) Push locking part to arrow direction, and then remove license lamp assembly (2).



I4RS0B920010-01

Installation

Reverse removal procedure for installation.

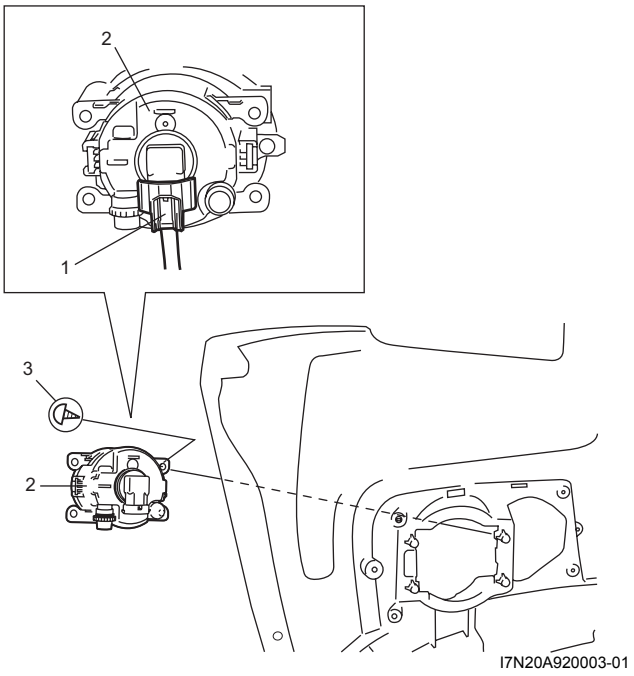
Front Fog Light Assembly Removal and Installation (If Equipped)

S7N20A9206014

M16A Engine Model

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper, and then remove front bumper guard from front bumper (if equipped) referring to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Disconnect coupler (1) from fog light (2).
4) Remove fog light screws (3), and remove front fog light assembly (2).



I7N20A920003-01

Installation

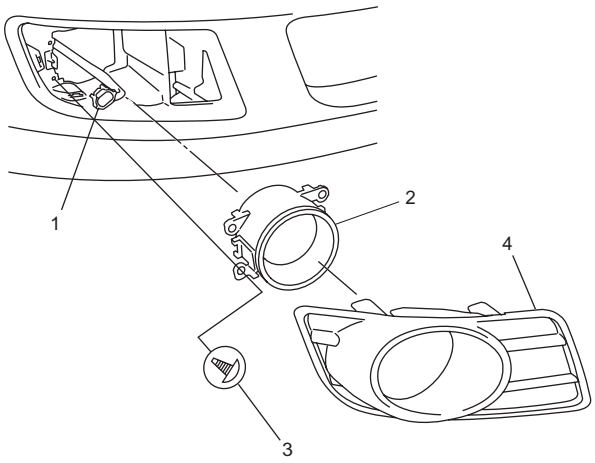
Reverse removal procedure for installation noting the following:

- After installing, adjust aiming referring to “Front Fog Light Aiming Adjustment with Screen (If Equipped)”.

Other than M16A Engine model

Removal

1) Remove front fog light cap (4).
2) Remove fog light screw (3).
3) Disconnect coupler (1) and remove front fog light assembly (2).



I7N20A920004-01

Installation

Reverse removal procedure for installation noting the following:

- After installing, adjust aiming referring to “Front Fog Light Aiming Adjustment with Screen (If Equipped)”.

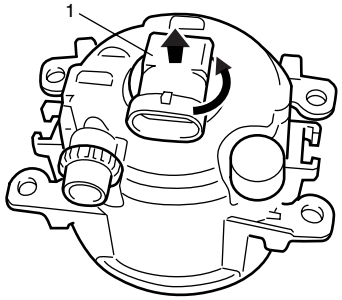
Front Fog Light Bulb Replacement (If Equipped)

S7N20A9206015

⚠ WARNING

- **To avoid danger of being burned, don’t touch when the bulb is hot.**
- **Don’t touch glass surface of bulb to avoid deteriorate as the case may be unclear when bulb light on at dirty condition.**

1) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
2) Remove fog light bulb (1) as shown.



I4RS0A920020-01

3) Replace fog light bulb and assemble all removed parts.

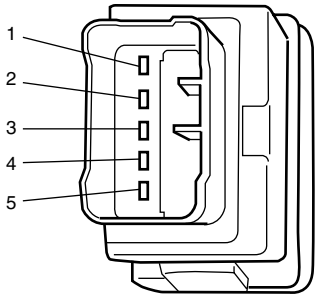
Front Fog Light Switch Inspection (If Equipped)

S7N20A9206016

NOTE

Front fog lights light up only when headlight switch is in HEADLIGHT position (low or high beams) or SMALL position. Front fog lights turn OFF automatically when headlight switch is turned to OFF position. If front fog light switch holds ON position, front fog lights turn ON automatically when headlight switch is tuned to HEADLIGHT position (low or high beams) or SMALL position again.

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



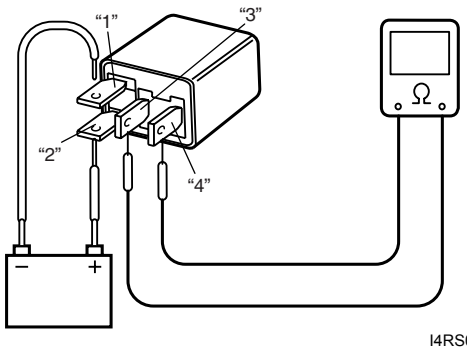
Switch Position \ Terminal	2	3	1	5	4
OFF		○—○	○	○—○	○
ON (PUSH IN)	○	○—○	○		

I4RS0A920021-01

Front Fog Light Relay Inspection (If Equipped)

S7N20A9206017

1) Check that there is no continuity between terminal “3” and “4”. If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal “2” of relay.
3) Connect battery negative (–) terminal to terminal “1” of relay.
4) Check continuity between terminal “3” and “4”. If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A920022-01

Front Fog Light Aiming Adjustment with Screen (If Equipped)

S7N20A9206018

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 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.)

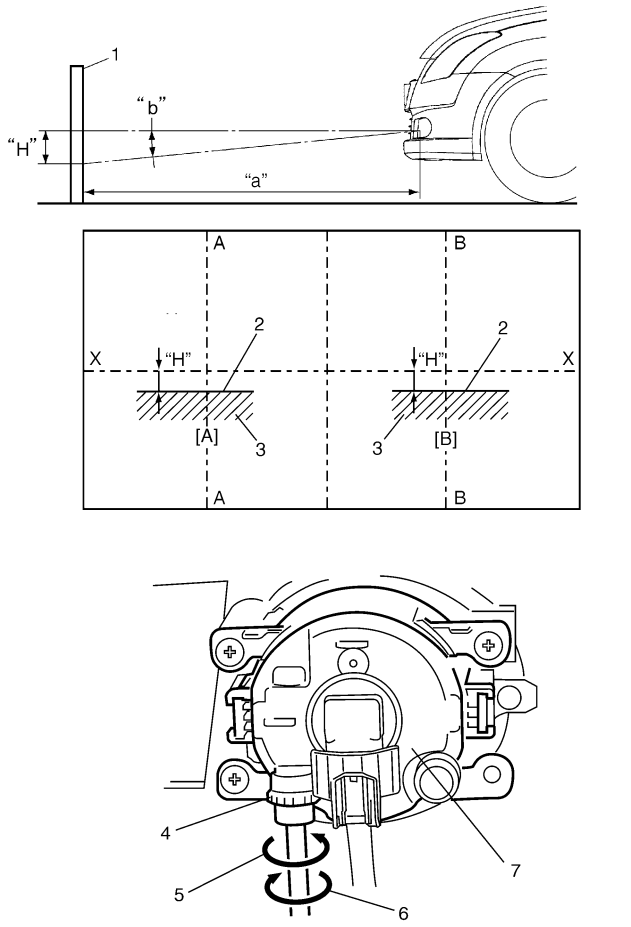
   - Adjust air pressure of all tired to the specified value respectively.
   - Bounce vehicle body up and down by hand to stabilize suspension.
   - Carry out aiming with a driver aboard.

     Driver’s weight
     75 kg (165 lb)

2) Check to see if hot spot (high intensity zone) of each front fog light axis falls as shown in the figure.

   Hot spot specification
   Angle “b”: 1.14° (Specification)
   Calculated distance “H”: Approx. 199 mm (7.83 in.)

3) If it is not set properly, align front fog light to specification by rotating aiming gear.



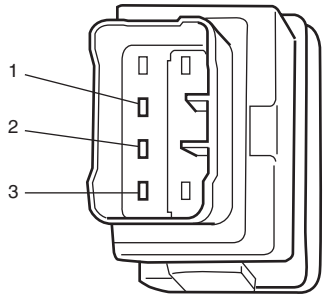
I4RS0B920011-01

2.	Bounding line
3.	Hot spot
4.	Aiming gear (for up / down adjustment)
5.	Turning (for up adjustment)
6.	Turning (for down 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

Headlight Levering Switch (If Equipped) Inspection

S7N20A9206019

Check for resistance between terminals at each switch position.
If check result is not as specified, replace switch.



Switch Position	Terminal	Resistance (Ω)
-	1 and 2	4370 - 4830
0	1 and 3	646 - 714
	2 and 3	3724 - 4116
1	1 and 3	1292 - 1428
	2 and 3	3078 - 3402
2	1 and 3	1938 - 2142
	2 and 3	2432 - 2688
3	1 and 3	2584 - 2856
	2 and 3	1786 - 1974
4	1 and 3	3230 - 3570
	2 and 3	1140 - 1260

I4RS0B920012-01

Headlight Leveling Actuator Inspection (If Equipped)

S7N20A9206020

1) Make sure all headlight couplers and leveling actuator couplers are correctly connected.
2) Turn the ignition switch to ON position.
3) Check if the leveling actuator sounds slightly while the leveling switch is moved.
   If no sound is heard with the movement of the leveling switch, check headlight leveling switch and wiring.
   If headlight leveling switch and wiring are OK, replace head light housing.
4) Make sure the replaced leveling actuator operates correctly after replacement.

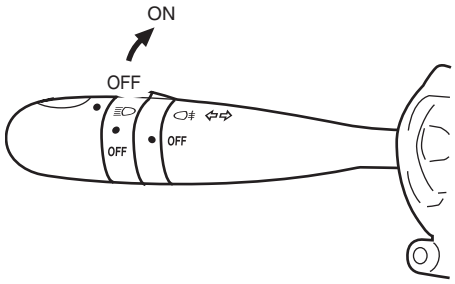
Rear Fog Light Switch Inspection

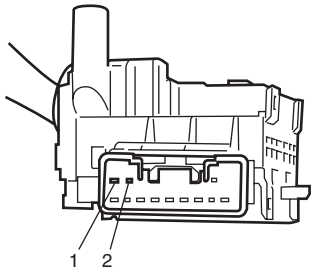
S7N20A9206021

NOTE

- **Rear fog light switch can be turned to ON position only when headlight switch is turned to HEADLIGHT position (low or high beams).**
- **Rear fog light switch turns OFF automatically when headlight switch is turned to OFF position.**

Check for continuity between terminals at each switch position.
If check result is not as specified, replace switch.





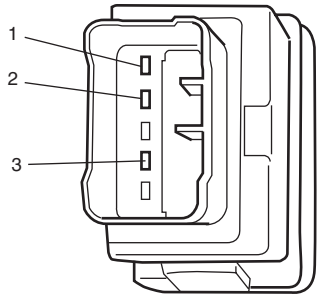
Shaft condition \ Terminal	1	2
OFF		
ON	○	○

I4RS0B920013-01

Illumination Cancel Switch (If Equipped) Inspection

S7N20A9206022

Check for continuity between terminals at each switch position.
If check result is not as specified, replace switch.



	1	2	3
[A]	○		○
[B]		○	○

I6RS0B920003-01

[A]: Switch OFF
[B]: Switch ON (push in)

Instrumentation / Driver Info. / Horn

General Description

CAN Communication Data of Combination Meter

S7N20A9301001

Combination meter communicates with each control module about the following information. For details of CAN communication, refer to “CAN Communication System Description: M13A / M15A / M16A in Section 1A” (petrol engine model) or “CAN Communication System Description: D13A / Z13DTJ in Section 1A”(diesel engine model).

Combination Meter Transmission Data

			BCM	ECM
Combination Meter	DATA Transmit	Fuel level signal	○	
		Engine oil request signal		○*2

I7N20A930001-02

Combination Meter Reception Data

			ECM	TCM (A/T model)	TCM (Automated Manual Transaxle model)	BCM	Keyless Start Control Module (if equipped)	ABS / ESP® Control Module (if equipped)
Combination Meter	DATA Receive	Engine speed signal	○					
		Engine coolant temperature signal	○					
		Vehicle speed signal	○					
		Glow plug indicator light control signal	○*2					
		Service vehicle soon (SVS) lamp control signal	○*2					
		Immobilizer indicator light control signal	○*1					
		MIL control signal	○*1	○	○			
		Engine oil pressure switch signal (oil pressure warning light control signal)	○*2			○*1		
		DPF warning light control signal	○*2					
		A/T selector position signal		○	○			
		Transaxle warning light control signal			○			
		Automated Manual Transaxle mode indicator signal			○			
		Brake fluid level switch signal (brake warning light control signal)				○		
		Parking brake switch signal (brake warning light control signal)				○		
		Driver side seat belt buckle switch signal (seat belt reminder light control signal)				○		
		Charging system signal (charge warning light control signal)				○		
		Illumination ON signal				○		
		Door switch status (open door warning light control signal)				○		
		Diagnostic trouble code (DTC)				○		
		Key indicator lamp control signal					○	
		ABS indication signal						○
		EBD indication signal (brake warning light control signal)						○
		ESP® status signal						○*3

I7N20A930002-02

NOTE

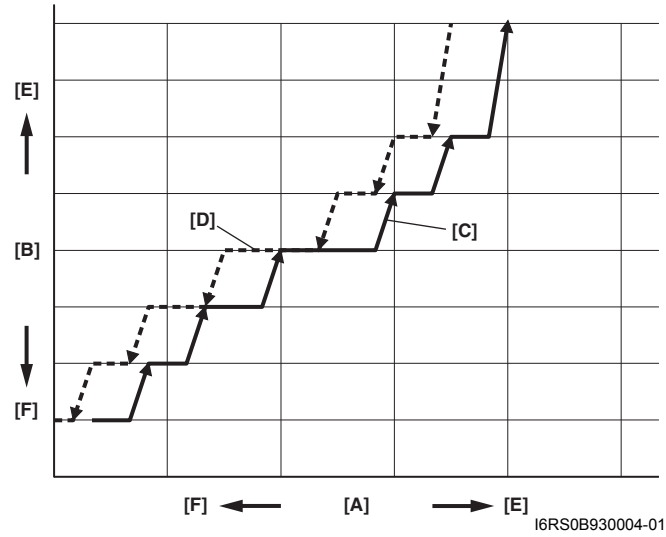
***1: Petrol engine model**
***2: Diesel engine model**
***3: ESP® model**

Auto Volume Control System Description (If Equipped)

S7N20A9301002

Function of auto volume control system is to vary sound volume according to changes of vehicle speed. How much sound volume varies depends on selected level.

Reference Correlation Chart of Vehicle Speed and Sound Volume



I6RS0B930004-01

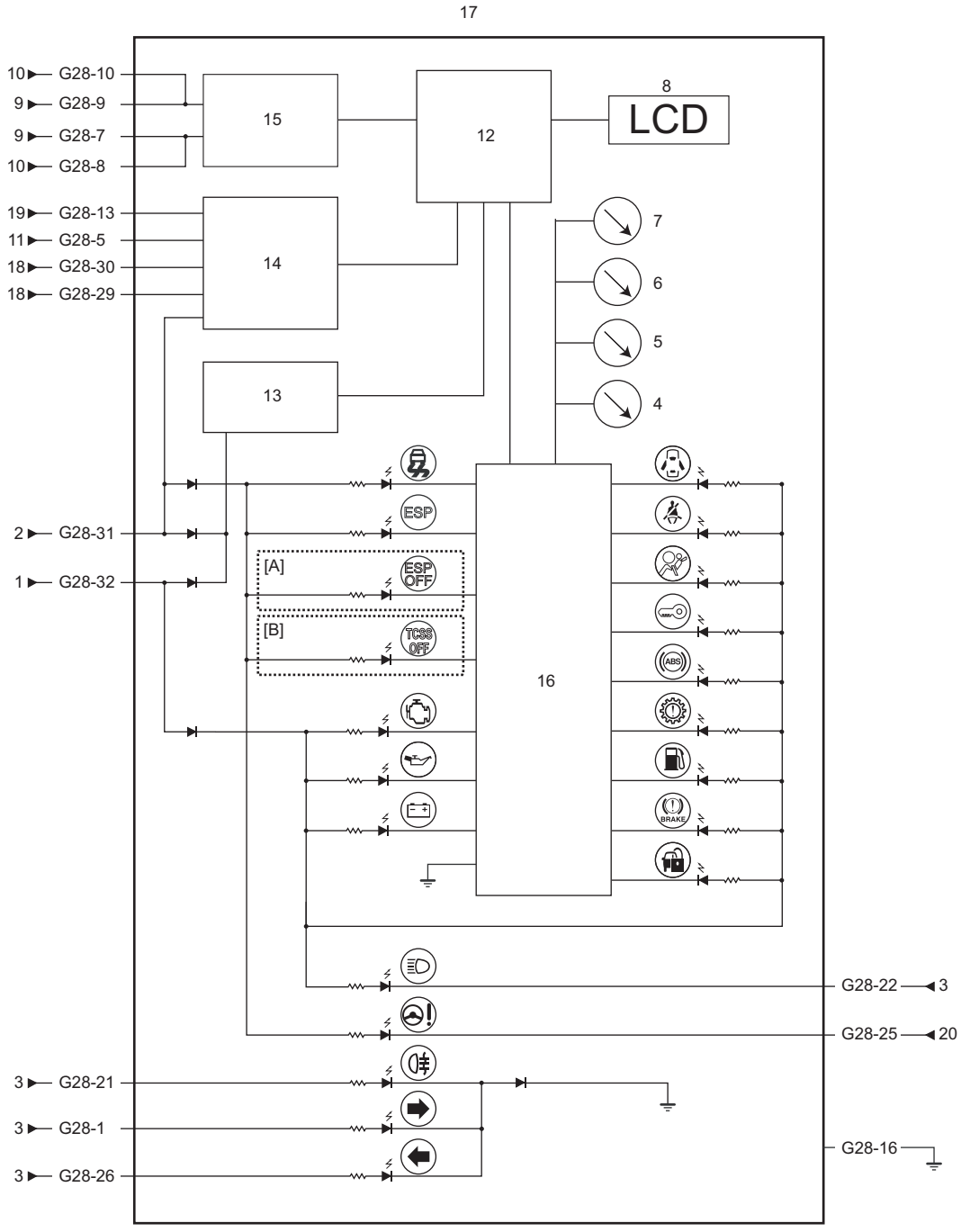
[A]: Vehicle speed	[C]: Acceleration	[E]: Increase
[B]: Sound volume	[D]: Deceleration	[F]: Decrease

Schematic and Routing Diagram

Combination Meter Circuit Diagram

S7N20A9302001

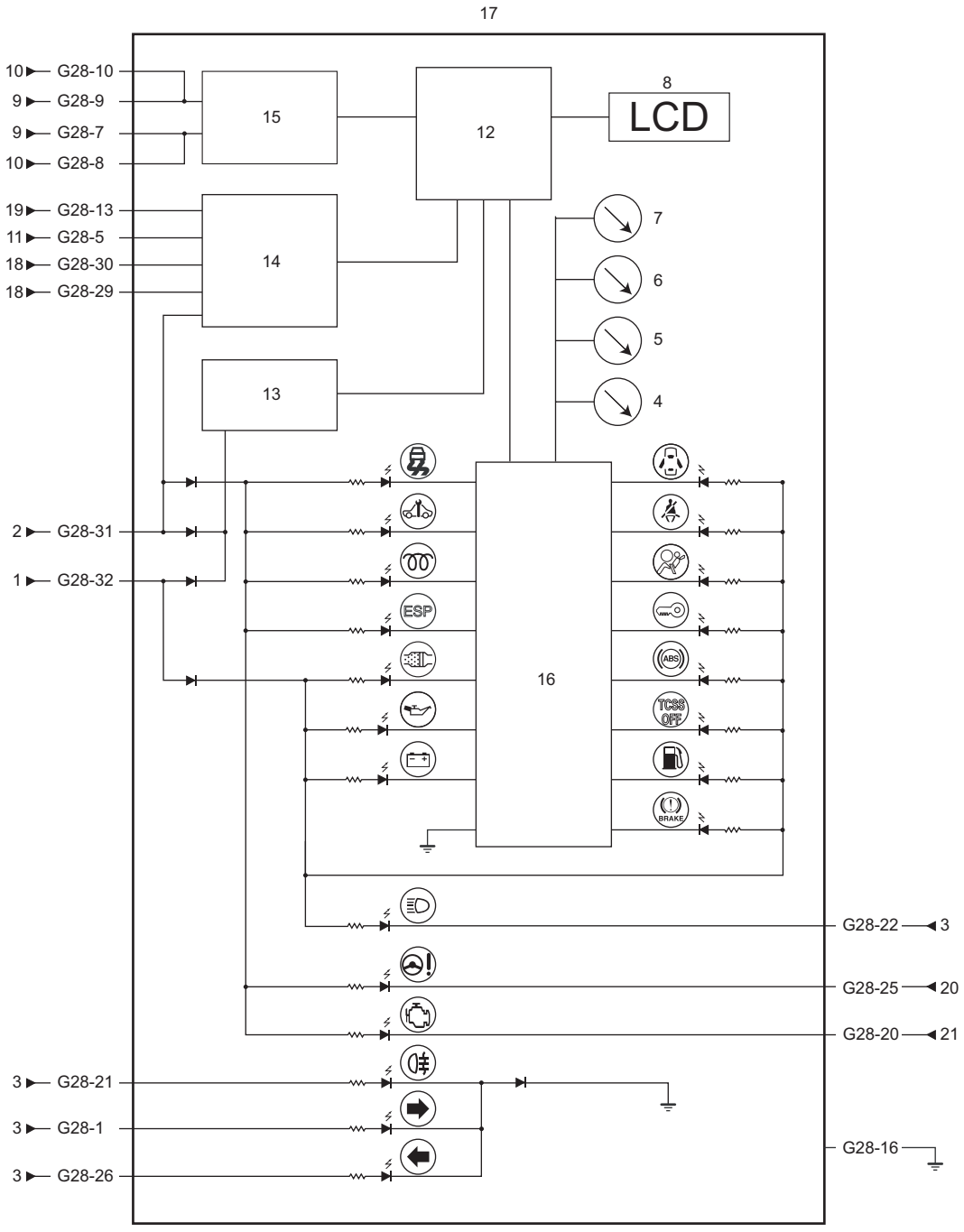
Petrol engine model



I7N20A930003-03

[A]: M16A engine model	5. Speedometer	11. SDM	17. Combination meter
[B]: Other than M16A engine model	6. Fuel meter	12. CPU	18. Fuel level sensor
1. RADIO fuse	7. ECT meter	13. Power supply	19. Illumination cancel switch (if equipped)
2. METER fuse	8. ODO, TRIP, Shift position (other than M/T model)	14. Interface circuit	20. P/S control module
3. Combination switch	9. Keyless start control module (if equipped)	15. CAN driver	
4. Tachometer	10. Each control module	16. Stepper motor and LED output driver	

Diesel engine model



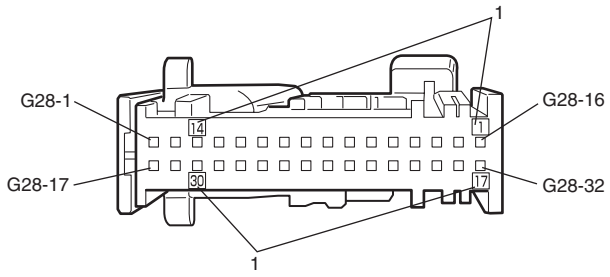
I7N20A930004-03

1. RADIO fuse	7. ECT meter	13. Power supply	19. Illumination cancel switch (if equipped)
2. METER fuse	8. ODO, TRIP, Shift position (other than M/T model)	14. Interface circuit	20. P/S control module
3. Combination switch	9. Keyless start control module (if equipped)	15. CAN driver	21. ECM
4. Tachometer	10. Each control module	16. Stepper motor and LED output driver	
5. Speedometer	11. SDM	17. Combination meter	
6. Fuel meter	12. CPU	18. Fuel level sensor	

Terminal arrangement of coupler viewed from terminal side

NOTE

Molded numbers (1) have no relation to the terminal numbers.



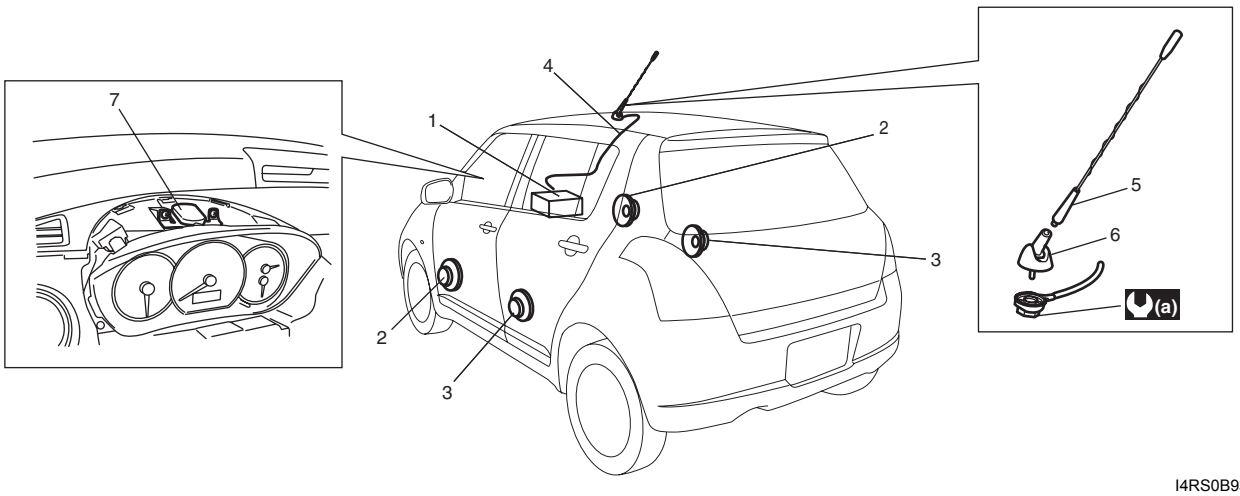
I4RS0A930003-02

Terminal	Circuit	Terminal	Circuit
G28-1	To turn signal light switch (turn R)	G28-17	—
G28-2	—	G28-18	—
G28-3	—	G28-19	—
G28-4	—	G22-20	To ECM (MIL control signal) (diesel engine model)
G28-5	To SDM (air bag indicator control signal)	G28-21	To rear fog light switch
G28-6	—	G28-22	To lighting switch (high beam)
G28-7	CAN communication line (Active High Signal)	G28-23	—
G28-8	CAN communication line (Active High Signal)	G28-24	—
G28-9	CAN communication line (Active Low Signal)	G28-25	To P/S control module (EPS warning light control signal)
G28-10	CAN communication line (Active Low Signal)	G28-26	To turn signal light switch (turn L)
G28-11	—	G28-27	—
G28-12	—	G28-28	—
G28-13	To illumination cancel switch	G28-29	To fuel level sensor ground
G28-14	—	G28-30	To fuel level sensor
G28-15	—	G28-31	To METER fuse
G28-16	GND	G28-32	To RADIO fuse

Component Location

Audio System Component Location

S7N20A9303001



I4RS0B930003-01

1. Radio or navigation assembly	4. Antenna feeder	7. GPS antenna (if equipped)
2. Front speaker	5. Antenna	(a) : 3.0 N·m (0.3 kgf-m, 2.2 lbf-ft)
3. Rear speaker	6. Antenna base	

Diagnostic Information and Procedures

Speedometer and VSS Symptom Diagnosis

S7N20A9304001

NOTE

Make sure that any DTC is not detected by all of ECM and TCM (A/T and Automated Manual Transaxle models), ABS control module (diesel engine model) or ESP® control module (with ESP® model) before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Speedometer shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	VSS faulty (Automated Manual Transaxle model)	*Check VSS referring to "Vehicle Speed Sensor (VSS) Inspection (If Equipped): M13A / M15A / M16A in Section 1C".*
	Front wheel speed sensor or sensor encoder faulty (Other than Automated Manual Transaxle model)	*Check front wheel speed sensor or sensor encoder. Refer to "Front Wheel Speed Sensor On-Vehicle Inspection in Section 4E" (without ESP® model), "Front / Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4F" (with ESP® model) or "Front Wheel Speed Sensor Encoder and Rear Wheel Speed Sensor Ring Inspection in Section 4E".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Tachometer Symptom Diagnosis

S7N20A9304002

NOTE

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Tachometer shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Engine Coolant Temperature (ECT) Meter Symptom Diagnosis

S7N20A9304003

NOTE

Make sure that any DTC is not detected by ECM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Engine coolant temperature (ECT) meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Fuel Meter Symptom Diagnosis

S7N20A9304004

Condition	Possible cause	Correction / Reference Item
Fuel meter shows no operation or incorrect operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Low Fuel Warning Light Symptom Diagnosis

S7N20A9304005

NOTE

- **Confirm that fuel meter is in good condition before referring to the following possible causes.**
- **When fuel level meter circuit is shorted to ground circuit, fuel level meter indicates empty and low fuel warning lamp comes ON even if fuel tank does not empty.**
- **The low fuel warning light comes ON when fuel level is lower than specification below.**

Low fuel warning light operation:

Low fuel warning light operation:	Fuel amount:	Resistance of fuel level sensor:
ON	Approx. 6.7 liter	Approx. 251 Ω

Condition	Possible cause	Correction / Reference Item
Low fuel warning light does not come ON when fuel level is lower than specification	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Low fuel warning light comes ON steady	Low fuel	*Refill fuel.*
	Fuel level sensor faulty	*Check fuel level sensor referring to "Fuel Level Sensor Inspection".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Oil Pressure Warning Light Symptom Diagnosis

S7N20A9304006

NOTE

Make sure that any DTC is not detected by ECM (diesel engine model) or BCM (petrol engine model) before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Oil pressure warning light does not light up when ignition switch is turned to ON position at engine off	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Oil pressure warning light stays ON	Oil pressure switch faulty	*Check oil pressure switch referring to "Oil Pressure Switch Inspection".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Oil pressure warning light keeps flashing (Diesel engine model)	Exchange timing of engine oil	*Replace engine oil with new one and reset warning light referring to "Engine Oil and Filter Change (Diesel Engine) in Section 0B".*

Brake and Parking Brake Warning Light Symptom Diagnosis

S7N20A9304007

NOTE

Make sure that any DTC is not detected by both BCM and ABS (ESP®) control module before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Brake warning light does not light up when brake fluid level is low or parking brake is pulled up or for 5 seconds after turning ON ignition switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Brake fluid level switch faulty	*Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection".*
	Parking brake switch faulty	*Check parking brake switch referring to "Parking Brake Switch Inspection".*
	ABS (ESP®) system faulty	*Refer to "ABS Check in Section 4E" (without ESP® model) or "Electronic Stability Program Check in Section 4F" (with ESP® model).*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Brake warning light stays ON	Brake fluid level switch faulty	*Check brake fluid level switch referring to "Brake Fluid Level Switch Inspection".*
	Parking brake switch faulty	*Check parking brake switch referring to "Parking Brake Switch Inspection".*
	EBD system faulty	*Refer to "EBD Warning Light (Brake Warning Light) Check in Section 4E" (without ESP® model) or "EBD Warning Light (Brake Warning Light) Check in Section 4F" (with ESP® model).*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Seat Belt Reminder Light Symptom Diagnosis (If Equipped)

S7N20A9304008

Condition	Possible cause	Correction / Reference Item
Seat belt reminder light does not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Seat belt reminder light stays ON	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

A/T Shift Position Indicator (A/T Model Only) Symptom Diagnosis

S7N20A9304009

NOTE

Make sure that any DTC is not detected by TCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
All A/T shift position indicator does not light up	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Transmission range sensor (shift switch) faulty	*Check transmission range sensor "Transmission Range Sensor (Shift Switch) Inspection and Adjustment in Section 5A".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Automated Manual Transaxle Shift Position Indicator (Automated Manual Transaxle Model Only) Symptom Diagnosis

S7N20A9304010

NOTE

Make sure that any DTC detected by TCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
No displaying Automated Manual Transaxle shift position indicator	Circuit fuse Blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Charge Warning Light Symptom Diagnosis

S7N20A9304011

NOTE

Make sure that any DTC is not detected by BCM before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.

Condition	Possible cause	Correction / Reference Item
Charge warning light does not come ON	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Charge warning light stay ON	Charging system faulty	*Check charging system.*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Main Beam (High Beam) Indicator Symptom Diagnosis

S7N20A9304012

Condition	Possible cause	Correction / Reference Item
Main beam (high beam) indicator does not come ON	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Combination switch faulty	*Check combination switch referring to "Headlight Switch (in Lighting Switch) Inspection in Section 9B".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*
Main beam (high beam) indicator stay ON	Combination switch faulty	*Check combination switch referring to "Headlight Switch (in Lighting Switch) Inspection in Section 9B".*
	Wiring or ground faulty	*Repair circuit.*
	Combination meter faulty	*Replace combination meter.*

Warning Buzzer Circuit Symptom Diagnosis

S7N20A9304013

NOTE

- **Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Warning buzzer shows no sounding	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Driver side door switch faulty	*Check driver side door switch referring to "Door Switch (Front / Rear Door) Inspection".*
	Lighting switch faulty	*Check lighting switch referring to "Headlight Switch (in Lighting Switch) Inspection in Section 9B".*
	Key remainder switch faulty	*Check key remainder switch referring to "Ignition Switch Inspection".*
	Seat belt switch faulty	*Check seat belt switch referring to "Front Seat Belt Inspection in Section 8A".*
	Wiring or ground faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Cigarette Lighter Symptom Diagnosis (If Equipped)

S7N20A9304014

Condition	Possible cause	Correction / Reference Item
Cigarette lighter shows no operation	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Cigarette lighter faulty	*Check cigarette lighter.*
	Ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*

Horn Symptom Diagnosis

S7N20A9304015

Condition	Possible cause	Correction / Reference Item
Horn does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Horn switch faulty	*Check horn switch.*
	Horn relay faulty	*Check horn relay.*
	Wiring or grounding faulty	*Repair circuit.*
	Horn faulty	*Replace horn.*

Information Display Symptom Diagnosis (If Equipped)

S7N20A9304016

NOTE

- **This thermometer indicates the ambient temperature in back of front bumper member. Under any one of the following listed conditions, however, even when the ambient temperature goes up, the thermometer display does not rise so as to correct the rise of the ambient temperature caused by the radiant heat of the engine. When the ambient temperature drops, the thermometer reading follows the change in the temperature.**
  Be sure to bear this in mind when diagnosing trouble.
  - **– The vehicle speed is 30 km/h (18 m.p.h.) or lower.**
  - **– Vehicle speed signal is faulty.**
  - **– The ignition switch is turned on again within 2 hours.**
- **Make sure that any DTC is not detected by all of BCM, ECM and TCM (A/T and Automated Manual Transaxle models), ABS control module (diesel engine model) or ESP® control module (with ESP® model) before starting the troubleshooting by using the following table. If any DTC is detected, troubleshoot the DTC advance.**

Condition	Possible cause	Correction / Reference Item
No displaying of information display	Circuit fuse Blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Information display unit faulty	*Replace unit.*
Incorrect thermometer display	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)".*
	Vehicle speed signal faulty	*Check VSS or vehicle speed signal referring to "VSS Inspection".*
	Wiring and/or grounding faulty	*Repair as necessary.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display does not change at –30 °C	Outside air temperature is –30 °C (–22 °F) or less	—
	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)".*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display does not change at 50 °C	Outside air temperature is 50 °C (122 °F) or more	—
	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)".*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display of thermometer does not change at "- - - °C"	Outside air temperature sensor faulty	*Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection (If Equipped)".*
	Outside air temperature sensor circuit is open or short	*Repair circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Display of fuel consumption does not change at "- - - l / 100 km (km/l, MPG)"	Vehicle is not running (instantaneous fuel consumption mode)	—
	Fuel consumption was reset (average fuel consumption mode, if equipped)	*Vehicle runs for a while.*
	Vehicle speed signal faulty	*Check VSS or vehicle speed signal referring to "VSS Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	ECM faulty	*Check input and output signal of ECM.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Clock Symptom Diagnosis (If Equipped)

S7N20A9304017

Condition	Possible cause	Correction / Reference Item
No displaying of clock	Circuit fuse Blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Clock unit faulty	*Replace unit.*

Audio System Symptom Diagnosis (If Equipped)

S7N20A9304018

Radio

NOTE

Electronic part / system with undiagnosed problem may cause electromagnetic interference. Electromagnetic interference condition may have poor radio reception. To test for presence of electromagnetic interference in part / system, perform the following procedures.

1. **Turn ignition switch to OFF.**
2. **Systematically disconnect the electronic part / system connector(s) one at a time.**
3. **Turn ignition switch to ON.**
4. **Check any improvement in radio reception.**

Condition	Possible cause	Correction / Reference Item
Poor radio reception	Out of service area (Poor location)	—
	Antenna faulty	*Replace antenna.*
	Electrical part / system faulty	*Repair or replace electrical part / system referring to after-mentioned NOTE.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio does not operate and speaker does not sound	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio does not operate, but speaker sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Radio is operative, but all speakers does not sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*
Sound quality is poor	Out of service area (Poor location)	—
	Speaker installed incorrectly	*Install correctly.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*

CD Player

Condition	Possible cause	Correction / Reference Item
CD-ROM does not insert	Another CD-ROM already inserted	*Eject CD-ROM.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Extraneous material come to be mixed CD player	*Clear extraneous material from CD player or replace radio assembly.*
	Radio assembly faulty	*Replace radio assembly.*
CD-ROM does not eject	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Extraneous material come to be mixed in CD player	*Clear extraneous material from CD player or replace radio assembly.*
	Radio assembly faulty	*Replace radio assembly.*
CD player does not load CD-ROM	CD-ROM faulty	—
	CD-ROM inserted with incorrect side up	*Insert correctly.*
	Temperature in cabin is too hot	—
	Water droplets form on internal lens	*Dry about 1 hour with power on.*
	Radio assembly faulty	*Replace radio assembly.*
Sound skips or is noisy	CD-ROM faulty	—
	Driving vibration	—
	Water droplets form on internal lens	*Dry about 1 hour with power on.*
	Radio assembly installed incorrectly	*Install correctly.*
	Radio assembly faulty	*Replace radio assembly.*
CD player is operative, but all speakers does not sound	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*
Individual speaker is noisy or inoperative	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker faulty	*Replace speaker.*
	Radio assembly faulty	*Replace radio assembly.*
Sound quality or volume is poor	CD-ROM faulty	—
	Wiring and/or grounding faulty	*Repair as necessary.*
	Speaker installed incorrectly	*Install correctly.*
	Speaker faulty	*Replace speaker.*

Auto Volume Control System

Condition	Possible cause	Correction / Reference Item
Sound volume does not vary according to changes of vehicle speed	Auto volume control system is “OFF” mode	*Select auto volume control.*
	Vehicle speed signal faulty	*Check vehicle speed signal referring to “Vehicle Speed Signal Inspection (For Audio Unit) (If Equipped)”.*
	Wiring or grounding faulty	*Repair circuit.*
	ECM faulty	*Check input and output signal of ECM.*
	Radio assembly faulty	*Replace radio assembly.*

Remote Audio Control Switch Symptom Diagnosis (If Equipped)

S7N20A9304019

Condition	Possible cause	Correction / Reference Item
Audio system is operative, but remote control switch does not control audio system	Remote audio control switch faulty	*Check remote audio control switch referring to “Remote Audio Control Switch Inspection”.*
	Contact coil faulty	*Replace contact coil.*
	Wiring and/or grounding faulty	*Repair as necessary.*
	Radio assembly faulty	*Replace radio assembly.*

Navigation Symptom Diagnosis (If Equipped)

S7N20A9304020

Condition	Possible cause	Correction / Reference Item
No displaying of navigation	Circuit fuse Blown	*Replace fuse and check for short circuit.*
	Wiring and/or grounding faulty	*Repair circuit.*
	Navigation unit faulty	*Replace unit.*

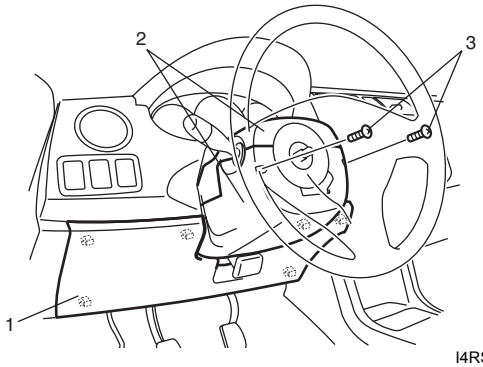
Repair Instructions

Ignition Switch Removal and Installation

S7N20A9306001

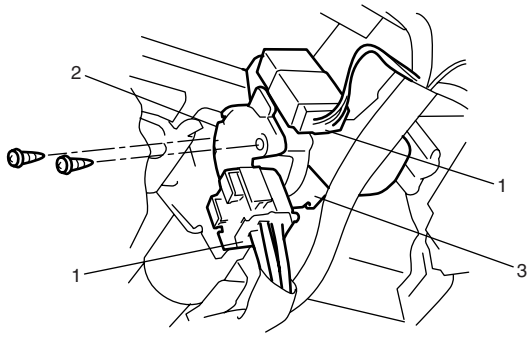
Removal

1) Disconnect negative cable at battery.
2) Confirm that ignition key is removed.
3) Remove steering column hole cover (1).
4) Turn steering wheel to remove steering column cover screws (3) and then remove steering column covers (2).



I4RS0B920004-02

5) Disconnect couplers (1) from ignition switch (2).
6) Remove ignition switch (2) from key cylinder (3).



I4RS0A930008-01

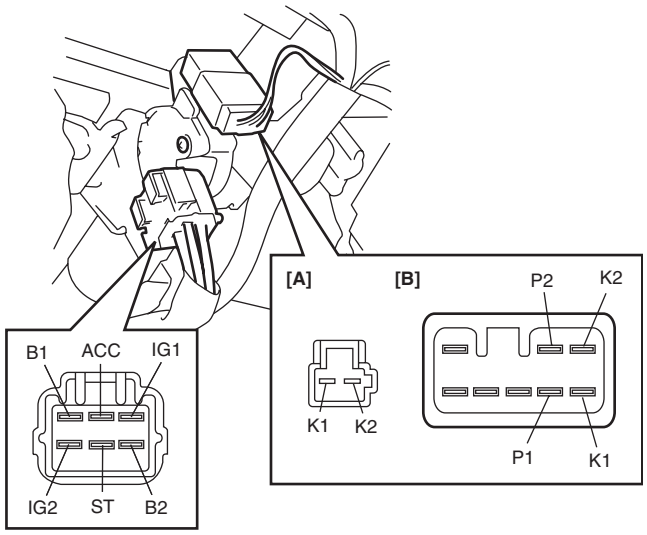
Installation

Reverse removal procedure.

Ignition Switch Inspection

S7N20A9306002

- Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Position \ Terminal	B1	B2	ACC	IG1	IG2	ST	K1	K2
OFF	○							
LOCK	○							
ACC	○		○					
ON	○		○	○			○	○
		○			○			
START	○		○			○		
		○						

Ignition knob switch \ Terminal	P1	P2
OFF (ignition knob switch released)		
ON (ignition knob switch pushed)	○	○

I4RS0B930004-02

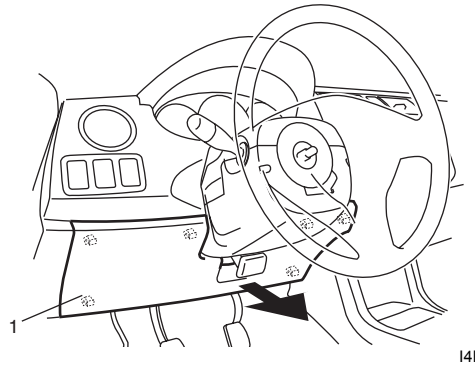
[A]: Without keyless start system
[B]: With keyless start system

Combination Meter Removal and Installation

S7N20A9306003

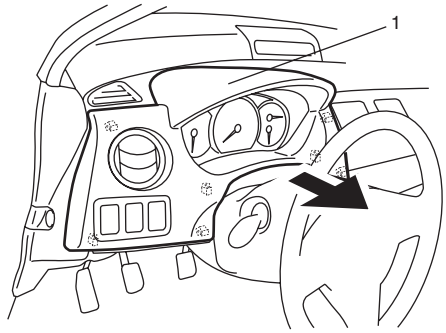
Removal

1) Disconnect negative (–) cable at battery.
2) Remove column hole cover (1) pulling it in arrow direction shown in figure.



I4RS0B930005-02

3) Remove combination meter cluster panel (1) pulling it in arrow direction shown in figure.



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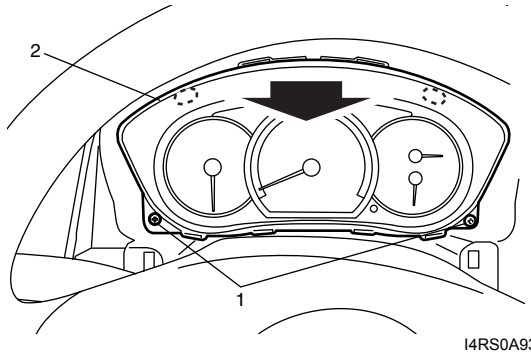
4) Remove screws (1) fastening combination meter.
5) Remove combination meter (2) pulling it arrow direction as shown.



I4RS0A930012-02

Installation

Reverse removal procedure.

Fuel Level Sensor Removal and Installation

S7N20A9306004

Removal

Remove fuel pump assembly referring to “Fuel Pump Assembly Removal and Installation: M13A / M15A / M16A in Section 1G” or “Fuel Pump Assembly Removal and Installation: D13A / Z13DTJ in Section 1G”.

Installation

Install fuel pump assembly referring to “Fuel Pump Assembly Removal and Installation: M13A / M15A / M16A in Section 1G” or “Fuel Pump Assembly Removal and Installation: D13A / Z13DTJ in Section 1G”.

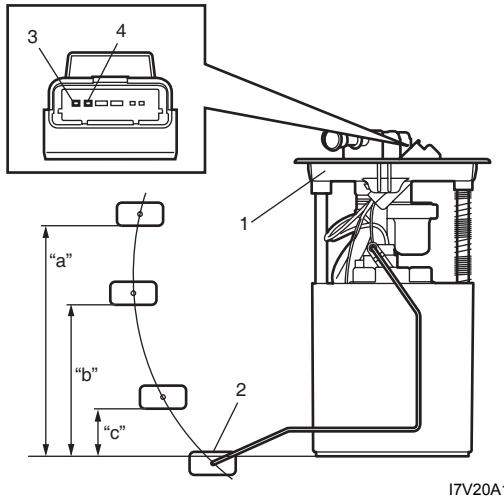
Fuel Level Sensor Inspection

S7N20A9306005

Check resistance between terminals “3” and “4” at each float position in the following.
If resistance is out of specification, replace fuel pump.

Fuel level sensor specifications

Float position		Resistance (Ω)
“a”	162.0 mm (6.378 in.)	74.6 – 80.6
“b”	108.1 mm (4.256 in.)	157 – 163
“c”	40.9 mm (1.62 in.)	260 – 268



I7V20A172026-02

1. Fuel pump	2. Float

Oil Pressure Switch Removal and Installation

S7N20A9306006

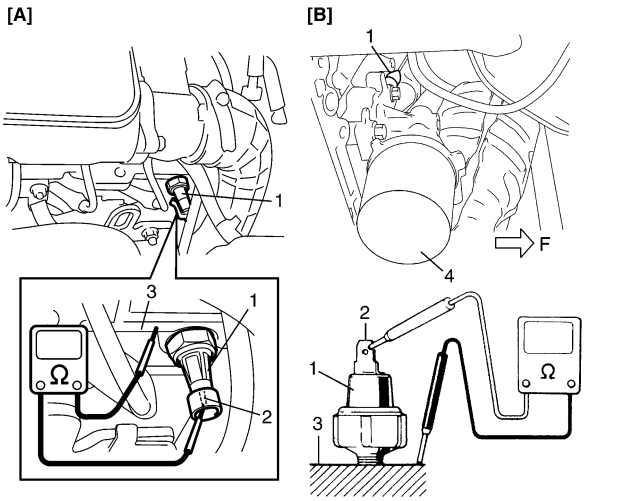
For removal and installation, refer to “Oil Pressure Check: M13A / M15A / M16A in Section 1E” or “Oil Pressure Switch Removal and Installation: D13A / Z13DTJ in Section 1E”.

Oil Pressure Switch Inspection

S7N20A9306007

1) Disconnect oil pressure switch (1) lead wire.
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 (1).

Oil pressure sensor specification
During engine running: No continuity
At engine stop: Continuity



I6RS0B930003-01

[A]: Diesel engine	4. Engine oil filter
[B]: Petrol engine	F: Front

VSS Removal and Installation

S7N20A9306008

For removal and installation, refer to “Output Shaft Speed Sensor (VSS) Removal and Installation in Section 5D” (Automated Manual Transaxle model), “Front Wheel Speed Sensor Removal and Installation in Section 4E” (Other than Automated Manual Transaxle model).

VSS Inspection

S7N20A9306009

Refer to “Vehicle Speed Sensor (VSS) Inspection (If Equipped): M13A / M15A / M16A in Section 1C” (Automated Manual Transaxle model), “Front Wheel Speed Sensor On-Vehicle Inspection in Section 4E” (other than Automated Manual Transaxle model and without ESP® model) or “Front / Rear Wheel Speed Sensor On-Vehicle Inspection in Section 4F” (with ESP® model).

Engine Coolant Temperature (ECT) Sensor Inspection

S7N20A9306010

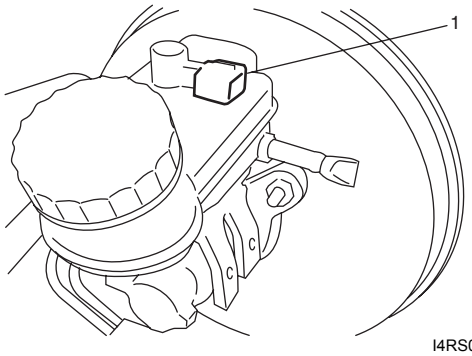
Check engine coolant temperature sensor for resistance, refer to “Engine Coolant Temperature (ECT) Sensor Inspection: M13A / M15A / M16A in Section 1C” or “Engine Coolant Temperature (ECT) Sensor Inspection: D13A / Z13DTJ in Section 1C”.

Brake Fluid Level Switch Inspection

S7N20A9306011

Check for continuity between terminals of brake fluid level switch coupler (1). If found defective, replace switch.

Brake fluid level switch specification
OFF position (float up): No continuity
ON position (float down): Continuity



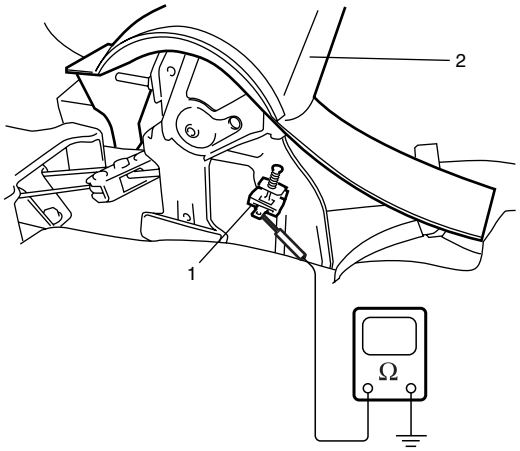
I4RS0B930007-01

Parking Brake Switch Inspection

S7N20A9306012

Check for continuity between parking brake switch terminal and body ground as shown in figure. If found defective, replace switch.

Parking brake switch specification
OFF position (parking brake released): No continuity
ON position (parking brake lever pulled up): Continuity



I4RS0A930014-01

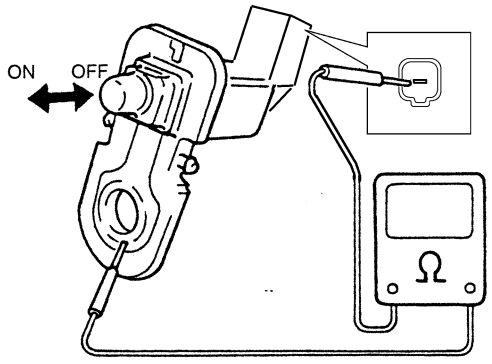
1. Parking brake switch	
2. Parking brake lever	

Door Switch (Front / Rear Door) Inspection

S7N20A9306013

Remove door switch from body and check switch for continuity. If found defective, replace switch.

Door switch (front / rear door) specification
OFF position (Door closed): No continuity
ON position (Door open): Continuity



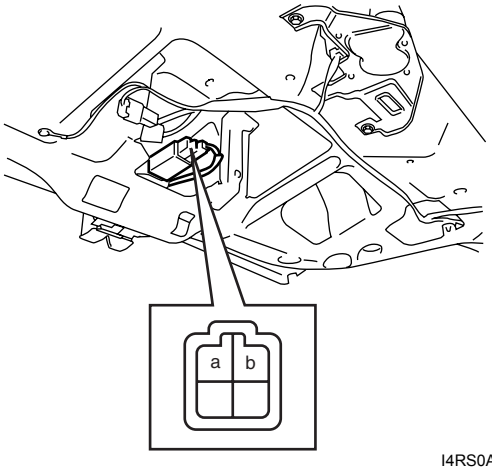
I3RH0A930004-01

Rear End Door Switch Inspection

S7N20A9306014

Check for continuity between terminal “a” and “b” shown in the following.
If check result is not as specified, replace switch.

Rear end door switch specification
Rear end door closed: No continuity
Rear end door opened: Continuity



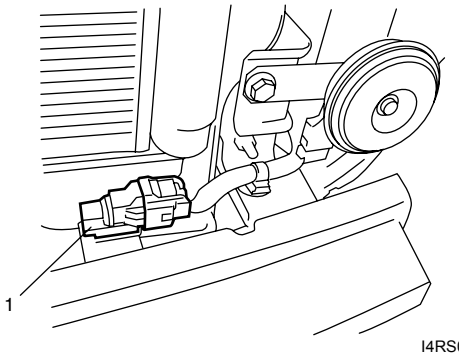
I4RS0A930015-01

Outside Air Temperature Sensor Removal and Installation (If Equipped)

S7N20A9306015

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Disconnect connector from outside air temperature sensor.
4) Remove outside air temperature sensor (1) from front bumper member.



I4RS0A930016-01

Installation

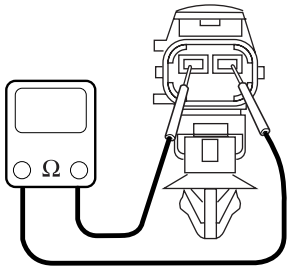
Reverse removal procedure for installation.

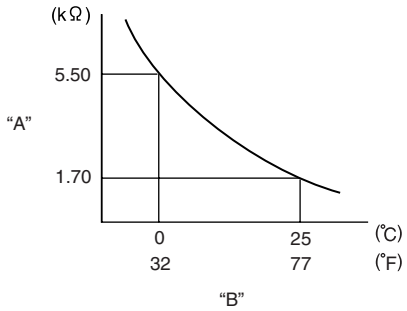
Outside Air Temperature Sensor Inspection (If Equipped)

S7N20A9306016

Measure resistance of outside air temperature sensor using an ohmmeter.
If resistance is out of specification, replace outside air temperature sensor.

Outside air temperature sensor resistance
1.62 kΩ – 1.78 kΩ at 25 °C (77 °F)





I4RS0A930017-01

“A”:	Resistance
“B”:	Temperature

Instrument Panel Removal and Installation

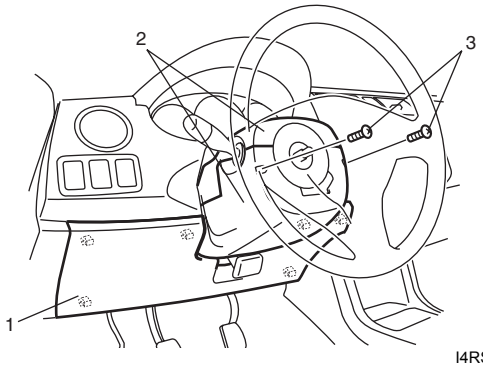
S7N20A9306017

⚠ WARNING

Refer to "Air Bag Warning in Section 00" before starting service work.

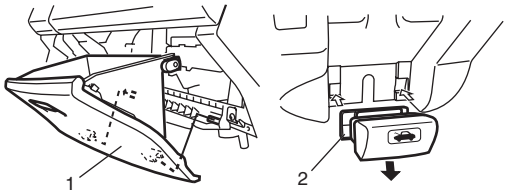
Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System in Section 8B".
3) Remove steering column hole cover (1).
4) Turn steering wheel to remove steering column cover screws (3).
5) Remove steering column covers (2).



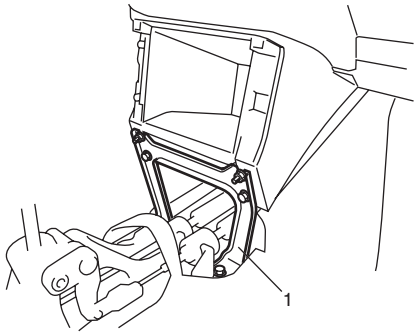
I4RS0B920004-02

6) Remove glove box (1).
7) Remove hood latch release lever (2).



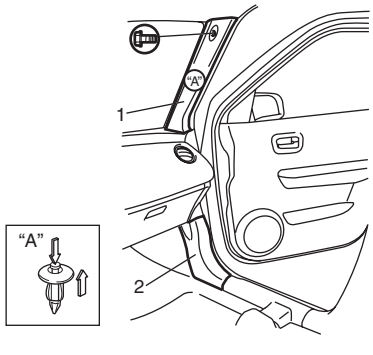
I4RS0B930008-01

8) Remove console box referring to "Console Box Components in Section 9H".
9) Remove instrument panel center lower bracket (1).



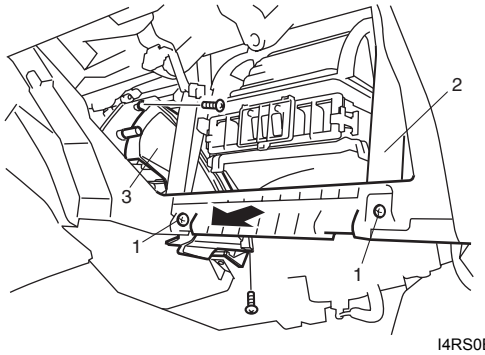
I4RS0B930009-01

10) Remove front pillar trims (1) and dash side trims (2).



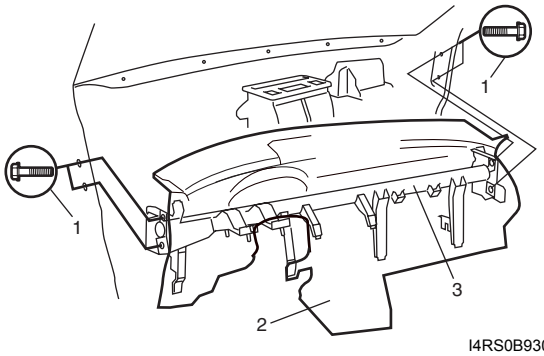
I4RS0B930010-01

11) Remove instrument panel mounting screws (1).
12) Detach instrument panel from steering support member (2) and then remove foot duct (3).



I4RS0B930011-01

13) Disconnect instrument panel harness connectors, heater control cables and antenna cable instrument panel removal.
14) Remove steering column mounting nuts referring to "Steering Column Removal and Installation in Section 6B".
15) Remove instrument panel ground wire.
16) Remove instrument panel mounting bolts (1).
17) Remove instrument panel (2) with steering support member (3) and instrument panel harness.

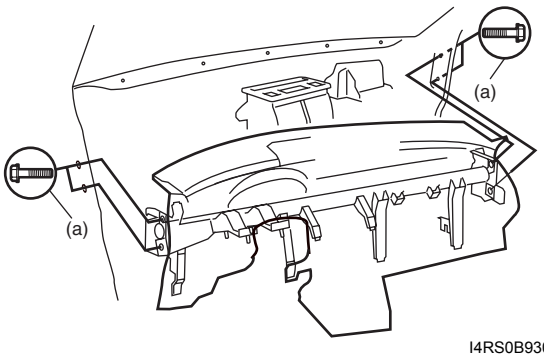


I4RS0B930012-01

Installation
Reverse removal procedure noting the following.

- When installing each part, be careful not to catch any cable or wiring harness.
- Tighten instrument panel mounting bolts to specified torque

  Tightening torque
  Instrument panel mounting bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I4RS0B930013-01

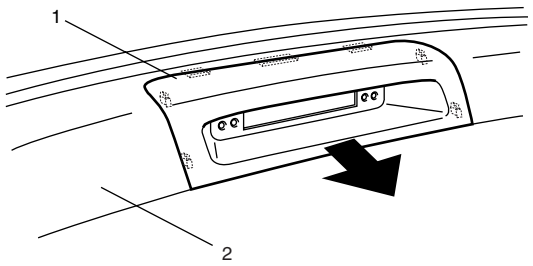
- Tighten steering column mounting nuts referring to "Steering Column Removal and Installation in Section 6B".
- Enable air bag system referring to "Enabling Air Bag System in Section 8B".

Information Display (Clock) Removal and Installation

S7N20A9306018

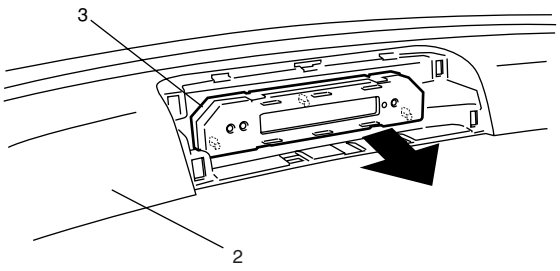
Removal

1) Remove information display (clock) garnish (1) from instrument panel (2) pulling it arrow direction as shown.



I4RS0A930032-01

2) Remove information display (clock) (3) from instrument panel (2) pulling it in arrow direction shown in figure.
3) Disconnect information display (clock) coupler.



I4RS0A930025-01

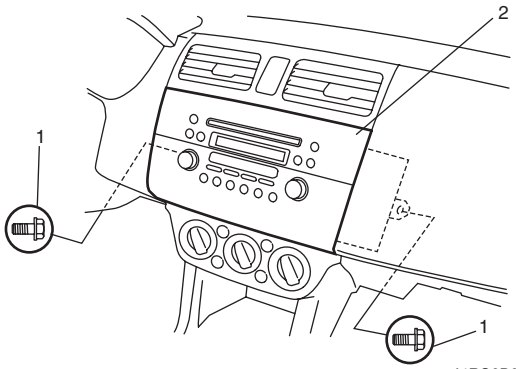
Installation
Reverse removal procedure.

Audio Unit Removal and Installation

S7N20A9306019

Removal

1) Disconnect negative (–) cable at battery.
2) Remove globe box referring to "Instrument Panel Removal and Installation".
3) Remove 2 mounting bolts (1).
4) Disconnect electrical connectors from audio unit.
5) Remove audio unit (2) from instrument panel.



I4RS0B930014-01

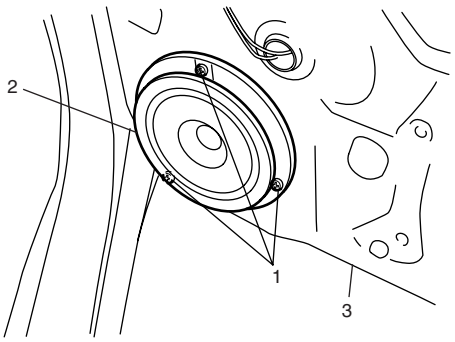
Installation
Reverse removal procedure.

Front Speaker Removal and Installation

S7N20A9306020

Removal

1) Remove door trim referring to Step 1) to 3) of "Front Door Glass Removal and Installation in Section 9E".
2) Remove 3 front speaker mounting screws (1).
3) Remove front speaker (2) from front door (3).
4) Disconnect front speaker coupler from front speaker (2).



I4RS0A930027-01

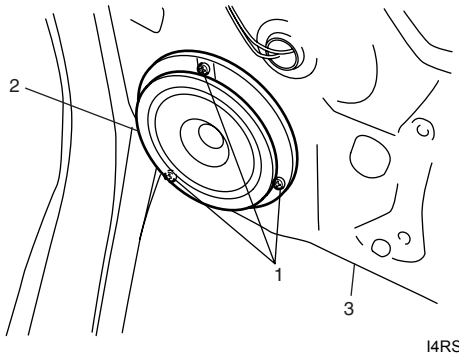
Installation
Reverse removal procedure.

Rear Speaker Removal and Installation (5 Door Model)

S7N20A9306021

Removal

1) Remove door trim referring to Step 1) to 4) of “Rear Door Glass Removal and Installation in Section 9E”.
2) Remove 3 rear speaker mounting screws (1).
3) Remove rear speaker (2) from rear door (3).
4) Disconnect rear speaker coupler from rear speaker (2).



I4RS0A930027-01

Installation

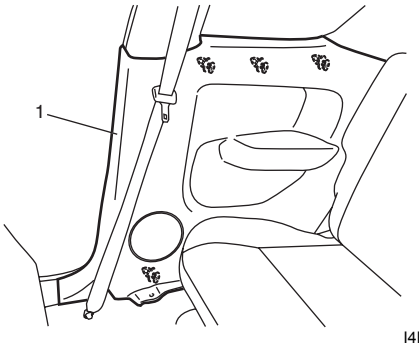
Reverse removal procedure.

Rear Speaker Removal and Installation (3 Door Model)

S7N20A9306022

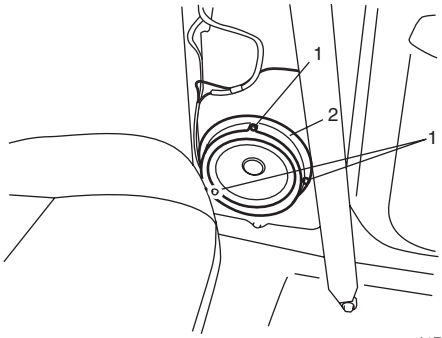
Removal

1) Remove quarter lower trim (1).



I4RS0B930015-01

2) Remove 3 rear speaker mounting screws (1) and rear speaker (2) from quarter panel.
3) Disconnect rear speaker coupler from rear speaker (2).



I4RS0B930016-01

Installation

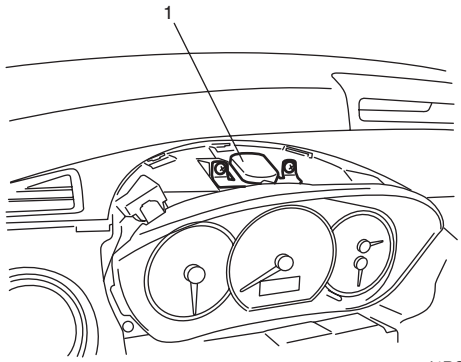
Reverse removal procedure.

GPS Antenna Removal and Installation (If Equipped)

S7N20A9306023

Removal

1) Remove combination meter cluster panel referring to step 1) to 3) of “Combination Meter Removal and Installation”.
2) Disconnect GPS antenna connector from navigation unit referring to “Audio Unit Removal and Installation”.
3) Remove GPS antenna (1).



I4RS0B930017-01

Installation

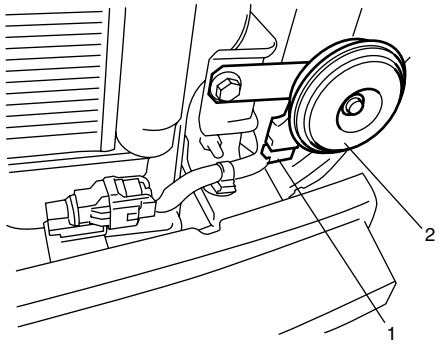
Reverse removal procedure.

Horn Removal and Installation

S7N20A9306024

Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Disconnect horn connector (1).
4) Remove horn (2).



I4RS0A930028-01

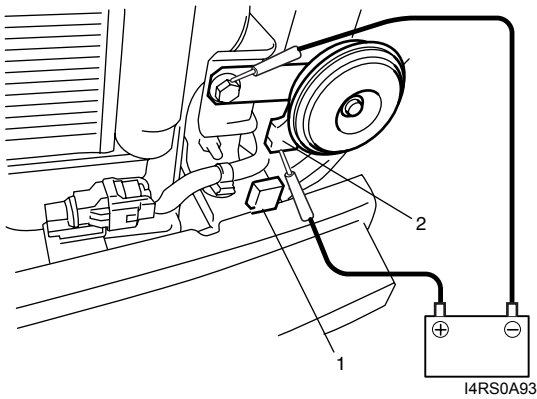
Installation

Reverse removal procedure for installation.

Horn Inspection

S7N20A9306025

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Disconnect horn connector (1).
4) Connect battery positive (+) to terminal of horn connector (2) and negative (–) terminal to body ground.
   If horn is not sounding, replace horn.

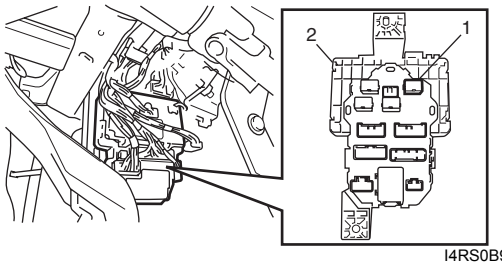


I4RS0A930030-01

Horn Relay Inspection

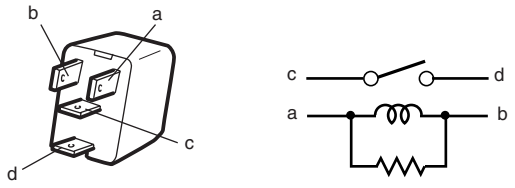
S7N20A9306026

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B”.
3) Remove horn relay (1) from junction block assembly (2).



I4RS0B930018-01

4) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
5) Check that there is continuity between terminals “c” and “d” when a 12 V battery is connected to terminals “a” and “b”. If malfunction is found, replace it with a new one.



I3JA01920006-01

Antenna Base Removal and Installation

S7N20A9306027

Removal

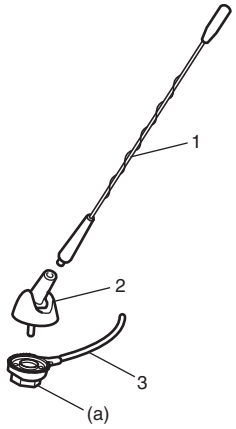
1) Remove dome light.
2) Remove antenna (1) from antenna base (2).
3) Disconnect antenna feeder (3) from antenna base (2).
4) Remove antenna base (2) from vehicle.

Installation

Reverse removal procedure noting the following.

- Tighten antenna base mounting nut to specified torque.

  Tightening torque
  Antenna base mounting nut (a): 3.0 N·m (0.3 kgf-m, 2.20 lbf-ft)



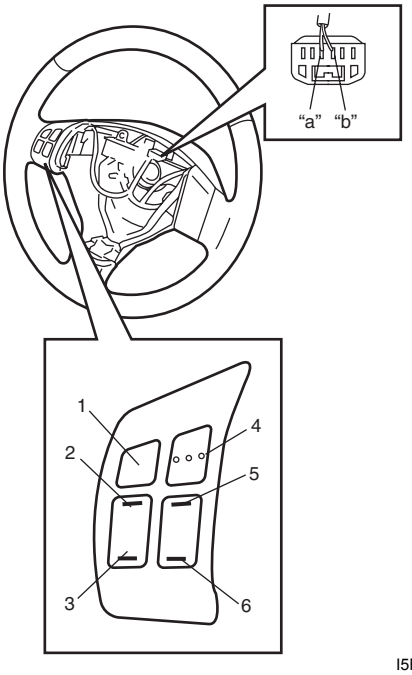
I4RS0B930019-01

Remote Audio Control Switch Inspection

S7N20A9306028

1) Remove driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module Removal and Installation in Section 8B".
2) Disconnect remote audio control switch connector from contact coil.
3) Check switch for resistance between "a" and "b" 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): 5119 – 5223 Ω
Switch "1" pushing on (ON): 55 – 57 Ω
Switch "2" pushing on (ON): 129 – 133 Ω
Switch "3" pushing on (ON): 238 – 244 Ω
Switch "4" pushing on (ON): 416 – 426 Ω
Switch "5" pushing on (ON): 743 – 759 Ω
Switch "6" pushing on (ON): 1555 – 1587 Ω



I5RW0A930027-01

Vehicle Speed Signal Inspection (For Audio Unit) (If Equipped)

S7N20A9306029

Petrol Model
Check vehicle speed pulse output signal of ECM referring to "Reference waveform No.8" under "Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A".

Diesel Model
Check vehicle speed pulse output signal of BCM referring to "Reference waveform No.9" under "Inspection of BCM and its Circuits in Section 10B".

Specifications

Tightening Torque Specifications

S7N20A9307001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Instrument panel mounting bolt	23	2.3	17.0	☞
Antenna base mounting nut	3.0	0.3	2.20	☞

NOTE

The specified tightening torque is also described in the following.
"Audio System Component Location: "

Reference:
For the tightening torque of fastener not specified in this section, refer to "Fasteners Information in Section 0A".

Wipers / Washers

Diagnostic Information and Procedures

Front Wiper and Washer Symptom Diagnosis

S7N20A9404001

Condition	Possible cause	Correction / Reference Item
Wiper malfunctions	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiper motor faulty	*Check wiper motor referring to "Windshield Wiper Motor Inspection".*
	Combination switch (wiper switch) faulty	*Check wiper switch referring to "Windshield Wiper and Washer Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
Washer malfunctions	Washer hose or nozzle clogged	*Clean or repair clogged hose or nozzle.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Washer motor faulty	*Check washer motor referring to "Washer Pump Inspection".*
	Combination switch (washer switch) faulty	*Check washer switch referring to "Windshield Wiper and Washer Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*

Rear Wiper and Washer Symptom Diagnosis (If Equipped)

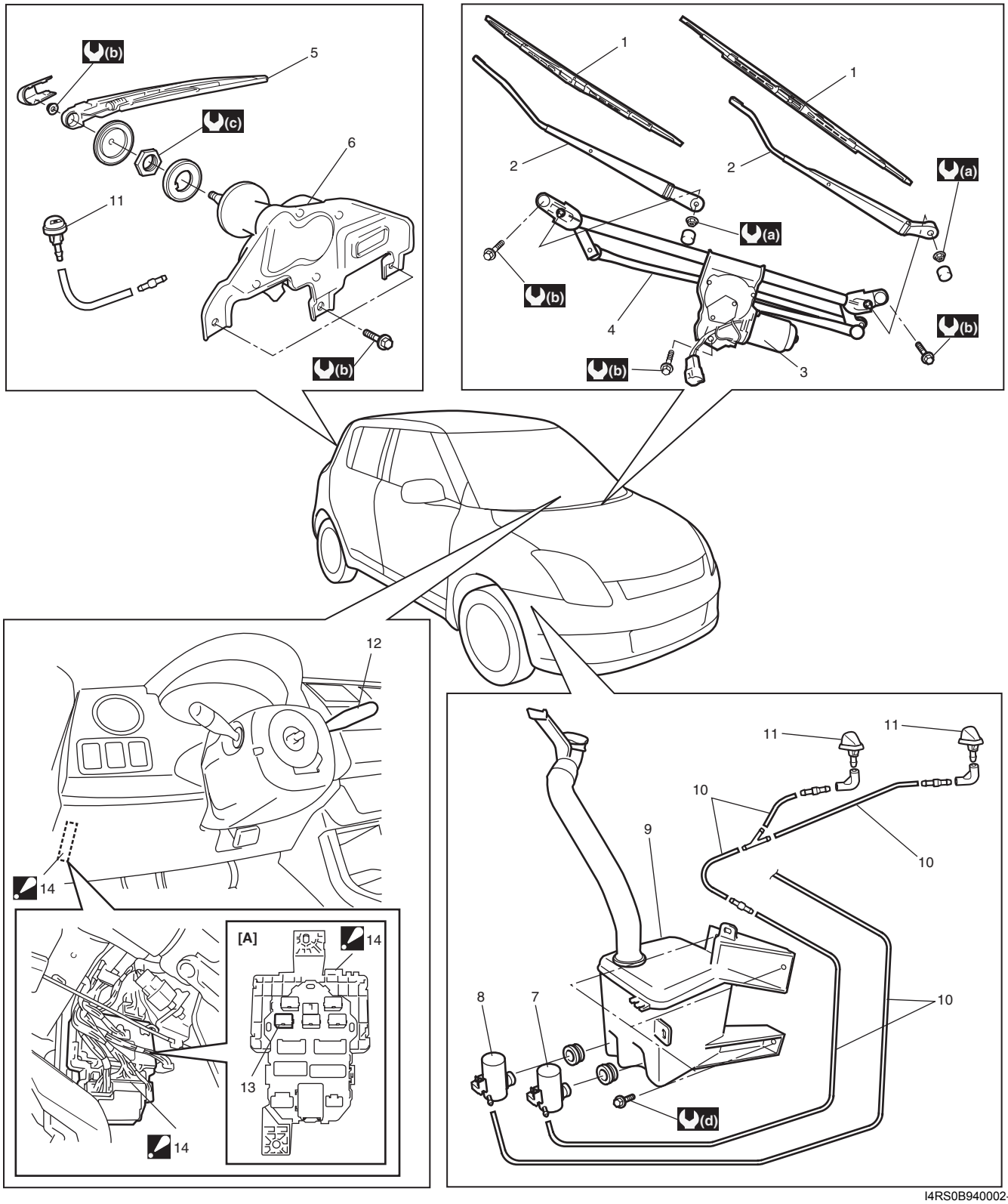
S7N20A9404002

Condition	Possible cause	Correction / Reference Item
Wiper malfunctions ***NOTE*** • ***Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".*** • ***Check each part in the order from the top of the following list.***	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiper motor faulty	*Check wiper motor referring to "Rear Wiper Motor Inspection (If Equipped)".*
	Combination switch (wiper switch) faulty	*Check wiper switch referring to "Rear Wiper and Washer Switch Inspection".*
	Rear wiper relay faulty	*Check rear wiper relay referring to "Rear Wiper Relay Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Washer malfunctions	Washer hose or nozzle clogged	*Clean or repair clogged hose or nozzle.*
	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Washer motor faulty	*Check washer motor referring to "Washer Pump Inspection".*
	Combination switch (washer switch) faulty	*Check washer switch referring to "Rear Wiper and Washer Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*

Repair Instructions

Wipers and Washers Components

S7N20A9406001



I4RS0B940002-03

1. Windshield wiper blade	8. Washer pump for rear washer (if equipped)	[A]: Junction block assembly viewed from relay side
2. Windshield wiper arm	9. Washer tank	(a) : 16 N·m (1.6 kgf-m, 11.5 lbf-ft)
3. Windshield wiper motor	10. Washer hose	(b) : 8 N·m (0.8 kgf-m, 6.0 lbf-ft)
4. Windshield wiper link	11. Washer nozzle	(c) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)
5. Rear wiper arm with blade assembly (if equipped)	12. Wiper switch	(d) : 4 N·m (0.4 kgf-m, 3.0 lbf-ft)

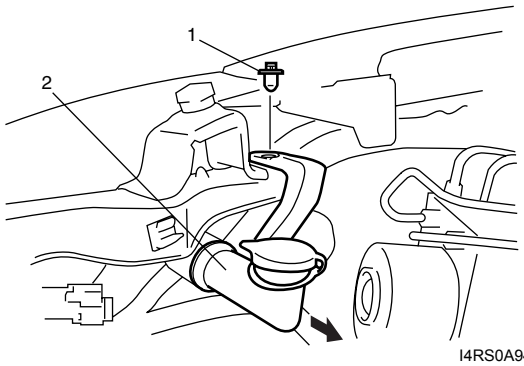
6. Rear wiper motor (if equipped)	13. Rear wiper relay (if equipped)	
7. Washer pump for windshield washer	14. Junction block assembly : BCM cannot be removed from junction block.	

Washer Tank and Washer Pump Removal and Installation

S7N20A9406002

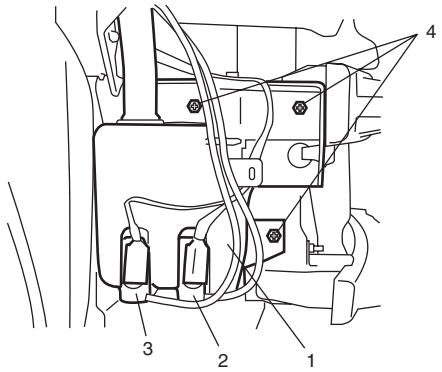
Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
3) Remove grommet (1) and upper part (2) of washer tank.



I4RS0A940002-01

4) Remove washer tank attaching bolts (4).
5) Disconnect washer pump lead wire couplers and hoses.
6) Remove washer tank (1).
7) Remove windshield washer pump (2) and rear washer pump (3) (if equipped) from washer tank (1).



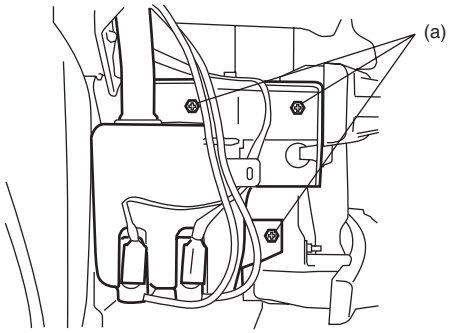
I4RS0B940014-01

Installation

Install washer tank and washer pump by reversing removal procedure, noting the following instructions.

- Connect washer pump connector(s) securely.
- Tighten washer tank bolts to specified torque.

Tightening torque
Washer tank bolt (a): 4 N·m (0.4 kgf-m, 3.0 lbf-ft)

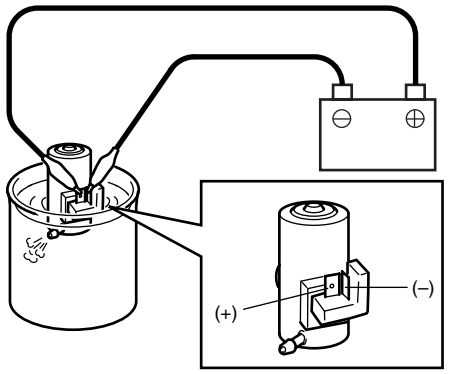


I4RS0B940015-01

Washer Pump Inspection

S7N20A9406003

1) Connect battery positive (+) and negative (–) terminals to pump (+) and (–) terminals respectively.
2) Check front and rear washer pumps for operation. If pump does not operate, replace washer pump.



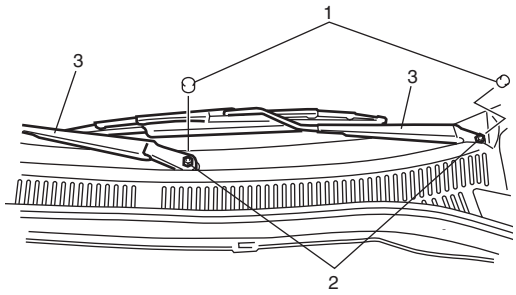
I4RS0A940005-01

Windshield Wiper Removal and Installation

S7N20A9406004

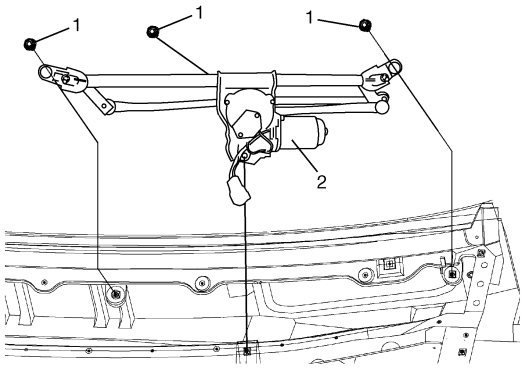
Removal

1) Disconnect negative (–) cable at battery.
2) Remove wiper pivot caps (1) and wiper arm nuts (2), and remove windshield wiper arms with wiper blades (3).



I4RS0B940003-03

3) Remove cowl top garnish referring to “Cowl Top Components in Section 9K”.
4) Disconnect coupler from windshield wiper motor.
5) Remove bolts (1), and remove windshield wiper assembly (2).

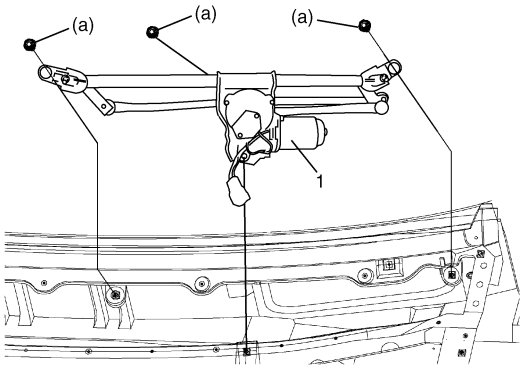


I4RS0B940016-01

Installation

1) Install windshield wiper assembly (1), and tighten bolts to specified torque.

Tightening torque
Windshield wiper bolt (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)

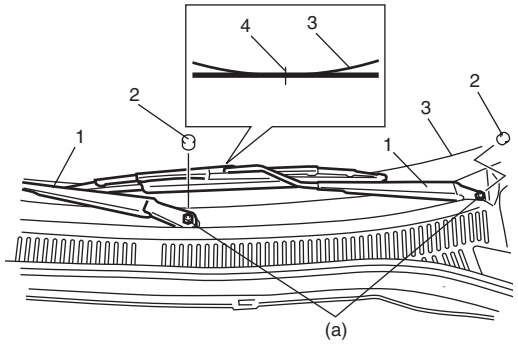


I4RS0B940017-01

2) Connect coupler to windshield wiper motor.
3) Install cowl top garnish referring to “Cowl Top Components in Section 9K”.
4) Install windshield wiper arms with wiper blades (1) to specified position as shown in figure, and then tighten windshield wiper nuts to specified torque.

Tightening torque
Windshield wiper arm nut (a): 16 N·m (1.6 kgf-m, 11.5 lbf-ft)

5) Install wiper pivot caps (2) to windshield wiper arm nuts



I4RS0B940004-03

3.	Ceramic line
4.	Wiper blade center

6) Connect negative (–) cable to battery.

Windshield Wiper Motor Inspection

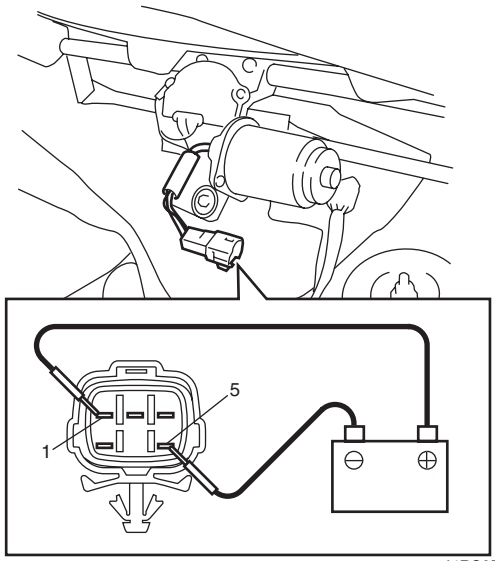
S7N20A9406005

NOTE

Make sure that battery voltage is 12 V or more.

1) Disconnect negative (–) cable at battery.
2) Remove windshield wiper arms with wiper blades referring to “Windshield Wiper Removal and Installation”.
3) Remove cowl top garnish referring to “Cowl Top Components in Section 9K”.
4) Disconnect coupler from windshield wiper motor.
5) Reinstall windshield wiper arms with wiper blade. For details, refer to Step 4) of “Installation” in “Windshield Wiper Removal and Installation”.
6) Check windshield wiper motor for operation as follows
   - For motor operation in low speed
     a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5”.
     b. Check if wiper arm reciprocation speed is as specification. If check result is not as specified, replace motor.

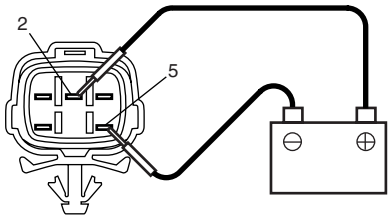
     Specification
     41 – 51 r/min (rpm)



I4RS0B940005-01

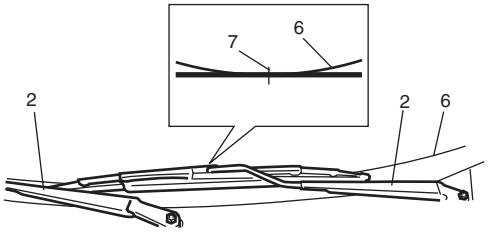
   - For motor operation in high speed
     a. Connect battery positive (+) terminal to “2” and its negative (–) terminal to terminal “5”.
     b. Check if motor revolution speed is as specification. If check result is not as specified, replace motor.

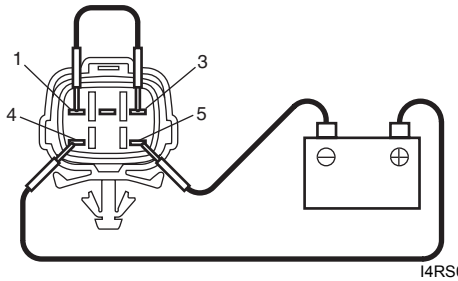
     Specification
     60 – 76 r/min (rpm)



I4RS0A940011-01

   - For automatic stop operation
     a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “5” and let the motor turn.
     b. Disconnect terminal “1” from battery positive (+) terminal, and let the motor stop.
     c. Connect terminals “1” and “3” with a jumper wire, and connect terminal “4” to battery positive (+) terminal.
     Observe the motor turns once again then stops at a specified position as shown.





I4RS0B940006-03

2.	Windshield wiper arms with wiper blades
6.	Ceramic line
7.	Wiper blade center

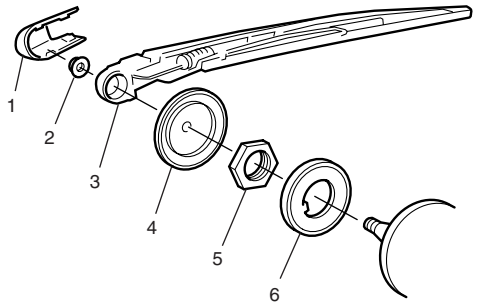
     d. Repeat Step 1) to 3) several times and check that the motor stops at the specified position every time.
     If check result is not satisfied, replace motor.

Rear Wiper Removal and Installation (If Equipped)

S7N20A9406006

Removal

1) Disconnect negative (–) cable at battery.
2) Remove arm cover (1), rear wiper arm nut (2), rear wiper arm with blade assembly (3), rear wiper pivot cap (4), rear wiper nut (5) and rear wiper seal (6).



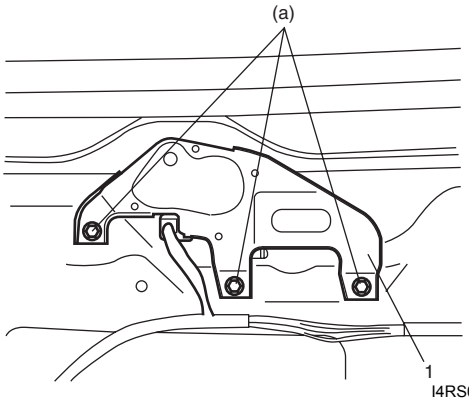
I4RS0A940013-01

3) Remove rear end door trim referring to “Rear End Door Lock Assembly Removal and Installation in Section 9F”.
4) Disconnect coupler from rear wiper motor.
5) Remove rear wiper motor.

Installation

1) Install rear wiper motor (1) and tighten rear wiper motor mounting bolts to specified torque.

Tightening torque
Rear wiper motor mounting bolt (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)

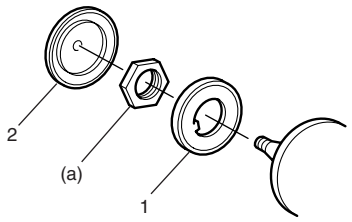


I4RS0B940018-01

2) Connect coupler to rear wiper motor
3) Install rear end door trim referring to “Rear End Door Lock Assembly Removal and Installation in Section 9F”.
4) Install rear wiper seal (1), and tighten rear wiper nut to specified torque.

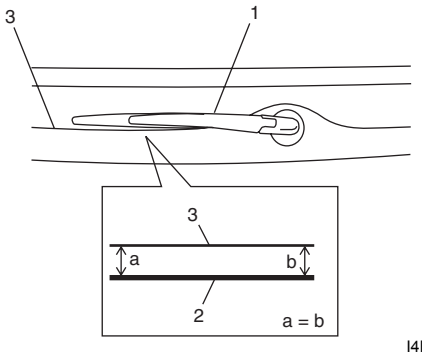
Tightening torque
Rear wiper nut (a): 5 N·m (0.5 kgf-m, 4.0 lbf-ft)

5) Install rear wiper pivot cap (2).



I4RS0A940015-01

6) Install rear wiper arm with blade assembly (1) to specified position as shown in figure.

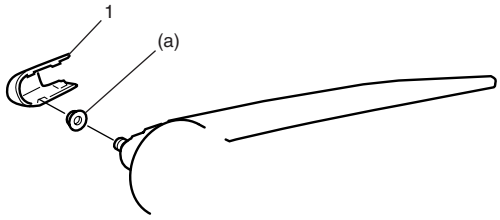


I4RS0B940019-01

2.	Rear wiper blade
3.	Ceramic line

7) Tighten rear wiper arm nut to specified torque, and then install arm cover (1).

Tightening torque
Rear wiper arm nut (a): 8 N·m (0.8 kgf-m, 6.0 lbf-ft)



I4RS0A940017-01

8) Connect negative (–) cable to battery.

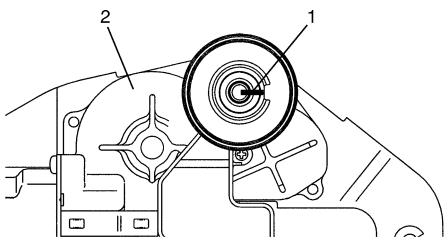
Rear Wiper Motor Inspection (If Equipped)

S7N20A9406007

NOTE

Make sure that battery voltage is 12 V or more.

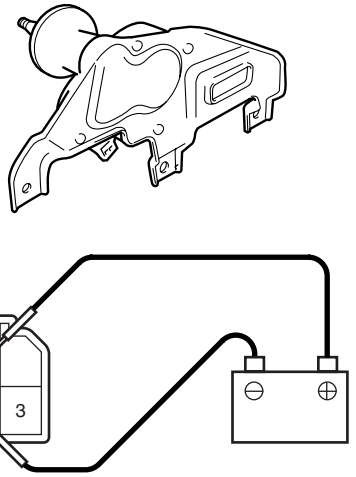
1) Make a mark (1) on rear wiper motor (2) stop position as shown.



I4RS0A940018-01

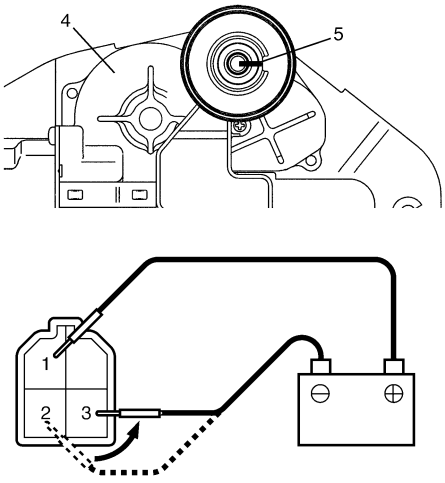
2) Check rear wiper motor for operation as follows.
   - For motor operation
     a. Connect battery positive terminal to terminal “1” and its negative terminal to terminal “2”.
     b. Check motor revolution speed as specification. If check result is not as specified, replace motor.

Specification
35 – 45 r/min (rpm)



I4RS0A940019-01

   - For automatic stop operation
     a. Connect battery positive (+) terminal to terminal “1” and its negative (–) terminal to terminal “2” and let the motor turn.
     b. Disconnect terminal “2” from battery negative (–) terminal and let the motor stop.
     c. Observe the motor (4) turns once again then stops at a specified position as shown.



I4RS0A940020-01

5. Mark

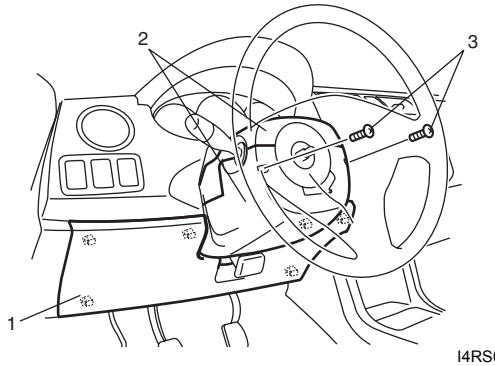
     d. Repeat Step a. to c. several times and check that the motor stops at the specified position every time.
     If check result is not satisfied, replace motor.

Windshield Wiper and Washer Switch Removal and Installation

S7N20A9406008

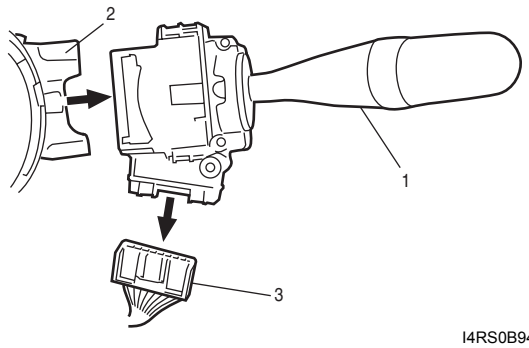
Removal

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover (1).
3) Remove steering column covers (2).
   Turn steering wheel to access steering column cover rear end screws (3).



I4RS0B940007-02

4) Remove windshield wiper and washer switch (1) from combination switch assembly (2) and disconnect its coupler (3).



I4RS0B940008-01

Installation

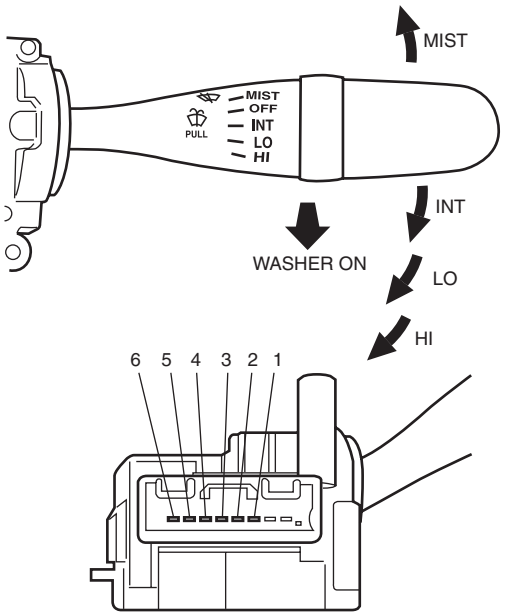
Reverse removal procedure.

Windshield Wiper and Washer Switch Inspection

S7N20A9406009

Windshield Wiper and Washer Switch

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



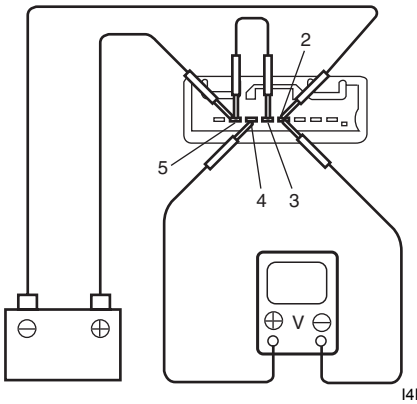
Terminal / Wiper SW	6	5	4	3
OFF			○	○
INT			○	○
LO		○	○	
HI	○	○		
MIST		○	○	

Terminal / Washer SW	1	2
ON	○	○
OFF		

I4RS0B940009-03

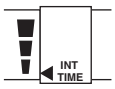
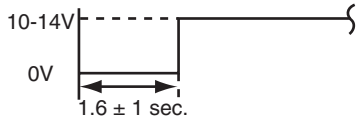
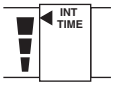
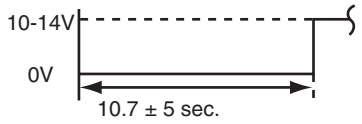
Intermittent Wiper Relay Circuit

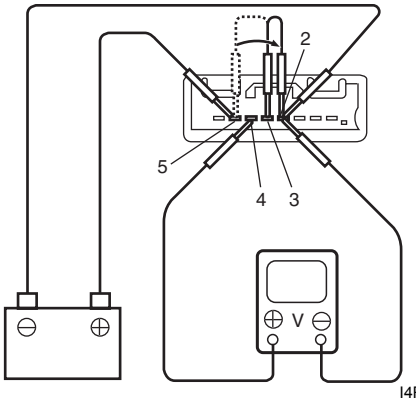
1) Turn the windshield wiper switch to “INT” position.
2) Connect battery positive (+) terminal to terminal “5” and its negative (–) terminal to terminal “2”.
3) Connect voltmeter positive lead to terminal “4” and its negative lead to terminal “2”.
4) Check that the voltmeter indicates the battery voltage (10 – 14 V).
5) Connect terminal “3” and terminal “5” by a jumper wire.



I4RS0B940010-01

6) Disconnect end of the jumper wire from terminal “5”.
7) Connect disconnected jumper wire end to terminal “2”, then check that voltage between terminal “4” and terminal “2” changes as shown.
If check result is not satisfied, replace switch.

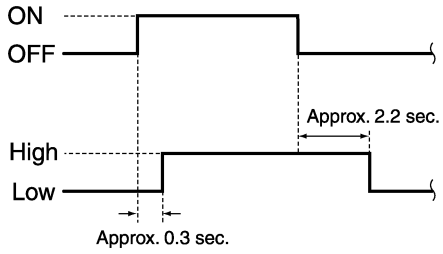
INT time control switch position	Voltage
	
	

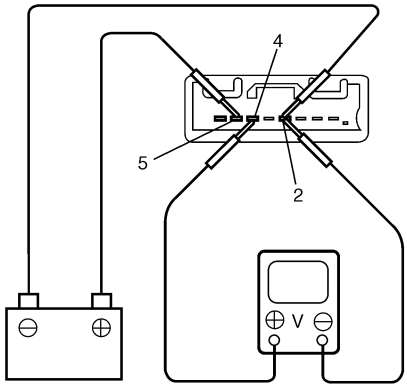


I4RS0B940011-01

Washer Linked Circuit

1) Make sure that front wiper switch is at “OFF” position.
2) Connect battery positive (+) terminal to terminal “5” and its negative (–) terminal to terminal “2”.
3) Connect voltmeter positive lead to terminal “4” and its negative lead to terminal “2”.
4) When front washer switch is ON, check that voltage changes as shown in figure.
   If check result is not satisfied, replace switch.





I4RS0B940012-01

Rear Wiper and Washer Switch Removal and Installation

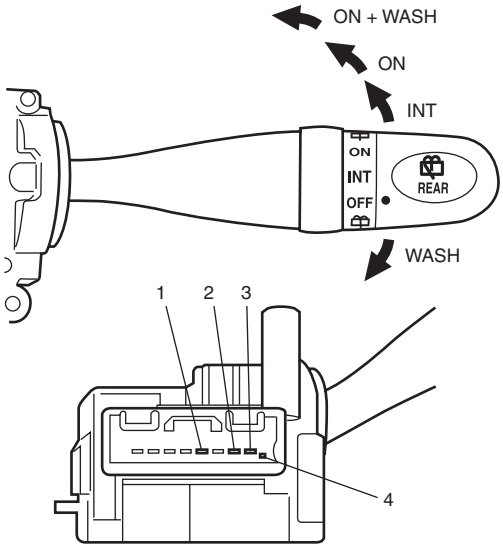
S7N20A9406010

For removal and installation, refer to “Windshield Wiper and Washer Switch Removal and Installation”.

Rear Wiper and Washer Switch Inspection

S7N20A9406011

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Position \ Terminal	1	2	3	4
OFF				
INT	○			○
ON	○		○	
ON + WASH	○	○	○	
WASH	○	○		

I4RS0B940013-03

Rear Wiper Relay Removal and Installation

S7N20A9406012

Removal

1) Disconnect negative (–) cable at battery.
2) Remove junction block assembly referring to “BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B”.
3) Remove rear wiper relay.

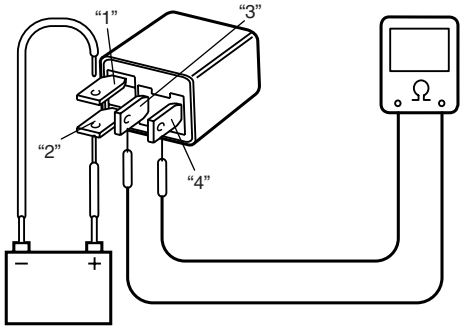
Installation

Reverse removal procedure for installation.

Rear Wiper Relay Inspection

S7N20A9406013

1) Check that there is no continuity between terminal “3” and “4”. If there is continuity, replace relay.
2) Connect battery positive (+) terminal to terminal “2” of relay.
3) Connect battery negative (–) terminal to terminal “1” of relay.
4) Check continuity between terminal “3” and “4”. If there is no continuity when relay is connected to the battery, replace relay.



I4RS0A940028-01

Specifications

Tightening Torque Specifications

S7N20A9407001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Washer tank bolt	4	0.4	3.0	☞
Windshield wiper bolt	8	0.8	6.0	☞
Windshield wiper arm nut	16	1.6	11.5	☞
Rear wiper motor mounting bolt	8	0.8	6.0	☞
Rear wiper nut	5	0.5	4.0	☞
Rear wiper arm nut	8	0.8	6.0	☞

NOTE

The specified tightening torque is also described in the following.
“Wipers and Washers Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Glass / Windows / Mirrors

General Description

Rear End Door Window Defogger System Description

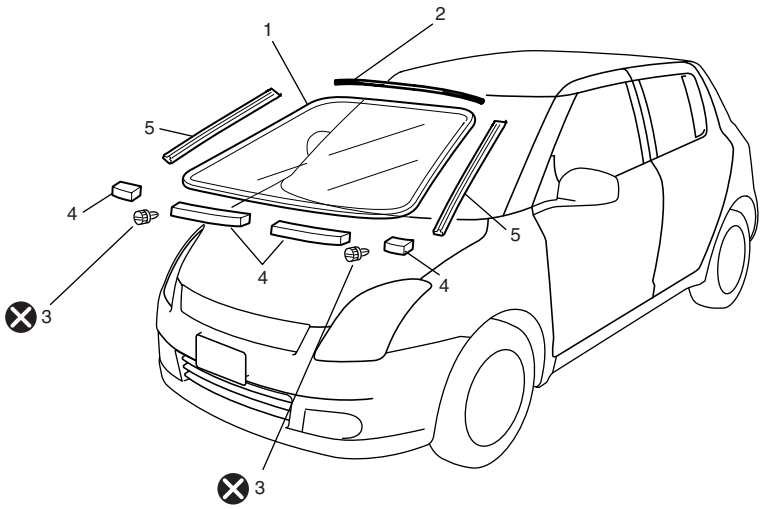
S7N20A9501001

The rear end door window defogger is controlled by BCM. For the BCM description refer to “BCM General Description in Section 10B”.

Windshield Construction

S7N20A9501002

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For the windshield replacement, it is important to use an adhesive which provides sufficient adhesion strength and follow the proper procedure.



I4RS0A950001-01

1. Windshield glass	3. Windshield glass stopper	5. Windshield side garnish
2. Windshield molding	4. Spacer	⊗ : Do not reuse.

⚠ CAUTION

- **Described is the glass replacement by using 3 types of primers and 1 type of adhesive made by YOKOHAMA (one component urethane adhesive to be used with primer in combination). When using primer and adhesive made by other manufacturers, be sure to refer to handling instructions supplied with them. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**
- **Should coated surface be scratched or otherwise damaged, be sure to repair damaged part, or corrosion may start from there.**

Use the specific adhesive which has the following property.

Glass adhesive shearing strength
40 kg/cm^2 (569 lb/in^2) or more

Adhesive materials and tools required for removal and installation.

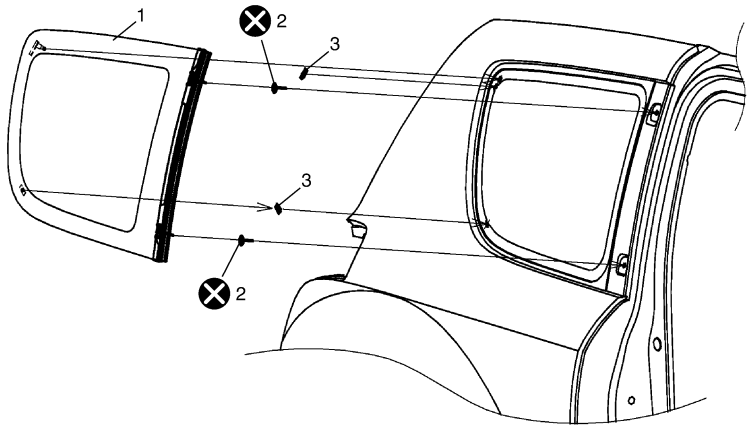
- One component urethane adhesive and primers used in combination (For one sheet of windshield).
  - Adhesive (470 g (15.7 oz.))
  - Primer for glass (30 g (1.0 oz.))
  - Primer for body (30 g (1.0 oz.))
  - Primer for molding (30 g (1.0 oz.))

- Eyeleteer
- Piano string
- Windshield knife
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

Rear Quarter Window Construction

S7N20A9501003

The rear quarter window is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For the rear quarter window replacement, it is important to use an adhesive which provides sufficient adhesion strength and follow the proper procedure.



I4RS0B950001-01

1. Rear quarter window glass	3. Fastener
2. Rear quarter window glass clip	⊗ : Do not reuse.

⚠ CAUTION

- **Described is the glass replacement by using 3 types of primers and 1 type of adhesive made by YOKOHAMA (one component urethane adhesive to be used with primer in combination). When using primer and adhesive made by other manufacturers, be sure to refer to handling instructions supplied with them. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**
- **Should coated surface be scratched or otherwise damaged, be sure to repair damaged part, or corrosion may start from there.**

Use the specific adhesive which has the following property.

Glass adhesive shearing strength
40 kg/cm^2 (569 lb/in^2) or more

Adhesive materials and tools required for removal and installation.

- One component urethane adhesive and primers used in combination (For one sheet of rear quarter window).
  - Adhesive (470 g (15.7 oz.))
  - Primer for glass (30 g (1.0 oz.))
  - Primer for body (30 g (1.0 oz.))
  - Primer for molding (30 g (1.0 oz.))

- Eyeleteer
- Piano string
- Windshield knife
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

Diagnostic Information and Procedures

Rear End door Window Defogger Symptom Diagnosis

S7N20A9504001

NOTE

- **Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Rear end door window defogger does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door window defogger switch faulty	*Check rear end door window defogger switch referring to "Rear End Door Window Defogger Switch Inspection".*
	Rear end door window defogger relay faulty	*Check rear end door window defogger relay referring to "Rear End Door Window Defogger Relay Inspection".*
	Defogger wire faulty	*Check defogger wire referring to "Rear End Door Window Defogger Wire Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Power Window Control System Symptom Diagnosis

S7N20A9504002

Condition	Possible cause	Correction / Reference Item
All power windows do not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power window main switch faulty	*Check power window main switch referring to "Power Window Main Switch Inspection".*
	Ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
Only one power window does not operate	Power window main switch faulty	*Check power window main switch referring to "Power Window Main Switch Inspection".*
	Power window sub switch faulty	*Check power window sub switch referring to "Power Window Sub Switch Inspection".*
	Wiring and/or coupler faulty	*Check wiring and/or coupler.*
	Power window regulator faulty	*Check window regulator.*
	Power window motor faulty	*Check power window motor.*
	Wiring or grounding faulty	*Repair circuit.*

Power Door Mirror Control System Symptom Diagnosis (If Equipped)

S7N20A9504003

Condition	Possible cause	Correction / Reference Item
All power mirrors do not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power door mirror switch faulty	*Check power door mirror switch referring to "Power Door Mirror Switch Inspection (If Equipped)".*
	Wiring or grounding faulty	*Repair circuit.*
One power mirror does not operate	Power door mirror switch faulty	*Check power door mirror switch referring to "Power Door Mirror Switch Inspection (If Equipped)".*
	Power door mirror actuator faulty	*Check actuator refraining to "Power Door Mirror Actuator Inspection (If Equipped)".*
	Wiring or grounding faulty	*Repair circuit.*

Door Mirror Heater Symptom Diagnosis (If Equipped)

S7N20A9504004

NOTE

- **Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
All door mirror heaters does not operate	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door window defogger switch faulty	*Check rear end door window defogger switch referring to "Rear End Door Window Defogger Switch Inspection".*
	Rear end door window defogger relay faulty	*Check rear end door window defogger relay referring to "Rear End Door Window Defogger Relay Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Only one door mirror heater does not operate	Door mirror heater faulty	*Check door mirror heater refiring to "Door Mirror Heater Inspection (If Equipped)".*
	Wiring or grounding faulty	*Repair circuit.*

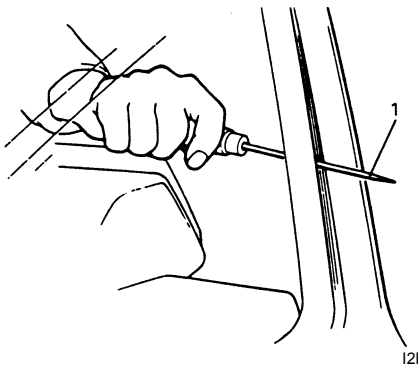
Repair Instructions

Windshield Removal and Installation

S7N20A9506001

Removal

1) Clean both inside and outside of glass and around it.
2) Remove wiper arms and cowl top garnish.
3) Remove windshield side garnish.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove rear view mirror, sun visor and front pillar trims (right & left).
6) If necessary, remove instrument panel. Refer to "Instrument Panel Removal and Installation in Section 9C".
7) If necessary, remove head lining. Refer to "Head Lining Removal and Installation in Section 9H".
8) Remove (or cut) windshield molding.
9) Drill hole with eyeleteer (1) through adhesive and let piano string through it.

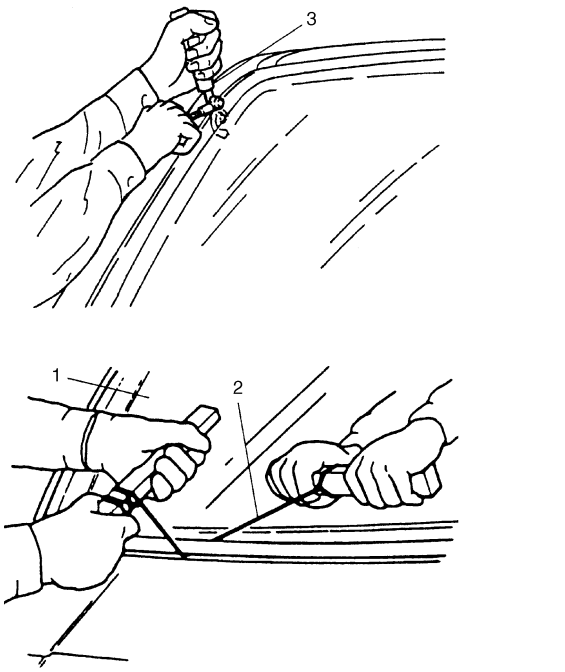


I2RH01950040-01

10) Cut adhesive all around windshield (1) with piano string (2). When using tool, windshield knife (3), to cut adhesive, be careful not to cause damage to windshield. Use wire to cut adhesive along lower part of windshield.

NOTE

Use piano string (2) as close to glass as possible so as to prevent damage to body and instrument panel.

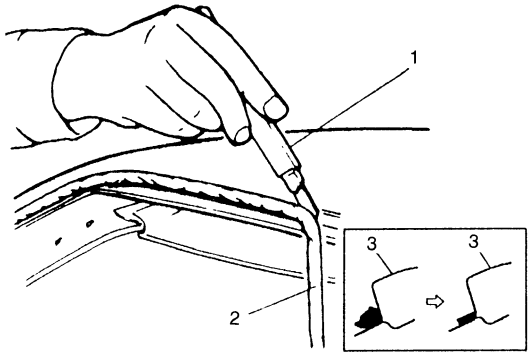


I3RH0A950006-01

11) Using knife (1), smoothen adhesive (2) remaining on body side (3) so that it is 1 – 2 mm (0.039 – 0.078 in.) thick all around.

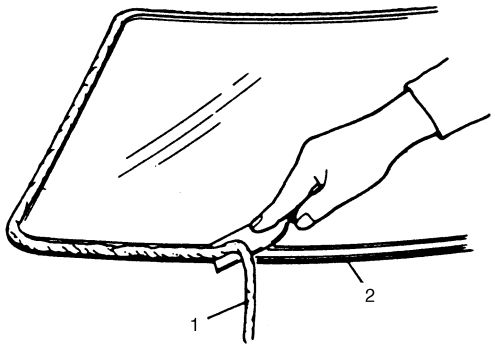
NOTE

Before using knife (1), clean it with alcohol or the like to remove oil from it.



I2RH01950042-01

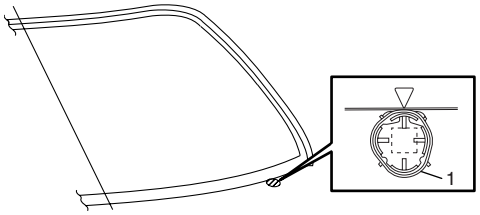
12) When reusing windshield, remove the adhesive (1) from it, using care not to damage primer coated surface (2).



I2RH01950043-01

Installation

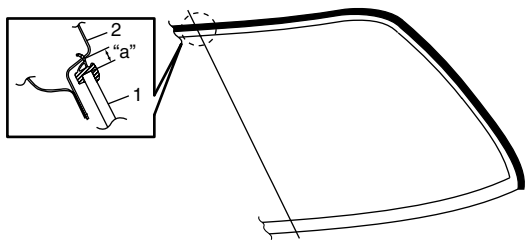
1) Using cleaning solvent, clean windshield edge where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Install new glass stoppers (1) (2 pieces) to lower side of windshield.



I4RH01950001-01

3) To determine installing position of glass (1) to body (2), position glass against body so that clearance between upper end of glass (1) and body (2) is approximately 5 mm (0.197 in.) and clearances between each side end (right & left) of glass (1) and body (2) are even. Then mark mating marks on glass (1) and body (2) as shown. Upper clearance can be adjusted by moving glass stoppers position.

Windshield clearance
"a": approx. 5 mm (0.197 in.)

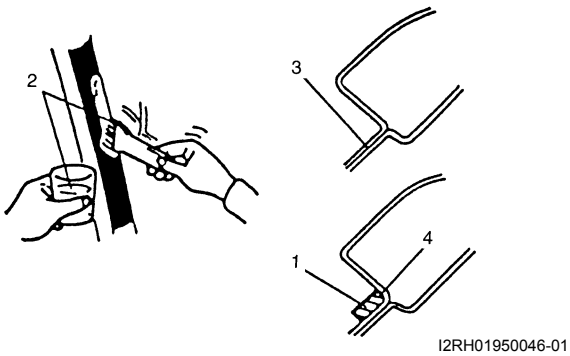


I2RH01950045-01

4) Clean contact surfaces of old adhesive (4), paint or bare metal thoroughly.
If surfaces of paint or bare metal come out, apply primer (2) for body with caution not to apply primer (2) to surface of adhesive remaining on body.

NOTE

- **Be sure to refer to primer maker's instruction for proper handling and drying time.**
- **Do not touch body and old adhesive surfaces where glass is to be adhered.**



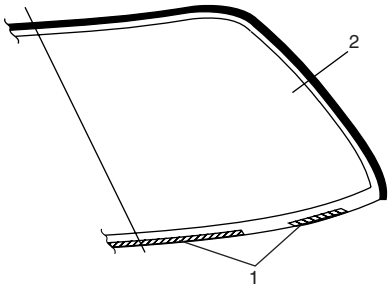
I2RH01950046-01

1.	Do not apply primer
3.	Apply primer

5) Install new molding to glass.
6) Clean glass surface to be adhered to body with clean cloth. If cleaning solvent is used, let it dry for 10 minutes or more.

Cleaning Area for windshield (distance from the edge of glass or molding)
30 – 50 mm (1.18 – 1.97 in.)

7) Install new spacers (1) to windshield (2).



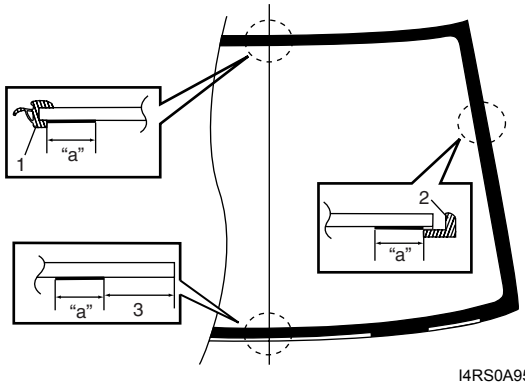
I4RS0A950002-01

8) Using new brush, apply sufficient amount of primer onto glass along glass edge.

NOTE

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not apply primer on outside of ceramic coated surface.**
- **Do not touch primer coated surface.**

Width applied primer for windshield
"a": 15 mm (0.59 in.)



I4RS0A950003-01

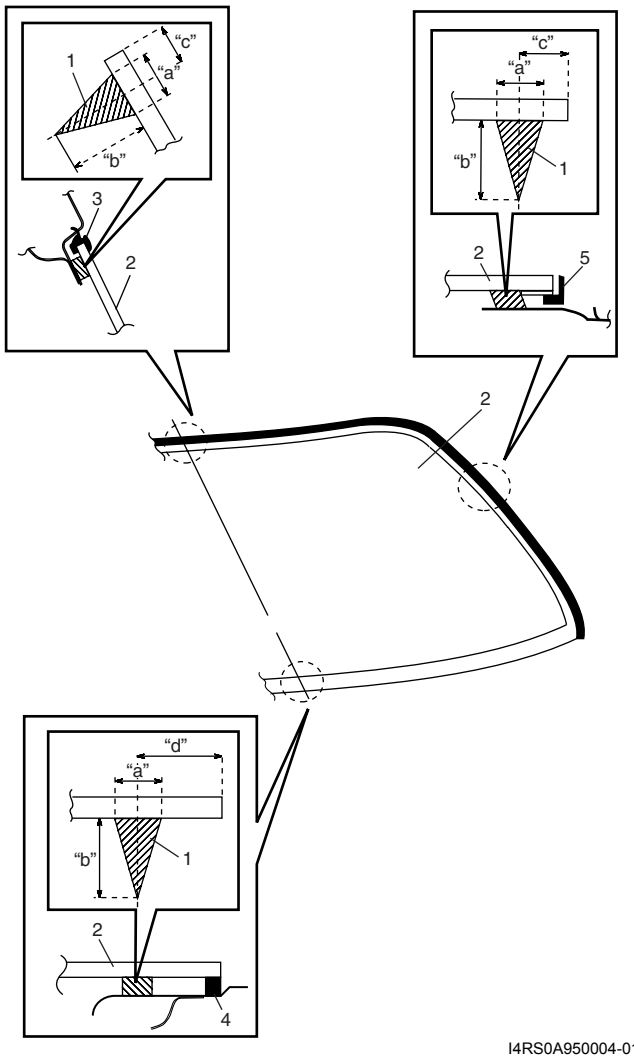
1.	Molding
2.	Windshield side garnish clip
3.	27.2 mm (1.07 in.)

9) Apply primer for molding along molding surface all around.
10) Apply adhesive (1) referring to figure.

NOTE

- **Press glass (2) against fittings surface of body panel quickly after adhesive (1) is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive (1) is applied.**
- **Perform steps 8) to 9) within 10 min. to ensure sufficient adhesion.**
- **Be sure to refer to adhesive maker's instruction for proper handling and drying time.**
- **Start from bottom side of glass (2).**
- **Be careful not to damage primer.**

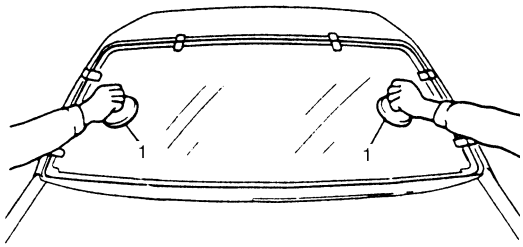
Adhesive amount specifications and position for windshield
Width “a”: Approx. 7 mm (0.27 in.)
Height “b”: Approx. 15 mm (0.59 in.)
Position “c”: Approx. 11 mm (0.43 in.) for front, rear and upper sections
Position “d”: Approx. 35 mm (1.38 in.) for bottom section



I4RS0A950004-01

3.	Molding
4.	Windshield glass spacer
5.	Windshield side garnish clip

11) Holding rubber sucker grips (1), place glass onto body by aligning mating marks marked in step 3) and press it.



I2RH01950050-01

12) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE

- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or like for drying.**

I2RH01950051-01

⚠ CAUTION

Upon completion of installation, note the following.

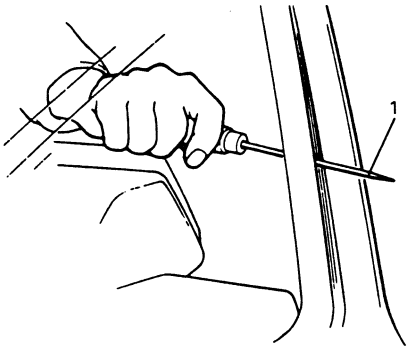
- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If molding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time.**
- **Be sure to refer to its maker’s instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

Rear Quarter Window Removal and Installation

S7N20A9506002

Removal

1) Clean both inside and outside of glass and around it.
2) Using tape, cover body surface around glass to prevent any damage.
3) If necessary, remove instrument panel. Refer to “Instrument Panel Removal and Installation in Section 9C”.
4) If necessary, remove quarter under panel, center pillar inner upper trim, rear pillar trim and head lining. Refer to “Head Lining Removal and Installation in Section 9H”.
5) Drill hole with eyeleteer (1) through adhesive and let piano string through it.

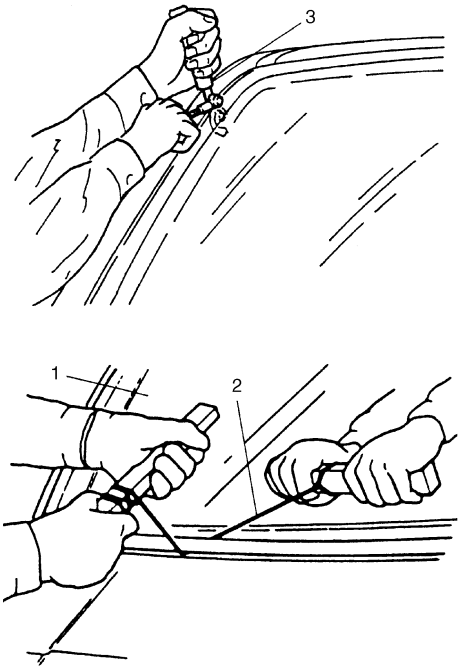


I2RH01950040-01

6) Cut adhesive all around rear quarter window (1) with piano string (2). When using tool, windshield knife (3), to cut adhesive, be careful not to cause damage to windshield. Use wire to cut adhesive along lower part of windshield.

NOTE

Use piano string (2) as close to glass as possible so as to prevent damage to body.

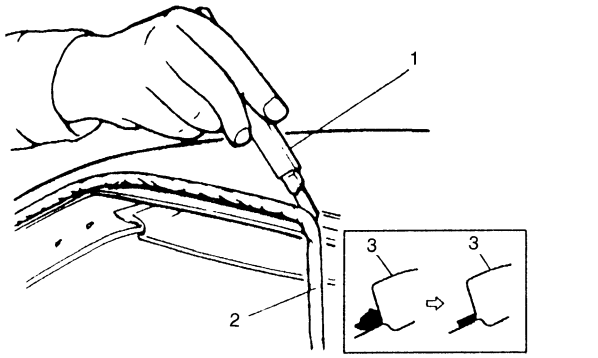


I3RH0A950006-01

7) Using knife (1), smoothen adhesive (2) remaining on body side (3) so that it is 1 – 2 mm (0.039 – 0.078 in.) thick all around.

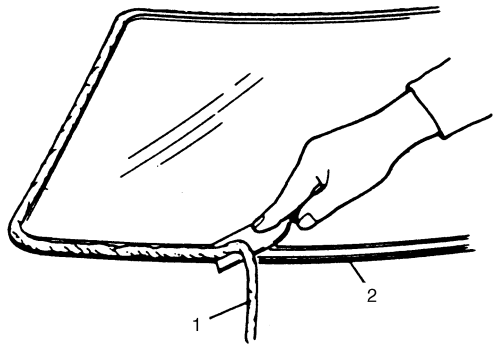
NOTE

Before using knife (1), clean it with alcohol or the like to remove oil from it.



I2RH01950042-01

8) When reusing rear quarter window, remove the adhesive (1) from it, using care not to damage primer coated surface (2).



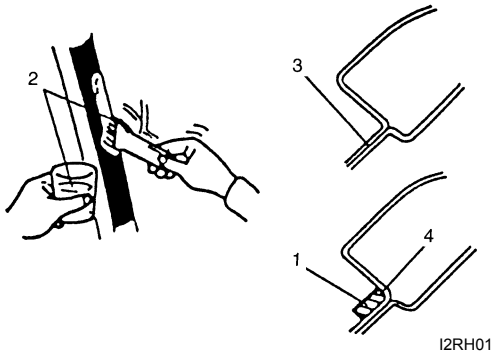
I2RH01950043-01

Installation

1) Using cleaning solvent, clean rear quarter window edge where rear quarter window glass is to be adhered. (Let it dry for more than 10 minutes.)
2) Clean contact surfaces of old adhesive (4), paint or bare metal thoroughly.
   If surfaces of paint or bare metal come out, apply primer (2) for body with caution not to apply primer (2) to surface of adhesive remaining on body.

NOTE

- **Be sure to refer to primer maker's instruction for proper handling and drying time.**
- **Do not touch body and old adhesive surfaces where glass is to be adhered.**



I2RH01950046-01

1. Do not apply primer	
3. Apply primer	

3) Clean glass surface to be adhered to body with clean cloth. If cleaning solvent is used, let it dry for 10 minutes or more.

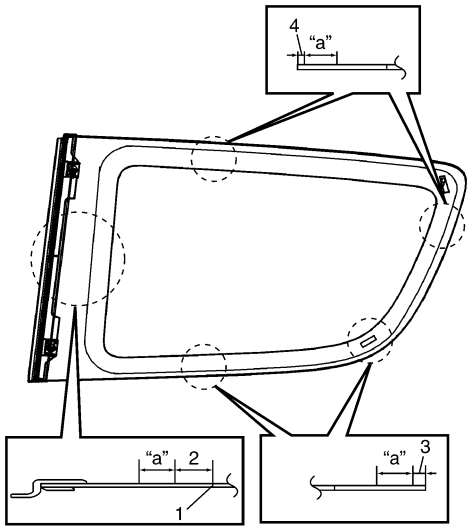
Cleaning Area for rear quarter window (distance from the edge of glass or molding)
30 – 50 mm (1.18 – 1.97 in.)

4) Using new brush, apply sufficient amount of primer onto glass along glass edge.

NOTE

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not apply primer on outside of ceramic coated surface.**
- **Do not touch primer coated surface.**

Width applied primer for rear quarter window
"a": 14 mm (0.55 in.)



I4RS0B950002-01

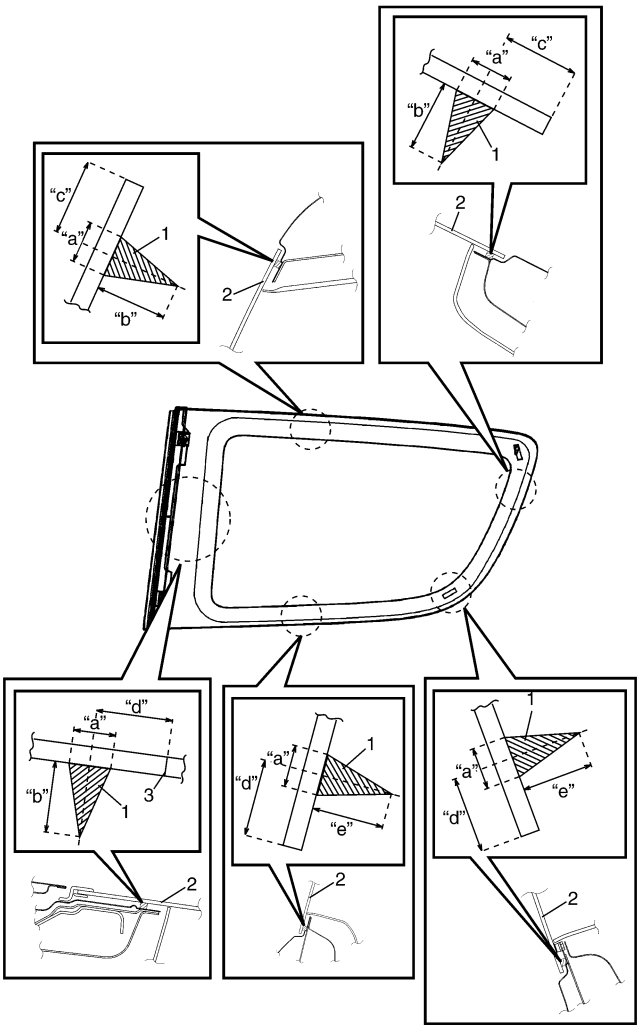
1. Ceramic print line	3. 1.0 mm (0.04 in.)
2. 21.5 mm (0.85 in.)	4. 5.0 mm (0.20 in.)

5) Apply primer for molding along molding surface all around.
6) Apply adhesive (1) referring to figure.

NOTE

- **Press glass (2) against fittings surface of body panel quickly after adhesive (1) is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive (1) is applied.**
- **Perform steps 4) to 5) within 10 min. to ensure sufficient adhesion.**
- **Be sure to refer to adhesive maker's instruction for proper handling and drying time.**
- **Start from bottom side of glass (2).**
- **Be careful not to damage primer.**

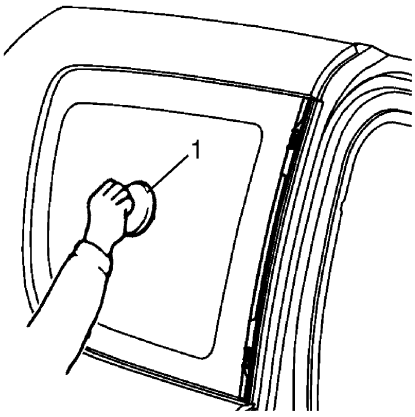
Adhesive amount specifications and position for rear quarter window
Width "a": Approx. 6 mm (0.24 in.)
Height "b": Approx. 13 mm (0.51 in.)
Position "c": Approx. 12 mm (0.47 in.)
Position "d": Approx. 28.5 mm (1.12 in.)
Position "e": Approx. 8 mm (0.31 in)



I4RS0B950003-01

3. Ceramic print line

7) Holding rubber sucker grip (1), place glass onto body by aligning mating marks marked in step 3) and press it.

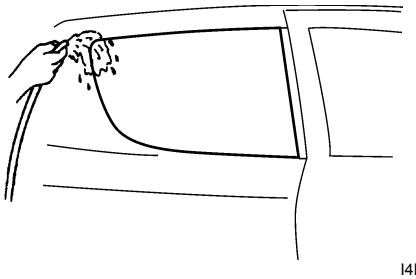


I4RS0B950004-01

8) Check for water leakage by pouring water over windshield through hose. If leakage is found, dry windshield and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE

- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or like for drying.**



I4RS0B950005-01

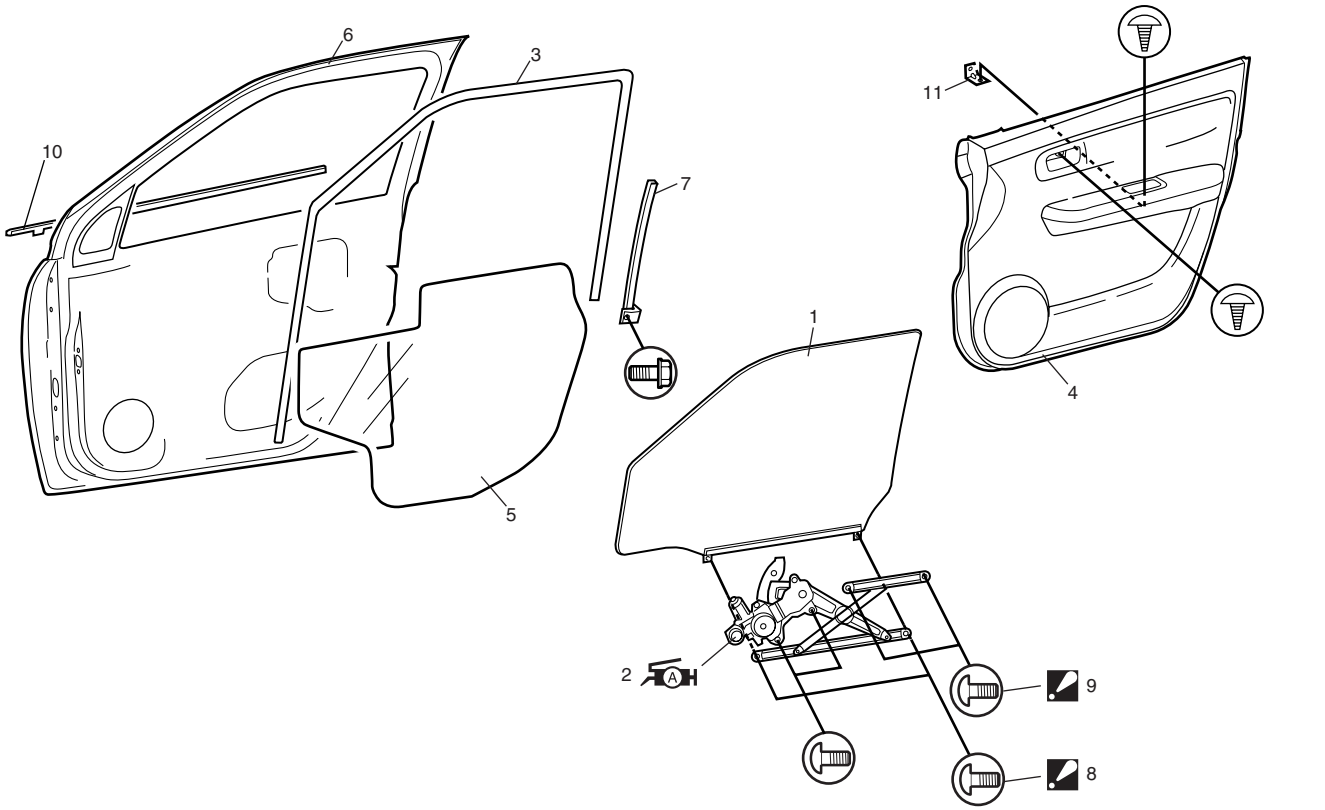
⚠ CAUTION

Upon completion of installation, note the following.

- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If molding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time.**
- **Be sure to refer to its maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain from driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

Front Door Window Components

S7N20A9506003



I4RS0A950005-01

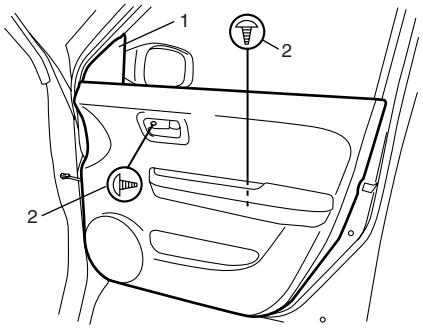
1. Door glass	5. Door sealing cover	9. Front door window regulator mounting screw : Tighten rear screw first, and then tighten front screw.
2. Window regulator assembly : Apply lithium grease 99000-25010 to sliding part.	6. Door panel	10. Front door outer weather-strip
3. Glass run	7. Front door sash	11. Door trim bracket
4. Door trim	8. Door glass mounting screw : Tighten rear screw first, and then tighten front screw.	

Front Door Glass Removal and Installation

S7N20A9506004

Removal

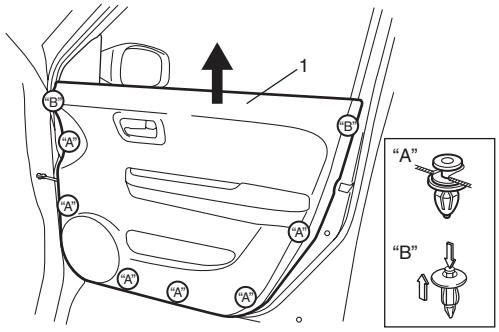
1) Remove door mirror trim (1).
2) Remove door trim mounting screws (2).



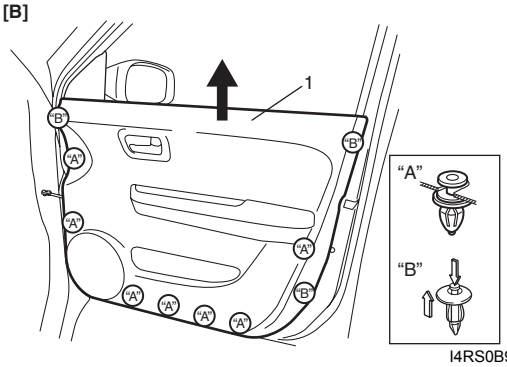
I4RS0A950006-01

3) Remove door trim (1) as shown.
And disconnect power window switch lead wire at coupler.

[A]



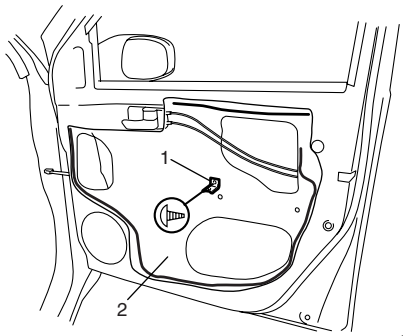
[B]



I4RS0B950006-01

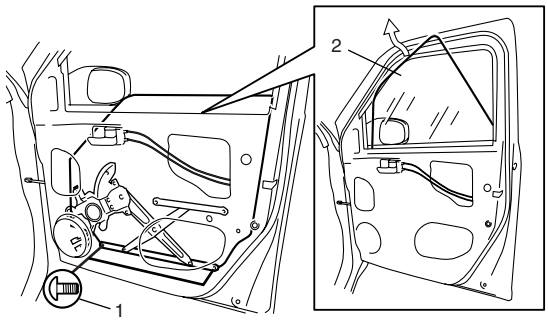
[A]: 5door model	[B]: 3door model

4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



I4RS0A950008-01

6) Remove door glass mounting screws (1).
7) Remove door glass (2) while tilting it as shown.

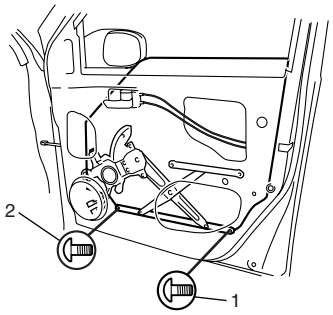


I4RS0A950009-01

Installation

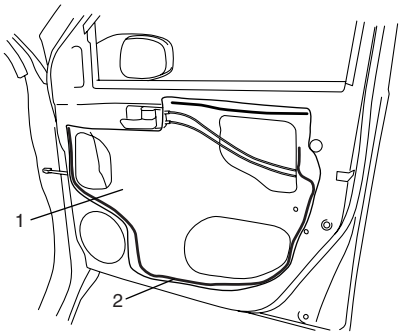
Reverse removal procedure noting the following instructions.

- If there is deformity for glass run, replace it with a new one.
- Tighten door glass rear mounting screw (1) first, and then tighten door glass front mounting screw (2).



I4RS0A950010-01

- Secure door sealing cover (1) with adhesive (2).

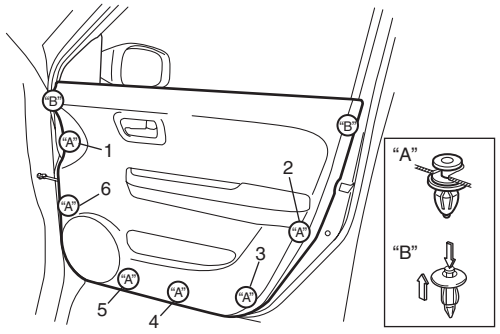


I4RS0A950011-01

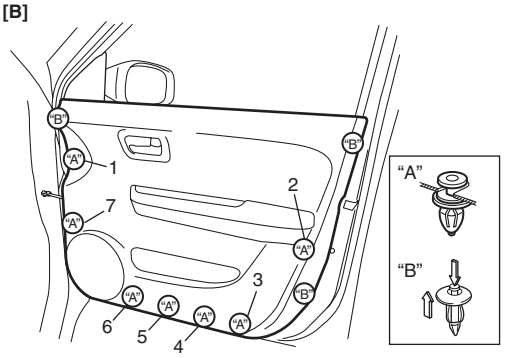
- Install front door trim.

Front door trim attaching order
5door model: (1) → (2) → (3) → (4) → (5) → (6)
3door model: (1) → (2) → (3) → (4) → (5) → (6) → (7)

[A]



[B]



I4RS0B950007-01

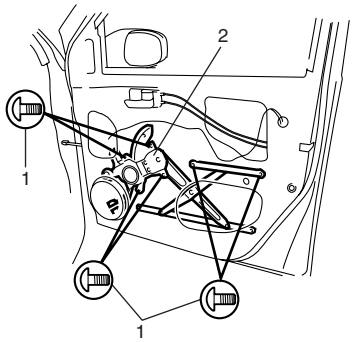
[A]: 5door model	[B]: 3door model

Front Door Window Regulator Removal and Installation

S7N20A9506005

Removal

1) Remove door glass referring to “Front Door Glass Removal and Installation”.
2) Disconnect power window motor lead wire at coupler.
3) Remove regulator mounting screws (1), and then remove front door window regulator (2).



I4RS0A950013-01

Installation

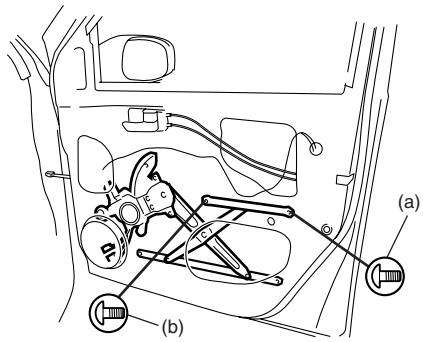
Reverse removal procedure noting the following instruction.

- Apply grease to sliding portions of window regulator.

  : Grease 99000–25010 (SUZUKI Super Grease A)

- Tighten front door window regulator attaching screws.

  Front door window regulator screw tightening order
  (a) → (b)



I4RS0A950014-01

Front Door Window Regulator Inspection

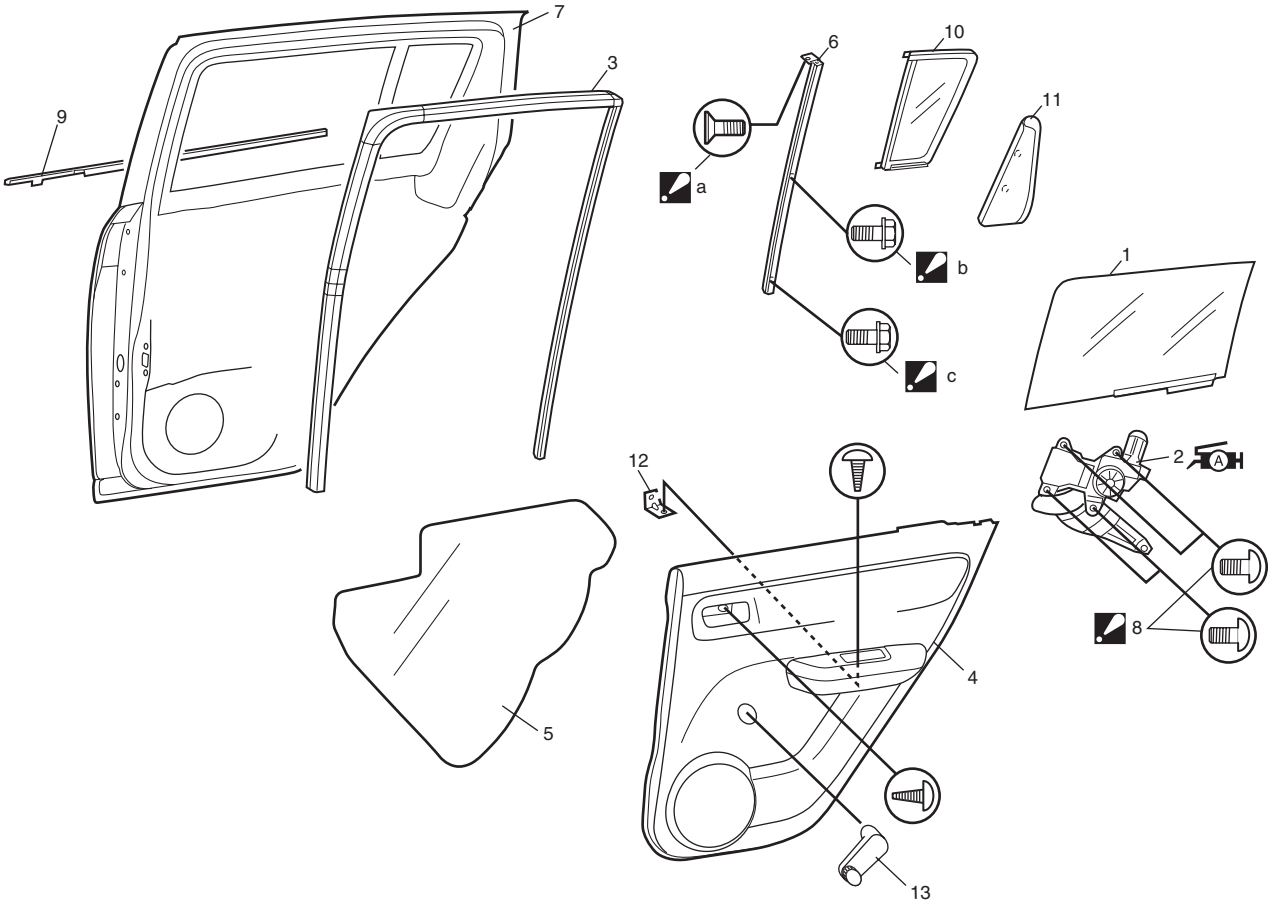
S7N20A9506006

Check the following parts for wear, damage, smooth operation and lubrication:

- Check regulator sliding and rotating parts.
- Check rollers.

Rear Door Window Components

S7N20A9506007



I4RS0B950008-01

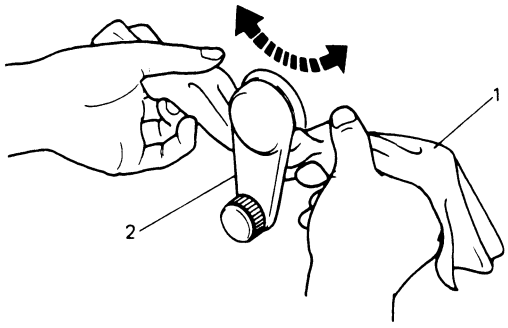
1. Door glass	6. Door sash	11. Rear door inner garnish
A H 2. Window regulator assembly : Apply lithium grease 99000-25010 to sliding part.	7. Door panel	12. Door trim bracket
3. Glass run	8. Rear door window regulator mounting screw : Tighten lower screw first, and then tighten upper screw.	13. Window regulator handle
4. Door trim	9. Rear door outer weather-strip	a: Sash upper mounting screw : Tightening order: a → b → c
5. Door sealing cover	10. Rear door partition glass.	b, c: Sash lower mounting bolt : Tightening order: a → b → c

Rear Door Glass Removal and Installation

S7N20A9506008

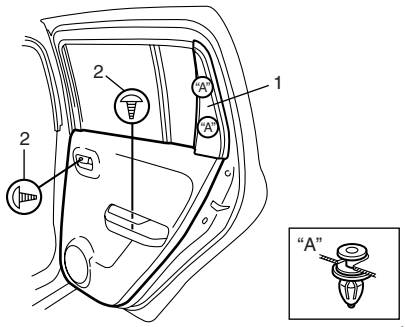
Removal

1) Remove window regulator handle (2) (if equipped). For its removal, pull off snap by using a cloth (1) as shown in figure.



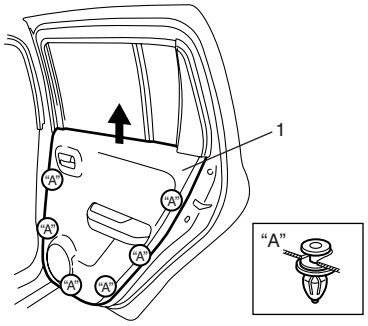
IYSY01950008-01

2) Remove rear door inner garnish (1).
3) Remove door trim mounting screws (2).



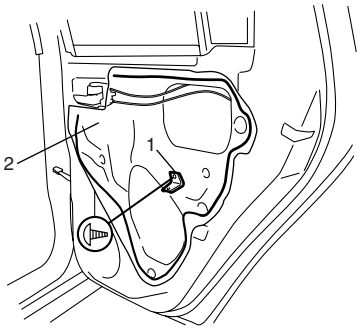
I4RS0A950016-01

4) Remove door trim (1) as shown.



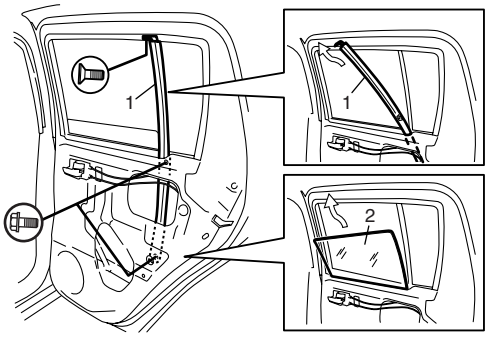
I4RS0A950017-01

5) Remove door trim bracket (1).
6) Remove door sealing cover (2).



I4RS0A950018-01

7) Detach rear part of glass run from door sash (1), and remove door sash (1).
8) Remove door glass (2) as shown.

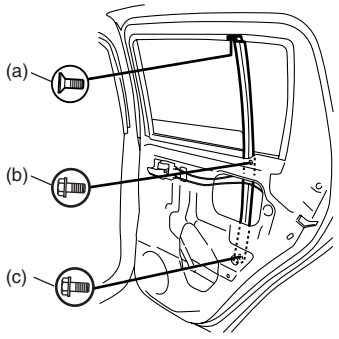


I4RS0A950019-01

Installation
Reverse removal procedure noting the following instructions.

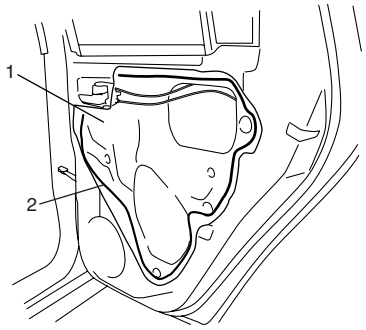
- If there is deformity for glass run, replace it with a new one.
- Tighten door sash mounting screw and bolts.

Door sash mounting screw and bolt tightening order
(a) → (b) → (c)



I4RS0A950020-01

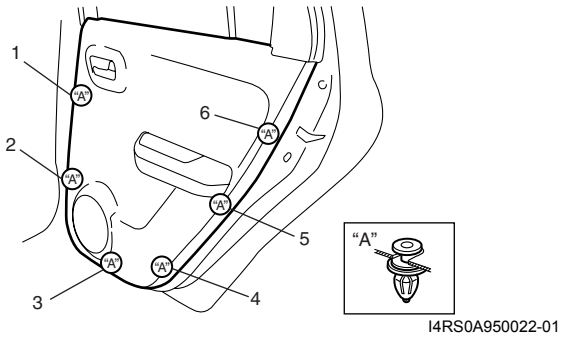
- Secure door sealing cover (1) with adhesive (2).



I4RS0A950021-01

- Install rear door trim.

Rear door trim attaching order
(1) → (2) → (3) → (4) → (5) → (6)



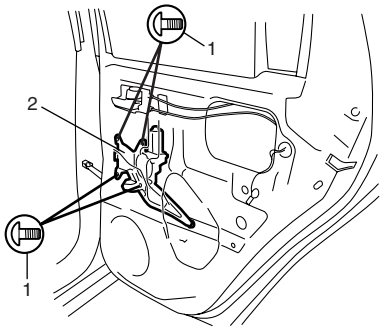
I4RS0A950022-01

Rear Door Window Regulator Removal and Installation

S7N20A9506009

Removal

1) Remove door glass referring to “Rear Door Glass Removal and Installation”.
2) Disconnect power window motor lead wire at coupler and loosen clamp.
3) Loosen regulator mounting screws (1), and then remove rear window regulator (2).



I4RS0A950023-01

Installation

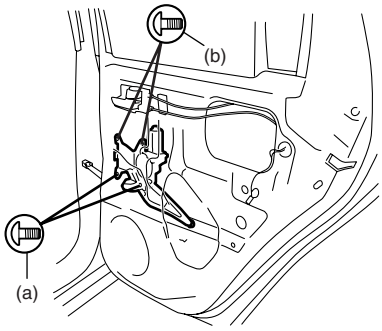
Reverse removal procedure noting the following.

- Apply grease to sliding and rotating portions of window regulator.

  : Grease 99000–25010 (SUZUKI Super Grease A)

- Tighten rear door window regulator attaching screws.

  Rear door window regulator screw tightening order
  (a) → (b)



I4RS0A950024-01

Rear Door Window Regulator Inspection

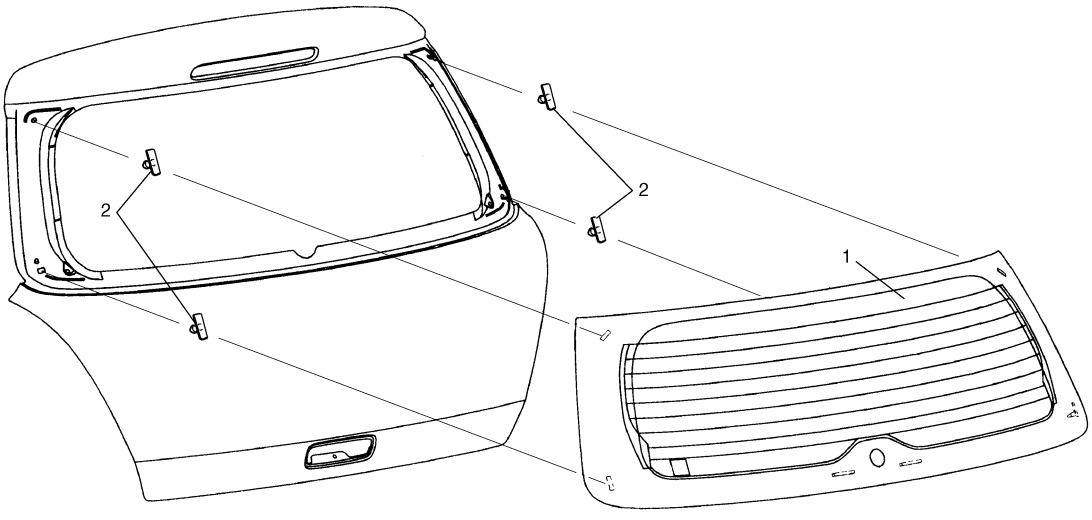
S7N20A9506010

Check the following point:

- Check regulator sliding and rotating parts.
- Check rollers for wear and damage.

Rear End Door Window Components

S7N20A9506011



I4RS0A950025-01

1. Rear end door glass	2. Fastener

Rear End Door Glass Removal and Installation

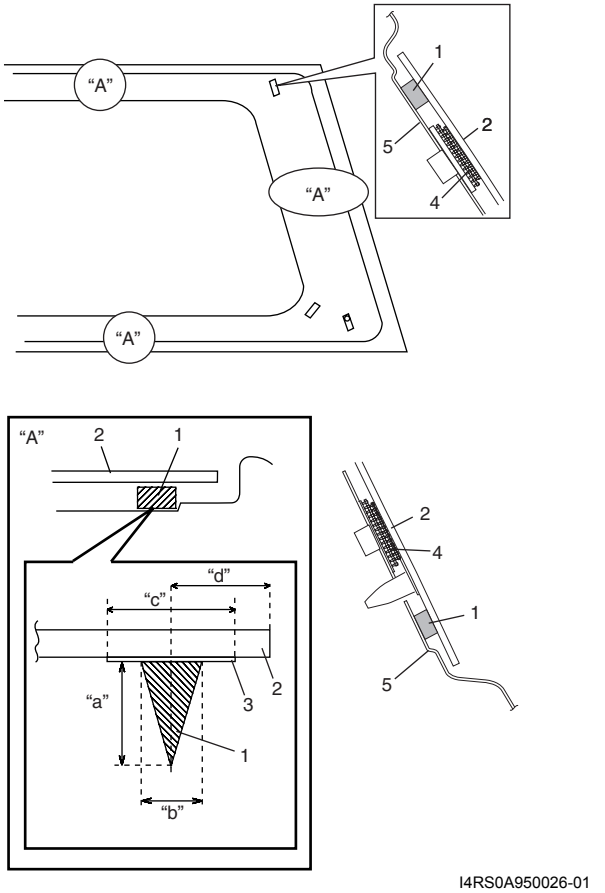
S7N20A9506012

Refer to “Windshield Removal and Installation” as removal and installation procedures are basically the same. However, note the following.

- Observe the following precautions when applying adhesive (1) along glass (2) edge.
- Adhesive (1) should be applied evenly especially in height.
- Be careful not to damage primer (3).
- With the position of fastener (4) properly aligned, install glass (2) on rear end door panel (5).
- Press glass against body quickly after adhesive (1) is applied.

Adhesive amount specifications and position for rear end door glass

Height “a”: 13 mm (0.51 in.)
Width “b”: 6 mm (0.24 in.)
Width “c”: 14 mm (0.55 in.)
Position “d”: 12 mm (0.47 in.) for glass upper section
Position “d”: 16 mm (0.63 in.) for glass bottom section
Position “d”: 32.5 mm (1.28 in.) for glass side sections



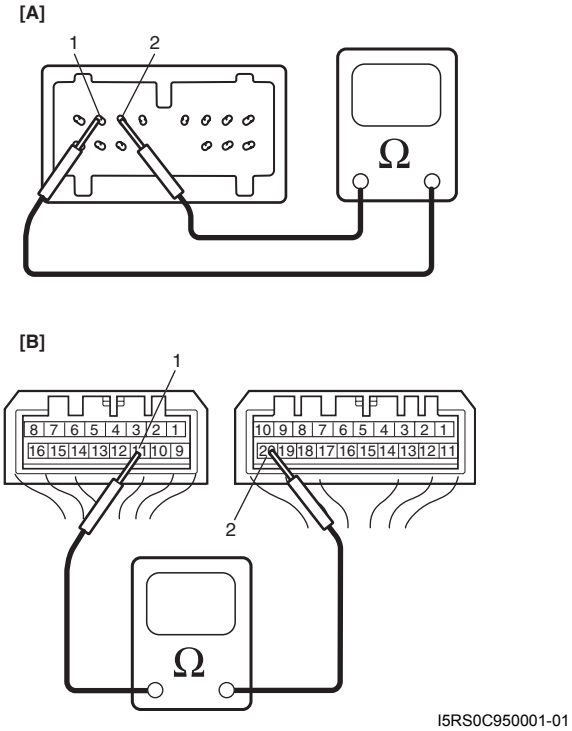
I4RS0A950026-01

Rear End Door Window Defogger Switch Inspection

S7N20A9506013

1) Check rear end door window defogger switch for operation as follows.
   a) Rear end door window defogger switch is built in HVAC control unit.
      Remove HVAC control unit referring to “HVAC Control Unit Removal and Installation in Section 7A” (manual A/C) or “HVAC Control Module Removal and Installation: Auto A/C in Section 7B” (automatic A/C).
   b) Check that there is continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at ON position. (Rear end door window defogger switch is kept in push.)
   c) Check that there is no continuity between terminal (1) and terminal (2) of HVAC control unit when rear end door window defogger switch is at OFF position.

If check result does not meet the above conditions, replace HVAC control unit.



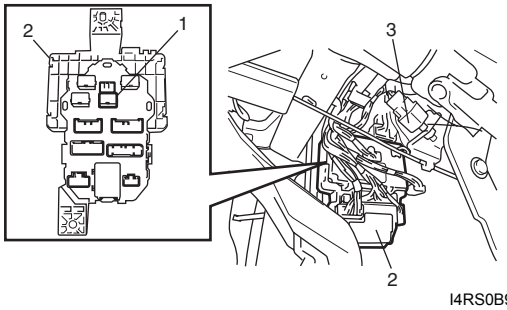
I5RS0C950001-01

[A]: Manual A/C	[B]: Automatic A/C

Rear End Door Window Defogger Relay Inspection

S7N20A9506014

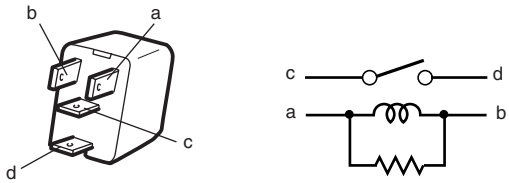
1) Disconnect negative (–) cable from battery.
2) Remove junction block assembly for inspection of rear end door window defogger relay.
   For removal, refer to “BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B”.
3) Remove rear end door window defogger relay (1) from junction block assembly (2).



I4RS0B950009-01

3. Brake (stop) lamp switch

4) Check that there is no continuity between terminal “c” and “d”. If there is continuity, replace relay.
5) Check that there is continuity between terminals “c” and “d” when a 12 V battery is connected to terminals “a” and “b”.
   If malfunction is found, replace it with a new one.



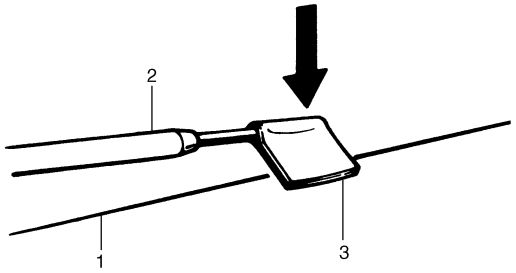
I4RS0A950028-01

Rear End Door Window Defogger Wire Inspection

S7N20A9506015

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.**



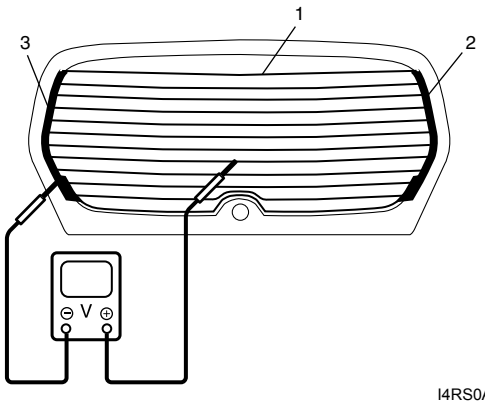
I2RH01950002-01

Wire Damage Inspection

1) Start engine.
2) Turn on defogger switch.
3) Measure voltage at the center of each defogger wire (1), and check defogger wire condition according to the following table.
   If defogger wire open is found, go to next step.

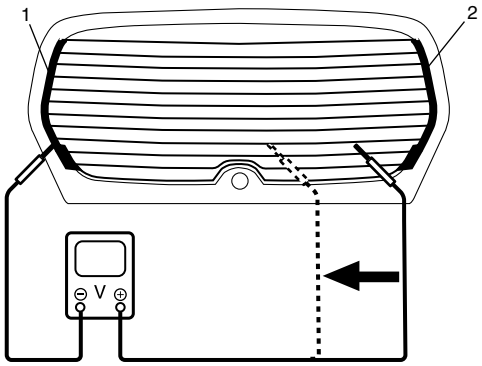
Defogger wire voltage

Voltage	Circuit
10 – 12 V	Defogger wire open between its center and defogger wire power source terminal end (2)
4 – 6 V	Normal condition
0 – 1 V	Defogger wire open between its center and defogger wire ground terminal end (3)



I4RS0A950029-01

4) Touch voltmeter negative (–) lead to defogger wire ground terminal end (1).
5) 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 10 – 12 V to 0 – 1 V is where there is open.
   If found defective, repair defogger wire referring to "Rear End Door Window Defogger Wire Repair".

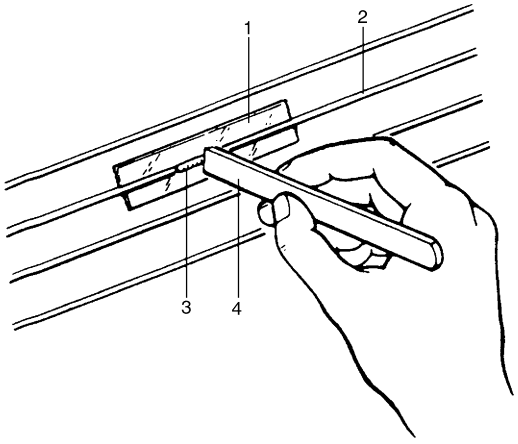


I4RS0A950030-01

Rear End Door Window Defogger Wire Repair

S7N20A9506016

1) Use white gasoline for cleaning.
2) Apply masking tape (1) at both upper and lower sides of heat wire (2) to be repaired.
3) Apply commercially-available repair agent (3) with a fine-tip brush (4).
4) 2 to 3 minutes later, remove masking tapes (1).



I2RH01950005-01

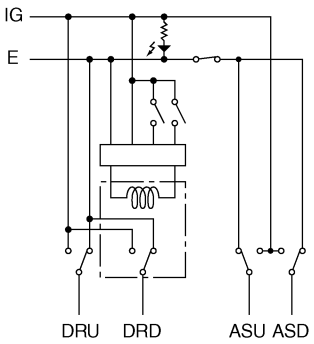
5) Leave repaired heat wire as it is for at least 24 hours before operating the defogger again.

Power Window Main Switch Inspection

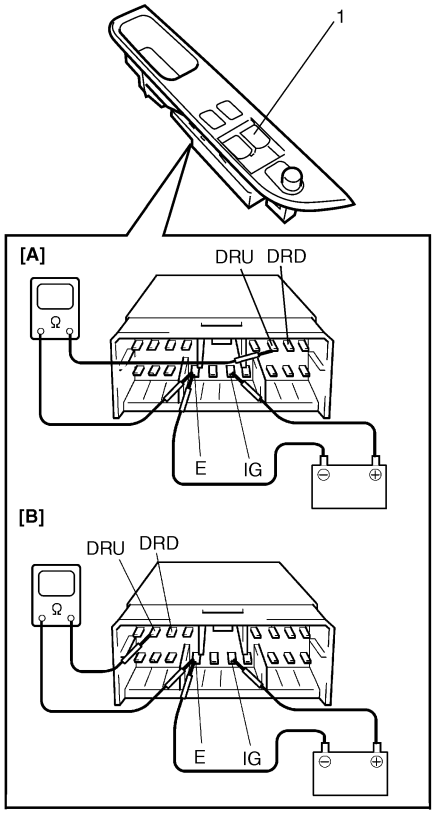
S7N20A9506017

Switch for driver side window

1) Remove driver side door trim referring to step 1) to 3) of "Front Door Glass Removal and Installation".
2) Remove power window main switch from door trim.
3) Connect 12 V battery positive (+) terminal to terminal "IG" of power window main switch and its negative (–) terminal to terminal "E" of power window main switch.
4) Check for continuity between terminals as shown below.
   If check result is not as specified, replace power window main switch.



	IG	DRU	DRD	E
UP	○—○			
OFF			○—○—○	
DOWN	○		○—○	



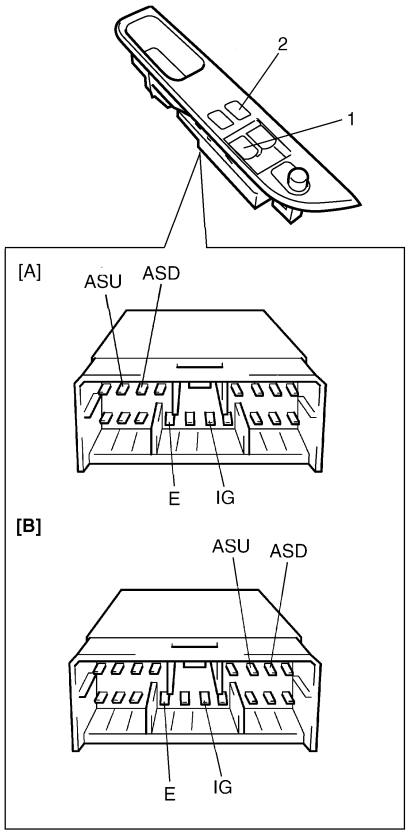
I4RS0B950010-01

Switch for other window than driver side

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation”.
2) Remove power window main switch from door trim.
3) Check for continuity between terminals as shown below.

If check result is not as specified, replace power window main switch.

Passenger side window switch		IG	ASU	ASD	E
UNLOCK (2)	UP	○	○		○
	OFF		○	○	○
	DOWN	○		○	
			○		○
LOCK (2)	UP	○	○		
	OFF		○	○	
	DOWN	○		○	



I4RS0B950011-01

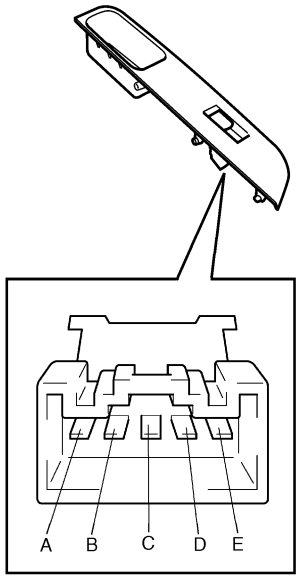
Power Window Sub Switch Inspection

S7N20A9506018

1) Remove front door trim from door panel, refer to Step 1) to 3) of “Front Door Glass Removal and Installation”.
2) Remove power window sub switch from door trim.
3) Check for continuity between terminals at each switch condition.

If check result is not as specified, replace switch.

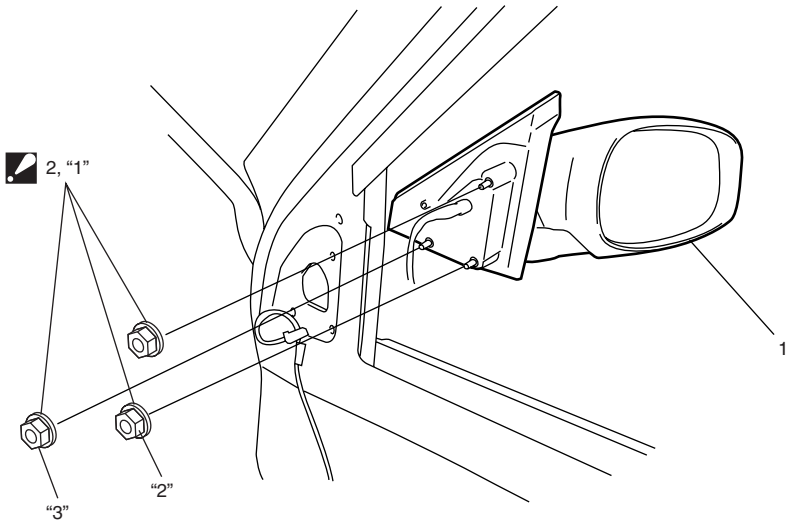
Switch Position \ Terminal	A	B	C	D	E
UP	○	○			
			○		○
OFF	○	○			
				○	○
DOWN		○	○		
				○	○



I4RS0B950012-01

Door Mirror Components

S7N20A9506019



I4RS0A950034-01

	1. Door mirror
✓	2. Door mirror mounting nut :Tighten nuts in such order as indicated in the figure.

Door Mirror Removal and Installation

S7N20A9506020

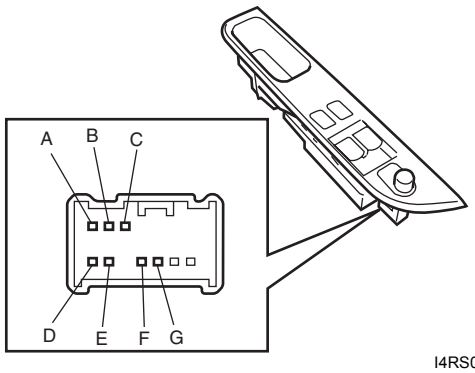
When removing or installing door mirror, refer to the figure in “Door Mirror Components”.

Power Door Mirror Switch Inspection (If Equipped)

S7N20A9506021

1) Remove driver side door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation”.
2) Remove power window main switch from door trim.
3) Check for continuity between terminals at each switch position.
   If check result is not as specified, replace door mirror switch.

L / R	A / B	C	D	E / F	G
Up		○	○	○	○
Down		○	○	○	○
Left	○	○	○	○	
Right	○	○	○	○	



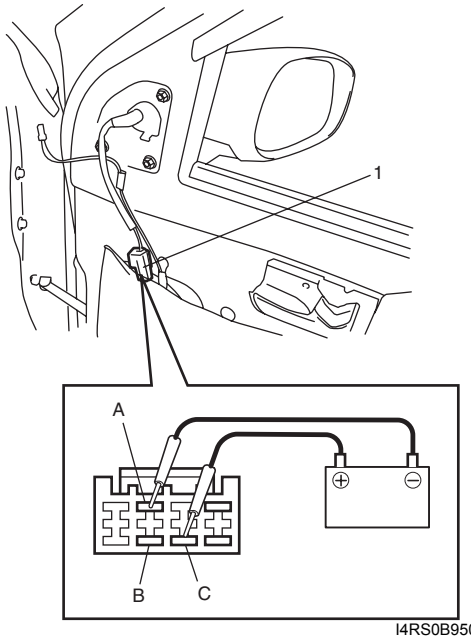
I4RS0B950013-01

Power Door Mirror Actuator Inspection (If Equipped)

S7N20A9506022

1) Remove door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation”.
2) Disconnect door mirror coupler (1).
3) Check that door mirror operates properly when battery voltage is applied to connector terminals.
4) Connect battery positive (+) and negative (–) terminal to the door mirror terminals as shown. If it does not follow the table’s operation, replace door mirror assembly.

Terminal / Operation	A	B	C
Up	⊕		⊖
Down	⊖		⊕
Left		⊕	⊖
Right		⊖	⊕

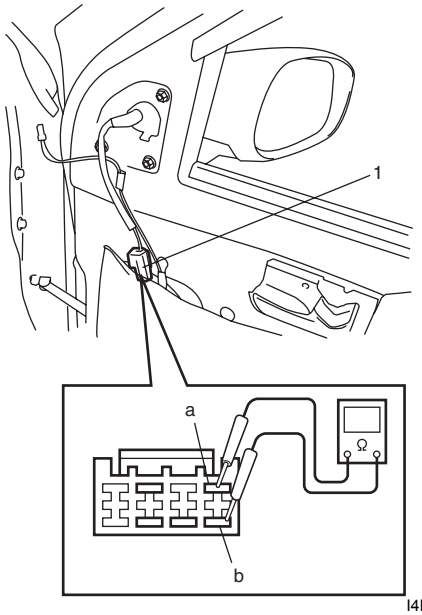


I4RS0B950014-01

Door Mirror Heater Inspection (If Equipped)

S7N20A9506023

1) Remove door trim referring to step 1) to 3) of “Front Door Glass Removal and Installation”.
2) Disconnect door mirror connector (1).
3) Check for continuity between terminals “a” and “b”. If no continuity, replace outside mirror.



I4RS0B950015-01

Special Tools and Equipment

Recommended Service Material

S7N20A9508001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞

NOTE

Required service material is also described in the following.
“Front Door Window Components: ”
“Rear Door Window Components: ”

Security and Locks

General Description

Key Coding Construction

S7N20A9601001

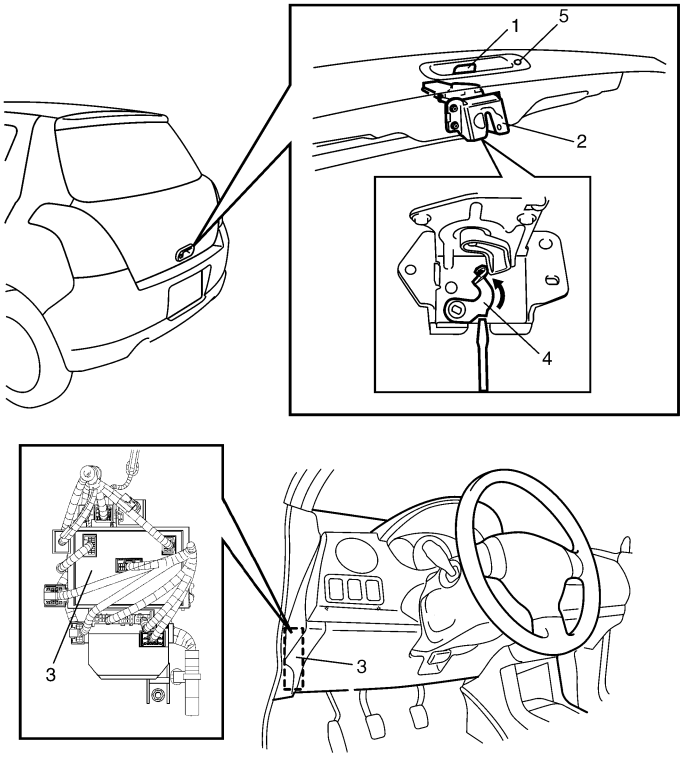
Key Usage and Identification

Key is used for ignition and door lock cylinders. 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).

Rear End Door Opener System Description

S7N20A9601002

Rear end door opener system consists of rear end door opener switch (1), rear end door opener relay (in BCM), rear end door lock assembly (2) and BCM (3) (in junction block assembly).
Rear end door opener system is activated by pushing rear end door opener switch after all doors are unlocked by manual door switch, key cylinder switch, keyless entry transmitter or request switch (5) (if equipped).
When rear end door opener switch pushed rear end door opener relay is ON. Then, BCM releases latch of rear end door lock assembly from striker and rear end door can be opened.
In addition, in case that rear end door cannot be opened by rear end door opener switch, rear end door can be opened by emergency lever (4) in rear end door lock assembly.



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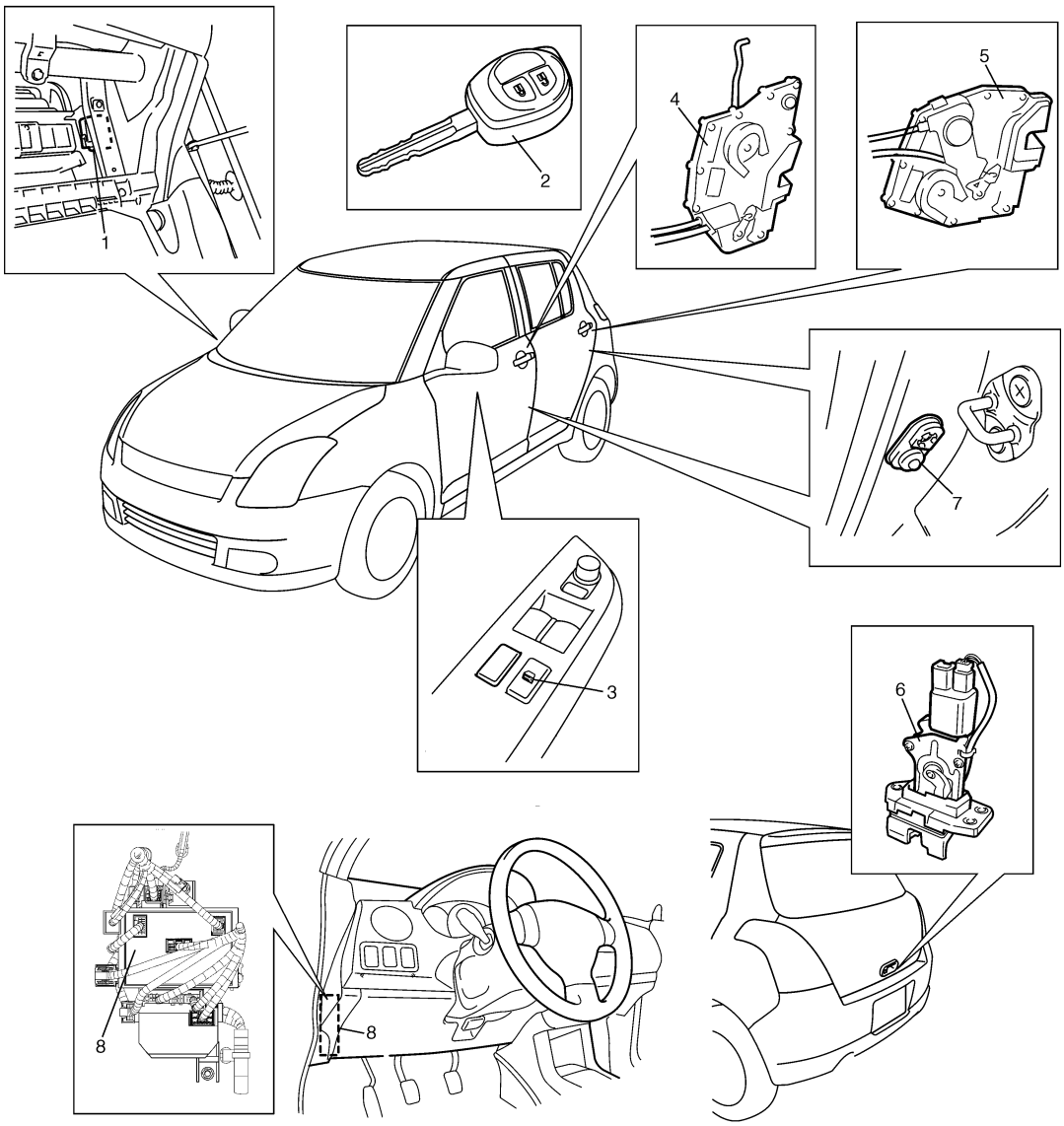
Component Location

Power Door Lock and Keyless Entry System Component Location

S7N20A9603001



I4RS0B960002-01

1. Keyless entry receiver	3. Power door lock switch	5. Rear door actuator (5 door model only)	7. Door switch
2. Transmitter	4. Front door actuator	6. Rear end door actuator	8. BCM (included in junction block assembly)

Diagnostic Information and Procedures

Power Door Lock System Symptom Diagnosis

S7N20A9604001

NOTE

- **Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to "Diagnosis Using Output Test Function of SUZUKI Scan Tool" under "Scan Tool Data in Section 10B".**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
All door can not be locked / unlocked by all of switches	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
All door can not be locked / unlocked by only power door lock switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Power door lock switch faulty	*Check power door lock switch referring to "Power Door Lock Switch Inspection".*
	Wiring harness connected to power door lock switch faulty	*Repair.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
All door can not be locked / unlocked by only key cylinder switch	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Key cylinder switch faulty	*Check key cylinder switch referring to "Door Key Cylinder Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Only one door can not be locked / unlocked	Power door lock actuator faulty	*Check actuator referring to "Power Door Lock Actuator Inspection (If Equipped)".*
	Wiring harness connected to applicable door lock actuator faulty	*Repair.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Power Door Lock System Operation Inspection

S7N20A9604002

1) Check the following operation:
   a) Turn the driver side key cylinder is turned LOCK once, check all doors lock.
   b) Turn the driver side door key cylinder is turned UNLOCK position with door key twice, check all doors unlock.
   c) With all doors unlocked, insert key in key cylinder of driver side door and turn it to lock side, turn it again to lock side within 3 seconds and check that no door can be opened even when door lock knob is moved to unlock side (deadlock function, if equipped).

If malfunction is found, go to "Power Door Lock System Symptom Diagnosis".

Keyless Entry System Symptom Diagnosis (If Equipped)

S7N20A9604003

NOTE

- **Confirm that power door lock system is in good condition before referring to the following possible causes.**
- **Check each part in the order from the top of the following list.**

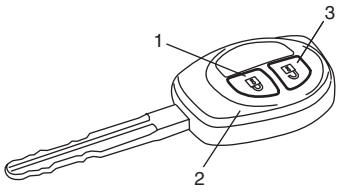
Condition	Possible cause	Correction / Reference Item
All door can not be locked / unlocked by only keyless entry transmitter	Transmitter battery dead	*Replace battery referring to "Replacement of Transmitter Battery".*
	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection in Section 9C" and/or "Rear End Door Switch Inspection in Section 9C".*
	Transmitter faulty	*Replace transmitter.*
	Key remainder switch in ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
	Keyless entry receiver faulty	*Check keyless entry receiver referring to "Keyless Entry Receiver and Its Circuit Inspection".*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Turn signal lights can not be flashed when doors are locked / unlocked by keyless entry transmitter	Turn signal and hazard warning relay faulty	*Check turn signal and hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection in Section 9B".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Interior light does not light when doors are unlocked by keyless entry transmitter	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Hazard warning lights do not light when doors are locked/unlocked by keyless entry transmitter	Turn signal and hazard warning relay faulty	*Check turn signal and hazard warning relay referring to "Turn Signal and Hazard Warning Relay Inspection in Section 9B".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*
Transmitter code can not be programmed to BCM	Door switch faulty	*Check door switch referring to "Door Switch (Front / Rear Door) Inspection in Section 9C" and/or "Rear End Door Switch Inspection in Section 9C".*
	Keyless entry receiver faulty	*Check keyless entry receiver referring to "Keyless Entry Receiver and Its Circuit Inspection".*
	Key reminder switch ignition switch faulty	*Check ignition switch referring to "Ignition Switch Inspection in Section 9C".*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Keyless Entry System Operation Inspection

S7N20A9604004

1) Confirm that power door lock system operates normally, refer to “Power Door Lock System Operation Inspection”.
2) All doors are closed and unlocked.
3) Check the following operation:
   a) Push “lock” button (1) on transmitter (2) or remote controller once, and check all doors lock and hazard waning lights flash once.
   b) Push “unlock” button (3) on transmitter (2) or remote controller twice, and check all doors unlock and hazard waning lights flash twice and interior light turns on several seconds with the interior light switch in the middle position.

If malfunction is found, go to “Keyless Entry System Symptom Diagnosis (If Equipped)”.



I4RS0B960013-01

Door Lock Function of Keyless Start System Symptom Diagnosis (If Equipped)

S7N20A9604005

Proceed to “Keyless Start System Symptom Diagnosis in Section 10E” in case that doors cannot be locked and unlocked by operating the request switch at the outside door handle.

Rear End Door Opener System Symptom Diagnosis

S7N20A9604006

NOTE

- **Use of SUZUKI scan tool makes it easy to check whether a faulty condition is on the input side or output side of BCM. For checking procedure, refer to “Diagnosis Using Output Test Function of SUZUKI Scan Tool” under “Scan Tool Data in Section 10B”.**
- **Check each part in the order from the top of the following list.**

Condition	Possible cause	Correction / Reference Item
Rear end door can not be opened	Circuit fuse blown	*Replace fuse and check for short circuit.*
	Rear end door opener switch faulty	*Check rear end door opener switch referring to “Rear End Door Opener Switch Inspection”.*
	Rear end door actuator faulty	*Check rear end door actuator referring to “Power Door Lock Actuator Inspection (If Equipped)”.*
	Wiring or grounding faulty	*Repair circuit.*
	BCM faulty	*Replace after making sure that none of above parts is faulty.*

Rear End Door Opener System Operation Inspection

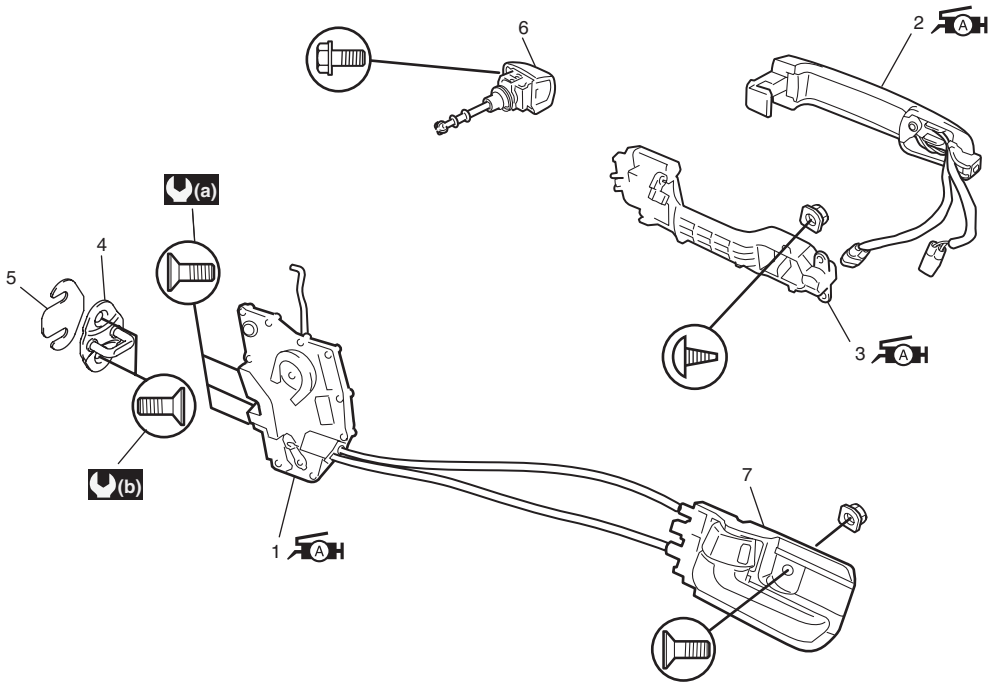
S7N20A9604007

1) Unlock all doors by using manual lock switch, keyless entry transmitter, or key cylinder switch.
2) Make sure that latch of rear end door is released from striker when rear end door opener switch is pushed.
   If malfunction is found, go to “Rear End Door Opener System Symptom Diagnosis”.

Repair Instructions

Front Door Lock Assembly Components

S7N20A9606001



I4RS0B960003-01

1. Front door latch assembly : Apply lithium grease 99000-25010 to sliding and rotating parts and spring if any.	4. Latch striker	7. Inside handle bezel
2. Outside handle assembly : Apply lithium grease 99000-25010 to sliding part.	5. Shim	(a) : 5.0 N·m (0.5 kgf-m, 4.0 lbf-ft)
3. Outside handle frame : Apply lithium grease 99000-25010 to sliding part and spring.	6. Key cylinder	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

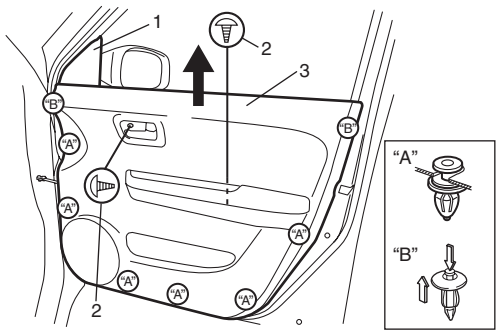
Front Door Lock Assembly Removal and Installation

S7N20A9606002

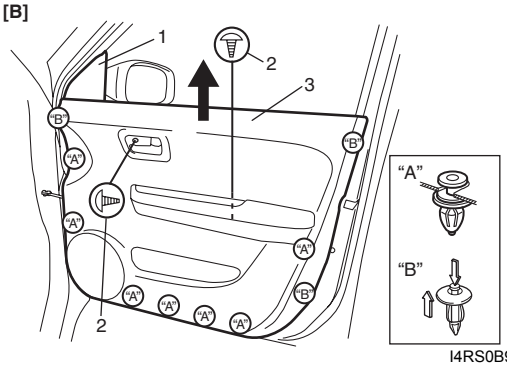
Removal

1) Remove door mirror trim (1).
2) Remove door trim (3) after removing screws (2) and clips “A” and “B”.

[A]



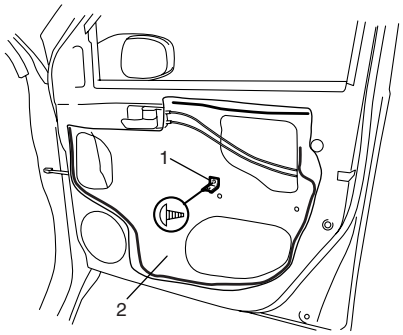
[B]



I4RS0B960004-01

[A]: 5 door model	[B]: 3 door model

3) Disconnect power window switch and mirror switch lead wire at coupler.
4) Remove door trim bracket (1).
5) Remove door sealing cover (2).



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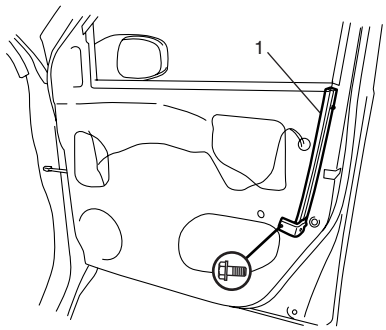
6) Raise window all the way up.
7) Remove door sash (1).



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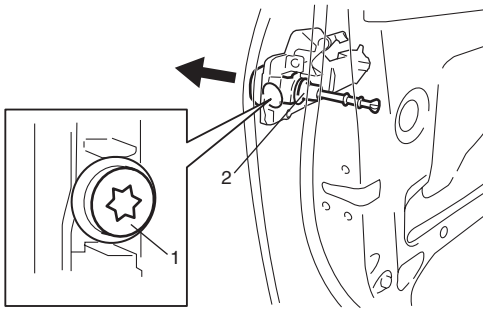
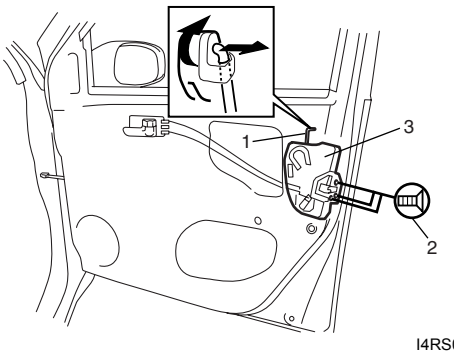
8) Remove key cylinder mounting bolt (1), and then remove key cylinder (2).



I4RS0B960005-01

9) Disconnect door opening control rod (1) from outside handle.
10) Disconnect door lock motor lead wire at coupler.
11) Remove door latch screws (2) and remove door lock assembly (3).



I4RS0A960006-01

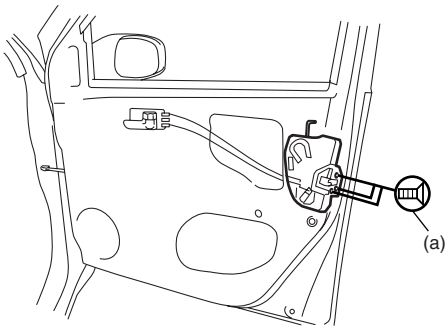
Installation
Reverse removal procedure to install front door lock assembly noting the following instructions.

- Apply grease to sliding parts of door latch assembly.

  : Grease 99000–25010 (SUZUKI Super Grease A)

- Tighten door latch screws to specified torque.

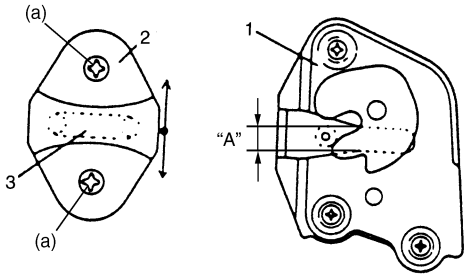
Tightening torque
Door latch screw (a): 5.0 N·m (0.5 kgf-m, 4.0 lbf-ft)



I4RS0A960008-01

- Move door latch striker (2) up or down so its center aligns with the center of groove “A” on the door lock assembly (1) as shown.
  Striker should be moved vertically and placed level.
  Do not adjust door lock.

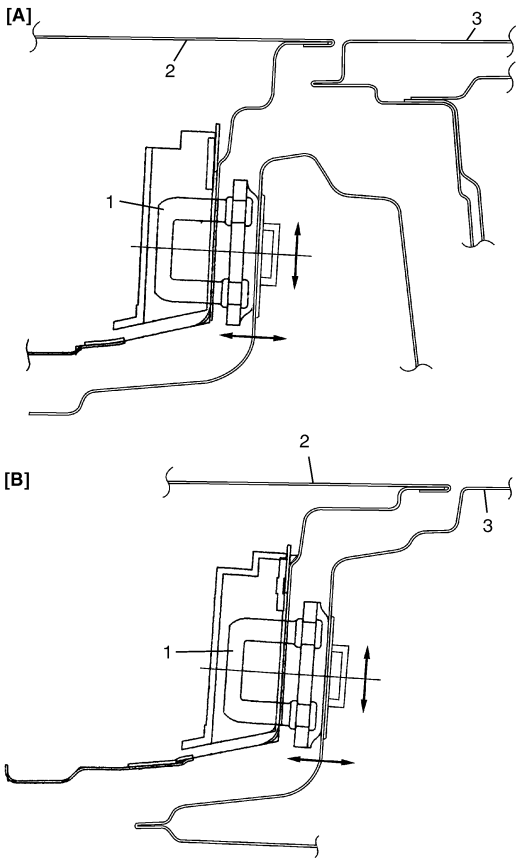
Tightening torque
Door latch striker screw (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0A960029-01

3. Shaft

- Move door latch striker (1) sideways to adjust door outer panel surface (2) flush with rear door outer panel or body outer panel surface (3) as shown. In order to correctly obtain door lock operation increase or decrease number of shims inserted between body and striker (1) to adjust it.



I3RM0A960013-01

[A]: Front door (5 door model)
[B]: Rear door (5 door model) or front door (3 door model)

Front Door Lock Assembly Inspection

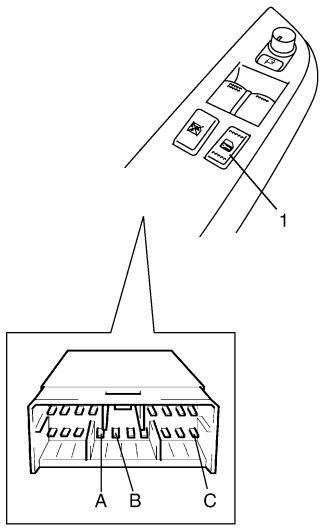
S7N20A9606003

- Check that door open and closes smoothly and properly.
- Check that door stops in the secondary latched position properly (preventing door from opening freely) and that door closed completely in the fully latched position.
- Adjust door latch striker position, if necessary.

Power Door Lock Switch Inspection

S7N20A9606004

Check for continuity between terminals at each switch position. If check result is not as specified, replace switch.



Switch \ Terminal	A	B	C
LOCK	○		○
OFF			
UNLOCK	○	○	

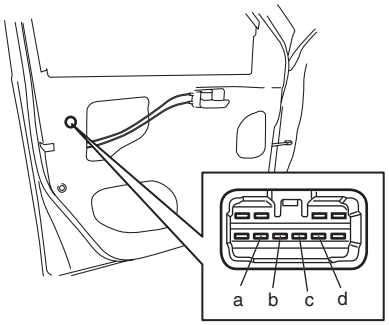
I4RS0B960006-01

1. Power door lock switch

Door Key Cylinder Switch Inspection

S7N20A9606005

1) Remove front door trim referring to Step 1) to 3) of "Front Door Glass Removal and Installation in Section 9E"
2) Check for continuity between terminals at each switch position. If check result is not as specified, replace door lock assembly.



Right side switch terminals	b	c	d
Left side switch terminals	c	b	a
LOCK	○		○
OFF			
UNLOCK	○	○	

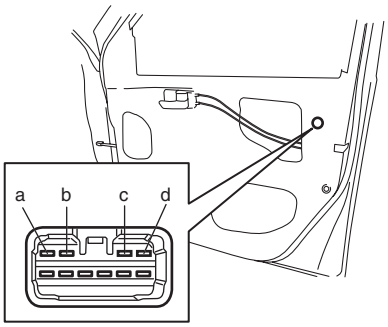
I4RS0B960007-01

Power Door Lock Actuator Inspection (If Equipped)

S7N20A9606006

1) Remove door trim from door panel.
   For front door, refer to Step 1) to 3) of “Front Door Glass Removal and Installation in Section 9E”.
   For rear door, refer to Step 1) to 4) of “Rear Door Glass Removal and Installation in Section 9E”.
   For rear end door, refer to Step 1) of “Rear End Door Assembly Removal and Installation in Section 9J”.
2) Disconnect power door lock actuator coupler.
3) Connect battery positive (+) and negative (–) terminals to the door lock actuator terminals (a, b, c, d) as shown in figure.
   If it does not operate as specified in the following table, replace door lock assembly.

For front door



[A]

Right side switch terminals			d	b
Left side switch terminals			a	c
Lock	→	Unlock	⊕	⊖
Unlock	→	Lock	⊖	⊕

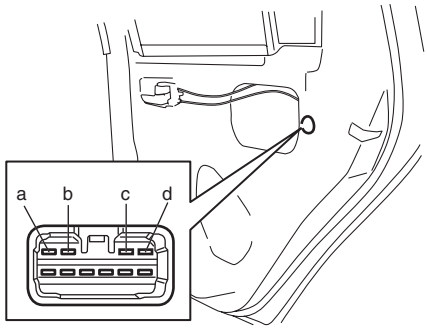
[B]

Right side switch terminals			d	**b**	a
Left side switch terminals			a	**c**	d
Unlock	→	Lock	⊖	⊕	⊖
Lock	→	Deadlock	⊖	⊕	⊕
Lock	→	Unlock	⊕	⊖	⊖
Deadlock	→	Unlock			

I5RW0C960002-03

[A[: Without deadlock
[B]: With deadlock

For rear door



[A]

Right side switch terminals			a	c
Left side switch terminals			d	b
Lock	→	Unlock	⊕	⊖
Unlock	→	Lock	⊖	⊕

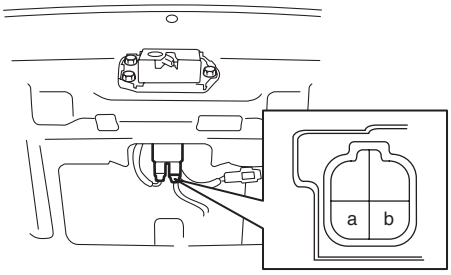
[B]

Right side switch terminals			a	**c**	d
Left side switch terminals			d	**b**	a
Unlock	→	Lock	⊖	⊕	⊖
Lock	→	Deadlock	⊖	⊕	⊕
Lock	→	Unlock	⊕	⊖	⊖
Deadlock	→	Unlock			

I5RW0C960001-03

[A]: Without deadlock
[B]: With deadlock

For rear end door

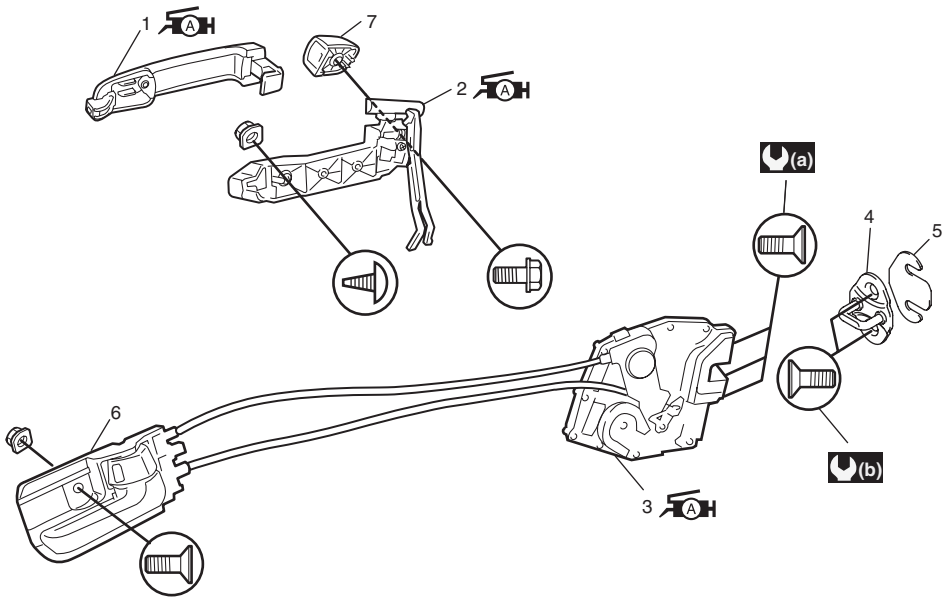


			a	b
Lock	→	Unlock	⊕	⊖

I5RW0C960003-03

Rear Door Lock Assembly Components

S7N20A9606007



I4RS0A960012-02

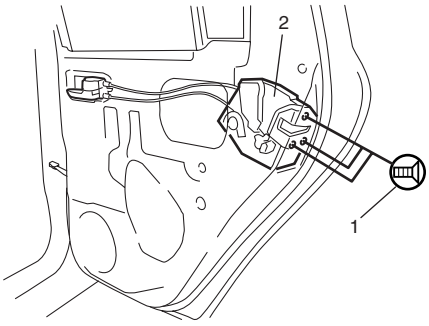
1. Outside handle : Apply lithium grease 99000-25010 to sliding part.	4. Latch striker	7. Out side handle cap
2. Outside handle frame : Apply lithium grease 99000-25010 to sliding part and spring.	5. Shim	(a) : 5.0 N·m (0.5 kgf-m, 4.0 lbf-ft)
3. Rear door latch assembly : Apply lithium grease 99000-25010 to sliding part.	6. Inside handle bezel	(b) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

Rear Door Lock Assembly Removal and Installation

S7N20A9606008

Removal

1) Remove rear door glass referring to “Rear Door Glass Removal and Installation in Section 9E”.
2) Disconnect door lock motor lead wire.
3) Remove door latch mounting screws (1) and remove door latch assembly (2).



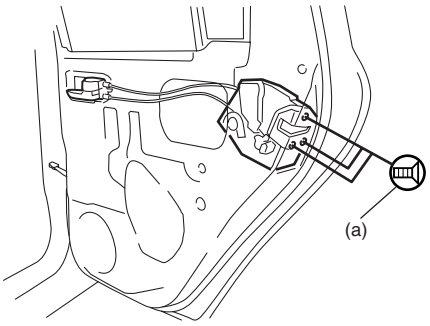
I4RS0A960013-01

Installation

Reverse removal procedure to install rear door lock assembly referring to the following instruction and “Front Door Lock Assembly Removal and Installation”.

- Tighten door latch screw to specified torque.

  Tightening torque
  Door latch screw (a): 5.0 N·m (0.5 kgf-m, 4.0 lbf-ft)



I4RS0A960014-01

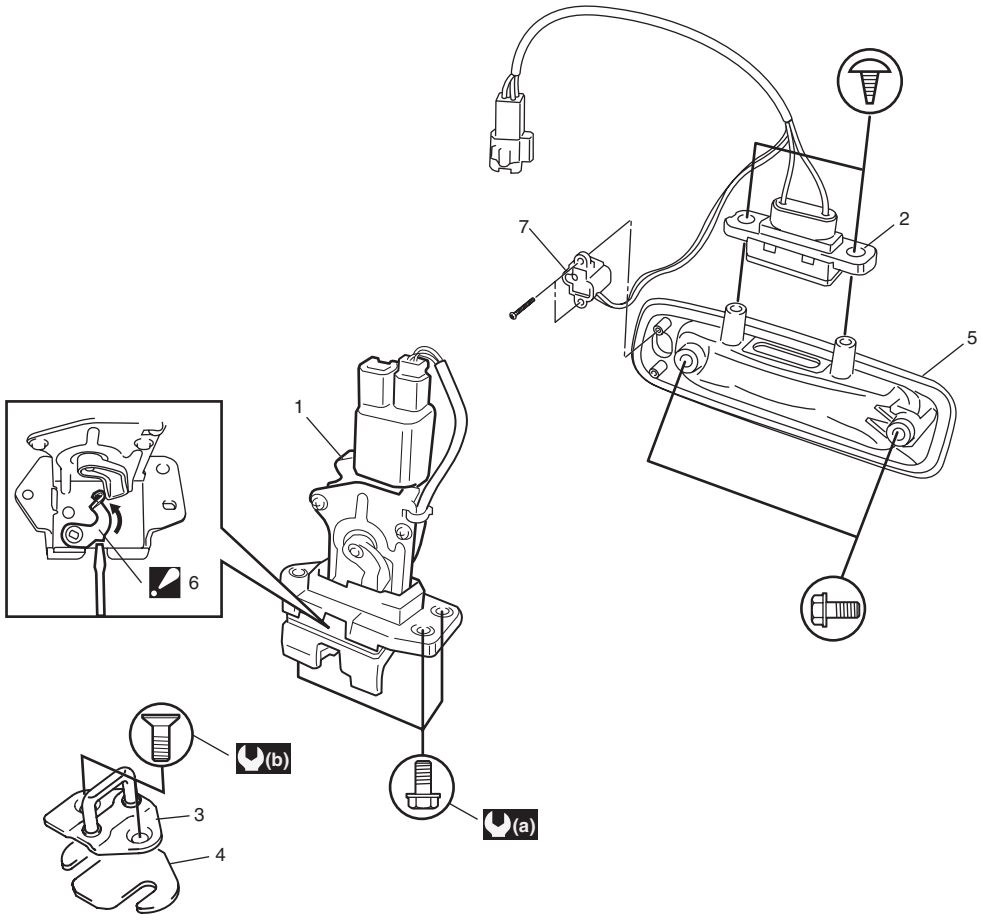
Rear Door Lock Assembly Inspection

S7N20A9606009

- 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.

Rear End Door Lock Assembly Components

S7N20A9606010



I4RS0B960009-01

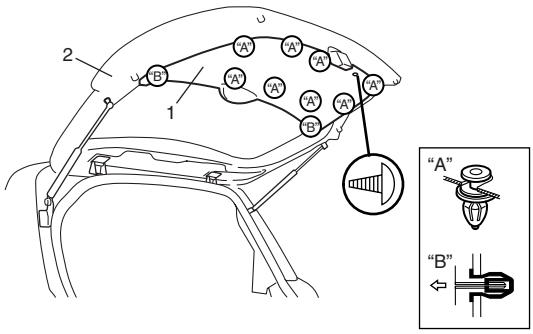
1. Rear end door latch assembly (rear end door switch is built in this assembly)	4. Shim	7. Rear end door request switch
2. Rear end door opener switch	5. Door handle	(a) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Latch striker	6. Emergency lever : Rear end door is unlocked by pushing emergency lever with flat head driver if rear end door lock can not be released by door opener switch.	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)

Rear End Door Lock Assembly Removal and Installation

S7N20A9606011

Removal

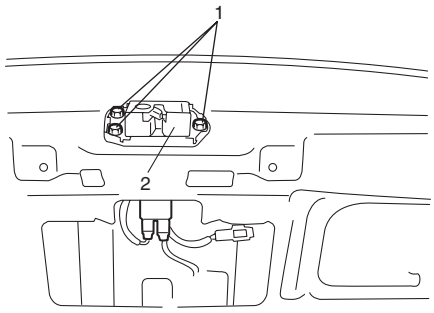
1) Remove door trim (1) from rear end door panel (2).



I4RS0A960016-01

2) Disconnect door lock motor lead wire.

3) Loosen door latch bolts (1) and remove door latch assembly (2).

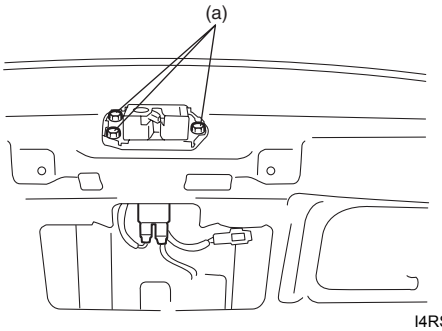


I4RS0A960017-01

Installation
Reverse removal procedure to install rear end door lock assembly noting the following instruction.

- Tighten rear end door latch bolt to specified torque.

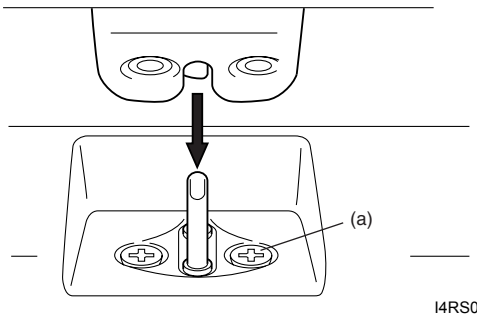
  Tightening torque
  Rear end door latch bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)



I4RS0A960018-01

- 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)



I4RS0A960019-01

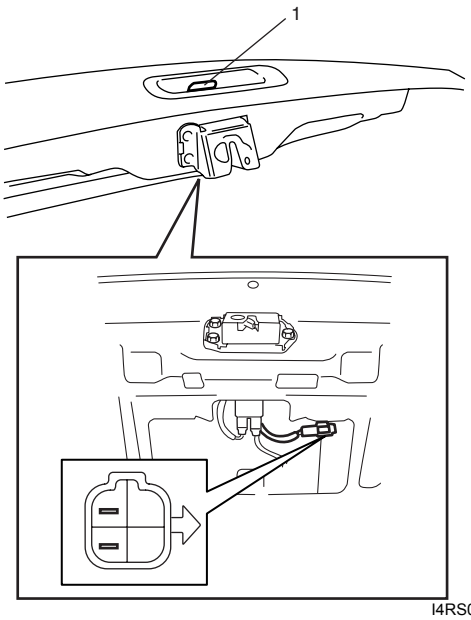
Rear End Door Lock Assembly Inspection
S7N20A9606012

- 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.

Rear End Door Opener Switch Inspection
S7N20A9606013

1) Remove rear end door trim.
2) Disconnect rear end door switch coupler.
3) Check that there is continuity between terminals when rear end door opener switch (1) is pushed.
4) Check that there is no continuity between terminals when rear end door opener switch (1) is not pushed.

If check result is not as specified, replace switch.



I4RS0A960020-01

Replacement of Transmitter Battery
S7N20A9606014

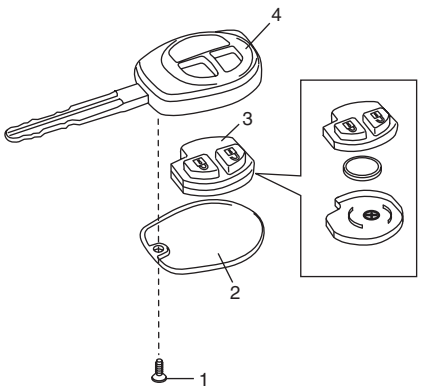
If transmitter becomes unreliable, replace transmitter battery as follows.

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 be attached on 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 1620 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.**

Programming Transmitter Code

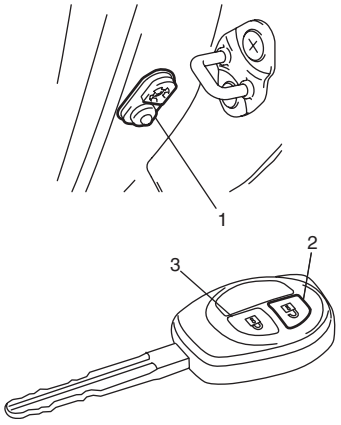
S7N20A9606015

NOTE

- **Three transmitter codes can be registered.**
- **When a new transmitter code is registered, the oldest one will be cleared.**
- **For vehicle equipped with keyless start system, refer to "Registration Procedure for Remote Controller ID Code in Section 10E".**

If transmitter or BCM (included in junction block assembly) 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 drawn 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 drawn ignition key from ignition key cylinder within 10 seconds after that. All doors automatically lock and unlock once.
   With this, registration mode.
6) Push "UNLOCK" button (2) on transmitter (3) within 20 seconds after Step 5). All doors automatically lock and unlock once.
   With this, code registration is completed.
7) If an additional transmitter, needs to be programed repeat the procedure of Step 1).



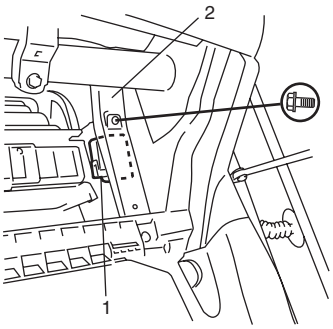
I4RS0B960010-01

Keyless Entry Receiver Removal and Installation

S7N20A9606016

Removal

1) Disconnect negative cable at battery.
2) Remove grove box referring to Step 6) of "Instrument Panel Removal and Installation in Section 9C".
3) Disconnect keyless entry receiver coupler.
4) Remove keyless entry receiver (1) from steering support member (2).



I4RS0B960011-01

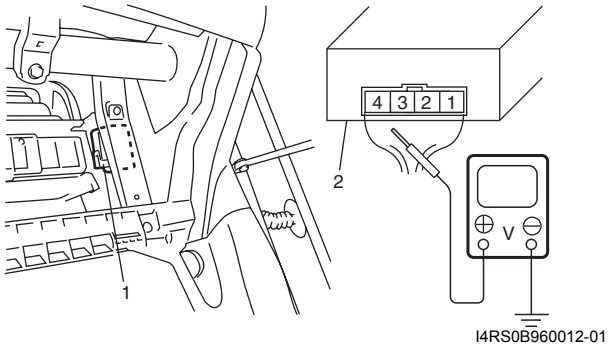
Installation

Reverse removal procedure.

Keyless Entry Receiver and Its Circuit Inspection

S7N20A9606017

1) Check that the voltage between the following terminals and body ground are specifications under each conditions. If check result is not as specified, check applicable circuit for open or short. If circuit is normal, proceed to next step.



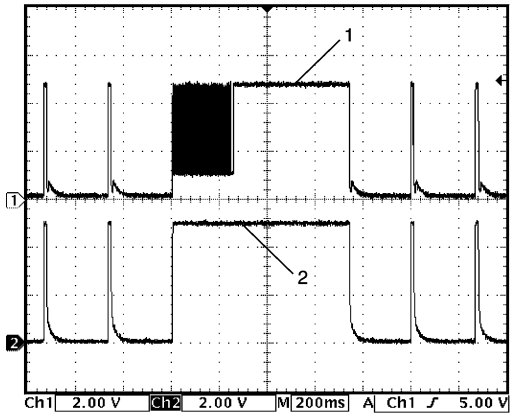
I4RS0B960012-01

1. Keyless entry receiver
2. Keyless entry receiver connector (view from harness side)

Terminal	Wire color	Circuit	Specification	Condition
G02-1	LT GRN	Power source	Figure [A]	Push “Lock” or “Unlock” button on transmitter.
			0-1 V	Except the above-mentioned condition.
G02-3	PNK	Lock/Unlock output signal circuit	Figure [A]	Push “Lock” or “Unlock” button on transmitter.
			0-1 V	Except the above-mentioned condition.
G02-4	BRN/WHT	Ground	0-1 V	—

Oscilloscope setting
CH1: 2V/DIV
CH2: 2V/DIV
TIME: 200 ms/DIV

[A]



I4RS0A960024-01

1. Lock/Unlock out put signal
2. Power source

1) Recheck keyless entry receiver as follows.
   a) Substitute a known-good keyless entry receiver.
   b) Record key code referring to “Programming Transmitter Code”.
   c) Recheck keyless entry receiver system.

Specifications

Tightening Torque Specifications

S7N20A9607001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Door latch screw	5.0	0.5	4.0	☞ / ☞
Door latch striker screw	10	1.0	7.5	☞
Rear end door latch bolt	10	1.0	7.5	☞
Rear end door striker screw	23	2.3	17.0	☞

NOTE

The specified tightening torque is also described in the following.
“Front Door Lock Assembly Components: ”
“Rear Door Lock Assembly Components: ”
“Rear End Door Lock Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A9608001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞

NOTE

Required service material is also described in the following.
“Front Door Lock Assembly Components: ”
“Rear Door Lock Assembly Components: ”

Seats

Diagnostic Information and Procedures

Front Seat Heater Symptom Diagnosis (If Equipped)

S7N20A9704001

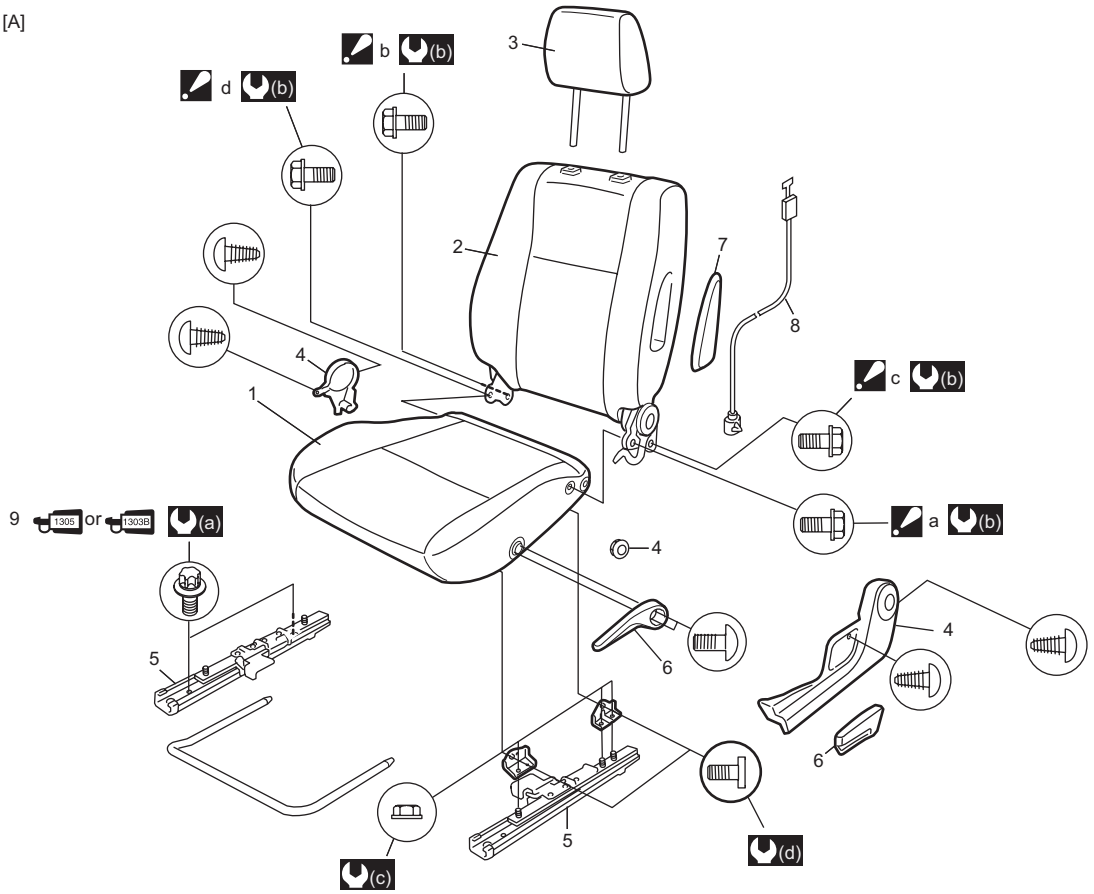
Condition	Possible cause	Correction / Reference Item
Both seat back and cushion do not become hot although seat heater switch is ON position	Wiring or grounding faulty	*Repair.*
	"SEAT HTR" fuse blown	*Replace fuse to check for short.*
	Seat heater switch faulty	*Replace switch.*
	Seat heater circuit in seat back and/or seat cushion faulty	*Replace heater front back and/or heater front cushion.*
Only seat back does not become hot although seat heater switch is ON position	Wiring faulty	*Repair.*
	Seat heater circuit in seat back and/or seat cushion faulty	*Replace heater front back and/or heater front cushion.*
Only seat cushion does not become hot although seat heater switch is ON position	Wiring faulty	*Repair.*
	Seat heater circuit in seat cushion faulty	*Replace heater front cushion.*

Repair Instructions

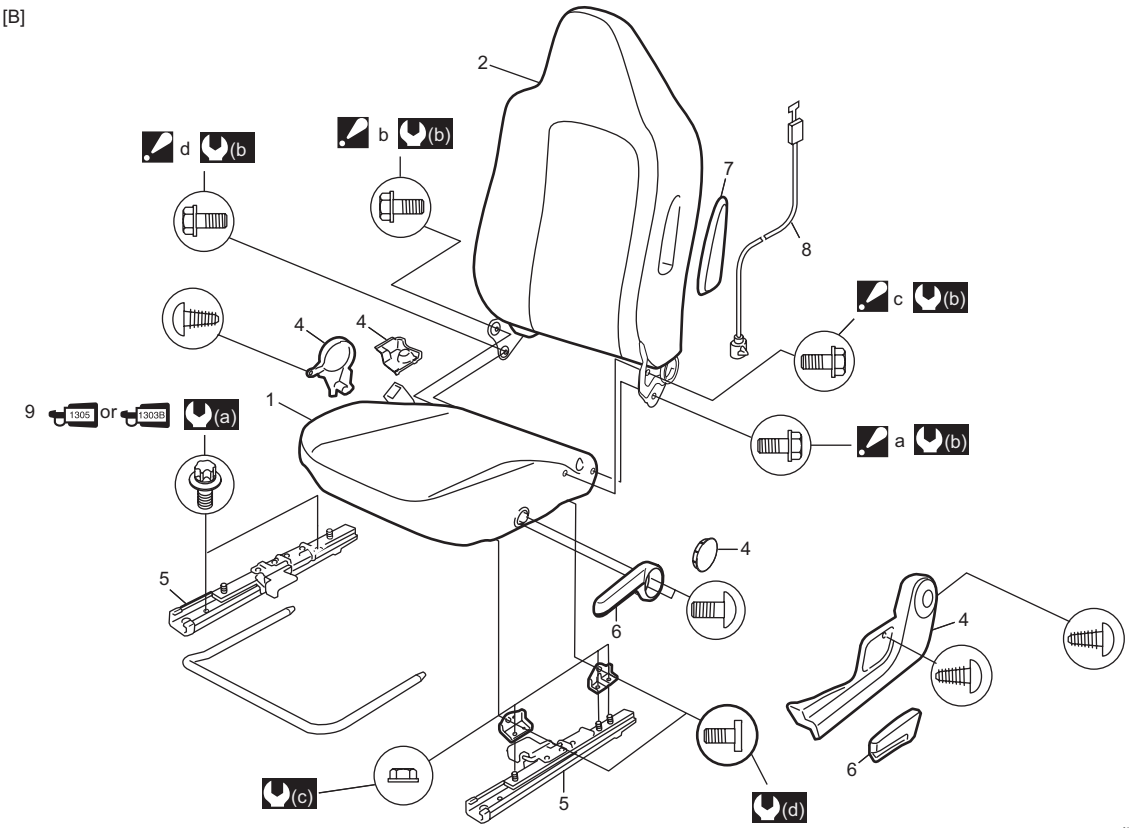
Front Seat Components

S7N20A9706001

[A]



[B]



I7N20A970001-02

[A]: Type A	5. Seat adjuster	(b) : 35 N·m (3.5 kgf-m, 25.5 lbf-ft)
[B]: Type B	6. Knob	(c) : 29 N·m (2.9 kgf-m, 21.0 lbf-ft)
1. Seat cushion	7. Side air bag module (if equipped)	(d) : 23 N·m (2.3 kgf-m, 17.0lbf-ft) (Non seat lifter type)8.4 N·m (0.86kgf-m, 6.5lbf-ft) (Seat lifter type)
2. Seat back	8. Side air bag harness (if equipped)	a, b, c, d: Seat back mounting bolt Tightening order: a → b → c → d
3. Headrest	1305 or 1303B 9. Seat mounting bolt : Apply thread lock 99000–32100 or 99000–32030 to all around thread part of bolt.	
4. Cover	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	

Front Seat Removal and Installation

S7N20A9706002

Removal

1) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
2) Disconnect seat harness coupler, seat heater coupler and side air bag coupler, if equipped.
3) Remove 4 mounting bolts to remove seat assembly.
4) Disassemble and repair seat as necessary.

Installation

Reverse removal procedure to install front seat.

- Apply thread lock cement to seat mounting bolt.

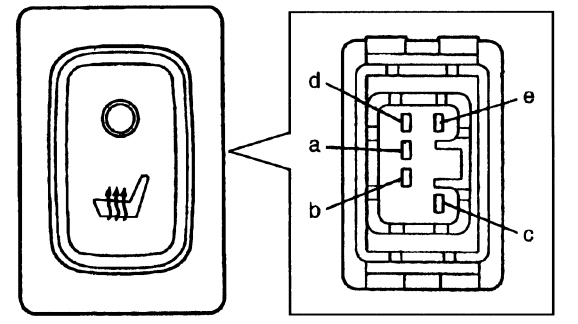
:Thread lock cement 99000–32100 or 99000–32030

- Torque to specifications as shown in “Front Seat Components”.
- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Front Seat Heater Switch (Driver and Passenger Side) Inspection (If Equipped)

S7N20A9706003

1) Confirm that ignition switch is OFF position.
2) Remove rear console box.
3) Disconnect seat heater switch coupler.
4) Check for continuity between terminals at each switch position as shown below. If check result is not as specified, replace.



POSITION \ TERMINAL	a	b	c	d	e
OFF		○	○	○	○
ON	○	○	○	○	○

I6RS0B970001-01

Front Seat Heater Wire Inspection (If Equipped)

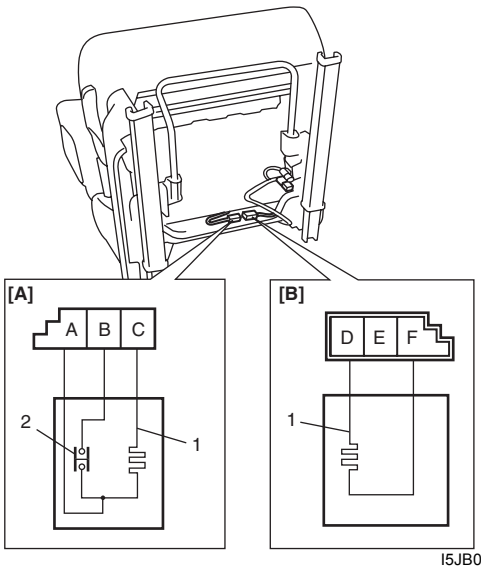
S7N20A9706004

1) Confirm that seat heater switch is OFF position.
2) Disconnect coupler of seat heater under the seat cushion.
3) Measure resistance between terminals as shown below. If resistance is out of specification, replace faulty seat cushion and/or seat back including seat heater.

Seat heater circuit resistance

Seat cushion side [A] (between terminal “B” and “C”, between terminal “A” and “C”): 4.7 – 5.7 Ω (at 20 °C, 68 °F)

Seat back side [B] (between terminal “F” and “D”): 10.7 – 13.1 Ω (at 20 °C, 68 °F)



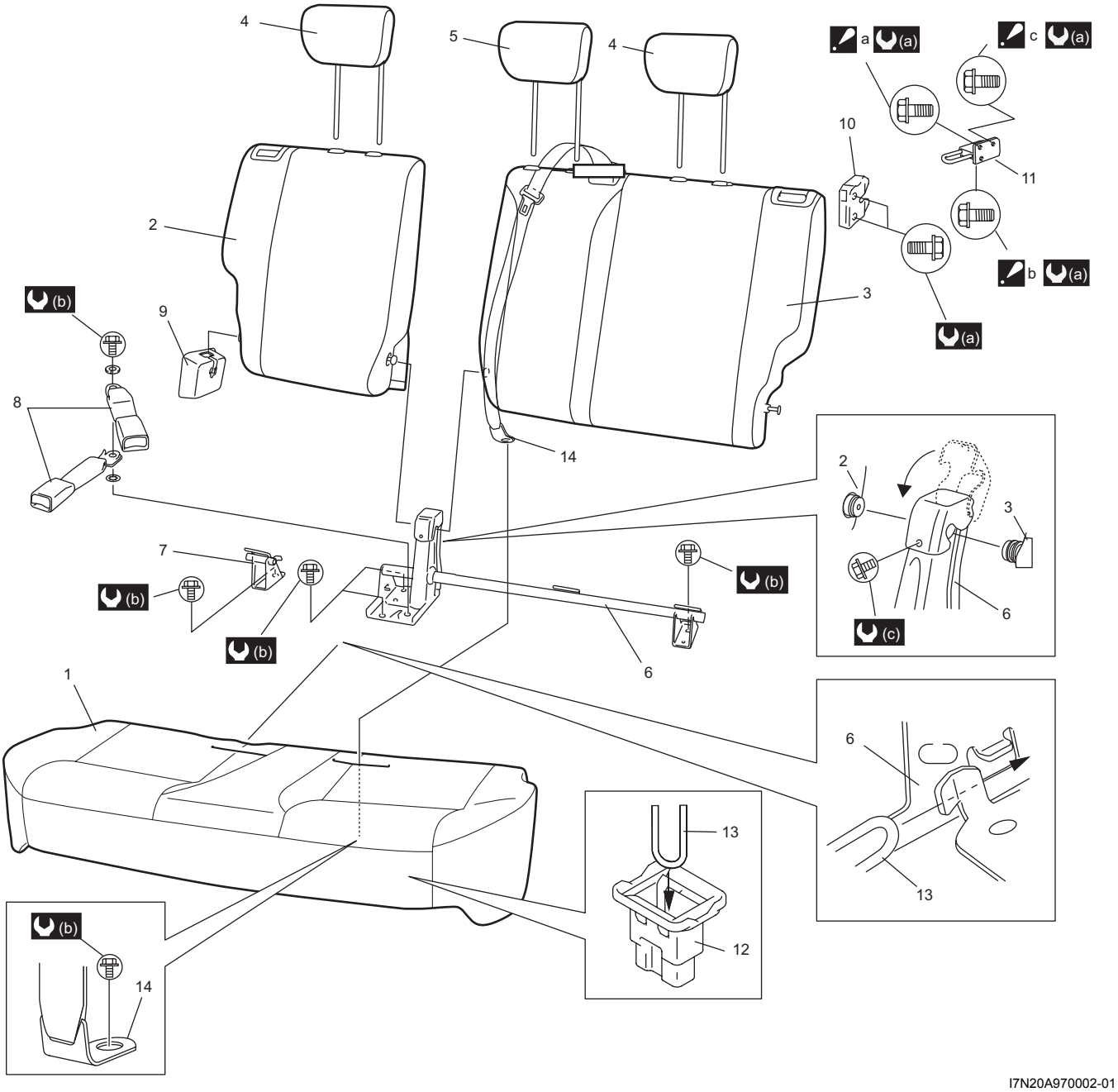
I5JB0A970002-01

1. Heater wire	[A]: Seat cushion side
2. Thermostat	[B]: Seat back side

Rear Seat Components

S7N20A9706005

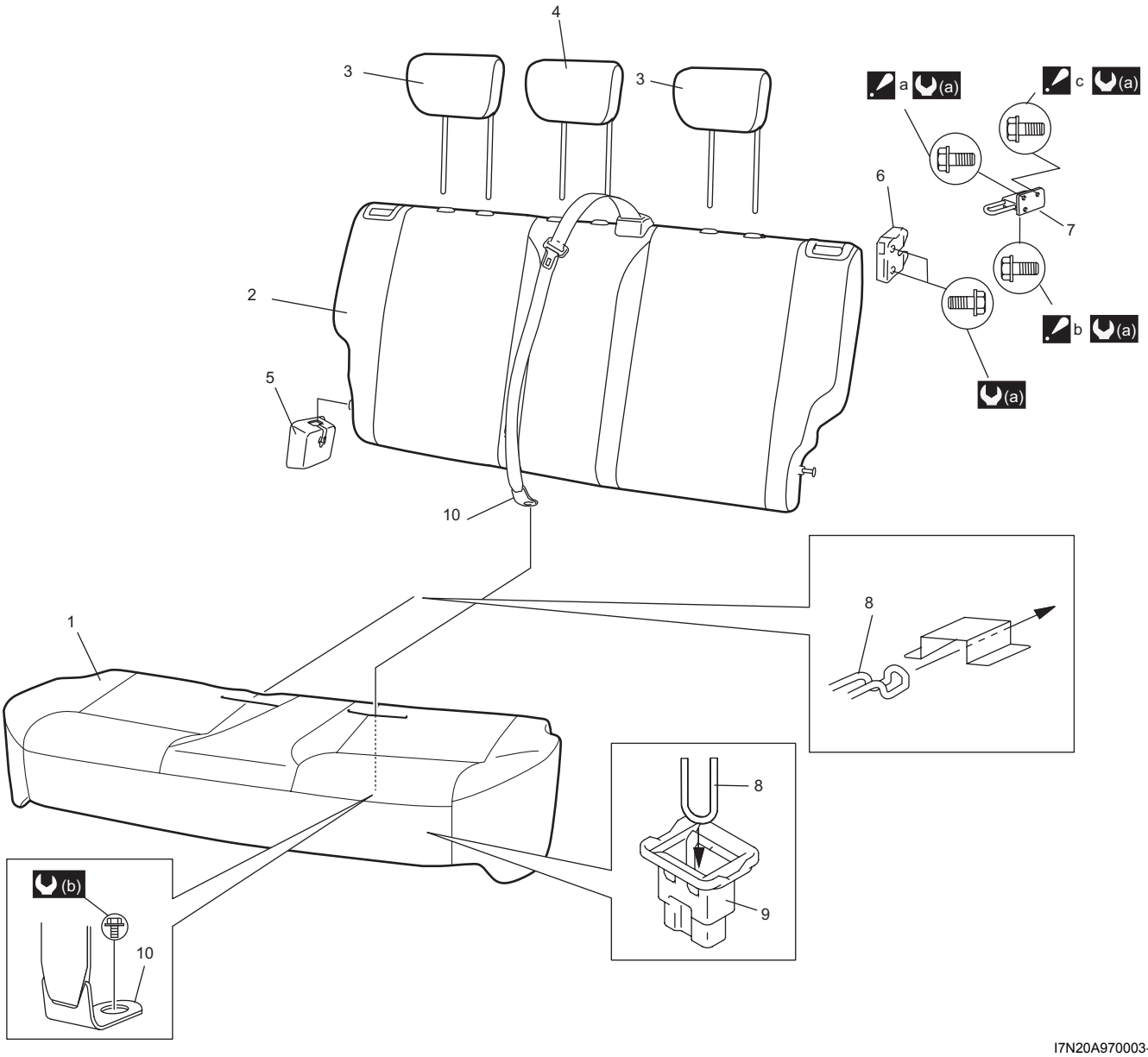
Separate Type



I7N20A970002-01

1. Rear seat cushion	8. Rear seat belt buckle	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
2. Rear seat back (right side)	9. Seat hinge bracket	(b) : 43 N·m (4.3 kgf-m, 31.5 lbf-ft)
3. Rear seat back (left side)	10. Seat back lock	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
4. Head rest	11. Seat back striker	a, b, c: Seat back striker mounting bolt : Tightening order (left side): a → b → c : Tightening order (right side): b → a → c
5. Head rest (if equipped)	12. Seat cushion hook	
6. Rear seat center hinge	13. Seat cushion insert wire	
7. Child anchorage bracket	14. Anchor plate (if equipped)	

Bench Type



I7N20A970003-01

1. Rear seat cushion	6. Seat back lock	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
2. Rear seat back	7. Seat back striker	(b) : 48 N·m (4.9 kgf-m, 35.0 lbf-ft)
3. Head rest	8. Seat cushion insert wire	(c) : 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
4. Head rest (if equipped)	9. Seat cushion hook	a, b, c: Seat back striker mounting bolt : Tightening order (left side): a → b → c : Tightening order (right side): b → a → c
5. Seat hinge bracket	10. Anchor plate (if equipped)	

Rear Seat Removal and Installation

S7N20A9706006

Removal

1) Remove seat cushion
   Simply pull up front end hook.
2) Remove center seat belt anchor bolt (if equipped).
3) Remove seat-mounting bolt on rear seat center hinge (for separate type).
4) Pull up seat back and remove it.
5) Disassemble and repair seat as necessary.

Installation

Reverse removal procedure to install rear seat.

- Specified tightening torque is shown in “Rear seat components”.
- Align seat cushion insert wire with center hinge bracket when installing seat cushion.

Specifications

Tightening Torque Specifications

S7N20A9707001

NOTE

The specified tightening torque is also described in the following.
“Front Seat Components: ”
“Rear Seat Components: ”

Reference:

For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A9708001

NOTE

Required service material is also described in the following.
“Front Seat Components: ”

Interior Trim

Repair Instructions

Floor Carpet Removal and Installation

S7N20A9806001

⚠ WARNING

Refer to “Air Bag Warning in Section 00” before starting service work.

Removal

1) Remove front seat and rear seat referring to “Front Seat Removal and Installation in Section 9G” and “Rear Seat Removal and Installation in Section 9G”.
2) Remove seat belt lower anchor bolts.
3) Remove dash side trims, front side sill scuffs, center pillar inner lower trims, rear side sill scuffs (if equipped), quarter inner front lower trims.
4) Remove console box.
5) Remove floor carpet.

Installation

Reverse removal sequence to install front floor carpet, noting the following instruction.

- For tightening torque of rear seat mounting bolt, refer to “Rear Seat Components in Section 9G”.
- For tightening torque of front seat mounting bolt, refer to “Front Seat Components in Section 9G”.

Head Lining Removal and Installation

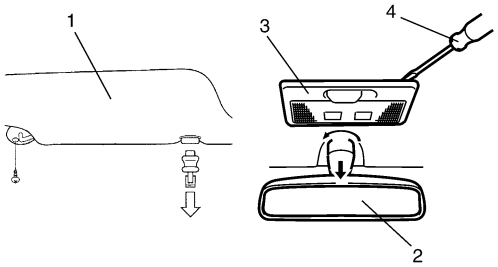
S7N20A9806002

⚠ WARNING

Refer to “Air Bag Warning: in Section 00” before starting service work.

Removal

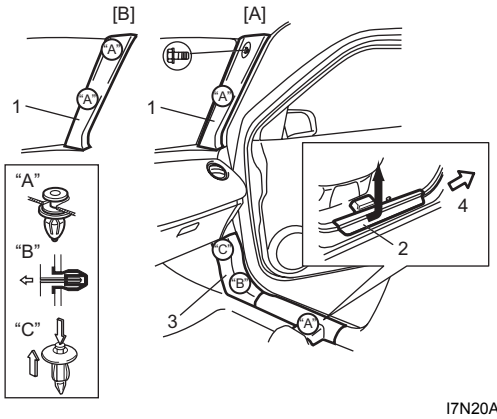
1) Remove sun visor (1).
2) Remove room mirror (2).
3) Remove dome light (3).



I4RS0A980011-01

4.	Flat head driver

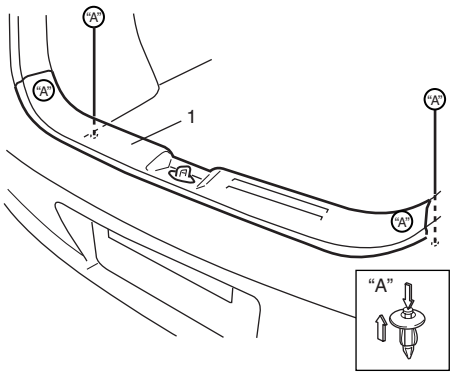
4) Remove front pillar trim (1), front side sill scuff (2) and dash side trim (3).



I7N20A980001-03

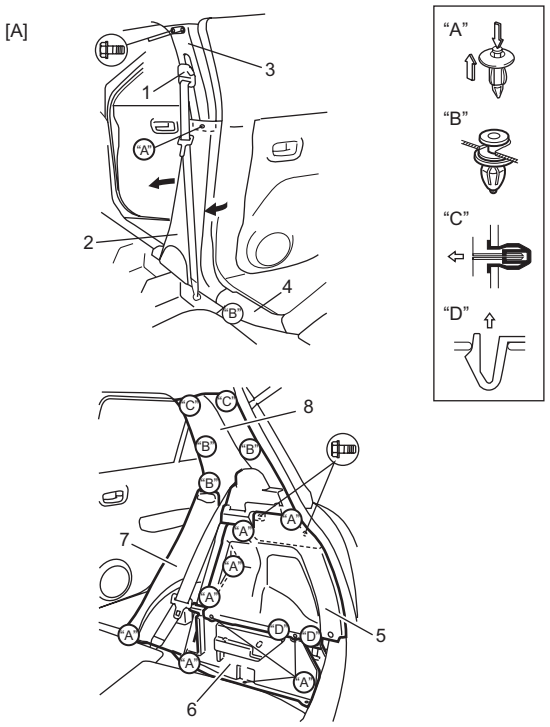
[A]:	With curtain air bag
[B]:	Without curtain air bag
4.	Forward

5) Remove rear seat referring to “Rear Seat Removal and Installation in Section 9G”.
6) Remove rear seat center hinge and child anchorage bracket referring to “Rear Seat Components in Section 9G” (if equipped).
7) Remove rear seat belt lower anchor bolt.
8) Remove tail end member trim (1).



I4RS0A980003-01

9) Remove front seat belt upper anchor (1), center pillar inner lower trim (2), center pillar inner upper trim (3), rear side sill scuff (4), quarter inner rear upper trim (6), quarter inner rear lower trim (5), quarter inner front lower trim (7), and quarter inner upper trim (8).

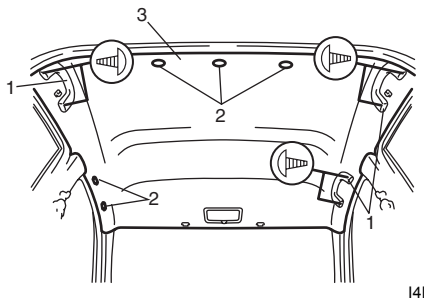


I7N20A980002-01

[A]: For 5 door model
[B]: For 3 door model

10) Remove assistant grip (1) (if equipped).

11) Remove head lining clips (2) then remove head lining (3).

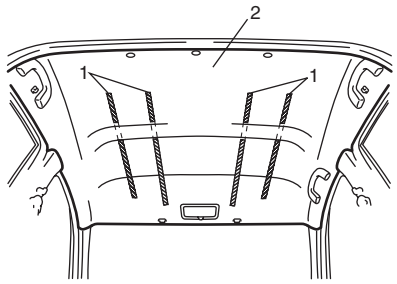


I4RS0B980003-01

Installation

Reverse removal procedure noting the following.

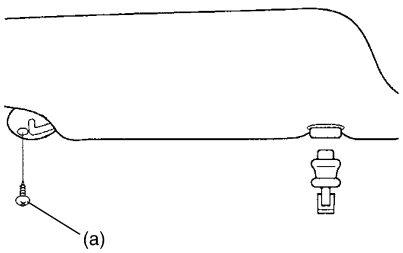
- Apply adhesive (1) to head lining (2) as shown in the figure, and then install head lining (2).



I4RS0B980004-01

- Tighten sun visor screw to specified torque.

  Tightening torque
  Sun visor screw (a): 4 N·m (0.4 kgf-m, 3.0 lbf-ft)

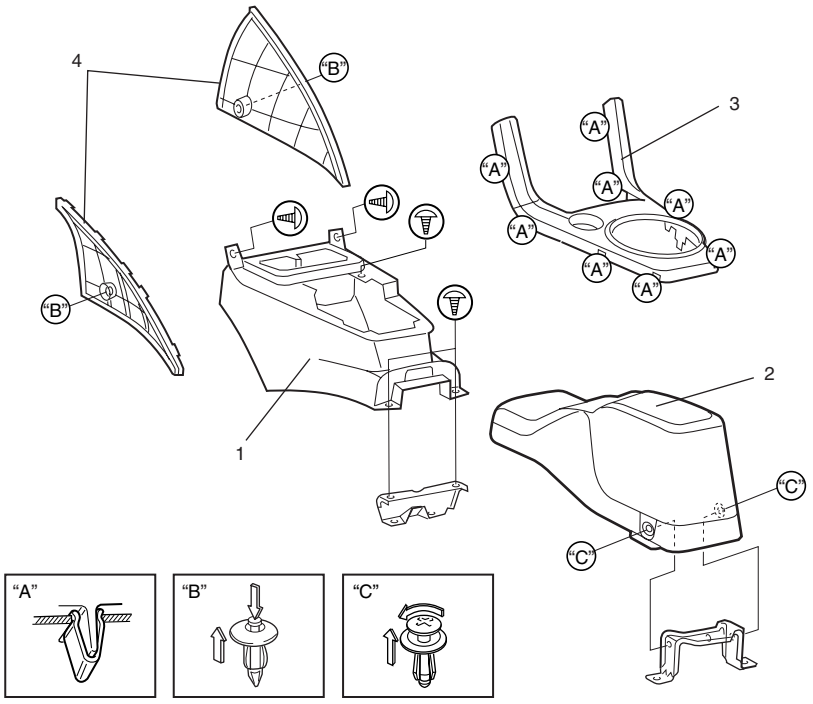


I4RS0A980007-01

- Specified tightening torque for front seat belt upper anchor bolt, refer to “Front Seat Belt Components in Section 8A”.
- Specified tightening torque for rear seat belt lower anchor bolt, refer to “Rear Seat Belt Components in Section 8A”.
- Specified tightening torque for rear seat center hinge bolt and child anchorage bracket bolt, refer to “Rear Seat Components in Section 9G”.

Console Box Components

S7N20A9806003



I4RS0A980008-01

1. Front console box	3. Front console box garnish
2. Rear console box	4. Console side cover

Specifications

Tightening Torque Specifications

S7N20A9807001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Sun visor screw	4	0.4	3.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Hood / Fenders / Doors

Repair Instructions

Hood Removal and Installation

S7N20A9A06001

Removal

⚠ CAUTION

Place cloth to prevent body from any damage.

1) Remove hood silencer (4).
2) Disconnect window washer hose (1) from hood.
3) Remove 4 mounting bolts (3) to detach hood (2).

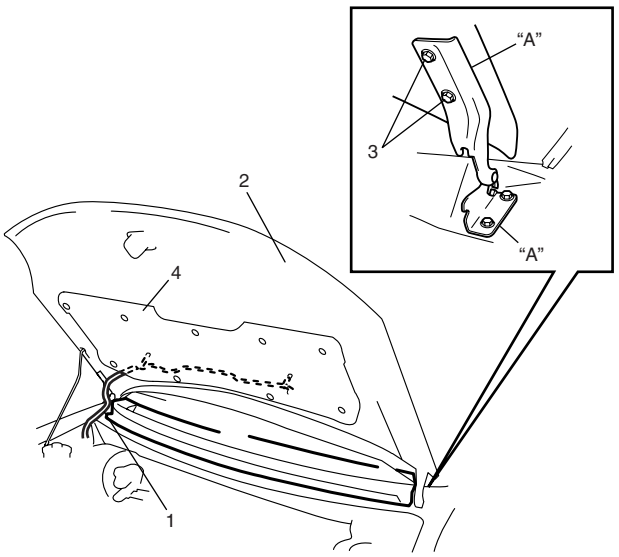
Installation

Reverse removal procedure noting the following.

- Apply sealant to contact face “A” of hood hinge. Specified sealant.

  “A”: Sealant 99000–31110 (SUZUKI Bond No.1215)

- Adjust hood lock position if necessary referring to “Hood Inspection and Adjustment”.



I4RS0A9A0001-01

Hood Inspection and Adjustment

S7N20A9A06002

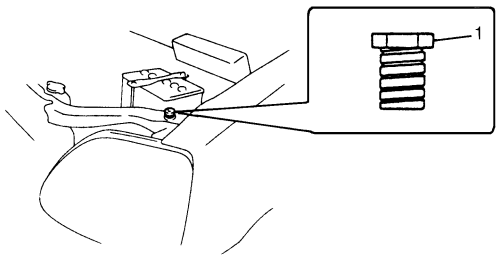
Inspection

- Check that hood opens and closes smoothly and properly. Lubricate if necessary.
- Check that hood stops in the secondary latched position properly (preventing hood from opening freely) and that hood closes completely in the fully latched position.
- Adjust hood locks position, if necessary.

Adjustment

Adjust the following point:

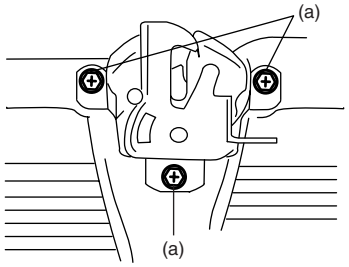
- Hood position adjustment.
  Fore-and-aft and right-and-left adjustment.
  Adjust hood clearance by loosening hood mounting bolts. Refer to “Panel Clearance in Section 9K”.
- Vertical adjustment
  If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion (1).



I2RH019A0022-01

- Hood lock position adjustment
  a. Loosen hood lock bolts.
  b. Adjust hood lock height position so the hood is locked without looseness.
  c. Tighten hood latch bolts to specified torque.

     Tightening torque
     Hood latch bolt (a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)

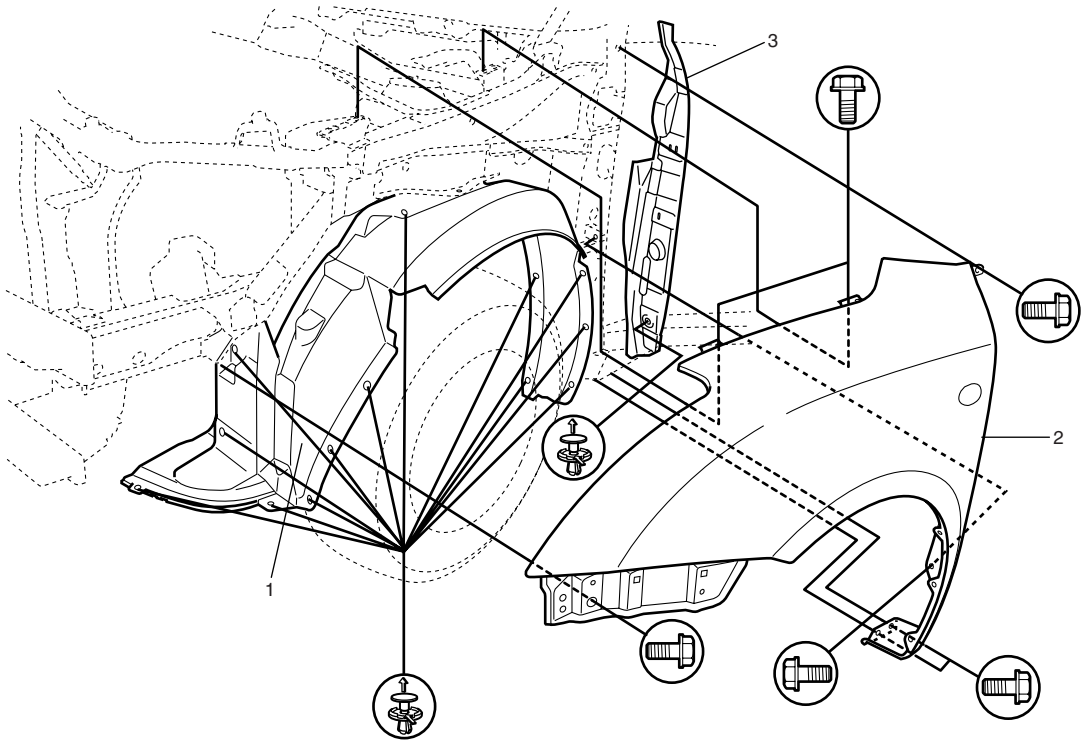


I4RS0A9A0002-01

  d. Make sure the hood is locked smoothly and securely.

Front Fender Components

S7N20A9A06003



I4RS0A9A0003-01

1. Front fender lining	2. Front fender	3. Front fender cover

Front Fender Removal and Installation

S7N20A9A06004

Removal

1) Remove splash guard (if equipped) referring to “Splash Guard (If Equipped) Components in Section 9M”.
2) Remove front fender lining.
3) Remove front bumper referring to “Front Bumper and Rear Bumper Components in Section 9K”.
4) Remove headlight assembly referring to “Headlight Housing Removal and Installation in Section 9B”.
5) Disconnect connector from side turn signal lamp.
6) Remove front fender cover.
7) Remove front fender.

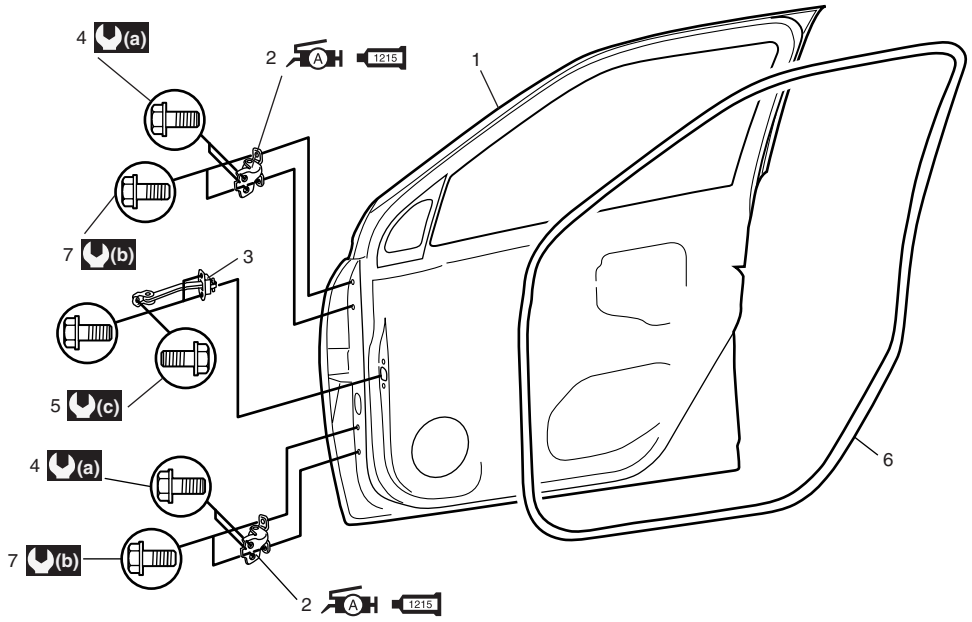
Installation

Reverse removal procedure to install front fender noting the following instruction.

- If paint on fender bolt is peeled off, be sure to apply paint again.
- Adjust panel clearance referring to “Panel Clearance in Section 9K”.

Front Door Assembly Components

S7N20A9A06005



I4RS0A9A0004-01

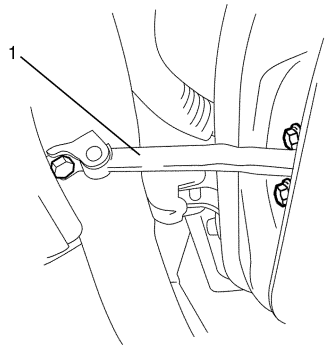
1. Door panel	5. Door open stopper bolt	(b) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
A 1215 2. Door hinge : Apply lithium grease 99000-25010 to rotating part. : Apply sealant 99000-31110 to contact face.	6. Front door opening weather-strip	(c) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)
3. Door open stopper	7. Front door hinge bolt (door side)	
4. Front door hinge bolt (body side)	(a) : 27 N·m (2.7 kgf-m, 19.5 lbf-ft)	

Front Door Assembly Removal and Installation

S7N20A9A06006

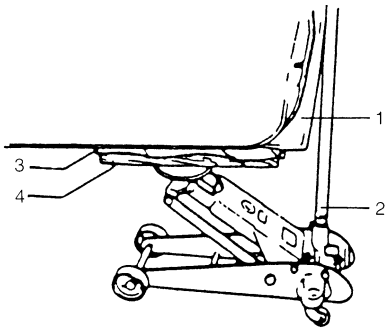
Removal

1) Remove front fender referring to “Front Fender Removal and Installation”.
2) Disconnect door harness lead wires at each coupler.
3) Remove door open stopper (1).



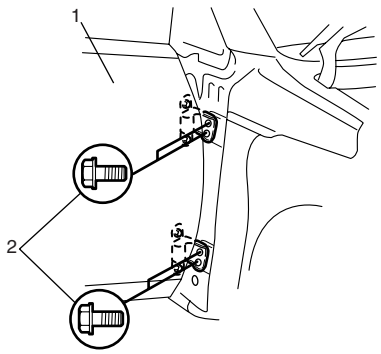
I4RS0A9A0005-01

4) Support door panel (1) using a jack (2) with rags (3) and a piece of wood (4) placed between jack (2) and panel (1) as shown.



I2RH019A0003-01

5) Remove door assembly (1) by loosening hinge mounting bolts (2).



I4RS0A9A0006-01

Installation

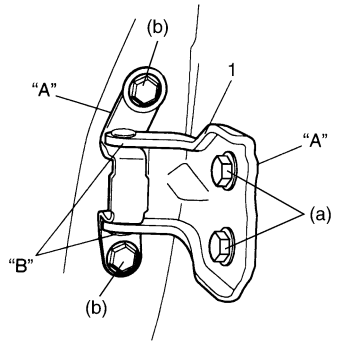
Reverse removal procedure to install door assembly noting the following instructions.

- When replacing door, coat replacement door inside with wax for proper anti-corrosion treatment. Refer to “Sealant Application Areas in Section 9L”.
- Apply sealant to contact face “A” of hinge (1) and apply grease to rotating part “B” of hinge (1). Specified sealant and grease.

  “A”: Sealant 99000–31110 (SUZUKI Bond No.1215)
  “B”: Grease 99000–25010 (SUZUKI Super Grease A)

- Tighten hinge bolt to specified torque.

  Tightening torque
  Door hinge mounting bolt (body side) (a): 27 N·m (2.7 kgf-m, 19.5 lbf-ft)
  Door hinge mounting bolt (door side) (b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



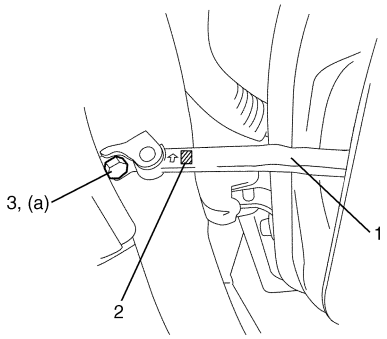
I4RS0A9A0007-01

- When door open stopper (1) is installed, be careful make sure punch mark (2) comes to the top.

  Door open stopper installing direction
  Left side door: L punch mark is upward
  Right side door: R punch mark is upward

- Tighten door open stopper bolt (3) to specified torque.

  Tightening torque
  Door open stopper bolt (a): 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

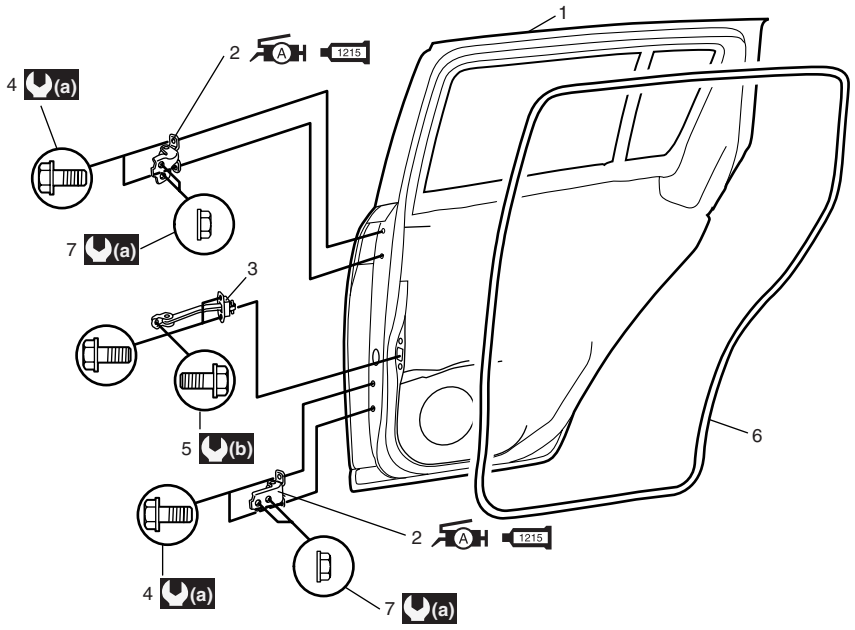


I4RS0A9A0008-01

- Adjust door latch striker position referring to “Front Door Lock Assembly Removal and Installation in Section 9F”.
- Adjust front door cushion so that door becomes flush with side body.
- After installation, open and close the door to check looseness.

Rear Door Assembly Components

S7N20A9A06007



I4RS0A9A0009-01

1. Door panel	4. Rear door hinge bolt	7. Rear door hinge nut
A 1215 2. Door hinge : Apply lithium grease 99000-25010 to rotating part. : Apply sealant 99000-31110 to contact face.	5. Door open stopper bolt	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
3. Door open stopper	6. Rear door opening weather-strip	(b) : 21 N·m (2.1 kgf-m, 15.5 lbf-ft)

Rear Door Assembly Removal and Installation

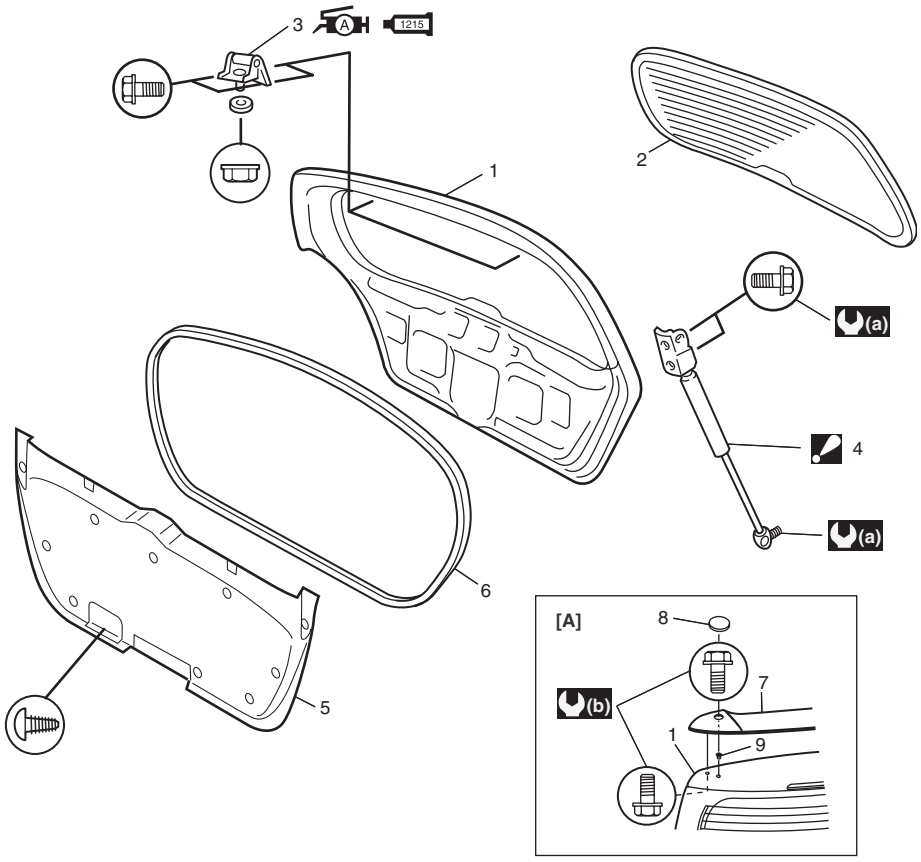
S7N20A9A06008

Refer to “Front Door Assembly Removal and Installation” as removal and installation procedures are basically the same. However, note the following.

- Tighten rear door hinge bolts and nuts to specified torque referring to “Rear Door Assembly Components”.

Rear End Door Assembly Components

S7N20A9A06009



I6RS0B9A0001-01

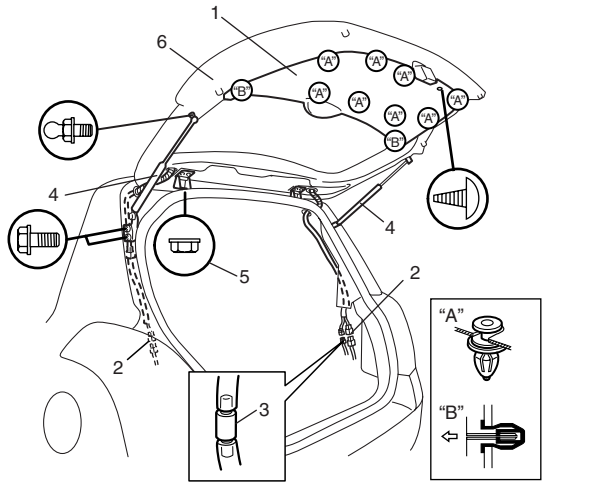
[A]: Rear end door spoiler installation position	5. Rear end door trim	(a) : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
1. Rear end door panel assembly	6. Rear end door opening wether-strip	(b) : 5 N·m (0.5 kgf-m, 4.0 lbf-ft)
2. Rear end door window glass	7. Rear end door spoiler (if equipped)	
A 1215 3. Rear end door hinge : Apply lithium grease 99000-25010 to door hinge moving section. : Apply sealant 99000-31110 to contact face.	8. Cap	
4. Rear end door balancer : Never disassemble rear end door balancer.	9. Rubber nut	

Rear End Door Assembly Removal and Installation

S7N20A9A06010

Removal

1) Remove rear end door trim (1).
2) Remove related section of head lining and rear trim.
3) Disconnect rear end door harness couplers (2) and washer hose (3).
4) Remove rear end door balancers (4).
5) Remove door hinge nuts (5) and remove rear end door assembly (6).



I4RS0A9A0011-01

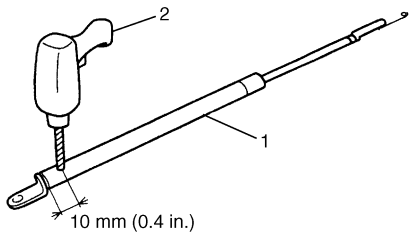
⚠ WARNING

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 to stick to 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 to remove gas inside as shown before discarding.**



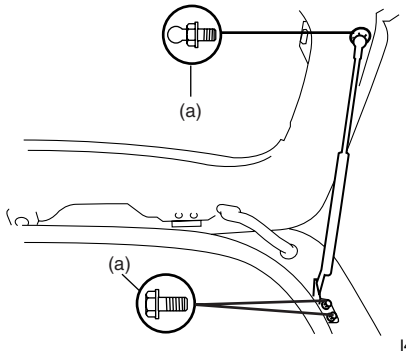
I2RH019A0010-01

Installation

Reverse removal procedure noting the following.

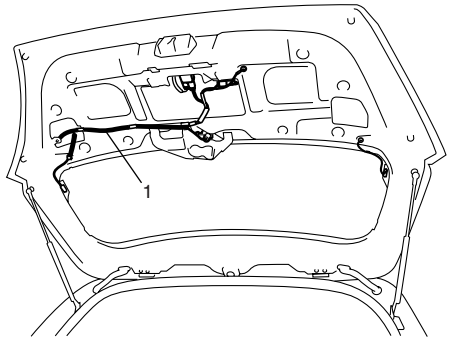
- Tighten rear end door balancer bolt to specified torque.

  Tightening torque
  Rear end door balancer bolt (a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)



I4RS0A9A0013-01

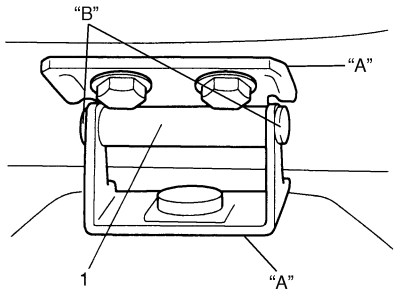
- Secure wiring harness (1).



I4RS0A9A0012-01

- Adjust door latch striker position by referring to “Rear End Door Lock Assembly Removal and Installation in Section 9F”.
- Adjust door cushion so that door contacts body when closed.
- Apply sealant to contact face “A” of door hinge (1) and apply grease to rotating part “B” of hinge (1).
  Specified sealant and grease.

  “A”: Sealant 99000–31110 (SUZUKI Bond No.1215)
  “B”: Grease 99000–25010 (SUZUKI Super Grease A)



I2RH019A1012-01

Specifications

Tightening Torque Specifications

S7N20A9A07001

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Hood latch bolt	10	1.0	7.5	☞
Door hinge mounting bolt (body side)	27	2.7	19.5	☞
Door hinge mounting bolt (door side)	23	2.3	17.0	☞
Door open stopper bolt	21	2.1	15.5	☞
Rear end door balancer bolt	23	2.3	17.0	☞

NOTE

The specified tightening torque is also described in the following.
“Front Door Assembly Components: ”
“Rear Door Assembly Components: ”
“Rear End Door Assembly Components: ”

Reference:
For the tightening torque of fastener not specified in this section, refer to “Fasteners Information in Section 0A”.

Special Tools and Equipment

Recommended Service Material

S7N20A9A08001

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25010	☞ / ☞
Sealant	SUZUKI Bond No.1215	P/No.: 99000–31110	☞ / ☞ / ☞

NOTE

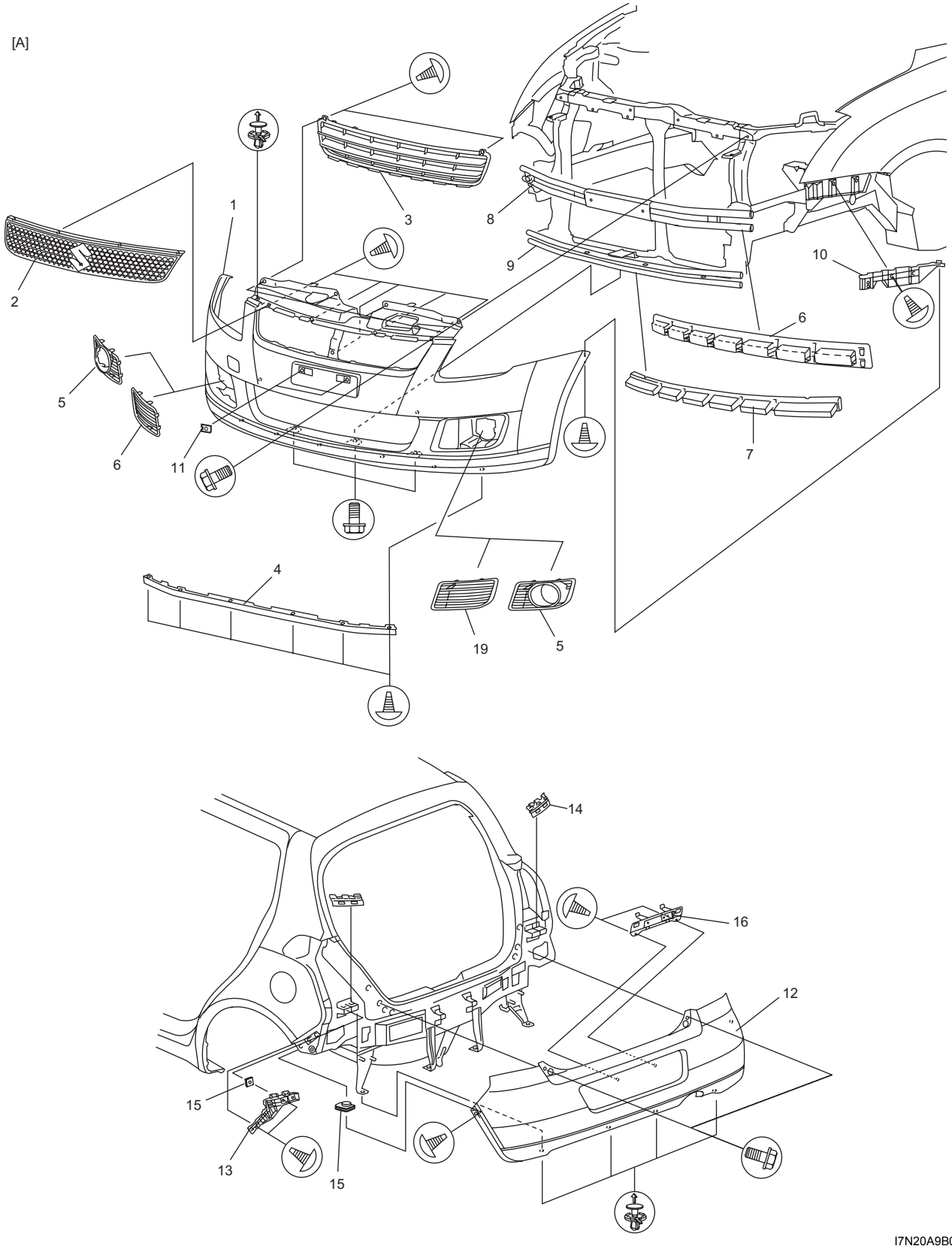
Required service material is also described in the following.
“Front Door Assembly Components: ”
“Rear Door Assembly Components: ”
“Rear End Door Assembly Components: ”

Body Structure

Repair Instructions

Front Bumper and Rear Bumper Components

S7N20A9B06001



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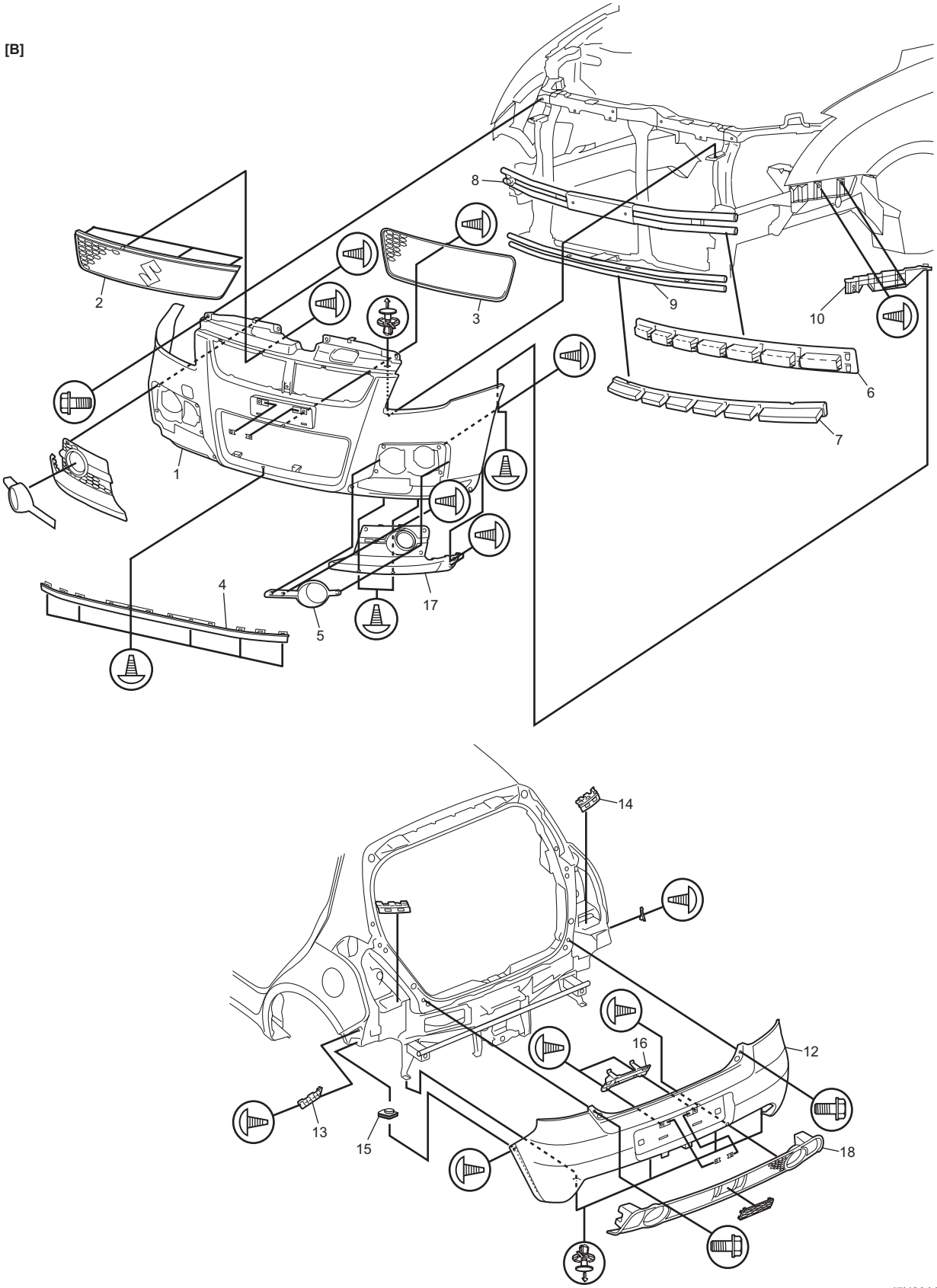
[B]



I7N20A9B0002-01

[A]: Type A	6. Front bumper upper absorber	13. Rear bumper holder
[B]: Type B	7. Front bumper lower absorber	14. Rear lamp holder
1. Front bumper	8. Front bumper upper member	15. Plastic nut
2. Radiator upper grill	9. Front bumper lower member	16. Rear license lamp stay
3. Radiator lower grill	10. Front bumper holder	17. Front bumper guard

4. Front air dam skirt	11. License plate nut	18. Rear bumper guard
5. Front fog lamp cap (with front fog lamp)	12. Rear bumper	19. Front fog lamp cap (without front fog lamp)

Cowl Top Components

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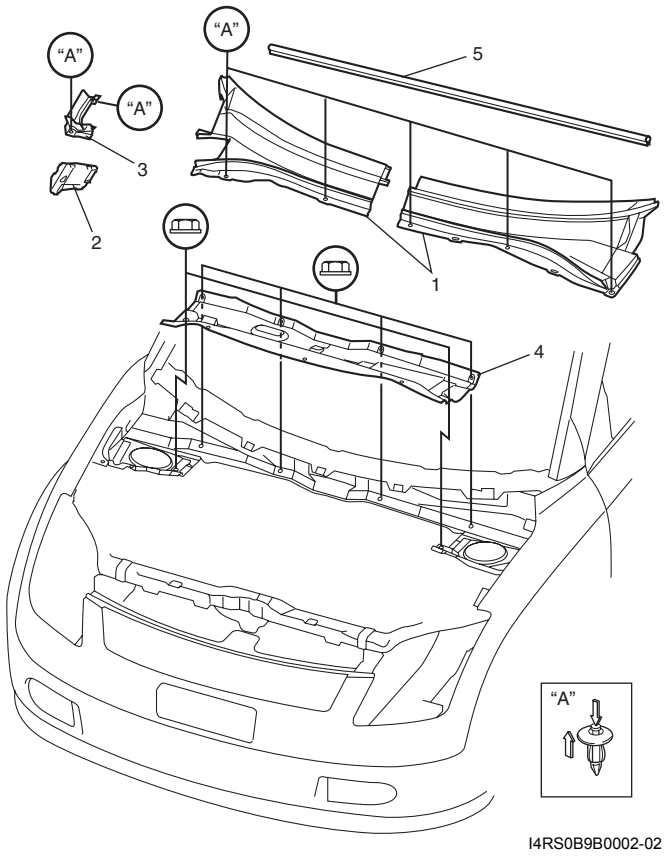

I4RS0B9B0002-02

1. Cowl top cover	3. Cowl top side garnish	5. Hood rear seal
2. Cowl top cover lid (if equipped)	4. Cowl top panel	

Specifications

Body Dimensions

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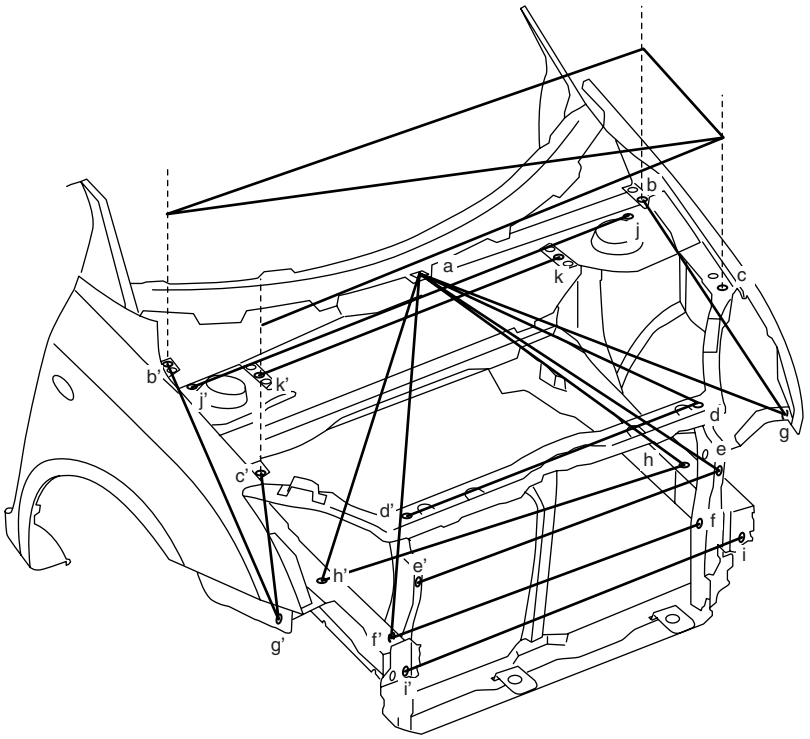
Engine Room



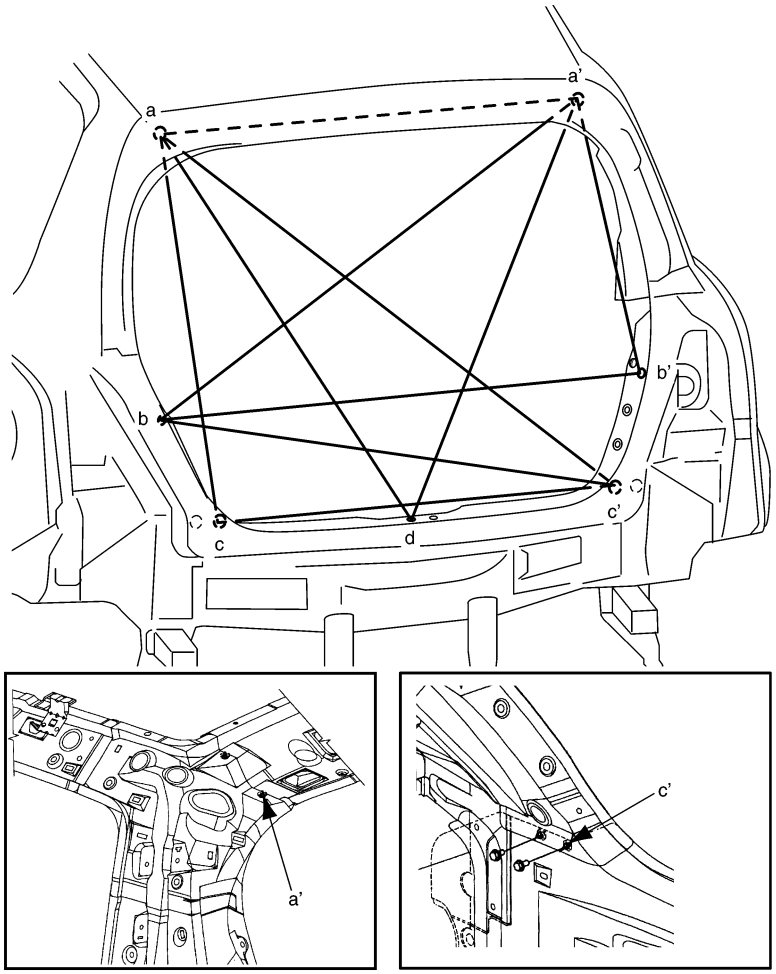
I4RS0A9B0003-01

a. Cowl top installation center hole	e (e'). Headlight installation hole	i (i'). Front bumper upper member installation hole
b (b'). Front fender installation hole	f (f'). Jig hole (ϕ 8 mm)	j (j'). Jig hole (ϕ 8 mm)
c (c'). Headlight installation hole	g (g'). Front fender installation hole	k (k'). Jig hole (ϕ 7 mm)
d (d'). Hood lock member installation hole (when hood lock member removed)	h (h'). Engine mounting installation front hole	

Hole to hole distance

a-d: 675 mm (26.57 in.)	**b-c: 343 mm (13.50 in.)**	**e-e': 851 mm (33.50 in.)**
a-e: 816 mm (32.13 in.)	**b-g: 625 mm (24.61 in.)**	**f-f': 817 mm (32.17 in.)**
a-g: 943 mm (37.13 in.)	**b'-c: 1364 mm (53.70 in.)**	**h-h': 950 mm (37.40 in.)**
a-h: 784 mm (30.87 in.)	**b'-g': 647 mm (25.47 in.)**	**i-i': 937 mm (36.89 in.)**
a-f': 864 mm (34.02 in.)	**c-c': 1310 mm (51.57 in.)**	**j-j': 1249 mm (49.17 in.)**
a-h': 743 mm (29.25 in.)	**c'-g': 324 mm (12.76 in.)**	**k-k': 886 mm (34.88 in.)**
b-b': 1317 mm (51.85 in.)	**d-d': 800 mm (31.50 in.)**	

Rear end Door



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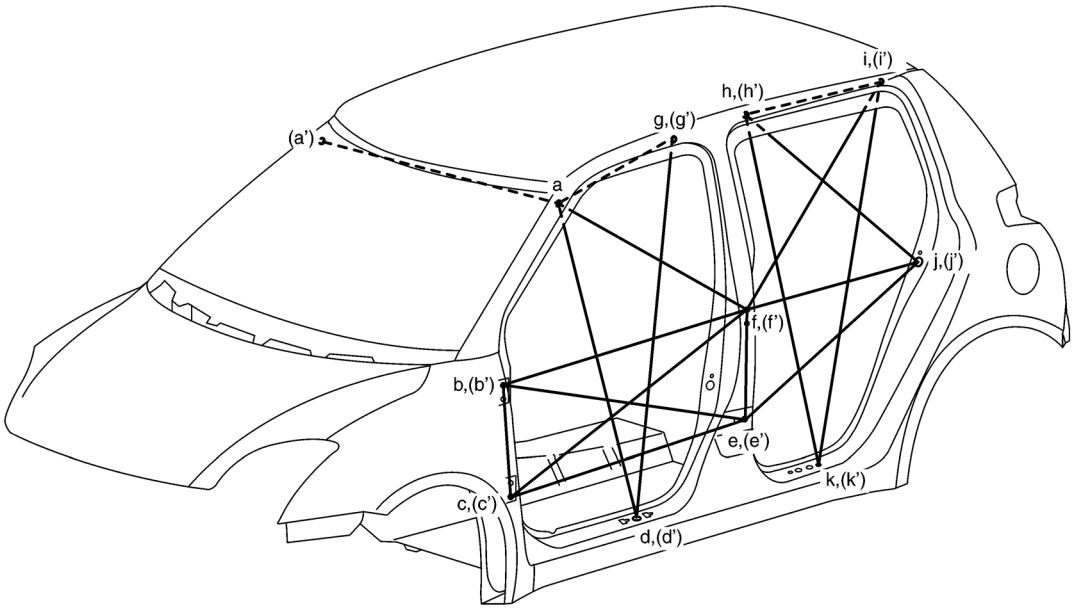
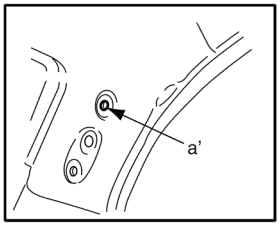
a (a'). Roof back member bolt installation hole	c (c'). Back panel bolt installation hole
b (b'). Jig hole	d. Rear end door striker installation left side hole

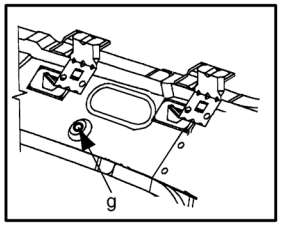
Hole to hole distance

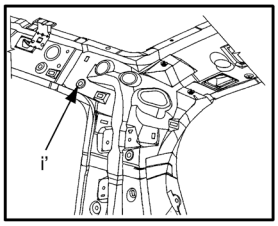
a-a': 759 mm (29.88 in.)	**a'-b: 1037 mm (40.83 in.)**	**b-c': 985 mm (38.78 in.)**
a-c: 762 mm (30.00 in.)	**a'-d: 904 mm (35.59 in.)**	**c-c': 850 mm (33.46 in.)**
a-d: 887 mm (34.92 in.)	**a'-b': 528 mm (20.79 in.)**	
a-c': 1107 mm (43.58 in.)	**b-b': 1051 mm (41.38 in.)**	

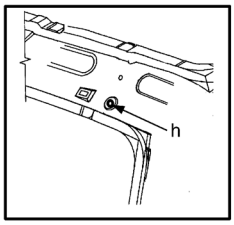
Side Body
5 door model











I4RS0A9B0005-02

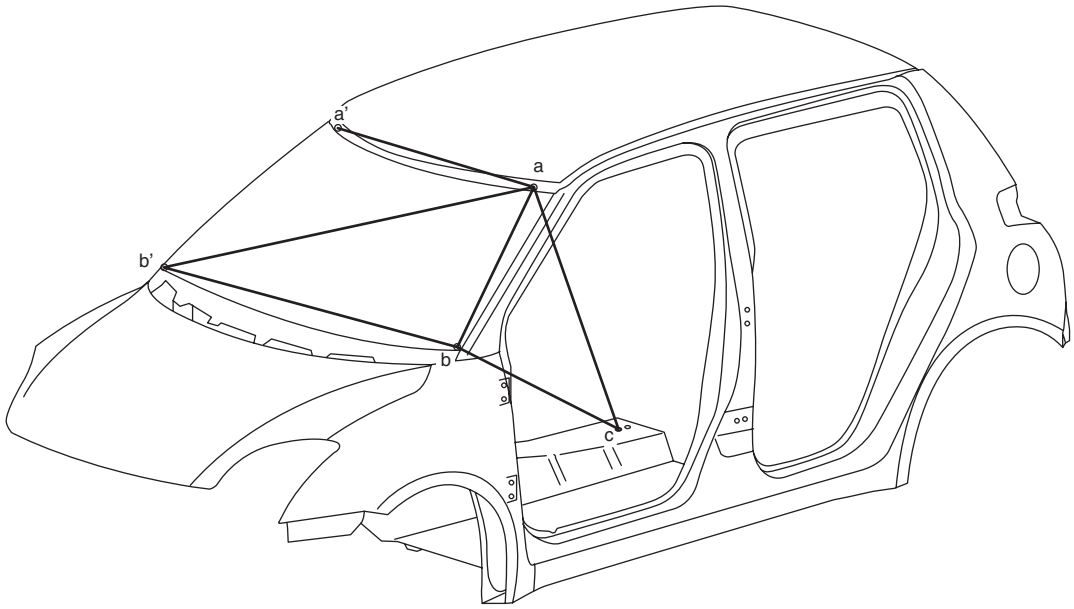
a (a'). Jig hole (ϕ 8 mm)	e (e'). Rear door lower hinge installation rear hole	i (i'). Jig hole (ϕ 10 mm)
b (b'). Front door upper hinge installation upper hole	f (f'). Rear door upper hinge installation upper hole	j (j'). Rear door switch installation hole (large hole)
c (c'). Front door lower hinge installation lower hole	g (g'). Jig hole (ϕ 10 mm)	k (k'). Rear side sill scuff installation hole
d (d'). Bleeding hole	h (h'). Curtain air bag clip installation hole	( ). Body right side

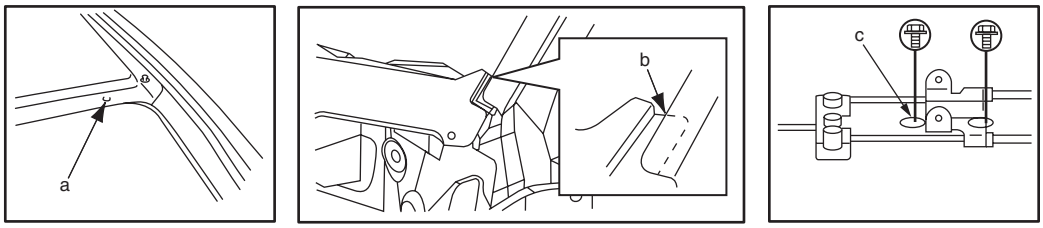
Hole to hole distance

a-d: 1055 mm (41.54 in.)	**c-e: 1021 mm (40.20 in.)**	**f-j: 835 mm (32.87 in.)**
a-f: 747 mm (29.41 in.)	**c-f: 1123 mm (44.21 in.)**	**h-i: 601 mm (23.66 in.)**
a-g: 378 mm (14.88 in.)	**d-g: 1129 mm (44.45 in.)**	**h-j: 817 mm (32.17 in.)**
b-c: 383 mm (15.08 in.)	**e-f: 354 mm (13.94 in.)**	**h-k: 1097 mm (43.19 in.)**
b-e: 1085 mm (42.72 in.)	**e-j: 946 mm (37.24 in.)**	**i-k: 1153 mm (45.39 in.)**
b-f: 1061 mm (41.77 in.)	**f-i: 926 mm (36.46 in.)**	

Hole to hole distance

a-a': 1039 mm (40.91 in.)	**e-e': 1474 mm (58.03 in.)**	**i-i': 1009 mm (39.72 in.)**
b-b': 1461 mm (57.52 in.)	**f-f': 1468 mm (57.80 in.)**	**j-j': 1327 mm (52.24 in.)**
c-c': 1489 mm (58.62 in.)	**g-g': 1018 mm (40.08 in.)**	**k-k': 1472 mm (57.95 in.)**
d-d': 1472 mm (57.95 in.)	**h-h': 1022 mm (40.24 in.)**	





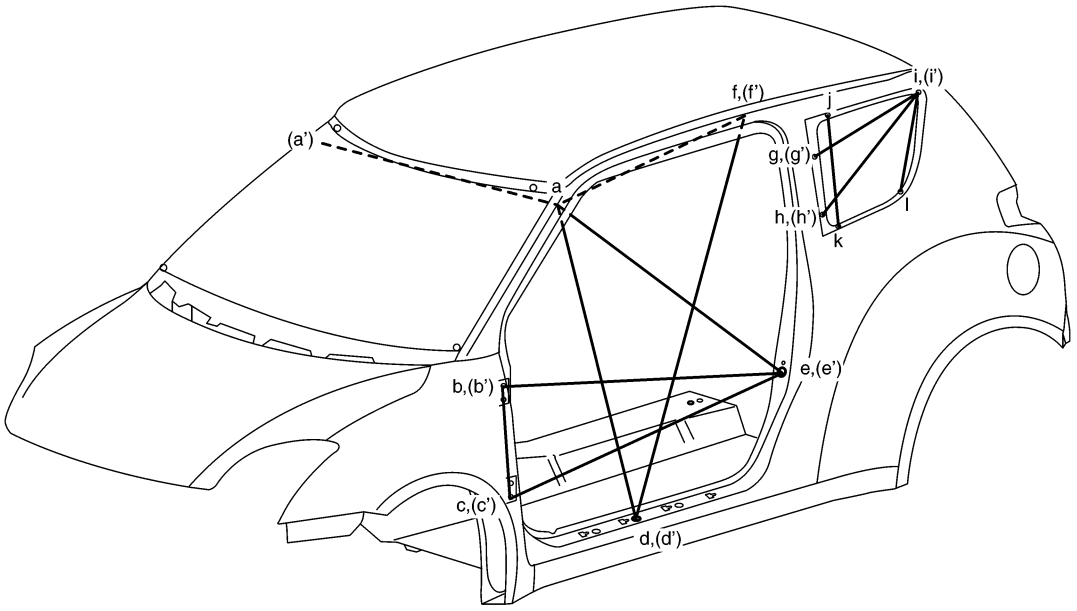
I4RS0B9B0004-02

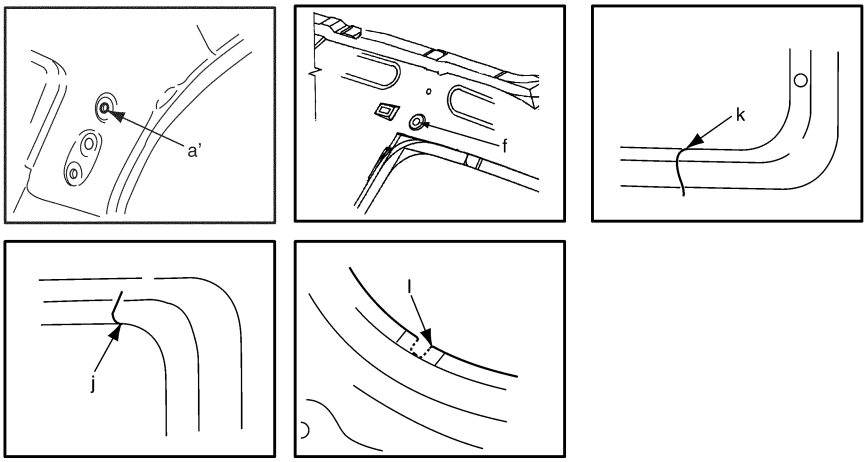
a (a'). Jig hole (ϕ 6.5 mm)	b (b'). Panel cross point	c. Parking brake cable bracket installation front hole

Hole to hole distance

a-b: 638 mm (25.12 in.)	**a-b': 1194 mm (47.01 in.)**
a-c: 1293 mm (50.91 in.)	**b-c: 1422 mm (55.98 in.)**
a-a': 800 mm (31.50 in.)	**b-b': 1272 mm (50.08 in.)**

3 door model





I4RS0B9B0005-03

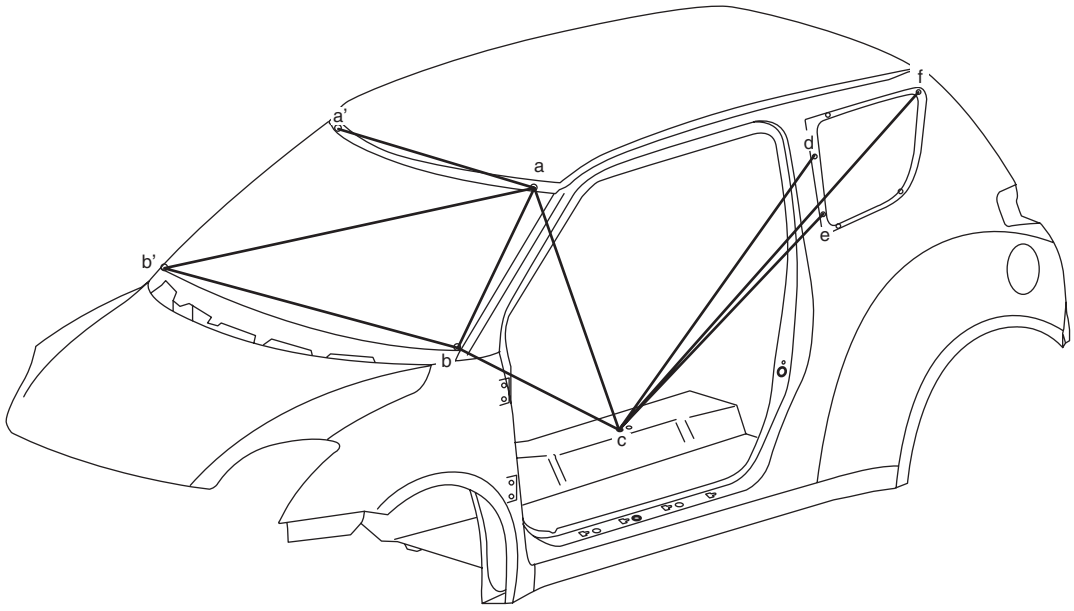
a (a'). Jig hole (ϕ 8 mm)	f (f'). Curtain air bag clip installation hole	k. Panel cross point (curve end)
b (b'). Front door upper hinge installation upper hole	g (g'). Jig hole	l. Quarter window fastener installation point (curve center)
c (c'). Front door lower hinge installation lower hole	h (h'). Jig hole	( ). Body right side
d (d'). Bleeding hole	i (i'). Quarter window fastener installation hole	
e (e'). Door switch installation hole (large hole)	j. Panel cross point	

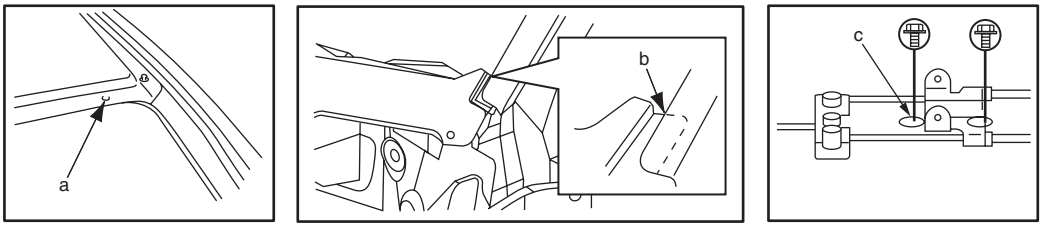
Hole to hole distance

a-d: 1055 mm (41.54 in.)	**b-e: 1208 mm (47.56 in.)**	**h-i: 590 mm (23.23 in.)**
a-e: 951 mm (37.44 in.)	**c-e: 1206 mm (47.48 in.)**	**i-l: 282 mm (11.10 in.)**
a-f: 712 mm (28.03 in.)	**d-f: 1255 mm (49.41 in.)**	**j-k: 335 mm (13.19 in.)**
b-c: 383 mm (15.08 in.)	**g-i: 525 mm (20.67 in.)**	

Hole to hole distance

a-a': 1039 mm (40.91 in.)	**d-d': 1472 mm (57.95 in.)**	**g-g': 1280 mm (50.39 in.)**
b-b': 1461 mm (57.52 in.)	**e-e': 1366 mm (53.78 in.)**	**h-h': 1394 mm (54.88 in.)**
c-c': 1489 mm (58.62 in.)	**f-f': 1022 mm (40.24 in.)**	**i-i': 1153 mm (45.39 in.)**





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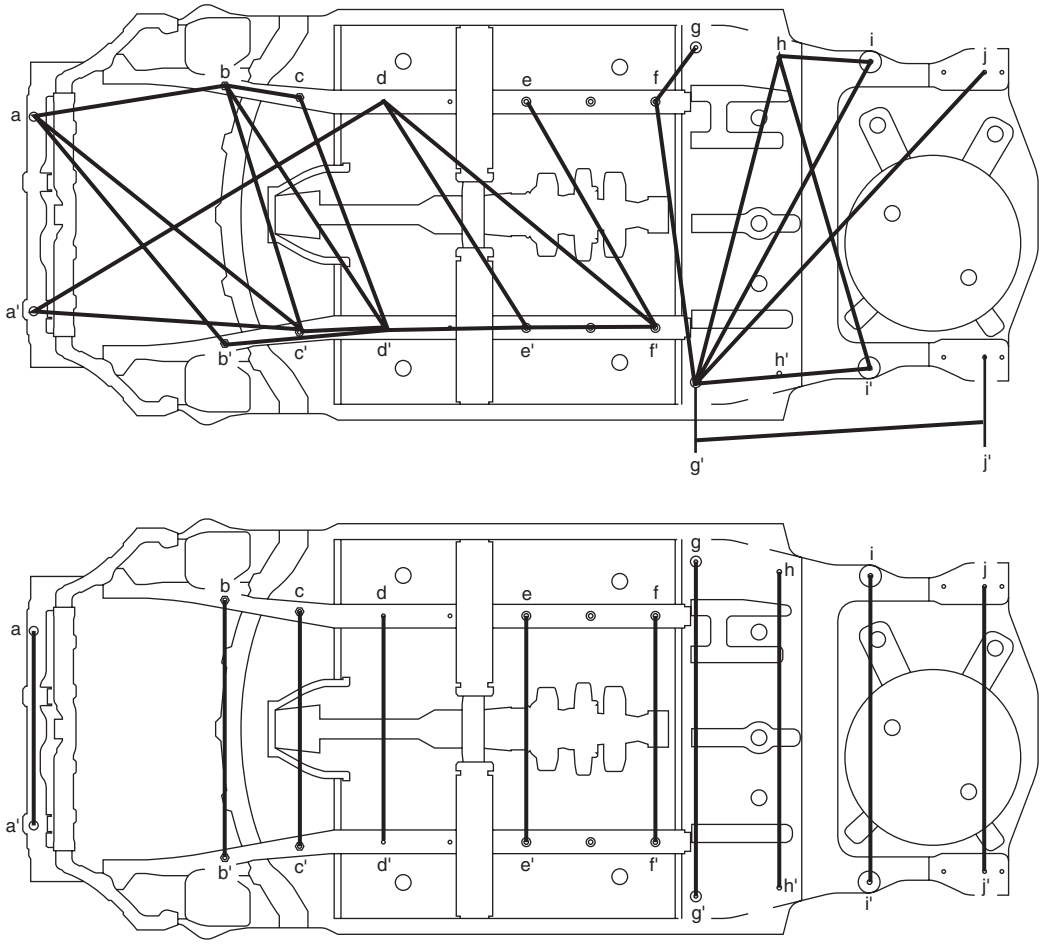
a (a'). Jig hole (ϕ6.5 mm)	c. Parking brake cable bracket installation front hole	e. Jig hole
b (b'). Panel cross point	d. Jig hole	f. Quarter window fastener installation hole

Hole to hole distance

a-b: 638 mm (25.12 in.)	**a-b': 1194 mm (47.01 in.)**	**c-d: 1186 mm (46.69 in.)**
a-c: 1293 mm (50.91 in.)	**b-c: 1422 mm (55.98 in.)**	**c-e: 1094 mm (43.07 in.)**
a-a': 800 mm (31.50 in.)	**b-b': 1272 mm (50.08 in.)**	**c-f: 1440 mm (56.69 in.)**

Under Body



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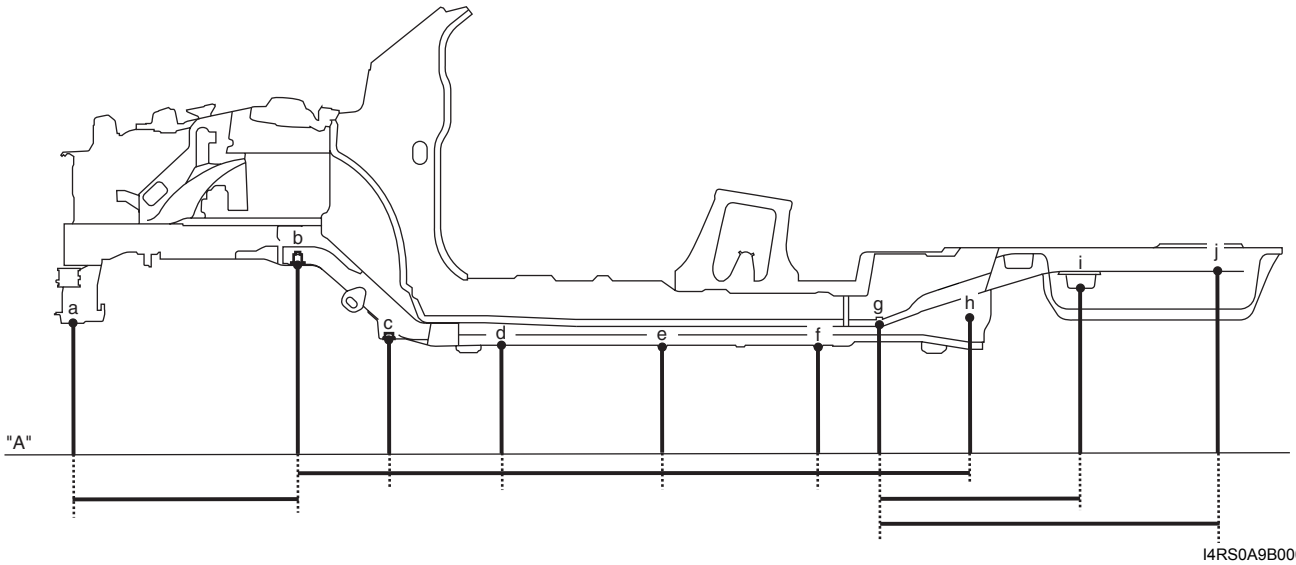
a (a'). Jig hole (ϕ 20 mm)	e (e'). Jig hole (ϕ 15 mm)	i (i'). Drain hole (ϕ 10 mm)
b (b'). Front suspension frame installation hole	f (f'). Jig hole (ϕ 15 mm)	j (j'). Jig hole (ϕ 16 mm)
c (c'). Front suspension frame installation hole	g (g'). Jig hole (ϕ 25 mm)	
d (d'). Jig hole (ϕ 10 mm)	h (h'). Rear axle housing installation inside hole	

Hole to hole distance

a-b: 674 mm (26.54 in.)	**c-d': 836 mm (32.91 in.)**	**g'-h: 1135 mm (44.69 in.)**
a-b': 1018 mm (40.08 in.)	**c'-d': 288 mm (11.34 in.)**	**g'-i: 1229 mm (48.39 in.)**
a-c': 1163 mm (45.79 in.)	**d-e': 911 mm (35.87 in.)**	**g'-i': 612 mm (24.09 in.)**
a'-d: 1391 mm (54.76 in.)	**d-f': 1205 mm (47.44 in.)**	**g'-j: 1433 mm (65.42 in.)**
a'-c': 908 mm (35.75 in.)	**d'-e': 488 mm (19.21 in.)**	**g'-j': 971 mm (38.23 in.)**
b-c: 335 mm (13.19 in.)	**e-f': 887 mm (34.92 in.)**	**h-i: 324 mm (12.76 in.)**
b-c': 904 mm (35.59 in.)	**e'-f': 440 mm (17.32 in.)**	**h-i': 1070 mm (42.13 in.)**
b-d': 1016 mm (40.00 in.)	**f-g: 240 mm (9.45 in.)**	
b'-d': 594 mm (23.39 in.)	**f-g': 969 mm (38.15 in.)**	

Hole to hole distance

a-a': 660 mm (25.98 in.)	**e-e': 770 mm (30.31 in.)**	**i-i': 992 mm (39.06 in.)**
b-b': 881 mm (34.69 in.)	**f-f': 770 mm (30.31 in.)**	**j-j': 970 mm (38.19 in.)**
c-c': 800 mm (31.50 in.)	**g-g': 1144 mm (45.04 in.)**	
d-d': 770 mm (30.31 in.)	**h-h': 1048 mm (41.26 in.)**	



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a. Jig hole (ϕ 20 mm)	e. Jig hole (ϕ 15 mm)	i. Drain hole (ϕ 10 mm)
b. Front suspension frame installation hole	f. Jig hole (ϕ 15 mm)	j. Jig hole (ϕ 16 mm)
c. Front suspension frame installation hole	g. Jig hole (ϕ 25 mm)	
d. Jig hole (ϕ 10 mm)	h. Rear axle housing installation inside hole	

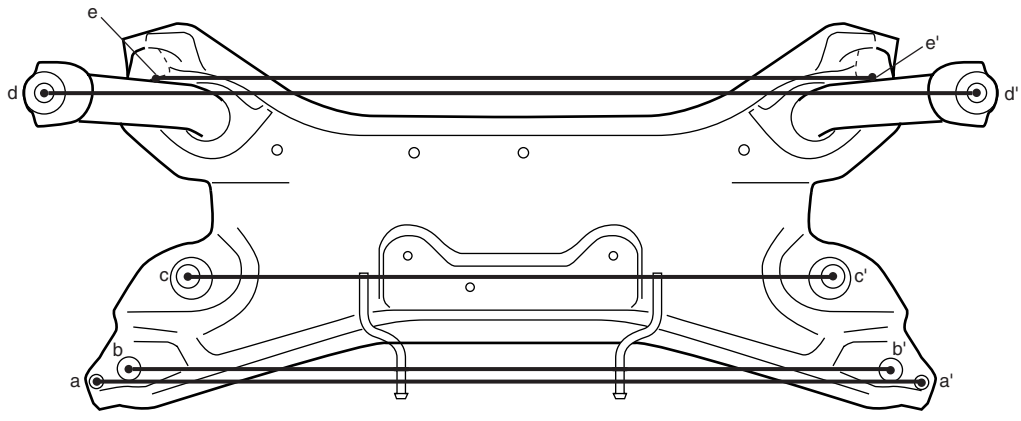
Hole to hole distance

a-b: 644 mm (25.35 in.)	**d-e: 488 mm (19.21 in.)**	**g-h: 293 mm (11.54 in.)**
b-c: 260 mm (10.24 in.)	**e-f: 440 mm (17.32 in.)**	**g-i: 597 mm (23.50 in.)**
c-d: 288 mm (11.34 in.)	**f-g: 138 mm (5.43 in.)**	**g-j: 956 mm (37.64 in.)**

Projection dimension from standard line “A”

a: 73 mm (2.87 in.)	**e: 10 mm (0.39 in.)**	**i: 181 mm (7.13 in.)**
b: 236 mm (9.29 in.)	**f: 10 mm (0.39 in.)**	**j: 221 mm (8.70 in.)**
c: 29 mm (1.14 in.)	**g: 68 mm (2.68 in.)**	
d: 12 mm (0.47 in.)	**h: 72 mm (2.83 in.)**	

Front Suspension Frame



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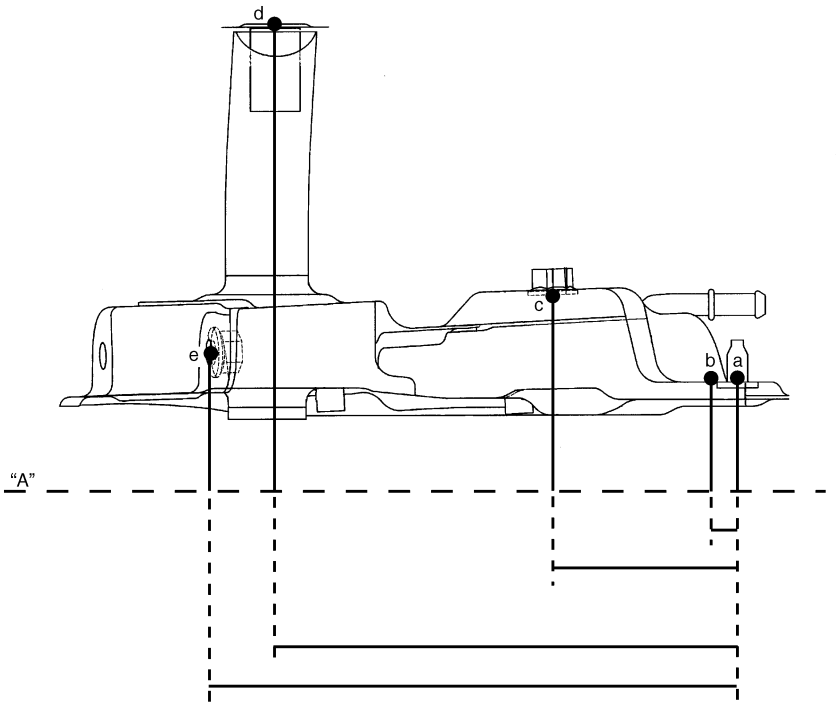
a (a’). Stud	d (d’). Front suspension frame installation hole
b (b’). Front suspension frame installation hole	e (e’). Front suspension control arm installation hole
c (c’). Front suspension control arm installation hole	

Hole to hole distance

a-a’: 896 mm (35.28 in.)	**d-d’: 881.5 mm (34.70 in.)**
b-b’: 800 mm (31.50 in.)	**e-e’: 765 mm (30.12 in.)**
c-c’: 666 mm (26.22 in.)	



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a. Stud	d. Front suspension frame installation hole
b. Front suspension frame installation hole	e. Front suspension control arm installation hole
c. Front suspension control arm installation hole	

Hole to hole distance

a-b: 10 mm (0.39 in.)	**a-d: 270 mm (10.63 in.)**
a-c: 108 mm (4.25 in.)	**a-e: 309 mm (12.17 in.)**

Projection dimension from standard line “A”

a: 50 mm (1.97 in.)	**d: 258 mm (10.16 in.)**
b: 50 mm (1.97 in.)	**e: 66 mm (2.60 in.)**
c: 97 mm (3.82 in.)	

Panel Clearance

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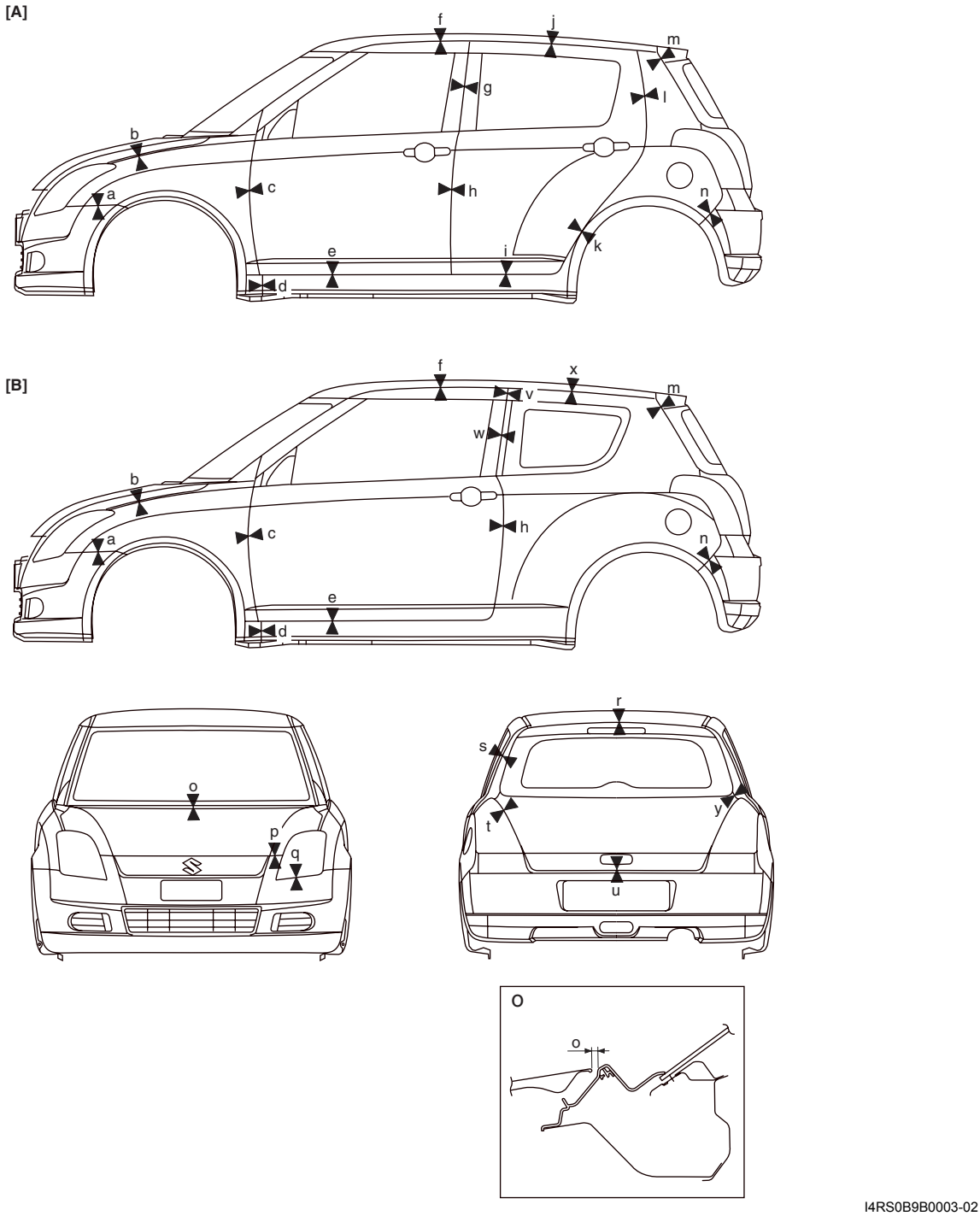

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Panel to panel distance

[A]: 5 door model	h: 3.1 – 5.1 mm (0.12 – 0.20 in.)	q: 1.4 – 2.9 mm (0.06 – 0.11 in.)
[B]: 3 door model	i: 4.7 – 6.7 mm (0.19 – 0.26 in.)	r: 7.3 – 8.8 mm (0.29 – 0.35 in.)
a: 0 – 1 mm (0 – 0.039in.)	j: 16.3 – 19.3 mm (0.642 – 0.760 in.)	s: 4.3 mm (0.17 in.)
b: 2.3 – 4.3 mm (0.091 – 0.17 in.)	k: 3.0 – 5.0 mm (0.12 – 0.20 in.)	t: 3.3 – 5.3 mm (0.13 – 0.21 in.)
c: 3.1 – 5.1 mm (0.12 – 0.20 in.)	l: 3.1 – 5.1 mm (0.12 – 0.20 in.)	u: 5.0 – 7.0 mm (0.20 – 0.28 in.)
d: 1.1 – 3.1 mm (0.043 – 0.122 in.)	m: 3.2 – 5.2 mm (0.13 – 0.20 in.)	v: 2.9 – 4.9 mm (0.11 – 0.19 in.)
e: 4.9 – 6.9 mm (0.19 – 0.27 in.)	n: 0 – 1.0 mm (0 – 0.039 in.)	w: 3.5 – 5.5 mm (0.14 – 0.19 in.)
f: 16.2 – 19.2 mm (0.638 – 0.756 in.)	o: 8.1 mm (0.32 in.)	x: 16.1 – 17.6 mm (0.634 – 0.693 in.)
g: 3.1 – 5.1 mm (0.12 – 0.20 in.)	p: 6.1 – 8.1 mm (0.24 – 0.32 in.)	y: 3.3 – 4.3 mm (0.13 – 0.20in.)

Paint / Coatings

General Description

Anti-Corrosion Treatment Construction

S7N20A9C01001

⚠ WARNING

Standard shop practices, particularly eye protection, should be followed during the performance of the following operations to avoid personal injury.

As rust proof treatment, steel sheets are given corrosion resistance on the interior and/or exterior.
These corrosion resistance steel sheet materials are called one of two-side galvanized steel sheets.
It is for the sake of rust protection that these materials are selected and given a variety of treatments as described blow.

- Steel sheets are treated with cathodic electro primer which is excellent in corrosion resistance.
- Rust proof wax coatings are applied to door and side sill insides where moisture is liable to stay.
- Vinyl coating is applied to body underside and wheel housing inside.
- Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration and resulting in rust occurrence.

In panel replacement or collision damage repair, leaving the relevant area untreated as it is in any operation which does disturb the rust proof treatment will cause corrosion to that area. Therefore, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area.
All the metal panels are coated with metal conditioners and primer coating during vehicle production. Following the repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to the application of sealer and rust proof wax coating.
Sealer is applied to the specific joints of a vehicle during production. The sealer is intended to prevent dust from entering the vehicle and serves also as an anticorrosion barrier. The sealer is applied to the door and hood hem areas and between panels. Correct and reseal the originally sealed joints if damaged. Reseal the attaching joints of a new replacement panel and reseal the hem area of a replacement door or hood.
Use a quality sealer to seal the flanged joints, overlap joints and seams. The sealer must have flexible characteristics and paint ability after it's applied to repair areas.
For the sealer to fill open joints, use caulking material. Select a sealer in conformance with the place and purpose of a specific use. Observe the manufacturer's label-stand instructions when using the sealer.
In many cases, repaired places require color painting. When this is required, follow the ordinary techniques specified for the finish preparation, color painting and undercoating build-up.
Rust proof wax, a penetrative compound, is applied to the metal-to-metal surfaces (door and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting the rust proof wax, it may be the penetrative type.
During the undercoating (vinyl coating) application, care should be taken that sealer is not applied to the engine-related parts and shock absorber mounting or rotating parts. Following the under coating, make sure that body drain holes are kept open.
The sequence of the application steps of the anti-corrosion materials are as follows:

1) Clean and prepare the metal surface.
2) Apply primer.
3) Apply sealer (all joints sealed originally).
4) Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
5) Apply anticorrosion compound (penetrative wax).
6) Apply undercoating (rust proof material).

Plastic Parts Finishing

S7N20A9C01002

Painting

Rigid or hard ABS plastic needs no primer coating. General acrylic lacquers can be painted properly over hard ABS plastic in terms of adherence.

1) Use cleaning solvent for paint finish to wash each part.
2) Apply conventional acrylic color lacquer to part surface.
3) Follow lacquer directions for required drying time. (Proper drying temperature range is 60 – 70 °C (140 – 158 °F)).

Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify ABS plastic is described below.

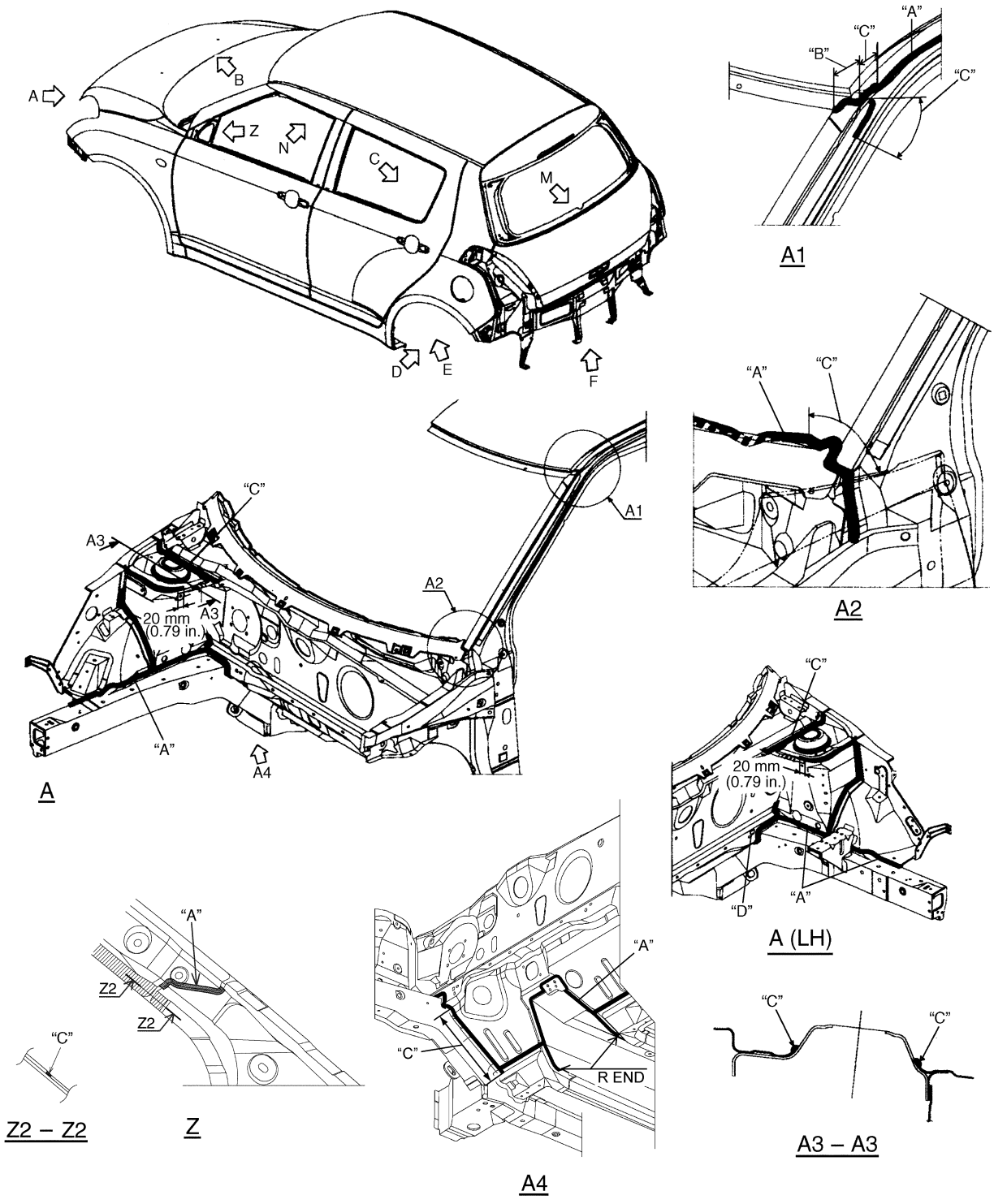
1) Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2) Hold sliver with pincers and set it on fire.
3) Carefully observe condition of the burning plastic.
4) ABS plastic must raise readily distinguishable back smoke while burning with its residue suspended in air temporarily.

5) Polypropylene must raise no readily distinguishable smoke while burning.

Component Location

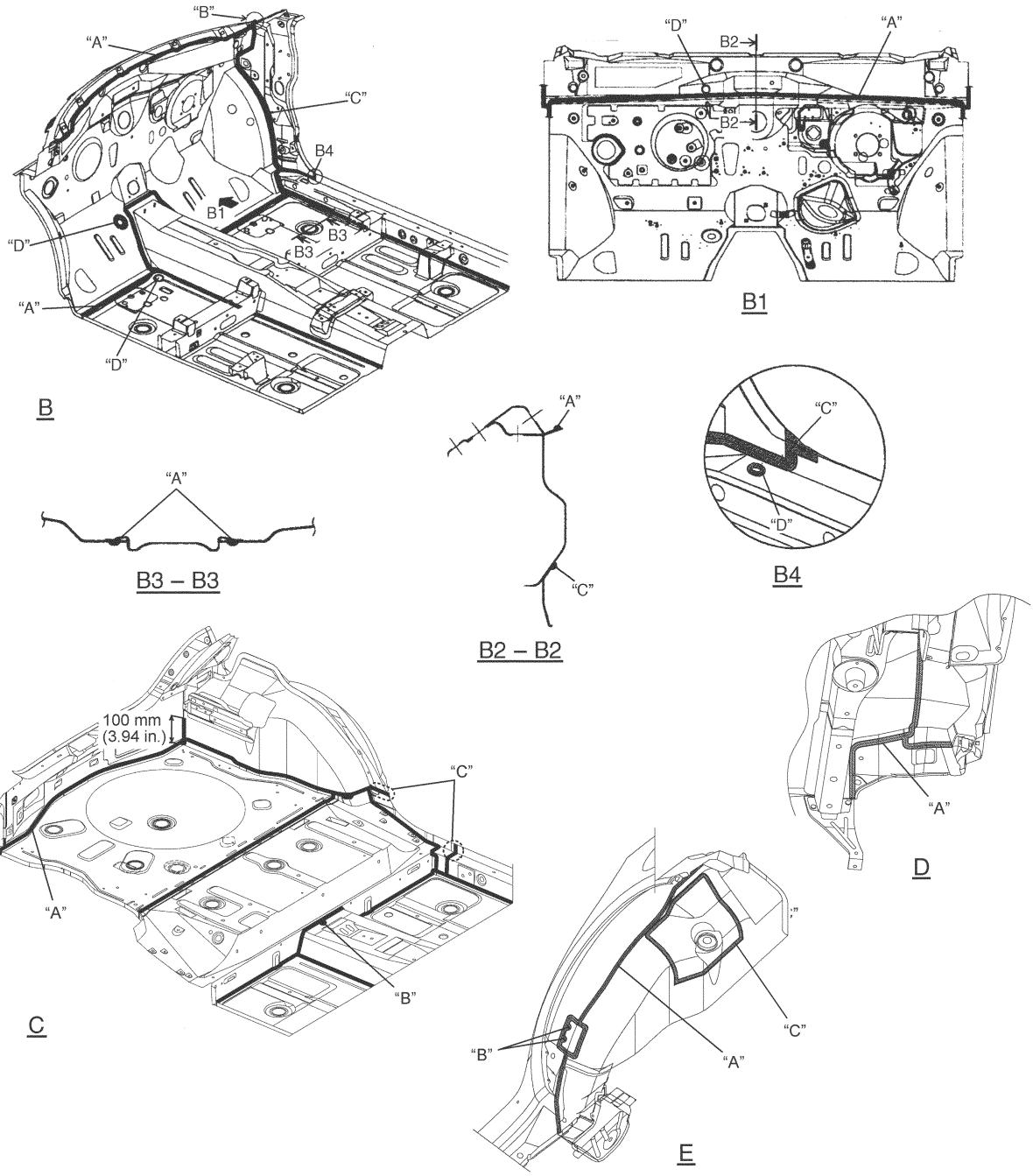
Sealant Application Areas

S7N20A9C03001



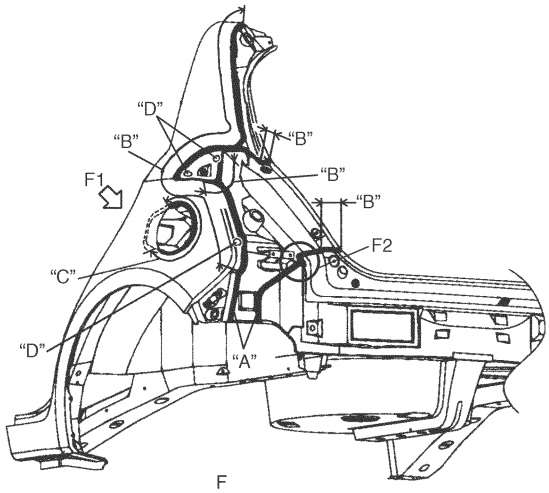
I7RS0A9C0001-01

"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Wipe off excess sealant after application.	"D": Do not apply sealant

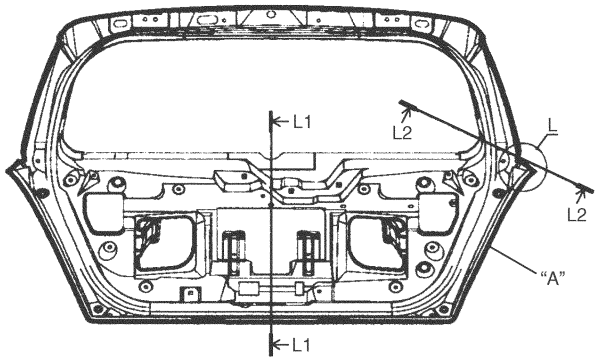


I7N20A9C0001-02

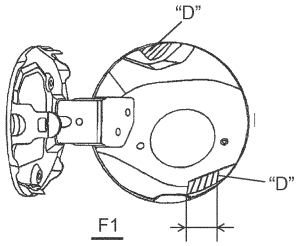
"A": Apply sealant.	"C": Smooth out sealant with a brush.
"B": Fill gap / hole with sealant.	"D": Do not apply sealant.



F

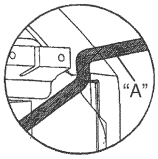


M

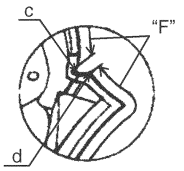


F1

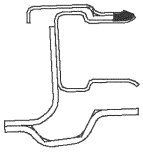
20 mm
(0.79 in.)



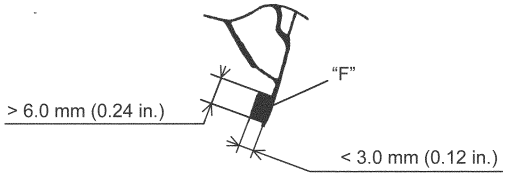
F2



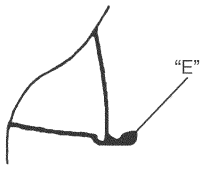
L



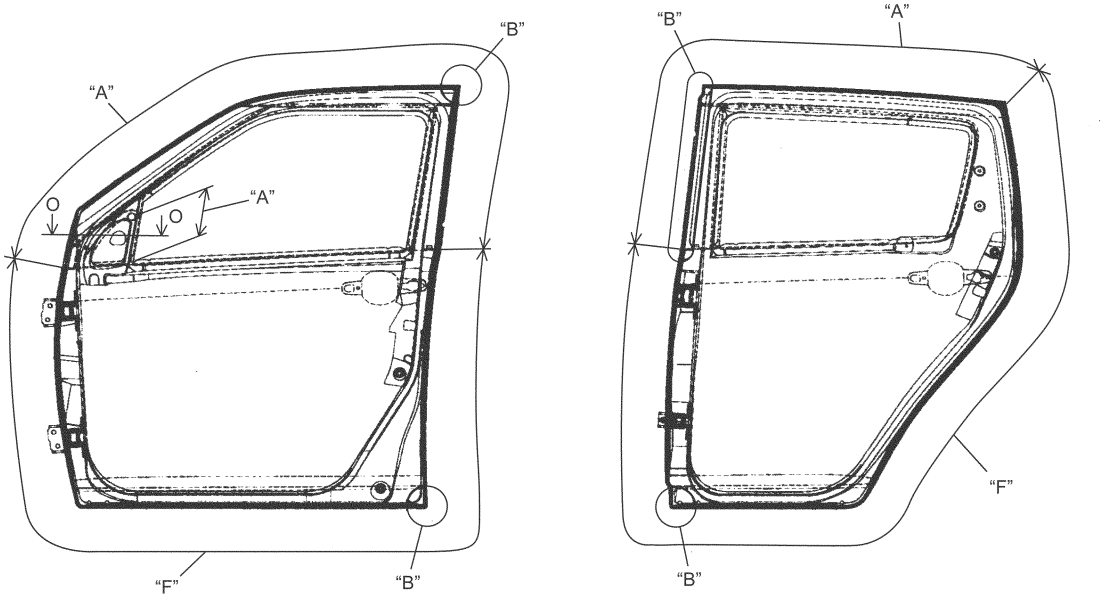
O - O



L1 - L1



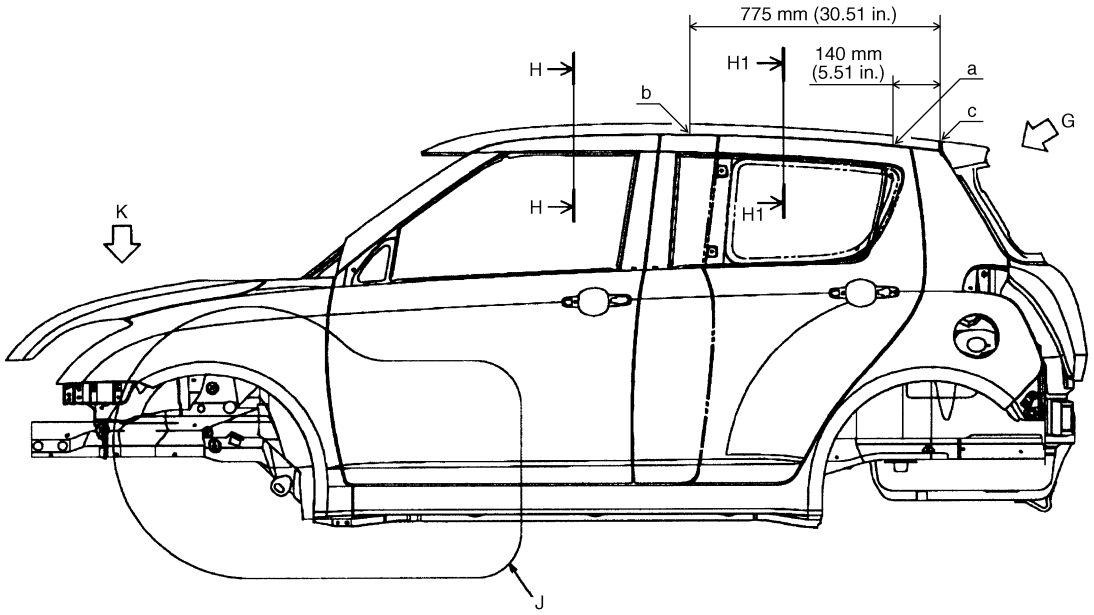
L2 - L2

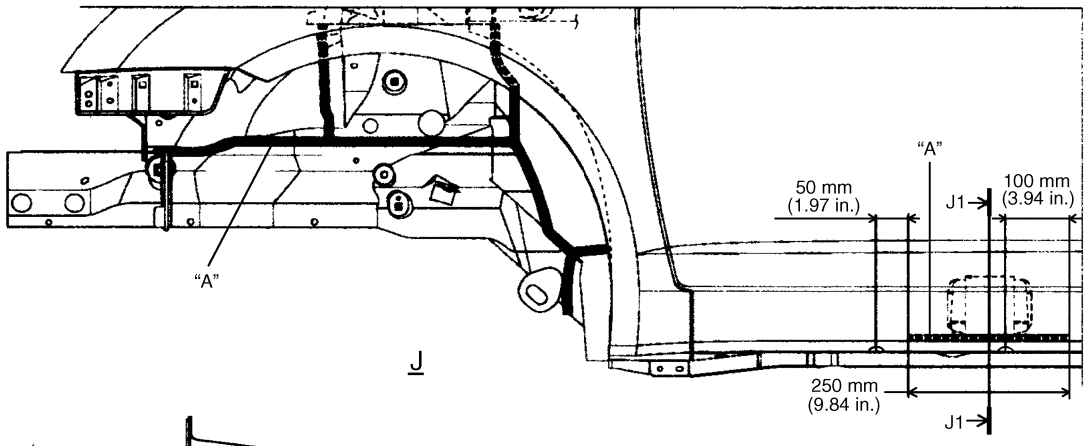


N

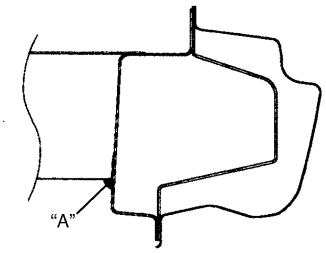
I7N20A9C0002-02

>: Minimum	"B": Wipe off excess sealant after application	"E": Apply sealant covering flange (between "c" and "d"
<: Maximum	"C": Smooth out sealant with a brush	"F": Apply wide sealant
"A": Apply sealant	"D": Do not apply sealant	

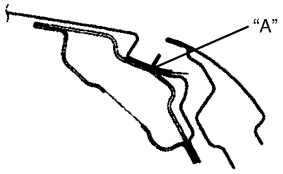




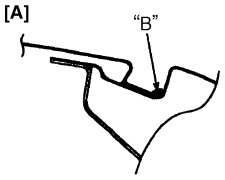
J



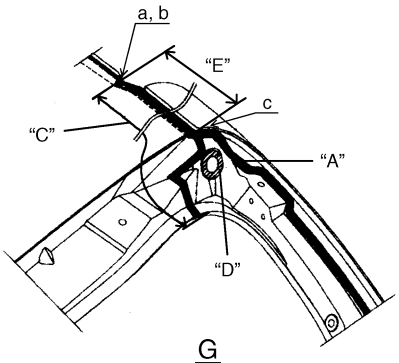
J1 – J1



H – H



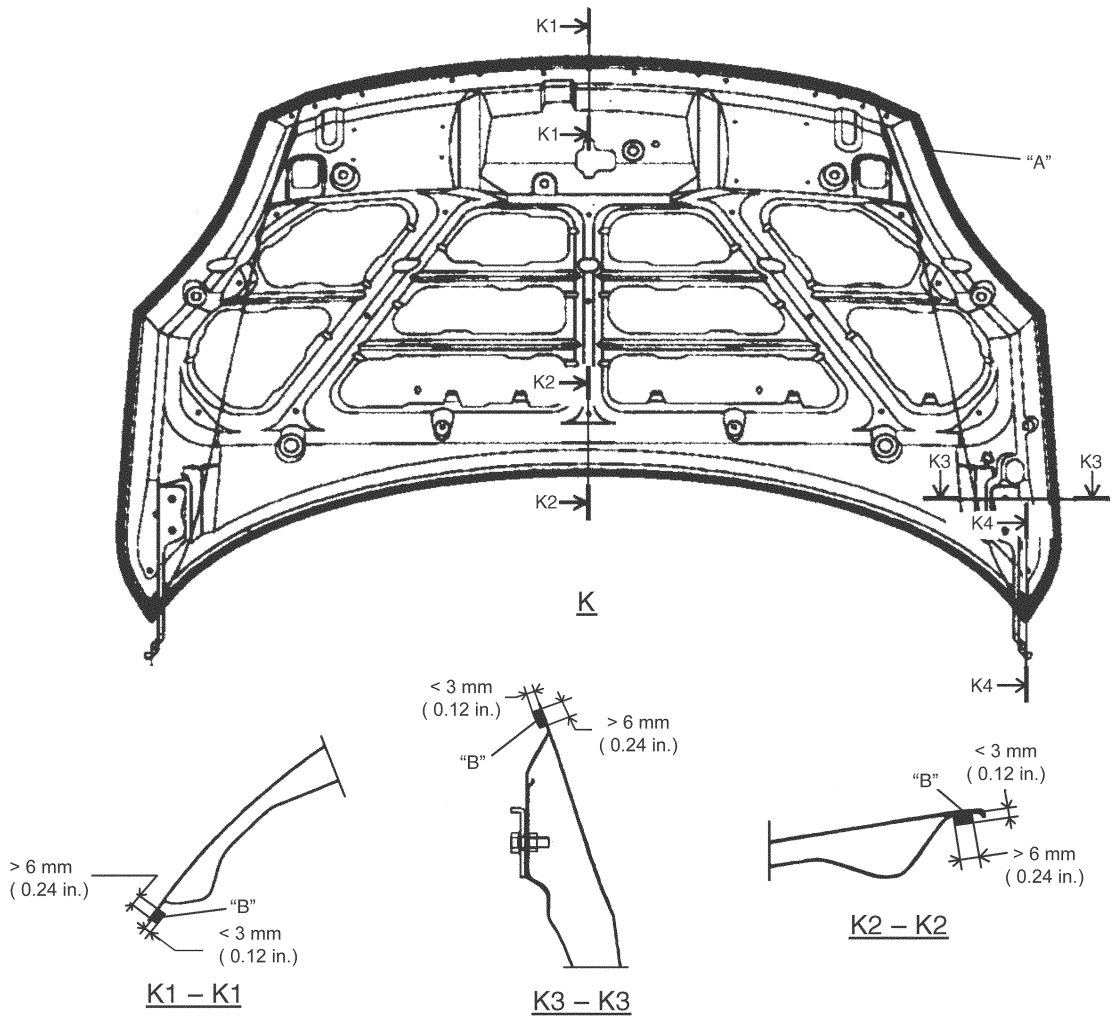
H1 – H1



G

I6RS0B9C0002-03

[A]: 3 door model	"C": Wipe off excess sealant after application.
"A": Apply sealant	"D": Do not apply sealant.
"B": Smooth out sealant with a brush (between "b" and "c").	"E": Sealant application area 3 door model 775 mm (30.51 in.) (between "b" and "c") 5 door model 140 mm (5.51 in.) (between "a" and "c")



K

K1 – K1

K3 – K3

K2 – K2

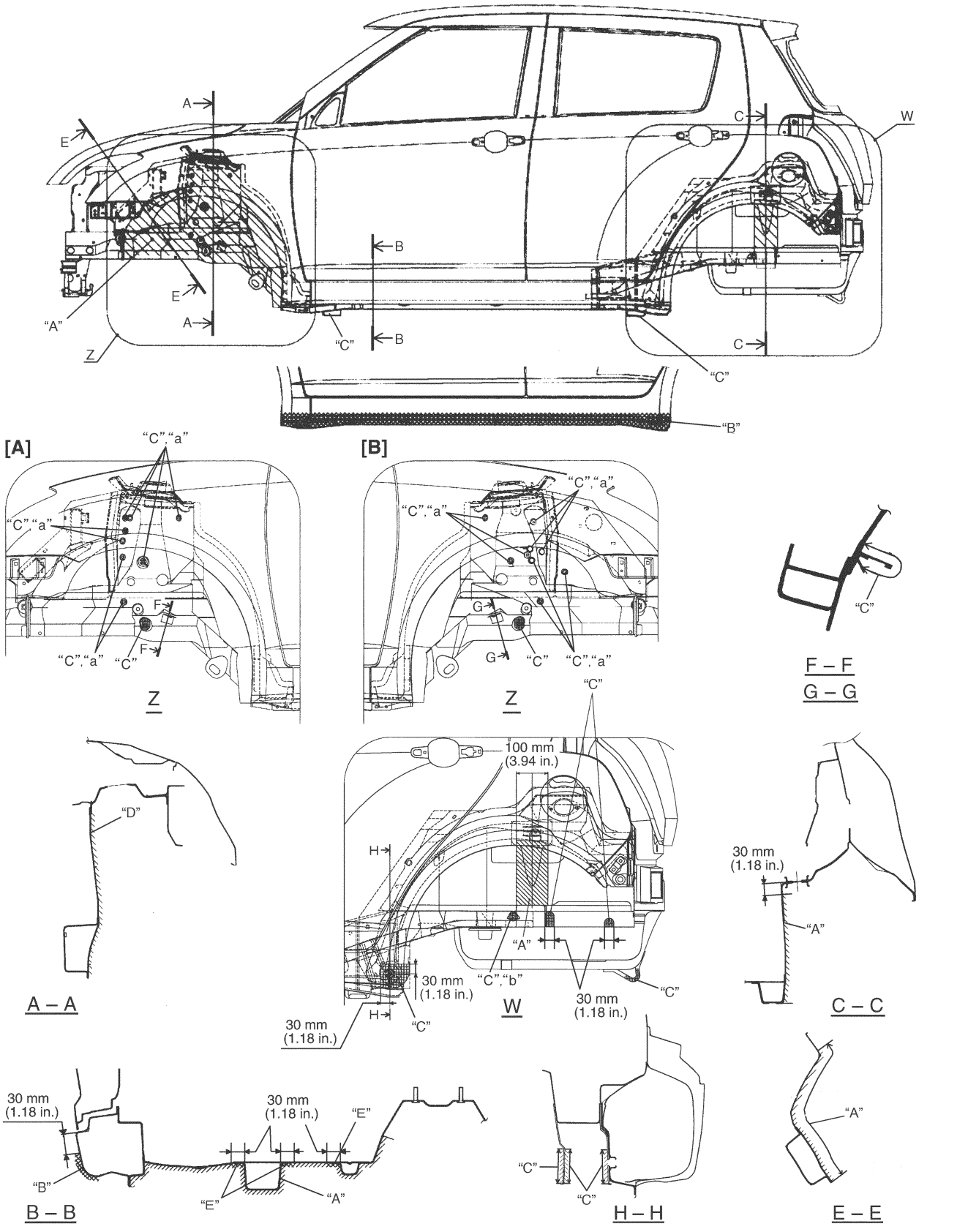
K4 – K4

I7N20A9C0003-02

>: Minimum	"A": Apply sealant.
<: Maximum	"B": Apply sealant covering flange end.

Under Coating Application Areas

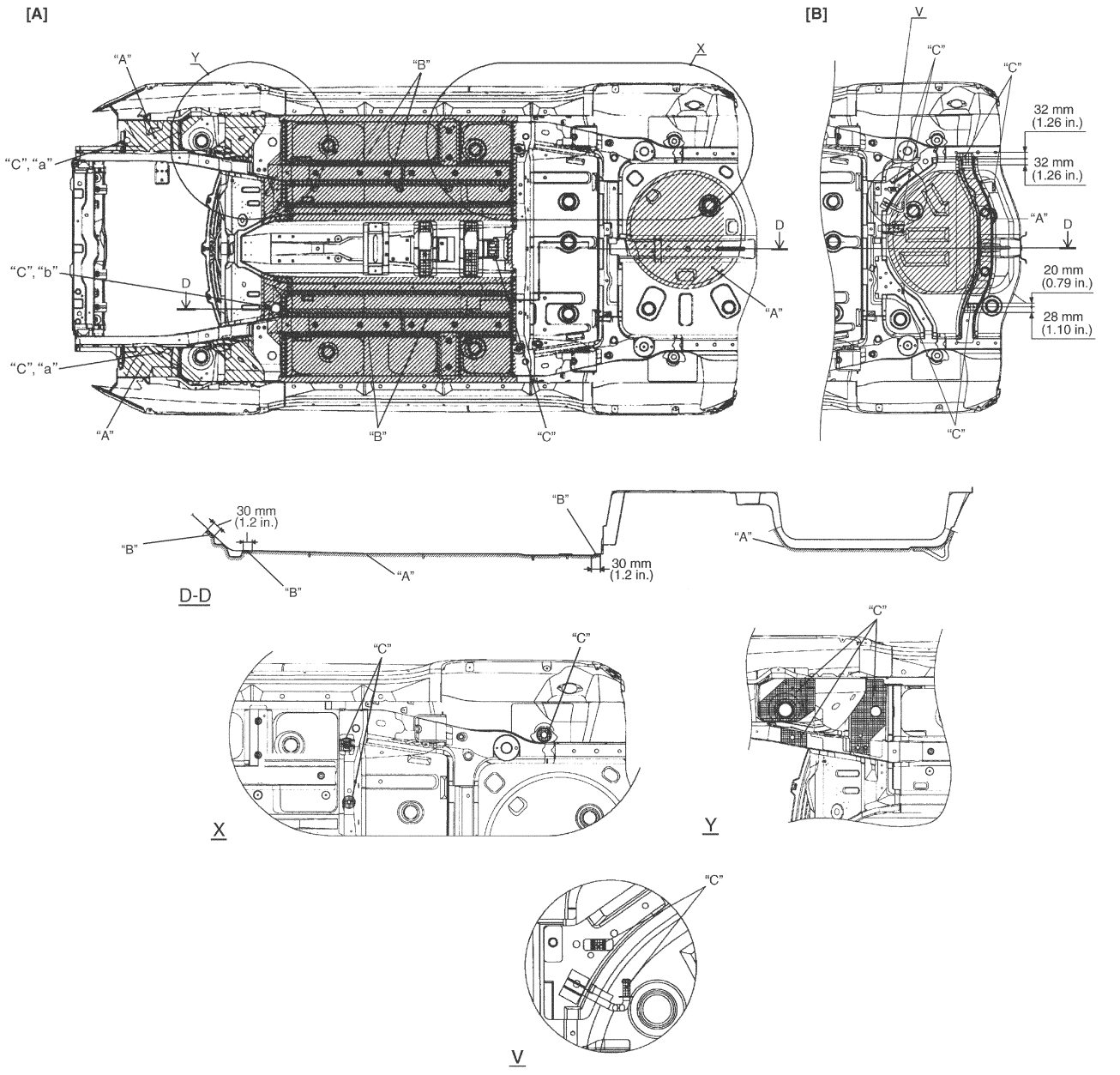
S7N20A9C03002



I7N20A9C0004-02

[A]: LH side	"D": Apply undercoating (PVC, 400 μm or more) covering flange end.
[B]: RH side	"E": Apply undercoating (PVC, 600 μm or more).
"A": Apply undercoating (PVC, 400 μm or more).	"a": ϕ 20 mm, (0.79 in.)
"B": Apply anti-chip coat (300 μm or more).	"b": ϕ 30 mm, (1.18 in.)

“C”: Do not apply undercoating.	

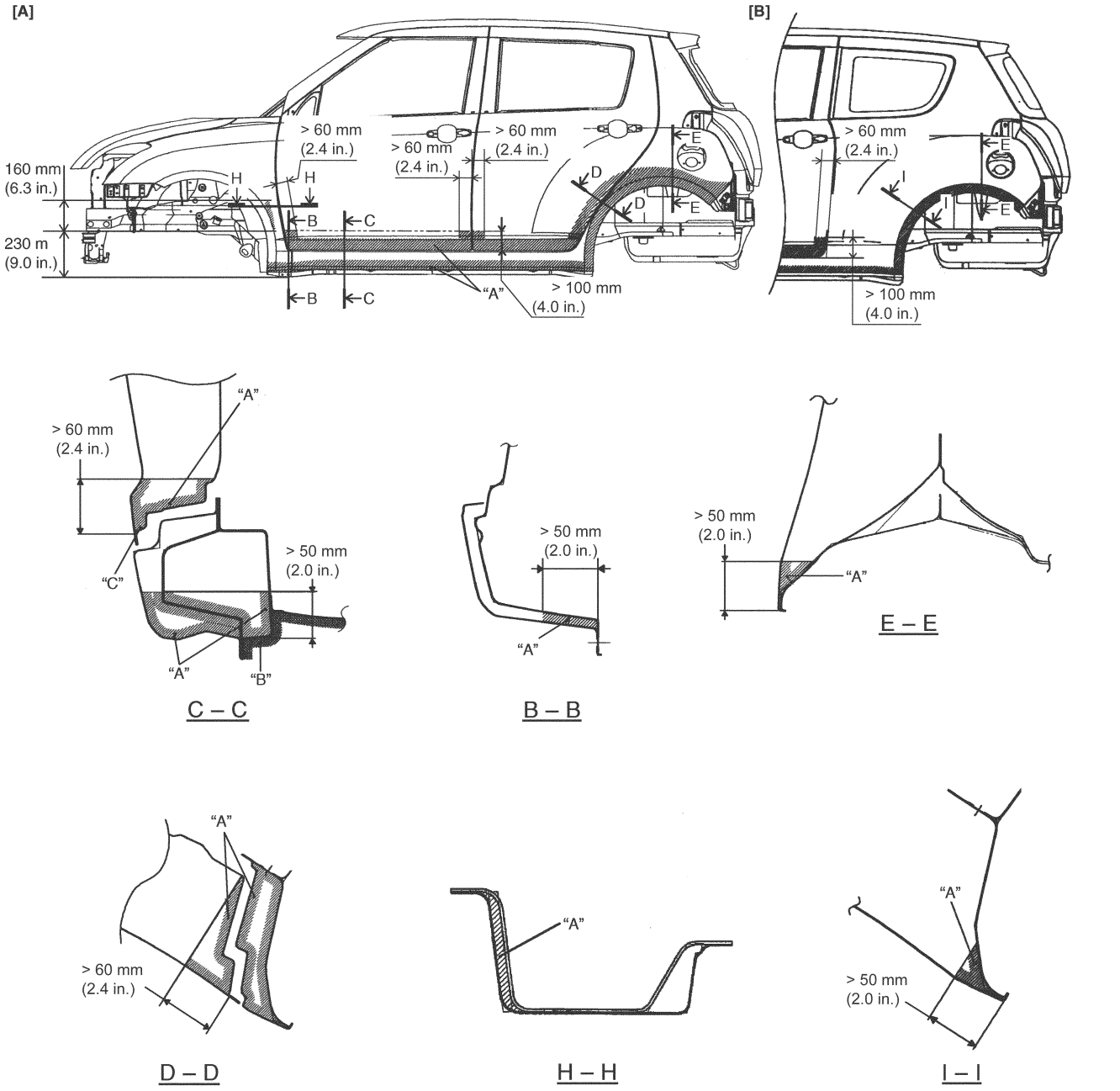


I7N20A9C0005-02

[A]: Other than M16 engine model	“C”: Do not apply undercoating.
[B]: M16 engine model	“a”: ϕ 30 mm (1.18 in.)
“A”: Apply undercoating (PVC, 400 μm or more).	“b”: ϕ 50 mm (1.97 in.)
“B”: Apply undercoating (PVC, 600 μm or more).	

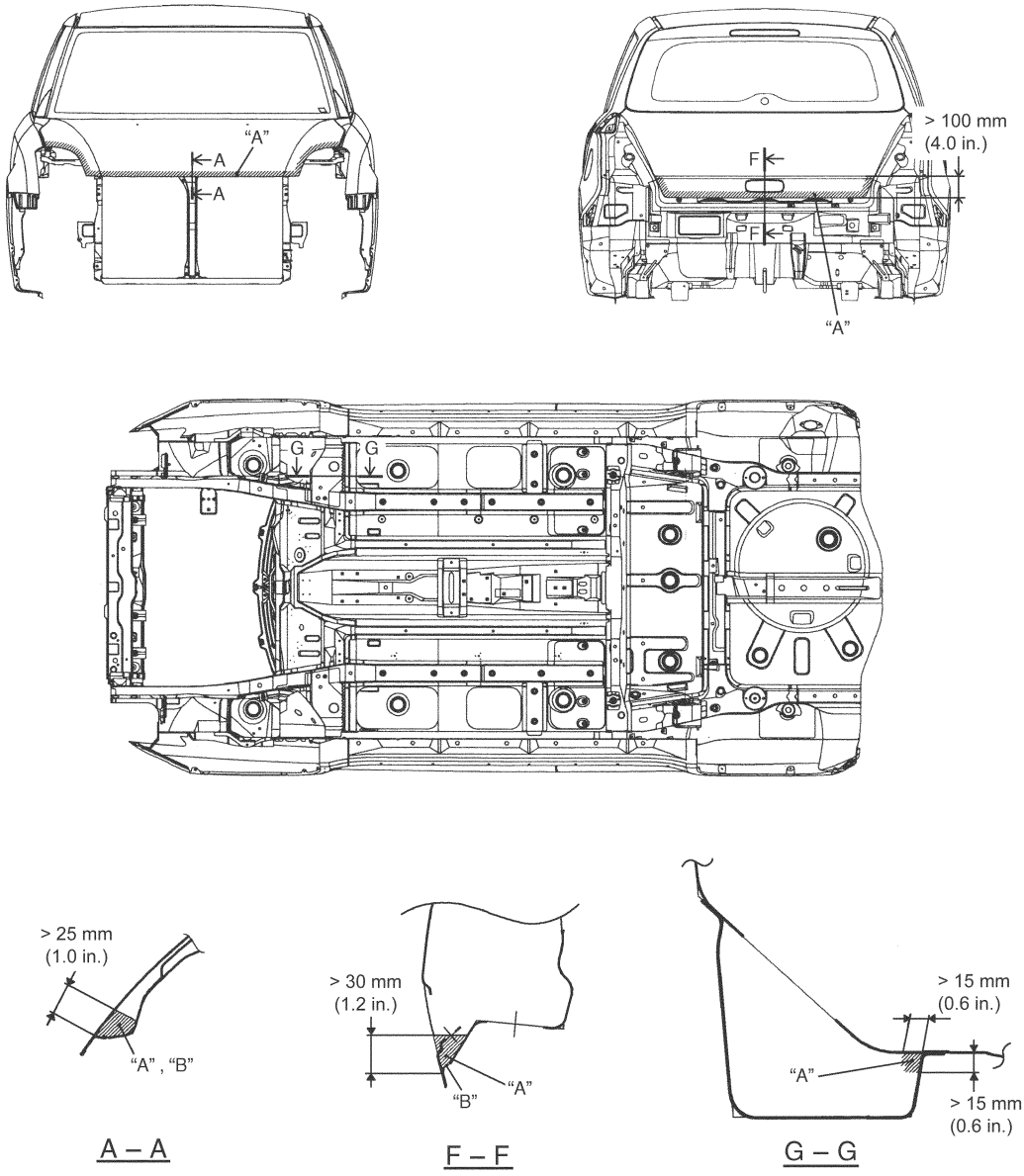
Anti-Corrosion Compound Application Area

S7N20A9C03003



I7N20A9C0006-03

>: Minimum	"A": Apply rust proof wax (hot wax 50 μm or more)
<: Maximum	"B": Apply rust proof wax (high viscosity wax 50 μm or more)
[A]: 5 door model.	"C": Never fill up drain holes with rust proof wax
[B]: 3 door model.	



I7N20A9C0007-02

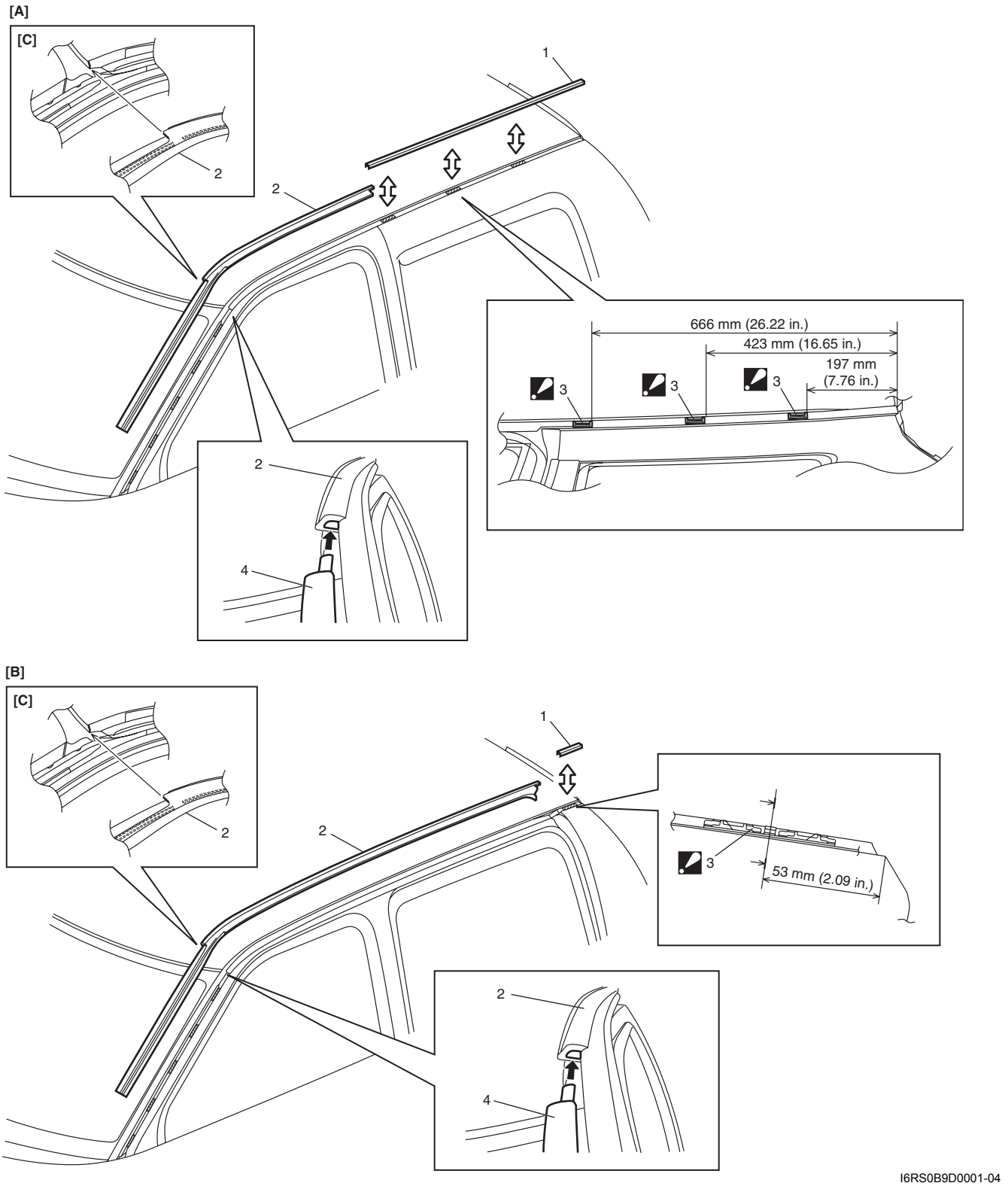
>: Minimum	"A": Apply rust proof wax (hot wax 50 μm or more).
<: Maximum	"B": Never fill up drain holes with rust proof wax.

Exterior Trim

Repair Instructions

Roof Molding Components

S7N20A9D06001



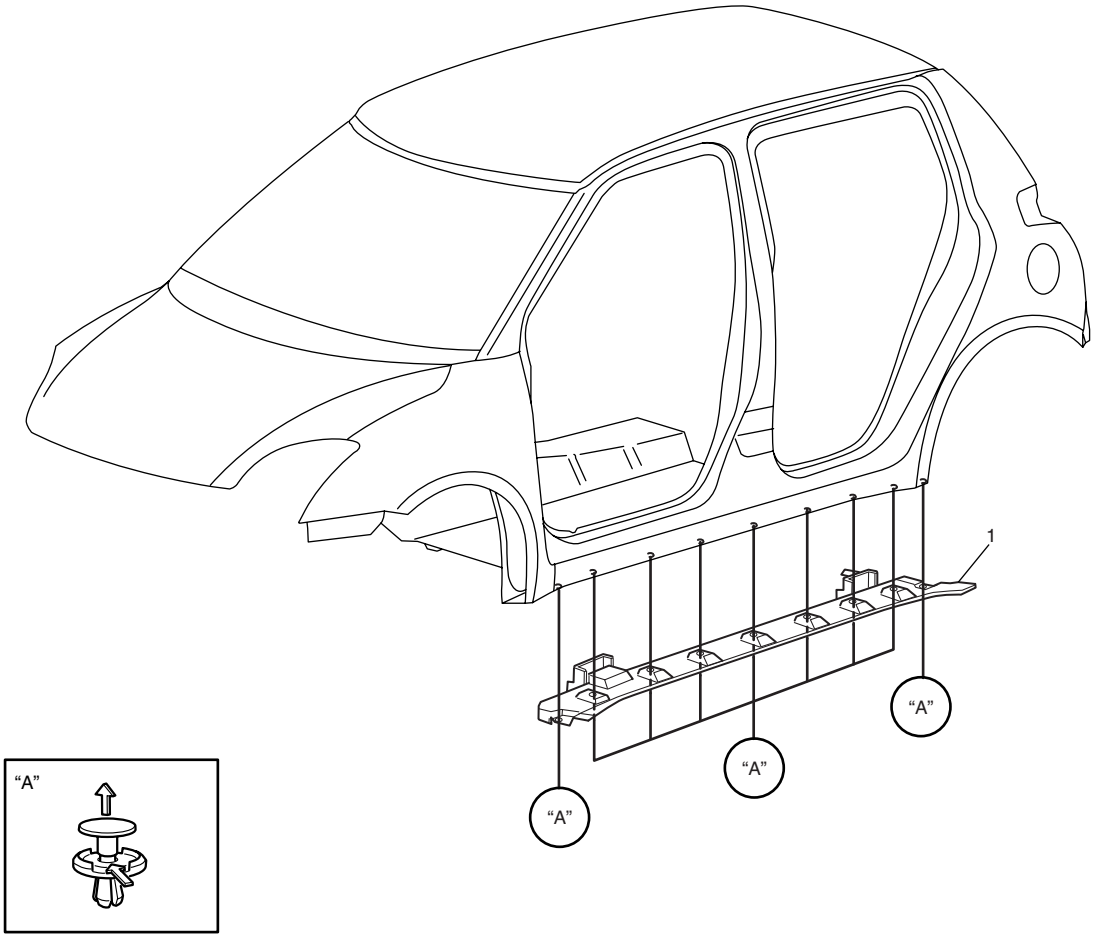
I6RS0B9D0001-04

[A]: 3 door model	2. Roof side weather-strip
[B]: 5 door model	3. Roof molding clip (Push-in type) : Install roof molding clip to specified position on body with epoxy adhesive applied.

[C]: Roof side weather-strip installation position	4. Windshield side garnish
1. Roof molding	

Splash Guard (If Equipped) Components

S7N20A9D06002



I4RS0A980010-01

1. Side sill splash guard

Section 10

Control Systems

CONTENTS

Precautions

Precautions

Precautions for Control Systems

S7N20AA000001

Air Bag Warning
Refer to “Air Bag Warning in Section 00”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble in Section 10B”.

Precautions in Diagnosing Troubles
Refer to “Precautions in Diagnosing Troubles: Petrol Model in Section 10C” and “Precautions in Diagnosing Troubles: Diesel Model in Section 10C”.

Precaution in Replacing ECM
Refer to “Precaution in Replacing ECM: Petrol Model in Section 10C”.

Precautions in Handling Immobilizer Control System
Refer to “Precautions in Handling Immobilizer Control System: Petrol Model in Section 10C” and “Precautions in Handling Immobilizer Control System: Diesel Model in Section 10C”.

Precautions after Replacing ECM or Immobilizer Control Module
Refer to “Precautions after Replacing ECM or Immobilizer Control Module: Diesel Model in Section 10C”.

Precautions in Diagnosing Trouble
Refer to “Precautions in Diagnosing Trouble: M13A / M15A / M16A in Section 1A” and “Precautions in Diagnosing Trouble: D13A / Z13DTJ in Section 1A”.

Body Electrical Control System

Precautions

Precautions in Diagnosing Trouble

S7N20AA200001

- Diagnostic information stored in BCM memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00" before inspection and observe what is written there.
- Communication of ECM, TCM (if equipped), ABS / ESP® control module, keyless start control module (if equipped), combination meter, steering angle sensor (if equipped) and BCM is established by CAN (Controller Area Network). For detail of CAN communication for BCM, refer to "CAN Communication System Description". Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System in Section 00".

General Description

BCM General Description

S7N20AA201001

The Body electrical Control Module (BCM) is incorporated in junction block assembly. Do not attempt removal of BCM from junction block assembly as it may cause contact failure.
The BCM incorporates relays and controllers which are used for the following systems and controls them.

- Power door lock
- Keyless entry
- Door lock function of keyless start system
- Rear wiper
- Combination meter
- Interior light
- Warning buzzer
- Rear end door window defogger and door miller heater
- Rear end door opener
- Alarm indicator lamp

Also, the BCM has a function to cause the interior light and open door warning lamp in the combination meter to turn off when any door is left open for longer than 15 minutes to reduce wasteful battery consumption.
In addition, it is possible to check operation of actuator which is controlled by BCM by using the output test function of SUZUKI scan tool to operate actuator simulatively.

CAN Communication System Description

S7N20AA201002

Refer to "CAN Communication System Description: M13A / M15A / M16A in Section 1A" or "CAN Communication System Description: D13A / Z13DTJ in Section 1A" for CAN communication system description.
BCM communication control data with each control module as follows.

BCM Transmission Data

				ECM	TCM (A/T model)	ESP® Control Module	Combination Meter	Keyless Start Control Module
BCM	Transmit	DATA	A/C switch ON signal	○				
			Electric load signal	○*1				
			"3" position switch signal		○			
			Brake fluid level switch signal			○	○	
			Parking brake switch signal			○	○	
			Diagnostic trouble code (DTC)				○	
			Illumination ON signal				○	
			Seat belt buckle switch signal				○	
			Charging system signal				○	○
			Engine oil pressure switch signal				○*1	○
			Door switch status				○	○*1
			Door lock status					○

I7N20AA20002-03

BCM Reception Data

				ECM	TCM (A/T model)	TCM (Automated Manual Transaxle model)	Combination Meter	Keyless Start Control Module
BCM	Receive	DATA	Engine speed signal	○				
			Engine coolant temperature signal	○				
			Vehicle speed signal	○				
			A/C compressor clutch signal	○				
			A/C refrigerant pressure signal	○				
			Fuel consumption signal	○				
			Brake pedal switch signal	○*2				
			Fuel heater signal	○*2				
			Engine oil pressure switch signal	○*2				
			Glow plug active signal	○*2				
			Fuel level signal	○*2			○*1	
			Transmission range sensor signal		○			
			Transmission shift position signal			○		
			Buzzer request signal			○		
			Door lock/unlock request signal					○
			Ignition knob switch signal					○
			Answer back request signal					○

I7N20AA20003-03

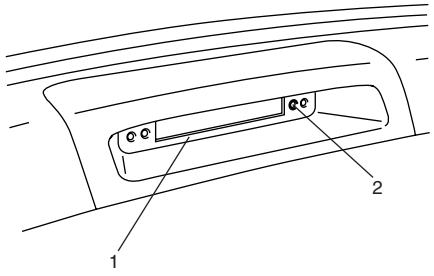
NOTE

***1: Petrol engine model.**
***2: Diesel engine model.**

Alarm Indicator Lamp Description

S7N20AA201003

The information display or clock (1) of this vehicle includes an alarm indicator lamp (2) for the theft preventive purpose. The BCM makes the alarm indicator lamp flash at certain intervals after the ignition switch is turned off until it is turned on again. Also, to check DTCs stored in BCM without using a SUZUKI scan tool when diagnosing troubles, it is possible to identify them by flashing patters of the alarm indicator lamp.



I4RS0AA20031-01

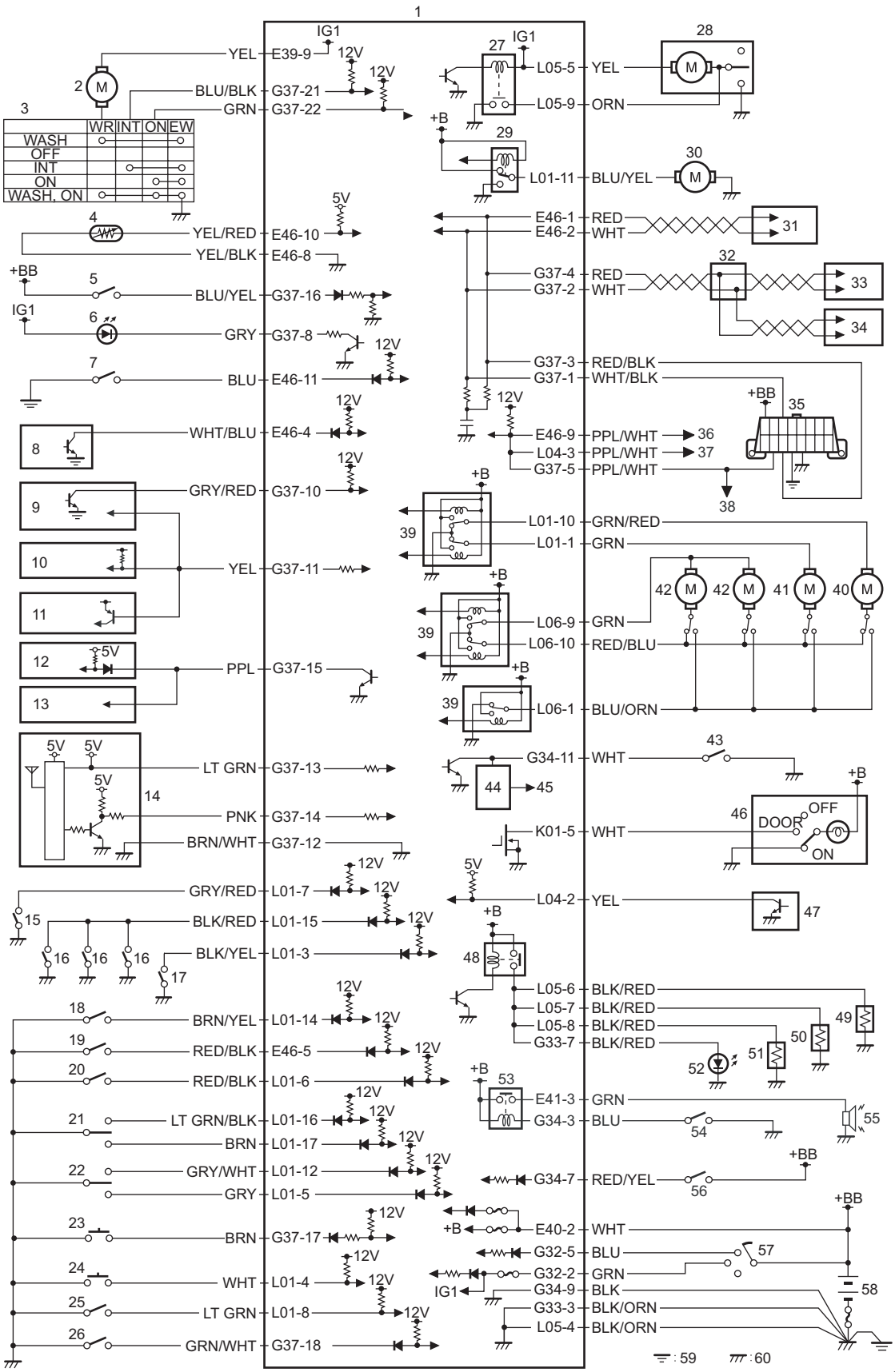
Schematic and Routing Diagram

Body Electrical Control System Wiring Circuit Diagram

S7N20AA202001

NOTE

This wiring diagram shows circuits related to only BCM, not the entire circuits of BCM and junction block. Refer to "Power Supply Diagram (Petrol) in Section 9A" or "Power Supply Diagram (DSL) in Section 9A" for wiring circuits other than the figure below.



I7N20AA20005-03

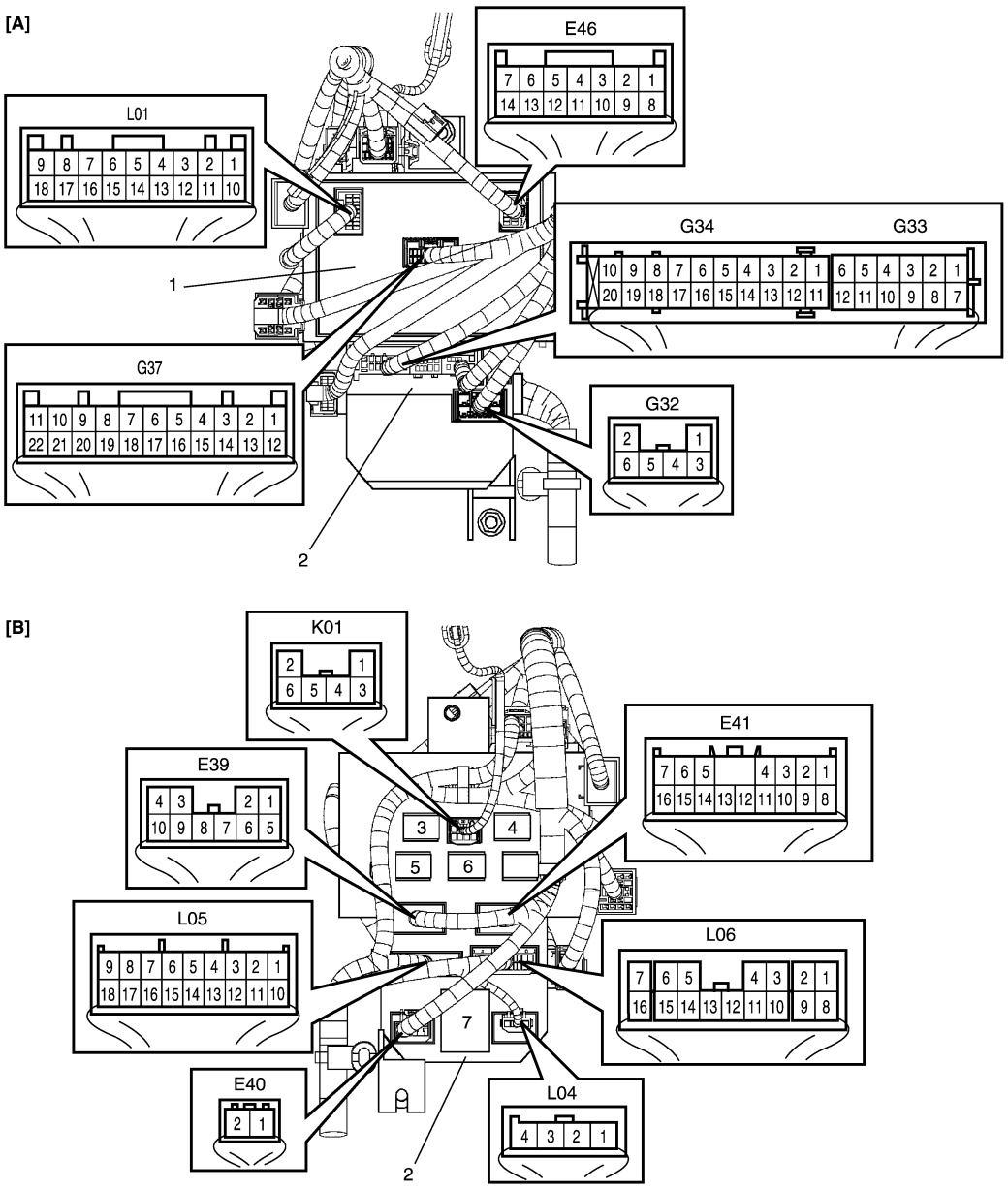
1. BCM (included in junction block)	21. Door key cylinder switch (included in door lock actuator)	41. Passenger side door lock actuator
2. Rear washer motor	22. Manual door lock switch	42. Rear door lock actuator (if equipped)
3. Rear wiper and washer switch	23. Rear end door window defogger switch	43. Hazard warning switch
4. Outside air temperature sensor (if equipped)	24. Rear end door opener switch	44. Turn signal and hazard warning relay

5. Key reminder switch	25. “3” position switch (A/T model)	45. To turn signal light
6. Alarm indicator lamp	26. A/C switch (if equipped)	46. Interior light
7. Oil pressure switch (petrol engine model)	27. Rear wiper relay	47. SDM
8. Generator	28. Rear wiper motor	48. Rear end door window defogger relay
9. Additional heater controller (if equipped)	29. Rear end door opener relay	49. Right side door mirror heater (if equipped)
10. Information display (if equipped)	30. Rear end door opener actuator	50. Left side door mirror heater (if equipped)
11. HVAC control module (if equipped)	31. ABS / ESP® control module	51. Rear end door window defogger
12. P/S control module	32. CAN junction connector (if equipped)	52. Rear end door window defogger indicator light
13. Audio unit (if equipped)	33. Combination meter	53. Horn relay
14. Keyless entry receiver (if equipped)	34. Steering angle sensor (if equipped)	54. Horn switch
15. Driver side door switch	35. Data link connector (DLC)	55. Horn
16. Other than driver side door switch	36. To ECM, ABS or ESP® control module, immobilizer control module (diesel engine model) P/S control module and TCM (A/T model)	56. Lighting switch
17. Rear end door switch	37. To SDM	57. Ignition switch
18. Driver side seat belt switch	38. To HVAC control module (if equipped) and TCM (Automated Manual Transaxle model)	58. Battery
19. Brake fluid level switch	39. Door lock actuator relay	59. Engine ground
20. Parking brake switch	40. Driver side door lock actuator	60. Body ground

Connector Layout Diagram of BCM and Junction Block Assembly

S7N20AA202002

BCM and junction block assembly connectors (viewed from harness side)



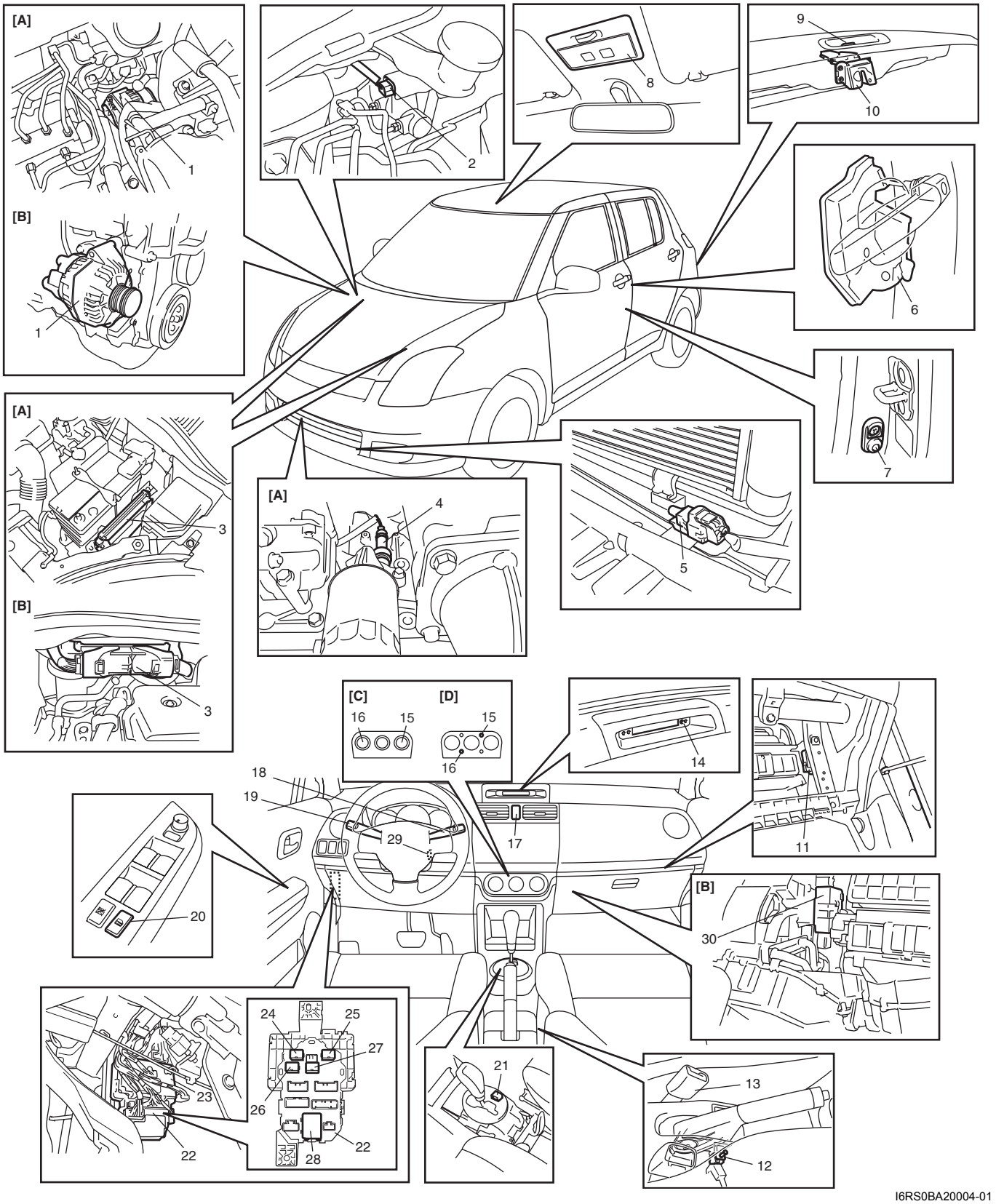
I4RS0AA20004-01

[A]: Junction block assembly (viewed from BCM side)	4. Horn relay
[B]: Junction block assembly (viewed from relay side)	5. Rear wiper relay
1. BCM	6. Rear end door window defogger relay
2. Junction block assembly	7. Turn signal and hazard warning relay
3. Heater relay	

Component Location

BCM and Related System Component Location

S7N20AA203001



I6RS0BA20004-01

[A]: Petrol engine model	9. Rear end door opener switch	21. “3” position switch
[B]: Diesel engine model	10. Rear end door lock actuator (incorporated in door switch)	22. Junction block

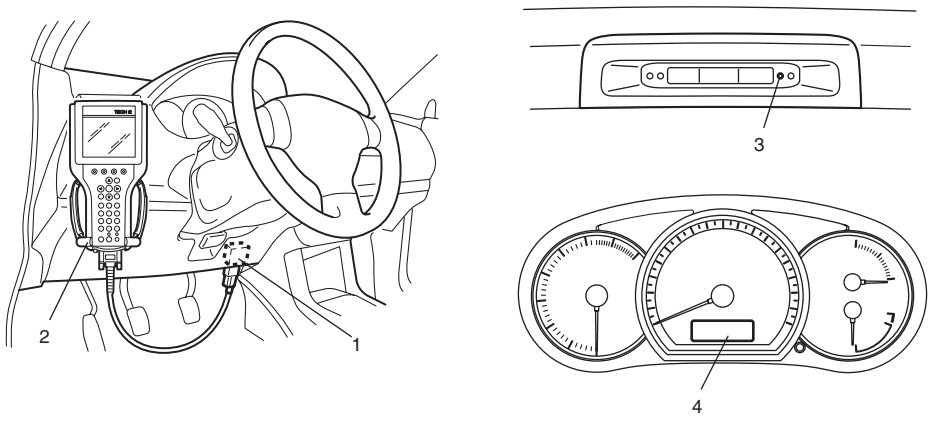
[C]: Automatic A/C	11. Keyless entry receiver or keyless start control module	23. BCM
[D]: Manual A/C	12. Parking brake switch	24. Heater relay
1. Generator	13. Seat belt buckle switch	25. Horn relay
2. Brake fluid level switch	14. Alarm indicator lamp	26. Rear wiper relay
3. ECM	15. Rear end door window defogger switch	27. Rear end door window defogger relay
4. Oil pressure switch	16. A/C switch	28. Turn signal and hazard warning relay
5. Outside air temperature sensor	17. Hazard warning switch	29. Key reminder switch (included in ignition switch)
6. Door lock actuator (incorporated in key cylinder switch)	18. Rear wiper switch	30. Additional heater controller
7. Door switch	19. Lighting switch	
8. Interior light	20. Manual door lock switch	

Diagnostic Information and Procedures

BCM Self-Diagnosis Function

S7N20AA204001

- BCM monitors conditions of the system components and its circuit with ignition switch turned to ON position. When an abnormality in the system occurs, the area where that abnormality lies is stored in the memory of EEPROM in BCM.
- DTC can be checked in either one of following ways.
  - DTC can be checked by SUZUKI scan tool (2) connected to DTC (1).
  - DTC can be read from flashing pattern of alarm indicator lamp (3). Also, DTC is displayed on combinations meter (4) at the same time.



I4RS0BA20004-03

BCM input / output table

Control	Input	Output
Power door lock system	• Key cylinder switch • Manual door lock switch	• Each door lock actuator
Keyless entry system	• Key reminder switch • Keyless entry receiver • Driver side door switch	• Each door lock actuator • Turn signal and hazard warning relay • Interior light
Keyless start system (Door lock function)	• Keyless start control module	• Each door lock actuator • Turn signal and hazard warning relay • Interior light
Rear wiper	• Rear wiper INT switch • Rear wiper LO switch	• Rear wiper relay

Control	Input	Output
Combination meter	• Tail light switch • Oil pressure switch (petrol engine model) • Parking brake switch • Driver side seat belt switch • Brake fluid level switch • Generator • Each door switch	• Combination meter
Interior light	• Each door switch • Key reminder switch	• Interior light
Warning buzzer	• Key reminder switch • Tail light switch • Driver side door switch • TCM (Automated Manual Transaxle model) • Keyless start control module (if equipped)	• Warning buzzer (located in BCM)
Rear end door window defogger	• Rear end door window defogger switch • Generator	• Rear end door window defogger relay
Rear end door opener	• Manual door lock switch (unlock signal) • Key cylinder switch (unlock signal) • Keyless entry transmitter (unlock signal) • Rear end door opener switch	• Rear end door opener relay
Alarm indicator lamp	• Key reminder switch	• Alarm indicator lamp (located in information display or clock)

Body Electrical Control System Check

S7N20AA204002

Step	Action	Yes	No
1	☞ **Customer complaint analysis** 1) Perform customer complaint analysis. *Was customer complaint analysis performed?*	Go to Step 2.	Perform customer complaint analysis.
2	☞ **Problem symptom confirmation** 1) Perform problem symptom confirmation. *Does trouble recur?*	Go to Step 3.	Go to Step 7.
3	☞ **DTC check** 1) Check DTC. *Is it malfunction code?*	Go to Step 4.	Go to Step 5.
4	☞ **Troubleshooting for DTC** 1) Check and repair according to DTC diag. flow. *Are check and repair completed?*	Go to Step 7.	Check and repair malfunction part(s).
5	☞ **Body electrical control system symptom diagnosis** 1) Perform check and repair referring to “Symptom Diagnosis” of system having a trouble. *Is there faulty condition?*	Repair or replace malfunction part(s).	Go to Step 6.
6	☞ **Check for intermittent problem** 1) Check for intermittent problem. *Is there faulty condition?*	Repair or replace malfunction part(s).	Go to Step 7.

Step	Action	Yes	No
7	☞ **Final confirmation test** 1) Clear DTC referring to “DTC Clearance”. 2) Check DTC referring to “DTC Check”. *Is there any DTC?*	Go to Step 4.	End.

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 ・ Rearend door window defogger does not operate ・ Rear wiper does not operate ・ Rearend door opener does not operate ・ Warning buzzer does not sound ・ Interior light does not light ・ Alarm indicator lamp does not flash		
Frequency of Occurrence	・ Continuous / Intermittent (_____ times a day, a month) / other_____		
Environmental Condition	・ Weather: fair / cloudy / rain / snow / other_____ ・ Temperature: _____ ° F (_____ ° C)		
Diagnostic Trouble Code	・ Normal code / malfunction code(_____)		

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Problem Symptom Confirmation
Check if what the customer claimed in “Customer Questionnaire” is accurately found in the vehicle. If that symptom is found, check whether the symptom is identified as a failure. (This step should be shared with the customer if possible.)

DTC check
Check DTC stored in BCM memory referring to “DTC Check”, record it and then clear it referring to “DTC Clearance”. DTC indicates malfunction that occurred in the system but does not indicate whether it exists now or it occurred in the past and the normal condition has been restored now. To check which case applies, clear DTC once and check whether or not any fault exists.

Troubleshooting for DTC
Based on the DTC indicated in Step 3 and referring to applicable DTC flow, locate the cause of the trouble, namely in a sensor, wire harness, connector, BCM or other part and repair or replace faulty parts.

Body Electrical Control System Symptom Diagnosis
Check the parts or system suspected as a possible cause referring to symptom diagnosis of each system.

Check for Intermittent Problem
Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection Inspection in Section 00”.

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, check DTC again and confirm that no DTC is indicated.

Scan Tool Data

S7N20AA204003

Scan tool Data	Condition	Normal condition / reference value
Vehicle Speed	At stop with ignition switch turned ON	0 km/h
Outside air Temp	Reference value is relative to outside air temperature	–40 °C – 70 °C (–40 °F – 158 °F)
Battery Voltage	At specified idle speed after warming up	10 – 14 V
Coolant Temp	At specified idle speed after warming up	80 °C – 100 °C (176 °F – 212 °F)
Engine Speed	Engine idling with no load applied after warming up	Desired idle speed ± 50 rpm
Fuel Consumption	At specified idle speed after warming up	0.0 km/l
Key Reminder Sw	Ignition key inserted in ignition key cylinder	Key in
	Ignition key pulled out from ignition key cylinder	Pulled
Rear Wiper Sw	Rear wiper switch at ON position and ignition switch turned ON	ON
	Rear wiper switch at INT position and ignition switch turned ON	INT
	Rear wiper switch at OFF position and ignition switch turned ON	OFF
Door key Sw	Key cylinder switch of driver side door at lock position	LOCK
	Key cylinder switch of driver side door not turned	Neutral
	Key cylinder switch of driver side door at unlock position	Unlock
Door Lock Sw	Lock side of manual door lock switch pressed	LOCK
	Manual door lock switch not pressed	Neutral
	Unlock side of manual door lock switch pressed	Unlock
Driv Door Sw	Driver side door open	Open
	Driver side door closed	Close
Pass Door Sw	Doors other than driver side door open	Open
	Doors other than driver side door closed	Close
Brake Fluid Level	Brake fluid level at MIN level or higher	Normal
	Brake fluid level lower than MIN level	Low
Parking Brake Sw	Parking brake lever pulled	ON
	Parking brake lever released	OFF
Rear Defogger Sw	Rear end door window defogger switch pressed with engine running	ON
	Rear end door window defogger switch not pressed with engine running	OFF
Tail Light Sw	Lighting switch at HEAD or CLEARANCE position	ON
	Lighting switch at OFF position	OFF
Driv Seatbelt Sw	Driver side seat belt fastened	Fasten
	Driver side seat belt unfastened	Unfasten
Rear end door opener	Rear end door opener switch pressed	ON
	Rear end door opener switch not pressed	OFF
“3” Position Sw	A/T select lever at 2nd or 3rd position with ignition switch turned ON	ON
	A/T select lever at other than 2nd or 3rd position with ignition switch turned ON	OFF
Charge Lamp	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
Oil pressure switch	Engine at stop with ignition switch turned ON	ON
	Engine running	OFF
A/C Switch	A/C and ignition switch turned ON	ON
	A/C switch turned OFF	OFF

Scan Tool Data Definitions

Vehicle Speed (km/h, mph): This parameter indicates the vehicle speed computed by ECM.
Outside air Temp (°C, °F): It is detected by outside air temperature sensor.
Battery Voltage (V): This parameter indicates battery positive voltage inputted to BCM.
Coolant Temp (Engine coolant temperature) (°C, °F): It is detected by engine coolant temperature sensor.
Engine Speed (RPM): It is computed by reference pulse signals from CMP sensor.
Fuel Consumption (km/l): This parameter indicates the fuel consumption computed by ECM.
Key Reminder Sw (Key remainder switch) (Pulled / Key in): This parameter indicates the state of the key reminder switch.
Rear Wiper Sw (Rear wiper switch) (ON / INT / OFF): This parameter indicates the state of the rear wiper switch.
Door key Sw (Door key cylinder switch) (Lock / Neutral / Unlock): This parameter indicates the state of the door key cylinder switch.
Door lock Sw (Manual door lock switch) (Lock / Neutral / Unlock): This parameter indicates the state of the manual door lock switch.
Driv Door Sw (Driver side door switch) (Open / Close): This parameter indicates the state of the driver side door switch.
Pass Door Sw (Other than driver side door switch) (Open / Close): This parameter indicates the state of the door switches other than driver side door switch.
Brake Fluid Level (Low / Normal): Low: Brake fluid level is lower than specified level.
Normal: Brake fluid level is higher than MIN level.
Parking Brake Sw (Parking brake switch) (ON / OFF): ON: Parking brake lever is pulled up.
OFF: Parking lever is released.
Rear Defogger Sw (Rear end door window defogger switch) (ON / OFF): This parameter indicates the state of the rear end door window defogger switch.
Tail Light Sw (Lighting switch) (ON / OFF): This parameter indicates the state of the lighting switch.
Driv Seatbelt Sw (Driver seat belt switch) (Fasten / Unfasten): This parameter indicates the state of the driver side seat belt buckle switch.
Rear end Door Opener (Rear end door opener switch) (ON / OFF): This parameter indicates the state of the rear end door opener switch.
"3" position Sw (ON/OFF) (A/T model): This parameter indicates the state of the "3" position switch included in A/T manual selector assembly.
Charge lamp (ON / OFF): This parameter indicates the state of the charging system monitor signal.
Oil pressure switch (ON / OFF) (petrol engine model): This parameter indicates the state of the oil pressure switch.
A/C Switch (ON / OFF): This parameter indicates the state of the air conditioning switch.

Diagnosis Using Output Test Function of SUZUKI Scan Tool

SUZUKI scan tool has the output test function which can force operation of following actuators and relays of the system controlled by BCM. When a malfunction is found in the system controlled by BCM, execute the output test which enables easy judgment whether the malfunction is on the input side or output side of BCM. For detailed information on operation of SUZUKI scan tool, refer to "SUZUKI Scan Tool Operator's Manual".

Output Teat Item	Controlled Parts
Hazard Warning Light	Turn signal and hazard warning relay
Interior (Dome) Light	Interior (Dome) light (when interior light switch is at DOOR position)
Door	Each door lock actuator
Rear end door open	Rear end door opener relay
Dead Lock	Each door lock actuator
Warning buzzer	Warning buzzer (in BCM)
Rear wiper	Rear wiper relay
Alarm indicator	Alarm indicator lamp (in information display or clock)
Rear defogger	Rear end door window defogger relay

DTC Table

S7N20AA204004

DTC (displayed on SUZUKI scan tool)	DTC (indicated by alarm indicator lamp)	DTC (displayed on odometer in combination meter)	Detected item	Detecting condition
NO DTC	0000	0000	—	No DTC detected
☞ B1133	1133	b1133	Battery voltage too high	Battery voltage too high
☞ B1141	1141	b1141	Outside air temperature (ambient temperature) sensor circuit open	Sensor output voltage too high
☞ B1142	1142	b1142	Outside air temperature (ambient temperature) sensor circuit short to ground	Sensor output voltage too low
☞ B1150	1150	b1150	Air bag communication circuit malfunction	Air bag communication circuit open or short to ground
☞ B1157	1157	b1157	Air bag deployment signal input	Air bag deployment signal inputted
☞ B1170	1170	b1170	EEPROM access error	Memory error
☞ U0155	0155	U0155	Lost communication with instrument panel cluster (IPC) control module	Receiving error of BCM from combination meter for specified time continuously
☞ U1073	1073	U1073	Control module communication bus off	Transmitting and receiving error of BCM for specified time continuously
☞ U1100	1100	U1100	Lost communication with ECM	Receiving error of BCM from ECM for specified time continuously
☞ U1101	1101	U1101	Lost communication with TCM or TCM (Automated Manual Transaxle)	Receiving error of BCM from TCM or TCM (Automated Manual Transaxle) for specified time continuously
☞ U1144	1144	U1144	Lost communication with key free control unit	Receiving error of BCM from keyless start control module for specified time continuously

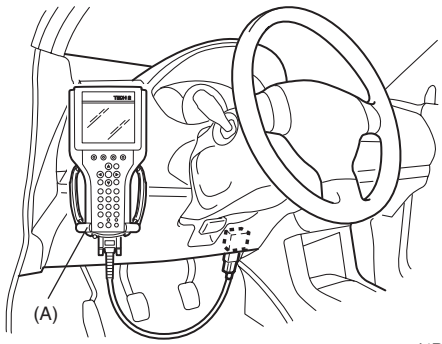
DTC Check

S7N20AA204005

Using SUZUKI Scan Tool

1) Prepare SUZUKI scan tool.
2) With ignition switch turned OFF, connect it to data link connector (DLC) located on underside of instrument panel of driver's side.

Special tool
(A): SUZUKI scan tool



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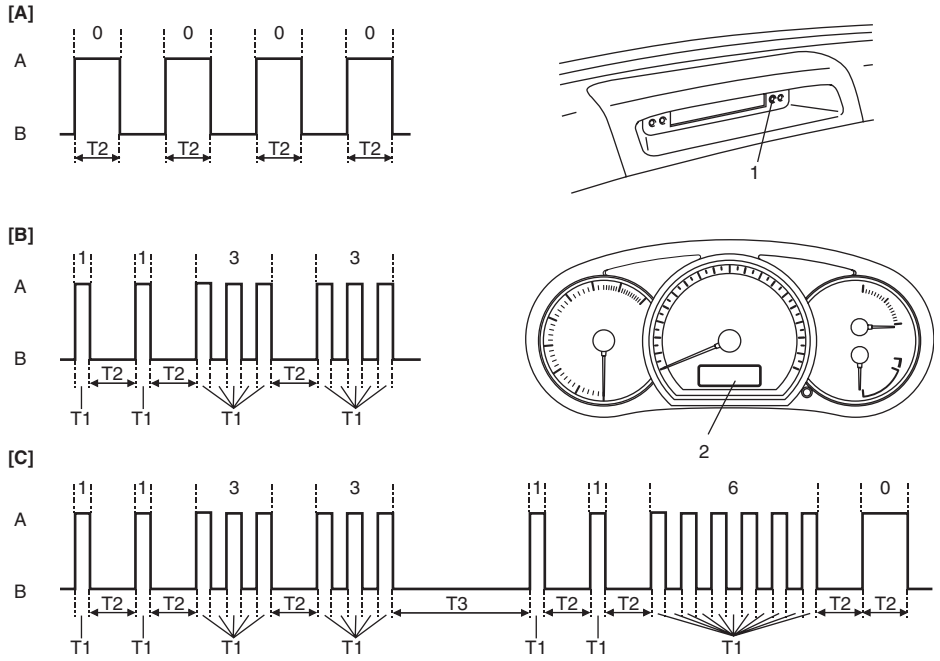
3) Turn ignition switch ON.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down.
   Refer to SUZUKI scan tool operator's manual for further details.
   If communication between SUZUKI scan tool and BCM is not possible, check if SUZUKI scan tool is communicable by connecting it to BCM in another vehicle. If communication is possible in this case, SUZUKI scan tool is in good condition. Then check data link connector and serial data line (circuit) in the vehicle with which communication was not possible.
5) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from data link connector.

Without Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Perform following Steps a) to d) within 10 seconds after ignition switch is turned ON and engine stops.
   a) Turn headlight switch to "SMALL" position.
   b) Turn headlight switch to "OFF" position.
   c) Repeat Steps a) and b) 2 times.
   d) Press and release driver side door switch 3 times.
3) Check DTC displayed on odometer of combination meter or read flashing pattern of alarm indicator lamp which represents DTC as shown in the following example and write it down.
   When more than 2 DTCs are stored in memory, flashing for each DTC starts with the smallest DTC number in increasing order. Also, DTC is indicated repeatedly until the ignition switch is turned OFF.



I4RS0AA20007-02

[A]: No DTC (No. 0000)	B: Indicator lamp turned OFF	1. Alarm indicator lamp
[B]: DTC B1133 (No. 1133)	T1: 0.3 seconds	2. Odometer
[C]: When 2 DTCs are detected	T2: 1.0 seconds	
A: Indicator lamp turned ON	T3: 3.0 seconds	

4) After completing the check, turn ignition switch to OFF position.

DTC Clearance

S7N20AA204006

After repair or replace of malfunction part(s), clear all DTCs by performing the following procedure.

Using SUZUKI Scan Tool

1) Connect SUZUKI scan tool to data link connector in the same manner as when making this connection for DTC check.
2) Turn ignition switch ON but do not start up engine.
3) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch off and disconnect scan tool from data link connector.

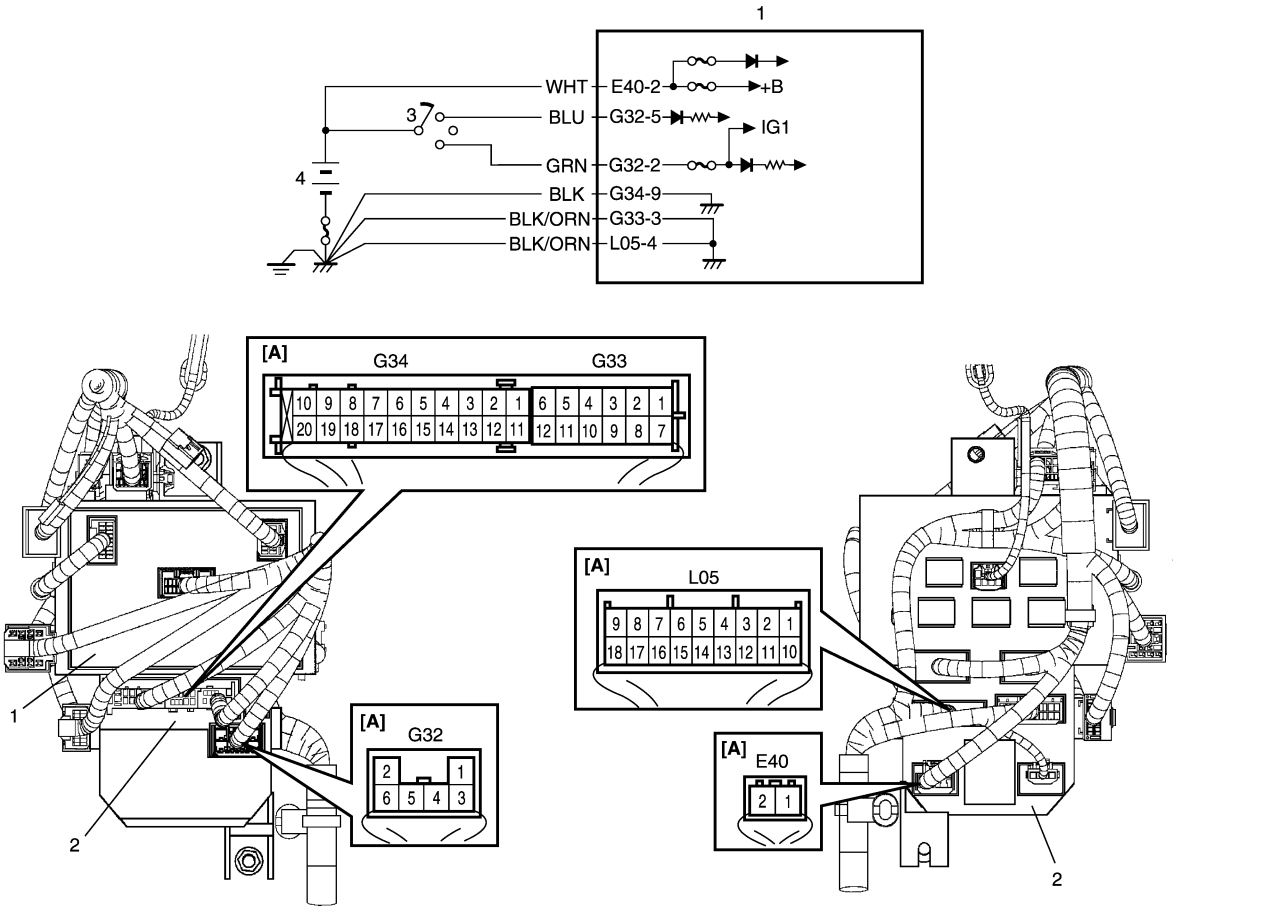
Without Using SUZUKI Scan Tool

1) Turn ignition switch to OFF position.
2) Perform following Steps a) to d) within 10 seconds after ignition switch is turned ON but do not start up engine.
   a) Turn headlight switch to "SMALL" position.
   b) Turn headlight switch to "OFF" position.
   c) Repeat Steps a) and b) 3 times.
   d) Press and release driver side door switch 4 times.
3) After completing above Steps, confirm that no malfunction DTC is detected.

BCM Power Circuit and Ground Circuit Check

S7N20AA204007

Wiring Diagram



I4RS0AA20008-01

[A]: Junction block assembly connector viewed from harness side	3. Ignition switch
1. BCM	4. Battery
2. Junction block assembly	

Troubleshooting

Step	Action	Yes	No
1	**Fuse check** 1) Turn ignition switch to OFF position. 2) Check circuit fuses for condition. *Are circuit fuses in good condition?*	Go to Step 2.	Replace fuse and check for short circuit to ground.
2	**Power supply circuit check** 1) Disconnect connectors from junction block assembly. 2) Check for proper connection to junction block assembly connector at terminal “E40-2”. 3) If OK, then measure voltage between “E40-2” terminal of junction block assembly connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	Repair power supply circuit.
3	**Power supply circuit check** 1) Check for proper connection to junction block assembly connector at terminals “G32-2” and “G32-5”. 2) If OK, turn ignition switch ON. 3) Measure voltage between following terminals. • Between “G32-2” terminal of junction block assembly connector and vehicle body ground • Between “G32-5” terminal of junction block assembly connector and vehicle body ground *Is each voltage 10 – 14 V?*	Go to Step 4.	Repair power supply circuit.
4	**Ground circuit check** 1) Turn ignition switch to OFF position. 2) Check for proper connection to junction block assembly connector at terminals “G33-3”, “G34-9” and “L05-4”. 3) If OK, then measure resistance between following terminals. • Between “G33-3” terminal of junction block assembly connector and vehicle body ground • Between “G34-9” terminal of junction block assembly connector and vehicle body ground • Between “L05-4” terminal of junction block assembly connector and vehicle body ground *Is each resistance 2 Ω or less?*	BCM power supply circuit and ground circuit are in good condition.	Repair ground circuit.

DTC B1133 (No. 1133): Battery Voltage Too High

S7N20AA204008

Wiring Diagram

Refer to “BCM Power Circuit and Ground Circuit Check”.

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
Power voltage supplied from battery to BCM is higher than 16V.	• Charging system malfunction • BCM malfunction

Flow Test Description
Step 1: Check charging system

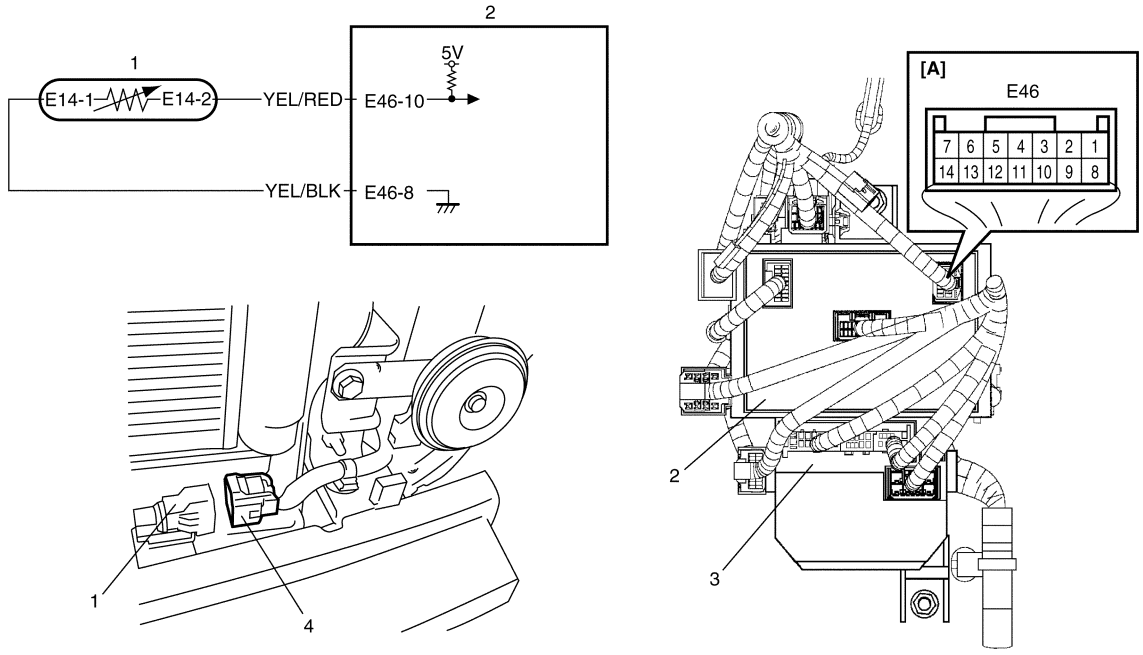
DTC Troubleshooting

Step	Action	Yes	No
1	**Charging system operation check** 1) Measure generator “B” terminal voltage at engine 2000 rpm. *Is voltage lower than 16 V?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Repair charging system.

DTC B1141 / B1142 (No. 1141 / No. 1142): Outside Air Temperature (Ambient Temp.) Sensor Circuit Malfunction

S7N20AA204009

Wiring Diagram



I4RS0AA20010-01

[A]: BCM connector viewed from harness side	3. Junction block assembly
1. Outside air temperature sensor	4. Outside air temperature sensor connector
2. BCM	

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
DTC B1141 (DTC No. 1141): Input signal from outside air temperature sensor is higher than 4.88 V.	• Open in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction
DTC B1142 (DTC No. 1142): Input signal from outside air temperature sensor is lower than 0.1 V.	• Short in outside air temperature sensor circuit • Outside air temperature sensor malfunction • BCM malfunction

Flow Test Description
Step 1: Check whether malfunction is in outside air temperature sensor.
Step 2: Check outside air temperature sensor input circuit.
Step 3: Check outside air temperature sensor ground circuit (for DTC B1141).

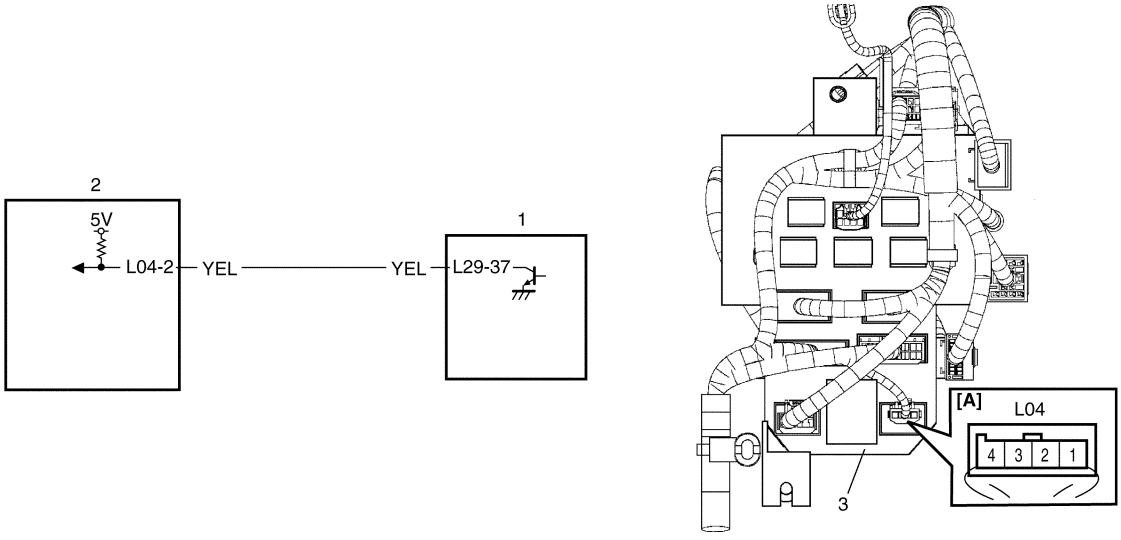
DTC Troubleshooting

Step	Action	Yes	No
1	**Check outside air temperature sensor** 1) Turn ignition switch to OFF position. 2) Disconnect connector from outside air temperature sensor. 3) Check outside air temperature sensor for resistance referring to “Outside Air Temperature Sensor Inspection (If Equipped) in Section 9C”. *Is it in good condition?*	Go to Step 2.	Replace outside air temperature sensor.
2	**Check outside air temperature sensor circuit** 1) Turn ignition switch to ON position. 2) Measure voltage between “E14-2” terminal of outside air temperature sensor connector and vehicle body ground. *Is voltage 4 – 6 V?*	Go to Step 3.	Open or short in “YEL/RED” circuit. If OK, substitute a known-good BCM (included in junction block assembly) and recheck.
3	**Check outside air temperature sensor circuit** 1) Turn ignition switch to OFF position. 2) Check for proper connection to “E46-8” terminal of BCM connector. 3) If OK, measure resistance between “E14-1” terminal of outside air temperature sensor connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good BCM (included in junction block assembly) and recheck.	Open or high resistance in “YEL/BLK” circuit.

DTC B1150 (No. 1150): Air Bag Communication Circuit Malfunction

S7N20AA204010

Wiring Diagram



I4RS0AA20011-01

[A]: Junction block assembly connector viewed from harness side	2. BCM
1. SDM	3. Junction block assembly

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
After ignition switch is turned on, abnormal signal is fed from SDM to BCM.	• Air bag communication circuit open or short • SDM malfunction • BCM malfunction

Flow Test Description
Step 1: Check air bag communication circuit.
Step 2: Check air bag communication circuit.
Step 3: Check air bag communication circuit.

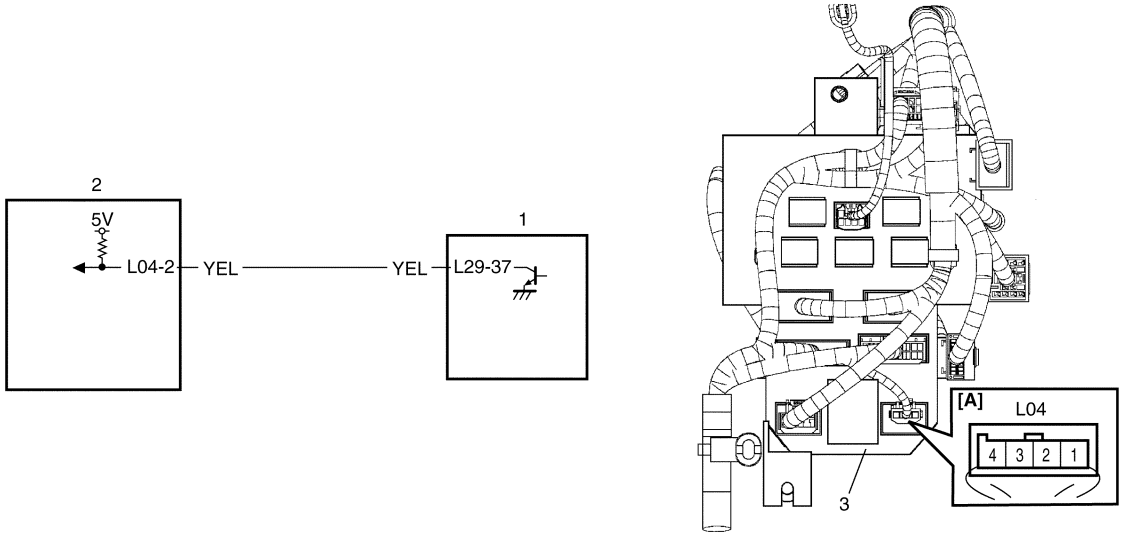
DTC Troubleshooting

Step	Action	Yes	No
1	**Check air bag communication circuit** 1) Turn ignition switch to OFF position. 2) Disconnect connector from SDM referring to “SDM Removal and Installation in Section 8B”. 3) Disconnect connector from junction block assembly. 4) Turn ignition switch to ON position. 5) Measure voltage between “L29-37” terminal of SDM connector and vehicle body ground. *Is voltage 0 V?*	Go to Step 2.	Short to power supply in air bag communication circuit.
2	**Check air bag communication circuit** 1) Turn ignition switch to OFF position. 2) Connect connectors to junction block assembly. 3) Turn ignition switch to ON position. 4) Measure voltage between “L04-2” terminal of junction block assembly connector and vehicle body ground. *Is voltage 4 – 6 V?*	Go to Step 3.	Short to ground in air bag communication circuit. If OK, substitute a known-good BCM (included in junction block assembly) and recheck.
3	**Check air bag communication circuit** 1) Measure voltage between “L29-37” terminal of SDM connector and vehicle body ground. *Is voltage 4 – 6 V?*	Substitute a known-good SDM and recheck.	Open or high resistance in air bag communication circuit.

DTC B1157 (No. 1157): Air Bag Deployment Signal Input

S7N20AA204011

Wiring Diagram



I4RS0AA20012-01

[A]: Junction block assembly connector viewed from harness side	2. BCM
1. SDM	3. Junction block assembly

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
Air bag deployment signal is fed from SDM to BCM.	• Air bag component parts • BCM malfunction

Flow Test Description
Step 1: Check DTC for SDM.

DTC Troubleshooting

Step	Action	Yes	No
1	**Check DTC for SDM** 1) Check DTC stored in SDM referring to “DTC Check in Section 8B”. *Is DTC B1021 detected?*	Go to “DTC B1021: Front Air Bag Module Deployed in Section 8B”.	Substitute a known-good BCM (included in junction block assembly) and recheck.

DTC B1170 (No. 1170): EEPROM Access Error

S7N20AA204012

DTC Detecting Condition and Possible Cause

DTC detecting condition	Possible cause
Data write error or check sum error.	BCM malfunction

DTC Troubleshooting

NOTE

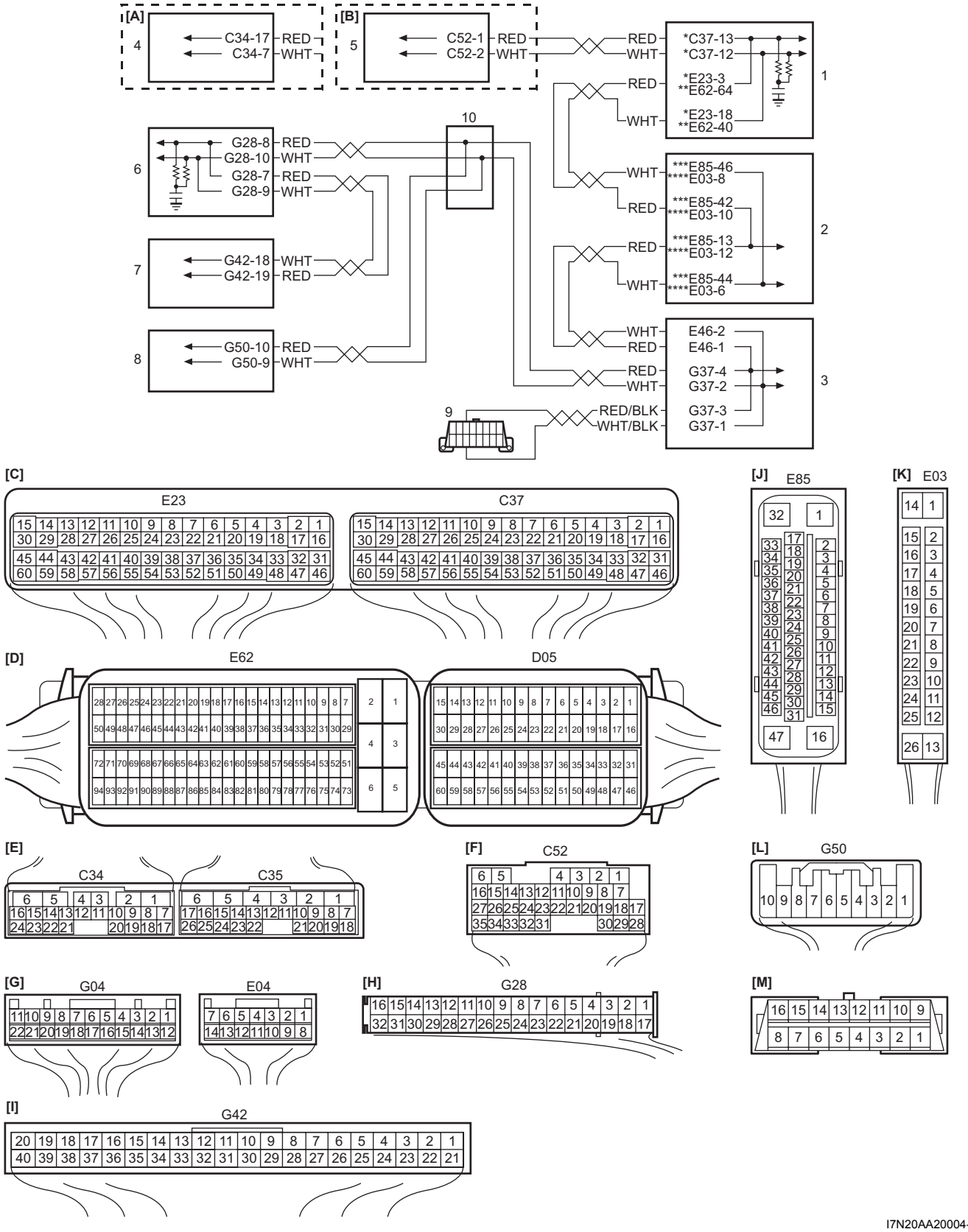
Before performing steps below, be sure to perform “Body Electrical Control System Check”.

1) Turn ignition switch to OFF position.
2) Replace BCM.
3) Repeat BCM Check Flow Table.

DTC U0155 (No. 0155): Lost Communication with Instrument Panel Cluster (IPC) Control Module

S7N20AA204021

Wiring Diagram



I7N20AA20004-03

[A]: A/T model	2. ABS/ESP® control module
[B]: Automated manual transaxle model	3. BCM
[C]: ECM connector (petrol engine model) (viewed from harness side)	4. TCM (A/T model)
[D]: ECM connector (diesel engine model) (viewed from harness side)	5. TCM (automated manual transaxle model)
[E]: TCM connector (A/T model) (viewed from harness side)	6. Combination meter
[F]: TCM connector (automated manual transaxle model) (viewed from harness side)	7. Keyless start control module
[G]: BCM connector (viewed from harness side)	8. Steering angle sensor (ESP® model)
[H]: Combination meter connector (viewed from harness side)	9. DLC
[I]: Keyless start control module connector (viewed from harness side)	10. CAN junction connector (ESP® model)
[J]: ESP® control module connector (viewed from terminal side)	*: Petrol engine model
[K]: ABS control module connector (viewed from terminal side)	**: Diesel engine model
[L]: Steering angle sensor connector (ESP® model) (viewed from harness side)	***: ESP® model
[M]: DLC (viewed from terminal side)	****: Non-ESP® model
1. ECM	

DTC Detecting Condition and Trouble Area

DTC detecting condition	Possible cause
BCM can not receive CAN data from combination meter for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • Combination meter

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start up engine and run it for 1 min. or more.
4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check of BCM** *Is DTC U0155 (No. 0155) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U0155 (No. 0155) detected?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**Combination meter power and ground circuit check** 1) Turn ignition switch to ON position. *Do warning lights in combination meter other than key indicator light light up?*	Go to Step 4.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.
4	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors from BCM, combination meter and steering angle sensor (ESP® model). 3) Check CAN communication circuit between BCM and combination meter for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.

Step	Action	Yes	No
5	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 4 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 6.	Repair circuit.
6	**DTC check of BCM** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. *Is DTC U0155 (No.0155) detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 2) one by one and check that DTC U0155 is detected by BCM each time connector is disconnected. When DTC U0155 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U0155 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1073 (No. 1073): Control Module Communication Bus Off

S7N20AA204014

Wiring Diagram

Refer to "DTC U0155 (No. 0155): Lost Communication with Instrument Panel Cluster (IPC) Control Module".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transmission error that is inconsistent between transmission data and transmission monitor (CAN bus monitor) data is detected more than 7 times continuously. (1 driving detection logic)	• CAN communication circuit • Combination meter • BCM • TCM (A/T or Automated Manual Transaxle model) • Keyless start control module (if equipped) • ECM • ESP® control module (if equipped) • Steering angle sensor (if equipped)

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC and pending DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck DTC. *Is DTC U1073 (No. 1073) detected?*	Go to Step 2.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.
2	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 3.	Repair circuit.
3	**DTC check of BCM** 1) Turn ignition switch to OFF position. 2) Connect connectors of disconnected control modules communicating by means of CAN. 3) Disconnect connector from any one of control modules other than BCM. 4) Recheck BCM for DTC. *Is DTC U1073 (No. 1073) detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 3) one by one and check that DTC U1073 is detected by BCM each time connector is disconnected. When DTC U1073 is not detected by BCM while checking in this way, go to description under “NO” below. If DTC U1073 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnect in Step 3). If circuit is OK, substitute a known-good control module disconnected in Step 3) and recheck.

DTC U1100 (No. 1100): Lost Communication with ECM

S7N20AA204015

Wiring Diagram

Refer to “DTC U0155 (No. 0155): Lost Communication with Instrument Panel Cluster (IPC) Control Module”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from ECM for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • ECM

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check of BCM** *Is DTC U1100 (No. 1100) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	**DTC check of ECM** 1) Check ECM for DTC. *Is DTC P1674 (petrol engine model) or DTC U2103 (diesel engine model) detected?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A in Section 1A" (petrol engine model) or "DTC U2103:: D13A / Z13DTJ in Section 1A" (diesel engine model).	Go to Step 3.
3	**DTC check of ABS / ESP® control module** 1) Check ABS / ESP® for DTC. *Is DTC U1073 detected?*	Go to "DTC U1073: Control Module Communication Bus Off in Section 4E" (non-ESP® model) or "DTC U1073: Control Module Communication Bus Off in Section 4F" (ESP® model).	Go to Step 4.
4	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1100 (No. 1100) detected?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
5	**DTC check of ABS / ESP® control module** 1) Check DTC for ABS / ESP® control module. *Is DTC U1100 detected?*	Go to Step 6.	Go to Step 7.
6	**CAN communication circuit check** 1) Disconnect connectors from ECM and ABS / ESP® control module. 2) Check CAN communication circuit between ECM and ABS / ESP® control module for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Check ECM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Repair circuit.
7	**CAN communication circuit check** 1) Disconnect connectors from BCM and ABS / ESP® control module. 2) Check CAN communication circuit between BCM and ABS / ESP® control module for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 8.	Repair circuit.
8	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 7 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 9.	Repair circuit.

Step	Action	Yes	No
9	**DTC check of BCM** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. *Is DTC U1100 (No.1100) detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 2) one by one and check that DTC U1100 is detected by BCM each time connector is disconnected. When DTC U1100 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1100 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1101 (No. 1101): Lost Communication with TCM

S7N20AA204018

Wiring Diagram

Refer to "DTC U0155 (No. 0155): Lost Communication with Instrument Panel Cluster (IPC) Control Module".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from TCM (A/T or Automated Manual Transaxle model) for longer than specified time continuously.	• CAN communication circuit • BCM (included in junction block assembly) • TCM (A/T or Automated Manual Transaxle model)

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check of BCM** *Is DTC U1101 (No. 1101) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	**DTC check of TCM (A/T or Automated Manual Transaxle model)** 1) Check TCM for DTC. *Is DTC P1774 detected?*	Go to "DTC P1774: Control Module Communication Bus Off in Section 5A" (A/T model) or "DTC P1774: Control Module Communication Bus Off in Section 5D" (automated manual transaxle model).	Go to Step 3.
3	**DTC check of ECM** 1) Check ECM for DTC. *Is DTC P1674 detected?*	Go to "DTC P1674: CAN Communication (Bus Off Error): M13A / M15A / M16A in Section 1A".	Go to Step 4.
4	**DTC check for ABS / ESP® control module** 1) Check ABS / ESP® for DTC. *Is DTC U1073 detected?*	Go to "DTC U1073: Control Module Communication Bus Off in Section 4E" (non-ESP® model) or "DTC U1073: Control Module Communication Bus Off in Section 4F" (ESP® model).	Go to Step 5.
5	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1101 (No. 1101) detected?*	Go to Step 6.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
6	**DTC check of ECM** 1) Check ECM for DTC. *Is DTC P1676 detected?*	Go to Step 7.	Go to Step 8.
7	**CAN communication circuit check** 1) Disconnect connectors from ECM and TCM. 2) Check CAN communication circuit between ECM and TCM for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Check TCM power and ground circuit. If circuit is OK, substitute a known-good ECM and recheck.	Repair circuit.
8	**CAN communication circuit check** 1) Disconnect connectors from BCM and ECM. 2) Check CAN communication circuit between BCM and ECM for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 9.	Repair circuit.

Step	Action	Yes	No
9	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 7 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 10.	Repair circuit.
10	**DTC check of BCM** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Disconnect connector of any one of control module other than BCM. 3) Recheck BCM for DTC. *Is DTC U1101 (No.1101) detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 2) one by one and check that DTC U1101 is detected by BCM each time connector is disconnected. When DTC U1101 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1101 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnected in Step 2). If circuit is OK, substitute a known-good control module disconnected in Step 2) and recheck.

DTC U1144 (No. 1144): Lost Communication with Keyless Start Control Module

S7N20AA204019

Wiring Diagram

Refer to "DTC U0155 (No. 0155): Lost Communication with Instrument Panel Cluster (IPC) Control Module".

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
BCM can not receive CAN data from keyless start control module for longer than specified time continuously.	• CAN communication circuit • Combination meter • Keyless start control module • BCM (included in junction block assembly)

DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool.
3) Start engine and run it for 1 min. or more.
4) Check DTC.

DTC Troubleshooting

Step	Action	Yes	No
1	**DTC check of BCM** *Is DTC U1144 (No. 1144) and DTC U1073 (No. 1073) detected together?*	Go to "DTC U1073 (No. 1073): Control Module Communication Bus Off".	Go to Step 2.
2	**DTC check of keyless start control module** 1) Check keyless start control module for DTC. *Is DTC No. 33 detected?*	Go to "DTC No. 33: Control Module Communication Bus Off in Section 10E".	Go to Step 3.
3	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck BCM for DTC. *Is DTC U1144 (No. 1144) detected?*	Go to Step 4.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
4	**CAN communication circuit check** 1) Disconnect connectors from BCM, combination meter and keyless start control module. 2) Check CAN communication circuit for open, short and high resistance. • Between BCM and combination meter • Between combination meter and keyless start control module *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 4 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 6.	Repair circuit.
6	**Combination meter operation check** 1) Connect connectors of disconnected control modules communicating by means of CAN. 2) Turn ignition switch to ON position. 3) Check combination meter operation for seat belt reminder light (fastening and unfastening driver side seat belt). *Are they OK?*	Go to Step 7.	Check combination meter power and ground circuit. If circuit is OK, substitute a known-good combination meter and recheck.
7	**Key indicator light operation check** 1) Turn ignition switch to OFF position. 2) Push ignition knob switch of steering lock unit. *Does key indicator light turn ON?*	Go to Step 8.	Check keyless start control module power and ground circuit. If circuit is OK, substitute a known-good keyless start control module and recheck.

Step	Action	Yes	No
8	**DTC check of BCM** 1) Disconnect connector of any one of control module other than BCM. 2) Recheck BCM for DTC. *Is DTC U1144 (No.1144) detected?*	Disconnect connectors of control modules other than the one whose connector is disconnected in Step 1) one by one and check that DTC U1144 is detected by BCM each time connector is disconnected. When DTC U1144 is not detected by BCM while checking in this way, go to description under "NO" below. If DTC U1144 is detected by BCM even when connectors of all control modules that use CAN communication with BCM are disconnected, substitute a known-good BCM and recheck.	Check power and ground circuit of control module disconnected in Step 1). If circuit is OK, substitute a known-good control module disconnected in Step 1) and recheck.

Inspection of BCM and its Circuits

S7N20AA204020

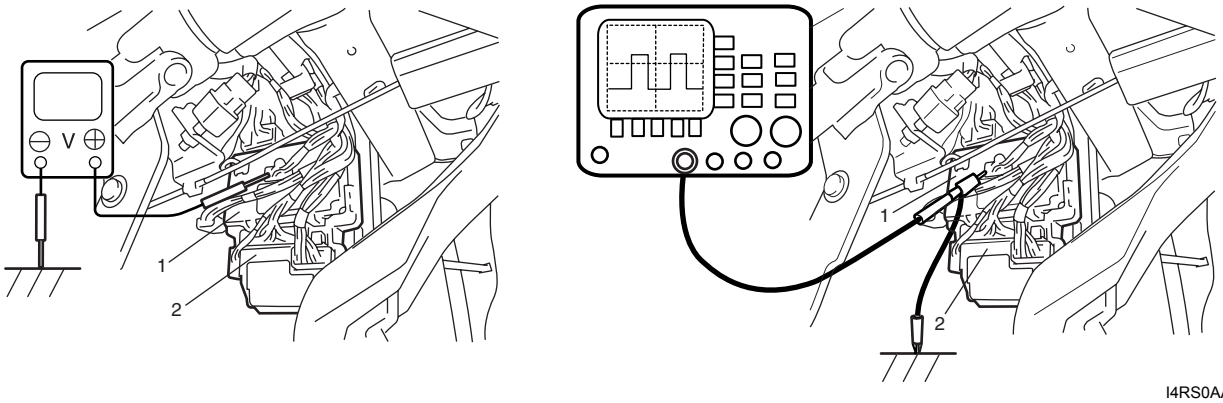
BCM and its circuits can be checked at BCM wiring couplers by measuring voltage and resistance.

⚠ CAUTION

BCM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to BCM with couplers disconnected from it.

Voltage Check

1) Disconnect negative cable (–) at battery.
2) Remove BCM (included in junction block assembly) referring to "BCM (Included in Junction Block Assembly) Removal and Installation".
3) Connect connectors to BCM (1) and junction block assembly (2).
4) Check voltage at each terminal number of couplers connected.
   For connector and terminal number, refer to "Connector Layout Diagram of BCM and Junction Block Assembly".



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NOTE

- **As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk (*) can not be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**

BCM connector "L01"

Terminal	Circuit	Normal voltage	Condition
L01-1	Passenger side door lock actuator control (Unlock)	10 – 14 V	Unlock signal is output for passenger side door lock actuator.
		0 V	Unlock signal is not output for passenger side door lock actuator.
L01-2	—	—	—
L01-3	Rear end door switch	10 – 14 V	Rear end door is closed
		0 V	Rear end door is opened
L01-4	Rear end door opener switch	10 – 14 V	Rear end door switch is not pushed
		0 V	Rear end door switch is pushed
L01-5	Manual door lock switch (Unlock)	10 – 14 V	Manual door lock switch is at any position other than unlock position
		0 V	Manual door lock switch is at unlock position
L01-6	Parking brake switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 1: "
		0 V	Ignition switch is at ON position and parking brake lever is pulled up
L01-7	Driver side door switch	10 – 14 V	Driver side door is closed
		0 V	Driver side door is opened
L01-8	"3" position switch (A/T model)	*0 – 1 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 2: "
		0 V	Ignition switch is at ON position and A/T select lever is at "2" or "3" position
L01-9	—	—	—
L01-10	Driver side door lock actuator control (Unlock)	10 – 14 V	Unlock signal is output for driver side door lock actuator.
		0 V	Unlock signal is not output for driver side door lock actuator.
L01-11	Rear end door actuator motor	0 V	Rear end door actuator motor is not in operation
		10 – 14 V	Rear end door actuator motor is in operation
L01-12	Manual door lock switch (Lock)	10 – 14 V	Manual door lock switch is at any position other than lock position
		0 V	Manual door lock switch is at lock position
L01-13	—	—	—
L01-14	Driver seat belt switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 3: "
		0 V	Ignition switch is at ON position and driver side seat belt is unfastened
L01-15	Door switch (other than driver side door and rear end door)	10 – 14 V	Rear right and left side door and passenger side door are closed
		0 V	Any one of the door is opened (except driver side door and rear end door)
L01-16	Driver side door key cylinder switch (Lock)	10 – 14 V	Driver side door key cylinder switch is at any position other than lock position
		0 V	Driver side door key cylinder switch is at lock position
L01-17	Driver side door key cylinder switch (Unlock)	10 – 14 V	Driver side door key cylinder switch is at any position other than unlock position
		0 V	Driver side door key cylinder switch is at unlock position
L01-18	—	—	—

BCM connector "E46"

Terminal	Circuit	Normal voltage	Condition
E46-1	CAN communication line (high) for ABS / ESP® control module	*2.5 – 3.6 V	Refer to "Reference waveform No. 4: "
E46-2	CAN communication line (low) for ABS / ESP® control module	*1.6 – 2.5 V	
E46-3	—	—	—
E46-4	Generator "L" terminal	10 – 14 V	Engine is running
		0 V	Ignition switch is at ON position
E46-5	Brake fluid level switch	*0 – 3 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 1: "
		0 V	Ignition switch is at ON position, parking brake lever is released and brake fluid level is lower than MIN level
E46-6	—	—	—
E46-7	—	—	—
E46-8	Sensor ground for outside air temperature sensor (if equipped)	0 V	—
E46-9	Serial communication line of data link connector for ECM, ABS or ESP® control module, P/S control module and TCM (A/T model)	8 – 12 V	Ignition switch is at ON position
E46-10	Outside air temperature sensor (if equipped)	About 1.5 V	Ignition switch is at ON position and outside air temperature approx. 20 °C (68 °F)
E46-11	Oil pressure switch (petrol engine model)	*3 – 14 V	Refer to "Reference waveform No. 5: "
		0 V	Ignition switch is at ON position and engine is at stop
E46-12	—	—	—
E46-13	—	—	—
E46-14	—	—	—

BCM connector "G37"

Terminal	Circuit	Normal voltage	Condition
G37-1	CAN communication line (low) for DLC	*1.6 – 2.5 V	Refer to "Reference waveform No. 4: "
G37-2	CAN communication line (low) for each control module		
G37-3	CAN communication line (high) for DLC	*2.5 – 3.6 V	
G37-4	CAN communication line (high) for each control module		
G37-5	Serial communication line of data link connector	8 – 12 V	Ignition switch is at ON position
G37-6	—	—	—
G37-7	—	—	—
G37-8	Alarm indicator lamp	10 – 14 V	Alarm indicator lamp is not lit up
		0 V	Alarm indicator lamp is lit up
G37-9	—	—	—
G37-10	Serial communication line for additional heater controller (diesel engine model) (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 6: "
G37-11	Serial communication line for information display (if equipped)	*0 – 1 V ↑↓ 10 – 14 V	Refer to "Reference waveform No. 7: "

Terminal	Circuit	Normal voltage	Condition
G37-12	Ground for keyless entry receiver (if equipped)	0 V	—
G37-13	Power supply for keyless entry receiver (if equipped)	4 – 6 V	Ignition switch is at all positions
G37-14	Signal for keyless entry receiver (if equipped)	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 8: ”
G37-15	Vehicle speed signal output (Diesel engine model)	*0 – 1 V ↑↓ 4 – 6 V	Refer to “Reference waveform No. 9: ”
G37-16	Key reminder switch	10 – 14 V	Ignition key is inserted to ignition key cylinder
		0 V	Ignition key is pulled out from ignition key cylinder
G37-17	Rear end door window defogger switch	0 V	Ignition switch is at ON position and rear end door window defogger switch is at ON position
		10 – 14 V	Ignition switch is at ON position and rear end door window defogger switch is at any position other than ON position
G37-18	A/C switch (if equipped)	*3 – 14 V	Refer to “Reference waveform No. 10: ”
		0 V	Ignition switch is at ON position, blower speed selector is at any position other than OFF position and A/C switch is at ON position
G37-19	—	—	—
G37-20	—	—	—
G37-21	Rear wiper INT switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 11: ”
		0 V	Ignition switch is at ON position and rear wiper switch is at INT position
G37-22	Rear wiper low switch	*0 – 1 V ↑↓ 10 – 14 V	Refer to “Reference waveform No. 11: ”
		0 V	Ignition switch is at ON position and rear wiper switch is at LOW position

Junction block connector “E40”

Terminal	Circuit	Normal voltage	Condition
E40-2	Backup power source	10 – 14 V	Ignition switch is at all positions

Junction block connector “E41”

Terminal	Circuit	Normal voltage	Condition
E41-3	Horn	10 – 14 V	Horn switch is at ON position
		0 V	Horn switch is at OFF position

Junction block connector "G32"

Terminal	Circuit	Normal voltage	Condition
G32-2	Power source (IG)	10 – 14 V	Ignition switch is at ON position
		0 V	Ignition switch is at any position other than ON position
G32-5	Power source (ACC)	10 – 14 V	Ignition switch is at ACC or ON position
		0 V	Ignition switch is at any position other than ACC or ON position

Junction block connector "G33"

Terminal	Circuit	Normal voltage	Condition
G33-3	Ground for BCM	0 V	Ignition switch is at all positions
G33-7	Rear end door window defogger switch indication	10 – 14 V	Engine is running and defogger switch indication is lit up
		0 V	Engine is running and defogger switch indication is not lit up

Junction block connector "G34"

Terminal	Circuit	Normal voltage	Condition
G34-3	Horn switch	10 – 14 V	Horn switch is not pushed
		0 V	Horn switch is pushed
G34-7	Lighting switch	10 – 14 V	Engine is running (equipped with DRL) or lighting switch is at any position other than OFF position
		0 V	Lighting switch is at OFF position
G34-9	Ground for BCM	0 V	Ignition switch is at all positions
G34-11	Hazard switch	0 V	Hazard switch is at ON position or lock or unlock button of keyless entry transmitter (answer back control) is pushed
		10 – 14 V	Hazard switch is at OFF position

Junction block connector "K01"

Terminal	Circuit	Normal voltage	Condition
K01-5	Interior light	10 – 14 V	Interior light switch is at DOOR position and interior light is not lit up
		0 V	Interior light switch is at DOOR position and interior light is lit up

Junction block connector "L04"

Terminal	Circuit	Normal voltage	Condition
L04-2	Air bag communication line	*0 – 1 V ↑↓ 4 – 6 V	Refer to "Reference waveform No. 12: "
L04-3	Serial communication line of data link connector for SDM	8 – 12 V	Ignition switch is at ON position

Junction block connector “L05”

Terminal	Circuit	Normal voltage	Condition
L05-4	Ground for BCM	0 V	Ignition switch is at all positions
L05-5	Power supply for rear wiper motor	10 – 14 V	Ignition switch is at ON position
L05-6	Right side door mirror heater (if equipped)	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L05-7	Left side door mirror heater (if equipped)	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L05-8	Rear end door window defogger wire	10 – 14 V	Engine is running and rear end door window defogger is in operation
		0 V	Engine is running and rear end door window defogger is not in operation
L05-9	Rear wiper control	10 – 14 V	Ignition switch is at ON position and rear wiper is not in operation
		0 V	Ignition switch is at ON position and rear wiper is in operation

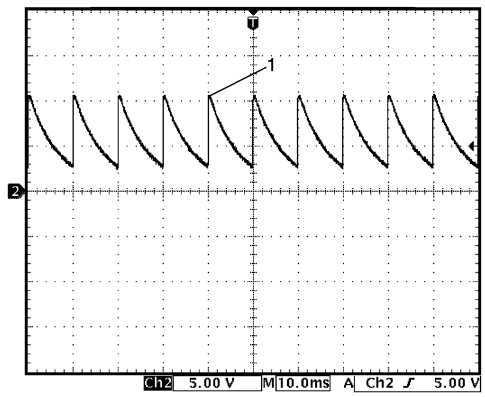
Junction block connector “L06”

Terminal	Circuit	Normal voltage	Condition
L06-1	Door lock actuator control (Dead lock) (if equipped)	10 – 14 V	Driver side key cylinder is turned to lock twice with in 3 seconds.
		0 V	Manual door lock switch is at any position other than LOCK position and driver side door key cylinder switch is at any position other than LOCK position
L06-9	Rear right and left door lock actuator control (Unlock)	10 – 14 V	Rear right and left door lock actuator motor is operated (Unlock)
		0 V	Rear right and left door lock actuator motor is not operated
L06-10	Door lock actuator control (Lock)	10 – 14 V	Manual door lock switch is at LOCK position or driver side door key cylinder switch is at LOCK position
		0 V	Manual door lock switch is at any position other than LOCK position or driver side door key cylinder switch is at any position other than LOCK position

Reference waveform No. 1

Parking brake or brake fluid level switch signal (1)

Measurement terminal	Parking brake switch CH2: “L01-6” to “G33-3” Brake fluid level switch CH2: “E46-5” to “G33-3”
Oscilloscope setting	CH1: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Parking brake switch: • Ignition switch is at ON position, parking brake lever is released Brake fluid level switch • Ignition switch is at ON position, brake fluid level is in normal



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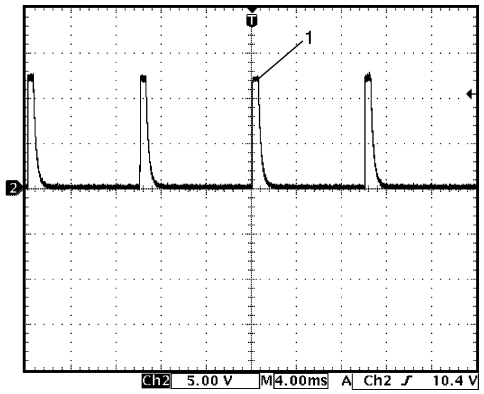
Reference waveform No. 2

"3" position switch signal (1) for TCM

Measurement terminal	CH2: "L01-8" to "G33-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 4 ms/DIV
Measurement condition	Ignition switch is at ON position and A/T selector lever is at any position other than "2" or "3" position



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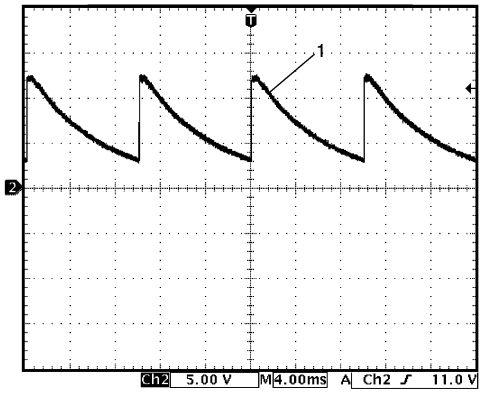
Reference waveform No. 3

Driver seat belt switch signal (1)

Measurement terminal	CH2: "L01-14" to "G33-3"
Oscilloscope setting	CH2: 5 V/DIV TIME: 4 ms/DIV
Measurement condition	Ignition switch is at ON position and driver side seat belt is fastened



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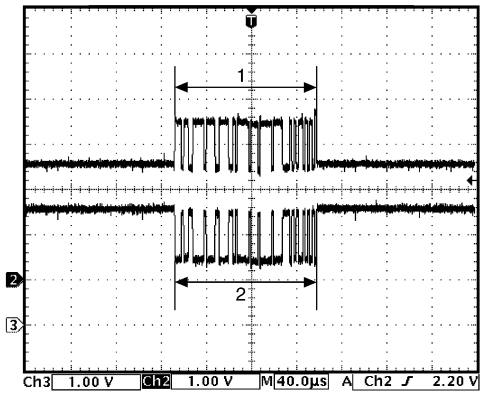
Reference waveform No. 4

CAN communication signal

Measurement terminal	CAN communication signal for ABS / ESP® control module CH2: "E46-1" to "G33-3" CH3: "E46-2" to "G33-3" CAN communication signal for DLC CH2: "G37-3" to "G33-3" CH3: "G37-1" to "G33-3" CAN communication signal for each control module CH2: "G37-4" to "G33-3" CH3: "G37-2" to "G33-3"
Oscilloscope setting	CH2: 1 V/DIV CH3: 1 V/DIV TIME: 40 μs/ DIV
Measurement condition	Ignition switch is at ON position



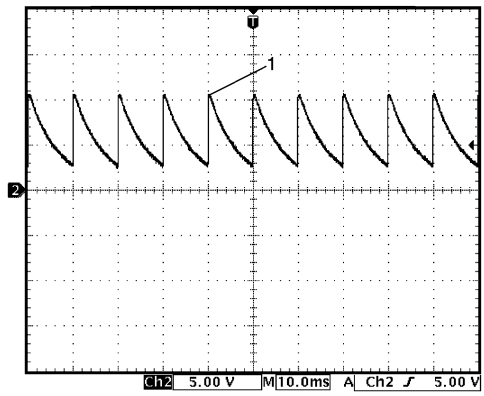
I4RS0AA20017-02

1. CAN communication line signal (High)
2. CAN communication line signal (Low)

Reference waveform No. 5

Oil pressure switch signal (1)

Measurement terminal	CH2: "E46-11" to "G33-3"
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Engine is running and oil pressure is in normal condition

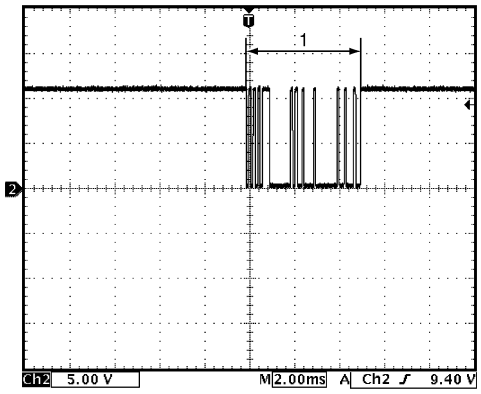


I4RS0AA20018-02

Reference waveform No. 6

Additional heater controller serial communication signal (1)

Measurement terminal	CH2: “G37-10” to “G33-3”
Oscilloscope setting	CH2: 5V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

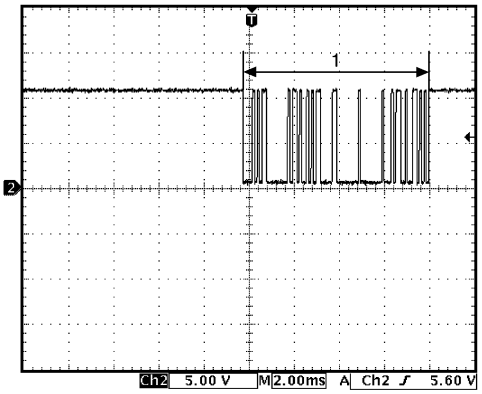


I5RS0BA20005-01

Reference waveform No. 7

Information display serial communication signal (1)

Measurement terminal	CH2: “G37-11” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 2 ms / DIV
Measurement condition	Ignition switch is at ON position

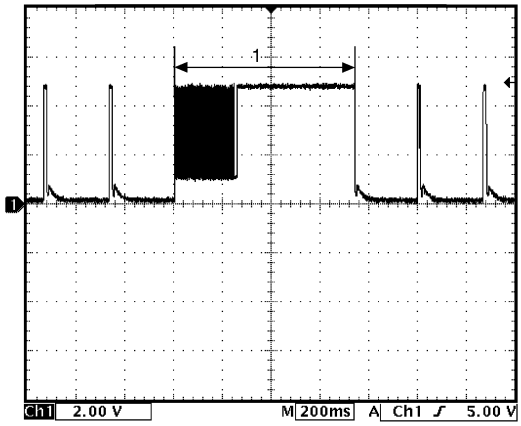


I4RS0AA20021-02

Reference waveform No. 8

Keyless entry receiver signal (1)

Measurement terminal	CH2: “G37-14” to “G33-3”
Oscilloscope setting	CH2: 2 V / DIV TIME: 200 ms / DIV
Measurement condition	Lock or unlock button of key less entry transmitter is pushed

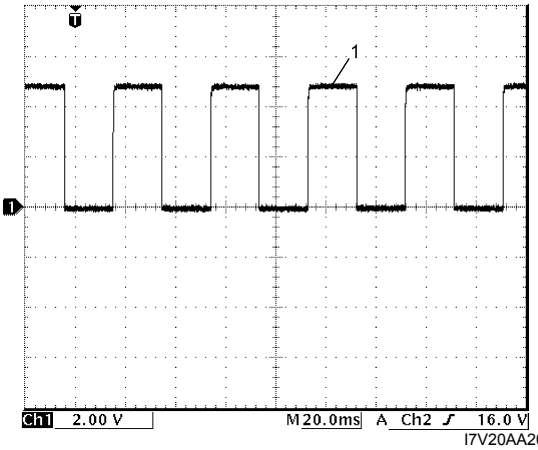


I4RS0AA20022-02

Reference waveform No. 9

Vehicle speed pulse output signal (1)

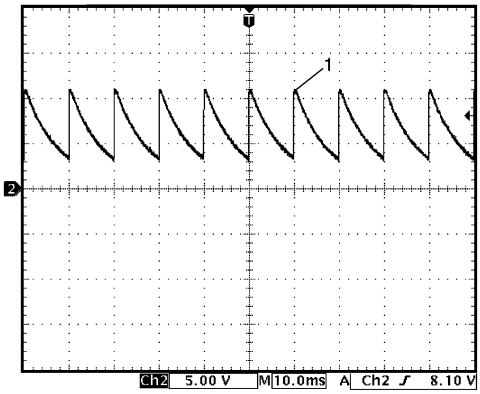
Measurement terminal	CH1: “G37-15” to “G33-3”
Oscilloscope setting	CH1: 2 V / DIV TIME: 20 ms / DIV
Measurement condition	Vehicle speed at 40 km/h (25 mile/h)



I7V20AA20017-01

Reference waveform No. 10
A/C switch signal (1)

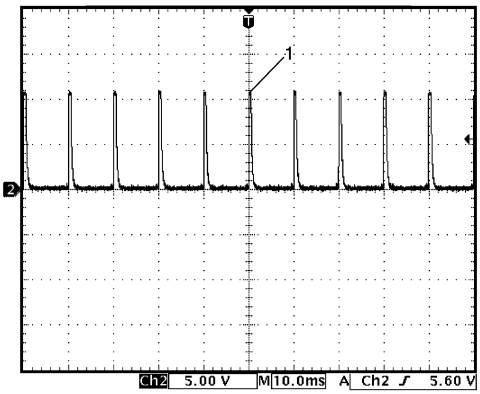
Measurement terminal	CH2: “G37-18” to “G33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Ignition switch is at ON position, A/C switch or blower speed selector is at OFF position



I4RS0AA20023-02

Reference waveform No. 11
Rear wiper switch signal (1)

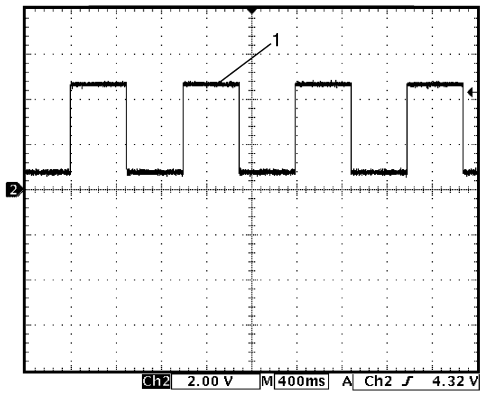
Measurement terminal	Rear wiper INT switch CH2: “G37-21” to “G33-3” Rear wiper LOW switch CH2: “G37-22” to “33-3”
Oscilloscope setting	CH2: 5 V / DIV TIME: 10 ms / DIV
Measurement condition	Rear wiper INT switch: • Ignition switch is at ON position and rear wiper switch is at any position other than INT position Rear wiper LOW switch: • Ignition switch is at ON position and rear wiper switch is at any position other than LOW position



I4RS0AA20024-02

Reference waveform No. 12
SDM communication signal (1)

Measurement terminal	CH2: “L04-2” to “G33-3”
Oscilloscope setting	CH2: 2 V / DIV TIME: 400 ms / DIV
Measurement condition	Ignition switch is at ON position



I4RS0AA20026-02

Repair Instructions

BCM (Included in Junction Block Assembly) Removal and Installation

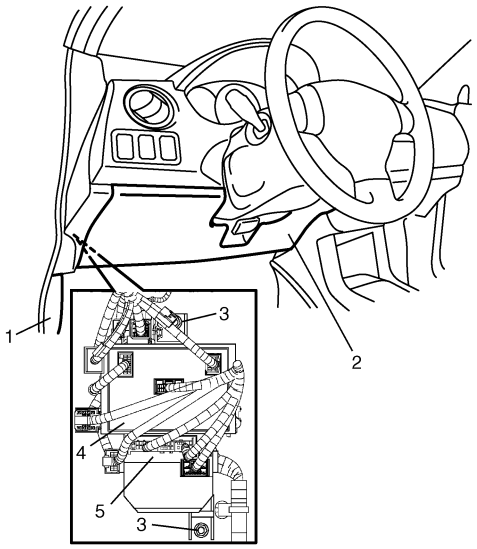
S7N20AA206001

⚠ CAUTION

Do not attempt removal of BCM from junction block assembly as it may cause contact failure.
If there is faulty condition in BCM, replace junction block assembly.

Removal

1) Disconnect negative cable from battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove dash side trim (1) and steering column hole cover (2).
4) Remove junction block assembly mounting nuts (3).



I4RS0BA20010-01

4. BCM
5. Junction block assembly

5) Disconnect connectors from BCM and junction block assembly.
6) Detach wiring harness clamp from junction block assembly.

Installation

Reverse removal procedure for installation, noting following points.

- Connect connectors securely.
- Enable air bag system referring to “Enabling Air Bag System in Section 8B”.

Outside Air Temperature Sensor Removal and Installation

S7N20AA206002

For removal and installation, refer to “Outside Air Temperature Sensor Removal and Installation (If Equipped) in Section 9C”.

Outside Air Temperature Sensor Inspection

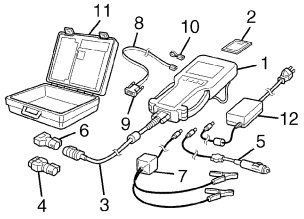
S7N20AA206003

For inspection, refer to “Outside Air Temperature Sensor Inspection (If Equipped) in Section 9C”.

Special Tools and Equipment

Special Tool

S7N20AA208001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞		

Immobilizer Control System

Petrol Model

Precautions

Precautions in Diagnosing Troubles

S7N20AA310001

- Before confirming the diagnostic trouble code (DTC), do not disconnect connector from ECM, battery cable from battery, ground wire harness, or main fuse. Such disconnection will erase DTC stored in ECM.
- DTC stored in ECM memory can be checked as well as cleared by using SUZUKI scan tool. Before using SUZUKI scan tool, read its operator's manual carefully to know how to use it and what functions are available.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00" before inspection.
- Communication of ECM, BCM, ABS / ESP® control module, TCM (for A/T model or automated manual transaxle model), keyless start control module (if equipped), combination meter, steering angle sensor (if equipped) and DLC is established by CAN (Controller Area Network). Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System in Section 00".
  For CAN communication system, refer to description on "CAN Communication System Description: M13A / M15A / M16A in Section 1A".

Precaution in Replacing ECM

S7N20AA310002

After ECM is replaced with new one or used one, the transponder code in the transponder built in the ignition key has to be registered with ECM. Or, the engine cannot be started up. For the registration procedure, refer to "Procedure after ECM Replacement: Petrol Model".

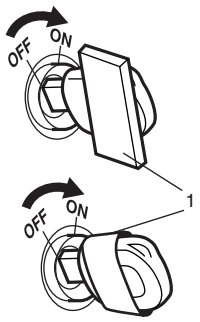
Precautions in Handling Immobilizer Control System

S7N20AA310003

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.

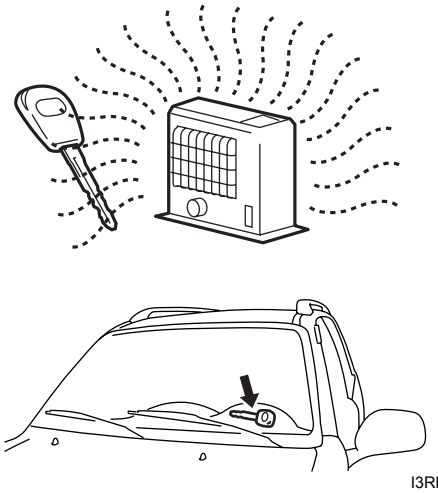
I3RH0AA30001-01

- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped its grip or in contact with it. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



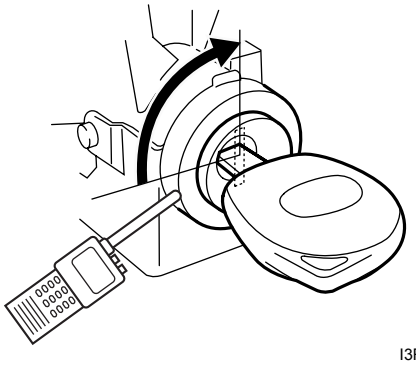
I3RH0AA30002-01

- Do not leave ignition key in a place where temperature is high. High temperature may cause damage to the transponder built in the ignition key.



I3RH0AA30003-01

- Do not turn ignition switch to ON position by bringing radio antenna close to coil antenna. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



I3RH0AA30004-01

General Description

Immobilizer Control System Introduction

S7N20AA311001

The immobilizer control system is an anti-theft device that immobilizes the vehicle. It stops the engine from working and prevents the vehicle from being stolen. It mainly consists of the following components.

- Engine Control Module (ECM)
- Immobilizer control module (ICM) with the built-in coil antenna
- Ignition key with the built-in transponder

A code called the transponder code is memorized in the transponder. And, the code is registered with ECM. Basically, when the ignition switch is turned ON, ECM reads the code by the coil antenna. Then, if the code in transponder in the ignition key does not match with the one registered with ECM, ECM stops the operation of the fuel injection so as not to start up the engine and turns the immobilizer indicator lamp ON and OFF using CAN communication lines. In the case of the vehicle equipped with the keyless start system, in addition to the above operation, ECM makes the immobilizer indicator lamp ON and OFF when it detects a trouble related to ID code verification of the keyless start system.

On-Board Diagnostic System Description (Self-diagnosis Function)

S7N20AA311002

ECM diagnoses if there is any trouble with the immobilizer control system. The diagnostic information is stored as the diagnostic trouble code (DTC) in ECM. To read the diagnostic information, use SUZUKI scan tool referring to “Diagnostic Trouble Code (DTC) Check: Petrol Model”.

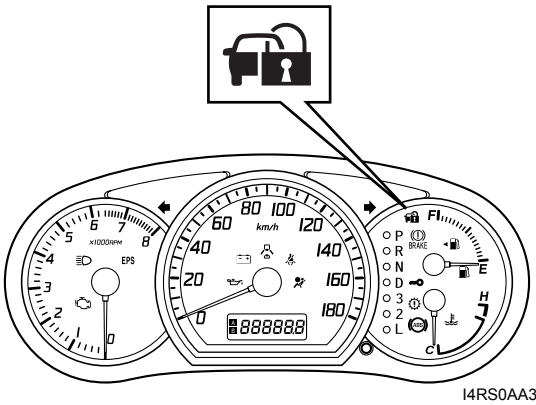
With the ignition switch turned ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether there is any trouble with the immobilizer control system or not by either lighting ON or flashing ON and OFF the immobilizer indicator lamp.

Immobilizer indicator lamp lights ON:

No trouble exists in the immobilizer control system. (After starting up the engine, the lamp turns OFF.)

Immobilizer indicator lamp flashes ON and OFF:

There is some trouble in the immobilizer control system. Its diagnostic information is stored in ECM.

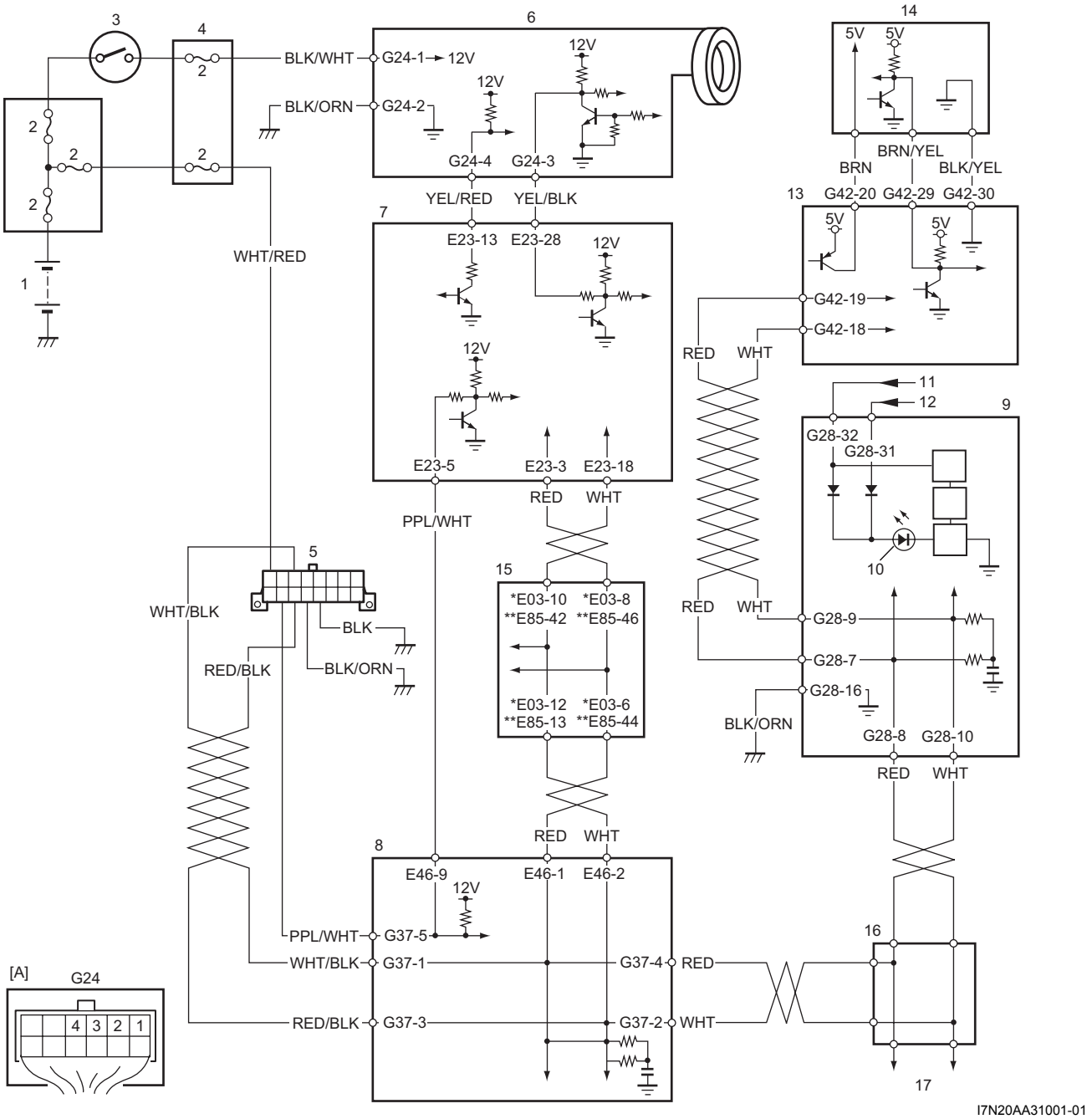


I4RS0AA30002-01

Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S7N20AA312001



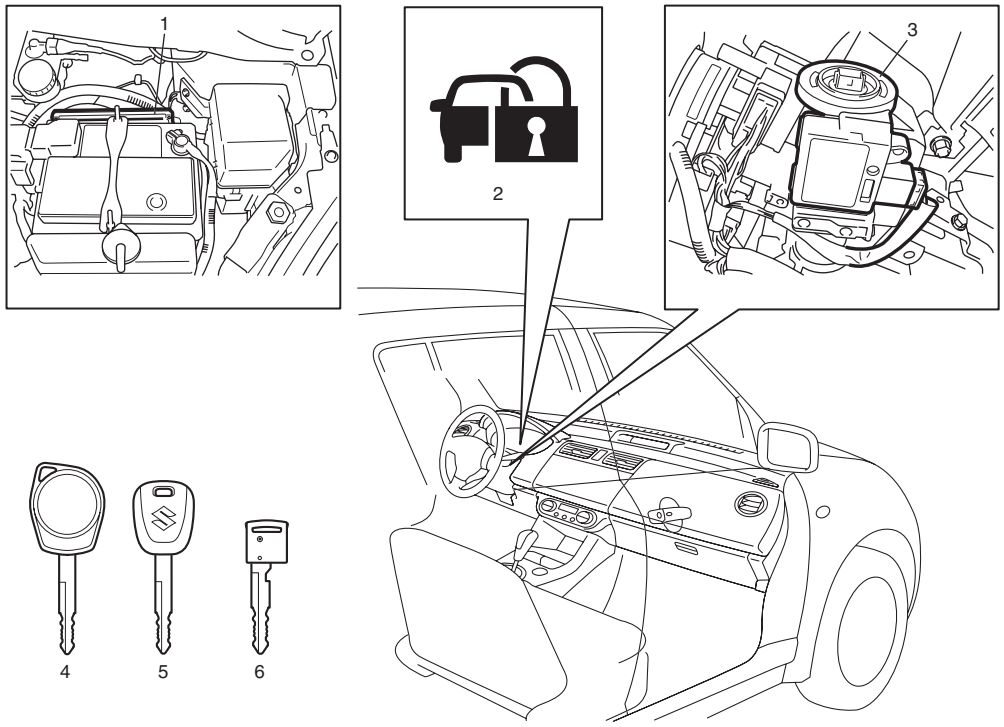
I7N20AA31001-01

[A]: Immobilizer control module connector “G24” (Viewed from harness side)	5. Data link connector (DTC)	10. Immobilizer indicator lamp	15. ABS / ESP® control module
1. Battery	6. Immobilizer control module (ICM)	11. From “MAIN” fuse	16. Junction connector
2. Fuse	7. ECM	12. From “METER” fuse	17. To steering angle sensor
3. Ignition switch	8. BCM	13. Keyless start control module	*: Non-ESP® model
4. Junction block assembly	9. Combination meter	14. Steering lock unit	**: ESP® model

Component Location

Immobilizer Control System Components Location

S7N20AA313001



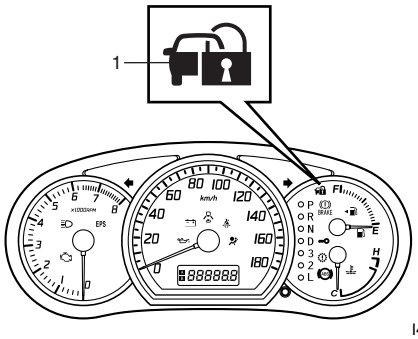
I4RS0BA30001-02

1. ECM	4. Ignition key with keyless entry system
2. Immobilizer indicator lamp	5. Ignition key without keyless entry system
3. Immobilizer control module (ICM)	6. Ignition key with keyless start system

Diagnostic Information and Procedures

Immobilizer Control System Check

S7N20AA314001

Step	Action	Yes	No
1	**Immobilizer Indicator Lamp Check** Turn ignition switch to ON position using ignition key. *Does it immobilizer indicator lamp (1) come on?*  I4RS0AA30004-01	Go to Step 2.	Go to “Immobilizer Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop: Petrol Model”.

Step	Action	Yes	No
2	**Immobilizer Indicator Lamp Flashing Check** *Does it immobilizer indicator lamp flashes on and off continuously in Step 1?*	Check what DTC is detected by ECM referring to "Diagnostic Trouble Code (DTC) Check: Petrol Model". Then, perform the troubleshooting referring to the corresponding flowchart in this section.	Go to Step 3.
3	**Engine Start Check** Start up engine using ignition key. *Does engine start up?*	Go to Step 4.	Perform "Engine and Emission Control System Check: M13A / M15A / M16A in Section 1A".
4	**Immobilizer Indicator Lamp Check after Starting Up Engine** Check if immobilizer Lamp remains ON after starting up engine. *Does immobilizer indicator lamp remains ON after engine start?*	Go to "Immobilizer Indicator Lamp Remains ON after Engine Starts: Petrol Model".	Immobilizer system is good condition. Then go to "Keyless Start System Check in Section 10E". (Vehicle equipped with keyless start system only)

Diagnostic Trouble Code (DTC) Check

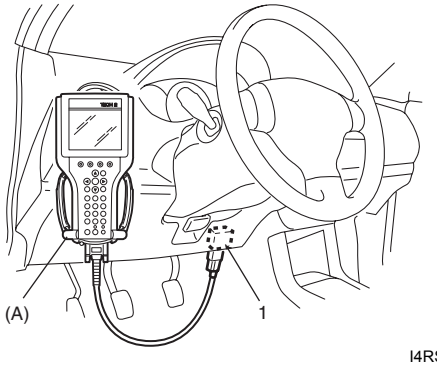
S7N20AA314002

NOTE

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0BA30003-03

3) Turn the ignition switch to ON position.
4) Check if any DTC is stored in ECM according to the instructions displayed on SUZUKI scan tool.
5) After completing the check, turn ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Clearance

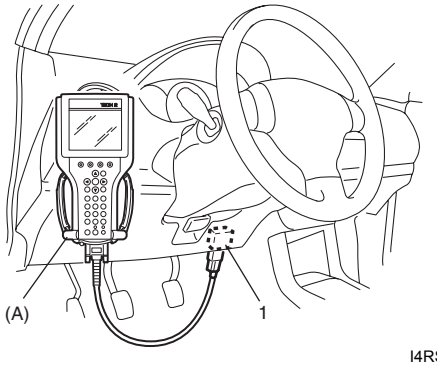
S7N20AA314003

NOTE

To know how to use SUZUKI scan tool in detail, refer to its operator's manual.

1) Turn the ignition switch to OFF position,
2) Connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

Special tool
(A): SUZUKI scan tool



I4RS0BA30003-03

3) Turn the ignition switch to ON position.
4) Clear DTC(s) according to the instructions displayed on SUZUKI scan tool.
5) After completing the clearance, turn the ignition switch to OFF position, and then disconnect SUZUKI scan tool from DLC.

Diagnostic Trouble Code (DTC) Table

S7N20AA314004

NOTE

ECM detects diagnostic trouble code (DTC). ICM does not.

DTC No.	Detecting Item	Detecting Condition	Immobilizer Indicator Lamp
☞P1614	Transponder response error	Transponder code in transponder built in ignition key cannot be read through ICM.	Flash
☞P1615	Steering lock unit communication error (for vehicle with keyless start system)	• While registering the transponder code in the transponder built in the ignition key in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. • The ID code could not be registered in the keyless start control module or ECM.	Flash
☞P1616	Unregistered keyless start control module (for vehicle with keyless start system)	ECM detects different ID codes registered in ECM and keyless start control module.	Flash
☞P1618	Keyless start control module CAN communication error (for vehicle with keyless start system)	Reception error of communication data for keyless start control module is detected for longer than specified time continuously.	Flash
☞P1621	Immobilizer communication line error	Communication error between ICM and ECM.	Flash
☞P1622	EEPROM reading / writing error	EEPROM in ECM is corrupted.	Flash
☞P1623	Unregistered transponder	Transponder code in the transponder built in the ignition key is invalid.	Flash
☞P1625	Immobilizer antenna error	ICM is faulty.	Flash
☞P1636	Immobilizer information registration failure	Communication error between ECM and BCM.	No operation
☞P1638	Immobilizer information mismatched	• Communication error between ECM and BCM. • Wrong ECM or BCM is used.	No operation

NOTE

If any DTC other than the above DTCs is detected, refer to "DTC Table: M13A / M15A / M16A in Section 1A".

Scan Tool Data

S7N20AA314005

Scan Tool Data	Vehicle Condition	Normal Data
NUMBER OF LEARNT KEY	Ignition switch at ON position	0 – 4
INPUT YEAR	Ignition switch at ON position	2004 or later
INPUT MONTH	Ignition switch at ON position	1 – 12

Scan Tool Data Definitions

NUMBER OF LEARNT KEY

0 – 4 PCS: The number of the transponder code in the transponder built in the ignition key that is registered with ECM

NOTE

A maximum of four transponder codes can be registered with ECM. Therefore, the maximal value should be 4.

INPUT YEAR

20:** The year in which the transponder code in the transponder built in the ignition key is registered with ECM

INPUT MONTH

1 – 12: The month in which the transponder code in the transponder built in the ignition key is registered with ECM

Immobilizer Indicator Lamp Does Not Come ON with Ignition Switch ON and Engine Stop

S7N20AA314006

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Circuit Description

When the ignition switch is turned ON, ECM read the code by the coil antenna from ignition key. Then if the code in transponder in the key match with the one registered with ECM, transmits indication ON signal of immobilizer indicator lamp to combination meter in order to turn immobilizer indicator lamp on. And then, combination meter turns immobilizer indicator lamp on. When the engine starts to run and no malfunction is detected in the system, ECM transmits immobilizer indicator lamp indication OFF signal to combination meter in order to turn immobilizer indicator lamp off. And then, combination meter turns immobilizer indicator lamp off, but if a malfunction was or is detected, immobilizer indicator lamp is flashes ON and OFF, when ignition switch turn to ON position.

Troubleshooting

Step	Action	Yes	No
1	**Immobilizer Indicator Lamp power supply check** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 4.
2	**DTC check for ECM** 1) Check ECM for DTC referring to “Diagnostic Trouble Code (DTC) Check: Petrol Model”. *Is DTC P1674, P1675, P1676 and/or P1678 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**DTC check for BCM** 1) Check BCM for DTC referring to “DTC Check in Section 10B”. *Is DTC U1073, U1100, U1101 and/or U1144 detected?*	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If immobilizer indicator lamp still remains off substitute a known-good ECM and recheck.
4	**Fuse check** 1) Turn ignition switch to OFF position. 2) Check fuse for combination meter circuit. *Is fuse in good condition?*	Go to Step 5.	Replace fuse and check for short.
5	**Combination meter power supply wire circuit check** 1) Remove combination meter referring to “Combination Meter Removal and Installation in Section 9C”. 2) Check for proper connection at terminals and wires of combination meter connector. 3) If OK, then turn ignition switch to ON position and measure voltage between power supply terminal of combination meter connector and vehicle body ground. Refer to “Combination Meter Circuit Diagram in Section 9C”. *Is it 10 – 14 V?*	Go to Step 6.	Repair open in power supply wire.
6	**Combination meter circuit check** 1) Turn ignition switch OFF position. 2) Measure resistance between ground terminal of combination meter connector and vehicle body ground. Refer to “Combination Meter Circuit Diagram in Section 9C”. *Is resistance 1 Ω or less?*	Substitute a known-good combination meter and recheck. If immobilizer indicator lamp still remains off, substitute a known-good ECM and recheck.	Repair open or high resistance in ground circuit.

Immobilizer Indicator Lamp Remains ON after Engine Starts

S7N20AA314007

Wiring Diagram
Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Circuit Description
When the ignition switch is turned ON, ECM read the code by the coil antenna from ignition key. Then if the code in transponder in the key match with the one registered with ECM, transmits indication ON signal of immobilizer indicator lamp to combination meter in order to turn immobilizer indicator lamp on. And then, combination meter turns immobilizer indicator lamp on. When the engine starts to run and no malfunction is detected in the system, ECM transmits immobilizer indicator lamp indication OFF signal to combination meter in order to turn immobilizer indicator lamp off. And then, combination meter turns immobilizer indicator lamp off, but if a malfunction was or is detected, immobilizer indicator lamp is flashes ON and OFF, when ignition switch turn to ON position.

Troubleshooting

Step	Action	Yes	No
1	**DTC check** 1) Check ECM for DTC referring to “Diagnostic Trouble Code (DTC) Check: Petrol Model”. *Is DTC P1674, P1675, P1676 and/or P1678 detected?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	**DTC check for BCM** 1) Check BCM for DTC referring to “DTC Check in Section 10B”. *Is DTC U1073, U1100, U1101 and/or U1144 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**CAN communication circuit check** 1) Check CAN communication circuits between combination meter and ECM for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Substitute a known-good combination meter and recheck. If still indicator lamp remains ON, substitute a known-good ECM and recheck.	Repair circuit and recheck.

DTC P1614: Transponder Response Error

S7N20AA314008

Wiring Diagram
Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Transponder code in the transponder built in the ignition key cannot be read through immobilizer control module (ICM).	• Communication among each component • Ignition key • Transponder • Immobilizer control module (ICM) • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was “Immobilizer Control System Check” performed?*	Go to Step 2.	Go to “Immobilizer Control System Check: Petrol Model”.
2	**Diagnostic Trouble Code (DTC) check** 1) Check if any DTC other than P1614 is detected referring to “Diagnostic Trouble Code (DTC) Check: Petrol Model”. *Is DTC other than P1614 is detected?*	Go to applicable DTC diag. flow.	Go to Step 3.

Step	Action	Yes	No
3	**Registration of ignition key in use with ECM** 1) Register ignition key in use with ECM referring to "Registration of the Ignition Key: Petrol Model". *Was registration of ignition key completed?*	Recheck DTC for ECM. If DTC P1614 is still detected, go to Step 4.	Go to Step 4.
4	**Registration of the spare ignition key** 1) Register the spare ignition key with ECM referring to "Registration of the Ignition Key: Petrol Model". *Was registration of spare ignition key completed?*	Replace ignition key which can not be registered.	Substitute a known-good ECM and recheck.

DTC P1615: ID Code Does Not Registered (Vehicle equipped with keyless start system only)

S7N20AA314009

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: Petrol Model".

Circuit Description

When the transponder code of the ignition key is registered in ECM, the ID code is also registered in ECM and keyless start control module at the same time. This DTC code P1615 is detected only when the ID code cannot be registered in both ECM and keyless start control module when the transponder code in the ignition key is registered in ECM.

NOTE

- **Perform troubleshooting of DTC P1618 if both DTC P1615 and P1618 have been detected.**
- **After replacing ECM, be sure to register the transponder code in the ignition key with ECM referring to "Registration of the Ignition Key: Petrol Model". After replacing the keyless start control module, be sure to register referring to "Registration of the Ignition Key: Petrol Model".**

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
• While registering the transponder code in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. • The ID code could not be registered in the keyless start control module or ECM.	• Wire circuits between steering lock unit and keyless start control module • CAN communication circuit • Steering lock unit • Keyless start control module • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was "Immobilizer Control System Check" performed?*	Go to Step 2.	Go to "Immobilizer Control System Check: Petrol Model".
2	**Registration of ignition key** 1) Register ignition key in use with ECM referring to "Registration of the Ignition Key: Petrol Model". *Was registration of ignition key completed?*	Recheck ECM for DTC. If DTC P1615 is still detected, go to Step 3.	Go to Step 3.
3	**DTC check** *Is DTC other than P1615 detected?*	Go to applicable DTC diag. flow.	Go to Step 5.
4	**DTC check for keyless start control module** 1) Check Keyless start control module for DTC referring to "DTC Check in Section 10B". *Is DTC detected?*	Go to applicable DTC diag. flow.	Go to Step 5.

Step	Action	Yes	No
5	**Check for communication circuit between steering lock unit and keyless start control module** 1) With the ignition switch at OFF position, disconnect steering lock unit connector and keyless start control module connector. 2) Check for proper connection at terminals and wires of each connector referring to “Intermittent and Poor Connection Inspection in Section 00”. 3) If OK, check for open, short, and high resistance in each circuit between steering lock unit and keyless start control module. Refer to Step 2 in “DTC No. 11: Communication Error with Steering Lock Unit in Section 10E”. *Is each circuit in good condition?*	Go to Step 6.	Repair malfunction part and recheck.
6	**Steering lock unit power supply check** 1) Connect keyless start control module connector. 2) With ignition switch at ON position, check power supply terminal voltage of steering lock unit connector. Refer to “Keyless Start Control Module Power and Ground Circuit Check in Section 10E”. *Is voltage 4 – 6 V?*	Replace steering lock unit and recheck.	Substitute a known-good keyless start control module and recheck. If DTC P1615 is still detected, substitute a known-good ECM and recheck.

DTC P1616: Different Registration ID Codes (Vehicle equipped with keyless start system only)

S7N20AA314010

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Circuit Description

P1616 is detected when ECM detects different ID codes registered in ECM and keyless control module after turning engine start knob to ON position.
Normally, when keyless start control module is replaced with new one, ECM automatically registers blank ID code of keyless control module to applicable one after turning ignition switch to ON position.
However, when keyless start control module is replaced with used one, ECM does not automatically register old ID code of keyless control module to applicable one even if ignition switch is turned to ON position.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
ECM detects different ID codes registered in ECM and keyless start control module.	• Keyless start control module • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was “Immobilizer Control System Check” performed?*	Go to Step 2.	Go to “Immobilizer Control System Check: Petrol Model”.
2	**Registration of the Ignition Key** 1) Clear DTC referring to “Diagnostic Trouble Code (DTC) Clearance: Petrol Model”. 2) Register the transponder code in the transponder in the ignition key with ECM referring to “Registration of the Ignition Key: Petrol Model”. *Is ignition key able to be registered?*	Recheck ECM for DTC. If DTC P1616 is still detected, go to Step 3.	Go to Step 3.

Step	Action	Yes	No
3	**DTC check** Check ECM for DTC. *Is DTC P1618 and/or P1615 detected other than P1616?*	Go to DTC P1618 troubleshooting.	Go to DTC P1615 troubleshooting.

DTC P1618: CAN Communication Error (Reception Error for Keyless Start Control Module) (Vehicle equipped with keyless start system only)

S7N20AA314011

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Reception error of communication data for keyless start control module is detected for longer than specified time continuously.	• CAN communication circuit • Steering angle sensor (if equipped) • Combination meter • Keyless start control module • TCM (for A/T model or automated manual transaxle model) • BCM • ESP® control module (if equipped) • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was “Immobilizer Control System Check” performed?*	Go to Step 2.	Go to “Immobilizer Control System Check: Petrol Model”.
2	**DTC check for ECM** *Is DTC other than P1618 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Control module connector check** 1) With the ignition switch at OFF position, check intermittent and poor connection of following each connector referring to “Intermittent and Poor Connection Inspection in Section 00”. • ECM • ABS / ESP® control module • BCM • TCM (for A/T model or automated manual transaxle model) • Keyless start control module • Combination meter • Steering angle sensor (if equipped) *Are all connectors in good condition?*	Go to Step 4.	Repair malfunction part and recheck.
4	**CAN communication circuit check** 1) Check for open, short and high resistance in CAN communication circuit between ECM and keyless start control module. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.

Step	Action	Yes	No
5	**Check of keyless start control module power and ground wire circuits** 1) Check keyless start control module power and ground wire circuits referring to “Keyless Start Control Module Power and Ground Circuit Check in Section 10E”. *Are they in normal?*	Substitute a known-good keyless start control module and module.	Repair malfunctional wire circuit.

DTC P1621: Immobilizer Communication Line Error

S7N20AA314012

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Communication error between immobilizer control module (ICM) and ECM is detected by ECM.	• Related fuse(s) blown • Poor connection at ICM connector • Power and ground circuit of ICM • Communication circuit between ICM and ECM • ICM • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was “Immobilizer Control System Check” performed?*	Go to Step 2.	Go to “Immobilizer Control System Check: Petrol Model”.
2	**Fuse check** 1) Check fuse for ICM circuit. *Is fuse in good condition?*	Replace blown fuse(s) and then, check for short to power circuit.	Go to Step 3.
3	**Voltage check at power and ground terminal** 1) Check power and ground terminal voltage of ICM connector referring to “Inspection of Immobilizer Control Module (ICM) and Its Circuit: Petrol Model”. *Is each terminal voltage in good condition?*	Go to Step 4.	Repair circuit.
4	**ICM and ECM connector check** 1) With the ignition switch at OFF position, check intermittent and poor connection of ICM connector and ECM connectors referring to “Intermittent and Poor Connection Inspection in Section 00”. *Is each connector in good condition?*	Go to Step 5.	Repair poor connection.
5	**Communication circuit check between ICM and ECM** 1) Check for open, short and high resistance in serial communication and clock circuit between ICM and ECM. *Is each communication circuit in good condition?*	Substitute a known-good ICM and recheck. If DTC P1621 is still detected, substitute a known-good ECM and recheck.	Repair circuit.

DTC P1622: EEPROM Error

S7N20AA314013

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
EEPROM in ECM is corrupted.	ECM

Troubleshooting

1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: Petrol Model”.
2) Turn the ignition switch to OFF position.
3) Check if DTC P1622 is still detected referring to “Diagnostic Trouble Code (DTC) Check: Petrol Model”. If still detected, go to the next step. If not, the troubleshooting is completed.
4) Replace ECM with new one referring to “Engine Control Module (ECM) Removal and Installation: M13A / M15A / M16A in Section 1C”.
5) Perform “Procedure after ECM Replacement: Petrol Model”.

DTC P1623: Unregistered Transponder

S7N20AA314014

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Transponder code in the transponder built in the ignition key is invalid.	• Transponder in the ignition key • Immobilizer control module (ICM) • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was “Immobilizer Control System Check” performed?*	Go to Step 2.	Go to “Immobilizer Control System Check: Petrol Model”.
2	**DTC check for ECM** *Is DTC other than P1623 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**Registration of unregistered ignition key with ECM** 1) Register the unregistered ignition key with ECM referring to “Registration of the Ignition Key: Petrol Model”. *Was registration of ignition key completed?*	Recheck DTC for ECM. If DTC P1623 is still detected, go to Step 4.	Go to Step 3.
4	**Registration of the spare ignition key** 1) Register the spare ignition key referring to “Registration of the Ignition Key: Petrol Model”. *Was registration of spare ignition key completed?*	Replace ignition key which cannot be registered.	Substitute a known-good ECM and recheck.

DTC P1625: Immobilizer Antenna Error

S7N20AA314015

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
Immobilizer control module (ICM) is faulty.	• ICM • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was “Immobilizer Control System Check” performed?*	Go to Step 2.	Go to “Immobilizer Control System Check: Petrol Model”.
2	**Diagnostic Trouble Code (DTC) confirmation** 1) Clear DTC(s) referring to “Diagnostic Trouble Code (DTC) Clearance: Petrol Model”. 2) Turn the ignition switch to OFF position. 3) Check if any DTC is detected referring to “Diagnostic Trouble Code (DTC) Check: Petrol Model”. *Is DTC P1625 still detected?*	Substitute a known-good ICM and recheck DTC. If DTC P1625 is detected, substitute a known- good ECM and recheck.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.

DTC P1636: Immobilizer Information Registration Failure

S7N20AA314016

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Petrol Model”.

DTC Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
The registration of the immobilizer control system information in ECM is failed.	• CAN communication circuit • Steering angle sensor (if equipped) • Combination meter • Keyless start control module (if equipped) • TCM (for A/T model or automated manual transaxle model) • BCM • ESP® control module (if equipped) • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was "Immobilizer Control System Check" performed?*	Go to Step 2.	Go to "Immobilizer Control System Check: Petrol Model".
2	**DTC Check for ECM** 1) Check ECM for DTC referring to "DTC Check: M13A / M15A / M16A in Section 1A". *Is DTC P1674, P1675, P1676 and/or U1678 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	**DTC check for BCM** 1) Check BCM for DTC referring to "DTC Check in Section 10B". *Is DTC U1073, U1100, U1101 and/or U1144 detected?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	**CAN communication circuit check** 1) Check for open, short and high resistance in CAN communication circuits between ECM and BCM. *Is each CAN communication circuit in good condition?*	Go to Step 5.	Repair circuit.
5	**Replacement of BCM** 1) Replace BCM with new one referring to "BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B". 2) Check ECM for DTC referring to "Diagnostic Trouble Code (DTC) Check: Petrol Model". *Is DTC P1636 still detected?*	Substitute a known-good ECM and recheck.	BCM faulty.

DTC P1638: Immobilizer Information Mismatched

S7N20AA314017

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: Petrol Model".

DTC Detecting Condition and Trouble Area

Detecting Condition	Trouble Area
• The immobilizer control system information in ECM and the one in BCM does not match. • The registration of the immobilizer control system information in ECM is failed.	• Use of the wrong ECM • CAN communication circuit • Steering angle sensor (if equipped) • Combination meter • Keyless start control module (if equipped) • TCM (for A/T model or automated manual transaxle model) • BCM • ESP® control module (if equipped) • ECM

Troubleshooting

Step	Action	Yes	No
1	*Was "Immobilizer Control System Check" performed?*	Go to Step 2.	Go to "Immobilizer Control System Check: Petrol Model".
2	**Diagnostic Trouble Code (DTC) confirmation** 1) Disconnect negative (–) cable from battery for more than 5 seconds. 2) Connect negative (–) cable to battery. 3) Check if any DTC is detected referring to "Diagnostic Trouble Code (DTC) Check: Petrol Model". *Is DTC P1638 still detected?*	Go to Step 3.	Intermittent trouble check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**ECM specification check** 1) Check ECM part number to see if ECM is applicable to the vehicle in service. *Is a correct ECM used for the vehicle in service?*	Go to Step 4.	Replace ECM with the correct one and recheck if DTC P1638 is still detected by ECM.
4	**DTC check for ECM** 1) Check ECM for DTC referring to "DTC Check: M13A / M15A / M16A in Section 1A". *Is DTC P1674, P1675 and/or P1678 detected?*	Go to applicable DTC diag. flow.	Go to Step 5.
5	**DTC check for BCM** 1) Check BCM for DTC referring to "DTC Check in Section 10B". *Is DTC U1073, U1100, U1101 and/or U1144 detected?*	Go to applicable DTC diag. flow.	Go to Step 6.
6	**CAN communication circuit check** 1) Check for open, short and high resistance in CAN communication circuits between ECM and BCM. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair circuit.
7	**Replacement of BCM** 1) Replace BCM with new one referring to "BCM (Included in Junction Block Assembly) Removal and Installation in Section 10B". 2) Check ECM for DTC referring to "Diagnostic Trouble Code (DTC) Check: Petrol Model". *Is DTC P1638 still detected?*	Substitute a known-good ECM and recheck.	BCM faulty.

Inspection of Immobilizer Control Module (ICM) and Its Circuit

S7N20AA314018

Immobilizer control module (ICM) and its circuit can be checked at immobilizer control module (ICM) wiring connector by measuring voltage.

⚠ CAUTION

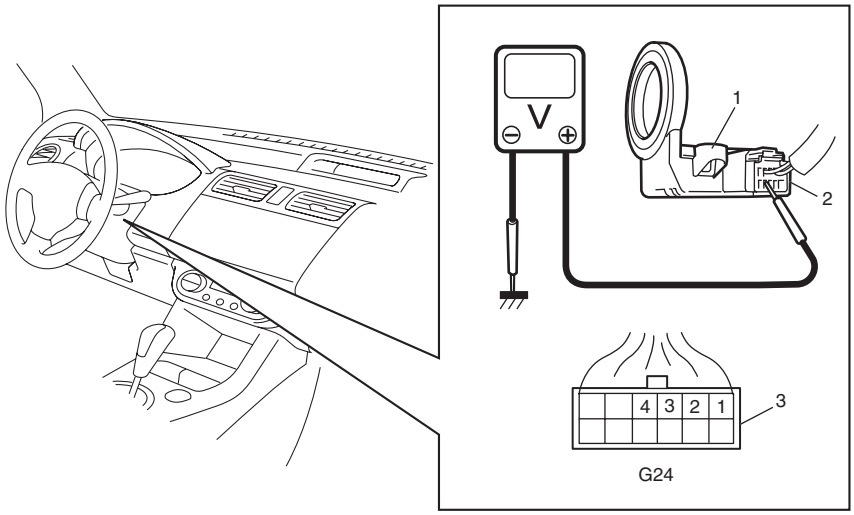
Immobilizer control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to immobilizer control module (ICM) with connector disconnected from it.

Voltage Check

1) Remove immobilizer control module (ICM) (1) from steering lock assembly or steering lock unit referring to "Immobilizer Control Module (ICM) Removal and Installation: Petrol Model".
2) Connect immobilizer control module (ICM) connector (2) to immobilizer control module (ICM).
3) Check voltage at each terminal.

NOTE

As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when the ignition switch is turned to ON position.



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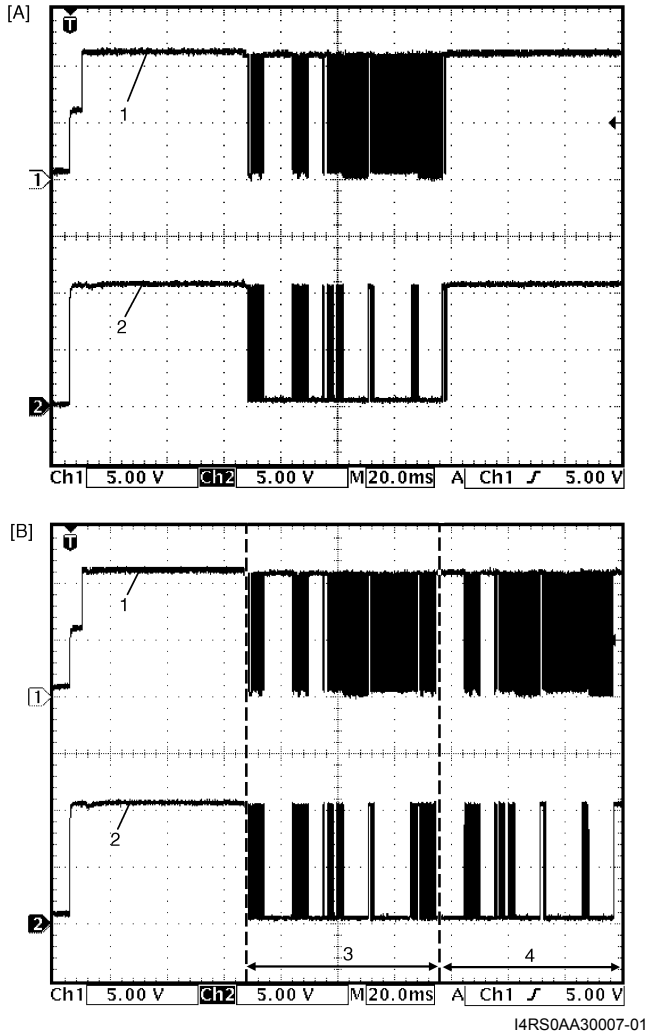
3. Immobilizer control module (ICM) connector (harness side view)

Connector	Terminal		Circuit	Normal Voltage	Condition
G24	1	BLK/ WHT	Power supply	About 12.0 V	Ignition switch at ON position
				0.0 V	Ignition switch at OFF position
	2	BLK/ ORG	Ground	0.0 V	Ignition switch at ON position
				0.0 V	Ignition switch at OFF position
	3	YEL/ BLK	Serial communication line	See the reference waveform.	—
				0.0 V	Ignition switch at OFF position
	4	YEL/ RED	Clock line	See the reference waveform.	—
				0.0 V	Ignition switch at OFF position

Reference Waveform



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[A]:	The transponder code read successfully at the first try.
[B]:	The transponder code read successfully at the second try.
1.	Serial communication line
2.	Clock line
3.	First try
4.	Second try

NOTE

When ECM cannot read the transponder code at the first try, ECM tries to read the transponder code repeatedly up to 8 times. The second waveform is the example showing that ECM read the transponder code successfully at the second try.

Measurement terminals	CH1: G24-3 to G24-2 CH2: G24-4 to G24-2
Oscilloscope settings	CH1: 5 V/DIV CH2: 5 V/DIV TIME: 20 ms
Measurement condition	Right after the ignition switch is turned ON, the waveform can be read.

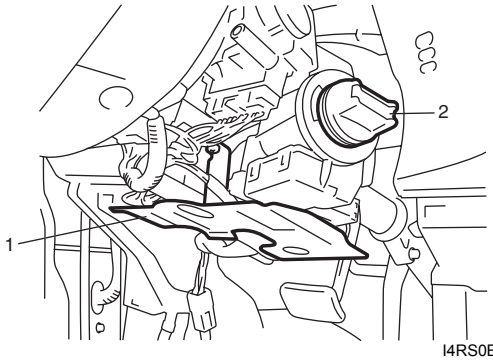
Repair Instructions

Immobilizer Control Module (ICM) Removal and Installation

S7N20AA316001

Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation in Section 8B”.
4) Remove steering wheel referring to “Steering Wheel Removal and Installation in Section 6B”.
5) Remove steering column lower and upper covers.
6) Remove knee protector plate (1).
7) Remove engine start knob (2). (if equipped with keyless start system)



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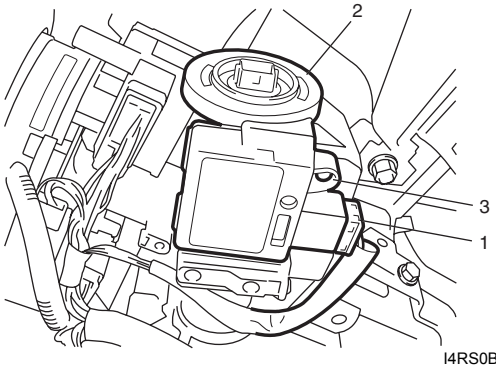
8) Disconnect connector (1) from immobilizer control module (ICM) (2).
9) Remove a screw (3) from immobilizer control module (ICM).



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10) Remove immobilizer control module (ICM) from steering lock assembly or steering lock unit.

NOTE

Do not add or twist strong power to antenna part of immobilizer control module (ICM).

Installation

Reverse the removal procedure.

Registration of the Ignition Key

S7N20AA316002

To finish the registration of the ignition key, the transponder code memorized in the transponder built in the ignition key has to be registered with ECM. To register the transponder code with ECM, perform “Register Ig Key” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

NOTE

- **A maximum of four transponder codes can be registered with ECM.**
- **At an early part of the registration process, all transponder codes of the ignition keys in use already registered with ECM are cleared. Therefore, before starting the registration, prepare all ignition keys in use in addition to the new ignition key(s) to be registered with ECM.**

Procedure after ECM Replacement

S7N20AA316003

After ECM is replaced with new one or used one, the transponder code in the transponder built in the ignition key has to be registered with ECM. To register transponder code in the ignition key with ECM, perform “Replace New ECM” mode of SUZUKI scan tool referring to “SUZUKI Tech 2 Operator’s Manual”.

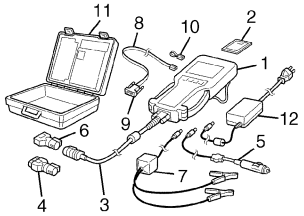
NOTE

A maximum of four transponder codes can be registered with ECM.

Special Tools and Equipment

Special Tool

S7N20AA318001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞ / ☞		

Diesel Model

Precautions

Precautions in Diagnosing Troubles

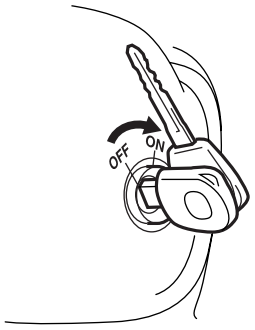
S7N20AA320001

- Before confirming DTC, do not disconnect connector from ECM, battery cable from battery, ground wire harness or main fuse. Such disconnection will erase memorized information in ECM.
- DTC stored in Immobilizer Control Module memory can be cleared as well as checked by using SUZUKI scan tool. Before using scan tool, read its Operator's (Instruction) Manual. Carefully to have good understanding as to what functions are available and how to use it.
- Be sure to read "Precautions for Electrical Circuit Service in Section 00" before inspection and observe what is written there.
- There are cases where service vehicle soon (SVS) lamp indicates that some trouble has occurred only temporarily and has gone. In such case, it may occur that good parts are replaced unnecessarily. To prevent such case, be sure to follow instructions when checking by using "Immobilizer Control System Check: Diesel Model".
- When trouble can be identified, it is not an intermittent one: check ignition key, wires and each connector and if they are all in good condition, substitute a known-good ECM and recheck.
- Communication of ECM, BCM, ABS / ESP® control module, steering angle sensor (ESP® model), combination meter, keyless start control module (if equipped) and DLC is established by CAN (Controller Area Network). Therefore, handle CAN communication lines with care referring to "Precaution for CAN Communication System in Section 00". For CAN communication system description, refer to "CAN Communication System Description: D13A / Z13DTJ in Section 1A".

Precautions in Handling Immobilizer Control System

S7N20AA320002

- Do not turn ON ignition switch with ignition key in contact with another one or quite close to another one. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



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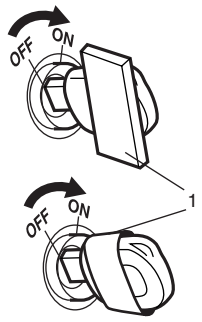
- Do not turn ON ignition switch by using ignition key with any type of metal (1) wrapped its grip or in contact with it. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



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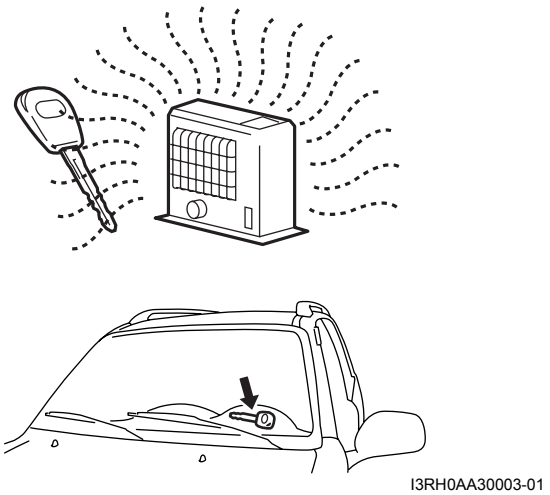
- Do not leave ignition key in a place where temperature is high. High temperature may cause damage to the transponder built in the ignition key.



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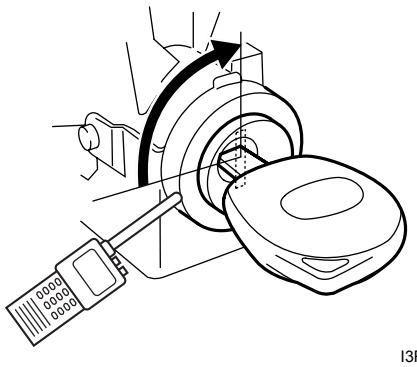
- Do not turn ignition switch to ON position by bringing radio antenna close to coil antenna. Or, the immobilizer control system may detect some abnormal condition and prevent the engine from starting.



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Precautions after Replacing ECM or Immobilizer Control Module

S7N20AA320003

- When ECM is replaced, including when replaced because rechecking by using a known-good ECM is necessary during trouble diagnosis, secret key and password must be registered in ECM by performing procedure described in “Procedure after ECM Replacement: Diesel Model”.
- When Immobilizer Control Module is replaced, including when replaced because rechecking by using a known-good Immobilizer Control Module is necessary during trouble diagnosis, transponder fix code, secret key and/or password must be registered in Immobilizer Control Module by performing procedure described in “Procedure after Immobilizer Control Module Replacement: Diesel Model”.

General Description

Immobilizer Control System Operation Description

S7N20AA321001

1) Each ignition key has its own FIX CODE stored in memory. When the ignition switch is turned to ON position Immobilizer Control Module reads the FIX CODE through its coil antenna from ignition key.
2) Immobilizer Control Module compares FIX CODE read in Step 1) and that registered in Immobilizer Control Module, and then checks if they match.
3) ECM sends variable (generated randomly) to transponder via Immobilizer Control Module, and then ECM calculates it with SECRET KEY CODE stored in its memory according to specified algorithm.
   On the other hand, transponder also calculates received variable with SECRET KEY CODE stored in its memory by means of same algorithm and sends back to ECM.
4) Only when ECM/transponder calculated values match, ECM keeps running engine.
   If two calculated values do not match, ECM stops operation of injectors and ignitor to stop engine after about 1.8 seconds at the first time. After the second time, ECM does not let engine start. And, so it does when FIX CODEs in Step 2) do not match.

Immobilizer Control System Components Description

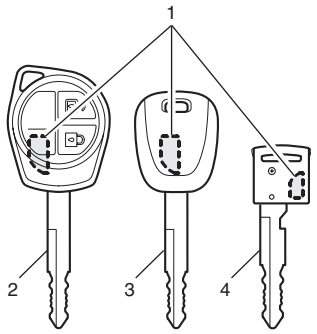
S7N20AA321002

The immobilizer control system designed to prevent vehicle burglar and it consists of the following components.

- Engine Control Module (ECM)
- Immobilizer Control Module (with coil antenna)
- Ignition key (with built-in transponder)

Ignition Key (with Built-In Transponder)

Transponder is built-in an ignition key grip. Each transponder (1) in the key has a FIX CODE and SECRET KEY CODE. The FIX CODE will be transmitted from the transponder via the coil antenna to Immobilizer Control Module when the ignition switch is turned to ON position. SECRET KEY CODE is used for calculation with parameter sent from ECM. SECRET KEY CODE is preset (programmed) at factory shipment.



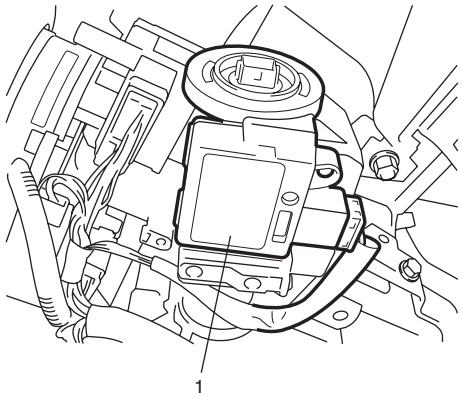
I5RW0BA30001-04

2.	Ignition key with keyless entry system
3.	Ignition key without keyless entry system
4.	Ignition key with keyless start system

Immobilizer Control Module

Immobilizer Control Module (1) is installed to steering column beside ignition key switch. The coil antenna is installed to Immobilizer Control Module. It energizes transponder and transmits the FIX CODE and data between transponder and Immobilizer Control Module. As main function, Immobilizer Control Module checks if FIX CODE transmitted from transponder and that registered in Immobilizer Control Module (up to 5 different FIX CODE can be registered) match. Immobilizer Control Module controls serial communication between scan tool and ECM. Immobilizer Control Module has 3 different values as the follows.

- Password: for accessing to program by means of scan tool.
- SECRET KEY CODE: for ECM and transponder to calculate with.
- FIX CODE: for checking if transponder is the registered one.



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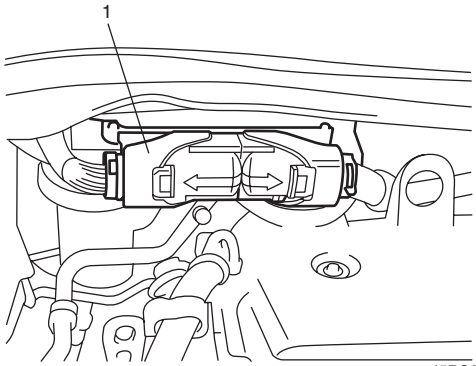
ECM

As main function other than engine control, ECM (1) sends randomized data to transponder and checks if a response from transponder and the value calculated in ECM match.

According to matching result, ECM decides to keep engine running or not.

ECM has 2 different values as follows.

- Password: for accessing to program immobilizer control system.
- SECRET KEY CODE: for calculating with this value for permission of engine start.



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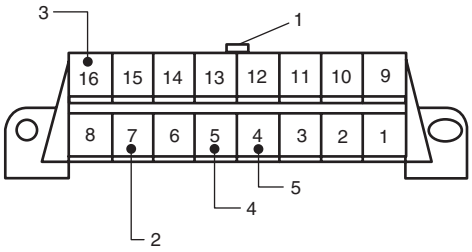
Data Link Connector (DLC)

OBD-II serial data line (K line of ISO 9141) (2) is used for SUZUKI scan tool to communicate with Immobilizer Control Module, Air bag SDM, ABS control module, etc.



I3RM0BA32004-01

1. DLC	4. ECM ground
3. B+	5. Body ground

On-Board Diagnostic System Description

S7N20AA321003

Immobilizer control module and ECM diagnose troubles which may occur in the area including the following parts when the ignition switch is turned to ON position.

Immobilizer Control Module:

- W-line (communication line between ECM and Immobilizer Control Module)
- Password
- SVS lamp circuit
- Transponder (ignition key)
- FIX CODE

ECM:

- SECRET KEY CODE
- Password
- Keyless start control module
- Steering lock unit
- CAN communication circuit

When a trouble exists in the immobilizer control system (when Immobilizer Control Module or ECM detects a DTC), ECM stops operation of the injector.

With the ignition switch at ON (but the engine at stop) regardless of the condition of the engine and emission control system, ECM indicates whether some trouble has occurred in the immobilizer control system or not by turning ON or flashing ON and OFF the SVS lamp (1).

SVS lamp is ON, and then OFF after 3 seconds:

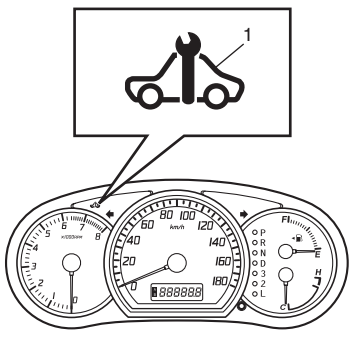
No trouble exists in the immobilizer control system.

SVS lamp flashes ON and OFF at 0.25 sec. intervals:

ECM or Immobilizer Control Module has detected some trouble in the immobilizer control system.

NOTE

As soon as the ignition switch is turned to ON position, ECM and Immobilizer Control Module diagnose if a trouble has occurred in the immobilizer control system in about 3 seconds at maximum. While the diagnosis is being made, the SVS lamp stays on and diagnosis result is “abnormal”, it immediately starts flashing but if the result is “normal”, it remains on.

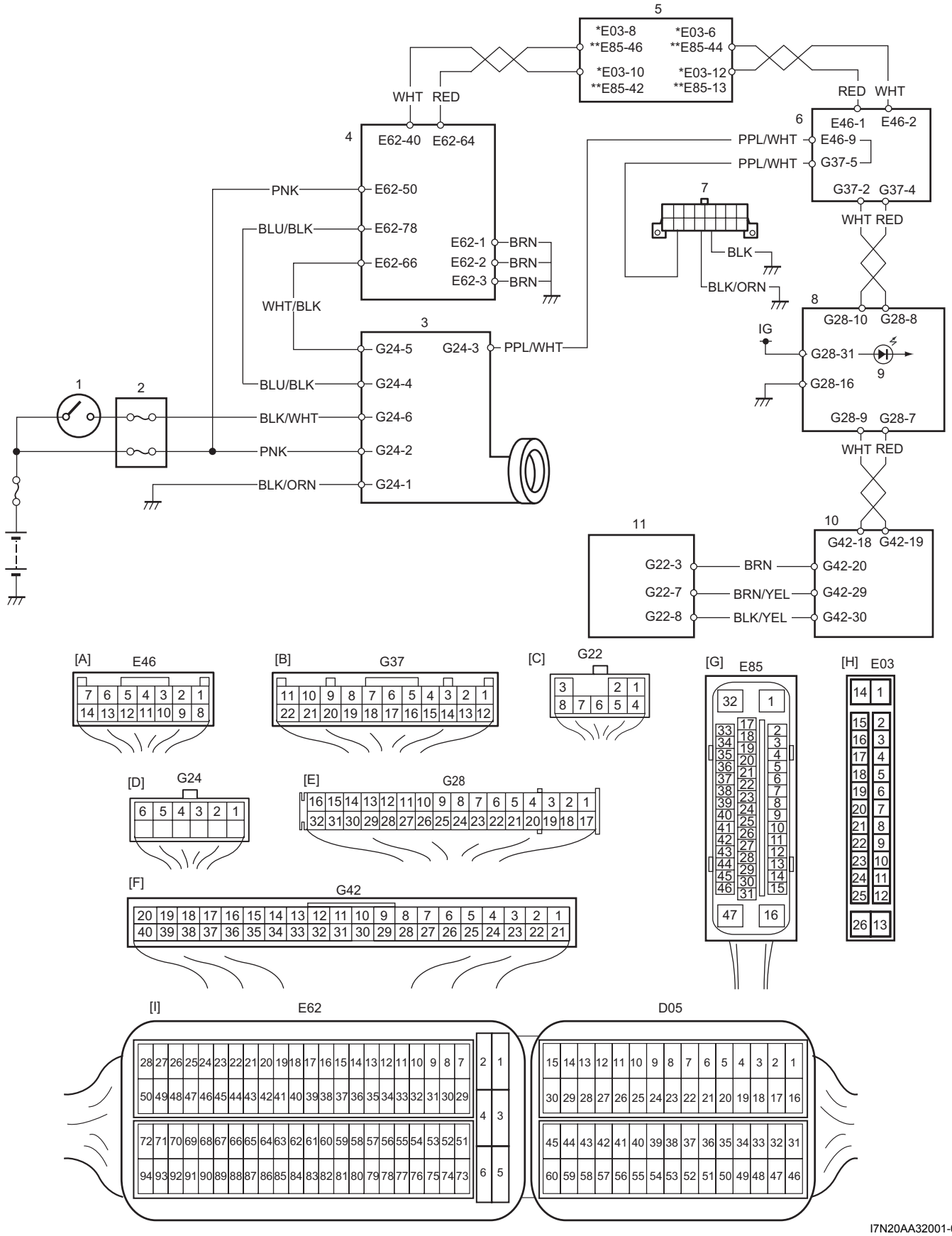


I5RS0BA30003-01

Schematic and Routing Diagram

Immobilizer Control System Wiring Circuit Diagram

S7N20AA322001



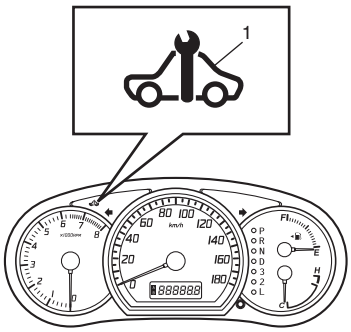
I7N20AA32001-02

[A]: BCM connector “E46” (Viewed from harness side)	[I]: ECM connector “E62” and “D05” (Viewed from harness side)	8. Combination meter
[B]: BCM connector “G37” (Viewed from harness side)	1. Ignition switch	9. SVS lamp
[C]: Steering lock unit connector “G22” (Viewed from harness side)	2. Junction block	10. Keyless start control module
[D]: Immobilizer control module connector “G24” (Viewed from harness side)	3. Immobilizer control module	11. Steering lock unit
[E]: Combination meter connector “G28” (Viewed from harness side)	4. ECM	*: Non-ESP® model
[F]: Keyless start control module connector “G42” (Viewed from harness side)	5. ABS/ESP® control module	**: ESP® model
[G]: ESP® control module connector “E85” (Viewed from harness side)	6. BCM	
[H]: ABS control module connector “E03” (Viewed from harness side)	7. DLC	

Diagnostic Information and Procedures

Immobilizer Control System Check

S7N20AA324001

Step	Action	Yes	No
1	**SVS Lamp Check** 1) Turn ignition switch to ON position. 2) Check that SVS lamp (1) comes on for 5 seconds and then go off.  I5RS0BA30003-01 *Does SVS lamp operate as specified?*	Go to Step 2.	Go to Step 3.
2	**Engine Start Check** 1) Start up engine using ignition key. *Does engine start up?*	Immobilizer system is good condition.	Go to “Engine and Emission Control System Check: D13A / Z13DTJ in Section 1A”.
3	**System Check** *Does SVS lamp flash on and off continuously in Step 1?*	Check DTC in immobilizer control module and/or ECM referring to “DTC Check: Diesel Model” and/or “DTC Check: D13A / Z13DTJ in Section 1A”.	Go to “SVS Lamp Does Not Come ON with Ignition Switch ON and Engine Stop: Diesel Model” or “SVS Lamp Remains On after Ignition Switch ON: Diesel Model”.

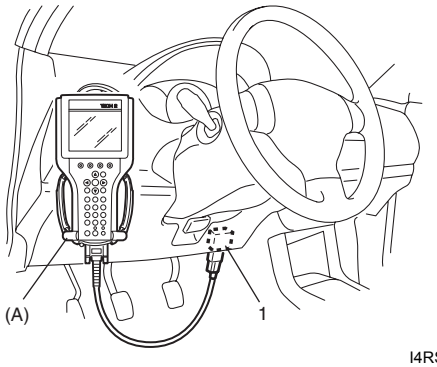
DTC Check

S7N20AA324002

Immobilizer Control Module

1) Prepare SUZUKI scan tool.
2) With ignition switch OFF position, connect SUZUKI scan tool to data link connector (DLC) (1) located under instrument panel at driver's seat side.

   Special tool
   (A): SUZUKI scan tool



I4RS0BA30003-03

3) Turn ignition switch to ON position.
4) Read DTC according to instructions displayed on SUZUKI scan tool referring to scan tool operator's manual for further details. If communication between scan tool and Immobilizer Control Module can not be established, check if SUZUKI scan tool is communicable by connecting it to immobilizer control system of another vehicle. If communication is possible in this case, SUZUKI scan tool is in good condition. Then, check data link connector and serial data line (circuit) in the vehicle with which communication can not be established.

   NOTE

   DTC No. B3040, B3042 and B3043 can not be confirmed by scan tool unless W-line circuit is in good condition.

5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC).

ECM

Refer to "DTC Check: D13A / Z13DTJ in Section 1A".

DTC Clearance

S7N20AA324003

Immobilizer Control Module

1) Connect SUZUKI scan tool to data link connector (DLC) located under instrument panel at driver's seat side.
2) Turn ignition switch to ON position.
3) Erase DTC according to instructions displayed on SUZUKI scan tool referring to scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.

ECM

Refer to "DTC Clearance: D13A / Z13DTJ in Section 1A".

DTC Table

S7N20AA324004

Immobilizer Control Module

DTC No.	Detected item	Detecting condition
☞ B1000	Immobilizer Control Module internal failure	Immobilizer Control Module failure
☞ B3040	W-line communication failure	Communication not finished correctly
☞ B3042	W-line circuit malfunction shorted to ground	W-line circuit voltage low
☞ B3043	W-line circuit malfunction shorted to battery	W-line circuit voltage high
☞ B3055	No transponder	• Ignition key without transponder is used. • Ignition switch is turned ON position using remote controller of keyless start system
☞ B3056	No transponder registered	FIX CODE is not registered in Immobilizer Control Module.
☞ B3057	No password registered	Password is not registered in Immobilizer Control Module.
☞ B3059	No request from ECM	• ECM/Immobilizer Control Module line (SVS lamp) is open or shorted. • Ignition switch is turned ON position using remote controller of keyless start system
☞ B3060	Incorrect transponder detected	Unregistered transponder is detected.
☞ B3061	Transponder communication failure	Incorrect signal or no response from transponder
☞ B3077	Read-only transponder detected	Transponder not for this system is detected.

ECM

DTC No. Display on scan tool	Detected item	Detecting condition
☞ P1610	Secret key / password not programed	SECRET KEY CODE and password are not registered in ECM.
☞ P1611	Password is not matched	Stored password is incorrect.
☞ P1612	No signal from immobilizer control module	Invalid signal from Immobilizer Control Module
☞ P1613	Immobilizer system malfunction	Invalid signal from Immobilizer Control Module
☞ P1614	Incorrect signal from immobilizer control module	Received response from transponder is incorrect.
☞ P1615	Steering lock unit communication error (for vehicle with keyless start system)	• While registering the transponder code in the transponder built in the ignition key in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. • The ID code could not be registered in the keyless start control module or ECM.
☞ P1616	Unregistered keyless start control module (for vehicle with keyless start system)	ECM detects different ID codes registered in ECM and keyless start control module.
☞ P1618	Keyless start control module CAN communication error (for vehicle with keyless start system)	Reception error of communication data for keyless start control module is detected for longer than specified time continuously.

NOTE

- **DTC B3040, B3042 and B3043 not be confirmed by scan tool unless W-line circuit is in good condition.**
- **DTC B3059 is detected when ignition switch is turned to ON position within 5 seconds after ignition switch turned to ACC or OFF position from ON position.**
- **Immobilizer control module detects DTC B3055, DTC B3059 and DTC B3061 when ignition switch is turned on by using remote controller of keyless start control system (not using the ignition key). It is not abnormal.**

Scan Tool Data

S7N20AA324005

The normal condition below that can be checked by the scan tool are those detected by immobilizer control module.

Scan Tool Data	Vehicle Condition	Normal Condition
Ignition Switch	Ignition switch at ON position	ON
	Ignition switch at OFF position	OFF
Password	Ignition switch at ON position	PRGRMD
Transponder	Ignition switch at ON position	DETECTED
Fix Code (IGN key)	Ignition switch at ON position	REGISTERED
Number of Fix Code	Ignition switch at ON position	0 – 5 PCS
Trans Secret Key	Ignition switch at ON position	REGISTERED
Wait Loop	Ignition switch at ON position	INACTIVE
Wait Time	Ignition switch at ON position	0 SEC.

Scan Tool Data Definitions

Ignition Switch

Ignition key switch position

ON: Ignition switch at ON position

OFF: Ignition switch at OFF position

Password

PRGRMD: Password is registered in immobilizer control module.

NOT PRGRMD: Password is not registered. It is necessary to register password to set immobilizer control module in normal operation status.

Transponder
DETECTED: Transponder in ignition key is detected by immobilizer control module.
NOT DETECTED: Transponder in ignition key is not detected.

Fix Code (IGN key)
REGISTERED: The FIX CODE of ignition key which is inserted in key cylinder is registered in immobilizer control module.
NOT REGISTERED: The FIX CODE of ignition key which is inserted in key cylinder is not registered in immobilizer control module.

Number of Fix Code
0 – 5 PCS: The number of registered ignition key (FIX CODE).

Trans Secret Key
REGISTERED: Secret key is registered in ignition key with built-in transponder.
NOT REGISTERED: Secret key is not registered in ignition key with built-in transponder yet.

Wait Loop
INACTIVE: Security system is inactive. It is ready for password input on scan tool.
ACTIVE: Incorrect password was inputted and system is in wait-loop status. Inputting password is inhibited for the waiting time described below.

Wait Time
The time it must be waited for reinput password for programming SUZUKI scan tool indicates “0 SEC.” when a correct password is input after wait time.
If failed to input correct password, it increase according to the times of misinput.

SVS Lamp Does Not Come ON with Ignition Switch ON and Engine Stop

S7N20AA324006

Wiring Diagram
Refer to “Immobilizer Control System Wiring Circuit Diagram: Diesel Model”.

Circuit Description
When the ignition switch is turned ON, immobilizer control module read the code by the coil antenna from ignition key. Then if the code in transponder in the key match with the one registered with immobilizer control module and ECM, ECM transmits indication ON signal of SVS lamp to combination meter in order to turn SVS lamp on. And then, combination meter turns SVS lamp on. When the engine starts to run and no malfunction is detected in the system, ECM transmits SVS lamp indication OFF signal to combination meter in order to turn SVS lamp off. And then, combination meter turns SVS lamp off, but if a malfunction was or is detected, SVS lamp is flashes ON and OFF, when ignition switch turn to ON position.

Troubleshooting

Step	Action	Yes	No
1	**SVS Lamp power supply check** 1) Turn ignition switch to ON position. *Do other warning lights come ON?*	Go to Step 2.	Go to Step 3.
2	**DTC check** 1) Connect scan tool to DLC with ignition switch turned OFF. 2) Turn ON ignition switch and check DTC. *Is there any DTC(s)?*	Go to applicable DTC diag. flow.	Substitute a known-good combination meter and recheck. If SVS lamp still remains off, substitute a known-good ECM and recheck.
3	**Fuse check** 1) Turn ignition switch to OFF position. 2) Check for fuse blown at combination meter circuit fuse in junction block assembly. *Is fuse in good condition?*	Go to Step 4.	Replace fuse and check for short.

Step	Action	Yes	No
4	**CAN communication line circuit check** 1) Check CAN communication circuit between combination meter and ECM referring to “A-5 Engine and A/C Control System (DSL) in Section 9A”. *Is circuit in good condition?*	Go to Step 5.	Repair or replace.
5	**Combination meter power supply check** 1) Remove combination meter referring to “Combination Meter Removal and Installation in Section 9C”. 2) Check for proper connection to combination meter connector at “G28-31” and “G28-16” terminals. 3) If OK, then turn ignition switch to ON position and measure voltage between combination meter connector at “G28-31” terminal and vehicle body ground. *Is it 10 – 14 V?*	Go to Step 6.	“RED/BLK” wire in open circuit.
6	**Combination meter circuit check** 1) Turn ignition switch OFF position. 2) Measure resistance between “G28-16” terminal of combination meter connector and vehicle body ground. *Is resistance 1 Ω or less?*	Substitute a known-good combination meter and recheck. If immobilizer indicator lamp still remains off, substitute a known-good ECM and recheck.	“BLK/ORN” wire circuit in open or high resistance circuit.

SVS Lamp Remains On after Ignition Switch ON

S7N20AA324007

When SVS lamp remains ON for more than 5 seconds after turning ignition switch to ON position, DTC is recorded to immobilizer control module and ECM.
After completion of immobilizer system repair, perform clearance of DTC.

DTC B1000: Immobilizer Control Module Internal Failure

S7N20AA324008

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Internal fault of Immobilizer Control Module	Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch at OFF position. 2) Disconnect connector from Immobilizer Control Module. 3) Check for proper connection to Immobilizer Control Module at all terminals. *Are they in good condition?*	Substitute a known-good Immobilizer Control Module referring to “Procedure after Immobilizer Control Module Replacement: Diesel Model” and recheck.	Repair or replace.

DTC B3040: W-Line Communication Failure

S7N20AA324009

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Diesel Model”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No response from ECM while Immobilizer Control Module requests signal	• W-line circuit • ECM power circuit

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch at OFF position. 2) Disconnect connector from ECM. 3) Check for proper connection to ECM at “E62-66” terminal. *Is it in good condition?*	Go to Step 2.	Repair or replace.
2	1) Turn ignition switch at OFF position. 2) Disconnect connector from Immobilizer Control Module. 3) Check for proper connection to Immobilizer Control Module at “G24-5” terminal. *Is it in good condition?*	Go to Step 3.	Repair or replace.
3	1) Connect ECM and Immobilizer Control Module connectors. 2) Measure voltage between terminal “G24-5” and ground with ignition switch at ON position. *Is it 10 – 14 V?*	Go to Step 4.	W-line (WHT/BLK) circuit open.
4	1) With ignition switch at ON position, measure voltage between “E62-50” and ground. *Are they 10 – 14 V?*	Substitute a known-good ECM referring to “Procedure after ECM Replacement: Diesel Model” and recheck.	ECM power supply (PNK) circuit open.

DTC B3042: W-Line Circuit Malfunction Shorted to Ground

S7N20AA324010

Wiring Diagram

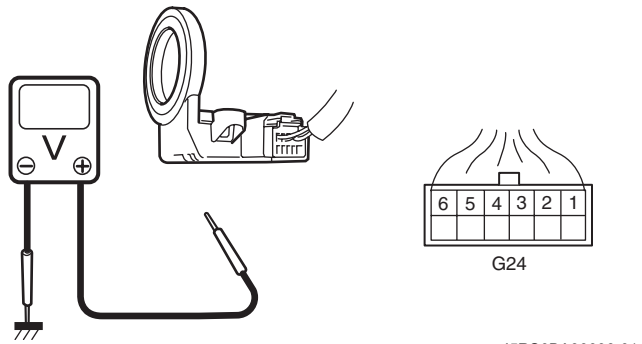
Refer to “Immobilizer Control System Wiring Circuit Diagram: Diesel Model”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
W-line circuit voltage is low.	W-line circuit

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch at OFF position. 2) Disconnect connector from ECM. 3) Check for proper connection to ECM at “E62-66” terminal. *Is it in good condition?*	Go to Step 2.	Repair or replace.

Step	Action	Yes	No
2	1) Connect connector to ECM. 2) Measure voltage between “G24-5” terminal of Immobilizer Control Module and body ground with ignition switch at ON position.  *Is it 10 – 14 V?*	Substitute a known-good ECM referring to “Procedure after ECM Replacement: Diesel Model” and recheck.	W-line (WHT/BLK) is shorted to ground. Repair and recheck.

DTC B3043: W-Line Circuit Malfunction Shorted to Battery

S7N20AA324011

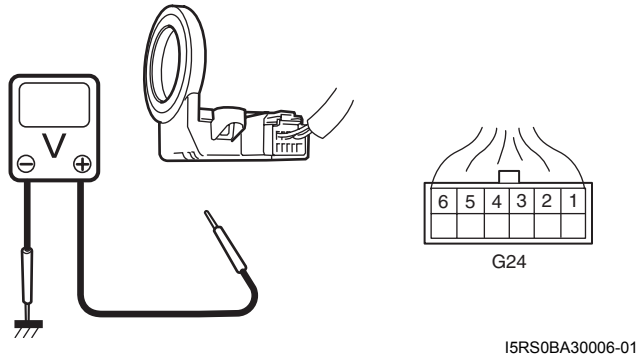
Wiring Circuit

Refer to “Immobilizer Control System Wiring Circuit Diagram: Diesel Model”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
W-line circuit voltage is high.	W-line circuit

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch at OFF position. 2) Disconnect connector from ECM. 3) Check for proper connection to ECM at “E62-66” terminal. *Is it in good condition?*	Go to Step 2.	Repair or replace.
2	1) Connect connector to ECM. 2) Measure voltage between “G24-5” terminal of Immobilizer Control Module and body ground with ignition switch at OFF position and scan tool disconnected.  *Is it 0 – 1 V?*	Substitute a known-good ECM referring to “Procedure after ECM Replacement: Diesel Model” and recheck.	W-line (WHT/BLK) is shorted to power supply circuit. Repair and recheck.

DTC B3055: No Transponder

S7N20AA324012

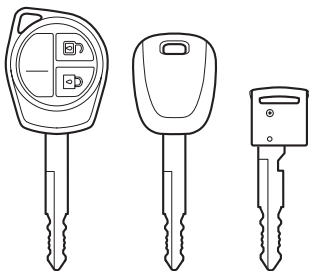
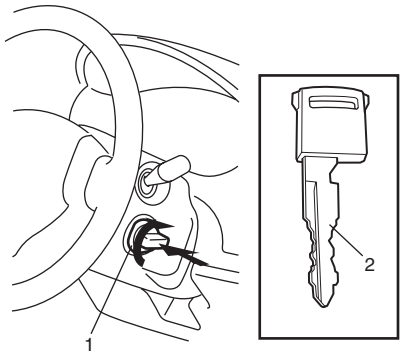
NOTE

Immobilizer control module detects DTC B3055, DTC B3059 and DTC B3061 when ignition switch is turned on by using remote controller of keyless start control system (not using the ignition key). It is not abnormal.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• No FIX CODE is transmitted from transponder. • FIX CODE transmission error. • Ignition switch is turned ON position using remote controller of keyless start system	Ignition key

DTC Troubleshooting

Step	Action	Yes	No
1	*Is vehicle equipped with keyless start system?*	Go to Step 4.	Go to Step 2.
2	1) Turn ignition switch at OFF position and leave it for 5 seconds or more. 2) Pull out ignition key and reinsert it. 3) Turn ignition switch to start up engine. *Does engine start up?*	Temporal error in code reading. Immobilizer control system is in good condition.	Go to Step 3.
3	1) Check ignition key for shape.  I5RW0BA30008-02 *Is it the original one?*	Check ignition key referring to “Precautions in Handling Immobilizer Control System: Diesel Model” and repair or replace.	Ignition key with built-in transponder unusable. Replace, register it if necessary and recheck.
4	1) Clear DTC. 2) Turn Ignition switch to OFF position. 3) Wait for 10 seconds. 4) Turn ignition switch (1) to ON position using ignition key (2).  I5RW0BA30010-02 5) Recheck DTC. *Is DTC B3055 still detected?*	Return to Step 2 again.	Temporary error in reading. Immobilizer control system is in good condition.

DTC B3056: No Fix Code Registered

S7N20AA324013

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
No transponder FIX CODE is registered in Immobilizer Control Module.	Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Check DATA LIST of SUZUKI Scan Tool for “Number of Fix Code”. *Is it 0?*	Go to Step 2.	Substitute a known-good Immobilizer Control Module referring to “Procedure after Immobilizer Control Module Replacement: Diesel Model” and recheck.
2	*Is DTC B3057 also output?*	Proceed to “DTC B3057: No Password Registered: Diesel Model”. Then go to Step 3.	Go to Step 3.
3	1) Register ignition key(s) with built-in transponder referring to “How to Register Ignition Key: Diesel Model”. 2) Check DATA LIST of SUZUKI scan tool for “Number of Fix Code”. *Is it 1 or more?*	Transponder FIX CODE(s) is registered.	Transponder registration procedure is not completed correctly. Register ignition key again.

DTC B3057: No Password Registered

S7N20AA324014

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Password is not registered in Immobilizer Control Module.	Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Register password by using SUZUKI scan tool. Refer to “Procedure after ECM Replacement: Diesel Model”. 2) Confirm that password is registered correctly, referring to SUZUKI scan tool DATA LIST. *Is password PRGRMD message output?*	Password registration is completed.	Register password again and recheck.

DTC B3059: No Request from ECM

S7N20AA324015

NOTE

Immobilizer control module detects DTC B3055, DTC B3059 and DTC B3061 when ignition switch is turned on by using remote controller of keyless start control system (not using the ignition key). It is not abnormal.

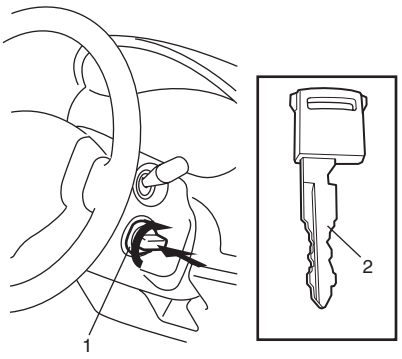
Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Diesel Model”.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• No request from ECM via SVS lamp circuit	• SVS lamp circuit
• Ignition switch is not reset correctly.	• Communication between ECM and Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	*Is vehicle equipped with keyless start system?*	Go to Step 6.	Go to Step 2.
2	1) Turn ignition switch to ACC position or OFF position for more than 5 seconds, then turn ignition switch to ON position. 2) Recheck DTC. *Is DTC B3059 still detected?*	Go to Step 3.	Communication between ECM and Immobilizer Control Module was not finished correctly.
3	1) Check for proper connection to ECM at "E62-78" terminal. *Is it in good condition?*	Go to Step 4.	Repair or replace.
4	1) Check for proper connection to Immobilizer Control Module at "G24-4" terminal. *Is it in good condition?*	Go to Step 5.	Repair or replace.
5	1) Check "BLU/BLK" wire of G24 connector for open or short. *Is it in good condition?*	Substitute a known-good ECM referring to "Procedure after ECM Replacement: Diesel Model" and recheck.	Repair or replace.
6	1) Clear DTC. 2) Turn Ignition switch (1) to OFF position. 3) Wait for 10 seconds. 4) Turn ignition switch (1) to ON position using ignition key (2).  I5RW0BA30010-02 5) Recheck DTC. *Is DTC B3059 still displayed?*	Return to Step 2 again.	Temporary error in reading. Immobilizer control system is in good condition.

DTC B3060: Incorrect Transponder Detected

S7N20AA324016

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• FIX CODE does not match with registered one. • FIX CODE is not registered in Immobilizer Control Module.	• Ignition key with built-in transponder • Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC B3056 also output?*	Proceed to "DTC B3056: No Fix Code Registered: Diesel Model". Then, go to Step 2.	Go to Step 2.

Step	Action	Yes	No
2	1) Check DATA LIST of SUZUKI scan tool for “Number of Fix Code”. *Is it 1 or more?*	Replace ignition key with built-in transponder. Then go to Step 3.	Go to Step 3.
3	1) Register transponder referring to “How to Register Ignition Key: Diesel Model”. 2) Check DATA LIST of SUZUKI scan tool for “Fix Code (IGN key)”. *Is it registered?*	Transponder FIX CODE is registered.	Transponder registration procedure is not completed correctly. Register ignition key again.

DTC B3061: Transponder Communication Failure

S7N20AA324017

NOTE

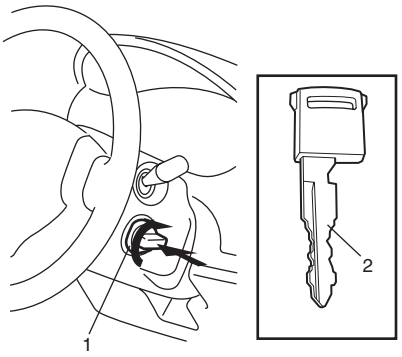
Immobilizer control module detects DTC B3055, DTC B3059 and DTC B3061 when ignition switch is turned on by using remote controller of keyless start control system (not using the ignition key). It is not abnormal.

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
• No response from transponder • SECRET KEY CODE is not matched between ignition key (transponder). • FIX CODE does not match with registered one. • FIX CODE is not registered in Immobilizer Control Module. • Ignition switch is turned ON position using remote controller of keyless start system.	• Ignition key with built-in transponder • SECRET KEY CODE is not registered in transponder. • SECRET KEY CODE is not registered in ECM. • SECRET KEY CODE is different between ECM and transponder. • Unregistered ignition key (FIX CODE) with built-in transponder is detected. • No FIX CODE in Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	*Is vehicle equipped with keyless start system?*	Go to Step 8.	Go to Step 2.
2	*Is DTC B3060 also output?*	Proceed to “DTC B3060: Incorrect Transponder Detected: Diesel Model”. Then go to Step 3.	Go to Step 3.
3	*Is DTC B3055 also output?*	Proceed to “DTC B3055: No Transponder: Diesel Model”. Then go to Step 4.	Go to Step 4.
4	1) Check DATA LIST of scan tool for “Trans Secret Key”. *Is it REGISTERED?*	Go to Step 6.	Go to Step 5.
5	1) Register SECRET KEY CODE by referring to “Procedure after Immobilizer Control Module Replacement: Diesel Model”. 2) Check DTC. *Is DTC B3061 still detected?*	Go to Step 6.	Register SECRET KEY CODE and recheck.
6	1) Register SECRET KEY CODE and password to ECM by referring to “Procedure after ECM Replacement: Diesel Model”. 2) Check DTC. *Is DTC B3061 still detected?*	Go to Step 7.	If there is other DTC, proceed to the DTC diag. flow.

Step	Action	Yes	No
7	1) Replace ignition key with new one and register it by referring to “How to Register Ignition Key: Diesel Model”. 2) Check DTC. *Is DTC B3061 still detected?*	Substitute a known-good Immobilizer Control Module referring to “Procedure after Immobilizer Control Module Replacement: Diesel Model” and recheck.	If there is other DTC, proceed to DTC diag. flow.
8	1) Clear DTC. 2) Turn Ignition switch to OFF position. 3) Wait for 10 seconds. 4) Turn ignition switch (1) to ON position using ignition key (2).  I5RW0BA30010-02 5) Recheck DTC. *Is DTC B3061 still detected?*	Return to Step 2 again.	Temporary error in reading. Immobilizer control system is in good condition.

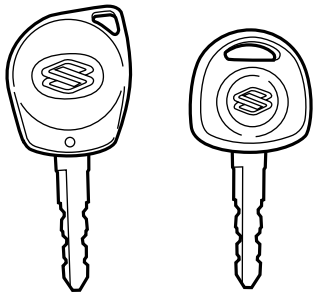
DTC B3077: Read-Only Transponder Detected

S7N20AA324018

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Transponder for other system is detected.	Ignition key with built-in transponder

DTC Troubleshooting

Step	Action	Yes	No
1	1) Turn ignition switch at OFF position and leave it for 5 seconds or more. 2) Pull out ignition key and reinsert it. 3) Start up engine using ignition key. *Does engine start up?*	Temporary error in reading. Immobilizer control system is in good condition.	Replace ignition key with built-in transponder. Register transponder referring to “How to Register Ignition Key: Diesel Model”.
2	1) Check ignition key for shape.  I3RM0AA30012-01 *Is it the original one?*	Check ignition key referring to “Precautions in Handling Immobilizer Control System: Diesel Model” and repair or replace.	Ignition key with built-in transponder unusable. Replace, register it if necessary and recheck.

DTC P1610: Secret Key / Password Not Programed

S7N20AA324019

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
SECRET KEY CODE and password are not registered in ECM.	ECM

DTC Troubleshooting

Step	Action	Yes	No
1	1) Register SECRET KEY CODE and password by using SUZUKI scan tool. Refer to “Procedure after ECM Replacement: Diesel Model”. 2) Check DTC. *Is DTC P1610 still detected?*	Perform registration procedure again and recheck.	ECM is registered correctly.

DTC P1611: Password Is Not Matched

S7N20AA324020

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Password registered in ECM is not correct.	ECM

DTC Troubleshooting

Step	Action	Yes	No
1	1) Register password and SECRET KEY CODE by referring to “Procedure after ECM Replacement: Diesel Model”. 2) Turn ignition switch to OFF position and leave it for 5 seconds or more. 3) Then turn ignition switch to ON position. *Is DTC P1611 still detected?*	Substitute a known-good ECM referring to “Procedure after ECM Replacement: Diesel Model” and recheck.	ECM is in good condition.

DTC P1612 / P1613: No Signal from Immobilizer Control Module / Immobilizer System Malfunction

S7N20AA324021

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Signal from Immobilizer Control Module is not received correctly.	• W-line circuit • Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	*Is DTC B3040, B3042 or B3043 detected at Immobilizer Control Module?*	W-line (WHT/BLK) failure. Proceed to each DTC diag. flow according to that DTC number. Check B3042 or B3043 first and then B3040 if two codes are detected at the same time.	Go to Step 2.
2	1) Turn ignition switch at OFF position and leave it for 5 seconds or more. 2) Pull out ignition key and reinsert it. 3) Start up engine. *Does engine start up?*	Temporary error in reading. Immobilizer control system is in good condition.	Substitute a known-good ECM referring to “Procedure after ECM Replacement: Diesel Model” and recheck.

DTC P1614: Incorrect Signal from Immobilizer Control Module

S7N20AA324022

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
Signal from Immobilizer Control Module is not matched.	• Ignition key with built-in transponder internally faulty • SECRET KEY CODE is not registered in transponder. • SECRET KEY CODE is not registered in ECM. • SECRET KEY CODE is different between ECM and transponder. • Unregistered ignition key (FIX CODE) with built-in transponder is detected. • No FIX CODE in Immobilizer Control Module

DTC Troubleshooting

Step	Action	Yes	No
1	1) Proceed to "DTC B3061: Transponder Communication Failure: Diesel Model" after completing troubleshooting. Recheck DTC. *Is DTC P1614 still output?*	Substitute a known-good ECM referring to "Procedure after ECM Replacement: Diesel Model" and recheck.	ECM and Immobilizer Control Module are programmed correctly.

DTC P1615: Steering Lock Unit Communication Error (for Vehicle with Keyless Start System)

S7N20AA324025

Wiring Diagram

Refer to "Immobilizer Control System Wiring Circuit Diagram: Diesel Model".

Circuit Description

When the transponder code in the ignition key is registered in ECM, the ID code is registered in both ECM and keyless start control module at the same time. This DTC is detected only in case that the ID code cannot be registered in both ECM and keyless start control module when the transponder code in the ignition key is registered in ECM.

NOTE

- **Troubleshoot DTC P1618 first if both DTC P1615 and P1618 are detected at the same time.**
- **After replacing ECM, be sure to perform "Procedure after ECM Replacement: Diesel Model". After replacing the keyless start control module (Diesel Model), be sure to perform "Procedure after ECM Replacement: Diesel Model".**

Detecting Condition and Trouble Area

DTC detecting Condition	Trouble Area
• While registering the transponder code in ECM, the keyless start control module sent a signal to ECM indicating that the ID code could not be registered. • The ID code could not be registered in the keyless start control module or ECM.	• Wire circuits between steering lock unit and keyless start control module faulty • CAN communication circuit faulty • Steering lock unit faulty • Keyless start control module faulty • ECM faulty

Troubleshooting

Step	Action	Yes	No
1	1) Register SECRET KEY CODE and password to ECM referring to “Procedure after ECM Replacement: Diesel Model”. *Was registration of SECRET KEY CODE and password to ECM completed?*	Recheck ECM for DTC. If DTC P1615 is still detected, go to Step 2.	Go to Step 2.
2	1) Check DTC. *Is DTC other than P1615 detected?*	Go to applicable DTC diag. flow.	Go to Step 3.
3	1) Check Keyless start control module for DTC referring to “DTC Check in Section 10E”. *Is DTC detected?*	Go to applicable DTC diag. flow.	Go to Step 4.
4	1) With the ignition switch at OFF position, disconnect steering lock unit connector and keyless start control module connector. 2) Check for proper connection at terminals and wires of each connector referring to “Intermittent and Poor Connection Inspection in Section 00”. 3) If OK, check for open, short, and high resistance in each circuit between steering lock unit and keyless start control module referring to Step 2 in “DTC No. 11: Communication Error with Steering Lock Unit in Section 10E”. *Is each circuit in good condition?*	Go to Step 5.	Repair malfunction part and recheck.
5	1) Connect keyless start control module connector. 2) With ignition switch at ON position, check power supply terminal voltage of steering lock unit connector referring to “Keyless Start Control Module Power and Ground Circuit Check in Section 10E”. *Is voltage 4 – 6 V?*	Replace steering lock unit and recheck.	Substitute a known-good keyless start control module and recheck. If DTC P1615 is still detected, substitute a known-good ECM and recheck.

DTC P1616: Unregistered Keyless Start Control Module (for Vehicle with Keyless Start System)

S7N20AA324026

Circuit Description

P1616 is detected when ECM detects different ID codes registered in ECM and keyless control module after turning engine start knob to ON position. Normally, when keyless start control module is replaced with new one, ECM automatically registers the applicable code in keyless start control module after turning ignition switch to ON position. However, when keyless start control module is replaced with used one, ECM does not automatically register the applicable code in keyless start control module even if ignition switch is turned to ON position.

Detecting Condition and Trouble Area

DTC detecting Condition	Trouble Area
ECM detects different ID codes registered in ECM and keyless start control module.	• Keyless start system wiring circuit faulty • Keyless start control module faulty • ECM faulty

Troubleshooting

Step	Action	Yes	No
1	1) Register SECRET KEY CODE and password to ECM referring to “Procedure after ECM Replacement: Diesel Model”. *Was registration of SECRET KEY CODE and password to ECM completed?*	Recheck ECM for DTC.	Go to Step 2.
2	1) Check ECM for DTC referring to “DTC Check: Diesel Model”. *Is DTC P1618 and/or P1615 detected other than P1616?*	Go to DTC P1618 troubleshooting.	Go to DTC P1615 troubleshooting.

DTC P1618: Keyless Start Control Module CAN Communication Error (for Vehicle with Keyless Start System)

S7N20AA324027

NOTE

If DTC related to CAN failure is detected by ECM and BCM, perform applicable related CAN DTC diag. flow first.

Wiring Diagram

Refer to “Immobilizer Control System Wiring Circuit Diagram: Diesel Model”.

Detecting Condition and Trouble Area

DTC detecting Condition	Trouble Area
Reception error of communication data for keyless start control module is detected for longer than specified time continuously.	• CAN communication circuit faulty • Keyless start control module faulty • BCM • Combination meter • ABS / ESP® control module faulty • ECM faulty

Troubleshooting

Step	Action	Yes	No
1	1) Check DTC. *Is DTC other than P1618 detected?*	Go to applicable DTC diag. flow.	Go to Step 2.
2	1) With the ignition switch at OFF position, check intermittent and poor connection of following each connector referring to “Intermittent and Poor Connection Inspection in Section 00”. • ECM • ABS / ESP® control module • BCM • Keyless start control module • Combination meter *Are all connectors in good condition?*	Go to Step 3.	Repair malfunction part and recheck.
3	1) Check for open, short and high resistance in CAN communication circuit between ECM and keyless start control module. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair circuit.
4	1) Check keyless start control module power and ground wire circuits referring to “Keyless Start Control Module Power and Ground Circuit Check in Section 10E”. *Are they in normal?*	Substitute a known-good keyless start control module and recheck.	Repair malfunctional wire circuit.

Registration Procedure of Immobilizer Control System Components

S7N20AA324023

When replacing any component of immobilizer control system, perform registration procedure according to the following flow.

NOTE

When replacing Immobilizer Control Module and ECM at the same time, the ignition key with built-in transponder that has been registered to the system (SECRET KEY CODE registered to transponder) can not be used. Prepare new ignition key with built-in transponder (SECRET KEY CODE unregistered to transponder), and perform Steps 1 to 4 as follows.

Step	Action	Yes	No
1	**DTC check** 1) Check for DTC referring to “DTC Check: Diesel Model”. *Are there DTC B1000, B3040, B3042, and/or B3043?*	Proceed to each diagnostic flow corresponding to that DTC(s).	Go to Step 2.
2	**Confirmation of password (PWD) registration** *Is there DTC B3057?*	Register Password by referring to “Procedure after ECM Replacement: Diesel Model”. Then, go to Step 3.	Go to Step 3.
3	**ECM replacement** *Is ECM replaced?*	Proceed to “Procedure after ECM Replacement: Diesel Model”. Then, go to Step 4.	Go to Step 4.
4	**Immobilizer Control Module replacement** *Is Immobilizer Control Module replaced?*	Proceed to “Procedure after Immobilizer Control Module Replacement: Diesel Model”.	Go to Step 5.
5	**Ignition key with built-in transponder registration** *Is ignition key registered?*	Proceed to “How to Register Ignition Key: Diesel Model”.	End.

Inspection of Immobilizer Control Module and Its Circuit

S7N20AA324024

Immobilizer Control Module can be checked at wiring connectors by measuring voltage.

⚠ CAUTION

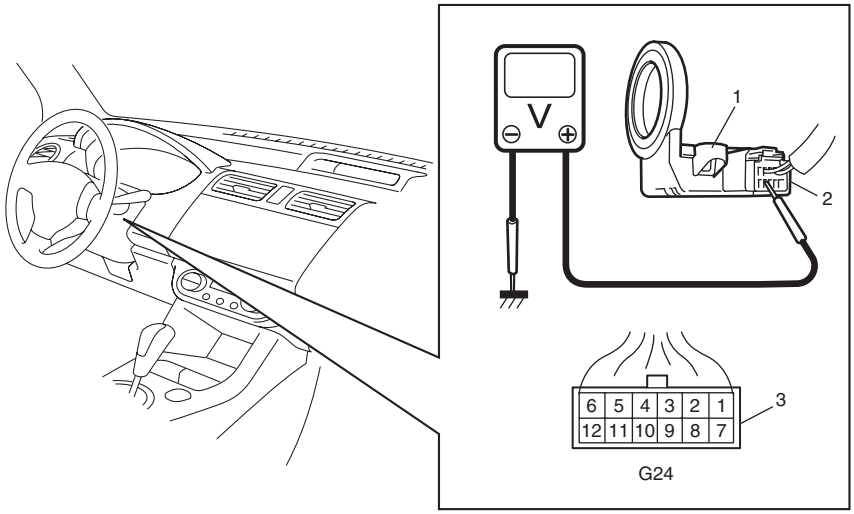
Immobilizer Control Module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to Immobilizer Control Module with coupler disconnected from it.

NOTE

As the battery voltage affects each terminal voltage, confirm that it is 11 V or more when ignition switch is turned to ON position.

Voltage Check

1) Remove immobilizer control module (1) from steering lock assembly or steering lock unit referring to “Immobilizer Control Module Removal and Installation: Diesel Model”.
2) Connect immobilizer control module connector (2) to immobilizer control module.
3) Check voltage at each terminal.



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3. Immobilizer control module connector (harness side view)

Connector	Terminal		Circuit	Normal voltage	Condition
G24	1	BLK/ORN	Ground	0 – 1 V	Anytime
	2	PNK	Power supply	10 – 14 V	Anytime
	3	PPL/WHT	Data link connector	10 – 14 V	SUZUKI scan tool connected
				0 – 1 V	SUZUKI scan tool disconnected
	4	BLU/BLK	SVS lamp and MIL	0 – 1 V	Ignition switch ON position
				10 – 14 V	After engine start
	5	WHT/BLK	W-line	10 – 14 V	Ignition switch ON position
				0 – 1 V	Ignition switch OFF position
	6	BLK/ WHT	Ignition switch signal	10 – 14 V	Ignition switch ON position
				0 – 1 V	Ignition switch OFF position
	7	—	Not used	—	—
	8	—	Not used	—	—
	9	—	Not used	—	—
	10	—	Not used	—	—
	11	—	Not used	—	—
	12	—	Not used	—	—

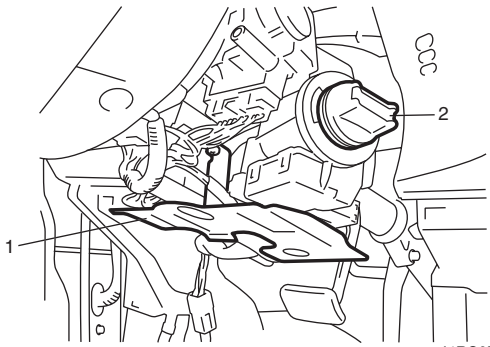
Repair Instructions

Immobilizer Control Module Removal and Installation

S7N20AA326001

Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System in Section 8B”.
3) Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module Removal and Installation in Section 8B”.
4) Remove steering wheel referring to “Steering Wheel Removal and Installation in Section 6B”.
5) Remove steering column lower and upper covers.
6) Remove knee protector plate (1).
7) Remove engine start knob (2). (if equipped with keyless start system)



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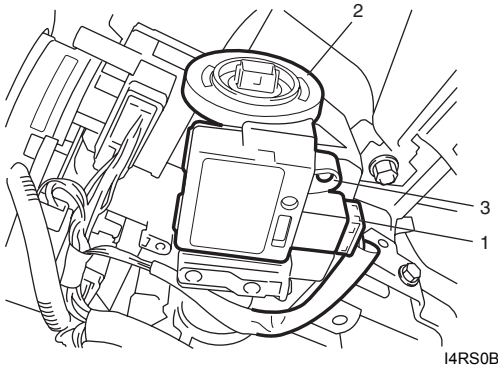
8) Disconnect connector (1) from immobilizer control module (2).
9) Remove a screw (3) from immobilizer control module.



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10) Remove immobilizer control module from steering lock assembly or steering lock unit.

NOTE

Do not add or twist strong power to antenna part of immobilizer control module.

Installation
Reverse the removal procedure.

How to Register Ignition Key

S7N20AA326002

To register ignition key with built-in transponder, perform "Register New IG Key (Fix Code)" mode by using SUZUKI scan tool.
For your details, refer to "SUZUKI Tech2 Operator's Manual".

Procedure after Immobilizer Control Module Replacement

S7N20AA326003

When Immobilizer Control Module must be replaced including when replaced because rechecking by using a known-good Immobilizer Control Module is necessary during trouble diagnosis, register FIX CODE and SECRET KEY CODE to Immobilizer Control Module by performing the following procedure.
Perform "IMM Cont (Register Secret Key Code)" and "Register New IG Key (Fix Code)" modes by using SUZUKI scan tool. For your details, refer to "SUZUKI Tech2 Operator's Manual".

Procedure after ECM Replacement

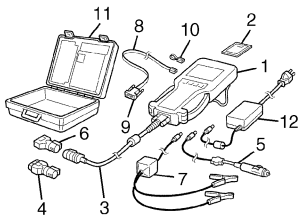
S7N20AA326004

When ECM is replaced including when replaced because rechecking by using a known-good ECM is necessary during trouble diagnosis, register password and SECRET KEY CODE to ECM by performing the following procedure.
Refer to "ECM Registration: D13A / Z13DTJ in Section 1C".

Special Tools and Equipment

Special Tool

S7N20AA328001

SUZUKI scan tool — This kit includes following items. 1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loop back adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loop back connector, 11. Storage case, 12.☞		

Keyless Start System

Precautions

Precautions in Diagnosing Troubles

S7N20AA500001

- The keyless start system executes data transmission/reception by means of the radio wave. Therefore, proper operation may not be obtained if use of the door lock function and engine start function of the keyless start system is attempted near the place where strong radio wave is emitted (TV and radio broadcasting stations, etc.).
- Diagnostic information stored in keyless start control module memory can be checked only by key indicator lamp.
- Be sure to use the trouble diagnosis procedure as described in “Keyless Start System Check”. Failure to follow it may result in incorrect diagnosis. (Some other DTC may be stored by mistake in the memory of keyless start control module during inspection.)
- Be sure to read “Precautions for Electrical Circuit Service in Section 00” before inspection and observe what is written there.
- Communication of ECM, BCM, TCM (A/T or Automated Manual Transaxle model), ABS / ESP® control module, keyless start control module, steering angle sensor (if equipped) and combination meter is established by CAN (Controller Area Network). (For detail of CAN communication for keyless start control module, refer to “CAN Communication of Keyless Start System”). Therefore, handle CAN communication line with care referring to “Precaution for CAN Communication System in Section 00”.
- Replacement of the keyless start control module
  When keyless start control module is replaced with new one, make sure that register remote controller ID code to Keyless start control module correctly according to “Registration Procedure for Remote Controller ID Code”.
- Keyless start control module substitution (petrol model)
  When the keyless start control module used in another vehicle was installed in the vehicle, register the ID code of the remote controller in the keyless start control module as well as the ignition key transponder code for the immobilizer control system in ECM. For the registration procedure of the ignition key transponder code, refer to “Registration of the Ignition Key: Petrol Model in Section 10C”.
- Keyless start control module substitution (diesel model)
  When the keyless start control module used in another vehicle was installed in the vehicle, register the ID code of the keyless start control module in ECM as well as the ID code of the remote controller in the keyless start control module. ID code of the keyless start control module is registered automatically by registering password and SECRET KEY CODE to ECM. For the registration procedure of the password and SECRET KEY CODE, refer to “Procedure after ECM Replacement: Diesel Model in Section 10C”.

General Description

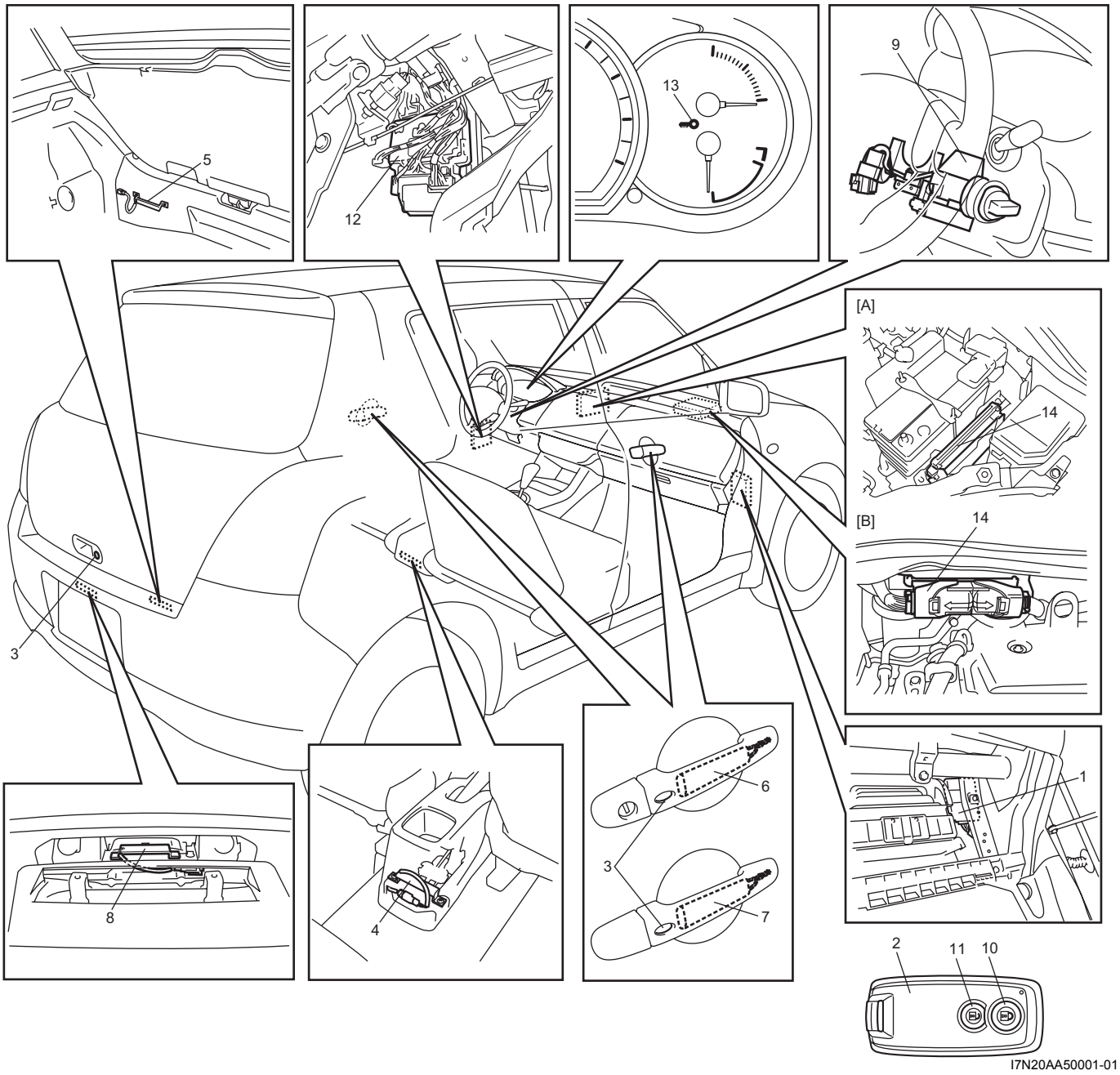
Keyless Start System Description

S7N20AA501001

Keyless start system consisting of the parts shown below has three functions as described below.

- Keyless engine start function:
  With the remote controller which has been registered in the keyless start control module carried with oneself, the engine can be started without using the ignition key.
- Door lock function:
  Pushing the request switch incorporated in the outside handle of the driver side door, passenger side door or rear end door while carrying the remote controller which has been registered in the keyless start control module, doors can be locked or unlocked.
- Keyless entry system function:
  It is possible to lock or unlock doors by pushing the lock or unlock button of remote controller.

The keyless start control module can accept registration of up to four remote controllers.



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[A]: Petrol model	5. Luggage room antenna	11. Lock button
[B]: Diesel model	6. Driver side door antenna	12. BCM
1. Keyless start control module	7. Passenger side door antenna	13. Key indicator lamp
2. Remote controller	8. Rear end door antenna	14. ECM
3. Request switch	9. Steering lock unit	
4. Center antenna	10. Unlock button	

Parts and Functions

S7N20AA501002

Parts	Function
Keyless start control module	• Activates each antenna • Verifies ID code of remote controller • Requests steering lock unit to release steering lock • Requests BCM to lock or unlock doors • Controls key indicator lamp in combination meter • Transmits its ID code to ECM
Remote controller	• Receives request signal from each antenna • Transmits ID code and request signal to keyless start control module • Request keyless start control module to lock or unlock doors (keyless entry system function)
Request switch	• Requests keyless start control module to activate each antenna
Center antenna	• Transmits request signal to remote controller
Luggage room antenna	• Transmits request signal to remote controller
Driver side door antenna	• Transmits request signal to remote controller
Passenger side door antenna	• Transmits request signal to remote controller
Rear end door antenna	• Transmits request signal to remote controller
Steering lock unit	• Releases steering lock
Unlock button	• Transmits door unlock request signal (keyless entry system function)
Lock button	• Transmits door lock request signal (keyless entry system function)
BCM	• Controls each door lock actuator • Controls warning buzzer • Lights hazard warning lamp and interior (DOME) light (answer back)
Key indicator lamp	• Indicates operation state of keyless start system (indicates check result of remote controller ID code)
ECM	• Checks keyless start control module ID code • Transmits its ID code to keyless start control module • Starts engine

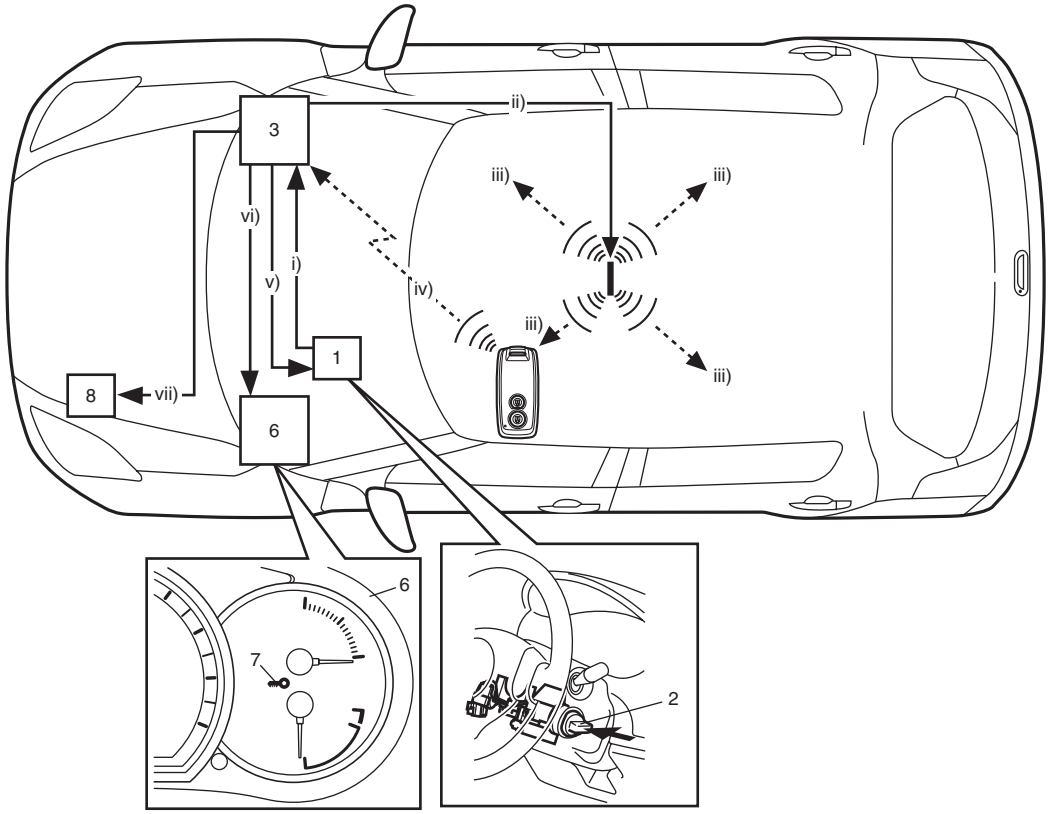
Keyless Engine Start Function

S7N20AA501003

When the ignition knob switch (2) installed to the steering lock unit (1) is pushed, the keyless start control module (3) activates the center antenna (4) to send out the request signal in the vehicle compartment. When the remote controller (5) receives the request signal from the center antenna, it transmits the ID code to the keyless start control module. The keyless start control module compares the ID code sent by the remote controller with the ID code registered in the keyless start control module. When these ID codes match, the keyless start control module makes the key indicator lamp (7) in the combination meter (6) light in blue and unlocks the steering lock unit to enable the ignition knob switch to turn. When the ignition knob switch is turned to ON position in this state, ID codes of ECM and keyless start control module are compared through CAN communication (immobilizer function). When they match, turning the ignition knob switch to start position will start the engine.

NOTE

When ignition knob switch is at ACC or ON position (engine not running) and any door has been kept open for a certain time, it may happen that engine fails to start. In such a case, turn ignition knob switch to OFF position once and then try to start engine again.



[A]: i) ~ vii)

I4RS0BA50002-03

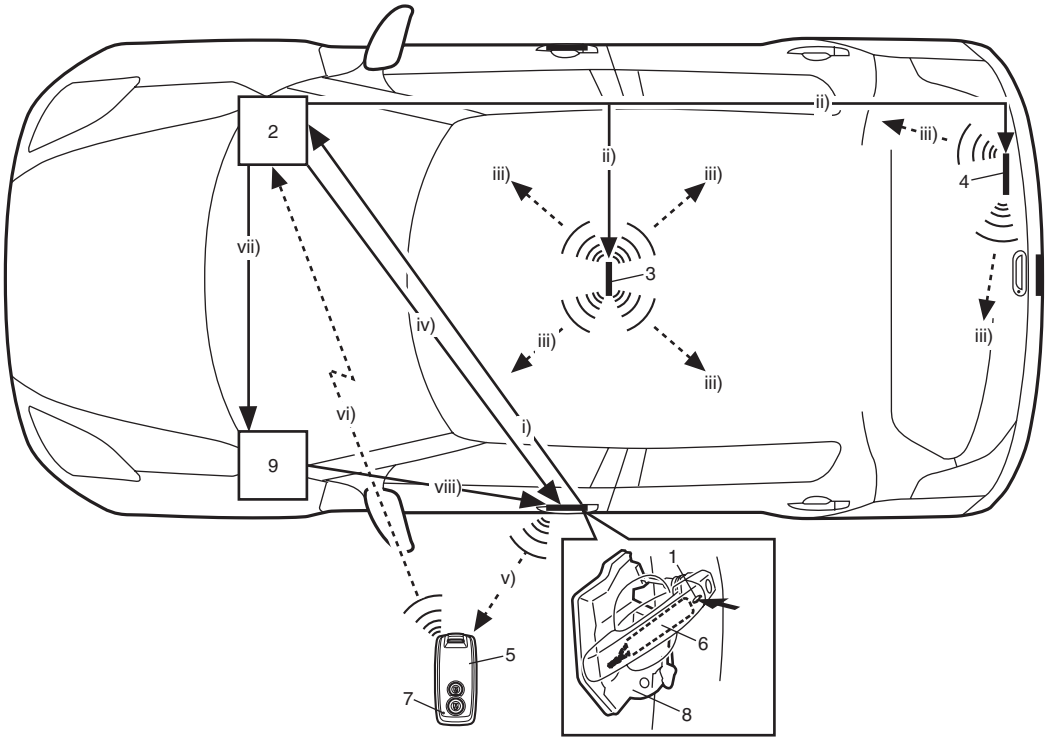
[A]: Signal flow	8. ECM

When the ID code from the remote controller and the ID code registered in the keyless start control module do not match or when the remote controller is outside the operation area of the remote controller and the ignition knob switch is pushed, the steering lock unit cannot be unlocked and so the ignition knob switch cannot be turned. Then, the keyless start control module makes the key indicator lamp in the combination meter light in red to warn the driver that it is not possible to turn the ignition knob switch. Also, when the ID code of ECM and that of the keyless start control module do not match, the engine cannot be started even if the ignition knob switch is turned to the start position. Then ECM makes the immobilizer lamp in the combination meter flash to warn the driver that it is not possible to start the engine.

Door Lock Function of Keyless Start System

S7N20AA501004

When the request switch (1) incorporated in the outside handle of the driver side door, front passenger side door or rear end door is pushed, the keyless start control module (2) activates the center antenna (3) and luggage room antenna (4) to send out the radio wave in the vehicle compartment to check if the remote controller (5) is in the vehicle compartment or not. When the keyless start control module receives no signal from the remote controller (i.e., the remote controller does not exist in the vehicle compartment), it activates the antenna (6) of the door of which the request switch has been pushed to send the request signal out of the compartment.
If the remote controller exists within the door lock operation area, it receives the request signal sent from the above said antenna, sends the ID code of the remote controller and the request signal to the keyless start control module and at the same time, it makes the operation indicator lamp (7) of the remote controller light up. Lighting of the operation indicator lamp indicates that the remote controller sent the ID code and the request signal.
The keyless start control module compares the ID code sent from the remote controller with the ID code registered in the keyless start control module. If both ID codes match, the keyless start control module outputs the lock or unlock request signal (depending on the door lock switch (8) state then) to BCM (9). When BCM receives such signal through CAN communication from the keyless start control module, it activates the door lock actuator to lock or unlock doors.
When the keyless start control module receives a signal from the remote controller (i.e., the remote controller exists in the vehicle compartment), the function of the keyless start system to prevent the remote controller from being closed in the vehicle works and the keyless start control module sends a request signal to unlock doors to BCM. In this way, doors are kept unlocked.
Also, when the driver or passenger has left the vehicle with the remote controller left behind in the vehicle compartment and locked doors by using the door lock knob or manual door lock switch, the function to prevent the remote controller from being closed in the vehicle works to unlock doors.



[A]: i) ~ viii)

I4RS0BA50003-02

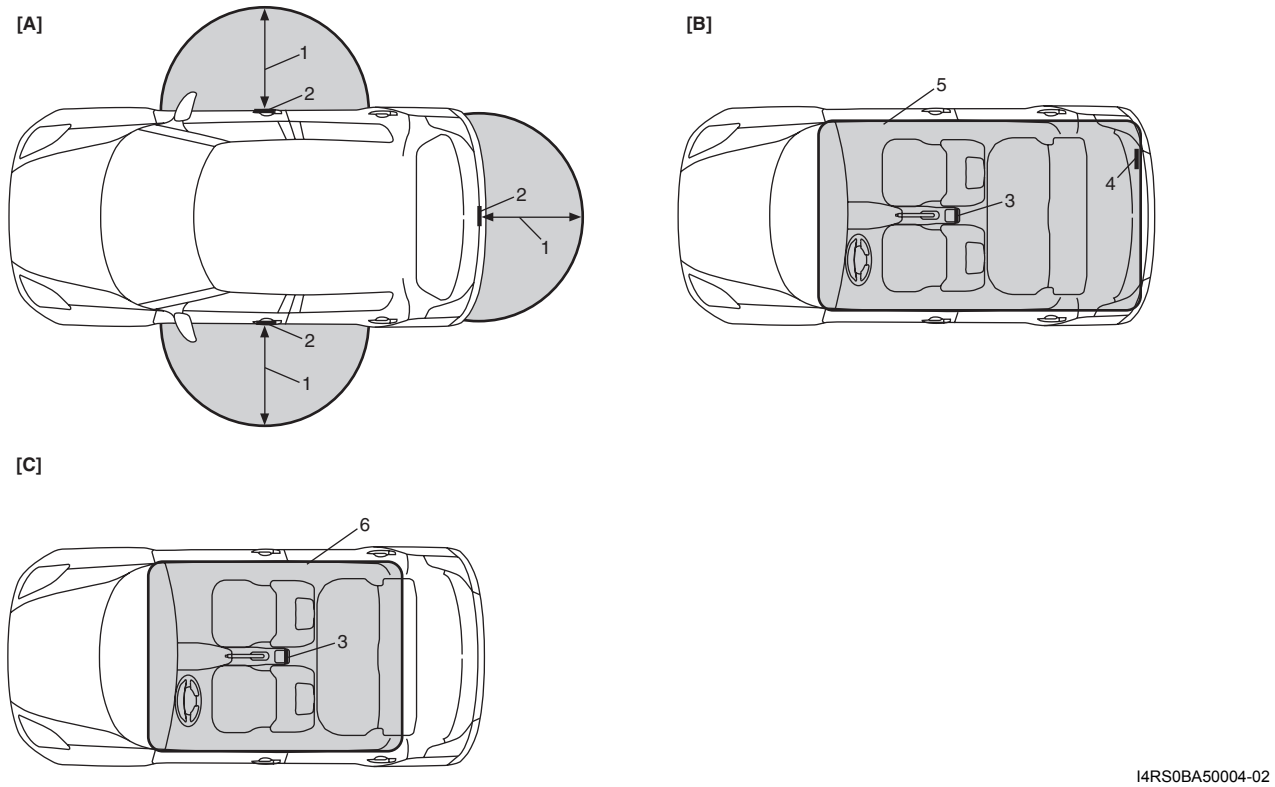
[A]: Signal flow

Furthermore, when ID codes of the remote controller and keyless start control module do not match or the remote controller exists outside of the operation area, doors are not locked or unlocked even if the request switch of the outside handle is operated.

Operation Area of Remote Controller

S7N20AA501005

Shown below are the operation areas of the remote controller for the keyless engine start function and door lock function of the keyless start system.



I4RS0BA50004-02

[A]: Door lock function of keyless start system	3. Center antenna
[B]: Function of keyless start system to prevent remote controller from being closed in vehicle compartment	4. Luggage room antenna
[C]: Keyless engine start function	5. Vehicle compartment including luggage room
1. About 80 cm (3.15 in, 2.6 ft)	6. Vehicle compartment excluding luggage room
2. Each door antenna	

However, even when the remote controller is within the operation area as shown above, there are cases where the keyless start system doesn't work under certain conditions as described below. And when the keyless engine start function doesn't work, the key indicator lamp in the combination meter may light up.

- Doors cannot be locked or unlocked using the door lock function of keyless start system when:
  - The remote controller which has been registered in the keyless start control module and another un-registered one are both carried at the same time
  - The remote controller is kept in some metallic container which disturb radio wave transmission/reception
  - One of doors is open
  - The ignition key is inserted in the ignition key cylinder
- The function of the keyless start system to prevent the remote controller from being closed in the vehicle compartment doesn't work when:
  - The remote controller is in the door pocket or in the glove box
  - The remote controller is kept in some metallic container which disturb radio wave transmission/reception
  - The remote controller is placed close to outside of the vehicle compartment (such as on the instrument panel beside the front window shield glass or in a corner of the luggage room)
- The ignition knob switch cannot be turned using the keyless engine start function fails to turn:
  - The remote controller which has been registered in the keyless start control module and another un-registered one are both carried at the same time
  - The remote controller is kept in some metallic container which disturbs radio wave transmission/reception
  - The ignition knob switch has been pushed for 5 seconds or longer

– The remote controller is placed close to outside of the vehicle compartment (such as on the instrument panel beside the front window shield glass or in a corner of the luggage room)

Alarm Function

S7N20AA501006

Under conditions as described in the table below, the keyless start control module makes the key indicator lamp flash in red and the buzzer sound to call the driver's attention.

Condition	Buzzer operation	Key indicator lamp operation
Ignition knob switch has stopped between ACC and OFF positions while driver side door is opened (ignition knob switch un-returned alarm)	Intermittent	—
Ignition switch has stopped between ACC and OFF positions while driver side door is closed (ignition knob switch un-returned alarm)	2 times	Flashing in red
Remote controller is carried out of vehicle and doors are closed while ignition switch is at ON position (remote controller carried-out alarm)	5 times	Flashing in red
Remote controller is carried out of vehicle through a window without opening door while ignition switch is at ON position (engine is running) and vehicle has been driven at 10km/h (6 MPH) or more speed without remote controller in vehicle compartment (the first time 10 km/h (66 MPH) speed is exceeded only) (Remote controller carried-out alarm)	5 times	Flashing in red

CAN Communication of Keyless Start System

S7N20AA501007

Refer to "CAN Communication System Description: M13A / M15A / M16A in Section 1A" or "CAN Communication System Description: D13A / Z13DTJ in Section 1A" for CAN communication system description.
Keyless start control module communicates control data with each control module as follows.

Keyless Start Control Module Transmission Data

				ECM	BCM	Combination Meter
Keyless Start Control Module	Transmit	DATA	ECM-keyless start control module code	○		
			Ignition knob switch signal		○	
			Door lock/unlock request signal		○	
			Buzzer request signal		○	
			Answer back request signal		○	
			Key indicator lamp control signal			○

I7N20AA50004-01

Keyless Start Control Module Reception Data

				ECM	BCM
Keyless Start Control Module	Receive	DATA	Vehicle speed signal	○	
			ECM-keyless start control module code	○	
			Door switch status		○
			Door lock status		○
			Charging system signal		○
			Engine oil pressure switch signal		○

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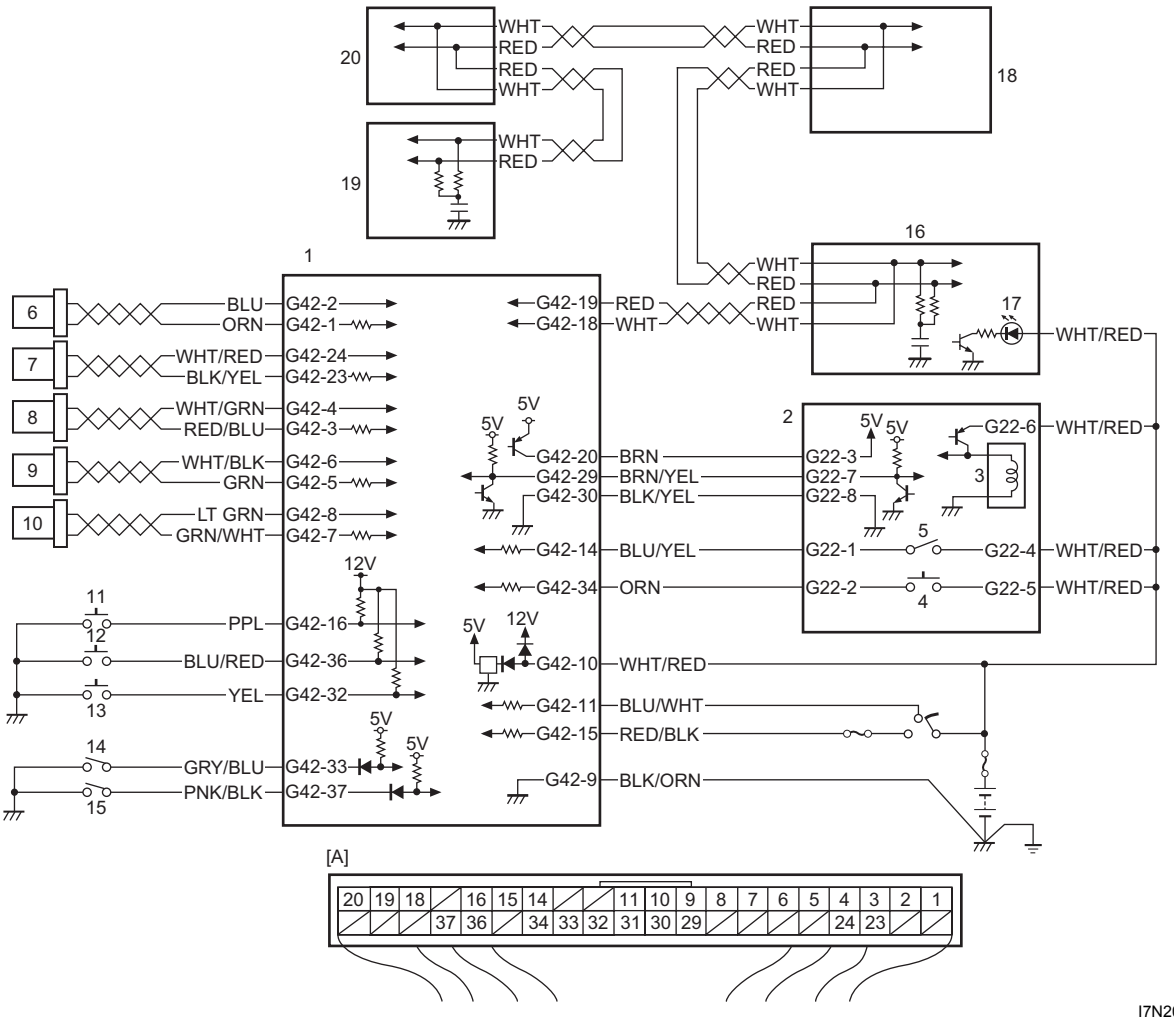
Schematic and Routing Diagram

Keyless Start System Electric Wiring Circuit Diagram

S7N20AA502001



I7N20AA50002-01

[A]: Keyless start control module connector (viewed from harness side)	7. Passenger side door antenna	14. Driver side door lock switch
1. Keyless start control model	8. Rear end door antenna	15. Passenger side door lock switch
2. Steering Lock unit	9. Center antenna	16. Combination meter
3. Steering lock solenoid	10. Luggage room antenna	17. Key indicator lamp
4. Ignition knob switch	11. Driver side door request switch	18. BCM
5. Key reminder switch	12. Passenger side door request switch	19. ECM
6. Driver side door antenna	13. Rear end door request switch	20. ABS / ESP® control module

Diagnostic Information and Procedures

Self-Diagnosis Function

S7N20AA504001

The keyless start control module has self-diagnosis function to monitor the system components and circuits while the keyless start system is at work. When the keyless start control module detects an abnormality in the system, it saves the area where such abnormality has occurred as a DTC in its memory. The DTC stored in memory of the keyless start control module is indicated by the key indicator lamp in the combination meter flashing in a specific pattern. For DTC indication, refer to “DTC Check” and for the clearing procedure, to “DTC Clearance”.

Keyless Start System Diagnosis Introduction

S7N20AA504002

To ensure that the trouble diagnosis is done accurately and smoothly, observe “Precautions in Diagnosing Troubles” and follow “Keyless Start System Check”.

Keyless Start System Check

S7N20AA504003

Step	Action	Yes	No
1	1) Record details of the problem. For your record, use of a questionnaire form will facilitate collecting information for proper analysis and diagnosis. 2) Check if the problem described in “Customer questionnaire (example)” actually occurs in the vehicle. (This step should be performed with the customer if possible.) Perform “Keyless Start System Operation Inspection” procedure to check if the symptom which has occurred is abnormal or not. 3) Check for DTC referring to “DTC Check”, and then record DTC(s). 4) Clear DTC referring to “DTC Clearance” if any DTC exists, and then recheck for DTC. *Is any DTC still detected?*	Go to Step 2.	Go to Step 3.
2	1) Check and repair referring to applicable “DTC Table”. *Are check and repair complete?*	Go to Step 5.	Check and repair malfunction part(s), and go to Step 5.
3	1) Inspect and repair basic parts referring to “Keyless Start System Symptom Diagnosis”. *Is there faulty condition?*	Repair or replace malfunction part(s), and go to Step 5.	Go to Step 4.
4	1) Check for intermittent problems referring to “Intermittent and Poor Connection Inspection in Section 00”. *Is there any faulty condition?*	Repair or replace malfunction part(s), and go to Step 5.	Go to Step 5.
5	1) Confirm if the problem is solved and the keyless start system is free from any abnormal conditions. If what has been repaired is related to the DTC, clear the DTC once and then confirm that no DTC is indicated. *Is there any problem symptom, DTC or abnormal condition?*	Go to 2) of Step 1 and perform trouble diagnosis again.	End.

Customer questionnaire (example)

S7N20AA504004

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg:	Date of problem:	Mileage:

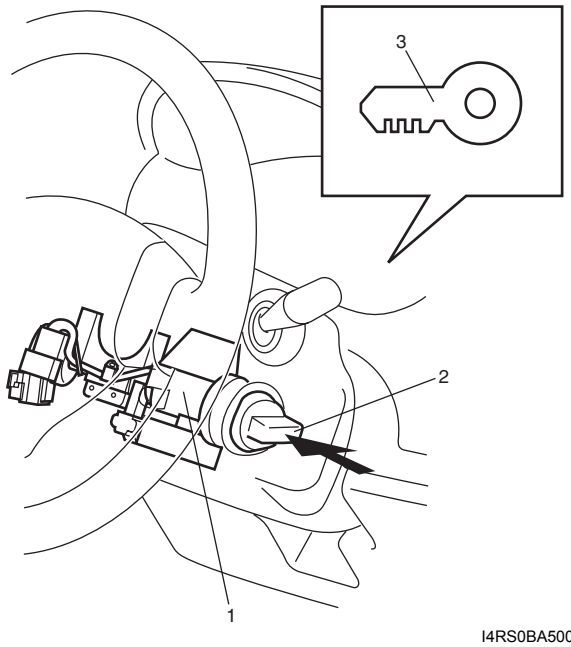
Problem Symptoms	・ Engine can not be started by turning Ignition knob switch ・ All doors can not be locked / unlocked by all of request switches ・ Other_____
Frequency of Occurrence	・Continuous / Intermittent (times a day, a month) / Other_____
Environmental Condition	・ Weather: Fine / Cloudy / Rain / Snow / Other_____ ・ Temperature: ℃(° F) ・ Stopping near area where intense radio waves are emitted such as TV station, radio station, etc. Yes / No
Diagnostic Trouble Code	・ First check: Normal code / malfunction code ( ) ・ Second check: Normal code / malfunction code ( )

I4RS0BA50007-03

Key Indicator Lamp Check

S7N20AA504005

Push the ignition knob switch (2) of the steering lock unit (1) and check that the key indicator lamp (3) in the combination meter lights up in red or blue. If it does not light, go to "Key Indicator Lamp Circuit Check (Key indicator lamp doesn't light when ignition knob switch is pushed.)".

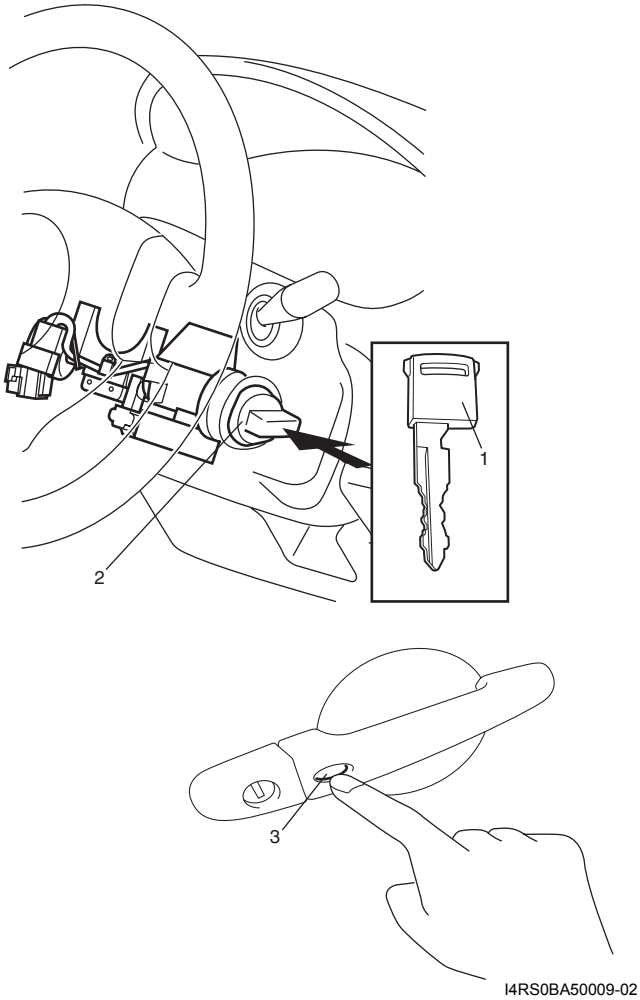


I4RS0BA50008-01

DTC Check

S7N20AA504006

1) Check to make sure that all doors are closed.
2) Open driver side door window glass and door.
3) Check to make sure that ignition key is not inserted in ignition key cylinder. If it is, remove it.
4) Perform “Key Indicator Lamp Check”.
5) Close driver side door and within 15 seconds after that, perform Steps a) through e) described below.
   a) Insert ignition key in ignition key cylinder (2).
   b) Remove ignition key from ignition key cylinder.
   c) Repeat Steps a) and b) twice.
   d) Insert ignition key in ignition key cylinder.
   e) Push driver side door request switch (3) 4 times. At the end of Step e), buzzer sounds 4 times to inform that trouble diagnosis mode has started.

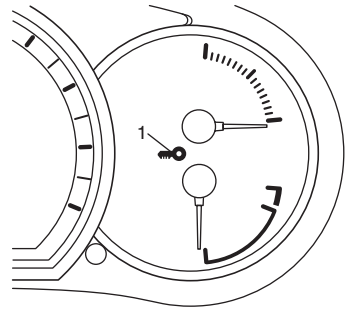


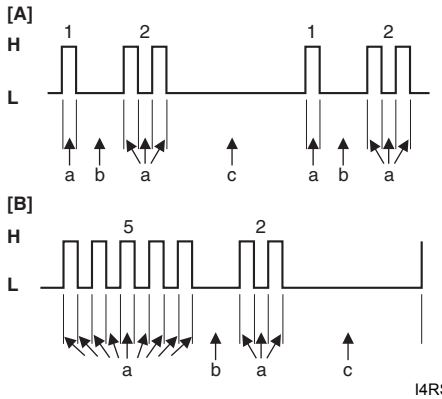
I4RS0BA50009-02

6) Read flashing pattern of key indicator lamp (1) which represents DTC as shown in example below and write it down. When more than 2 DTCs are stored in memory, flashing for each DTC is repeated three times starting with the smallest DTC number in increasing order.

NOTE

Go to “No DTC Detection After Performing DTC Check” in case that any DTC is detected after performing the procedure mentioned above.





I4RS0BA50010-02

[A]: DTC NO. 12 (Normal)	K: Key indicator lamp
[B]: DTC NO. 52	a: 0.3 seconds
H: Key indicator lamp turned ON	b: 1.0 second
L: Key indicator lamp turned OFF	c: 3.0 seconds

7) After completing the check, remove ignition key from ignition key cylinder.

DTC Table

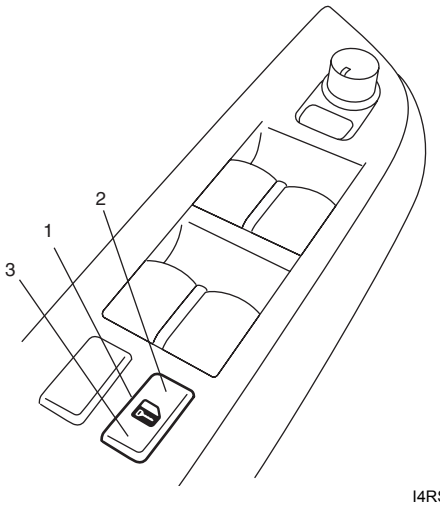
S7N20AA504007

DTC (Flashing pattern of key indicator lamp)	Detected parts item	Detecting condition
☞ 11	Communication Error With Steering Lock Unit	No communication is available between keyless start control module and steering lock unit
12	—	Normal (No malfunction DTC is detected)
☞ 13	Release Signal Error from Steering Lock Unit	Although lock release signal is output to steering lock unit, it is not inputted from steering lock unit
☞ 14	Steering Lock Unit Malfunction	Steering lock unit cannot be unlocked due to its temperature rise
☞ 21	Internal Error in Keyless Start Control Module (EEPROM Reading Error)	Data cannot be read from memory in keyless start control module
☞ 22	Internal Error in Keyless Start Control Module (EEPROM Writing Error)	Data cannot be written into memory in keyless start control module
☞ 31	Lost Communication With BCM	Keyless start control module cannot receive data sent by CAN from BCM
☞ 33	Control Module Communication Bus Off	No communication is available with all control modules connected by CAN
☞ 51	Driver Side Door Request Switch Malfunction	Input signal from driver side door request switch remains ON, unchanged
☞ 52	Passenger Side Door Request Switch Malfunction	Input signal from passenger side door request switch remains ON, unchanged
☞ 53	Rear end Door Request Switch Malfunction	Input signal from rear end door request switch remains ON, unchanged

DTC Clearance

S7N20AA504008

1) Perform Steps 1) through 5) of DTC check procedure and have DTC indicated.
2) Open driver side door.
3) Close driver side door and within 10 seconds after that, perform Steps a) to c) described below.
   a) Push unlock side (3) of driver side manual door lock switch (1).
   b) Push lock side (2) of driver side manual door lock switch.
   c) Repeat Steps a) and b) 3 times.
   At the end of Step c), DTCs are cleared and key indicator lamp indicates DTC No. 12 (Normal).



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4) After completing DTC clearance, remove ignition key from ignition key cylinder.

Keyless Start System Symptom Diagnosis

S7N20AA504009

Door Lock Function of Keyless Start System

NOTE

Before performing trouble diagnosis procedure for door lock function of keyless start system, check that power door lock system operates properly referring to "Power Door Lock System Operation Inspection in Section 9F". If power door lock system does not operate properly, go to "Power Door Lock System Symptom Diagnosis in Section 9F".

Condition	Possible cause	Correction / Reference Item
All doors can not be locked / unlocked by all of door request switches	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Remote controller battery dead	*Replace battery.*
	Remote controller faulty	*Check remote controller for operation referring to "Remote Controller Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	Antennas or keyless start control module faulty	*Check input and output signals of Keyless start control module referring to "Inspection of Keyless Start Control Module and Its Circuits".*
	BCM faulty	*Check input and output signal of BCM referring to "Inspection of BCM and its Circuits in Section 10B".*
All doors can not be locked / unlocked by any one of door request switch	Request switch faulty	*Check request switch for operation referring to "Front Door (Driver and Passenger Side) Rear End Door Request Switch Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	Antennas or Keyless start control module faulty	*Check input and output signals of Keyless start control module referring to "Inspection of Keyless Start Control Module and Its Circuits".*
	BCM faulty	*Check input and output signal of BCM referring to "Inspection of BCM and its Circuits in Section 10B".*

Keyless Engine Start Function

NOTE

Before performing symptom diagnosis procedure for keyless engine start system, check that engine starts by using ignition key. If it cannot be started by using ignition key, go to "Engine Symptom Diagnosis: M13A / M15A / M16A in Section 1A" or "Engine Symptom Diagnosis: D13A / Z13DTJ in Section 1A".

Condition	Possible cause	Correction / Reference Item
Engine can not be started by turning Ignition knob switch	Circuit fuse(s) blown	*Replace fuse(s) and check for short circuit.*
	Remote controller battery dead	*Replace battery.*
	Remote controller faulty	*Check remote controller for operation referring to "Remote Controller Inspection".*
	Steering lock unit faulty	*Check steering lock unit for operation referring to "Steering Lock Unit Inspection".*
	Wiring or grounding faulty	*Repair circuit.*
	Antennas or Keyless start control module faulty	*Check input and output signals of Keyless start control module referring to "Inspection of Keyless Start Control Module and Its Circuits".*
	ECM faulty	*Check input and output signal of ECM referring to "Inspection of ECM and Its Circuits: M13A / M15A / M16A in Section 1A" or "ECM and Its Circuits Voltage Value (for Reference): D13A / Z13DTJ in Section 1A"*

Keyless Start System Operation Inspection

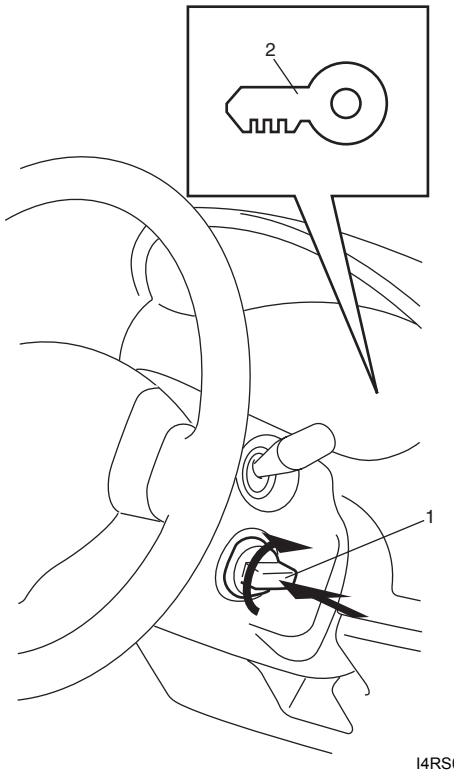
S7N20AA504010

Keyless engine start operation

1) Sit in driver seat with remote controller carried with you.
2) Check that all doors are closed and ignition key is not inserted in ignition key cylinder.
3) While pushing ignition knob switch (1) of steering lock unit, check if ignition knob switch can be turned from its lock position.
   If key indicator lamp (2) in combination meter lights in blue and ignition knob switch can be turned from its lock position in this check, keyless engine start operation is in good condition.
   If key indicator lamp in combination meter lights in red and ignition knob switch cannot be turned from its lock position in this check, go to “Keyless Start System Check”.

NOTE

Pushing ignition knob switch for 5 seconds or longer causes function to protect steering lock releasing solenoid against heat to work. Then steering lock unit stops energizing solenoid, preventing ignition knob switch from turning. At the same time, key indicator lamp in combination meter turns off. In such case, take your hand off from ignition knob switch once and operate it again.

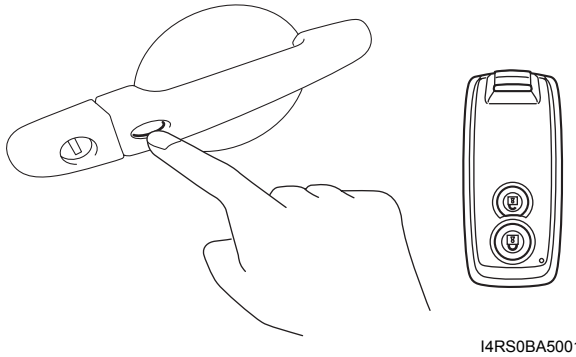


I4RS0BA50012-01

Door Lock Operation Check (Keyless Start System)

S7N20AA504011

1) Check that all door locks are released and all doors are closed.
2) With remote controller of which ID code is registered in keyless start control module carried with yourself, check that pushing driver door request switch once locks all doors.
3) Check that pushing request switch of driver door, passenger door or rear end door once releases corresponding door lock.
4) Check that pushing again request switch pushed in Step 3) releases all door locks.



I4RS0BA50013-01

NOTE

If door of which request switch has been pushed is opened/closed before performing Step 4), all door locks will not be released even when Step 4) is performed. If Step 4) is performed after door is opened/closed, only the door of which request switch was pushed will be locked.

Inspection of Keyless Start Control Module and Its Circuits

S7N20AA504012

Keyless start control module and its circuits can be checked at keyless start control module wiring couplers by measuring voltage and resistance.

⚠ CAUTION

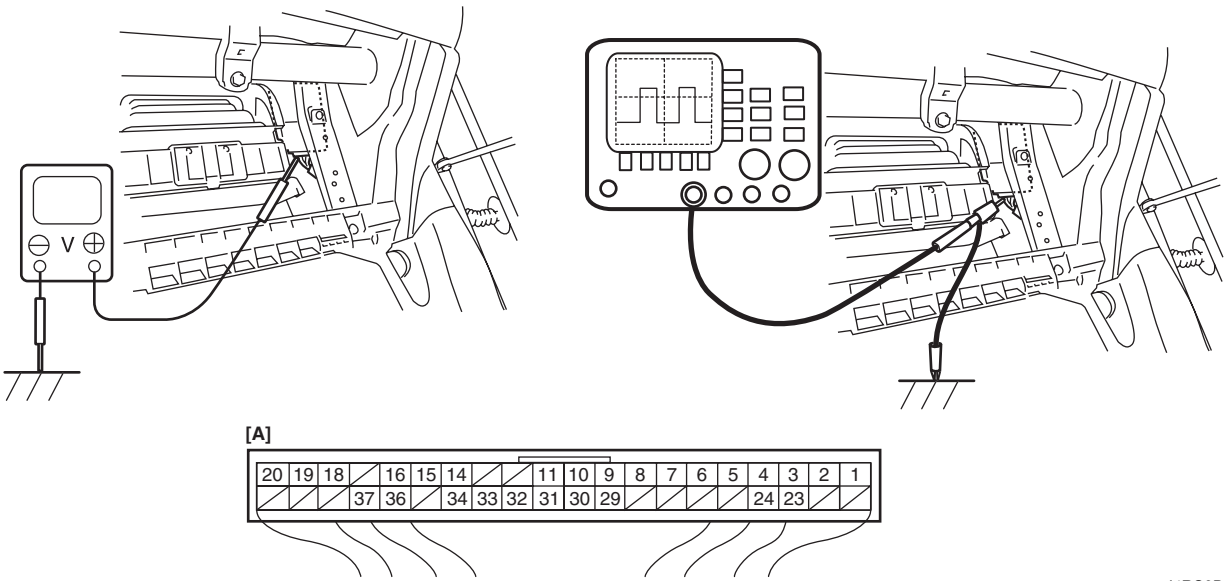
Keyless start control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to keyless start control module with coupler disconnected from it.

Voltage Check

1) Disconnect negative cable (–) at battery.
2) Remove keyless start control module from vehicle body referring to “Keyless start control module Removal and Installation”.
3) Connect connector to keyless start control module.
4) Check voltage at each terminal number of couplers connected.

NOTE

- **As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Voltage with asterisk (*) cannot be measured by voltmeter because it is pulse signal.**



I4RS0BA50014-02

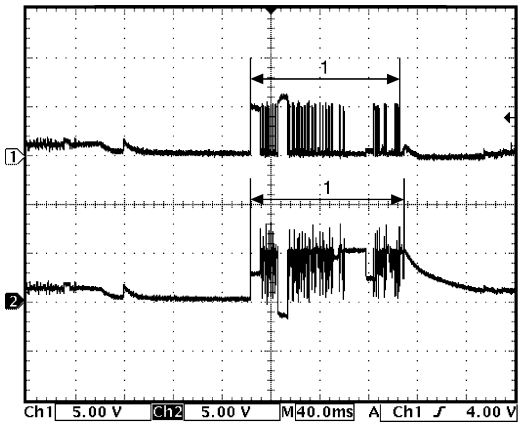
[A]: Keyless start control module connector (viewed from harness side)

Terminal Number	Circuit	Normal Voltage	Condition
G42-1	Driver side door antenna (–)	Refer to “Reference waveform No. 1: ”	
G42-2	Driver side door antenna (+)		
G42-3	Rear end door antenna (–)	Refer to “Reference waveform No. 1: ”	
G42-4	Rear end door antenna (+)		
G42-5	Center antenna (–)	Refer to “Reference waveform No. 2: ”	
G42-6	Center antenna (+)		
G42-7	Luggage antenna (–)	Refer to “Reference waveform No. 3: ”	
G42-8	Luggage antenna (+)		
G42-9	Ground for keyless start control module	0 – 1 V	Ignition switch is at all positions
G42-10	Power source	10 – 12 V	Ignition switch is at all positions
G42-11	Ignition switch (ACC signal)	10 – 12 V	Ignition switch is at ACC or ON position
		0 – 1 V	Ignition switch is at any position other than ACC or ON position
G42-12	—	—	—

Terminal Number	Circuit	Normal Voltage	Condition
G42-13	—	—	—
G42-14	Ignition switch (Key reminder signal)	10 – 12 V	Insert ignition key to ignition key cylinder
		0 – 1 V	Pull out ignition key from ignition key cylinder
G42-15	Ignition switch (ON signal)	10 – 12 V	Ignition switch is at ON position
		0 – 1 V	Ignition switch is at any position other than ON position
G42-16	Driver side door request switch	10 – 12 V	Request switch of driver side door is released
		0 – 1 V	Request switch of driver side door is pushed
G42-17	—	—	—
G42-18	CAN communication line (low) for combination meter	Refer to “Reference waveform No. 4: ”	
G42-19	CAN communication line (high) for combination meter		
G42-20	Power supply for steering lock unit	4 – 6 V	Full time
G42-21	—	—	—
G42-22	—	—	—
G42-23	Passenger side door antenna (–)	Refer to “Reference waveform No. 1: ”	
G42-24	Passenger side door antenna (+)		
G42-25	—	—	—
G42-26	—	—	—
G42-27	—	—	—
G42-28	—	—	—
G42-29	Signal for steering lock unit	4 – 6 V	Ignition knob switch is at any position other than ON and OFF position
		Refer to “Reference waveform No. 5: ”	
G42-30	Ground for steering lock unit	0 – 1 V	Full time
G42-31	—	—	—
G42-32	Rear end door request switch	10 – 12 V	Request switch of rear end door is at any position other than ON position
		0 – 1 V	Request switch of rear end door is at ON position
G42-33	Driver side door lock switch	0 – 1 V	Driver side door is at unlock position and passenger side door is at lock position
		4 – 6 V	Driver and passenger side door is at lock position
		Refer to “Reference waveform No. 6: ”	
G42-34	Ignition knob switch	10 – 12 V	When pushing ignition knob switch of steering lock unit
		0 – 1 V	When releasing ignition knob switch of steering lock unit
G42-35	—	—	—
G42-36	Passenger side door request switch	10 – 12 V	Request switch of passenger side door is at any position other than ON position
		0 – 1 V	Request switch of passenger side door is at ON position
G42-37	Passenger side door lock switch	0 – 1 V	Passenger side door is at unlock position and driver side door is at lock position
		4 – 6 V	Driver and passenger side door is at lock position
		Refer to “Reference waveform No. 6: ”	
G42-38	—	—	—
G42-39	—	—	—
G42-40	—	—	—

Reference waveform No. 1
Driver, passenger and rear end door antenna request signals (Request signal (1) transmitted by each door antenna when each door request switch is pushed)

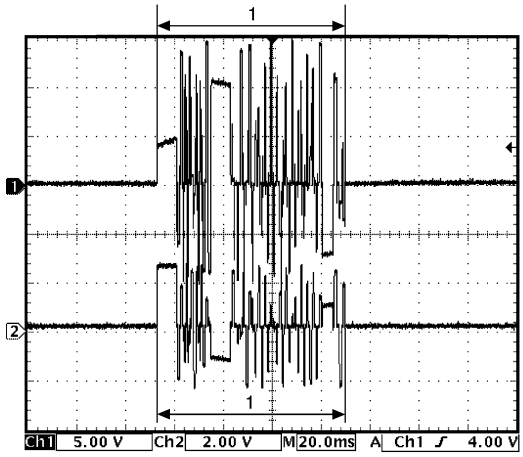
Measurement terminal	Driver side door antenna • CH1: “G42-2” to “G42-9” • CH2: “G42-1” to “G42-9” Passenger side door antenna • CH1: “G42-24” to “G42-9” • CH2: “G42-23” to “G42-9” Rear end door antenna • CH1: “G42-4” to “G42-9” • CH2: “G42-3” to “G42-9”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 5V/DIV TIME: 40 ms/DIV
Measurement condition	Request switch of each door is pushed with remote controller carried



I4RS0BA50015-02

Reference waveform No. 2
Center antenna signal
(Request signal (1) transmitted by center antenna when each door request switch is pushed)

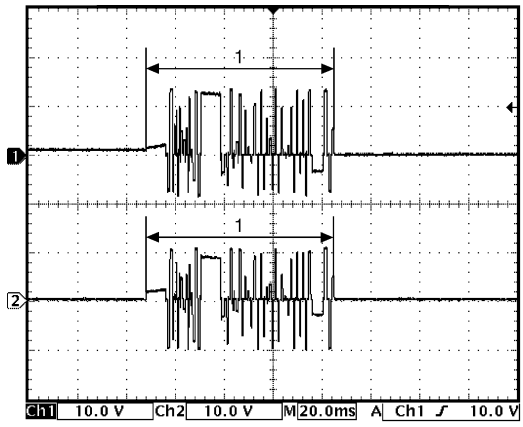
Measurement terminal	CH1: “G42-6” to “G42-9” CH2: “G42-5” to “G42-9”
Oscilloscope setting	CH1: 5 V/DIV, CH2: 2 V/DIV TIME: 20 ms/DIV
Measurement condition	• Ignition knob switch of steering lock unit is pushed • Any one of door is opened • Request switch of each door is pushed



I4RS0BA50016-02

Reference waveform No. 3
Luggage room antenna signal
(Request signal (1) transmitted by luggage room antenna when each door request switch is pushed)

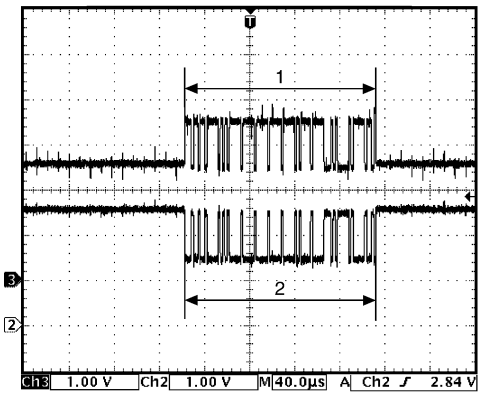
Measurement terminal	CH1: “G42-8” to “G42-9” CH2: “G42-7” to “G42-9”
Oscilloscope setting	CH1: 10 V/DIV, CH2: 10 V/DIV TIME: 20 ms/DIV
Measurement condition	• Any one of door is opened • Request switch of each door is pushed



I4RS0BA50017-02

Reference waveform No. 4
CAN communication signals for combination meter (CAN signal communicated between keyless start control module and combination meter when ignition switch is turned ON)

Measurement terminal	CH1: “G42-19” to “G42-9” CH2: “G42-18” to “G42-9”
Oscilloscope setting	CH1: 1 V/DIV, CH2: 1V/DIV TIME: 40 μs/DIV
Measurement condition	Ignition switch is at ON position

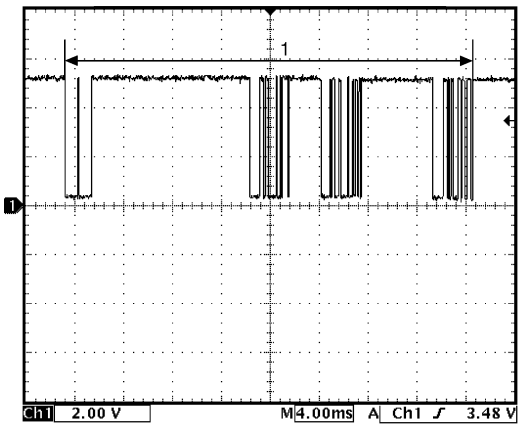


I4RS0BA50018-02

1. CAN communication line signal (high)
2. CAN communication line signal (low)

Reference waveform No. 5
Steering lock unit signal
(Signal (1) communicated between keyless start control module and steering lock unit when measurement condition described below applies)

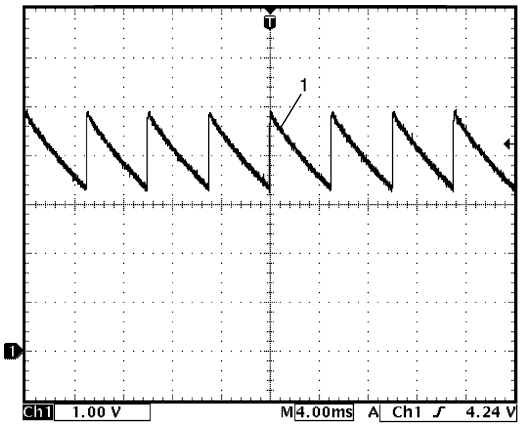
Measurement terminal	CH1: “G42-29” to “G42-9”
Oscilloscope setting	CH1: 2 V/DIV TIME: 4 ms/DIV
Measurement condition	• Ignition knob switch of steering lock unit is pushed • Any one of door is opened • Request switch of each door is pushed



I4RS0BA50019-02

Reference waveform No. 6
Driver side and passenger side door lock switch signals (Signal (1) indicating door lock switch status which keyless start control module receives from BCM)

Measurement terminal	Driver side door lock switch • CH1: “G42-33” to “G42-9” Passenger side door lock switch • CH2: “G42-37” to “G42-9”
Oscilloscope setting	CH1: 1 V/DIV TIME: 4 ms/DIV
Measurement condition	Driver side door lock switch • Driver side door is at lock position • Passenger side door is at unlock position Passenger side door lock switch • Driver side door is at unlock position • Passenger side door is at lock position

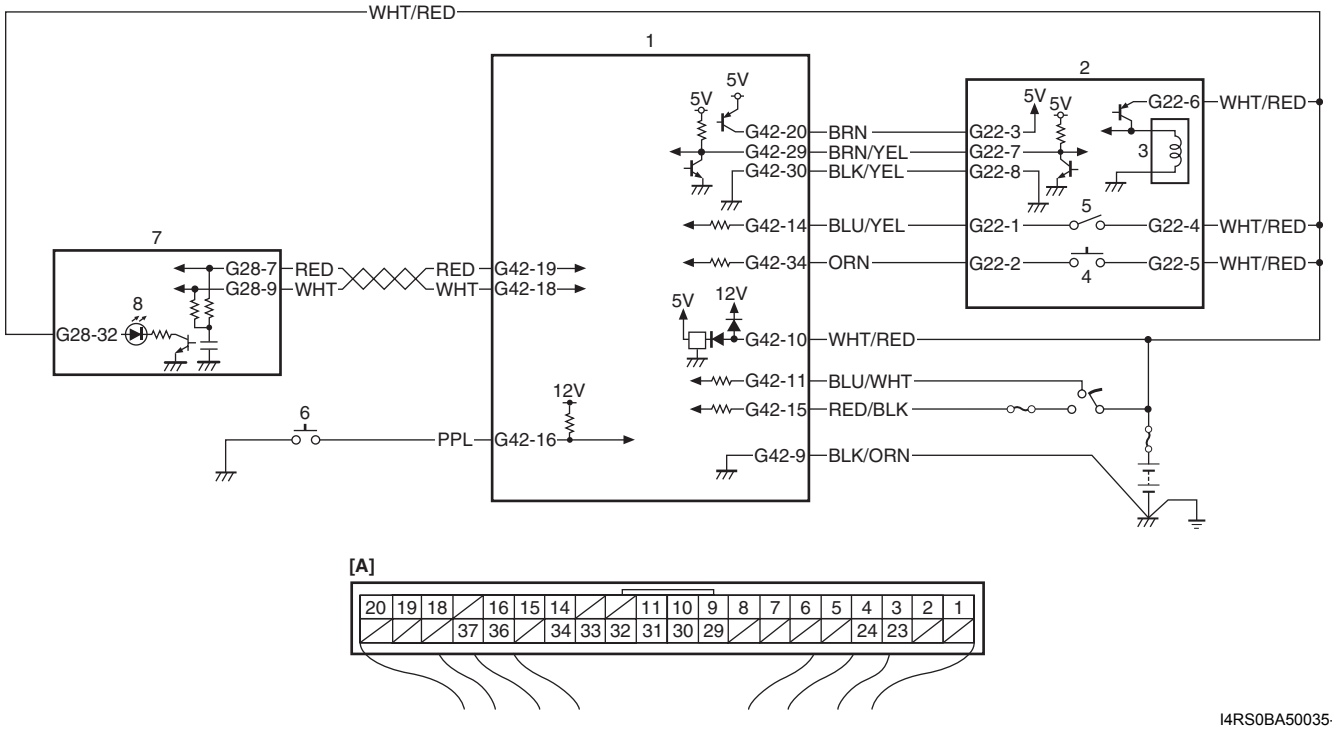


I4RS0BA50020-02

No DTC Detection After Performing DTC Check

S7N20AA504013

Wiring Diagram



I4RS0BA50035-01

[A]: Keyless start control module connector (viewed from harness side)	3. Steering lock solenoid	6. Driver side door request switch
1. Keyless start control module	4. Ignition knob switch	7. Combination meter
2. Steering lock unit	5. Key reminder switch	8. Key indicator lamp

Description

The keyless start control module detects DTC by using signals from the key reminder and driver side door request switches. The keyless start control module makes the key indicator lamp in the combination meter flash on and off by using CAN communication.

Troubleshooting

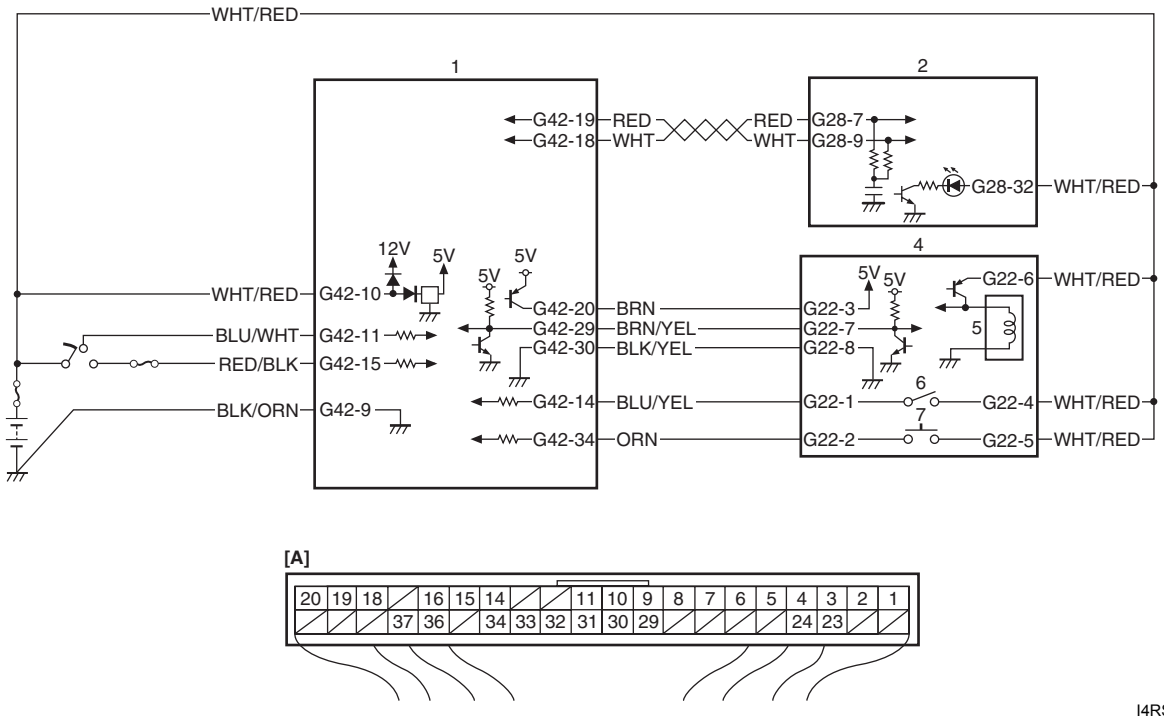
Step	Action	Yes	No
1	**Combination meter power and ground circuit check** 1) Turn ignition switch to ON position. *Do warning lamps in combination meter other than key indicator lamp light up?*	Go to Step 2.	Check main fuse, circuit fuse, combination meter power and ground circuit.
2	**Driver side door request switch and its circuit check** 1) Check driver side door request switch and its circuit referring to “DTC No. 51 / No. 52 / No. 53: Driver Side / Passenger Side / Rear End Door Request Switch Failure”. *Is it in good condition?*	Go to Step 3.	Repair or replace malfunction part.
3	**Key reminder switch and its circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from ignition switch. 3) Check key reminder switch for operation referring to “Ignition Switch Inspection in Section 9C”. 4) If OK, check for open, short and high resistance in key reminder switch circuit. *Is it in good condition?*	Go to Step 4.	Repair or replace malfunction part.

Step	Action	Yes	No
4	**Keyless start control module power supply and ground circuit** 1) Check keyless start control module power and ground circuit for condition referring to “Keyless Start Control Module Power and Ground Circuit Check”. *Is it in good condition?*	Go to Step 5.	Repair circuit.
5	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Substitute a known-good keyless start control module and recheck.	Repair circuit.

Key Indicator Lamp Circuit Check (Key indicator lamp doesn’t light when ignition knob switch is pushed.)

S7N20AA504014

Wiring Diagram



I4RS0BA50021-01

[A]: Keyless start control module connector (viewed from harness side)	4. Steering lock unit
1. Keyless start control module	5. Steering lock solenoid
2. Combination meter	6. Key reminder switch
3. Key indicator lamp	7. Ignition knob switch

Description

When the ignition knob switch is pushed, the key indicator lamp lights up in blue if you carry the remote controller registered in the keyless start control module and it lights in red if you carry the remote controller which has not been registered in the keyless start control module or if you carry no remote controller.

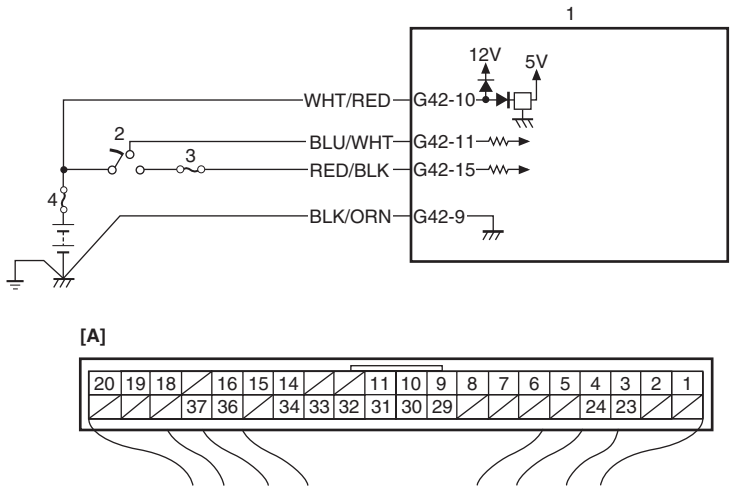
Troubleshooting

Step	Action	Yes	No
1	**Combination meter power and ground circuit check** 1) Turn ignition switch to ON position. *Do warning lamps in combination meter other than key indicator lamp light up?*	Go to Step 2.	Check main fuse, circuit fuse, combination meter power and ground circuit.
2	**Keyless start control module power and ground circuit check** 1) Check keyless start control module power and ground circuit for condition referring to “Keyless Start Control Module Power and Ground Circuit Check”. *Is it in good condition?*	Go to Step 3.	Repair circuit.
3	**Steering lock unit ignition knob switch check** 1) Check ignition knob switch of steering lock unit for operation referring to “Steering Lock Unit Inspection”. *Is it in good condition?*	Go to Step 4.	Replace steering lock unit.
4	**Wire harness check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from keyless start control module, steering lock unit and combination meter. 3) Check for open, short and high resistance in. • Between “G22-2” terminal of steering lock unit connector and “G42-34” terminal of keyless start control module connector • Between “G28-7” terminal of combination meter connector and “G42-19” terminal of keyless start control module connector • Between “G28-9” terminal of combination meter connector and “G42-18” terminal of keyless start control module connector *Is it in good condition?*	Go to Step 5.	Repair circuit.
5	**Keyless start system operation check** 1) With remote controller of which ID code is registered in keyless start control module carried with you, try to turn ignition knob switch. *Can it be turned to any position other than “LOCK” position?*	Replace combination meter.	Substitute a known-good keyless start control module and recheck.

Keyless Start Control Module Power and Ground Circuit Check

S7N20AA504015

Wiring Diagram



I4RS0BA50022-01

[A]: Keyless start control module connector (viewed from harness side)	3. Circuit fuse
1. Keyless start control module	4. Main fuse
2. Ignition switch	

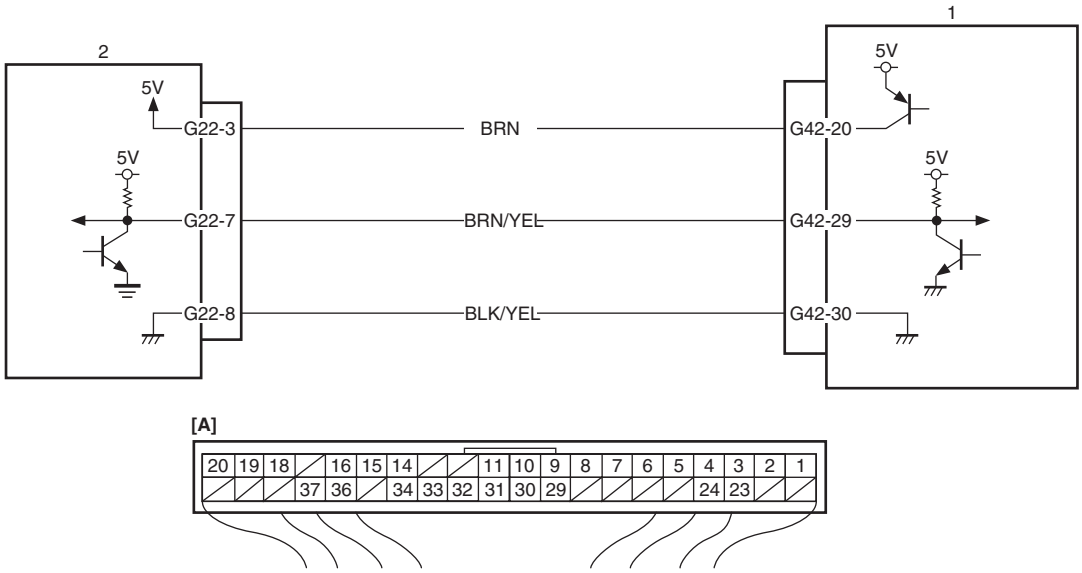
Troubleshooting

Step	Action	Yes	No
1	**Fuse check** 1) Turn ignition switch to OFF position. 2) Check circuit fuse and main fuse for condition. *Are fuses in good condition?*	Go to Step 2.	Replace fuse(s) and check for short.
2	**Power supply circuit check** 1) Disconnect connector from keyless start control module. 2) Check for proper connection to “G42-10”, “G42-11” and “G42-15” terminals of keyless start control module connector. 3) If OK, measure voltage between the following terminals. • When ignition switch is at OFF position Between “G42-10” terminal of keyless start control module connector and vehicle body ground: 10 – 14 V • When ignition switch is at ACC position Between “G42-11” terminal of keyless start control module connector and vehicle body ground: 10 – 14 V • When ignition switch is at ON position Between “G42-15” terminal of keyless start control module connector and vehicle body ground: 10 – 14 V *Is check result satisfactory?*	Go to Step 3.	Repair power supply circuit.
3	**Ground circuit check** 1) Check for proper connection to “G42-9” terminal of keyless start control module connector. 2) If OK, measure resistance between “G42-9” terminal of keyless start control module connector and vehicle body ground. *Is resistance 1 Ω or less?*	Power and ground circuit is in good condition.	Repair ground circuit.

DTC No. 11: Communication Error with Steering Lock Unit

S7N20AA504016

Wiring Diagram



I4RS0BA50023-01

[A]: Keyless start control module connector “G42” (viewed from harness side)
1. Keyless start control module
2. Steering lock unit

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
No communication is available between keyless start control module and steering lock unit	• Steering lock unit and its circuit • Keyless start control module

DTC Confirmation Procedure

1) Clear DTC referring to “DTC Clearance”.
2) Turn ignition knob switch pushing ignition knob switch.
3) Check DTC referring to “DTC Check”.

Troubleshooting

Step	Action	Yes	No
1	*Was “Keyless Start System Check” performed?*	Go to Step 2.	Go to “Keyless Start System Check”.
2	**Steering lock unit circuit check** 1) Disconnect connector from keyless start control module. 2) Check for proper connection to “G42-20”, “G42-29” and “G42-30” terminals of keyless start control module connector. 3) If OK, check for open, short and high resistance in each circuit. • Between “G22-3” terminal of steering lock unit connector and “G42-20” terminal of keyless start control module connector • Between “G22-7” terminal of steering lock unit connector and “G42-29” terminal of keyless start control module connector • Between “G22-8” terminal of steering lock unit connector and vehicle body ground *Is each circuit in good condition?*	Go to Step 3.	Repair circuit.

Step	Action	Yes	No
3	**Steering lock unit power supply voltage check** 1) Connect connector to keyless start control module. 2) Measure voltage between “G22-3” terminal of steering lock unit connector and vehicle body ground. *Is voltage 4 – 6 V?*	Replace steering lock unit.	Substitute a known-good keyless start control module and recheck.

DTC No. 13 / No. 14: Release Signal Error from Steering Lock Unit / Steering Lock Unit Malfunction

S7N20AA504017

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
DTC No. 13: Although lock release signal is output to steering lock unit, no lock release signal is inputted from steering lock unit. (wire harness is normal) **DTC No. 14:** Although lock release signal is output to steering lock unit, steering lock is not released due to temperature rise of steering lock unit solenoid and no lock release signal is inputted. (wire harness is normal)	• Steering lock unit

DTC Confirmation Procedure

1) Clear DTC referring to “DTC Clearance”.
2) Turn ignition knob switch pushing ignition knob switch.
3) Check DTC referring to “DTC Check”.

Troubleshooting

Replace steering lock unit and recheck.

NOTE

DTC No. 13 is also set is such case where the keyless start control module which was used in another vehicle is installed, the remote controller ID code is registered in it but the ignition key transponder code (petrol model) or ID code of the keyless start control module (diesel model) is not registered in ECM. Therefore, when DTC No. 13 is detected, register the ignition key transponder code (petrol model) or ID code of the keyless start control module (diesel model) in ECM before replacing the steering lock unit.

DTC No. 21 / No. 22: Internal Error of Keyless Start Control Module (EEPROM reading error) / (EEPROM writing error)

S7N20AA504018

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
DTC No. 21: Data cannot be read from memory in keyless start control module. **DTC No. 22:** Data cannot be written into memory in keyless start control module.	• Keyless start control module

DTC Confirmation Procedure

1) Clear DTC referring to “DTC Clearance”.
2) Turn ignition knob switch pushing ignition knob switch.
3) Push request switch of each door.
4) Check DTC referring to “DTC Check”.

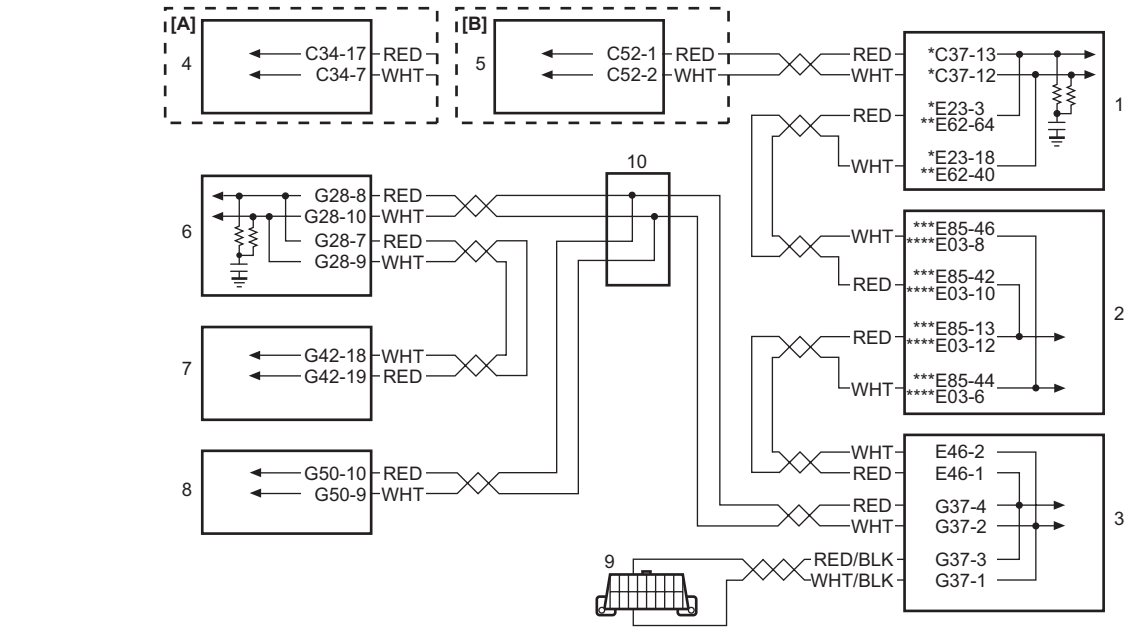
Troubleshooting

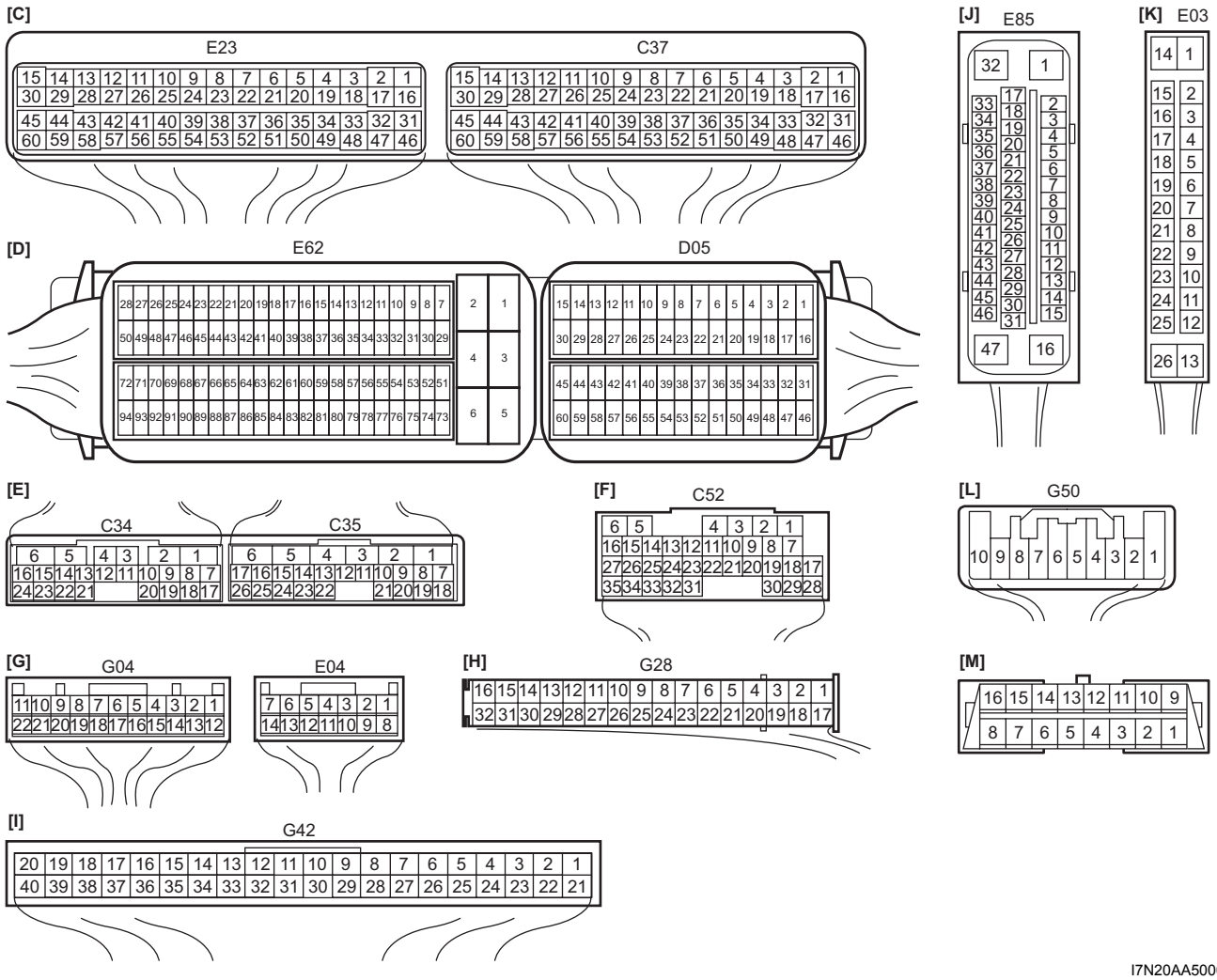
Substitute a known-good keyless start control module and recheck.

DTC No. 31: Lost Communication with BCM

S7N20AA504019

Wiring Diagram





I7N20AA50003-01

[A]: A/T model	2. ABS/ESP® control module
[B]: Automated manual transaxle model	3. BCM
[C]: ECM connector (petrol model) (viewed from harness side)	4. TCM (A/T model)
[D]: ECM connector (diesel model) (viewed from harness side)	5. TCM (automated manual transaxle model)
[E]: TCM connector (A/T model) (viewed from harness side)	6. Combination meter
[F]: TCM connector (automated manual transaxle model) (viewed from harness side)	7. Keyless start control module
[G]: BCM connector (viewed from harness side)	8. Steering angle sensor (ESP® model)
[H]: Combination meter connector (viewed from harness side)	9. DLC
[I]: Keyless start control module connector (viewed from harness side)	10. CAN junction connector (ESP® model)
[J]: ESP® control module connector (viewed from terminal side)	*: Petrol model
[K]: ABS control module connector (viewed from terminal side)	**: Diesel model
[L]: Steering angle sensor connector (ESP® model) (viewed from harness side)	***: ESP® model
[M]: DLC (viewed from harness side)	****: Non-ESP® model
1. ECM	

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
Keyless start control module cannot receive data sent by CAN from BCM	• CAN communication circuit • Keyless start control module • Combination meter • BCM

DTC Confirmation Procedure

1) Clear DTC referring to “DTC Clearance”.
2) Turn ignition key knob by pushing ignition key knob.
3) Check DTC referring to “DTC Check”.

Troubleshooting

Step	Action	Yes	No
1	*Was “Keyless Start System Check” performed?*	Go to Step 2.	Go to “Keyless Start System Check”.
2	**DTC check of keyless start control module** *Is DTC No. 33 detected?*	Go to “DTC No. 33: Control Module Communication Bus Off”.	Go to Step 3.
3	**DTC check of BCM** 1) Check BCM for DTC. *Is DTC U1073, DTC U1100 or DTC U1101 detected?*	Go to applicable DTC diag flow.	Go to Step 4.
4	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck keyless start control module for DTC. *Is DTC No.31 detected?*	Go to Step 5.	Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection Inspection in Section 00”.
5	**CAN communication circuit check** 1) Disconnect connectors from BCM, combination meter and keyless start control module. 2) Check CAN communication circuit for open, short and high resistance. • Between BCM and combination meter • Between combination meter and keyless start control module *Is each CAN communication circuit in good condition?*	Go to Step 6.	Repair circuit.

Step	Action	Yes	No
6	**CAN communication circuit check** 1) Disconnect connectors of all control modules communicating by means of CAN. 2) Check CAN communication circuit between control modules other than Step 5 for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 7.	Repair circuit.
7	**DTC check of ECM** 1) Connect connectors disconnected control module communications by means of CAN. 2) Check ECM for DTC. *Is DTC P1678 or U2107 detected?*	Check BCM power and ground circuit. If circuit is OK, substitute a known-good BCM and recheck.	Go to Step 8.
8	**DTC check of keyless start control module** 1) Turn ignition switch to OFF position. 2) Disconnect connector of any one of control module other than keyless start control module. 3) Recheck keyless start control module for DTC. *Is DTC No.31 detected?*	Using same method, disconnect connectors of control module other than keyless start control module one by one to check if DTC No.31 is detected. If DTC No.31 is detected even through connector of control module other than keyless start control module is disconnected, substitute a known-good keyless start control module and recheck.	Check power and ground circuit of disconnected control module and recheck. If circuit is OK, substitute a known-good disconnected control module and recheck.

DTC No. 33: Control Module Communication Bus Off

S7N20AA504020

Wiring Diagram

Refer to “DTC No. 31: Lost Communication with BCM”.

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
Communication is not available with all control modules connected by CAN	• CAN communication circuit • Combination meter • Keyless start control module • BCM • TCM (A/T or Automated Manual Transaxle model) • ECM • ABS / ESP® control module • Steering angle sensor (if equipped)

DTC Confirmation Procedure

1) Clear DTC referring to “DTC Clearance”.
2) Start engine and run it for 1 min. or more.
3) Check DTC referring to “DTC Check”.

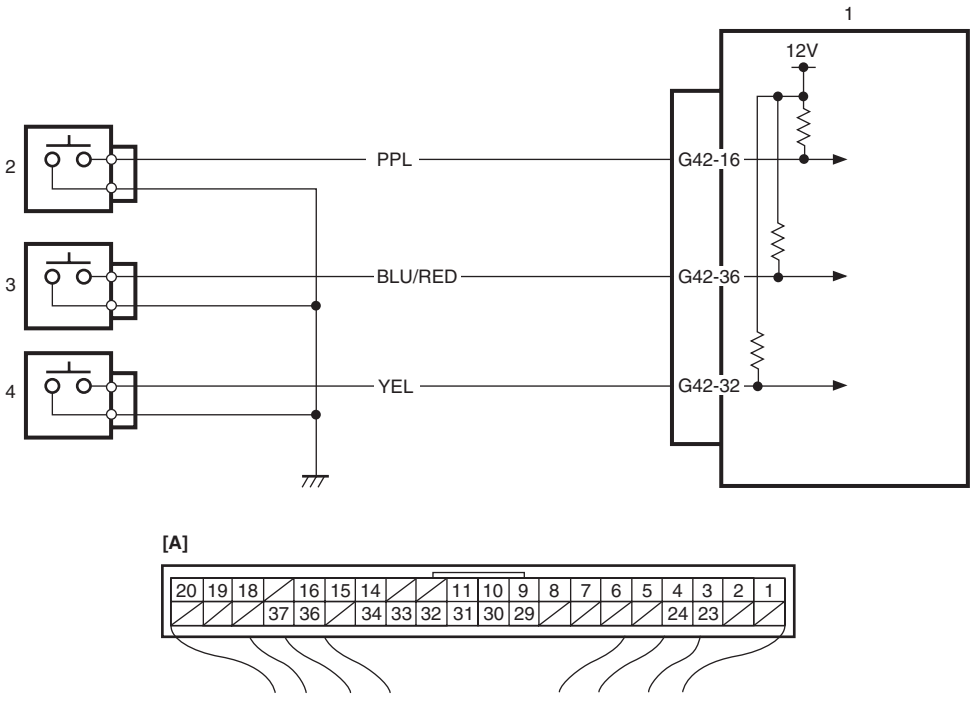
Troubleshooting

Step	Action	Yes	No
1	*Was "Keyless Start System Check" performed?*	Go to Step 2.	Go to "Keyless Start System Check".
2	**Control module connector check** 1) Check connection of connectors of all control modules communicating by means of CAN. 2) Recheck keyless start control module for DTC. *Is DTC No. 33 detected?*	Go to Step 3.	Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection Inspection in Section 00".
3	**CAN communication circuit check** 1) Turn ignition switch to OFF position. 2) Disconnect connectors of all control modules communicating by means of CAN. 3) Check CAN communication circuit between control modules for open, short and high resistance. *Is each CAN communication circuit in good condition?*	Go to Step 4.	Repair circuit.
4	**DTC check of keyless start control module** 1) Turn ignition switch to OFF position. 2) Connect connectors of disconnected control modules communicating by means of CAN. 3) Disconnect connector of any one control module other than keyless start control module. 4) Recheck keyless start control module for DTC. *Is DTC No.33 detected?*	Using same method, disconnect connectors of control module other than keyless start control module one by one to check if DTC No.33 is detected. If DTC No.33 is detected even through connector of control module other than keyless start control module is disconnected, substitute a known-good keyless start control module and recheck.	Check power and ground circuit of disconnect control module. If circuit is OK, substitute a known-good disconnected control module and recheck.

DTC No. 51 / No. 52 / No. 53: Driver Side / Passenger Side / Rear End Door Request Switch Failure

S7N20AA504021

Wiring Diagram



I4RS0BA50026-01

[A]: Keyless start control module connector “G42” (viewed from harness side)	3. Passenger side door request switch
1. Keyless start control module	4. Rear end door request switch
2. Driver side door request switch	

DTC Detecting condition and trouble area

DTC detecting condition	Trouble area
DTC No. 51: Input signal from driver side door request switch remains ON, unchanged for 10 minutes or longer. **DTC No. 52:** Input signal from passenger side door request switch remains ON, unchanged for 10 minutes or longer. **DTC No. 53:** Input signal from rear end door request switch remains ON, unchanged for 10 minutes or longer.	• Driver side door request switch and its circuit • Passenger side door request switch and its circuit • Rear end door request switch and its circuit • Keyless start control module

DTC Confirmation Procedure

1) Clear DTC referring to “DTC Clearance”.
2) Push request switch of each door.
3) Check DTC referring to “DTC Check”.

Troubleshooting

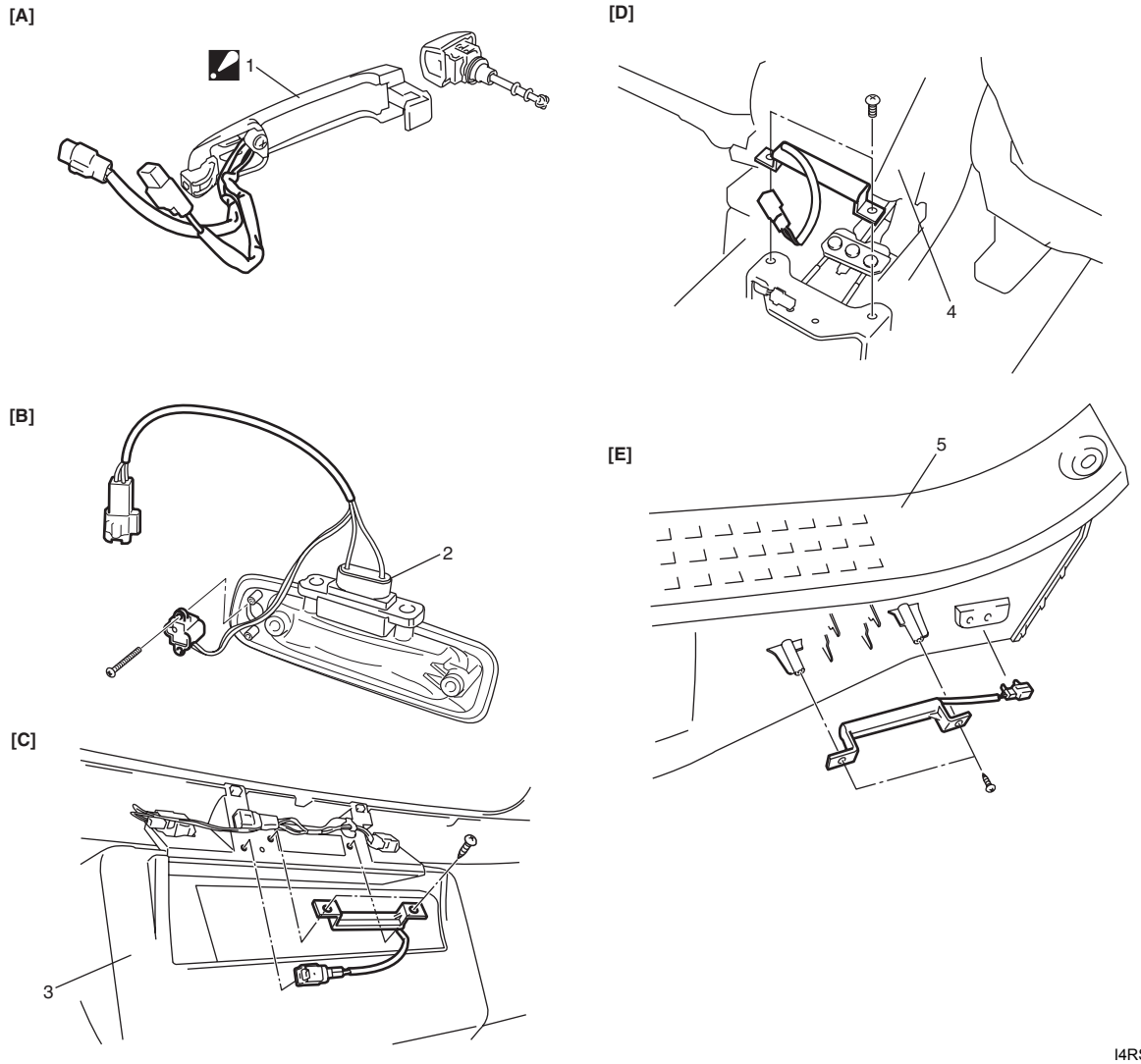
Step	Action	Yes	No
1	*Was "Keyless Start System Check" performed?*	Go to Step 2.	Go to "Keyless Start System Check".
2	**Keyless start control module voltage check** 1) Turn ignition switch to OFF position. 2) Disconnect connector from each door request switch. 3) Check for proper connection to all terminals of each door request switch connector. 4) If OK, measure voltage between "PPL", "BLU/RED" or "YEL" terminal of related door request switch connector and vehicle body ground. *Is voltage 10 – 14 V?*	Go to Step 3.	Go to Step 4.
3	**Request switch check** 1) Check related door request switch for function referring to "Front Door (Driver and Passenger Side) Rear End Door Request Switch Inspection". *Is each switch in good condition?*	Check for open and high resistance in ground circuit of related door request switch. If ground circuit is OK, substitute a known-good keyless start control module and recheck.	Replace request switch.
4	**Wire harness check** 1) Disconnect connector from keyless start control module. 2) Check for open, short and high resistance in related circuit. • Between "PPL" terminal of driver side door request switch connector and "G42-16" terminal of keyless start control module connector • Between "BLU/RED" terminal of passenger side door request switch connector and "G42-36" terminal of keyless start control module connector • Between "YEL" terminal of rear end door request switch connector and "G42-32" terminal of keyless start control module connector *Is it in good condition?*	Substitute a known-good keyless start control module and recheck.	Repair circuit.

Repair Instructions

Antennas and Request Switches Removal and Installation

S7N20AA506001

Remove and install antennas and request switches referring to the following figures.



I4RS0BA50027-04

[A]: Front door antenna and request switch (included in outside door handle assembly)	1. Outside handle assembly : Antenna and request switch can not be removed from outside door handle assembly
[B]: Rear end door opener and request switch assembly	2. Rear end opener and request switch
[C]: Rear end door antenna	3. Rear bumper (viewed from inside)
[D]: Center antenna	4. Parking brake lever
[E]: Luggage room antenna	5. Tail end member trim

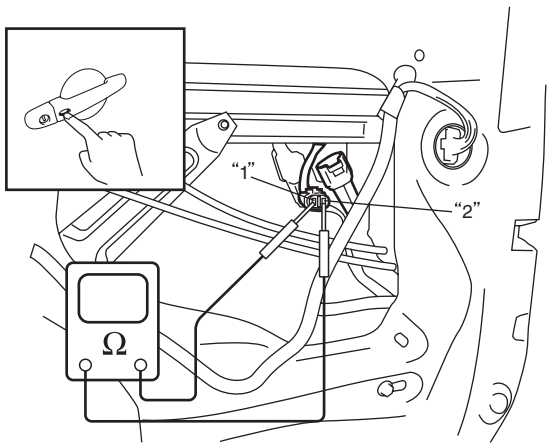
Front Door (Driver and Passenger Side) Rear End Door Request Switch Inspection

S7N20AA506002

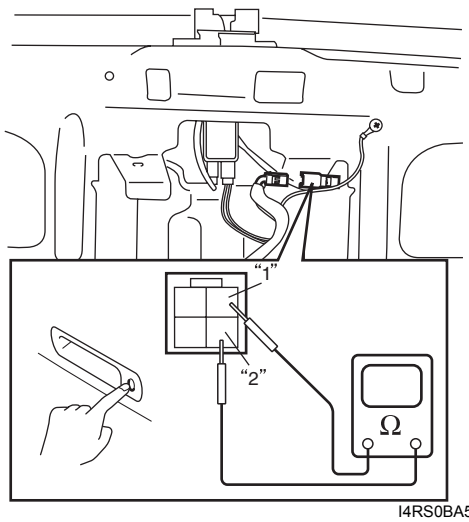
1) Remove door trim from door panel.
   For front door trim, refer to Step 1) to 3) of "Front Door Glass Removal and Installation in Section 9E".
   For rear end door trim, refer to Step 1) of "Rear End Door Lock Assembly Removal and Installation in Section 9F".
2) Check for continuity between terminals "1" and "2" at each switch position as shown below. If check result is not as specified, replace.

Request switch specification
ON position (request switch pushed): Continuity
OFF position (request switch released): No continuity

[A]



[B]



I4RS0BA50028-02

[A]:	Front door request switch (driver and passenger side)
[B]:	Rear end door request switch

Steering Lock Unit Removal and Installation

S7N20AA506003

For removal and installation, refer to "Steering Lock Assembly (Ignition Switch) Removal and Installation in Section 6B".

Steering Lock Unit Inspection

S7N20AA506004

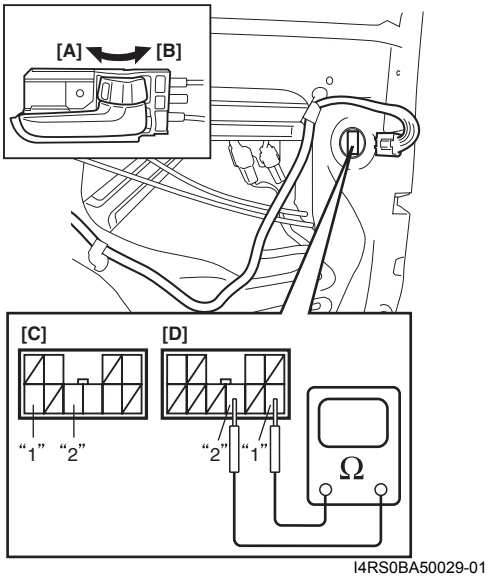
Check key reminder switch and ignition knob switch in steering lock unit for operation referring to "Ignition Switch Inspection in Section 9C".

Front Door Lock Switch Inspection

S7N20AA506005

1) Remove door trim from door panel referring to Step 1) to 3) of "Front Door Glass Removal and Installation in Section 9E".
2) Check for continuity between terminals "1" and "2" at each switch position as shown below. If check result is not as specified, replace.

Door lock switch specification
LOCK position: No continuity
UNLOCK position: Continuity



I4RS0BA50029-01

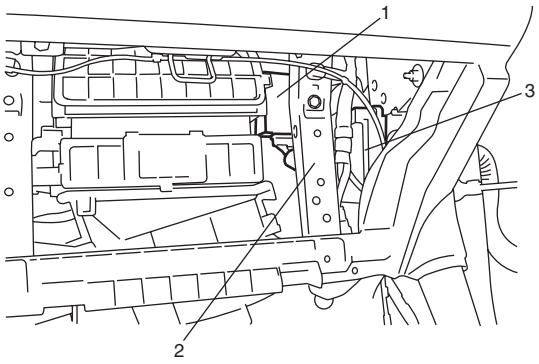
[A]: Lock	[C]: Right side door lock switch
[B]: Unlock	[D]: Left side door lock switch

Keyless start control module Removal and Installation

S7N20AA506006

Removal

1) Disconnect negative cable at battery.
2) Remove glove box from instrument panel.
3) Remove keyless start control module (1) as follows.
   - For vehicle equipped with M/T:
     a. Disconnect connector from keyless start control module.
     b. Remove keyless start control module mounting bolt and then remove keyless start control module from steering support member (2).
   - For vehicle equipped with A/T or Automated Manual Transaxle:
     a. Remove TCM (3) from vehicle body referring to “Transmission Control Module (TCM) Removal and Installation in Section 5A” or “Transmission Control Module (TCM) Removal and Installation in Section 5D”.
     b. Disconnect connector from keyless start control module.
     c. Remove keyless start control module mounting bolt and then remove keyless start control module from steering support member.



I4RS0BA50030-01

Installation

For installation, reverse removal procedure.
If Keyless start control module is replaced, register ID code of remote controller into Keyless start control module, referring to “Registration Procedure for Remote Controller ID Code”.

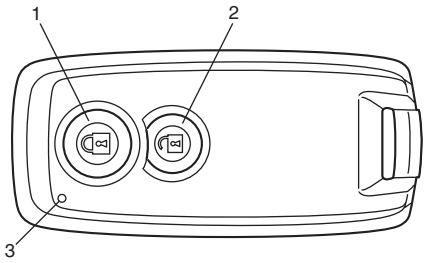
Remote Controller Inspection

S7N20AA506007

Check that remote controller operation indicator lamp (3) lights up when lock (1) or unlock (2) button of remote controller is pushed.
If it doesn’t light up in this check, replace battery and then recheck. If it doesn’t light up even after battery replacement, replace remote controller.

NOTE

When remote controller transmits lock or unlock signal, it makes operation indicator lamp light up.



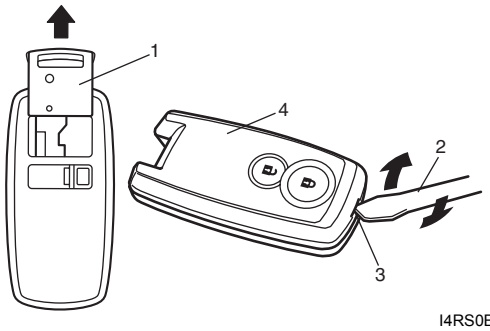
I4RS0BA50031-01

Replacement of Remote Controller Battery

S7N20AA506008

If remote controller operation indicator lamp fails to light up when lock or unlock button of remote controller is pushed, replace its battery as follows.

1) If ignition key (1) is inserted in remote controller, remove it.
2) With tip of flat blade screwdriver (2) put in slot (3) of remote controller (4), pry it open.



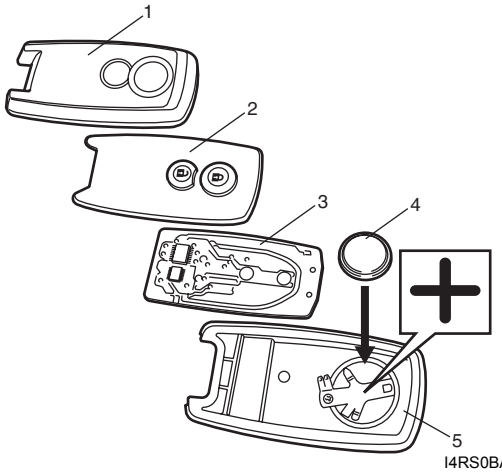
I4RS0BA50032-01

3) Remove battery (4) from lower case (5).

⚠ CAUTION

Use care not to allow grease or dirt to be attached on the printed circuit board and the battery.

4) Replace the battery (lithium disc-type CR 2032 or equivalent battery) so its (+) terminal faces on remote controller lower case.



I4RS0BA50033-01

1. Upper case	3. Printed circuit board
2. Rubber switch	

5) Install printed circuit board and rubber switch to upper case and then fit lower case securely.

NOTE

- **To prevent theft, be sure to break the remote controller 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.**

Registration Procedure for Remote Controller ID Code

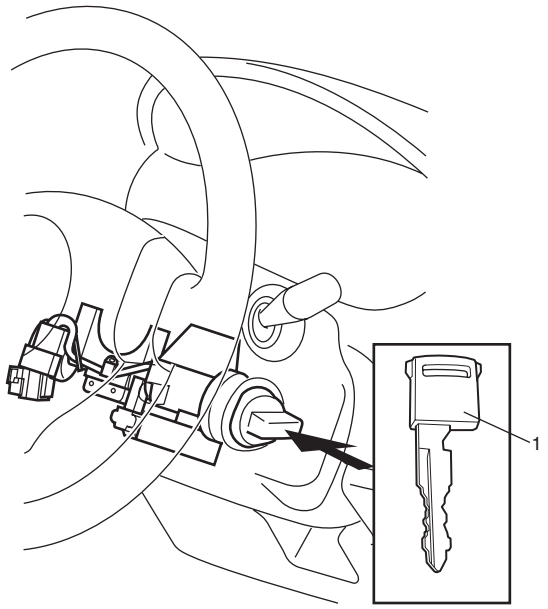
S7N20AA506009

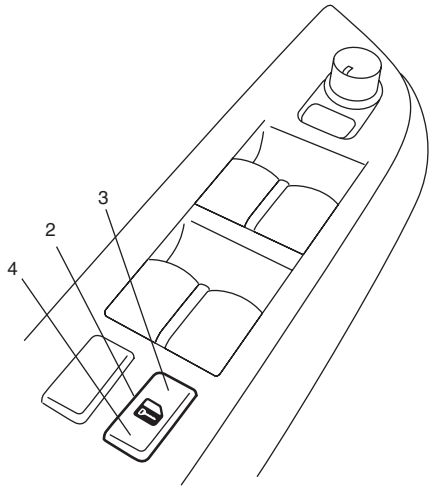
NOTE

- **It is possible to register up to 4 remote controllers in keyless start control module.**
- **Setting keyless start control module to ID code registration mode of remote controller will erase all remote controller ID codes that have been registered in keyless start control module.**
  Therefore, when registering remote controller ID codes in keyless start control module, have all of those to be registered ready and execute their registration at the same time.
- **When registration of more than four remote controller ID codes is attempted, the oldest remote controller ID code will be erased and that inputted after the fourth one will be registered.**
- **For petrol model, when keyless start control module which was used in another vehicle has been installed, it is necessary to perform both registration of remote controller ID code in keyless start control module and registration of ignition key transponder code in ECM. For registration procedure of ignition key transponder code, refer to "Registration of the Ignition Key: Petrol Model in Section 10C".**
- **For diesel model, when keyless start control module which was used in another vehicle has been installed, it is necessary to perform both registration of remote controller ID code in keyless start control module and registration of keyless start control module ID code in ECM. ID code of the keyless start control module is registered automatically by registering password and SECRET KEY CODE to ECM. For the registration procedure of the password and SECRET KEY CODE, refer to "Procedure after ECM Replacement: Diesel Model in Section 10C".**

If remote controller or keyless start control module is replaced with a new one or additional remote controller is necessary, register ID code(s) of remote controller.

1) Sit in driver seat and close all doors.
2) Check that door lock of driver seat is unlocked.
3) Insert ignition key (1) into ignition key cylinder.
4) Perform Steps a) through f) described blow within 25 seconds after Step 3).
   a) First push manual door lock switch (2) toward lock side (3) and then push it toward unlock side (4).
   b) Repeat Step a) 2 more times.
   c) Push lock side of manual door lock switch.
   d) Remove ignition key from ignition key cylinder once and then insert it again.
   e) Repeat Step d) 3 more times.
   f) Start engine and wait for 3 seconds.





I4RS0BA50034-02

NOTE

When 60 seconds elapse after engine is started, the above process to enter registration mode will be cancelled. Therefore, be sure to proceed to the next step within 60 seconds.

5) Turn ignition switch to OFF position.
   When ignition switch is turned to OFF position, buzzer sounds twice and door lock is activated from lock position to unlock position. This operation indicates that keyless start control module has entered registration mode.
6) Push lock or unlock button of remote controller within 30 seconds after Step 5) to be registered.
   When lock or unlock button of remote controller is pushed, buzzer sounds twice, door lock is activated to lock position and then to unlock position. This operation indicates that remote controller ID code has been registered in keyless start control module. If an additional remote controller needs to be registered, repeat the procedure of Step 6) within 30 seconds after Step 5).
7) To end registration mode, remove ignition key from ignition key cylinder or turn it to ON position.
   If engine start function of keyless start system does not work after registration, check ECM if DTC P1615 is detected. If it is detected, go to “DTC P1615: ID Code Does Not Registered (Vehicle equipped with keyless start system only): Petrol Model in Section 10C” or “DTC P1615: Steering Lock Unit Communication Error (for Vehicle with Keyless Start System): Diesel Model in Section 10C”. If it is not detected, perform registration procedure again.

Prepared by
MAGYAR SUZUKI CORPORATION LTD.

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