# 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:**

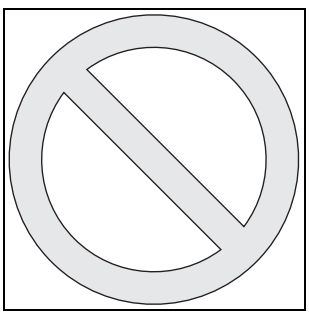
**This service manual is intended for authorized Suzuki dealers and qualified service technictans only. Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual.**
**Improper repair may result in injury to the mechanic 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 (air bag (inflator) modules, forward sensor(s), SDM and/or seat belt pretensioners) 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 SUPPLEMANTARY SERVICE MANUAL is a supplement to GRAND VITARA (SQ416/SQ420/SQ625) SERVICE MANUAL. It has been prepared exclusively for the following applicable model.

**Applicable models: GRAND VITARA XL-7 H27 Engine Vehicles (JA627) with the following vehicle identification numbers (VINs) and GRAND VITARA XL-7 RHW Engine Vehicles (JA420WD).**

| H27 engine model | | RHW engine model | |
|---|---|---|---|
| JSAHTX92V00170001 | ~ | JSAHTX83V00200001 | ~ |
| JSAHTX92V30170001 | ~ | | |
| JSAHTX92V34170001 | ~ | | |
| JSAHTY92V00170001 | ~ | | |
| JS3TX92V□34170001 | ~ | | |

**NOTE:**

**Service information for two types of H27 engine model, TYPE A and TYPE B, is provided in this manual. To distinguish between TYPE A and TYPE B, identify the following vehicle identification numbers (VINs).**

| TYPE A of H27 engine model: | | | TYPE B of H27 engine model: | |
|---|---|---|---|---|
| JSAHTX92V00170001 | ~ | JSAHTX92V00199999 | JSAHTX92V00200001 | ~ |
| JSAHTX92V30170001 | ~ | JSAHTX92V30199999 | JSAHTX92V40200001 | ~ |
| JSAHTX92V34170001 | ~ | JSAHTX92V34199999 | JSAHTX92V44200001 | ~ |
| JSAHTY92V00170001 | ~ | JSAHTY92V00199999 | JS3TX92V□44200001 | ~ |
| JS3TX92V□34170001 | ~ | JS3TX92V□34199999 | | |

This supplementary service manual describes only different service information of the above applicable model as compared with GRAND VITARA (SQ416/SQ420/SQ625) SERVICE MANUAL. Therefore, whenever servicing the above applicable model, consult this supplement first. And for any section, item or description not found in this supplement, refer to the related service manual below

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

All information, illustration 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.

**NOTE:**

**"SUZUKI Dealers" means Authorized Suzuki Service Workshop (in Europe).**

**RELATED MANUAL:**
Refer to the following page for the related manuals.

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**RELATED MANUAL:**

| Manual Name | Manual No. | H27 engine model | RHW engine model |
|---|---|---|---|
| GRAND VITARA (SQ416/SQ420/SQ625) SERVICE MANUAL | 99500-65D20-01E | Applicable | Applicable |
| GRAND VITARA/XL-7 (SQ416/SQ420/SQ625/JA627/JA420WD) UNIT REPAIR MANUAL (for Manual Transmission, Automatic Transmission, Transfer and Differential) | 99501-65D50-01E | Applicable | Applicable |
| GRAND VITARA (SQ420WD/SQ420VD) SUPPLEMENTARY SERVICE MANUAL (with RHW engine) | 99501-68D00-01E | Not applicable | Applicable |
| GRAND VITARA XL-7 (JA627) WIRING DIAGRAM MANUAL | 99512-52D20-015 | Applicable | Not applicable |
| GRAND VITARA/GRAND VITARA XL-7 (SQ420WD/SQ420VD/ JA420WD) WIRING DIAGRAM MANUAL | 99512-68D30-015 | Not applicable | Applicable |

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**NOTE:**

**For the screen toned Section in the above table, refer to the same section of the GRAND VITARA (99500-65D2#-01#) Service Manuals mentioned in FOREWORD of this manual.**
**However, for the section with asterisk mark (*), refer to the same section of the GRAND VITARA (99501-68D0#-01#) Supplementary Service Manuals mentioned in FOREWORD of tis manual.**

# SECTION 0A



# GENERAL INFORMATION

**NOTE:**

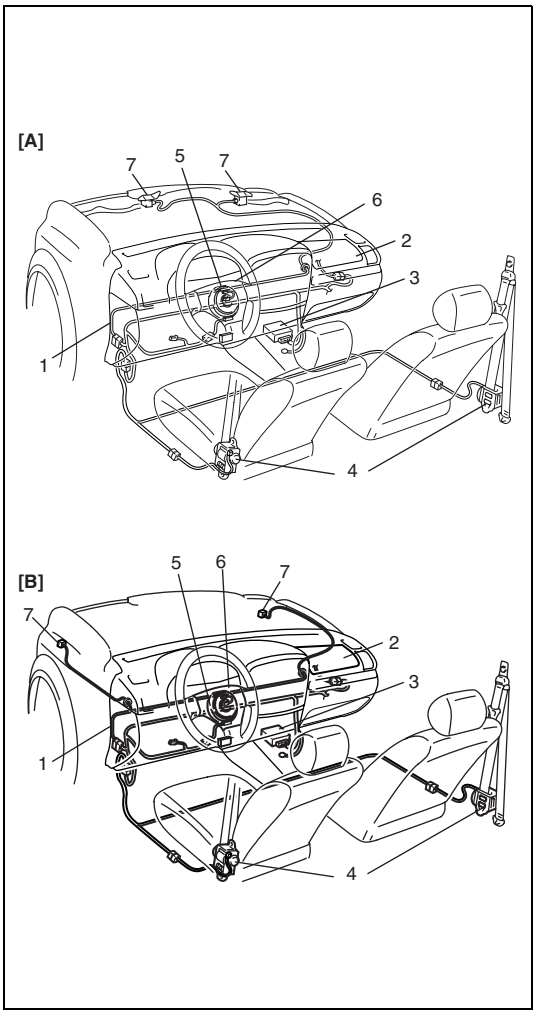
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **For distinction between type A and B of H27 engine model described in this section, refer to "FOREWORD" of this manual.**

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# Precautions

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



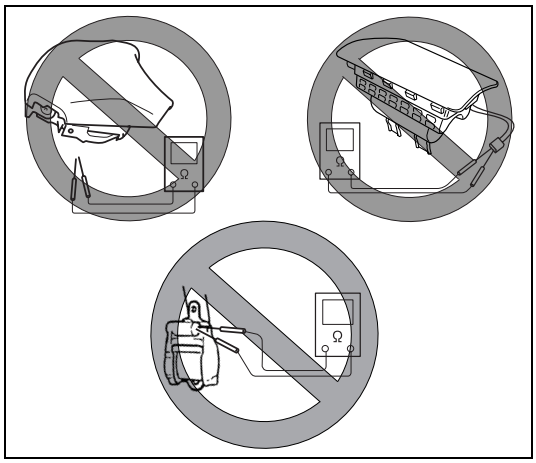

**WARNING:**

- **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 Section 10B. 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.**

| | |
|---|---|
| [A]: Type A of H27 engine model | 4. Seat belt pretensioners (if equipped) |
| [B]: RHW engine model and type B of H27 engine model | 5. Contact coil |
| 1. Air bag wire harness | 6. Driver air bag (inflator) module |
| 2. Passenger air bag (inflator) module | 7. Forward sensors |
| 3. SDM | |

## Diagnosis

- **When troubleshooting air bag system, be sure to follow "DIAGNOSIS" in Section 10B. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.**
- **Never use electrical test equipment other than that specified in this manual.**

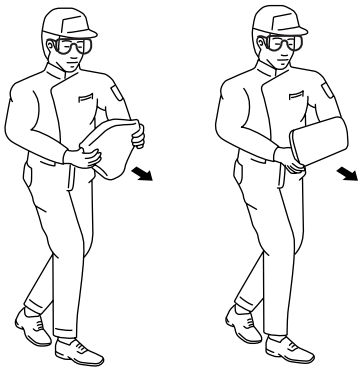


**WARNING:**

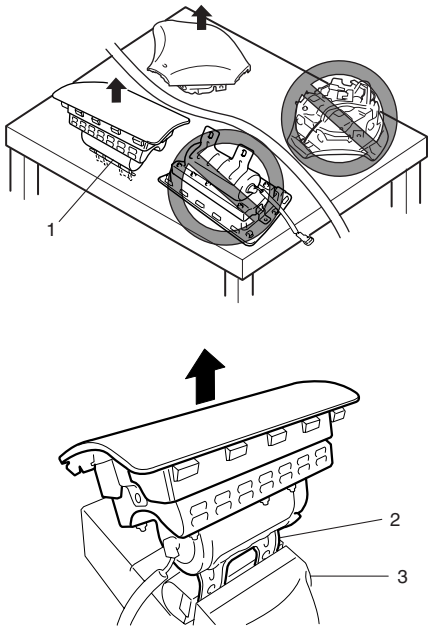
**Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger) and seat belt pretensioners (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag or activate the pretensioners.**

## Servicing and handling

[A]



[B]




**WARNING:**

**Many of service procedures require disconnection of "AIR BAG" fuse and all air bag (inflator) module(s) from initiator circuit to avoid an accidental deployment.**

**Driver and Passenger Air Bag (Inflator) Modules**

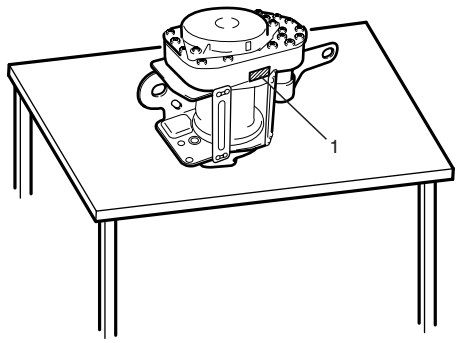
- **For handling and storage of a live air bag (inflator) module, select a place where the ambient temperature below 65°C (150°F), without high humidity and away from electric noise.**
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. In case of an 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 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. Otherwise, personal injury may result.**
- **Never dispose of live (undeployed) air bag (inflator) modules (driver and passenger). If disposal is necessary, be sure to deploy them according to deployment procedures described in Section 10B 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.**

| | |
|---|---|
| [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. |
| 1. | Slit on workbench |
| 2. | Lower mounting bracket |
| 3. | Workbench vise |

**WARNING:**

**SDM**

- **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, 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 or to put a seat belt pretensioner on top of another. 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 Section 10B 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.**

**CAUTION:**

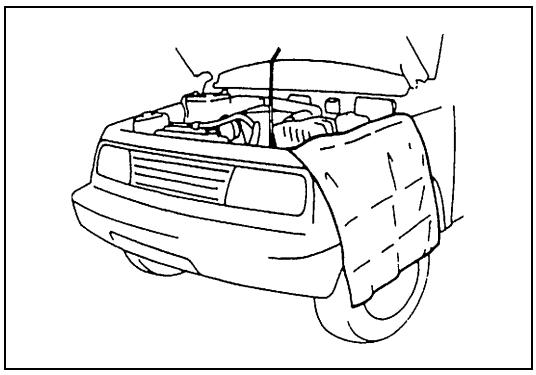
- **Even when the accident was light enough not to cause air bags to activate, be sure to inspect system parts and other related parts according to instructions under "Repair and Inspection Required After an Accident" in Section 10B.**
- **When servicing parts other than air bag system, if shocks may be applied to air bag system component parts, remove those parts beforehand.**
- **When handling the air bag (inflator) modules (driver and passenger), forward sensors or SDM, be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., dropped from a height of 91.4 cm (3 feet) or more), 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 and passenger), wipe off immediately with a dry cloth.**
- **Air bag wire harness can be identified easily as it 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.**
- **Do not apply power to the air bag system unless all components are connected or a diagnostic chart requests it, as this will set a diagnostic trouble code.**
- **Never use air bag system component parts from another vehicle.**
- **When using electric welding, be sure to temporarily disable air bag system referring to "Disabling Air Bag System" in Section 10B.**
- **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 10B.**

## General Precautions

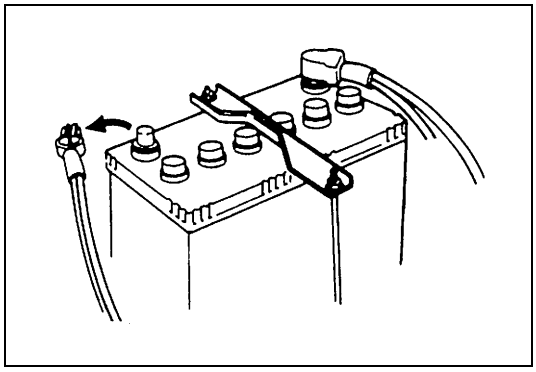
The WARNING and CAUTION below describe some general precautions that you should observe when servicing a vehicle. These general precautions apply to many of the service procedures described in this manual, and they will not necessarily be repeated with each procedure to which they apply.

**WARNING:**

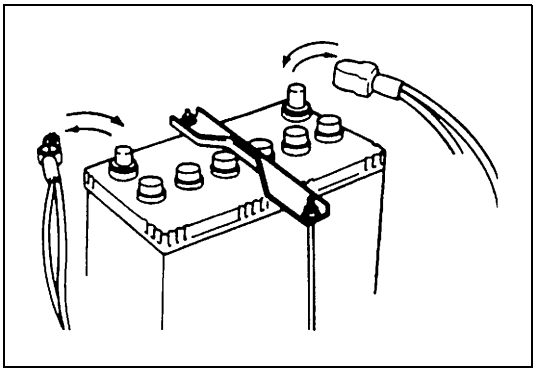
- **Whenever raising a vehicle for service, be sure to follow the instructions under "Vehicle Lifting Points" on Section 0A.**
- **When it is necessary to do service work with the engine running, make sure that the parking brake is set fully and the transmission is in Neutral (for manual transmission 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, tailpipe, 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 dishwashing 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.**
- **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.**



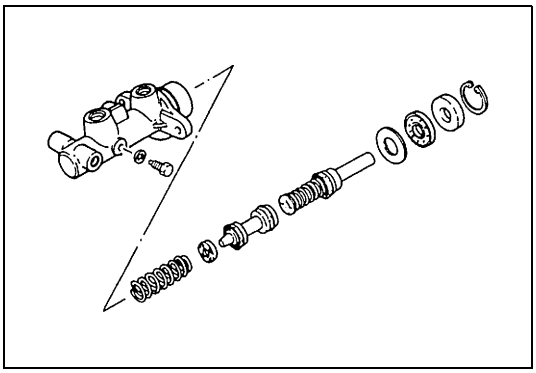
- **Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g, buttons) may cause damage to the vehicle's finish.**



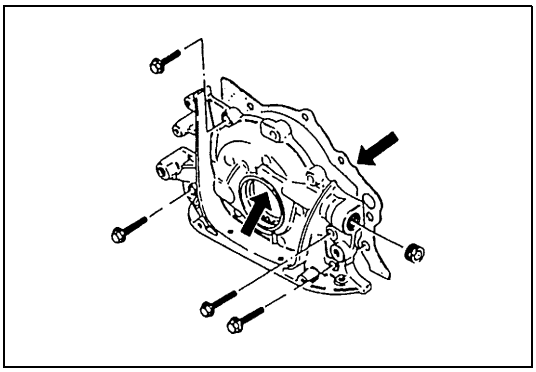
- **When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.**



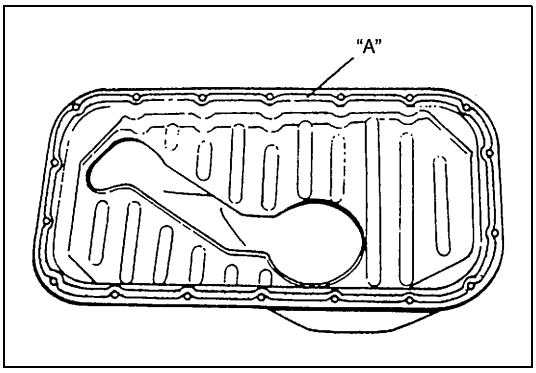
- When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.



- 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.

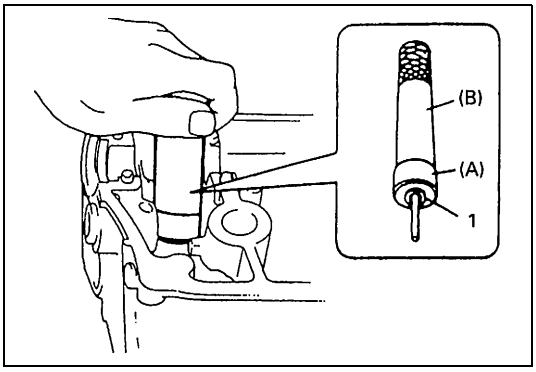


- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.



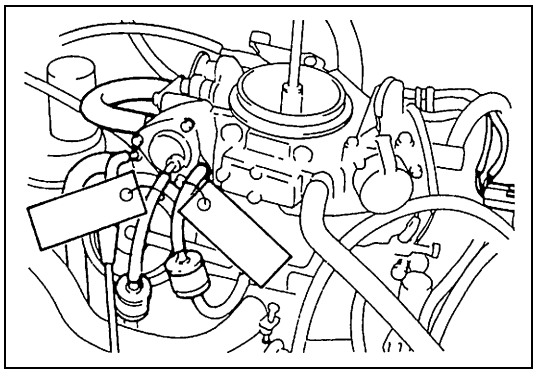

- Make sure that all parts used in reassembly are perfectly clean.
- When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.

"A": Sealant 99000-31150

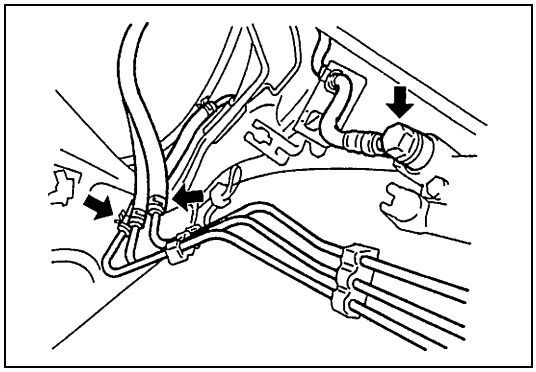



- Be sure to use special tools when instructed.

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

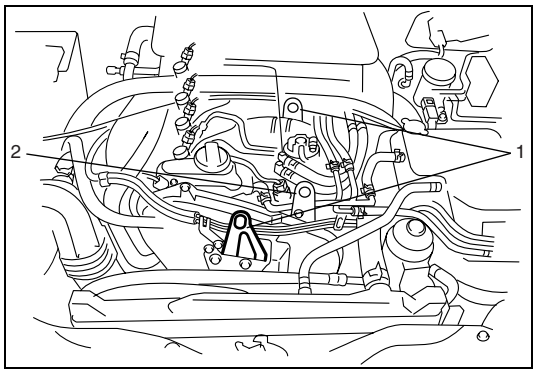


- **When disconnecting vacuum hoses, attach a tag describing the correct installation positions so that the hoses can be reinstalled correctly.**



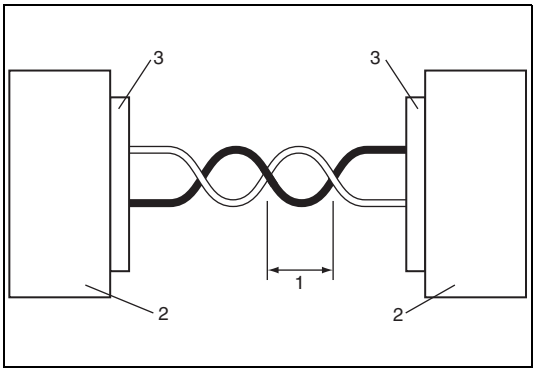
- **After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.**

- **For vehicles equipped with gasoline 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 the fuel line between the fuel pump and injector within 30 sec. after engine stop, or fuel can be sprayed out under pressure.**



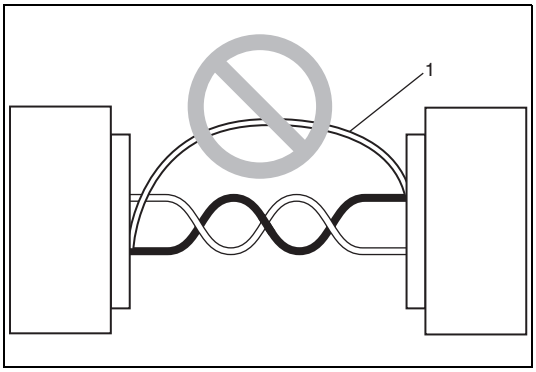

- **Be sure to use engine hooks (1) for hanging RHW engine. Never use engine hook (2) for this purpose. This prohibited service may damage fuel line.**

## Precaution for CAN Communication System




- 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 line discrimination. Excessive loosed lines may be influenced by the electric noise.

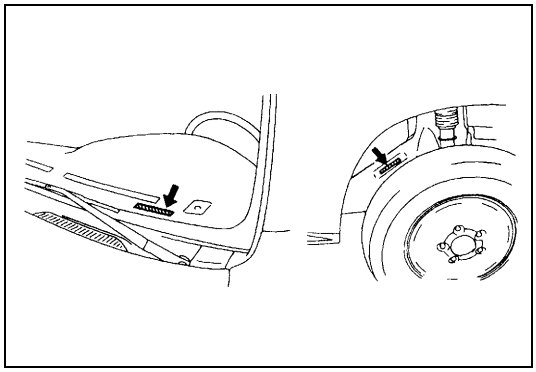
| |
|---|
| 2. Controller |




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

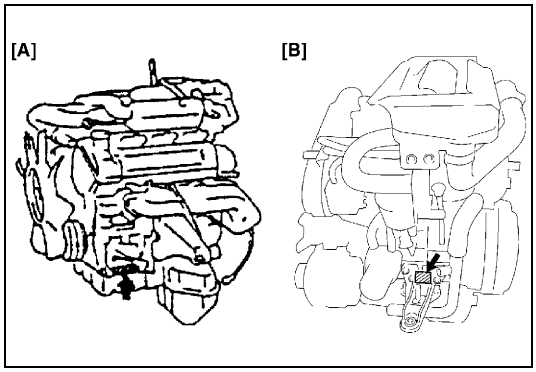
# Identification Information

## Vehicle Identification Number



The number is punched on the chassis inside the tire housing on the right front side and it is also on the left side of instrument panel depending on the vehicle specification.

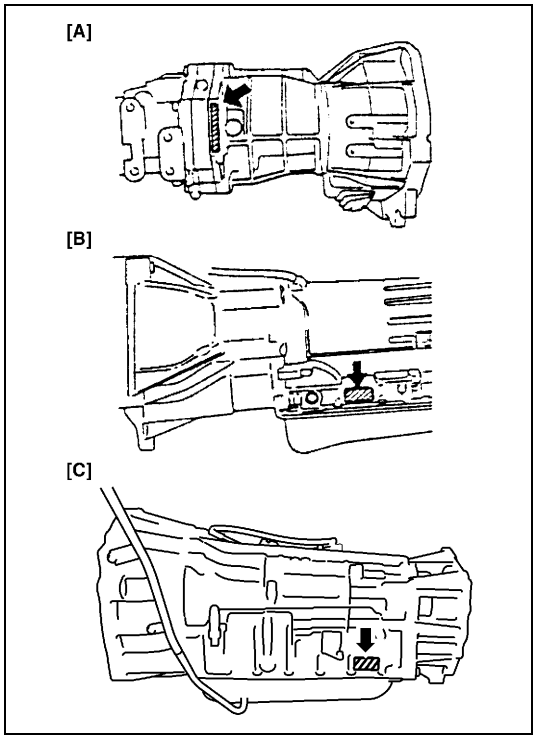
## Engine Identification Number




The number is punched on the cylinder block.

| |
|---|
| [A]: H27 engine |
| [B]: RHW engine |

## Transmission Identification Number




The number is located on the transmission case as shown.

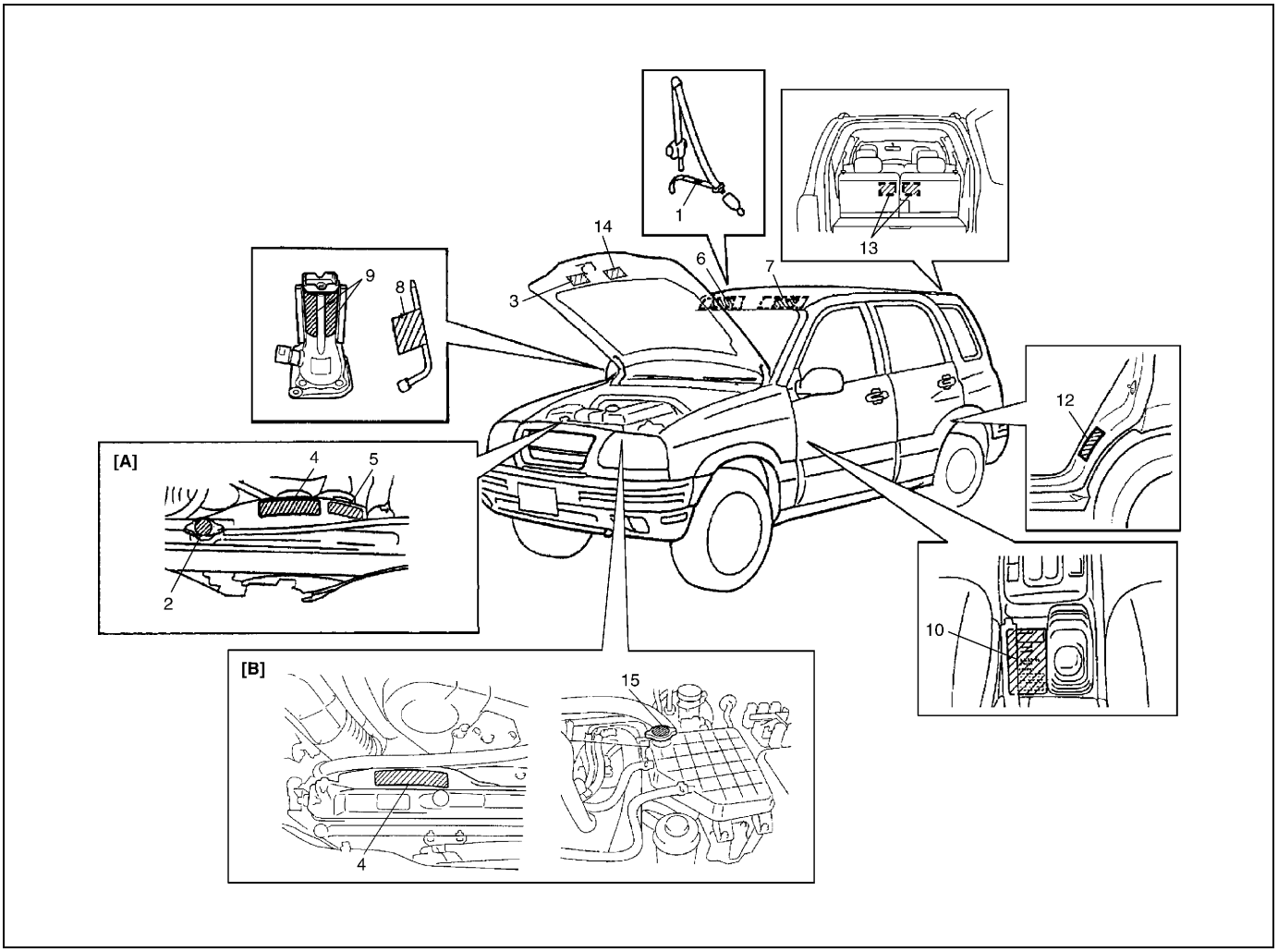
| |
|---|
| [A]: M/T |
| [B]: 4 A/T |
| [C]: 5 A/T |

# Warning, Caution and Information Labels

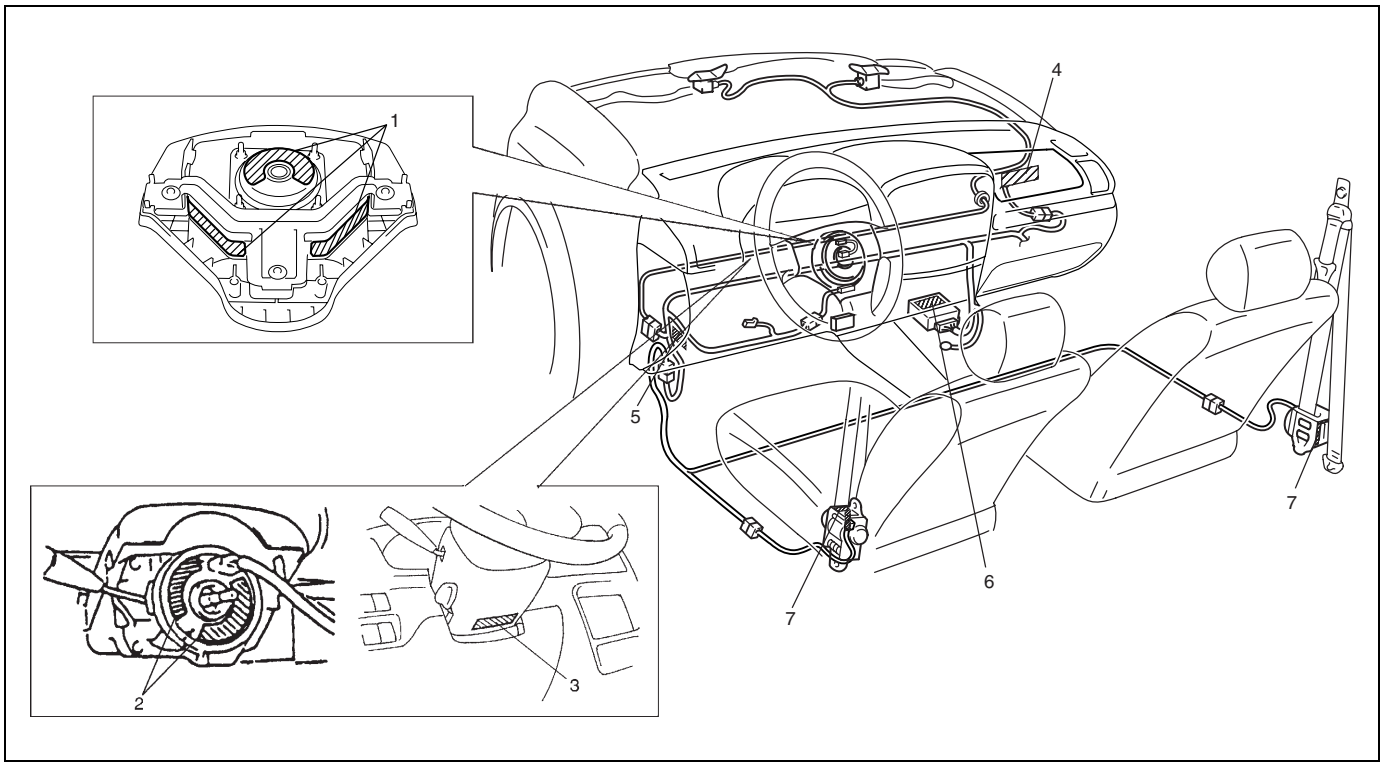
The figure below shows main labels among others that are attached to vehicle component parts.
When servicing and handling parts, refer to WARNING/CAUTION instructions printed on labels.
If any WARNING/CAUTION label is found stained or damaged, clean or replace it as necessary.

**NOTE:**

**Air bag CAUTION/WARNING labels are attached on the vehicle equipped with air bag system only.**




| | | |
|---|---|---|
| [A]: H27 engine | 5. A/C labels | 11. Blank |
| [B]: RHW engine | 6. Air bag label on sun visor | 12. Seat label (Both RH and LH) |
| 1. Passenger seat belt label | 7. Air bag label and utility vehicle label on sun visor | 13. Seat labels (3rd row seat) |
| 2. Radiator cap label | 8. Jacking instructions | 14. Smoke level label (RHW engine) |
| 3. Air bag label (if equipped) | 9. Jacking instruction label | 15. Degassing tank cap (radiator cap) label |
| 4. Radiator cooling fan label | 10. Transfer label (if equipped) | |

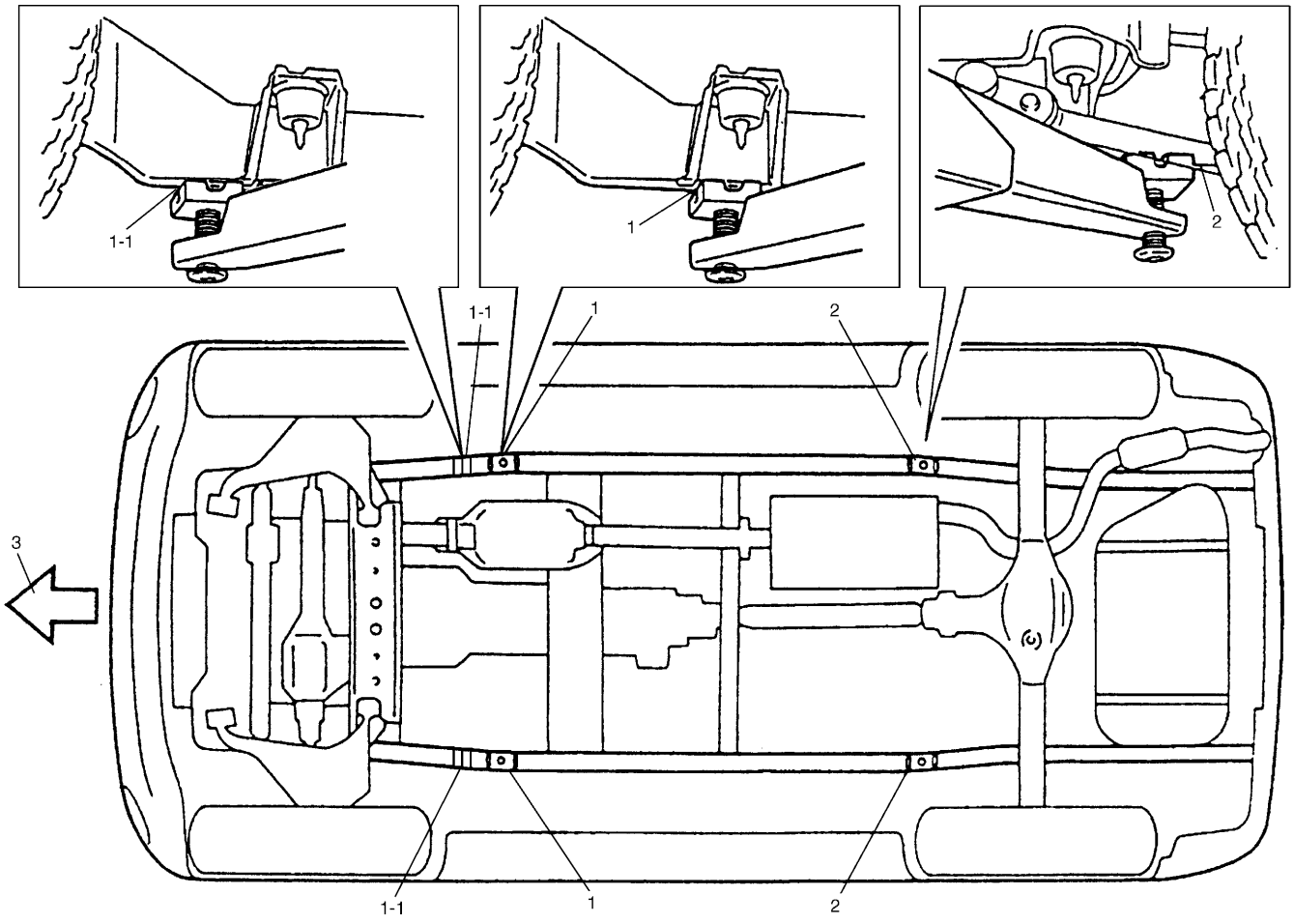



| | |
|---|---|
| 1. Air bag label on driver air bag (inflator) module | 5. Air bag label on wire harness |
| 2. Air bag label on combination switch and contact coil assembly | 6. Air bag label on SDM |
| 3. Air bag label on steering column cover | 7. Pretensioner label on seat belt pretensioner (if equipped) |
| 4. Air bag label on passenger air bag (inflator) module | |

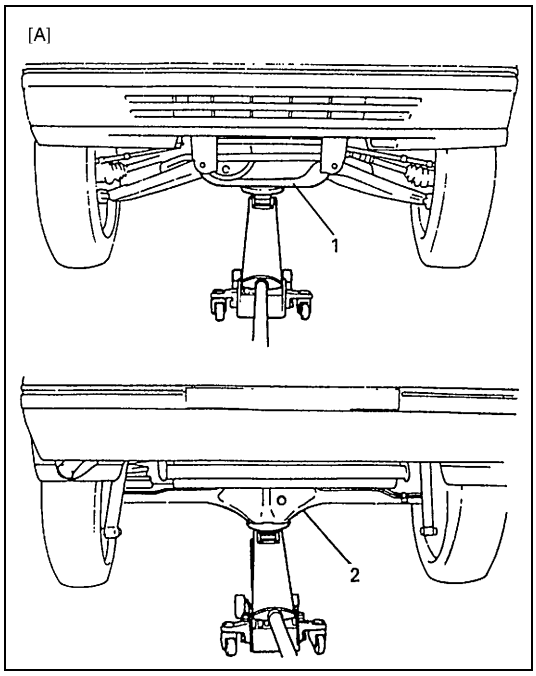
# Vehicle Lifting Points

**WARNING:**

- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending of 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.**




| | |
|---|---|
| [A]: When using frame contact hoist | 2. Rear lifting point |
| 1. Front lifting point (Type A of H27 engine model) | 3. Front |
| 1-1. Front lifting point (RHW engine model and type B of H27 engine model) | |

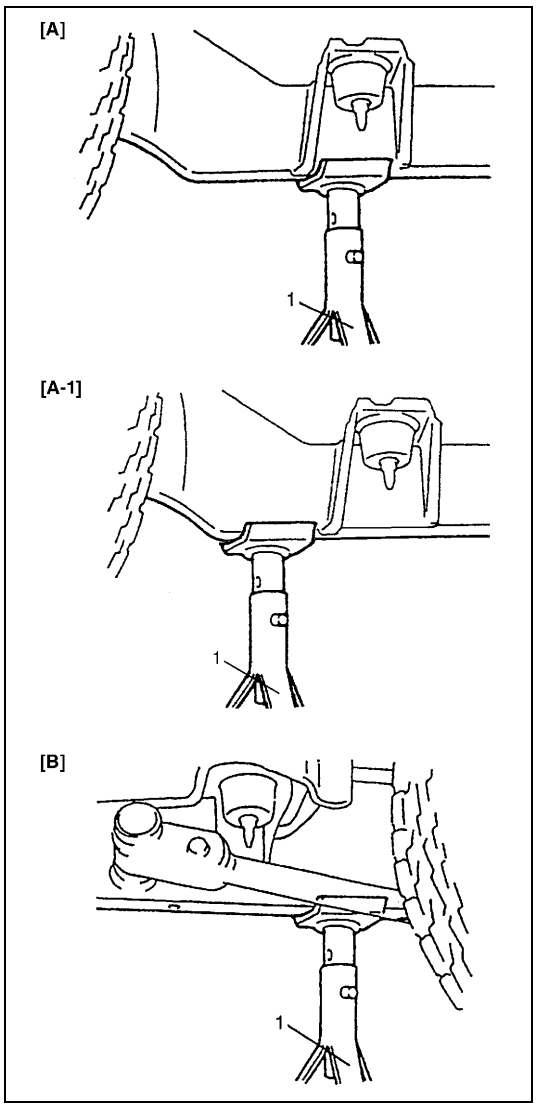



In raising front or rear vehicle end off the floor by jacking, be sure to put the jack against the center portion of the front suspension frame or rear axle housing.

**WARNING:**

- **Never apply jack against suspension parts (i.e., stabilizer, etc.) or vehicle floor, or it may get deformed.**
- **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.**

| |
|---|
| [A]: When using floor jack |
| 1. Front suspension frame |
| 2. Rear axle housing |




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

| |
|---|
| [A]: Front (Type A of H27 engine model) |
| [A-1]: Front (RHW engine model and type B of H27 engine model) |
| [B]: Rear |
| 1. Safety stands |

# Abbreviations May Be Used in This Manual

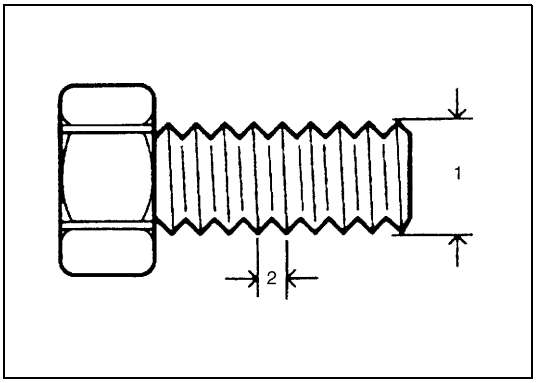
| | | |
|---|---|---|
| A | ABS | Anti-lock Brake System |
| | ABDC | After Bottom Dead Center |
| | AC | Alternating Current |
| | A/C | Air Conditioning |
| | A-ELR | Automatic-Emergency Locking Retractor |
| | A/F | Air Fuel Mixture Ratio |
| | ALR | Automatic Locking Retractor |
| | API | American Petroleum Institute |
| | A/T | Automatic Transmission |
| | ATDC | After Top Dead Center |
| | ATF | Automatic Transmission Fluid |
| B | B+ | Battery Positive Voltage |
| | BBDC | Before Bottom Dead Center |
| | BCM | Body Electrrical Control Module |
| | BTDC | Before Top Dead Center |
| C | CAN | Controller Area Network |
| | CKT | Circuit |
| | CKP | Crankshaft Position |
| | CMP Sensor | Camshaft Position Sensor (Crank Angle Sensor, CAS) |
| | 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 |
| | DRL | Daytime Running Light |
| | DTC | Diagnostic Trouble Code (Diagnostic Code) |
| E | EBCM | Electronic Brake Control Module, ABS Control Module |
| | EBD | Electric 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) |
| | ELR | Emergency Locking Retractor |
| | EPS | Electronic Power Steering |
| | EVAP | Evaporative Emission |
| | EVAP Canister | Evaporative Emission Canister (Charcoal Canister) |
| F | 4WD | 4 Wheel Drive |
| G | GEN | Generator |
| | GND | Ground |
| H | HC | Hydrocarbons |
| | HO2S | Heated Oxygen Sensor |
| | HVAC | Heating, Ventilating and Air Conditioning |
| 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 (Motor) |
| L | LH | Left Hand |
| | 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) |
| | MIL | Malfunction Indicator Lamp (“CHECK ENGINE” Light) |
| | Min | Minimum |
| | M/T | Manual Transmission |
| 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 |

| | | |
|---|---|---|
| **P** | PNP | Park/Neutral Position |
| | P/S | Power Steering |
| | PSP Switch | Power Steering Pressure Switch (P/S Pressure Switch) |
| **R** | RH | Right Hand |
| **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 |
| | 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 |
| **W** | WU-OC | Warm Up Oxidation Catalytic Converter |
| | WU-TWC | Warm Up Three Way Catalytic Converter |

# Metric Information

## Metric Fasteners

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




**CAUTION:**

**Note that both ISO and JIS type bolts and nuts are used for the RHW engine assembly and related parts. Even when the diameter (1) of the thread is the same, its pitch (2) may vary between these two types. Installing a mismatched bolt or nut will cause damage to the thread. As the first step, make sure to tighten it by hand temporarily and if it feels tight, check the thread pitch for correct matching.**

# SECTION 0B



# MAINTENANCE AND LUBRICATION

**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.**
- **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).**

**NOTE:**

- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **For distinction between type A and B of H27 engine model described in this section, refer to "FOREWORD" of this manual.**

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Brake lever and cable ..... *

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# Maintenance Schedule

## Maintenance Schedule under Normal Driving Conditions

**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.**

**H27 Engine Model**

| Interval | | Km (× 1,000) | | 15 | 30 | 45 | 60 | 75 | 90 |
|---|---|---|---|---|---|---|---|---|---|
| | | Miles (× 1,000) | | 9 | 18 | 27 | 36 | 45 | 54 |
| | | Months | | 12 | 24 | 36 | 48 | 60 | 72 |
| **ENGINE** | | | | | | | | | |
| Accessory drive belt | | | | – | – | I | – | – | R |
| Engine oil and oil filter | | | | R | R | R | R | R | R |
| Engine coolant | | | | – | – | R | – | – | R |
| Exhaust system | | | | – | I | – | I | – | I |
| **IGNITION SYSTEM** | | | | | | | | | |
| ✱Spark plugs | When unleaded fuel is used | Vehicle without HO2S | Nickel plug | – | R | – | R | – | R |
| | | | Iridium plug | – | – | – | R | – | – |
| | | Vehicle with HO2S | Nickel plug | – | – | R | – | – | R |
| | | | Iridium plug | Replace every 105,000 km, 63,000 miles or 84 months | | | | | |
| | When leaded fuel is used, refer to “Maintenance Recommended Under Severe Driving Conditions” in this section. | | | | | | | | |
| **FUEL SYSTEM** | | | | | | | | | |
| Air cleaner filter | | | Paved-road | I | I | R | I | I | R |
| | | | Dusty condition | Refer to “Maintenance Recommended under Severe Driving Conditions” in this section. | | | | | |
| Fuel lines and connections | | | | – | I | – | I | – | I |
| Fuel filter | | | | Replace every 105,000 km or 63,000 miles | | | | | |
| Fuel tank | | | | – | – | I | – | – | I |
| **EMISSION CONTROL SYSTEM** | | | | | | | | | |
| Crankcase ventilation hoses and connections (Vehicle without HO2S) | | | | – | – | I | – | – | I |
| ✱PCV valve | | Vehicle without HO2S | | – | – | I | – | – | I |
| | | Vehicle with HO2S | | – | – | – | – | – | I |
| ✱Fuel evaporative emission control system | | Vehicle without HO2S | | – | I | – | I | – | I |
| | | Vehicle with HO2S | | – | – | – | – | – | I |

**NOTE:**

- **“R”: Replace or change**
- **“I”: Inspect and correct, replace or lubricate if necessary**
- **For Sweden, items with asterisk (✱) should be performed by odometer reading only.**
- **For spark plugs, replace every 50,000 km if the local law requires.**
- **Nickel spark plug: BKR6E-11 or K20PR-U11**
- **Iridium spark plug: IFR6J11 (Type B of H27 engine model) or IFR5J11/SK16PR11 (Type A of H27 engine model)**

## RHW Engine Model

| Interval | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Km | (× 1,000) | 15 | 30 | 45 | 60 | 75 | 90 |
| | Miles | (× 1,000) | 9 | 18 | 27 | 36 | 45 | 54 |
| | Months | | 12 | 24 | 36 | 48 | 60 | 72 |
| **ENGINE** | | | | | | | | |
| Accessory drive belt | | | – | – | I | – | – | R |
| Camshaft timing belt | | | Replace every 150,000 km (90,000 miles). | | | | | |
| Engine oil and oil filter | | | Replace every 20,000 km (12,000 miles) or 16 months. | | | | | |
| Engine coolant | | | – | – | R | – | – | R |
| Exhaust system | | | – | I | – | I | – | I |
| Heater (Glow) plugs | | | Inspect every 120,000 km (72,000 miles) or 96 months. | | | | | |
| **FUEL SYSTEM** | | | | | | | | |
| Air cleaner filter | | | I | I | R | I | I | R |
| Fuel lines | | | – | I | – | I | – | I |
| Fuel filter | | | Replace every 60,000 km (36,000 miles). | | | | | |
| | | | Drain water every 20,000 km (12,000 miles). | | | | | |
| Fuel tank | | | – | – | I | – | – | I |

### H27 and RHW Engine Models

| Interval | | | 15 | 30 | 45 | 60 | 75 | 90 |
|---|---|---|---|---|---|---|---|---|
| | Km | (× 1,000) | | | | | | |
| | Miles | (× 1,000) | 9 | 18 | 27 | 36 | 45 | 54 |
| | Months | | 12 | 24 | 36 | 48 | 60 | 72 |
| **CHASSIS AND BODY** | | | | | | | | |
| Clutch (fluid level) | | | – | I | – | I | – | I |
| Brake discs and pads (thickness, wear, damage) | | | I | I | I | I | I | I |
| Brake drums and shoes (wear, damage) | | | – | I | – | I | – | I |
| Brake hoses and pipes (leakage, damage, clamp) | | | – | I | – | I | – | I |
| Brake fluid | | | – | R | – | R | – | R |
| Brake lever and cable (damage, stroke, operation) | | | Inspect at first 15,000 km (9,000 miles) only | | | | | |
| Tires (wear, damage, rotation) | | | I | I | I | I | I | I |
| Wheel discs (damage) | | | I | I | I | I | I | I |
| Suspension system (tighteness, damage, rattle, breakage) | | | – | I | – | I | – | I |
| Propeller shafts and drive shafts | | | – | – | I | – | – | I |
| Manual transmission oil (leakage, level) (I: 1st 15,000 km only) | | | I | – | R | – | – | R |
| Automatic transmission | Fluid level | | – | I | – | I | – | I |
| | Fluid change | | Replace every 165,000 km (99,000 miles) | | | | | |
| | Fluid hose | | – | – | – | I | – | – |
| Transfer oil (leakage, level) | | | I | – | I | – | I | – |
| Differential oil (leakage, level) (R: 1st 15,000 km only) | | | R or I | – | I | – | I | – |
| Steering system (tighteness, damage, breakage, rattle) | | | – | I | – | I | – | I |
| Power steering (if equipped) | | | I | I | I | I | I | I |
| All latches, hinges and locks | | | – | I | – | I | – | I |
| Air conditioning filter (if equipped) | | | – | 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

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 given in the chart below.

**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: Town use/Towing a trailer/Sustained high speed driving/Hot climates, above 30°C (86°F)/Low quality lubricants or fuel**
- **H: Trailer towing (if admitted)**

| Severe Condition Code | Maintenance | | Maintenance Operation | Maintenance Interval |
|---|---|---|---|---|
| – B CD – – – | Accessory drive belt (V-rib belt) | | I | Every 15,000 km (9,000 miles) or 12 months |
| | | | R | Every 45,000 km (27,000 miles) or 36 months |
| A – CDE – G – | Camshaft timing belt (RHW engine) | | R | Every 120,000 km (72,000 miles) |
| A – CDEF – H | Engine oil and oil filter | H27 engine | R | Every 5,000 km (3,000 miles) or 4 months |
| A – CDE – G – | | RHW engine | R | Every 10,000 km (6,000 miles) or 8 months |
| – B– – – – – – | Exhaust pipe mountings | | I | Every 15,000 km (9,000 miles) or 12 months |
| – – C – – – – – | Air cleaner filter *1 | | I | Every 2,500 km (1,5000 miles) |
| | | | R | Every 30,000 km (18,000 miles) or 24 months |
| A B C – E F – H | Spark plugs (H27 engine) | Nickel plug | R | Every 10,000 km (6,000 miles) or 8 months |
| | | Iridium plug | R | Every 30,000 km (18,000 miles) or 24 months |
| – B – D E – – H | Propeller shafts and drive shafts | | I | Every 15,000 km (9,000 miles) or 12 months |
| – B – – E – – H | Manual transmission, transfer and differential 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 transmission fluid | | R | Every 30,000 km (18,000 miles) or 24 months |
| – B – – – – – – | Suspension bolts and nuts | | T | Every 15,000 km (9,000 miles) or 12 months |
| – B C D – – – H | Wheel bearing | | I | Every 15,000 km (9,000 miles) or 12 months |

| | | | |
|---|---|---|---|
| – – CD – – – – | Air conditioning filter *2 (if equipped) | 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, replace or lubricate if necessary**
**"R": Replace or change**
**"T": Tighten to the specified torque**
***1: Inspect or replace more frequently if necessary.**
***2: Clean or replace more frequently if the air from the air conditioning decreases.**

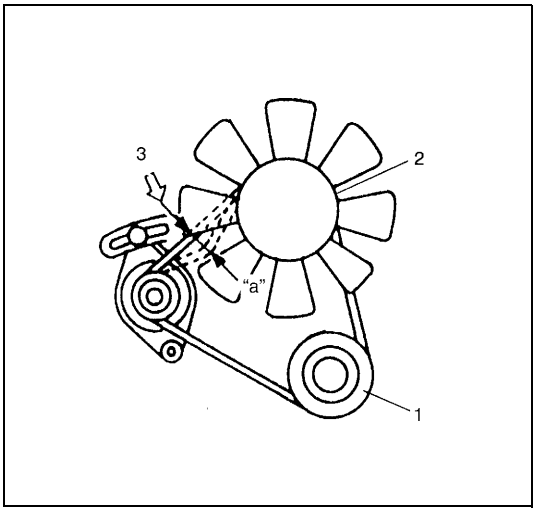
# Maintenance Service

## Engine (H27 Engine)

### Accessory drive belt (H27 Engine)

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

#### Water Pump and Generator Drive Belt Inspection




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": 9 – 11 mm (0.35 – 0.43 in.) deflection under 100 N, 10 kg or 22 lb pressure**

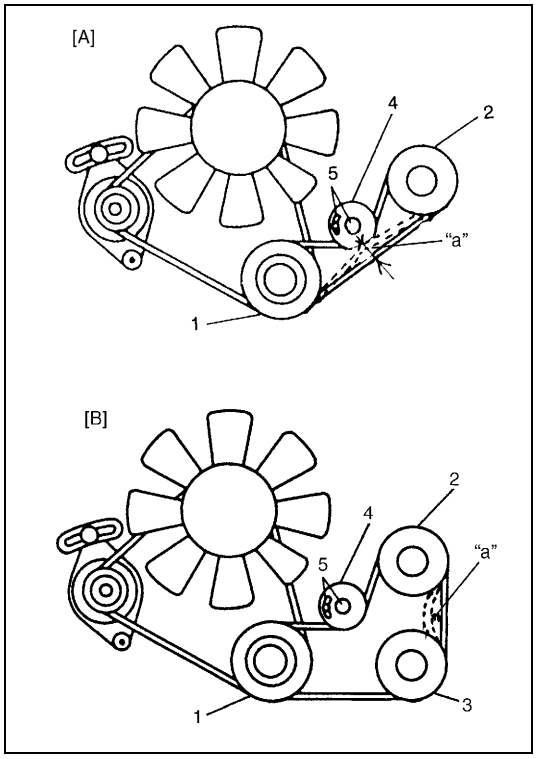
   **NOTE:**
   **When replacing belt with a new one, adjust belt tension to 7 – 9 mm (0.28 – 0.35 in.)**

| | |
|---|---|
| 1. | Crankshaft pulley |
| 2. | Water pump pulley |
| 3. | 100 N, 10 kg or 22 lb |

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

#### Water Pump and Generator Drive Belt Replacement

Replace belt. Refer to "Cooling Fan Belt" in Section 6B for replacement procedure of pump belt.




### Power Steering Pump and/or A/C Compressor Drive Belts (If Equipped) Inspection

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 above specification, adjust it referring to "Power Steering Pump Drive Belt" in Section 3B1.

**Power steering pump and/or A/C compressor drive belt tension**
**"a": 4 – 7 mm (0.16 – 0.28 in.) deflection under 100 N (10 kg, 22 lb) pressure**

| |
|---|
| [A]: H27 engine with P/S system |
| [B]: H27 engine with P/S and A/C system |
| 1. Crankshaft pulley |
| 2. P/S pump pulley |
| 3. A/C compressor pulley (if equipped) |
| 4. Tension pulley |
| 5. Tension pulley bolts |

3) Connect negative (–) cable to battery.

### Power Steering Pump and/or A/C Compressor Drive Belts (If Equipped) Replacement

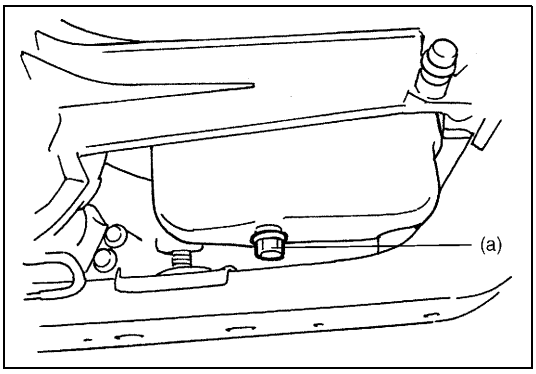
Replace belt referring to "Power Steering Pump Drive Belt" in Section 3B1 for replacement procedure of belt.

## Engine oil and filter (H27 Engine)

### Replacement

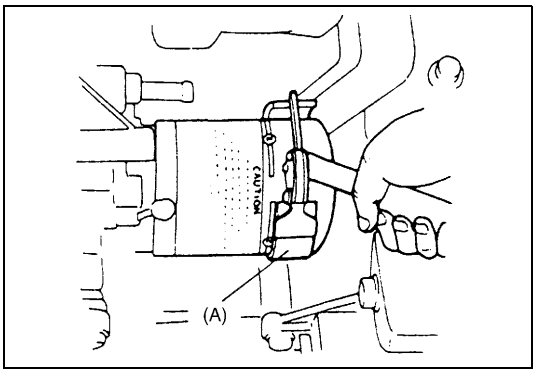
**WARNING:**
- **New and used engine oil can be hazardous. Be sure to read "WARNING" in General Precaution in Section 0A and observe what in written there.**
- **Step 1) – 7) outlined below must be performed with ENGINE NOT RUNNING. For step 8), be sure to have adequate ventilation while engine is running.**

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.



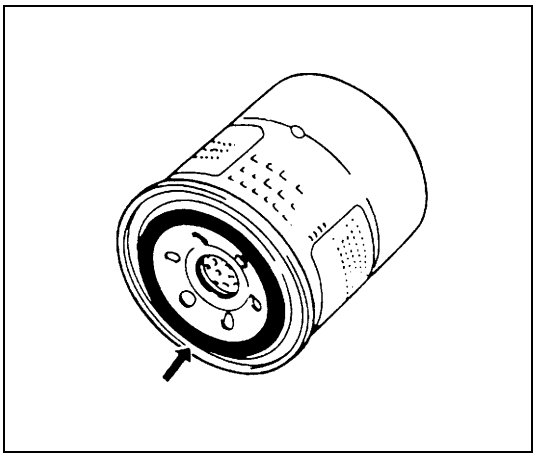

1) Drain engine oil by removing drain plug.
2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

**Tightening torque**
**Engine oil drain plug (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**




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

**Special tool**
**(A): 09915-47310**



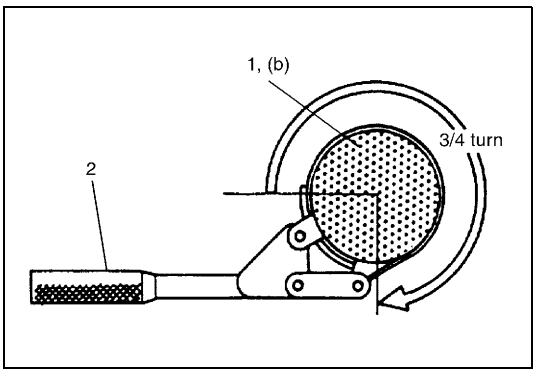
**NOTE:**

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

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

**CAUTION:**

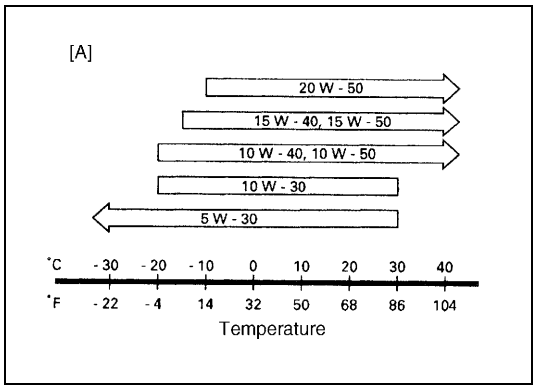
**To tighten oil filter properly, it is important to accurately identify the position at which filter O-ring first contacts the mounting surface.**




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

**Tightening torque**
**Oil filter (b): 14 N·m (1.4 kg-m, 10.5 lb-ft) (For reference)**

| | |
|---|---|
| 1. | Oil filter |
| 2. | Oil filter wrench |




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 or SL grade.

**NOTE:**
**Select the appropriate oil viscosity according to the proper engine oil viscosity chart [A].**

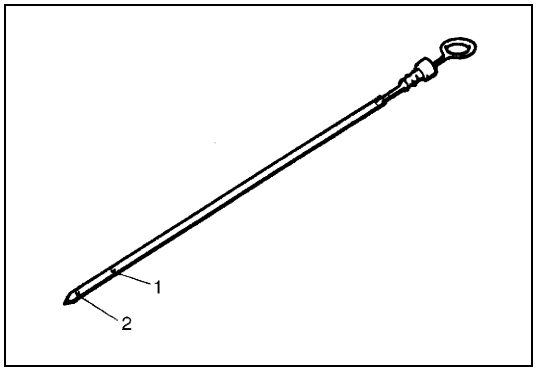
| [A]: Proper engine oil viscosity chart |
|---|

**Engine oil specification:**

| | | H27 engine |
|---|---|---|
| Oil pan capacity | liters (US/Imp pt.) | About 5.0 (10.6/8.8) |
| Oil filter capacity | liters (US/Imp pt.) | About 0.5 (1.1/0.9) |
| Others | liters (US/Imp pt.) | About 0.7 (1.5/1.2) |
| Total | liters (US/Imp pt.) | About 6.2 (13.1/10.9) |

**NOTE:**
**Engine oil capacity is specified. However, note that the amount of oil required when actually changing oil may somewhat differ from the data in the table depending on various conditions (temperature, viscosity, etc.)**

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




8) 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 on dipstick.

| 1. Full level mark (hole) |
|---|
| 2. Low level mark (hole) |

### Engine coolant (H27 Engine)

#### Change

**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.**

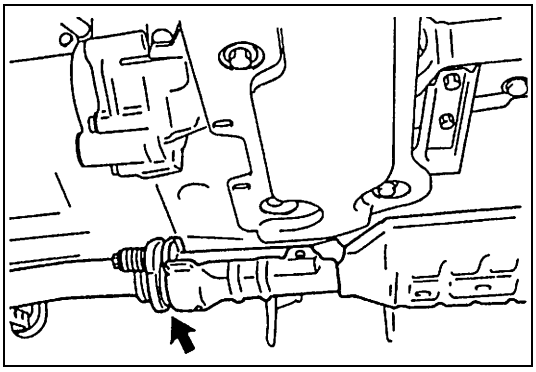
Change engine coolant with new one referring to “Cooling System Flush and Refill” in Section 6B.

### Exhaust system (H27 Engine)

#### Inspection

**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 the floor carpet.
- Any defects should be fixed at once.

## Ignition System (H27 Engine)

### Spark plugs (H27 Engine)

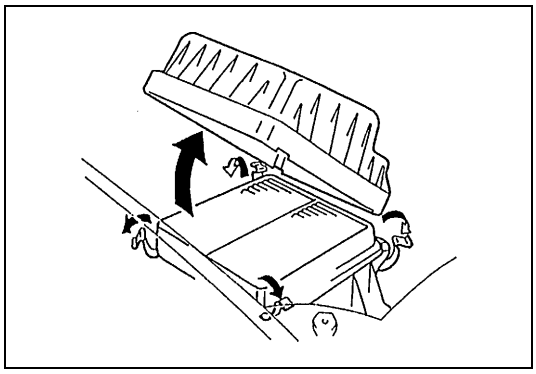
#### Replacement

Replace spark plugs with new ones referring to “Spark Plugs” in Section 6F2.

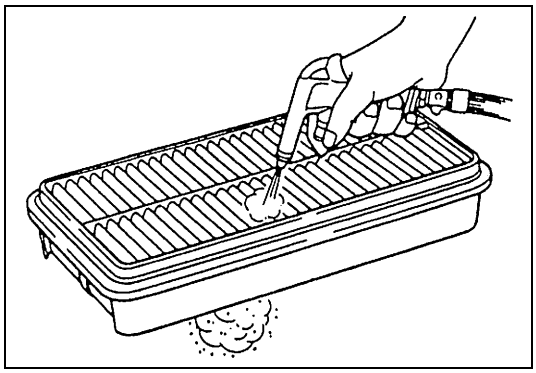
# Fuel System (H27 Engine)

## Air cleaner filter (H27 Engine)

### Inspection



1) Remove air cleaner case clamps.
2) Take cleaner filter out of air cleaner case.
3) Check air cleaner filter for dirt. Replace excessively dirty filter.



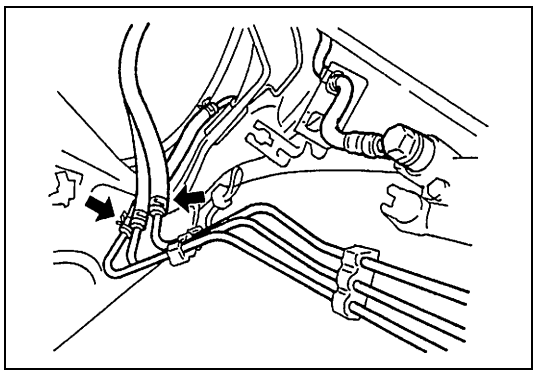
4) Blow off dust by compressed air from air outlet side of filter.
5) Install air cleaner filter into case.
6) Install air cleaner case cap and clamp it securely.

### Replacement

Replace air cleaner filter with new one according to above steps 1), 2) and 5), 6).

## Fuel lines and connections (H27 Engine)

### Inspection

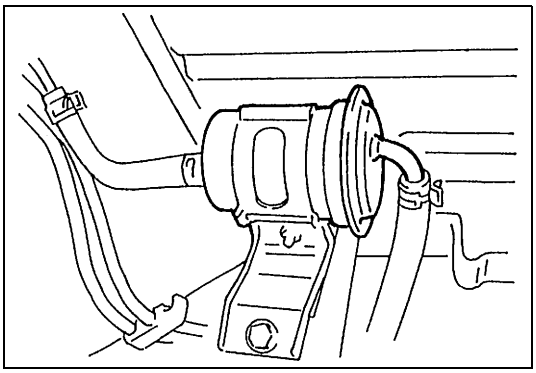


1) Visually inspect fuel lines and connections for evidence of fuel leakage, hose cracking and damage. Make sure all clamps are secure.
   Repair leaky joints, if any.
   Replace hoses that are suspected of being cracked.

### Fuel filter (H27 Engine)

#### Replacement

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



Fuel filter is located at the front part of fuel tank, inside the right-hand side of chassis.
Replace fuel filter with new one periodically, referring to Section 6C for proper procedure.

### Fuel tank (H27 Engine)

#### Inspection

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

## Emission Control System (H27 Engine)

### Crankcase ventilation hoses and connections (vehicle not equipped with oxygen sensor) (H27 Engine)

#### Inspection

Refer to the following PCV valve inspection.

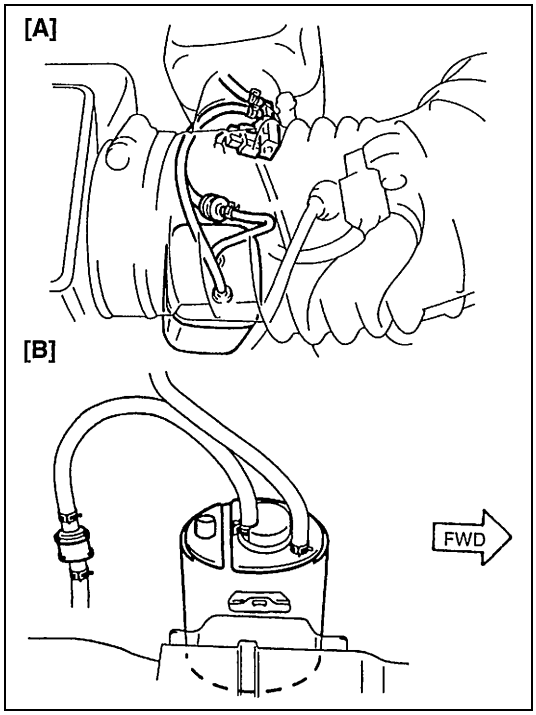
### PCV (positive crankcase ventilation) valve (H27 Engine)

#### Inspection

Check crankcase ventilation hose and PCV hose for leaks, cracks or clog, and PCV valve for stick or clog. Refer to “PCV Valve” in Section 6E2 for PCV valve checking procedure.

## Fuel evaporative emission control system (H27 Engine)

### Inspection




Visually inspect hoses for cracks, damage, or excessive bends.

1) Inspect all clamps for damage and proper position.
2) Check EVAP canister for operation and clog, referring to "EVAP Canister Inspection" in Section 6E2.
   If a malfunction is found, repair or replace.

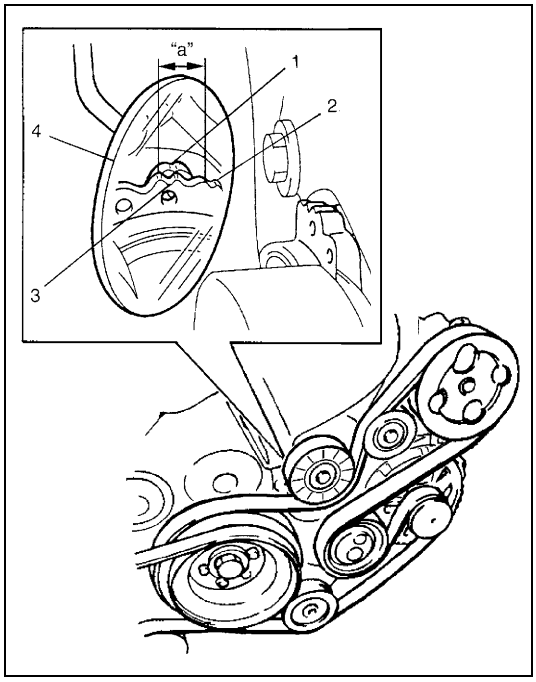
| |
|---|
| [A]: Type 1 |
| [B]: Type 2 |

# Engine (RHW Engine)

## Accessory drive belt (RHW Engine)

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

### Generator Drive Belt Inspection



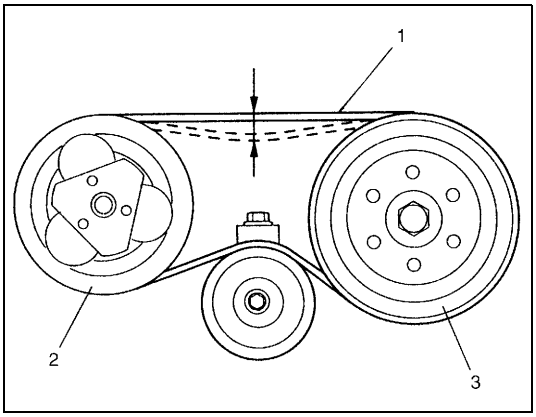

1) Disconnect negative cable at battery.
2) Inspect belt for cracks, cuts, deformation, wear and cleanliness using mirror under enough lighting.
   If any defect exists, replace.
3) Check that belt wear check mark (1) (tension indicator) is within range "a" using mirror (4) under enough lighting.
   If wear check mark (1) is aligned with maximum wear mark (2) or out of range "a" passing mark (2), replace accessory drive belt with a new one.
4) Connect negative cable to battery.

| |
|---|
| 3. Zero wear mark |

### Generator Drive Belt Replacement

Replace belt with a new one referring to “Generator Belt” in Section 6H1.

### Air Conditioning Compressor Drive Belt Inspection




Check compressor drive belt (1) for wear, cracks and tension referring to “Compressor Drive Belt” in Section 1B.
Repair or replace if any faulty condition is found.

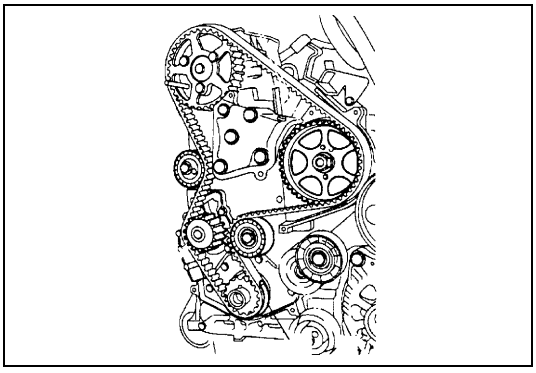
| |
|---|
| 2. Compressor |
| 3. Crankshaft pulley |

### Air Conditioning Compressor Drive Belt Replacement

Replace belt with a new one referring to “Compressor Drive Belt” in Section 1B.

## Camshaft timing belt (RHW Engine)

### Replacement

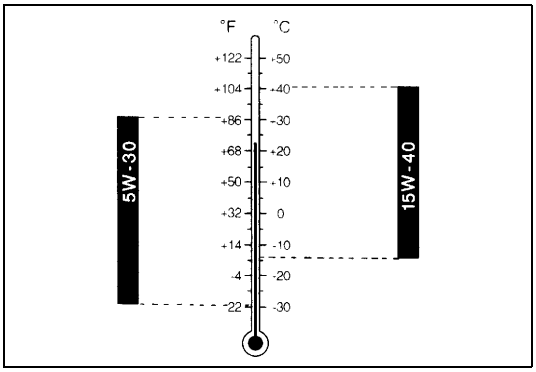


Replace belt with new one. Refer to “Timing Belt” in Section 6A3 for replacement procedure.

**CAUTION:**
- **Do not bend or twist timing belt.**
- **Do not allow timing belt to come into contact with oil, water, etc.**

## Engine oil and oil filter (RHW Engine)

### Change

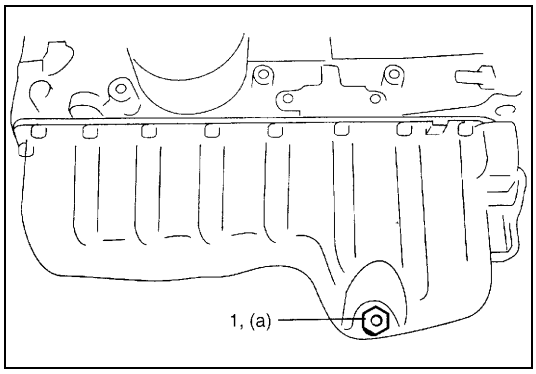



It is recommended to use the following engine oil or higher quality level oils.

**5W-30: API CF (except CF-2) or ACEA B3-98**
**15W-40: API SG/CF (except CF-2) or ACEA B2-96**

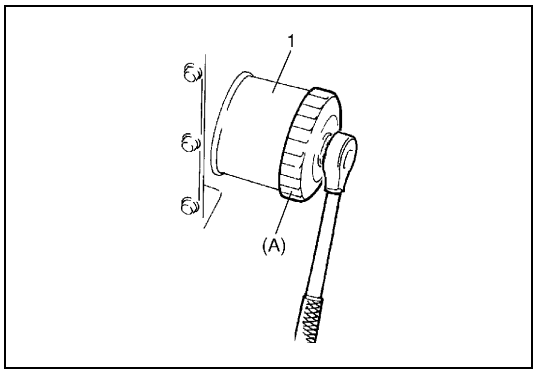
Select the appropriate oil viscosity according to the left chart.

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



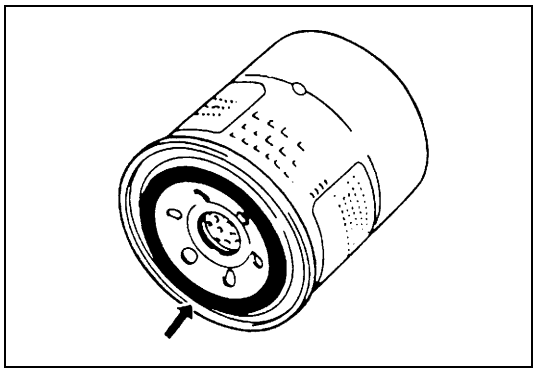

1) Remove engine under-cover and drain engine oil by removing drain plug (1).
2) After draining oil, wipe drain plug clean. Reinstall drain plug, and tighten it securely as specified below.

**Tightening torque**
**Engine oil drain plug (a): 34 N·m (3.4 kg-m, 25.0 lb-ft)**

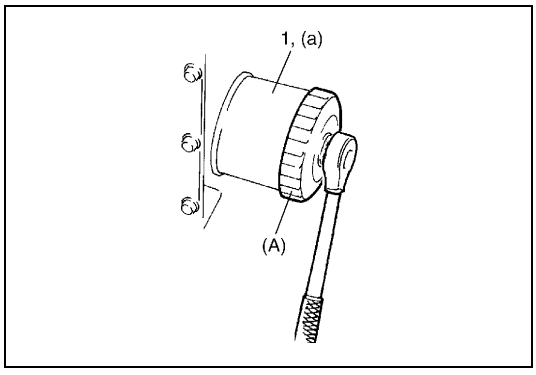



3) Loosen oil filter (1) by using oil filter wrench (Special tool).

**Special tool**
**(A): 09915-46510**



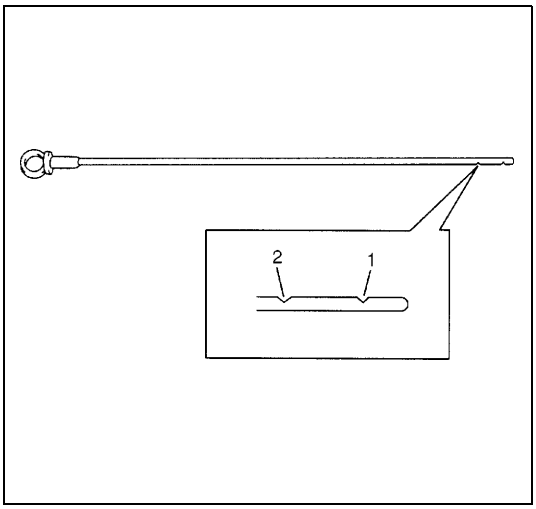
4) Apply engine oil to new oil filter O-ring.
5) Screw new filter on oil filter stand by hand.




6) Tighten filter (1) to specified torque.

**Special tool**
**(A): 09915-46510**

**Tightening torque**
**(a): 14 N·m (1.4 kg-m, 10.5 lb-ft)**




7) Replenish oil until oil level is brought to FULL level mark (2) on dipstick. (about 4.75 liters or 10.0/8.4 US/Imp pt.).

**NOTE:**

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

8) Start engine and run it for three minutes. Stop it and wait another 5 minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark (2) on dipstick.
9) Check oil filter and drain plug for oil leakage.

1. LOW level mark

## Engine coolant (RHW Engine)

### Change

**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% water and 50% ethylene-glycol base coolant (Anti-freeze/Anti-corrosion coolant) for the purpose of corrosion protection and lubrication.**

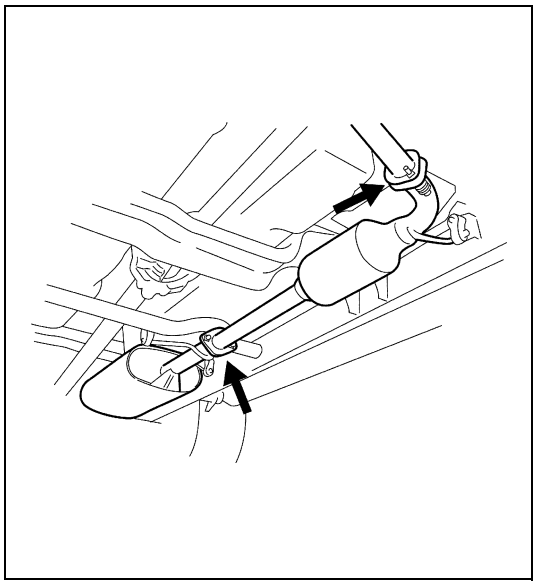
Change engine coolant with new one referring to “Cooling System Flush” in Section 6B1.

## Exhaust system (RHW Engine)

### Inspection

**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.**

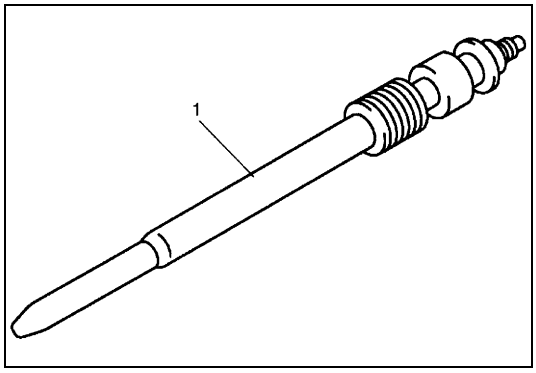


Check exhaust system as follows:

- Check rubber mountings for damage and deterioration.
- Check exhaust system for leakage, loose connections, dents, and damages.
  If bolts or nuts are loose, tighten them to specification.
  Refer to “Exhaust System Components” in Section 6K1 for torque specification of bolts and nuts.
- 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 vehicle.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to floor carpet.
- Any defects should be fixed at once.

### Heater (Glow) plugs (RHW Engine)

#### Inspection

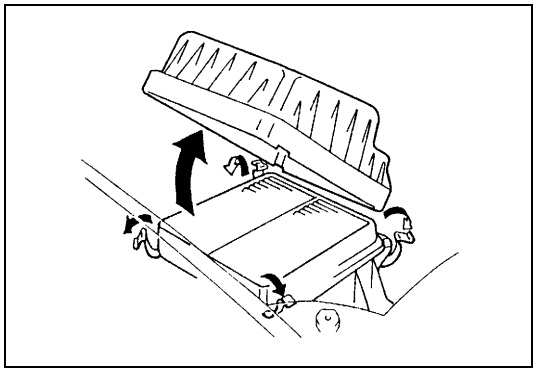



Check heater (Glow) plug (1) for external damage such as deformation, scratch, crack, etc.
If damage is found, replace.

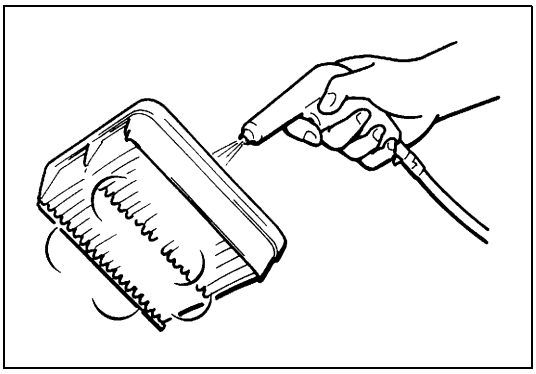
## Fuel System (RHW Engine)

### Air cleaner filter (RHW Engine)

#### Inspection



1) Unclamp air cleaner case clamps.
2) Take filter out of air cleaner case.
3) Check filter for dirt. Replace excessively dirty filter.



4) Clean filter with compressed air from air outlet side of filter (i.e., the side facing up when installed).
5) Install filter and clamp case securely.

**Replacement**

Replace air cleaner filter with new one according to above steps 1), 2) and 5).

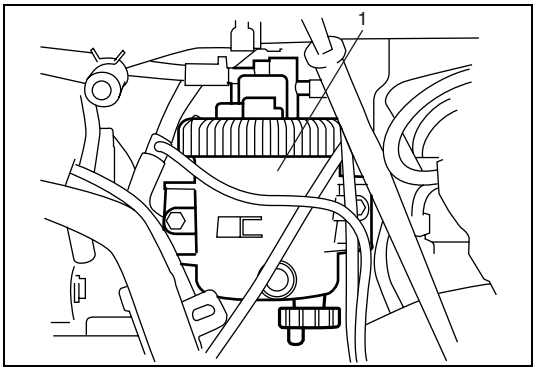
## Fuel lines and connections (RHW Engine)

**Inspection**

1) 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.

## Fuel filter (RHW Engine)

**Replacement**




**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 Filter Element” in Section 6C1.

**Water Draining of Fuel Filter**

Bleed fuel filter of water referring to “Water Draining of Fuel Filter” in Section 6C1.

## Fuel tank (RHW Engine)

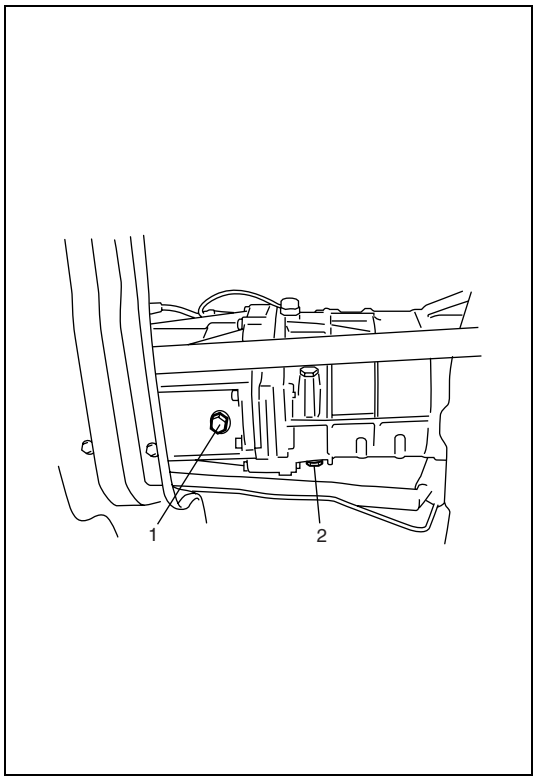
**Inspection**

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

# Chassis and Body

## Manual transmission oil

### Inspection




1) Inspect transmission 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 level plug of transmission.
4) Check oil level.
   Oil level can be checked roughly by means of 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 amount of specified oil.
5) Tighten level plug to specified torque.
   Refer to "Transmission Gear Oil" in Section 7A2 for installation and tightening torque.

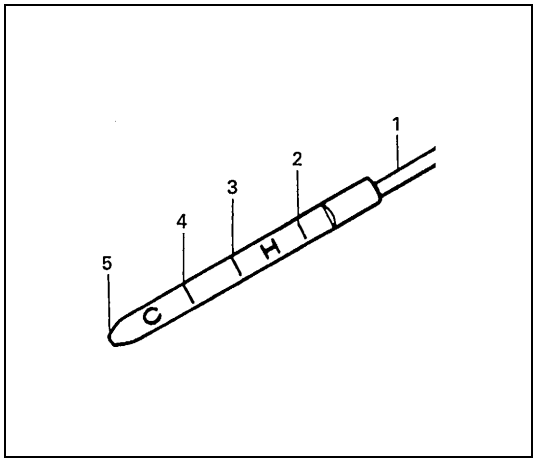
### Change

Change transmission oil with new specified oil referring to "Transmission Gear Oil" in Section 7A2.

| | |
|---|---|
| 1. | Drain plug |
| 2. | Filler/level plug |

## Automatic transmission fluid

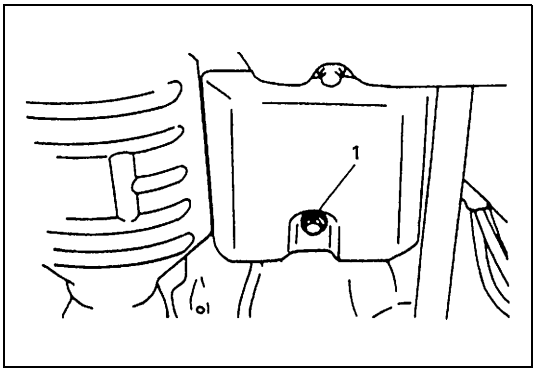
### Inspection




1) Inspect transmission case for evidence of fluid leakage.
   Repair leaky point, if any.
2) Make sure that vehicle is placed level for fluid level check.
3) Check fluid level.
   For fluid level checking procedure, refer to "Fluid Level" in Section 7B1 or 7B2 and be sure to perform it under specified conditions.
   If fluid level is low, replenish specified fluid.

| | | | |
|---|---|---|---|
| 1. | Level gauge | 4. | FULL COLD mark |
| 2. | FULL HOT mark | 5. | LOW COLD mark |
| 3. | LOW HOT mark | | |

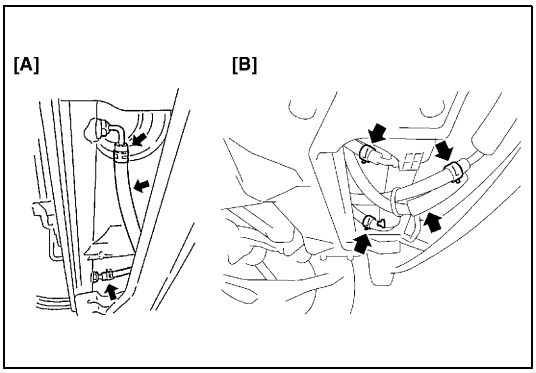
### Change




1) Inspect transmission 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 “Fluid Change” in Section 7B1 or 7B2.

| |
|---|
| 1. Drain plug |

### Fluid Cooler Hose Inspection

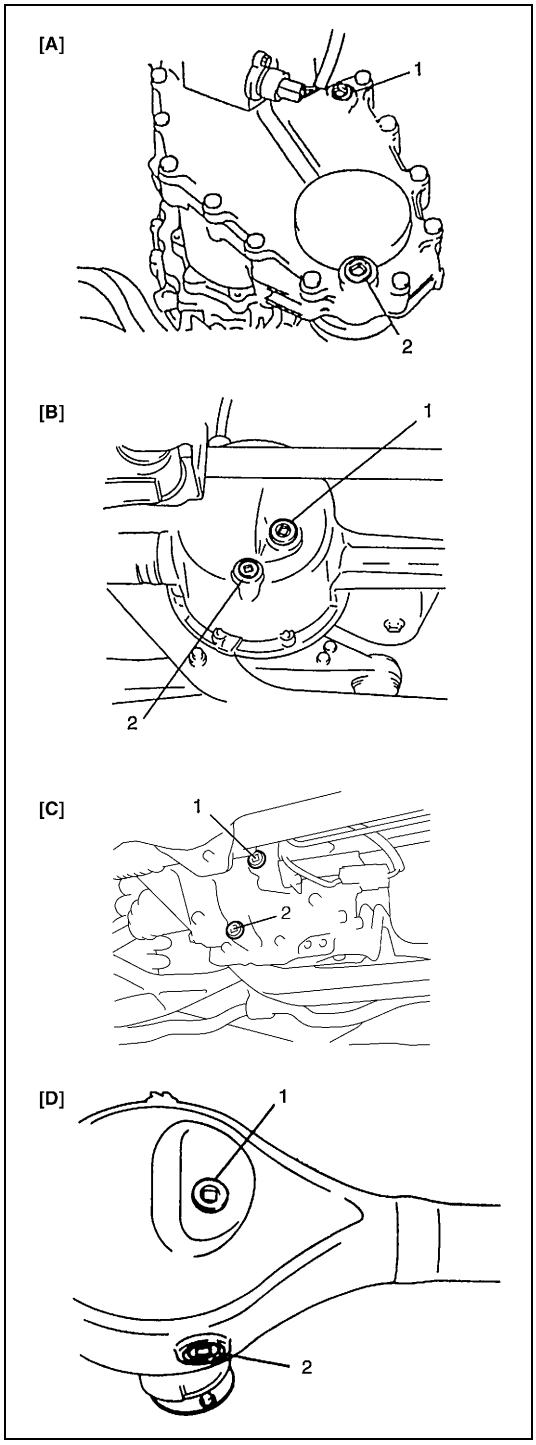



Check automatic transmission fluid cooler hose for fluid leakage, cracks, damage and deterioration.
Replace hose and/or clamp if any faulty condition is found.

| |
|---|
| [A]: 4AT |
| [B]: 5AT |

## Transfer and differential oil

### Inspection




1) Check transfer case and differential for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove level plug of transfer or differentials (front and rear) and check oil level.
   Oil level can be checked roughly by means of 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 amount of specified oil referring to “Transfer Gear Oil” in Section 7D, “Gear Oil Change” in 7E, 7E1 or 7F.

| | |
|---|---|
| [A]: | Transfer |
| [B]: | Front differential with air pump |
| [C]: | Front differential with motor |
| [D]: | Rear differential |
| 1. | Oil level/filler plug |
| 2. | Drain plug |

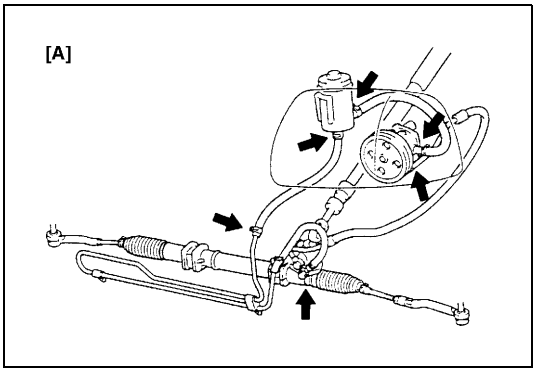
4) Tighten level plug to specified torque.
   Refer to “Transfer Gear Oil” in Section 7D, “Gear Oil Change” in 7E, 7E1 or 7F for tightening torque.

### Change

Change transfer oil or differentials oil with new specified oil referring to “Transfer Gear Oil” in Section 7D, “Gear Oil Change” in 7E, 7E1 and 7F respectively.

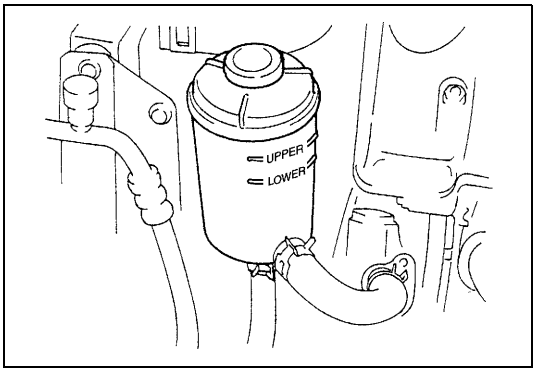
## Power steering (P/S) system (if equipped)

### Inspection




1) Visually check power steering system for fluid leakage and hose for damage and deterioration.
   Repair or replace defective parts, if any.

[A]: The figure shows left-hand steering vehicle




2) With engine stopped, check fluid level indicated on fluid tank, which should be between MAX (UPPER) and MIN (LOWER) marks. If it is lower than MIN (LOWER), fill fluid up to MAX (UPPER) mark.

**NOTE:**

- **Be sure to use the specified fluid.**
- **Fluid level should be checked when fluid is cool.**

3) Visually check pump drive belt for cracks and wear.
4) Check belt for tension, referring to “Accessory drive belt” in this section.
   If necessary, have belt adjusted or replaced.

# Recommended Fluids and Lubricants

| | |
|---|---|
| Engine oil | Refer to “Engine Oil and Oil Filter” of this section. |
| Engine coolant<br>(Ethylene glycol base coolant) | “Antifreeze/Anticorrosion coolant” |
| Brake fluid | DOT 3 |
| Manual transmission oil | Refer to “Transmission Gear Oil” in Section 7A2 or “Transfer Gear Oil” in Section 7D. |
| Transfer oil | |
| Differential oil (front & rear) | Refer to “Gear Oil Change” in Section 7E, 7E1 or 7F. |
| Automatic transmission fluid | Refer to “Fluid Change” in Section 7B1 or 7B2. |
| Power steering fluid | Refer to “Required Service Material” in Section 3B1. |
| Door hinges | Engine oil or water resistance chassis grease |
| Hood latch assembly | |
| Key lock cylinder | Spray lubricant |

# SECTION 1B

# AIR CONDITIONING (OPTIONAL)



**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" 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.**
- **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).**

**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 CFC-12 (R-12) and the other using refrigerant HFC-134a (R-134a).**
**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" in this section.**
**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.**

**NOTE:**

- **For the items with asterisk (*) the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**

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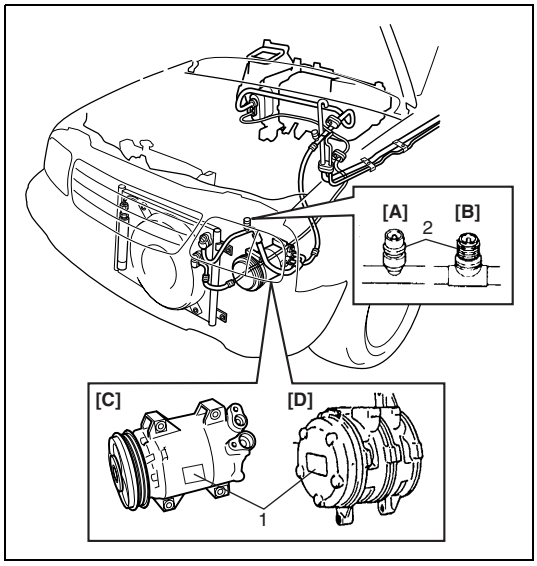
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DTC B1510 (No.10) : Engine Coolant Temperature (ECT) Sensor and Its Circuit Malfunction ..... *
DTC B1511 (No.11) : Temperature Control Actuator (Position Sensor) and Its Circuit Malfunction ..... *
DTC B1512 (No.12) : Air Flow Control Actuator (Position Sensor) and Its Circuit Malfunction..... *
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# General Description

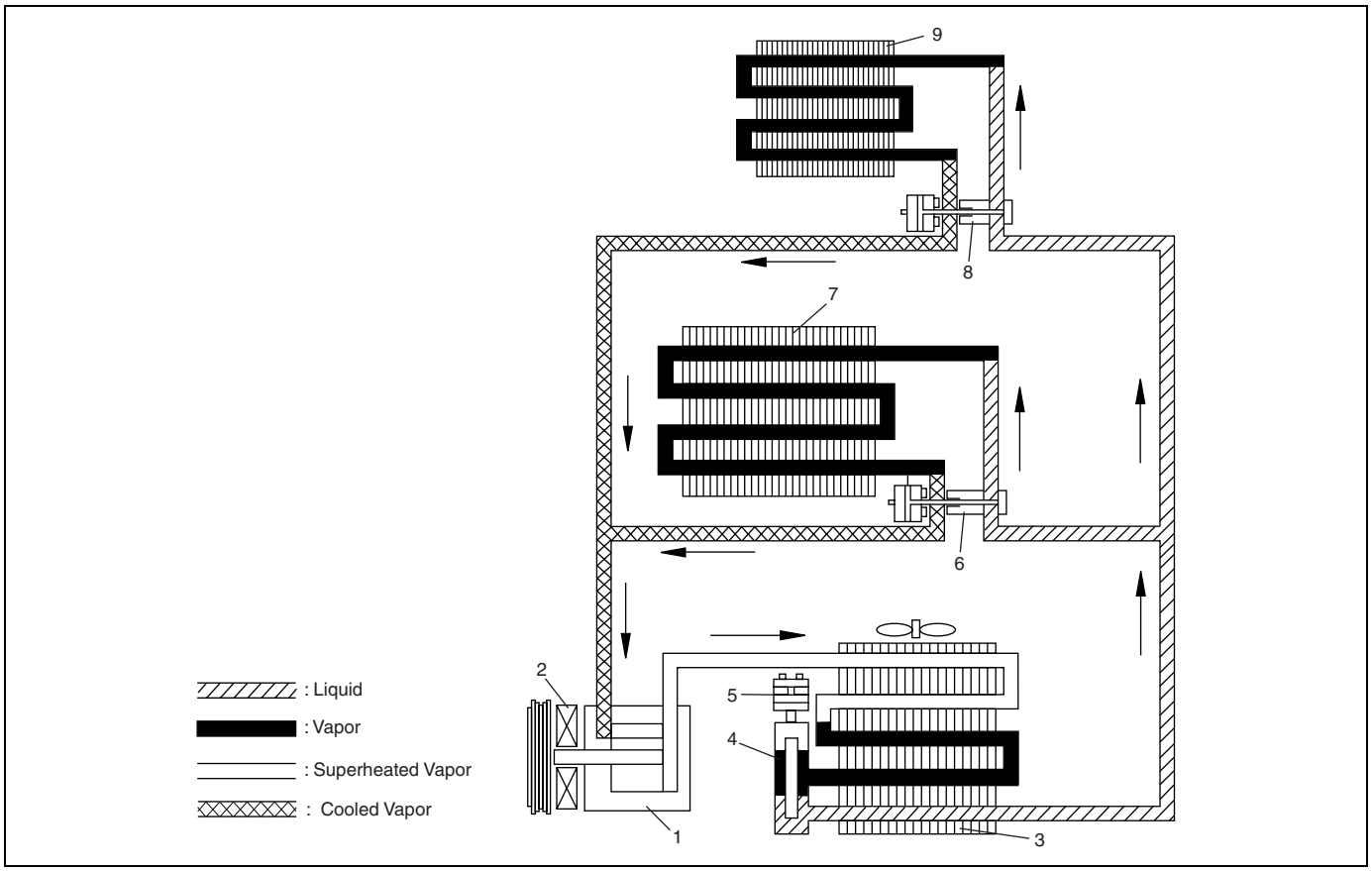
## Refrigerant Type




Whether the A/C in the vehicle being serviced uses HFC-134a (R-134a) or CFC-12 (R-12) is indicated on LABEL on the compressor. Also, it can be checked by the shape of the service (charge) valve.

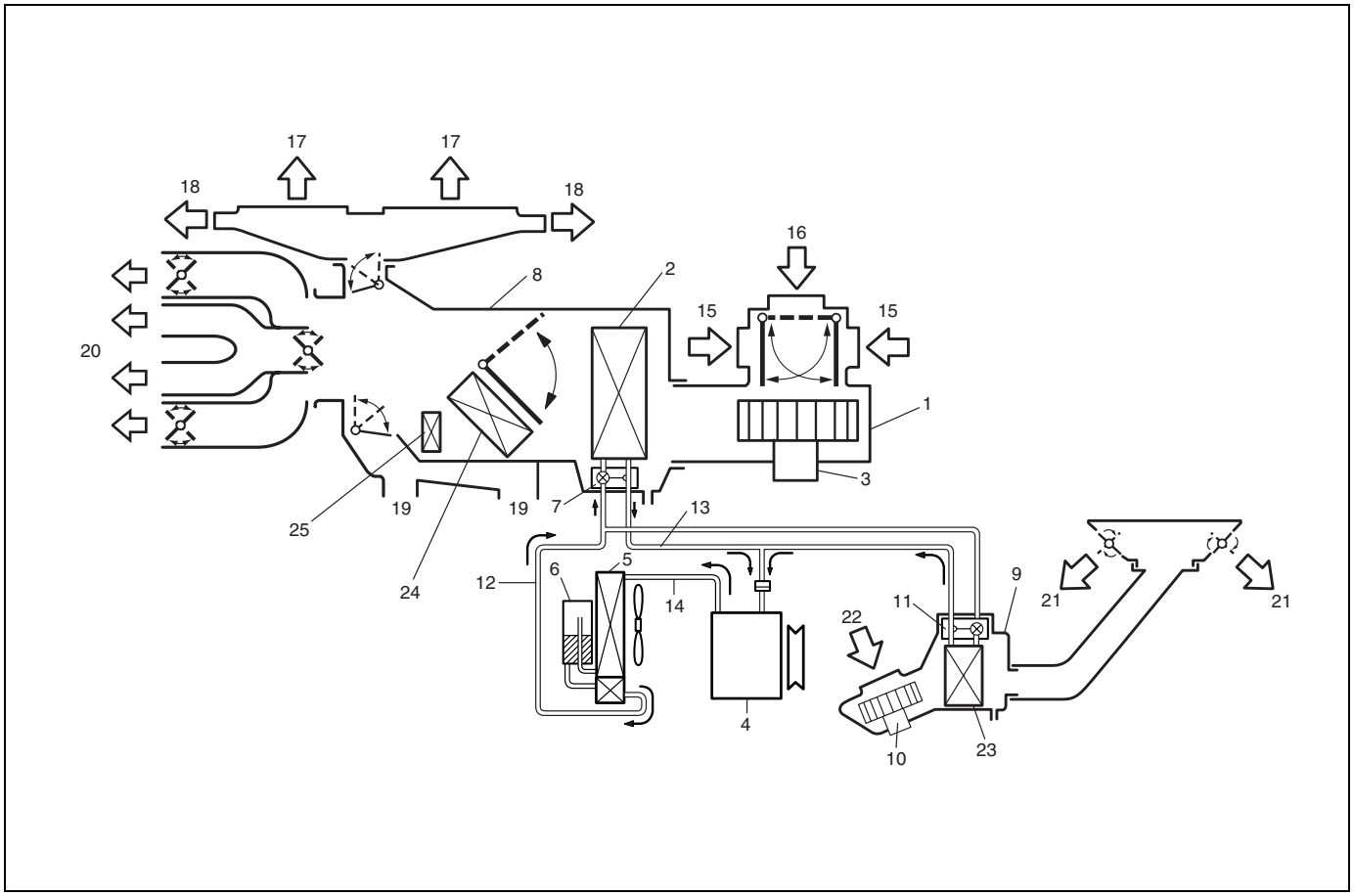
| |
|---|
| [A]: HFC-134a (R-134a) |
| [B]: CFC-12 (R-12) |
| [C]: H27 engine |
| [D]: RHW engine |
| 1. Compressor label |
| 2. Service valve |

## Refrigerant Flow of Air Conditioning System



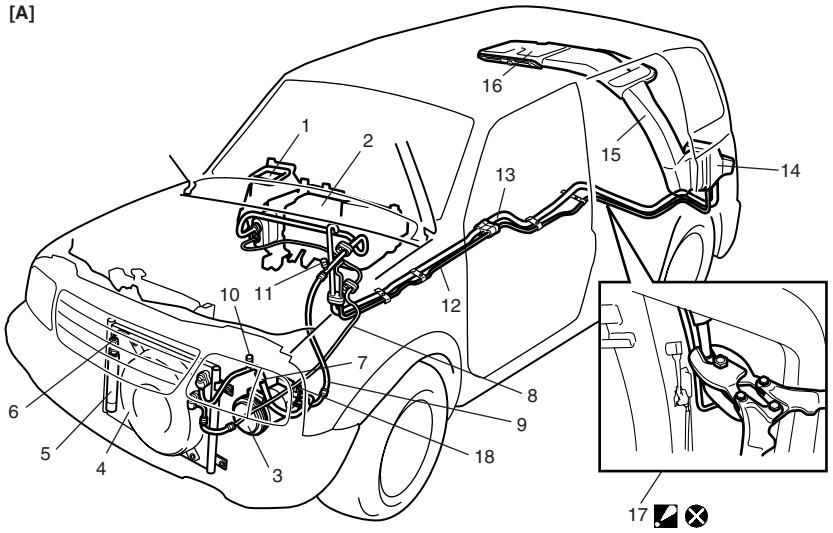

| | | | | |
|---|---|---|---|---|
| 1. Compressor | 3. Condenser assembly | 5. Pressure switch | 7. A/C evaporator | 9. Rear A/C evaporator (if equipped) |
| 2. Magnet clutch | 4. Receiver/dryer | 6. Expansion valve | 8. Rear expansion valve (if equipped) | |

# Major Components and Location

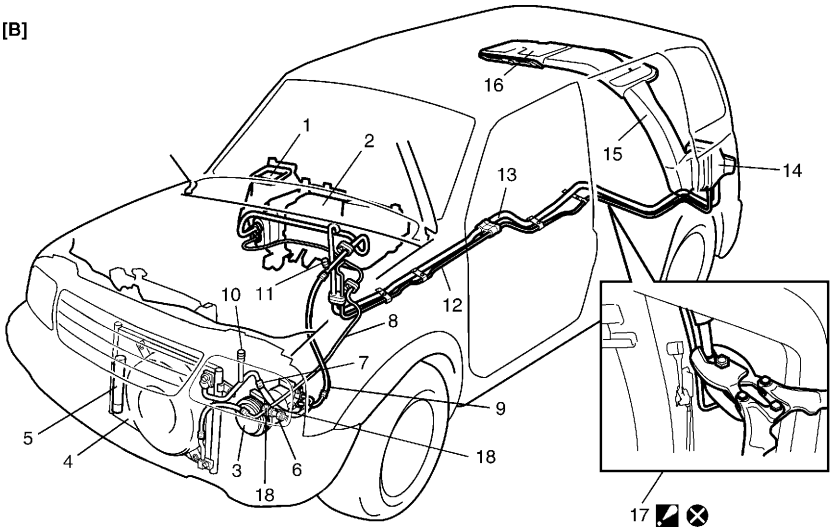



| | | | |
|---|---|---|---|
| 1. Front blower unit | 8. Heater and cooling unit | 15. Recirculation air | 22. Room air (if equipped) |
| 2. Front A/C evaporator | 9. Rear A/C unit (if equipped) | 16. Fresh air | 23. Rear A/C evaporator (if equipped) |
| 3. Front blower fan motor | 10. Rear blower fan motor (if equipped) | 17. Defroster air | 24. Heater core |
| 4. Compressor | 11. Rear expansion valve (if equipped) | 18. Demister air | 25. Supplementary heater (for RHW engine) |
| 5. Condenser assembly | 12. Liquid pipe | 19. Foot air | |
| 6. Receiver/dryer | 13. Suction pipe | 20. Ventilation air | |
| 7. Front expansion valve | 14. Discharge pipe | 21. Rear A/C air (if equipped) | |

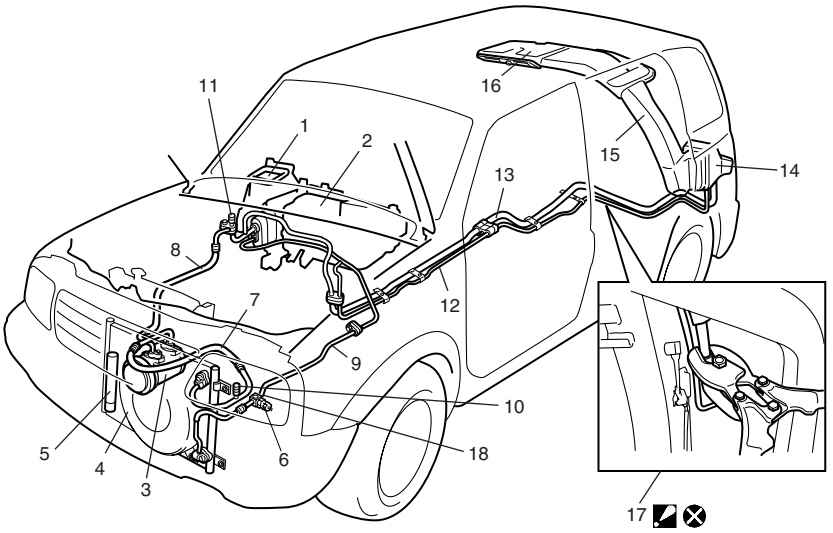
[A]




[B]




[C]




| | | | |
|---|---|---|---|
| [A]: H27 engine (Type A) | 4. Condenser assembly | 10. High pressure charge valve | 16. Rear A/C duct No.2 (if equipped) |
| [B]: H27 engine (Type B) | 5. Receiver/dryer | 11. Low pressure charge valve | 17. A/C No.3 pipe (if equipped) |
| [C]: RHW engine | 6. A/C refrigerant pressure switch | 12. Floor liquid pipe (if equipped) | 18. Sight glass |
| 1. Blower unit | 7. Discharge pipe | 13. Floor suction pipe (if equipped) | See NOTE below when removing this pipe. |
| 2. Heater and cooling unit | 8. Liquid pipe | 14. Rear A/C unit (if equipped) | Do not reuse. |
| 3. Compressor | 9. Suction pipe | 15. Rear A/C duct No.1 (if equipped) | |

**NOTE:**

**Remove A/C No.3 pipe referring to "Refrigerant Pipes and Hoses" in this section.**

# General Diagnosis

## General Diagnosis Table

**Front A/C System**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Cool air does not come out (A/C system does not operate)** | No refrigerant | Perform recover, evacuation and charge referring to "Recovery", "Charging" and "Evacuating" in this section. |
| | Fuse blown | Check related fuses, and check short circuit to ground. |
| | A/C evaporator temperature sensor faulty | Check A/C evaporator temperature sensor (A/C evaporator temperature sensor) referring to "A/C Evaporator Thermistor (A/C Evaporator Temperature Sensor)" in this section. |
| | A/C refrigerant pressure switch faulty | Check A/C refrigerant pressure switch referring to "A/C Refrigerant (Triple) Pressure Switch (H27 Engine)" or "A/C Refrigerant (Dual) Pressure Switch (RHW Engine)" in this section. |
| | Wiring or grounding faulty | Check wiring, grounding and repair as necessary. |
| | ECT sensor faulty | Check ECT sensor referring to "Engine coolant temperature sensor (ECT sensor)" in Section 6E1 or 6E2. |
| | HVAC control module faulty | Check HVAC control module referring to "HVAC Control Module and Its Circuits" in this section. |
| | ECM (PCM) and/or its circuit faulty (H27 engine) | Check ECM (PCM) and/or its circuit referring to "ECM (PCM) and Its Circuits (H27 Engine)" in this section. |
| | A/C controller faulty (RHW engine) | Check A/C controller referring to "A/C Controller (RHW Engine)" in this section. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Cool air does not come out (A/C compressor does not operate (doesn't rotate))** | Fuse blown | Check related fuses, and check short circuit to ground. |
| | Magnet clutch faulty | Check magnet clutch referring to "Magnet Clutch" in this section. |
| | Compressor relay faulty | Check compressor relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in this section. |
| | Drive belt loose or broken | Replace compressor drive belt. |
| | A/C compressor faulty | Check compressor referring to "Compressor Assembly" in this section. |
| | ECM (PCM) and/or its circuit faulty (H27 engine) | Check ECM (PCM) and/or its circuit referring to "ECM (PCM) and Its Circuits (H27 Engine)" in this section. |
| | HVAC control module faulty | Check HVAC control module referring to "HVAC Control Module and Its Circuits" in this section. |
| | A/C controller faulty (RHW engine) | Check A/C controller referring to "A/C Controller (RHW Engine)" in this section. |
| **Cool air does not come out (A/C condenser cooling fan motor doesn't operate)** | Fuse blown | Check related fuses, and check short circuit to ground. |
| | Condenser cooling fan motor relay faulty | Check compressor relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in this section. |
| | Wiring or grounding faulty | Check wiring, grounding and repair as necessary. |
| | ECM (PCM) and/or its circuit faulty (H27 engine) | Check ECM (PCM) and/or its circuit referring to "ECM (PCM) and Its Circuits (H27 Engine)" in this section. |
| | Condenser cooling fan motor faulty | Check condenser cooling fan motor referring to "A/C Condenser Fan Assembly" in this section. |
| **Cool air does not come out (Blower motor does not operate)** | Fuse blown | Check related fuses, and check short circuit to ground. |
| | Blower motor relay faulty | Check blower motor relay referring to "Blower Motor Relay" in Section 1A. |
| | HVAC control module faulty | Check HVAC control module referring to "HVAC Control Module and Its Circuits" in this section. |
| | Wiring or grounding faulty | Check wiring, grounding and repair as necessary. |
| | Blower motor controller faulty | Check blower motor controller referring to "Blower Motor Controller" in Section 1A. |
| | Blower motor faulty | Check blower motor referring to "Blower Motor" in Section 1A. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Cool air does not come out or insufficient cooling (A/C system operates normally)** | Insufficient or excessive charge of refrigerant | Check charge of refrigerant. |
| | Refrigerant leak in system | Check system for leaks. |
| | Condenser clogged | Check condenser referring to “A/C Condenser Assembly” in this section. |
| | A/C evaporator clogged or frosted | Check A/C evaporator and A/C evaporator thermistor (A/C evaporator temperature sensor referring to “A/C Evaporator” and “A/C Evaporator Thermistor (A/C Evaporator Temperature Sensor)” in this section. |
| | A/C evaporator temperature sensor faulty | Check A/C evaporator thermistor (A/C evaporator temperature sensor) referring to “A/C Evaporator Thermistor (A/C Evaporator Temperature Sensor)” in this section. |
| | ECM (PCM) and/or its circuit faulty (H27 engine) | Check ECM (PCM) and/or its circuit referring to “ECM (PCM) and Its Circuits (H27 Engine)” in this section. |
| | Expansion valve faulty | Check expansion valve referring to “Expansion Valve” in this section. |
| | Drive belt slipping | Check or replace compressor drive belt. |
| | Magnet clutch faulty | Check magnet clutch referring to “Magnet Clutch” in this section. |
| | A/C compressor faulty | Check compressor referring to “Compressor Assembly” in this section. |
| | Air in A/C system | Replace desiccant, and perform evacuation and charging. |
| | Air leaking from cooling unit or air duct | Repair as necessary. |
| | Heater and ventilation system faulty | Check air intake door and temperature control door operation. |
| | HVAC control module faulty | Check HVAC control module referring to “HVAC Control Module and Its Circuits” in this section. |
| | Blower motor faulty | Check blower motor referring to “Blower Motor” in Section 1A. |
| | Condenser cooling fan motor faulty | Check condenser cooling fan motor referring to “A/C Condenser Fan Assembly” in this section. |
| | Refrigerant pressure switch faulty | Check A/C refrigerant pressure switch referring to “A/C Refrigerant (Triple) Pressure Switch (H27 Engine)” or “A/C Refrigerant (Dual) Pressure Switch (RHW Engine)” in this section. |
| | Excessive compressor oil existing in A/C system | Pull out compressor oil in A/C system circuit, and check compressor referring to “Compressor Assembly” in this section. |
| | Outside air temperature sensor faulty (for automatic air conditioning system) | Check outside air temperature sensor referring to “Outside Air Temperature Sensor (for Vehicle with Automatic Air conditioning System)” in Section 8H. |
| | Sunload sensor faulty (for automatic air conditioning system) | Check sunload sensor referring to “Sunload Sensor (for Vehicle with Automatic Air conditioning System)” in this section. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Cool air does not come out or insufficient cooling (A/C system operates normally)** | Aspirator hose faulty | Check aspirator hose. |
| | A/C controller faulty (RHW engine) | Check A/C controller referring to "A/C Controller (RHW Engine)" in this section. |
| **Cool air does not come out only intermittently** | Wiring connection faulty | Repair as necessary. |
| | Expansion valve faulty | Check expansion valve referring to "Expansion Valve" in this section. |
| | Excessive moisture in A/C system | Replace desiccant, and perform evacuation and charge. |
| | ECM (PCM) and/or its circuit faulty (H27 engine) | Check ECM (PCM) and/or its circuit referring to "ECM (PCM) and Its Circuits (H27 Engine)" in this section. |
| | Magnet clutch faulty | Check magnet clutch referring to "Magnet Clutch" in this section. |
| | Excessive charge of refrigerant | Check charge of refrigerant. |
| **Cool air comes out only at high speeds** | Condenser clogged | Check condenser referring to "A/C Condenser Assembly" in this section. |
| | Insufficient charge of refrigerant | Check charge of refrigerant. |
| | Air in A/C system | Replace desiccant, and perform evacuation and charging. |
| | Drive belt slipping | Check or replace compressor drive belt. |
| | A/C compressor faulty | Check compressor referring to "Compressor Assembly" in this section. |
| **Cool air does not come out only at high speeds** | Excessive charge of refrigerant | Check charge of refrigerant. |
| | A/C evaporator frosted | Check A/C evaporator thermistor (A/C evaporator temperature sensor) referring to "A/C Evaporator Thermistor (A/C Evaporator Temperature Sensor)" in this section. |
| **Insufficient velocity of cooled air** | A/C evaporator clogged or frosted | Check A/C evaporator and A/C evaporator thermistor (A/C evaporator temperature sensor) referring to "A/C Evaporator" and "A/C Evaporator Thermistor (A/C Evaporator Temperature Sensor)" in this section. |
| | Air leaking from cooling unit or air duct | Repair as necessary. |
| | Blower motor faulty | Check blower motor referring to "Blower Motor" in Section 1A. |
| | Wiring or grounding faulty | Check wiring, grounding and repair as necessary. |

**Rear A/C System**

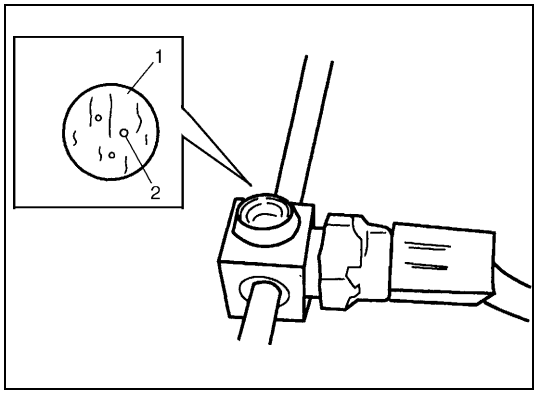
| Condition | Possible Cause | Correction |
|---|---|---|
| **Cool air dose not come out (Rear blower motor normal operation)** | Diode in rear A/C harness faulty | Check diode, and then replace rear A/C harness if necessary. |
| | Rear blower motor switch faulty | Check rear blower motor switch referring to “Rear Blower Motor Switch” in this section. |
| | Rear A/C evaporator clogged or frosted | Check rear A/C evaporator referring to “Rear A/C Unit (Rear A/C Evaporator)” in this section. |
| | Rear expansion valve faulty | Check rear expansion valve referring to “Rear Expansion Valve” in this section. |
| | Air leaking from rear A/C unit or air duct | Check and repair if necessary. |
| | Insufficient or excessive charge of refrigerant | Check charge of refrigerant referring to “Evacuating” and “Charging” in this section. |
| | Refrigerant pipe or hose deformed | Check pipe (hose), and then replace if necessary. |
| **Cool air dose not come out (Rear blower motor dose not operate)** | Fuse blown | Check related fuses, and check for short circuit to ground. |
| | Rear blower motor relay faulty | Check rear blower motor relay referring to “Rear Blower Motor Relay” in this section. |
| | Rear A/C main switch faulty | Check rear A/C main switch referring to “Rear A/C Main Switch” in this section. |
| | Rear blower motor switch faulty | Check rear blower motor switch referring to “Rear Blower Motor Switch” in this section. |
| | Rear blower motor resister faulty | Check rear blower motor resister referring to “Rear Blower Motor Resister” in this section. |
| | Wiring or grounding faulty | Check and repair. |
| | Rear blower motor faulty | Check rear blower motor referring to “Rear Blower Motor Assembly” in this section. |
| **Cool air dose not come out at only intermittently** | Loose or poor connected wiring connector | Connect connector correctly. |
| | Rear expansion valve faulty | Check rear expansion valve referring to “Rear Expansion Valve” in this section. |
| | Wiring or grounding faulty | Check and repair. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Insufficient velocity of cooled air** | Rear A/C evaporator clogged or frosted | Check rear A/C evaporator referring to "Rear A/C Unit (Rear A/C Evaporator)" in this section. |
| | Air leaking from rear A/C unit or air duct | Check rear A/C unit and air duct, and then repair if necessary. |
| | Rear blower motor faulty | Check rear blower motor referring to "Rear Blower Motor Assembly" in this section. |
| | Wiring or grounding faulty | Check and repair. |

## Quickly Checking of Refrigerant Charge

The following procedure can be used for quickly checking whether the A/C system has a proper charge of refrigerant or not.

1) Start engine and warm up to normal operating temperature (ECT more than 85 °C, 185 °F).
2) Operate A/C for a few minutes in the following conditions.
   - Main (front) A/C switch at ON position.
   - Rear A/C main switch at ON position (if equipped).
   - Front blower speed selector at max position.
   - Rear blower motor switch at max position (if equipped).
   - Air flow selector at face position.
   - Temperature selector at max cool position.
   - All windows and doors open.
   - Air inlet door at recirculation position.
3) Look at the sight glass (1) and compare what is observed with the symptoms listed in the table.




2. Bubbles

| Condition | Possible Cause | Correction |
|---|---|---|
| **Bubbles observed in sight glass** | Insufficient charge of refrigerant in system | Check system for leaks with a leak tester. |
| **No temperature difference between compressor inlet and outlet** | Empty or nearly empty system | Perform recovery, evacuating and charging system and then check it for leaks with a leak tester. |
| **Noticeable temperature difference between compressor inlet and outlet** | Proper or too much charge of refrigerant in system | Refer to the following items. |
| **When A/C is turned OFF, refrigerant in sight glass clears immediately and remains clear** | Too much charge of refrigerant in system | Recharge with specified amount of refrigerant. |

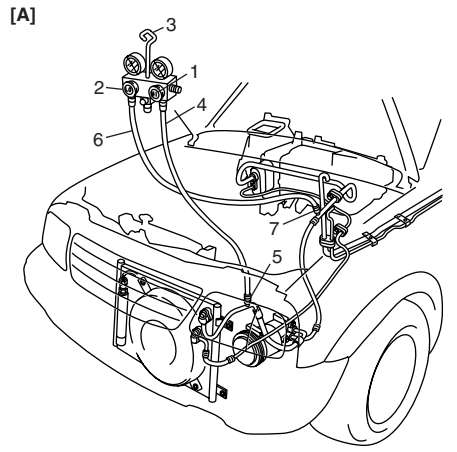
| Condition | Possible Cause | Correction |
|---|---|---|
| **When A/C is turned OFF, refrigerant in sight glass once produces bubbles and then clears** | Proper charge of refrigerant in system | Perform “Performance Diagnosis” in this section. |

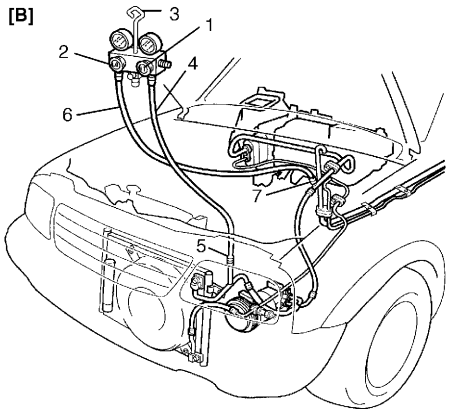
**NOTE:**

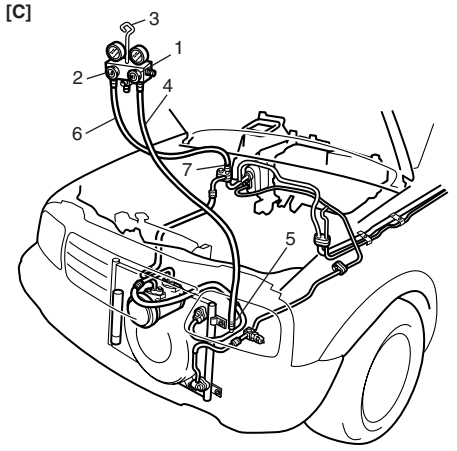
**For specified amount of refrigerant, refer to “Operation Procedure for Charging A/C with Refrigerant” in this section.**

## Performance Diagnosis

1) Confirm that vehicle and environmental conditions are as follows.
   - Vehicle is not exposed to direct sun.
   - Ambient temperature is within 15 – 35 °C (59 – 95 °F).
2) Make sure that high pressure valve (1) and low pressure valve (2) of manifold gauge (3) are firmly closed.
3) Connect high pressure charging hose (4) to high pressure service valve (5) on vehicle, and connect low pressure charging hose (6) to low pressure service valve (7) on vehicle.



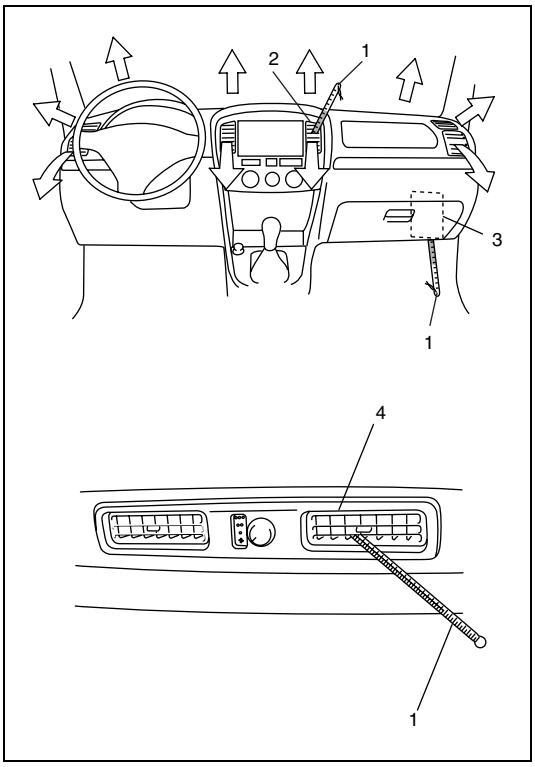

| | |
|---|---|
| [A]: | H27 engine (Type A) |
| [B]: | H27 engine (Type B) |
| [C]: | RHW engine |

4) Bleed the air in charging hoses by loosening their respective nuts on manifold gauge, utilizing the refrigerant pressure. When a hiss is heard, immediately tighten nut.

**CAUTION:**

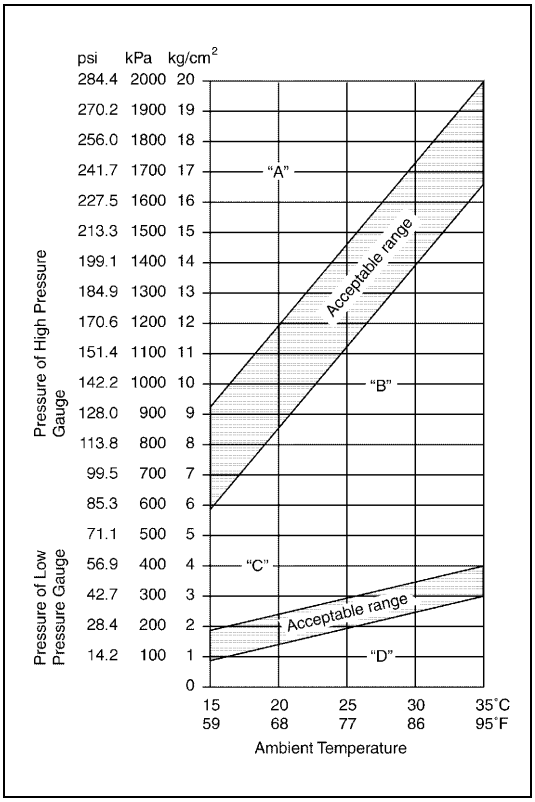
**Do not interchange high and low pressure charging hoses by mistake.**

5) Warm up engine to normal operating temperature (engine coolant temperature at 80 – 90 °C (176 – 194 °F)) and keep it at specified idle speed.
6) Operate A/C at the following conditions.
   - Main (front) A/C switch at ON position.
   - Rear A/C main switch at ON position (if equipped).
   - Front blower speed selector at max position.
   - Rear blower motor switch at max position (if equipped).
   - Air flow selector at face position.
   - Temperature selector at max cool position.
   - Air inlet door at recirculation position.
   - Keep engine speed at 1,500 – 2,000 rpm
7) Keep all windows, doors and engine food open.




8) With about 20 mm (0.8 in.) of dry bulb thermometer (1) inserted into center face air outlet (2), rear A/C air outlet (4) (dual A/C model only) and near A/C evaporator air inlet, read temperature indicated on each thermometer to know temperature difference between air inlet and air outlet.

| |
|---|
| 3. Blower fan motor air inlet |



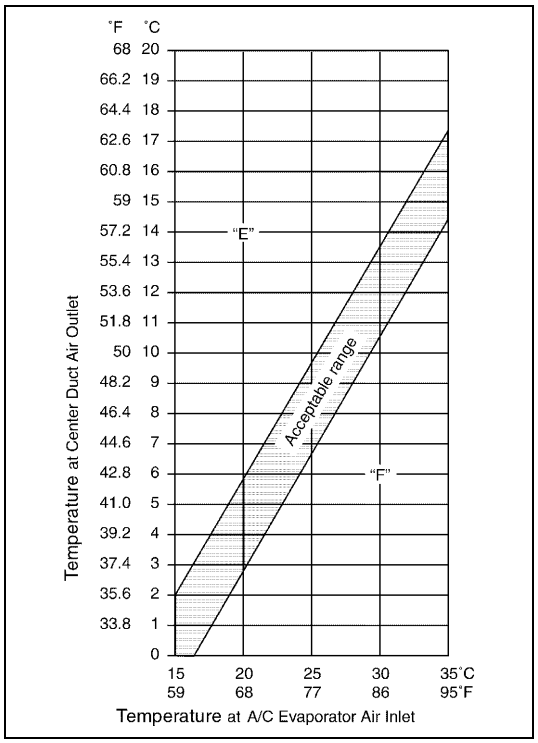

9) Check for each pressure of low side and high side if it is within shaded range of graph.
If each gauge reading is out of specified pressure, correct defective part referring to "Performance Diagnosis Table" in this section.

**Example:**

| **Gauges should read as follows when ambient temperature is 30 °C (86 °F)** | |
|---|---|
| **Pressure on high pressure gauge (HI):** | **1400 – 1750 kPa**<br>**14.0 – 17.5 kg/cm$^2$**<br>**199.1 – 248.9 psi** |
| **Pressure on high pressure gauge (LO):** | **230 – 350 kPa**<br>**2.3 – 3.5 kg/cm$^2$**<br>**32.7 – 49.8 psi** |

**NOTE:**

**Pressure registered on gauge varies with ambient temperature. Therefore, use the graphs when determining if pressures are normal or not.**




10) Check inlet port temperature-to-outlet port temperature relationship using graph.
    For example, if A/C evaporator inlet port temperature is 25 °C (77 °F) and center face air outlet temperature is 8 °C (46.4 °F), their crossing point is within acceptable range as shown in the graph.
11) If crossing point is out of acceptable range, diagnose trouble referring to "Performance Diagnosis Table" in this section.
12) Check that difference in temperature of center face air outlet air and rear A/C air outlet air are within 5 °C (41 °F).
    If the rear A/C air outlet air temperature is higher over 5 °C (41 °F) than center face air outlet air temperature, check rear A/C unit.

## Performance diagnosis table

### High Pressure Gauge

| Condition | Possible Cause | Correction |
|---|---|---|
| **Pressure high ("A" area of high side graph)** | Refrigerant overcharged | Recharge. |
| | Expansion valve frozen or clogged | Check expansion valve. |
| | Clogged refrigerant passage of high side | Clean or replace. |
| | Condenser cooling fan malfunction (Insufficient cooling of condenser) | Check condenser 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. |
| **Pressure low ("B" area of high side graph)** | 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 high ("C" area of low side graph)** | Expansion valve malfunction (valve opens too wide) | Check expansion valve. |
| | Compressor malfunction (Insufficient compression) | Check compressor. |
| **Pressure low ("D" area of low side graph)** | 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. |

**Thermometer at Center Duct**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Outlet air temperature at center duct is high (Crossing point is in area "E")** | 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 damper in cooling (heater) unit | Repair or replace. |
| | Compressor malfunction | Check compressor. |
| **Outlet air temperature at center duct is low (Crossing point is in area "F")** | Insufficient air volume from center duct (Heater blower malfunction) | Check blower motor and fan. |
| | Compressor malfunction | Check compressor. |

**NOTE:**

**If ambient temperature is within 30 – 35 °C (86 – 95 °F), it is possible to do using "Detail Diagnosis Table (at ambient temperature within 30 – 35 °C (86 – 95 °F))" in this section for detail diagnosis.**

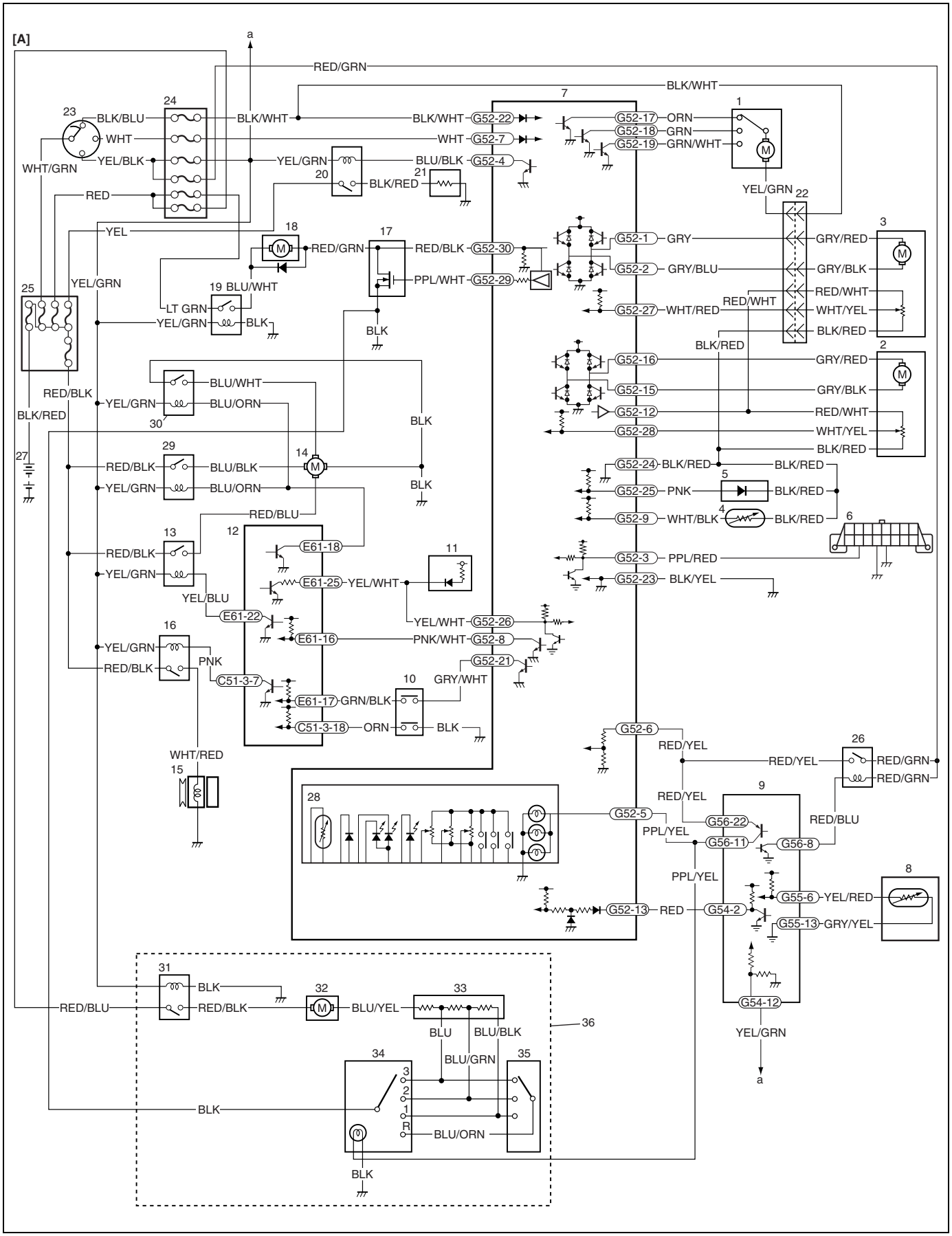
## Detail diagnosis table (at ambient temperature within 30 – 35 °C (86 – 95 °F))

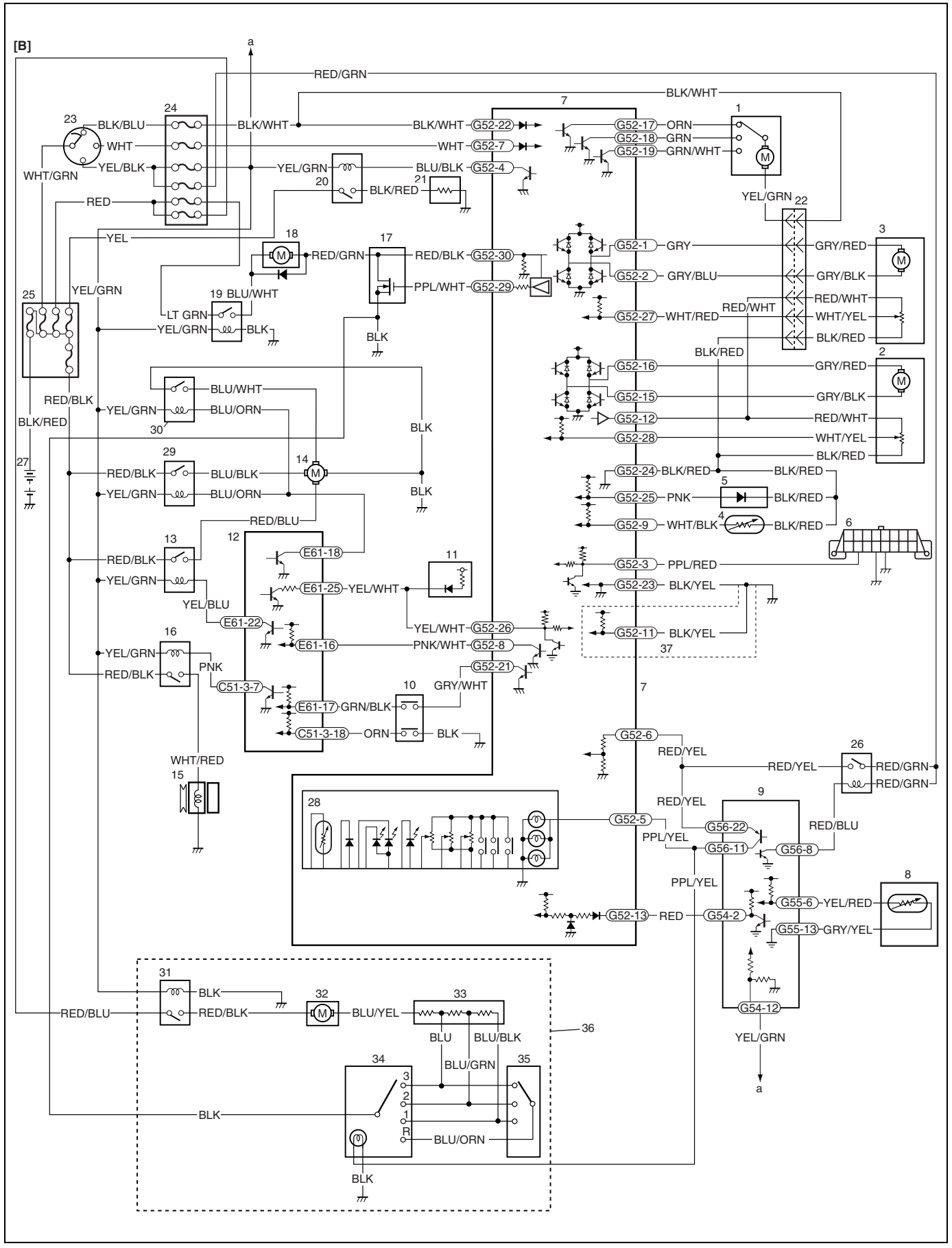
| Condition | | | Possible Cause | Correction |
|---|---|---|---|---|
| MANIFOLD GAUGE | MPa ($kg/cm^2$) (psi) | Detail | | |
| Lo | Hi | | | |
| **0.23 – 0.35 (2.3 – 3.5) (33 – 50)** | **1.4 – 1.75 (14 – 17.5) (200 – 249)** | **Normal condition** | – | – |
| **Negative pressure** | **0.5 – 0.6 (5 – 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 condenser/ dryer. Evacuate the A/C system and recharge with fresh refrigerant. |
| **Normal: 0.23 – 0.35 (2.3 – 3.5) (33 – 50) ↑ ↓ Abnormal: Negative pressure** | **Normal: 1.4 – 1.75 (14 – 17.5) (200 – 249) ↑ ↓ 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 condenser/ dryer. Evacuate A/C system and recharge with fresh refrigerant. |
| **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. Continuous air bubbles are visible through sight glass. Output air is slightly cold.** | Insufficient refrigerant in system. (Refrigerant leaking) | Using a gas 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. |

| Condition | | | Possible Cause | Correction |
|---|---|---|---|---|
| MANIFOLD GAUGE | MPa ($kg/cm^2$) (psi) | Detail | | |
| Lo | Hi | | | |
| **0.35 – 0.45 (3.5 – 4.5) (50 – 64)** | **2.0 – 2.5 (20 – 25) (285 – 355)** | **High pressure reading on both low and high pressure sides. Air bubbles are not visible even when engine rpm is lowered.** | Overcharged A/C system.<br>Faulty condenser cooling operation.<br>Faulty condenser fan operation. | Adjust refrigerant to specified amount.<br>Clean condenser.<br>Inspect and repair condenser fan. |
| | | **High pressure reading on both low and high pressure sides. Low pressure side tubing is not cold when touched. Air bubbles are visible through sight glass.** | Presence of air in A/C system. (Improperly evacuated) | Replace condenser dryer.<br>Inspect quantity of compressor oil and presence of contaminants in oil.<br>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.<br>Refrigerant flow is not regulated properly. | Replace expansion valve. |

# Wiring Circuit

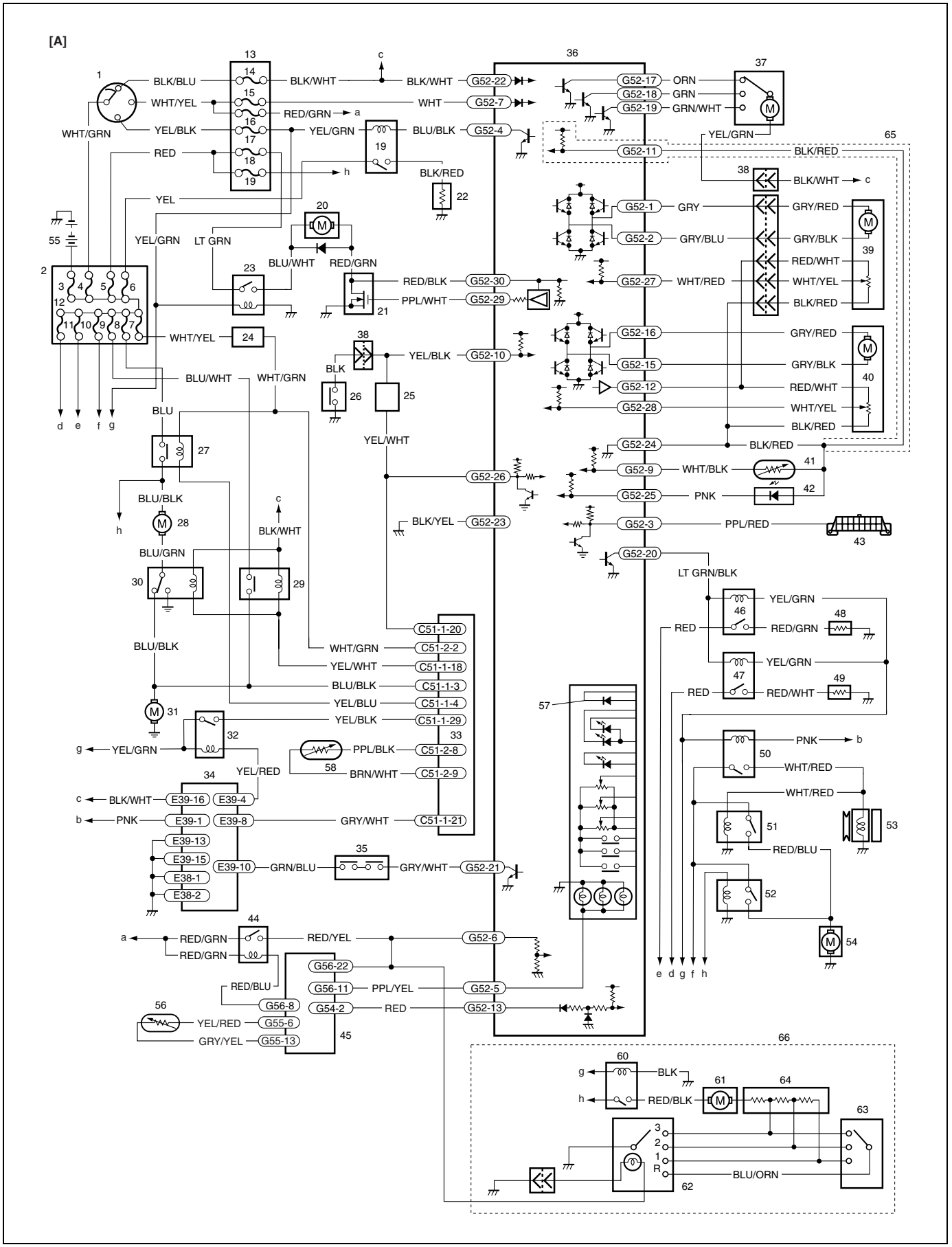
## H27 Engine



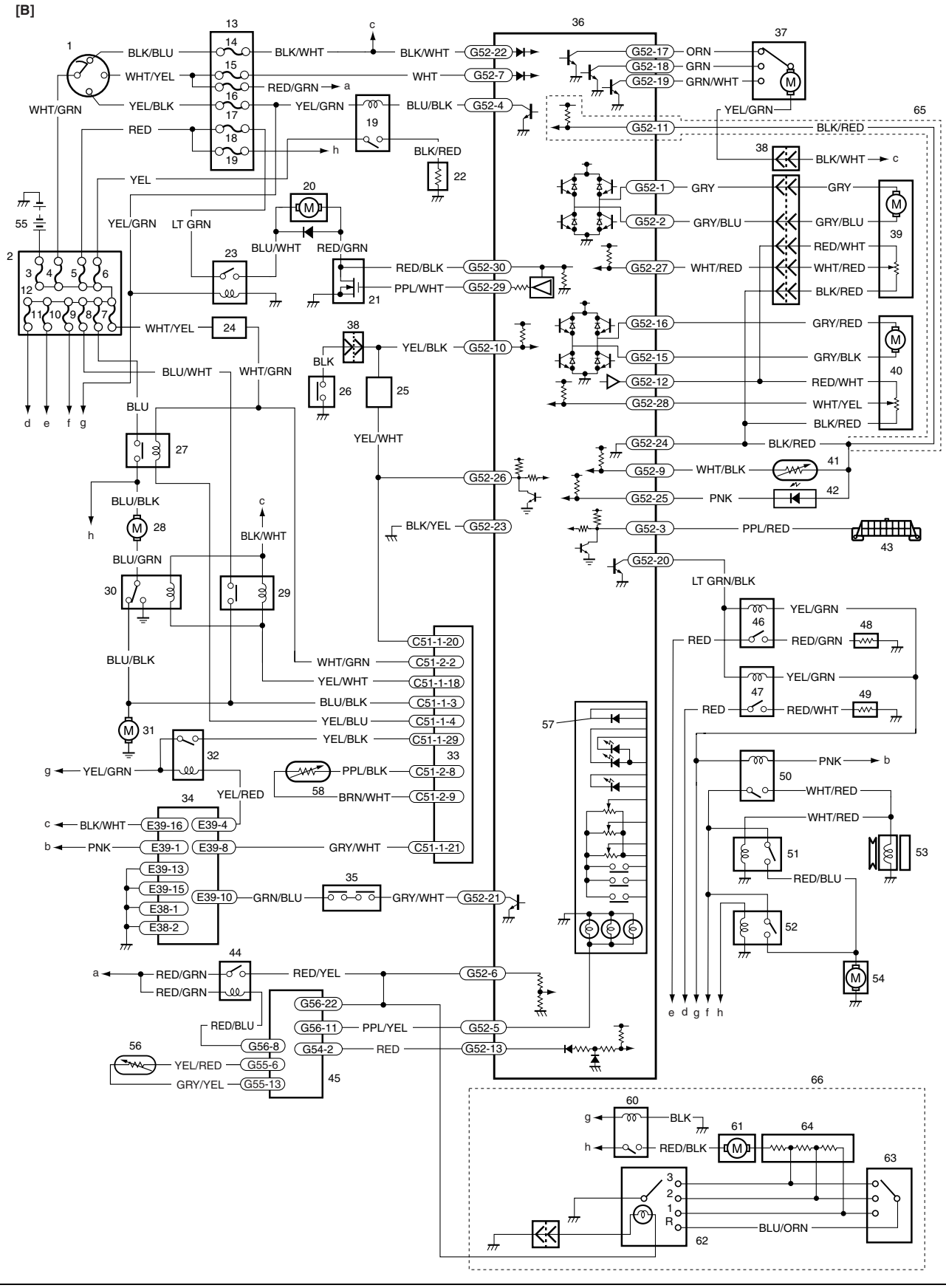

[B]
a
RED/GRN
BLK/WHT
7
1
24
23
BLK/BLU
WHT
YEL/BLK
WHT/GRN
RED
BLK/WHT
BLK/WHT
G52-22
WHT
G52-7
YEL/GRN
BLU/BLK
G52-4
20
21
BLK/RED
G52-17
ORN
G52-18
GRN
G52-19
GRN/WHT
M
YEL/GRN
22
YEL
18
M
RED/GRN
17
RED/BLK
G52-30
PPL/WHT
G52-29
G52-1
GRY
G52-2
GRY/BLU
G52-27
WHT/RED
3
GRY/RED
GRY/BLK
RED/WHT
WHT/YEL
BLK/RED
RED/WHT
25
YEL/GRN
19 BLU/WHT
LT GRN
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BLK
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G52-16
GRY/RED
G52-15
GRY/BLK
G52-12
RED/WHT
G52-28
WHT/YEL
BLK/RED
BLU/WHT
RED/BLK
YEL/GRN
BLU/ORN
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BLK
BLK/RED
G52-24
BLK/RED
BLK/RED
5
G52-25
PNK
BLK/RED
4
G52-9
WHT/BLK
BLK/RED
6
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RED/BLK
BLU/BLK
14
M
YEL/GRN
BLU/ORN
BLK
RED/BLU
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13
RED/BLK
YEL/GRN
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E61-25
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G52-3
PPL/RED
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YEL/BLU
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G56-11
G56-8
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8
G52-13
RED
G54-2
G55-6
YEL/RED
G55-13
GRY/YEL
31
BLK
32
33
RED/BLU
RED/BLK
M
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36
BLU
BLU/BLK
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BLU/GRN
35
3
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1
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BLK
BLU/ORN
BLK
G54-12
YEL/GRN
a

| | | |
|---|---|---|
| [A]: LH steering vehicle | 12. ECM or PCM | 25. Main fuse box |
| [B]: RH steering vehicle | 13. Condenser fan motor low speed relay | 26. Headlight relay No.2 |
| 1. Air intake actuator | 14. Condenser cooling fan motor | 27. Battery |
| 2. Air flow control actuator | 15. A/C compressor | 28. Inside air temperature sensor (for vehicle with automatic air conditioning model) |
| 3. Temperature control actuator | 16. A/C compressor relay | 29. Condenser fan motor high speed relay No.1 |
| 4. A/C evaporator temperature sensor | 17. Blower motor controller | 30. Condenser fan motor high speed relay No.2 |
| 5. Sunload sensor (for vehicle with automatic air conditioning model) | 18. Blower motor | 31. Rear blower motor relay |
| 6. DLC | 19. Blower motor relay | 32. Rear blower motor |
| 7. HVAC control module | 20. Rear window defogger relay | 33. Rear blower motor resister |
| 8. Outside air temperature sensor (for vehicle with automatic air conditioning model) | 21. Rear window defogger | 34. Rear A/C main switch |
| 9. BCM | 22. Connector | 35. Rear blower motor switch |
| 10. A/C refrigerant (triple) pressure switch | 23. Ignition switch | 36. Rear A/C wiring circuit (if equipped) |
| 11. Engine coolant temperature meter (in combination meter) | 24. Fuse box | 37. Function switch (for vehicle with automatic air conditioning model) |

## RHW Engine

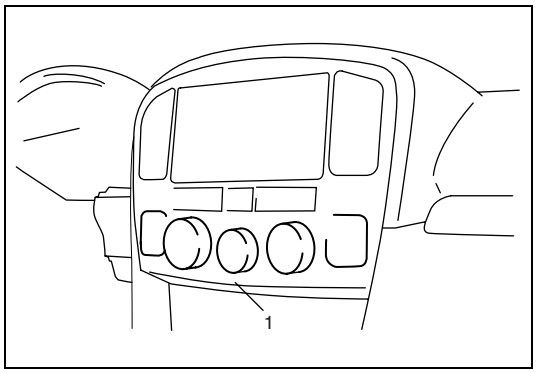

[A]
BLK/BLU
WHT/YEL
WHT/GRN
YEL/BLK
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YEL/WHT
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BLK/YEL
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LT GRN/BLK
YEL/BLU
YEL/RED
BRN/WHT
GRY/WHT
GRN/BLU
PPL/YEL
PPL/BLK
G52-22
G52-7
G52-4
G52-11
G52-17
G52-18
G52-19
G52-1
G52-2
G52-27
G52-30
G52-29
G52-16
G52-15
G52-12
G52-28
G52-10
G52-24
G52-9
G52-25
G52-3
G52-20
G52-26
G52-23
G52-6
G52-5
G52-13
G52-21
ORN
GRN
GRN/WHT
GRY
GRY/BLU
WHT/RED
GRY/RED
GRY/BLK
RED/WHT
WHT/YEL
PNK
PPL/RED
C51-1-20
C51-2-2
C51-1-18
C51-1-3
C51-1-4
C51-1-29
C51-2-8
C51-2-9
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E39-16
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G55-13
YEL/RED
GRY/YEL
RED/BLU
BLU/ORN
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[B]


BLK/BLU
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WHT/GRN
YEL/BLK
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YEL/GRN
LT GRN
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BLU/ORN
G52-22
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G52-28
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G52-18
G52-19
C51-1-20
C51-2-2
C51-1-18
C51-1-3
C51-1-4
C51-1-29
C51-2-8
C51-2-9
C51-1-21
E39-16
E39-4
E39-1
E39-8
E39-13
E39-15
E38-1
E38-2
E39-10
G52-21
G52-6
G56-22
G56-11
G54-2
G52-5
G52-13
G56-8
G55-6
G55-13
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GRY/BLU
WHT/RED
GRY/RED
GRY/BLK
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|---|---|---|---|
| [A]: LH steering vehicle | 16. "TAIL" fuse | 33. ECM | 50. Compressor relay |
| [B]: RH steering vehicle | 17. "HTR" fuse | 34. A/C controller | 51. Condenser fan motor relay |
| 1. Ignition switch | 18. "FRONT BLOW" fuse | 35. A/C refrigerant (dual) pressure switch | 52. Condenser fan motor high relay |
| 2. Main fuse box | 19. Rear window defogger relay | 36. HVAC control module | 53. A/C compressor |
| 3. Main fuse | 20. Blower motor | 37. Air intake actuator | 54. Condenser fan |
| 4. "IG" fuse | 21. Blower motor controller | 38. Connector | 55. Battery |
| 5. "HTR" fuse | 22. Rear window defogger | 39. Temperature control actuator | 56. Outside air temperature sensor (for vehicle with automatic A/C system) |
| 6. "RR DEF" fuse | 23. Blower motor relay | 40. Air flow control actuator | 57. Inside air temperature sensor (for vehicle with automatic A/C system) |
| 7. "PTC 1" fuse | 24. Double relay | 41. A/C evaporator temperature sensor | 58. ECT sensor |
| 8. "PTC 2" fuse | 25. Speedometer | 42. Sunload sensor (for vehicle with automatic A/C system) | 59. "Rear fan blower motor" fuse |
| 9. "RDTR" fuse | 26. Oil pressure switch | 43. Data link connector | 60. Rear blower motor relay |
| 10. "A/C" fuse | 27. Radiator fan relay No.3 (LOW) | 44. Headlight relay No.2 | 61. Rear blower motor |
| 11. "PTC 1" fuse | 28. Radiator fan motor No.1 | 45. BCM | 62. Rear A/C main switch |
| 12. "PTC 2" fuse | 29. Radiator fan relay No.2 (HIGH) | 46. Supplementary heater relay No.1 | 63. Rear A/C sub switch |
| 13. Fuse box | 30. Radiator fan relay No.1 (HIGH) | 47. Supplementary heater relay No.2 | 64. Rear blower motor resistor |
| 14. "METER" fuse | 31. Radiator fan motor No.2 | 48. Supplementary heater No.1 | 65. Function switch (for vehicle with manual air conditioning system) |
| 15. "RADIO DOME" fuse | 32. A/C signal relay | 49. Supplementary heater No.2 | 66. Rear A/C wiring circuit (if equipped) |

## HVAC Control Module and Its Circuits



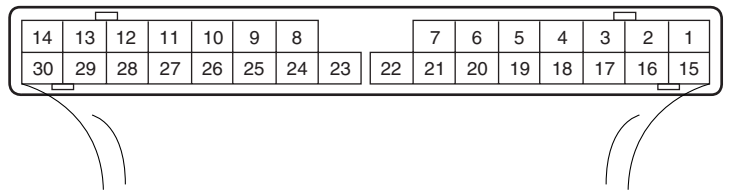

**CAUTION:**
**HVAC controller module (1) cannot be checked by itself. It is strictly prohibited to connect voltmeter to HVAC controller module with couplers disconnected from it.**

HVAC Control module and its circuits can be checked at HVAC control module wiring couplers by measuring voltage.

### Voltage Check

1) Remove HVAC control module from vehicle referring to "HVAC Control Module" in this section.
2) Connect HVAC control module and body control module couplers to HVAC control module and body control module.
3) Check each terminal voltage by referring to the "HVAC control module voltage table".

### Terminal Arrangement of HVAC Control Module Connector "G52" Viewed from Harness Side



## HVAC control module voltage table

### H27 Engine

| Terminal | Wire Color | Circuit | Measurement Ground | Normal Value | Condition |
|---|---|---|---|---|---|
| G52-1 | GRY | Temperature control actuator (COOL) | Ground to body | about 10.0 V | Ignition switch ON, Temperature selector max HOT to max COOL |
| | | | | less than 1.5 V | Ignition switch ON, Temperature selector max COOL to max HOT position |
| G52-2 | GRY/BLU | Temperature control actuator (HOT) | Ground to body | about 10.0 V | Ignition switch ON, Temperature selector max COOL to max HOT position |
| | | | | less than 1.5 V | Ignition switch ON, Temperature selector max HOT to max COOL |
| G52-3 | PPL/RED | Serial communication line of data link connector | – | – | – |
| G52-4 | BLU/BLK | Rear defogger relay output | Ground to body | less than 1.0 V | Ignition switch ON, Rear defogger switch ON |
| | | | | 10 – 14 V | Ignition switch ON, Rear defogger switch OFF |
| G52-5 | PPL/YEL | Illumination switch | Ground to body | 10 – 14 V | Ignition switch ON, Illumination switch ON, Illumination controller to the lightest position |
| | | | | 0.0 V | Ignition switch ON, Illumination switch OFF |
| G52-6 | RED/YEL | Illumination controller switch | Ground to body | 10 – 14 V | Ignition switch ON, Illumination switch ON |
| | | | | 0.0 V | Ignition switch ON, Illumination switch OFF |
| G52-7 | WHT | Power Supply | Ground to body | 10 – 14 V | – |
| G52-8 | PNK/WHT | Electric load signal for blower motor | Ground to body | less than 1.0 V | Ignition switch ON, Blower speed selector more than 3rd position (not including OFF and AUTO position) |
| | | | | 10 – 14 V | Ignition switch ON, Blower speed selector is 1st or 2nd position (not including OFF and AUTO position) |
| G52-9 | WHT/BLK | A/C evaporator temperature sensor | Ground to body | Reference graph No.1 | Ignition switch ON |
| G52-10 | – | – | – | – | – |
| G52-11 | – | – | Ground to body | about 5.0 V | Ignition switch ON |

| Terminal | Wire Color | Circuit | Measurement Ground | Normal Value | Condition |
|---|---|---|---|---|---|
| G52-12 | RED/WHT | Output of 5 V power source for air flow control actuator and temperature control actuator | Ground to body | about 5.0 V | Ignition switch ON |
| | | | | less than 0.5 V | Ignition switch OFF |
| G52-13 | RED | Serial communication line for BCM (for automatic air conditioning system) | Ground to body | Reference waveform No.1 | Ignition switch ON |
| G52-14 | – | – | – | – | – |
| G52-15 | GRY/BLK | Air flow control actuator (VENT) | Ground to body | about 10.0 V | Ignition switch ON, Air flow selector DEF to VENT position |
| | | | | less than 1.5 V | Ignition switch ON, Air flow selector VENT to DEF position |
| G52-16 | GRY/RED | Air flow control actuator (DEF) | Ground to body | about 10.0 V | Ignition switch ON, Air flow selector VENT to DEF position |
| | | | | less than 1.5 V | Ignition switch ON, Air flow selector DEF to VENT position |
| G52-17 | ORN | Air intake actuator (FRE) | Ground to body | less than 1.0 V | Ignition switch ON, Air Intake switch to FRE (Fresh air) |
| | | | | 10 – 14 V | Ignition switch ON, Air Intake switch to REC (Recirculation air) |
| G52-18 | GRN | Air intake actuator (REC) | Ground to body | less than 1.0 V | Ignition switch ON, Air Intake switch to REC (Recirculation air) |
| | | | | 10 – 14 V | Ignition switch ON, Air Intake switch to FRE (Fresh air) |
| G52-19 | GRN/WHT | Air intake actuator (MIX) | Ground to body | less than 1.0 V | Ignition switch ON, Air intake switch to FRE (Fresh air), Engine coolant temperature between 60 °C (140 °F) and 80 °C (176 °F), Air flow selector to any position except VENT position |
| | | | | 10 – 14 V | Ignition switch ON, Air intake switch to REC (Recirculation air), Engine coolant temperature between 60 °C (140 °F) and 80 °C (176 °F), Air flow selector to DEF position |
| G52-20 | – | – | – | – | – |
| G52-21 | GRY/WHT | A/C request signal (if equipped) | Ground to body | less than 1.0 V | Ignition switch ON, A/C switch ON |
| | | | | 10 – 14 V | Ignition switch ON, A/C switch OFF |
| G52-22 | BLK/WHT | Ignition switch signal | Ground to body | 10 – 14 V | Ignition switch ON |
| | | | | less than 0.5 V | Ignition switch OFF |
| G52-23 | BLK/YEL | Ground | Ground to body | less than 0.5 V | – |
| G52-24 | BLK/RED | Sensor ground | Ground to body | less than 0.5 V | – |

| Terminal | Wire Color | Circuit | Measurement Ground | Normal Value | Condition |
|---|---|---|---|---|---|
| G52-25 | PNK | Sunload sensor (for automatic air conditioning system) | Ground to body | about 2.5 V | Ignition switch ON, Light over sunload sensor vertically with incandescent lamp of 100 watt, Distance between sunload sensor and incandescent lamp 100 mm (3.94 in.) |
| | | | | about 4.5 V | Ignition switch ON, Block light to sunload sensor |
| G52-26 | YEL/WHT | ECT signal | Ground to body | Reference waveform No.2 (H27 engine) | Ignition switch ON |
| G52-27 | WHT/RED | Temperature control actuator position sensor | Ground to body | about 0.5 V | Ignition switch ON, Temperature selector to max COOL position |
| | | | | about 4.5 V | Ignition switch ON, Temperature selector to max HOT position |
| G52-28 | WHT/YEL | Air flow control actuator position sensor | Ground to body | about 4.5 V | Ignition switch ON, Air flow selector to VENT position |
| | | | | about 3.7 V | Ignition switch ON, Air flow selector to VENT/FOOT position |
| | | | | about 2.0 V | Ignition switch ON, Air flow selector to FOOT position |
| | | | | about 1.4 V | Ignition switch ON, Air flow selector to DEF/FOOT position |
| | | | | less than 0.5 V | Ignition switch ON, Air flow selector to DEF position |
| G52-29 | PPL/WHT | Blower motor controller | Ground to body | less than 1.0 V | Ignition switch ON, Blower speed selector OFF |
| | | | | about 2.5 V | Ignition switch ON, Blower speed selector 1st position (not including OFF and AUTO position) |
| | | | | about 10.0 V | Ignition switch ON, Blower speed selector 8th position |
| G52-30 | RED/BLK | Blower motor control voltage feedback | Ground to body | 10 – 14 V | Ignition switch ON, Blower speed selector OFF |
| | | | | about 7.5 V | Ignition switch ON, Blower speed selector 1st position (not including OFF and AUTO position) |
| | | | | less than 0.2 V | Ignition switch ON, Blower speed selector 8th position |

**RHW Engine**

| Terminal | Wire Color | Circuit | Measurement Ground | Normal Value | Condition |
|---|---|---|---|---|---|
| G52-1 | GRY | Temperature control actuator (COOL) | Ground to body | about 10.0 V | Ignition switch ON, Temperature selector max HOT to max COOL position |
| | | | | less than 1.5 V | Ignition switch ON, Temperature selector max COOL to max HOT position |
| G52-2 | GRY/BLU | Temperature control actuator (HOT) | Ground to body | about 10.0 V | Ignition switch ON, Temperature selector max COOL to max HOT position |
| | | | | less than 1.5 V | Ignition switch ON, Temperature selector max HOT to max COOL position |
| G52-3 | PPL/RED | Serial communication line of data link connector | – | – | – |
| G52-4 | BLU/BLK | Rear defogger relay output | Ground to body | less than 1.0 V | Ignition switch ON, Rear defogger switch ON |
| | | | | 10 – 14 V | Ignition switch ON, Rear defogger switch OFF |
| G52-5 | PPL/YEL | Illumination switch | Ground to body | 10 – 14 V | Ignition switch ON, Illumination switch ON, Illumination controller to the lightest position |
| | | | | 0.0 V | Ignition switch ON, Illumination switch OFF |
| G52-6 | RED/YEL | Illumination controller switch | Ground to body | 10 – 14 V | Ignition switch ON, Illumination switch ON |
| | | | | 0.0 V | Ignition switch ON, Illumination switch OFF |
| G52-7 | WHT | Power supply | Ground to body | 10 – 14 V | – |
| G52-8 | – | – | – | – | – |
| G52-9 | WHT/BLK | A/C evaporator temperature sensor | Ground to body | See reference graph No.1. | Ignition switch ON |
| G52-10 | YEL/BLK | Engine on signal | Ground to body | 10 – 14 V | Engine running |
| | | | | less than 1.0 V | Ignition switch ON |
| G52-11 | BLK | Function switch | Ground to body | 5 V (RH steering vehicle) | Ignition switch ON |
| | | | | 0.0 V (LH steering vehicle) | |

| Terminal | Wire Color | Circuit | Measurement Ground | Normal Value | Condition |
|---|---|---|---|---|---|
| G52-12 | RED/WHT | Output of 5 V power source for air flow control actuator and temperature control actuator | Ground to body | about 5.0 V | Ignition switch ON |
| | | | | less than 0.5 V | Ignition switch OFF |
| G52-13 | RED | Outside air temperature communication line (for automatic air conditioning system) | Ground to body | See reference waveform No.1. | Ignition switch ON |
| G52-14 | – | – | – | – | – |
| G52-15 | GRY/BLK | Air flow control actuator (VENT) | Ground to body | about 10.0 V | Ignition switch ON, Air flow selector DEF to VENT position |
| | | | | less than 1.5 V | Ignition switch ON, Air flow selector VENT to DEF position |
| G52-16 | GRY/RED | Air flow control actuator (DEF) | Ground to body | about 10.0 V | Ignition switch ON, Air flow selector VENT to DEF position |
| | | | | less than 1.5 V | Ignition switch ON, Air flow selector DEF to VENT position |
| G52-17 | ORN | Air intake actuator (FRE) | Ground to body | less than 1.0 V | Ignition switch ON, Air Intake switch to FRE (fresh air) |
| | | | | 10 – 14 V | Ignition switch ON, Air Intake switch to REC (recirculation air) |
| G52-18 | GRN | Air intake actuator (REC) | Ground to body | less than 1.0 V | Ignition switch ON, Air Intake switch to REC (recirculation air) |
| | | | | 10 – 14 V | Ignition switch ON, Air Intake switch to FRE (fresh air) |
| G52-19 | GRN/WHT | Air intake actuator (MIX) | Ground to body | less than 1.0 V | Ignition switch ON, Air intake switch to FRE (fresh air), Engine coolant temperature between 60 °C (140 °F) and 80 °C (176 °F), Air flow selector at any position except VENT position |
| | | | | 10 – 14 V | Ignition switch ON, Air intake switch to REC (recirculation air), Engine coolant temperature between 60 °C (140 °F) and 80 °C (176 °F), Air flow selector at DEF position |
| G52-20 | LT GRN/BLK | Supplementary heater relay | Ground to body | less than 1.0 V | Engine running, Blower speed selector at ON position, Temperature selector at MAX HOT position, Air flow selector at FOOT, DEF/FOOT, or DEF position, Engine coolant temperature less than 75 °C (167 °F), Battery voltage more than 9 V |
| | | | | 10 – 14 V | Ignition switch ON, Blower speed selector at OFF position |

| Terminal | Wire Color | Circuit | Measurement Ground | Normal Value | Condition |
|---|---|---|---|---|---|
| G52-21 | GRY/WHT | A/C request signal (if equipped) | Ground to body | less than 1.0 V | Ignition switch ON, A/C switch ON |
| | | | | 10 – 14 V | Ignition switch ON, A/C switch OFF |
| G52-22 | BLK/WHT | Ignition switch signal | Ground to body | 10 – 14 V | Ignition switch ON |
| | | | | less than 0.5 V | Ignition switch OFF |
| G52-23 | BLK/YEL | Ground | Ground to body | less than 0.5 V | – |
| G52-24 | BLK/RED | Sensor ground | Ground to body | less than 0.5 V | – |
| G52-25 | PNK | Sunload sensor (for automatic air conditioning system) | Ground to body | about 2.5 V | Ignition switch ON, Sunload sensor lighted over vertically with incandescent lamp of 100 watt (distance between sunload sensor and incandescent lamp 100 mm (3.94 in.)) |
| | | | | about 4.5 V | Ignition switch ON, Sunload sensor covered |
| G52-26 | YEL/WHT | ECT signal | Ground to body | See reference waveform No.2. (RHW engine) | Ignition switch ON |
| G52-27 | WHT/RED | Temperature control actuator position sensor | Ground to body | about 0.5 V | Ignition switch ON, Temperature selector at max COOL position |
| | | | | about 4.5 V | Ignition switch ON, Temperature selector at max HOT position |
| G52-28 | WHT/YEL | Air flow control actuator position sensor | Ground to body | about 4.5 V | Ignition switch ON, Air flow selector at VENT position |
| | | | | about 3.7 V | Ignition switch ON, Air flow selector at VENT/FOOT position |
| | | | | about 2.0 V | Ignition switch ON, Air flow selector at FOOT position |
| | | | | about 1.4 V | Ignition switch ON, Air flow selector at DEF/FOOT position |
| | | | | less than 0.5 V | Ignition switch ON, Air flow selector at DEF position |
| G52-29 | PPL/WHT | Blower motor controller | Ground to body | less than 1.0 V | Ignition switch ON, Blower speed selector OFF |
| | | | | about 2.5 V | Ignition switch ON, Blower speed selector at 1st position (not including OFF and AUTO position) |
| | | | | about 10.0 V | Ignition switch ON, Blower speed selector at 8th position |
| G52-30 | RED/BLK | Blower motor control voltage feedback | Ground to body | 10 – 14 V | Ignition switch ON, Blower speed selector at OFF position |
| | | | | about 7.5 V | Ignition switch ON, Blower speed selector at 1st position (not including OFF and AUTO position) |
| | | | | less than 0.2 V | Ignition switch ON, Blower speed selector at 8th position |

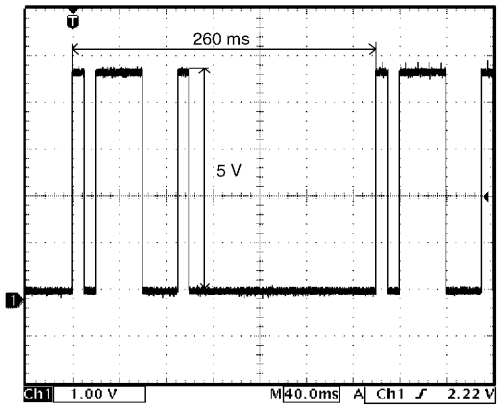
## Reference Waveform No.1

**NOTE:**

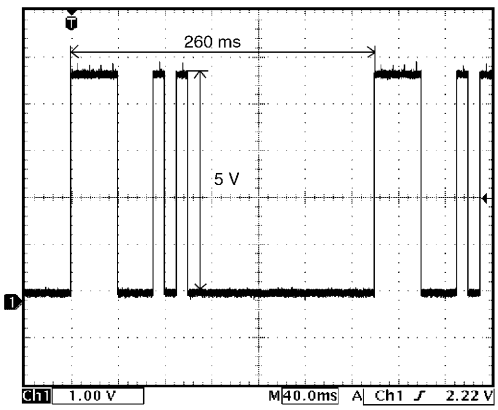
**The shape of waveform varies with outside air temperature.**

| | |
|---|---|
| Measurement terminal | G52-13 to G52-23 |
| Oscilloscope setting | CH1: 1 V / DIV<br>TIME: 40 ms / DIV |
| Measurement condition | Ignition switch turned ON |

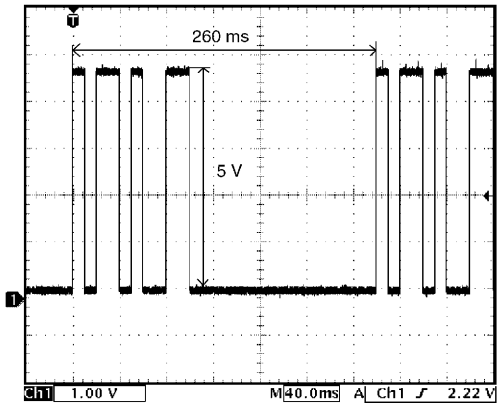
[A]




[B]




[C]




| | | |
|---|---|---|
| [A]: Waveform at –20 °C (–4 °F) | [B]: Waveform at 0 °C (32 °F) | [C]: Waveform at 30 °C (86 °F) |

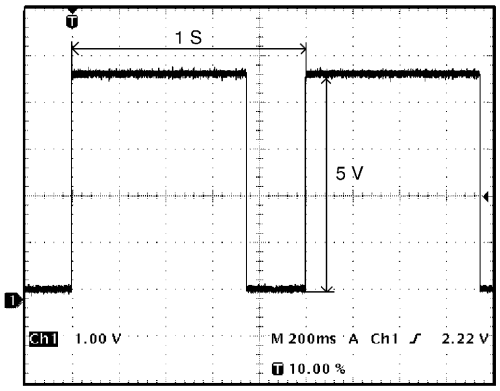
## Reference Waveform No.2 (H27 Engine)

**NOTE:**

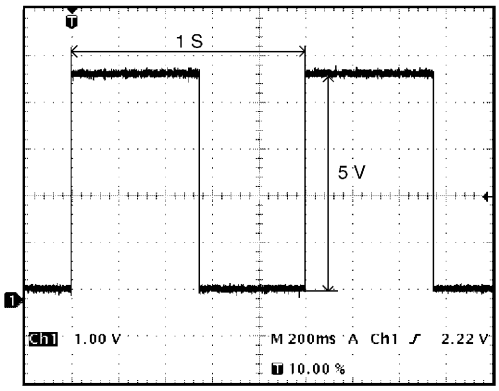
**The shape of waveform varies with engine coolant temperature.**

| | |
|---|---|
| Measurement terminal | G52-23 to G52-26 |
| Oscilloscope setting | CH1: 1 V / DIV<br>TIME: 200 ms / DIV |
| Measurement condition | Ignition switch turned ON |

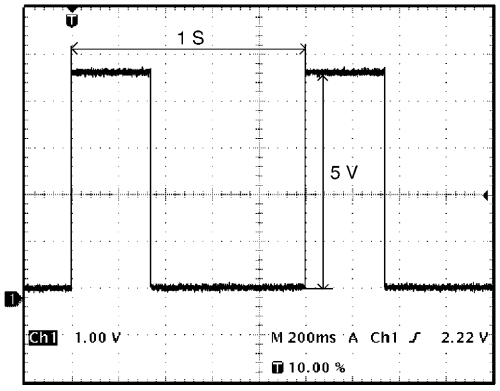
[A]




[B]




[C]




| | | |
|---|---|---|
| [A]: Waveform at 0 °C (32 °F) | [B]: Waveform at 40 °C (104 °F) | [C]: Waveform at 80 °C (176 °F) |

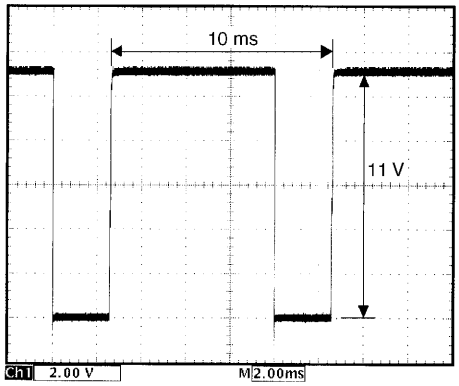
## Reference Waveform No.2 (RHW Engine)

**NOTE:**

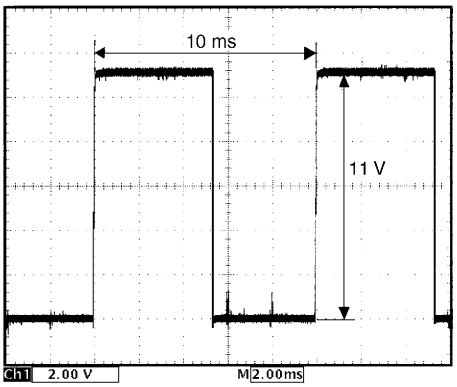
**The shape of waveform varies with engine coolant temperature.**

| | |
|---|---|
| Measurement terminal | G52-23 to G52-26 |
| Oscilloscope setting | CH1: 2 V / DIV<br>TIME: 2.00 ms / DIV |
| Measurement condition | Ignition switch turned ON |

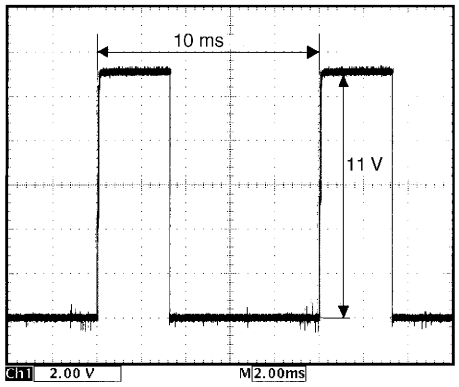
[A]




[B]

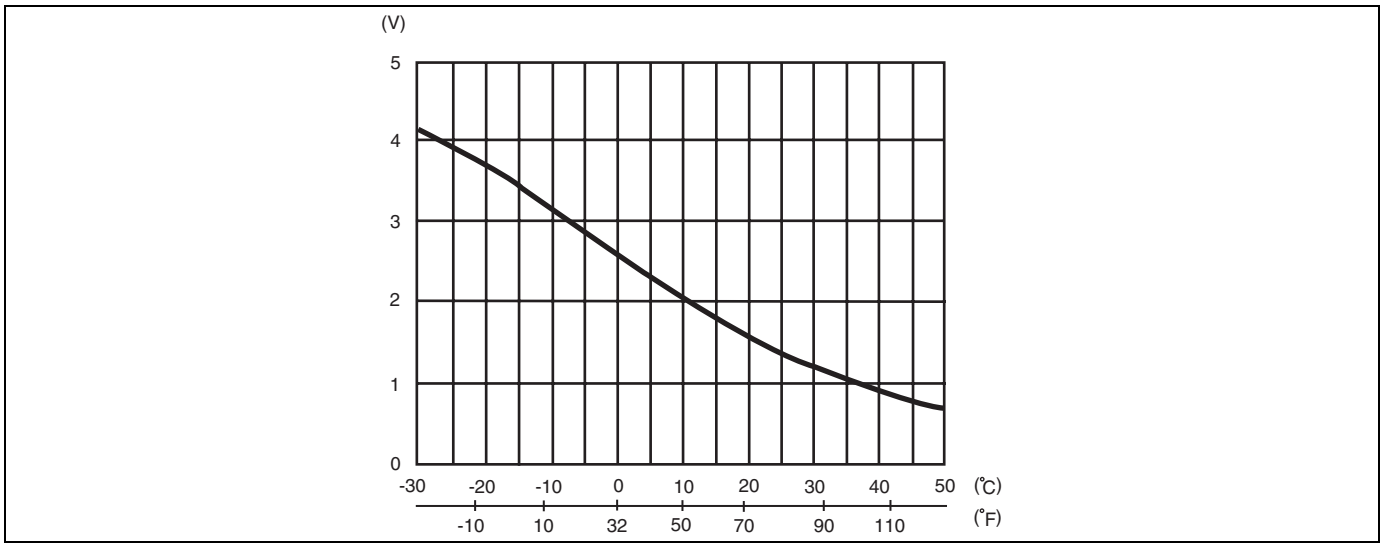



[C]



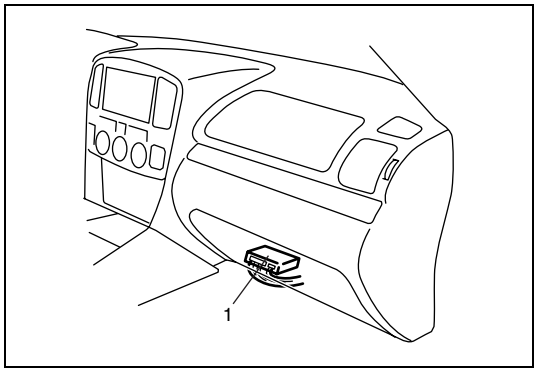

| | | |
|---|---|---|
| [A]: Waveform at 0 °C (32 °F) | [B]: Waveform at 40 °C (104 °F) | [C]: Waveform at 80 °C (176 °F) |

## Reference Graph No.1



# A/C Controller and Its Circuits (RHW Engine)

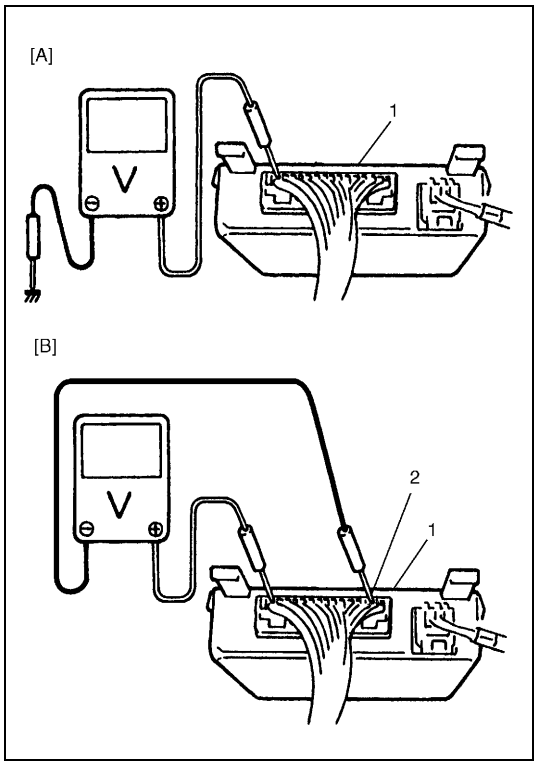
**CAUTION:**
**A/C controller (1) cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to A/C controller with couplers disconnected from it.**




A/C controller (1) and its circuits can be checked at A/C controller wiring couplers by measuring voltage.

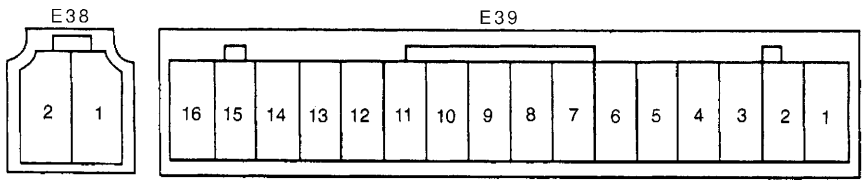
### Voltage Check

1) Remove A/C controller (1) from blower unit referring to "A/C Controller (RHW Engine)" in this section.
2) Connect A/C controller couplers to A/C controller (1).
3) Check each terminal voltage referring to "A/C controller voltage value table" in this section.




| |
|---|
| [A]: Fig. A |
| [B]: Fig. B |
| 1. A/C controller |
| 2. E39-15 |

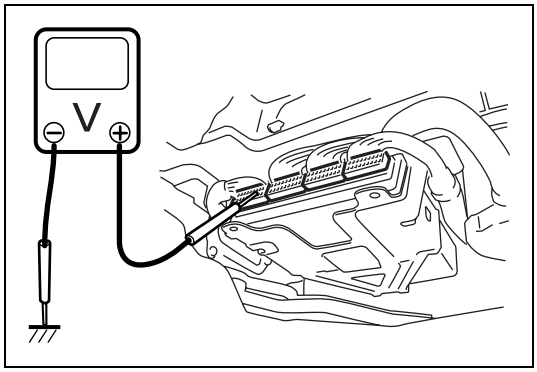
### Terminal arrangement of A/C controller



## A/C controller voltage value table

| Terminal | Wire color | Circuit | Measurement ground | Normal value | Condition |
|---|---|---|---|---|---|
| E39-1 | PNK | Compressor magnet clutch relay drive | Ground to engine (Fig. B) | –0.3 – 0.3 V | Fulfill all of the following conditions.<br>• Blower speed selector ON<br>• Fulfill either one of the following conditions.<br>– A/C switch ON<br>– Air flow selector at DEF or DEF/FOOT position<br>• Engine running<br>• A/C evaporator thermistor (A/C evaporator temperature sensor) temperature input more than approx. 4 °C (39.2 °F)<br>• A/C refrigerant (dual) pressure switch ON<br>• Signal input from ECM ON |
| | | | | 12 – 15 V | Except the above conditions with engine running |
| E39-4 | YEL/RED | A/C ON signal output to A/C controller through relay | Ground to engine (Fig. B) | 4 – 6 V | Fulfill all of the following conditions.<br>• Blower speed selector ON<br>• Fulfill either one of the following conditions.<br>– A/C switch ON<br>– Air flow selector at DEF or DEF/FOOT position<br>• Engine running<br>• A/C evaporator thermistor (A/C evaporator temperature sensor) temperature input more than approx. 4 °C (39.2 °F)<br>• A/C refrigerant (dual) pressure switch ON |
| | | | | 12 – 15 V | Except the above conditions with engine running |
| E39-8 | GRY/WHT | A/C ON permission | Ground to engine (Fig. B) | 10 – 14 V | A/C ON permitted |
| | | | | –0.3 – 0.3 V | A/C ON forbidden |
| E39-10 | GRN/BLU | A/C refrigerant (dual) pressure switch input | Ground to engine (Fig. B) | –0.3 – 0.3 V | A/C refrigerant (dual) pressure switch is ON with engine running |
| | | | | 12 – 15 V | A/C refrigerant (dual) pressure switch is OFF with engine running |
| E39-13 | BLK | Controller main ground | Ground to body (Fig. A) | –0.3 – 0.3 V | Engine running |
| E39-15 | BLK | Controller main ground | Ground to body (Fig. A) | –0.3 – 0.3 V | Engine running |
| E39-16 | BLK/WHT | Controller main power supply | Ground to engine (Fig. B) | 10 – 14 V | Ignition switch is ON position |
| E38-1 | BLK | Controller main ground | Ground to body (Fig. A) | –0.3 – 0.3 V | Engine running |
| E38-2 | BLK | Controller main ground | Ground to body (Fig. A) | –0.3 – 0.3 V | Engine running |

## ECM (PCM) and Its Circuits (H27 Engine)



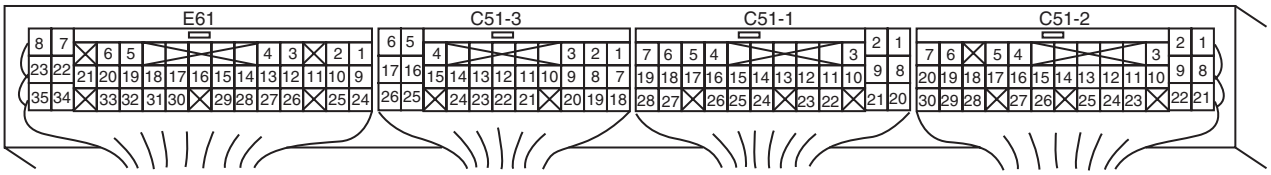

**CAUTION:**
**ECM (PCM) (1) cannot be checked by itself. It is strictly prohibited to connect voltmeter (2) to ECM (PCM) with couplers disconnected from it.**

ECM (PCM) and its circuits can be checked at ECM (PCM) wiring couplers by measuring voltage.

**Voltage Check**

1) Remove ECM (PCM) cover.
2) Check each terminal voltage with couplers connected.

**Terminal Arrangement of ECM (PCM)**




**ECM (PCM) Voltage Values Table**

| Terminal | Wire Color | Circuit | Normal Value | Condition |
|---|---|---|---|---|
| E16-16 | PNK/WHT | Electric load signal for blower motor | 10 – 14 V | Ignition switch turned ON, blower speed selector selected at under 3rd speed position |
| | | | 0 – 1 V | Ignition switch turned ON, blower speed selector selected at 3rd speed position or more |
| E61-17 | GRN/BLK | A/C request signal | 10 – 14 V (High input) | Ignition switch turned ON, blower speed selector selected at OFF position or A/C switch turned OFF or A/C evaporator temperature less than 2.5 °C, 36.5 °F |
| | | | 0 – 1 V (Low input) | Ignition switch turned ON, blower speed selector selected at ON position and A/C switch turned ON with A/C evaporator temperature more than 4 °C, 39.2 °F |
| E61-18 | BLU/ORN | Relay of high speed side for A/C condenser fan motor | 10 – 14 V | Ignition switch turned ON, engine coolant temperature under 115 °C, 239 °F or A/C request signal high input |
| | | | 0 – 1 V | Ignition switch turned ON, engine coolant temperature more than 114 °C, 237 °F or medium pressure switch in refrigerant pressure switch is OFF with A/C request signal low input |

| Terminal | Wire Color | Circuit | Normal Value | Condition |
|---|---|---|---|---|
| E61-22 | YEL/BLU | Relay output of low speed side for A/C condenser fan motor | 10 – 14 V | Ignition switch turned ON, engine coolant temperature under 115 °C, 239 °F or A/C request signal high input |
| | | | 0 – 1 V | Ignition switch turned ON, engine coolant temperature more than 114 °C, 237 °F or A/C request signal low input |
| E61-25 | YEL/WHT | ECT sensor signal for combination meter | 0 – 0.6 V<br>↑↓<br>4 – 6 V<br>(Repeated indicator) | Ignition switch turned ON<br>(Output signal is 1 Hz active low duty pulse. Duty ratio varies depending on ECT.)<br>ECT –30 °C = 10 % ON duty<br>ECT 130 °C = 90 % ON duty |
| C51-3-7 | PNK | A/C compressor relay output | 10 – 14 V | Engine running, A/C request signal high input or ECT more than 113 °C, 235 °F |
| | | | 0 – 1 V | Engine running, A/C request signal low input and ECT less than 110 °C, 198 °F |
| C51-3-18 | ORN | Medium pressure signal for A/C refrigerant pressure switch | 0 – 1 V | Ignition switch turned ON, A/C refrigerant pressure below 1400 kPa, 14 kg/cm$^2$, 21.5 psi |
| | | | 10 – 14 V | Ignition switch turned ON, A/C refrigerant pressure over 1800 kPa, 18 kg/cm$^2$, 27.5 psi |

# HVAC Diagnosis

## Scan Tool Data

As the data values given below 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 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 | <For vehicle with automatic A/C system><br>Each reference value is relative to the position of temperature selector of HVAC control module. | Max Cool, 20 °C (68 °F), 20.5 °C (68.9 °F)... 29.5 °C (85.1 °F), 30 °C (86 °F), Max Hot |
| | <For vehicle with manual A/C system><br>Each reference value is relative to the position of temperature selector of HVAC control module. | Max Cool, P1, P2... P20, P21, Max Hot |
| CABIN TEMPERATURE (NOTE 1) | Reference value is relative to in-car temperature. | –29 °C – 47.5 °C (–20.2 °F – 117 °F) |
| OUTSIDE AIR TEMP (NOTE 1) | Reference value is relative to outside air temperature. | –29 °C – 47.5 °C (–20.2 °F – 117.5 °F) |
| EVAPORATOR TEMP | Reference value is relative to temperature of evaporator. | –29 °C – 47.5° C (–20.2 °F – 117.5 °F) |
| COOLANT TEMP | At specified idle speed after warming up engine | 80 °C – 100 °C (176 °F – 212 °F) |
| SUNLOAD (NOTE 1) | Reference value depends on the amount of sunlight. | 0 W/m$^2$ – 1963.5 W/m$^2$ |
| MODE CONT SWITCH | <For vehicle with automatic A/C system><br>Each reference value is relative to the position of airflow selector of HVAC control module. | AUTO, VENT, BI-LEVEL, FOOT, DEF-FOOT, DEF |
| | <For vehicle with manual A/C system><br>Each reference value is relative to the position of airflow selector of HVAC control module. | VENT, BI-LEVEL, FOOT, DEF-FOOT, DEF |
| FAN CONT SWITCH | <For vehicle with automatic A/C system><br>Each reference value is relative to the position of blower speed selector of HVAC control module. | AUTO, 1st, 2nd... 7th, 8th |
| | <For vehicle with manual A/C system><br>Each reference value is relative to the position of blower speed selector of HVAC control module. | 1st, 2nd... 7th, 8th |
| FAN DESIRE VOLT | Reference value is relative to the position of blower speed selector of HVAC control module. | 0 – 15.5 V |
| AIR MIX POS SENSOR | Reference value is relative to the position of temperature selector of HVAC control module. | 0.5 V (Max Cool) |
| | | 4.5 V (Max Hot) |
| MODE POS SENSOR | Reference value is relative to the position of airflow selector of HVAC control module. | 0.5 V (DEF) |
| | | 4.5 V (VENT) |
| A/C CONT SIG | A/C system is ON. | ON |
| | A/C system is OFF. | OFF |
| BLOWER FAN LOAD | Position of blower speed selector is at OFF, 1st or 2nd position. | OFF |
| | Position of blower speed selector is at more than 3rd position. | ON |

| Scan Tool Data | Condition | Normal Condition / Reference Value |
|---|---|---|
| AIR INTAKE MODE | Fresh air (FRE) mode is activated. | FRE |
| | Recirculation air (REC) mode is activated. | REC |
| | • Engine coolant temperature is less than 60 °C.<br>• Air outlet is other than FACE position.<br>• When air intake mode is changed to recirculation air (REC) mode. | MIX |
| A/C INDICATOR LAMP | A/C indicator lamp is lighted. | ON |
| | A/C indicator lamp is not lighted. | OFF |
| FRE INDICATOR LAMP | Fresh air (FRE) indicator lamp is lighted. | ON |
| | Fresh air (FRE) indicator lamp is not lighted. | OFF |
| REC INDICATOR LAMP | Recirculation air (REC) indicator lamp is lighted. | ON |
| | Recirculation air (REC) indicator lamp is not lighted. | OFF |
| REAR DEF INDICATOR | Rear defogger indicator lamp is lighted. | ON |
| | Rear defogger indicator lamp is not lighted. | OFF |
| ILLUMINATION | Lighting switch is at parking or ON position. | ON |
| | Lighting switch is at OFF position. | OFF |
| SUPPLEMENT HEATER (NOTE 3) | • Engine is running.<br>• Position of temperature selector is at max hot.<br>• Position of blower speed selector is at ON.<br>• Engine coolant temperature is less than 60 °C.<br>• Position of air flow selector is at FOOT, DEF/FOOT, or DEF.<br>• Battery voltage is more than 9 V. | ON |
| | Other than the above condition | OFF |
| STEERING WHEEL (NOTE 1) | For vehicle equipped with left steering wheel | Left |
| | For vehicle equipped with right steering wheel | Right |
| FUEL TYPE (NOTE 2) | For vehicle which uses gasoline fuel | Gasoline |
| | For vehicle which uses diesel fuel | Diesel |

**NOTE1:**

**This data is for vehicle with automatic air conditioning system.**

**NOTE2:**

**This data is for vehicle with manual air conditioning system.**

**NOTE3:**

**This data is for vehicle with RHW engine.**

## Scan tool data definitions

### TEMP CONT SWITCH

Position of temperature control selector of HVAC control module

### CABIN TEMPERATURE (for vehicle with automatic air conditioning system)

In-car temperature detected by inside air temperature sensor installed in HVAC control module

### OUTSIDE AIR TEMPERATURE (for vehicle with automatic air conditioning system)

Outside air temperature detected by outside air temperature sensor installed on 4WD air pump assembly bracket

**EVAPORATOR TEMP**
Temperature of air passed through evaporator

**COOLANT TEMP**
Engine coolant temperature detected by engine coolant temperature sensor

**SUNLOAD (for vehicle with automatic air conditioning system)**
Amount of sunlight detected by sunload sensor installed on the driver side on the dashboard

**MODE CONT SWITCH**
Position of airflow selector of HVAC control module

**FAN CONT SWITCH**
Position of blower speed selector of HVAC control module

**FAN DESIRE VOLT**
Voltage for blower motor

**AIR MIX POS SENSOR**
Input signal from position sensor in temperature control actuator

**MODE POS SENSOR**
Input signal form position sensor in air flow control actuator

**A/C CONT SIG (ON or OFF)**
State of A/C indicator lamp

**BLOWER FAN LOAD (ON or OFF)**
ON: Position of blower speed selector is at 1st or 2nd position.
OFF: Position of blower speed selector is at more than 3rd position.

**AIR INTAKE MODE (FRE, REC or MIX)**
State of air intake switch

**A/C INDICATOR LAMP (ON or OFF)**
State of A/C indicator lamp

**FRE INDICATOR LAMP (ON or OFF)**
State of fresh air (FRE) indicator lamp

**REC INDICATOR LAMP (ON or OFF)**
State of recirculation air (REC) indicator lamp

**REAR DEF INDICATOR (ON or OFF)**
State of rear defogger indicator lamp

**ILLUMINATION (ON or OFF)**

State of lighting switch

**STEERING WHEEL (RIGHT or LEFT) (for vehicle with automatic air conditioning system)**

Position of steering wheel

**FUEL TYPE (GASOLINE or DIESEL) (for vehicle with manual air conditioning system)**

Type of fuel which should be used

**SUPPLEMENT HEATER (ON or OFF) (RHW engine)**

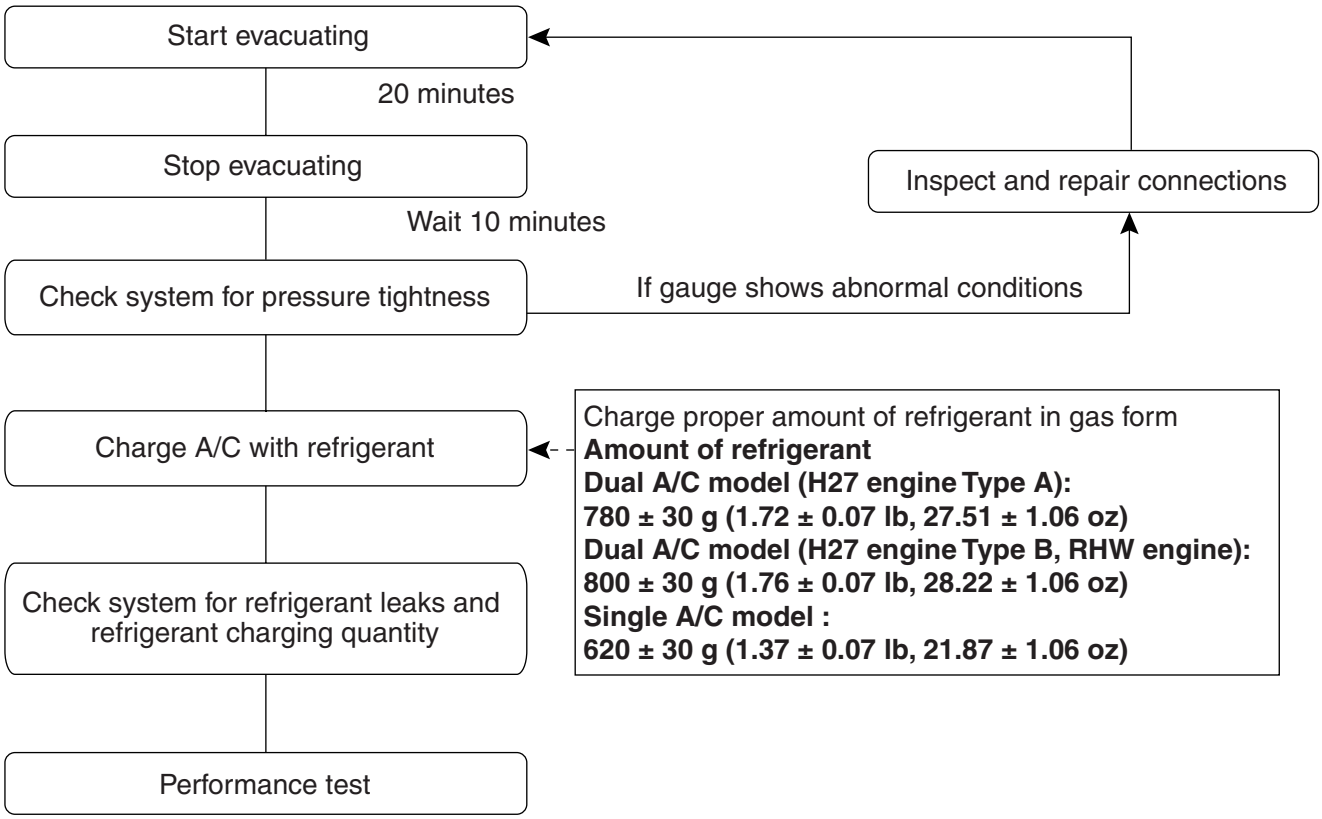
State of supplementary heater in heater and cooling unit

# Refrigerant Recovery, Evacuation and Charging

**WARNING:**

- **Your eyes should not be exposed to refrigerant (liquid).**
  **Any liquid Refrigerant-134a escaping by accident shows a temperature as low as approx. –6 °C (21.2 °F) below freezing point. Should liquid HFC-134a (R-134a) get into your eyes, it may cause a serious injury. To protect your eyes against such accident, it is necessary to always wear goggles. Should it occur that HFC-134a (R-134a) strikes your eye(s), consult a doctor immediately.**
  - **Do not use your hand to rub the affected eye(s). Instead, use quantities of 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 HFC-134a (R-134a) liquid come into contact with your skin, the affected area should be treated in the same manner as when skin is frostbitten or frozen.**
- **Refrigerant must not be handled near where welding or steam cleaning is performed.**
- **Refrigerant should be kept at a cold and dark place. It should never be stored where a high temperature is anticipated, e.g. where exposed to direct sun light, close to fire or inside vehicle (including trunk room).**
- **Avoid breathing fumes produced when HFC-134a (R-134a) is burned. Such fumes may be hazardous to health.**

## Operation Procedure for Charging A/C with Refrigerant

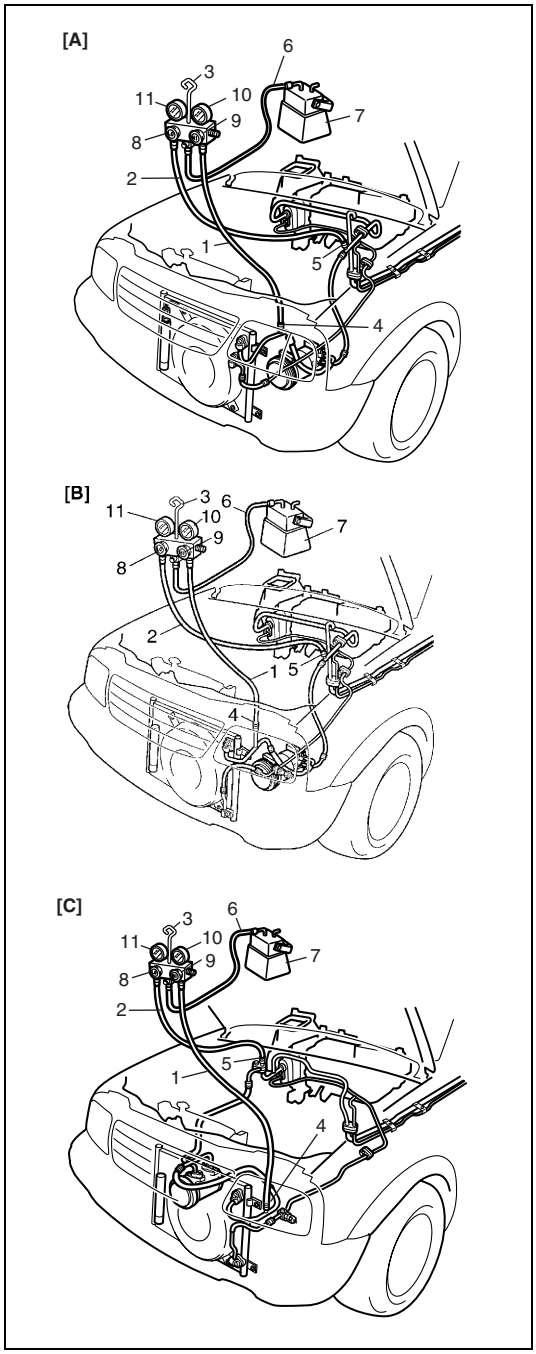


# Evacuating

## Evacuating Procedure

**CAUTION:**
**Do not evacuate before recovering refrigerant in system.**

**NOTE:**
**Whenever opened (exposed to atmospheric air), air conditioning 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 approx. 20 minutes.**




1) Connect high charging hose (1) and low charging hose (2) of manifold gauge set (3) respectively as follows:
   High Charging Hose (1) → High pressure charging valve (4) on Discharge Hose
   Low Charging Hose (2) → Low pressure charging valve (5) on Suction Pipe
2) Attach center charging hose (6) of manifold gauge set (3) to vacuum pump (7).
3) Operate vacuum pump (7), and then open discharge-side valve (9) (Hi) of manifold gauge set (3).
   If there is no blockage in the system, there will be an indication on high pressure gauge (10).
   When this occurs, open the other-side valve (8) (Lo) of the set.
4) Approx. 10 minutes later, low pressure gauge (11) should show –10 kPa (–1.0 kg/cm$^2$, –760 mmHg, –14.2 psi) providing no leakage exists.

| |
|---|
| [A]: H27 engine (Type A) |
| [B]: H27 engine (Type B) |
| [C]: RHW engine |

**NOTE:**

- **If the system does not show –10 kPa (–1.0 kg/cm$^2$, –760 mmHg, –14.2 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 20 minutes.
6) Continue evacuation until low pressure gauge indicates –10 kPa (–1.0 kg/cm$^2$, –760 mmHg, –14.2 psi), and then close both valves (8), (9).

7) Stop vacuum pump (7). Disconnect center charging hose (6) from pump inlet. Now, the system is ready for charging refrigerant.

### Checking System for Pressure Leaks

After completing the evacuation, close manifold gauge high pressure valve (HI) and low-pressure valve (LO) 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, make necessary corrections, and evacuate system once again, making sure that there are no leaks.**

## Charging

**CAUTION:**

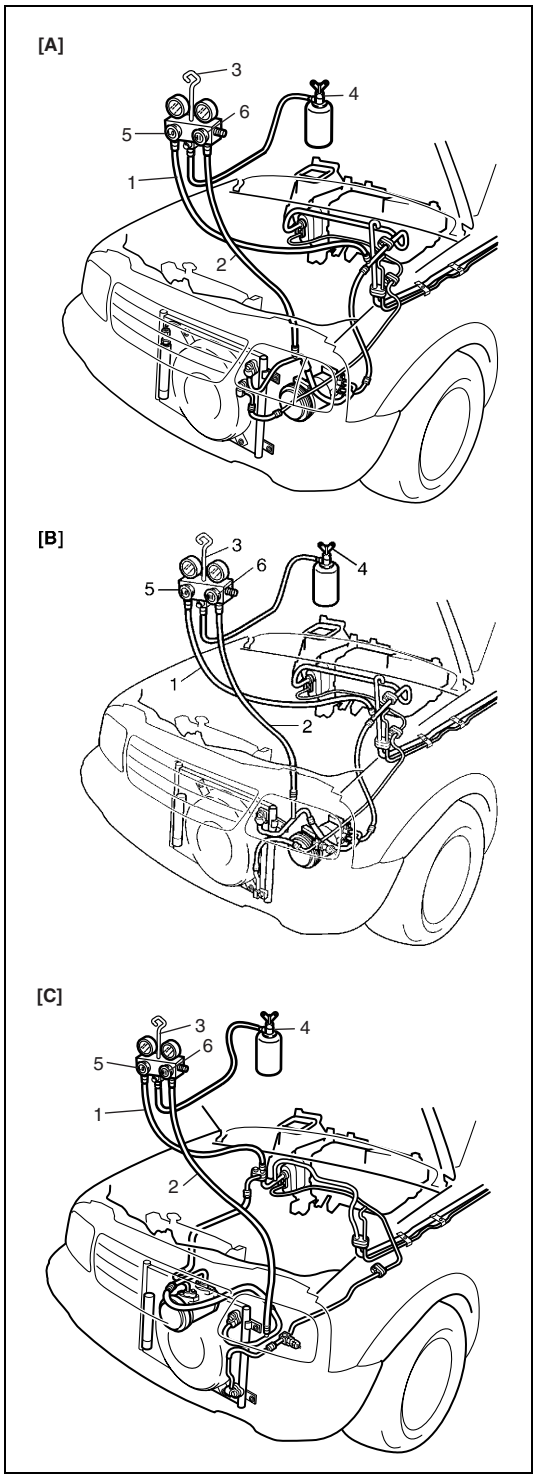
- **Always charge through low pressure-side of A/C system at after the initial charging is performed from the high-pressure side with the engine stopped.**
- **Never charge to high pressure-side of A/C system with engine running.**
- **Do not charge while compressor is hot.**
- **When installing tap 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 charging.**
- **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 charging. 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 charging of the A/C system is performed from 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 to make sure that hoses are routed properly after evacuating the system.




2) Connect low-side hose (1) and high-side hose (2) of the manifold gauge set (3) in position. Thus open refrigerant container valve (4) to purge the charging line.
3) Open the high-pressure side valve (6) and charge refrigerant to system.
4) After a while, open the low-pressure side valve (5) and close the high-pressure side valve (6).

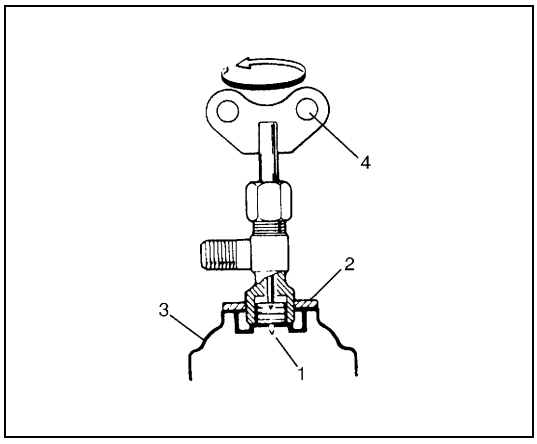
**WARNING:**
**Make sure that high pressure-side valve is closed securely.**

| |
|---|
| [A]: H27 engine (Type A) |
| [B]: H27 engine (Type B) |
| [C]: RHW engine |

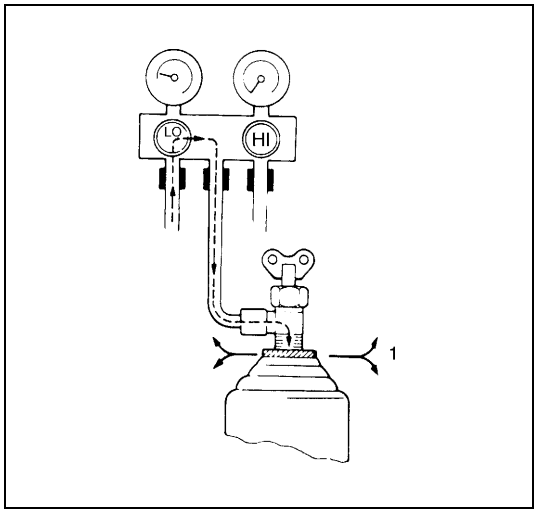
5) Start engine and keep engine speed at 1500 rpm. Then, operate air conditioning.

**NOTE:**
**For Dual A/C model, rear A/C system must also be operated.**

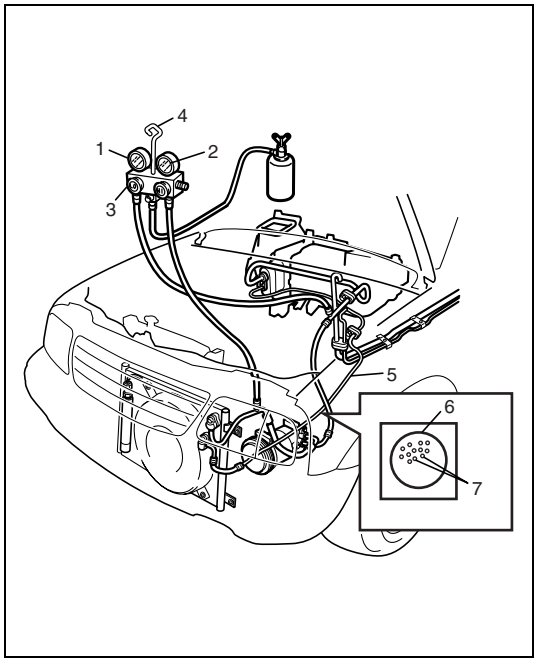
6) Charge A/C system with refrigerant in vapor state. At this time, refrigerant container should be held upright.




7) When refrigerant container (3) is emptied, use the following procedure to replace it with a new refrigerant container (3).
   a) Close low pressure valve.
   b) Replace empty container (3) with a refrigerant container which has been charged with refrigerant. When using refrigerant container tap valve (4), use the following procedure for replacement.
      i) Retract needle (1) and remove refrigerant container tap valve (4) by loosening its plate nut (2).
      ii) Install previously-removed refrigerant container tap valve (4) to a new refrigerant container (3).




   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 and then loosen (open) plate nut slightly.
      ii) Open low pressure valve of manifold gauge set a little.
      iii) As soon as refrigerant comes out with a “hiss” (1) through a clearance between refrigerant container and tap valve, tighten plate nut as well as manifold gauge set low pressure 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.




8) After the system has been charged with specified amount of refrigerant or when low pressure gauge (1) and high pressure gauge (2) must indicated the following specified amount, close low pressure side valve (3) of manifold gauge set (4). If equipped with sight glass in this time, look into the sight glass (6) of condenser outlet pipe (5) and check that there are no bubbles (7) in it, which means that the system is fully charged.

**Low pressure gauge when charged with specified amount:**

**About 200 – 300 kPa (2 – 3 kg/cm$^2$, 29 – 43 psi)**
**(At A/C inlet temperature 30 – 35 °C (86 – 95 °F))**
**High pressure gauge when charged with specified amount:**

**About 1370 – 1670 kPa (14 – 17 kg/cm$^2$, 200 – 244 psi)**
**(At A/C inlet temperature 30 – 35 °C (86 – 95 °F))**

# On-Vehicle Service

**WARNING:**

**Should refrigerant HFC-134a (R-134a) strike your eye(s), consult a doctor immediately.**

- **Do not use your hand to rub affected eye(s).**
  **Instead, use quantities of 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) get on your skin, such affected part should be treated in the same manner as when skin is frostbitten or frozen.**

**CAUTION:**

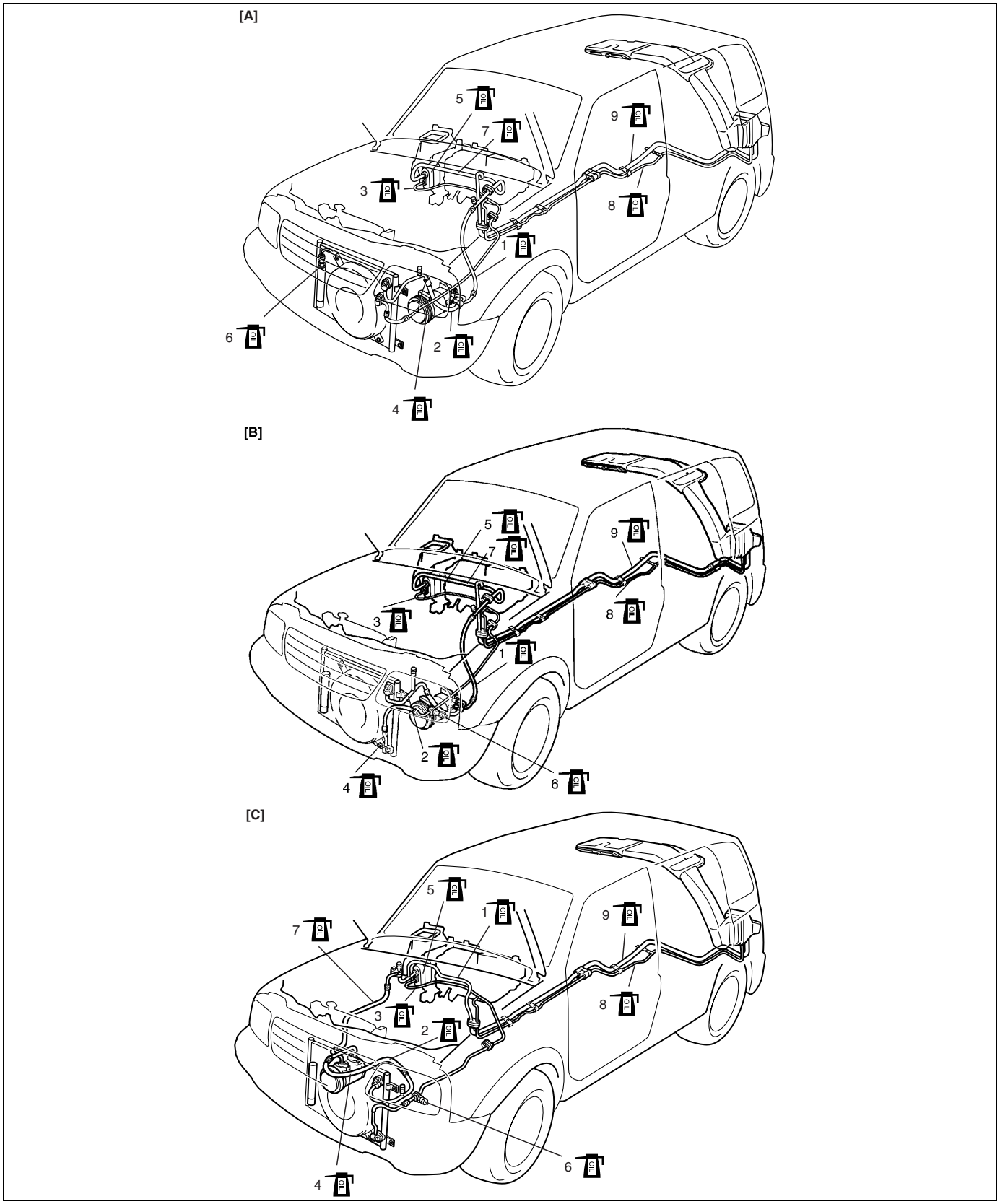
**None of refrigerant, compressor oil and component parts is interchangeable between two types of A/C: one using CFC-12 (R-12) and the other using HFC-134a (R-134a).**
**(For identification between these two types, refer to "Refrigerant Type" in this section.**
**When replenishing or changing refrigerant 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.**

## Precaution

When servicing air conditioning system, the following rules must be observed.

### Piping

- When connecting hoses and pipes, apply a few drops of compressor oil (refrigerant oil) to seats of coupling nuts and O-ring.




| | | | |
|---|---|---|---|
| [A]: H27 engine (Type A) | 1. Suction hose | 4. Condenser outlet pipe | 7. Front suction pipe |
| [B]: H27 engine (Type B) | 2. Discharge hose | 5. Expansion valve | 8. Rear liquid pipe (if equipped) |
| [C]: RHW engine | 3. Front liquid pipe | 6. Refrigerant (triple) pressure switch | 9. Rear suction pipe (if equipped) |
| Apply compressor oil (refrigerant oil) to O-ring. | | | |

- Never use heat for bending pipes. When bending a pipe, try to make its bending radius as slight 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 tightening or loosening a fitting, use two wrenches, one for turning and the other for support.
- Tighten flared nuts to specified torque.

**Tightening torque**
**8 mm (0.31 in.) pipe: 15 N·m (1.5 kg-m, 11.0 lb-ft)**
**16 mm (0.63 in.) pipe: 25 N·m (2.5 kg-m, 18.0 lb-ft)**

- Route drain hose so that drained water does not make any contact to vehicle components.

### Handling Refrigerant HFC-134a (R-134a)

- When handling refrigerant, always wear goggles to protect your eyes.
- Avoid you direct contact to liquid refrigerant.
- Do not heat refrigerant container higher than 40 °C (104 °F).
- Do not discharge refrigerant into atmosphere.
- Do not allow liquid refrigerant to touch bright metals. Refrigerant combined with moisture is corrosive and will tarnish surfaces of bright metals including chrome.
- After recovering refrigerant from system, the amount of compressor oil removed must be measured and the same amount added to the system.

### Refrigerant Recovery

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment. Discharging refrigerant HFC-134a (R-134a) into atmosphere would cause adverse effect to environments.

**NOTE:**
**When handling recovery and recycling equipment, be sure to follow the instruction manual for the equipment.**

### Refrigerant Charge

Charge a proper amount of refrigerant to A/C system according to charging procedure described in recovery, evacuation and charging.

**CAUTION:**
**Do not perform an additional refrigerant charging to A/C system. This cause it to overcharge.**

### Replenishing Compressor Oil

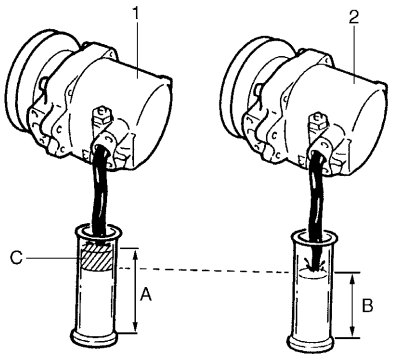
**CAUTION:**
**Be sure to use HFC-134a (R-134a) compressor oil.**

When replacing air conditioning parts with new ones, it is necessary to replenish oil by the amount supposedly remaining in each part.

### When Changing Gas Only

When it is unavoidable to change gas without replacing any component part for engine removal and installation or for some other reason, replenish 20 $cm^3$ (20 cc) oil. When replenishing gas only, oil replenishment is not necessary.

### When Replacing Compressor




Compressor oil is sealed in each new compressor (1) by the amount required for air conditioner cycle. Therefore, when using a new compressor for replacement, drain oil from it by the amount calculated as follows.

**"C" = "A" – "B"**
**"C": Amount of oil to be drained**
**"A": Amount of oil sealed in a new compressor**
**"B": Amount of oil remaining in removed compressor (2)**

**NOTE:**
**Compressor assembly supplied from factory is filled up with the following amount of oil.**

**Amount of oil in new compressor:**

| | H27 engine | RHW engine |
|---|---|---|
| Dual A/C model | 200 $cm^3$ (200 cc) | 140 $cm^3$ (140 cc) |
| Single A/C model | 150 $cm^3$ (150 cc) | 100 $cm^3$ (100 cc) |

### When Replacing Other Part

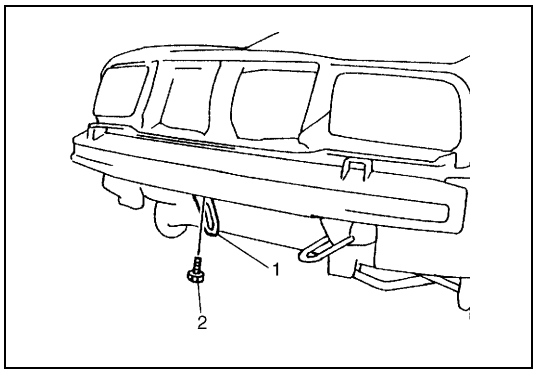
**Amount of compressor oil:**

| Replaced part | Amount of compressor oil to be replenished |
|---|---|
| Evaporator | 50 $cm^3$ (50 cc) |
| Rear evaporator (for dual A/C model) | 50 $cm^3$ (50 cc) |
| Condenser | 30 $cm^3$ (30 cc) |
| Receiver/dryer | 10 $cm^3$ (10 cc) |
| Hoses | 10 $cm^3$ (10 cc) each |
| Pipes | 10 $cm^3$ (10 cc) each |

# A/C Condenser Assembly

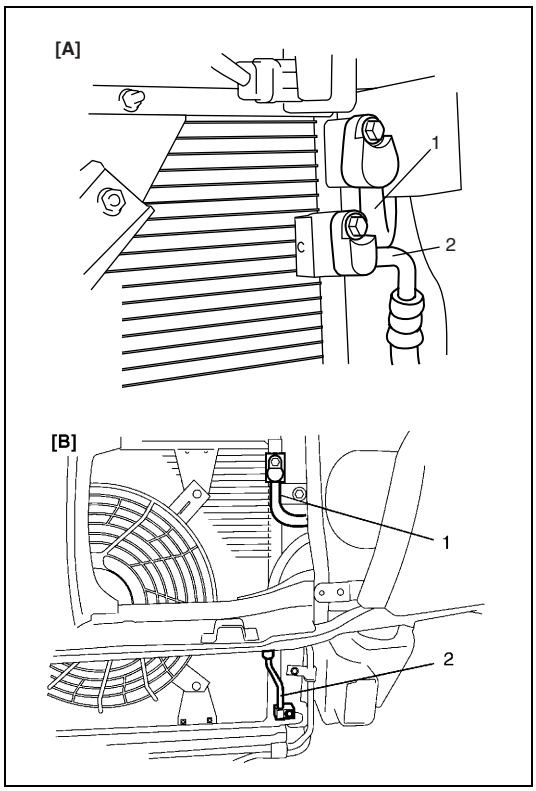
## Removal

1) Disconnect negative (–) cable at battery.
2) Recover refrigerant by using recovery and recycling equipment.
   Be sure to follow the instruction manual for the equipment.
   The amount of compressor oil removed must be measured and the same amount added to the system.




3) Remove front bumper assembly and lower stay (1) referring to “Front Bumper” in Section 9.

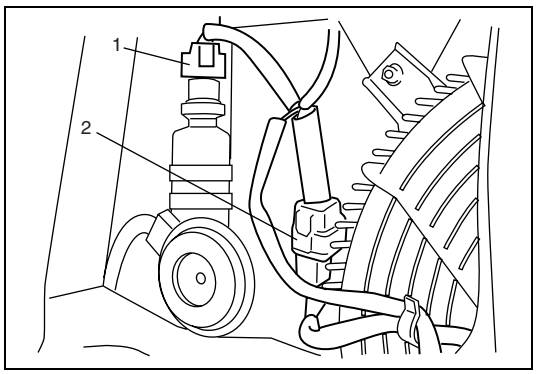
| |
|---|
| 2. Bolt |



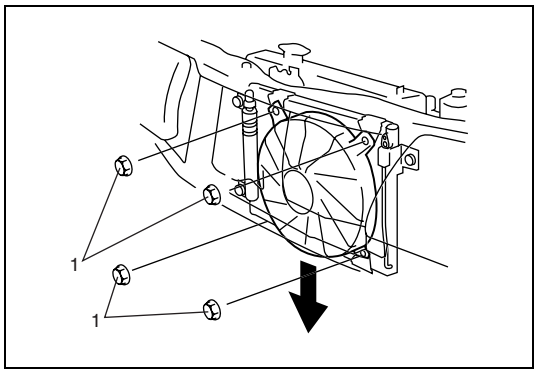

4) Disconnect compressor delivery hose (1) and liquid pipe (2) from condenser inlet fittings.

**CAUTION:**
**As soon as above hose and pipe are disconnected, cap opened fittings so that moisture and dust do not enter condenser.**

| |
|---|
| [A]: H27 engine (Type A) |
| [B]: H27 engine (Type B), RHW engine |



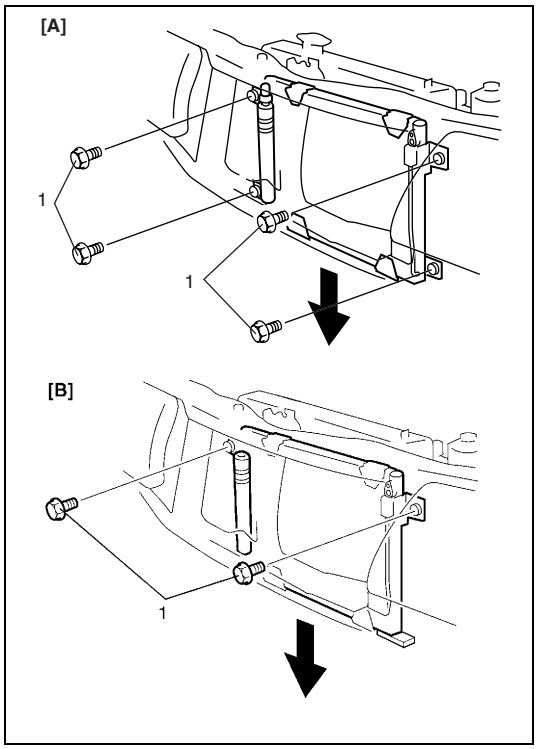

5) Disconnect coupler from triple pressure switch (1) (H27 engine (Type A) only).
6) Disconnect condenser cooling fan motor coupler (2).




7) Remove condenser fan mounting nuts (1) from condenser.
8) Remove condenser fan.

**NOTE:**

**Be careful not to damage fins of condenser.**




9) Remove receiver/dryer assembly from condenser.
10) Remove condenser mounting nuts (1) from vehicle.
11) Remove condenser.

**NOTE:**

**Be careful not to damage fins of condenser and radiator.**

| |
|---|
| [A]: H27 engine (Type A) |
| [B]: H27 engine (Type B), RHW engine |

### Inspection

**CAUTION:**

**Be careful not to damage condenser fins. If condenser fin is bent, straighten it by using a screwdriver or pair of pliers. If any leakage is found from fitting or tube, repair or replace condenser.**

**NOTE:**

**Clogged condenser fins should be washed with water, and should be dried with compressed air.**

Check the following items.

- Condenser fins for blockage
- Condenser fittings for leakage
- Condenser fins for damage

### Installation

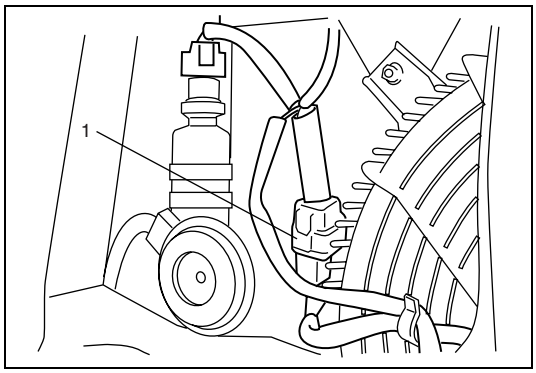
Reverse removal procedure to install condenser, noting the following points.

- When replacing condenser, add 30 cc of refrigerating oil from compressor suction-side.
- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

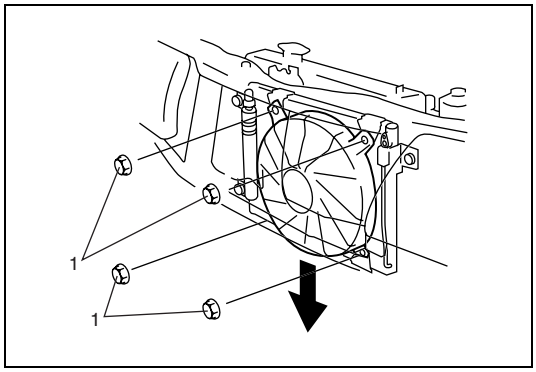
## A/C Condenser Fan Assembly

### Removal

1) Disconnect negative (–) cable at battery.
2) Remove front bumper referring to “Front Bumper” in Section 9.



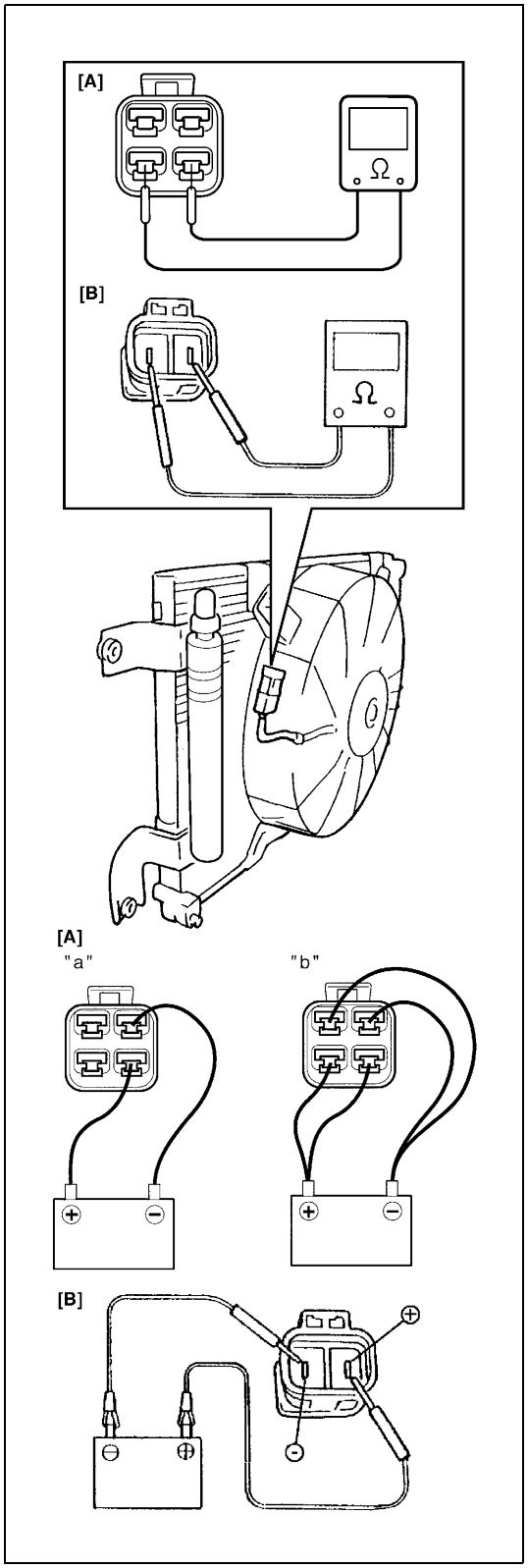

3) Disconnect condenser cooling fan motor coupler (1).




4) Remove condenser fan mounting nuts (1) from condenser.
5) Remove condenser fan.

**NOTE:**

**Be careful not to damage fins of condenser.**




## Inspection

- Check continuity between each terminal. If check results are continuity, proceed to the next operation check. If not, replace if with new one.
- Connect battery to condenser fan motor as shown in figure, and then check if it operates smoothly and fan speed varies. If it does not operate smoothly, replace it with new one.

**Reference specified consumption current at 12 V**
**H27 engine:**
**LOW: 6.0 – 8.0 A**
**HIGH: 9.0 – 11.0 A**

**RHW engine:**
**Maximum 12 A**

| | |
|---|---|
| [A]: | H27 engine |
| [B]: | RHW engine |
| "a": | Low |
| "b": | High |

## Installation

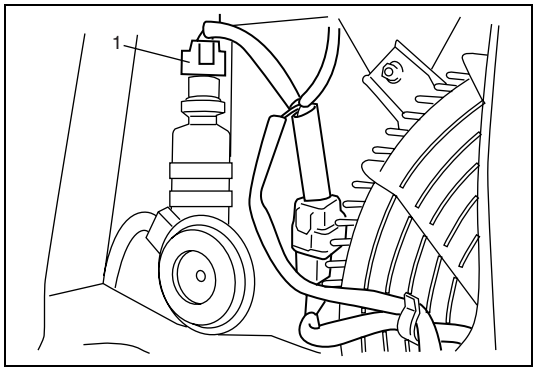
Reverse removal procedure to install condenser fan assembly.

# Receiver/Dryer

## H27 engine (Type A)

### Removal

1) Disconnect negative (–) cable at battery.
2) Recover refrigerant by using recovery and recycling equipent.
   Be sure to follow the instruction manual for the equipment
   The amount of compressor oil removed must be measured and the same amount added to the system.
3) Remove front bumper referring to “Front Bumper” in Section 9.




4) Disconnect coupler from A/C refrigerant (triple) pressure switch (1).
5) Remove receiver/dryer.

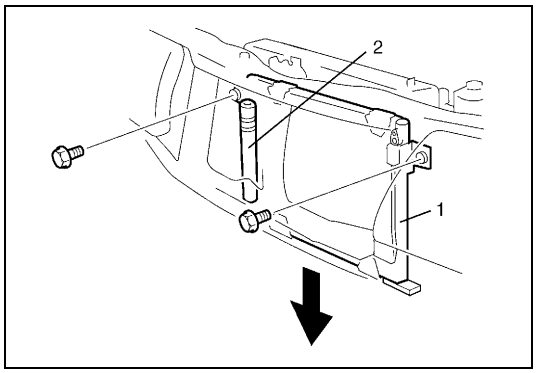
### Installation

Reverse removal procedure to install receiver/dryer, noting the following points.

- When replacing receiver/dryer, add 10 cc of refrigerating oil.
- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

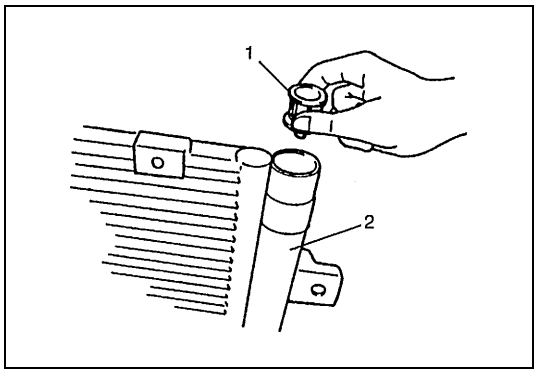
## H27 engine (Type B) and RHW engine

### Removal

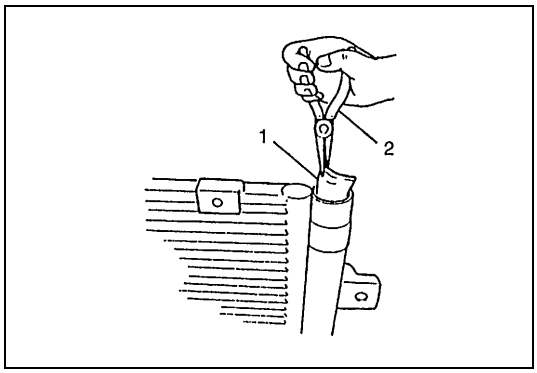



1) Remove A/C condenser assembly (1) from vehicle referring to “A/C Condenser Assembly” in this section.
2) Remove the condenser dryer cap from condenser.

| |
|---|
| 2. Condenser dryer section |

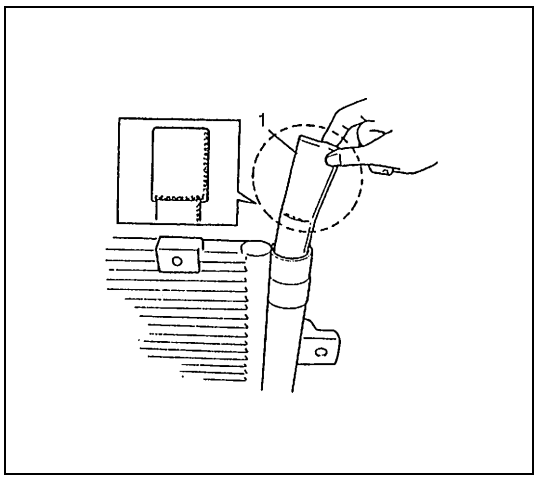



3) Remove the filter (1) from the condenser (receiver/dryer) (2).




4) Remove the desiccant (1) using a pliers (2).

### Installation




Reverse removal sequence to install condenser dryer, according to instruction manual with supply parts.

**NOTE:**

- **When replacing condenser dryer, add 40 cc of refrigerating oil the same as compressor oil.**
- **Do not remove the desiccant from the plastic bag until just before inserting it into the receiver/dryer.**
- **Install the desiccant (1) with its double-layer portion facing the bottom of the receiver/dryer.**
- **If desiccant cap installing is bolt type, tighten specified torque for its bolt.**

# A/C Refrigerant (Triple) Pressure Switch (H27 Engine)

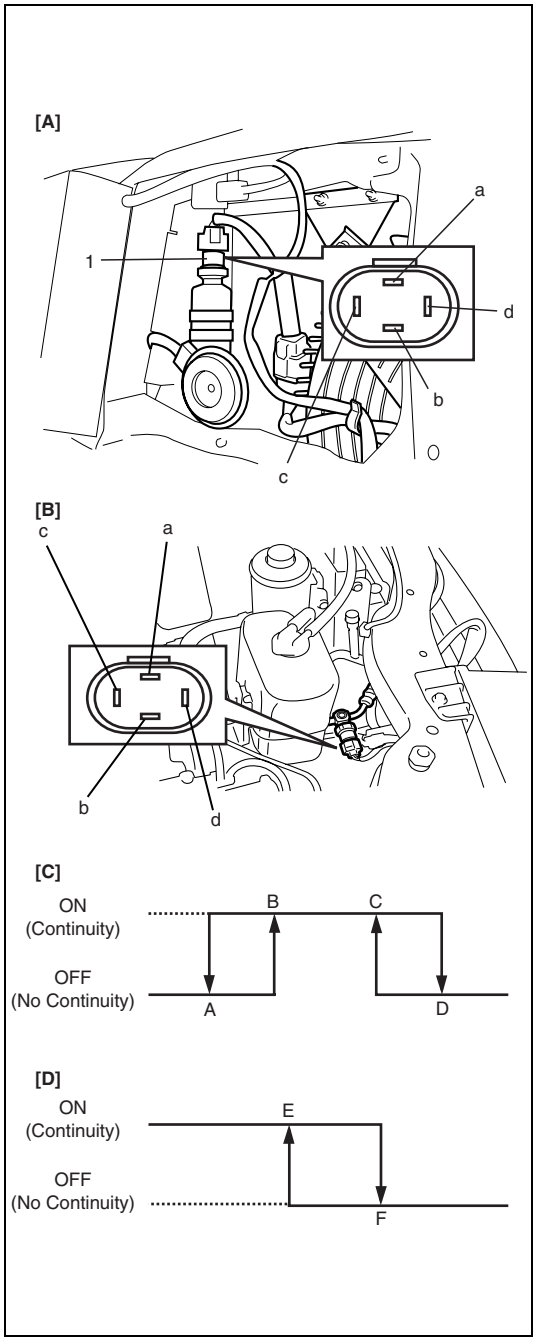
## Inspection

### A/C Control Pressure Switch

1) Run engine and A/C switch ON.
2) Check continuity between “a” and “b” terminals of A/C refrigerant pressure switch (1) in normal A/C condition.
   If there is no continuity, replace A/C refrigerant pressure switch.

### A/C Condenser Cooling Fan Control Pressure Switch

1) Connect manifold gauge set to charging valve.
2) Run engine and A/C switch ON.
3) Check continuity and no continuity between “c” and “d” terminals of A/C refrigerant pressure switch (1) according to A/C refrigerant pressure as shown. If operation is not as specified, replace A/C refrigerant pressure switch.




| | |
|---|---|
| [A]: | Type A |
| [B]: | Type B |
| [C]: | A/C control pressure switch ON/OFF operation |
| [D]: | A/C condenser fan control pressure switch |

**[A]: Type A**

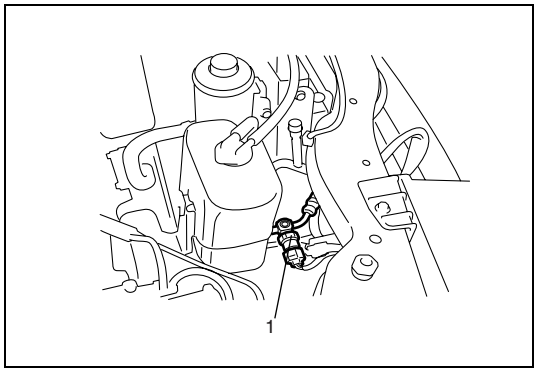
| |
|---|
| **A: Approx. 177 kPa (1.77 kg/cm$^2$, 25.5 psi)** |
| **B: Approx. 206 kPa (2.06 kg/cm$^2$, 29.5 psi)** |
| **C: Approx. 590 kPa (5.90 kg/cm$^2$, 84.0 psi)** |
| **D: Approx. 2940 kPa (29.40 kg/cm$^2$, 418.0 psi)** |
| **E: Approx. 1080 kPa (10.80 kg/cm$^2$, 135.5 psi)** |
| **F: Approx. 1470 kPa (14.70 kg/cm$^2$, 209.0 psi)** |

**[B]: Type B**

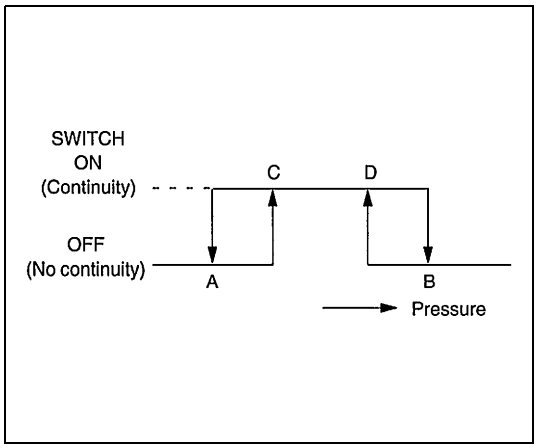
| |
|---|
| **A: Approx. 196 kPa (1.96 kg/cm$^2$, 27.9 psi)** |
| **B: Approx. 225 kPa (2.25 kg/cm$^2$, 32.0 psi)** |
| **C: Approx. 2550 kPa (25.50 kg/cm$^2$, 362.6 psi)** |
| **D: Approx. 3140 kPa (31.40 kg/cm$^2$, 446.5 psi)** |
| **E: Approx. 1080 kPa (10.80 kg/cm$^2$, 153.5 psi)** |
| **F: Approx. 1470 kPa (14.70 kg/cm$^2$, 209.0 psi)** |

## A/C Refrigerant (Dual) Pressure Switch (RHW engine)

### Inspection




1) Check dual pressure switch (1) on liquid pipe for continuity at normal temperature (approx. 25 °C (77 °F)) when A/C system has a proper charge of refrigerant and when A/C system (compressor) is under operation. In each of these cases, switch should show proper continuity.



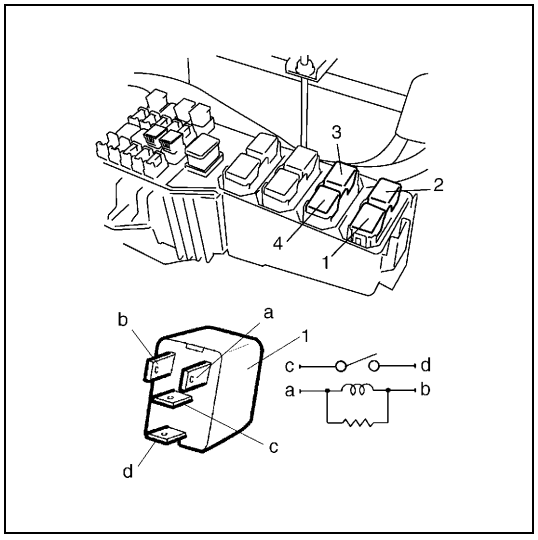

2) Using a manifold gauge set, check switch for operation at specified pressure as shown, refer to "Performance Diagnosis" in this section.

**A/C refrigerant (Dual) pressure switch specification**
**Switch ON: above "C" and below "D"**
**Switch OFF: below "A" or above "B"**

**"A": Approx. 200 kPa (2.0 kg/cm$^2$)**
**"B": Approx. 3200 kPa (32 kg/cm$^2$)**
**"C": Approx. 230 kPa (2.3 kg/cm$^2$)**
**"D": Approx. 2800 kPa (28 kg/cm$^2$)**

## A/C Compressor Relay and Condenser Fan Motor Relay

### Inspection



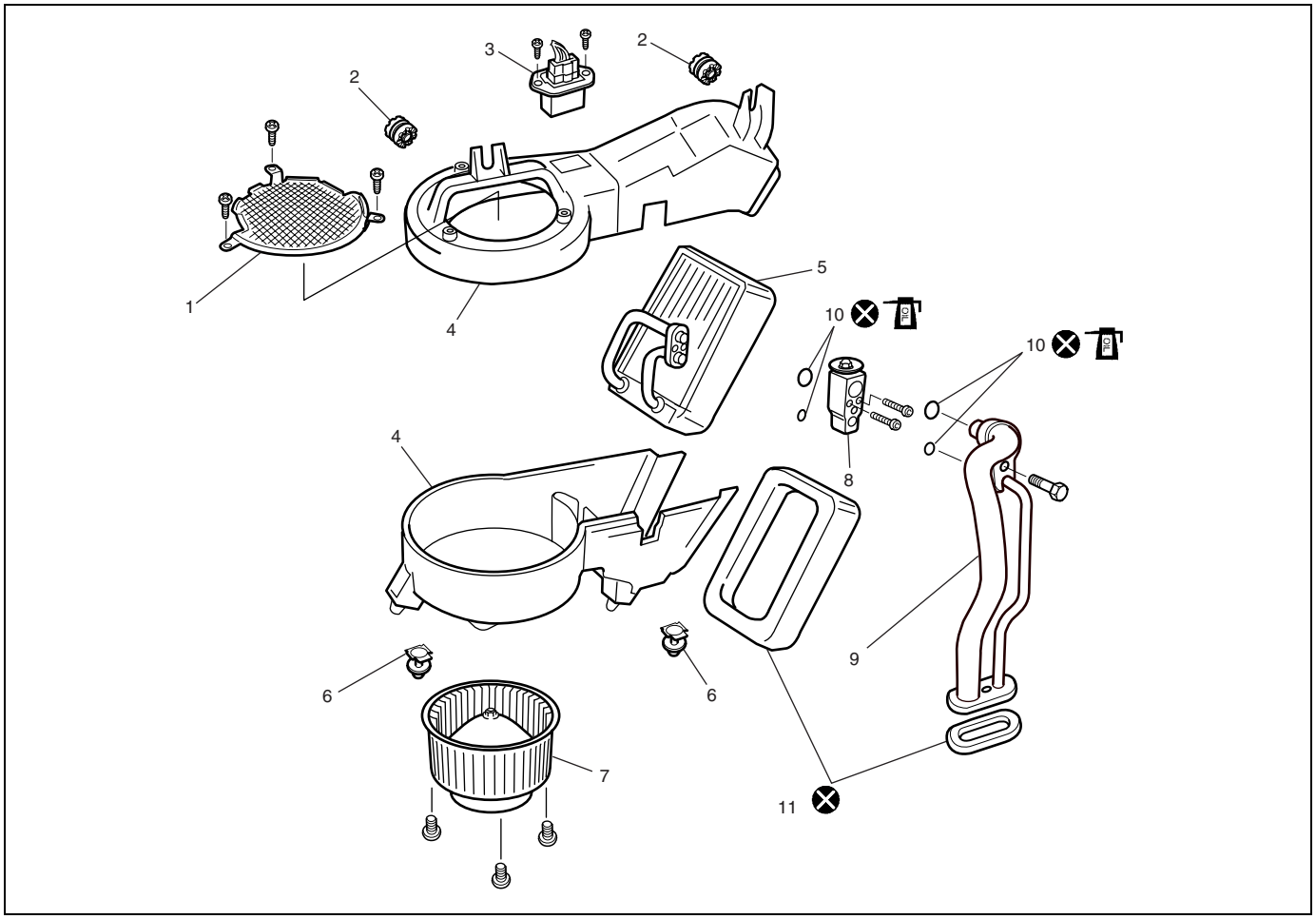

1) Disconnect negative (–) cable at battery.
2) Remove the following relays.

   H27 Engine
   - Condenser fan motor low speed relay(2)
   - Condenser fan motor high speed relay #1 (4)
   - Condenser fan motor high speed relay #2 (3)
   - Compressor relay (1)

   RHW Engine
   - Condenser fan motor relay(2)
   - Condenser fan motor high relay (3)
   - Compressor relay (1)

3) Check if 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 to 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.

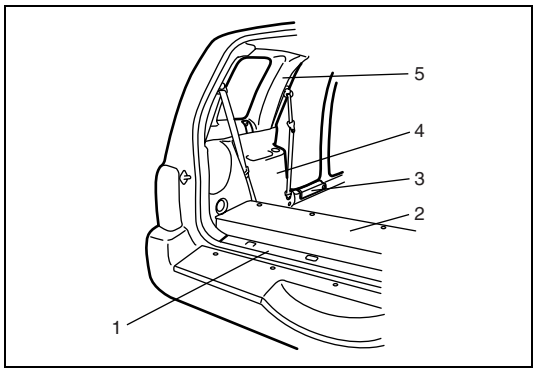
# Rear A/C Unit (Rear A/C Evaporator)



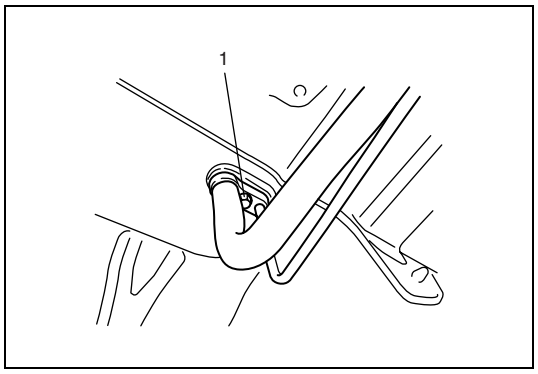

| | | | |
|---|---|---|---|
| 1. Rear blower fan cover | 5. Rear A/C evaporator | 9. Rear suction pipe | Apply compressor (refrigerant) oil to O-ring |
| 2. Rear A/C unit mounting bush | 6. Rear A/C unit mounting clip | 10. O-ring | |
| 3. Rear blower fan resistor | 7. Rear blower motor assembly | 11. Packing | |
| 4. Rear A/C unit cover | 8. Rear expansion valve | Do not reuse. | |

## Removal

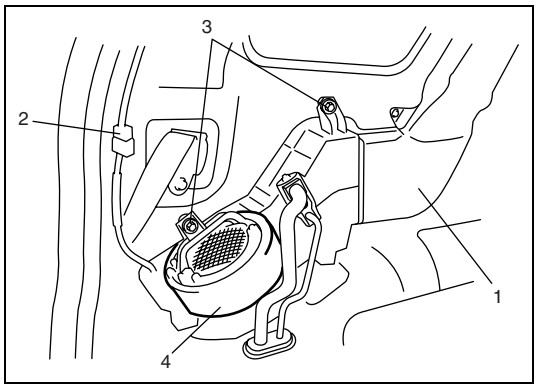
1) Disconnect negative (–) cable at battery.
2) Recover refrigerant by using recovery and recycling equipment. Be sure to follow the instruction manual for the equipment.
   The amount of compressor oil removed must be measured and the same amount added to the system.




3) Remove rear luggage mat end garnish (1), rear luggage box (2) (if equipped), rear side sill scuff (3) rear quarter lower trim (4) and rear quarter upper trim (5).




4) Loosen floor suction pipe and floor liquid pipe mounting bolt (1).




5) Remove rear A/C No.1 duct (1).
6) Disconnect rear A/C unit wire coupler (2).
7) Remove rear A/C unit mounting bolts (3), and then remove rear A/C unit (4).

**NOTE:**

**Cap open fitting immediately to keep moisture out of system.**

### Inspection

Check the following.

- Clog of rear A/C evaporator fins.
  If any clogs are found, rear A/C evaporator fins should be washed with water, and should be dried with compressed air.
- Rear A/C evaporator fins for leakage and breakage.
  If any defects are found, repair or replace rear A/C evaporator.

### Installation

Reverse removal procedure to install rear A/C unit noting the following points.

- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.
- If rear A/C unit or rear A/C evaporator is replaced, pour 50 $cm^3$ (50 cc) of refrigerating oil to compressor suction-side.

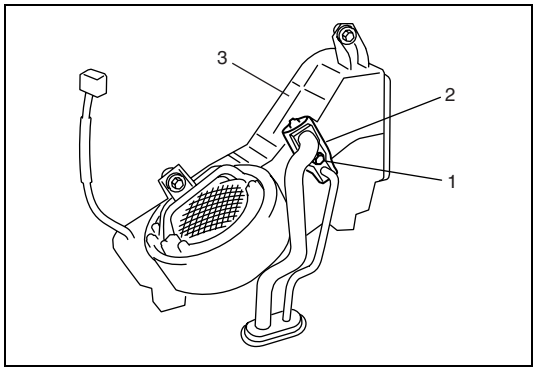
## Rear Expansion Valve

### Inspection

Refer to “Performance Diagnosis” in this section.

### Removal

1) Remove rear A/C unit referring to “Rear A/C Unit (Rear A/C Evaporator)” in this section.




2) Remove rear liquid pipe and rear suction pipe bolt (1) from rear expansion valve (2).
3) Remove rear expansion valve (2) from rear A/C unit (3).

**NOTE:**

**Cap open fitting immediately to keep moisture out of system.**

### Installation

Reverse removal procedure to install rear expansion valve noting the following points.

- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

## Refrigerant Pipes and Hoses

### Inspection

Perform the following.

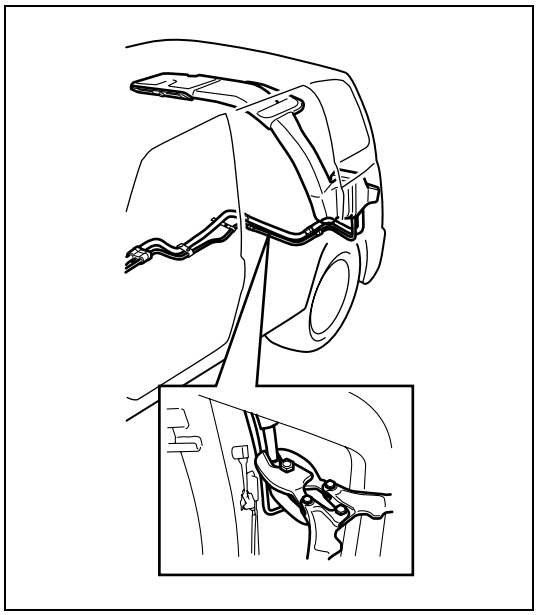
- Use a leak tester to check hoses and pipes for any gas leakage.
- Check each hose or pipe clamp for tightness. Retighten or replace loose clamp as required, if any.

### Removal

**CAUTION:**

**As soon as the refrigerant hose or pipe is disconnected, cap its opened fitting to prevent moisture and dust from entering.**

1) Recover refrigerant by using recovery and recycling equipment. Be sure to follow the instruction manual for the equipment.
   The amount of compressor oil removed must be measured and the same amount must be added to the system when reinstalling.
2) Replace defective hose or pipe.



**NOTE:**

**Cut A/C No.3 pipe referring to the figure if the pipe is not equipped with union and nut.**

### Installation

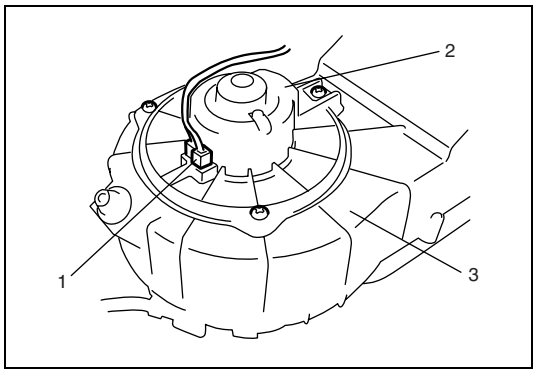
Reverse removal procedure to install refrigerant line noting the following points.

- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

## Rear Blower Motor Assembly

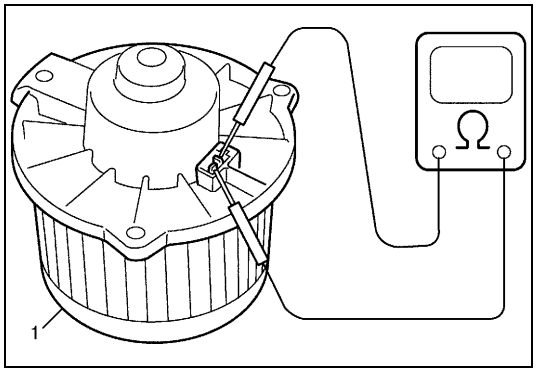
### Removal

1) Remove rear A/C unit referring to “Rear A/C Unit (Rear A/C Evaporator)” in this section.
2) Remove rear liquid pipe and suction pipe.

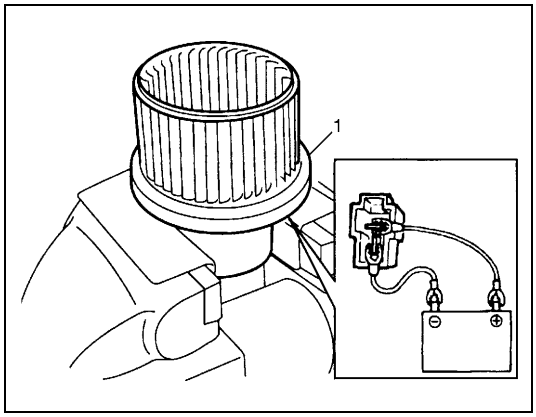



3) Disconnect rear blower motor coupler (1).
4) Remove rear blower motor assembly (2) from rear A/C unit (3).

### Inspection




1) Check continuity between two terminal as shown.
   If check results are no continuity, replace rear blower motor assembly (1).




2) Check for operation and current.
   a) Fix rear blower motor assembly (1) by using vise.
   b) Connect battery to rear blower motor assembly (1) as shown.
   c) Check that there is smoothly operates and no noise.
   d) Check that ammeter indicates specified current.
      If measure current is incorrect, replace blower motor assembly.

**Rear blower fan motor specified current at 12 V**
**: 16 A maximum**

### Installation

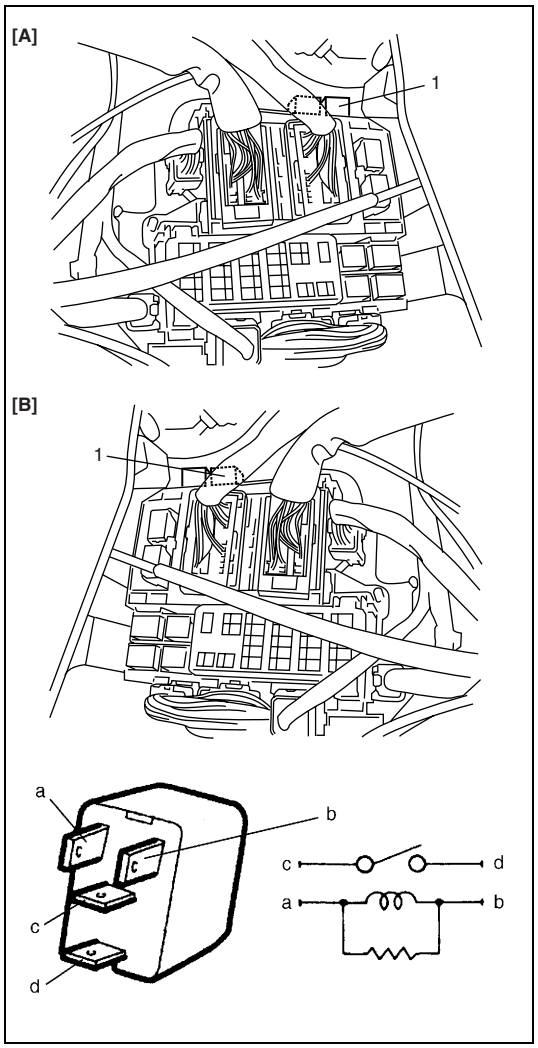
Reverse removal procedure to install rear blower motor assembly noting the following points.

- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

## Rear Blower Motor Relay

### Inspection

1) Disconnect negative (–) cable at battery.
2) Remove rear blower motor relay (1) from vehicle.
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 “a” of relay.
5) Connect battery negative (–) terminal “b” of relay.
6) Check continuity between terminal “c” and “d”.
   If there is no continuity when relay is connected to the battery, replace relay.

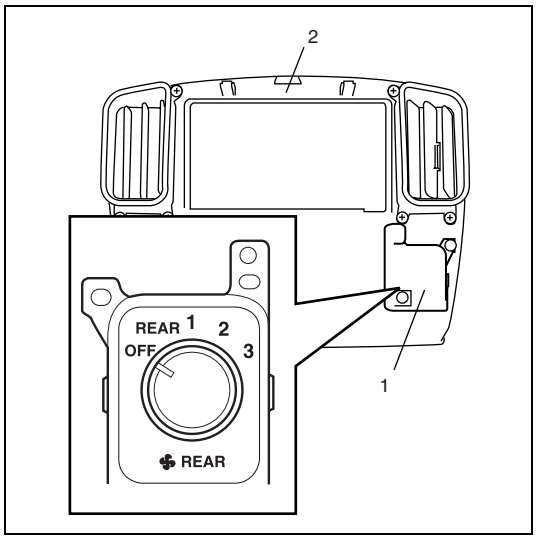



| | |
|---|---|
| [A]: | LH steering vehicle |
| [B]: | RH steering vehicle |

## Rear A/C Main Switch

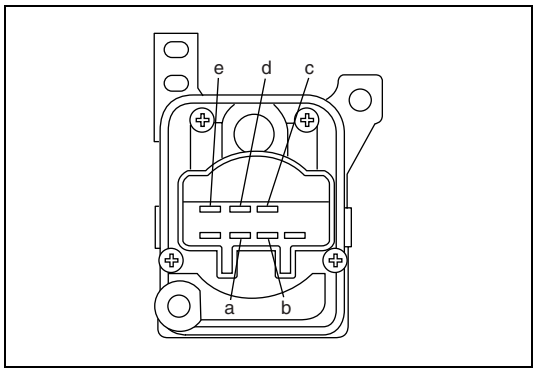
### Removal

1) Disconnect negative (–) cable at battery.
2) If equipped with air bag system, disable air bag system referring to “Disabling Air Bag System” in Section 10B.
3) Remove HVAC control module referring to “HVAC Control Module” in Section 1A.




4) Remove rear A/C main switch (1) from center garnish (2).

### Inspection




- Check rear A/C main switch for each terminal-to-terminal continuity.
  If check results are not specified, replace rear A/C main switch.

| POSITION \ TERMINAL | a | b | c | d | e |
|---|---|---|---|---|---|
| OFF | | | | | |
| REAR | ○ | ○ | | | |
| 1 | ○ | | ○ | | |
| 2 | ○ | | | ○ | |
| 3 | ○ | | | | ○ |

### Installation

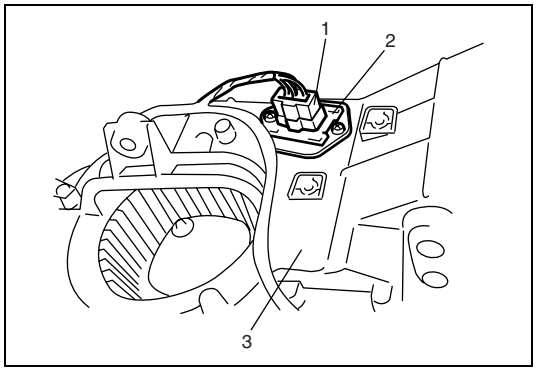
Reverse removal procedure to install rear A/C main switch noting the following instruction.

- If equipped with air bag system, enable air bag system referring to “Enabling Air Bag System” in Section 10B.

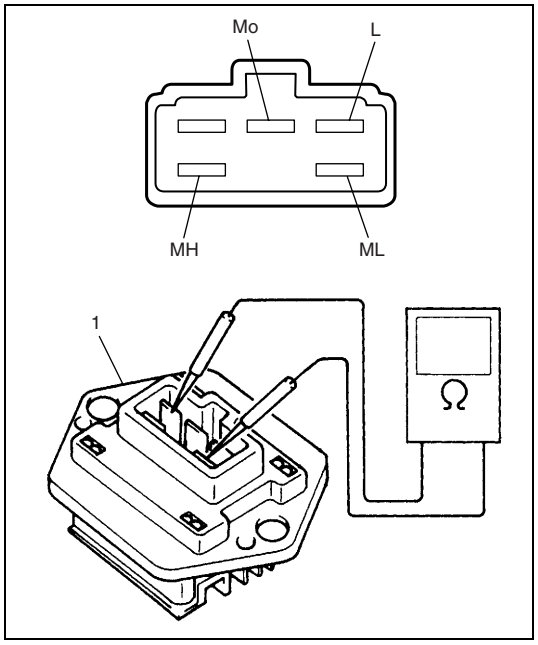
## Rear Blower Motor Resistor

### Removal

1) Remove rear A/C unit referring to “Rear A/C Unit (Rear A/C Evaporator)” in this section.




2) Disconnect rear blower motor resistor connector (1).
3) Remove rear blower motor resistor (2) from rear A/C unit (3).




### Inspection

Measure each terminal-to-terminal resistance.
If measured resistance is incorrect, replace rear blower motor resistor (1).

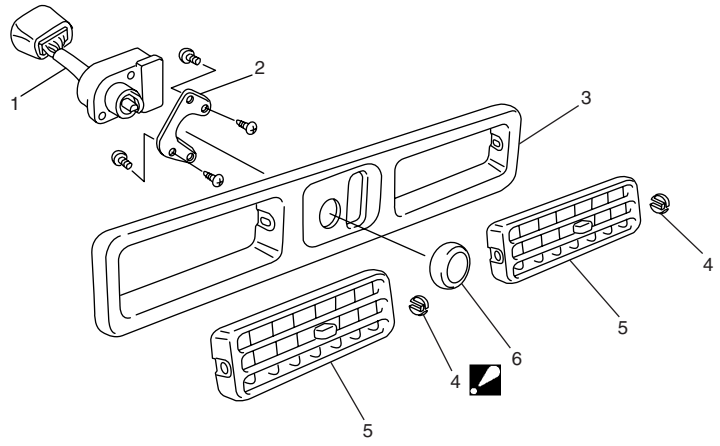
**Rear blower motor resister resistance**
**Mo – L: Approx. 2.4 Ω**
**Mo – ML: Approx. 1.2 Ω**
**Mo – MH: Approx. 0.6 Ω**

### Installation

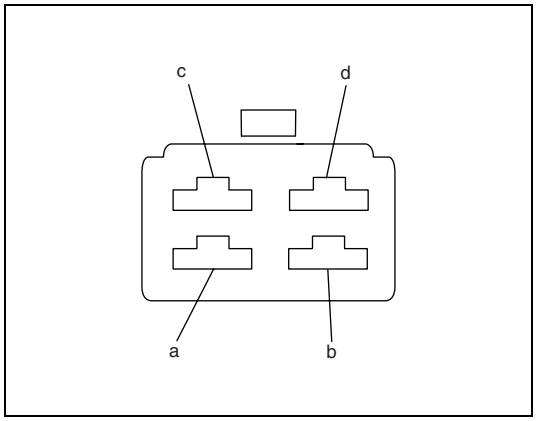
Reverse removal procedure to install rear blower motor resistor noting the following points.

- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

## Rear Blower Motor Switch




| | | |
|---|---|---|
| 1. Rear blower motor switch | ◢ | 4. Rear A/C air louver holder<br>Install proper direction as shown in figure |
| 2. Bracket | | 5. Rear A/C air louver |
| 3. Rear A/C air louver case | | 6. Knob |




### Inspection

- Check rear blower motor switch for each terminal-to-terminal continuity.
  If check results are not specified, replace rear blower motor switch.

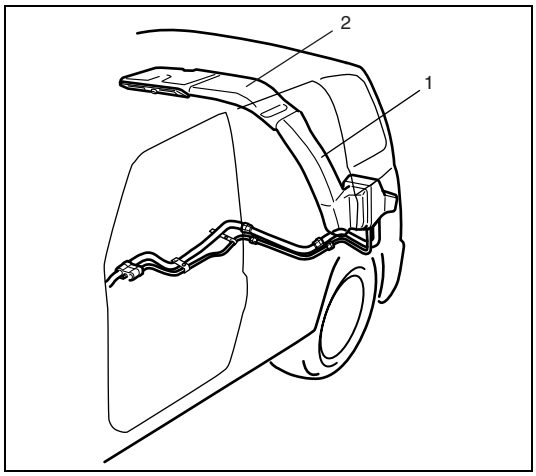
| POSITION \ TERMINAL | | a | b | c | d |
|---|---|---|---|---|---|
| OFF | | | | | |
| Low | • | ○ | ○ | | |
| Middle | • • | ○ | | ○ | |
| High | • • • | ○ | | | ○ |

## Rear A/C No.1 and No.2 Duct

### Rear A/C No.1 duct

#### Removal

1) Remove rear A/C unit referring to “Rear A/C Unit (Rear A/C Evaporator)” in this section.
2) Remove rear A/C No.1 duct (1).




#### Installation

Reverse removal procedure to install rear A/C No.1 duct (1).

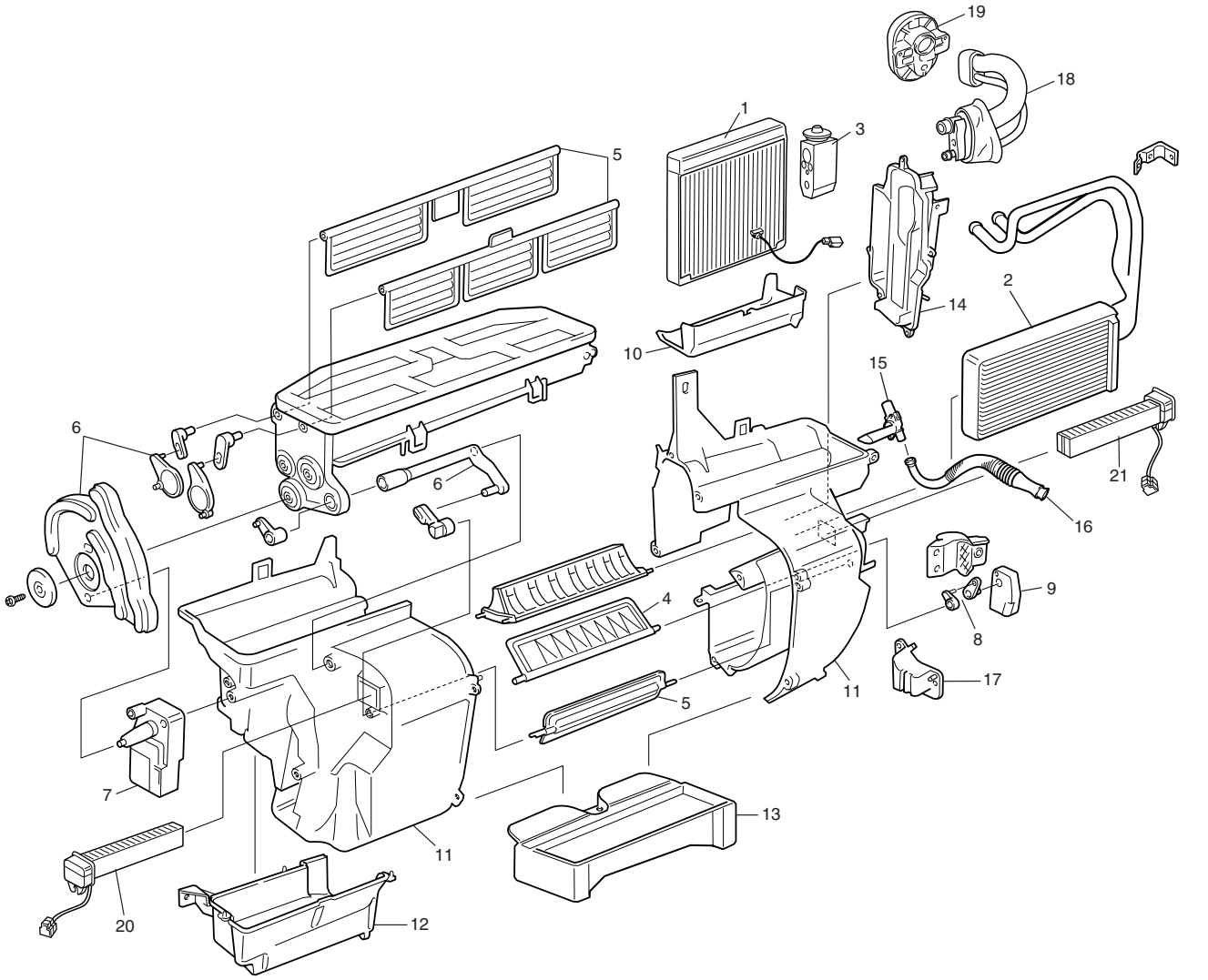
### Rear A/C No.2 duct

**CAUTION:**
**Never remove rear A/C No.2 duct (2) from head lining. Performing this prohibited service will break head lining.**

# Heater and Cooling Unit

**CAUTION:**

**Be careful not to damage A/C evaporator fins. If A/C evaporator fin is bent, straighten the bend by using flat head screwdriver or pair of pliers.**




| | | | |
|---|---|---|---|
| 1. A/C evaporator | 7. Air flow control actuator | 13. Foot air duct | 19. Packing |
| 2. Heater core | 8. Temperature control link assembly | 14. Air joint duct | 20. Supplementary heater No.1 (if equipped) |
| 3. Expansion valve | 9. Temperature control actuator | 15. Aspirator (for vehicle with automatic A/C system) | 21. Supplementary heater No.2 (if equipped) |
| 4. Temperature control door | 10. A/C evaporator undercover | 16. Aspirator hose (for vehicle with automatic A/C system) | |
| 5. Air flow control door | 11. Heater and cooling case | 17. Heater core bracket | |
| 6. Air flow control link assembly | 12. A/C evaporator undercase | 18. Pipe assembly | |

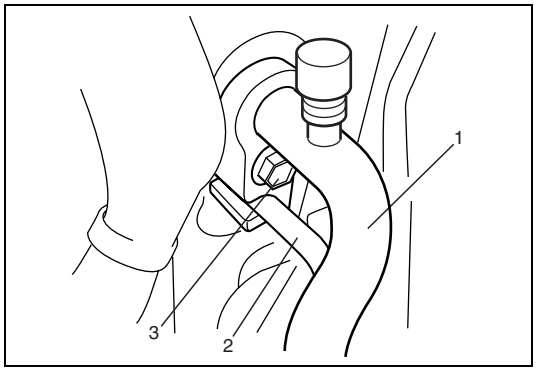
### Removal

**WARNING:**

**Failure to follow the following procedure and WARNING may cause unexpected deployment, personal injury, damage to parts, or undeployment.**

- **Never rest a steering column assembly on steering wheel with air bag (inflator) module face down and column vertical.**
- **When handling the air bag (inflator) modules (driver and passenger), be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., dropped from a height of 91.4 cm (3 feet) or more), never attempt disassembly or repair but replace it with a new one.**
- **When grease, cleaning agent, oil, water, and so forth have got onto air bag (inflator) modules (driver and passenger), wipe off immediately with a dry cloth.**

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System" in Section 10B.
3) Recover refrigerant by using recovery and recycling equipment.
4) Drain engine coolant, and then disconnect heater hoses from heater unit.

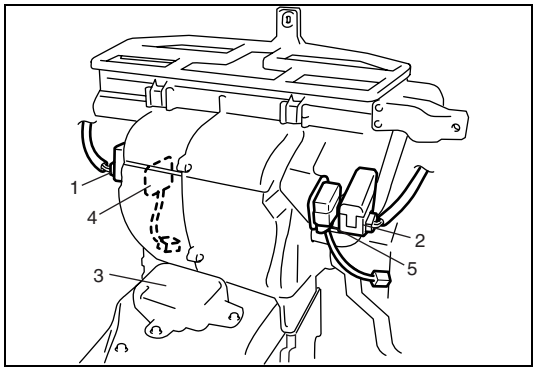



5) Disconnect suction pipe (1) and condenser outlet pipe (2) after removing attaching bolt (3).

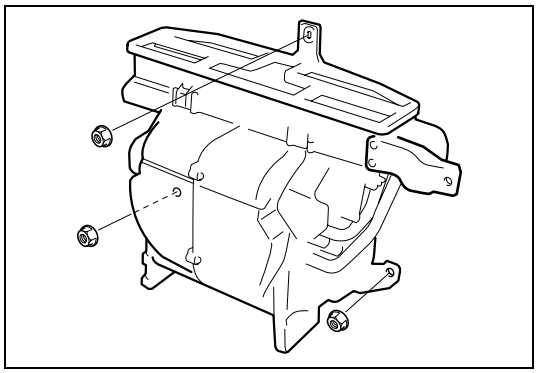
**CAUTION:**

**As soon as suction pipe and condenser outlet pipe are disconnected, cap opened fittings to prevent ingression of moisture or dust.**

6) Remove instrument panel referring to "Instrument Panel" in Section 9.
7) Remove blower unit referring to "Blower Unit" in Section 1A.
8) Disconnect rear duct from heater unit.
9) Disconnect A/C evaporator thermistor wire coupler.




10) Disconnect air flow control actuator lead wire at coupler (1) and temperature control actuator lead wire at coupler (2).
11) Disconnect supplementary heater No.1 (4) and No.2 (5) lead wires at couplers (if equipped).
12) Remove SDM (3).



13) Remove heater and cooling unit from dash panel.

**Installation**

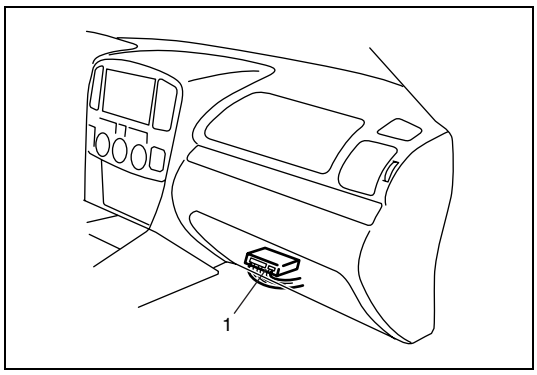
Install heater and cooling unit by reversing removal procedure noting the following items.

- When installing each part, be careful not to catch any wiring harness.
- When installing steering column assembly, refer to “Steering Column” in Section 3C.
- Fill engine coolant to radiator.
- Enable air bag system referring to “Enabling Air Bag System” in Section 10B.
- Evacuate and charge system referring to “Evacuating” and “Charging” in this section.

## A/C Controller (RHW Engine)

**Removal**

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System” in Section 10B.




3) Remove A/C controller (1) from blower unit by removing brackets and bolts.

**Installation**

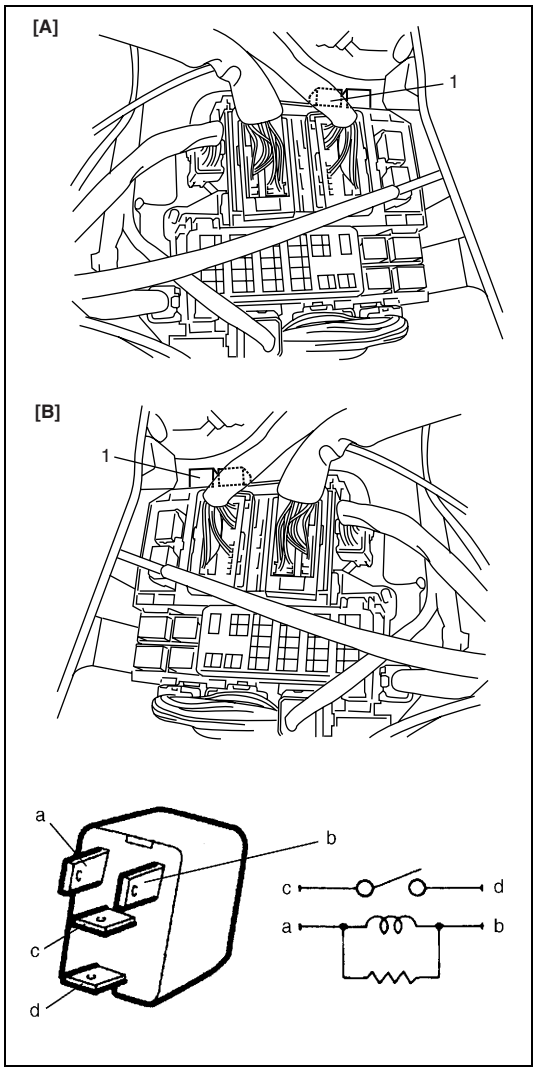
Reverse removal procedure for installation noting the following.

- Enable air bag system referring to “Enabling Air Bag System” in Section 10B.

# A/C Signal Relay

## Inspection

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System” in Section 10B.
3) Remove A/C signal relay (1) under the instrumental panel on the driver’s seat side.




| | |
|---|---|
| [A] | LH steering vehicle |
| [B] | RH steering vehicle |

4) Check for continuity between terminal “c” and “d”. If there is continuity, replace relay with new one.
5) Check for continuity between terminals “c” and “d” when 12 V battery is connected to terminals “a” and “b”. If there is no continuity, replace relay with new one.

## Drive Belt

### Inspection

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.

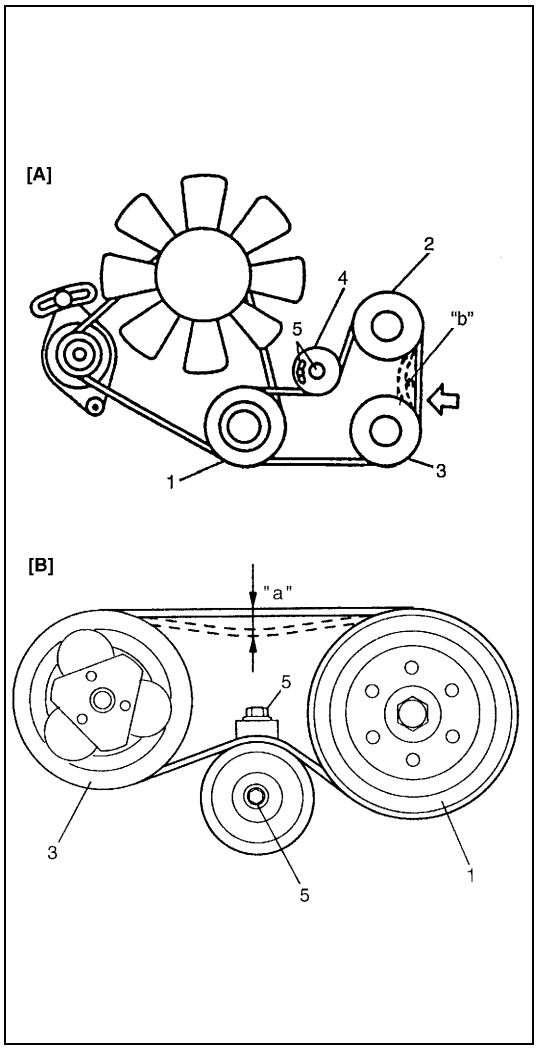
**Power steering pump and/or A/C compressor drive belt tension.**
**"a": 9 mm (0.35 in.) deflection under 100 N, 10 kg or 22 lb pressure.**
**"b": 4 – 7 mm (0.16 – 0.28 in.) deflection under 100 N, 10 kg or 22 lb pressure.**

If belt tension is out of above specification, adjust it referring to "Power Steering Pump Drive Belt" in Section 3B1.

3) Connect negative cable to battery.

### Replacement

Replace belt and then adjust belt tension referring to "Power Steering Pump Drive Belt" in Section 3B1 for replacement procedure of belt.

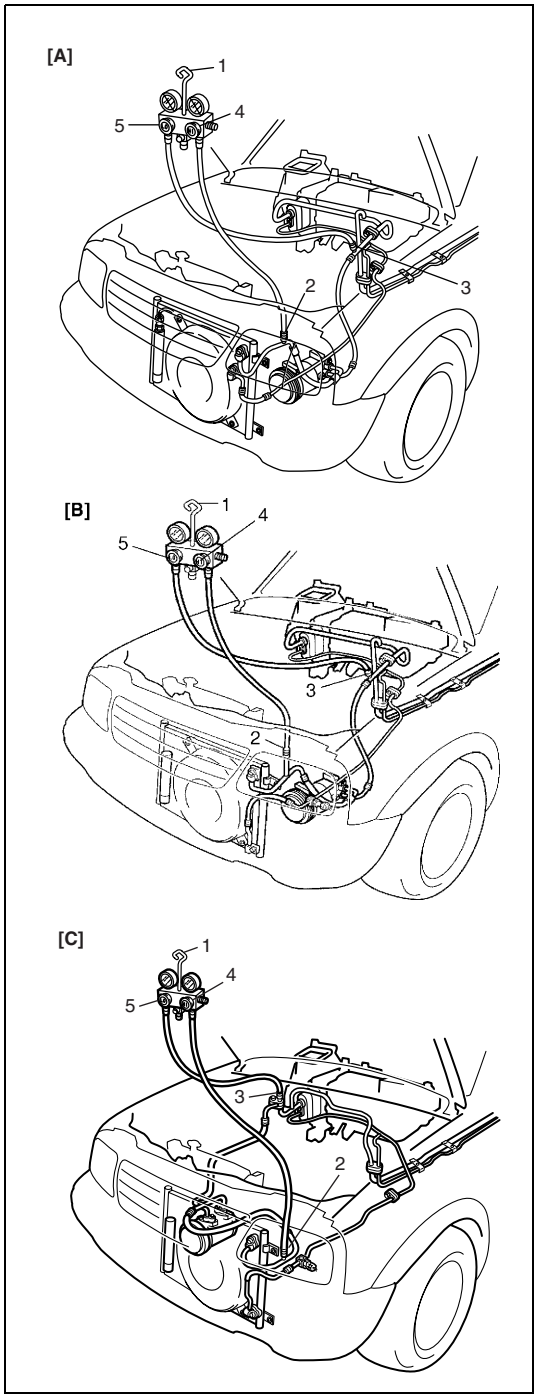



| | |
|---|---|
| 1. | Crankshaft pulley |
| 2. | P/S pump pulley |
| 3. | A/C compressor pulley |
| 4. | Tension pulley |
| 5. | Tension pulley adjusting bolt |
| [A] | H27 engine |
| [B] | RHW engine |

## Compressor Assembly

**CAUTION:**

**None of refrigerant, compressor oil and component parts is interchangeable between two types of A/C: one using CFC-12 (R-12) and the other using HFC-134a (R-134a).**
**For identification between these two types, refer to "Refrigerant Type" in this section.**
**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 refrigerant or compressor oil will result in leakage of refrigerant, damage in parts or other faulty condition.**
**When servicing the compressor, keep dirt or foreign material away from getting on or into the compressor parts and system. Clean tools and a clean work area are important for proper service.**
**The compressor connection and the outside of the compressor should be cleaned before any "On-vehicle" repair or before removal of the compressor. The parts must be kept clean at all times and any parts to be reassembled should be cleaned with Trichloromethane, naphtha, kerosene or equivalent solvent and dried with dry air. Use only lint free cloths to wipe parts.**
**The operations described are based on bench overhaul with compressor removed from the vehicle, except as noted. They have been prepared in order of accessibility of the components.**
**When compressor is removed from the vehicle for servicing, the oil remaining in the compressor should be discarded and new refrigerant oil added to the compressor.**
**Minor repair procedures may be done on the vehicle without discharging the system. Major repair procedures require that the system be discharged of refrigerant.**




## Inspection

1) Install manifold gauge set (1) as shown in the figure.
2) Close Hi (4) and Lo (5) side valves.

| | |
|---|---|
| [A]: | H27 engine (Type A) |
| [B]: | H27 engine (Type B) |
| [C]: | RHW engine |
| 2. | High pressure side (Delivery side hose) |
| 3. | Low pressure side (Suction side pipe) |

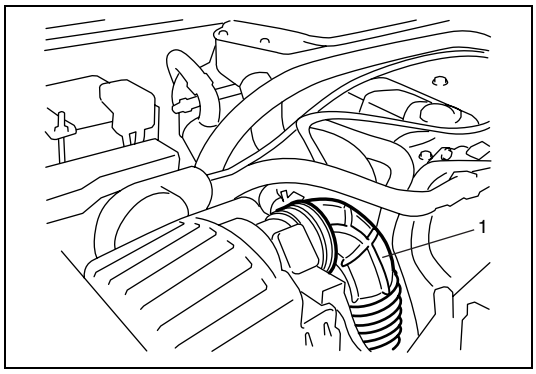
3) Run engine at fast idle.
4) Check compressor for the following items.
   If any of the checks indicated a defect, repair compressor.
   - High pressure gauge reading is not low and low pressure gauge reading is not higher than normal.
   - Metallic sound.
   - Leakage from compressor.

## Removal

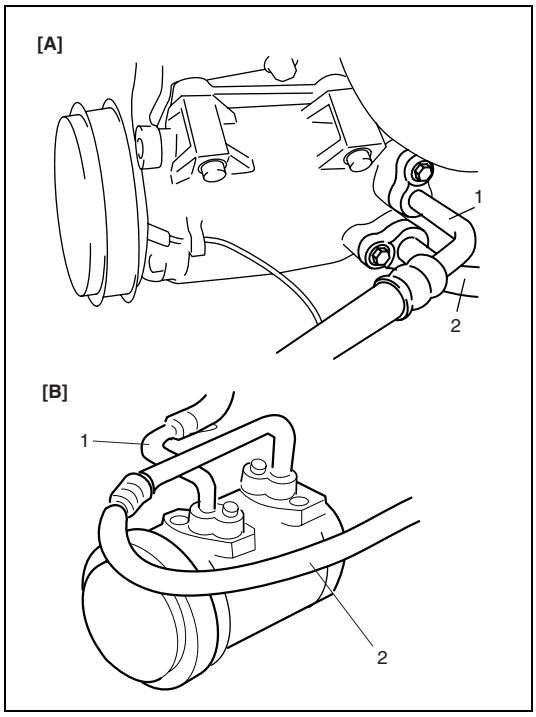
1) Run engine at idle with A/C ON for 10 minutes.
2) Disconnect negative (–) cable at battery.
3) Recover refrigerant from refrigeration system using recovery and recycling equipment.

**NOTE:**

**The amount of compressor oil at removed must be measured and the same amount must be poured when installing the compressor.**




4) Remove air cleaner outlet hose (1). (RHW engine only)
5) Remove P/S pump referring to “P/S Pump” in Section 3B1. (H27 engine only)
6) Remove P/S oil tank, P/S high pressure hose and pipe. (H27 engine only)
7) Disconnect magnet clutch connector.

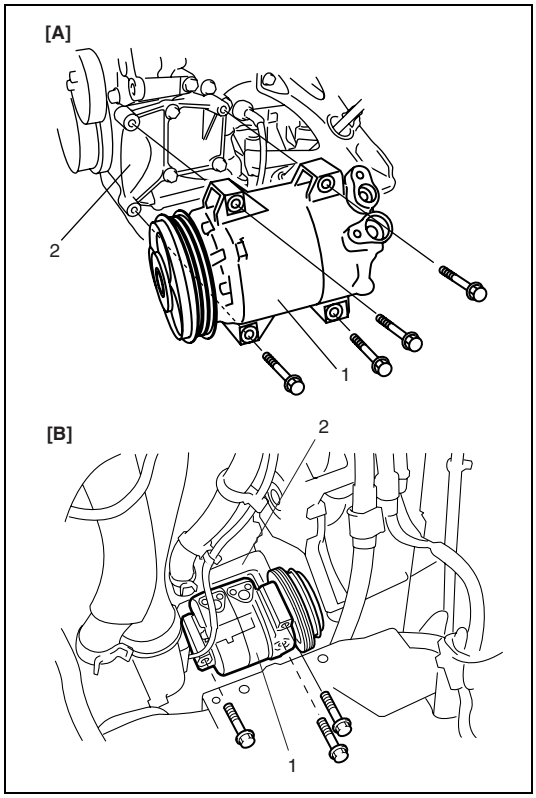



8) Disconnect suction hose (1) and discharge hose (2) from compressor.

**NOTE:**

**Cap open fitting immediately to keep moisture out of system.**

| |
|---|
| [A]: H27 engine |
| [B]: RHW engine |




9) Remove compressor (1) from its mount (2).

| |
|---|
| [A]: H27 engine |
| [B]: RHW engine |

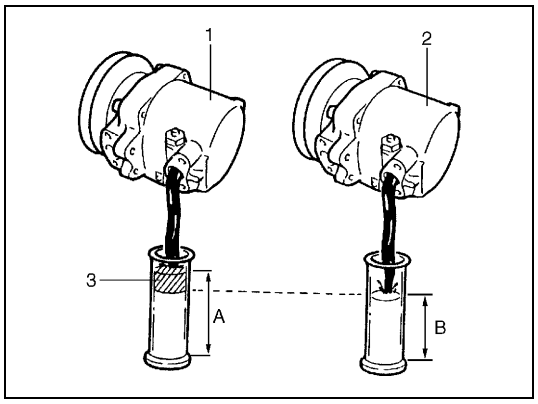
**NOTE:**

**If compressor assembly is replaced. Drain oil from compressor, and measure its amount.**

### Installation

**CAUTION:**
**Be sure to use HFC-134a (R-134a) compressor oil.**

Reverse removal procedure to install compressor assembly noting the following instructions.



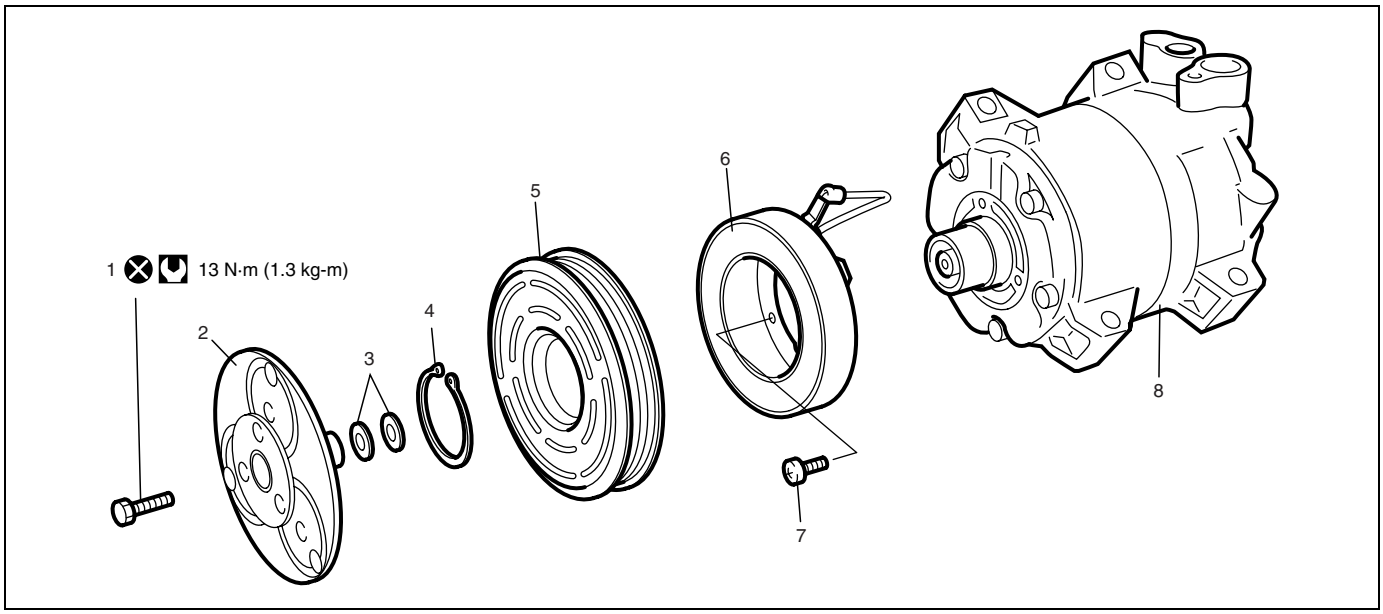

- If compressor was replaced, pour new compressor oil with the same amount as that drained from compressor referring to “Replenishing Compressor Oil” in this section.

| |
|---|
| 1. New compressor |
| 2. Removed compressor |
| 3. Excess oil (A–B) |

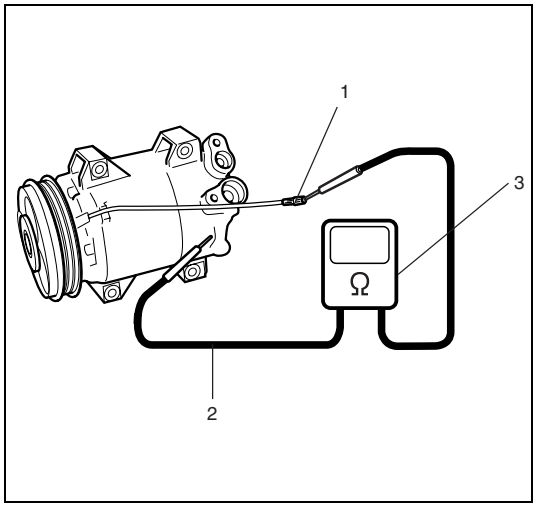
- Install P/S pump referring to “P/S Pump” in Section 3B1. (H27 engine only)
- Fill specified power steering fluid after installation and bleed air without failure referring to “Air Bleeding Procedure” in Section 3B1. (H27 engine only)
- Evacuate A/C system referring to “Evacuating” in this section.
- Charge A/C system referring to “Charging” or “Recovery” in this section.

# Magnet Clutch

## H27 engine




| | | | |
|---|---|---|---|
| 1. Armature plate bolt | 4. Circlip | 7. Screw | Do not reuse. |
| 2. Armature plate | 5. Magnet clutch pulley | 8. Compressor body assembly | |
| 3. Shim(s) | 6. Magnet clutch coil | Tightening torque | |




### Inspection

Check the following items.

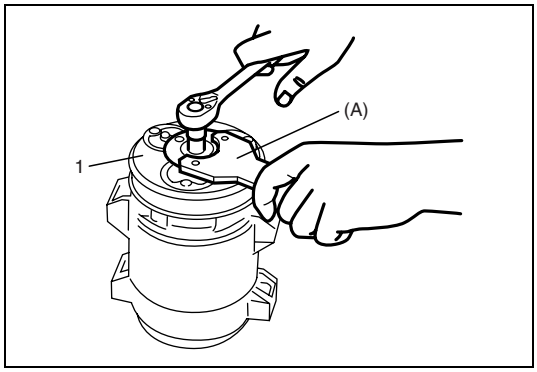
- Inspect pressure plate and rotor for signs of oil.
- Check clutch bearings for noise and grease leakage.
- Using an ohmmeter (3), measure resistance of stator coil between clutch lead wire (1) and body ground (2).
  If measured resistance is not within tolerance, replace coil.

**Specified current of magnet clutch**
**3.4 – 4.6 Ω at 25 °C (77 °F)**

If any detects are found, repair or replace magnet clutch assembly.

**Removal**

1) Remove compressor from vehicle referring to “Compressor Assembly” in this section.

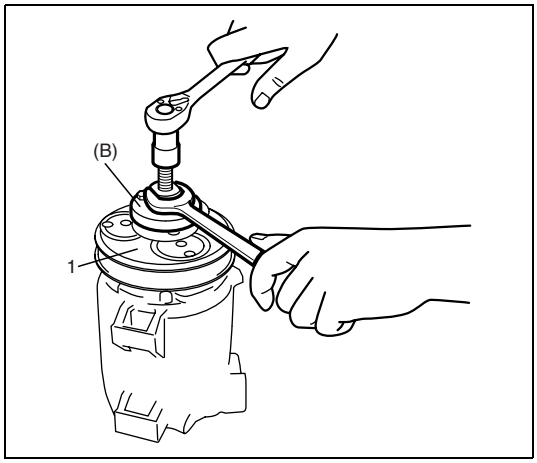



2) Fix armature plate (1) with special tool and remove armature plate bolt.

**Special tool**
**(A): 09991-06520**

**NOTE:**

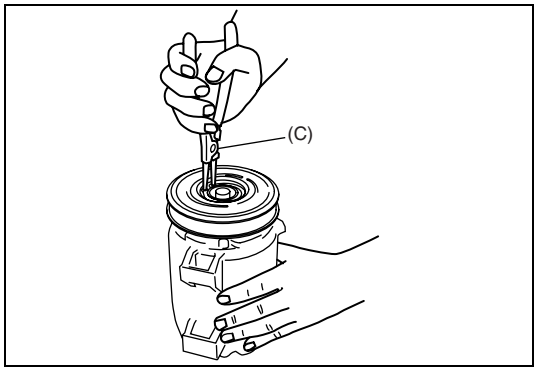
**Do not reuse armature plate bolt.**




3) Using special tool, remove armature plate (1).

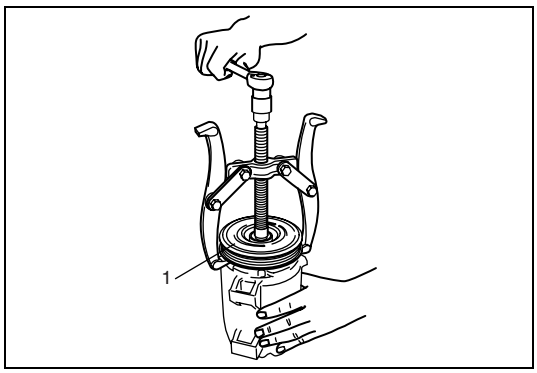
**Special tool**
**(B): 09991-06530**

4) Remove shim(s) from shaft.




5) Using special tool, remove circlip.

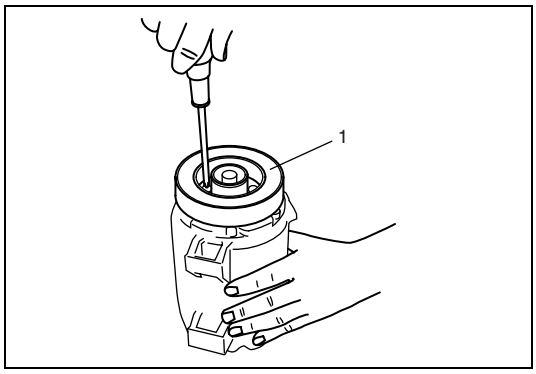
**Special tool**
**(C): 09900-06107**




6) Remove magnet clutch pulley (1) with puller.

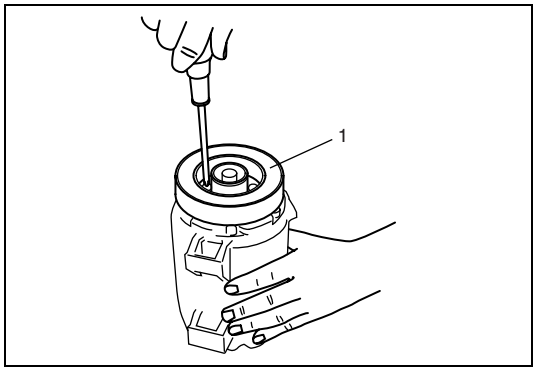
**NOTE:**

**Be careful not to damage pulley when tapping magnet clutch.**




7) Remove three screws, and then remove magnet clutch coil (1).

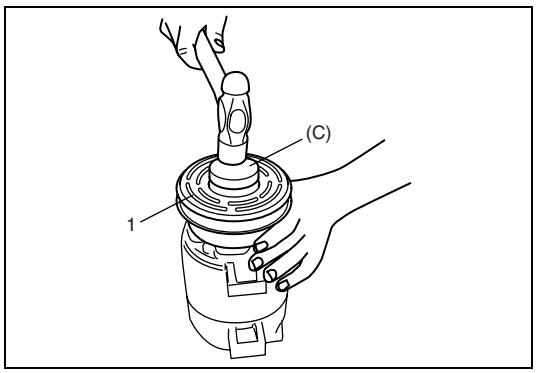
**Installation**




1) Install magnet clutch coil (1).

**NOTE:**

**Protrusion on underside of magnet clutch coil and hole on compressor body assembly must match to stop movement of magnet clutch coil and to locate lead wire correctly.**

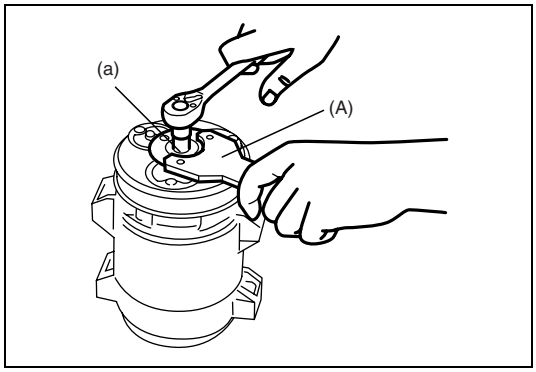



2) Install magnet clutch (1) as follows.
   a) Set magnet clutch horizontally over clutch installation boss.
   b) Place special tool onto magnet clutch bearing, and then hit top of special tool by hammer.

**Special tool**
**(C): 09991-06510**

   c) Install new circlip.

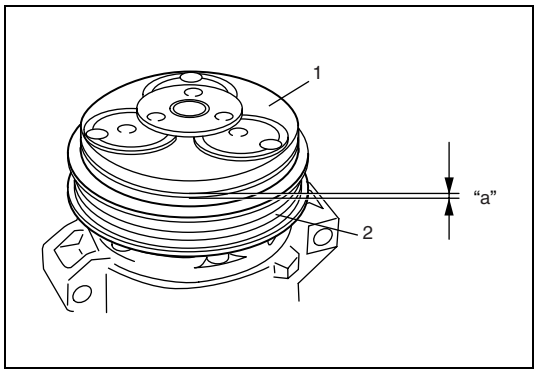
3) Install armature plate.




4) Using special tool, tighten new armature plate bolt to specified torque.

**Tightening torque**
**Armature plate bolt (a): 13 N·m (1.3 kg-m, 9.0 lb-ft)**

**Special tool**
**(A): 09991-06520**

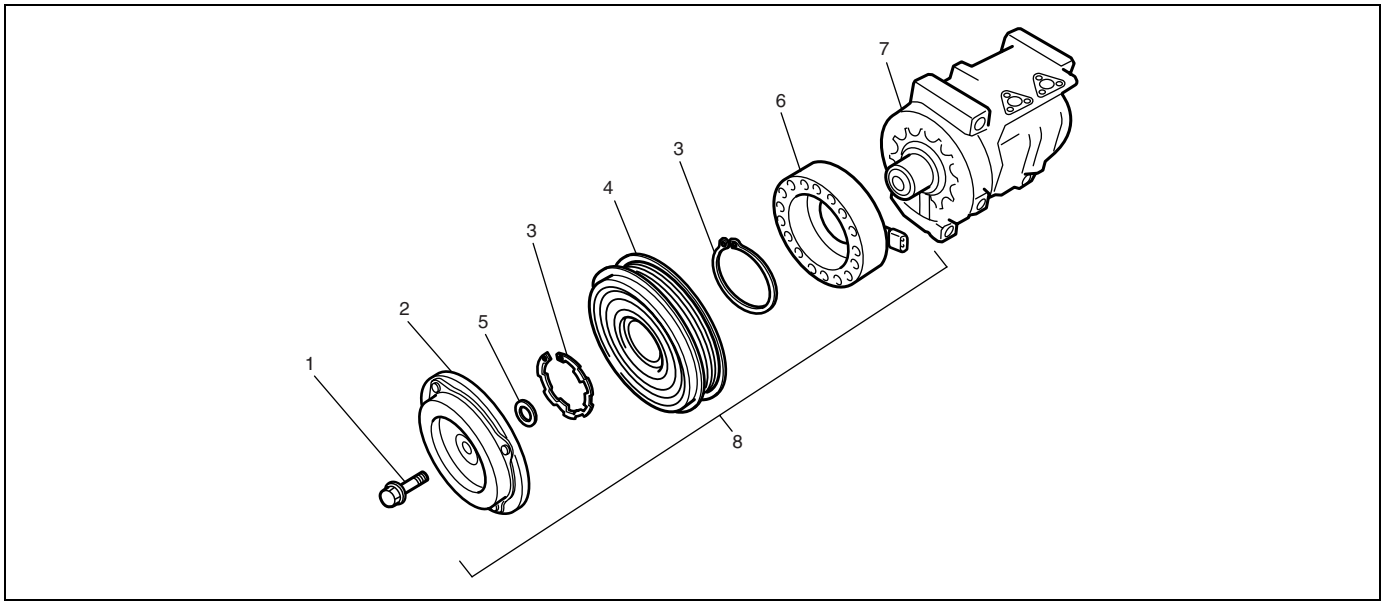



5) Measure clearance between armature plate (1) and magnet clutch (2). If clearance is out of range, adjust clearance by either putting or removing shim(s) on compressor shaft.

**Standard clearance between armature plate and magnet clutch**
**"a": 0.3 – 0.7 mm (0.012 – 0.028 in.)**

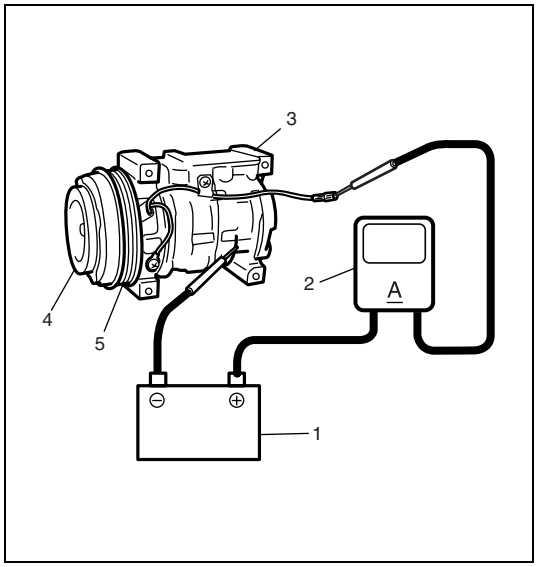
6) Install compressor to vehicle referring to "Compressor Assembly" in this section.

## RHW engine




| | | | |
|---|---|---|---|
| 1. Armature plate bolt | 3. Circlip | 5. Shim (s) | 7. Compressor body assembly |
| 2. Armature plate | 4. Magnet clutch | 6. Magnet clutch coil | 8. Magnet clutch assembly |

### Inspection




Check the following items.

- Check no sigh of compressor oil leakage
- Check magnet clutch pulley bearing for noise and grease leakage.
- Check magnet clutch operation as follows:

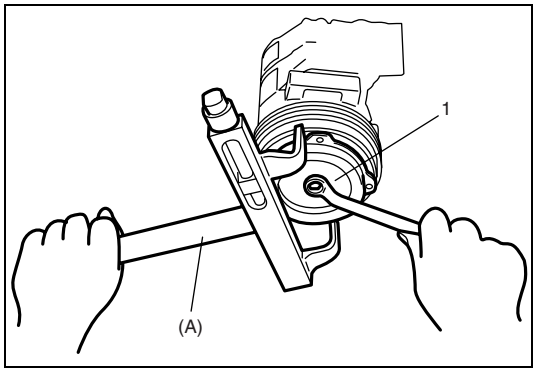
a) Connect battery (1) and ammeter (2) to compressor (3) as shown.
b) Check that steadily locks between armature plate (4) and magnet clutch pulley (5).
c) Check that ammeter (2) indicates specified current.

**Specified current of magnet clutch**
**4 A MAX at 12 V**

If any detects are found, repair or replace magnet clutch assembly.

**Removal**

1) Remove compressor from vehicle. Refer to "Compressor Assembly" in this section.



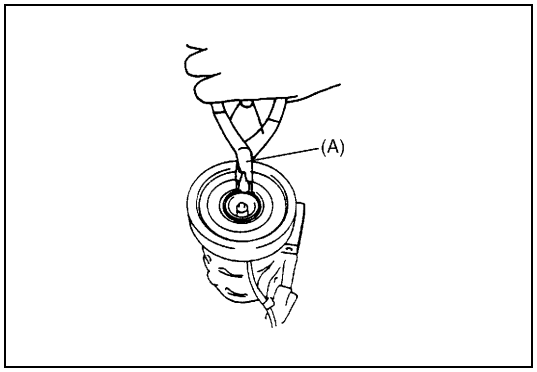

2) Fix armature plate (1) with special tool and remove armature plate bolt.

**Special tool**
**(A): 09920-53740**

**NOTE:**

**Do not reuse armature plate bolt.**

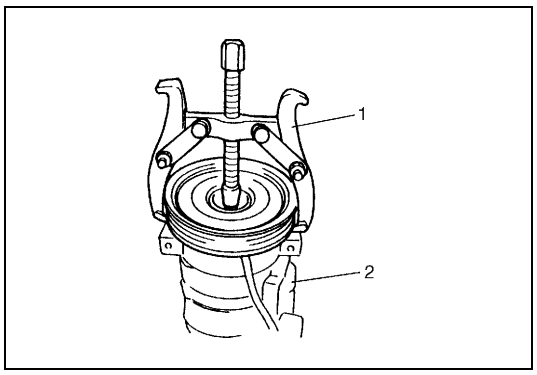
3) Remove armature plate (1).
4) Remove shims from shaft.




5) Using special tool, remove circlip.

**Special tool**
**(A): 09900-06107**

6) Remove magnet clutch lead wire clamp screw, and remove magnet clutch read wire ground terminal.

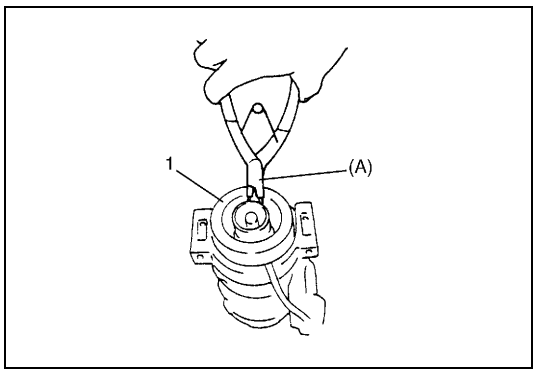



7) Remove magnet clutch with puller (1).

**NOTE:**

**Be careful not to damage pulley when tapping magnet clutch.**

| |
|---|
| 2. Compressor |

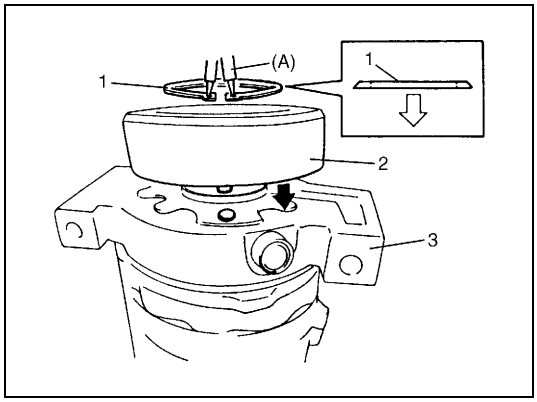



8) Remove circlip using special tool.

**Special tool**
**(A): 09900-06107**

9) Remove magnet clutch coil (1).

### Installation




1) Install magnet clutch coil (2).

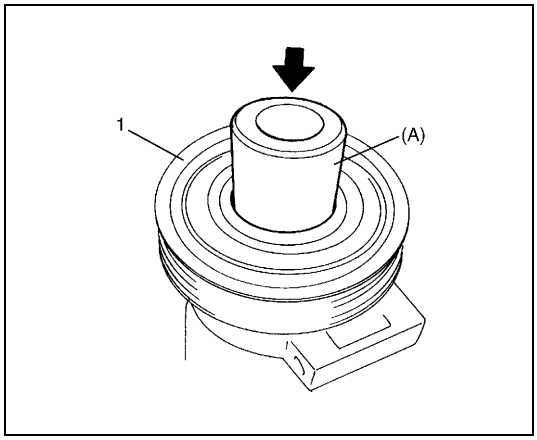
**NOTE:**

**Protrusion on under side of magnet clutch coil (2) must match hole in compressor assembly (3) to prevent movement and correctly locate lead wire.**

2) Using special tool, install new circlip (1) as shown.

**Special tool**
**(A): 09990-06107**

3) Install clamp portion and ground terminal of lead wire.

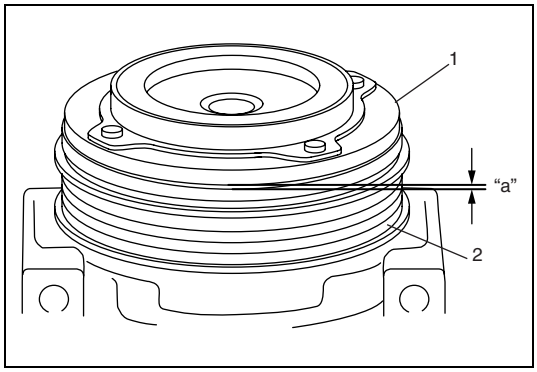



4) Install magnet clutch (1).
   a) Set magnet clutch squarely over clutch installation boss.
   b) Place special tool onto clutch bearing.
      Ensure that edge rests only on inner race of bearing.

**Special tool**
**(A): 09991-06010**

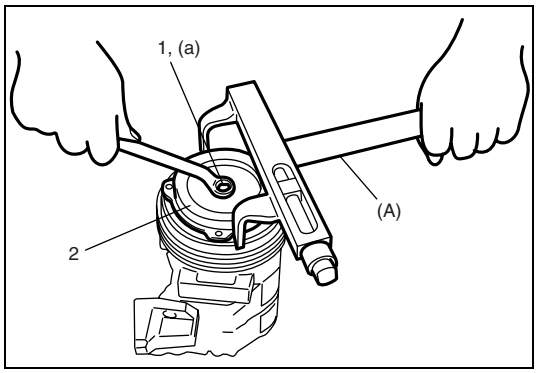
   c) Install new circlip.

**CAUTION:**
**Be careful not to scratch bearing seal.**




5) Adjust clearance between armature plate (1) and magnet clutch (2) by putting shim(s) on compressor shaft.

**Standard clearance between armature plate and magnet clutch "a":**
**0.35 - 0.6 mm (0.014 - 0.023 in.)**




6) Tighten new armature plate nut (1) to specified torque.

**Tightening torque**
**Armature plate nut (a):18 N·m (1.8 kg-m, 13.0 lb-ft)**

**Special tool**
**(A): 09920-53740**

| |
|---|
| 2. Armature plate |

7) Install compressor to vehicle. Refer to "Compressor Assembly" in this section.

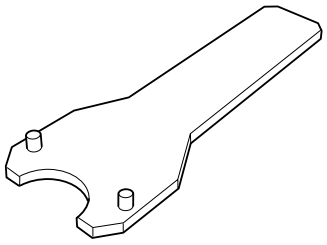
# Required Service Materials

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| Compressor oil (refrigerant oil) | COMPRESSOR OIL (DH-PS, 250 cc) (99000-99022-00E) | • O-ring<br>• Each component |

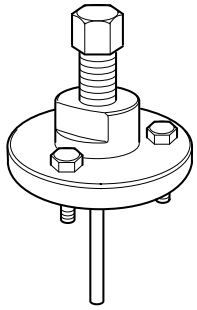
# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Refrigerant pipe (8 mm (0.31 in.)) | 15 | 1.5 | 11.0 |
| Refrigerant pipe (16 mm (0.63 in.)) | 25 | 2.5 | 18.0 |
| Armature plate nut | 13 | 1.3 | 9.0 |

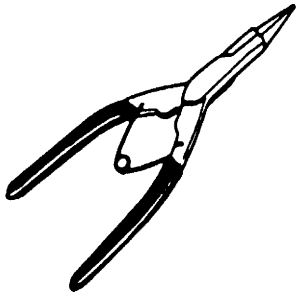
# Special Tool



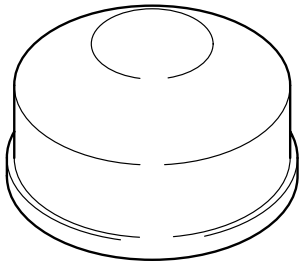
09991-06520
Armature plate holder



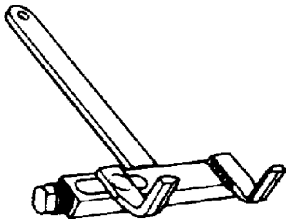
09991-06530
Armature plate remover



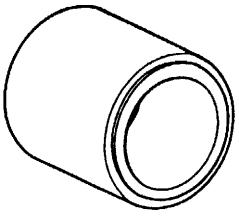
09900-06107
Snap ring pliers
(Open type)



09991-06510
Magnet clutch pulley installer



09920-53740
Clutch sleeve hub holder



09991-06010
Magnet clutch pulley installer

# SECTION 3A

# FRONT END ALIGNMENT

**NOTE:**

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**



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Toe Adjustment ..... *
Camber and Caster Adjustment ..... *
Steering Angle ..... *
Side Slip (Reference) ..... 3A-1

# General Information

## Caster

**Caster angle for without load**
**2°30' ± 1°**

## Side Slip (Reference)

For inspecting front wheel side slip with side slip tester:

**Side slip**
**Limit:**
**IN 4 – OUT 2 mm/m (IN 0.158 – OUT 0.078 in./3.3 ft)**
**Adjusting value:**
**IN 4 – IN 1 mm/m (IN 0.158 – IN 0.039 in./3.3 ft)**

If side slip exceeds above limit, toe or front wheel alignment may not be correct.

**NOTE:**

**When side slip limit is exceeded or when adjusting wheel alignment while doing some other work, adjust alignment so as to obtain above side slip adjusting value.**

## SECTION 3B1

# POWER STEERING (P/S) SYSTEM

**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.**
- **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).**



**NOTE:**

- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B) and RHW engine model, is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**
- **For the items with asterisk mark (*) in the "CONENTS" below, refer to the same section of the Service Manual mentioned in "FOREWARD" of this manual.**
- **Some parts in the Power Steering Gear Box cannot be disassembled or adjusted. For detailed information, refer to the description of "Power Steering Gear Box Assembly".**
- **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.**
- **Although the figures in this section show only the left-hand steering vehicle, the same work procedure and data apply to the right-hand steering vehicle.**

## CONTENTS

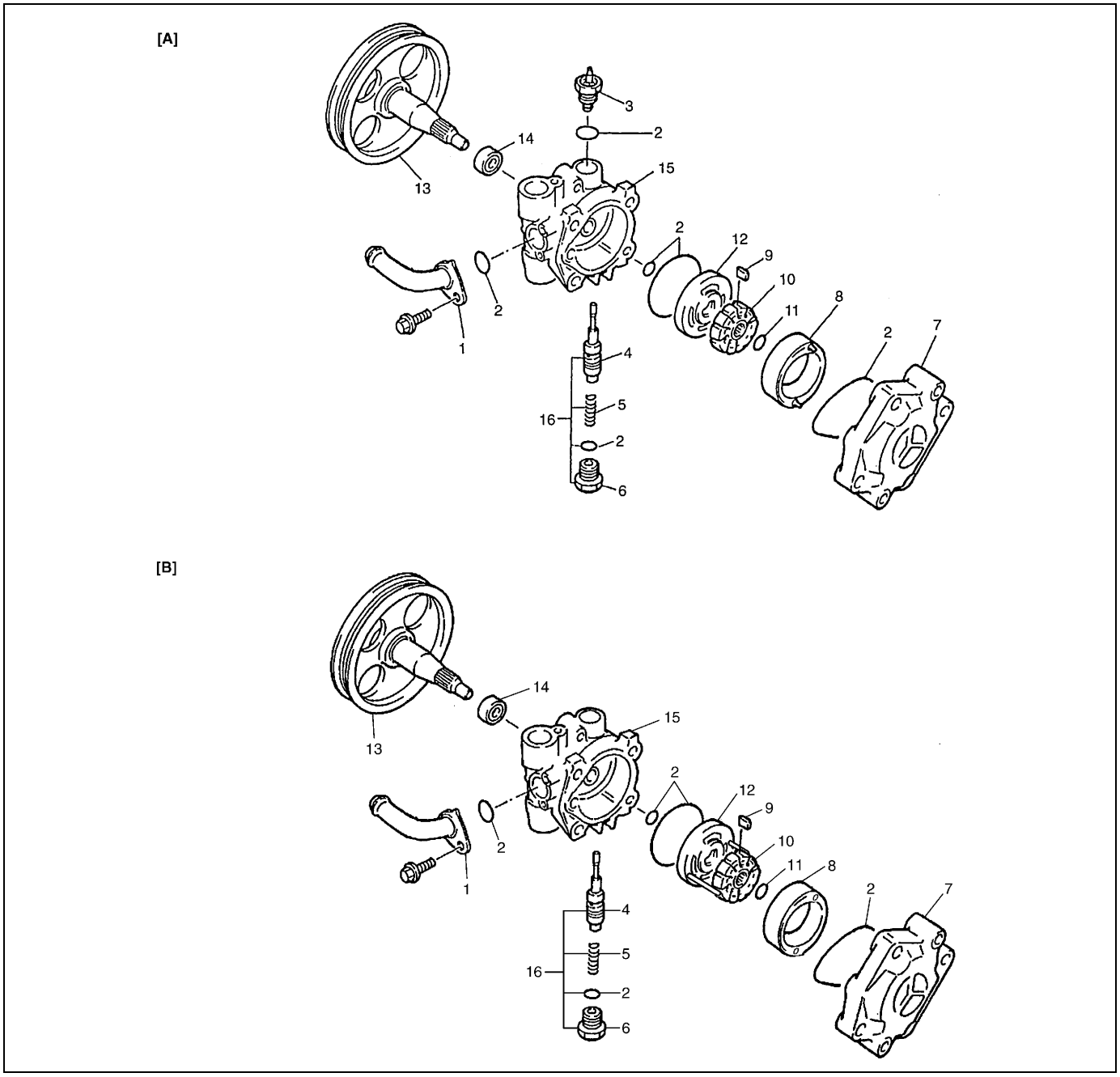
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# General Description

## Power Steering (P/S) Pump

The power steering pump is a vane type and is driven by the V-ribbed belt from the crankshaft.




| | | | | |
|---|---|---|---|---|
| [A]: H27 engine model | 3. Pressure switch | 7. Pump cover | 11. Snap ring | 15. Pump body |
| [B]: RHW engine model | 4. Flow control valve (Relief valve) | 8. Cam ring | 12. Side plate | 16. Flow control valve assembly |
| 1. Suction connector | 5. Spring | 9. Vane | 13. Pulley (pump shaft) | |
| 2. O-ring | 6. Plug | 10. Rotor | 14. Oil seal | |

**For H27 engine model**

| | | |
|---|---|---|
| **Model** | | Vane type |
| **Hydraulic pressure control** | **Relieved pressure** | 7850 kPa (78.5 kg/cm$^2$, 1116 psi) |
| | **Control device** | Flow control valve |
| | | Relief valve |
| **Power steering pressure switch** | | Switch turns on (closes) when the pressure is higher than 2500 – 3500 kPa (25 – 35 kg/cm$^2$, 356 – 498 psi). ECM uses this signal for idle speed control. |
| **Capacity** | | 0.70 – 0.75 L (1.48/1.23 – 1.58/1.32 US pt/Imp. pt) |
| **Specified fluid** | | DEXRON®II, DEXRON®III A/T fluid or equivalent |

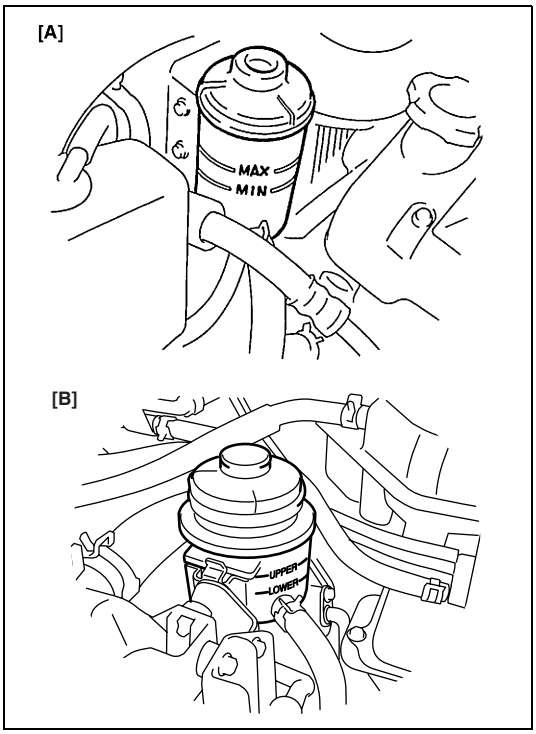
**For RHW engine model**

| | | |
|---|---|---|
| **Model** | | Vane type |
| **Hydraulic pressure control** | **Relieved pressure** | 7850 kPa (78.5 kg/cm$^2$, 1116 psi) |
| | **Control device** | Flow control valve |
| | | Relief valve |
| **Capacity** | | 0.75 – 0.8 L (1.58/1.32 – 1.69/1.41 US pt/Imp. pt) |
| **Specified fluid** | | DEXRON®II A/T fluid or the equivalent |

# Diagnosis

## Power Steering Fluid

### Power steering fluid level check




With engine stopped, check fluid level indicated on P/S fluid reservoir. The fluid level should be between “UPPER” or “MAX” and “LOWER” or “MIN” lines. If it is lower than “LOWER” or “MIN” line, fill fluid up to “UPPER” or “MAX” line.

**NOTE:**

- **Be sure to use the specified power steering fluid.**
- **Fluid level should be checked when fluid is cool.**

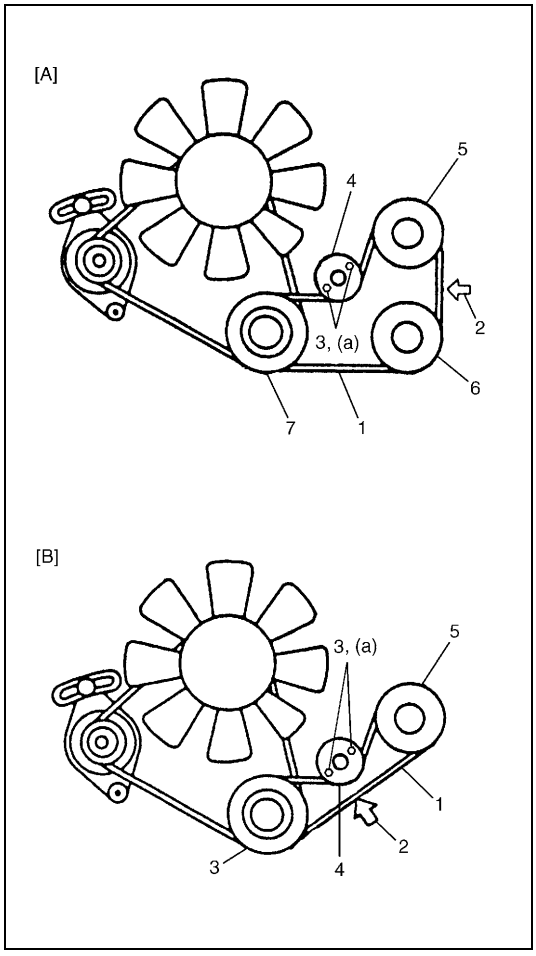
| |
|---|
| [A]: H27 engine model (type A) |
| [B]: H27 engine model (type B) and RHW engine model |

# Power Steering Pump Drive Belt

**NOTE:**

**For RHW engine model, refer to "Generator belt" under "Generator" in Section 6H in this manual for belt inspection, belt tension check, and belt tension adjustment.**

## Belt inspection




Check P/S pump drive belt (1) is free from any damage and properly fitted in pulley groove.

## Belt tension check

Check belt tension by measuring how much it deflects when pushed at arrow point (2) between pulleys with about 100 N·m (10 kg-m, 72.5 lb-ft) force.

**Deflection of P/S belt**
**4 – 7 mm (0.16 – 0.28 in.)**

## Belt tension adjustment

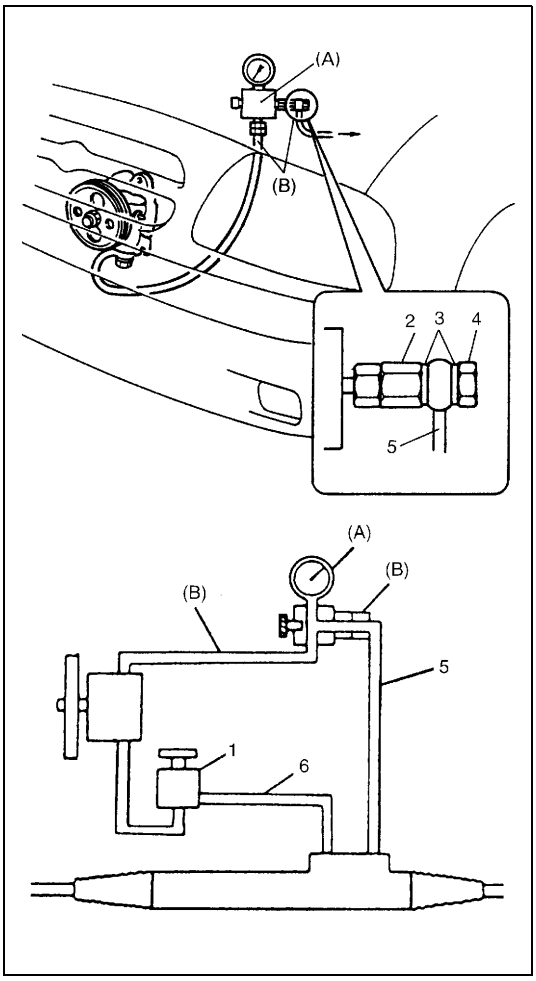
1) To adjust P/S pump drive belt (1) tension, loosen tension pulley bolts (3) and turn tension pulley (4) using hexagon wrench.
2) Adjust belt tension to above specification.
   Then tighten tension pulley bolts (3) to specified torque.

**Tightening torque**
**Tension pulley bolts**
**(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)**

| | |
|---|---|
| 5. | P/S pump pulley |
| 6. | A/C compressor pulley (if equipped) |
| 7. | Crankshaft pulley |
| [A]: | With A/C |
| [B]: | Without A/C |

# Hydraulic Pressure in P/S Circuit

## Hydraulic pressure check



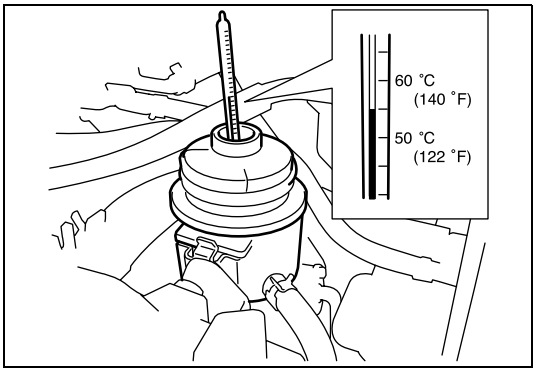

1) After cleaning joint of high pressure hose and P/S pump thoroughly, disconnect hose from pump and install special tool (oil pressure gauge, attachment and hose).

**CAUTION:**
**Take care not to cause damage to A/C condenser during service operation, if equipped.**

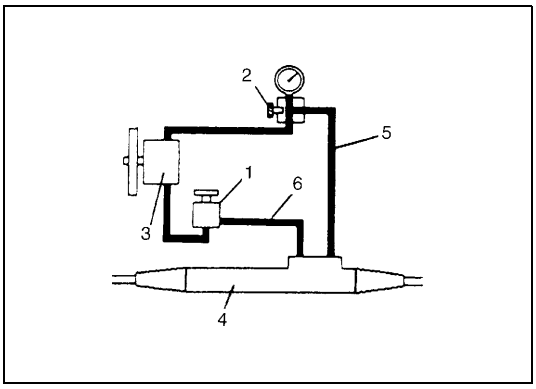
**Special tool**
**(A): 09915-77411 (Oil pressure gauge)**
**(B): 09915-77420**

2) Check each connection for fluid leakage and bleed air.
Refer to "Air Bleeding Procedure" in this section.

| | |
|---|---|
| 1. | P/S fluid reservoir |
| 2. | Attachment |
| 3. | Gasket |
| 4. | Union bolt |
| 5. | High pressure side |
| 6. | Low pressure side |




3) With engine idling, turn steering wheel and warm up engine till temperature of fluid in P/S fluid reservoir rises to 50 – 60°C (122 – 140°F).

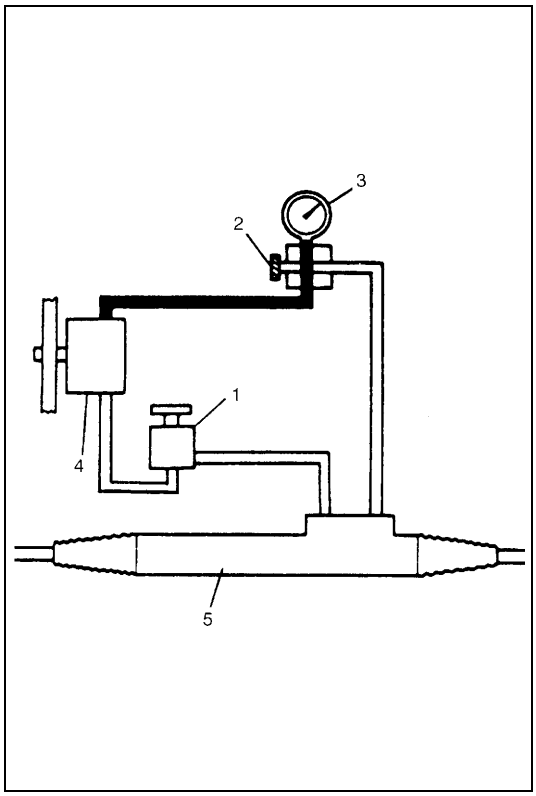



4) Check back pressure by measuring hydraulic pressure with engine idling and hands off steering wheel.
When back pressure is higher than specified values, check control valve and piping for clogging.

**Back pressure**

**Lower than 1000 kPa (10 kg/cm$^2$, 142 psi)**

| | | | |
|---|---|---|---|
| 1. | P/S fluid reservoir | 4. | P/S gear box |
| 2. | Gauge valve (open) | 5. | High pressure side |
| 3. | P/S pump | 6. | Low pressure side |

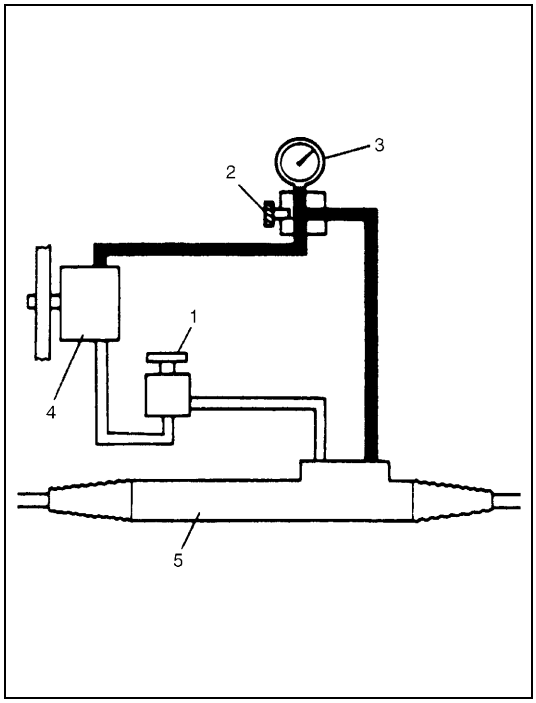



5) Check relief pressure.
   a) Increase engine speed to about 1500 r/min (rpm). Close gauge valve gradually while watching pressure increase indicated by gauge and take reading of relief pressure (maximum hydraulic pressure).
   When it is higher than specified values, possible cause is malfunction of relief valve.
   When it is lower than specified values, possible cause is either failure of P/S pump or settling of relief valve spring.

**Relief pressure (when gauge valve is closed)**
**7650 – 8350 kPa (76.5 – 83.5 kg/cm$^2$, 1088 – 1187 psi)**

**CAUTION:**
**Be sure not to close gauge valve for longer than 10 seconds.**

| | |
|---|---|
| 1. | P/S fluid reservoir |
| 2. | Gauge valve (shut) |
| 3. | Oil pressure gauge |
| 4. | P/S pump |
| 5. | P/S gear box |




   b) Next, open gauge valve fully and increase engine speed to about 1500 r/min (rpm). Then turn steering wheel to the left or right fully and take reading of relief pressure.
   When it is higher than specified values, possible cause is malfunction of relief valve.
   When it is lower than specified values, possible cause is failure in steering gear box. Replace gear box.

**Relief pressure (when gauge valve is opened)**
**7650– 8350 kPa (76.5 – 83.5 kg/cm$^2$, 1088 – 1187 psi)**

**CAUTION:**
**Be sure not to hold steering wheel at fully turned position for longer than 10 seconds.**

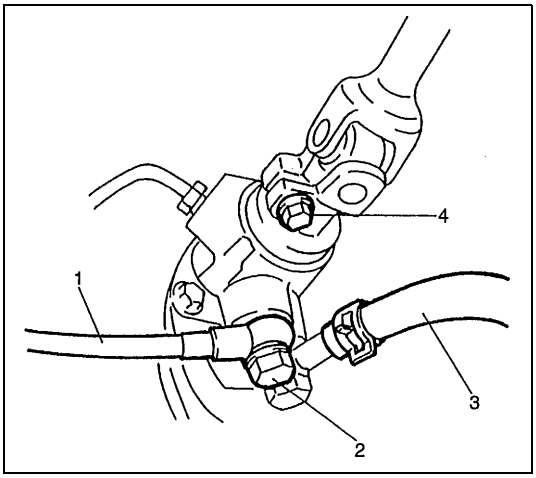
| | |
|---|---|
| 1. | P/S fluid reservoir |
| 2. | Gauge valve (open) |
| 3. | Oil pressure gauge |
| 4. | P/S pump |
| 5. | P/S gear box |

# On-Vehicle Service

## Power Steering Gear Box Assembly

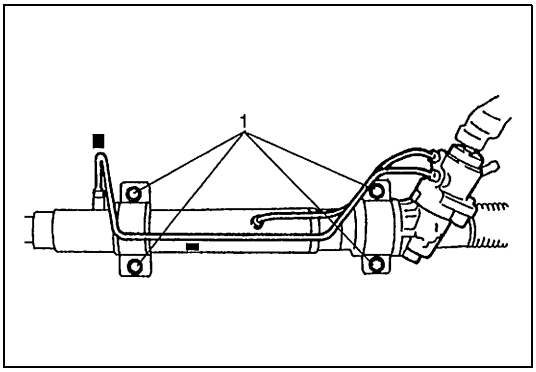
**CAUTION:**
**Never disassemble P/S gear box. Disassembly will affect original performance.**

### Removal




**NOTE:**
**As fluid flows out of disconnected joints, put a receptacle under joints or a plug to pipe.**

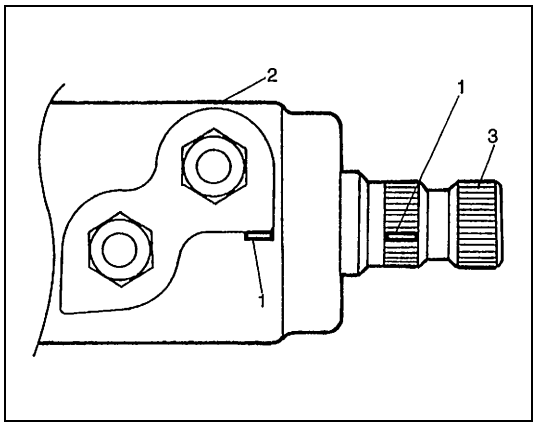
1) Take out fluid in P/S fluid reservoir with syringe or the equivalent.
2) Disconnect high pressure pipe (1) from steering gear box by removing union bolt (2).
3) Disconnect low pressure hose (3) from steering gear box.
4) Remove steering lower shaft bolt (4).
5) Hoist vehicle and remove both right and left wheels.
6) Remove engine undercover.
7) Disconnect both right and left tie rod ends from knuckle referring to Steps 2) to 3) of “Tie-Rod End Removal” in this section.




8) Remove steering gear box mounting bolts (1), and then remove steering gear box from vehicle.

## Installation

Reverse removal procedure for installation of steering gear box noting the following points.

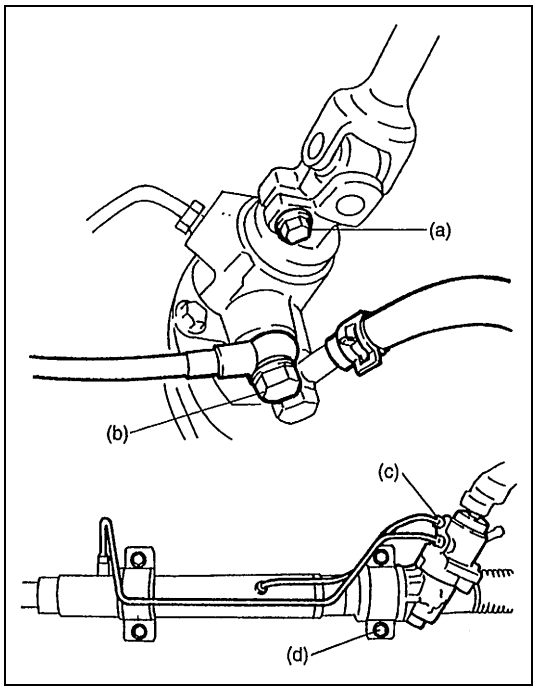



**CAUTION:**

**Be sure to confirm that steering wheel and front tires (wheels) are in straight position when inserting steering lower joint into steering pinion shaft.**

- After confirming that front tire is in straight position, install steering gear box to body temporarily. Next, with tie-rod end installed to knuckle, set rack in position close to neutral. Then obtain the neutral state by aligning match marks (1) on pinion shaft and steering gear case (2) and insert steering lower joint into pinion shaft (3).

- If a plug was put to disconnected pipe when removing steering gear box, remove that plug before reconnecting pipe.




- Use specified torque as given below.

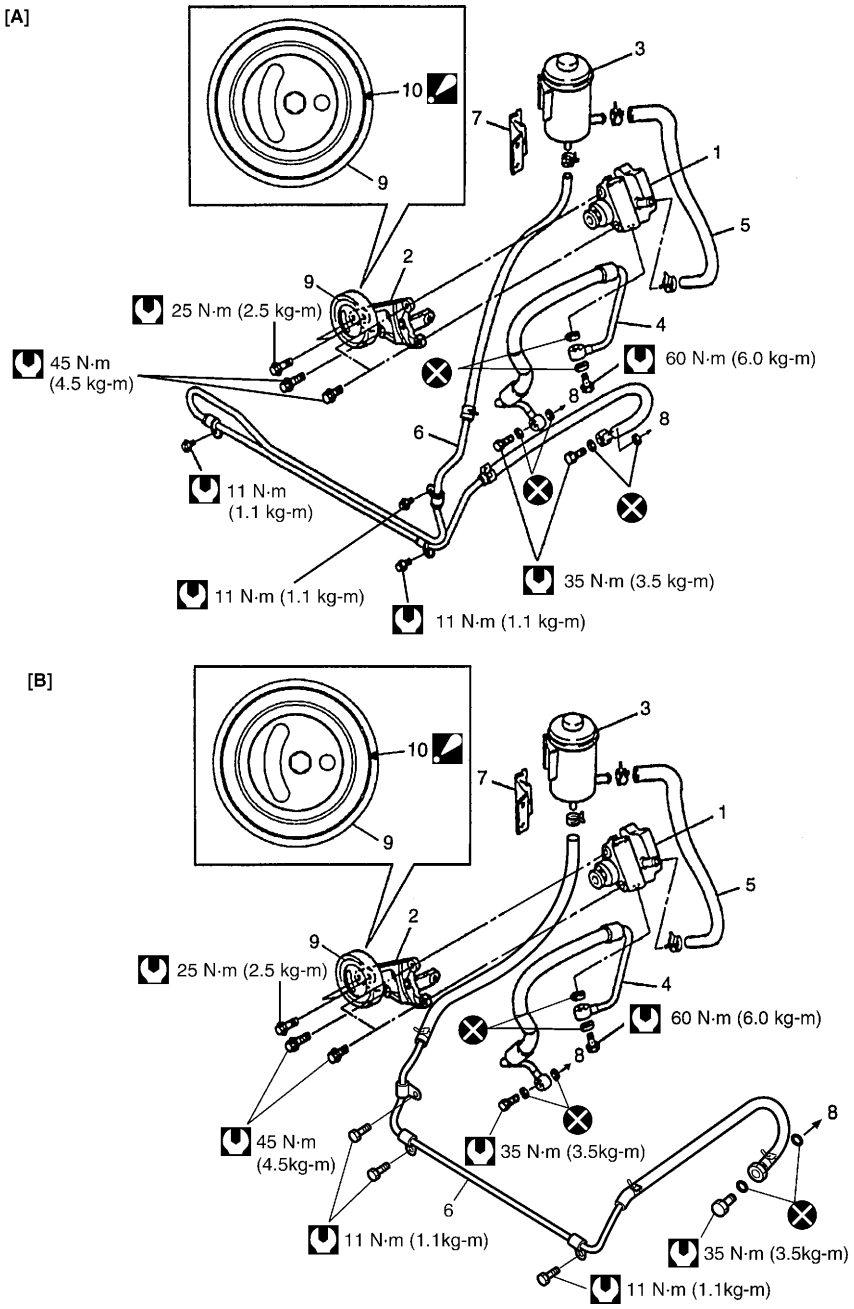
**Tightening torque**
**Steering lower shaft bolt**
**(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)**
**Gear box high pressure pipe union bolt**
**(b): 35 N·m (3.5 kg-m, 25.5 lb-ft)**
**Gear box cylinder pipe flare nut**
**(c): 25 N·m (2.5 kg-m, 18.0 lb-ft)**
**Gear box mounting bolt**
**(d): 55 N·m (5.5 kg-m, 40.0 lb-ft)**

- After installation, be sure to fill specified power steering fluid and bleed air.
- Check toe setting and adjust as required referring to the Section 3A “FRONT END ALIGNMENT”.

# Power Steering Pump (For H27 Engine Model: Type A)

**NOTE:**

**For removal, disassembly, inspection, assembly, and installation, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**

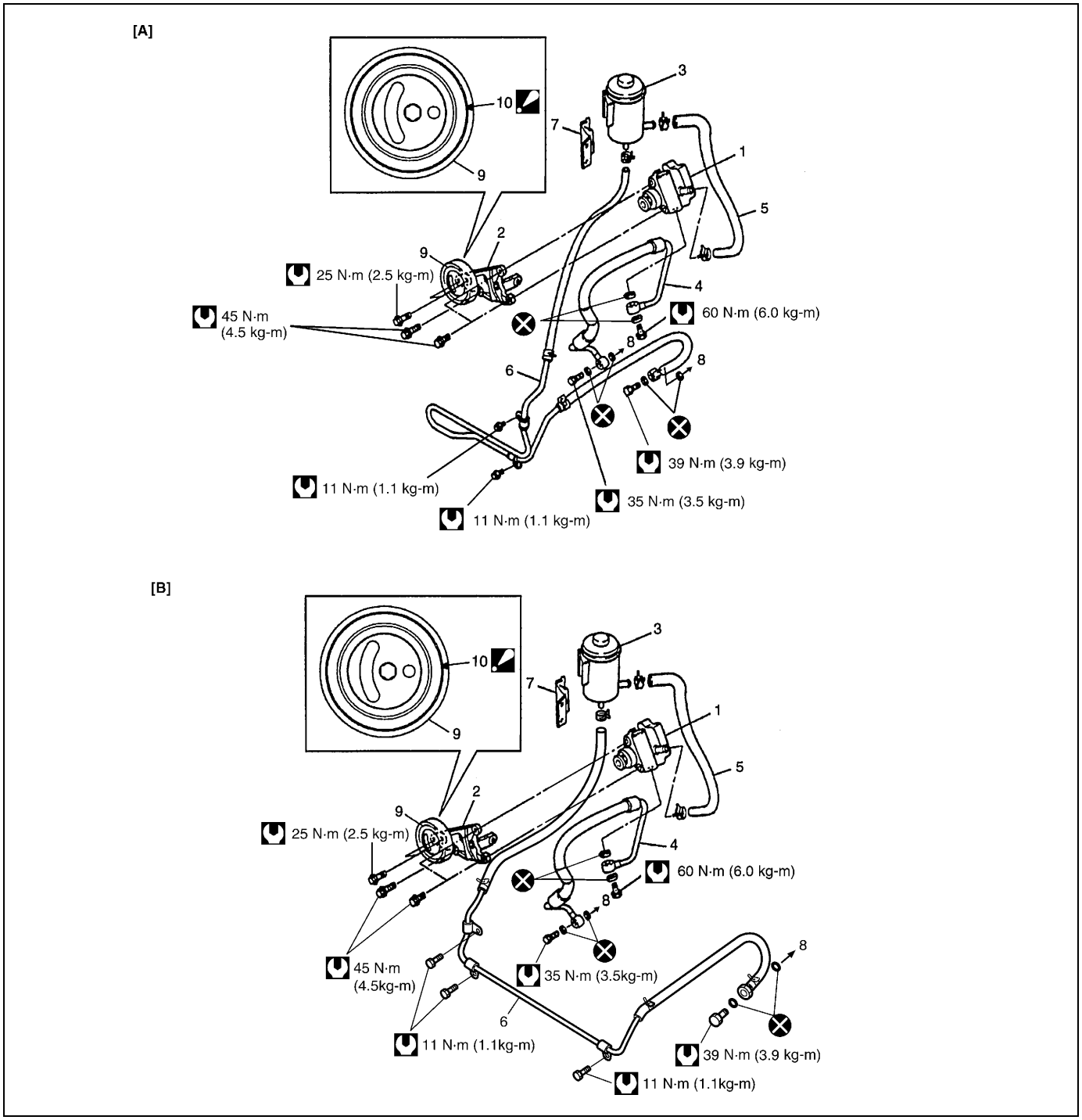



| | | | |
|---|---|---|---|
| [A]: LH steering vehicle | 3. P/S fluid reservoir | 7. P/S fluid reservoir bracket | When reinstalling the used pulley:<br>Before removing the tensioner pulley, put marking on tensioner pulley to install it in the same direction.<br>When installing new pulley:<br>Install tensioner pulley with its punch mark (10) faced to engine. |
| [B]: RH steering vehicle | 4. High pressure hose & pipe | 8. To P/S gear box | Tightening torque |
| 1. Power steering pump assembly | 5. Suction hose | 9. Tensioner pulley | Do not reuse. |
| 2. Bracket | 6. Low pressure return hose | 10. Punch mark | |

# Power Steering Pump (For H27 Engine Model: Type B)

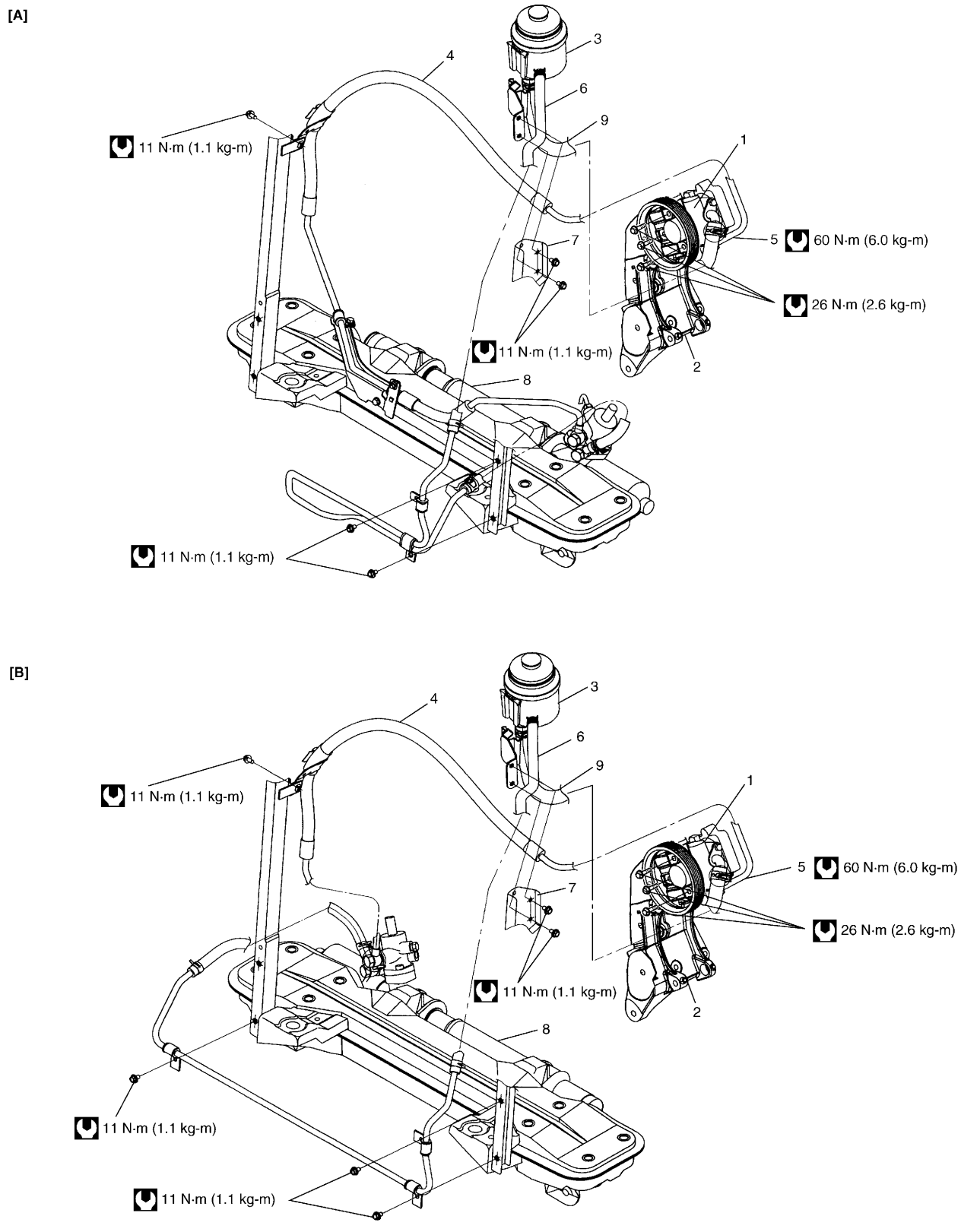
**NOTE:**

**For removal, disassembly, inspection, assembly, and installation, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**



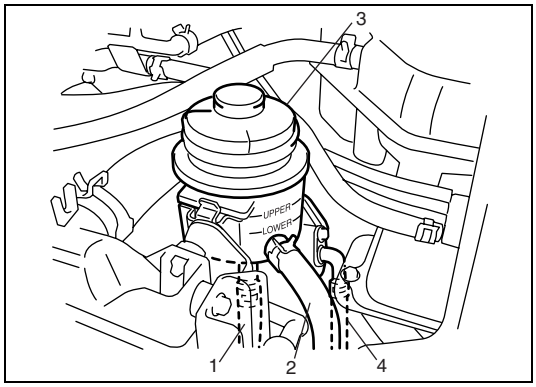

| | | | |
|---|---|---|---|
| [A]: LH steering vehicle | 3. P/S fluid reservoir | 7. P/S fluid reservoir bracket | When reinstalling the used pulley:<br>Before removing the tensioner pulley, put marking on tensioner pulley to install it in the same direction.<br>When installing new pulley:<br>Install tensioner pulley with its punch mark (10) faced to engine. |
| [B]: RH steering vehicle | 4. High pressure hose & pipe | 8. To P/S gear box | Tightening torque |
| 1. Power steering pump assembly | 5. Suction hose | 9. Tensioner pulley | Do not reuse. |
| 2. Bracket | 6. Low pressure return hose | 10. Punch mark | |

# Power Steering Pump (For RHW Engine Model)




| | | | |
|---|---|---|---|
| [A]: LH steering vehicle | 2. Power steering pump bracket | 5. Pump union bolt | 8. Power steering gear box |
| [B]: RH steering vehicle | 3. Power steering fluid reservoir | 6. Low pressure hose and pipe | 9. Suction hose |
| 1. Power steering pump assembly | 4. High pressure hose and pipe | 7. Power steering fluid reservoir bracket | Tightening torque |

## Removal




**NOTE:**

**Be sure to clean each joint of suction and discharge sides thoroughly before removal.**

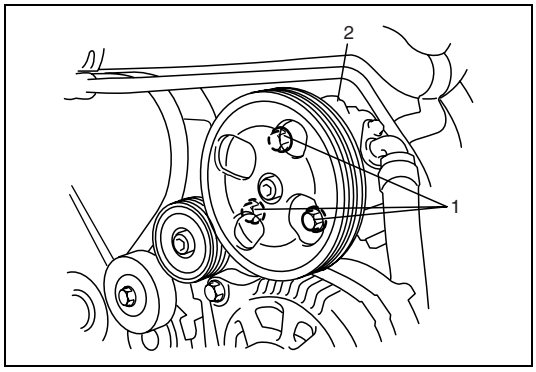
1) Remove P/S fluid from P/S fluid reservoir (3).
2) Disconnect suction hose (1) and low pressure return hose (2) from P/S fluid reservoir (3).
3) Remove suction hose (4) from pump.

4) Remove union bolt. Then, disconnect high pressure pipe from pump.

**NOTE:**

**As fluid flows out of disconnected joints, put a receptacle under joints or a plug to pipe.**

5) Remove P/S drive belt referring to "Generator belt" under "Generator" in Section 6H.



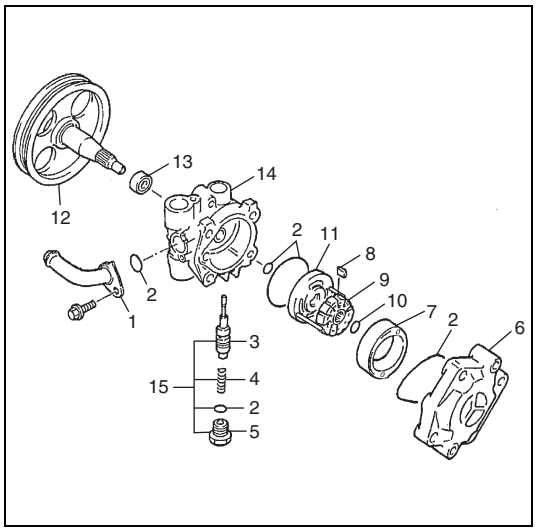

6) Remove P/S pump mounting bolts (1).
7) Remove P/S pump (2).

**NOTE:**

**Plug each port of removed P/S pump to prevent interfusion of dust or any other foreign particle.**

## Disassembly

1) Clean its exterior thoroughly.
2) With aluminum plates placed on vise first, fix pump body with vise.

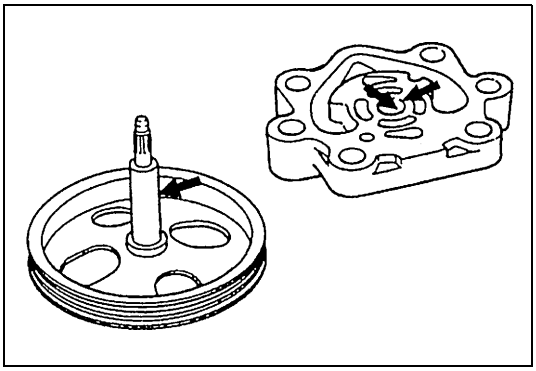



3) Remove suction connector bolt, suction connector (1) and O-ring (2) from pump body (14).
4) Remove plug (5), flow control spring (4) and relief valve (flow control valve) (3) from pump body.
5) Remove cover bolts, pump cover (6) and O-ring from pump body.
6) Remove snap ring (10) from pump shaft.
7) Remove vanes (8) from rotor.
8) Remove cam ring (7), rotor (9), side plate (11) and O-rings from pump body.
9) Pull out P/S pulley (12) from pump body.
10) Remove oil seal (13) from pump body.

| |
|---|
| 15. Flow control valve Assembly |

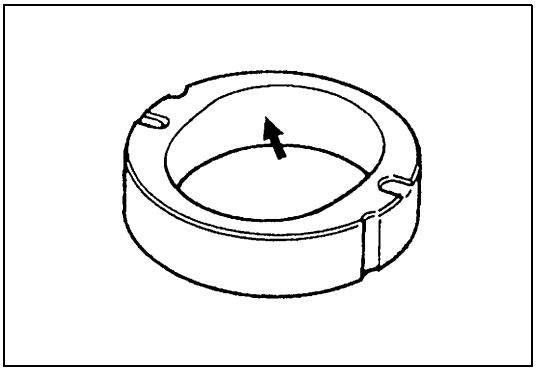
### Inspection

#### Pump Body, Cover, Side Plate and Shaft



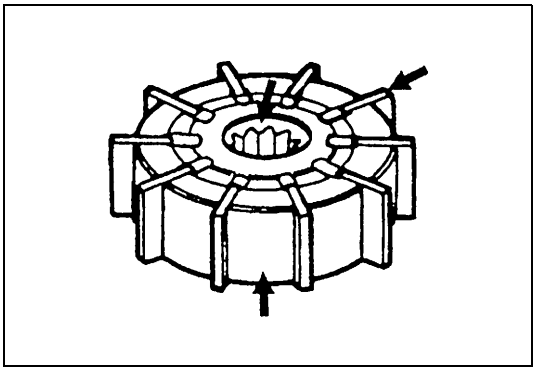
Check sliding surfaces of each part for wear and damage.
If any abnormality is found, replace pump assembly.

#### Cam Ring

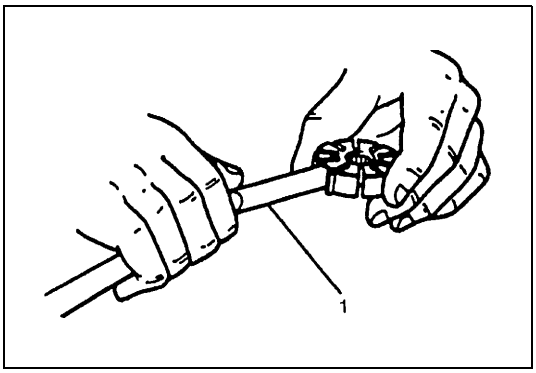


Check vane sliding surface of cam ring for wear and damage.
If any abnormality is found, replace pump assembly.

#### Rotor and Vane



- Check sliding surfaces of rotor and vane for wear and damage.

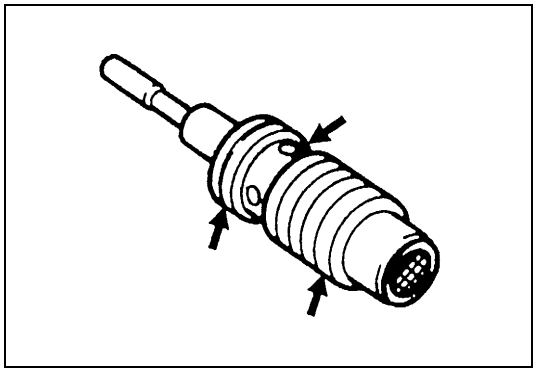



- Check clearance between rotor and vane by using thickness gauge (1).

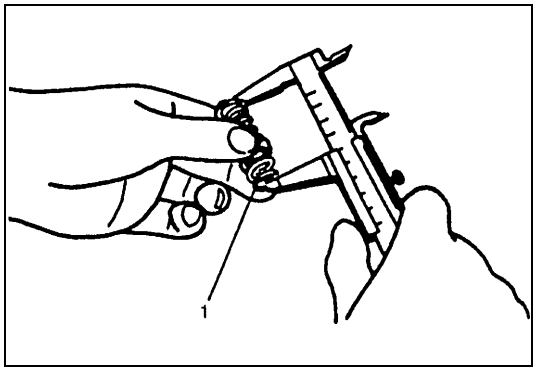
**Clearance between rotor and vane**
**Standard: 0.015 mm (0.0006 in.)**
**Limit: 0.027 mm (0.0011 in.)**

Replace pump assembly if any abnormality is found.

### Relief Valve (Flow Control Valve) and its Spring



- Check fluid passage of relief valve and orifice of connector for obstruction (clogged).
- Check sliding surface of relief valve for wear and damage.

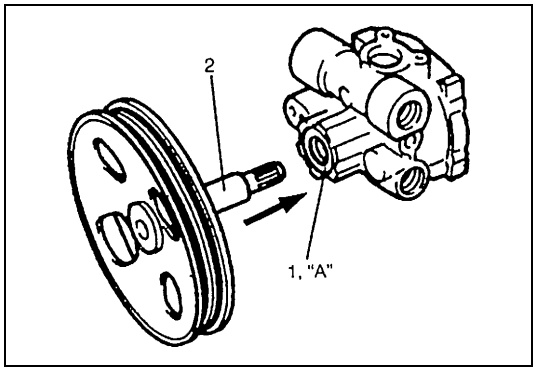



- Check free length of relief valve spring (1).

**Relief valve spring free length**
**Standard: 22.0 mm (0.866 in.)**
**Limit: 19.0 mm (0.748 in.)**

Replace pump assembly if any abnormality is found.

### Assembly

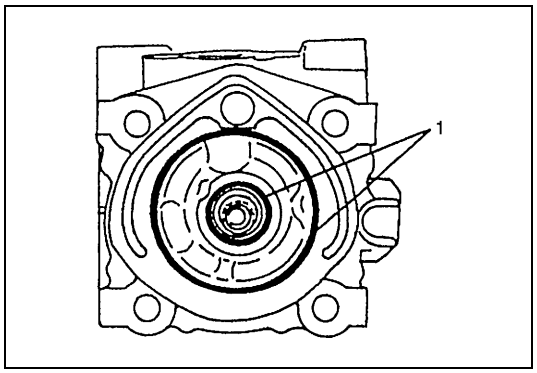



Reverse disassembly procedure for assembly, noting the following.

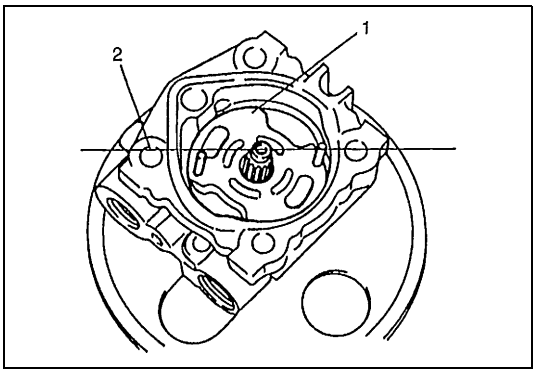
1) Apply grease to oil seal lip and apply power steering fluid to sliding surface of the shaft then insert pulley's shaft (2) from oil seal side of the pump body.

**"A": Grease 99000-25010**

| |
|---|
| 1. Oil seal |



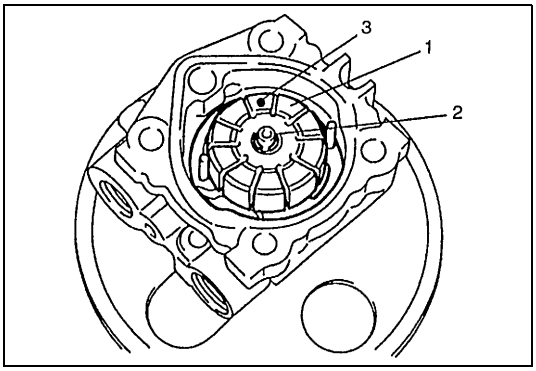

2) Apply power steering fluid to O-rings (1) and fit them to pump body.




3) Install side plate (1) to pump body.

**NOTE:**

**Carefully align the dowel pins on the side plate (1) at bolt hole (2) as shown in figure.**

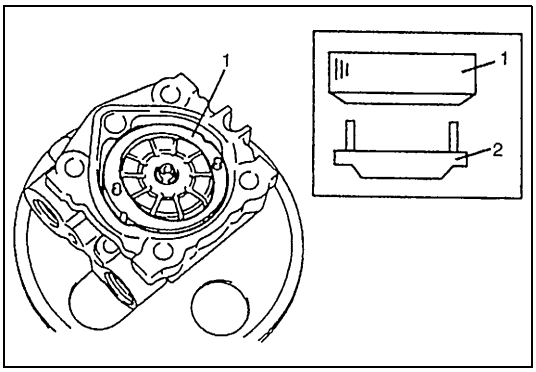



4) Apply power steering fluid to sliding surface of rotor (1).
5) Install rotor to shaft, directing dot marked side of rotor facing up.
6) Install new snap ring (2) to shaft, then make sure to fit snap into shaft groove securely.

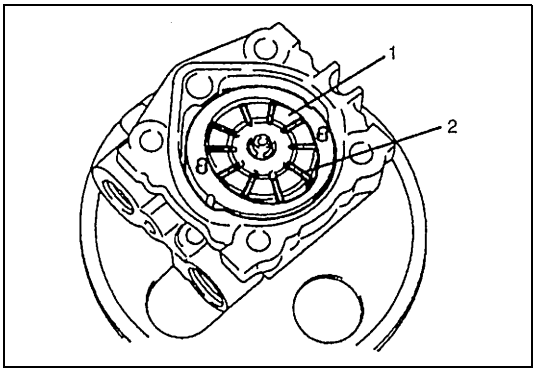
**NOTE:**

**Never reuse the removed snap ring.**

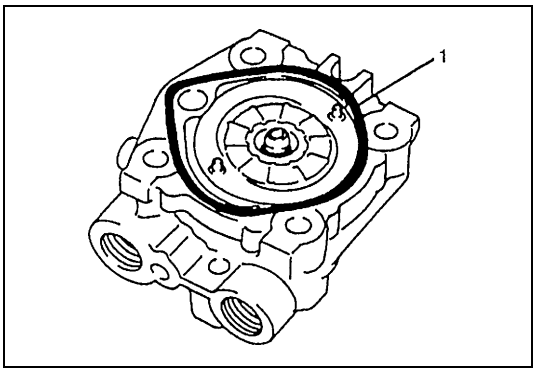
| |
|---|
| 3. Dot |



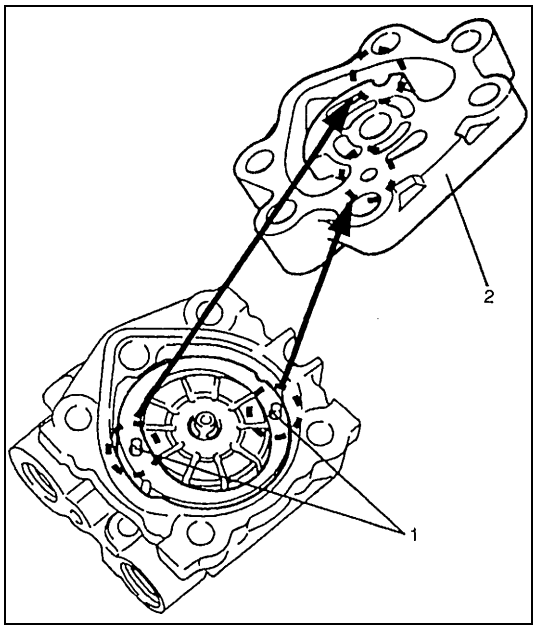

7) Apply power steering fluid to sliding surface of cam ring (1).
8) Install cam ring to pump body. The tapered end of cam ring should face the side plate (2).



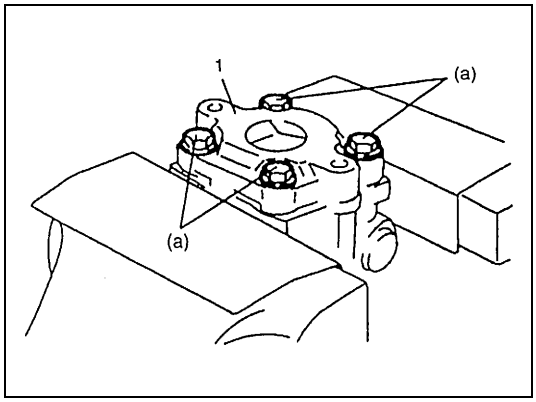

9) Apply power steering fluid to each vane (2).
10) Install vanes (10 pieces) to rotor (1).




11) Apply power steering fluid to O-ring (1).
12) Install O-ring to pump body.




13) Apply power steering fluid to sliding surface of pump cover and rotor.
14) Match the dowel pins (1) to the holes of the cover plate (2) as shown and install pump cover to pump body.

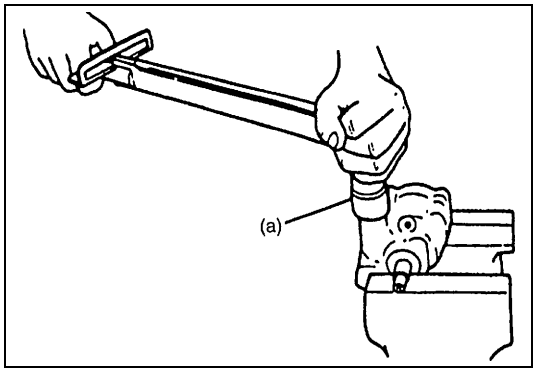



15) Gradually tighten new pump cover bolts to specified torque.

**NOTE:**

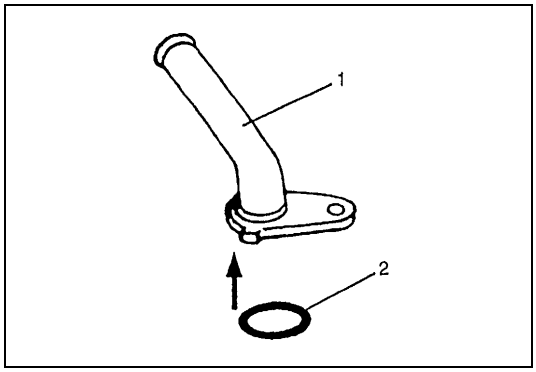
**After installing pump cover (1), make sure if shaft can be turned by hand.**

**Tightening torque**
**Oil pump cover bolts**
**(a): 28 N·m (2.8 kg-m, 20.0 lb-ft)**

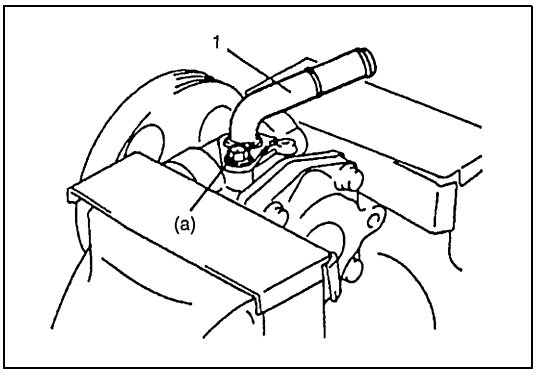



16) Apply power steering fluid to relief valve (flow control valve).
17) Install relief valve (flow control valve) to pump body.
18) Install flow control spring.
19) Apply power steering fluid to O-rings of plug.
20) Install O-rings to plug.
21) Tighten plug to specified torque.

**Tightening torque**
**Plug**
**(a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**




22) Apply power steering fluid to O-ring of suction connector (1).
23) Install O-ring (2) to suction connector.




24) Install suction connector (1) to pump body as shown in figure.
Tighten new suction connector bolts to specified torque.

**Tightening torque**
**Suction connector bolt**
**(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)**

### Installation

Reverse removal procedure noting the following instructions.

- For tightening torques, refer to structural diagram on previous page.
- Adjust power steering pump drive belt by referring to “Belt Tension Adjustment” under “Power Steering Pump Drive Belt” in this section.
- Fill specified power steering fluid after installation and bleed air without failure. (Refer to “Air Bleeding Procedure” in this section.)

# SECTION 3E

# REAR SUSPENSION

**NOTE:**

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.**
- **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.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**



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Rear suspension fasteners ..... *
Bearing Retainer and Axle Shaft Inner Oil Seal Check ..... *
Wheel Disc, Nut & Bearing Check ..... *
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Rear Axle Shaft Inner Oil Seal ..... 3E-7
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# General Description

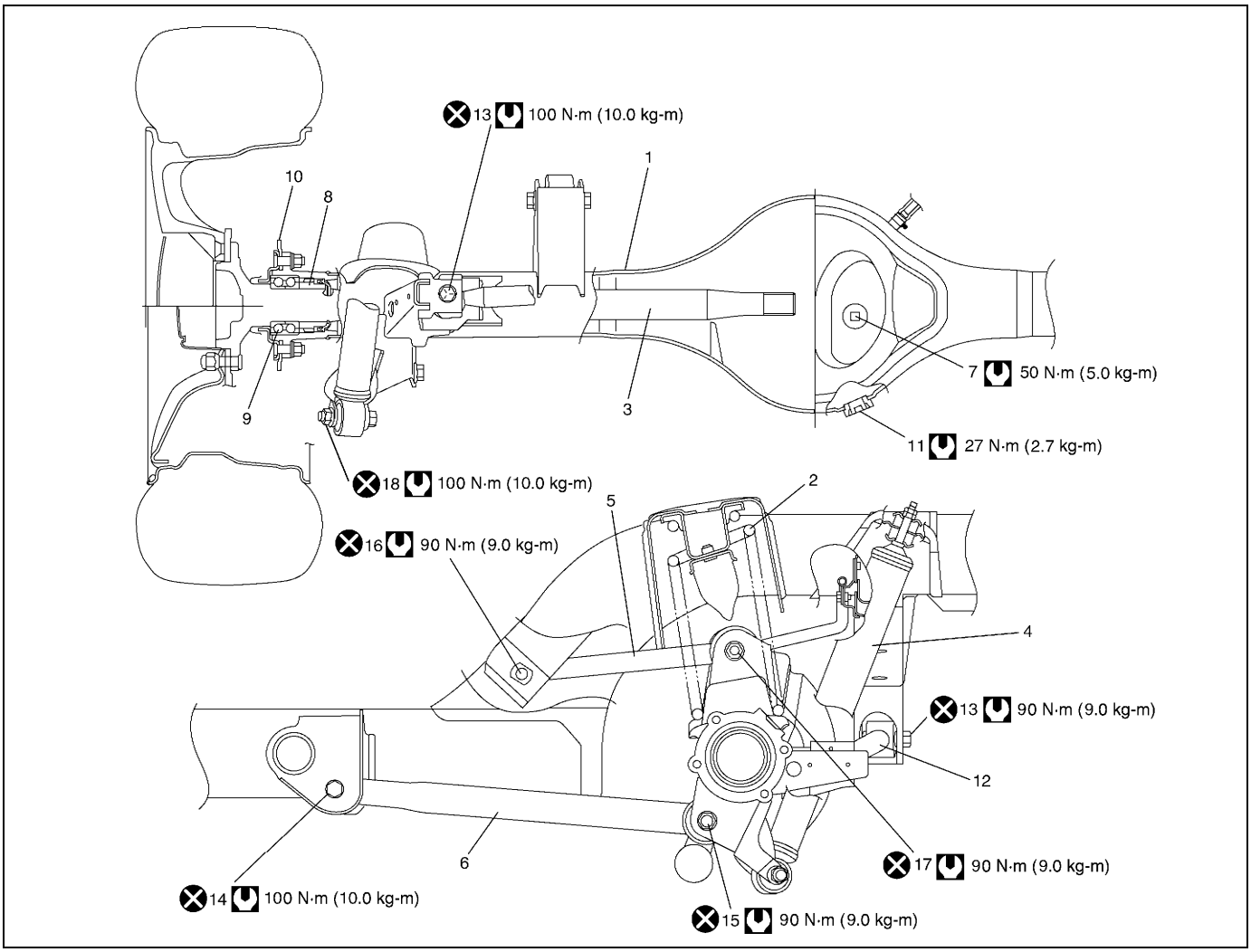
Rear suspension is 5 link type of rigid axle which consists of coil springs, rear axle, shock absorbers, upper rods, lower rods and lateral rod.
The lower rod and upper rod are connected with the axle and body by using bushes so that axle moves up and down with bushes as their supporting points.
The shock absorber is installed between the body and axle to absorb up-and-down movement of the vehicle body.

**CAUTION:**

**The shock absorber is non-adjustable, non-refillable, and cannot be disassembled.**
**The only service the shock absorber requires is replacement when it has lost its resistance, is damaged, or leaking fluid.**

**NOTE:**

**When installing differential gear oil drain plug, clean the thread portion of the plug and then apply sealant (SUZUKI BOND No. 1215, 99000-31110) to the portion.**



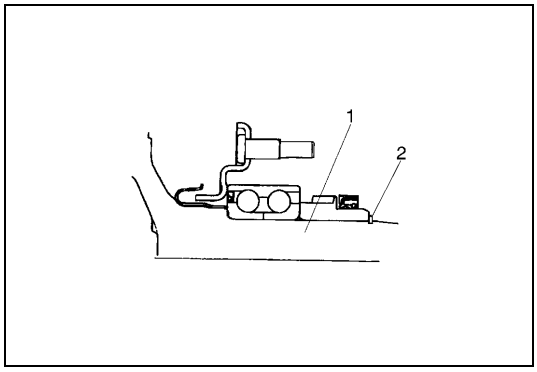

| | | | |
|---|---|---|---|
| 1. Rear axle housing | 6. Lower rod | 11. Oil drain plug | 16. Upper rod front bolt |
| 2. Coil spring | 7. Oil level plug | 12. Lateral rod | 17. Upper rod rear bolt |
| 3. Axle shaft | 8. Wheel bearing retainer | 13. Lateral rod bolt | 18. Shock absorber bolt |
| 4. Shock absorber | 9. Rear wheel bearing | 14. Lower rod front bolt | Tightening torque |
| 5. Upper rod | 10. Brake back plate | 15. Lower rod rear bolt | Do not reuse. |

# On-Vehicle Service

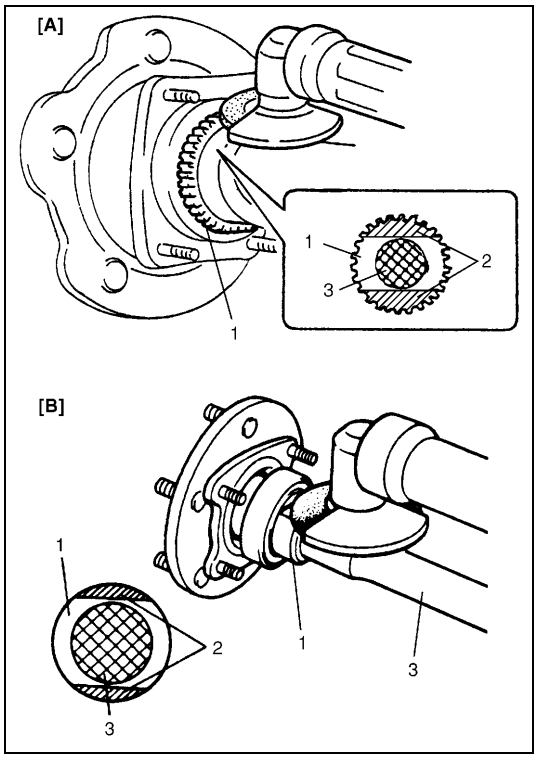
## Rear Axle Shaft and Wheel Bearing

### Removal

1) Remove axle shaft from axle housing according to Step1) to 7) in the same section in the service manual mentioned in the FOREWORD of this manual noting following points.



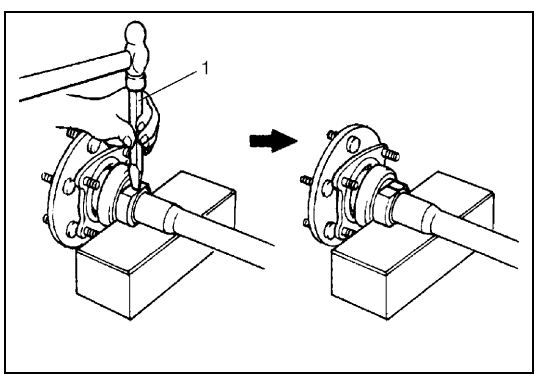

2) Remove circlip (2) (if equipped) from axle shaft (1).



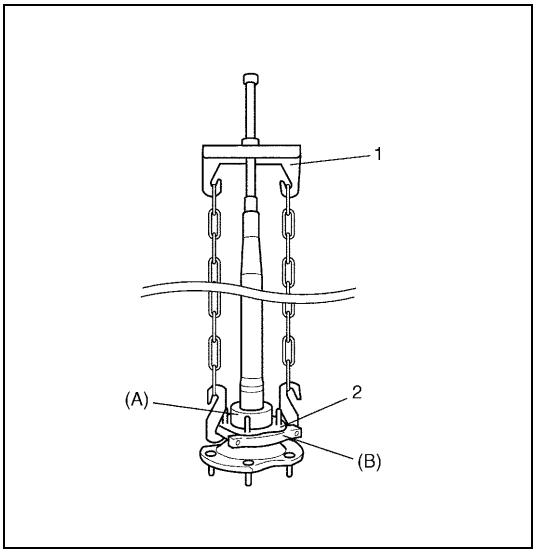

3) In order to remove retainer ring (1) from axle shaft (3), grind with a grinder two portion (2) of bearing retainer ring as illustrated till it becomes thin.

**CAUTION:**
**Be careful not to grind axle shaft.**

| |
|---|
| [A]: Vehicle with ABS |
| [B]: Vehicle without ABS |




4) Break with a chisel (1) the thin ground sensor rotor and retainer ring, and it can be removed.



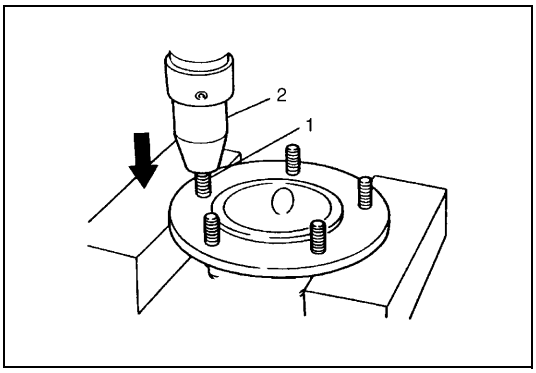

5) Remove wheel bearing (1) and bearing retainer (2) using special tools as shown in figure.

**Special tool**
**(A): 09927-18411**
**(B): 09921-57810**

**NOTE:**

**If inner race of wheel bearing is left in axle shaft, remove it from axle shaft with the same procedure as above-mentioned.**

**CAUTION:**
**Do not reuse wheel bearing.**



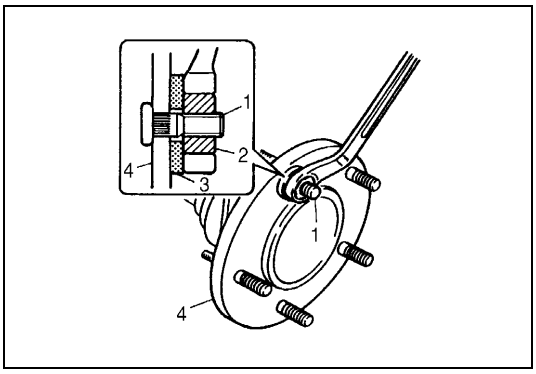

6) Remove stud bolt(s) (1) by using hydraulic press (2).

## Installation

Install removed parts in reverse order of removal procedure, noting the following.

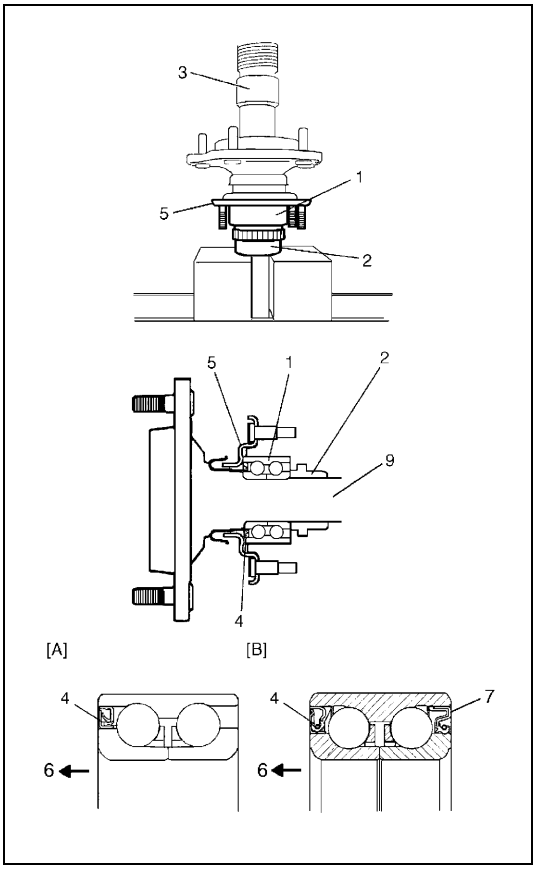
**NOTE:**

**There are two types of axle shaft, with or without circlip groove. Also, even when circlip groove exists, circlip may or may not be installed. In any case, it is not necessary to install a circlip regardless of existence of circlip groove.**




1) Aligning serrations between new stud bolt(s) (1) and flange (4), install new stud bolt(s) (1) by tightening nut (2) as shown in the figure.

| |
|---|
| 3. Washer |

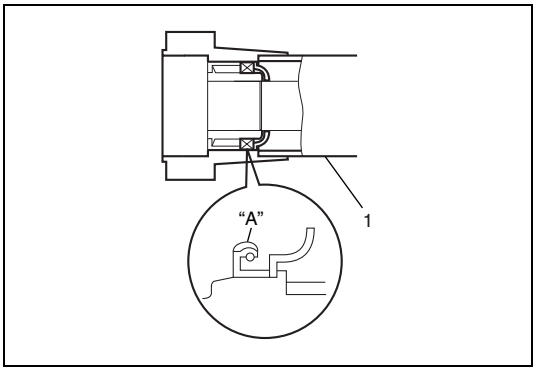



2) Install bearing retainer (5) to axle shaft.
3) Press fit new wheel bearing (1) using press (3) until it contacts stepped part of axle shaft.
4) Press fit new retainer ring (2) using press (3) until it contacts bearing (1).

**NOTE:**

- **Seal side (4) of wheel bearing must face bearing retainer (5) side.**
- **Use care not to cause any damage to outside of retainer ring (2).**

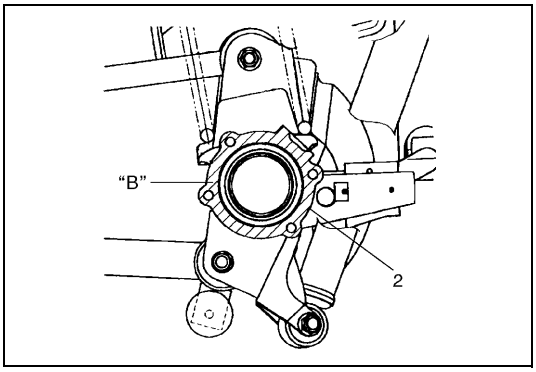
| |
|---|
| [A]: Type-1 for Koyo made bearing |
| [B]: Type-2 SKF made bearing |
| 6. Bearing retainer side (Brake drum side) |
| 7. Rubber seal side of bearing comes differential gear side |




5) Apply grease "A" to axle shaft inner oil seal lip as shown in the figure.

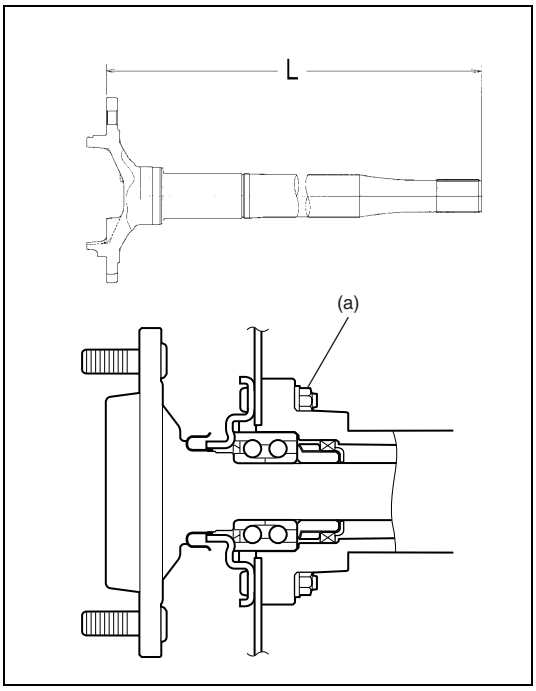
**"A": Grease 99000-25010**

| |
|---|
| 1. Axle housing |




6) Apply water tight sealant "B" to mating surfaces of brake back plate and rear axle hub (2).

**"B": Water tight sealant 99000-31110**



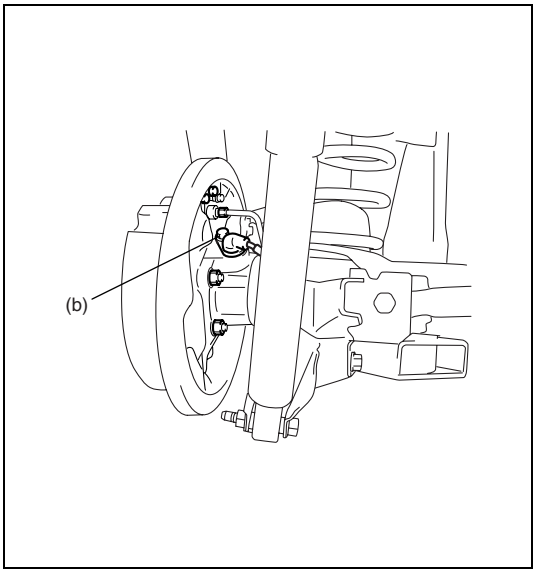

7) Install rear axle shaft to rear axle housing and tighten bearing retainer nuts to specified torque.

**Rear axle shaft length "L"**
**Left side: 702.0 mm (27.6 in.)**
**Right side: 771.0 mm (30.4 in.)**

**NOTE:**

**When installing rear axle shaft, be careful not to cause damage to oil seal lip in axle housing.**

**Tightening torque**
**Bearing retainer nut (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**




8) Tighten wheel speed sensor bolt to specified torque (if equipped with ABS).

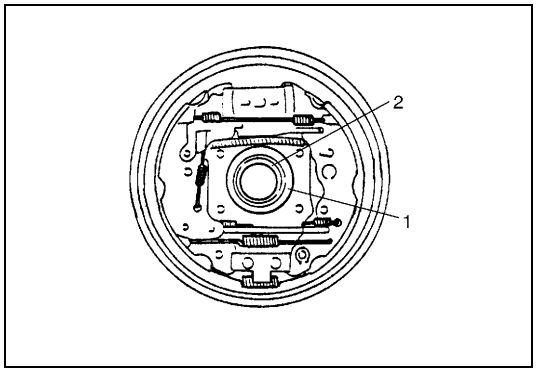
**Tightening torque**
**Wheel speed sensor bolt**
**(b): 21 N·m (2.1 kg-m, 15.5 lb-ft)**

9) Tighten oil drain plug to specified torque and refill rear differential housing with new specified gear oil.
   Refer to "Maintenance Service" in Section 7F.
10) Tighten oil filler plug to specified torque.
    Refer to "Maintenance Service" in Section 7F.
11) Install brake drum. Refer to "Brake Drum" in Section 5C.
12) Check to ensure that brake drum is free from dragging and proper braking is obtained.
13) Perform brake test (foot brake and parking brake).
14) Check each installed part for oil leakage.

## Rear Axle Shaft Inner Oil Seal

### Removal

1) Remove axle shaft from axle housing according to Step 1) to 7) in the same section in the service manual mentioned in the FOREWORD of this manual noting following points.
2) Fix brake back plate by inserting screwdriver to the hole for bearing retainer mounting.

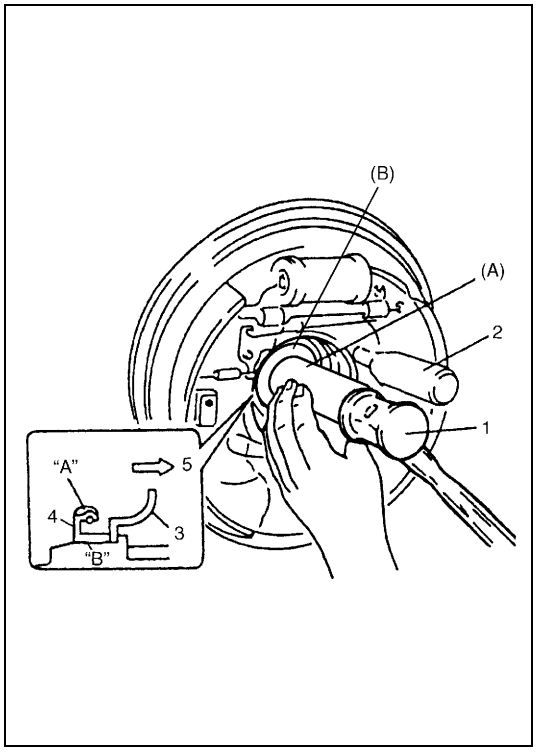



3) Remove rear axle shaft inner oil seal (2) from axle housing (1).

**NOTE:**

**Take care not to bend the brake pipe.**

### Installation




1) Using special tool drive in oil seal until it contacts oil seal protector in axle housing.

**NOTE:**

- **Make sure that oil seal is free from inclination as it is installed.**
- **Refer to the figure so that oil seal is installed in proper direction.**

**Special tool**
**(A): 09924-74510**
**(B): 09944-88210**

**"A": Grease 99000-25010**
**"B": Sealant 99000-31110**

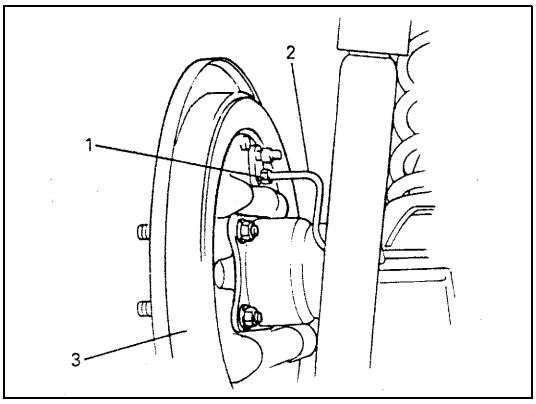
| | |
|---|---|
| 1. Hammer | 4. Oil seal |
| 2. Rod | 5. Body center |
| 3. Oil seal protector | |

2) For procedure hereafter, refer to steps 7) to 14) of "Installation" under "Rear Axle Shaft and Wheel Bearing" in this section.

# Rear Axle Housing

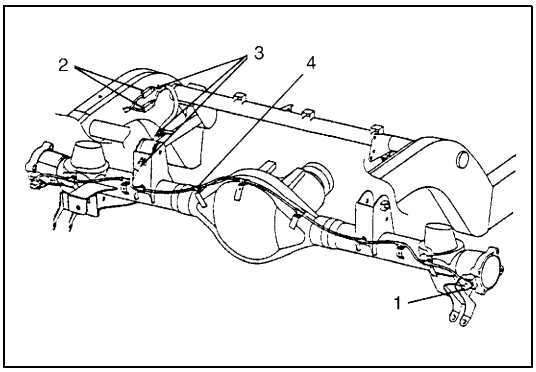
## Removal

1) Drain differential gear oil.
   Carry out steps 2) to 7) and 15) to 18) on both right and left wheels.
   Note that left wheel and its related parts are used in illustrations in this section.
2) Remove rear brake drum. Refer to “Rear Brake Drum” in Section 5C.



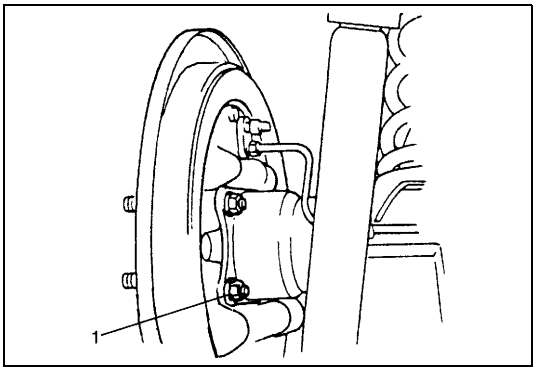

3) Disconnect brake pipe (2) from wheel cylinder. With right side wheel cylinder, disconnect 2 brake pipes.

| | |
|---|---|
| 1. | Brake pipe flare nut |
| 3. | Brake back plate |

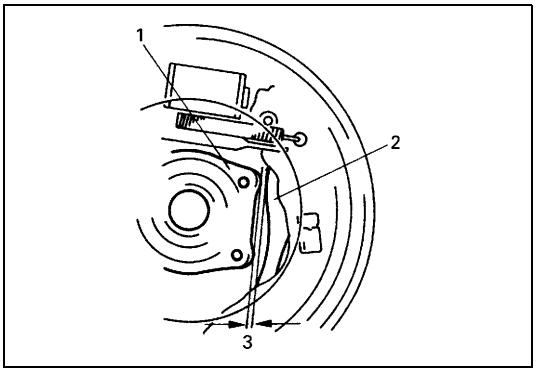



4) For vehicle with ABS, disconnect wheel speed sensor coupler (2) and remove wheel speed sensor (1) with its harness (4).

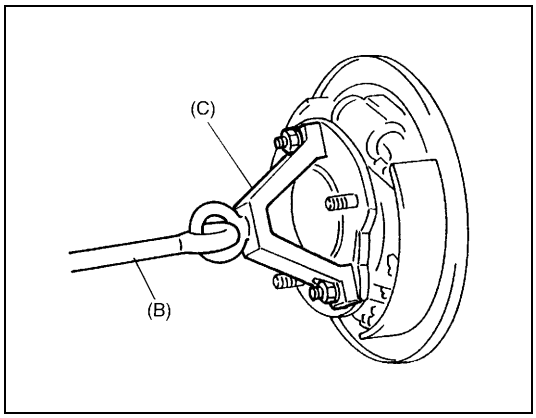
| | |
|---|---|
| 3. | Wheel speed sensor harness clamp |




5) Remove rear wheel bearing retainer nuts (1) from rear axle housing.




6) Check to ensure that there is clearance (3) between rear wheel bearing retainer (1) and parking brake shoe lever (2). If no clearance is found, loosen cable locking nut further to obtain clearance (3).

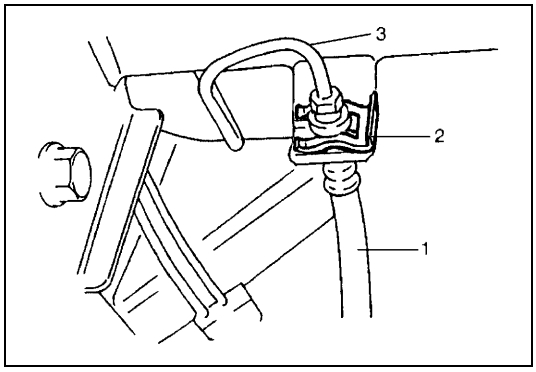



7) Using special tools (B) & (C) indicated below, draw out axle shafts.
   For vehicle equipped with ABS, remove wheel speed sensor from axle housing before drawing out axle shaft.

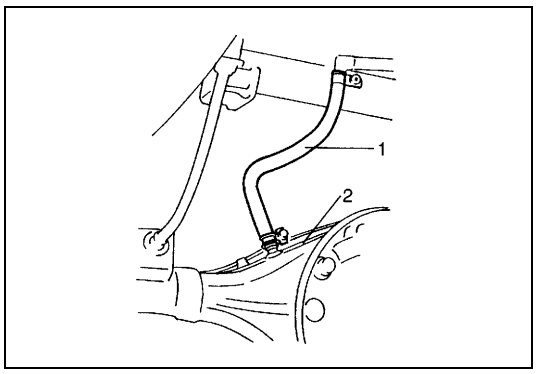
**NOTE:**

**Use care not to pull brake back plate along with shaft.**

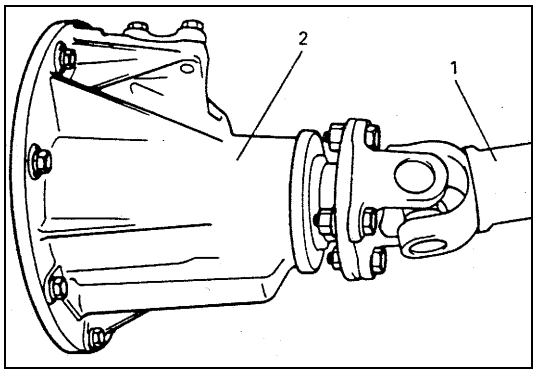
**Special tool**
**(C): 09943-35512**
**(B): 09942-15511**



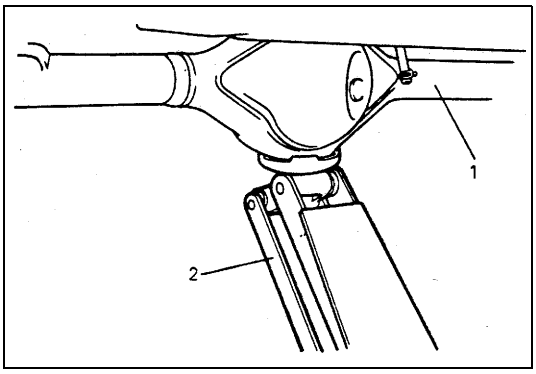

8) Remove brake back plate from rear axle housing.
9) Disconnect brake pipe (3) from flexible hose (1) and remove E-ring (2) (front side).



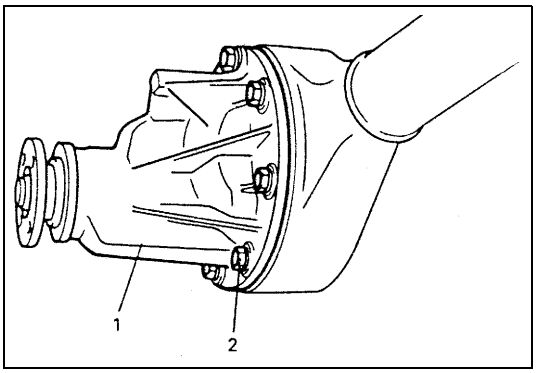

10) Remove brake pipe clamps and pipes from axle housing and disconnect breather hose (1) from axle housing (2).



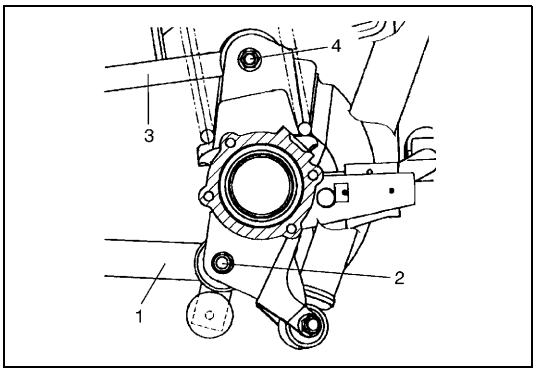

11) Disconnect propeller shaft (1) from differential carrier (2) and remove propeller shaft from transmission.



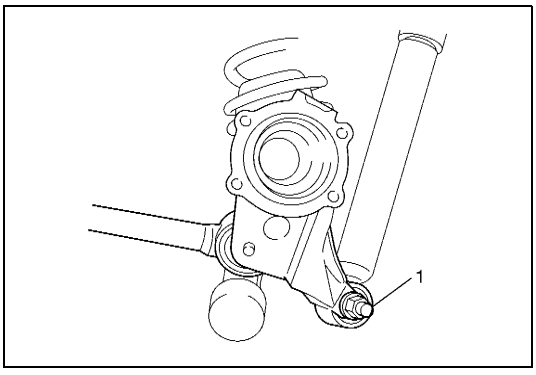

12) For jobs hereafter, support rear axle housing (1) by using floor jack (2) under axle housing (1).




13) Remove differential carrier bolts (2) and differential assembly (1).

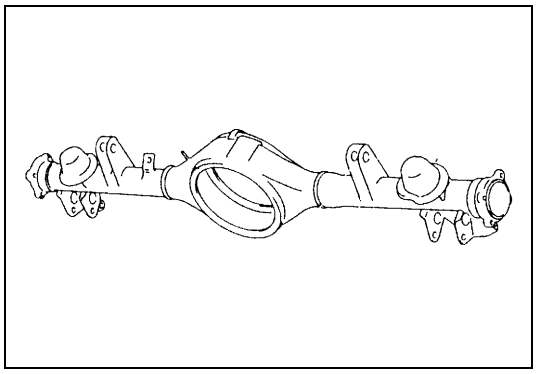



14) Loosen rear mount nut (4) of upper rod (3) but don't remove bolt.
15) Loosen rear mount nut (2) of lower rod (1) but don't remove bolt.




16) Remove rear axle side lateral rod mount bolt.
17) Remove shock absorber lower mount bolt (1).

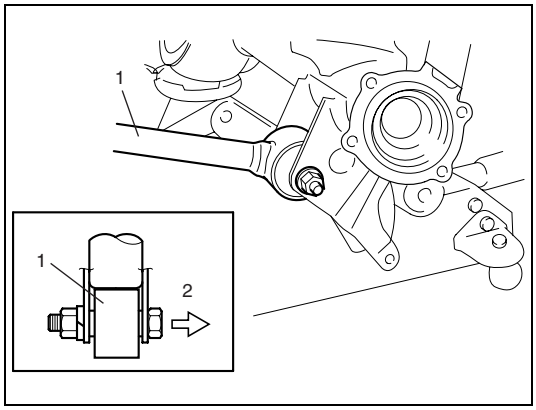
18) Lower floor jack until tension of suspension coil spring becomes a little loose and remove rear mount bolt of upper, lower and lateral rod.
19) Lower rear axle housing gradually.



20) Remove axle housing.

**Installation**

Install removed parts in reverse order of removal, noting the following.

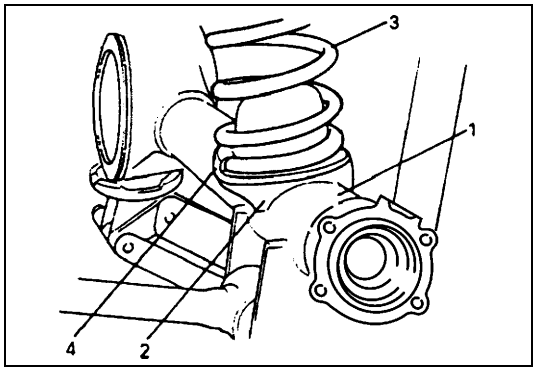



1) Place rear axle housing on floor jack. Then install upper/lower rod rear mounting bolts (right & left) in proper direction as shown in the figure.
   At this time, mount nuts but don't tighten them.

**NOTE:**

**Use new upper rod mounting bolts and lower rod mounting bolts.**

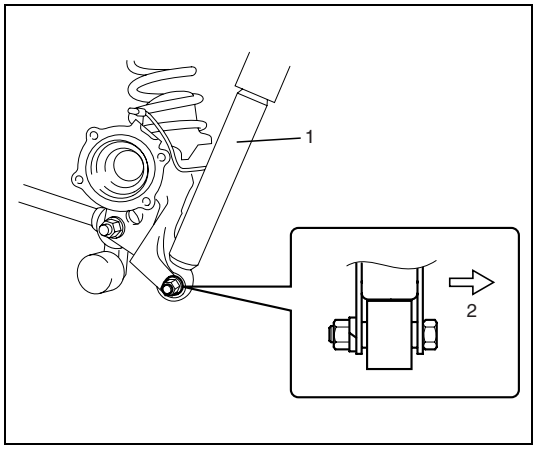
| | |
|---|---|
| 1. | Lower rod |
| 2. | Body center |




2) Install coil spring (3) (right & left) on spring seat (2) of axle housing (1) and raise axle housing (1).

**NOTE:**

**When seating coil spring, mate spring end with stepped part (4) of rear axle spring seat (2) as shown.**




3) Install lateral rod to rear axle housing.

**NOTE:**

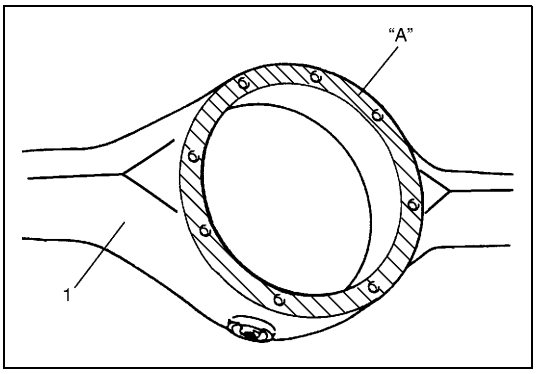
**Use new lateral rod mounting bolts.**

4) Install lower part of shock absorber (1) to right and left sides of axle housing and install bolts in proper direction as shown in figure. At this time, mount nuts but don't tighten them.

**NOTE:**

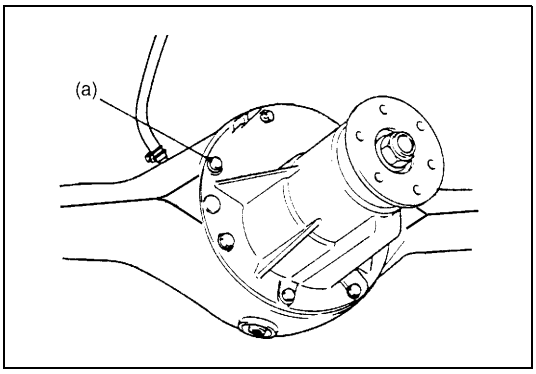
**Use new shock absorber mounting bolts.**

| | |
|---|---|
| 2. | Body center |




5) Clean mating surfaces of axle housing (1) and differential carrier and apply sealant "A" to housing side.

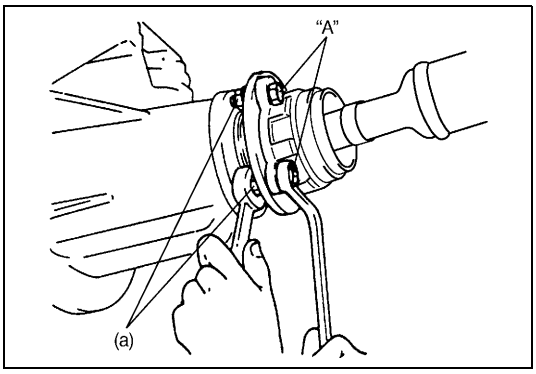
**"A": Sealant 99000-31110**




6) Install differential carrier assembly to axle housing and tighten carrier bolts to specified torque.

**Tightening torque**
**Differential carrier bolt**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**

7) For vehicle with ABS, connect wheel speed sensor coupler and install harness clamps.

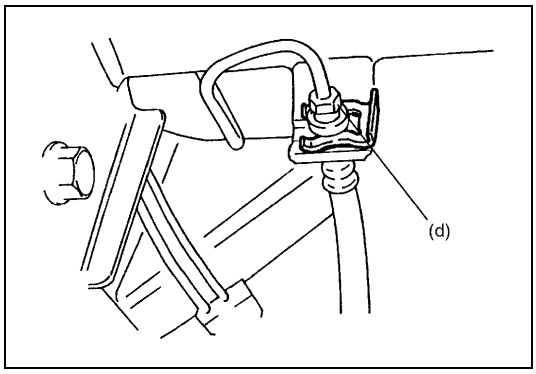



8) Apply thread lock cement to thread of propeller shaft flange bolt if reused. Install propeller shaft to joint flange aligning match marks and torque flange nuts to specification.

**"A": Cement 99000-32110**

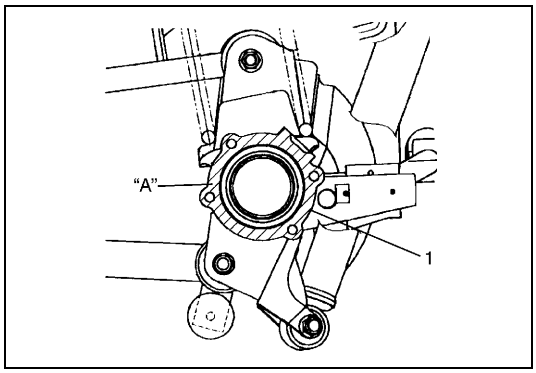
**Tightening torque**
**Propeller shaft nut (for H27 engine model)**
**(a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**
**Propeller shaft nut (for RHW engine model)**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**

9) Remove floor jack from axle housing.
10) Connect breather hose onto axle housing and clamp it securely.
11) Connect brake pipes onto axle housing and clamp them securely.
    For clamping positions, refer to "Rear Brake Hose/Pipe" in Section 5A.
12) Connect brake flexible hose to bracket on axle housing and secure it with E-ring.



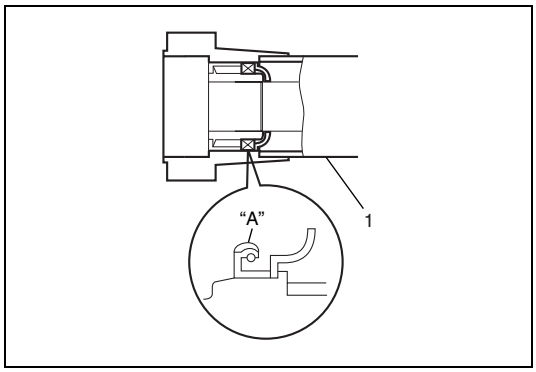

13) Connect brake pipe to brake flexible hose and tighten brake pipe flare nut to specified torque.

**Tightening torque**
**Brake pipe flare nut**
**(d): 16 N·m (1.6 kg-m, 11.5 lb-ft)**




14) Clean mating surface of axle housing (1) (right & left) and brake back plate, then apply sealant as shown.

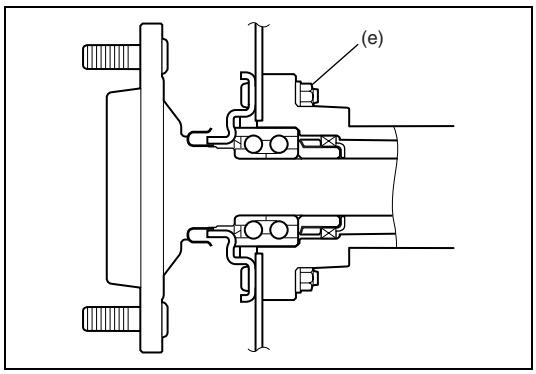
**"A": Sealant 99000-31110**




15) Apply grease to axle shaft inner oil seal lip as shown in the figure.

**"A": Grease 99000-25010**

| |
|---|
| 1. Axle housing |

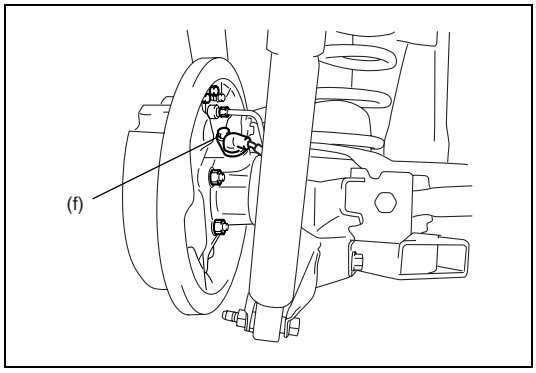



16) Install rear axle shaft to rear axle housing and tighten bearing retainer nuts to specified torque.

**NOTE:**

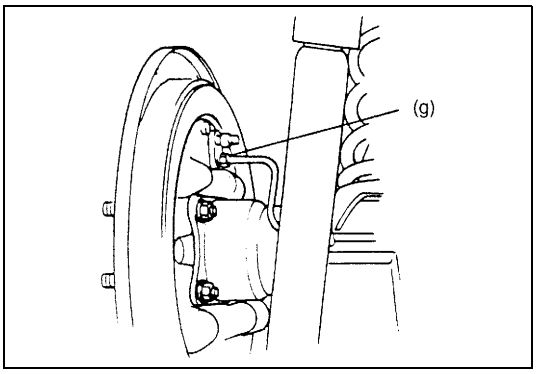
**When installing rear axle shaft, be careful not to cause damage to oil seal lip in axle housing.**

**Tightening torque**
**Bearing retainer nut**
**(e): 50 N·m (5.0 kg-m, 36.5 lb-ft)**




17) For vehicle with ABS, tighten wheel speed sensor bolt to specified torque.

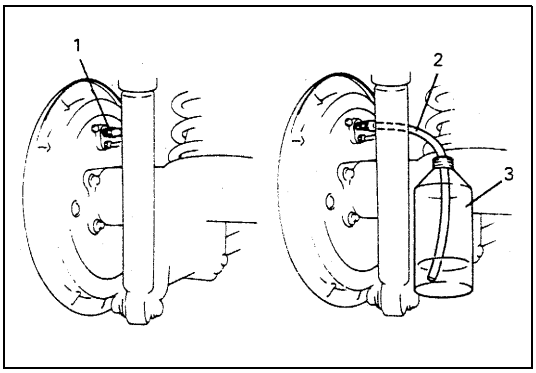
**Tightening torque**
**Wheel speed sensor bolt**
**(f): 21 N·m (2.1 kg-m, 15.5 lb-ft)**




18) Connect brake pipes to wheel cylinders (right & left) and tighten brake pipe flare nuts to specified torque.

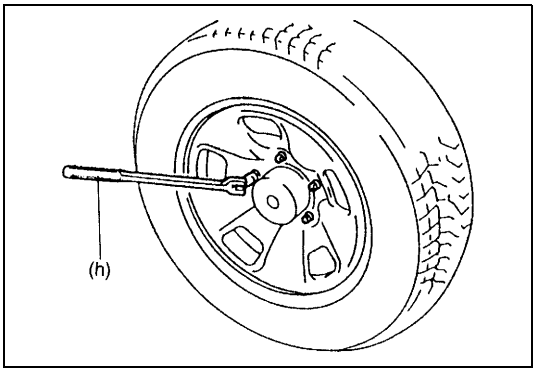
**Tightening torque**
**Brake pipe flare nut**
**(g): 16 N·m (1.6 kg-m, 11.5 lb-ft)**

19) Install brake drum (right & left). For details, refer to "Brake Drum" in Section 5C.
20) Tighten drain plug and refill differential gear housing with new specified gear oil. Refer to "Maintenance Service" in Section 7F.




21) Fill reservoir with brake fluid and bleed brake system. Refer to "Bleeding Brakes" in Section 5.

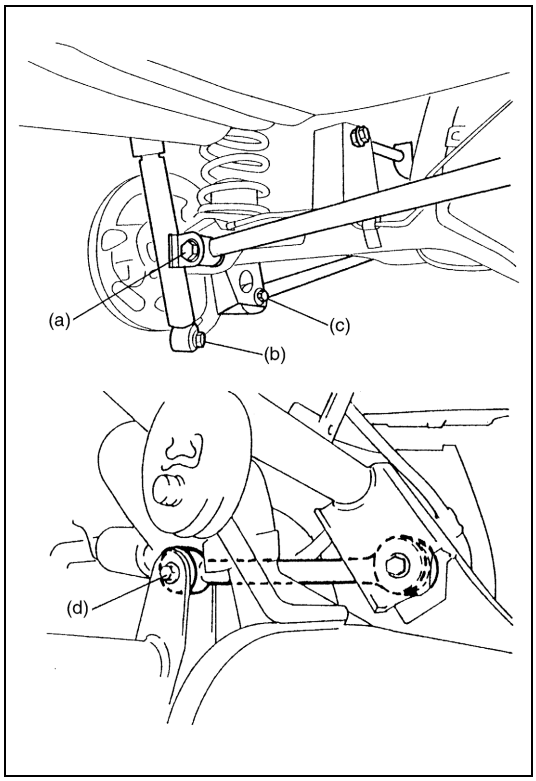
| | |
|---|---|
| 1. | Plug cap |
| 2. | Vinyl tube |
| 3. | Container |




22) Install wheel and tighten wheel nuts to specified torque.

**Tightening torque**
**Wheel nuts**
**(h): 100 N·m (10.0 kg-m, 72.5 lb-ft)**

23) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load three to ten times so as to obtain proper drum-to-shoe clearance.
Adjust parking brake cable. Refer to "Parking Brake Check and Adjustment" in Section 5.
24) Tighten parking brake lever cover (console box) screws.
25) Lower hoist.




26) Tighten right and left lower/upper rod nuts lateral rod mount bolt and shock absorber nuts to specified torque.

**NOTE:**

**When tightening these nuts, be sure that vehicle is off hoist and in non loaded condition.**

**Tightening torque**
**Lateral rod axle housing side bolt**
**(a): 100 N·m (10.0 kg-m, 72.5 lb-ft)**
**Absorber lower nut**
**(b): 100 N·m (10.0 kg-m, 72.5 lb-ft)**
**Lower rod rear side nut**
**(c): 90 N·m (9.0 kg-m, 65.0 lb-ft)**
**Upper rod rear side nut**
**(d): 90 N·m (9.0 kg-m, 65.0 lb-ft)**

27) Check to ensure that brake drum is free from dragging and proper braking is obtained.
28) Perform brake test (foot brake and parking brake).
29) Check each installed part for oil leakage.

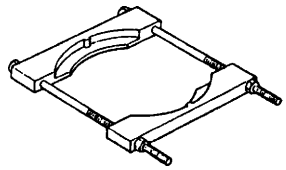
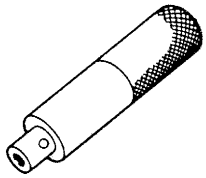
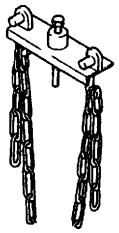
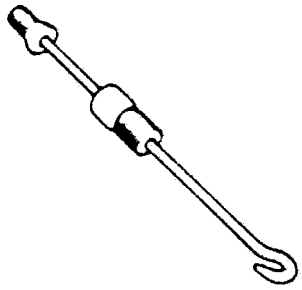
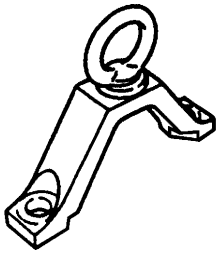
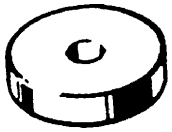
# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Wheel nut | 100 | 10.0 | 72.5 |
| Shock absorber lock nut | 29 | 2.9 | 21.0 |
| Shock absorber nut | 29 | 2.9 | 21.0 |
| Shock absorber lower nut | 100 | 10.0 | 72.5 |
| Lower rod front bolt | 100 | 10.0 | 72.5 |
| Lower rod rear nut | 90 | 9.0 | 65.0 |
| Upper rod front bolt | 90 | 9.0 | 65.0 |
| Upper rod rear nut | 90 | 9.0 | 65.0 |
| Lateral rod mounting bolt axle housing side | 100 | 10.0 | 72.5 |
| Lateral rod mounting bolt body side | 90 | 9.0 | 65.0 |
| Wheel speed sensor bolt | 21 | 2.1 | 15.5 |
| Rear differential carrier bolt | 55 | 5.5 | 40.0 |
| Rear propeller shaft bolt (Differential side) H27 engine model | 60 | 6.0 | 43.5 |
| Rear propeller shaft bolt (Differential side) RHW engine model | 55 | 5.5 | 40.0 |
| Brake pipe flare nut | 16 | 1.6 | 11.5 |
| Bearing retainer nut | 50 | 5.0 | 36.5 |

# Required Service Material

| Material | Recommended product | Use |
|---|---|---|
| Lithium grease | SUZUKI SUPER GREASE A (99000-25010) | • Oil seal lip |
| Brake fluid | DOT 3 | • Brake reservoir tank |
| Sealant | SUZUKI BOND NO. 1215 (99000-31110) | • Joint seam of axle and brake back plate<br>• Joint seam of differential carrier and axle housing<br>• Drain plug<br>• Mating surface of oil seal and axle housing |
| Gear oil | For gear oil information, refer to Section 7F | • Differential gear (Rear axle housing) |
| Thread lock cement | THREAD LOCK CEMENT SUPER 1322 (99000-32110) | • Rear propeller shaft flange bolts |

# Special Tool

| | | | |
|---|---|---|---|
|  <br>09921-57810<br>Counter shaft holder |  <br>09924-74510<br>Bush remover handle |  <br>09927-18411<br>Universal puller |  <br>09942-15511<br>Sliding hammer |
|  <br>09943-35512<br>Brake drum remover |  <br>09944-88210<br>Bearing installer | | |

# SECTION 3F

# WHEELS AND TIRES

**NOTE:**

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.**
- **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.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**



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**Diagnosis ..... ***
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Tire repair ..... *
**Tightening Torque Specifications ..... ***

# General Description

## Tires

This vehicle is equipped with following tire.

**Tire specification:**
**235/60 R16 100H**

The tires are of tubeless type. The tires are designed to operate satisfactorily with loads up to the full rated load capacity when inflated to the recommended inflation pressure.
Correct tire pressures and driving habits have an important influence on tire life. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increase tire wear.

## Wheels

Standard equipment wheels are following steel wheels.

**Wheel specification:**
**16 x 7 JJ**

## SECTION 4A2

# FRONT DRIVE SHAFT / SHAFT BEARING, OIL SEAL

## CONTENTS

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**Diagnosis ..... 4A2-2**
Diagnosis Table ..... 4A2-2
Drive Shaft Boot and Joint Check ..... 4A2-2
**On-Vehicle Service ..... 4A2-3**
Drive Shaft ..... 4A2-3
Front Drive Shaft Bearing / Oil Seal Removal and Installation ..... 4A2-11
**Tightening Torque Specifications ..... 4A2-13**
**Required Service Material ..... 4A2-13**
**Special Tool ..... 4A2-14**

# General Description

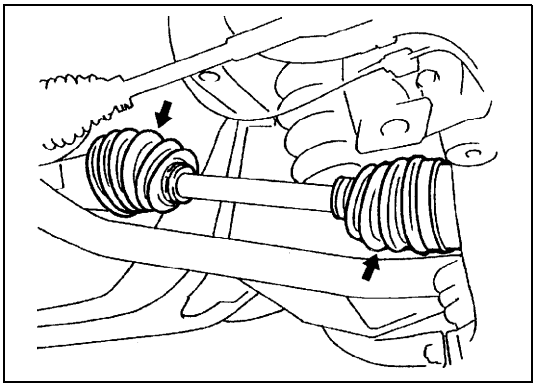
A constant velocity double offset joint (DOJ) is used on the differential side of both the right and left side drive shaft assemblies. And, a constant velocity ball joint is used on the wheel side of both the right and left drive shaft assemblies. The drive shaft can slide through the DOJ in the extension / contraction direction.

# Diagnosis

## Diagnosis Table

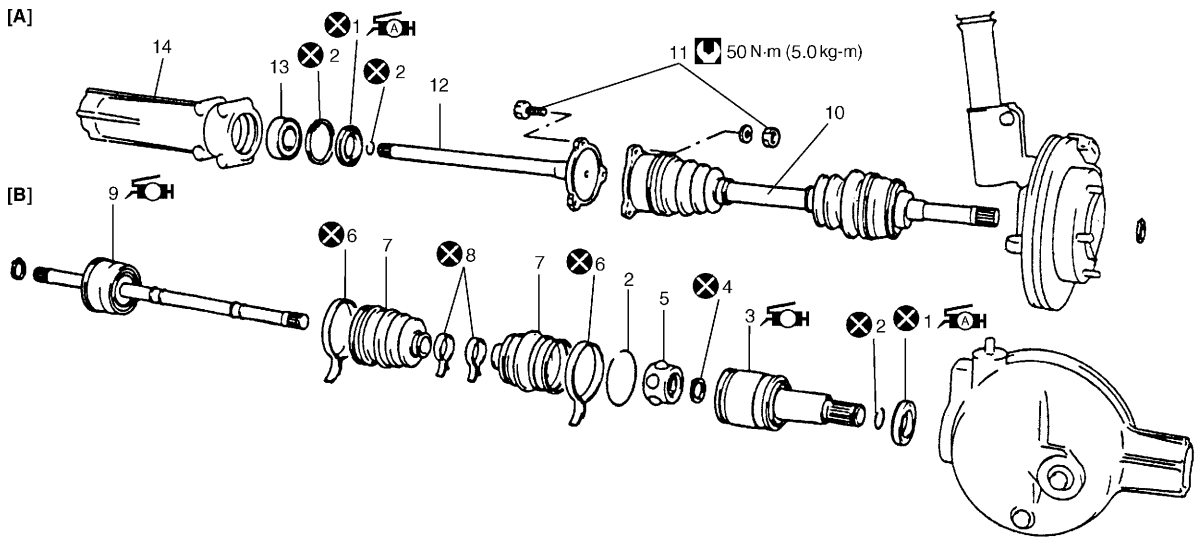
| Condition | Possible Cause | Correction |
|---|---|---|
| **When starting: Abnormal noise** | Loose wheel nut(s) | Tighten wheel nut(s). |
| | Loose drive shaft flange bolt(s) | Tighten drive shaft flange bolt(s). |
| | Broken or damaged wheel bearing | Replace. |
| **When making turns: Abnormal noise** | Grease leakage from boot | Replace boot and apply grease. |
| | Worn or broken drive shaft joint | Replace drive shaft joint. |
| **When running: Abnormal noise** | Broken drive shaft joint | Replace drive shaft joint. |
| | Poorly lubricated or worn joint | Lubricate or replace joint. |
| | Loose drive shaft flange bolt(s) | Tighten drive shaft flange bolt(s). |
| | Deformed drive shaft oil seal | Replace. |
| **Vibration** | Worn drive shaft joint | Replace drive shaft joint. |
| | Deformed drive shaft oil seal | Replace. |
| | Deformed drive shaft | Replace. |

## Drive Shaft Boot and Joint Check



- Check boot for tear. If even a small tear is found, replace with new one.
- Check drive shaft joint for wear, breakage, and any other damage. Replace if any abnormality is found.

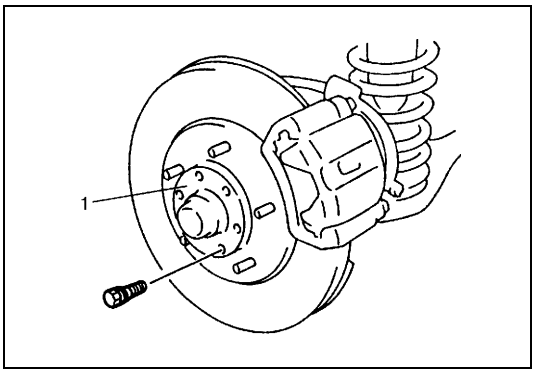
# On-Vehicle Service



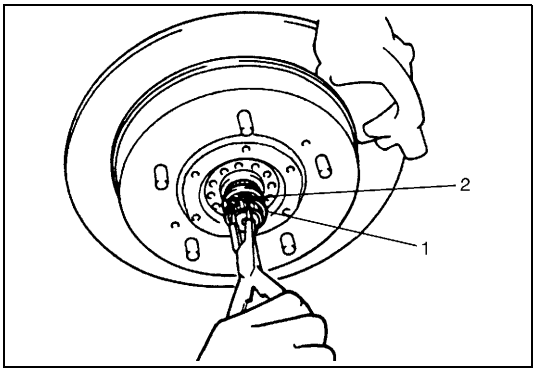

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | [A]: Left side | | 4. Snap ring | | 9. Ball joint assembly : Apply black grease included in spare part. | | 14. Left drive shaft case |
| | [B]: Right side | | 5. Cage | | 10. Drive shaft assembly | | Tightening torque |
| | 1. Drive shaft oil seal : Apply grease 99000-25010 to seal lip. | | 6. Boot big band | | 11. Drive shaft flange bolts and nuts | | Do not reuse. |
| | 2. Circlip | | 7. Boot | | 12. Left drive shaft | | |
| | 3. DOJ housing : Apply dark gray grease included in spare part. | | 8. Boot small band | | 13. Drive shaft bearing | | |

## Drive Shaft

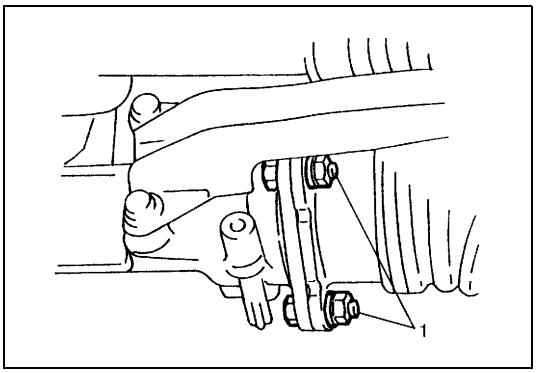
### Removal (Left Side)



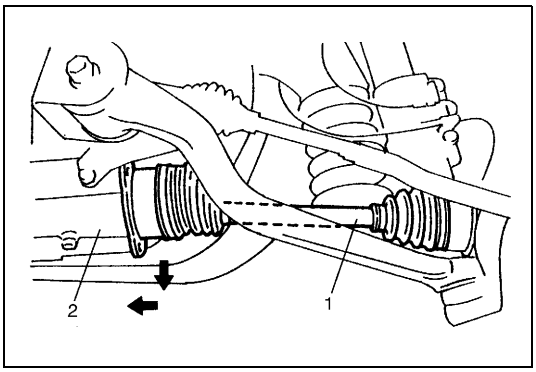

1) Hoist vehicle and remove wheel.
2) Remove engine undercover.
3) Remove axle shaft drive flange (1).




4) Remove circlip (1) and front spindle thrust washer (2).

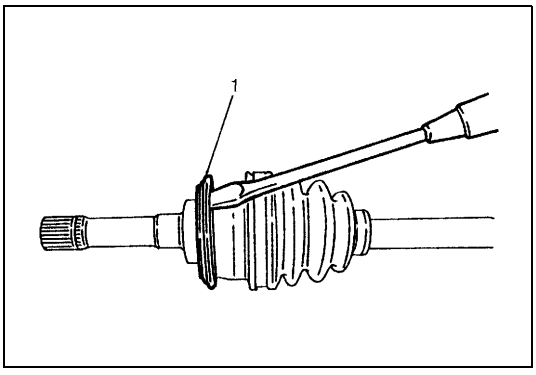



5) Remove drive shaft flange bolts and nuts (1).




6) Remove drive shaft assembly (1) from left drive shaft case (2) as shown in the figure.

**CAUTION:**
**To prevent breakage of boots (wheel side and differential side), do not contact them with other parts when removing drive shaft assembly.**

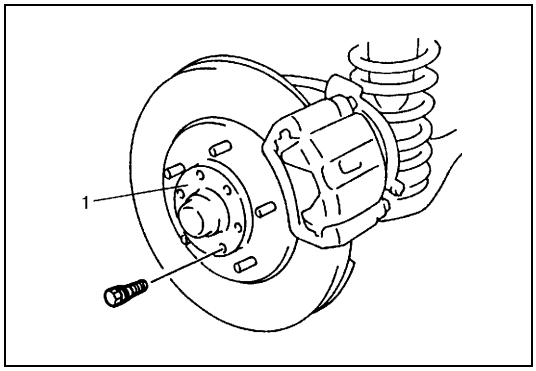



7) Remove drive shaft oil seal (1) as shown in the figure.

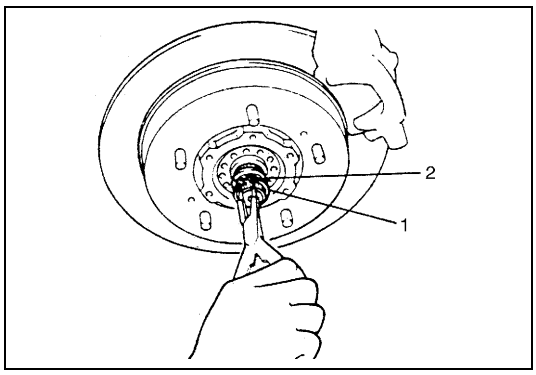
**CAUTION:**
**Do not damage drive shaft joint and boot.**

**Removal (Right Side)**

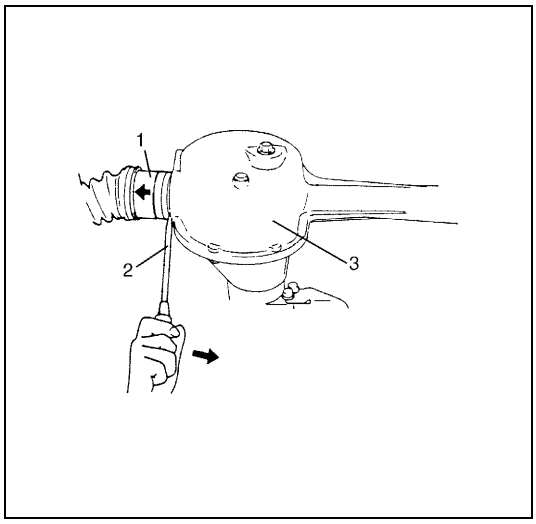
1) Hoist vehicle and remove wheel.
2) Remove engine undercover.
3) Drain differential gear oil referring to “Differential Gear Oil Change” in Section 7E.




4) Remove axle shaft drive flange (1).



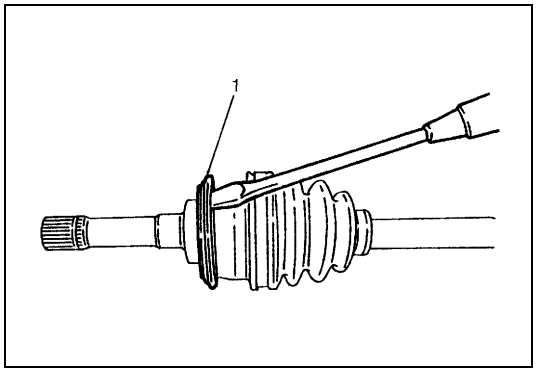

5) Remove circlip (1) and front spindle thrust washer (2).
6) Remove knuckle and wheel hub component referring to “Knuckle / Wheel Spindle” in Section 3D.




7) Remove drive shaft assembly. To detach circlip fitted on the spline of differential side joint (1) from differential side gear, pull differential side joint by using a tire lever (2).

**CAUTION:**
**To prevent breakage of boots (wheel side and differential side), do not contact them with other parts when removing drive shaft assembly.**

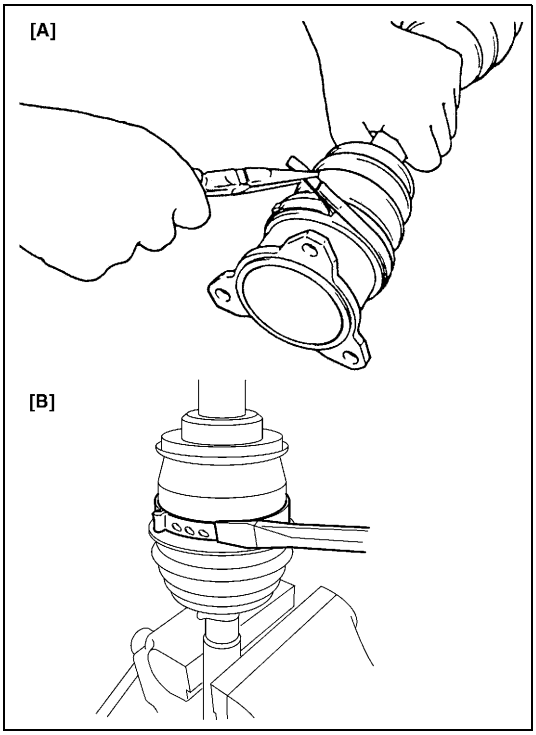
| |
|---|
| 3. Front differential assembly |




8) Remove drive shaft oil seal (1) as shown in the figure.

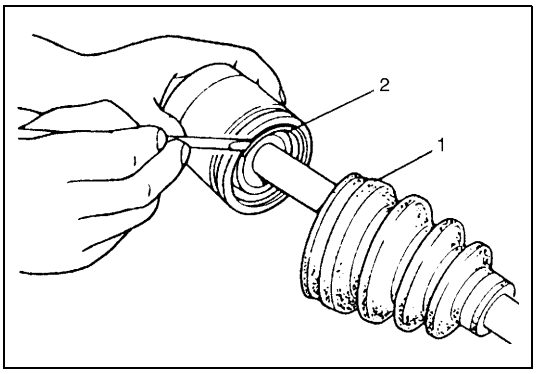
**CAUTION:**
**Do not damage drive shaft joint and boot.**

## Disassembly

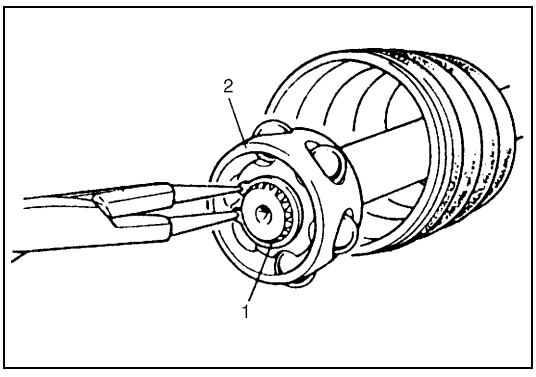



1) Remove boot big and small bands of differential and wheel side joint.

| | |
|---|---|
| [A]: | For differential side |
| [B]: | For wheel side |




2) Slide boot (1) toward the center of shaft, remove snap ring (2) from DOJ housing, and take shaft out of DOJ housing.




3) Remove snap ring (1), and then cage (2) from shaft.

4) Remove differential and wheel side boots from shaft.

**CAUTION:**

- **Do not disassemble ball joint assembly (wheel side joint). If any abnormality is found in joint, replace it as assembly.**
- **Do not disassemble cage of differential side joint. If any abnormality is found in cage, replace differential side joint assembly.**

### Inspection

- Check boots for breakage or deterioration. Replace them as necessary.
- Check circlip, snap ring and boot bands for breakage or deformation. Replace as necessary.

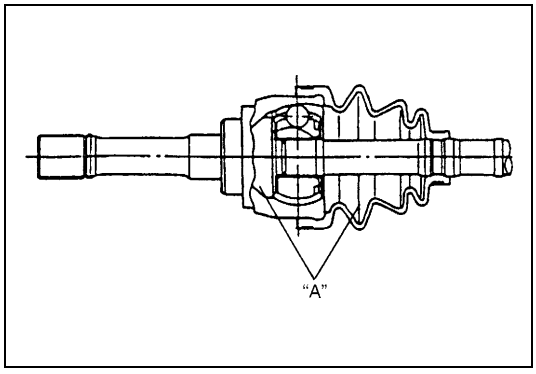
### Cleaning

- Wash disassembled parts (except boots) in degreaser. After wash, dry parts completely by blowing air.
- Clean boots with cloth. DO NOT wash boots in degreaser, such as gasoline or kerosene, etc.
  Washing in degreaser causes deterioration of boots.

### Assembly

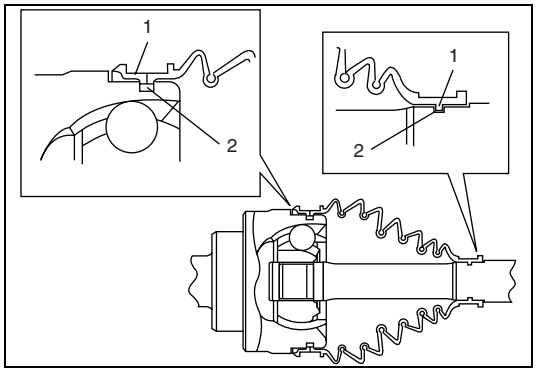
**CAUTION:**

- **To prevent any problem caused by washing solution, do not wash boots. Degreasing boots with cloth is allowed.**
- **Bend each boot band end against forward rotation.**
- **Do not squeeze or distort boot when fastening it with bands.**
  **Distorted boot caused by squeezing air may reduce its durability.**

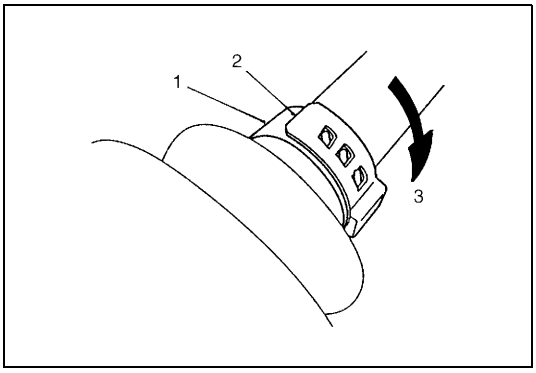



1) Fully apply joint grease to wheel side joint. Use joint grease in the tube included in spare part.

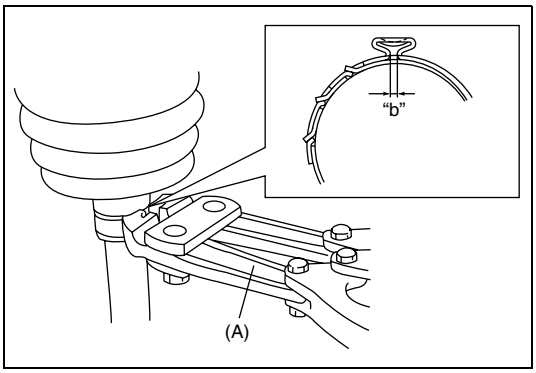
**Grease color**
**"A": Dark gray**
**Amount**
**"A": approx. 80 – 90 g (2.8 – 3.2 oz) for type A**
**"A": approx. 105 – 125 g (3.7 – 4.4 oz) for type B and RHW engine model**




2) Install wheel side boot.
   a) Install wheel side boot by fitting convex part (1) of boot onto concave part (2) of DOJ housing and shaft.




b) Place new wheel side boot small band (1) onto boot putting band outer end (2) against forward rotation (3) as shown in figure.

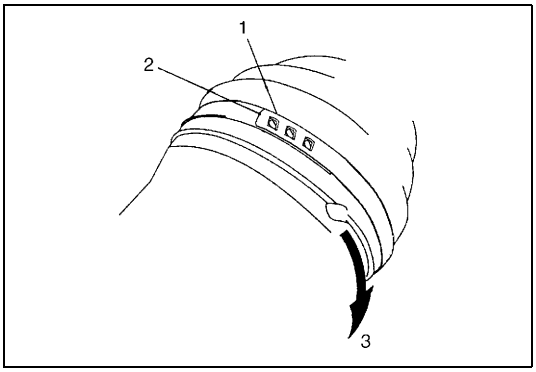



c) Fasten boot small band by using special tool.

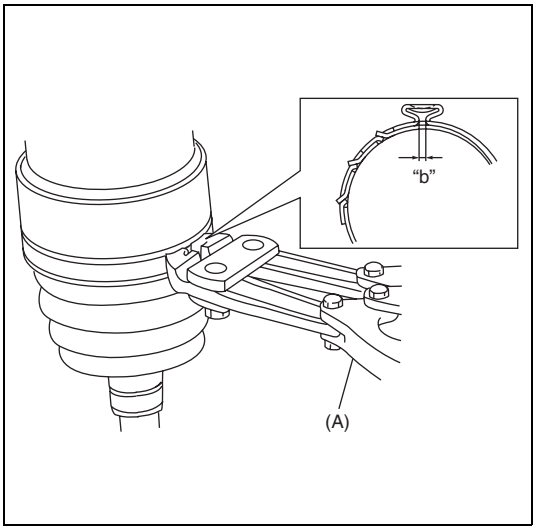
**NOTE:**

- **Boot small band must not come out of its installation section.**
- **Fasten boot small band securely until complete contact "b" is obtained.**

**Special tool**
**(A): 09943-57010**




d) Place new wheel side boot big band (1) onto boot putting band outer end (2) against forward rotation (3) as shown in figure.



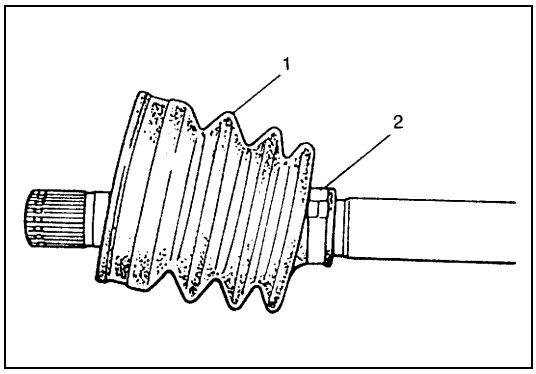

e) Before fastening boot big band, insert screwdriver into boot on ball joint housing side and allow air to enter boot so that air pressure in boot becomes the same as atmospheric pressure.

f) Fasten boot big band by using special tool.

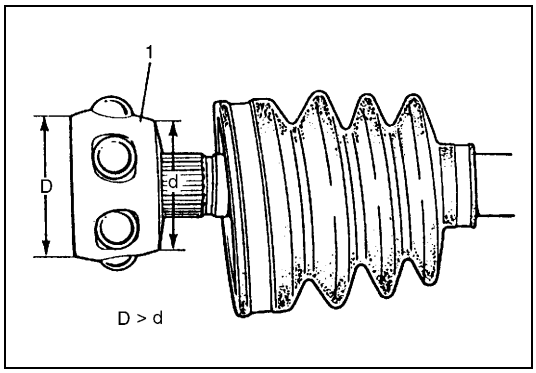
**NOTE:**

- **Boot big band must not come out of its installation section.**
- **Fasten boot big band securely until complete contact "b" is obtained.**

**Special tool**
**(A): 09943-57010**

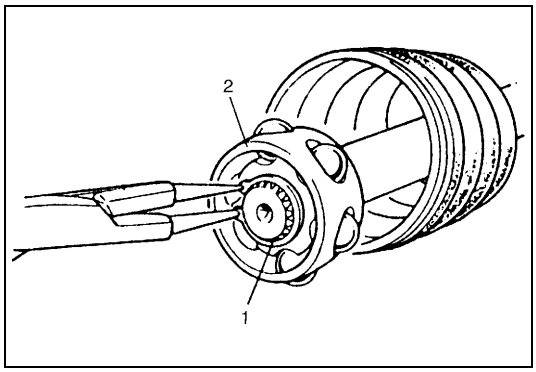



3) Install differential side boot (1) onto drive shaft till its small diameter side fits to shaft groove and fix there with boot small band (2).



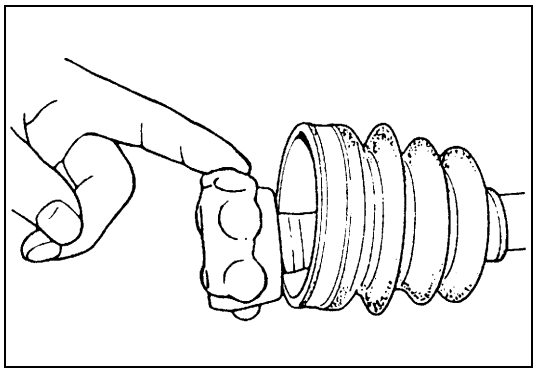

4) Install cage (1) to shaft.

**CAUTION:**
**Install cage (1) directing smaller outside diameter side to shaft end.**

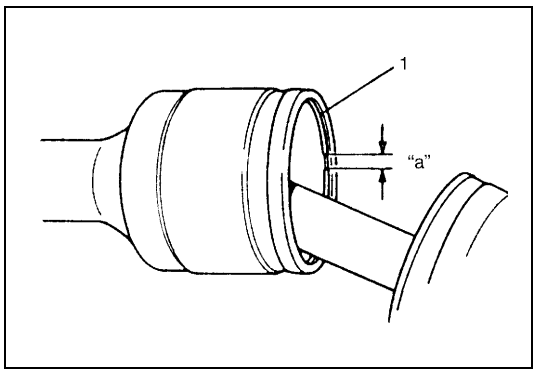



5) Install snap ring (1) by using snap ring plier.

2. Cage

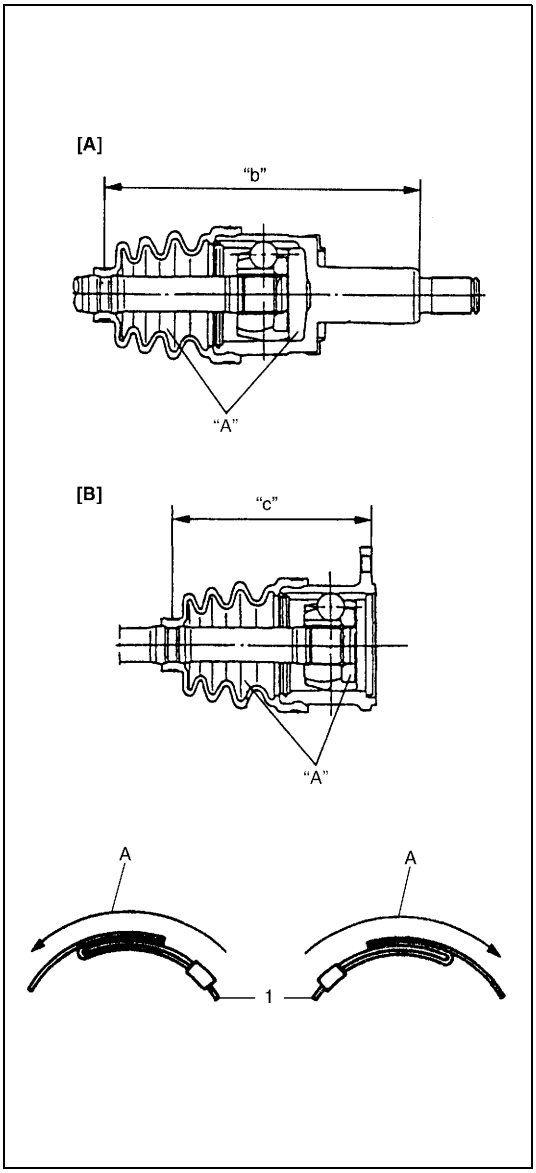


6) Apply grease to entire surface of cage.
Use joint grease in tube included in spare part.




7) Insert cage into DOJ housing and fit circlip (1) into groove of DOJ housing.

**CAUTION:**
**Position opening of circlip "a" so that it will not be lined up with a ball.**




8) Apply grease in tube included in spare part to inside of DOJ housing, and fit differential side boot to DOJ housing. Fill up inside of differential side boot with grease.

**Grease color**
**"A": Dark gray for type A**
**"A": Black for type B and RHW engine model**
**Amount**
**"A": approx. 90 – 110 g (3.2 – 3.3 oz) for type A**
**"A": approx. 95 – 115 g (3.4 – 4.0 oz) for type B and RHW engine model**

9) Fitting boot to DOJ housing, adjust so that measurements "b" and "c" become as shown in the figure.

**CAUTION:**
- **Bend each boot band end against forward rotation (A).**
- **Do not squeeze or distort boot when fastening it with bands.**
  **Distorted boot caused by squeezing air may reduce its durability.**

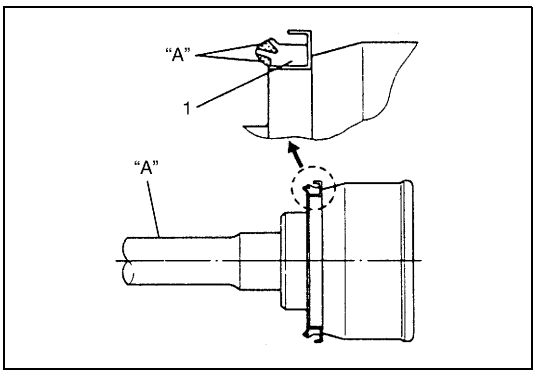
**Length**
**"b": 196.8 – 206.8 mm (7.75 – 8.14 in.) for type A**
**"b": 205.0 – 215.0 mm (8.07 – 8.46 in.) for type B and RHW engine model**

**"c": 127.5 – 137.5 mm (5.02 – 5.41 in.) for type A**
**"c": 134.4 – 144.4 mm (5.29 – 5.69 in.) for type B and RHW engine model**

| |
|---|
| [A]: Differential side (RH) |
| [B]: Differential side (LH) |

10) Before fixing boot big band, insert screwdriver into differential side boot on DOJ housing side and allow air to enter differential side boot so that air pressure in differential side boot becomes the same as atmospheric pressure.
11) Check differential side boot for distortion or dent. If any abnormality is found, fix it. If not, fasten boot big band.

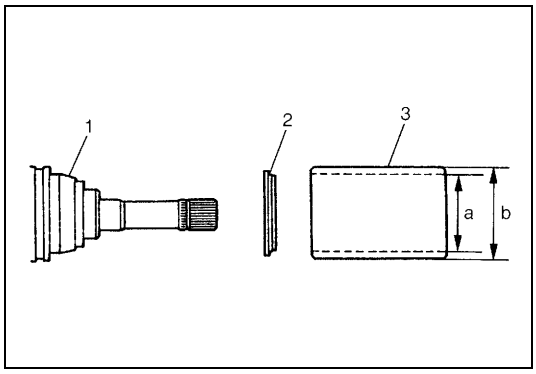
### Installation




Install drive shaft assembly by reversing removal procedure and noting the following points.
- Clean front drive shaft oil seal (1) and then apply lithium grease to oil seal and DOJ shaft.

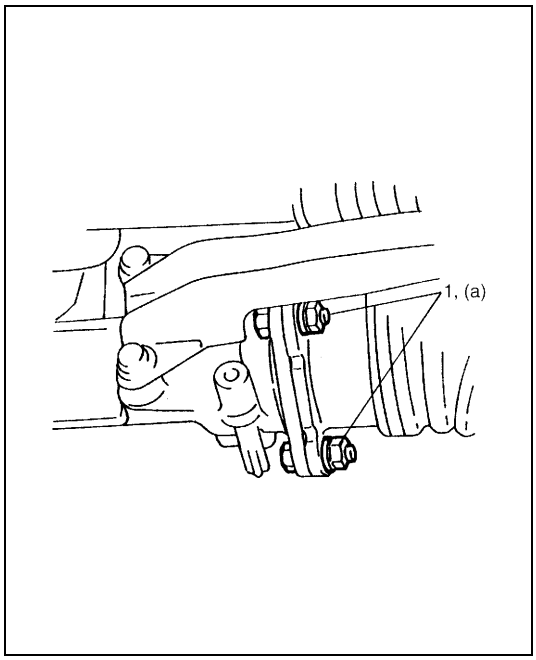
**"A": Grease 99000-25010**

- Check oil seal (1) for breakage or deterioration. Replace it as necessary.




- Install oil seal (2) until its end contacts stepped surface of drive shaft joint (1) by using a pipe (3) whose inner diameter is 76 mm (2.992 in.) or more and outer diameter is 80 mm (3.150 in.) or less.

**Pipe diameter**
**Inner "a": 76 mm (2.992 in.) or more**
**Outer "b": 80 mm (3.150 in.) or less**




- RH Side:
  Push differential side joint by hand until it is positioned by snap ring fitted to its spline.
- LH Side:
  Tighten drive shaft flange bolts and nuts (1) to specified torque.

**Tightening torque**
**Drive shaft flange nut (differential side)**
**(a): 50 N·m (5.0 kg-m, 36.0 lb-ft)**

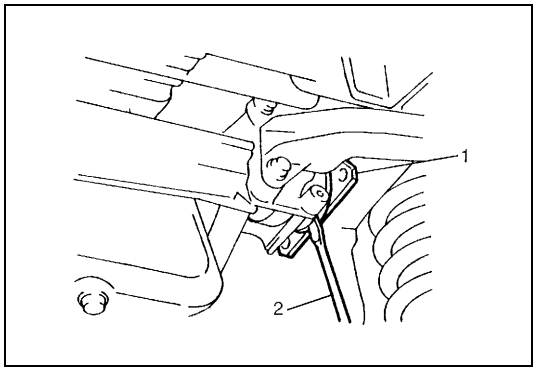
**CAUTION:**
- **To prevent breakage of boots (wheel side and differential side), do not contact them with other parts when installing drive shaft assembly.**
- **Do not pull housing of differential side joint. If housing is pulled, it may be detached from drive shaft.**

- Install knuckle and wheel hub component referring to "Knuckle / Wheel Spindle" in Section 3D.
- Fill differential gear oil referring to "Differential Gear Oil Change" in Section 7E.
- Tighten wheel nut referring to "Wheel" in Section 3F.

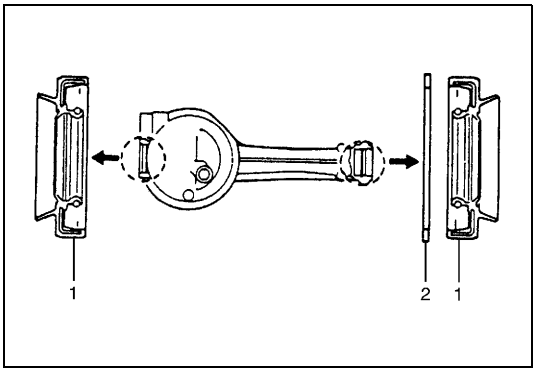
## Front Drive Shaft Bearing / Oil Seal Removal and Installation

### Removal

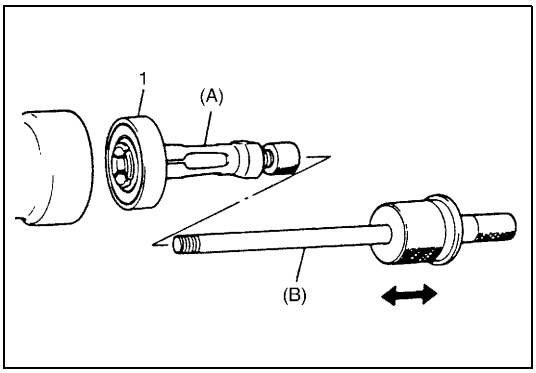
1) Remove drive shaft assembly referring to "Drive Shaft" in this section.




2) Remove left drive shaft (1) by using tire lever (2) or the like.
3) Remove left side strut referring to "Strut Damper" in Section 3D.



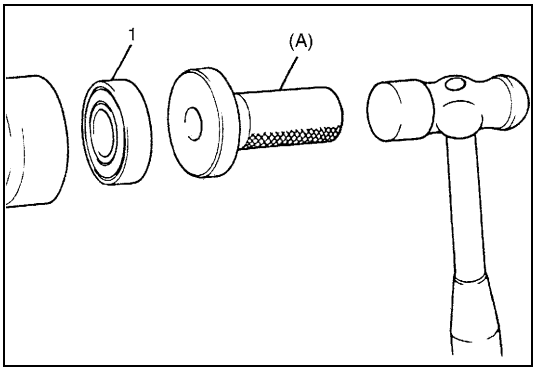

4) Remove drive shaft oil seal (1) using plain screwdriver.
5) Remove circlip (2).




6) Remove drive shaft bearing (1) using special tools.

**Special tool**
**(A): 09941-64511**
**(B): 09930-30104**

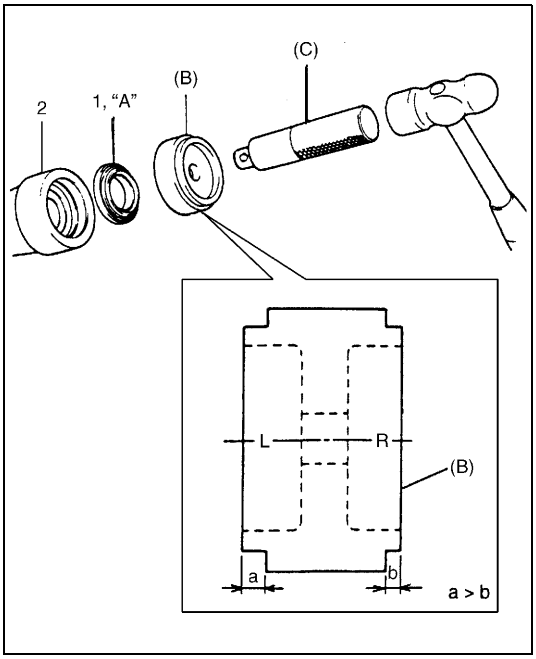
**Installation**




1) Install drive shaft bearing (1) with special tool (on left hand side).

**Special tool**
**(A): 09913-75520**

2) Install new circlip.

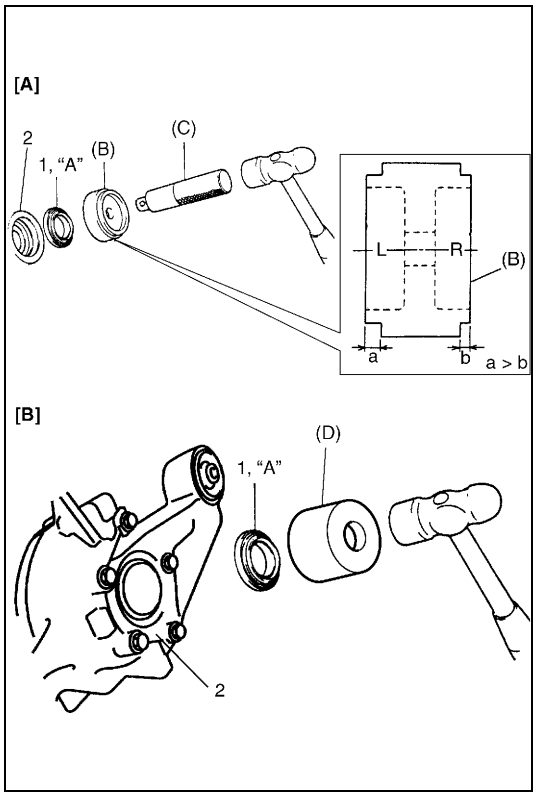



3) Install new drive shaft oil seal (1) onto left drive shaft case (2) of axle housing by using special tools and then apply grease to oil seal lip.

**"A": Grease 99000-25010**

**CAUTION:**
**Use the L stamped side of special tool (B) for oil seal side. Otherwise, the oil seal can not be installed properly.**

**Special tool**
**(B): 09951-16090**
**(C): 09924-74510**




4) Install new drive shaft oil seal (1) onto right side of axle housing (2) by using special tool and then apply grease to oil seal lip.

**"A": Grease 99000-25010**

**CAUTION:**
**Use the R stamped side of special tool (B) for oil seal side. Otherwise, the oil seal can not be installed properly.**

**Special tool**
**(B): 09951-16090 (for type B and RHW engine)**
**(C): 09924-74510 (for type B and RHW engine)**
**(D): 09951-46010 (for type A)**

| |
|---|
| [A]: For type B and RHW engine |
| [B]: For type A |

5) Install left drive shaft.
6) Install left side strut referring to "Strut Damper" in Section 3D.
7) Install drive shaft assembly referring to "Drive Shaft" in this section.

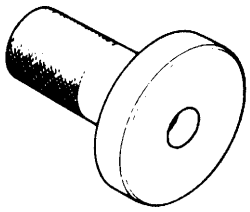
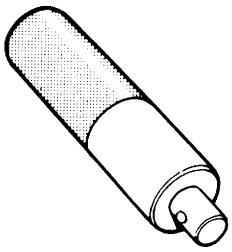
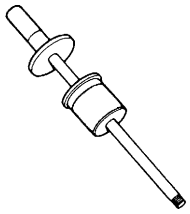
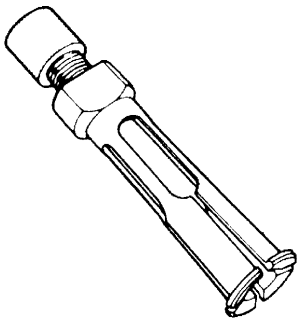
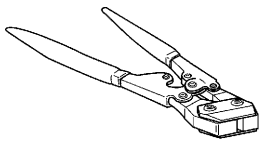
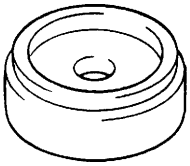
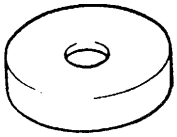
# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Drive shaft flange nut (differential side) | 50 | 5.0 | 36.0 |

# Required Service Material

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| Grease | SUZUKI SUPER GREASE A (99000-25010) | • Oil seal lips |

# Special Tool

| | | | |
|---|---|---|---|
|  <br>09913-75520<br>Bearing installer |  <br>09924-74510<br>Bearing and oil seal handle |  <br>09930-30104<br>Sliding shaft |  <br>09941-64511<br>Bearing & oil seal remover |
|  <br>09943-57010<br>Band compressor |  <br>09951-16090<br>Oil seal installer |  <br>09951-46010<br>Drive shaft oil seal installer | |

# SECTION 4B

# PROPELLER SHAFTS

**NOTE:**

- **All propeller shaft 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 this part.**
- **Never attempt to heat, quench or straighten any propeller shaft part. Replace it with a new part, or damage to the part may result.**

## CONTENTS

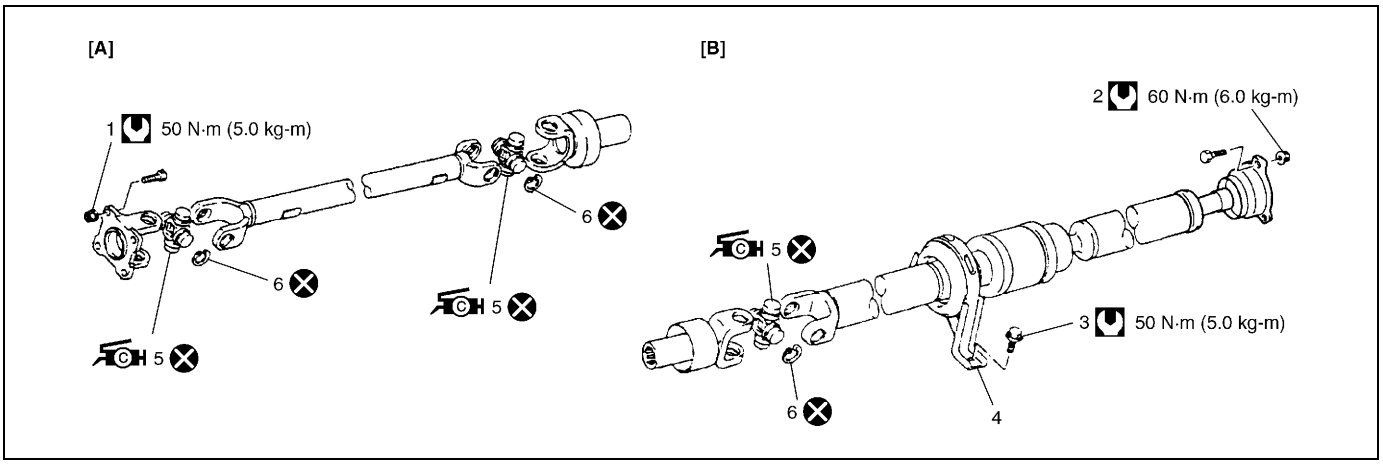
**General Description ..... 4B-2**
Propeller Shaft Components ..... 4B-2
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For RHW engine model ..... 4B-2
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# General Description

Most universal joints require no maintenance. They are lubricated for life and cannot be lubricated on the vehicle.
If a universal joint becomes noisy or worn, it must be replaced.
The propeller shaft is a balanced unit. Handle it carefully so that balance can be maintained.

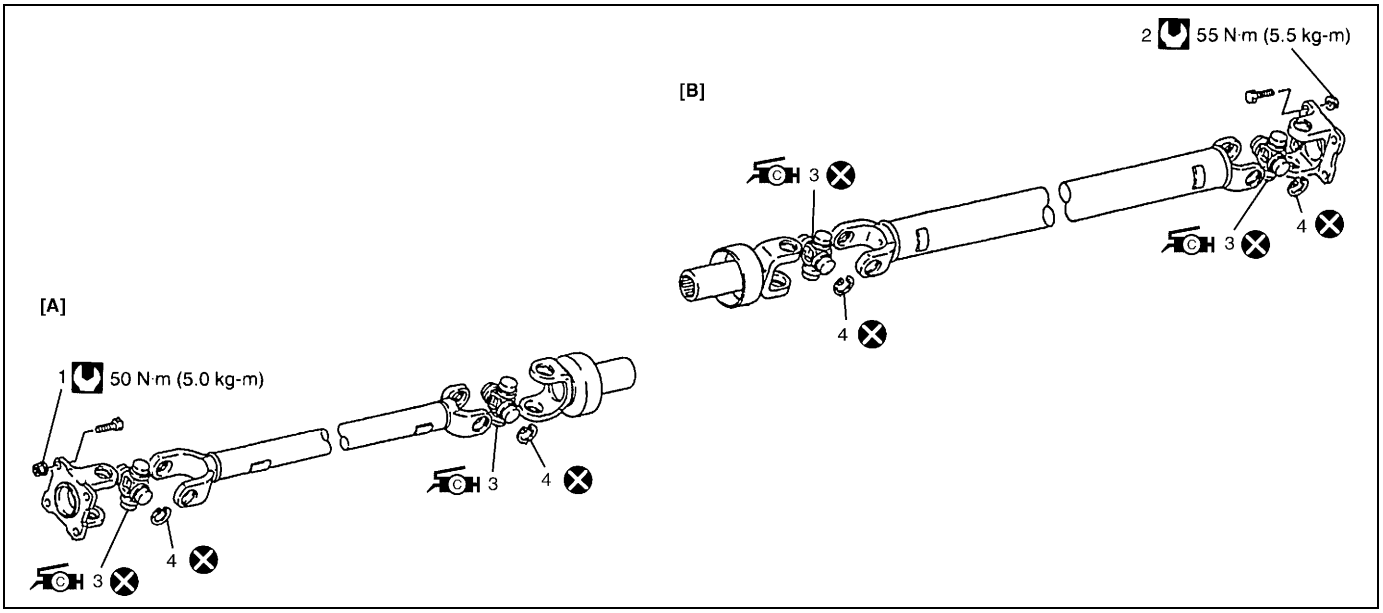
## Propeller Shaft Components

### For H27 engine model




| | | |
|---|---|---|
| [A]: Front propeller shaft | 3. Center support mounting bolt | Tightening torque |
| [B]: Rear propeller shaft | 4. Center support | Do not reuse. |
| 1. Front propeller shaft flange nut | 5. Spider and its bearing<br>: Apply grease (99000-25030) to spider bearing race. | |
| 2. Rear propeller shaft flange nut | 6. Circlip | |

### For RHW engine model



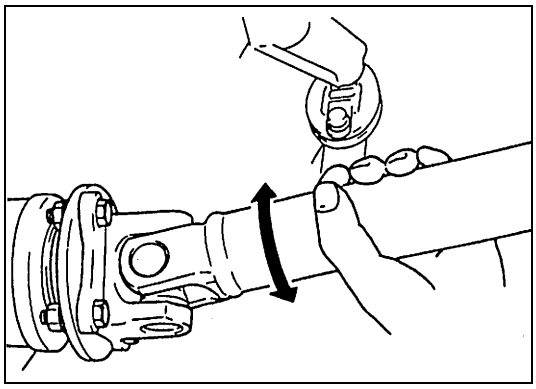

| | | | |
|---|---|---|---|
| [A]: Front propeller shaft | 1. Front propeller shaft flange nut | 3. Spider and its bearing<br>: Apply grease (99000-25030) to spider bearing race. | Tightening torque |
| [B]: Rear propeller shaft | 2. Rear propeller shaft flange nut | 4. Circlip | Do not reuse. |

# Diagnosis

## Diagnosis Table

| Condition | Possible Cause | Correction |
|---|---|---|
| **Abnormal noise** | Loose propeller shaft flange nut | Tighten propeller shaft flange nut. |
| | Spider bearing worn out or stuck | Replace. |
| | Wear spider | Replace propeller shaft. |
| **Vibration** | Deformed propeller shaft | Replace. |

### Propeller shaft joint check



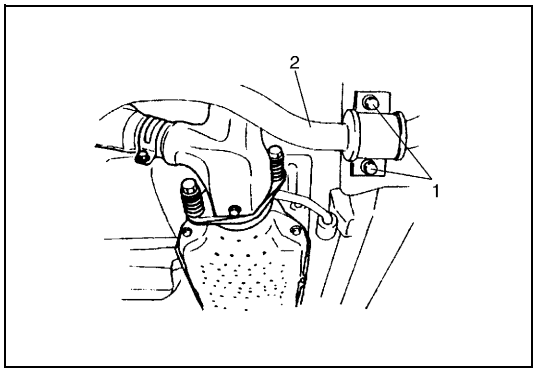
If universal joints are suspected of producing chattering or rattling noise, inspect them for wear. Check to see if cross spider rattles in yokes or if splines are worn down and replace defective propeller shaft with new one.
Noise coming from universal joint can be easily distinguished from other noises because rhythm of chattering or rattling is in step with cruising speed. Noise is pronounced particularly on standing start or in coasting condition (when braking effect of engine is showing in the drive line).

# On-Vehicle Service

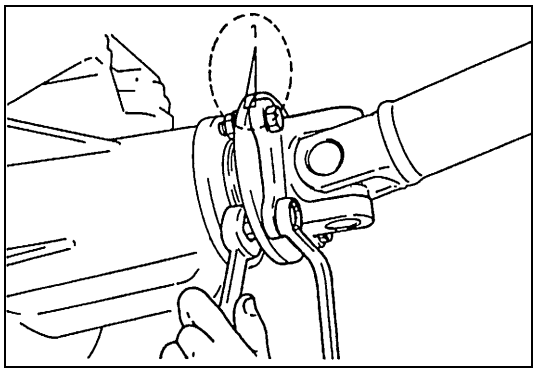
## Propeller Shaft

### Removal

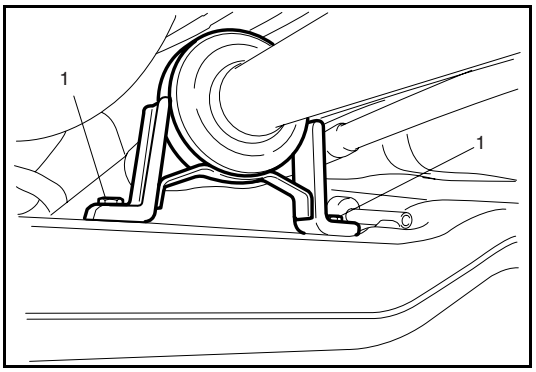
1) Hoist vehicle.




2) For front propeller shaft removal, perform the following step a) and b).
   a) Drain transfer oil referring to “Transfer Gear Oil” in Section 7D.
   b) Remove stabilizer bar mounting bracket bolts (1) and pull down stabilizer bar (2).

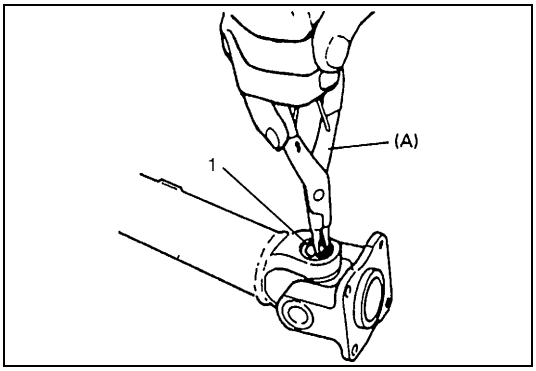



3) Give match marks (1) on joint flange and propeller shaft as shown.




4) Remove center support mounting bolts (1) (if equipped).
5) Remove propeller shaft.

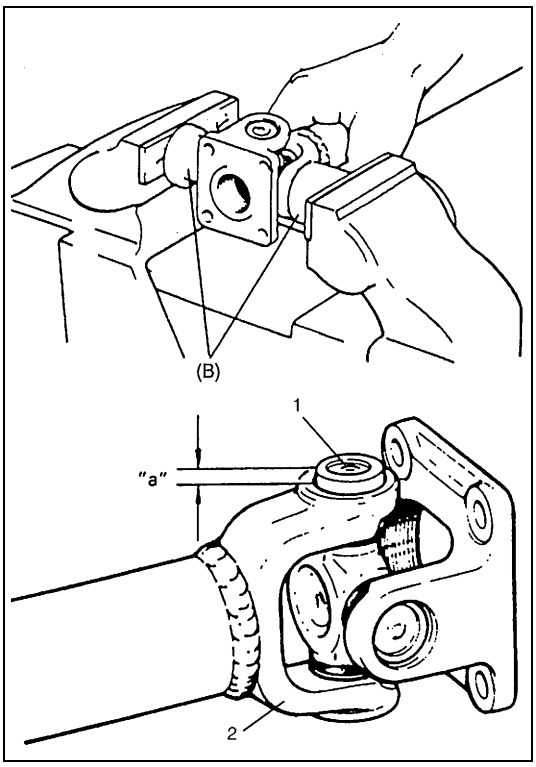
**Disassembly**




**CAUTION:**
**Never disassemble center support.**
**Performing this prohibited service will affect its original performance.**

1) Using special tool (A), remove 2 circlips (1).

**Special tool**
**(A): 09900-06108**

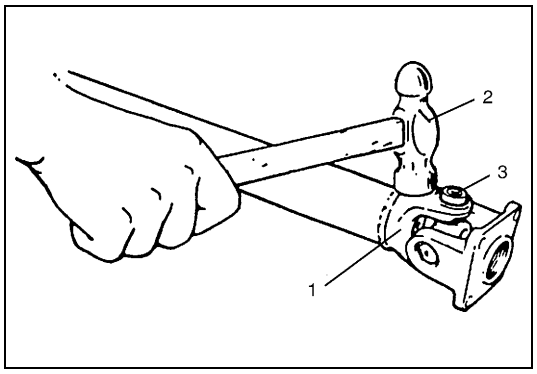



2) Using special tool (B), push spider bearing race (1) out 3 – 4 mm (0.12 – 0.16 in.) from shaft yoke race (2).

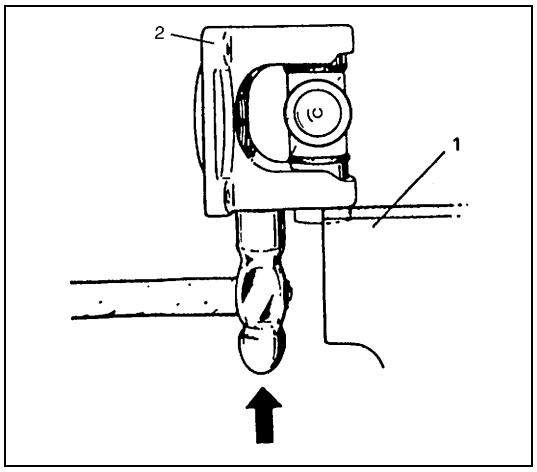
**NOTE:**
**Before pushing it out, apply penetrate lubricant between bearing race (1) and yoke race (2).**

**Special tool**
**(B): 09926-48010**

**Length "a": 3 – 4 mm (0.12 – 0.16 in.)**




3) Tapping yoke (1) with a hammer (2), completely remove bearing race (3).
4) Take out bearing race on the other side in the same way as in 2) and 3).

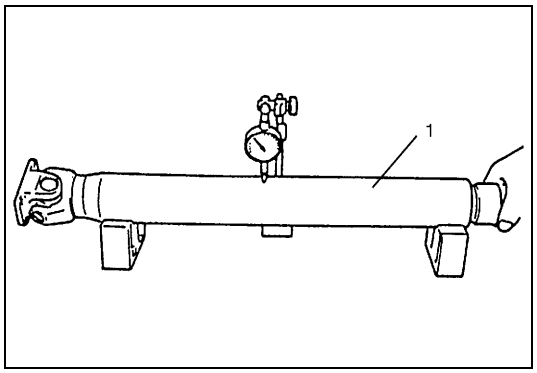



5) Push out bearing race on flange yoke side as described in 1) and 2), and then, holding bearing race (2) in a vise (1), tap flange yoke and take out race. (Refer to the figure.)
Remove bearing race on the opposite side in the same way.

**NOTE:**

- **Take care not to lose rollers in spider bearing race when removing it.**
- **Fit removed bearings temporarily in spider so that they can be reinstalled in their original positions.**

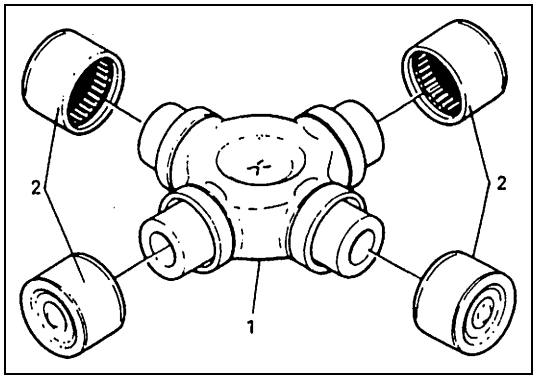
### Inspection




Inspect propeller shaft and flange yoke for damage, and propeller shaft for (1) runout.
If damage is found or shaft runout exceeds its limit, replace.

**Runout limit: 0.8 mm (0.031 in.)**

### Assembly

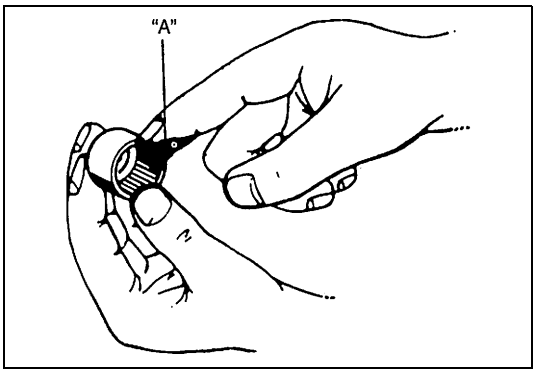



**CAUTION:**

**In assembly, be sure to use new circlips, spider (1) and bearings (2). Reuse of circlips, spider and bearings once assembled is prohibited.**

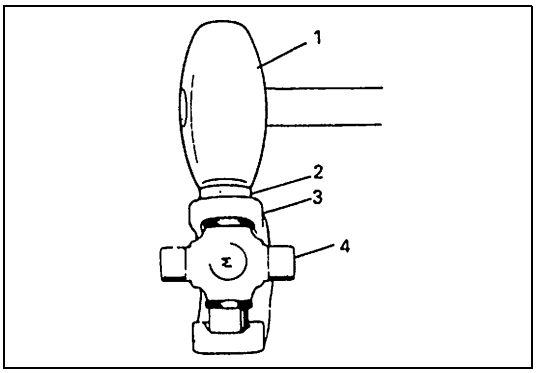
**NOTE:**

**Make sure that rollers inside spider bearing race are all in place.**

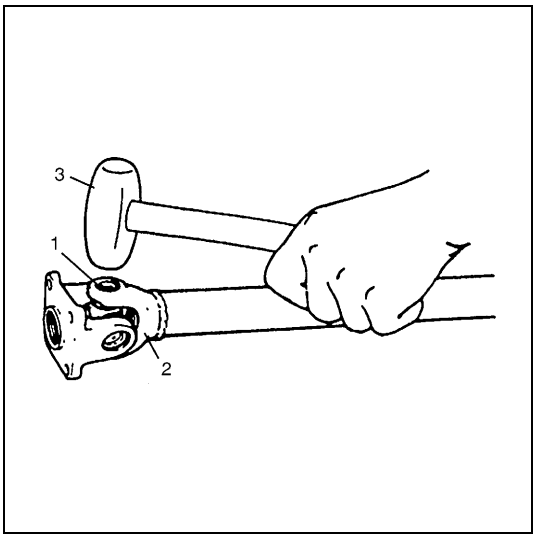



1) Make sure to apply grease to spider bearing race.

**"A": Grease 99000-25030**




2) Insert bearing race (2) into yoke (3), tapping it with a copper hammer (1), until it is flush with yoke face. When doing this, insert spider (4) into bearing race to prevent rollers in bearing race from coming out.




3) Insert the other bearing race (1) on the opposite side into yoke (2), tapping with a copper hammer (3) until it is flush with yoke (2) face.
4) Insert bearing races on the flange yoke side in the same way as described in 2) and 3) above.
5) Place a metal plate on bearing races when tapping them in to avoid damaging yoke.
6) Securely fit 4 circlips to shaft and flange yoke.

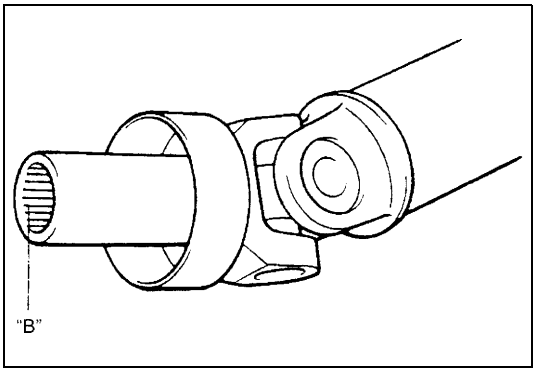
**NOTE:**

**Make sure that each circlip is fitted in groove securely.**

7) After assembly, check to ensure that both shaft yoke and flange yoke move smoothly.

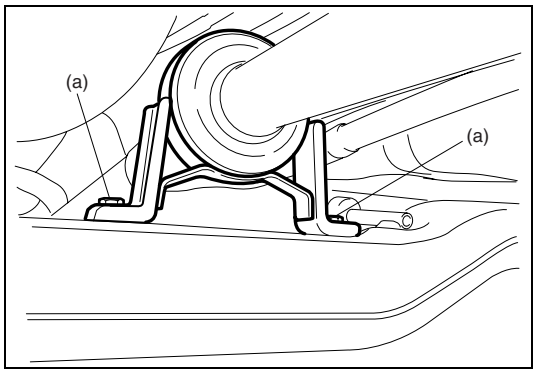
### Installation

Reverse removal procedure to install propeller shaft noting the following points.



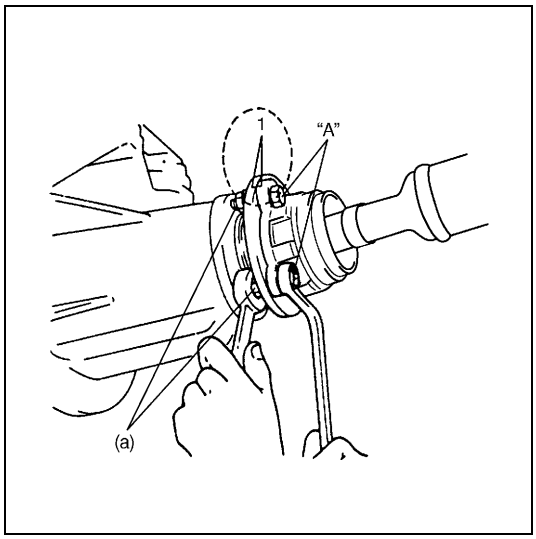

- Clean and inspect sliding portion of propeller shaft end (where oil seal contacts) before installation and if even small dent or scrach exists, correct end clean it again.
  Then apply grease inside splines of propeller shaft.

**"B": Grease 99000-25010**




- Tighten center support mounting bolts to specified torque (if equipped).

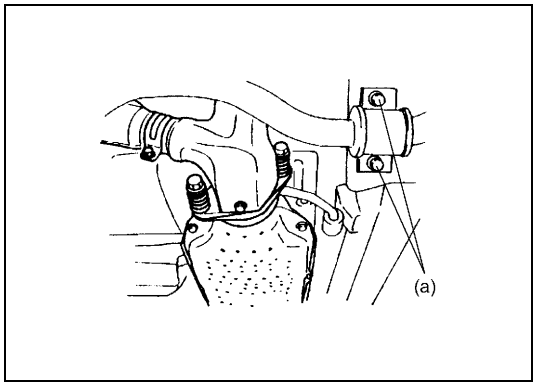
**Tightening torque**
**Center support mounting bolt**
**(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**




- When installing propeller shaft align the match marks (1). Otherwise, vibration may occur during driving.
- Use the following specifications to torque propeller shaft flange bolts and nuts. For rear propeller shaft flange bolts, apply thread lock cement to thread part of bolts if reused.

**"A": Cement 99000-32110**

**Tightening torque**
**Front propeller shaft flange nut**
**: 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Rear propeller shaft flange nut for H27 engine model**
**(a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**
**Rear propeller shaft flange nut for RHW engine model**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**




- For front propeller shaft installation, perform the following Steps a) and b).

a) Install stabilizer bar.
   Tighten stabilizer bar mounting bracket bolts to specified torque.

**Tightening torque**
**Stabilizer bar mounting bracket bolt**
**(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)**

b) Fill transfer oil referring to "Transfer Gear Oil" in Section 7D.

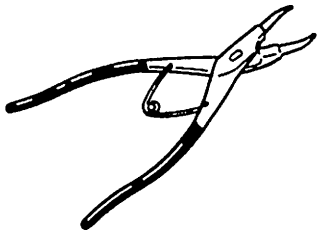
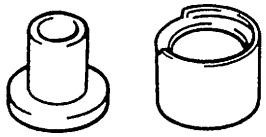
# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Front propeller shaft flange nut | 50 | 5.0 | 36.5 |
| Rear propeller shaft flange nut for H27 engine model | 60 | 6.0 | 43.5 |
| Center support mounting bolt | 50 | 5.0 | 36.5 |
| Rear propeller shaft flange nut for RHW engine model | 55 | 5.5 | 40.0 |
| Stabilizer bar mounting bracket bolt | 23 | 2.3 | 17.0 |

# Required Service Material

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| Lithium grease | SUPER GREASE C (99000-25030) | Spider bearing race |
| Thread lock cement | Thread lock 1322 (99000-32110) | Rear propeller shaft flange bolt |

# Special Tool

| | |
|---|---|
|  |  |
| 09900-06108<br>Snap ring pliers (Closing type) | 09926-48010<br>Universal joint disassembling tool set |

# SECTION 5

# BRAKES

**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.**
- **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).**

**NOTE:**

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **When inspecting and servicing vehicle equipped with ABS, be sure to refer to section 5E2 first.**
- **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.**



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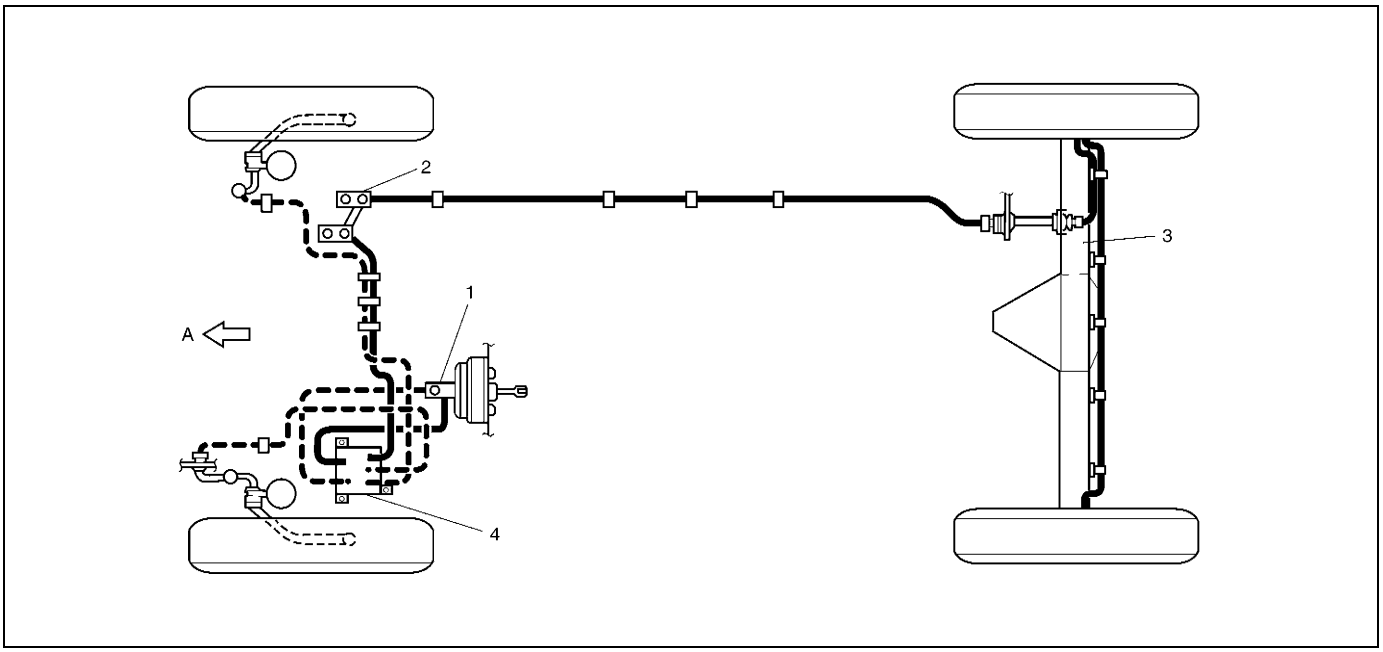
# General Description

## Brake Construction

When the foot brake pedal is depressed, hydraulic pressure is developed in the master cylinder to actuate pistons (two in front and four 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 brakes (right and left) and the other connects rear brakes (right and left).
In this brake system, the disc brake type is used for the front wheel brake and a drum brake typed (leading/trailing shoes) for the rear 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 are used for both parking and foot brakes.

**NOTE:**

**The figure shows left hand steering vehicle.**




| | |
|---|---|
| A. Front side | 3. Rear axle housing |
| 1. Master cylinder | 4. ABS hydraulic unit |
| 2. 2-way joint | |

# Diagnosis

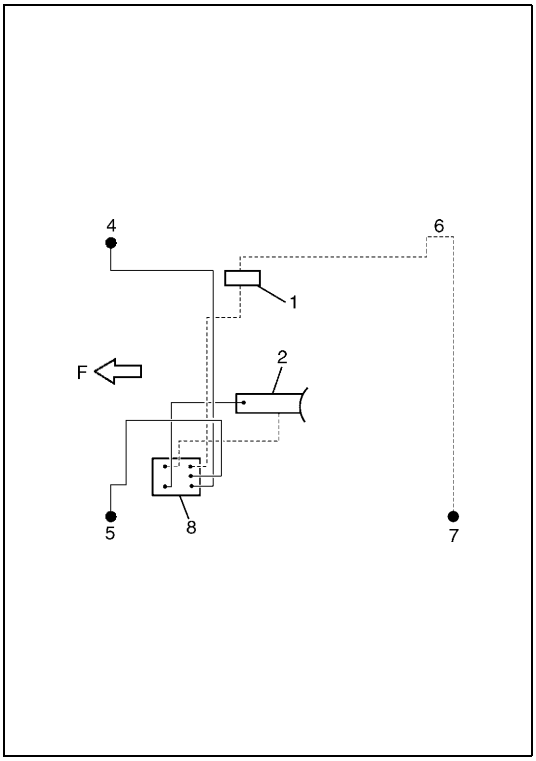
## Diagnosis Table

For the item not found in this column, refer to the same item of the same section in the service manual mentioned in the FOREWORD of this manual.

| Condition | Possible Cause | Correction |
|---|---|---|
| **Brake warning light turns ON 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 “Table – E EBD Warning Lamp (Brake Warning Lamp) Check – Lamp Comes ON Steady” in Section 5E2. |
| **ABS warning light does not turn ON for 2 – 3 sec. after ignition switch has turned ON.** | Malfunctioning combination meter | Replace combination meter. |
| | ABS warning light circuit open (including check relay) | Check system referring to “Table – A ABS Warning Lamp Circuit Check – Lamp Does Not Come ON at Ignition Switch ON” in Section 5E2. |
| **ABS warning light remains ON after ignition switch has turned ON for 2 – 3 sec.** | Malfunctioning ABS | Check system referring to “Table – B ABS warning Lamp Circuit Check – Lamp Comes ON Steady” in Section 5E2. |

# Check and Adjustment

## Bleeding Brakes




**CAUTION:**

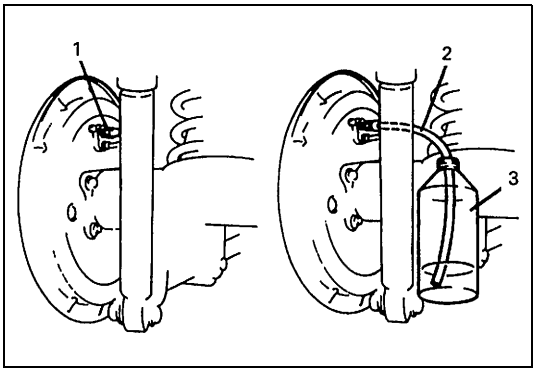
**Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.**

**NOTE:**

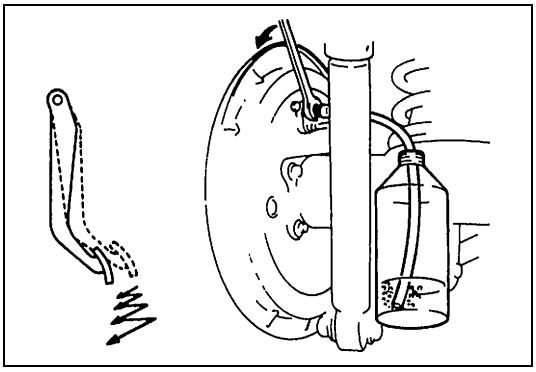
**For vehicle equipped with ABS, make sure that ignition switch turns off.**

Be sure to bleed air of brake system according to following procedure when its oil hydraulic circuit has been disconnected.
Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes.
Air bleeding is necessary at right and left front wheel brakes and left rear wheel brake i.e. 3 places (for vehicle with ABS) in all.

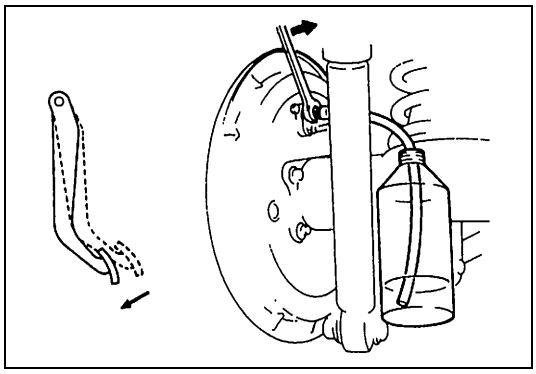
| | |
|---|---|
| 1. 2-way joint | 6. Right wheel cylinder |
| 2. Master cylinder | 7. Left wheel cylinder |
| 3. BLANK | 8. ABS actuator |
| 4. Right brake caliper | ●: Air bleeding point |
| 5. Left brake caliper | F: Front side |



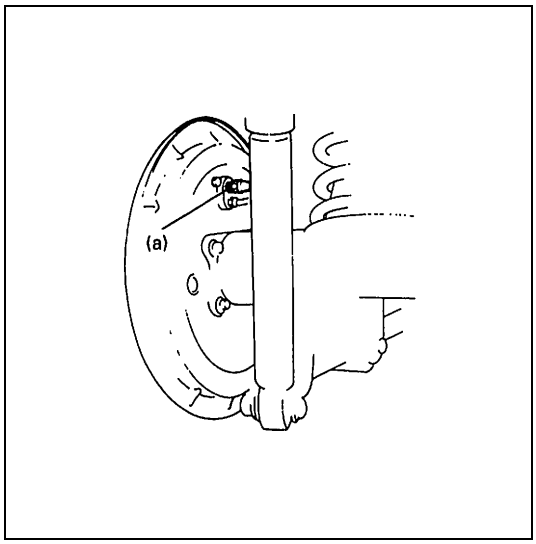

1) Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2) Remove bleeder plug cap (1).
   Attach a vinyl tube (2) to bleeder plug of wheel cylinder, and insert the other end into container (3).



3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one half turn.

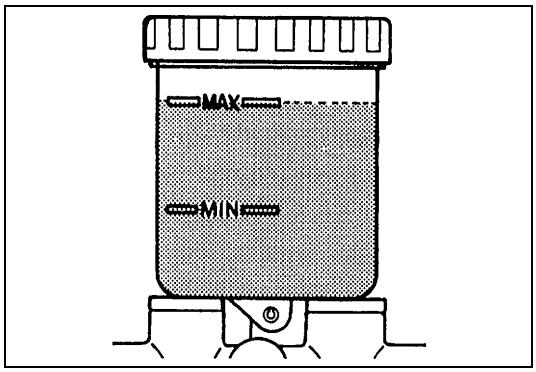


4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.




5) Repeat this operation until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

**Tightening torque**
**[Front brake]**
**TOKICO brake caliper bleeder plug: 8.5 N·m (0.85 kg-m, 6.5 lb-ft)**
**SUMITOMO ELECTRIC brake caliper bleeder plug: 8.0 N·m (0.8 kg-m, 6.0 lb-ft)**
**[Rear brake]**
**Wheel cylinder bleeder plug**
**(a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)**




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.
10) Check brake pedal for “sponginess”. If found spongy, repeat entire procedure of bleeding.

# SECTION 5A

# BRAKES PIPE/HOSE/MASTER CYLINDER

**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.**
- **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).**

**NOTE:**

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **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.**



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# General Description

## Master Cylinder Assembly

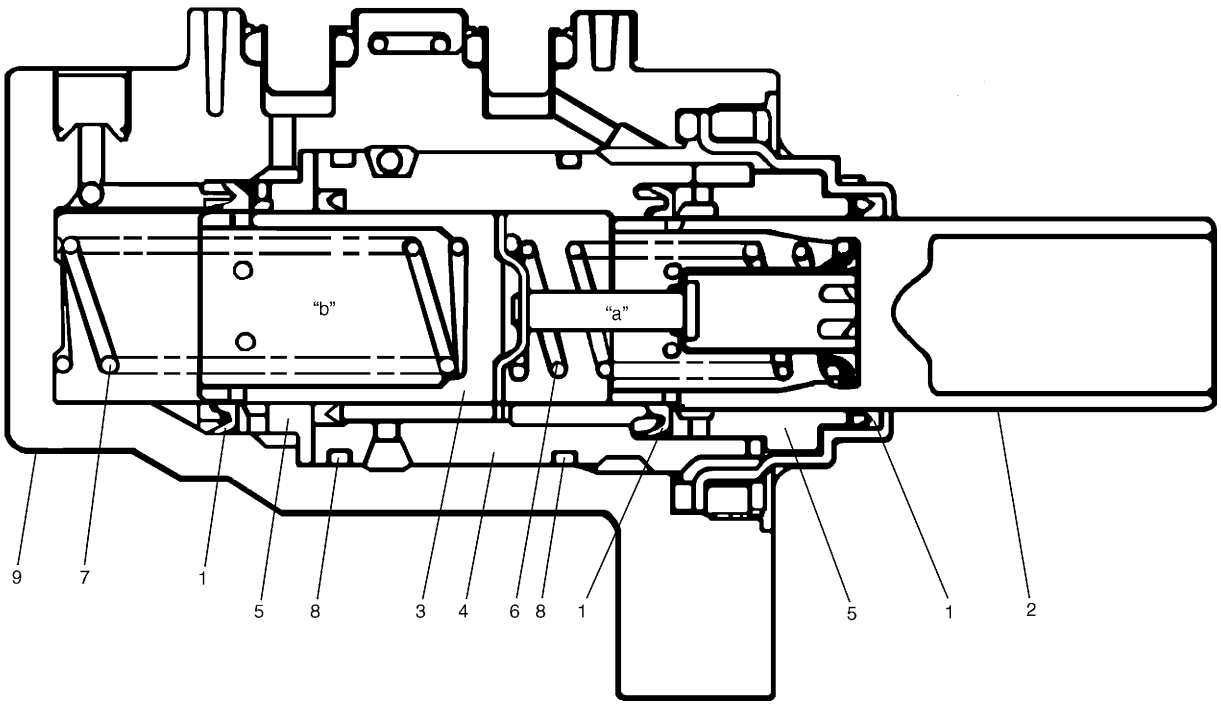
The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the figure below) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes.
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes.

**WARNING:**

**Brake master cylinder cannot be disassembled. When anything faulty is found in it, it must be replaced as an assembly.**

**CAUTION:**

**Brake master cylinder cannot be disassembled in principle. Should primary piston have come off from cylinder while dismounting or handling it, wash it in the same specified fluid as that in reservoir and place it back in cylinder.**




| | | |
|---|---|---|
| 1. Piston cup | 4. Sleeve | 7. Secondary piston return spring |
| 2. Primary piston | 5. Ring guide | 8. O-ring |
| 3. Secondary piston | 6. Primary piston return spring | 9. Master cylinder body |

# On-Vehicle Service

## Front Brake Hose/Pipe

### Removal

1) Raise and suitably support vehicle. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and flexible hose.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.

### Installation

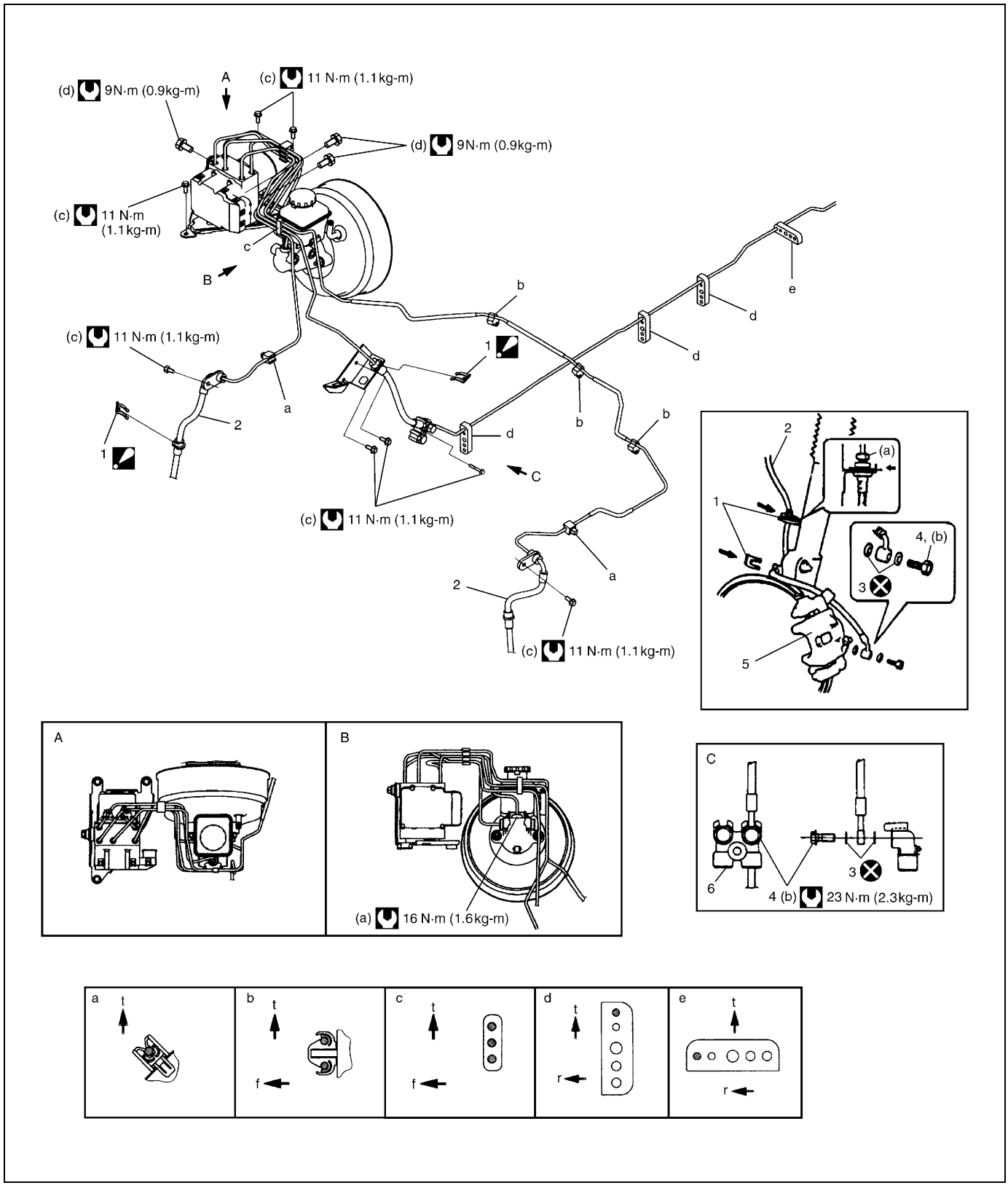
1) Reverse removal procedure for brake hose and pipe installation procedure.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.
2) Perform brake test and check installed part for fluid leakage.

**Tightening torque**
**Brake pipe flare nut (a): 16 N·m (1.6 kg-m, 12.0 lb-ft)**
**Brake flexible hose bolt (brake caliper/2-way joint) (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)**
**2-way joint mounting bolt (c): 11 N·m (1.1 kg-m, 8.0 lb-ft)**
**Brake hose/pipe bracket bolt (c): 11 N·m (1.1 kg-m, 8.0 lb-ft)**
**ABS actuator bracket bolt (c): 11 N·m (1.1 kg-m, 8.0 lb-ft)**
**ABS actuator mounting bolt (d): 9 N·m (0.9 kg-m, 6.5 lb-ft)**

**NOTE:**

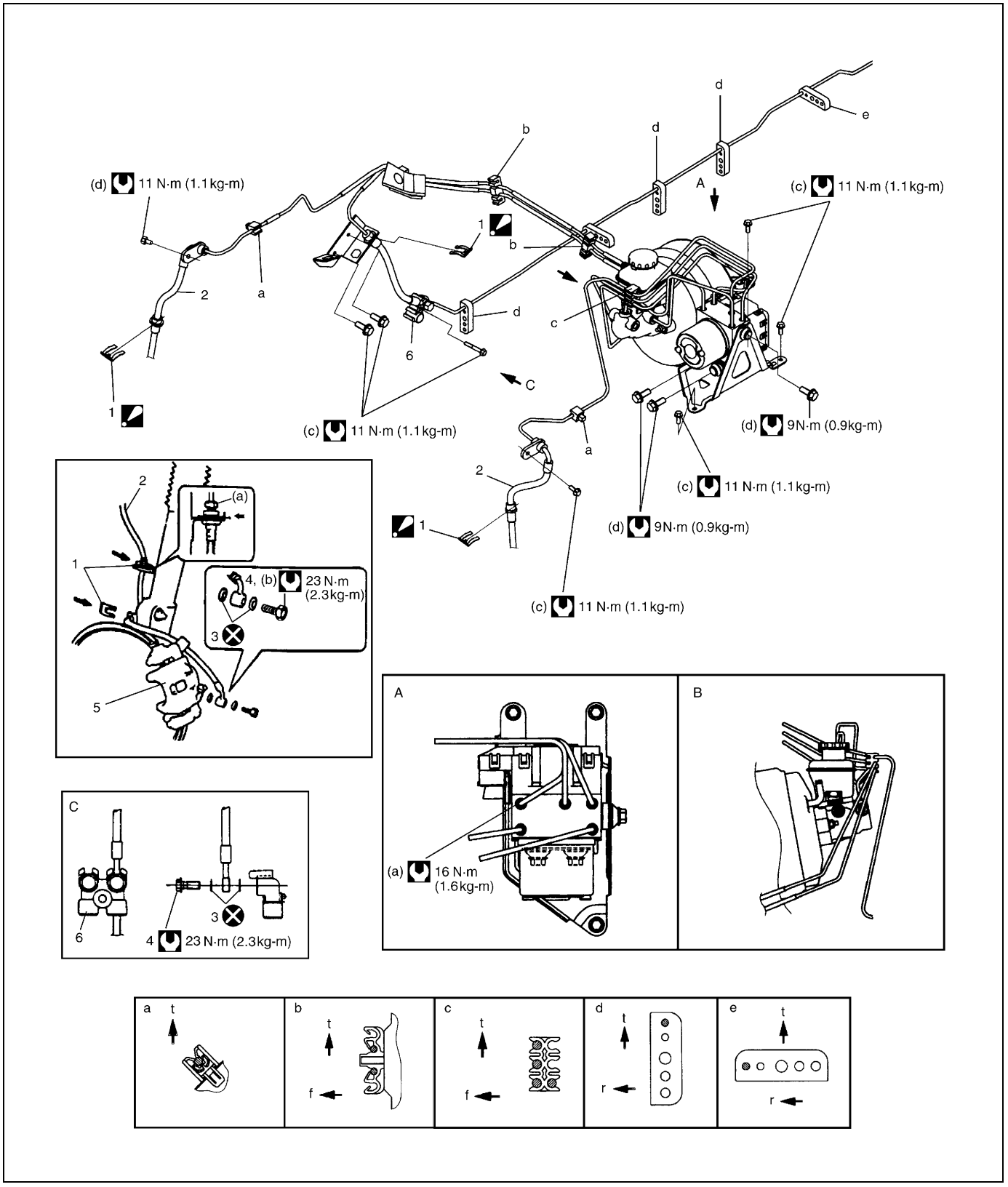
**Insert E-ring till its end surface is flush with or lower than bracket end surface.**

## For RH steering vehicle




| | | | |
|---|---|---|---|
| A: View A | c: Clamp c | t: Top side | 5. Brake caliper |
| B: View B | d: Clamp d | 1. E-ring | 6. 2 way joint |
| C: View C | e: Clamp e | 2. Flexible hose | Tightening torque |
| a: Clamp a | f: Front side | 3. Hose washer | Do not reuse. |
| b: Clamp b | r: Right side | 4. Hose bolt | Note on reassembly |

## For LH steering vehicle

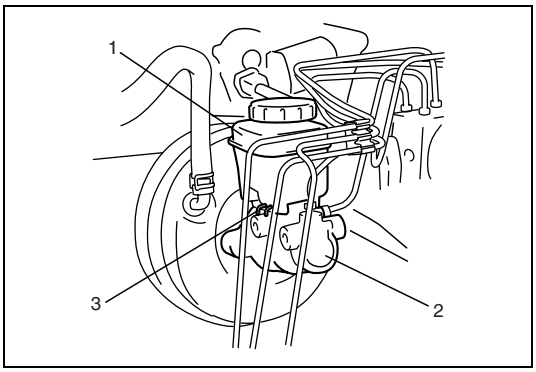



| | | | |
|---|---|---|---|
| A: View A | c: Clamp c | t: Top side | 5. Brake caliper |
| B: View B | d: Clamp d | 1. E-ring | 6. 2 way joint |
| C: View C | e: Clamp e | 2. Flexible hose | Tightening torque |
| a: Clamp a | f: Front side | 3. Hose washer | Do not reuse. |
| b: Clamp b | r: Right side | 4. Hose bolt | Note on reassembly |

## Master Cylinder Reservoir

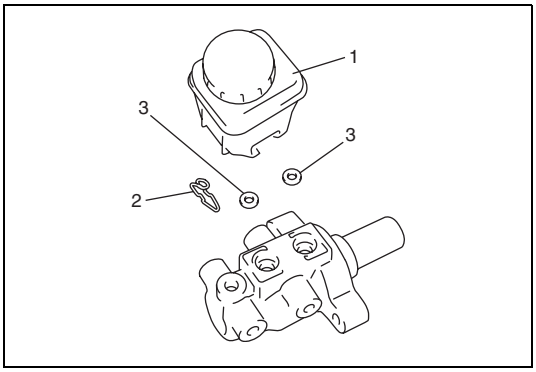
### Removal

1) Disconnect reservoir lead wire at coupler.




2) Clean outside of reservoir (1).
3) Take out fluid with syringe or such.
4) Remove reservoir stopper (3).

| |
|---|
| 2. Master cylinder |




5) Remove reservoir (1).

**NOTE:**

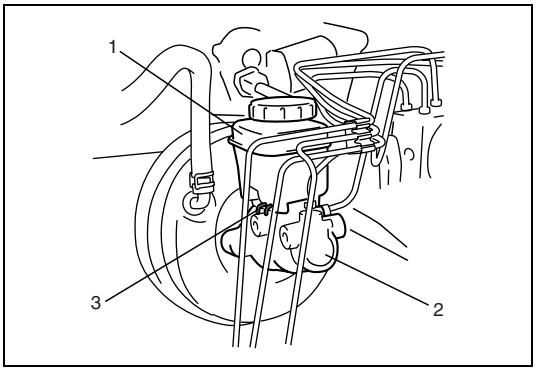
**Do not allow brake fluid to get on painted surfaces.**

| |
|---|
| 2. Stopper |
| 3. Grommets |

### Installation

**NOTE:**

**See NOTE at the beginning of this section.**

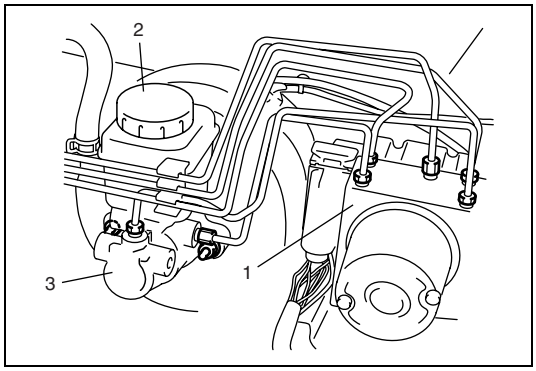



1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir (1) with. Then press-fit grommets to master cylinder (2). Grommets must be seated in place.
2) Install reservoir (1) and then insert stopper (3).
3) Connect reservoir lead wire.
4) Fill reservoir with specified fluid.
5) Upon completion of installation, check for fluid leakage.

## Master Cylinder Assembly

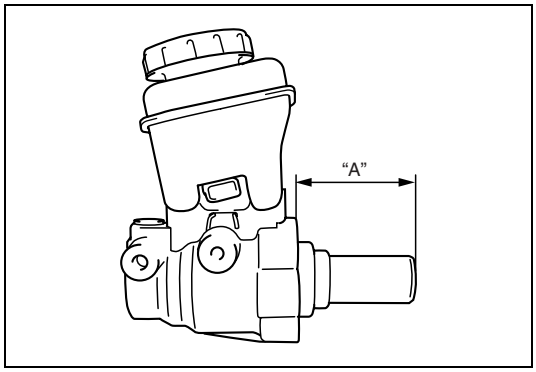
### Removal

**NOTE:**
**Do not allow brake fluid to get on painted surfaces.**




1) Disconnect reservoir lead wire at coupler.
2) Clean around reservoir cap (2) and take out fluid with syringe or such.
3) Loosen flare nuts from master cylinder and ABS actuator (if equipped).
4) Disconnect brake pipes from master cylinder (3) and ABS actuator (1).
5) Remove master cylinder with reservoir from brake booster.

### Inspection



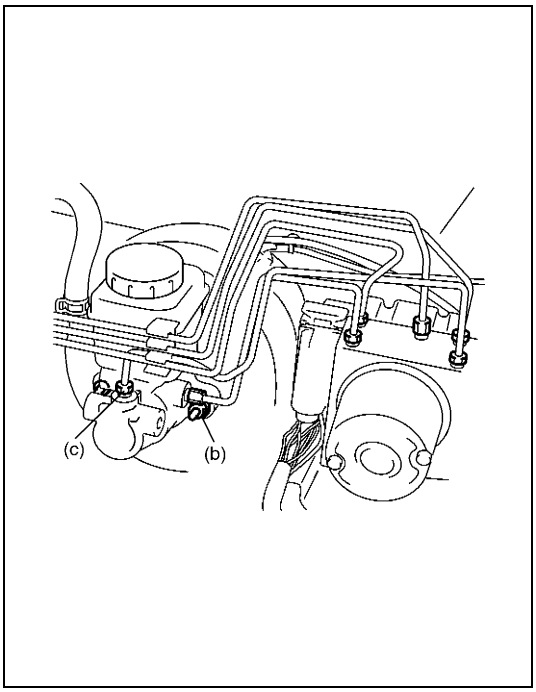

Inspect distance "A" to be the following.

**Distance between master cylinder body and primary piston end**
**"A": 57.4 mm (2.26 in) or more**

If measurement is out of above specification, replace master cylinder assembly.

### Installation

**NOTE:**
**See NOTE at the beginning of this section.**




1) Install master cylinder to brake booster.
2) Tighten master cylinder attaching nuts to specified torque.

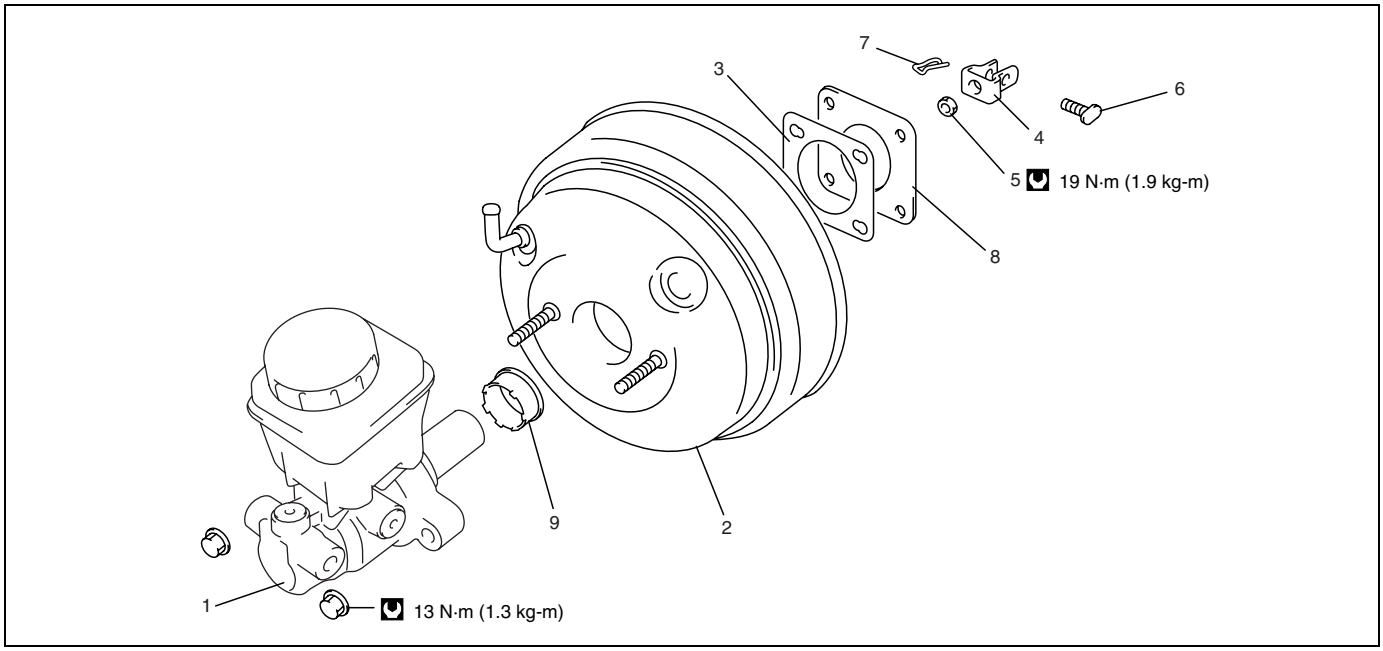
**Tightening torque**
**Master cylinder attaching nut**
**(b): 13 N·m (1.3 kg-m, 9.5 lb-ft)**

3) Connect hydraulic lines to master cylinder and ABS actuator and tighten flare nuts to specified torque.

**Tightening torque**
**Brake pipe flare nut**
**(c): 16 N·m (1.6 kg-m, 12.0 lb-ft)**

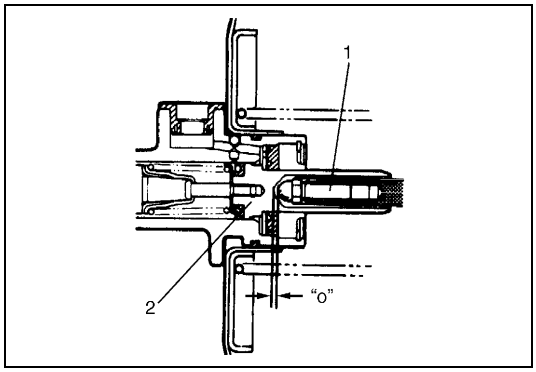
4) Connect reservoir lead wire.
5) Fill reservoir with specified brake fluid.
6) After installing, check brake pedal play and bleed air from system (Refer to “Brake Pedal Play Check” and “Bleeding Brakes” in Section 5).
7) Perform brake test and check each installed part for fluid leakage.

# Brake Booster



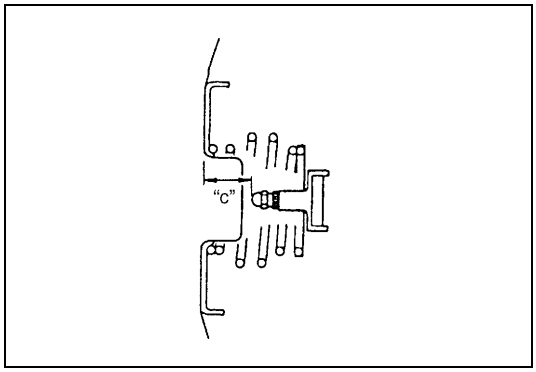

| | | | |
|---|---|---|---|
| 1. Brake master cylinder assembly | 4. Push rod clevis | 7. Clip | Tightening torque |
| 2. Brake booster assembly | 5. Nut | 8. Plate | |
| 3. Gasket | 6. Clevis pin | 9. Seal | |

### Clearance Between Booster Piston Rod and Master Cylinder Piston Check and Adjustment



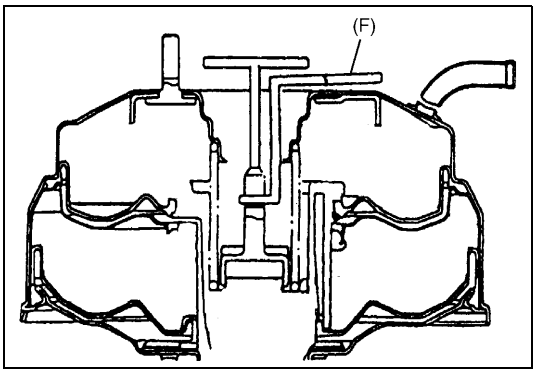

The length of booster piston rod (1) is adjusted to provide specified clearance "0" between piston rod (1) end and master cylinder piston (2).

1) Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
2) Keep inside of booster at atmospheric pressure for measurement.



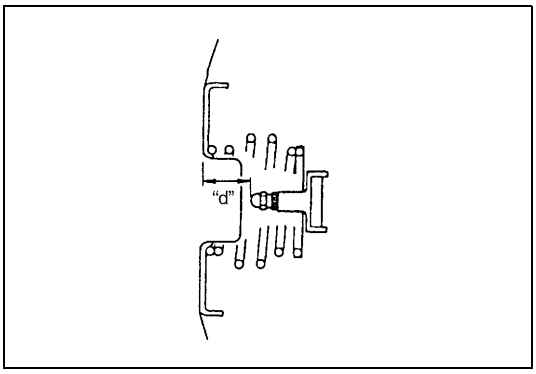

3) Check depth of piston rod, i.e. distance between piston rod and mating surface of booster-to-master cylinder.

**Distance between piston rod and brake booster for check "c": 15.8 – 16.6 mm (0.623 – 0.653 in.)**




4) If measured depth is out of above specifications, adjust to specifications below by turning adjusting screw of piston rod.

**Special tool**
**(F): 09952-16021**

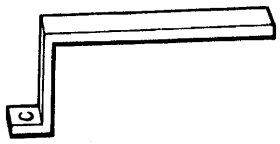
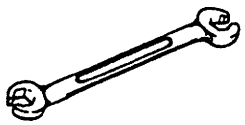



**Distance between piston rod and brake booster for adjustment**
**"d": 16.3 – 16.6 mm (0.642 – 0.653 in.)**

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Brake flexible hose bolt (Brake caliper/2 way joint) | 23 | 2.3 | 17.0 |
| Brake hose / pipe bracket bolt | 11 | 1.1 | 8.0 |
| ABS actuator bracket bolt | 11 | 1.1 | 8.0 |
| ABS actuator mounting bolt | 9 | 0.9 | 6.5 |
| Master cylinder attaching nut | 13 | 1.3 | 9.5 |
| Booster nut | 13 | 1.3 | 9.5 |
| Clevis nut | 19 | 1.9 | 13.7 |
| 2-way joint mounting bolt | 11 | 1.1 | 8.0 |
| Brake pipe flare nut | 16 | 1.6 | 12.0 |
| Brake bleeder plug (Front caliper (M8)) | 8 | 0.8 | 6.0 |
| Brake bleeder plug (Wheel cylinder) | 7.5 | 0.75 | 5.5 |
| Wheel nut | 100 | 10.0 | 72.5 |

# Special Tool

| | |
|---|---|
|  |  |
| 09952-16021<br>Booster piston rod adjuster | 09950-78220<br>Flare nut wrench (10 mm) |

# SECTION 5B1

# FRONT BRAKE (JA420WD)

**NOTE:**

**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.**

## CONTENTS

**General Description ..... 5B1-2**
Disc Brake Caliper Assembly ..... 5B1-2
**Diagnosis ..... 5B1-3**
**Check and Adjustment ..... 5B1-3**
**On-Vehicle Service ..... 5B1-3**
Front Disc Brake Pad ..... 5B1-3
Front Disc Brake Caliper ..... 5B1-6
Front Brake Disc ..... 5B1-10
**Tightening Torque Specification ..... 5B1-11**
**Required Service Material ..... 5B1-11**

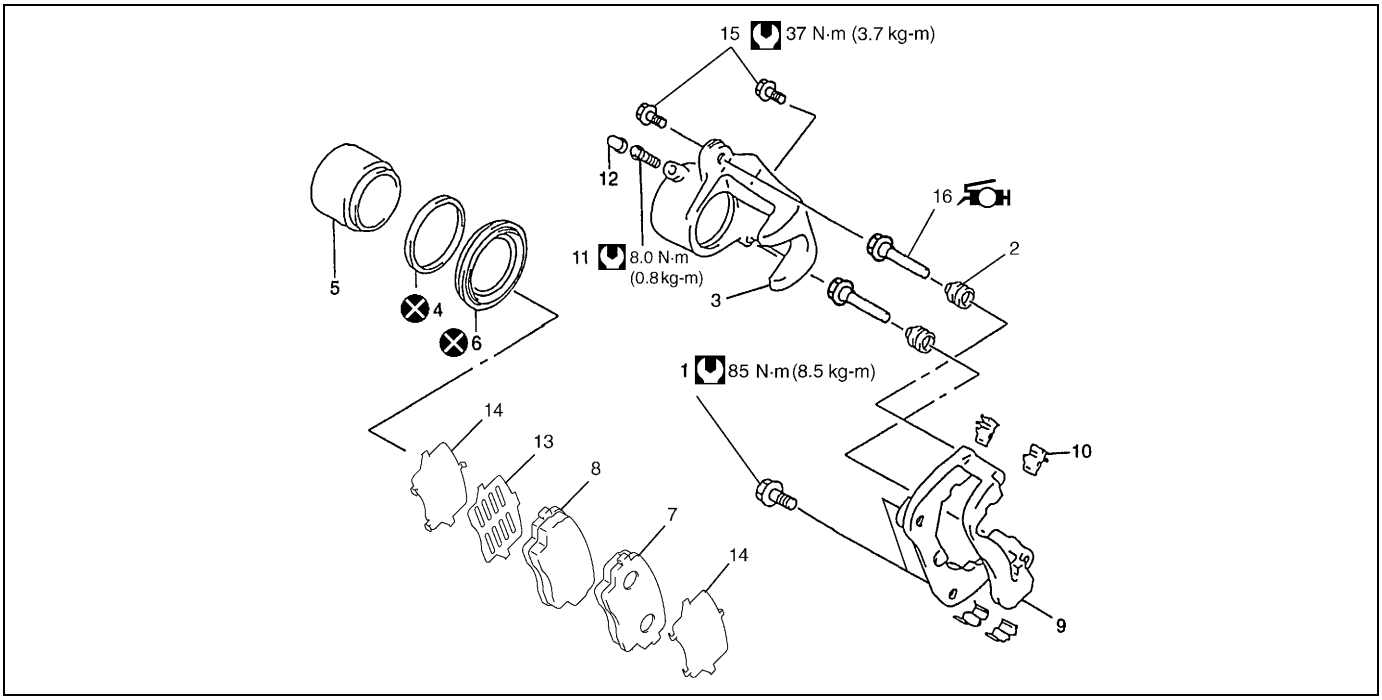
# General Description

## Disc Brake Caliper Assembly

This caliper is mounted to the brake caliper carrier with two caliper pin bolts. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings against the disc, creating friction to stop the vehicle.

**NOTE:**

- **Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system. Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.**
- **For identification of the brake caliper type, see maker name or mark on brake caliper as shown.**




| | | | | |
|---|---|---|---|---|
| 1. Brake carrier bolt | 5. Disc brake piston | 9. Brake caliper carrier | 13. Anti noise shim | Tightening torque |
| 2. Boot | 6. Cylinder boot | 10. Pad spring | 14. Inner shim | Apply rubber grease. |
| 3. Disc brake caliper (Disc brake cylinder) | 7. Disc brake inner pad | 11. Bleeder plug | 15. Caliper pin bolt | Do not reuse. |
| 4. Piston seal | 8. Disc brake outer pad | 12. Bleeder plug cap | 16. Caliper slide pin: Apply specified rubber grease to guiding and locking pins surfaces for smooth movement. | |

# Diagnosis

Refer to Section 5 (BRAKES).

# Check and Adjustment

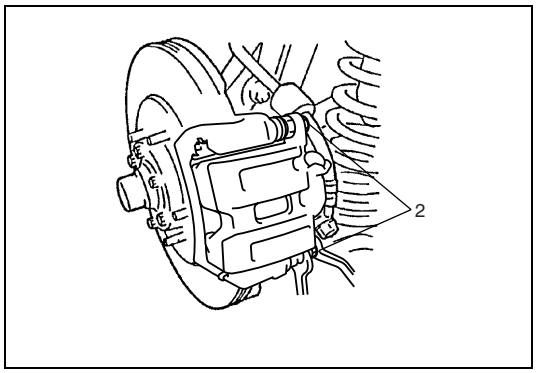
Refer to Section 5 (BRAKES).

# On-Vehicle Service

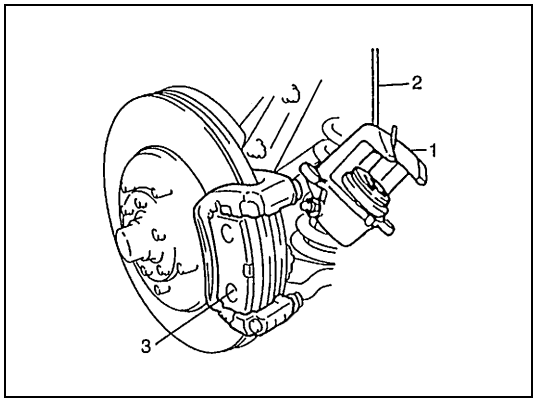
## Front Disc Brake Pad

### Removal

1) Hoist vehicle and remove wheel.




2) Remove caliper pin bolts (2).




3) Remove E-ring from strut and then remove caliper (1) from caliper carrier.

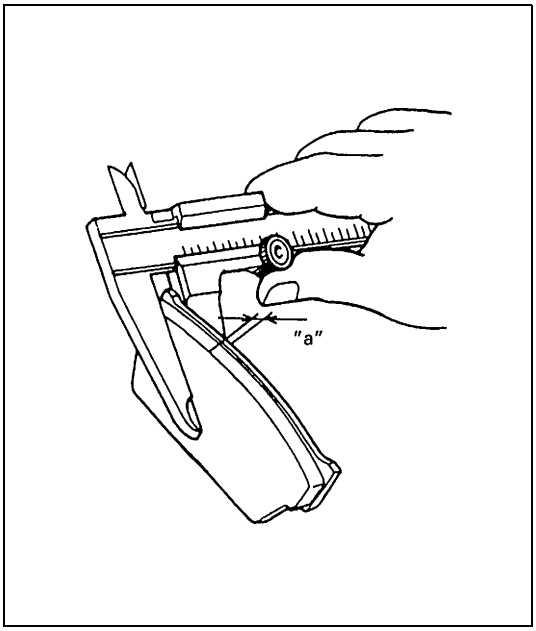
**NOTE:**

**Hang removed caliper with a wire hook (2) or the like so as to prevent brake hose from bending and twisting excessively or being pulled. Don't operate brake pedal with pads (3) removed.**

4) Remove pads (3).

## Inspection

### Brake pad




Check pad lining for wear. When wear exceeds limit, replace with new one.

**CAUTION:**

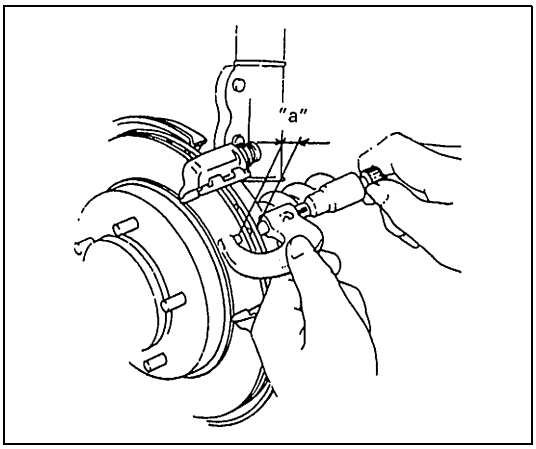
**Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.**

**Pad thickness (lining + rim) "a"**
**Standard: 15.5 mm (0.610 in.)**
**Service limit: 7.5 mm (0.295 in.)**

**NOTE:**

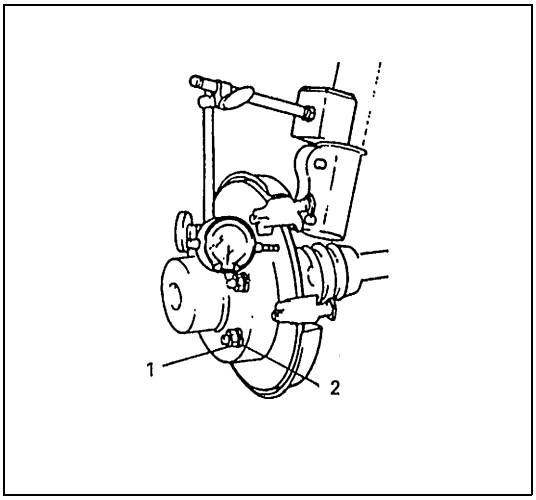
**When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.**

### Brake disc




Before this inspection, brake pads must be removed.
Check disc surface for scratches in wearing parts. Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious. But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratched, polish and correct that side.

**Disc thickness "a"**
**Standard: 22 mm (0.866 in.)**
**Service limit: 20 mm (0.787 in.)**



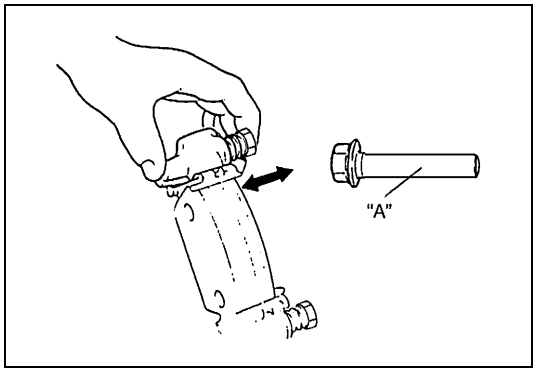

Use wheel nuts and suitable plain washers to hold the disc securely against the hub, then mount a dial indicator as shown and measure the runout at 25 mm (0.98 in.) from the outer edge of the disc.

**Limit on disc deflection**
**0.15 mm (0.006 in.)**

**NOTE:**

**Check front wheel bearing for looseness before measurement.**

| | |
|---|---|
| 1. | Wheel nut |
| 2. | Washer (or spacer) |




### Cylinder slide pin (bush)/pin bolt

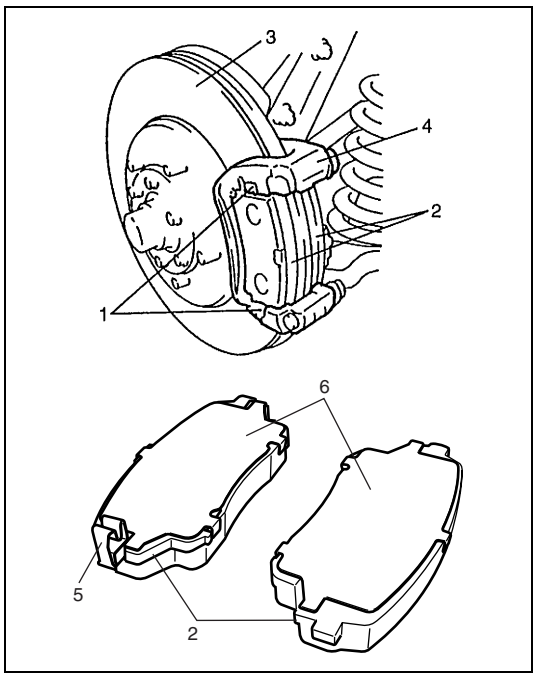
Check slide pin for smooth movement as shown.
If it is found faulty, correct or replace. Apply rubber grease "A" to slide pin outer surface. Rubber grease should be the on whose viscosity is less affected by such low temperature a –40 °C (–40 °F).

### Dust boot

Check boot for breakage, crack and damage. If defective, replace.

### Installation

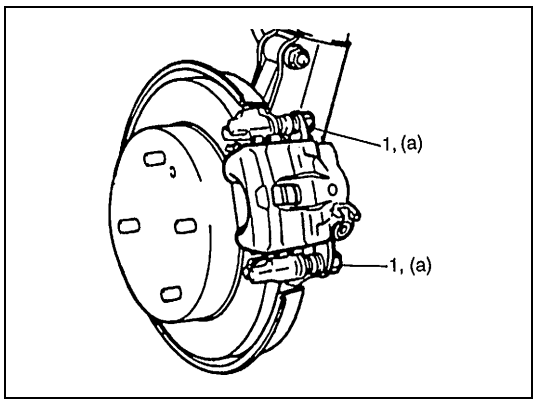
**NOTE:**
**See NOTE at the beginning of this section.**




1) Install pad clips (1) and pads (2).

**NOTE:**
**Install pad with sensor (5) to body center side of caliper.**

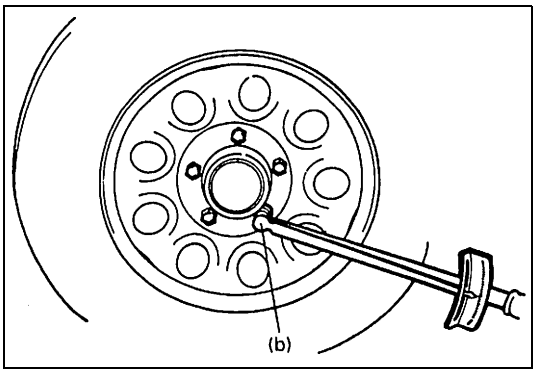
| | |
|---|---|
| 3. | Disc |
| 4. | Caliper carrier |
| 6. | Shim |




2) Install caliper and torque caliper pin bolts (1) to specification.

**Tightening torque**
**Caliper pin bolt (a): 37 N·m (3.7 kg-m, 27.0 lb-ft)**

**NOTE:**
**Make sure that boots are fit into groove securely.**




3) Torque front wheel nuts to specification.

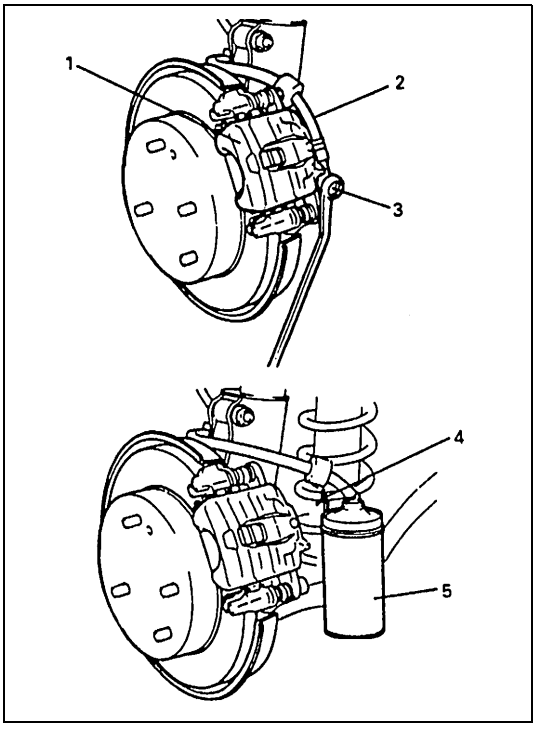
**Tightening torque**
**Wheel nut (b): 100 N·m (10.0 kg-m, 72.5 lb-ft)**

4) Upon completion of installation, perform brake test.

## Front Disc Brake Caliper

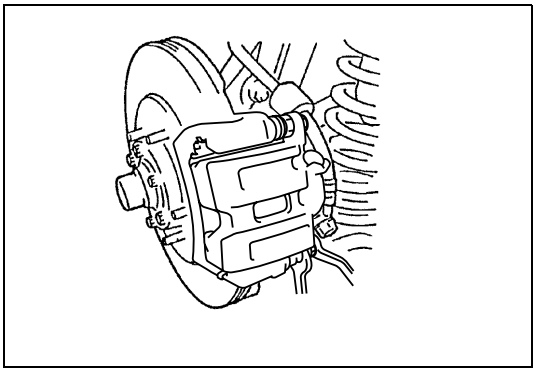
### Removal

1) Hoist vehicle and remove wheel.




2) Remove brake flexible hose mounting bolt (3) from caliper (1). As this will allow fluid to flow out of hose (2), have a container (5) ready beforehand.

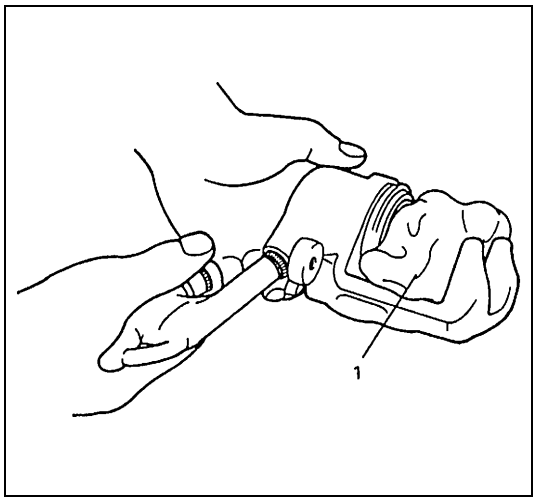
| |
|---|
| 4. Wire hook |



3) Remove caliper pin bolts.
4) Remove caliper.

### Disassembly

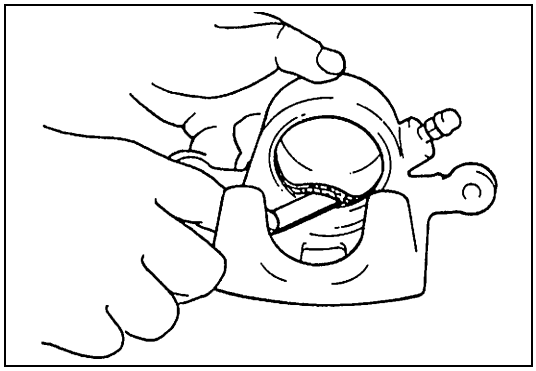
Before disassembly, clean all around caliper with brake fluid.




1) Remove anti noise shim (if equipped) and blow compressed air into cylinder through bolt hole where flexible hose was fitted.
   With this air pressure, piston can be pushed out of cylinder.

**WARNING:**
**Do not apply too highly compressed air which will cause piston to jump out of cylinder. It should be taken out gradually with moderately compressed air. Do not place your fingers in front of piston when using compressed air.**

1. Cloth

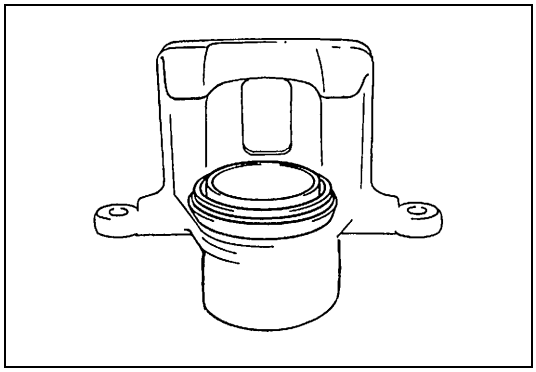


2) Remove piston seal using a thin blade like a thickness gauge, etc.

**CAUTION:**
**Be careful not to damage inside (bore side) of cylinder.**

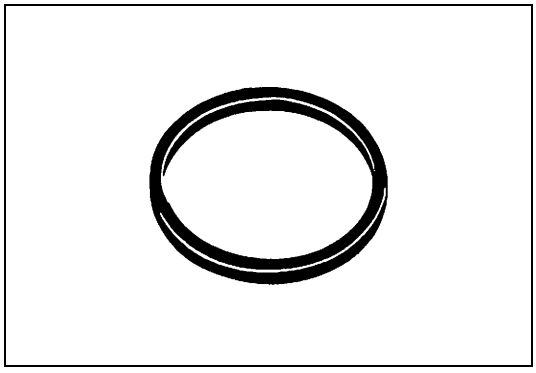
### Inspection

#### Cylinder boot



Check boots for breakage, crack and damage. If defective, replace.

#### Piston seal



Excessive or uneven wear of pad lining may indicate unsmooth return of the piston. In such a case, replace rubber seal.

### Assembly

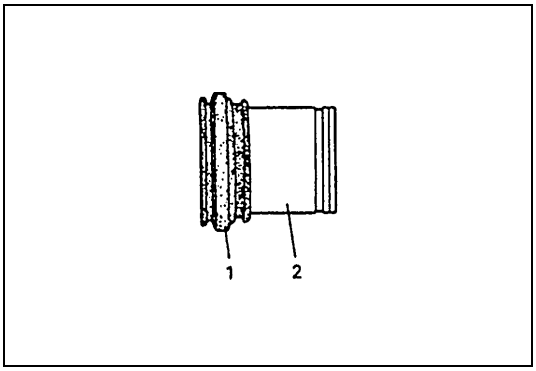
Reassemble front brake in reverse order of disassembly, noting the following points.

**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 and piston seal to cylinder, apply fluid to them.**
- **After reassembling brake lines, bleed air from them.**

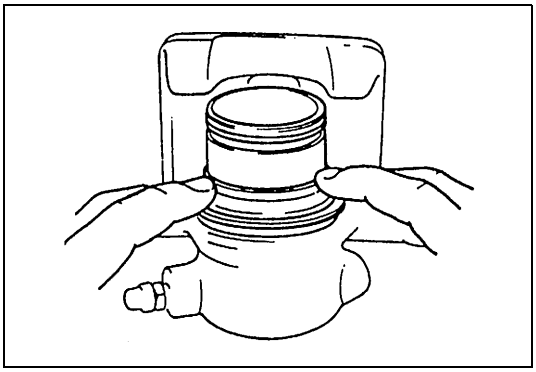
### Piston seal

Piston seal is used to seal piston and cylinder and to adjust clearance between pad and disc. Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

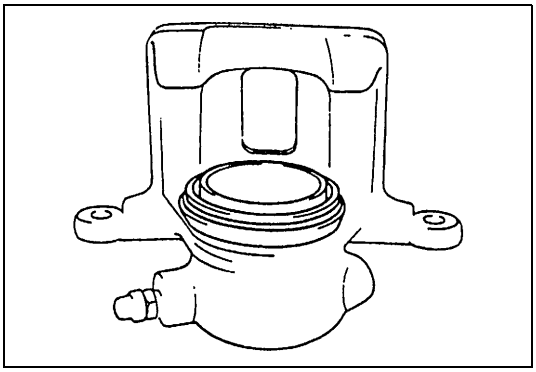
### Piston and boot



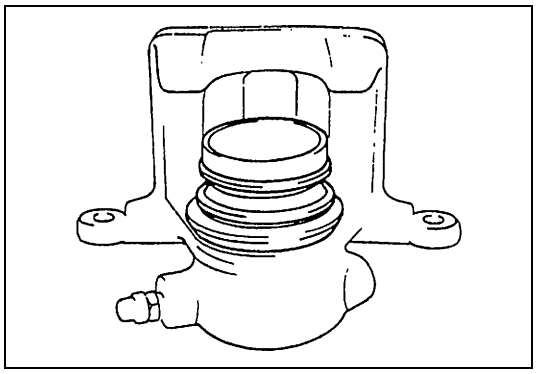

1) Before inserting piston (2) into cylinder, install boot (1) onto piston as shown.



2) Fit boot as it is in Step 1) into boot groove in cylinder with fingers.
   Check to make sure that boot is fitted into boot groove in cylinder completely in its circumference.



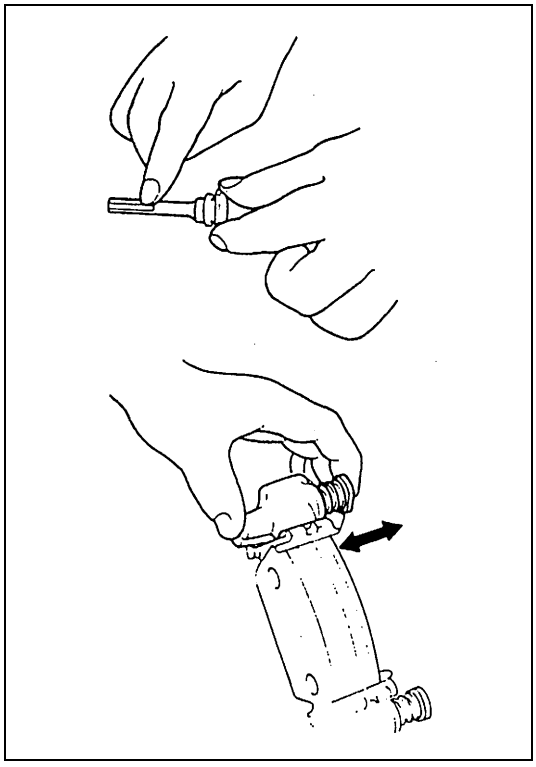
3) Insert piston into cylinder by hand and fit boot in boot groove in piston.



4) 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.

5) Insert piston into cylinder by hand.

### Caliper

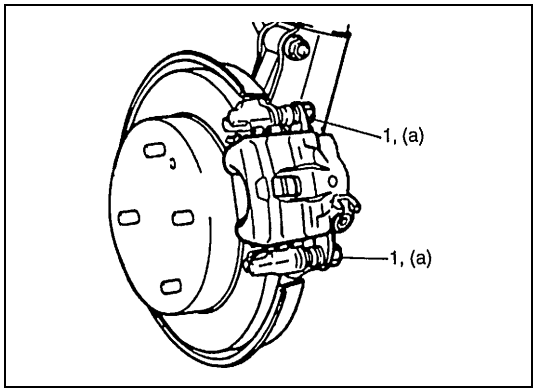


Before installing caliper (cylinder body) to carrier, check to ensure that slide pin inserted in each caliper carrier hole can be moved smoothly in thrust direction.

**NOTE:**

**Where temperature gets as low as –30 °C in cold weather, use rubber grease whose viscosity varies very little even at –40 °C (–40 °F).**

### Installation

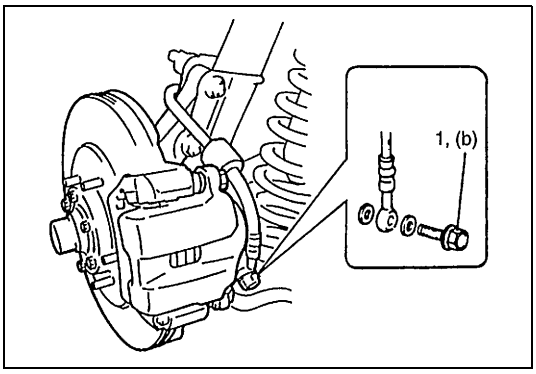



1) Install caliper to caliper carrier.
2) Torque caliper pin bolts (or caliper slide pin bolts) (1) to specifications.

**Tightening torque**
**Caliper pin bolt (a): 37 N·m (3.7 kg-m, 27.0 lb-ft)**

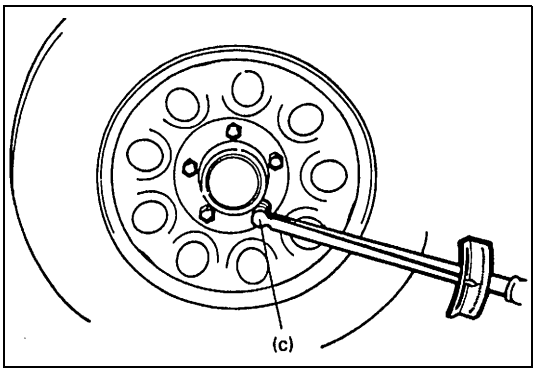
**NOTE:**

**Make sure that boots are fit into groove securely.**




3) Install brake flexible hose as shown and torque hose bolt (1) to specification.

**Tightening torque**
**Flexible hose bolt (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)**




4) Torque wheel nuts to specification.

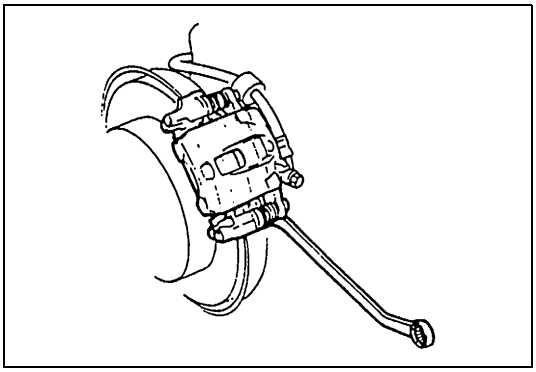
**Tightening torque**
**Wheel nut (c): 100 N·m (10.0 kg-m, 72.5 lb-ft)**

5) After completing installation, fill reservoir with brake fluid and bleed brake system. Perform brake test and check each installed part for oil leakage.

## Front Brake Disc

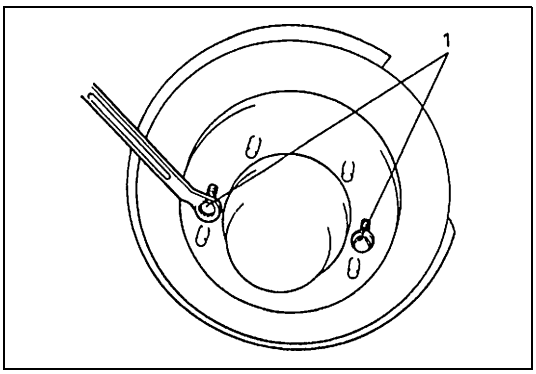
### Removal

1) Hoist vehicle and remove wheel.



2) Remove caliper assembly by loosening carrier bolts (2 pcs.).

**CAUTION:**
**During removal, be careful not to damage brake flexible hose and not to depress brake pedal.**




3) Remove disc by using 8 mm bolts (1) (2 pcs.).

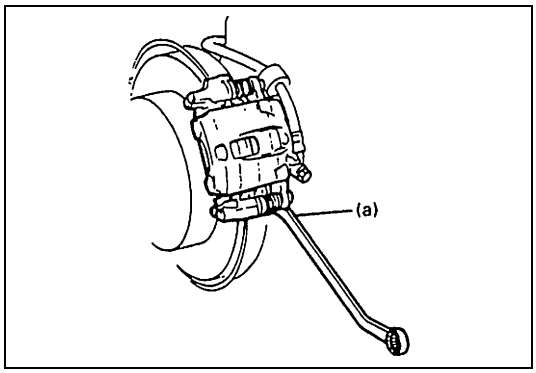
### Inspection

Refer to “Inspection” under “Front Disc Brake Pad” in this section.

### Installation

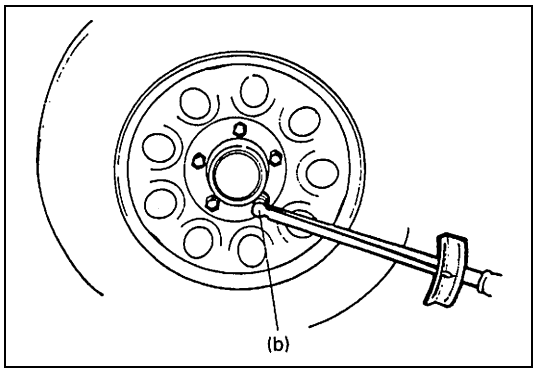
**NOTE:**
**See NOTE at the beginning of this section.**

1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.




3) Torque caliper carrier bolts to specification.

**Tightening torque**
**Caliper carrier bolt (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)**




4) Torque front wheel nuts to specifications.

**Tightening torque**
**Wheel nut (b): 100 N·m (10.0 kg-m, 72.5 lb-ft)**

5) Upon completion of installation, perform brake test.

## Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Brake caliper bleeder plug | 8.0 | 0.80 | 6.0 |
| Caliper pin bolt | 37 | 3.7 | 27.0 |
| Flexible hose bolt | 23 | 2.3 | 17.0 |
| Brake carrier bolt | 85 | 8.5 | 61.5 |
| Wheel nut | 100 | 10.0 | 72.5 |

## Required Service Material

| Material | Recommended product | Use |
|---|---|---|
| Brake fluid | Indicated on reservoir cap or described in owner's manual of vehicle | • To fill master cylinder reservoir.<br>• To clean and apply to inner parts of master cylinder, brake caliper and wheel cylinder when they are disassembled. |

| Material | Recommended product | Use |
|---|---|---|
| Rubber grease | Rubber grease should be the on whose viscosity is less affected by such low temperature a –40 °C (–40 °F) | • To apply to slide pin outer surface of brake caliper |

# SECTION 5C

# PARKING AND REAR BRAKE

**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.**
- **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).**

**NOTE:**

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **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.**



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# General Description

## Drum Brake Assembly

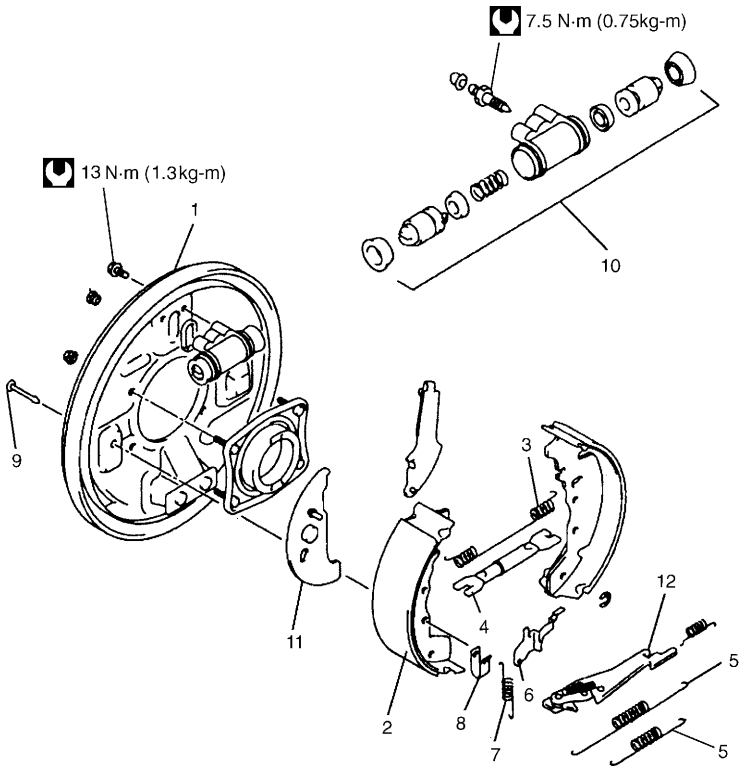
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times. Rear brake is a drum type. It uses leading trailing operation when brake pedal is depressed and when parking brake is applied on level road.
It also uses duo servo operation when parking brake is applied on gradient road and load is applied in longitudinal direction of vehicle.

**NOTE:**

**Replace all components included in repair kits to service this drum brake. Lubricate parts as specified.**

**WARNING:**

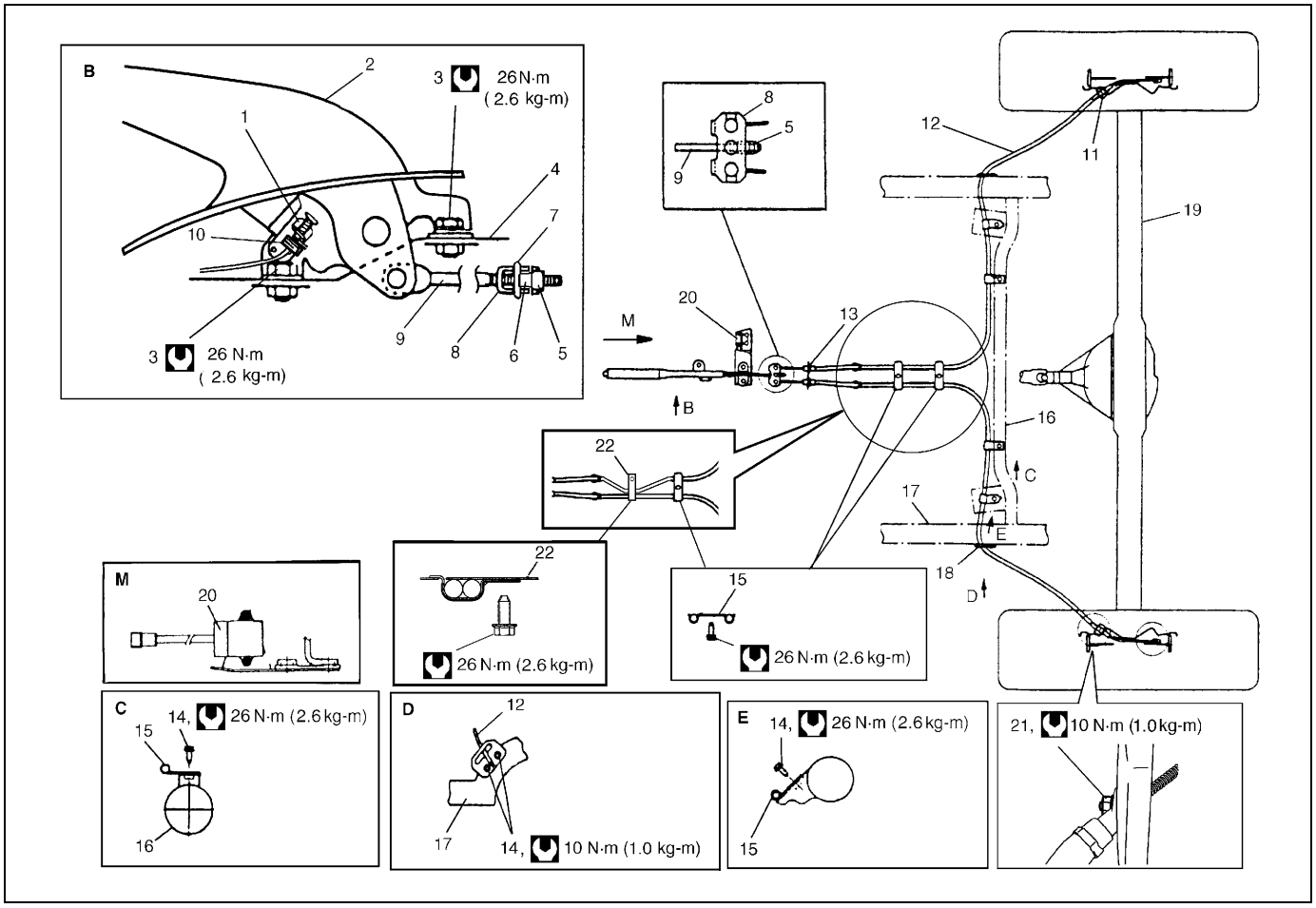
**If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.**




| | | |
|---|---|---|
| 1. Brake back plate | 6. Adjuster lever | 11. Link |
| 2. Brake shoe | 7. Adjuster spring | 12. Strut assembly |
| 3. Shoe return upper spring | 8. Shoe hold down spring | Tightening torque |
| 4. Adjuster assembly | 9. Shoe hold down pin | |
| 5. Shoe return lower spring | 10. Wheel cylinder | |

# On-Vehicle Service

## Parking Brake Cable




| | | | | |
|---|---|---|---|---|
| 1. Parking brake switch | 6. Equalizer | 11. Color ring | 16. Cross member | 21. Parking brake cable nut |
| 2. Parking brake lever | 7. Pin | 12. Cable | 17. Chassis frame | 22. Clamp (if equipped) |
| 3. Parking brake lever bolt | 8. Equalizer | 13. Grommet | 18. Hanger | Tightening torque |
| 4. Floor | 9. Adjust rod | 14. Bolt | 19. Rear axle | |
| 5. Locking nut | 10. Coupler | 15. Clamp (if equipped) | 20. G-sensor (if equipped) | |

### Removal

1) Remove brake drum referring to Step 1) to 5) of “Removal” under “Brake Drum” in this section.
2) Check the color of ring or tape for installation.

**NOTE:**

**Color ring on brake cable is for the purpose of identification.**

3) Disconnect parking brake cable from brake shoe lever referring to Steps 2) to 5) of “Removal” under “Brake Shoe” in Section 5C.
4) Disconnect brake cable from rear brake back plate.

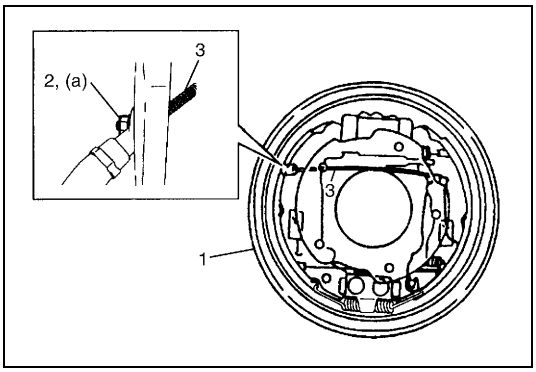
**NOTE:**

**When it is necessary to remove both right and left parking brake cables, repeat above Steps 1) to 4) on right and left wheels.**

5) Remove brake cable from parking brake lever, referring to Steps 1) to 5) of “Removal” under “Parking Brake Lever” in Section 5C.

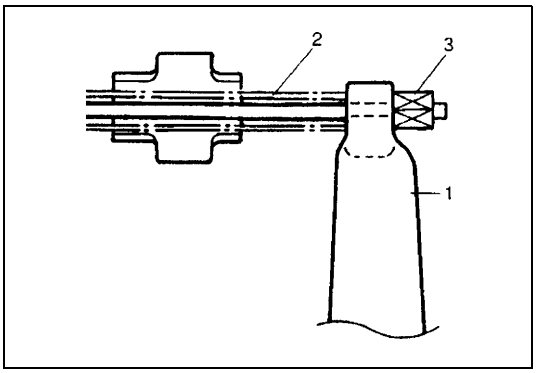
### Installation

Install parts in reverse order of removal procedure, noting the following.




1) Install parking brake cable (3) to brake back plate (1) and tighten parking brake cable nut (2) to specified torque.

**Tightening torque**
**Parking brake cable nut (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)**




2) Install brake cable spring (2) and nipple end (3) to parking brake shoe lever (1) securely as shown in figure.

3) Install brake shoes, referring to Steps 1) to 5) of “Installation” under “Brake Shoe” in Section 5C.
4) Install brake drum, referring to Steps 1) to 2) of “Installation” under “Brake Drum” in this section.
5) For proper routing and secure clamping of parking brake cable.
6) Install parking bake cable to parking brake lever.
7) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load 3 to 10 times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to “Parking Brake Check and Adjustment” in Section 5.)
8) Install rear center console box.
9) Install wheel and tighten wheel nuts to specified torque.

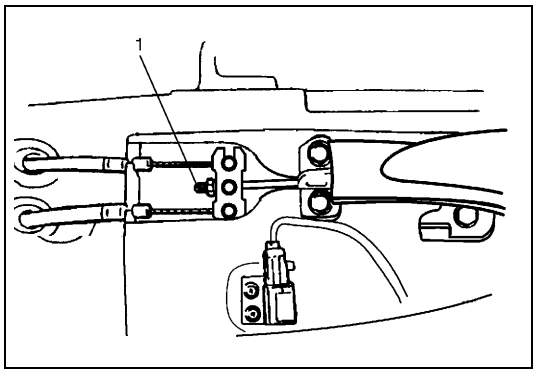
**Tightening torque**
**Wheel nut (b): 100 N·m (10.0 kg-m, 72.5 lb-ft)**

10) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).

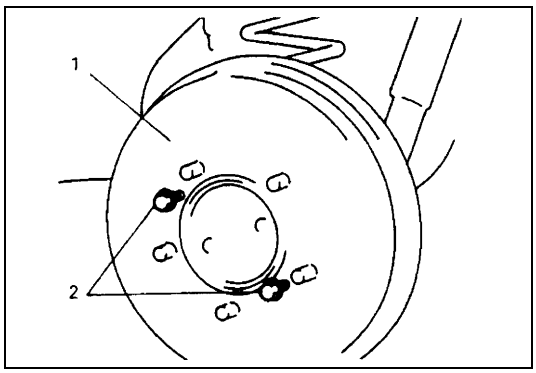
## Brake Drum

### Removal

1) Hoist vehicle and pull up parking brake lever.
2) Remove wheel.
3) Release parking brake lever.



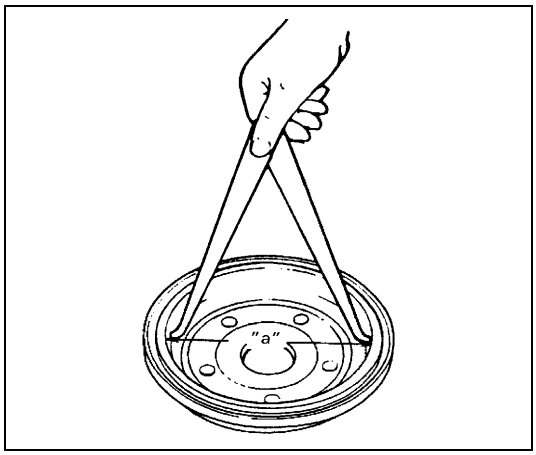

4) Remove rear center console box and loosen parking brake cable locking nut (1).




5) Remove brake drum (1) by using 8 mm bolts (2) (2 pcs.).

### Inspection

### Brake drum




Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.
Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.

**Brake dram inside diameter "a"**
**Standard: 254 mm (9.99 in.)**
**Service Limit: 256 mm (10.07 in.)**

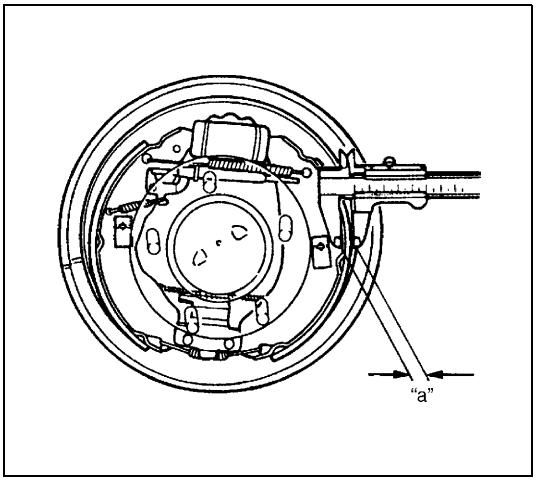
### Cracked, scored, or grooved drum

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 but should no be turned.

**NOTE:**

**When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.**

### Brake shoe




Where lining is worn out beyond service limit, replace shoe.
If one of brake linings is to service limit, all linings must be replaced at the same time.

**Rear brake drum shoe thickness "a"**
**Standard: 7.1 mm (0.28 in.)**
**Service limit: 3.6 mm (0.14 in.)**

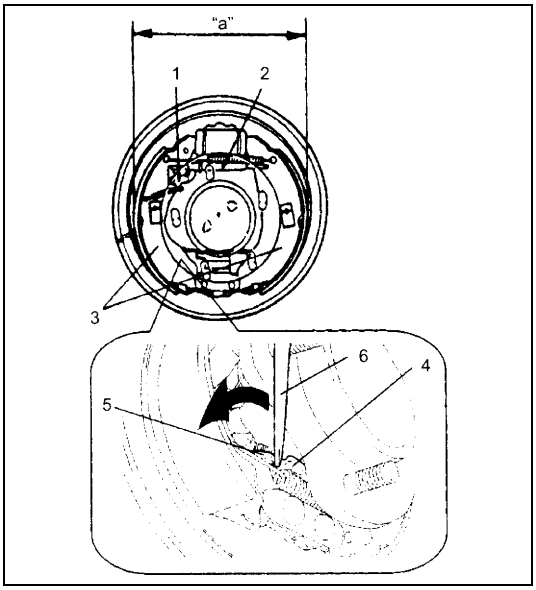
**CAUTION:**

**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.**

### Installation

**NOTE:**

**See NOTE at the beginning of this section.**




1) Before installing brake drum, check outer diameter of brake shoes (3). If it is not within value as specified below, adjust it to specification by turning adjuster (2).

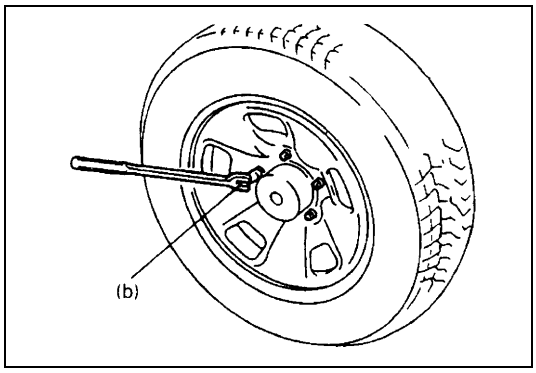
**NOTE:**

**For equipped with adjustable strut (4).**
**Before installing brake drum, to minimize length of strut assembly, put flat end rod (6) between rod (4) and ratchet (5) of strut assembly and push down ratchet as shown in figure.**

**Rear brake shoe outer diameter**
**"a": 253.3 – 253.7 mm (9.972 – 9.988 in.)**

1. Adjuster lever

2) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
3) Upon completion of all jobs, depress brake pedal with about 300 N (30 kg, 66 lbs) load 3 to 10 times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to "Parking Brake Check and Adjustment" in Section 5.)
4) Install rear center console box.




5) Install wheel and tighten wheel nuts to specified torque.

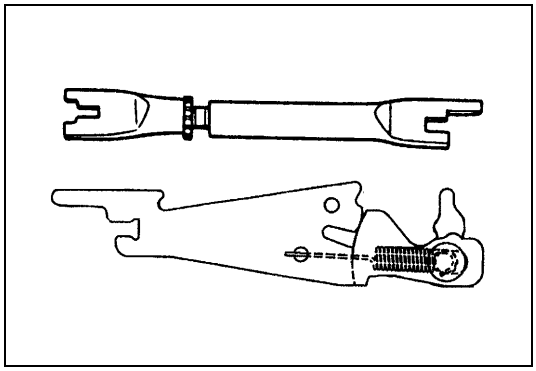
**Tightening torque**
**Wheel nut (b): 100 N·m (10.0 kg-m, 72.5 lb-ft)**

6) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).

## Brake Shoe

### Inspection

#### Adjuster assembly/Strut assembly



Check thread or ratchet of adjuster and strut assemblies for wear, sticking and corrosion. If defective, replace.

## Brake Back Plate

### Removal

Remove brake back plate, referring to Steps 1) to 6) of "Removal" under "Rear Axle Shaft and Wheel Bearing" in Section 3E.

### Installation

Install brake back plate, referring to Steps 5) to 14) of "Installation" under "Rear Axle Shaft and Wheel Bearing" in Section 3E.

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Wheel cylinder bleeder plug | 7.5 | 0.75 | 5.5 |
| Parking brake lever bolt | 26 | 2.6 | 19.0 |
| Wheel cylinder bolt | 13 | 1.3 | 9.5 |
| Brake pipe flare nut | 16 | 1.6 | 12.0 |
| Brake back plate nut (Bearing retainer nut) | 50 | 5.0 | 36.5 |
| Wheel nut | 100 | 10.0 | 72.5 |
| Parking brake cable nut | 10 | 1.0 | 7.5 |

# SECTION 6-1

# ENGINE GENERAL INFORMATION AND DIAGNOSIS (H27 ENGINE: TYPE A)

**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.**
- **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).**

**NOTE:**

- **Service information for H27 engine model TYPE A is provided in this section. To distinguish TYPE A, refer to the foreword of this service manual.**
- **Whether following systems (parts) are used in the particular vehicle or not depends on specifications. Be sure to bear this in mind when performing service work.**
  - **– Monitor connector**
  - **– CKP sensor**
  - **– MAP sensor**
  - **– EGR valve**
  - **– Heated oxygen sensor or CO adjusting resistor**
  - **– Three way catalytic converter, Warm-up three way catalytic converter**



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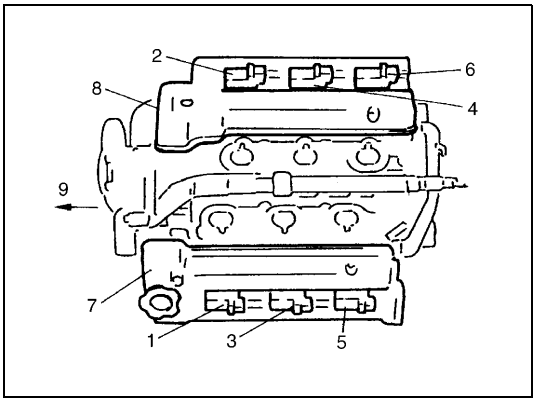
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# General Information

## Statement of Cleanliness and Care

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. Throughout this section, 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 surface 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.



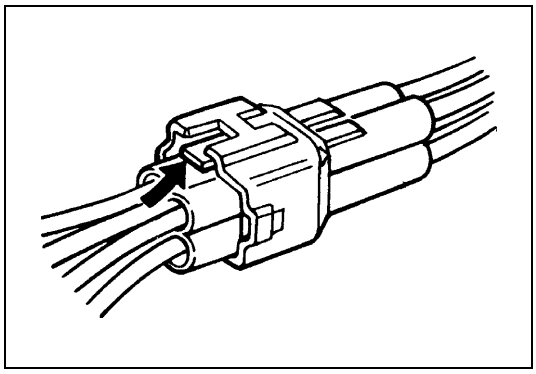

- Throughout this manual, the 6 cylinders of the engine are identified by numbers; No.1, No.2, No.3, No.4, No.5 and No.6 as counted from crankshaft pulley side (9) to flywheel side.
- Figure at shows engine with intake manifold removed and viewed from the top.
  LH (No.1) bank (7) consists of No.1 (1), No.3 (3) and No.5 (5) cylinders.
  RH (No.2) bank (8) consists of No.2 (2), No.4 (4) and No.6 (6) cylinders.

## Precaution

### Precaution on engine service

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

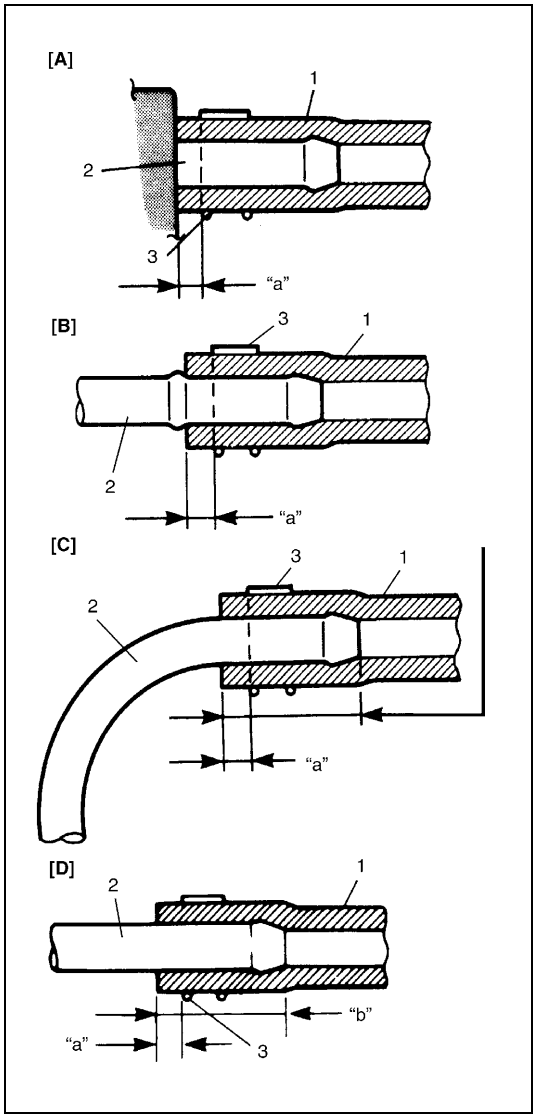
- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
  When performing any work where electrical terminals could possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, air cleaner outlet hose, throttle body, surge tank pipe, intake collector 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.

## Precaution on fuel system service

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel pressure regulator) 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 feed line, make sure to release fuel pressure according to "Fuel Pressure Relief Procedure" in this section.
  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. Put that cloth in an approved container when disconnection is completed.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.




- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to figure.
  After connecting, make sure that the hose has no twist or kink.

| | |
|---|---|
| [A]: | With short pipe, fit hose as far as it reaches pipe joint as shown. |
| [B]: | With following type pipe, fit hose as far as its peripheral projection as shown. |
| [C]: | With bent pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose. |
| [D]: | With straight pipe, fit hose till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose. |
| 1. | Hose |
| 2. | Pipe |
| 3. | Clamp |
| "a": | Clamp securely at a position 3 to 7 mm (0.12 – 0.27 in.) from hose end. |
| "b": | 20 to 30 mm (0.79 – 1.18 in.) |

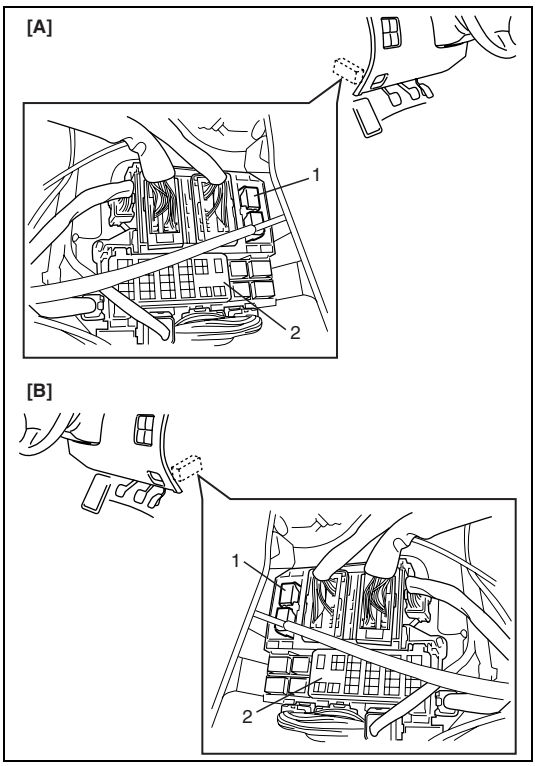
- When installing fuel pipe union bolt gasket, always use new gasket and tighten union bolt to specified torque referring to "Fuel Injector" in Section 6E2.
- When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O-ring with gasoline.

## Fuel pressure relief procedure

**CAUTION:**
**This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.**

After making sure that engine is cold, relief fuel pressure as follows.

1) Place transmission gear shift lever in “Neutral” (shift selector lever to “P” range for A/T vehicle), set parking brake, and block drive wheels.
2) Remove fuel pump relay (1) from its connector.
3) Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
4) Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2 – 3 times of about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
5) Upon completion of servicing, install fuel pump relay to relay and fuse box.




| | |
|---|---|
| [A]: | Left hand steering vehicle |
| [B]: | Right hand steering vehicle |
| 2. | Relay and fuse box |

## Fuel leakage check procedure

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 (till fuel pressure is felt by hand placed on fuel return hose).
2) In this state, check to see that there are no fuel leakages from any part of fuel system.

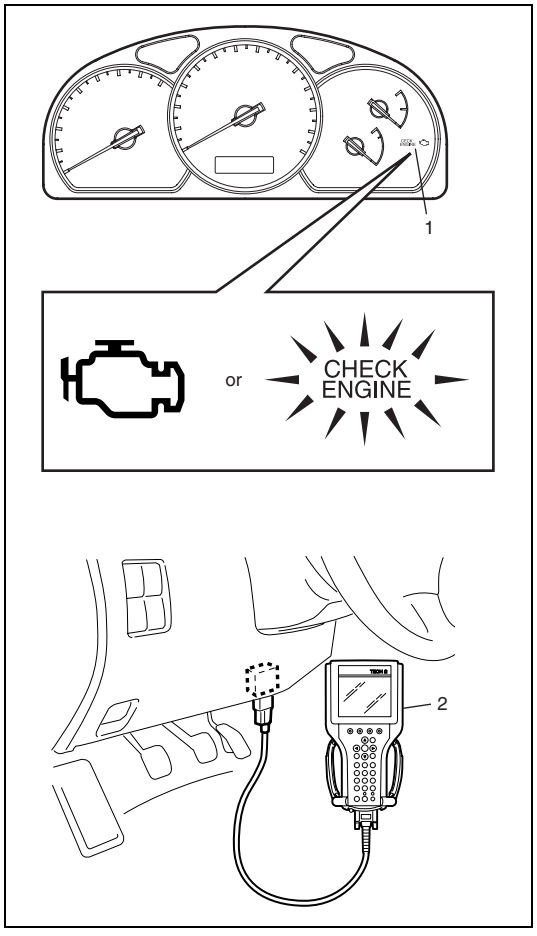
# Diagnosis

## Engine Diagnosis General Description

This vehicle is equipped with an engine and emission control system which are under control of ECM (PCM). The engine and emission control system in this vehicle are controlled by ECM (PCM). ECM (PCM) 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” and each item in “Precaution in Diagnosing Trouble for Engine” and execute diagnosis according to “Engine and Emission Control System Check” in this section.
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” in this section.

## On-Board Diagnostic System Description (Vehicle without Diagnosis Connector)

ECM (PCM) in this vehicle has 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 (PCM) 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 (PCM) memory as freeze frame data. (For the details, refer to description on Freeze frame data.)
- It is possible to communicate by using not only SUZUKI scan tool (2) but also generic scan tool. (Diagnostic information can be accessed by using a scan tool.)

### 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 (158°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 Cycle Detection Logic

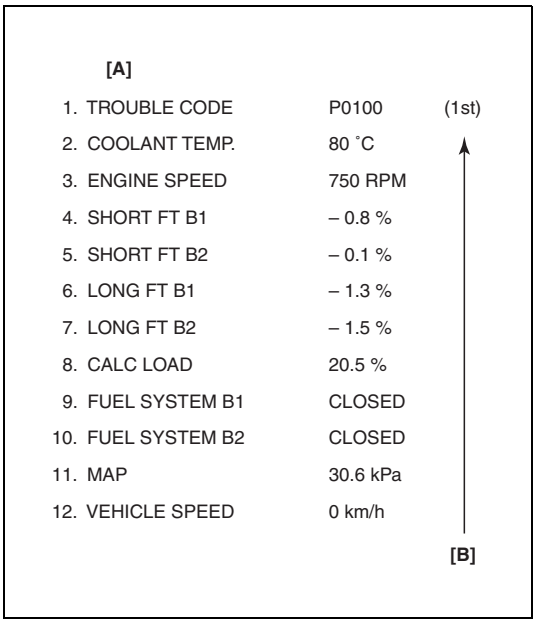
The malfunction detected in the first driving cycle is stored in ECM (PCM) memory (in the form of pending DTC) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

### 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 (PCM) 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 (PCM) has a function to store each freeze frame data for three different malfunctions in the order as the 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.




| | |
|---|---|
| [A]: | An example of freeze frame data |
| [B]: | 1st, 2nd or 3rd in parentheses here represents which position in the order the malfunction is detected. |

**Priority of Freeze Frame Data:**

ECM (PCM) 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 below. (If malfunction as described in the upper square "1" below 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".)

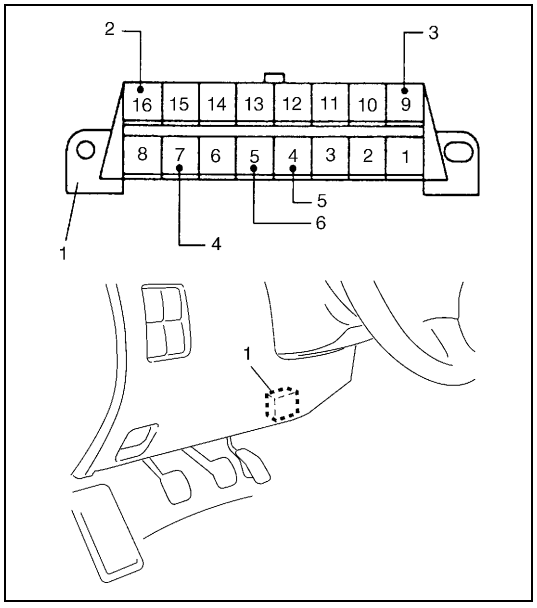
| Priority | Freeze Frame Data in Frame 1 |
|---|---|
| 1 | Freeze frame data at initial detection of malfunction among misfire detected (P0300-P0306), fuel system too lean (P0171, P0174) and fuel system too rich (P0172, P0175) |
| 2 | Freeze frame data when a malfunction other than those in "1" above is detected |

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as the malfunction is detected. These data are not updated regardless of the priority.
Shown in the table below are examples of how freeze frame data are stored when two or more malfunctions are detected.

| | | | 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 | No freeze frame data | No freeze frame data | No freeze frame data |
| MALFUNCTION DETECTED ORDER | 1 | P0110 (IAT) detected | Data at P0110 detection | Data at P0110 detection | No freeze frame data | No freeze frame data |
| | 2 | P0171 (Fuel system) detected | Data at P0171 detection | Data at P0110 detection | Data at P0171 detection | No freeze frame data |
| | 3 | P0300 (Misfire) detected | Data at P0171 detection | Data at P0110 detection | Data at P0171 detection | Data at P0300 detection |
| | 4 | P0301 (Misfire) detected | Data at P0171 detection | Data at P0110 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.



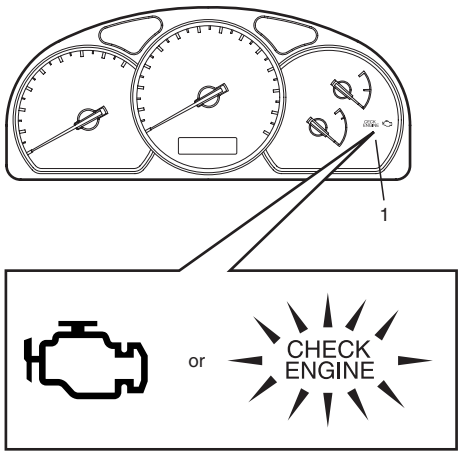

**Data Link Connector (DLC)**

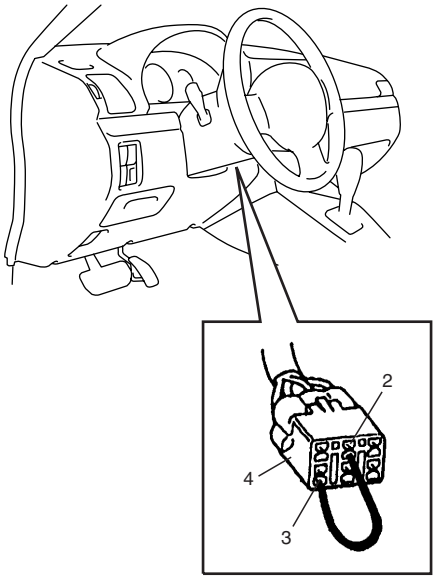
DLC (1) is in compliance with SAEJ1962 in its installation position, the shape of connector and pin assignment.

K line of ISO 9141 (4) is used for SUZUKI scan tool or generic scan tool to communicate with ECM (PCM), ABS control module and Air bag SDM. SUZUKI serial data line (3) is used for SUZUKI scan tool to communicate with Immobilizer control module.

| |
|---|
| 2. B+ |
| 5. Body ground |
| 6. ECM ground |

## On-Board Diagnostic System Description (Vehicle with Diagnosis Connector)




ECM diagnosis troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on of flashing malfunction indicator lamp (1).

- Heated oxygen sensor (if equipped)
- ECT sensor
- TP sensor
- IAT sensor
- CMP sensor
- MAF sensor
- Knock sensor
- EGR (if equipped)
- VSS
- CPU (Central Processing Unit) of ECM

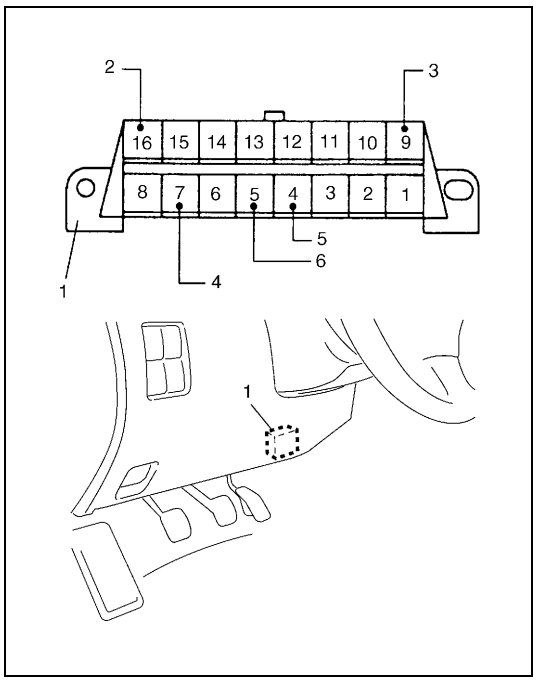
ECM and malfunction indicator lamp (1) operate as follows.

- Malfunction indicator lamp (1) light when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Engine and Emission control system. This is only to check the malfunction indicator lamp (1) circuit.
- If the above areas of Engine and Emission control system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp (1) turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp (1) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the trouble area in ECM back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for specified time.)
  ECM also indicates trouble area in memory by means of flashing of malfunction indicator lamp (1) at the time of inspection. (i.e. when diagnosis switch terminal (2) is connected to ground terminal (3) with a service wire and ignition switch is turned ON.)

**NOTE:**

**When a trouble occurs in the above areas and disappears soon while the diagnosis switch terminal is ungrounded and the engine is running, malfunction indicator lamp (1) lights and remains ON as the trouble exists but it turns OFF when the normal condition is restored.**

4. Diagnosis connector (white connector)




### Data Link Connector (DLC)

DLC (1) is in compliance with SAEJ1962 in its installation position, the shape of connector and pin assignment.
K line of ISO 9141 (4) is used for SUZUKI scan tool to communicate with ECM (PCM), ABS control module and air bag SDM. SUZUKI serial data line (3) is used for SUZUKI scan tool to communicate with Immobilizer control module.

| | |
|---|---|
| 2. | B+ |
| 5. | Body ground |
| 6. | ECM ground |

## Precaution in Diagnosing Trouble for Engine

- Don't disconnect couplers from ECM (PCM), battery cable from battery, ECM (PCM) ground wire harness from engine or main fuse before confirming diagnostic information (DTC, freeze frame data, etc.) stored in ECM (PCM) memory. Such disconnection will erase memorized information in ECM (PCM) memory.
- Diagnostic information stored in ECM (PCM) 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.
- Priorities for diagnosing troubles (Vehicle without diagnosis connector)
  If two or more diagnostic trouble codes (DTCs) are stored, proceed to the flow table of the DTC which was detected earliest in the order and follow the instruction in that table.
  If no instructions are given, troubleshoot diagnostic trouble codes according to the following priorities.
  – Diagnostic trouble codes (DTCs) other than DTC P0171/P0172/P0174/P0175 (Fuel system too lean/too rich), DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 (Misfire detected) and DTC P0400 (EGR flow malfunction)
  – DTC P0171/P0172/P0174/P0175 (Fuel system too lean/too rich) and DTC P0400 (EGR flow malfunction)
  – DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service" in Section 0A before inspection and observe what is written there.
- ECM (PCM) Replacement
  When substituting a known-good ECM (PCM), check for following conditions. Neglecting this check may cause damage to a known-good ECM (PCM).
  – Resistance value of all relays, actuators is as specified respectively.
  – MAF sensor, MAP sensor and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.

## Engine and Emission Control System Check

Refer to following pages for the detail of each step.

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Customer Complaint Analysis<br>1) Perform customer complaint analysis.<br>Was customer complaint analysis performed? | Go to Step 2. | Perform customer complaint analysis. |
| 2 | DTC(s)/Freeze Frame Data Check<br>1) Check DTC(s)/Freeze frame data.<br>Is there any malfunction DTC(s)? | Record DTC(s)/Freeze frame data.<br>Clear DTC(s).<br>Go to Step 3. | Go to Step 4. |
| 3 | Visual Inspection<br>1) Perform visual inspection.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 5. |
| 4 | Visual Inspection<br>1) Perform visual inspection.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 8. |
| 5 | Trouble Symptom Confirmation<br>1) Confirm trouble symptom based on customer complaint analysis, DTC(s)/freeze frame data in Step 1.<br>Is trouble symptom identified? | Go to Step 6. | Go to Step 7. |
| 6 | DTC/Freeze Frame Data Recheck<br>1) Recheck DTC/freeze frame data.<br>Is there any malfunction DTC(s)? | Go to Step 9. | Go to Step 8. |
| 7 | DTC/Freeze Frame Data Recheck<br>1) Recheck DTC/freeze frame data.<br>Is there any malfunction DTC(s)? | Go to Step 9. | Go to Step 10. |
| 8 | Engine Basic Inspection<br>1) Check and repair according to “Engine Basic Inspection” and “Engine Symptom Diagnosis” in this section.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 9 | DTC Trouble Shooting<br>1) Check and repair according to applicable “DTC Diag. Flow Table” in this section.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 10 | Intermittent Problems Check<br>1) Check for intermittent problems referring to “Check for Intermittent Problem” in Section 0A.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 11. |
| 11 | Final Confirmation Test<br>1) Clear DTC if any.<br>2) Perform final confirmation test referring to “DTC Confirmation Procedure” in this section.<br>Is there any problem symptom, malfunction 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 From (Example)

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

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

| VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS | |
|---|---|
| **Environmental Condition** | |
| Weather<br>Temperature<br>Frequency<br>Road | ☐ Fair ☐ Cloudy ☐ Rain ☐ Snow ☐ Always ☐ Other_____<br>☐ Hot ☐ Warm ☐ Cool ☐ Cold ( °F/ °C) ☐ Always<br>☐ Always ☐ Sometimes ( times/ day, month) ☐ Only once ☐ Under certain condition<br>☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous (☐ Uphill ☐ Downhill) ☐ Tarmacadam<br>☐ Gravel ☐ Other_____ |
| **Vehicle Condition** | |
| Engine Condition | ☐ Cold ☐ Warming up phase ☐ Warmed up ☐ Always ☐ Other at starting<br>☐ Immediately after start ☐ Racing without load ☐ Engine speed ( r/min) |
| Vehicle condition | ☐ During driving: ☐ Constant speed ☐ Accelerating ☐ Decelerating<br>☐ Right hand corner ☐ left hand corner ☐ When shifting (Lever position ) ☐ At stop<br>☐ 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 ☐ Normal code ☐ Malfunction code ( ) |
| | Second check: ☐ No code ☐ Normal code ☐ Malfunction code ( ) |

**NOTE:**

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

**Step 2. Diagnostic Trouble Code (DTC)/Freeze Frame Data Check, Record and Clearance**

First, check DTC, referring to "Diagnostic Trouble Code (DTC) Check" in this section. If DTC is indicated, record DTC and freeze frame data.
After that clear DTC referring to "Diagnostic Trouble Code (DTC) Clearance" in this section. 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, 7.
Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC (including pending DTC) in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

**NOTE:**

**For A/T vehicle, if only DTC P0705, P0715, P0720, P0741, P0743, P0751, P0753, P0756, P0758, or P1875 is indicated in this step, proceed to "DIAGNOSIS" in SECTION 7B1.**

**Step 3. and 4. Visual Inspection**

Be sure to perform visual check of the following items that support proper function of the engine.

## Visual Inspection

Visual check following parts and systems.

| Inspection Item | Reference Section |
|---|---|
| • Engine oil - - - - - level, leakage | Section 0B |
| • Engine coolant - - - - - level, leakage | Section 0B |
| • Fuel - - - - - level, leakage | Section 0B |
| • A/T fluid - - - - - level, leakage | Section 0B |
| • Air cleaner element - - - - - dirt, clogging | Section 0B |
| • Battery - - - - - fluid level, corrosion of terminal | Section 0B |
| • Water pump belt and/or cooling fan belt - - - - - tension, damage | Section 6C |
| • Accelerator cable - - - - - play, installation | Section 6E2 |
| • A/T throttle cable - - - - - play, installation | Section 6E2 |
| • Vacuum hoses of air intake system | |
| - - - - - disconnection, looseness, deterioration, bend | Section 6E2 |
| • Connectors of electric wire harness - - - - - disconnection, friction | |
| • Fuses - - - - - burning | Section 8 |
| • Parts - - - - - installation, bolt - - - - - looseness | |
| • Parts - - - - - deformation | |
| • Other parts that can be checked visually | |
| • Also check following items at engine start, if possible | |
| – Malfunction indicator lamp - - - - - operation | Section 6-1 |
| – Charge warning lamp - - - - - operation | Section 6H |
| – Engine oil pressure warning lamp - - - - - operation | Section 8/6A2 |
| – Engine coolant temp. meter - - - - - operation | Section 8 |
| – Fuel lever meter - - - - - operation | Section 8 |
| – Abnormal air being inhaled from air intake system | |
| – Exhaust system - - - - - leakage of exhaust gas, noise | |
| – Other parts that can be checked visually | |

**Step 5. Trouble Symptom Confirmation**

Based on information obtained in Step 1 "Customer Complaint Analysis" and Step 2 "DTC/Freeze Frame Data Check", confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each "DTC Flow Table".

**Step 6. and 7. Rechecking and Record of DTC/Freeze Frame Data**

Refer to "Diagnostic Trouble Code (DTC) Check" in this section for checking procedure.

**Step 8. Engine Basic Inspection and Engine Symptom Diagnosis**

Perform basic engine check according to the "Engine Basic Inspection" first. When the end of the flow table has been reached, check the parts of the system suspected as a possible cause referring to "Engine Symptom Diagnosis" 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.

## Engine Basic Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | Check battery voltage.<br>Is it 11 V or more? | Go to Step 3. | Charge or replace battery. |
| 3 | Is engine cranked? | Go to Step 4. | Go to "Diagnosis Table" in Section 6G. |
| 4 | Does engine start? | Go to Step 5. | Go to Step 7. |
| 5 | Check engine idle speed/IAC duty referring to "Idle Speed Idle Air Control (IAC) Duty Inspection" in Section 6E2.<br>Is check result as specified? | Go to Step 6. | Go to "Engine Symptom Diagnosis" in this section. |
| 6 | Check ignition timing referring to "Ignition Timing Check and Adjustment" in Section 6F2.<br>Is check result as specified? | Go to "Engine Symptom Diagnosis" in this section. | Adjust ignition timing. |
| 7 | Check fuel supply as follows:<br>1) Check to make sure that enough fuel is filled in fuel tank.<br>2) Turn ON ignition switch for 3 seconds and then OFF.<br>Repeat this a few times.<br>Is fuel return pressure (returning sounds) felt from fuel return hose when ignition switch is turned ON? | Go to Step 9. | Go to Step 8. |
| 8 | Check fuel pump for operating.<br>1) Was fuel pump operating sound heard from fuel filler for about 3 seconds after ignition switch ON and stop? | Go to "Diag. Flow Table B-3" in this section. | Go to "Diag. Flow Table B-1" in this section. |
| 9 | Check ignition spark referring to "Ignition Spark Check" in Section 6F2.<br>Is it in good condition? | Go to Step 10. | Go to "Diagnosis Flow Table" in Section 6F2. |

| Step | Action | Yes | No |
|---|---|---|---|
| 10 | Check fuel injector referring to “Fuel Injector” in Section 6E2.<br>Is it in good condition? | Go to “Engine Symptom Diagnosis” in this section. | Go to “Diag. Flow Table B-2” in this section. |

**Step 9. Troubleshooting for DTC (See each DTC Diag. Flow Table.)**

Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow table in this section, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ECM (PCM) or other part and repair or replace faulty parts.

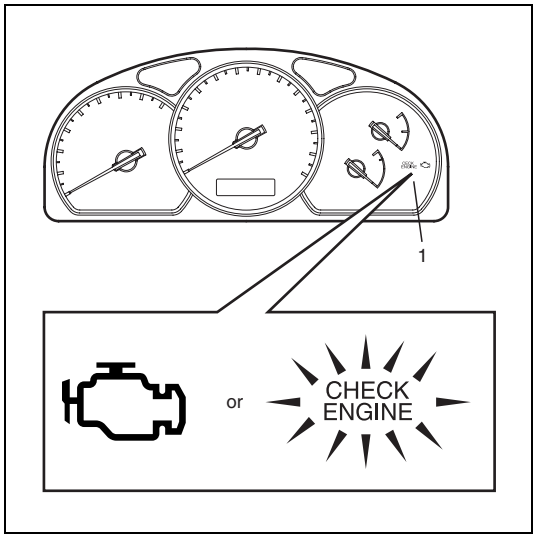
**Step 10. Check for Intermittent Problem**

Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to “Intermittent and Poor Connection” in Section 0A 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 malfunction DTC (a normal code) is indicated.

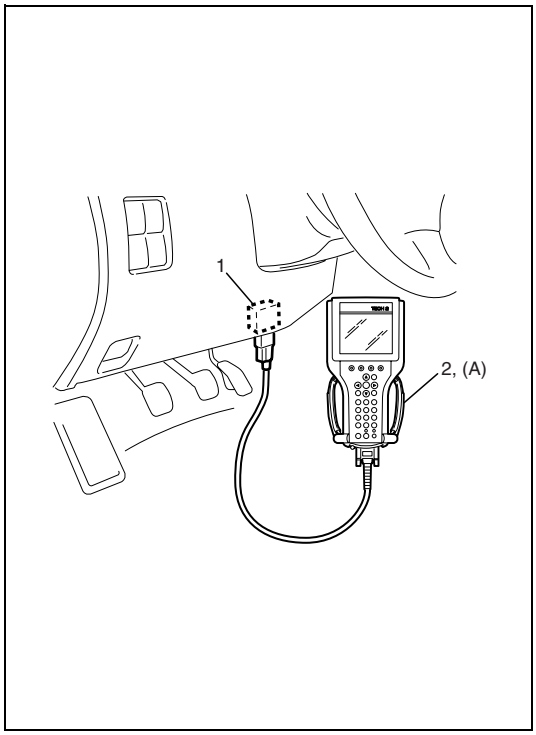
## Malfunction Indicator Lamp (MIL) Check




1) Turn ON ignition switch (but the engine at stop) and check that MIL (1) lights.
   If MIL does not light up, go to "Diagnostic Flow Table A-1" for troubleshooting.
2) Start engine and check that MIL turns OFF.
3) If MIL remains ON, and no DTC is stored in ECM (PCM), go to "Diagnostic Flow Table A-2" for troubleshooting.

## Diagnostic Trouble Code (DTC) Check

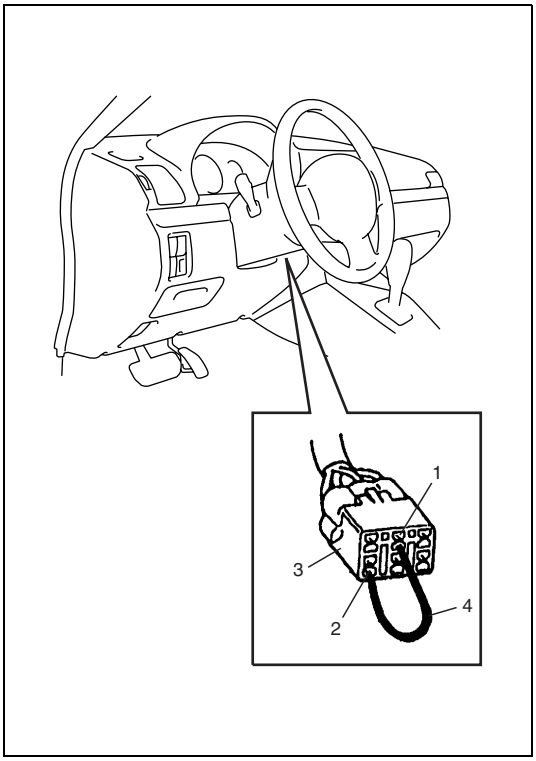
**[Using SUZUKI Scan Tool]**




1) Prepare generic scan tool or SUZUKI scan tool (2).
2) With ignition switch 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**

3) Turn ignition switch ON and confirm that MIL lights.
4) Read 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 (PCM) is not possible, check if scan tool is communicable by connecting it to ECM (PCM) 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.




**[Without Using SUZUKI Scan Tool] (Vehicle with Diagnosis Connector)**

1) Check malfunction indicator lamp referring to "Malfunction Indicator Lamp (MIL) Check" in this section.
2) With the ignition switch OFF position, disconnect SUZUKI scan tool if connected and using service wire (4), connect diagnosis switch terminal (1) to ground terminal (2) in diagnosis connector (white connector) (3).
3) With the ignition switch ON position and leaving engine OFF, read DTC from flashing pattern of malfunction indicator lamp. Refer to "Diagnostic Trouble Code (DTC) Table".
   If lamp remains ON, go to "Diagnostic Flow Table A-4".

**NOTE:**

- **If abnormality or malfunction lies in two or more areas, malfunction indicator lamp indicates applicable codes three times each.**
  **And flashing of these codes is repeated as long as diagnosis terminal is grounded and ignition switch is held at ON position.**
- **Take a note of diagnostic trouble code indicated first.**

4) After completing the check, turn the ignition switch OFF position and disconnect service wire from diagnosis connector.

## Diagnostic Trouble Code (DTC) Clearance

**[Using Scan Tool]**

1) With ignition switch OFF, connect generic scan tool or SUZUKI scan tool to data link connector (DLC).
2) Turn ignition switch ON.
3) Erase DTC according to instructions displayed on scan tool. Freeze frame data is cleared with the DTC. 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 (PCM) memory are also cleared in following cases. Be careful not to clear them before keeping their record.**

- **When power to ECM (PCM) is cut off (by disconnecting battery cable, removing fuse or disconnecting ECM (PCM) connectors)**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles (refer to "Warm-Up Cycle" of "On-Board Diagnostic System (Vehicle without Diagnosis Connector)" in this section.)**

**[Without Using Scan Tool]**

1) Turn the ignition switch OFF position.
2) Disconnect battery negative cable for specified time below to erase diagnostic trouble code stored in ECM memory and reconnect it.

**Time required to erase DTC**

| Ambient temperature | Time to cut power to ECM |
|---|---|
| Over 0°C (32°F) | 30 sec. or longer |
| Under 0°C (32°F) | Not specifiable. Select a place with higher than 0°C (32°F) temperature. |

## Diagnostic Trouble Code (DTC) Table

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P0100 (No.34) | Mass air flow circuit malfunction | Sensor output too low | 1 driving cycle | 1 driving cycle |
| P0100 (No.33) | | Sensor output too high | | |
| P0110 (No.25) | Intake air temp. circuit malfunction | Intake air temp. circuit low input | 1 driving cycle | 1 driving cycle |
| P0110 (No.23) | | Intake air temp. circuit high input | | |
| P0115 (No.15) | Engine coolant temp. circuit malfunction | Engine coolant temp. circuit low input | 1 driving cycle | 1 driving cycle |
| P0115 (No.14) | | Engine coolant temp. circuit high input | | |
| P0120 (No.22) | Throttle position circuit malfunction | Throttle position circuit low input | 1 driving cycle | 1 driving cycle |
| P0120 (No.21) | | Throttle position circuit high input | | |
| P0121 | Throttle position circuit performance problem | Poor performance of TP sensor | 2 driving cycles | Not applicable |
| *P0130 | HO2S circuit malfunction (Bank 1 - Sensor 1) | Min. output voltage of HO2S–1 is higher than specification. | 2 driving cycles | Not applicable |
| | | Min. output voltage of HO2S–1 is lower than specification. | | |
| | | Output voltage of HO2S–1 fails to go above specification. | | |
| **P0130 (No.13) | HO2S (Bank 1 - Sensor 1) no activity detected | Output voltage of HO2S–1 fails to go above specification (or HO2S–1 circuit open). | 2 driving cycles | 2 driving cycles |

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P0133 | HO2S circuit slow response (Bank 1 - Sensor 1) | Response time of HO2S–1 output voltage between rich and lean is longer than specification. | 2 driving cycles | Not applicable |
| P0135 | HO2S heater circuit malfunction (Bank 1 - Sensor 1) | Terminal voltage is lower than specification at heater OFF or it is higher at heater ON. | 2 driving cycles | Not applicable |
| P0136 | HO2S circuit malfunction (Bank 1 - Sensor 2) | Max. voltage of HO2S–2 is lower than specification or its min. voltage is higher than specification. | 2 driving cycles | Not applicable |
| P0141 | HO2S heater circuit malfunction (Bank 1 - Sensor 2) | Terminal voltage is lower than specification at heater OFF or it is higher at heater ON. | 2 driving cycles | Not applicable |
| *P0150 | HO2S circuit malfunction (Bank 2 - sensor 1) | Min. output voltage of HO2S–1 is higher than specification.<br>Min. output voltage of HO2S–1 is lower than specification.<br>Output voltage of HO2S–1 fails to go above specification. | 2 driving cycles | Not applicable |
| **P0150 (No.26) | HO2S (Bank 2 - Sensor 1) no activity detected | Output voltage of HO2S–1 fails to go above specification (or HO2S–1 circuit open). | 2 driving cycles | 2 driving cycles |
| P0153 | HO2S circuit slow response (Bank 2 - Sensor 1) | Response time HO2S–1 output voltage between rich and lean is longer than specification. | 2 driving cycles | Not applicable |
| P0155 | HO2S heater circuit malfunction (Bank 2 - Sensor 1) | Terminal voltage i lower than specification at heater OFF or it is higher at heater ON. | 2 driving cycles | Not applicable |
| P0156 | HO2S circuit malfunction (Bank 2 - Sensor 2) | Max. voltage of HO2S–2 is lower than specification or its min. voltage is higher than specification. | 2 driving cycles | Not applicable |
| P0161 | HO2S heater circuit malfunction (Bank 2 - Sensor 2) | Terminal voltage is lower than specification at heater OFF or it is higher at heater ON (or heater circuit or short). | 2 driving cycles | Not applicable |
| P0171 | Fuel system too lean (Bank 1) | Short term fuel trim or total fuel trim (short and long terms added) is larger than specification for specified time or longer. (Fuel trim toward rich side is large.) | 2 driving cycles | Not applicable |
| P0172 | Fuel system too rich (Bank 1) | Short term fuel trim or total fuel trim (short and long terms added) is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.) | 2 driving cycles | Not applicable |

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P0174 | Fuel system too lean (Bank 2) | Short term fuel trim or total fuel trim (short and long terms added) is larger than specification for specified time or longer. (Fuel trim toward rich side is large.) | 2 driving cycles | Not applicable |
| P0175 | Fuel system too rich (Bank 2) | Short term fuel trim or total fuel trim (short and long terms added) is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.) | 2 driving cycles | Not applicable |
| P0300<br>P0301<br>P0302<br>P0303<br>P0304<br>P0305<br>P0306 | Random misfire detected<br>Cylinder 1 misfire detected<br>Cylinder 2 misfire detected<br>Cylinder 3 misfire detected<br>Cylinder 4 misfire detected<br>Cylinder 5 misfire detected<br>Cylinder 6 misfire detected | Misfire of such level as to cause damage to three way catalyst | MIL flashing during misfire detection | Not applicable |
| | | Misfire of such level as to deteriorate emission but not to cause damage to three way catalyst | 2 driving cycles | Not applicable |
| P0325 (No.43) | Knock sensor circuit malfunction | Sensor output too low | 1 driving cycle | 1 driving cycle |
| | | Sensor output too high | | |
| P0335 | Crankshaft position sensor circuit malfunction | No signal during engine running and CMP sensor signal inputting | 1 driving cycle | Not applicable |
| P0340 (No.42) | Camshaft position sensor circuit malfunction | No signal for 3 sec. during engine cranking, REF signal pattern incorrect or POS signal voltage too high or too low | 1 driving cycle | Not applicable |
| P0400 | Exhaust gas recirculation flow malfunction detected | Excessive or insufficient EGR flow. | 2 driving cycles | Not applicable |
| P0403 (No.51) | EGR valve circuit malfunction | EGR valve electrical circuit open or shot to ground | 1 driving cycle | 1 driving cycle |
| P0420 | Catalyst system efficiency below threshold (Bank 1) | Output waveforms of HO2S–1 and HO2S–2 are similar. (Time from output voltage change of HO2S–1 to that of HO2S–2 is shorter than specification.) | 2 driving cycles | Not applicable |
| P0430 | Catalyst system efficiency below threshold (Bank 2) | Output waveforms of HO2S–1 and HO2S–2 are similar. (Time from output voltage change of HO2S–1 to that of HO2S–2 is shorter than specification.) | 2 driving cycles | Not applicable |
| P0443 | Purge control valve circuit malfunction | Purge control valve circuit is open or shorted to ground. | 2 driving cycles | Not applicable |
| P0500 (No.24) | Vehicle speed sensor malfunction | No signal while running in “D” range or during fuel cut at decelerating. | 2 driving cycles | 1 driving cycle |

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P0505 | Idle air control system malfunction | Difference between desired idle speed and actual idle speed continues to exceed specified value for longer than specified time. | 2 driving cycles | Not applicable |
| P0601 (No.71) | Internal control module memory check sum error | Data write error (or check sum error) when written into ECM | 1 driving cycle | 1 driving cycle |
| P1408 | Manifold absolute pressure sensor circuit malfunction | Manifold absolute pressure sensor output voltage is higher or lower than specified value (or sensor circuit shorted to ground or open). | 2 driving cycles | Not applicable |
| P1450 | Barometric pressure sensor circuit malfunction | Barometric pressure is lower or higher than specification. | 1 driving cycle | Not applicable |
| P1451 | Barometric pressure sensor performance problem | Difference between intake manifold pressure and barometric pressure is larger than specification. | 2 driving cycles | Not applicable |
| P1500 | Engine starter signal circuit malfunction | Engine starts with no starter signal or signal input during long period after start. | 2 driving cycles | Not applicable |
| P1510 | ECM back-up power supply malfunction | No back-up power after starting engine. | 1 driving cycle | Not applicable |

## For A/T system (Refer to Section 7B1 for diagnosis)

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P0705 (No.72) | Transmission range switch circuit malfunction | Multiple signals inputted simultaneously or P, R, N, D, 2 or L range signal not inputted while running at 60km/h or more. | 2 driving cycles | Not applicable |
| P0715 (No.76) | Input speed sensor circuit malfunction | Input speed sensor signal is lower than specification while running. | 2 driving cycles | Not applicable |
| P0720 (No.75) | Output speed sensor circuit malfunction | Output speed sensor signal not inputted while VSS signal being inputted. | 2 driving cycles | Not applicable |
| P0741 | TCC (lock-up) solenoid performance or stuck off | Actual TCC operation does not agree with ON/OFF control from PCM to TCC. | 2 driving cycles | Not applicable |
| P0743 (No.65) (No.66) | TCC (lock-up) solenoid electrical | Monitor signal OFF is detected when TCC control solenoid is ON or monitor signal ON is detected when it is OFF. | 1 driving cycle | Not applicable |
| P0751 | Shift solenoid A (#1) performance or stuck off | Gear change control from PCM to A/T does not agree with actual gear position of A/T. | 2 driving cycles | Not applicable |

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P0753 (No.61) (No.62) | Shift solenoid A (#1) electrical | Monitor signal OFF is detected when shift solenoid A (#1) is ON or monitor signal ON is detected when it is OFF. | 1 driving cycle | Not applicable |
| P0756 | Shift solenoid B (#2) performance or stuck off | Gear change control from PCM to A/T does not agree with actual gear position of A/T. | 2 driving cycles | Not applicable |
| P0758 (No.63) (No.64) | Shift solenoid B (#2) electrical | Monitor signal OFF is detected when shift solenoid B (#2) is ON or monitor signal ON is detected when it is OFF. | 1 driving cycle | Not applicable |
| P1875 | 4WD low switch circuit malfunction | Difference between vehicle speed detected by VSS and vehicle speed detected by output speed sensor and compensated by 4WD low switch is larger than specification. | 2 driving cycles | Not applicable |

### For immobilizer control system (Refer to Section 8G for diagnosis)

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting:) | MIL (vehicle without monitor connector) | MIL (vehicle with monitor connector) |
|---|---|---|---|---|
| P1620 (No.84) | ECU code not registered | Refer to Section 8G. | | |
| P1621 (No.83) | NO ECU code transmitted from Immobilizer Control Module | | | |
| P1622 (No.82) | Fault ECM | | | |
| P1623 (No.81) | ECU code not matched | | | |

**NOTE:**

- **DTC No. with asterisk (*) is detected only vehicle without diagnosis connector.**
- **DTC No. with asterisks (**) is detected only vehicle with diagnosis connector.**
- **For parenthetic No. in DTC column, it can used for vehicle with diagnosis connector.**
- **DTC No.12 appears when none of the other codes is identified.**

## Fail-Safe Table

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

| DTC No. | Trouble Area | Fail Safe Operation |
|---|---|---|
| P0100 (No.33, 34) | MAF SENSOR | • Injector drive time (fuel injection volume) is determined according to throttle valve opening and engine speed.<br>• EGR valve stops.<br>• Air flow of IAC valve is limited. |
| P0110 (No.23, 25) | IAT SENSOR | Each control is performed on the basis of 22.1°C (71.7°F) intake air temp. |
| P0115 (No.14, 15) | ECT SENSOR | • Each control except 4-A/T is performed on the basis of 29.9°C (85.8°F) engine coolant temp.<br>• 4-A/T control is performed assuming 31°C (87°F) (engine warmed up) or higher after 15 min. from engine start. |
| P0120 (No.21, 22) | TP SENSOR | • Each control except 4-A/T is performed on the basis of 124.5° throttle valve opening.<br>• 4-A/T control is performed on the basis of 0° throttle valve opening. |
| P0460 | FUEL LEVEL SENSOR | Each control is performed in the basis of full fuel level. |
| P0500 | VEHICLE SPEED SENSOR | Air flow of IAC valve is limited. |
| P1450 | BAROMETRIC PRESSURE SENSOR | Each control is performed based on 760 mmHg barometric pressure. |
| P0705 | TR SWITCH | A/T control is performed in priority order of L, 2, N, D, R and P. |
| P0720 | OUTPUT SPEED SENSOR CIRCUIT MALFUNCTION | A/T control is performed by using signal from VSS. |
| P0753 | SHIFT SOLENOID A (#1) | • A/T control using 3rd gear is performed when D range, 1st, or 2nd gear is used.<br>• TCC solenoid OFF |
| P0758 | SHIFT SOLENOID B (#2) | • A/T control using 4th gear is performed when D range, 2nd or 3rd gear is used.<br>• When both shift solenoids A (#1) and B (#2) failed simultaneously, A/T control using 4th gear is always performed in D range.<br>• TCC solenoid OFF |
| P0743 | TCC (Lock-up) SOLENOID | TCC (Lock-up) solenoid OFF |

## Scan Tool Data

As the data values given below 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 in the below table that can be checked by the scan tool are those output from ECM (PCM) 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 referring to "Ignition Timing Inspection" in Section 6F2.

**NOTE:**

- **For asterisk (∗) marked item in "OTHER" column, item can be read only SUZUKI scan tool.**
- **When checking the data with the engine running at idle or racing, be sure to shift M/T 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, all electric loads, P/S and all the other necessary switches.**

| Scan Tool Data | Condition | Normal Condition/ Reference Value | Other |
|---|---|---|---|
| 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 | Environmental temp. +20 °C (+36 °F) –5 °C (–9 °F) | |
| DESIRE IDLE (Desired idle speed) | At idling with no load after warming up | 700 rpm | ∗ |
| CLOSED THROT POS (Closed Throttle Position) | With ignition switch ON, accelerator pedal released | ON | ∗ |
| | With ignition switch ON, accelerator pedal depressed | OFF | |
| IAC FLOW DUTY | At specified idle speed after warming up | 5 – 40 % | ∗ |
| ENGINE SPEED | At idling with no load after warming up | Desired idle speed ± 50 rpm | |
| SHORT FT B1 (Short term fuel trim) | At specified idle speed after warming up | –15 ~ +15 % | |
| SHORT FT B2 (Short term fuel trim) | At specified idle speed after warming up | –15 ~ +15 % | |
| LONG FT B1 (Long term fuel trim) | At specified idle speed after warming up | –15 ~ +15 % | |
| LONG FT B2 (Long term full trim) | At specified idle speed after warning up | –15 ~ +15 % | |
| IGNITION ADVANCE | At specified idle speed with no load after warming up | 6 – 17° | |
| BATTERY VOLTAGE | Ignition switch ON/engine stopped | 10 – 14 V | ∗ |
| MAF (Mass Air Flow Rate) | At specified idle speed with no load after warming up. | 2.6 – 4.5 g/s 0.34 – 0.59 lb/min | |
| | At 2500 r/min with no load after warming up. | 10 – 16 g/s 1.32 – 2.11 lb/min | |
| INJ PULSE WIDTH B1 (Fuel Injection Pulse Width) | At specified idle speed with no load after warming up. | 2.0 – 3.3 msec | ∗ |
| | At 2500 r/min with no load after warming up. | 2.2 – 3.2 msec | |

| Scan Tool Data | Condition | Normal Condition/ Reference Value | Other |
|---|---|---|---|
| INJ PULSE WIDTH B2 | At specified idle speed with no load after warming up. | 2.0 – 3.3 msec | * |
| | At 2500 r/min with no load after warming up. | 2.2 – 3.2 msec | |
| THROTTLE POS (Absolute Throttle Position) | With ignition switch ON/warmed up engine stopped, accelerator pedal released | 9.8 – 18.2 % | |
| | With ignition switch ON/warmed up engine stopped, accelerator pedal depressed fully | 72 – 87.2 % | |
| TP SENSOR VOLT (TP Sensor Output Voltage) | With ignition switch ON/warmed up engine stopped, accelerator pedal released | 0.4 – 1.0 V | * |
| | With ignition switch ON/warmed up engine stopped, accelerator pedal depressed fully. | 3.76 – 4.36 V | |
| O2S B1 S1 (HO2S-1 Output Voltage) | At specified idle speed after warming up | 0.05 – 0.95 V | |
| O2S B1 S2 (HO2S-2 Output Voltage) | When engine is running at 2000 r/min. for 3 min or longer after warming up. | 0.05 – 0.95 V | |
| O2S B2 S1 (HO2S-2 Output Voltage) | When engine is running at 2000 r/min. for 3 min or longer after warming up. | 0.05 – 0.95 V | |
| O2S B2 S2 (HO2S-2 Output Voltage) | When engine is running at 2000 r/min. for 3 min or longer after warming up. | 0.05 – 0.95 V | |
| FUEL SYSTEM B1 (Fuel System Status) | At specified idle speed after warming up. | Closed | * |
| FUEL SYSTEM B2 (Fuel System Status) | At specified idle speed after warming up. | Closed | |
| CALC LOAD (Calculated Load Value) | At specified idle speed with no load after warming up. | 10 – 25 % | |
| | At 2500 r/min with no load after warming up. | 14 – 23 % | |
| TOTAL FT TRIM B1 | At specified idle speed after warming up. | –30 – +30 % | * |
| TOTAL FT TRIM B2 | At specified idle speed after warming up. | –30 – +30 % | |
| MAP | At specified idle speed after warming up. | 25 – 35 kPa | |
| CANIST PRG DUTY (EVAP Canister Purge Flow Duty) | At specified idle speed after warming up. | 0 % | * |
| VEHICLE SPEED. | At stop. | 0 km/h 0 MPH | |
| FUEL CUT | When engine is at fuel cut condition | ON | * |
| | Other than fuel cut condition | OFF | |
| EGR VALVE | At specified idle speed after warming up | 0 % | * |
| BLOWER FAN | Ignition switch ON, blower fan switch ON | ON | * |
| | Ignition switch ON, blower fan switch OFF | OFF | |
| A/C CONDENSER FAN | Ignition switch ON, A/C not operating | OFF | * |
| | Ignition switch ON, A/C operating | ON | |
| PSP SWITCH | Engine running at idle speed and steering wheel at straight ahead position | OFF | * |
| | Engine running at idle speed and steering wheel turned to the right or left as far as it stops | ON | |
| A/C SWITCH (if equipped) | When A/C not operating | OFF | * |
| | When A/C operating | ON | |

| Scan Tool Data | Condition | Normal Condition/ Reference Value | Other |
|---|---|---|---|
| PNP SIGNAL (Transmission Range Switch) (for 4-A/T) | With ignition switch ON, selector lever in "P" or "N" position | P/N Range | * |
| | With ignition switch ON, selector lever in "R", "D", "2" or "L" position | D Range | |
| FUEL TANK LEVEL | Ignition switch ON | 0 – 100 % | * |
| ELECTRIC LOAD | Ignition ON, small light OFF | OFF | * |
| | Ignition switch ON, small light ON | ON | * |
| VSS (Vehicle speed sensor) (for 4-A/T) | At stop. | 0 km/h 0 MPH | * |
| GEAR POSITION (for 4-A/T) | Ignition switch ON, selector lever is shifted at "R", "D", "2" or "L" range and vehicle stops. | 1st | * |
| THROT POS LEVEL (Throttle position level for 4-A/T) | "0" (about idle position), "1","2","3","4","5","6" or "7" (about full open) appears according to throttle valve opening. | | * |
| SHIFT SOL #1 (A) CON (Shift solenoid #1 command signal) MON (Shift solenoid #1 monitor) (for 4-A/T) | Ignition switch ON<br>Selector lever is shifted at "P", "R", "N", "D", "2" or "L" range.<br>Vehicle stops. | ON | * |
| SHIFT SOL #2 (B) CON (Shift solenoid #2 command signal) MON (Shift solenoid #2 monitor) (for 4-A/T) | Ignition switch ON<br>Selector lever is shifted at "P", "R", "N", "D", "2" or "L" range.<br>Vehicle stops. | OFF | * |
| TCC SOL (for 4-A/T) CON (Torque converter clutch solenoid command signal) MON (Torque converter clutch solenoid monitor) | Ignition switch ON<br>Selector lever is shifted at "P", "R", "N", "D", "2" or "L" range.<br>Vehicle stops. | OFF | * |
| TRANS RANGE (for 4-A/T) | Ignition switch ON, selector lever is at "P", "R", "N", "D", "2" or "L" range. | P, R, N, D, 2 or L | * |
| BRAKE SW (Brake, stop lamp, switch) (for 4-A/T) | Ignition switch ON, Brake pedal is released. | OFF | * |
| | Ignition switch ON, Brake pedal is depressed. | ON | |
| O/D OFF SW (Overdrive cut switch) | Ignition switch ON, Overdrive cut switch OFF | OFF | * |
| | Ignition switch ON, Overdrive cut switch ON | ON | |
| MODE SELECT SW (Power/Normal change switch) (for 4-A/T) | Ignition switch ON, P/N change switch is at normal position. | NORMAL | * |
| | Ignition switch ON, P/N change switch is at power position. | POWER | |
| 4WD-L SW (4WD low switch) | Ignition switch ON, Transfer lever is shifted at "4H" or "2H" position. | OFF | * |
| | Ignition switch ON, Transfer lever is shifted at "4L" position. | ON | |

## Scan tool data definitions

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

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

**DESIRE IDLE (DESIRED IDLE SPEED RPM)**
The desired idle speed is an ECM (PCM) internal parameter which indicates the ECM (PCM) requested idle. If the engine is not running, the number is not valid.

**CLOSED THROT POS (CLOSED THROTTLE POSITION ON/OFF)**
This parameter will read ON when the throttle valve is fully closed. Or OFF when the throttle is not fully closed.

**IAC FLOW DUTY (%)**
This parameter indicates IAC valve opening rate which controls bypass air flow.

**ENGINE SPEED (RPM)**
It is computed by reference pulses from the Camshaft Position Sensor.

**SHORT FT B1 (SHORT TERM FUEL TRIM BANK 1, %)/SHORT FT B2 (SHORT TERM FUEL TRIM BANK 2, %)**
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 BANK 1, %)/LONG FT B2 (LONG TERM FUEL TRIM BANK 2, %)**
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.

**IGNITION ADVANCE (IGNITION TIMING ADVANCE FOR NO.1 CYLINDER, °)**
Ignition timing of No.1 cylinder is commanded by ECM (PCM). 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 (PCM).

**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.

**INJ PULSE WIDTH B1 (FUEL INJECTION PULSE WIDTH BANK 1, MSEC)/INJ PULSE WIDTH B2 (FUEL INJECTION PULSE WIDTH BANK 2, MSEC)**
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM (PCM).

**THROTTLE POS (ABSOLUTE THROTTLE POSITION, %)**
When throttle position sensor is fully closed position, throttle opening is indicated as 0 % and 100 % for full open position.

**TP SENSOR VOLT (TP SENSOR OUTPUT VOLTAGE, V)**
Throttle Position Sensor reading provides throttle valve opening information in the from of voltage.

**O2S B1 S1 (HO2S BANK 1 SENSOR 1 OUTPUT VOLTAGE, V)/O2S B2 S1 (HO2S BANK 2 SENSOR 1 OUTPUT VOLTAGE, V)**
It indicates output voltage of HO2S SENSOR 1 installed on exhaust manifold (pre-catalyst).

**O2S B1 S2 (HO2S BANK 1 SENSOR 2 OUTPUT VOLTAGE, V)/O2S B2 S2 (HO2S BANK 2 SENSOR 2 OUTPUT VOLTAGE, V)**
If indicates output voltage of HO2S SENSOR 2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

**FUEL SYSTEM B1 (FUEL SYSTEM BANK 1 STATUS)/FUEL SYSTEM B2 (FUEL SYSTEM BANK 2 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.
CLOSED-ONE O2S: Closed loop, but fault with at least one oxygen sensor may be using single oxygen sensor for fuel control.

**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 x 100%.

**TOTAL FUEL TRIM (%)**
The value of total fuel trim is obtained by putting values of short term fuel trim and long term fuel trim together. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

**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.

**VEHICLE SPEED (KM/H, MPH)**
It is computed based on pulse signals from vehicle speed sensor on transfer or transmission.

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

**MAP (MANIFOLD ABSOLUTE PRESSURE, MMHG, KPA)**
This parameter indicates the pressure in the intake manifold absolute pressure.

**A/C CONDENSER FAN (ON/OFF)**
This parameter indicates the state of the A/C Condenser Fan control signal.

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

**EGR VALVE (%)**
This parameter indicates opening rate of EGR valve which controls the amount of EGR flow.

**A/C SWITCH (ON/OFF)**
ON: Command for operation being output from A/C amplifier to compressor.
OFF: Command for operation not being output.

**PSP SWITCH (ON/OFF)**
ON: PSP switch detects P/S operation. (high P/S pressure)
OFF: PSP switch not detects P/S operation.

**PNP SIGNAL (TRANSMISSION RANGE SWITCH, P/N OR D RANGE)**
Whether the transmission range switch (P/N position switch) at P or N range or at R, D, 2 or L range is displayed. If at P or N range, "P/N range" is displayed and if at R, D, 2 or L range, "D range" is displayed.

**FUEL TANK LEVEL (%)**
This parameter indicates approximate fuel level in the fuel tank. As the detectable range of the fuel level sensor is set as 0 to 100 %, however, with some models whose fuel tank capacity is smaller, the indicated fuel level may be only 70 % even when the fuel tank is full.

**ELECTRIC LOAD (ON/OFF)**
ON: Small light switch ON or rear window defogger switch ON.
OFF: Small light switch OFF and rear window defogger switch OFF.

**VSS (4-A/T) (KM/H, MPH)**
It is computed by using pulse signals from vehicle speed sensor on 4-speed automatic transmission.

**THROT POS LEVEL (THROTTLE POSITION LEVEL FOR 4-A/T, "0", "1", "2", "3", "4","5","6" OR "7")**
This parameter indicates which level (zone) the throttle valve opening is in.
The throttle opening is divided into 8 levels (zones) from "0" (about idle position) to "7" (about full open) and signals are assigned to each opening level (zone). PCM controls the automatic gear change of the automatic transmission by using these signals according to the signal from the TP sensor.

**GEAR POSITION (1ST, 2ND, 3RD OR 4TH)**
The gear position is determined on the basis of the command state signals generated from PCM to shift solenoids A and B (#1 and #2) and displayed as shown in the table below.

| | | SHIFT SOLENOID-A | SHIFT SOLENOID-B |
|---|---|---|---|
| DISPLAY | 1ST | ON | OFF |
| | 2ND | ON | ON |
| | 3RD | OFF | ON |
| | 4TH | OFF | OFF |

**SHIFT SOL #1 CON/MON (SHIFT SOLENOID #1, A COMMAND/MONITOR, ON/OFF)**
CON-ON: ON command being output to shift solenoid #1, A.
CON-OFF: ON command not being output.
MON-ON: Electricity being passed to shift solenoid #1, A.
MON-OFF: Electricity not being passed.

**SHIFT SOL #2 CON/MON (SHIFT SOLENOID #2, B COMMAND/MONITOR, ON/OFF)**
CON-ON: ON command being output to shift solenoid #2, B.
CON-OFF: ON command not being output.
MON-ON: Electricity being passed to shift solenoid #2, B.
MON-OFF: Electricity not being passed.

**TCC SOL CON/MON (TORQUE CONVERTER CLUTCH SOLENOID COMMAND/MONITOR, ON/OFF)**
CON-ON: ON command being output to TCC solenoid.
CON-OFF: ON command not being output.
MON-ON: Electricity being passed to TCC solenoid.
MON-OFF: Electricity not being passed.

**TRANS RANGE (TRANSMISSION RANGE, P, R, N, D, 2 OR L)**
It indicates transmission range according to transmission range switch signal.

**BRAKE SW (BRAKE, STOP LAMP, SWITCH, ON/OFF)**
OFF: Brake pedal is released.
ON: Brake pedal is depressed.

**O/D OFF SW (OVERDRIVE CUT SWITCH, ON/OFF)**
OFF: Overdrive cut switch OFF.
ON: Overdrive cut switch ON.

**MODE SELECT SW (POWER/NORMAL CHANGE SWITCH, POWER/NORMAL)**
POWER: Switch button is at POWER position.
NORMAL: Switch button is at NORMAL position.

**4WD-L SW (4WD-LOW SWITCH, ON/OFF)**
ON: Transfer lever is shifted to 4L position.
OFF: Transfer lever is shifted to 4H or 2H position.

## Engine Symptom Diagnosis

Perform troubleshooting referring to following table when ECM (PCM) has detected no DTC and no abnormality has been found in visual inspection and engine basic inspection previously.

| Condition | Possible Cause | Correction |
|---|---|---|
| **Hard starting (Engine cranks OK)** | Faulty idle air control system | "Diag. Flow Table B-4" in this section. |
| | Faulty ECT sensor or MAF sensor | "Engine Coolant Temperature Sensor (ECT Sensor)" or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| | Low compression | "Compression Check" in Section 6A2. |
| | Faulty hydraulic valve lash adjuster | "Camshaft and Valve Lash Adjuster" in Section 6A2. |
| | Compression leak from valve seat | "Valves and Cylinder Heads" in Section 6A2. |
| | Sticky valve stem | "Valves and Cylinder Heads" in Section 6A2. |
| | Weak or damaged valve springs | "Valves and Cylinder Heads" in Section 6A2. |
| | Compression leak at cylinder head gasket | "Valves and Cylinder Heads" in Section 6A2. |
| | Sticking or damaged piston ring | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn piston, ring or cylinder | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Malfunctioning PCV valve | "PCV System" in Section 6E2. |
| **Engine has no power** | Engine overheating | Refer to "Overheating" in this table. |
| | Defective spark plug | "Spark Plug" in Section 6F2. |
| | Faulty ignition coil with ignitor | "Ignition Coil Assembly (Ignitor and Ignition Coil)" in Section 6F2. |
| | Fuel pressure out of specification (dirty fuel filter, dirty or clogged fuel hose or pipe, malfunctioning fuel pressure regulator, malfunctioning fuel pump) | "Diag. Flow Table B-3" in this section. |
| | Maladjusted TP sensor installation angle | "Throttle Position Sensor (TP Sensor)" in Section 6E2. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty TP sensor, ECT sensor or MAF sensor | Refer to "Throttle position sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECT Sensor)", or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |
| | Dragging brakes | "Diagnosis Table" in Section 5. |
| | Slipping clutch | "Diagnosis Table" in Section 7C. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Improper engine idling or engine fails to idle** | Faulty spark plug | "Spark Plug" in Section 6F2. |
| | Faulty ignition coil with ignitor | "Ignition Coil Assembly (Ignitor and Ignition Coil)" in Section 6F2. |
| | Fuel pressure out of specification | "Diag. Flow Table B-3" in this section. |
| | Engine overheating | Refer to "Overheating" in this table. |
| | Maladjusted TP sensor installation angle if adjustable | "Throttle Position Sensor (TP Sensor)" in Section 6E2. |
| | Faulty idle air control system | "Diag. Flow Table B-4" in this section. |
| | Faulty FIA (fast idle air) valve | "Fast Idle Air Valve" in Section 6E2. |
| | Faulty evaporative emission control system | "Emission Control System" in Section 6E2. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECT sensor, TP sensor or MAF sensor | Refer to "Throttle Position Sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECT Sensor)", or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |
| | Malfunctioning PCV valve | "PCV System" in Section 6E2. |
| **Engine hesitates (Momentary lack of response as the accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make the vehicle move, as from a stop sign.)** | Spark plug faulty or plug gap as out of adjustment | "Spark Plug" in Section 6F2. |
| | Fuel pressure out of specification (clogged fuel filter, faulty fuel pressure regulator, clogged fuel filter, hose or pipe) | "Diag. Flow Table B-3" in this section. |
| | Engine overheating | Refer to "Overheating" in this table. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty TP sensor, ECT sensor or MAF sensor | Refer to "Throttle position sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECT Sensor)", or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Surges (Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and down with no change in the accelerator pedal.)** | Defective spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.) | "Spark Plug" in Section 6F2. |
| | Variable fuel pressure (clogged fuel filter, kinky or damaged fuel hose and line, faulty fuel pressure regulator) | "Diag. Flow Table B-3" in this section. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty MAF sensor | "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| **Excessive detonation (The engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)** | Engine overheating | Refer to "Overheating" in this table. |
| | Faulty spark plug | "Spark Plug" in Section 6F2. |
| | Improper ignition timing | "Ignition Timing Check and Adjustment" in Section 6F2. |
| | Clogged fuel filter and fuel lines | "Fuel Pressure Inspection" in Section 6E2. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty ECT sensor or MAF sensor | Refer to "Engine Coolant Temperature Sensor (ECT Sensor)" or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2 |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| | Excessive carbon deposits in combustion chamber | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Poor knock sensor performance | "DTC P0325 Diag. Flow Table" in this section. |
| **Overheating** | Inoperative thermostat | "Thermostat" in Section 6B. |
| | Poor water pump performance | "Water Pump" in Section 6B. |
| | Clogged or leaky radiator | "Radiator" in Section 6B. |
| | Improper engine oil grade | "Engine Oil and Oil Filter Change" in Section 0B. |
| | Clogged oil filter or oil strainer | "Oil Pressure Check" in Section 6A2. |
| | Poor oil pump performance | "Oil Pressure Check" in Section 6A2. |
| | Dragging brakes | "Diagnosis Table" in Section 5. |
| | Slipping clutch | "Diagnosis Table" in Section 7C. |
| | Blown cylinder head gasket | "Valves and Cylinder Heads" in Section 6A2. |
| | Faulty A/C condenser fan control system | "Diag. Flow Table B-6" and "Diag. Flow Table B-7" in this section. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor gasoline mileage** | Faulty spark plug (improper gap, heavy deposits, and burned electrodes, etc.) | "Spark Plug" in Section 6F2. |
| | Fuel pressure out of specification | "Diag. Flow Table B-3" in this section. |
| | Faulty TP sensor, ECT sensor or MAF sensor | Refer to "Throttle Position Sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECT Sensor)", or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECM (PCM) | "Inspection of ECM (PCM) and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |
| | Poor valve seating | "Valves and Cylinder Heads" in Section 6A2. |
| | Dragging brakes | "Diagnosis Table" in Section 5. |
| | Slipping clutch | "Diagnosis Table" in Section 7C. |
| | Thermostat out of order | "Thermostat" in Section 6B. |
| | Improper tire pressure | "Diagnosis Table" in Section 3. |
| | Faulty A/C compressor control system | "Diag. Flow Table B-5" and "Diag. Flow Table B-8" in this section. |
| **Excessive engine oil consumption** | Sticky piston ring | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn piston and cylinder | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn piston ring groove and ring | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Improper location of piston ring gap | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn or damaged valve stem seal | "Valves and Cylinder Heads" in Section 6A2. |
| | Worn valve stem | "Valves and Cylinder Heads" in Section 6A2. |
| **Low oil pressure** | Improper oil viscosity | "Engine Oil and Oil Filter Change" in Section 0B. |
| | Malfunctioning oil pressure switch | "Oil Pressure Switch" in Section 8C. |
| | Clogged oil strainer | "Oil Pan and Oil Pump Strainer" in Section 6A2. |
| | Functional deterioration of oil pump | "Oil Pump" in Section 6A2. |
| | Worn oil pump relief valve | "Oil Pump" in Section 6A2. |
| | Excessive clearance in various sliding parts | "Inspection" for each parts in Section 6A2. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Engine noise See NOTE below.** | Faulty hydraulic valve lash adjuster | "Camshaft and Valve Lash Adjuster" in Section 6A2. |
| | Worn valve stem and guide | "Valves and Cylinder Heads" in Section 6A2. |
| | Weak or broken valve spring | "Valves and Cylinder Heads" in Section 6A2. |
| | Warped or bent valve | "Valves and Cylinder Heads" in Section 6A2. |
| | Loose camshaft housing bolts | "Camshaft and Valve Lash Adjuster" in Section 6A2. |
| | Worn piston, ring and cylinder bore | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn crankpin bearing | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn crankpin | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Loose connecting rod nuts | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Low oil pressure | Refer to "Low Oil Pressure" of this table. |
| | Worn crankshaft journal bearing | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |
| | Worn crankshaft journal | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |
| | Loose lower crankcase (bearing cap) bolts | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |
| | Excessive crankshaft thrust play | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |

**NOTE:**

**Before checking the mechanical noise, make sure the followings.**

- **Ignition timing is properly adjusted.**
- **Specified spark plug is used.**
- **Specified fuel is used.**

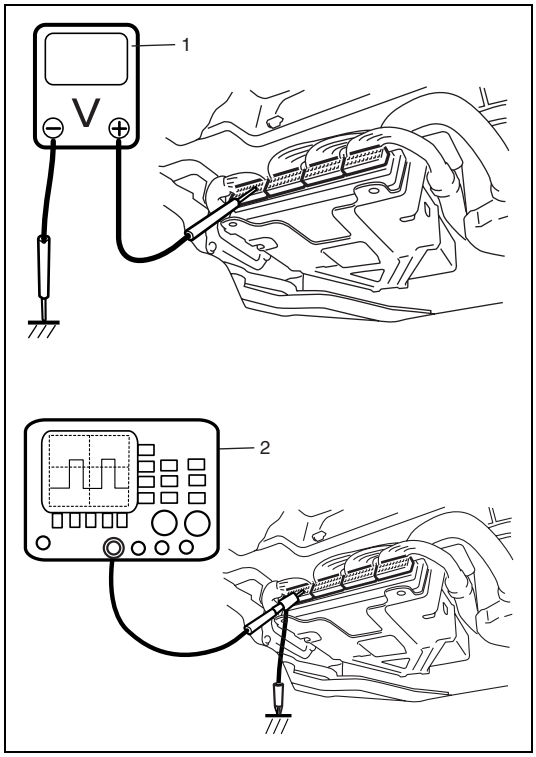
## Inspection of ECM (PCM) and Its Circuits

PCM (ECM) and its circuits can be checked at PCM (ECM) wiring couplers by measuring voltage, pulse signal and resistance.

**CAUTION:**

**PCM/ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to PCM (ECM) with couplers disconnected from it.**

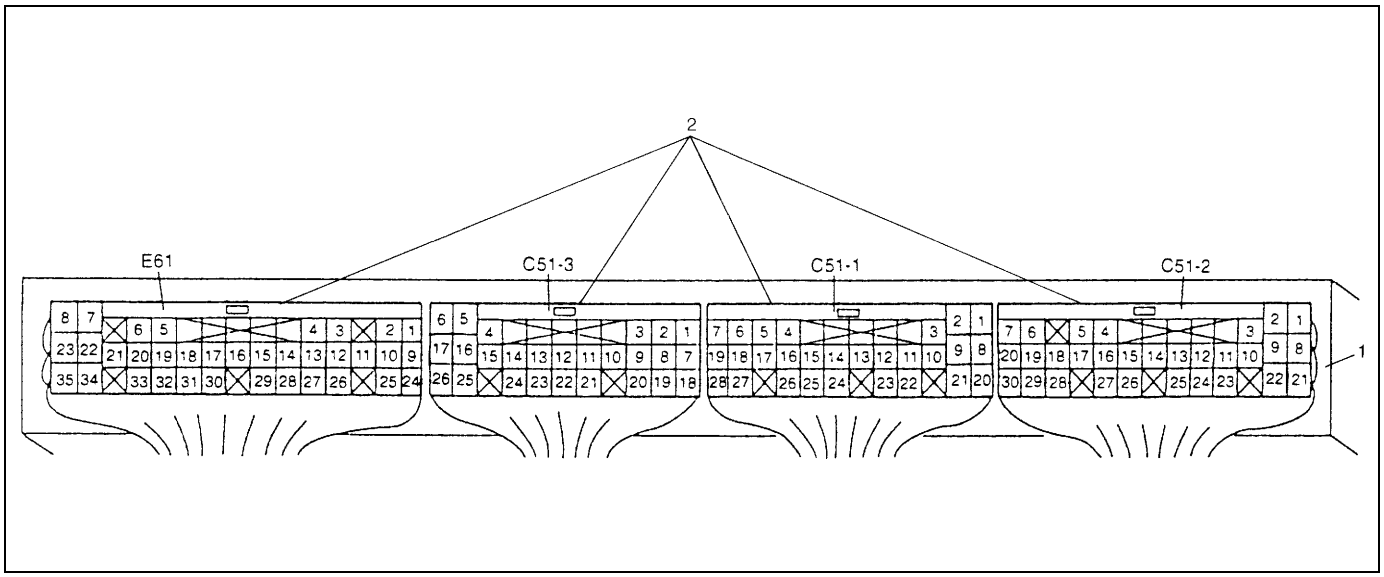
### Voltage Check




1) Remove PCM (ECM) cover from bracket referring to "Engine Control Module (ECM)/Powertrain Control Module (PCM)" in Section 6E2.
2) Check voltage at each terminal of couplers connected, using voltmeter, or oscilloscop (2).

**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.**




| | |
|---|---|
| 1. | PCM (ECM) |
| 2. | PCM (ECM) connector (Viewed from harness side) |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| E61-1 | GRY/BLK | Output of 5 V power source for CO adjusting resistor (if equipped) | 4.5 – 5.5 V | Ignition switch turned ON |
| E61-2 | WHT | Power source for internal memory | 10 – 14 V | Ignition switch turned ON and OFF |
| E61-3 | WHT/BLU | Output duty select switch terminal (if equipped) | 10 – 14 V | Ignition switch turned ON |
| E61-4 | GRY | Throttle position signal for cruise control module (if equipped) | ✱0 – 0.6 V ↑↓ 8 – 12 V (Repeated indicator) | Ignition switch turned ON (Output signal is 64 Hz active low duty pulse. Duty ratio varies as throttle valve is opened gradually.) Throttle opening 0% = 0.9ms ON duty Throttle opening 100% = 9.38ms ON duty |
| E61-5 | PPL | Duty output terminal (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | Immobilizer indicator lamp output (if equipped) | 10 – 14 V | While engine running |
| E61-6 | BRN | Engine revolution signal for tachometer | 0 – 1 V | Ignition switch turned ON with engine stop |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is pulse. Pulse frequency varies depending on engine speed. (3000 r/min = 150 Hz)) |
| E61-7 | PPL/YEL | MIL (Malfunction indicator lamp) output | 0 – 2.5 V | Ignition switch turned ON with engine stop |
| | | | 3.5 – 4.5 V | Engine running |
| E61-8 | PNK | Serial communication line for BCM | 10 – 14 V | Ignition switch turned ON |
| E61-9 | BLU | Main power supply relay output | 10 – 14 V | Ignition switch turned OFF |
| | | | 0 – 2 V | Ignition switch turned ON |
| E61-10 | GRY/BLU | CO adjusting resistor signal (if equipped) | – | – |
| E61-11 | – | – | – | – |
| E61-12 | PPL/WHT | Serial communication line of data link connector 5 V | 4 – 6 V | Ignition switch turned ON |
| E61-13 | PPL/RED | Serial communication line of data link connector 12 V | 10 – 14 V | Ignition switch turned ON |
| E61-14 | WHT/RED | Test switch terminal (if equipped) | 10 – 14 V | Ignition switch turned ON |
| E61-15 | BLK/RED | Electric load signal for rear defogger switch (if equipped) | 0 – 1 V | Ignition switch turned ON, rear defogger switch OFF |
| | | | 10 – 14 V | Ignition switch turned ON, rear defogger switch ON |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| E61-16 | PNK/WHT | Electric load signal for heater blower motor | 10 – 14 V | Ignition switch turned ON, blower fan selector selected at under 3rd speed position |
| | | | 0 – 1 V | Ignition switch turned ON, blower fan selector selected at 3rd speed position or more |
| E61-17 | GRN/BLK | A/C request signal (if equipped) | 10 – 14 V (High input) | Ignition switch turned ON, Blower fan selector selected OFF position or A/C switch turned OFF or A/C evaporator temp. less than 2.5°C, 36.5°F |
| | | | 0 – 1 V (Low input) | Ignition switch turned ON, Blower fan selector selected ON position and A/C switch turned ON with A/C evaporator temp. more than 4°C, 39.2°F |
| E61-18 | BLU/ORN | Relay of high speed side for A/C condenser fan motor (if equipped) | 10 – 14 V | Ignition switch turned ON, Engine coolant temperature under 115°C, 239°F or A/C request signal high input |
| | | | 0 – 1 V | Ignition switch turned ON, Engine coolant temperature more than 114°C, 237°F or medium pressure switch in refrigerant pressure switch is OFF with A/C request signal low input |
| E61-19 | ORN/BLK | "4WD" lamp output | 0 – 1 V | Ignition switch turned ON, Transfer selector selected at "4H" or "4L" range |
| | | | 10 – 14 V | Ignition switch turned ON, Transfer selector selected at "2H" range |
| E61-20 | – | – | – | – |
| E61-21 | – | – | – | – |
| E61-22 | YEL/BLU | Relay output of low speed side for A/C condenser fan motor (if equipped) | 10 – 14 V | Ignition switch turned ON, Engine coolant temperature under 115°C, 239°F or A/C request signal high input |
| | | | 0 – 1 V | Ignition switch turned ON, Engine coolant temperature more than 114°C, 237°F or A/C request signal low input |
| E61-23 | WHT/GRN | Fuel pump relay output (without immobilizer control system) | 0 – 2.5 V | For 3 sec. after ignition switch turned ON or while engine running |
| | | | 10 – 14 V | After 3 sec. from ignition switch turned ON or at engine stopped |
| E61-24 | GRY/YEL | Ground for CO adjusting resistor (if equipped) | Below 0.3 V | Ignition switch turned ON |
| E61-25 | YEL/WHT | ECT sensor signal for combination meter | ✱0 – 0.6 V ↑↓ 4 – 6 V (Repeated indicator) | Ignition switch turned ON (Output signal is 1 Hz active low duty pulse. Duty ratio varies depending on ECT.) ECT –30°C = 10% ON duty ECT 130°C = 90% ON duty |
| E61-26 | – | – | – | – |
| E61-27 | – | – | – | – |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| E61-28 | BLU/WHT | Fuel level sensor signal | 0 – 6 V | Ignition switch turned ON<br>Voltage depends on fuel level |
| E61-29 | YEL | Diagnosis switch terminal (if equipped) | 10 – 14 V | Ignition switch turned ON |
| E61-30 | PNK/BLK | Idle up signal from ABS control module (if equipped) | 10 – 14 V | Ignition switch turned ON, ABS not operated |
| | | | 0 – 1 V | Ignition switch turned ON, ABS operated |
| E61-31 | ORN/BLU | Selector switch signal of Power mode/Normal mode for A/T | 0 – 1 V | Ignition switch turned ON, Selector switch selected at Power mode |
| | | | 10 – 14 V | Ignition switch turned ON, Selector switch selected at Normal mode |
| E61-32 | RED/YEL | Electric load signal for clearance lamp | 0 – 1 V | Ignition switch turned ON, Clearance lamp not lighted up |
| | | | 10 – 14 V | Ignition switch turned ON, Clearance lamp lighted up |
| E61-33 | YEL/RED | Selector switch signal of OD On/Off for A/T | 0 – 1 V | Ignition switch turned ON, while OD On/Off switch pushed |
| | | | 10 – 14 V | Ignition switch turned ON, while OD On/Off switch not pushed |
| E61-34 | GRN/WHT | Electric load signal for stop lamp | 0 – 1 V | Ignition switch turned ON, Stop lamp not lighted up |
| | | | 10 – 14 V | Ignition switch turned ON, Stop lamp lighted up |
| E61-35 | PNK/BLU | OD off signal for cruise control module (if equipped) | 0 – 1 V | Ignition switch turned ON, OD OFF selector switch selected at OD OFF |
| | | | 10 – 14 V | Ignition switch turned ON, OD OFF selector switch selected at OD ON |
| | | | | |
| C51-3-1 | LT BLU | Intake air temp. (IAT) sensor signal | 3.7 – 3.9 V | Ignition switch turned ON, IAT at 0°C, 32°F |
| | | | 1.8 – 2.1 V | Ignition switch turned ON, IAT at 40°C, 104°F |
| | | | 1.5 – 1.75 V | Ignition switch turned ON, IAT at 80°C, 176°F |
| C51-3-2 | ORN/BLK | Engine coolant temp. (ECT) sensor signal | 3.7 – 3.85 V | Ignition switch turned ON, ECT at 0°C, 32°F |
| | | | 1.45 – 1.6 V | Ignition switch turned ON, ECT at 50°C, 122°F |
| | | | 0.4 – 0.5 V | Ignition switch turned ON, ECT at 100°C, 212°F |
| C51-3-3 | WHT | Knock sensor signal | 2 – 3 V | Ignition switch turned ON |
| C51-3-4 | BLU/BLK | Main power supply | 10 – 14 V | Ignition switch turned ON |
| C51-3-5 | GRY/YEL | Ground for mass air flow (MAF) sensor | Below 0.3 V | Ignition switch turned ON |
| C51-3-6 | BLK/GRN | Ground for ECM | Below 0.3 V | Ignition switch turned ON |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-3-7 | PNK | A/C compressor relay output (if equipped) | 10 – 14 V | Engine running, A/C request signal high input or ECT more than 113°C, 235°F |
| | | | 0 – 1 V | Engine running, A/C request signal low input and ECT less than 110°C, 198°F |
| C51-3-8 | RED/WHT | Manifold absolute pressure (MAP) sensor signal (if equipped) | 3.3 – 4.3 V | Ignition switch turned ON with barometric pressure at 100kPa, 760mmHg |
| | | | 3.3 – 4.3 V | While specified idle speed with barometric pressure at 100kPa, 760mmHg |
| C51-3-9 | RED/GRN | Throttle position (TP) sensor signal | 0.5 – 1.2 V | Ignition switch turned ON and throttle valve at idle position with warmed engine |
| | | | 3.4 – 4.7 V | Ignition switch turned ON and throttle valve at full open position |
| C51-3-10 | PPL/WHT | Mass air flow (MAF) sensor signal | 1.0 – 1.6 V | Ignition switch turned ON with engine stop |
| | | | 1.7 – 2.0 V | While engine running with idle speed |
| C51-3-11 | RED | Oxygen signal of heated oxygen sensor–1 (Bank 1) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 0.5 V and under 0.45 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |
| C51-3-12 | GRY/YEL | Ground for throttle position (TP) sensor | Below 0.3 V | Ignition switch turned ON |
| C51-3-13 | GRY/RED | Output of 5 V power source for throttle position (TP) sensor | 4.5 – 5.5 V | Ignition switch turned ON |
| C51-3-14 | GRY/RED | Output of 5 V power source for Manifold absolute pressure (MAP) sensor (if equipped) | 4.5 – 5.5 V | Ignition switch turned ON |
| C51-3-15 | BLU/BLK | Main power supply | 10 – 14 V | Ignition switch turned ON |
| C51-3-16 | – | – | – | – |
| C51-3-17 | BLK/ORN | Ground for ECM | Below 0.3 V | Ignition switch turned ON |
| C51-3-18 | ORN | Medium pressure signal for A/C refrigerant pressure switch (if equipped) | 0 – 1 V | Ignition switch turned ON, A/C refrigerant pressure below 1400kPa, 14kg/cm$^2$, 21.5psi |
| | | | 10 – 14 V | Ignition switch turned ON, A/C refrigerant pressure over 1800kPa, 18kg/cm$^2$, 27.5psi |
| C51-3-19 | – | – | – | – |
| C51-3-20 | BLK/WHT | Ignition switch signal | 0 – 1 V | Ignition switch turned OFF |
| | | | 10 – 14 V | Ignition switch turned ON |
| C51-3-21 | RED/BLU | Oxygen signal of heated oxygen sensor–1 (Bank 2) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 0.5 V and under 0.45 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-3-22 | RED/BLK | Oxygen signal of heated oxygen sensor–2 (Bank 1) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 1.2 V and under 0.6 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |
| C51-3-23 | RED/YEL | Oxygen signal of heated oxygen sensor–2 (Bank 2) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 1.2 V and under 0.6 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |
| C51-3-24 | GRY/YEL | Ground for engine coolant temp. (ECT) sensor | Below 0.3 V | Ignition switch turned ON |
| C51-3-25 | GRY/YEL | Ground for sensors | Below 0.3 V | Ignition switch turned ON |
| C51-3-26 | GRY/YEL | Ground for CMP sensor | Below 0.3 V | Ignition switch turned ON |
| | | | | |
| C51-1-1 | GRN/RED | Shift solenoid-B output for A/T | 0 – 1 V | Ignition switch turned ON |
| C51-1-2 | GRN | Shift solenoid-A output for A/T | 10 – 14 V | Ignition switch turned ON |
| C51-1-3 | – | – | – | – |
| C51-1-4 | PPL/BLK | IAC valve output (stepper motor coil 2) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-5 | LT GRN/BLK | IAC valve output (stepper motor coil 1) | 0 – 1V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-6 | RED | “R” position signal for transmission range selector switch (A/T) | 10 – 14 V | Ignition switch turned ON, Selector switch selected at “R” position |
| | | | 0 – 1V | Ignition switch turned ON, Selector switch selected at other than “R” position |
| C51-1-7 | ORN/GRN | “P” position signal for transmission range selector switch (A/T) | 10 – 14 V | Ignition switch turned ON, Selector switch selected at “P” position |
| | | | 0 – 1V | Ignition switch turned ON, Selector switch selected at other than “P” position |
| C51-1-8 | GRN/YEL | Torque converter clutch (TCC) solenoid output for A/T | 0 – 1 V | Ignition switch turned ON, A/T Lock-up not operated |
| | | | 10 – 14 V | Ignition switch turned ON, while A/T Lock-up operated |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-1-9 | RED | 4WD air pump assembly output | 10 – 14 V | Ignition switch turned ON, Transfer selector selected at “4L” or “4H” position |
| | | | 0 – 1 V | Ignition switch turned ON, Transfer selector selected at “2H” position |
| C51-1-10 | BLU/GRN | A/T input shaft speed sensor signal (–) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V ↑↓ –4 – –6 V (Repeated indicator) | Engine running at idling after warming up between A/T input shaft speed sensor signal (–) and (+) (Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 90Hz at idling speed) |
| C51-1-11 | BLU/YEL | A/T input shaft speed sensor signal (+) | 0 – 1V | Ignition switch turned ON |
| | | | ✱4 – 6 V ↑↓ –4 – –6 V (Repeated indicator) | Engine running at idling after warming up between A/T input shaft speed sensor signal (–) and (+). (Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 90Hz at idling speed) |
| C51-1-12 | YEL/GRN | Reference signal for CMP sensor | ✱0 – 1 V ↑↓ 4 – 6 V (Repeated indicator) | Engine running at idling after warming up (Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated par 1camshaft revolution)) |
| C51-1-13 | YEL/BLU | Position signal for CMP sensor | ✱0 – 1 V ↑↓ 4 – 6 V (Repeated indicator) | Engine running at idling after warming up (Sensor signal is pulse. Pulse frequency varies depending on engine speed. (4 pulses are generated par 1camshaft revolution)) |
| C51-1-14 | BLU/YEL | Vehicle speed sensor signal | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Vehicle running. (Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (2590 pulses are generated par 60 km/h, 37.5 ml/h)) |
| C51-1-15 | GRN/BLK | EVAP canister purge valve output | 10 – 14 V | Ignition switch turned ON with engine stop |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running. (Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.) |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-1-16 | PPL/YEL | IAC valve output (stepper motor coil 4) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱0 – 1 V<br>↑↓<br>8 – 14 V<br>(Repeated indicator) | While engine running.<br>(Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-17 | GRY/BLU | IAC valve output (stepper motor coil 3) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V<br>↑↓<br>8 – 14 V<br>(Repeated indicator) | While engine running.<br>(Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-18 | YEL/GRN | "D" position signal for transmission range selector switch (A/T) | 10 – 14 V | Ignition switch turned ON, Selector switch selected at "D" position |
| | | | 0 – 1 V | Ignition switch turned ON, Selector switch selected at other than "D" position |
| C51-1-19 | ORN/BLU | "N" position signal for transmission range selector switch (A/T) | 10 – 14 V | Ignition switch turned ON, Selector switch selected at "N" position |
| | | | 0 – 1 V | Ignition switch turned ON, Selector switch selected at other than "N" position |
| C51-1-20 | – (shield ground) | Ground of shield wire for A/T output shaft speed sensor | Below 0.3 V | Ignition switch turned ON |
| C51-1-21 | – (shield ground) | Ground of shield wire for A/T input shaft speed sensor | Below 0.3 V | Ignition switch turned ON |
| C51-1-22 | ORN | A/T output shaft speed sensor signal (–) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V<br>↑↓<br>–4 – –6 V<br>(Repeated indicator) | Engine running at idling after warming up between A/T output shaft speed sensor signal (–) and (+)<br>(Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 90Hz at idling speed) |
| C51-1-23 | WHT | A/T output shaft speed sensor signal (+) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V<br>↑↓<br>–4 – –6 V<br>(Repeated indicator) | Engine running at idling after warming up between A/T output shaft speed sensor signal (–) and (+).<br>(Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 90Hz at idling speed) |
| C51-1-24 | BLK/YEL | Starting motor signal | 0 – 1 V | Ignition switch turned ON |
| | | | 6 – 14 V | While engine cranking |
| C51-1-25 | BLU/ORN | Power steering pressure switch signal | 10 – 14 V | Ignition switch turned ON |
| | | | 0 – 1 V | With engine running at idle speed, turning steering wheel to the right or left as far as it stop |

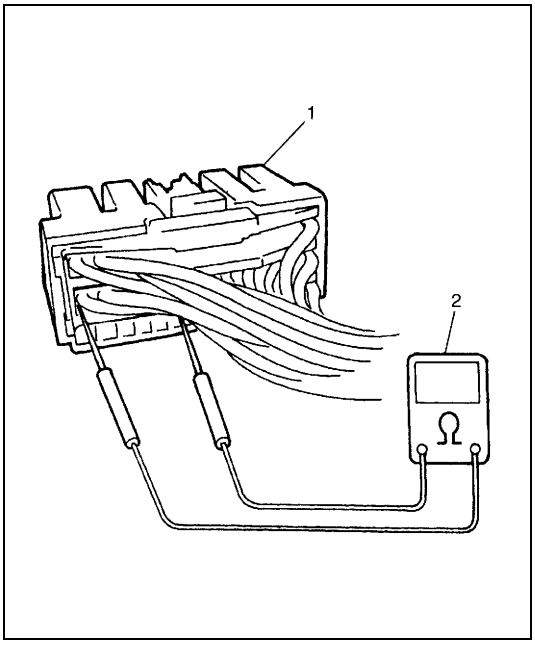
| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-1-26 | ORN/WHT | 4WD Low (4L) switch signal | 0 – 1 V | Ignition switch turned ON, Transfer selector lever selected at “4L” position |
| | | | 10 – 14 V | Ignition switch turned ON, Transfer selector lever selected at “4H” or “2H” position |
| C51-1-27 | GRN/BLU | “L” position signal for transmission range switch (A/T) | 10 – 14 V | Ignition switch turned ON, Selector switch selected at “L” position |
| | | | 0 – 1 V | Ignition switch turned ON, Selector switch selected at other than “L” position |
| C51-1-28 | GRN/ORN | “2” position signal for transmission range switch (A/T) | 10 – 14 V | Ignition switch turned ON, Selector switch selected at “2” position |
| | | | 0 – 1 V | Ignition switch turned ON, Selector switch selected at other than “2” position |
| C51-2-1 | PNK/BLK | Fuel injector No.2 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-2 | PNK | Fuel injector No.1 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-3 | – | – | – | – |
| C51-2-4 | GRY | Heater output of heated oxygen sensor–1 (Bank 1) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-5 | BLK/RED | Heater output of heated oxygen sensor–1 (Bank 2) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-6 | – | – | – | – |
| C51-2-7 | BLK/GRN | Ground for ECM | Below 0.3 V | Ignition switch turned ON |
| C51-2-8 | PNK/BLU | Fuel injector No.4 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-2-9 | PNK/GRN | Fuel injector No.3 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-10 | PNK | Pressure switch signal for 4WD air pump assembly | 10 – 14 V | Ignition switch turned ON, Transfer selector lever selected at “4H” or “4L” position |
| | | | 0 – 1 V | Ignition switch turned ON, Transfer selector lever selected at “2H” position |
| C51-2-11 | BLK/ORN | 4WD switch signal | 0 – 1 V | Ignition switch turned ON, Transfer selector lever selected at “4H” or “4L” position |
| | | | 10 – 14 V | Ignition switch turned ON, Transfer selector lever selected at “2H” position |
| C51-2-12 | LT GRN/ RED | EGR valve (stepper motor coil 4) output (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-13 | LT GRN/ YEL | EGR valve (stepper motor coil 3) output (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-14 | LT GRN/ WHT | EGR valve (stepper motor coil 2) output (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-15 | LT GRN | EGR valve (stepper motor coil 1) output (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-16 | WHT/BLK | Heater output of heated oxygen sensor–2 (Bank 1) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling with after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-2-17 | PNK/WHT | Heater output of heated oxygen sensor–2 (Bank 2) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling with after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-18 | WHT/GRN | Fuel pump relay output (with immobilizer control system) | 0 – 2.5 V | For 3 sec. after ignition switch turned ON or while engine running |
| | | | 10 – 14 V | After 3 sec. from ignition switch turned ON or while engine is stopped |
| C51-2-19 | WHT/BLU | CKP sensor signal (+) (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V ↑↓ –4 – –6 V (Repeated indicator) | Engine running at idling after warming up between CKP sensor signal (–) and (+) (Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 280Hz at idling speed) |
| C51-2-20 | ORN/BLU | CKP sensor signal (–) (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V ↑↓ –4 – –6 V (Repeated indicator) | Engine running at idling after warming up between CKP sensor signal (–) and (+) (Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 280Hz at idling speed) |
| C51-2-21 | GRY/BLK | Fuel injector No.6 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-22 | GRY/GRN | Fuel injector No.5 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-23 | BLK/BRN | Ignition coil No.6 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 2 – 4 V (Repeated indicator) | Engine running (Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |

| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| C51-2-24 | BRN/RED | Ignition coil No.5 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-25 | BRN/YEL | Ignition coil No.4 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-26 | BRN/WHT | Ignition coil No.3 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-27 | BRN/BLK | Ignition coil No.2 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-28 | BRN | Ignition coil No.1 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-29 | – | – | – | – |
| C51-2-30 | – (shield ground) | Ground of shield wire for CKP sensor (if equipped) | Below 0.3 V | Ignition switch turned ON |

### Resistance Check




1) Disconnect couplers (1) from ECM/PCM with ignition switch OFF.

**CAUTION:**
**Never touch terminals of ECM/PCM itself or connect voltmeter or ohmmeter (2).**

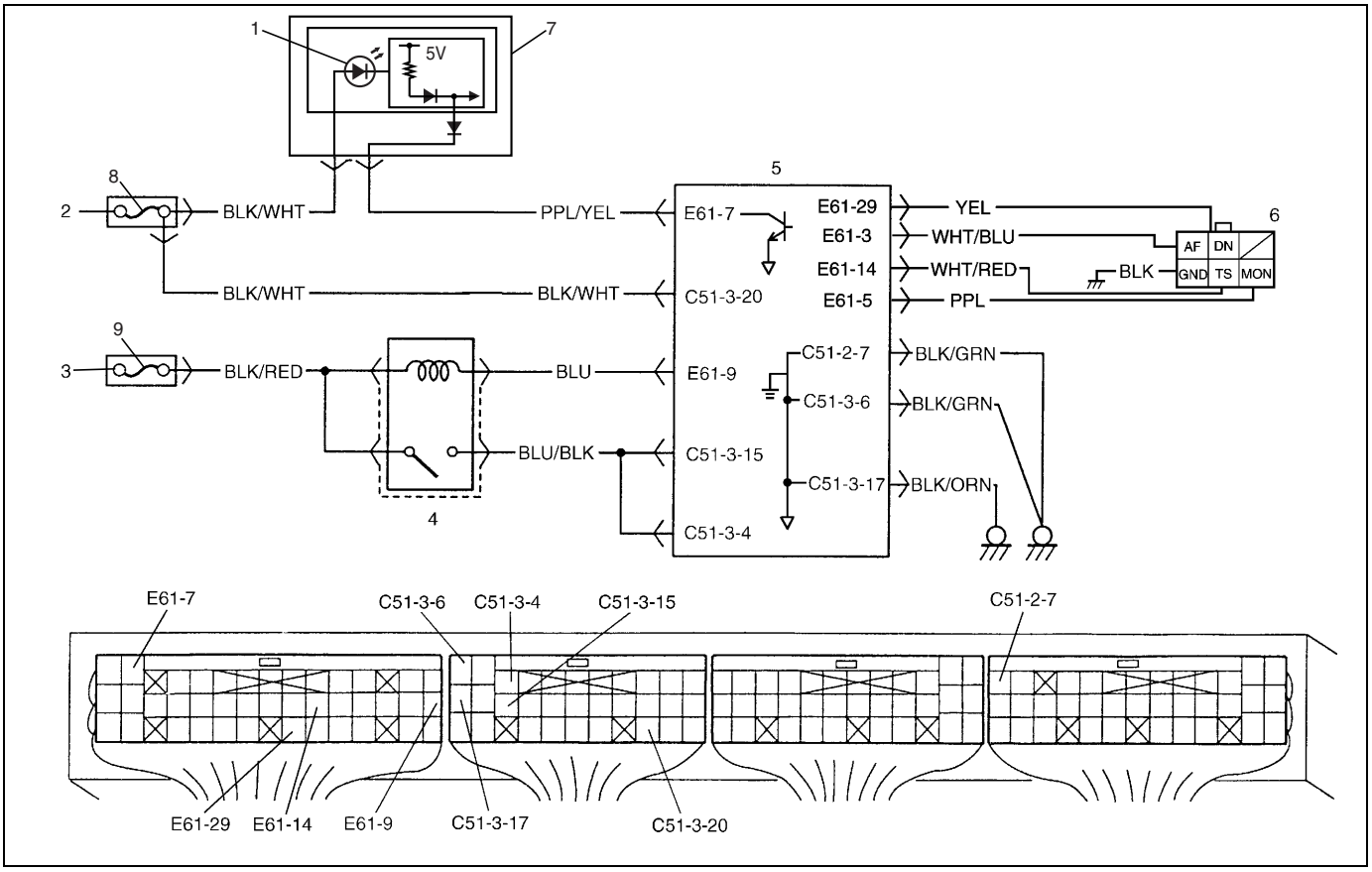
2) Check resistance between each pair of terminals of disconnected couplers (1) as listed in following table.

**CAUTION:**
- **Be sure to connect ohmmeter (2) probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in table represents that when parts temperature is 20°C (68°F).**

| Terminals | Circuit | Standard Resistance | Condition |
|---|---|---|---|
| E61-9 and E61-2 | Main relay | 160 – 240 Ω | – |
| E61-22 and C51-3-20 | A/C condenser fan motor relay (if equipped) | 75 – 110 Ω | Battery disconnected and ignition switch ON |
| E61-23 (without immobilizer control system)/C51-2-18 (with immobilizer control system) and C51-3-20 | Fuel pump relay | 160 – 240 Ω | – |
| C51-3-6 and Body ground | Ground | Continuity | – |
| C51-3-17 and Body ground | Ground | Continuity | – |
| C51-1-1 and Body ground | Shift solenoid B (A/T) | 11 – 15 Ω | – |
| C51-1-2 and Body ground | Shift solenoid A (A/T) | | |
| C51-1-4 and C51-3-4 | IAC valve (stepper motor coil 2) | 25.5 – 33.5 Ω | – |
| C51-1-5 and C51-3-4 | IAC valve (stepper motor coil 1) | | |
| C51-1-8 and Body ground | TCC solenoid (A/T) | 11 – 15 Ω | – |
| C51-1-15 and C51-3-4 | EVAP canister purge valve | 28 – 35 Ω | – |
| C51-1-16 and C51-3-4 | IAC valve (stepper motor coil 4) | 25.5 – 33.5 Ω | – |
| C51-1-17 and C51-3-4 | IAC valve (stepper motor coil 3) | | |
| C51-2-1 and C51-3-4 | Fuel injector No.2 | 13 – 16 Ω | – |
| C51-2-2 and C51-3-4 | Fuel injector No.1 | | |
| C51-2-7 and Body ground | Ground | Continuity | – |
| C51-2-8 and C51-3-4 | Fuel injector No.4 | 13 – 16 Ω | – |
| C51-2-9 and C51-3-4 | Fuel injector No.3 | | |
| C51-2-12 and C51-3-4 | EGR valve (stepper motor coil 4) | 20 – 24 Ω | – |
| C51-2-13 and C51-3-4 | EGR valve (stepper motor coil 3) | | |
| C51-2-14 and C51-3-4 | EGR valve (stepper motor coil 2) | | |
| C51-2-15 and C51-3-4 | EGR valve (stepper motor coil 1) | | |
| C51-2-21 and C51-3-4 | Fuel injector No.6 | 13 – 16 Ω | – |
| C51-2-22 and C51-3-4 | Fuel injector No.5 | | |

# Table A-1 Malfunction Indicator Lamp Circuit Check – Lamp Does Not Come "ON" or Dims at Ignition Switch ON (But Engine at Stop)

## Wiring Diagram




| | | | | |
|---|---|---|---|---|
| 1. MIL | 3. Main fuse | 5. ECM (PCM) | 7. Combination meter | 9. "FI" fuse |
| 2. To ignition switch | 4. Main relay | 6. Diagnosis connector (if equipped) | 8. "METER" 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, turns ON the malfunction indicator lamp (MIL). When the engine starts to run and no malfunction is detected in the system, MIL goes OFF but if a malfunction was or is detected, MIL remains ON even when the engine is running.

## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | MIL power supply check:<br>1) Turn ignition switch ON.<br>Do other indicator/warning lights in combination meter comes ON? | Go to Step 2. | "METER" fuse blown, main fuse blown, Ignition switch malfunction, "BLK/WHT" circuit between "METER" fuse and combination meter or poor coupler connection at combination meter. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | ECM power and ground circuit check:<br>Does engine start? | Go to Step 3. | Go to "Table A-5 ECM (PCM) Power and Ground Circuit Check" in this section.<br>If engine is not cranked, go to "Diagnosis Table" in Section 6G. |
| 3 | MIL circuit check:<br>1) Turn ignition switch OFF and disconnect connectors from ECM.<br>2) Check for proper connection to ECM at terminal E61-7.<br>3) If OK, then using service wire, ground terminal E61-7 in connector disconnected.<br>Does MIL turn on at ignition switch ON? | Substitute a known-good ECM (PCM) and recheck. | Faulty combination meter or "PPL/YEL" wire circuit open. |

## Table A-2 Malfunction Indicator Lamp Circuit Check – Lamp Remains "ON" after Engine Starts

### Wiring Diagram/Circuit Description

Refer to TABLE A-1.

### Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | DTC check:<br>1) With ignition switch OFF, install scan tool.<br>2) Start engine and check DTC.<br>Is there any malfunction DTC (s). | Go to Step 2 of "Engine and Emission Control System Check" in this section. | Go to Step 2. |
| 2 | MIL circuit check:<br>1) With ignition switch OFF, disconnect couplers from ECM (PCM).<br>Does MIL turn ON at ignition switch ON? | "PPL/YEL" wire shorted to ground circuit. | Substitute a known-good ECM (PCM) and recheck. |

## Table A-3 Malfunction Indicator Lamp Check – MIL Flashes at Ignition Switch ON (Vehicle with Diagnosis Connector)

**Wiring Diagram/Circuit Description**

Refer to TABLE A-1.

**Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | MIL Flashing Pattern check:<br>1) Turn ignition switch ON.<br>Does lamp flashing pattern indicate diagnostic trouble code? | Go to Step 2. | Go to "Diagnosis" in Section 8G. |
| 2 | Diag. Switch Circuit check:<br>Is diag. switch terminal connected to ground via service wire? | System is in good condition. | "YEL" circuit shorted to ground. If circuit is OK substitute a known-good ECM (PCM) and recheck. |

## Table A-4 Malfunction Indicator Lamp Check – MIL Does Not Flash or Just Remains ON Even with Grounding Diagnosis Switch Terminal (Vehicle with Diagnosis Connector)

**Wiring Diagram/Circuit Description**

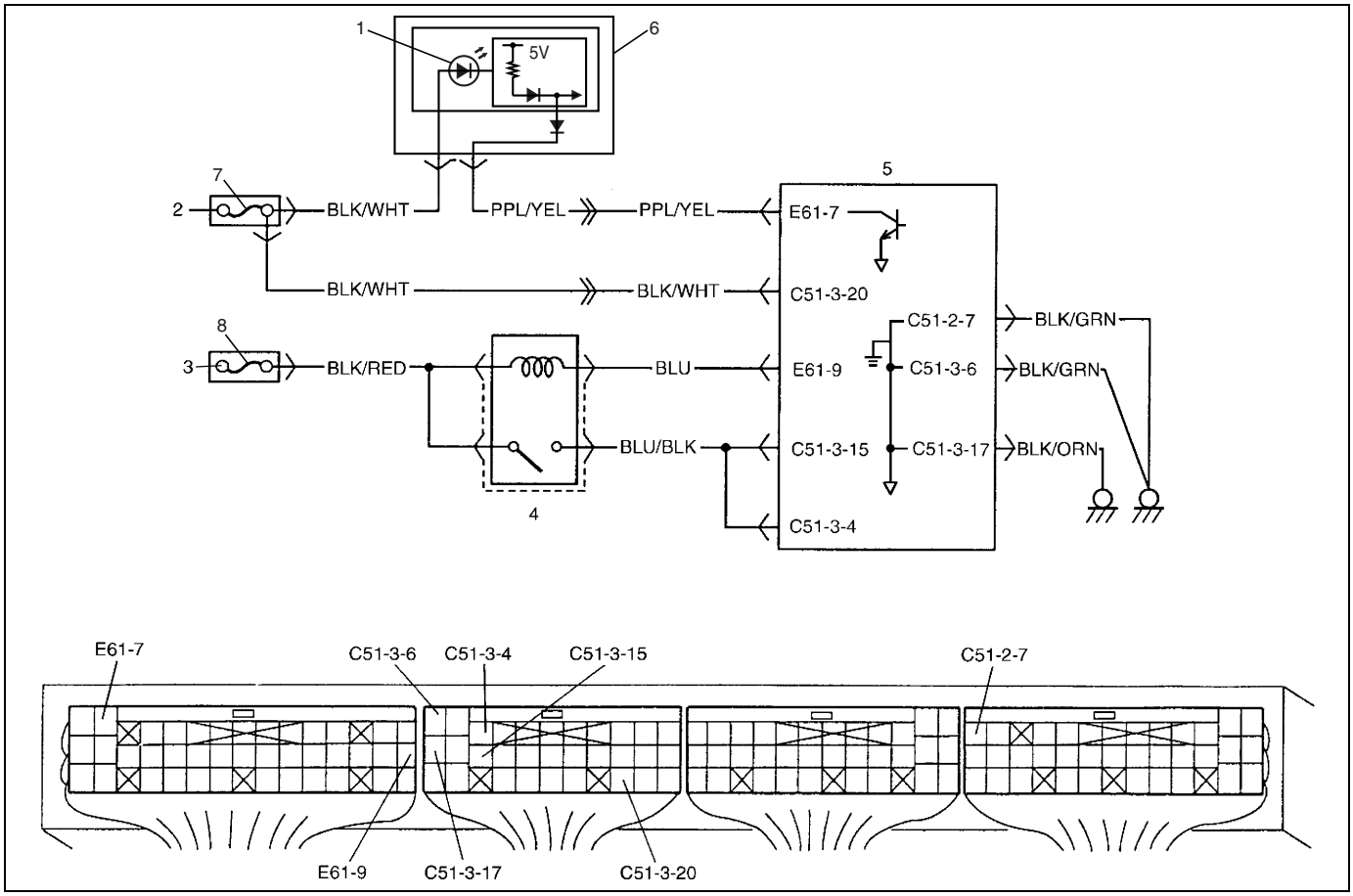
Refer to TABLE A-1.

**Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | MIL Circuit check:<br>1) Turn ignition switch OFF and disconnect connectors from ECM (PCM).<br>Does MIL turn ON at ignition switch ON? | "PPL/YEL" circuit shorted to ground. | Go to Step 2. |
| 2 | ECM (PCM) Connection check:<br>1) Turn ignition switch OFF.<br>Is connector (E61-29 connection) connected to ECM (PCM) properly? | Go to Step 3. | Poor connector connection. |
| 3 | Diag. switch Terminal Circuit check:<br>1) Connect connectors to ECM (PCM).<br>2) Using service wire, ground E61-29 terminal with connectors connected to ECM (PCM).<br>3) Turn ignition switch ON.<br>Does MIL flash? | "YEL" or "BLK" circuit open. | Substitute a known-good ECM (PCM) and recheck. |

# Table A-5 ECM (PCM) Power and Ground Circuit Check – MIL Doesn't Light at Ignition Switch ON and Engine Doesn't Start Though It Is Cranked Up

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. MIL | 3. Main fuse | 5. ECM (PCM) | 7. "METER" fuse |
| 2. To ignition switch | 4. Main relay | 6. Combination meter | 8. "FI" fuse |

## 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 (PCM).

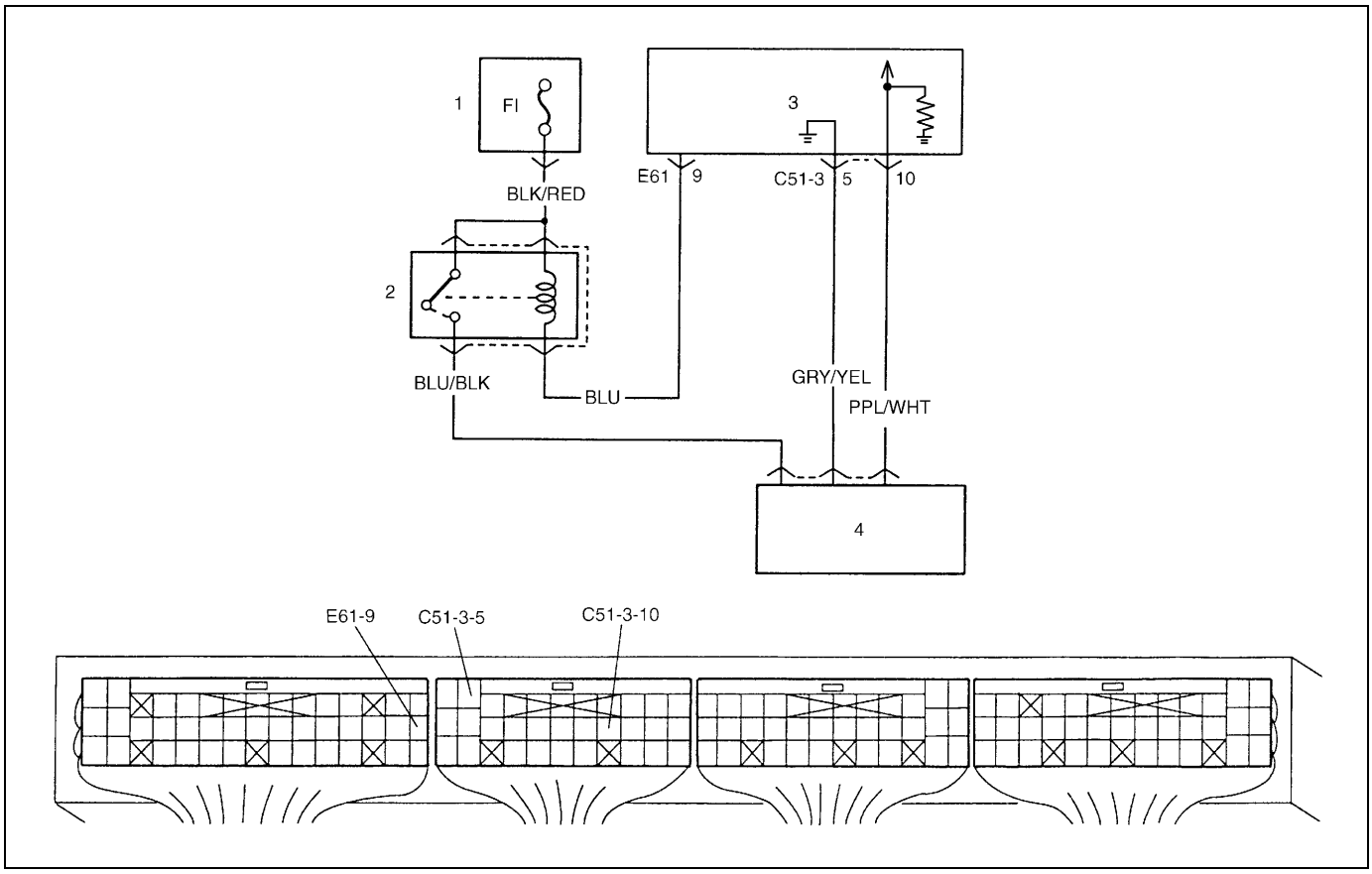
## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Main relay operating sound check:<br>Is operating sound of main relay heard at ignition switch ON? | Go to Step 5. | Go to Step 2. |
| 2 | Fuse check:<br>Is main "FI" fuse in good condition? | Go to Step 3. | Check for short in circuits connected to this fuse. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Main relay check:<br>1) Turn OFF ignition switch and remove main relay.<br>2) Check for proper connection to main relay at "BLK/RED" wire and "BLU" wire Terminals.<br>3) If OK, check main relay for resistance and operation referring to "Main Relay" in Section 6E2.<br>Is check result satisfactory? | Go to Step 4. | Replace main relay. |
| 4 | ECM (PCM) power circuit check:<br>1) Turn OFF ignition switch, disconnect connectors from ECM (PCM) and install main relay.<br>2) Check for proper connection to ECM (PCM) at terminals C51-3-20, E61-9, C51-3-15 and C51-3-4.<br>3) If OK, then measure voltage between terminal C51-3-20 and ground, E61-9 and ground with ignition switch ON.<br>Is each voltage 10 – 14 V? | Go to Step 5. | "BLK/WHT", "BLU" or "BLK/RED" circuit open. |
| 5 | ECM power circuit check:<br>1) Using service wire, ground terminal E61-9 and measure voltage between terminal C51-3-15 and ground at ignition switch ON.<br>Is it 10 – 14 V? | Check ground circuits "BLK/GRN" and "BLK/ORN" for open.<br>If OK, then substitute a known-good ECM (PCM) and recheck. | Go to Step 6. |
| 6 | Is operating sound of main relay heard in Step 1? | Go to Step 7. | "BLK/RED" or "BLU/BLK" wire open. |
| 7 | Main relay check:<br>1) Check main relay according to procedure in Step 3.<br>Is main relay in good condition? | "BLK/RED" or "BLU/BLK" wire open. | Replace main relay. |

# DTC P0100 (DTC No.33, 34) Mass Air Flow Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. | Main fuse |
| 2. | Main relay |
| 3. | ECM/PCM |
| 4. | Mass air flow sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the following conditions are detected for 5 sec. continuously.<br>• Engine running and more than 3 sec. after ignition switch ON and less than 0.64 mA MAF sensor output current continues for 100 msec.<br>• Engine running and more than 3 sec. after ignition switch ON and more than 4.90 mA MAF sensor output current continues for 100 msec. | • MAF sensor circuit<br>• MAF sensor<br>• ECM (PCM) |

### 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 person, 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.: – 8°C (18°F) or higher**
**Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
**Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

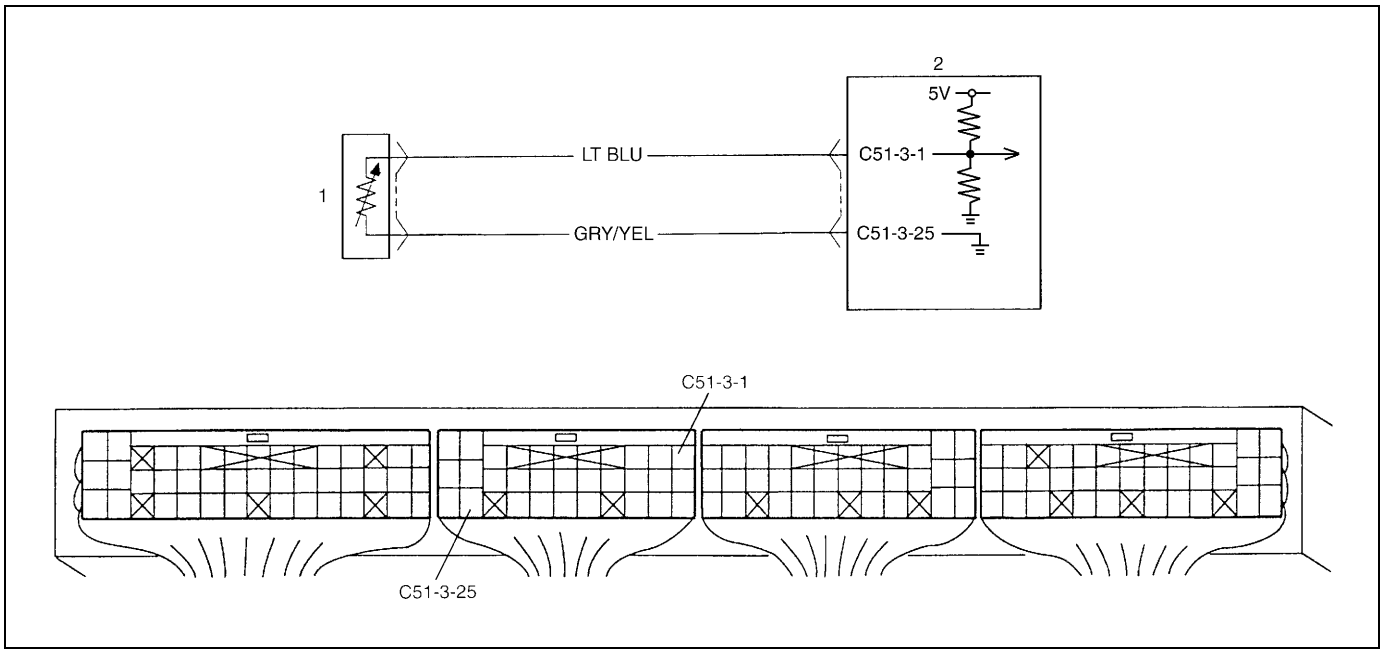
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 20 sec. or more.
3) Check DTC by using scan tool.

### 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" in this section. |
| 2 | MAF sensor check:<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data" in this section for normal value.)<br>Is normal value indicated? | Intermittent trouble.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | MAF sensor power supply check:<br>1) With ignition switch OFF, disconnect MAF sensor coupler.<br>2) With ignition switch ON, check voltage between "BLU/BLK" wire terminal of MAF sensor coupler and ground.<br>Is voltage 10 – 14 V? | Go to Step 4. | Faulty "BLU/BLK" wire. |
| 4 | MAF sensor output voltage check:<br>1) With ignition switch OFF, connect MAF sensor coupler.<br>2) Remove ECM (PCM) cover.<br>3) With ignition switch ON leaving engine OFF, check voltage between C51-3-10 and C51-3-5 terminal.<br>Is voltage 1.0 – 1.6 V? | Poor C51-3-10 or/C51-3-5 terminal connection.<br>If OK, substitute a known-good ECM (PCM) and recheck. | Faulty "PPL/WHT" wire.<br>Poor MAF sensor coupler terminal connection.<br>If wire and connection are OK, substitute a known-good MAF sensor and recheck. |

# DTC P0110 (DTC No.23, 25) Intake Air Temp. (IAT) Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. IAT sensor |
| 2. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the conditions are detected for 5 sec. continuously.<br>• Low intake air temperature (high voltage-high resistance)<br>• High intake air temperature (Low voltage-low resistance) | • IAT sensor circuit<br>• IAT sensor<br>• ECM (PCM) malfunction |

## DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed and engine coolant temp. 110°C (230°F) or lower for 10 sec. or more.
3) Check DTC by using scan tool.

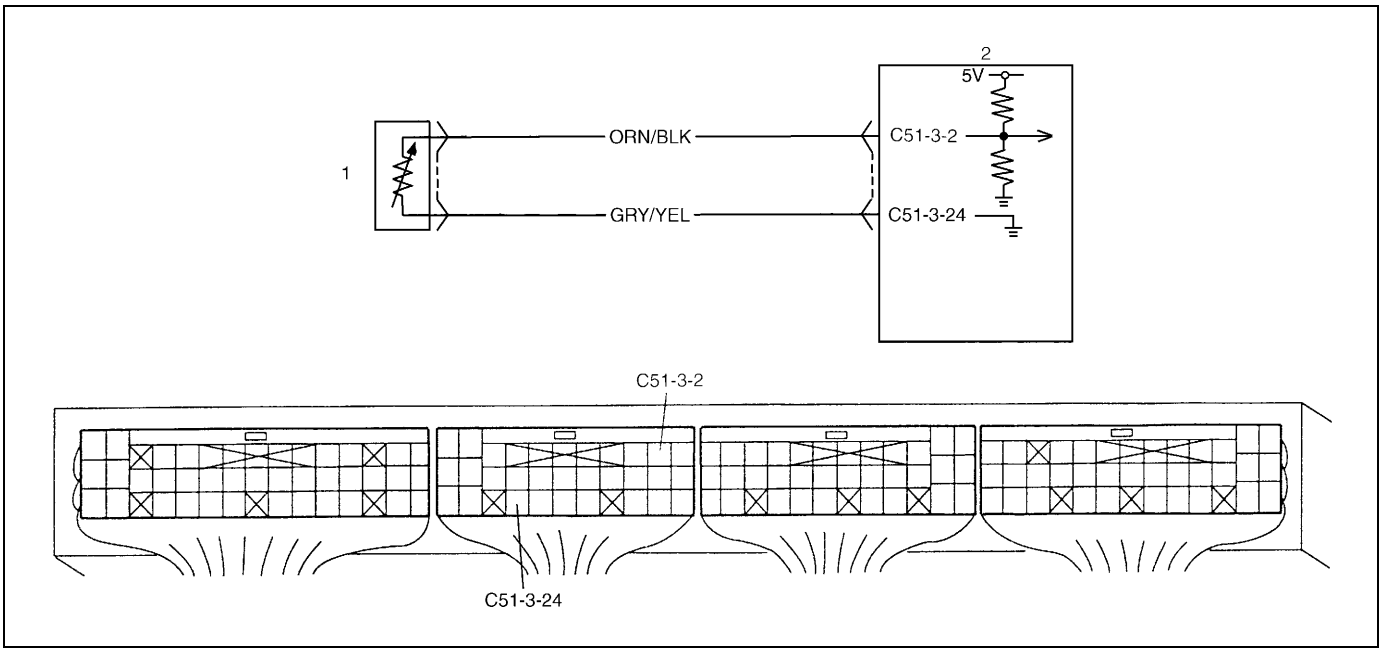
## Troubleshooting

| 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” in this section. |
| 2 | Check IAT sensor and its circuit:<br>1) Connect scan tool with ignition switch OFF.<br>2) Turn ignition switch ON.<br>3) Check intake air temp. displayed on scan tool.<br>Is –40°C (–40°F) or 165°C (329°F) indicated? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Check wire harness:<br>1) Disconnect IAT sensor connector with ignition switch OFF.<br>2) Check for proper connection to IAT sensor at "LT BLU" and "GRY/YEL" wire terminals.<br>If OK, then with ignition switch ON, is voltage applied to "LT BLU" wire terminal about 4 – 6 V? | Go to Step 4. | "LT BLU" wire open or short, or poor C51-3-1 connection.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. |
| 4 | Check wire harness:<br>1) Using service wire, connect IAT sensor connector terminals.<br>2) Turn ignition switch ON and check intake air temp. displayed on scan tool.<br>Is 165°C (329°F) indicated? | Replace IAT sensor. | "GRY/YEL" wire open or poor C51-3-25 connection.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. |

## DTC P0115 (DTC No.14, 15) Engine Coolant Temp. Circuit Malfunction

### Wiring Diagram




| |
|---|
| 1. ECT sensor |
| 2. ECM (PCM) |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the conditions are detected for 5 sec. continuously.<br>• Low engine coolant temperature (high voltage-high resistance)<br>• High engine coolant temperature (low voltage-low resistance) | ECT sensor circuit<br>ECT sensor<br>ECM (PCM) |

### DTC Confirmation Procedure

**NOTE:**

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

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

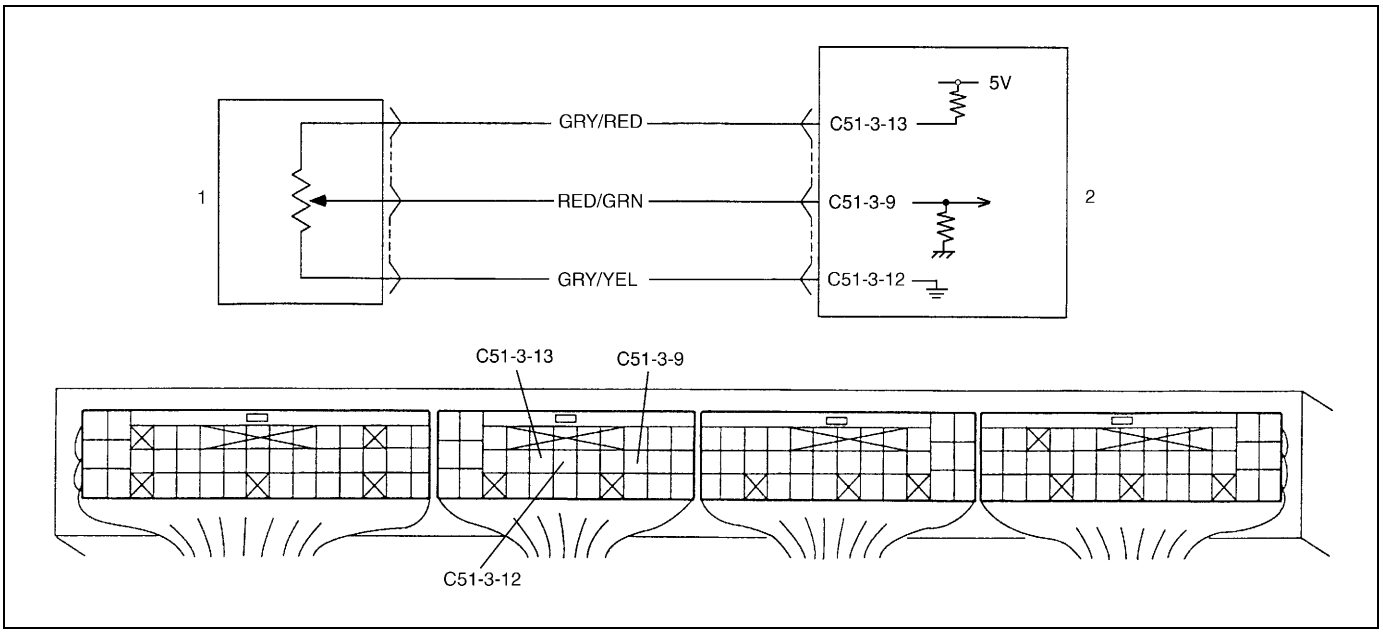
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

### Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control Systme Check" in this section. |
| 2 | Check ECT sensor and its circuit:<br>1) Connect scan tool with ignition switch OFF.<br>2) Turn ignition switch ON.<br>3) Check engine coolant temp. displayed on scan tool.<br>Is –40°C (–40°F) or 164°C (327°F) indicated? | Go to Step 3. | Intermittent trouble.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. |
| 3 | Check wire harness:<br>1) Disconnect ECT sensor connector with ignition switch OFF.<br>2) Check for proper connection to ECT sensor at "ORN/BLK" and "GRY/YEL" wire terminals.<br>If OK, then with ignition switch ON, is voltage applied to "ORN/BLK" wire terminal about 4 – 6 V? | Go to Step 4. | "ORN/BLK" wire open or short, or poor C51-3-2 connection.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. |
| 4 | Check wire harness:<br>1) Using service wire, connect ECT sensor connector terminals.<br>2) Turn ignition switch ON and check engine coolant temp. displayed on scan tool.<br>Is 164°C (327°F) indicated? | Replace ECT sensor. | "GRY/YEL" wire open or poor C51-3-23 connection.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. |

# DTC P0120 (DTC No.21, 22) Throttle Position Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. Throttle position sensor |
| 2. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• Signal voltage low or signal voltage high | • TP sensor circuit<br>• TP sensor<br>• ECM (PCM) |

**NOTE:**

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

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude barometric pressure: 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

## DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

## 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”. |
| 2 | Check TP sensor and its circuit.<br>1) Connect scan tool to DLC with ignition switch OFF and then turn ignition switch ON.<br>2) Check throttle valve opening percentage displayed on scan tool.<br>Is it displayed 3% or less?<br>3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position.<br>Is it displayed 96% or higher? | Go to Step 3. | Intermittent trouble.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |
| 3 | Check wire harness.<br>1) Disconnect connector from TP sensor with ignition switch OFF.<br>2) Check for proper connection to TP sensor at “GRY/RED”, “RED/GRN” and “GRY/YEL” wire terminal.<br>3) If OK, then with ignition switch ON, check voltage between each of “GRY/RED” or “RED/GRN” wire terminals and body ground.<br>Is voltage about 4 – 6 V at each terminal? | Go to Step 4. | “GRY/RED” wire open, “GRY/RED” wire shorted to ground circuit or power circuit or “RED/GRN” wire, “GRY/YEL” wire open or shorted to ground circuit or poor C51-3-13 or C51-3-9 connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | Check TP sensor.<br>1) Check resistance between terminals of TP sensor referring to “Throttle Position Sensor (TP Sensor)” in Section 6E2.<br>Are measured values within specifications? | “RED/GRN” wire shorted to power circuit.<br>If wire is OK, substitute a known-good ECM (PCM) and recheck. | Replace TP sensor. |

# DTC P0121 Throttle Position Circuit Range/Performance Problem

### Wiring Diagram/Circuit Description

Refer to DTC P0120.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Throttle opening change is smaller than specification while intake air volume changes and engine is running at constant speed. (2 driving cycle detection logic) | • TP sensor<br>• ECM (PCM) |

### 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.**

**NOTE:**

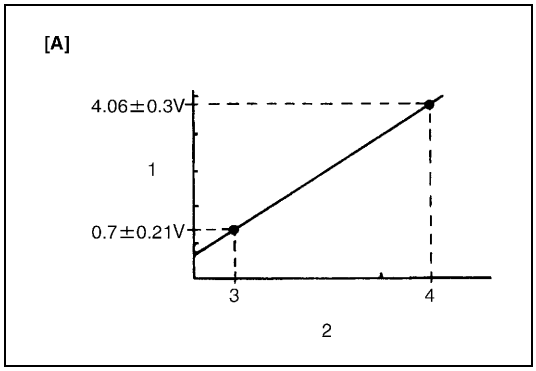
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 60 km/h (40 mph).
4) Keep driving above vehicle speed for 5 min (Change of vehicle speed is permitted in this step).
5) Stop vehicle and run engine at idle speed for 1 min.
6) Increase vehicle speed till engine speed is reached 2,000 – 3,000 r/min in proper gear.
7) Keep driving at that engine speed for 30 sec or more (Engine speed is kept constant in this step).
8) Stop vehicle.
9) Repeat step 6) to 8).
10) Check pending DTC by using scan tool.

## Troubleshooting

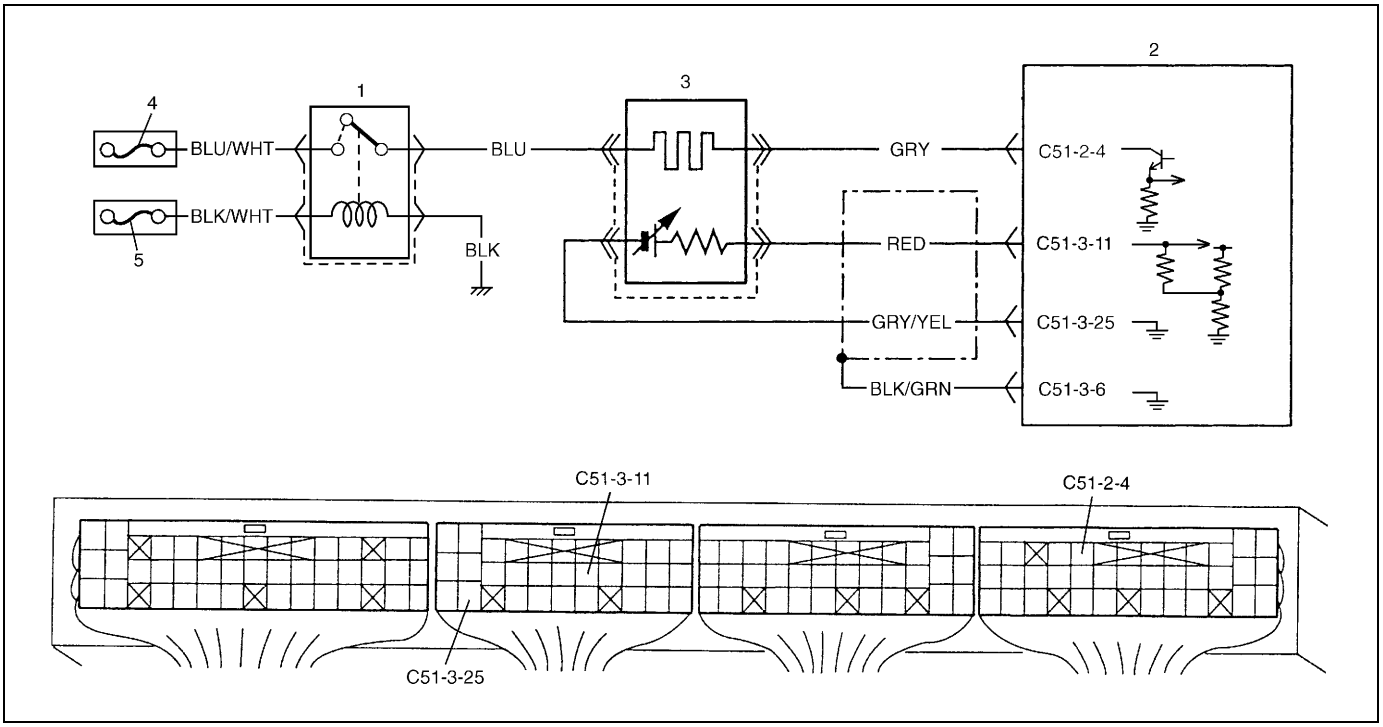
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | Is there a DTC related to TP sensor (DTC P0120)? | Go to applicable DTC Diag. Flow Table. | Go to Step 3. |
| 3 | Do you have SUZUKI scan tool ? | Go to Step 4. | Go to Step 5. |
| 4 | Check TP sensor and its circuit (using SUZUKI scan tool):<br>1) Turn ignition switch OFF and connect SUZUKI scan tool to DLC.<br>2) Turn ignition switch ON and check TP sensor output voltage when throttle valve is at idle position and fully opened.<br>Does voltage vary within specified value linearly as shown in the figure? | Substitute a known-good ECM (PCM) and recheck. | Go to Step 6. |
| 5 | Check TP sensor and its circuit (not using SUZUKI scan tool):<br>1) Turn ignition switch ON.<br>2) Check voltage at terminal C51-3-9 of ECM connector connected, when throttle valve is at idle position and fully opened.<br>Does voltage vary within specified value linearly as shown in the figure? | Check terminal C51-3-9 for poor connection.<br>If OK, substitute a known-good ECM (PCM) and recheck. | Go to Step 6. |
| 6 | Check TP sensor:<br>1) Turn ignition switch OFF.<br>2) Disconnect TP sensor connector.<br>3) Check for proper connection to TP sensor at each terminal.<br>4) If OK, check TP sensor for resistance referring to “Throttle Position Sensor (TP Sensor)” in Section 6E2.<br>Is check result satisfactory? | High resistance in “GRY/RED”, “RED/GRN” or “GRY/YEL” circuit.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. | Replace TP sensor. |




| [A]: Fig. for Step 4 and 5 |
|---|
| 1. Voltage |
| 2. Throttle opening |
| 3. At idle position |
| 4. Fully open |

# DTC P0130 (DTC No.13) HO2S-1 (Bank 1) Circuit Malfunction or No Activity Detected

## Wiring Diagram




| | |
|---|---|
| 1. HO2S heater relay | 4. Main fuse |
| 2. ECM (PCM) | 5. "IG COIL" fuse |
| 3. HO2S–1 (Bank–1) | |

## DTC Detecting Condition and Trouble Area

**NOTE:**

**For vehicle with diagnosis connector, DTC will set when following only (*) mark condition is detected.**

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>• 4.5 V or more HO2S circuit voltage is detected, when 5 V power is connected to HO2S circuit in ECM (PCM), or<br>• Max. output voltage of HO2S is 0.6 V or lower on average and its minimum voltage on average is 0.3 V or lower.<br>• Min. output voltage of HO2S is over 3.0 V or<br>• Max. output voltage of HO2S is 0.74 V or higher on average and its min. voltage on average is 0.33 V or higher.<br>• *Output voltage of HO2S–1 does not exceed 0.45 V for specified time.<br>(2 driving cycle detection logic) | HO2S–1 or its circuit.<br>Fuel system<br>ECM (PCM) |

### 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.**

**NOTE:**

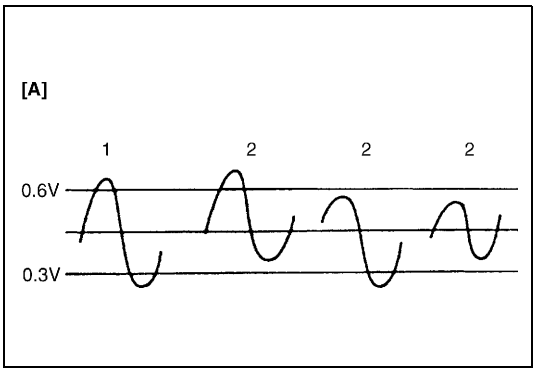
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat step 3) through 6).

### 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" in this section. |
| 2 | HO2S–1 output voltage check:<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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 and check HO2S output voltage displayed on scan tool. See Fig.<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | HO2S–1 check:<br>1) With ignition switch OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter to "GRY/YEL" wire terminal and "RED" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "RED" or "GRY/YEL" circuit open or short.<br>If wire and connections are OK, substitute a known-good ECM (PCM) and recheck. | Replace HO2S–1. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | Short term fuel trim check:<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20 %? | Intermittent trouble or faulty ECM (PCM).<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to DTC P0171/ P0172 Diag. Flow Table. |




| [A]: Fig. for Step 2 | 2. NG |
|---|---|
| 1. Normal | |

## DTC P0133 HO2S-1 (Bank 1) Circuit Slow Response

### Wiring Diagram/Circuit Description

Refer to DTC P0130.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>Hi/Lo cycle (TRANS TIME displayed on scan tool) of HO2S–1 output voltage is longer than specification or response rates of Hi → Lo and Lo → Hi (TRANS TIME displayed as R → L threshold V or L → R threshold V on scan tool) are longer than specification.<br>(2 driving cycle detection logic) | HO2S–1<br>ECM (PCM) |

### DTC Confirmation Procedure

Refer to DTC P0130.

### 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" in this section. |
| 2 | 1) Replace HO2S–1 and recheck.<br>Is DTC P0133 detected? | Substitute a known-good ECM (PCM) and recheck. | HO2S–1 malfunction. |

# DTC P0135 HO2S-1 (Bank 1) Heater Circuit Malfunction

### Wiring Diagram

Refer to DTC P0130.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following condition is detected when HO2S heater is electrically live (2 driving cycle detection logic).<br>• Current of HO2S heater is 5.3 A or more or less than 0.09 A, or<br>• Voltage of HO2S heater is 14.0 V or higher or lower than 11.7 V. | HO2S–1 heater circuit<br>HO2S–1 heater<br>ECM (PCM)<br>HO2S heater relay |

### DTC Confirmation Procedure

**NOTE:**

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

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

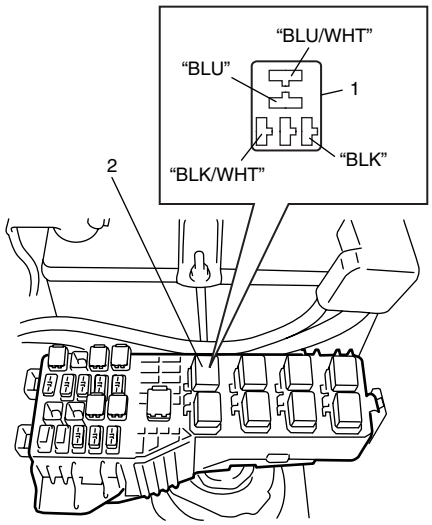
1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 5 min.
3) Check pending DTC by using scan tool.

### 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" in this section. |
| 2 | HO2S–1 heater check:<br>1) Disconnect HO2S–1 coupler with ignition switch OFF.<br>2) Check resistance between "GRY" wire terminal and "BLU" wire terminal of HO2S–1 coupler.<br>**HO2S-1 heater resistance:**<br>**5.0 – 6.4 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–1. |
| 3 | HO2S heater power supply check:<br>1) With ignition switch ON leaving engine OFF, check voltage between "BLK/WHT" wire terminal of HO2S heater relay coupler and ground, "BLU/WHT" wire terminal of HO2S heater relay coupler and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | "HO2S", and/or "IG COIL" fuse blown.<br>If OK, faulty "BLK/WHT" wire or "BLU/WHT" wire. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | HO2S heater control circuit check:<br>1) With ignition switch OFF, install HO2S heater relay.<br>2) With ignition switch ON leaving engine OFF, check voltage between C51-2-4 and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM (PCM) and recheck. | Faulty HO2S heater relay or “BLK” wire open, “BLU” wire open or shorted to ground circuit<br>or<br>“GRY” wire open or shorted to ground circuit.<br>If OK, substitute a known-good ECM (PCM) and recheck. |

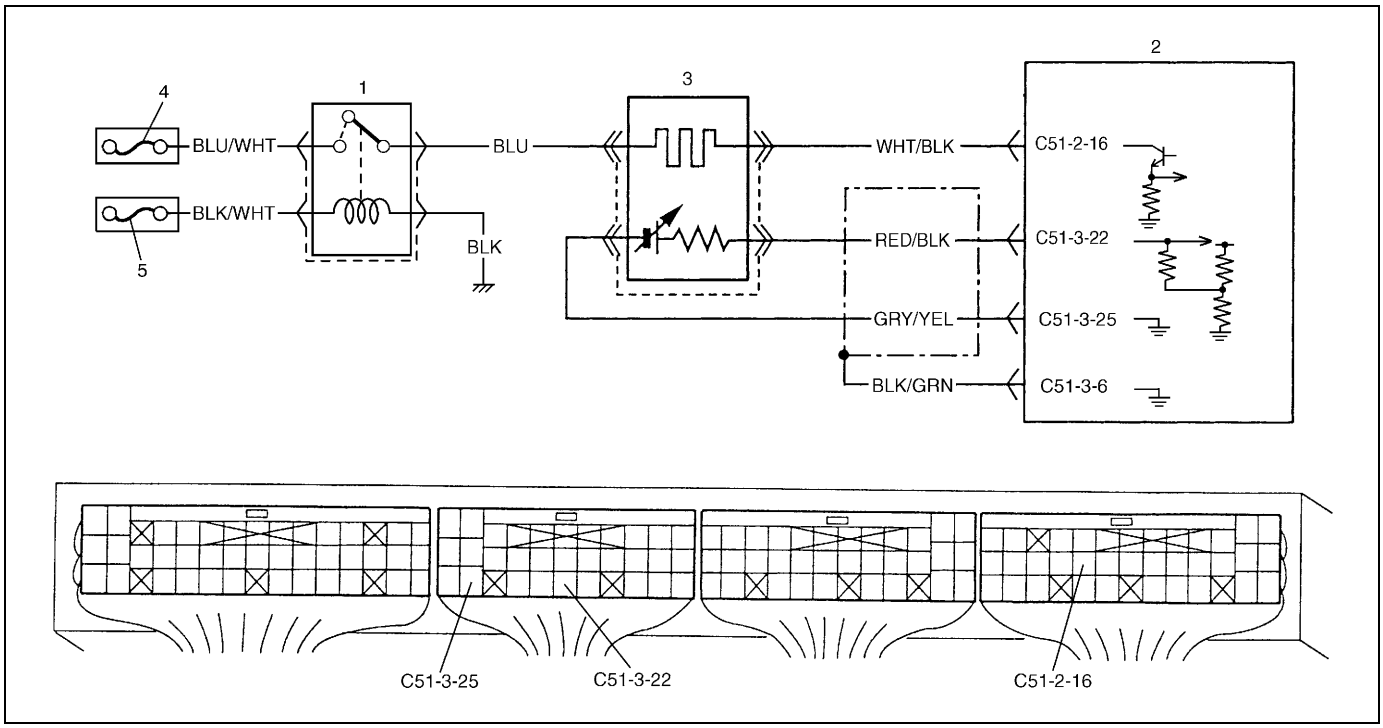
[A]




| |
|---|
| [A]: Fig. for Step 3 |
| 1. Fuse/relay box coupler viewed from relay side |
| 2. HO2S heater relay |

# DTC P0136 HO2S-2 (Bank 1) Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. HO2S heater relay | 4. Main fuse |
| 2. ECM (PCM) | 5. "IG COIL" fuse |
| 3. HO2S–2 (Bank–1) | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC will set when any one of following conditions is detected (2 driving cycle detection logic).<br>• 4.5 V or more HO2S circuit voltage is detected when 5 V power is connected to HO2S circuit in ECM (PCM).<br>• While running with A/F feed back, average output voltage during specified time is too high or too low.<br>or<br>• While running with A/F feed back, max output voltage during specified time is lower than specified value or min. output voltage during specified time is higher than specified value. | • HO2S–2 or its circuit<br>• Fuel system<br>• ECM (PCM) |

## 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.**

**NOTE:**

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

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (40 mph) or more.
4) Keep driving above vehicle speed till engine is warmed up completely (Changed of vehicle speed is permitted in this step).
5) Keep driving 50 – 60 km/h (30 – 40 mph) for 8 min. or more.
6) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor heater monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor heater monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 6).

**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" in this section. |
| 2 | HO2S–2 output voltage check:<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 2 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | HO2S–2 check:<br>1) With ignition switch OFF, disconnect HO2S–2 coupler.<br>2) Connect voltmeter between "RED/BLK" and "GRY/YEL" wire terminal of HO2S–2 coupler.<br>3) Start engine and check voltmeter while repeating racing engine.<br>Is over and below 0.3 V indicated? | "RED/BLK" or "GRY/YEL" circuit open/short.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. | Replace HO2S–2. |
| 4 | Short term fuel trim check:<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20 %? | Intermittent trouble or faulty ECM (PCM).<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to DTC P0171/P0172 Diag. Flow Table. |

# DTC P0141 HO2S-2 (Bank 1) Heater Circuit Malfunction

### Wiring Diagram

Refer to DTC P0136.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following condition is detected when HO2S–2 heater operates (2 driving cycle detection logic).<br>• Current of HO2S–2 heater is more than 11.4 A or less than 0.32 A, or<br>• Voltage of HO2S–2 heater is more than 13.8 V or less than 8.7 V. | HO2S–2 heater or its circuit<br>ECM (PCM) |

### 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.**

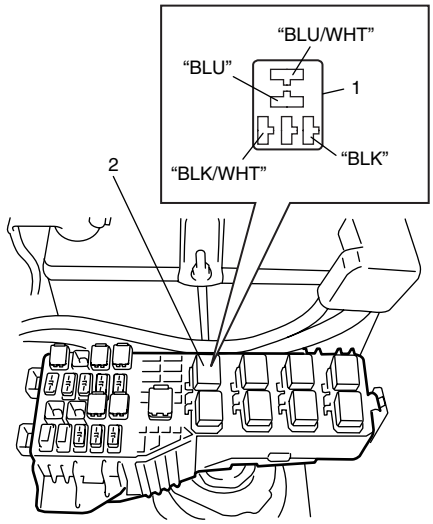
**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 5 min. (Change of vehicle speed is permitted in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor heater monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor heater monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 5).

## Troubleshooting

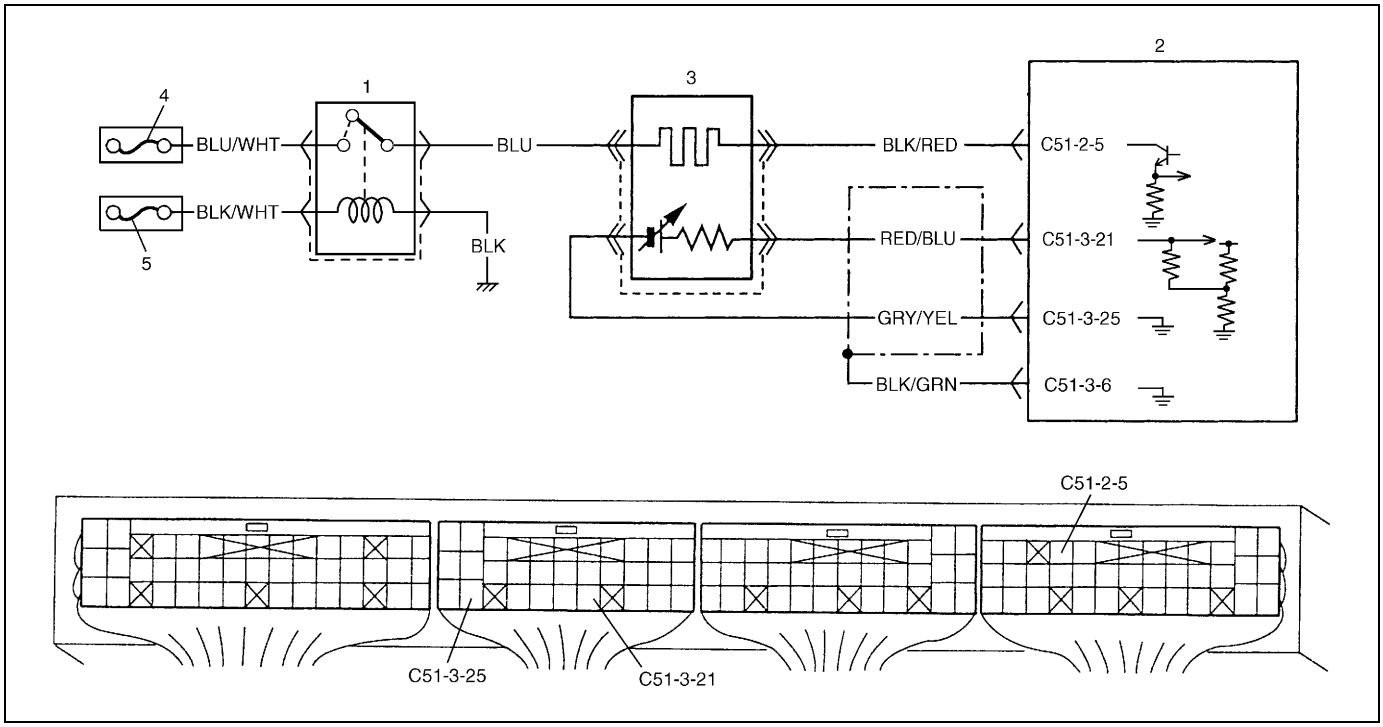
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | HO2S–2 heater check:<br>1) Disconnect HO2S–2 coupler with ignition switch OFF.<br>2) Check resistance between “WHT/BLK” wire terminal and “BLU” wire terminal of HO2S–2 connector.<br>**HO2S–2 heater resistance:**<br>**11.7 – 14.3 Ω (at 20°C (68°F))**<br>Is it within above specification | Go to Step 3. | Replace HO2S–2. |
| 3 | HO2S heater power supply check:<br>1) With ignition switch ON leaving engine OFF, check voltage between “BLK/WHT” wire terminal of HO2S heater relay coupler and ground, “BLU/WHT” wire terminal of HO2S heater relay coupler and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | Main fuse and/or “IG COIL” fuse blown.<br>If OK, faulty “BLK/WHT” wire or “BLU/WHT” wire. |
| 4 | HO2S heater control circuit check:<br>1) With ignition switch OFF, install HO2S heater relay.<br>2) With ignition switch ON leaving engine OFF, check voltage between C51-2-16 and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM (PCM) and recheck. | Faulty HO2S heater relay or “BLK” wire open, “BLU” wire open or shorted to ground circuit, “WHT/BLK” wire open or shorted to ground circuit.<br>If OK, substitute a known-good ECM (PCM) and recheck. |




| [A]: Fig. for Step 3 |
|---|
| 1. Fuse/relay box coupler viewed from relay side |
| 2. HO2S heater relay |

# DTC P0150 (DTC No.26) HO2S-1 (Bank 2) Circuit Malfunction or No Activity Detected

## Wiring Diagram




| | |
|---|---|
| 1. HO2S heater relay | 4. Main fuse |
| 2. ECM (PCM) | 5. "IG COIL" fuse |
| 3. HO2S-1 (Bank-2) | |

## DTC Detecting Condition and Trouble Area

**NOTE:**

**For vehicle with diagnosis connector, DTC will set when following only (*) mark condition is detected.**

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>• 4.5 V or more HO2S circuit voltage is detected, when 5 V power is connected to HO2S circuit in ECM (PCM), or<br>• Max. output voltage of HO2S is 0.6 V or lower on average and its minimum voltage on average is 0.3 V or lower.<br>• Min. output voltage of HO2S is over 3.0 V or<br>• Max. output voltage of HO2S is 0.74 V or higher on average and its min. voltage on average is 0.33 V or higher.<br>• Output voltage of HO2S–1 does not exceed 0.45 V for specified time.<br>(2 driving cycle detection logic) | HO2S–1 or its circuit.<br>Fuel system<br>ECM (PCM) |

### 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.**

**NOTE:**

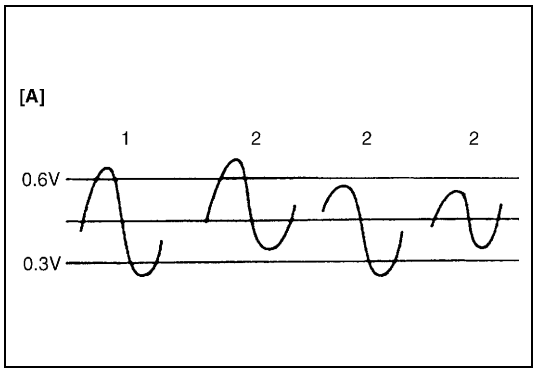
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat step 3) through 6).

### 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" in this section. |
| 2 | HO2S–1 output voltage check:<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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 and check HO2S output voltage displayed on scan tool. See Fig.<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | HO2S–1 check:<br>1) With ignition switch OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter to "GRY/YEL" wire terminal and "RED/BLU" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "RED/BLU" or "GRY/YEL" circuit open or short.<br>If wire and connections are OK, substitute a known-good ECM (PCM) and recheck. | Replace HO2S–1. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | Short term fuel trim check:<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20 %? | Intermittent trouble or faulty ECM (PCM).<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to DTC P0174/ P0175 Diag. Flow Table. |




| [A]: Fig. for Step 2 |
|---|
| 1. Normal |
| 2. NG |

## DTC P0153 HO2S-1 (Bank 2) Circuit Slow Response

### Wiring Diagram/Circuit Description

Refer to DTC P0150.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>Hi/Lo cycle (TRANS TIME displayed on scan tool) of HO2S–1 output voltage is longer than specification or response rates of Hi → Lo and Lo → Hi (TRANS TIME displayed as R → L threshold V or L → R threshold V on scan tool) are longer than specification.<br>(2 driving cycle detection logic) | HO2S–1<br>ECM (PCM) |

### DTC Confirmation Procedure

Refer to DTC P0150.

### 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" in this section. |
| 2 | 1) Replace HO2S–1 and recheck.<br>Is DTC P0153 detected? | Substitute a known-good ECM (PCM) and recheck. | HO2S–1 malfunction. |

# DTC P0155 HO2S-1 (Bank 2) Heater Circuit Malfunction

### Wiring Diagram

Refer to DTC P0150.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following condition is detected when HO2S heater is electrically live (2 driving cycle detection logic).<br>• Current of HO2S heater is 5.3 A or more or less than 0.09 A, or<br>• Voltage of HO2S heater is 14.0 V or higher or lower than 11.7 V. | HO2S–1 heater circuit<br>HO2S–1 heater<br>ECM (PCM) |

### DTC Confirmation Procedure

**NOTE:**

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

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

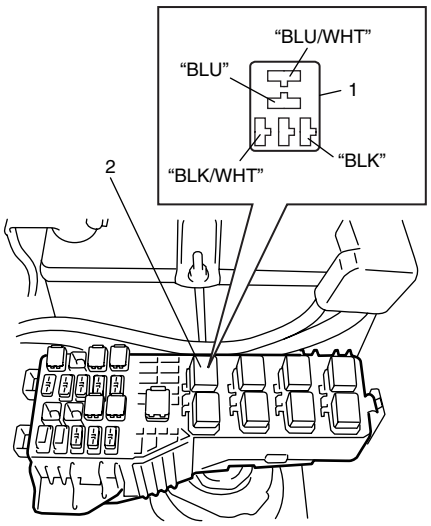
1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 5 min.
3) Check pending DTC by using scan tool.

### 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" in this section. |
| 2 | HO2S–1 heater check:<br>1) Disconnect HO2S–1 coupler with ignition switch OFF.<br>2) Check resistance between "BLK/RED" wire terminal and "BLU" wire terminal of HO2S–1 coupler.<br>**HO2S–1 heater resistance:**<br>**5.0 – 6.4 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–1. |
| 3 | HO2S heater power supply check:<br>1) With ignition switch ON leaving engine OFF, check voltage between "BLK/WHT" wire terminal of HO2S heater relay coupler and ground, "BLU/WHT" wire terminal of HO2S heater relay coupler and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | Main fuse and/or "IG COIL" fuse blown.<br>If OK, faulty "BLK/WHT" wire or "BLU/WHT" wire. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | HO2S heater control circuit check:<br>1) With ignition switch OFF, install HO2S heater relay.<br>2) With ignition switch ON leaving engine OFF, check voltage between C51-2-4 and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM (PCM) and recheck. | Faulty HO2S heater relay or “BLK” wire open, “BLU” wire open or shorted to ground circuit, “BLK/RED” wire open or shorted to ground circuit.<br>If OK, substitute a known-good ECM (PCM) and recheck. |

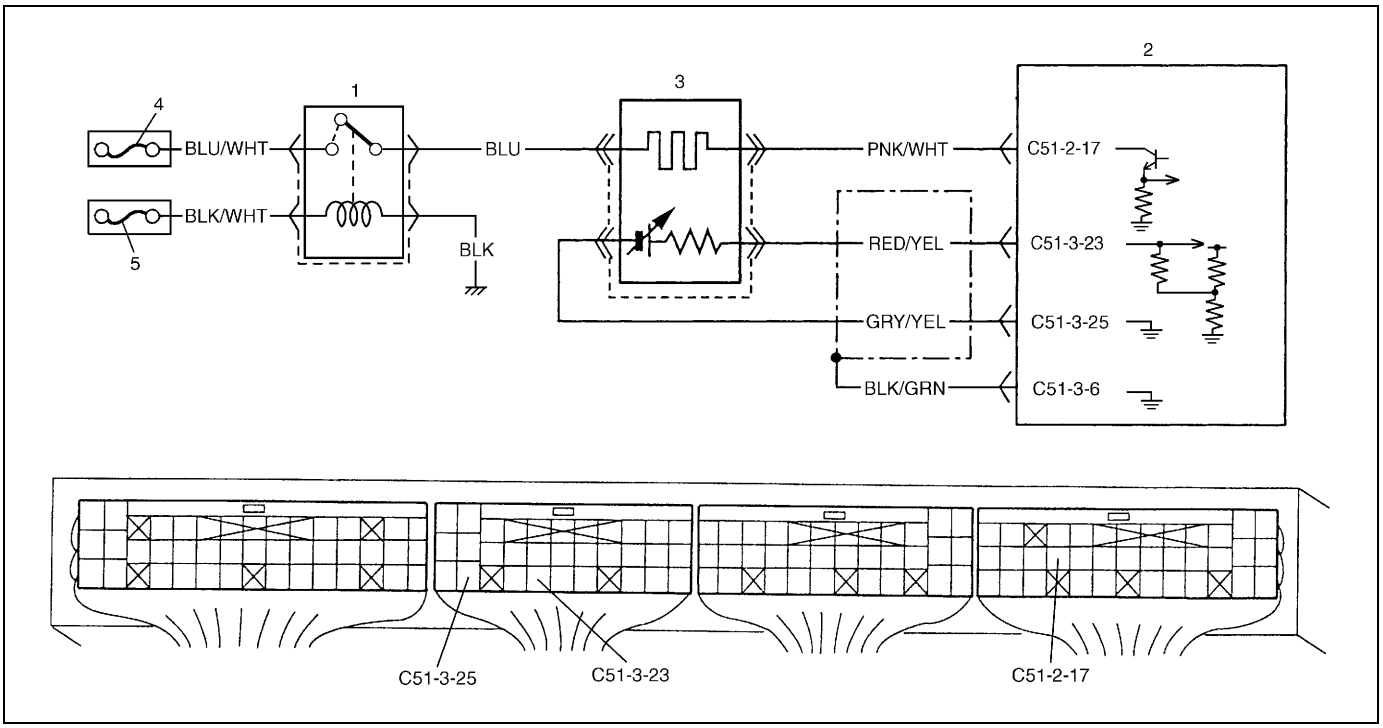
[A]




| |
|---|
| [A]: Fig. for Step 3 |
| 1. Fuse/relay box coupler viewed from relay side |
| 2. HO2S heater relay |

# DTC P0156 HO2S-2 (Bank 2) Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. HO2S heater relay | 4. Main fuse |
| 2. ECM (PCM) | 5. "IG COIL" fuse |
| 3. HO2S–2 (Bank–2) | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC will set when any one of following conditions is detected (2 driving cycle detection logic).<br>• 4.5 V or more HO2S circuit voltage is detected when 5 V power is connected to HO2S circuit in ECM (PCM).<br>• While running with A/F feed back, average output voltage during specified time is too high or too low.<br>or<br>• While running with A/F feed back, max output voltage during specified time is lower than specified value or min. output voltage during specified time is higher than specified value. | • HO2S–2 or its circuit<br>• Fuel system<br>• ECM (PCM) |

## 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.**

**NOTE:**

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

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (40 mph) or more.
4) Keep driving above vehicle speed till engine is warmed up completely (Changed of vehicle speed is permitted in this step).
5) Keep driving 50 – 60 km/h (30 – 40 mph) for 8 min. or more.
6) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor heater monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor heater monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 6).

**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" in this section. |
| 2 | HO2S–2 output voltage check:<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 2 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | HO2S–2 check:<br>1) With ignition switch OFF, disconnect HO2S–2 coupler.<br>2) Connect voltmeter between "RED/YEL" wire terminal and "GRY/YEL" wire terminal of HO2S–2 coupler.<br>3) Start engine and check voltmeter while repeating racing engine.<br>Is over and below 0.3 V indicated? | "RED/YEL" or "GRY/YEL" circuit open/short.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. | Replace HO2S–2. |
| 4 | Short term fuel trim check:<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20 %? | Intermittent trouble or faulty ECM (PCM).<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to DTC P0174/P0175 Diag. Flow Table. |

# DTC P0161 HO2S-2 (Bank 2) Heater Circuit Malfunction

### Wiring Diagram

Refer to DTC P0156.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following condition is detected when HO2S–2 heater operates (2 driving cycle detection logic).<br>• Current of HO2S–2 heater is more than 11.4 A or less than 0.32 A, or<br>• Voltage of HO2S–2 heater is more than 13.8 V or less than 8.7 V. | HO2S–2 heater or its circuit<br>ECM (PCM) |

### 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.**

**NOTE:**

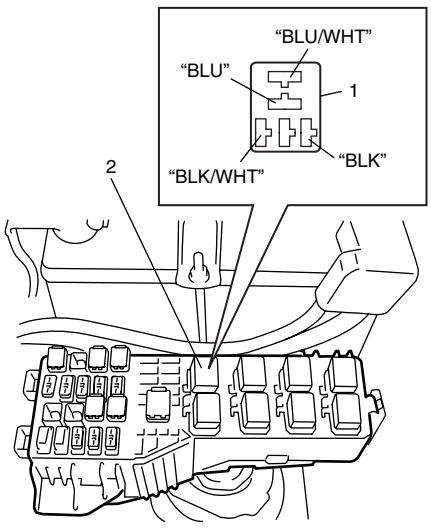
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 5 min. (Change of vehicle speed is permitted in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor heater monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor heater monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 5).

## 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” in this section. |
| 2 | HO2S–2 heater check:<br>1) Disconnect HO2S–2 coupler with ignition switch OFF.<br>2) Check resistance between “PNK/WHT” wire terminal and “BLU” wire terminal of HO2S–2 connector.<br>**HO2S–2 heater resistance:**<br>**11.7 – 14.3 Ω (at 20°C (68°F))**<br>Is it within above specification | Go to Step 3. | Replace HO2S–2. |
| 3 | HO2S heater power supply check:<br>1) With ignition switch ON leaving engine OFF, check voltage between “BLK/WHT” wire terminal of HO2S heater relay coupler and ground, “BLU/WHT” wire terminal of HO2S heater relay coupler and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | Main fuse and/or “IG COIL” fuse blown.<br>If OK, faulty “BLK/WHT” wire or “BLU/WHT” wire. |
| 4 | HO2S heater control circuit check:<br>1) With ignition switch OFF, install HO2S heater relay.<br>2) With ignition switch ON leaving engine OFF, check voltage between C51-2-17 and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM (PCM) and recheck. | Faulty HO2S heater relay or “BLK” wire open, “BLU” wire open or shorted to ground circuit, “PNK/WHT” wire open or shorted to ground circuit.<br>If OK, substitute a known-good ECM (PCM) and recheck. |




| [A]: Fig. for Step 3 |
|---|
| 1. Fuse/relay box coupler viewed from relay side |
| 2. HO2S heater relay |

# DTC P0171/P0172 Fuel System Too Lean/Rich (Bank 1)

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| When running after engine warmed (2 driving cycle detection logic).<br>• Short term fuel trim exceeding 15 % or long term fuel trim exceeding 20 % and total trim exceeding 43 % is detected.<br>– Fuel system too lean<br>• Short term fuel trim less than – 11 % or long term fuel trim less than – 11 % and total trim less than – 30 % is detected.<br>– Fuel trim too rich | • Vacuum leaks (air inhaling)<br>• Exhaust gas leakage<br>• Fuel pressure out of specification<br>• Heated oxygen sensor malfunction<br>• EGR system malfunction<br>• MAF sensor poor performance<br>• ECT sensor poor performance<br>• Fuel level sensor. |

### 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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp. at start: – 8 – 60°C (18 – 140°F)**
- **Engine coolant temp. at start: – 8 – 95°C (18 – 203°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: 110°C (230°F) or lower**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 3 min. or more.
5) Stop vehicle and check pending DTC by using scan tool.

## 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” in this section. |
| 2 | Is there DTC (s) other than “DTC P0171/ P0172”? | Go to applicable “DTC Flow Table”. | Go to Step 3. |
| 3 | Check intake system and exhaust system for leakage.<br>Are intake system and exhaust system in good condition? | Go to Step 4. | Repair or replace. |
| 4 | Check fuel pressure referring to “Table B-3” in this section.<br>Is check result satisfactory? | Go to Step 5. | Repair or replace. |
| 5 | Check fuel injectors referring to “Fuel Injector” in Section 6E2.<br>Is check result satisfactory? | Go to Step 6. | Faulty injector (s). |
| 6 | Check fuel level sensor referring to “Fuel Sender Gauge” in Section 8C.<br>Is check result satisfactory? | Go to Step 7. | Faulty fuel level sensor or its circuit. |
| 7 | Check MAF sensor for performance referring to “Mass Air Flow Sensor (MAF Sensor)” in Section 6E2.<br>Is check result satisfactory? | Go to Step 8. | Faulty MAF sensor or its circuit. |
| 8 | Check ECT sensor referring to “Engine Coolant Temperature Sensor (ECT Sensor)” in Section 6E2.<br>Is check result satisfactory? | Go to Step 9. | Faulty ECT sensor. |
| 9 | Check HO2S–1 referring to “DTC P0130 Diag. Flow Table”.<br>Is check result satisfactory? | Substitute a known-good ECM (PCM) and recheck. | Faulty HO2S–1. |

# DTC P0174/P0175 Fuel System Too Lean/Rich (Bank 2)

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| When running after engine warmed (2 driving cycle detection logic).<br>• Short term fuel trim exceeding 15 % or long term fuel trim exceeding 20 % and total trim exceeding 43 % is detected.<br>– Fuel system too lean<br>• Short term fuel trim less than – 11 % or long term fuel trim less than – 11 % and total trim less than – 30 % is detected.<br>– Fuel trim too rich | • Vacuum leaks (air inhaling)<br>• Exhaust gas leakage<br>• Fuel pressure out of specification<br>• Heated oxygen sensor malfunction<br>• EGR system malfunction<br>• MAF sensor poor performance<br>• ECT sensor poor performance<br>• Fuel level sensor. |

## 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.**

**NOTE:**

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

- **Intake air temp. at start: – 8 – 60°C (18 – 140°F)**
- **Engine coolant temp. at start: – 8 – 95°C (18 – 203°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: 110°C (230°F) or lower**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 3 min. or more.
5) Stop vehicle and check pending DTC by using scan tool.

## 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” in this section. |
| 2 | Is there DTC (s) other than “DTC P0174/ P0175”? | Go to applicable “DTC Flow Table”. | Go to Step 3. |
| 3 | Check intake system and exhaust system for leakage.<br>Are intake system and exhaust system in good condition? | Go to Step 4. | Repair or replace. |
| 4 | Check fuel pressure referring to “Table B-3” in this section.<br>Is check result satisfactory? | Go to Step 5. | Repair or replace. |
| 5 | Check fuel injectors referring to “Fuel Injector” in Section 6E2.<br>Is check result satisfactory? | Go to Step 6. | Faulty injector (s). |
| 6 | Check fuel level sensor referring to “Fuel Level Gauge (Sender Gauge) in Section 8C.<br>Is check result satisfactory? | Go to Step 7. | Faulty fuel level sensor or its circuit. |
| 7 | Check MAF sensor for performance referring to “Mass Air Flow Sensor (MAF Sensor)” in Section 6E2.<br>Is check result satisfactory? | Go to Step 8. | Faulty MAF sensor or its circuit. |
| 8 | Check ECT sensor referring to “Engine Coolant Temperature Sensor (ECT Sensor)” in Section 6E2.<br>Is check result satisfactory? | Go to Step 9. | Faulty ECT sensor. |
| 9 | Check HO2S–1 referring to “DTC P0150 Diag. Flow Table”.<br>Is check result satisfactory? | Substitute a known-good ECM (PCM) and recheck. | Faulty HO2S–1. |

# DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 Random Misfire/Cylinder 1 Misfire/Cylinder 2 Misfire/Cylinder 3 Misfire/Cylinder 4 Misfire Detected/Cylinder 5 Misfire Detected/Cylinder 6 Misfire Detected

### System Description

ECM (PCM) measures the angle speed 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 the ECM (PCM) beyond the DTC detecting condition, it determines the cylinder where the misfire occurred and outputs it as DTC.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC P0300:<br>• 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.)<br>• Misfire which affects exhaust emission adversely during 1000 engine revolutions is detected at 2 or more cylinders (2 driving cycle detection logic) | • Ignition system<br>• Fuel injector and its circuit<br>• Fuel line pressure<br>• Engine compression<br>• Abnormal air drawn in<br>• EGR system<br>• Fuel level sensor<br>• Valve lash adjuster<br>• Valve timing |
| DTC P0301, P0302, P0303, P0304, P0305, P0306:<br>• Misfire which causes catalyst to overheat during 200 engine revolutions is detected at 1 cylinder. (MIL flashes as long as this misfire occurs continuously.)<br>• Misfire which affects exhaust emission adversely during 1000 engine revolutions 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 with 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.: – 8 – 70°C (18 – 158°F)**
- **Engine coolant temp.: – 8°C (18°F) or higher**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

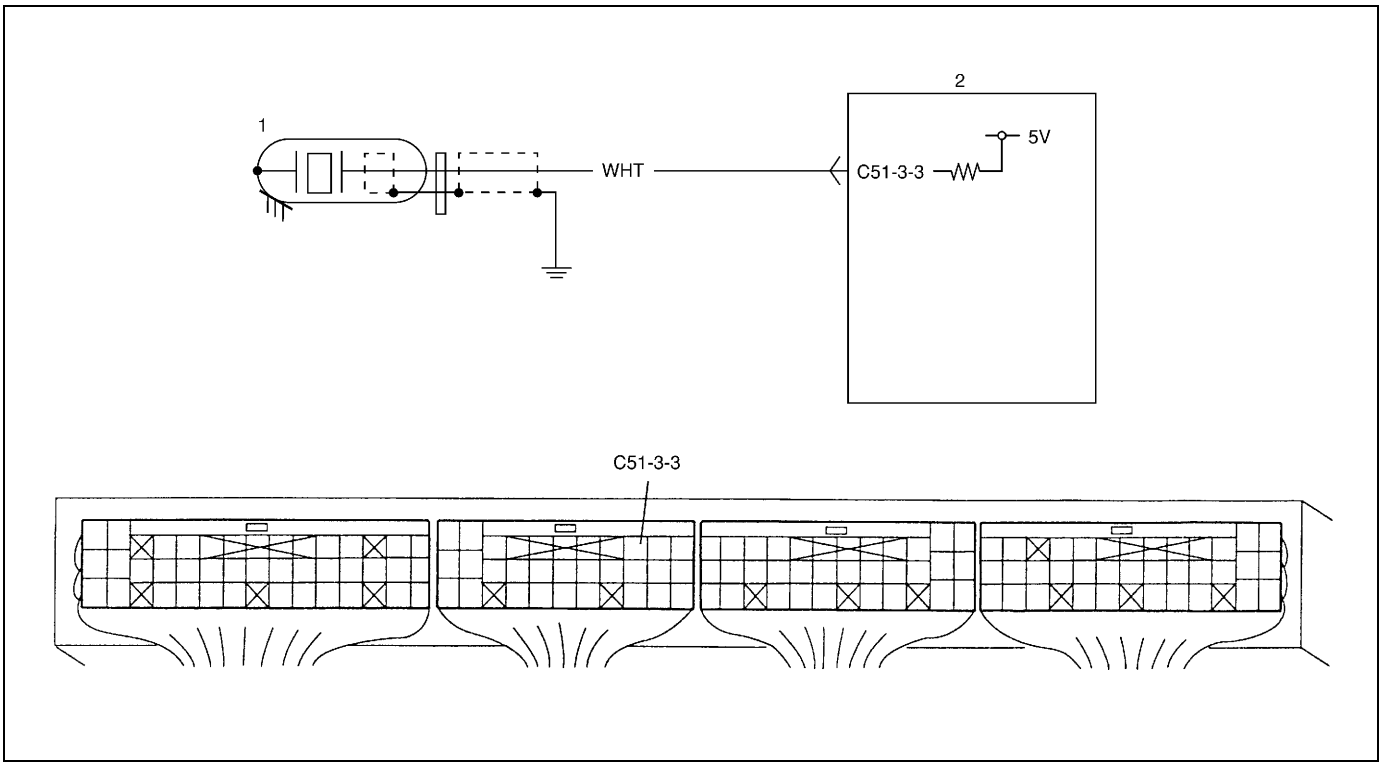
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to speed recorded as freeze frame data (V) ± 5 km/h when detecting misfire.
4) Keep driving above vehicle speed for 5 min.
5) Stop vehicle and check DTC (or pending DTC) by using scan tool.

## 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” in this section. |
| 2 | Ignition system inspection:<br>1) Check spark plug and ignition spark of cylinder where misfire occurs, referring to “Spark Plug” and “Ignition Spark Check and Adjustment” in Section 6F2.<br>Is it in good condition? | Go to Step 3. | Faulty ignition coil, wire harness, or other system parts. |
| 3 | Fuel injector circuit inspection:<br>1) Using sound scope, check each injector operating sound at engine cranking or idling.<br>Do all injectors make operating sound? | Go to Step 4. | Check coupler connection and wire harness of injector not making operating sound and injector itself.<br>If OK, substitute a known-good ECM (PCM) and recheck. |
| 4 | Fuel pressure inspection:<br>1) Check fuel pressure referring to “Table B-3” in this section.<br>Is check result satisfactory? | Go to Step 5. | Repair or replace. |
| 5 | Fuel injector inspection:<br>1) Check fuel injector(s) referring to “Fuel Injector” in Section 6E2.<br>Is check result satisfactory? | Go to Step 6. | Replace. |
| 6 | Ignition timing inspection:<br>1) Check ignition timing referring to “Ignition Timing Check and Adjustment” in Section 6F2.<br>Is check result satisfactory? | Go to Step 7. | Adjust or check system related parts. |
| 7 | EGR system inspection:<br>1) Check EGR system referring to “EGR System (If Equipped)” in Section 6E2.<br>Is check result satisfactory? | Go to Step 8. | Repair or replace. |
| 8 | Fuel level sensor inspection:<br>1) Check fuel level sensor referring to “Fuel Level Gauge (Sender Gauge) in Section 8C.<br>Is check result satisfactory? | Go to Step 9. | Repair or replace. |
| 9 | Check engine mechanical parts or system which can cause engine rough idle or poor performance.<br>• Engine compression (See “Compression Check” in Section 6A2).<br>• Valve lash or lash adjuster (See “Camshaft and Valve Lash Adjuster” in Section 6A2).<br>• Valve timing (Timing chain installation. See Section 6A2).<br>Are they in good condition? | Check wire harness and connection of ECM (PCM) ground, ignition system and fuel injector for intermittent open and short. | Repair or replace. |

# DTC P0325 (DTC No.43) Knock Sensor Circuit Malfunction

## Circuit Description




| |
|---|
| 1. Knock sensor |
| 2. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

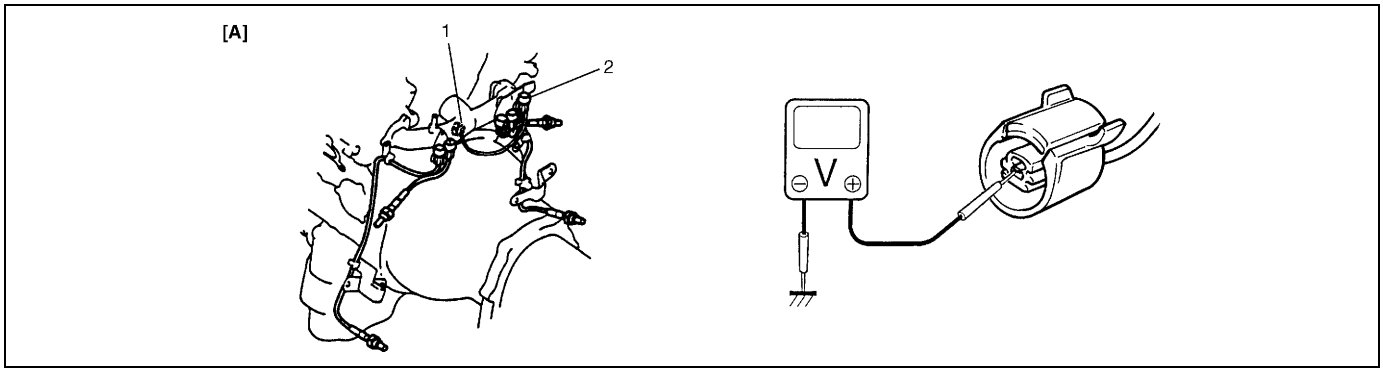
| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC will set when one of the following condition is detected.<br>• Knock sensor voltage is 0.90 V or less, or<br>• Knock sensor voltage is 3.98 V or more | • "WHT" circuit open or shorted to ground<br>• Knock sensor malfunction<br>• ECM malfunction |

## DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch 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.

## Troubleshooting

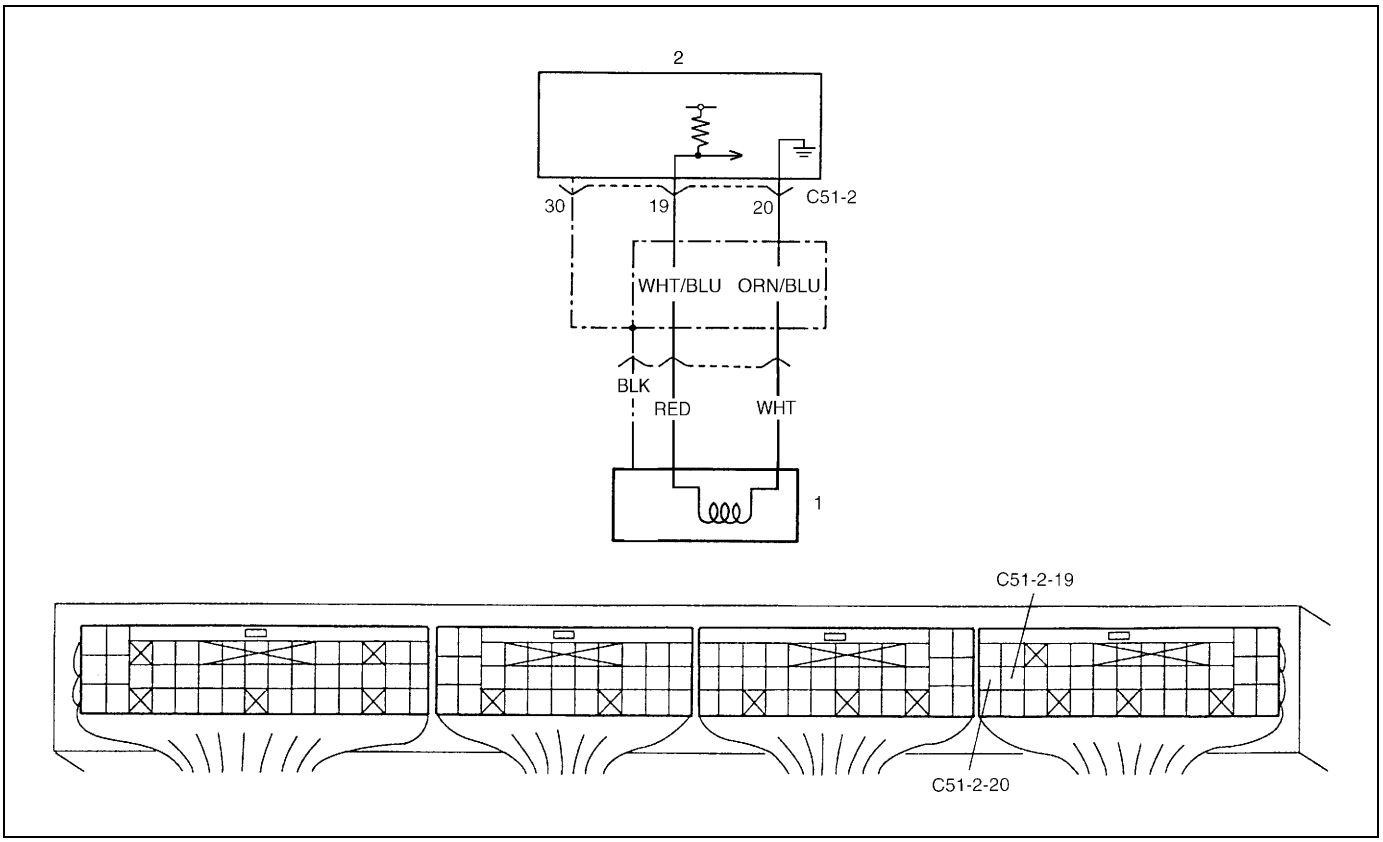
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | Knock sensor and its circuit check:<br>1) With engine running, check voltage from “C51-3-3” terminal of ECM connector to body ground.<br>Is voltage about 0.90 – 3.98 V? | Knock sensor and its circuit are in good condition. Intermittent trouble or faulty ECM. Recheck, referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | Knock sensor power source circuit check:<br>1) Stop engine.<br>2) With ignition switch at OFF position, disconnect knock sensor connector (2).<br>3) With ignition switch at ON position, check voltage from “WHT” to body ground terminal of knock sensor connector. See Fig.<br>Is it 4 – 5 V? | Substitute a known-good knock sensor and recheck. | “WHT” wire open, shorted to ground circuit or poor “C51-3-3” connection. If wire and connection are OK, substitute a known-good substitute a known-good ECM and recheck. |




| [A]: Fig. for Step 3 |
|---|
| 1. Knock sensor |

# DTC P0335 Crankshaft Position Sensor Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. CKP sensor |
| 2. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| CKP sensor signal is not input while 100 pulses of CMP sensor signal are input after engine start. | CKP sensor circuit<br>CKP sensor<br>ECM (PCM) |

## DTC Confirmation Procedure

**NOTE:**

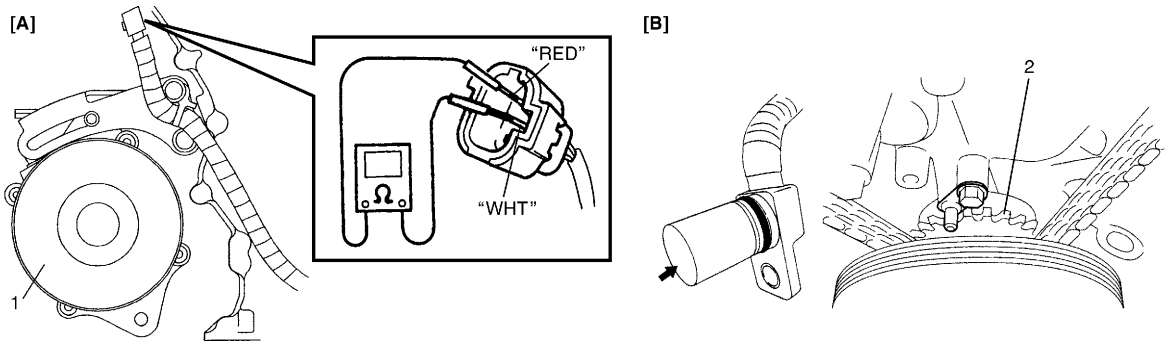
**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 10 sec.
3) Check DTC by using scan tool.

## Troubleshooting

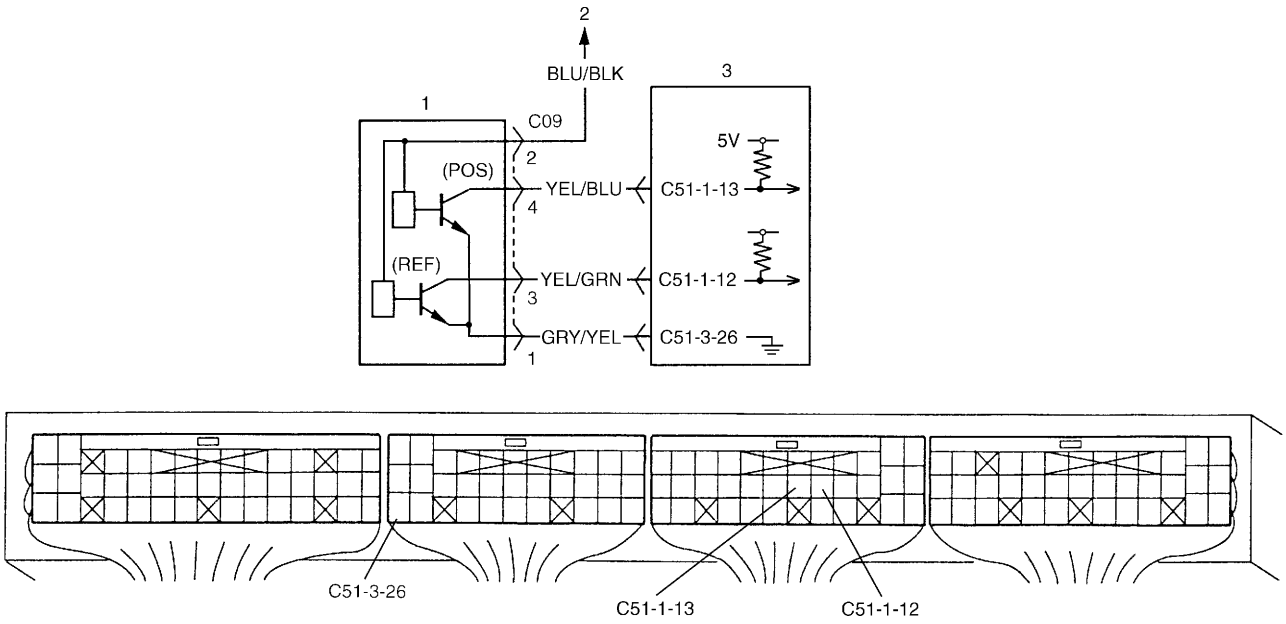
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | CKP sensor and its circuit resistance check:<br>1) With ignition switch OFF, disconnect ECM (PCM) coupler (C51-2).<br>2) Check for proper connection to ECM (PCM) at C51-2-19 and C51-2-20 terminals.<br>3) If OK, check resistance of followings.<br>**CKP sensor resistance between C51-2-19 and C51-2-20 terminals:**<br>**484 – 656 Ω at 20°C (68°F)**<br>**CKP sensor resistance between each terminal and ground:**<br>**1 MΩ or more**<br>Is check result satisfactory? | Go to Step 4. | Go to Step 3. |
| 3 | CKP sensor resistance check:<br>1) With ignition switch OFF, disconnect CKP sensor coupler.<br>2) Check resistance between terminals of CKP sensor coupler. (See Fig.)<br>Were measured resistance values as specified in Step 2? | Faulty “WHT/BLU” wire or “ORN/BLU” wire. | Faulty CKP sensor. |
| 4 | CKP sensor visual inspection:<br>Check visually CKP sensor and signal rotor for the followings. (See Fig.)<br>• Damage<br>• No foreign material attached<br>• Correct installation<br>Are they in good condition? | Intermittent trouble or faulty ECM (PCM). Recheck for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Replace or reinstall. |




| | |
|---|---|
| [A]: Fig. for Step 3 | 1. Generator |
| [B]: Fig. for Step 4 | 2. Sensor plate |

# DTC P0340 (DTC No.42) Camshaft Position Sensor Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. | CMP sensor |
| 2. | To main relay |
| 3. | ECM (PCM) |

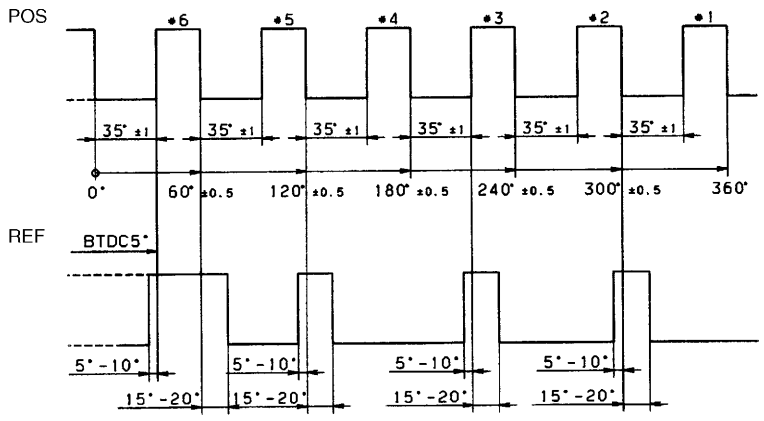
## System Description

CMP sensor detects REF signal and POS signal.

- REF signal: 4 pulses/1 revolution of camshaft. There are 2 different kinds of wavelength. Based on REF signal, ECM (PCM) judges which cylinder is at TDC.
- POS signal: 6 pulse/1 revolution of camshaft. Each of POS signals has equivalent wavelength. Based on POS signal, ECM (PCM) judges the wavelength of REF signals, engine speed and piston position.

## Reference

Connect oscilloscope between terminals C51-1-13 (POS) or C51-1-12 (REF) and C51-3-26 (ground) of ECM (PCM) connector connected to ECM (PCM) and check CMP sensor signal.



**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| CMP sensor signal is not inputted for 3 sec. even though engine start signal is being inputted.<br>or<br>REF signal pattern is incorrect while POS signal varies.<br>or<br>POS signal voltage too high or too low. | CMP sensor circuit<br>CMP sensor<br>Engine starter signal circuit<br>ECM (PCM) |

**DTC Confirmation Procedure**

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool.
3) Crank engine for 3 seconds or more and keep it at idle for 1 min.
4) Check DTC by using scan tool.

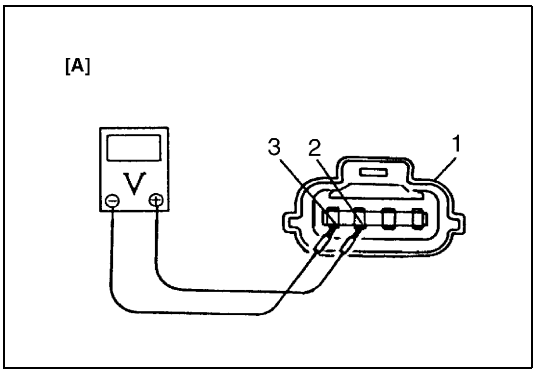
**Troubleshooting**

**NOTE:**

**If starter circuit is open (i.e., starter signal circuit is OK but starter fails to run), this DTC is stored in memory at starter switch ON, even through CMP sensor is in good condition.**
**When starter motor fails to run and this DTC appears, check starter circuit first.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | Is engine cranked? | Go to Step 3. | Go to Section 6G. |
| 3 | Is there DTC P1500 (Engine starter signal circuit)? | Go to DTC P1500 Diag. Flow Table. | Go to Step 4. |
| 4 | CMP sensor power supply voltage check:<br>1) With ignition switch OFF, disconnect CMP sensor coupler.<br>2) With ignition switch ON, check voltage between "BLU/BLK" wire terminal and "GRY/YEL" wire terminal of CMP sensor coupler. (See Fig.)<br>Is the voltage 10 – 14 V? | Go to Step 5. | Faulty "BLU/BLK" wire and/or "GRY/YEL" wire. |

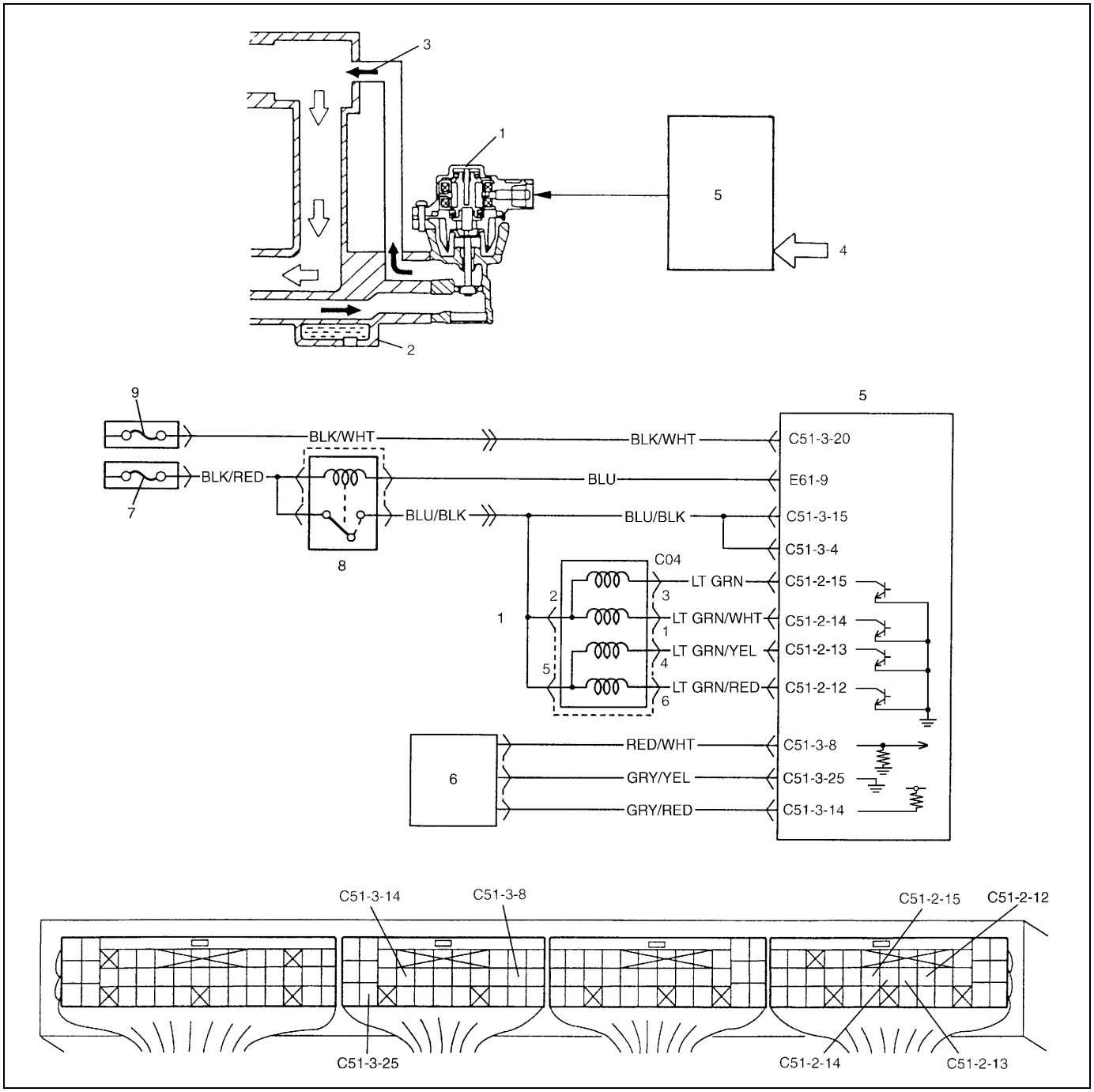
| Step | Action | Yes | No |
|---|---|---|---|
| 5 | CMP sensor (REF) signal check:<br>1) With ignition switch OFF, connect CMP sensor coupler.<br>2) Disconnect couplers from ignition coil assembly and fuel injectors.<br>3) With ignition switch ON and crankshaft turned slowly, check voltage between C51-1-12 and C51-3-26 terminal.<br>Does voltmeter indicator deflect between 0 – 1 V and 3 – 5.25 V 4 times while crankshaft turned two revolutions? | Go to Step 6. | Faulty "YEL/GRN" wire or CMP sensor.<br>If OK, substitute a known-good ECM (PCM) and recheck. |
| 6 | CMP sensor (POS) signal check:<br>1) With ignition switch ON and crankshaft turned slowly, check voltage between C51-1-13 and C51-3-26 terminal.<br>Does voltmeter indicator deflect between 0 – 1 V and 3 – 5.25 V 6 times while crankshaft turned two revolutions? | Poor C51-1-12 and/or C51-3-13 terminal of ECM (PCM) coupler connection.<br>If OK, substitute a known-good ECM (PCM) and recheck. | Faulty "YEL/BLU" wire or CMP sensor.<br>If OK, substitute a known-good ECM (PCM) and recheck. |




| [A]: Fig. for Step 4 |
|---|
| 1. Disconnected CMP sensor coupler |
| 2. "BLU/BLK" wire terminal |
| 3. "GRY/YEL" wire terminal |

# DTC P0400 Exhaust Gas Recirculation Flow Malfunction

## System/Wiring Diagram




| | |
|---|---|
| 1. EGR valve | 6. MAP sensor |
| 2. Intake manifold | 7. Main fuse (“FI”) |
| 3. Exhaust gas | 8. Main relay |
| 4. Sensed information | 9. “METER” fuse |
| 5. ECM (PC) | |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| During deceleration (engine speed high with closed throttle position) in which fuel cut is involved, difference in intake manifold pressure between when EGR valve is opened and when it is closed is smaller than specified value.<br>(2 driving cycle detection logic) | • EGR valve<br>• EGR passage<br>• Manifold absolute pressure sensor<br>• ECM (PCM) |

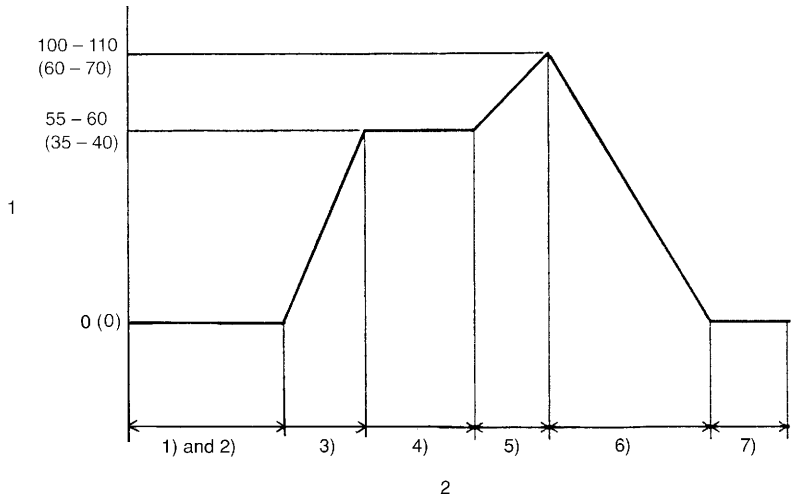
### DTC Confirmation Procedure

**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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 55 – 60 km/h (35 – 40 mph).
4) Keep driving above vehicle speed for 7 min. or more.
5) Increase vehicle speed to 100 – 110 km/h (60 – 70 mph).
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting and then stop vehicle.
7) Check if pending DTC exists by using scan tool. If not, check if EGR system monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and EGR system monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 6).



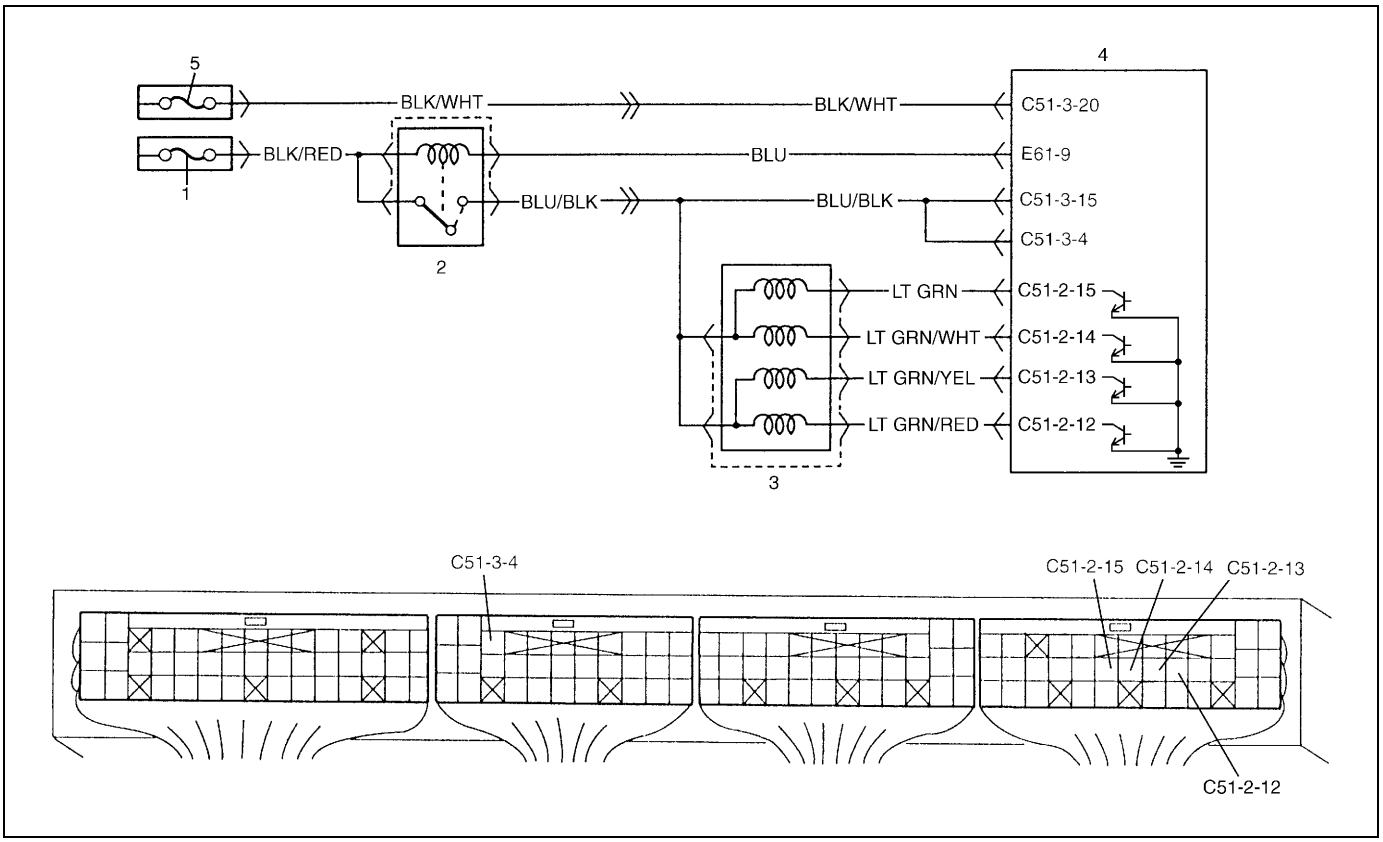

| |
|---|
| 1. Vehicle speed km/h (mph) |
| 2. Step |

## 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” in this section. |
| 2 | Is there DTC P0403 (EGR circuit malfunction)? | Go to DTC P0403 Diag. Flow Table. | Go to Step 3. |
| 3 | Do you have SUZUKI scan tool? | Go to Step 4. | Go to Step 6. |
| 4 | EGR valve operation check:<br>1) With ignition switch OFF, install SUZUKI scan tool.<br>2) Check EGR system referring to “EGR System” in Section 6E2.<br>Is it in good condition? | Go to Step 5. | Go to Step 6. |
| 5 | MAP sensor check:<br>1) Check MAP sensor for performance referring to “Manifold Absolute Pressure Sensor” in Section 6E2.<br>Is check result satisfactory? | Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Repair or replace. |
| 6 | EGR valve power supply circuit check:<br>1) With ignition switch OFF, disconnect EGR valve coupler.<br>2) With ignition switch ON, check voltage between C04-2 (“BLU/BLK” wire terminal of EGR valve coupler) and ground, C04-5 (“BLU/BLK” wire terminal of EGR valve coupler) and ground.<br>Is each voltage 10 – 14 V? | Go to Step 7. | Faulty “BLU/BLK” wire. |
| 7 | EGR valve stepper motor coil circuit check:<br>1) With ignition switch OFF, connect EGR valve coupler and disconnect ECM (PCM) couplers.<br>2) Check resistance between C51-3-4 and C51-2-12, C51-2-13, C51-2-14, C51-2-15.<br>Is each resistance 20 – 24 Ω at 20°C (68°F)? | Go to Step 8. | Faulty EGR valve. |
| 8 | MAP sensor check:<br>1) Check MAP sensor for performance referring to “Manifold Absolute Pressure Sensor” in Section 6E2.<br>Is check result satisfactory? | EGR passage clogged or EGR valve malfunction.<br>If all above are OK, intermittent trouble or faulty ECM (PCM).<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Repair or replace. |

# DTC P0403 (DTC No.51) Exhaust Gas Recirculation Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. Main fuse (“FI”) | 4. ECM (PCM) |
| 2. Main relay | 5. “METER” fuse |
| 3. EGR valve | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| High voltage is detected at EGR valve stepping motor electrical circuit for specified time continuously. (Circuit open or short). | EGR valve (stepping motor) or its circuit ECM (PCM) |

## DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this “DTC Confirmation Procedure”.**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

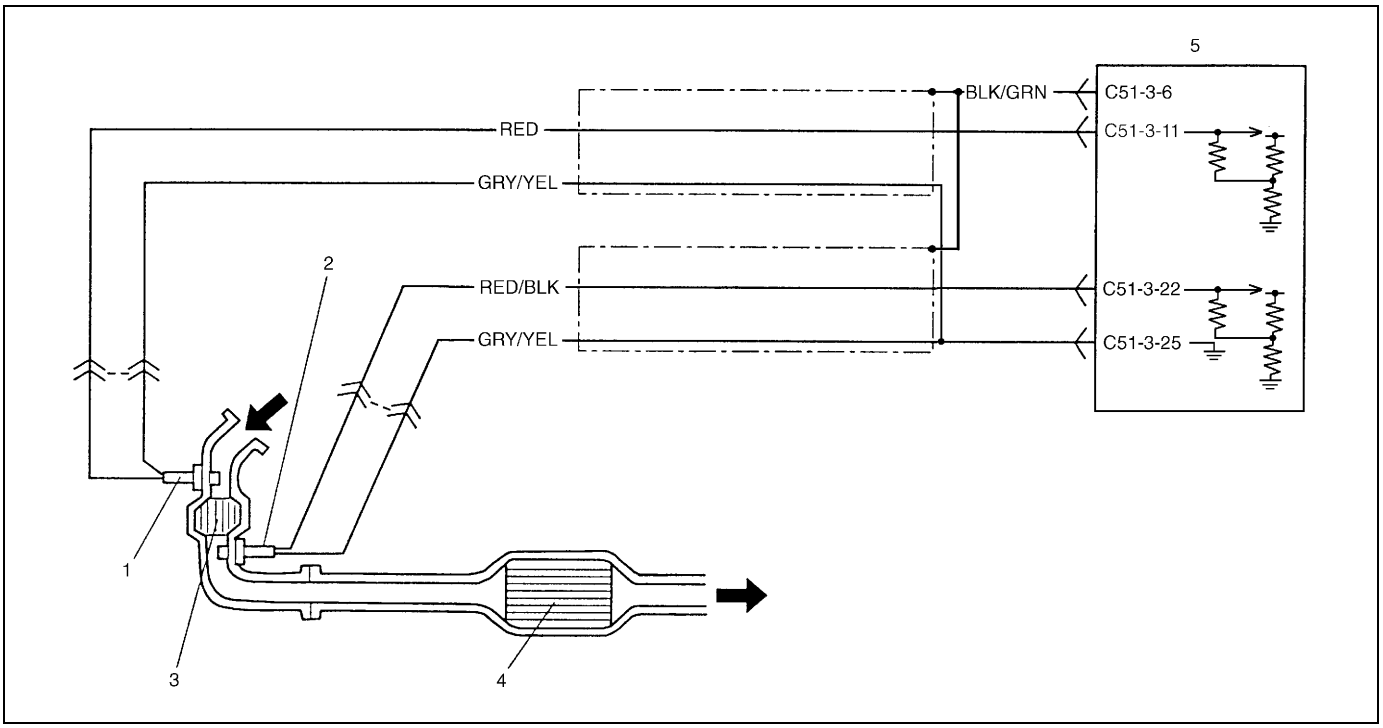
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC by using scan tool.

## 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” in this section. |
| 2 | EGR valve check:<br>1) With ignition switch OFF, disconnect connector from EGR valve.<br>2) Check for proper connection to EGR valve at each terminal.<br>3) If OK, check EGR valve for resistance referring to “EGR System (If Equipped)” in Section 6E2.<br>Is check result as specified? | Go to Step 3. | EGR valve malfunction. |
| 3 | Wire harness check:<br>1) Connect connector to EGR valve.<br>2) Remove ECM (PCM) cover and disconnect connector from ECM (PCM).<br>3) Check for proper connection to ECM (PCM) at system related terminals.<br>4) If OK, check for resistance between the following terminals of ECM (PCM) connector disconnected.<br>**EGR valve resistance**<br>**C51-2-13 and C51-3-4, C51-2-14 and C51-3-4, C51-2-15 and C51-3-4, C51-2-12 and C51-3-4: 20 – 24 Ω at 20°C (68°F)**<br>**C51-2-13 and ground, C51-2-14 and ground, C51-2-15 and ground, C51-2-12 and ground: Infinity (∞)**<br>Is check result as specified? | Intermittent trouble or faulty ECM (PCM). Recheck referring to “Intermittent and Poor Connection” in Section 0A. | “BLU/BLK”, “LT GRN”, “LT GRN/WHT”, “LT GRN/YEL” or “LT GRN/RED” circuit open or shorted to ground. |

# DTC P0420 Catalyst System Efficiency Below Threshold (Bank 1)

## System Diagram




| | |
|---|---|
| 1. HO2S–1 (Bank–1) | 4. TWC |
| 2. HO2S–2 (Bank–1) | 5. ECM (PCM) |
| 3. WU-TWC | |

## Circuit Description

Exhaust oxygen concentration at the pre-catalyst and the post-catalyst of WU-TWC is detected from HO2S–1 and HO2S–2 respectively and accordingly ECM (PCM) controls the closed loop which then controls the fuel injection volume. (Refer to Section 6E2.) While the above control is going on and if WU-TWC is in good condition, the output voltage of HO2S–2 is maintained at specified level. As WU-TWC becomes deteriorated, even when the above control is going on, the exhaust gas which has passed WU-TWC then passes HO2S–2 at the exhaust oxygen concentration similar to that of the pre-catalyst without being oxygenated or converted. Thus, waveforms of HO2S–1 and HO2S–2 output voltages become alike. ECM (PCM) judges deterioration of WU-TWC by comparing waveforms of HO2S–1 and HO2S–2.

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| While running under conditions described for “DTC Confirmation Procedure”, output waveform of HO2S–1 becomes similar to that of HO2S–2.<br>(2 driving cycle detection logic) | • Exhaust gas leakage<br>• Warm up three way catalytic converter<br>• Heated oxygen sensor–2 or its circuit<br>• ECM (PCM) |

### 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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

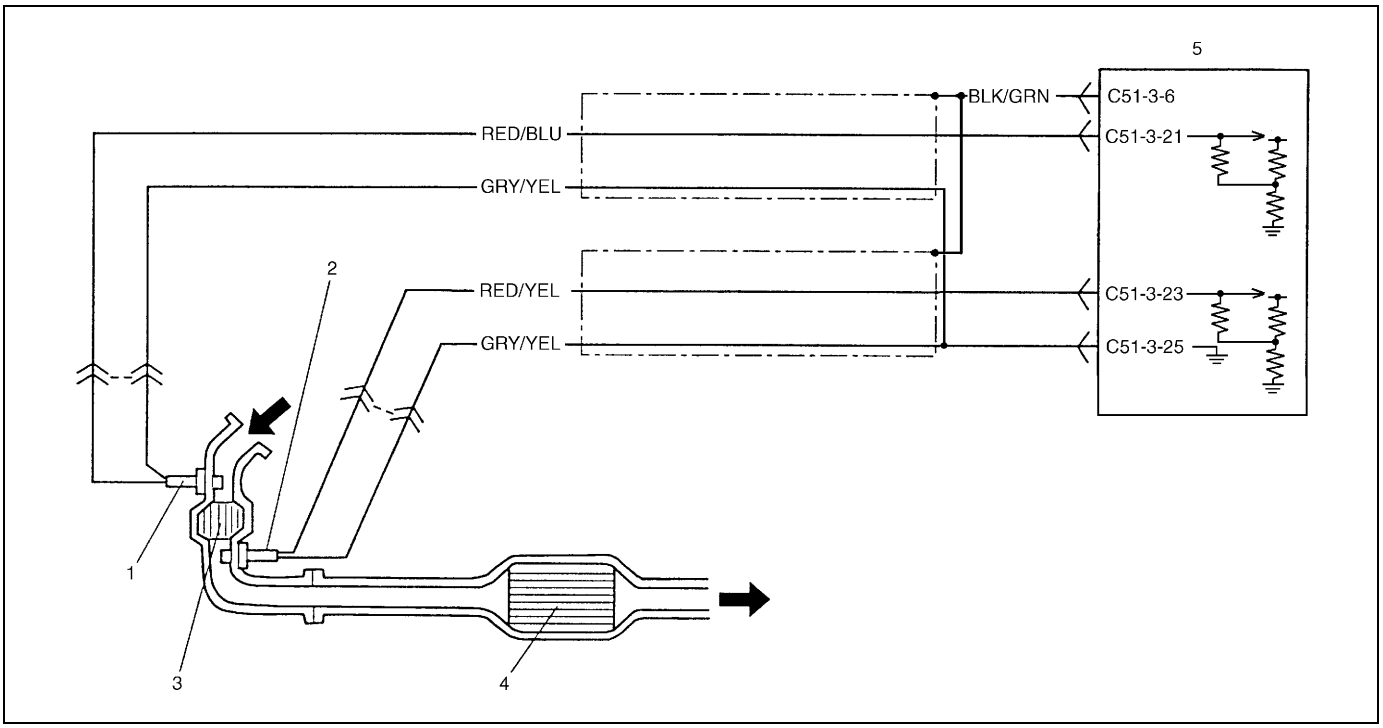
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Increase vehicle speed to 80 – 90 km/h (50 – 56 mph).
4) Keep above vehicle speed for 5 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if catalyst monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

### 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" in this section. |
| 2 | Exhaust system visual inspection:<br>1) Check exhaust system for leaks, damage and loose connection.<br>Is it in good condition? | Go to Step 3. | Repair or replace. |
| 3 | HO2S–2 output voltage check:<br>1) Check output voltage of HO2S–2 referring Step 2 of "DTC P0136 Diag. Flow Table".<br>Is check result satisfactory? | Replace warm up three way catalytic converter. | Check "RED/BLK" and "GRY/YEL" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S–2. |

# DTC P0430 Catalyst System Efficiency Below Threshold (Bank 2)

## System Diagram




| | |
|---|---|
| 1. HO2S–1 (Bank–2) | 4. TWC |
| 2. HO2S–2 (Bank–2) | 5. ECM (PCM) |
| 3. WU-TWC | |

## Circuit Description

Exhaust oxygen concentration at the pre-catalyst and the post-catalyst of WU-TWC is detected from HO2S–1 and HO2S–2 respectively and accordingly ECM (PCM) controls the closed loop which then controls the fuel injection volume. (Refer to Section 6E2.) While the above control is going on and if WU-TWC is in good condition, the output voltage of HO2S–2 is maintained at specified level. As WU-TWC becomes deteriorated, even when the above control is going on, the exhaust gas which has passed TWC then passes HO2S–2 at the exhaust oxygen concentration similar to that of the pre-catalyst without being oxygenated or converted. Thus, waveforms of HO2S–1 and HO2S–2 output voltages become alike. ECM (PCM) judges deterioration of WU-TWC by comparing waveforms of HO2S–1 and HO2S–2.

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| While running under conditions described for “DTC Confirmation Procedure”, output waveform of HO2S–1 becomes similar to that of HO2S–2.<br>(2 driving cycle detection logic) | • Exhaust gas leakage<br>• Warm up three way catalytic converter<br>• Heated oxygen sensor–2 or its circuit<br>• ECM (PCM) |

### 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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

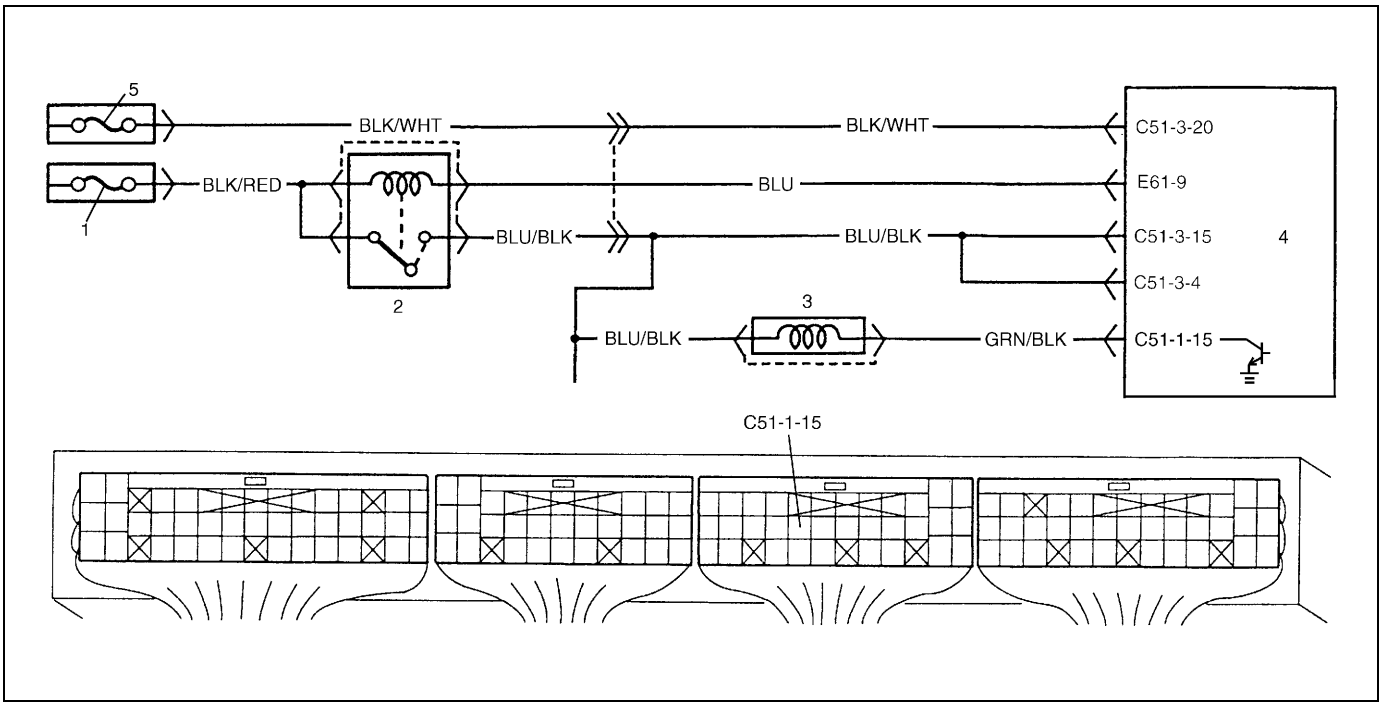
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Increase vehicle speed to 80 – 90 km/h (50 – 56 mph).
4) Keep above vehicle speed for 5 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if catalyst monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

### 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" in this section. |
| 2 | Exhaust system visual inspection:<br>1) Check exhaust system for leaks, damage and loose connection.<br>Is it in good condition? | Go to Step 3. | Repair or replace. |
| 3 | HO2S–2 output voltage check:<br>1) Check output voltage of HO2S–2 referring Step 2 of "DTC P0156 Diag. Flow Table".<br>Is check result satisfactory? | Replace warm up three way catalytic converter. | Check "RED/YEL" and "GRY/YEL" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S–2. |

# DTC P0443 Evap Control System Purge Control Valve Circuit Malfunction

## System/Wiring Diagram




| | | |
|---|---|---|
| 1. Main fuse (“FI”) | 3. EVAP canister purge valve | 5. “METER” fuse |
| 2. Main relay | 4. ECM (PCM) | |

## 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)<br>(2 driving cycle detection logic) | • EVAP canister purge valve and its circuit<br>• ECM (PCM) |

## 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.**

**NOTE:**

**Check to make sure that following condition is satisfied when using the “DTC Confirmation Procedure.”**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

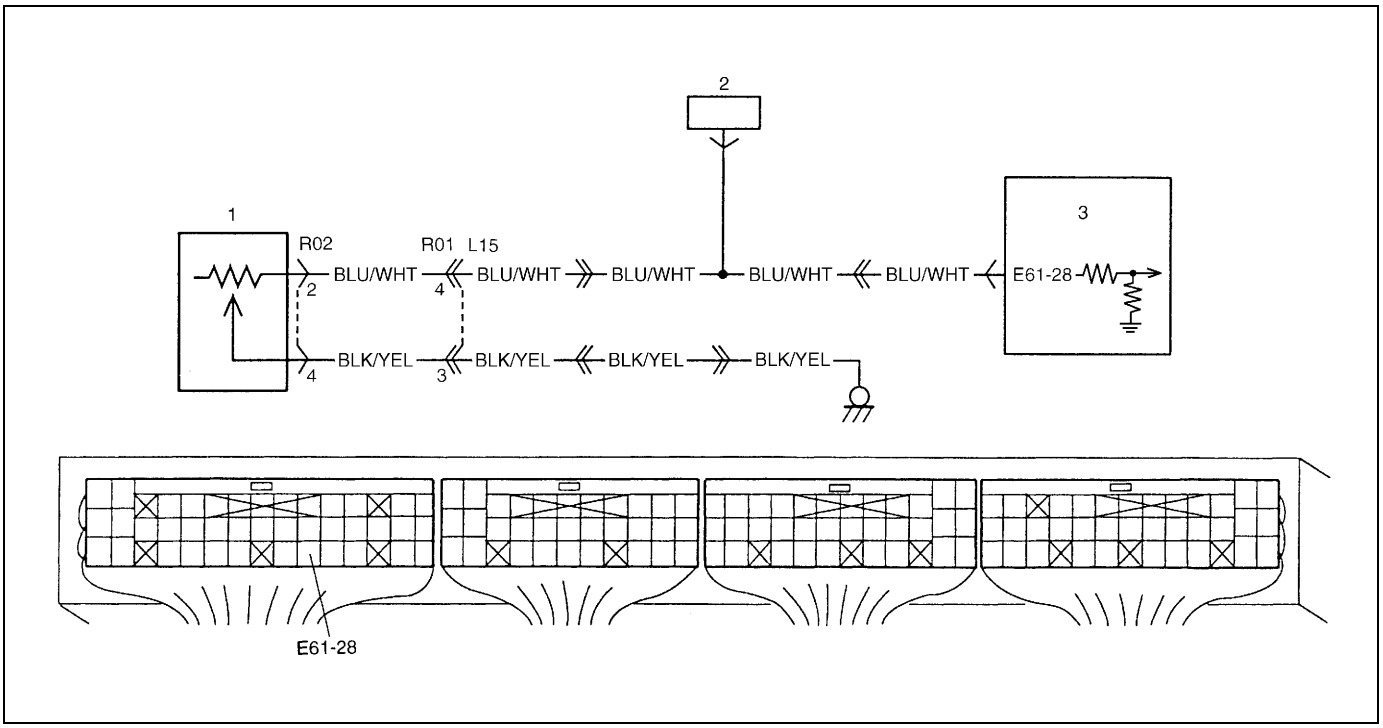
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and warm up it completely.
4) Increase vehicle speed to 55 km/h (35 mph) or more.
5) Keep driving above vehicle speed for 20 min or more (Change of vehicle speed is permitted in this step).
6) Release accelerator pedal, stop vehicle and run engine at speed for 2 min.
7) Check DTC and pending DTC by using scan tool.

**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” in this section. |
| 2 | Check EVAP canister purge system for operation referring to “EVAP Canister Purge System” in Section 6E2.<br>Is check result satisfactory? | Intermittent trouble or faulty ECM (PCM).<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | Check EVAP canister purge valve for resistance referring to “EVAP Canister Purge Valve” in Section 6E2.<br>Is resistance as specified? | “GRN/BLK” or “BLU/BLK” circuit open or short.<br>If wire and connections are OK, substitute a known-good ECM (PCM) and recheck. | Replace EVAP canister purge valve. |

# DTC P0460 Fuel Level Sensor Circuit High Input

## Wiring Diagram/Circuit Description




| |
|---|
| 1. Fuel level sensor |
| 2. Fuel meter in combination meter |
| 3. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Fuel level sensor output voltage higher than specified value is detected for specified time.<br>(2 driving cycle detection logic) | • Fuel level gauge or its circuit<br>• Fuel level sensor or its circuit<br>• ECM (PCM) |

## DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

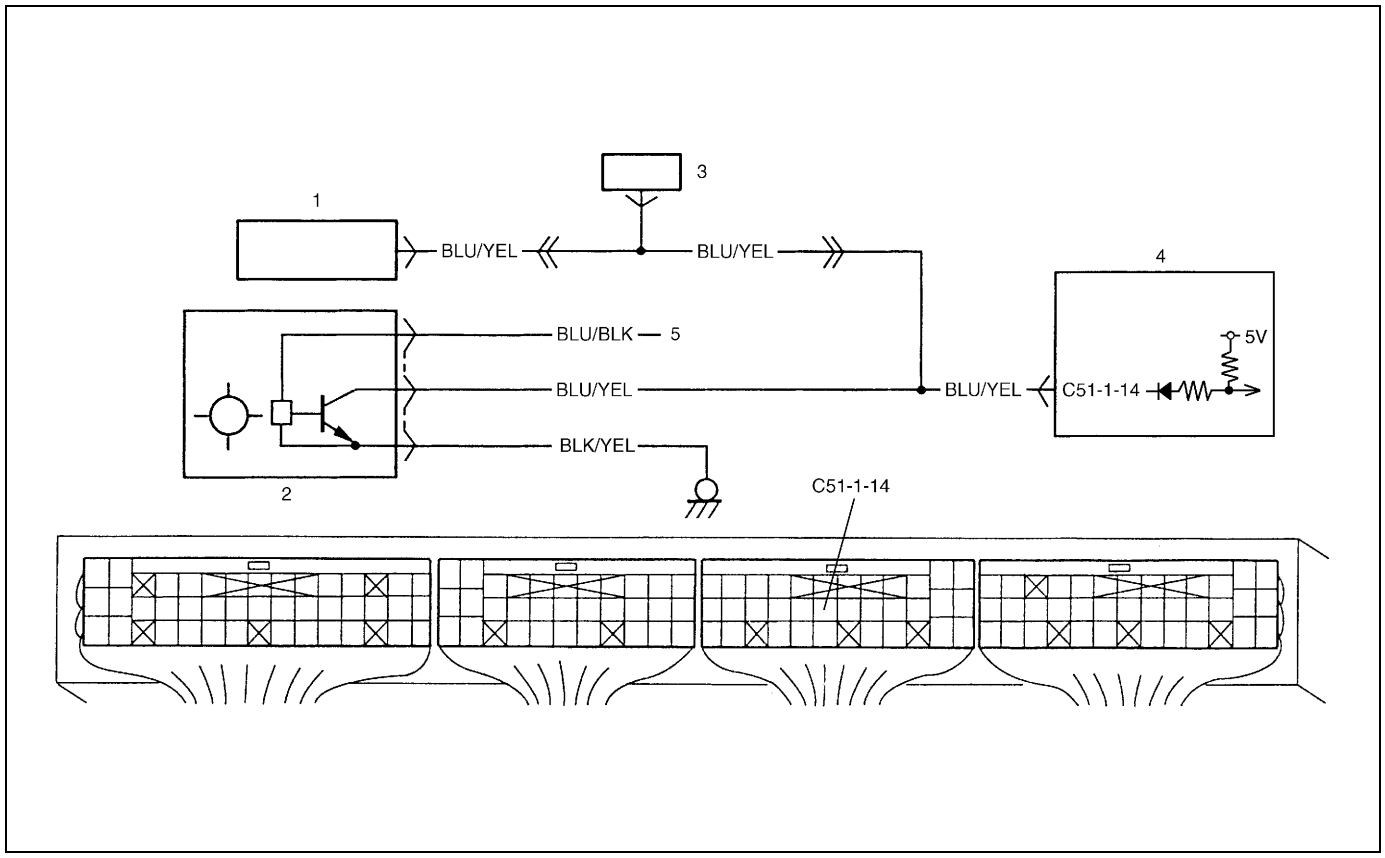
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine for 1 min.
3) Check pending DTC by using scan tool.

## 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” in this section. |
| 2 | Does fuel level meter in combination meter indicate “E” (Empty)? | Replenish fuel tank with fuel and go to Step 3. | Go to Step 3. |
| 3 | Check fuel level sensor and its circuit:<br>1) Check voltage between terminal E61-28 and ground with ignition switch ON.<br>Is it about 7.1 V or more? | Go to Step 4. | Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |
| 4 | Is voltage in Step 3 “9 – 14 V”? | “BLU/WHT” wire shorted to power circuit or fuel level meter malfunction. | Go to Step 5. |
| 5 | Check Fuel Level Sensor:<br>1) Turn ignition switch OFF and disconnect fuel level sensor connector (L15 (floor harness connector) – R01 (fuel tank harness connector)).<br>2) Check for proper connection to fuel level sensor at L15-4 (“BLU/WHT”) and L15-3 (“BLU/YEL”) terminals in floor harness connector.<br>3) If OK, then check resistance between R01-4 (“BLU/WHT”) and R01-3 (“BLU/YEL”) terminals. (Refer to “Fuel Level Gauge (Sender Gauge)” in Section 8C.)<br>Is value close to one of above values indicated? | “BLU/WHT” or “BLK/YEL” circuit open.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. | Check “BLU/WHT” and “BLK/YEL” wires between R01 and R02 (fuel tank harness connector) connections.<br>If OK, replace fuel level sensor. |

# DTC P0500 (DTC No.24) Vehicle Speed Sensor Malfunction

## Wiring Diagram




| |
|---|
| 1. Speedometer |
| 2. Vehicle speed sensor |
| 3. Cruise control module (if equipped) |
| 4. ECM (PCM) |
| 5. To main relay |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Vehicle speed signal not inputted although fuel is kept cut for longer than 5 seconds<br>(2 driving cycle detection logic) | • Vehicle speed sensor circuit open or short<br>• Vehicle speed sensor<br>• Vehicle speed sensor drive gear or driven gear<br>• Speedometer malfunction<br>• Cruise control module malfunction (if equipped)<br>• ECM (PCM) |

### 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.**

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

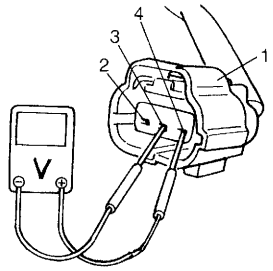
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 100 – 110 km/h (60 – 70 mph).
4) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 seconds or more and then stop vehicle.
5) Check pending DTC by using scan tool.

### Troubleshooting

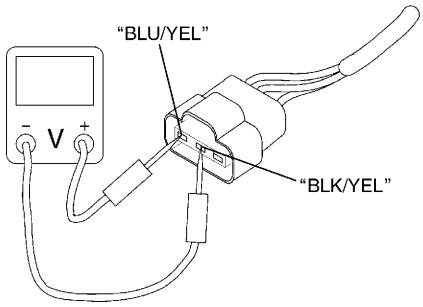
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | Does speedometer indicate vehicle speed? | Faulty "BLU/YEL" wire or poor C51-1-14 connection. If wire and connection are OK, intermittent trouble or faulty ECM (PCM). Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | VSS power supply voltage check:<br>1) With ignition switch OFF, remove VSS coupler (1).<br>2) With ignition switch ON leaving engine OFF, check voltage between "BLU/BLK" wire terminal (4) and "BLK/YEL" wire terminal (3) of VSS coupler.<br>Is voltage 10 – 14 V? | Go to Step 4. | "BLK/BLU" or "BLK/YEL" wire open/short. |
| 4 | VSS signal harness check:<br>1) With ignition switch ON leaving engine OFF, check voltage between "BLU/YEL" wire terminal and "BLK/YEL" wire terminal of VSS coupler.<br>Is voltage 4 V or more? | Go to Step 5. | Go to Step 6. |

| Step | Action | Yes | No |
|---|---|---|---|
| 5 | VSS visual inspection:<br>1) Remove VSS (1) referring to "Speedometer Driven Gear" in Section 7D.<br>2) Check VSS drive gear (2) and driven gear (3) for damage and excessive wear.<br>Are they in good condition? | Poor VSS connection or VSS malfunction.<br>If connection is OK, substitute a known-good VSS and recheck. | Replace VSS. |
| 6 | Speedometer circuit check:<br>1) With ignition switch OFF, disconnect couplers from combination meter.<br>2) With ignition switch ON leaving engine OFF, check voltage between "BLU/YEL" wire terminal and "BLK/YEL" wire terminal of VSS coupler.<br>Is voltage 4 V or more? | Substitute a known-good combination meter and recheck. | Go to Step 7. |
| 7 | Cruise control module circuit check (if equipped):<br>1) With ignition switch OFF, disconnect cruse control module coupler from cruise control module.<br>2) With ignition switch ON leaving engine OFF, check voltage between "BLU/YEL" wire terminal and "BLK/YEL" wire terminal of VSS coupler.<br>Is voltage 4 V or more? | Substitute a known-good cruise control module and recheck. | "BLU/YEL" wire open/ short or faulty ECM (PCM).<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. |

[A]

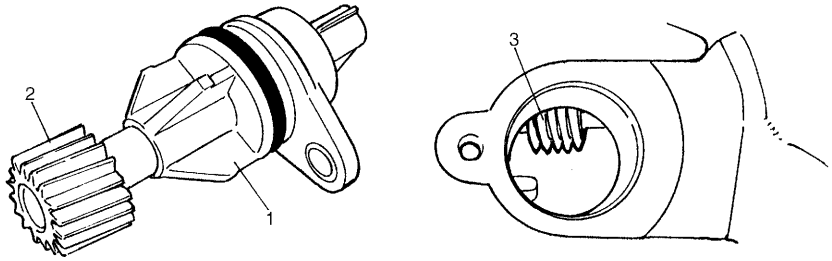



[B]




| [A]: Fig. for Step 3 | [B]: Fig. for Step 4, 6, 7 |
|---|---|

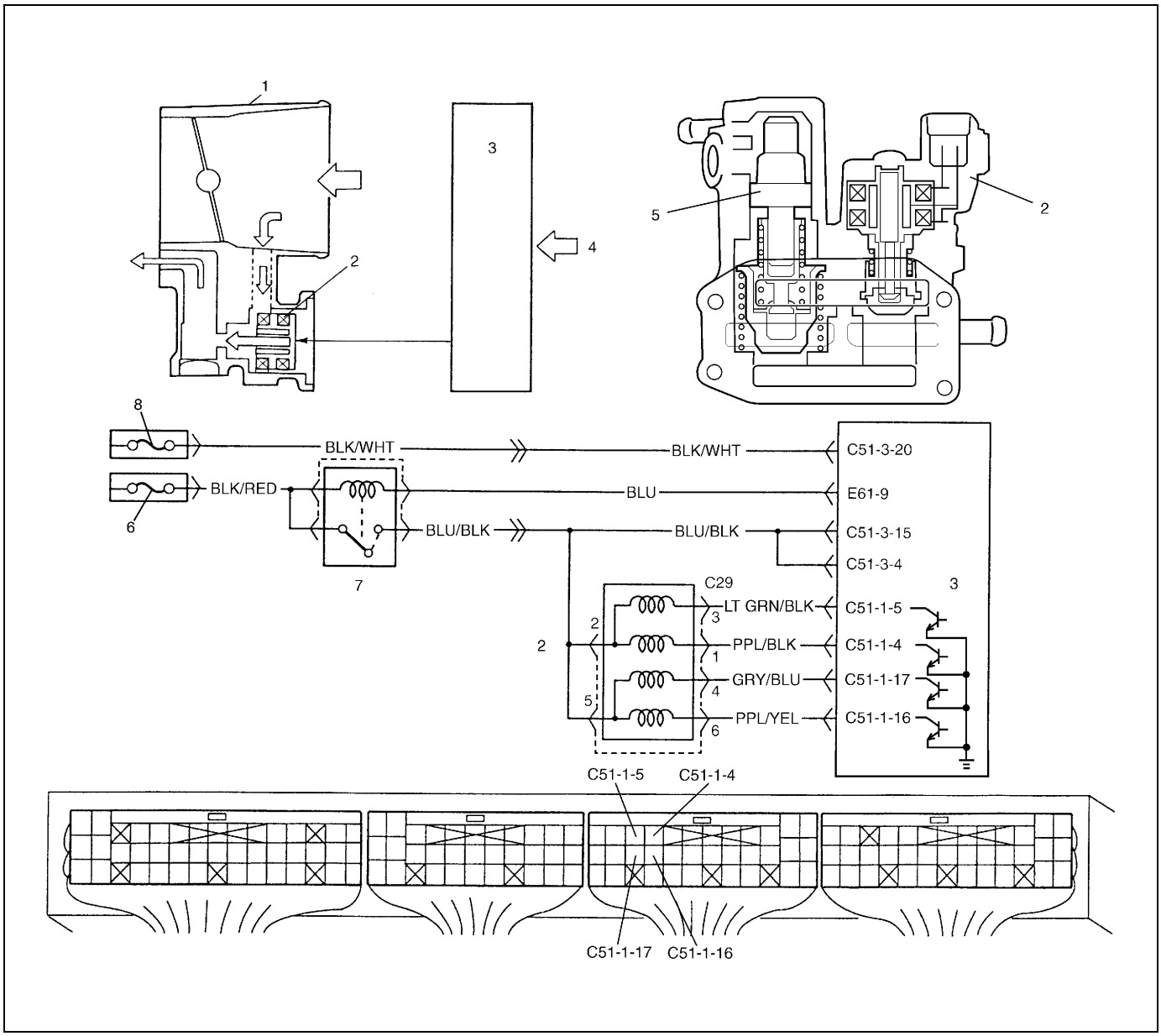
**[A]**




| [A]: Fig. for Step 5 |
|---|

# DTC P0505 Idle Air Control System Malfunction

## System/Wiring Diagram




| | | | |
|---|---|---|---|
| 1. Throttle body | 3. ECM (PCM) | 5. FIA valve | 7. Main relay |
| 2. Idle air control valve | 4. Sensed information | 6. Main fuse (“FI”) | 8. “METER” fuse |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| • Engine idle speed is 100 r/min. or more lower than target idle speed for longer than 20 sec. continuously.<br>or<br>• Engine idle speed is 200 r/min or more higher than target idle speed for longer than 20 sec. continuously.<br>(2 driving cycle detection logic) | • IAC valve or its circuit<br>• Abnormal air drawn in air intake system<br>• FIA (fast idle air) valve |

### DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check pending DTC by using scan tool.

### 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" in this section. |
| 2 | Idle speed check:<br>1) Check engine idle speed referring to "Idle Speed/Idle Air Control (IAC) Duty Inspection" in Section 6E2.<br>Is engine idle speed within specification? | Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | IAC valve check:<br>1) Check IAC valve referring to "Idle Air Control Valve (IAC Valve)" in Section 6E2.<br>Is check result as specified? | Go to Step 6. | Go to Step 4. |
| 4 | IAC valve circuit check:<br>1) With ignition switch OFF, disconnect ECM (PCM) couplers.<br>2) Check for proper connection to IAC valve at C51-1-4, C51-1-5, C51-1-16 and C51-1-17 terminals.<br>3) If OK, check resistance between C51-1-4 and C51-1-5, C51-1-16 and C51-1-17.<br>Is each resistance 51 – 67 Ω? | Go to Step 5. | "LT GRN/BLK", "PPL/BLK", "GRY/BLU" or "PPL/YEL" wire open or short.<br>If wire and connections are OK, replace IAC valve. |
| 5 | IAC valve power supply voltage check:<br>1) Connect ECM (PCM) couplers.<br>2) With ignition switch OFF, disconnect coupler of IAC valve.<br>3) With ignition switch ON, check voltage between C29-2 ("BLU/BLK" wire terminal of IAC valve coupler) and ground, C29-5 ("BLU/BLK" wire terminal of IAC valve coupler) and ground.<br>Is each voltage 10 – 14 V? | IAC valve or ECM (PCM) malfunction. | Open "BLU/BLK" wire. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | Was idle speed higher than specification in Step 2? | Check FIA valve for malfunction.<br>Check abnormal air inhaling from intake manifold, throttle body, PCV valve and EVAP canister purge control system. | Check parts or system which can cause engine low idle.<br>Check FIA valve for stuck.<br>Air inhaling from between throttle body and MAF sensor, EGR valve malfunction (leakage from valve seat), accessory engine load, clog of idle air passage, engine mechanical, engine overheat and etc. |

## DTC P0601 (DTC No.71) Internal Control Module Memory Check Sum Error

### System Description

Internal control module is installed in ECM (PCM).

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Data write error or check sum error | ECM (PCM) |

### DTC Confirmation Procedure

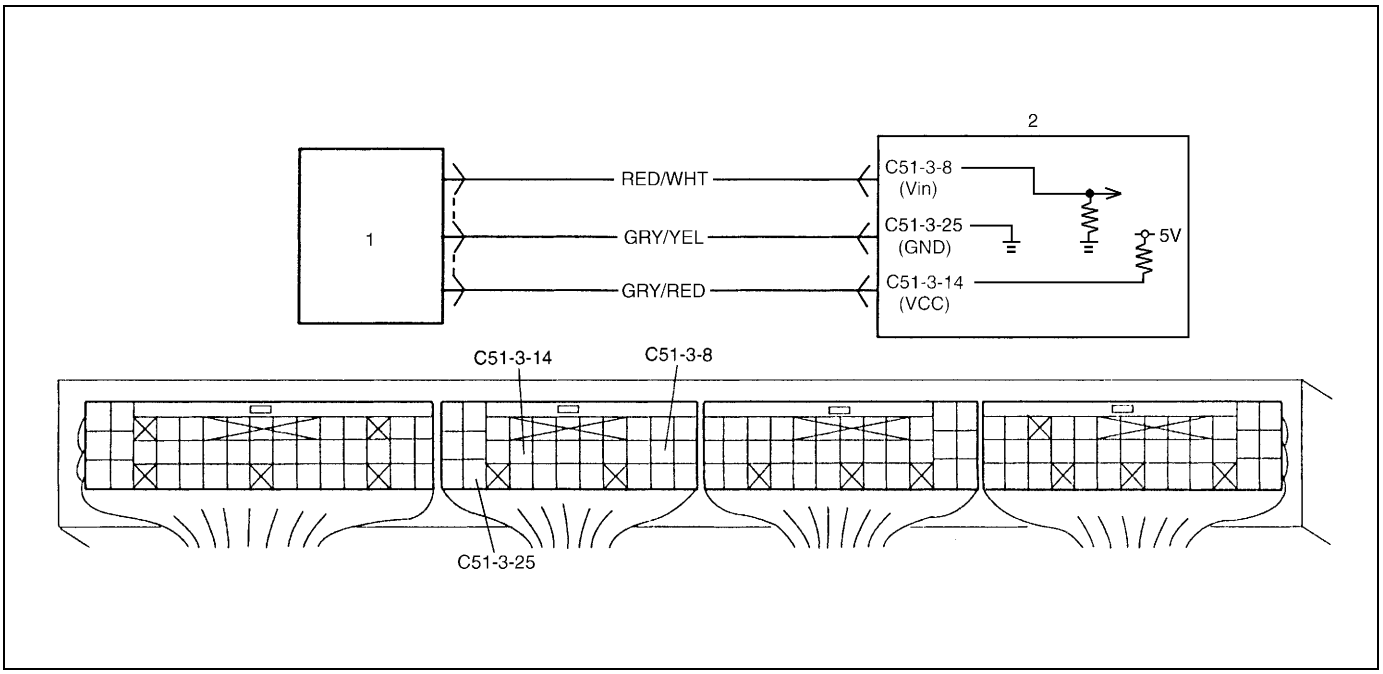
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it at idle if possible.
4) Check DTC by using scan tool.

### Troubleshooting

Substitute a known-good ECM (PCM) and recheck.

# DTC P1408 Manifold Absolute Pressure Sensor Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. MAP sensor |
| 2. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| • While engine is running after being warmed up and with throttle opening smaller than specification, higher than 4.6 V manifold absolute pressure sensor output voltage is detected for specified time or with throttle opening larger than specification, lower than 0.2 V manifold absolute pressure output voltage is detected for specified time.<br>(2 driving cycle detection logic) | • Manifold absolute pressure sensor<br>• Manifold absolute pressure sensor vacuum passage<br>• ECM (PCM) |

## 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.**

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Run engine at idle speed for 1 min. (engine coolant temp. becomes 76°C (169°F) or more).
4) Increase vehicle speed to 80 km/h (50 mph).
5) Keep driving above vehicle speed for 1 min (Change of vehicle speed is permitted in this step).
6) Stop vehicle and check pending DTC by using scan tool.

**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” in this section. |
| 2 | MAP sensor signal check:<br>1) Remove ECM (PCM) cover.<br>2) Check voltage between C51-3-8 and C51-3-25 under following conditions.<br>• With ignition switch ON leaving engine OFF: 0.2 V or higher<br>• At idling: 4.6 V or lower<br>Is check result as specified? | Intermittent trouble or faulty ECM (PCM). Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | MAP sensor check:<br>1) Disconnect connector from MAP sensor.<br>2) Check for proper connection to MAP sensor at each terminal.<br>3) If OK, check MAP sensor for performance referring to “Manifold Absolute Pressure Sensor” in Section 6E2.<br>Is check result satisfactory? | “RED/WHT”, “GRY/YEL” or “GRY/RED” circuit open/short. If wire and connections are OK, substitute a known-good ECM (PCM) and recheck. | Replace MAP sensor. |

# DTC P1450/P1451 Barometric Pressure Sensor Circuit Malfunction/Performance Problem

## System Description

Barometric pressure sensor is installed in ECM (PCM).

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC P1450:<br>Barometric pressure out of specification is detected. | • Barometric pressure sensor in ECM (PCM) |
| DTC P1451:<br>While running under conditions described for "DTC Confirmation Procedure", barometric pressure value compared with intake manifold vacuum value in fuel cut state is not as specified.<br>(2 driving cycle detection logic) | • Manifold absolute pressure sensor performance problem<br>• Barometric pressure sensor in ECM (PCM) |

## DTC Confirmation Procedure

### For DTC P1450

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

### For DTC P1451

**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.**

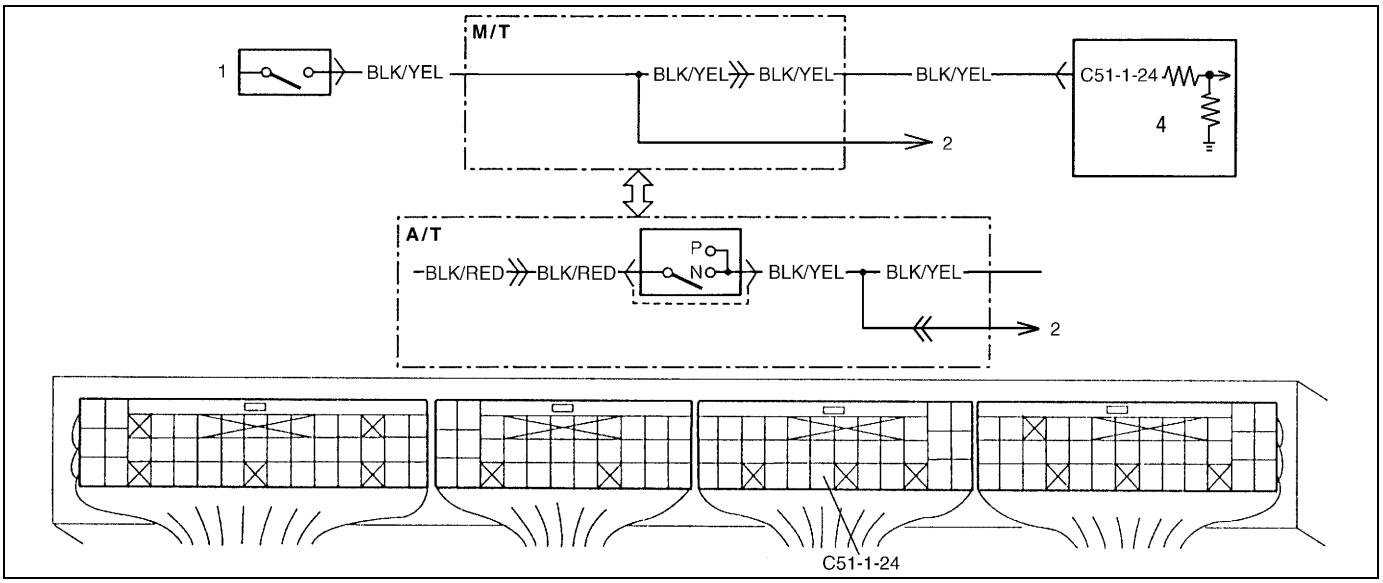
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine to normal operating temperature.
3) Increase engine speed to 3,000 r/min. in 3rd gear in case of M/T and "2" range in case of A/T.
4) 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 1600 – 3000 r/min for 5 sec. or more.
5) Stop vehicle and run engine at idle.
6) Repeat steps 3) – 5) 2 times.
7) Check pending DTC by using scan tool.

**Troubleshooting (DTC P1450/P1451)**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | Is DTC P1451 set? | Go to Step 3. | Substitute a known-good ECM (PCM) and recheck. |
| 3 | MAP sensor check:<br>1) Check MAP sensor and its circuit referring to Steps 2 and 3 of “DTC P1408 Diag. Flow Table”.<br>Is check result satisfactory? | Substitute a known-good ECM (PCM) and recheck. | MAP sensor or its circuit malfunction. |

# DTC P1500 Engine Starter Signal Circuit Malfunction

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. Engine start switch in ignition (main) switch | 2. Starting motor | 3. Transmission range sensor (switch) | 4. ECM (PCM) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| • Engine starts even though vehicle is at stop and engine start signal is not inputted.<br>or<br>• Engine start signal is inputted continuously for specified time while engine is running.<br>(2 driving cycle detection logic) | • Engine start signal circuit<br>• ECM (PCM) |

## DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

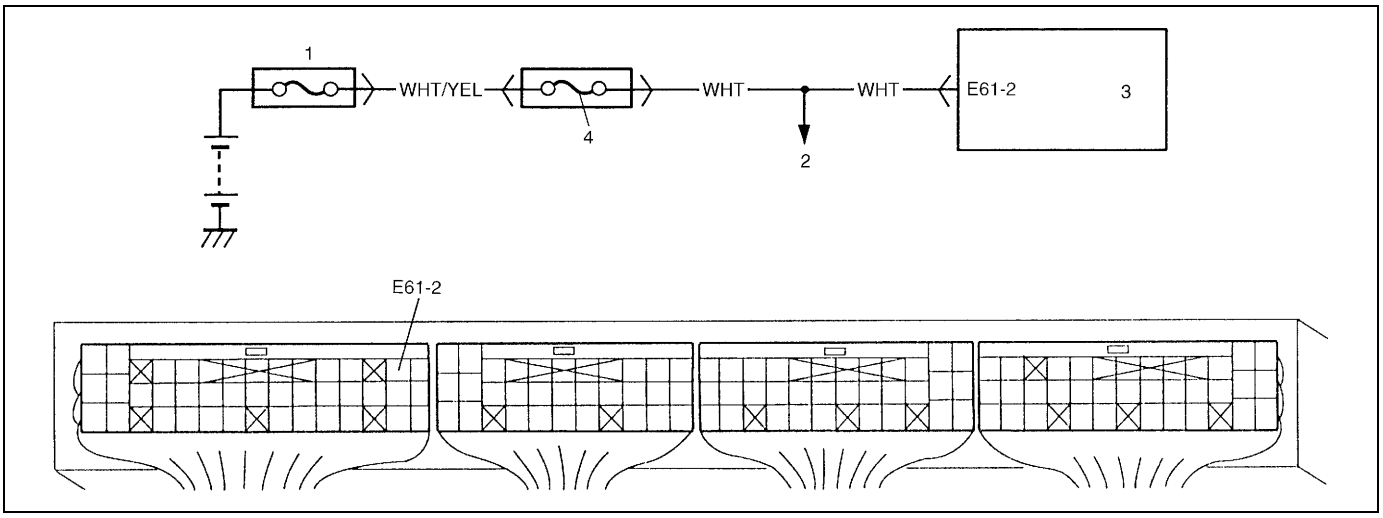
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC by using scan tool, then start engine and run it for 3 min. or more.
3) Check pending DTC by using scan tool.

## 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” in this section. |
| 2 | Check for voltage at terminal C51-1-24 of ECM (PCM) connector connected, under following condition.<br>**Engine starter signal specification**<br>**While engine cranking: 6 – 14 V**<br>**After starting engine: 0 – 1 V**<br>Is voltage as specified? | Poor C51-1-24 connection or intermittent trouble.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.<br>If wire and connections are OK, substitute a known-good ECM (PCM) and recheck. | “BLK/YEL” circuit open. |

# DTC P1510 Ecm Back-Up Power Supply Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. Main fuse box | 3. ECM (PCM) |
| 2. To DLC | 4. "RADIO DOME" fuse |

## Circuit Description

Battery voltage is supplied to keep DTC memory, values that ECM has learned to control engine, etc. in ECM even when ignition switch is turned OFF.

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Back-up circuit voltage lower than specification is detected while engine is running. | • ECM (PCM) back-up circuit<br>• ECM (PCM) |

## DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: – 8°C (18°F) or higher**
- **Engine coolant temp.: – 8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

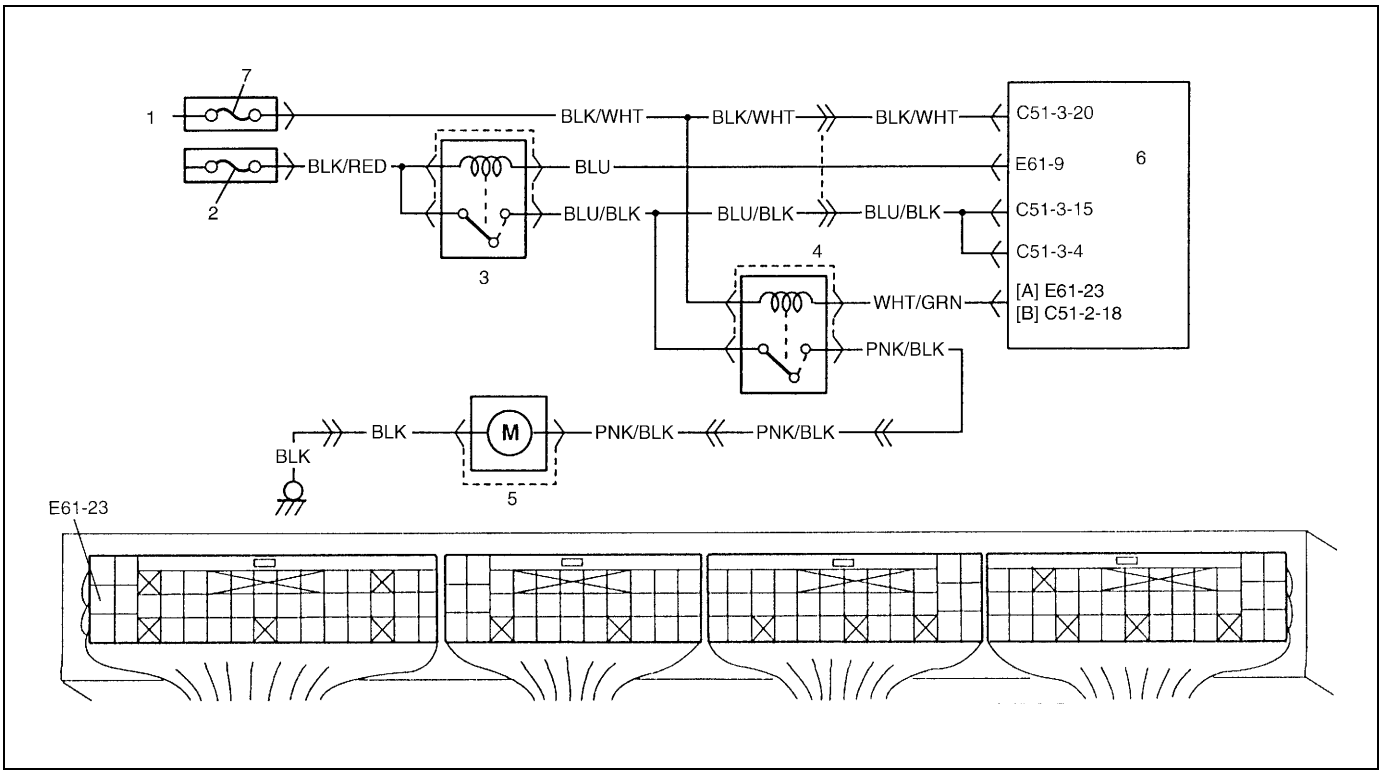
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 1min.
3) Check DTC by using scan tool.

## 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” in this section. |
| 2 | Battery voltage supply circuit check:<br>1) Remove ECM (PCM) cover.<br>2) While engine running, check voltage between E61-2 and ground.<br>Is voltage 10 – 14 V? | Poor E61-2 connection or intermittent trouble.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.<br>If wire and connections are OK, substitute a known-good ECM (PCM) and recheck. | “WHT” circuit open or short. |

# Table B-1 Fuel Pump Circuit Inspection

## Wiring Diagram



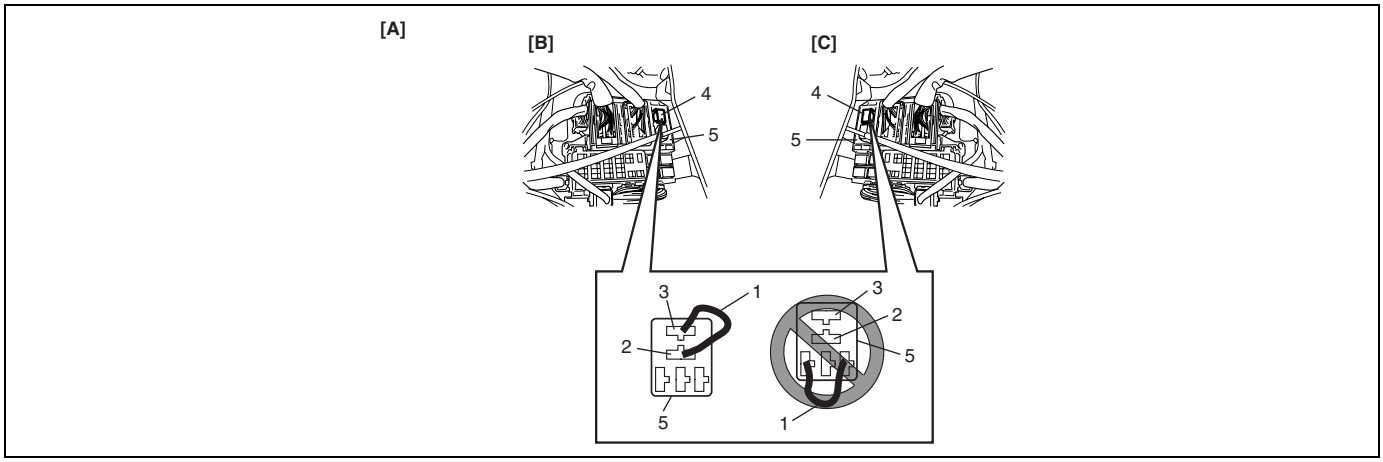

| | | |
|---|---|---|
| [A]: Vehicle without immobilizer control system | 2. Main fuse (“FI”) | 5. Fuel pump |
| [B]: Vehicle with immobilizer control system | 3. Main relay | 6. ECM (PCM) |
| 1. To ignition switch | 4. Fuel pump relay | 7. “METER” fuse |

## Inspection

**CAUTION:**
**Check to make sure that connection is made between correct terminals.**
**Wrong connection can cause damage to ECM, wire harness etc.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Fuel pump operation check:<br>1) Remove fuel filler cap.<br>2) Turn ON ignition switch.<br>Is fuel pump operation sound heard for 3 sec. after ignition switch ON? | Fuel pump circuit is in good condition. | Go to Step 2. |
| 2 | Fuel pump circuit check:<br>1) With ignition switch OFF, remove fuel pump relay (4) from fuse and relay box (5).<br>2) Check for proper connection to relay at each terminal.<br>3) If OK, using service wire (1), connect “PNK/BLK” wire terminal (2) and “BLU/BLK” wire terminal (3) of relay connector. (See Fig.)<br>Is fuel pump heard to operate at ignition switch ON? | Go to Step 3. | “BLU/BLK”, “PNK/BLK” or “BLK” circuit open or fuel pump malfunction. |

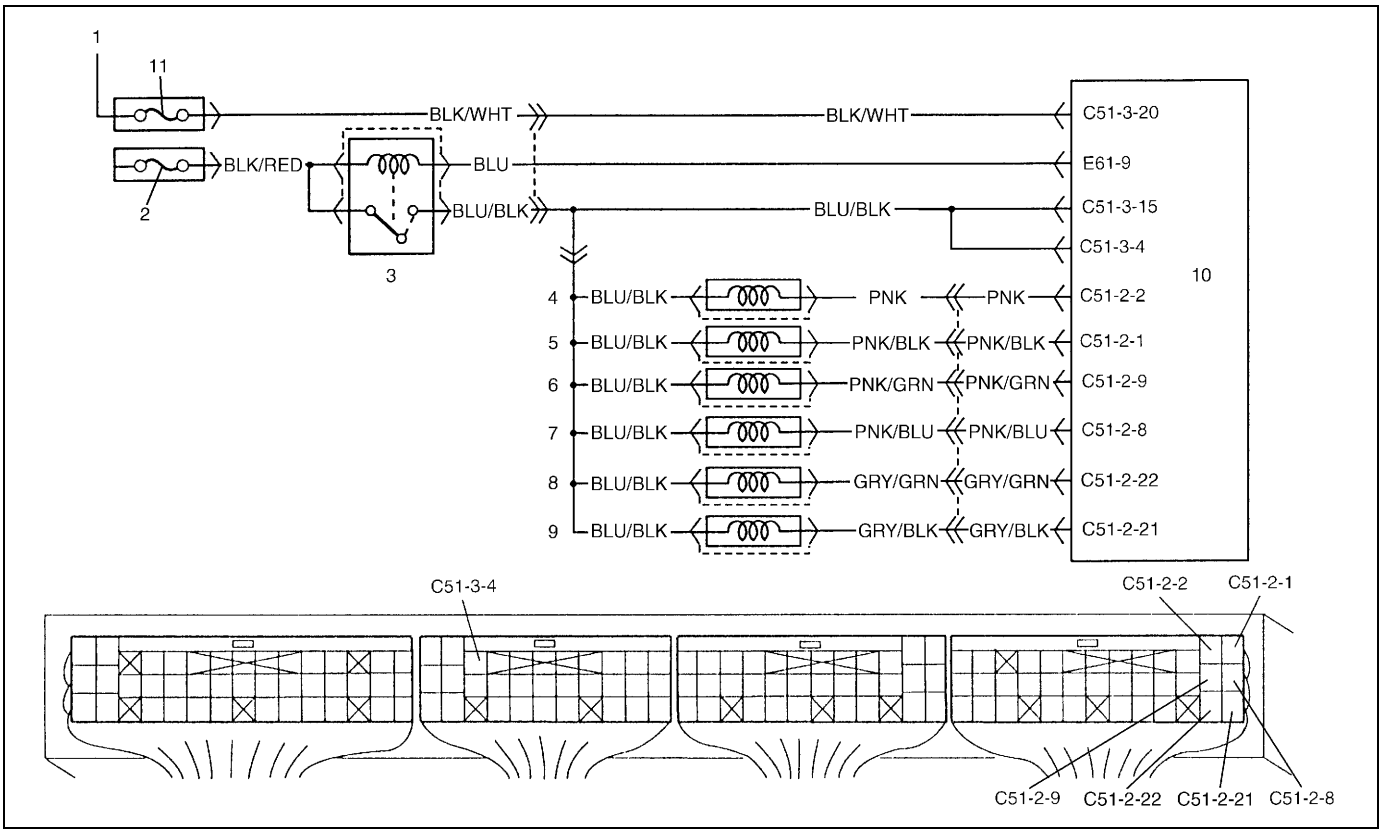
| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Fuel pump relay check:<br>1) Check fuel pump relay referring to "Fuel Pump Relay" in Section 6E2.<br>Is it in good condition? | "BLK/WHT" or "WHT/GRN" circuit open or poor E61-23 (vehicle without immobilizer control system) or C51-2-18 (vehicle with immobilizer control system) connection.<br>If wire and connection are OK, substitute a known-good ECM (PCM) and recheck. | Replace fuel pump relay. |




| |
|---|
| [A]: Fig. for Step 2 |
| [B]: Left hand steering vehicle |
| [C]: Right hand steering vehicle |

# Table B-2 Fuel Injectors and Circuit Inspection

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. To ignition switch | 4. Injector No.1 | 7. Injector No.4 | 10. ECM (PCM) |
| 2. Main fuse (“FI”) | 5. Injector No.2 | 8. Injector No.5 | 11. “METER” fuse |
| 3. Main relay | 6. Injector No.3 | 9. Injector No.6 | |

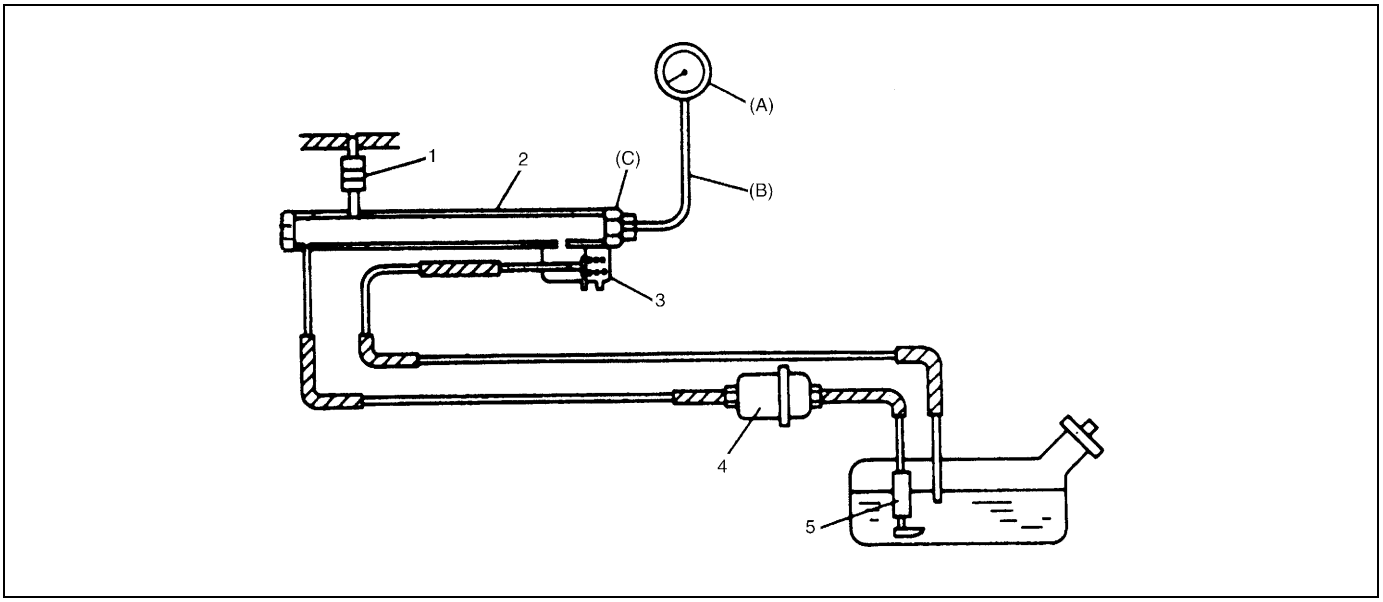
## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check injector for operating sound:<br>Using sound scope, check each injector for operating sound at engine cranking.<br>Do all 6 injectors make operating sound? | Go to Step 2. | Go to Step 3. |
| 2 | Wire harness check:<br>1) Remove ECM (PCM) cover and disconnect connectors from ECM (PCM).<br>2) Check for resistance between following terminals of ECM (PCM) connector disconnected.<br>**Fuel injector and its circuit resistance (C51-2-1 – C51-3-4, C51-2-2 – C51-3-4, C51-2-8 – C51-3-4, C51-2-9 – C51-3-4, C51-2-21 – C51-3-4 and C51-2-22 – C51-3-4):**<br>**14.2 – 14.8 Ω at 20°C (68°F)**<br>Is check result as specified? | Fuel injector circuit is in good condition. | “PNK”, “PNK/BLK”, “PNK/GRN”, “PNK/BLU”, “GRY/GRN” and “GRY/BLK” shorted each other. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Does none of 6 injectors make operating sound at Step 1? | Go to Step 4. | Check coupler connection and wire harness of injector not making operating sound and injector itself (Refer to “Fuel Injector” in Section 6E2). |
| 4 | Check power circuit of injectors for open and short.<br>Is it normal? | Check all 6 injectors for resistance respectively.<br>It resistance is OK, substitute a known-good ECM (PCM) and recheck. | Power circuit open or short. |

# Table B-3 Fuel Pressure Inspection

## System Diagram




| | |
|---|---|
| 1. Injector | 4. Fuel filter |
| 2. Delivery pipe | 5. Fuel pump |
| 3. Fuel pressure regulator | |

**Special tool**
**(A): 09912-58441**
**(B): 09912-58431**
**(C): 09919-58421**

## Inspection

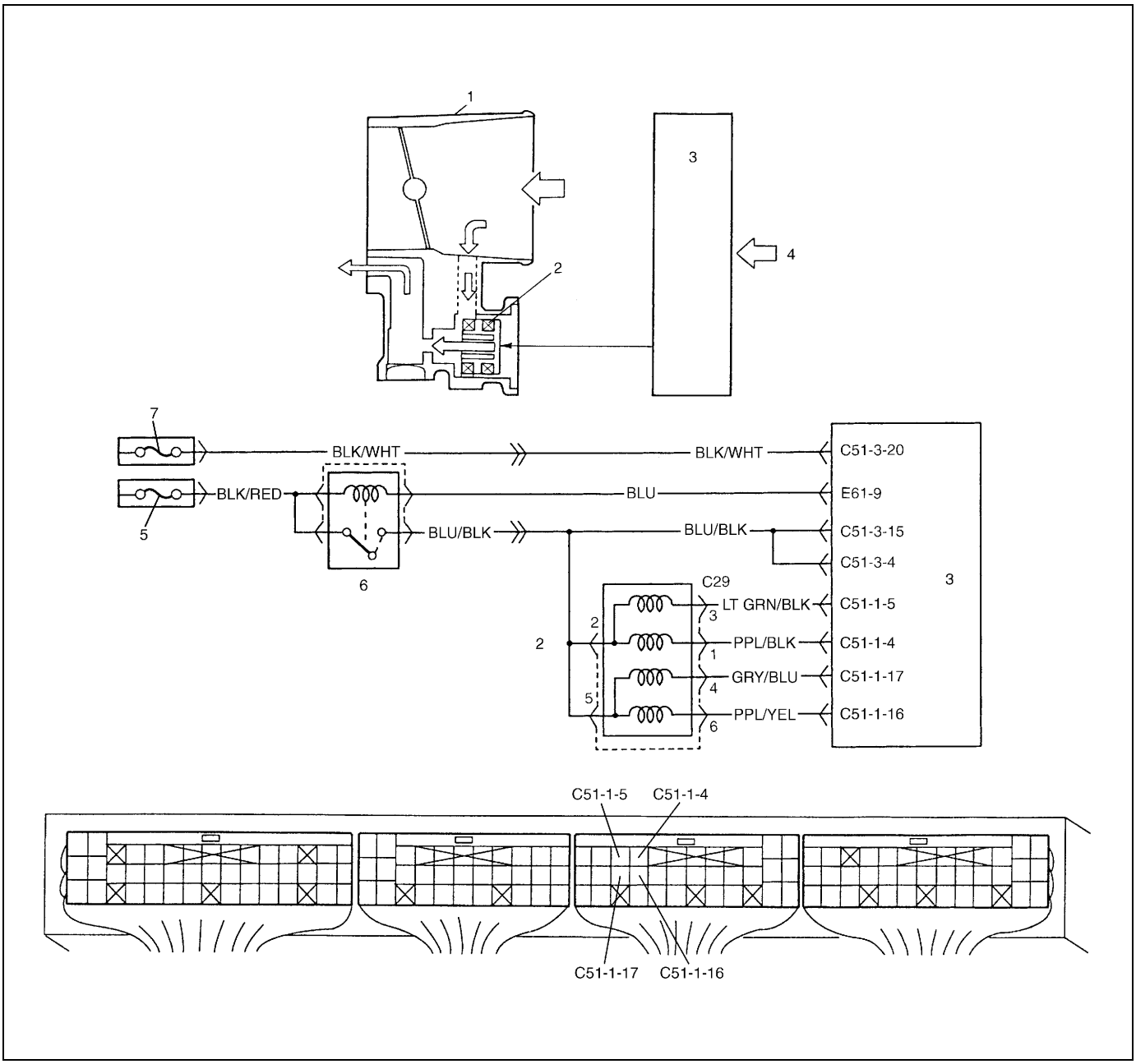
**NOTE:**
**Before using the following flow table, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Install fuel pressure gauge, referring to "Fuel Pressure Inspection" in Section 6E2.<br>2) Operate fuel pump.<br>Is fuel pressure then 270 – 310 kPa (2.7 – 3.1 kg/cm$^2$, 38.4 – 44.0 psi)? | Go to Step 2. | Go to Step 5. |
| 2 | Is 200 kPa (2.0 kg/cm$^2$, 28.4 psi) or higher fuel pressure retained for 1 minute after fuel pump is stopped at Step 1? | Go to Step 3. | Go to Step 4. |
| 3 | 1) Start engine and warm it up to normal operating temperature.<br>2) Keep it running at specified idle speed.<br>Is fuel pressure then within 210 – 260 kPa (2.1 – 2.6 kg/cm$^2$, 29.8 – 37.0 psi)? | Normal fuel pressure. | Clogged vacuum passage for fuel pressure regulator or faulty fuel pressure regulator. |
| 4 | Is there fuel leakage from fuel feed line hose, pipe or joint? | Fuel leakage from hose, pipe or joint. | Go to Step 10. |
| 5 | Was fuel pressure higher than spec. in Step 1? | Go to Step 6. | Go to Step 7. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | 1) Disconnect fuel return hose from fuel pipe and connect new hose to it.<br>2) Put the other end of new return hose into approved gasoline container.<br>3) Operate fuel pump.<br>Is specified fuel pressure obtained then? | Restricted fuel return hose or pipe. | Faulty fuel pressure regulator. |
| 7 | Was no fuel pressure applied in Step 1? | Go to Step 8. | Go to Step 9.<br>(Low pressure is measured.) |
| 8 | With fuel pump operated and fuel return hose blocked by pinching it, is fuel pressure applied? | Faulty fuel pressure regulator. | Shortage of fuel or fuel pump or its circuit defective (Refer to “Table B-1”). |
| 9 | 1) Operate fuel pump.<br>2) With fuel return hose blocked by pinching it, check fuel pressure.<br>Is it 450 kPa (4.5 kg/cm$^2$, 64.0 psi) or more? | Faulty fuel pressure regulator. | Clogged fuel filter, restricted fuel feed hose or pipe, faulty fuel pump or fuel leakage from hose connection in fuel tank. |
| 10 | 1) Disconnect fuel return hose from fuel pipe and connect new hose to it.<br>2) Put the other end of new return hose into approved gasoline container.<br>3) Check again if specified fuel pressure is retained.<br>While doing so, does fuel come out return hose? | Faulty fuel pressure regulator. | Fuel leakage from injector, faulty fuel pump (faulty check valve in fuel pump) or fuel leakage from fuel pressure regulator diaphragm. |

# Table B-4 Idle Air Control System Inspection

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. Throttle body | 3. ECM (PCM) | 5. Main fuse (“FI”) | 7. “METER” fuse |
| 2. Idle air control valve | 4. Sensed information | 6. Main relay | |

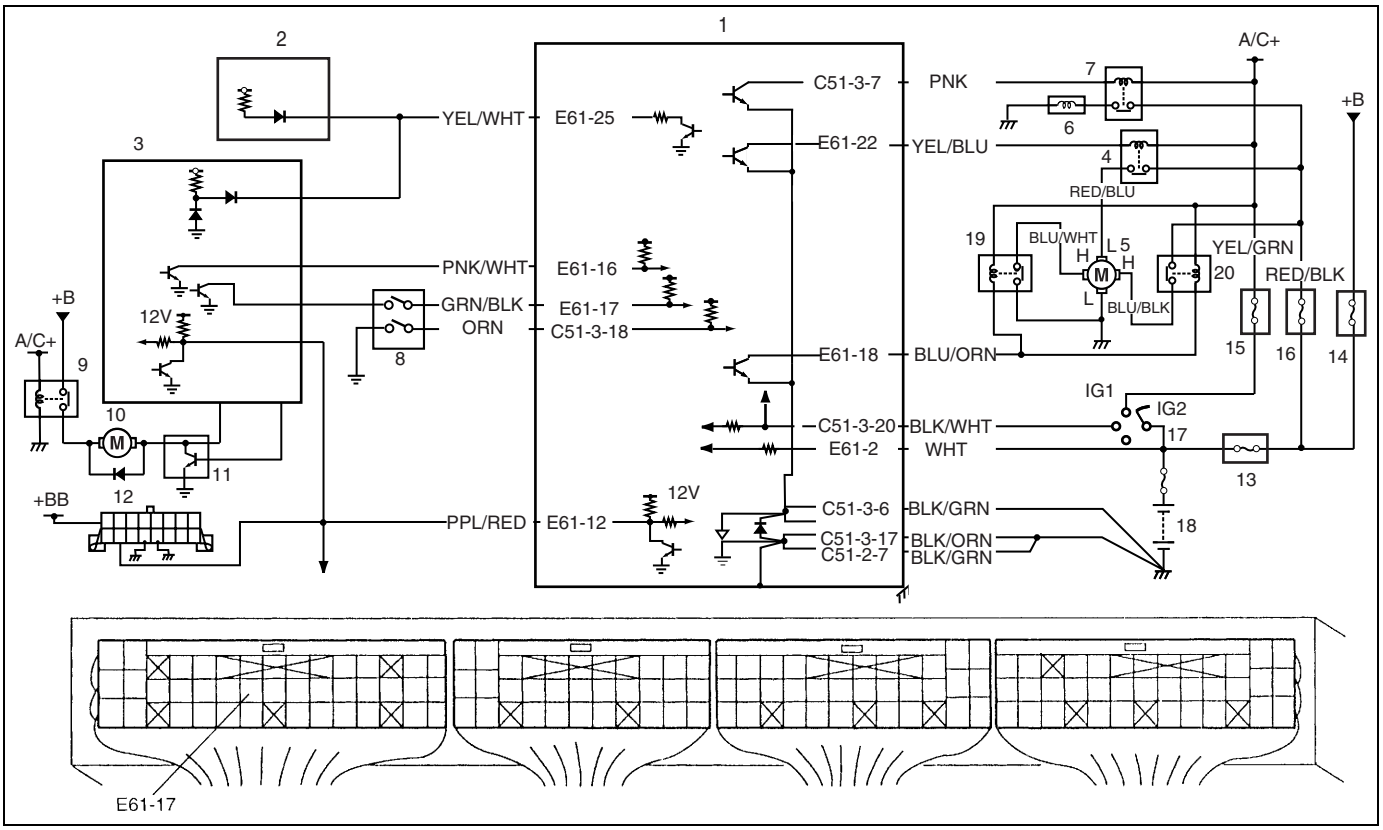
## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check engine idle speed and IAC duty referring to “Idle Speed/Idle Air Control (IAC) Duty Inspection” in Section 6E2. Is idle speed/IAC duty within specification? | Go to Step 2. | Go to Step 3. |
| 2 | Is engine idle speed kept specified speed even with headlights turned ON? | System is in good condition. | Go to Step 3. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Check IAC valve referring to “Idle Air Control (IAC Valve)” in Section 6E2.<br>Is check result as specified? | Go to Step 4. | IAC valve malfunction, “BLU/BLK”, “LT GRN/BLK”, “PPL/BLK”, “GRY/BLU” or “PPL/YEL” wire open or short or poor coupler connection.<br>If all above are OK, substitute a known-good ECM (PCM) and recheck. |
| 4 | Was idle speed within specification in Step 1? | Check for following:<br>FIA valve, Vacuum leaks, air inhaling, EVAP canister purge control system, accessory engine load, stuck of PCV valve, clog of idle air passage, MAF sensor, TP sensor, ECT sensor, EGR valve malfunction (leakage from valve seat), A/C signal, transmission range switch signal and power steering switch signal. | Go to Step 5. |
| 5 | Was idle speed higher than specification in Step 1? | Go to Step 6. | Go to Step 8. |
| 6 | Check A/C (request) signal circuit referring to “Inspection of ECM (PCM) and Its Circuits” in this section. (A/C signal can be also checked by using SUZUKI scan tool.)<br>Is it in good condition? | Go to Step 7. | A/C signal circuit open or short, or A/C system malfunction. |
| 7 | Was IAC duty less than about 2% in Step 1 of this table? | Check FIA valve.<br>Check abnormal air inhaling from intake manifold, throttle body, PCV valve and EVAP canister purge control system. | Check TP sensor (closed throttle position) and ECT sensor for performance.<br>If sensors are OK, substitute a known-good ECM (PCM) and recheck. |
| 8 | Check transmission range switch signal referring to “Inspection of ECM (PCM) and Its Circuit” in this section.<br>Is check result satisfactory? | Go to Step 9. | Transmission range switch malfunction or its circuits open or short. |
| 9 | Was IAC duty more than about 30% in Step 1 of this table? | Check parts or system which can cause engine low idle.<br>Check FIA valve.<br>Air inhaling from between throttle body and MAF sensor, EGR valve malfunction (leakage from valve seat), accessory engine load, clog of idle air passage and etc. | Substitute a known-good ECM (PCM) and recheck. |

# Table B-5 A/C Signal Circuits Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM (PCM) | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR 60 A" fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "HTR 40 A" fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR 15 A" fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

HVAC control module outputs A/C ON request signal to ECM (PCM) when A/C switch and heater blower motor switch are turned ON.

Then A/C condenser fan motor low speed relay and compressor relay are turned ON by ECM (PCM) when engine condition is normal.

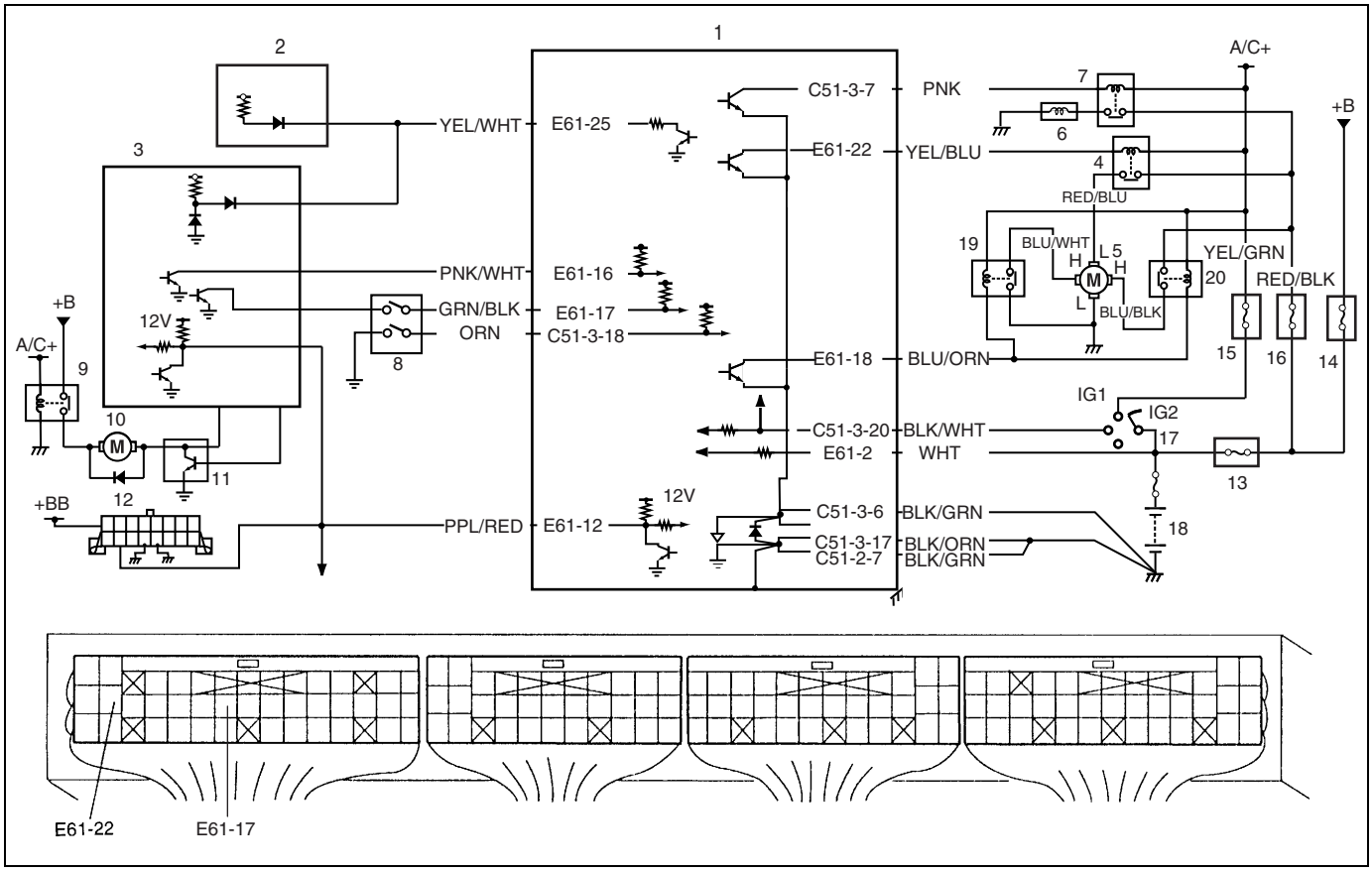
If A/C condenser fan control switch (in refrigerant pressure switch) is turned OFF with A/C ON (A/C compressor in operation), A/C condenser fan motor high speed relays are turned ON by ECM (PCM).

## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check A/C Signal Circuit.<br>1) Check voltage at terminal E61-17 with ignition switch ON.<br>**A/C signal circuit specification**<br>**A/C switch and/or heater blower switch OFF (A/C is not operating): 10 – 14 V**<br>**Both A/C switch and heater blower switch ON: 0 – 1.5 V**<br>Are check result as specified? | A/C signal circuit is in good condition. | "GRN/BLK" circuit open or short, Evaporative temperature is below 2.5°C (36.5°F) or faulty A/C system. |

# Table B-6 A/C Condenser Fan Motor Relay Low Speed Control System Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM (PCM) | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR 60 A" fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "HTR 40 A" fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR 15 A" fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

A/C condenser fan motor low speed relay is turned ON by ECM (PCM) when A/C signal is inputted to ECM (PCM) while engine condition is normal.

When A/C condenser fan control switch (in refrigerant pressure switch) OFF signal is inputted to ECM (PCM) with A/C ON (A/C compressor in operation), A/C condenser fan motor high speed relays are turned ON by ECM (PCM).

## Inspection

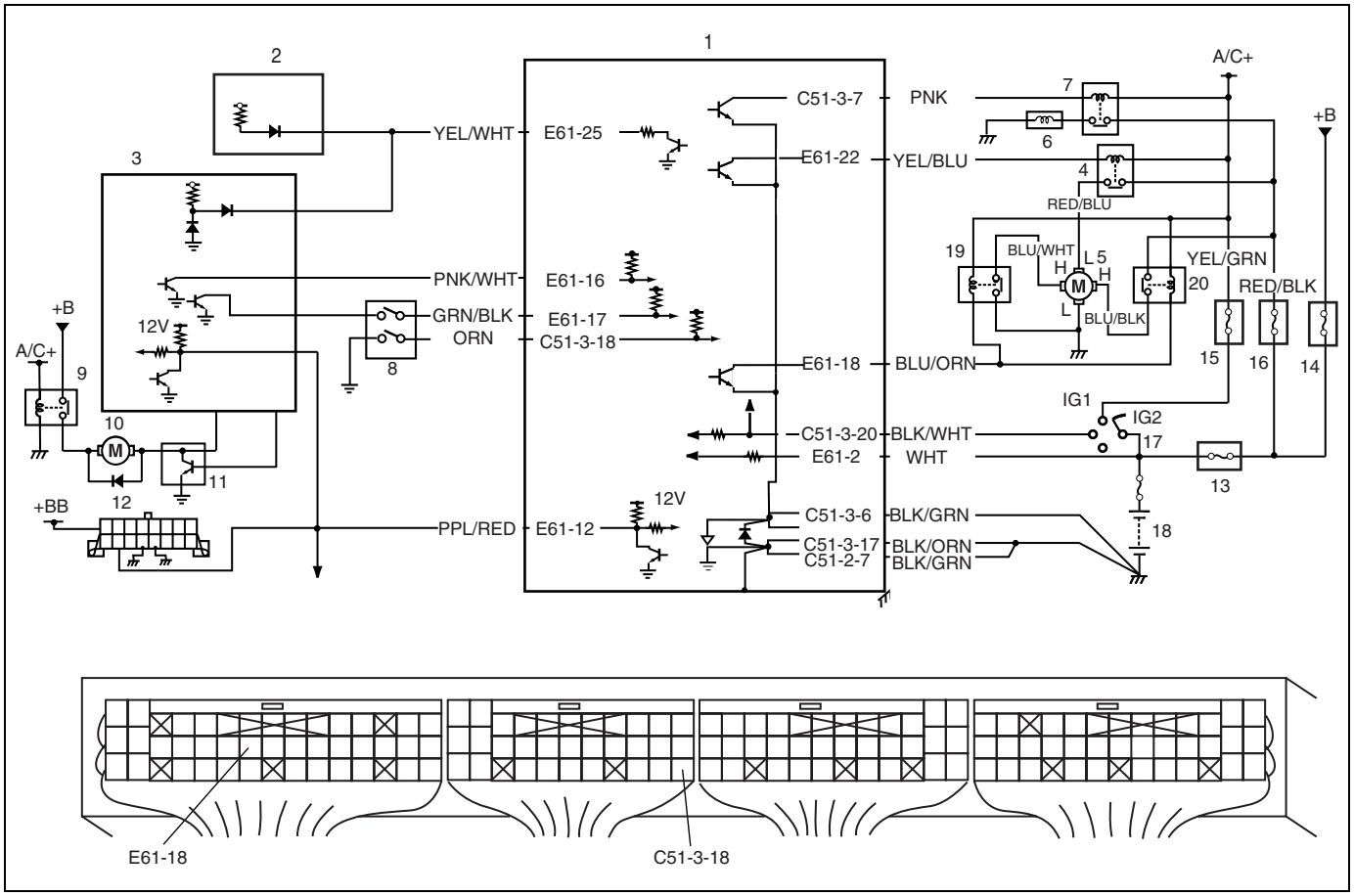
**WARNING:**

**Keep hands, tools, and clothing away from A/C condenser 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 in the "ON" position.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | A/C condenser fan motor control circuit check:<br>1) Remove ECM (PCM) cover.<br>2) Measure voltage between E61-22 and vehicle body ground with ignition turned ON.<br>Is voltage 10 – 14 V? | Go to Step 3. | Go to Step 2. |
| 2 | A/C condenser fan motor control circuit check:<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "HTR 15A" fuse.<br>3) If OK, check A/C condenser fan motor low speed relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "YEL/GRN" wire to "YEL/BLU" wire is open circuit. | Faulty A/C condenser fan motor low speed relay. |
| 3 | A/C condenser fan motor low speed control signal check:<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure voltage between E61-22 and vehicle body ground.<br>Is voltage 0 – 1 V? | Go to Step 4. | Go to Step 6. |
| 4 | A/C condenser control circuit check:<br>1) Turn OFF ignition switch.<br>2) Disconnect A/C condenser fan motor connector.<br>3) Start engine.<br>4) Turn ON A/C switch and heater blower motor switch.<br>5) Measure voltage between "RED/BLU" wire terminal in A/C condenser fan motor connector and vehicle body ground.<br>Is voltage 10 – 14 V? | Go to Step 6. | Go to Step 5. |
| 5 | A/C condenser control circuit check:<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "A/C 25 A" fuse.<br>3) If OK, check A/C condenser fan motor low speed relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "RED/BLK" wire or "RED/BLU" wire is open circuit. | Faulty A/C condenser fan motor low speed relay. |
| 6 | A/C switch signal check:<br>1) Turn ON A/C switch and heater blower motor switch.<br>2) Measure voltage between E61-17 and vehicle body ground with ignition switch turned ON.<br>Is voltage 0 – 1 V? | Substitute a known-good ECM (PCM) and recheck. | Faulty "GRN/BLK" wire, A/C evaporator temperature is below 2.5°C, 36.5°F, faulty refrigerant pressure switch or faulty A/C system referring to "HVAC Control Module" in Section 1B. |

# Table B-7 A/C Condenser Fan Motor Relay High Speed Control System Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM (PCM) | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR 60 A" fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "HTR 40 A" fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR 15 A" fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

A/C Condenser fan motor low-speed relay is turned ON by ECM (PCM) when A/C signal is inputted to ECM (PCM) while engine conditions is normal.

A/C Condenser fan motor high-speed relays should be operated under the following conditions.

- When A/C condenser fan control switch signal in refrigerant pressure switch is inputted to ECM (PCM) with A/C ON.
- When ECT is more than 115°C, 239°F.

## Inspection

**WARNING:**

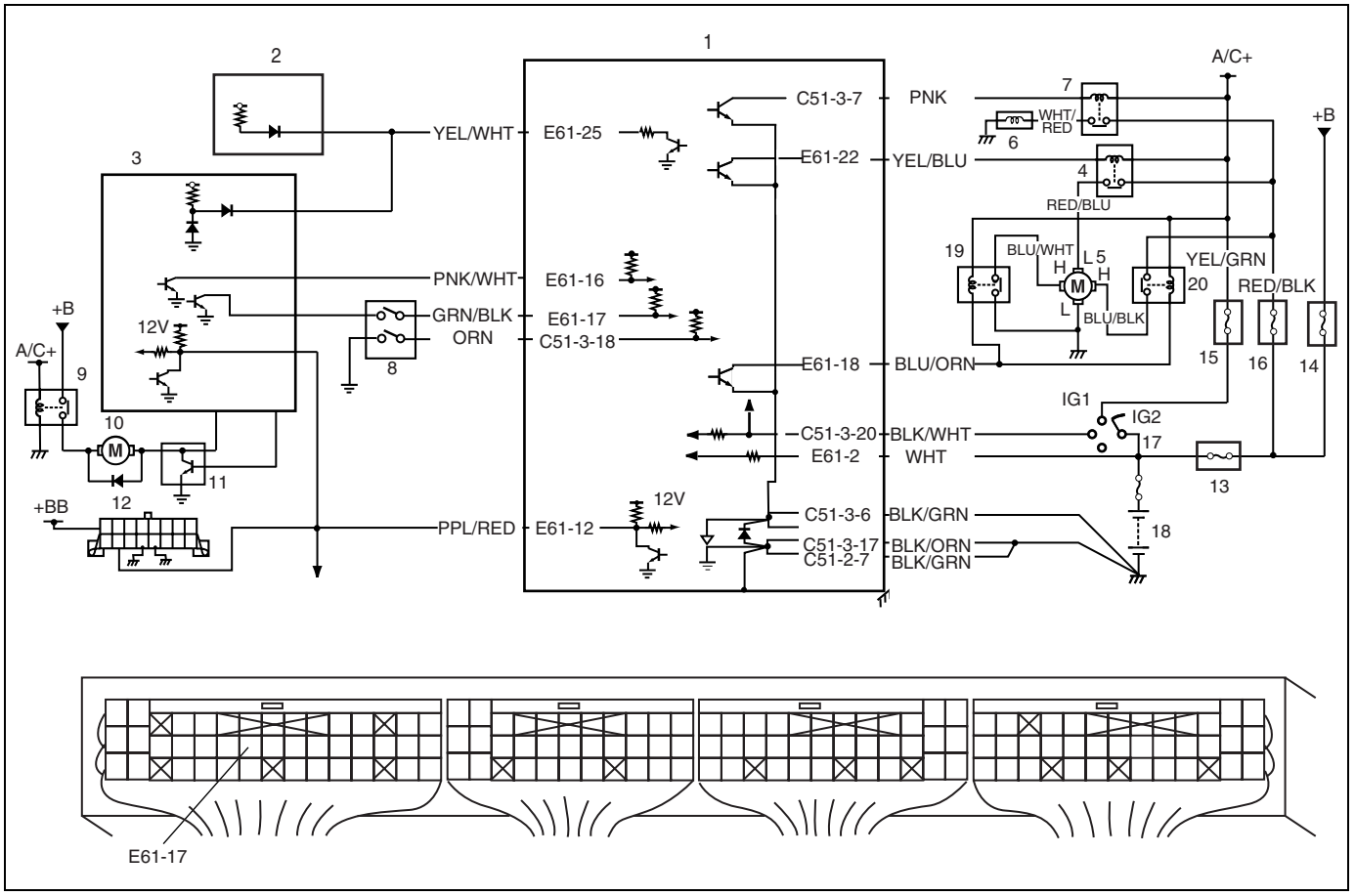
**Keep hands, tools, and clothing away from A/C condenser fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch in the "ON" position.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | A/C condenser fan motor control circuit check<br>1) Remove ECM (PCM) cover.<br>2) Measure voltage between E61-18 and vehicle body ground with ignition switch turned ON.<br>Is voltage 10 – 14 V? | Go to Step 3. | Go to Step 2. |
| 2 | A/C condenser fan motor control circuit check<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "HTR 15 A" fuse.<br>3) If OK, check A/C condenser fan motor high-speed relay No.1 and No.2 referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "YEL/GRN" wire or "BLU/ORN" wire is open circuit. | Faulty A/C condenser fan motor relay. |
| 3 | A/C condenser fan motor high-speed control signal check<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure voltage between E61-18 and vehicle body ground.<br>Is voltage 0 – 1 V? | Go to Step 4. | Go to Step 7. |
| 4 | A/C condenser fan control circuit check<br>1) Turn OFF ignition switch.<br>2) Disconnect A/C condenser fan motor connector.<br>3) Start engine.<br>4) Turn ON A/C switch and heater blower motor switch.<br>5) Measure voltage between "BLU/BLK" wire terminal in A/C condenser fan motor connector and vehicle body ground.<br>Is voltage 10 – 14 V? | Go to Step 7. | Go to Step 5. |
| 5 | A/C condenser control circuit check<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "A/C 25 A" fuse.<br>3) If OK, check A/C condenser fan motor high speed relay No.1 and No.2 referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "RED/BLK" wire, "BLU/BLK" wire are open circuit. | Faulty A/C condenser fan motor high-speed relay No.1 or No.2. |
| 6 | A/C condenser control circuit check<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure resistance between "BLU/WHT" wire terminal in A/C condenser fan motor connector and vehicle body ground.<br>Is resistance below 5 Ω? | "BLU/WHT" wire or "BLK" wire are open circuit. | Faulty A/C condenser fan motor high-speed relay No.1 or No.2. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | A/C refrigerant pressure switch signal check:<br>1) Turn ON A/C switch and heater blower motor switch while A/C condenser fan motor connector disconnected.<br>2) Start engine.<br>3) Measure voltage between C51-3-18 and vehicle body ground with engine running.<br>Is voltage 5 – 12 V? | Substitute a known-good ECM (PCM) and recheck. | Faulty “ORN” wire or faulty refrigerant pressure switch or faulty A/C system referring to “HVAC control module” in Section 1B. |

## Table B-8 A/C Compressor Relay Control System Inspection (If Equipped)

### Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM (PCM) | 6. A/C compressor | 11. Heater blower motor controller | 16. “A/C” 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. “HTR 60 A” fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. “HTR 40 A” fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. “HTR 15 A” fuse | 20. A/C condenser fan motor high speed relay No.2 |

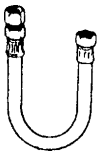
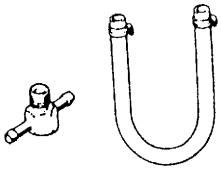
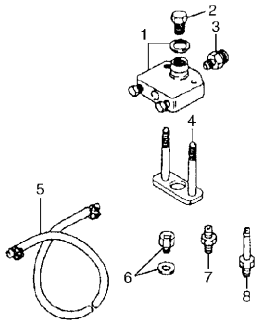
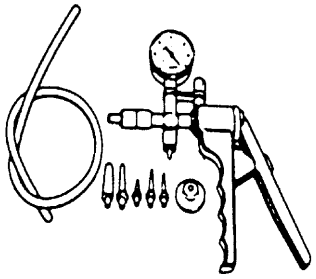
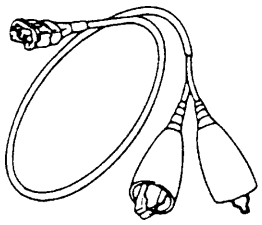
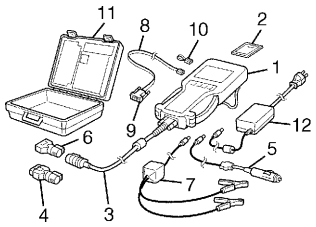
### Circuit Description

A/C Compressor relay is turned ON by ECM (PCM), when A/C signal is inputted to ECM (PCM) while engine conditions is normal.

**Inspection**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | A/C compressor control circuit check:<br>1) Remove ECM (PCM) cover.<br>2) Measure voltage between C51-3-7 and vehicle body ground with ignition switch turned ON.<br>Is voltage 10 – 14 V? | Go to Step 3. | Go to Step 2. |
| 2 | A/C compressor control circuit check:<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "HTR 15 A" fuse.<br>3) If OK, check A/C compressor relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "YEL/GRN" wire or "PNK" wire is open circuit. | Faulty A/C compressor relay. |
| 3 | A/C compressor control signal check:<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure voltage between C51-3-7 and vehicle body ground with engine running.<br>Is voltage 0 – 1 V? | Go to Step 4. | Go to Step 5. |
| 4 | A/C compressor control signal check:<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "A/C 25 A" fuse.<br>3) If OK, check A/C compressor relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "RED/BLK" wire or "WHT/RED" wire is open circuit. If wire circuits are OK, check A/C compressor referring to "Magnet Clutch Operation Check" in Section 1B. | Faulty A/C compressor relay. |
| 5 | A/C switch signal check:<br>1) Turn ON A/C switch and heater blower motor switch.<br>2) Measure voltage between E61-17 and vehicle body ground with ignition turned ON.<br>Is voltage 0 – 1 V? | Poor performance of ECT sensor or its circuit. If they are OK, substitute a known-good ECM (PCM) and recheck. | Faulty "GRN/BLK" wire, A/C evaporator temperature is below 2.5°C, 36.5°F, faulty refrigerant pressure switch or faulty A/C system referring to "HVAC Control Module" in Section 1B. |

# Special Tool

| | | | |
|---|---|---|---|
|  <br>09912-58441<br>Pressure gauge |  <br>09912-58431<br>Pressure hose |  <br>09912-58490<br>3-way joint & hose |  <br>09912-58421<br>Checking tool set<br>(See NOTE “A”.) |
|  <br>09917-47011<br>Vacuum pump gauge |  <br>09930-88521<br>Injector test lead |  <br>Tech 2 kit (SUZUKI scan tool) (See NOTE “B”.) | |

**NOTE:**

- **“A”: This kit includes the following items.**
  **1. Tool body & washer, 2. Body plug, 3. Body attachment-1, 4. Holder,**
  **5. Return hose & clamp, 6. Body attachment-2 & washer, 7. Hose attachment-1,**
  **8. Hose attachment-2**
- **“B”: This kit includes the following items.**
  **1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loopback connector, 11. Storage case, 12. Power supply**

# SECTION 6-2

# ENGINE GENERAL INFORMATION AND DIAGNOSIS (H27 ENGINE: TYPE B)

**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.**
- **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).**

**NOTE:**

- **Service information for H27 engine model TYPE B is provided in this section. To distinguish TYPE B, refer to the foreword of this service manual.**
- **Whether following systems (parts) are used in the particular vehicle or not depends on specifications. Be sure to bear this in mind when performing service work.**
  - **Monitor connector**
  - **CKP sensor**
  - **MAP sensor**
  - **EGR valve**
  - **Heated oxygen sensor or CO adjusting resistor**
  - **Three way catalytic converter, Warm-up three way catalytic converter**



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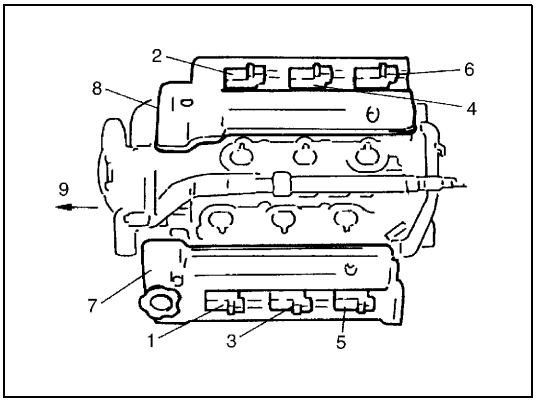
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# General Information

## Statement of Cleanliness and Care

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. Throughout this section, 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 surface 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.




- Throughout this manual, the 6 cylinders of the engine are identified by numbers; No.1, No.2, No.3, No.4, No.5 and No.6 as counted from crankshaft pulley side (9) to flywheel side.
- Figure at shows engine with intake manifold removed and viewed from the top.
  LH (No.1) bank (7) consists of No.1 (1), No.3 (3) and No.5 (5) cylinders.
  RH (No.2) bank (8) consists of No.2 (2), No.4 (4) and No.6 (6) cylinders.

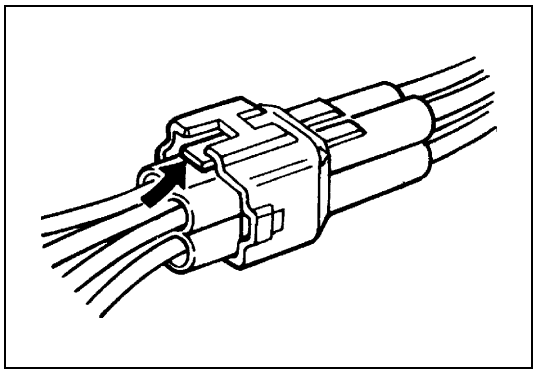
## Precaution

### Precaution on engine service

**CAUTION:**

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

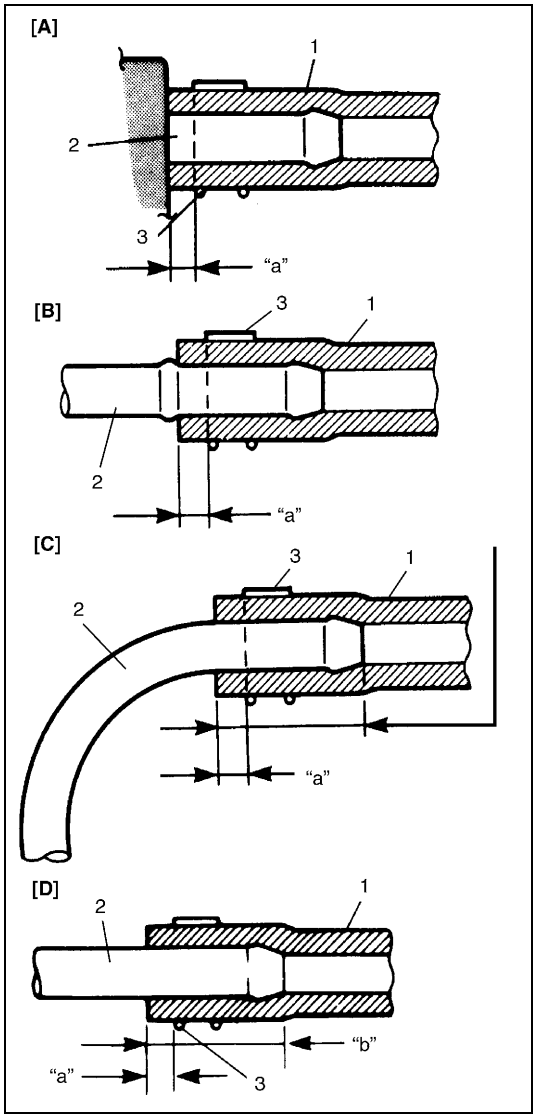
- When raising or supporting engine for any reason, do not use a jack under oil pan. Due to small clearance between oil pan and oil pump strainer, jacking against oil pan may cause it to be bent against strainer resulting in damaged oil pick-up unit.
- It should be kept in mind, while working on engine, that 12-volt electrical system is capable of violent and damaging short circuits.
  When performing any work where electrical terminals could possibly be grounded, ground cable of the battery should be disconnected at battery.
- Any time the air cleaner, air cleaner outlet hose, throttle body, surge tank pipe, intake collector 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.

## Precaution on fuel system service

- Work must be done with no smoking, in a well-ventilated area and away from any open flames.
- As fuel feed line (between fuel pump and fuel pressure regulator) 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 feed line, make sure to release fuel pressure according to "Fuel Pressure Relief Procedure" in this section.
  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. Put that cloth in an approved container when disconnection is completed.
- Never run engine with fuel pump relay disconnected when engine and exhaust system are hot.




- Fuel or fuel vapor hose connection varies with each type of pipe. When reconnecting fuel or fuel vapor hose, be sure to connect and clamp each hose correctly referring to figure.
  After connecting, make sure that the hose has no twist or kink.

| | |
|---|---|
| [A]: | With short pipe, fit hose as far as it reaches pipe joint as shown. |
| [B]: | With following type pipe, fit hose as far as its peripheral projection as shown. |
| [C]: | With bent pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose. |
| [D]: | With straight pipe, fit hose till pipe is about 20 to 30 mm (0.79 – 1.18 in.) into the hose. |
| 1. | Hose |
| 2. | Pipe |
| 3. | Clamp |
| "a": | Clamp securely at a position 3 to 7 mm (0.12 – 0.27 in.) from hose end. |
| "b": | 20 to 30 mm (0.79 – 1.18 in.) |

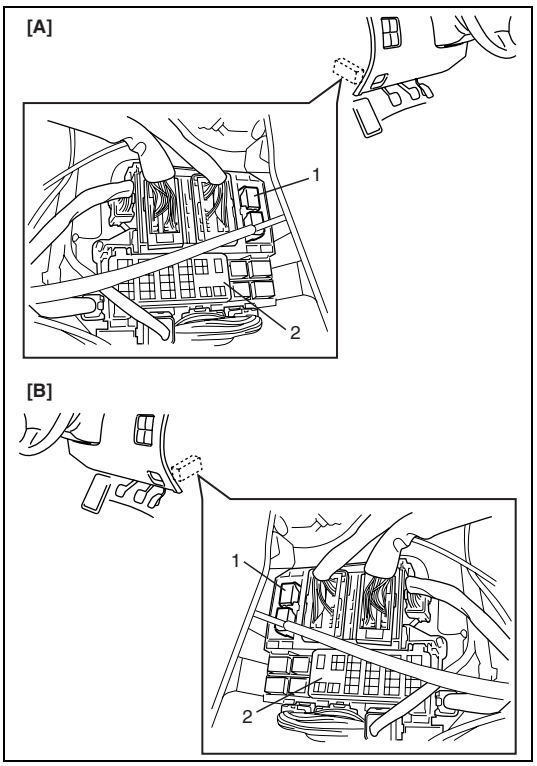
- When installing fuel pipe union bolt gasket, always use new gasket and tighten union bolt to specified torque referring to "Fuel Injector" under "Fuel Delivery System" in Section 6E2.
- When installing injector, fuel feed pipe or fuel pressure regulator, lubricate its O-ring with gasoline.

## Fuel pressure relief procedure

**CAUTION:**
**This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.**

After making sure that engine is cold, relief fuel pressure as follows.

1) Place transmission gear shift lever in “Neutral” (shift selector lever to “P” range for A/T vehicle), set parking brake, and block drive wheels.
2) Remove fuel pump relay (1) from its connector.
3) Remove fuel filler cap to release fuel vapor pressure in fuel tank and then reinstall it.
4) Start engine and run it till it stops for lack of fuel. Repeat cranking engine 2 – 3 times of about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
5) Upon completion of servicing, install fuel pump relay to relay and fuse box.




| | |
|---|---|
| [A]: | Left hand steering vehicle |
| [B]: | Right hand steering vehicle |
| 2. | Relay and fuse box |

## Fuel leakage check procedure

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 (till fuel pressure is felt by hand placed on fuel return hose).
2) In this state, check to see that there are no fuel leakages from any part of fuel system.

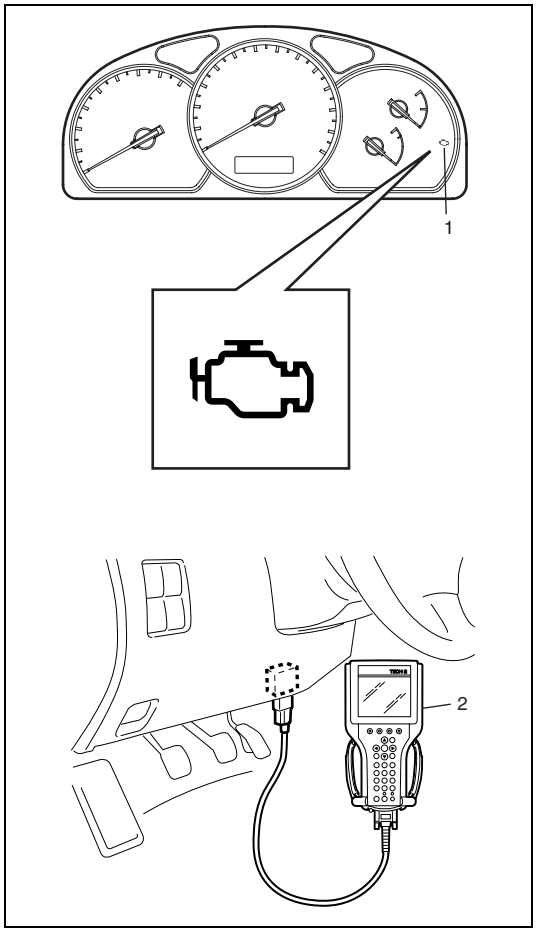
# Diagnosis

## Engine Diagnosis General Description

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" and each item in "Precaution in Diagnosing Trouble for Engine" and execute diagnosis according to "Engine and Emission Control System Check" in this section.
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" in this section.

## On-Board Diagnostic System Description (Vehicle without Diagnosis Connector)

ECM in this vehicle has 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.)
- It is possible to communicate by using not only SUZUKI scan tool (2) but also generic scan tool. (Diagnostic information can be accessed by using a scan tool.)

### 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 (158°F).

### Driving Cycle

A “Driving Cycle” consists of engine startup, driving mode where a malfunction would be detected if present and engine shutoff.

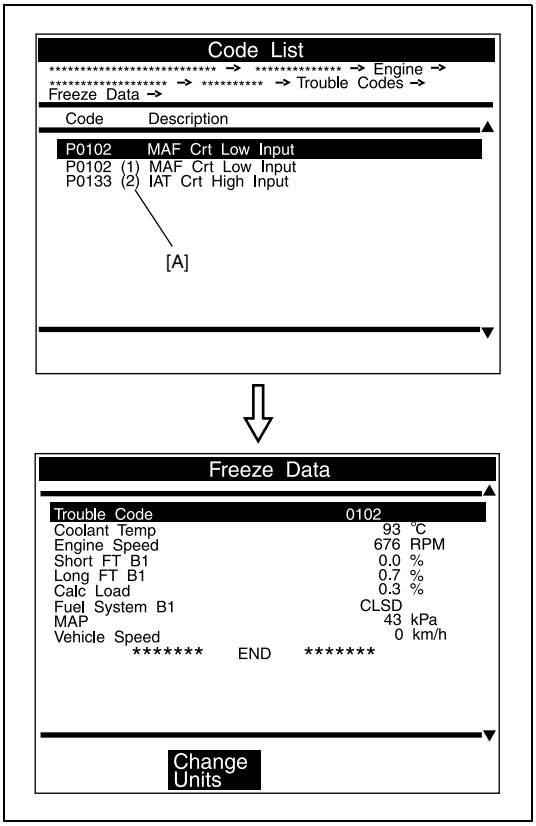
### 2 Driving Cycle Detection Logic

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 the 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.

[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 below. (If malfunction as described in the upper square "1" below 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".)

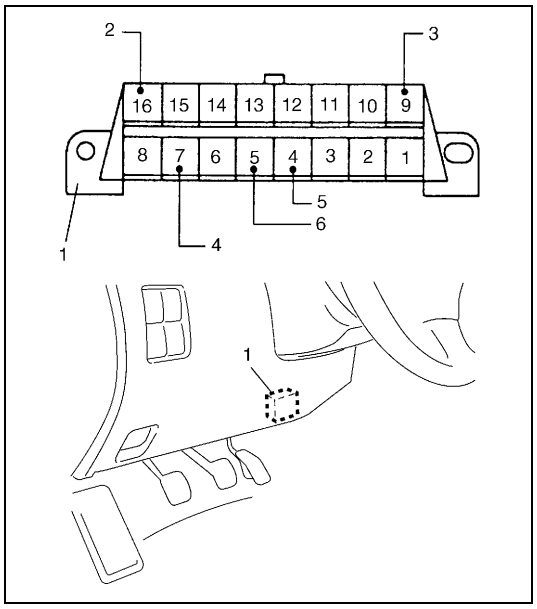
| PRIORITY | FREEZE FRAME DATA IN FRAME 1 |
|---|---|
| 1 | Freeze frame data at initial detection of malfunction among misfire detected (P0300-P0306), fuel system too lean (P0171, P0174) and fuel system too rich (P0172, P0175) |
| 2 | Freeze frame data when a malfunction other than those in "1" above is detected |

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order as the malfunction is detected. These data are not updated regardless of the priority.
Shown in the table below are examples of how freeze frame data are stored when two or more malfunctions are detected.

| | | | 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 | No freeze frame data | No freeze frame data | No freeze frame data |
| MALFUNCTION DETECTED ORDER | 1 | P0110 (IAT) detected | Data at P0110 detection | Data at P0110 detection | No freeze frame data | No freeze frame data |
| | 2 | P0171 (Fuel system) detected | Data at P0171 detection | Data at P0110 detection | Data at P0171 detection | No freeze frame data |
| | 3 | P0300 (Misfire) detected | Data at P0171 detection | Data at P0110 detection | Data at P0171 detection | Data at P0300 detection |
| | 4 | P0301 (Misfire) detected | Data at P0171 detection | Data at P0110 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.



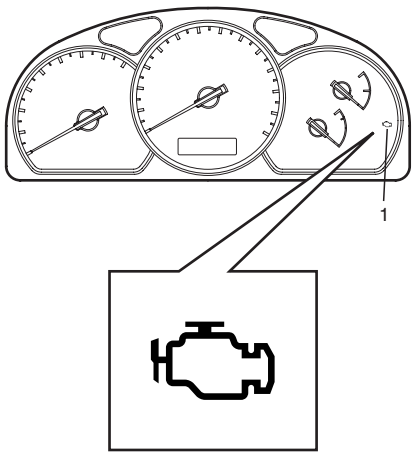

**Data Link Connector (DLC)**

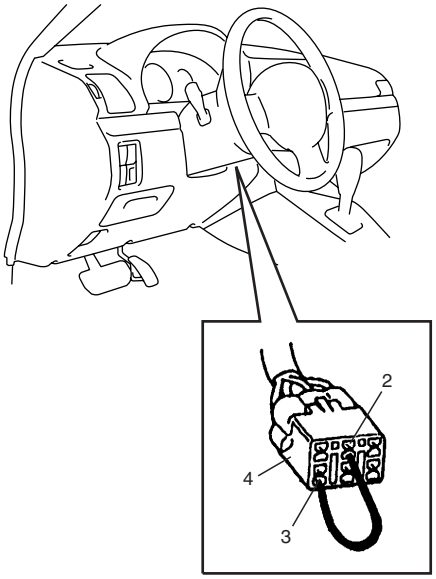
DLC (1) is in compliance with SAEJ1962 in its installation position, the shape of connector and pin assignment.

K line of ISO 9141 (4) is used for SUZUKI scan tool or generic scan tool to communicate with ECM, TCM, BCM, ABS control module Air bag SDM and HVAC control module (if equipped). SUZUKI serial data line (3) is used for SUZUKI scan tool to communicate with Immobilizer control module.

| |
|---|
| 2. B+ |
| 5. Body ground |
| 6. ECM ground |

## On-Board Diagnostic System Description (Vehicle with Diagnosis Connector)




ECM diagnosis troubles which may occur in the area including the following parts when the ignition switch is ON and the engine is running, and indicates the result by turning on of flashing malfunction indicator lamp (1).

- Heated oxygen sensor (if equipped)
- ECT sensor
- TP sensor
- IAT sensor
- CMP sensor
- MAF sensor
- Knock sensor
- EGR (if equipped)
- VSS
- CPU (Central Processing Unit) of ECM

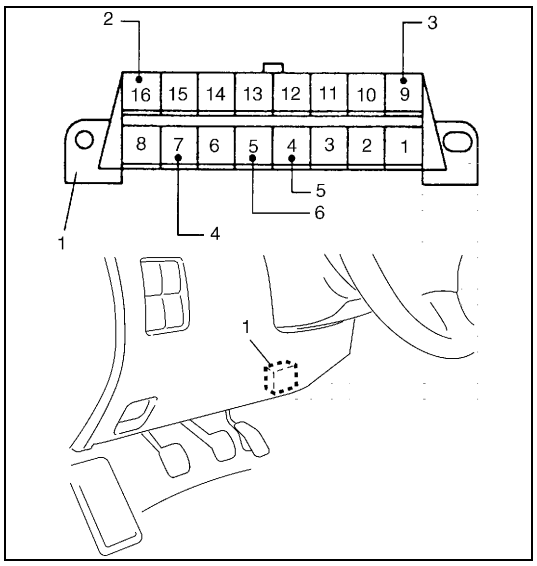
ECM and malfunction indicator lamp (1) operate as follows.

- Malfunction indicator lamp (1) light when the ignition switch is turned ON (but the engine at stop) with the diagnosis switch terminal ungrounded regardless of the condition of Engine and Emission control system. This is only to check the malfunction indicator lamp (1) circuit.
- If the above areas of Engine and Emission control system is free from any trouble after the engine start (while engine is running), malfunction indicator lamp (1) turns OFF.
- When ECM detects a trouble which has occurred in the above areas, it makes malfunction indicator lamp (1) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the trouble area in ECM back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to ECM is shut off for specified time.)
  ECM also indicates trouble area in memory by means of flashing of malfunction indicator lamp (1) at the time of inspection. (i.e. when diagnosis switch terminal (2) is connected to ground terminal (3) with a service wire and ignition switch is turned ON.)

**NOTE:**

**When a trouble occurs in the above areas and disappears soon while the diagnosis switch terminal is ungrounded and the engine is running, malfunction indicator lamp (1) lights and remains ON as the trouble exists but it turns OFF when the normal condition is restored.**

4. Diagnosis connector (white connector)




**Data Link Connector (DLC)**

DLC (1) is in compliance with SAEJ1962 in its installation position, the shape of connector and pin assignment.
K line of ISO 9141 (4) is used for SUZUKI scan tool to communicate with ECM, TCM, BCM, ABS control module, air bag SDM and HVAC control module (if equipped). SUZUKI serial data line (3) is used for SUZUKI scan tool to communicate with Immobilizer control module.

| | |
|---|---|
| 2. | B+ |
| 5. | Body ground |
| 6. | ECM ground |

## Precaution in Diagnosing Trouble for Engine

- 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 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 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 generic scan tool displays DTC detected by each of ECM and TCM simultaneously.
- Priorities for diagnosing troubles (Vehicle without diagnosis connector)
  If two or more diagnostic trouble codes (DTCs) are stored, proceed to the flow table of the DTC which was detected earliest in the order and follow the instruction in that table.
  If no instructions are given, troubleshoot diagnostic trouble codes according to the following priorities.
  – Diagnostic trouble codes (DTCs) other than DTC P0171/P0172/P0174/P0175 (Fuel system too lean/too rich), DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 (Misfire detected) and DTC P0401/P0402 (EGR flow malfunction)
  – DTC P0171/P0172/P0174/P0175 (Fuel system too lean/too rich) and DTC P0401/P0402 (EGR flow malfunction)
  – DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service" in Section 0A before inspection and observe what is written there.
- ECM Replacement
  When substituting a known-good ECM, check for following conditions. Neglecting this check may cause damage to a known-good ECM.
  – Resistance value of all relays, actuators is as specified respectively.
  – MAF sensor, MAP sensor and TP sensor are in good condition and none of power circuits of these sensors is shorted to ground.
- 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 0A.

## Engine and Emission Control System Check

Refer to following items for the detail of each step.

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **Customer Complaint Analysis**<br>1) Perform customer complaint analysis.<br>Was customer complaint analysis performed? | Go to Step 2. | Perform customer complaint analysis. |
| 2 | **DTC(s)/Freeze Frame Data Check**<br>1) Check DTC(s)/Freeze frame data.<br>Is there any malfunction DTC(s)? | Record DTC(s)/Freeze frame data.<br>Clear DTC(s).<br>Go to Step 3. | Go to Step 4. |
| 3 | **Visual Inspection**<br>1) Perform visual inspection.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 5. |
| 4 | **Visual Inspection**<br>1) Perform visual inspection.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 8. |
| 5 | **Trouble Symptom Confirmation**<br>1) Confirm trouble symptom based on customer complaint analysis, DTC(s)/freeze frame data in Step 1.<br>Is trouble symptom identified? | Go to Step 6. | Go to Step 7. |
| 6 | **DTC/Freeze Frame Data Recheck**<br>1) Recheck DTC/freeze frame data.<br>Is there any malfunction DTC(s)? | Go to Step 9. | Go to Step 8. |
| 7 | **DTC/Freeze Frame Data Recheck**<br>1) Recheck DTC/freeze frame data.<br>Is there any malfunction DTC(s)? | Go to Step 9. | Go to Step 10. |
| 8 | **Engine Basic Inspection**<br>1) Check and repair according to “Engine Basic Inspection” and “Engine Symptom Diagnosis” in this section.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 9 | **DTC Trouble Shooting**<br>1) Check and repair according to applicable “DTC Diag. Flow Table” in this section.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 10 | **Intermittent Problems Check**<br>1) Check for intermittent problems referring to “Check for Intermittent Problem” in Section 0A.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 11. |
| 11 | **Final Confirmation Test**<br>1) Clear DTC if any.<br>2) Perform final confirmation test referring to “DTC Confirmation Procedure” in this section.<br>Is there any problem symptom, malfunction 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 of Reg.: | Date of problem: | Mileage: |

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

| VEHICLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS | |
|---|---|
| **Environmental Condition** | |
| Weather<br>Temperature<br>Frequency<br>Road | ☐ Fair ☐ Cloudy ☐ Rain ☐ Snow ☐ Always ☐ Other_____<br>☐ Hot ☐ Warm ☐ Cool ☐ Cold ( °F/ °C) ☐ Always<br>☐ Always ☐ Sometimes ( times/ day, month) ☐ Only once ☐ Under certain condition<br>☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous (☐ Uphill ☐ Downhill) ☐ Tarmacadam<br>☐ Gravel ☐ Other_____ |
| **Vehicle Condition** | |
| Engine Condition | ☐ Cold ☐ Warming up phase ☐ Warmed up ☐ Always ☐ Other at starting<br>☐ Immediately after start ☐ Racing without load ☐ Engine speed ( r/min) |
| Vehicle condition | ☐ During driving: ☐ Constant speed ☐ Accelerating ☐ Decelerating<br>☐ Right hand corner ☐ left hand corner ☐ When shifting (Lever position ) ☐ At stop<br>☐ 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 ☐ Normal code ☐ Malfunction code ( ) | |
| | Second check: ☐ No code ☐ Normal code ☐ Malfunction code ( ) | |

**NOTE:**

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

**Step 2. Diagnostic Trouble Code (DTC)/Freeze Frame Data Check, Record and Clearance**

First, check DTC, referring to "Diagnostic Trouble Code (DTC) Check" in this section. If DTC is indicated, record DTC and freeze frame data.
After that clear DTC referring to "Diagnostic Trouble Code (DTC) Clearance" in this section. 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, 7.
Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC (including pending 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**

Be sure to perform visual check of the following items that support proper function of the engine.

## Visual Inspection

Visually check following parts and systems.

| INSPECTION ITEM | REFERRING SECTION |
|---|---|
| • Engine oil - - - - - level, leakage | Section 0B |
| • Engine coolant - - - - - level, leakage | Section 0B |
| • Fuel - - - - - level, leakage | Section 0B |
| • A/T fluid - - - - - level, leakage | Section 0B |
| • Air cleaner element - - - - - dirt, clogging | Section 0B |
| • Battery - - - - - fluid level, corrosion of terminal | Section 0B |
| • Water pump belt and/or cooling fan belt - - - - - tension, damage | Section 6C |
| • Accelerator cable - - - - - play, installation | Section 6E2 |
| • A/T throttle cable - - - - - play, installation | Section 6E2 |
| • Vacuum hoses of air intake system | |
| - - - - - disconnection, looseness, deterioration, bend | Section 6E2 |
| • Connectors of electric wire harness - - - - - disconnection, friction | |
| • Fuses - - - - - burning | Section 8 |
| • Parts - - - - - installation, bolt - - - - - looseness | |
| • Parts - - - - - deformation | |
| • Other parts that can be checked visually | |
| • Also check following items at engine start, if possible | |
| – Malfunction indicator lamp - - - - - operation | Section 6-1 |
| – Charge warning lamp - - - - - operation | Section 6H |
| – Engine oil pressure warning lamp - - - - - operation | Section 8/6A2 |
| – Engine coolant temp. meter - - - - - operation | Section 8C |
| – Fuel lever meter - - - - - operation | Section 8C |
| – Abnormal air being inhaled from air intake system | |
| – Exhaust system - - - - - leakage of exhaust gas, noise | |
| – Other parts that can be checked visually | |

**Step 5. Trouble Symptom Confirmation**

Based on information obtained in Step 1 "Customer Complaint Analysis" and Step 2 "DTC/Freeze Frame Data Check", confirm trouble symptoms. Also, reconfirm DTC according to "DTC Confirmation Procedure" described in each "DTC Flow Table".

**Step 6. and 7. Rechecking and Record of DTC/Freeze Frame Data**

Refer to “Diagnostic Trouble Code (DTC) Check” in this section for checking procedure.

**Step 8. Engine Basic Inspection and Engine Symptom Diagnosis**

Perform basic engine check according to the “Engine Basic Inspection” first. When the end of the flow table has been reached, check the parts of the system suspected as a possible cause referring to “Engine Symptom Diagnosis” 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.

## Engine Basic Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | Check battery voltage.<br>Is it 11 V or more? | Go to Step 3. | Charge or replace battery. |
| 3 | Is engine cranked? | Go to Step 4. | Go to “Diagnosis” in Section 6G. |
| 4 | Does engine start? | Go to Step 5. | Go to Step 7. |
| 5 | Check engine idle speed/IAC duty referring to “Idle Speed Idle Air Control (IAC) Duty Inspection” in Section 6E2.<br>Is check result as specified? | Go to Step 6. | Go to “Engine Diagnosis Table” in this section. |
| 6 | Check ignition timing referring to “Ignition Timing Check and Adjustment” in Section 6F2.<br>Is check result as specified? | Go to “Engine Symptom Diagnosis” in this section. | Adjust ignition timing. |
| 7 | **Check fuel supply as follows**<br>1) Check to make sure that enough fuel is filled in fuel tank.<br>2) Turn ON ignition switch for 3 seconds and then OFF.<br>Repeat this a few times.<br>Is fuel return pressure (returning sounds) felt from fuel return hose when ignition switch is turned ON? | Go to Step 9. | Go to Step 8. |
| 8 | Check fuel pump for operating.<br>1) Was fuel pump operating sound heard from fuel filler for about 3 seconds after ignition switch ON and stop? | Go to “Diag. Flow Table B-3” in this section. | Go to “Diag. Flow Table B-1” in this section. |
| 9 | Check ignition spark referring to “Ignition Spark Check” in Section 6F2.<br>Is it in good condition? | Go to Step 10. | Go to “Diagnosis” in Section 6F2. |
| 10 | Check fuel injector referring to “Fuel Injector” under “Fuel Delivery System” in Section 6E2.<br>Is it in good condition? | Go to “Engine Symptom Diagnosis” in this section. | Go to “Diag. Flow Table B-2” in this section. |

**Step 9. Troubleshooting for DTC (See each DTC Diag. Flow Table.)**

Based on the DTC indicated in Step 6 or 7 and referring to the applicable DTC diag. flow table in this section, 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.

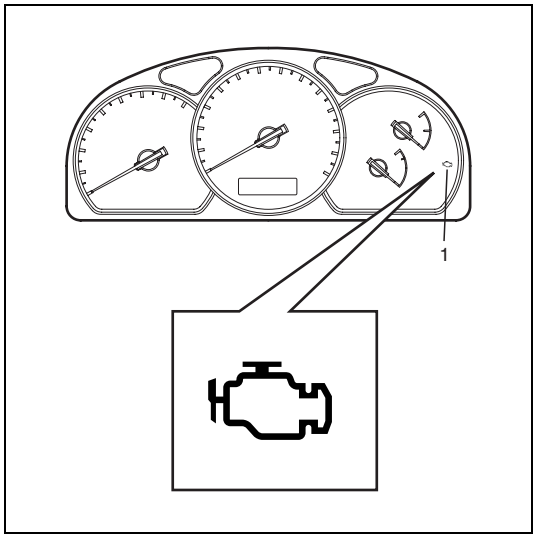
**Step 10. Check for Intermittent Problem**

Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to "Intermittent and Poor Connection" in Section 0A 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 malfunction DTC (a normal code) is indicated.

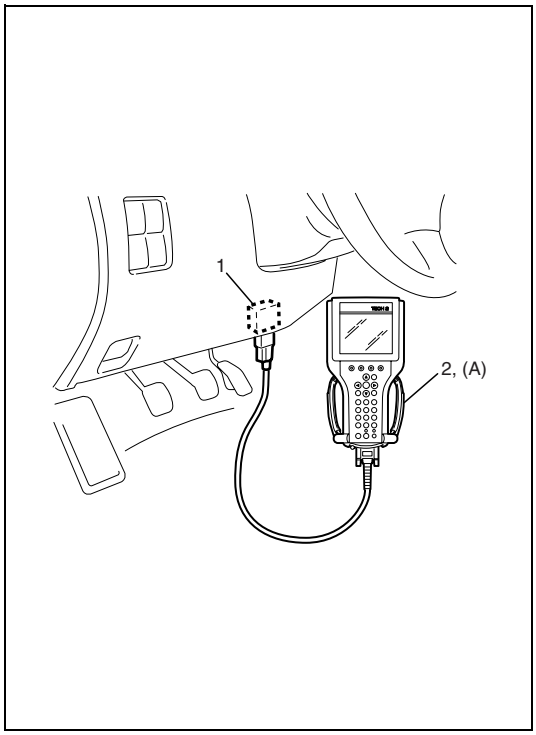
## Malfunction Indicator Lamp (MIL) Check




1) Turn ON ignition switch (but the engine at stop) and check that MIL (1) lights.
   If MIL does not light up, go to "Diagnostic Flow Table A-1" for troubleshooting.
2) Start engine and check that MIL turns OFF.
3) If MIL remains ON, and no DTC is stored in ECM, go to "Diagnostic Flow Table A-2" for troubleshooting.

## Diagnostic Trouble Code (DTC) Check

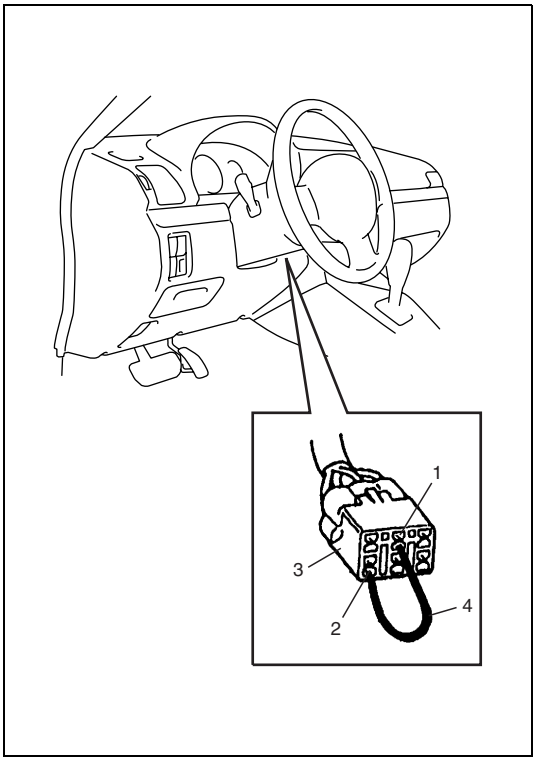
**[Using SUZUKI Scan Tool]**




1) Prepare generic scan tool or SUZUKI scan tool (2).
2) With ignition switch 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**

3) Turn ignition switch ON and confirm that MIL lights.
4) Read 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.
5) After completing the check, turn ignition switch off and disconnect scan tool from data link connector.




**[Without Using SUZUKI Scan Tool] (Vehicle with Diagnosis Connector)**

1) Check malfunction indicator lamp referring to "Malfunction Indicator Lamp (MIL) Check" in this section.
2) With the ignition switch OFF position, disconnect SUZUKI scan tool if connected and using service wire (4), connect diagnosis switch terminal (1) to ground terminal (2) in diagnosis connector (white connector) (3).
3) With the ignition switch ON position and leaving engine OFF, read DTC from flashing pattern of malfunction indicator lamp. Refer to "Diagnostic Trouble Code Table".
   If lamp remains ON, go to "Diagnostic Flow Table A-4".

**NOTE:**

- **If abnormality or malfunction lies in two or more areas, malfunction indicator lamp indicates applicable codes three times each.**
  **And flashing of these codes is repeated as long as diagnosis terminal is grounded and ignition switch is held at ON position.**
- **Take a note of diagnostic trouble code indicated first.**

4) After completing the check, turn the ignition switch OFF position and disconnect service wire from diagnosis connector.

## Diagnostic Trouble Code (DTC) Clearance

**[Using Scan Tool]**

1) With ignition switch OFF, connect generic scan tool or SUZUKI scan tool to data link connector (DLC).
2) Turn ignition switch ON.
3) Erase DTC according to instructions displayed on scan tool. Freeze frame data is cleared with the DTC. 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 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 (refer to "Warm-Up Cycle" of "On-Board Diagnostic System (Vehicle without Diagnosis Connector)" in this section.)**

**[Without Using Scan Tool]**

1) Turn the ignition switch OFF position.
2) Disconnect battery negative cable for specified time below to erase diagnostic trouble code stored in ECM memory and reconnect it.

**Time required to erase DTC**

| Ambient temperature | Time to cut power to ECM |
|---|---|
| Over 0°C (32°F) | 30 sec. or longer |
| Under 0°C (32°F) | Not specifiable. Select a place with higher than 0°C (32°F) temperature. |

## Diagnostic Trouble Code (DTC) Table

### For vehicle with diagnosis connector

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0100 (No.34) | Mass air flow circuit malfunction | Sensor output too low | 1 driving cycle |
| P0100 (No.33) | | Sensor output too high | |
| P0110 (No.25) | Intake air temp. circuit malfunction | Intake air temp. circuit low input | 1 driving cycle |
| P0110 (No.23) | | Intake air temp. circuit high input | |
| P0115 (No.15) | Engine coolant temp. circuit malfunction | Engine coolant temp. circuit low input | 1 driving cycle |
| P0115 (No.14) | | Engine coolant temp. circuit high input | |
| P0120 (No.22) | Throttle position circuit malfunction | Throttle position circuit low input | 1 driving cycle |
| P0120 (No.21) | | Throttle position circuit high input | |
| P0130 (No.13) | HO2S circuit malfunction (Bank 1 - Sensor 1) | Min. output voltage of HO2S–1 is lower than specification. | 2 driving cycles |
| P0135 (No.16) | HO2S heater circuit malfunction (Bank 1 - Sensor 1) | Terminal voltage is lower than specification at heater OFF or it is higher at heater ON. | 1 driving cycle |
| P0150 (No.26) | HO2S circuit malfunction (Bank 2 - sensor 1) | Min. output voltage of HO2S–1 is lower than specification. | 2 driving cycles |
| P0155 (No.17) | HO2S heater circuit malfunction (Bank 2 - Sensor 1) | Terminal voltage i lower than specification at heater OFF or it is higher at heater ON. | 1 driving cycle |
| P0325 (No.43) | Knock sensor circuit malfunction | Sensor output too low | 1 driving cycle |
| | | Sensor output too high | |
| P0340 (No.42) | Camshaft position sensor circuit malfunction | No signal for 3 sec. during engine cranking, REF signal pattern incorrect or POS signal voltage too high or too low | 1 driving cycle |
| P0403 (No.51) | EGR valve circuit malfunction | EGR valve electrical circuit open or shot to ground | 1 driving cycle |

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0443 (No.55) | Purge control valve circuit malfunction | Purge control valve circuit is open or shorted to ground. | 2 driving cycles |
| P0500 (No.24) | Vehicle speed sensor malfunction | No signal while running in “D” range or during fuel cut at decelerating. | 1 driving cycle |
| P0601 (No.71) | Internal control module memory check sum error | Data write error (or check sum error) when written into ECM | 1 driving cycle |
| P0660 (No.57) | Intake manifold tuning valve control circuit/open | Vacuum solenoid valve circuit open or short | 2 driving cycles |
| P1510 (No.36) | ECM back-up power supply malfunction | No back-up power after starting engine. | 1 driving cycle |
| P1601 (No.37) | CAN communication error | Transmitting or receiving error detected to ECM for specified time continuously | 1 driving cycle |
| P1603 | TCM trouble code detected | Abnormality either on the idle speed control signal or on the engine power control signal outputted from TCM is detected by ECM | Immediately |

## For vehicle without diagnosis connector

| DTC No. | Detected item | Detecting condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0031 | HO2S (Bank 1 Sensor–1) heater control circuit low | Heater current is less than specification while heater ON. | 2 driving cycles |
| P0032 | HO2S (Bank 1 Sensor–1) heater control circuit high | Heater current is more than specification while heater ON. | 2 driving cycles |
| P0037 | HO2S (Bank 1 Sensor–2) heater control circuit low | Heater current is less than specification while heater ON. | 2 driving cycles |
| P0038 | HO2S (Bank 1 Sensor–2) heater control circuit high | Heater current is more than specification while heater ON. | 2 driving cycles |
| P0051 | HO2S (Bank 2 Sensor–1) heater control circuit low | Heater current is less than specification while heater ON. | 2 driving cycles |
| P0052 | HO2S (Bank 2 Sensor–1) heater control circuit high | Heater current is more than specification while heater ON. | 2 driving cycles |
| P0057 | HO2S (Bank 2 Sensor–2) heater control circuit low | Heater current is less than specification while heater ON. | 2 driving cycles |
| P0058 | HO2S (Bank 2 Sensor–2) heater control circuit high | Heater current is more than specification while heater ON. | 2 driving cycles |
| P0102 | Mass air flow circuit low input | Sensor output too low | 1 driving cycle |
| P0103 | Mass air flow circuit high input | Sensor output too high | 1 driving cycle |
| P0107 | Manifold absolute pressure circuit low input | Manifold absolute pressure sensor output voltage is lower than specification. | 1 driving cycle |
| P0108 | Manifold absolute pressure circuit high input | Manifold absolute pressure sensor output voltage is higher than specification. | 1 driving cycle |
| P0112 | Intake air temperature sensor circuit low | High temperature-low voltage (or IAT sensor circuit shorted to ground) | 1 driving cycle |
| P0113 | Intake air temperature sensor circuit high | Low temperature-high voltage (or IAT sensor circuit open) | 1 driving cycle |

| DTC No. | Detected item | Detecting condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0117 | Engine coolant temperature circuit low | High temperature-low voltage (or ECT sensor circuit shorted to ground) | 1 driving cycle |
| P0118 | Engine coolant temperature circuit high | Low-temperature-high voltage (or ECT sensor circuit open) | 1 driving cycle |
| P0121 | Throttle position sensor circuit performance | Poor performance of TP sensor | 2 driving cycles |
| P0122 | Throttle position sensor circuit low | Low voltage (or TP sensor circuit shorted to ground) | 1 driving cycle |
| P0123 | Throttle position sensor circuit high | High voltage (or TP sensor circuit open) | 1 driving cycle |
| P0131 | O2 sensor (Bank 1 Sensor–1) circuit low voltage | Max. output voltage of HO2S–1 is lower than specification | 2 driving cycles |
| P0132 | O2 sensor (Bank 1 Sensor–1) circuit high voltage | Min. output voltage of HO2S–1 is higher than specification | 2 driving cycles |
| P0133 | O2 sensor (Bank 1 Sensor–1) circuit slow response | Response time of HO2S–1 output voltage is longer than specification | 2 driving cycles |
| P0134 | O2 sensor (Bank 1 Sensor–1) no activity detected | Output voltage of HO2S–1 fails to go above specification | 2 driving cycles |
| P0137 | O2 sensor (Bank 1 Sensor–2) circuit low voltage | HO2S–2 output voltage is lower than specification (or HO2S–2 circuit open) | 2 driving cycles |
| P0138 | O2 sensor (Bank 1 Sensor–2) circuit high voltage | HO2S–2 output voltage is higher than specification | 2 driving cycles |
| P0140 | O2 sensor (Bank 1 Sensor–2) circuit no activity detected | HO2S–2 output voltage is lower than specification | 2 driving cycles |
| P0151 | O2 sensor (Bank 2 Sensor–1) circuit low voltage | Max. output voltage of HO2S–1 is lower than specification | 2 driving cycles |
| P0152 | O2 sensor (Bank 2 Sensor–1) circuit high voltage | Min. output voltage of HO2S–1 is higher than specification | 2 driving cycles |
| P0153 | O2 sensor (Bank 2 Sensor–1) circuit slow response | Response time of HO2S–1 output voltage is longer than specification | 2 driving cycles |
| P0154 | O2 sensor (Bank 2 Sensor–1) no activity detected | Output voltage of HO2S–1 fails to go above specification | 2 driving cycles |
| P0157 | O2 sensor (Bank 2 Sensor–2) circuit low voltage | HO2S–2 output voltage is lower than specification (or HO2S–2 circuit open) | 2 driving cycles |
| P0158 | O2 sensor (Bank 2 Sensor–2) circuit high voltage | Min. output voltage of HO2S–2 is higher than specification | 2 driving cycles |
| P0160 | O2 sensor (Bank 2 Sensor–2) circuit no activity detected | Max. output voltage of HO2S–2 is lower than specification | 2 driving cycles |
| P0171 | System too lean (Bank 1) | Total trim (short and long terms added) is larger than specification for specified time or longer. (Fuel trim toward rich side is large.) | 2 driving cycles |
| P0172 | System too rich (Bank 1) | Total trim (short and long terms added) is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.) | 2 driving cycles |
| P0174 | System too lean (Bank 2) | Total trim (short and long terms added) is larger than specification for specified time or longer. (Fuel trim toward rich side is large.) | 2 driving cycles |

| DTC No. | Detected item | Detecting condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0175 | System too rich (Bank 2) | Total trim (short and long terms added) is smaller than specification for specified time or longer. (Fuel trim toward lean side is large.) | 2 driving cycles |
| P0300/ P0301/ P0302/ P0303/ P0304/ P0305/ P0306 | Random misfire detected Cylinder 1 misfire detected Cylinder 2 misfire detected Cylinder 3 misfire detected Cylinder 4 misfire detected Cylinder 5 misfire detected Cylinder 6 misfire detected | Misfire of such level as to cause damage to three way catalyst. | MIL blinks during actual misfire and remain continuously illuminated otherwise. |
| | | 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 | Knock sensor circuit shorted to ground (low voltage) | 1 driving cycle |
| P0328 | Knock sensor circuit high | Knock sensor circuit open (high voltage) | 1 driving cycle |
| P0335 | Crankshaft position sensor circuit | No signal during engine running and CMP sensor signal inputting | 1 driving cycle |
| P0340 | Camshaft position sensor circuit | No signal for 3 sec. during engine cranking, REF signal pattern incorrect or POS signal voltage too high or too low | 1 driving cycle |
| P0401 | Exhaust gas recirculation flow insufficient detected | Insufficient EGR flow | 2 driving cycles |
| P0402 | Exhaust gas recirculation flow excessive detected | Excessive EGR flow | 2 driving cycles |
| P0403 | Exhaust gas recirculation control circuit | EGR valve electrical circuit open or short | 1 driving cycle |
| P0420 | Catalyst system efficiency below threshold (Bank 1) | Output wave forms of HO2S–1 and HO2S–2 are similar. | 2 driving cycles |
| P0430 | Catalyst system efficiency below threshold (Bank 2) | Output wave forms 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 short) | 2 driving cycles |
| P0463 | Fuel level sensor circuit high | Fuel level sensor circuit open (high voltage) | 2 driving cycles |
| P0500 | Vehicle speed sensor | No signal during fuel cut | 2 driving cycles |
| P0506 | Idle air control system RPM lower than expected | Engine idle speed is lower than specified target idle speed during idle speed feed back compensation | 2 driving cycles |
| P0507 | Idle air control system RPM higher than expected | Engine idle speed is higher than specified target idle speed during idle speed feed back compensation | 2 driving cycles |
| P0601 | Internal control module memory check sum error | Data write error when written in to ECM | 1 driving cycle |
| P0616 | Starter relay circuit low | Engine starts with no starter signal | 2 driving cycles |

| DTC No. | Detected item | Detecting condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0617 | Starter relay circuit high | Starter signal inputs during long period after engine start | 2 driving cycles |
| P0660 | Intake manifold tuning valve control circuit/open | Vacuum solenoid valve circuit open or short | – |
| P1107 | Manifold absolute pressure circuit performance low | Poor performance of manifold absolute pressure sensor | 2 driving cycles |
| P1108 | Manifold absolute pressure circuit performance high | Poor performance of manifold absolute pressure sensor | 2 driving cycles |
| P1510 | ECM back-up power circuit low | No back-up power after starting engine. | 1 driving cycle |
| P1601 | CAN communication error | Transmitting or receiving error detected to ECM for specified time continuously | 1 driving cycle |
| P1603 | TCM trouble code detected | Abnormality either on the idle speed control signal or on the engine power control signal outputted from TCM is detected by ECM. | 1 driving cycle |
| P2227 | Barometric pressure circuit performance | Difference between intake manifold pressure and barometric pressure is larger than specification | 2 driving cycles |
| P2228 | Barometric pressure circuit low | Barometric pressure is lower than specification. | 1 driving cycle |
| P2229 | Barometric pressure circuit high | Barometric pressure is higher than specification. | 1 driving cycle |

### For A/T System (Only OBD Generic Scan Tool Is Displayed on the Following DTC(s) at the Same Time)

| DTC No. | Detected item | Detecting condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0705 (No.34) | Transmission range sensor circuit malfunction (PRNDL input) | Refer to “DTC Table” in Section 7B2. | |
| P0707 (No.34) | Transmission range sensor circuit low input | | |
| P0711 (No.81) | Transmission fluid temperature sensor range/ performance | | |
| P0712 (No.38) | Transmission fluid temperature sensor “A” circuit low | | |
| P0713 (No.36) | Transmission fluid temperature sensor “A” circuit high | | |
| P0717 (No.14) | Input/turbine speed sensor circuit no signal | | |
| P0722 (No.31) | Output speed sensor circuit no signal | | |
| P0741 (No.78) | TCC (lock-up) solenoid performance or stuck off | | |
| P0742 (No.77) | Torque converter clutch circuit stuck on | | |
| P0751 (No.62) | Shift solenoid “A” performance or stuck off | | |
| P0752 (No.61) | Shift solenoid “A” stuck on | | |
| P0756 (No.65) | Shift solenoid “B” performance or stuck off | | |
| P0757 (No.63) | Shift solenoid “B” stuck on | | |
| P0771 (No.67) | Shift solenoid “E” performance or stuck off | | |
| P0772 (No.66) | Shift solenoid “E” stuck on | | |
| P0781 (No.68) | 1 – 2 shift | | |

| DTC No. | Detected item | Detecting condition (DTC will set when detecting) | MIL |
|---|---|---|---|
| P0797 (No.79) | Pressure control solenoid “C” stuck on | Refer to “DTC Table” in Section 7B2. | |
| P0962 (No.41) | Pressure control solenoid “A” control circuit low | | |
| P0963 (No.42) | Pressure control solenoid “A” control circuit high | | |
| P0966 (No.43) | Pressure control solenoid “B” control circuit low | | |
| P0967 (No.44) | Pressure control solenoid “B” control circuit high | | |
| P0970 (No.45) | Pressure control solenoid “C” control circuit low | | |
| P0971 (No.46) | Pressure control solenoid “C” control circuit high | | |
| P0973 (No.22) | Shift solenoid “A” control circuit low | | |
| P0974 (No.21) | Shift solenoid “A” control circuit high | | |
| P0976 (No.24) | Shift solenoid “B” control circuit low | | |
| P0977 (No.23) | Shift solenoid “B” control circuit high | | |
| P0985 (No.49) | Shift solenoid “E” control circuit low | | |
| P0986 (No.48) | Shift solenoid “E” control circuit high | | |
| P1740 (No.75) | Cruise control signal circuit | | |
| P1701 (No.76) | CAN communication problem – TCM | | |
| P1702 (No.83) | Internal control module memory check sum error | | |
| P1874 (No.15) | 4WD low switch circuit malfunction (short) | | |
| P1875 (No.15) | 4WD low switch circuit malfunction | | |
| P2742 (No.59) | Transmission fluid temperature sensor “B” circuit low | | |
| P2743 (No.58) | Transmission fluid temperature sensor “B” circuit high | | |
| P2763 (No.26) | Torque converter clutch pressure control circuit high | | |
| P2764 (No.25) | Torque converter clutch pressure control circuit low | | |

## For immobilizer control system (Refer to Section 8G for diagnosis)

| DTC No. | Detected Item | Detecting Condition (DTC will set when detecting) | MIL (Vehicle without diagnosis connector) | MIL (Vehicle with diagnosis connector) |
|---|---|---|---|---|
| P1620 (No.84) | ECU code not registered | Refer to “Diagnostic Trouble Code Table” in Section 8G | | |
| P1621 (No.83) | NO ECU code transmitted from Immobilizer Control Module | | | |
| P1622 (No.82) | Fault ECM | | | |
| P1623 (No.81) | ECU code not matched | | | |

**NOTE:**

**For parenthetic No.in DTC column, it can be used for vehicle with diagnosis connector.**

## Fail-Safe Table

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.

### For vehicle with diagnosis connector

| DTC No. | Trouble Area | Fail-Safe Operation |
|---|---|---|
| P0100 (No.33, 34) | MAF SENSOR | • Injector drive time (fuel injection volume) is determined according to throttle valve opening and engine speed.<br>• EGR valve stops.<br>• Air flow of IAC valve is limited. |
| P0110 (No.23, 25) | IAT SENSOR | Each control is performed on the basis of 22.1°C (71.8°F) intake air temp. |
| P0115 (No.14, 15) | ECT SENSOR | Each control is performed on the basis of 38°C (100°F) engine coolant temp. |
| P0120 (No.21, 22) | TP SENSOR | Each control is performed on the basis of 124.5° throttle valve opening. |
| P0500 (No.24) | VEHICLE SPEED SENSOR | Air flow of IAC valve is limited. |

### For vehicle without diagnosis connector

| DTC No. | Trouble Area | Fail-Safe Operation |
|---|---|---|
| P0102<br>P0103 | MAF SENSOR | • Injector drive time (fuel injection volume) is determined according to throttle valve opening and engine speed.<br>• EGR valve stops.<br>• Air flow of IAC valve is limited. |
| P0112<br>P0113 | IAT SENSOR | Each control is performed on the basis of 22.1°C (71.8°F) intake air temp. |
| P0117<br>P0118 | ECT SENSOR | Each control is performed on the basis of 38°C (100°F) engine coolant temp. |
| P0121<br>P0122<br>P0123 | TP SENSOR | Each control is performed on the basis of 124.5° throttle valve opening. |
| P0463 | FUEL LEVEL SENSOR | Each control is performed in the basis of full fuel level. |
| P0500 | VEHICLE SPEED SENSOR | Air flow of IAC valve is limited. |
| P2227/<br>P2228/<br>P2229 | BAROMETRIC PRESSURE SENSOR | Each control is performed based on 760 mmHg barometric pressure. |

## Scan Tool Data

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 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 referring to "Ignition Timing Check and Adjustment" in Section 6F2.

**NOTE:**

- **Item with asterisk (*) in "Other" column can be read only by SUZUKI scan tool.**
- **When checking the data with the engine running at idle or racing, be sure to shift M/T 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, all electric loads, P/S and all the other necessary switches.**

| Scan tool data | Condition | Normal condition/ reference value | Other |
|---|---|---|---|
| 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 | Environmental temp. +20°C (+36°F) –5°C (–9°F) | |
| ENGINE SPEED | At idling with no load after warming up | Desired idle speed ±50 rpm | |
| BATTERY VOLTAGE | Ignition switch ON/engine stopped | 10 – 14 V | * |
| INJ PULSE WIDTH (Fuel Injection Pulse Width) | At specified idle speed with no load after warming up | 2.0 – 3.3 msec. | * |
| | At 2500 r/min. with no load after warming up | 2.2 – 3.2 msec. | |
| TP SENSOR VOLT (TP Sensor Output Voltage) | With ignition switch ON/warmed up engine stopped, accelerator pedal released | 0.49 – 0.91 V | * |
| | With ignition switch ON/warmed up engine stopped, accelerator pedal depressed fully | 3.76 – 4.36 V | |
| DESIRED IDLE (Desired idle speed) | At idling with no load after warming up | 690 rpm | * |
| CLOSED THROTTLE POS (Closed Throttle Position) | With ignition switch ON, accelerator pedal released | ON | * |
| | With ignition switch ON, accelerator pedal depressed | OFF | |
| IAC FLOW DUTY | At specified idle speed after warming up | 5 – 40% | * |
| VEHICLE SPEED | At stop | 0 km/h, 0 MPH | |
| SHORT FT B1 (Short term fuel trim) | At specified idle speed after warming up | –15 – +15% | |
| LONG FT B1 (Long term fuel trim) | At specified idle speed after warming up | –15 – +15% | |
| TOTAL FUEL TRIM B1 | At specified idle speed after warming up | –30 – +30% | * |
| SHORT FT B2 (Short term fuel trim) | At specified idle speed after warming up | –15 – +15% | |
| LONG FT B2 (Long term full trim) | At specified idle speed after warning up | –15 – +15% | |

| Scan tool data | Condition | Normal condition/ reference value | Other |
|---|---|---|---|
| TOTAL FUEL TRIM B2 | At specified idle speed after warming up | –30 – +30% | * |
| INJ PULSE WIDTH B2 | At specified idle speed with no load after warming up | 2.0 – 3.3 msec. | * |
| | At 2500 r/min. with no load after warming up | 2.2 – 3.2 msec. | |
| MAP | At specified idle speed after warming up | 25 – 35 kPa | |
| VARIABLE INTAKE SOL | When engine is running at 6000 r/min. with accelerator pedal depressed fully | ON | * |
| | At specified idle speed after warming up | OFF | |
| CANIST PRG DUTY (EVAP Canister Purge Flow Duty) | At specified idle speed after warming up | 0% | * |
| FUEL CUT | When engine is at fuel cut condition | ON | * |
| | Other than fuel cut condition | OFF | |
| STEP EGR FLOW DUTY | At specified idle speed after warming up | 0% | * |
| FUEL TANK LEVEL | Ignition switch ON | 0 – 100% | * |
| IGNITION ADVANCE | At specified idle speed with no load after warming up | 6 – 17° | |
| MAF (Mass Air Flow Rate) | At specified idle speed with no load after warming up | 2.6 – 4.5 g/s<br>0.34 – 0.59 lb/min. | |
| | At 2500 r/min. with no load after warming up | 10 – 16 g/s<br>1.32 – 2.11 lb/min. | |
| CALC LOAD (Calculated Load Value) | At specified idle speed with no load after warming up | 10 – 25% | |
| | At 2500 r/min. with no load after warming up | 14 – 23% | |
| THROTTLE POSITION (Absolute Throttle Position) | With ignition switch ON/warmed up engine stopped, accelerator pedal released | 9.8 – 18.2% | |
| | With ignition switch ON/warmed up engine stopped, accelerator pedal depressed fully | 72 – 87.2% | |
| O2S B1 S1 (HO2S–1 Output Voltage) | At specified idle speed after warming up | 0.05 – 0.95 V | |
| O2S B1 S2 (HO2S–2 Output Voltage) | When engine is running at 2000 r/min. for 3 min. or longer after warming up | 0.05 – 0.95 V | |
| O2S B2 S1 (HO2S–2 Output Voltage) | When engine is running at 2000 r/min. for 3 min. or longer after warming up | 0.05 – 0.95 V | |
| O2S B2 S2 (HO2S–2 Output Voltage) | When engine is running at 2000 r/min. for 3 min. or longer after warming up | 0.05 – 0.95 V | |
| FUEL SYSTEM B1 (Fuel System Status) | At specified idle speed after warming up | Closed | |
| FUEL SYSTEM B2 (Fuel System Status) | At specified idle speed after warming up | Closed | |
| BAROMETRIC PRESS | – | Display the barometric pressure | * |
| BLOWER FAN | Ignition switch ON, blower fan switch ON | ON | * |
| | Ignition switch ON, blower fan switch OFF | OFF | |
| A/C COND FAN | Ignition switch ON, A/C not operating | OFF | * |
| | Ignition switch ON, A/C operating | ON | |
| A/C SWITCH (if equipped) | When A/C not operating | OFF | * |
| | When A/C operating | ON | |

| Scan tool data | Condition | Normal condition/ reference value | Other |
|---|---|---|---|
| A/C MAG CLUTCH | When A/C operating | ON | * |
| | When A/C not operating | OFF | |
| FUEL PUMP | Within 3 seconds after ignition switch ON or engine running | ON | * |
| | Engine stop at ignition switch ON. | OFF | * |
| ELECTRIC LOAD | Ignition ON, head light OFF | OFF | * |
| | Ignition switch ON, head light ON | ON | * |
| PSP SWITCH | Engine running at idle speed and steering wheel at straight ahead position | OFF | * |
| | Engine running at idle speed and steering wheel turned to the right or left as far as it stops | ON | |

## Scan tool data definitions

**COOLANT TEMP. (Engine Coolant Temp., °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.

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

**INJ PULSE WIDTH (Fuel Injection Pulse Width Bank 1, msec)**
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM.

**TP SENSOR VOLT (TP Sensor Output Voltage, V)**
Throttle Position Sensor reading provides throttle valve opening information in the from of voltage.

**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, the number is not valid.

**CLOSED THROTTLE POS (Closed Throttle Position ON/OFF)**
This parameter will read ON when the throttle valve is fully closed. Or OFF when the throttle is not fully closed.

**IAC FLOW DUTY (%)**
This parameter indicates IAC valve opening rate which controls bypass air flow.

**VEHICLE SPEED (km/h, MPH)**
It is computed based on pulse signals from vehicle speed sensor on transfer or transmission.

**SHORT FT B1 (Short Term Fuel Trim Bank 1, %)**
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 Bank 1, %)**
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 putting values of short term fuel trim and long term fuel trim together. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

**SHORT FT B2 (Short Term Fuel Trim Bank 2, %)**
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 B2 (Long Term Fuel Trim Bank 2,%)**
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 B2 (%)**
The value of total fuel trim is obtained by putting values of short term fuel trim and long term fuel trim together. This value indicates how much correction is necessary to keep the air/fuel mixture stoichiometrical.

**INJ PULSE WIDTH B2 (Fuel Injection Pulse Width Bank 2, msec)**
This parameter indicates time of the injector drive (valve opening) pulse which is output from ECM.

**MAP (Manifold Absolute Pressure, inHg, kPa)**
This parameter indicates the pressure in the intake manifold absolute pressure.

**VARIABLE INTAKE SOL (ON/OFF)**
ON: Intake manifold air tuning valve is open.
OFF: Intake manifold air tuning valve is 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.

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

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

**FUEL TANK LEVEL (%)**
This parameter indicates approximate fuel level in the fuel tank. As the detectable range of the fuel level sensor is set as 0 to 100%, however, with some models whose fuel tank capacity is smaller, the indicated fuel level may be only 70% even when the fuel tank is full.

**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.

**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 x 100%.

**THROTTLE POSITION (Absolute Throttle Position, %)**
When throttle position sensor is fully closed position, throttle opening is indicated as 0% and 100% for full open position.

**O2S B1 S1 (HO2S Bank 1 Sensor 1 Output Voltage, V)**
It indicates output voltage of HO2S SENSOR 1 installed on exhaust manifold (pre-catalyst).

**O2S B1 S2 (HO2S Bank 1 Sensor 2 Output Voltage, V)**
If indicates output voltage of HO2S SENSOR 2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

**O2S B2 S1 (HO2S Bank 2 Sensor 1 Output Voltage, V)**
It indicates output voltage of HO2S SENSOR 1 installed on exhaust manifold (pre-catalyst).

**O2S B2 S2 (HO2S Bank 2 Sensor 2 Output Voltage, V)**
If indicates output voltage of HO2S SENSOR 2 installed on exhaust pipe (post-catalyst). It is used to detect catalyst deterioration.

**FUEL SYSTEM B1 (Fuel System Bank 1 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.
CLOSED-ONE O2S: Closed loop, but fault with at least one oxygen sensor-may be using single oxygen sensor for fuel control.

**FUEL SYSTEM B2 (Fuel System Bank 2 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.
CLOSED-ONE O2S: Closed loop, but fault with at least one oxygen sensor-may be using single oxygen sensor for fuel control.

**BAROMETRIC PRESS (BAROMETRIC PRESSURE, inHg, kPa)**
This parameter indicates the value of barometric pressure sensor in ECM.

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

**A/C COND FAN (ON/OFF)**
This parameter indicates the state of the A/C Condenser Fan control signal.

**A/C SWITCH (ON/OFF)**
ON: Command for A/C operation being output from HVAC control module.
OFF: Command for A/C operation not being output from HVAC control module.

**A/C MAG CLOTCH (ON/OFF)**
ON: Command for A/C magnet clutch operation is output from ECM.
OFF: Command for A/C magnet clutch operation is not output from ECM.

**FUEL PUMP (ON/OFF)**
This parameter indicates the state of the fuel pump control signal.

**ELECTRIC LOAD (ON/OFF)**
ON: Head light switch ON or rear window defogger switch ON.
OFF: Head light switch OFF and rear window defogger switch OFF.

**PSP SWITCH (ON/OFF)**
ON: PSP switch detects P/S operation. (high P/S pressure)
OFF: PSP switch does not detect P/S operation.

## Engine Symptom Diagnosis

Perform troubleshooting referring to following table when ECM has detected no DTC and no abnormality has been found in visual inspection and engine basic inspection previously.

| Condition | Possible Cause | Correction |
|---|---|---|
| **Hard starting (Engine cranks OK)** | Faulty idle air control system | "Diag. Flow Table B-4" in this section. |
| | Faulty ECT sensor or MAF sensor | "ECT Sensor" or "MAF Sensor" in Section 6E2. |
| | Faulty ECM | "Inspection of ECM and Its Circuit" in this section. |
| | Low compression | "Compression Check" in Section 6A2. |
| | Faulty hydraulic valve lash adjuster | "Camshaft and Valve Lash Adjuster" in Section 6A2. |
| | Compression leak from valve seat | "Valves and Cylinder Heads" in Section 6A2. |
| | Sticky valve stem | "Valves and Cylinder Heads" in Section 6A2. |
| | Weak or damaged valve springs | "Valves and Cylinder Heads" in Section 6A2. |
| | Compression leak at cylinder head gasket | "Valves and Cylinder Heads" in Section 6A2. |
| | Sticking or damaged piston ring | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn piston, ring or cylinder | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Malfunctioning PCV valve | "PCV System" in Section 6E2. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Engine has no power** | Engine overheating | Refer to “Overheating” in this table. |
| | Defective spark plug | “Spark Plug” in Section 6F2. |
| | Faulty ignition coil with ignitor | “Ignition Coil Assembly (Igniter and Ignition Coil)” in Section 6F2. |
| | Fuel pressure out of specification (dirty fuel filter, dirty or clogged fuel hose or pipe, malfunctioning fuel pressure regulator, malfunctioning fuel pump) | “Diag. Flow Table B-3” in this section. |
| | Maladjusted TP sensor installation angle | “Throttle Position Sensor (TP Sensor)” in Section 6E2. |
| | Faulty EGR system | “DTC P0401/P0402 Diag. Flow Table” in this section. |
| | Faulty injector | “Fuel Injector” in Section 6E2. |
| | Faulty TP sensor, ECT sensor or MAF sensor | “Throttle Position Sensor (TP Sensor)”, Engine Coolant Temperature Sensor (ECM Sensor)” or “Mass Air Flow Sensor (MAF Sensor)” in Section 6E2. |
| | Faulty ECM | “Inspection of ECM and Its Circuit” in this section. |
| | Low compression | Refer to the same item in “Hard Starting” of this table. |
| | Dragging brakes | “Diagnosis Table” in Section 5. |
| | Slipping clutch | “Diagnosis Table” in Section 7C1. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Improper engine idling or engine fails to idle** | Faulty spark plug | "Spark Plug" in Section 6F2. |
| | Faulty ignition coil with ignitor | "Ignition Coil Assembly (Igniter and Ignition Coil)" in Section 6F2. |
| | Fuel pressure out of specification | "Diag. Flow Table B-3" in this section. |
| | Engine overheating | Refer to "Overheating" in this table. |
| | Maladjusted TP sensor installation angle if adjustable | "Throttle Position Sensor (TP Sensor)" in Section 6E2. |
| | Faulty idle air control system | "Diag. Flow Table B-4" in this section. |
| | Faulty FIA (fast idle air) valve | "Fast Idle Air Valve" in Section 6E2. |
| | Faulty evaporative emission control system | "Emission Control System" in Section 6E2. |
| | Faulty EGR system | "DTC P0401/P0402 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECT sensor, TP sensor or MAF sensor | "Throttle Position Sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECM Sensor)" or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty ECM | "Inspection of ECM and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |
| | Malfunctioning PCV valve | "PCV System" in Section 6E2. |
| **Engine hesitates (Momentary lack of response as the accelerator is depressed. Can occur at all vehicle speeds. Usually most severe when first trying to make the vehicle move, as from a stop sign.)** | Spark plug faulty or plug gap as out of adjustment | "Spark Plug" in Section 6F2. |
| | Fuel pressure out of specification (clogged fuel filter, faulty fuel pressure regulator, clogged fuel filter, hose or pipe) | "Diag. Flow Table B-3" in this section. |
| | Engine overheating | Refer to "Overheating" in this table. |
| | Faulty EGR system | "DTC P0401/P0402 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty TP sensor, ECT sensor or MAF sensor | "Throttle Position Sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECT Sensor)" or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty ECM | "Inspection of ECM and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Surges (Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and down with no change in the accelerator pedal.)** | Defective spark plug (excess carbon deposits, improper gap, and burned electrodes, etc.) | "Spark Plug" in Section 6F2. |
| | Variable fuel pressure (clogged fuel filter, kinky or damaged fuel hose and line, faulty fuel pressure regulator) | "Diag. Flow Table B-3" in this section. |
| | Faulty EGR system | "DTC P0401/P0402 Diag. Flow Table" in this section. |
| | Faulty MAF sensor | "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECM | "Inspection of ECM and Its Circuit" in this section. |
| **Excessive detonation (The engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)** | Engine overheating | Refer to "Overheating" in this table. |
| | Faulty spark plug | "Spark Plug" in Section 6F2. |
| | Improper ignition timing | "Ignition Timing Check and Adjustment" in Section 6F2. |
| | Clogged fuel filter and fuel lines | "Fuel Pressure Inspection" in Section 6E2. |
| | Faulty EGR system | "DTC P0401/P0402 Diag. Flow Table" in this section. |
| | Faulty ECT sensor or MAF sensor | "Engine Coolant Temperature Sensor (ECT Sensor)" or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECM | "Inspection of ECM and Its Circuit" in this section. |
| | Excessive carbon deposits in combustion chamber | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Poor knock sensor performance | "DTC P0325/P0327/P0328 Diag. Flow Table" in this section. |
| **Overheating** | Inoperative thermostat | "Thermostat" in Section 6B. |
| | Poor water pump performance | "Water Pump" in Section 6B. |
| | Clogged or leaky radiator | "Radiator" in Section 6B. |
| | Improper engine oil grade | "Engine Oil and Oil Filter Change" in Section 0B. |
| | Clogged oil filter or oil strainer | "Oil Pressure Check" in Section 6A2. |
| | Poor oil pump performance | "Oil Pressure Check" in Section 6A2. |
| | Dragging brakes | "Diagnosis Table" in Section 5. |
| | Slipping clutch | "Diagnosis Table" in Section 7C1. |
| | Blown cylinder head gasket | "Valves and Cylinder Heads" in Section 6A2. |
| | Faulty A/C condenser fan control system | "Diag. Flow Table B-6" and "Diag. Flow Table B-7" in this section. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor gasoline mileage** | Faulty spark plug (improper gap, heavy deposits, and burned electrodes, etc.) | "Spark Plug" in Section 6F2. |
| | Fuel pressure out of specification | "Diag. Flow Table B-3" in this section. |
| | Faulty TP sensor, ECT sensor or MAF sensor | "Throttle Position Sensor (TP Sensor)", "Engine Coolant Temperature Sensor (ECT Sensor)" or "Mass Air Flow Sensor (MAF Sensor)" in Section 6E2. |
| | Faulty EGR system | "DTC P0400 Diag. Flow Table" in this section. |
| | Faulty injector | "Fuel Injector" in Section 6E2. |
| | Faulty ECM | "Inspection of ECM and Its Circuit" in this section. |
| | Low compression | Refer to the same item in "Hard Starting" of this table. |
| | Poor valve seating | "Valves and Cylinder Heads" in Section 6A2. |
| | Dragging brakes | "Diagnosis Table" in Section 5. |
| | Slipping clutch | "Diagnosis Table" in Section 7C1. |
| | Thermostat out of order | "Thermostat" in Section 6B. |
| | Improper tire pressure | "Diagnosis Table" in Section 3. |
| | Faulty A/C compressor control system | "Diag. Flow Table B-5" and "Diag. Flow Table B-8" in this section. |
| **Excessive engine oil consumption** | Sticky piston ring | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn piston and cylinder | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn piston ring groove and ring | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Improper location of piston ring gap | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn or damaged valve stem seal | "Valves and Cylinder Heads" in Section 6A2. |
| | Worn valve stem | "Valves and Cylinder Heads" in Section 6A2. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Low oil pressure** | Improper oil viscosity | "Engine Oil and Oil Filter Change" in Section 0B. |
| | Malfunctioning oil pressure switch | "Oil Pressure Switch" in Section 8C. |
| | Clogged oil strainer | "Oil Pan and Oil Pump Strainer" in Section 6A2. |
| | Functional deterioration of oil pump | "Oil Pump" in Section 6A2. |
| | Worn oil pump relief valve | "Oil Pump" in Section 6A2. |
| | Excessive clearance in various sliding parts | "Inspection" for each parts in Section 6A2. |
| **Engine noise**<br>**See NOTE below.** | Faulty hydraulic valve lash adjuster | "Camshaft and Valve Lash Adjuster" in Section 6A2. |
| | Worn valve stem and guide | "Valves and Cylinder Heads" in Section 6A2. |
| | Weak or broken valve spring | "Valves and Cylinder Heads" in Section 6A2. |
| | Warped or bent valve | "Valves and Cylinder Heads" in Section 6A2. |
| | Loose camshaft housing bolts | "Camshaft and Valve Lash Adjuster" in Section 6A2. |
| | Worn piston, ring and cylinder bore | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn crankpin bearing | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Worn crankpin | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Loose connecting rod nuts | "Piston, Piston Rings, Connecting Rods and Cylinders" in Section 6A2. |
| | Low oil pressure | Refer to "Low Oil Pressure" of this table. |
| | Worn crankshaft journal bearing | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |
| | Worn crankshaft journal | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |
| | Loose lower crankcase (bearing cap) bolts | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |
| | Excessive crankshaft thrust play | "Main Bearing, Crankshaft and Cylinder Block" in Section 6A2. |

**NOTE:**

**Before checking the mechanical noise, make sure the followings.**

- **Ignition timing is properly adjusted.**
- **Specified spark plug is used.**
- **Specified fuel is used.**

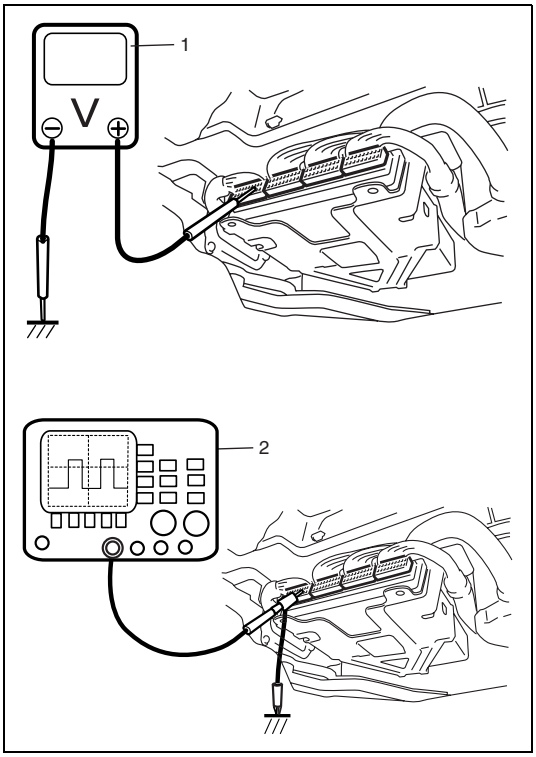
## Inspection of ECM and Its Circuits

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage, pulse signal and resistance.

**CAUTION:**

**ECM cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to ECM with couplers disconnected from it.**

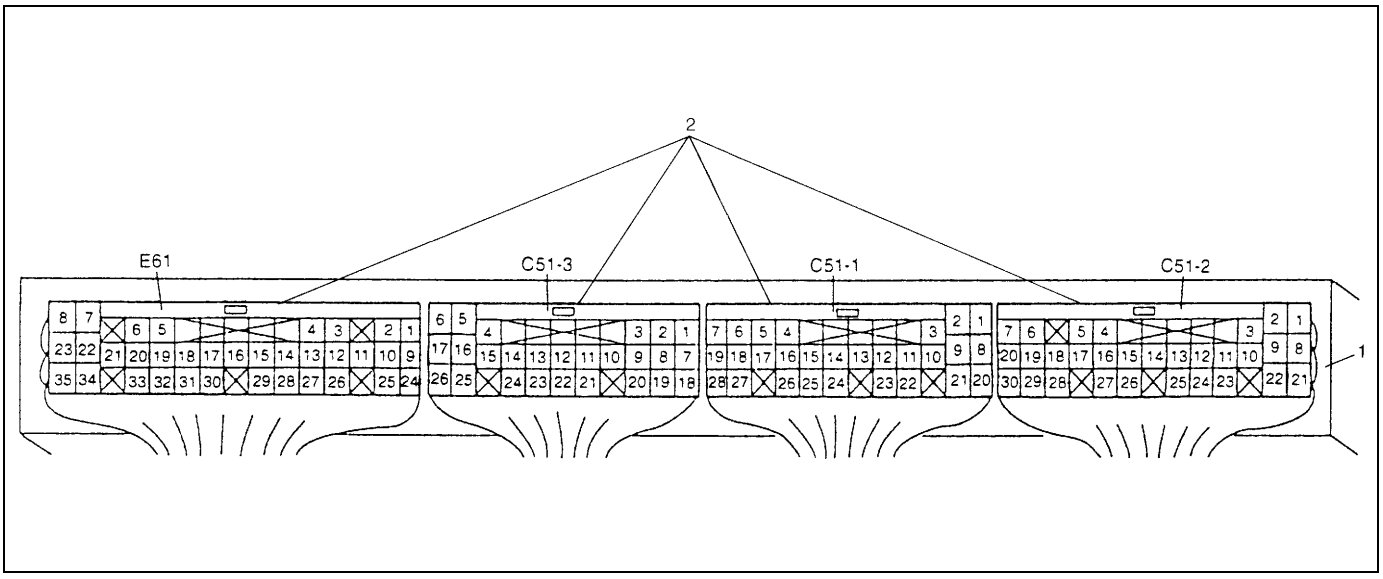
### Voltage Check




1) Remove ECM cover from bracket referring to “Engine Control Module (ECM)/Powertrain Control Module (PCM)” in Section 6E2.
2) Check voltage at each terminal of couplers connected, using voltmeter, or oscilloscop (2).

**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.**




| |
|---|
| 1. ECM |
| 2. ECM connector (Viewed from harness side) |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| E61-1 | GRY/RED | Output of 5 V power source for CO adjusting resistor (if equipped) | 4.5 – 5.5 V | Ignition switch turned ON |
| E61-2 | WHT | Power source for internal memory | 10 – 14 V | Ignition switch turned ON and OFF |
| E61-3 | WHT/BLU | Output duty select switch terminal (if equipped) | 10 – 14 V | Ignition switch turned ON |
| E61-4 | PPL/RED | Throttle position signal for cruise control module (if equipped) | ✱0 – 0.6 V ↑↓ 8 – 12 V (Repeated indicator) | Ignition switch turned ON (Output signal is 64 Hz active low duty pulse. Duty ratio varies as throttle valve is opened gradually.) Throttle opening 0% = 0.9ms ON duty Throttle opening 100% = 9.38ms ON duty |
| E61-5 | PPL | Duty output terminal (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | Immobilizer indicator lamp output (if equipped) | 10 – 14 V | While engine running |
| E61-6 | BRN | Engine revolution signal for tachometer | 0 – 1 V | Ignition switch turned ON with engine stop |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is pulse. Pulse frequency varies depending on engine speed. (3000 r/min = 150 Hz)) |
| E61-7 | PPL/YEL | MIL (Malfunction indicator lamp) output | 0 – 2.5 V | Ignition switch turned ON with engine stop |
| | | | 3.5 – 4.5 V | Engine running |
| E61-8 | – | – | – | – |
| E61-9 | BLU | Main power supply relay output | 10 – 14 V | Ignition switch turned OFF |
| | | | 0 – 2 V | Ignition switch turned ON |
| E61-10 | GRY/BLK | CO adjusting resistor signal (if equipped) | – | – |
| E61-11 | – | – | – | – |
| E61-12 | PPL/WHT | Serial communication line of data link connector 5 V | 4 – 6 V | Ignition switch turned ON |
| E61-13 | PPL/RED | Serial communication line of data link connector 12 V | 10 – 14 V | Ignition switch turned ON |
| E61-14 | WHT/RED | Test switch terminal (if equipped) | 10 – 14 V | Ignition switch turned ON |
| E61-15 | – | – | – | – |
| E61-16 | PNK/WHT | Electric load signal for heater blower motor | 10 – 14 V | Ignition switch turned ON, blower fan selector selected at under 3rd speed position |
| | | | 0 – 1 V | Ignition switch turned ON, blower fan selector selected at 3rd speed position or more |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| E61-17 | GRN/BLK | A/C request signal (if equipped) | 10 – 14 V (High input) | Ignition switch turned ON, blower fan selector selected OFF position or A/C switch turned OFF or A/C evaporator temp. less than 2.5°C, 36.5°F |
| | | | 0 – 1 V (Low input) | Ignition switch turned ON, blower fan selector selected ON position and A/C switch turned ON with A/C evaporator temp. more than 4°C, 39.2°F |
| E61-18 | BLU/ORN | Relay of high speed side for A/C condenser fan motor (if equipped) | 10 – 14 V | Ignition switch turned ON, engine coolant temperature under 115°C, 239°F or A/C request signal high input |
| | | | 0 – 1 V | Ignition switch turned ON, engine coolant temperature more than 114°C, 237°F or medium pressure switch in refrigerant pressure switch is OFF with A/C request signal low input |
| E61-19 | ORN/BLK | "4WD" lamp output | 0 – 1 V | Ignition switch turned ON, transfer selector selected at "4H" or "4L" range |
| | | | 10 – 14 V | Ignition switch turned ON, transfer selector selected at "2H" range |
| E61-20 | – | – | – | – |
| E61-21 | – | – | – | – |
| E61-22 | YEL/BLU | Relay output of low speed side for A/C condenser fan motor (if equipped) | 10 – 14 V | Ignition switch turned ON, engine coolant temperature under 115°C, 239°F or A/C request signal high input |
| | | | 0 – 1 V | Ignition switch turned ON, engine coolant temperature more than 114°C, 237°F or A/C request signal low input |
| E61-23 | WHT/GRN | Fuel pump relay output (without immobilizer control system) | 0 – 2.5 V | For 3 sec. after ignition switch turned ON or while engine running |
| | | | 10 – 14 V | After 3 sec. from ignition switch turned ON at engine stopped |
| E61-24 | GRY/YEL | Ground for CO adjusting resistor (if equipped) | Below 0.3 V | Ignition switch turned ON |
| E61-25 | YEL/WHT | ECT sensor signal for combination meter | ✱0 – 0.6 V ↑↓ 4 – 6 V (Repeated indicator) | Ignition switch turned ON (Output signal is 1 Hz active low duty pulse. Duty ratio varies depending on ECT.) ECT –30°C = 10% ON duty ECT 130°C = 90% ON duty |
| E61-26 | – | – | – | – |
| E61-27 | – | – | – | – |
| E61-28 | BLU/WHT | Fuel level sensor signal | 0 – 6 V | Ignition switch turned ON Voltage depends on fuel level |
| E61-29 | YEL | Diagnosis switch terminal (if equipped) | 10 – 14 V | Ignition switch turned ON |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| E61-30 | PNK/BLK | Idle up signal from ABS control module (if equipped) | 10 – 14 V | Ignition switch turned ON, ABS not operated |
| | | | 0 – 1 V | Ignition switch turned ON, ABS operated |
| E61-31 | – | – | – | – |
| E61-32 | WHT | CAN communication line (active low signal) | ✱1.6 – 2.8 V | Engine running at idling after warming up. (CAN communication line signal is pulse. Pulse signal is displayed with a regular frequency varying depending on engine condition.) |
| E61-33 | RED | CAN communication line (active high signal) | ✱2.5 – 3.8 V | |
| E61-34 | GRN/WHT | Electric load signal for stop lamp | 0 – 1 V | Ignition switch turned ON, stop lamp not lighted up |
| | | | 10 – 14 V | Ignition switch turned ON, stop lamp lighted up |
| E61-35 | WHT/GRN | Fuel pump relay output (with immobilizer control system) | 0 – 2.5 V | For 3 sec. ignition switch turned ON or while engine running |
| | | | 10 – 14 V | After 3 sec. ignition switch turned ON or while engine stopped |
| | | | | |
| C51-3-1 | LT BLU | Intake air temp. (IAT) sensor signal | 3.7 – 3.9 V | Ignition switch turned ON, IAT at 0°C, 32°F |
| | | | 1.8 – 2.1 V | Ignition switch turned ON, IAT at 40°C, 104°F |
| | | | 1.5 – 1.75 V | Ignition switch turned ON, IAT at 80°C, 176°F |
| C51-3-2 | GRN | Engine coolant temp. (ECT) sensor signal | 3.7 – 3.85 V | Ignition switch turned ON, ECT at 0°C, 32°F |
| | | | 1.45 – 1.6 V | Ignition switch turned ON, ECT at 50°C, 122°F |
| | | | 0.4 – 0.5 V | Ignition switch turned ON, ECT at 100°C, 212°F |
| C51-3-3 | WHT | Knock sensor signal | 2 – 3 V | Ignition switch turned ON |
| C51-3-4 | BLU/BLK | Main power supply | 10 – 14 V | Ignition switch turned ON |
| C51-3-5 | GRY/YEL | Ground for mass air flow (MAF) sensor | Below 0.3 V | Ignition switch turned ON |
| C51-3-6 | BLK/GRN | Ground for ECM | Below 0.3 V | Ignition switch turned ON |
| C51-3-7 | PNK | A/C compressor relay output (if equipped) | 10 – 14 V | Engine running, A/C request signal high input or ECT more than 113°C, 235°F |
| | | | 0 – 1 V | Engine running, A/C request signal low input and ECT less than 110°C, 198°F |
| C51-3-8 | RED/WHT | Manifold absolute pressure (MAP) sensor signal (if equipped) | 3.3 – 4.3 V | Ignition switch turned ON with barometric pressure at 100kPa, 760mmHg |
| | | | 3.3 – 4.3 V | While specified idle speed with barometric pressure at 100kPa, 760mmHg |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-3-9 | RED/GRN | Throttle position (TP) sensor signal | 0.5 – 1.2 V | Ignition switch turned ON and throttle valve at idle position with warmed engine |
| | | | 3.4 – 4.7 V | Ignition switch turned ON and throttle valve at full open position |
| C51-3-10 | PPL/WHT | Mass air flow (MAF) sensor signal | 1.0 – 1.6 V | Ignition switch turned ON with engine stop |
| | | | 1.7 – 2.0 V | While engine running with idle speed |
| C51-3-11 | RED | Oxygen signal of heated oxygen sensor–1 (Bank 1) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 0.5 V and under 0.45 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |
| C51-3-12 | GRY/YEL | Ground for throttle position (TP) sensor | Below 0.3 V | Ignition switch turned ON |
| C51-3-13 | GRY/RED | Output of 5 V power source for throttle position (TP) sensor | 4.5 – 5.5 V | Ignition switch turned ON |
| C51-3-14 | GRY/RED | Output of 5 V power source for Manifold absolute pressure (MAP) sensor (if equipped) | 4.5 – 5.5 V | Ignition switch turned ON |
| C51-3-15 | BLU/BLK | Main power supply | 10 – 14 V | Ignition switch turned ON |
| C51-3-16 | – | – | – | – |
| C51-3-17 | BLK/ORN | Ground for ECM | Below 0.3 V | Ignition switch turned ON |
| C51-3-18 | ORN | Medium pressure signal for A/C refrigerant pressure switch (if equipped) | 0 – 1 V | Ignition switch turned ON, A/C refrigerant pressure below 1400kPa, 14kg/cm$^2$, 21.5psi |
| | | | 10 – 14 V | Ignition switch turned ON, A/C refrigerant pressure over 1800kPa, 18kg/cm$^2$, 27.5psi |
| C51-3-19 | – | – | – | – |
| C51-3-20 | BLK/WHT | Ignition switch signal | 0 – 1 V | Ignition switch turned OFF |
| | | | 10 – 14 V | Ignition switch turned ON |
| C51-3-21 | RED/BLU | Oxygen signal of heated oxygen sensor–1 (Bank 2) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 0.5 V and under 0.45 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |
| C51-3-22 | RED/BLK | Oxygen signal of heated oxygen sensor–2 (Bank 1) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 1.2 V and under 0.6 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-3-23 | RED/YEL | Oxygen signal of heated oxygen sensor–2 (Bank 2) (if equipped) | 0.5 – 1.5 V | Ignition switch turned ON |
| | | | ✱Deflects between over 1.2 V and under 0.6 V | While engine running at 2,000 r/min. for 1min. or longer after warmed up |
| C51-3-24 | – | – | – | – |
| C51-3-25 | GRY/YEL | Ground for sensors | Below 0.3 V | Ignition switch turned ON |
| C51-3-26 | GRY/YEL | Ground for CMP sensor | Below 0.3 V | Ignition switch turned ON |
| | | | | |
| C51-1-1 | – | – | – | – |
| C51-1-2 | – | – | – | – |
| C51-1-3 | – | – | – | – |
| C51-1-4 | PPL/BLK | IAC valve output (stepper motor coil 2) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-5 | LT GRN/ BLK | IAC valve output (stepper motor coil 1) | 0 – 1V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-6 | – | – | – | – |
| C51-1-7 | – | – | – | – |
| C51-1-8 | – | – | – | – |
| C51-1-9 | – | – | – | – |
| C51-1-10 | – | – | – | – |
| C51-1-11 | – | – | – | – |
| C51-1-12 | YEL/GRN | Reference signal for CMP sensor | ✱0 – 1 V ↑↓ 4 – 6 V (Repeated indicator) | Engine running at idling after warming up (Sensor signal is pulse. Pulse frequency varies depending on engine speed. (6 pulses are generated par 1camshaft revolution)) |
| C51-1-13 | YEL/BLU | Position signal for CMP sensor | ✱0 – 1 V ↑↓ 4 – 6 V (Repeated indicator) | Engine running at idling after warming up (Sensor signal is pulse. Pulse frequency varies depending on engine speed. (4 pulses are generated par 1camshaft revolution)) |
| C51-1-14 | BLU/YEL | Vehicle speed sensor signal | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Vehicle running. (Sensor signal is pulse. Pulse frequency varies depending on vehicle speed. (2590 pulses are generated par 60 km/h, 37.5 ml/h)) |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-1-15 | GRN/BLK | EVAP canister purge valve output | 10 – 14 V | Ignition switch turned ON with engine stop |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running. (Output signal is 10 Hz duty pulse. Duty ratio varies depending on vehicle condition.) |
| C51-1-16 | PPL/YEL | IAC valve output (stepper motor coil 4) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-17 | GRY/BLU | IAC valve output (stepper motor coil 3) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-1-18 | – | – | – | – |
| C51-1-19 | – | – | – | – |
| C51-1-20 | – | – | – | – |
| C51-1-21 | – | – | – | – |
| C51-1-22 | – | – | – | – |
| C51-1-23 | – | – | – | – |
| C51-1-24 | BLK/YEL | Starting motor signal | 0 – 1 V | Ignition switch turned ON |
| | | | 6 – 14 V | While engine cranking |
| C51-1-25 | BLU/ORN | Power steering pressure switch signal | 10 – 14 V | Ignition switch turned ON |
| | | | 0 – 1 V | With engine running at idle speed, turning steering wheel to the right or left as far as it stop |
| C51-1-26 | – | – | – | – |
| C51-1-27 | – | – | – | – |
| C51-1-28 | – | – | – | – |
| C51-2-1 | PNK/BLK | Fuel injector No.2 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-2 | PNK | Fuel injector No.1 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |

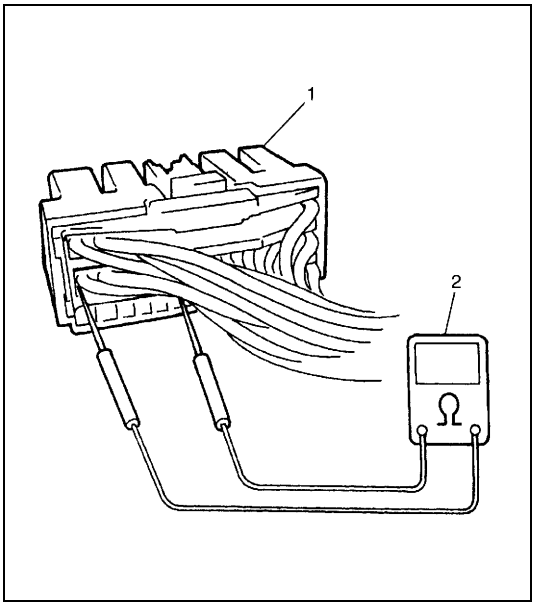
| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-2-3 | GRN/YEL | Axle lock actuator motor output | 10 – 14 V | Ignition switch turned to ON position and axle lock actuator being rotated to lock direction when transfer shifted from 2H/N to 4H/4L position |
| | | | 0 – 1 V | Ignition switch turned to ON position and axle lock actuator in other than above mentioned condition |
| C51-2-4 | GRY | Heater output of heated oxygen sensor–1 (Bank 1) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-5 | BLK/RED | Heater output of heated oxygen sensor–1 (Bank 2) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-6 | GRY/RED | Vacuum solenoid valve output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 2 V | Engine racing after warmed up to normal operating temperature. |
| C51-2-7 | BLK/GRN | Ground for ECM | Below 0.3 V | Ignition switch turned ON |
| C51-2-8 | PNK/BLU | Fuel injector No.4 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-9 | PNK/GRN | Fuel injector No.3 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running (Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-10 | GRN/BLK | Axle lock actuator motor output | 10 – 14 V | Ignition switch turned to ON position and axle lock actuator being rotated to free direction when transfer shifted from 2H/N to 4H/4L position |
| | | | 0 – 1 V | Ignition switch turned to ON position and axle lock actuator in other than above mentioned condition |
| C51-2-11 | WHT/YEL | 4WD switch signal | 0 – 1 V | Ignition switch turned ON, Transfer selector lever selected at “4H” or “4L” position |
| | | | 10 – 14 V | Ignition switch turned ON, Transfer selector lever selected at “2H” position |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-2-12 | LT GRN/ RED | EGR valve (stepper motor coil 4) output (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-13 | LT GRN/ YEL | EGR valve (stepper motor coil 3) output (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-14 | LT GRN/ WHT | EGR valve (stepper motor coil 2) output (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-15 | LT GRN | EGR valve (stepper motor coil 1) output (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 8 – 14 V (Repeated indicator) | While engine running. (Output signal is active low duty pulse. Pulse generated time depending vehicle condition) |
| C51-2-16 | WHT/BLK | Heater output of heated oxygen sensor–2 (Bank 1) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling with after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-17 | PNK/WHT | Heater output of heated oxygen sensor–2 (Bank 2) (if equipped) | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 1 V ↑↓ 10 – 14 V (Repeated indicator) | Engine running at idling with after warming up. (Output signal is active low duty pulse. Duty ratio varies depending on engine condition.) |
| C51-2-18 | – | – | – | – |
| C51-2-19 | WHT/BLU | CKP sensor signal (+) (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V ↑↓ –4 – –6 V (Repeated indicator) | Engine running at idling after warming up between CKP sensor signal (–) and (+) (Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 280Hz at idling speed) |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-2-20 | ORN/BLU | CKP sensor signal (–) (if equipped) | 0 – 1 V | Ignition switch turned ON |
| | | | ✱4 – 6 V<br>↑↓<br>–4 – –6 V<br>(Repeated indicator) | Engine running at idling after warming up between CKP sensor signal (–) and (+)<br>(Input signal is sinusoidal waveform. Waveform frequency varies depending on engine speed. Signal generated 280Hz at idling speed) |
| C51-2-21 | GRY/BLK | Fuel injector No.6 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>10 – 14 V<br>(Repeated indicator) | Engine running<br>(Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-22 | GRY/GRN | Fuel injector No.5 output | 10 – 14 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>10 – 14 V<br>(Repeated indicator) | Engine running<br>(Output signal is active low pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-23 | BLK/BRN | Ignition coil No.6 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-24 | BRN/RED | Ignition coil No.5 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-25 | BRN/YEL | Ignition coil No.4 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-26 | BRN/WHT | Ignition coil No.3 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |

| TERMINAL NUMBER | WIRE COLOR | CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|---|---|
| C51-2-27 | BRN/BLK | Ignition coil No.2 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-28 | BRN | Ignition coil No.1 output | 0 – 0.6 V | Ignition switch turned ON |
| | | | ✱0 – 0.6 V<br>↑↓<br>2 – 4 V<br>(Repeated indicator) | Engine running<br>(Output signal is active high pulse. Pulse frequency varies depending on engine speed.) |
| C51-2-29 | – | – | – | – |
| C51-2-30 | – (shield ground) | Ground of shield wire for CKP sensor (if equipped) | Below 0.3 V | Ignition switch turned ON |

### Resistance Check




1) Disconnect couplers (1) from ECM with ignition switch OFF.

**CAUTION:**
**Never touch terminals of ECM itself or connect voltmeter or ohmmeter (2).**

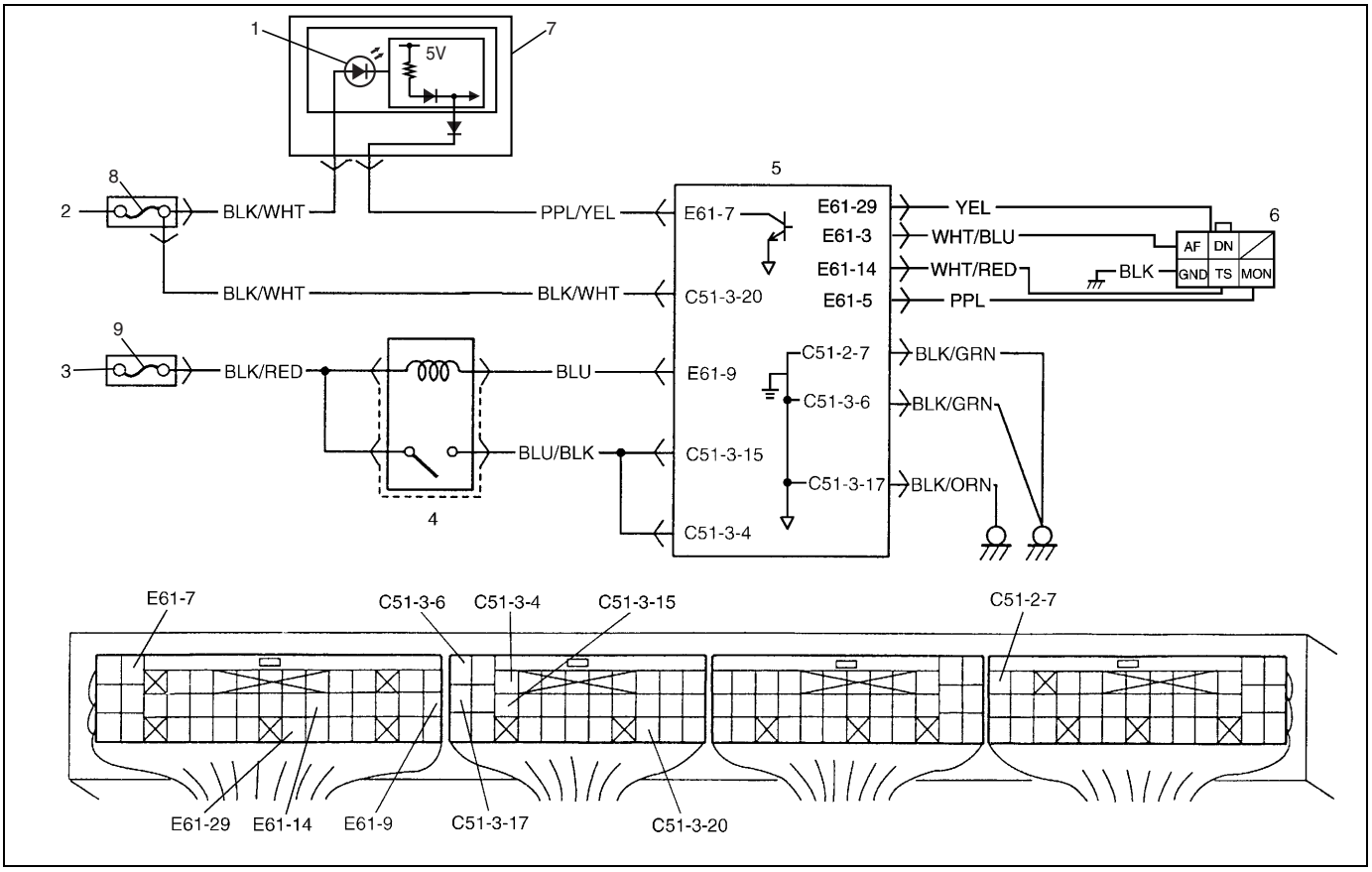
2) Check resistance between each pair of terminals of disconnected couplers (1) as listed in following table.

**CAUTION:**
- **Be sure to connect ohmmeter (2) probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in table represents that when parts temperature is 20°C (68°F).**

| TERMINALS | CIRCUIT | STANDARD RESISTANCE | CONDITION |
|---|---|---|---|
| E61-9 and E61-2 | Main relay | 160 – 240 Ω | – |
| E61-22 and C51-3-20 | A/C condenser fan motor relay (if equipped) | 75 – 110 Ω | Battery disconnected and ignition switch ON |
| E61-23 (without immobilizer control system)/E61-35 (with immobilizer control system) and C51-3-20 | Fuel pump relay | 160 – 240 Ω | – |
| C51-3-6 and Body ground | Ground | Continuity | – |
| C51-3-17 and Body ground | Ground | Continuity | – |
| C51-1-4 and C51-3-4 | IAC valve (stepper motor coil 2) | 25.5 – 33.5 Ω | – |
| C51-1-5 and C51-3-4 | IAC valve (stepper motor coil 1) | | |
| C51-1-15 and C51-3-4 | EVAP canister purge valve | 28 – 35 Ω | – |
| C51-1-16 and C51-3-4 | IAC valve (stepper motor coil 4) | 25.5 – 33.5 Ω | – |
| C51-1-17 and C51-3-4 | IAC valve (stepper motor coil 3) | | |
| C51-2-1 and C51-3-4 | Fuel injector No.2 | 13 – 16 Ω | – |
| C51-2-2 and C51-3-4 | Fuel injector No.1 | | |
| C51-2-4 and C51-2-5 | Heater of HO2S–1 | 10.0 – 12.8 Ω | – |
| C51-2-6 and C51-3-4 | Vacuum solenoid valve | 33 – 39 Ω | – |
| C51-2-7 and Body ground | Ground | Continuity | – |
| C51-2-8 and C51-3-4 | Fuel injector No.4 | 13 – 16 Ω | – |
| C51-2-9 and C51-3-4 | Fuel injector No.3 | | |
| C51-2-12 and C51-3-4 | EGR valve (stepper motor coil 4) | 20 – 24 Ω | – |
| C51-2-13 and C51-3-4 | EGR valve (stepper motor coil 3) | | |
| C51-2-14 and C51-3-4 | EGR valve (stepper motor coil 2) | | |
| C51-2-15 and C51-3-4 | EGR valve (stepper motor coil 1) | | |
| C51-2-16 and C51-2-17 | Heater of HO2S–2 | 23.4 – 28.6 Ω | – |
| C51-2-21 and C51-3-4 | Fuel injector No.6 | 13 – 16 Ω | – |
| C51-2-22 and C51-3-4 | Fuel injector No.5 | | |
| C51-3-7 and C51-3-20 | A/C compressor clutch relay (if equipped) | 160 – 240 Ω | Battery disconnected and ignition switch ON |

# Table A-1 Malfunction Indicator Lamp Circuit Check – Lamp Does Not Come "ON" or Dims at Ignition Switch ON (But Engine at Stop)

## Wiring Diagram




| | | | | |
|---|---|---|---|---|
| 1. MIL | 3. Main fuse | 5. ECM | 7. Combination meter | 9. "FI" fuse |
| 2. To ignition switch | 4. Main relay | 6. Diagnosis connector (if equipped) | 8. "METER" 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, turns ON the malfunction indicator lamp (MIL). When the engine starts to run and no malfunction is detected in the system, MIL goes OFF but if a malfunction was or is detected, MIL remains ON even when the engine is running.

## Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **MIL power supply check**<br>1) Turn ignition switch ON.<br>Do other indicator/warning lights in combination meter comes ON? | Go to Step 2. | "METER" fuse blown, main fuse blown, Ignition switch malfunction, open wire in "BLK/WHT" circuit between "METER" fuse and combination meter or poor coupler connection at combination meter. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | **ECM power and ground circuit check**<br>Does engine start? | Go to Step 3. | Go to "Table A-5 ECM Power and Ground Circuit Check" in this section. If engine is not cranked, go to "Diagnosis Table" in Section 6G. |
| 3 | **MIL circuit check**<br>1) Turn ignition switch OFF and disconnect connectors from ECM.<br>2) Check for proper connection to ECM at terminal E61-7.<br>3) If OK, then using service wire, ground terminal E61-7 of ECM connector disconnected.<br>Does MIL turn on at ignition switch ON? | Substitute a known-good ECM and recheck. | Faulty combination meter or "PPL/YEL" wire circuit open. |

## Table A-2 Malfunction Indicator Lamp Circuit Check – Lamp Remains "ON" after Engine Starts

### Wiring Diagram/Circuit Description

Refer to TABLE A-1.

### Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **DTC check**<br>1) With ignition switch OFF, install scan tool.<br>2) Start engine and check DTC.<br>Is there any malfunction DTC (s). | Go to Step 2 of "Engine and Emission Control System Check" in this section. | Go to Step 2. |
| 2 | **MIL circuit check**<br>1) With ignition switch OFF, disconnect couplers from ECM.<br>Does MIL turn ON at ignition switch ON? | "PPL/YEL" wire shorted to ground circuit. | Substitute a known-good ECM and recheck. |

## Table A-3 Malfunction Indicator Lamp Check – MIL Flashes at Ignition Switch ON (Vehicle with Diagnosis Connector)

**Wiring Diagram/Circuit Description**

Refer to TABLE A-1.

**Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **MIL flashing pattern check**<br>1) Turn ignition switch ON.<br>Does lamp flashing pattern indicate diagnostic trouble code? | Go to Step 2. | Go to "Diagnostic Flow Table" in Section 8G. |
| 2 | **Diag. switch circuit check**<br>Is diag. switch terminal connected to ground via service wire? | System is in good condition. | "YEL" circuit shorted to ground. If circuit is OK substitute a known-good ECM and recheck. |

## Table A-4 Malfunction Indicator Lamp Check – MIL Does Not Flash or Just Remains ON Even with Grounding Diagnosis Switch Terminal (Vehicle with Diagnosis Connector)

**Wiring Diagram/Circuit Description**

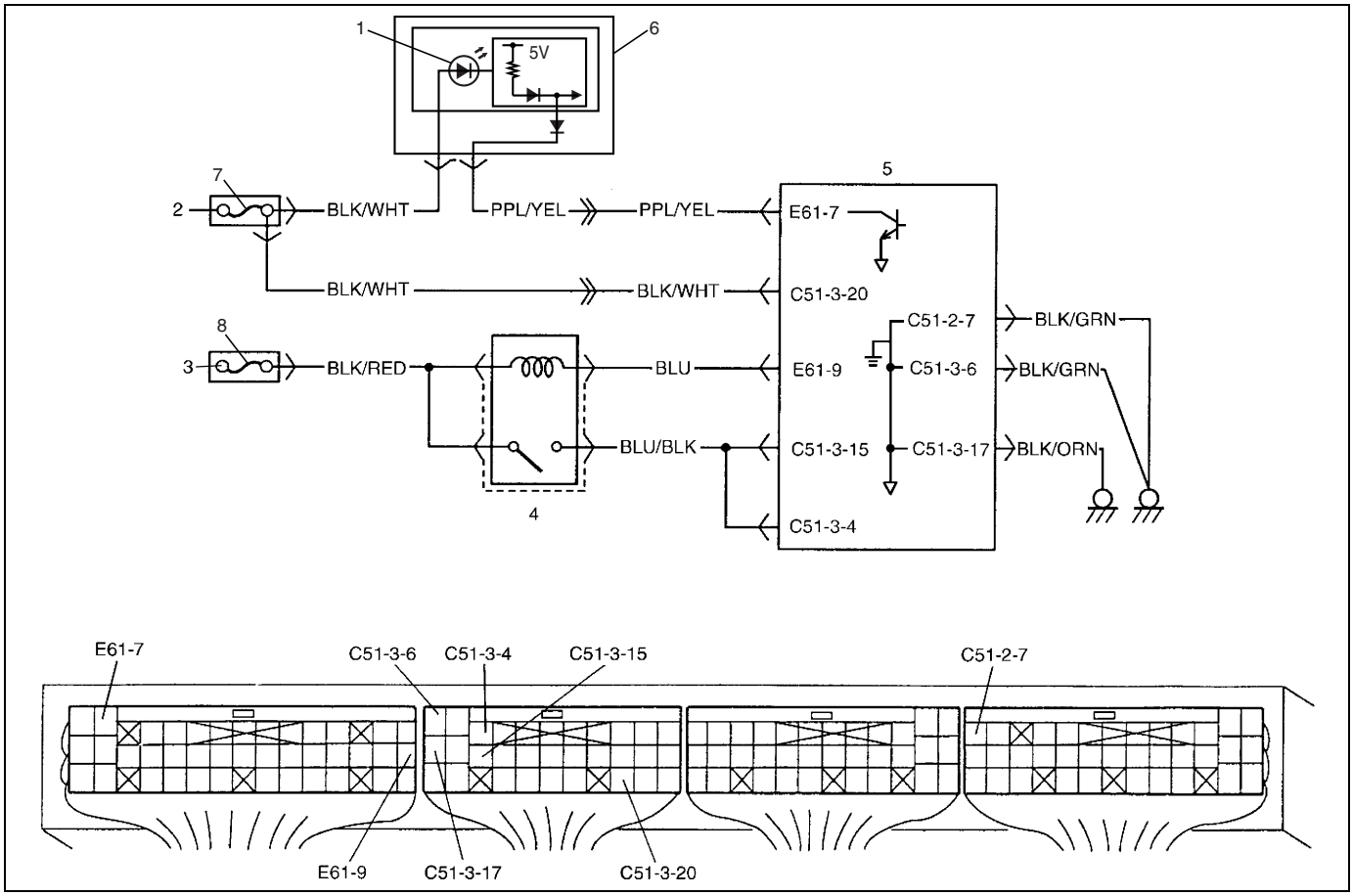
Refer to TABLE A-1.

**Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **MIL circuit check**<br>1) Turn ignition switch OFF and disconnect connectors from ECM.<br>Does MIL turn ON at ignition switch ON? | "PPL/YEL" circuit shorted to ground. | Go to Step 2. |
| 2 | **ECM connection check**<br>1) Turn ignition switch OFF.<br>Is connector (E61-29 connection) connected to ECM properly? | Go to Step 3. | Poor connector connection. |
| 3 | **Diag. switch terminal circuit check**<br>1) Connect connectors to ECM.<br>2) Using service wire, ground E61-29 terminal with connectors connected to ECM.<br>3) Turn ignition switch ON.<br>Does MIL flash? | "YEL" or "BLK" circuit open. | Substitute a known-good ECM and recheck. |

# Table A-5 ECM Power and Ground Circuit Check – MIL Doesn't Light at Ignition Switch ON and Engine Doesn't Start Though It Is Cranked Up

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. MIL | 3. Main fuse | 5. ECM | 7. "METER" fuse |
| 2. To ignition switch | 4. Main relay | 6. Combination meter | 8. "FI" fuse |

## Circuit Description

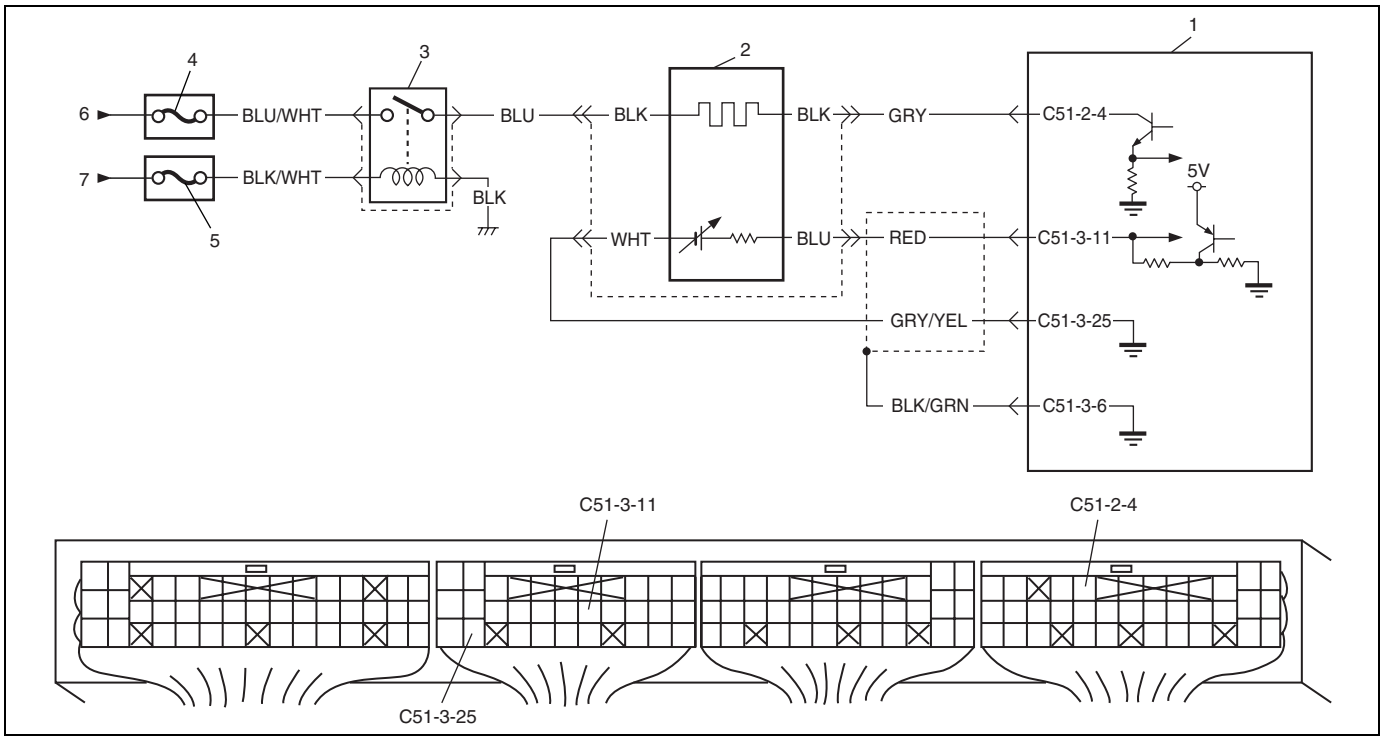
When the ignition switch is turned ON, the main relay turns ON (the contact point closes) and the main power is supplied to ECM.

## Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **Main relay operating sound check**<br>Is operating sound of main relay heard at ignition switch ON? | Go to Step 5. | Go to Step 2. |
| 2 | **Fuse check**<br>Is main "FI" fuse in good condition? | Go to Step 3. | Check for short in circuits connected to this fuse. |
| 3 | **Main relay check**<br>1) Turn OFF ignition switch and remove main relay.<br>2) Check for proper connection to main relay at "BLK/RED" wire and "BLU" wire Terminals.<br>3) If OK, check main relay for resistance and operation referring to "Main Relay" in Section 6E2.<br>Is check result satisfactory? | Go to Step 4. | Replace main relay. |
| 4 | **ECM power circuit check**<br>1) Turn OFF ignition switch, disconnect connectors from ECM and install main relay.<br>2) Check for proper connection to ECM at terminals C51-3-20, E61-9, C51-3-15 and C51-3-4.<br>3) If OK, then measure voltage between terminal C51-3-20 and ground, E61-9 and ground with ignition switch ON.<br>Is each voltage 10 – 14 V? | Go to Step 5. | "BLK/WHT", "BLU" or "BLK/RED" circuit open. |
| 5 | **ECM power circuit check**<br>1) Using service wire, ground terminal E61-9 and measure voltage between terminal C51-3-15 and ground at ignition switch ON.<br>Is it 10 – 14 V? | Check ground circuits "BLK/GRN" and "BLK/ORN" for open.<br>If OK, then substitute a known-good ECM and recheck. | Go to Step 6. |
| 6 | Is operating sound of main relay heard in Step 1? | Go to Step 7. | "BLK/RED" or "BLU/BLK" wire open. |
| 7 | **Main relay check**<br>1) Check main relay according to procedure in Step 3.<br>Is main relay in good condition? | "BLK/RED" or "BLU/BLK" wire open. | Replace main relay. |

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

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0031:**<br>HO2S–1 heater current is less than 0.12 A or potential difference between heater positive and negative terminals is higher than 14 V while HO2S–1 heater ON.<br>(2 driving cycle detection logic) | • HO2S–1 heater circuit<br>• HO2S–1 heater<br>• ECM<br>• HO2S heater relay |
| **DTC P0032:**<br>HO2S–1 heater current is more than 6.92 A or potential difference between heater positive and negative terminals is lower than 11.7 V while HO2S–1 heater ON.<br>(2 driving cycle detection logic) | |

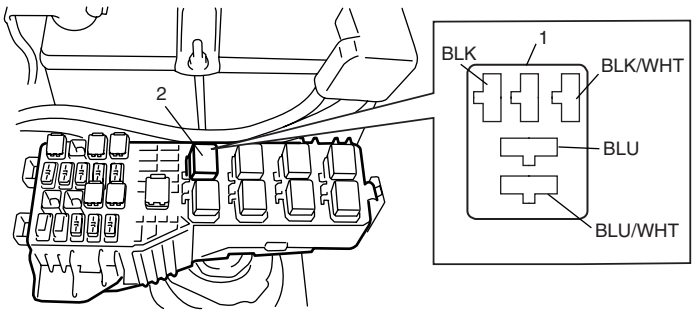
## DTC Confirmation Procedure

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 5 min.
3) Check pending DTC by using scan tool.

## 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” in this section. |
| 2 | **HO2S–1 heater check**<br>1) Disconnect HO2S–1 coupler with ignition switch turned OFF.<br>2) Measure resistance between “BLK” wire terminal and “BLK” wire terminal of HO2S–1 coupler.<br>**HO2S–1 heater resistance:**<br>**5.0 – 6.4 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–1. |
| 3 | **HO2S heater power supply check**<br>1) Remove HO2S heater relay (2) with ignition switch turned OFF.<br>2) With ignition switch turned ON leaving engine stopped, measure each voltage between “BLU/WHT” wire terminal of HO2S heater relay and ground, between “BLK/WHT” wire terminal of HO2S heater relay and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | “HO2S” fuse and/or “IG COIL” fuse blown. If OK, open in “BLK/WHT” circuit or “BLU/WHT” circuit. |
| 4 | **HO2S heater control circuit check**<br>1) With ignition switch turned OFF, install HO2S heater relay and connect HO2S–1 coupler.<br>2) With ignition switch turned ON leaving engine stopped, measure voltage between “C51-2-4” and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM and recheck. | Faulty HO2S heater relay or “GRY” circuit shorted to ground. If OK, substitute a known-good ECM and recheck. |

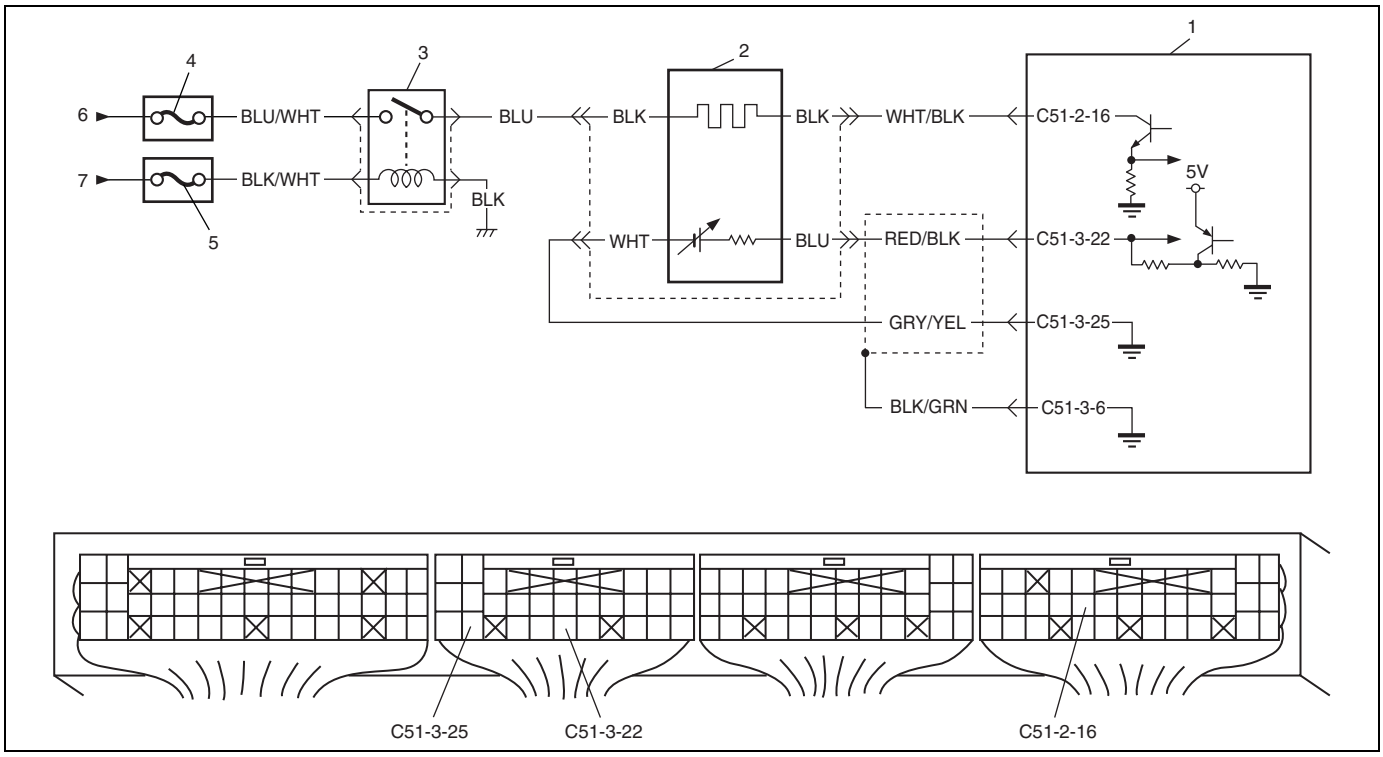
[A]




[A]: Fig. for Step 3
1. Fuse/relay box coupler viewed from relay side

# DTC P0037/P0038 HO2S (Bank 1 Sensor-2) Heater Control Circuit Low/High

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–2 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0037:**<br>HO2S–2 heater current is less than 0.14 A or potential difference between heater positive and negative terminals is higher than 13.8 V while HO2S–2 heater ON.<br>(2 driving cycle detection logic) | • HO2S–2 heater or its circuit<br>• ECM<br>• HO2S heater relay |
| **DTC P0038:**<br>HO2S–2 heater current is more than 2.5 A or potential difference between heater positive and negative terminals is lower than 8.7 V while HO2S–2 heater ON.<br>(2 driving cycle detection logic) | |

## DTC Confirmation Procedure

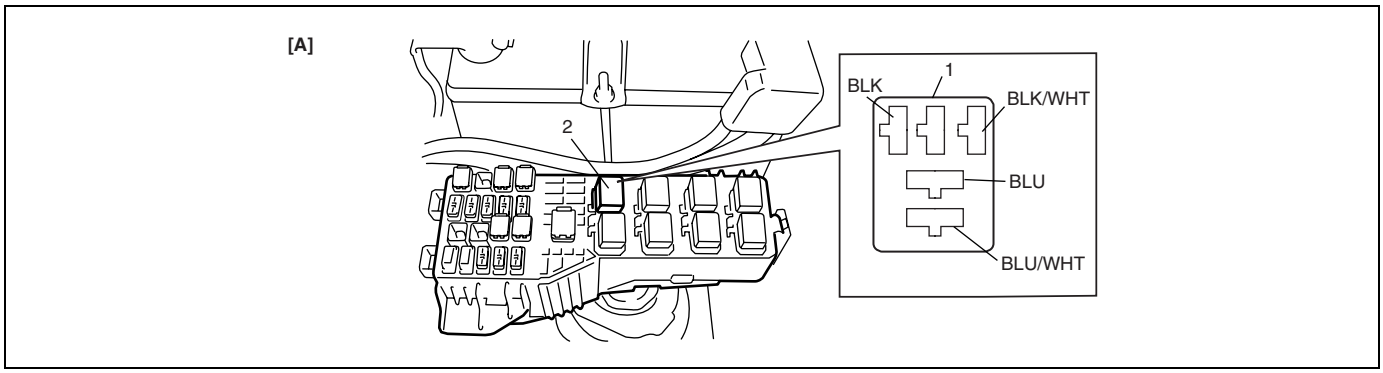
**WARNING:**

- **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 with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 5 min. (Change of vehicle speed is permitted in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor heater monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor heater monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 5).

**Troubleshooting**

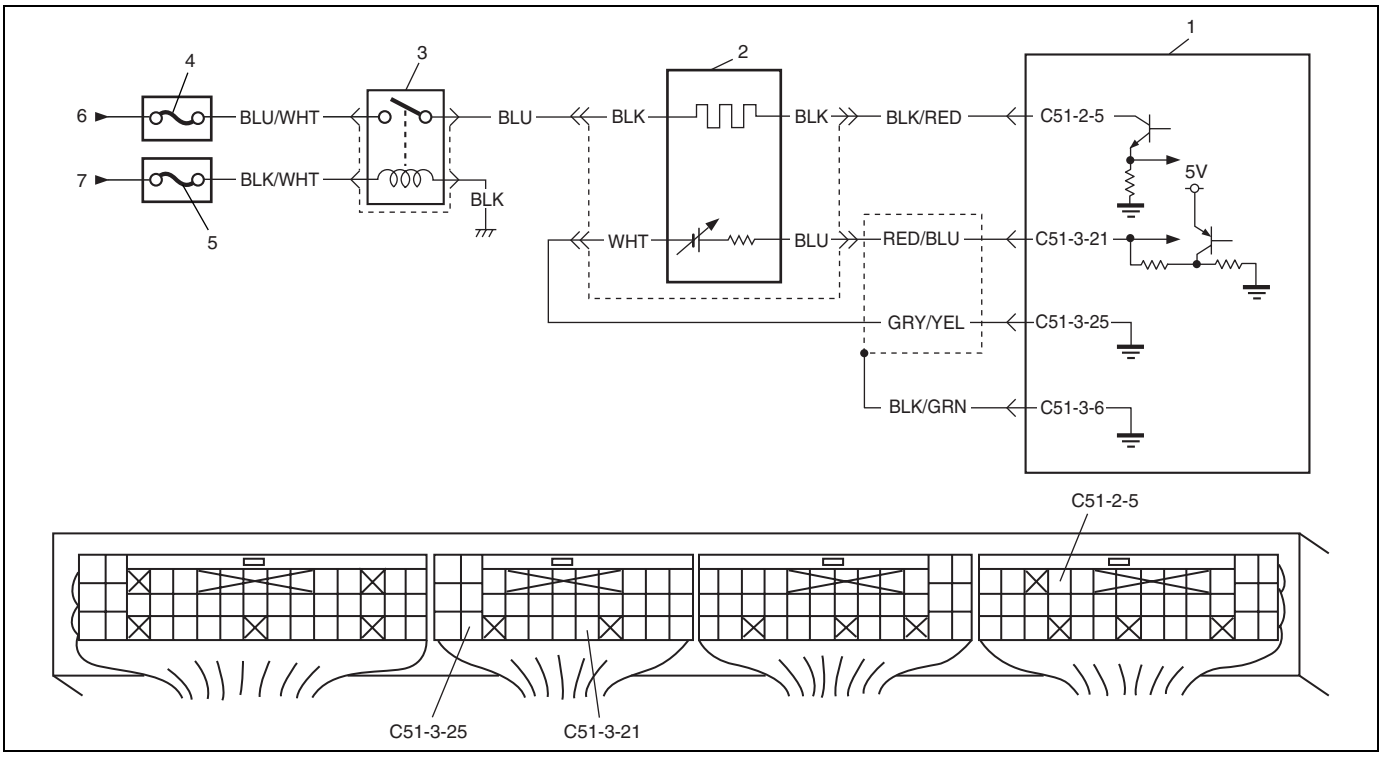
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | **HO2S–2 heater check**<br>1) Disconnect HO2S–2 coupler with ignition switch turned OFF.<br>2) Measure resistance between "BLK" wire terminal and "BLK" wire terminal of HO2S–2 connector.<br>**HO2S–2 heater resistance:**<br>**11.7 – 14.3 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–2. |
| 3 | **HO2S heater power supply check**<br>1) Remove HO2S heater relay (2) with ignition switch turned OFF.<br>2) With ignition switch turned ON leaving engine stopped, measure each voltage between "BLU/WHT" wire terminal of HO2S heater relay and ground, between "BLK/WHT" wire terminal of HO2S heater relay and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | "HO2S" fuse and/or "IG COIL" fuse blown. If OK, open in "BLK/WHT" circuit or "BLU/WHT" circuit. |
| 4 | **HO2S heater control circuit check**<br>1) With ignition switch turned OFF, install HO2S heater relay and connect HO2S–2 coupler.<br>2) With ignition switch turned ON leaving engine stopped, measure voltage between "C51-2-16" and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM and recheck. | Faulty HO2S heater relay or "WHT/BLK" circuit shorted to ground.<br>If OK, substitute a known-good ECM and recheck. |




| |
|---|
| [A]: Flg. for Step 3 |
| 1. Fuse/relay box coupler viewed from relay side |

# DTC P0051/P0052 HO2S (Bank 2 Sensor-1) Heater Control Circuit Low/High

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0051:**<br>HO2S–1 heater current is less than 0.12 A or potential difference between heater positive and negative terminals is higher than 14 V while HO2S–1 heater ON.<br>(2 driving cycle detection logic) | • HO2S–1 heater circuit<br>• HO2S–1 heater<br>• ECM<br>• HO2S heater relay |
| **DTC P0052:**<br>HO2S–1 heater current is more than 6.92 A or potential difference between heater positive and negative terminals is lower than 11.7 V while HO2S–1 heater ON.<br>(2 driving cycle detection logic) | |

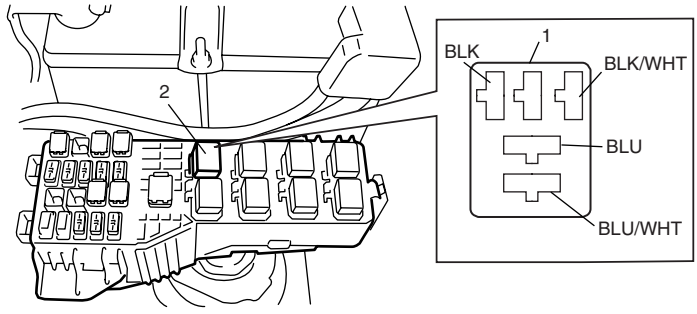
## DTC Confirmation Procedure

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 5 min.
3) Check pending DTC by using scan tool.

## 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” in this section. |
| 2 | **HO2S–1 heater check**<br>1) Disconnect HO2S–1 coupler with ignition switch turned OFF.<br>2) Measure resistance between “BLK” wire terminal and “BLK” wire terminal of HO2S–1 coupler.<br>**HO2S–1 heater resistance:**<br>**5.0 – 6.4 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–1. |
| 3 | **HO2S heater power supply check**<br>1) Remove HO2S heater relay (2) with ignition switch turned OFF.<br>2) With ignition switch turned ON leaving engine stopped, measure each voltage between “BLK/WHT” wire terminal of HO2S heater relay and ground, between “BLU/WHT” wire terminal of HO2S heater relay and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | “HO2S” fuse and/or “IG COIL” fuse blown. If OK, open in “BLK/WHT” circuit or “BLU/WHT” circuit. |
| 4 | **HO2S heater control circuit check**<br>1) With ignition switch turned OFF, install HO2S heater relay and connect HO2S–1 coupler.<br>2) With ignition switch turned ON leaving engine OFF, measure voltage between “C51-2-5” and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM and recheck. | Faulty HO2S heater relay or “BLK/RED” circuit shorted to ground.<br>If OK, substitute a known-good ECM and recheck. |

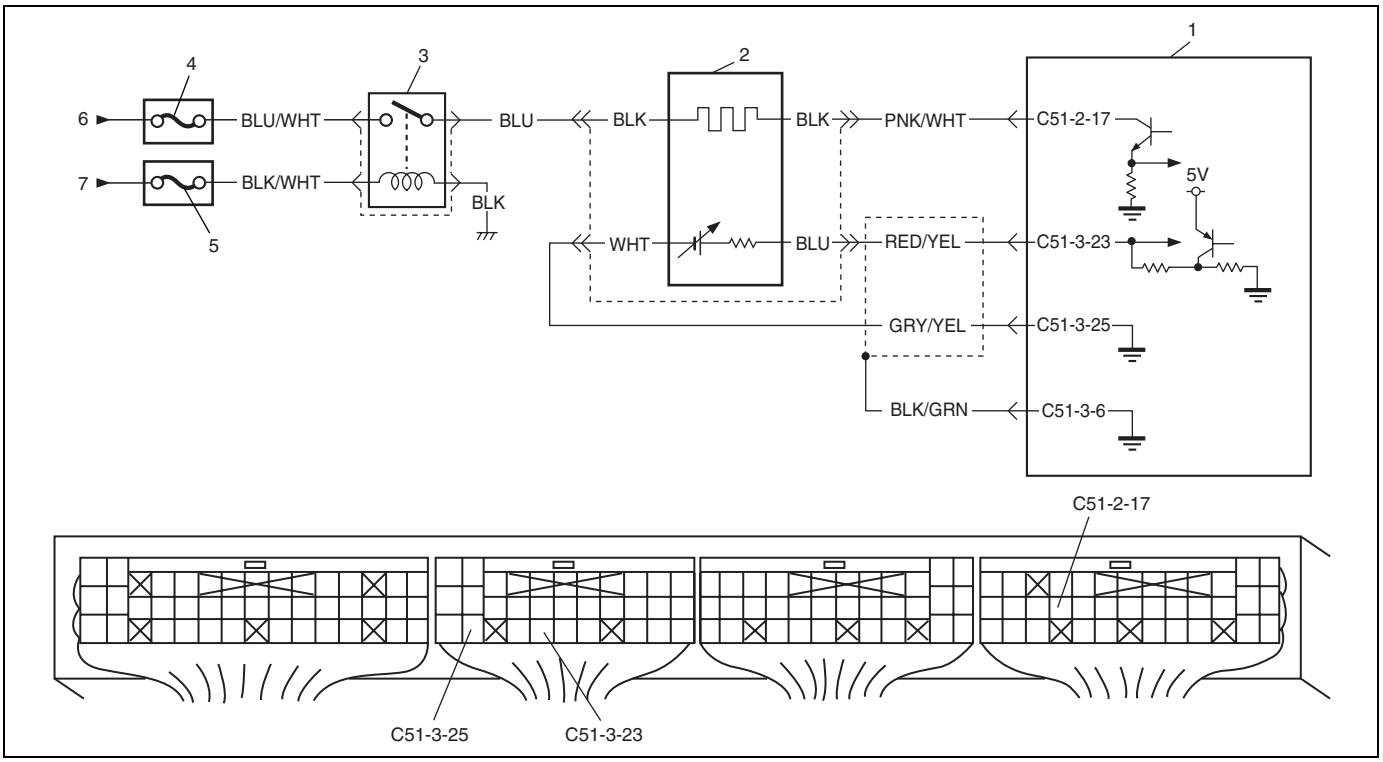
[A]




[A]: FIg. for Step 3
1. Fuse/relay box coupler viewed from relay side

# DTC P0057/P0058 HO2S (Bank 2 Sensor-2) Heater Control Circuit Low/High

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–2 (BANK–2) | 4. "HO2S' fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0057:**<br>HO2S–2 heater current is less than 0.14 A or potential difference between heater positive and negative terminals is higher than 13.8 V while HO2S–2 heater ON.<br>(2 driving cycle detection logic) | • HO2S–2 heater or its circuit<br>• ECM<br>• HO2S heater relay |
| **DTC P0058:**<br>HO2S–2 heater current is more than 2.5 A or potential difference between heater positive and negative terminals is lower than 8.7 V while HO2S–2 heater ON.<br>(2 driving cycle detection logic) | |

## DTC Confirmation Procedure

**WARNING:**

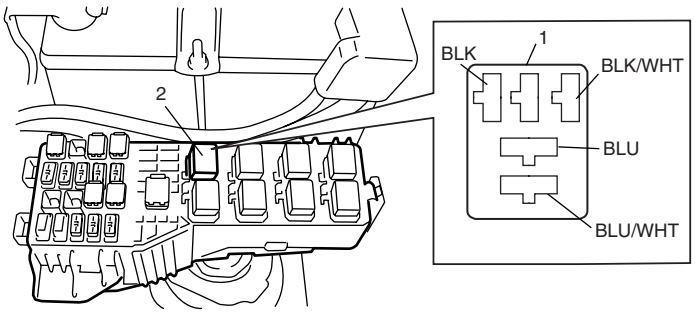
- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 5 min. (Change of vehicle speed is permitted in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor heater monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor heater monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 5).

**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" in this section. |
| 2 | **HO2S–2 heater check**<br>1) Disconnect HO2S–2 coupler with ignition switch turned OFF.<br>2) Measure resistance between "BLK" wire terminal and "BLK" wire terminal of HO2S–2 connector.<br>**HO2S–2 heater resistance:**<br>**11.7 – 14.3 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–2. |
| 3 | **HO2S heater power supply check**<br>1) Remove HO2S heater relay (2) with ignition switch turned OFF.<br>2) With ignition switch turned ON leaving engine stopped, measure each voltage between "BLU/WHT" wire terminal of HO2S heater relay and ground, between "BLK/WHT" wire terminal of HO2S heater relay and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | "HO2S" fuse and/or "IG COIL" fuse blown. If OK, open in "BLK/WHT" circuit or "BLU/WHT" circuit. |
| 4 | **HO2S heater control circuit check**<br>1) With ignition switch turned OFF, install HO2S heater relay and connect HO2S–2 coupler.<br>2) With ignition switch turned ON leaving engine stopped, measure voltage between "C51-2-17" and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM and recheck. | Faulty HO2S heater relay or "PNK/WHT" circuit shorted to ground. If OK, substitute a known-good ECM and recheck. |

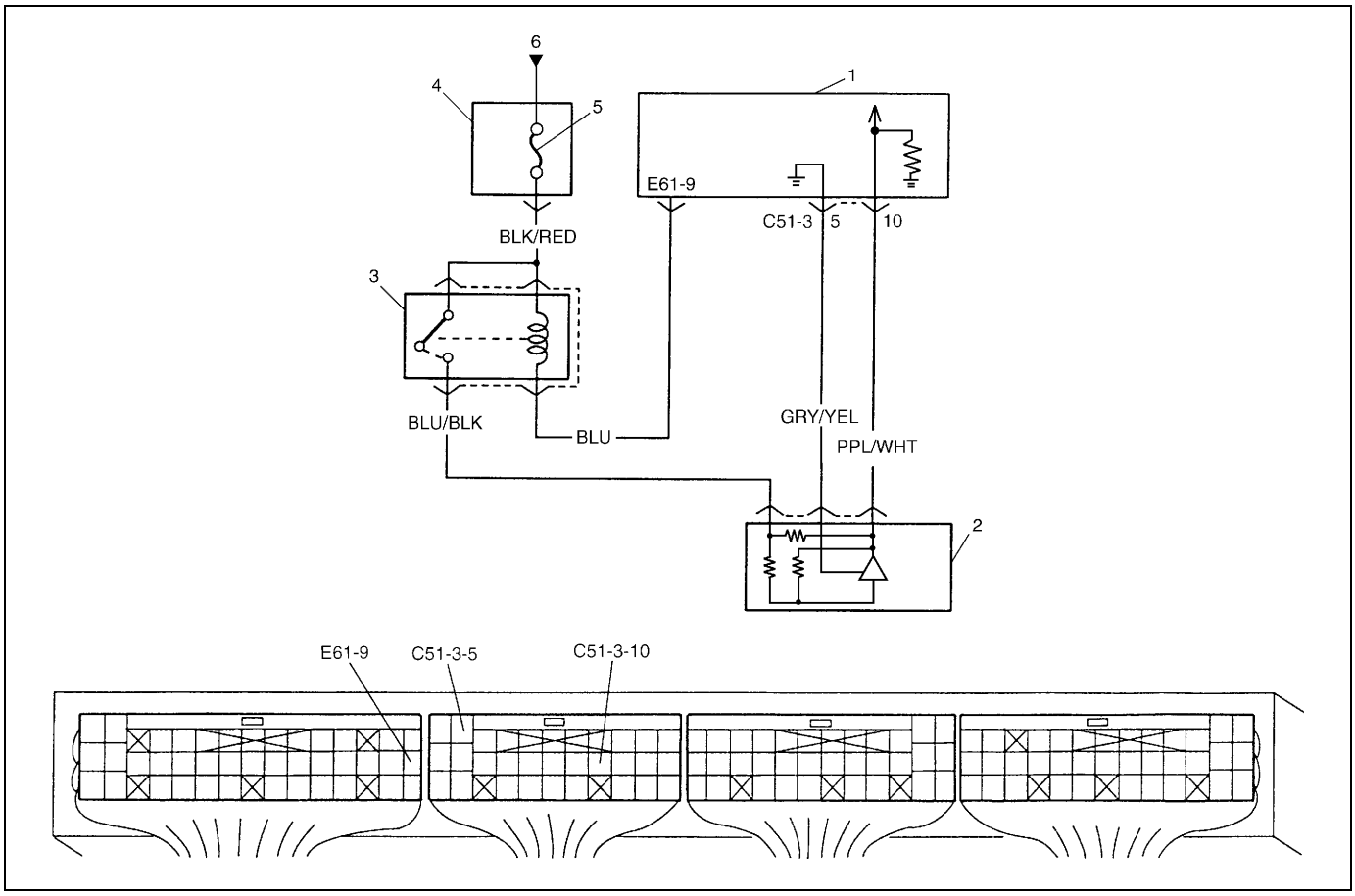
[A]




| |
|---|
| [A]: Flg. for Step 3 |
| 1. Fuse/relay box coupler viewed from relay side |

# DTC P0100 (DTC No.33, 34) Mass Air Flow Circuit Malfunction

## Wiring Diagram




| | | |
|---|---|---|
| 1. ECM | 3. Main relay | 5. "FI" fuse |
| 2. MAF sensor | 4. Main fuse box | 6. To battery |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the following conditions are detected for 5 sec. continuously.<br>• Engine running and more than 3 sec. after ignition switch ON and less than 0.64 mA MAF sensor output current continues for 100 msec.<br>• Engine running and more than 3 sec. after ignition switch ON and more than 4.90 mA MAF sensor output current continues for 100 msec. | • MAF sensor circuit<br>• MAF sensor<br>• 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 person, 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.: –8°C (18°F) or higher**
**Engine coolant temp.: –8 – 110°C (18 – 230°F)**
**Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg, 75 kPa or more)**

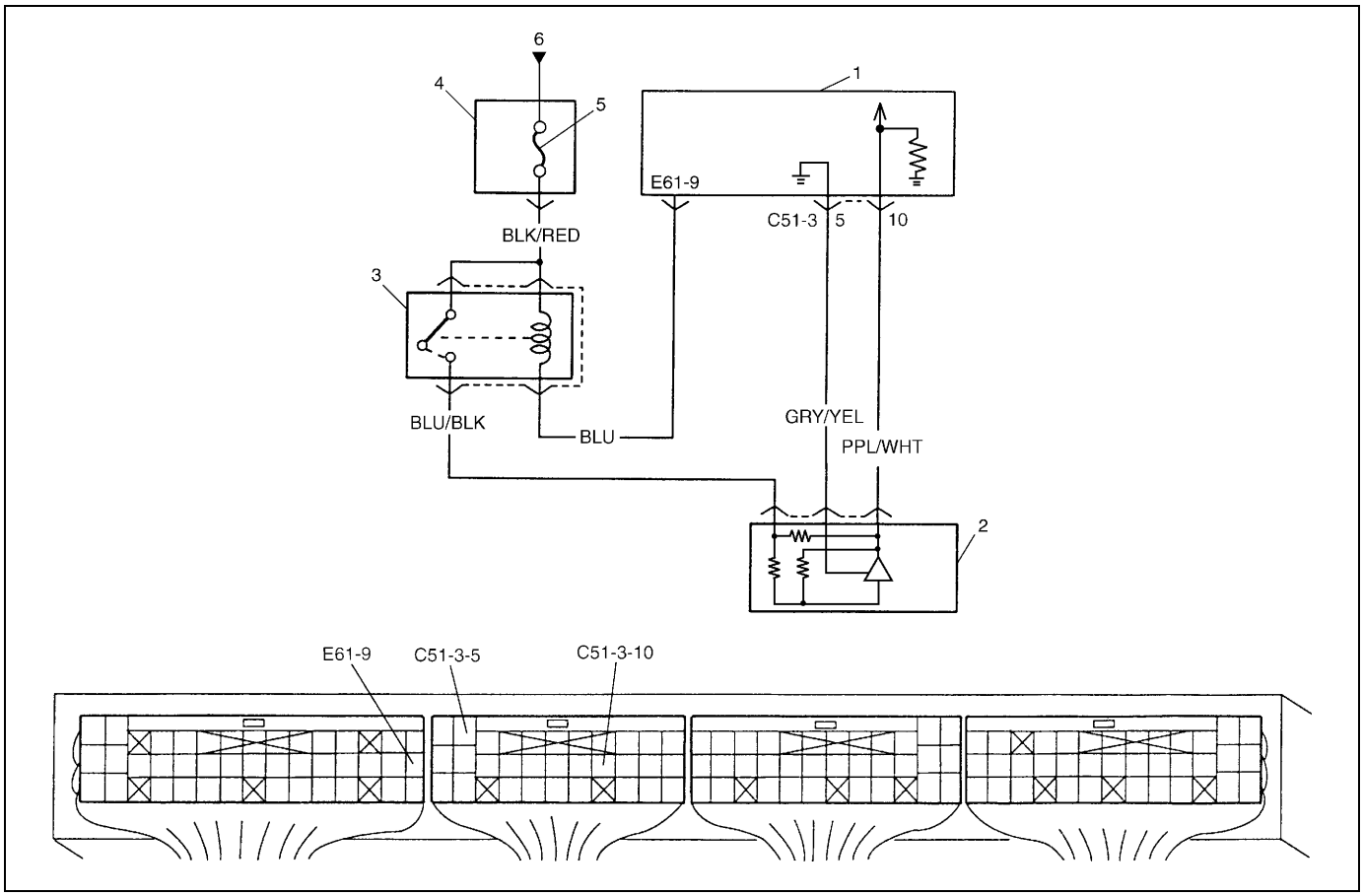
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 20 sec. or more.
3) Check DTC by using scan tool.

### 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" in this section. |
| 2 | **MAF sensor check**<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Start engine and check MAF value displayed on scan tool. (Refer to "Scan Tool Data" in this section for normal value.)<br>Is normal value indicated? | Intermittent trouble.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **MAF sensor power supply check**<br>1) With ignition switch OFF, disconnect MAF sensor coupler.<br>2) With ignition switch ON, check voltage between "BLU/BLK" wire terminal of MAF sensor coupler and ground.<br>Is voltage 10 – 14 V? | Go to Step 4. | Faulty "BLU/BLK" wire. |
| 4 | **MAF sensor output voltage check**<br>1) With ignition switch OFF, connect MAF sensor coupler.<br>2) Remove ECM cover.<br>3) With ignition switch ON leaving engine OFF, check voltage between C51-3-10 and C51-3-5 terminal.<br>Is voltage 1.0 – 1.6 V? | Poor C51-3-10 or/C51-3-5 terminal connection.<br>If OK, substitute a known-good ECM and recheck. | Faulty "PPL/WHT" wire.<br>Poor MAF sensor coupler terminal connection.<br>If wire and connection are OK, substitute a known-good MAF sensor and recheck. |

# DTC P0102 Mass Air Flow Circuit Low Input

## Wiring Diagram




| | | |
|---|---|---|
| 1. ECM | 3. Main relay | 5. "FI" fuse |
| 2. MAF sensor | 4. Main fuse box | 6. To battery |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• Less than 0.64 mA MAF sensor output current continues for 100 msec. | • MAF sensor circuit open or short<br>• MAF sensor<br>• ECM |

## DTC Confirmation Procedure

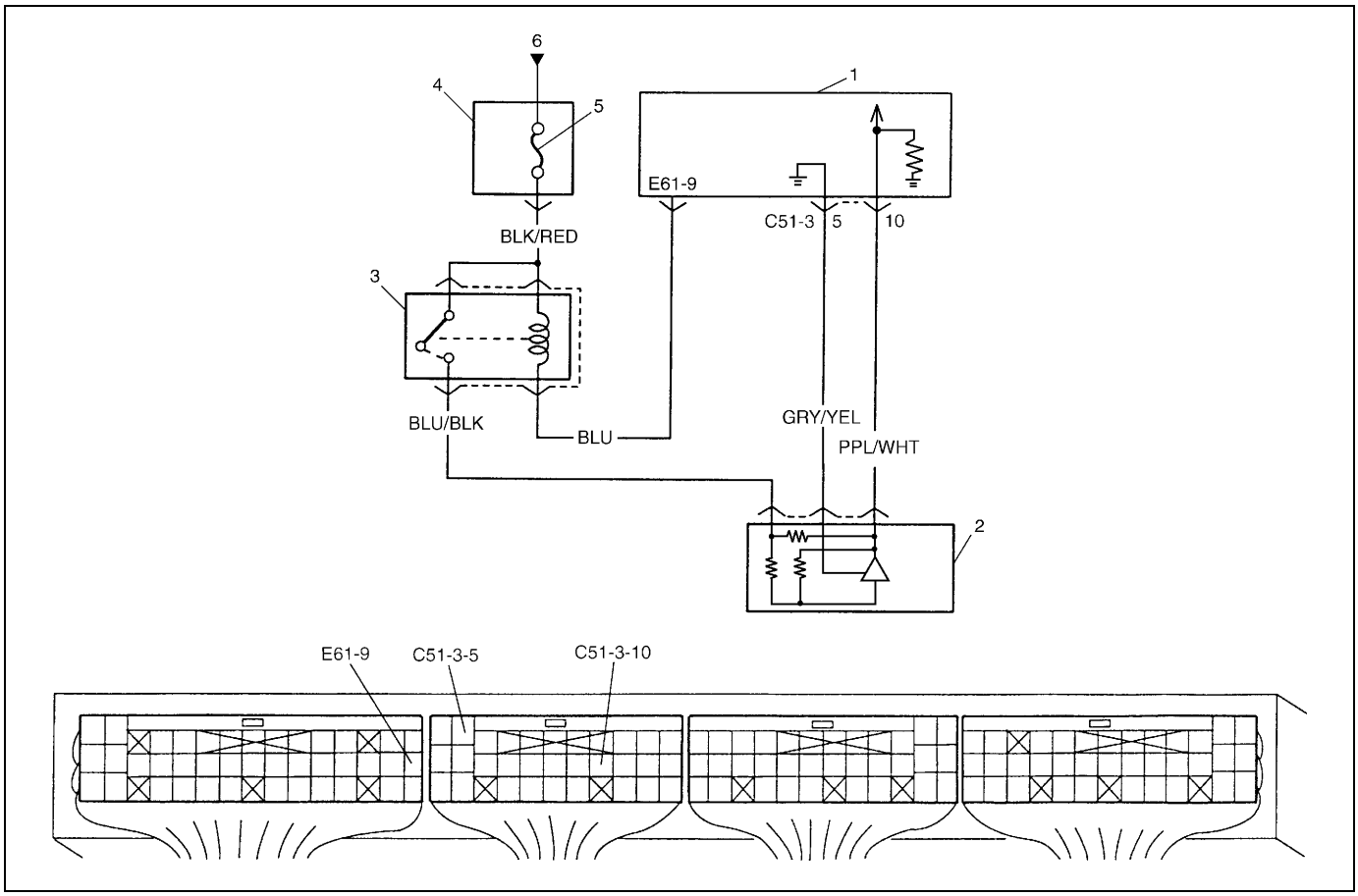
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 20 sec. or more.
3) Check DTC by using scan tool.

### 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” in this section. |
| 2 | **MAF sensor check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Start engine and check MAF value displayed on scan tool. Refer to “Scan Tool Data” in this section for normal value.<br>Is normal value indicated? | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | **MAF sensor power supply check**<br>1) With ignition switch turned OFF, disconnect MAF sensor coupler.<br>2) With ignition switch turned ON, measure voltage between “BLU/BLK” wire terminal of MAF sensor coupler and engine ground.<br>Is voltage 10 – 14 V? | Go to Step 4. | Open in “BLU/BLK” circuit. |
| 4 | **MAF sensor output voltage check**<br>1) With ignition switch turned OFF, connect MAF sensor coupler.<br>2) Remove ECM cover.<br>3) With ignition switch turned ON leaving engine stopped, measure voltage between “C51-3-10” and “C51-3-5” terminals of ECM connector.<br>Is voltage 1.0 – 1.6 V? | Poor “C51-3-10” connection.<br>If OK, substitute a known-good ECM and recheck. | Faulty “PPL/WHT” wire.<br>Poor “MAF sensor” coupler terminal connection.<br>If wire and connection are OK, substitute a known-good MAF sensor and recheck. |

# DTC P0103 Mass Air Flow Circuit High Input

## Wiring Diagram




| | | |
|---|---|---|
| 1. ECM | 3. Main relay | 5. "FI" fuse |
| 2. MAF sensor | 4. Main fuse box | 6. To battery |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• More than 3 sec. after ignition switch ON and more than 4.90 mA MAF sensor output current continues for 10 msec. | • MAF sensor circuit open or short<br>• MAF sensor<br>• ECM |

## DTC Confirmation Procedure

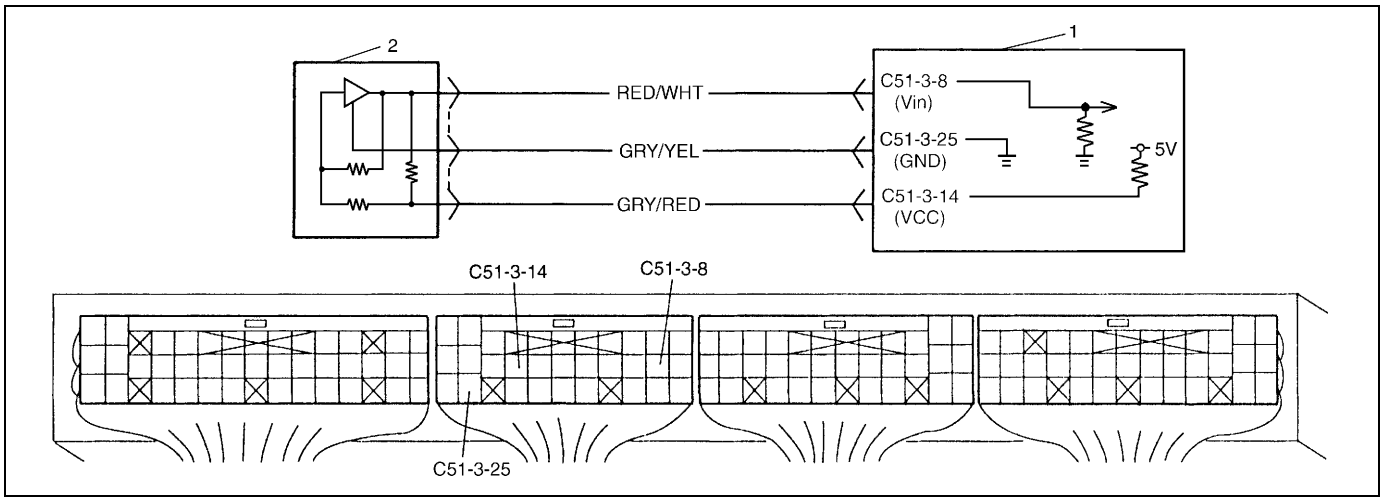
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 20 sec. or more.
3) Check DTC by using scan tool.

### 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” in this section. |
| 2 | **MAF sensor check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Start engine and check MAF value displayed on scan tool. Refer to “Scan Tool Data” in this section for normal value.<br>Is normal value indicated? | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | **MAF sensor output voltage check**<br>1) Remove ECM cover.<br>2) With ignition switch turned ON leaving engine stopped, measure voltage between “C51-3-10” and “C51-3-5” terminals of ECM connector.<br>Is voltage 1.0 – 1.6 V? | Go to Step 4. | “PPL/WHT” circuit shorted to power supply line or open in “GRY/YEL” circuit.<br>If OK, substitute a known-good MAF sensor and recheck. |
| 4 | **MAF sensor performance check**<br>1) Start engine and measure voltage between “C51-3-10” and “C51-3-5” terminals of ECM connector.<br>Does voltage rise within 5 V range when engine speed is increased? | Substitute a known-good ECM and recheck. | Substitute a known-good MAF sensor and recheck. |

# DTC P0107/P0108 Manifold Absolute Pressure Circuit Low Input/High Input

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. Manifold absolute pressure sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0107:**<br>While engine is running, lower than 0.2 V manifold absolute pressure sensor output voltage is detected for 5 sec.<br>(1 driving cycle detection logic) | • Manifold absolute pressure sensor and its circuit<br>• Manifold absolute pressure sensor vacuum passage<br>• ECM |
| **DTC P0108:**<br>While engine is running, higher than 4.8 V manifold absolute pressure output voltage is detected for 5 sec.<br>(1 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 with 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 temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8°C (18°F) or higher**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

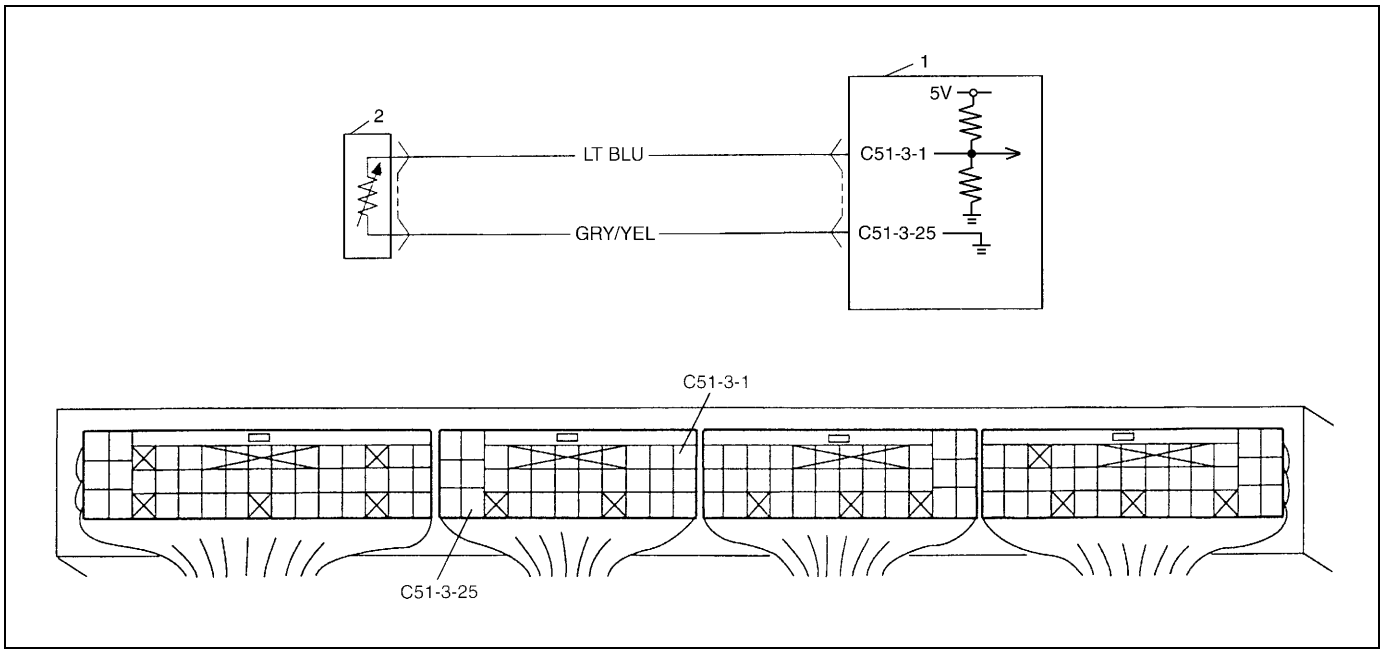
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Run engine at idle speed for 1 min.
4) Check pending DTC by using scan tool.

**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” in this section. |
| 2 | **MAP sensor signal check**<br>1) Remove ECM cover.<br>2) Measure voltage between “C51-3-8” and “C51-3-25” terminals of ECM connector under the following conditions.<br>• With ignition switch turned ON leaving engine stopped: 0.2 V or higher<br>• At idling: 4.6 V or lower<br>Is check result as specified? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | **MAP sensor check**<br>1) Disconnect connector from MAP sensor with ignition switch turned OFF.<br>2) Check for proper connection to MAP sensor at each terminal.<br>3) If OK, check MAP sensor for performance referring to “Manifold Absolute Pressure Sensor” under “Electronic Control System” in Section 6E2.<br>Is check result satisfactory? | “RED/WHT” wire, “GRY/YEL” wire or “GRY/RED” wire circuit open/short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace MAP sensor. |

# DTC P0110 (DTC No.23, 25) Intake Air Temp. (IAT) Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. IAT sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the conditions are detected for 5 sec. continuously.<br>• Low intake air temperature (high voltage-high resistance)<br>• High intake air temperature (Low voltage-low resistance) | • IAT sensor circuit<br>• IAT sensor<br>• ECM malfunction |

## DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed and engine coolant temp. 110°C (230°F) or lower for 10 sec. or more.
3) Check DTC by using scan tool.

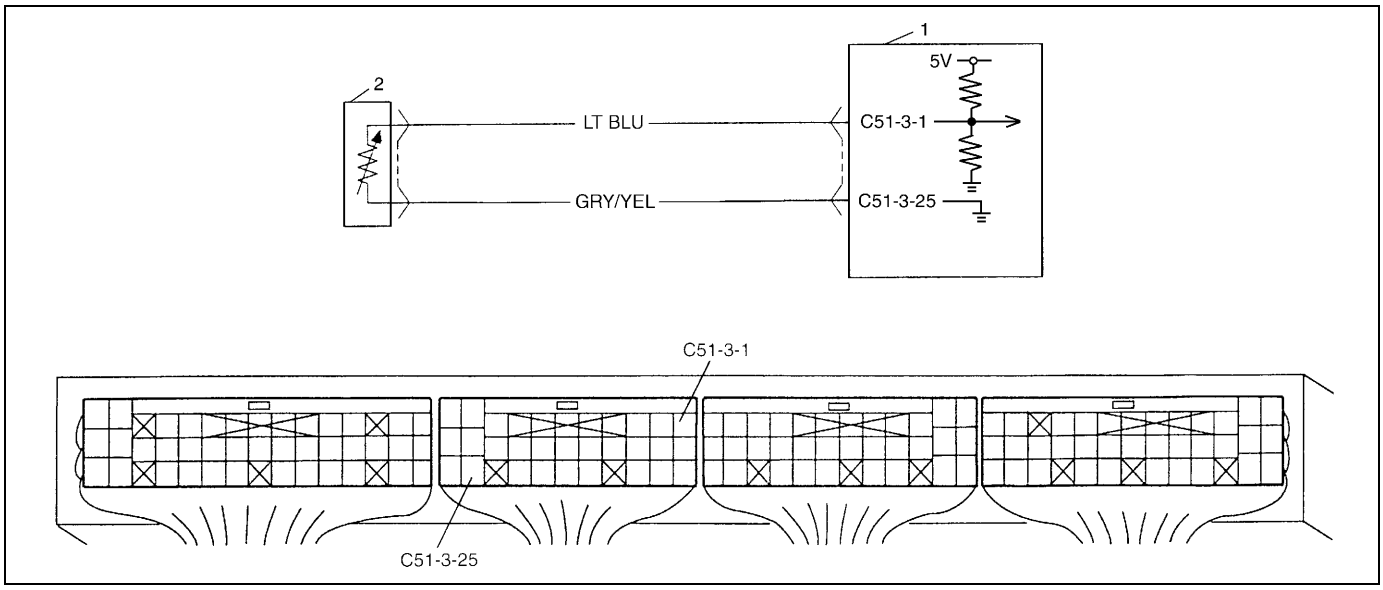
## Troubleshooting

| 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" in this section. |
| 2 | **Check IAT sensor and its circuit**<br>1) Connect scan tool with ignition switch OFF.<br>2) Turn ignition switch ON.<br>3) Check intake air temp. displayed on scan tool.<br>Is –40°C (–40°F) or 165°C (329°F) indicated? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire harness**<br>1) Disconnect IAT sensor connector with ignition switch OFF.<br>2) Check for proper connection to IAT sensor at "LT BLU" and "GRY/YEL" wire terminals.<br>If OK, then with ignition switch ON, is voltage applied to "LT BLU" wire terminal about 4 – 6 V? | Go to Step 4. | "LT BLU" wire open or short, or poor C51-3-1 connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | **Check wire harness**<br>1) Using service wire, connect IAT sensor connector terminals.<br>2) Turn ignition switch ON and check intake air temp. displayed on scan tool.<br>Is 165°C (329°F) indicated? | Replace IAT sensor. | "GRY/YEL" wire open or poor C51-3-25 connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |

# DTC P0112 Intake Air Temperature Sensor Circuit Low

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. IAT sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• High intake air temperature (Low voltage – Low resistance) | • IAT sensor circuit short<br>• IAT sensor<br>• ECM |

## DTC Confirmation Procedure

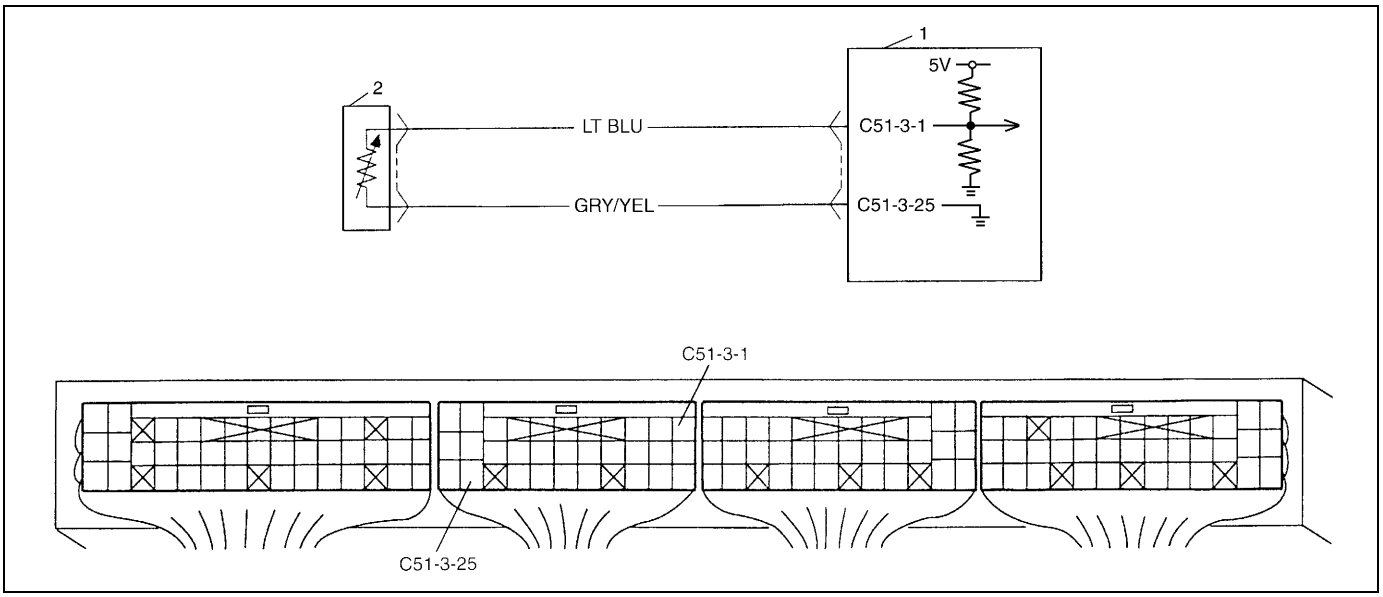
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed and engine coolant temp. 110°C (230°F) or lower for 10 sec. or more.
3) Check DTC by using scan tool.

## 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" in this section. |
| 2 | **IAT sensor and its circuit check**<br>1) Connect scan tool with ignition switch turned OFF.<br>2) Turn ON ignition switch.<br>3) Check intake air temp. displayed on scan tool.<br>Is 136°C (277°F) indicated? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. |
| 3 | **IAT sensor circuit check**<br>1) Disconnect IAT sensor connector with ignition switch turned OFF.<br>2) Check intake air temp. displayed on scan tool.<br>Is –48°C (–54°F) indicated? | Replace IAT sensor. | "LT BLU" circuit shorted to ground. If wire is OK, substitute a known-good ECM and recheck. |

# DTC P0113 Intake Air Temperature Sensor Circuit High

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. IAT sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously<br>• Engine running<br>• Low intake air temperature (High voltage – High resistance) | • IAT sensor circuit open or short<br>• IAT sensor malfunction<br>• ECM malfunction |

## 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 and run engine at idle speed and engine coolant temp. 110°C (230°F) or lower for 10 sec. or more.
3) Check DTC by using scan tool.

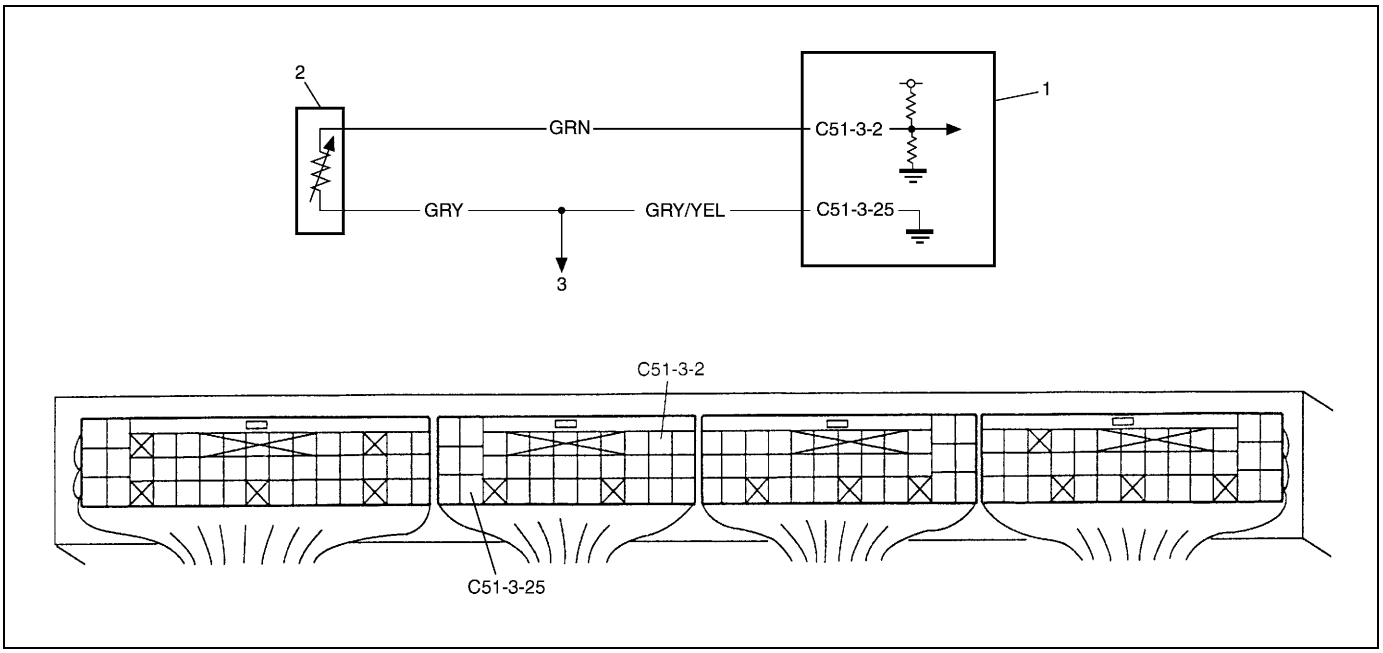
## Troubleshooting

| 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” in this section. |
| 2 | **Check IAT sensor and its circuit**<br>1) Connect scan tool with ignition switch turned OFF.<br>2) Turn ON ignition switch.<br>3) Check intake air temp. displayed on scan tool.<br>Is –40°C (–40°F) indicated? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire harness**<br>1) Disconnect IAT sensor connector with ignition switch turned OFF.<br>2) Check for proper connection to IAT sensor at "LT BLU" and "GRY/YEL" wire terminals.<br>If OK, then with ignition switch turned ON, is voltage applied to "LT BLU" wire terminal about 4 – 6 V? | Go to Step 4. | "LT BLU" wire open or shorted to power, or poor "C51-3-1" terminal connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | **Check wire harness**<br>1) Using service wire, connect IAT sensor connector terminals.<br>2) Turn ON ignition switch and check intake air temp. displayed on scan tool.<br>Is 165°C (329°F) indicated? | Replace IAT sensor. | Open in "GRY/YEL" circuit or poor "C51-3-25" terminal connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |

# DTC P0115 (DTC No.14, 15) Engine Coolant Temp. Circuit Malfunction

## Wiring Diagram




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

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the conditions are detected for 5 sec. continuously.<br>• Low engine coolant temperature (high voltage-high resistance)<br>• High engine coolant temperature (low voltage-low resistance) | ECT sensor circuit<br>ECT sensor<br>ECM |

## DTC Confirmation Procedure

**NOTE:**

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

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

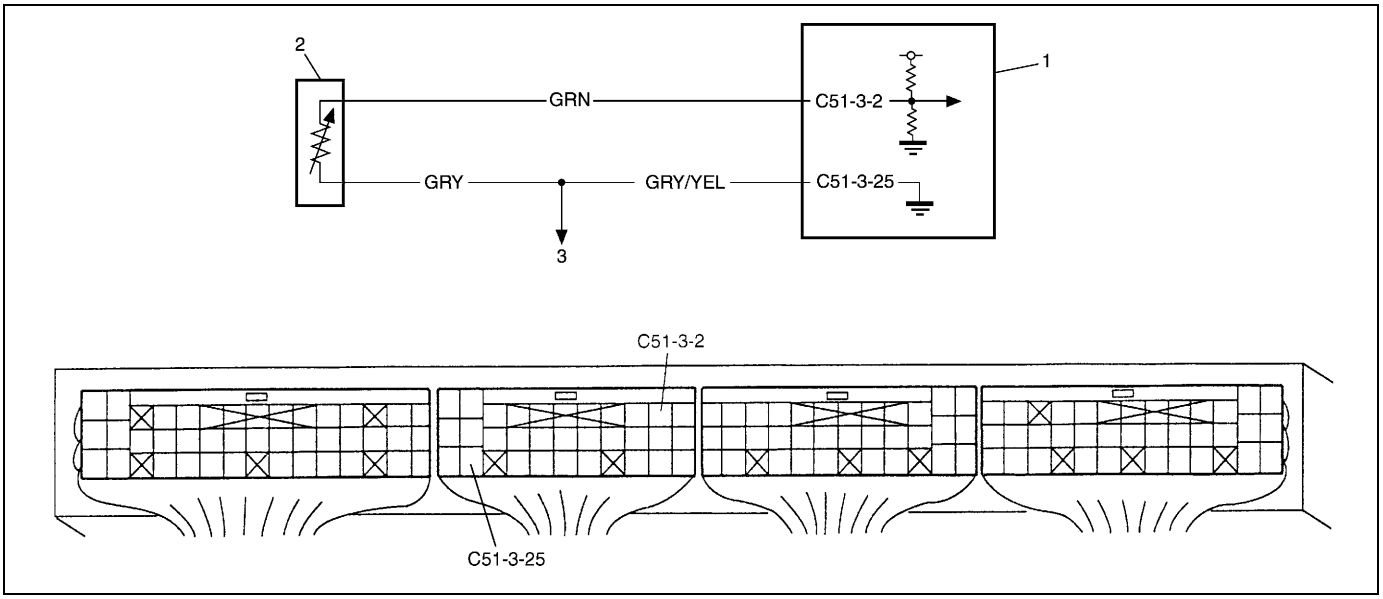
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

## 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” in this section. |
| 2 | **Check ECT sensor and its circuit**<br>1) Connect scan tool with ignition switch OFF.<br>2) Turn ignition switch ON.<br>3) Check engine coolant temp. displayed on scan tool.<br>Is –40°C (–40°F) or 164°C (327°F) indicated? | Go to Step 3. | Intermittent trouble.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |
| 3 | **Check wire harness**<br>1) Disconnect ECT sensor connector with ignition switch OFF.<br>2) Check for proper connection to ECT sensor at “ORN/BLK” and “GRY/YEL” wire terminals.<br>If OK, then with ignition switch ON, is voltage applied to “ORN/BLK” wire terminal about 4 – 6 V? | Go to Step 4. | “ORN/BLK” wire open or short, or poor C51-3-2 connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | **Check wire harness**<br>1) Using service wire, connect ECT sensor connector terminals.<br>2) Turn ignition switch ON and check engine coolant temp. displayed on scan tool.<br>Is 164°C (327°F) indicated? | Replace ECT sensor. | “GRY/YEL” wire open or poor C51-3-23 connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |

# DTC P0117 Engine Coolant Temperature Circuit Low

## Wiring Diagram




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

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• High engine coolant temperature (Low voltage – Low resistance) | • ECT sensor circuit short<br>• ECT sensor<br>• 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 and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

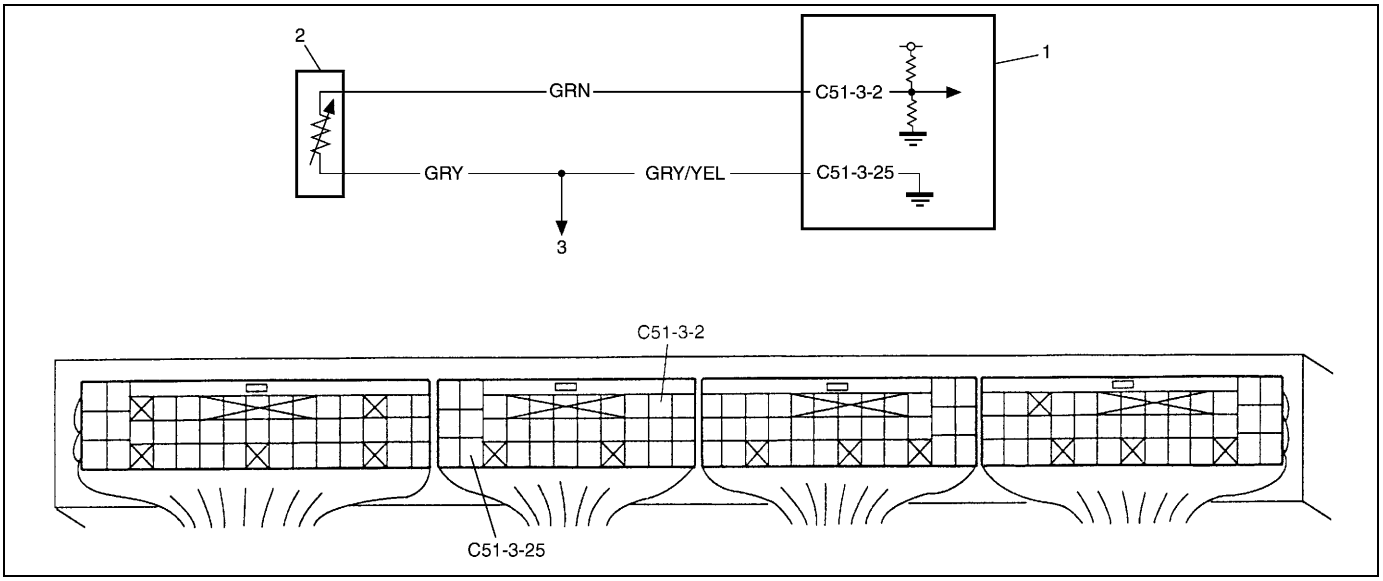
## Troubleshooting

| 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” in this section. |
| 2 | **Check ECT sensor and its circuit**<br>1) Connect scan tool with ignition switch turned OFF.<br>2) Turn ON ignition switch.<br>3) Check engine coolant temp. displayed on scan tool.<br>Is 164 °C (327 °F) indicated? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire harness**<br>1) Disconnect ECT sensor connector with ignition switch turned OFF.<br>2) Check engine coolant temp. displayed on scan tool.<br>Is –40 °C (–40 °F) indicated? | Replace ECT sensor. | "GRN" circuit shorted to ground. If wire is OK, substitute a known-good ECM and recheck. |

# DTC P0118 Engine Coolant Temperature Circuit High

## Wiring Diagram




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

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• Low engine coolant temperature (High voltage – High resistance) | • ECT sensor circuit open or short<br>• ECT sensor<br>• 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 and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

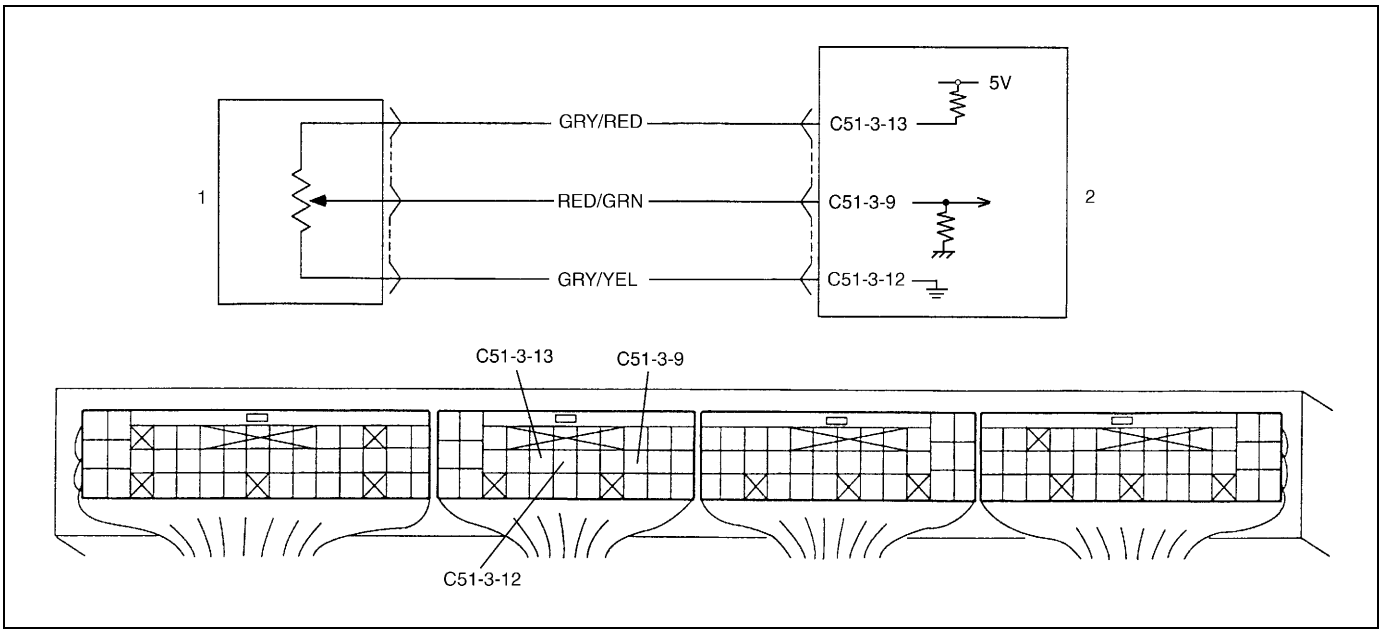
## Troubleshooting

| 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” in this section. |
| 2 | **Check ECT sensor and its circuit**<br>1) Connect scan tool with ignition switch turned OFF.<br>2) Turn ON ignition switch.<br>3) Check engine coolant temp. displayed on scan tool.<br>Is –40 °C (–40 °F) indicated? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire harness**<br>1) Disconnect ECT sensor connector with ignition switch turned OFF.<br>2) Check for proper connection to ECT sensor at "GRN" and "GRY" wire terminals.<br>If OK, then with ignition switch turned ON, is voltage applied to "GRN" wire terminal about 4 – 6 V? | Go to Step 4. | Open in "GRN" circuit or shorted to power supply line, or poor "C51-3-2" terminal connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | **Check wire harness**<br>1) Using service wire, connect ECT sensor connector terminals.<br>2) Turn ON ignition switch and check engine coolant temp. displayed on scan tool.<br>Is 164 °C (327 °F) indicated? | Replace ECT sensor. | Open in "GRY" or "GRY/YEL" circuit or poor "C51-3-23" terminal connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |

# DTC P0120 (DTC No.21, 22) Throttle Position Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. Throttle position sensor |
| 2. ECM |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• Signal voltage low or signal voltage high | • TP sensor circuit<br>• TP sensor<br>• ECM |

**NOTE:**

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

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude barometric pressure: 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

## DTC Confirmation Procedure

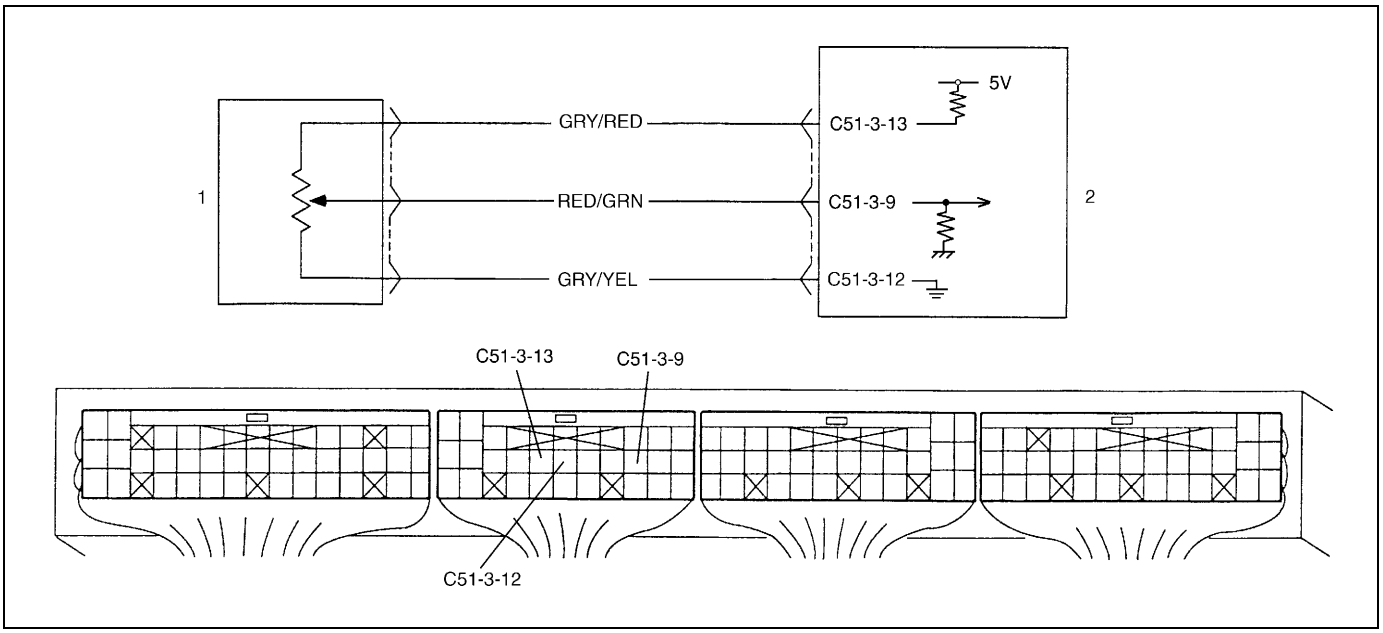
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

**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”. |
| 2 | Check TP sensor and its circuit.<br>1) Connect scan tool to DLC with ignition switch OFF and then turn ignition switch ON.<br>2) Check throttle valve opening percentage displayed on scan tool.<br>Is it displayed 3% or less?<br>3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position.<br>Is it displayed 96% or higher? | Go to Step 3. | Intermittent trouble.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |
| 3 | Check wire harness.<br>1) Disconnect connector from TP sensor with ignition switch OFF.<br>2) Check for proper connection to TP sensor at “GRY/RED”, “RED/GRN” and “GRY/YEL” wire terminal.<br>3) If OK, then with ignition switch ON, check voltage between each of “GRY/RED” or “RED/GRN” wire terminals and body ground.<br>Is voltage about 4 – 6 V at each terminal? | Go to Step 4. | “GRY/RED” wire open, “GRY/RED” wire shorted to ground circuit or power circuit or “RED/GRN” wire, “GRY/YEL” wire open or shorted to ground circuit or poor C51-3-13 or C51-3-9 connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | Check TP sensor.<br>1) Check resistance between terminals of TP sensor referring to “TP Sensor” in Section 6E2.<br>Are measured values within specifications? | “RED/GRN” wire shorted to power circuit.<br>If wire is OK, substitute a known-good ECM and recheck. | Replace TP sensor. |

# DTC P0121 Throttle Position Circuit Range/Performance Problem

## Wiring Diagram




| |
|---|
| 1. Throttle position sensor |
| 2. ECM |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Throttle opening change is smaller than specification while intake air volume changes and engine is running at constant speed. (2 driving cycle detection logic) | • TP sensor<br>• 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.**

**NOTE:**

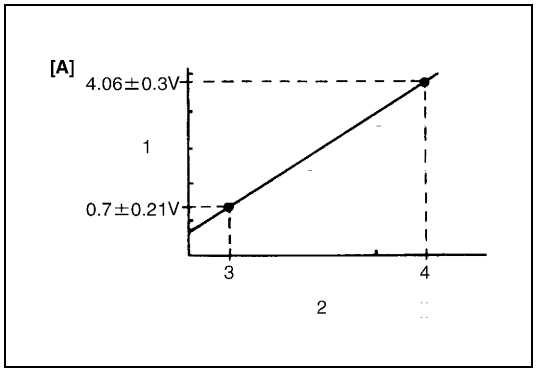
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude barometric pressure: 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 60 km/h (40 mph).
4) Keep driving above vehicle speed for 5 min (Change of vehicle speed is permitted in this step).
5) Stop vehicle and run engine at idle speed for 1 min.
6) Increase vehicle speed till engine speed is reached 2,000 – 3,000 r/min in proper gear.
7) Keep driving at that engine speed for 30 sec or more (Engine speed is kept constant in this step).

8) Stop vehicle.
9) Repeat step 6) to 8).
10) Check pending DTC by using scan tool.

**Troubleshooting**

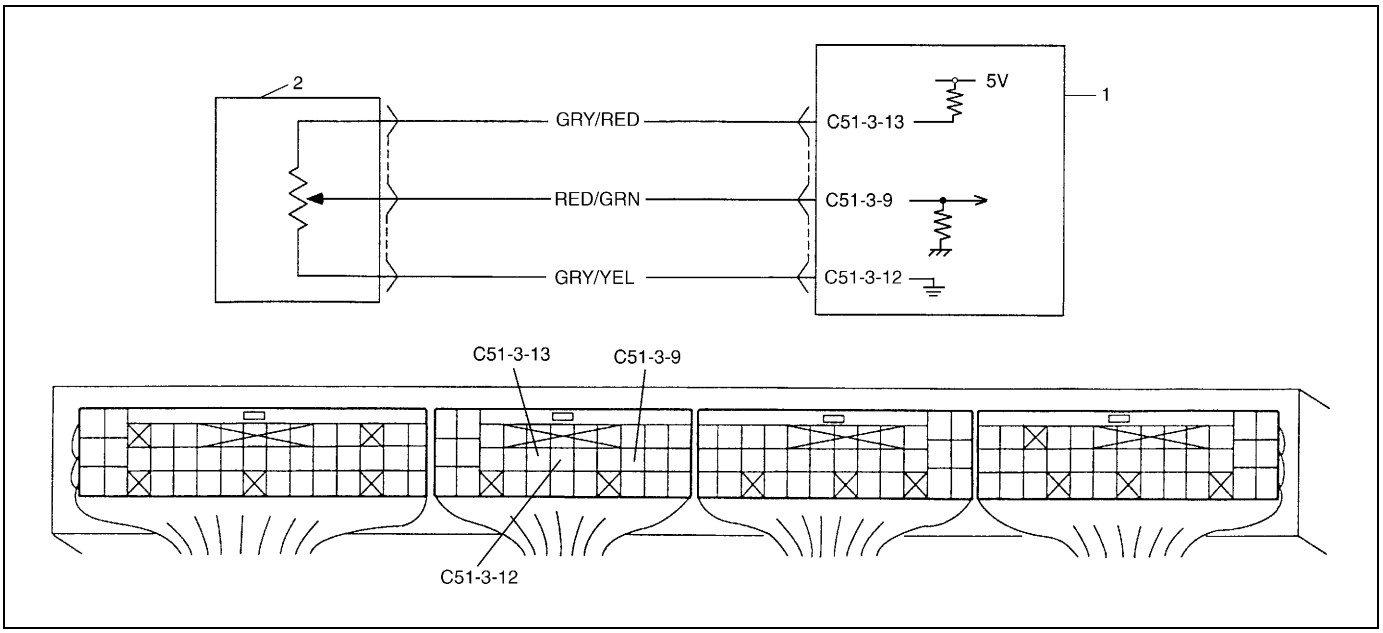
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | Is there a DTC related to TP sensor (DTC P0120 (DTC No.21, 22)? | Go to applicable DTC Diag. Flow Table. | Go to Step 3. |
| 3 | Do you have SUZUKI scan tool? | Go to Step 4. | Go to Step 5. |
| 4 | **TP sensor and its circuit (using SUZUKI scan tool) check**<br>1) Turn ignition switch OFF and connect SUZUKI scan tool to DLC.<br>2) Turn ignition switch ON and check TP sensor output voltage when throttle valve is at idle position and fully opened. (See Fig.)<br>Does voltage vary within specified value linearly as shown in the figure? | Substitute a known-good ECM and recheck. | Go to Step 6. |
| 5 | **TP sensor and its circuit (not using SUZUKI scan tool) check**<br>1) Turn ignition switch ON.<br>2) Check voltage at terminal C51-3-9 of ECM connector connected, when throttle valve is at idle position and fully opened. (See Fig.)<br>Does voltage vary within specified value linearly as shown in the figure? | Check terminal C51-3-9 for poor connection.<br>If OK, substitute a known-good ECM and recheck. | Go to Step 6. |
| 6 | **TP sensor check**<br>1) Turn ignition switch OFF.<br>2) Disconnect TP sensor connector.<br>3) Check for proper connection to TP sensor at each terminal.<br>4) If OK, check TP sensor for resistance referring to "Throttle Position Sensor (TP sensor)" under "Electronic Control System" in Section 6E2.<br>Is check result satisfactory? | High resistance in "GRY/RED", "RED/GRN" or "GRY/YEL" circuit.<br>If wire and connection are OK, substitute a known-good ECM and recheck. | Replace TP sensor. |




| [A]: Fig. for Steps 4 and 5 |
|---|
| 1. Voltage |
| 2. Throttle opening |
| 3. At idle position |
| 4. Fully open |

# DTC P0122 Throttle Position Sensor Circuit Low

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. Throttle position sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• Signal voltage low | • TP sensor circuit open or short<br>• TP sensor<br>• 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 and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

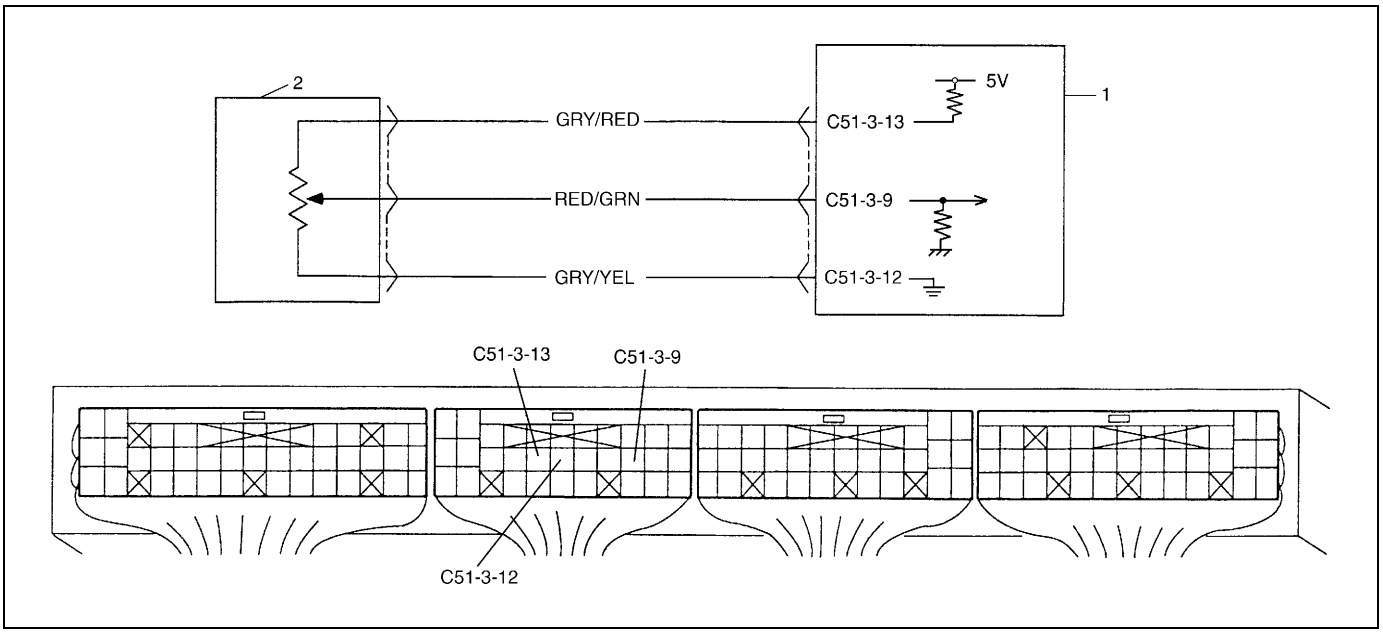
## Troubleshooting

| 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” in this section. |
| 2 | **Check TP sensor and its circuit**<br>1) Connect scan tool to DLC with ignition switch turned OFF and then turn ON ignition switch.<br>2) Check throttle valve opening percentage displayed on scan tool while opening throttle valve.<br>Is it displayed 0%? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire harness**<br>1) Disconnect connector from TP sensor with ignition switch turned OFF.<br>2) Check for proper connection to TP sensor at each "GRY/RED" wire terminal and "RED/GRN" wire terminal of disconnected connector.<br>3) If OK, then with ignition switch turned ON, measure voltage at "GRY/RED" wire terminal of disconnected connector.<br>Is voltage about 4 – 6 V? | Go to Step 4. | Open in "GRY/RED" circuit, "GRY/RED" circuit shorted to ground or poor "C51-3-13" terminal connection.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | **Check TP Sensor**<br>1) Check resistance between terminals of TP sensor referring to "Throttle Position Sensor (TP sensor)" under "Electronic Control System" in Section 6E2.<br>Are measured values within specifications? | "RED/GRN" circuit wire is open/shorted to ground or poor "C51-3-9" terminal connection.<br>If OK, substitute a known-good ECM and recheck. | Replace TP sensor. |

# DTC P0123 Throttle Position Sensor Circuit High

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. Throttle position sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected for 5 sec. continuously.<br>• Engine running<br>• Signal voltage high | • TP sensor circuit open or short<br>• TP sensor<br>• 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 and run engine at idle speed for 10 sec. or more.
3) Check DTC by using scan tool.

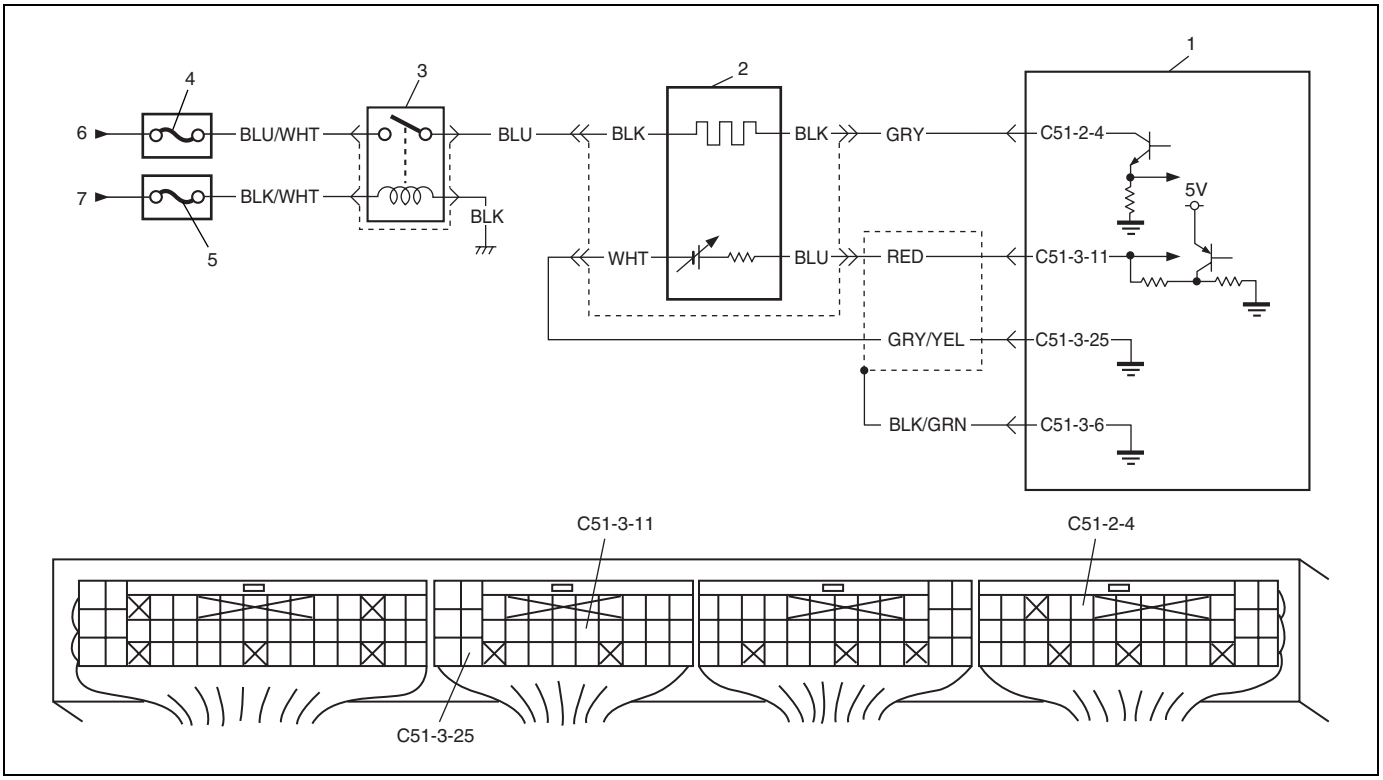
## Troubleshooting

| 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” in this section. |
| 2 | **Check TP sensor and its circuit**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Turn ON ignition switch.<br>3) Check throttle valve opening percentage displayed on scan tool while opening throttle valve from idle position to full open position.<br>Is it displayed 100%? | Go to Step 3. | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire harness**<br>1) Disconnect connector from TP sensor with ignition switch turned OFF.<br>2) Check for proper connection to TP sensor at "GRY/YEL" wire terminal.<br>3) If OK, then with ignition switch turned ON, measure voltage between "GRY/RED" wire terminal and "GRY/YEL" wire terminal at TP sensor connector.<br>Is voltage about 4 – 6 V? | Go to Step 4. | "GRY/RED" circuit shorted to power supply line, open in "GRY/YEL" circuit or poor "C51-3-12" terminal connection. If wire and connection are OK, substitute a known-good ECM and recheck. |
| 4 | **Check TP sensor**<br>1) Check resistance between terminals of TP sensor referring to "Throttle Position Sensor (TP sensor)" under "Electronic Control System" in Section 6E2.<br>Are measured values within specifications? | "RED/GRN" circuit shorted to power supply line.<br>If wire is OK, substitute a known-good ECM and recheck. | Replace TP sensor. |

# DTC P0130 (DTC No.13) HO2S-1 (Bank 1) Circuit Malfunction or No Activity Detected

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

**NOTE:**

**For vehicle with diagnosis connector, DTC will set when following only (*) mark condition is detected.**

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>• 4.5 V or more HO2S circuit voltage is detected, when 5 V power is connected to HO2S circuit in ECM, or<br>• Max. output voltage of HO2S is 0.6 V or lower on average and its minimum voltage on average is 0.3 V or lower.<br>• Min. output voltage of HO2S is over 3.0 V or<br>• Max. output voltage of HO2S is 0.74 V or higher on average and its min. voltage on average is 0.33 V or higher.<br>• *Output voltage of HO2S–1 does not exceed 0.45 V for specified time.<br>(2 driving cycle detection logic) | HO2S–1 or its circuit.<br>Fuel system<br>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.**

**NOTE:**

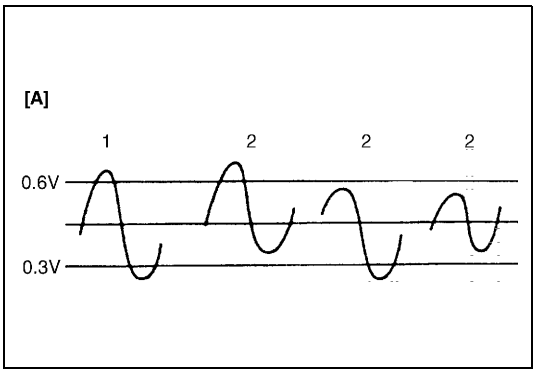
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat step 3) through 6).

### 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" in this section. |
| 2 | **HO2S–1 output voltage check**<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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 and check HO2S output voltage displayed on scan tool. See Fig.<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–1 check**<br>1) With ignition switch OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter to "GRY/YEL" wire terminal and "RED" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "RED" or "GRY/YEL" circuit open or short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace HO2S–1. |

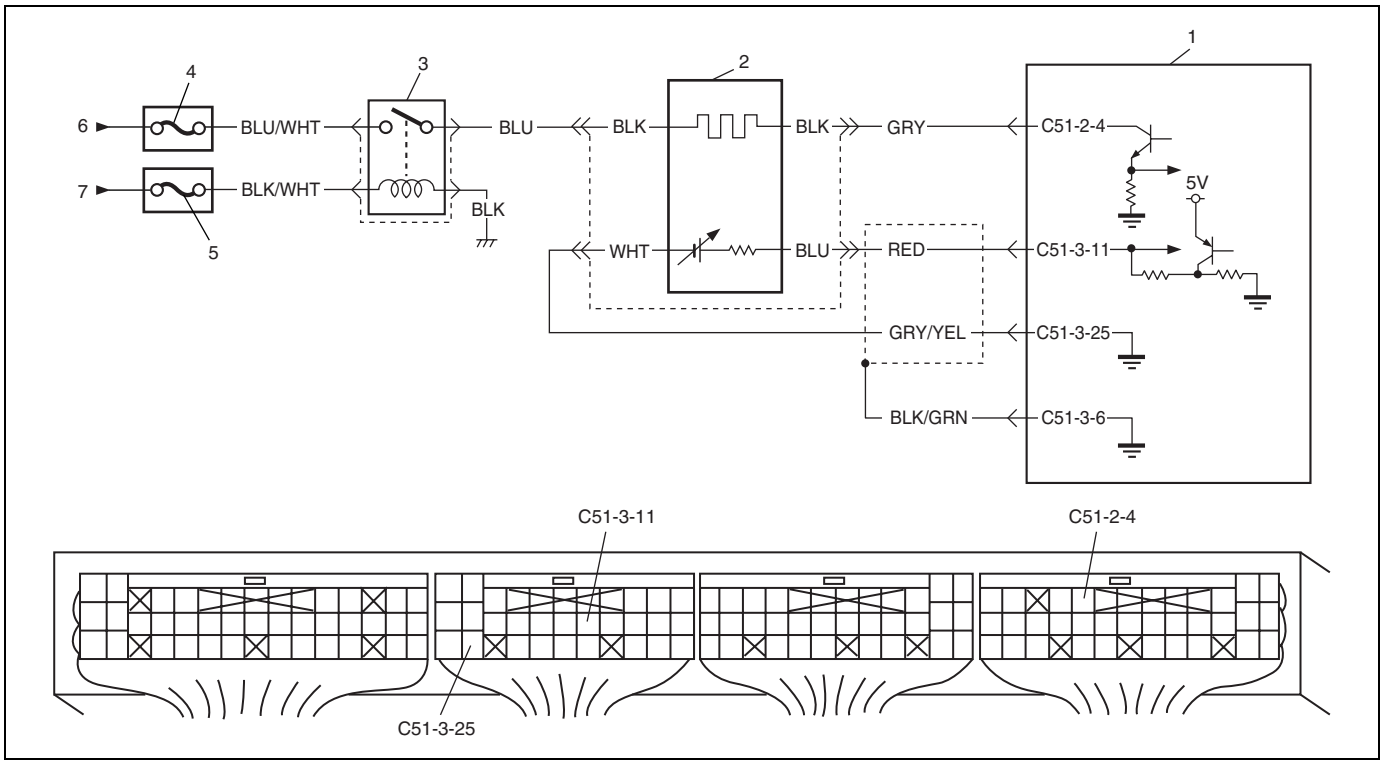
| Step | Action | Yes | No |
|---|---|---|---|
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to DTC P0171/ P0172 Diag. Flow Table. |




| [A]: Fig. for Step 2 |
|---|
| 1. Normal |
| 2. NG |

# DTC P0131/P0132 O2 Sensor (Bank 1 Sensor-1) Circuit Low/High Voltage

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>**DTC P0131:**<br>• 4.5 V or more HO2S circuit voltage is detected, when 5 V power is connected to HO2S circuit in ECM, or<br>• Max. output voltage of HO2S is 0.6 V or lower on average and its minimum voltage on average is 0.3 V or lower.<br>(2 driving cycle detection logic)<br>**DTC P0132:**<br>• Min. output voltage of HO2S is over 3.01 V or<br>• Max. output voltage of HO2S is 0.74 V or higher on average and its min. voltage on average is 0.34 V or higher.<br>(2 driving cycle detection logic) | • HO2S–1 or its circuit<br>• Fuel system<br>• ECM<br>• Air intake system (clog or leakage)<br>• Exhaust gas leakage |

## 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.**

**NOTE:**

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

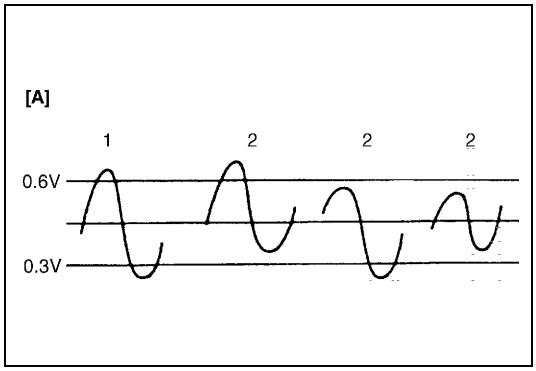
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Steps 3) through 6).

**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" in this section. |
| 2 | **HO2S–1 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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) and check HO2S output voltage displayed on scan tool. (See Fig.)<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–1 check**<br>1) With ignition switch turned OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter "WHT" wire terminal and "BLU" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open or short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace HO2S–1. |

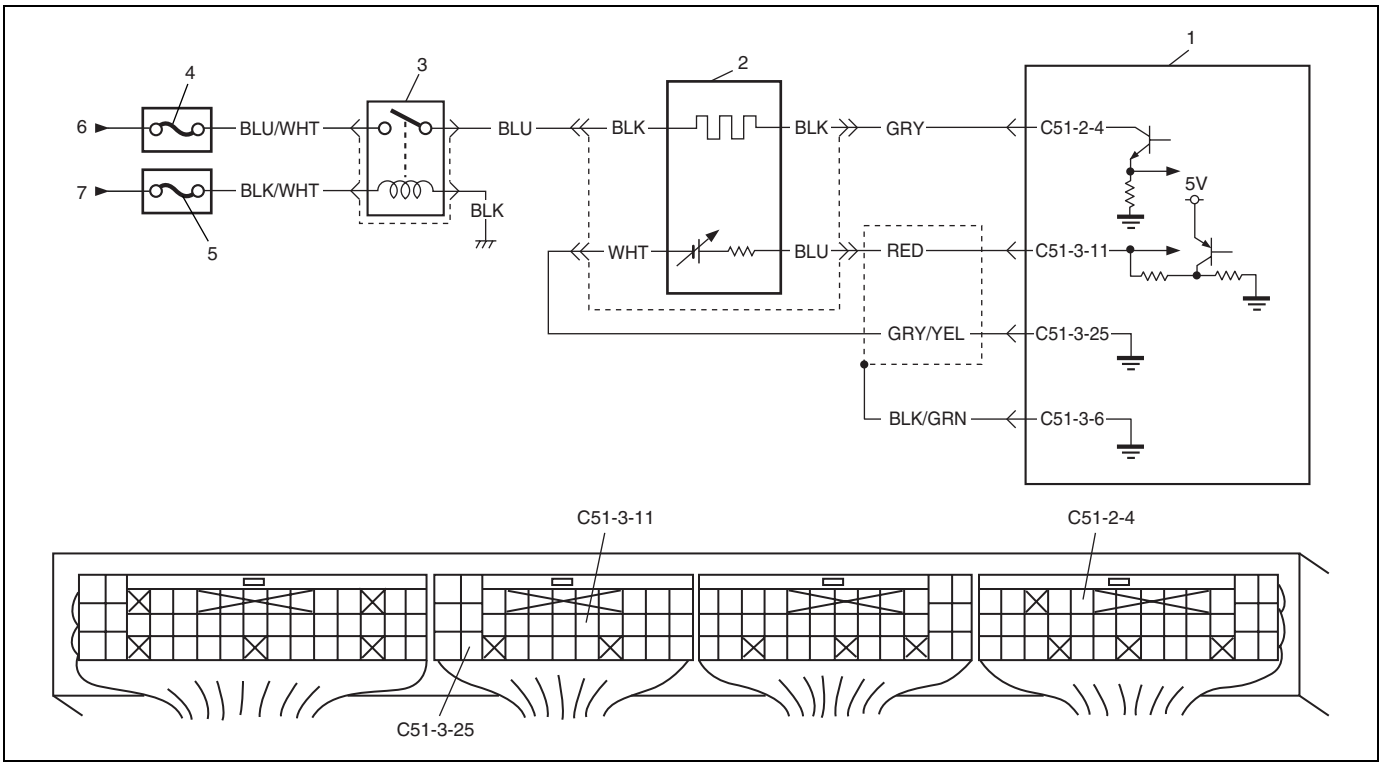
| Step | Action | Yes | No |
|---|---|---|---|
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to “DTC P0171/P0172 Fuel System Too Lean/ Rich (Bank 1)” and “DTC P0174/P0175 Fuel System too lean/Rich (Bank 2)” in this section. |




| [A]: Fig for Step 2 |
|---|
| 1. Normal |
| 2. NG |

# DTC P0133 HO2S-1 (Bank 1) Circuit Slow Response

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>Hi/Lo cycle (TRANS TIME displayed on scan tool) of HO2S–1 output voltage is longer than specification or response rates of Hi → Lo and Lo → Hi (TRANS TIME displayed as R → L threshold V or L → R threshold V on scan tool) are longer than specification.<br>(2 driving cycle detection logic) | HO2S–1<br>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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

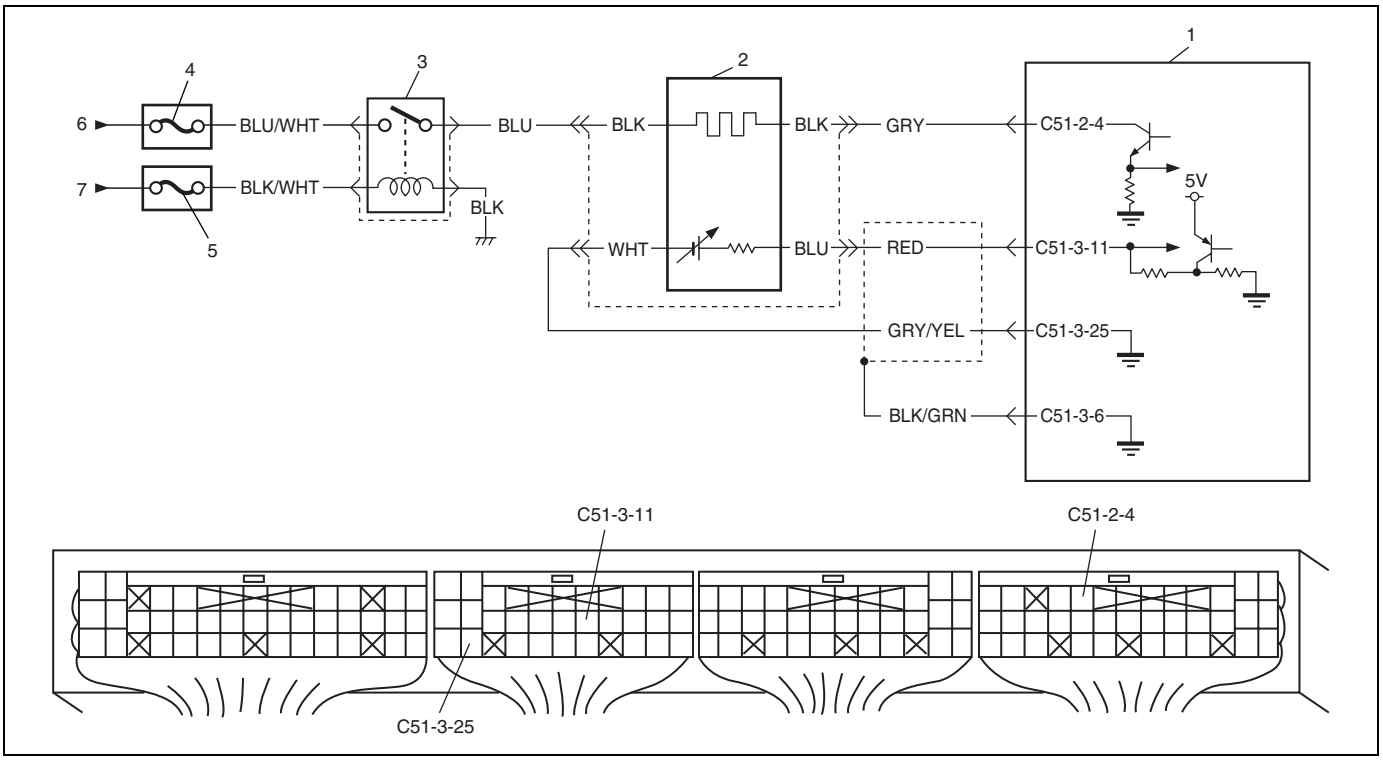
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat step 3) through 6).

### 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" in this section. |
| 2 | 1) Replace HO2S–1 and recheck.<br>Is DTC P0133 detected? | Substitute a known-good ECM and recheck. | HO2S–1 malfunction. |

# DTC P0134 O2 Sensor (Bank 1 Sensor-1) No Activity Detected

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected in vehicle running state while running under driving conditions described for "DTC Confirmation Procedure".<br>Output voltage of HO2S–1 does not exceed 0.45 V for specified time. (2 driving cycle detection logic) | • HO2S–1 or its circuit<br>• Fuel system<br>• ECM<br>• Air intake system (clog or leakage)<br>• Exhaust gas leakage<br>• PCV hose |

## 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.**

**NOTE:**

**Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°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 turned OFF.

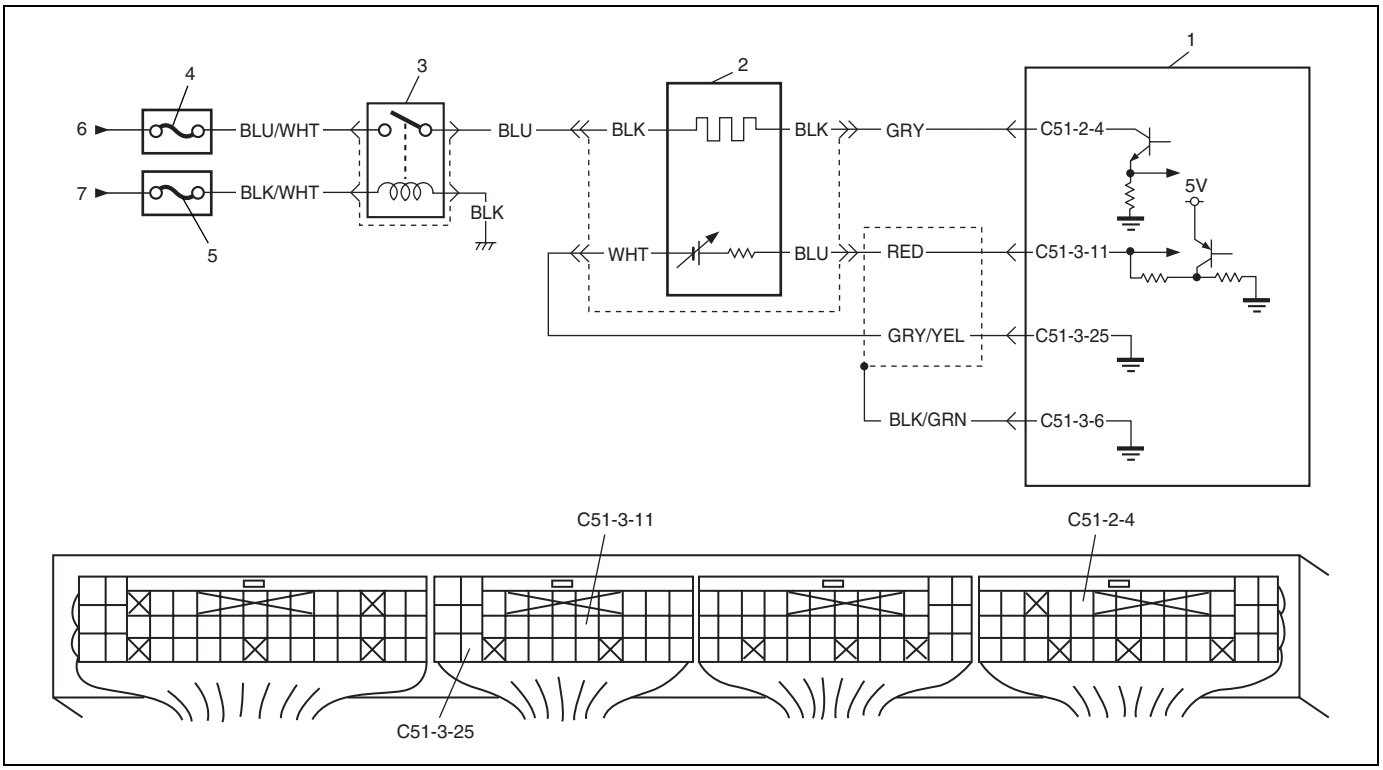
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Steps 3) through 6).

**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" in this section. |
| 2 | **HO2S–1 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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) and check HO2S output voltage displayed on scan tool.<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–1 check**<br>1) With ignition switch turned OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter "WHT" wire terminal and "BLU" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open or short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace HO2S–1. |
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to "DTC P0171/P0172 Fuel System Too Lean/Rich (Bank 1)" and "DTC P0174/P175 Fuel System Too Lean/Rich (Bank 2)" in this section. |

# DTC P0135 HO2S-1 (Bank 1) Heater Circuit Malfunction

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following condition is detected when HO2S heater is electrically live (2 driving cycle detection logic).<br>• Current of HO2S heater is 5.3 A or more or less than 0.09 A, or<br>• Voltage of HO2S heater is 14.0 V or higher or lower than 11.7 V. | HO2S–1 heater circuit<br>HO2S–1 heater<br>ECM<br>HO2S heater relay |

## DTC Confirmation Procedure

**NOTE:**

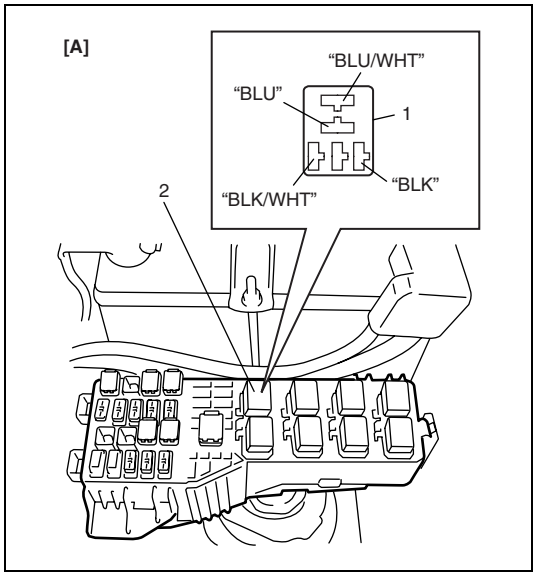
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 5 min.
3) Check pending DTC by using scan tool.

## Troubleshooting

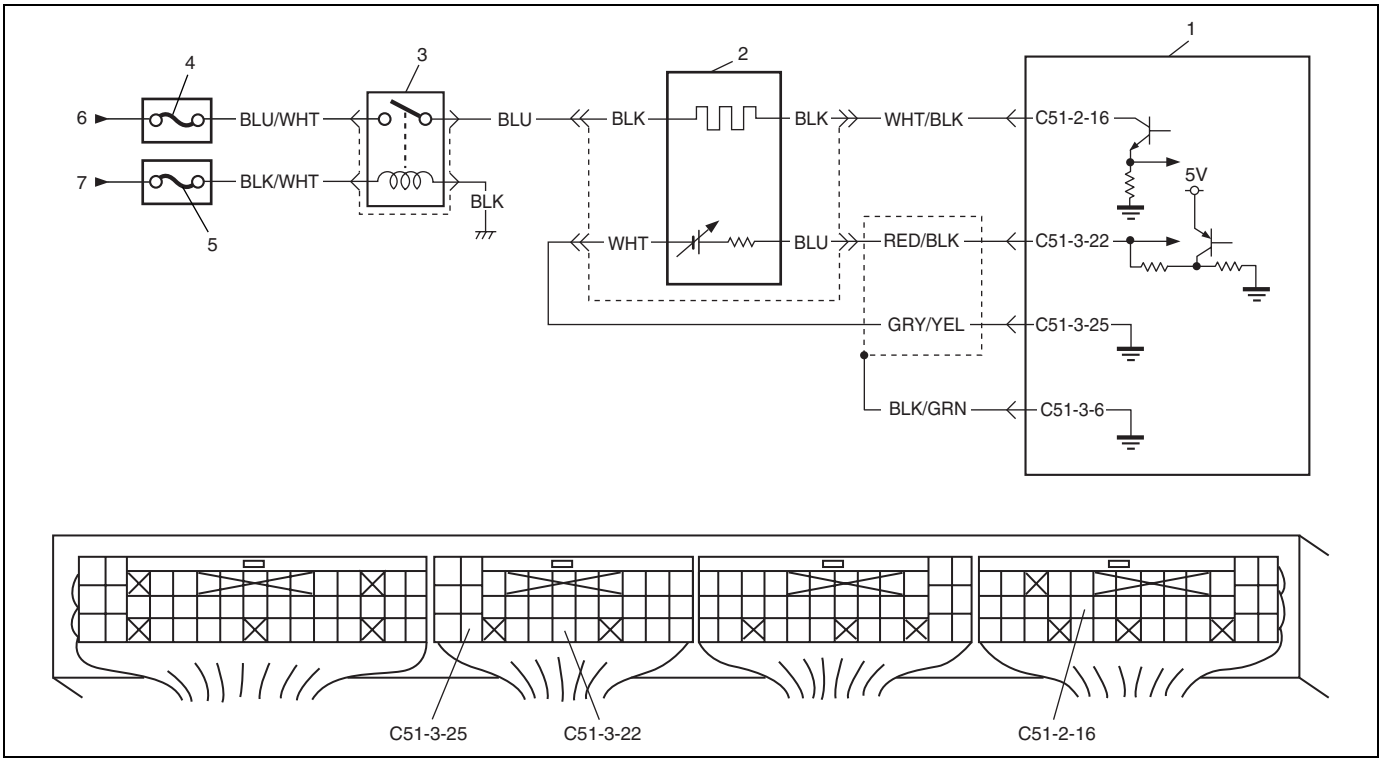
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | **HO2S–1 heater check**<br>1) Disconnect HO2S–1 coupler with ignition switch OFF.<br>2) Check resistance between “GRY” wire terminal and “BLU” wire terminal of HO2S–1 coupler.<br>**HO2S–1 heater resistance:**<br>**5.0 – 6.4 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–1. |
| 3 | **HO2S heater power supply check**<br>1) With ignition switch ON leaving engine OFF, check voltage between “BLK/WHT” wire terminal of HO2S heater relay coupler and ground, “BLU/WHT” wire terminal of HO2S heater relay coupler and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | “HO2S”, and/or “IG COIL” fuse blown.<br>If OK, faulty “BLK/WHT” wire or “BLU/WHT” wire. |
| 4 | **HO2S heater control circuit check**<br>1) With ignition switch OFF, install HO2S heater relay.<br>2) With ignition switch ON leaving engine OFF, check voltage between C51-2-4 and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM and recheck. | Faulty HO2S heater relay or “BLK” wire open, “BLU” wire open or shorted to ground circuit<br>or<br>“GRY” wire open or shorted to ground circuit.<br>If OK, substitute a known-good ECM and recheck. |




| [A]: Fig. for Step 3 |
|---|
| 1. Fuse/relay box coupler viewed from relay side |
| 2. HO2S heater relay |

# DTC P0137 O2 Sensor (Bank 1 Sensor-2) Circuit Low Voltage

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–2 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| 4.5 V or more HO2S circuit voltage is detected when 5 V power is connected to HO2S circuit in ECM.<br>(2 driving cycle detection logic) | • HO2S–2 or its circuit<br>• 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.**

**NOTE:**

**Check to make sure that the following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.

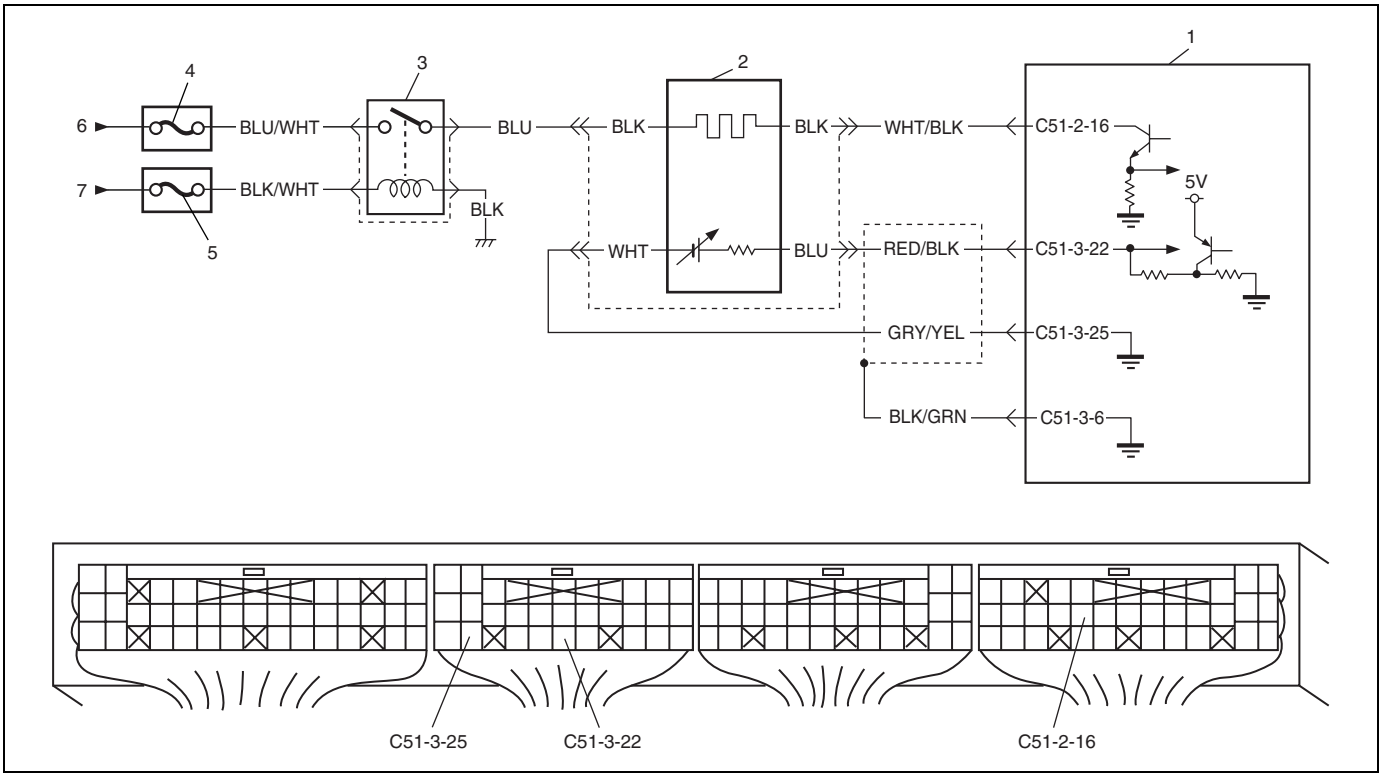
3) Warm up engine completely.
4) Keep driving 50 – 60 km/h (30 – 40 mph) for 3 min. or more.
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 5).

**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" in this section. |
| 2 | **HO2S–2 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 3 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **HO2S–2 check**<br>1) With ignition switch turned OFF, disconnect HO2S–2 coupler.<br>2) Connect voltmeter between "WHT" wire terminal and "BLU" wire terminal of HO2S–2 coupler.<br>3) Start engine and check voltmeter while repeating racing engine.<br>Is over and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open/short.<br>If wire and connection are OK, substitute a known-good ECM and recheck. | Replace HO2S–2. |

# DTC P0138/P0140 O2 Sensor (Bank 1 Sensor-2) Circuit High Voltage/No Activity Detected

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–2 (BANK–1) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0138:**<br>• While running with A/F feed back, average output voltage during specified time is too high.<br>or<br>• While running with A/F feed back, minimum output voltage during specified time is higher than specified value.<br>(2 driving cycle detection logic) | • HO2S–2 or its circuit<br>• Fuel system<br>• ECM |
| **DTC P0140:**<br>• While running with A/F feed back, average output voltage during specified time is too low.<br>or<br>• While running with A/F feed back, maximum output voltage during specified time is lower than specified value.<br>(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 with 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 temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed till engine is warmed up completely (Changed of vehicle speed is permitted in this step).
5) Keep driving 50 – 60 km/h (30 – 40 mph) for 8 min. or more.
6) Increase vehicle speed to 100 – 110 km/h (60 – 70 mph).
7) Release accelerator pedal and with engine brake applied, keep vehicle coasting and then stop vehicle.
8) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 7).

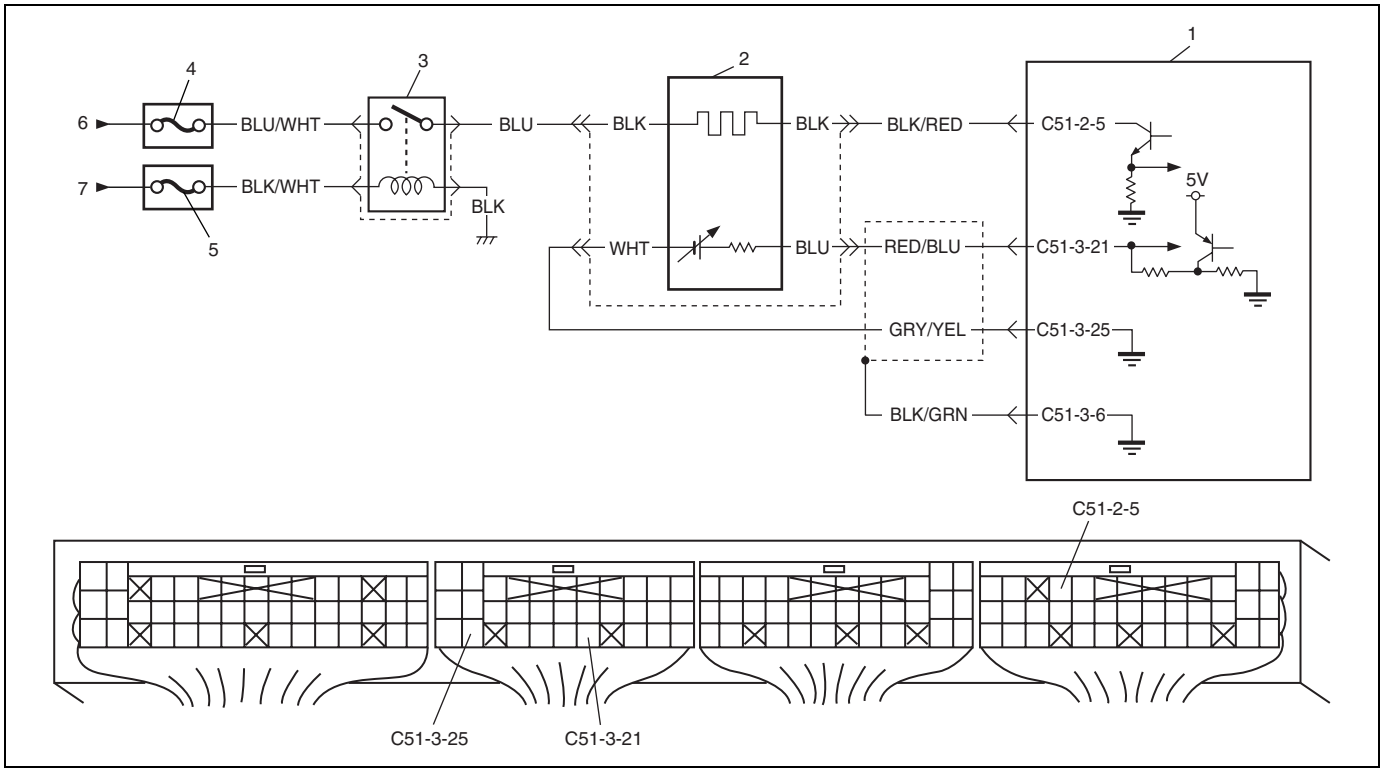
**Troubleshooting**

| 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" in this section. |
| 2 | **HO2S–2 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 2 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–2 check**<br>1) With ignition switch turned OFF, disconnect HO2S–2 coupler.<br>2) Connect voltmeter between "WHT" wire terminal and "BLU" wire terminal of HO2S–2 coupler.<br>3) Start engine and check voltmeter while repeating racing engine.<br>Is over and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open/short.<br>If wire and connection are OK, substitute a known-good ECM and recheck. | Replace HO2S–2. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to "DTC P0171/ P0172 Fuel System Too Lean/Rich (Bank 1)" and "DTC P0174/ P0175 Fuel System Too Lean/Rich (Bank 2)" in this section. |

# DTC P0150 (DTC No.26) HO2S-1 (Bank 2) Circuit Malfunction or No Activity Detected

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

**NOTE:**

**For vehicle with diagnosis connector, DTC will set when following only (*) mark condition is detected.**

| DTC Detecting Condition | Trouble Area |
|---|---|
| Any one of the following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>• 4.5 V or more HO2S circuit voltage is detected, when 5 V power is connected to HO2S circuit in ECM, or<br>• Max. output voltage of HO2S is 0.6 V or lower on average and its minimum voltage on average is 0.3 V or lower.<br>• Min. output voltage of HO2S is over 3.0 V or<br>• Max. output voltage of HO2S is 0.74 V or higher on average and its min. voltage on average is 0.33 V or higher.<br>• Output voltage of HO2S–1 does not exceed 0.45 V for specified time.<br>(2 driving cycle detection logic) | HO2S–1 or its circuit.<br>Fuel system<br>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.**

**NOTE:**

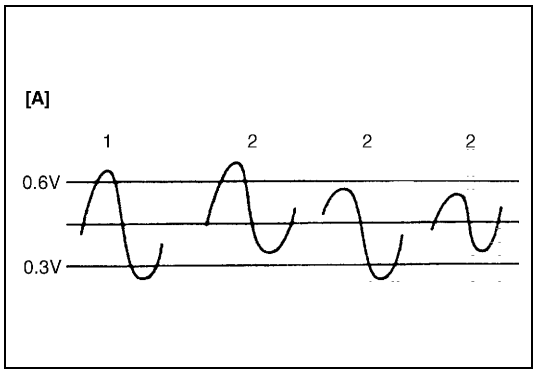
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat step 3) through 6).

### 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" in this section. |
| 2 | **HO2S–1 output voltage check**<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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 and check HO2S output voltage displayed on scan tool. See Fig.<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–1 check**<br>1) With ignition switch OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter to "GRY/YEL" wire terminal and "RED/BLU" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "RED/BLU" or "GRY/YEL" circuit open or short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace HO2S–1. |

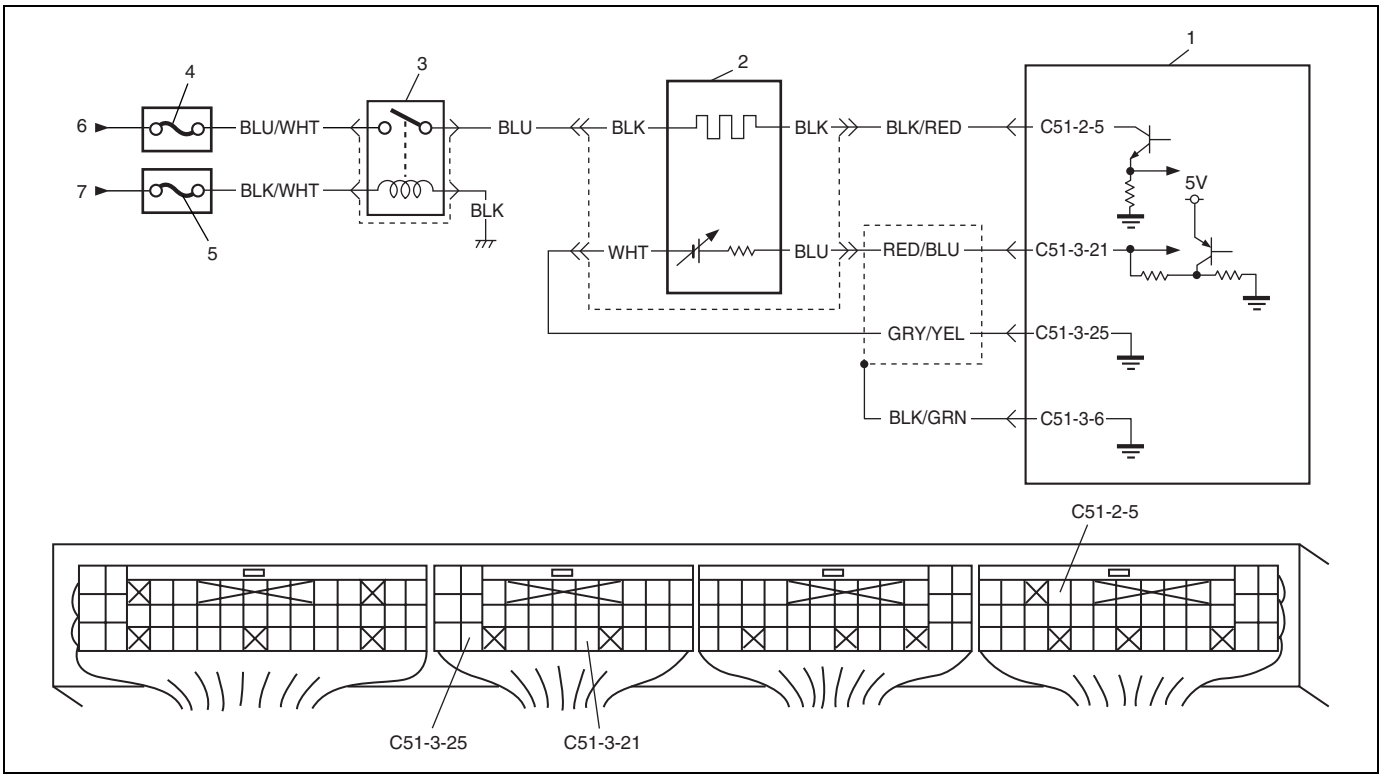
| Step | Action | Yes | No |
|---|---|---|---|
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to DTC P0174/ P0175 Diag. Flow Table. |




| [A]: Fig. for Step 2 |
|---|
| 1. Normal |
| 2. NG |

# DTC P0151/P0152 O2 Sensor (Bank 2 Sensor-1) Circuit Low/High Voltage

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>**DTC P0151:**<br>• 4.5 V or more HO2S circuit voltage is detected, when 5 V power is connected to HO2S circuit in ECM, or<br>• Max. output voltage of HO2S is 0.6 V or lower on average and its minimum voltage on average is 0.3 V or lower.<br>(2 driving cycle detection logic)<br>**DTC P0152:**<br>• Min. output voltage of HO2S is over 3.01 V or<br>• Max. output voltage of HO2S is 0.74 V or higher on average and its min. voltage on average is 0.34 V or higher.<br>(2 driving cycle detection logic) | • HO2S–1 or its circuit.<br>• Fuel system<br>• ECM<br>• Air intake system (clog or leakage)<br>• Exhaust gas leakage |

## 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.**

**NOTE:**

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

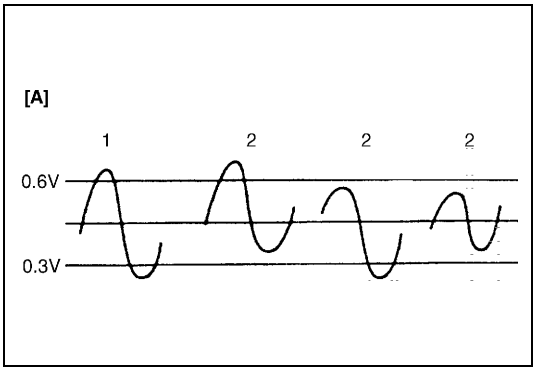
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Steps 3) through 6).

**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" in this section. |
| 2 | **HO2S–1 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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) and check HO2S output voltage displayed on scan tool. (See Fig.)<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–1 check**<br>1) With ignition switch turned OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter "WHT" wire terminal and "BLU" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open or short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace HO2S–1. |

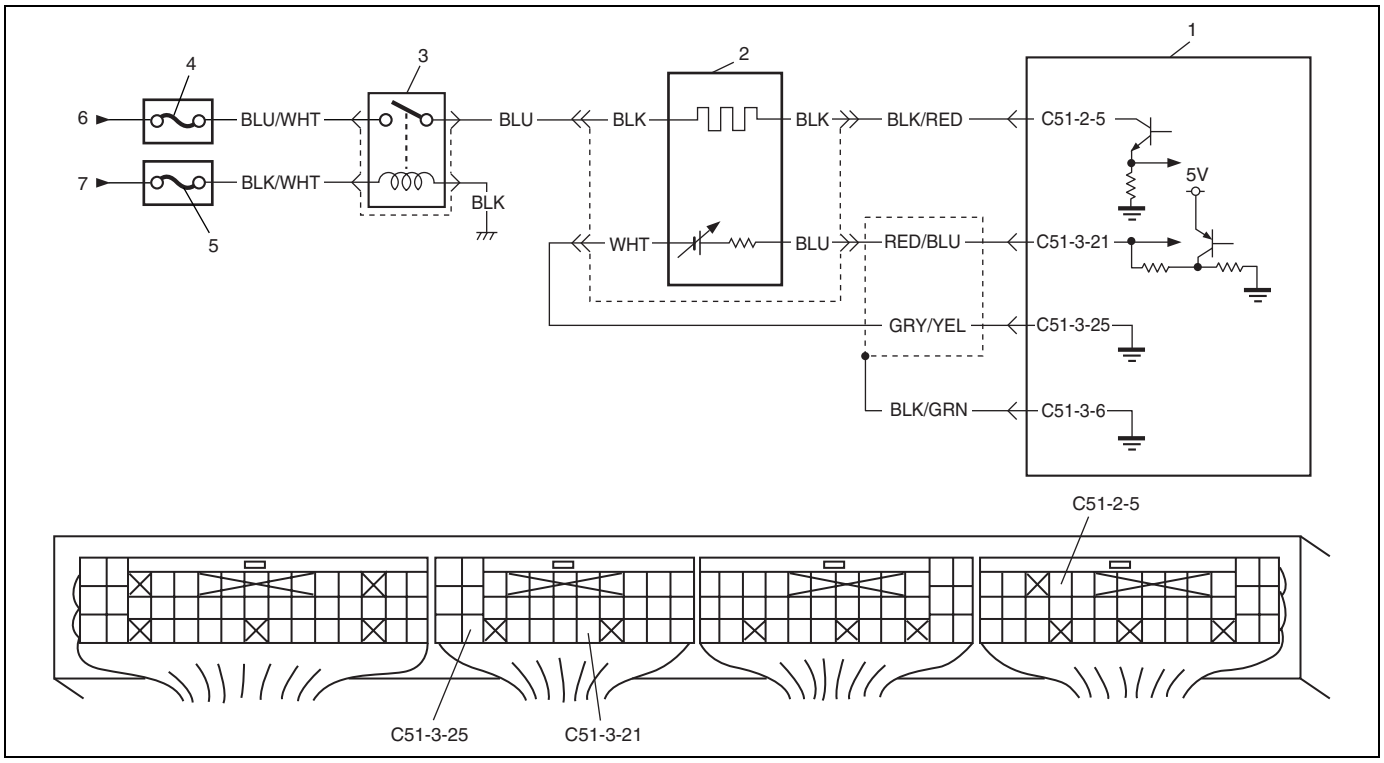
| Step | Action | Yes | No |
|---|---|---|---|
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to “DTC P0171/P0172 Fuel System Too Lean/ Rich (Bank 1)” and “DTC P0174/P0175 Fuel System Too Lean/Rich (Bank 2)” in this section. |




| | |
|---|---|
| [A]: | Fig for Step 2 |
| 1. | Normal |
| 2. | NG |

# DTC P0153 HO2S-1 (Bank 2) Circuit Slow Response

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following conditions are detected in idle state while running under driving conditions described for "DTC Confirmation Procedure".<br>Hi/Lo cycle (TRANS TIME displayed on scan tool) of HO2S–1 output voltage is longer than specification or response rates of Hi → Lo and Lo → Hi (TRANS TIME displayed as R → L threshold V or L → R threshold V on scan tool) are longer than specification.<br>(2 driving cycle detection logic) | HO2S–1<br>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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

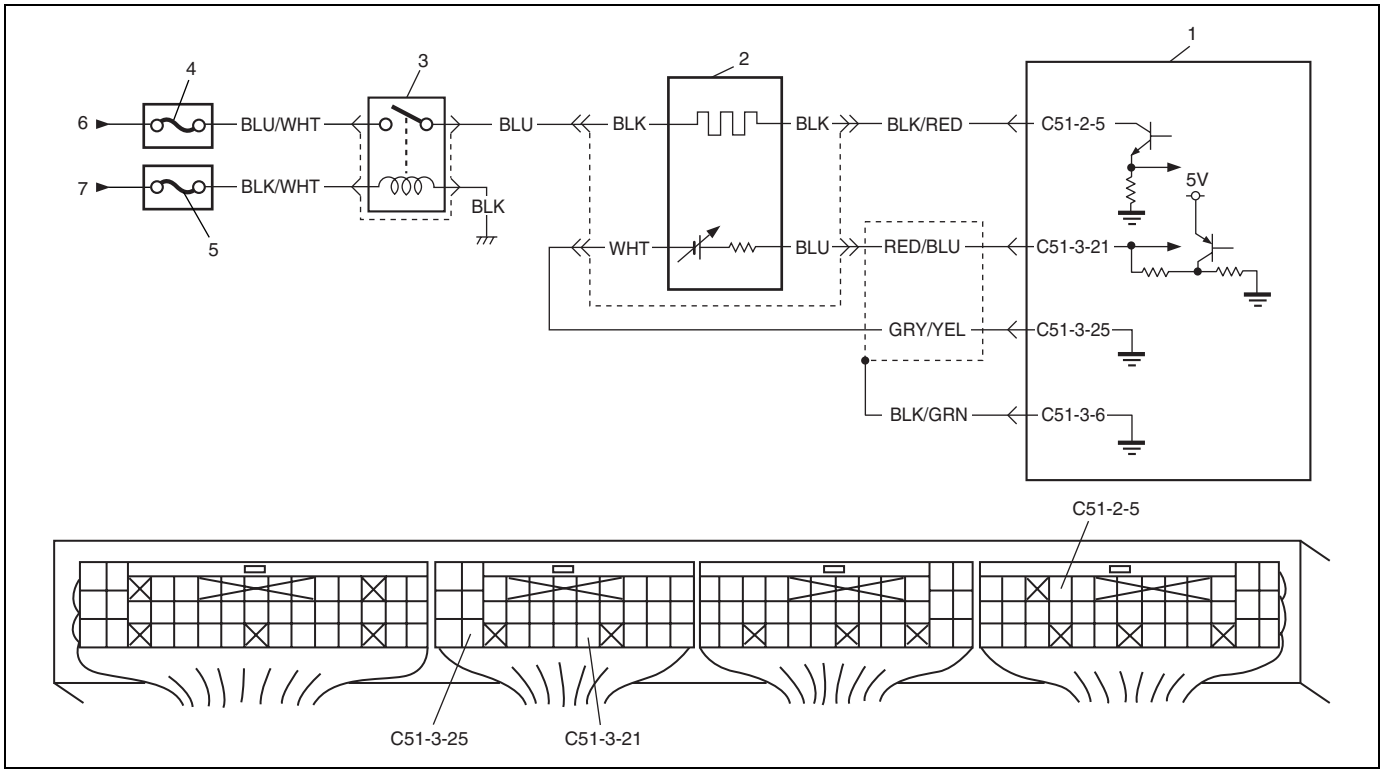
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat step 3) through 6).

### 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" in this section. |
| 2 | 1) Replace HO2S–1 and recheck.<br>Is DTC P0153 detected? | Substitute a known-good ECM and recheck. | HO2S–1 malfunction. |

# DTC P0154 O2 Sensor (Bank 2 Sensor-1) No Activity Detected

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (Bank–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| The following conditions are detected in vehicle running state while running under driving conditions described for "DTC Confirmation Procedure".<br>Output voltage of HO2S–1 does not exceed 0.45 V for specified time.<br>(2 driving cycle detection logic) | • HO2S–1 or its circuit<br>• Fuel system<br>• 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.**

**NOTE:**

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

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

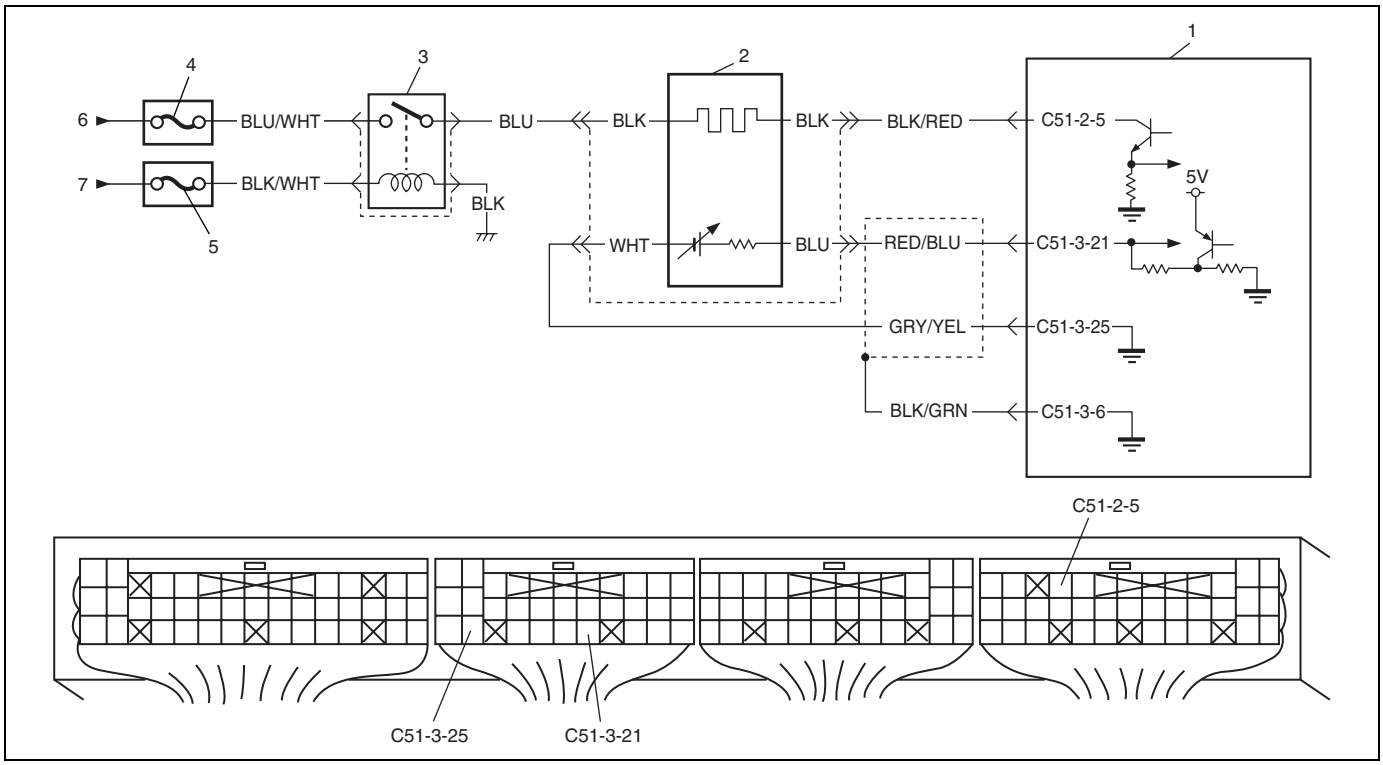
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed for 2 min. or more (Change of vehicle speed is permitted in this step).
5) Stop vehicle, and run engine at idle speed for 1 min.
6) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle condition (environmental) and repeat Steps 3) through 6).

**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" in this section. |
| 2 | **HO2S–1 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Warm up engine to normal operating temperature and keep it at 2000 r/min. for 60 sec.<br>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) and check HO2S output voltage displayed on scan tool.<br>Is over 0.6 V and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–1 check**<br>1) With ignition switch turned OFF, disconnect HO2S–1 connector.<br>2) Check for proper connection to HO2S–1 at each terminal.<br>3) If OK, connect voltmeter "WHT" wire terminal and "BLU" wire terminal of HO2S–1 connector.<br>4) Start engine and check voltmeter while repeating racing engine.<br>Is over 0.6 V and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open or short. If wire and connections are OK, substitute a known-good ECM and recheck. | Replace HO2S–1. |
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within – 20 to +20%? | Intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to "DTC P0171/ P0172 Fuel System Too Lean/Rich (Bank 1)" and "DTC P0174/ 0175 Fuel System Too Lean/Rich (Bank 2)" in This section. |

# DTC P0155 HO2S-1 (Bank 2) Heater Circuit Malfunction

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–1 (BANK–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Following condition is detected when HO2S heater is electrically live (2 driving cycle detection logic).<br>• Current of HO2S heater is 5.3 A or more or less than 0.09 A, or<br>• Voltage of HO2S heater is 14.0 V or higher or lower than 11.7 V. | HO2S–1 heater circuit<br>HO2S–1 heater<br>ECM |

## DTC Confirmation Procedure

**NOTE:**

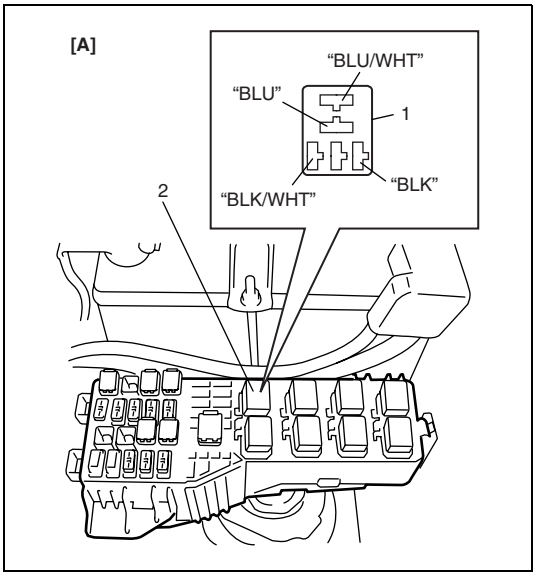
**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 5 min.
3) Check pending DTC by using scan tool.

## Troubleshooting

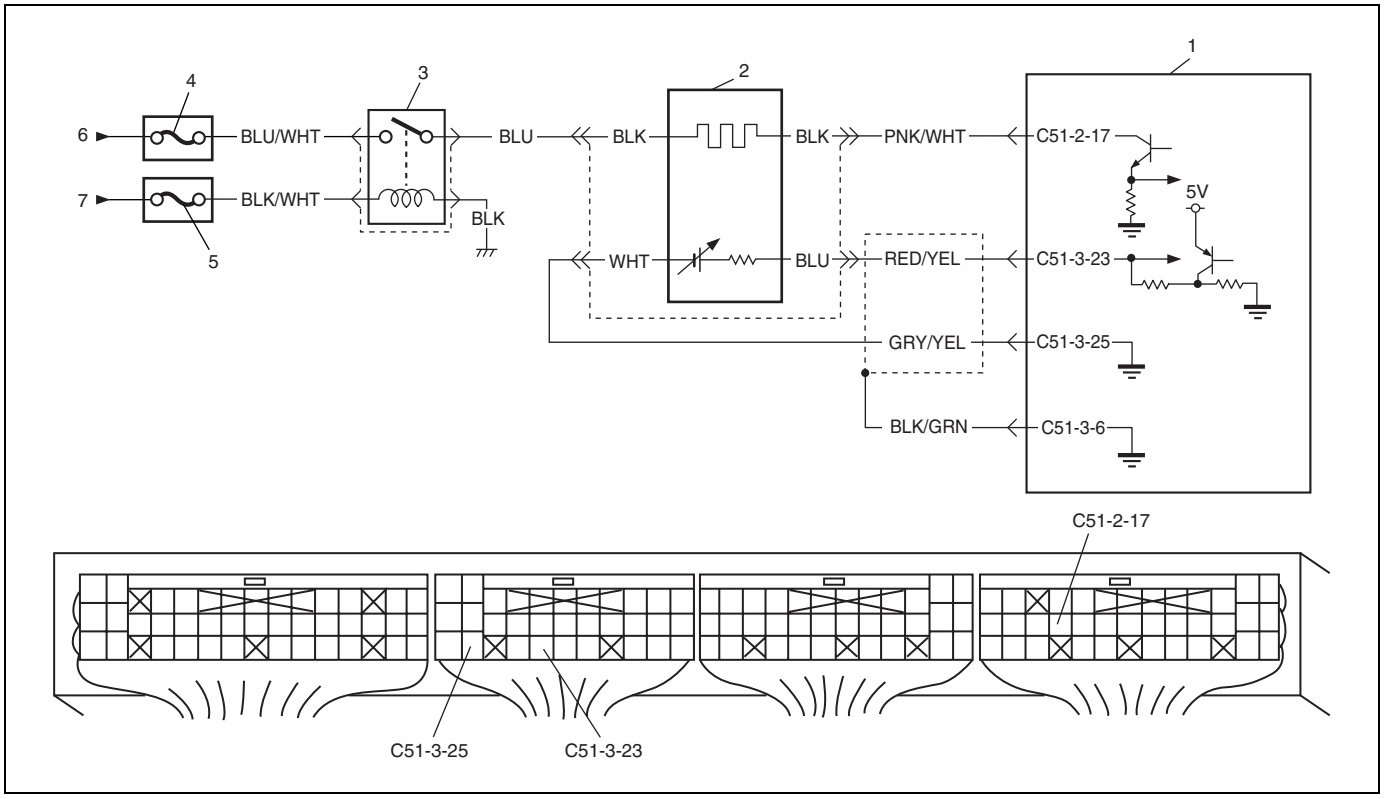
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | **HO2S–1 heater check**<br>1) Disconnect HO2S–1 coupler with ignition switch OFF.<br>2) Check resistance between "BLK/RED" wire terminal and "BLU" wire terminal of HO2S–1 coupler.<br>**HO2S–1 heater resistance:**<br>**5.0 – 6.4 Ω (at 20°C (68°F))**<br>Is it within above specification? | Go to Step 3. | Replace HO2S–1. |
| 3 | **HO2S heater power supply check**<br>1) With ignition switch ON leaving engine OFF, check voltage between "BLK/WHT" wire terminal of HO2S heater relay coupler and ground, "BLU/WHT" wire terminal of HO2S heater relay coupler and ground. (See Fig.)<br>Is each voltage 10 – 14 V? | Go to Step 4. | Main fuse and/or "IG COIL" fuse blown.<br>If OK, faulty "BLK/WHT" wire or "BLU/WHT" wire. |
| 4 | **HO2S heater control circuit check**<br>1) With ignition switch OFF, install HO2S heater relay.<br>2) With ignition switch ON leaving engine OFF, check voltage between C51-2-4 and ground.<br>Is the voltage 10 – 14 V? | Substitute a known-good ECM and recheck. | Faulty HO2S heater relay or "BLK" wire open, "BLU" wire open or shorted to ground circuit, "BLK/RED" wire open or shorted to ground circuit.<br>If OK, substitute a known-good ECM and recheck. |




| [A]: Fig. for Step 3 |
|---|
| 1. Fuse/relay box coupler viewed from relay side |
| 2. HO2S heater relay |

# DTC P0157 O2 Sensor (Bank 2 Sensor-2) Circuit Low Voltage

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–2 (Bank–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| 4.5 V or more HO2S circuit voltage is detected when 5 V power is connected to HO2S circuit in ECM.<br>(2 driving cycle detection logic) | HO2S–2 or its circuit<br>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.**

**NOTE:**

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

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

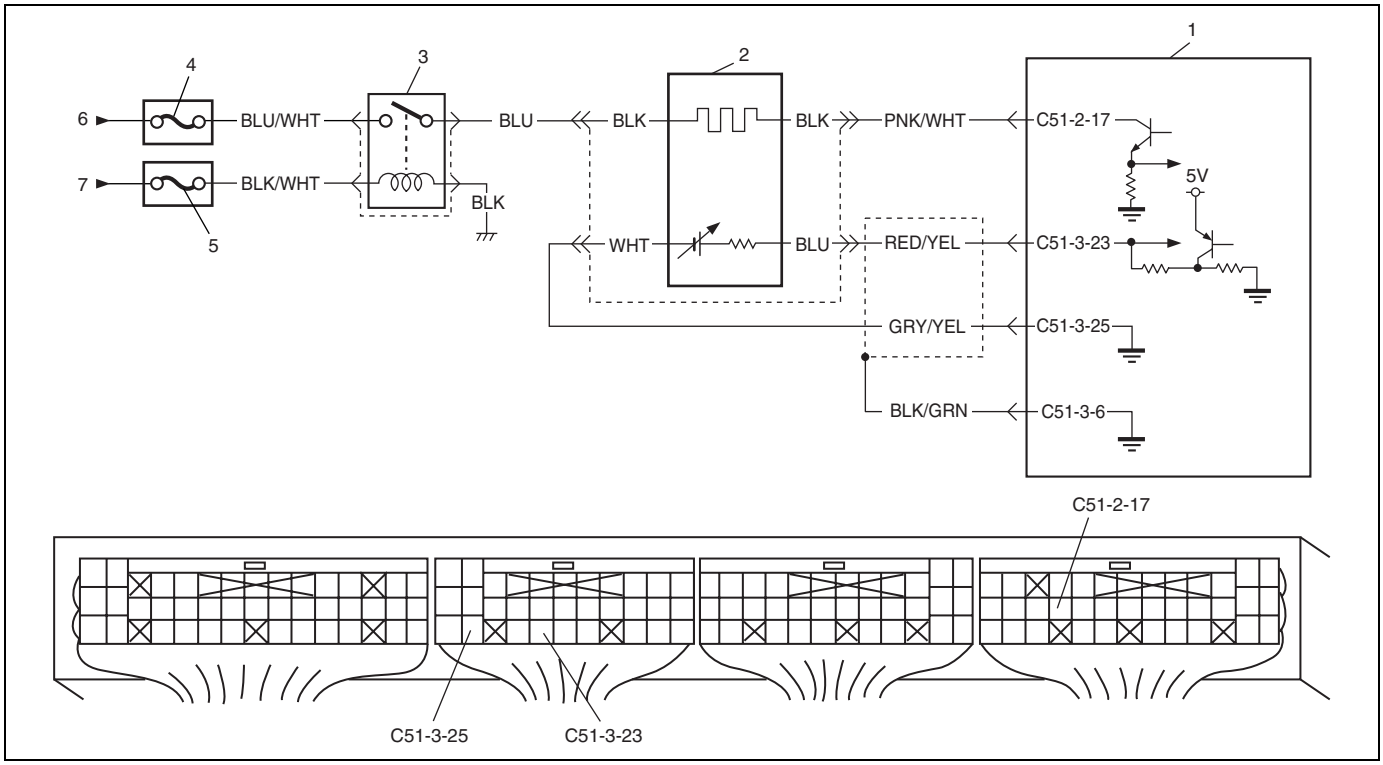
1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Warm up engine completely.
4) Keep driving 50 – 60 km/h (30 – 40 mph) for 3 min. or more.
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 5).

**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" in this section. |
| 2 | **HO2S–2 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 3 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **HO2S–2 check**<br>1) With ignition switch turned OFF, disconnect HO2S–2 coupler.<br>2) Connect voltmeter between "WHT" wire terminal and "BLU" wire terminal of HO2S–2 coupler.<br>3) Start engine and check voltmeter while repeating racing engine.<br>Is over and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open/short.<br>If wire and connection are OK, substitute a known-good ECM and recheck. | Replace HO2S–2. |

# DTC P0158/P0160 O2 Sensor (Bank 2 Sensor-2) Circuit High Voltage/No Activity Detected

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. HO2S heater relay | 5. "IG COIL" fuse | 7. To ignition switch |
| 2. HO2S–2 (Bank–2) | 4. "HO2S" fuse | 6. To battery | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0158:**<br>• While running with A/F feed back, average output voltage during specified time is too high.<br>or<br>• While running with A/F feed back, minimum output voltage during specified time is higher than specified value.<br>(2 driving cycle detection logic) | • HO2S–2 or its circuit<br>• Fuel system<br>• ECM |
| **DTC P0160:**<br>• While running with A/F feed back, average output voltage during specified time is too low.<br>or<br>• While running with A/F feed back, maximum output voltage during specified time is lower than specified value.<br>(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 with 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 temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data in ECM memory by using scan tool and start engine.
3) Increase vehicle speed to 55 km/h (35 mph) or more.
4) Keep driving above vehicle speed till engine is warmed up completely (Changed of vehicle speed is permitted in this step).
5) Keep driving 50 – 60 km/h (30 – 40 mph) for 8 min. or more.
6) Increase vehicle speed to 100 – 110 km/h (60 – 70 mph).
7) Release accelerator pedal and with engine brake applied, keep vehicle coasting and then stop vehicle.
8) Check if pending DTC exists by using scan tool. If not, check if oxygen sensor monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and oxygen sensor monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 7).

### 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" in this section. |
| 2 | **HO2S–2 output voltage check**<br>1) Connect scan tool to DLC with ignition switch turned OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 2 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Go to Step 4. | Go to Step 3. |
| 3 | **HO2S–2 check**<br>1) With ignition switch turned OFF, disconnect HO2S–2 coupler.<br>2) Connect voltmeter between "WHT" wire terminal and "BLU" wire terminal of HO2S–2 coupler.<br>3) Start engine and check voltmeter while repeating racing engine.<br>Is over and below 0.3 V indicated? | "WHT" or "BLU" circuit wire is open/short.<br>If wire and connection are OK, substitute a known-good ECM and recheck. | Replace HO2S–2. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | **Short term fuel trim check**<br>1) Run engine at 2000 r/min. for 60 sec.<br>2) With engine idling, check short term fuel trim displayed on scan tool.<br>Is it within –20 to +20%? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to "DTC P0171/P0172 Fuel System Too Lean/Rich (Bank 1)" and "DTC P0174/P0175 Fuel System Too Lean/Rich (Bank 2)" in this section. |

## DTC P0171/P0172 Fuel System Too Lean/Rich (Bank 1)

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| When running after engine warmed (2 driving cycle detection logic).<br>• Short term fuel trim exceeding 15% or long term fuel trim exceeding 20% and total trim exceeding 43% is detected.<br>– Fuel system too lean<br>• Short term fuel trim less than – 11% or long term fuel trim less than – 11% and total trim less than – 30% is detected.<br>– Fuel trim too rich | • Vacuum leaks (air inhaling)<br>• Exhaust gas leakage<br>• Fuel pressure out of specification<br>• Heated oxygen sensor malfunction<br>• EGR system malfunction<br>• MAF sensor poor performance<br>• ECT sensor poor performance<br>• Fuel level sensor. |

### 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.**

**NOTE:**

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

- **Intake air temp. at start: –8 – 60°C (18 – 140°F)**
- **Engine coolant temp. at start: –8 – 95°C (18 – 203°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: 110°C (230°F) or lower**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 3 min. or more.
5) Stop vehicle and check pending DTC by using scan tool.

## 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” in this section. |
| 2 | Is there DTC (s) other than “DTC P0171/ P0172”? | Go to applicable “DTC Flow Table”. | Go to Step 3. |
| 3 | Check intake system and exhaust system for leakage.<br>Are intake system and exhaust system in good condition? | Go to Step 4. | Repair or replace. |
| 4 | Check fuel pressure referring to “Table B-3” in this section.<br>Is check result satisfactory? | Go to Step 5. | Repair or replace. |
| 5 | Check fuel injectors referring to “Fuel Injector” under “Fuel Delivery System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 6. | Faulty injector (s). |
| 6 | Check fuel level sensor referring to “Fuel Level Sensor (Sender Gauge)” in Section 8C.<br>Is check result satisfactory? | Go to Step 7. | Faulty fuel level sensor or its circuit. |
| 7 | Check MAF sensor for performance referring to “Mass Air Flow Sensor (MAF sensor)” under “Electronic Control System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 8. | Faulty MAF sensor or its circuit. |
| 8 | Check ECT sensor referring to “Engine Coolant Temperature Sensor (ECT sensor)” under “Electronic Control System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 9. | Faulty ECT sensor. |
| 9 | Check HO2S–1 referring to “DTC P0134 Diag. Flow Table”.<br>Is check result satisfactory? | Substitute a known-good ECM and recheck. | Faulty HO2S–1. |

# DTC P0174/P0175 Fuel System Too Lean/Rich (Bank 2)

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| When running after engine warmed (2 driving cycle detection logic).<br>• Short term fuel trim exceeding 15% or long term fuel trim exceeding 20% and total trim exceeding 43% is detected.<br>– Fuel system too lean<br>• Short term fuel trim less than – 11% or long term fuel trim less than – 11% and total trim less than – 30% is detected.<br>– Fuel trim too rich | • Vacuum leaks (air inhaling)<br>• Exhaust gas leakage<br>• Fuel pressure out of specification<br>• Heated oxygen sensor malfunction<br>• EGR system malfunction<br>• MAF sensor poor performance<br>• ECT sensor poor performance<br>• Fuel level sensor. |

## 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.**

**NOTE:**

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

- **Intake air temp. at start: –8 – 60°C (18 – 140°F)**
- **Engine coolant temp. at start: –8 – 95°C (18 – 203°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: 110°C (230°F) or lower**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 50 – 60 km/h (30 – 40 mph).
4) Keep driving above vehicle speed for 3 min. or more.
5) Stop vehicle and check pending DTC by using scan tool.

## 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” in this section. |
| 2 | Is there DTC (s) other than “DTC P0174/ P0175”? | Go to applicable “DTC Flow Table”. | Go to Step 3. |
| 3 | Check intake system and exhaust system for leakage.<br>Are intake system and exhaust system in good condition? | Go to Step 4. | Repair or replace. |
| 4 | Check fuel pressure referring to “Table B-3” in this section.<br>Is check result satisfactory? | Go to Step 5. | Repair or replace. |
| 5 | Check fuel injectors referring to “Fuel Injector” under “Fuel Delivery System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 6. | Faulty injector (s). |
| 6 | Check fuel level sensor referring to “Fuel Level Gauge (Sender Gauge)” in Section 8C.<br>Is check result satisfactory? | Go to Step 7. | Faulty fuel level sensor or its circuit. |
| 7 | Check MAF sensor for performance referring to “Mass Air Flow Sensor (MAF sensor)” under “Electronic Control System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 8. | Faulty MAF sensor or its circuit. |
| 8 | Check ECT sensor referring to “Engine Coolant Temperature Sensor (ECT sensor)” under “Electronic Control System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 9. | Faulty ECT sensor. |
| 9 | Check HO2S–1 referring to “DTC P0154 O2 Sensor (Bank 2 Sensor–1) No Activity Detected”.<br>Is check result satisfactory? | Substitute a known-good ECM and recheck. | Faulty HO2S–1. |

# DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 Random Misfire/Cylinder 1 Misfire/Cylinder 2 Misfire/Cylinder 3 Misfire/Cylinder 4 Misfire Detected/Cylinder 5 Misfire Detected/Cylinder 6 Misfire Detected

## System Description

ECM measures the angle speed 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 the ECM beyond the DTC detecting condition, it determines the cylinder where the misfire occurred and outputs it as DTC.

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC P0300:<br>• 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.)<br>• Misfire which affects exhaust emission adversely during 1000 engine revolutions is detected at 2 or more cylinders (2 driving cycle detection logic) | • Ignition system<br>• Fuel injector and its circuit<br>• Fuel line pressure<br>• Engine compression<br>• Abnormal air drawn in<br>• EGR system<br>• Fuel level sensor<br>• Valve lash adjuster<br>• Valve timing |
| DTC P0301, P0302, P0303, P0304, P0305, P0306:<br>• Misfire which causes catalyst to overheat during 200 engine revolutions is detected at 1 cylinder. (MIL flashes as long as this misfire occurs continuously.)<br>• Misfire which affects exhaust emission adversely during 1000 engine revolutions 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 with 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.: –8 – 70°C (18 – 158°F)**
- **Engine coolant temp.: –8°C (18°F) or higher**
- **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, pending DTC and freeze frame data by using scan tool and start engine.
3) Increase vehicle speed to speed recorded as freeze frame data (V) ± 5 km/h when detecting misfire.
4) Keep driving above vehicle speed for 5 min.
5) Stop vehicle and check DTC (or pending DTC) by using scan tool.

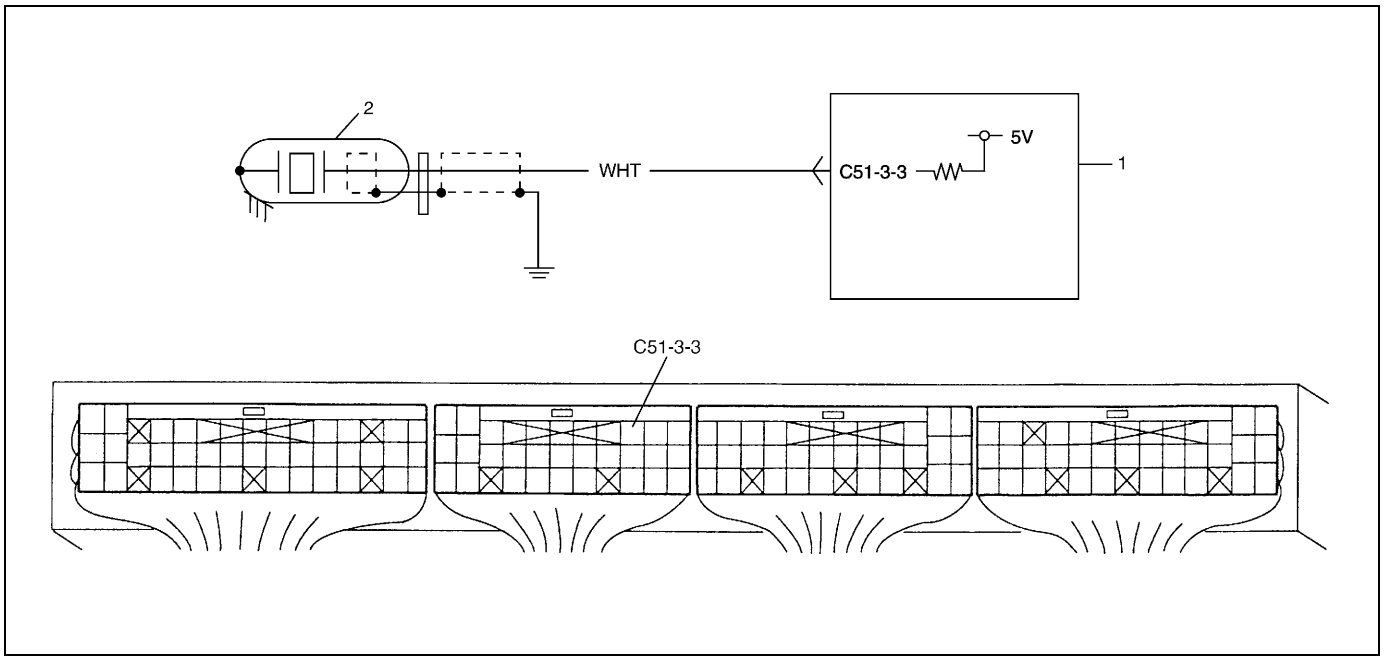
## Troubleshooting

| 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” in this section. |
| 2 | **Ignition system inspection**<br>1) Check spark plug and ignition spark of cylinder where misfire occurs, referring to “Spark Plug” and “Ignition Spark Check” in Section 6F2.<br>Is it in good condition? | Go to Step 3. | Faulty ignition coil, wire harness, or other system parts. |
| 3 | **Fuel injector circuit inspection**<br>1) Using sound scope, check each injector operating sound at engine cranking or idling.<br>Do all injectors make operating sound? | Go to Step 4. | Check coupler connection and wire harness of injector not making operating sound and injector itself.<br>If OK, substitute a known-good ECM and recheck. |
| 4 | **Fuel pressure inspection**<br>1) Check fuel pressure referring to “Table B-3” in this section.<br>Is check result satisfactory? | Go to Step 5. | Repair or replace. |
| 5 | **Fuel injector inspection**<br>1) Check fuel injector(s) referring to “Fuel Injector” under “Fuel Delivery System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 6. | Replace. |
| 6 | **Ignition timing inspection**<br>1) Check ignition timing referring to “Ignition Timing Check and Adjustment” in Section 6F2.<br>Is check result satisfactory? | Go to Step 7. | Adjust or check system related parts. |
| 7 | **EGR system inspection**<br>1) Check EGR system referring to “EGR System (If Equipped)” under “Emission Control System” in Section 6E2.<br>Is check result satisfactory? | Go to Step 8. | Repair or replace. |
| 8 | **Fuel level sensor inspection**<br>1) Check fuel level sensor referring to “Fuel Level Gauge (Sender Gauge)” in Section 8C.<br>Is check result satisfactory? | Go to Step 9. | Repair or replace. |

| Step | Action | Yes | No |
|---|---|---|---|
| 9 | Check engine mechanical parts or system which can cause engine rough idle or poor performance.<br>• Engine compression (See "Compression Check" in Section 6A2).<br>• Valve lash or lash adjuster (See "Camshaft and Valve Lash Adjuster" in Section 6A2).<br>• Valve timing (Timing chain installation. See Section 6A2).<br>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. |

## DTC P0325 (DTC No.43) Knock Sensor Circuit Malfunction

### Circuit Description




| |
|---|
| 1. ECM |
| 2. Knock sensor |

### DTC Detecting Condition and Trouble Area

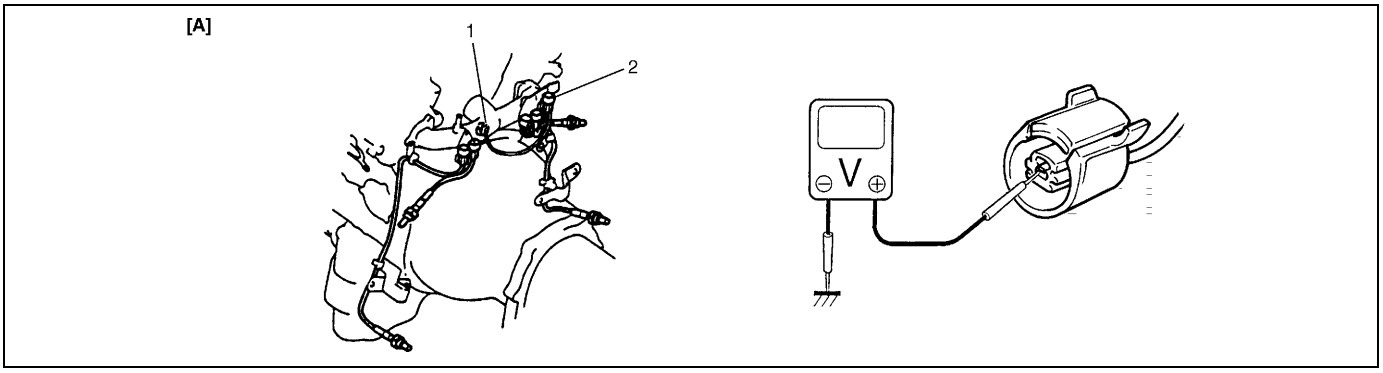
| DTC Detecting Condition | Trouble Area |
|---|---|
| DTC will set when one of the following condition is detected.<br>• Knock sensor voltage is 0.90 V or less, or<br>• Knock sensor voltage is 3.98 V or more | • "WHT" circuit open or shorted to ground<br>• Knock sensor malfunction<br>• ECM malfunction |

### DTC Confirmation Procedure

1) Connect scan tool to DLC with ignition switch 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.

### Troubleshooting

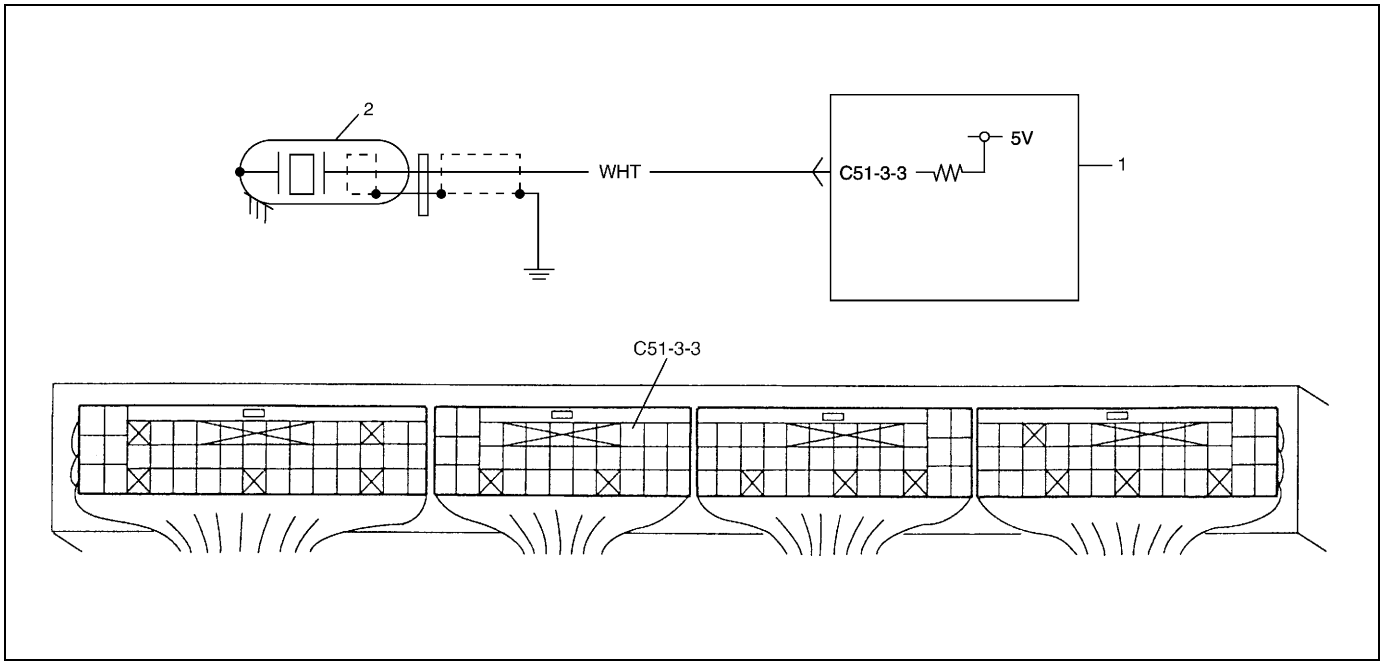
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | **Knock sensor and its circuit check**<br>1) With engine running, check voltage from "C51-3-3" terminal of ECM connector to body ground.<br>Is voltage about 0.90 – 3.98 V? | Knock sensor and its circuit are in good condition. Intermittent trouble or faulty ECM. Recheck, referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **Knock sensor power source circuit check**<br>1) Stop engine.<br>2) With ignition switch at OFF position, disconnect knock sensor connector (2).<br>3) With ignition switch at ON position, check voltage from "WHT" to body ground terminal of knock sensor connector. See Fig.<br>Is it 4 – 5 V? | Substitute a known-good knock sensor and recheck. | "WHT" wire open, shorted to ground circuit or poor "C51-3-3" connection. If wire and connection are OK, substitute a known-good substitute a known-good ECM and recheck. |




| [A]: Fig. for Step 3 |
|---|
| 1. Knock sensor |

# DTC P0327/P0328 Knock Sensor Circuit Low/High

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. Knock sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **P0327:**<br>Knock sensor voltage: 0.90 V or less | "WHT" circuit open or shorted to ground<br>Knock sensor malfunction<br>ECM malfunction |
| **P0328:**<br>Knock sensor voltage: 4.0 V or more | |

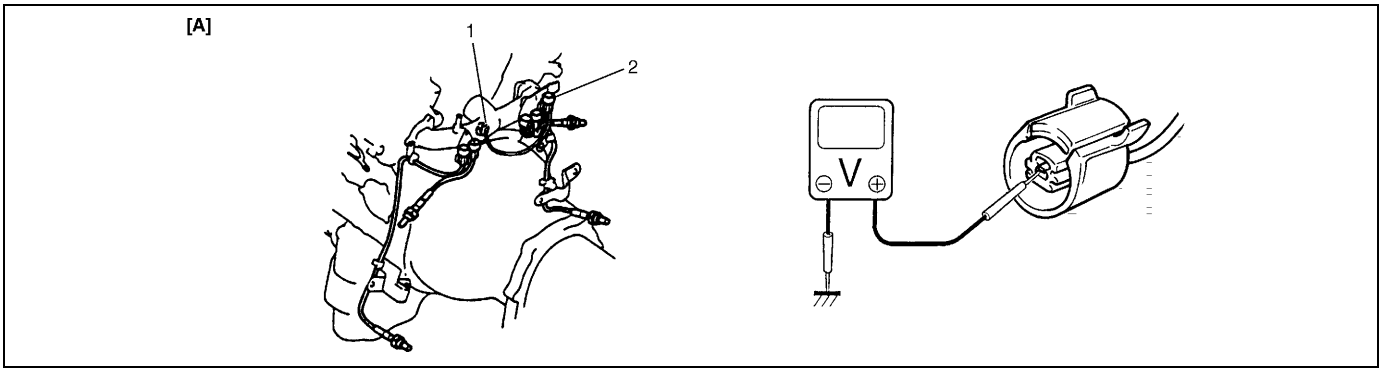
## DTC Confirmation Procedure

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.

## 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" in this section. |

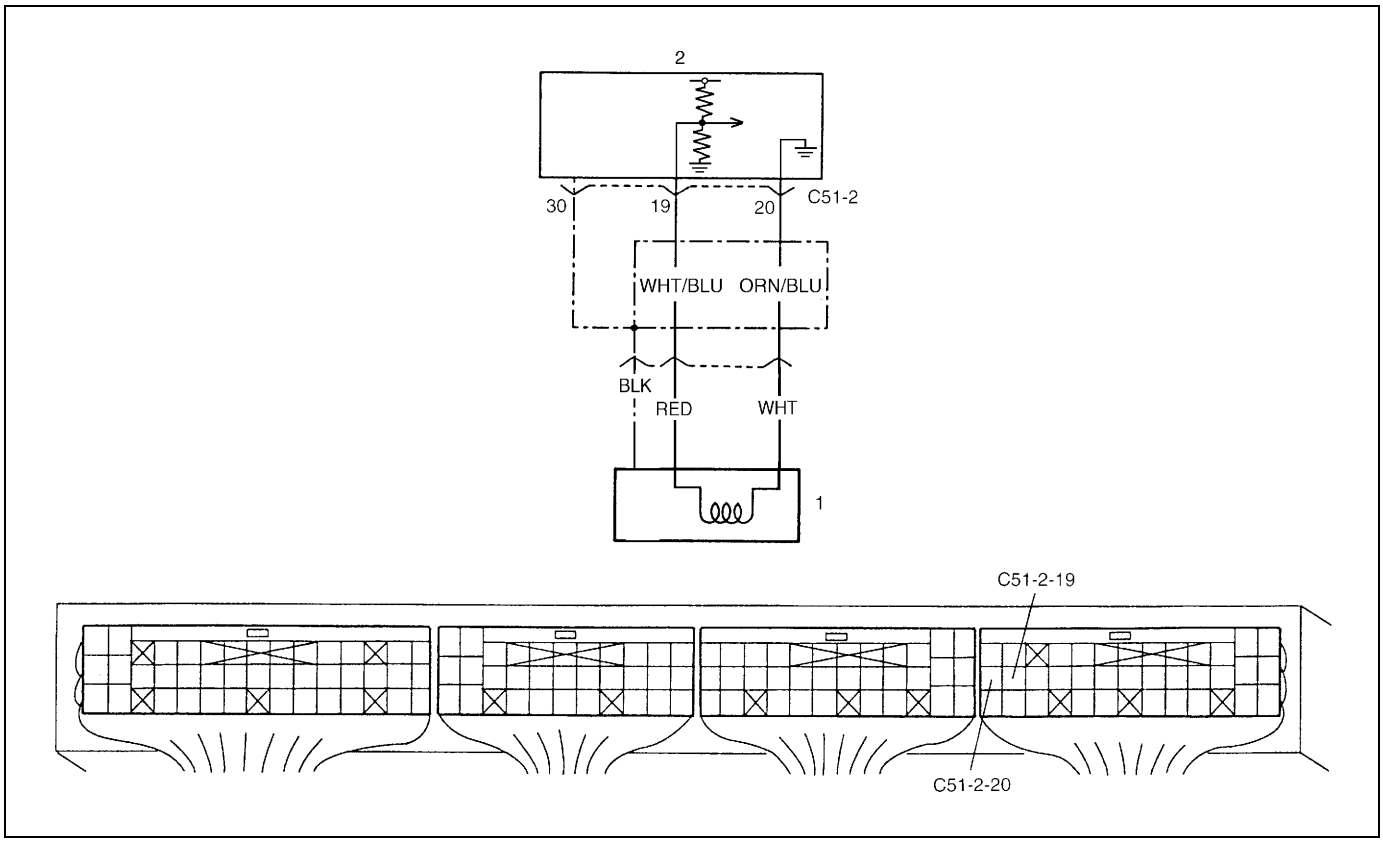
| Step | Action | Yes | No |
|---|---|---|---|
| 2 | **Knock sensor and its circuit check**<br>1) Remove ECM cover.<br>2) With engine running, measure voltage from "C51-3-3" terminal of ECM connector to body ground.<br>Is voltage about 0.90 – 3.98 V? | Knock sensor and its circuit are in good condition.<br>Intermittent trouble or faulty ECM.<br>Recheck, referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **Knock sensor power source circuit check**<br>1) Stop engine.<br>2) With ignition switch at OFF position, disconnect knock sensor connector (2).<br>3) With ignition switch at ON position, measure voltage between "WHT" wire terminal of knock sensor connector and body ground. (See fig.)<br>Is it 4 – 5 V? | Substitute a known-good knock sensor and recheck. | "WHT" circuit wire is open, shorted to ground or poor connection at "C51-3-3" terminal.<br>If wire and connection are OK, substitute a known-good substitute a known-good ECM and recheck. |




| [A]: Fig for Step 3 |
|---|
| 1. Knock sensor |

# DTC P0335 Crankshaft Position Sensor Circuit Malfunction

## Wiring Diagram




| |
|---|
| 1. CKP sensor |
| 2. ECM |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| CKP sensor signal is not input while 100 pulses of CMP sensor signal are input after engine start. | CKP sensor circuit<br>CKP sensor<br>ECM |

## DTC Confirmation Procedure

**NOTE:**

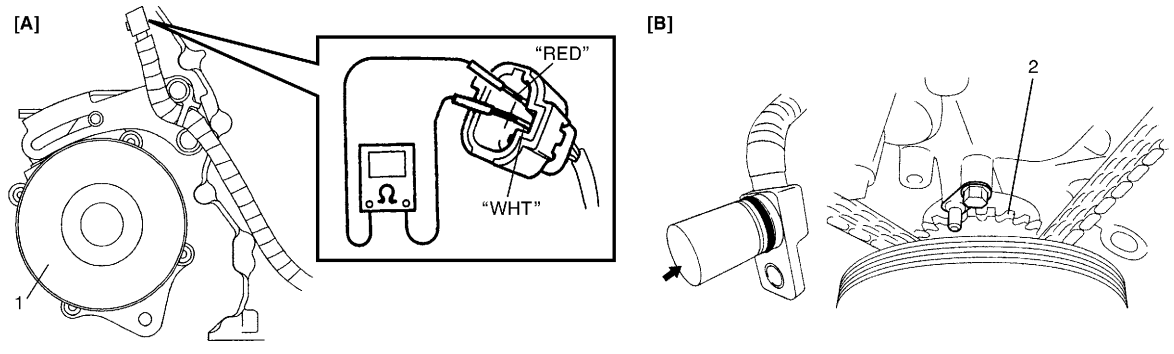
**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 10 sec.
3) Check DTC by using scan tool.

## Troubleshooting

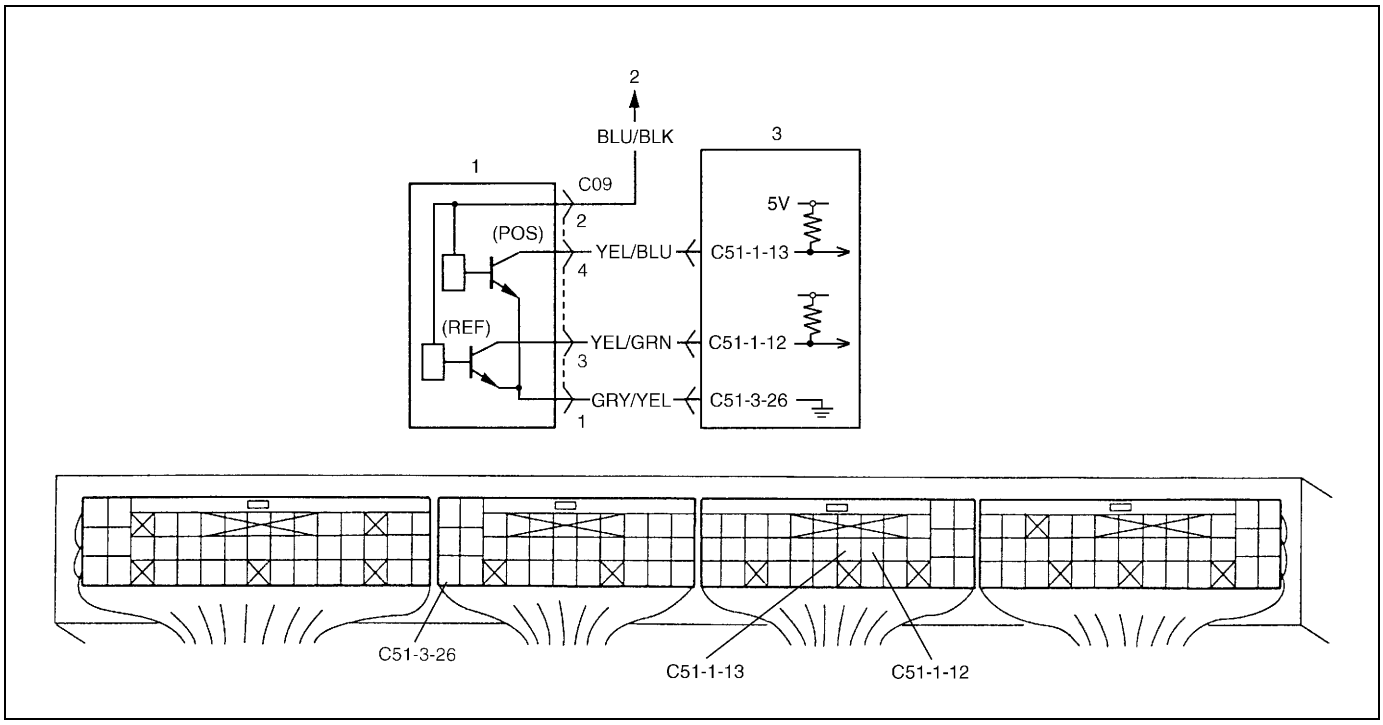
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine and Emission Control System Check” performed? | Go to Step 2. | Go to “Engine and Emission Control System Check” in this section. |
| 2 | **CKP sensor and its circuit resistance check**<br>1) With ignition switch OFF, disconnect ECM coupler (C51-2).<br>2) Check for proper connection to ECM at C51-2-19 and C51-2-20 terminals.<br>3) If OK, check resistance of followings.<br>**CKP sensor resistance between C51-2-19 and C51-2-20 terminals:**<br>**484 – 656 Ω at 20°C (68°F)**<br>**CKP sensor resistance between each terminal and ground:**<br>**1 MΩ or more**<br>Is check result satisfactory? | Go to Step 4. | Go to Step 3. |
| 3 | **CKP sensor resistance check**<br>1) With ignition switch OFF, disconnect CKP sensor coupler.<br>2) Check resistance between terminals of CKP sensor coupler. (See Fig.)<br>Were measured resistance values as specified in Step 2? | Faulty “WHT/BLU” wire or “ORN/BLU” wire. | Faulty CKP sensor. |
| 4 | **CKP sensor visual inspection**<br>Check visually CKP sensor and signal rotor (2) for the followings. (See Fig.)<br>• Damage<br>• No foreign material attached<br>• Correct installation<br>Are they in good condition? | Intermittent trouble or faulty ECM. Recheck for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Replace or reinstall. |




| |
|---|
| [A]: Fig. for Step 3 |
| [B]: Fig. for Step 4 |
| 1. Generator |

# DTC P0340 (DTC No.42) Camshaft Position Sensor Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. | CMP sensor |
| 2. | To main relay |
| 3. | ECM |

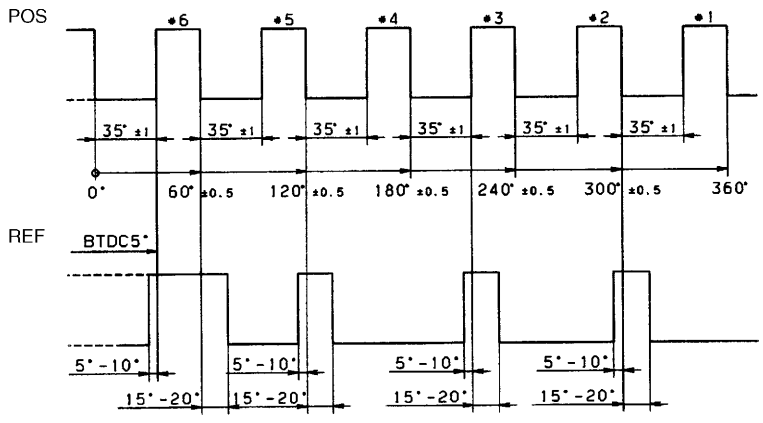
## System Description

CMP sensor detects REF signal and POS signal.

- REF signal: 4 pulses/1 revolution of camshaft. There are 2 different kinds of wavelength. Based on REF signal, ECM judges which cylinder is at TDC.
- POS signal: 6 pulse/1 revolution of camshaft. Each of POS signals has equivalent wavelength. Based on POS signal, ECM judges the wavelength of REF signals, engine speed and piston position.

## Reference

Connect oscilloscope between terminals C51-1-13 (POS) or C51-1-12 (REF) and C51-3-26 (ground) of ECM connector connected to ECM and check CMP sensor signal.



### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| CMP sensor signal is not inputted for 3 sec. even though engine start signal is being inputted.<br>or<br>REF signal pattern is incorrect while POS signal varies.<br>or<br>POS signal voltage too high or too low. | CMP sensor circuit<br>CMP sensor<br>Engine starter signal circuit<br>ECM |

### DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°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, pending DTC and freeze frame data by using scan tool.
3) Crank engine for 3 seconds or more and keep it at idle for 1 min.
4) Check DTC by using scan tool.

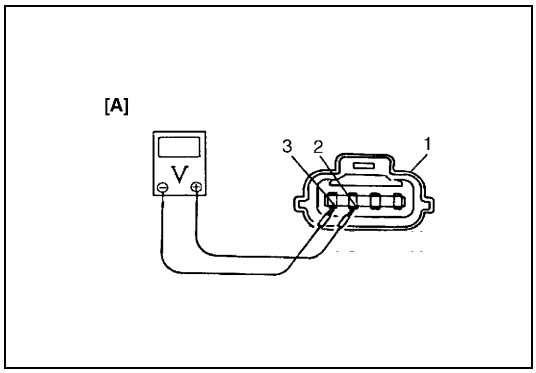
### Troubleshooting

**NOTE:**

**If starter circuit is open (i.e., starter signal circuit is OK but starter fails to run), this DTC is stored in memory at starter switch ON, even through CMP sensor is in good condition.**
**When starter motor fails to run and this DTC appears, check starter circuit first.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |
| 2 | Is engine cranked? | Go to Step 3. | Go to "Diagnosis" in Section 6G. |
| 3 | Is there DTC O0616 and/or P0617? | Go to "DTC P0616 Starter Relay Circuit Low" and/or "DTC P0617 Starter Relay Circuit High" in this section. | Go to Step 4. |
| 4 | **CMP sensor power supply voltage check**<br>1) With ignition switch OFF, disconnect CMP sensor coupler.<br>2) With ignition switch ON, check voltage between "BLU/BLK" wire terminal and "GRY/YEL" wire terminal of CMP sensor coupler. (See Fig.)<br>Is the voltage 10 – 14 V? | Go to Step 5. | Faulty "BLU/BLK" wire and/or "GRY/YEL" wire. |

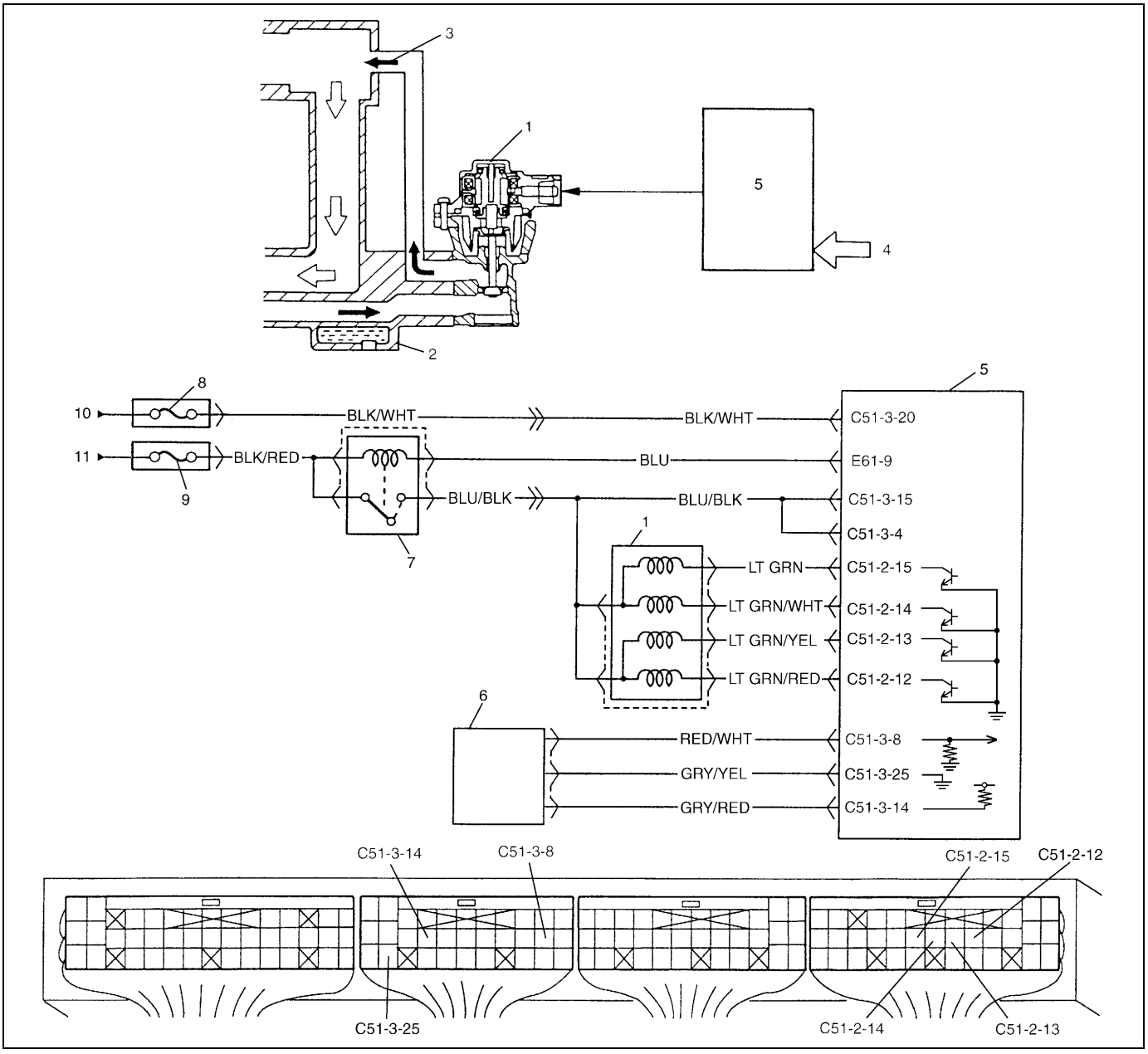
| Step | Action | Yes | No |
|---|---|---|---|
| 5 | **CMP sensor (REF) signal check**<br>1) With ignition switch OFF, connect CMP sensor coupler.<br>2) Disconnect couplers from ignition coil assembly and fuel injectors.<br>3) With ignition switch ON and crankshaft turned slowly, check voltage between C51-1-12 and C51-3-26 terminal.<br>Does voltmeter indicator deflect between 0 – 1 V and 3 – 5.25 V 4 times while crankshaft turned two revolutions? | Go to Step 6. | Faulty "YEL/GRN" wire or CMP sensor.<br>If OK, substitute a known-good ECM and recheck. |
| 6 | **CMP sensor (POS) signal check**<br>1) With ignition switch ON and crankshaft turned slowly, check voltage between C51-1-13 and C51-3-26 terminal.<br>Does voltmeter indicator deflect between 0 – 1 V and 3 – 5.25 V 6 times while crankshaft turned two revolutions? | Poor C51-1-12 and/or C51-3-13 terminal of ECM coupler connection.<br>If OK, substitute a known-good ECM and recheck. | Faulty "YEL/BLU" wire or CMP sensor.<br>If OK, substitute a known-good ECM and recheck. |




| [A]: Fig. for Step 4 |
|---|
| 1. Disconnected CMP sensor coupler |
| 2. "BLU/BLK" wire terminal |
| 3. "GRY/YEL" wire terminal |

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

## System/Wiring Diagram




| | | | |
|---|---|---|---|
| 1. EGR valve | 4. Sensed information | 7. Main relay | 10. To ignition switch |
| 2. Intake manifold | 5. ECM | 8. “IG COIL” fuse | 11. To battery |
| 3. Exhaust gas | 6. MAP sensor | 9. “FI” fuse | |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0401:**<br>During deceleration (engine speed high with closed throttle position) in which fuel cut is involved, difference in intake manifold pressure between when EGR valve is opened and when it is closed is smaller than specified value.<br>(2 driving cycle detection logic) | • EGR valve<br>• EGR passage<br>• Manifold absolute pressure sensor<br>• ECM |
| **DTC P0402:**<br>During deceleration in which fuel cut is involved, difference in intake manifold pressure between when EGR valve is opened and when it is closed is larger than specified value.<br>(2 driving cycle detection logic) | |

### DTC Confirmation Procedure

**WARNING:**

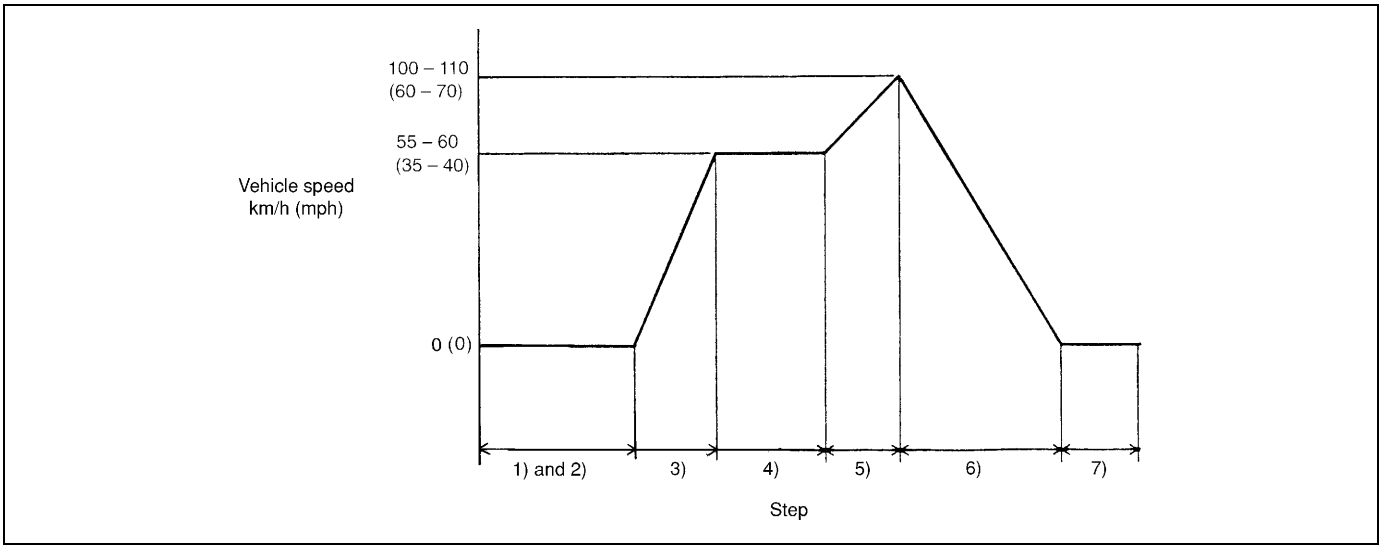
- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

**NOTE:**

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

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°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 turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 55 – 60 km/h (35 – 40 mph).
4) Keep driving above vehicle speed for 7 min. or more.
5) Increase vehicle speed to 100 – 110 km/h (60 – 70 mph).
6) Release accelerator pedal and with engine brake applied, keep vehicle coasting and then stop vehicle.
7) Check if pending DTC exists by using scan tool. If not, check if EGR system monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and EGR system monitoring test not completed), check vehicle conditions (environmental) and repeat Steps 3) through 6).



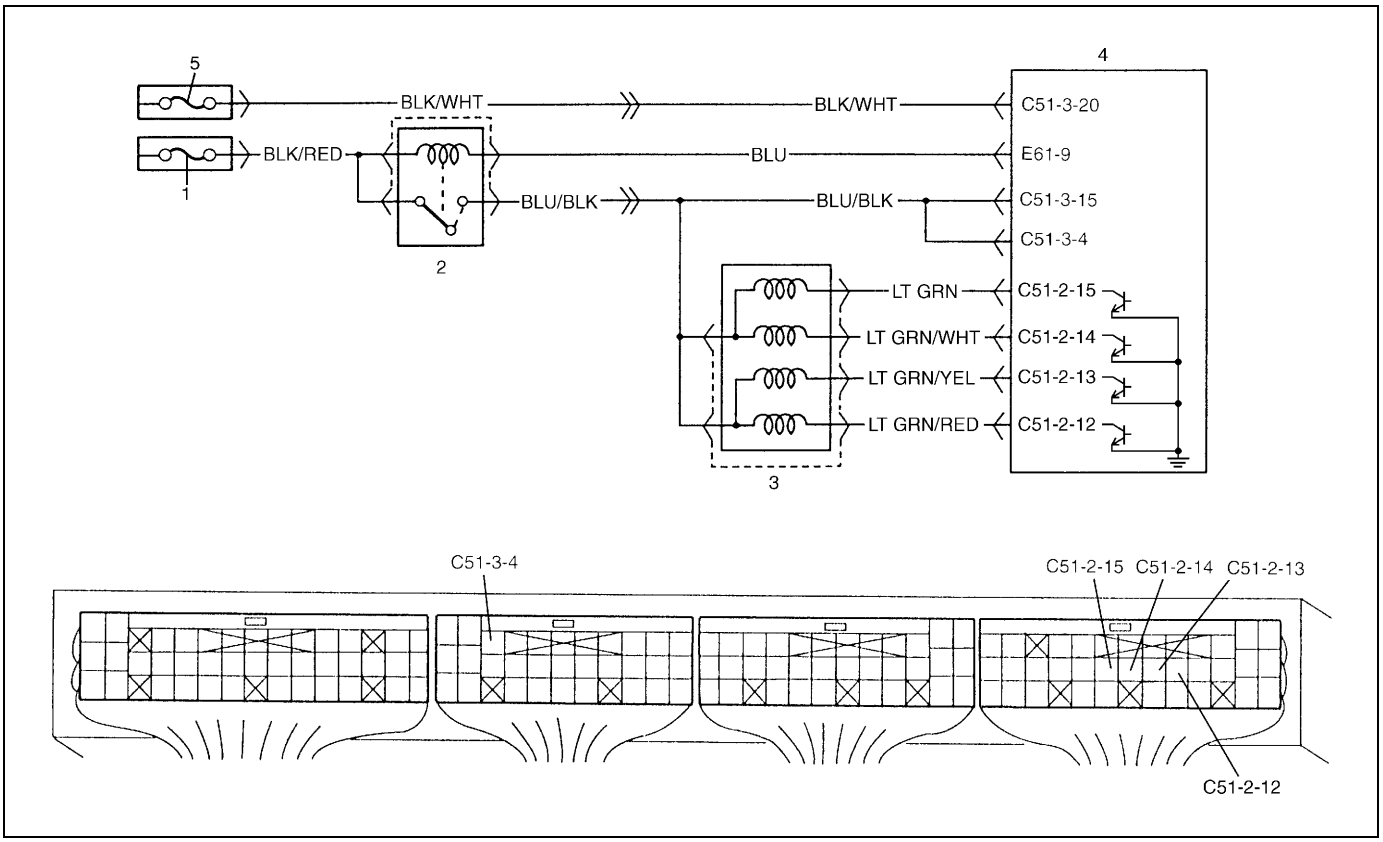

## Troubleshooting

| 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” in this section. |
| 2 | Is there DTC P0403 (DTC No.51) (EGR circuit malfunction)? | Go to “DTC P0403 (DTC No.51) Exhaust Gas Recirculation Circuit Malfunction” in this section. | Go to Step 3. |
| 3 | Do you have SUZUKI scan tool? | Go to Step 4. | Go to Step 6. |
| 4 | **EGR valve operation check**<br>1) With ignition switch turned OFF, connect SUZUKI scan tool to DLC.<br>2) Check EGR system referring to “EGR System (If Equipped)” under “Emission Control System” in Section 6E2.<br>Is it in good condition? | Go to Step 5. | Go to Step 6. |
| 5 | **MAP sensor check**<br>1) Check MAP sensor for performance referring to “Manifold Absolute Pressure Sensor” under “Electronic Control System” in Section 6E2.<br>Is check result satisfactory? | Intermittent trouble or faulty ECM. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Repair or replace. |
| 6 | **EGR valve power supply circuit check**<br>1) With ignition switch turned OFF, disconnect EGR valve coupler.<br>2) With ignition switch turned ON, measure voltage between each “BLU/BLK” wire terminal and ground at EGR valve coupler.<br>Is each voltage 10 – 14 V? | Go to Step 7. | Faulty “BLU/BLK” wire. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | **EGR valve stepper motor coil circuit check**<br>1) With ignition switch turned OFF, connect EGR valve coupler.<br>2) Remove ECM cover and disconnect ECM couplers.<br>3) Measure resistance between "C51-3-4" terminal and each terminal of "C51-2-12", "C51-2-13", "C51-2-14", "C51-2-15" at ECM couplers disconnected.<br>Is each resistance 20 – 24 Ω at 20 °C (68 °F)? | Go to Step 8. | Faulty EGR valve. |
| 8 | **MAP sensor check**<br>1) Check MAP sensor for performance referring to "Manifold Absolute Pressure Sensor" under "Electronic Control System" in Section 6E2.<br>Is check result satisfactory? | EGR passage clogged or EGR valve malfunction.<br>If all above are OK, intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Repair or replace. |

# DTC P0403 (DTC No.51) Exhaust Gas Recirculation Circuit Malfunction

## Wiring Diagram




| | |
|---|---|
| 1. "FI" fuse | 4. ECM |
| 2. Main relay | 5. "IG COIL" fuse |
| 3. EGR valve | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| High voltage is detected at EGR valve stepping motor electrical circuit for specified time continuously. (Circuit open or short). | EGR valve (stepping motor) or its circuit ECM |

## DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

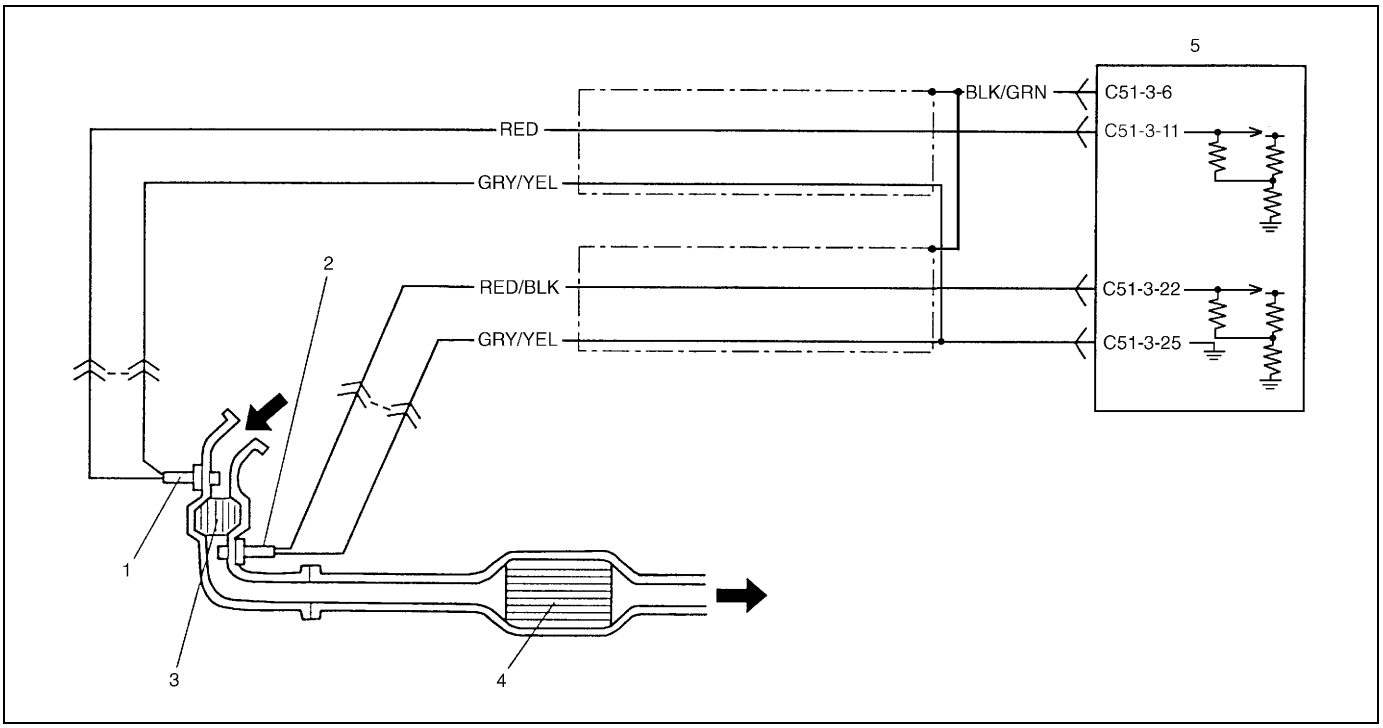
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it for 10 sec.
4) Check DTC by using scan tool.

## 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” in this section. |
| 2 | **EGR valve check**<br>1) With ignition switch OFF, disconnect connector from EGR valve.<br>2) Check for proper connection to EGR valve at each terminal.<br>3) If OK, check EGR valve for resistance referring to “EGR System (if equipped)” under “Emission Control System” in Section 6E2.<br>Is check result as specified? | Go to Step 3. | EGR valve malfunction. |
| 3 | **Wire harness check**<br>1) Connect connector to EGR valve.<br>2) Remove ECM cover and disconnect connector from ECM.<br>3) Check for proper connection to ECM at system related terminals.<br>4) If OK, check for resistance between the following terminals of ECM connector disconnected.<br>**EGR valve resistance**<br>**C51-2-13 and C51-3-4, C51-2-14 and C51-3-4, C51-2-15 and C51-3-4, C51-2-12 and C51-3-4: 20 – 24 Ω at 20°C (68°F)**<br>**C51-2-13 and ground, C51-2-14 and ground, C51-2-15 and ground, C51-2-12 and ground: Infinity (∞)**<br>Is check result as specified? | Intermittent trouble or faulty ECM.<br>Recheck referring to “Intermittent and Poor Connection” in Section 0A. | “BLU/BLK”, “LT GRN”, “LT GRN/WHT”, “LT GRN/YEL” or “LT GRN/RED” circuit open or shorted to ground. |

# DTC P0420 Catalyst System Efficiency Below Threshold (Bank 1)

## System Diagram




| | |
|---|---|
| 1. HO2S–1 (Bank–1) | 4. TWC |
| 2. HO2S–2 (Bank–1) | 5. ECM |
| 3. WU-TWC | |

## Circuit Description

Exhaust oxygen concentration at the pre-catalyst and the post-catalyst of WU-TWC is detected from HO2S–1 and HO2S–2 respectively and accordingly ECM controls the closed loop which then controls the fuel injection volume. (Refer to Section 6E2.) While the above control is going on and if WU-TWC is in good condition, the output voltage of HO2S–2 is maintained at specified level. As WU-TWC becomes deteriorated, even when the above control is going on, the exhaust gas which has passed WU-TWC then passes HO2S–2 at the exhaust oxygen concentration similar to that of the pre-catalyst without being oxygenated or converted. Thus, waveforms of HO2S–1 and HO2S–2 output voltages become alike. ECM judges deterioration of WU-TWC by comparing waveforms of HO2S–1 and HO2S–2.

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| While running under conditions described for DTC Confirmation Procedure, output waveform of HO2S–1 becomes similar to that of HO2S–2.<br>(2 driving cycle detection logic) | • Exhaust gas leakage<br>• Warm up three way catalytic converter<br>• Heated oxygen sensor–2 or its circuit<br>• 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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

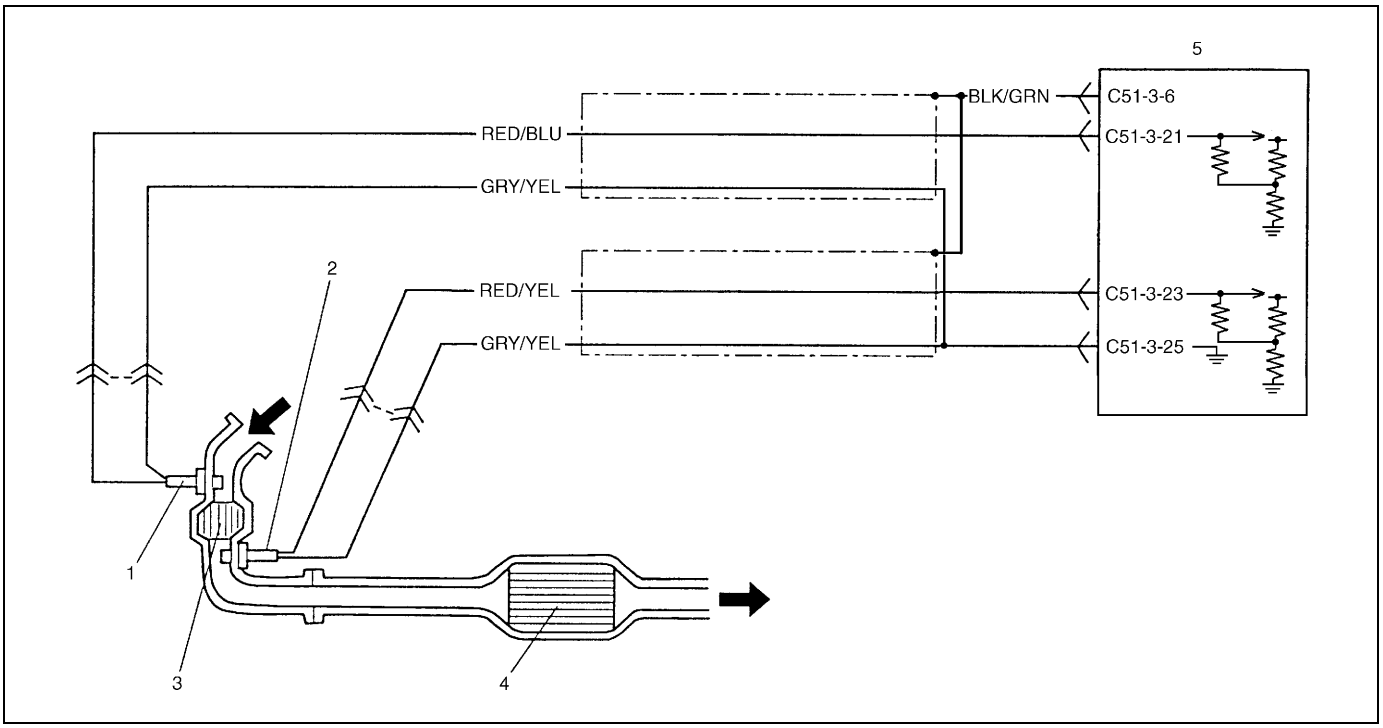
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Increase vehicle speed to 80 – 90 km/h (50 – 56 mph).
4) Keep above vehicle speed for 5 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if catalyst monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

### 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" in this section. |
| 2 | **Exhaust system visual inspection**<br>1) Check exhaust system for leaks, damage and loose connection.<br>Is it in good condition? | Go to Step 3. | Repair or replace. |
| 3 | **HO2S–2 output voltage check**<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 2 min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan toll while repeating racing engine.<br>Is over and below 0.3 V indicated? | Replace warm up three way catalytic converter. | Check "RED/BLK" and "GRY/YEL" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S–2. |

# DTC P0430 Catalyst System Efficiency Below Threshold (Bank 2)

## System Diagram




| | |
|---|---|
| 1. HO2S–1 (Bank–2) | 4. TWC |
| 2. HO2S–2 (Bank–2) | 5. ECM |
| 3. WU-TWC | |

## Circuit Description

Exhaust oxygen concentration at the pre-catalyst and the post-catalyst of WU-TWC is detected from HO2S–1 and HO2S–2 respectively and accordingly ECM controls the closed loop which then controls the fuel injection volume. (Refer to Section 6E2.) While the above control is going on and if WU-TWC is in good condition, the output voltage of HO2S–2 is maintained at specified level. As WU-TWC becomes deteriorated, even when the above control is going on, the exhaust gas which has passed TWC then passes HO2S–2 at the exhaust oxygen concentration similar to that of the pre-catalyst without being oxygenated or converted. Thus, waveforms of HO2S–1 and HO2S–2 output voltages become alike. ECM judges deterioration of WU-TWC by comparing waveforms of HO2S–1 and HO2S–2.

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| While running under conditions described for DTC Confirmation Procedure, output waveform of HO2S–1 becomes similar to that of HO2S–2.<br>(2 driving cycle detection logic) | • Exhaust gas leakage<br>• Warm up three way catalytic converter<br>• Heated oxygen sensor–2 or its circuit<br>• 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.**

**NOTE:**

**Check to make sure that following conditions are satisfied when using this "DTC Confirmation Procedure".**
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

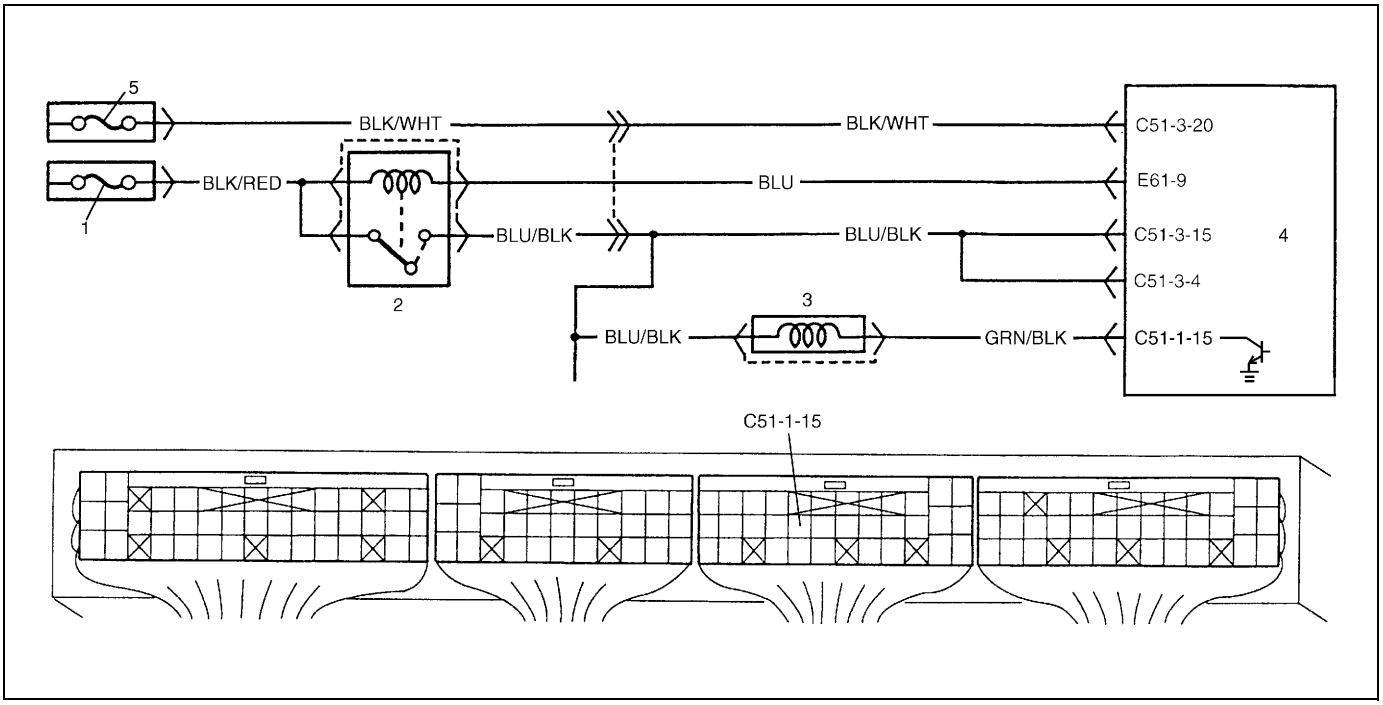
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Increase vehicle speed to 80 – 90 km/h (50 – 56 mph).
4) Keep above vehicle speed for 5 min. or more (Throttle valve opening is kept constant in this step).
5) Stop vehicle and check if pending DTC exists by using scan tool. If not, check if catalyst monitoring test has completed by using scan tool. If not in both of above checks (i.e., no pending DTC and catalyst monitoring test not completed), check vehicle condition (environmental) and repeat Step 3) through 5).

### 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" in this section. |
| 2 | **Exhaust system visual inspection**<br>1) Check exhaust system for leaks, damage and loose connection.<br>Is it in good condition? | Go to Step 3. | Repair or replace. |
| 3 | **HO2S–2 output voltage check**<br>1) Connect scan tool to DLC with ignition switch OFF.<br>2) Drive vehicle about 35 mph, 55 km/h for 2min. or more.<br>3) Stop vehicle and check HO2S–2 output voltage displayed on scan tool while repeating racing engine.<br>Is over and below 0.3 V indicated? | Replace warm up three way catalytic converter. | Check "RED/YEL" and "GRY/YEL" wires for open and short, and connections for poor connection. If wires and connections are OK, replace HO2S–2. |

# DTC P0443 (No.55) Evap Control System Purge Control Valve Circuit Malfunction

## System/Wiring Diagram




| | | |
|---|---|---|
| 1. "FI" fuse | 3. EVAP canister purge valve | 5. "IG COIL" fuse |
| 2. Main relay | 4. ECM | |

## 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)<br>(2 driving cycle detection logic) | • EVAP canister purge valve and its circuit<br>• 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.**

**NOTE:**

**Check to make sure that following condition is satisfied when using the "DTC Confirmation Procedure."**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

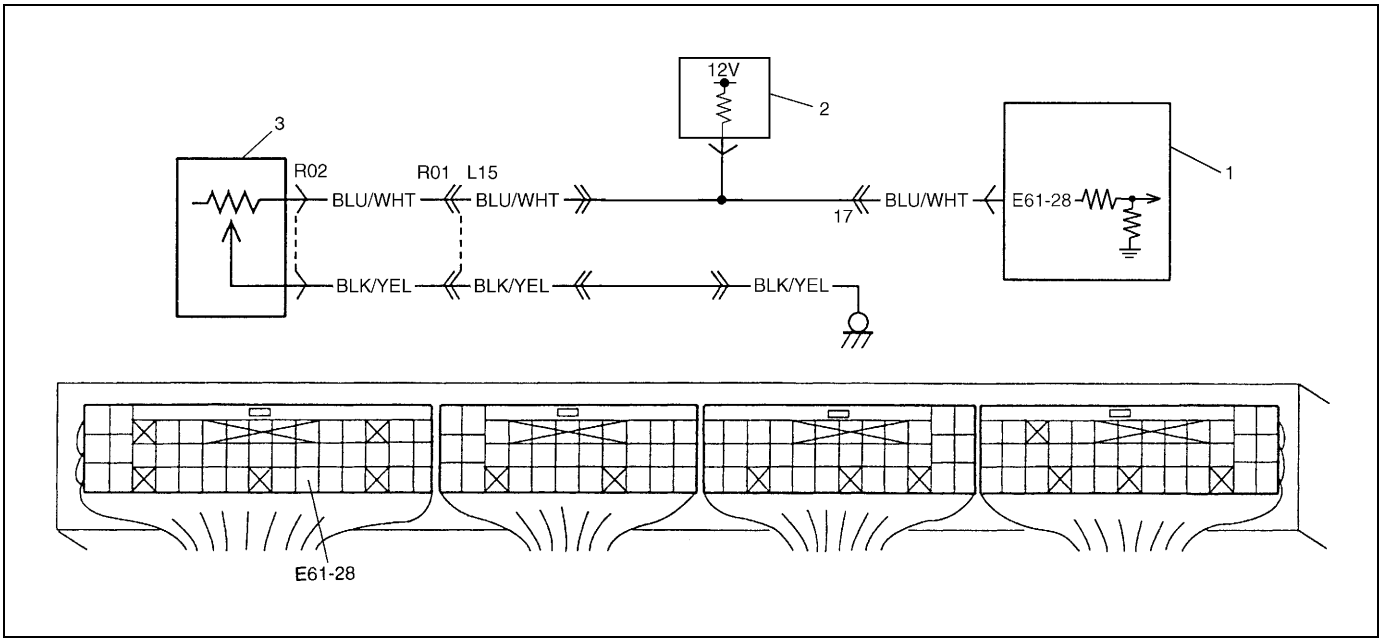
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and warm up it completely.
4) Increase vehicle speed to 55 km/h (35 mph) or more.
5) Keep driving above vehicle speed for 20 min or more (Change of vehicle speed is permitted in this step).
6) Release accelerator pedal, stop vehicle and run engine at speed for 2 min.
7) Check DTC and pending DTC by using scan tool.

**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” in this section. |
| 2 | Check EVAP canister purge system for operation referring to “EVAP Canister Purge System” under “Emission Control System” in Section 6E2.<br>Is check result satisfactory? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 3. |
| 3 | Check EVAP canister purge valve for resistance referring to “EVAP Canister Purge Valve and Its Circuit” under “Emission Control System” in Section 6E2.<br>Is resistance as specified? | “GRN/BLK” or “BLU/BLK” circuit open or short.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | Replace EVAP canister purge valve. |

# DTC P0463 Fuel Level Sensor Circuit High

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. Fuel level meter in combination meter |
| 3. Fuel level sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Fuel level sensor output voltage higher than specified value is detected for specified time.<br>(2 driving cycle detection logic) | • Fuel level gauge or its circuit<br>• Fuel level sensor or its circuit<br>• 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 and run engine for 1 min.
3) Check pending DTC by using scan tool.

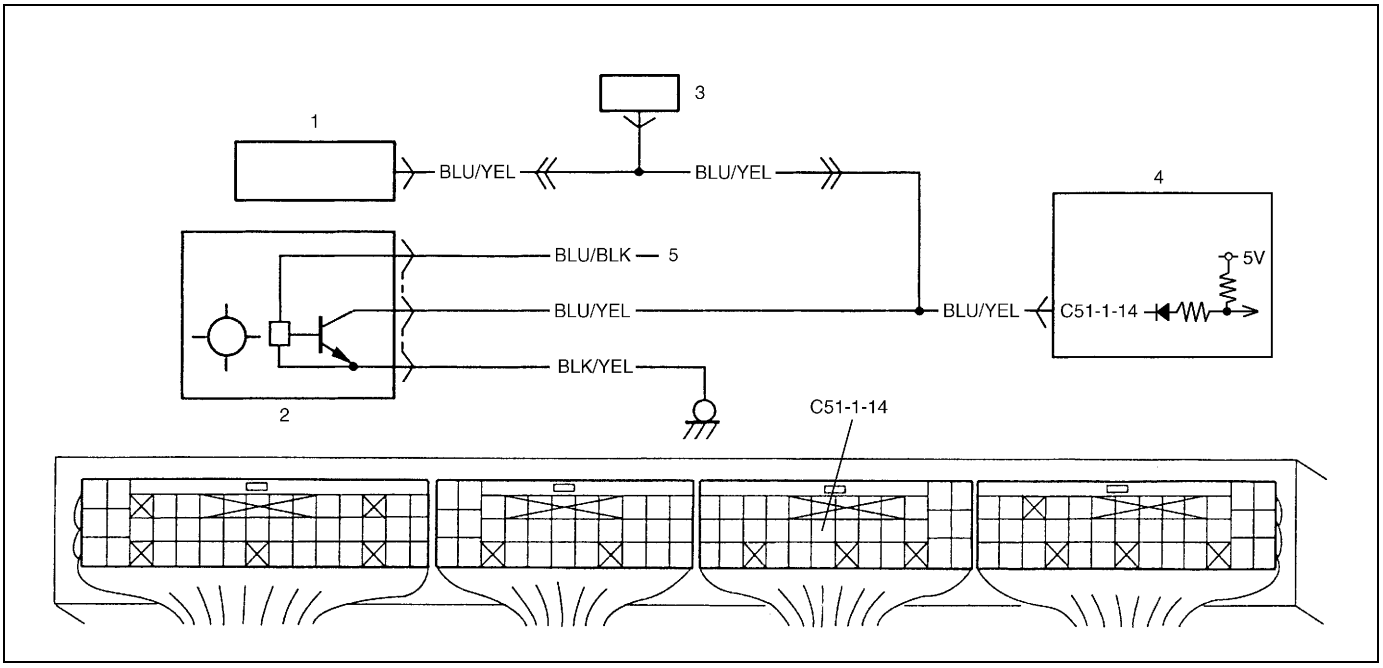
## Troubleshooting

| 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” in this section. |
| 2 | Does fuel level meter in combination meter indicate “E” (Empty)? | Replenish fuel tank with fuel and go to Step 3. | Go to Step 3. |
| 3 | **Check fuel level sensor and its circuit**<br>1) Measure voltage between terminal “E61-28” of ECM connector and ground with ignition switch turned ON.<br>Is it about 8.6 V or more? | Go to Step 4. | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | Is voltage in Step 3 "9 – 14 V"? | "BLU/WHT" circuit shorted to power supply line or fuel level meter malfunction. | Go to Step 5. |
| 5 | **Check Fuel Level Sensor**<br>1) Remove fuel pump assembly referring to "Fuel Pump" in Section 6C.<br>2) Check for proper connection to fuel level sensor at "BLU/WHT" wire terminal and "BLK/YEL" wire terminal of disconnected connector.<br>3) If OK, then check fuel level sensor for resistance referring to "Fuel Level Sensor (Sender Gauge)" in Section 8C.<br>Is check result satisfactory? | Open in "BLU/WHT" or "BLK/YEL" circuit.<br>If wire and connection are OK, substitute a known-good ECM and recheck. | Check "BLU/WHT" and "BLK/YEL" wires between fuel pump harness connector (R01) and (R02) connections.<br>If OK, replace fuel level sensor. |

# DTC P0500 (DTC No.24) Vehicle Speed Sensor Malfunction

## Wiring Diagram




| | | |
|---|---|---|
| 1. Speedometer | 3. Cruise control module (if equipped) | 5. To main relay |
| 2. Vehicle speed sensor | 4. ECM | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Vehicle speed signal not inputted for longer than 7 seconds although fuel is kept cut for longer than 5 seconds (2 driving cycle detection logic) | • Vehicle speed sensor circuit open or short<br>• Vehicle speed sensor<br>• Vehicle speed sensor drive gear or driven gear<br>• Speedometer malfunction<br>• Cruise control module malfunction (if equipped)<br>• 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.**

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

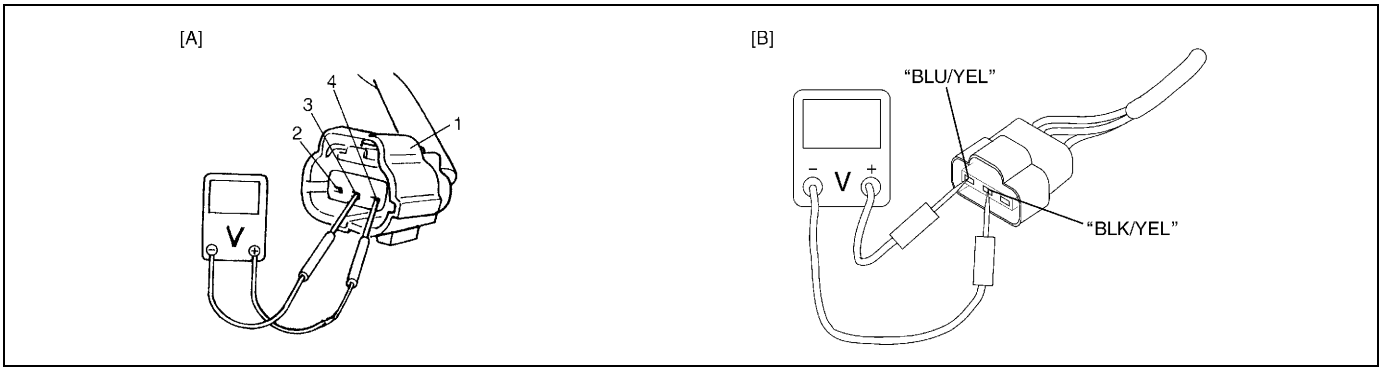
- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 100 – 110 km/h (60 – 70 mph).
4) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 5 seconds or more and then stop vehicle.
5) Check pending DTC by using scan tool.

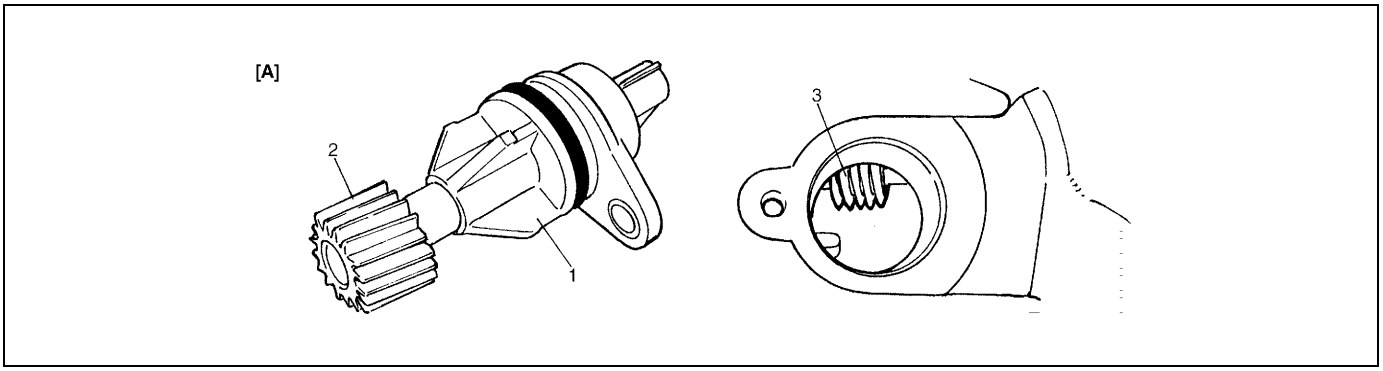
**Troubleshooting**

| 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" in this section. |
| 2 | Does speedometer indicate vehicle speed? | Faulty "BLU/YEL" wire or poor C51-1-14 connection. If wire and connection are OK, intermittent trouble or faulty ECM. Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **VSS power supply voltage check**<br>1) With ignition switch OFF, remove VSS coupler (1).<br>2) With ignition switch ON leaving engine OFF, check voltage between "BLU/BLK" wire terminal (4) and "BLK/YEL" wire terminal (3) of VSS coupler. (See Fig.)<br>Is voltage 10 – 14 V? | Go to Step 4. | "BLK/BLU" or "BLK/YEL" wire open/short. |
| 4 | **VSS signal harness check**<br>1) With ignition switch ON leaving engine OFF, check voltage between "BLU/YEL" wire terminal and "BLK/YEL" wire terminal of VSS coupler. (See Fig.)<br>Is voltage 4 V or more? | Go to Step 5. | Go to Step 6. |
| 5 | **VSS visual inspection**<br>1) Remove VSS (1) referring to "Speed Sensor" in Section 7D.<br>2) Check VSS drive gear (2) and driven gear (3) for damage and excessive wear. (See Fig.)<br>Are they in good condition? | Poor VSS connection or VSS malfunction. If connection is OK, substitute a known-good VSS and recheck. | Replace VSS. |
| 6 | **Speedometer circuit check**<br>1) With ignition switch OFF, disconnect couplers from combination meter.<br>2) With ignition switch ON leaving engine OFF, check voltage between "BLU/YEL" wire terminal and "BLK/YEL" wire terminal of VSS coupler. (See Fig.)<br>Is voltage 4 V or more? | Substitute a known-good combination meter and recheck. | Go to Step 7. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | **Cruise control module circuit check (if equipped)**<br>1) With ignition switch OFF, disconnect cruse control module coupler from cruise control module.<br>2) With ignition switch ON leaving engine OFF, check voltage between "BLU/YEL" wire terminal and "BLK/YEL" wire terminal of VSS coupler. (See Fig.)<br>Is voltage 4 V or more? | Substitute a known-good cruise control module and recheck. | "BLU/YEL" wire open/ short or faulty ECM.<br>If wire and connection are OK, substitute a known-good ECM and recheck. |



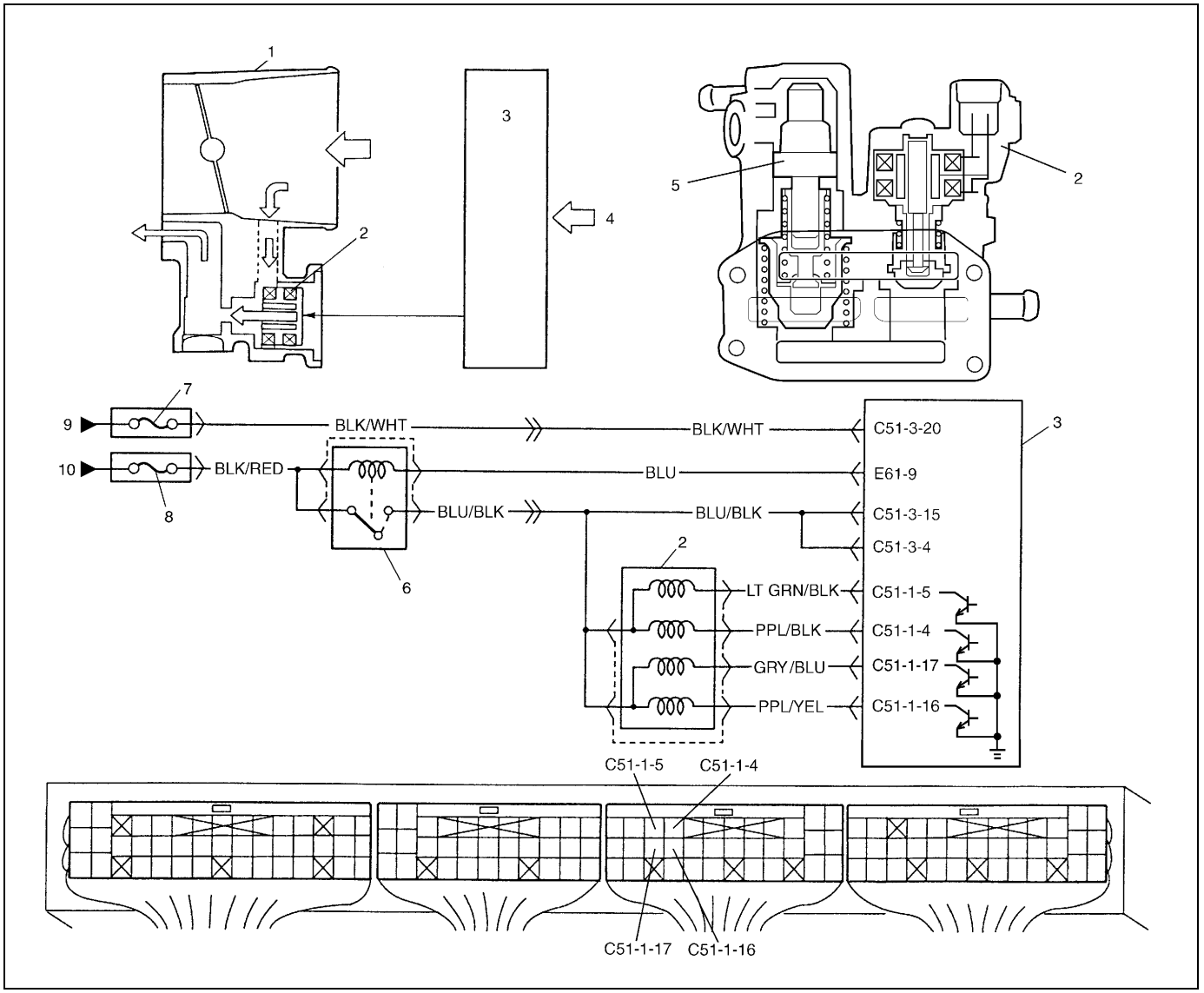

[A]: Fig. for Step 3
[B]: Fig. for Step 4, 6 and 7




[A]: Fig. for Step 5

# DTC P0506/P0507 Idle Air Control System RPM Lower than Expected/Higher than Expected

## System/Wiring Diagram




| | | | | |
|---|---|---|---|---|
| 1. Throttle body | 3. ECM | 5. Idle air control (IAC) thermal valve | 7. "IG COIL" fuse | 9. To ignition switch |
| 2. Idle air control (IAC) valve | 4. Sensed information | 6. Main relay | 8. "FI" fuse | 10. To battery |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0506:**<br>Engine idle speed is 100 r/min. or lower than target idle speed for longer than 20 sec. continuously.<br>(2 driving cycle detection logic) | • IAC valve or its circuit<br>• Abnormal air drawn in air intake system<br>• IAC thermal valve |
| **DTC P0507:**<br>Engine idle speed is 200 r/min. or higher than target idle speed for longer than 20 sec. continuously.<br>(2 driving cycle detection logic) | |

### 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 and warm up engine completely.
3) Run engine at idle speed for 1 min.
4) Check pending DTC by using scan tool.

### 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" in this section. |
| 2 | **Idle speed check**<br>1) Check engine idle speed referring to "Idle Speed/Idle Air Control (IAC) Duty Inspection" in Section 6E2.<br>Is engine idle speed within specification? | Intermittent trouble or faulty ECM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 3. |
| 3 | **IAC valve check**<br>1) Check IAC valve referring to "Table B-4 Idle Air Control System Inspection" in this section.<br>Is check result as specified? | Go to Step 6. | Go to Step 4. |
| 4 | **IAC valve circuit check**<br>1) Remove ECM cover.<br>2) With ignition switch turned OFF, disconnect ECM couplers.<br>3) Check for proper connection to IAC valve at "C51-1-4", "C51-1-5", "C51-1-16" and "C51-1-17" terminals.<br>4) If OK, measure resistance between "C51-1-4" and "C51-1-5", "C51-1-16" and "C51-1-17".<br>Is each resistance 51 – 67 Ω? | Go to Step 5. | "LT GRN/BLK", "PPL/BLK", "GRY/BLU" or "PPL/YEL" circuit wire is open or short.<br>If wire and connections are OK, replace IAC valve. |
| 5 | **IAC valve power supply voltage check**<br>1) Connect ECM couplers.<br>2) With ignition switch turned OFF, disconnect idle air control (IAC) valve coupler.<br>3) With ignition switch turned ON, measure voltage between each "BLU/BLK" wire terminal of IAC valve coupler and ground.<br>Is each voltage 10 – 14 V? | IAC valve or ECM malfunction. | Open in "BLU/BLK" circuit. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | Was idle speed higher than specification in Step 2? | Check IAC thermal valve for malfunction.<br>Check abnormal air inhaling from intake manifold, throttle body, PCV valve and EVAP canister purge control system. | Check parts or system which can cause engine low idle.<br>Check IAC thermal valve for stuck.<br>Air inhaling from between throttle body and MAF sensor, EGR valve malfunction (leakage from valve seat), accessory engine load, clog of idle air passage, engine mechanical, engine overheat and etc. |

## DTC P0601 (DTC No.71) Internal Control Module Memory Check Sum Error

### System Description

Internal control module is installed in ECM.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Data write error or check sum error | ECM |

### DTC Confirmation Procedure

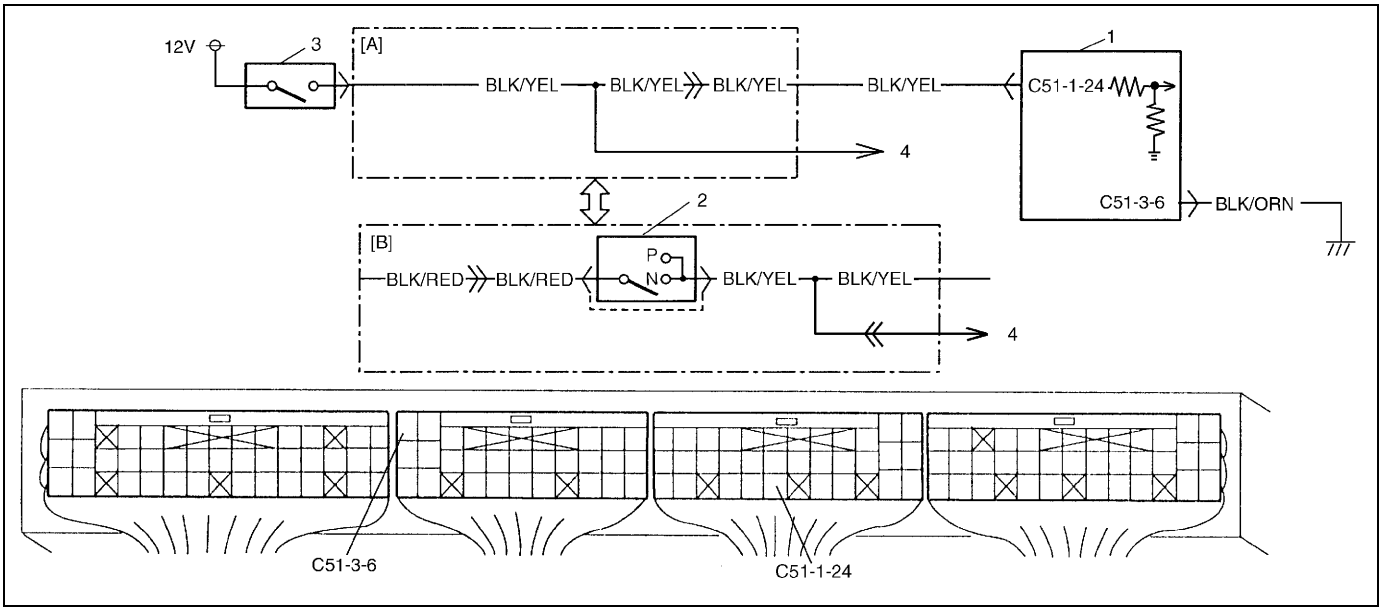
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and run it at idle if possible.
4) Check DTC by using scan tool.

### Troubleshooting

Substitute a known-good ECM and recheck.

# DTC P0616 Starter Relay Circuit Low

## Wiring Diagram




| | | |
|---|---|---|
| [A]: M/T | 1. ECM | 3. Engine start switch (ignition switch) |
| [B]: A/T | 2. Transmission range sensor (switch) | 4. Starting motor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Engine starts even though vehicle is at stop and engine start signal is not inputted.<br>(2 driving cycle detection logic) | • Engine start signal circuit<br>• 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, then start engine and run it for 3 min. or more.
3) Check DTC and pending DTC by using scan tool.

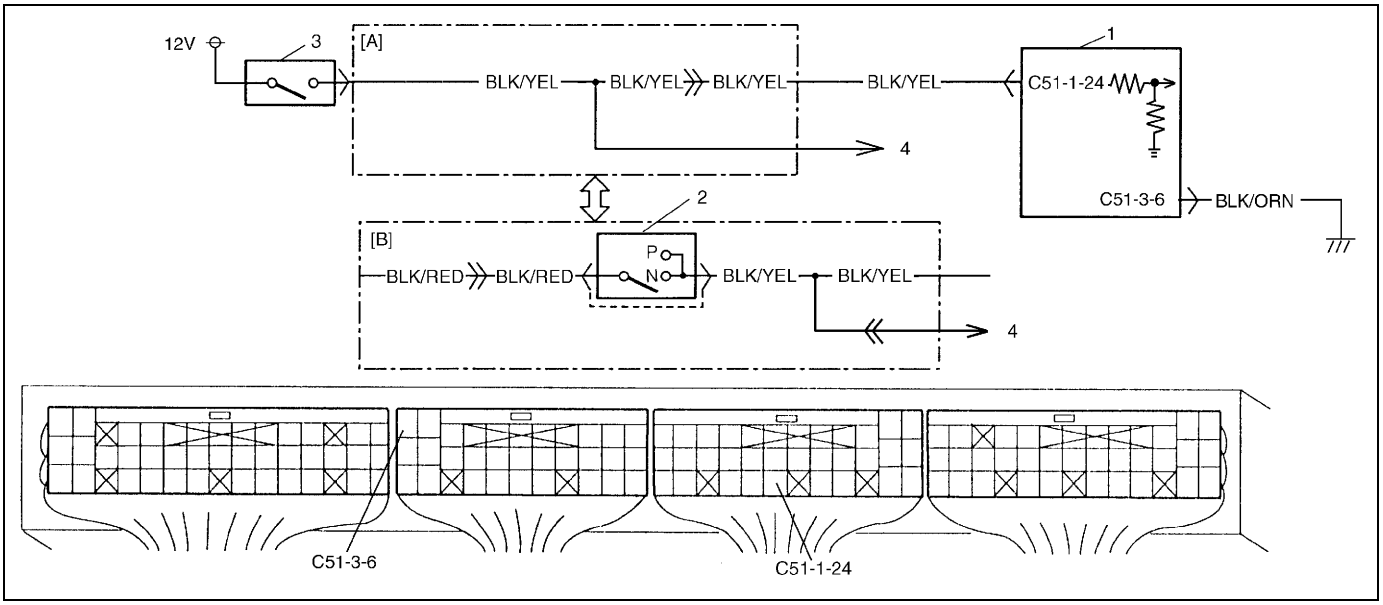
## Troubleshooting

| 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” in this section. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | 1) Remove ECM cover.<br>2) Measure voltage at terminal "C51-1-24" of ECM connector connected, under the following condition.<br>**Engine starter signal specifications**<br>**While engine cranking: 6 – 14 V**<br>Is voltage as specified? | Poor "C51-1-24" terminal connection or intermittent trouble.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. If wire and connections are OK, substitute a known-good ECM and recheck. | Go to Step 3. |
| 3 | **Starter signal circuit check**<br>1) Turn OFF ignition switch.<br>2) Disconnect connectors from ECM.<br>3) Measure resistance between "C51-1-24" terminal in disconnected ECM connector and "C51-3-6" terminal in disconnected ECM connector.<br>Is resistance less than 100 Ω? | Substitute a known-good ECM and recheck. | Open in "BLK/YEL" circuit or high resistance in "BLK/YEL" circuit. |

# DTC P0617 Starter Relay Circuit High

## Wiring Diagram




| | | |
|---|---|---|
| [A]: M/T | 1. ECM | 3. Engine start switch (ignition switch) |
| [B]: A/T | 2. Transmission range sensor (switch) | 4. Starting motor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Engine start signal is inputted for specified time while engine is running.<br>(2 driving cycle detection logic) | • Engine start signal circuit<br>• ECM<br>• Ignition switch |

## DTC Confirmation Procedure

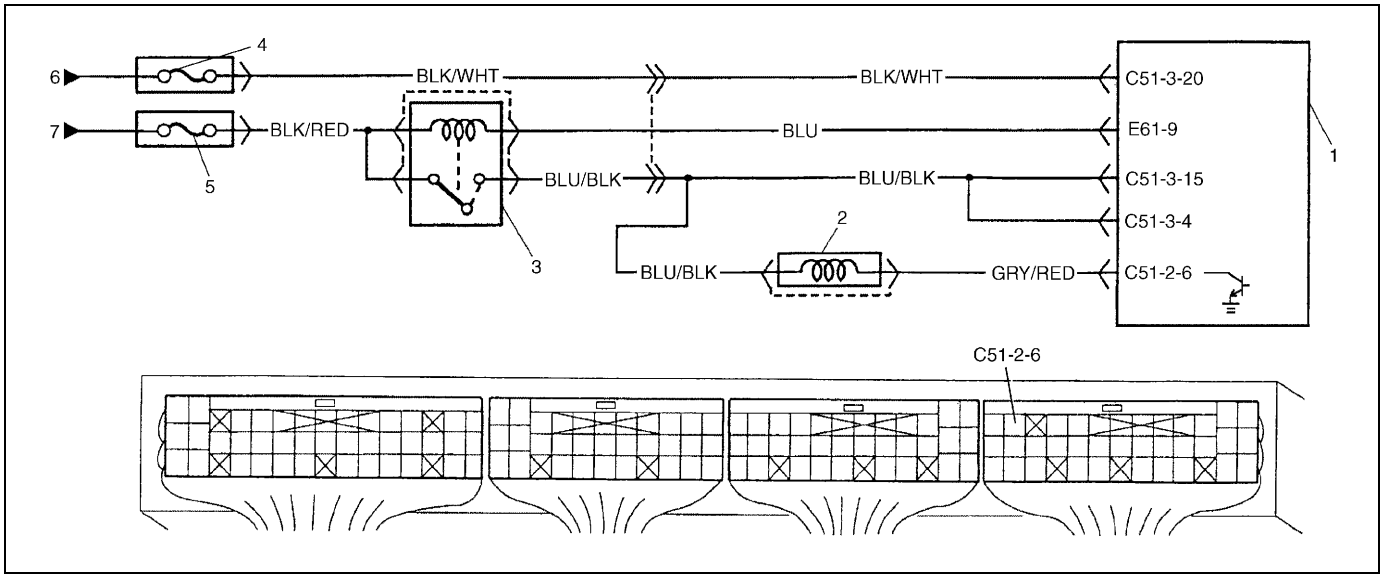
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC by using scan tool, then start engine and run it for 5 min. or more.
3) Check DTC and pending DTC by using scan tool.

## 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” in this section. |
| 2 | 1) Remove ECM cover.<br>2) Measure voltage at terminal “C51-1-24” of ECM connector connected, under the following condition.<br>**Engine starter signal specifications**<br>**After starting engine: 0 – 1 V**<br>Is voltage as specified? | Intermittent power short or faulty ECM. Check Intermittent power short.<br>If intermittent power short is OK, substitute a known-good ECM and recheck. | “BLK/YEL” circuit shorted to other circuit. If “BLK/YEL” circuit is OK, substitute a known-good ECM and recheck. |

# DTC P0660 (No.57) Intake Manifold Tuning Valve Control Circuit/Open

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 3. Main relay | 5. "FI" fuse | 7. To battery |
| 2. Vacuum solenoid valve | 4. "IG COIL" fuse | 6. To ignition switch | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Monitor signal of vacuum solenoid valve is different from command signal.<br>(2 driving cycle detection logic) | • Vacuum solenoid valve and its circuit<br>• ECM malfunction |

## 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 at idle for 3 min. or more.
4) Check DTC and pending DTC by using scan tool.

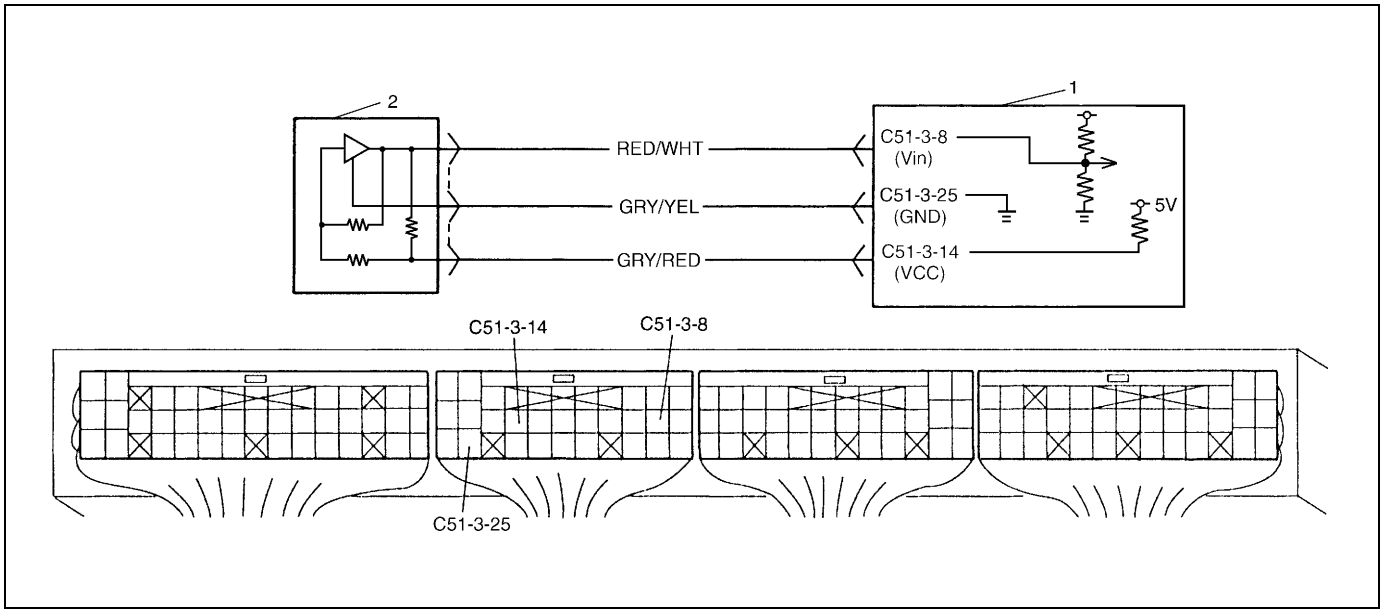
## Troubleshooting

| 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" in this section. |
| 2 | **Check wire circuit**<br>1) Turn OFF ignition switch.<br>2) Disconnect connector from vacuum solenoid valve.<br>3) Check for proper connection of vacuum solenoid valve connector at "BLU/BLK" and "GRY/RED" wire terminals.<br>4) If OK, turn ON ignition switch and measure voltage between "BLU/BLK" wire of vacuum solenoid valve connector and engine ground.<br>Is voltage 10 – 14 V? | Go to Step 3. | Open in "BLU/BLK" circuit. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Check wire circuit**<br>1) Remove ECM cover.<br>2) Turn OFF ignition switch.<br>3) Disconnect connectors from ECM.<br>4) Check for proper connection of ECM connector at "C51-2-6" terminal.<br>5) If OK, measure resistance between "C51-2-6" terminal of ECM connector and vehicle body ground.<br>Is resistance infinity? | Go to Step 4. | "GRY/RED" circuit shorted to ground. |
| 4 | **Check wire circuit**<br>1) Turn ON ignition switch.<br>2) Measure voltage "C51-2-6" terminal of ECM connector and vehicle body ground.<br>Is voltage 0 V? | Go to Step 5. | "GRY/RED" circuit shorted to power supply line. |
| 5 | **Check wire circuit**<br>1) Turn OFF ignition switch.<br>2) Connect connector from vacuum solenoid valve.<br>3) Turn ON ignition switch.<br>4) Measure voltage "C51-2-6" terminal of ECM connector and vehicle body ground.<br>Is voltage 10 – 14 V? | Go to Step 6. | Open in "GRY/RED" circuit. |
| 6 | **Check vacuum solenoid valve performance**<br>1) Check vacuum solenoid valve referring to "Vacuum Tank Assembly" under "Air Intake System" in Section 6E2.<br>Is check result satisfactory? | Substitute a known-good ECM and recheck. | Replace vacuum tank assembly. |

# DTC P1107/P1108 Manifold Absolute Pressure Circuit Performance Low/High

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. Manifold absolute pressure sensor |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P1107:**<br>While vehicle is running with engine speed at less than 3000 r/min after being warmed up and with throttle opening larger than specification, lower than 1 V manifold absolute pressure sensor output voltage is detected for specified time.<br>(2 driving cycle detection logic) | • Manifold absolute pressure sensor<br>• Manifold absolute pressure sensor vacuum passage<br>• ECM |
| **DTC P1108:**<br>While engine is running after being warmed up and with throttle opening smaller than specification, higher than 4 V manifold absolute pressure output voltage is detected for specified time.<br>(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 with 2 persons, a driver and a tester, on a level road.**

**NOTE:**

**Check to make sure that the following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: 5 °C (41 °F) or higher**
- **Engine coolant temp.: 74 – 110 °C (165 – 230 °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 turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine completely.
3) Increase vehicle speed to 80 km/h (50 mph).
4) Keep driving above vehicle speed for 3 min. while engine speed keeps less than 2500 rpm.
5) Stop vehicle and check pending DTC by using scan tool.

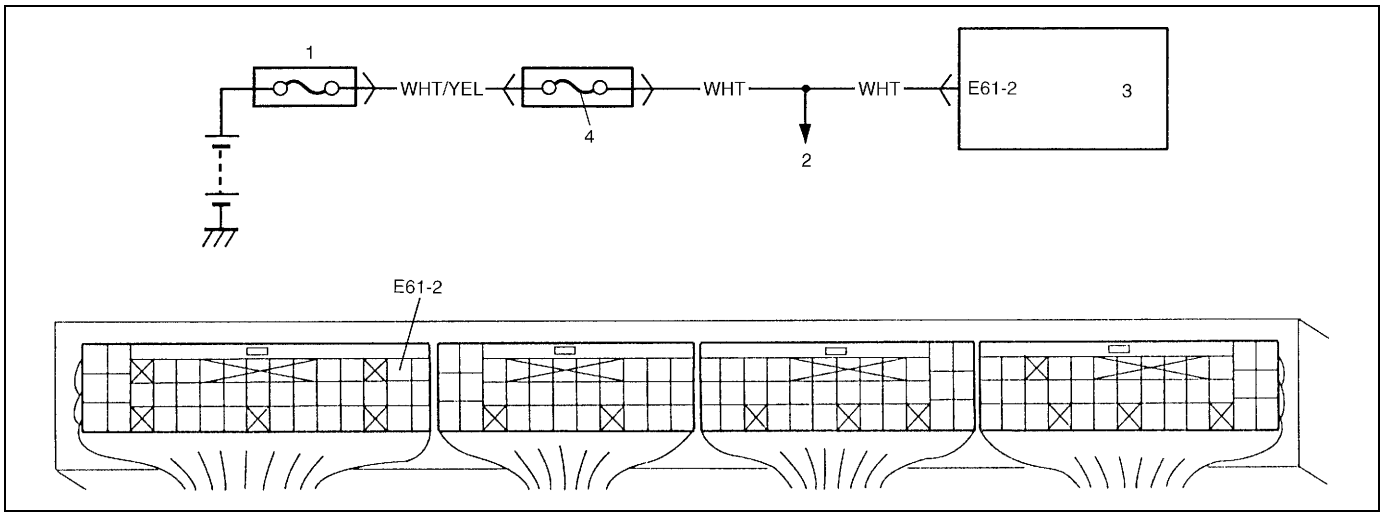
**Troubleshooting**

| 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" in this section. |
| 2 | Is DTC P0107 or P0108 indicated? | Go to "DTC P0107/ P0108 Manifold Absolute Pressure Circuit Low Input/High Input". | Go to Step 3. |
| 3 | **MAP sensor power supply voltage check**<br>1) Disconnect connector from MAP sensor with ignition switch turned OFF.<br>2) Check for proper connection of MAP sensor connector at "GRY/RED", "GRY/YEL" and "RED/WHT" wire terminals.<br>3) If OK, with ignition switch turned ON, measure voltage between engine ground and "GRY/RED" wire terminal of MAP sensor connector.<br>Is voltage 4 – 5 V? | Go to Step 4. | "GRY/RED" wire is shorted to other circuit. |
| 4 | **MAP sensor signal check**<br>1) Disconnect connectors from ECM with ignition switch turned OFF.<br>2) Check for proper connection of ECM connector at "C51-3-8", "C51-3-14" and "C51-3-25" terminal.<br>3) If OK, measure resistance between "C51-3-8" terminal of ECM connector and "RED/WHT" wire terminal of MAP sensor connector.<br>Is resistance below 5 Ω? | Go to Step 5. | High resistance wire in "RED/WHT" circuit. |
| 5 | **MAP sensor ground circuit check**<br>1) Measure resistance between "C51-3-25" terminal of ECM connector and "GRY/YEL" wire terminal of MAP sensor connector.<br>Is resistance below 5 Ω? | Go to Step 6. | High resistance wire in "GRY/YEL" circuit. |
| 6 | **MAP sensor signal check**<br>1) Measure resistance between "C51-3-14" terminal of ECM connector and "GRY/RED" wire terminal of MAP sensor connector.<br>Is resistance below 5 Ω? | Go to Step 7. | High resistance wire in "GRY/RED" circuit. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | **MAP sensor signal check**<br>1) With ignition switch turned ON.<br>2) Measure voltage between engine ground and "RED/WHT" wire terminal of MAP sensor connector.<br>Is voltage 0 V? | Go to Step 8. | "RED/WHT" wire shorted to other circuits. |
| 8 | **MAP sensor check**<br>1) Check MAP sensor referring to "Manifold Absolute Pressure Sensor" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | Substitute a known-good ECM and recheck. | Faulty MAP sensor. |

## DTC P1510 (No.36) ECM Back-Up Power Supply Malfunction

### Wiring Diagram




| | |
|---|---|
| 1. Main fuse box | 3. ECM |
| 2. To DLC | 4. "RADIO DOME" fuse |

### Circuit Description

Battery voltage is supplied to keep DTC memory, values that ECM has learned to control engine, etc. in ECM even when ignition switch is turned OFF.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Back-up circuit voltage lower than specification is detected while engine is running. | • ECM back-up circuit<br>• ECM |

### DTC Confirmation Procedure

**NOTE:**

**Check to make sure that following condition is satisfied when using this "DTC Confirmation Procedure".**

- **Intake air temp.: –8°C (18°F) or higher**
- **Engine coolant temp.: –8 – 110°C (18 – 230°F)**
- **Altitude (barometric pressure): 2400 m, 8000 ft or less (560 mmHg (75 kPa) or more)**

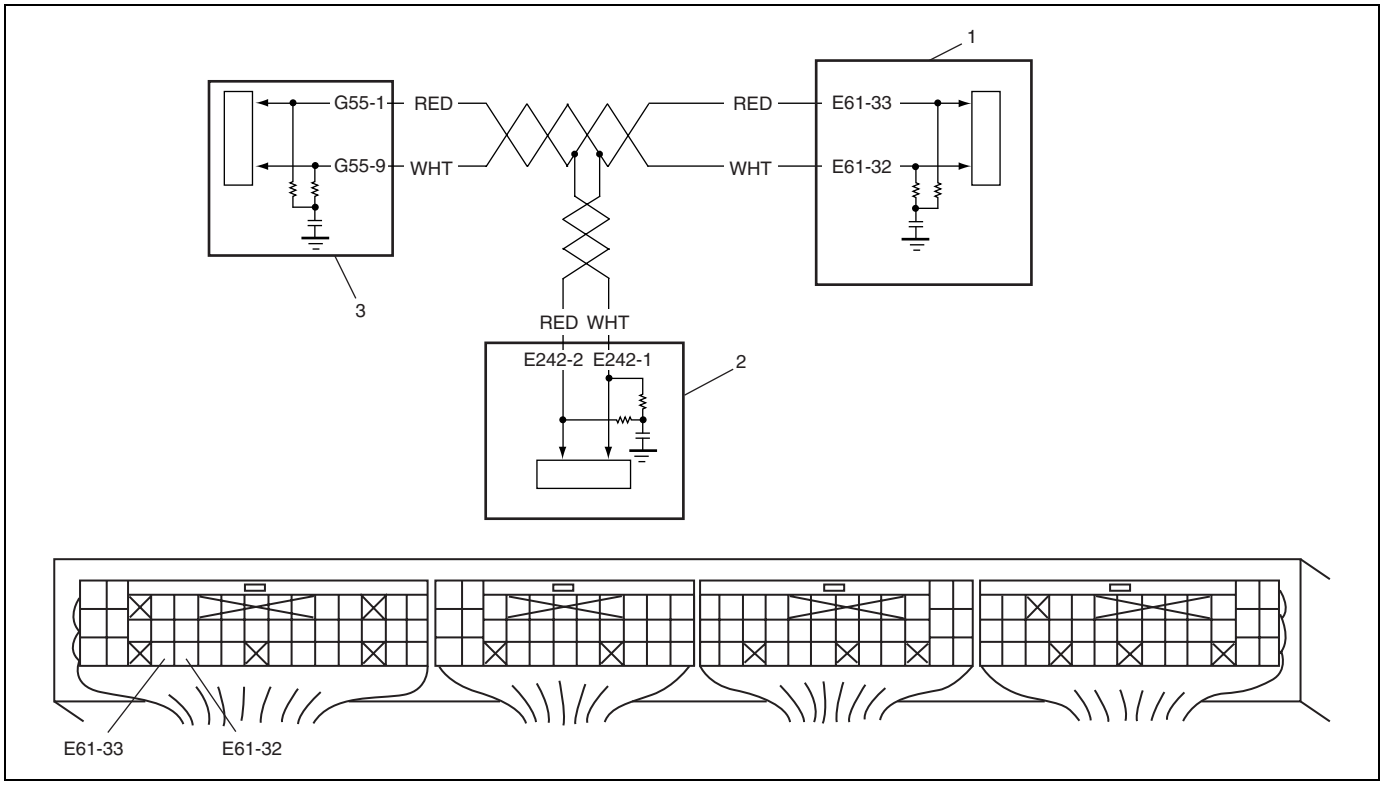
1) Connect scan tool to DLC with ignition switch OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and run engine at idle speed for 1min.
3) Check DTC by using scan tool.

### 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” in this section. |
| 2 | **Battery voltage supply circuit check**<br>1) Remove ECM cover.<br>2) While engine running, check voltage between E61-2 and ground.<br>Is voltage 10 – 14 V? | Poor E61-2 connection or intermittent trouble.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A.<br>If wire and connections are OK, substitute a known-good ECM and recheck. | “WHT” circuit open or short. |

# DTC P1601 (No.37) CAN Communication Error

## Wiring Diagram




| |
|---|
| 1. ECM |
| 2. TCM |
| 3. BCM |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission or reception error of communication data is detected by ECM for specified time continuously.<br>(1 driving cycle detection logic) | • "RED" or "WHT" wire circuit open or short<br>• BCM malfunction<br>• TCM malfunction<br>• ECM malfunction |

## 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, then start engine and run it for 1 min. or more.
3) Check DTC and pending DTC by using scan tool.

## Troubleshooting

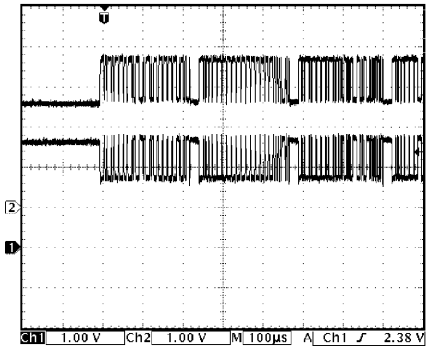
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Engine and Emission Control System Check" performed? | Go to Step 2. | Go to "Engine and Emission Control System Check" in this section. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | **DTC check**<br>1) Check DTC of ECM, TCM and BCM.<br>Is there any DTC(s) (other than DTC P1601, DTC P1701 and DTC B1156)? | Go to applicable DTC diag. flow. | Go to Step 3. |
| 3 | **Circuit check**<br>1) Turn OFF ignition switch.<br>2) Disconnect connectors from ECM and BCM.<br>3) Check for proper connection to ECM and BCM at applicable terminals.<br>4) If OK, measure resistance between "E61-32" terminal of ECM connector and "G55-9" terminal of BCM connector, between "E61-33" terminal of ECM connector and "G55-1" terminal of BCM connector.<br>Is each resistance 1 Ω or less? | Go to Step 4. | "WHT" wire circuit (between "E61-32" terminal of ECM connector and "G55-9" terminal of BCM connector) or "RED" wire circuit (between "E61-33" terminal of ECM connector and "G55-1" terminal of BCM connector) open or high resistance. |
| 4 | **Circuit check**<br>1) Disconnect connectors from TCM.<br>2) Check for proper connection to TCM at applicable terminals.<br>3) If OK, measure resistance between "E61-32" terminal of ECM connector and "E242-1" terminal of TCM connector, between "E61-33" terminal of ECM connector and "E242-2" terminal of TCM connector.<br>Is each resistance 1 Ω or less? | Go to Step 5. | "WHT" wire circuit (between "E61-32" terminal of ECM connector and "E242-1" terminal of TCM connector) or "RED" wire circuit (between "61-33" terminal of ECM connector and "242-2" terminal of TCM connector) open or high resistance. |
| 5 | **Circuit check**<br>1) Measure resistance between "E242-1" terminal of TCM connector and "G55-9" terminal of BCM connector, between "E242-2" terminal of TCM connector and "G55-1" terminal of BCM connector.<br>Is each resistance 1 Ω or less? | Go to Step 6. | "WHT" wire circuit (between "E242-1" terminal of TCM connector and "G55-9" terminal of BCM connector) or "RED" wire circuit (between "E242-2" terminal of TCM connector and "G55-1" terminal of BCM connector) open or high resistance. |
| 6 | **Circuit check**<br>1) Turn ignition switch to ON position.<br>2) Measure voltage between "E61-32" terminal of ECM connector and vehicle body ground, between "E61-33" terminal of ECM connector and vehicle body ground.<br>Is each voltage 0 – 1 V? | Go to Step 7. | "WHT" circuit or "RED" circuit shorted to power supply line. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | **Circuit check**<br>1) Turn ignition switch to OFF position.<br>2) Measure resistance between "E61-32" terminal of ECM connector and vehicle body ground, between "E61-33" terminal of ECM connector and vehicle body ground.<br>As they infinite? | Go to Step 8. | "WHT" circuit or "RED" circuit shorted to ground. |
| 8 | **Circuit check**<br>1) Measure resistance between "E61-32" and "E61-33" terminals of ECM connector.<br>Is it infinite? | Go to Step 9. | "WHT" circuit is shorted to "RED" circuit. |
| 9 | Do you have oscilloscope? | Go to Step 10. | Substitute a known-good BCM and recheck.<br>If malfunction is detected, substitute a known-good TCM and recheck.<br>If malfunction is detected, substitute a known-good ECM and recheck. |
| 10 | **Waveform range check**<br>1) Connect connectors to ECM, TCM and BCM.<br>2) Connect oscilloscope between "E61-32" terminal of ECM connector and ground, between "E61-33" terminal of ECM connector and ground.<br>3) Check if each range of two waveforms is as specified in illustration below. (See fig.)<br>Is it in good condition? | Go to Step 13. | Go to Step 11. |
| 11 | **Waveform range check**<br>1) Disconnect connectors from BCM.<br>2) Connect oscilloscope between "E61-32" terminal of ECM connector and ground, between "E61-33" terminal of ECM connector and ground.<br>3) Check if each range of two waveforms is as specified in illustration below. (See fig.)<br>Is it in good condition? | Substitute a known-good BCM and recheck. | Go to Step 12. |
| 12 | **Waveform range check**<br>1) Disconnect connectors from TCM.<br>2) Connect connectors to BCM.<br>3) Connect oscilloscope between "E61-32" terminal of ECM connector and ground, between "E61-33" terminal of ECM connector and ground.<br>4) Check if each range of two waveforms is as specified in illustration below. (See fig.)<br>Is it in good condition? | Substitute a known-good TCM and recheck. | Substitute a known-good ECM and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 13 | **Communication check**<br>1) Disconnect connector from ECT sensor.<br>2) Start engine for 1 minute or more.<br>3) Check DTC of TCM referring to “DTC Check” in Section 7B2.<br>Is DTC P1703 indicated? | Go to Step 14. | Substitute a known-good ECM and recheck. |
| 14 | **Communication check**<br>1) Connect connector to ECT sensor.<br>2) Disconnect connector from input shaft speed sensor.<br>3) Perform “DTC Confirmation Procedure” referring to “DTC P0717/ (No.14) Input/Turbine Speed Sensor Circuit No Signal”.<br>4) Check DTC for ECM referring to “Diagnostic Trouble Code (DTC) Check” in this section.<br>Is DTC P1603 indicated? | Substitute a known-good BCM and recheck. | Substitute a known-good TCM and recheck. |

[A]




[A]: Fig. for Step 10, 11 and 12

## DTC P1603 TCM Trouble Code Detected

### DTC Detecting Condition

When abnormality on the idle speed control signal, the engine power control signal or so on outputted from TCM is detected by ECM, ECM sets DTC P1603. (TCM outputs the trouble code to ECM when TCM cannot compute the engine control signal due to malfunctions of sensor circuits used for gear shift control.)

### 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" in this section. |
| 2 | **DTC check**<br>1) Check DTC of TCM referring to "DTC Check" in Section 7B2.<br>Is there any DTC(s)? | Go to applicable DTC troubleshooting. | Substitute a known-good ECM and recheck. |

## DTC P2227/P2228/P2229 Barometric Pressure Circuit Performance/Low/High

### System Description

Barometric pressure sensor is installed in ECM.

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P2227:**<br>While running under conditions described for "DTC Confirmation Procedure", barometric pressure value compared with intake manifold vacuum value in fuel cut state is not as specified.<br>(2 driving cycle detection logic) | • Manifold absolute pressure sensor performance problem<br>• Barometric pressure sensor in ECM |
| **DTC P2228:**<br>Barometric pressure signal less than specification is detected. | • Barometric pressure sensor in ECM |
| **DTC P2229:**<br>Barometric pressure signal more than specification is detected. | |

### DTC Confirmation Procedure

#### DTC P2228/P2229

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

## 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 with 2 persons, a driver and a tester, on a level road.**

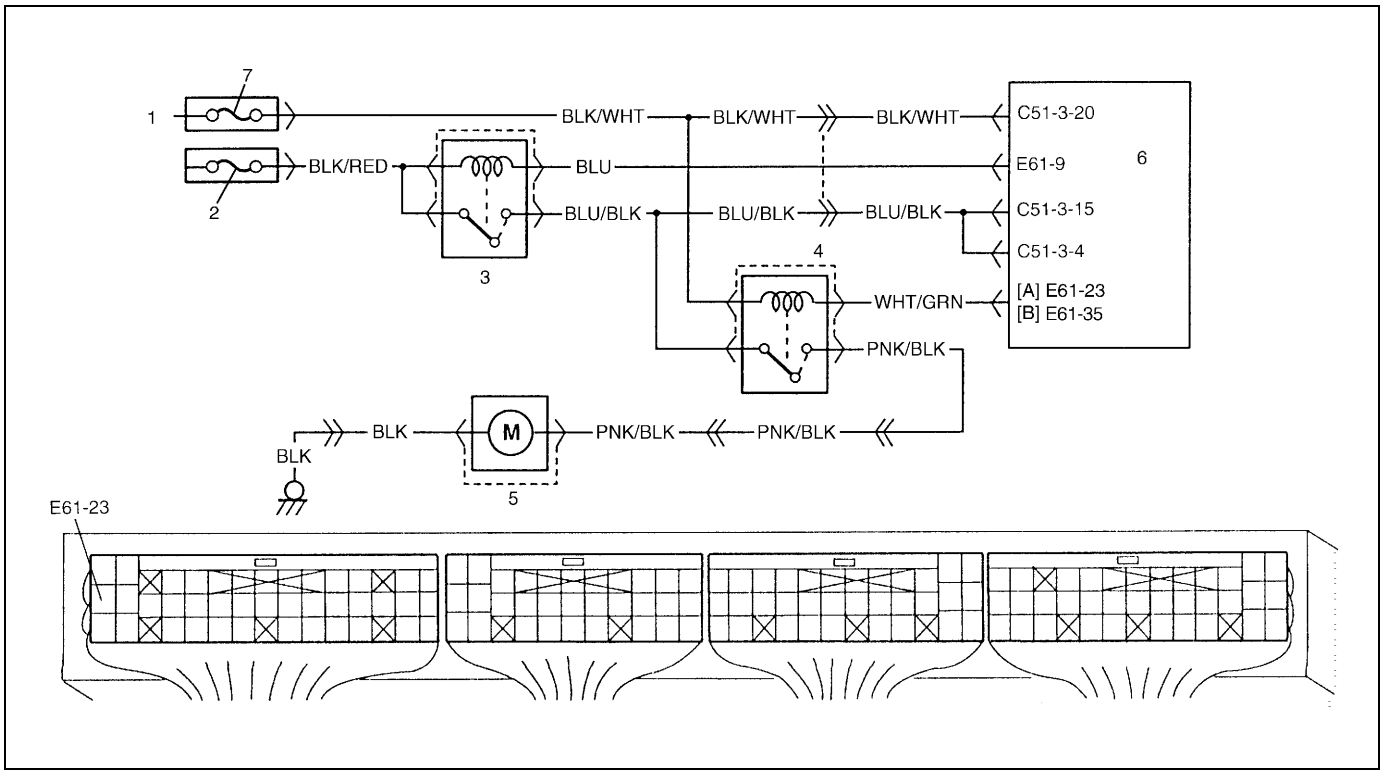
1) Connect scan tool to DLC with ignition switch turned OFF.
2) Turn ON ignition switch and clear DTC, pending DTC and freeze frame data by using scan tool and warm up engine to normal operating temperature.
3) Increase engine speed to 3000 rpm in 3rd gear in case of M/T and "2" range in case of A/T.
4) 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 1600 – 3000 rpm for 5 sec. or more.
5) Stop vehicle and run engine at idle.
6) Repeat Steps 3) – 5) 2 times.
7) Check DTC and pending DTC by using scan tool.

### 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" in this section. |
| 2 | Is DTC P2227 set? | Go to Step 3. | Substitute a known-good ECM and recheck. |
| 3 | **MAP sensor check**<br>1) Check MAP sensor and its circuit referring to Steps 2 and 3 of "DTC P0107/P0108 Manifold Absolute Pressure Circuit Performance Low/High" in this section.<br>Is check result satisfactory? | Substitute a known-good ECM and recheck. | MAP sensor or its circuit malfunction. |

# Table B-1 Fuel Pump Circuit Inspection

## Wiring Diagram



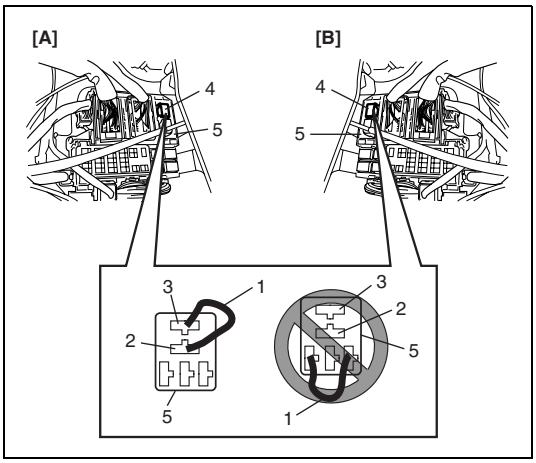

| | | |
|---|---|---|
| [A]: Vehicle with immobilizer control system | 2. Main fuse (“FI”) | 5. Fuel pump |
| [B]: Vehicle without immobilizer control system | 3. Main relay | 6. ECM |
| 1. To ignition switch | 4. Fuel pump relay | 7. “IG COIL” fuse |

## Inspection

**CAUTION:**
**Check to make sure that connection is made between correct terminals.**
**Wrong connection can cause damage to ECM, wire harness etc.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **Fuel pump operation check**<br>1) Remove fuel filler cap.<br>2) Turn ON ignition switch.<br>Is fuel pump operation sound heard for 3 sec. after ignition switch ON? | Fuel pump circuit is in good condition. | Go to Step 2. |
| 2 | **Fuel pump circuit check**<br>1) With ignition switch OFF, remove fuel pump relay (4) from fuse and relay box (5).<br>2) Check for proper connection to relay at each terminal.<br>3) If OK, using service wire (1), connect “PNK/BLK” wire terminal (2) and “BLU/BLK” wire terminal (3) of relay connector. (See Fig.)<br>Is fuel pump heard to operate at ignition switch ON? | Go to Step 3. | “BLU/BLK”, “PNK/BLK” or “BLK” circuit open or fuel pump malfunction. |

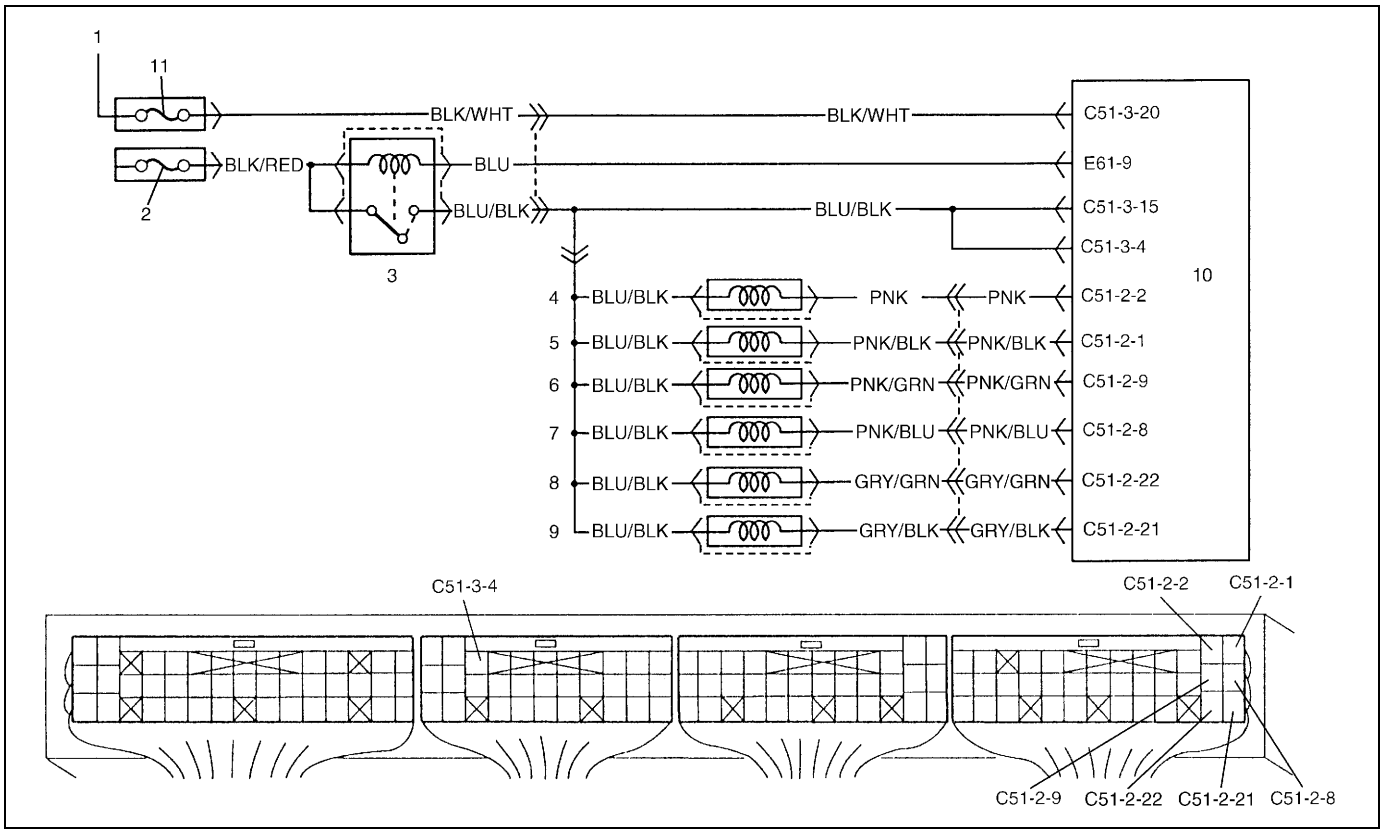
| Step | Action | Yes | No |
|---|---|---|---|
| 3 | **Fuel pump relay check**<br>1) Check fuel pump relay referring to "Fuel Pump Relay" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | "BLK/WHT" or "WHT/GRN" circuit open or poor E61-23 (vehicle with immobilizer control system) or E61-35 (vehicle without immobilizer control system) connection. If wire and connection are OK, substitute a known-good ECM and recheck. | Replace fuel pump relay. |




| |
|---|
| [A]: Fig. for Step 2 (Left hand steering vehicle) |
| [B]: Fig. for Step 2 (Right hand steering vehicle) |

# Table B-2 Fuel Injectors and Circuit Inspection

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. To ignition switch | 4. Injector No.1 | 7. Injector No.4 | 10. ECM |
| 2. Main fuse (“FI”) | 5. Injector No.2 | 8. Injector No.5 | 11. “IG COIL” fuse |
| 3. Main relay | 6. Injector No.3 | 9. Injector No.6 | |

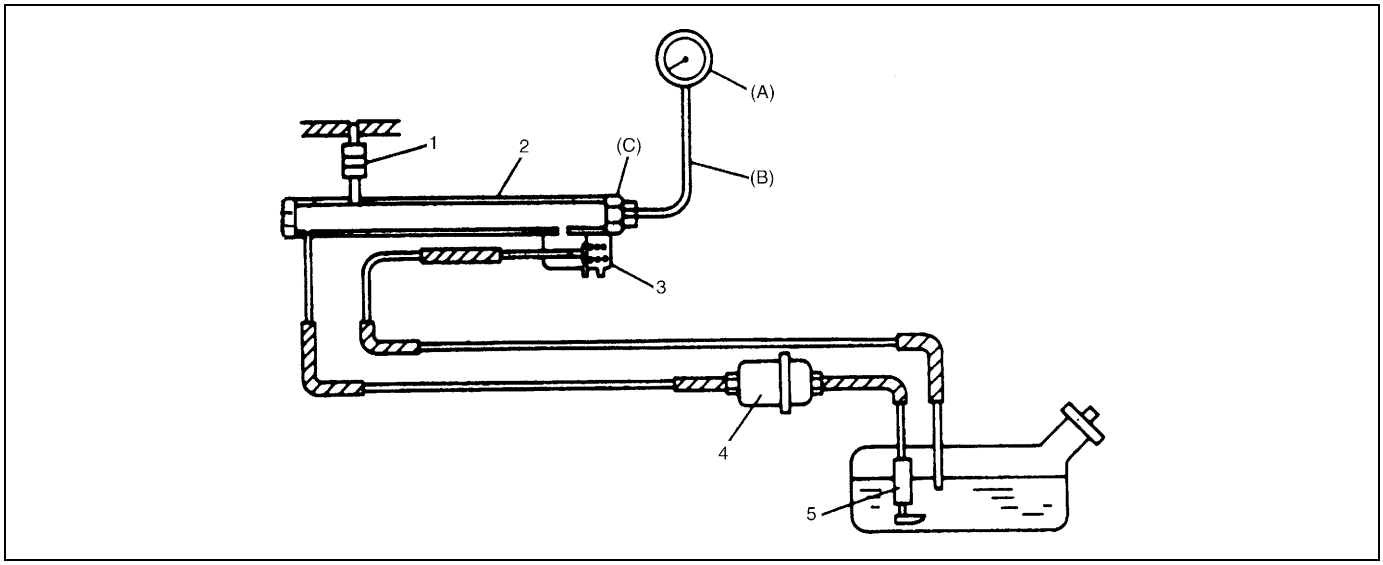
## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **Injector check for operating sound**<br>Using sound scope, check each injector for operating sound at engine cranking.<br>Do all 6 injectors make operating sound? | Go to Step 2. | Go to Step 3. |
| 2 | **Wire harness check**<br>1) Remove ECM cover and disconnect connectors from ECM.<br>2) Check for resistance between following terminals of ECM connector disconnected.<br>**Fuel injector and its circuit resistance (C51-2-1 – C51-3-4, C51-2-2 – C51-3-4, C51-2-8 – C51-3-4, C51-2-9 – C51-3-4, C51-2-21 – C51-3-4 and C51-2-22 – C51-3-4):**<br>**14.2 – 14.8 Ω at 20°C (68°F)**<br>Is check result as specified? | Fuel injector circuit is in good condition. | “PNK”, “PNK/BLK”, “PNK/GRN”, “PNK/BLU”, “GRY/GRN” and “GRY/BLK” shorted each other. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Does none of 6 injectors make operating sound at Step 1? | Go to Step 4. | Check coupler connection and wire harness of injector not making operating sound and injector itself (Refer to “Fuel Injector” under “Fuel Delivery System” in Section 6E2). |
| 4 | Check power circuit of injectors for open and short.<br>Is it normal? | Check all 6 injectors for resistance respectively.<br>It resistance is OK, substitute a known-good ECM and recheck. | Power circuit open or short. |

# Table B-3 Fuel Pressure Inspection

## System Diagram




| | |
|---|---|
| 1. Injector | 4. Fuel filter |
| 2. Delivery pipe | 5. Fuel pump |
| 3. Fuel pressure regulator | |

**Special tool**
**(A): 09912-58441**
**(B): 09912-58431**
**(C): 09919-58421**

## Inspection

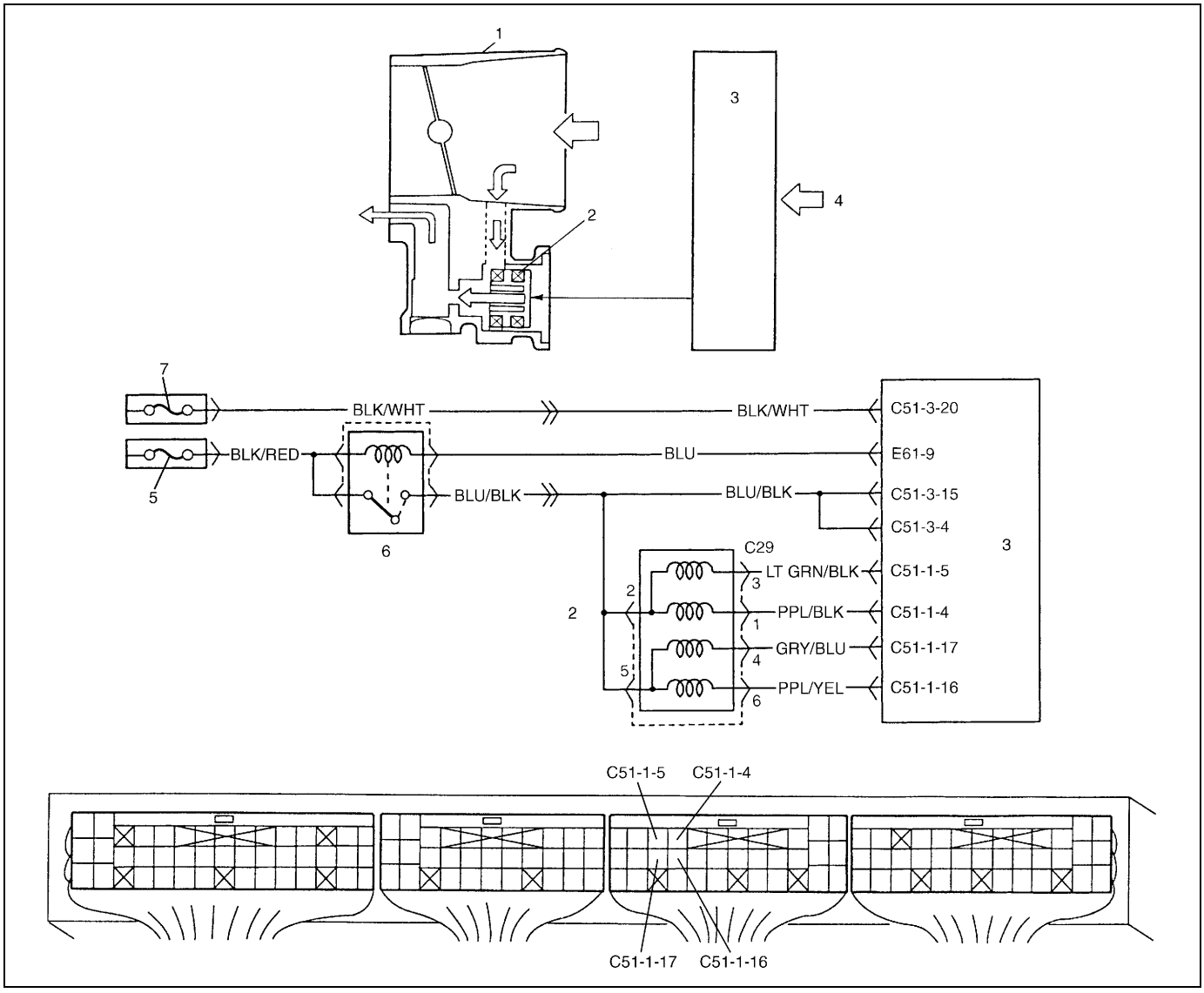
**NOTE:**
**Before using the following flow table, check to make sure that battery voltage is higher than 11 V. If battery voltage is low, pressure becomes lower than specification even if fuel pump and line are in good condition.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Install fuel pressure gauge, referring to "Fuel Pressure Inspection" under "Fuel Delivery System" in Section 6E2.<br>2) Operate fuel pump.<br>Is fuel pressure then 270 – 310 kPa (2.7 – 3.1 kg/cm$^2$, 38.4 – 44.0 psi)? | Go to Step 2. | Go to Step 5. |
| 2 | Is 200 kPa (2.0 kg/cm$^2$, 28.4 psi) or higher fuel pressure retained for 1 minute after fuel pump is stopped at Step 1? | Go to Step 3. | Go to Step 4. |
| 3 | 1) Start engine and warm it up to normal operating temperature.<br>2) Keep it running at specified idle speed.<br>Is fuel pressure then within 210 – 260 kPa (2.1 – 2.6 kg/cm$^2$, 29.8 – 37.0 psi)? | Normal fuel pressure. | Clogged vacuum passage for fuel pressure regulator or faulty fuel pressure regulator. |
| 4 | Is there fuel leakage from fuel feed line hose, pipe or joint? | Fuel leakage from hose, pipe or joint. | Go to Step 10. |
| 5 | Was fuel pressure higher than spec. in Step 1? | Go to Step 6. | Go to Step 7. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | 1) Disconnect fuel return hose from fuel pipe and connect new hose to it.<br>2) Put the other end of new return hose into approved gasoline container.<br>3) Operate fuel pump.<br>Is specified fuel pressure obtained then? | Restricted fuel return hose or pipe. | Faulty fuel pressure regulator. |
| 7 | Was no fuel pressure applied in Step 1? | Go to Step 8. | Go to Step 9.<br>(Low pressure is measured.) |
| 8 | With fuel pump operated and fuel return hose blocked by pinching it, is fuel pressure applied? | Faulty fuel pressure regulator. | Shortage of fuel or fuel pump or its circuit defective (Refer to “Table B-1”). |
| 9 | 1) Operate fuel pump.<br>2) With fuel return hose blocked by pinching it, check fuel pressure.<br>Is it 450 kPa (4.5 kg/cm$^2$, 64.0 psi) or more? | Faulty fuel pressure regulator. | Clogged fuel filter, restricted fuel feed hose or pipe, faulty fuel pump or fuel leakage from hose connection in fuel tank. |
| 10 | 1) Disconnect fuel return hose from fuel pipe and connect new hose to it.<br>2) Put the other end of new return hose into approved gasoline container.<br>3) Check again if specified fuel pressure is retained.<br>While doing so, does fuel come out return hose? | Faulty fuel pressure regulator. | Fuel leakage from injector, faulty fuel pump (faulty check valve in fuel pump) or fuel leakage from fuel pressure regulator diaphragm. |

# Table B-4 Idle Air Control System Inspection

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. Throttle body | 3. ECM | 5. Main fuse (“FI”) | 7. “IG COIL” fuse |
| 2. Idle air control valve | 4. Sensed information | 6. Main relay | |

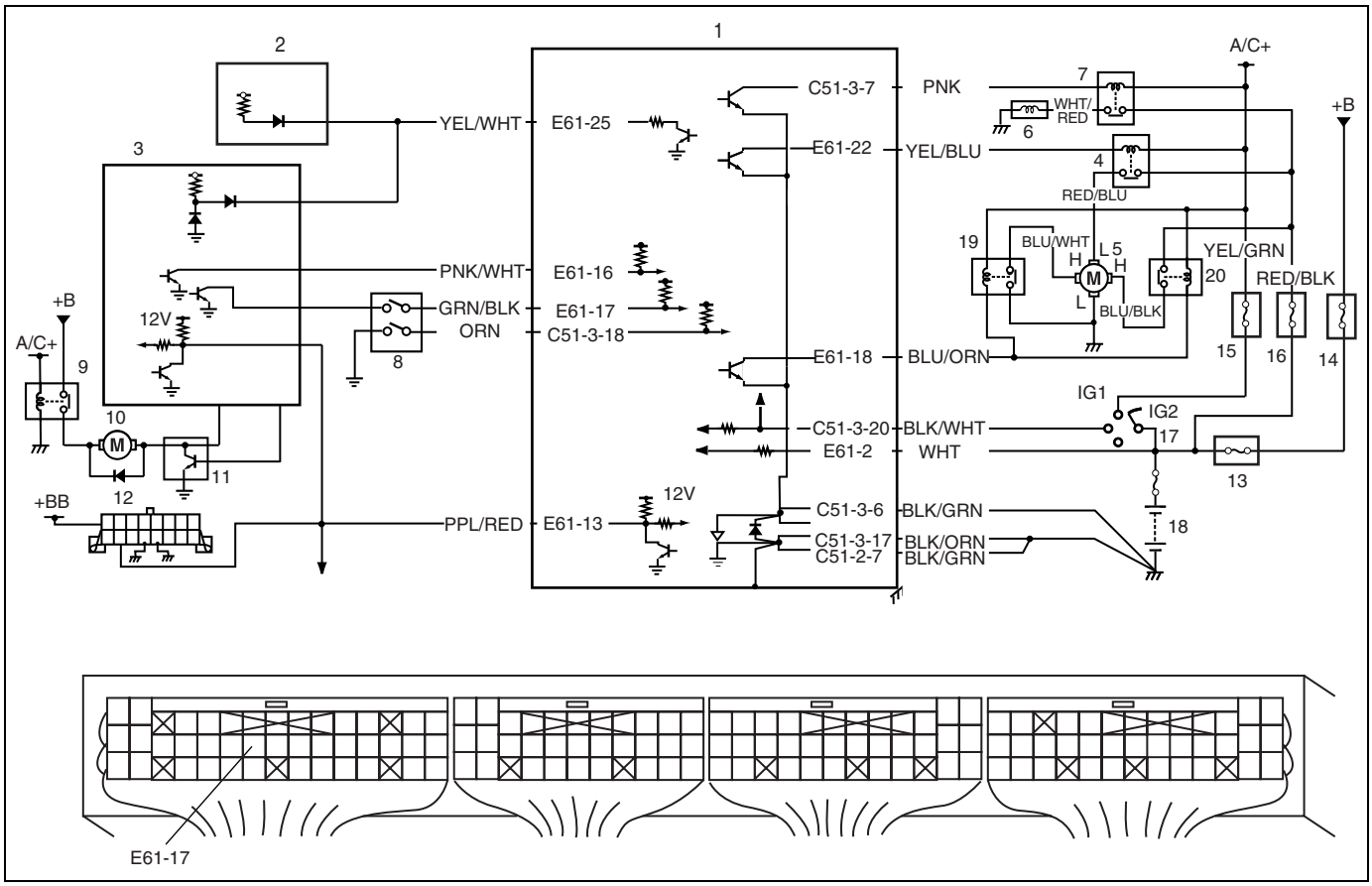
## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check engine idle speed and IAC duty referring to “Idle Speed/Idle Air Control (IAC) Duty Inspection” in Section 6E2. Is idle speed/IAC duty within specification? | Go to Step 2. | Go to Step 3. |
| 2 | Is engine idle speed kept specified speed even with headlights turned ON? | System is in good condition. | Go to Step 3. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Check IAC valve referring to "Idle Air Control Valve (IAC valve)" under "Air Intake System" in Section 6E2.<br>Is check result as specified? | Go to Step 4. | IAC valve malfunction, "BLU/BLK", "LT GRN/BLK", "PPL/BLK", "GRY/BLU" or "PPL/YEL" wire open or short or poor coupler connection.<br>If all above are OK, substitute a known-good ECM and recheck. |
| 4 | Was idle speed within specification in Step 1? | Check for following:<br>FIA valve, Vacuum leaks, air inhaling, EVAP canister purge control system, accessory engine load, stuck of PCV valve, clog of idle air passage, MAF sensor, TP sensor, ECT sensor, EGR valve malfunction (leakage from valve seat), A/C signal, transmission range switch signal and power steering switch signal. | Go to Step 5. |
| 5 | Was idle speed higher than specification in Step 1? | Go to Step 6. | Go to Step 8. |
| 6 | Check A/C (request) signal circuit referring to "Inspection of ECM and Its Circuits" in this section. (A/C signal can be also checked by using SUZUKI scan tool.)<br>Is it in good condition? | Go to Step 7. | A/C signal circuit open or short, or A/C system malfunction. |
| 7 | Was IAC duty less than about 2% in Step 1 of this table? | Check FIA valve.<br>Check abnormal air inhaling from intake manifold, throttle body, PCV valve and EVAP canister purge control system. | Check TP sensor (closed throttle position) and ECT sensor for performance.<br>If sensors are OK, substitute a known-good ECM and recheck. |
| 8 | Check transmission range switch signal referring to "Inspection of ECM and Its Circuit" in this section.<br>Is check result satisfactory? | Go to Step 9. | Transmission range switch malfunction or its circuits open or short. |
| 9 | Was IAC duty more than about 30% in Step 1 of this table? | Check parts or system which can cause engine low idle.<br>Check FIA valve.<br>Air inhaling from between throttle body and MAF sensor, EGR valve malfunction (leakage from valve seat), accessory engine load, clog of idle air passage and etc. | Substitute a known-good ECM and recheck. |

# Table B-5 A/C Signal Circuits Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR" 60 A fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "FRONT BLOW" 40 A fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR" 15 A fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

HVAC control module outputs A/C ON request signal to ECM when A/C switch and heater blower motor switch are turned ON.

Then A/C condenser fan motor low speed relay and compressor relay are turned ON by ECM when engine condition is normal.

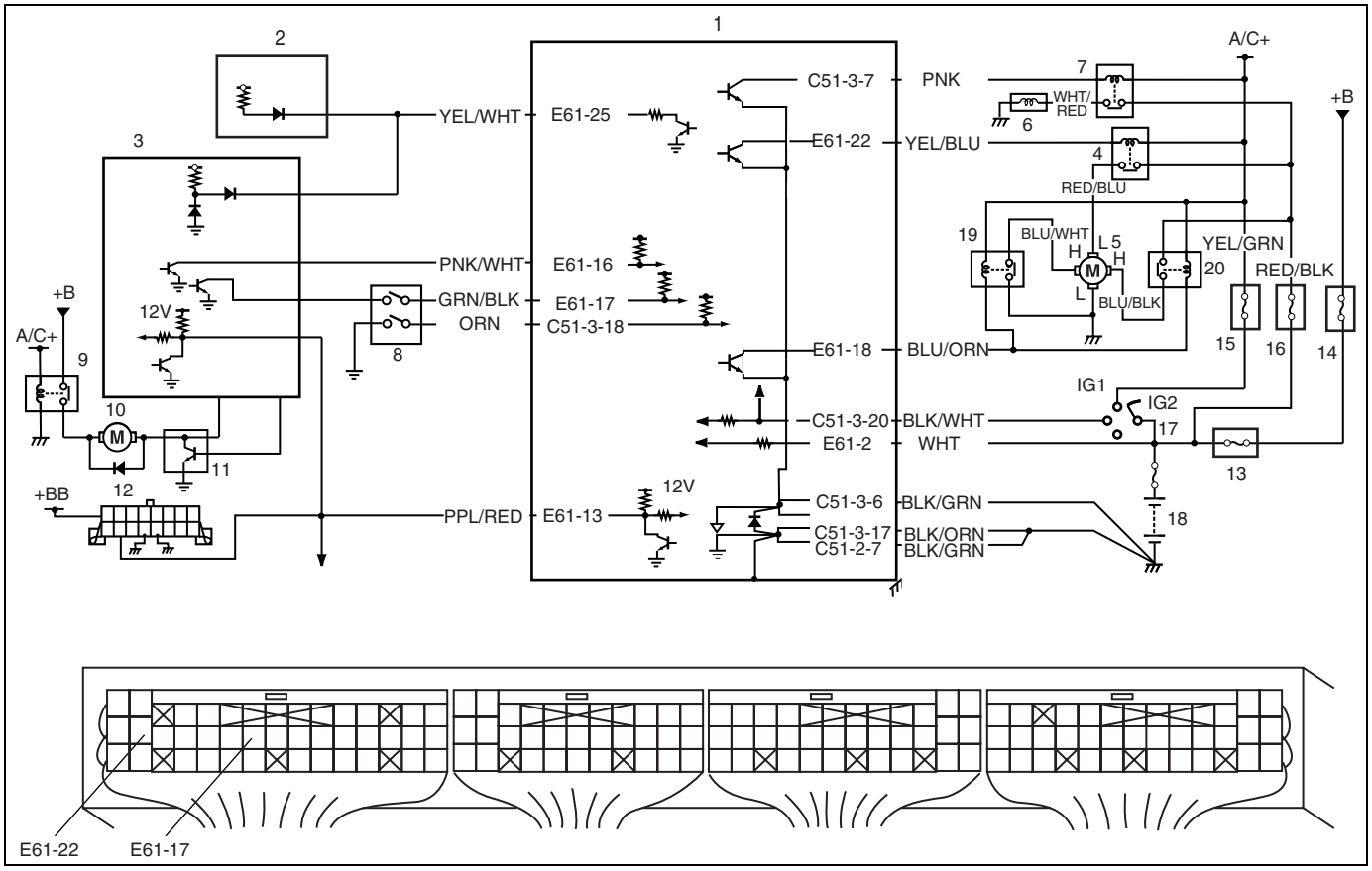
If A/C condenser fan control switch (in refrigerant pressure switch) is turned OFF with A/C ON (A/C compressor in operation), A/C condenser fan motor high speed relays are turned ON by ECM.

## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **A/C signal circuit check**<br>1) Check voltage at terminal E61-17 with ignition switch ON.<br>**A/C signal circuit specification**<br>**A/C switch and/or heater blower switch OFF (A/C is not operating): 10 – 14 V**<br>**Both A/C switch and heater blower switch ON: 0 – 1.5 V**<br>Are check result as specified? | A/C signal circuit is in good condition. | "GRN/BLK" circuit open or short, evaporative temperature is below 2.5°C (36.5°F) or faulty A/C system. |

# Table B-6 A/C Condenser Fan Motor Relay Low Speed Control System Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR" 60 A fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "FRONT BLOW" 40 A fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR" 15 A fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

A/C condenser fan motor low speed relay is turned ON by ECM when A/C signal is inputted to ECM while engine condition is normal.

When A/C condenser fan control switch (in refrigerant pressure switch) OFF signal is inputted to ECM with A/C ON (A/C compressor in operation), A/C condenser fan motor high speed relays are turned ON by ECM.

## Inspection

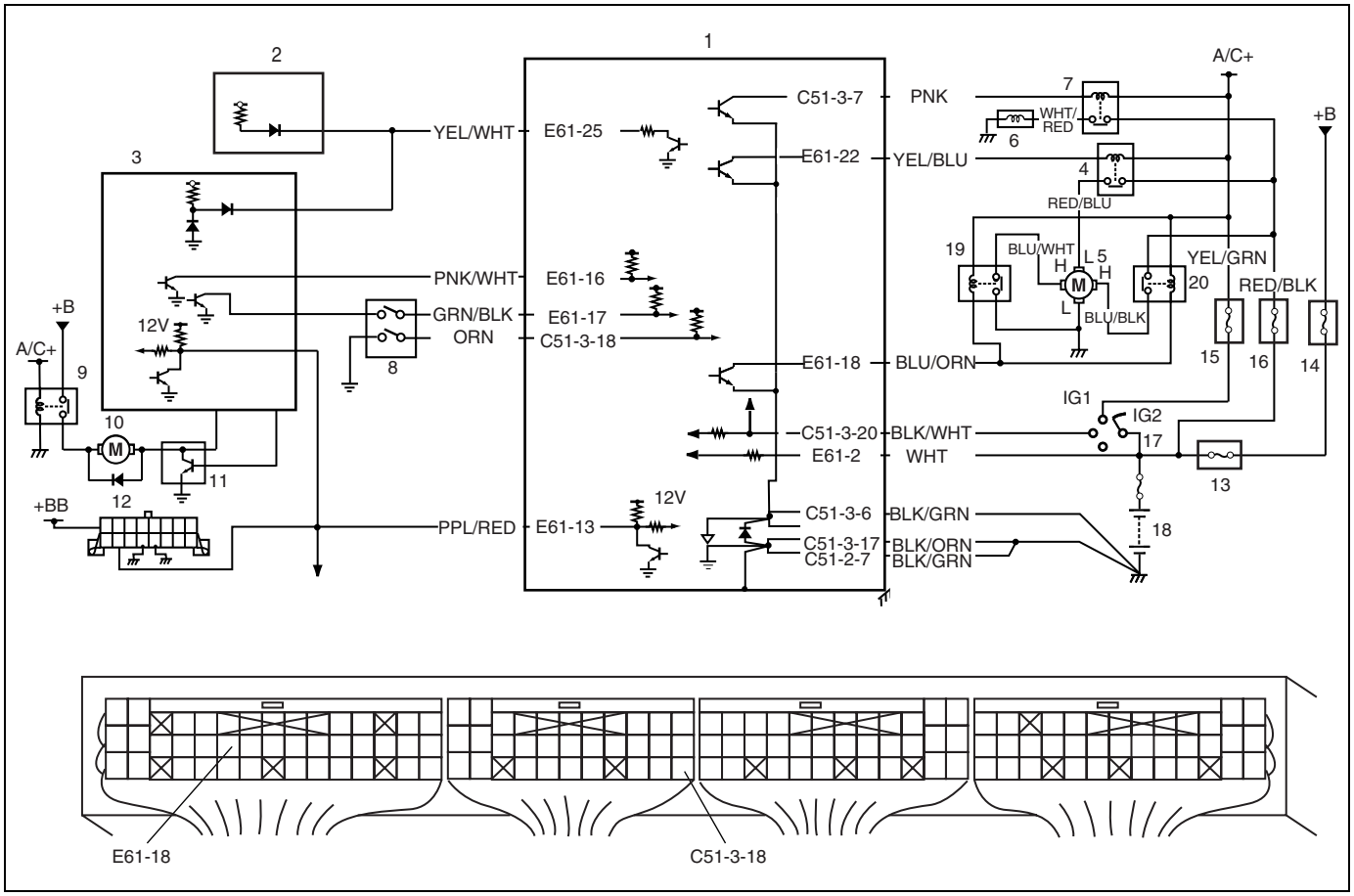
**WARNING:**

**Keep hands, tools, and clothing away from A/C condenser 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 in the "ON" position.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **A/C condenser fan motor control circuit check**<br>1) Remove ECM cover.<br>2) Measure voltage between E61-22 and vehicle body ground with ignition turned ON.<br>Is voltage 10 – 14 V? | Go to Step 3. | Go to Step 2. |
| 2 | **A/C condenser fan motor control circuit check**<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "HTR" 15A fuse.<br>3) If OK, check A/C condenser fan motor low speed relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | "YEL/GRN" wire to "YEL/BLU" wire is open circuit. | Faulty A/C condenser fan motor low speed relay. |
| 3 | **A/C condenser fan motor low speed control signal check**<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure voltage between E61-22 and vehicle body ground.<br>Is voltage 0 – 1 V? | Go to Step 4. | Go to Step 6. |
| 4 | **A/C condenser control circuit check**<br>1) Turn OFF ignition switch.<br>2) Disconnect A/C condenser fan motor connector.<br>3) Start engine.<br>4) Turn ON A/C switch and heater blower motor switch.<br>5) Measure voltage between "RED/BLU" wire terminal in A/C condenser fan motor connector and vehicle body ground.<br>Is voltage 10 – 14 V? | Go to Step 6. | Go to Step 5. |
| 5 | **A/C condenser control circuit check**<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "A/C 25 A" fuse.<br>3) If OK, check A/C condenser fan motor low speed relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | "RED/BLK" wire or "RED/BLU" wire is open circuit. | Faulty A/C condenser fan motor low speed relay. |
| 6 | **A/C switch signal check**<br>1) Turn ON A/C switch and heater blower motor switch.<br>2) Measure voltage between E61-17 and vehicle body ground with ignition switch turned ON.<br>Is voltage 0 – 1 V? | Substitute a known-good ECM and recheck. | Faulty "GRN/BLK" wire, A/C evaporator temperature is below 2.5°C, 36.5°F, faulty refrigerant pressure switch or faulty A/C system referring to "HVAC Control Module" in Section 1B. |

# Table B-7 A/C Condenser Fan Motor Relay High Speed Control System Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR" 60 A fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "FRONT BLOW" 40 A fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR" 15 A fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

A/C Condenser fan motor low-speed relay is turned ON by ECM when A/C signal is inputted to ECM while engine conditions is normal.

A/C Condenser fan motor high-speed relays should be operated under the following conditions.

- When A/C condenser fan control switch signal in refrigerant pressure switch is inputted to ECM with A/C ON.
- When ECT is more than 115°C, 239°F.

## Inspection

**WARNING:**

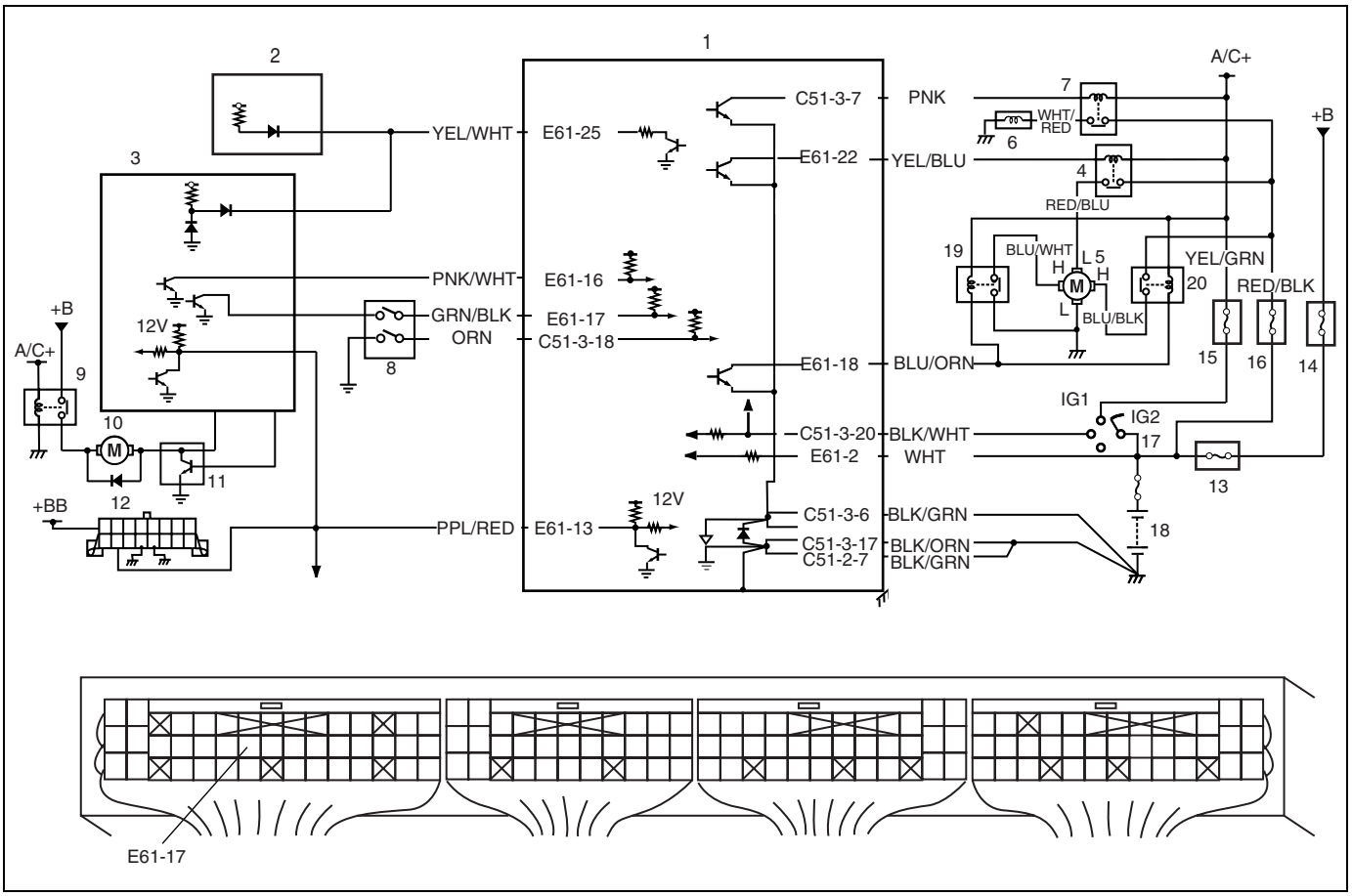
**Keep hands, tools, and clothing away from A/C condenser fan to help prevent personal injury. This fan is electric and can come on whether or not the engine is running. The fan can start automatically in response to the ECT sensor with the ignition switch in the "ON" position.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **A/C condenser fan motor control circuit check**<br>1) Remove ECM cover.<br>2) Measure voltage between E61-18 and vehicle body ground with ignition switch turned ON.<br>Is voltage 10 – 14 V? | Go to Step 3. | Go to Step 2. |
| 2 | **A/C condenser fan motor control circuit check**<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "HTR" 15 A fuse.<br>3) If OK, check A/C condenser fan motor high-speed relay No.1 and No.2 referring to "A/C Compressor Relay and Condenser Fan Motor Relay" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | "YEL/GRN" wire or "BLU/ORN" wire is open circuit. | Faulty A/C condenser fan motor relay. |
| 3 | **A/C condenser fan motor high-speed control signal check**<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure voltage between E61-18 and vehicle body ground.<br>Is voltage 0 – 1 V? | Go to Step 4. | Go to Step 7. |
| 4 | **A/C condenser fan control circuit check**<br>1) Turn OFF ignition switch.<br>2) Disconnect A/C condenser fan motor connector.<br>3) Start engine.<br>4) Turn ON A/C switch and heater blower motor switch.<br>5) Measure voltage between "BLU/BLK" wire terminal in A/C condenser fan motor connector and vehicle body ground.<br>Is voltage 10 – 14 V? | Go to Step 6. | Go to Step 5. |
| 5 | **A/C condenser control circuit check**<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "A/C 25 A" fuse.<br>3) If OK, check A/C condenser fan motor high speed relay No.1 and No.2 referring to "A/C Compressor Relay and Condenser Fan Motor Relay" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | "RED/BLK" wire, "BLU/BLK" wire are open circuit. | Faulty A/C condenser fan motor high-speed relay No.1 or No.2. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | **A/C condenser control circuit check**<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure resistance between "BLU/WHT" wire terminal in A/C condenser fan motor connector and vehicle body ground.<br>Is resistance below 5 Ω? | "BLU/WHT" wire or "BLK" wire are open circuit. | Faulty A/C condenser fan motor high-speed relay No.1 or No.2. |
| 7 | **A/C refrigerant pressure switch signal check**<br>1) Turn ON A/C switch and heater blower motor switch while A/C condenser fan motor connector disconnected.<br>2) Start engine.<br>3) Measure voltage between C51-3-18 and vehicle body ground with engine running.<br>Is voltage 5 – 12 V? | Substitute a known-good ECM and recheck. | Faulty "ORN" wire or faulty refrigerant pressure switch or faulty A/C system referring to "HVAC control module" in Section 1B. |

# Table B-8 A/C Compressor Relay Control System Inspection (If Equipped)

## Wiring Diagram




| | | | |
|---|---|---|---|
| 1. ECM | 6. A/C compressor | 11. Heater blower motor controller | 16. "A/C" 25 A fuse |
| 2. Combination meter (ECT meter) | 7. A/C compressor relay | 12. DLC | 17. Ignition switch |
| 3. HVAC control module | 8. Refrigerant pressure switch | 13. "HTR" 60 A fuse | 18. Battery |
| 4. A/C condenser fan motor low speed relay | 9. Heater blower motor relay | 14. "FRONT BLOW" 40 A fuse | 19. A/C condenser fan motor high speed relay No.1 |
| 5. Blank | 10. Heater blower motor | 15. "HTR" 15 A fuse | 20. A/C condenser fan motor high speed relay No.2 |

## Circuit Description

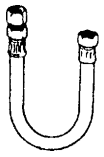
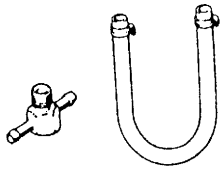
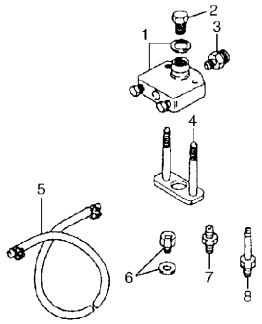
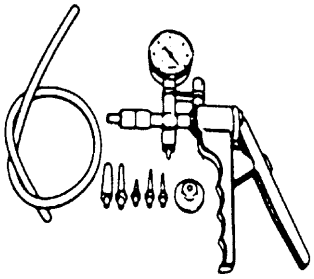
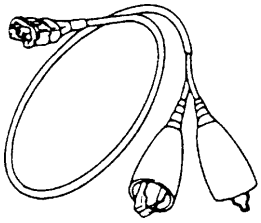
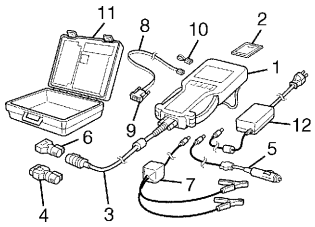
A/C Compressor relay is turned ON by ECM, when A/C signal is inputted to ECM while engine conditions is normal.

## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | **A/C compressor control circuit check**<br>1) Remove ECM cover.<br>2) Measure voltage between C51-3-7 and vehicle body ground with ignition switch turned ON.<br>Is voltage 10 – 14 V? | Go to Step 3. | Go to Step 2. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | **A/C compressor control circuit check**<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "HTR" 15 A fuse.<br>3) If OK, check A/C compressor relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" under "Electronic Control System" in Section 6E2.<br>Is it in good condition? | "YEL/GRN" wire or "PNK" wire is open circuit. | Faulty A/C compressor relay. |
| 3 | **A/C compressor control signal check**<br>1) Start engine.<br>2) Turn ON A/C switch and heater blower motor switch.<br>3) Measure voltage between C51-3-7 and vehicle body ground with engine running.<br>Is voltage 0 – 1 V? | Go to Step 4. | Go to Step 5. |
| 4 | **A/C compressor control signal check**<br>1) Turn OFF ignition switch.<br>2) Check for fuse blow at "A/C" 25 A fuse.<br>3) If OK, check A/C compressor relay referring to "A/C Compressor Relay and Condenser Fan Motor Relay" in Section 6E2.<br>Is it in good condition? | "RED/BLK" wire or "WHT/RED" wire is open circuit. If wire circuits are OK, check A/C compressor referring to "Magnet Clutch Operation Check" in Section 1B. | Faulty A/C compressor relay. |
| 5 | **A/C switch signal check**<br>1) Turn ON A/C switch and heater blower motor switch.<br>2) Measure voltage between E61-17 and vehicle body ground with ignition turned ON.<br>Is voltage 0 – 1 V? | Poor performance of ECT sensor or its circuit. If they are OK, substitute a known-good ECM and recheck. | Faulty "GRN/BLK" wire, A/C evaporator temperature is below 2.5°C, 36.5°F, faulty refrigerant pressure switch or faulty A/C system referring to "HVAC control module" in Section 1B. |

# Special Tool

| | | | |
|---|---|---|---|
|  <br>09912-58441<br>Pressure gauge |  <br>09912-58431<br>Pressure hose |  <br>09912-58490<br>3-way joint & hose |  <br>09912-58421<br>Checking tool set<br>(See NOTE “A”.) |
|  <br>09917-47011<br>Vacuum pump gauge |  <br>09930-88521<br>Injector test lead |  <br>Tech 2 kit (SUZUKI scan tool) (See NOTE “B”.) | |

**NOTE:**

- **“A”: This kit includes the following items.**
  **1. Tool body & washer, 2. Body plug, 3. Body attachment-1, 4. Holder,**
  **5. Return hose & clamp, 6. Body attachment-2 & washer, 7. Hose attachment-1,**
  **8. Hose attachment-2**
- **“B”: This kit includes the following items.**
  **1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loopback connector, 11. Storage case, 12. Power supply**

# SECTION 6A2

# ENGINE MECHANICAL (H27 ENGINE)

**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.**
- **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).**

**NOTE:**

- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this manual. Especially, service information for H27 engine model TYPE A and TYPE B is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**
- **Whether the following systems (parts) are used in the particular vehicle or not depends on specifications. Be sure to bear this in mind when performing service work.**
  - **– EGR valve**
  - **– Warm up three way catalytic converter**
  - **– Heated oxygen sensor(s)**
  - **– Three way catalytic converter**
  - **– CKP sensor**
  - **– MAP sensor**



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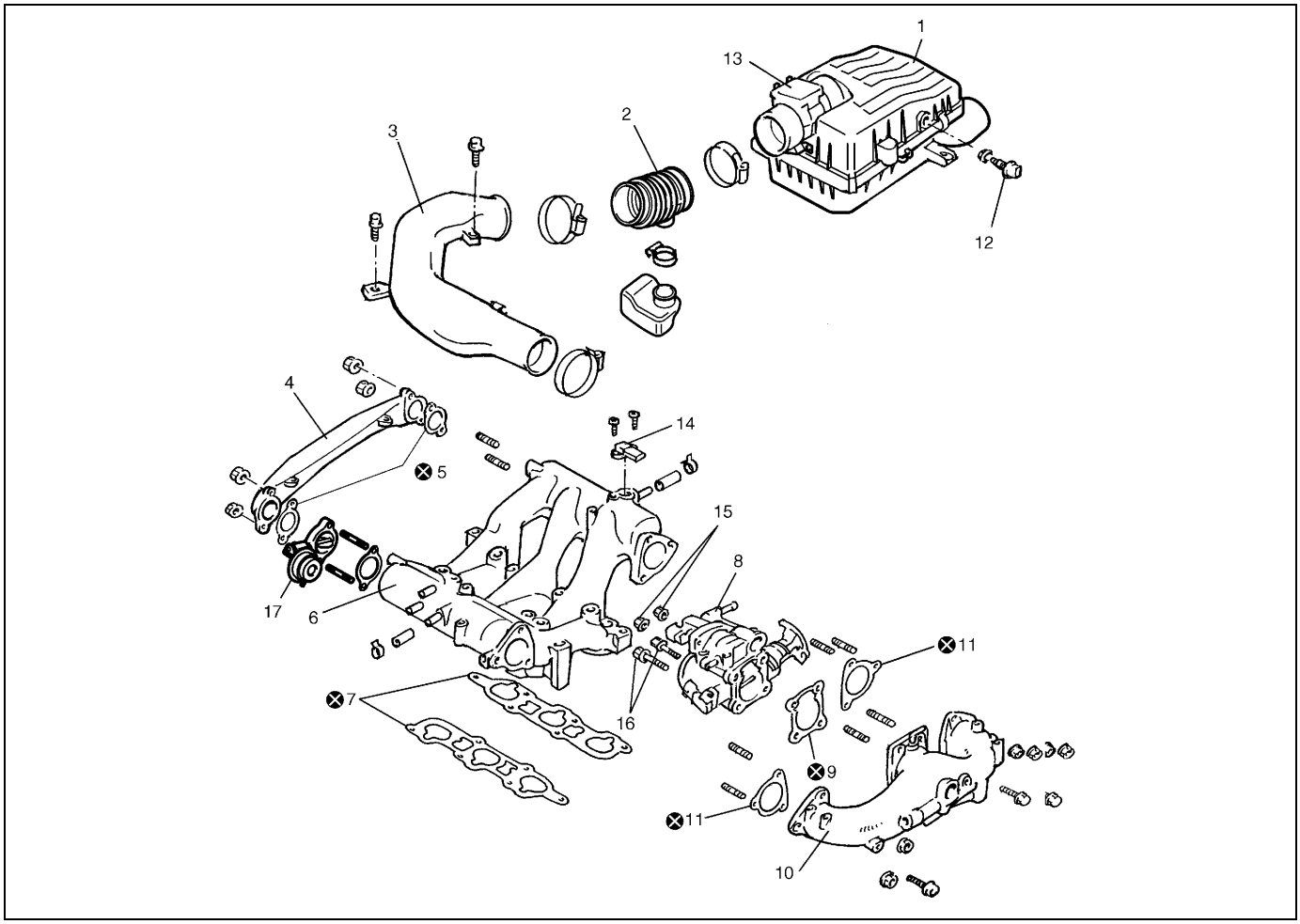
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**Unit Repair Overhaul** ..... **6A2-28**

Engine Assembly ..... 6A2-28
Main Bearings, Crankshaft and Cylinder Block ..... 6A2-32
**Special Tool ..... 6A2-45**
**Required Service Material ..... ***
**Tightening Torque Specifications ..... 6A2-47**

# On-Vehicle Service

## Throttle Body and Intake Manifold

### Components



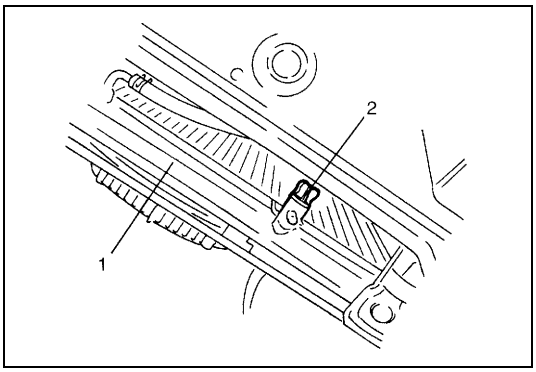

| | | | |
|---|---|---|---|
| 1. Air cleaner box | 6. Intake manifold | 11. Gasket | 16. Throttle body bolt |
| 2. Intake air hose | 7. Intake manifold gasket | 12. IAT sensor | 17. Intake control valve (if equipped) |
| 3. Intake air pipe | 8. Throttle body assembly | 13. MAF sensor | ⊗ Do not reuse. |
| 4. Surge tank pipe | 9. Throttle body gasket | 14. MAP sensor | |
| 5. Gasket | 10. Intake collector | 15. Throttle body nut | |

**Removal**

1) Release fuel pressure in fuel feed line by referring to “Fuel Pressure Relief Procedure” in Section 6-1.

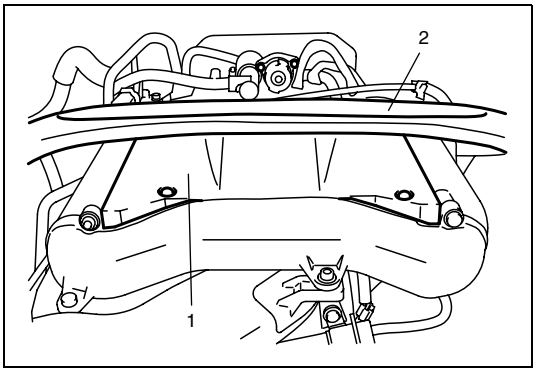
**CAUTION:**
**This work must not be done when engine is hot. If done so, it may cause adverse effect to catalyst.**

2) Disconnect negative (–) cable at battery.

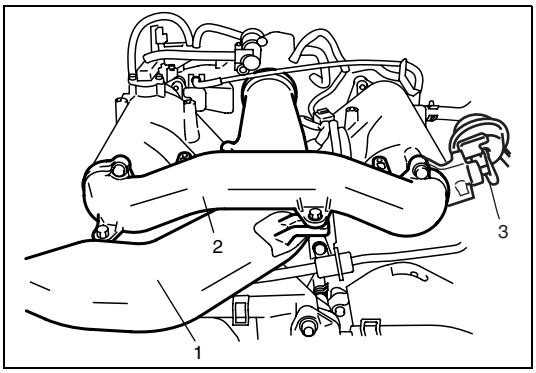



3) Drain coolant.

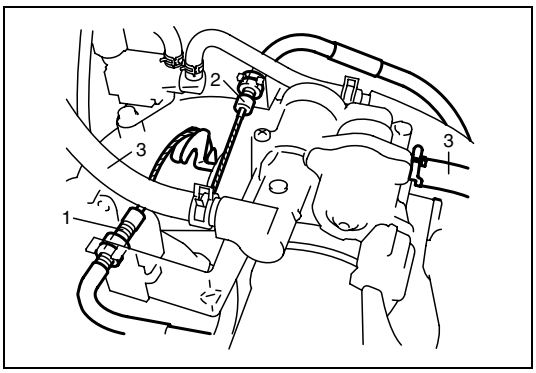
**WARNING:**
**To help avoid danger of being burned, do not remove drain plug (2) and radiator cap while engine and radiator (1) are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.**



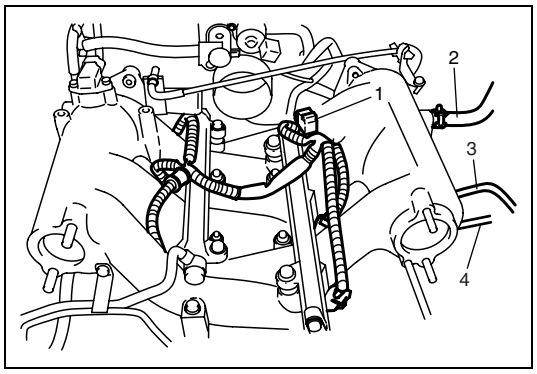

4) Detach fuse/relay box and remove strut tower bar (2).
5) Disconnect coupler from intake air temp. sensor and MAF sensor.
6) Remove surge tank cover (1).



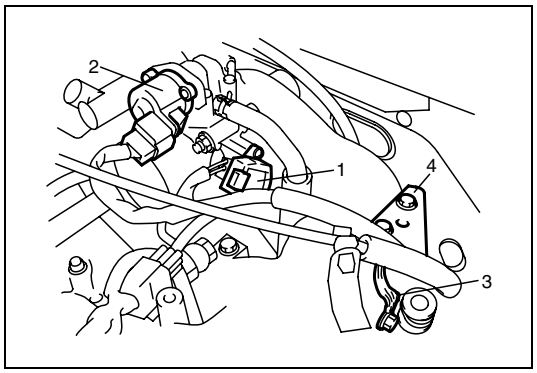

7) Remove air cleaner upper case, intake air hose, intake air pipe (1) and surge tank pipe (2) as one component. Do not disassemble them, when removing and reinstalling.
8) Remove intake control valve (3) (if equipped).



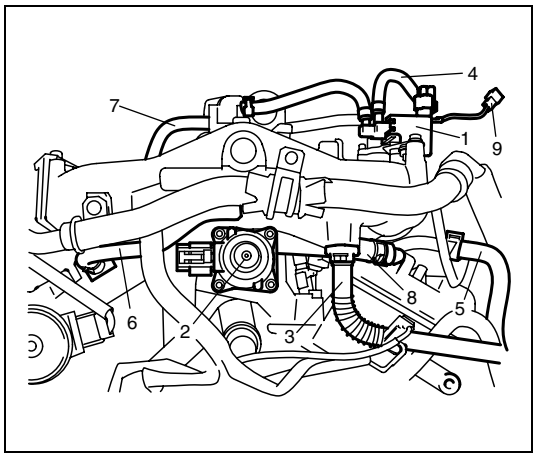

9) Disconnect accelerator cable (1) and A/T throttle cable (2) (if equipped) from throttle body.
10) Disconnect water hoses (3) from throttle body.




11) Disconnect injector wire (1) coupler.
12) Disconnect brake booster hose (2), fuel pressure regurator vacuum hose (4) (if equipped) and intake control valve hose (3) (if equipped) from intake manifold.

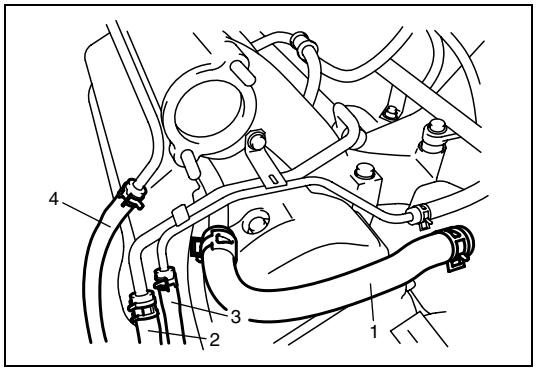



13) Disconnect couplers of TP sensor (1) and IAC valve (2).
14) Disconnect earth terminal (3) from intake collector.
15) Remove clamp bracket (4) from intake collector.

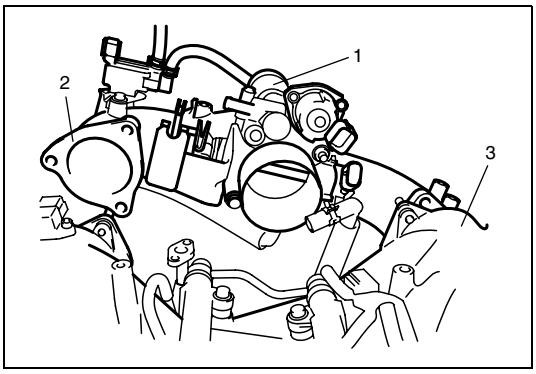



16) Disconnect couplers from manifold absolute pressure (MAP) sensor, EVAP canister purge valve (1), ground terminal and EGR valve (2).
17) Disconnect PCV hose (6) from cylinder head cover.
18) Disconnect breather hoses (8) from throttle body or cylinder head cover.
19) Disconnect EVAP canister purge valve hose (4) and heater hose (5).
20) Remove EGR pipe (3).

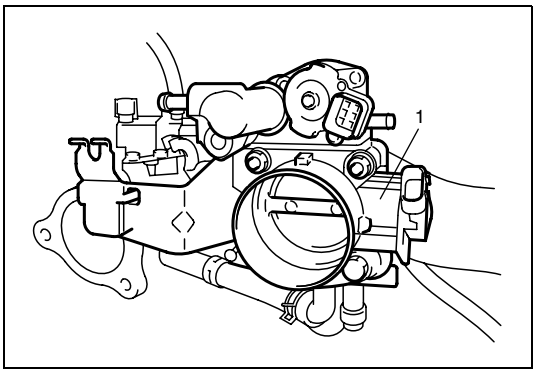
| | |
|---|---|
| 7. | Water hose |
| 9. | Ground terminal coupler |



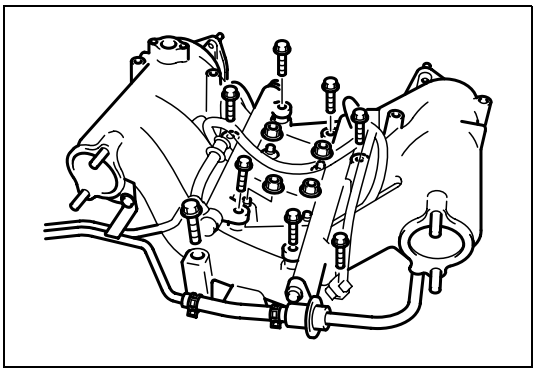

21) Disconnect heater hose (1), EVAP canister hose (4), fuel feed hose (2) and fuel return hose (3).




22) Remove throttle body (1) and intake collector (2) from intake manifold (3).
23) Disconnect hoses of PCV valve and EVAP canister purge valve from intake collector.

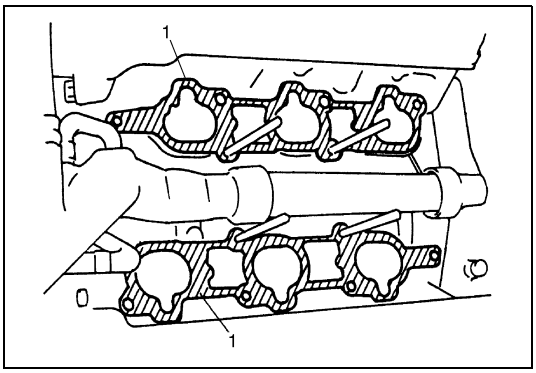



24) Remove throttle body (1) from intake collector.
25) Remove EGR valve and EVAP canister purge valve from intake collector.

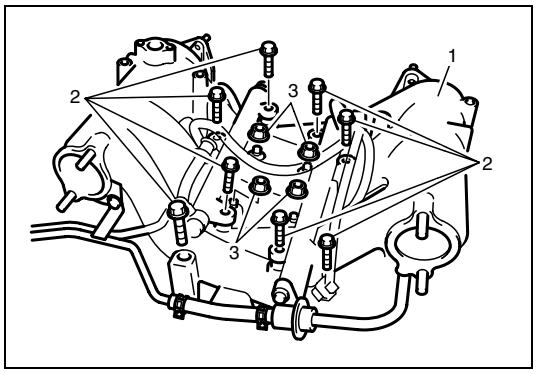


26) Remove intake manifold bolts (8 pc.) and nuts (4 pc.).
27) Remove intake manifold.

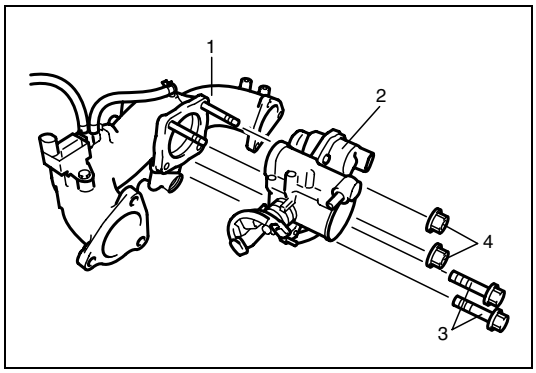
**Installation**



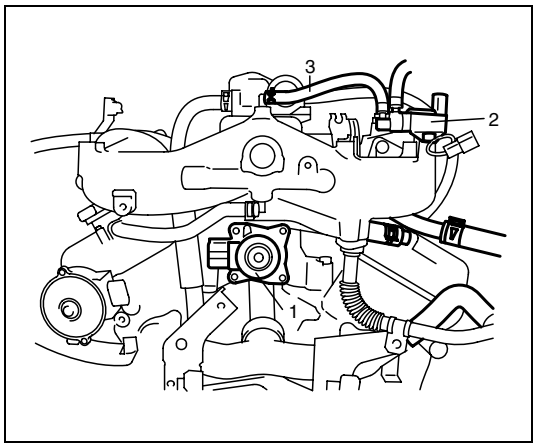

1) Install new intake manifold gaskets (1) to cylinder heads.




2) Install intake manifold (1).
   Tighten bolts (2) and nuts (3) to specified torque.



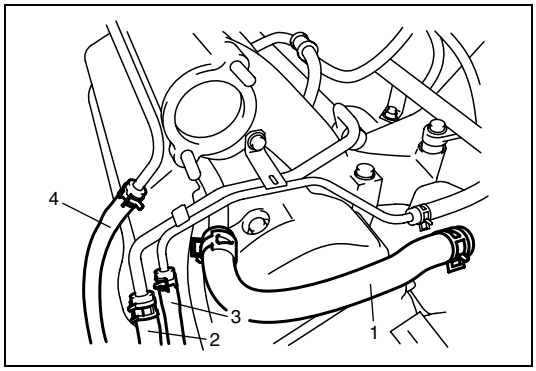

3) Install throttle body (2) to intake collector (1) with new throttle body gasket.
   Tighten bolts (3) and nuts (4).



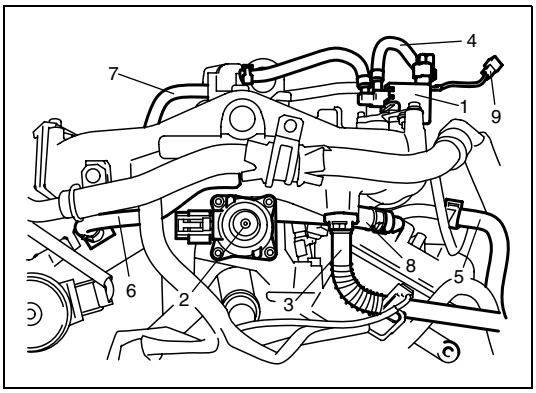

4) Install EGR valve (1) with new gasket, EVAP canister purge valve (2), manifold absolute pressure (MAP) sensor and each hoses to intake collector and throttle body if removed.

| |
|---|
| 3. EVAP canister purge valve hose |

5) Install throttle body and intake collector assembly to intake manifold with new intake collector gaskets.

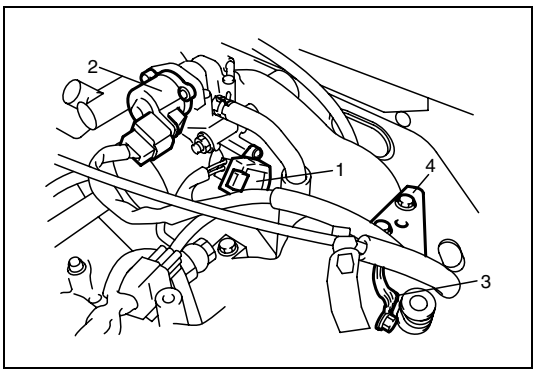



6) Connect heater hose (1), EVAP canister hose (4), fuel feed hose (2) and fuel return (3).

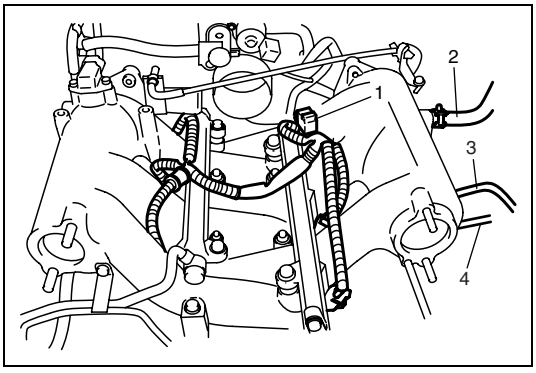



7) Install EGR pipe (3) with new gaskets.
8) Connect EVAP canister purge valve hose (4) and heater hose (5).
9) Connect PCV hose (6), breather hose (8) and water hose (7).
10) Connect couplers of manifold absolute pressure (MAP) sensor, EVAP canister purge valve (1) and EGR valve (2). Fix wire harness with clamps.

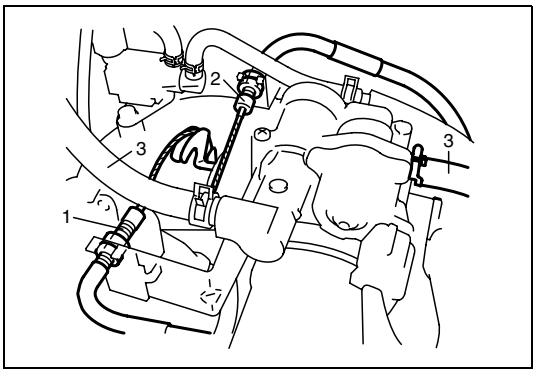
| 9. Earth terminal coupler |
|---|



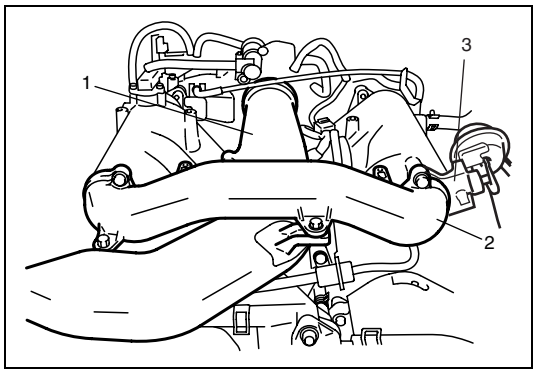

11) Install clamp bracket (4) to intake collector.
12) Connect earth terminal (3) to intake collector.
13) Connect couplers of TP sensor (1) and IAC valve (2).



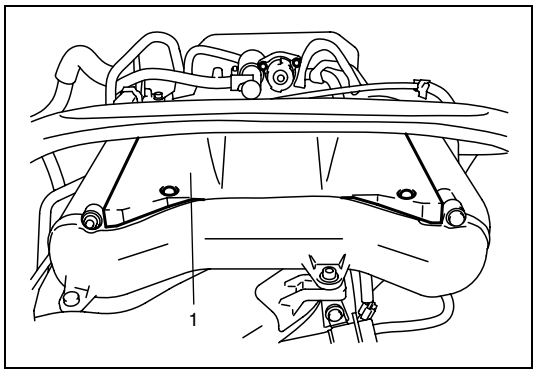

14) Connect brake booster hose (2), fuel pressure regulator vacuum hose (4) (if equipped) and intake control valve hose (3) (if equipped) to intake manifold.
15) Connect injector wire coupler (1).



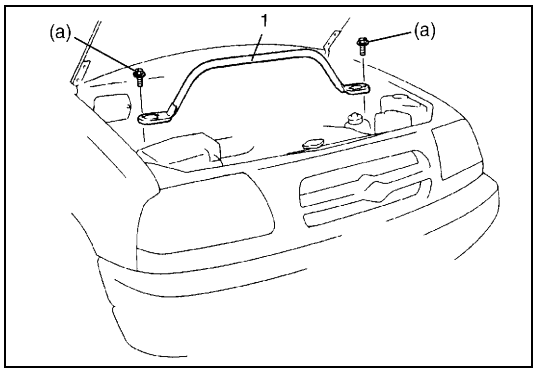

16) Connect water hoses (3) to throttle body.
17) Connect accelerator cable (1) and A/T throttle cable (2) (if equipped) to throttle body.




18) Install surge tank pipe (2) and intake control valve (3) (if equipped) to intake manifold with new gaskets and intake air pipe (1) to throttle body.




19) Install surge tank cover (1).
20) Install air cleaner upper case.
21) Connect coupler to intake air temp. sensor and MAF sensor.




22) Install strut tower bar (1) and tighten strut tower bar mounting bolts to specified torque.

**Tightening torque**
**Strut tower bar mounting bolt**
**(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**

23) Install fuse/relay box.
24) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
25) Refill cooling system referring to “Cooling System flush and Refill” in Section 6B.
26) Connect negative cable at battery.
27) Upon completion of installation, verify that there is no fuel leakage at each connection according to procedure described in “Fuel Leakage Check Procedure” of Section 6-1.

## Intake Control Valve (if equipped)

### Removal

Refer to “Throttle Body and Intake Manifold” in this section.

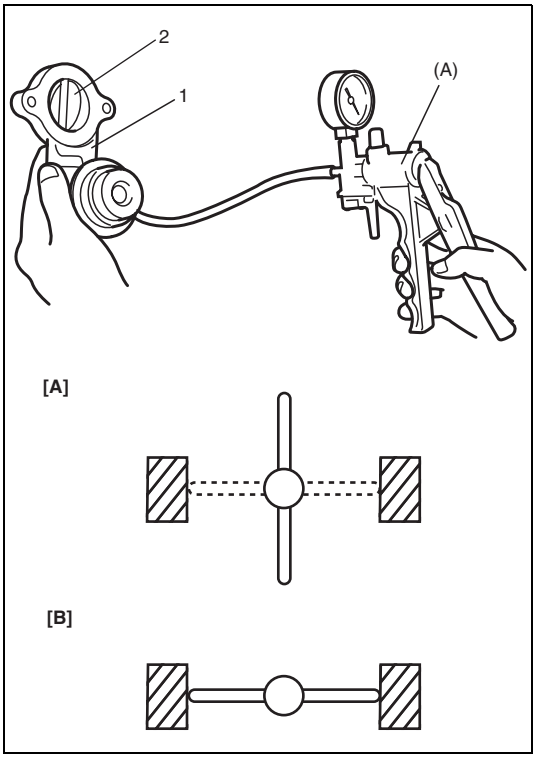
### Installation

Refer to “Throttle Body and Intake Manifold” in this section.

### Inspection

**CAUTION:**

**Do not apply more than –88 kPa (–0.88 kg/cm$^2$, –12.52 psi) vacuum pressure to intake control valve.**
**Damage may occur to intake control valve.**




1) Check that valve (1) opens fully under no vacuum applied.
2) Connect special tool (A) to intake control valve (1).

**Special tool**
**(A): 09917-47011**

3) Apply specified vacuum below to intake control valve (1) and check that valve (2) fully closes.
   If intake control valve fails to operate as above steps 1) and 3), replace it.

**Valve operation vacuum pressure**

**–1.3 to –34.0 kPa (–0.013 to –0.340 kg/cm$^2$, –0.185 to –4.836 psi)**

4) Leave the valve for 15 seconds at the state of step 3) and check that valve is kept at the fully closed position. If valve is not kept at that position, replace intake control valve (1).

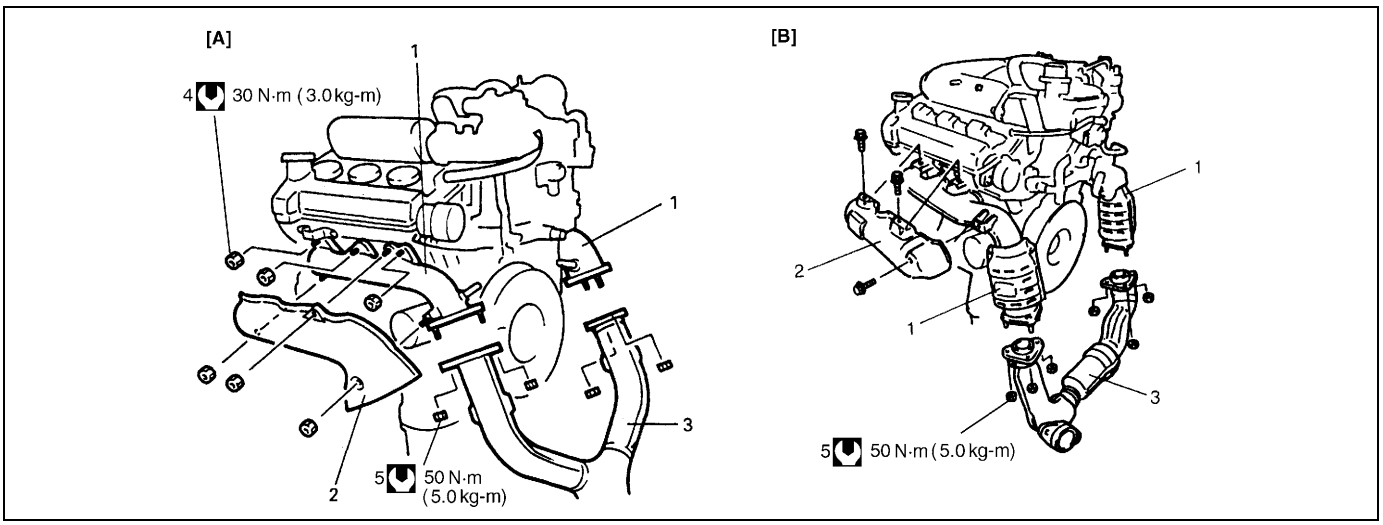
| | |
|---|---|
| [A]: | Valve full open |
| [B]: | Valve full close |

## Exhaust Manifold

### Components

**WARNING:**

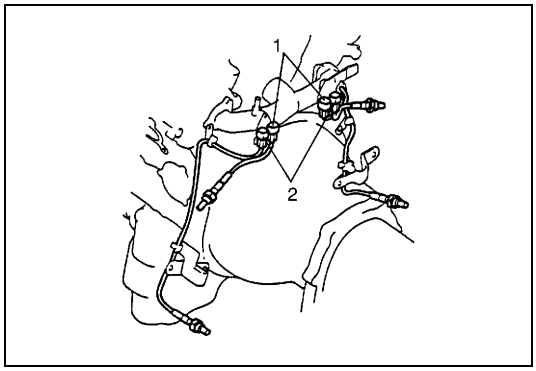
**To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system has cooled off.**




| | | | |
|---|---|---|---|
| [A]: Without WU-TWC | 1. Left (No.1) exhaust manifold<br>Right (No.2) exhaust manifold | 3. Exhaust No.1 pipe | 5. Exhaust No.1 pipe nut |
| [B]: With WU-TWC | 2. Exhaust manifold cover | 4. Exhaust manifold nut | Tightening torque |

## Removal

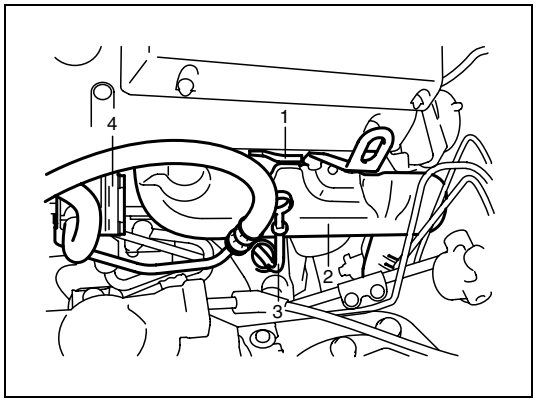
1) Disconnect negative (–) cable at battery.
2) Remove engine under cover (if equipped).
3) Remove air cleaner upper case and intake air hose if right side exhaust manifold is removed.



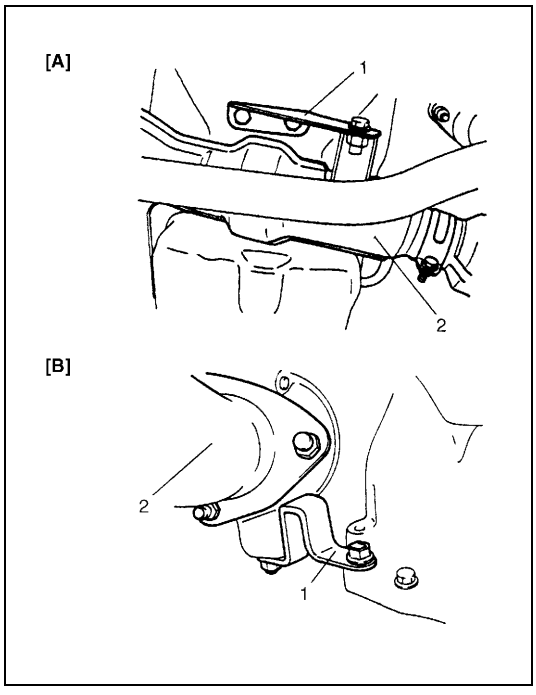

4) Detach couplers from their bracket and disconnect oxygen sensor lead wires at couplers.

| | |
|---|---|
| 1. | HO2S–1 (Blue connector) |
| 2. | HO2S–2 (White connector) |

5) Disconnect EGR pipe from right (No.2) bank exhaust manifold if right side exhaust manifold is removed.




6) Remove oil level gauge guide (3) if left side exhaust manifold is removed.
7) Detach P/S pump assembly as following, if left side exhaust manifold is removed.
   a) Loosen P/S pump drive belt by loosening tensioner bolt.
   b) Remove P/S pump mounting bolts.
   c) Detach P/S pump assembly (4) with its hoses from cylinder block.
8) Remove exhaust manifold covers (2) from exhaust manifolds (1).
9) Hoist vehicle.
10) For 4WD vehicle, disconnect propeller shaft from front differential referring to “Propeller Shaft” in Section 4B.



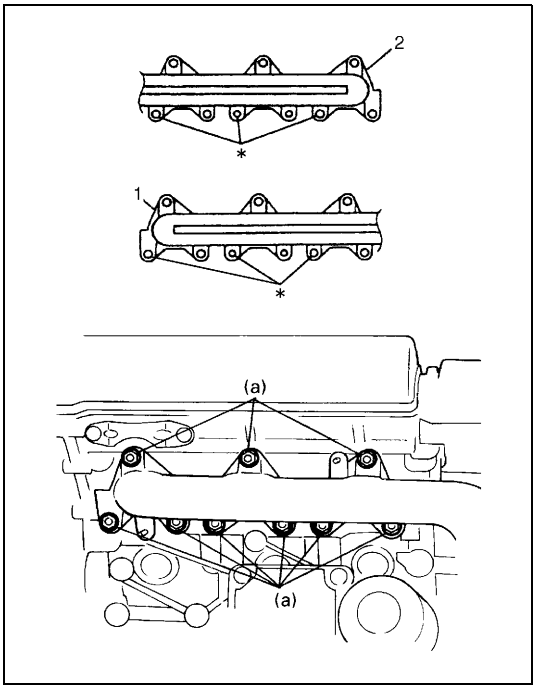

11) Remove exhaust manifold stiffeners (1).

| | |
|---|---|
| 2. | Exhaust No.1 pipe |
| [A]: | Without WU-TWC |
| [B]: | With WU-TWC |

12) Remove stabilizer bar mounting bolt and pull down stabilizer bar if right side exhaust manifold is removed.
13) Remove exhaust manifolds and their gaskets from cylinder heads.

## Installation

1) Install new manifold gaskets to cylinder heads and No.1 pipe gasket to exhaust No.1 pipe.

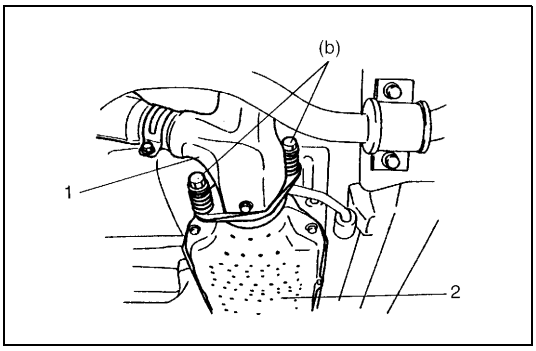



2) Install exhaust manifolds as follows.
   a) Always install new bolts with pre-coated adhesive to the locations with ✱ mark.
   b) Tighten manifold nuts and bolts to specified torque.

**Tightening torque**
**Exhaust manifold bolt and nut**
**(a): 30 N·m (3.0 kg-m, 22.0 lb-ft)**

| | |
|---|---|
| 1. | Left (No.1) exhaust manifold |
| 2. | Right (No.2) exhaust manifold |

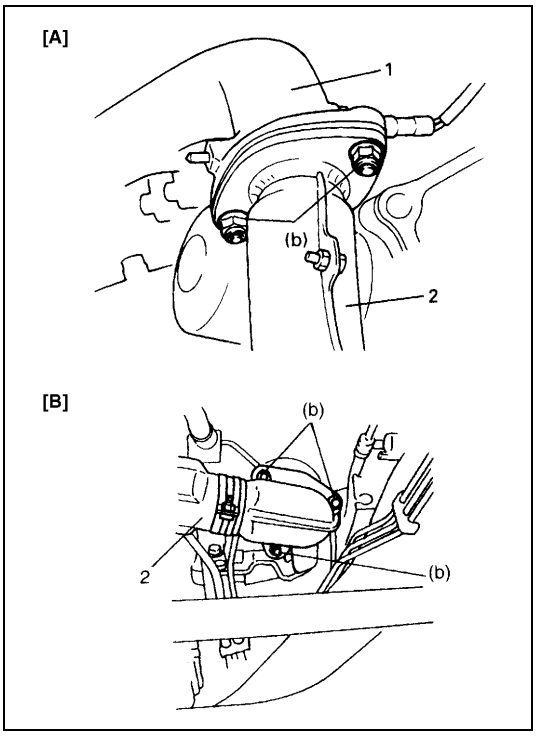
3) Install stabilizer bar if it was removed. Refer to “Stabilizer Bar/Bushings” in Section 3D.
4) Install exhaust manifold stiffeners (if removed).




5) Install exhaust No.1 pipe (1).
   Tighten exhaust No.1 pipe bolts to specified torque.

**Tightening torque**
**Exhaust No.1 pipe bolt**
**(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)**

| | |
|---|---|
| 2. | Exhaust No. 2 pipe |

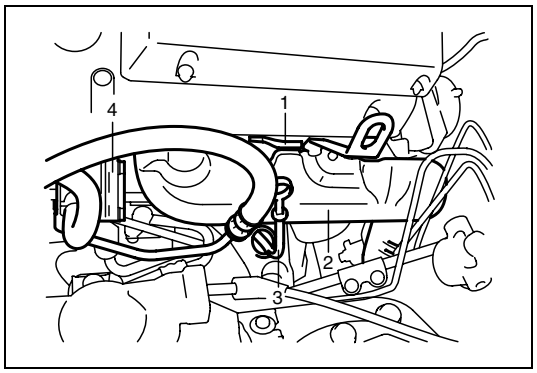



6) Tighten exhaust No.1 pipe nuts to specified torque.

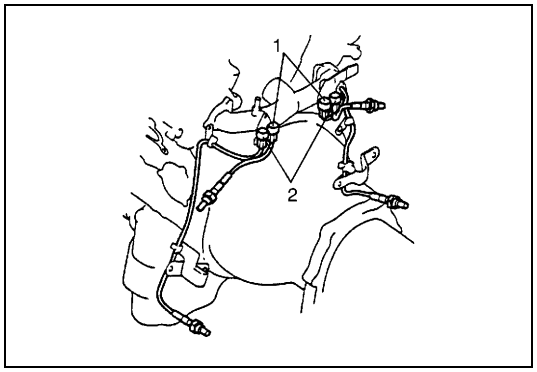
**Tightening torque**
**Exhaust No.1 pipe nut**
**(b): 50 N·m (5.0 kg-m, 36-5 lb-ft)**

| | |
|---|---|
| 1. | Exhaust No.1 pipe |
| 2. | Exhaust manifold |
| [A]: | Without WU-TWC |
| [B]: | With WU-TWC |

7) For 4WD vehicle, connect propeller shaft to front differential referring to “Propeller Shaft” in Section 4B.




8) Connect EGR pipe to left (No.1) bank exhaust manifold (1).
9) Install exhaust manifold covers (2).
10) Install oil level gauge guide (3) using new O-ring.
11) Install P/S pump assembly (4) if it was removed. Refer to "Power Steering Pump" in Section 3B1.
12) Adjust P/S pump drive belt tension, refer to "Power Steering Pump Drive Belt" in Section 3B1.



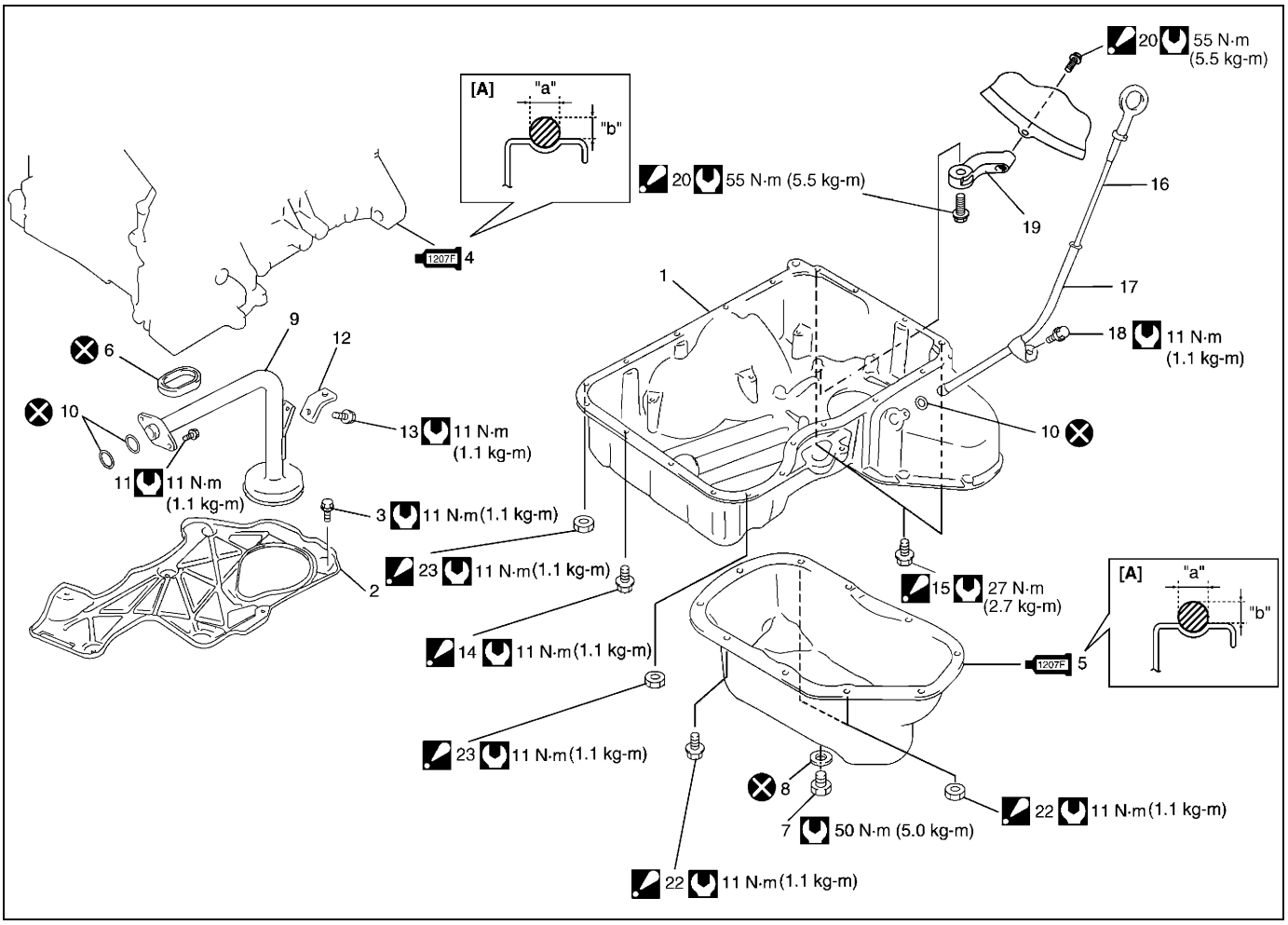

13) Connect oxygen sensor lead wire couplers.
Be sure to clamp its lead wires.

| | |
|---|---|
| 1. | HO2S–1 (Blue connector) |
| 2. | HO2S–2 (White connector) |

14) Install engine under cover (if equipped).
15) Connect negative (–) cable to battery.
16) Upon completion of installation, start engine and check that no exhaust gas leakage exists.

# Oil Pan and Oil Pump Strainer

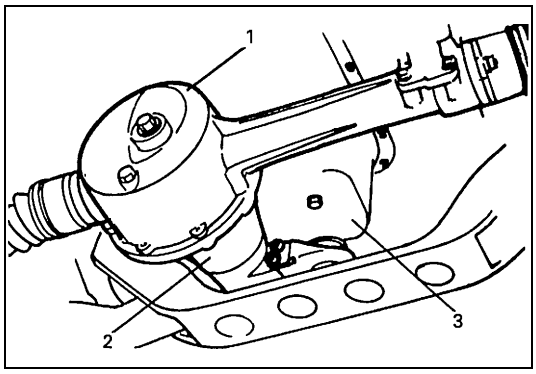
## Components




| | | | | | |
|---|---|---|---|---|---|
| | [A]: Sealant application amount | | 8. Gasket | | 18. Oil gauge guide bolt |
| | "a": 3 mm (0.12 in.) | | 9. Oil pump strainer | | 19. Stiffener (if equipped) |
| | "b": 2 mm (0.08 in.) | | 10. O-ring | | 20. Stiffener bolt (if equipped) :Tighten this referring to the specified procedure. |
| | 1. Upper oil pan | | 11. Oil pump strainer bolt | | 21. Lower oil pan nut :Tighten this referring to the specified procedure. |
| | 2. Oil pan baffle plate | | 12. Oil pump strainer bracket | | 22. Lower oil pan bolt :Tighten this referring to the specified procedure. |
| | 3. Oil pan baffle plate bolt | | 13. Oil pump strainer bracket bolt | | 23. Upper oil pan mounting nut Tighten according to the specified procedure. |
| 1207F | 4. Cylinder block : Apply sealant 99000-31250 to mating surface | | 14. Upper oil pump mounting bolt :Tighten this referring to the specified procedure. | | Tightening torque |
| 1207F | 5. Lower oil pan : Apply sealant 99000-31250 to mating surface | | 15. Upper oil pump mounting bolt :Tighten this referring to the specified procedure. | | Do not reuse. |
| | 6. O-ring | | 16. Oil level gauge | | |
| | 7. Drain plug | | 17. Oil level gauge guide | | |

### Removal

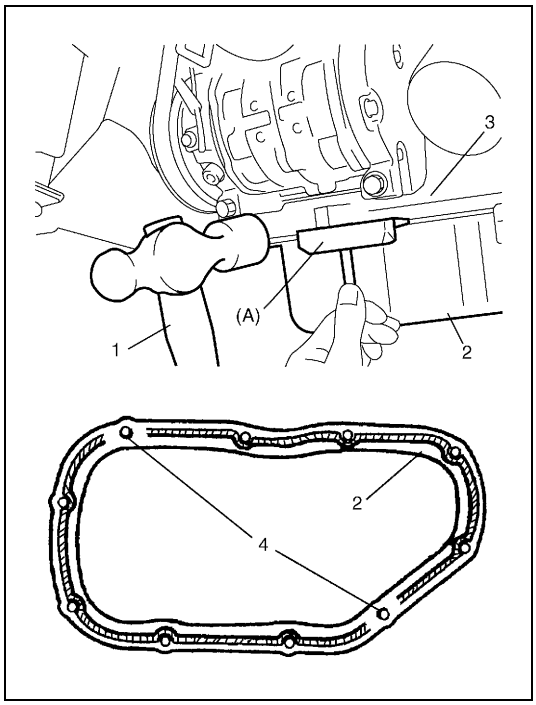
1) Remove engine under cover (if equipped).
2) Remove oil level gauge guide.
3) Raise vehicle and remove both front wheels.
4) Remove rack and pinion assembly.
   Refer to “Power Steering Gear Box Assembly” in Section 3B1 for removal.




5) Remove front differential housing (1) with differential (2) from chassis if equipped.
   Refer to “Dismounting” in Section 7E for removal.

3. Oil pan

6) Drain engine oil by removing drain plug (3).
7) Remove stiffener (if equipped).



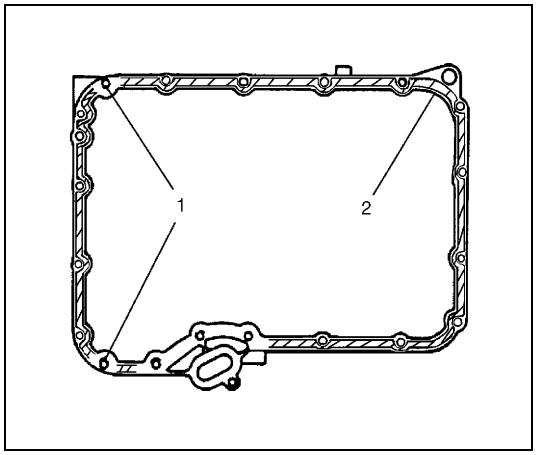

**CAUTION:**
**Be careful not to damage stud bolts (4) when cutting sealant.**

8) Remove lower oil pan according to the following procedure.
   a) Remove lower oil pan bolts and nuts.
   b) Cut sealant indicated by hatched line in the figure using special tool and hammer (1).

**Special tool**
**(A): 09921-96510**

2. Lower oil pan

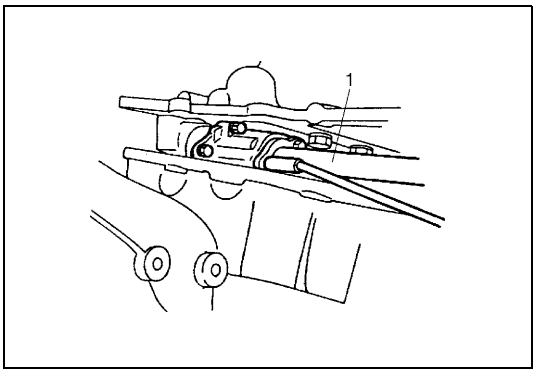
9) Remove oil strainer bracket.
10) Detach radiator outlet pipe (if equipped) from upper oil pan (3).




**CAUTION:**
**Be careful not to damage bolts (1) and oil pump mating surfaces between upper oil pan (2) and crank case when cutting sealant.**

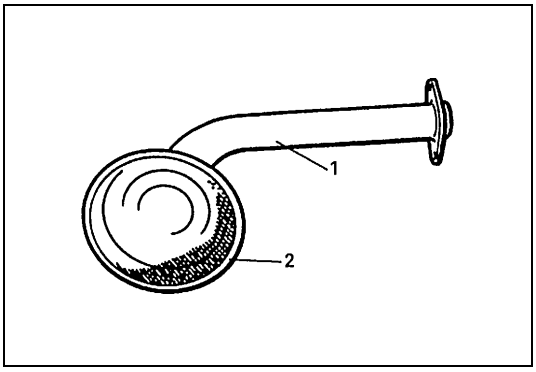
11) Remove upper oil pan according to the following procedure.
   a) Remove upper oil pan bolts and nuts.
   b) Cut sealant at hatched part as shown using special tool (A) and hammer as same manner of step 8).

**Special tool**
**(A): 09921-96510**



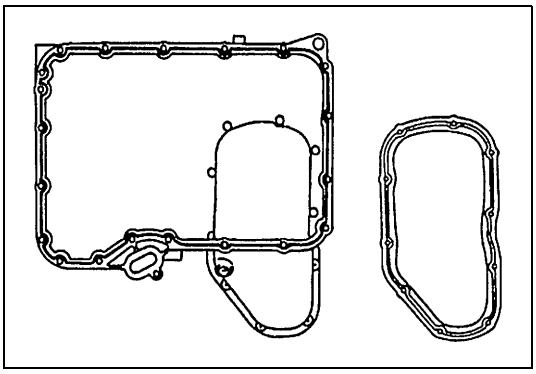

c) Lower upper oil pan until it stops by way of crossmember and oil pump strainer (1) and keep it at that position temporarily.
d) With wrench inserted between upper oil pan and lower crankcase, and oil pump strainer mounting bolt removed, remove oil pump strainer (1).
e) Remove upper oil pan from temporarily supported position.

**Clean**



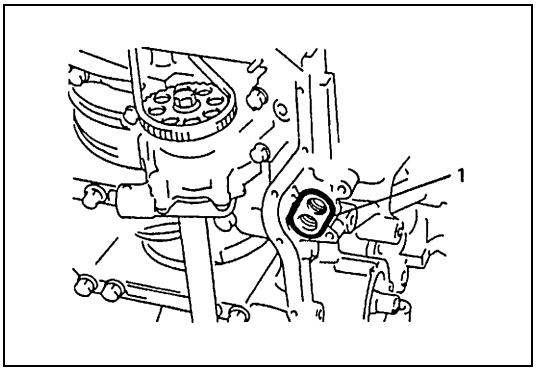

- Inside of oil pan and oil pump strainer screen (2).

| |
|---|
| 1. Oil strainer |

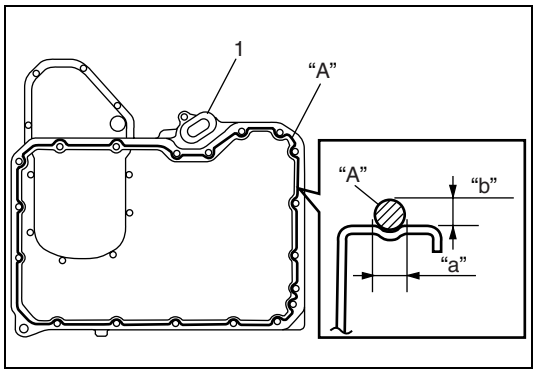


- Clean sealing surface on upper oil pan, lower oil pan and lower crankcase.
  Remove oil, old sealant, and dust from sealing surface.

**Installation**



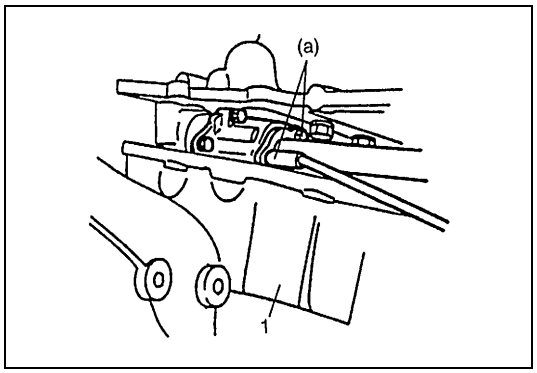

1) Install new O-ring (1) to lower crankcase as shown in figure.
2) Install two new O-rings to oil pump strainer.




3) Apply sealant "A" to upper oil pan (1) sealing surface area as shown in figure.

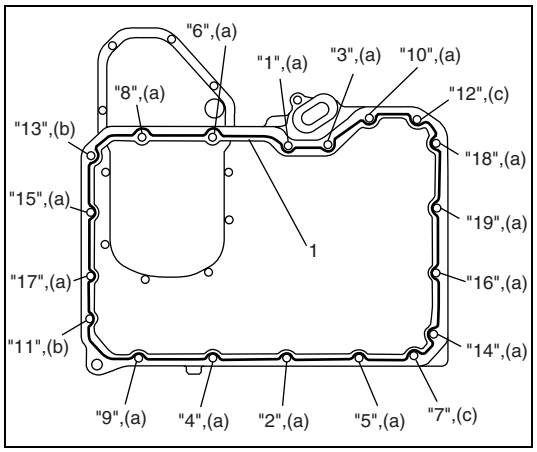
**"A": Sealant 99000-31250**

**Sealant amount**
**Width "a": 3 mm (0.12 in.)**
**Height "b": 2 mm (0.08 in.)**



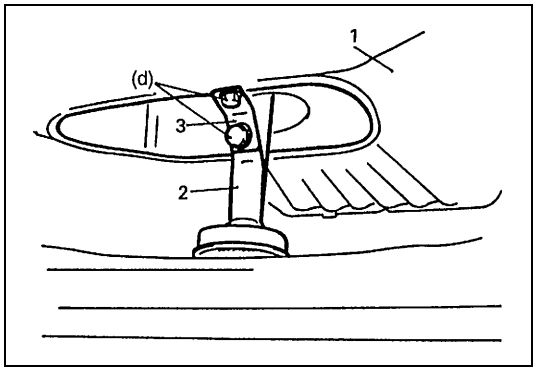

4) Place the upper oil pan (1) on the cross member and suspension member (just beneath the lower crankcase).
At this point install oil pump strainer.

**Tightening torque**
**Oil pump strainer bolt**
**(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)**



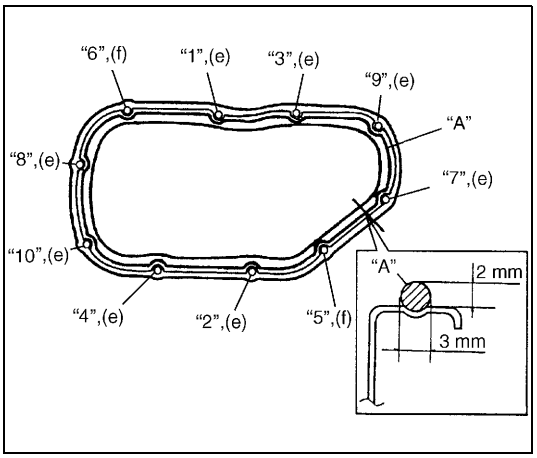

5) Install upper oil pan (1) to lower crankcase as follows.
a) Fit upper oil pan (1) to cylinder block.
b) Tighten upper oil pan bolts and nuts temporarily by hand.
c) Tighten upper oil pan bolts and nuts to specified torque by numerical order as shown in figure.

**Tightening torque**
**Upper oil pan bolt (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)**
**Upper oil pan bolt (b): 27 N·m (2.7 kg-m, 19.5 lb-ft)**
**Upper oil pan nut (c): 11 N·m (1.1 kg-m, 8.0 lb-ft)**




6) Install bracket (3) to oil pump strainer (2) and upper oil pan (1).

**Tightening torque**
**Oil pump strainer bracket bolt**
**(d): 11 N·m (1.1 kg-m, 8.0 lb-ft)**




7) Apply sealant "A" to lower oil pan sealing surface area as shown in the figure.

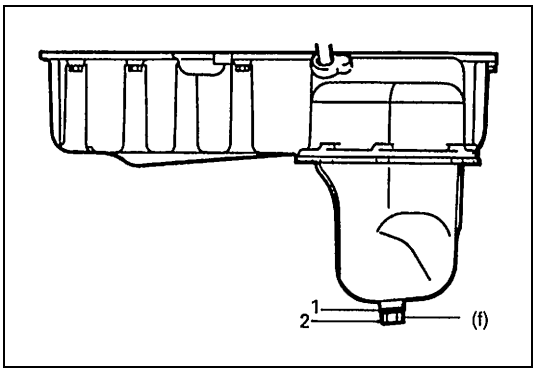
**"A": Water tight sealant 99000-31250**

8) Install lower oil pan to upper oil pan as follows.
   a) Fit lower oil pan (1) to upper oil pan.
   b) Tighten lower oil pan bolts and nuts temporarily by hand.
   c) Tighten lower oil pan bolts and nuts to specified torque by numerical order as shown in figure.

**Tightening torque**
**Lower oil pan bolt (e): 11 N·m (1.1 kg-m, 8.0 lb-ft)**
**Lower oil pan nut (f): 11 N·m (1.1 kg-m, 8.0 lb-ft)**

9) Install lower oil pan to upper oil pan.

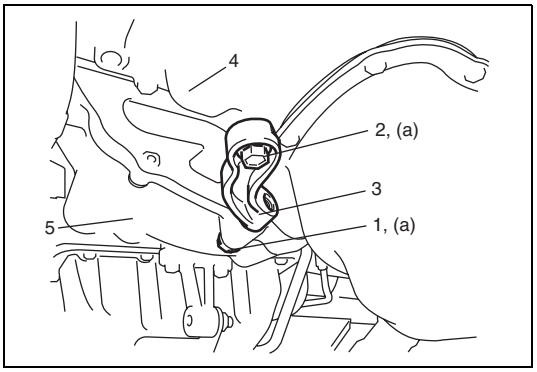
**Tightening torque**
**Lower oil pan bolt (e): 11 N·m (1.1 kg-m, 8.0 lb-ft)**




10) Install new gasket (1) and drain plug (2) to oil pan.

**Tightening torque**
**Drain plug**
**(f): 50 N·m (5.0 kg-m, 36.5 lb-ft)**

11) Attach radiator outlet pipe (if equipped) to upper oil pan.




12) Install stiffener (3) as follows (if equipped).
   a) Temporarily tighten stiffener bolt (1), then other bolt (2).
   b) Tighten stiffener bolt (1), then other bolt (2) to specified torque.

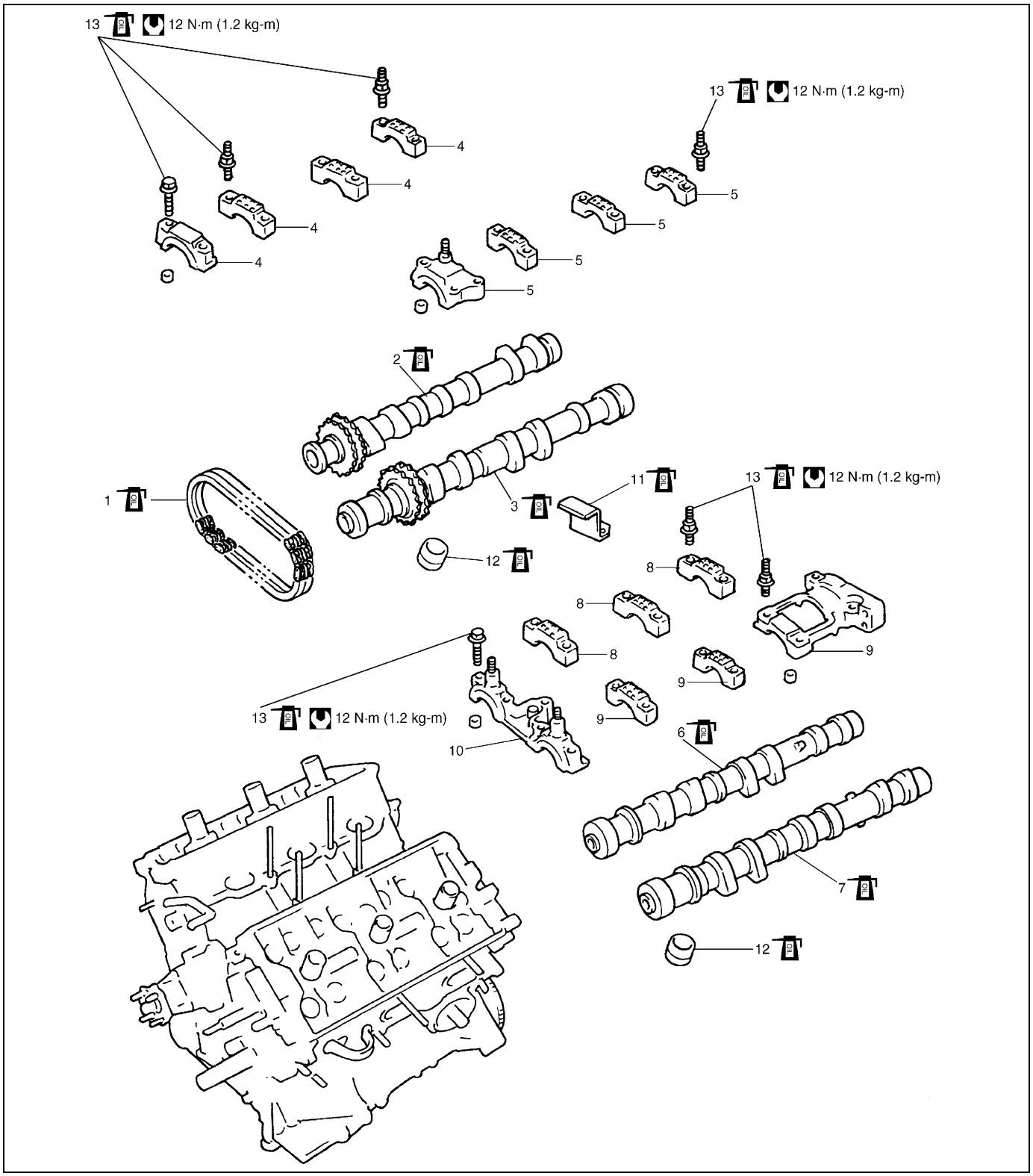
**Tightening torque**
**Stiffener bolt (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**

| | |
|---|---|
| 4. | Upper oil pan |
| 5. | Transmission case |

13) Install front differential housing according to installation procedure described in "Remounting" of Section 7E if removed.
14) Install rack and pinion assembly.
    Refer to "Power Steering Gear Box Assembly" in Section 3B1 for installation.
15) Refill front differential housing with gear oil if drained, referring to "Maintenance Service" in Section 7E.
16) Install oil level gauge guide with new O-ring.
17) Install engine under cover (if equipped).
18) Refill engine with engine oil, referring to item "Engine Oil and Filter Change" in Section 0B.
19) Check wheel alignment, referring to "Front End Alignment" in Section 3A.

# Camshaft and Valve Lash Adjuster

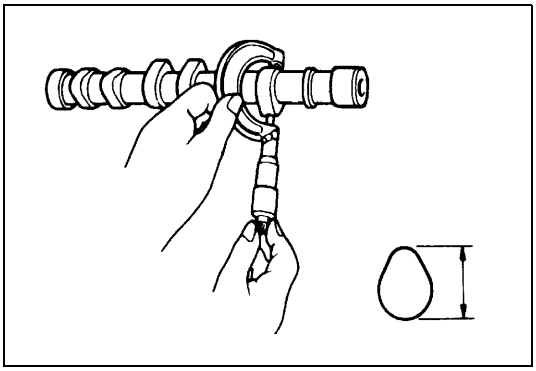
## Components




| | | |
|---|---|---|
| 1. RH bank 2nd timing chain | 6. LH bank intake camshaft | 11. Timing chain guide No.5 |
| 2. RH bank exhaust camshaft | 7. LH bank exhaust camshaft | 12. Valve lash adjuster |
| 3. RH bank intake camshaft | 8. LH bank intake camshaft holder | 13. Camshaft housing bolt |
| 4. RH bank exhaust camshaft holder | 9. LH bank exhaust camshaft holder | Tightening Torque |
| 5. RH bank intake camshaft holder | 10. LH bank camshaft holder | Apply engine oil to sliding surface of each parts. |

## Inspection

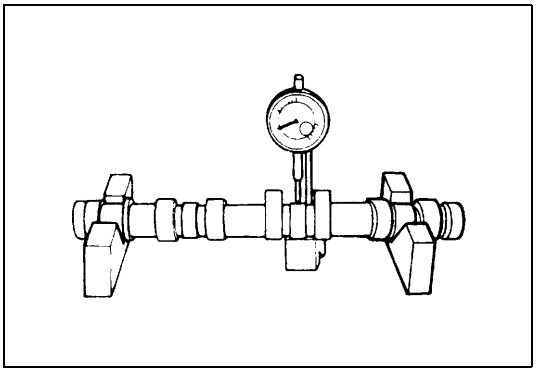
### Cam Wear



Using a micrometer, measure cam height. If measured height is below its limit, replace camshaft.

**Intake cam height**
**Standard: 40.402 – 40.562 mm (1.5907 – 1.5969 in.)**
**Limit: 40.300 mm (1.5866 in.)**
**Exhaust cam height**
**Standard: 39.428 – 39.588 mm (1.5523 – 1.585 in.)**
**Limit: 39.400 mm (1.5511 in.)**

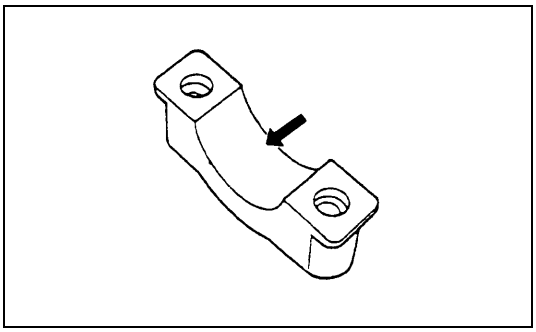
### Camshaft Runout



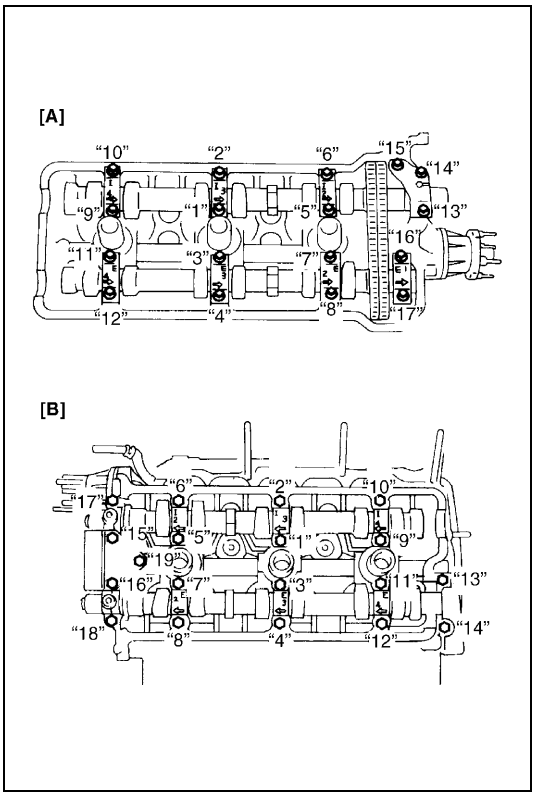
Set camshaft between two “V” blocks, and measure its runout by using a dial gauge.
If measured runout exceeds below specified limit, replace camshaft.

**Camshaft runout limit**
**0.04 mm (0.002 in.)**

### 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.




Check clearance by using gaging plastic. The procedure is as follows.

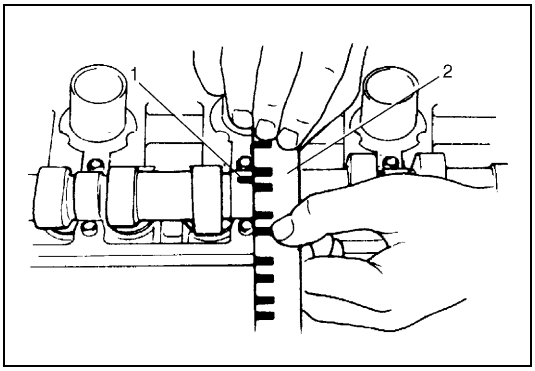
1) Clean housings and camshaft journals.
2) Make sure that all valve lash adjusters are removed and install camshaft to cylinder head.
3) Place a piece of gaging plastic the full width of journal of camshaft (parallel to camshaft).
4) Install camshaft housing.
5) Tighten camshaft housing bolts in such order ([A]: "1" → "17", [B]: "1" → "19") as shown in the figure a little at a time till they are tightened to specified torque.

**NOTE:**

**Do not rotate camshaft while gaging plastic is installed.**

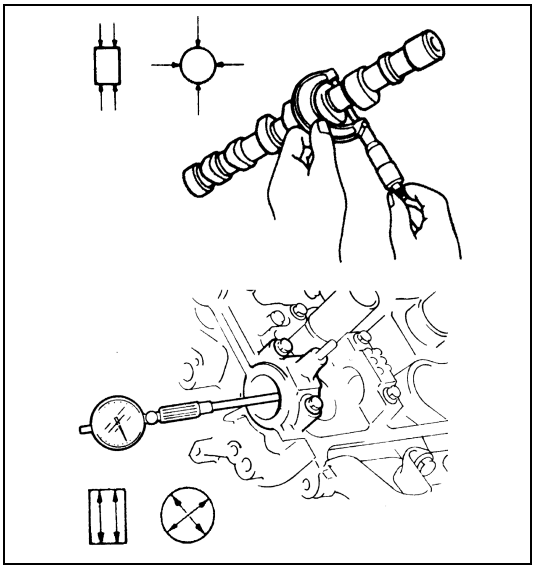
**Tightening torque**
**Camshaft housing bolt**
**12 N·m (1.2 kg-m, 9.0 lb-ft)**

| | |
|---|---|
| [A]: | RH bank |
| [B]: | LH bank |




6) Remove housing, and using scale (2) on gaging plastic (1) envelop, measure gaging plastic (1) width at its widest point.

**Camshaft journal clearance**
**Standard: 0.045 – 0.099 mm (0.0018 – 0.0038 in.)**
**Limit: 0.12 mm (0.0047 in.)**

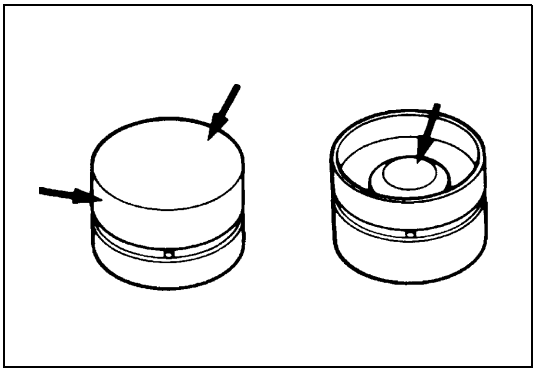


If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

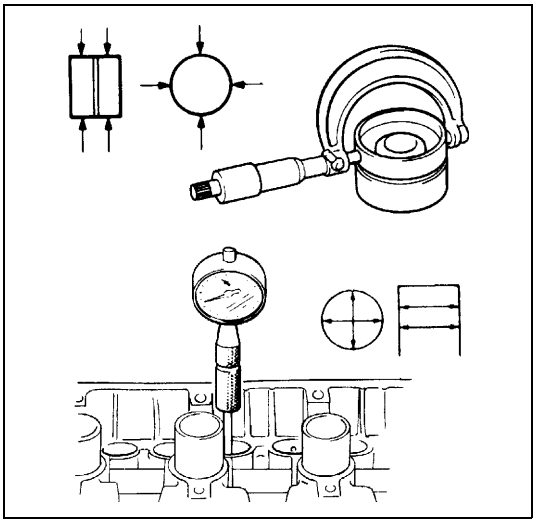
**Camshaft journal bore dia. (IN & EX)**
**Standard: 26.000 – 26.033 mm (1.0237 – 1.0249 in.)**

**Camshaft journal O.D. (IN & EX)**
**Standard: 25.934 – 25.955 mm (1.0211 – 1.0218 in.)**

### Wear of Hydraulic Valve Lash Adjuster



Check adjuster for pitting, scratches, or damage.
If any malcondition is found, replace.



Measure cylinder head bore and adjuster outside diameter to determine cylinder head-to-adjuster clearance. If clearance exceeds limit, replace adjuster or cylinder head.

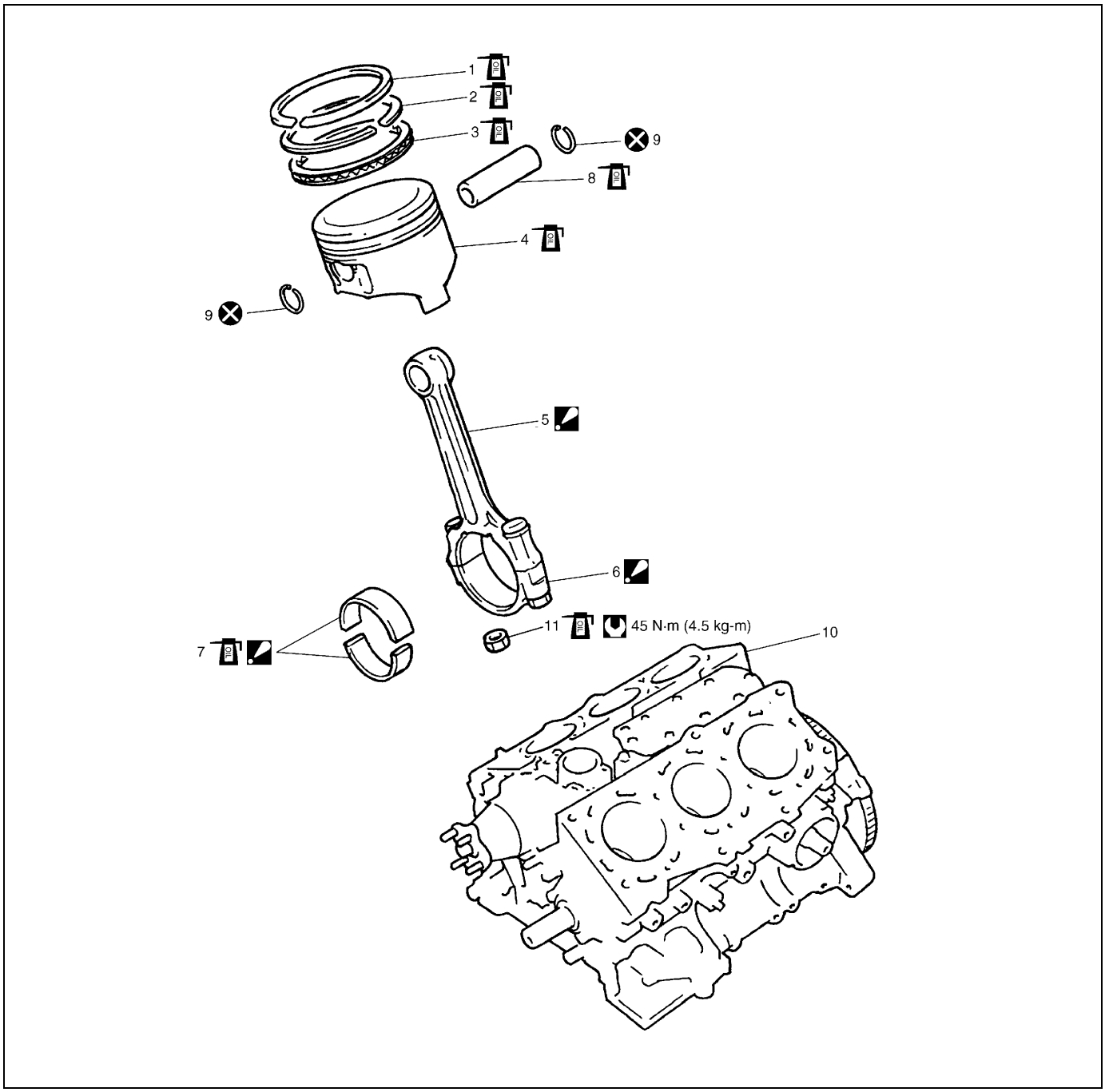
**Hydraulic valve lash adjuster O.D.**
**Standard: 30.959 – 30.975 mm (1.2189 – 1.2194 in.)**

**Cylinder head bore**
**Standard: 31.000 – 31.025 mm (1.2205 – 1.2214 in.)**

**Cylinder head to adjuster clearance**
**Standard: 0.025 – 0.066 mm (0.0010 – 0.0025 in.)**
**Limit: 0.15 mm (0.0059 in.)**

# Piston, Piston Rings, Connecting Rods and Cylinders

## Components

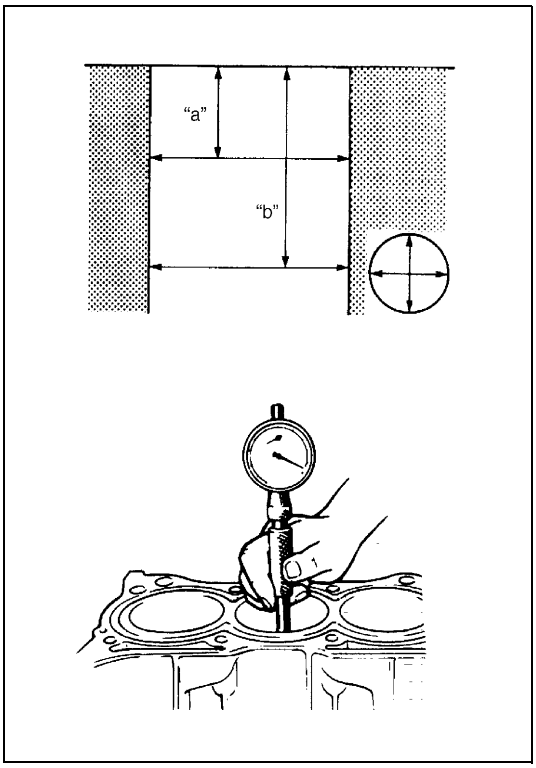



| | | | |
|---|---|---|---|
| 1. Top ring | 5. Connecting rod: Clean bearing installing surface when install. | 9. Piston pin circlip | Tightening Torque |
| 2. 2nd ring | 6. Connecting rod bearing cap: Clean bearing installing surface when install. | 10. Cylinder block | Do not reuse. |
| 3. Oil ring | 7. Connecting rod bearing: Clean outer surface when install. | 11. Bearing cap nut | Apply engine oil to sliding surface of each parts. |
| 4. Piston | 8. Piston pin | | |

## Inspection

### Cylinders

- 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.




- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at 2 positions (1, 2) as shown in the figure.
  If any of the following conditions is noted, rebore cylinder.
  – Cylinder bore dia. exceeds limit.
  – Difference of measurements at 2 positions exceeds taper limit.
  – Difference between thrust and axial measurements exceeds out-of-round limit.

**Cylinder bore diameter limit**
**88.050 mm (3.4665 in.)**
**Cylinder bore taper and out-of-round limit**
**0.10 mm (0.0039 in.)**

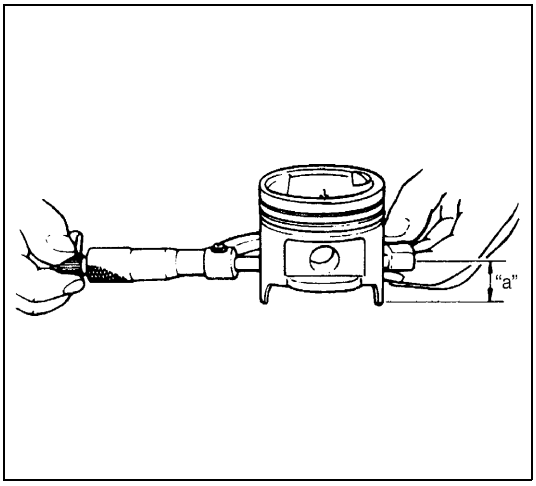
**NOTE:**

**If any one of six cylinders has to be rebored, rebore all six to the same next oversize. This is necessary for the sake of uniformity and balance.**

| |
|---|
| "a": 50 mm (1.96 in.) |
| "b": 95 mm (3.74 in.) |

### Pistons

- Inspect piston for faults, cracks or other damages.
  Damaged or faulty piston should be replaced.

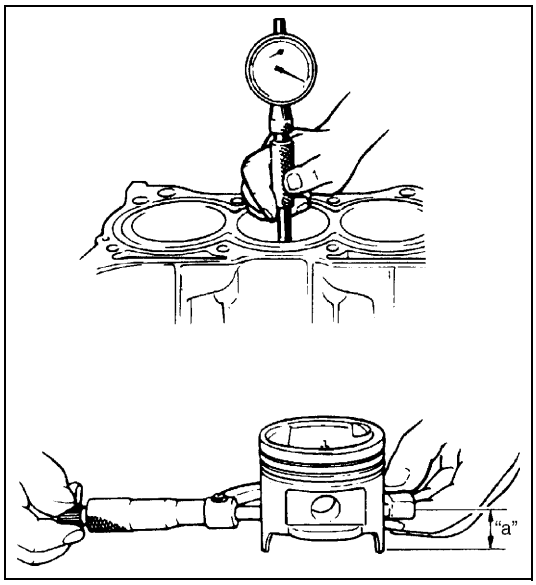



- Piston diameter:
  As shown in the figure, piston diameter should be measured at position "a" from piston skirt end in the direction perpendicular to piston pin.

**Piston diameter**

| | |
|---|---|
| **Standard** | **87.970 – 87.990 mm (3.4634 – 3.4641 in.)** |
| **Oversize: 0.50 mm (0.0196 in.)** | **88.470 – 88.490 mm (3.4831 – 3.4838 in.)** |

| |
|---|
| "a": 26.5 mm (1.04 in.) |



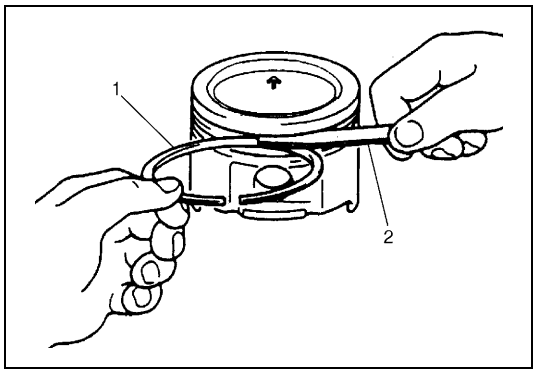

- Piston clearance:
  Measure cylinder bore diameter and piston diameter to find their difference which is piston clearance. Piston clearance should be within specification as given below. If it is out of specification, rebore cylinder and use oversize piston.

**Piston clearance**
**0.02 – 0.04 mm (0.0008 – 0.0015 in.)**

**NOTE:**

**Cylinder bore diameters used here are measured in thrust direction at 2 positions.**

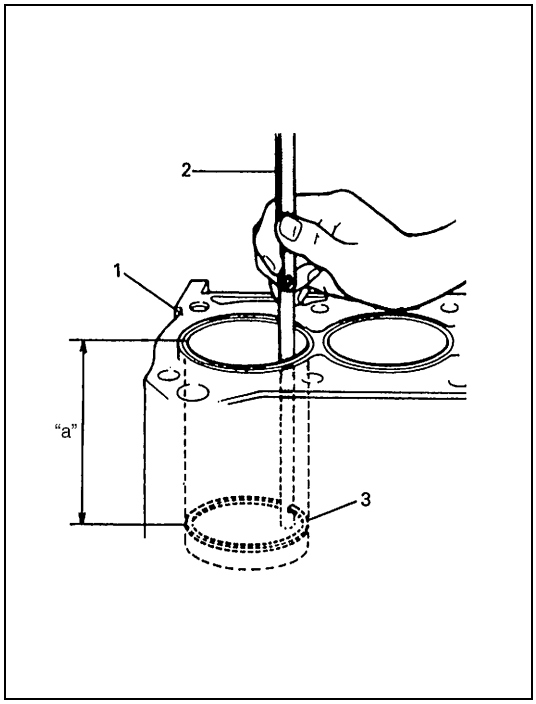
| "a": 26.5 mm (1.04 in.) |
|---|




- Ring groove clearance:
  Before checking, piston grooves must be clean, dry and free of carbon.
  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:**
**Top: 0.03 – 0.07 mm (0.0012 – 0.0027 in.)**
**2nd: 0.02 – 0.06 mm (0.0008 – 0.0023 in.)**

## Piston Rings




To measure end gap, insert piston ring (3) into cylinder bore and then measure the gap at position "a" using thickness gauge (2). If measure gap is out of specification, replace ring.

**NOTE:**

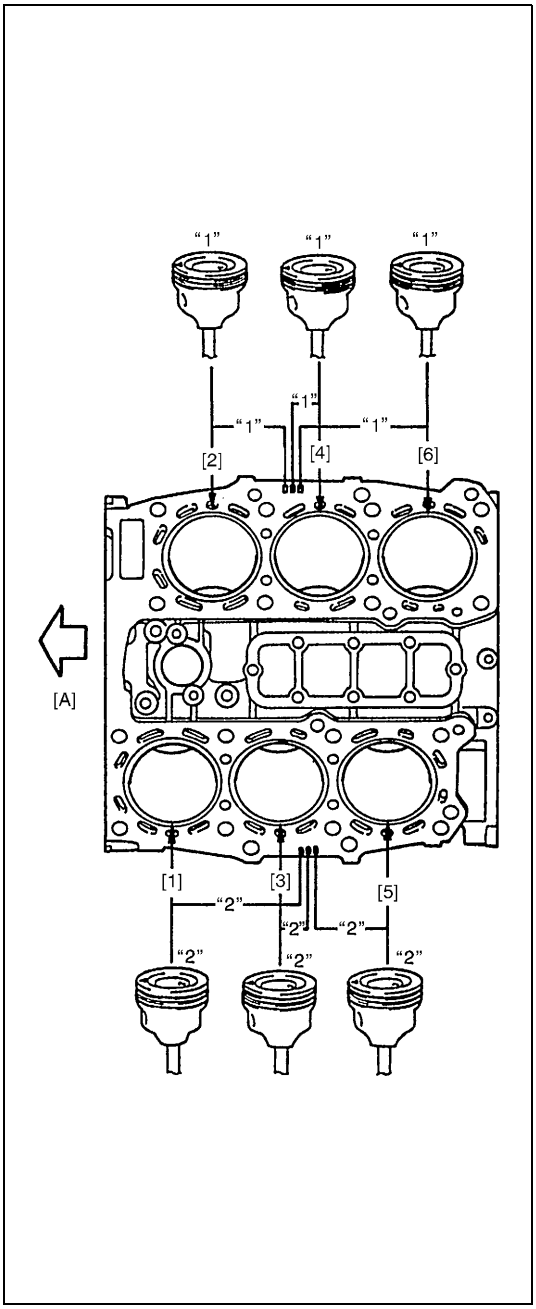
**Clean carbon and any other dirt from top of cylinder bore before inserting piston ring.**

**Piston ring end gap**

| | Standard | Limit |
|---|---|---|
| **Top ring** | **0.20 – 0.35 mm (0.0079 – 0.0137 in.)** | **0.7 mm (0.0275 in.)** |
| **2nd ring** | **0.35 – 0.47 mm (0.0138 – 0.0185 in.)** | **0.7 mm (0.0275 in.)** |
| **Oil ring** | **0.20 – 0.70 mm (0.0079 – 0.0275 in.)** | **1.8 mm (0.0708 in.)** |

| 1. Cylinder block |
|---|
| "a": 120 mm (4.72 in.) |

## Assembly




1) 2 sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing a standard size piston, make sure to match piston with cylinder as follows.
   a) Each piston has stamped number (1 or 2) on its piston head. It represents outer diameter of piston.
   b) There are also stamped numbers of 1 and 2 on the cylinder block as shown in the figure.
   c) Stamped number on piston and cylinder block must correspond. That is, install number "2" stamped piston to cylinder which is stamped also number "2" and a number "1" piston to cylinder with number "1".

**Piston-to-cylinder clearance**
**Piston:**

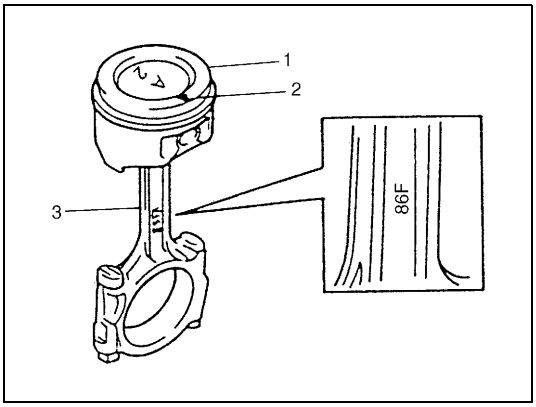
| Number at the top (mark) | Outer diameter |
|---|---|
| 1 | 87.9800 – 87.9900 mm (3.4638 – 3.4641 in.) |
| 2 | 87.9700 – 87.9799 mm (3.4634 – 3.4637 in.) |

**Cylinder:**

| Number on cylinder block (mark) | Outer diameter |
|---|---|
| 1 | 88.0101 – 88.0200 mm (3.4650 – 3.4653 in.) |
| 2 | 88.0000 – 88.0100 mm (3.4646 – 3.4650 in.) |

**Piston-to-cylinder clearance**
**0.02 – 0.04 mm (0.0008 – 0.0015 in.)**

| | | | |
|---|---|---|---|
| [A]: | Crankshaft pulley side | [4]: | No.4 cylinder |
| [1]: | No.1 cylinder | [5]: | No.5 cylinder |
| [2]: | No.2 cylinder | [6]: | No.6 cylinder |
| [3]: | No.3 cylinder | | |

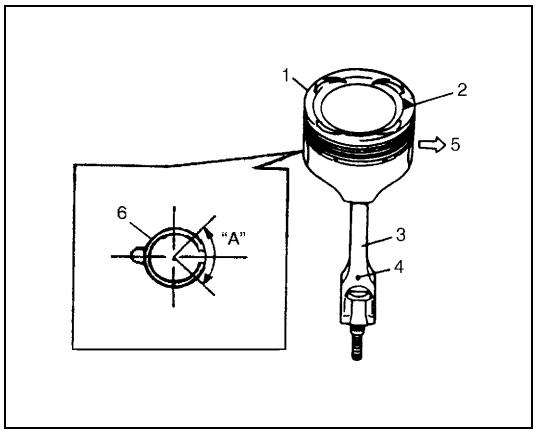



2) Install piston pin to piston (1) and connecting rod (3):
   After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as shown in the figure and insert piston pin to piston and connecting rod, and install piston pin circlips.

**NOTE:**

**"86F" mark on connecting rod must face toward crankshaft pulley side.**

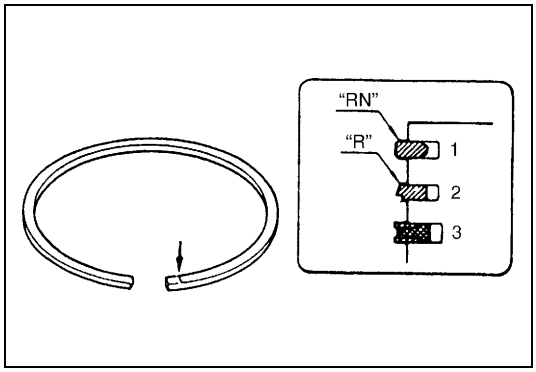
| | |
|---|---|
| 2. | Arrow mark |



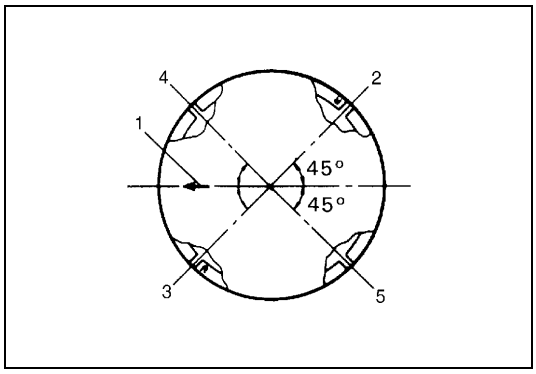

**NOTE:**

- **Install circlip (6) with its cut part facing as shown in the figure.**
- **Install so that circlip end gap comes within such range as indicated by arrow "A".**

| | |
|---|---|
| 1. | Piston |
| 2. | Arrow mark |
| 3. | Connecting rod |
| 4. | Oil hole |
| 5. | Crankshaft pulley side |




3) Install piston rings to piston:
   - 1st rings (1) differs from 2nd ring (2) in thickness, shape and marking.
     Distinguish 1st ring from 2nd ring by referring to the figure and install these piston rings to piston directing marked side of each ring toward top of piston.
   - When installing oil ring (3), install spacer first and then 2 rails.




4) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in the figure.

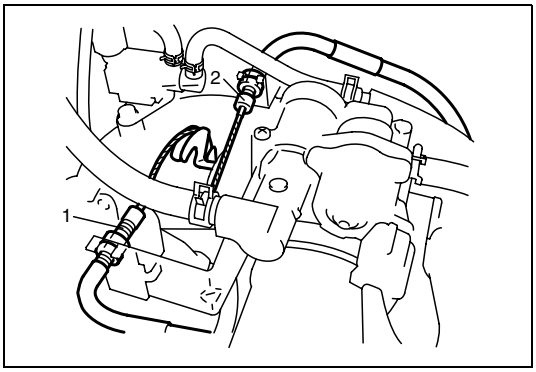
| | |
|---|---|
| 1. | Arrow mark |
| 2. | 1st ring end gap |
| 3. | 2nd ring end gap and oil ring spacer gap |
| 4. | Oil ring upper rail gap |
| 5. | Oil ring lower rail gap |

# Unit Repair Overhaul

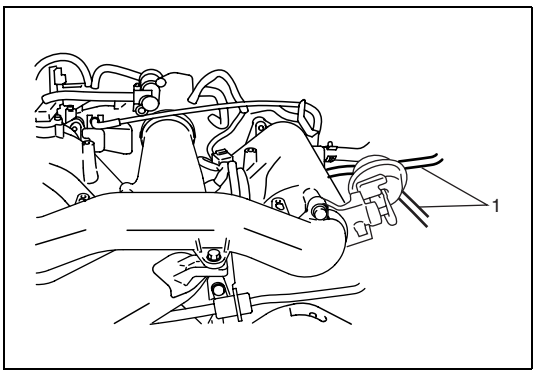
## Engine Assembly

### Removal

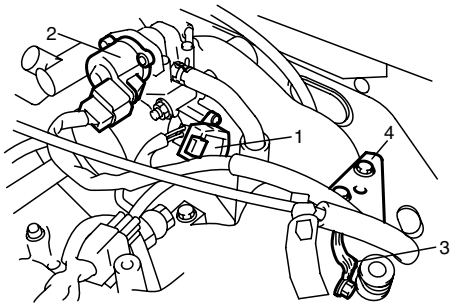
1) Release fuel pressure in fuel feed line. Refer to “Fuel Pressure Relief Procedure” in Section 6-1.
2) Disconnect negative (–) cable at battery.
3) Remove engine hood.
4) Remove engine under cover (if equipped).
5) Drain engine oil.
6) Drain coolant.
7) Remove radiator, radiator fan shroud, cooling fan and radiator reservoir. Refer to “Cooling Fan and Fan Clutch” and “Radiator” in Section 6B.

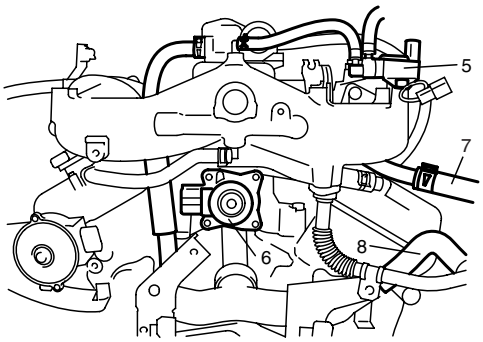



8) Disconnect accelerator cable (1) and A/T throttle cable (if equipped) (2) from throttle body.
9) Detach fuse/relay box, then remove strut tower bar and surge tank cover.
10) Disconnect IAT sensor coupler and MAF sensor coupler then remove air cleaner upper case, intake air hose, intake air pipe and surge tank pipe as a component.




11) Disconnect intake control valve hose (1) (if equipped).
12) Remove engine oil level gauge guide and A/T fluid level gauge guide (for A/T vehicle).
13) Remove ignition coil covers.



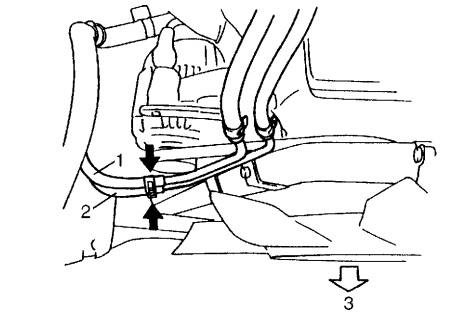




14) Disconnect the following electric lead wires:
- Injector wire coupler
- CMP sensor coupler
- Ignition coil couplers
- CKP sensor coupler
- MAP sensor coupler
- TP sensor (1) coupler
- IAC valve (2) coupler
- Earth wire (3) from surge tank
- EVAP canister purge valve coupler
- EGR valve (6) coupler
- Oxygen sensor -1 and -2 couplers referring to “Exhaust Manifold” in this section
- Coolant temperature sensor coupler
- Knock sensor coupler
- Generator wires
- Starter wires
- Oil pressure wire
- P/S pump wire
- Earth wire from generator bracket

15) Remove clamps and brackets.
16) Disconnect the following hoses:
- Heater hose (7) from heater water pipe
- Heater hose (8) from water outlet cap
- EVAP canister hose from canister pipe
- Brake booster vacuum hose

17) Remove EVAP canister purge valve (5).

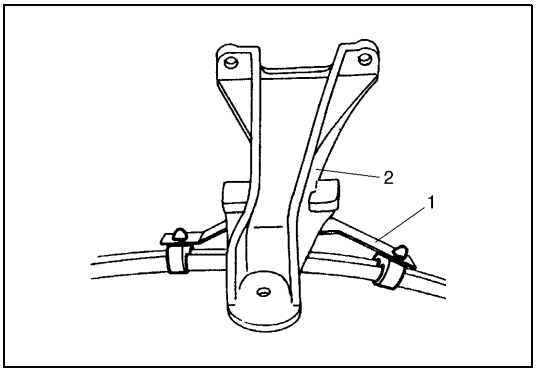
| |
|---|
| 4. Clamp bracket |



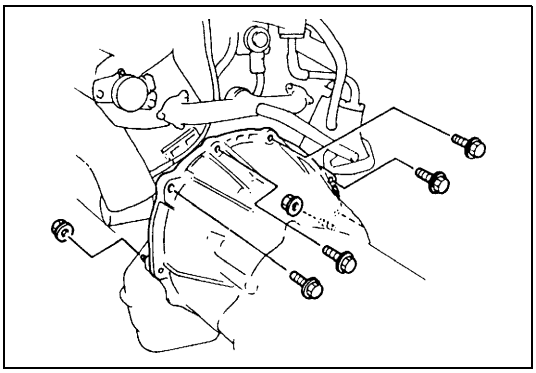

18) Disconnect the following hoses at the location shown in the figure:
- Fuel feed hose (1) from fuel feed pipe
- Fuel return hose from (2) fuel return pipe

| |
|---|
| 3. Front |

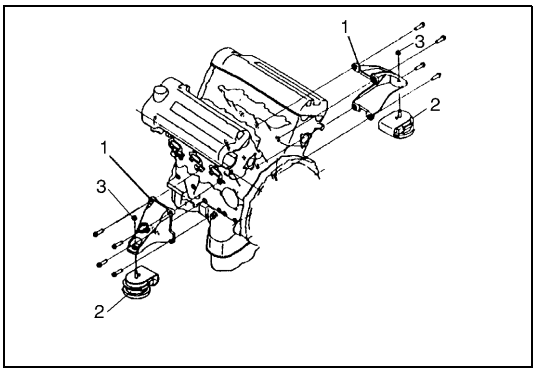
19) Remove P/S pump assembly. Refer to “Power Steering Pump” in Section 3B1.
20) Remove A/C compressor assembly. Refer to “Compressor Assembly” in Section 1B.
21) Remove steering shaft lower assembly. Refer to “Steering Lower Shaft Assembly” in Section 3C1.
22) Raise vehicle.
23) Remove front differential housing with differential from chassis if equipped. Refer to “Dismounting” in Section 7E.
24) Remove exhaust No.1 pipe. Refer to “Exhaust Manifold” in this section.
25) Remove exhaust manifold stiffener from transmission.




26) Remove A/T fluid hose clamps (1) from engine mounting bracket (2). (for A/T vehicle)
27) Removal stiffener (if equipped).
28) Remove clutch housing lower plate.
29) Remove torque converter bolts (for A/T vehicle).
30) Remove starter motor.
31) Lower vehicle.
32) Support transmission. For A/T vehicle, don't jack under A/T oil pan to support transmission.



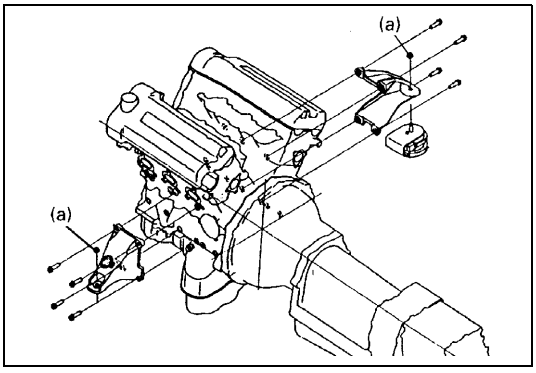
33) Remove bolts and nuts fastening cylinder block and transmission.
34) Install lifting device.




35) Disconnect engine side mounting brackets (1) from engine mountings (2) by removing nuts (3).
36) Before lifting engine, check to ensure all hoses, wires and cables are disconnected from engine.
37) Remove engine assembly from chassis and transmission by sliding toward front, and then, carefully hoist engine assembly.

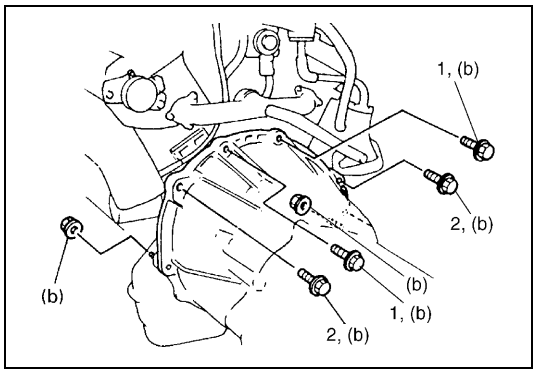
### Installation

Reverse removal procedure for installation, noting the following points.




1) Lower engine assembly into engine compartment. Connect engine to transmission and engine side mounting brackets to engine mountings.
2) Tighten nuts fastening engine side mounting brackets and engine mountings.

**Tightening torque**
**Engine side mounting bracket nut**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**

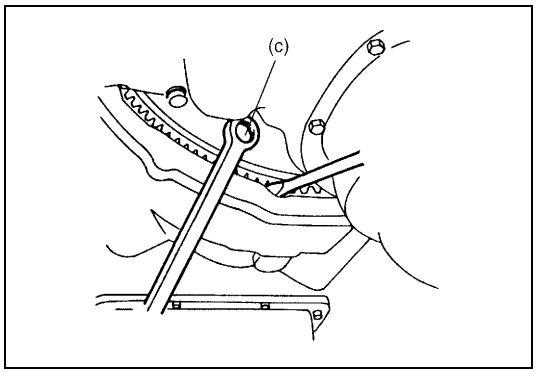



3) Tighten bolts and nuts fastening cylinder block and transmission to specified torque.

**Tightening torque**
**Transmission to cylinder block bolt and nut**
**(b): 85 N·m (8.5 kg-m, 61.5 lb-ft) (for M/T vehicle)**
**(b): 80 N·m (8.0 kg-m, 58.0 lb-ft) (for A/T vehicle)**

| | |
|---|---|
| 1. | Bolt (short) |
| 2. | Bolt (Long) |

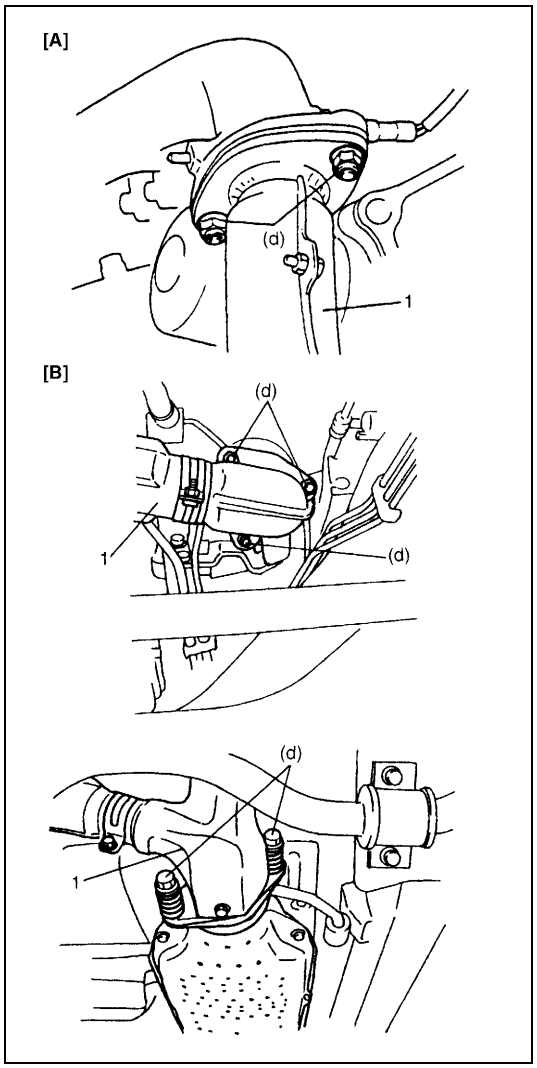
4) Remove lifting device




5) Tighten torque converter bolts to specified torque (for A/T vehicle).

**Tightening torque**
**Torque converter bolt**
**(c): 65 N·m (6.5 kg-m, 47.0 lb-ft)**

6) Install stiffener (if equipped). Refer to “Oil Pan and Oil Pump Strainer”.




7) Tighten bolts and nuts of exhaust No.1 pipe (1) to specified torque.

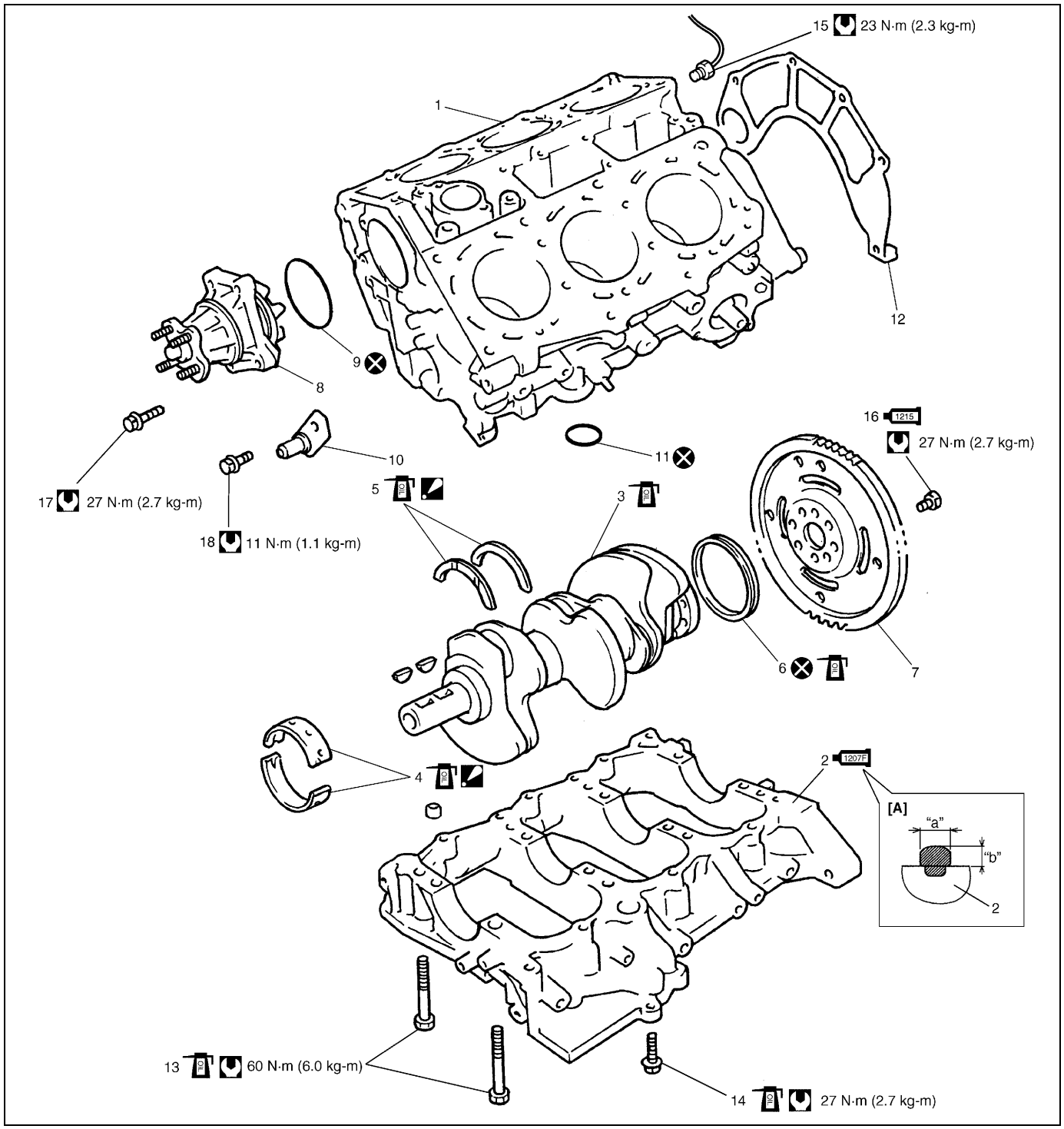
**Tightening torque**
**Exhaust No.1 pipe bolt and nut**
**(d): 50 N·m (5.0 kg-m, 36.5 lb-ft)**

| | |
|---|---|
| [A]: | Vehicle not equipped with warm up three way catalytic converter |
| [B]: | Vehicle equipped with warm up catalytic converter |

8) Install front differential housing with differential to chassis if removed. Refer to “Remounting” in Section 7E.
9) Install steering shaft lower assembly. Refer to “Steering Lower Shaft Assembly” in Section 3C1.
10) Install A/C compressor assembly. Refer to “Compressor Assembly” in Section 1B.
11) Install P/S pump assembly. Refer to “Power Steering Pump” in Section 3B1.
12) Connect hoses, cables and electric wires.
13) Adjust accelerator cable play and A/T throttle cable play (if equipped). Refer to “Accelerator Cable Adjustment” and “A/T Throttle Cable Adjustment (A/T Vehicle)” in Section 6E2.
14) Refill engine with engine oil referring to “Engine Oil and Filter Change” in Section 0B.
15) Refill cooling system, referring to “Cooling System Flush and Refill” in Section 6B.
16) Check to ensure that all fasteners and clamps are tightened.
17) Upon completion of installation, verify that there is no fuel leakage, coolant leakage, P/S fluid leakage or exhaust gas leakage at each connection.
18) Install engine under cover (if equipped).

# Main Bearings, Crankshaft and Cylinder Block

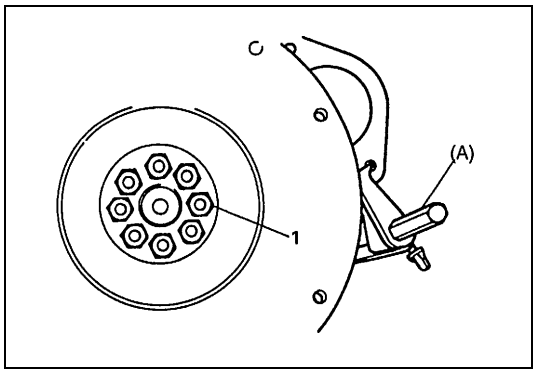
## Components




| | | | |
|---|---|---|---|
| 1. Cylinder block | 7. Flywheel (M/T) Drive plate (A/T) | 13. Crankcase bolt (10 mm (0.39 in.) thread diameter) | [A]: Sealant application amount |
| 1207F 2. Lower crankcase : Apply sealant 99000-31250 to lower crankcase mating surface. | 8. Water pump | 14. Crankcase bolt (8 mm (0.31 in.) thread diameter) | Tightening Torque |
| 3. Crankshaft | 9. O-ring | 15. Knock sensor | Do not reuse. |
| 4. Main bearing : Do not apply engine oil to bearing outside surfaces. | 10. Timing chain oil jet | 1215 16. Flywheel or drive plate bolt : Apply sealant 99000-31110 to thread part. | Apply engine oil to sliding surface of each parts. |
| 5. Thrust bearing : Set bearing facing grooved side to crank weds. | 11. O-ring | 17. Water pump bolt | "a": Width 3 mm (0.12 in.) |
| 6. Rear oil seal | 12. Clutch housing plate | 18. Timing chain oil jet bolt | "b": Height 2 mm (0.08 in.) |

### Removal

1) Remove engine assembly from vehicle referring to “Engine Assembly” in this section.

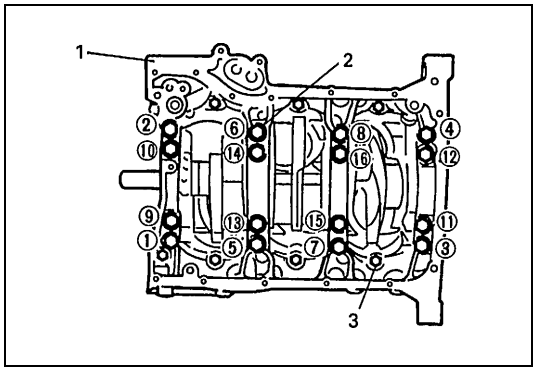



2) Remove clutch and flywheel (for M/T vehicle) or drive plate (for A/T vehicle). For clutch removal, refer to “Clutch Cover, Clutch Disc and Flywheel” in Section 7C1.
   Using special tool (flywheel holder), remove flywheel (M/T vehicle) or drive plate (A/T vehicle).

**Special tool**
**(A): 09924-17811**

| |
|---|
| 1. Flywheel bolt |

3) Remove throttle body, intake manifold, exhaust manifolds.
4) Remove oil pans (lower and upper) and oil pump strainer. Refer to “Oil Pan and Oil Pump Strainer” in this section for removal.
5) Remove cylinder head cover.
6) Remove timing chain cover. Refer to “Timing Chain Cover” in this section for removal.
7) Remove timing chains and chain tensioners, LH Bank 2nd timing chain, 1st timing chain and RH Bank 2nd timing chain.
8) Remove cylinder head assembly.
9) Remove pistons and connecting rods.
10) Remove oil pump and oil pump chain.



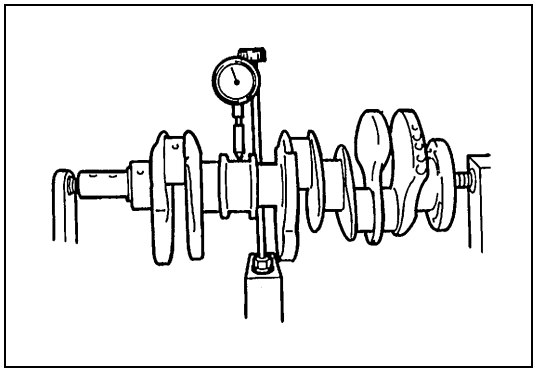

11) Loosen crankcase bolts, following sequence in figure and remove them.

| |
|---|
| 1. Lower crankcase |
| 2. 10 mm (0.394 in.) thread diameter bolt |
| 3. 8 mm (0.315 in.) thread diameter bolt |

12) Remove crankshaft from cylinder block.

### Inspection

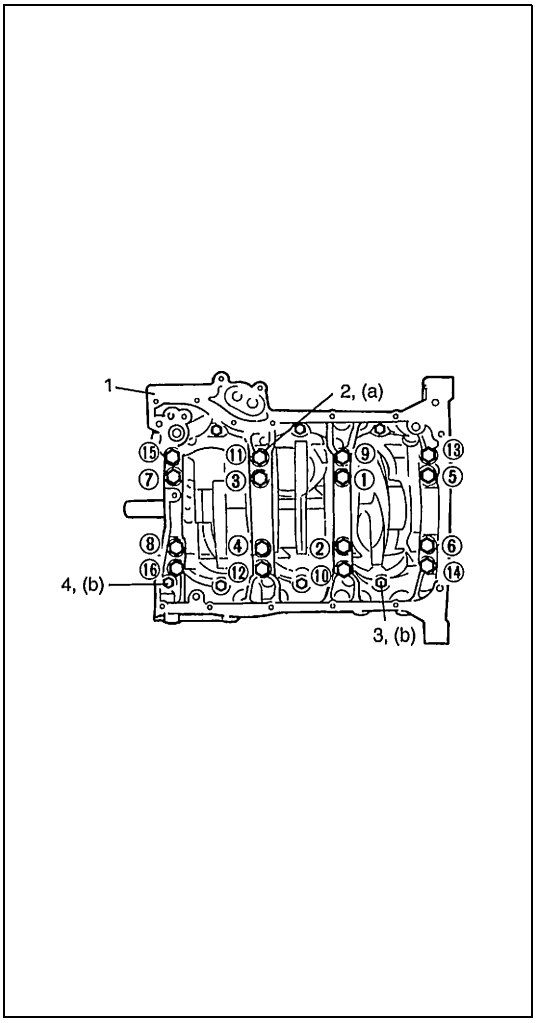
#### Crankshaft Runout



Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

**Crankshaft runout limit**
**0.06 mm (0.0023 in.)**

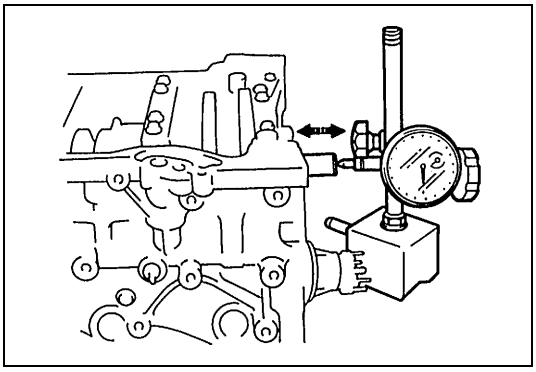
## Crankshaft Thrust Play




1) Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing and lower crankcase (1) installed. Tighten crankcase bolts gradually as follows.
   a) Tighten crankcase bolts (10 mm (0.39 in.) thread diameter) to 42 N·m (4.2 kg-m, 30.5 lb-ft) according to numerical order in figure.
   b) Loosen then until tightening torque is reduced to 0 in reverse order of tightening.
   c) In the same manner as in Step a), tighten them to 42 N·m (4.2 kg-m, 30.5 lb-ft).
   d) In the same manner as Step a) again tighten them to specified torque.
   e) Tighten crankcase bolts (8 mm (0.31 in.) thread diameter) to specified torque.

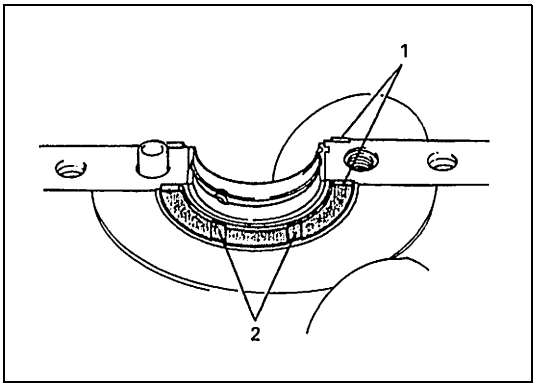
**Tightening torque**
**Lower crankcase bolt (10 mm (0.394 in.) thread diameter) (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**
**Lower crankcase bolt (8 mm (0.315 in.) thread diameter) (b): 27 N·m (2.7 kg-m, 19.5 lb-ft)**

| | |
|---|---|
| 2. Bolt (10 mm (0.394 in.) thread diameter) | 4. Long bolt (8 mm (0.315 in.) thread diameter) |
| 3. Bolt (8 mm (0.315 in.) thread diameter) | |



2) 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: 0.10 – 0.35 mm (0.0040 – 0.0137 in.)**
**Limit: 0.38 mm (0.0149 in.)**

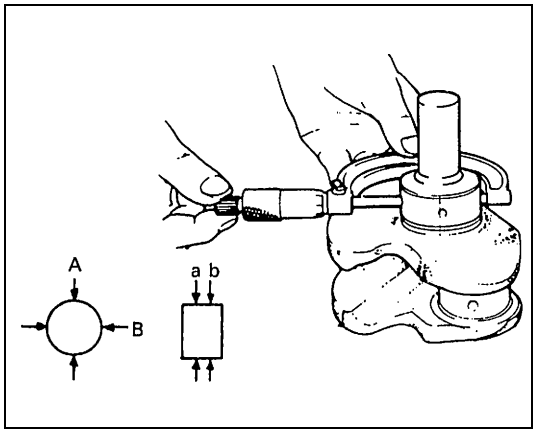



**Thickness of crankshaft thrust bearing**

| **Thrust Bearing** | |
|---|---|
| **Standard** | **2.425 – 2.475 mm (0.0955 – 0.0967 in.)** |
| **Oversize 0.125 mm (0.0049 in.)** | **2.488 – 2.538 mm (0.0980 – 0.0999 in.)** |

| |
|---|
| 1. Thrust bearing |
| 2. Oil groove |

### 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 explained above exceeds its limit, regrind or replace crankshaft.

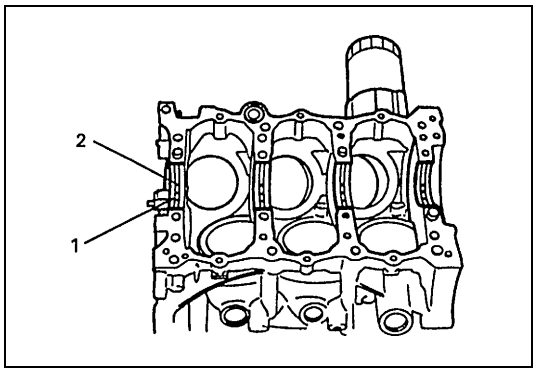
**Crankshaft journal out-of-round (A – B)**
**Limit: 0.01 mm (0.0004 in.)**

**Crankshaft taper (a – b)**
**Limit: 0.01 mm (0.0004 in.)**

### Main Bearings

### 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.



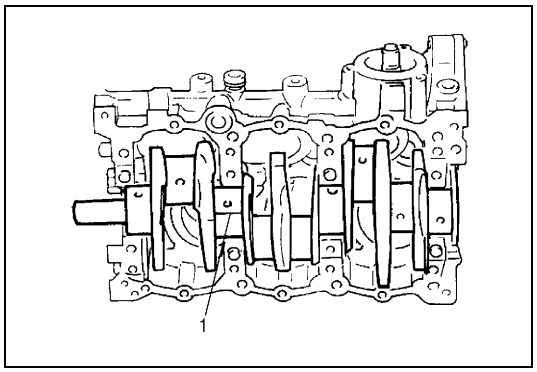

- Upper half of bearing (1) has oil groove (2) as shown in figure. Install this half with oil groove toward cylinder block.

- Lower half of bearing does not have oil groove.

### Inspection

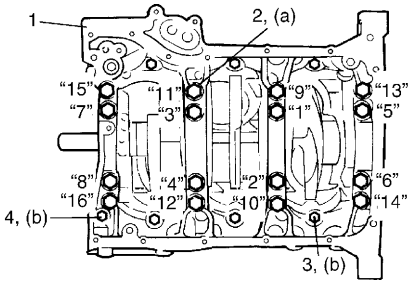
Check bearings for pitting, scratches, wear or damage.
If any malcondition is found, replace both upper and lower halves.
Never replace either half without replacing the other half.

### Main bearing clearance




Check clearance by using gaging plastic (1) according to the following procedure.

1) Remove crankcase.
2) Clean bearings and main journals.
3) Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



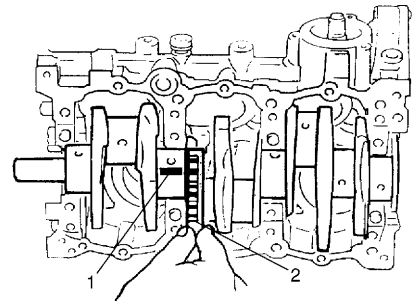

4) Install crankcase (1) to cylinder block.
   Tighten crankcase bolts, gradually as follows.
   a) Tighten crankcase bolts (10 mm (0.39 in.) thread diameter) to 42 N·m (4.2 kg-m, 30.5 lb-ft) according to numerical order in figure.
   b) Loosen then until tightening torque is reduced to 0 in reverse order of tightening.
   c) In the same manner as Step a), tighten them to 42 N·m (4.2 kg-m, 30.5 lb-ft).
   d) In the same manner as Step a) again, tighten them to specified torque.
   e) Tighten crankcase bolts (8 mm (0.31 in.) thread diameter) to specified torque.

**Tightening torque**
**Thrust and journal bearing cap bolt (8 mm (0.315 in.) thread diameter)**
**(a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**
**Thrust and journal bearing cap bolt (10 mm (0.394 in.) thread diameter)**
**(b): 27 N·m (2.7 kg-m, 19.5 lb-ft)**

**NOTE:**

**Do not rotate crankshaft while gaging plastic is installed.**

| | |
|---|---|
| 2. | Bolt (10 mm (0.394 in.) thread diameter) |
| 3. | Bolt (8 mm (0.315 in.) thread diameter) |
| 4. | Long bolt (8 mm (0.315 in.) thread diameter) |




5) Remove crankcase and using scale (2) on gaging plastic (1) envelop, measure gaging plastic (1) width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
   A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
   After selecting new bearing, recheck clearance.

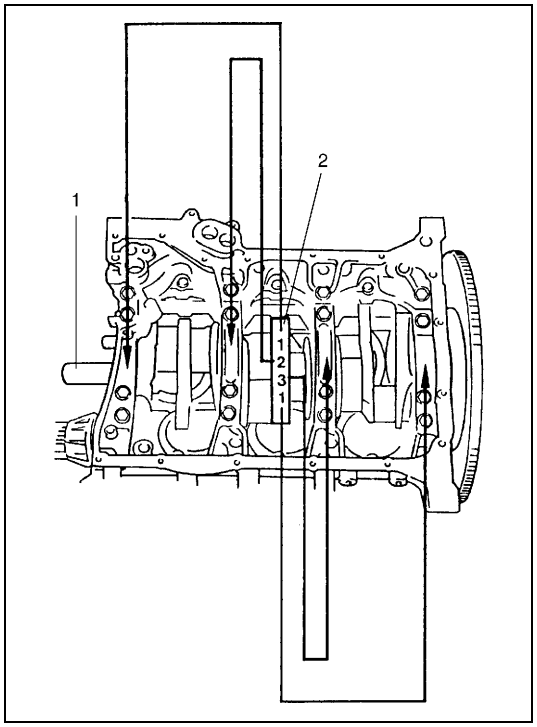
**Main Bearing Clearance**
**Standard: 0.024 – 0.044 mm (0.0009 – 0.0017 in.)**
**Limit: 0.060 mm (0.0023 in.)**

### Selection of Main Bearings

- STANDARD BEARING:

**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 cylinder block and crank case due to any reason, select new standard bearings to be installed by referring to number stamped on new crankshaft or alphabets stamped on new crankcase lower side.**

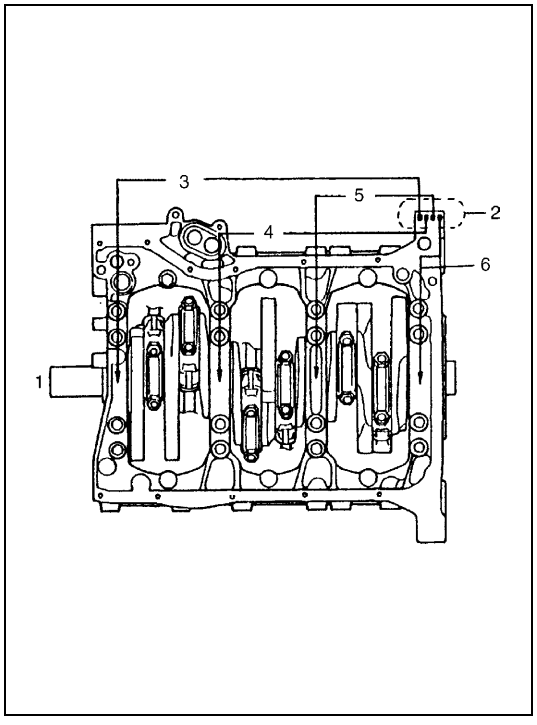



1) First check journal diameter. As shown in the figure, crank web (2) has stamped numbers and alphabet at the center.
   3 kinds of numbers ("1", "2" and "3") represent the following journal diameters.

**Crankshaft journal specification**

| Stamped numbers | Journal diameter |
|---|---|
| 1 | 65.0000 – 65.0060 mm (2.5591 – 2.5592 in.) |
| 2 | 64.9940 – 64.9999 mm (2.5589 – 2.5590 in.) |
| 3 | 64.9880 – 64.9939 mm (2.5586 – 2.5588 in.) |

| | |
|---|---|
| 1. Crankshaft | |

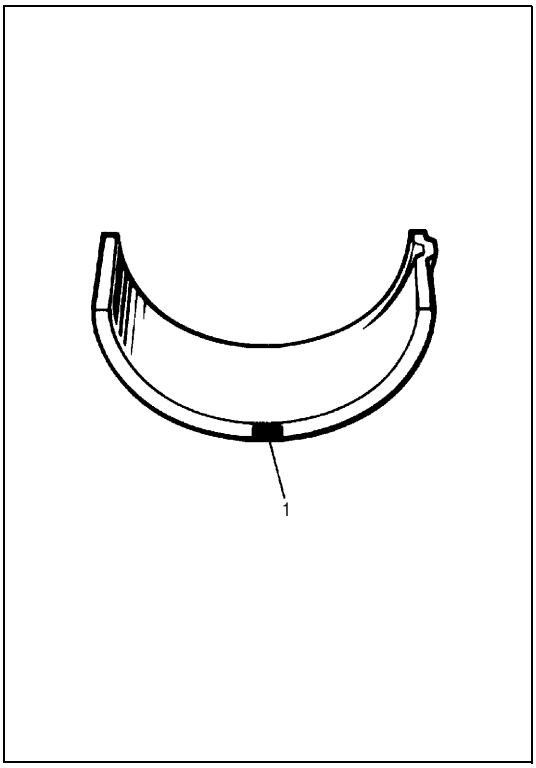



2) Next, check crankcase (bearing cap) bore diameter without bearing. On lower surface of lower crankcase 4 alphabets are stamped as shown in the figure.
   3 kinds of alphabets (A, B and C) represent the following cap bore diameters.

**Main bearing cap bore diameter specification**

| Stamped numbers | Bearing cap bore diameter (without bearing) |
|---|---|
| A | 70.0000 – 70.0060 mm (2.7559 – 2.7561 in.) |
| B | 70.0061 – 70.0120 mm (2.7562 – 2.7563 in.) |
| C | 70.0121 – 70.0180 mm (2.7564 – 2.7566 in.) |

| | |
|---|---|
| 1. Crankshaft pulley side | 4. No.2 bearing |
| 2. Stamped alphabets | 5. No.3 bearing |
| 3. No.1 bearing | 6. No.4 bearing |




3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position as shown in the figure.
   Each color indicates the following thickness at the center of bearing.

**Standard size main bearing specification**

| Color painted | Bearing thickness |
|---|---|
| **Black** | **2.496 – 2.500 mm (0.09827 – 0.09843 in.)** |
| **Colorless (no paint)** | **2.499 – 2.503 mm (0.09839 – 0.09854 in.)** |
| **Yellow** | **2.502 – 2.506 mm (0.09851 – 0.09866 in.)** |
| **Blue** | **2.505 – 2.509 mm (0.09863 – 0.09877 in.)** |
| **Pink** | **2.508 – 2.512 mm (0.09874 – 0.09889 in.)** |

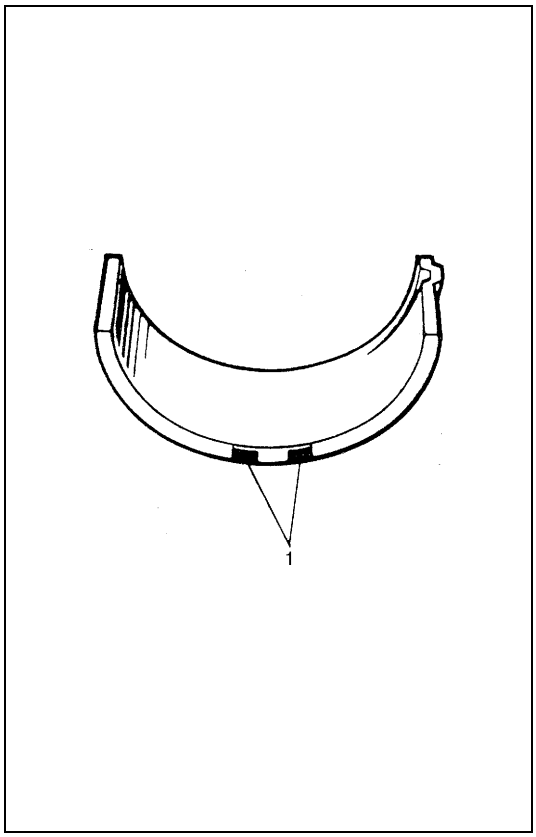
1. Paint

4) From number stamped on crank webs at its center and alphabets stamped on crankcase lower side, determine new standard bearing to be installed to journal, by referring to table shown below.
   For example, if number stamped on crank webs is “1” and alphabet stamped on crankcase is “B”, install a new standard bearing painted in “Black” to its journal.

**New standard size main bearing specification**

| | | Number stamped on crank web (Journal diameter) | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| Alphabet stamped on lower crankcase (Cap bore dia.) | A | Black | Colorless | Yellow |
| | B | Colorless | Yellow | Blue |
| | C | Yellow | Blue | Pink |

5) Check bearing clearance with newly selected standard bearing referring to “Main Bearing Clearance” under “Main Bearings, Crankshaft and Cylinder Block” in this section.
   If clearance still exceeds its limit, use next thicker bearing and recheck clearance.




- UNDERSIZE BEARING (0.25 mm):
  0.25 mm undersize bearing is available, in 5 kinds varying in thickness.
  To distinguish them, each bearing is painted in the following colors at such position as shown in the figure.
  Each color represents the following thickness at the center of bearing.

**Undersize main bearing specification**

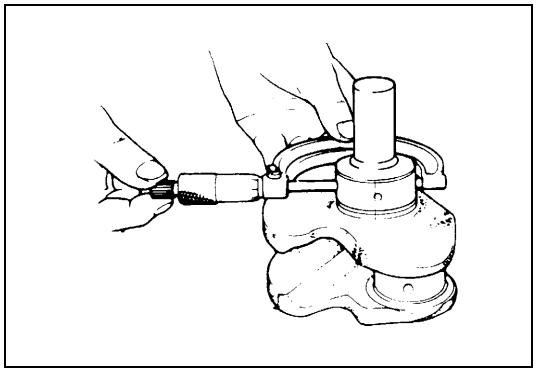
| Color painted | Bearing thickness |
|---|---|
| **Black & Red** | **2.621 – 2.625 mm (0.10319 – 0.10335 in.)** |
| **Red** | **2.624 – 2.628 mm (0.10331 – 0.10346 in.)** |
| **Red & Yellow** | **2.627 – 2.631 mm (0.10343 – 0.10358 in.)** |
| **Red & Blue** | **2.630 – 2.634 mm (0.10355 – 0.10370 in.)** |
| **Red & Pink** | **2.633 – 2.637 mm (0.10367 – 0.10381 in.)** |

1. Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.

1) Regrind journal to the following finished diameter.

**Finished journal diameter of crankshaft journal**
**64.738 – 64.756 mm (2.5487 – 2.5494 in.)**

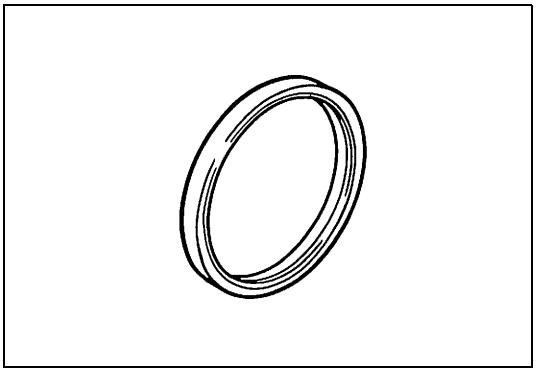


2) Using micrometer, measure reground journal diameter.
   Measurement should be taken in 2 directions perpendicular to each other in order to check for out-of-round.
3) Using journal diameter measured above and alphabets stamped on lower crankcase, select an undersize bearing by referring to table given below.
   Check bearing clearance with newly selected undersize bearing.

**Under size main bearing specification**

| | | Measured journal diameter | | |
|---|---|---|---|---|
| | | **64.7500 – 64.7560 mm (2.5492 – 2.5494 in.)** | **64.7440 – 64.7499 mm (2.5490 – 2.5492 in.)** | **64.7380 – 64.7439 mm (2.5488– 2.5489 in.)** |
| **Alphabets stamped on lower crankcase** | **A** | **Black & Red** | **Red** | **Red & Yellow** |
| | **B** | **Red** | **Red & Yellow** | **Red & Blue** |
| | **C** | **Red & Yellow** | **Red & Blue** | **Red & Pink** |

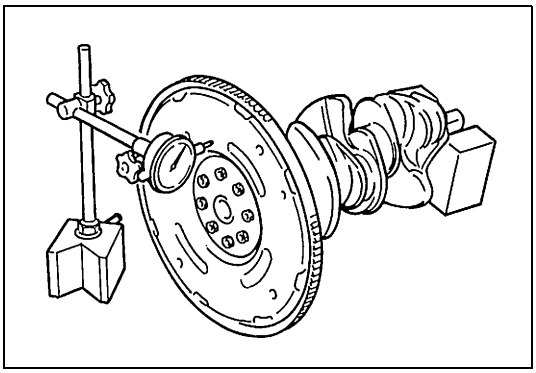
### Rear Oil Seal



Carefully inspect oil seal for wear or damage. If lip portion is worn or damaged, replace oil seal.

### Flywheel

- If ring gear is damaged, cracked or worn, replace flywheel.
- If the surface contacting clutch disc is damaged, or excessively worn, replace flywheel.

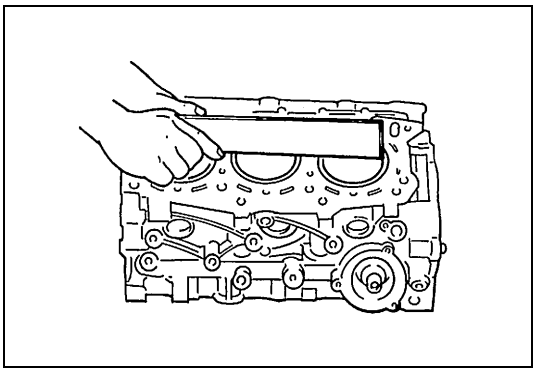


- Check flywheel for face runout with a dial gauge.
  If runout exceeds its limit, replace flywheel.

**Limit on runout of flywheel**
**0.2 mm (0.0078 in.)**

### Cylinder Block

### Distortion of gasketed surface

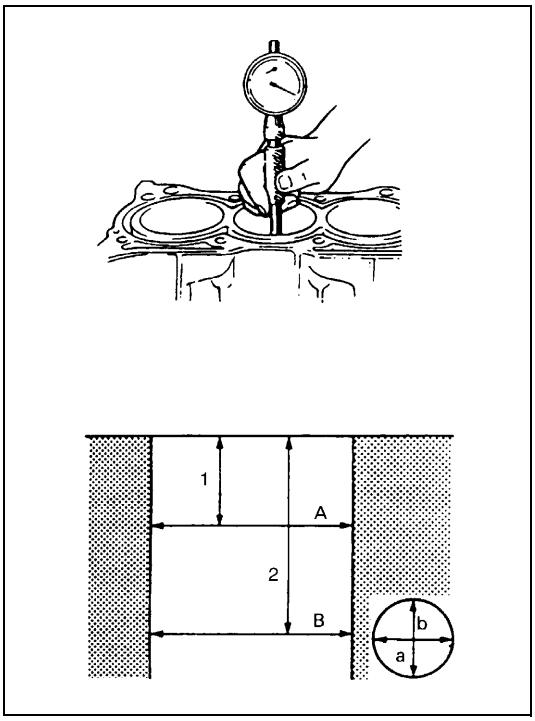


- Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

**Flatness limit of cylinder block**
**0.06 mm (0.0024 in.)**

### 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**

| Size | Piston diameter |
|---|---|
| **Standard** | **87.970 – 87.990 mm (3.4634 – 3.4641 in.)** |
| **Oversize 0.50** | **88.470 – 88.490 mm (3.4831 – 3.4838 in.)** |

3) Using micrometer, measure piston diameter.
4) Calculate cylinder bore diameter to be rebored as follows.
   D = A + B – C
   Cylinder bore diameter to be rebored
   A: Piston diameter as measured
   B: Piston clearance = 0.02 – 0.04 mm (0.0008 – 0.0015 in.)
   C: Allowance for honing = 0.02 mm (0.0008 in.)

| |
|---|
| 1. 50 mm (1.96 in.) |
| 2. 95 mm (3.74 in.) |

5) Rebore and hone cylinder to calculated dimension.

**NOTE:**

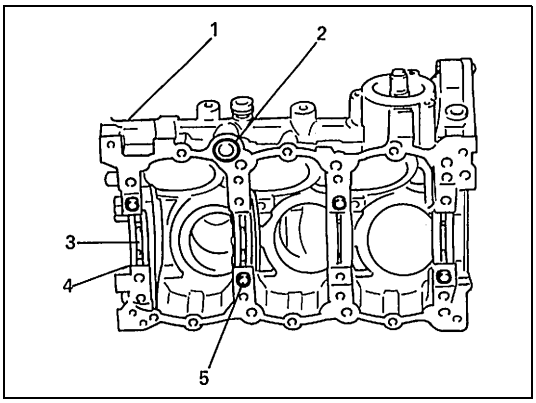
**Before reboring, install all main bearing caps in place and tighten to specification to avoid distortion of bearing bores.**

6) Measure piston clearance after honing.

## Installation

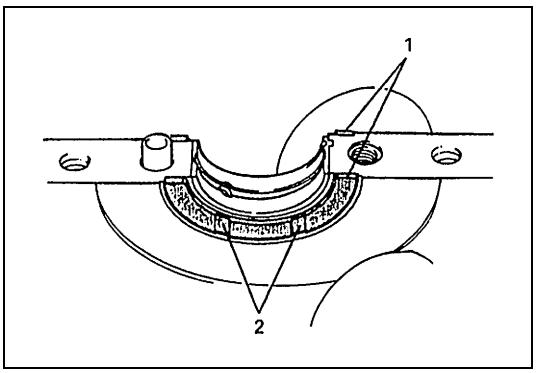
**NOTE:**

- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crank pins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, crankcase (bearings caps), connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb combination and try to see that each part goes back to where it came from, when installing.**
- **Clean mating surface of cylinder block and crankcase, remove oil, old sealant and dust from mating surface.**

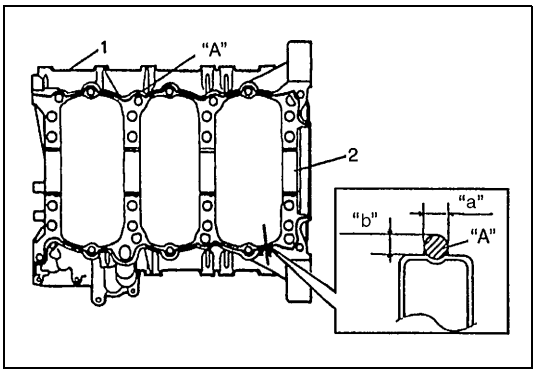



1) Fit main bearings (4) to cylinder block.
   One of two halves of main bearing, has oil groove (3). Install this half with oil groove to cylinder block (1), and another half without oil groove to crankcase.
   Make sure that two halves are painted in the same color.
2) Install O-ring (2) to cylinder block.

| |
|---|
| 5. Knock pin |




3) Fit thrust bearings (1) to cylinder block between No.4 and No.5 cylinders. Face oil groove (2) sides to crank webs.
4) Put crankshaft to cylinder block.

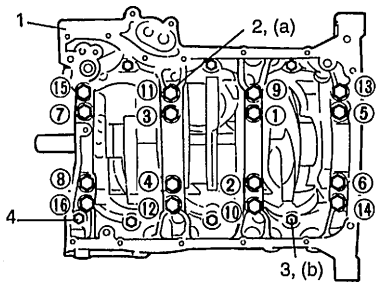



5) Apply sealant "A" to crankcase (1) mating surface area as shown in figure.

**"A": Sealant 99000-31250**

**Sealant amount**
**Width "a": 3 mm (0.12 in.)**
**Height "b": 2 mm (0.08 in.)**

| |
|---|
| 2. Bearing |



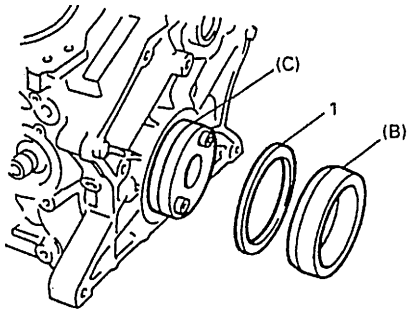

6) Install crankcase (1) to cylinder block. Apply oil to crankcase bolts before installing them. Tighten crankcase bolts gradually as follows.
   a) Tighten crankcase bolts (10 mm (0.39 in.) thread diameter) to 42 N·m (4.2 kg-m, 30.5 lb-ft) according to numerical order in figure.
   b) Loosen then until tightening torque is reduced to 0 in reverse order of tightening.
   c) In the same manner as Step a), tighten them to 42 N·m (4.2 kg-m, 30.5 lb-ft).
   d) In the same manner as Step a) again tighten them to specified torque.
   e) Tighten crankcase bolts (8 mm (0.31 in.) thread diameter) to specified torque.

**Tightening torque**
**Lower crankcase bolt (10 mm (0.394 in.) thread diameter) (a): 60 N·m (6.0 kg-m, 43.5 lb-ft)**
**Lower crankcase bolt (8 mm (0.315 in.) thread diameter) (b): 27 N·m (2.7 kg-m, 19.5 lb-ft)**

**NOTE:**

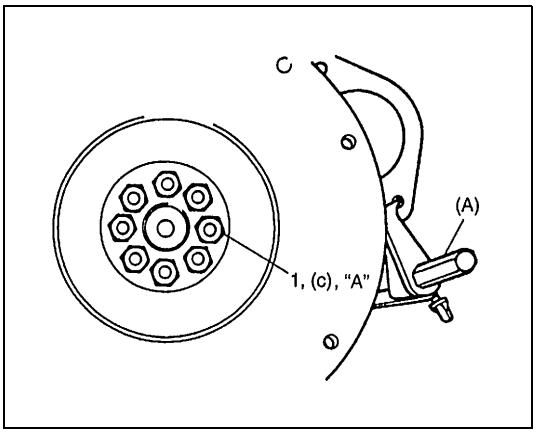
**After tightening crankcase bolts, check to be sure that crankshaft rotates smoothly when turned by hand.**

| | |
|---|---|
| 2. Bolt (10 mm (0.394 in.) thread diameter) | 4. Long bolt (8 mm (0.315 in.) thread diameter) |
| 3. Bolt (8 mm (0.315 in.) thread diameter) | |




7) Using special tools (Oil seal installer and oil seal guide), install rear oil seal (1).

**Special tool**
**(B): 09911-97811**
**(C): 09911-97710**




8) Install flywheel (M/T vehicle) or drive plate (A/T vehicle). Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts (1) applied with sealant to specification.

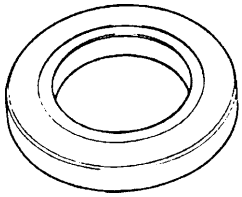
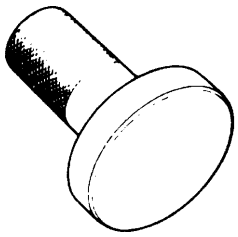
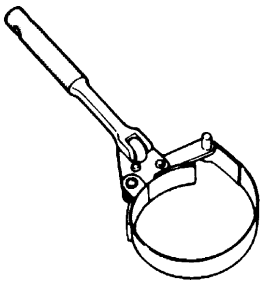
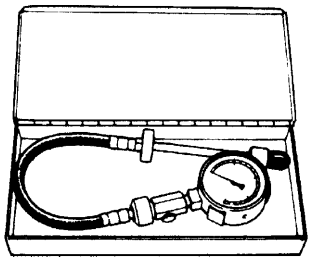
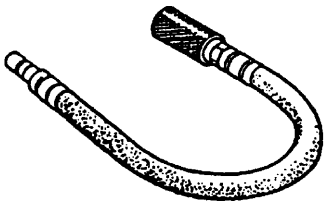
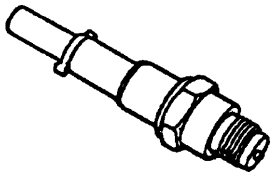
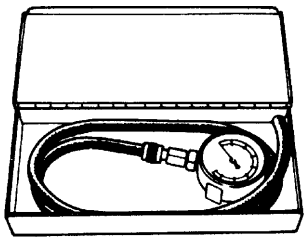
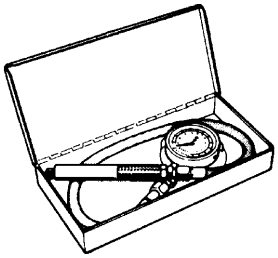
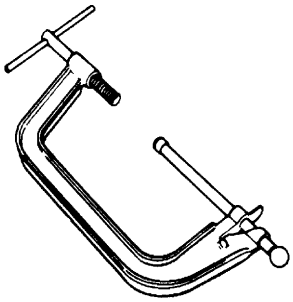
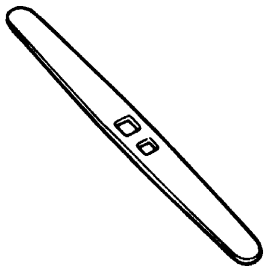
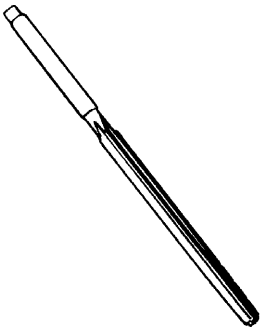
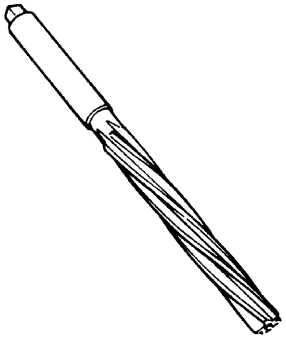
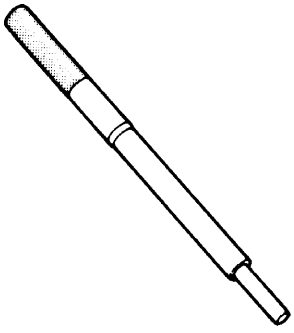
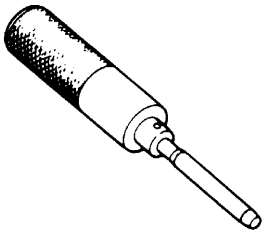
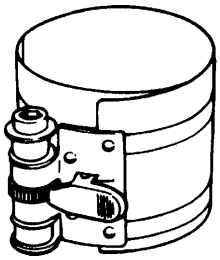
**"A": Sealant 1215 99000-31110**

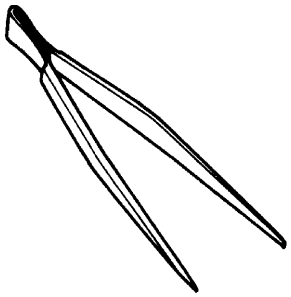
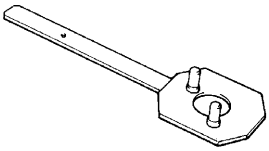
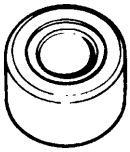
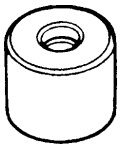
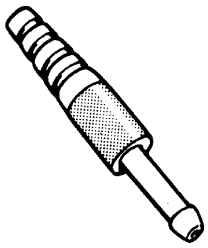
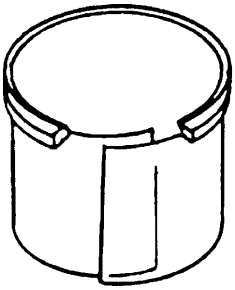
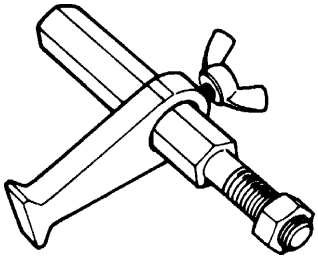
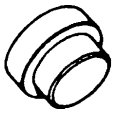
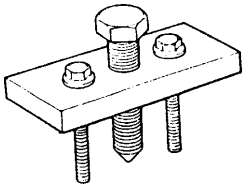
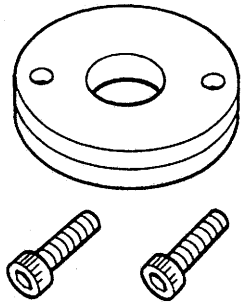
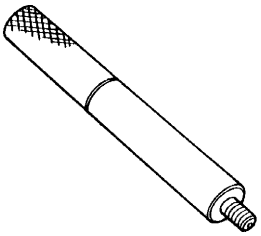
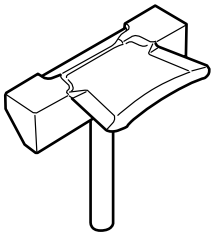
**Special tool**
**(A): 09924-17811**

**Tightening torque**
**Flywheel or drive plate bolt**
**(c): 70 N·m (7.0 kg-m, 51.0 lb-ft)**

9) Install oil pump, pistons and connecting rods referring to "Oil Pump" and "Pistons, Piston Rings, Connecting Rods and Cylinders" in this section.
10) Install oil pump strainer and oil pan.
11) Install cylinder heads assembly to cylinder block referring to "Valves and Cylinder Heads" in this section.
12) Install oil pump chain referring to "Oil Pump Chain" in this section.
13) Install RH bank 2nd timing chain and tensioner "RH (No.2) Bank 2nd Timing Chain and Chain Tensioner" in this section.
14) Install 1st timing chain and tensioner "1st Timing Chain and Chain Tensioner" in this section.
15) Install LH bank 2nd timing chain and tensioner "LH (No.1) Bank 2nd Timing Chain and Chain Tensioner" in this section.
16) Install timing chain cover and crank pulley referring to "Timing Chain Cover" in this section.
17) Install cylinder head covers referring to "Cylinder Head Covers" in this section.
18) Install exhaust manifold referring to "Exhaust Manifold" in this section.
19) Install intake manifold with throttle body referring to "Throttle Body and Intake Manifold" in this section.
20) Install clutch to flywheel (for M/T vehicle). For clutch installation, refer to "Clutch Cover, Clutch Disc and Flywheel" in Section 7C1.
21) Install engine assembly to vehicle referring to "Engine Assembly" in this section.

# Special Tool

| | | | |
|---|---|---|---|
|  <br>09911-97811<br>Oil seal installer |  <br>09913-75510<br>Bearing installer |  <br>09915-47311<br>Oil filter wrench |  <br>09915-64512<br>Compression gauge |
|  <br>09915-64530<br>Compression gauge hose |  <br>09915-67010<br>Compression gauge attachment (c) |  <br>09915-67311<br>Vacuum gauge |  <br>09915-77311<br>Oil pressure gauge |
|  <br>09916-14510<br>Valve lifter |  <br>09916-14910<br>Valve lifter attachment |  <br>09916-34542<br>Reamer handle |  <br>09916-37810<br>Reamer (6 mm) |
|  <br>09916-38210<br>Reamer (11 mm) |  <br>09916-44910<br>Valve guide remover |  <br>09916-58210<br>Valve guide installer handle |  <br>09916-77310<br>Piston ring compressor |

| | | | |
|---|---|---|---|
|  <br>09916-84511<br>Forceps |  <br>09917-68221<br>Camshaft lock holder |  <br>09917-87810<br>Valve guide installer |  <br>09917-98221<br>Valve stem seal installer |
|  <br>09918-08210<br>Vacuum gauge hose joint |  <br>09919-28610<br>Protective sleeve |  <br>09924-17811<br>Flywheel holder |  <br>09926-58010<br>Bearing puller attachment |
|  <br>09944-36011<br>Steering wheel remover |  <br>09911-97710<br>Oil seal guide |  <br>09915-76510<br>Oil pressure gauge attachment |  <br>09921-96510<br>Oil pan seal cutter |

# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Oil pressure switch | 14 | 1.4 | 10.5 |
| Strut tower bar mounting bolt | 50 | 5.0 | 36.5 |
| Exhaust manifold nut and bolt | 30 | 3.0 | 22.0 |
| Cylinder head cover nut | 11 | 1.1 | 8.0 |
| Exhaust No.1 pipe bolt or nut | 50 | 5.0 | 36.5 |
| Front propeller shaft universal join flange bolt | 55 | 5.5 | 40.0 |
| Upper oil pan nut | 11 | 1.1 | 8.0 |
| Upper oil pan bolt | 27 | 2.7 | 19.5 |
| Lower oil pan bolt | 11 | 1.1 | 8.0 |
| Timing chain cover bolt | 11 | 1.1 | 8.0 |
| Crankshaft pulley bolt | 150 | 15.0 | 108.5 |
| Oil pump strainer bolt | 11 | 1.1 | 8.0 |
| Oil pump strainer bracket bolt | 11 | 1.1 | 8.0 |
| Drain plug | 50 | 5.0 | 36.5 |
| Stiffener bolt | 55 | 5.5 | 40.0 |
| Oil pump chain guide bolt | 11 | 1.1 | 8.0 |
| Oil pump case bolt | 12 | 1.2 | 9.0 |
| Oil pump bolt | 27 | 2.7 | 19.5 |
| Camshaft timing sprocket bolt | 80 | 8.0 | 58.0 |
| Timing chain tensioner adjuster No.3 nut | 45 | 4.5 | 33.0 |
| Timing chain tensioner adjuster No.3 bolt | 11 | 1.1 | 8.0 |
| Timing chain guide No.4 bolt | 11 | 1.1 | 8.0 |
| Timing chain tensioner nut | 27 | 2.7 | 19.5 |
| Idler sprocket No.1 bolt | 45 | 4.5 | 32.5 |
| Timing chain tensioner adjuster No.1 bolt | 11 | 1.1 | 8.0 |
| Timing chain guide No.1 and No.2 bolt | 9 | 0.9 | 6.5 |
| Timing chain tensioner adjuster No.2 bolt | 11 | 1.1 | 8.0 |
| Camshaft housing bolt | 12 | 1.2 | 9.0 |
| Timing chain guide No.3 bolt | 11 | 1.1 | 8.0 |
| Oil pump chain guide bolt | 11 | 1.1 | 8.0 |
| CKP sensor bolt | 6 | 0.6 | 4.5 |
| Cylinder head bolt | 105 | 10.5 | 76.0 |
| Cylinder head bolt (hex hole bolt) | 11 | 1.1 | 8.0 |
| Connecting rod bearing cap nut | 45 | 4.5 | 32.5 |
| Engine side mounting bracket nut | 55 | 5.5 | 40.0 |
| Transmission to cylinder block bolt and nut (for M/T vehicle) | 85 | 8.5 | 61.5 |
| Transmission to cylinder block bolt and nut (for A/T vehicle) | 80 | 8.0 | 58.0 |
| Torque converter bolt | 65 | 6.5 | 47.0 |
| Crankcase bolt (10 mm (0.39 in.) thread diameter) | 60 | 6.0 | 43.5 |
| Crankcase bolt (8 mm (0.31 in.) thread diameter) | 27 | 2.7 | 19.5 |
| Flywheel or drive plate bolt | 70 | 7.0 | 51.0 |
| Timing chain oil jet bolt | 11 | 1.1 | 8.0 |
| Water pump bolt | 27 | 2.7 | 19.5 |
| Knock sensor | 23 | 2.3 | 17.0 |

# SECTION 6B

# ENGINE COOLING (H27 ENGINE)

**NOTE:**

- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this manual. Especially, service information for H27 engine model TYPE A and TYPE B is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the descriptions of H25 engine in the same section of the Service Manual mentioned in "FOREWORD" of this manual.**

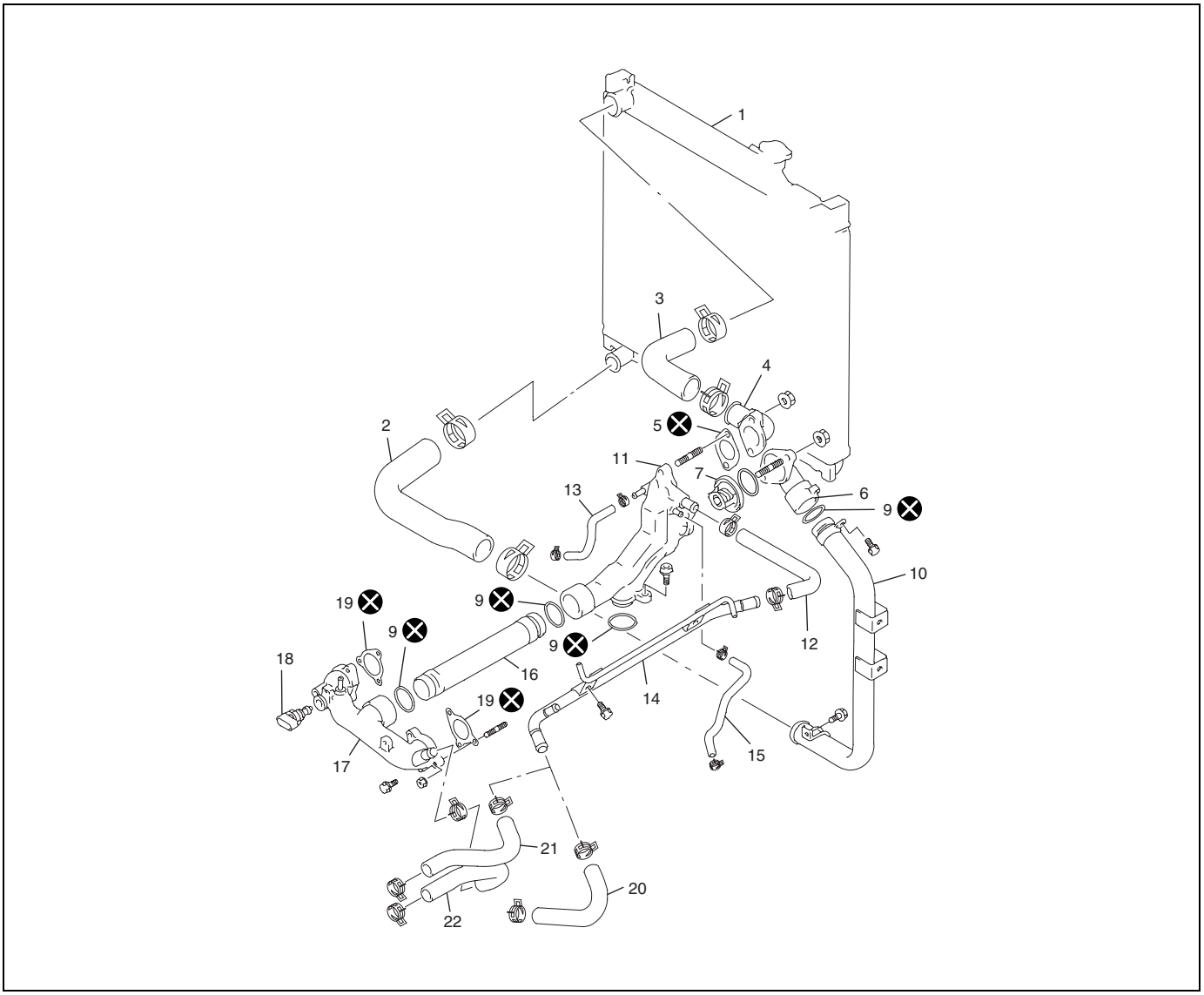
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# General Description

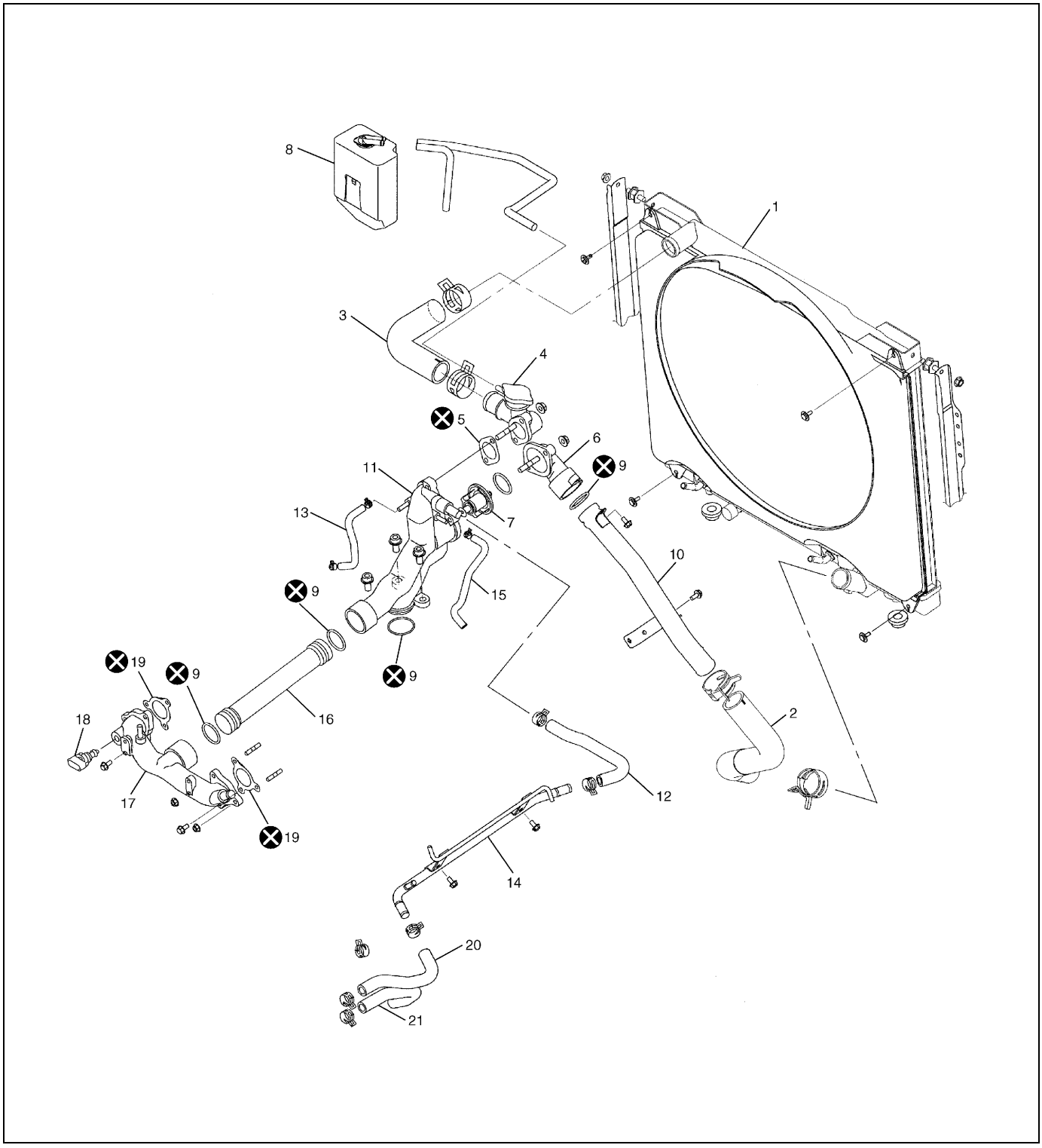
## Cooling System Component

### For type A




| | | | |
|---|---|---|---|
| 1. Radiator | 7. Thermostat | 13. Water head LH hose | 19. Water outlet cap gasket |
| 2. Radiator outlet hose | 8. Blank | 14. Heater outlet pipe | 20. Water circulation hose |
| 3. Radiator inlet hose | 9. O-ring | 15. Water head RH hose | 21. Heater outlet hose |
| 4. Water outlet cap | 10. Water inlet pipe | 16. Water outlet pipe | 22. Heater inlet hose |
| 5. Water outlet cap gasket | 11. Thermostat case | 17. Water outlet cap | ⊗ Do not reuse. |
| 6. Thermostat cap | 12. Heater pipe to case hose | 18. Water temperature sensor | |

## For type B




| | | | |
|---|---|---|---|
| 1. Radiator | 7. Thermostat | 13. Water head LH hose | 19. Water outlet cap gasket |
| 2. Radiator outlet hose | 8. Reservoir | 14. Heater outlet pipe | 20. Heater outlet hose |
| 3. Radiator inlet hose | 9. O-ring | 15. Water head RH hose | 21. Heater inlet hose |
| 4. Water outlet cap | 10. Water inlet pipe | 16. Water outlet pipe | ⊗ Do not reuse. |
| 5. Water outlet cap gasket | 11. Thermostat case | 17. Water outlet cap | |
| 6. Thermostat cap | 12. Heater pipe to case hose | 18. Water temperature sensor | |

# Maintenance

## Coolant

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir.
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° (–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).

**Anti-freeze proportioning chart:**

| | | |
|---|---|---|
| **Freezing temperature** | **°C** | **–36** |
| | **°F** | **–33** |
| **Antifreeze/Anticorrosion coolant concentration** | **%** | **50** |
| **Ratio of compound to cooling water** | **ltr.** | **4.1/4.1** |
| | **US pt** | **8.8/8.8** |
| | **Imp. pt.** | **7.2/7.2** |

**Coolant capacity:**

| | **Engine, radiator and heater** | **Reservoir** | **Total** |
|---|---|---|---|
| **ltr. (US/Imp. pt.)** | **7.3 (15.4 / 12.8)** | **0.9 (1.9 / 1.6)** | **8.2 (17.5 / 14.4)** |

**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 demineraled water or distilled water.**

# SECTION 6B1

# ENGINE COOLING (RHW ENGINE)

**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 "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 "Precautions" 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.**
- **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).**

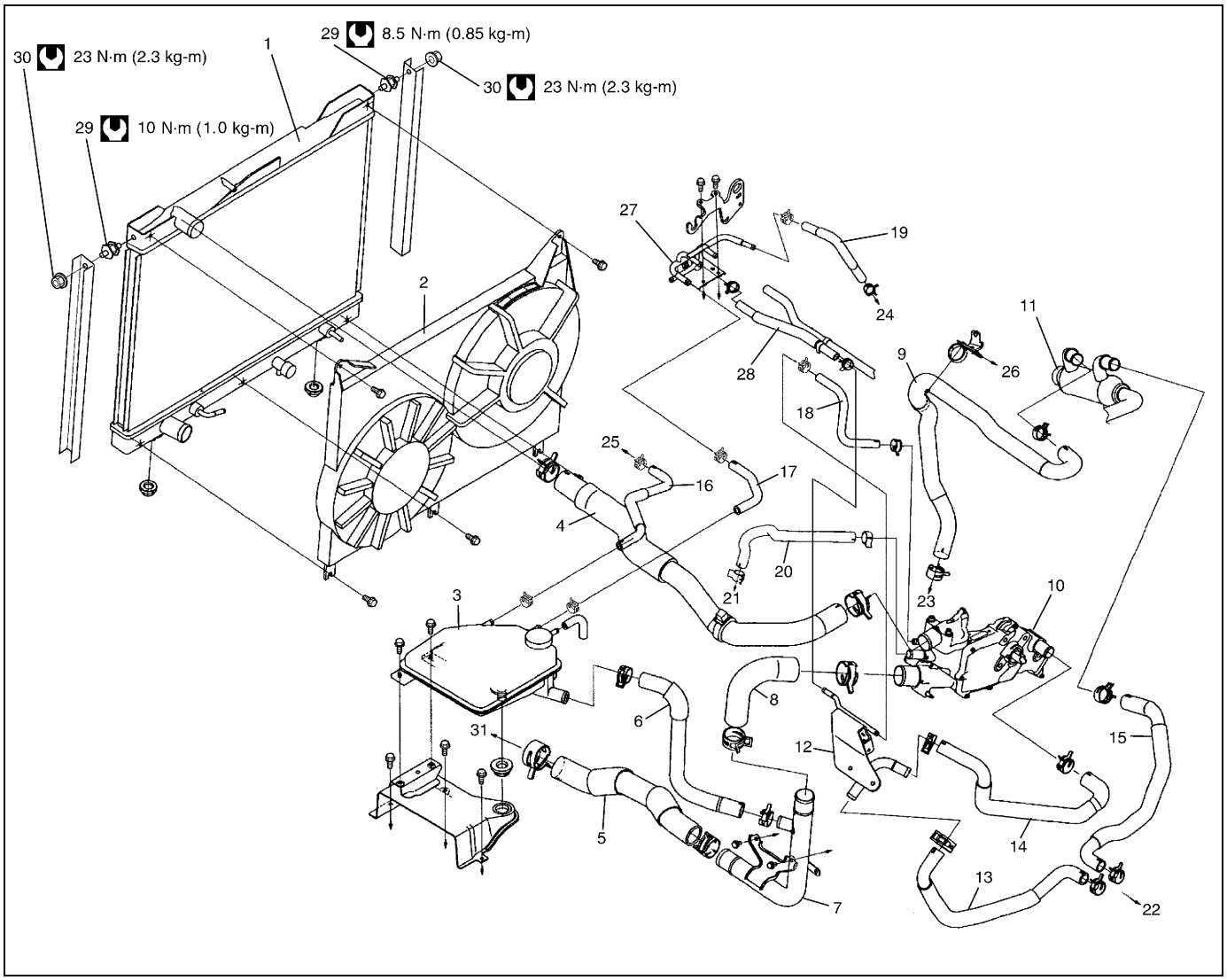
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# General Description

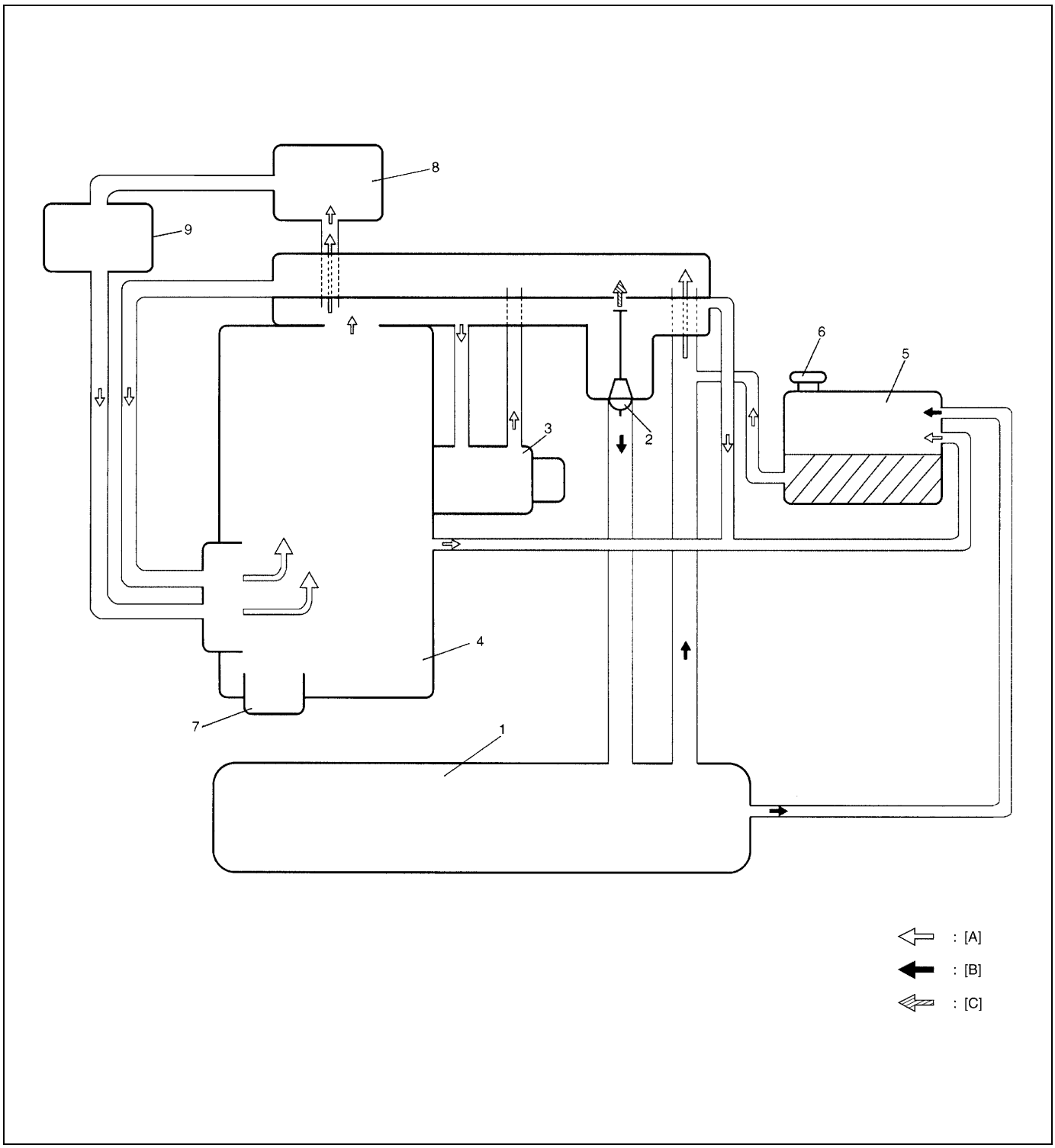
The cooling system consists of the degassing tank cap, radiator, degassing tank, hoses, water pump, cooling fan, thermostat. The radiator is of tube-and-fin type.

## Cooling System Component



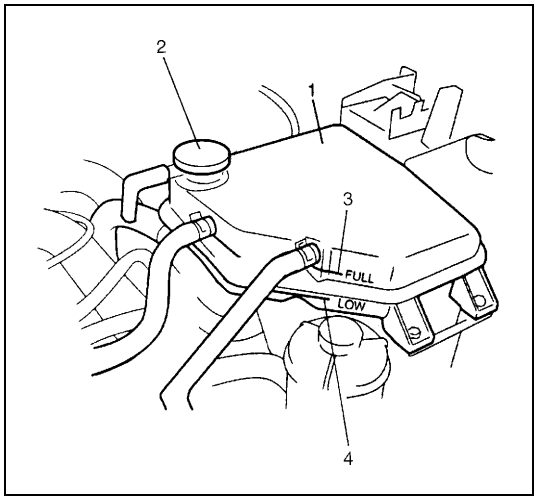

| | | |
|---|---|---|
| 1. Radiator | 12. Inter cooler bracket | 23. To water pump |
| 2. Engine cooling fan | 13. Heater inlet hose | 24. To cylinder head |
| 3. Degassing tank | 14. Heater inlet hose (engine to pipe) | 25. To radiator upper tank |
| 4. Radiator inlet hose | 15. Heater outlet hose | 26. To timing belt cover |
| 5. Radiator outlet hose | 16. Vent. hose (radiator to degassing) | 27. Water ventilation pipe |
| 6. Degassing tank outlet hose | 17. Vent. hose (pipe to degassing) | 28. Vent. hose (waterbox to pipe) No.2 |
| 7. Water inlet pipe | 18. Vent. hose (waterbox to pipe) No.1 | 29. Radiator support upper bush |
| 8. Radiator outlet No.2 hose | 19. Vent. hose (engine to pipe) | 30. Radiator support upper nut |
| 9. Heater outlet No.2 hose | 20. Oil cooler hose | 31. To radiator lower tank |
| 10. Water box | 21. To oil cooler | Tightening torque |
| 11. EGR cooler | 22. To heater unit | |

# Cooling System Circulation



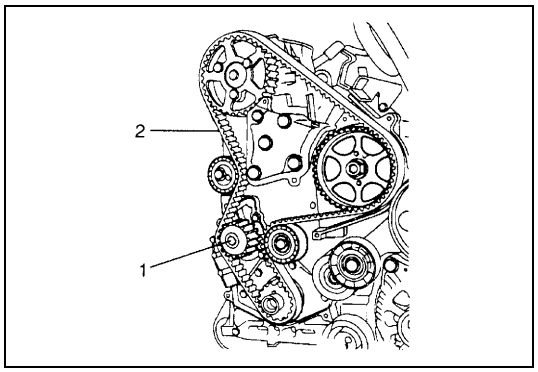

| | | | |
|---|---|---|---|
| [A]: When thermostat is open and close | 1. Radiator | 4. Engine | 7. Water pump |
| [B]: When thermostat is open | 2. Thermostat | 5. Degassing tank | 8. Heater |
| [C]: When thermostat is close | 3. Engine oil cooler | 6. Degassing tank cap (Radiator cap) | 9. EGR cooler |

## Coolant Degassing Tank



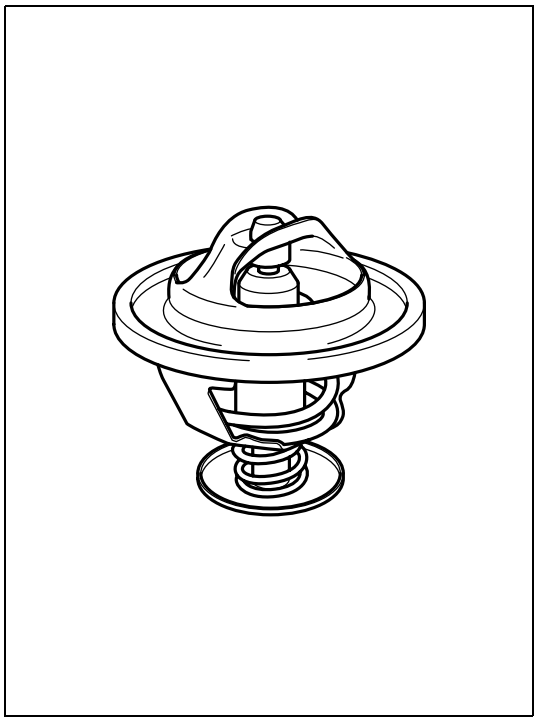

The degassing tank (1) consists of a “see-through” plastic tank, a hose and a degassing tank cap (2).
During operation, the coolant circulates inside of the degassing tank constantly. As the coolant warms up and expands, the coolant level in the degassing tank rises. On the other hand, it lowers as the 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.
Thus, the radiator is kept filled with coolant to the desired level at all times, resulting in increased cooling efficiency.
Coolant level should be between “FULL” (3) and “LOW” (4) marks on the degassing tank.

## Water Pump




The water pump (1) is driven by timing belt (2).
The water pump can not be disassembled.

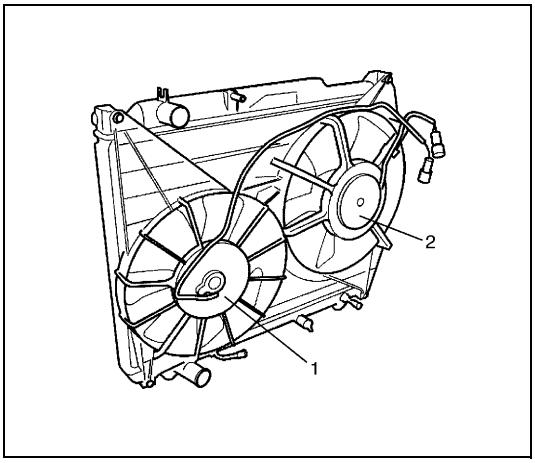
## Thermostat



A wax pellet type thermostat is used in the coolant outlet passage to control the flow of engine coolant, to provide fast engine warm up and to regulate coolant temperatures.
A wax pellet element is hermetically contained in a metal case, and expands when heated and contracts when cooled.
When the pellet is heated and expands, the metal case pushed down the valve to open it.
As the pellet is cooled, the contraction allows the spring to close the valve.
Thus, the valve remains closed while the coolant is cold, preventing circulation of coolant through the radiator.
At this point, coolant is allowed to circulate only throughout the engine to warm it quickly and evenly.
As the engine warms, the pellet expands and the thermostat valve opens, permitting coolant to flow through the radiator.

| **Thermostat functional spec. ±1.5 °C (2.7 °F)** | |
|---|---|
| **Temp. at which valve begins to open** | **83 °C (181 °F)** |
| **Temp. at which valve becomes fully open** | **95 °C (203 °F)** |

## Cooling Fan




The cooling fan is driven by electric motor, and the motor is activated by ECM (and ECT sensor).

**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 relays with the ignition switch in the "ON" position.**

| |
|---|
| 1. Radiator fan motor 1 |
| 2. Radiator fan motor 2 |

## Coolant

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).

### Anti-freeze proportioning chart:

| | | |
|---|---|---|
| Freezing temperature | °C | –36 |
| | °F | –33 |
| Antifreeze/Anticorrosion coolant concentration | % | 50 |
| Ratio of compound to cooling water | ltr. | 4.75/4.75 |
| | US pt | 10.04/10.04 |
| | Imp. pt. | 8.36/8.36 |

### Coolant capacity

| | Engine, radiator heater and degassing tank etc. |
|---|---|
| ltr. (US/Imp. pt.) | 9.5 (20.1/16.72) |

**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 demineraled water or distilled water.**

# Diagnosis

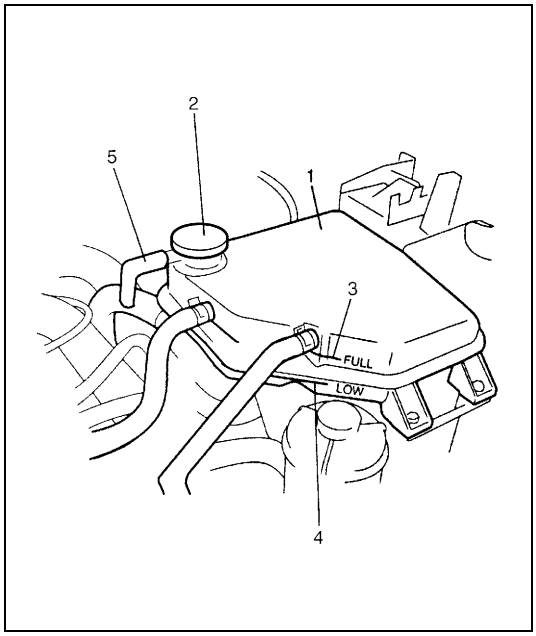
## Diagnosis Table

| Condition | Possible Cause | Correction |
|---|---|---|
| **Engine overheats** | 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. |
| | Defective cooling fan motor or its circuit | Check and replace as necessary. |
| | Plugged radiator | Check and replace radiator as necessary. |
| | Faulty degassing tank cap | Replace. |
| | Dragging brakes | Adjust brake. |
| | Slipping clutch | Adjust or replace. |

# Maintenance

## Coolant Level Check

**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 (1).
A normal coolant level should be between "FULL" (3) and "LOW" (4) marks on degassing tank (1).
If coolant level is below "LOW" mark, remove degassing tank cap and add recommended coolant to tank to bring coolant level up to "FULL" mark. Then, install degassing cap, making sure that the ear of cap lines up with degassing tank pipe (5).

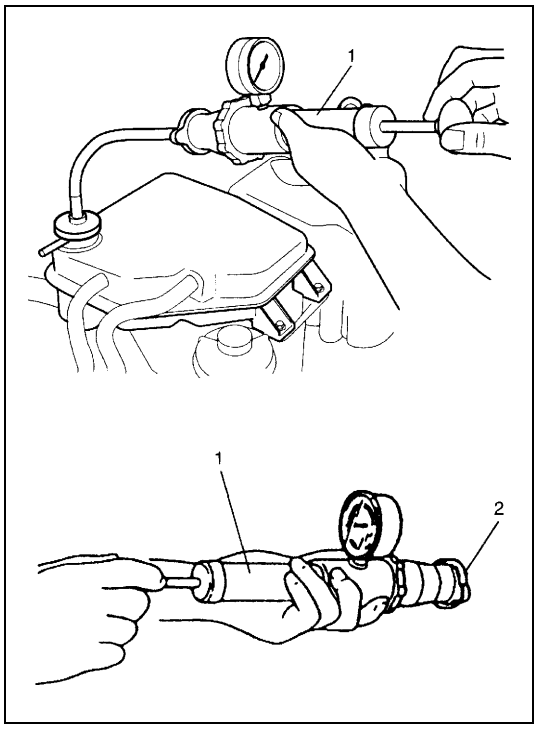
**NOTE:**
**If recommended quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.**

## Cooling System Service

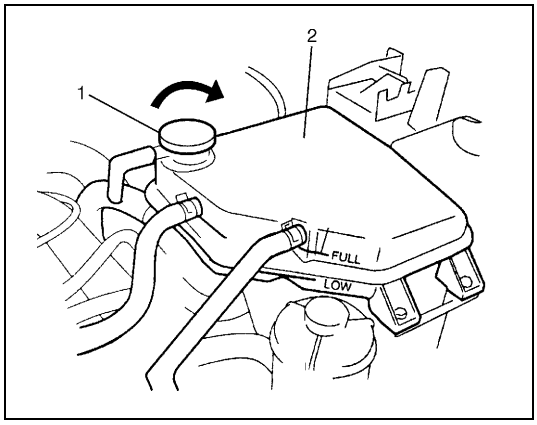
**WARNING:**
**To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot.**
**Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

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 110 kpa (1.1 kg/cm$^2$, 15.6 psi). If replacement of cap is required, use proper cap specified for this vehicle.



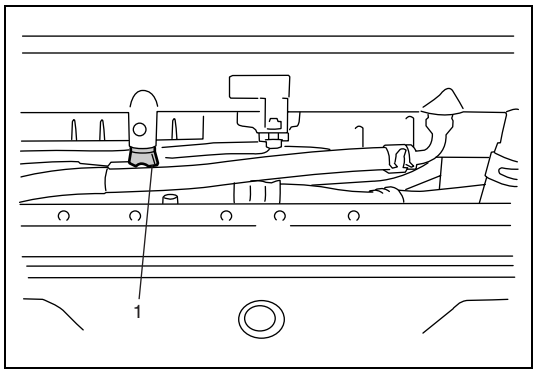

5) Install degassing tank cap (1) to degassing tank (2) turning it clockwise up to stop.

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 Flush

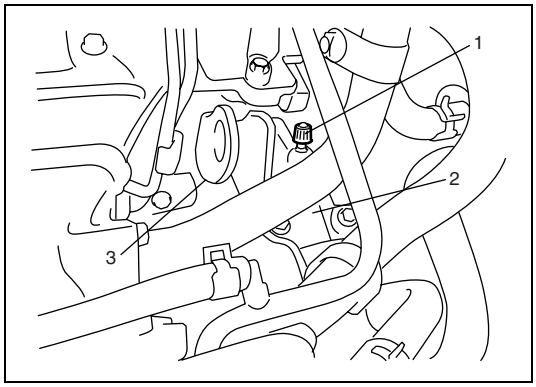
**WARNING:**
**To help avoid danger of being burned, do not remove degassing tank cap while engine and radiator are still hot.**
**Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.**

1) Remove degassing tank cap turning it counter clockwise when engine is cool.
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 remove engine under cover.




4) Stop engine and open radiator drain plug (1) to drain coolant.
5) Close drain plug.

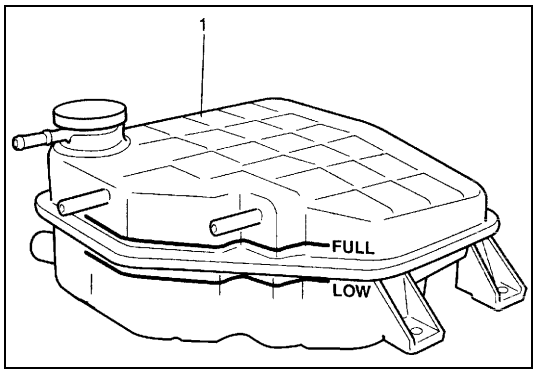
6) Fill the circuit slowly with water.
7) Remove intercooler referring to “Intercooler” in Section 6E3.




8) Loosen bleed screw (1) to bleed air and tighten it after confirmation of overflow.

| |
|---|
| 2. Thermostat cap |
| 3. Engine rear hook |

9) Install intercooler referring to “Intercooler” in Section 6E3.
10) Run engine until upper radiator hose is hot again.
11) Stop engine, and repeat steps 4) and 10) several times until drained liquid is nearly colorless.
12) Drain cooling system and then close radiator drain plug tightly.

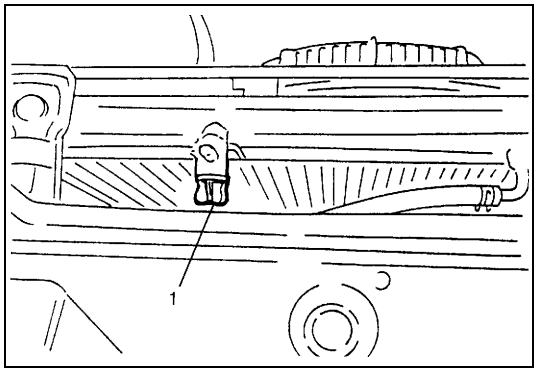



13) Disconnect hoses from degassing tank (1). Remove degassing tank and pour out any fluid. Scrub and clean inside of degassing tank (1) with soap and water. Flush it well with clean water and drain.
    Reinstall degassing tank and hose.
14) Refill cooling system referring to “Cooling System Refill” in this section.

## On-Vehicle Service

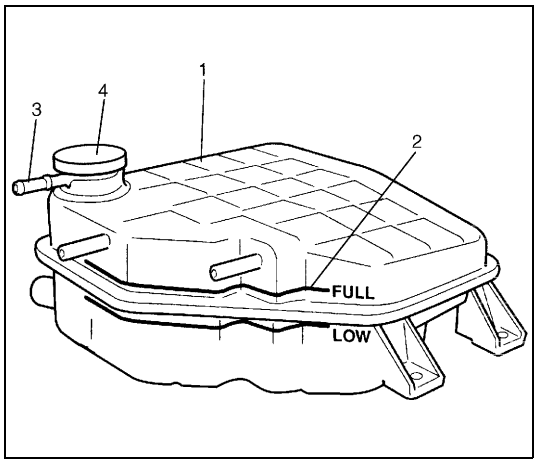
**WARNING:**
- **Check to make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cord from battery terminal before removing any part.**

## Cooling System Draining



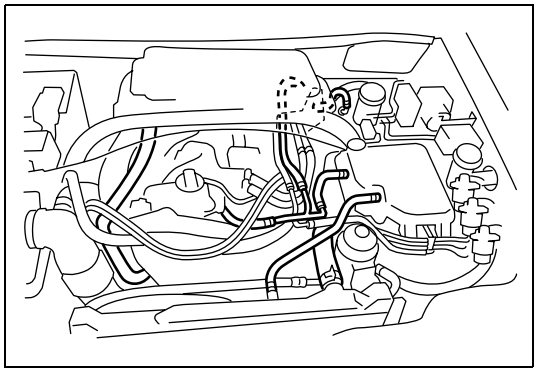

1) Remove degassing tank cap.
2) Loosen drain plug (1) on radiator to drain coolant.
3) After draining coolant, be sure to tighten drain plug securely.

## Cooling System Refill




1) Add 50/50 mixture of good quality ethylene glycol antifreeze and water to degassing tank (1).
   Fill to "FULL" level mark (2).
2) Remove intercooler referring to "Intercooler" in Section 6E3.
3) Loosen bleed screw to bleed air and tighten it after confirmation of overflow.
4) Install intercooler referring to "Intercooler" in Section 6E3.
5) Run engine, with degassing tank cap (4) removed, until radiator upper hose is hot.
6) With engine idling, add coolant to degassing tank (1) until level reaches "FULL" mark.
   Install degassing tank cap (4) turning it clockwise up to stop.

## Cooling Water Pipes or Hoses



**REMOVAL**

1) Drain cooling system referring to "Cooling System Draining" in this section.
2) To remove these pipes or hoses, loosen clamp on each hose and pull hose end off.

### INSTALLATION

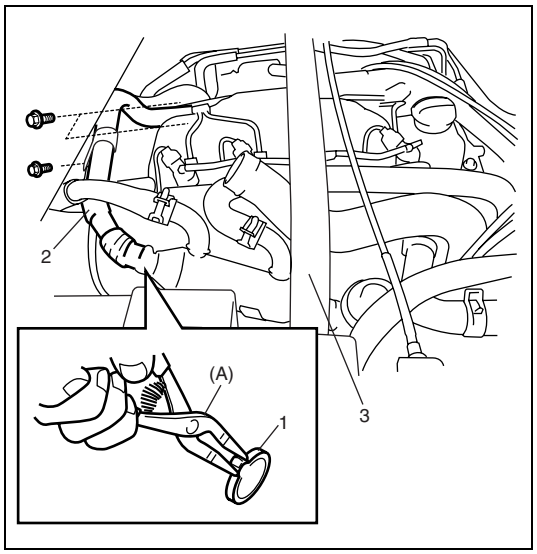
Install removed parts in reverse order of removal procedure noting the following.

- Tighten each clamp securely.
- Refill cooling system with proper coolant referring to “Cooling System Refill” in this section.

## Thermostat

### REMOVAL

1) Remove battery from vehicle.
2) Drain cooling system referring to “Cooling System Draining” in this section.
3) Remove intercooler referring to “Intercooler” in Section 6E3.

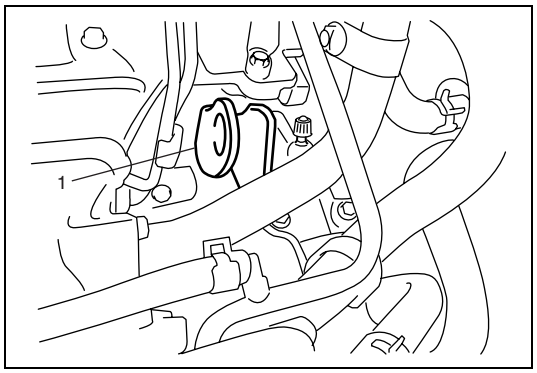



4) Remove EGR pipe clamp (1) by using special tool.

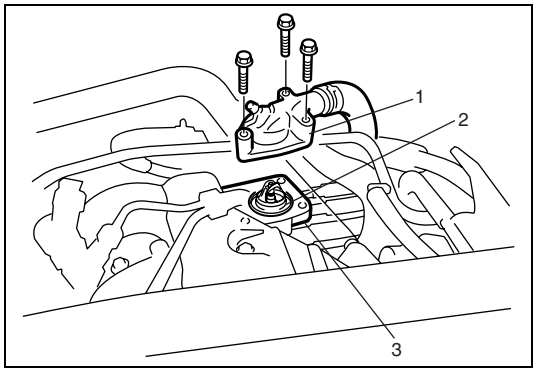
**Special tool**
**(A): 09919-46510/OUT0000110**

5) Remove EGR pipe (2).

| |
|---|
| 3. Strut tower bar |



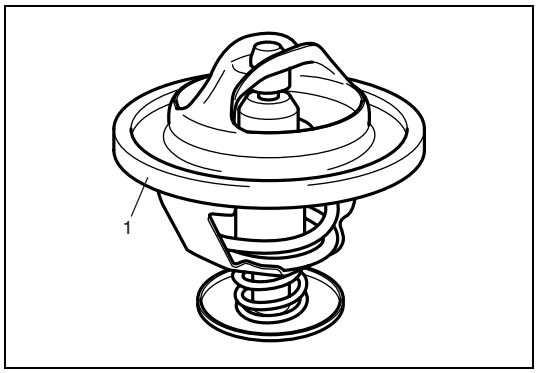

6) Remove Engine hunger bracket (1).

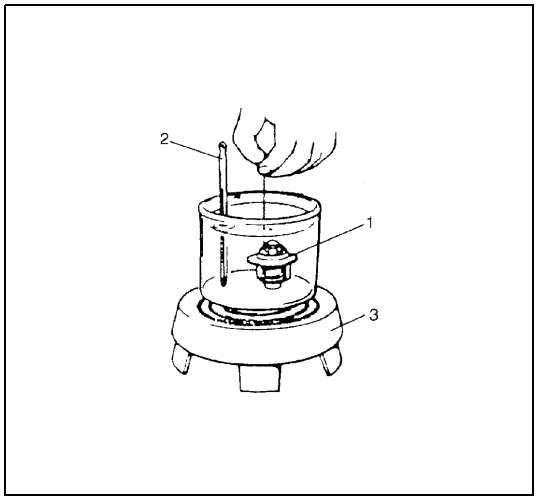



7) Remove thermostat cap (1) from water box (3).
8) Remove thermostat (2) from water box (3).

## INSPECTION

- Check to make sure that valve seat is free from foreign matters which would prevent valve from seating tight.
- Check thermostat seal (1) for breakage, deterioration or any other damage.




- Check thermostatic movement of wax pellet as follows:

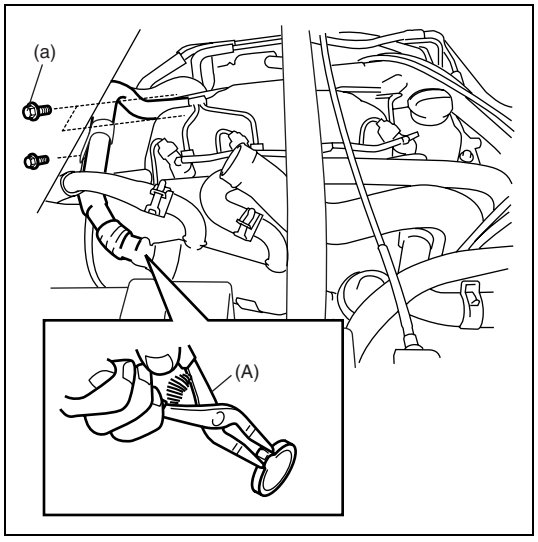
1) Immerse thermostat (1) in water, and heat water gradually.
2) Check that valve starts to open at specific temperature.
3) If valve starts to open at a temperature substantially below or above specific temperature, thermostat unit should be replaced with a new one. Such a unit, if reused, will bring about overcooling or overheating tendency.

| | |
|---|---|
| **Temp. at which valve begins to open** | **83 °C (181 °F)** |
| **Temp. at which valve becomes fully open** | **95 °C (203 °F)** |

| |
|---|
| 2. Thermometer |
| 3. Heater |

## INSTALLATION

For installation, reverse removal procedure noting the following.




- Tighten EGR pipe bolts to specified torque.

**Tightening torque**
**EGR pipe bolt**
**(a): 11 N·m (1.1 Kg-m, 8.0 lb-ft)**

- Install new EGR pipe clamp using special tool.

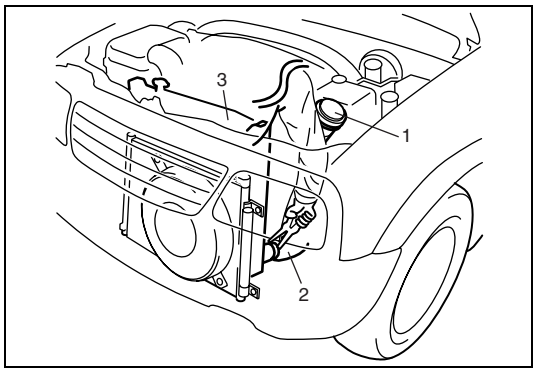
**Special tool**
**(A): 09919-46510/OUT0000110**

- Refill cooling system referring to “Cooling System Refill” in this section.

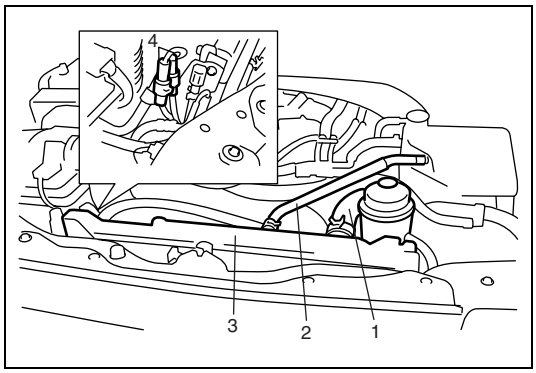
# Radiator

## REMOVAL

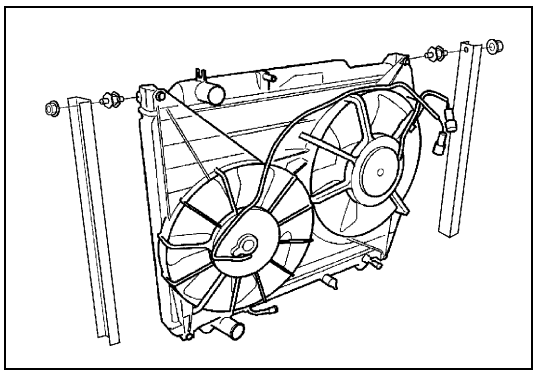
1) Disconnect negative (–) cable at battery.
2) Drain cooling system referring to “Cooling System” in this section.
3) Remove engine under cover.




4) Detach P/S fluid reservoir (1) and disconnect radiator outlet hose (2) from radiator (3) as shown in figure.




5) Disconnect radiator inlet hose (1) and degassing tank hose (2) from radiator (3).
6) Remove P/S fluid reservoir bracket.
7) Remove P/S high pressure hose clamp.
8) Disconnect radiator fan motor couplers (4).



9) Remove radiator (1) with radiator fan motor assembly from vehicle.
10) Remove radiator fan motor assembly from radiator (1).

### INSPECTION

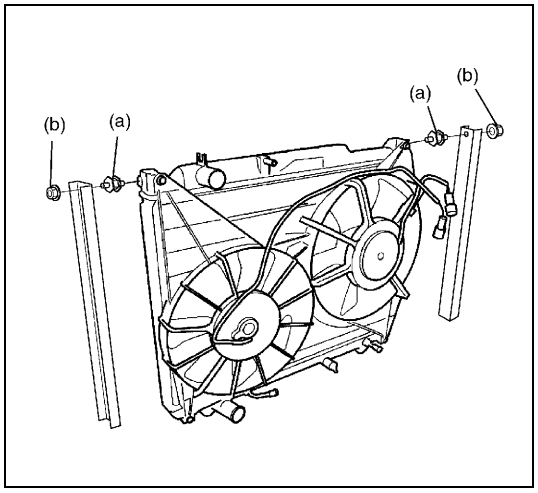
Check radiator for leakage or damage. Straighten bent fins, if any.

### CLEANING

Clean frontal area of radiator cores.

### INSTALLATION

Reverse removal procedures, noting the following.




- Tighten radiator support upper bush and radiator support upper nut to specified torque.

**Tightening torque**
**Radiator support upper bush**
**(a): 8.5 N·m (0.85 kg-m, 6.0 lb-ft)**
**Radiator support upper nut**
**(b): 23 N·m (2.3 kg-m, 16.5 lb-ft)**

- Refill cooling system with proper coolant referring to “Cooling System Refill” in this section.
- After installation, check each joint for leakage.

## Radiator Fan Relay

### INSPECTION

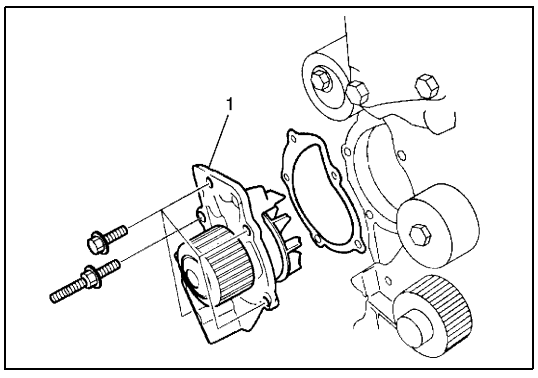
Refer to “Radiator Fan Control System” in Section 6E3.

## Water Pump

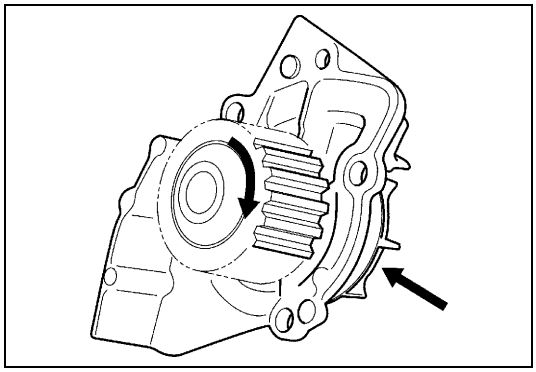
**CAUTION:**
**Do not disassemble water pump.**
**If any repair is required on pump, replace it as assembly.**

### REMOVAL

1) Disconnect negative (–) cable at battery.
2) Drain cooling system referring to “Coolant System Draining” in this section.
3) Remove timing belt referring to “Timing Belt and Belt Tensioner” in Section 6A3.
4) Remove water pump assembly (1).

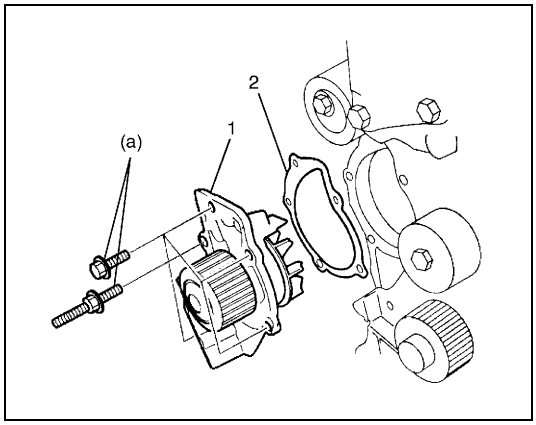


## INSPECTION



- Rotate water pump by hand to check for smooth operation. If pump does not rotate smoothly or makes abnormal noise, replace it.
- Inspect water pump impeller for damage.
  Replace as necessary.

## INSTALLATION




1) Install new pump gasket (2) to water pump (1).
2) Install water pump to cylinder block.

**Tightening torque**
**Water pump bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)**

3) Install timing belt and timing belt covers referring to “Timing Belt and Belt Tensioner” in Section 6A3.
4) Connect negative (–) cable at battery.
5) Fill coolant referring to “Coolant System Refill” in this section.
6) After installation, check each part for leakage.

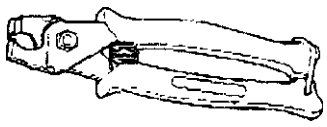
# Required Service Materials

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| Ethylene glycol base coolant (Anti-freeze/Anti-corrosion coolant) | – | • Engine cooling system for improving cooling efficiency and for protection against rusting. |

# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| EGR pipe bolt | 11 | 1.1 | 8.0 |
| Water pump bolt | 15 | 1.5 | 11.0 |
| Radiator support upper bush | 8.5 | 0.85 | 6.0 |
| Radiator support upper nut | 23 | 2.3 | 16.5 |

# Special Tool



09919-46510
(OUT0000110) Clamp pliers

## SECTION 6E2

# ENGINE AND EMISSION CONTROL SYSTEM (H27 ENGINE)

**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.**
- **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).**

**NOTE:**

- **Whether following systems (parts) are used in the particular vehicle or not depends on specifications. Be sure to bear this in mind when performing service work.**
  - **– Diagnosis connector**
  - **– CKP sensor**
  - **– MAP sensor**
  - **– EGR valve**
  - **– Heated oxygen sensor or CO adjusting resistor**
  - **– Three way catalytic converter, Warm-up three way catalytic converter**
- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this manual. Especially, service information for H27 engine model TYPE A and TYPE B is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**

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# General Description

### Engine and Emission Control System Introduction

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

Air intake system includes air cleaner, mass air flow sensor, throttle body, idle air control valve, intake manifold air tuning valve (Type B only) and intake manifold.

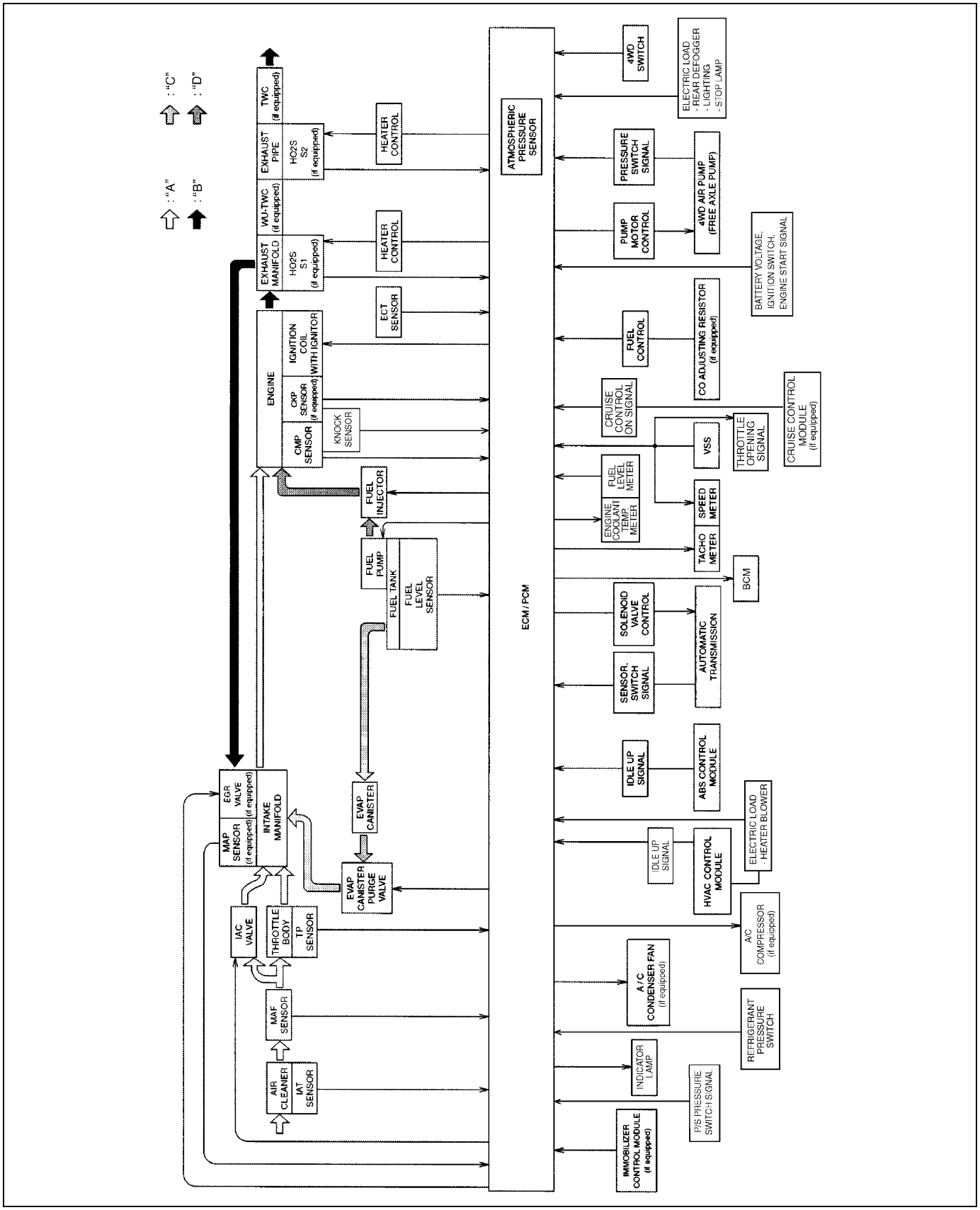
Fuel delivery system includes fuel pump, delivery pipe, fuel pressure regulator, fuel injectors, etc.

Electronic control system includes ECM (or PCM), various sensors and controlled devices.

Emission control system includes EGR, EVAP and PCV systems.

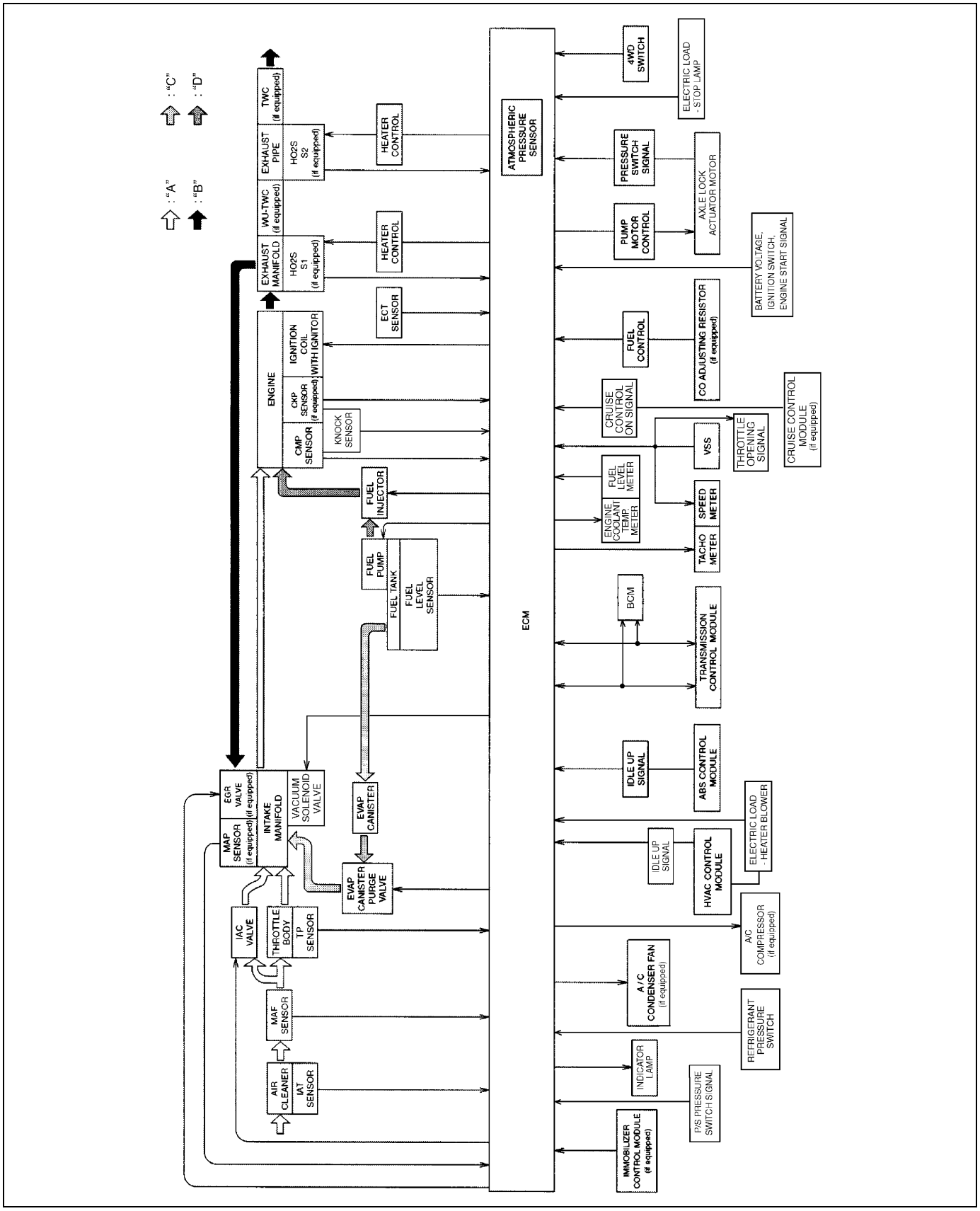
## Engine and Emission Control System Flow Chart

### Type A




| | |
|---|---|
| "A": Air | "C": Vapor |
| "B": Exhaust gas | "D": Fuel |

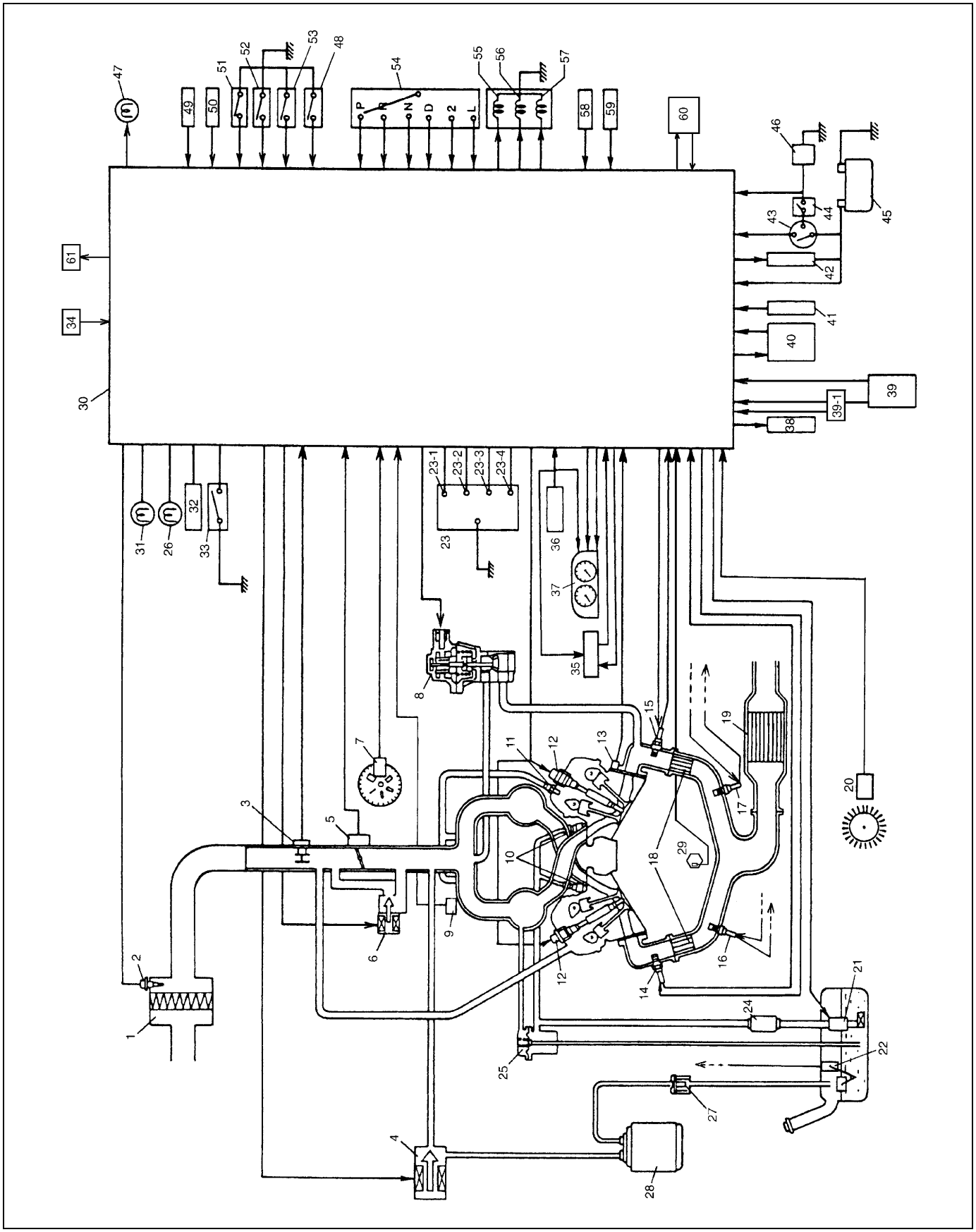
## Type B




| | |
|---|---|
| "A": Air | "C": Vapor |
| "B": Exhaust gas | "D": Fuel |

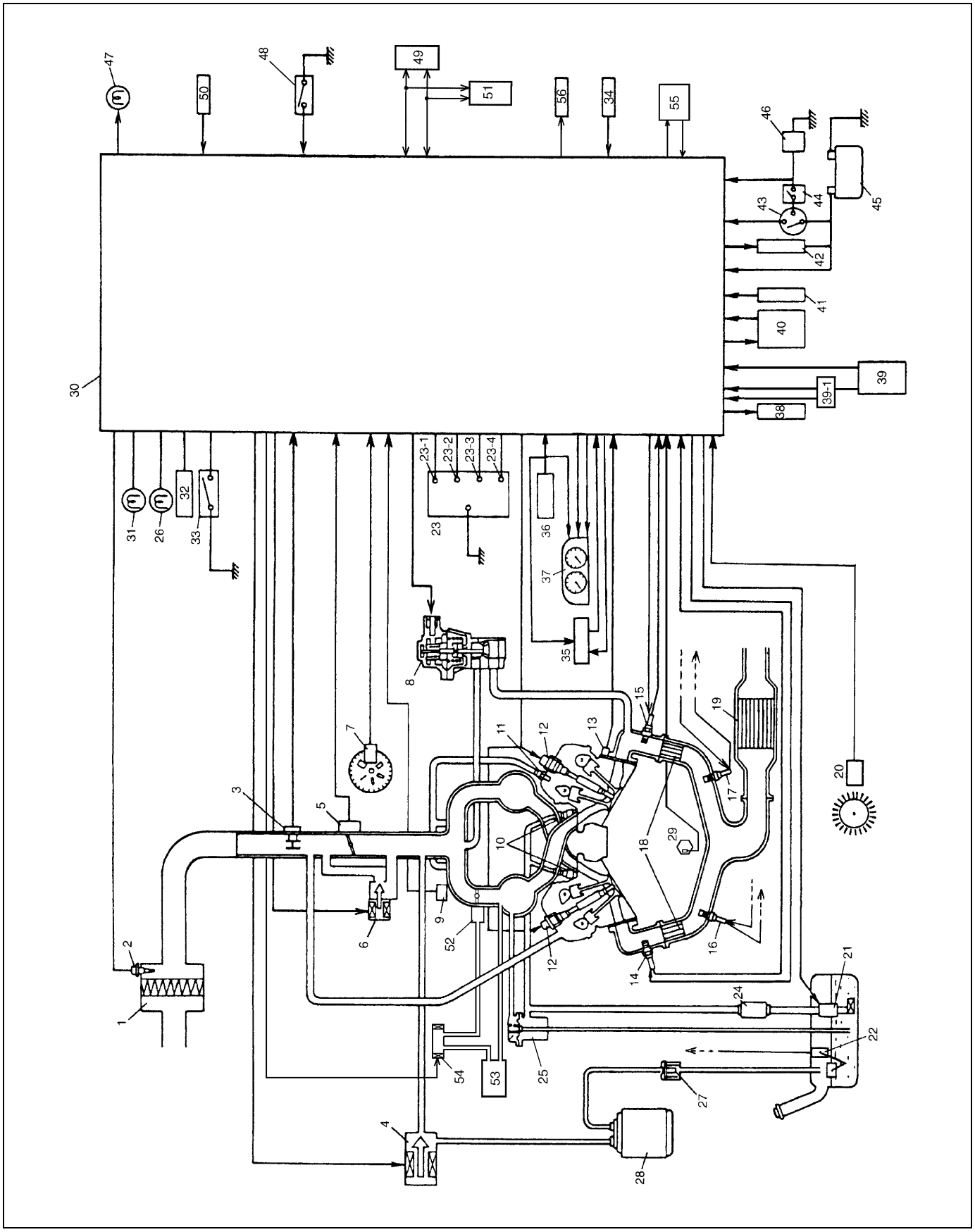
## Engine and Emission Control System Diagram

### Type A



| | | |
|---|---|---|
| 1. Air cleaner | 23. Diagnosis connector (if equipped) | 40. Data link connector/Immobilizer control module (if equipped) |
| 2. Intake air temp. sensor | 23-1. Diag. switch terminal | 41. ABS control module |
| 3. Mass air flow sensor | 23-2. Test switch terminal | 42. Main relay |
| 4. EVAP canister purge valve | 23-3. Output duty select switch terminal | 43. Ignition switch |
| 5. Throttle position sensor | 23-4. Duty output terminal | 44. Park/Neutral position switch in TR switch (A/T) |
| 6. Idle air control valve | 24. Fuel filter | 45. Battery |
| 7. Camshaft position sensor | 25. Fuel pressure regulator | 46. Starter magnetic switch |
| 8. EGR valve (if equipped) | 26. Immobilizer indicator lamp (if equipped) | 47. 4WD lamp |
| 9. Manifold absolute pressure sensor (if equipped) | 27. Tank pressure control valve | 48. 4WD switch |
| 10. Fuel injector | 28. EVAP canister | 49. Lighting switch (A/T) |
| 11. PCV valve | 29. Knock sensor | 50. Stop lamp switch (A/T) |
| 12. Ignition coil assembly | 30. ECM/PCM (Engine control module/Powertrain control module) | 51. O/D cut switch (A/T) |
| 13. Engine coolant temperature sensor | 31. Malfunction indicator lamp | 52. POWER/NORMAL change switch (A/T) |
| 14. Heated oxygen sensor (bank 1 sensor 1) (if equipped) | 32. Electric loads (rear defogger (if equipped), lighting) | 53. 4WD low switch (A/T) |
| 15. Heated oxygen sensor (bank 2 sensor 1) (if equipped) | 33. Power steering pressure switch | 54. Transmission range switch (A/T) |
| 16. Heated oxygen sensor (bank 1 sensor 2) (if equipped) | 34. CO adjusting resistor (if equipped) | 55. Solenoid valve A (A/T) |
| 17. Heated oxygen sensor (bank 2 sensor 2) (if equipped) | 35. Cruise control module | 56. Solenoid valve B (A/T) |
| 18. Warm-up three way catalytic converter (if equipped) | 36. Vehicle speed sensor | 57. TCC solenoid valve (A/T) |
| 19. Three way catalytic converter (if equipped) | 37. Combination meter | 58. A/T input speed sensor (A/T) |
| 20. Crankshaft position sensor (if equipped) | 38. A/C condenser fan relay (if equipped) | 59. A/T vehicle (output) speed sensor (A/T) |
| 21. Fuel pump | 39. HVAC control module | 60. 4WD actuator |
| 22. Fuel level sensor | 39-1. A/C refrigerant pressure switch (if equipped) | 61. A/C compressor relay (if equipped) |

## Type B


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| | | |
|---|---|---|
| 1. Air cleaner | 22. Fuel level sensor | 39. HVAC control module |
| 2. Intake air temp. sensor | 23. Diagnosis connector (if equipped) | 39-1. A/C refrigerant pressure switch (if equipped) |
| 3. Mass air flow sensor | 23-1. Diag. switch terminal | 40. Data link connector/Immobilizer control module (if equipped) |
| 4. EVAP canister purge valve | 23-2. Test switch terminal | 41. ABS control module |
| 5. Throttle position sensor | 23-3. Output duty select switch terminal | 42. Main relay |
| 6. Idle air control valve | 23-4. Duty output terminal | 43. Ignition switch |
| 7. Camshaft position sensor | 24. Fuel filter | 44. Park/Neutral position switch in TR switch (A/T) |
| 8. EGR valve (if equipped) | 25. Fuel pressure regulator | 45. Battery |
| 9. Manifold absolute pressure sensor (if equipped) | 26. Immobilizer indicator lamp (if equipped) | 46. Starter magnetic switch |
| 10. Fuel injector | 27. Tank pressure control valve | 47. 4WD lamp |
| 11. PCV valve | 28. EVAP canister | 48. 4WD switch |
| 12. Ignition coil assembly | 29. Knock sensor | 49. TCM (A/T) |
| 13. Engine coolant temperature sensor | 30. ECM | 50. Stop lamp switch (A/T) |
| 14. Heated oxygen sensor (bank 1 sensor 1) (if equipped) | 31. Malfunction indicator lamp | 51. BCM |
| 15. Heated oxygen sensor (bank 2 sensor 1) (if equipped) | 32. Electric loads (heater blower motor) | 52. Intake manifold air tuning valve |
| 16. Heated oxygen sensor (bank 1 sensor 2) (if equipped) | 33. Power steering pressure switch | 53. Vacuum tank |
| 17. Heated oxygen sensor (bank 2 sensor 2) (if equipped) | 34. CO adjusting resistor (if equipped) | 54. Vacuum solenoid valve |
| 18. Warm-up three way catalytic converter (if equipped) | 35. Cruise control module | 55. 4WD actuator |
| 19. Three way catalytic converter (if equipped) | 36. Vehicle speed sensor | 56. A/C compressor relay (if equipped) |
| 20. Crankshaft position sensor (if equipped) | 37. Combination meter | |
| 21. Fuel pump | 38. A/C condenser fan relay (if equipped) | |

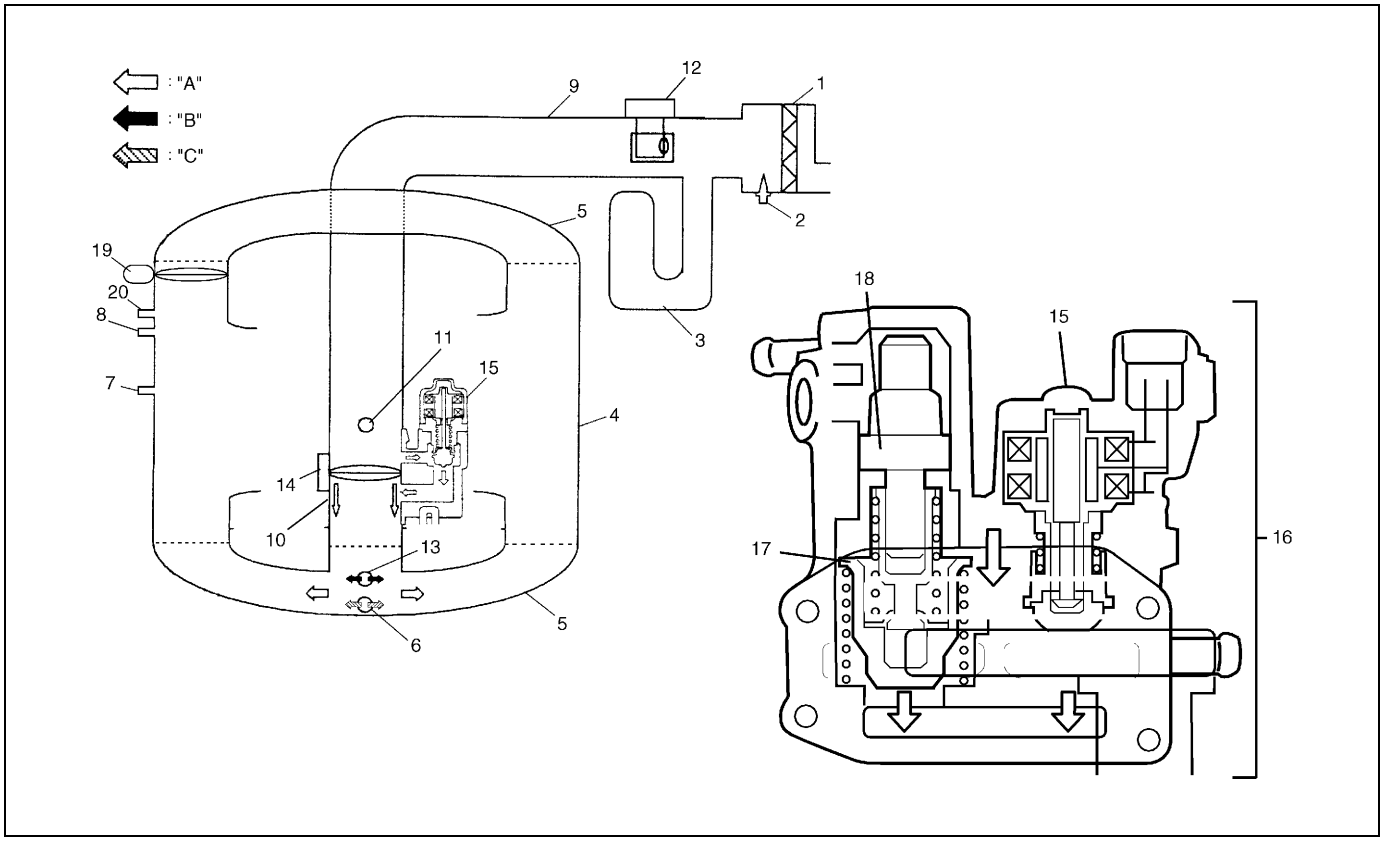
# Air Intake System Description

The main components of the air intake system are air cleaner (1), mass air flow sensor (12), air cleaner intake air pipe (9), throttle body (10), intake collector (5), idle air control valve (15), intake manifold air tuning valve (19) (Type B only) and intake manifold (4).

The air (by the amount corresponding to the throttle valve opening and engine speed) is filtered by the air cleaner, passes through the throttle body, is distributed by the intake manifold and finally drawn into each combustion chamber.

When the idle air control valve is opened according to the signal from ECM (or PCM), the air bypasses the throttle valve through bypass passage and is finally drawn into the intake manifold.

### Air Intake System Diagram

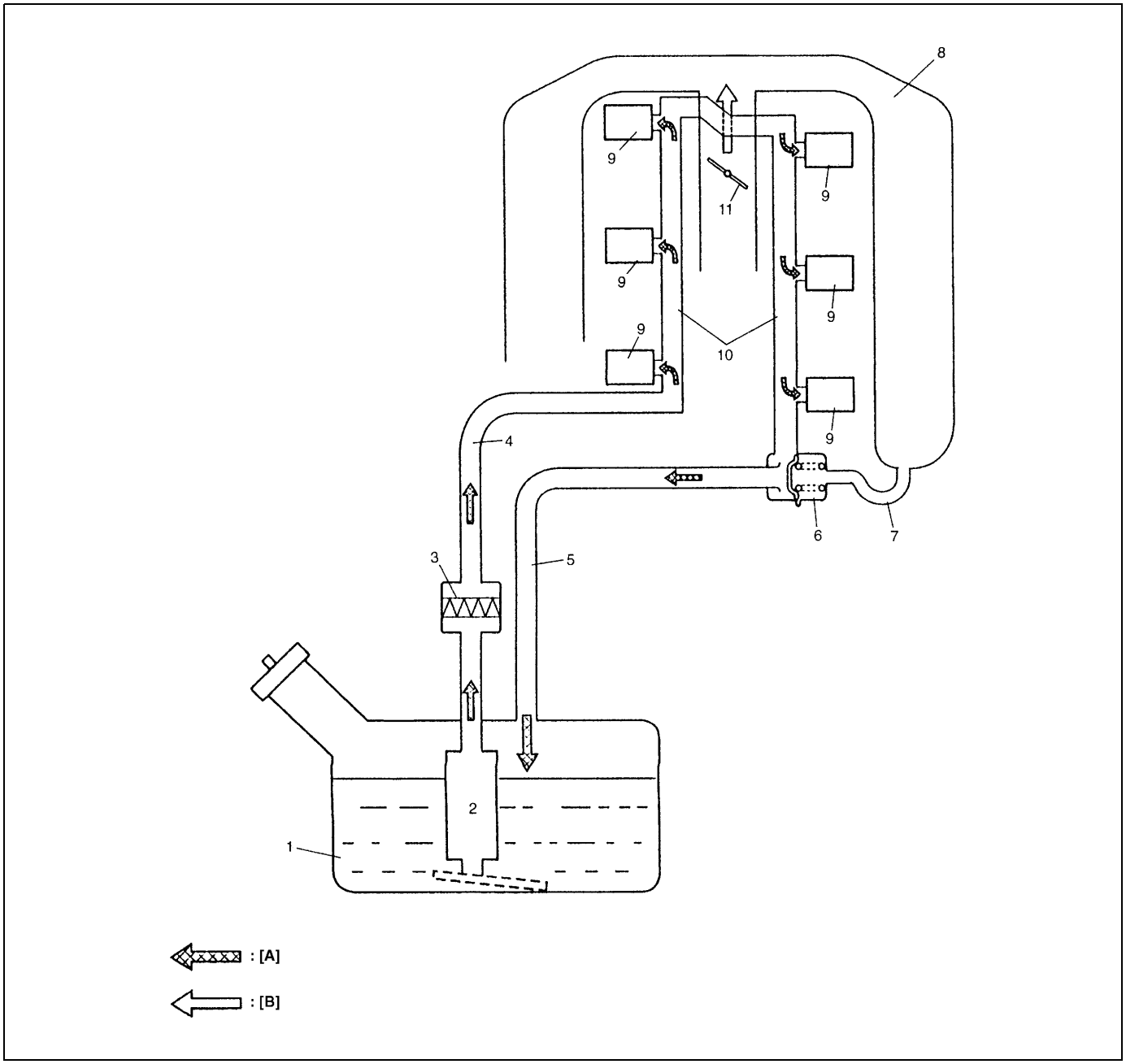



| | | | |
|---|---|---|---|
| "A": Air | 3. Resonator | 11. Breather hose | 17. FIA valve |
| "B": Exhaust gas | 6. From PCV valve | 13. From EGR valve | 18. Thermo - WAX |
| "C": Blow-by gas | 7. To brake booster | 14. TP sensor | 20. To vacuum tank assembly (Type B only) |
| 2. IAT sensor | 8. Fuel pressure regulator hose | 16. IAC valve and fast idle control system | |

# Fuel Delivery System Description

The fuel delivery system consists of the fuel tank (1), fuel pump (2), fuel filter (3), fuel pressure regulator (6), delivery pipe (10) and fuel injectors (9).
The fuel in the fuel tank is pumped up by the fuel pump, filtered by the fuel filter and fed under pressure to each injector through the delivery pipe.
As the fuel pressure applied to the injector (the fuel pressure in the fuel feed line (4)) is always kept a certain amount higher than the pressure in the intake manifold by the fuel pressure regulator, the fuel is injected into the intake port of the cylinder head when the injector opens according to the injection signal from ECM (or PCM).
The fuel relieved by the fuel pressure regulator returns through the fuel return line (5) to the fuel tank.

### Fuel Delivery System Diagram




| | | |
|---|---|---|
| [A]: Fuel | 7. Vacuum hose for fuel pressure regulator | 11. Throttle valve |
| [B]: Air | 8. Intake manifold surge tank | |

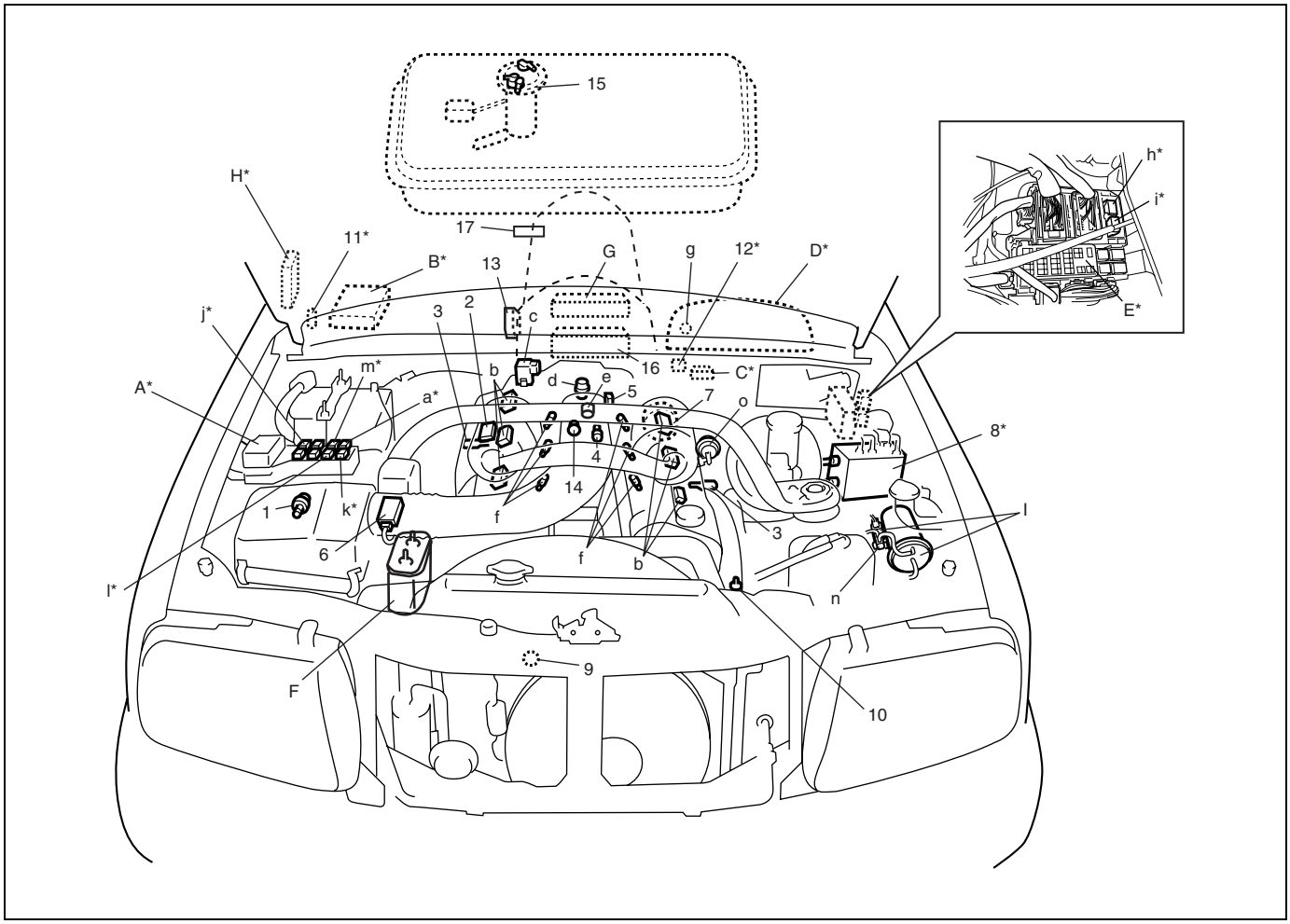
# Electronic Control System Description

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM (or PCM) 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
- Heated oxygen sensor heater control system (if equipped)
- Idle air control system
- Fuel pump control system
- Evaporative emission control system
- Ignition control system
- EGR system (if equipped)
- Intake manifold air tuning valve control system (Type B only)
  Also, with A/T model, PCM controls A/T. (Type A only)
  ECM (Engine Control Module), TCM (Transmission Control Module) and BCM (Body Electrical Control Module) are communicated by CAN (Controller Area Network). (Type B only)

### Electronic Control System Component Location



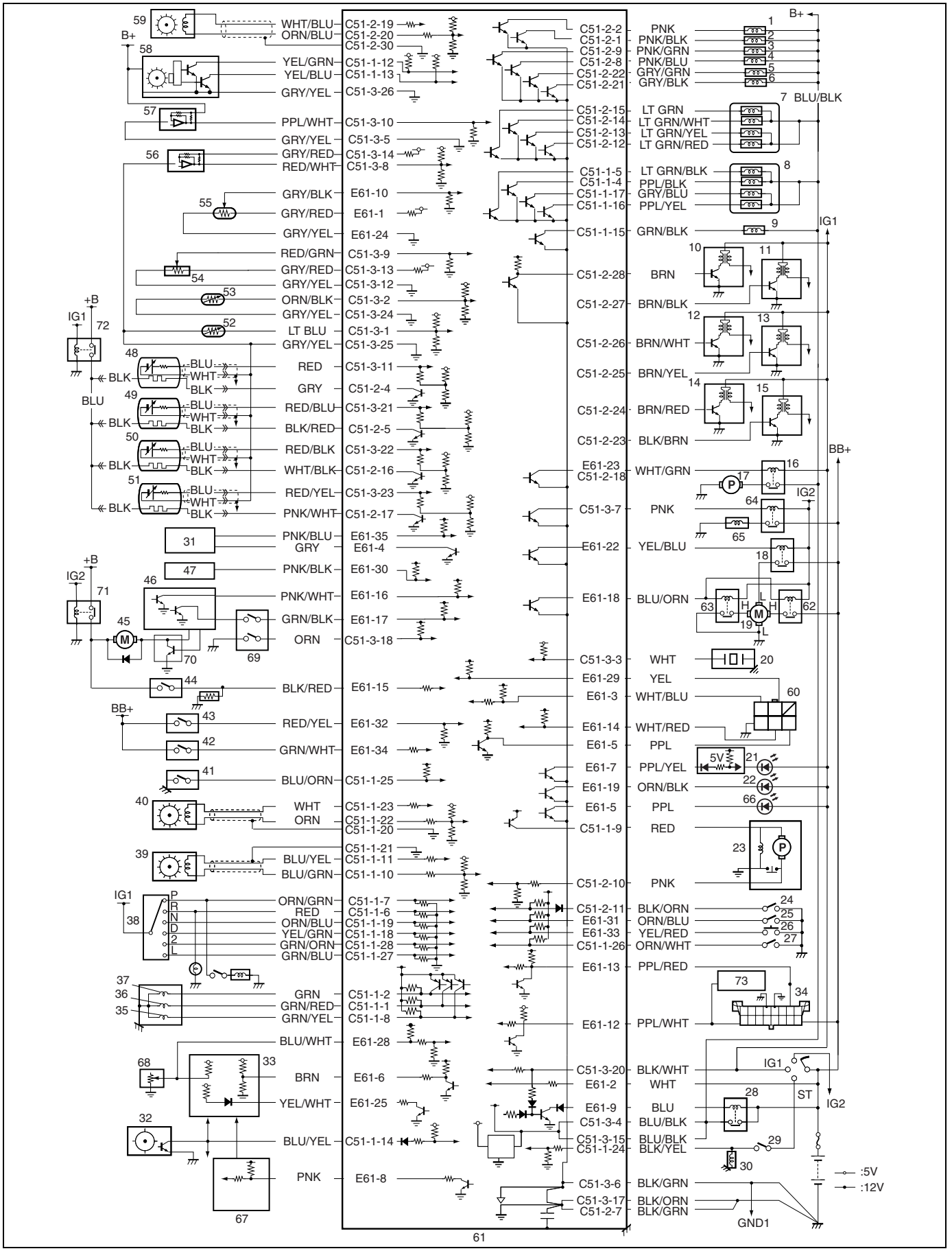
| INFORMATION SENSORS | CONTROLLED DEVICES | OTHERS |
|---|---|---|
| 1. IAT sensor | a: A/C condenser fan motor relay (if equipped) | A: Main fuse box |
| 2. MAP sensor (if equipped) | b: Ignition coil assemblies | B: ECM (or PCM) |
| 3. Heated oxygen sensor (sensor 1) (if equipped) | c: EVAP canister purge valve | C: Data link connector |
| 4. ECT sensor | d: EGR valve (if equipped) | D: Combination meter |
| 5. TP sensor | e: Idle air control valve | E: Fuse box |
| 6. MAF sensor | f: Injectors | F: EVAP canister |
| 7. Camshaft position sensor (CMP sensor) | g: Malfunction indicator lamp | G: BCM |
| 8. ABS control module | h: Fuel pump relay | H: TCM (Type B only) |
| 9. Crankshaft position sensor (CKP sensor) (if equipped) | i: Main relay | I: Vacuum tank assembly (Type B only) |
| 10. Power steering pressure switch (PSP switch) | j: Oxygen sensor heater relay (if equipped) | |
| 11. CO adjusting resistor (if equipped) | k: A/C compressor relay (if equipped) | |
| 12. Diagnosis connector (if equipped) | l: A/C condenser fan motor relay 1 (High side) (if equipped) | |
| 13. Transmission range switch (A/T) | m: A/C condenser fan motor relay 2 (High side) (if equipped) | |
| 14. Knock sensor | n: Vacuum solenoid valve (Type B only) | |
| 15. Fuel level sensor | o: Intake manifold air tuning valve (Type B only) | |
| 16. HVAC control module | | |
| 17. VSS | | |

**NOTE:**

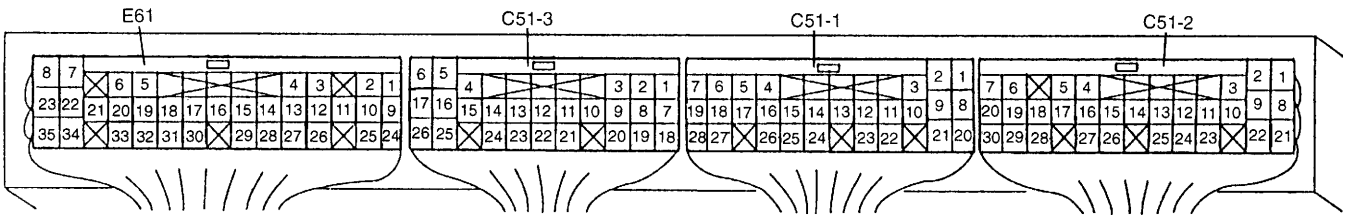
**Above figure shows left-hand steering vehicle. For right-hand steering vehicle, parts with (*) are installed at the side of symmetry.**

## Electronic Control System Wiring Circuit

## Type A



**[A]**




| | | |
|---|---|---|
| [A]: Terminal arrangement of ECM (PCM) connector (viewed from harness side) | 25. Power/Normal change switch (A/T) | 50. Heater oxygen sensor-2 (Bank1) (if equipped) |
| 1. Fuel injector No.1 | 26. O/D cut switch (A/T) | 51. Heater oxygen sensor-2 (Bank2) (if equipped) |
| 2. Fuel injector No.2 | 27. 4WD low switch (4WD) | 52. Intake air temp. sensor |
| 3. Fuel injector No.3 | 28. Main relay | 53. Engine coolant temp. sensor |
| 4. Fuel injector No.4 | 29. Transmission range switch (Park/Neutral Position Switch) or clutch pedal position switch | 54. Throttle position sensor |
| 5. Fuel injector No.5 | 30. Starter magnetic switch | 55. CO adjusting resistor (if equipped) |
| 6. Fuel injector No.6 | 31. Cruise control module (if equipped) | 56. Manifold absolute pressure sensor (if equipped) |
| 7. EGR valve (if equipped) | 32. Vehicle speed sensor | 57. Mass air flow sensor |
| 8. Idle air control | 33. Combination meter | 58. Camshaft position sensor |
| 9. EVAP canister purge valve | 34. Data link connector | 59. Crankshaft position sensor (if equipped) |
| 10. Ignition coil for No.1 | 35. TCC solenoid (A/T) | 60. Diagnosis connector (if equipped) |
| 11. Ignition coil for No.2 | 36. Shift solenoid-B (A/T) | 61. Engine control module (Powertrain control module) |
| 12. Ignition coil for No.3 | 37. Shift solenoid-A (A/T) | 62. A/C condenser fan high speed No.1 relay (if equipped) |
| 13. Ignition coil for No.4 | 38. Transmission range switch (sensor) (A/T) | 63. A/C condenser fan high speed No.2 relay (if equipped) |
| 14. Ignition coil for No.5 | 39. A/T input speed sensor (A/T) | 64. A/C compressor relay (if equipped) |
| 15. Ignition coil for No.6 | 40. A/T vehicle (output) speed sensor (A/T) | 65. A/C compressor (if equipped) |
| 16. Fuel pump relay | 41. Power steering pressure switch | 66. Immobilizer indicator lamp (if equipped) |
| 17. Fuel pump | 42. Stop lamp switch (Brake pedal switch) | 67. BCM |
| 18. A/C condenser fan low speed relay (if equipped) | 43. Lighting switch | 68. Fuel level sensor |
| 19. A/C condenser fan motor (if equipped) | 44. Rear defogger switch (if equipped) | 69. A/C refrigerant pressure switch (if equipped) |
| 20. Knock sensor | 45. Heater blower motor (if equipped) | 70. Blower motor controller |
| 21. Malfunction indicator lamp | 46. HVAC control module | 71. Heater blower fan relay |
| 22. “4WD” lamp (4WD) | 47. ABS control module | 72. Heated oxygen sensor heater relay (if equipped) |
| 23. 4WD air pump assembly (4WD) | 48. Heated oxygen sensor-1 (Bank1) (if equipped) | 73. Immobilizer control module (if equipped) |
| 24. 4WD switch (4WD) | 49. Heated oxygen sensor-1 (Bank2) (if equipped) | |

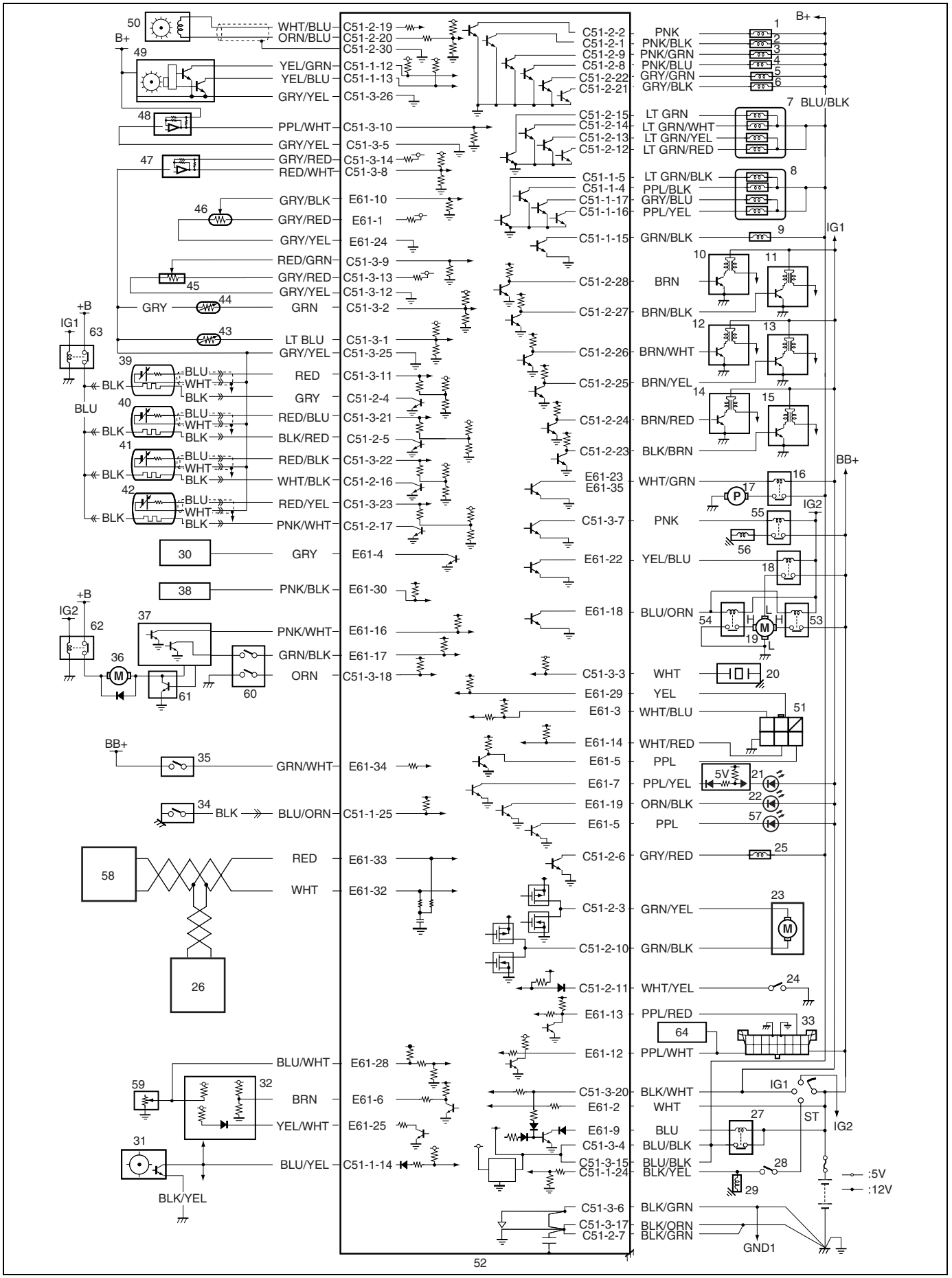
| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| E61-1 | GRY/RED | Output of 5V power source for CO adjusting resistor (if equipped) | E61-18 | BLU/ORN | Relay of high speed side for A/C condenser fan motor (if equipped) |
| E61-2 | WHT | Power source for internal memory | E61-19 | ORN/BLK | “4WD” lamp output |
| E61-3 | WHT/BLU | Output duty select switch terminal (if equipped) | E61-20 | – | – |
| E61-4 | GRY | Throttle position signal for cruise control module (if equipped) | E61-21 | – | – |
| E61-5 | PPL | Duty output terminal (if equipped) | E61-22 | YEL/BLU | Relay output of low speed side for A/C condenser fan motor (if equipped) |
| | | Immobilizer indicator lamp output (if equipped) | E61-23 | WHT/GRN | Fuel pump relay output (without immobilizer control system) |
| E61-6 | BRN | Engine revolution signal for tachometer | E61-24 | GRY/YEL | Ground for CO adjusting resistor (if equipped) |
| E61-7 | PPL/YEL | MIL (Malfunction indicator lamp) output | E61-25 | YEL/WHT | ECT sensor signal for combination meter |
| E61-8 | PNK | Serial communication line for BCM | E61-26 | – | – |
| E61-9 | BLU | Main power supply relay output | E61-27 | – | – |
| E61-10 | GRY/BLK | CO adjusting resistor signal (if equipped) | E61-28 | BLU/WHT | Fuel level sensor signal |
| E61-11 | – | – | E61-29 | YEL | Diagnosis switch terminal (if equipped) |
| E61-12 | PPL/WHT | Serial communication line of data link connector 5 V | E61-30 | PNK/BLK | Idle up signal from ABS control module (if equipped) |
| E61-13 | PPL/RED | Serial communication line of data link connector 12 V | E61-31 | ORN/BLU | Selector switch signal of Power mode/Normal mode for A/T |
| E61-14 | WHT/RED | Test switch terminal (if equipped) | E61-32 | RED/YEL | Electric load signal for clearance lamp |
| E61-15 | BLK/RED | Electric load signal for rear defogger switch (if equipped) | E61-33 | YEL/RED | Selector switch signal of OD On/Off for A/T |
| E61-16 | PNK/WHT | Electric load signal for heater blower motor | E61-34 | GRN/WHT | Electric load signal for stop lamp |
| E61-17 | GRN/BLK | A/C request signal (if equipped) | E61-35 | PNK/BLU | OD off signal for cruise control module (if equipped) |

| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| C51-3-1 | LT BLU | Intake air temp. (IAT) sensor signal | C51-3-14 | GRY/RED | Output of 5 V power source for Manifold absolute pressure (MAP) sensor (if equipped) |
| C51-3-2 | ORN/BLK | Engine coolant temp. (ECT) sensor signal | C51-3-15 | BLU/BLK | Main power supply |
| C51-3-3 | WHT | Knock sensor signal | C51-3-16 | – | – |
| C51-3-4 | BLU/BLK | Main power supply | C51-3-17 | BLK/ORN | Ground for ECM |
| C51-3-5 | GRY/YEL | Ground for mass air flow (MAF) sensor | C51-3-18 | ORN | Medium pressure signal for A/C refrigerant pressure switch (if equipped) |
| C51-3-6 | BLK/GRN | Ground for ECM | C51-3-19 | – | – |
| C51-3-7 | PNK | A/C compressor relay output (if equipped) | C51-3-20 | BLK/WHT | Ignition switch signal |
| C51-3-8 | RED/WHT | Manifold absolute pressure (MAP) sensor signal (if equipped) | C51-3-21 | RED/BLU | Oxygen signal of heated oxygen sensor–1 (Bank 2) (if equipped) |
| C51-3-9 | RED/GRN | Throttle position (TP) sensor signal | C51-3-22 | RED/BLK | Oxygen signal of heated oxygen sensor–2 (Bank 1) (if equipped) |
| C51-3-10 | PPL/WHT | Mass air flow (MAF) sensor signal | C51-3-23 | RED/YEL | Oxygen signal of heated oxygen sensor–2 (Bank 2) (if equipped) |
| C51-3-11 | RED | Oxygen signal of heated oxygen sensor–1 (Bank 1) (if equipped) | C51-3-24 | GRY/YEL | Ground for engine coolant temp. (ECT) sensor |
| C51-3-12 | GRY/YEL | Ground for throttle position (TP) sensor | C51-3-25 | GRY/YEL | Ground for sensors |
| C51-3-13 | GRY/RED | Output of 5 V power source for throttle position (TP) sensor | C51-3-26 | GRY/YEL | Ground for CMP sensor |

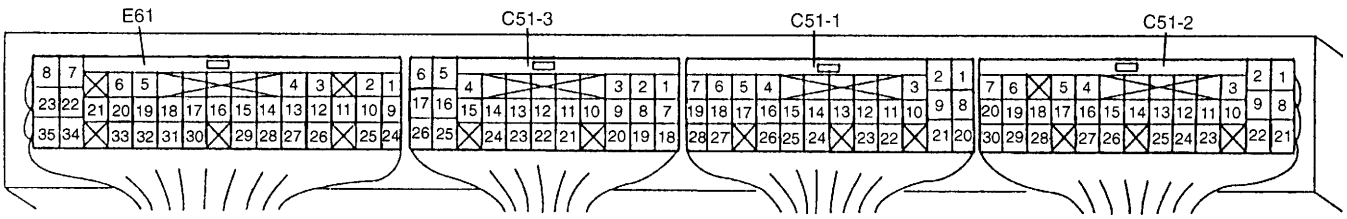
| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| C51-1-1 | GRN/RED | Shift solenoid–B output for A/T | C51-1-15 | GRN/BLK | EVAP canister purge valve output |
| C51-1-2 | GRN | Shift solenoid–A output for A/T | C51-1-16 | PPL/YEL | IAC valve output (stepper motor coil 4) |
| C51-1-3 | – | – | C51-1-17 | GRY/BLU | IAC valve output (stepper motor coil 3) |
| C51-1-4 | PPL/BLK | IAC valve output (stepper motor coil 2) | C51-1-18 | YEL/GRN | “D” position signal for transmission range selector switch (A/T) |
| C51-1-5 | LT GRN/BLK | IAC valve output (stepper motor coil 1) | C51-1-19 | ORN/BLU | “N” position signal for transmission range selector switch (A/T) |
| C51-1-6 | RED | “R” position signal for transmission range selector switch (A/T) | C51-1-20 | – (shield ground) | Ground of shield wire for A/T output shaft speed sensor |
| C51-1-7 | ORN/GRN | “P” position signal for transmission range selector switch (A/T) | C51-1-21 | – (shield ground) | Ground of shield wire for A/T input shaft speed sensor |
| C51-1-8 | GRN/YEL | Torque converter clutch (TCC) solenoid output for A/T | C51-1-22 | ORN | A/T output shaft speed sensor signal (–) |
| C51-1-9 | RED | 4WD air pump assembly output | C51-1-23 | WHT | A/T output shaft speed sensor signal (+) |
| C51-1-10 | BLU/GRN | A/T input shaft speed sensor signal (–) | C51-1-24 | BLK/YEL | Starting motor signal |
| C51-1-11 | BLU/YEL | A/T input shaft speed sensor signal (+) | C51-1-25 | BLU/ORN | Power steering pressure switch signal |
| C51-1-12 | YEL/GRN | Reference signal for CMP sensor | C51-1-26 | ORN/WHT | 4WD Low (4L) switch signal |
| C51-1-13 | YEL/BLU | Position signal for CMP sensor | C51-1-27 | GRN/BLU | “L” position signal for transmission range switch (A/T) |
| C51-1-14 | BLU/YEL | Vehicle speed sensor signal | C51-1-28 | GRN/ORN | “2” position signal for transmission range switch (A/T) |

| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| C51-2-1 | PNK/BLK | Fuel injector No.2 output | C51-2-16 | WHT/BLK | Heater output of heated oxygen sensor–2 (Bank 1) (if equipped) |
| C51-2-2 | PNK | Fuel injector No.1 output | C51-2-17 | PNK/WHT | Heater output of heated oxygen sensor–2 (Bank 2) (if equipped) |
| C51-2-3 | – | – | C51-2-18 | WHT/GRN | Fuel pump relay output (with immobilizer control system) |
| C51-2-4 | GRY | Heater output of heated oxygen sensor–1 (Bank 1) (if equipped) | C51-2-19 | WHT/BLU | CKP sensor signal (+) (if equipped) |
| C51-2-5 | BLK/RED | Heater output of heated oxygen sensor–1 (Bank 2) (if equipped) | C51-2-20 | ORN/BLU | CKP sensor signal (–) (if equipped) |
| C51-2-6 | – | – | C51-2-21 | GRY/BLK | Fuel injector No.6 output |
| C51-2-7 | BLK/GRN | Ground for ECM | C51-2-22 | GRY/GRN | Fuel injector No.5 output |
| C51-2-8 | PNK/BLU | Fuel injector No.4 output | C51-2-23 | BLK/BRN | Ignition coil No.6 output |
| C51-2-9 | PNK/GRN | Fuel injector No.3 output | C51-2-24 | BRN/RED | Ignition coil No.5 output |
| C51-2-10 | PNK | Pressure switch signal for 4WD air pump assembly | C51-2-25 | BRN/YEL | Ignition coil No.4 output |
| C51-2-11 | BLK/ORN | 4WD switch signal | C51-2-26 | BRN/WHT | Ignition coil No.3 output |
| C51-2-12 | LT GRN/RED | EGR valve (stepper motor coil 4) output (if equipped) | C51-2-27 | BRN/BLK | Ignition coil No.2 output |
| C51-2-13 | LT GRN/YEL | EGR valve (stepper motor coil 3) output (if equipped) | C51-2-28 | BRN | Ignition coil No.1 output |
| C51-2-14 | LT GRN/WHT | EGR valve (stepper motor coil 2) output (if equipped) | C51-2-29 | – | – |
| C51-2-15 | LT GRN | EGR valve (stepper motor coil 1) output (if equipped) | C51-2-30 | – (shield ground) | Ground of shield wire for CKP sensor (if equipped) |

## Type B


WHT/BLU
ORN/BLU
YEL/GRN
YEL/BLU
GRY/YEL
PPL/WHT
GRY/YEL
GRY/RED
RED/WHT
GRY/BLK
GRY/RED
GRY/YEL
RED/GRN
GRY/RED
GRY/YEL
GRY
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YEL
WHT/BLU
WHT/RED
PPL
PPL/YEL
ORN/BLK
PPL
GRY/RED
GRN/YEL
GRN/BLK
WHT/YEL
PPL/RED
PPL/WHT
BLK/WHT
WHT
BLU
BLU/BLK
BLU/BLK
BLK/YEL
BLK/GRN
BLK/ORN
BLK/GRN
B+
IG1
IG2
ST
BB+
+B
GND1
:5V
:12V
5V
H
L
M
P
52

**[A]**




| | | |
|---|---|---|
| [A]: Terminal arrangement of ECM connector (viewed from harness side) | 22. "4WD" lamp (4WD) | 44. Engine coolant temp. sensor |
| 1. Fuel injector No.1 | 23. Axle lock actuator motor (4WD) | 45. Throttle position sensor |
| 2. Fuel injector No.2 | 24. 4WD switch (4WD) | 46. CO adjusting resistor (if equipped) |
| 3. Fuel injector No.3 | 25. Intake manifold air tuning valve | 47. Manifold absolute pressure sensor (if equipped) |
| 4. Fuel injector No.4 | 26. Transmission control module (TCM) | 48. Mass air flow sensor |
| 5. Fuel injector No.5 | 27. Main relay | 49. Camshaft position sensor |
| 6. Fuel injector No.6 | 28. Transmission range switch (Park/Neutral Position Switch) or clutch pedal position switch | 50. Crankshaft position sensor (if equipped) |
| 7. EGR valve (if equipped) | 29. Starter magnetic switch | 51. Diagnosis connector (if equipped) |
| 8. Idle air control | 30. Cruise control module (if equipped) | 52. Engine control module (ECM) |
| 9. EVAP canister purge valve | 31. Vehicle speed sensor | 53. A/C condenser fan high speed No.1 relay (if equipped) |
| 10. Ignition coil for No.1 | 32. Combination meter | 54. A/C condenser fan high speed No.2 relay (if equipped) |
| 11. Ignition coil for No.2 | 33. Data link connector | 55. A/C compressor relay (if equipped) |
| 12. Ignition coil for No.3 | 34. Power steering pressure switch | 56. A/C compressor (if equipped) |
| 13. Ignition coil for No.4 | 35. Stop lamp switch (Brake pedal switch) | 57. Immobilizer indicator lamp (if equipped) |
| 14. Ignition coil for No.5 | 36. Heater blower motor (if equipped) | 58. BCM |
| 15. Ignition coil for No.6 | 37. HVAC control module | 59. Fuel level sensor |
| 16. Fuel pump relay | 38. ABS control module | 60. A/C refrigerant pressure switch (if equipped) |
| 17. Fuel pump | 39. Heated oxygen sensor-1 (Bank1) (if equipped) | 61. Blower motor controller |
| 18. A/C condenser fan low speed relay (if equipped) | 40. Heated oxygen sensor-1 (Bank2) (if equipped) | 62. Heater blower fan relay |
| 19. A/C condenser fan motor (if equipped) | 41. Heater oxygen sensor-2 (Bank1) (if equipped) | 63. Heated oxygen sensor heater relay (if equipped) |
| 20. Knock sensor | 42. Heater oxygen sensor-2 (Bank2) (if equipped) | 64. Immobilizer control module (if equipped) |
| 21. Malfunction indicator lamp | 43. Intake air temp. sensor | |

| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| E61-1 | GRY/RED | Output of 5V power source for CO adjusting resistor (if equipped) | E61-18 | BLU/ORN | Relay of high speed side for A/C condenser fan motor (if equipped) |
| E61-2 | WHT | Power source for internal memory | E61-19 | ORN/BLK | “4WD” lamp output |
| E61-3 | WHT/BLU | Output duty select switch terminal (if equipped) | E61-20 | – | – |
| E61-4 | GRY | Throttle position signal for cruise control module (if equipped) | E61-21 | – | – |
| E61-5 | PPL | Duty output terminal (if equipped) | E61-22 | YEL/BLU | Relay output of low speed side for A/C condenser fan motor (if equipped) |
| | | Immobilizer indicator lamp output (if equipped) | E61-23 | WHT/GRN | Fuel pump relay output (without immobilizer control system) |
| E61-6 | BRN | Engine revolution signal for tachometer | E61-24 | GRY/YEL | Ground for CO adjusting resistor (if equipped) |
| E61-7 | PPL/YEL | MIL (Malfunction indicator lamp) output | E61-25 | YEL/WHT | ECT sensor signal for combination meter |
| E61-8 | – | – | E61-26 | – | – |
| E61-9 | BLU | Main power supply relay output | E61-27 | – | – |
| E61-10 | GRY/BLK | CO adjusting resistor signal (if equipped) | E61-28 | BLU/WHT | Fuel level sensor signal |
| E61-11 | – | – | E61-29 | YEL | Diagnosis switch terminal (if equipped) |
| E61-12 | PPL/WHT | Serial communication line of data link connector 5 V | E61-30 | PNK/BLK | Idle up signal from ABS control module (if equipped) |
| E61-13 | PPL/RED | Serial communication line of data link connector 12 V | E61-31 | – | – |
| E61-14 | WHT/RED | Test switch terminal (if equipped) | E61-32 | WHT | CAN communication line (active low signal) |
| E61-15 | – | – | E61-33 | RED | CAN communication line (active high signal) |
| E61-16 | PNK/WHT | Electric load signal for heater blower motor | E61-34 | GRN/WHT | Electric load signal for stop lamp |
| E61-17 | GRN/BLK | A/C request signal (if equipped) | E61-35 | WHT/GRN | Fuel pump relay output (with immobilizer control system) |

| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| C51-3-1 | LT BLU | Intake air temp. (IAT) sensor signal | C51-3-14 | GRY/RED | Output of 5 V power source for Manifold absolute pressure (MAP) sensor (if equipped) |
| C51-3-2 | GRN | Engine coolant temp. (ECT) sensor signal | C51-3-15 | BLU/BLK | Main power supply |
| C51-3-3 | WHT | Knock sensor signal | C51-3-16 | – | – |
| C51-3-4 | BLU/BLK | Main power supply | C51-3-17 | BLK/ORN | Ground for ECM |
| C51-3-5 | GRY/YEL | Ground for mass air flow (MAF) sensor | C51-3-18 | ORN | Medium pressure signal for A/C refrigerant pressure switch (if equipped) |
| C51-3-6 | BLK/GRN | Ground for ECM | C51-3-19 | – | – |
| C51-3-7 | PNK | A/C compressor relay output (if equipped) | C51-3-20 | BLK/WHT | Ignition switch signal |
| C51-3-8 | RED/WHT | Manifold absolute pressure (MAP) sensor signal (if equipped) | C51-3-21 | RED/BLU | Oxygen signal of heated oxygen sensor–1 (Bank 2) (if equipped) |
| C51-3-9 | RED/GRN | Throttle position (TP) sensor signal | C51-3-22 | RED/BLK | Oxygen signal of heated oxygen sensor–2 (Bank 1) (if equipped) |
| C51-3-10 | PPL/WHT | Mass air flow (MAF) sensor signal | C51-3-23 | RED/YEL | Oxygen signal of heated oxygen sensor–2 (Bank 2) (if equipped) |
| C51-3-11 | RED | Oxygen signal of heated oxygen sensor–1 (Bank 1) (if equipped) | C51-3-24 | – | – |
| C51-3-12 | GRY/YEL | Ground for throttle position (TP) sensor | C51-3-25 | GRY/YEL | Ground for sensors |
| C51-3-13 | GRY/RED | Output of 5 V power source for throttle position (TP) sensor | C51-3-26 | GRY/YEL | Ground for CMP sensor |

| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| C51-1-1 | – | – | C51-1-15 | GRN/BLK | EVAP canister purge valve output |
| C51-1-2 | – | – | C51-1-16 | PPL/YEL | IAC valve output (stepper motor coil 4) |
| C51-1-3 | – | – | C51-1-17 | GRY/BLU | IAC valve output (stepper motor coil 3) |
| C51-1-4 | PPL/BLK | IAC valve output (stepper motor coil 2) | C51-1-18 | – | – |
| C51-1-5 | LT GRN/BLK | IAC valve output (stepper motor coil 1) | C51-1-19 | – | – |
| C51-1-6 | – | – | C51-1-20 | – | – |
| C51-1-7 | – | – | C51-1-21 | – | – |
| C51-1-8 | – | – | C51-1-22 | – | – |
| C51-1-9 | – | – | C51-1-23 | – | – |
| C51-1-10 | – | – | C51-1-24 | BLK/YEL | Starting motor signal |
| C51-1-11 | – | – | C51-1-25 | BLU/ORN | Power steering pressure switch signal |
| C51-1-12 | YEL/GRN | Reference signal for CMP sensor | C51-1-26 | – | – |
| C51-1-13 | YEL/BLU | Position signal for CMP sensor | C51-1-27 | – | – |
| C51-1-14 | BLU/YEL | Vehicle speed sensor signal | C51-1-28 | – | – |

| TERMINAL | WIRE COLOR | CIRCUIT | TERMINAL | WIRE COLOR | CIRCUIT |
|---|---|---|---|---|---|
| C51-2-1 | PNK/BLK | Fuel injector No.2 output | C51-2-16 | WHT/BLK | Heater output of heated oxygen sensor–2 (Bank 1) (if equipped) |
| C51-2-2 | PNK | Fuel injector No.1 output | C51-2-17 | PNK/WHT | Heater output of heated oxygen sensor–2 (Bank 2) (if equipped) |
| C51-2-3 | GRN/YEL | Axle lock actuator output | C51-2-18 | – | – |
| C51-2-4 | GRY | Heater output of heated oxygen sensor–1 (Bank 1) (if equipped) | C51-2-19 | WHT/BLU | CKP sensor signal (+) (if equipped) |
| C51-2-5 | BLK/RED | Heater output of heated oxygen sensor–1 (Bank 2) (if equipped) | C51-2-20 | ORN/BLU | CKP sensor signal (–) (if equipped) |
| C51-2-6 | GRN/RED | Intake manifold air tuning valve output | C51-2-21 | GRY/BLK | Fuel injector No.6 output |
| C51-2-7 | BLK/GRN | Ground for ECM | C51-2-22 | GRY/GRN | Fuel injector No.5 output |
| C51-2-8 | PNK/BLU | Fuel injector No.4 output | C51-2-23 | BLK/BRN | Ignition coil No.6 output |
| C51-2-9 | PNK/GRN | Fuel injector No.3 output | C51-2-24 | BRN/RED | Ignition coil No.5 output |
| C51-2-10 | GRN/BLK | Axle lock actuator output | C51-2-25 | BRN/YEL | Ignition coil No.4 output |
| C51-2-11 | WHT/YEL | 4WD switch signal | C51-2-26 | BRN/WHT | Ignition coil No.3 output |
| C51-2-12 | LT GRN/RED | EGR valve (stepper motor coil 4) output (if equipped) | C51-2-27 | BRN/BLK | Ignition coil No.2 output |
| C51-2-13 | LT GRN/YEL | EGR valve (stepper motor coil 3) output (if equipped) | C51-2-28 | BRN | Ignition coil No.1 output |
| C51-2-14 | LT GRN/WHT | EGR valve (stepper motor coil 2) output (if equipped) | C51-2-29 | – | – |
| C51-2-15 | LT GRN | EGR valve (stepper motor coil 1) output (if equipped) | C51-2-30 | – (shield ground) | Ground of shield wire for CKP sensor (if equipped) |

### Engine and Emission Control Input/Output Table

| Function | Input / Output | CMP sensor | MAF sensor | TP sensor | ECT sensor | IAT sensor | HO2S (sensor 1)(if equipped) | VSS | Blower motor controller | Rear defogger switch (Type A only) | PSP switch | Ignition switch | Starter switch | HVAC control module | TR switch (A/T VEHICLE) (Type A only) | Light switch (Type A only) | Knock sensor | CO adjusting resistor (if equipped) | Test swich terminal (Vehicle with diagnosis connector) | Diag. swich terminal (Vehicle with diagnosis connector) | Brake switch (A/T VEHICLE) | ABS control module | Refrigerant pressure switch (if equipped) | TCM (Type B only) | BCM (Type B only) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main relay control | Main relay | | | | | | | | | | | ○ | | | | | | | | | | | | | |
| Fuel pump control | Fuel pump relay | ○ | | | | | | | | | | ○ | ○ | | | | | | | | | | | | |
| Injection control | Injectors | ○ | ○ | ○ | ○ | | ○ | | | | | | ○ | | | | | ○ | | | ○ | | | | |
| Idle air control | IAC valve | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | ○ | ○ | | | ○ | ○ | ○ | | | | | | ○ | | ○ | ○ |
| Ignition control | Ignition coil with igniter | ○ | ○ | | ○ | ○ | | | | | | | ○ | | | | ○ | | ○ | | | | | | |
| MIL control | MIL | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | | ○ | | | | ○ | | | ○ | | | | ○ | |
| EVAP purge control | EVAP canister purge valve | ○ | ○ | ○ | ○ | | | ○ | | | | | | | | | | | | | | | | | |
| EGR control | EGR valve (if equipped) | ○ | ○ | ○ | ○ | ○ | | ○ | | | | | | | | | | | | | | | | | |
| HO2S heater control | HO2S (if equipped) | ○ | ○ | | | | | | | | | | | | | | | | | | | | | | |
| A/C control | A/C compressor clutch (if equipped) | ○ | | ○ | ○ | | | | | | | | ○ | ○ | | | | | | | | | ○ | | |
| A/C condensor fan control | A/C condensor fan relay (if equipped) | ○ | | ○ | ○ | | | | | | | | ○ | ○ | | | | | | | | | ○ | | |
| Intake manifold air tuning control | Intake manifold air tuning valve (Type B only) | ○ | | ○ | ○ | | | | | | | | | | | | | | | | | | | | |

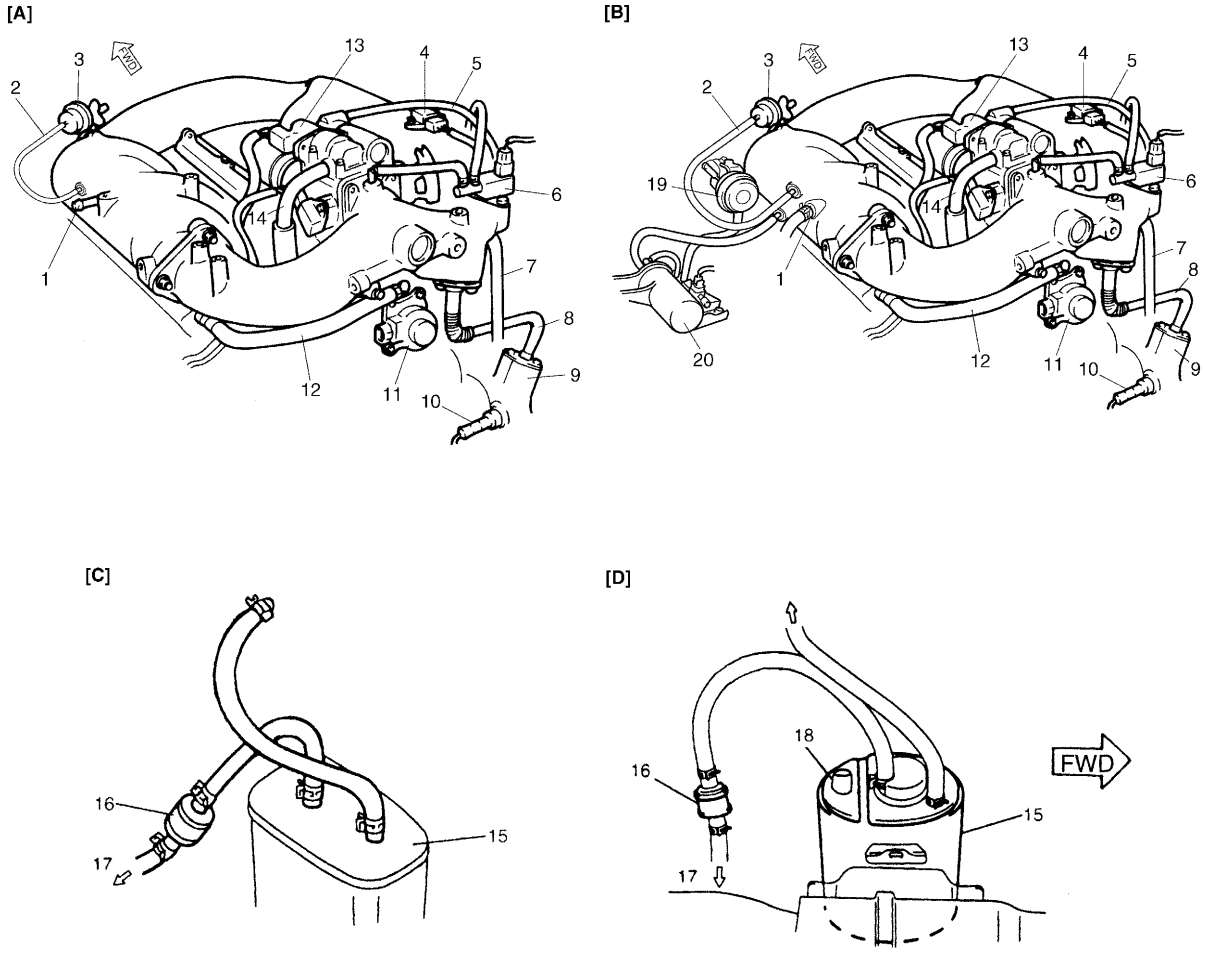
# Diagnosis

Refer to “Engine Diagnosis Table” in Section 6-1 (Type A) or 6-2 (Type B).

# On-Vehicle Service

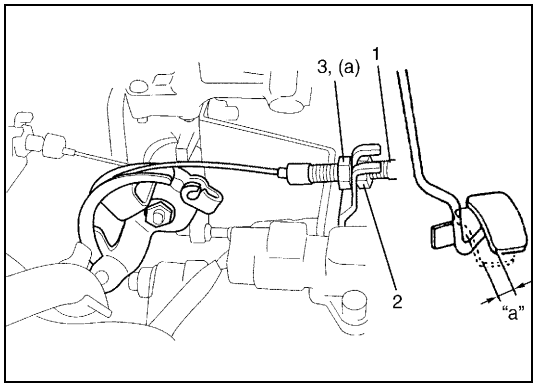
## Engine and Emission Control System Description

When hoses are disconnected and system components are removed for service, reinstall components properly, and route and connect hoses correctly after service. Refer to figure for proper routing of hoses.




| | | |
|---|---|---|
| 1. Brake booster hose pipe | 9. Exhaust manifold | 17. To fuel tank |
| 2. Vacuum hose for fuel pressure regulator | 10. Heated oxygen sensor | 18. Cap |
| 3. Fuel pressure regulator | 11. EGR valve (if equipped) | 19. Intake manifold air tuning valve |
| 4. MAP sensor (if equipped) | 12. PCV hose | 20. Vacuum tank assembly |
| 5. Engine coolant hose | 13. IAC valve | [A]: Type A |
| 6. EVAP canister purge valve | 14. IAC hose | [B]: Type B |
| 7. Heater hose | 15. EVAP canister | [C]: Vehicle without diagnosis connector |
| 8. EGR pipe (if equipped) | 16. Tank pressure control valve | [D]: Vehicle with diagnosis connector |

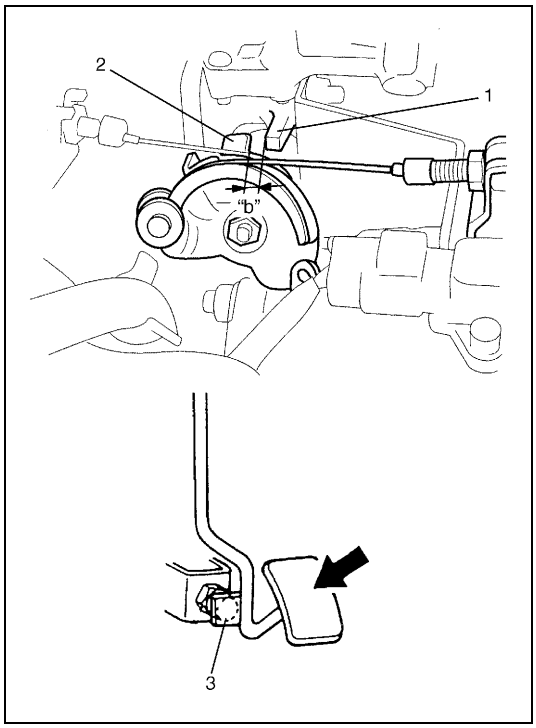
## Accelerator Cable Adjustment




1) With throttle valve closed, check accelerator pedal play which should be within following specification.
   If measured value is out of specification, adjust accelerator cable (1) to specification with cable adjusting nut (2).
   Tighten accelerator cable lock nut to specified torque.

**Accelerator pedal play**
**"a": 2 – 5 mm (0.08 – 0.19 in.)**

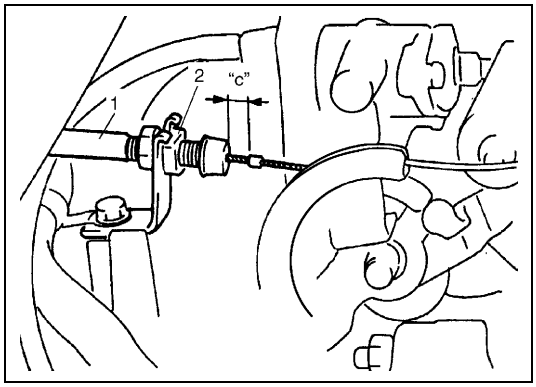
**Tightening torque**
**Accelerator cable lock nut (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)**




2) With accelerator pedal depressed fully, check clearance between throttle lever (2) and lever stopper (1) (throttle body) which should be within following specification.
   If measured value is out of specification, adjust it to specification by changing height of pedal stopper bolt (3).

**Clearance between throttle lever and lever stopper (throttle body) (with accelerator pedal depressed fully)**
**"b": 0.5 – 2.0 mm (0.02 – 0.07 in.)**

## A/T Throttle Cable Adjustment (4 A/T Vehicle)




1) Make sure that accelerator cable is adjusted as specified.
2) With throttle valve closed, check clearance "c" which should be within the following specification.
   If it is out of specification, adjust A/T throttle cable (1) by turning cable adjusting nut (2).

**A/T throttle cable installing position specification clearance**
**"c": 0.8 – 1.5 mm (0.04 – 0.05 in.)**

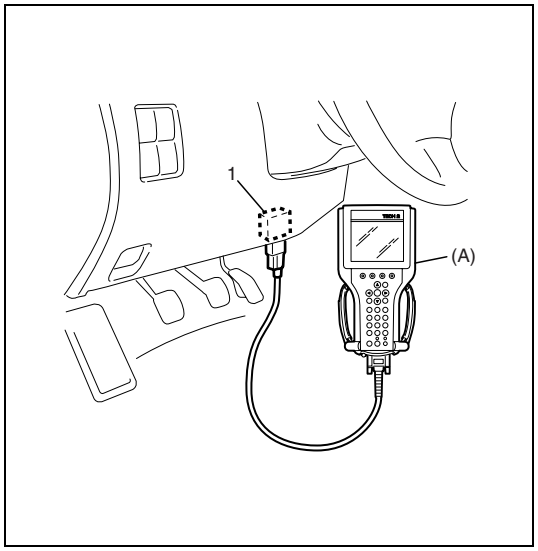
## Idle Speed/Idle Air Control (IAC) Duty Inspection

1) Before idle speed/IAC duty check, make sure of the following.
   - Lead wires and hoses of engine/emission control systems are connected securely.
   - Accelerator cable is adjusted.
   - 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.
   - ECM (or PCM) does not detect any malfunction DTC.
2) After above items are all confirmed, check idle speed and IAC duty as follows.

**NOTE:**

**Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T vehicle), and set parking brake and block drive wheels.**

a) Using SUZUKI scan tool




i) Connect SUZUKI scan tool to DLC (1) with ignition switch OFF.

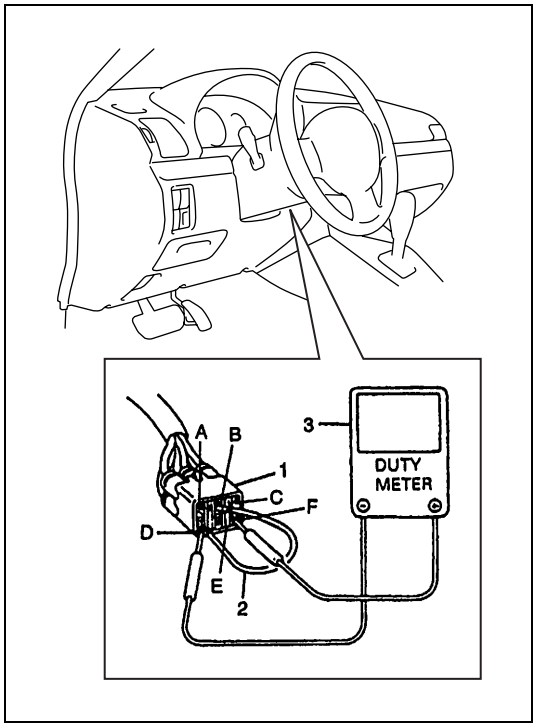
**Special tool**
**(A): SUZUKI scan tool**

ii) Warm up engine to normal operating temperature.
iii) Check IAC duty and idle speed by using "Data List" mode of SUZUKI scan tool.

**Engine idle speed:**
**A/C OFF: 700 ± 50 r/min.**
**A/C ON: 750 ± 50 r/min.**

**IAC duty at specified idle speed:**
**5 – 40 % (at A/C OFF)**

iv) If duty and/or idle speed is out of specifications, check idle air control system referring to "Diag. Flow Table B-4" in Section 6-1 (Type A) or 6-2 (Type B).
v) Check that specified engine idle speed is obtained with A/C ON if vehicle is equipped with A/C. If not, check A/C ON signal circuit and idle air control system.




b) Not using SUZUKI scan tool (vehicle with monitor connector)
   i) Disconnect scan tool from DLC if connected.
   ii) Warm up engine to normal operating temperature.
   iii) Stop engine and connect duty meter (3) between duty output terminal and ground terminal of diagnosis connector (1) (white connector)
   iv) Using service wire (2), ground diagnosis switch terminal in diagnosis connector.
   v) Set tachometer.
   vi) Start engine and warm it up completely.
   vii) Check IAC duty and idle speed. If duty and/or idle speed is out of specifications, check idle air control system referring to Diagnostic Flow Table B-4 "Idle Air Control System Inspection" in Section 6-1 (Type A) or 6-2 (Type B).

| |
|---|
| A: Output duty select switch terminal |
| B: Diagnosis switch terminal |
| C: Blank |
| D: Ground terminal |
| E: Test switch terminal |
| F: Duty output terminal |

**Engine idle speed**
**A/C OFF: 700 ± 50 r/min.**
**A/C ON: 750 ± 50 r/min.**

**IAC duty at specified idle speed**
**5 – 40 % (0.7 – 5.6 V when battery voltage is 14 V)**

**NOTE:**

- **IAC duty can be checked roughly by using voltmeter. IAC duty to voltage relation is as follows.**
- **"OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0 V".**
- **"$V_B$" represents battery voltage while engine of vehicle being checked is running.**

**IAC duty to voltage relation**

| ON DUTY METER INDICATION (%) | OFF DUTY INDICATION (%) | VOLT METER INDICATION (V) |
|---|---|---|
| 0 | 10 | 0 |
| 50 | 50 | 0.5 x $V_B$ |
| 100 | 0 | $V_B$ |

   viii) Remove service wire from diagnosis connector.
   ix) Check that specified engine idle speed is obtained with A/C ON if vehicle is equipped with A/C.
   If not, check A/C ON signal circuit and idle air control system.

## Idle mixture inspection/adjustment (vehicle without heated oxygen sensor)

All vehicles not equipped with heated oxygen sensor are shipped with their CO % factory adjusted as follows.

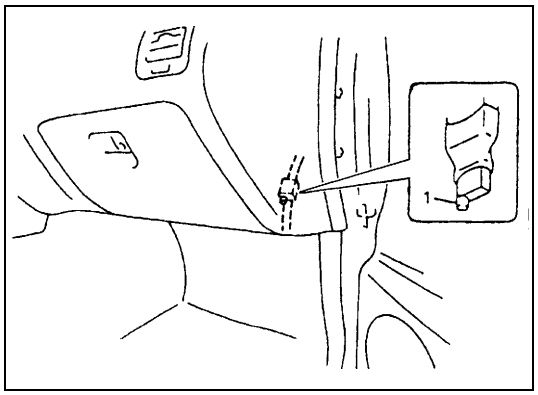
**Engine idle mixture (CO %)**
**0.8 – 1.3 % at specified idle speed**

Idle mixture adjustment should never be changed from the original factory setting. However, if during diagnosis, the check indicates idle mixture to be the cause of a driver performance complaint or emission failure, the idle mixture can be adjusted using the following procedures.

**NOTE:**

**For this inspection and adjustment, exhaust gas tester (CO meter) and engine tachometer are necessary.**

1) Check idle speed according to “Idle Speed/Idle Air Control (IAC) Duty Inspection” in this section.
2) Using exhaust gas tester, check that idle mixture CO % is within above specification. If it is out of specification, adjust it to specification by turning resistor knob (1).

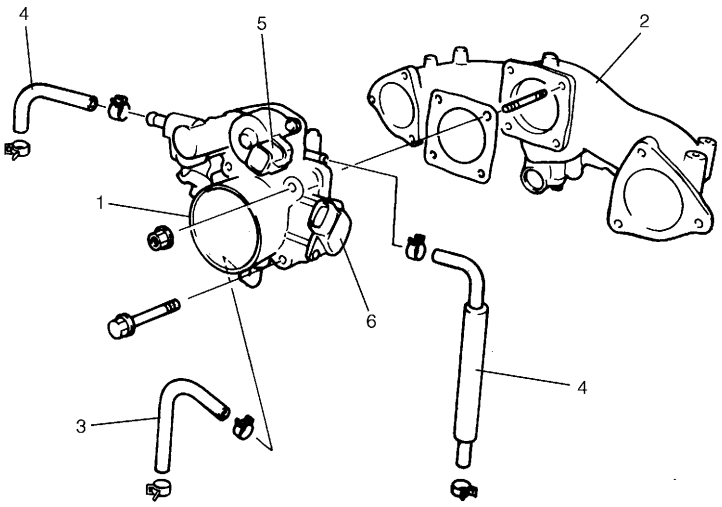



3) If idle mixture has been adjusted, confirm that idle speed is within specification.

# Air Intake System

## Throttle body

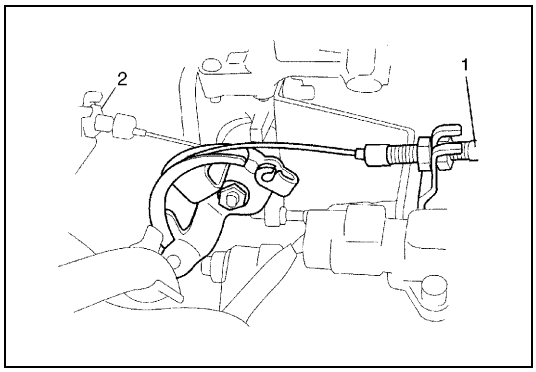
### Throttle Body Components




| | |
|---|---|
| 1. Throttle body | 4. Water hose |
| 2. Intake collector | 5. IAC valve |
| 3. Breather hose | 6. TP sensor |

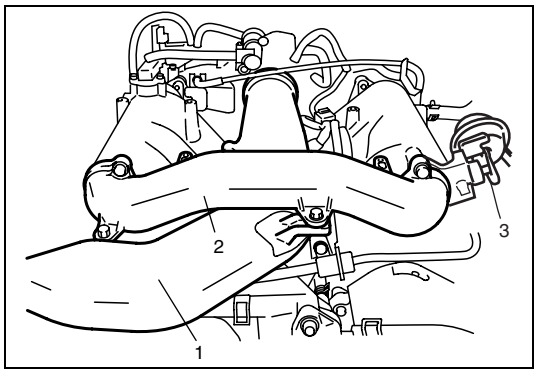
### Removal

1) Disconnect negative (–) cable at battery.
2) Drain cooling system.
3) Remove strut tower bar.



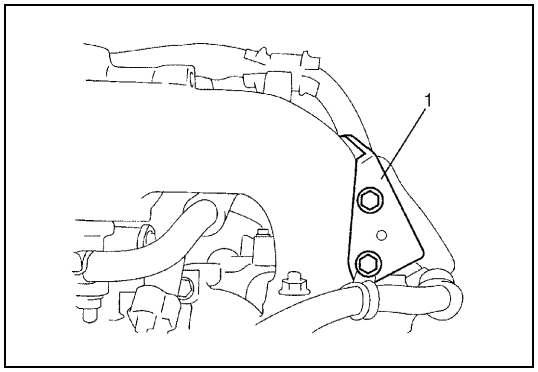

4) Disconnect accelerator cable (1) and or A/T throttle cable (2) (for 4 A/T vehicle) from throttle body.
5) Disconnect water hoses from throttle body.

6) Remove surge tank cover.

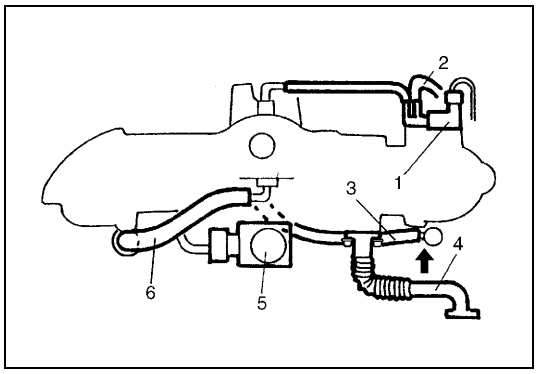



7) Remove intake air pipe (1), surge tank pipe (2) and intake manifold air tuning valve (3) (Type B only).

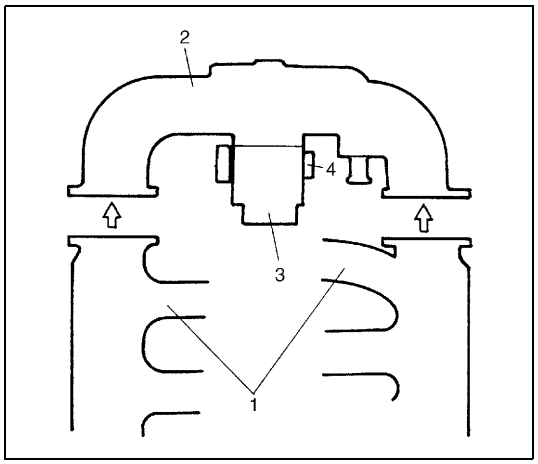
8) Disconnect connectors of TP sensor and IAC valve.
9) Disconnect ground wire at connector.




10) Remove clamp bracket (1) and harness clamps from intake collector.




11) Disconnect connectors of EVAP canister purge valve (1), MAP sensor and EGR valve (5).
12) Disconnect PCV valve hose (6), breather hose (3) from cylinder head and EVAP canister purge valve hose (2).
13) Detach EGR pipe (4) from intake air collector.



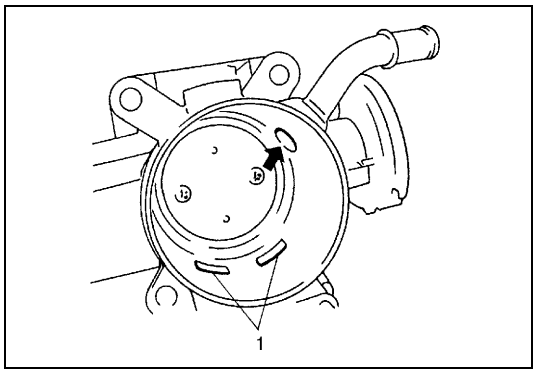

14) Remove throttle body (3) and intake collector (2) from intake manifold (1).
15) Disconnect hoses of PCV from throttle body.
16) Remove throttle body from intake collector.

**CAUTION:**

- **TP sensor (4), or other components containing rubber must not be placed in a solvent or cleaner bath. A chemical reaction will cause these parts to swell, harden or get distorted.**
- **Don't put drills or wires into passages for cleaning. It causes damages in passages.**

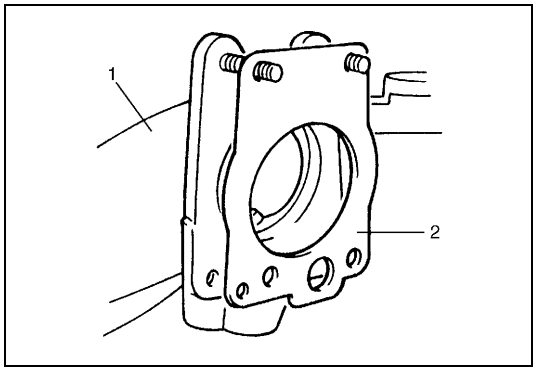
### Cleaning

**CAUTION:**
- **Do not blow compressed air through bypass air passage with IAC valve installed to throttle body. This will cause IAC valve to malfunction.**
- **TP sensor, idle air control valve or other components containing rubber must not be places in a solvent or cleaner bath.**
  **A chemical reaction will cause these parts to swell, harden or get distorted.**



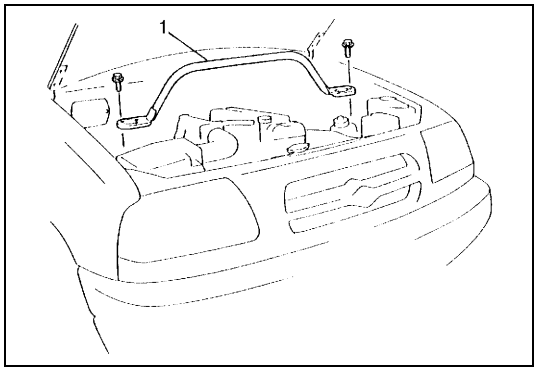

Clean throttle body bore and bypass air passages (1) by blowing compressed air.

### Installation




1) Clean mating surfaces and install throttle body gasket to intake collector (1) with new gasket (2).
2) Install throttle body to intake collector and tighten bolts and nuts.
3) Connect PCV hose.
4) Install throttle body and intake collector to intake manifold with new intake collector gaskets.
5) Install EGR pipe with new gaskets.
6) Connect breather hose, EVAP canister purge valve hose and PCV valve hose.
7) Connect connectors of EVAP canister purge valve, MAP sensor and EGR valve.
   Fix wire harness with clamps.
8) Install clamp bracket to intake collector.
9) Connect ground wire connector.
10) Connect connectors of TP sensor, ground and IAC valve.
11) Install surge tank pipe and intake manifold air tuning valve (Type B only) to intake manifold with new gaskets and intake air pipe to throttle body. Install surge tank cover.
12) Connect engine coolant hoses to throttle body.

13) Connect accelerator cable and A/T throttle cable (4 A/T vehicle).




14) Install strut tower bar (1) and tighten bolts to specified torque referring to “Strut Damper” in Section 3D.

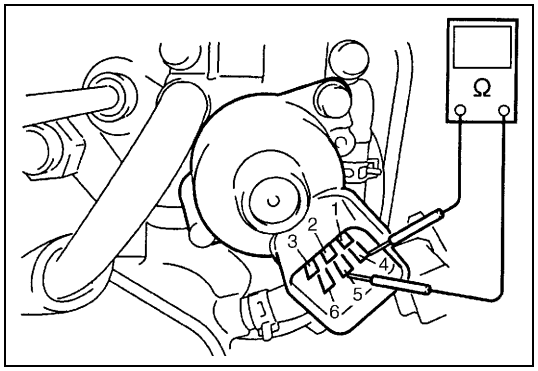
15) Refill cooling system.
16) Connect negative (–) cable at battery.
17) Adjust accelerator cable and A/T throttle cable (4 A/T vehicle), refer to “Accelerator Cable Adjustment” and “A/T Throttle Cable Adjustment (4 A/T vehicle)” in this section.

## Idle air control valve (IAC valve)

### On-Vehicle Inspection

### Idle Air Control Valve

1) Disconnect negative cable at battery.
2) Disconnect connector from IAC valve.
3) Remove surge tank cover.




4) Check each coil of IAC valve for resistance.
   If resistances is out of specification, replace IAC valve.

**IAC valve resistance**

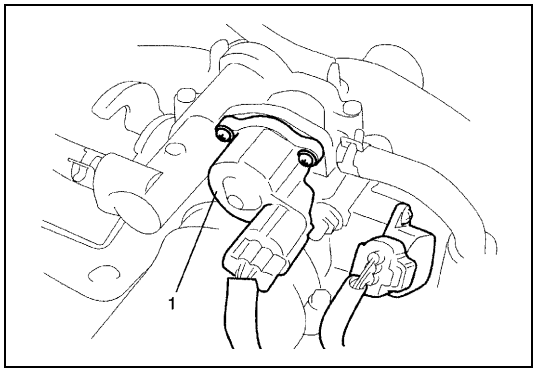
| Terminals | Resistance |
|---|---|
| **Between “1” and “2”** | **25.5 – 33.5 Ω** |
| **Between “3” and “2”** | |
| **Between “4” and “5”** | |
| **Between “6” and “5”** | |

## Fast idle air valve

1) Disconnect IAC valve coupler with ignition switch OFF.
2) Check that with cold engine started, as cooling water temperature rises, engine idle speed reduces gradually.
   If check result is as described above, fast idle air valve is in good condition.
   If not, fast idle air valve, air passage or coolant passage is faulty.

### Removal

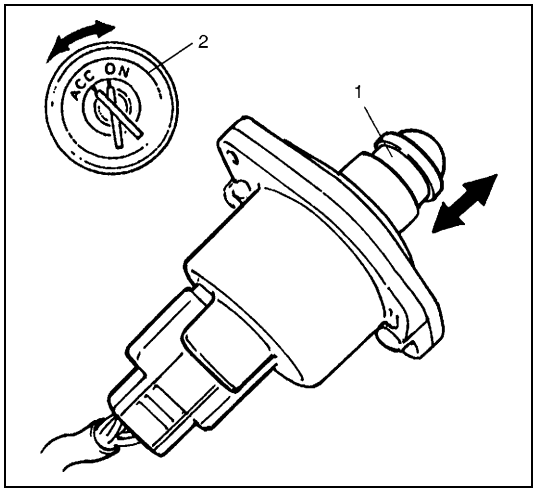
1) Disconnect negative (–) cable at battery.
2) Disconnect IAC valve connector.
3) Remove surge tank cover.




4) Remove IAC valve (1) from throttle body.

### Inspection

1) Connect connector to IAC valve.



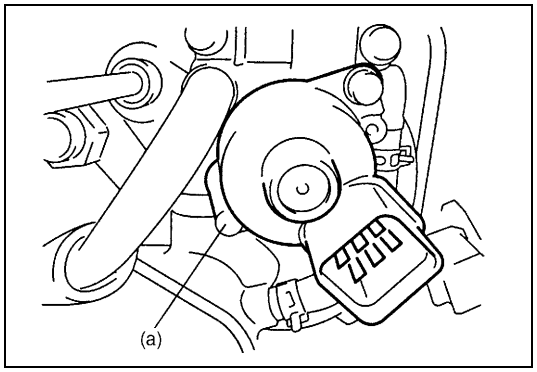

2) Check that plunger (1) of IAC valve moves once and then stops as soon as ignition switch (2) is turned to OFF position after ON position.
   If plunger (1) of IAC valve does not operate at all, check wire harnesses for open and short. If wire harnesses are in good condition, replace IAC valve and recheck.

**NOTE:**

**This check should be performed by two people, one person operates ignition switch while the other checks plunger operation.**

### Installation

1) Install new O-ring to throttle body.
2) Install IAC valve to throttle body.




3) Tighten IAC valve screws to specified torque.

**Tightening torque**
**IAC valve screw (a): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)**

4) Install surge tank cover.
5) Connect IAC valve connector securely.
6) Connect negative (–) cable to battery.

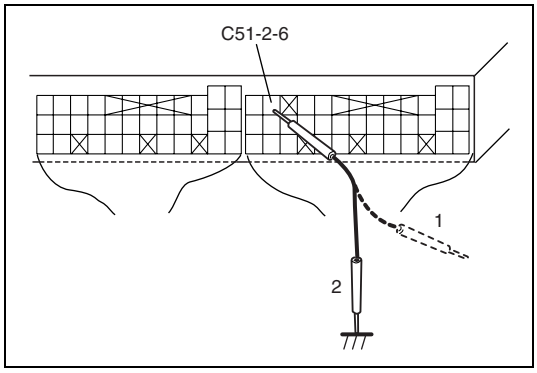
## Vacuum tank assembly of intake manifold air tuning valve (Type B only)

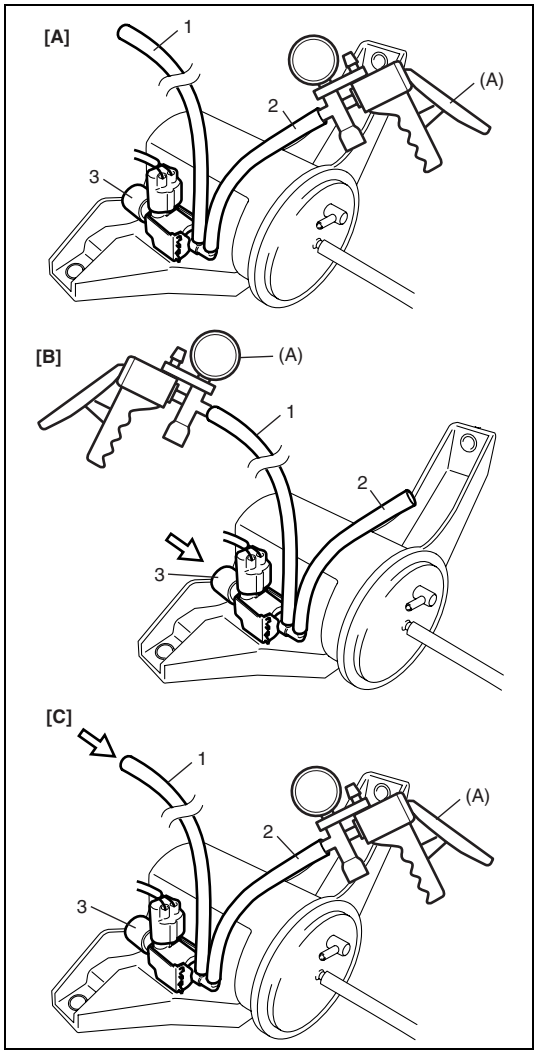
### Inspection

**CAUTION:**
**Do not apply vacuum more than –86 kPa (–12.47 Psi); otherwise vacuum solenoid valve could be damaged.**

### Vacuum solenoid valve and its circuit

1) Disconnect vacuum hoses from intake manifold air tuning valve and vacuum tank.
2) Remove ECM cover.
3) Turn ignition switch to ON position. Using service wire, ground "C51-2-6" terminal of ECM connector (valve ON) (2) and unground it (valve OFF) (1).



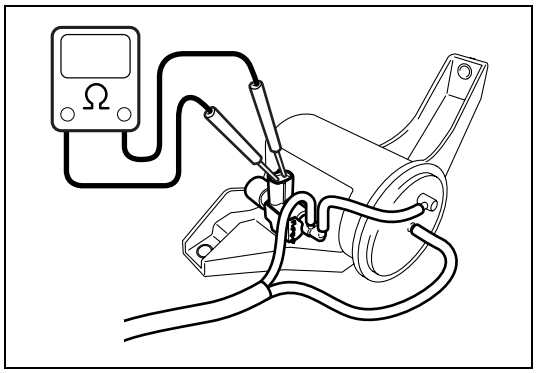

4) Check vacuum solenoid valve for operation below and vacuum passage for clog when valve is ON and OFF by using service wire.
   If check result is not satisfactory, check vacuum hose, vacuum solenoid valve, wire harness and connections.

**Vacuum solenoid valve specification**
**[A] Valve OFF: When applying vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (2), vacuum is maintained.**
**[B] Valve OFF: When applying vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (1), air goes into filter (3) only.**
**[C] Valve ON: When applying vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (2), air goes into hose (1) only.**

**Special tool**
**(A): 09917-47911**

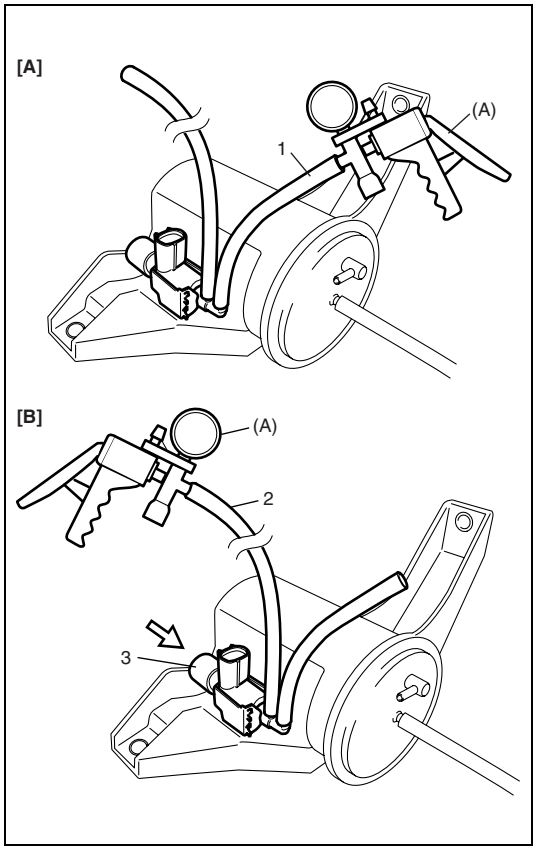
### Vacuum solenoid valve

1) With ignition switch OFF, disconnect connector from vacuum solenoid valve.



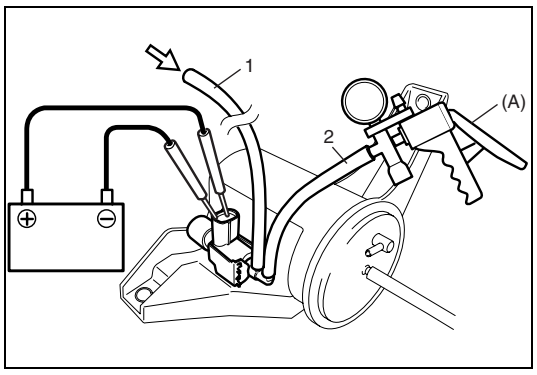
2) Check resistance of vacuum solenoid valve.
   If resistance is as specified, proceed to next operation check.
   If not, replace vacuum solenoid valve.

**Resistance of vacuum solenoid valve**
**Between two terminals: 33 – 39 Ω at 20°C (68°F)**




3) Disconnect vacuum hoses (1 and 2) from intake manifold air tuning valve and vacuum tank.
4) Check for vacuum passage of vacuum solenoid valve as follows.
   a) When applying vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (1), vacuum is maintained: [A]
   b) When applying vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (2), air goes into filter (3) only: [B]
      If check result is not satisfactory, replace vacuum solenoid valve.

**Special tool**
**(A): 09917-47911**



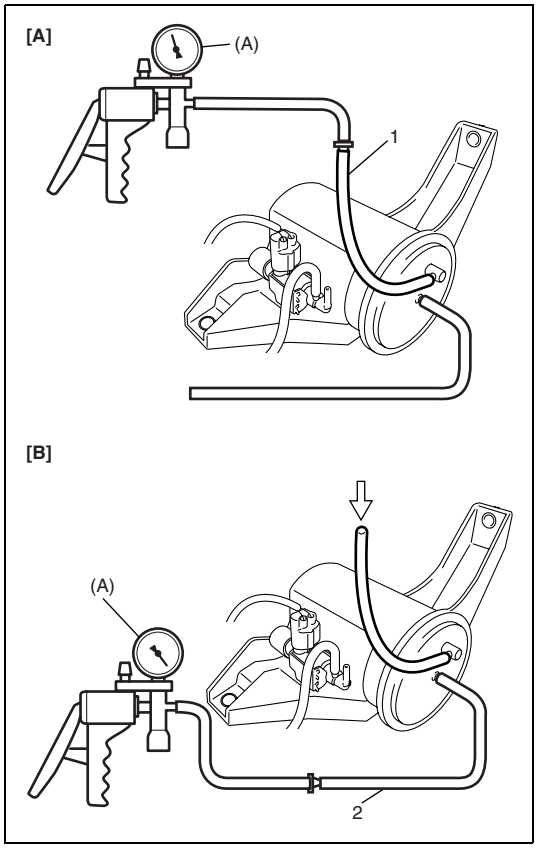

5) Connect 12 V-battery to vacuum solenoid valve terminals. In this state, apply vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (2). Check that air goes into hose (1) only.
   If check result is not satisfactory, replace vacuum solenoid valve.

**Special tool**
**(A): 09917-47911**

6) Connect vacuum hoses to intake manifold air tuning valve and vacuum tank.
7) Connect vacuum solenoid valve connector securely.

**Vacuum tank**

1) Check for outside of vacuum tank visually.
2) Disconnect vacuum hoses from intake manifold and vacuum solenoid valve.



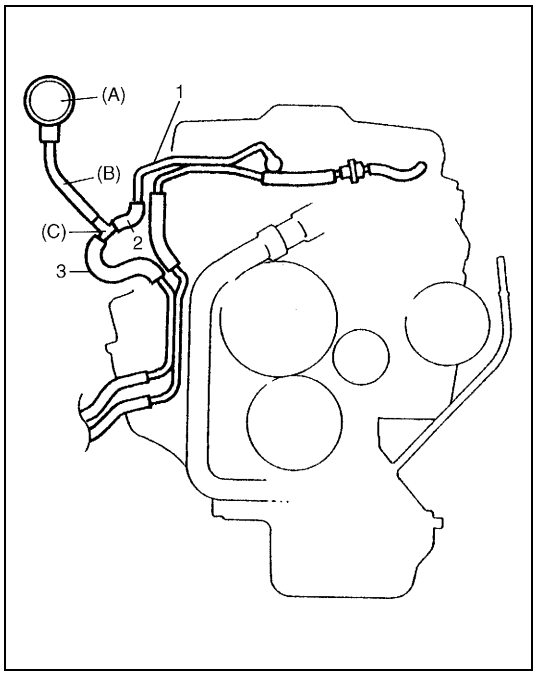

3) Check for vacuum passage of vacuum tank as follows by using vacuum pump.
   a) When applying vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (1), vacuum is maintained (there is no leakage): [A]
   b) When applying vacuum –53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (2), vacuum is not maintained: [B]
   If check result is not described, replace vacuum tank assembly.

**Special tool**
**(A): 09917-47911**

4) Connect vacuum hoses to intake manifold and vacuum solenoid valve.

# Fuel Delivery System

## Fuel pressure inspection




1) Relieve fuel pressure in fuel feed line referring to "Fuel Pressure Relief Procedure" in Section 6-1 (Type A) or 6-2 (Type B).
2) Disconnect fuel feed hose from (3) delivery fuel feed pipe (1).

**CAUTION:**
**A small amount of fuel may be released when fuel feed hose is removed. Place container under the fuel feed hose or fuel feed pipe with a shop cloth so that released fuel is caught in container or absorbed in cloth. Place that cloth in an approved container.**

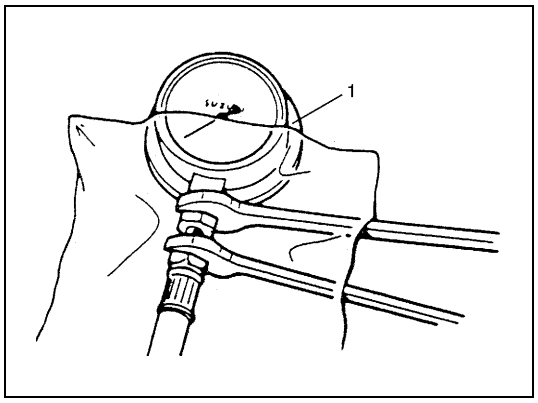
3) Connect special tools and hose (2) between fuel feed hose and fuel feed pipe as shown in figure, and clamp hose securely to ensure no leaks occur during checking.

**Special tool**
**(A): 09912-58442**
**(B): 09912-58432**
**(C): 09912-58490**

4) Check that battery voltage is above 11 V.
5) Turn ignition switch ON to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.
6) Start engine.
7) Measure fuel pressure at idling.
   If measure pressure doesn't satisfy specification, refer to "Diagnostic Flow Table B-3" in Section 6-1 (Type A) or 6-2 (Type B) and check each possibly defective part. Replace if found defective.

**Fuel pressure specification**

| CONDITION | FUEL PRESSURE |
|---|---|
| With fuel pump operating and engine stopped | 270 – 310 kPa<br>2.7 – 3.1 kg/cm$^2$<br>38.4 – 44.0 psi |
| At specified idle speed | 210 – 260 kPa<br>2.1 – 2.6 kg/cm$^2$<br>29.8 – 37.0 psi |
| With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes) | over 200 kPa<br>2.0 kg cm$^2$<br>28.4 psi |




8) After checking fuel pressure, remove fuel pressure gauge (1).

**CAUTION:**

**As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to following procedures.**

- **Place fuel container under joint.**
- **Cover joint with rag and loosen joint nut slowly to release fuel pressure gradually.**

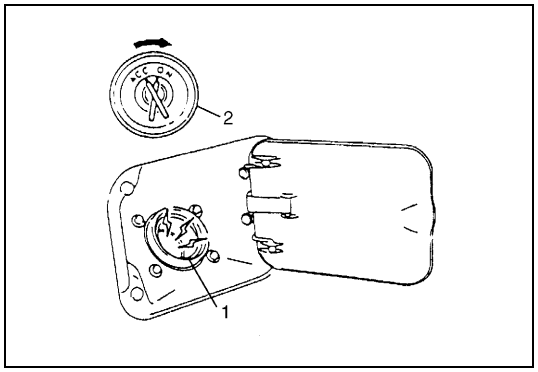
9) Remove fuel pressure gauge, hose and 3-way joint.
10) Connect fuel feed hose and clamp it securely.
11) With engine "OFF" and ignition switch "ON", check for fuel leaks.

## Fuel pump

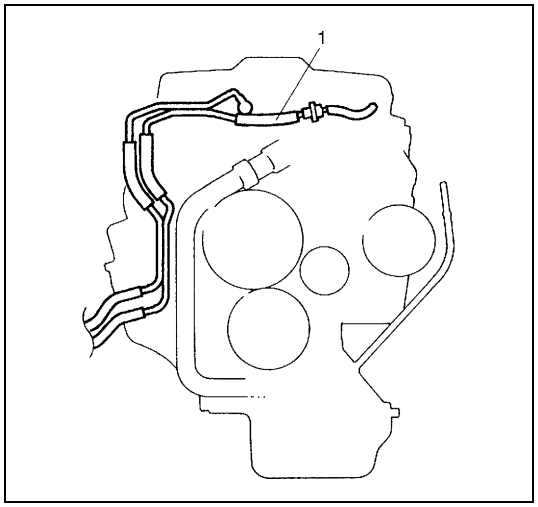
### On-Vehicle Inspection

**CAUTION:**

**When fuel filler cap is removed in any procedure, work must be done in a well-ventilated area, keep away from any open flames and without smoking.**




1) Remove filler cap and turn ON ignition switch (2). Then fuel pump operating sound should be heard from fuel filler (1) for about 3 seconds and stop. Be sure to reinstall fuel filler cap after checking.
   If above check result is not satisfactory, advance to "Diagnostic Flow Table B-1" in Section 6-1 (Type A) or 6-2 (Type B).




2) Fuel pressure should be felt at fuel return hose (1) for 3 seconds after ignition switch ON.
   If fuel pressure is not felt, advance to "Diagnostic Flow Table B-3" in Section 6-1 (Type A) or 6-2 (Type B).

### Removal

Remove fuel tank from body according to procedure described in "Fuel Tank" of Section 6C and remove fuel pump from fuel tank.

### Inspection

Check fuel pump filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in fuel tank.

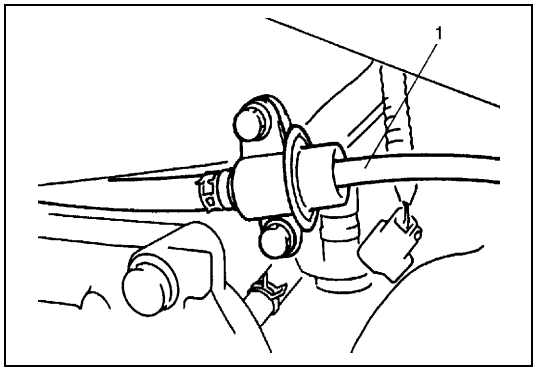
### Installation

Install fuel pump to fuel tank and then install fuel tank to body according to procedure described in "Fuel Tank" of Section 6C.

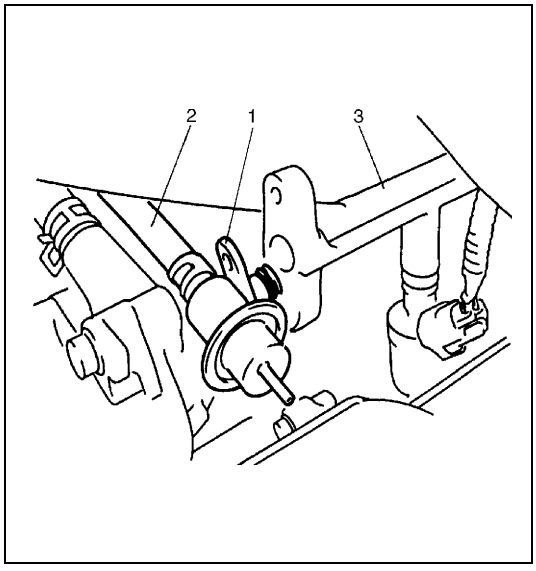
## Fuel pressure regulator

### Removal

1) Relieve fuel pressure in fuel feed line referring to "Fuel Pressure Relief Procedure" in Section 6-1 (Type A) or 6-2 (Type B).
2) Disconnect negative (–) cable from battery.
3) Disconnect vacuum hose (1) from fuel pressure regulator.




4) Remove fuel pressure regulator (1) from fuel delivery pipe (3).



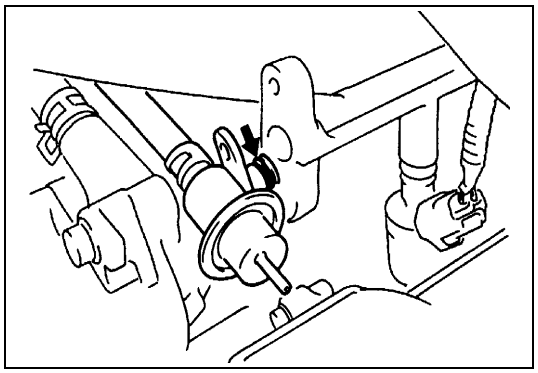

**CAUTION:**
**A small amount of fuel may be released when it is from delivery pipe.**
**Place a shop cloth under delivery pipe so that released fuel is absorbed in it.**

5) Disconnect fuel return hose (2) from fuel pressure regulator.

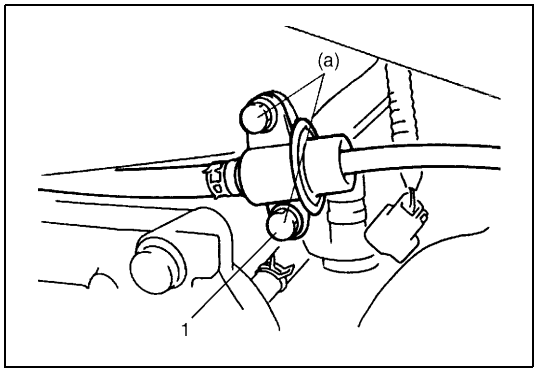
**CAUTION:**
**A small amount of fuel may be released when hose is disconnected. Cover hose to be disconnected with a shop cloth.**

### Installation

For installation, reverse removal procedure and note the followings.



- Use new O-ring.
- Apply thin coat of gasoline to O-ring to facilitate installation.



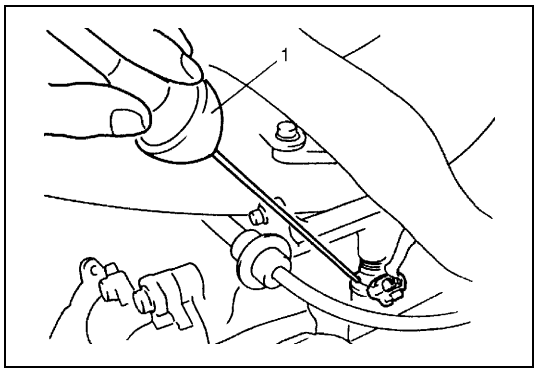

- Tighten fuel pressure regulator (1) bolts to specified torque.

**Tightening torque**
**Fuel pressure regulator bolt**
**(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)**

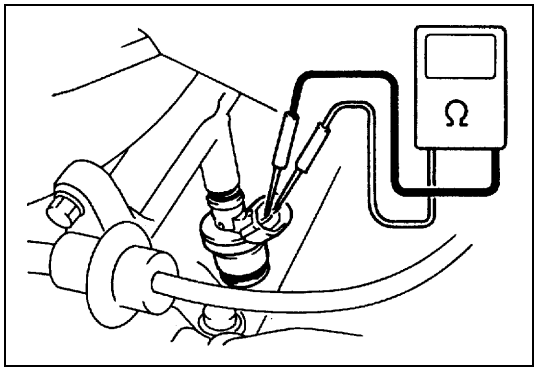
- With engine "OFF" and ignition switch "ON", check for fuel leaks around fuel line connection.

## Fuel injector

### On-Vehicle Inspection




1) Using sound scope (1) 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 injector circuit (wire or coupler) or injector.



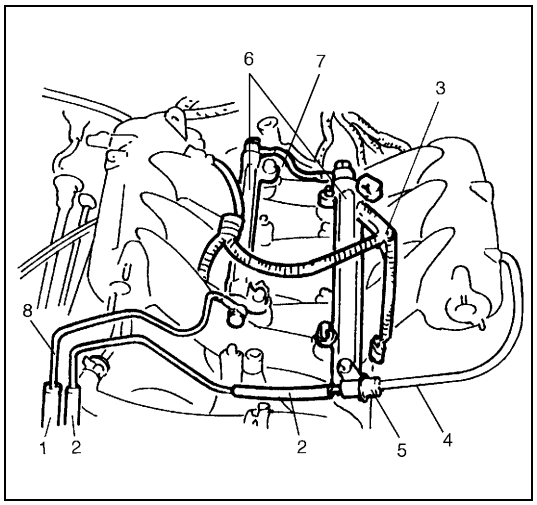

2) Disconnect connector from injector, connect ohmmeter between terminals of injector and check resistance.
   If resistance is out of specification, replace fuel injector.

**Fuel injector resistance**
**14.2 – 14.8 Ω (at 20°C, 68°F)**

3) Connect connector to injector securely.

### Removal

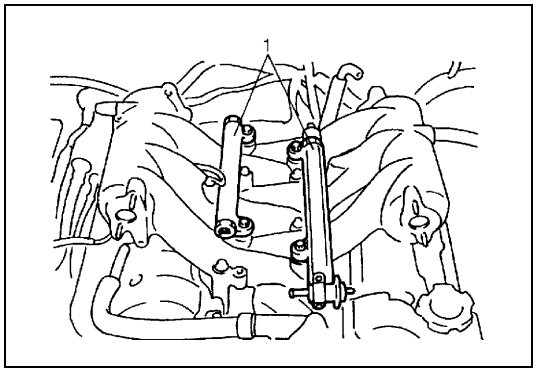
1) Relieve fuel pressure in fuel feed line referring to “Fuel Pressure Relief Procedure” in Section 6-1 (Type A) or 6-2 (Type B).
2) Remove throttle body and intake collector, refer to “Throttle Body” in this section.




3) Disconnect fuel feed hose (1) and fuel return hose (2).
4) Disconnect vacuum hose (4) and fuel return hose from fuel pressure regulator (5).
5) Remove fuel feed pipe (8) and fuel connect pipe (7) from delivery pipes (6) (right and left).

**CAUTION:**
**A small amount of fuel may be released when it is from delivery pipe.**
**Place a shop cloth under delivery pipe so that released fuel is absorbed in it.**

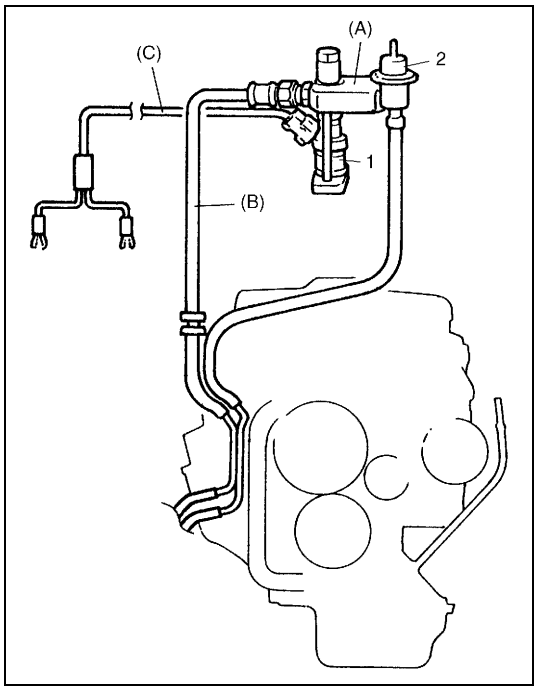
6) Disconnect connector (3) from each injector.




7) Remove delivery pipes (1) (right and left) from intake manifold.
8) Remove fuel injector(s).

### Inspection

**WARNING:**
**As fuel is injected in this inspection, perform in a well ventilated area and away from open flames.**
**Use special care to prevent sparking when connecting and disconnecting test lead to and from battery.**




1) Install injector (1) and fuel pressure regulator (2) to special tool (injector checking tool).

**NOTE:**

**Remove grommet from injector, then install injector to special tool and tighten bolts by hand.**

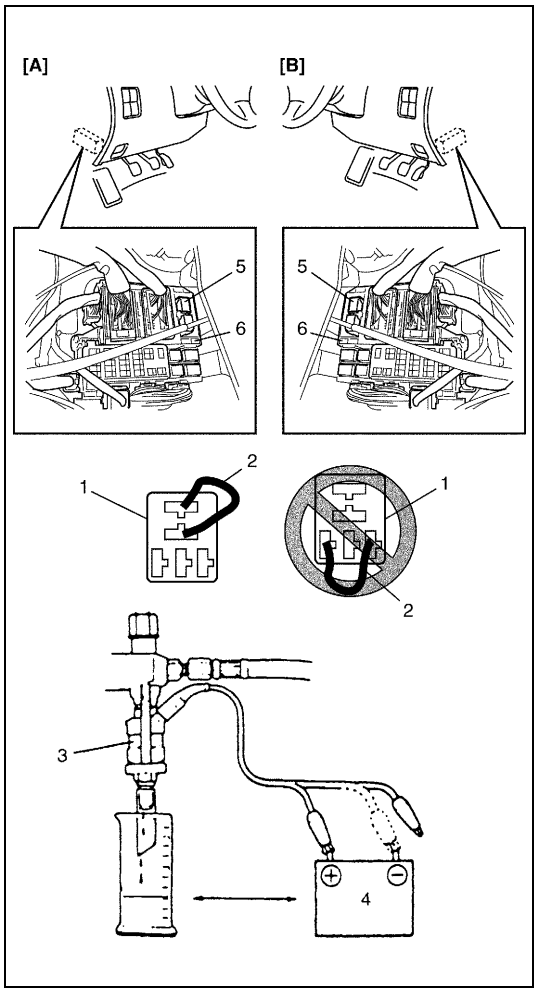
**Special tool**
**(A): 09912-58421**

2) Connect special tools (hoses and attachment) to pipes of vehicle.

**Special tool**
**(B): 09912-58432**

3) Connect special tool (test lead) to injector.

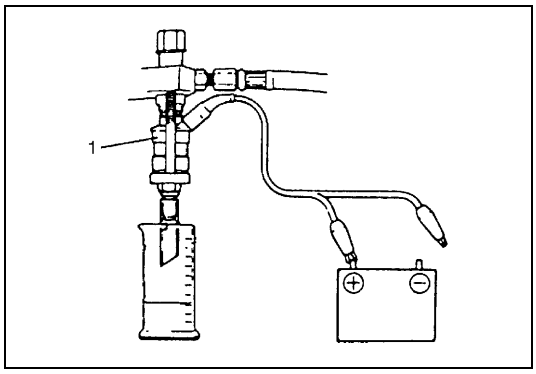
**Special tool**
**(C): 09930-88521**




4) Install suitable vinyl tube onto injector (3) nozzle to prevent fuel from splashing out when injecting.
5) Put graduated cylinder under injector as far apart as possible.
6) Disconnect fuel pump relay (5).
7) To operate fuel pump and apply fuel pressure to injector, using wire harness (2) as thick as the one used for fuel pump circuit, connect two terminals of relay connector (1) in relay box (6) as shown in the figure.
8) Apply battery (4) voltage to injector 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**
**64 – 70 cc/15 sec. (2.16/2.25 – 2.37/2.47 US/Imp. oz/15 sec.)**

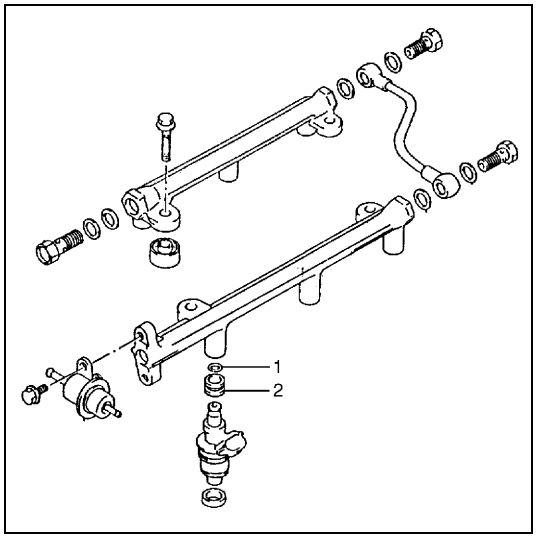
| |
|---|
| [A]: Left-hand steering vehicle |
| [B]: Right-hand steering vehicle |



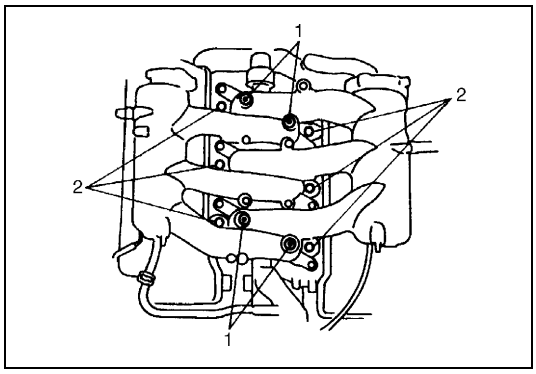

9) Check fuel leakage from injector (1) nozzle. Do not operate injector for this check (but fuel pump should be at work). If fuel leaks more than following specifications, replace.

**Fuel leakage**
**Less than 1 drop/min.**

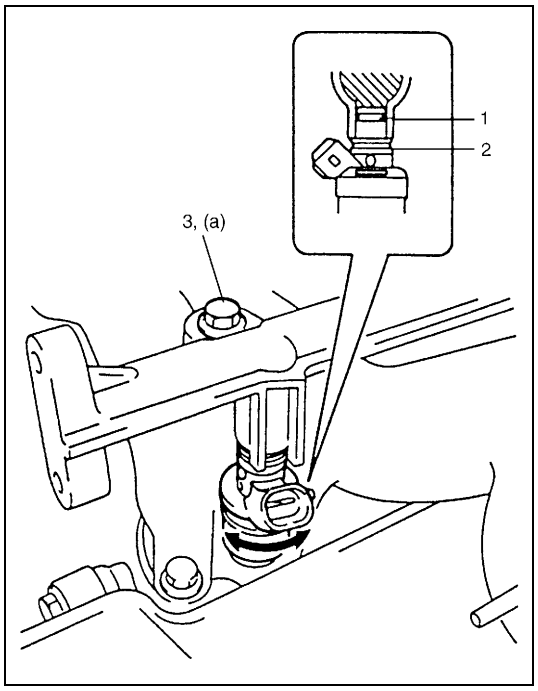
## Installation




1) Replace injector O-ring (1) with new one using care not to damage it. Install grommet (2) to injector.

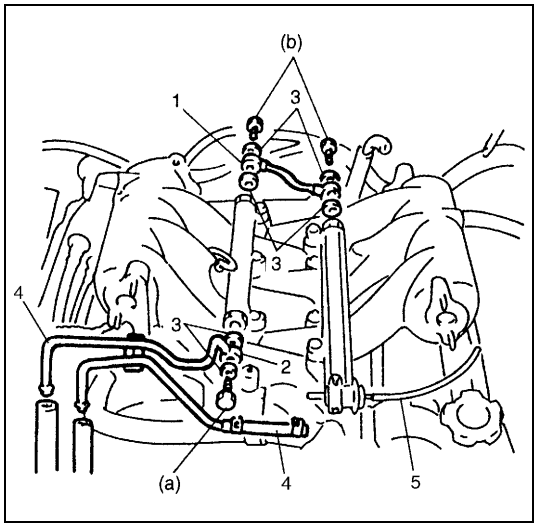



2) Check if insulator (1) is scored or damaged. If it is, replace with new one.
Install insulators and cushions (2) to intake manifold.




3) Apply thin coat of fuel to O-rings (1) and then install injectors into delivery pipes (right and left) and intake manifold.
   Make sure that injectors rotate smoothly. If not, probable cause is incorrect installation of O-ring or grommet (2). Replace O-ring with new one.
4) Tighten delivery pipe bolts (3) and make sure that injectors rotate smoothly.

**Tightening torque**
**Delivery pipe bolt (a): 25 N·m (2.5 kg-m, 18.5 lb-ft)**



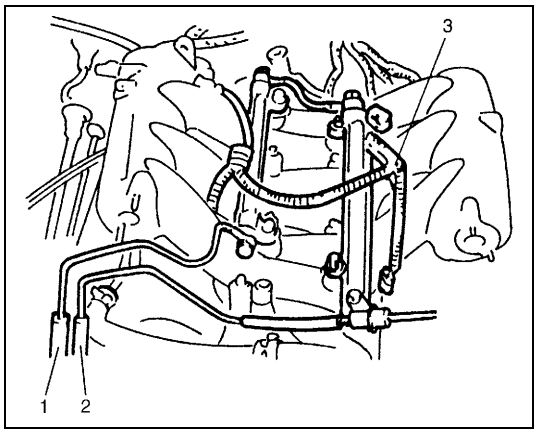

5) Install fuel connect pipe (1) and tighten union bolts to specified torque with new gaskets (3).

**Tightening torque**
**Fuel connect pipe union bolt**
**(b): 30 N·m (3.0 kg-m, 22.0 lb-ft)**

6) Install fuel feed pipe (2) and tighten union bolt to specified torque with new gaskets.

**Tightening torque**
**Fuel feed pipe union bolt**
**(a): 30 N·m (3.0 kg-m, 22.0 lb-ft)**

7) Connect vacuum hose (5) and fuel return hose (4) to fuel pressure regulator.




8) Connect fuel feed hose (1) and fuel return hose (2).
9) Connect connectors of injector wire (3) to injectors.

10) Install throttle body and intake collector, refer to “Throttle Body” in this section.
11) With engine “OFF” and ignition switch “ON”, check for fuel leaks around fuel line connection.

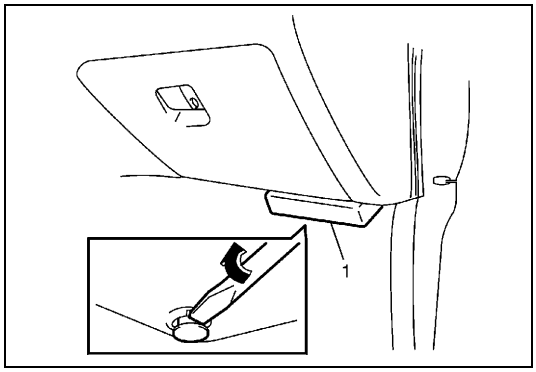
# Electronic Control System

## Engine control module (ECM)/powertrain control module (PCM)

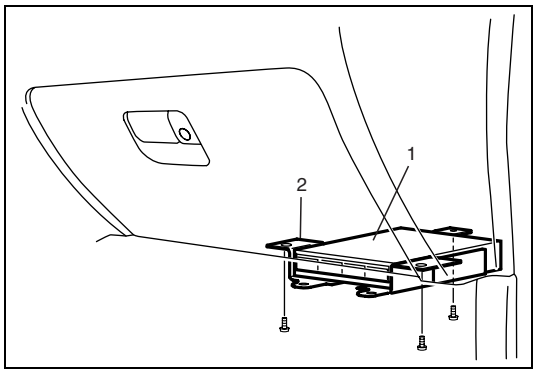
**CAUTION:**
**As ECM (or PCM) consists of precision parts, be careful not to expose it to excessive shock.**

### Removal

1) Disconnect negative (–) cable from battery.
2) Disable air bag system (if equipped) referring to “Disabling the Air Bag System” in Section 10B.
3) Remove ECM (or PCM) cover (1) from bracket.




4) Disconnect connectors from ECM (or PCM) (1).
5) Remove ECM (or PCM) (1) with bracket (2).




### Installation

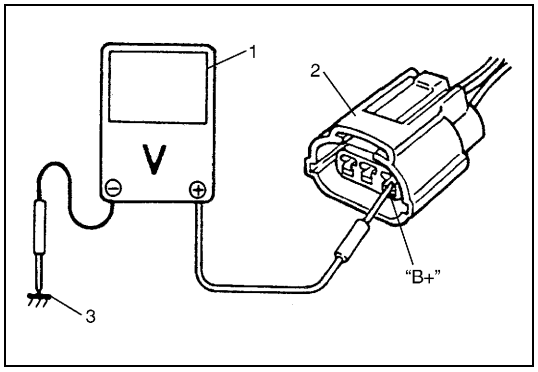
1) Install ECM (or PCM) with bracket to vehicle.
2) Connect connectors to ECM (or PCM) securely.
3) Install ECM (or PCM) cover to bracket.
4) Enable air bag system (if equipped) referring to “Enabling Air Bag System” in Section 10B.
5) Connect negative (–) cable to battery.

## Mass air flow sensor (MAF sensor)

### On-Vehicle Inspection

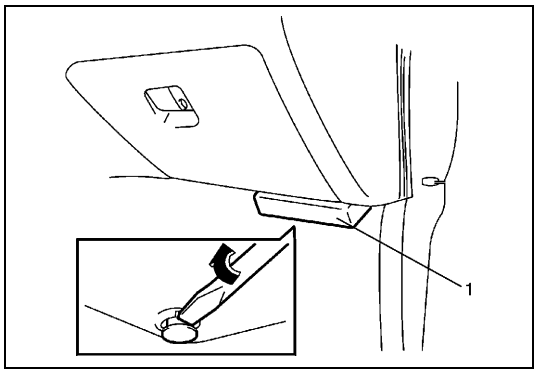
**NOTE:**

**Use voltmeter with high-impedance (10 kΩ/V minimum) or digital type voltmeter.**



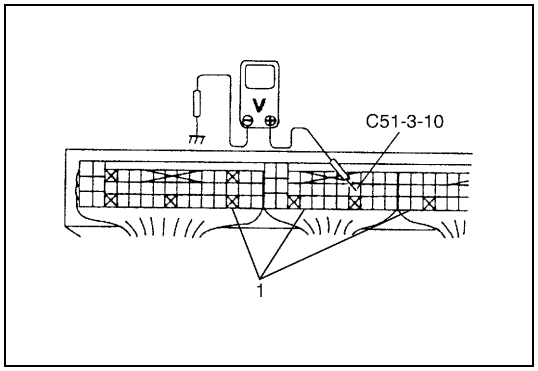

1) Connect voltmeter (1) to "B+" terminal of MAF sensor (2) coupler disconnected and ground (3).

2) Turn ignition switch ON and check that voltage is battery voltage. If not, check if wire harness is open or connection is poor.




3) Turn ignition switch OFF and remove ECM (or PCM) cover (1) from bracket.

4) Connect MAF sensor coupler to MAF sensor.




5) Turn ignition switch ON and check voltage at MAF sensor output terminal of ECM (or PCM) connector (1).

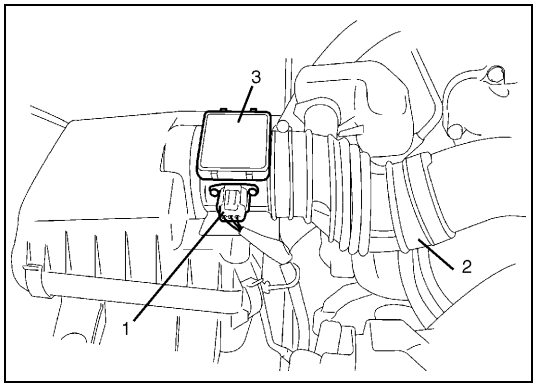
**MAF sensor output voltage**
**Voltage: 1.0 – 1.6 V**

6) Start engine and check that voltage is lower than 5 V and it rises as engine speed increases.
(Reference data: 1.7 – 2.0 V at specified idle speed)
If check result is not as specified above, cause may lie in wire harness, coupler connection, MAF sensor or ECM (or PCM).

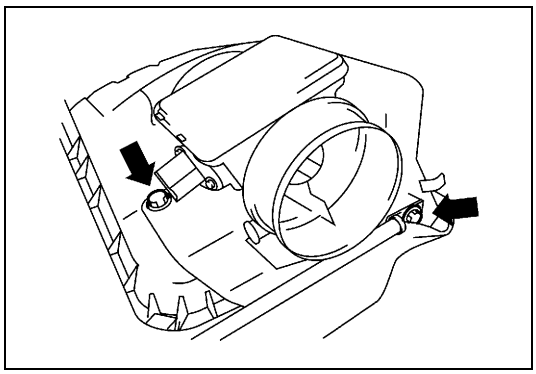
### Removal

**CAUTION:**
- **Don't disassemble MAF sensor.**
- **Do not expose MAF 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 sensor. Malfunction may occur.**

### Type A

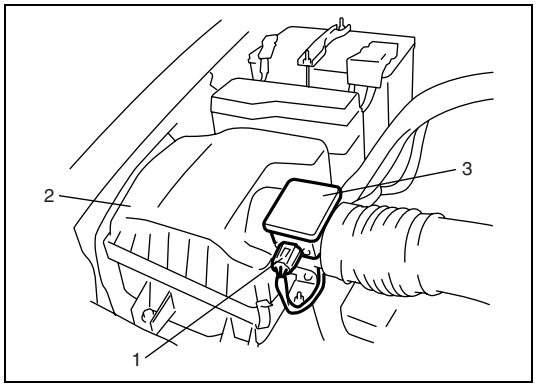



1) Disconnect negative (–) cable at battery and coupler (1) from MAF sensor (3).
2) Remove air cleaner outlet hose (2) from throttle body and MAF sensor (3).

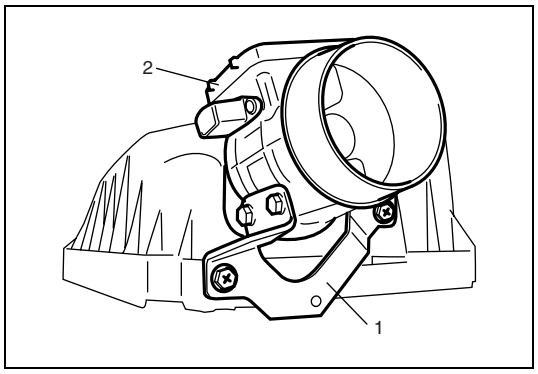


3) Remove MAF sensor from air cleaner case.

### Type B



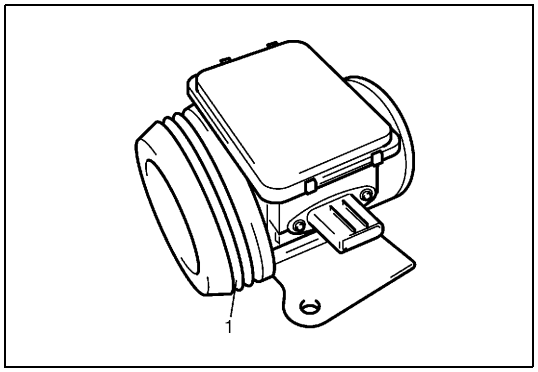

1) Disconnect negative (–) cable at battery and coupler (1) from MAF sensor (3).
2) Remove air cleaner case (2) with MAF sensor (3).




3) Remove bracket (1) and MAF sensor (2) from air cleaner case.

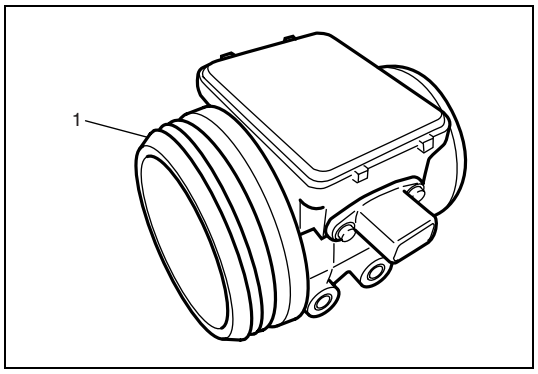
**Installation**

**Type A**




1) Check MAF sensor seal (1) for deterioration and damage.
2) Install MAF sensor to air cleaner case.
3) Install air cleaner outlet hose.
4) Connect MAF sensor coupler securely.
5) Connect negative (–) cable to battery.

**Type B**



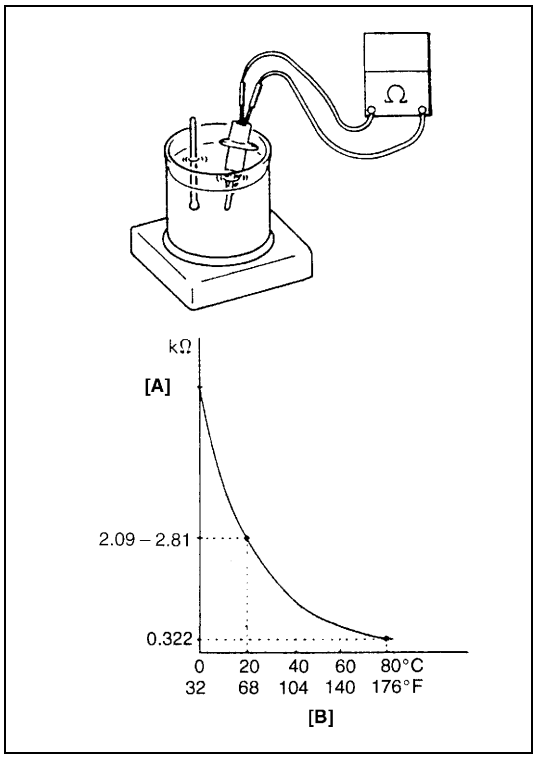

1) Check MAF sensor seal (1) for deterioration and damage.
2) Install MAF sensor and bracket to air cleaner case.
3) Install air cleaner case.
4) Connect MAF sensor coupler securely.
5) Connect negative cable (–) to battery.

## Intake air temperature (IAT) sensor

### Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect IAT sensor coupler.
3) Remove IAT sensor from air cleaner case.

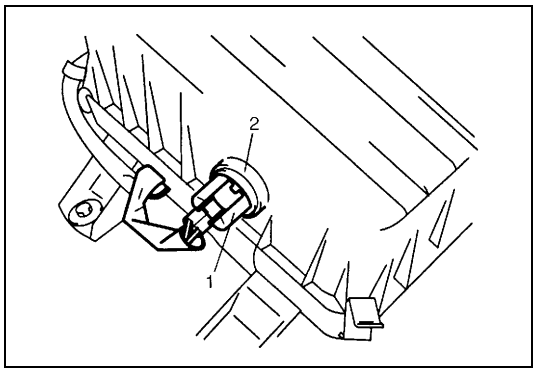
### Inspection




Immerse temperature sensing part of IAT sensor in water (or ice) and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't show such characteristic as shown in the figure, replace IAT sensor.

| [A]: Resistance | [B]: Temperature |
|---|---|

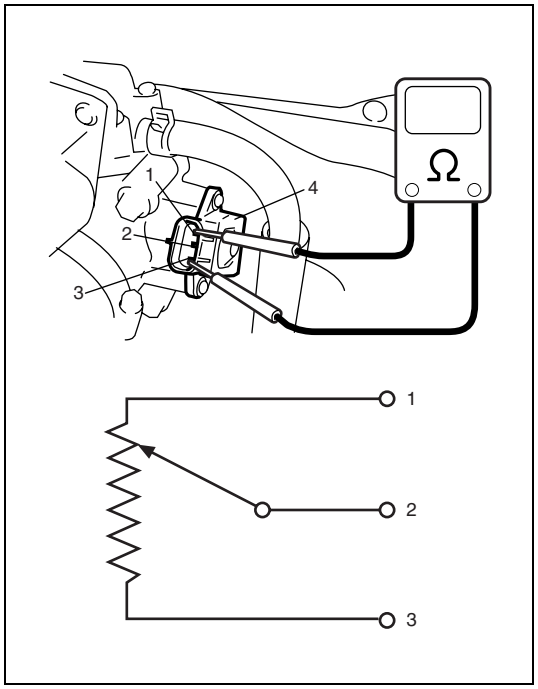
### Installation




1) Clean mating surface of sensor and seal (2) on air cleaner case.
2) Install IAT sensor (1) into seal.
3) Connect connector to IAT sensor securely.

## Throttle position sensor (TP sensor)

### On-Vehicle Inspection




1) Disconnect negative (–) cable at battery and coupler from TP sensor (4).
2) Using ohmmeter, check resistance between terminals under each condition given in table below.
   If check result is not satisfactory, replace TP sensor.

**TP sensor specification**

| TERMINALS | RESISTANCE |
|---|---|
| **Between 1 and 3 terminals** | **4.0 – 6.0 kΩ** |
| **Between 2 and 3 terminals** | **0.02 – 6.0 kΩ varying linearly according to throttle valve opening** |

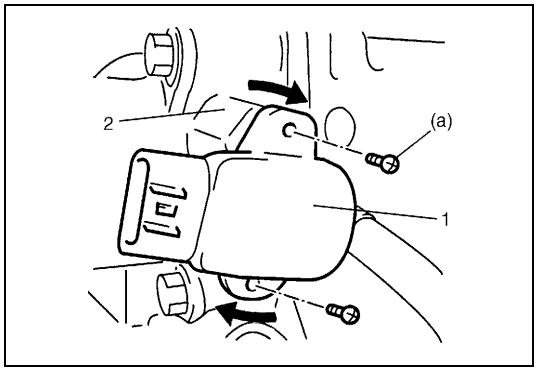
| |
|---|
| 1. Reference voltage terminal |
| 2. Output voltage terminal |
| 3. Ground terminal |

3) Connect TP sensor coupler securely.
4) Connect negative cable to battery.

### Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect coupler from TP sensor.
3) Remove TP sensor from throttle body.

### Installation




1) Install TP sensor (1) to throttle body (2).
   Fit TP sensor (1) to throttle body (2) in such way that its holes are a little away from TP sensor screw holes as shown in the figure and turn TP sensor (1) clockwise so that those holes align.

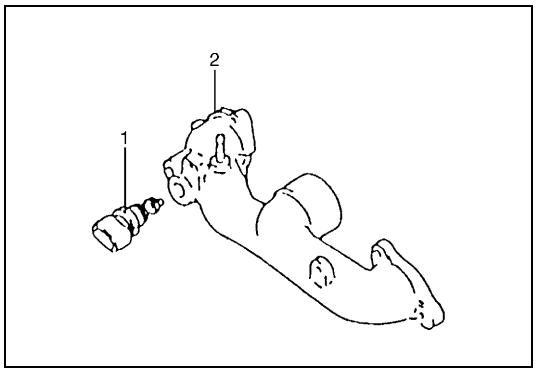
**Tightening torque**
**TP sensor screw**
**(a): 3.5 N·m (0.35 kg-m, 2.5 lb-ft)**

2) Connect coupler to TP sensor securely.
3) Connect battery negative (–) cable to battery.

## Engine coolant temperature sensor (ECT sensor)

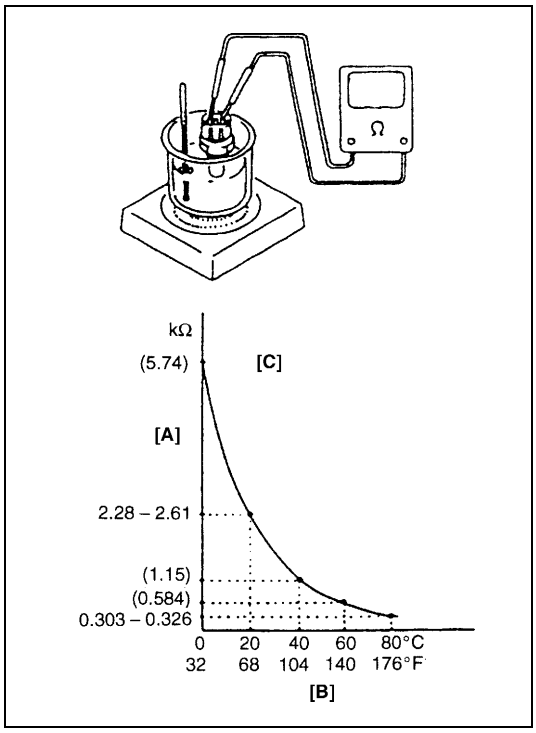
### Removal

1) Disconnect negative (–) cable from battery.
2) Drain cooling system.




3) Disconnect coupler from ECT sensor (1).
4) Remove ECT sensor from water outlet cap (2).

### Inspection

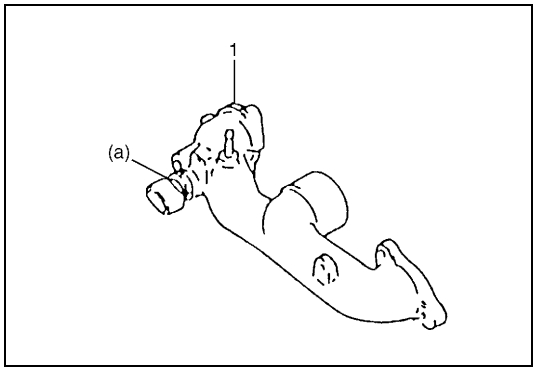



Immerse temperature sensing part of ECT sensor in water and measure resistance between sensor terminals while heating water gradually.
If measured resistance doesn't shown such characteristic as shown in the figure, replace ECT sensor.

| [A]: Resistance | [B]: Temperature | [C]: ( ) for resistance |
|---|---|---|

### Installation

Reverse removal procedure noting the followings.



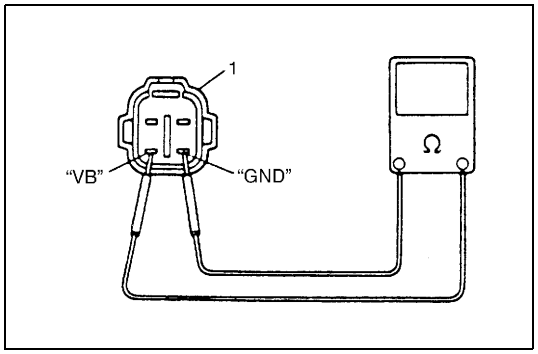

- Clean mating surfaces of sensor and water outlet cap (1).
- Use new O-ring.
- Tighten ECT sensor to specified torque.

**Tightening torque**
**ECT sensor (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)**

- Connect coupler to sensor securely.
- Refill cooling system.

## Heated oxygen sensor (sensor 1)

### On-Vehicle Inspection




1) Disconnect HO2S–1 coupler.
2) Using ohmmeter, measure heater resistance between terminals "VB" and "GND" of HO2S–1 coupler (1).
   If found faulty, replace HO2S–1.

**NOTE:**

**Temperature of HO2S affects resistance value largely. Make sure that HO2S heater is at correct temperature.**

**Resistance of HO2S–1 heater**
**5.0 – 6.4 Ω (at 20 °C (68 °F))**

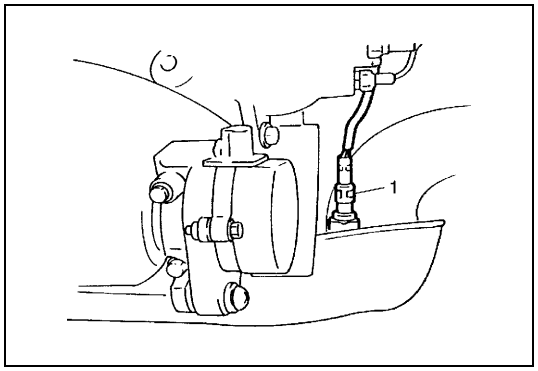
3) Check that HO2S-1 signal voltage varies from low to high or from high to low as specified referring to the following.
   - Type A:
     Step 3 of "DTC P0130 (DTC No.13) Diag. Flow" or "DTC P0150 (DTC No.26) Diag. Flow" in Section 6-1.
   - Type B:
     Step 3 of "DTC P0130 (No.13)/P0131/P0132 Diag. Flow" or "DTC P0150 (No.26)/P0151/P0152 Diag. Flow" in Section 6-2.
     If signal voltage varies as specified, HO2S–1 is in good condition.
     If not, replace HO2S–1.
4) Connect HO2S–1 coupler securely.

### 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 from battery.
2) Disconnect coupler of oxygen sensor (s).




3) Remove oxygen sensor (s) from exhaust manifold (s).

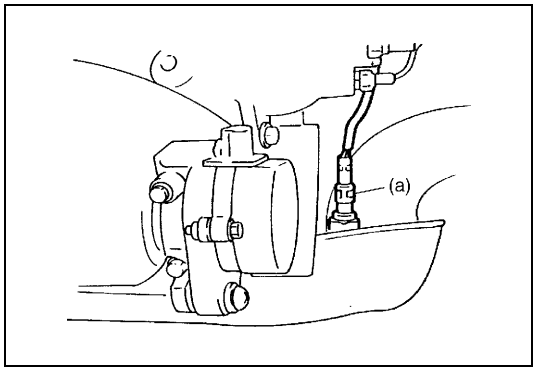
**NOTE:**

**Be careful not to expose it to excessive shock.**

1. Left (No.1) bank oxygen sensor (sensor 1)

### Installation

Reverse removal procedure noting the followings.



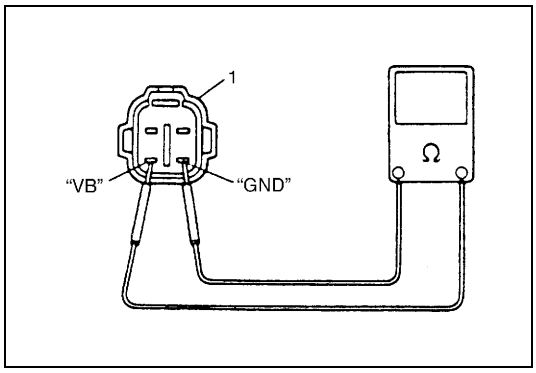

- Tighten oxygen sensor (s) to specified torque.

**Tightening torque**
**Heated oxygen sensor 1**
**(a): 45 N·m (4.5 kg-m, 32.5 lb-ft)**

- Connect connector of oxygen sensor (s) and clamp wire harness securely.
- After installing oxygen sensor (s), start engine and check that no exhaust gas leakage exists.

## Heated oxygen sensor (sensor 2) (if equipped)

### On-Vehicle Inspection




1) Disconnect HO2S–2 coupler.
2) Using ohmmeter, measure heater resistance between terminals "VB" and "GND" of HO2S–2 coupler (1).
   If found faulty, replace HO2S–2.

**NOTE:**

**Temperature of HO2S affects resistance value largely. Make sure that HO2S heater is at correct temperature.**

**Resistance of HO2S–2 heater**
**11.7 – 14.3 Ω (at 20 °C (68 °F))**

3) Check that HO2S-2 signal voltage varies from low to high or from high to low as specified referring to the following.
   - Type A:
     Step 3 of "DTC P0136 Diag. Flow" or "DTC P0156 Diag. Flow" in Section 6-1
   - Type B:
     Step 3 of "DTC P0137 Diag. Flow" or "DTC P0157 Diag. Flow" in Section 6-2.

   If signal voltage varies as specified, HO2S–2 is in good condition.
   If not, replace HO2S–2.
4) Connect HO2S–2 coupler securely.

## Removal

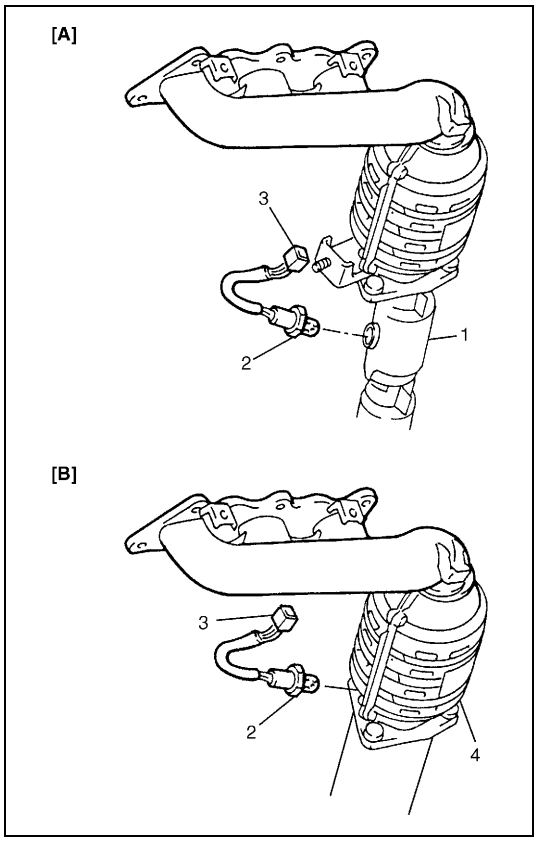
**WARNING:**

**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.**

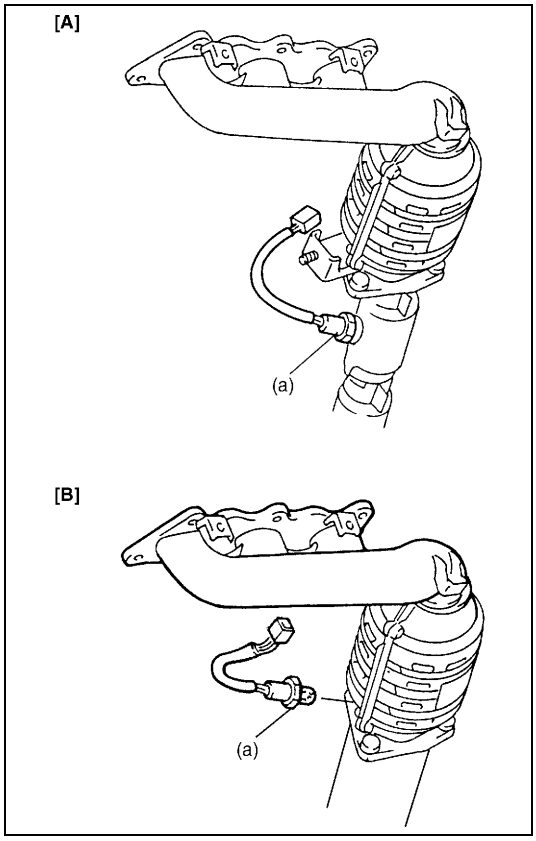
1) Disconnect negative (–) cable from battery.
2) Disconnect coupler (3) of oxygen sensor(s).
3) Remove oxygen sensor(s) (2) from exhaust No.1 pipe(s) (1) or exhaust manifold(s) (4).

**NOTE:**

**Be careful not to expose it to excessive shock.**




| |
|---|
| [A]: Type A |
| [B]: Type B |




## Installation

Reverse removal procedure noting the followings.

- Tighten oxygen sensor(s) to specified torque.

**Tightening torque**
**Heated oxygen sensor 2 (a): 45 N·m (4.5 kg-m, 32.5 lb-ft)**

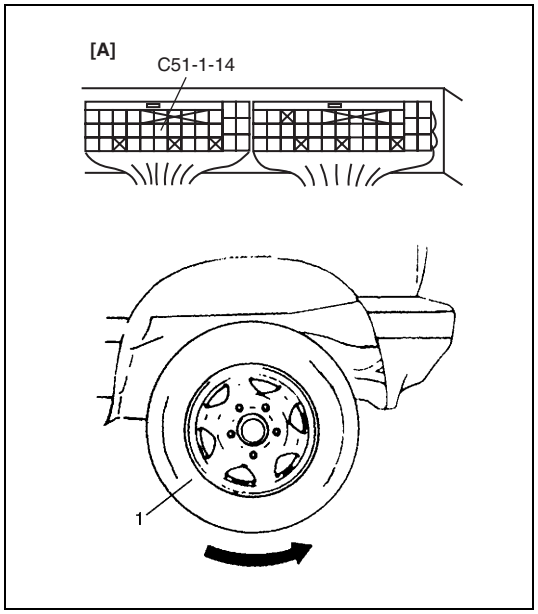
| |
|---|
| [A]: Type A |
| [B]: Type B |

- Connect connector of oxygen sensor(s) and clamp wire harness securely.
- After installing oxygen sensor(s), start engine and check that no exhaust gas leakage exists.

## Vehicle speed sensor (VSS)

### On-Vehicle Inspection

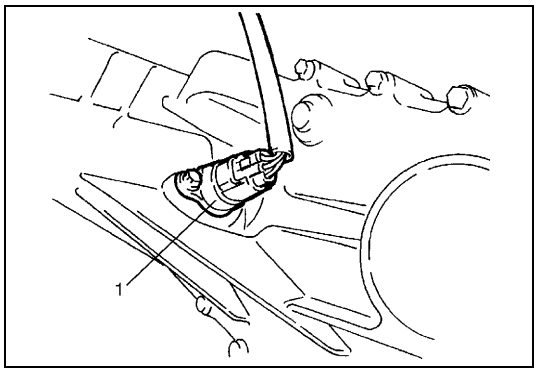
1) Hoist vehicle.
2) Release parking brake lever, set transmission in neutral and transfer in “2H”.
3) Remove ECM (or PCM) cover.




4) Connector voltmeter between VSS terminal C51-1-14 of ECM (or PCM) connector and body ground.
5) Turn ignition switch ON and turn rear right tire slowly with rear left tire locked.
   Voltmeter should indicate deflection between 0 – 1 V and 8 – 14 V a few times while tire (1) is turned one revolution.
   If check result is not satisfactory, proceed to flow table of “DTC P0500” in Section 6-1 (Type A) or 6-2 (Type B).

[A]: Terminal arrangement of ECM (or PCM) coupler (viewed from harness side)

### Removal, Inspection and Installation




Refer to “Speed Sensor” in Section 7D.

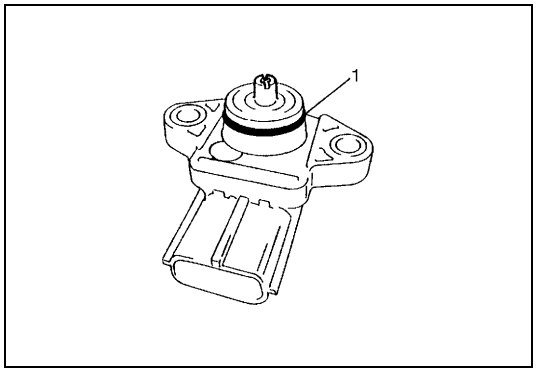
1. VSS

## Manifold absolute pressure sensor

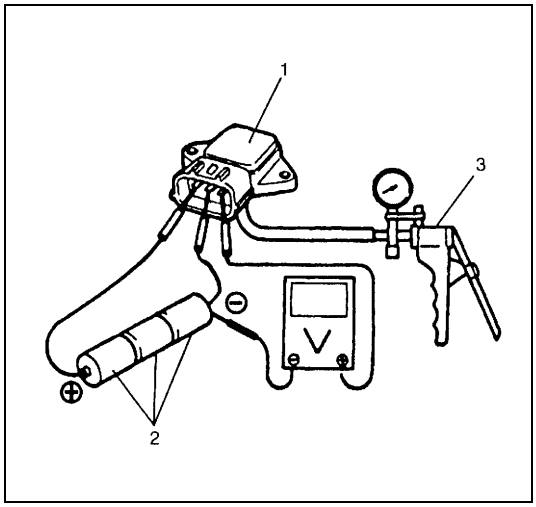
### Removal

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

### Inspection




1) Check sensor O-ring (1) for damage and deterioration. Replace as necessary.

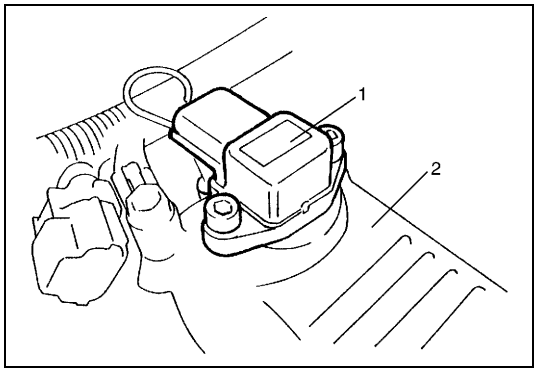



2) Arrange 3 new 1.5 V batteries (2) in series and connect its positive terminal to "Vin" terminal of MAP sensor (1) and negative terminal to "Ground" terminal. Then check voltage between "Vout" and "Ground".
   Also, check if voltage reduces when vacuum is slowly applied up to 400 mmHg by using vacuum pump (3).
   If check result is not satisfactory, replace manifold absolute pressure sensor.

**CAUTION:**
**As connection to wrong terminal will cause damage to manifold absolute pressure sensor, make absolutely sure to connect properly as shown in the figure.**

**MAP sensor output voltage (Vin voltage 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 |




### Installation

1) Confirm that vacuum passage on intake manifold is free from clog.
2) Apply engine oil to O-ring of sensor.
3) Install sensor (1) to intake manifold (2).
4) Connect connector to sensor (1) securely.

## Fuel level sensor (sender gauge)

Refer to “Fuel Level Sensor (Sender Gauge)” in Section 8C.

## Camshaft position sensor

### Removal and Installation

Refer to “CMP Sensor” in Section 6F2.

### Inspection

1) Confirm that terminal voltage at CMP sensor connector terminal is in good condition referring to Step 4 of “DTC P0340 (DTC No.42) Diag. Flow” in Section 6-1 (Type A) or 6-2 (Type B).
   If not, repair CMP sensor circuit.
2) Confirm that “YEL/BLU” and “YEL/GRN” wires are in good condition.
   If not, repair wires.
3) Check that CMP sensor signal voltage varies from low to high or from high to low as specified referring to Step 5 and 6 of “DTC P0340 (DTC No.42) Diag. Flow” in Section 6-1 (Type A) or 6-2 (Type B).
   If signal voltage varies as specified, CMP sensor is in good condition.
   If not, replace CMP sensor.

## Crankshaft position sensor

### Removal and Installation

Refer to “Timing Chain Cover” in Section 6A2.

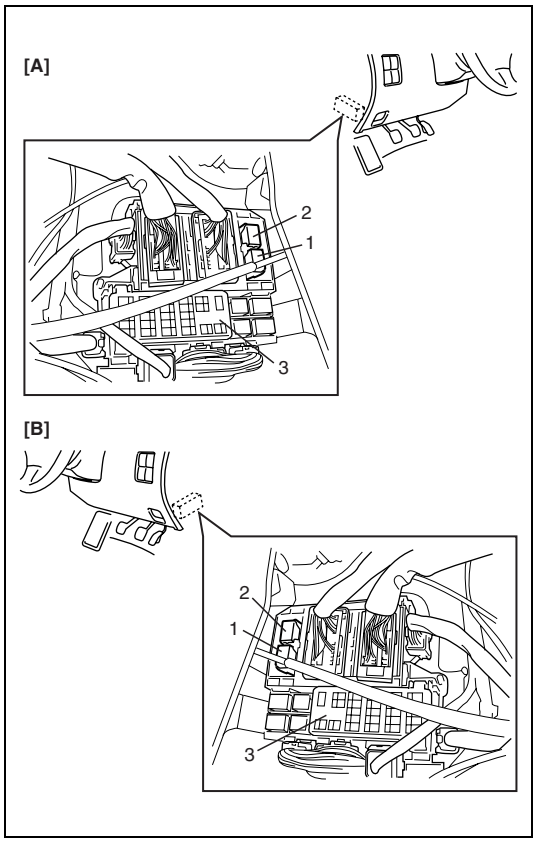
### Inspection

Check that CKP sensor resistance is as specified valve referring to Step 3 of “DTC P0335 Diag. Flow” in Section 6-1 (Type A) or 6-2 (Type B).
If resistance as specified, CKP sensor is in good condition.
If not, replace CKP sensor.

## Main relay

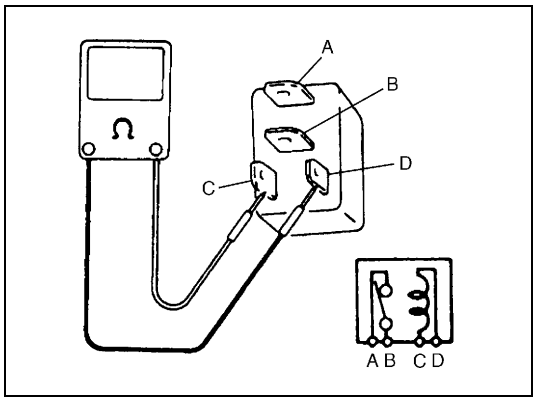
### Inspection

1) Disconnect negative (–) cable at battery.




2) Remove main relay (1) from its connector.

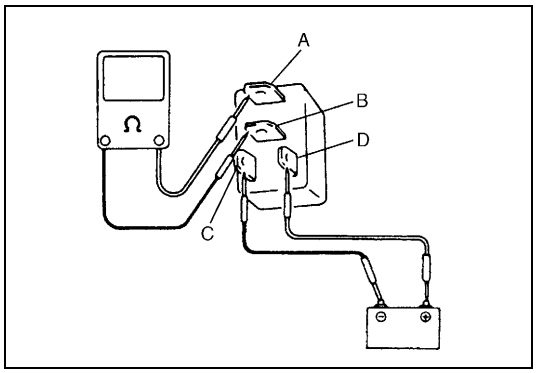
| | |
|---|---|
| 2. | Fuel pump relay |
| 3. | Fuse box |
| [A]: | Left-hand steering vehicle |
| [B]: | Right-hand steering vehicle |




3) Check resistance between each two terminals as in table below.
If check results are as specified, proceed to next operation check. If not, replace.

**Main relay resistance**

| TERMINALS | RESISTANCE |
|---|---|
| **Between "A" and "B"** | **∞ (Infinity)** |
| **Between "C" and "D"** | **160 – 240 Ω (at 20°C (68°F))** |

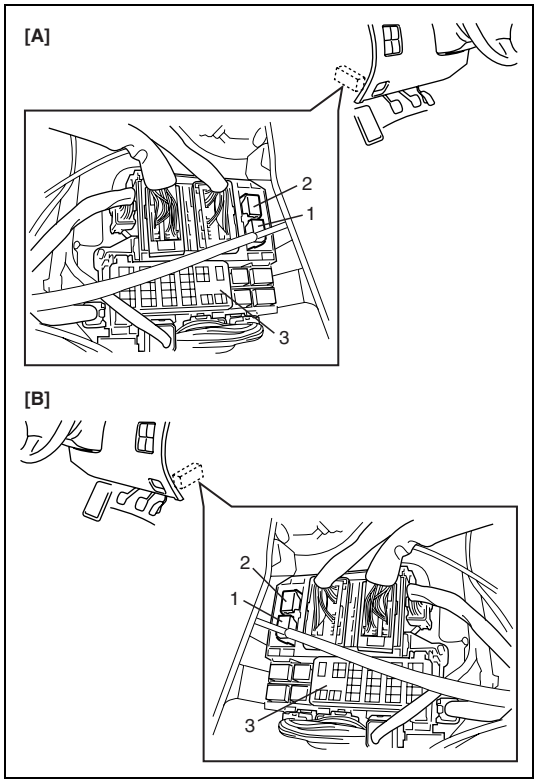



4) Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D".
If malfunction is found, replace.

## Fuel pump relay

### Inspection

1) Disconnect negative (–) cable at battery.



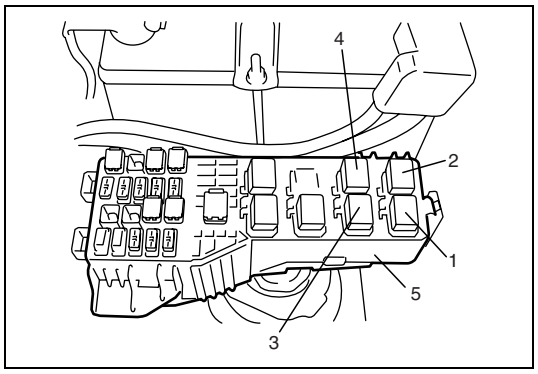

2) Remove fuel pump relay (2) from connector.
3) Structure of fuel pump relay is the same as that of main relay.
   Check its resistance and operation using the same procedure as that for main relay.
   If malfunction is found, replace.

| | |
|---|---|
| 1. | Main relay |
| 3. | Fuse box |
| [A]: | Left-hand steering vehicle |
| [B]: | Right-hand steering vehicle |

## A/C compressor relay and condenser fan motor relay

### Inspection

1) Disconnect negative (–) cable at battery.



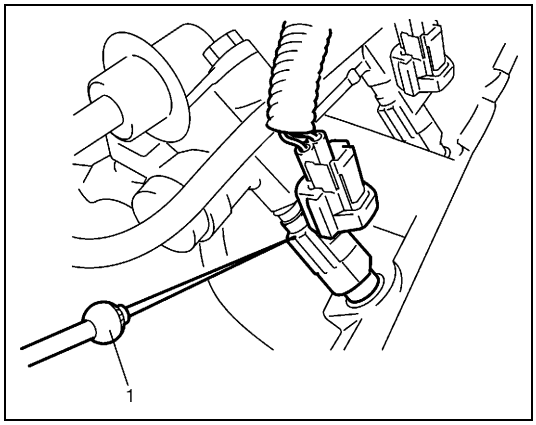

2) Remove A/C compressor relay (1), A/C condenser fan motor low speed relay (2), A/C condenser fan motor high speed relay No.1 (3) or A/C condenser fan motor high speed relay No.2 (4) from fuse/relay box (5).
3) Structure of A/C compressor relay or A/C condenser relay is the same as structure of main relay.
   Check relay resistance and operation according to the same procedure as main relay.
   If malfunction is found, replace.

## Fuel cut operation

### Inspection

**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.**

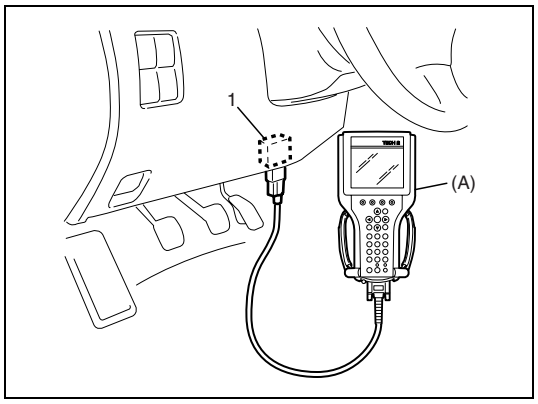



1) Warm up engine to normal operating temperature.
2) While listening to sound of injector by using sound scope (1) or such, increase engine speed to higher than 3,000 r/min.
3) Check to make sure that sound to indicate operation of injector stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to less than about 2,000 r/min.

# Emission Control System

## EGR system (if equipped)

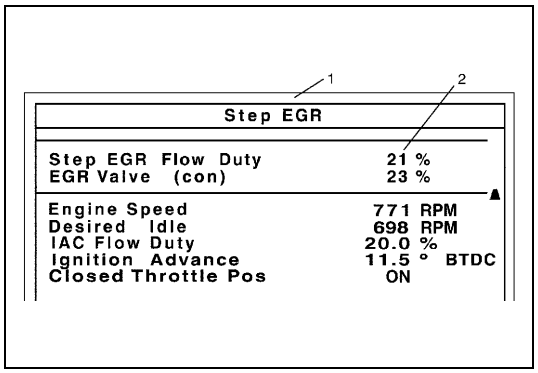
### EGR System Inspection (Using Suzuki Scan Tool)




1) Connect SUZUKI scan tool to data link connector (DLC) (1) with ignition switch OFF.

**Special tool**
**(A): SUZUKI scan tool**

2) Start engine and warm up it to normal operating temperature.

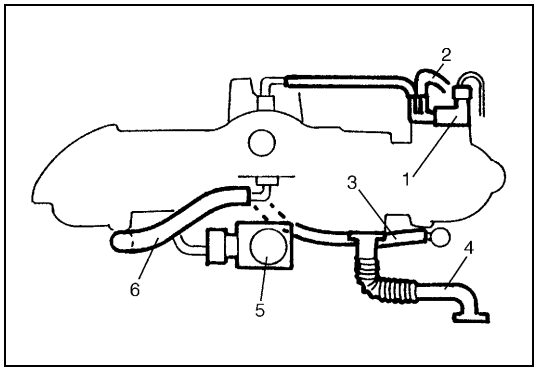



3) With engine idling (without depressing accelerator pedal), open EGR valve by using “MISC. TEST” mode.
In this state, according as EGR valve opening increases engine idle speed drops. If not, possible cause is clogged EGR gas passage, stuck or faulty EGR valve.

| |
|---|
| 1. SUZUKI scan tool display |
| 2. EGR valve opening (0: Close, 100: Full Open) |

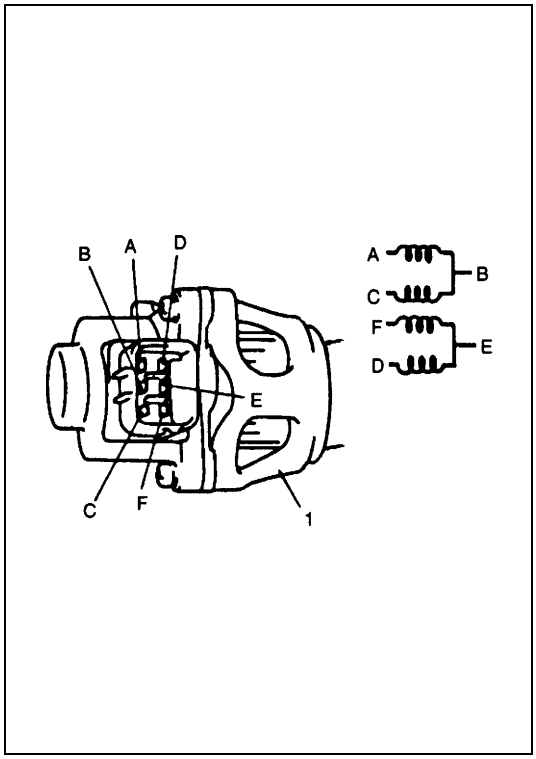
### Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect EGR valve coupler.
3) Remove wire harness bracket from intake collector.
4) Remove EGR valve (5) and gasket from intake collector.




| | |
|---|---|
| 1. EVAP canister purge valve | 4. EGR pipe |
| 2. EVAP canister purge valve hose | 6. PCV hose |
| 3. Breather hose | |

## Inspection




1) Check resistance between following terminals of EGR valve (1) in each pair.
   If found faulty, replace EGR valve assembly.

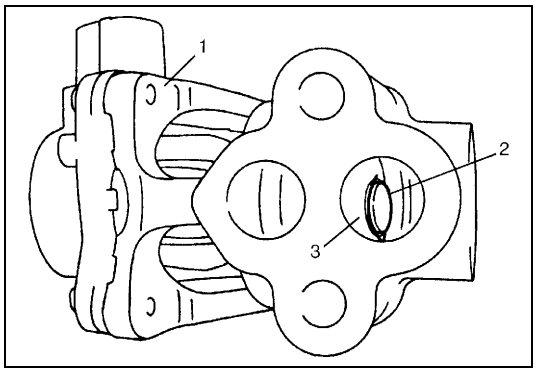
**EGR valve resistance**

| Terminals | Standard resistance |
|---|---|
| **A – B**<br>**C – B**<br>**F – E**<br>**D – E** | **20 – 24 Ω at 20°C (68°F)** |
| **B - valve body**<br>**E - valve body** | **infinity (∞)** |

2) Remove carbon from EGR valve gas passage.

**NOTE:**

**Do not use any sharp-edged tool to remove carbon.**
**Be careful not to damage or bend EGR valve, valve seat and rod.**




3) Inspect valve (2), valve seat (3) and rod for fault, cracks, bend or other damage.
   If found faulty, replace EGR valve assembly (1).

## Installation

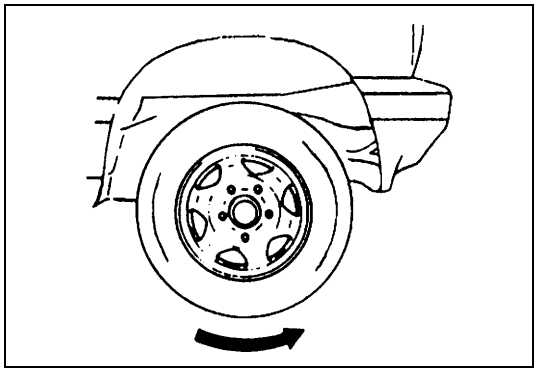
Reverse removal procedure noting the followings.

- Clean mating surface of valve and intake manifold.
- Use new gasket.

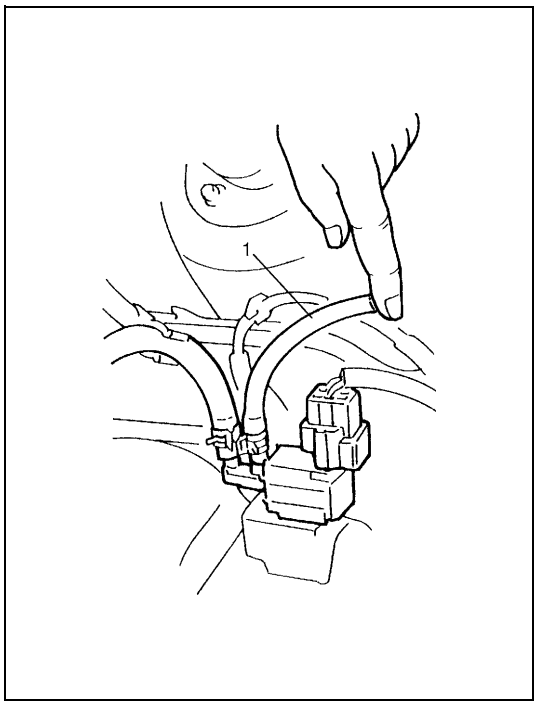
## Evap canister purge system

### Inspection

1) Warm up engine to normal operating temperature.



2) Hoist vehicle so that all wheels rotate freely.
3) Set M/T in “Neutral” or A/T in “P” position and parking brake.



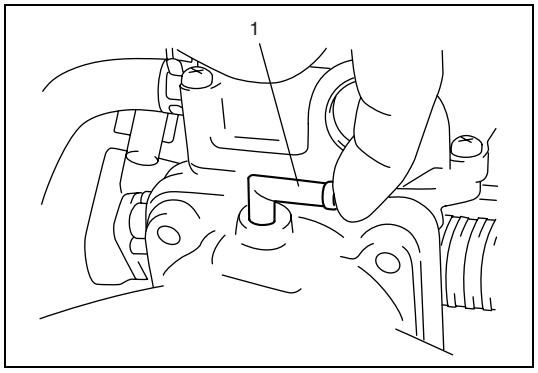

4) Disconnect purge hose (1) from EVAP canister.
5) Place finger against the end of disconnected hose (1) and check that vacuum is not felt there when engine is running at idle speed.
6) Release parking brake lever, set transfer in “2H” and M/T in “1st” or A/T in “L”.

**WARNING:**
**Make sure that transfer is set to “2H” range position for this check. If it is set to “4H” or “4L” position, front and rear wheels turn at high speed and a very dangerous situation may occur.**

7) Also check that vacuum is felt when engine speed is increased to higher than about 1,500 r/min. and keep it for 3 min. or more. If check result is not described in steps 5) and 7), check EVAP canister purge valve, wire harness and vacuum passage.

## Vacuum passage

### Inspection




Start engine and run it at idle speed. With finger placed against vacuum nozzle (1), check that vacuum is applied.
If it is not applied, clean vacuum passage by blowing compressed air.

## Vacuum hose

### Inspection

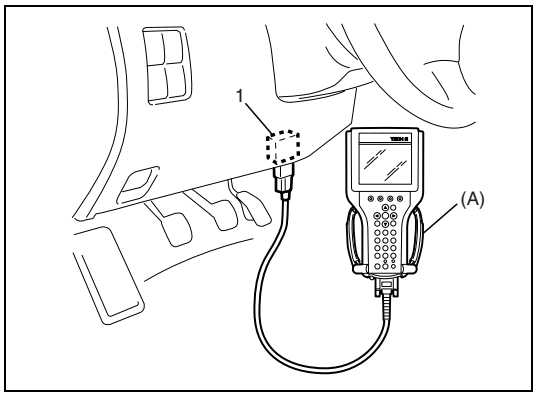
Check hoses for connection, leakage, clog and deterioration. Replace as necessary.

## Evap canister purge valve and its circuit

### Inspection

**WARNING:**
**Do not apply vacuum by mouth; otherwise harmful fuel vapor can be breathed in.**

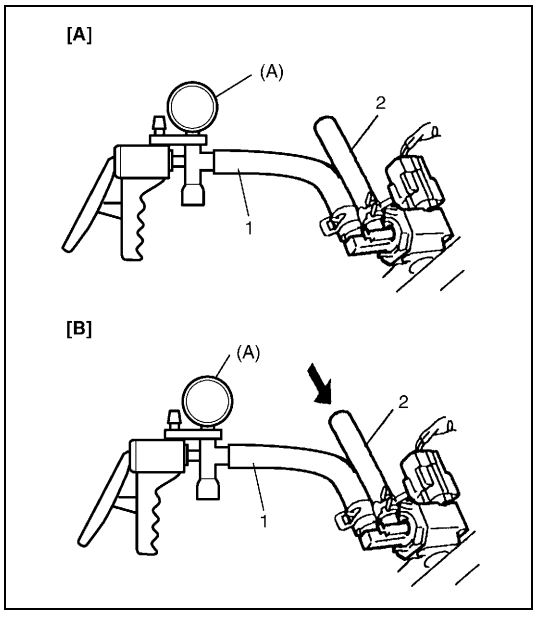
**CAUTION:**
**Do not apply vacuum more than –86 kPa (–12.47 Psi); otherwise EVAP canister purge valve could be damaged.**




1) Connect SUZUKI scan tool to DLC (1) with ignition switch OFF and disconnect vacuum hoses from each pipe.

**Special tool**
**(A): SUZUKI scan tool**

2) Turn ignition switch ON, clear DTC and select "MISC TEST" mode on SUZUKI scan tool.




3) Check purge valve for operation and vacuum passage for clog when valve is switched ON and OFF by using SUZUKI scan tool.
If check result is not satisfactory, check vacuum hoses, purge valve, wire harness and connections.

**EVAP canister purge valve**
**Valve OFF [A]: When vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) is applied to hose (1), vacuum should not be applied to hose (2).**
**Valve ON [B]: When vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) is applied to hose (1), vacuum should be applied to hose (2).**

**Special tool**
**(A): 09917-47911**

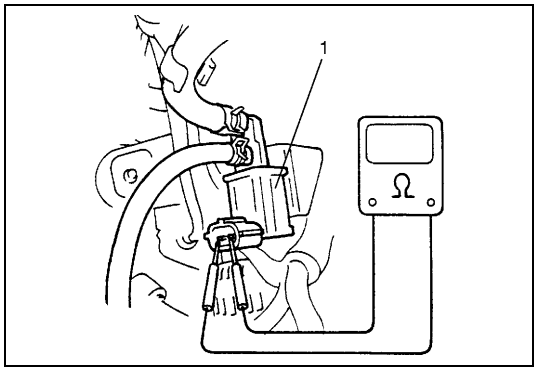
## Evap canister purge valve

### Inspection

**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.**

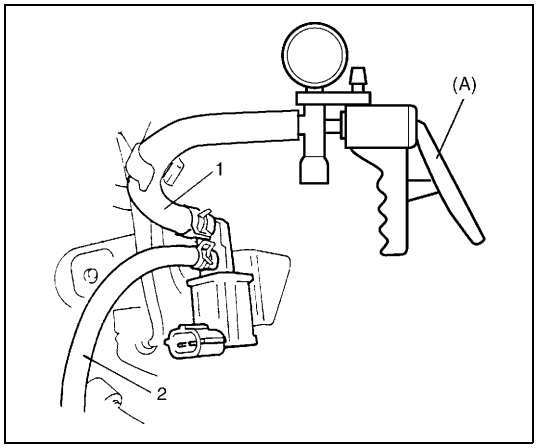
1) With ignition switch OFF, disconnect coupler from canister purge valve.




2) Check resistance between two terminals of EVAP canister purge valve (1).
   If resistance is as specified, proceed to next operation check.
   If not, replace.

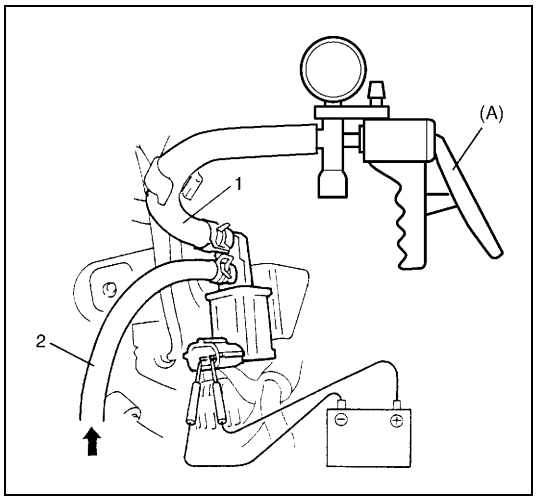
   **Resistance of EVAP canister purge valve**
   **28 – 35 Ω at 20°C (68°F)**

3) Disconnect vacuum hoses from intake manifold and EVAP canister.




4) Apply vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (1) using a special tool. Check that vacuum can not be applied to hose (2).
   If check result is not satisfactory, replace EVAP canister purge valve.

   **Special tool**
   **(A): 09917-47911**




5) Connect 12 V-battery to EVAP canister purge valve terminals. In this state, apply vacuum (–53 kPa (–7.69 Psi) to –67 kPa (–9.72 Psi)) to hose (1) using a special tool.
Check that vacuum can be applied to hose (2).
If check result is not satisfactory, replace EVAP canister purge valve.

**WARNING:**
**DO NOT SUCK the air through valve. Fuel vapor inside valve is harmful.**

**Special tool**
**(A): 09917-47911**

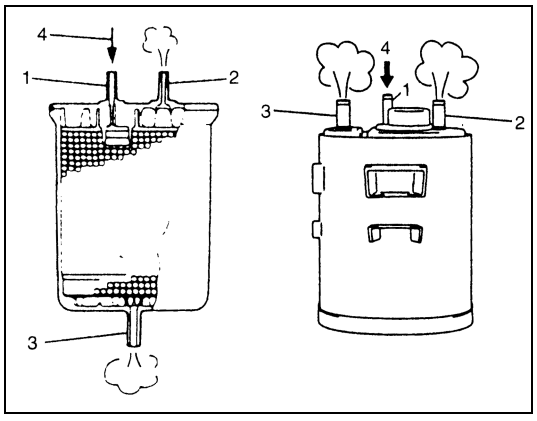
6) Connect vacuum hoses.
7) Connect EVAP canister purge valve coupler securely.

## EVAP canister

### Inspection

**WARNING:**
**DO NOT SUCK nozzles on EVAP canister. Fuel vapor inside EVAP canister is harmful.**

1) Disconnect vacuum hoses from EVAP canister and remove EVAP canister.




2) When air is blown into tank pipe (1), there should be no restriction of flow through purge pipe (2) and air pipe (3).
If operation differs from above description, EVAP canister must be replaced.

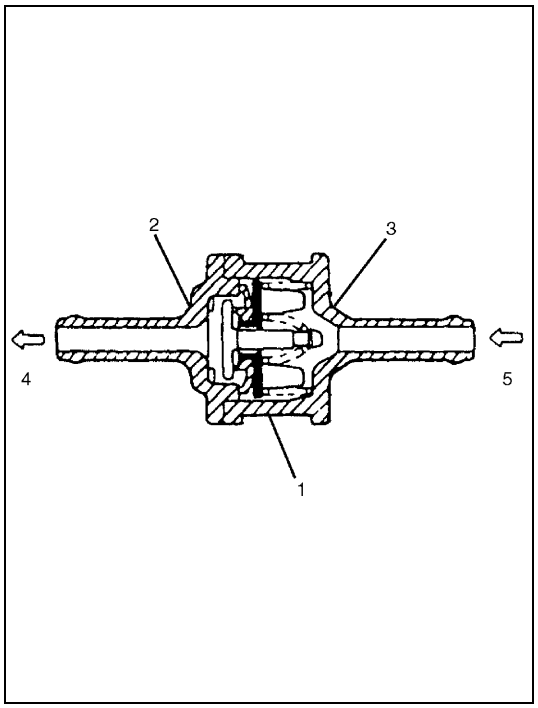
4. Blow air

3) Install EVAP canister and connect hoses to canister.

## Tank pressure control valve

### Inspection

1) Remove tank pressure control valve installed around EVAP canister.




2) Air should pass through valve smoothly from black side (3) of tank pressure control valve (1) to orange side (2) when blown hard.
3) From orange side, even when blown softly, air should come out of black side.
4) If air doesn't pass through valve in Step 2) or hard blow is required in Step 3), replace tank pressure control valve.

**WARNING:**
**DO NOT SUCK air through tank pressure control valve. Fuel vapor inside the valve is harmful.**

5) Plug orange nozzle and apply 26 kPa (20 cmHg) vacuum to black nozzle. Check that vacuum is held at that level (there is no leakage).
   If vacuum leaks, replace.

| | |
|---|---|
| 4. | To canister |
| 5. | From fuel tank |

6) Install tank pressure control valve.

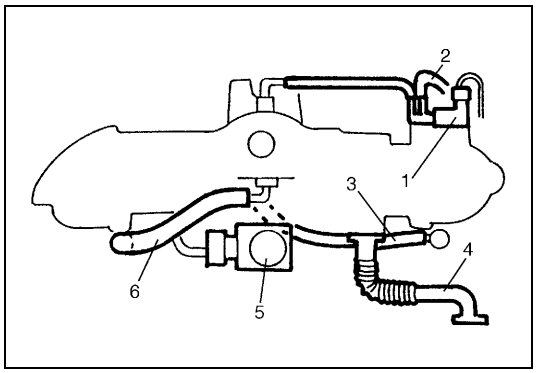
# PCV System

**NOTE:**

**Be sure to check that there is no obstruction in PCV valve or its hoses before checking engine idle speed/IAC duty for obstructed PCV valve or hose hampers its accurate checking.**

## PCV hose

### Inspection




Check hoses for connection, leakage, clog, and deterioration. Replace as necessary.

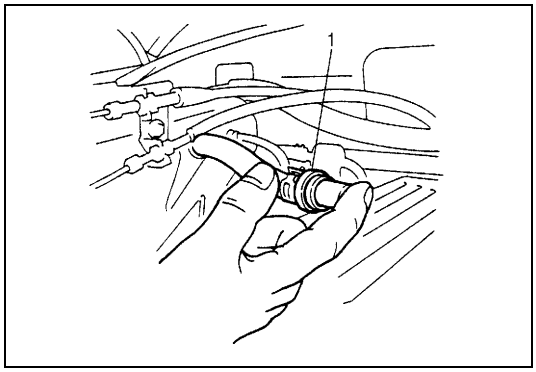
| | |
|---|---|
| 1. EVAP canister purge valve | 4. EGR pipe |
| 2. EVAP canister purge valve hose | 5. EGR valve |
| 3. Breather hose | 6. PCV hose |

## PCV valve

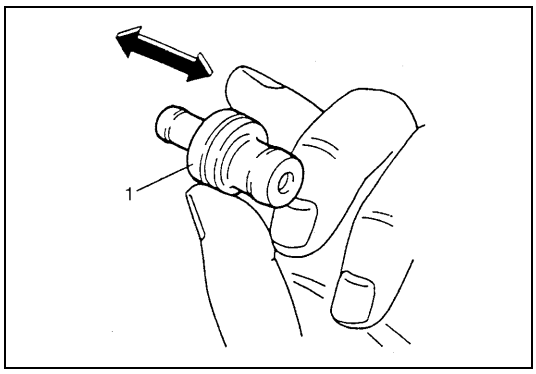
### Inspection

### Type A

1) Disconnect PCV valve from cylinder head cover and plug head cover hole.
2) Run engine at idle.



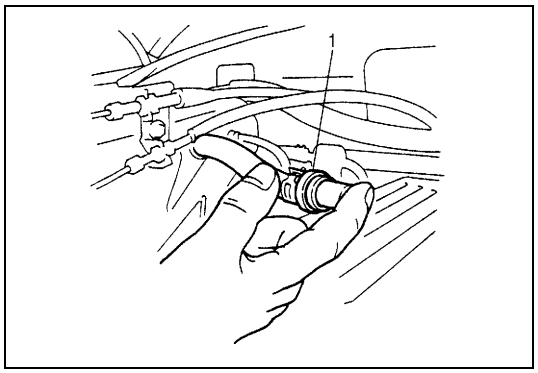

3) Place your finger over end of PCV valve (1) to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.



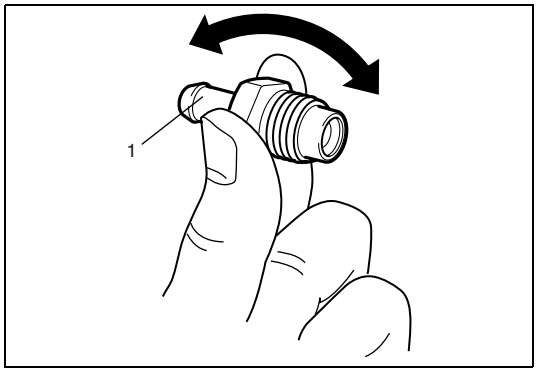

4) After checking vacuum, stop engine and remove PCV valve (1). Shake valve and listen for the rattle of check needle inside the valve (1). If valve does not rattle, replace.
5) After checking, connect PCV valve (1), PCV hose and clamp securely.

**Type B**

1) Disconnect PCV valve hose from PCV valve.
2) Remove PCV valve from cylinder head cover.




3) Connect PCV valve (1) to PCV hose and plug head cover hole.
4) Run engine at idle.
5) Place your finger on the hole of PCV valve (1) to check for vacuum. If there is no vacuum, check for clogged valve. Replace as necessary.




6) After checking vacuum, stop engine and remove PCV valve (1). Shake valve and listen for the rattle of check needle inside the valve. If valve does not rattle, replace.

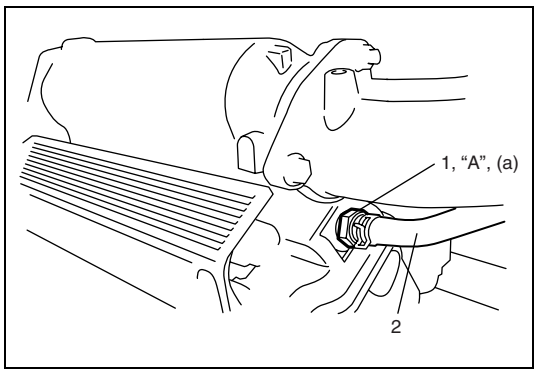
7) After inspection, remove plug from head cover hole.
8) Apply sealant to thread part of PCV valve (1).

**"A": Water tight sealant 99000-31250**

9) Install PCV valve (1) onto cylinder head cover.

**Tightening torque**
**PCV valve (a): 27 N·m (2.7 kg-m, 19.5 lb-ft)**

10) Connect PCV hose (2) to PCV valve.



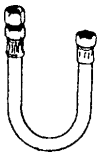
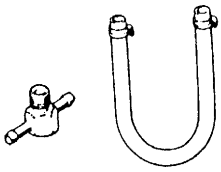
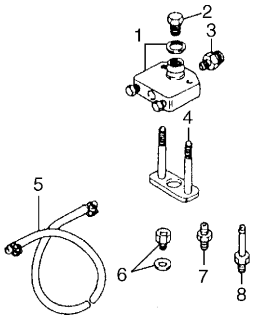
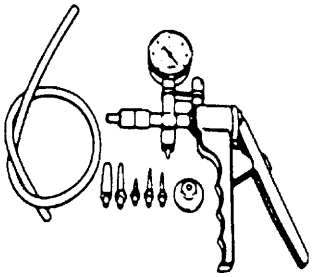
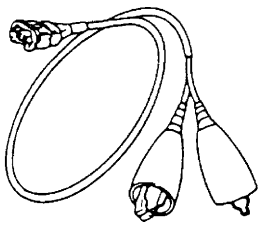
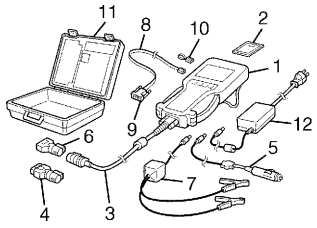
# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Heated oxygen sensor | 45 | 4.5 | 32.5 |
| Fuel pressure regulator bolt | 11 | 1.1 | 8.0 |
| Fuel feed pipe union bolt | 30 | 3.0 | 22.0 |
| Engine coolant temp. sensor | 15 | 1.5 | 11.0 |
| TP sensor screw | 3.5 | 0.35 | 2.5 |
| IAC valve screw | 3.5 | 0.35 | 2.5 |
| Delivery pipe bolt | 25 | 2.5 | 18.5 |
| Fuel connect pipe union bolt | 30 | 3.0 | 22.0 |
| PCV valve | 27 | 2.7 | 19.5 |

# Required Service Material

| Material | Recommended SUZUKI product | Use |
|---|---|---|
| Sealant | SUZUKI BOND NO. 1207F (99000-31250) | PCV valve |

# Special Tool

| | | | |
|---|---|---|---|
|  09912-58442 Pressure gauge |  09912-58432 Pressure hose |  09912-58490 3-way joint & hose |   09912-58421 Checking tool set (See NOTE “A”.) |
|  09917-47911 Vacuum pump gauge |  09930-88521 Injector test lead |   Tech 2 kit (SUZUKI scan tool) (See NOTE “B”.) | |

**NOTE:**

- **"A": This kit includes the following items.**
  **1. Tool body & washer, 2. Body plug, 3. Body attachment-1, 4. Holder**
  **5. Return hose & clamp, 6. Body attachment-2 & washer, 7. Hose attachment-1**
  **8. Hose attachment-2**
- **"B": This kit includes the following items and substitutes for the Tech 1 kit.**
  **1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable,**
  **6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter,**
  **10. RS232 loopback connector, 11. Storage case, 12. Power supply**

# SECTION 6F2



# IGNITION SYSTEM (H27 ENGINE)

**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.**
- **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).**

**NOTE:**

**Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this manual. Especially, service information for H27 engine model TYPE A and TYPE B is provided in this section. To distinguish between Type A and Type B, refer to the foreword of this service manual.**

## CONTENTS

**General Description ..... 6F2-2**
Components ..... 6F2-2
System Wiring ..... 6F2-3
**Diagnosis ..... 6F2-3**
Diagnostic Flow Table ..... 6F2-4
**On-Vehicle Service ..... 6F2-5**
Ignition Spark Check ..... 6F2-5
Ignition Timing Check and Adjustment ..... 6F2-5
Ignition Coil Assembly (Igniter and Ignition Coil) ..... 6F2-7
Spark Plug ..... 6F2-8
CMP Sensor ..... 6F2-10
Noise Suppressor ..... 6F2-12
**Tightening Torque Specification ..... 6F2-13**
**Special Tool ..... 6F2-13**

# General Description

The ignition system is a direct ignition system. It consists of the parts as described below and has an electronic ignition control system.

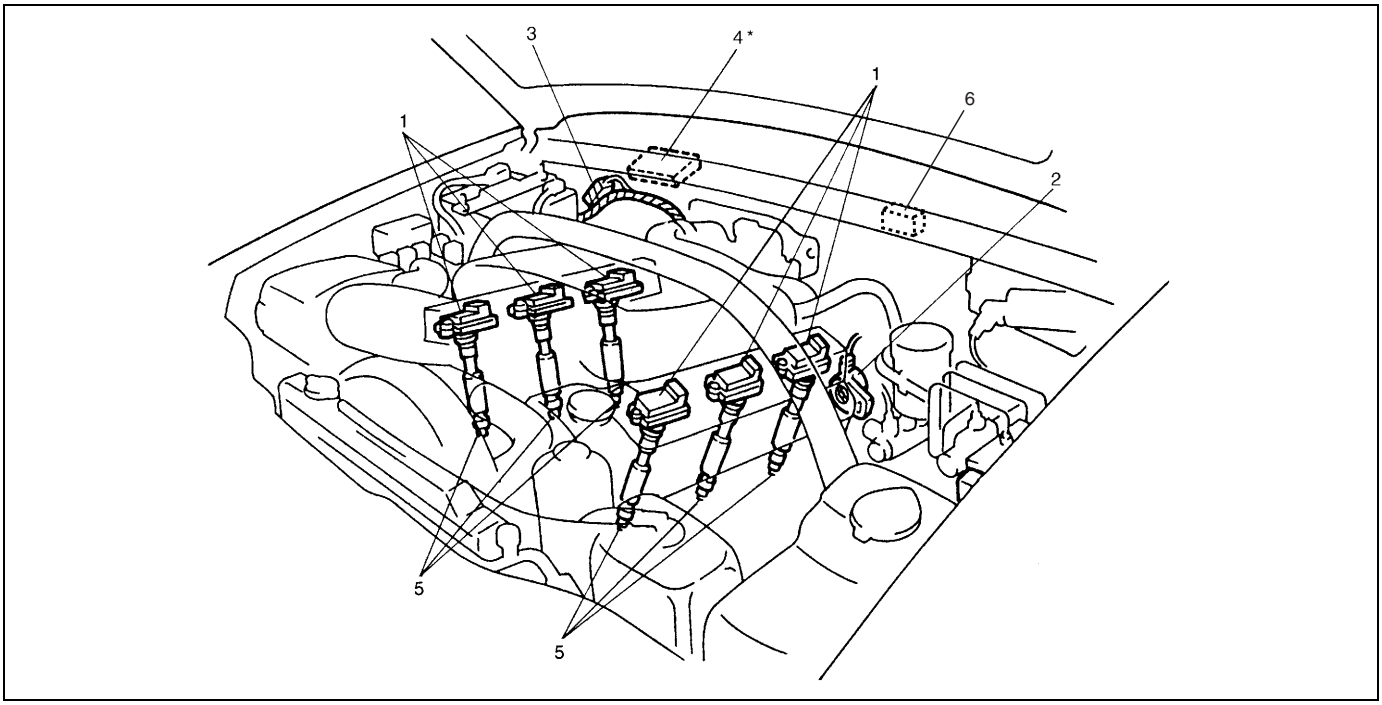
- ECM (or PCM)
  It detects the engine condition through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the igniter (in ignition coil assembly).
- Ignition coil assembly (including an igniter and an ignition coil)
  The ignition coil assembly has a built-in igniter and ignition coil which turns ON and OFF the primary current of the ignition coil according to the signal from ECM (or PCM). When the ignition coil primary current is turned OFF, a high voltage is induced in the secondary wiring. One ignition coil is in charge of ignition of one cylinder only.
- Spark plug and noise suppressor
- CMP sensor, TP sensor, ECT sensor, IAT sensor, VSS, knock sensor and MAF sensor
  For their details, refer to "Electronic Control System" in Section 6E2.

This ignition system does not have a distributor and high-tension cords but each cylinder has an ignition coil assembly (igniter and ignition coil) and the secondary voltage which occurred in the ignition coil is sent to the spark plug directly. Also, the signal(s) are sent from the CMP sensor to ECM (or PCM) so as to control each ignition coil independently through the igniter (in ignition coil assembly).

## Components

**NOTE:**

**For other components not found in this figure, refer to "Electronic Control System" in Section 6E2.**




| | | |
|---|---|---|
| 1. Ignition coil assembly (igniter and ignition coil) | 3. Noise suppressor | 5. Spark plug |
| 2. CMP sensor | 4. ECM (or PCM) (*) | 6. Diagnosis connector |

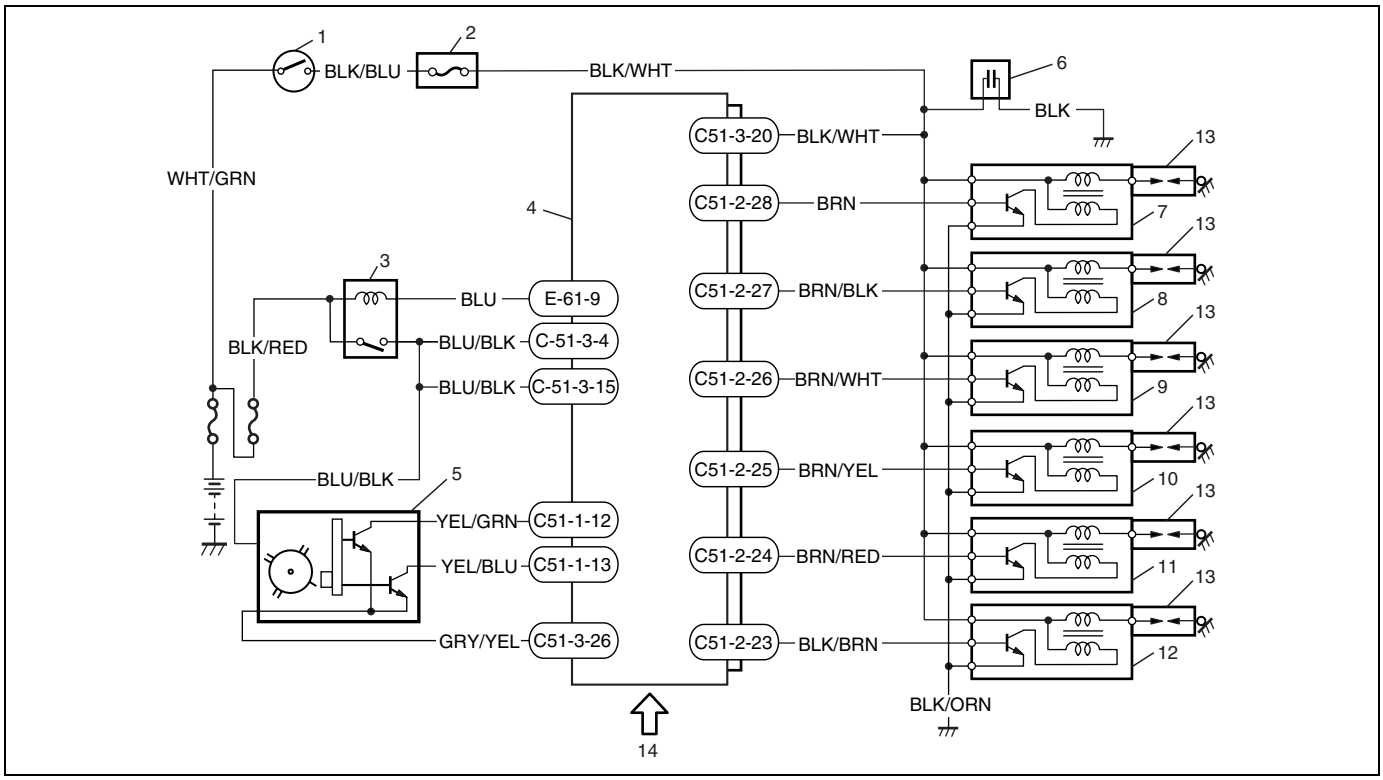
**NOTE:**

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

## System Wiring

**NOTE:**

**For ECM (or PCM) terminal assignment, refer to "Electronic Control System" in Section 6E2.**



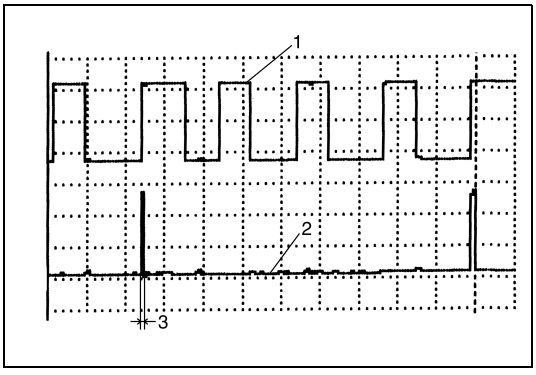

| | |
|---|---|
| 1. Ignition switch | 8. Ignition coil assembly (for No.2 cylinder) |
| 2. "IG COIL" fuse | 9. Ignition coil assembly (for No.3 cylinder) |
| 3. Main relay | 10. Ignition coil assembly (for No.4 cylinder) |
| 4. ECM (or PCM) | 11. Ignition coil assembly (for No.5 cylinder) |
| 5. CMP sensor | 12. Ignition coil assembly (for No.6 cylinder) |
| 6. Noise suppressor | 13. Spark plug |
| 7. Ignition coil assembly (for No.1 cylinder) | 14. Sensed information (MAF sensor, ECT sensor, IAT sensor, TP sensor, CKP sensor, Engine start switch, VSS) |

# Diagnosis

| Condition | Possible Cause | Correction |
|---|---|---|
| **Engine cranks, but does not start or hard to start (No spark)** | Blown fuse for ignition coil assembly | Replace. |
| | Loose connection or disconnection of lead wire | Connect securely. |
| | Faulty spark plug (s) | Replace. |
| | Faulty ignition coil assembly (s) | Replace. |
| | Faulty CMP sensor | Replace. |
| | Faulty ECM (or PCM) | Replace. |
| | Incorrect ignition timing | Adjust. |
| **Poor fuel economy or engine performance** | Incorrect ignition timing | Adjust. |
| | Faulty spark plug(s) | Replace. |
| | Faulty ignition coil assembly (s) | Replace. |
| | Faulty CMP sensor | Replace. |
| | Faulty ECM (or PCM) | Replace. |
| | Faulty knock sensor | Replace. |

## Diagnostic Flow Table

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “Engine Diagnostic Flow Table” in Section 6-1 (Type A) or 6-2 (Type B) performed? | Go to Step 2. | Go to “Engine Diagnostic Flow Table” in Section 6-1 (Type A) or 6-2 (Type B). |
| 2 | Ignition Spark Test<br>1) Check all spark plug for condition and type, referring to “Spark Plug” in this section.<br>2) If OK, perform ignition spark test, referring to “Ignition Spark Check” in this section.<br>Is spark emitted from all spark plugs? | Go to Step 8. | Go to Step 3. |
| 3 | Diagnostic Trouble Code (DTC) Check<br>1) Check DTC stored in ECM (or PCM), referring to “Diagnostic Trouble Code (DTC) Check” in Section 6-1 (Type A) or 6-2 (Type B).<br>Is DTC stored? | Go to applicable flow table corresponding to that code No. in Section 6-1 (Type A) or 6-2 (Type B). | Go to Step 4. |
| 4 | Electrical Connection Check<br>1) Check ignition coil assemblies for electrical connection.<br>Are they connected securely? | Go to Step 5. | Connect securely. |
| 5 | Ignition Coil Assembly Power Supply, Ground and Trigger Signal Circuits Check<br>1) Check these circuits for open and short.<br>Are circuits in good condition? | Go to Step 6. | Repair or replace. |
| 6 | Ignition Coil Assembly Check<br>1) Substitute a known-good ignition coil assembly and then repeat Step 2.<br>Is check result of Step 2 satisfactory? | Malfunction of ignition coil assembly. | Go to Step 7. |
| 7 | CMP Sensor Check<br>1) Check CMP sensor.<br>Refer to “Camshaft Position Sensor” in Section 6E2.<br>Is check result satisfactory? | Substitute a known-good ECM (or PCM) and then repeat Step 2. | Tighten CMP sensor bolt or replace CMP sensor. |
| 8 | Ignition Timing Check<br>1) Check initial ignition timing and ignition timing advance, referring to “Ignition Timing Check and Adjustment” in this section.<br>Is check result satisfactory? | System is in good condition. | Adjust ignition timing or check ECM (or PCM) input signals related to this system. |




**Reference**

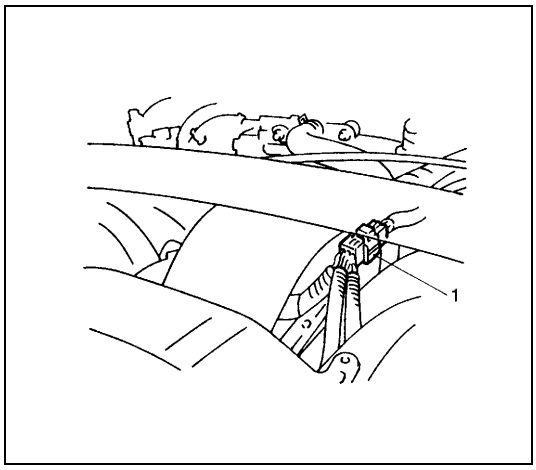
Oscilloscope waveforms of CMP sensor REF signal and No.1 ignition trigger signal are as shown in figure when connecting oscilloscope between terminal C51-1-13 of ECM (or PCM) connector connected to ECM (or PCM) and ground, and between terminal C51-2-28 and ground.

| |
|---|
| 1. REF signal of CMP sensor |
| 2. No.1 ignition trigger signal |
| 3. Primary coil current flow time |

# On-Vehicle Service

## Ignition Spark Check

**WARNING:**
**Without disconnection of injector coupler, combustible gas may come out from spark plug holes during this test and may get ignited in engine room.**



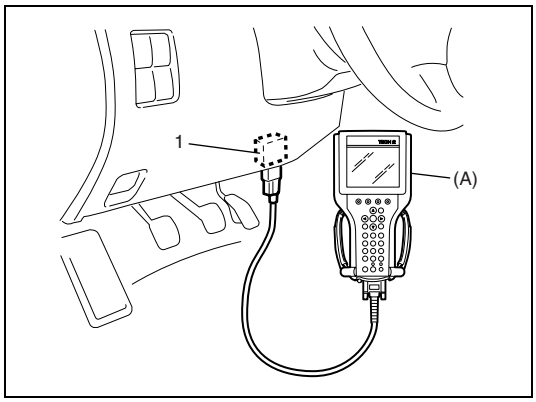

1) Remove surge tank cover.
2) Disconnect injector coupler (1).
3) Remove spark plug and check it for condition and type, referring to "Spark Plug" in this section.
4) If OK, connect ignition coil coupler to ignition coil assembly and connect spark plug to ignition coil assembly. Ground spark plug.
5) Crank engine and check if each spark plug sparks.
   If no spark is emitted, inspect the related parts as described under "Diagnosis" in this section.
6) After checking, install spark plug, referring to "Spark Plug" in this section.
7) Connect injector coupler (1).
8) Install surge tank cover.

## Ignition Timing Check and Adjustment

**NOTE:**

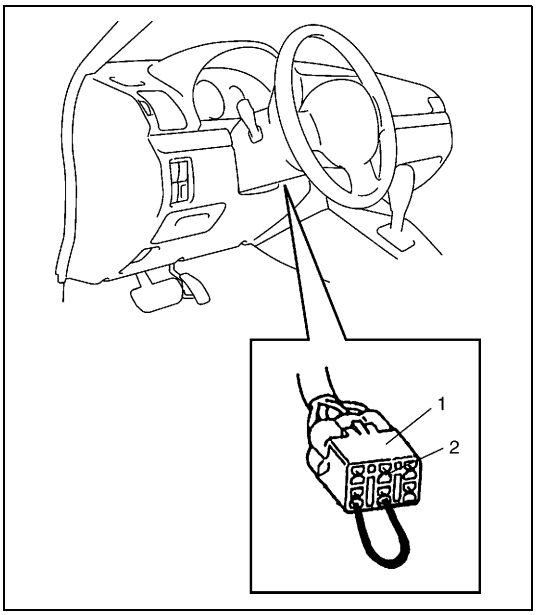
**Before starting engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake.**

1) Start engine and warm it up to normal operating temperature.
2) Make sure that all of electrical loads except ignition are switched off.
3) Check to be sure that idle speed is within specification referring to "Idle Speed/Idle Air Control (IAC) Duty Inspection" in Section 6E2.



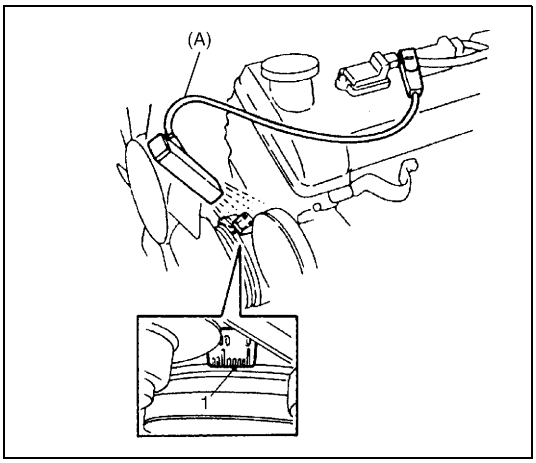

4) [Using SUZUKI scan tool]
   Connect SUZUKI scan tool to DLC (1) with ignition switch OFF, restart engine and fix ignition timing by using fixed spark mode of SUZUKI scan tool.

**Special tool**
**(A): SUZUKI scan tool**




[Not using SUZUKI scan tool]
Ground test switch terminal (2) in diagnosis connector (1) by using service wire so that ignition timing is fixed on initial one.

5) Remove ignition coil cover and set timing light to ignition harness for No.1 cylinder.



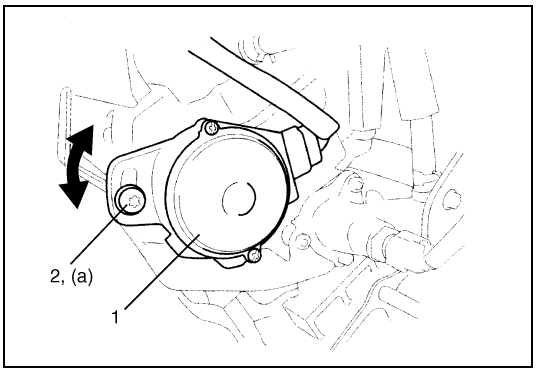

6) Using timing light, check that timing observed from viewpoint is within specification.

**Initial ignition timing of viewpoint (when it is fixed by SUZUKI scan tool or test switch terminal): 5 ± 1° BTDC**

**Ignition order: 1-6-5-4-3-2**

**Special tool**
**(A): 09930-76420**

1. Timing mark on crankshaft pulley




7) If ignition timing is out of specification, loosen CMP sensor bolt (2), adjust timing by turning CMP sensor (1) while engine is running, and then tighten CMP sensor bolt.

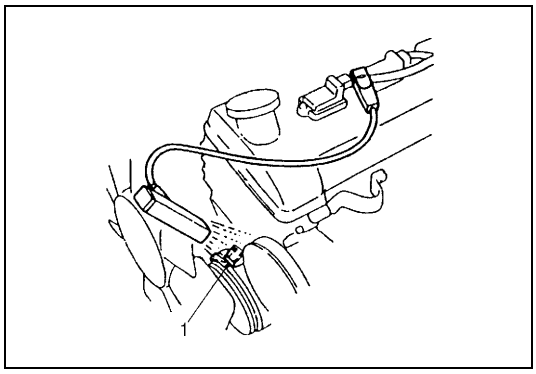
**Tightening torque**
**CMP sensor bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)**

8) After tightening bolt (2), recheck that ignition timing is within specification.

9) Install ignition coil cover.
10) After checking and/or adjusting, end fixed spark mode of SUZUKI scan tool or remove service wire from diagnosis connector.

**NOTE:**

**In this state, ignition timing may vary more or less of initial ignition timing but it is nothing abnormal.**



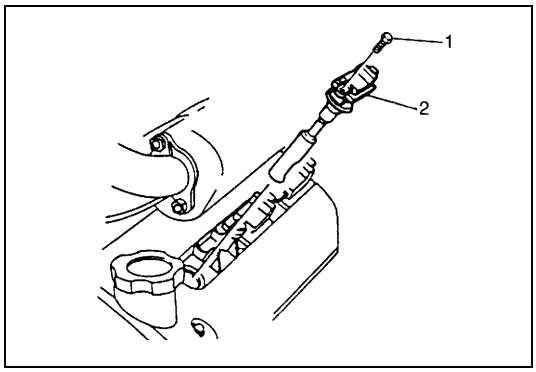

11) With engine idling (closed throttle position and vehicle stopped), check that ignition timing is about BTDC 12 – 16° (shown in the figure). Also, check that increasing engine speed advances ignition timing.
If above check results are not satisfactory, check input signals related to this system.

1. Timing mark on crankshaft pulley

## Ignition Coil Assembly (Igniter and Ignition Coil)

### Removal

1) Remove ignition coil cover.
2) Disconnect ignition coil coupler.




3) Remove ignition coil bolt (1), and then pull out ignition coil assembly (2).

### Inspection

Check ignition coil assembly for the following:

- Damage
- Deterioration
- Terminal for corrosion

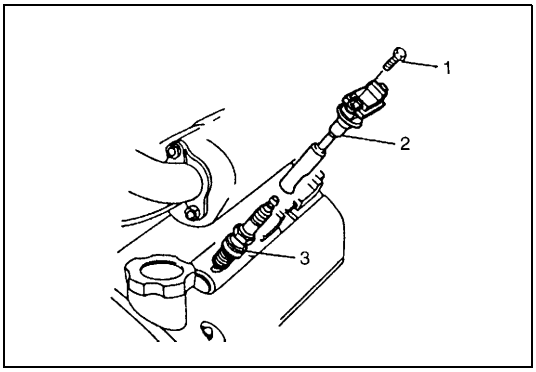
### Installation

Install in reverse order of removal.

## Spark Plug

### Removal

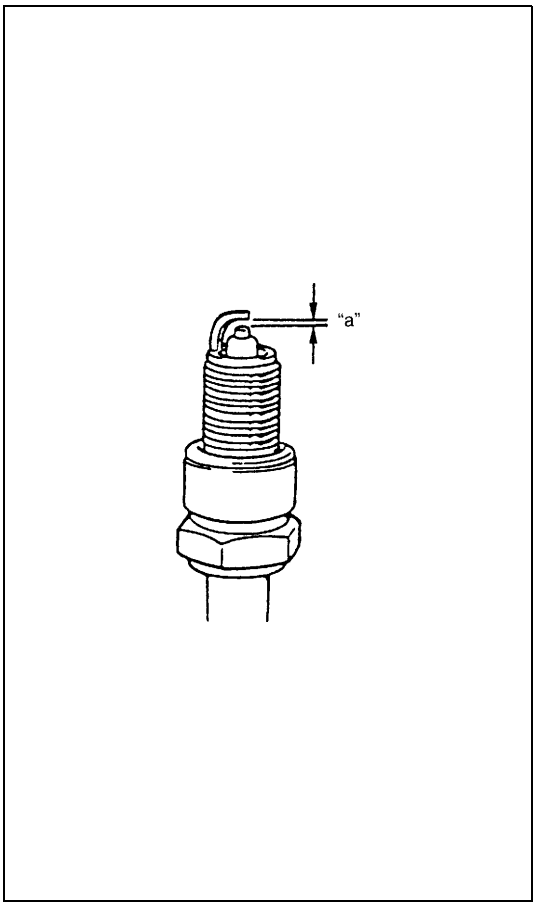
1) Remove ignition coil cover.
2) Disconnect ignition coil coupler.




3) Remove ignition coil bolt (1), and then pull out ignition coil assembly (2).
4) Remove spark plug (3).

### Inspection

**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.**

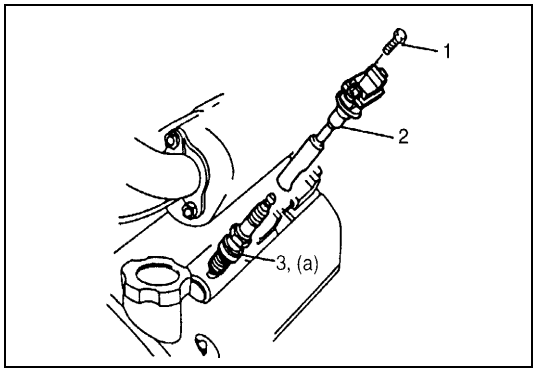



Inspect them for electrode wear, carbon deposits and Insulator damage.
If any abnormality is found, for nickel spark plugs, adjust air gap, clean with spark plug cleaner or replace them with specified new pugs.
For iridium/platinum spark plugs, replace them with new plugs.

**Spark plug air gap**
**"a": 1.0 – 1.1 mm (0.039 – 0.043 in.)**

**Spark plug type:**
**Type A**
**DENSO K20PR-U11 (Nickel spark plug)/SK16PR11 (Iridium spark plug)**
**NGK BKR6E-11 (Nickel spark plug)/*IFR5J11 (Iridium spark plug)**
**Type B**
**DENSO K20PR-U11 (Nickel spark plug)**
**NGK BKR6E-11 (Nickel spark plug)/*IFR6J11 (Iridium spark plug)**

**NOTE:**
**Under –25°C (–13°F), it is highly recommended to use the spark plugs with an asterisk (*) for better engine starting performance.**




## Installation

1) Install spark plugs (3) and tighten them to specified torque.

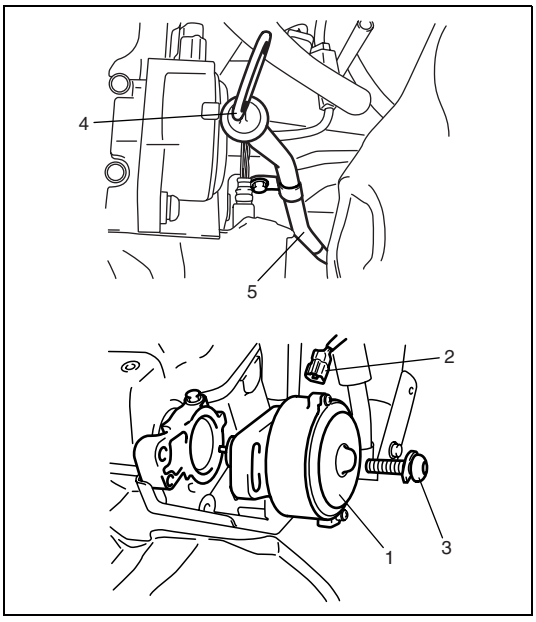
**Tightening torque**
**Spark plug (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)**

2) Install ignition coil assemblies (2) securely.
3) Tighten ignition coil bolt (1), and then connect ignition coil coupler.
4) Install ignition coil cover.

## CMP Sensor

**CAUTION:**
**Disassembly of CMP sensor is prohibited. If anything faulty is found, replace it as an assembly unit with new one.**

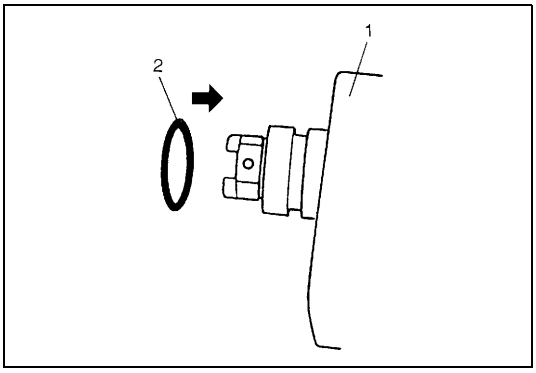
### Removal



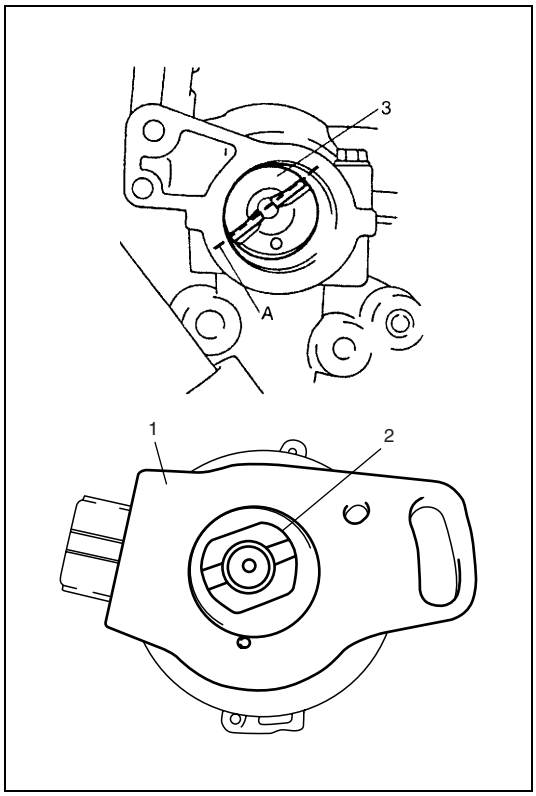

1) Disconnect CMP sensor coupler (2).
2) Remove A/T fluid level gauge (4) and filler tube (5).
3) Remove CMP sensor (1) by removing CMP sensor bolt (3).

### Installation

**NOTE:**
**After installing CMP sensor, adjust ignition timing referring to "Ignition Timing Check and Adjustment" in this section.**




1) Install a new O-ring (2) with engine oil applied to CMP sensor (1).

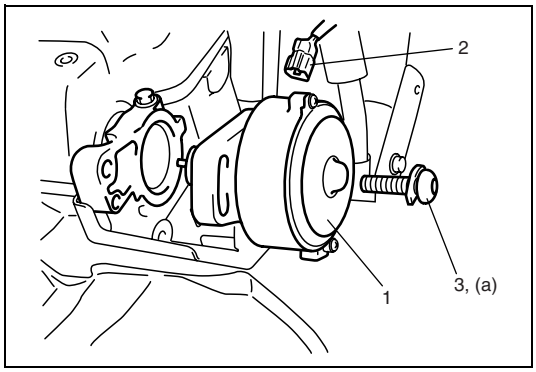



2) Install CMP sensor (1) to camshaft (3).

**NOTE:**

**Fit the dog of CMP sensor coupling (2) into the slots of camshaft (3) when installing. The dogs of CMP sensor coupling (2) are offset. Therefore, if the dogs can not be fitted into the slots, turn the CMP sensor shaft by 180 degree and try again.**

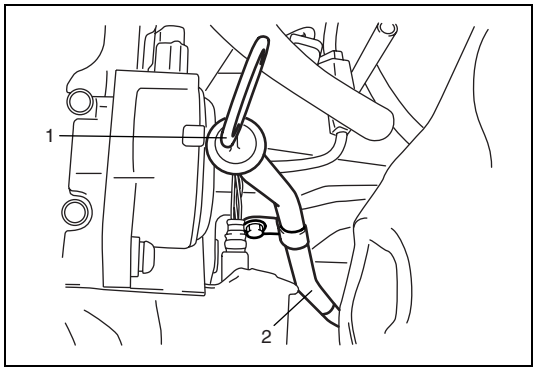
| A: Slot offset |
|---|




3) Tighten CMP sensor bolt (3).

**Tightening torque**
**CMP sensor bolt (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)**

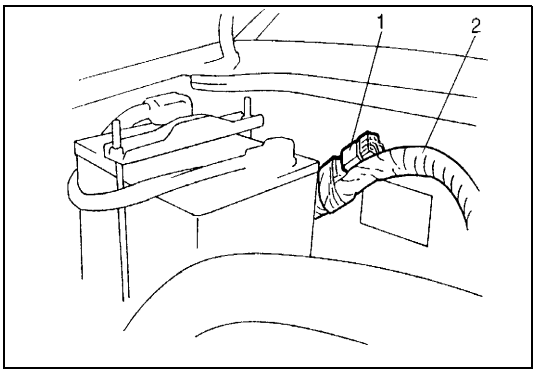
4) Connect CMP sensor coupler (2) to CMP sensor (1).




5) Install A/T fluid level gauge (1) and filler tube (2).

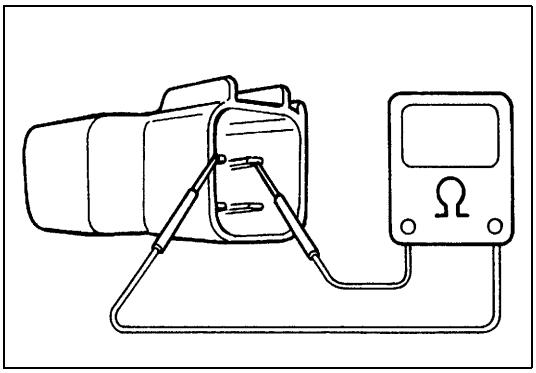
## Noise Suppressor

### Removal




1) Disconnect coupler of noise suppressor (1).
2) Remove noise suppressor (1) from harness (2).

### Inspection




Using ohmmeter, check to be sure that capacitor (condenser) in noise suppressor is not conductive.
If check result is not satisfactory, replace noise suppressor.

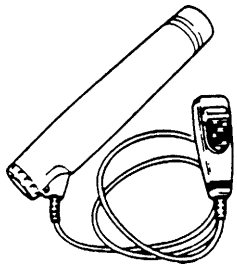
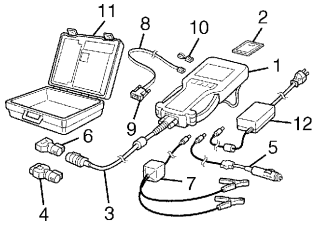
### Installation

For installation, reverse removal procedure.

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Spark plug | 25 | 2.5 | 18.0 |
| CMP sensor bolt | 15 | 1.5 | 11.0 |

# Special Tool

| | |
|---|---|
|  |  |
| 09930-76420<br>Timing light (Dry cell type) | Tech 2 kit (SUZUKI scan tool) (See NOTE.) |

**NOTE:**

**This kit includes the following items.**

**1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loopback connector, 11. Storage case, 12. Power supply**

# SECTION 6K

# EXHAUST SYSTEM (H27 ENGINE)

**CAUTION:**

**Be sure to use UNLEADED FUEL for the catalytic converter equipped vehicle. Use of LEADED FUEL will affect performance of the catalytic converter adversely to a great extent.**



**NOTE:**

- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this manual. Especially, service information for H27 engine model TYPE A and TYPE B is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**
- **For the items with asterisk (*) in the "CONTENTS" below, refer to the same section if the Service Manual mentioned in "FOREWORD" of this manual.**

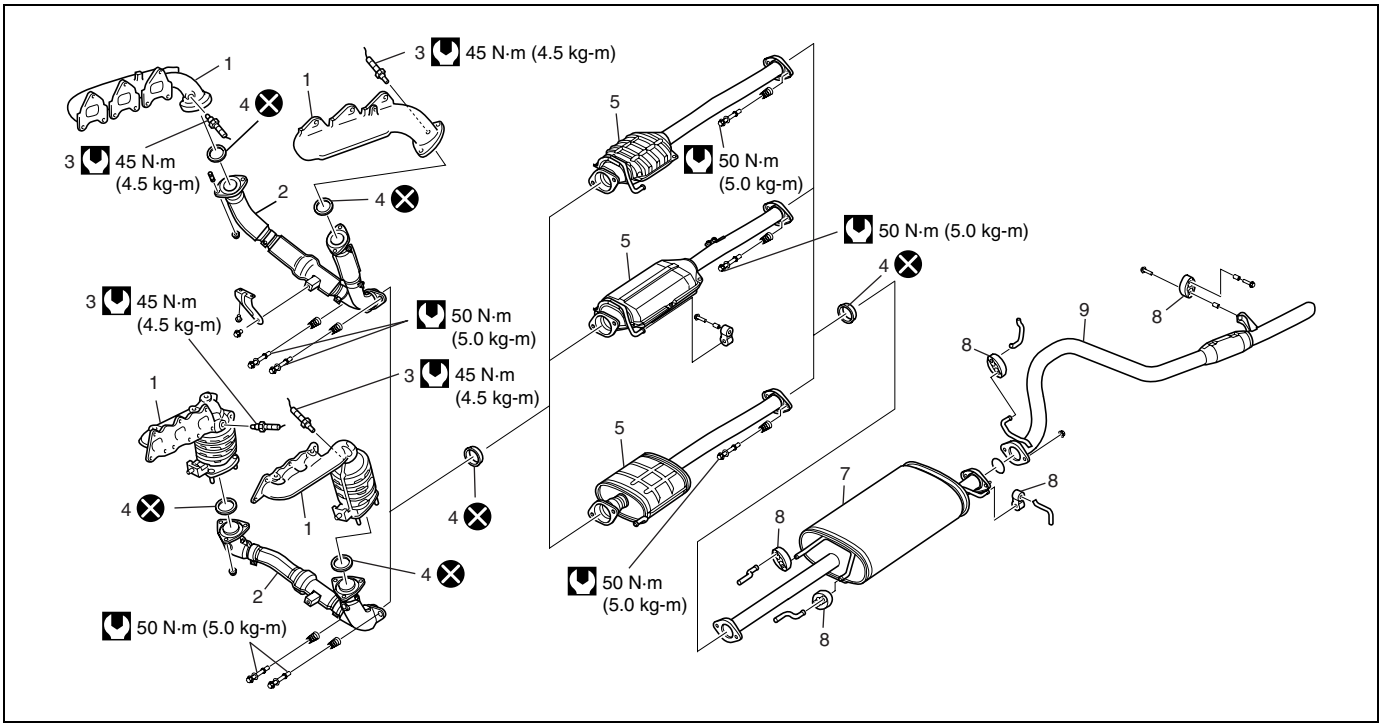
## CONTENTS

**General Description .....6K-2**
Components .....6K-2
For type A .....6K-2
For type B .....6K-3
**Maintenance ..... ***
**On-Vehicle Service ..... ***
Exhaust Manifold ..... *
Muffler ..... *

# General Description

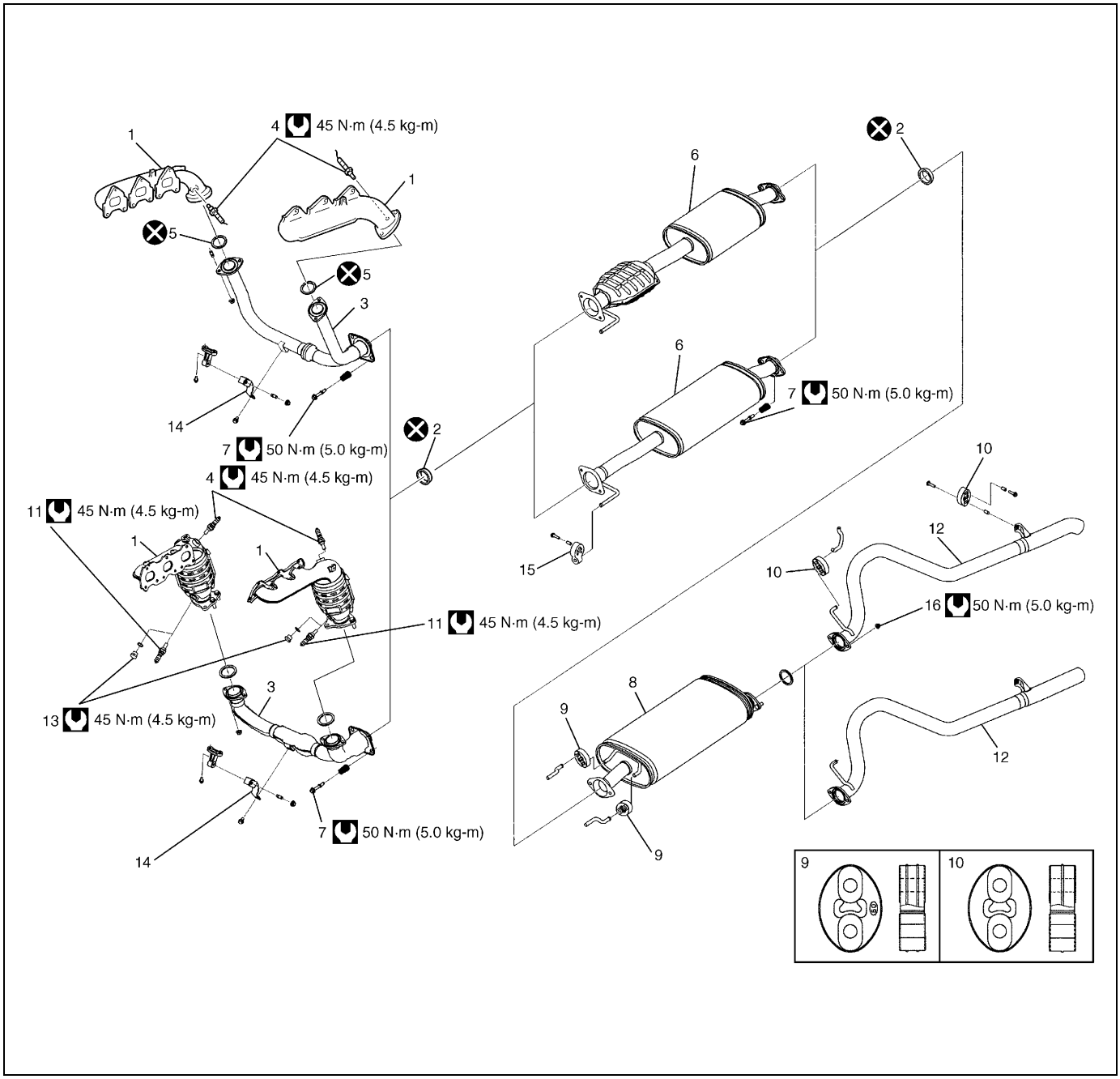
## Components

### For type A




| | | | |
|---|---|---|---|
| 1. Exhaust manifold | 4. Gasket | 7. Muffler | Tightening Torque |
| 2. Exhaust No.1 pipe | 5. Exhaust No.2 pipe | 8. Rubber mounting | Do not reuse. |
| 3. Heated oxygen sensor | 6. Blank | 9. Muffler tail pipe | |

## For type B




| | | |
|---|---|---|
| 1. Exhaust manifold | 7. Exhaust pipe bolt | 13. Muffler tail pipe |
| 2. Seal ring | 8. Muffler | 14. Exhaust pipe stiffener |
| 3. Exhaust No.1 pipe | 9. Mounting No.1 | 15. Mounting No.3 |
| 4. Heated oxygen sensor–1 | 10. Mounting No.2 | 16. Muffler nut |
| 5. Exhaust pipe gasket | 11. Heated oxygen sensor–2 | Tightening Torque |
| 6. Exhaust No.2 pipe | 12. Plug | Do not reuse. |

# SECTION 6K1

# EXHAUST SYSTEM (RHW ENGINE)



## CONTENTS

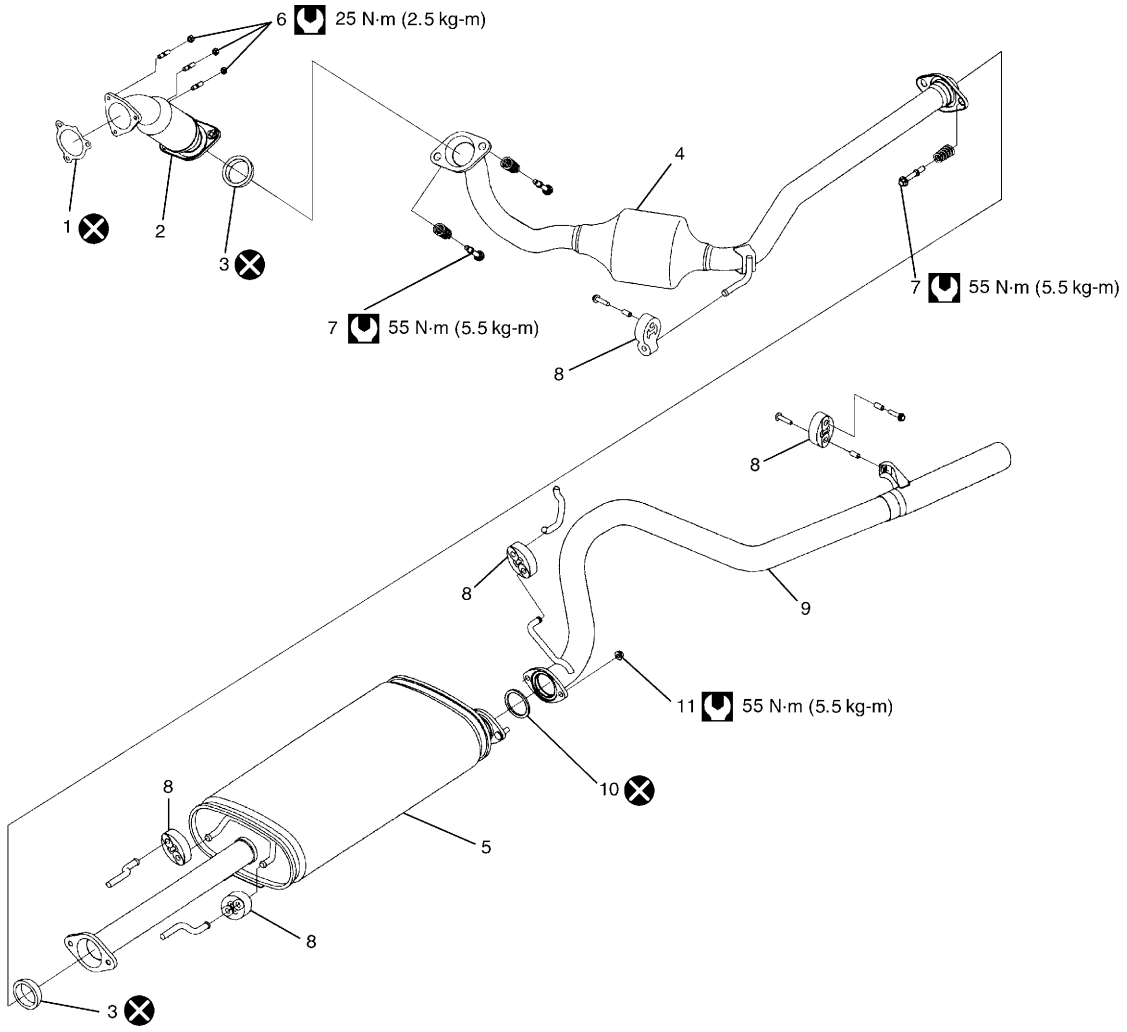
**General Description ..... 6K1-2**
Exhaust System Components ..... 6K1-2
**Maintenance ..... 6K1-3**
**On-Vehicle Service ..... 6K1-4**
Exhaust Manifold ..... 6K1-4
Muffler ..... 6K1-4
**Tightening Torque Specifications ..... 6K1-4**

# General Description

The exhaust system consists of an exhaust manifold, an exhaust No.1 pipe, an exhaust No.2 pipe, a muffler and seal, gaskets and etc., and the exhaust No.2 pipe has the catalytic converter for oxidation.

The catalytic converter for oxidation 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.

## Exhaust System Components



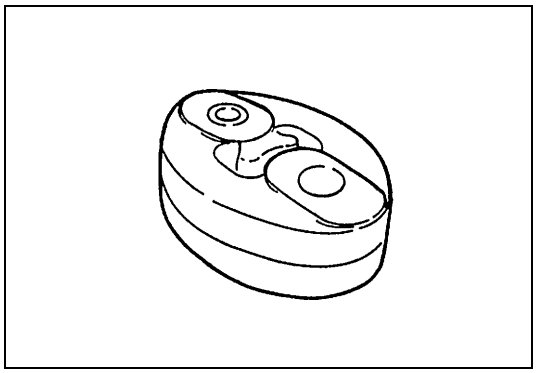

| | | |
|---|---|---|
| 1. Exhaust pipe gasket | 6. Exhaust No.1 pipe nut | 11. Exhaust pipe and muffler nut |
| 2. Exhaust No.1 pipe | 7. Exhaust pipe bolt | Tightening torque |
| 3. Exhaust pipe seal ring | 8. Mounting | Do not reuse. |
| 4. Exhaust No.2 pipe for M/T model | 9. Muffler tail pipe | |
| 5. Muffler | 10. Muffler gasket | |

# Maintenance

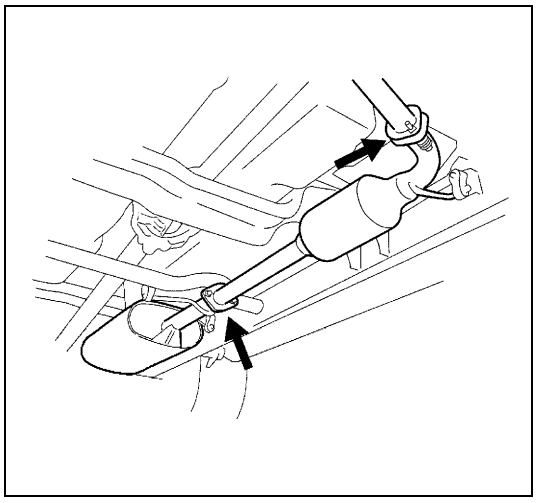
**WARNING:**

**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.



- Check exhaust system for leakage, loose connection, dent and damage.
  If bolts or nuts are loosened, tighten them to specified torque.
  Refer to “Exhaust System Components” in this section for torque data.
- Check nearby body areas damaged, missing, 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.

# On-Vehicle Service

**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.**

## Exhaust Manifold

Refer to “Turbocharger” and “Exhaust Manifold” in Section 6A3 for removal and installation procedures. Before installation, check gasket and seal for deterioration or damage. Replace them as necessary.

## Muffler

**CAUTION:**
**As exhaust No.2 pipe has 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” in this section for location of bolts and nuts.
- After installation, start engine and check each joint of exhaust system for leakage.

# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Exhaust pipe and muffler nut | 55 | 5.5 | 40.0 |
| Exhaust No.1 pipe nut | 25 | 2.5 | 18.0 |
| Exhaust pipe bolt | 55 | 5.5 | 40.0 |

# SECTION 7A2

# MANUAL TRANSMISSION (TYPE 3)

## CONTENTS

**General Description ..... 7A2-2**
System Description ..... 7A2-2
**Diagnosis ..... 7A2-2**
**On-Vehicle Service ..... 7A2-3**
Transmission Gear Oil ..... 7A2-3
Transmission Shift Control Lever ..... 7A2-4
Back Up Light Switch ..... 7A2-4
Engine Rear Mounting ..... 7A2-4
Dismounting of Transmission Unit ..... 7A2-4
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For RHW engine model ..... 7A2-6
Remounting of Transmission Unit ..... 7A2-9
For H27 engine model ..... 7A2-9
For RHW engine model ..... 7A2-10
**Unit Repair ..... 7A2-12**
**Tightening Torque Specifications ..... 7A2-12**

# General Description

## System Description

The manual transmission consists of the input shaft, main shaft, countershaft and reverse idle gear shaft which are installed in the die-cast aluminum alloy and cast-iron cases. This transmission provides five forward speeds and one reverse speed.

The 1st, 2nd and 3rd speeds are for speed reduction drive, 4th speed is for direct drive and 5th speed is for over drive.

The low speed (1st and 2nd) synchronizer is mounted on middle of the main shaft and engaged with the main shaft 1st or 2nd gear. The high speed (3rd and 4th) synchronizer is mounted on forefront of the main shaft and engaged with the main shaft 3rd gear or input shaft. The 5th speed synchronizer is mounted on the countershaft and engaged with the countershaft 5th gear. The 5th speed synchronizer is also equipped with the prevention device from gear cracking noise when shifting gear into the reverse gear. The triple cone synchronizer mechanism is provided to the 1st, 2nd and 3rd gear synchromesh devices for high performance of shifting into the 1st, 2nd and 3rd gear.

The gear shift lever case is located at the upper behind the transmission case and has a cam which prevents direct gear shifting from the 5th speed gear into the reverse gear.

As the die-cast aluminum alloy and cast-iron cases are sealed with liquid type gasket, it is necessary to use genuine sealant or its equivalent on its mating surface when reassembling them. Also, the case fastening bolts must be tightened to specified torque by means of the torque wrench and tightening over or below the specified torque should be avoided.

# Diagnosis

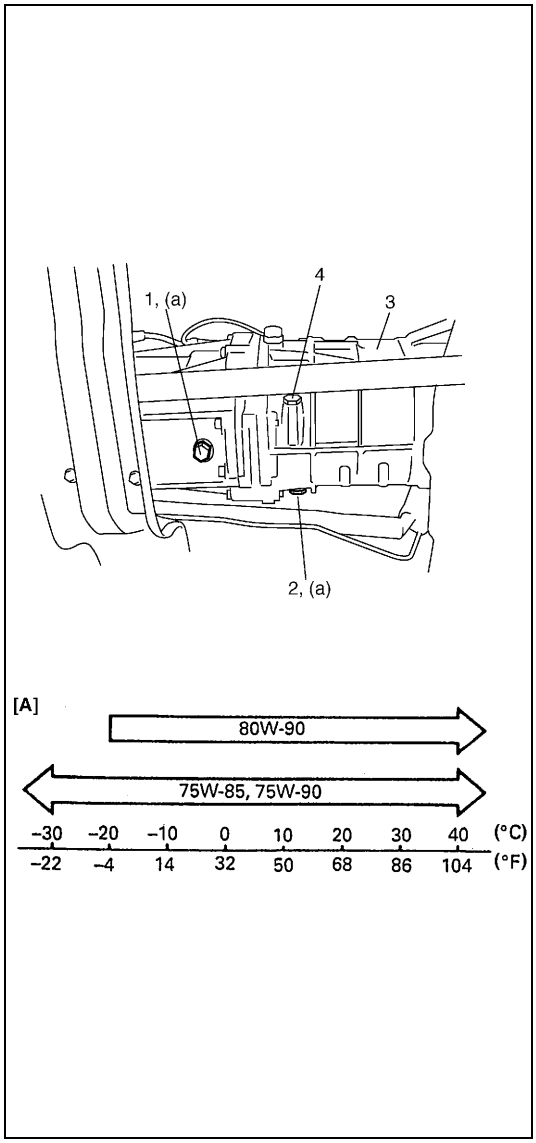
| Condition | Possible Cause | Correction |
|---|---|---|
| **Gear slipping out of mesh** | Worn shift fork shaft | Replace |
| | Worn shift fork or synchronizer sleeve | Replace |
| | Weak or damaged locating spring | Replace |
| | Worn bearings on input shaft or main shaft | Replace |
| | Worn chamfered tooth on sleeve or gear | Replace sleeve and gear |
| | Missing or disengagement of circlip(s) | Install or replace |
| **Gears refusing to disengage** | Weakened or broken synchronizer spring | Replace |
| | Distorted shift shaft or shift fork | Replace |
| **Hard shifting** | Improper clutch pedal free travel | Adjust |
| | 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 and gear |
| | Distorted shift shaft | Replace |
| **Noise** | Inadequate or insufficient lubricant | Replenish |
| | Damaged or worn bearing(s) | Replace |
| | Damaged or worn gear(s) | Replace |
| | Damaged or worn synchronizer ring | Replace |
| | Damaged or worn chamfered tooth on sleeve or gear | Replace |

# On-Vehicle Service

## Transmission Gear Oil

### INSPECTION AND CHANGE

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 or repair it.




3) Drain old oil removing drain plug (1).

**NOTE:**

- **Do not drain transmission oil from plug (4).**
- **Whenever vehicle is hoisted for any service work other than oil change, check for oil leakage.**
- **If water or rust is mixed in drained oil, be sure to check breather hose and boot of transmission.**

4) Fill new specified oil as shown by specified amount (up to level hole).

**NOTE:**

**It is highly recommended to use SAE 75W-90 gear oil.**

**Gear Oil Specification**
**Oil grade: API GL-4**
**Viscosity: SAE 75W-85, 75W-90 or 80W-90**

**Oil Capacity:**
**2.3 liters (4.9/4.0 US/Imp. pt)**

5) Torque drain plug (1) and level/filler plug (2) as specified.

**CAUTION:**
**Transmission oil must not be poured through gear shift control lever part.**

**Tightening torque**
**(a): 37 N·m (3.7 kg-m, 27.0 lb-ft)**

[A]: Viscosity chart SAE

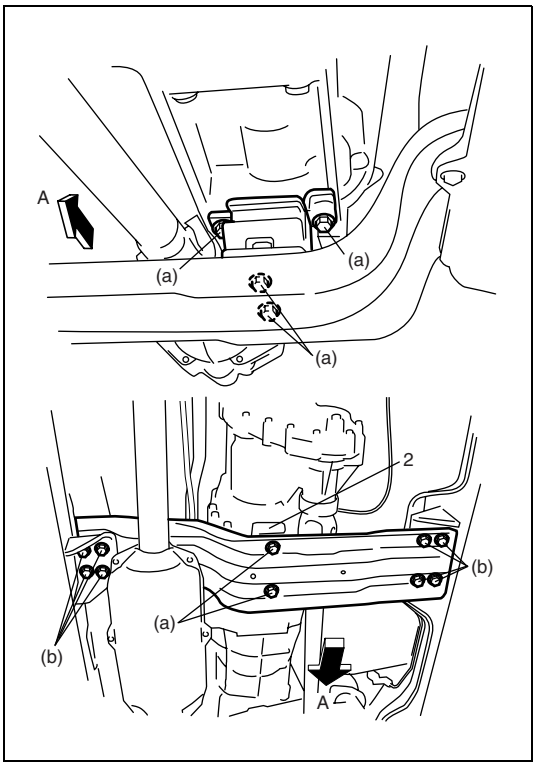
## Transmission Shift Control Lever

Refer to “Transmission Shift Control Lever” in Section 7A of the Service Manual mentioned in “Foreword” of this manual.

## Back Up Light Switch

Refer to “Back Up Light Switch” in Section 7A of the Service Manual mentioned in “Foreword” of this manual.

## Engine Rear Mounting




When replacement of mounting parts are necessary, torque bolts as specified below.

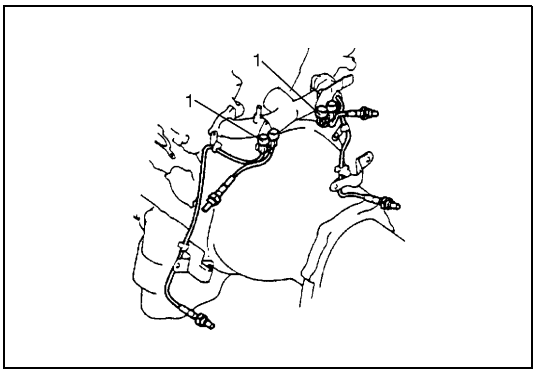
**Tightening torque**
**Engine rear mounting bolt**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Engine rear mounting member bolt**
**(b): 55 N·m (5.5 kg-m, 40.0 lb-ft**

| | |
|---|---|
| 1. | Engine rear mounting member |
| 2. | Engine rear mounting |
| A: | Forward |

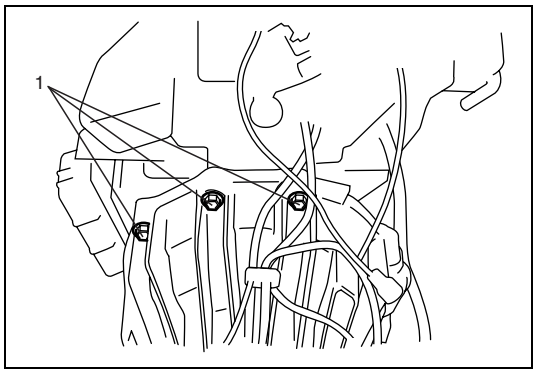
## Dismounting of Transmission Unit

### For H27 engine model

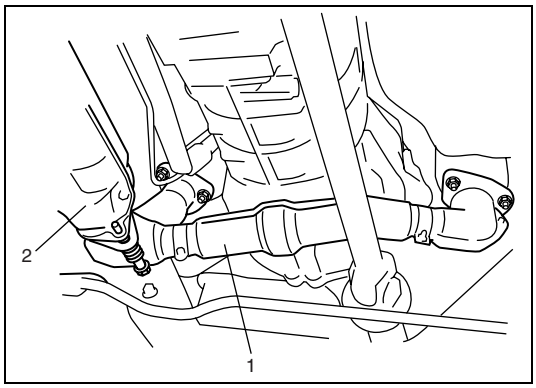
1) Disconnect negative (–) cable of battery.
2) Remove transmission shift control lever referring to “Transmission Shift Control Lever” in this section.
3) Remove transfer shift control lever referring to “Transfer Shift Control Lever” in Section 7D of the service Manual mentioned in “Foreword” of this manual.



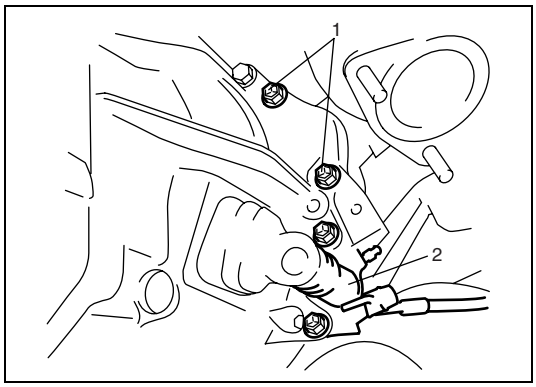

4) Detach couplers from their bracket and disconnect HO2S lead wires at couplers (1).



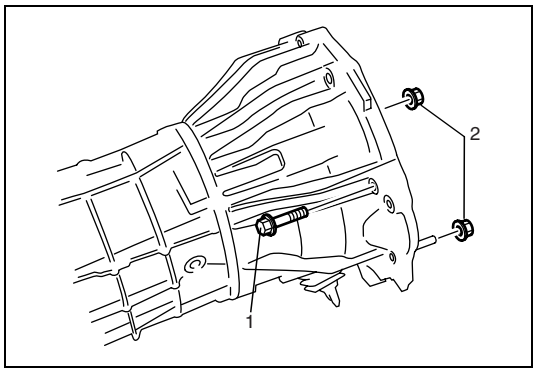

5) Remove 3 transmission fastening bolts (1) at engine room with engine harness clamp disconnected from intake connector.
6) Hoist vehicle.
7) Drain oil from transmission and transfer.
8) Remove propeller shaft(s) referring to “Propeller Shaft” in Section 4B of the Service manual mentioned in “Foreword” of this manual.



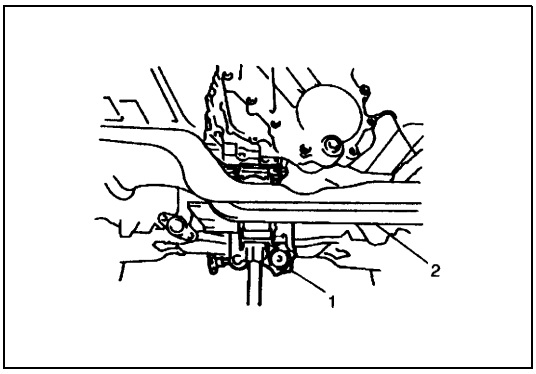

9) Remove exhaust No.1 pipe (1) and No.2 pipe (2).
10) Remove exhaust manifold stiffeners (if equipped).



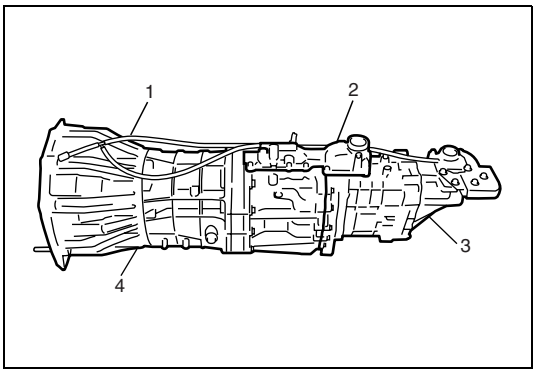

11) Remove starting motor bolts (1).
12) Remove clutch operating cylinder (2) from transmission. It is not necessary to disconnect clutch hose from operating cylinder.
13) Remove clutch housing lower plate.




14) Remove transmission fastening bolt (1) and nuts (2).
15) Disconnect couplers from 4WD switch, back up light switch and speed sensor assembly and release their harness from clamps.



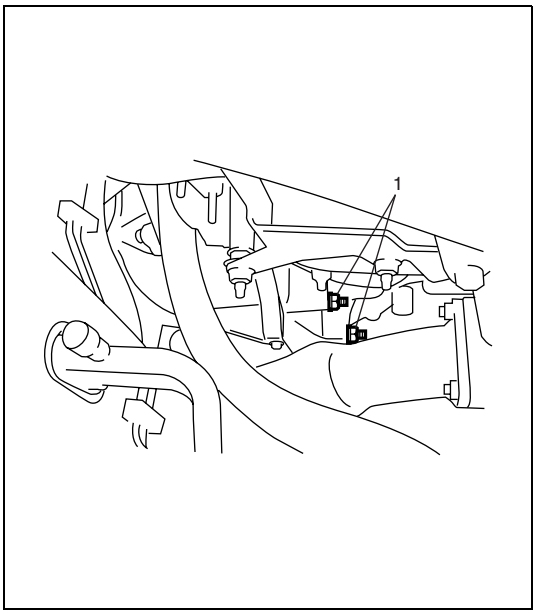

16) Apply transmission jack (1) and remove engine rear mounting member (2) taking off its bolts.
17) After removing mounting member, move rearward transmission and transfer assemblies placed on jack and then lower them.



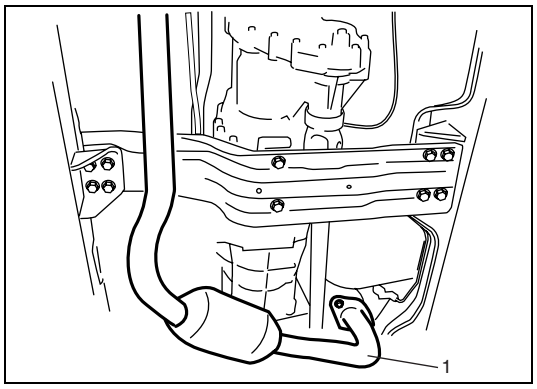

18) Remove breather hoses (1).
19) Separate gear shift lever case (2) and transfer assembly (3) from transmission assembly (4).

## For RHW engine model

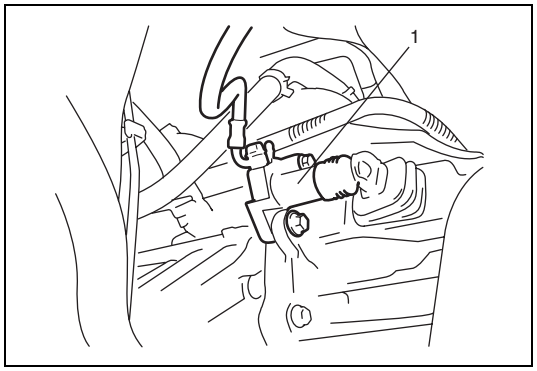
1) Remove battery.
2) Detach fuse/relay box, remove strut tower bar.
3) Remove crankshaft position sensor from clutch housing referring to “Crankshaft Position Sensor (engine speed sensor)” in Section 6E3.
4) Remove starting motor bolts.



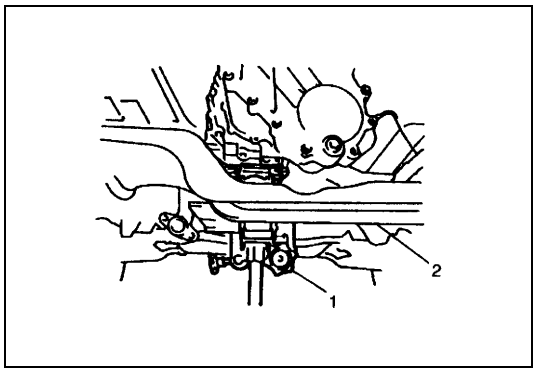

5) Remove transmission to engine nuts (1).
6) Remove transmission shift control lever referring to “Transmission Shift Control Lever” in Section 7A of the Service Manual mentioned in “Foreword” of this manual.
7) Remove transfer shift control lever referring to “Transfer Shift Control Lever” in Section 7D of the Service Manual mentioned in “Foreword” of this manual.
8) Hoist vehicle.
9) Drain transmission gear oil referring to “Transmission Gear Oil” in this section.
10) Drain transfer gear oil referring to “Transfer Gear Oil” in Section 7D of the Service Manual mentioned in “Foreword” of this manual.
11) Remove propeller shafts referring to “Propeller Shaft” in Section 4B of the Service Manual mentioned in “Foreword” of this manual.



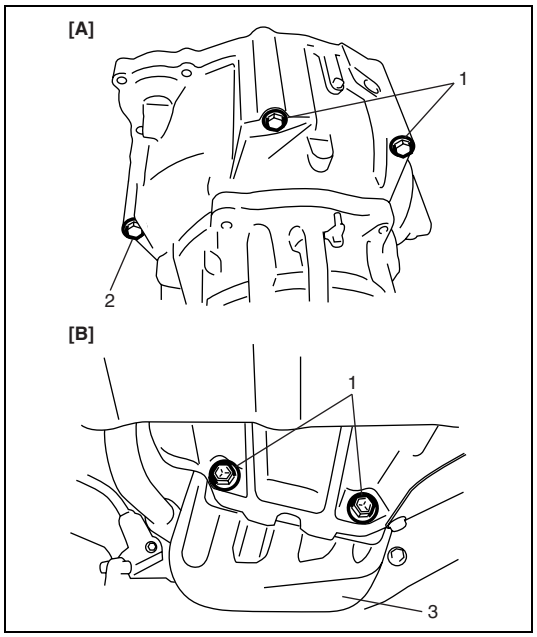

12) Remove exhaust No.2 pipe (1).




13) Remove clutch operating cylinder (1) from transmission. It is not necessary to disconnect clutch hose from operating cylinder.




14) Apply transmission jack (1) and remove engine rear mounting member (2) taking off its bolts.
15) Lower the transmission jack (1) slowly.
16) Disconnect couplers from 4WD switch, back up light switch and speed sensor assembly and release their harness from clamps.



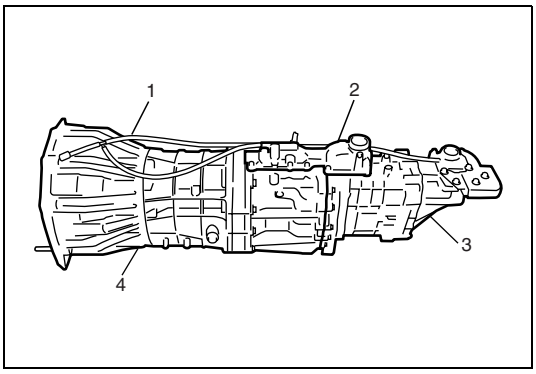

17) Remove transmission fastening bolts (1 and 2).

| |
|---|
| [A]: Upper side |
| [B]: Lower side |
| 3. Oil pan |

**NOTE:**

**If bolt (2) cannot be removed, loosen it only completely.**

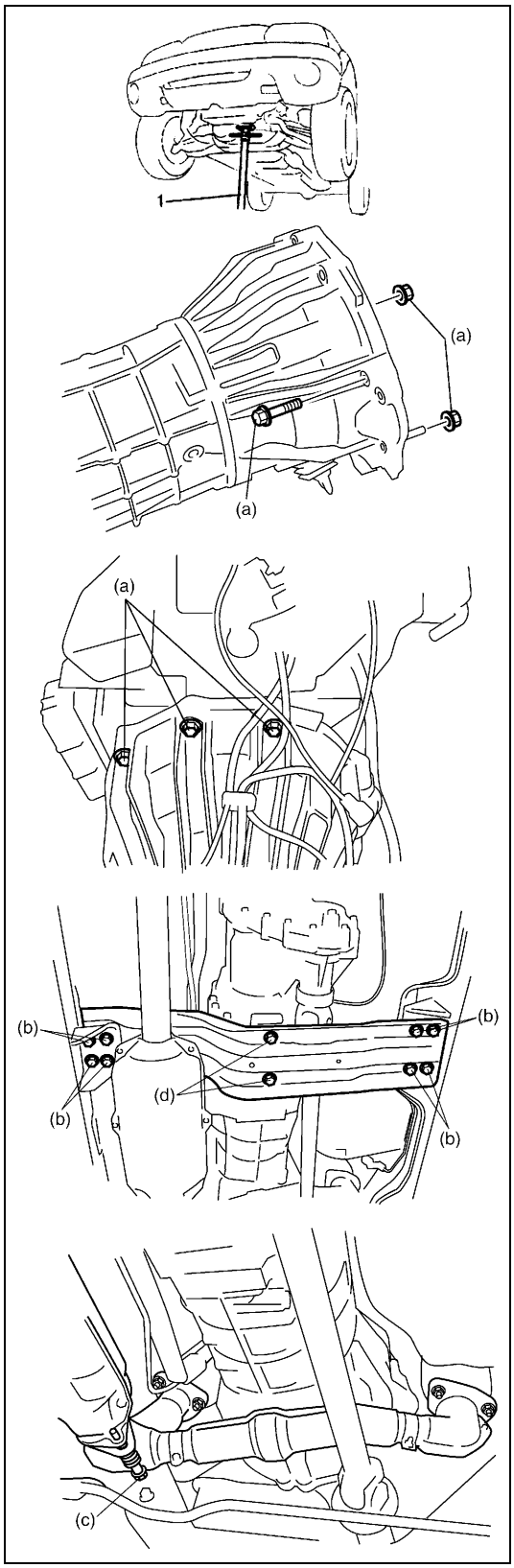
18) Move rearward transmission and transfer assemblies placed on jack and then lower them.




19) Remove breather hoses (1).
20) Separate gear shift lever case (2) and transfer assembly (3) from transmission assembly (4).

# Remounting of Transmission Unit

## For H27 engine model



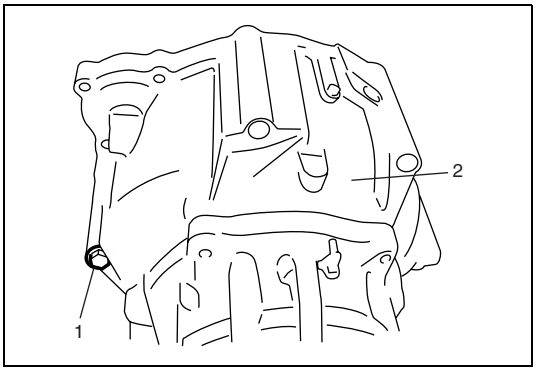

Reverse dismounting procedure for remounting noting followings.

- Slant the rear of the engine down, using support device (1) and install transmission to engine.
- Use specified torques as given below.

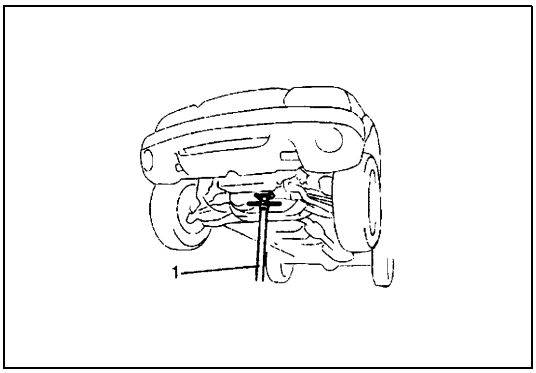
**Tightening torque**
**Transmission to engine bolt and nut**
**(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)**
**Engine rear mounting member bolt**
**(b): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Exhaust No.1 pipe to exhaust No.2 pipe bolt**
**(c): 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Exhaust No.2 pipe to muffler bolt**
**: 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Engine rear mounting bolt**
**(d): 55 N·m (5.5 kg-m, 40.0 lb-ft)**

- Set each clamp for wiring and hoses securely.
- Set clamp for shift control lever boots securely.
- After installing clutch operating cylinder, check clutch pedal free travel. Refer to “Clutch Pedal Free Travel” in section 7C1 of the Service Manual mentioned in “Foreword” of this manual.
- Fill gear oil to transmission and transfer as specified.
- Install propeller shaft(s) referring to “Propeller Shafts” in Section 4B of the Service Manual mentioned in “Foreword” of this manual.
- Connect battery and check function of engine, clutch, transmission and transfer.

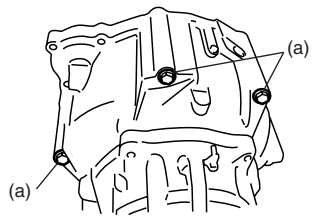
## For RHW engine model

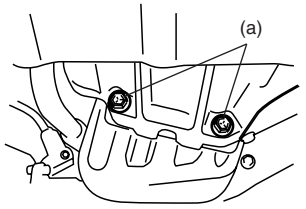


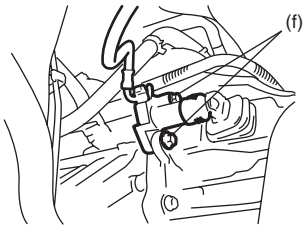

1) Set transmission fasting bolt (1) to transmission assembly (2) as shown beforehand, if transmission fasting bolt (1) could not be removed at step 16) of “Dismounting of Transmission Unit” for RHW engine model in this section.
2) Reverse dismounting procedure for remounting noting the following.

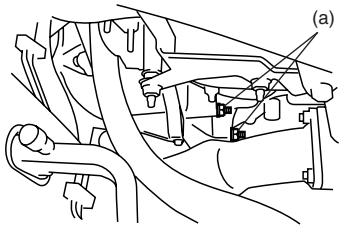


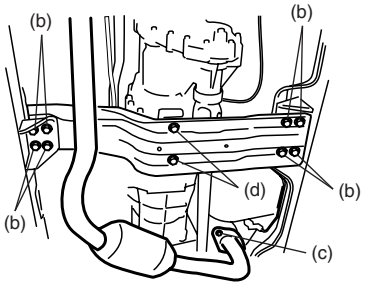

- Slant the rear of the engine down, using support device (1) and install transmission to engine.

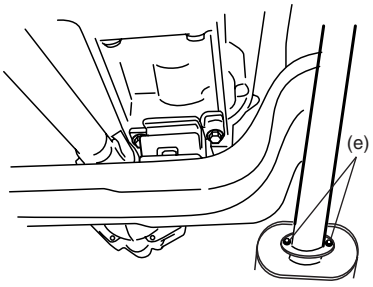



- Use specified torques as given below.

**Tightening torque**
**Transmission to engine bolt and nut**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Engine rear mounting member bolt**
**(b): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Turbocharger outlet pipe to exhaust No.2 pipe bolt**
**(c): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Engine rear mounting bolt**
**(d): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Exhaust No.2 pipe to muffler bolt or nut**
**(e): 55 N·m (5.5 kg-m, 40.0 lb-ft)**
**Clutch operating cylinder bolt**
**(f): 50 N·m (5.0 kg-m, 36.5 lb-ft)**

- Set each clamp for wiring and hoses securely.
- Set clamp for shift control lever boots securely.
- Fill gear oil to transmission and transfer as specified referring to “Transmission Gear Oil” in this section and “Transfer Gear Oil” in Section 7D of the Service Manual mentioned in “Foreword” of this manual.
- Install propeller shafts referring to “Propeller Shafts” in Section 4B of the Service Manual mentioned in “Foreword” of this manual.
- Install strut tower bar referring to “Strut Damper” in Section 3D of the Service Manual mentioned in “Foreword” of this manual.
- Install battery and check function of engine, clutch, transmission and transfer.

# Unit Repair

Refer to the same section of “Unit Repair Manual” mentioned in “Foreword” of this manual.

# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Transmission oil filler/level and drain plugs | 37 | 3.7 | 27.0 |
| Transmission to engine bolt and nut for H27 engine model | 85 | 8.5 | 61.5 |
| Transmission to engine bolt and nut for RHW engine model | 55 | 5.5 | 40.0 |
| Engine rear mounting member bolt | 55 | 5.5 | 40.0 |
| Exhaust No.1 to exhaust No.2 pipe bolt for H27 engine model | 50 | 5.0 | 36.5 |
| Turbocharger outlet pipe to exhaust No.2 pipe bolt | 50 | 5.0 | 36.5 |
| Exhaust No.2 pipe to muffler bolt and nut | 50 | 5.0 | 36.5 |
| Engine rear mounting bolt | 55 | 5.5 | 40.0 |
| Clutch operating cylinder bolt | 50 | 5.0 | 36.5 |

# SECTION 7B1

# AUTOMATIC TRANSMISSION (4 A/T)

**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 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.**
- **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).**



**NOTE:**

**For the items with asterisk (*) in the "CONTENTS" below, refer to the same section of the Service Manual mentioned in "FOREWORD" of this manual.**

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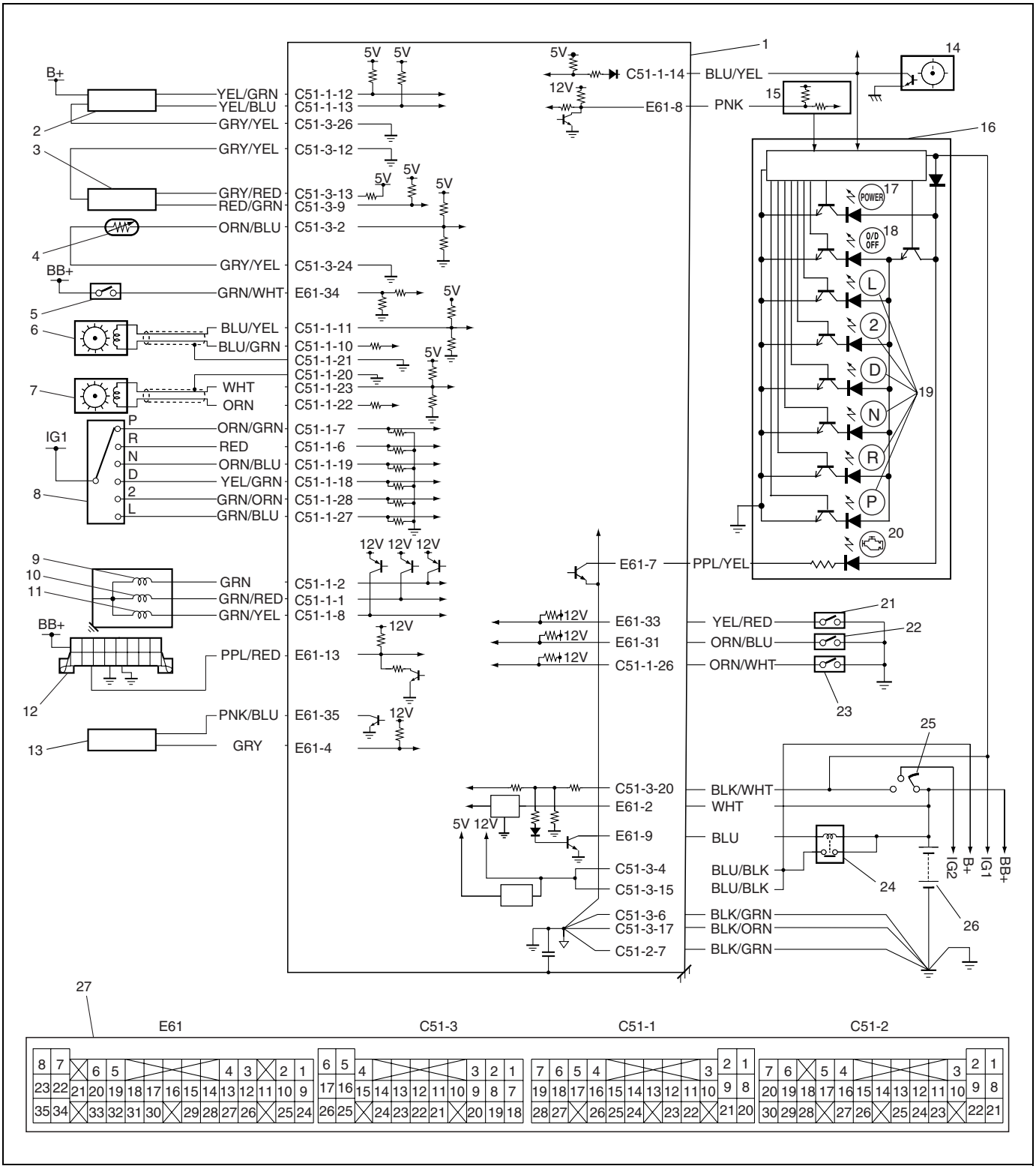
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# General Description

| Item | | | Specifications | |
|---|---|---|---|---|
| Torque converter | Type | | 3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism) | |
| | Stall torque ratio | | 2.0 | |
| Oil pump | Type | | Trochoid type oil pump | |
| | Drive system | | 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 (O/D ON) | Forward 1st ↔ 2nd ↔ 3rd ↔ 4th (O/D) automatic gear change |
| | | | "D" range (O/D OFF) | Forward 1st ↔ 2nd ↔ 3rd automatic gear change |
| | | | "2" range | (Normal mode) Forward 1st ↔ 2nd ← 3rd automatic gear change<br>(Power mode) Forward 2nd ← 3rd automatic gear change and fixed at 2nd gear |
| | | | "L" range | Forward 1st ← 2nd ← 3rd reduction, and fixed at 1st gear |
| | Gear ratio | 1st (low gear) | 2.826 | |
| | | 2nd (second gear) | 1.493 | |
| | | 3rd (top gear) | 1.000 | |
| | | 4th (overdrive gear) | 0.689 | |
| | | Reverse (reverse gear | 2.703 | |
| | Control elements | | Wet type multi-disc clutch ... 3 sets<br>Wet type multi-disc brake ... 4 sets<br>One-way clutch ... 3 sets | |
| | Transfer | | Hi: 1.000<br>Lo: 1.816 (4WD model only) | |
| | Final gear reduction ratio (Differential) | | 5.125 | |
| Lubrication | Lubrication system | | Force feed system by oil pump | |
| Cooling | Cooling system | | Radiator assisted cooling (water-cooled) | |
| Fluid used | | | An equivalent of DEXRON®III | |

# Electronic Shift Control System




| | | |
|---|---|---|
| 1. PCM (ECM) | 10. Shift solenoid-B | 19. Transmission range indictor light |
| 2. CMP sensor | 11. TCC solenoid | 20. MIL (“SERVICE ENGINE SOON” lamp) |
| 3. TP sensor | 12. Data link connector | 21. O/D off switch |
| 4. ECT sensor | 13. Cruise control module | 22. P/N change switch |
| 5. Stop lamp switch | 14. VSS | 23. 4WD low switch |
| 6. Input shaft speed sensor | 15. BCM | 24. Main relay |
| 7. Output shaft speed sensor | 16. Combination meter | 25. Ignition switch |
| 8. Transmission range sensor | 17. “POWER” lamp | 26. Battery |
| 9. Shift solenoid-A | 18. “O/D OFF” lamp | 27. PCM (ECM) connector terminal (viewed from harness side) |

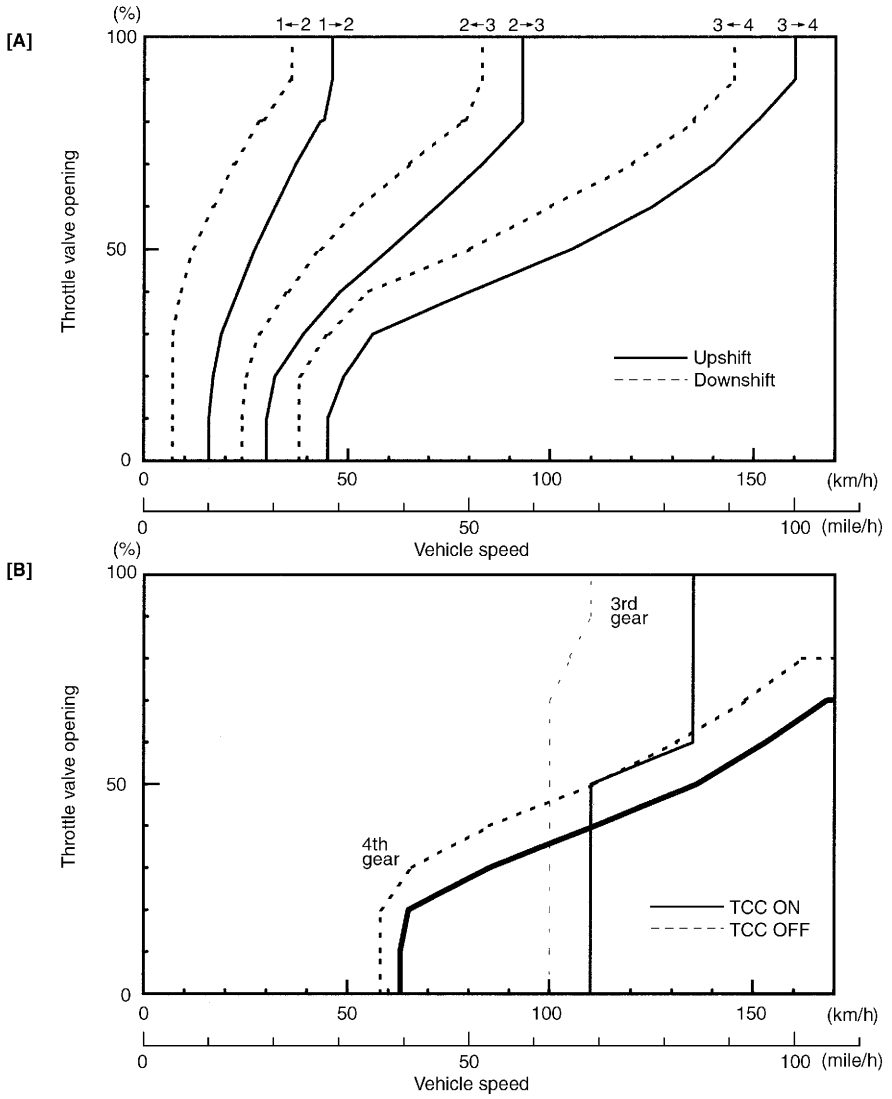
## Automatic gear shift diagram

Automatic shift schedule as a result of shift control is shown below. In case that select lever is shifted to L at a higher than 55 km/h or 34 mile/h speed, 2nd or 3rd gear is operated and then down shifts to 1st at a speed lower than that. No up shift is available in L.
The same as, the select lever is shifted to 2 at a higher than 105 km/h (65 mile/h) speed, 3rd gear is operated and then down shifts to 2nd at a speed lower than that.

### [POWER MODE]

| | | Shift | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 → 2 | 2 → 3 | 3 → 4 | 4 → 3 | 3 → 2 | 2 → 1 |
| **Throttle opening** | Full throttle km/h (mile/h) | 46 (29) | 93 (58) | 160 (100) | 150 (94) | 83 (52) | 36 (23) |
| | Closed throttle km/h (mile/h) | 16 (10) | 30 (19) | 45 (28) | 38 (16) | 24 (11) | 7 (4) |

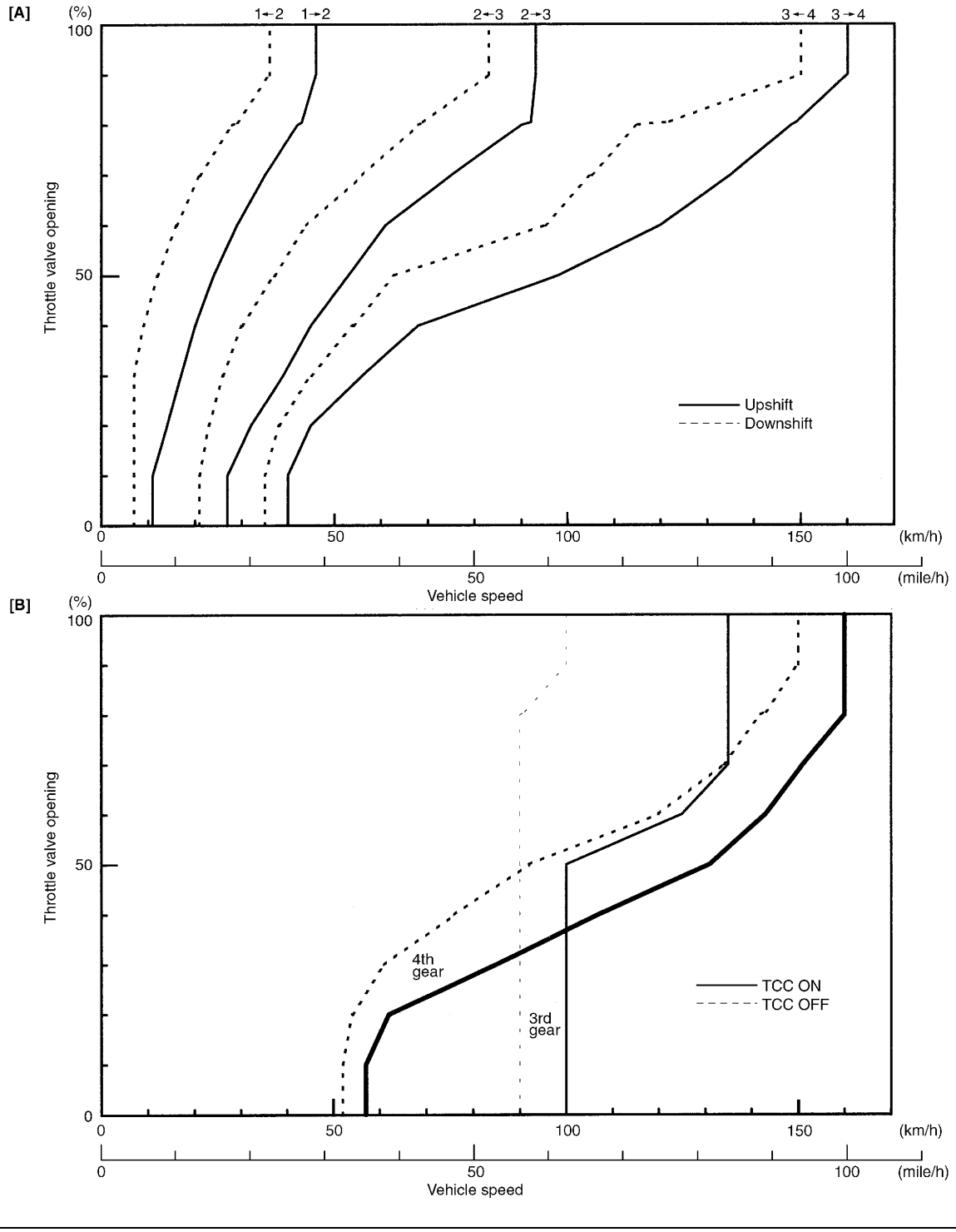
### GEAR SHIFT DIAGRAM [A] AND TCC LOCK-UP DIAGRAM [B]



## [NORMAL MODE]

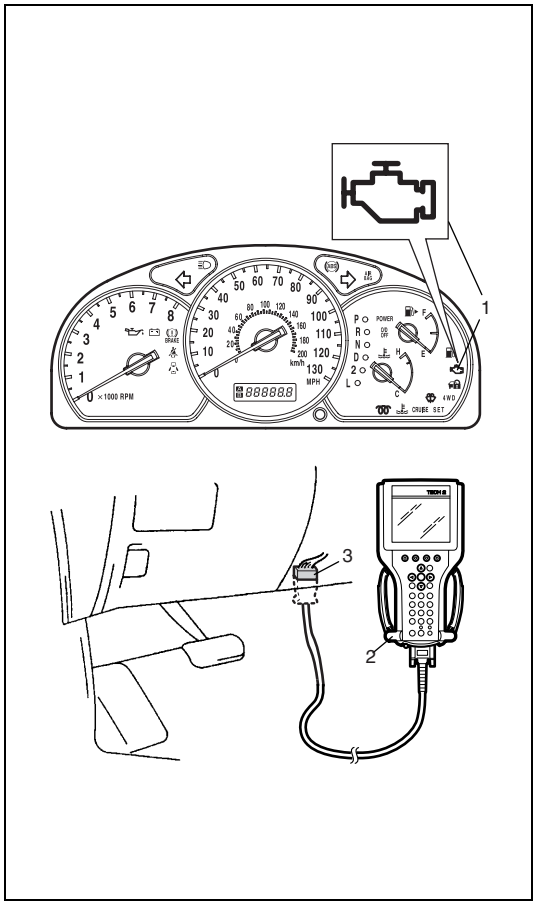
| | | Shift | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 → 2 | 2 → 3 | 3 → 4 | 4 → 3 | 3 → 2 | 2 → 1 |
| **Throttle opening** | Full throttle km/h (mile/h) | 46 (29) | 93 (58) | 160 (100) | 150 (94) | 83 (52) | 36 (23) |
| | Closed throttle km/h (mile/h) | 11 (7) | 27 (17) | 40 (25) | 35 (22) | 21 (13) | 7 (4) |

## GEAR SHIFT DIAGRAM [A] AND TCC LOCK-UP DIAGRAM [B]



# Diagnosis

This vehicle is equipped with an electronic transmission control system, which control the automatic shift up and shift down timing, TCC operation, etc. suitably to vehicle driving conditions.
PCM (ECM) has an On-Board Diagnosis system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission.
When diagnosing a trouble in the transmission including this system, be sure to have full understanding of the outline of “ON-Board Diagnostic System” and each item in “Precaution in Diagnosing Trouble” and execute diagnosis according to “Automatic Transmission Diagnostic Flow Table” to obtain correct result smoothly.




## On-Board Diagnostic System (Vehicle without Monitor Connector)

For automatic transmission control system, PCM (ECM) has following functions. Refer to Section 6-1 for details.

- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) (1) turns ON to check the bulb of the MIL.
- When PCM detects a malfunction in A/T control system (and/or a malfunction which gives an adverse effect to vehicle emission) while the engine is running, it makes the malfunction indicator lamp in the meter cluster of the instrument panel turn ON and stores the malfunction area.
  (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.)
- It is possible to communicate through DLC (3) by using not only SUZUKI scan tool (2). (Diagnostic information can be accessed by using a scan tool (2).)

### 2 DRIVING CYCLE DETECTION LOGIC

Refer to Section 6-1 for details.

### PENDING DTC

Refer to Section 6-1 for details.

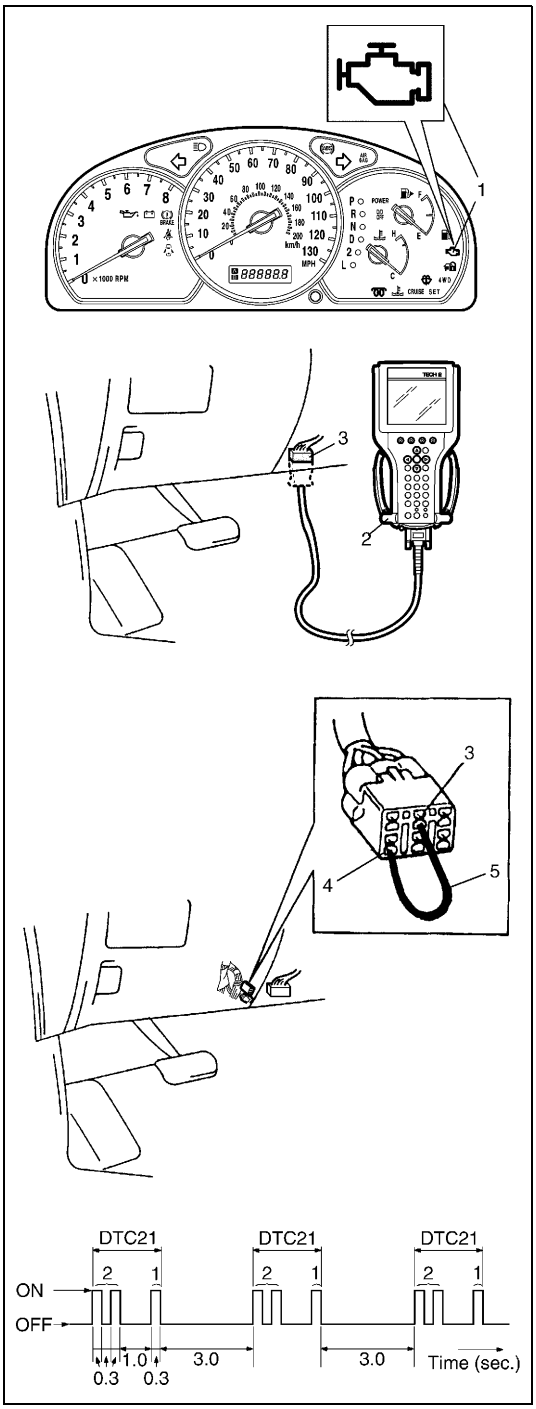
### FREEZE FRAME DATA

Refer to Section 6-1 for details.

## On-Board Diagnostic System (Vehicle with Monitor Connector)

For automatic transmission control system, PCM (ECM) has following functions. Refer to Section 6/6-1 for details.

- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) turns ON to check the bulb of the MIL.
- When PCM detects a trouble in electronic shift control system, it stores its trouble code in ECM back-up memory. (The memory is kept as it is even if the trouble was only temporary and disappeared immediately. And it is not erased unless the power to PCM is shut off for 30 seconds or longer.)
- It is possible to communicate through DLC by using not only SUZUKI scan tool (2) but also generic scan tool. (Diagnostic information can be accessed by using a scan tool.)
- ECM also indicates trouble area in memory by means of flashing of malfunction indicator lamp (1) at the time of inspection. (i.e. when diagnosis switch terminal (3) is connected to ground terminal (4) with a service wire (5) and ignition switch is turned ON.)



## Precaution in Diagnosing Trouble

- Don't disconnect couplers from PCM (ECM), battery cable from battery, PCM ground wire harness from engine or main fuse before checking the diagnosis information (DTC, freeze frame data, etc.) stored in PCM memory. Such disconnection will clear memorized information in PCM memory.
- Using SUZUKI scan tool or also generic scan tool for vehicle without monitor connector, the diagnostic information stored in PCM 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.
- Priorities for diagnosing troubles
  If two or more diagnostic trouble codes (DTCs) are stored, proceed to the flow table of the DTC which was detected earliest in the order and follow the instruction in that table.
  If no instructions are given, troubleshoot diagnostic trouble codes according to the following priorities.
  – Diagnostic trouble codes (DTCs) other than DTC P0171/P0172/P0174/P0175 (Fuel system too lean/too rich), DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 (Misfire detected) and DTC P0400 (EGR flow malfunction)
  – DTC P0171/P0172/P0174/P0175 (Fuel system too lean/too rich) and DTC P0400 (EGR flow malfunction)
  – DTC P0300/P0301/P0302/P0303/P0304/P0305/P0306 (Misfire detected)
- Be sure to read "Precautions for Electrical Circuit Service" in Section 0A before inspection and observe what is written there.
- PCM replacement
  When substituting a known-good PCM, check for following conditions.
  Neglecting this check may result in damage to a good PCM.
  – All relays and actuators have resistance of specified value.
  – MAF sensor, MDP sensor, TP sensor and fuel tank pressure sensor are in good condition. Also, the power circuit of these sensors is not shorted to the ground.

## Automatic Transmission Diagnostic Flow Table

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

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Customer Complaint Analysis<br>1) Perform customer complaint analysis referring to the next page.<br>Was customer complaint analysis performed according to instruction? | Go to Step 2. | Perform customer complaint analysis. |
| 2 | Diagnostic Trouble Code (DTC) and Freeze Frame Data Check, Record and Clearance<br>1) Check for DTC (including pending DTC)<br>Is there any DTC(s)? | Print DTC and freeze frame data or write them down and clear them by referring to “DTC Clearance” in this section<br>Go to Step 3. | Go to Step 4. |
| 3 | Visual Inspection<br>1) Perform visual inspection referring to the next page.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 5. |
| 4 | Visual Inspection<br>1) Perform visual inspection referring to the next page.<br>Is there any faulty condition? | | Go to Step 8. |
| 5 | Trouble Symptom Confirmation<br>1) Confirm trouble symptom referring to the next page.<br>Is trouble symptom identified? | Go to Step 6. | Go to Step 7. |
| 6 | Rechecking and Record of DTC/Freeze Frame Data<br>1) Recheck for DTC and freeze frame data referring to “DTC Check” in this section.<br>Is there any DTC(s)? | Go to Step 9. | Go to Step 8. |
| 7 | Rechecking and Record of DTC/Freeze Frame Data<br>1) Recheck for DTC and freeze frame data referring to “DTC Check” in this section.<br>Is there any DTC(s)? | Go to Step 9. | Go to Step 10. |
| 8 | Automatic Transmission Basic Inspection and Trouble Diagnosis Table<br>1) Check and repair according to “A/T Basic Check” and “Trouble Diagnosis Table” in this section.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 9 | Troubleshooting for DTC<br>1) Check and repair according to applicable DTC diag. flow Table.<br>Are check and repair complete? | | |
| 10 | Check for Intermittent Problems<br>1) Check for intermittent problems referring to the next page.<br>Is there any faulty condition? | Repair or replace malfunction part(s).<br>Go to Step 11. | Go to Step 11. |

| Step | Action | Yes | No |
|---|---|---|---|
| 11 | Final Confirmation Test<br>1) Clear DTC if any.<br>2) Perform final confirmation test referring to the next page.<br>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 a inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

**STEP 2. DIAGNOSTIC TROUBLE CODE (DTC)/FREEZE FRAME DATA CHECK, RECORD AND CLEARANCE**

First, referring to DTC check section, check DTC (including pending DTC). If DTC exists, print or write down DTC and freeze frame data and then clear them by referring to DTC clearance section. 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 STEP 4. VISUAL INSPECTION**

As a preliminary step, be sure to perform visual check of the items that support proper function of the A/T and engine referring to Visual Inspection section.

**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”.
Also, recheck DTC according to “DTC Confirmation Procedure” described in each “DTC Flow Table”.

**STEP 6 and STEP 7. RECHECKING AND RECORD OF DTC/FREEZE FRAME DATA**

Refer to “DTC Check” in this section for checking procedure.

**STEP 8. A/T BASIC CHECK AND TROUBLE DIAGNOSIS TABLE**

Perform A/T basic check according to the “A/T Basic Check Flow Table” first. When the end of the flow table has been reached, check the parts of the system suspected as a possible cause referring to “Trouble Diagnosis Table” 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. DIAGNOSTIC TROUBLE CODE FLOW TABLE**

Based on the DTC indicated in Step 6 and 7 and referring to “Diagnostic Trouble Code Flow Table” in this section, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, PCM 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" in Section 0A and related circuit of DTC recorded in Step 2.

### STEP 11. FINAL CONFIRMATION TEST

Confirm that the problem symptom has gone and the A/T is free from any abnormal conditions.
If what has been repaired is related to the malfunction DTC, clear the DTC once, set conditions under which DTC was detected and A/T and/or vehicle was repaired and confirm that no DTC is indicated.

### CUSTOMER PROBLEM INSPECTION FORM (EXAMPLE)

| User name: | Model: | VIN: | |
|---|---|---|---|
| Date of issue: | Date of Reg: | Date of problem: | Mileage: |

| PROBLEM SYMPTOMS | |
|---|---|
| ☐Engine does not start | ☐Engine stops |
| ☐Vehicle does not move (forward, rearward) | ☐Transmission does not shift (1st, 2nd, 3rd, 4th, Rev) gear |
| ☐No lock-up (TCC clutch operation) | ☐Automatic shift does not occur |
| ☐Shift point too high or too low | ☐Transmission slipping in (1st, 2nd, 3rd, 4th, Rev) gear |
| ☐Excessive gear change shock | ☐Other: |

| VEHICLE/ ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS | |
|---|---|
| **Environmental Condition** | |
| Weather | ☐Fair/☐Cloudy/☐Rain/☐Snow/☐Always/☐Other ( ) |
| Temperature | ☐Hot/☐Warm/☐Cool/☐Cold/☐( °C °F)/☐Always |
| Frequency | ☐Always/☐Sometimes/☐( times/ day, month)/☐Only Once |
| Road | ☐Urban/☐Suburb/☐Highway/☐Mountainous (uphill/downhill)/☐Paved road/☐Gravel/ ☐Other( ) |
| **Vehicle Condition** | |
| Transmission range | ☐(P,R,N,D,2,L) range/☐( → ) range |
| Transmission temp. | ☐Cold/☐Warming up phase/☐Warmed up |
| Vehicle | ☐At stop/☐During driving (constant speed/accelerating/decelerating/ right hand corner/left hand corner)/☐Other ( )/☐Speed ( km/h mile/h) |
| Engine | ☐Speed( r/min)/☐Throttle opening(idle/about %/full) |
| Brake | ☐Apply/☐Not apply |
| O/D off switch | ☐ON/☐OFF |
| P/N change switch | ☐Power/☐Normal |

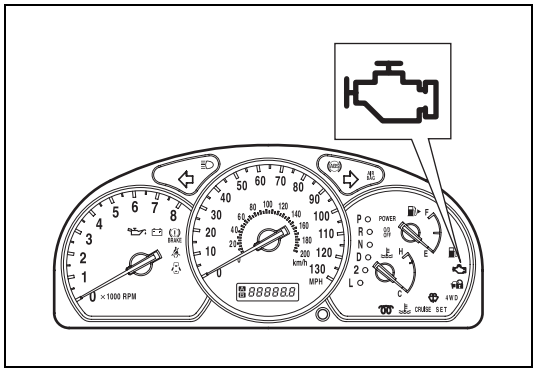
| Malfunction indicator lamp("SERVICE ENGINE SOON" light) condition | | | |
|---|---|---|---|
| ☐Always ON | ☐Sometimes ON | ☐Always OFF | ☐Good condition |

| Diagnostic trouble code | | | |
|---|---|---|---|
| | First check : ☐No code | ☐Malfunction code( ) | |
| | Second check : ☐No code | ☐Malfunction code( ) | |

**NOTE:**

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

## Malfunction Indicator Lamp (MIL) Check



Refer to the same item in Section 6-1 for checking procedure.

## "O/D OFF" Lamp Check

1) Turn ignition switch ON.
2) Check that "O/D OFF" lamp lights for about 2 – 4 sec. and then goes OFF.
   If anything faulty is found, advance "Diagnostic Flow Table B-1 or B-2 "O/D OFF" Lamp Circuit Check".

## "POWER" Lamp Check

1) Check that Power/Normal change switch button is at Normal position.
2) Turn ignition switch ON.
3) Check that "POWER" lamp lights for about 2 – 4 sec. and then goes OFF.
   If anything faulty is found, advance "Diagnostic Flow Table B-3 or B-4 "POWER" Lamp Circuit Check".

## Diagnostic Trouble Code (DTC) Check

Refer to the same item in Section 6-1 for checking procedure.

## Diagnostic Trouble Code Clearance

Refer to the same item in Section 6-1 for clearance procedure.

## Diagnostic Trouble Code Table

Refer to the same item in Section 6-1.

## Fail Safe Table

Refer to the same item in Section 6-1.

## Visual Inspection

Visually check following parts and systems.

| INSPECTION ITEM | REFERRING SECTION |
|---|---|
| • A/T fluid - - - - - level, leakage, color | SECTION 0B |
| • A/T fluid hoses - - - - - disconnection, looseness, deterioration | SECTION 7B1 |
| • Throttle (accelerator) cable - - - - - play, installation | SECTION 6E2 |
| • A/T throttle cable - - - - - play, installation | SECTION 7B1 |
| • A/T select cable - - - - - installation, operation | SECTION 7B1 |
| • Engine oil - - - - - level, leakage | SECTION 0B |
| • Engine coolant - - - - - level, leakage | SECTION 0B |
| • Battery - - - - - fluid level, corrosion of terminal | |
| • Connectors of electric wire harness - - - - - disconnection, friction | Section 6-1 or 7B1 |
| • Fuses - - - - - burning | SECTION 8 |
| • Parts - - - - - installation, damage | |
| • bolt - - - - - looseness | |
| • Other parts that can be checked visually | |
| • Also check following items at engine start, if possible. | |
| – "O/D OFF" lamp - - - - - Operation | SECTION 7B1 |
| – "POWER" lamp - - - - - Operation | SECTION 7B1 |
| – Malfunction indicator lamp ("SERVICE ENGINE SOON" lamp) - - - - - Operation | Section 6-1 |
| – Charge warning lamp - - - - - Operation | SECTION 6H |
| – Engine oil pressure warning lamp - - - - - Operation | SECTION 8C (SECTION 6A2 for pressure check) |
| – Engine coolant temp. meter - - - - - Operation | |
| – Other parts that can be checked visually | |

## A/T Basic Check

This inspection is important for troubleshooting when PCM (ECM) has detected no DTC and no abnormality has been noted in visual inspection. Follow flow table carefully.

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Automatic Transmission Diagnostic Flow Table" performed? | Go to Step 2. | Go to "Automatic Transmission Diagnostic Flow Table". |
| 2 | Perform "Manual Road Test" in this section.<br>Is it OK? | Go to Step 3. | Go to Step 4. |
| 3 | Proceed to "Trouble Diagnosis Table 1" in this section.<br>Is trouble identified? | Repair or replace defective parts. | Go to Step 5. |
| 4 | Perform stall test, time rag test, line pressure test, engine brake test and "P" range test referring to "Stall Test", "Line Pressure Test", "Engine Brake Test" and ""P" Range Test" in this section.<br>Are the test results satisfactory? | Go to Step 5. | Proceed to "Trouble Diagnosis Table 3" in this section. |
| 5 | Proceed to "Trouble Diagnosis Table 2" in this section.<br>Is trouble identified? | Repair or replace defective parts. | Proceed to "Trouble Diagnosis Table 3" in this section. |

## Trouble Diagnosis Table 1

| Condition | Possible Cause | Correction |
|---|---|---|
| **TCC does not operate** | Brake pedal (stop lamp) switch or its circuit faulty (H25 engine only) | Refer to “Diagnostic Flow Table A-1” in this section. |
| | 4WD low switch or its circuit faulty | |
| | Engine coolant temp. sensor or its circuit faulty | |
| | Cruise control signal circuit faulty (if equipped) | |
| **Gear does not change to 4th** | O/D off switch or its circuit faulty | Refer to “Diagnostic Flow Table A-2” in this section. |
| | 4WD low switch or its circuit faulty | |
| | Engine coolant temp. sensor or its circuit faulty | |
| | Cruise control signal circuit faulty (if equipped) | |

## Trouble Diagnosis Table 2

### TRANSMISSION FLUID

| Condition | Possible Cause | Correction |
|---|---|---|
| **Low fluid pressure** | Clogged oil pump strainer | Wash strainer. |
| | Malfunction of pressure regulator valve | Overhaul valve body. |
| **High fluid pressure** | Pressure regulator valve | Overhaul valve body. |

### RUNNING CONDITION

| Condition | Possible Cause | Correction |
|---|---|---|
| **Unable to run in all range** | Regulator valve stick | Replace. |
| | Clogged oil strainer | Wash strainer. |
| | Seized or broken planetary gear | Repair or replace. |
| | Faulty manual valve | Replace. |
| **Poor 1st speed running or excessive slippage in “D” or “2”** | Faulty 1–2 shift valve | Replace. |

### GEAR SHIFT

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor 1–2 shift, excessive slippage** | Regulator valve sticking | Replace. |
| | 1–2 shift valve sticking | Replace. |
| | Shift solenoid valve-B sticking | Replace. |
| | Intermediate coast modulator valve sticking | Replace. |
| **Poor 2–3 shift, excessive slippage** | 2–3 shift valve sticking | Replace. |
| | Shift solenoid valve-A sticking | Replace. |
| **Poor start or surging in "D" range** | Regulator valve sticking | Replace. |
| **Poor 3-4 shift, excessive slippage** | 3–4 shift valve sticking | Replace. |
| | Shift solenoid valve-B sticking | Replace. |
| **Excessive shock on 1–2 shift** | Regulator valve sticking | Replace. |
| | Faulty accumulator, second brake piston | Replace. |
| **Excessive shock on 2–3 shift** | Regulator valve sticking | Replace. |
| | Faulty accumulator, direct clutch piston | Replace. |
| **Excessive shock on 3–4 shift** | Regulator valve sticking | Replace. |
| **Non operate lock-up system** | TCC (Lock-up) control valve sticking | Replace. |
| | Solenoid valve No.2 (TCC solenoid valve) sticking | Replace. |

## Trouble Diagnosis Table 3

### TRANSMISSION FLUID

| Condition | Possible Cause | Correction |
|---|---|---|
| **Low fluid pressure** | Leakage from oil pressure circuit | Overhaul. |

### RUNNING CONDITION

| Condition | Possible Cause | Correction |
|---|---|---|
| **Unable to run in all range** | Wear in oil pump | Replace. |
| | Seizure in oil pump | Replace. |
| | Fluid pressure leakage to over drive clutch due to wear of oil pump bushing | Replace. |
| | Faulty in torque converter | Replace. |
| **Poor 1st speed running or excessive slippage in "D" or "2"** | Fluid pressure leakage from forward clutch due to wear or breakage of O/D case seal ring | Replace. |
| | Overdrive clutch slipping | Replace. |
| **Unable to run or excessive slippage in "L" range** | Fluid pressure leakage of forward clutch due to wear or breakage of O/D case seal ring | Replace. |
| | Reverse brake disc slipping | Replace. |
| | Broken brake piston O-ring | Replace. |
| **Unable to run or excessive slippage in "R" range** | Fluid pressure leakage to direct clutch due to wear or breakage of center support seal ring | Replace. |
| | Worn direct clutch | Replace. |

**GEAR SHIFT**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor 1–2 shift, excessive slippage** | Fluid pressure leakage to overdrive clutch due to wear or breakage of O/D case seal ring | Replace. |
| | Faulty second brake | Replace. |
| | Broken O-ring of second brake piston | Replace. |
| | Faulty second coast brake (in "2" range) | Replace. |
| **Poor 2–3 shift, excessive slippage** | Fluid pressure leakage to overdrive clutch due to wear or breakage of O/D case seal ring | Replace. |
| | Worn direct clutch bushing | Replace. |
| | Direct clutch slipping | Replace. |
| | Foreign material caught in direct clutch piston check ball | Replace. |
| **Poor start or surging in "D" range** | Fluid pressure leakage of forward clutch due to wear or breakage of O/D case seal ring | Replace. |
| | Malfunction of forward clutch | Replace. |
| **Poor 3–4 shift, excessive slippage** | Faulty overdrive brake | Replace. |
| | Faulty overdrive clutch | Replace. |
| **Poor start or juddering in "R" range** | Fluid pressure leakage of direct clutch due to wear or breakage of oil center support seal ring | Replace. |
| | Worn direct clutch | Replace. |
| **Excessive shock on 1– 2 shift** | Faulty one-way clutch | Replace. |
| **Non operate lock-up system** | Faulty torque converter | Replace. |

**ABNORMAL NOISE**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Abnormal noise in "P" or "N" range** | Worn oil pump | Replace. |

## Scan Tool Data

Refer to Section 6-1.

## Inspection of PCM and Its Circuit

Refer to Section 6-1.

## Wire Harness and Connectors

Refer to Section 6-1.

# Table A-1: No TCC Lock-Up Occurs

## SYSTEM DESCRIPTION

PCM turns TCC solenoid OFF under any of the following conditions.

- Brake pedal switch: ON
- 4WD LOW switch: ON
- Cruise control module: TCC OFF command signal is output (if equipped).
- ECT: ECT < 30 °C (86 °F)

## TROUBLESHOOTING

**WARNING:**

- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 person, a driver and tester, on a level road.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Automatic Transmission Diagnostic Flow Table" performed? | Go to Step 2. | Go to "Automatic Transmission Diagnostic flow Table" in this section. |
| 2 | ECT check:<br>1) Warm up engine to normal operating temperature.<br>2) Check ECT using scan tool.<br>Is ECT more than 30 °C (86 °F)? | Go to Step 3. | Faulty ECT sensor, its circuit or engine cooling system.<br>If OK, substitute a known-good PCM and recheck. |
| 3 | Perform running test under the following conditions and check voltage between C51-1-8 terminal of PCM coupler and ground.<br>• Normal mode in "D" range.<br>• Transfer "2H" position.<br>• Cruise control is not operated (if equipped).<br>• Brake pedal released.<br>• Drive vehicle with TCC ON condition referring to "TCC LOCK-UP DIAGRAM" in this section.<br>Is it battery voltage? | Faulty TCC solenoid valve, its circuit or transmission. | Go to Step 4. |
| 4 | Brake switch signal inspection:<br>With ignition switch ON, check voltage between E61-34 terminal of PCM coupler terminal and ground.<br>**Brake switch specification**<br>**Brake pedal released: 0 V**<br>**Brake pedal depressed: Battery voltage**<br>Is the result as specified? | Go to Step 5. | Faulty brake pedal switch or its circuit.<br>If OK, substitute a known-good PCM and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 5 | "4WD LOW" switch signal inspection:<br>With ignition switch ON, check voltage between C51-1-26 terminal of PCM coupler and ground.<br>**"4WD LOW" switch specification**<br>**Transfer gear position "4L" or "N": 0 V**<br>**Transfer gear position "4H" or "2H":**<br>**Battery voltage**<br>Is the result as specified? | Go to Step 6. | Faulty "4WD LOW" switch or its circuit.<br>If OK, substitute a known-good PCM and recheck. |
| 6 | Is vehicle equipped with cruise control system? | Go to Step 7. | Substitute a know-good PCM and recheck. |
| 7 | Cruise control signal inspection:<br>With ignition switch ON, check voltage between E61-35 terminal of PCM coupler and ground.<br>Is it battery voltage? | Substitute a known-good PCM and recheck. | Faulty cruise control module or its circuit.<br>If OK, substitute a known-good PCM and recheck. |

# Table A-2: No Gear Shift to O/D

## SYSTEM DESCRIPTION

PCM does not shift to O/D gear under any of the following conditions.

- O/D off switch: ON
- 4WD LOW switch: ON
- Cruise control module: O/D OFF command signal is output (if equipped).
- ECT: ECT < 30 °C (86 °F)

## TROUBLESHOOTING

**WARNING:**

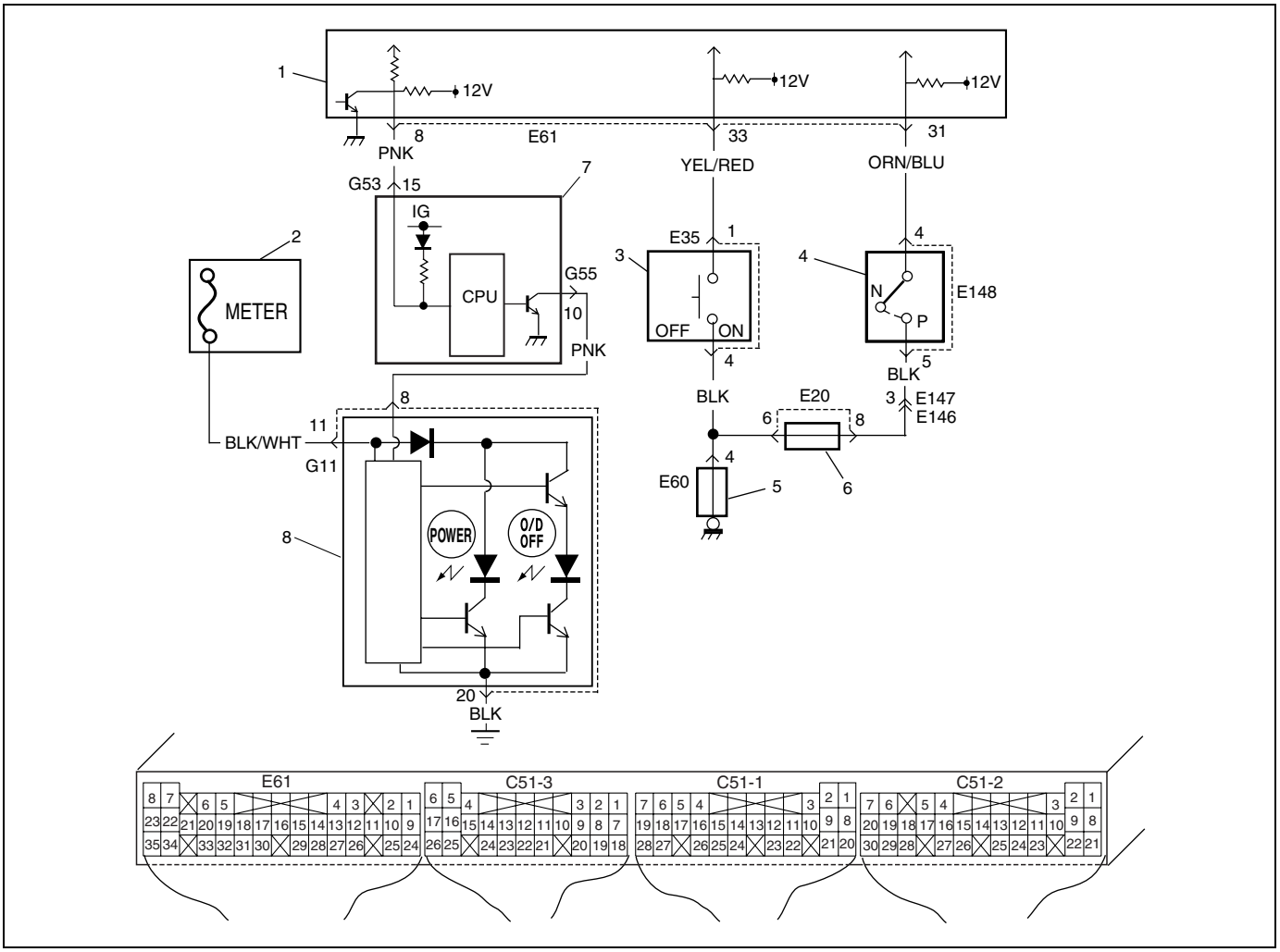
- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 person, a driver and tester, on a level road.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "Automatic Transmission Diagnostic Flow Table" performed? | Go to Step 2. | Go to "Automatic Transmission Diagnostic Flow Table" in this section. |
| 2 | ECT check:<br>1) Warm up engine to normal operating temperature.<br>2) Check ECT using scan tool.<br>Is ECT more than 30 °C (86 °F)? | Go to Step 3. | Faulty ECT sensor, its circuit or engine cooling system.<br>If OK, substitute a known-good PCM and recheck. |
| 3 | Perform running test under the following conditions and check voltage between C51-1-2 terminal of PCM coupler and ground, C51-1-1 terminal of PCM coupler and ground.<br>• O/D off switch OFF ("O/D OFF" lamp OFF).<br>• Normal mode in "D" range.<br>• Transfer "2H" position.<br>• Cruise control is not operated (if equipped).<br>• Drive vehicle with 4th gear condition referring to "Gear shift diagram" in this section.<br>Is each voltage about 0 V? | Faulty shift solenoid valve, its circuit or transmission | "GRN" wire or "GRN/RED" wire shorted to power circuit.<br>If OK, go to Step 4. |
| 4 | O/D off switch signal inspection:<br>With ignition switch ON, check voltage between E61-33 terminal of PCM coupler and ground.<br>**"O/D" cut switch specification**<br>**"O/D" cut switch OFF: Battery voltage**<br>**"O/D" cut switch ON: 0 V**<br>Is the result as specified? | Go to Step 5. | Faulty O/D off switch or its circuit.<br>If OK, substitute a known-good PCM and recheck. |
| 5 | "4WD LOW" switch signal inspection:<br>With ignition switch ON, check voltage between C51-1-26 terminal of PCM coupler and ground.<br>**"4WD LOW" switch specification**<br>**Transfer gear position "4L" or "N": 0 V**<br>**Transfer gear position "4H" or "2H": Battery voltage**<br>Is the result as specified? | Go to Step 6. | Faulty "4WD LOW" switch or its circuit.<br>If OK, substitute a known-good PCM and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | Is vehicle equipped with cruise control system? | Go to Step 7. | Substitute a known-good PCM and recheck. |
| 7 | Cruise control signal inspection:<br>With ignition switch ON, check voltage between E61-35 terminal of PCM coupler and ground.<br>Is it battery voltage? | Substitute a known-good PCM and recheck. | Faulty cruise control module or its circuit.<br>If OK, substitute a known-good PCM and recheck. |

# Table B-1: "O/D OFF" Light Circuit Check ("O/D OFF" Light Does Not Light at Ignition Switch ON But Engine Starts Up)

## WIRING DIAGRAM




| | | |
|---|---|---|
| 1. PCM | 4. P/N change switch | 7. BCM |
| 2. Fuse | 5. J/C | 8. Combination meter |
| 3. O/D off switch | 6. J/C | |

## CIRCUIT DESCRIPTION

Refer to "Diagnosis" in Section 8.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Are "O/D OFF" light, "POWER" light and transmission range indicator light in combination meter kept turned off with ignition switch ON? | Poor G11-11 terminal connection on BCM, "METER" fuse blown or faulty "BLK/WHT" wire. | Replace combination meter. |

# Table B-2: "O/D OFF" Light Circuit Check ("O/D OFF" Light Comes ON Steadily)

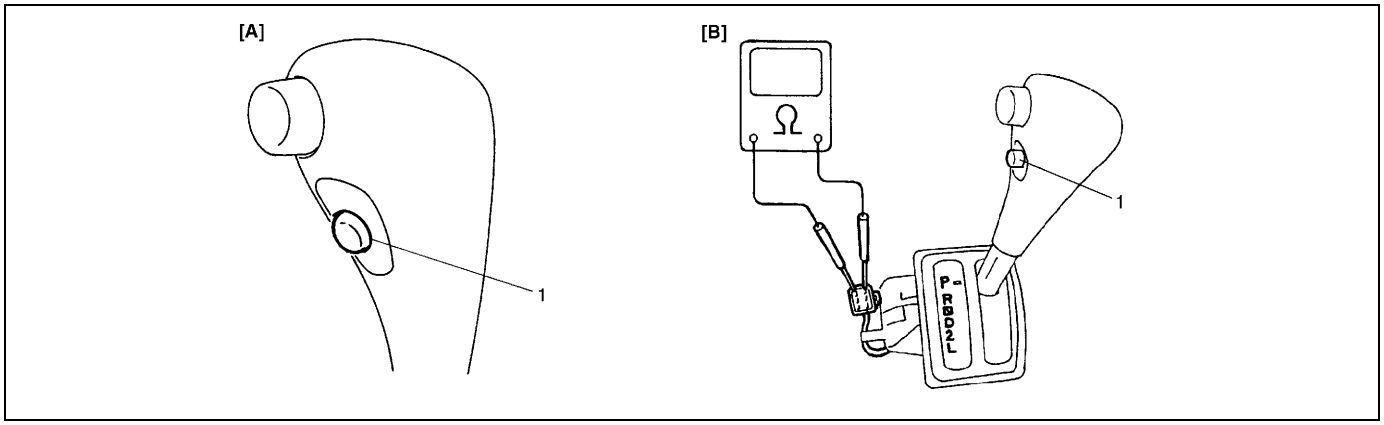
## WIRING DIAGRAM

Refer to "TABLE B-1" in this section.

## TROUBLESHOOTING

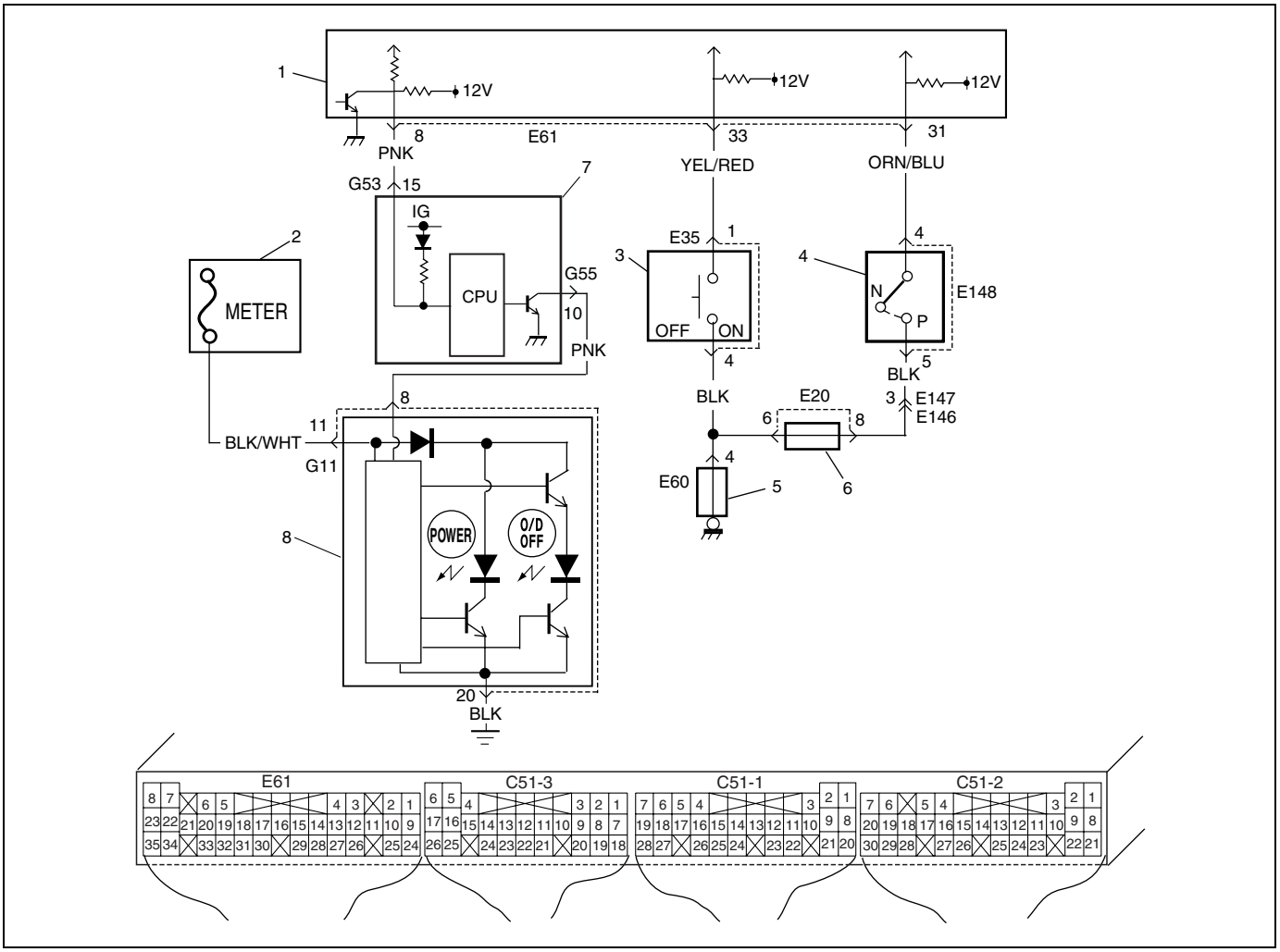
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check O/D off switch status.<br>Press O/D off switch button (1).<br>Does "O/D OFF" light come ON steadily? | Go to Step 2. | System is OK. |
| 2 | Check O/D off switch circuit.<br>1) Check resistance between terminal E61-33 of disconnected PCM connector and body ground, pressing O/D off button (1) repeatedly.<br>Is continuity indicated steadily? | Go to Step 3. | Go to Step 4. |
| 3 | Check O/D off switch for operation.<br>1) Remove console box.<br>2) Disconnect O.D off switch connector.<br>3) Check continuity between switch terminals under each condition shown below.<br>**O/D off switch operation**<br>**With O/D off switch button (1) released:**<br>**No continuity**<br>**With O/D off switch button (1) held pressed in:**<br>**Continuity**<br>Is check result satisfactory? | "YEL/RED" circuit shorted to ground. | Replace O/D off switch. |
| 4 | Check PCM internal circuit.<br>1) Turn ignition switch OFF.<br>2) Disconnect PCM connector.<br>3) Turn ignition switch ON.<br>Does "O/D OFF" light come ON steadily? | Replace combination meter. | Replace PCM. |

[A] for Step 1/[B] for Step 4



# Table B-3: "POWER" Light Circuit Check ("POWER" Light Does Not Light at Ignition Switch ON But Engine Starts Up)

## WIRING DIAGRAM




| | | |
|---|---|---|
| 1. PCM | 4. P/N change switch | 7. BCM |
| 2. Fuse | 5. J/C | 8. Combination meter |
| 3. O/D off switch | 6. J/C | |

## CIRCUIT DESCRIPTION

Refer to "Diagnosis" in Section 8.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Are "O/D OFF" light "POWER" light and transmission range indicator light in combination meter kept turned off with ignition switch ON? | Poor G11-11 terminal connection on BCM, "METER" fuse blown or faulty "BLK/WHT" wire. | Replace combination meter. |

# Table B-4: "POWER" Light Circuit Check ("POWER" Light Comes ON Steadily)

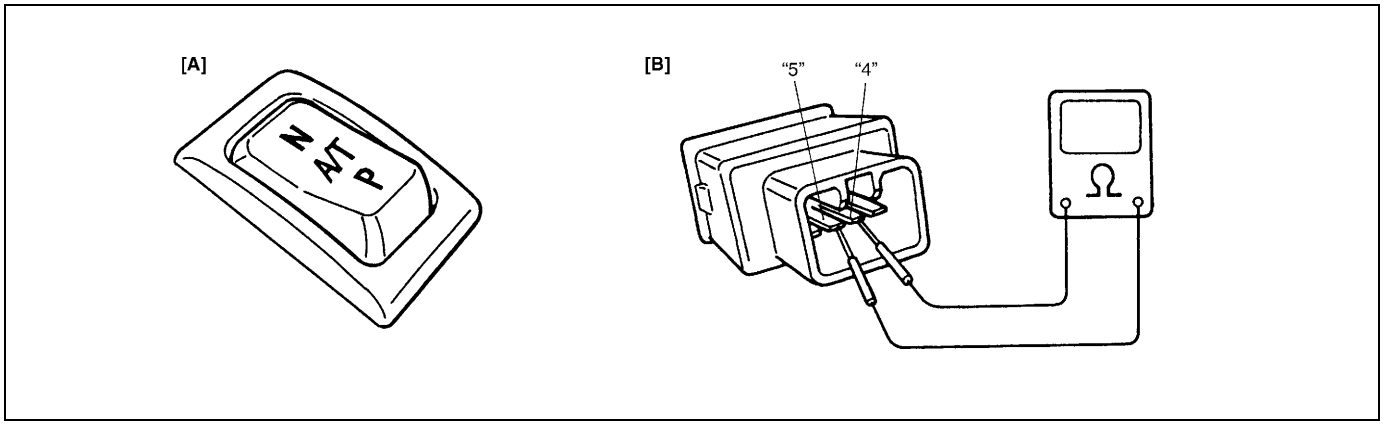
## WIRING DIAGRAM

Refer to "TABLE B-3" in this section.

## TROUBLESHOOTING

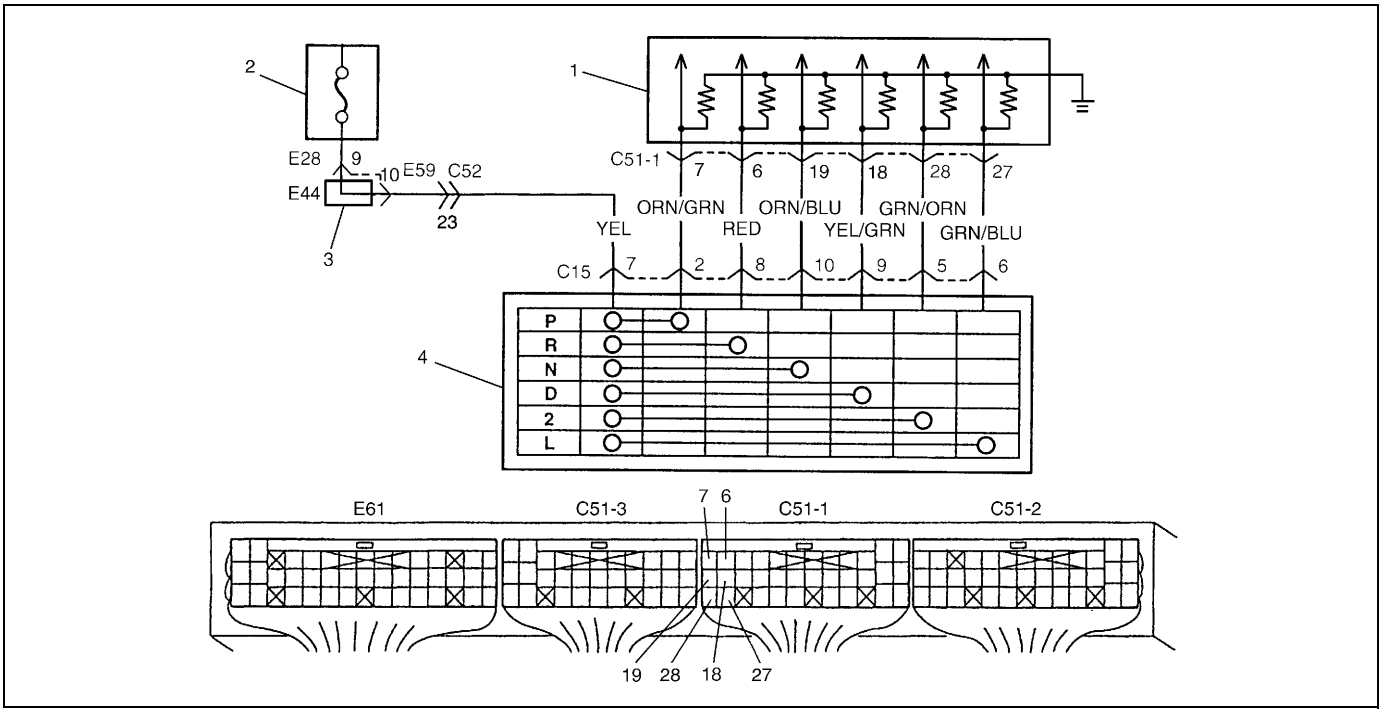
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check Power/Normal change switch position.<br>Is switch button at Normal position? | Go to Step 2. | Set Power/Normal change switch at Normal position. |
| 2 | Check Power/Normal change switch circuit.<br>1) Check resistance between terminal E61-31 of disconnected PCM connector and body ground with P/N change switch at Normal position.<br>Is continuity indicated? | Go to Step 3. | Go to Step 4. |
| 3 | Check Power/Normal change switch for operation.<br>1) Remove Power/Normal change switch.<br>2) Check continuity between switch terminals "4" and "5" under each condition shown below.<br>Normal position: No continuity<br>Power position: Continuity<br>Is check result satisfactory? | "ORN/BLU" circuit shorted to ground. | Replace Power/Normal change switch. |
| 4 | Check PCM internal circuit.<br>1) Turn ignition switch OFF.<br>2) Disconnect PCM connector.<br>3) Turn ignition switch ON.<br>Does "POWER" light come ON steadily? | Replace combination meter. | Replace PCM. |

[A] for Step 1/[B] for Step 4



# DTC P0705 (DTC NO.72) – Transmission Range Sensor (Switch) Circuit Malfunction

## WIRING DIAGRAM




| | |
|---|---|
| 1. PCM | 3. J/C |
| 2. Fuse | 4. Transmission range sensor (switch) |

## 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 25 sec, at 60 km/h (38 mile/h) or higher vehicle speed.<br>or<br>• Multiple signals are inputted simultaneously for 25 sec.<br>(2 driving cycle detection logic) | • Transmission range sensor (switch) maladjusted.<br>• Transmission range sensor (switch) or its circuit malfunction.<br>• PCM |

## 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, pending DTC and freeze frame data in PCM memory by using scan tool and start engine.
3) Shift A/T selector lever to each of L, 2, D, N, R and P ranges for 30 seconds each.
4) Increase vehicle speed to about 70 km/h (45 mile/h) in D range.
5) Keep driving above vehicle speed for 30 seconds.
6) Release accelerator pedal, decrease vehicle speed and stop vehicle.
7) Check DTC and/or pending DTC.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T Diagnostic Flow Table” in this section performed? | Go to Step 2. | Go to “A/T Diagnostic Flow Table” in this section. |
| 2 | Do you have SUZUKI scan tool? | Go to Step 3. | Go to Step 4. |
| 3 | Check Transmission range switch (sensor) circuit for operation.<br>Check by using SUZUKI scan tool:<br>1) Connect SUZUKI scan tool to DLC with ignition switch OFF.<br>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.<br>Is applicable range indicated?<br>Are check results satisfactory? | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 5. |
| 4 | Check Transmission range switch (sensor) circuit for operation.<br>Check by not using SUZUKI scan tool:<br>1) Turn ignition switch ON.<br>2) Check voltage at terminals C51-1-6, C51-1-7, C51-1-18, C51-1-19, C51-1-27 and C51-1-28 respectively with select lever shifted to each range.<br>Taking terminal C51-1-28 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 figure?<br>Check voltage at other terminals likewise, referring to figure.<br>Are check results satisfactory? | Intermittent trouble. Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 5. |
| 5 | Check select cable for adjustment referring to “Select Cable Adjustment” in this section.<br>Is it adjusted correctly? | Go to Step 6. | Adjust. |

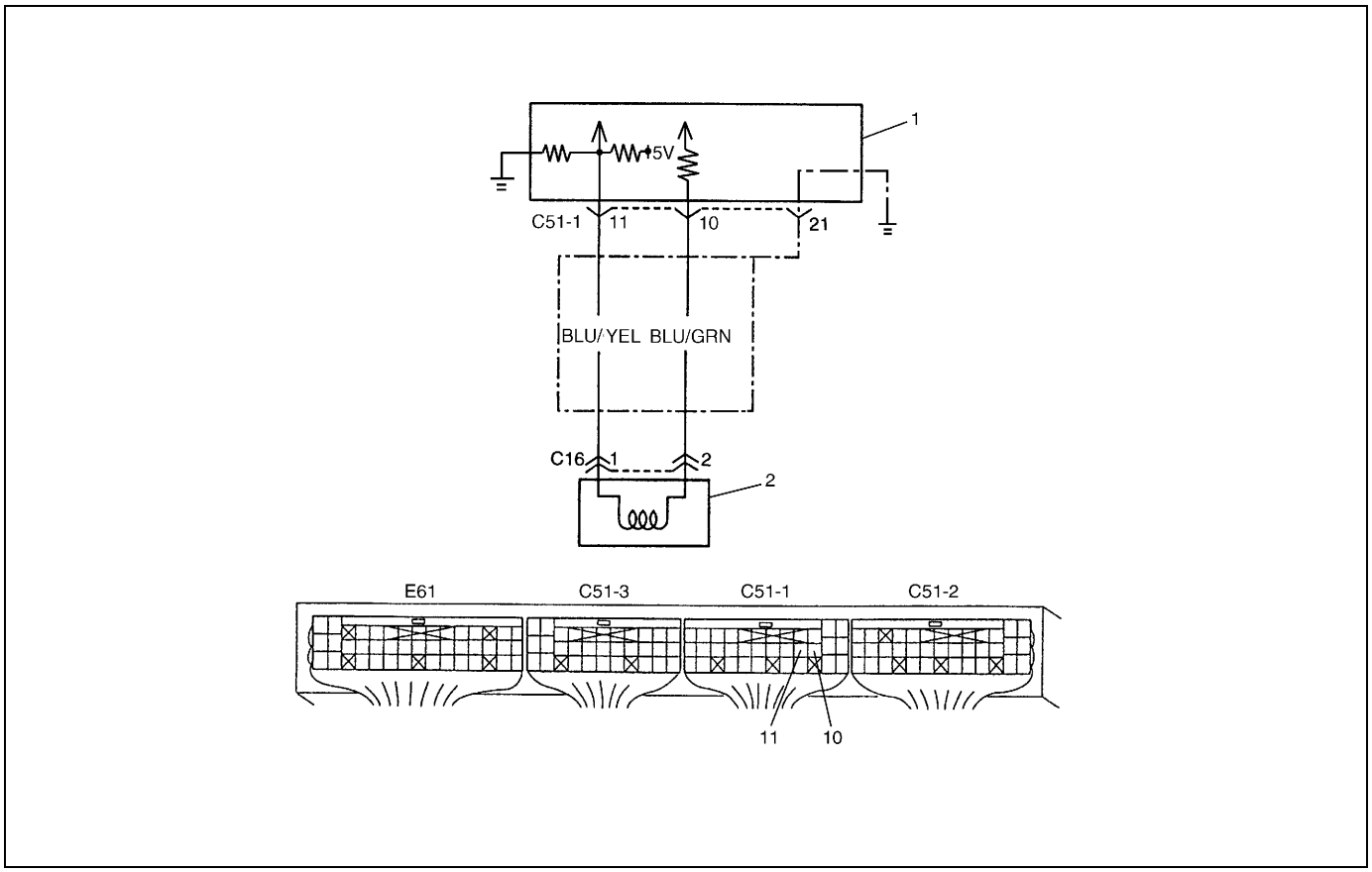
| Step | Action | Yes | No |
|---|---|---|---|
| 6 | Check transmission range switch for installation position.<br>1) Shift select lever to “N” range.<br>2) Check that “N” reference line on switch and center line on shaft are aligned.<br>Are they aligned? | Go to Step 7. | Adjust. |
| 7 | Check transmission range switch (sensor) referring to “Transmission Range Switch” in this section.<br>Are check results satisfactory? | “YEL”, “ORN/GRN”, “RED”, “ORN/BLU”, “YEL/GRN”, “GRN/ORN” or “GRN/BLU” circuit open or short. If wires and connections are OK, substitute a known-good PCM and recheck. | Replace Transmission range switch. |

Fig. for Step 2.

| | | Terminal | | | | | |
|---|---|---|---|---|---|---|---|
| | | C51-1-7 | C51-1-6 | C51-1-19 | C51-1-18 | C51-1-28 | C51-1-27 |
| Select lever position | P | B + V | 0 V | 0 V | 0 V | 0 V | 0 V |
| | R | 0 V | B + V | 0 V | 0 V | 0 V | 0 V |
| | N | 0 V | 0 V | B + V | 0 V | 0 V | 0 V |
| | D | 0 V | 0 V | 0 V | B + V | 0 V | 0 V |
| | 2 | 0 V | 0 V | 0 V | 0 V | B + V | 0 V |
| | L | 0 V | 0 V | 0 V | 0 V | 0 V | B + V |

# DTC P0715 (DTC NO.76) – Input/Turbine Speed Sensor Circuit Malfunction

## WIRING DIAGRAM




| |
|---|
| 1. PCM |
| 2. Input shaft speed sensor |

## DTC DETECTING CONDITION AND TROUBLE AREA

| DTC DETECTING CONDITION | TROUBLE AREA |
|---|---|
| Input speed sensor detected speed is lower than specification while vehicle running under all of the following conditions:<br>• at higher than 10 km/h (7 mile/h) with 1st gear in D range for 1 sec. or more.<br>• at higher than 20 km/h (13 mile/h) with 2nd gear in D range for 2 sec. or more.<br>• at higher than 30 km/h (20 mile/h) with 3rd gear in D range for 2 sec. or more.<br>(2 driving cycle detection logic) | Input speed sensor and its circuit<br>PCM |

## 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.**

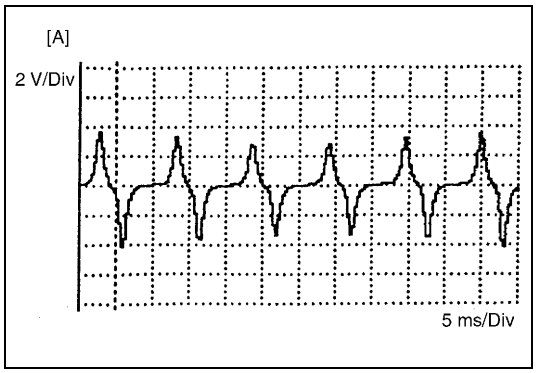
1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC, pending DTC and freeze frame data by using scan tool.
3) Start engine and turn O/D cut switch ON.
4) Shift select lever to D range and start vehicle.
5) Keep vehicle speed at higher than 10 km/h (7 mile/h) with 1st gear in D range for 2 sec. or more.
6) Increase vehicle speed and keep it at higher than 20 km/h (13 mile/h) with 2nd gear in D range for 2 sec. or more.
7) Increase vehicle speed and keep it at higher than 30 km/h (20 mile/h) with 3rd gear in D range for 2 sec. or more.
8) Stop vehicle.
9) Check DTC and/or pending DTC.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T Diagnostic Flow Table" in this section performed? | Go to Step 2. | Go to "A/T Diagnostic Flow Table" in this section. |
| 2 | Input shaft speed sensor circuit check:<br>1) Remove PCM cover.<br>2) With ignition switch OFF, disconnect PCM connectors.<br>3) Check for proper connection to input shaft speed sensor at C51-1-10 and C51-1-11 terminals.<br>4) If OK, check resistance of sensor circuit.<br>**Input shaft speed sensor resistance:**<br>**Resistance between C51-1-10 and C51-1-11**<br>**530 – 650 Ω (at 20 °C (68 °F))**<br>**Resistance between C51-1-10/C51-1-11 and ground:**<br>**1 MΩ or more**<br>Are check results satisfactory? | Go to Step 4. | Go to Step 3. |
| 3 | Input shaft speed sensor check:<br>1) With ignition switch OFF, disconnect input shaft speed sensor connector.<br>2) Check for proper connection to input shaft speed sensor at each terminals.<br>3) If OK, then check resistance of input shaft speed sensor.<br>Are measured values as specified in Step 2? | "BLU/GRN" or "BLU/YEL" wire open or shorted to ground. | Replace input shaft speed sensor. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | Check visually input speed sensor and over-drive clutch drum for the followings.<br>• No damage<br>• No foreign material attached<br>• Correct installation<br>Are they in good condition? | Intermittent trouble or faulty PCM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | Clean, repair or replace. |

**REFERENCE**

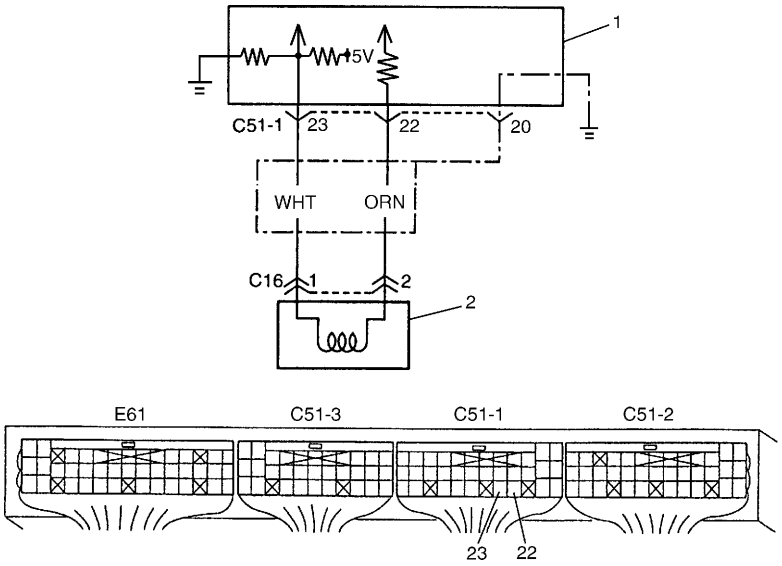



Connect oscilloscope between C51-1-11 (+) and C51-1-10 (–) of PCM connector connected to PCM and check input speed sensor signal.

[A]: Oscilloscope waveforms at specified idle speed in “p” range

# DTC P0720 (DTC NO.75) Output Speed Sensor Circuit Malfunction

## WIRING DIAGRAM




| |
|---|
| 1. PCM |
| 2. Output shaft speed sensor |

## DTC DETECTING CONDITION AND TROUBLE AREA

| DTC DETECTING CONDITION | TROUBLE AREA |
|---|---|
| • With 4WD LOW switch OFF, no output shaft speed sensor signal is inputted while vehicle speed sensor signal are inputted,<br>or<br>• With 4WD LOW switch OFF, no output shaft speed sensor signal is inputted while engine running at higher than specified engine speed with “D” range. (2 driving cycle detection logic) | • Output speed sensor or its circuit<br>• PCM |

## DTC CONFIRMATION PROCEDURE

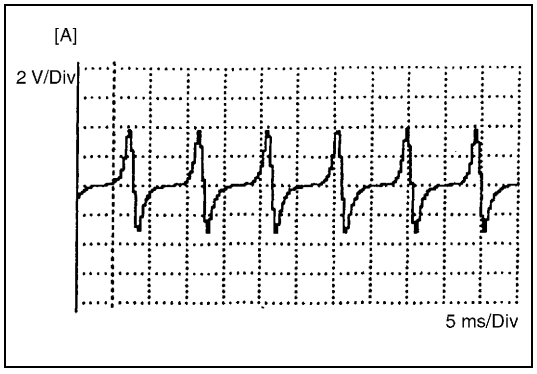
**WARNING:**
- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC, pending DTC and freeze frame data in PCM memory by using scan tool.
3) Start engine and shift transfer lever to “2H” or “4H” range.
4) Drive vehicle at 40 km/h (25 mile/h) or more for longer than 10 sec. (or higher than 3500 r/min engine speed with “D” range for longer than 10 sec.)
5) Stop vehicle and check DTC and/or pending DTC.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T Diagnostic Flow Table" in this section performed? | Go to Step 2. | Go to "A/T Diagnostic Flow Table" in this section. |
| 2 | Output shaft speed sensor circuit check:<br>1) Remove PCM cover.<br>2) With ignition switch OFF, disconnect PCM connectors.<br>3) Check for proper connection to output speed sensor at C51-1-22 and C51-1-23 terminals.<br>4) If OK, check resistance of sensor circuit.<br>**Resistance between C51-1-22 and C51-1-23: 387 – 473 Ω (at 20 °C (68 °F))**<br>**Resistance between C51-1-22/C51-1-23 and ground: 1 MΩ or more**<br>Are check results satisfactory? | Go to Step 4. | Go to Step 3. |
| 3 | Output shaft speed sensor check:<br>1) With ignition switch OFF, disconnect output shaft speed sensor connector.<br>2) Check for proper connection to output shaft speed sensor at each terminals.<br>3) If OK, then check resistance of output shaft speed sensor.<br>Are measured values as specified in Step 2? | "ORN" or "WHT" wire open or shorted to ground. | Replace output shaft speed sensor. |
| 4 | Check visually output shaft speed sensor and sensor rotor for the followings.<br>• No damage<br>• No foreign material attached<br>• Correct installation<br>Are they in good condition? | Intermittent trouble or faulty PCM.<br>Check for intermittent referring to "Intermittent and Poor Connection" in Section 0A. | Clean, repair or replace. |

## REFERENCE

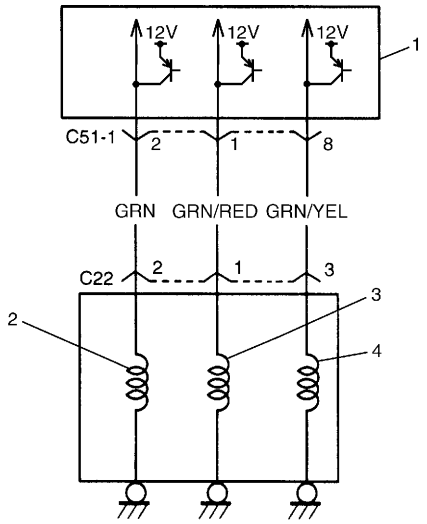


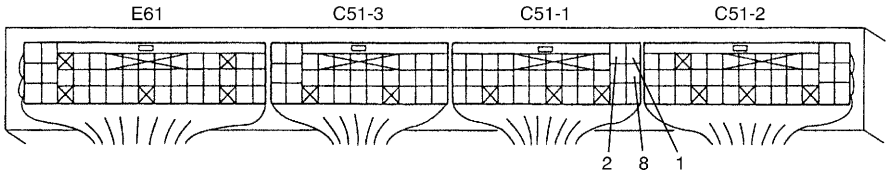

Connect oscilloscope between C51-1-23 (+) and C51-1-22 (–) of PCM connector connected to PCM and check output speed sensor signal.

[A]: Oscilloscope waveforms at about 40 km/h (25 mile/h)

# DTC P0743 (DTC NO.65/66) – TCC (Lock-Up) Solenoid Electrical

## WIRING DIAGRAM




| |
|---|
| 1. PCM |
| 2. Shift solenoid-A |
| 3. Shift solenoid-B |
| 4. TCC solenoid |

## DTC DETECTING CONDITION AND TROUBLE AREA

| DTC DETECTING CONDITION | TROUBLE AREA |
|---|---|
| Voltage at terminal C51-1-8 of PCM is high while TCC solenoid OFF is commanded or low while TCC solenoid ON is commanded. | • TCC (lock-up) solenoid valve<br>• TCC (lock-up) solenoid valve circuit<br>• PCM |

## 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.**

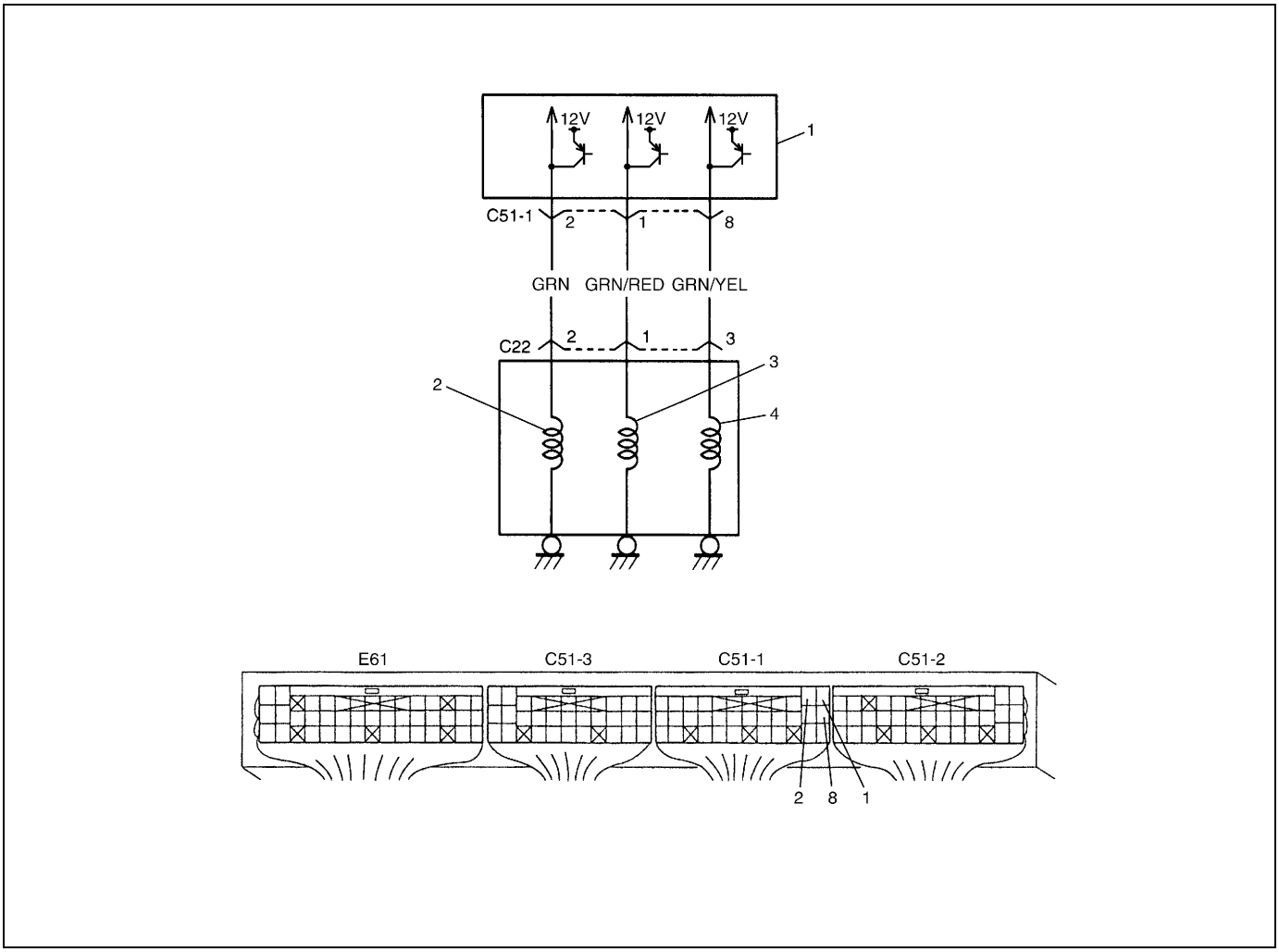
1) Connect scan tool to DLC with ignition switch OFF, if available.
2) Clear DTC, pending DTC and freeze frame data in PCM memory by using scan tool.
3) Start engine, warm it up to normal operating temperature and shift transfer lever to “2H” or “4H” range.
4) Shift selector lever in D range and keep it there for 10 seconds.
5) Increase vehicle speed to about 80 km/h (50 mile/h) in 4th gear and in D range.
6) Keep driving at above speed for 20 seconds.
7) Release accelerator pedal, decrease vehicle speed and stop vehicle.
8) Check DTC and/or pending DTC.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T Diagnostic Flow Table” in this section performed? | Go to Step 2. | Go to “A/T Diagnostic Flow Table” in this section. |
| 2 | Check TCC solenoid circuit for short.<br>1) Turn ignition switch OFF and disconnect PCM connectors.<br>2) Check for proper connection to PCM at terminal C51-1-8.<br>3) If OK, then turn ignition switch ON and measure voltage between terminal C51-1-8 of disconnected PCM connector and ground.<br>Is it about 0 V? | Go to Step 3. | “GRN/YEL” circuit shorted to power circuit. |
| 3 | Check TCC solenoid circuit for open or short.<br>1) Turn ignition switch OFF.<br>2) Measure resistance between terminal C51-1-8 of disconnected PCM connector and ground.<br>Is it 11 – 15 Ω (at 20 °C (68 °F))? | Intermittent trouble or faulty PCM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | “GRN/YEL” circuit open or shorted to ground.<br>If wire and connections are OK, replace TCC solenoid. |

# DTC P0753 (DTC NO.61/62) Shift Solenoid-A (#1) Electrical
# DTC P0758 (DTC NO.63/64) Shift Solenoid-B (#2) Electrical

## WIRING DIAGRAM




| |
|---|
| 1. PCM |
| 2. Shift solenoid-A |
| 3. Shift solenoid-B |
| 4. TCC solenoid |

## DTC DETECTING CONDITION AND TROUBLE AREA

| DTC DETECTING CONDITION | TROUBLE AREA |
|---|---|
| DTC P0753 (DTC NO.61/62):<br>Voltage detected at C51-1-2 terminal is specified voltage or lower when shift solenoid valve-A is ON or specified voltage or higher when it is OFF. | • Shift solenoid valve-A<br>• Shift solenoid valve-A circuit<br>• PCM |
| DTC P0758 (DTC NO.63/64):<br>Voltage detected at C51-1-1 terminal is specified voltage or lower when shift solenoid valve-B is ON or specified voltage or higher when it is OFF. | • Shift solenoid valve-B<br>• Shift solenoid valve-B circuit<br>• PCM |

## 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, pending DTC and freeze frame data in PCM memory by using scan tool.
3) Start engine and shift transfer lever to “2H” or “4H” range.
4) Shift selector lever in D range and keep it for 10 seconds.
5) Drive vehicle about 30 km/h (20 mile/h) with 2nd gear in “D” range for 10 seconds.
6) Increase vehicle speed to about 80 km/h (50 mile/h) with 4th gear in D range and keep it for 10 seconds.
7) Release accelerator pedal, decrease vehicle speed and stop vehicle.
8) Check DTC and/or pending DTC.

## TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T Diagnostic Flow Table” in this section performed? | Go to Step 2. | Go to “A/T Diagnostic Flow Table” in this section. |
| 2 | Check shift solenoid circuit for short.<br>1) Turn ignition switch OFF and disconnect PCM connectors.<br>2) Check for proper connection to PCM at terminals C51-1-2 or C51-1-1.<br>3) If OK, then turn ignition switch ON and measure voltage between terminal C51-1-2 or C51-1-1 of disconnected PCM connector and ground.<br>Is it about 0 V? | Go to Step 3. | “GRN” or “GRN/RED“ circuit shorted to power circuit. |
| 3 | Check shift solenoid circuit for open or short.<br>1) Turn ignition switch OFF.<br>2) Measure resistance between terminal C51-1-2 or C51-1-1 of disconnected PCM connector and ground.<br>Is it 11 – 15 Ω (at 20 °C (68 °F))? | Intermittent trouble or faulty PCM.<br>Check for intermittent referring to “Intermittent and Poor Connection” in Section 0A. | “GRN” or “GRN/RED“ circuit open or shorted to ground.<br>If wire and connections are OK, replace malfunction shift solenoid. |

## Stall Test

This test is to check overall performance of automatic transmission and engine by measuring stall speed at “D” and “R” ranges. Be sure to perform this test only when transmission 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, for fluid temperature may rise excessively high.**
- **After performing stall test, be sure to leave engine running at idle for longer than 30 seconds before another stall test.**

1) Apply parking brake and block wheels.
2) Install tachometer.
3) Start engine with select lever shifted to “P”.
4) Depress brake pedal fully.
5) Shift select lever to “D” 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.

**Stall speed:**
**2,460 – 2,760 r/min.**

### TROUBLESHOOTING

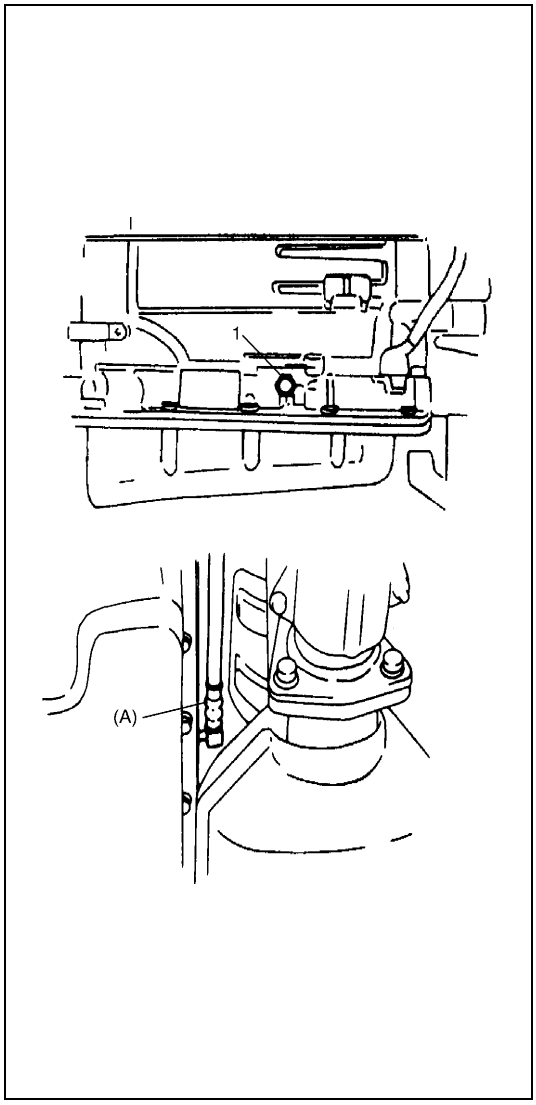
| Condition | Possible cause |
|---|---|
| Lower than standard level | • Faulty engine output<br>• Defective torque converter |
| Higher than standard level in “D” range | • Slippery O/D clutch<br>• Slippery forward clutch<br>• Malfunctioning O/D one-way clutch<br>• Malfunctioning one-way clutch No. 2<br>• Low line pressure |
| Higher than standard level in “R” range | • Slippery direct clutch<br>• Slippery reverse brake<br>• Low fluid pressure<br>• Slippery O/D clutch<br>• Defective O/D one-way clutch |

## Line Pressure Test

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line. Line pressure test requires following conditions.

- Automatic fluid is at normal operating temperature (70 to 80 °C/158 – 176 °F).
- Fluid is filled to proper level (between FULL HOT and LOW HOT on dipstick).

1) Apply parking brake securely and place checks against wheels.




2) Attach oil pressure gauge to fluid pressure check hole (1) in transmission case.

**Special tool**
**(A): 09925-37811-001**

**CAUTION:**
**After attaching oil pressure gauge, check that not fluid leakage exists.**

3) Depress foot brake fully, run engine at idle and stall.
4) Check fluid pressure in “D” or “R” range within the following specification.

**CAUTION:**
**Do not continue running engine at stall speed longer than 5 seconds.**

**Line pressure:**

| | “D” range | “R” range |
|---|---|---|
| **Idle speed** | **4.1 – 4.6 kg/cm$^2$ 58 – 65 psi** | **5.4 – 6.0 kg/cm$^2$ 77 – 85 psi** |
| **Stall speed** | **12.0 – 13.5 kg/cm$^2$ 171 – 192 psi** | **14.6 – 17.1 kg/cm$^2$ 208 – 243 psi** |

5) If check result is OK, disconnect special tool, then tighten transmission case plug to specified torque.

**Tightening torque**
**Transmission case plug: 17 N·m (1.7 kg-m, 12.0 lb-ft)**

**TROUBLESHOOTING**

| Condition | Possible cause |
|---|---|
| Line pressure higher than standard level in each range | • Malfunctioning regulator valve<br>• Malfunctioning throttle valve<br>• Maladjusted A/T throttle cable |
| Line pressure lower than standard level in each range | • Defective O/D clutch<br>• Defective oil pump<br>• Malfunctioning throttle valve<br>• Malfunctioning regulator value<br>• Maladjusted A/T throttle cable |
| Line pressure lower than standard level only in “D” range | • Fluid leakage from forward clutch<br>• Defective O/D clutch<br>• Leakage from “D” range fluid pressure circuit |
| Line pressure lower than standard level only in “R” range | • Fluid leakage from direct clutch<br>• Defective O/D clutch<br>• Fluid leakage from reverse brake<br>• Fluid leakage from “R” range fluid circuit |

## Road Test

This test is to check if upshift and downshift take place at specified speed 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 select lever “D”.
3) Accelerate vehicle speed by depressing accelerator pedal gradually.
4) While driving in “D” range, check if gear shift occurs properly as shown in “GEAR SHIFT DIAGRAM” in this section.

**TROUBLESHOOTING**

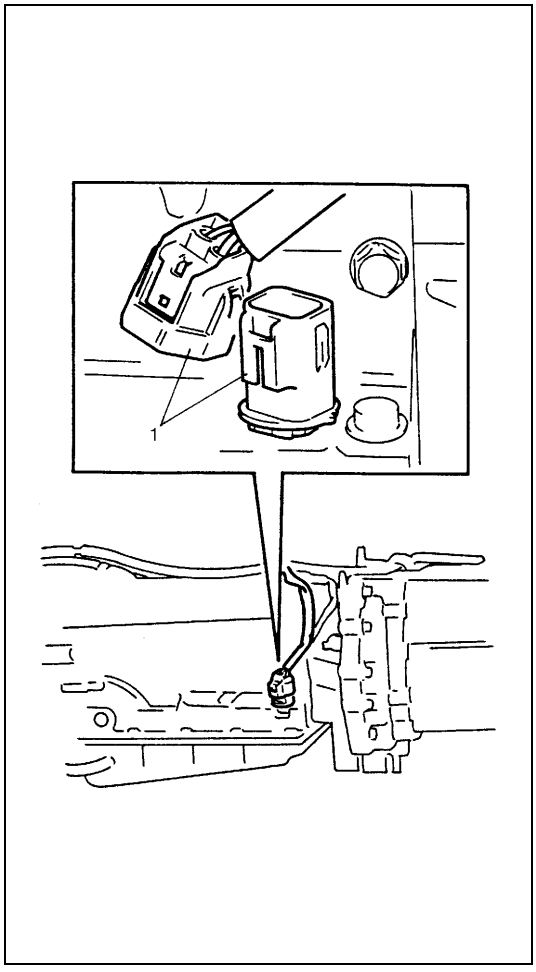
| Condition | Possible cause |
|---|---|
| When 1 → 2 upshift fails to occur | 1–2 shift valve stuck |
| When 2 → 3 upshift fails to occur | 2–3 shift valve stuck |
| When 3 → O/D upshift fails to occur | 3–4 shift valve stuck |
| When gear shift point is incorrect | • Maladjusted throttle cable<br>• Defective shift solenoid valve -A or -B<br>• 1–2, 2–3 or 3–4 shift valve not operating properly |

## Manual Road Test

This test check the gear being used in “L”, “2” or “D” range when driven with unoperated gear shift control system. Test drive vehicle on a level road.

**NOTE:**

**Before this test, check diagnostic trouble code (DTC).**




1) Disconnect shift solenoid coupler (1) valves on transmission.

**WARNING:**

**To avoid the danger of being burned, do not touch the hot exhaust system when disconnecting shift solenoid coupler (1).**

2) With select lever in “P”, start engine and warm it up.
3) With select lever in “L” range, start vehicle and accelerate to 20 km/h (12.5 mile/h). Check in this state that 1st gear is being used.
4) At 20 km/h (12.5 mile/h), shift select lever to “2” range and accelerate to 40 km/h (25 mile/h). Check in this state that 3rd gear is being used.
5) At 40 km/h (25 mile/h), shift select lever to “D” range and check that O/D gear is used when speed is higher than 40 km/h (25 mile/h).
6) After above checks, stop vehicle then engine, and connect shift solenoids coupler (1) with ignition switch OFF.

**WARNING:**

**To avoid the danger of being burned, do not touch the hot exhaust system when connecting shift solenoid coupler (1).**

7) Clear DTC with scan tool.

## Time Lag Test

This test is to check conditions of clutch, reverse 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.

**Specification for time lag:**

| | |
|---|---|
| **“N” → “D”** | **Less than 1.2 sec.** |
| **“N” → “R”** | **Less than 1.5 sec.** |

**NOTE:**

- **When repeating this test, be sure to wait at least minute after select lever is shifted back to "N" range.**
- **Engine should be warmed up fully for this test.**

**TROUBLESHOOTING**

| Condition | Possible cause |
|---|---|
| When "N" → "D" time lag exceeds specification | • Low line pressure<br>• Worn forward clutch |
| When "N" → "R" time lag exceeds specification | • Low line pressure<br>• Worn direct clutch<br>• Worn reverse brake |

## Engine Brake Test

**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) If engine brake fails to operate in above tests, possible causes for such failure are as follows. Check each part which is suspected to be the cause.

**TROUBLESHOOTING**

| Condition | Possible cause |
|---|---|
| Fails to operate when shifted down to "2" range | Second coast brake defective |
| Fails to operate when shifted down to "L" range | Reverse brake defective |

## "P" Range Test

1) Stop vehicle on a slope, shift select lever to "P" range and at the same time apply parking brake.
2) After stopping engine, depress brake pedal and release paring 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, check to make sure no one is around vehicle or down on a slope and keep watchful for safety during test.**

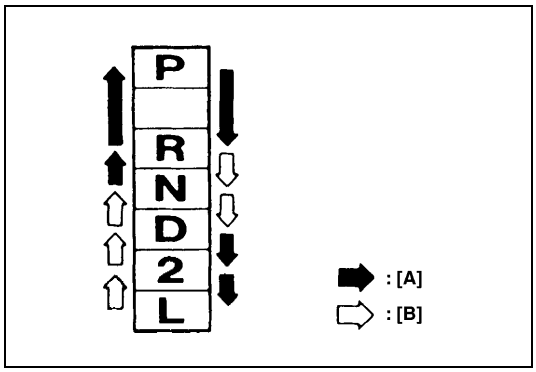
# On-Vehicle Service

## Maintenance Service

### Fluid level

#### LEVEL CHECK AT NORMAL OPERATING TEMPERATURE

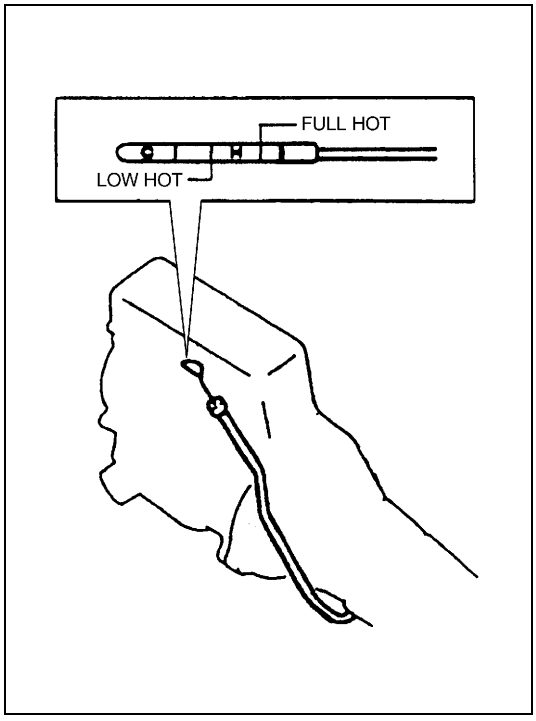
1) Stop vehicle and place it level.
2) Apply parking brake and place chocks against wheels.
3) With selector at P position, start engine.
4) Warm up engine till fluid temperature reaches normal operating temperature (70 – 80 °C (158 – 176 °F)). As a guide to check fluid temperature, warm up engine till engine coolant temperature meter indicated around 1 unit above “C” point.




5) Keep engine idling and shift selector slowly to “L” and back to “P” position.

| | |
|---|---|
| [A]: | Shift the select lever with its button pushed in. |
| [B]: | Shift the select lever without pushing its button. |

6) With engine idling, pull out dipstick, wipe it off with a clean cloth and put it back into place.



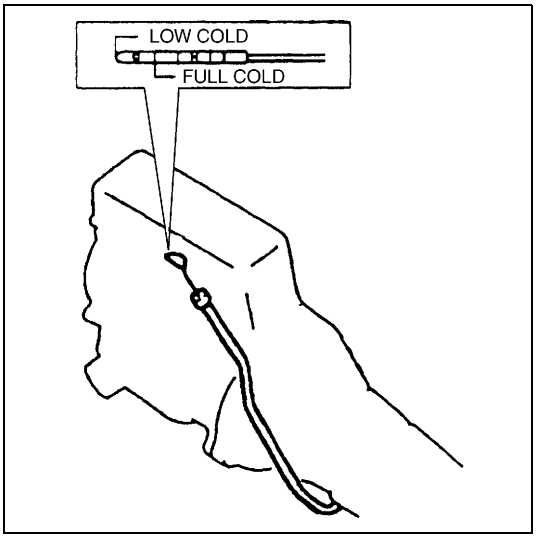

7) Pull out dipstick again and check fluid level indicated on it. Fluid level should be between FULL HOT and LOW HOT. if it is below LOW HOT, add an equivalent of DEXRON®-III up to FULL HOT.

**Fluid specification:**

**An equivalent of DEXRON®-III**

**NOTE:**

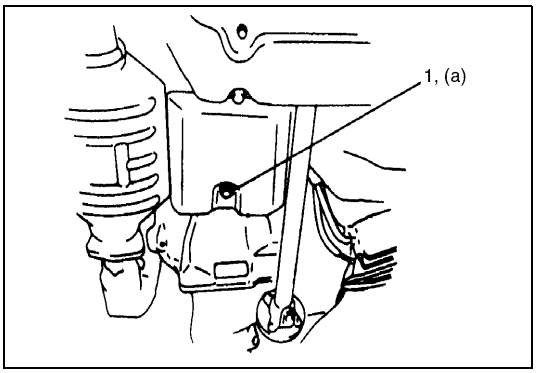
- **DO NOT RACE ENGINE while checking fluid level, even after the engine start.**
- **DO NOT OVERFILL. Overfilling can causes foaming and loss of fluid through breather. Then slippage and transmission failure can result.**
- **Bringing the level from LOW HOT to FULL HOT requires 0.3 liters (0.64/0.53 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.**




## LEVEL CHECK AT ROOM TEMPERATURE

The fluid level check at room temperature (20 – 30 °C (68 – 86 °F)) performed after repair or fluid change before test driving is just preparation for level check of normal operating temperature. The checking procedure itself is the same as that described previously. If the fluid level is between FULL COLD and LOW COLD, proceed to test drive. And when the fluid temperature has reached the normal operating temperature, check fluid level again and adjust it as necessary.

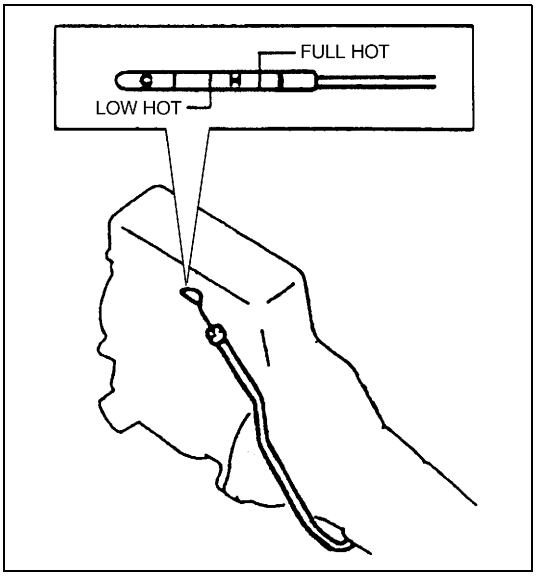
## Fluid change




1) Lift up vehicle.
2) With engine is cool, remove drain plug (1) from oil pan and drain A/T fluid.
3) Install drain plug (1).

**Tightening torque**
**A/T fluid drain plug (a):**
**23 N·m (2.3 kg-m, 17.0 lb-ft)**

4) Lower vehicle and fill proper amount of an equivalent of DEXRON®-III.




5) Check fluid level referring to “Level Check Normal Operating Temperature” of “Fluid Level” in this section.

**Fluid specification:**

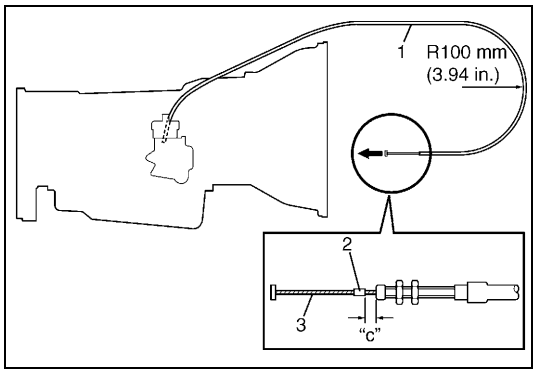
**An equivalent of DEXRON®-III**

**Fluid capacity**
**When draining from drain plug hole:**
**2.5 liters (5.28/4.40 US/Imp.pt.)**

**When overhauling:**
**6.8 liters (14.37/11.97 US/Imp.pt.)**

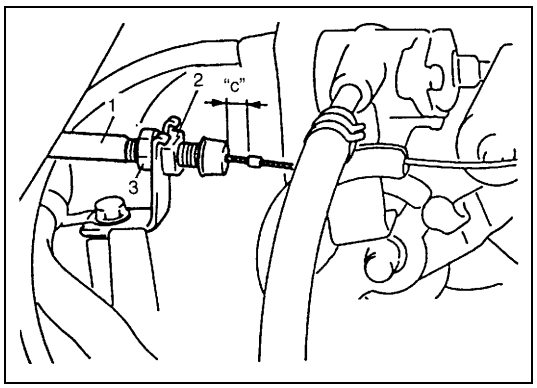
## A/T Throttle Cable

### ADJUSTMENT




1) Pull inner cable (3) by force of 2 N (0.2 kg, 0.45 lb) or less to be no slack of inner cable with A/T throttle cable (1) curved as shown in the figure.
2) Fix stopper (2) to inner cable (3) with clearance "c".

**A/T throttle cable adjusting position (clearance "c"):**
**0.8 – 1.5 mm (0.03 – 0.06 in.)**




3) Warm up engine and transmission to normal operating temperature.
4) Make sure that accelerator cable is adjusted as specified.
5) With throttle valve closed, check clearance "c", which should be within the following specification, of A/T throttle cable (1). If it is out of specification, adjust it by turning cable adjusting nut (2).

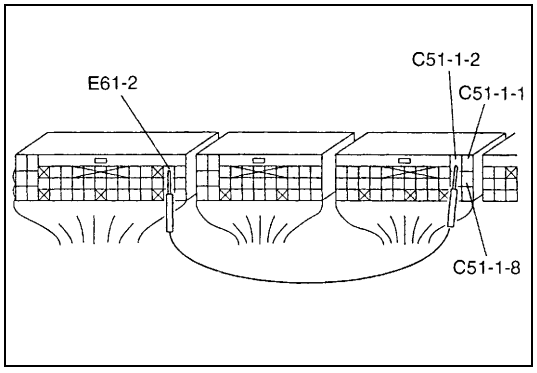
**A/T throttle cable adjusting position (clearance "c"):**
**0.8 – 1.5 mm (0.03 – 0.06 in.)**

6) Tighten lock nut (3) securely.

## Solenoid Valves (Shift Solenoid Valves and TCC Solenoid Valve)

### INSPECTION

With PCM couplers disconnected and using service wire as shown in the figure, check each solenoid valve for clicking sound.

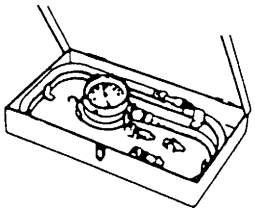
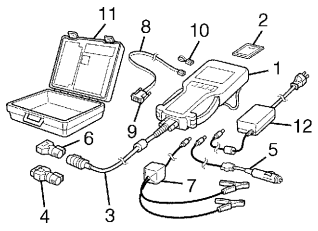



| | |
|---|---|
| Shift solenoid valve - A (#1) | C51-1-2 |
| Shift solenoid valve - B (#2) | C51-1-1 |
| TCC (Lock-up) solenoid valve | C51-1-8 |

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Automatic transmission fluid drain plug | 23 | 2.3 | 17.0 |
| Transfer oil level/filler and drain plugs | 23 | 2.3 | 17.0 |
| Transmission case plug | 17 | 1.7 | 12.5 |
| Manual select lever nut | 13 | 1.3 | 9.5 |
| Manual select cable nut | 7 | 0.7 | 5.5 |
| Manual selector assembly bolts | 18 | 1.8 | 13.5 |
| Transmission to engine bolts and nuts | 85 | 8.5 | 61.5 |
| Engine rear mounting bolts<br>Engine rear mounting member bolts | 50 | 5.0 | 36.5 |
| Universal joint flange bolts and nuts | 50 | 5.0 | 36.5 |
| Torque converter mounting bolts | 65 | 6.5 | 47.0 |
| Adapter case or extension case bolts | 42 | 4.2 | 30.0 |
| Transmission range switch lock bolt | 5.5 | 0.55 | 4.0 |
| Oil pipe union bolts | 35 | 3.5 | 22.5 |
| Drive plate bolts | 78 | 7.8 | 56.5 |
| Interlock cable clamp screw | 2.2 | 0.22 | 1.5 |
| Interlock cable outer mounting nut | 13 | 1.3 | 9.5 |

# Special Tool

| | |
|---|---|
|  |  |
| 09925-37811-001<br>Oil pressure gauge | Tech 2 kit (SUZUKI scan tool) (See NOTE.) |

**NOTE:**

- **This kit includes the following items and substitutes for the Tech 1A kit.**
  **1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loopback connector, 11. Storage case, 12. Power supply**

# SECTION 7B2

# AUTOMATIC TRANSMISSION (5A/T)

**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.**
- **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).**



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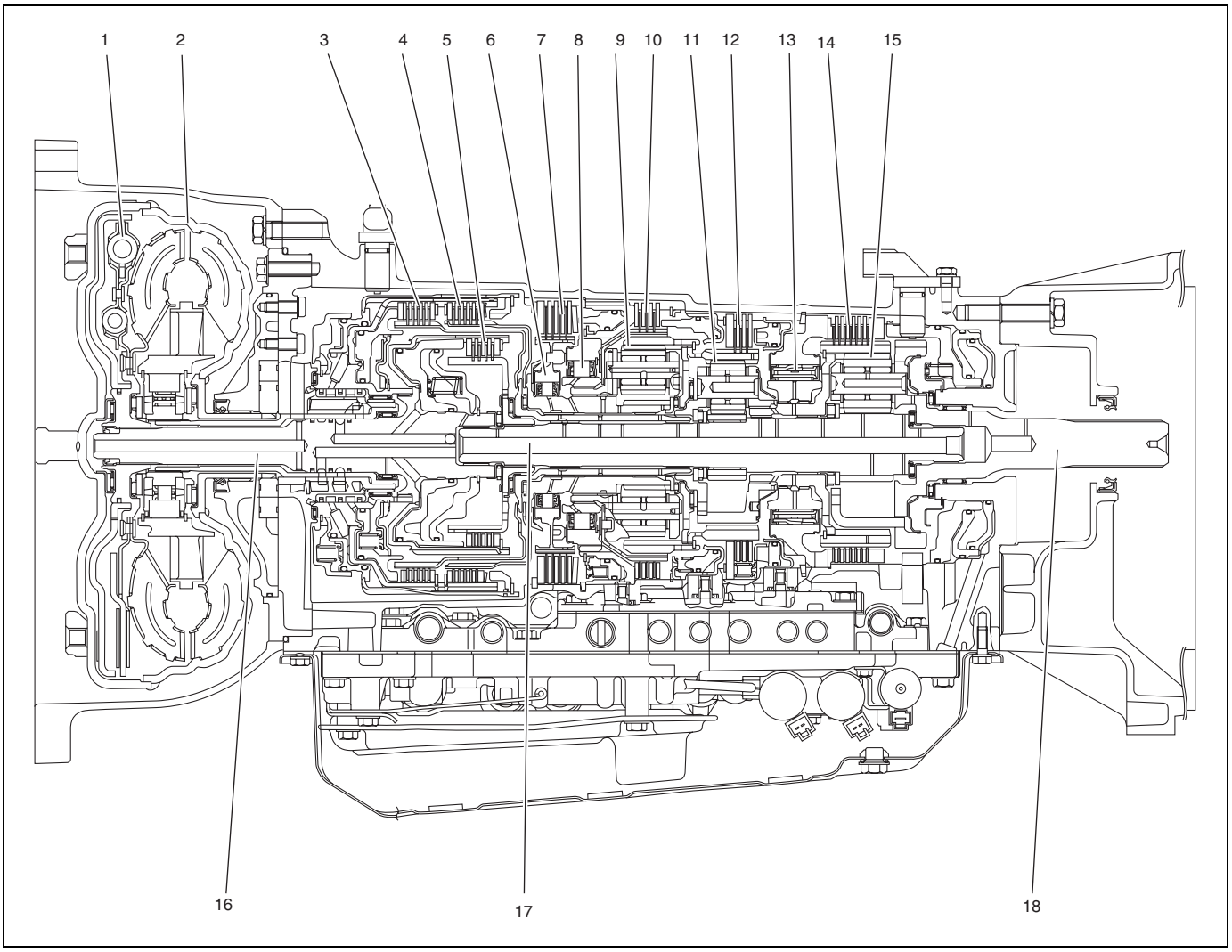
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# General Description

## Automatic Transmission Description

This automatic transmission is a full automatic type with 4-speed plus overdrive (O/D).
The toque converter is a 3-element, 1-step and 2-phase type and is equipped with an electronically controlled lock-up mechanism. The gear shift device consists of 3 sets of planetary gear units, 3 disc type clutches, 4 disc type brakes and 3 one-way clutches. The gear shift is done by selecting one of 6 positions (“P”, “R”, “N”, “D”, “3” and “L”) by means of the select lever installed on the floor. On the shift knob, there is an overdrive (O/D) cut switch which allows shift-up to the overdrive mode (except at 4L) and shift-down from the overdrive mode. Also, by using the P/N change switch located on the console box, it is possible to select the gear change timing of 2 modes, normal and power.
This automatic transmission has the clutch-to-clutch (brake) control function when the gear is upshifted from the 4th gear to the 5th gear and downshifted from the 5th gear to the 4th gear. With this function, gears are synchronized by controlling the hydraulic pressure to the forward clutch and No.1 brake without using the one-way clutch. This automatic transmission also has the line pressure learning control function to achieve gear changes smoothly. Therefore, when any of the following conditions applies, initialize the line pressure learning control of TCM referring to “Learning Control Initialization: 5 A/T”. Neglecting this initialization may cause excessive shift shock.

- The A/T unit has been overhauled
- The A/T unit has been replaced
- The engine has been overhauled
- The engine has been replaced
- ECM has been replaced with used one

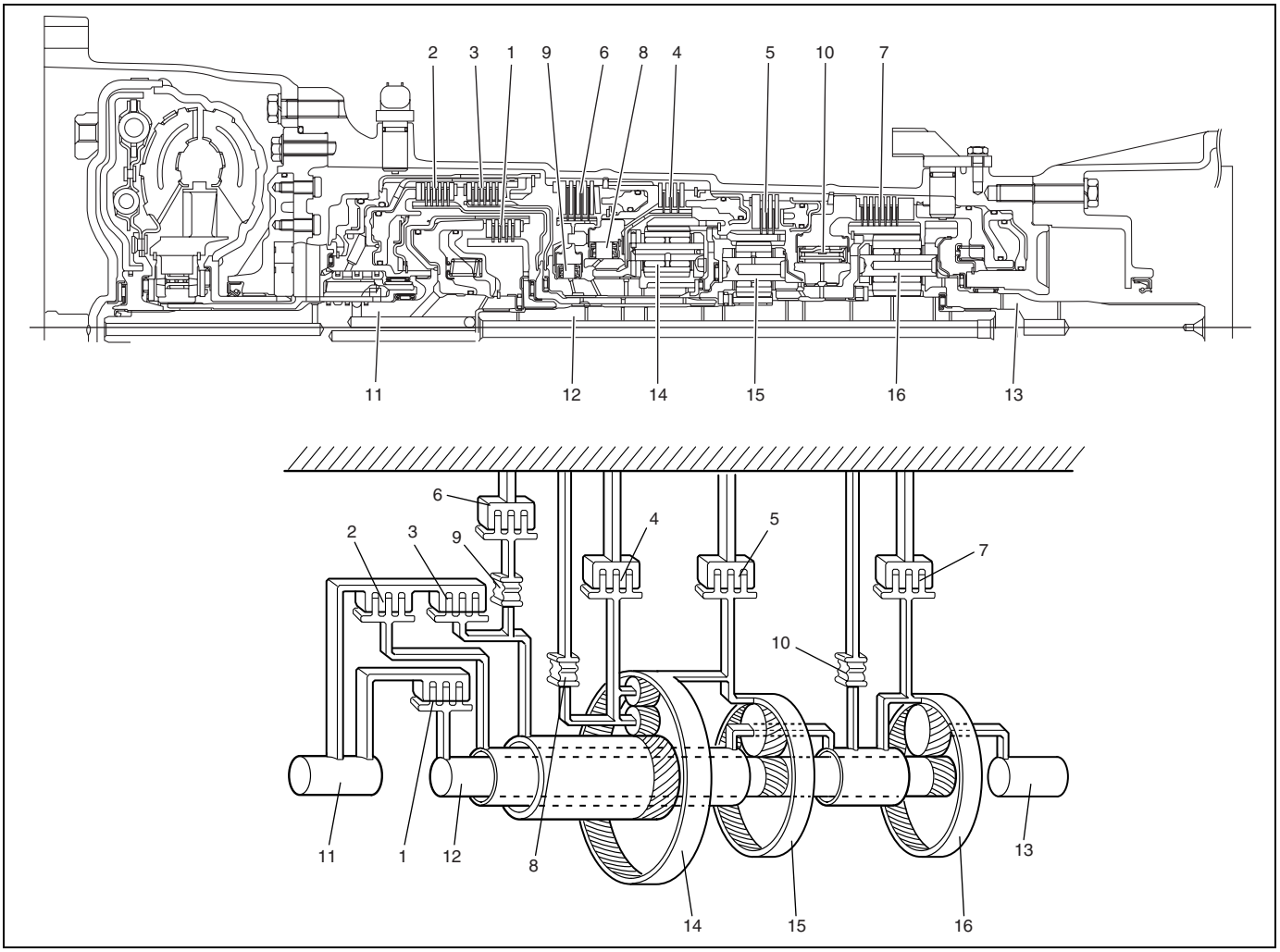



| | | |
|---|---|---|
| 1. Torque converter clutch (TCC) | 7. 2nd brake | 13. One-way No.3 clutch |
| 2. Torque converter | 8. One-way No.1 clutch | 14. 1st and reverse brake |
| 3. Direct clutch | 9. Front planetary gear | 15. Rear planetary |
| 4. Reverse clutch | 10. No.1 brake | 16. Input shaft |
| 5. Forward clutch | 11. Middle planetary gear | 17. Intermediate shaft |
| 6. One-way No.2 clutch | 12. No.2 brake | 18. Output shaft |

# Specifications

| Item | | | Specifications | |
|---|---|---|---|---|
| Torque converter | Type | | 3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism) | |
| | Stall torque ratio | | 1.77 | |
| Oil pump | Type | | Trochoid type oil pump | |
| | Drive system | | Engine driven | |
| Gear change device | Type | | Forward 5-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 (O/D ON) | Forward 1st ↔ 2nd ↔ 3rd ↔ 4th ↔ 5th (O/D) automatic gear change |
| | | | "D" range (O/D OFF) | Forward 1st ↔ 2nd ↔ 3rd ↔ 4th automatic gear change |
| | | | "D" range (Transfer 4L) | Forward 1st ↔ 2nd ↔ 3rd ↔ 4th automatic gear change |
| | | | "3" range | Forward 1st ↔ 2nd ↔ 3rd ← 4th ← 5th automatic gear change |
| | | | "L" range | Forward 1st ← 2nd ← 3rd ← 4th ← 5th reduction, and fixed at 1st gear |
| | Gear ratio | 1st | 3.520 | |
| | | 2nd | 2.043 | |
| | | 3rd | 1.401 | |
| | | 4th | 1.000 | |
| | | 5th | 0.717 | |
| | | Reverse | 3.224 | |
| | Control elements | | Wet type multi-disc clutch ... 3 sets<br>Wet type multi-disc brake ... 4 sets<br>One-way clutch ... 3 sets | |
| | Transfer | | Hi: 1.000<br>Lo: 1.816 | |
| | Final gear reduction ratio | | 4.300 | |
| Lubrication | Lubrication system | | Forced feed system by oil pump | |
| Cooling | Cooling system | | Air-cooling and radiator assisted cooling (water-cooled) | |
| Fluid used | | | Equivalent of DEXRON®-III | |

# Clutch / Brake / Planetary Gear




| | | | |
|---|---|---|---|
| 1. Forward clutch | 5. No.2 brake | 9. One-way No.2 clutch | 13. Output shaft |
| 2. Direct clutch | 6. 2nd brake | 10. One-way No.3 clutch | 14. FR planetary |
| 3. Reverse clutch | 7. 1st and reverse brake | 11. Input shaft | 15. MD planetary |
| 4. No.1 brake | 8. One-way No.1 clutch | 12. Intermediate shaft | 16. RR planetary |

## Functions

| Part Name | Function |
|---|---|
| Forward clutch | Meshes input shaft and intermediate shaft. |
| Direct clutch | Meshes input shaft and MD planetary carrier. |
| Reverse clutch | Meshes input shaft and FR sun gear. |
| No.1 brake | Fixes FR planetary carrier. |
| No.2 brake | Fixes FR and MD ring gear. |
| 2nd brake | Fixes outer race of one-way No.2 clutch, to prevent FR sun gear from turning counterclockwise (reverse direction of engine input rotation direction). |
| 1st and reverse brake | Fixes RR ring gear. |
| One-way No.1 | Prevent FR planetary carrier from turning counterclockwise. |
| One-way No.2 | Prevent FR sun gear from turning counterclockwise only when 2nd brake is at work. |
| One-way No.3 | Prevent RR ring gear from turning counterclockwise. |

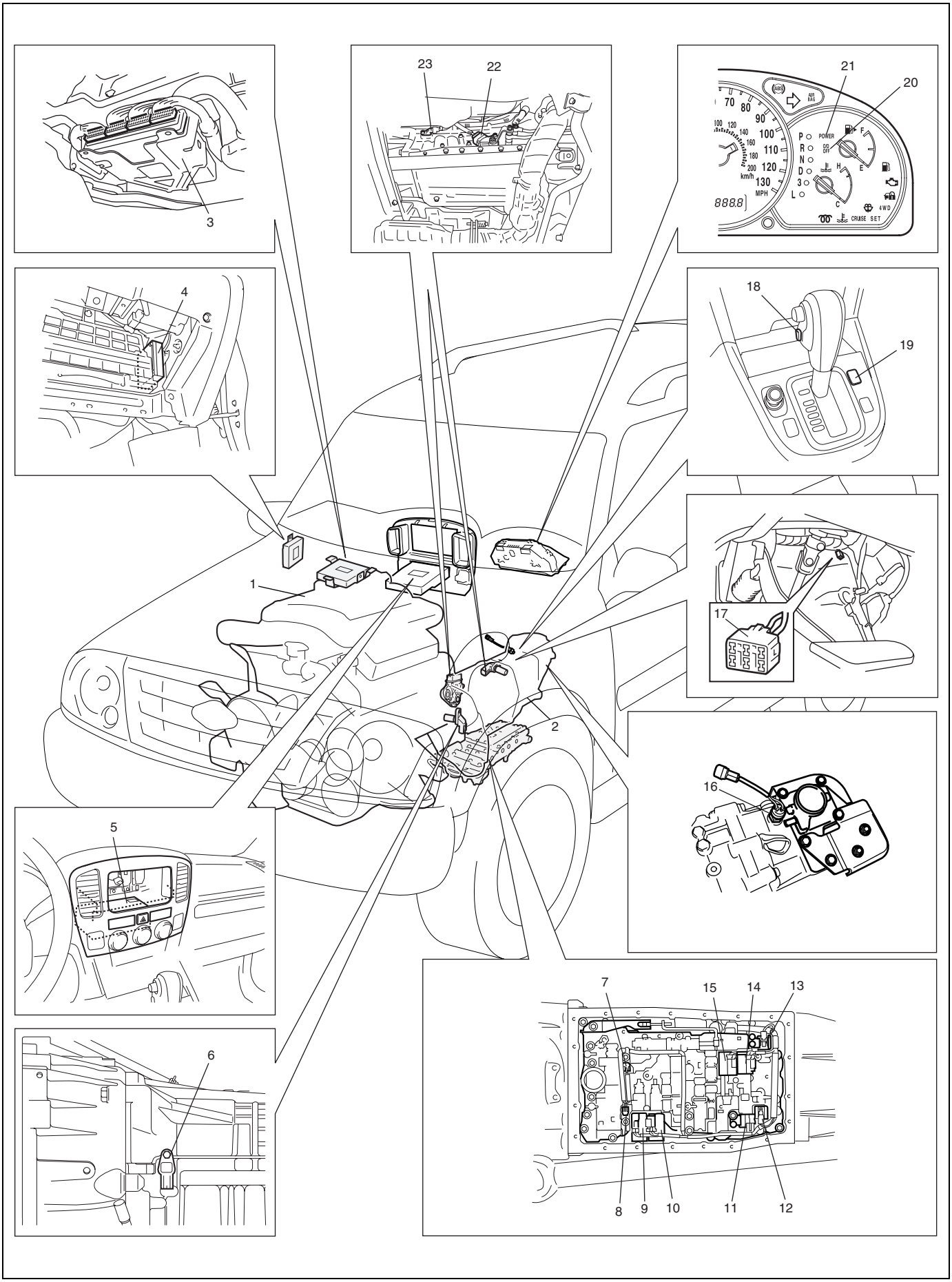
## Table of Component Operation

| | | Forward clutch | Direct clutch | Reverse clutch | No.1 brake | No.2 brake | 2nd brake | 1st and Reverse brake | One-way No.1 clutch | One-way No.2 clutch | One-way No.3 clutch |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | — | — | — | — | — | — | — | — | — | — |
| R | | — | — | ❍ | ❍ | — | — | ❍ | ❍ | — | — |
| N | | — | — | — | — | — | — | — | — | — | — |
| D | 1st | ❍ | — | — | — | — | — | — | — | — | ❍ |
| | 2nd | ❍ | — | — | — | — | ❍ | — | ❍ | ❍ | — |
| | 3rd | ❍ | — | ❍ | — | — | ❍ | — | ❍ | — | — |
| | 4th | ❍ | ❍ | ❍ | — | — | ❍ | — | — | — | — |
| | 5th | — | ❍ | ❍ | ❍ | — | ❍ | — | — | — | — |
| 3 | 1st | ❍ | — | — | — | — | — | — | — | — | ❍ |
| | 2nd | ❍ | — | — | — | — | ❍ | — | ❍ | ❍ | — |
| | 3rd | ❍ | — | ❍ | ❍X | ❍X | ❍ | — | ❍ | — | — |
| L | 1st | ❍ | — | — | — | — | — | ❍X | — | — | ❍ |

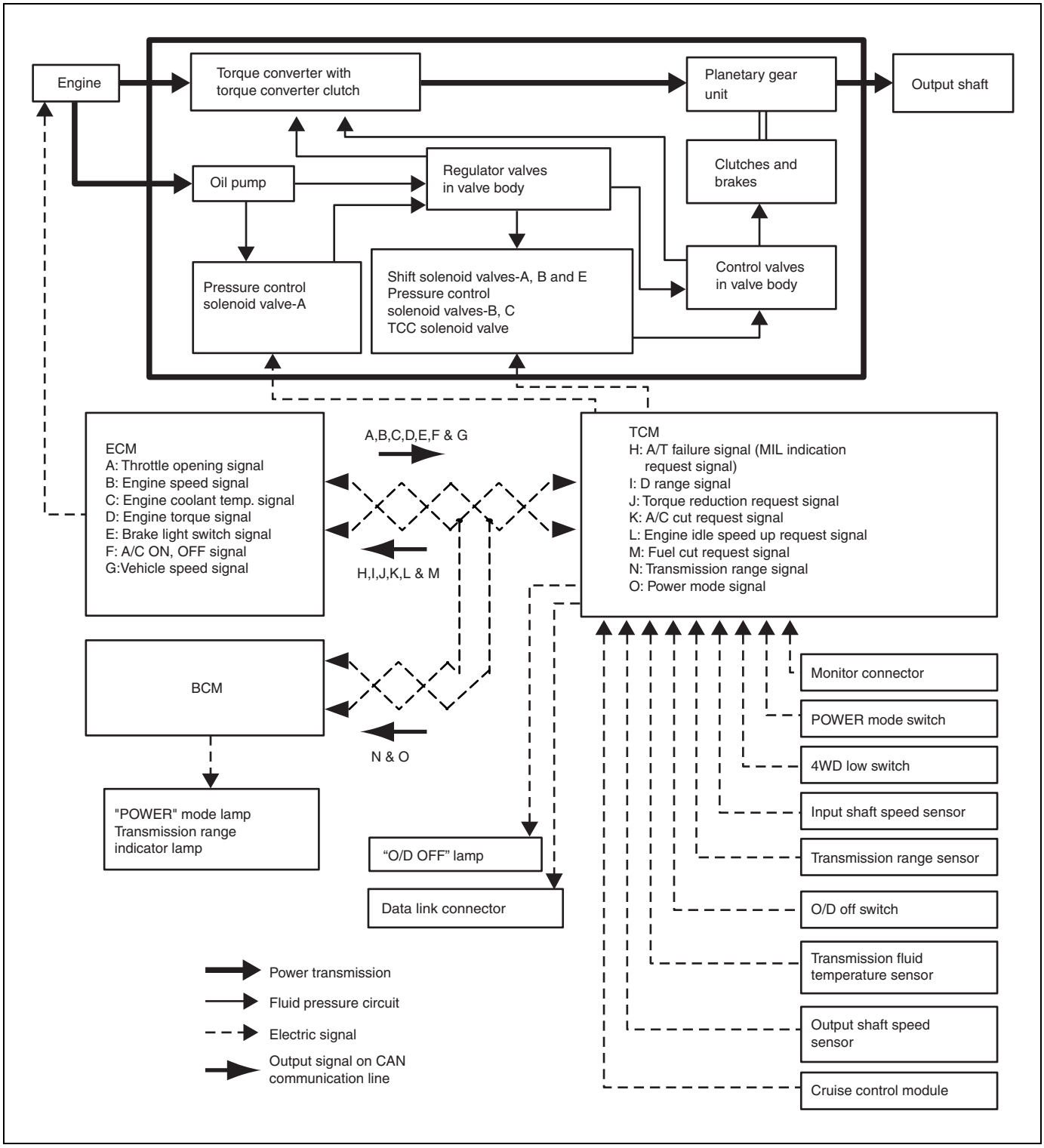
❍: Operating

❍X: Operating when vehicle is deaccelerating

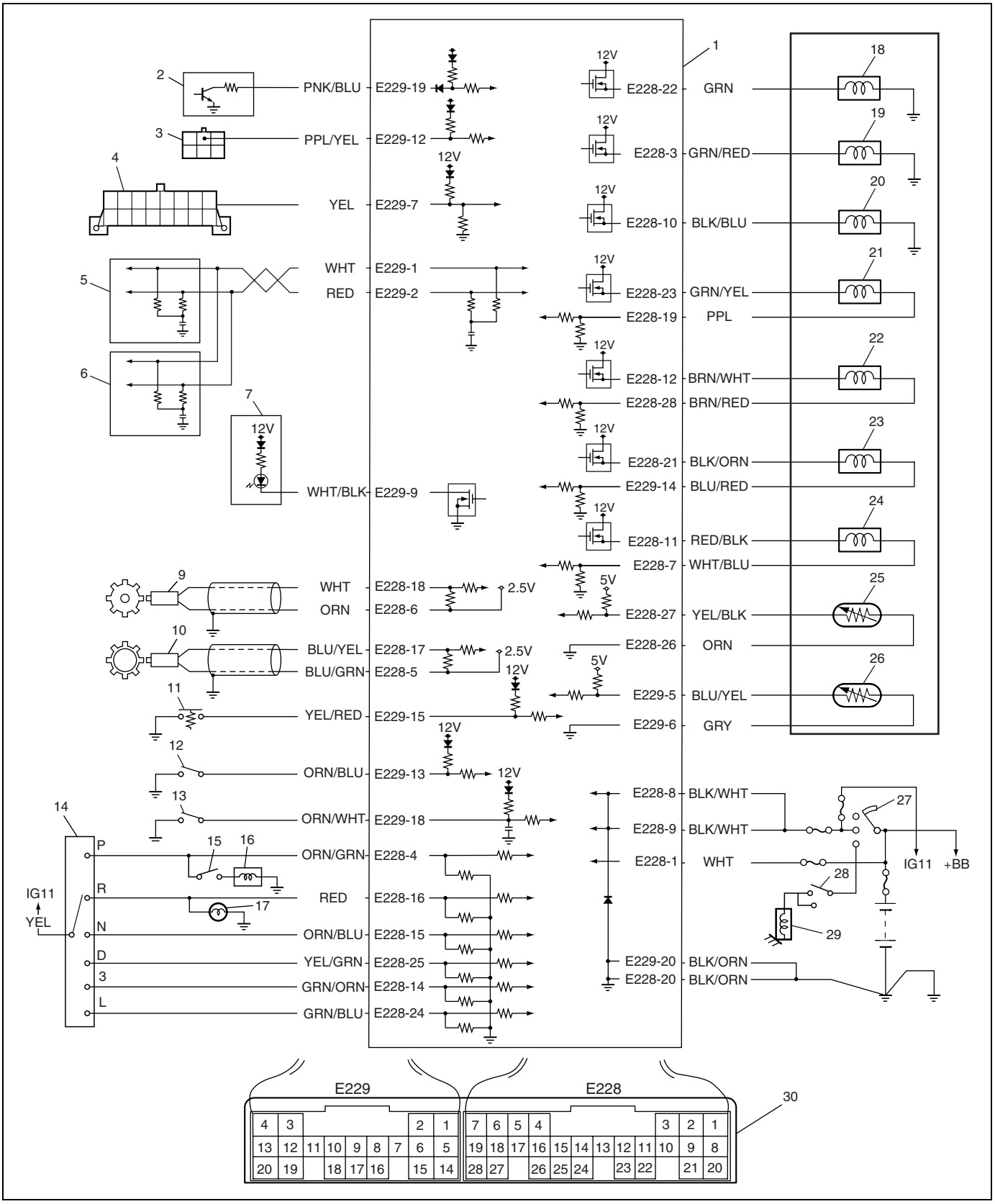
# Electronic Shift Control System



| | | | |
|---|---|---|---|
| 1. Engine | 7. Transmission fluid temperature sensor A | 13. Shift solenoid valve–E | 19. Power mode switch |
| 2. Transmission | 8. Transmission fluid temperature sensor B | 14. TCC solenoid valve | 20. O/D OFF lamp |
| 3. ECM | 9. Pressure control solenoid valve–A | 15. Pressure control solenoid valve–C | 21. POWER mode lamp |
| 4. TCM | 10. Pressure control solenoid valve–B | 16. 4WD low switch | 22. Transmission range switch |
| 5. BCM | 11. Shift solenoid valve–A | 17. Monitor connector | 23. Output shaft speed sensor |
| 6. Input shaft speed sensor | 12. Shift solenoid valve–B | 18. O/D OFF switch | |



# Transmission Control Module (TCM)



| | | | |
|---|---|---|---|
| 1. TCM | 9. Output shaft speed sensor | 17. Back-up light | 25. Transmission fluid temperature sensor A |
| 2. Cruise control module | 10. Input shaft speed sensor | 18. Shift solenoid valve–A | 26. Transmission fluid temperature sensor B |
| 3. Monitor connector | 11. O/D OFF switch | 19. Shift solenoid valve–B | 27. Ignition switch |
| 4. DLC | 12. Power mode switch | 20. Shift solenoid valve–E | 28. Inhibitor switch |
| 5. ECM | 13. 4WD low switch | 21. TCC solenoid valve | 29. Starter motor relay |
| 6. BCM | 14. Transmission range switch | 22. Pressure control solenoid valve–A | 30. TCM connector |
| 7. Combination meter | 15. Brake light switch | 23. Pressure control solenoid valve–B | |
| 8. Blank | 16. Shift lock solenoid, if equipped | 24. Pressure control solenoid valve–C | |

## Operation of shift solenoid valves and TCC solenoid valve

| Range | | D | | | | | 3 | | | L | R | | P & N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gear | | 1st | 2nd | 3rd | 4th | 5th | 1st | 2nd | 3rd | 1st | Rev (≥ 11 km/h) | Rev (< 11 km/h) | — |
| Solenoids | Shift solenoid valve–A | ❍ | ❍ | X | X | X | ❍ | ❍ | X | ❍ | X | ❍ | ❍ |
| | Shift solenoid valve–B | X | ❍ | ❍ | X | X | X | ❍ | ❍ | X | ❍ | X | X |
| | Shift solenoid valve–E | X | X | X | X | ❍ | X | X | X | X | X | X | X |
| | Pressure control solenoid valve–B | X | X | X | X | ❍ | X | X | X | X | X | X | X |
| | Pressure control solenoid valve–C | ❍ | ❍ | ❍ | ❍ | X | ❍ | ❍ | X | X | ❍ | ❍ | ❍ |
| | TCC solenoid valve | X | X | X | (❍) | (❍) | X | X | X | X | X | X | X |

❍: ON (Turn power on)
X: OFF (Turn power off)

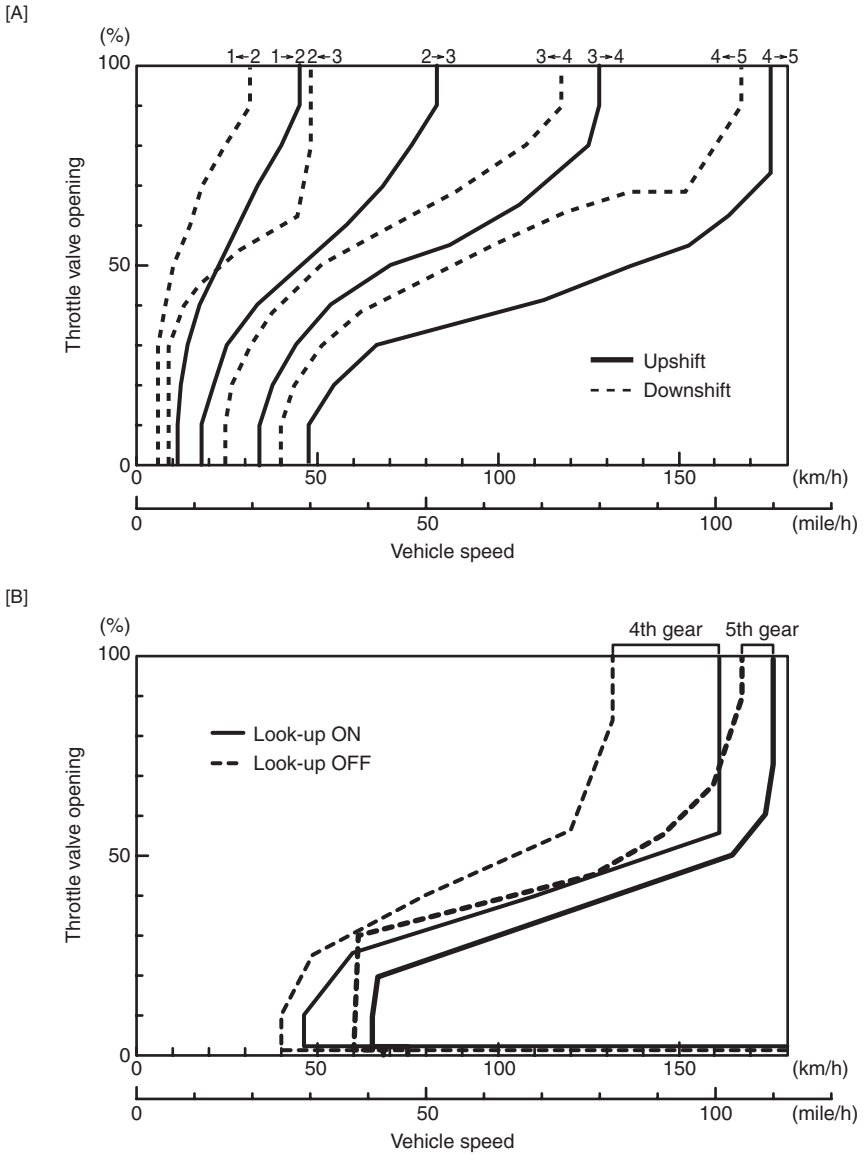
## Automatic Gear Shift Diagram

Automatic shift schedule as a result of shift control is shown. In case that select lever is shifted to “L” at a higher than 45 km/h or 30 mile/h speed, 2nd gear is operated and then down shifts to “1st” at a speed lower than that. No up shift is available in “L”.
The same as, the select lever is shifted to “3” at a higher than 128 km/h (80 mile/h) speed, 4th gear is operated and then down shifts to “3rd” at a speed lower than that.

**[Normal Mode]**

| | Shift | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Throttle opening | 1→2 | 2→3 | 3→4 | 4→5 | 5→4 | 4→3 | 3→2 | 2→1 |
| Full throttle km/h (mile/h) | 45 (30.5) | 83 (51.5) | 128 (80) | 175 (109) | 168 (104) | 118 (73.5) | 48 (30) | 31 (19.5) |
| Closed throttle km/h (mile/h) | 11 (7) | 18 (11) | 34 (21) | 48 (30) | 40 (25) | 25 (16) | 9 (5.5) | 6 (4) |

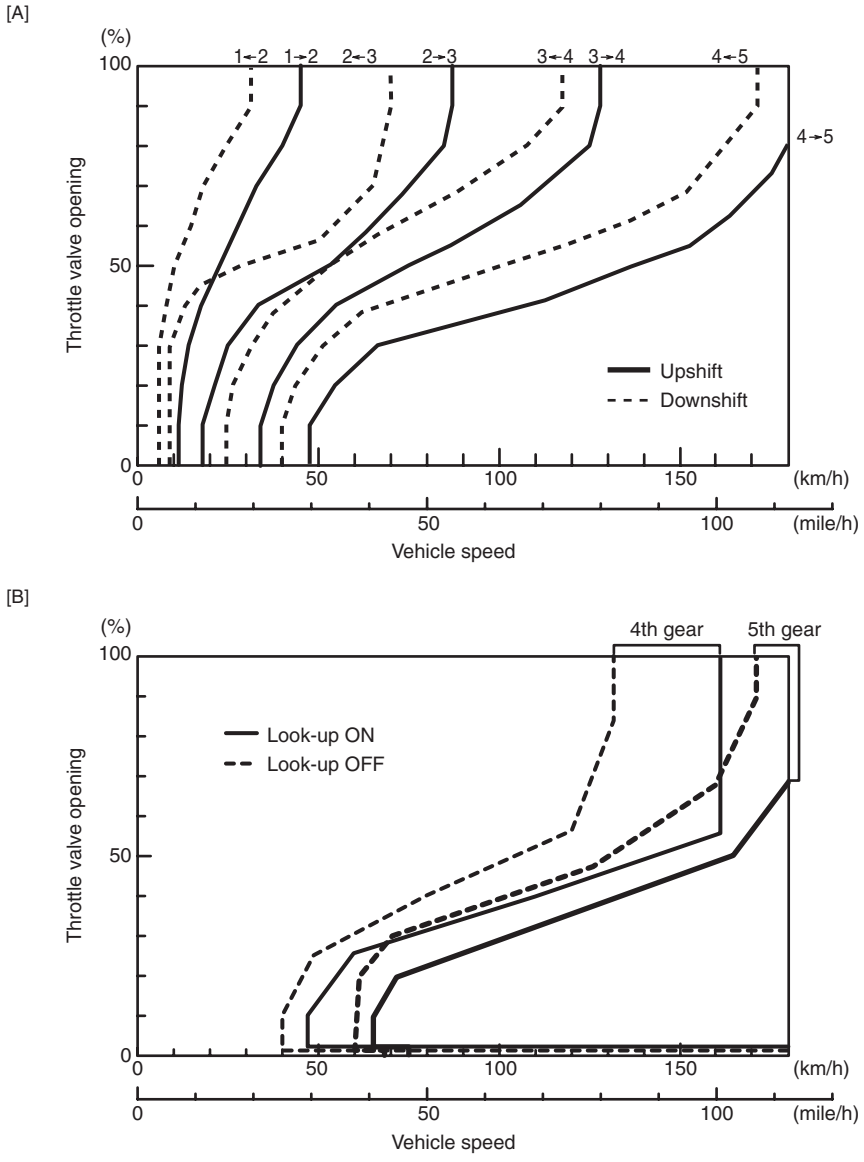
**GEAR SHIFT DIAGRAM [A] AND TCC LOCK-UP DIAGRAM [B]**



**[Power Mode]**

| | Shift | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Throttle opening | 1→2 | 2→3 | 3→4 | 4→5 | 5→4 | 4→3 | 3→2 | 2→1 |
| Full throttle km/h (mile/h) | 45 (30.5) | 88 (66) | 128 (80) | 190 (118) | 171 (106) | 118 (73.5) | 70 (43.5) | 31 (19.5) |
| Closed throttle km/h (mile/h) | 11 (7) | 18 (11) | 34 (21) | 48 (30) | 40 (25) | 25 (22) | 9 (5.5) | 6 (4) |

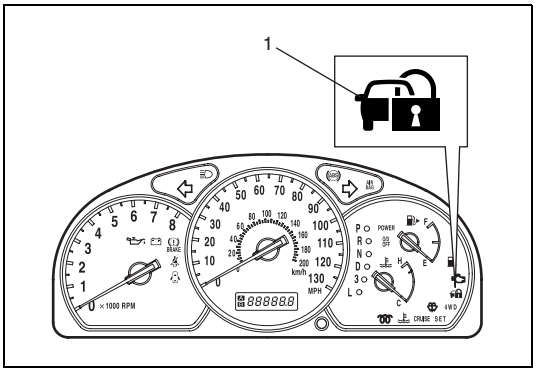
## GEAR SHIFT DIAGRAM [A] AND TCC LOCK-UP DIAGRAM [B]



# Diagnosis

## General Description

This vehicle is equipped with an electronic transmission control system, which control 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 and abnormality of those parts that influence the engine exhaust emission.
When diagnosing a trouble in the transmission including this system, be sure to have full understanding of the outline of “On-Board Diagnostic System Description: 5 A/T” and each item in “Precautions in Diagnosing Trouble: 5 A/T” and execute diagnosis according to “A/T System Check: 5 A/T” to obtain correct result smoothly.



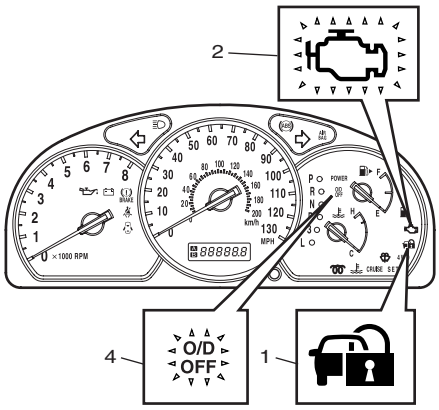

**NOTE:**

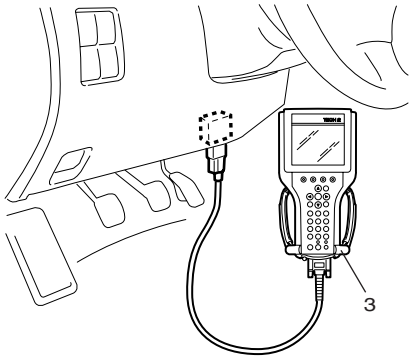
**There are two types of On-Board Diagnostic System depending on vehicle specifications. The type of system for vehicle being serviced can be identified by whether equipped with immobilizer lamp (1) as indicator in combination meter or not. Identify the type of system by confirming whether equipped with immobilizer lamp (1) in combination meter turning ignition switch ON with leaving engine OFF.**

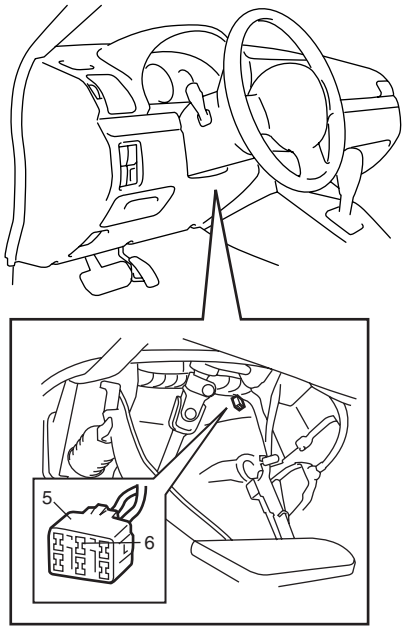
## On-Board Diagnostic System

**[For vehicle with immobilizer lamp]**

For automatic transmission control system, TCM has following functions.




- When the ignition switch is turned ON with the engine at a stop, malfunction indicator lamp (MIL) (2) turns ON to check the bulb of the MIL.
- When TCM detects a malfunction in A/T control system (and/or a malfunction which gives an adverse effect to vehicle emission) while the engine is running, TCM requires ECM to make the malfunction indicator lamp in the meter cluster of the instrument panel turn ON. TCM stores DTC / freeze frame data in TCM memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL turn OFF although DTC stored in its memory will remain.)
- It is possible to communicate with TCM through DLC (2) by using scan tool (3). (Diagnostic information can be accessed by using a scan tool.)
- It is also possible to output DTC stored in TCM by flashing of "O/D OFF" lamp (4) with diagnosis switch terminal (6) of monitor connector (5) grounded. If no DTC is stored in TCM memory, DTC No.12 is outputted repeatedly. If one or more DTCs are stored in TCM memory, they are outputted three times per one code starting from smallest code number in increasing order. After all DTCs are outputted, they are outputted again in the same manner.

| | |
|---|---|
| 1. | Immobilizer lamp |
| 10. | Glove box |

## 2 driving cycle detection logic

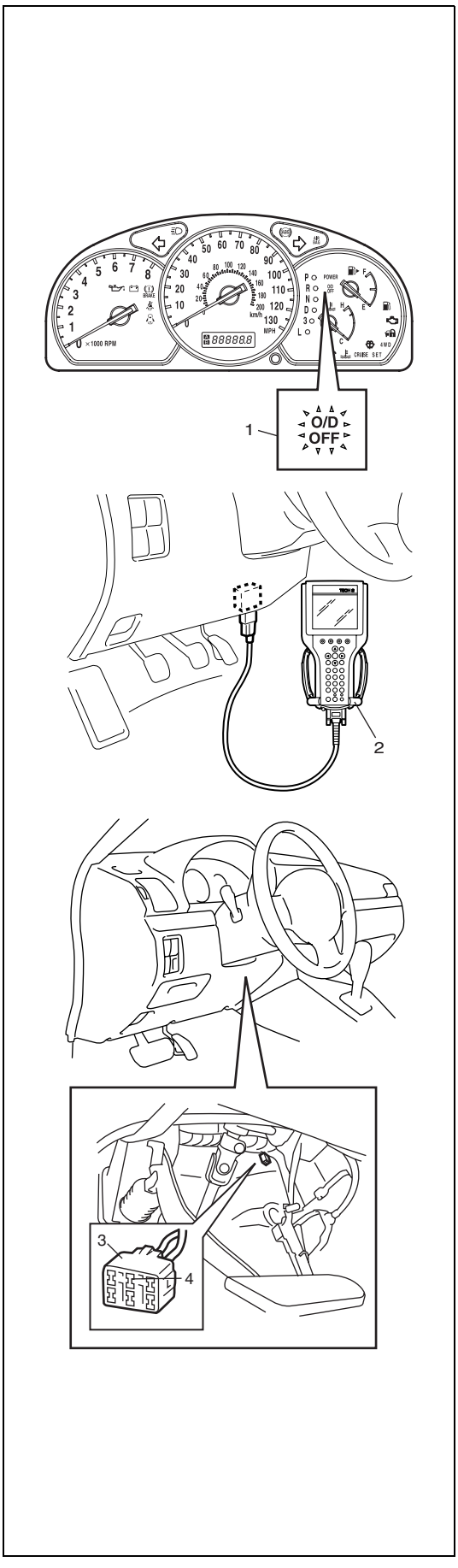
The malfunction detected in the first driving cycle is stored in TCM memory (in the form of pending DTC and freeze frame data) but the malfunction indicator lamp does not light at this time. It lights up at the second detection of same malfunction also in the next driving cycle.

## 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

TCM stores the engine and driving conditions at the moment of the detection of a malfunction in its memory. This data is called "Freeze frame data".
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the vehicle was running or stopped) when a malfunction was detected by checking the freeze frame data.




**[For vehicle without immobilizer lamp]**

For automatic transaxle control system, TCM has following functions.

- When ignition switch is turned ON with O/D off switch turned OFF and no malfunction in A/T control system is detected, “O/D OFF” lamp (1) lights for about 2 seconds after ignition switch is turned ON and then goes OFF for bulb check. If O/D off switch is ON at this time, however, “O/D OFF” lamp remains ON to let driver known that gear is not shifted to overdrive gear.
- When TCM detects a malfunction in A/T control system, it flashes “O/D OFF” lamp (1) and stores malfunction DTC in its memory.
- It is possible to communicate with TCM through data link connector (DLC) by using SUZUKI scan tool (3). Diagnostic information can be checked and erased by using scan tool.
- It is also possible to output DTC stored in TCM by flashing of “O/D OFF” lamp (1) with diagnosis switch terminal (4) of monitor connector (3) grounded. If no DTC is stored in TCM memory, DTC No.12 is outputted repeatedly. If one or more DTCs are stored in TCM memory, they are outputted three times per one code starting from smallest code number in increasing order. After all DTCs are outputted, they are outputted again in the same manner.

## Precaution in Diagnosing Trouble

- 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.
- For vehicle with immobilizer lamp, 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.
- For vehicle without immobilizer lamp, using SUZUKI scan tool the diagnostic information stored in TCM memory can be checked and cleared as well. Before its use, be sure to read Operator's Manual supplied with it carefully to have good understanding of its functions and usage.
- Not using scan tool, the DTC stored in TCM memory also can be checked and cleared. DTC stored in the TCM memory is outputted by flashing of "O/D OFF" lamp with diagnosis terminal of monitor connector grounded. If no DTC is stored in TCM memory, DTC No.12 is outputted repeatedly. If one or more DTCs are stored in TCM memory, they are outputted starting from smallest code number in increasing order. After all DTCs are outputted, all DTCs are outputted repeatedly.
- When replacing TCM with used one, all learned controls which are stored in TCM memory should be erased after the replacement referring to "Learning Control Initialization: 5 A/T". Neglecting this initialization may cause excessive shift shock.
- Be sure to read "Precautions for Electrical Circuit Service: " in Section 0A before inspection and observe what is written there.
- TCM and/or ECM replacement:
  When substituting a known-good TCM and/or ECM, check for the following conditions.
  Neglecting this check may result in damage to a good TCM and/or ECM.
  – All relays and actuators have resistance of specified value.
  – MAF sensor, Manifold absolute pressure (MAP) sensor, TP sensor and fuel tank pressure sensor are in good condition. Also, the power circuit of these sensors is not shorted to the ground.
- Communication of ECUs, ECM, TCM, and BCM, is established by CAN (Computer Area Network). Therefore, handle CAN communication line with care referring to "Precaution for CAN Communication System: " in Section 0A.

# Diagnostic Information and Procedures

## A/T System Check

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

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Customer Complaint Analysis<br>1) Perform customer complaint analysis.<br>Was customer complaint analysis performed according to instruction? | Go to Step 2. | Perform customer complaint analysis. |
| 2 | DTC / Freeze frame data check, record and clearance<br>1) Check for DTC (including pending DTC)<br>Is there any DTC(s)? | Print DTC and freeze frame data or write them down and clear them by referring to “DTC Clearance: 5 A/T”.<br>Go to Step 3. | Go to Step 4. |
| 3 | Visual Inspection<br>1) Perform visual inspection.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 5. |
| 4 | Visual Inspection<br>1) Perform visual inspection.<br>Is there any faulty condition? | Repair or replace malfunction part.<br>Go to Step 11. | Go to Step 8. |
| 5 | Trouble Symptom Confirmation<br>1) Confirm trouble symptom.<br>Is trouble symptom identified? | Go to Step 6. | Go to Step 7. |
| 6 | Rechecking and Record of DTC / Freeze frame data<br>1) Recheck for DTC and freeze frame data referring to “DTC Check: 5 A/T”.<br>Is there any DTC(s)? | Go to Step 9. | Go to Step 8. |
| 7 | Rechecking and Record of DTC / Freeze frame data<br>1) Recheck for DTC and freeze frame data referring to “DTC Check: 5 A/T”.<br>Is there any DTC(s)? | Go to Step 9. | Go to Step 10. |
| 8 | A/T Basic Check and A/T Trouble Diagnosis<br>1) Check and repair according to “A/T Basic Check: 5 A/T” and “A/T Symptom Diagnosis: 5 A/T”.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 9 | Troubleshooting for DTC<br>1) Check and repair according to applicable DTC diag. flow.<br>Are check and repair complete? | Go to Step 11. | Check and repair malfunction part(s).<br>Go to Step 11. |
| 10 | Check for Intermittent Problem<br>1) Check for intermittent problem.<br>Is there any faulty condition? | Repair or replace malfunction part(s).<br>Go to Step 11. | Go to Step 11. |
| 11 | Final Confirmation Test<br>1) Clear DTC if any.<br>2) Perform final confirmation test.<br>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 a inspection form will facilitate collecting information to the point required for proper analysis and diagnosis.

**Step 2. DTC/Freeze Frame Data Check, Record and Clearance**
First, referring to "DTC Check: 5 A/T", check DTC (including pending DTC). If DTC exists, print or write down DTC and freeze frame data and then clear them by referring to "DTC Clearance: 5 A/T". 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 Step 4. Visual Inspection**
As a preliminary step, be sure to perform visual check of the items that support proper function of the A/T and engine referring to "Visual Inspection: 5 A/T".

**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, recheck DTC according to "DTC Confirmation Procedure" described in each DTC flow.

**Step 6 and Step 7. Recheck and Record of DTC / Freeze Frame Data**
Refer to "DTC Check: 5 A/T" for checking procedure.

**Step 8. A/T Basic Check and A/T Trouble Diagnosis**
Perform A/T basic check according to "A/T Basic Check: 5 A/T" 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: 5 A/T" 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 and 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 0A and related circuit of DTC recorded in Step 2.

**Step 11. Final Confirmation Test**
Confirm that the problem symptom has gone and the A/T is free from any abnormal conditions.
If what has been repaired is related to the malfunction DTC, clear the DTC once, set conditions under which DTC was detected and A/T and/or vehicle was repaired and confirm that no DTC is indicated.

**Customer Problem Inspection Form (Example)**

| | | | |
|---|---|---|---|
| User name: | Model: | VIN: | |
| Date of issue: | Date of Reg: | Date of problem: | Mileage: |

| PROBLEM SYMPTOMS | |
|---|---|
| ☐Engine does not start | ☐Engine stops |
| ☐Vehicle does not move (forward, rearward) | ☐Transmission does not shift (1st, 2nd, 3rd, 4th, 5th, Rev) gear |
| ☐No lock-up (TCC clutch operation) | ☐Automatic shift does not occur |
| ☐Shift point too high or too low | ☐Transmission slipping in (1st, 2nd, 3rd, 4th, 5th, Rev) gear |
| ☐Excessive gear change shock | ☐Other: |

| VEHICLE/ ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS | |
|---|---|
| Environmental Condition | |
| Weather | ☐Fair/☐Cloudy/☐Rain/☐Snow/☐Always/☐Other ( ) |
| Temperature | ☐Hot/☐Warm/☐Cool/☐Cold/☐( °C °F)/☐Always |
| Frequency | ☐Always/☐Sometimes/☐( times/ day, month)/☐Only Once |
| Road | ☐Urban/☐Suburb/☐Highway/☐Mountainous (uphill/downhill)/☐Paved road/☐Gravel/ ☐Other( ) |
| Vehicle Condition | |
| Transmission range | ☐(P,R,N,D,3,L) range/☐( → ) range |
| Transmission temp. | ☐Cold/☐Warming up phase/☐Warmed up |
| Vehicle | ☐At stop/☐During driving (constant speed/accelerating/decelerating/ right hand corner/left hand corner)/☐Other ( )/☐Speed ( km/h mile/h) |
| Engine | ☐Speed( r/min)/☐Throttle opening(idle/about %/full) |
| Brake | ☐Apply/☐Not apply |
| O/D OFF switch | ☐ON/☐OFF |
| P/N change switch | ☐Power/☐Normal |

| Malfunction indicator lamp("SERVICE ENGINE SOON" light) condition | | | |
|---|---|---|---|
| ☐Always ON | ☐Sometimes ON | ☐Always OFF | ☐Good condition |

| Diagnostic trouble code | | |
|---|---|---|
| | First check : ☐No code | ☐Malfunction code( ) |
| | Second check : ☐No code | ☐Malfunction code( ) |

**NOTE:**

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

## Malfunction Indicator Lamp (MIL) Check

Refer to "Malfunction Indicator Lamp (MIL) Check" in Section 6-2.

## "O/D OFF" Lamp Operation Check

1) Turn ignition switch ON.
2) Check that "O/D OFF" lamp lights for about 2 – 4 sec. and then goes OFF.
   If anything faulty is found, advance to ""O/D OFF" Light Does Not Light at Ignition Switch ON: 5 A/T" or ""O/D OFF" Light Comes ON Steadily: 5 A/T".

## "POWER" Lamp Operation Check

1) Check that Power/Normal change switch button is at Normal position.
2) Turn ignition switch ON.
3) Check that "POWER" lamp lights for about 2 – 4 sec. and then goes OFF.
   If anything faulty is found, advance to ""POWER" Light Does Not Light at Ignition Switch ON: 5 A/T" or ""POWER" Light Comes ON Steadily: 5 A/T".

## DTC Table

**NOTE:**

- **Confirmation available table of automatic transmission related DTC is shown below.**

| | Vehicle with immobilizer Lamp | | Vehicle without immobilizer Lamp | |
|---|---|---|---|---|
| | Code type I | Code type II | Code type I | Code type II |
| SUZUKI scan tool | ○ | × | ○ | × |
| Generic scan tool | ○ | × | × | × |
| Not using scan tool (Displaying on odometer) | × | ○ | × | ○ |

○ :Available-DTC can be confirmed
× :Not available-DTC can not be confirmed

**NOTE:**

- **A: Driving cycles when MIL lightening and storing DTC in TCM memory for vehicle with immobilizer lamp**
- **B: Driving cycles when "O/D OFF" light flashing and storing DTC in TCM memory for vehicle without immobilizer lamp**
- **Type 1 DTC: DTC code which can be checked by using scan tool.**
- **Type 2 DTC: DTC code which can be checked by using "O/D OFF" lamp.**

| DTC NO. | | Detecting Item | Detecting Condition (DTC will set when detecting) | A | B |
|---|---|---|---|---|---|
| Type I | Type II | | | | |
| P0705 | 34 | Transmission Range Sensor Circuit Malfunction (PRNDL Input) | Multiple signals are inputted simultaneously. | 1 driving cycle | 1 driving cycle |
| P0707 | | Transmission Range Sensor Circuit Low | No sensor signal is inputted. | 2 driving cycles | 2 driving cycles |
| P0711 | 81 | Transmission Fluid Temperature Sensor Range / Performance | Transmission Fluid Temperature Sensor variation is less than specified value even though engine was running for specified time after engine start. | 2 driving cycles | *2<br>2 driving cycles |
| P0712 | 38 | Transmission Fluid Temperature Sensor "A" Circuit Low | Sensor output voltage is too low. | 1 driving cycle | 1 driving cycle |

| DTC NO. | | Detecting Item | Detecting Condition (DTC will set when detecting) | A | B |
|---|---|---|---|---|---|
| Type I | Type II | | | | |
| P0713 | 36 | Transmission Fluid Temperature Sensor “A” Circuit High | Sensor output voltage is too high. | 1 driving cycle | 1 driving cycle |
| P0717 | 14 | Input / Turbine Speed Sensor Circuit No Signal | No sensor signal is detected although output speed sensor signal is inputted. | 1 driving cycle | 1 driving cycle |
| P0722 | 31 | Output Speed Sensor Circuit No Signal | No sensor signal is inputted although input speed sensor signal is inputted. | 1 driving cycle | 1 driving cycle |
| P0741 | 78 | 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 | *2 2 driving cycles |
| P0742 | 77 | 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 | *2 2 driving cycles |
| P0751 | 62 | Shift Solenoid “A” Performance or Stuck Off | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0752 | 61 | Shift Solenoid “A” Stuck On | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0756 | 65 | Shift Solenoid “B” Performance or Stuck Off | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0757 | 63 | Shift Solenoid “B” Stuck On | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0771 | 67 | Shift Solenoid “E” Performance or Stuck Off | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0772 | 66 | Shift Solenoid “E” Stuck On | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0781 | 68 | 1-2 Shift | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0797 | 79 | Pressure Control Solenoid “C” Stuck On | The gear commanded by TCM does not match the actual gear when driving. | 2 driving cycles | *2 2 driving cycles |
| P0962 | 41 | Pressure Control Solenoid “A” Control Circuit Low | No electric flow is detected on pressure control solenoid circuit. | 1 driving cycle | 1 driving cycle |
| P0963 | 42 | Pressure Control Solenoid “A” Control Circuit High | Too much electric flow is detected on pressure control solenoid circuit. | 1 driving cycle | 1 driving cycle |
| P0966 | 43 | Pressure Control Solenoid “B” Control Circuit Low | No electric flow is detected on pressure control solenoid circuit. | 1 driving cycle | 1 driving cycle |

| DTC NO. | | Detecting Item | Detecting Condition (DTC will set when detecting) | A | B |
|---|---|---|---|---|---|
| Type I | Type II | | | | |
| P0967 | 44 | Pressure Control Solenoid “B” Control Circuit High | Too much electric flow is detected on pressure control solenoid circuit. | 1 driving cycle | 1 driving cycle |
| P0970 | 45 | Pressure Control Solenoid “C” Control Circuit Low | No electric flow is detected on pressure control solenoid circuit. | 1 driving cycle | 1 driving cycle |
| P0971 | 46 | Pressure Control Solenoid “C” Control Circuit High | Too much electric flow is detected on pressure control solenoid circuit. | 1 driving cycle | 1 driving cycle |
| P0973 | 22 | Shift Solenoid “A” Control Circuit Low | Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON. | 1 driving cycle | 1 driving cycle |
| P0974 | 21 | Shift Solenoid “A” Control Circuit High | Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF. | 1 driving cycle | 1 driving cycle |
| P0976 | 24 | Shift Solenoid “B” Control Circuit Low | Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON. | 1 driving cycle | 1 driving cycle |
| P0977 | 23 | Shift Solenoid “B” Control Circuit High | Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF. | 1 driving cycle | 1 driving cycle |
| P0985 | 49 | Shift Solenoid “E” Control Circuit Low | Voltage of shift solenoid terminal is low although TCM is commanding shift solenoid to turn ON. | 1 driving cycle | 1 driving cycle |
| P0986 | 48 | Shift Solenoid “E” Control Circuit High | Voltage of shift solenoid terminal is high although TCM is commanding shift solenoid to turn OFF. | 1 driving cycle | 1 driving cycle |
| P1701 | 76 | CAN communication problem - TCM | Transmitting or receiving error detected to TCM for specified time continuously. | 1 driving cycle | 1 driving cycle |
| P1702 | 83 | 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 | 1 driving cycle |
| P1703 | 86 | CAN Invalid Data - TCM | TCM receives malfunction signal of throttle position, engine coolant temperature, engine revolution and engine torque from ECM. | *1 | *2<br>1 driving cycle |
| P1740 | 75 | Cruise Control Signal Malfunction | O/D off signal from cruise control module is inputted although vehicle speed is too slow for executing cruise control. | 1 driving cycle | *2<br>1 driving cycle |
| P1874 | 15 | 4WD Low switch circuit malfunction (Short) | Actual transfer position is 2H or 4H although transfer low signal is inputted. | 1 driving cycle | *2<br>1 driving cycle |
| P1875 | | 4WD Low switch circuit malfunction (Open) | Actual transfer position is 4L although transfer low signal is not inputted. | 1 driving cycle | *2<br>1 driving cycle |
| P2742 | 59 | Transmission Fluid Temperature Sensor “B” Circuit Low | Sensor output voltage is too low. | 1 driving cycle | 1 driving cycle |

| DTC NO. | | Detecting Item | Detecting Condition (DTC will set when detecting) | A | B |
|---|---|---|---|---|---|
| Type I | Type II | | | | |
| P2743 | 58 | Transmission Fluid Temperature Sensor "B" Circuit High | Sensor output voltage is too high. | 1 driving cycle | 1 driving cycle |
| P2763 | 26 | Torque Converter Clutch Circuit High | Too much electric flow is detected on TCC solenoid circuit. | 1 driving cycle | 1 driving cycle |
| P2764 | 25 | Torque Converter Clutch Circuit Low | No electric flow is detected on TCC solenoid circuit. | 1 driving cycle | 1 driving cycle |

**NOTE:**

***1: TCM does not desire turning on malfunction indicator lamp to ECM but DTC is stored in TCM memory.**

***2: "O/D OFF" lamp does not flash although DTC is detected and stored for vehicle without immobilizer lamp.**

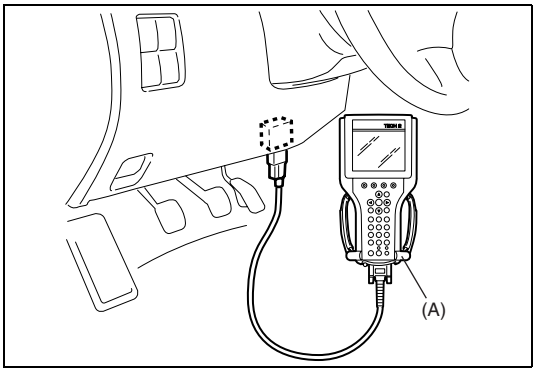
## DTC Check

**NOTE:**

**For vehicle with immobilizer lamp, the MIL is turned on when the ECM and/or TCM detect malfunction(s). Each ECU 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 ECUs 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 ECUs 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.**

Automatic transmission DTC can be checked using any one of the following 2 methods.

### Reading DTC Using SUZUKI Scan Tool

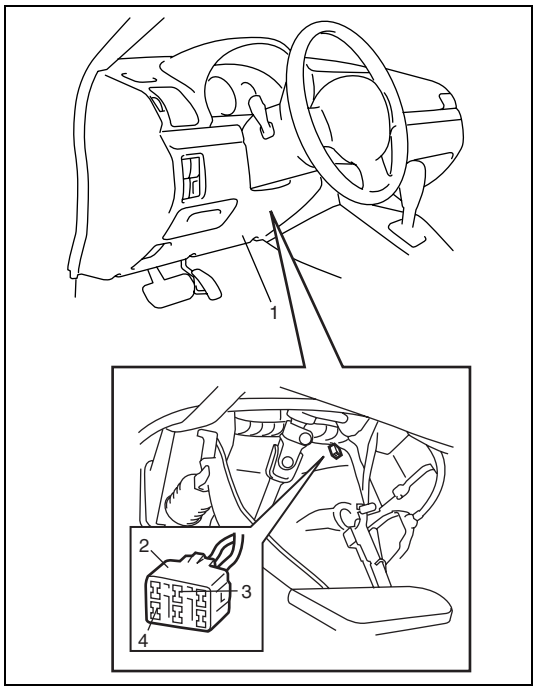



1) Turn ignition switch OFF.
2) Connect SUZUKI scan tool to data link connector (DLC).

**Special tool**
**(A): SUZUKI scan tool**

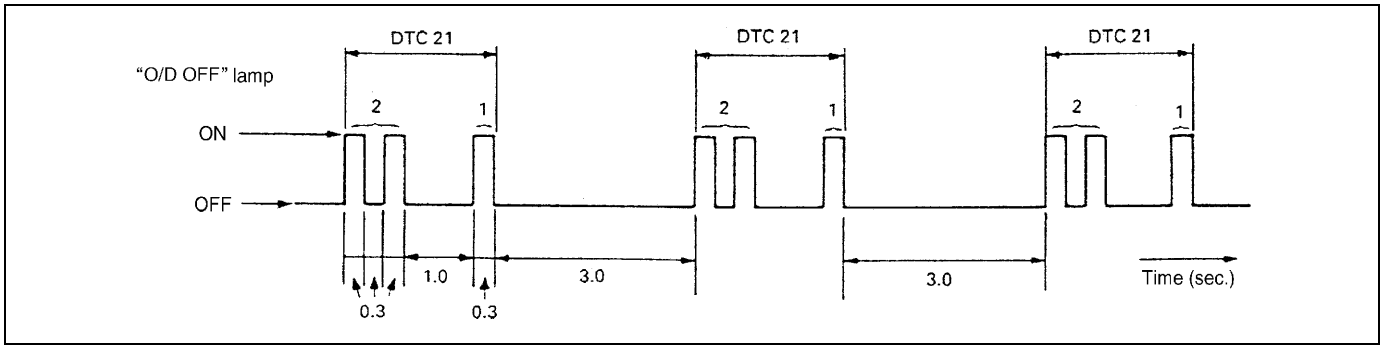
3) Read DTC according to instructions displayed on SUZUKI scan tool and write it down. Refer to SUZUKI scan tool operator's manual for further details.
4) After completing the check, turn ignition switch OFF and disconnect SUZUKI scan tool from data link connector (DLC).

### Reading DTC Using "O/D OFF" Lamp




1) Turn ignition switch OFF.
2) Remove steering column hole cover (1).
3) Using service wire, connect diagnosis switch terminal (3) of monitor connector (2) to ground terminal (4).
4) Turn ignition switch ON.
5) Read flashing pattern of "O/D OFF" lamp which represents DTC as shown in example below and write it down.

**Example: Shift solenoid "A" control circuit high (DTC 21)**




6) After completing the check, turn ignition switch OFF and disconnect service wire from monitor connector.

## DTC Clearance

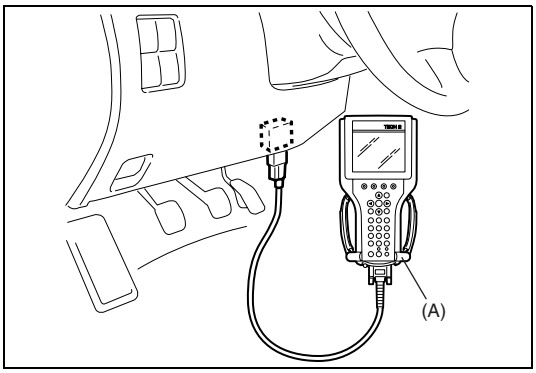
Automatic transmission DTC can be cleared using any one of the following 2 methods.

**NOTE:**

**DTC and freeze frame data stored in TCM memory are also cleared in 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 connector).**
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**

## DTC Clearance Using SUZUKI Scan Tool

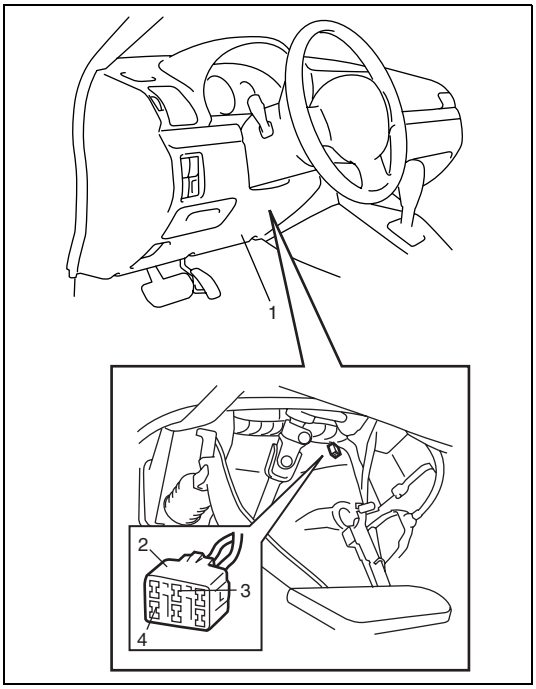



1) Turn ignition switch OFF.
2) Connect SUZUKI scan tool to data link connector (DLC) (1).

**Special tool**
**(A): SUZUKI scan tool**

3) Clear DTC according to instructions displayed on SUZUKI scan tool. Refer to SUZUKI scan tool operator's manual for further details.
4) After completing the clearance, turn ignition switch OFF and disconnected SUZUKI scan tool from data link connector (DLC).

## DTC Clearance Using Monitor Connector




1) Remove steering column hole cover (1).
2) Turn ignition switch ON.
3) After 6 seconds or more, repeat connecting and disconnecting diagnosis switch terminal (3) and ground terminal (4) of monitor connector (2) 5 times at about 1 second interval within 10 seconds, using service wire.
4) Check TCM that no malfunction DTC remains in memory of it.

## Fail Safe Table

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, TCM or its circuit.

| DTC No. | | Trouble Area | Fail Safe Operation |
|---|---|---|---|
| Type I | Type II | | |
| P0705 | 34 | Transmission Range Sensor Circuit Malfunction (PRNDL Input) | • TCM control is performed in priority order below.<br>D > 3 > L > R > N > P<br>• Vehicle starting at 2nd gear is inhibited. |
| P0707 | | Transmission Range Sensor Circuit Low | • Range is assumed to be “D” range.<br>• Vehicle starting at 2nd gear is inhibited. |
| P0712 | 38 | Transmission Fluid Temperature Sensor “A” Circuit Low | • A/T fluid temperature is assumed to be 80 °C (176 °F).<br>• Upshifting to 5th gear is inhibited.<br>• Learning control is inhibited. |
| P0713 | 36 | Transmission Fluid Temperature Sensor “A” Circuit High | |
| P0717 | 14 | Input/Turbine Speed Sensor Circuit No Signal | • Upshifting to 5th gear is inhibited.<br>• Torque reducing request to ECM (torque reduction control) is inhibited.<br>• Learning control is inhibited. |
| P0722 | 31 | 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.<br>• Upshifting to 5th gear is inhibited.<br>• Torque reducing request to ECM (torque reduction control) is inhibited.<br>• Learning control is inhibited. |
| P0752 | 61 | Shift Solenoid “A” Stuck On | Upshifting to 4th and 5th gear is inhibited. |
| P0756 | 65 | Shift Solenoid “B” Performance or Stuck Off | Shift changing to 1st and 2nd gear in L range is inhibited. |
| P0757 | 63 | Shift Solenoid “B” Stuck On | Upshifting to 4th and 5th gear is inhibited. |
| P0772 | 66 | Shift Solenoid “E” Stuck On | Shift changing to 1st and 2nd gear in L range is inhibited. |
| P0781 | 68 | 1-2 Shift | Upshifting to 4th and 5th gear is inhibited. |
| P0797 | 79 | Pressure Control Solenoid “C” Stuck On | • Upshifting to 4th and 5th gear is inhibited.<br>• Shift changing to 1st and 2nd gear in L range is inhibited. |

| DTC No. | | Trouble Area | Fail Safe Operation |
|---|---|---|---|
| Type I | Type II | | |
| P0962 | 41 | Pressure Control Solenoid “A” Control Circuit Low | • Power supply for all solenoid valves is cut.<br>• Gear position is fixed according to select lever position as shown in the following.<br>R: Reverse<br>D: 4th<br>3: 3rd<br>L: 3rd<br>• Lock-up function is inhibited to operate.<br>• Line pressure control at gear shifting is inhibited.<br>• Learning control is inhibited. |
| P0963 | 42 | Pressure Control Solenoid “A” Control Circuit High | |
| P0966 | 43 | Pressure Control Solenoid “B” Control Circuit Low | |
| P0967 | 44 | Pressure Control Solenoid “B” Control Circuit High | |
| P0970 | 45 | Pressure Control Solenoid “C” Control Circuit Low | |
| P0971 | 46 | Pressure Control Solenoid “C” Control Circuit High | |
| P0973 | 22 | Shift Solenoid “A” Control Circuit Low | |
| P0974 | 21 | Shift Solenoid “A” Control Circuit High | |
| P0976 | 24 | Shift Solenoid “B” Control Circuit Low | |
| P0977 | 23 | Shift Solenoid “B” Control Circuit High | |
| P0985 | 49 | Shift Solenoid “E” Control Circuit Low | |
| P0986 | 48 | Shift Solenoid “E” Control Circuit High | |
| P1701 | 76 | CAN communication problem - TCM | • Throttle opening used for line pressure control is assumed to be 100%.<br>• Throttle opening used for gear shifting control is assumed to be 0%.<br>• After 15 minutes passing from malfunction detection, engine coolant temperature is assumed to be 90 °C (194 °F).<br>• Upshifting to O/D is inhibited.<br>• Lock-up function is inhibited to operate.<br>• Line pressure control at gear shifting is inhibited.<br>• Torque reducing request to ECM (torque reduction control) is inhibited.<br>• Learning control is inhibited.<br>• Line pressure control at gear shifting is inhibited. |
| P1702 | 83 | Internal Control Module Memory Check Sum Error | • Power supply for all solenoid valves is cut.<br>• Gear position is fixed according to select lever position as shown in the following.<br>R: Reverse<br>D: 4th<br>3: 3rd<br>L: 3rd<br>• Lock-up function is inhibited to operate.<br>• Line pressure control at gear shifting is inhibited. |

| DTC No. | | Trouble Area | Fail Safe Operation |
|---|---|---|---|
| Type I | Type II | | |
| P1703 | 86 | CAN Invalid Data - TCM | In case of throttle position signal malfunction:<br>• Throttle opening used for line pressure control is assumed to be 100%.<br>• Throttle opening used for gear shifting control is assumed to be 0%.<br>• Upshifting to 5th gear is inhibited.<br>• Lock-up function is inhibited to operate.<br>• Learning control is inhibited.<br>In case of engine coolant temperature signal malfunction:<br>• Engine coolant temperature is assumed to be 80 °C (176 °F).<br>In case of engine revolution signal malfunction:<br>• Engine revolution is assumed to be maximum revolution.<br>• Upshifting to 5th gear is inhibited.<br>• Learning control is inhibited.<br>In case of engine torque signal malfunction:<br>• Upshifting to 5th gear is inhibited.<br>• Engine torque is assumed to be maximum torque.<br>• Learning control is inhibited. |
| P1740 | 75 | Cruise Control Signal Malfunction | 5th gear control by cruise control signal is inhibited. |
| P2764 | 25 | Torque Converter Clutch Circuit Low | • Lock-up function is inhibited to operate.<br>• Learning control is inhibited. |
| P2763 | 26 | Torque Converter Clutch Circuit High | • Power supply for all solenoid valves is cut.<br>• Gear position is fixed according to select lever position as shown in the following.<br>R: Reverse<br>D: 4th<br>3: 3rd<br>L: 3rd<br>• Lock-up function is inhibited to operate.<br>• Line pressure control at gear shifting is inhibited.<br>• Learning control is inhibited. |

## Scan Tool Data

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 value. 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 transmission or actuator is not operating (in the condition) as indicated by the scan tool.

| Scan Tool Data | Vehicle Condition | | Normal Condition / Reference Values |
|---|---|---|---|
| Input Shaft Rev | At engine idle speed and selector lever is in “P” position | | (Engine idle speed is displayed in increments of 50 rpm) |
| | At 60 km/h (37.5 mile/h) constant speed, O/D OFF switch ON, 30% or less throttle opening and 4th gear (D range) | | 2000 RPM (Engine idle speed is displayed in increments of 50 rpm) |
| Gear Position | Ignition switch ON POWER mode OFF | Select lever is in “P” position | N |
| | | Select lever is in “R” position | R |
| | | Select lever is in “N” position | N |
| | | Select lever is in “D” position | 1ST |
| | | Select lever is in “3” position | 1ST |
| | | Select lever is in “L” position | 1ST |
| Output Shaft Rev | At vehicle stop | | 0 RPM |
| | At 60 km/h (37.5 mile/h) constant speed, O/D OFF switch ON, 30% or less throttle opening and 4th gear (D range) | | 2000 RPM (Engine idle speed is displayed in increments of 50 rpm) |
| Vehicle Speed | At vehicle stop | | 0 km/h |
| Battery Voltage | Ignition switch ON and engine stop | | 9 – 16 V |
| ATF Temp | After driving at 60 km/h (37.5 mile/h) for 15 minutes or more, and A/T fluid temperature reaches 70 – 80 °C (158 – 176 °F) | | 70 – 80 °C (158 – 176 °F) |
| Engine Speed | At engine idle speed | | Engine idle speed is displayed |
| Shift Sol A Con | At vehicle stop, closed throttle and 1st gear | | ON |
| | At 30 km/h (18.5 mile/h) constant speed, 30% or less throttle opening and 3rd gear. | | OFF |
| Shift Sol A Mon | At vehicle stop, closed throttle and 1st gear | | ON |
| | At 30 km/h (18.5 mile/h) constant speed, 30% or less throttle opening and 3rd gear. | | OFF |
| Shift Sol B Con | At vehicle stop, closed throttle and 1st gear | | OFF |
| | At 16 km/h (10 mile/h) constant speed, 30% or less throttle opening and 2nd gear. | | ON |
| Shift Sol B Mon | At vehicle stop, closed throttle and 1st gear | | OFF |
| | At 16 km/h (10 mile/h) constant speed, 30% or less throttle opening and 2nd gear. | | ON |
| Shift Sol E Con | At vehicle stop, closed throttle and 1st gear | | OFF |
| | At 80 km/h (50 mile/h) constant speed, O/D OFF switch OFF, 20% or less throttle opening and 5th gear. | | ON |
| Shift Sol E Mon | At vehicle stop, closed throttle and 1st gear | | OFF |
| | At 80 km/h (50 mile/h) constant speed, O/D OFF switch OFF, 20% or less throttle opening and 5th gear. | | ON |
| TCC Sol Duty | At vehicle stop, closed throttle and 1st gear | | 0% |
| | At 80 km/h (50 mile/h) constant speed, O/D OFF switch ON, 30% or less throttle opening and 4th gear. | | 100% |
| Press Cont Sol A | At vehicle stop, closed throttle and 1st gear | | 9.5% |
| Press Cont Sol B | At vehicle stop, closed throttle and 1st gear | | 0% |
| | At 80 km/h (50 mile/h) constant speed, O/D OFF switch OFF, 20% or less throttle opening and 5th gear. | | 100% |

| Scan Tool Data | Vehicle Condition | | Normal Condition / Reference Values |
|---|---|---|---|
| Press Cont Sol C | At vehicle stop, closed throttle and 1st gear | | 100% |
| | At 80 km/h (50 mile/h) constant speed, O/D OFF switch OFF, 20% or less throttle opening and 5th gear. | | 0% |
| Engine Torque | Ignition switches ON and engine stop | | 0 N·m |
| Coolant Temp | Ignition switch ON | | Engine coolant temperature is displayed |
| O/D Off Switch (mon) | Ignition switch ON | O/D OFF switch OFF | OFF |
| | | O/D OFF switch ON | ON |
| Trans Range | Ignition switch ON | Select lever is in “P” position | P |
| | | Select lever is in “R” position | R |
| | | Select lever is in “N” position | N |
| | | Select lever is in “D” position | D |
| | | Select lever is in “3” position | 3 |
| | | Select lever is in “L” position | L |
| 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 |
| 4WD Low Switch | Ignition switch ON, transfer position switch is “4H” or “2H” position. | | OFF |
| | Ignition switch ON, transfer position switch is “4L” position. | | ON |
| A/C Switch | When AC is not operating | | OFF |
| | When AC is operating | | ON |
| Mode Select Switch | Ignition switch ON, P/N change switch is at Normal position | | NORMAL |
| | Ignition switch ON, P/N change switch is at Power position | | POWER |
| Target Engine Torque | Ignition switch ON | | 0 N·m |
| Shifting Signal | Ignition switch ON | | OFF |
| MIL Request | Ignition switch ON | | OFF |
| Fuel Cut Flag | Ignition switch ON | | OFF |

## Scan Tool Data Definitions

**Input Shaft Rev (RMP):**

Input shaft revolution computed by reference pulses coming from input shaft speed sensor on transmission case.

**Gear Position (1ST, 2ND, 3RD, 4TH, 5TH, N, R)**

Current gear position computed by throttle position coming from ECM and vehicle speed.

**Output Shaft Rev (RMP)**

Output shaft revolution computed by reference pulses coming from output shaft speed sensor on transmission case.

**Vehicle Speed (Km/h)**

Vehicle speed computed by reference pulses coming from vehicle speed sensor on transfer case.

**Battery Voltage (V)**

Battery voltage read by TCM as analog input signal by TCM.

**ATF Temp (°C)**

ATF temperature detected by signal from transmission fluid temperature sensor A installed in valve body.

**Engine Speed (RPM)**

Engine speed computed by reference pulses coming from crankshaft position sensor.

**Shift Sol A Con / MON (ON, OFF)**

COM-ON: ON command being outputted to shift solenoid–A.
COM-OFF: OFF command not being outputted to shift solenoid–A.
MON-ON: Electricity being passed to shift solenoid–A.
MON-OFF: Electricity not being passed to shift solenoid–A.

**Shift Sol B Con / MON (ON, OFF)**

COM-ON: ON command being outputted to shift solenoid–B.
COM-OFF: OFF command not being outputted to shift solenoid–B.
MON-ON: Electricity being passed to shift solenoid–B.
MON-OFF: Electricity not being passed to shift solenoid–B.

**Shift Sol E Con / MON (ON, OFF)**

COM-ON: ON command being outputted to shift solenoid–E.
COM-OFF: OFF command not being outputted to shift solenoid–E.
MON-ON: Electricity being passed to shift solenoid–E.
MON-OFF: Electricity not being passed to shift solenoid–E.

**TCC Sol Duty (%)**

Electric current value ration between electric current value being outputted from TCM to TCC solenoid and maximum value can be outputted by TCM.

**Press Cont Sol A (%)**

Electric current value ratio between electric current value being outputted from TCM to pressure control solenoid–A and maximum value can be outputted by TCM.

**Press Cont Sol B (%)**

Electric current value ration between electric current value being outputted from TCM to pressure control solenoid–B and maximum value can be outputted by TCM.

**Press Cont Sol C (%)**

Electric current value ration between electric current value being outputted from TCM to pressure control solenoid–C and maximum value can be outputted by TCM.

**Engine Torque (Nm)**

Actual engine torque detected by signal on CAN communication line fed from ECM.

**Coolant Temp (°C)**

Engine coolant temperature detected by signal on CAN communication line fed from ECM.

**O/D Off Switch (mon) (ON, OFF)**

Inputted signal from O/D OFF switch on select lever knob.
ON: O/D OFF switch depressed.
OFF: O/D OFF switch released.

**Trans Range (P, R, N, D, 3, L)**

It indicates transmission range according to transmission range sensor signal.

**Throttle Position (%)**

Throttle opening ratio detected by signal on CAN communication line fed from ECM.

**Brake Switch (ON, OFF)**

Brake light switch position detected by signal on CAN communication line fed from ECM.
ON: Brake pedal depressed
OFF: Brake pedal released

**4WD Low Switch (ON, OFF)**

Inputted signal from 4WD low switch on transfer case.
ON: Transfer gear position is 4L
OFF: Transfer gear position is 2H and 4H

**A/C Switch (ON, OFF)**

ON: Signal which inform that air conditioner compressor is turned ON.
OFF: Signal which inform that air conditioner compressor is turned OFF.

**Mode Select Switch (NORMAL, POWER)**

Inputted signal from power mode switch on center console.
NORMAL: Power mode switch is at OFF position.
POWER: Power mode switch is at ON position.

**Target Engine Torque**

Target engine torque detected by signal on CAN communication line fed from ECM.

**Shifting Signal (ON, OFF)**

ON: Command for AT shift change operation being output.
OFF: Command for AT shift change operation not being output.

**MIL Request (ON, OFF)**

ON: Signal which TCM requires ECM to turn on malfunction indicator lamp.
OFF: Signal which TCM does not require ECM 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.

## Visual Inspection

Visually check the following parts and systems.

| Inspection Item | | Referring |
|---|---|---|
| A/T fluid | Level, leakage, color | “A/T Fluid Level Check: 5 A/T” |
| A/T fluid hoses | Disconnection, looseness, deterioration | “Oil Cooler Hoses Replacement: 5 A/T” |
| Throttle (accelerator) cable | Play, installation | “Accelerator Cable Adjustment” in Section 6E2. |
| A/T select cable | Installation, operation | “Select Cable Adjustment: 5 A/T” |
| Engine oil | Level, leakage | “Engine Oil and Filter” in Section 0B. |
| Engine coolant | Level, leakage | “Engine Coolant” in Section 0B. |
| Battery | Fluid level, corrosion of terminal | |

| Inspection Item | | Referring |
|---|---|---|
| Connectors of electric wire harness | Disconnection friction | "Intermittent and Poor Connection" in Section 0A. |
| Fuses | Burning | "Cautions in Servicing" in Section 8. |
| Parts | Installation, damage | |
| Bolt | Looseness | |
| "O/D OFF" lamp | Operation at engine start | ""O/D OFF" Lamp Operation Check: 5 A/T" |
| "POWER" lamp | Operation at engine start | ""POWER" Lamp Operation Check: 5 A/T" |
| Malfunction indicator lamp ("SERVICE ENGINE SOON" lamp) | Operation at engine start | "Malfunction Indicator Lamp (MIL) Check" in Section 6-2. |
| Charge warning lamp | Operation at engine start | "Generator" in Section 6H. |
| Engine oil pressure warning lamp | Operation at engine start | "Oil Pressure Switch" in Section 8C. |
| Engine coolant temp. meter | Operation at engine start | |
| Other parts that can be checked visually | | |

## A/T Basic Check

This check is important for troubleshooting when TCM has detected no DTC and no abnormality has been noted in visual inspection. Follow the flow table carefully.

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T System Check" preformed? | Go to Step 2. | Go to "A/T System Check: 5 A/T". |
| 2 | Perform "Road Test"<br>Is it OK? | Go to Step 3. | Proceed to "Troubleshooting" in "Road Test: 5 A/T". |
| 3 | Perform "Manual Road Test"<br>Is it OK? | Go to Step 4. | Proceed to "Troubleshooting" in "Manual Road Test: 5 A/T". |
| 4 | Perform "Engine Brake Test"<br>Is it OK? | Go to Step 5. | Proceed to "Troubleshooting" in "Engine Brake Test: 5 A/T". |
| 5 | Perform "Stall Test"<br>Is it OK? | Go to Step 6. | Proceed to "Troubleshooting" in "Stall Test: 5 A/T". |
| 6 | Perform "Time Lag Test"<br>Is it OK? | Go to Step 7. | Proceed to "Troubleshooting" in "Time Lag Test: 5 A/T". |
| 7 | Perform "Line Pressure Test"<br>Is it OK? | Go to Step 8. | Proceed to "Troubleshooting" in "Line Pressure Test: 5 A/T". |
| 8 | 1) Proceed to "Trouble Diagnosis 1" in "A/T Symptom Diagnosis: 5 A/T".<br>Is trouble identified? | Repair or replace faulty parts. | Go to Step 9. |
| 9 | 1) Proceed to "Trouble Diagnosis 2" in "A/T Symptom Diagnosis: 5 A/T".<br>Is trouble identified? | Repair or replace faulty parts. | Proceed to "Trouble Diagnosis 3" in "A/T Symptom Diagnosis: 5 A/T". |

## Road Test

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 select “D”.
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 Diagram: 5 A/T”.

**Troubleshooting**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Unable to run in all range** | Faulty oil pump | Inspect. If NG, replace. |
| | Seized or broken planetary gear | Inspect. If NG, replace. |
| | Faulty torque converter | Inspect. If NG, replace. |
| | Damaged drive plate | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body assembly. |
| **Unable to run in reverse position** | Faulty reverse clutch | Inspect. If NG, replace. |
| | Faulty 1st & reverse brake | Inspect. If NG, replace. |
| **1 → 2 upshift fails to occur** | Malfunction of transmission range sensor | Inspect. If NG, replace. |
| | Maladjust shift control cable | Adjust. |
| | Faulty valve body component | Replace valve body component. |
| | Faulty 2nd brake | Inspect. If NG, replace. |
| | Faulty one-way No.1 clutch | Inspect. If NG, replace. |
| | Faulty one-way No.2 clutch | Inspect. If NG. replace. |
| **2 → 3 upshift fails to occur** | Malfunction of transmission range sensor | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body component. |
| | Faulty reverse clutch | Inspect. If NG, replace. |
| **3 → 4 upshift fails to occur** | Malfunction of transmission range sensor | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body component. |
| | Faulty direct clutch | Inspect. If NG, replace. |
| **4 → 5 upshift fails to occur** | Malfunction of transmission range sensor | Inspect. If NG, replace. |
| | Malfunction of input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body component. |
| | Faulty forward clutch | Inspect. If NG, replace. |
| | Faulty No.1 brake | Inspect. If NG, replace. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Incorrect gear shift point** | Malfunction of throttle position sensor | Inspect. If NG, replace. |
| | Malfunction of input shaft speed sensor | Inspect. If NG, replace. |
| | Malfunction of output shaft speed sensor | Inspect. If NG, replace. |
| | Malfunction of power mode switch | Inspect, If NG, replace. |
| | Malfunction of transmission fluid temperature sensor A | Inspect. If NG, replace. |
| **TCC (lock-up) function does not operate** | Malfunction of engine coolant temperature (ECT) sensor | Inspect. If NG, replace. |
| | Malfunction of brake light switch | Inspect. If NG, replace. |
| | Malfunction of throttle position sensor | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body component. |
| | Faulty torque converter | Replace torque converter. |

## Manual Road Test

This test checks the gears being used in “L”, “3” or “D” range when driven with unoperated gear shift control system. Test drive vehicle on a level road.

**NOTE:**

**Before this test, check diagnostic trouble code (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 connector.
3) With select lever in “L” range, start vehicle. Check that 3rd gear is being used referring to V1000 table shown below.
4) While vehicle is running, shift select lever to “3” range and check that 3rd gear is being used.
5) While vehicle is running, shift select lever to “D” range and check that 4th gear is being used when speed is higher than 40 km/h (25 mile/h).
6) After the checks, stop vehicle then turn ignition switch OFF, and connect valve body connector.
7) Clear DTC.

**Vehicle speed per 1000 rpm in engine speed**

| Gear position | Vehicle speed |
|---|---|
| 1st | 8.3 km/h (5.2 mile/h) |
| 2nd | 14.3 km/h (8.9 mile/h) |
| 3rd | 20.9 km/h (13.0 mile/h) |
| 4th | 29.3 km/h (18.2 mile/h) |
| 5th | 40.8 km/h (25.4 mile/h) |

**Troubleshooting**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Selected gear is incorrect** | Faulty valve body component | Replace valve body assembly. |
| | Faulty clutch or brake | Inspect clutch and brake. If any parts are faulty, replace them. |

## Stall Test

This test is to check overall performance of automatic transmission and engine by measuring stall speed at "D" and "R" ranges. Be sure to perform this test only when transmission 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, for 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".
4) Depress brake pedal fully.
5) Shift select lever to "D" 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 following specification.

**Engine stall speed**
**Standard: 2,320 – 2,620 rpm**

### Troubleshooting

| Condition | Possible Cause | Correction |
|---|---|---|
| **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. |
| | Malfunction of primary regulator valve (Low line pressure) | Replace valve body assembly. |
| | Slippery forward clutch | Inspect. If NG, replace. |
| | Faulty one-way No.3 clutch | Inspect. If NG, replace. |
| | Leakage from "D" range fluid pressure circuit | Overhaul or replace valve body assembly. |
| **Higher than standard level in "R" range** | Malfunction of pressure control solenoid valve (Low line pressure) | Inspect. If NG, replace valve body assembly. |
| | Malfunction of primary regulator valve (Low line pressure) | Replace valve body assembly. |
| | Slippery reverse clutch | Inspect. If NG, replace. |
| | Slippery 1st and reverse brake | Inspect. If NG, replace. |
| | Faulty one-way No.1 clutch | Inspect. If NG, replace. |
| | Leakage from "R" range fluid pressure circuit | Overhaul or replace valve body assembly. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **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. |
| | Malfunction of primary regulator valve (Low line pressure) | 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

This test is to check conditions of clutch, reverse 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 |
|---|---|---|
| **N → "D" time lag exceeds specification** | Malfunction of pressure control solenoid valve (Low line pressure) | Inspect. If NG, replace valve body assembly. |
| | Malfunction of primary regulator valve (Low line pressure) | 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.3 clutch | Inspect. If NG, replace. |
| | Leakage from "D" range fluid pressure circuit | Overhaul or replace valve body assembly. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **N → "R" time lag exceeds specification** | Malfunction of pressure control solenoid valve (Low line pressure) | Inspect. If NG, replace valve body assembly. |
| | Malfunction of primary regulator valve (Low line pressure) | 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. |
| | Faulty one-way No.1 clutch | Inspect. If NG, replace. |
| | Leakage from "R" range fluid pressure circuit | Overhaul or replace valve body assembly. |

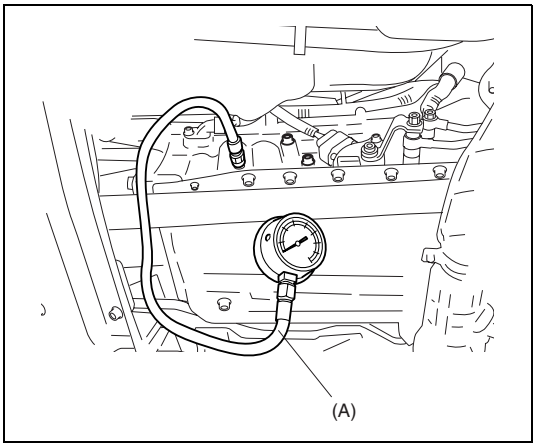
## Line Pressure Test

Purpose of this test is to check operating conditions of each part by measuring fluid pressure in fluid pressure line.
Line pressure test requires following conditions.

- Automatic fluid is at normal operating temperature (70 – 80 °C / 158 – 176 °F).
- Fluid is filled 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 transmission 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 transmission line pressure**

| | “D” range | “R” range |
|---|---|---|
| **At idle speed** | **362 – 420 kPa (3.7 – 4.3 kg/cm$^2$, 53 – 61 psi)** | **500 – 580 kPa (5.1 – 5.9 kg/cm$^2$, 73 – 84 psi)** |
| **At stall speed** | **1390 – 1490 kPa (14.2 – 15.2 kg/cm$^2$, 202 – 216 psi)** | **1700 – 1840 kPa (17.3 – 18.8 kg/cm$^2$, 246 – 267 psi)** |

**Troubleshooting**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Higher than standard level in each range** | Malfunction of pressure control solenoid valve–A (Low line pressure) | Inspect. If NG, replace valve body assembly. |
| | Malfunction of primary regulator valve (Low line pressure) | Replace valve body assembly. |
| **Lower than standard level in each range** | Malfunction of pressure control solenoid valve–A (Low line pressure) | Inspect. If NG, replace valve body assembly. |
| | Malfunction of primary regulator valve (Low line pressure) | 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. |
| | Faulty forward clutch | Inspect. If NG, replace. |
| **Lower than standard level only in “R” range** | Leakage from “R” range fluid pressure circuit | Overhaul or replace valve body assembly. |
| | Faulty reverse clutch | Inspect. If NG, replace. |
| | Faulty 1st and reverse brake | Inspect. If NG, replace. |

## Engine Brake Test

**WARNING:**
**Before test, make sure that there is no vehicle behind so as to prevent rear-end collision.**

1) While driving vehicle in 4th gear of “D” range, shift select lever down to “3” 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 |
|---|---|---|
| **Failure to operate when shifted down to “3” range** | Faulty No.1 brake | Inspect. If NG, replace. |
| | Faulty No.2 brake | Inspect. If NG, replace. |
| **Failure to operate when shifted down to “L” range** | Faulty 1st / reverse brake | Inspect. If NG, replace. |

## "P" Range Test

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 |
|---|---|---|
| **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

### Trouble diagnosis 1

**Electrical repair**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor 1 → 2 and/or 2 → 1 shift** | Transmission range sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Poor 2 → 3 and/or 3 → 2 shift** | Transmission range sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Poor 3 → 4 and/or 4 → 3 shift** | Transmission range sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Poor 4 → 5 and/or 5 → 4 shift** | Transmission range sensor | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–E circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–C circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Input shaft speed sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Incorrect gear shift point** | Throttle position sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Input shaft speed sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Output shaft speed sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Power mode switch circuit faulty | Inspect. If NG, replace. |
| | Pressure control solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Transmission fluid temperature sensor A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **TCC (lock-up) function does not operate** | TCC solenoid valve circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Engine coolant temperature (ECT) sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Engine coolant temperature (ECT) signal circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| | ECM | Substitute a known-good ECM and recheck. |
| **No kick down** | Shift solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| **Higher or lower stall speed** | Pressure control solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Higher or lower line pressure** | Pressure control solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Excessive shock at "N" → "D"** | Input shaft speed sensor circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Transmission fluid temperature sensor A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Excessive shock at "N" → "R"** | Shift solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Excessive shock at shift up and down** | Shift solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–E circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Pressure control solenoid valve–C circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Transmission fluid temperature sensor A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | TCM | Substitute a known-good TCM and recheck. |
| **Excessive shock at kick down** | Shift solenoid valve–A circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–B circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |
| | Shift solenoid valve–E circuit faulty | Inspect circuit for open, short and intermittent trouble. If NG, repair. |

## Trouble diagnosis 2

### On-vehicle repair

| Condition | Possible Cause | Correction |
|---|---|---|
| **Unable to run in all range** | Faulty shift control cable | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body assembly. |
| **Poor 1 → 2 shift, excessive shock or slippage** | Maladjust shift control cable | Adjust. |
| | Faulty transmission range sensor | Inspect. If NG, replace. |
| | Faulty shift solenoid valve–A | Inspect. If NG, replace. |
| | Faulty input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty pressure control solenoid valve–B | Inspect. If NG, replace valve body component. |
| | Faulty valve body component | Replace valve body assembly. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor 2 → 3 shift, excessive shock or slippage** | Faulty transmission range sensor | Inspect. If NG, replace. |
| | Faulty input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty pressure control solenoid valve–B | Inspect. If NG, replace valve body component. |
| | Faulty valve body component | Replace valve body assembly. |
| **Poor 3 → 4 shift, excessive shock or slippage** | Faulty transmission range sensor | Inspect. If NG, replace. |
| | Faulty input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty shift solenoid valve–A | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty pressure control solenoid valve–B | Inspect. If NG, replace valve body component. |
| | Faulty valve body component | Replace valve body assembly. |
| **Poor 4 → 5 shift, excessive shock or slippage** | Faulty transmission range sensor | Inspect. If NG, replace. |
| | Faulty shift solenoid valve–A | Inspect. If NG, replace. |
| | Faulty shift solenoid valve–E | Inspect. If NG, replace. |
| | Faulty input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty pressure control solenoid valve–B | Inspect. If NG, replace valve body component. |
| | Faulty pressure control solenoid valve–C | Inspect. If NG. replace valve body component. |
| | Faulty valve body component | Replace valve body assembly. |
| **Incorrect gear shift point** | Faulty throttle position sensor | Inspect. If NG, replace. |
| | Faulty input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty output shaft speed sensor | Inspect. If NG, replace. |
| | Faulty power mode switch | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty transmission fluid temperature sensor A | Inspect. If NG, replace. |
| **TCC (lock-up) function does not operate** | Faulty TCC solenoid valve | Inspect. If NG, replace valve body component. |
| | Faulty engine coolant temperature (ECT) sensor | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body component. |
| | Faulty torque converter | Replace torque converter. |
| **Excessive shock at "N" → "D"** | Faulty input shaft speed sensor | Inspect. If NG, replace. |
| | Faulty shift solenoid valve–A | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty transmission fluid temperature sensor A | Inspect. If NG, replace. |
| | Faulty valve body component | Replace valve body component. |
| **Excessive shock at "N" → "R"** | Faulty shift solenoid valve–A | Inspect. If NG, replace. |
| | Faulty pressure control solenoid valve–A | Inspect. If NG, replace valve body component. |
| | Faulty valve body component | Replace valve body component. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **Poor engine brake in downshift to "3" range** | Faulty valve body component | Replace valve body component. |
| **Poor engine brake in downshift to "L" range** | Faulty valve body component | Replace valve body component. |

## Trouble diagnosis 3

### Off-vehicle repair

| Condition | Possible Cause | Correction |
|---|---|---|
| **Unable to run in all range** | Faulty oil pump | Inspect. If NG, replace. |
| | Seized or broken planetary gear | Inspect. If NG, replace. |
| | Faulty torque converter | Inspect. If NG, replace. |
| | Damaged drive plate | Inspect. If NG, replace. |
| **Unable to run in reverse position** | Faulty reverse clutch | Inspect. If NG, replace. |
| | Faulty 1st & 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. |
| | Faulty one-way No.2 clutch | Inspect. If NG, replace. |
| **Poor 2 → 3 shift, excessive shock or slippage** | Faulty reverse clutch | Inspect. If NG, replace. |
| **Poor 3 → 4 shift, excessive shock or slippage** | Faulty direct clutch | Inspect. If NG, replace. |
| **Poor 4 → 5 shift, excessive shock or slippage** | Faulty forward clutch | Inspect. If NG, replace. |
| | Faulty No.1 brake | Inspect. If NG, replace. |
| **TCC (lock-up) function does not operate** | Faulty torque converter | Replace torque converter. |
| **Excessive "N" → "D"** | Faulty oil pump | Inspect. If NG, replace. |
| | Faulty forward clutch | Inspect. If NG, replace. |
| | Faulty one-way No.3 clutch | Inspect. If NG, replace. |
| **Excessive "N" → "R"** | Faulty oil pump | Inspect. If NG, replace. |
| | Faulty reverse clutch | Inspect. If NG, replace. |
| | Faulty 1st & reverse brake | Inspect. If NG, replace. |
| | Faulty one-way No.1 clutch | Inspect. If NG, replace. |
| **Poor engine brake in downshift to "3" range** | Faulty 2nd brake | Inspect. If NG, replace. |
| **Poor engine brake in downshift to "L" range** | Faulty 1st & reverse brake | Inspect. If NG, replace. |

## No Gear Shift to O/D

### System Description

TCM does not shift to 5th gear under any of the following condition.

- O/D OFF signal is inputted. ("O/D OFF" lamp ON)
- 4WD LOW switch is turned ON. (4L mode)
- Engine coolant temperature is lower than 50 °C (122 °F).
- A/T fluid temperature is lower than 30 °C (86 °F).
- O/D off signal by cruise control module is ON.
- TCM detects the following DTCs.
  DTC P0712, P0713, P0717, P0722, P0752, P0781, P0797, P0962, P0963, P0966 P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0985, P0986, P1701, P1703 and P2763

### 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 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: 5 A/T". |
| 2 | Check DTC<br>Is DTC P0712, P0713, P0717, P0722, P0752, P0781, P0797, P0962, P0963, P0966 P0967, P0970, P0971, P0973, P0974, P0976, P0977, P0985, P0986, P1701, P1703 or P2763 detected? | Perform DTC Flow to repair and retry. | Go to Step 3. |
| 3 | ECT check<br>1) Warm up engine to normal operating temperature.<br>2) Check ECT monitored by TCM using scan tool.<br>Is ECT more than 50 °C (122 °F)? | Go to Step 4. | Faulty ECT sensor, its circuit or engine cooling system. If OK, substitute a known-good TCM and recheck. |
| 4 | A/T fluid temperature check<br>1) Warm up engine to normal operating temperature.<br>2) Check A/T fluid temperature using scan tool.<br>Is A/T fluid temperature more than 30 °C (86 °F)? | Go to Step 5. | Faulty A/T fluid temperature sensor or transmission. If OK, substitute a known-good TCM and recheck. |
| 5 | "O/D OFF" switch signal inspection<br>1) With ignition switch ON, check voltage between terminal "E229-15" of TCM connector and ground under the following conditions.<br>**"O/D OFF" switch specification**<br>**Switch button released: Battery voltage**<br>**Switch button pressed: 0 – 2 V**<br>Is result as specified? | Go to Step 6. | Faulty O/D OFF switch or its circuit. If OK, substitute a known-good TCM and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 6 | "4WD LOW" switch signal inspection<br>1) With ignition switch ON, check voltage between terminal "E229-18" of TCM connector and ground.<br>**"4WD LOW" switch specification**<br>**Transfer gear position "2H" or "4H": Battery voltage**<br>**Transfer gear position "4L" or "N": 0 – 2 V**<br>Is result as specified? | Go to Step 7. | Faulty "4WD LOW" switch or its circuit. If OK, substitute a known-good TCM and recheck. |
| 7 | Cruise control signal inspection<br>1) With ignition switch ON, check voltage between terminal "E229-19" of TCM connector and ground.<br>Is it battery voltage? | Substitute a known-good TCM and recheck. | Faulty cruise control module or its circuit. If OK, substitute a known-good TCM and recheck. |

## No Lock-Up Occurs

**System Description**

TCM turns TCC solenoid OFF under any of the following conditions.

- Engine coolant temperature is lower than 50 °C (122 °F).
- Lock-up off signal by cruise control module is ON.
- 4WD LOW switch is turned ON. (4L mode)
- Brake light switch is turned ON. (Brake pedal is depressed)
- TCM detects the following DTCs.
  P0741, P0962, P0963, P0966, P0967 P0970, P0971, P0973, P0974, P0976, P0977, P0985, P0986, P1701, P1703, P2763 and P2764

**Troubleshooting**

**WARNING:**

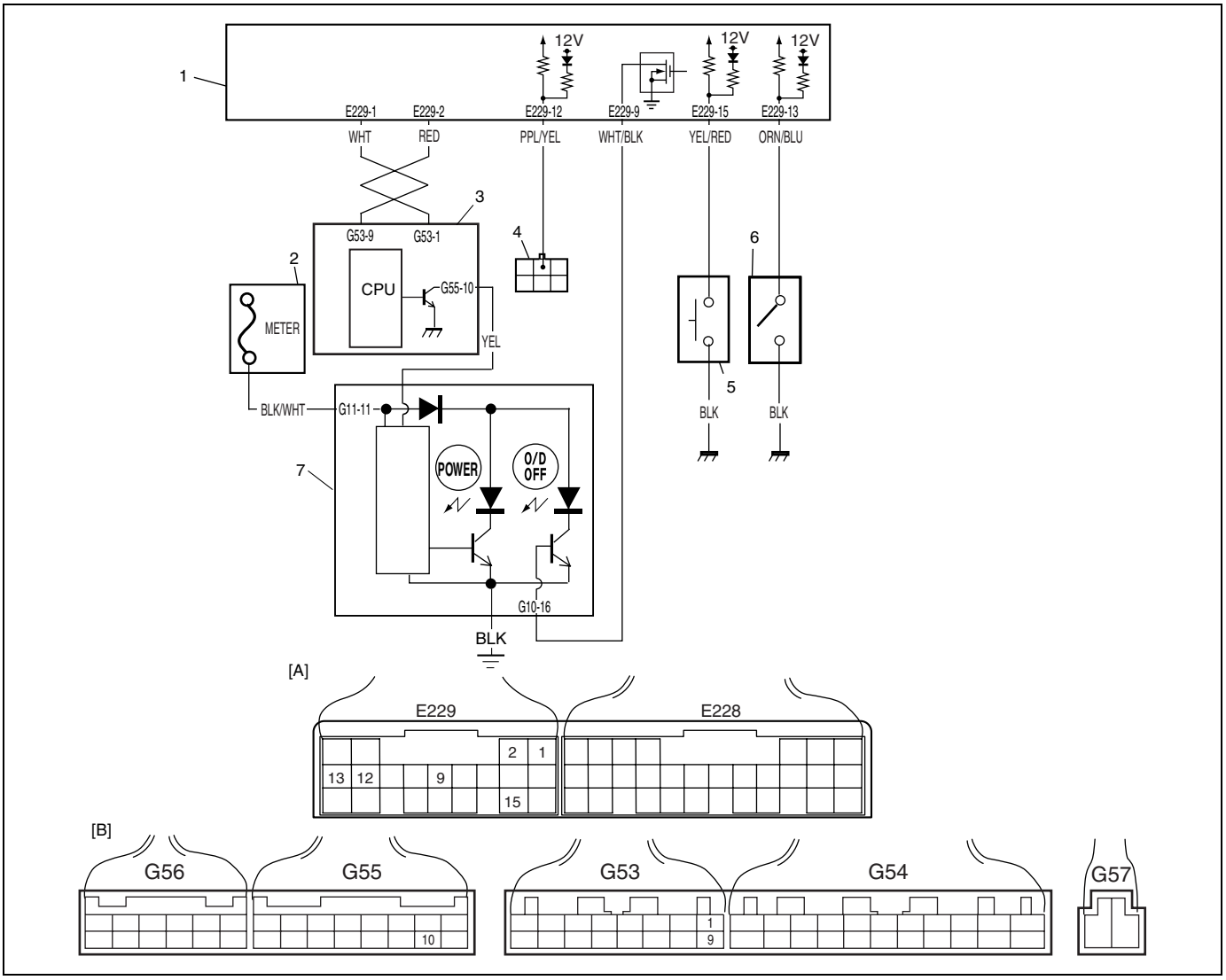
- **When performing a road test, select a place where there is no traffic or possibility of a traffic accident and be very careful during testing to avoid occurrence of an accident.**
- **Road test should be carried out with 2 persons, a driver and tester, on a level road.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T System Check" performed? | Go to Step 2. | Go to "A/T System Check: 5 A/T". |
| 2 | Check DTC<br>Is DTC P0741, P0962, P0963, P0966, P0967 P0970, P0971, P0973, P0974, P0976, P0977, P0985, P0986, P1701, P1703, P2763 or P2764 detected? | Perform DTC Flow to repair and retry. | Go to Step 3. |
| 3 | ECT check<br>1) Warm up engine to normal operating temperature.<br>2) Check ECT using scan tool.<br>Is ECT more than 50 °C (122 °F)? | Go to Step 4. | Faulty ECT sensor, its circuit or engine cooling system. If OK, substitute a known-good TCM and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | "4WD LOW" switch signal inspection<br>1) With ignition switch ON, check voltage between terminal "E229-18" of TCM connector and ground.<br>**"4WD LOW" switch specification**<br>**Transfer gear position "2H" or "4H": Battery voltage**<br>**Transfer gear position "4L" or "N": 0 – 2 V**<br>Is result as specified? | Go to Step 5. | Faulty "4WD LOW" switch or its circuit. If OK, substitute a known-good TCM and recheck. |
| 5 | Brake light switch signal inspection<br>1) With ignition switch ON, check voltage between terminal "E61-34" of ECM connector and ground.<br>**Brake light switch specification**<br>**Brake pedal is released: 0 – 1 V**<br>**Brake pedal is depressed: Battery voltage**<br>Is result as specified? | Go to Step 6. | Mis-adjusted brake light switch, faulty brake light switch or its circuit. If OK, substitute a known-good TCM and recheck. |
| 6 | Cruise control signal inspection<br>1) With ignition switch ON, check voltage between terminal "E229-19" of TCM connector and ground.<br>Is it battery voltage? | Substitute a known-good TCM and recheck. | Faulty cruise control module or its circuit. If OK, substitute a known-good TCM and recheck. |

# "O/D OFF" Light Does Not Light at Ignition Switch ON

## Wiring Diagram




| | | |
|---|---|---|
| 1. TCM | 4. Monitor connector | 7. Combination meter |
| 2. Fuse | 5. O/D off switch | [A]: Terminal arrangement of TCM connector (Viewed from harness side) |
| 3. BCM | 6. P/N change switch | [B]: Terminal arrangement of BCM |

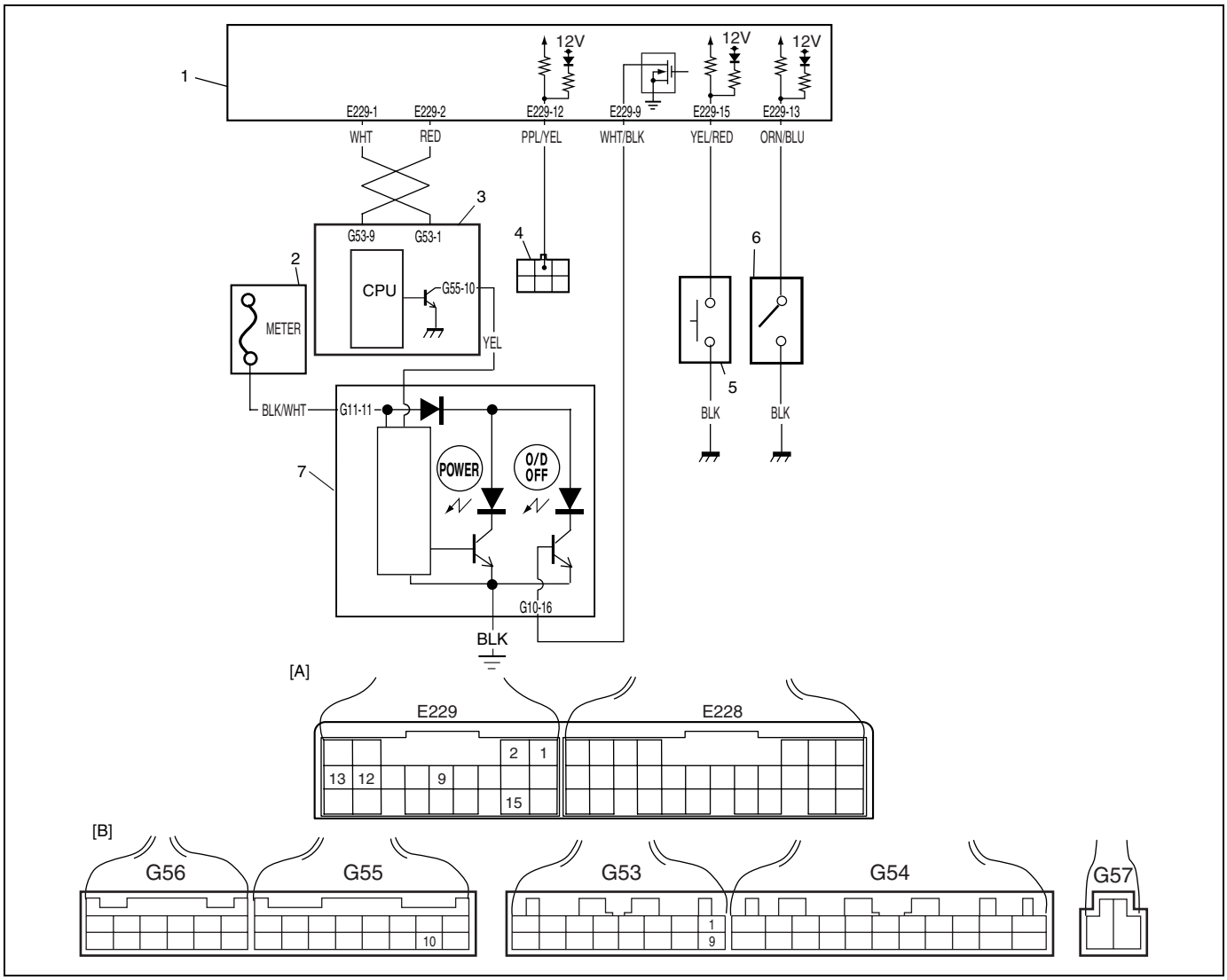
## Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Power circuit check of combination meter<br>Are "O/D OFF" light, "POWER" light and other indicator light in combination meter kept turned OFF with ignition switch ON? | Poor "G11-11" terminal connection on combination meter, "METER" fuse blown or faulty "BLK/WHT" or "BLK" wire. | Go to Step 2. |
| 2 | "O/D OFF" light circuit check<br>1) Disconnect TCM connector "E229" from TCM and combination meter connector "G10" from combination meter.<br>2) Check continuity between "E229-9" and "G10-16".<br>Is continuity indicated? | Go to Step 3. | "WHT/BLK" circuit open. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | "O/D OFF" light circuit check<br>1) Connect TCM connector "E229" to TCM.<br>2) Turn ignition switch ON.<br>3) Measure voltage between terminal "G10-16" of combination meter connector and ground with O/D OFF signal inputted once.<br>Is it 12 V or more? | Replace combination meter. | Substitute a known-good TCM and recheck. |

## "O/D OFF" Light Comes ON Steadily

### Wiring Diagram



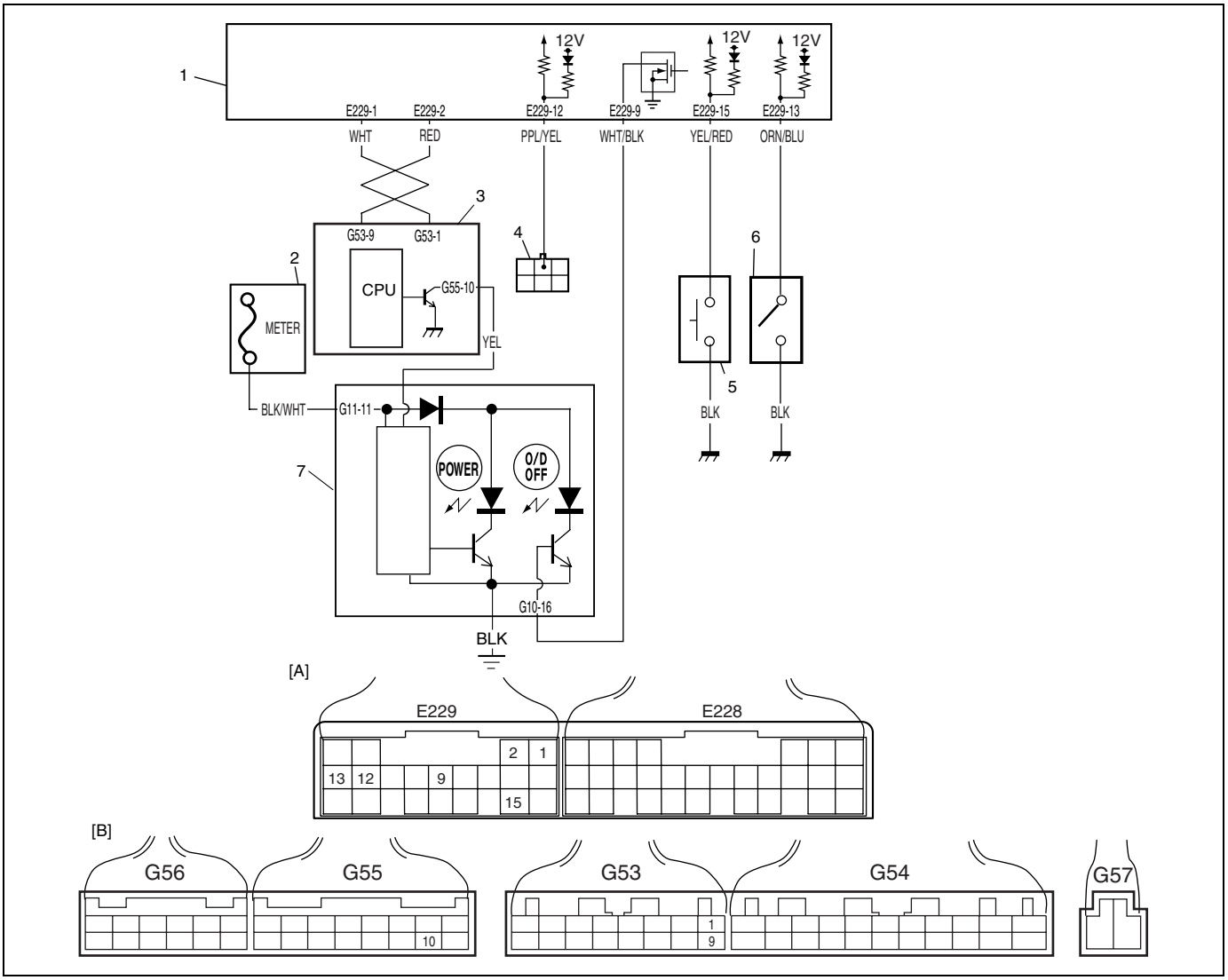

| | | |
|---|---|---|
| 1. TCM | 4. Monitor connector | 7. Combination meter |
| 2. Fuse | 5. O/D off switch | [A]: Terminal arrangement of TCM connector (Viewed from harness side) |
| 3. BCM | 6. P/N change switch | [B]: Terminal arrangement of BCM |

### Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check light circuit for shorted to power circuit<br>1) Disconnect TCM connector "E229" from TCM.<br>2) Measure voltage between "G10-16" and ground with ignition switch ON.<br>Is it 12 V or more? | "WHT/BLK" circuit is shorted to power circuit. | Substitute a known-good TCM and recheck. |

## "POWER" Light Does Not Light at Ignition Switch ON

### Wiring Diagram



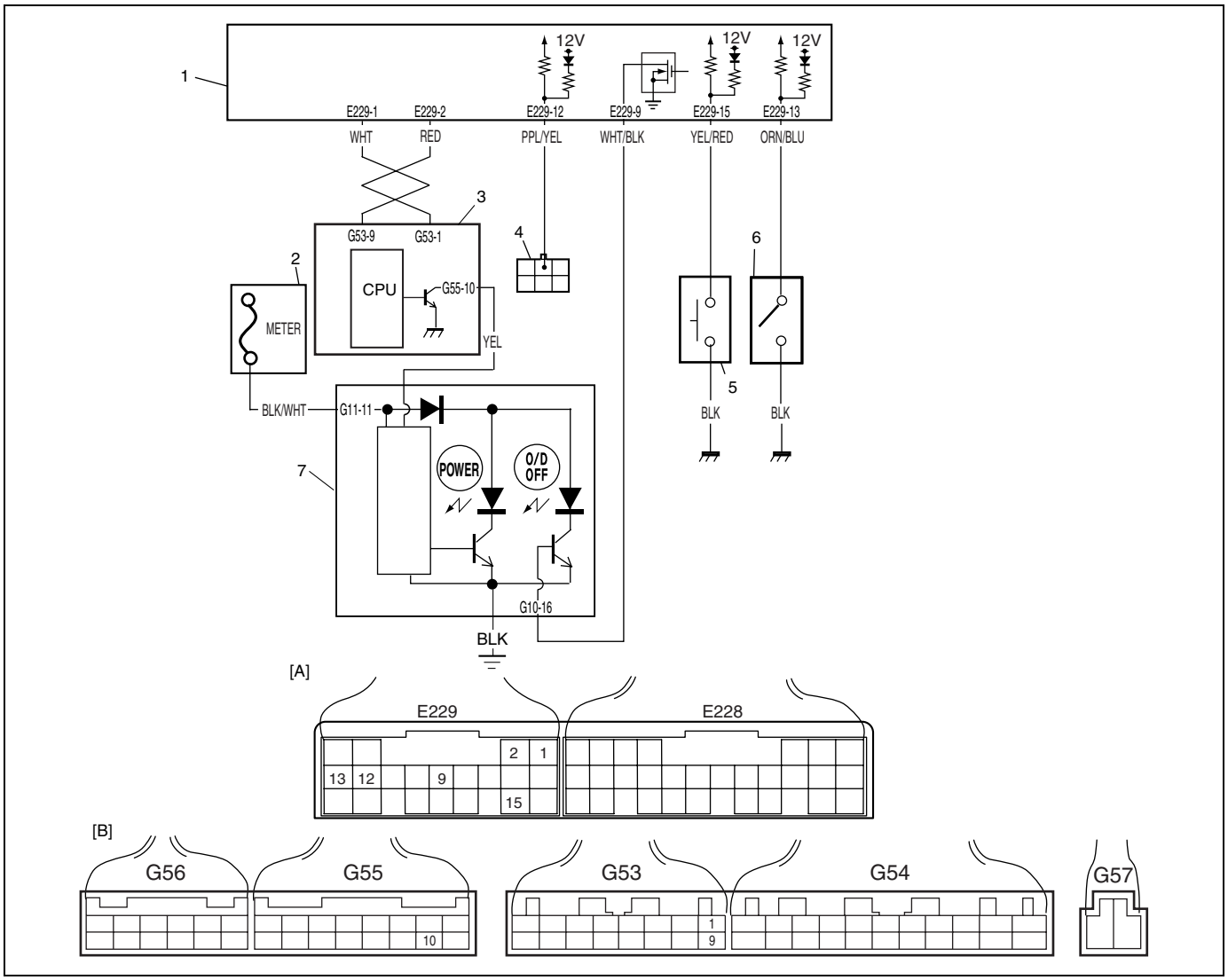

| | | |
|---|---|---|
| 1. TCM | 4. Monitor connector | 7. Combination meter |
| 2. Fuse | 5. O/D off switch | [A]: Terminal arrangement of TCM connector (Viewed from harness side) |
| 3. BCM | 6. P/N change switch | [B]: Terminal arrangement of BCM |

### Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | "POWER" light circuit check<br>Are "O/D OFF" light, "POWER" light and other indicator light in combination meter kept turned OFF with ignition switch ON? | Poor "G11-11" terminal connection on combination meter, "METER" fuse blown or faulty "BLK/WHT" or "BLK" wire. | Replace combination meter. |

## "POWER" Light Comes ON Steadily

### Wiring Diagram

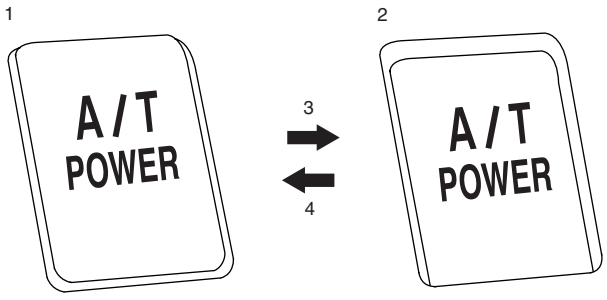



| | | |
|---|---|---|
| 1. TCM | 4. Monitor connector | 7. Combination meter |
| 2. Fuse | 5. O/D off switch | [A]: Terminal arrangement of TCM connector (Viewed from harness side) |
| 3. BCM | 6. P/N change switch | [B]: Terminal arrangement of BCM |

## Troubleshooting

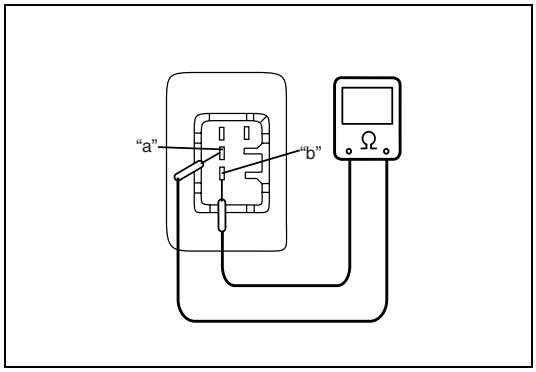
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Check Power / Normal change switch position.<br>See Figure.<br>Is switch button at Normal position? | Go to Step 2. | Set Power / Normal change switch at Normal position. |
| 2 | Check Power / Normal switch circuit<br>1) Check resistance between terminal "E229-13" of disconnected TCM connector and body ground, with P/N change switch at Normal position.<br>Is continuity indicated? | Go to Step 3. | Go to Step 4. |
| 3 | Check Power / Normal switch for operation<br>1) Remove Power / Normal change switch.<br>2) Check continuity between switch terminals "a" and "b" under each condition.<br>3) Check continuity between switch terminals under each condition shown below.<br>See Figure.<br>**Power / Normal change switch operation**<br>**Normal position: No continuity**<br>**Power position: Continuity**<br>Is check result satisfactory? | "ORN/BLU" circuit shorted to ground. | Replace Power / Normal switch. |
| 4 | Check TCM internal circuit<br>1) Turn ignition switch OFF.<br>2) Disconnect TCM connector.<br>3) Turn ignition switch ON.<br>Does "POWER" light come ON steadily? | Replace combination meter. | Substitute a known-good TCM and recheck. |

Fig. for Step 1



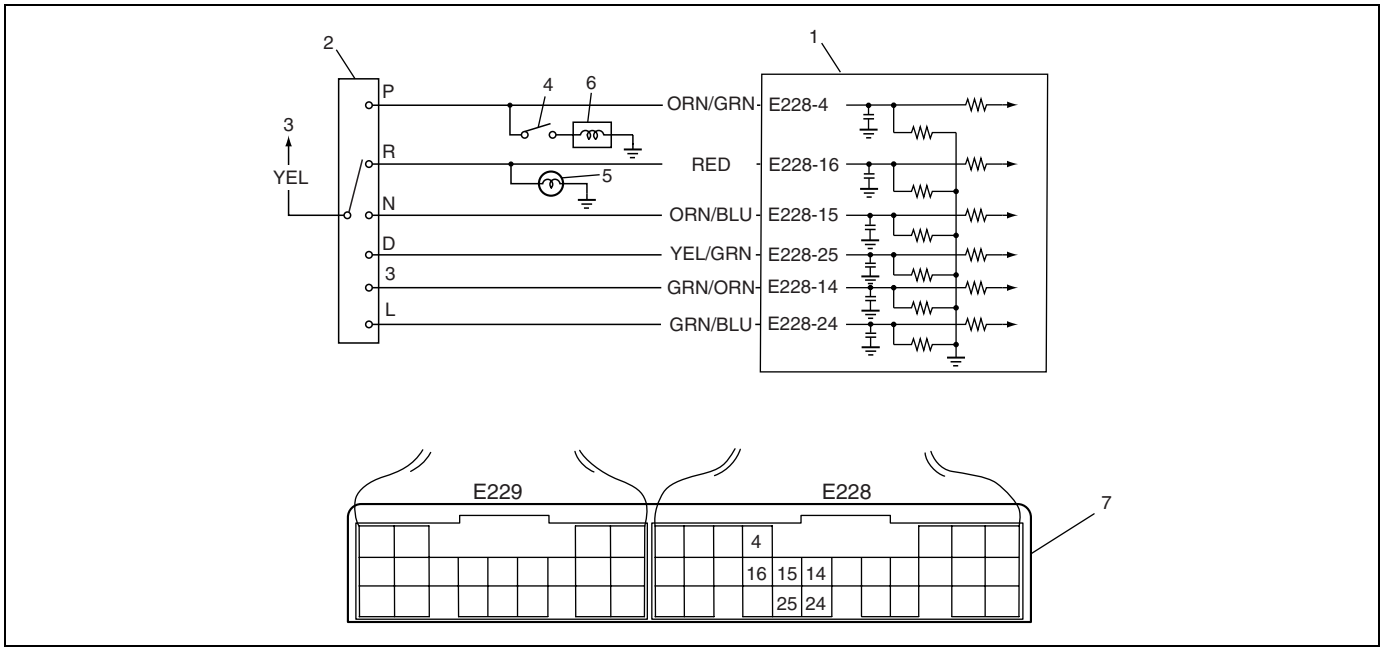

| | |
|---|---|
| 1. Normal position | 3. Push |
| 2. Power position | 4. Push again to release |

Fig. for Step 3




## DTC P0705 (No.34) Transmission Range Sensor Circuit Malfunction

### Wiring Diagram




| | | |
|---|---|---|
| 1. TCM | 4. Brake light switch | 7. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Transmission range sensor | 5. Back-up light | |
| 3. From ignition switch | 6. Shift lock solenoid | |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Multiple signals are inputted simultaneously for 2 seconds. | • Select cable maladjusted.<br>• Transmission range sensor (switch) maladjusted.<br>• Transmission range sensor (switch) or its circuit malfunction.<br>• 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.
3) Start engine and shift select lever to "D" range.
4) Keep engine running at idle speed for 25 seconds or more.

5) Check DTC, pending DTC and freeze-frame data.

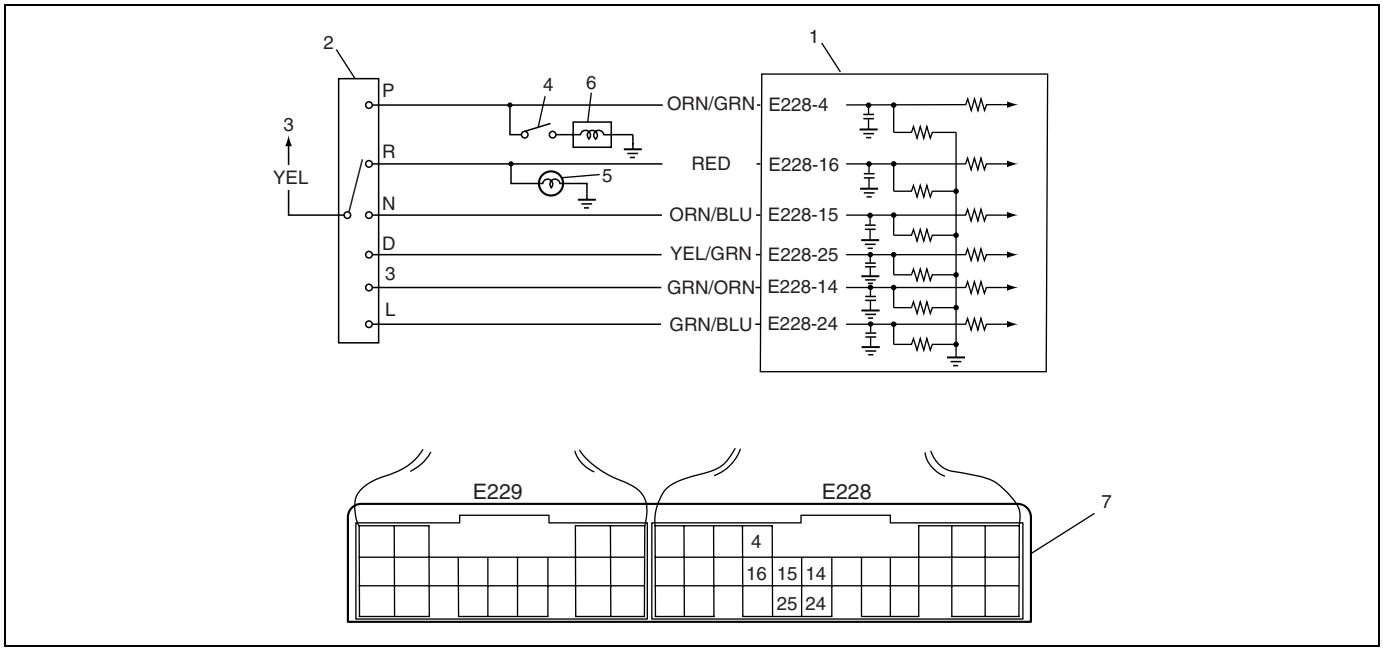
**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Do you have SUZUKI scan tool? | Go to Step 3. | Go to Step 4. |
| 3 | Check transmission range sensor (switch) circuit for operation<br>Check by using SUZUKI scan tool:<br>1) Connect SUZUKI scan tool to DLC with ignition switch OFF.<br>2) Turn ignition switch ON and check transmission range sensor signal (“P”, “R”, “N”, “D”, “3” or “L”) on display when shifting select lever to each range.<br>Is applicable range indicated? | Intermittent trouble. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 5. |
| 4 | Check transmission range sensor (switch) circuit for operation<br>Check without using SUZUKI scan tool:<br>1) Turn ignition switch ON.<br>2) Check voltage at terminals “E228-4”, “E228-14”, “E228-15”, “E228-16”, “E228-24” and “E228-25” respectively with select lever shifted to each range.<br>Taking terminal “E228-4” as an example, is battery voltage will be indicated only when shift lever is shifted to “P” range and 0 V for other ranges as shown in table. Check voltage at other terminals likewise, referring to table.<br>Are check results satisfactory? | Intermittent trouble. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. | Go to Step 5. |
| 5 | Check transmission range sensor (switch) for installation position<br>1) Check transmission range sensor (switch) for installation position referring to “Transmission Range Sensor Inspection and Adjustment: 5 A/T”.<br>Is it adjusted correctly? | Go to Step 6. | Adjust transmission range sensor (switch) and recheck. |
| 6 | Check select cable for adjustment<br>1) Check select cable for adjustment referring to “Select Cable Adjustment: 5 A/T”.<br>Is it adjusted correctly? | Go to Step 7. | Adjust select cable and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | Check transmission range sensor (switch)<br>1) Check transmission range sensor (switch) referring to "Transmission Range Sensor Inspection and Adjustment: 5 A/T".<br>Are check results satisfactory? | "ORN/GRN", "RED", "ORN/BLU", "YEL/GRN", "GRN/ORN" or "GRN/BLU" circuit shorted to power circuit or shorted each other. If wires and connections are OK, substitute a known-good TCM and recheck. | Replace transmission range sensor (switch). |

## DTC P0707 (No.34) Transmission Range Sensor Circuit Low

### Wiring Diagram




| | | |
|---|---|---|
| 1. TCM | 4. Brake light switch | 7. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Transmission range sensor | 5. Back-up light | |
| 3. From ignition switch | 6. Shift lock solenoid | |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission range switch signal (P, R, N, D, 3, L) is not inputted for more than 2 seconds at more than 30 km/h (19 mile/h) vehicle speed. | • Select cable maladjusted.<br>• Transmission range sensor (switch) maladjusted.<br>• Transmission range sensor (switch) or its circuit malfunction.<br>• 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.
3) Start engine and shift select lever to "D" range.
4) Start vehicle and increase vehicle speed to 50 km/h (31 mile/h) or more for 2 minutes.
5) Stop vehicle and turn ignition switch OFF.

6) Repeat Step 3) to 5) one time.
7) Stop vehicle.
8) Check DTC, pending DTC and freeze-frame data.

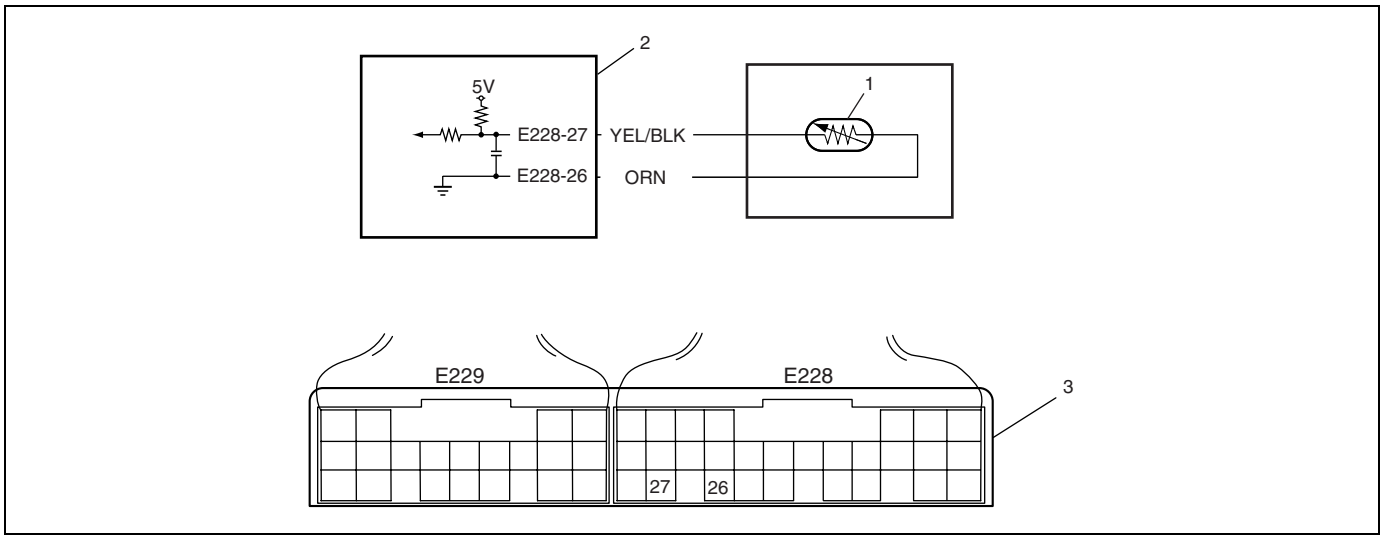
**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T System Check" performed? | Go to Step 2. | Go to "A/T System Check: 5 A/T". |
| 2 | Do you have SUZUKI scan tool? | Go to Step 3. | Go to Step 4. |
| 3 | Check transmission range sensor (switch) circuit for operation<br>Check by using SUZUKI scan tool:<br>1) Connect SUZUKI scan tool to DLC with ignition switch OFF.<br>2) Turn ignition switch ON and check transmission range sensor signal ("P", "R", "N", "D", "3" or "L") on display when shifting select lever to each range.<br>Is applicable range indicated? | Intermittent trouble.<br>Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 5. |
| 4 | Check transmission range sensor (switch) circuit for operation<br>Check without using SUZUKI scan tool:<br>1) Turn ignition switch ON.<br>2) Check voltage at terminals "E228-4", "E228-14", "E228-15", "E228-16", "E228-24" and "E228-25" respectively with select lever shifted to each range.<br>Taking terminal "E228-4" as an example, is battery voltage will be indicated only when shift lever is shifted to "P" range and 0 V for other ranges as shown in table. Check voltage at other terminals likewise, referring to table.<br>Are check results satisfactory? | Intermittent trouble.<br>Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. | Go to Step 5. |
| 5 | Check transmission range sensor (switch) for installation position<br>1) Check transmission range sensor (switch) for installation position referring to "Transmission Range Sensor Inspection and Adjustment: 5 A/T".<br>Is it adjusted correctly? | Go to Step 6. | Adjust transmission range sensor (switch) and recheck. |
| 6 | Check select cable for adjustment<br>1) Check select cable for adjustment referring to "Select Cable Adjustment: 5 A/T".<br>Is it adjusted correctly? | Go to Step 7. | Adjust select cable and recheck. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | Check transmission range sensor (switch)<br>1) Check transmission range sensor (switch) referring to "Transmission Range Sensor Inspection and Adjustment: 5 A/T".<br>Are check results satisfactory? | "YEL", "ORN/GRN", "RED", "ORN/BLU", "YEL/GRN", "GRN/ORN" or "GRN/BLU" circuit open or shorted to ground. If wires and connections are OK, substitute a known-good TCM and recheck. | Replace transmission range sensor (switch). |

## DTC P0711 (No.81) Transmission Fluid Temperature Sensor Range / Performance

### Wiring Diagram




| | |
|---|---|
| 1. Transmission fluid temperature sensor A | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission fluid temperature sensor variation is less than specified value even though engine was running for specified time after engine start. | • Transmission fluid temperature sensor A or its circuit.<br>• TCM |

### DTC Confirmation Procedure

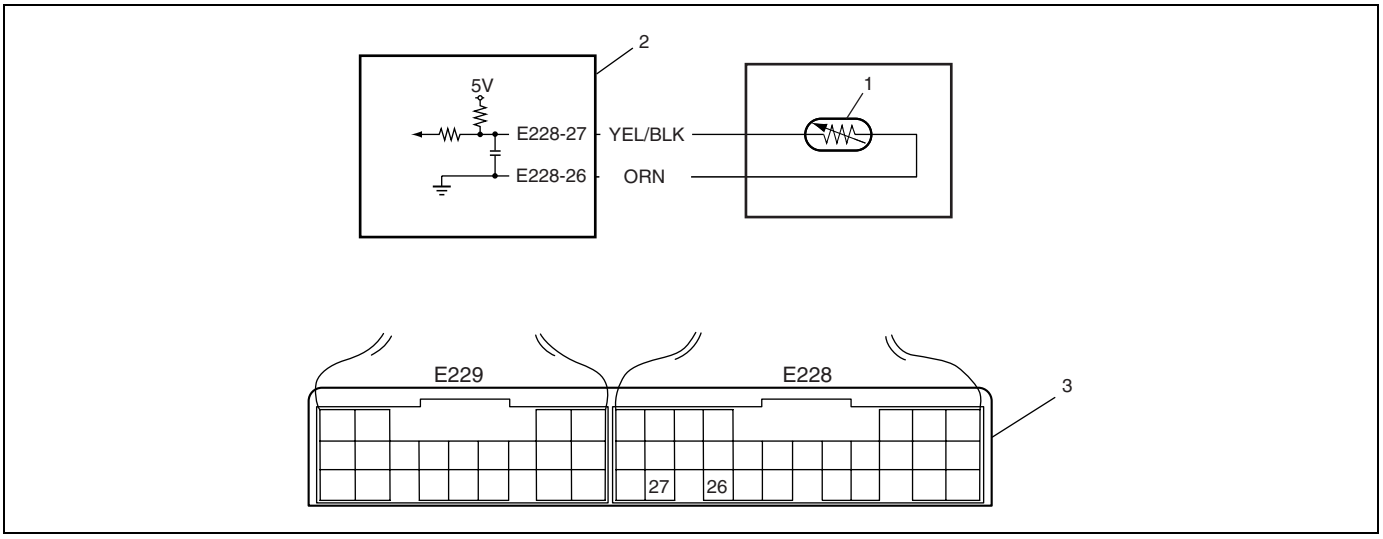
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Shift select lever to "D" range.
5) Start vehicle and increase vehicle speed to 50 km/h (31 mile/h) or more with throttle position 10% for 30 minutes.
6) Stop vehicle and turn ignition switch OFF.
7) Repeat Step 3) to 4) one time.
8) Stop vehicle.
9) 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: 5 A/T”. |
| 2 | Inspection transmission fluid temperature sensor A<br>1) Inspection transmission fluid temperature sensor A referring to “Transmission Fluid Temperature Sensor A and B Inspection: 5 A/T”.<br>Is result satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace valve body harness including transmission fluid temperature sensor A referring to “Transmission Fluid Temperature Sensor A and B Removal and Installation: 5 A/T”. |

## DTC P0712 (No.38) Transmission Fluid Temperature Sensor “A” Circuit Low

### Wiring Diagram




| | |
|---|---|
| 1. Transmission fluid temperature sensor A | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission temperature sensor terminal voltage is less than 0.05 V for 6 minutes or more after ignition switch ON. | • Transmission fluid temperature sensor A or its circuit.<br>• TCM |

### DTC Confirmation Procedure

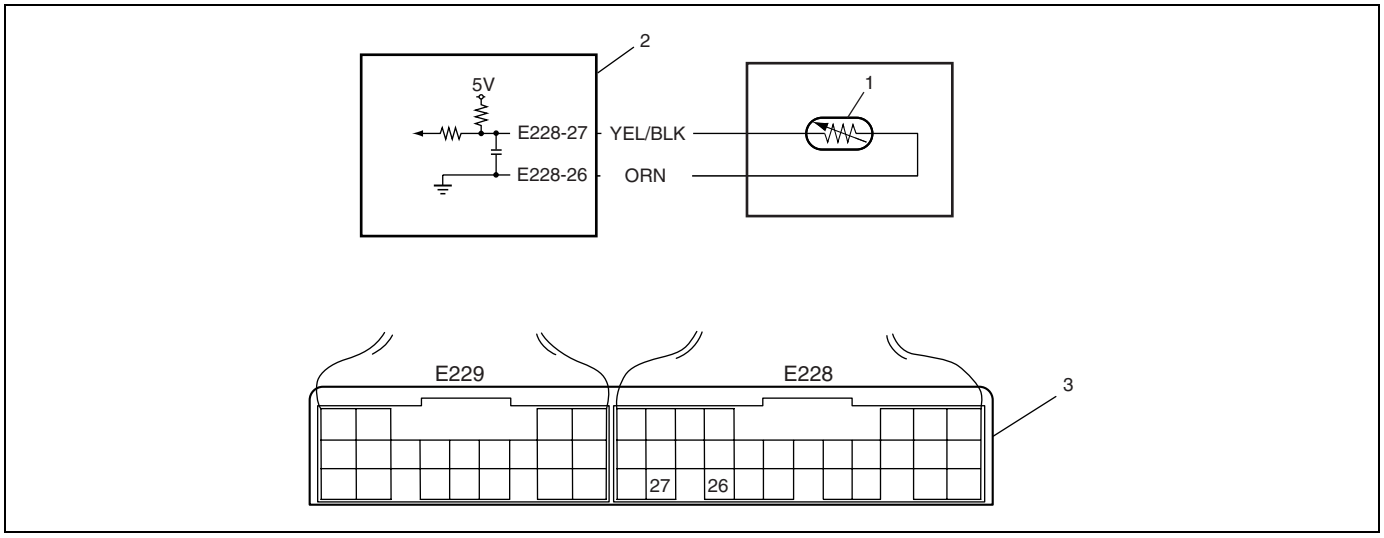
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Keep engine running at idle speed for 10 minutes or more.
5) Check DTC, pending DTC and freeze-frame data.

### DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Check transmission fluid temperature sensor A circuit for ground short<br>1) Turn ignition switch OFF.<br>2) Disconnect TCM connectors from TCM.<br>3) Check for proper connection to transmission fluid temperature sensor A at terminal “E228-26” and “E228-27”.<br>4) If OK, check continuity between terminal “E228-26” of disconnected harness side TCM connector and ground.<br>Is continuity indicated? | “YEL/BLK” circuit shorted to ground. | Go to Step 3. |
| 3 | Inspection transmission fluid temperature sensor A<br>1) Inspection transmission fluid temperature sensor A referring to “Transmission Fluid Temperature Sensor A and B Inspection: 5 A/T”.<br>Is result satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace valve body harness including transmission fluid temperature sensor A referring to “Transmission Fluid Temperature Sensor A and B Removal and Installation: 5 A/T”. |

## DTC P0713 (No.36) Transmission Fluid Temperature Sensor “A” Circuit High

### Wiring Diagram




| | |
|---|---|
| 1. Transmission fluid temperature sensor A | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission temperature sensor terminal voltage is less than 4.89 V under vehicle condition shown in the following.<br>• Ignition switch is turned on for 15 minutes or more<br>• Engine coolant temperature is more than 50 °C (122 °F) | • Transmission fluid temperature sensor or its circuit.<br>• TCM |

**DTC Confirmation Procedure**

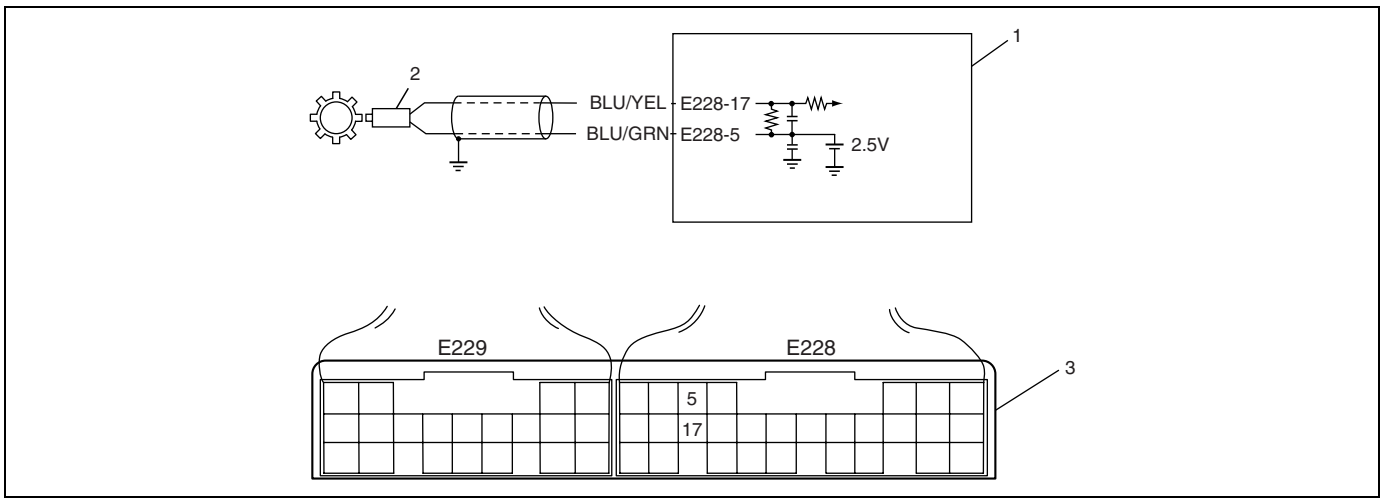
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Start vehicle and increase vehicle speed to about 40 km/h (25 mile/h) for 20 minutes or more.
5) Stop vehicle.
6) Check DTC, pending DTC and freeze-frame data.

**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T System Check" performed? | Go to Step 2. | Go to "A/T System Check: 5 A/T". |
| 2 | Check transmission fluid temperature sensor A circuit for open<br>1) Turn ignition switch OFF.<br>2) Disconnect TCM connectors from TCM.<br>3) Check for proper connection to transmission fluid temperature sensor A at terminal "E228-26" and "E228-27".<br>4) If OK, check continuity between terminal "E228-26" and "E228-27" of disconnected harness side TCM connector.<br>Is continuity indicated? | Go to Step 3. | "YEL/BLK" or "ORN" circuit open. |
| 3 | Check transmission fluid temperature sensor A circuit for IG short<br>1) Cool down A/T fluid temperature under ambient temperature.<br>2) Connect TCM connectors to TCM with ignition switch OFF.<br>3) Turn ignition switch ON.<br>4) Measure voltage between terminal "E228-27" of TCM connector and ground.<br>Is it 4.89 V or more? | "YEL/BLK" circuit shorted to power circuit. If circuit is OK, go to Step 4. | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. |
| 4 | Inspection transmission fluid temperature sensor A<br>1) Inspection transmission fluid temperature sensor A referring to "Transmission Fluid Temperature Sensor A and B Inspection: 5 A/T".<br>Is result satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace valve body harness including transmission fluid temperature sensor A. |

# DTC P0717 (No.14) Input / Turbine Speed Sensor Circuit No Signal

## Wiring Diagram




| | |
|---|---|
| 1. TCM | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Input shaft speed sensor | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| No pulse signal of input shaft speed sensor is inputted for 5 pulses period of output shaft speed sensor through it is detected more than 600 rpm. | • Input shaft speed sensor or its circuit malfunction.<br>• Improper input shaft speed sensor installation.<br>• Damaged clutch drum.<br>• Foreign material attachment to sensor or drum.<br>• TCM |

## DTC Confirmation Procedure

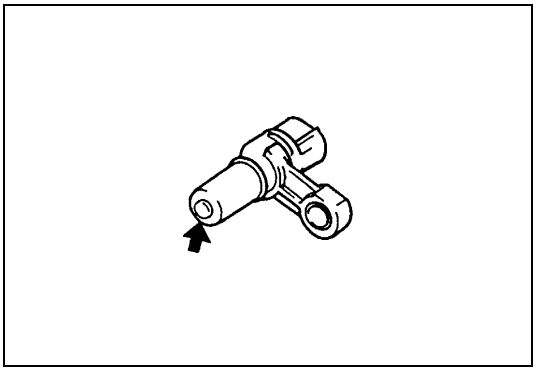
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed to about 40 km/h (25 mile/h) for 3 minutes or more.
5) Stop vehicle.
6) Check DTC, pending DTC 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: 5 A/T”. |

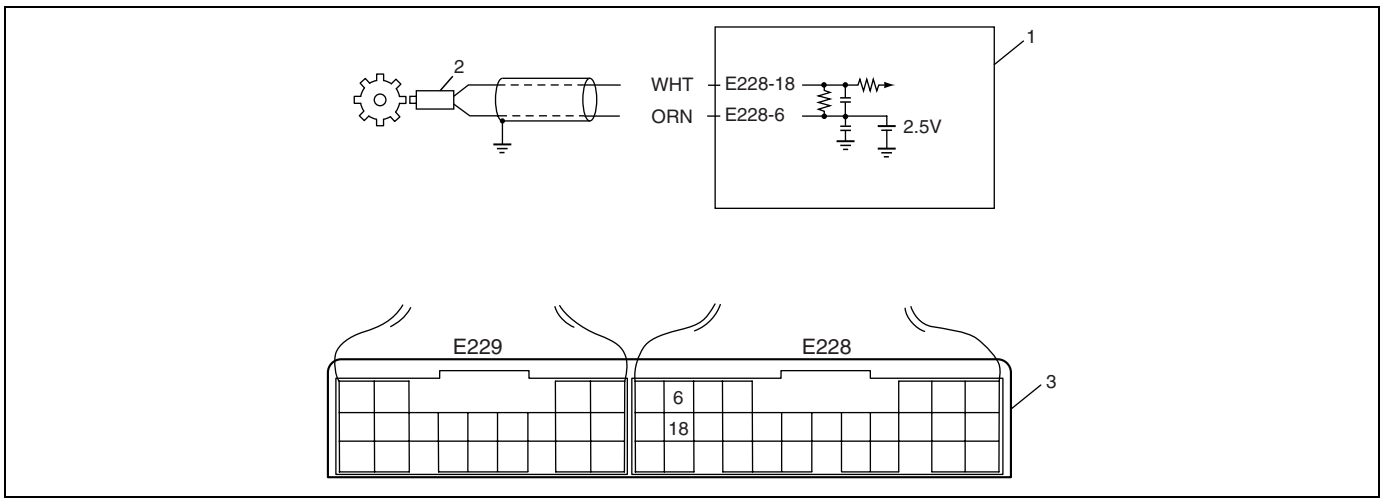
| Step | Action | Yes | No |
|---|---|---|---|
| 2 | Check input shaft speed sensor circuit<br>1) Disconnect TCM connectors with ignition switch OFF.<br>2) Check for proper connection to input shaft speed sensor at “E228-5” and “E228-17” terminals.<br>3) If OK, check resistance of sensor circuit.<br>**Resistance of input shaft speed sensor circuit**<br>**Between terminals “E228-5” and “E228-17” of disconnected harness side TCM connector: 560 – 680 Ω at 20 °C (68 °F)**<br>**Between terminals “E228-17” of disconnected harness side TCM connector and ground: No continuity**<br>Are check results satisfactory? | Go to Step 4. | Go to Step 3. |
| 3 | Inspection input shaft speed sensor<br>Inspect input shaft speed sensor referring to “Input Shaft Speed Sensor Inspection: 5 A/T”.<br>Is check result satisfactory? | “BLU/YEL” or “BLU/GRN” circuit open or short. | Go to Step 4. |
| 4 | Check visually input shaft speed sensor and clutch drum using mirror for following. See Figure.<br>• No damage<br>• No foreign material attached<br>• Correct installation<br>Are they in good condition? | Intermittent trouble.<br>Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. | Clean, repair or replace. |

Fig. for Step 4



# DTC P0722 (No.31) Output Speed Sensor Circuit No Signal

## Wiring Diagram




| | |
|---|---|
| 1. TCM | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Output shaft speed sensor | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| No pulse signal of output shaft speed sensor is inputted for 18 pulses period of input shaft speed sensor. | • Output shaft speed sensor or its circuit malfunction.<br>• Improper output shaft speed sensor installation.<br>• Damaged sensor rotor.<br>• Foreign material attachment to sensor or rotor.<br>• TCM |

## DTC Confirmation Procedure

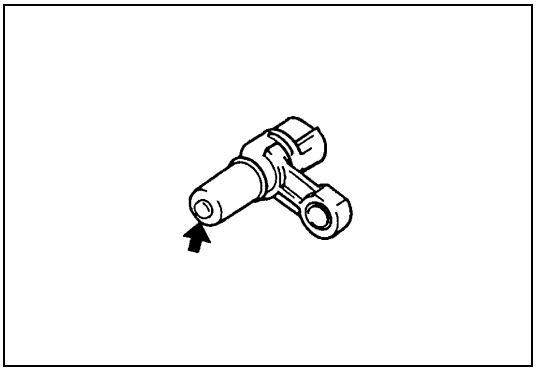
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed to about 80 km/h (50 mile/h) for 2 minutes or more.
5) Stop vehicle.
6) Check DTC, pending DTC 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: 5 A/T”. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | Check input shaft speed sensor circuit<br>1) Disconnect TCM connectors with ignition switch OFF.<br>2) Check for proper connection to input shaft speed sensor at “E228-6” and “E228-18” terminals.<br>3) If OK, check resistance of sensor circuit.<br>**Resistance of input shaft speed sensor circuit**<br>**Between terminals “E228-6” and “E228-18” of disconnected harness side TCM connector: 560 – 680 Ω at 20 °C (68 °F)**<br>**Between terminals “E228-18” of disconnected harness side TCM connector and ground: No continuity**<br>Are check results satisfactory? | Go to Step 4. | Go to Step 3. |
| 3 | Inspection output shaft speed sensor<br>Inspect input shaft speed sensor referring to “Output Shaft Speed Sensor Inspection: 5 A/T”.<br>Is check result satisfactory? | “WHT” or “ORN” circuit open or short. | Go to Step 4. |
| 4 | Check visually Output shaft speed sensor and sensor rotor using mirror for following. See Figure.<br>• No damage<br>• No foreign material attached<br>• Correct installation<br>Are they in good condition? | Intermittent trouble.<br>Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. | Clean, repair or replace. |

Fig. for Step 4



# DTC P0741 / P0742 (No.78 / No.77) TCC Circuit Performance or Stuck OFF / TCC Circuit Stuck ON

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0741:**<br>When driving vehicle with 5th gear in "D" range, difference in revolution between engine and A/T input (input shaft speed) is lager than specification although TCM commanded TCC solenoid to turn ON. | • Mechanical malfunction of TCC solenoid valve.<br>• Malfunction of valve body assembly.<br>• Fluid passage clogged or leaking.<br>• Torque converter clutch malfunction. |
| **DTC P0742:**<br>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. | |

### 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) Shift select lever to "N" and "D" range for each 10 seconds.
5) Drive vehicle with 5th in "D" range and lock-up ON for 20 seconds or longer referring to "Automatic Gear Shift Diagram: 4 A/T" or "Automatic Gear Shift Diagram: 5 A/T".
6) Turn O/D OFF switch ON keeping on driving in "D" range. (Confirm "O/D OFF" lamp lights.)
7) Drive vehicle with 2nd or 3rd gear in "D" range, 15 – 20% throttle opening and at vehicle speed of 40 km/h (25 mile/h).
8) Stop vehicle and turn ignition switch OFF.
9) Repeat Step 3) to 7) one time.
10) Stop vehicle.
11) 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: 5 A/T". |
| 2 | Check TCC solenoid valve for operation referring to "Solenoid Valves (Shift Solenoid-A, Shift Solenoid-B, Shift Solenoid-E, TCC Solenoid, Pressure Control Solenoid-A, Pressure Control Solenoid-B, and Pressure Control Solenoid-C) Inspection: 5 A/T".<br>Are they in good condition? | Clean fluid passage or replace valve body assembly. | Replace TCC solenoid valve. |

# DTC P0751 / P0752 (No.62 / No.61) Shift Solenoid-A Performance or Stuck OFF / Shift Solenoid-A Stuck ON

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0751:**<br>4th gear ratio is detected although TCM command is for 1st gear and 5th gear ratio is detected although TCM command is for 5th gear while vehicle running at 2 km/h (1.5 mile/h) or more in "D" range after engine being warmed up. | • Mechanical malfunction of shift solenoid valve–A.<br>• Malfunction of valve body assembly.<br>• Fluid passage clogged or leaking.<br>• Mechanical malfunction of automatic transmission (clutch, brake or gear etc). |
| **DTC P0752:**<br>When one of the following condition was detected while vehicle running at 2 km/h (1.5 mile/h) or more in "D" range after engine being warmed up.<br>• 1st gear ratio is detected although TCM command is for 1st gear for 4th gear (See table below *1).<br>Or<br>• 2nd gear ratio is detected although TCM command is for 3rd gear and Neutral gear is detected although TCM command is for 5th gear (See table below *2).<br>Or<br>• 1st gear ratio is detected although TCM command is for 4th gear and Neutral gear is detected although TCM command is for 5th gear (See table below *3). | |

### Table for detecting condition

| TCM output gear position | | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|---|
| Actual gear position | Stuck OFF (DTC P0751) | 4th | 3rd | 3rd | 4th | 5th |
| | Stuck ON (DTC P0752) | 1st*1 | 2nd | 2nd*2 | 1st*1, *3 | Neutral*2, *3 |

### 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) Shift select lever to "N" and "D" range for each 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.
9) 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: 5 A/T”. |
| 2 | Check shift solenoid valve–A for operation referring to “Solenoid Valves (Shift Solenoid-A, Shift Solenoid-B, Shift Solenoid-E, TCC Solenoid, Pressure Control Solenoid-A, Pressure Control Solenoid-B, and Pressure Control Solenoid-C) Inspection: 5 A/T”.<br>Are they in good condition? | Clean fluid passage or replace valve body assembly. | Replace shift solenoid valve–A. |

## DTC P0756 / P0757 (No.65 / No.63) Shift Solenoid-B Performance or Stuck OFF / Shift Solenoid-B Stuck ON

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0756:**<br>1st gear ratio is detected although TCM command is for 1st gear for 4th gear while vehicle running at 2 km/h (1.5 mile/h) or more in “D” range after engine being warmed up. | • Mechanical malfunction of shift solenoid valve–B.<br>• Malfunction of valve body assembly.<br>• Fluid passage clogged or leaking.<br>• Mechanical malfunction of automatic transmission (clutch, brake or gear etc). |
| **DTC P0757:**<br>When one of the following condition was detected while vehicle running at 2 km/h (1.5 mile/h) or more in “D” range after engine being warmed up.<br>• 2nd gear ratio is detected although TCM command is for 1st gear and Neutral gear is detected although TCM command is for 5th gear (See table below *1).<br>Or<br>• 3rd gear ratio is detected although TCM command is for 4th gear and Neutral gear is detected although TCM command is for 5th gear (See table below *2). | |

**Table for detecting condition**

| TCM output gear position | | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|---|
| Actual gear position | Stuck OFF (DTC P0756) | 1st | 1st | 4th | 4th | 5th |
| | Stuck ON (DTC P0757) | 2nd*1 | 2nd | 3rd | 3rd*2 | Neutral*1, *2 |

**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) Shift select lever to “N” and “D” range for each 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.
9) 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: 5 A/T”. |
| 2 | Check shift solenoid valve–B for operation referring to “Solenoid Valves (Shift Solenoid-A, Shift Solenoid-B, Shift Solenoid-E, TCC Solenoid, Pressure Control Solenoid-A, Pressure Control Solenoid-B, and Pressure Control Solenoid-C) Inspection: 5 A/T”.<br>Are they in good condition? | Clean fluid passage or replace valve body assembly. | Replace shift solenoid valve–B. |

## DTC P0771 / P0772 (No.67 / No.66) Shift Solenoid-E Performance or Stuck OFF / Shift Solenoid-E Stuck ON

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0771:**<br>4th gear ratio is detected although TCM command is for 5th gear while vehicle running at 2 km/h (1.5 mile/h) or more in “D” range after engine being warmed up. | • Mechanical malfunction of shift solenoid valve–E.<br>• Malfunction of valve body assembly.<br>• Fluid passage clogged or leaking.<br>• Mechanical malfunction of automatic transmission (clutch, brake or gear etc). |
| **DTC P0772:**<br>TCM detected the turn rise of input speed over the specified value when upshifting 1st to 2nd gear. | |

**Table for detecting condition**

| TCM output gear position | | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|---|
| Actual gear position | Stuck OFF (DTC P0771) | 1st | 2nd | 3rd | 4th | 4th |
| | Stuck ON (DTC P0772) | 1st | 2nd | 3rd | 4th | 5th |

**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) Shift select lever to “N” and “D” range for each 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.
7) Start vehicle and increase vehicle speed to 65 km/h (40 mile/h) with throttle position 10% or more.
8) Stop vehicle and turn ignition switch OFF.
9) Repeat Step 3) to 7) one time.
10) Stop vehicle.
11) 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: 5 A/T". |
| 2 | Check shift solenoid valve–E for operation referring to "Solenoid Valves (Shift Solenoid-A, Shift Solenoid-B, Shift Solenoid-E, TCC Solenoid, Pressure Control Solenoid-A, Pressure Control Solenoid-B, and Pressure Control Solenoid-C) Inspection: 5 A/T".<br>Are they in good condition? | Clean fluid passage or replace valve body assembly. | Replace shift solenoid valve–E. |

## DTC P0781 (No.68) 1-2 Shift

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0781:**<br>When one of the following condition was detected while vehicle running at 2 km/h (1.5 mile/h) or more in "D" range after engine being warmed up.<br>• 1st gear ratio is detected although TCM command is for 2nd gear and 4th gear is detected although TCM command is for 4th gear (See table below *1).<br>Or<br>• 1st gear ratio is detected although TCM command is for 2nd gear and Neutral gear is detected although TCM command is for 5th gear (See table below *2). | • Mechanical malfunction of 1-2 shift valve.<br>• Malfunction of valve body assembly.<br>• Mechanical malfunction of automatic transmission (clutch, brake or gear etc). |

**Table for detecting condition**

| TCM output gear position | | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|---|
| Actual gear position | 1-2 Shift (DTC P0781) | 1st | 1st*1, *2 | 3rd | 4th*1 | Neutral*2 |

**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) Shift select lever to “N” and “D” range for each 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.
7) Start vehicle and increase vehicle speed to 65 km/h (40 mile/h) with throttle position 10% or more.
8) Stop vehicle and turn ignition switch OFF.
9) Repeat Step 3) to 7) one time.
10) Stop vehicle.
11) Check DTC, pending DTC and freeze-frame data.

**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Repair or replace transmission valve body assembly. | Go to “A/T System Check: 5 A/T”. |

## DTC P0797 (No.79) Pressure Control Solenoid “C” Stuck ON

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| **DTC P0797:**<br>When one of the following condition was detected while vehicle running at 2 km/h (1.5 mile/h) or more in “D” range after engine being warmed up.<br>• 1st gear ratio is detected although TCM command is for 1st gear, 3rd gear is detected although TCM command is for 3rd gear and Neutral gear is detected although TCM command is for 5th gear (See table below *1).<br>Or<br>• 4th gear ratio is detected although TCM command is for 4th gear and Neutral gear is detected although TCM command is for 5th gear (See table below *2). | • Mechanical malfunction of pressure control solenoid valve–C.<br>• Malfunction of valve body assembly.<br>• Fluid passage clogged or leaking.<br>• Mechanical malfunction of automatic transmission. |

**Table for detecting condition**

| TCM output gear position | | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|---|
| Actual gear position | Stuck ON (DTC P0797) | 1st*1 | 2nd | 3rd*1 | 4th*2 | Neutral*1, *2 |

**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) Shift select lever to “N” and “D” range for each 10 seconds.
5) Start vehicle and increase vehicle speed to 65 km/h (40 mile/h) with throttle position 10% or more.

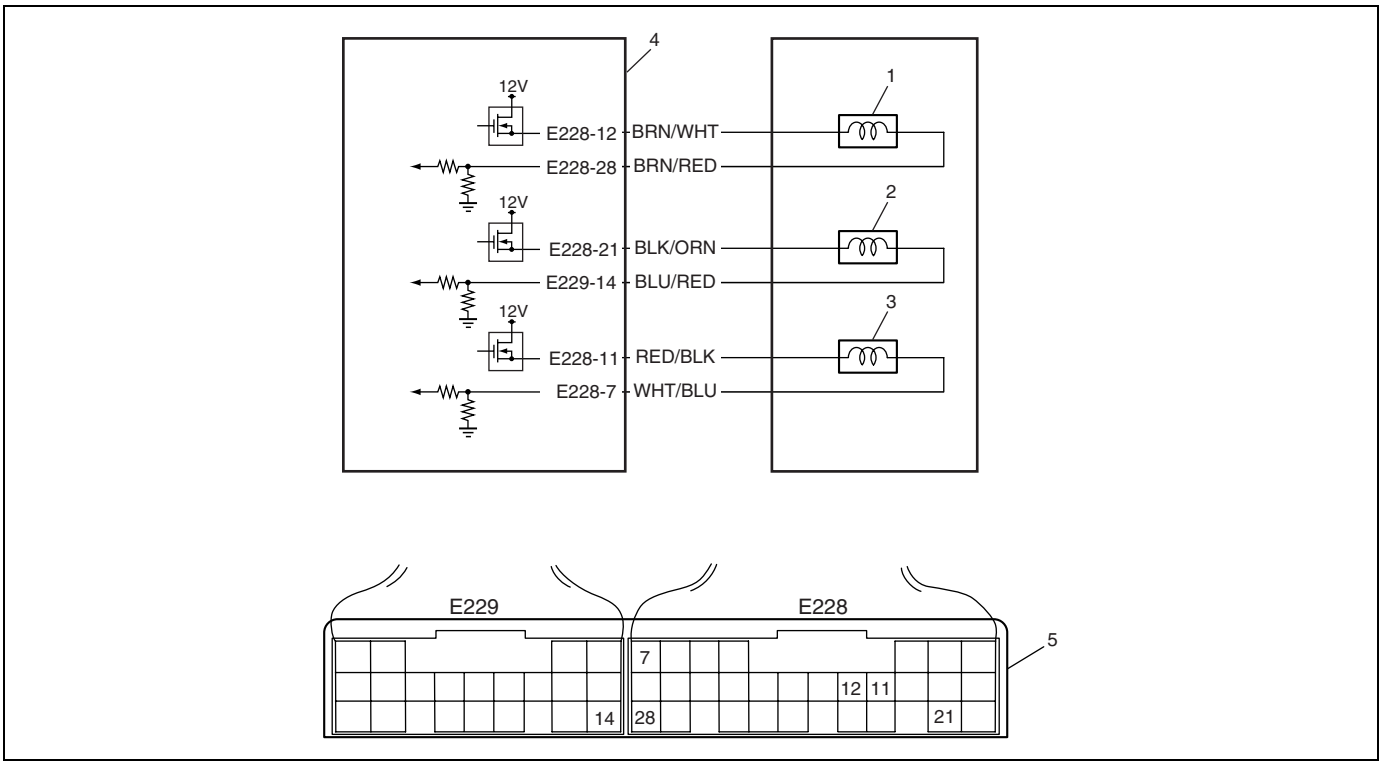
6) Stop vehicle and turn ignition switch OFF.
7) Repeat Step 3) to 5) one time.
8) Stop vehicle.
9) Check DTC, pending DTC and freeze-frame data.

**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Check pressure control solenoid valve–C for operation referring to “Solenoid Valves (Shift Solenoid-A, Shift Solenoid-B, Shift Solenoid-E, TCC Solenoid, Pressure Control Solenoid-A, Pressure Control Solenoid-B, and Pressure Control Solenoid-C) Inspection: 5 A/T”.<br>Are they in good condition? | Clean fluid passage or replace valve body assembly. | Replace pressure control solenoid valve–C. |

# DTC P0962 / P0966 / P0970 (No.41 / No.43 / No.45) Pressure Control Solenoid “A” Control Circuit Low / Pressure Control Solenoid “B” Control Circuit Low / Pressure Control Solenoid “C” Control Circuit Low

## Wiring Diagram




| | | |
|---|---|---|
| 1. Pressure control solenoid valve–A | 3. Pressure control solenoid valve–C | 5. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Pressure control solenoid valve–B | 4. TCM | |

## 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.<br>• Malfunction of pressure control solenoid valve.<br>• TCM |

## DTC Confirmation Procedure

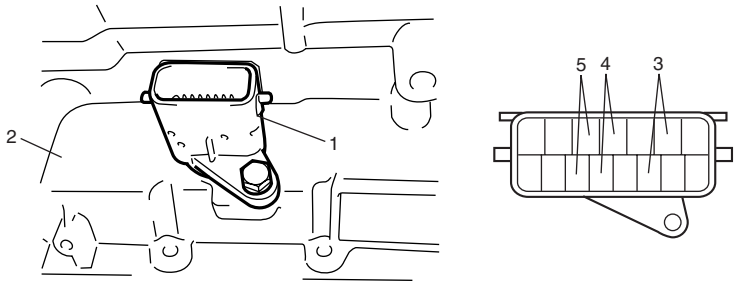
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Keep engine running at idle speed for 30 seconds or more.
5) Check DTC, pending DTC and freeze-frame data.

**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Check pressure control solenoid valve resistance<br>1) Turn ignition switch OFF.<br>2) Disconnect valve body harness connector (1) on automatic transmission (2).<br>3) Check for proper connection to solenoid at “BRN/WHT” and “BRN/RED” (for pressure solenoid valve–A), “BLK/ORN” and “BLU/RED” (for pressure solenoid valve–B) or “RED/BLK” and “WHT/BLU” (for pressure solenoid valve–C) circuit.<br>4) Check resistance of pressure control solenoid valve–A (3), pressure control solenoid valve–B (4) or pressure control solenoid valve–C (5).<br>**Resistance of pressure control solenoid valve**<br>**Between pressure control solenoid valve terminals of transmission side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)**<br>**Between pressure control solenoid valve terminals of transmission side valve body harness connector and transmission body: Infinity**<br>Is check results satisfactory? | Go to Step 4. | Replace applicable pressure control solenoid valve or valve body harness. |
| 3 | Check pressure control solenoid valve circuit for ground short<br>1) Connect valve body harness connector.<br>2) Disconnect TCM connectors.<br>3) Check for proper connection to TCM at terminals “E228-12” and “E228-28” (for pressure solenoid valve–A), “E228-21” and “E229-14” (for pressure solenoid valve–B) or “E228-11” and “E228-7” (for pressure solenoid valve–C).<br>4) If connection is OK, check continuity between terminal “E228-12” (for pressure solenoid valve–A), “E228-21” (for pressure solenoid valve–B) or “E228-11” (for pressure solenoid valve–C) of disconnected harness side TCM connector and ground.<br>Is continuity indicated? | DTC P0962: “BRN/WHT” or “BRN/RED” circuit shorted to ground.<br>DTC P0966: “BLK/ORN” or “BLU/RED” circuit shorted to ground.<br>DTC P0970: “RED/BLK” or “WHT/BLU” circuit shorted to ground. | Go to Step 4. |

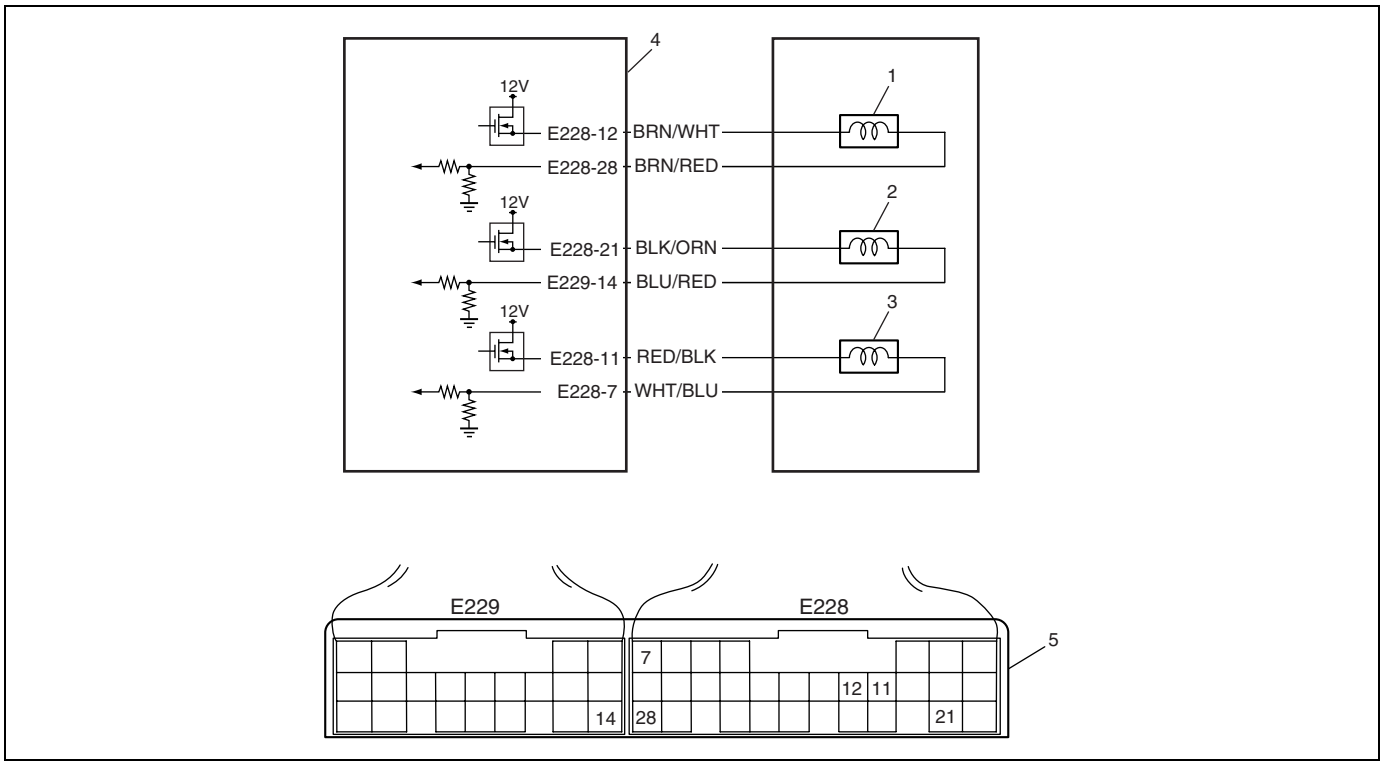
| Step | Action | Yes | No |
|---|---|---|---|
| 4 | Check pressure control solenoid valve circuit for open<br>1) Check resistance between terminals “E228-12” and “E228-28” (for pressure solenoid valve–A), “E228-21” and “E229-14” (for pressure solenoid valve–B) or “E228-11” and “E228-7” (for pressure solenoid valve–C) of disconnected harness side TCM connector.<br>Is it infinity? | DTC P0962: “BRN/WHT” or “BRN/RED” circuit open.<br>DTC P0966: “BLK/ORN” or “BLU/RED” circuit open.<br>DTC P0970: “RED/BLK” or “WHT/BLU” circuit open. | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. |

Fig. for Step 2



# DTC P0963 / P0967 / P0971 (No.42 / No.44 / No.46) Pressure Control Solenoid “A” Control Circuit High / Pressure Control Solenoid “B” Control Circuit High / Pressure Control Solenoid “C” Control Circuit High

## Wiring Diagram




| | | |
|---|---|---|
| 1. Pressure control solenoid valve–A | 3. Pressure control solenoid valve–C | 5. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Pressure control solenoid valve–B | 4. TCM | |

## 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.<br>• Pressure control solenoid valve malfunction.<br>• TCM |

## DTC Confirmation Procedure

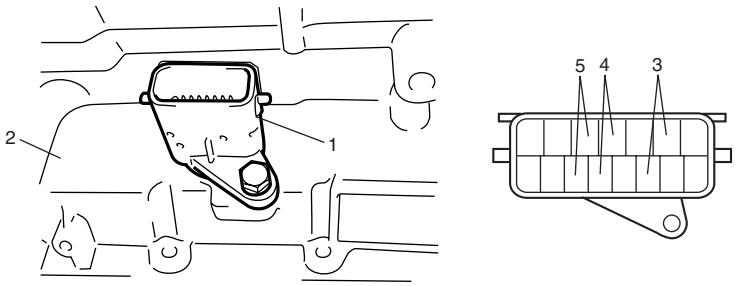
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Keep engine running at idle speed for 10 seconds or more.
5) Check DTC, pending DTC and freeze-frame data.

## DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |

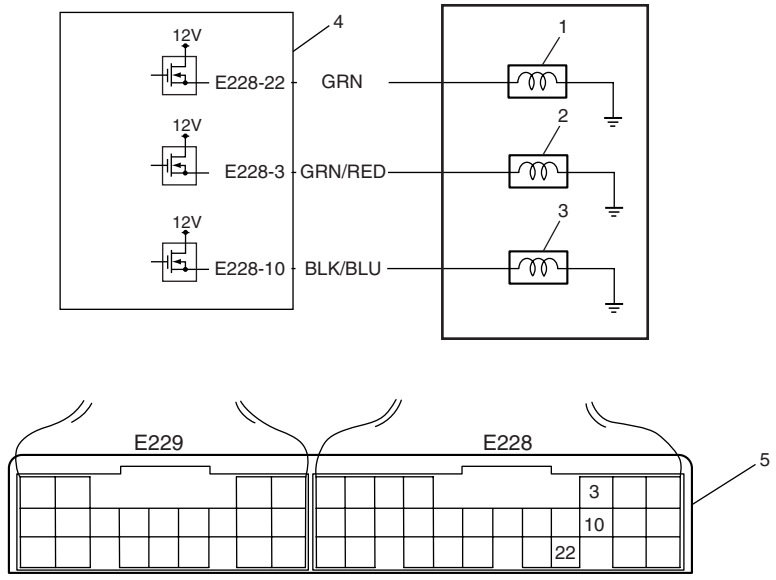
| Step | Action | Yes | No |
|---|---|---|---|
| 2 | Check pressure control solenoid valve–A circuit for IG short<br>1) Connect valve body harness connector.<br>2) Disconnect TCM connectors.<br>3) Check for proper connection to TCM at terminal “E228-12” and “E228-28” (for pressure solenoid valve–A), “E228-21” and “E229-14” (for pressure solenoid valve–B) or “E228-11” and “E228-7” (for pressure solenoid valve–C).<br>4) If connection is OK, turn ignition switch ON and measure voltage between terminal “E228-12” (for pressure solenoid valve–A), “E228-21” (for pressure solenoid valve–B) or “E228-11” (for pressure solenoid valve–C) of disconnected harness side TCM connector and ground.<br>Is it 0 – 2 V? | Go to Step 3. | DTC P0962: “BRN/WHT” or “BRN/RED” circuit shorted to power circuit.<br>DTC P0966: “BLK/ORN” or “BLU/RED” circuit shorted to power circuit.<br>DTC P0970: “RED/BLK” or “WHT/BLU” circuit shorted to power circuit. |
| 3 | Check pressure control solenoid valve resistance<br>1) Turn ignition switch OFF.<br>2) Disconnect valve body harness connector (1) on automatic transmission (2).<br>3) Check for proper connection to solenoid at “BRN/WHT” and “BRN/RED” (for pressure solenoid valve–A), “BLK/ORN” and “BLU/RED” (for pressure solenoid valve–B) or “RED/BLK” and “WHT/BLU” (for pressure solenoid valve–C) circuit.<br>4) Check resistance of pressure control solenoid valve–A (3), pressure control solenoid valve–B (4) or pressure control solenoid valve–C (5).<br>**Resistance of pressure control solenoid valve**<br>**Between pressure control solenoid valve terminals of transmission side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)**<br>**Between pressure control solenoid valve terminals of transmission side valve body harness connector and transmission body: Infinity**<br>Is check results satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace applicable pressure control solenoid valve or valve body harness. |

Fig. for Step 3




## DTC P0973 / P0976 / P0985 (No.22 / No.24 / No.49) Shift Solenoid “A” Control Circuit Low / Shift Solenoid “B” Control Circuit Low / Shift Solenoid “E” Control Circuit Low

### Wiring Diagram




| | | |
|---|---|---|
| 1. Shift solenoid valve–A | 3. Shift solenoid valve–E | 5. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Shift solenoid valve–B | 4. TCM | |

### 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.<br>• Malfunction of shift solenoid valve.<br>• TCM |

### DTC Confirmation Procedure

**DTC P0973 / P0985:**

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.
4) Shift select lever to “N” and “D” range for each 20 seconds.
5) Check DTC, pending DTC and freeze-frame data.

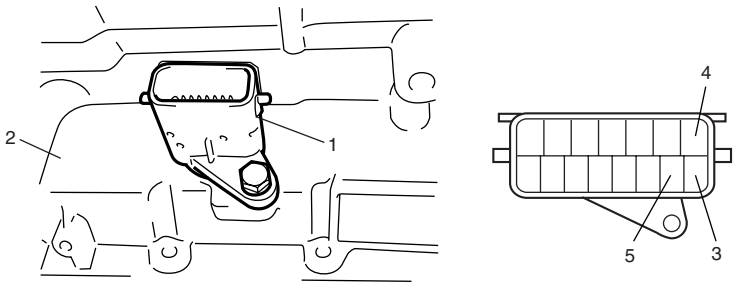
**DTC P0976:**

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.
4) Select power mode switch to “POWER MODE”.
5) Shift select lever to “3” range and keep engine running at idle speed for 20 seconds.
6) Check DTC, pending DTC and freeze-frame data.

**DTC Troubleshooting**

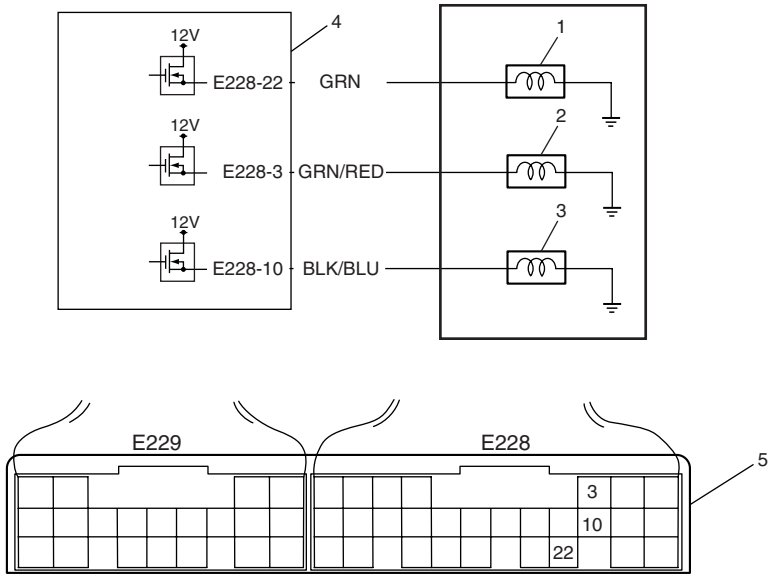
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Check shift solenoid valve resistance<br>1) Turn ignition switch OFF.<br>2) Disconnect valve body harness connector (1) on automatic transmission (2).<br>3) Check for proper connection to solenoid at “GRN” (for shift solenoid valve–A), “GRN/RED” (for shift solenoid valve–B) or “BLK/BLU” (for shift solenoid valve–E) circuit.<br>4) Check resistance of solenoid.<br>**Resistance of shift solenoid valve**<br>**Between shift solenoid valve–A terminal (3) and transmission: 11 – 15 Ω at 20 °C (68 °F)**<br>**Between shift solenoid valve–B terminal (4) and transmission: 11 – 15 Ω at 20 °C (68 °F)**<br>**Between shift solenoid valve–E terminal (5) and transmission: 11 – 15 Ω at 20 °C (68 °F)**<br>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<br>1) Disconnect TCM connectors.<br>2) Check for proper connection to TCM at terminals “E228-22” (for shift solenoid valve–A), “E228-3” (for shift solenoid valve–B) or “E228-10” (for shift solenoid valve–E).<br>3) If connection is OK, check continuity between terminal “E228-22” (for shift solenoid valve–A), “E228-3” (for shift solenoid valve–B) or “E228-10” (for shift solenoid valve–E) of disconnected harness side TCM connector and ground.<br>Is continuity indicated? | DTC P0973: “GRN” circuit shorted to ground.<br>DTC P0976: “GRN/RED” circuit shorted to ground.<br>DTC P0985: “BLK/BLU” circuit shorted to ground. | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. |

Fig. for Step 2




## DTC P0974 / P0977 / P0986 (No.21 / No.23 / No.48) Shift Solenoid “A” Control Circuit High / Shift Solenoid “B” Control Circuit High / Shift Solenoid “E” Control Circuit High

### Wiring Diagram




| | | |
|---|---|---|
| 1. Shift solenoid valve–A | 3. Shift solenoid valve–E | 5. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Shift solenoid valve–B | 4. TCM | |

### 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.<br>• Malfunction of shift solenoid valve.<br>• 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.**

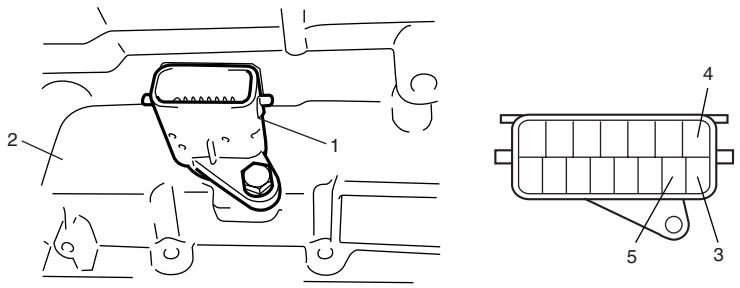
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and shift select lever to “D” range.
4) Start vehicle and increase vehicle speed to 60 km/h (37 mile/h) in “D” range.
5) Keep on driving in the speed for 20 seconds and decrease vehicle speed gradually.
6) Stop vehicle.
7) 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: 5 A/T”. |
| 2 | Check shift solenoid valve circuit for IG short<br>1) Connect valve body harness connector.<br>2) Disconnect TCM connectors.<br>3) Check for proper connection to TCM at terminal “E228-22” (for shift solenoid valve–A), “E228-3” (for shift solenoid valve–B) or “E228-10” (for shift solenoid valve–E).<br>4) If connection is OK, turn ignition switch ON and measure voltage between terminal “E228-22” (for shift solenoid valve–A), “E228-3” (for shift solenoid valve–B) or “E228-10” (for shift solenoid valve–E) of disconnected harness side TCM connector and ground.<br>Is it 0 – 2 V? | Go to Step 3. | DTC P0974: “GRN” circuit shorted to power circuit.<br>DTC P0977: “GRN/RED” circuit shorted to power circuit.<br>DTC P0986: “BLK/BLU” circuit shorted to power circuit. |

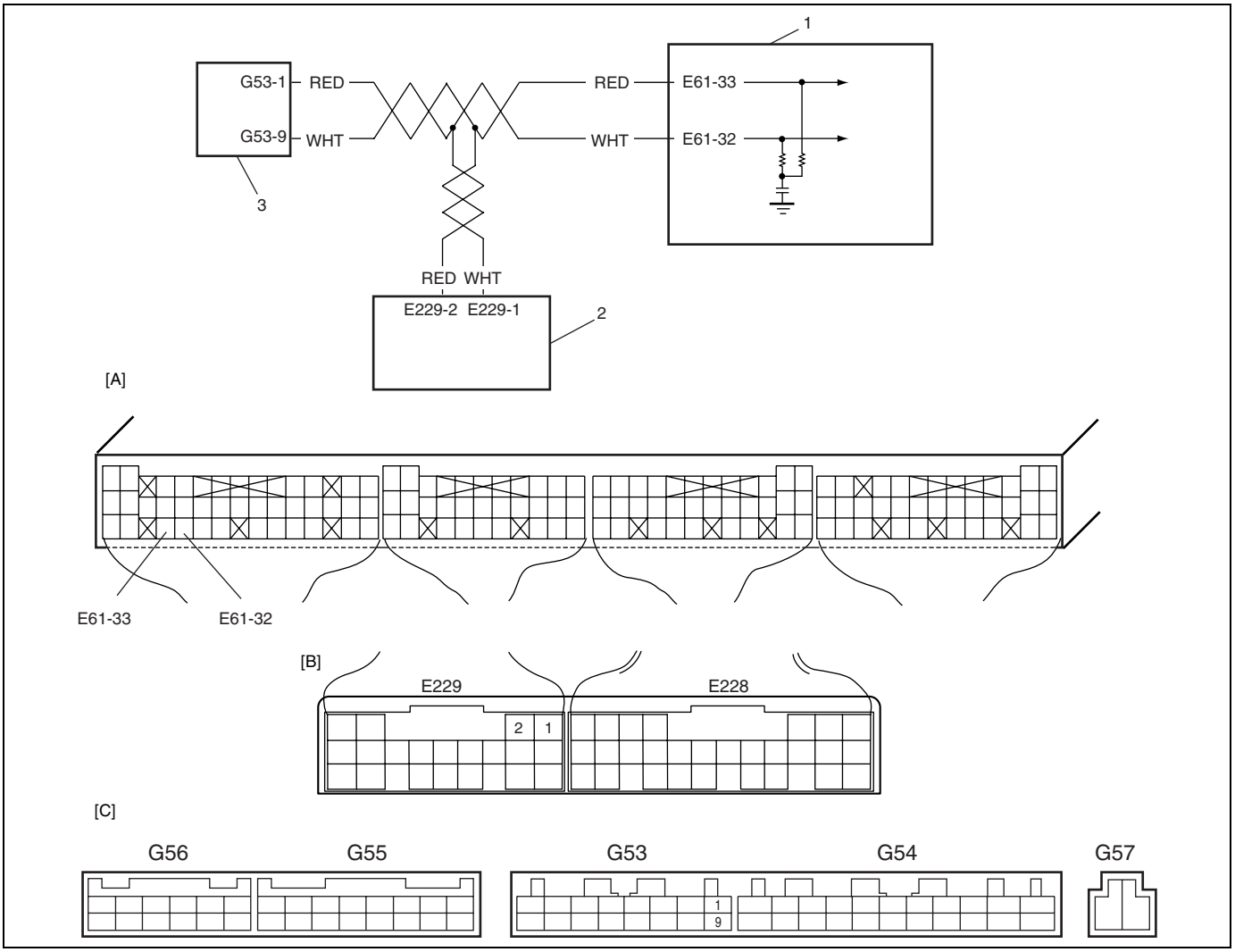
| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Check shift solenoid valve resistance<br>1) Turn ignition switch OFF.<br>2) Disconnect valve body harness connector (1) on automatic transmission (2).<br>3) Check for proper connection to solenoid at "GRN" (for shift solenoid valve–A), "GRN/RED" (for shift solenoid valve–B) or "BLK/BLU" (for shift solenoid valve–E) circuit.<br>4) Check resistance of solenoid.<br>**Resistance of shift solenoid valve**<br>**Between shift solenoid valve–A terminal (3) and transmission: 11 – 15 Ω at 20 °C (68 °F)**<br>**Between shift solenoid valve–B terminal (4) and transmission: 11 – 15 Ω at 20 °C (68 °F)**<br>**Between shift solenoid valve–E terminal (5) and transmission: 11 – 15 Ω at 20 °C (68 °F)**<br>Is check results satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace applicable shift solenoid valve or valve body harness. |

Fig. for Step 2



# DTC P1701 (No.76) CAN Communication Problem - TCM

## Wiring Diagram




| | |
|---|---|
| 1. ECM | [A]: Terminal arrangement of ECM connector (viewed from harness side) |
| 2. TCM | [B]: Terminal arrangement of TCM connector (viewed from harness side) |
| 3. BCM | [C]: Terminal arrangement of BCM connector (viewed from harness side) |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmitting or receiving error detected to TCM for specified time continuously.<br>Transmission or reception error of communication data is detected by TCM for specified time continuously. | • “RED” or “WHT” wire circuit open or short<br>• BCM malfunction<br>• TCM malfunction<br>• ECM malfunction |

## DTC Confirmation Procedure

1) Turn ignition switch turned OFF.
2) Clear DTC with ignition switch ON.
3) Start engine and run it for 10 sec. or more.
4) Check DTC and pending DTC.

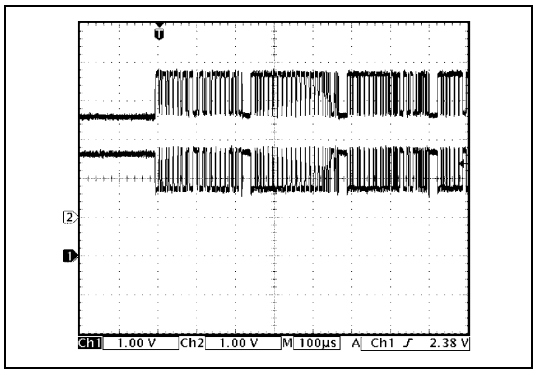
**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | DTC check<br>5) Check DTC of ECM, TCM and BCM.<br>Is there any DTC(s) (other than DTC P1601, DTC P1701 and DTC B1156)? | Go to applicable DTC diag. flow. | Go to Step 3. |
| 3 | Circuit check<br>1) Turn OFF ignition switch.<br>2) Disconnect connectors from TCM and BCM.<br>3) Check for proper connection to TCM and BCM at applicable terminals.<br>4) If OK, measure resistance between “E229-1” terminal of TCM connector and “G53-9” terminal of BCM connector, between “E229-2” terminal of ECM connector and “G53-1” terminal of BCM connector.<br>Is each resistance 1 Ω or less? | Go to Step 4. | “WHT” wire circuit (between “E229-1” terminal of TCM connector and “G53-9” terminal of BCM connector) or “RED” wire circuit (between “E229-2” terminal of ECM connector and “G53-1” terminal of BCM connector) open or high resistance. |
| 4 | Circuit check<br>1) Disconnect connectors from ECM.<br>2) Check for proper connection to ECM at applicable terminals.<br>3) If OK, measure resistance between “E229-1” terminal of TCM connector and “E61-32” terminal of ECM connector, between “E229-2” terminal of TCM connector and “E61-33" terminal of ECM connector.<br>Is each resistance 1 Ω or less? | Go to Step 5. | “WHT” wire or “RED” wire in shorted to power circuit. |
| 5 | Circuit check<br>1) Measure resistance between “E61-32” terminal of ECM connector and “G53-9” terminal of BCM connector, between “E61-33” terminal of ECM connector and “G53-1” terminal of BCM connector.<br>Is each resistance 1 W or less? | Go to Step 6. | “WHT” wire circuit (between “E61-32” terminal of ECM connector and “G53-9” terminal of BCM connector) or “RED” wire circuit (between “E61-33” terminal of ECM connector and “G53-1” terminal of BCM connector) open or high resistance. |
| 6 | Circuit check<br>1) Turn ignition switch to ON position.<br>2) Measure voltage between “E229-1” terminal of TCM connector and vehicle body ground, between “E229-2” terminal of TCM connector and vehicle body ground.<br>Is each voltage 0 – 1 V? | Go to Step 7. | “WHT” circuit or “RED” circuit shorted to power supply line. |

| Step | Action | Yes | No |
|---|---|---|---|
| 7 | Circuit check<br>1) Turn ignition switch to OFF position.<br>2) Measure resistance between “E229-1” terminal of TCM connector and vehicle body ground, between “E229-1” terminal of TCM connector and vehicle body ground.<br>As they infinite? | Go to Step 8. | “WHT” circuit or “RED” circuit shorted to ground. |
| 8 | Circuit check<br>1) Measure resistance between “E229-1” and “E229-2” terminals of TCM connector.<br>Is it infinite? | Go to Step 9. | “WHT” circuit is shorted to “RED” circuit. |
| 9 | Do you have oscilloscope? | Go to Step 10. | Substitute a known-good BCM and recheck.<br>If malfunction is detected, substitute a known-good TCM and recheck.<br>If malfunction is detected, substitute a known-good ECM and recheck. |
| 10 | Waveform range check<br>1) Connect connectors to ECM, TCM and BCM.<br>2) Connect oscilloscope between “E229-1” terminal of TCM connector and ground, between “E229-2” terminal of TCM connector and ground.<br>3) Check if each range of two waveforms is as specified in illustration below.<br>See Figure.<br>Is it in good condition? | Go to Step 13. | Go to Step 11. |
| 11 | Waveform range check<br>1) Disconnect connectors from BCM.<br>2) Connect oscilloscope between “E229-1” terminal of TCM connector and ground, between “E229-2” terminal of TCM connector and ground.<br>3) Check if each range of two waveforms is as specified in illustration below.<br>See Figure.<br>Is it in good condition? | Substitute a known-good BCM and recheck. | Go to Step 12. |

| Step | Action | Yes | No |
|---|---|---|---|
| 12 | Waveform range check<br>1) Disconnect connectors from TCM.<br>2) Connect connectors to BCM.<br>3) Connect oscilloscope between “E61-32” terminal of ECM connector and ground, between “E61-33” terminal of ECM connector and ground.<br>4) Check if each range of two waveforms is as specified in illustration below. See Figure.<br>Is it in good condition? | Substitute a known-good TCM and recheck. | Substitute a known-good ECM and recheck. |
| 13 | Communication check<br>1) Disconnect connector from input shaft speed sensor.<br>2) Start engine for 1 minute or more.<br>3) Check DTC of ECM referring to “Diagnostic Trouble Code (DTC) Check” in Section 6-2.<br>Is DTC P1603 indicated? | Go to Step 14. | Substitute a known-good ECM and recheck. |
| 14 | Communication check<br>1) Connect connector to input shaft speed sensor.<br>2) Disconnect connector from ECT sensor.<br>3) Perform “DTC Confirmation Procedure” referring to “DTC P0115: Engine Coolant Temp. Circuit Malfunction” in Section 6E2.<br>4) Check DTC for TCM referring to “DTC Check: 5 A/T”.<br>Is DTC P1703 indicated? | Substitute a known-good BCM and recheck. | Substitute a known-good TCM and recheck. |

Fig. for Step 10, 11 and 12



# DTC P1702 (No.83) Internal Control Module Memory Check Sum Error

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| An internal TCM fault is detected by TCM | • TCM |

**NOTE:**

**DTC P1702 can never be cleared once it has been set.**

1) Ignition switch OFF.
2) Replace TCM.
3) Repeat “A/T System Check: 5 A/T”.

# DTC P1703 (No.86) CAN Invalid Data - TCM

### DTC Detecting Condition and Trouble Area

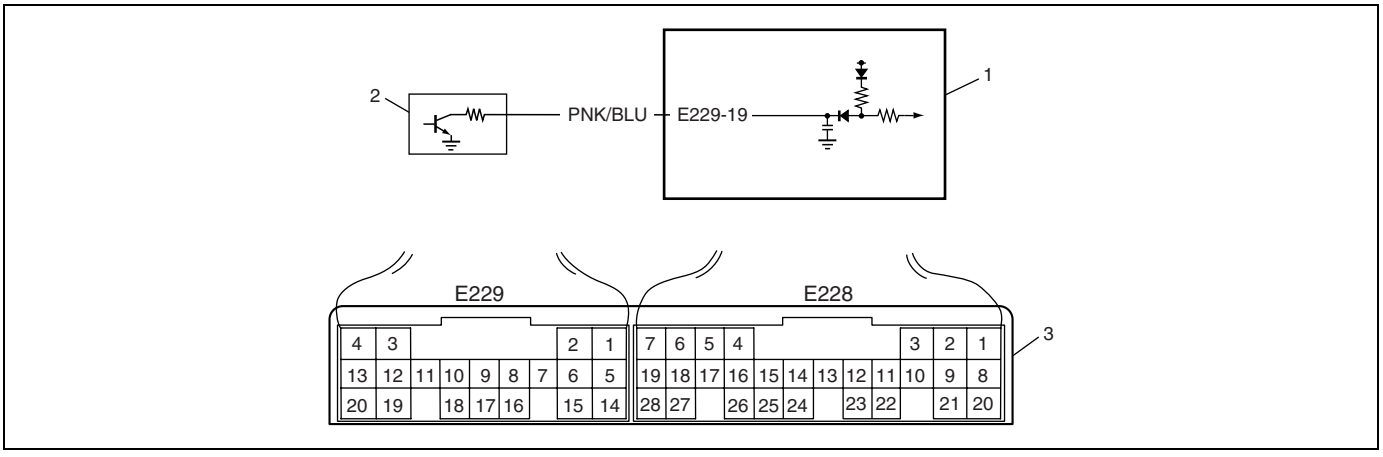
| DTC Detecting Condition | Trouble Area |
|---|---|
| When abnormality on the gear shift control signal from ECM is detected by TCM, TCM sets DTC P1703. | • Engine control system<br>• TCM<br>• ECM |

### DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | DTC Check<br>Check DTC of TCM referring to “Diagnostic Trouble Code (DTC) Check” in Section 6-2.<br>Is there any DTC(s)? | Go to applicable DTC troubleshooting. | Substitute a known-good TCM and recheck. |

# DTC P1740 (No.75) Cruise Control Signal Malfunction

### Wiring Diagram




| | |
|---|---|
| 1. TCM | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. Cruise control module | |

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| O/D and lock-up off signal from cruise control module is inputted although vehicle speed is 10 km/h (6 mile/h) or slower. | • Cruise control signal circuit malfunction<br>• Cruise control module<br>• TCM |

**DTC Confirmation Procedure**

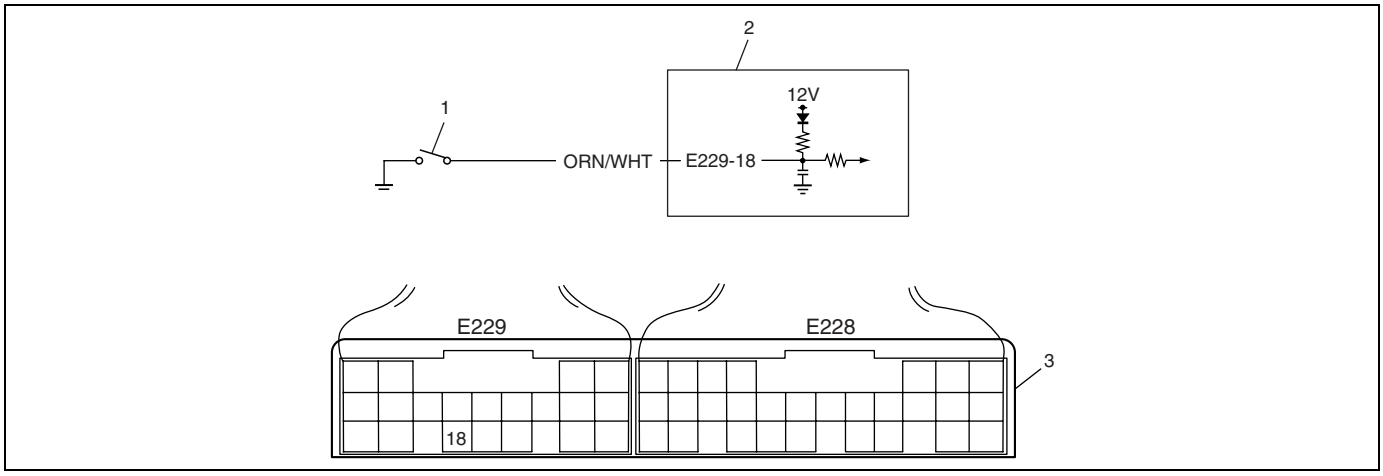
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Keep engine running at idle speed for 20 seconds.
5) Check DTC, pending DTC and freeze-frame data.

**DTC Troubleshooting**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was "A/T System Check" performed? | Go to Step 2. | Go to "A/T System Check: 5 A/T". |
| 2 | Check cruise control signal circuit<br>1) Turn ignition switch OFF.<br>2) Disconnect TCM and cruise control module connectors.<br>3) Check continuity between terminal "E229-19" of disconnected harness side TCM connector and ground.<br>Is continuity indicated? | "PNK/BLU" circuit shorted to ground. | Intermittent trouble, faulty TCM or cruise control module. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM or cruise control module and recheck. |

## DTC P1874 (No.15) 4WD Low Switch Circuit Malfunction (Short)

**Wiring Diagram**




| | |
|---|---|
| 1. 4WD low switch | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

**DTC Detecting Condition and Trouble Area**

| DTC Detecting Condition | Trouble Area |
|---|---|
| Actual transfer position is 2H or 4H although TCM detected transfer low switch is turned ON with vehicle speed between 29 km/h (18 mile/h) and 88 km/h (55 mile/h). | • 4WD low switch or its circuit.<br>• TCM |

**DTC Confirmation Procedure**

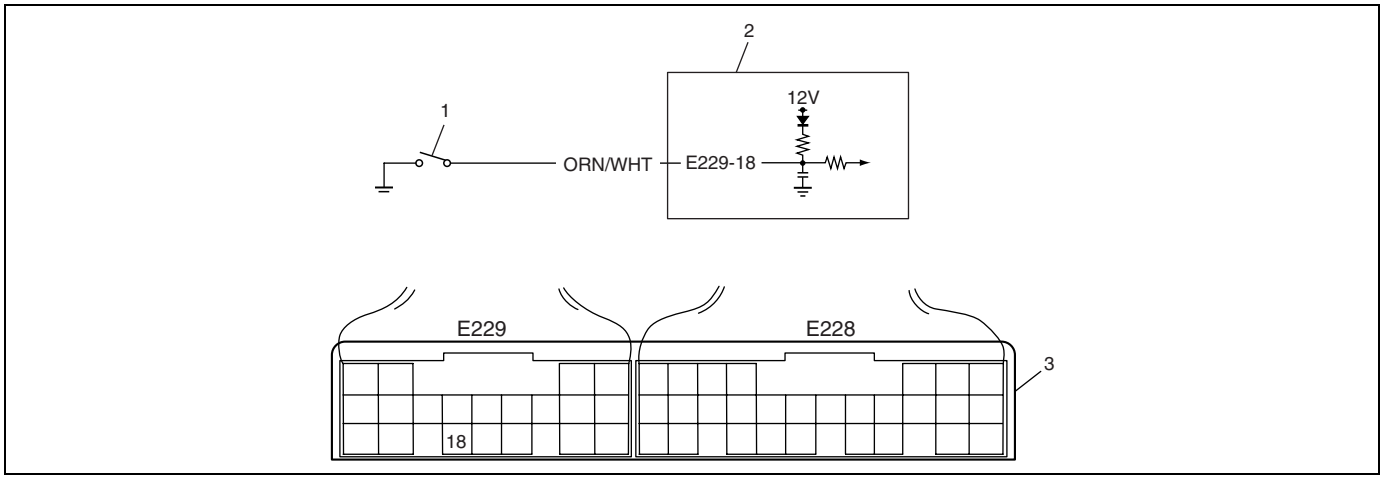
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and transfer position switch to "2H" or "4H" position.
4) Keep engine running at idle speed for 10 seconds or more with select lever "D" range.
5) Start vehicle and increase vehicle speed to about 60 km/h (37 mile/h) for 2 minutes.
6) Stop vehicle.
7) 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: 5 A/T". |
| 2 | Do you have SUZUKI scan tool? | Go to Step 3. | Go to Step 4. |
| 3 | "4WD Low" switch and its circuit check<br>1) Connect SUZUKI scan tool to DLC with ignition switch OFF.<br>2) Turn ignition switch ON.<br>3) Select "DATA LIST" mode on scan tool.<br>4) Check 4WD low switch signal (ON or OFF) on display when turning transfer switch to each position.<br>**"4WD LOW" switch specifications (scan tool)**<br>**"4H" or "2H" position: OFF**<br>**"4L" position: ON**<br>Is OFF / ON displayed as described above? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Go to Step 5. |
| 4 | "4WD Low" switch and its circuit check<br>1) Turn ignition switch ON.<br>2) Check terminal voltage "E229-18" of TCM connector connected when turning transfer switch to each position.<br>**"4WD LOW" switch specifications (without scan tool)**<br>**"4H" or "2H" position: 10 – 14 V**<br>**"4L" position: 0 – 1 V**<br>Is voltage as specified? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Go to Step 5. |
| 5 | "4WD Low" switch check<br>1) Check 4WD low switch for operation referring to "4WD LOW Switch Inspection: 5 A/T".<br>Is check result satisfactory? | "ORN/WHT" circuit short to ground. If wire and connections are OK, substitute a known-good TCM and recheck. | Replace 4WD low switch. |

# DTC P1875 (No.15) 4WD Low Switch Circuit Malfunction (Open)

## Wiring Diagram




| | |
|---|---|
| 1. 4WD low switch | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Actual transfer position is 4L although TCM detected transfer low switch is turned OFF with vehicle speed between 29 km/h (18 mile/h) and 88 km/h (55 mile/h). | • 4WD low switch or its circuit.<br>• 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.
3) Start engine and transfer position switch to “4L” position.
4) Keep engine running at idle speed for 10 seconds or more with select lever “D” range.
5) Start vehicle and increase vehicle speed to about 50 km/h (31 mile/h) in “4L” position for 2 minutes.
6) Stop vehicle.
7) Check DTC, pending DTC and freeze-frame data.

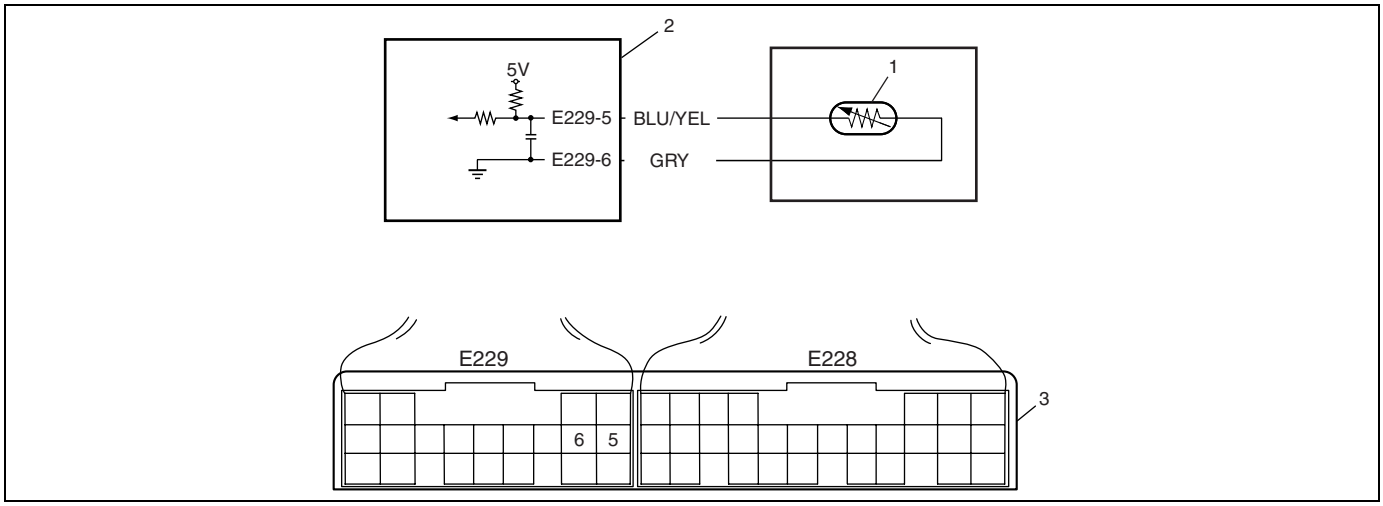
## DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Do you have SUZUKI scan tool? | Go to Step 3. | Go to Step 4. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | "4WD Low" switch and its circuit check<br>1) Connect SUZUKI scan tool to DLC with ignition switch OFF.<br>2) Turn ignition switch ON.<br>3) Select "DATA LIST" mode on scan tool.<br>4) Check 4WD low switch signal (ON or OFF) on display when turning transfer switch to each position.<br>**"4WD LOW" switch specifications (scan tool)**<br>**"4H" or "2H" position: OFF**<br>**"4L" position: ON**<br>Is OFF / ON displayed as described above? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Go to Step 5. |
| 4 | "4WD Low" switch and its circuit check<br>1) Turn ignition switch ON.<br>2) Check terminal voltage "E229-18" of TCM connector connected when turning transfer switch to each position.<br>**"4WD LOW" switch specifications (without scan tool)**<br>**"4H" or "2H" position: 10 – 14 V**<br>**"4L" position: 0 – 1 V**<br>Is voltage as specified? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Go to Step 5. |
| 5 | "4WD Low" switch check<br>1) Check 4WD low switch for operation referring to "4WD LOW Switch Inspection: 5 A/T".<br>Is check result satisfactory? | "ORN/WHT" or "BLK" circuit open. If wire and connections are OK, substitute a known-good TCM and recheck. | Replace 4WD low switch. |

# DTC P2742 (No.59) Transmission Fluid Temperature Sensor “B” Circuit Low

## Wiring Diagram




| | |
|---|---|
| 1. Transmission fluid temperature sensor B | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | 4. Valve body connector |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission temperature sensor terminal voltage is less than 0.05 V for 6 minutes or more after ignition switch ON. | • Transmission fluid temperature sensor B or its circuit.<br>• 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.
3) Start engine.
4) Keep engine running at idle speed for 10 minutes or more.
5) Check DTC, pending DTC and freeze-frame data.

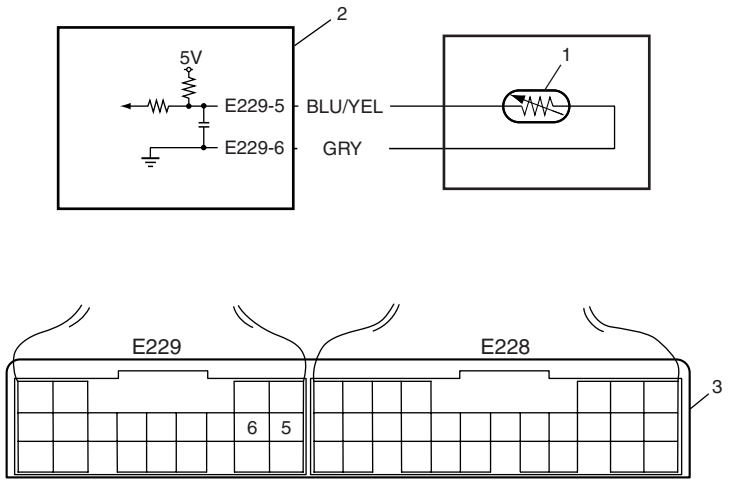
## DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |
| 2 | Check transmission fluid temperature sensor B circuit for ground short<br>1) Turn ignition switch OFF.<br>2) Disconnect TCM connectors from TCM.<br>3) Check for proper connection to transmission fluid temperature sensor B at terminal “E229-5” and “E229-6”.<br>4) If OK, check continuity between terminal “E229-5” of disconnected harness side TCM connector and ground.<br>Is continuity indicated? | “BLU/YEL” circuit shorted to ground. | Go to Step 3. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Inspection transmission fluid temperature sensor B<br>1) Inspection transmission fluid temperature sensor B referring to “Transmission Fluid Temperature Sensor A and B Inspection: 5 A/T”.<br>Is result satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace valve body harness including transmission fluid temperature sensor B referring to “Transmission Fluid Temperature Sensor A and B Removal and Installation: 5 A/T”. |

## DTC P2743 (No.58) Transmission Fluid Temperature Sensor “B” Circuit High

### Wiring Diagram




| | |
|---|---|
| 1. Transmission fluid temperature sensor B | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | 4. Valve body connector |

### DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Transmission temperature sensor terminal voltage is less than 4.89 V under vehicle condition shown in the following.<br>• Ignition switch is turned on for 15 minutes or more<br>• Engine coolant temperature is more than 50 °C (122 °F) | • Transmission fluid temperature sensor or its circuit.<br>• TCM |

### DTC Confirmation Procedure

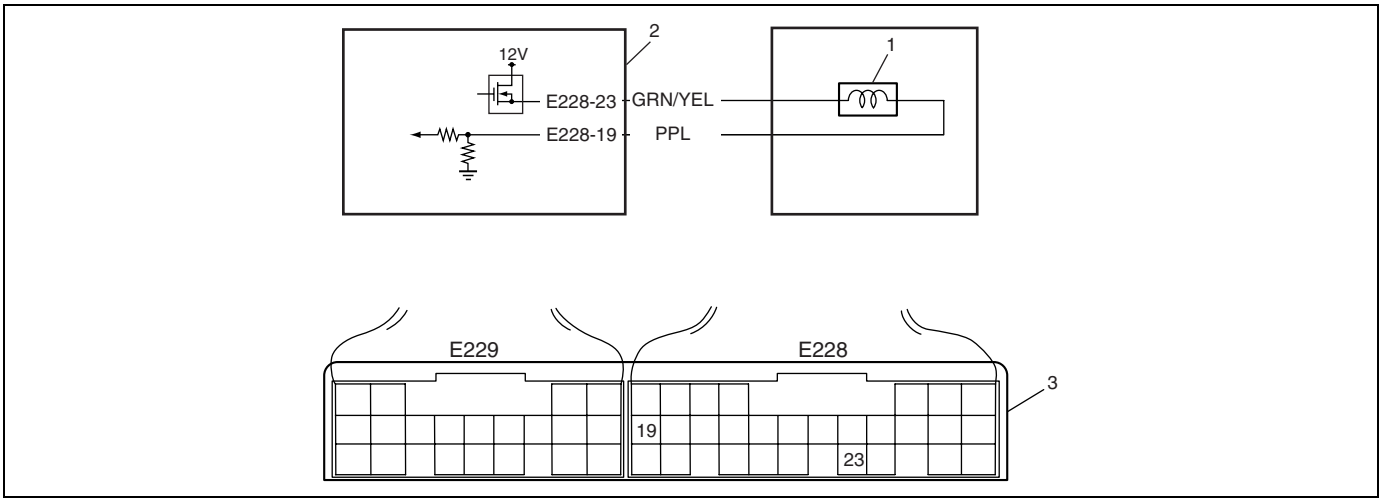
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine and warm it up to normal operating temperature.
4) Start vehicle and increase vehicle speed to about 40 km/h (25 mile/h) in “D” range for 20 minutes or more.
5) Stop vehicle.
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: 5 A/T”. |
| 2 | Check transmission fluid temperature sensor B circuit for open<br>1) Turn ignition switch OFF.<br>2) Disconnect TCM connectors from TCM.<br>3) Check for proper connection to transmission fluid temperature sensor B at terminal “E229-5” and “E229-6”.<br>4) If OK, check continuity between terminal “E229-5” and “E229-6” of disconnected harness side TCM connector.<br>Is continuity indicated? | Go to Step 3. | “BLU/YEL” or “GRY” circuit open. |
| 3 | Check transmission fluid temperature sensor B circuit for IG short<br>1) Cool down A/T fluid temperature under ambient temperature.<br>2) Connect TCM connectors to TCM with ignition switch OFF.<br>3) Turn ignition switch ON.<br>4) Measure voltage between terminal “E229-5” of TCM connector and ground.<br>Is it 4.89 V or more? | “GRY/BLU” circuit shorted to power circuit. If circuit is OK, go to Step 5. | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. |
| 4 | Inspection transmission fluid temperature sensor B<br>1) Inspection transmission fluid temperature sensor B referring to “Transmission Fluid Temperature Sensor A and B Inspection: 5 A/T”.<br>Is result satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to “Intermittent and Poor Connection” in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace valve body harness including transmission fluid temperature sensor B referring to “Transmission Fluid Temperature Sensor A and B Removal and Installation: 5 A/T”. |

# DTC P2763 (No.26) Torque Converter Clutch (TCC) Circuit High

## Wiring Diagram




| | |
|---|---|
| 1. TCC solenoid valve | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Voltage of TCC solenoid valve TCM terminal is high although TCM is commanding TCC solenoid to turn OFF. | • TCC solenoid valve circuit shorted to ground.<br>• Malfunction of TCC solenoid valve.<br>• 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.**

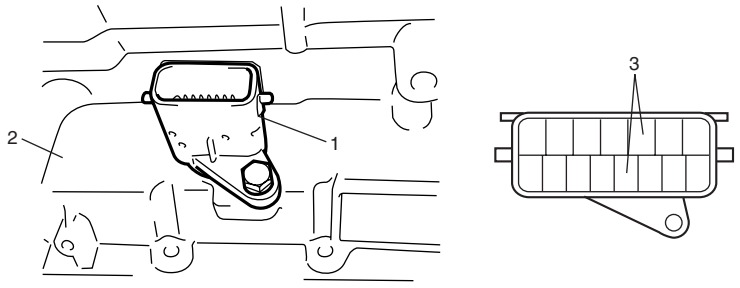
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 10 seconds or more.
5) Check DTC, pending DTC and freeze-frame data.

## DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |

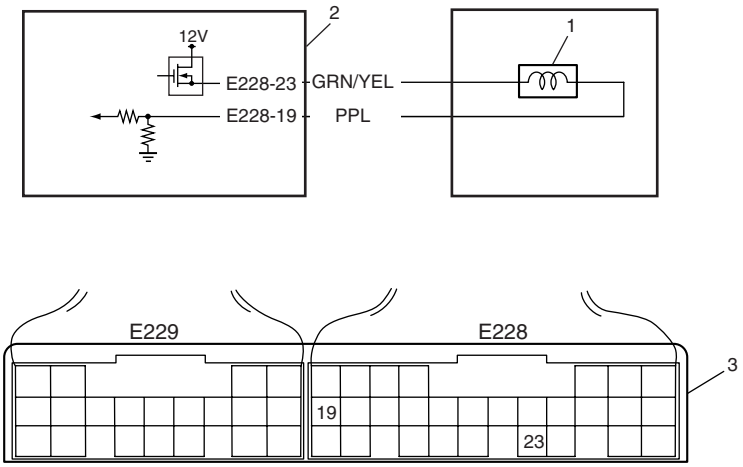
| Step | Action | Yes | No |
|---|---|---|---|
| 2 | Check TCC solenoid valve circuit for IG short<br>1) Connect valve body harness connector.<br>2) Disconnect TCM connectors.<br>3) Check for proper connection to TCM at terminal "E228-19" and "E228-23".<br>4) If connection is OK, turn ignition switch ON and measure voltage between terminal "E228-23" of disconnected harness side TCM connector and ground.<br>Is it 0 – 2 V? | Go to Step 3. | "GRN/YEL" circuit shorted to power circuit. |
| 3 | Check TCC solenoid valve resistance<br>1) Turn ignition switch OFF.<br>2) Disconnect valve body harness connector (1) on automatic transmission (2).<br>3) Check for proper connection to solenoid at "GRN/YEL" and "PPL" circuit.<br>4) Check resistance of solenoid (3).<br>**Resistance of TCC solenoid valve**<br>**Between TCC solenoid valve terminals of transmission side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)**<br>**Between TCC solenoid valve terminals of transmission side valve body harness connector and transmission body: Infinity**<br>Is check results satisfactory? | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. | Replace TCC solenoid valve or lead wire. |

Fig. for Step 3



# DTC P2764 (No.25) Torque Converter Clutch (TCC) Circuit Low

## Wiring Diagram




| | |
|---|---|
| 1. TCC solenoid valve | 3. Terminal arrangement of TCM connector (viewed from harness side) |
| 2. TCM | |

## DTC Detecting Condition and Trouble Area

| DTC Detecting Condition | Trouble Area |
|---|---|
| Voltage of TCC solenoid valve TCM terminal is low although TCM is commanding TCC solenoid to turn ON. | • TCC solenoid valve circuit shorted to ground.<br>• Malfunction of TCC solenoid valve<br>• 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.**

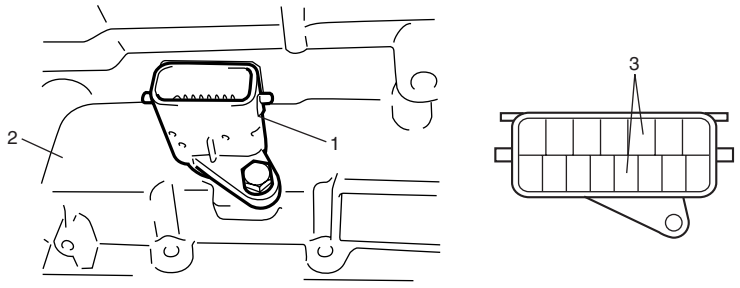
1) Connect scan tool to DLC with ignition switch OFF.
2) Clear DTCs in TCM and ECM memories by using scan tool.
3) Start engine.
4) Keep engine running at idle speed in “P” range for 20 seconds or more.
5) Check DTC, pending DTC and freeze-frame data.

## DTC Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Was “A/T System Check” performed? | Go to Step 2. | Go to “A/T System Check: 5 A/T”. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | Check TCC control solenoid valve resistance<br>1) Turn ignition switch OFF.<br>2) Disconnect valve body harness connector (1) on automatic transmission (2).<br>3) Check for proper connection to solenoid at "GRN/YEL" and "PPL" circuit.<br>4) Check resistance of solenoid (3).<br>**Resistance of TCC solenoid valve**<br>**Between TCC solenoid valve terminals of transmission side valve body harness connector: 5.0 – 5.6 Ω at 20 °C (68 °F)**<br>**Between TCC solenoid valve terminals of transmission side valve body harness connector and transmission body: Infinity**<br>Is check results satisfactory? | Go to Step 4. | Replace TCC solenoid valve or lead wire. |
| 3 | Check TCC solenoid valve circuit for ground short<br>1) Disconnect TCM connectors.<br>2) Check for proper connection to TCM at terminals "E228-23".<br>3) If connection is OK, check continuity between terminal "E228-23" of disconnected harness side TCM connector and ground.<br>Is continuity indicated? | "GRN/YEL" circuit shorted to ground. | Intermittent trouble or faulty TCM. Check for intermittent trouble referring to "Intermittent and Poor Connection" in Section 0A. If OK, substitute a known-good TCM and recheck. |

Fig. for Step 2



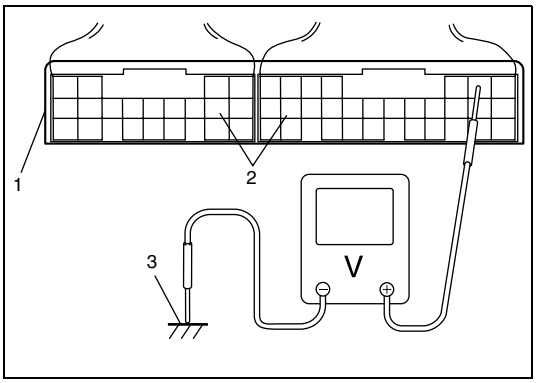
## Inspection of TCM and Its Circuits

TCM and its circuits can be checked at TCM wiring connectors by measuring voltage 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.**

### INSPECTION



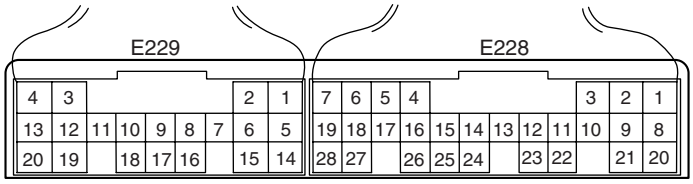

1) Remove TCM (1) from vehicle referring to "Transmission Control Module (TCM) Removal and Installation: 5 A/T".
2) Connect TCM connectors (2) to TCM.
3) Check voltage at each terminal of connectors connected.

**NOTE:**

**As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition switch is ON.**

3. Body ground

**Terminal arrangement of TCM coupler (Viewed from harness side)**



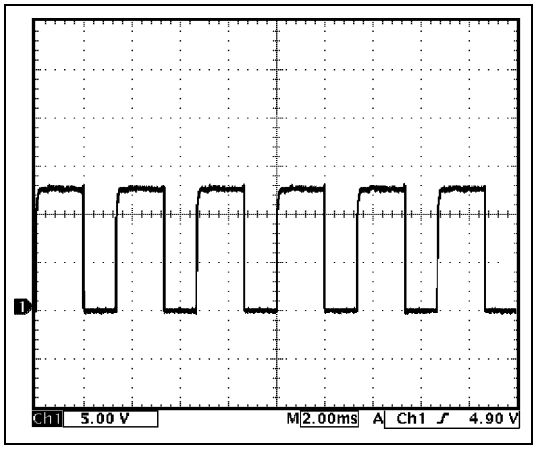

| Connector: E228 | | | | |
|---|---|---|---|---|
| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
| 1 | WHT | Power source for back-up | 10 – 14 V | Constantly |
| 2 | — | — | — | — |
| 3 | GRN/RED | Shift solenoid valve–A | 0 – 1 V | Ignition switch ON |
| 4 | ORN/GRN | Transmission range sensor ("D" 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 |
| 5 | BLU/GRN | Input shaft speed sensor (–) | 2 – 3 V | Ignition switch ON, engine at stop |
| 6 | ORN | Output shaft speed sensor (–) | 2 – 3 V | Ignition switch ON, engine at stop |
| 7 | WHT/BLU | Pressure control solenoid valve–C (–) | 0.6 – 1.0 V | Ignition switch ON |
| 8 | BLK/WHT | Power source | 10 – 14 V | Ignition switch ON |
| 9 | BLK/WHT | Power source | 10 – 14 V | Ignition switch ON |
| 10 | BLK/BLU | Shift solenoid valve–E | 9 – 14 V | Ignition switch ON |

| Connector: E228 | | | | |
|---|---|---|---|---|
| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
| 11 | RED/BLK | Pressure control solenoid valve–C (+) | 0 – 0.6 V<br>↑ ↓<br>10 – 14 V<br>(Reference waveform No.1) | Ignition switch ON<br>(Output signal is duty pulse.) |
| 12 | BRN/WHT | Pressure control solenoid valve–A (+) | 0 – 0.6 V<br>↑ ↓<br>10 – 14 V<br>(Reference waveform No.2) | Ignition switch ON<br>(Output signal is duty pulse.) |
| 13 | — | — | — | — |
| 14 | GRN/ORN | Transmission range sensor (“3” range) | 8 – 14 V | Ignition switch ON, selector lever at “3” range |
| | | | 0 – 1 V | Ignition switch ON, selector lever at other than “3” range |
| 15 | ORN/BLU | 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 |
| 16 | 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 |
| 17 | BLU/YEL | Input shaft speed sensor (+) | 2 – 3 V | Ignition switch turned ON, engine stops. |
| | | | (Reference waveform No.3) | While engine running.<br>(Output signal is waveform. Waveform frequency varies depending on input shaft speed. (24 pulses are generated par 1 input shaft revolution.)) |
| 18 | WHT | Output shaft speed sensor (+) | 2 – 3 V | Ignition switch turned ON, engine stops. |
| | | | (Reference waveform No.4) | Vehicle running.<br>(Output signal is waveform. Waveform frequency varies depending on output shaft speed. (18 pulses are generated par 1 output shaft revolution.)) |
| 19 | PPL | TCC solenoid valve (–) | 0.6 – 1.0 V | Ignition switch ON |
| 20 | BLK/ORN | Ground | 0 – 1 V | Ignition switch ON |
| 21 | BLK/ORN | Pressure control solenoid valve–B (+) | 0 – 0.6 V<br>↑ ↓<br>10 – 14 V<br>(Reference waveform No.5) | Engine running at idling<br>(Output signal is duty pulse.) |
| 22 | GRN | Shift solenoid valve–A | 9 – 14 V | Ignition switch ON |
| 23 | GRN/YEL | TCC solenoid valve (+) | 0 – 0.6 V<br>↑ ↓<br>10 – 14 V<br>(Reference waveform No.6) | Ignition switch ON<br>(Output signal is duty pulse.) |

| Connector: E228 | | | | |
|---|---|---|---|---|
| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
| 24 | GRN/BLU | 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 |
| 25 | YEL/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 |
| 26 | ORN | Transmission fluid temperature sensor A (–) | 0 – 1 V | Ignition switch ON |
| 27 | YEL/BLK | Transmission fluid temperature sensor A (+) | 2.9 – 3.1 V | Ignition switch ON, fluid temperature is 20 °C (68 °F) |
| | | | 0.7 – 0.9 V | Ignition switch ON, fluid temperature is 80 °C (176 °F) |
| 28 | BRN/RED | Pressure control solenoid valve–A (–) | 0.6 – 1.0 V | Ignition switch ON |

| Connector: E229 | | | | |
|---|---|---|---|---|
| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
| 1 | BLU | CAN communication line (Low) | 2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (Reference waveform No.7) | Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.) |
| 2 | RED | CAN communication line (High) | 2.5 – 3.6 V ↑↓ 1.6 – 2.5 V (Reference waveform No.7) | Engine running at idling with after warming up. (CAN communication signal is pulse. Pulse signal frequency varies depending on engine condition.) |
| 3 | — | — | — | — |
| 4 | — | — | — | — |
| 5 | BLU/YEL | Transmission fluid temperature sensor B (+) | 2.9 – 3.1 V | Ignition switch ON, fluid temperature is 20 °C (68 °F) |
| | | | 0.7 – 0.9 V | Ignition switch ON, fluid temperature is 80 °C (176 °F) |
| 6 | GRY | Transmission fluid temperature sensor B (–) | 0 – 1 V | Ignition switch ON |
| 7 | YEL | Data link connector | 8 – 14 V | Ignition switch ON |
| 8 | — | — | — | — |
| 9 | WHT/BLK | “O/D OFF” light | 0 – 1 V | Ignition switch ON (lamp turned ON) |
| | | | 8 – 14 V | Ignition switch ON (lamp turned OFF) |
| 10 | — | — | — | — |
| 11 | — | — | — | — |
| 12 | PPL/YEL | Diagnosis switch | 8 – 14 V | Ignition switch ON |
| 13 | ORN/BLU | Power mode switch | 0 – 1 V | Power mode switch ON |
| | | | 8 – 14 V | Power mode switch OFF |
| 14 | BLU/RED | Pressure control solenoid valve–B (–) | 0.6 – 1.0 V | Ignition switch ON |

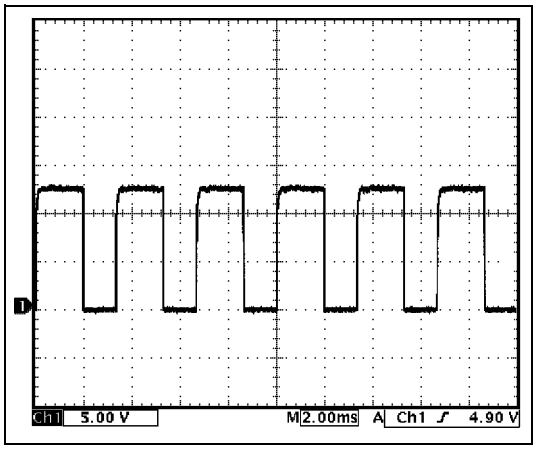
| Connector: E229 | | | | |
|---|---|---|---|---|
| Terminal Number | Wire Color | Circuit | Normal Voltage | Condition |
| 15 | YEL/RED | O/D OFF switch | 0 – 1 V | O/D OFF switch pressed |
| | | | 8 – 14 V | O/D OFF switch released |
| 16 | — | — | — | — |
| 17 | — | — | — | — |
| 18 | ORN/WHT | 4WD low switch | 0 – 1 V | 4WD low switch ON |
| | | | 8 – 14 V | 4WD low switch OFF |
| 19 | — | — | — | — |
| 20 | BLK/ORN | Ground | 0 – 1 V | Ignition switch ON |




**Reference waveform No.1**

Pressure control solenoid valve–C signal at ignition switch ON position

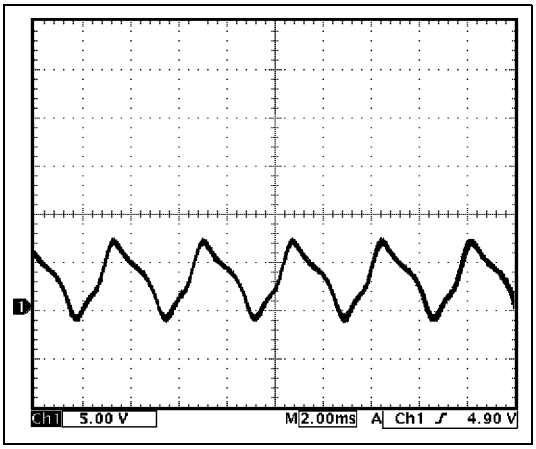
| Measurement terminal | CH1: E228-11 to E228-20 |
|---|---|
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | • Ignition switch turned ON<br>• Selector lever at “P” range |




**Reference waveform No.2**

Pressure control solenoid valve–A signal at ignition switch ON position

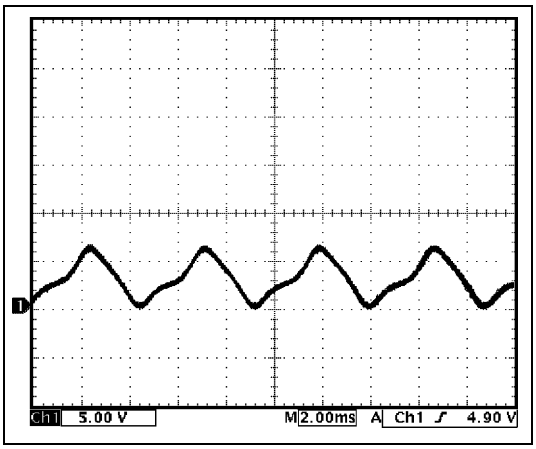
| Measurement terminal | CH1: E228-12 to E228-20 |
|---|---|
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | • Ignition switch turned ON<br>• Selector lever at “P” range |




**Reference waveform No.3**

Input shaft speed sensor signal at engine idling

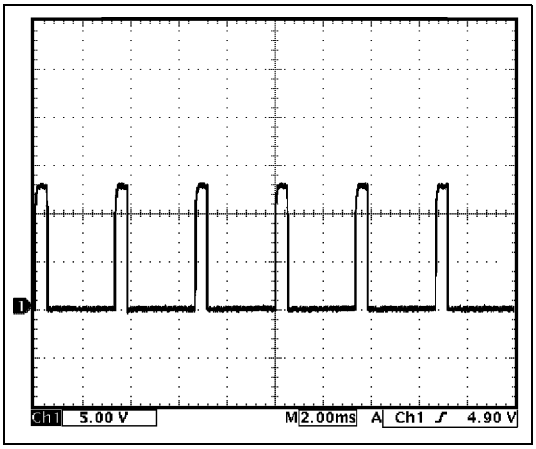
| | |
|---|---|
| Measurement terminal | CH1: E228-17 to E228-20 |
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | • After warmed up to normal operating temperature<br>• Engine at idling speed (700 r/min.) |




**Reference waveform No.4**

Output shaft speed sensor signal at vehicle speed 20 km/h, 12.5 mile/h

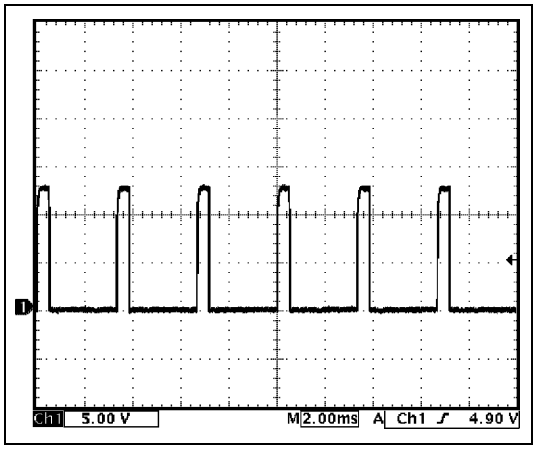
| | |
|---|---|
| Measurement terminal | CH1: E228-17 to E228-20 |
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | • After warmed up to normal operating temperature<br>• Vehicle speed at 20 km/h, 12.5 mile/h |




**Reference waveform No.5**

Pressure control solenoid valve–B signal at ignition switch ON position

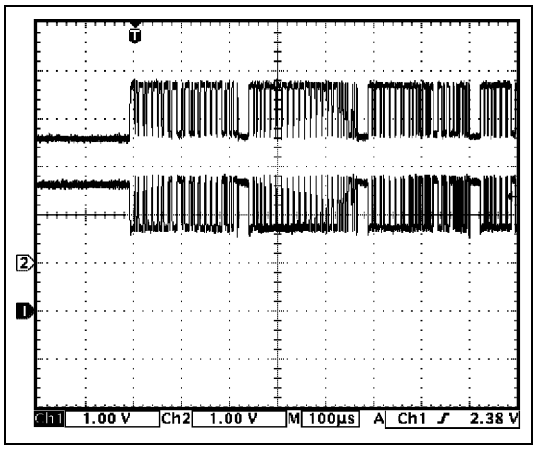
| | |
|---|---|
| Measurement terminal | CH1: E228-21 to E228-20 |
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | • Ignition switch turned ON<br>• Selector lever at “P” range |




**Reference waveform No.6**

TCC solenoid valve signal at ignition switch ON position

| | |
|---|---|
| Measurement terminal | CH1: E228-21 to E228-20 |
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | • Ignition switch turned ON<br>• Selector lever at “P” range |

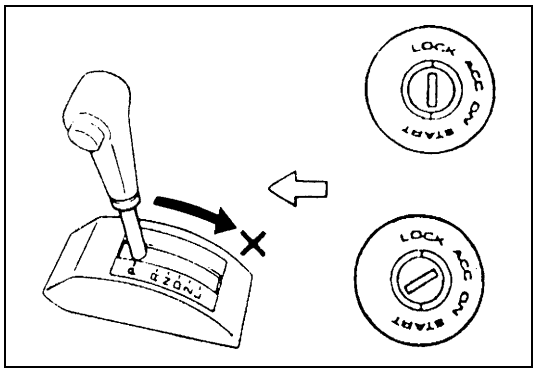



**Reference waveform No.7**

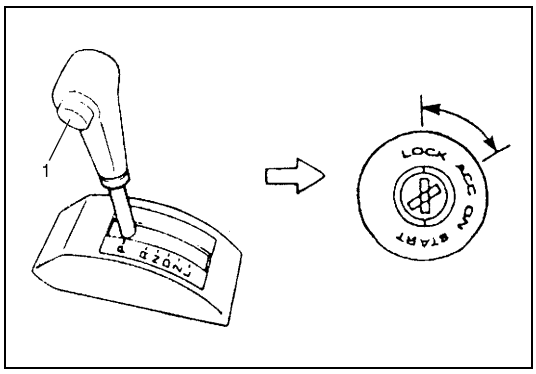
CAN communication line signal at engine idling

| | |
|---|---|
| Measurement terminal | CH1: E229-1 to E228-20, CH2: E229-2 to E228-20 |
| Oscilloscope setting | CH1: 1 V/DIV, CH2: 1 V/DIV<br>TIME: 100 µs/DIV |
| Measurement condition | • After warmed up to normal operating temperature<br>• Engine at idling speed (700 r/min.) |

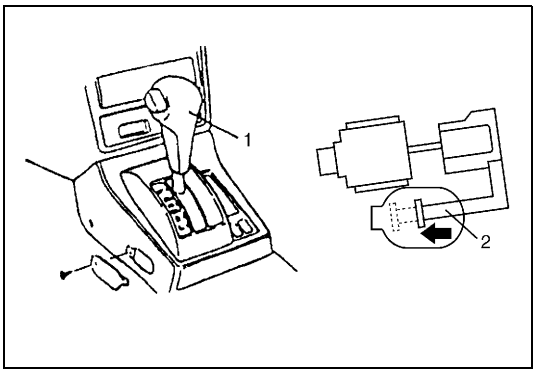
## Brake Interlock System (If Equipped) Inspection



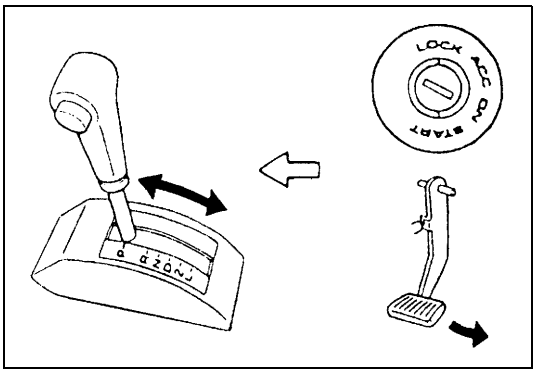

1) Check to make sure that select lever cannot be moved to any other range from “P” range position when ignition switch key is at “ACC” position, at “LOCK” position (or it is removed from keyhole of ignition switch) or brake pedal is not depressed.



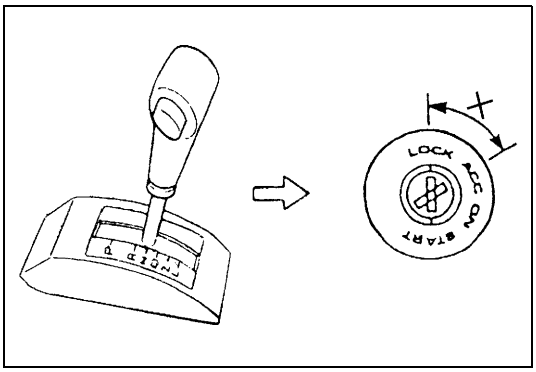

2) Shift select lever to “P” range position, release knob button (1) and check for the following.
   - Ignition key can be turned between “LOCK” and “ACC” positions back and forth and also it can be removed from ignition switch.




- With shift lock solenoid rod (or manual release plate) (2) moved in arrow direction and ignition key turned to “ACC” position, select lever (1) can be shifted from “P” range position to any other range.
- With shift lock solenoid rod (or manual release plate) (2) moved in arrow direction and ignition key turned to “LOCK” position, select lever (1) can not be shifted from “P” range position to any other range.



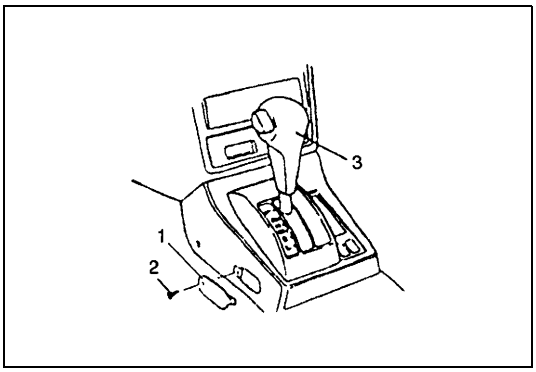

- When ignition switch is turned “ON” and brake pedal is depressed, select lever can be shifted from “P” range position to any other range.




3) With select 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.

## Shift Lock (Solenoid) Manual Release System Inspection

Shift lock can be manually released by the following procedure.




1) Remove access hole cover (1) by unfastening screw (2).
2) Turn ignition key to “ACC” position and move shift lock solenoid rod (or manual release plate) toward rear side of vehicle by using flat end rod or the like.
3) In this state, select lever (3) can be moved to any range or position.

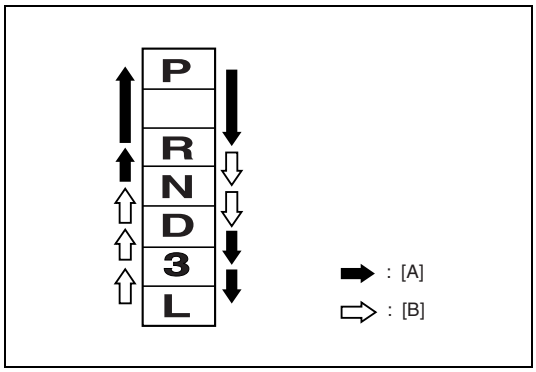
# On-Vehicle Service

## Maintenance

### Fluid level

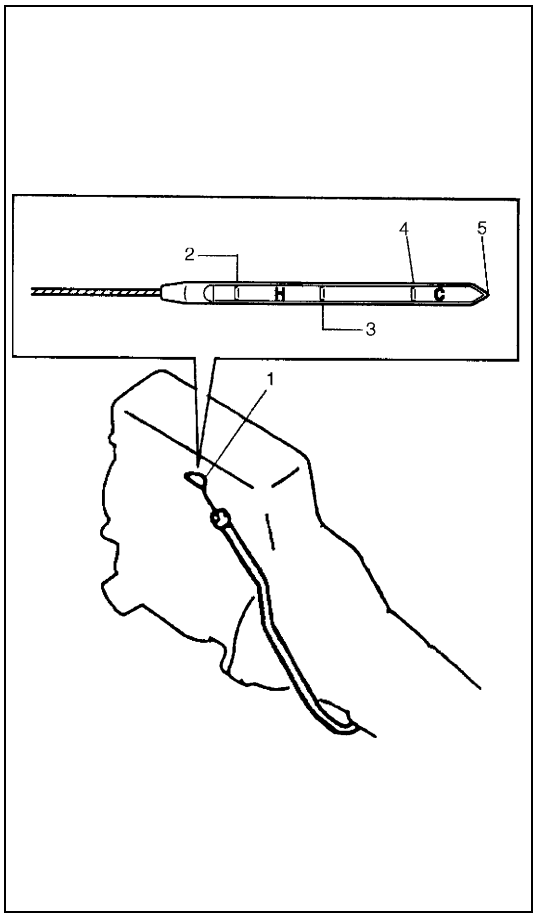
#### Level check at normal operating temperature

1) Stop vehicle and place it level.
2) Apply parking brake and place chocks against wheels.
3) With select lever at “P” range, start engine.
4) Warm up engine till A/T 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 temperature.




5) Keep engine idling and shift selector slowly to “L” and back to “P” range.

| | |
|---|---|
| [A] : | shift select lever with its button pushed in. |
| [B] : | shift select lever without pushing its button. |




6) With engine idling, pull out dipstick (1), wipe it off with a clean cloth and put it back into place.
7) Pull out dipstick (1) again and check fluid level indicated on it. Fluid level should be between FULL HOT and LOW HOT.

   If it is below LOW HOT, add equivalent of DEXRON®-III up to FULL HOT.

**A/T fluid specification**

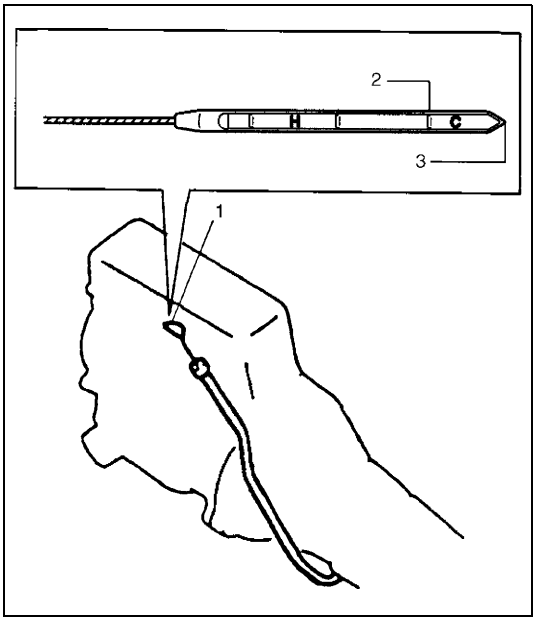
**Equivalent of DEXRON®-III**

**NOTE:**

- **DO NOT RACE ENGINE while checking fluid level, even after engine is started.**
- **DO NOT OVERFILL. Overfilling can causes foaming and loss of fluid through breather. Then slippage and transmission failure can result.**
- **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.**

| | |
|---|---|
| 2. “FULL HOT” | 4. “FULL COLD” |
| 3. “LOW HOT” | 5. “LOW COLD” |

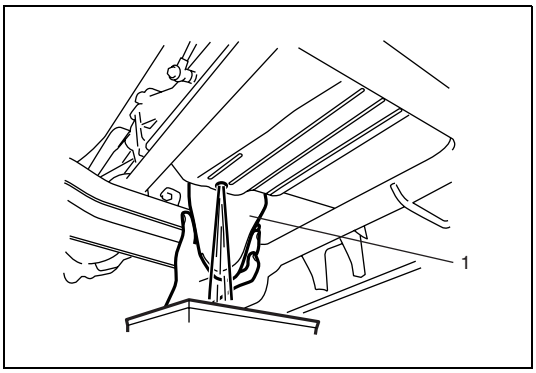
### Level check at room temperature




The fluid level check at room temperature performed after repair or fluid change before test driving is just preparation for level check of normal operating temperature. The checking procedure itself is the same as that described in “Level Check at Normal Operating Temperature: 5 A/T” under “Fluid Level: 5 A/T”. If the fluid level is between FULL COLD and LOW COLD, proceed to test drive. And when the fluid temperature has reached the normal operating temperature, check fluid level again and adjust it as necessary.

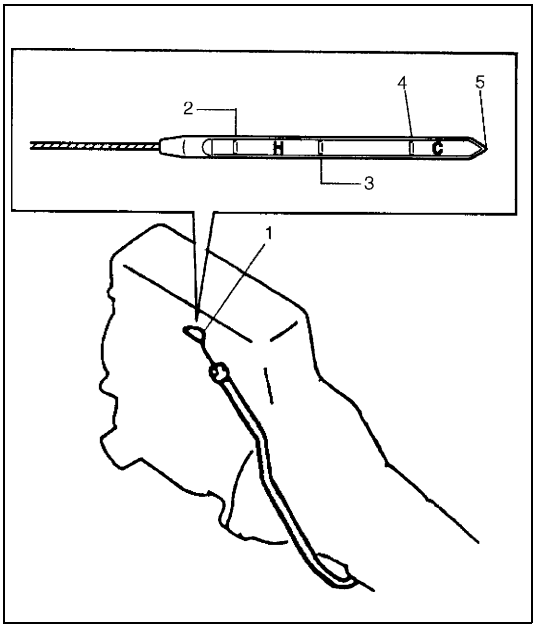
| | |
|---|---|
| 1. | Dipstick |
| 2. | “FULL COLD” |
| 3. | “LOW COLD” |

## Fluid change




1) Lift up vehicle.
2) When engine is cool, remove drain plug from oil pan and drain A/T fluid using oil gutter (1).
3) Install drain plug.

**Tightening torque**
**A/T fluid drain plug : 20 N·m (2.0 kg-m, 14.5 lb-ft)**




4) Lower vehicle and fill proper amount of specified fluid.
5) Check fluid level referring to “Level Check Normal Operating Temperature: 5 A/T” under “Fluid Level: 5 A/T”.

**A/T fluid specification**
**Equivalent of DEXRON®-III**

**A/T fluid capacity reference value**
**When draining from drain plug hole :**
**Approx. 3.0 liters (1.41/1.70 US/Imp. pt.)**

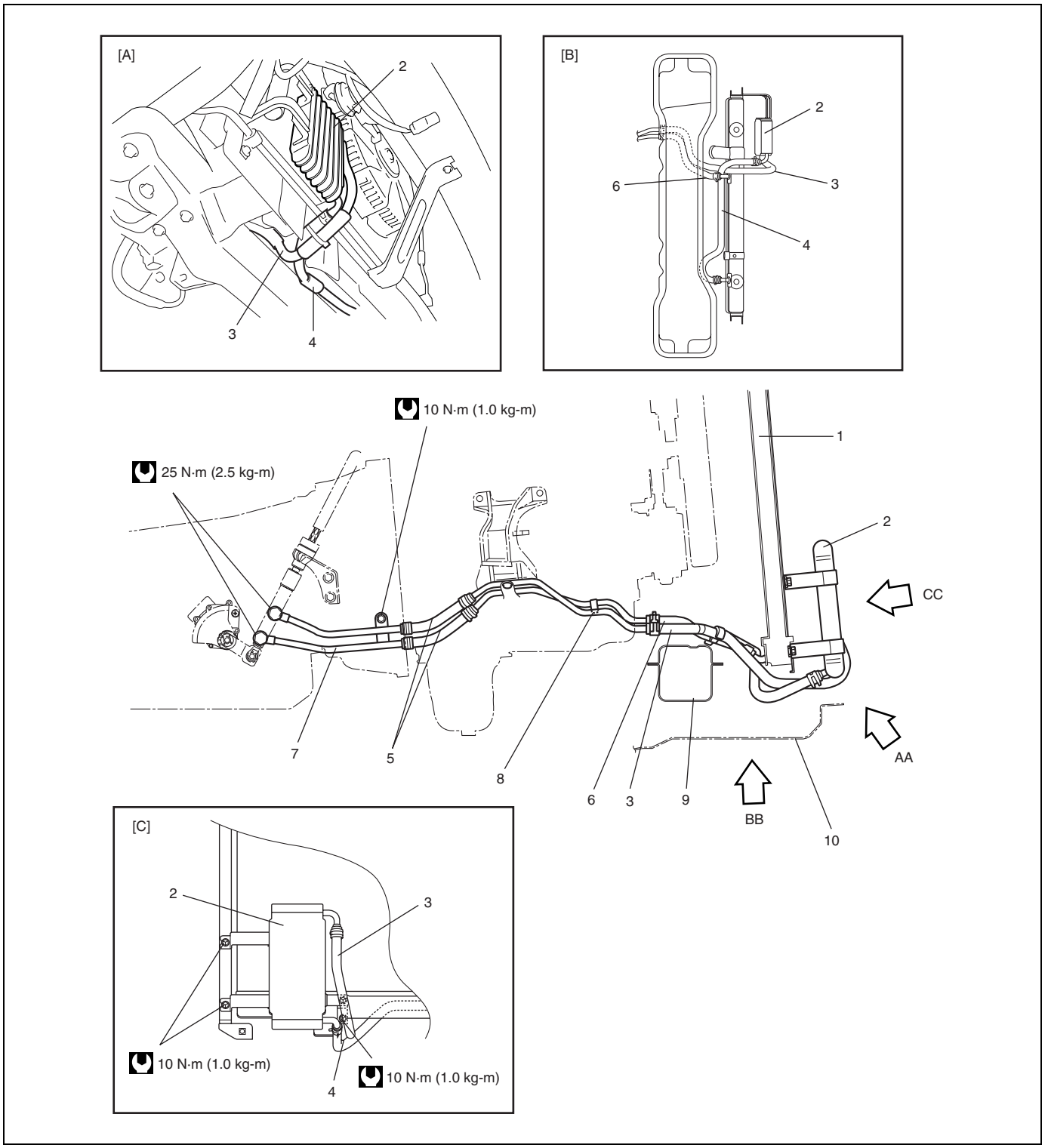
**When overhauling :**
**Approx. 10.3 liters (4.83/15.85 US/Imp. pt.)**

| | | | |
|---|---|---|---|
| 1. | Dipstick | 4. | “FULL COLD” |
| 2. | “FULL HOT” | 5. | “LOW COLD” |
| 3. | “LOW HOT” | | |

# Oil Cooler Hoses

When replace them, make sure to note the followings.

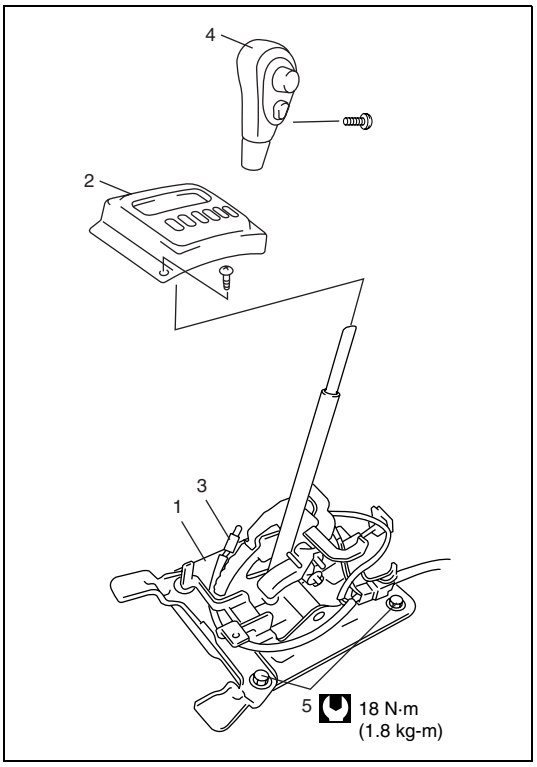
- to replace clamps at the same time
- to insert hose as far as bulge of pipe
- to clamp hose securely




| | | |
|---|---|---|
| [A]: View from AA side | 2. ATF cooler | 6. Oil hose clamp bracket bolt |
| [B]: View from BB side | 3. Oil hose No.2 | 7. ATF cooler bolt |
| [C]: View from CC side | 4. Oil hose No.3 | Tightening torque |
| 1. Radiator | 5. Oil hose No.1 | |

# Manual Selector Assembly

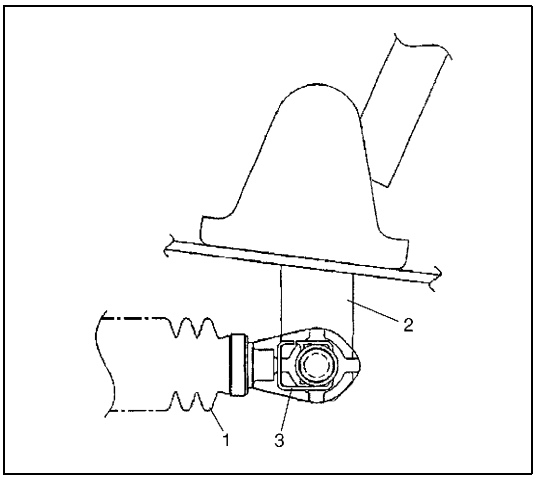
## Components




| | |
|---|---|
| 1. Manual lever assembly | 4. Knob assembly |
| 2. Select indicator assembly | 5. Manual selector assembly mounting bolt |
| 3. Illumination lamp assembly | Tightening torque |

## Removal

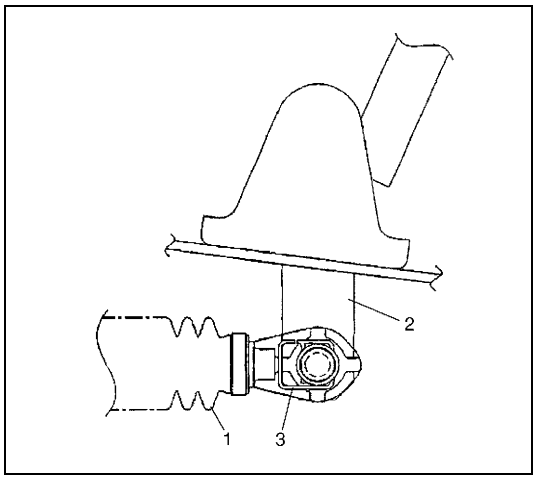
1) Disconnect negative cable at battery.
2) Remove front center console box.
3) Disconnect illumination lamp and O/D OFF switch connector.
4) Remove manual selector assembly mounting bolts.




5) Disconnect select cable (1) from manual selector assembly (2) expanding select cable clip (3).

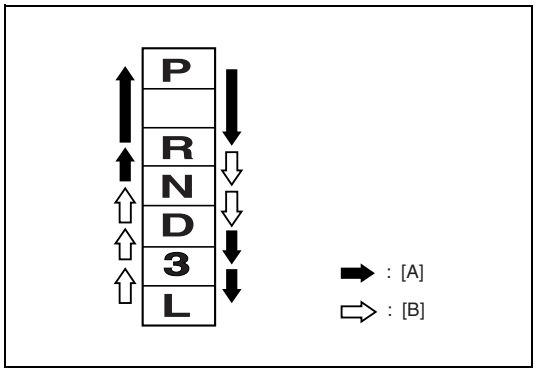
## Installation

Reverse removal procedure to install manual selector assembly noting the following instructions.




- Make sure that select cable clip (3) holds select cable (1) on manual selector assembly (2) securely.
- Tighten manual selector assembly mounting bolts to specified torque.

**Tightening torque**
**Manual selector assembly mounting bolt :**
**18 N·m (1.8 kg-m, 13.5 lb-ft)**



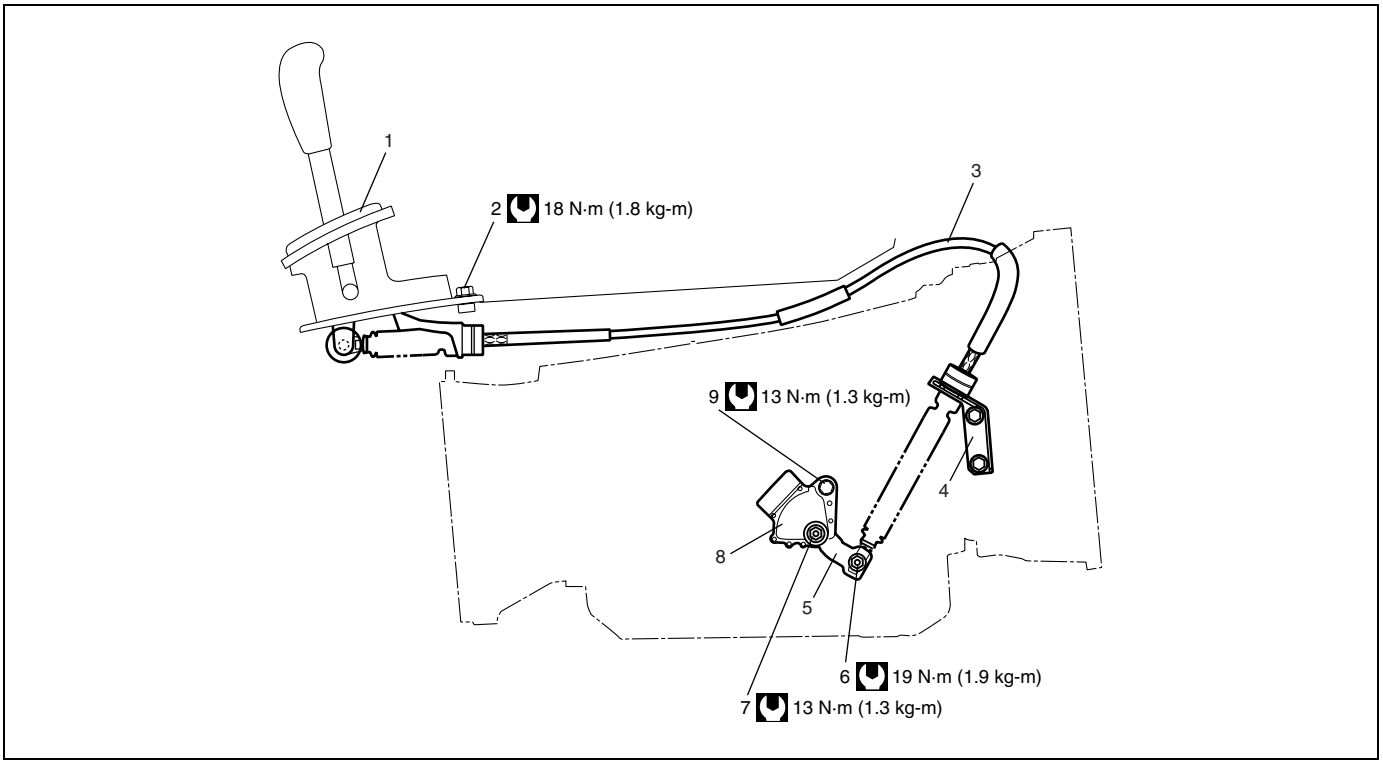

### Inspection

Check select lever for smooth and clear-cut movement and position indicator for correct indication.
For operation of select lever, refer to the figure.

| | |
|---|---|
| [A] : | Shift select lever with its button pushed in. |
| [B] : | Shift select lever without pushing its button. |

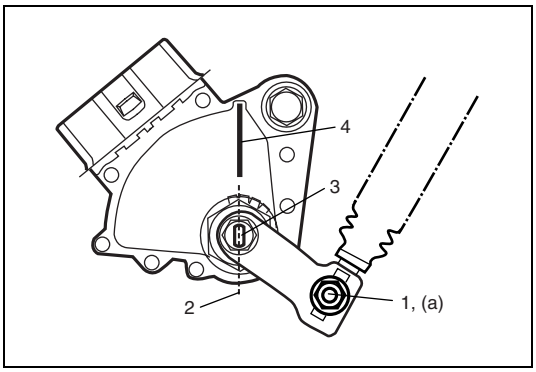
# Select Cable

## Location




| | | |
|---|---|---|
| 1. Manual selector assembly | 5. Manual select lever | 9. Transmission range sensor bolt |
| 2. Manual selector assembly mounting bolt | 6. Manual select cable end nut | Tightening torque |
| 3. Select cable | 7. Manual select lever nut | |
| 4. Select cable bracket | 8. Transmission range sensor | |

## Adjustment



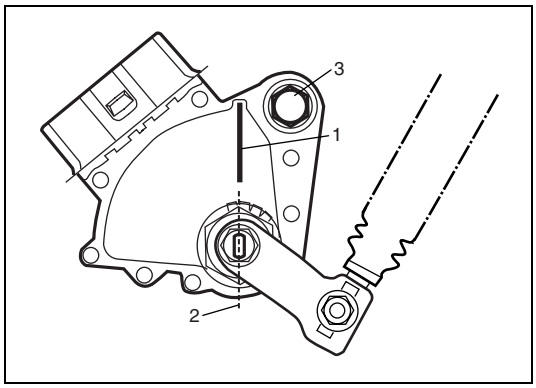

1) Loosen manual select cable end nut (1).
2) Shift select lever to “N”.
3) Align center line (2) on manual shift shaft (3) to “N” reference line (4) as shown in figure.
4) Tighten manual select cable end nut (1) to specified torque.

**Tightening torque**
**Manual select cable end nut**
**(a) : 19 N·m (1.9 kg-m, 14.0 lb-ft)**

5) After select cable was installed, check for the following
- Push vehicle with selector lever shifted to “P”. Vehicle should not move.
- Vehicle can not be driven in “N”.
- Vehicle can be driven in “D”, “3” and “L”.
- Vehicle can be backed in “R”.

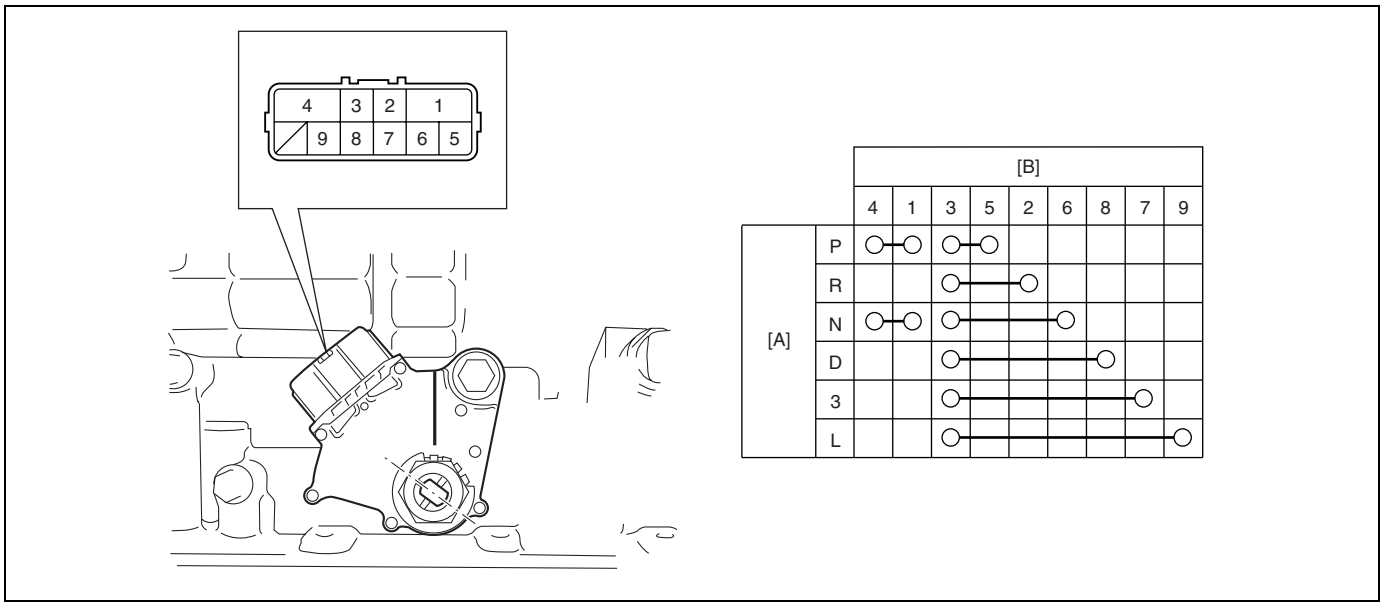
# Transmission Range Sensor

## Inspection and adjustment




1) Manual select lever to “N” range.
2) Check that center line (2) on manual shift and “N” reference line (1) on sensor are aligned. If not, loosen sensor bolt (3) and align them.
3) Check that engine starts in “N” and “P” ranges but it doesn’t start in “D”, “3”, “L” or “R” range. Also, check that back-up lamp lights in “R” range.

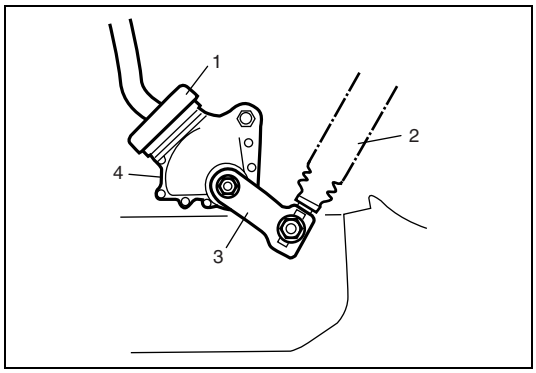
If faulty condition cannot be corrected by adjustment, disconnect transmission range sensor connector and check that continuity exists as shown by moving select lever.



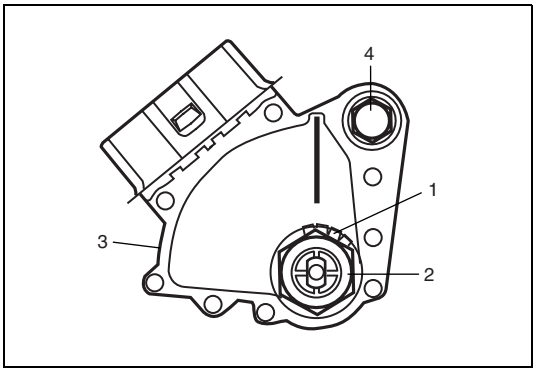

| | |
|---|---|
| [A] : | Sensor position |
| [B] : | Terminal No. |

### Removal

1) Disconnect negative cable at battery.
2) Hoist vehicle.

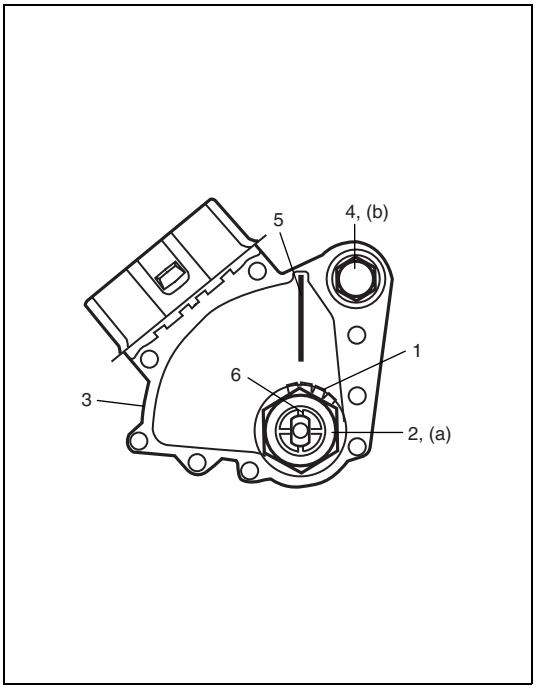



3) Disconnect transmission range sensor connector (1).
4) Disconnect select cable (2) from manual select lever (3).
5) Remove manual select lever (3) from transmission range sensor (4).




6) Unbend bend parts of lock washer (1), then remove manual shift shaft nut (2), lock washer (1) and grommet.
7) Remove transmission range sensor (3) by removing sensor bolt (4).

**Installation**

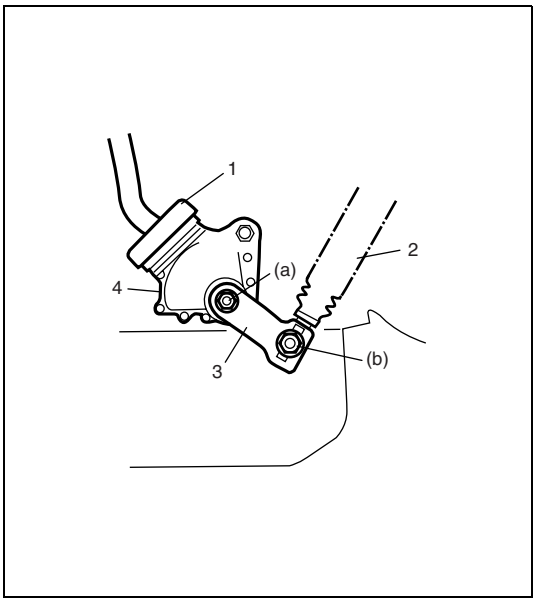



1) Install transmission range sensor (3) and tighten sensor bolt (4) temporarily.
2) Install grommet, lock washer (1) and manual shift shaft nut (2).
   Tighten nut to specified torque. After tightening it, bend claws of lock washer (1).

**Tightening torque**
**Manual shift shaft nut**
**(a) : 7 N·m (0.7 kg-m, 5.0 lb-ft)**

3) After turning manual shift shaft fully counterclockwise, turn it clockwise by 2 notches and set it to "N" range.
4) With "N" reference line (5) on range sensor and shaft center (6) aligned, tighten transmission range sensor bolt (4) to specified torque.

**Tightening torque**
**Transmission range sensor bolt**
**(b) : 13 N·m (1.3 kg-m, 9.5 lb-ft)**




5) Install manual select lever (3) to transmission range sensor (4).
   Tighten nut to specified torque.

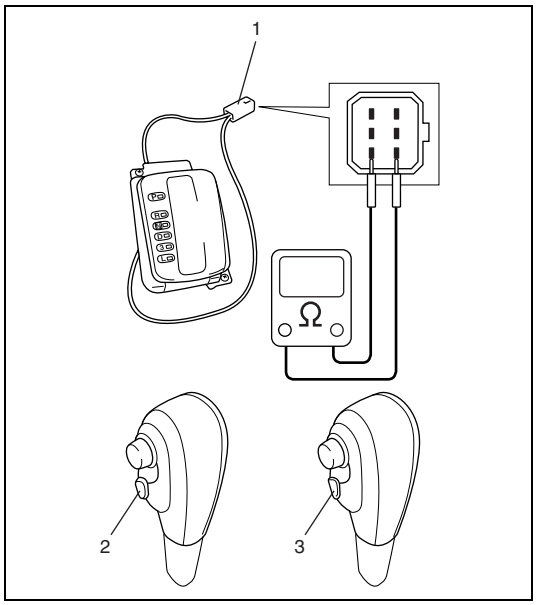
**Tightening torque**
**Manual select lever nut**
**(a) : 13 N·m (1.3 kg-m, 9.5 lb-ft)**

6) Connect select cable (2) to manual select lever (3).
   Tighten select cable end nut to specified torque referring to "Adjustment" of "Select Cable: 5 A/T".

**Tightening torque**
**Manual select cable end nut**
**(b) : 19 N·m (1.9 kg-m, 14.0 lb-ft)**

7) Connect transmission range sensor connector (1).
8) Connect negative cable at battery.

## O/D OFF Switch



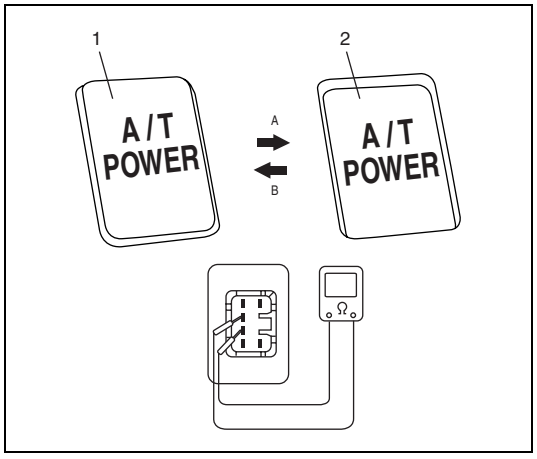

### Inspection

1) Remove front center console box.
2) Disconnect O/D OFF switch connector (1).
3) Check continuity between O/D OFF switch terminals.

| O/D OFF switch | Press | Release |
|---|---|---|
| Continuity | Continuity | No Continuity |

| |
|---|
| 2. O/D OFF switch ON |
| 3. O/D OFF switch OFF |

## Power/Normal Change Switch




### Inspection

1) Pull out Power/Normal Change Switch from front center console box.
2) Disconnect Power/Normal Change Switch connector.
3) Check continuity between Power/Normal Change Switch terminals.

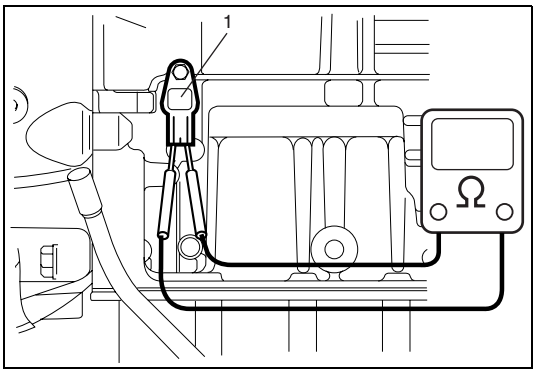
| Power/Normal Change Switch | Normal position | Power position |
|---|---|---|
| Continuity | No continuity | Continuity |

| |
|---|
| 1. Normal position |
| 2. Power position |
| A: Push |
| B: Push again to release |

## Input Shaft Speed Sensor

### Inspection

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Disconnect input shaft speed sensor connector.

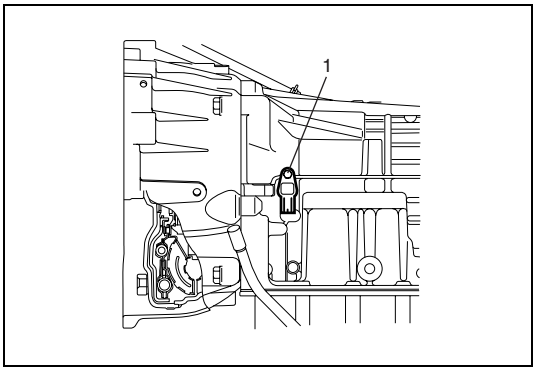



4) Check input shaft speed sensor (1) for resistance between terminals of sensor.

**Input shaft speed sensor resistance**
**Standard : 560 – 680 Ω (at 20 °C (68 °F))**

**Removal**

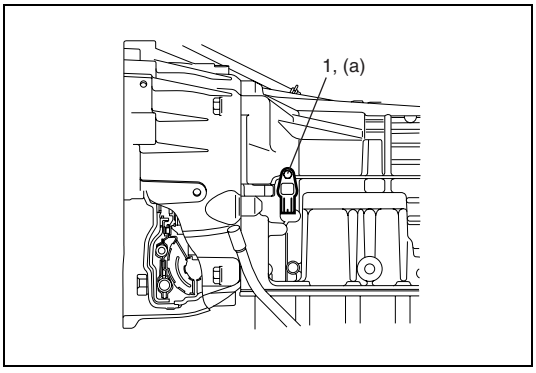
1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Disconnect input shaft speed sensor connector.




4) Remove input shaft speed sensor (1) from transmission.

**Installation**

1) Check that sensor is free from any metal particles and damage.




2) Apply A/T fluid to new O-ring and then install input shaft speed sensor (1) to transmission.
   Tighten sensor bolt to specified torque.

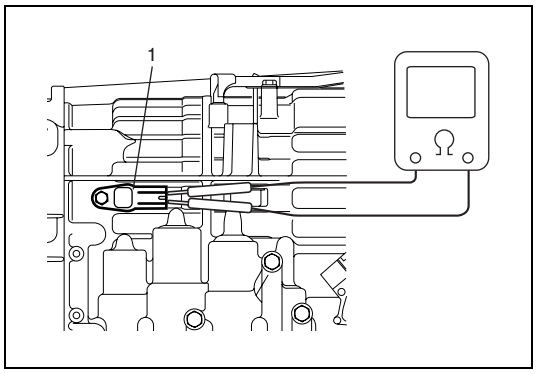
**Tightening torque**
**Input shaft speed sensor bolt**
**(a) : 5.5 N·m (0.55 kg-m, 4.0 lb-ft)**

3) Connect input shaft speed sensor connector.
4) Lower hoist.
5) Connect negative cable at battery.

## Output Shaft Speed Sensor

**Inspection**

1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Disconnect output shaft speed sensor connector.

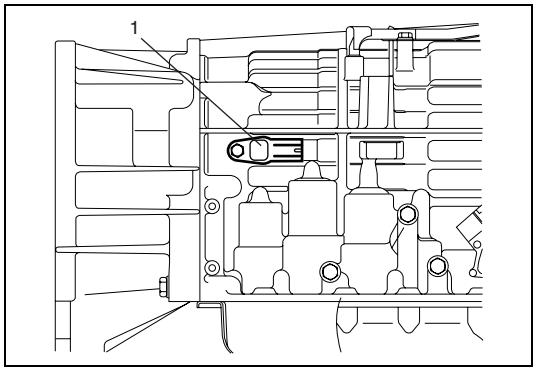



4) Check output shaft speed sensor (1) for resistance between terminals of sensor.

**Output shaft speed sensor resistance**
**Standard : 560 – 680 Ω (at 20 °C (68 °F))**

**Removal**

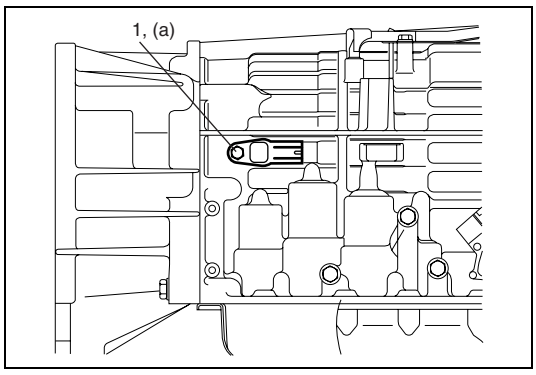
1) Disconnect negative cable at battery.
2) Hoist vehicle.
3) Disconnect output shaft speed sensor connector.




4) Remove output shaft speed sensor (1) from transmission.

**Installation**

1) Check that sensor is free from any metal particles and damage.




2) Apply A/T fluid to new O-ring and then install output shaft speed sensor (1) to transmission.
   Tighten sensor bolt to specified torque.

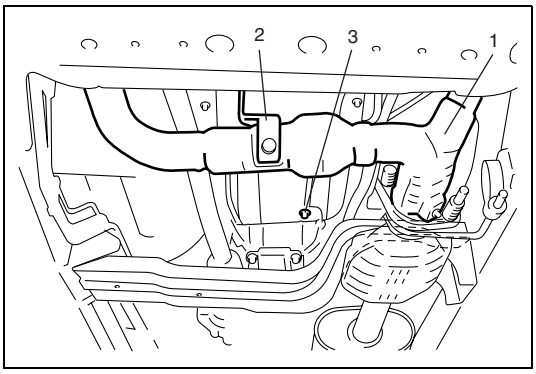
**Tightening torque**
**Output shaft speed sensor bolt**
**(a) : 5.5 N·m (0.55 kg-m. 4.0 lb-ft)**

3) Connect output shaft speed sensor connector.
4) Lower hoist.
5) Connect negative cable at battery.

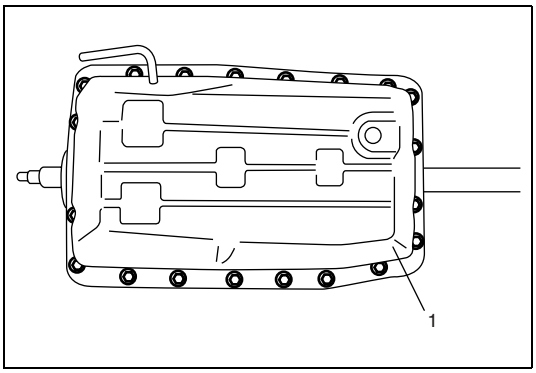
## Solenoid valves (Shift solenoid-A, Shift solenoid-B, Shift solenoid-E, TCC solenoid, Pressure control solenoid-A, Pressure control solenoid-B and Pressure control solenoid-C)

### Removal

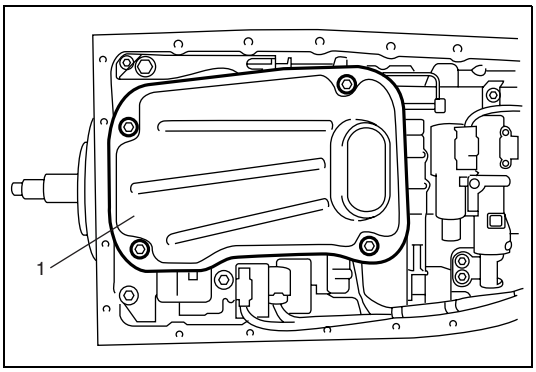
1) Disconnect negative cable at battery.
2) Pull out fluid level gauge and lift up vehicle.



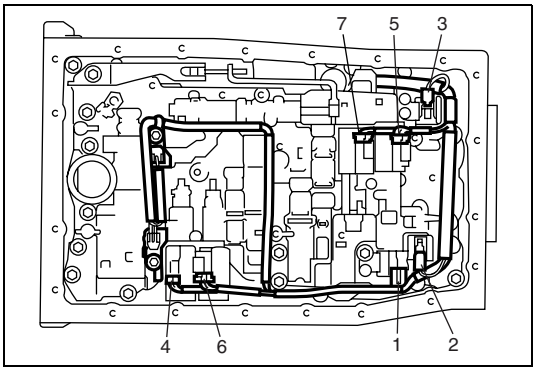

3) Remove exhaust No.1 pipe (1) and exhaust pipe bracket (2).
4) Remove drain plug (3) and drain A/T fluid.
5) Install drain plug (3). Refer to “Fluid Change: 5 A/T”.




6) Remove A/T oil pan (1).




7) Remove A/T oil strainer (1).



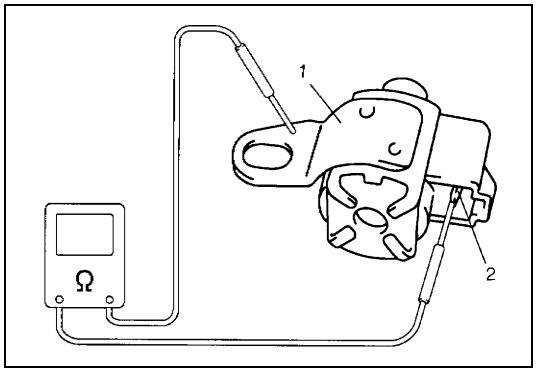

8) Disconnect shift solenoid-A connector (1), shift solenoid-B connector (2), shift solenoid-E connector (3), TCC solenoid connector (4), Pressure control solenoid-A connector (5), Pressure control solenoid-B connector (6) and Pressure control solenoid-C connector (7).
9) Remove solenoid valves.

### Inspection

### Solenoid valves (Shift solenoid-A, Shift solenoid-B and Shift solenoid-E)

### Resistance check

**CAUTION:**
**Be very careful as dust etc. does not enter when solenoid valves are inspected.**

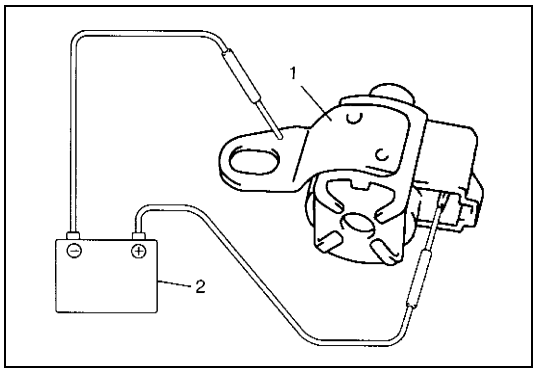



Measure resistance between terminal (2) and solenoid valve body. If resistance is out of specification, replace solenoid valve.

**Shift solenoid-A, Shift solenoid-B and Shift solenoid-E resistance**
**Standard : 11 – 15 Ω (at 20 °C (68 °F))**

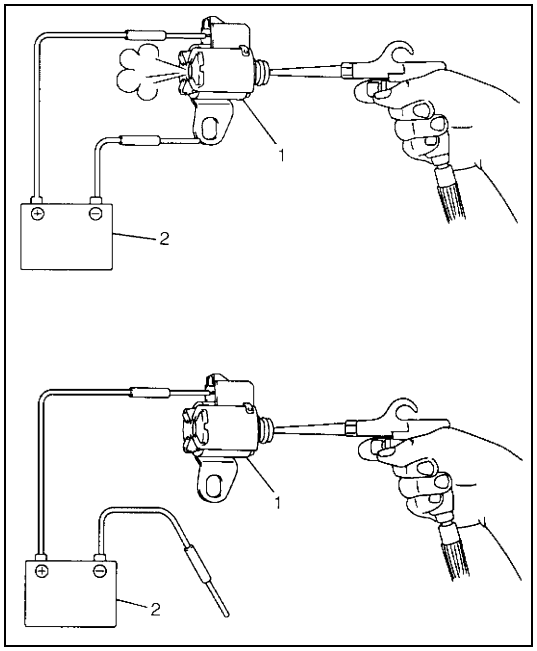
1. Shift solenoids

### Operation check




- With solenoid connected to battery (2) as shown in the figure, check that solenoid valve is actuated with click sound.

1. Shift solenoids



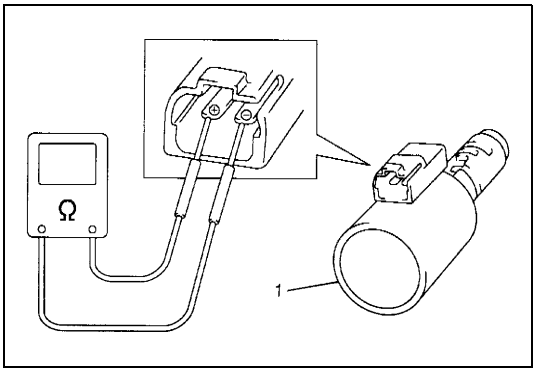

- With shift solenoid valve (1) connected to battery (2), confirm that shift solenoid valve is open by blowing air (50 – 200 kpa, 0.5 – 2.0 kg/cm$^2$, 7 – 28.5 psi) into solenoid valve as shown in the figure.
- With shift solenoid valve (1) not connected to battery (2), confirm that shift solenoid valve is closed by blowing air (50 – 200 kpa, 0.5 – 2.0 kg/cm$^2$, 7 – 28.5 psi) into solenoid valve as shown in the figure.

**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.**

**Pressure control solenoid valves (Pressure control solenoid-A, Pressure control solenoid-B, Pressure control solenoid-C and TCC solenoid valve)**

**Resistance check**

**CAUTION:**
**Be very careful as dust etc. does not enter when pressure control solenoid valves are inspected.**



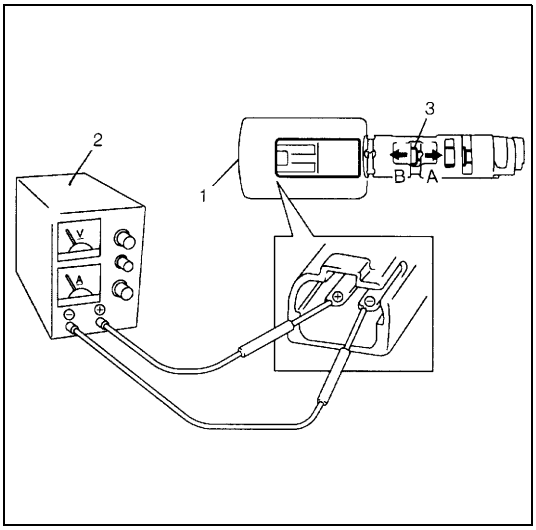

Measure resistance between pressure control solenoid valves (Pressure control solenoid-A, Pressure control solenoid-B, Pressure control solenoid-C and TCC solenoid) (1) terminals. If resistance is out of specification, replace valve body assembly.

**Pressure control solenoid-A, Pressure control solenoid-B, Pressure control solenoid-C and TCC solenoid resistance**
**Standard : 5.0 – 5.6 Ω (at 20 °C (68 °F))**

**Operation check**

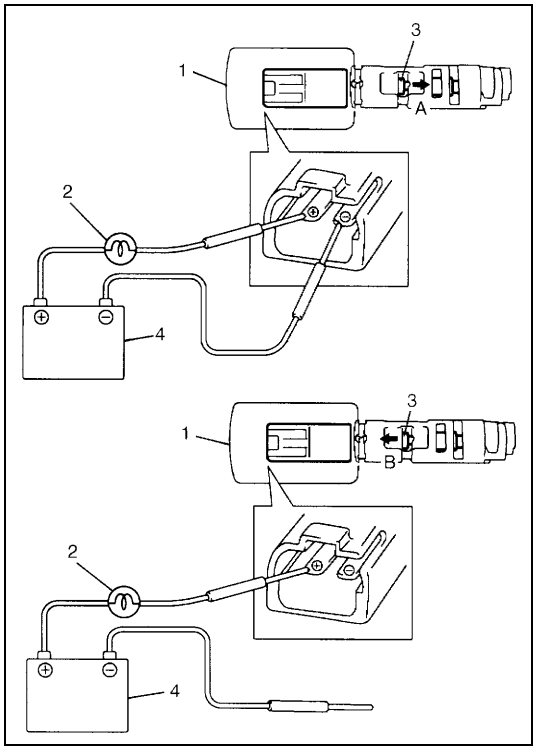
Check pressure control solenoid valves (Pressure control solenoid-A, Pressure control solenoid-B, Pressure control solenoid-C and TCC solenoid) (1) operation in either of the following methods.

**[Using regulated DC power supply]**




1) Connect pressure control solenoid valve (1) with regulated DC power supply (2) as shown in the figure.
2) Turn regulated DC power supply switch ON, increase voltage of power supply keeping current within 1.0 A.
3) Check that valve (3) moves gradually in arrow “A” direction as voltage increases.
4) Check that valve (3) moves in arrow “B” direction as voltage decreases.
5) Turn power supply switch OFF.

**CAUTION:**
**Do not feed current 1.0 A or more, or pressure control solenoid will be burned out.**




**[Not using regulated DC power supply]**

1) Connect pressure control solenoid valve (1) to battery (4) setting 21 W bulb (2) in between as shown in the figure.
2) Check that valve (3) moves in arrow “A” direction.
3) Disconnect pressure control solenoid valve (1) from battery (4) and check that valve (3) moves in arrow “B” direction as shown in the figure.

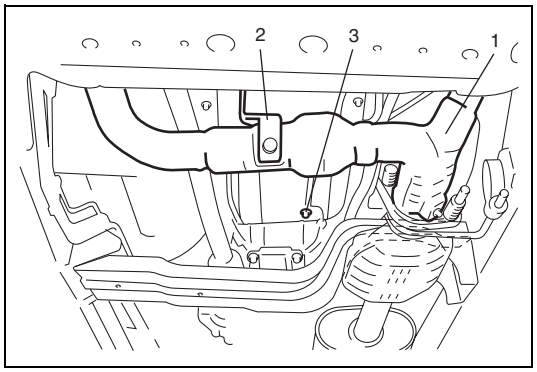
**CAUTION:**
**Set 21 W bulb in between, or pressure control solenoid valve will be burned out.**

**Installation**

Remove removal procedure to install solenoid valves, noting the following points.

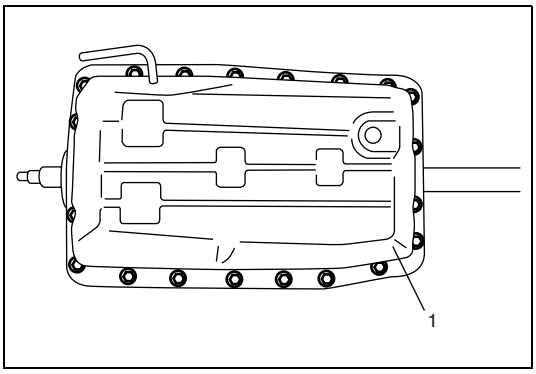
- For details of solenoid valves and their connectors installation, refer to “Unit Repair: 5 A/T”. Use new O-ring.
- For details of A/T oil pan installation, refer to “Unit Repair: 5 A/T”.
- Tighten exhaust No.1 pipe bolts & nuts and exhaust bracket bolts & nuts, refer to “Exhaust System Components” in Section 6K.
- Fill A/T fluid and check fluid level according to procedure described in “Fluid Change: 5 A/T”.
- Check for fluid leakage after warming up A/T.

## Transmission Fluid Temperature Sensor

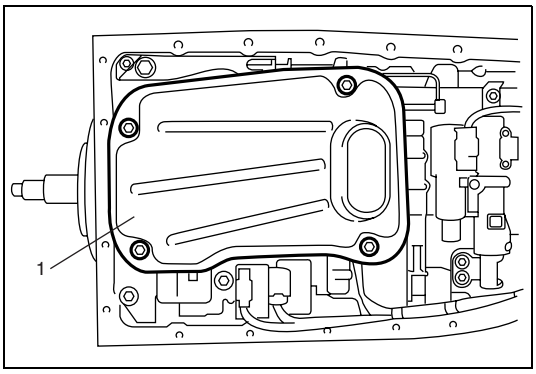



**Removal**

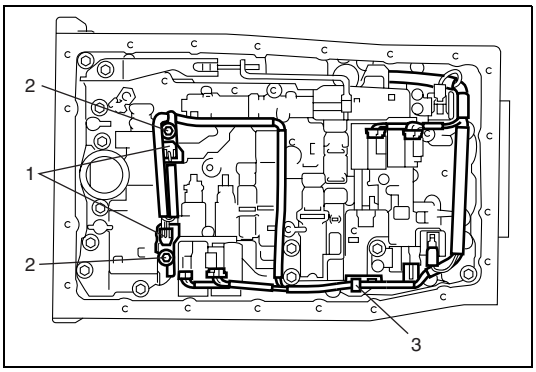
1) Disconnect negative cable at battery.
2) Pull out fluid level gauge and lift up vehicle.
3) Remove exhaust No.1 pipe (1) and exhaust pipe bracket (2).
4) Remove drain plug (3) and drain A/T fluid.
   Install drain plug (3). Refer to “Fluid Change: 5 A/T”.



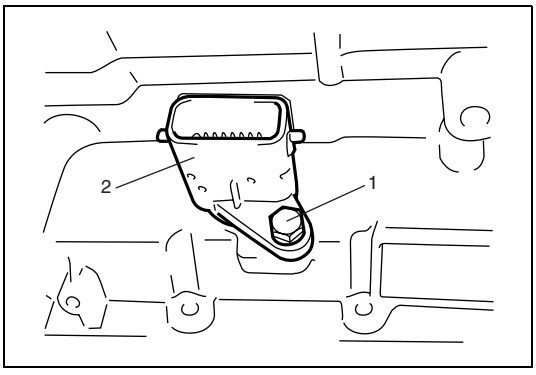

5) Remove A/T oil pan (1).




6) Remove A/T oil strainer (1).



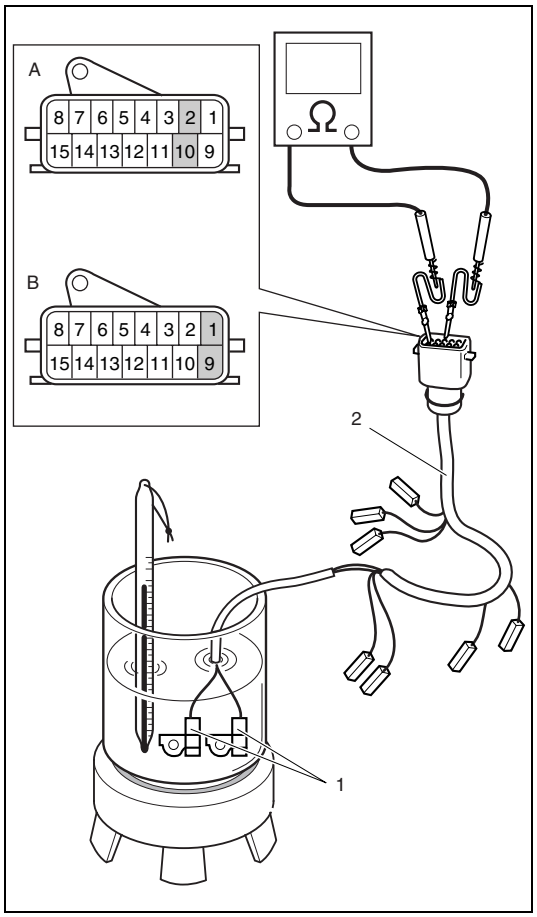

7) Remove transmission fluid temperature sensors (1) from sensor clamps (2).
8) Remove wire clamp (3).
9) Disconnect the following connectors from shift solenoid-A, shift solenoid-B, shift solenoid-E, TCC solenoid, pressure control solenoid-A, pressure control solenoid-B and pressure control solenoid-C.




10) After removing bolt (1) pull out transmission wire connector (2) from transmission case.

**CAUTION:**

**When pulling transmission wire harness out of transmission case, take care not to damage connectors and transmission fluid temperature sensors at narrow exist of case. Careless sensor treatment might cause sensor malfunction.**




### Inspection

Immerse transmission fluid temperature sensor A and B (1) in water or oil. Check transmission fluid temperature sensor A or B resistance between terminals of connector. Thus make sure its resistance decreases as temperature rises.

**Transmission fluid temperature sensor A and B resistance**

| Temperature | Resistance |
|---|---|
| 10 °C (50 °F) | 6.445 kΩ |
| 25 °C (77 °F) | 3.5 kΩ |
| 110 °C (230 °F) | 0.247 kΩ |

### Installation

Remove removal procedure to install transmission fluid temperature sensor, noting the following points.

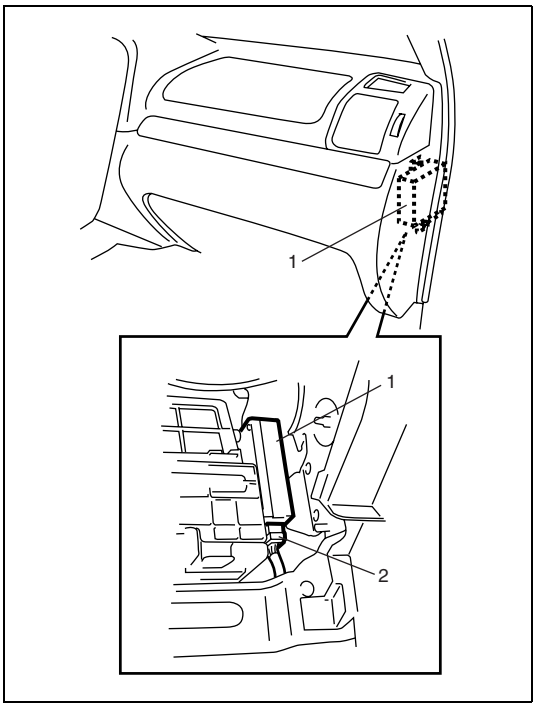
- For details of transmission fluid temperature sensor and solenoid valve connectors installation, refer to “Unit Repair: 5 A/T”.
- For details of A/T oil pan installation, refer to “Unit Repair: 5 A/T”.
- Tighten exhaust No.1 pipe bolts and nuts and exhaust bracket bolts and nuts, refer to “Exhaust System Components” in Section 6K.
- Fill A/T fluid and check fluid level according to procedure described in “Fluid Change: 5 A/T”.
- Check for fluid leakage after warming up A/T.

## Transmission Control Module (TCM)

**CAUTION:**
**TCM consists of highly precise parts, so when handling it, be careful not to expose it to excessive shock.**

### Removal

1) Disconnect negative cable at battery.
2) Disable air bag system.
   Refer to “Disabling Air Bag System” in Section 10B.
3) Remove glove box.
4) Disconnect connectors (2) from TCM (1).
5) Loosen screws and remove TCM (1).

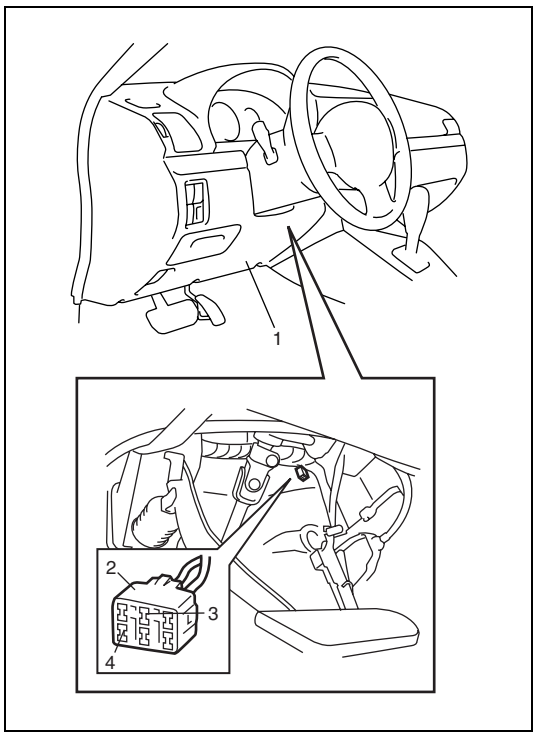



### Installation

Reverse removal procedure noting the following points.

- Connect TCM connectors securely.
- Be sure to enable air bag system after TCM is back in place.
  Refer to “Enabling Air Bag System” in section 10B.

### Learning control initialization




1) Remove steering column hole cover (1).
2) Using service wire, connect diagnosis switch terminal (3) and ground terminal (4) of blue monitor connector (2).
3) Turn ignition switch ON but engine stop.
4) Shift select lever to "L" range.
5) With brake pedal and accelerator pedal depressed fully, repeat ON and OFF operation of O/D OFF switch 5 times within 10 seconds.
6) Confirm that O/D OFF lamp is turned OFF to complete memory initialization.

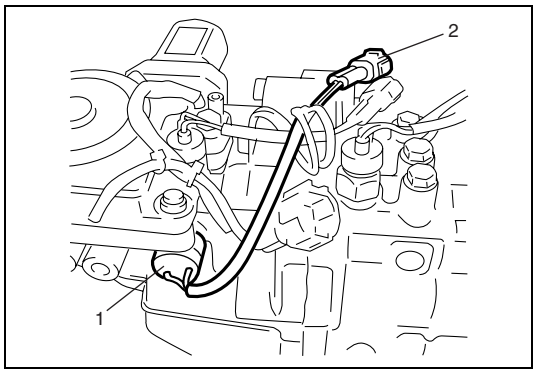
**NOTE:**

**When initialization is achieved, "O/D OFF" lamp neither light nor flash unless diagnosis switch terminal is once disconnected from ground terminal of monitor connector. If initialization is failed, re-try initializing procedure.**

## 4WD LOW Switch

### Inspection

1) Disconnect negative cable at battery.
2) Hoist vehicle.

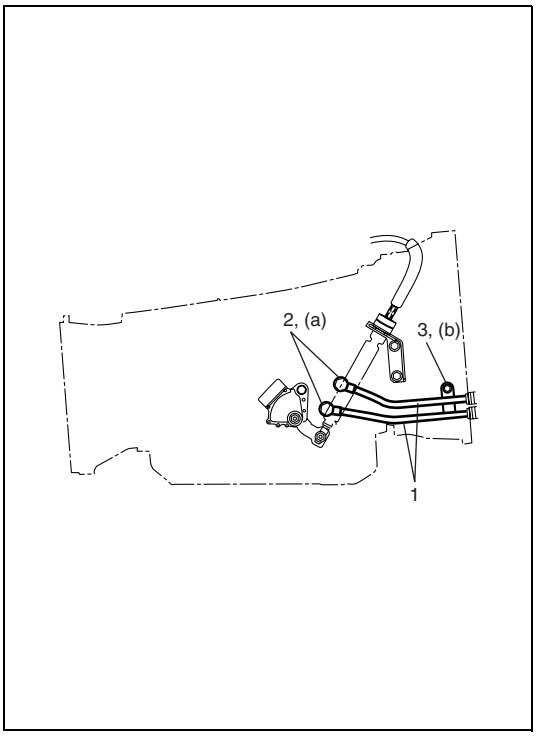



3) Disconnect 4WD LOW switch connector (2).
4) Check continuity between 4WD LOW switch (1) terminals. There should be continuity when transfer switch is shifted to 4L position and it should be infinity when transfer switch is shifted to 4H or 2H position.
   If not, replace 4WD LOW switch (1).
5) Connect 4WD LOW switch connector.
6) Lower hoist and connect negative cable.

## Oil Cooler Pipes

### Removal

1) Lift up vehicle.
2) Make sure to wash dirt off from around pipe joints.




3) When engine is cool, loosen oil cooler pipe union bolts with oil outlet union locked and remove oil cooler pipes (1) from oil outlet union and hoses.

**NOTE:**

**To avoid fluid leakage, plug open ends of oil outlet unions and hoses right after they are disconnected.**

### Installation

1) Use new union gaskets and connect oil cooler pipes to oil outlet unions.
2) Connect hoses to pipes and clamp them securely.
3) Tighten union bolts (2) to specified torque with oil outlet union locked.

**Tightening torque**
**Oil cooler pipe union bolt**
**(a) : 25 N·m (2.5 kg-m, 18.0 lb-ft)**

4) Tighten pipe clamp bolt (3) to specified torque.
**Tightening torque**
**Pipe clamp bolt (b) : 10 N·m (1.0 kg-m, 7.5 lb-ft)**

5) Check A/T fluid level according to procedure described in "Fluid level: 5 A/T".
6) Check for fluid leakage after warming up A/T.

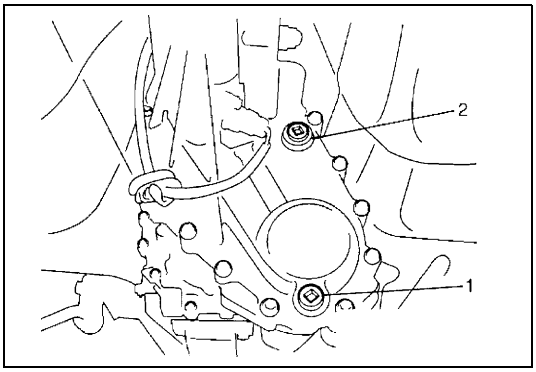
## Automatic Transmission Assembly (with Transfer)

### Dismounting

#### In Engine Room

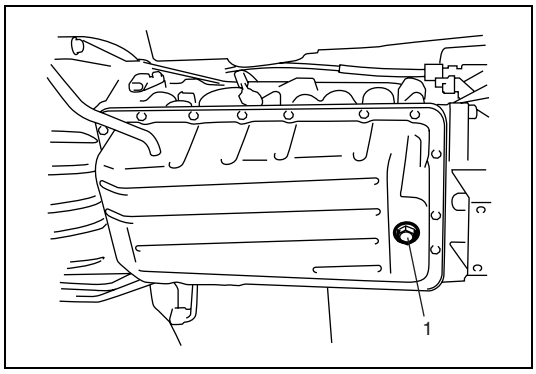
1) Disconnect negative cable at battery.
2) Remove dipstick and oil filler tube.

#### On lift




1) Drain transfer oil.

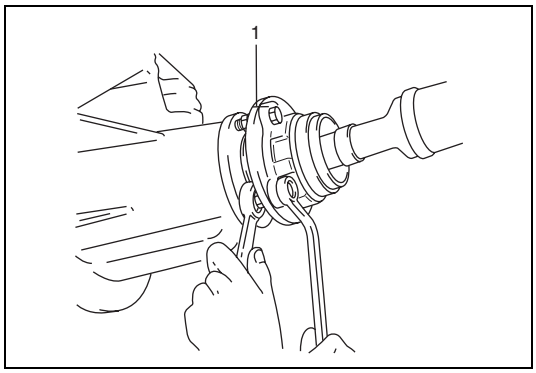
| | |
|---|---|
| 1. | Drain plug |
| 2. | Level and filler plug |




2) Remove drain plug (1) and drain A/T fluid.

**NOTE:**

**If automatic transmission is overhauled later on, draining A/T fluid at this point will facilitate work.**



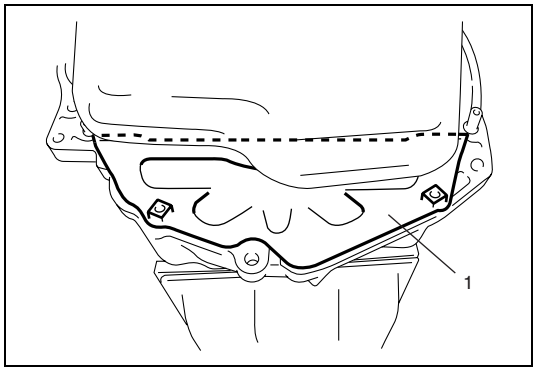

3) Before removing propeller shaft, give match marks (1) on joint flange and propeller shaft as shown in the figure.
4) Remove universal joint flange bolts and take out rear propeller shaft.

5) Likewise, take out front propeller shaft.
6) Remove nut from the end of select cable and bracket to set cable free.
7) Remove select cable bracket by removing its 2 bolts.
8) Remove engine under cover.
9) Remove exhaust No.1 pipe, exhaust pipe brackets and exhaust No.2 pipe.
10) Remove stabilizer bar mount bush bracket bolts.
11) Remove clamp and then disconnect oil cooler hoses from pipes.

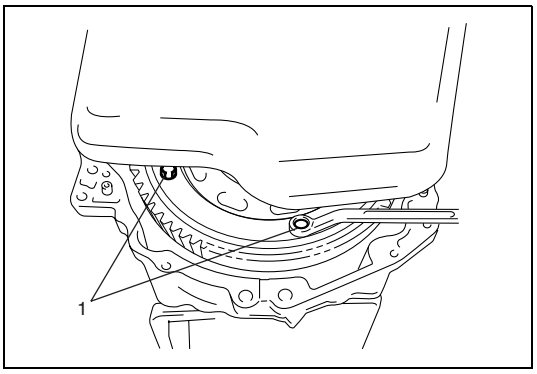
**NOTE:**

**To avoid leakage of transmission fluid, plug open ends of oil cooler pipes and hoses right after they are disconnected.**

12) Remove stiffener mount bolts.

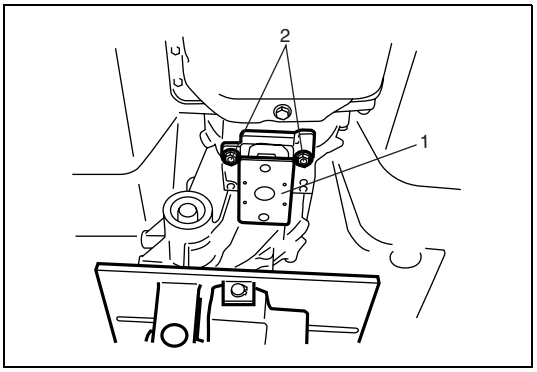



13) Remove torque converter housing cover and converter housing lower plate (1).

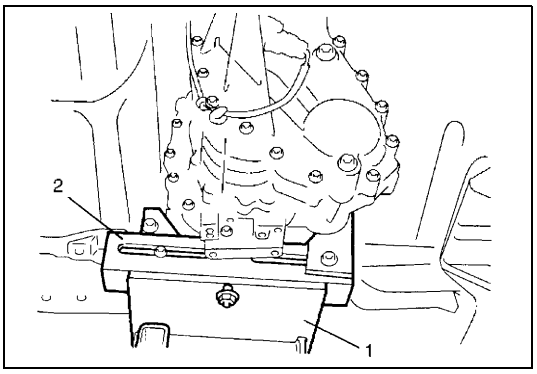



14) Holding crankshaft pulley bolt stationary with wrench, remove torque converter mounting bolts (1) with wrench.

15) Apply transmission jack and take off rear mounting member by removing its bolts.

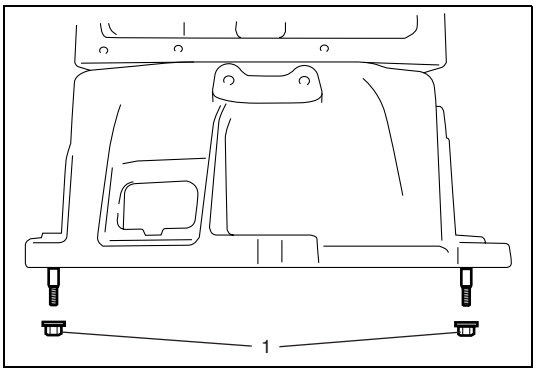



16) Remove rear mounting (1) by removing its bolts (2).

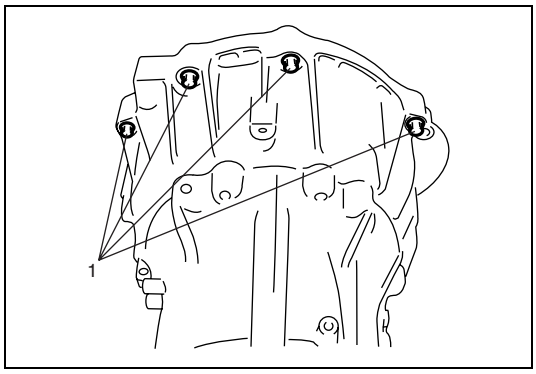



17) Lower transmission jack slowly. Remove it from transmission, then install auxiliary arm (2) to transmission jack (1).
18) Raise transmission jack until it contacts transmission.

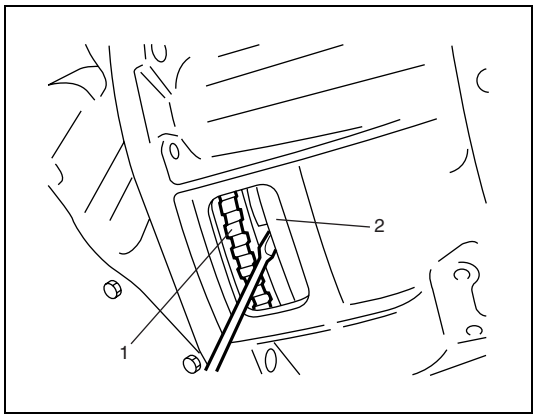
19) Disconnect connectors from VSS, output shaft speed sensor, input shaft speed sensor, transmission range sensor, transmission wire, 4WD low switch and transfer shift control actuator, release their wire harnesses from clamps.
20) Remove breather hose and harness clamp mounting bolts from transmission.
21) Remove starter motor bolts.




22) Remove nuts (1) fixing engine to transmission.




23) Remove bolts (1) fixing engine to transmission.




24) With transmission assembly held up on jack, move then to the rear and lower them including torque converter.
As necessary, insert a rod into the gap between drive plate (1) and torque converter (2), then separate drive plate (1) from torque converter (2).

**WARNING:**
**Transmission assembly may tilt rearward on jack. It is recommended to use an auxiliary arm of jack for the purpose of safety.**

**After dismounting**

**WARNING:**
**Be sure to keep transmission and transfer assembly horizontal throughout the work. Should they be tilted, torque converter may fall off and cause personal injury and A/T fluid may flow out.**

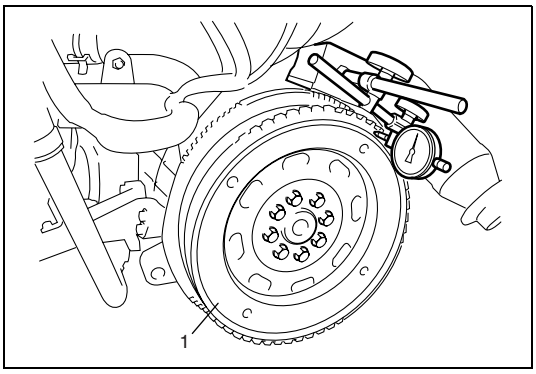
1) Remove transfer breather hoses.
2) Remove transfer by removing its bolts.

**Remounting**

**WARNING:**
**When moving transmission assembly with torque converter equipped in it, be sure to keep it horizontal. Tilting it with its front facing down may allow converter to fall off, thereby an injury may result.**

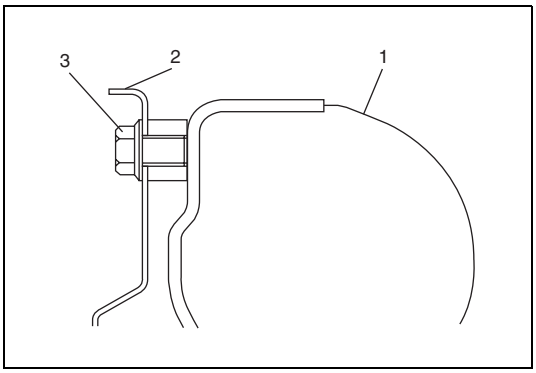
Reverse dismounting procedure for remounting noting the following points.

- When installing transmission and transfer to engine, lift the front of engine about 10 cm (3.94 in.) by using hoist.

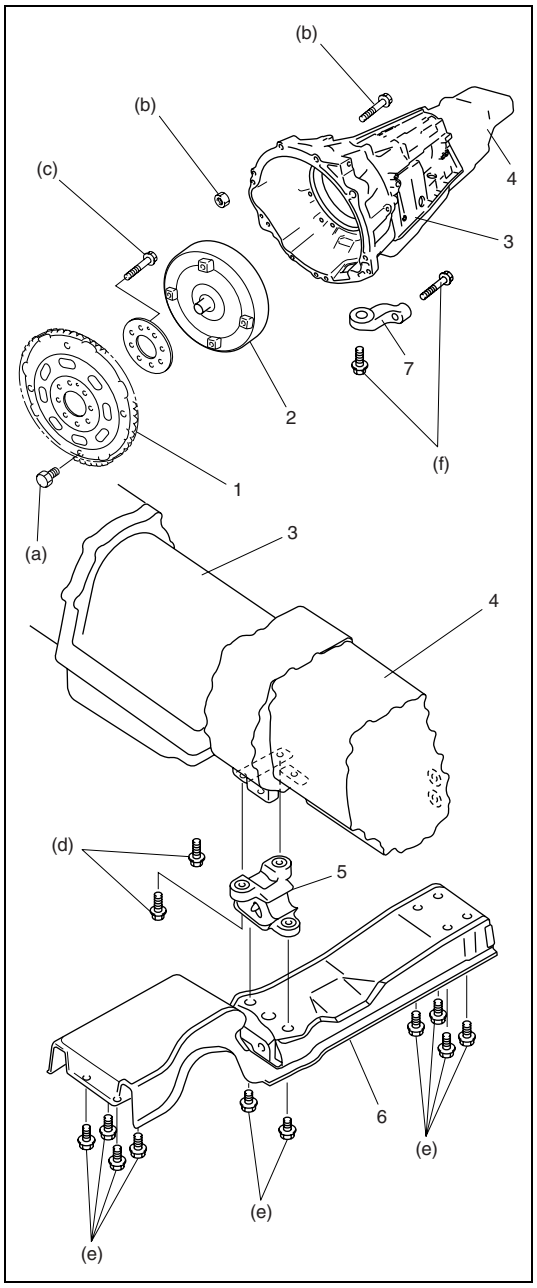



- Check drive plate (1) for runout by using magnetic stand and dial gauge. If runout is not within specification or ring gear is damaged. replace drive plate.

**Drive plate runout limit :**
**0.2 mm (0.079 in.)**




- Install torque converter (1) to drive plate (2) by using the torque converter mounting bolts (3) of correct length.




- Tighten bolts and nuts to specified torque.

**Tightening torque**
**Torque converter mounting bolt**
**(a) : 65 N·m (6.5 kg-m, 45.5 lb-ft)**
**Transmission to engine bolts and nut**
**(b) : 80 N·m (8.0 kg-m, 56.0 lb-ft)**
**Drive plate bolt**
**(c) : 69 N·m (6.9 kg-m, 48.3 lb-ft)**
**Engine rear mounting bolt**
**(d) : 55 N·m (5.5 kg-m, 38.5 lb-ft)**
**Engine rear mounting member bolt**
**(e) : 55 N·m (5.5 kg-m, 38.5 lb-ft)**
**Stiffener mount bolt**
**(f) : 55 N·m 5.5 kg-m, 38.5 lb-ft)**
**Exhaust No.1 pipe to exhaust No.2 pipe nut :**
**50 N·m (5.0 kg-m, 35.0 lb-ft)**
**Exhaust muffler pipe to exhaust No.2 pipe nut :**
**60 N·m (6.0 kg-m, 42.0 lb-ft)**
**Front propeller shaft universal joint flange bolt :**
**50 N·m (5.0 kg-m, 35.0 lb-ft)**
**Rear propeller shaft universal joint flange bolt :**
**60 N·m (6.0 kg-m, 42.0 lb-ft)**
**Stabilizer bar mount bush bracket bolt :**
**23 N·m (2.3 kg-m, 16.1 lb-ft)**

| | |
|---|---|
| 1. Drive plate | 5. Engine rear mounting |
| 2. Torque converter | 6. Rear mounting member |
| 3. Automatic transmission | 7. Stiffener |
| 4. Transfer | |

- Clamp wire harness and hoses securely.
- Refer to “Select Cable: 5 A/T” for adjusting procedure of select cable.
- Follow fluid level check procedure for refilling automatic transmission fluid and adjusting its level.
- Install battery, and confirm that engine and transmission function acceptably.
- When remounting drive plate, use specified bolts.

# Unit Repair

Refer to the same section of “Unit Repair Manual” mentioned in Foreword of this manual.

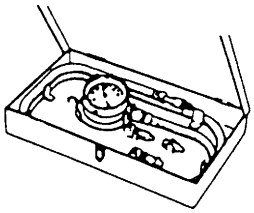
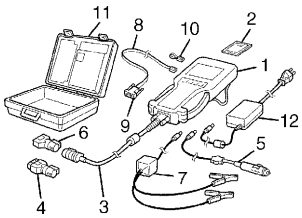
# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| A/T fluid drain plug | 20 | 2.0 | 14.5 |
| Manual selector assembly mounting bolt | 18 | 1.8 | 13.5 |
| Manual select cable end nut | 19 | 1.9 | 14.0 |
| Manual shift shaft nut | 7 | 0.7 | 5.0 |
| Transmission range sensor bolt | 13 | 1.3 | 9.5 |
| Manual select lever nut | 13 | 1.3 | 9.5 |
| Input shaft speed sensor bolt | 5.5 | 0.55 | 4.0 |
| Output shaft speed sensor bolt | 5.5 | 0.55 | 4.0 |
| Oil cooler pipe union bolt | 25 | 2.5 | 18.0 |
| Stiffener mount bolt | 55 | 5.5 | 38.5 |
| Torque converter mounting bolt | 65 | 6.5 | 45.5 |
| Transmission to engine bolt and nut | 80 | 8.0 | 56.0 |
| Drive plate bolt | 69 | 6.9 | 48.3 |
| Engine rear mounting bolt | 55 | 5.5 | 38.5 |
| Engine rear mounting member bolt | 55 | 5.5 | 38.5 |
| Exhaust No.1 pipe to exhaust No.2 pipe nut | 50 | 5.0 | 35.0 |
| Exhaust muffler pipe to exhaust No.2 pipe nut | 60 | 6.0 | 42.0 |
| Front propeller shaft universal joint flange bolt | 50 | 5.0 | 35.0 |
| Rear propeller shaft universal joint flange bolt | 60 | 6.0 | 42.0 |
| Stabilizer bar mount bush bracket bolt | 23 | 2.3 | 16.1 |

# Required Service Material

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| A/T fluid | Refer to Section 0B | • Automatic transmission<br>• Parts lubrication when installing<br>• Solenoid valve O-ring<br>• A/T fluid temperature sensor O-ring |

# Special Tool

| | |
|---|---|
|  |  |
| 09925-37811-001<br>Oil pressure gauge | SUZUKI scan tool<br>(See NOTE) |

**NOTE:**

**This kit includes the following items and substitutes for the Tech 1 kit.**
**1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loopback connector, 11. Storage case, 12. Power supply**

# SECTION 7D

# TRANSFER

**NOTE:**

**Refer to the same section of the Service Manual mentioned in the FOREWORD of this manual for all of this section except the following.**

- **Use the SUZUKI BOND NO. 1217G (99000-31260) instead of the SUZUKI BOND NO. 1216B (99000-31230) which is instructed in the same section of the Service Manual mentioned in "FOREWORD" of this Manual.**

## SECTION 7E

# DIFFERENTIAL (FRONT) (AIR PUMP SHIFTING TYPE)

**NOTE:**

**For all contents (item) of this section, refer to the Section 7E "DIFFERENTIAL (FRONT)" of Grand VITARA (SQ416/420/625) service manual mentioned in "FOREWORD" of this manual.**

## SECTION 7E1

# DIFFERENTIAL (FRONT) (MOTOR-SHIFTING TYPE)

## CONTENTS

**General Description ..... 7E1-1**
4WD Control System ..... 7E1-2
System circuit ..... 7E1-3
Components and functions ..... 7E1-3
**Diagnosis ..... 7E1-5**
Diagnosis Table ..... 7E1-5
Differential assembly ..... 7E1-5
4WD control system diagnostic flow table ..... 7E1-5
4WD Control Circuit Inspection ..... 7E1-7
**On-Vehicle Service ..... 7E1-9**
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**Unit Repair ..... 7E1-17**
**Tightening Torque Specifications ..... 7E1-17**
**Required Service Material ..... 7E1-17**
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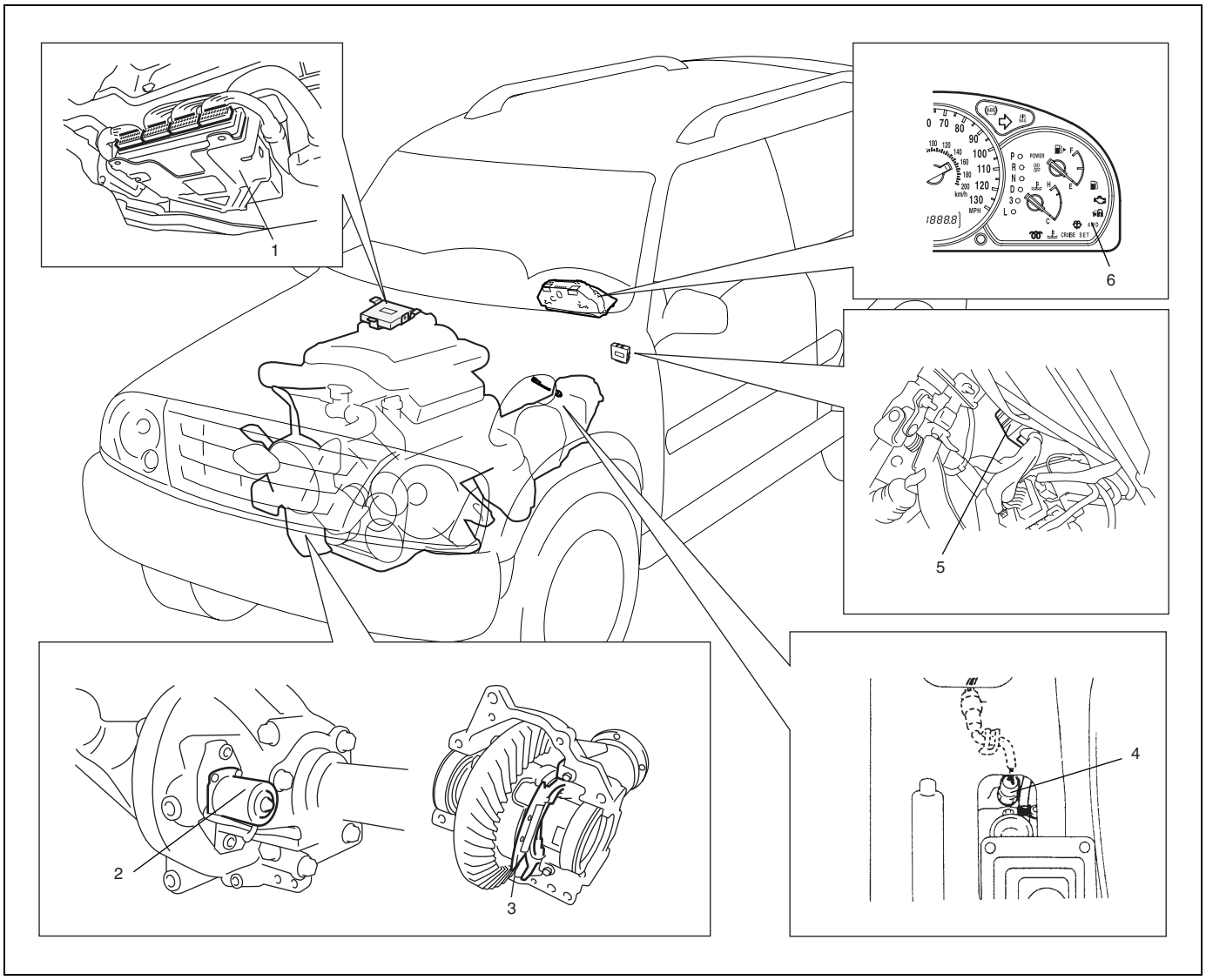


## General Description

The differential assembly using a hypoid bevel pinion and gear is installed to the front axle.
4WD control system controls drive force to be transmitted to front axles or not. The reduction ratio varies depending on transmission or engine type.
The differential assembly is decisive in that the drive power is concentrated there. Therefore, use of genuine parts and specified torque is compulsory. Further, because of sliding tooth meshing with high pressure between bevel pinion and gear, it is mandatory to lubricate them by hypoid gear oil.

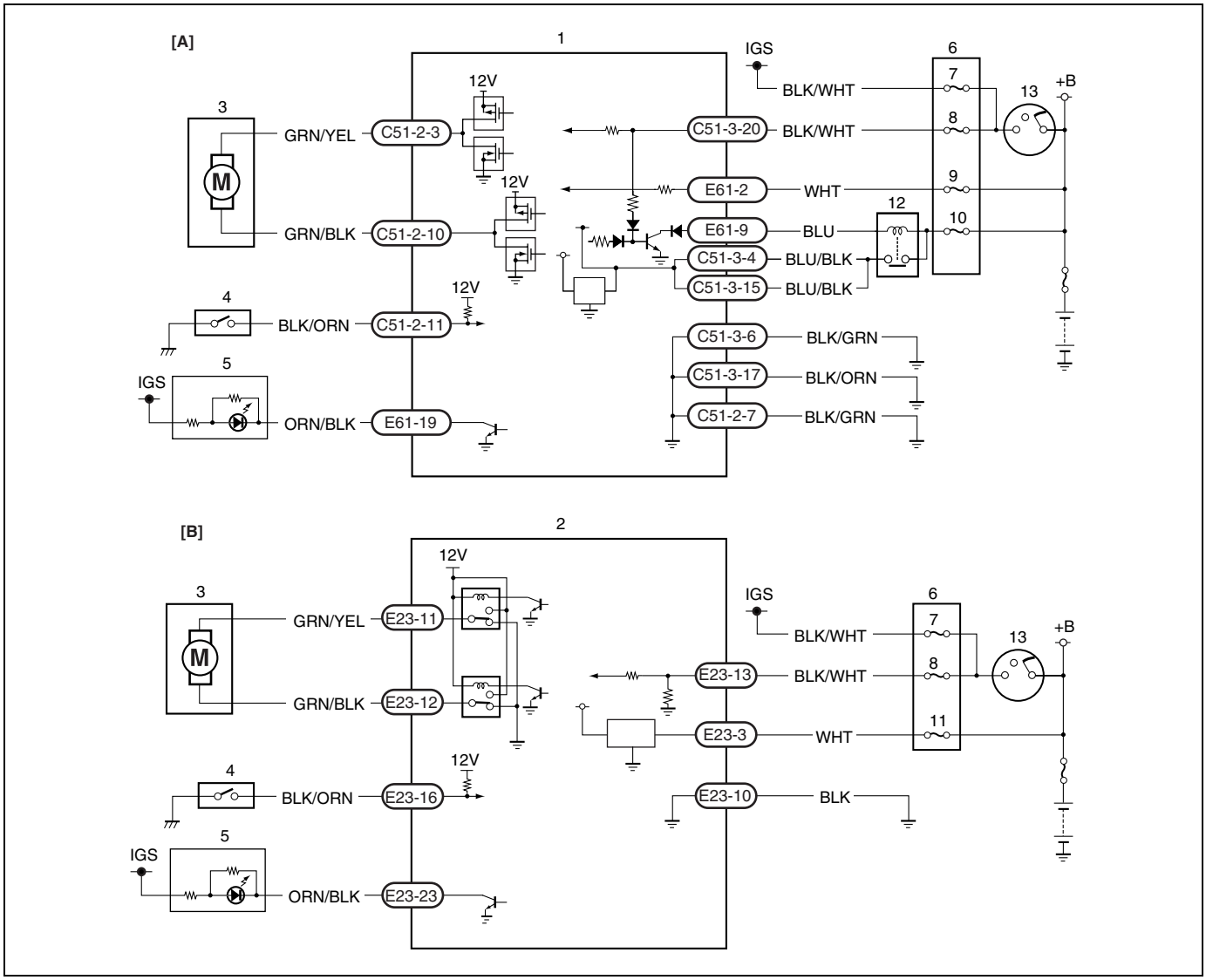
## 4WD Control System

When the 4WD switch is turned ON by shifting the transfer shift lever, ECM (H27 engine model) or 4WD controller (RHW engine model) actuates the axle lock actuator motor on the front differential assembly so that the motor actuates the axle lock actuator in the front differential assembly. It causes the axle lock clutch and the free axle hub in the differential case assembly to be engaged resulting in the 4WD mode or disengaged resulting in the 2WD mode.




| | | |
|---|---|---|
| 1. ECM (For H27 engine model) | 3. Axle lock actuator | 5. 4WD controller (For RHW engine model) |
| 2. Axle lock actuator motor | 4. 4WD switch | 6. 4WD indicator lamp |

## System circuit

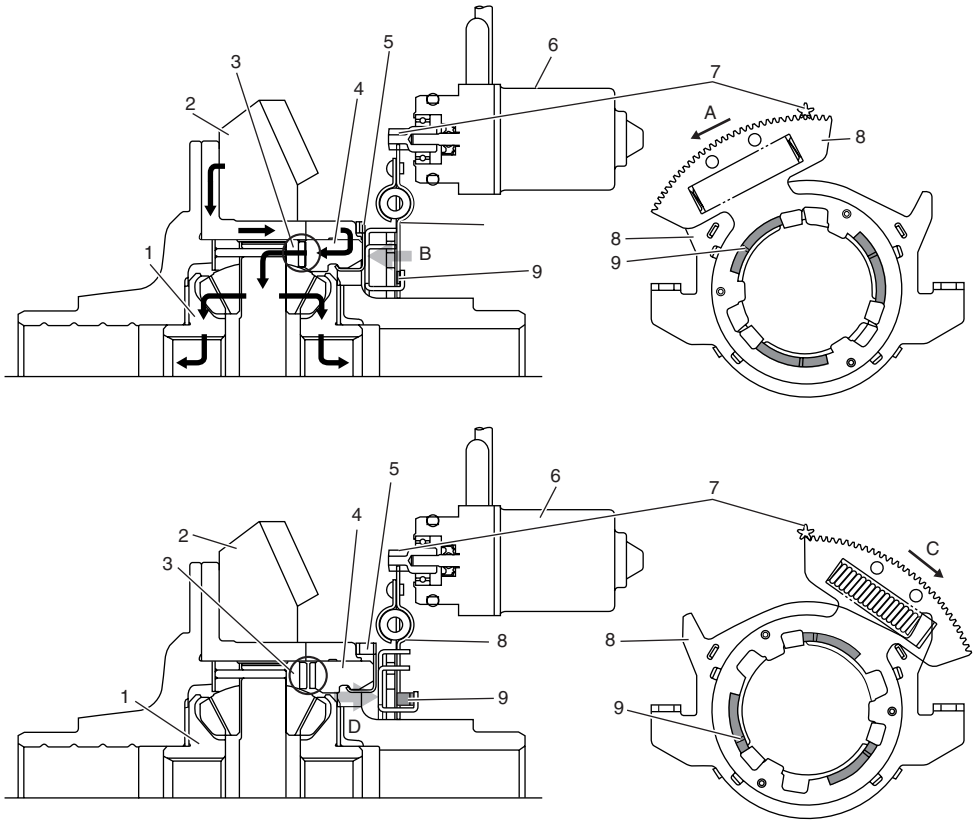



| | | | |
|---|---|---|---|
| [A]: H27 engine model | 3. Axle lock actuator motor | 7. "METER" fuse | 11. "4WD" fuse |
| [B]: RHW engine model | 4. 4WD switch | 8. "IG COIL" fuse | 12. Main relay |
| 1. ECM | 5. 4WD indicator lamp | 9. "RADIO DOME" fuse | 13. Ignition switch |
| 2. 4WD controller | 6. Circuit fuse box | 10. "FI" fuse | |

## Components and functions

| Component | Function |
|---|---|
| 4WD switch | When the transfer shift lever is shifted to 4L or 4H position, this switch turns ON and causes the 4WD control system to turn ON. |
| ECM (H27 engine model) or 4WD controller (RHW engine model) | This module/controller controls the axle lock actuator motor on the front differential assembly to engage and disengage the axle lock clutch and the free axle hub in the differential assembly according to the transfer position. |
| Axle lock actuator motor | Operates axle lock clutch to engage/disengage. |

| | |
|---|---|
| Differential assembly<br>• Free axle hub<br>• Axle lock clutch<br>• Actuator | The axle lock actuator motor drives the pinion gear to rotate and thus the gear section of the actuator moves in the “A” direction. At this time, the cam makes the sliding section of the actuator move in the “B” direction, thereby the lock clutch and free axle hub get linked by the clutch lock. In this way, the driving force is transmitted to the front axle, resulting in the 4WD mode.<br>The axle lock actuator motor drives the pinion gear to rotate and thus the gear section of the actuator moves in the “C” direction. At this time, the cam makes the sliding section of the actuator move in the “D” direction and the return spring separates the axle lock clutch from the free axle hub, resulting in the 2WD mode. |
| “4WD” indicator lamp | It lights up when 4WD control system is in the 4WD mode. |




| | | |
|---|---|---|
| 1. Differential assembly | 4. Axle lock clutch | 7. Pinion gear |
| 2. Bevel gear | 5. Return spring | 8. Actuator |
| 3. Free axle hub | 6. Axle lock actuator motor | 9. Cam |

# Diagnosis

## Diagnosis Table

### Differential assembly

| Condition | Possible Cause | Correction |
|---|---|---|
| **Gear noise** | Deteriorated or water mixed lubricant | Repair and replenish |
| | Inadequate or insufficient lubricant | Repair and replenish |
| | Maladjusted backlash between bevel pinion and gear | Adjust |
| | Improper tooth contact in the mesh between bevel pinion and gear | Adjust or replace |
| | Loose bevel gear securing bolts | Replace or retighten |
| | Damaged side gear(s) or side pinion(s) | Replace |
| **Bearing noise** | (Constant noise) Deteriorated or water mixed lubricant | Repair and replenish |
| | (Constant noise) Inadequate or insufficient lubricant | Repair and replenish |
| | (Noise while coasting) Damaged bearing(s) of bevel pinion | Replace |
| | (Noise while turning) Damaged diff. side bearing(s) or axle bearing(s) | Replace |
| **Oil leakage** | Worn or damaged oil seal | Replace |
| | Excessive oil | Adjust oil level |
| | Loose differential carrier bolts | Replace or retighten |
| **2WD/4WD shifting error** | Abnormality in 4WD control system except actuator | Inspect referring to “4WD Control System Diagnostic Flow Table”. |
| | Defective actuator | Replace |

### 4WD control system diagnostic flow table

Before performing the trouble diagnosis, check that the transfer and front differential are in good condition and there is no air leakage from air hoses and the actuator. Refer to “On-Vehicle Service” in this section for air leakage.

[NOTES ON SYSTEM CIRCUIT INSPECTION]

- Be sure to read “Precautions for Electrical Circuit Service” in Section 0A before circuit inspection and observe what is written there.
- For system circuit, refer to the figure of “General Description” in this section.
- For terminal arrangement, refer to “4WD Control Circuit Inspection” in this section.

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Is RHW engine model | Go to step 3. | Go to step 2. |
| 2 | Turn ON ignition switch (but engine at stop) and check malfunction indicator lamp.<br>Does lamp light up? | Go to step 3. | A trouble has occurred at some place. Repair it referring to “Malfunction Indicator Lamp (“Check Engine” Lamp) Check” of Section 6. |

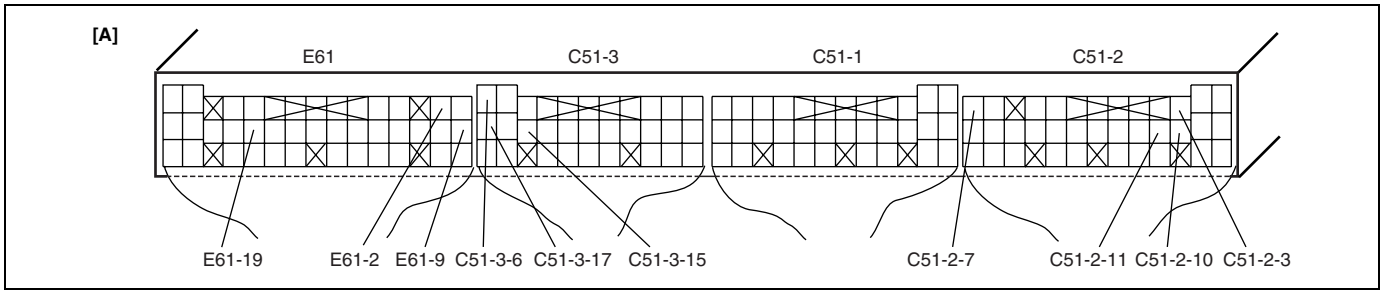
| Step | Action | Yes | No |
|---|---|---|---|
| 3 | Check axle lock actuator motor power supply<br>1) Turn ignition switch ON.<br>2) Check voltage between C51-2-3 and C51-2-10 (ground) for H27 engine model (E23-11 and E23-12 (ground) for RHW engine model). The check results should be as follows.<br>• When transfer shift lever is in N or 2H: 0 – 1 V<br>• When transfer shifted from N or 2H to 4H or 4L: 10 – 14 V<br>Is the check result satisfactory? | Go to step 4 | Go to step 5 |
| 4 | Check axle lock actuator motor power supply<br>1) Turn ignition switch ON.<br>2) Check voltage between C51-2-10 and C51-2-3 (ground) for H27 engine model (E23-12 and E23-11 (ground) for RHW engine model). The check results should be as follows.<br>• When transfer shift lever is in 4H or 4L: 0 – 1 V<br>• When transfer shifted from 4H or 4L to N or 2H: 10 – 14 V<br>Is the check result satisfactory? | Go to step 6 | Go to step 5 |
| 5 | Check 4WD switch circuit.<br>Turn ignition switch ON and check that voltage of ECM or 4WD controller terminal between terminal C51-2-11 and terminal C51-3-17 (ground) for H27 engine model (terminal E23-16 and terminal E23-10 (ground) for RHW engine model) is as follows.<br>• When transfer shift lever is in N or 2H: 10 – 14 V<br>• When transfer shift lever is in 4L or 4H: 0 – 1 V<br>Is the check result satisfactory? | Substitute a known-good ECM or 4WD controller and recheck. | Check 4WD switch (refer to Section 7D), “BLK/ORN” and “BLK” circuits of 4WD switch. |
| 6 | Check axle lock actuator and motor.<br>Check axle lock actuator and motor referring to “Axle lock actuator and motor” in this section.<br>Is the check result satisfactory? | Check “GRN/YEL” or “GRN/BLK” circuit.<br>If OK, substitute a known-good ECM or 4WD controller and recheck. | Faulty front axle lock actuator motor. |

# 4WD Control Circuit Inspection

**Voltage Check [H27 engine model]**

Check for input or output voltage (voltage between each circuit and body ground) of ECM with ECM connector connected.

| Terminal | Circuit | Wire color | Normal voltage | Condition |
|---|---|---|---|---|
| C51-2-3 | Front axle lock actuator motor 1 | GRN/YEL | 10 – 14 V | Ignition switch turned to ON position and front axle lock actuator being rotated to lock direction when transfer shifted from 2H/N to 4H/4L position. |
| | | | 0 – 1 V | Ignition switch turned to ON position and front axle lock actuator in other than above-mentioned condition. |
| C51-2-7 | Ground | BLK/GRN | 0 – 1 V | – |
| C51-2-10 | Front axle lock actuator motor 2 | GRN/BLK | 10 – 14 V | Ignition switch turned to ON position and front axle lock actuator being rotated to free direction when transfer shifted from 4H/4L to 2H/N position. |
| | | | 0 – 1 V | Ignition switch turned to ON position and front axle lock actuator in other than above-mentioned condition. |
| C51-2-11 | 4WD switch | BLK/ORN | 10 – 14 V | Ignition switch turned to ON position and transfer shifted to 2H or N position. |
| | | | 0 – 1 V | Ignition switch turned to ON position and transfer shifted to 4H or 4L position. |
| C51-3-4 | Main power supply | BLU/BLK | 0 – 1 V | Ignition switch turned to OFF position |
| | | | 10 – 14 V | Ignition switch turned to ON position |
| C51-3-6 | Ground | BLK/GRN | 0 – 1 V | – |
| C51-3-15 | Main power supply | BLU/BLK | 0 – 1 V | Ignition switch turned to OFF position |
| | | | 10 – 14 V | Ignition switch turned to ON position |
| C51-3-17 | Ground | BLK/ORN | 0 – 1 V | – |
| C51-3-20 | Ignition switch signal | BLK/WHT | 0 – 1 V | Ignition switch turned to OFF position |
| | | | 10 – 14 V | Ignition switch turned to ON position |
| E61-2 | Power source for internal memory | WHT | 10 – 14 V | – |
| E61-9 | Main power supply relay output | BLU | 10 – 14 V | Ignition switch turned to OFF position |
| | | | 0 – 1 V | Ignition switch turned to ON position |
| E61-19 | 4WD indicator | ORN/BLK | 10 – 14 V | Ignition switch turned to ON position and transfer shifted to 2H or N position |
| | | | 0 – 1 V | Ignition switch turned to ON position and transfer shifted to 4H or 4L position |

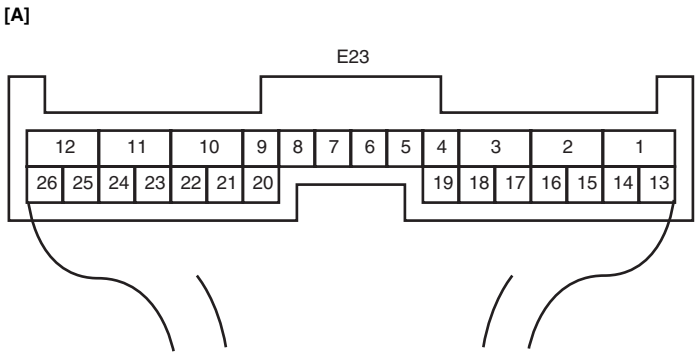



[A]: ECM: viewed from harness side

**Voltage Check [RHW engine model]**

Check for input or output voltage (voltage between each circuit and body ground) of 4WD controller with 4WD controller connector connected.

| Terminal | Circuit | Wire color | Normal voltage | Condition |
|---|---|---|---|---|
| E23-3 | Power source for internal memory | WHT | 10 – 14 V | – |
| E23-10 | Ground | BLK | 0 – 1 V | – |
| E23-11 | Front axle lock actuator motor 1 | GRN/YEL | 10 – 14 V | Ignition switch turned to ON position and front axle lock actuator being rotated to lock direction when transfer shifted from 2H/N to 4H/4L position. |
| | | | 0 – 1 V | Ignition switch turned to ON position and front axle lock actuator in other than above-mentioned condition. |
| E23-12 | Front axle lock actuator motor 2 | GRN/BLK | 10 – 14 V | Ignition switch turned to ON position and front axle lock actuator being rotated to free direction when transfer shifted from 4H/4L to 2H/N position. |
| | | | 0 – 1 V | Ignition switch turned to ON position and front axle lock actuator in other than above-mentioned condition. |
| E23-13 | Main power source | BLK/WHT | 0 – 1 V | Ignition switch turned to OFF position |
| | | | 10 – 14 V | Ignition switch turned to ON position |
| E23-16 | 4WD switch | BLK/ORN | 10 – 14 V | Ignition switch turned to ON position and transfer shifted to 2H or N position. |
| | | | 0 – 1 V | Ignition switch turned to ON position and transfer shifted to 4H or 4L position. |
| E23-23 | 4WD indicator | ORN/BLK | 10 – 14 V | Ignition switch turned to ON position and transfer shifted to 2H or N position |
| | | | 0 – 1 V | Ignition switch turned to ON position and transfer shifted to 4H or 4L position |




[A]: 4WD controller: viewed from harness side

# On-Vehicle Service

## Maintenance Service

**NOTE:**

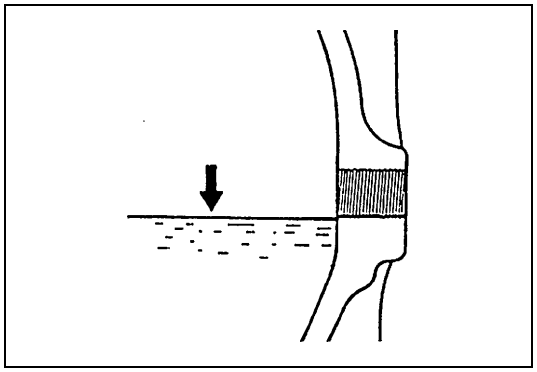
- **When having driven through water, check immediately if water has entered (if so, oil is cloudy). Water mixed oil must be changed at once.**
- **Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage and status of breather hoses.**

### Gear oil change

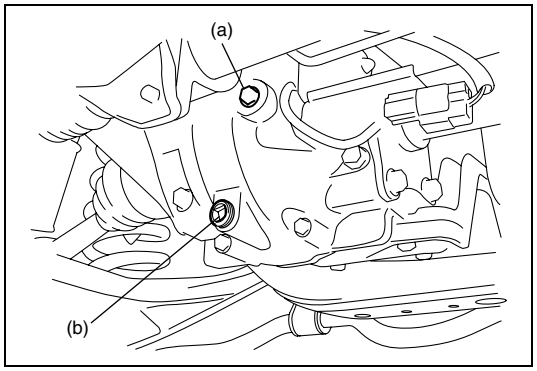
**NOTE:**

- **Hypoid gear oil must be used for differential.**
- **It is highly recommended to use SAE 75W-90 viscosity.**

1) Before oil change or inspection, be sure to stop engine and lift up vehicle horizontally.



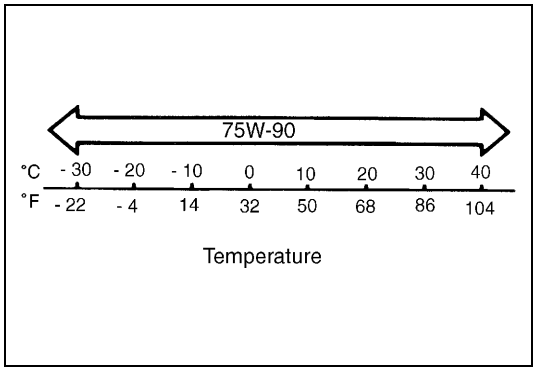
2) Check oil level and existence of leakage. If leakage is found, correct its cause.
3) Drain old oil and pour proper amount of gear oil as specified below (roughly up to level hole).




4) Apply sealant to thread of drain plug (b) and torque plugs to specification.

**Sealant 99000-31110**

**Tightening torque**
**(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)**
**(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)**



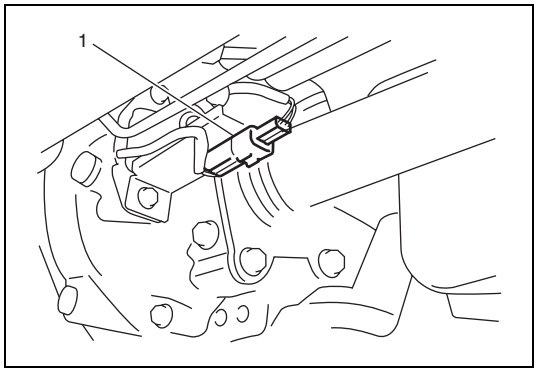

**Specified gear oil:**
**Hypoid gear oil API GL-4**
**SAE 75W-90**
**For oil viscosity, refer to left chart.**

**Oil capacity:**
**1.25 liters (2.6/2.2 US/Imp. pt)**

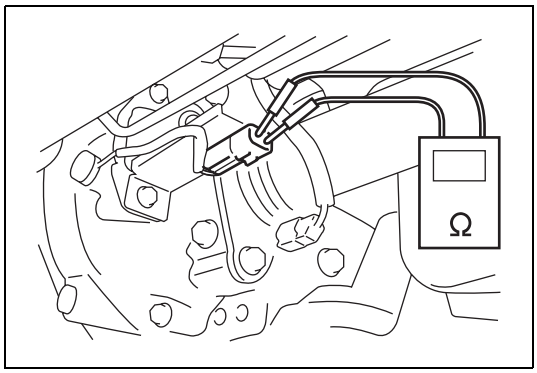
# Inspection

## Axle lock actuator and motor

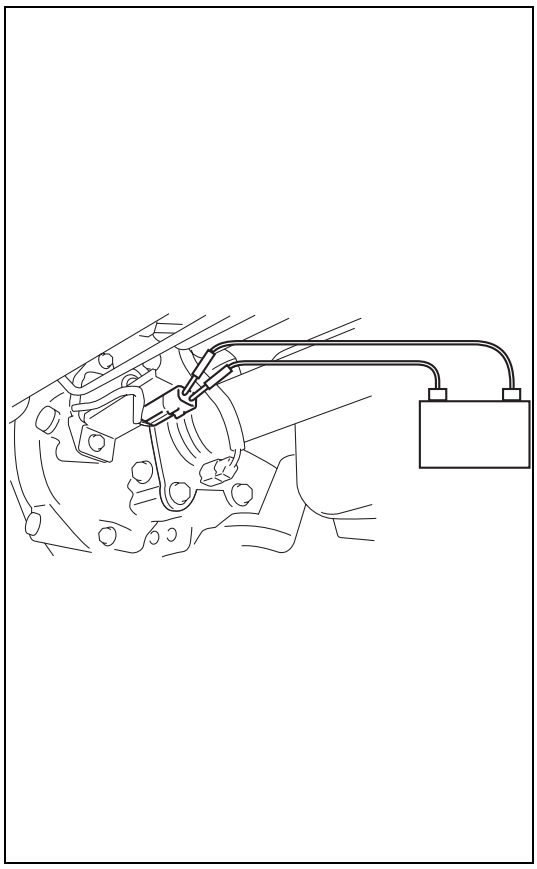
1) Disconnect negative (–) cable from battery.
2) Disconnect axle lock actuator connector (1).




3) Check axle lock actuator motor coil for continuity between terminals as shown in figure. If no continuity is found, replace axle lock actuator motor with new one.

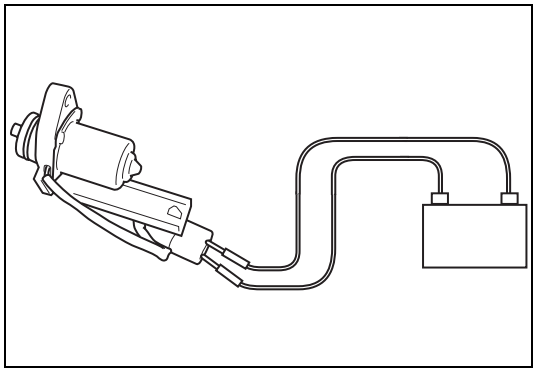



4) With the vehicle lifted so that both of the front wheels are off the ground, turn one of the front wheels by hand and check the other wheel, which should be activated as described below. If the result is not satisfactory, inspect differential assembly referring to “Inspection” of Section 7E1 in “Unit Repair Manual”.
   - Connect the battery positive (+) terminal to the “GRN/YEL” wire of the axle lock actuator motor and the negative terminal (–) to the “GRN/BLK” wire of the axle lock actuator motor for 3 to 5 seconds, check if the other front wheel turn in the direction opposite to the tire turned by hand.
   - Connect the battery positive (+) terminal to the “GRN/BLK” wire of the axle lock actuator motor and the negative terminal (–) to the “GRN/YEL” wire of the axle lock actuator motor for 3 to 5 seconds, check if the other front wheel should remain stationary while the tire being turned by hand.



**CAUTION:**
**Do not connect the battery to the axle lock actuator motor for more than 5 seconds otherwise, excessive power supply cause damage to axle lock actuator motor.**

### Axle lock actuator motor



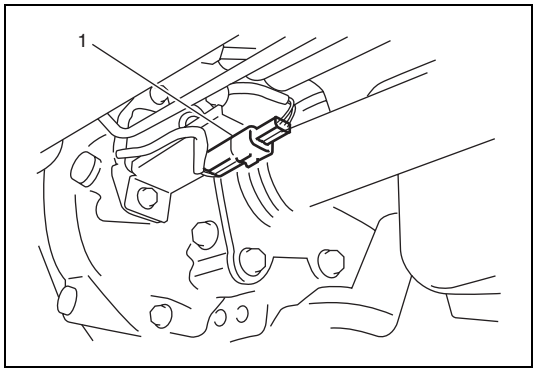
1) Remove axle lock actuator motor referring to “axle lock actuator motor” in this section.
2) Fix axle lock actuator motor using soft-jawed vise.
3) Connect battery positive (+) terminal to “GRN/YEL” wire and battery negative (–) terminal to “GRN/BLK” wire.
4) Check for smooth operation and abnormal noise.

## Removal and Installation

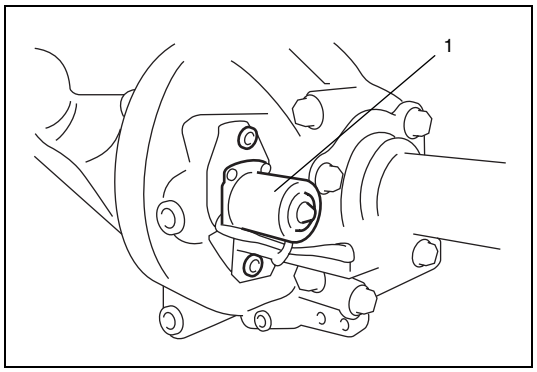
### Axle lock actuator motor

#### Removal

1) Disconnect negative (–) cable from battery.

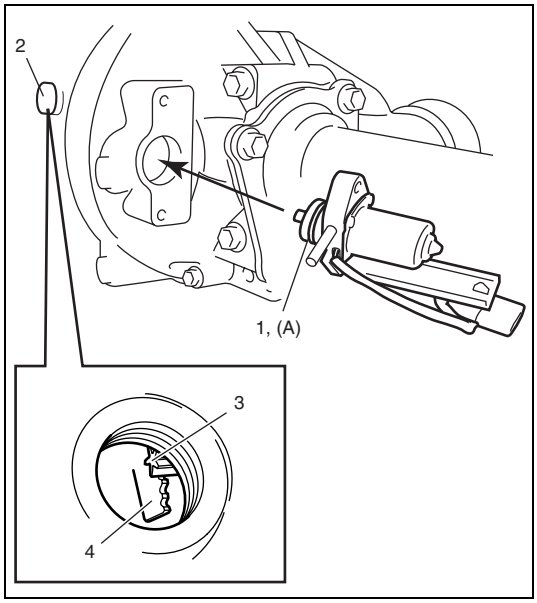



2) Disconnect axle lock actuator connector (1).




3) Remove axle lock actuator motor (1) from differential carrier cover.

## Installation

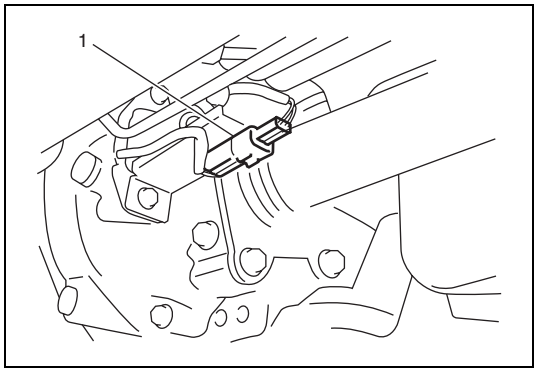



1) Apply grease to O-ring (1) and then install axle lock actuator motor onto differential carrier cover.

**"A": Grease 99000-25010**

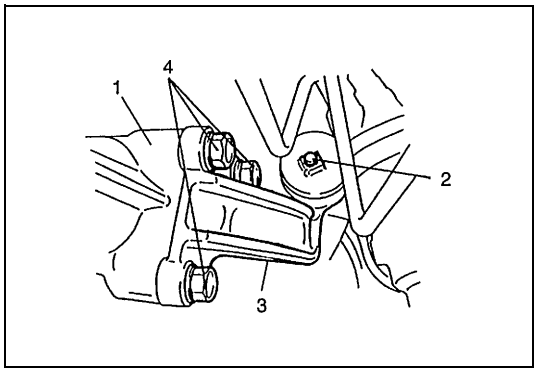
**NOTE:**

**After installing the axle lock actuator motor, check that the pinion gear (3) of the axle lock actuator motor and the gear section (4) of the actuator are engaged by removing the oil level/filler plug (2).**

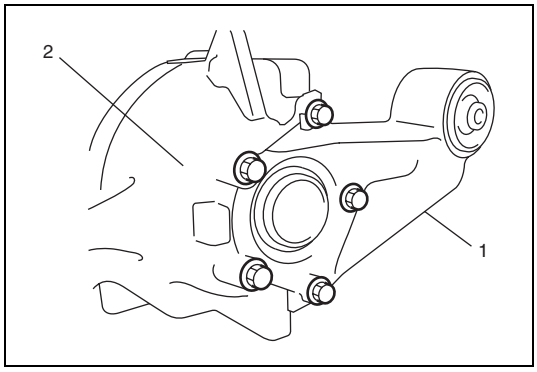



2) Connect axle lock actuator connector (1).
3) Connect negative (–) cable at battery.

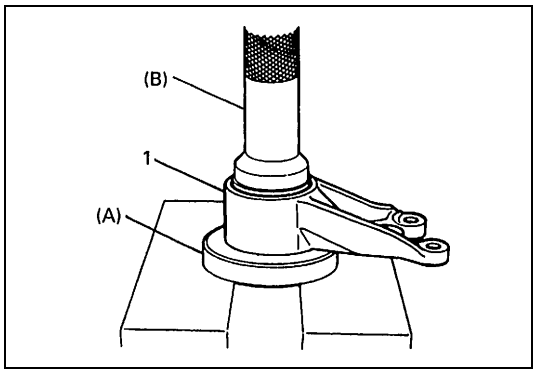
## Differential mountings




1) Lift up vehicle and turn steering wheel all way to the left.
2) Remove front mounting bracket L (3) from front drive shaft case of differential housing (1) by removing front mounting bracket bolts (4) and front mounting bolt (2).



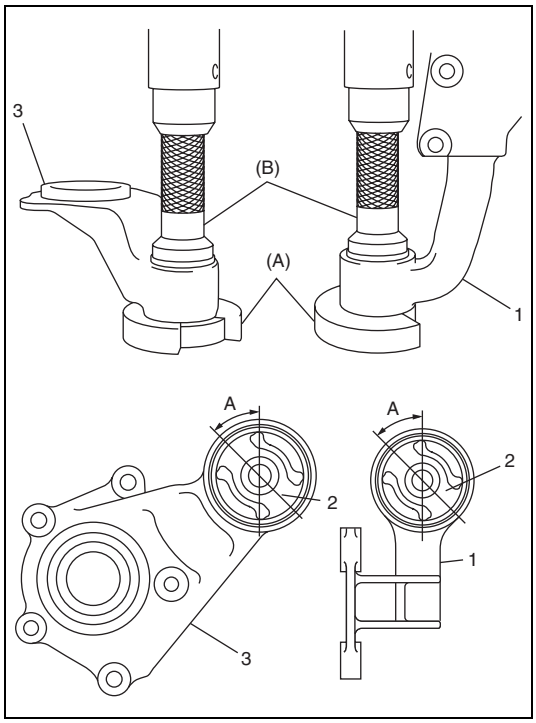

3) Dismount front differential referring to "Dismounting" in this section.
4) Remove front mounting bracket R (1) from differential housing (2).




5) Check conditions of each bush. If it is damaged or deteriorated, drive it out with special tools and hydraulic press for replacement.

**Special tool**
**(A): 09951-26010**
**(B): 09951-16080**

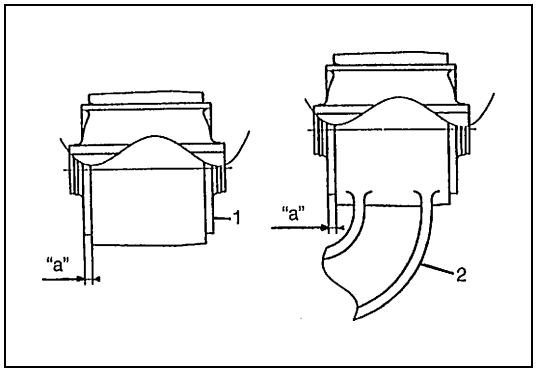
| |
|---|
| 1. Mounting bracket |




6) Position slit in each mounting bush as shown when press-fitting it.

**Special tool**
**(A): 09951-26010**
**(B): 09951-16080**

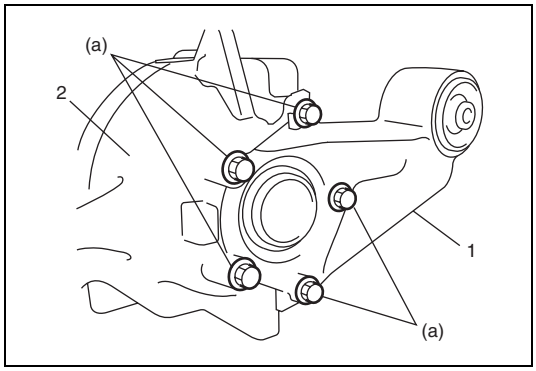
| |
|---|
| 1. Mounting bracket L |
| 2. Bush |
| 3. Mounting bracket R |
| A: Slit alignment 45° |




7) Position each bush to bracket as shown.

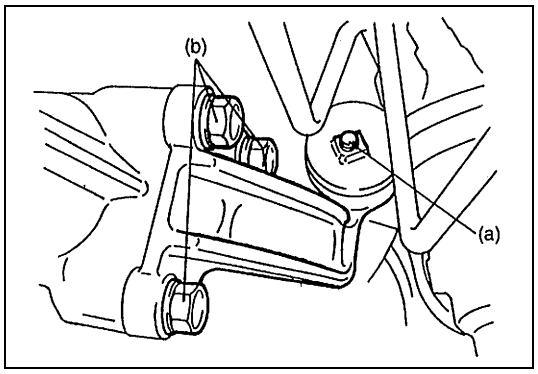
**Length "a": 3.0 mm (0.12 in.)**

| |
|---|
| 1. Mounting bracket R |
| 2. Mounting bracket L |




8) Install front mounting bracket R (1) to differential housing (2).

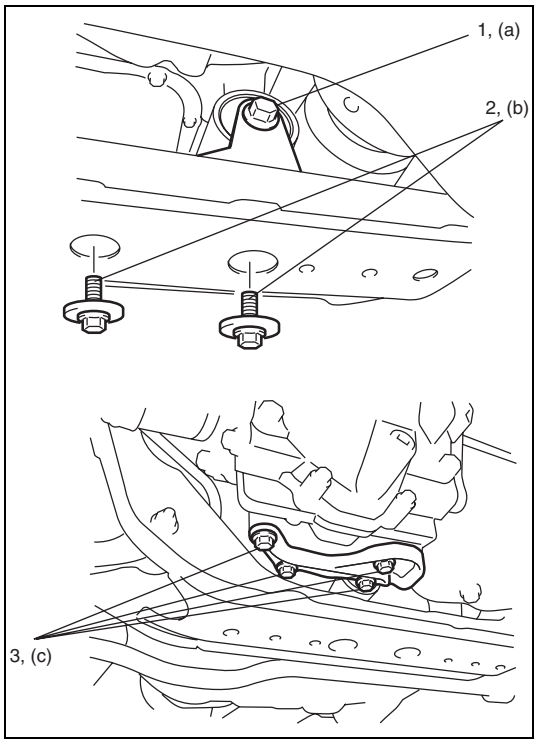
**Tightening torque**
**(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**




9) Use following torque for reinstallation.

**Tightening torque**
**(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)**
**(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)**

**Rear Mounting (For front differential carrier)**



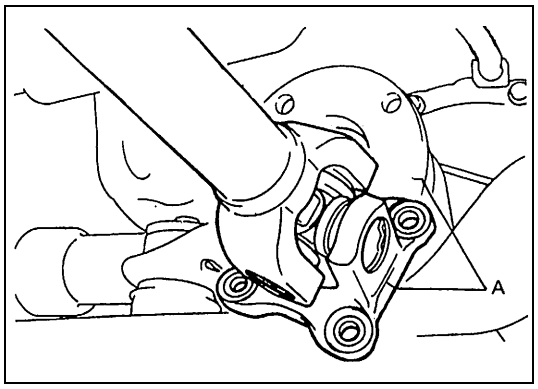

1) Lift up vehicle and remove rear mounting bracket and rear mounting bracket No.2 by removing rear mounting bolt, rear mounting bracket bolts and rear mounting bracket No.2 bolts.
2) Check mounting rubber for damage or deterioration and replace as necessary.
3) Tighten rear mounting bolt, new rear mounting bracket bolts and rear mounting bracket No.2 bolts to specified torque for reinstallation.

**Tightening torque**
**Rear mounting bolt (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)**
**Rear mounting bracket bolt (b):**
**90 N·m (9.0 kg-m, 65.0 lb-ft)**
**Rear mounting bracket No.2 bolt (c):**
**55 N·m (5.5 kg-m, 40.0 lb-ft)**

| | |
|---|---|
| 1. | Rear mounting bolt |
| 2. | Rear mounting bracket bolt |
| 3. | Rear mounting bracket No.2 bolt |

## Dismounting

1) Lift up vehicle and drain oil.
2) Disconnect axle lock actuator motor connector and breather hose from differential housing.

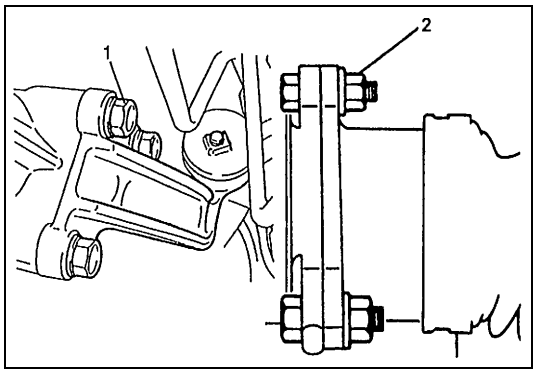



3) Before removing propeller shaft, give match marks on universal joint flange and propeller shaft as shown.
4) Remove propeller shaft flange by removing its 4 bolts and suspend it with cord or the like.

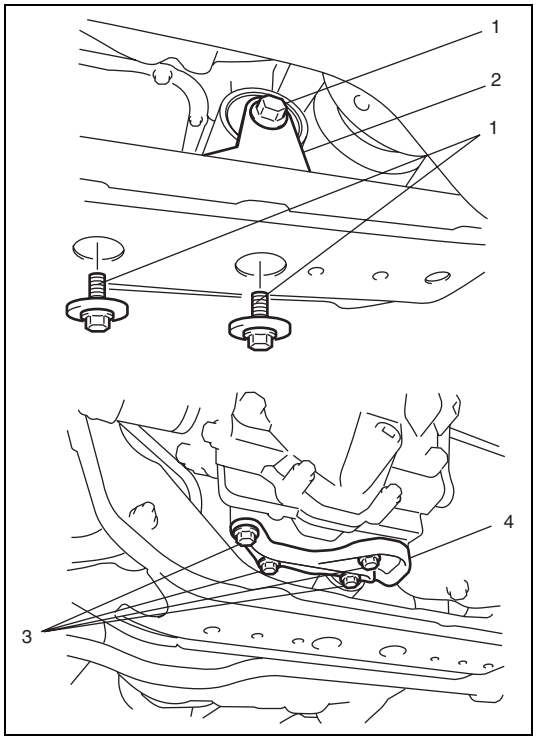
**NOTE:**

**In case of pulling out propeller shaft, transfer oil must be drained before pulling out.**

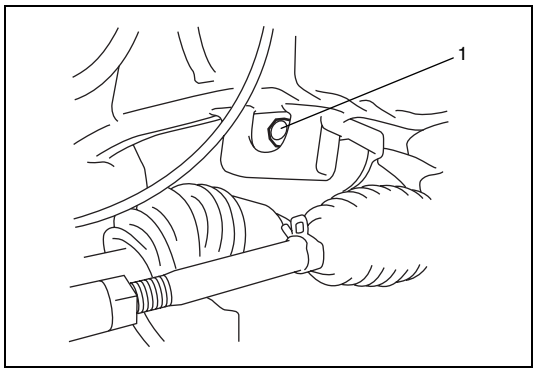
| | |
|---|---|
| A: | Match marks |



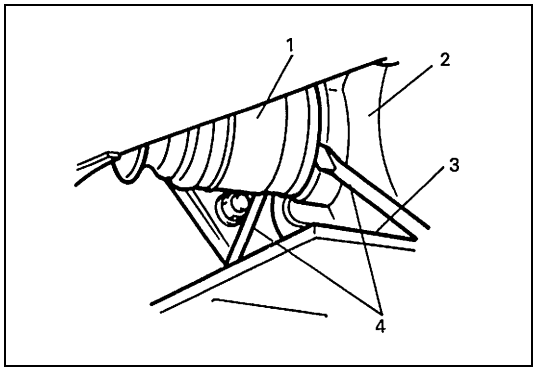

5) Remove 3 bolts (1) for front mounting bracket L and bolts and nuts (2) for drive shaft flange to set left side of differential free.




6) Remove bolts (1) and rear mounting bracket (2).
7) Remove bolts (3) and rear mounting bracket No.2 (4).




8) With differential housing assembly held with transmission jack, remove front mounting bracket R bolt (1).



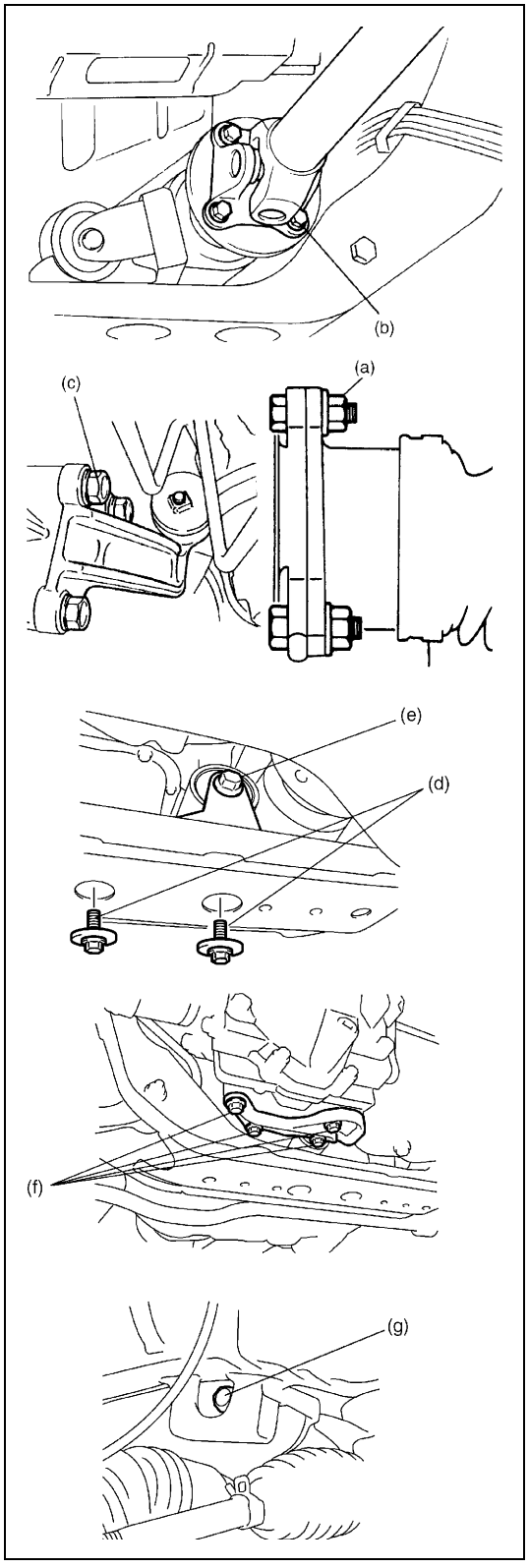

9) Using 2 large flat end rods (4) as levers, pull out right side drive shaft joint (1) from differential (2). Then, dismount housing assembly from vehicle.

**CAUTION:**

**During above work, use care not to cause damage to drive shaft boot.**

3. Transmission jack

## Remounting




For remounting, reverse dismounting procedure and use following tightening torque.

**Tightening torque**
**Front drive shaft flange bolts**
**(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Propeller shaft flange bolts**
**(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Front mounting bracket bolts**
**(c): 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Rear mounting bracket bolts**
**(d): 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Rear mounting bolt**
**(e): 85 N·m (8.5 kg-m, 61.5 lb-ft)**
**Rear mounting bracket No.2 bolts**
**(f): 85 N·m (8.5 kg-m, 61.5 lb-ft)**
**Front mounting R bolt**
**(g): 85 N·m (8.5 kg-m, 61.5 lb-ft)**

After tightening all fasteners properly, fill hypoid gear oil as specified and check tightening of plugs with specification.
Do not reuse rear mounting bracket bolt (c).

# Unit Repair

Refer to the same section of “Unit Repair Manual” mentioned in Foreword of this manual.

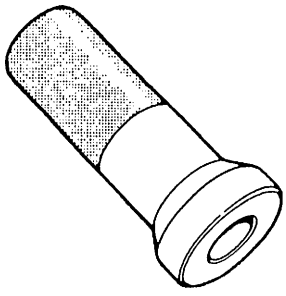
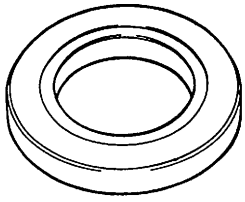
# Tightening Torque Specifications

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Differential oil level/filler plug | 23 | 2.3 | 17.0 |
| Differential oil drain plug | 23 | 2.3 | 17.0 |
| Front mounting bolts | 85 | 8.5 | 61.5 |
| Front mounting bracket bolts | 50 | 5.0 | 36.5 |
| Front drive shaft flange bolts | 50 | 5.0 | 36.5 |
| Propeller shaft flange bolts | 50 | 5.0 | 36.5 |
| Rear mounting bolt | 85 | 8.5 | 61.5 |
| Rear mounting bracket bolts | 90 | 9.0 | 65.0 |
| Rear mounting bracket No.2 bolts | 55 | 5.5 | 40.0 |
| Front mounting R bolt | 85 | 8.5 | 61.5 |

# Required Service Material

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| Grease | SUZUKI Super Grease A (99000-25010) | Axle lock actuator motor O-ring |
| Sealant | SUZUKI BOND NO. 1215 (99000-31110) | Front differential drain plug |

# Special Tool

| | |
|---|---|
|  |  |
| 09951-16080<br>Bearing installer | 09951-26010<br>Bush remover plate |

# SECTION 7F

# DIFFERENTIAL (REAR)

## CONTENTS

**General Description ..... 7F-2**
**Diagnosis ..... 7F-2**
Diagnosis Table ..... 7F-2
**On-Vehicle Service ..... 7F-3**
Precaution for Maintenance Service ..... 7F-3
Differential Gear Oil Change ..... 7F-3
Rear Differential Assembly ..... 7F-4
Dismounting ..... 7F-4
Remounting ..... 7F-4
**Unit Repair ..... 7F-5**
**Tightening Torque Specification ..... 7F-6**
**Required Service Material ..... 7F-6**

# General Description

The differential assembly using a hypoid bevel pinion and gear is installed to the rear axle. It is set in the conventional type axle housing.
The differential assembly is decisive in that the drive power is concentrated there. Therefore, use of genuine parts and specified torque is compulsory. Further, because of sliding tooth meshing with high pressure between bevel pinion and gear, it is mandatory to lubricate them by hypoid gear oil.

# Diagnosis

## Diagnosis Table

| Condition | Possible Cause | Correction |
|---|---|---|
| **Gear noise** | Deteriorated or water mixed lubricant | Repair and replenish. |
| | Inadequate or insufficient lubricant | Repair and replenish. |
| | Maladjusted backlash between drive bevel pinion and gear | Adjust as prescribed. |
| | Improper tooth contact in the mesh between drive bevel pinion and gear | Adjust or replace. |
| | Loose drive bevel gear securing bolts | Replace or retighten. |
| | Damaged differential gear(s) or differential pinion(s) | Replace. |
| **Bearing noise** | (Constant noise) Deteriorated or water mixed lubricant | Repair and replenish. |
| | (Constant noise) Inadequate or insufficient lubricant | Repair and replenish. |
| | (Noise while coasting) Damaged bearing(s) of drive bevel pinion | Replace. |
| | (Noise while turning) Damaged differential side bearing(s) or axle bearing(s) | Replace. |
| **Oil leakage** | Clogged breather plug | Clean. |
| | Worn or damaged oil seal | Replace. |
| | Excessive oil | Adjust oil level. |

# On-Vehicle Service

## Precaution for Maintenance Service

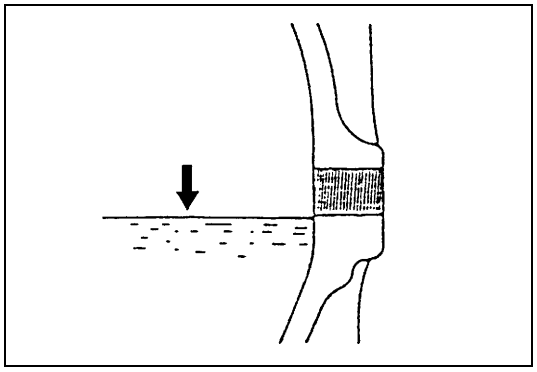
- When having driven through water, check immediately if water has entered (if so, oil is cloudy). Water mixed oil must be changed at once.
- Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage and status of breather hoses.

## Differential Gear Oil Change

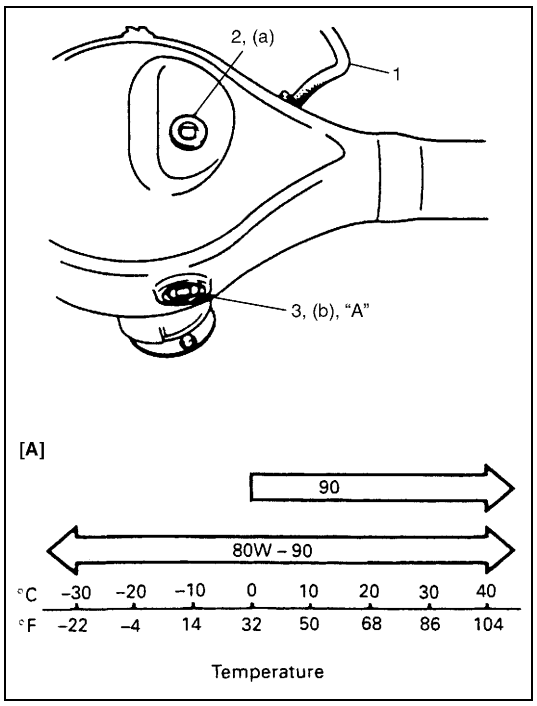
**NOTE:**

- **Hypoid gear oil must be used for differential.**
- **It is highly recommended to use SAE 80W-90 viscosity.**

1) Before oil change or inspection, be sure to stop engine and lift up vehicle horizontally.
2) Check oil level and existence of leakage. If leakage is found, correct its cause.



3) Drain old oil and pour proper amount of gear oil as specified (roughly up to level hole).




4) Apply sealant to thread of drain plug (3), and torque drain plug (3) and level/filler plugs (2) to specified torque.

**"A": Sealant 99000-31260**

**Tightening torque**
**Differential oil level/filler plug**
**(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)**
**Differential oil drain plug**
**(b): 28 N·m (2.8 kg-m, 20.5 lb-ft)**

**Hypoid gear oil:**
**API GL-5, SAE 80W-90 or 90**

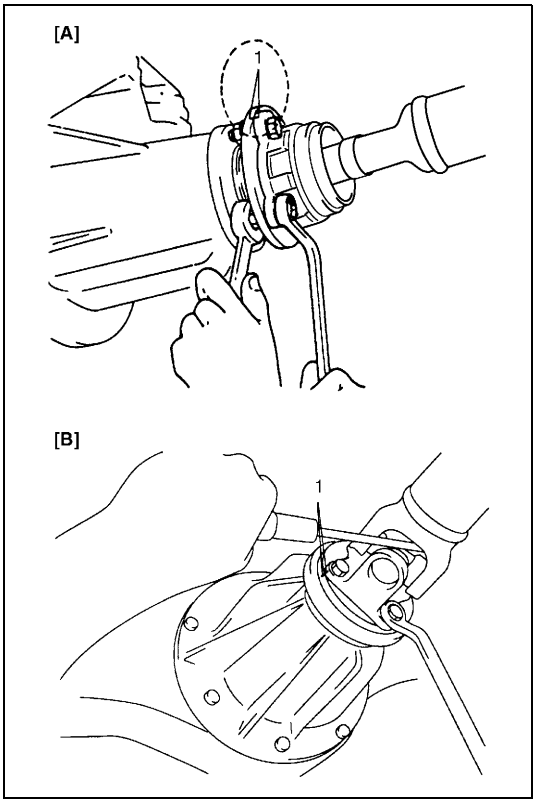
**Oil capacity:**
**2.5 liters (5.3/4.4 US/Imp. pt.)**

| | |
|---|---|
| 1. | Breather hose |
| [A]: | Viscosity chart SAE |

# Rear Differential Assembly

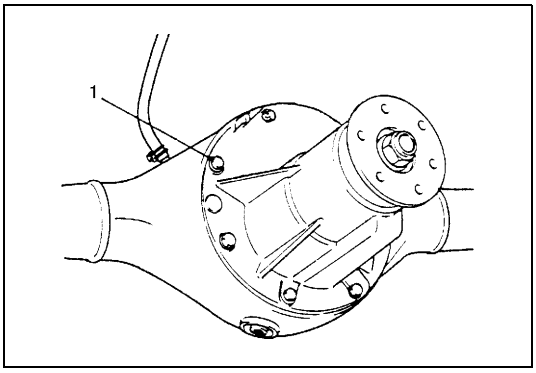
## Dismounting

1) Drain differential oil referring to “Differential Gear Oil Change” in this section.
2) Remove right and left rear axle shafts referring to “Rear Axle Shaft and Wheel Bearing” in Section 3E.



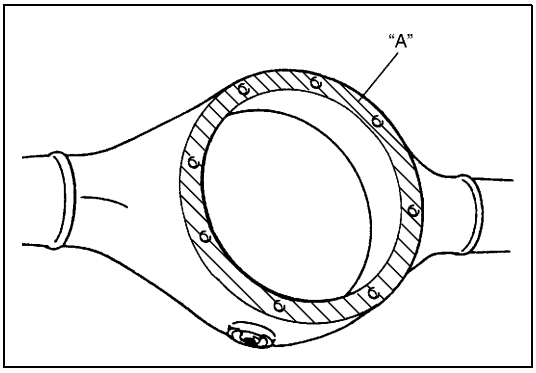

3) Before removing propeller shaft, give match marks (1) on joint flange and propeller shaft as shown.
4) Remove propeller shaft by removing its flange bolts and nuts.

| |
|---|
| [A]: H27 engine model |
| [B]: RHW engine model |



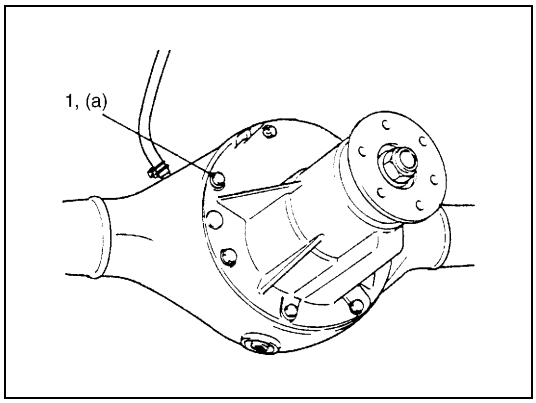

5) Remove differential assembly by removing its 8 fastening bolts (1).

## Remounting



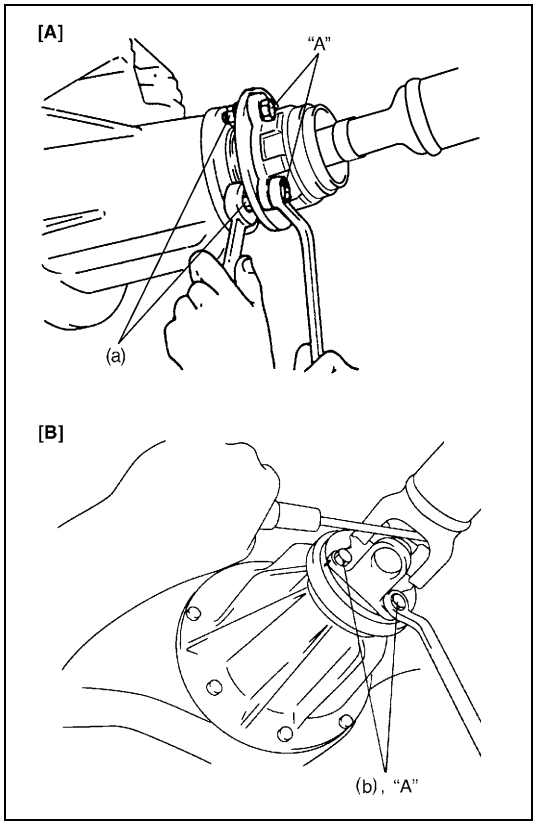

1) Clean mating surfaces of rear axle and differential assembly and apply sealant to axle housing side evenly.

**“A”: Sealant 99000-31260**




2) Install differential assembly to axle housing and fix it with bolts (1) tightened to specified torque.

**Tightening torque**
**Differential carrier bolt**
**(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)**




3) Install propeller shaft to joint flange aligning match marks and torque flange nuts to specification. Apply thread lock cement to thread part of bolt if reused.

**"A": Cement 99000-32110**

**Tightening torque**
**Propeller shaft flange nut**
**(a): 60 N·m (6.0 kg-m, 43.5 lb-ft) for H27 engine model**
**(b): 55 N·m (5.5 kg-m, 40.0 lb-ft) for RHW engine model**

| |
|---|
| [A]: H27 engine model |
| [B]: RHW engine model |

4) Install right and left rear axle shafts referring to "Rear Axle Shaft and Wheel Bearing" in Section 3E.
5) Fill differential oil referring to "Differential Gear Oil Change" in this section.

# Unit Repair

Refer to the same section of "Unit Repair Manual" mentioned in Foreword of this manual.

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Differential oil level/filler plug | 50 | 5.0 | 36.5 |
| Differential oil drain plug | 28 | 2.8 | 20.5 |
| Propeller shaft flange nut for H27 engine model | 60 | 6.0 | 43.5 |
| Propeller shaft flange nut for RHW engine model | 55 | 5.5 | 40.0 |
| Differential carrier bolt | 55 | 5.5 | 40.0 |

# Required Service Material

| Material | Recommended SUZUKI product (Part Number) | Use |
|---|---|---|
| Sealant | SUZUKI BOND NO. 1217G (99000-31260) | • Rear differential drain plug<br>• Mating surface of differential housing<br>• Mating surface of rear axle housing |
| Thread lock cement | THREAD LOCK 1322 (99000-32110) | • Propeller shaft flange bolt |

# SECTION 8B

# LIGHTING SYSTEM

**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.**
- **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).**

**NOTE:**

**For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**

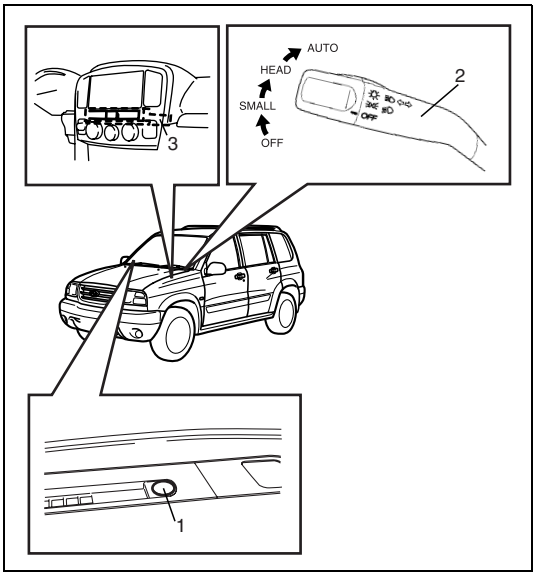
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# General Description

## Auto-On Headlights System (If Equipped)




The auto-on headlights system works as follows.
With the ignition switch turned ON, the lighting switch turned to the “AUTO” position and the parking brake released, when it becomes dark the headlights and clearance lights are turned ON and when it becomes bright, both of these lights are turned OFF.

| | |
|---|---|
| 1. | Auto-on headlight sensor |
| 2. | Headlight switch |
| 3. | BCM |

# Diagnosis

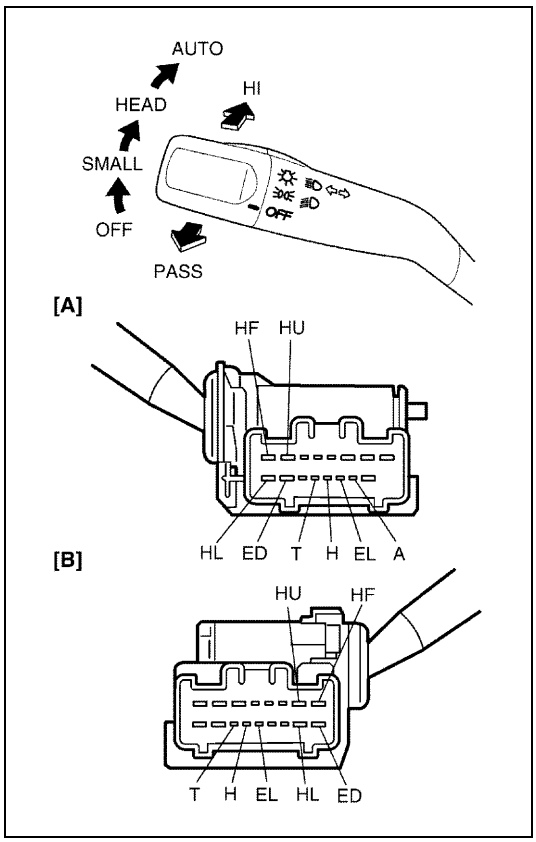
## Auto-On Headlights System (If Equipped)

| Condition | Possible Cause | Correction |
|---|---|---|
| **Auto-on headlights system does not operate even after darkened or lightened** | Auto-on light sensor faulty | Check Auto-on sensor referring to “Auto-On Headlight Sensor (If Equipped)” in this section. |
| | Headlight switch faulty | Check headlight switch referring to “Headlight Switch (in Lighting Switch)” in this section. |
| | Headlight relay faulty | Check headlight relay referring to “Headlight and Clearance Light Relays” in this section. |
| | Headlight diode faulty | Check headlight diode referring to “Headlight Diode” in this section. |
| | Parking brake switch or its circuit faulty | Repair or replace switch. |
| | Wiring or grounding faulty | Repair as necessary. |
| | BCM faulty | Check BCM referring to “Inspection of BCM and Its Circuits” in Section 8H or 8H1. |

# On-Vehicle Service

## Headlight Switch (in Lighting Switch)

### Inspection




Use a circuit tester to check the continuity at each switch position as shown in the following table.
If check result is not as specified, replace.

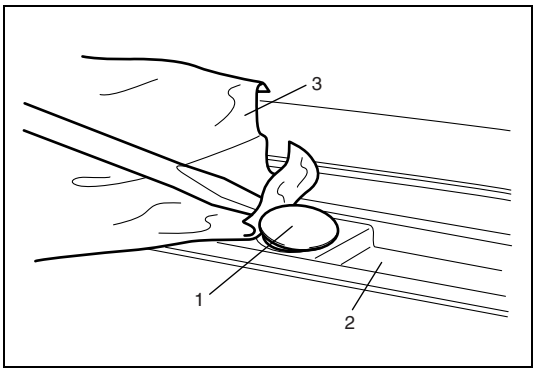
| Switch Position \ Terminal | | ED | HL | HU | HF | EL | T | H | A |
|---|---|---|---|---|---|---|---|---|---|
| OFF | LO | ○ | ○ | | | | | | |
| | PASS | ○ | | ○ | ○ | | | | |
| | HI | ○ | | ○ | | | | | |
| CLEARANCE | LO | ○ | ○ | | | | | | |
| | PASS | ○ | | ○ | ○ | ○ | ○ | | |
| | HI | ○ | | ○ | | | | | |
| HEAD | LO | ○ | ○ | | | | | | |
| | PASS | ○ | | ○ | ○ | ○ | ○ | ○ | |
| | HI | ○ | | ○ | | | | | |
| AUTO | LO | ○ | ○ | | | | | | |
| | PASS | ○ | | ○ | ○ | ○ | | | ○ |
| | HI | ○ | | ○ | | | | | |

| |
|---|
| [A]: LH steering vehicle |
| [B]: RH steering vehicle |

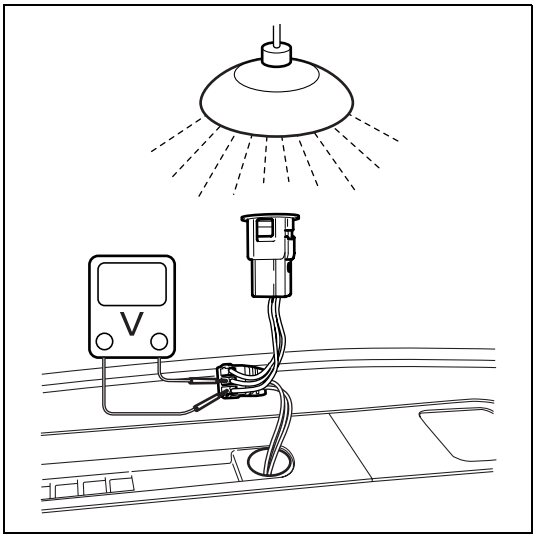
## Auto-On Headlight Sensor (If Equipped)

### Inspection

1) Disconnect negative (–) cable at battery.




2) Remove auto-on headlight sensor (1) located on the passenger side of the dashboard (2). Be careful not to damage the sensor (1) and dashboard by using rag (3).




3) Measure voltage between white wire terminal and black wire terminal at the following condition.
   If measured voltage is out of specification, replace sensor.

**Auto-on headlight sensor voltage specifications**
**Cover the sensor lens with hand: 0.4 V**
**Light the sensor lens with incandescent lamp 100 W: 3 – 4.5 V**

## SECTION 8C

# INSTRUMENTATION/DRIVER INFORMATION

**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.**
- **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).**

**NOTE:**

- **For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**
- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**

8C

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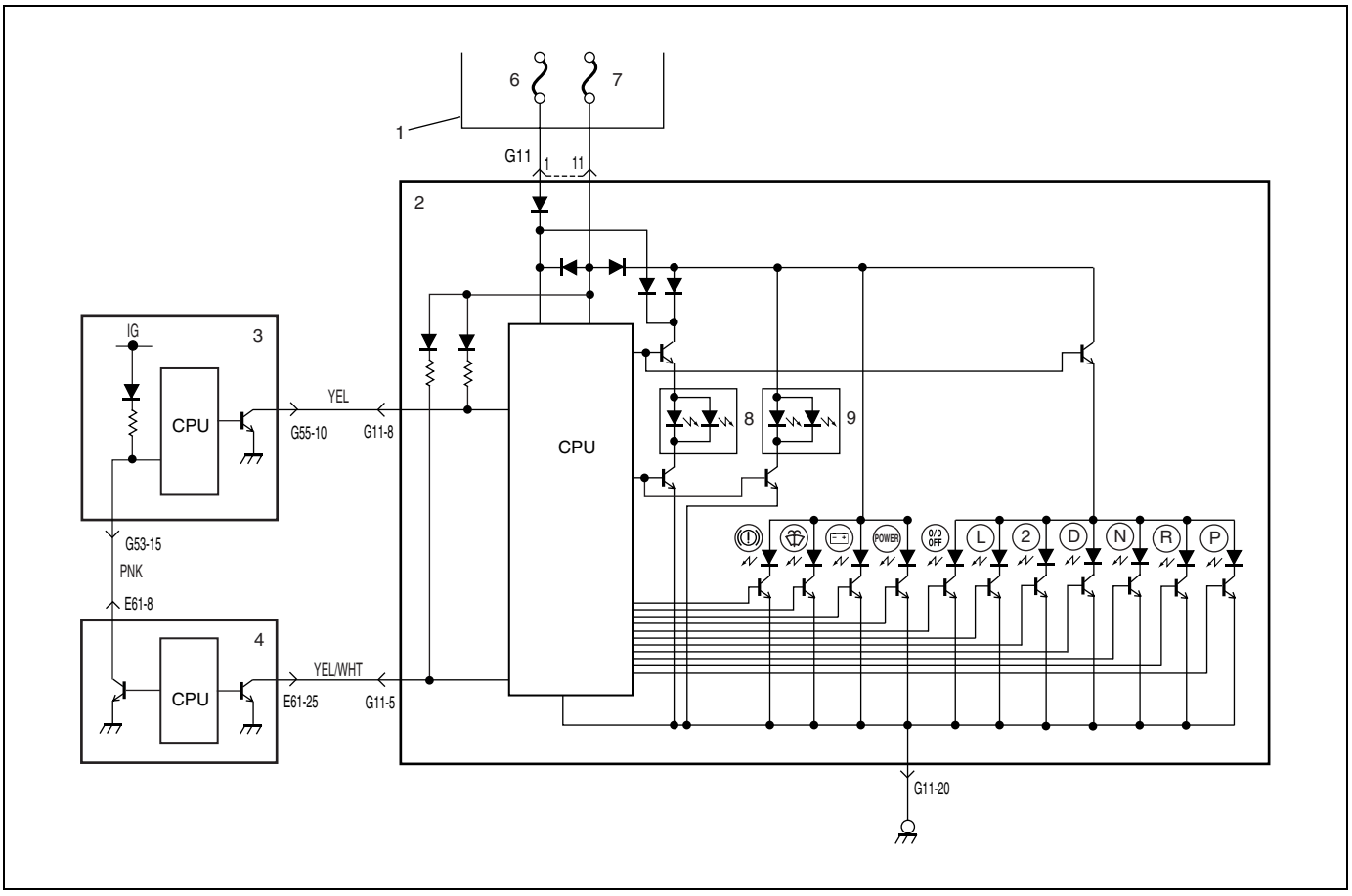

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# General Description

## PCM-BCM (4 A/T Model Only) and BCM-METER Signal Circuit Construction

- PCM-BCM signal (A/T model only) is a voltage signal (0 – 12 volts) which is outputted from PCM to BCM through the signal circuit, based on A/T selector position signal, O/D OFF switch position signal and A/T mode switch position signal from each switches.
- BCM-METER signal is a voltage signal (0 – 12 volts) which is outputted from BCM to combination meter through the signal circuit, based on charging system warning signal, Brake indicator signal, windshield washer level switch signal, light switch cognition, A/T selector position signal (A/T model only), O/D OFF switch position signal (A/T model only) and A/T mode switch position signal (A/T model only) from each switches and controller.
- CPU in combination meter operates charging system warning indicator, Brake indicator, washer level indicator, A/T selector position indicator (A/T model only), O/D OFF indicator (A/T model only) and POWER indicator (A/T model only) by analyzing BCM-METER signal.
- If CPU in combination meter detects a malfunction of PCM-BCM signal, it makes each lights in combination meter turn OFF or flashing at the same time as follows when ignition switch is turned to ON position and warn the driver of such occurrence of trouble.
  - O/D OFF indicator light keep flashing.
  - All A/T selector position indicators turn OFF.
  - POWER indicator turns OFF.
- If CPU in combination meter detects a malfunction of BCM-METER signal, it makes each lights in combination meter turn OFF or flashing at the same time as follows when ignition switch is turned to ON position and warn the driver of such occurrence of trouble.
  - Charging system warning indicator keep flashing
  - Brake indicator keep flashing
  - Washer level indicator keep flashing
  - O/D OFF indicator light keep flashing (A/T model only)
  - All A/T selector position indicators turn OFF (A/T model only)
  - POWER indicator turns OFF (A/T model only)

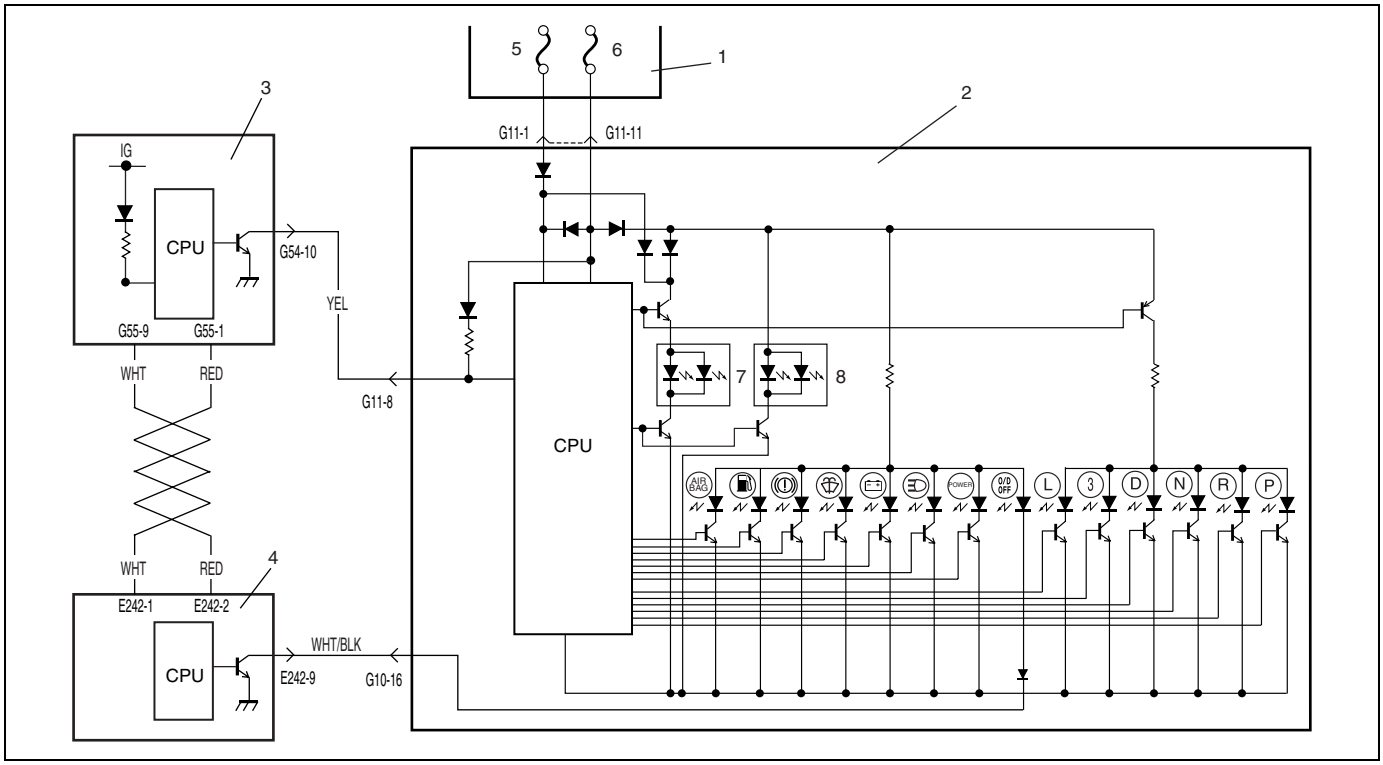



| | | | | |
|---|---|---|---|---|
| 1. Circuit fuse box | 3. BCM | 5. CPU | 7. METER fuse | 9. Meter pointer |
| 2. Combination meter | 4. ECM (PCM) | 6. RADIO DOME fuse | 8. Back light | |

## TCM-BCM (5 A/T Model Only) and BCM-METER Signal Circuit Construction

- TCM-BCM signal (A/T model only) is a voltage signal (1.6 – 2.5 volts and 2.5 – 3.6 volts) which is outputted from TCM to BCM through the CAN communication line (low and high), based on A/T selector position signal and A/T mode switch position signal from each switches.
- BCM-METER signal is a voltage signal (0 – 12 volts) which is outputted from BCM to combination meter through the signal circuit, based on charging system warning signal, DRL indicator signal, Brake indicator signal, windshield washer level switch signal, light switch cognition, A/T selector position signal (A/T model only) and A/T mode switch position signal (A/T model only) from each switches and controller.
- CPU in combination meter operates charging system warning indicator, DRL indicator, Brake indicator, washer level indicator, A/T selector position indicator (A/T model only) and POWER indicator (A/T model only) by analyzing BCM-METER signal.
- If CPU in combination meter detects a malfunction of TCM-BCM signal, it makes each lights in combination meter turn OFF or flashing at the same time as follows when ignition switch is turned to ON position and warn the driver of such occurrence of trouble.
  - All A/T selector position indicators turn OFF.
  - POWER indicator turns OFF.
- If CPU in combination meter detects a malfunction of BCM-METER signal, it makes each lights in combination meter turn OFF or flashing at the same time as follows when ignition switch is turned to ON position and warn the driver of such occurrence of trouble.
  - Charging system warning indicator keep flashing
  - DRL indicator keep flashing
  - Brake indicator keep flashing
  - Washer level indicator Keep flashing

– All A/T selector position indicators turn OFF (A/T model only)
– POWER indicator turns OFF (A/T model only)



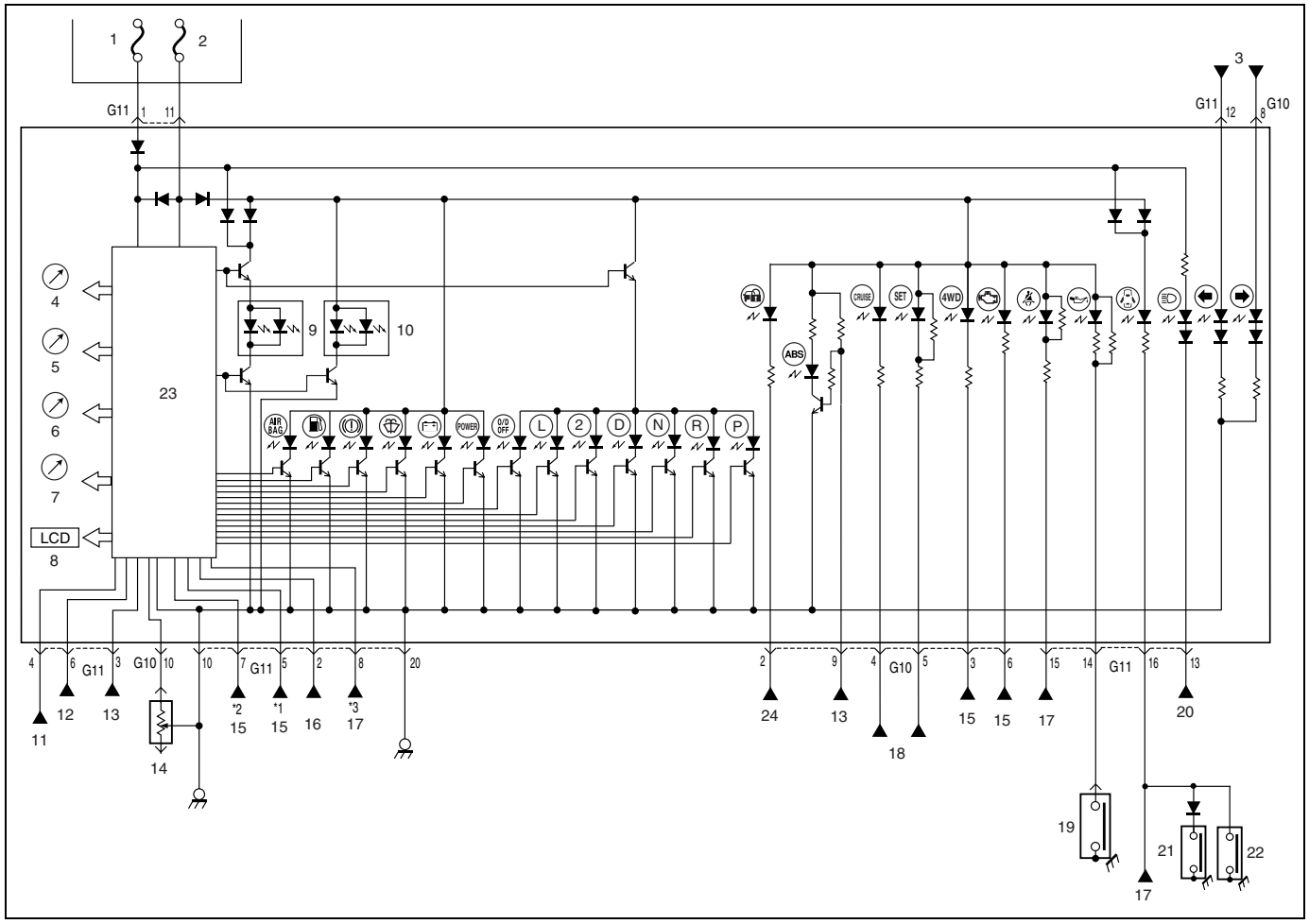

| | | | |
|---|---|---|---|
| 1. Circuit fuse box | 3. BCM | 5. RADIO DOME fuse | 7. Back light |
| 2. Combination meter | 4. TCM | 6. METER fuse | 8. Meter pointer |

# Combination Meter

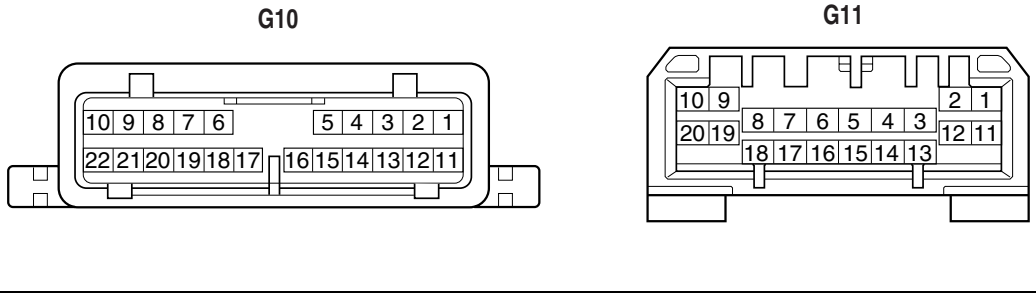
## Combination meter internal circuits and couplers for type A

**NOTE:**

**Terminal arrangement of coupler viewed from harness side.**




| | | | | |
|---|---|---|---|---|
| 1. RADIO DOME fuse | 7. ECT meter | 13. ABS control module | 19. Oil pressure switch | *1. Serial communication |
| 2. METER fuse | 8. ODO-TRIP | 14. Fuel level gauge | 20. Lighting switch | *2. Engine revolution signal |
| 3. Turn signal relay | 9. Back light | 15. ECM | 21. Driver side door switch | *3. Serial communication |
| 4. Tachometer | 10. Meter pointer | 16. SDM | 22. Except driver side door switch | |
| 5. Speedometer | 11. Illumination controller | 17. BCM | 23. CPU | |
| 6. Fuel meter | 12. VSS | 18. Cruise control module | 24. Immobilizer control module | |

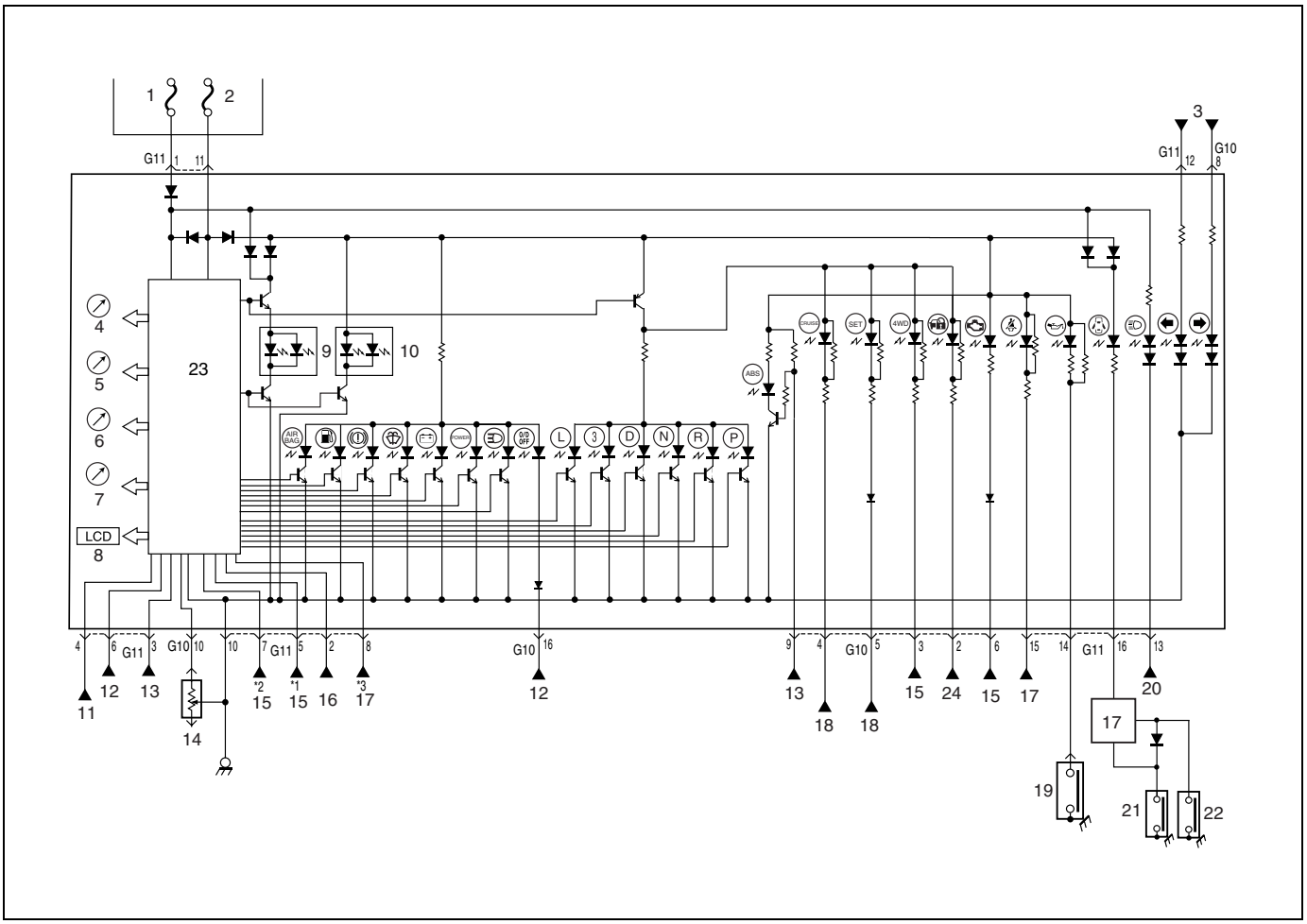


| Terminal | Wire Color | Circuit |
|---|---|---|
| G10-1 | – | – |
| G10-2 | PPL | To Immobilizer control module (if equipped) |
| G10-3 | ORN/BLK | To ECM (PCM) (4WD indicator control signal) |
| G10-4 | LT GRN/WHT | To Cruise control module (CRUISE indicator control signal) (if equipped) |
| G10-5 | GRY/YEL | To Cruise control module (SET indicator control signal) (if equipped) |
| G10-6 | PPL/YEL | To ECM (PCM) (Malfunction indicator lamp control signal) |
| G10-7 | – | – |
| G10-8 | GRN/YEL | To combination switch (Turn R signal indicator control signal) |
| G10-9 | BLU/ORN | To ABS control module (ABS indicator control signal) |
| G10-10 | BLU/WHT | To fuel level gauge |
| G10-11 | – | – |
| G10-12 | – | – |
| G10-13 | – | – |
| G10-14 | – | – |
| G10-15 | PPL/RED | To data link connector |
| G10-16 | – | – |
| G10-17 | – | – |
| G10-18 | – | – |
| G10-19 | – | – |
| G10-20 | – | – |
| G10-21 | – | – |
| G10-22 | – | – |
| G11-1 | WHT | To RADIO DOME fuse (+BB) |
| G11-2 | BLU | To SDM |
| G11-3 | ORN | To ABS control module (EBD warning indictor control signal) |
| G11-4 | RED/GRN | To illumination controller (if equipped) |
| G11-5 | YEL/WHT | To ECM (PCM) (ECT meter signal) |
| G11-6 | BLU/YEL | To VSS |
| G11-7 | BRN | To ECM (PCM) (Tachometer signal) |
| G11-8 | YEL | To BCM (Brake fluid level, Parking brake, Charge warning, Washer level, POWER, O/D OFF, A/T selector position indicator control and Light switch cognition signal) |
| G11-9 | – | – |
| G11-10 | BLK/YEL | To Fuel level gauge ground |
| G11-11 | BLK/WHT | To METER fuse (IG1) |
| G11-12 | GRN/RED | To combination switch (Turn L signal indicator control signal) |
| G11-13 | RED | To combination switch (High beam indicator control signal) |
| G11-14 | YEL/BLK | To oil pressure switch |
| G11-15 | GRN | To BCM (Driver side seat belt reminder control signal) |
| G11-16 | BLK/RED | To door switch |
| G11-17 | – | – |
| G11-18 | – | – |
| G11-19 | – | – |
| G11-20 | BLK | To ground |

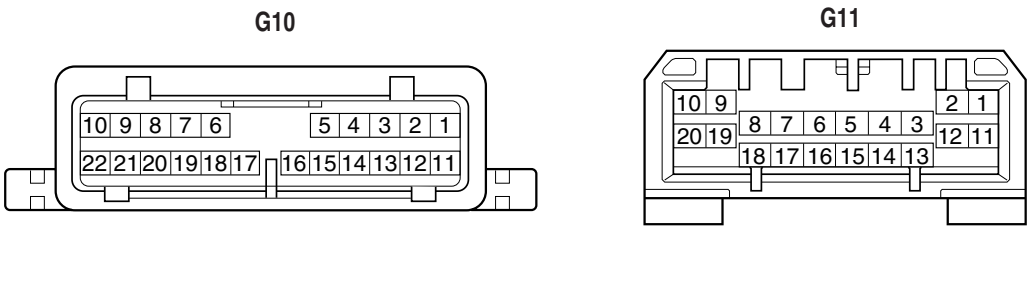
## Combination meter internal circuits and couplers for type B

**NOTE:**

**Terminal arrangement of coupler viewed from harness side.**




| | | | | |
|---|---|---|---|---|
| 1. RADIO DOME fuse | 7. ECT meter | 13. ABS control module | 19. Oil pressure switch | *1. Serial communication |
| 2. METER fuse | 8. ODO-TRIP | 14. Fuel level gauge | 20. Lighting switch | *2. Engine revolution signal |
| 3. Turn signal relay | 9. Back light | 15. ECM | 21. Driver side door switch | *3. Serial communication |
| 4. Tachometer | 10. Meter pointer | 16. SDM | 22. Except driver side door switch | |
| 5. Speedometer | 11. Illumination controller | 17. BCM | 23. CPU | |
| 6. Fuel meter | 12. TCM | 18. Cruise control module | 24. Immobilizer control module | |

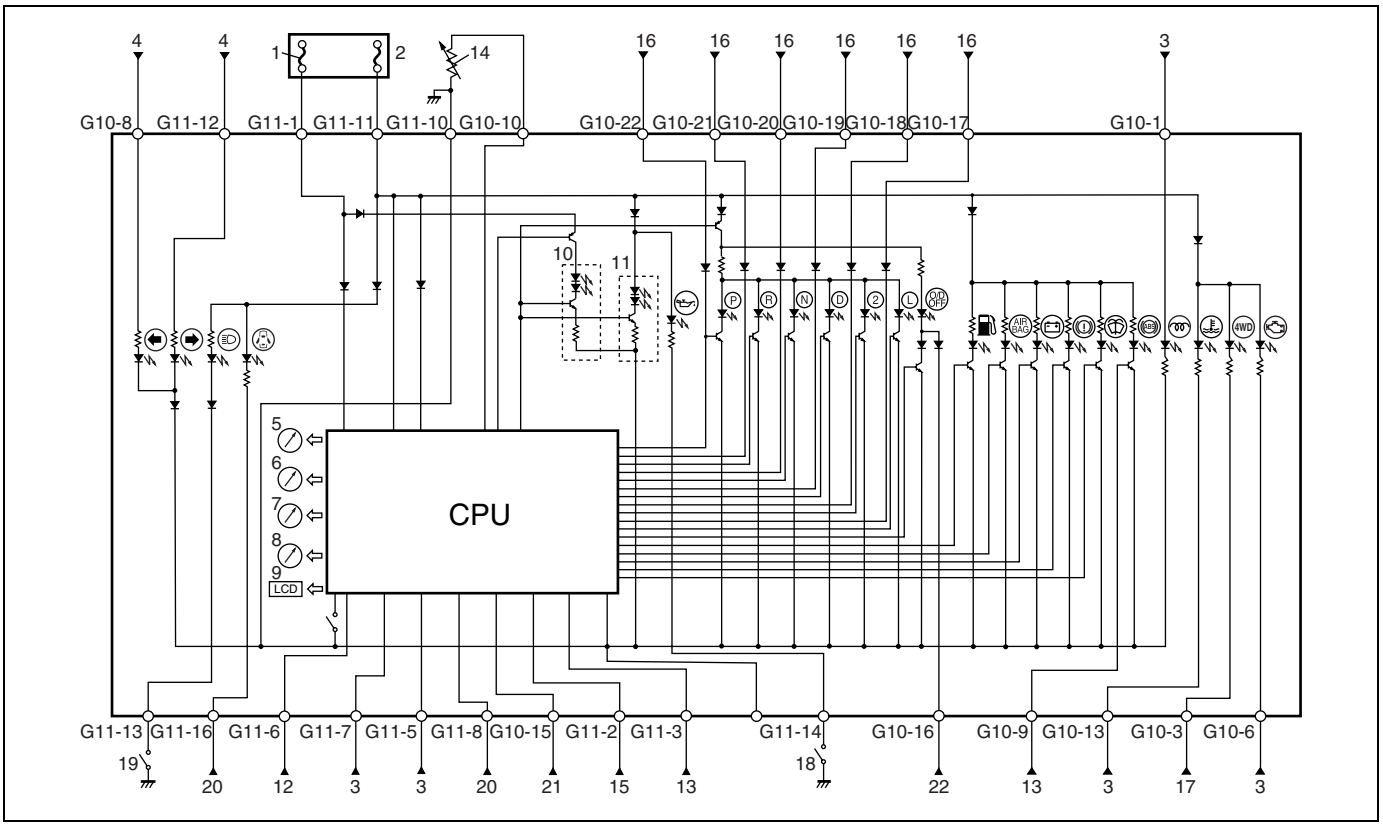


| Terminal | Wire Color | Circuit |
|---|---|---|
| G10-1 | – | – |
| G10-2 | PPL | To Immobilizer control module (if equipped) |
| G10-3 | ORN/BLK | To ECM (4WD indicator control signal) |
| G10-4 | LT GRN/WHT | To Cruise control module (CRUISE indicator control signal) (if equipped) |
| G10-5 | GRY/YEL | To Cruise control module (SET indicator control signal) (if equipped) |
| G10-6 | PPL/YEL | To ECM (Malfunction indicator lamp control signal) |
| G10-7 | – | – |
| G10-8 | GRN/YEL | To combination switch (Turn R signal indicator control signal) |
| G10-9 | BLU/ORN | To ABS control module (ABS indicator control signal) |
| G10-10 | BLU/WHT | To fuel level gauge |
| G10-11 | – | – |
| G10-12 | – | – |
| G10-13 | – | – |
| G10-14 | – | – |
| G10-15 | PPL/RED | To data link connector |
| G10-16 | WHT/BLK | To TCM (O/D OFf indicator control signal) |
| G10-17 | – | – |
| G10-18 | – | – |
| G10-19 | – | – |
| G10-20 | – | – |
| G10-21 | – | – |
| G10-22 | – | – |
| G11-1 | WHT | To RADIO DOME fuse (+BB) |
| G11-2 | BLU | To SDM |
| G11-3 | ORN | To ABS control module (EBD warning indictor control signal) |
| G11-4 | RED/GRN | To illumination controller (if equipped) |
| G11-5 | YEL/WHT | To ECM (ECT meter signal) |
| G11-6 | BLU/YEL | To TCM (VSS indicator control signal) |
| G11-7 | BRN | To ECM (Tachometer signal) |
| G11-8 | YEL | To BCM (Brake fluid level, Parking brake, Charge warning, Washer level, POWER, A/T selector position indicator control and Light switch cognition signal) |
| G11-9 | – | – |
| G11-10 | BLK/YEL | To Fuel level gauge ground |
| G11-11 | BLK/WHT | To METER fuse (IG1) |
| G11-12 | GRN/RED | To combination switch (Turn L signal indicator control signal) |
| G11-13 | RED | To combination switch (High beam indicator control signal) |
| G11-14 | YEL/BLK | To oil pressure switch |
| G11-15 | GRN | To BCM (Driver side seat belt reminder control signal) |
| G11-16 | BLK/RED | To door switch |
| G11-17 | – | – |
| G11-18 | – | – |
| G11-19 | – | – |
| G11-20 | – | – |

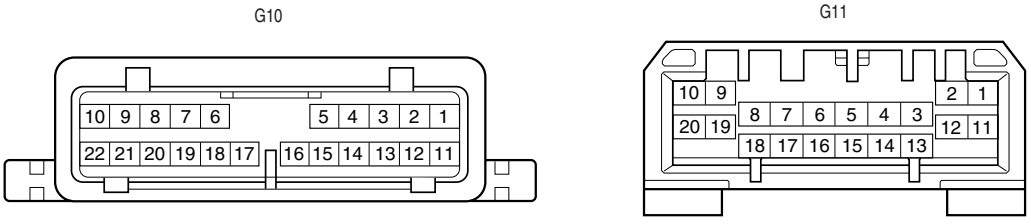
## Combination meter internal circuits and couplers for RHW engine

**NOTE:**

**Terminal arrangement of coupler viewed from harness side.**




| | | | |
|---|---|---|---|
| 1. RADIO DOME fuse | 7. Fuel meter | 13. To ABS control module | 19. To lighting switch |
| 2. METER fuse | 8. Engine coolant temperature meter | 14. Fuel level gauge | 20. To BCM |
| 3. To ECM | 9. ODO-TRIP meter | 15. To SDM | 21. To data link connector |
| 4. To turn signal relay | 10. Back light | 16. To transmission range sensor | 22. To TCM |
| 5. Tachometer | 11. Meter pointer | 17. To 4WD controller | |
| 6. Speedometer | 12. To VSS | 18. Oil pressure switch | |




| Terminal | Wire Color | Circuit |
|---|---|---|
| G10-1 | RED/BLK | To ECM (Glow indicator control signal) |
| G10-2 | – | – |
| G10-3 | ORN/BLK | To 4WD controller (4WD indicator control signal) |
| G10-4 | – | – |
| G10-5 | – | – |
| G10-6 | PPL/YEL | To ECM (MIL indicator control signal) |
| G10-7 | – | – |

| Terminal | Wire Color | Circuit |
|---|---|---|
| G10-8 | GRN/YEL | To combination switch (Turn R signal indicator control signal) |
| G10-9 | BLU/ORN | To ABS control module (ABS indicator control signal) |
| G10-10 | BLU/WHT | To fuel level gauge |
| G10-11 | – | – |
| G10-12 | – | – |
| G10-13 | BLK/RED | To ECM (Engine coolant temperature warning indicator control signal) |
| G10-14 | – | – |
| G10-15 | PPL/RED | To data link connector |
| G10-16 | WHT/BLK | To TCM (O/D OFF indicator control signal) |
| G10-17 | GRN/BLU | To transmission range sensor (“L” range indicator control signal) |
| G10-18 | GRN/ORN | To transmission range sensor (“2” range indicator control signal) |
| G10-19 | YEL/GRN | To transmission range sensor (“D” range indicator control signal) |
| G10-20 | ORN/BLU | To transmission range sensor (“N” range indicator control signal) |
| G10-21 | RED | To transmission range sensor (“R” range indicator control signal) |
| G10-22 | ORN/GRN | To transmission range sensor (“P” range indicator control signal) |
| G11-1 | WHT | To “RADIO DOME” fuse |
| G11-2 | BLU | To SDM (AIR BAG indicator control signal) |
| G11-3 | ORN | To ABS control module (EBD warning indicator control signal) |
| G11-4 | – | – |
| G11-5 | YEL/WHT | To ECM (Engine coolant temperature meter signal) |
| G11-6 | BLU/YEL | To VSS (Speedometer signal) |
| G11-7 | BRN | To ECM (Tachometer signal) |
| G11-8 | YEL | To BCM (brake fluid level, parking brake, charge warning, washer level indicator and light switch cognition signal) |
| G11-9 | – | – |
| G11-10 | BLK/YEL | To fuel level gauge ground |
| G11-11 | BLK/WHT | To “METER” fuse |
| G11-12 | GRN/RED | To combination switch (Turn L signal indicator control signal) |
| G11-13 | RED | To combination switch (High beam indicator control signal) |
| G11-14 | YEL/BLK | To oil pressure switch |
| G11-15 | – | – |
| G11-16 | BLK/RED | To door switch |
| G11-17 | – | – |
| G11-18 | – | – |
| G11-19 | – | – |
| G11-20 | – | – |

# Diagnosis

## A/T Selector Position Indicator

### 4 A/T model

| Condition | Possible Cause | Correction |
|---|---|---|
| **Selected A/T selector position indicator does not come ON** | Transmission range sensor (switch) faulty | Check transmission range sensor (switch) referring to “Transmission Range Switch (Sensor)” in Section 7B1. |
| | Wiring faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to “Inspection of BCM and Its Circuits” in Section 8H. |
| | PCM faulty | Check PCM referring to “Inspection of ECM (PCM) and Its Circuits” in Section 6-1. |
| **All A/T selector position indicators does not come ON** | “METER” fuse blown | After checking short circuit, replace “METER” fuse. |
| | Transmission range sensor (switch) faulty | Check transmission range sensor (switch) referring to “Transmission Range Switch (Sensor)” in Section 7B1. |
| | PCM-BCM signal wire harness faulty | Check PCM-BCM signal circuit. |
| | BCM-METER signal wire harness faulty | Check BCM-METER signal circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to “Inspection of BCM and Its Circuits” in Section 8H. |
| | PCM faulty | Check PCM referring to “Inspection of ECM (PCM) and Its Circuits” in Section 6-1. |

**5 A/T model**

| Condition | Possible Cause | Correction |
|---|---|---|
| **Selected A/T selector position indicator does not come ON** | Transmission range sensor (switch) faulty | Check transmission range sensor (switch) referring to "Transmission Range Sensor Inspection and Adjustment" in Section 7B2. |
| | Wiring faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H1. |
| | TCM faulty | Check TCM referring to "Inspection of TCM and Its Circuits" in Section 7B2. |
| **All A/T selector position indicators does not come ON** | "METER" fuse blown | After checking short circuit, replace "METER" fuse. |
| | Transmission range sensor (switch) faulty | Check transmission range sensor (switch) referring to "Transmission Range Sensor Inspection and Adjustment" in Section 7B2. |
| | TCM-BCM signal wire harness faulty | Check TCM-BCM signal circuit. |
| | BCM-METER signal wire harness faulty | Check BCM-METER signal circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H1. |
| | TCM faulty | Check TCM referring to "Inspection of TCM and Its Circuits" in Section 7B2. |

## O/D OFF Indicator Lamp

**4 A/T model**

| Condition | Possible Cause | Correction |
|---|---|---|
| **O/D OFF indicator lamp does not come ON (when O/D OFF switch is pushed on)** | "METER" fuse blown | After checking short circuit, replace "METER" fuse. |
| | O/D OFF switch faulty | Check O/D OFF switch referring to "O/D Cut Switch" in Section 7B1. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H. |
| | PCM faulty | Check PCM referring to "Inspection of ECM (PCM) and Its Circuits" in Section 6-1. |
| **O/D OFF indicator lamp stay ON** | O/D OFF switch faulty | Check O/D OFF switch referring to "O/D Cut Switch" in Section 7B1. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H. |
| | PCM faulty | Check PCM referring to "Inspection of ECM (PCM) and Its Circuits" in Section 6-1. |

| Condition | Possible Cause | Correction |
|---|---|---|
| **O/D OFF indicator lamp keep flashing** | A/T system faulty | See NOTE. |
| | BCM-METER signal circuit faulty | Check BCM-METER signal circuit referring to “BCM-METER Signal Circuit” in this section. |
| | PCM-BCM signal circuit faulty | Check PCM-BCM signal circuit referring to “PCM-BCM Signal Circuit” in this section. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Replace BCM. |

**NOTE:**

**If combination meter indicates the following conditions at the same time, check automatic transmission system referring to “A/T System Check” in Section 7B1.**

- **O/D OFF indicator lamp keeps flashing.**
- **Selected A/T selector indicator comes ON.**
- **Charge warning indicator, BRAKE warning, POWER indicator and washer level indicator are not flashing.**

**5 A/T model**

| Condition | Possible Cause | Correction |
|---|---|---|
| **O/D OFF indicator lamp does not come ON (when O/D OFF switch is pushed on)** | “METER” fuse blown | After checking short circuit, replace “METER” fuse. |
| | O/D OFF switch faulty | Check O/D OFF switch referring to “O/D OFF Switch Inspection” in Section 7B2. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | TCM faulty | Check TCM referring to “Inspection of TCM and Its Circuits” in Section 7B2. |
| **O/D OFF indicator lamp stay ON** | O/D OFF switch faulty | Check O/D OFF switch referring to “O/D OFF Switch Inspection” in Section 7B2. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | TCM faulty | Check TCM referring to “Inspection of TCM and Its Circuits” in Section 7B2. |
| **O/D OFF indicator lamp keep flashing** | A/T system faulty | Check automatic transmission system referring to “A/T System Check” in Section 7B2. |
| | Diag. switch circuit shorted to ground | Repair circuit. |
| | TCM faulty | Replace TCM. |

# POWER Indicator Lamp

**4 A/T model**

| Condition | Possible Cause | Correction |
|---|---|---|
| **POWER indicator does not come ON** | "METER" fuse blown | After checking short circuit, replace "METER" fuse. |
| | A/T mode switch faulty | Check A/T mode switch referring to "Power/Normal Change Switch" in Section 7B1. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | PCM-BCM signal wire harness faulty | Check PCM-BCM signal circuit referring to "PCM-BCM Signal Circuit (4 A/T Model)" in this section. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits in Section 8H. |
| | PCM faulty | Check PCM referring to "Inspection of ECM (PCM) and Its Circuits" in Section 6-1. |
| **POWER indicator lamp stay ON** | A/T mode switch faulty | Check A/T mode switch referring to "Power/Normal Change Switch" in Section 7B1. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H. |
| | PCM faulty | Check PCM referring to "Inspection of ECM (PCM) and Its Circuits" in Section 6-1. |
| **POWER indicator lamp keep flashing** | BCM-METER signal circuit faulty | Check BCM-METER signal circuit referring to "BCM-METER Signal Circuit (4 A/T Model)" in this section. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H. |

**5 A/T model**

| Condition | Possible Cause | Correction |
|---|---|---|
| **POWER indicator does not come ON** | "METER" fuse blown | After checking short circuit, replace "METER" fuse. |
| | A/T mode switch faulty | Check A/T mode switch referring to "Power/Normal Change Switch Inspection" in Section 7B2. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | TCM-BCM signal wire harness faulty | Check TCM-BCM signal circuit referring to "TCM-BCM Signal Circuit (5 A/T Model)" in this section. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits in Section 8H1. |
| | TCM faulty | Check TCM referring to "Inspection of TCM and Its Circuits" in Section 7B2. |
| **POWER indicator lamp stay ON** | A/T mode switch faulty | Check A/T mode switch referring to "Power/Normal Change Switch Inspection" in Section 7B2. |
| | Wiring faulty or grounding faulty | Repair circuit. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H1. |
| | TCM faulty | Check TCM referring to "Inspection of TCM and Its Circuits" in Section 7B2. |
| **POWER indicator lamp keep flashing** | BCM-METER signal circuit faulty | Check BCM-METER signal circuit referring to "BCM-METER Signal Circuit (5 A/T Model)" in this section. |
| | Combination meter faulty | Replace combination meter. |
| | BCM faulty | Check BCM referring to "Inspection of BCM and Its Circuits" in Section 8H1. |

# On-Vehicle Service

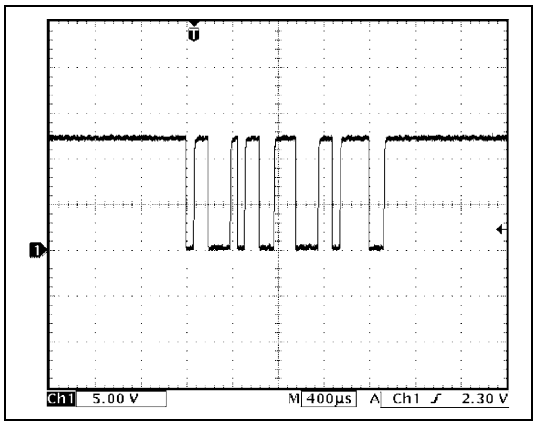
## PCM-BCM Signal Circuit (4 A/T model)

### Inspection

**NOTE:**

- **When PCM-BCM signal circuit is malfunction, combination meter indicates the following condition at the same time (A/T model only). Be sure to bear this mind when diagnosing trouble.**
  - **– O/D OFF indicator keeps flashing**
  - **– POWER indicator turns OFF**
  - **– A/T selector position indicator turns OFF**
- **If O/D OFF indicator, "POWER" indicator and A/T selector position indicator display abnormal condition of PCM-BCM signal circuit described in "Description", perform the following procedure.**

1) Check open, short to ground and short to power circuit of PCM-BCM signal circuit wire harness ("PNK") between "E61-8" and "G53-15" terminals.
   If OK, go to next step.
   If found abnormal condition, repair circuit.
2) Substitute a known-good BCM, and check that related indicator lights come to good conditions.
   If found abnormal condition, go to next step.
3) Substitute a known-good PCM, and recheck that the above indicators and warning operate in normal.




| | |
|---|---|
| Measurement terminal | CH1: "E61-8" to "C51-3-6" |
| Oscilloscope setting | CH1: 5 V / DIV<br>TIME: 400 µs / DIV |
| Measurement condition | • Ignition switch ON<br>• A/T shift selector is "P" position<br>• O/D is ON<br>• A/T mode is normal mode |

# TCM-BCM CAN Communication Circuit (5 A/T model)

## Inspection

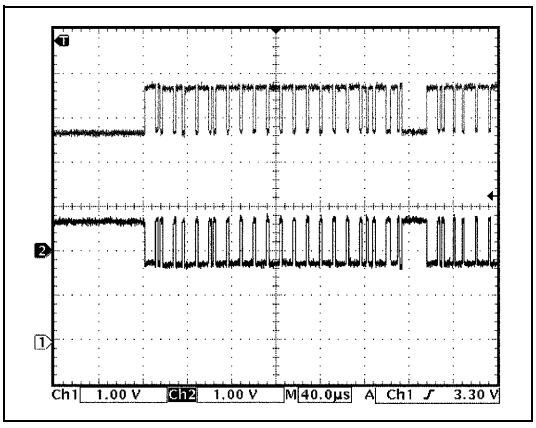
**NOTE:**

- **When TCM-BCM CAN communication circuit is malfunction, combination meter indicates the following condition at the same time (A/T model only). Be sure to bear this mind when diagnosing trouble.**
  - **– POWER indicator turns OFF**
  - **– A/T selector position indicator turns OFF**
- **If "POWER" indicator and A/T selector position indicator display abnormal condition of TCM-BCM CAN communication circuit described in "Description", perform the following procedure.**

1) Refer to Step 1) to 4) of "DTC B1156 CAN Communication Error (H27 Engine Only)" in Section 8H1 to make sure that CAN communication circuit wires are not in the following condition.
   - Open circuit
   - Shorted to ground
   - Shorted to power circuit

If OK, go to next step.
If found abnormal condition, repair circuit.

2) Substitute a known-good BCM, and check that related indicator lights come to good conditions.
   If found abnormal condition, go to next step.
3) Substitute a known-good TCM, and recheck that the above indicators and warning operate in normal.




| | |
|---|---|
| Measurement terminal | CH1: "G55-9" to "G55-3", CH2: "G55-1" to "G55-3" |
| Oscilloscope setting | CH1: 1 V / DIV, CH2: 1 V / DIV<br>TIME: 40 µs / DIV |
| Measurement condition | • Ignition switch ON<br>• A/T shift selector is "P" position<br>• A/T mode is normal mode |

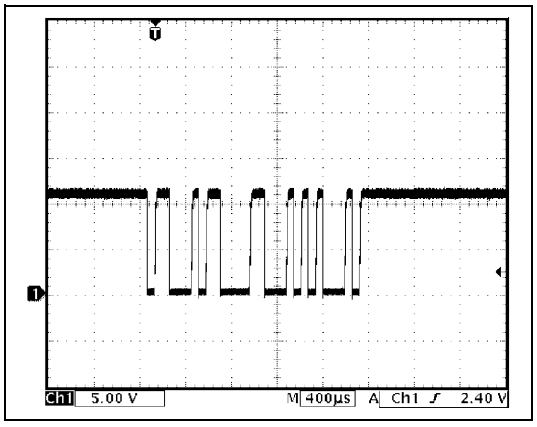
# BCM-METER Signal Circuit (4 A/T model)

## Inspection

**NOTE:**

- **When BCM-Meter signal circuit is malfunction, combination meter indicates the following condition at the same time. Be sure to bear this mind when diagnosing trouble.**
  - **– Charge warning indicator keeps flashing**
  - **– Brake indicator keeps flashing**
  - **– Windshield washer level indicator keeps flashing**
  - **– "O/D OFF" indicator keeps flashing (A/T model only)**
  - **– "POWER" indicator keeps flashing (A/T model only)**
  - **– A/T selector position indicator turns OFF (A/T model only)**
- **If charging system warning indicator, Brake indicator, washer level indicator, O/D OFF indicator (A/T model only), POWER indicator (A/T model only) and A/T selector position indicator (A/T model only) display abnormal condition of BCM-METER signal circuit described in "Description", perform the following procedure.**

1) Check open, short to ground and short to power circuit of BCM-METER signal circuit wire harness ("YEL") between "G55-10" and "G11-8" terminals.
   If OK, go to next step.
   If found abnormal condition, repair circuit.
2) Substitute a known-good BCM, and check that related indicator lights come to good conditions.
   If found abnormal condition, go to next step.
3) Substitute a known-good combination meter, and recheck that the above indicators and warning operate in normal.




| | |
|---|---|
| Measurement terminal | CH1: "G11-8" to "G11-10" |
| Oscilloscope setting | CH1: 5 V / DIV<br>TIME: 400 µs / DIV |
| Measurement condition | • Ignition switch ON<br>• Parking brake is applied<br>• Washer level switch is full position |

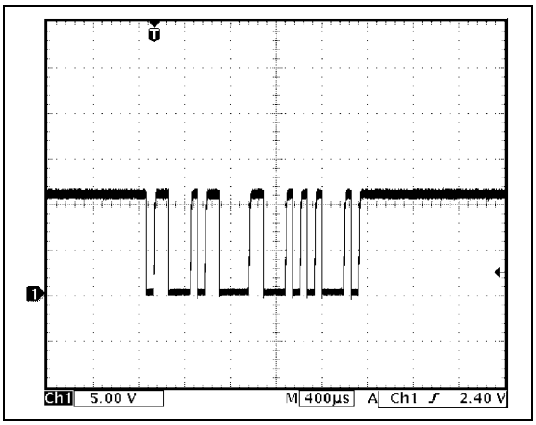
# BCM-METER Signal Circuit (5 A/T model)

## Inspection

**NOTE:**

- **When BCM-Meter signal circuit is malfunction, combination meter indicates the following condition at the same time. Be sure to bear this mind when diagnosing trouble.**
  - **– Charge warning indicator keeps flashing**
  - **– Brake indicator keeps flashing**
  - **– Windshield washer level indicator keeps flashing**
  - **– "POWER" indicator keeps flashing (A/T model only)**
  - **– A/T selector position indicator turns OFF (A/T model only)**
- **If charging system warning indicator, Brake indicator, washer level indicator, POWER indicator (A/T model only) and A/T selector position indicator (A/T model only) display abnormal condition of BCM-METER signal circuit described in "Description", perform the following procedure.**

1) Check open, short to ground and short to power circuit of BCM-METER signal circuit wire harness ("YEL") between "G54-10" and "G11-8" terminals.
   If OK, go to next step.
   If found abnormal condition, repair circuit.
2) Substitute a known-good BCM, and check that related indicator lights come to good conditions.
   If found abnormal condition, go to next step.
3) Substitute a known-good combination meter, and recheck that the above indicators and warning operate in normal.

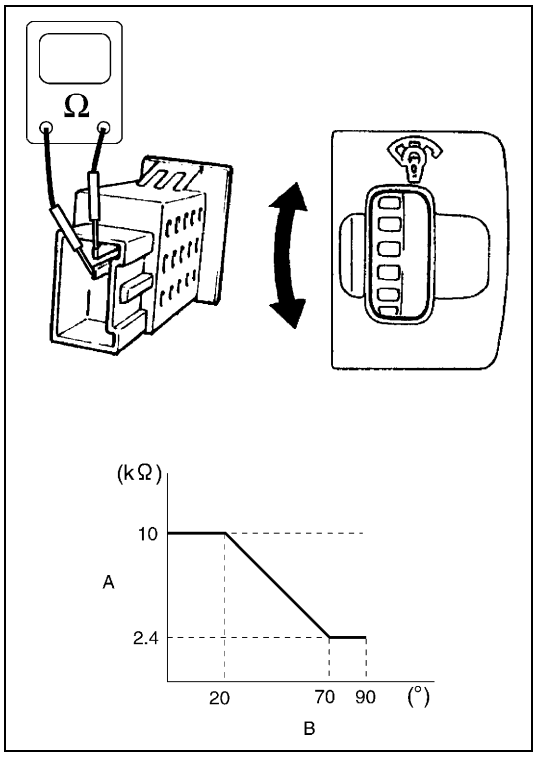



| | |
|---|---|
| Measurement terminal | CH1: "G11-8" to "G11-10" |
| Oscilloscope setting | CH1: 5 V / DIV<br>TIME: 400 µs / DIV |
| Measurement condition | • Ignition switch ON<br>• Parking brake is applied<br>• Washer level switch is full position |

# Illumination Controller

## Inspection

1) Remove illumination controller from instrument panel.
2) Check resistance between terminals for illumination controller.
   If measured value is out of specification, replace illumination controller.

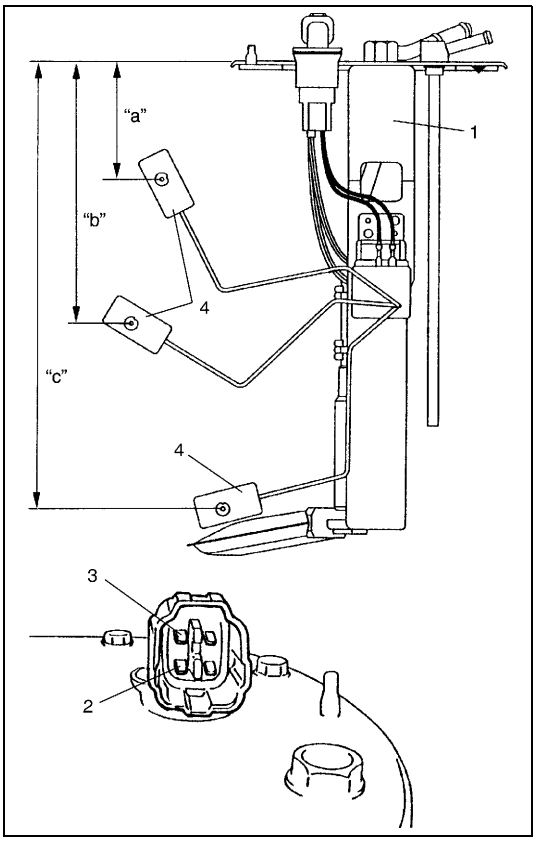



| |
|---|
| A: Resistance |
| B: Knob revolution angle |

# Fuel Level Sensor (Sender Gauge) for H27 Engine

## Inspection

1) Remove fuel pump assembly referring to “Fuel Pump” in Section 6C.
2) Use an ohmmeter to confirm that resistance of sender gauge unit changes with change of float position.
   If measured value is out of specification, replace fuel sender gauge.




| | Float Position | Resistance (Ω) |
|---|---|---|
| “a” | 55 mm (2.16 in.) | 17 – 19 |
| “b” | 139.6 mm (5.50 in.) | 62 – 68 |
| “c” | 254.9 mm (10.04 in.) | 111 – 113 |

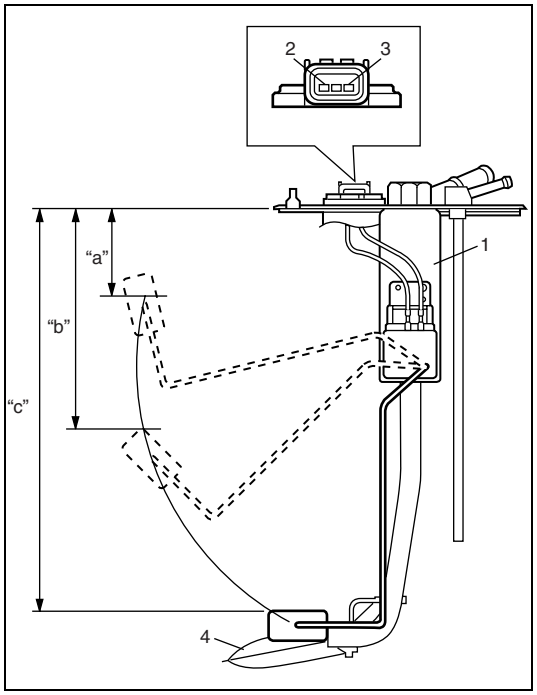
| |
|---|
| 1. Fuel pump assembly |
| 2. Fuel level gauge (–) terminal |
| 3. Fuel level gauge (+) terminal |
| 4. Float |

# Fuel Meter/Fuel Gauge Unit RHW Engine

## Fuel level gauge

### Inspection

Remove fuel level gauge referring to “Fuel Level Gauge” in Section 6C of this manual.




Using an ohmmeter, confirm that resistance of level gauge unit changes with change of float position.

**Fuel level gauge specification**

| | Float Position | | Fuel Meter Position | Resistance (Ω) |
|---|---|---|---|---|
| | Short Body Vehicle | Long Body Vehicle | | |
| “a” | 90.1 mm (3.55 in.) | 55 mm (2.17 in.) | F | 17 – 19 |
| “b” | 157.2 mm (6.19 in.) | 139.6 mm (5.50 in.) | 1/2 | 62 – 68 |
| “c” | 254.9 mm (10.04 in.) | 254.9 mm (10.04 in.) | E | 111 – 113 |

If measured valve is out of specification, replace fuel lever gauge.

1. Fuel level gauge
2. Fuel level gauge (+) terminal
3. Fuel level gauge (–) terminal
4. Float

# Engine Coolant Temperature (ECT) Sensor for RHW Engine

### Removal, Inspection and Installation

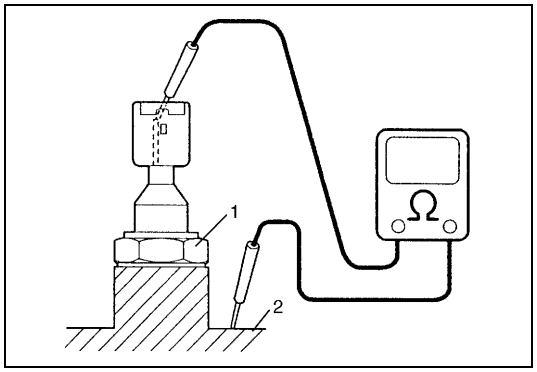
Refer to “Engine Coolant Temperature (ECT) Sensor” in Section 6E3.

# Oil Pressure Switch for RHW Engine

### Removal and Installation

Refer to “Oil Pressure Switch” in Section 6A3 of this manual for details.

### Inspection

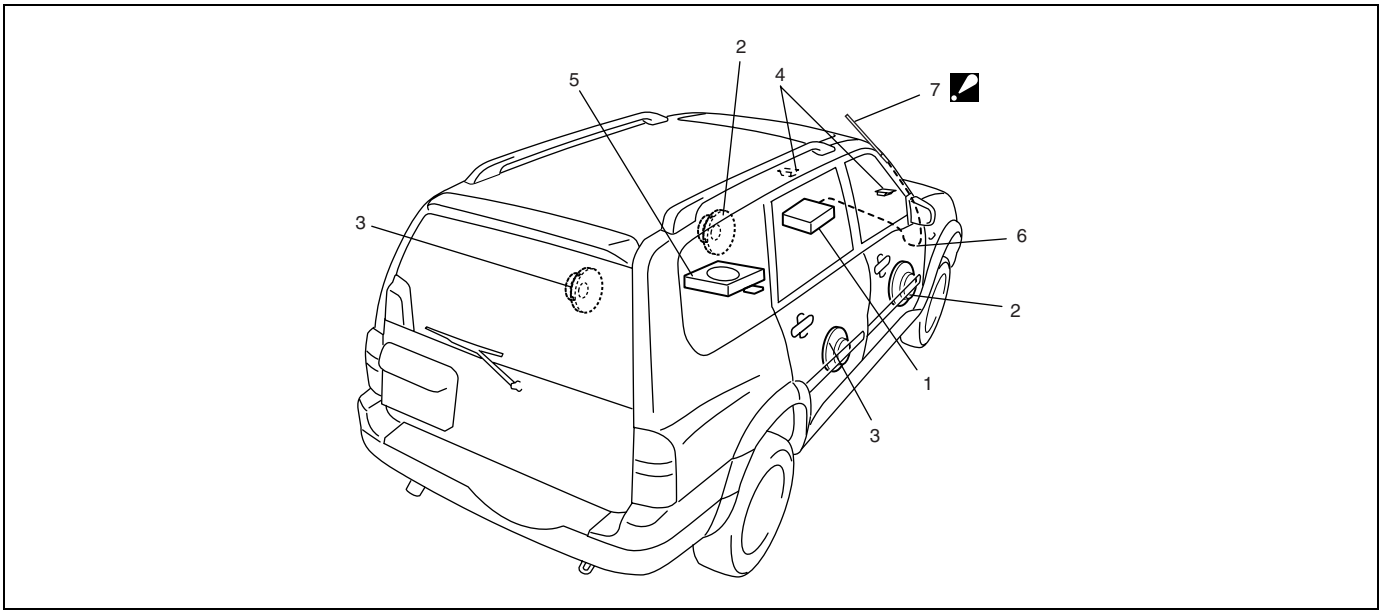



Check oil pressure switch (1) for continuity using an ohmmeter.
If check result is not satisfactory, replace oil pressure switch.

| During Engine Running | No continuity (∞ Ω) |
|---|---|
| At Engine Stop | Continuity (0 Ω) |

2. Cylinder block

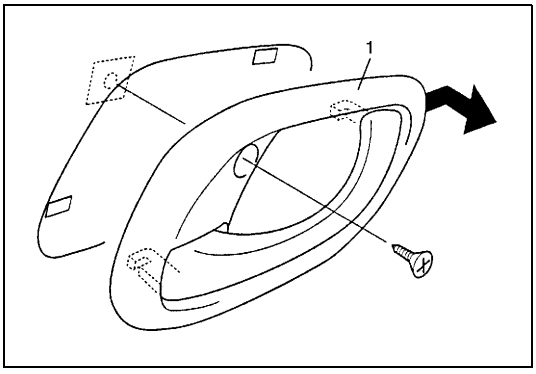
# Audio System



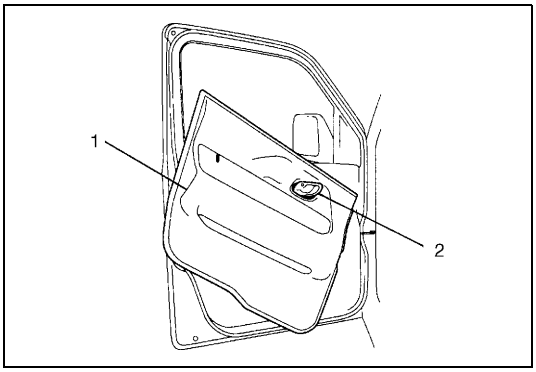

| | | |
|---|---|---|
| 1. Radio assembly | 4. Tweeter speaker (if equipped) | 7. Antenna |
| 2. Front speaker | 5. Sub woofer speaker (if equipped) | The figure shows right-hand steering vehicle. For left-hand steering vehicle, antenna is installed at the side of symmetry. |
| 3. Rear speaker for wagon | 6. Antenna feeder | |

## Front speaker and rear speaker

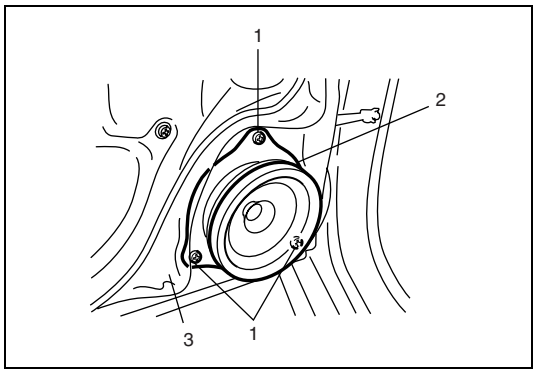
### Removal




1) Remove inside handle bezel (1).
2) Remove inside lock knob and door inside pull handle case fitting screw.




3) Remove door trim (1).
   With inside handle bezel (2) tilted as shown in figure, turn door trim (1) 90° clockwise to remove it.
   And disconnect power window switch lead wire at coupler.




4) Remove 3 speaker mounting screws (1).
5) Remove speaker (2) from door (3).
6) Disconnect speaker coupler from speaker (2).

**Installation**

Reverse removal procedure to install speaker.

## SECTION 8D

# WINDOWS, MIRRORS, SECURITY AND LOCKS

**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.**
- **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).**

**NOTE:**

- **For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**
- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**

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## CONTENTS

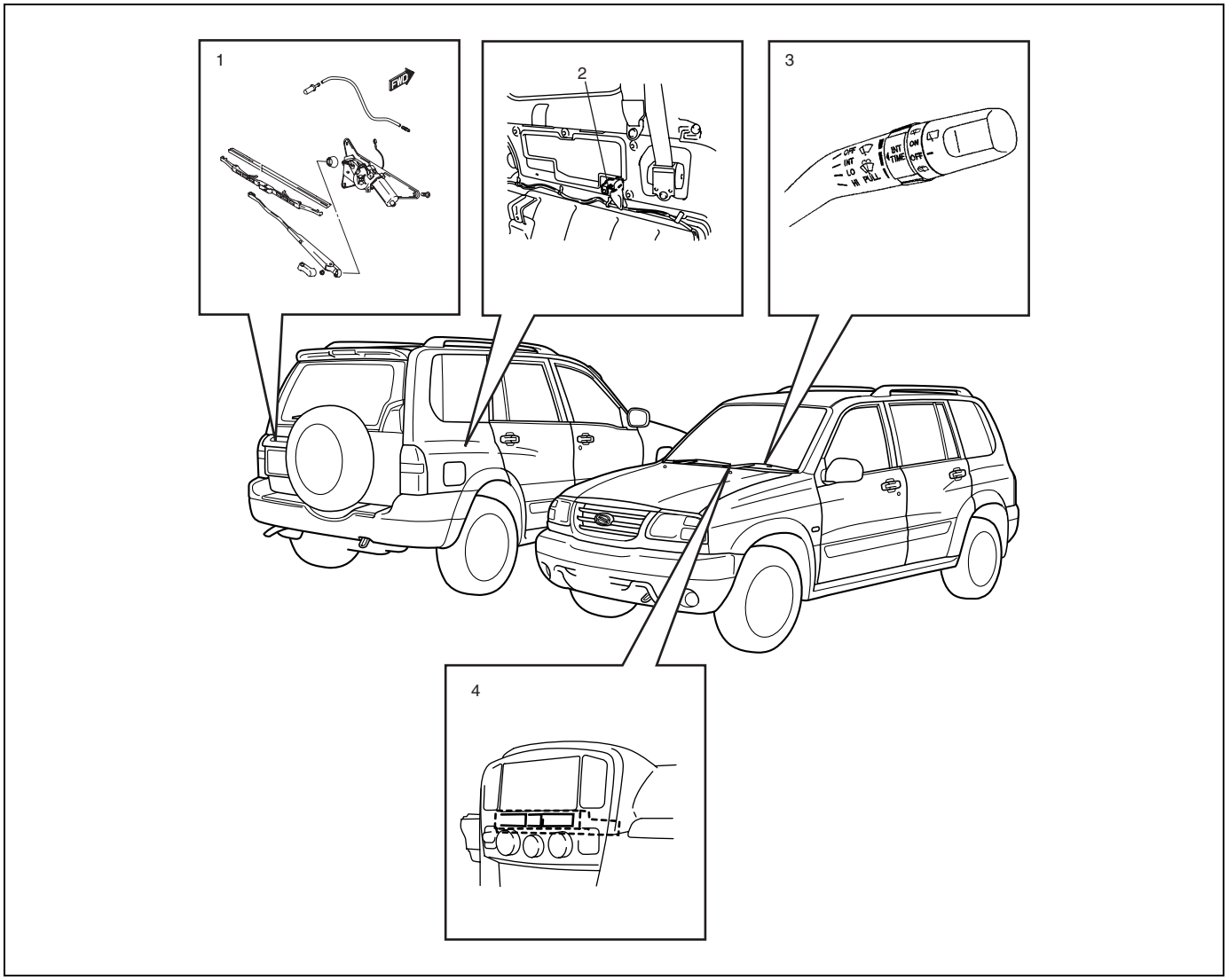

**OTHER THAN CANVAS TOP MODEL ..... ***
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# General Description

## Windshield Wiper and Washer

### Rear wiper and washer



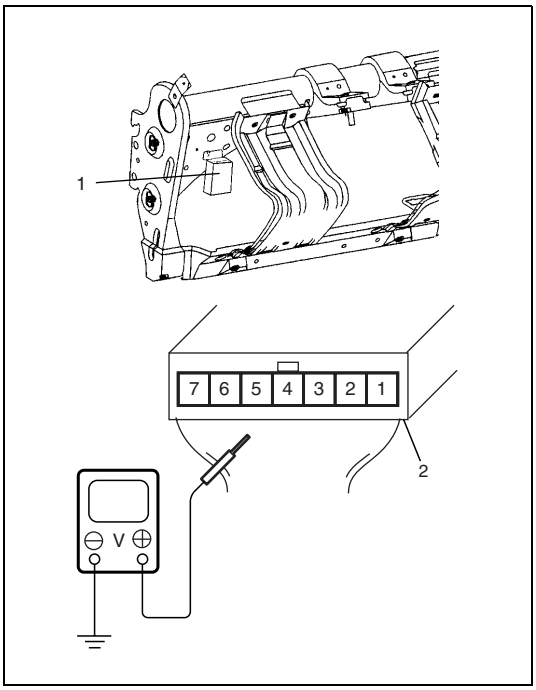

| | |
|---|---|
| 1. Rear wiper assembly | 3. Rear wiper and washer switch |
| 2. Rear wiper relay | 4. BCM |

# On-vehicle Service

## Keyless Entry System

### Keyless entry receiver circuit for type A

#### Inspection

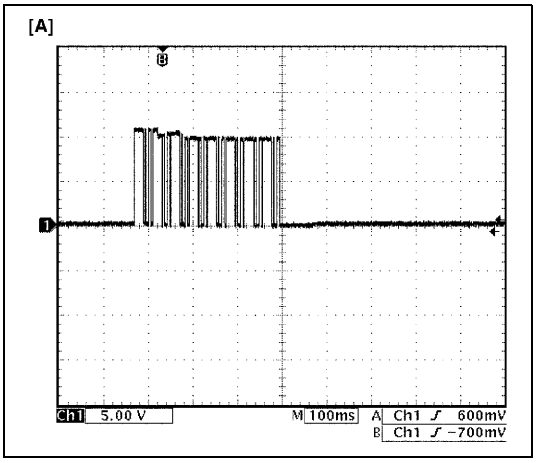



Check that the voltage between the following terminals and body ground are specifications under each conditions. If check result is not as specified, check applicable circuit for open or short. If circuit is normal, recheck keyless entry receiver (1) as follows.

1) Substitute a known-good keyless entry receiver.
2) Record key code referring to "Programming Transmitter Code" in this section.
3) Recheck keyless entry receiver system.

2. Keyless entry receiver connector (view from harness side)

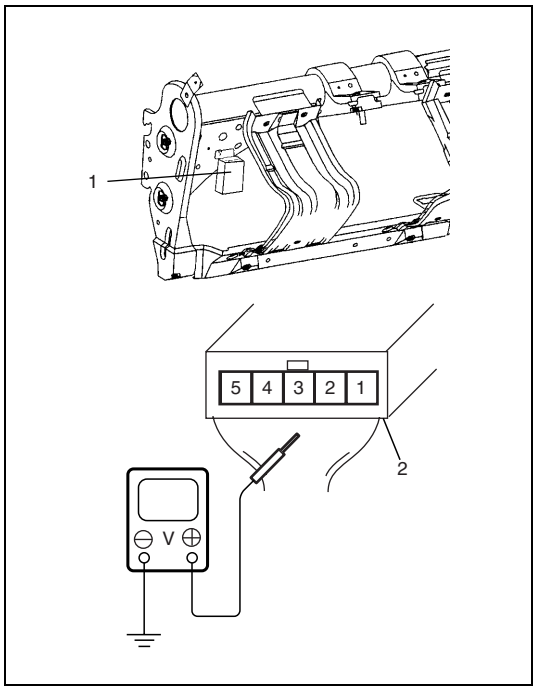
| Terminal | Wire color | Circuit | Specification | Condition |
|---|---|---|---|---|
| G36-1 | WHT | Main power supply | 10 – 14 V | – |
| G36-2 | BLK/WHT | Lock/Unlock output signal circuit | Figure [A] | Push "Lock" or "Unlock" button on transmitter. |
| | | | 0 – 1 V | Ignition switch is ON position. |
| G36-4 | BRN | Enabling signal of programmable transmitter input circuit | 0 – 1 V | Ignition switch is ON position. |
| G36-7 | BLK | Ground | 0 – 1 V | – |




**Oscilloscope setting**
**CH1: 5 V / DIV**
**TIME: 100 ms / DIV**

## Keyless entry receiver circuit for type B and RHW engine

### Inspection

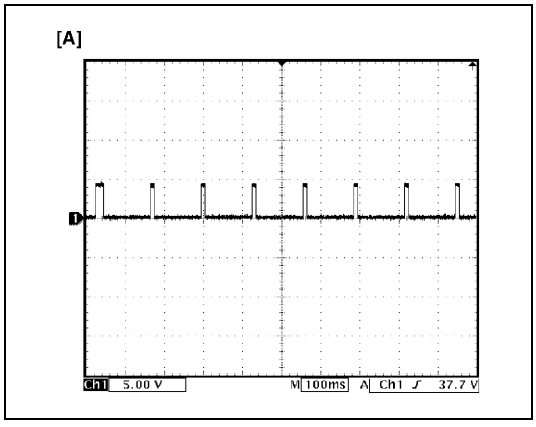



Check that the voltage between the following terminals and body ground are specifications under each conditions. If check result is not as specified, check applicable circuit for open or short. If circuit is normal, recheck keyless entry receiver (1) as follows.

1) Substitute a known-good keyless entry receiver.
2) Record key code referring to “Programming Transmitter Code” in this section.
3) Recheck keyless entry receiver system.

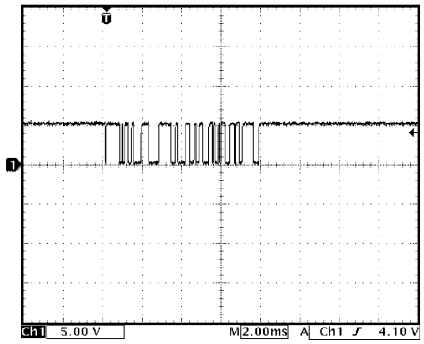
2. Keyless entry receiver connector (view from harness side)

| Terminal | Wire color | Circuit | Specification | Condition |
|---|---|---|---|---|
| G45-1 | YEL/WHT | Main power supply | 4 – 6 V | – |
| G45-3 | BRN | Enabling signal of programmable transmitter input circuit | Figure [A] | – |
| G45-4 | BLK/WHT | Lock/Unlock output signal circuit | Figure [B] | Push “Lock” or “Unlock” button on transmitter. |
| | | | 4 – 6 V | – |
| G45-5 | YEL/BLK | Ground | 0 – 1 V | – |




**Oscilloscope setting**
**CH1: 5 V / DIV**
**TIME: 100 ms / DIV**

[B]




**Oscilloscope setting**
**CH1: 5 V / DIV**
**TIME: 2 ms / DIV**

# SECTION 8E

# CRUISE CONTROL SYSTEM

**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.**
- **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).**

**NOTE:**

**For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**

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8E


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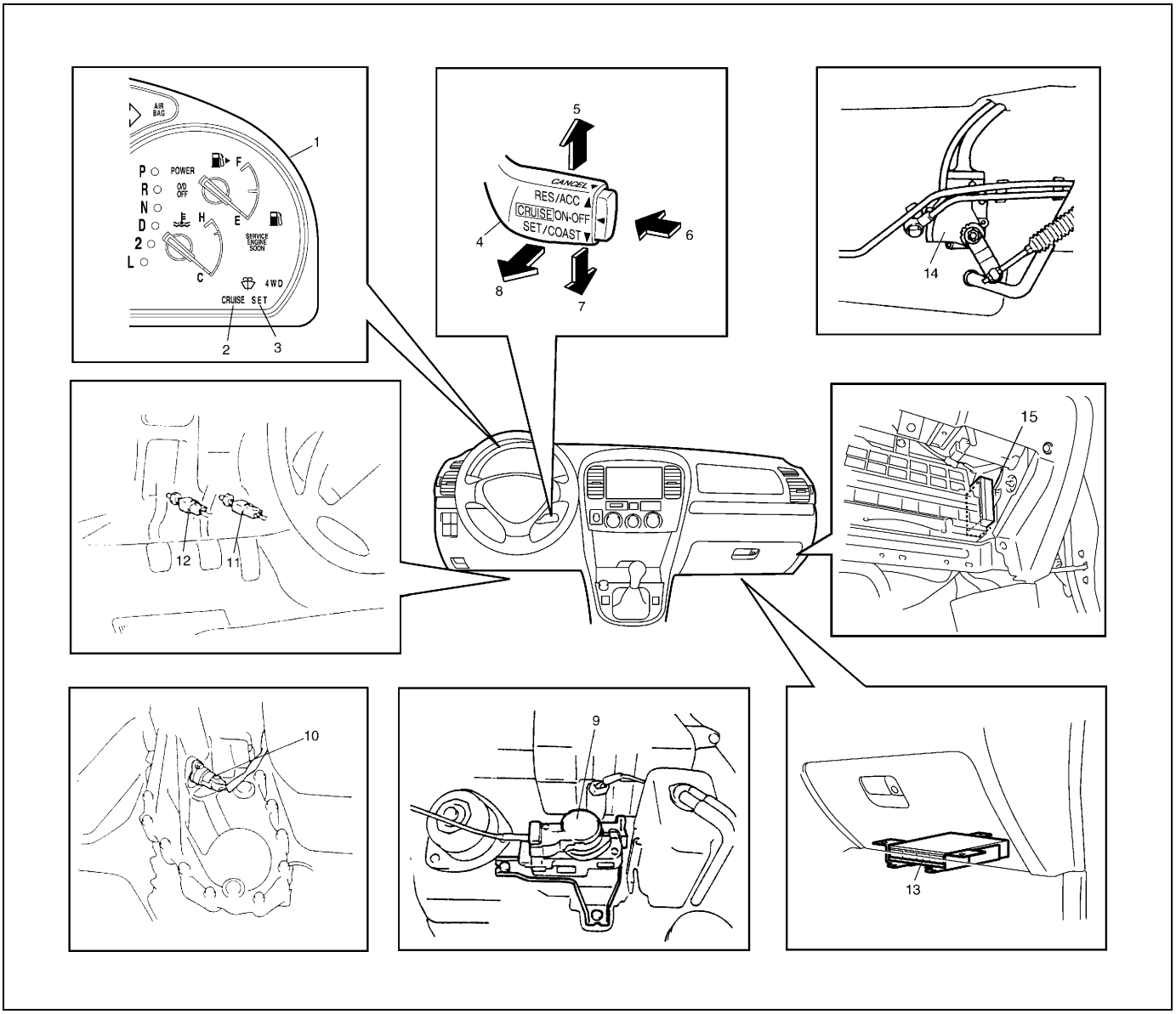
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- Cruise Cable ..... *

# General Description

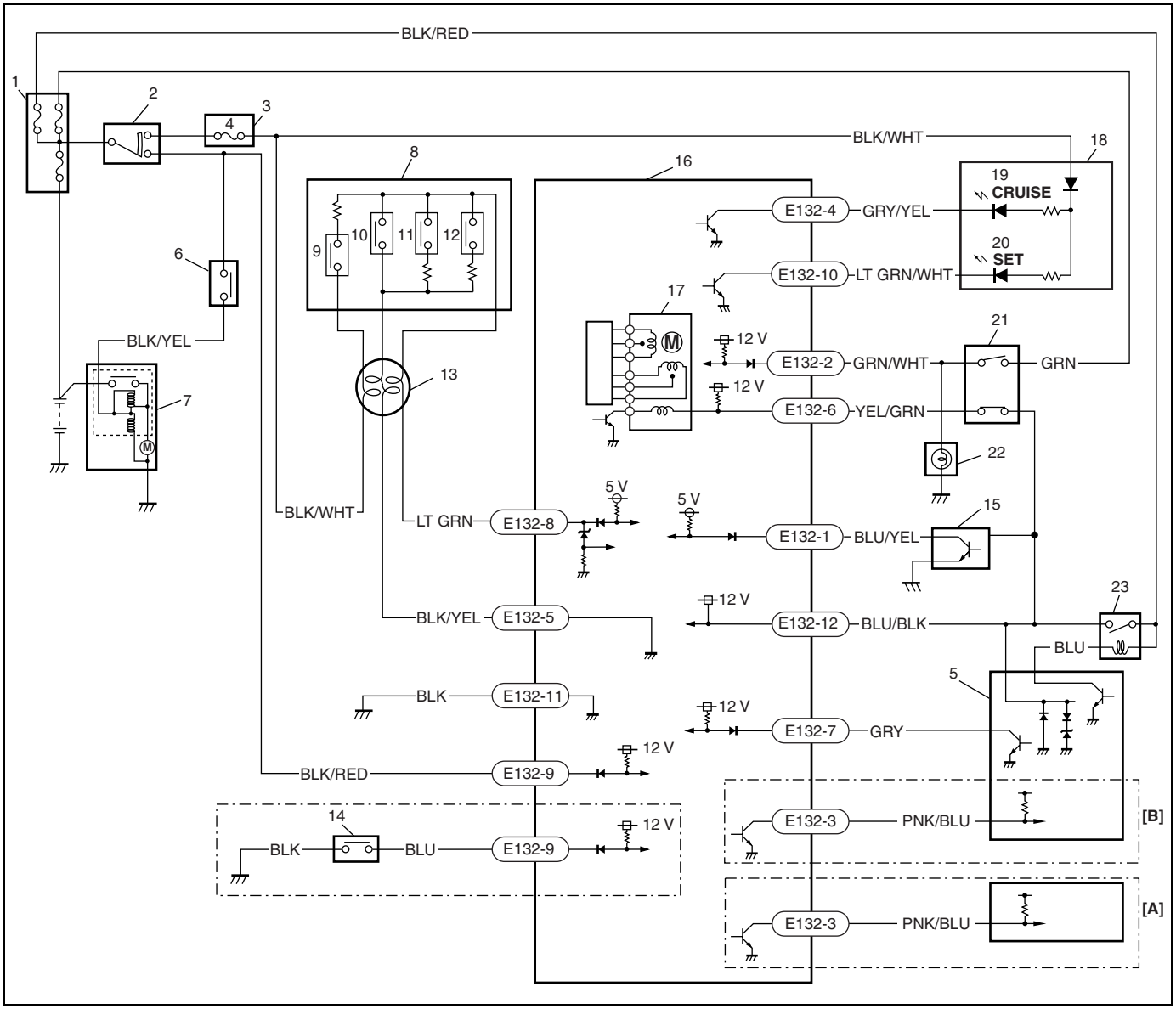
## Cruise Control System

The cruise control system is a device which maintains a preset vehicle speed while driving at a high speed, e.g., on a highway. It allows the driver to drive his vehicle at a constant speed of 40 km/h (25 mile/h) or higher without depressing the accelerator pedal (constant cruising). The system also has such functions as to change the vehicle speed without operating the accelerator pedal (but using SET/COAST and RES/ACC switches), cancel cruise control (CANCEL switch) and resume the speed in memory automatically after cruise control is cancelled (RES/ACC switch). The system mainly consists of a vehicle speed sensor, an actuator assembly incorporated with control module, cruise main switch, SET/COAST switch, RES/ACC switch and CANCEL switch, etc.




| | | |
|---|---|---|
| 1. Combination meter | 6. Cruise ON/OFF switch | 11. Brake light switch with brake pedal position switch |
| 2. “CRUISE” indicator lamp | 7. SET/COAST switch | 12. Clutch pedal position switch (M/T vehicle only) |
| 3. “SET” indicator lamp | 8. CANCEL switch | 13. ECM or PCM (4 A/T vehicle only) |
| 4. Cruise control lever | 9. Cruise control actuator assembly with control module | 14. Transmission range sensor (shift switch) (A/T vehicle only) |
| 5. RES/ACC switch | 10. Vehicle speed sensor (VSS) | 15. TCM (5 A/T vehicle only) |

## Cruise control system circuit




| | | | |
|---|---|---|---|
| [A]: TCM (5 A/T vehicle only) | 6. Transmission range sensor (shift switch) (A/T vehicle only) | 13. Contact coil | 20. “SET” indicator lamp |
| [B]: PCM (4 A/T vehicle only) | 7. Starter | 14. Clutch pedal position (CPP) switch (M/T vehicle only) | 21. Brake light switch with brake pedal position switch |
| 1. Main fuse box | 8. Cruise control switch assembly | 15. Vehicle speed sensor (VSS) | 22. Stop lamp (A/T vehicle only) |
| 2. Ignition switch | 9. Cruise ON/OFF switch | 16. Cruise control module | 23. Main relay |
| 3. Circuit fuse box | 10. CANCEL switch | 17. Cruise control actuator | |
| 4. “METER” fuse | 11. SET/COAST switch | 18. Combination meter | |
| 5. ECM (5 A/T vehicle only) or ECM (PCM) (4 A/T vehicle only) | 12. RES/ACC switch | 19. “CRUISE” indicator lamp | |

## Components and functions

| Component | Function |
|---|---|
| Cruise control actuator assembly with control module | Cruise control module:<br>Executes centralized control by means of a microcomputer over all functions including setting a constant speed, resuming it, setting coast, limiting minimum speed and cancelling cruise control.<br>Cruise control actuator (stepping motor & clutch):<br>Actuates accelerator pedal through cruise cable and arm according to a signal from cruise control module to control vehicle speed. |
| Cruise ON/OFF switch | This switch has a momentary contact type button to turn the cruise control system ON and OFF. |
| SET/COAST switch | When this switch is moved downward and then released (OFF) while vehicle is running at a speed 40 km/h (25 mile/h) or higher, vehicle speed at that OFF moment is stored in memory and it is maintained (constant cruising). Turning this switch (ON) continuously during constant cruising keeps slowing down vehicle speed as long as it is ON. When it is released (OFF), vehicle speed at that moment is stored in memory and vehicle starts constant cruising. |
| RES/ACC switch | When this switch is moved upward during constant cruising, vehicle speed keeps increasing as long as it is ON. When it is released (OFF), vehicle speed at that moment is stored in memory and vehicle starts constant cruising. If vehicle speed is higher than 40 km/h (25 mile/h) after cruise control is cancelled, turning this switch ON momentarily will resume the speed at which vehicle was running before cancellation. |
| CANCEL switch | When this switch is pressed (ON), cruise control (accelerator pedal control) is cancelled. |
| Vehicle speed sensor (VSS) | The vehicle speed sensor (VSS) is mounted on the transfer or transmission. The VSS converts vehicle speed into pulse signal and send it to the cruise control module. |
| Brake light switch | The brake light switch has 2 contact points. One contact point closes when the brake pedal is depressed to light the brake light and provides a voltage signal to the cruise control module. This signal, when inputted cancels cruise control (sets the accelerator pedal free).<br>The other contact point (brake pedal position switch) opens when the brake pedal is depressed, to shut off the power to the magnetic clutch in the actuator, thereby cancelling cruise control (setting the accelerator pedal free). This switch is installed to cancel cruise control (constant cruising) without fail. |
| Clutch pedal position switch (M/T vehicle only) | When the clutch pedal is depressed, the clutch pedal position switch closes and provides a ground signal to cruise control module.<br>The cruise control module cancels cruise control (accelerator pedal control) when this signal is inputted. |
| Transmission range sensor (shift switch) (Park/Neutral position switch) (A/T vehicle only) | When the selector lever is places in either “P” or “N” position, the transmission range switch closes and provides a ground signal to cruise control module. The cruise control module cancels cruise control (accelerator pedal control) when signal is inputted. |

| Component | Function |
|---|---|
| PCM (4 A/T vehicle only) or TCM (5 A/T vehicle only) – Throttle opening signal (A/T vehicle only) | Throttle opening signal is inputted from PCM (4 A/T vehicle only) or ECM (5 A/T vehicle only).<br>According to this signal, the cruise control module detects the throttle opening and uses it as one of the factors to output the overdrive and TCC OFF command signal to PCM or ECM. |
| PCM (4 A/T vehicle only) or TCM (5 A/T vehicle only) – Overdrive and TCC off command signal output | When the throttle opening for the vehicle speed exceeds the specified value during cruise control, the cruise control module sends this signal to PCM or TCM. PCM or TCM uses this signal as one of signals to control A/T. |
| "CRUISE" indicator lamp | In the state with the ignition switch ON and the cruise control system OFF, pressing cruise ON/OFF switch once and releasing it will activate the cruise control system and the cruise control module will cause the indicator lamp to light up. |
| "SET" indicator lamp | It lights up when cruise control (accelerator pedal control) is functioning. |

## Cancel conditions

Constant cruising is cancelled under the following conditions.

- Ignition switch is turned OFF.
- Cruise ON/OFF switch is turned OFF.
- Vehicle speed has slowed down to lower than minimum operating speed (40 km/h (25 mile/h)).
- *Vehicle speed varies beyond cancel speed range (–15 km/h (–9 mile/h)) from preset speed.
- *Brake pedal is depressed. (Brake light switch is turned ON).
- *Clutch pedal is depressed (Clutch pedal position switch is turned ON) (M/T vehicle only).
- *Selector lever is shifted to N range (Park/Neutral position switch in transmission range switch is turned ON) (A/T vehicle only).
- *CANCEL switch is turned ON.

**NOTE:**

**When constant cruising is cancelled under above any condition with * (asterisk), vehicle speed before cancellation can be resumed by operating RES/ACC switch, provided that vehicle speed is higher than 40 km/h (25 mile/h).**

# Diagnosis

## Diagnosis Table

| Condition | Possible Cause | Correction |
|---|---|---|
| **"CRUISE" indicator lamp fails to light up or remains ON.** | "CRUISE" indicator lamp circuit faulty | Refer to ""CRUISE" Indicator Lamp Circuit Check" in this section. |
| | Cruise control module power and ground circuits faulty | Refer to "CRUISE Control Module Power and Ground Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **"SET" indicator lamp fails to light up or remains ON.** | "SET" indicator lamp circuit | Refer to ""SET" Indicator Lamp Circuit Check" in this section. |
| | Cruise control module power and ground circuits | Refer to "Cruise Control Module Power and Ground Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Vehicle speed can not be set.** | Actuator cable play maladjusted or actuator cable faulty | Refer to "Cruise Cable Play Inspection and Adjustment" in this section. |
| | Cruise ON/OFF switch, "SET/COAST", "RES/ACC" and "CANCEL" switch circuits faulty circuits faulty | Refer to "Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches Circuits Check" in this section. |
| | VSS circuit faulty | Refer to "VSS Circuit Check" in this section. |
| | Brake light switch circuit faulty | Refer to "Brake Light Switch With Pedal Position Switch Circuits Check" in this section. |
| | Transmission range switch circuit (A/T vehicle only) faulty | Refer to "Transmission Range Sensor (Shift Switch) Circuit Check" in this section. |
| | Clutch pedal position switch circuit (M/T vehicle only) faulty | Refer to "Clutch Pedal Position Switch Circuit Check" in this section. |
| | Cruise control module power and ground circuits faulty | Refer to "Cruise Control Module Power and Ground Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Vehicle set speed is unstable.** | Actuator cable play maladjusted or actuator cable faulty | Refer to "Cruise Cable Play Inspection and Adjustment" in this section. |
| | VSS circuit faulty | Refer to "VSS Circuit Check" in this section. |
| | Throttle valve opening signal circuit faulty | Refer to "Throttle Valve Opening Signal Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Actual vehicle speed deviates above or below set speed.** | Actuator cable play maladjusted or actuator cable faulty | Refer to "Cruise Cable Play Inspection and Adjustment" in this section. |
| | Throttle valve opening signal circuit faulty | Refer to "Throttle Valve Opening Signal Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Acceleration or deceleration by using "RES/ACC" or "SET/ COAST" switch is not attained.** | Cruise ON/OFF switch, "SET/COAST", "RES/ACC" and "CANCEL" switch circuits faulty | Refer to "Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches Circuits Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |

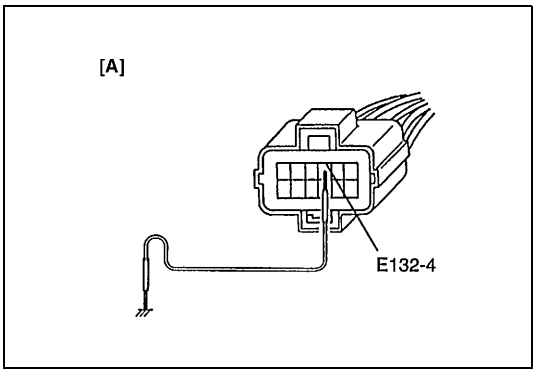
| Condition | Possible Cause | Correction |
|---|---|---|
| **Cruise control is not cancelled even when "CANCEL" switch is operated.** | Cruise ON/OFF switch, "SET/COAST", "RES/ACC" and "CANCEL" switch circuits faulty | Refer to "Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches Circuits Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **"RES/ACC" switch fails to resume preset vehicle speed after cruise control is cancelled.** | Cruise ON/OFF switch, "SET/COAST", "RES/ACC" and "CANCEL" switch circuits faulty | Refer to "Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches Circuits Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Cruise control is not cancelled even when brake pedal is depressed.** | Brake light switch circuit faulty | Refer to "Brake Light Switch With Pedal Position Switch Circuits Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Cruise control is not cancelled even when clutch pedal is depressed.** | Clutch pedal position switch circuit faulty | Refer to "Clutch Pedal Position Switch Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **Cruise control is not cancelled even when selector lever is shifted to "N" position.** | Transmission range switch circuit (A/T vehicle only) faulty | Refer to "Transmission Range Sensor (Shift Switch) Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **A/T gear shifting is frequent between 3rd (4 A/T vehicle only) or 4th (5 A/T vehicle only) and overdrive when driving on uphill road (Hunting).** | Throttle valve opening signal circuit faulty | Refer to "Throttle Valve Opening Signal Circuit Check" in this section. |
| | Overdrive and TCC off command signal circuit faulty | Refer to "Overdrive and TCC OFF Command Signal Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |
| **A/T is not shifted to overdrive gear even though not on uphill road.** | Throttle valve opening signal circuit faulty | Refer to "Throttle Valve Opening Signal Circuit Check" in this section. |
| | Overdrive and TCC off command signal circuit faulty | Refer to "Overdrive and TCC OFF Command Signal Circuit Check" in this section. |
| | Actuator assembly faulty | Replace actuator assembly. |

## Note On System Circuit Inspection

Refer to "Precaution for Electrical Circuit Service" in Section 0A.

# “CRUISE” Indicator Lamp Circuit Check

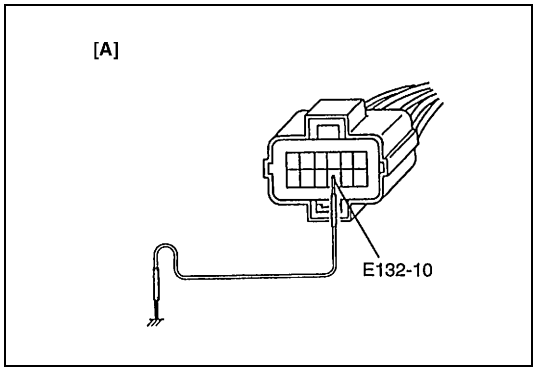
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check Circuit for Short<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Turn ignition switch ON.<br>Does “CRUISE” indicator lamp turn ON? | “GRY/YEL” circuit is shorted to ground. | Go to Step 2. |
| 2 | Check Circuit for Open<br>1) Check for proper connection to cruise control module at terminal E132-4.<br>2) If OK, connect terminal E132-4 to ground.<br>Does indicator lamp turn ON at ignition switch ON? | Lamp circuit is OK. | “BLK/WHT” or “GRY/YEL” circuit is open. If circuit is OK, replace combination meter. |




[A]: Fig. for Step 2

# “SET” Indicator Lamp Circuit Check

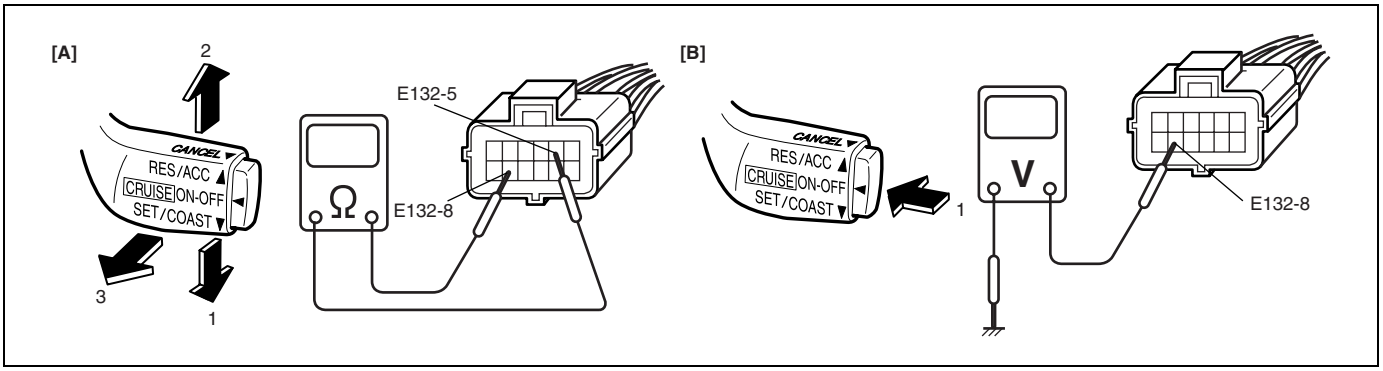
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check Circuit for Short<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Turn ignition switch ON.<br>Does “SET” indicator lamp turn ON? | ”LT GRN/WHT” circuit is shorted to ground. | Go to Step 2. |
| 2 | Check Circuit for Open<br>1) Check for proper connection to cruise control module at terminal E132-10.<br>2) If OK, connect terminal E132-10 to ground.<br>Does indicator lamp turn ON at ignition switch ON? | Lamp circuit is OK. | “BLK/WHT” or “LT GRN/WHT” circuit open. If circuit is OK, replace combination meter. |




[A]: Fig. for Step 2

# Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches Circuits Check

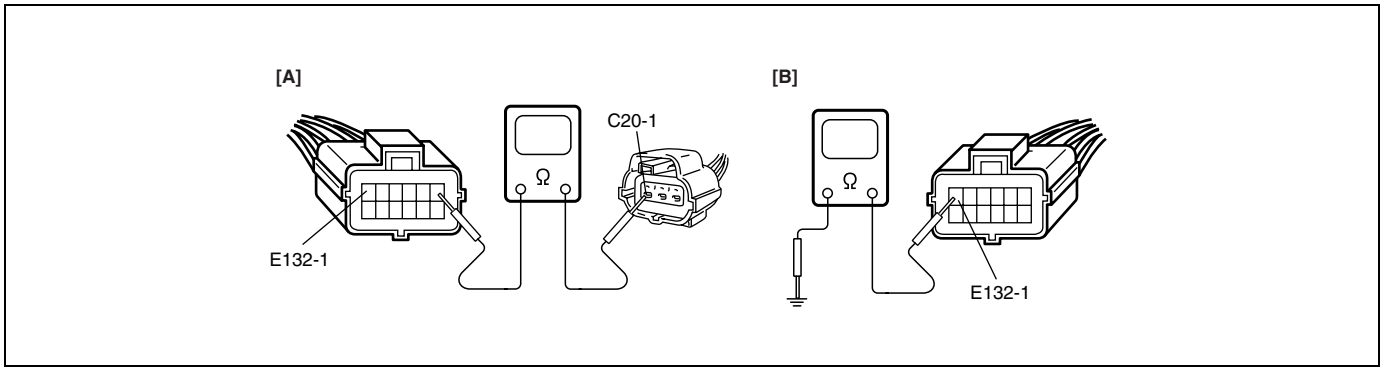
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | SET/COAST, RES/ACC and CANCEL switches circuit check<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Check for proper connection to cruise control module at terminal "E132-8".<br>3) If OK, check resistance between terminal "E132-8" and "E132-5" under each condition as follows.<br>**Switch circuit specifications (resistance)**<br>**All switches OFF: Infinity**<br>**SET/COAST switch (1) moved downward (ON): 217 – 223 Ω**<br>**RES/ACC switch (2) moved upward (ON): 900 – 920 Ω**<br>**CANCEL switch (3) pulled (ON): About 0 Ω**<br>Are check results satisfactory? | Go to Step 3. | Go to Step 2. |
| 2 | SET/COAST, RES/ACC and CANCEL switches check<br>1) Check SET/COAST, RES/ACC and CANCEL switches referring to "Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches" in this section.<br>Is switch in good condition? | "BLK/YEL" circuit, "LT GRN" circuit or contact coil is open or short. | Replace cruise control lever. |
| 3 | Cruise ON/OFF switch circuit check<br>1) Turn ignition switch ON and check voltage between terminal "E132-8" and ground under each condition as follows.<br>**Switch circuit specification s**<br>**Cruise ON/OFF switch (1) released (OFF): 0 V**<br>**Cruise ON/OFF switch (1) pressed (ON): 10 – 14 V**<br>Are check results satisfactory? | Cruise control lever circuit are OK. | Go to Step 4. |
| 4 | Cruise ON/OFF switch check<br>1) Check cruise ON/OFF switch referring to "Cruise ON/OFF, SET/COAST, RES/ACC and CANCEL Switches" in this section.<br>Is switch in good condition? | "BLK/WHT" circuit or contact coil is open or short. | Replace cruise control lever. |




[A]: Fig. for Step 1 | [B]: Fig. for Step 3

## VSS Circuit Check

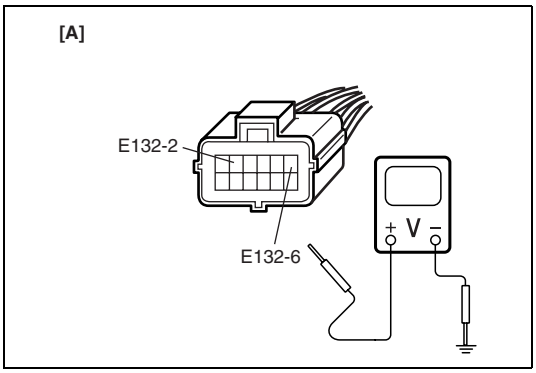
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Engine control module (ECM) DTC check<br>1) Check DTC in ECM referring to "Diagnostic Trouble Code (DTC) Check" in Section 6-1 or Section 6-2.<br>Is DTC P0500 detected? | Go to applicable diag. flow in Section 6-1 or Section 6-2. | Go to Step 2. |
| 2 | Check VSS circuit for open<br>1) Disconnect VSS connector "C20" and cruise control module connector "E132" with ignition switch OFF.<br>2) Check for proper connection to VSS connector at "C20-1" terminal and cruise control module connector at "E132-1" terminal.<br>3) If OK, check for continuity between terminals "C20-1" and "E132-1".<br>Is check result satisfactory? | Go to Step 3. | "BLU/YEL" circuit is open. |
| 3 | Check VSS circuit for short<br>1) Check for resistance between "E132-1" terminal and body ground.<br>Is resistance infinity? | VSS circuit is OK. | "BLU/YEL" circuit is short. |




[A]: Fig. for Step 2 | [B]: Fig. for Step 3

## Brake Light Switch With Pedal Position Switch Circuits Check

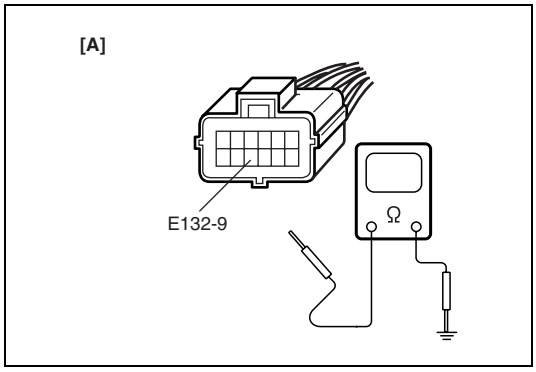
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Brake Light Switch With Pedal Position Switch Circuits Check<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Check for proper connection to cruise control module at terminals E132-2 and E132-6.<br>3) If OK, turn ignition switch ON.<br>4) Check Voltage between each terminal and ground under each condition below.<br>Brake light switch circuit specification<br>Brake pedal released terminal E132-2:0 V<br>Brake pedal released terminal E132-6:10 – 14 V<br>Brake pedal depressed terminal E132-2:10 – 14 V<br>Brake pedal depressed terminal E132-6:0 V<br>Is check result satisfactory? | Brake light switch with pedal position switch circuits are OK. | Go to Step 2. |
| 2 | Brake Light Switch Position Check<br>1) Check brake light switch for installation position referring to “Brake Light Switch Adjustment” in Section 5.<br>Is check result satisfactory? | Go to Step 3. | Adjust brake light switch position. |
| 3 | Brake light Switch With Pedal Position Switch Check<br>1) Disconnect connector from brake light switch.<br>2) Check for proper connection to brake light switch at all terminals.<br>3) If OK, check brake light and pedal position switches for operation referring to “Brake Light Switch” in Section 8B.<br>Is this switch in good condition? | “YEL/GRN” or “GRN/WHT” circuit is open or short. | Replace brake light switch. |




[A]: Fig. for Step 1

## Transmission Range Sensor (Shift Switch) Circuit Check

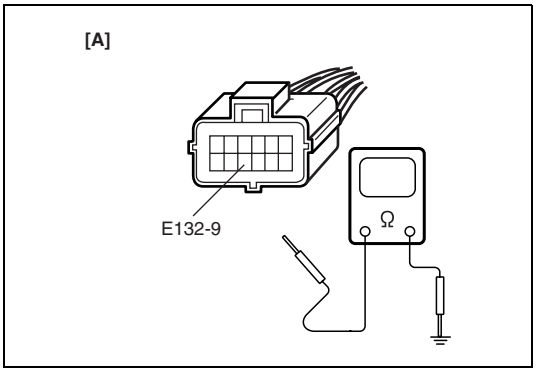
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Transmission Range Sensor (Shift Switch) Circuit Check<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Check for proper connection to cruise control module at terminal E132-9.<br>3) If OK, connect ohmmeter between terminal E132-9 and ground.<br>4) Check for continuity under each condition below.<br>**Transmission range sensor (shift switch) circuit specification**<br>**Selector lever at "P" or "N" range: Continuity**<br>**"R", "D", "2" or "L" range: Infinity (4 A/T vehicle)**<br>**"R", "D", "3" or "L" range: Infinity (5 A/T vehicle)**<br>Is check result satisfactory? | Transmission range sensor (shift switch) circuit is OK. | Go to Step 2. |
| 2 | Transmission Range Sensor (Shift Switch) Check<br>1) Disconnect transmission range sensor (shift switch) connector.<br>2) Check for proper connection to transmission range sensor (shift switch) at disconnected connector terminals.<br>3) If OK, check transmission range sensor (shift switch) for operation referring to "Transmission Range Sensor (Shift Switch)" in Section 7B1 or "Transmission Range Switch (Sensor) Inspection and Adjustment" in Section 7B2.<br>Is check result satisfactory? | "BRK/RED" or "BLK/YEL" circuit is open or short. | Adjust or replace transmission range sensor (shift switch). |




[A]: Fig. for Step 1

## Clutch Pedal Position Switch Circuit Check

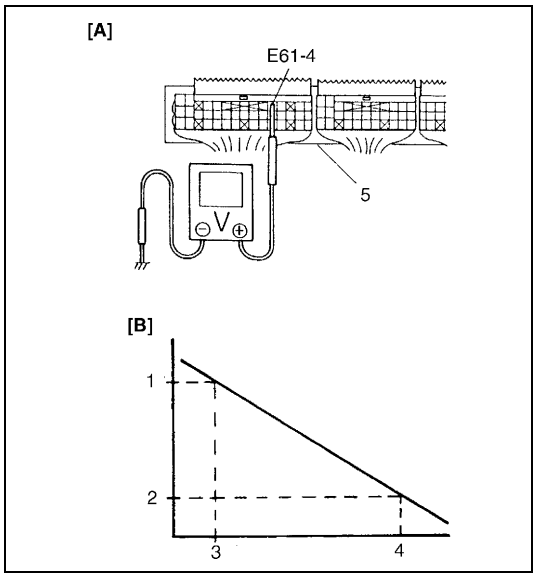
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Clutch Pedal Position Switch Circuit Check<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Check for proper connection to cruise control module at terminal E132-9.<br>3) If OK, check for resistance between terminal E132-9 and ground under each condition below.<br>Clutch pedal position switch circuit specification<br>Clutch pedal released: Infinity<br>Clutch pedal depressed: Continuity<br>Is check result satisfactory? | Clutch pedal position switch circuit is OK. | Go to Step 2. |
| 2 | Clutch Pedal Position Switch Position Check<br>1) Check clutch pedal position switch for installation position referring to “Clutch Pedal Position (CPP) Switch” in this section.<br>Is check result satisfactory? | Go to Step 3. | Adjust. |
| 3 | Clutch Pedal Position Switch Check<br>1) Disconnect connector from clutch pedal position switch.<br>2) Check for proper connection to clutch pedal position switch at all terminals.<br>3) If OK, check clutch pedal position switch for operation referring to “Clutch Pedal Position (CPP) Switch” in this section.<br>Is this switch in good condition? | “BLU” or “BLK” circuit is open or short. | Replace. |




[A]: Fig. for Step 1

## Throttle Valve Opening Signal Circuit Check

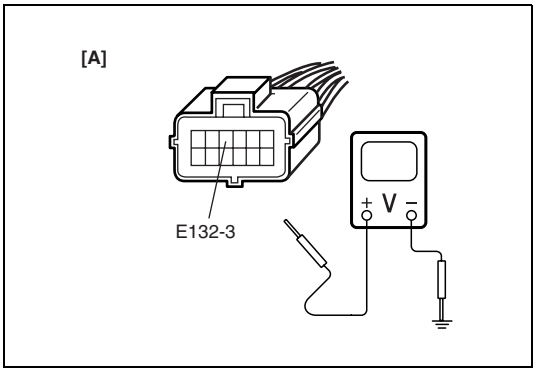
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Diagnostic Trouble Code Check<br>1) Check PCM (4 A/T vehicle only) or ECM (5 A/T vehicle only) for DTC.<br>Is there a DTC related to throttle position sensor? | Go to applicable DTC diag. flow in Section 6-1 or Section 6-2. | Go to Step 2. |
| 2 | Throttle Valve Opening Signal Circuit Check<br>1) Turn ignition switch ON.<br>2) Check voltage between terminal “E61-4” of PCM or ECM connector connected and ground.<br>Does voltage vary linearly according to throttle opening? | Throttle valve opening signal circuit is OK. | Go to Step 3. |
| 3 | Supply Voltage Check<br>1) Disconnect connector from PCM or ECM with ignition switch OFF.<br>2) Check for proper connection to PCM or ECM at terminal “E61-4”.<br>3) If OK, connect “BLU” wire terminal of main relay to ground with service wire.<br>4) Turn ignition switch ON.<br>5) Check voltage between “E61-4” of PCM or ECM connector and ground.<br>Is it 10 – 14 V? | Substitute a known-good PCM or ECM and recheck. | Check “GRY” wire for open and short.<br>If OK, proceed to cruise control module power and ground circuits check. |




| |
|---|
| [A]: Fig. for Step 2 |
| [B]: TP sensor signal voltage characteristic |
| 1. TP sensor signal voltage (9 – 13.5 V) |
| 2. TP sensor signal voltage (4 – 6.5 V) |
| 3. Throttle valve close (at idle) |
| 4. Throttle valve full open |
| 5. ECM or PCM |

## Overdrive and TCC OFF Command Signal Circuit Check

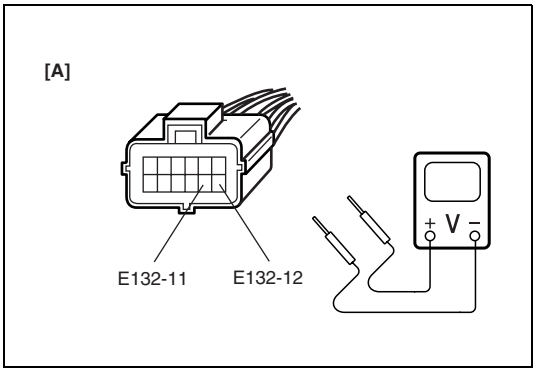
| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Overdrive off Command Signal Circuit Check<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Check for proper connection to cruise control module at terminal E132-3.<br>3) If OK, turn ignition switch ON.<br>4) Check voltage between terminal E132-3 and ground.<br>Is it 10 –14 V? | This signal circuit is OK. | Check “PNK/BLU” wire for open and short.<br>If OK, substitute a known-good PCM (4 A/T vehicle only) or TCM (5 A/T vehicle only) and recheck. |




[A]: Fig. for Step 1

## Cruise Control Module Power and Ground Circuits Check

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Power and Ground Circuits Check<br>1) Disconnect connector from cruise control module with ignition switch OFF.<br>2) Check for proper connection to cruise control module at terminals E132-12 and E132-11.<br>3) If OK, turn ignition switch ON.<br>4) Check voltage between terminals E132-12 and E132-11.<br>Does voltmeter indicate 10 – 14 V? | Power and ground circuits are OK. | “BLU/BLK” or “BLK” circuit is open. |




[A]: Fig. for Step 1

## Cruise Control Module and Its Circuit Inspection

**CAUTION:**

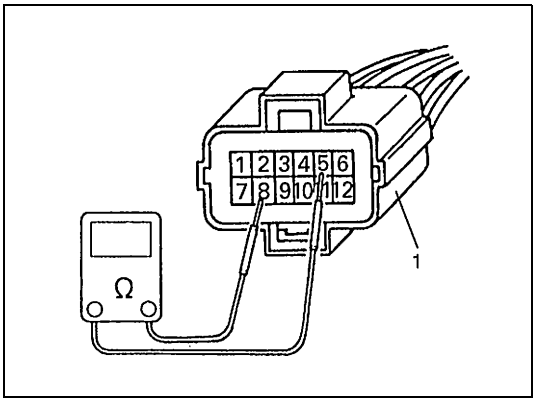
**Cruise control module can not be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to cruise control module with coupler disconnected from it.**

### Voltage Check

Check for input or output voltage of control module (voltage between each circuit and body ground) with cruise control module connector connected.

| CIRCUIT | NORMAL VOLTAGE | CONDITION |
|---|---|---|
| Vehicle speed sensor | Indicator deflection repeated between 0 – 1 V and 10 – 14 V | Ignition switch ON and cruise ON/OFF switch ON. Vehicle hoisted and rear left tire turned slowly with rear right tire locked. |
| Brake light switch | 0 – 2 V | Brake pedal released. |
| | 10 – 14 V | Brake pedal depressed. |
| Overdrive and TCC off signal (A/T only) | 10 – 14 V | Ignition switch ON. |
| "SET" indicator light | 10 – 14 V | Ignition switch ON. |
| Ground | – | – |
| Brake pedal position switch in Brake light switch | 10 – 14 V | Ignition switch ON and brake pedal released. |
| | 0 V | Ignition switch ON and brake pedal depressed. |
| Throttle valve opening signal from PCM (4 A/T vehicle only) or ECM (5 A/T vehicle only) | Ignition switch ON. Voltage varies as specified by graph in "Throttle Valve Opening Signal Circuit Check". | |
| Cruise ON/OFF switch | 4 – 5 V | Ignition switch ON and cruise ON/OFF switch released. |
| | 7 – 9 V | Ignition switch ON and cruise ON/OFF switch pressed. |
| CANCEL switch | 0 – 1 V | Ignition switch ON and CANCEL switch pressed. |
| SET/COAST switch | 1 – 2 V | Ignition switch ON and SET/COAST switch rotated. |
| RES/ACC switch | 2.5 – 4 V | Ignition switch ON and RES/ACC switch rotated. |
| Clutch pedal position switch (M/T only) | 10 – 14 V | Ignition switch ON and clutch pedal released. |
| | 0 – 1 V | Ignition switch ON and clutch pedal depressed fully. |
| Transmission range sensor (Park/Neutral position switch) (A/T only) | 0 V | Ignition switch ON and selector lever in "P" or "N" range. |
| | 10 – 14 V | Ignition switch ON and selector lever in "R", "D", "2" or "L" range (4 A/T vehicle only) or "R", "D", "3" or "L" range (5 A/T vehicle only). |
| "CRUISE" indicator lamp | 10 – 14 V | Ignition switch ON. |
| Ground | 0 V | – |
| Main power supply | 0 – 1 V | Ignition switch OFF. |
| | 10 – 14 V | Ignition switch ON. |

### Resistance Check




1) Disconnect cruise control module connector from cruise control module with ignition switch OFF.

**CAUTION:**
**Never touch terminals of cruise control module itself or connect voltmeter or ohmmeter.**

2) Check resistance between each pair of terminals of disconnected connectors as shown in the following table.

1. Cruise control module connector (E132)

| TERMINALS | CIRCUIT | STANDARD RESISTANCE | CONDITION |
|---|---|---|---|
| E132-11 – body ground | Ground | Continuity | – |
| E132-6 – E132-12 | Brake pedal position switch in brake light switch | Continuity | Brake pedal released. |
| | | No continuity | Brake pedal depressed. |
| E132-8 – E132-5 | CANCEL switch | No continuity | CANCEL switch OFF (released). |
| | | Continuity | CANCEL switch ON (pressed). |
| | SET/COAST switch | No continuity | SET/COAST switch OFF (released). |
| | | 200 – 240 Ω | SET/COAST switch ON (rotated). |
| | RES/ACC switch | No continuity | RES/ACC switch OFF (released). |
| | | 820 – 1000 Ω | RES/ACC switch ON (rotated). |
| E132-9 – E132-11 (M/T) | Clutch pedal position switch (M/T only) | No continuity | Clutch pedal released. |
| | | Continuity | Clutch pedal depressed fully. |
| E132-9 – E132-11 (A/T) | Transmission range switch (Park/neutral position switch) (A/T only) | Continuity | Selector lever in “P” or “N” range. |
| | | No continuity | Selector lever in “R”, “D”, “2” or “L” range (4 A/T vehicle only) or “R”, “D”, “3” or “L” range (5 A/T vehicle only). |

## SECTION 8G

# IMMOBILIZER CONTROL SYSTEM (H27 ENGINE MODEL) (IF EQUIPPED)

**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.**
- **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).**

**NOTE:**

**For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**

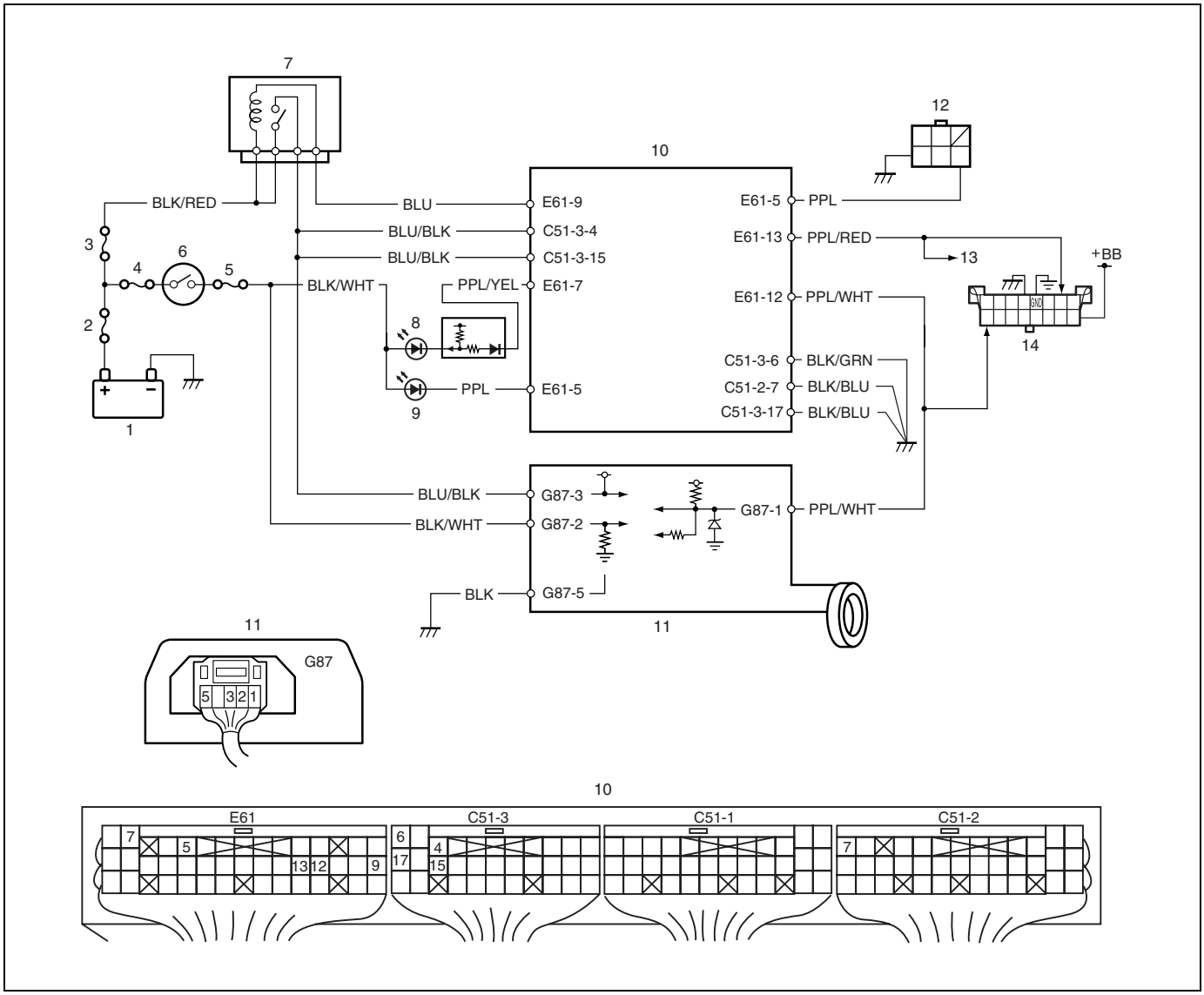
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DTC21 ECM/Immobilizer Control Module Code Not Matched (Immobilizer Control Module Side) ..... *
DTC81 (P1623) ECM/Immobilizer Control Module Code Not Matched (ECM Side) ..... *
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# General Description

## Wiring Circuit




| | | |
|---|---|---|
| 1. Battery | 6. Ignition Switch | 11. Immobilizer Control Module |
| 2. Main fuse (100 A) | 7. Main relay | 12. Diagnosis connector (for vehicle not equipped with immobilizer indicator lamp) |
| 3. “FI” fuse (15 A) | 8. Immobilizer indicator lamp (if equipped) | 13. To ABS control module, SDM, and TCM |
| 4. “IG” fuse (60 A) | 9. Malfunction indicator lamp | 14. Data link connector (DLC) |
| 5. “METER” fuse (10 A) | 10. ECM | |

# SECTION 8H

# BODY ELECTRICAL CONTROL MODULE (TYPE A)

**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.**
- **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).**

**NOTE:**

- **For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**
- **Service information for H27 engine model TYPE A is provided in this section. To distinguish TYPE A, refer to the foreword of this service manual.**

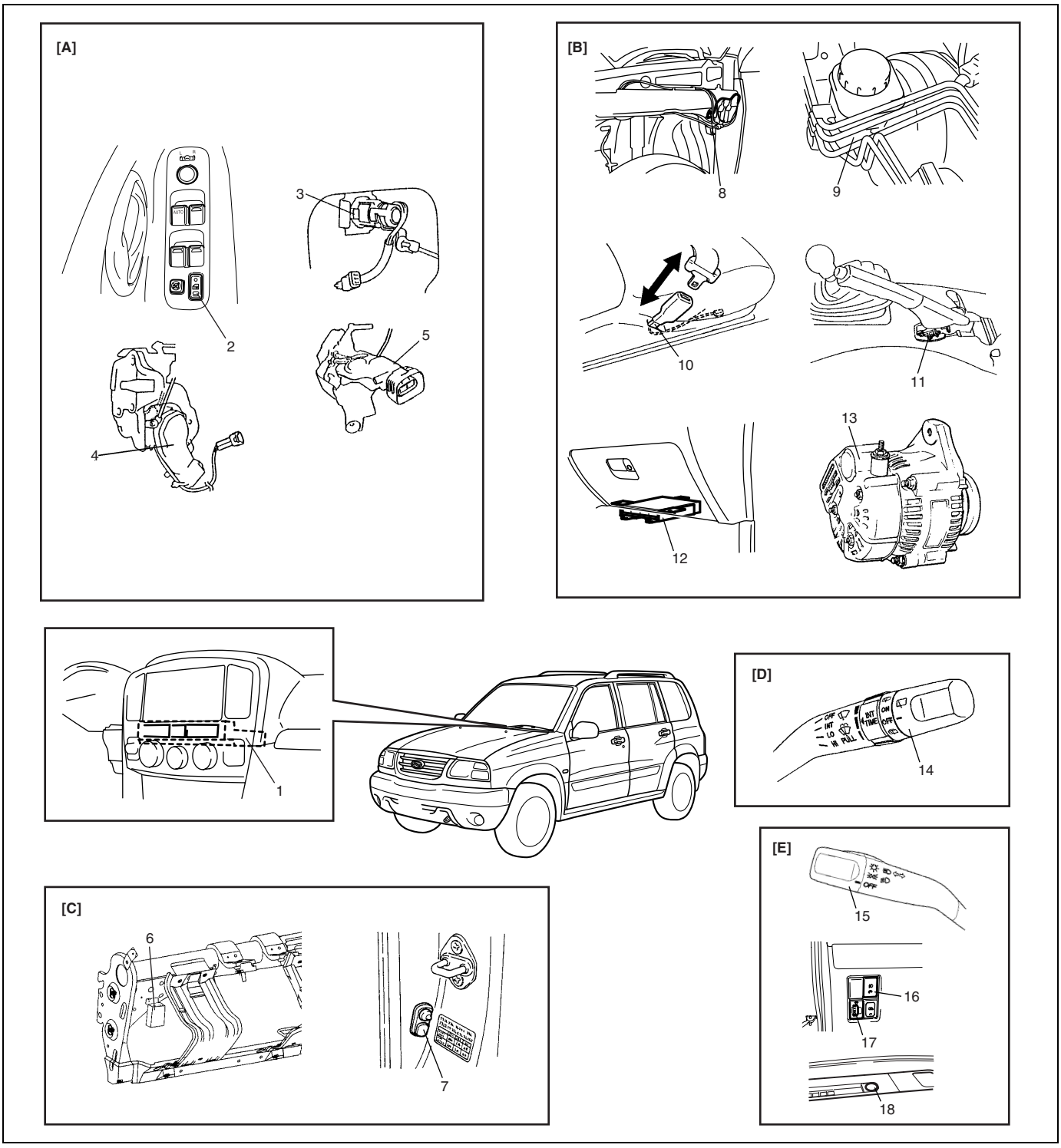


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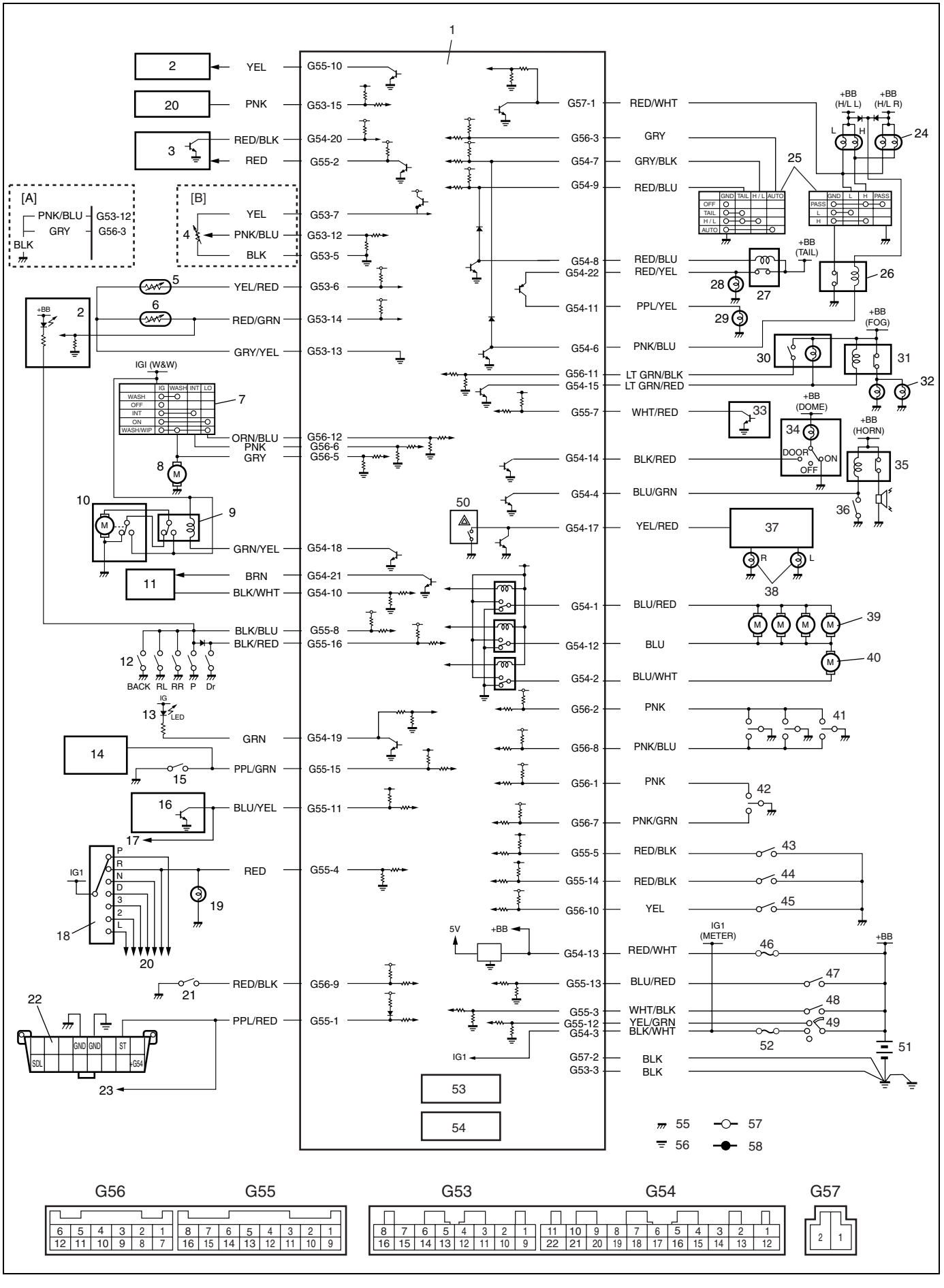
# Component Locator

## BCM and Related System Locator




| | | |
|---|---|---|
| [A]: Power door lock system components | 4. Door lock actuator | 12. PCM |
| [B]: Combination meter control (input signal parts) | 5. Back door lock actuator | 13. Generator |
| [C]: Keyless entry system (input signal parts: 6, 7 and key remainder switch in ignition switch) | 6. Keyless entry receiver (if equipped) | 14. Rear wiper and washer switch |
| [D]: Rear wiper and washer control (input signal parts) | 7. Driver side door switch | 15. Headlight, tail light and auto-on headlight switch (if equipped) |
| [E]: Lighting system (input signal parts: 15, 16, 17, 18 and generator L terminal) | 8. Windshield washer level switch | 16. Front fog light switch (if equipped) |
| 1. BCM | 9. Brake fluid level switch | 17. Illumination controller (if equipped) |
| 2. Manual door lock switch | 10. Seat belt buckle switch | 18. Auto-on headlight sensor (if equipped) |
| 3. Key cylinder switch | 11. Parking brake switch | |

# System Wiring Circuit



| | | |
|---|---|---|
| [A]: Vehicle equipped with DRL | 19. Back up light | 39. Door lock actuator (Except driver side) |
| [B]: Vehicle equipped with illumination control | 20. PCM | 40. Driver side door lock actuator |
| 1. BCM | 21. Diagnosis switch (BCM monitor connector) | 41. Driver side key cylinder switch |
| 2. Combination meter | 22. Data link connector | 42. Manual door lock switch |
| 3. HVAC control module | 23. To ECM(PCM), SDM, ABS control module, HVAC control module and combination meter | 43. Parking brake switch |
| 4. Auto light sensor (if equipped) | 24. Headlight bulb | 44. Brake fluid level switch |
| 5. Outside air temperature sensor | 25. Lighting switch | 45. Windshield washer level switch |
| 6. Illumination controller (if equipped) | 26. Headlight relay | 46. DOOR LOCK fuse |
| 7. Rear wiper and washer switch | 27. Clearance light relay | 47. Key reminder switch |
| 8. Rear washer motor | 28. Clearance, tail, license plate and illumination lamp (Without illumination control model)<br>Clearance, tail and license plate lamp (With illumination control model) | 48. Accessory switch |
| 9. Rear wiper intermittent relay | 29. Radio dimmer (Without illumination control model)<br>Illumination lamp (With illumination control model) | 49. Ignition switch |
| 10. Rear wiper motor | 30. Front fog light switch | 50. Hazard warning switch |
| 11. Keyless entry receiver | 31. Front fog light relay | 51. Battery |
| 12. Door switch | 32. Front fog light | 52. METER fuse |
| 13. Driver side seat belt indicator (in combination meter) | 33. Generator | 53. Clock/Temp. display |
| 14. SDM | 34. Interior light | 54. Warning buzzer |
| 15. Driver side seat belt buckle switch | 35. Horn relay | 55. Body ground |
| 16. VSS | 36. Horn switch | 56. Engine ground |
| 17. To ECM(PCM), combination meter | 37. Turn signal and hazard warning relay | 57. 5 V |
| 18. Transmission range switch (sensor) | 38. Turn signal and hazard warning light | 58. 12 V |

## BCM Input/Output Table

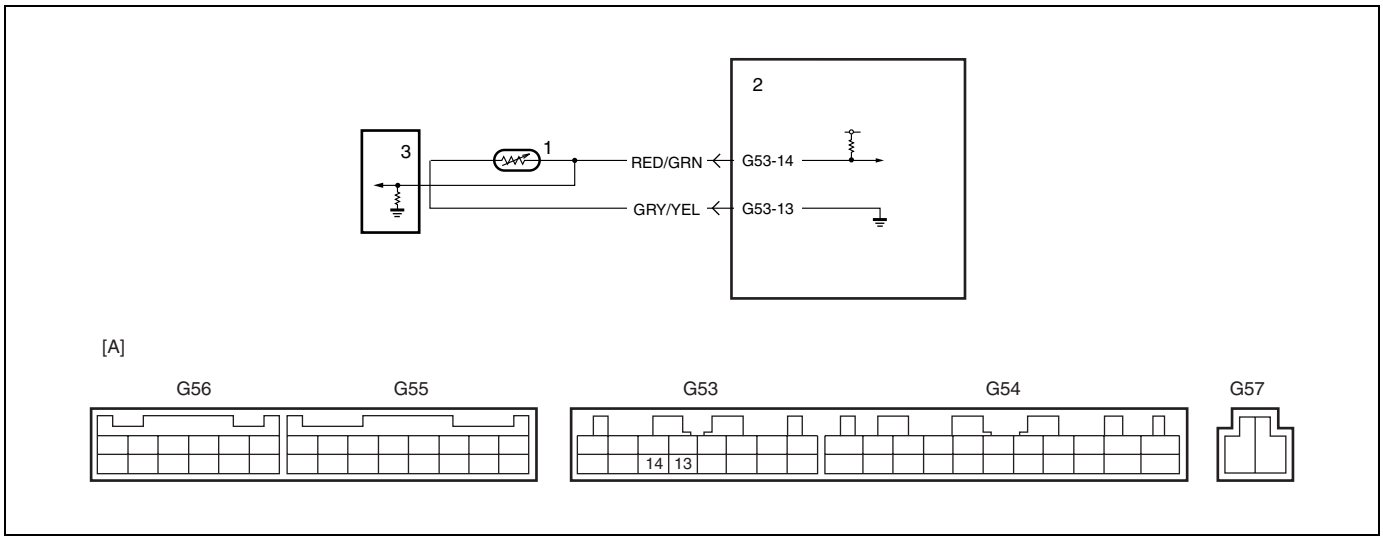
| System/Parts | Input signal | Controlled device |
|---|---|---|
| Power door lock system | • Key cylinder switch<br>• Manual door lock switch | • All of door lock actuator |
| Keyless entry system | • Key reminder switch (in ignition switch)<br>• Keyless entry receiver (if equipped)<br>• Driver side door switch | • All of door lock actuator<br>• Turn signal and hazard warning relay<br>• Interior light<br>• Keyless entry receiver (if equipped) |
| Lighting system | • Headlight switch<br>• Tail light switch<br>• Auto light switch (if equipped)<br>• Front fog light switch (if equipped)<br>• Auto light sensor (if equipped)<br>• Illumination controller (if equipped)<br>• Generator L terminal | • Headlight<br>• Tail light<br>• Front fog light (if equipped)<br>• Illumination lamp |
| Rear wiper and washer | • Rear wiper INT switch<br>• Rear wiper switch<br>• Rear washer switch | • Rear wiper motor<br>• Rear washer motor |
| Combination meter | • Headlight switch<br>• Tail light switch<br>• Auto light switch (if equipped)<br>• Brake fluid level switch<br>• Charging system monitor switch<br>• Washer level switch<br>• PCM (O/D OFF switch, transmission range switch, A/T mode switch) | • Combination meter |
| Interior light | • All of door switches<br>• Key reminder switch (in ignition switch) | • Interior light |
| Warning buzzer | • Key reminder switch (in ignition switch)<br>• Headlight switch<br>• Tail light switch<br>• Driver side seat belt switch<br>• Driver side door switch | • Warning buzzer (located in BCM) |

## Diagnostic Trouble Code (DTC) Table

| DTC (displayed on SUZUKI scan tool) | DTC (indicated by "Clock/Temp." display) | DETECTED PARTS ITEM | DETECTING CONDITION |
|---|---|---|---|
| NO DTC | 12 | Normal | Normal |
| B1121 | 21 | DRL circuit malfunction (Vehicle with DRL function model only) | DRL control circuit open or shorted to ground |
| B1131 | 31 | Illumination control input circuit open (Vehicle with illumination function model only) | Illumination control signal voltage is out of specification |
| B1141 | 41 | Outside air temperature (ambient temp.) sensor circuit open | Sensor output voltage too high |
| B1142 | 42 | Outside air temperature (ambient temp.) sensor circuit short to ground | Sensor output voltage too low |
| B1170 | 70 | Factory register error | Memory error |
| B1171 | 71 | Memory check sum error | |
| B1172 | 72 | Memory write error | |

# DTC B1131 Illumination Control Input Circuit Open

## Wiring Diagram




| | |
|---|---|
| [A]: View from harness side | 2. BCM |
| 1. Illumination controller | 3. Combination meter |

| DTC DETECTING CONDITION | POSSIBLE CAUSE |
|---|---|
| • High voltage at terminal G53-14 when ignition switch on position | • "RED/GRN" circuit open<br>• "GRN/YEL" circuit open<br>• Illumination controller malfunction<br>• BCM malfunction |

## Table Test Description

STEP 1: Check whether malfunction is in illumination controller.
STEP 2: Check illumination controller input circuit.
STEP 3: Check illumination controller ground circuit.

## Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Disconnect illumination controller coupler from illumination controller.<br>2) Check illumination controller referring to "Illumination Controller" in Section 8C.<br>Is it good condition? | Go to Step 2. | Replace illumination controller. |
| 2 | With ignition switch ON, measure voltage between "RED/GRN" circuit terminal of illumination controller coupler and body ground.<br>Is voltage 4.5 – 5.5 V? | Go to Step 3. | "RED/GRN" circuit open or short to ground.<br>If wire and connection are OK, substitute a known-good BCM and recheck. |
| 3 | Measure resistance between illumination controller coupler and "G53-13" terminal of BCM connector.<br>Is resistance infinity? | "GRY/YEL" wire open. | Replace BCM. |

# On-Vehicle Service

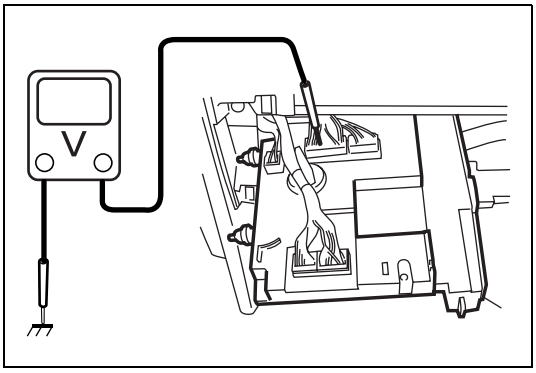
## Inspection of BCM and Its Circuits

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

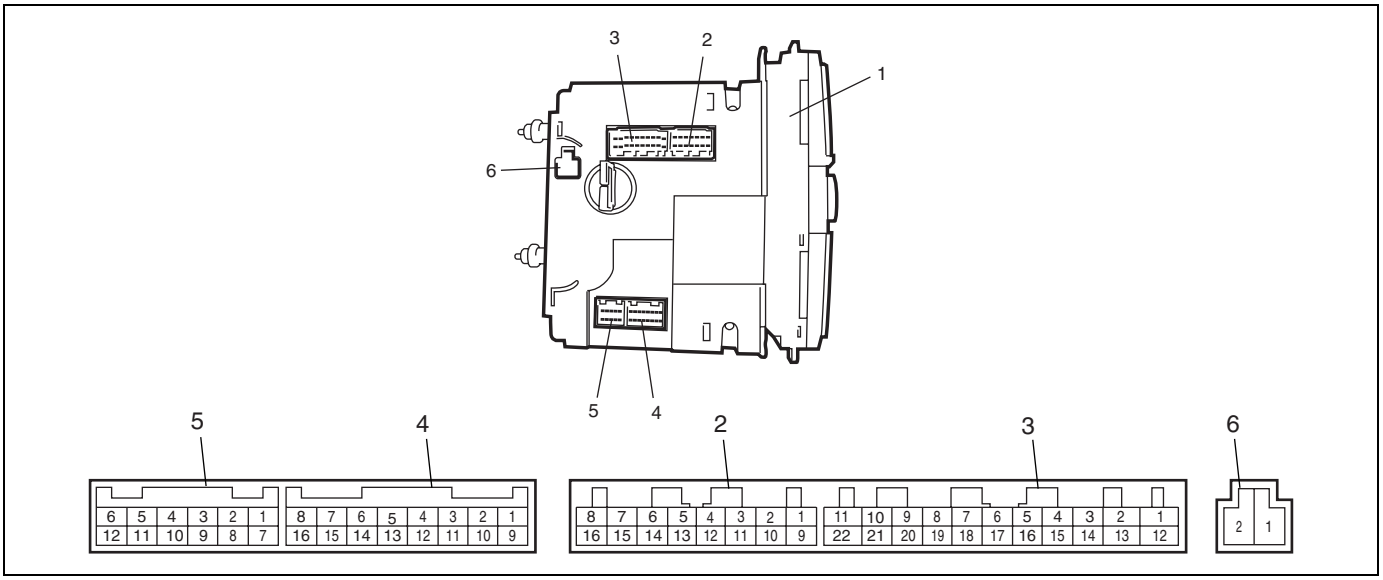
1) Disconnect negative cable (–) at battery.
2) Remove BCM referring to "BCM Removal and Installation" in this section.




3) Connect BCM connector as shown in figure.
4) Check voltage at each terminal of couplers connected.

**NOTE:**

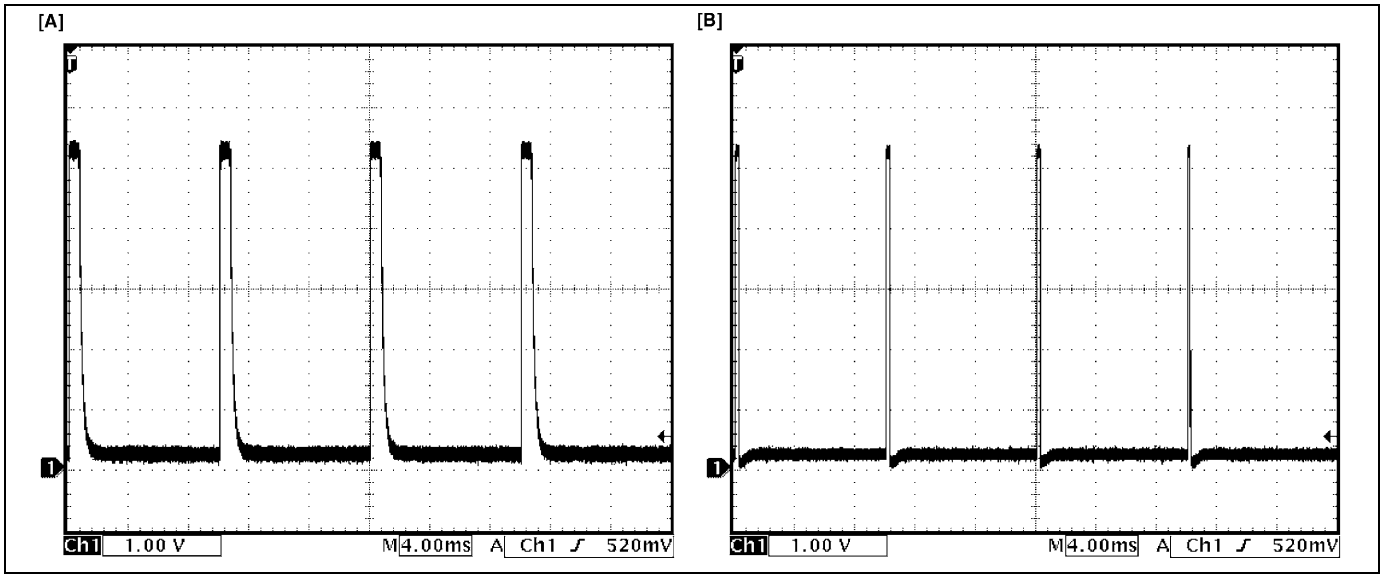
- **As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Pulse signal cannot be measured by voltmeter. It can be measured by oscilloscope.**




| | | |
|---|---|---|
| 1. BCM | 3. G54 BCM connector (viewed from harness side) | 5. G56 BCM connector (viewed from harness side) |
| 2. G53 BCM connector (viewed from harness side) | 4. G55 BCM connector (viewed from harness side) | 6. G57 BCM connector (viewed from harness side) |

As the input signal of the switch described below repeats ON and OFF at every 10ms as shown in the figure below, measurement of the terminal voltage will indicate an abnormal voltage value.
Also, if no signal input/output occurs for 10seconds or longer while the ignition switch remains OFF, the stand-by current is controlled by reducing its ON time (Sleep mode).

**Applicable switch:**
**Manual door lock/unlock switch**
**Door key cylinder lock/unlock switch**
**Auto-on headlight switch (if equipped)**
**Diagnosis switch**
**Windshield washer level switch**




| [A]: Normal mode (Ignition switch: ON) | [B]: Sleep mode |
|---|---|

| | |
|---|---|
| Measurement terminal | CH1: “G56-1” or “G56-7” to “G53-3” (Manual door lock/unlock switch)<br>CH1: “G56-2” or “G56-8” to “G53-3” (Door key cylinder lock/unlock switch)<br>CH1: “G56-3” to “G53-3” (Auto-on headlight switch) (if equipped)<br>CH1: “G56-9” to “G53-3” (Diagnosis switch)<br>CH1: “G56-10” to “G53-3” (Windshield washer level switch) |
| Oscilloscope setting | CH1: 1 V/DIV<br>TIME: 4.0 ms/DIV |
| Measurement condition | Ignition switch turns to ON position. |

**Terminal “G53”**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G53-1 | – | – | – | – |
| G53-2 | – | – | – | – |
| G53-3 | BLK | Ground | – | – |
| G53-4 | – | – | – | – |
| G53-5 | BLK | Sensor ground for auto light sensor (vehicle with illumination control function model) | – | – |
| G53-6 | YEL/RED | Outside air temperature sensor | 2.5 V | Ignition switch: ON<br>Outside air temperature at approx. 25 °C (77 °F) |
| G53-7 | YEL | Power supply for auto light sensor (vehicle with illumination control function model) | 4.75 – 5.25 V | Ignition switch turned ON |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G53-8 | – | – | – | – |
| G53-9 | – | – | – | – |
| G53-10 | – | – | – | – |
| G53-11 | – | – | – | – |
| G53-12 | PNK/BLU | Auto-on headlight sensor (vehicle with illumination control function model) | 0.2 V | Ignition switch: ON<br>Cover the sensor lens with hand |
| | | | 3 – 4 V | Ignition switch: ON<br>Light the sensor lens with light |
| | | DRL selector line (vehicle with DRL function model) | 0 V | Ignition switch: ON |
| G53-13 | GRY/YEL | Sensor ground | – | – |
| G53-14 | RED/GRN | Illumination volume resister (vehicle with illumination control function model) | 0 – 0.5 V | Ignition switch: ON, Light switch: ON<br>Illumination volume: Full open |
| | | | 3.5 – 4.5 V | Ignition switch: ON, Light switch: ON<br>Illumination volume: Full close |
| G53-15 | PNK | PCM-BCM communication line (AT model only) | 0 – 1 V<br>↑↓<br>10 – 14 V | Refer to “PCM-BCM (4 A/T model only) and BCM-METER Signal Circuit Construction” and “BCM-METER Signal Circuit (4 A/T Model)” in Section 8C. |
| G53-16 | – | – | – | – |

**Terminal “G54”**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G54-1 | BLU/RED | Door unlock control (except driver side) | 0 V | Ignition switch: ON |
| | | | 10 – 14 V (Reference waveform No.1) | Manual door unlock or door key cylinder unlock switch turned ON |
| G54-2 | BLU/WHT | Driver side door unlock control | 0 V | Ignition switch turned ON |
| | | | 10 – 14 V (Reference waveform No.1) | Manual door unlock or door key cylinder unlock switch turned ON |
| G54-3 | BLK/WHT | Power source (IG1) | 10 – 14 V | Ignition switch: ON |
| G54-4 | BLU/GRN | Horn control | 10 – 14 V | Horn switch: OFF |
| G54-5 | – | – | – | – |
| G54-6 | PNK/BLU | Headlight control | 10 – 14 V | Headlight switch: OFF |
| | | | 0 V | Headlight switch: ON |
| G54-7 | GRY/BLK | Headlight switch | 10 – 14 V | Headlight switch: OFF |
| | | | 0 V | Headlight switch: ON |
| G54-8 | RED/BLU | Tail light control | 10 – 14 V | Taillight switch: OFF |
| | | | 0 V | Taillight switch: ON |
| G54-9 | RED/BLU | Tail light switch | 10 – 14 V | Taillight switch: OFF |
| | | | 0 V | Taillight switch: ON |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G54-10 | BLK/WHT | Keyless entry system communication line | 0 – 1 V<br>↑↓<br>10 – 14 V<br>(Reference waveform No.3) | Unlock switch pushed ON of keyless entry transmitter |
| | | | 0 V | Ignition switch: ON |
| G54-11 | PPL/YEL | Illumination control (vehicle with illumination control function model) | 10 – 14 V | Tail or head light switch: ON<br>Illumination control: Full open |
| | | | 4 – 6 V | Tail or head lamp switch: ON<br>Illumination control: Full close |
| | | | 0 V | Tail or head light switch: OFF |
| | | Illumination control (other than above model) | 10 – 14 V | Tail or head lamp switch: ON |
| | | | 0 V | Tail or head light switch: OFF |
| G54-12 | BLU | Door lock control | 10 – 14 V<br>(Reference waveform No.2) | Manual door lock or door key cylinder lock switch: ON |
| | | | 0 V | Ignition switch: ON |
| G54-13 | RED/WHT | Backup power source | 10 – 14 V | – |
| G54-14 | BLK/RED | Interior light control | 10 – 14 V | Dome lamp switch DOOR position and all door is closed |
| | | | 0 V | Dome lamp: ON |
| G54-15 | LT GRN/RED | Fog light control | 10 – 14 V | Front fog lamp: OFF |
| | | | 0 V | Front fog lamp: ON |
| G54-16 | – | – | – | – |
| G54-17 | YEL/RED | Hazard warning light control | 10 – 14 V | Hazard warning switch: OFF |
| | | | 0 V | Hazard warning switch: ON |
| G54-18 | GRN/YEL | Rear wiper control | 10 – 14 V | Rear wiper switch: OFF |
| | | | 0 V | Rear wiper switch: ON |
| G54-19 | GRN | Driver seat belt warning indicator | 10 – 14 V | Driver seat belt warning indicator turned OFF |
| | | | 0 V | Driver seat belt warning indicator turned ON |
| G54-20 | BLK/BLK | Rear defogger input | 10 – 14 V | Rear defogger switch: OFF |
| | | | 0 V | Rear defogger switch: ON |
| G54-21 | BRN | Keyless entry system communication | 0 V | Ignition switch: ON |
| G54-22 | RED/YEL | Power supply for illumination | 10 – 14 V | Tail or head light switch: ON<br>DRL or auto-on headlight: Active |
| | | | 0 V | Tail or head light switch: OFF |

**Terminal "G55"**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G55-1 | PPL/RED | Data link connector | 10 – 14 V | Scan tool not connected to DLC |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G55-2 | RED | Outside air temperature communication line | 0 V<br>↑↓<br>4.75 – 5.25 V | Refer to “Reference waveform No.1” of “HVAC Control Module and Its Circuits Inspection” in Section 1B. |
| G55-3 | WHT/BLK | Accessory switch | 10 – 14 V | Ignition switch: ACC |
| G55-4 | RED | Reverse switch (for AT model) (if equipped) | 10 – 14 V | Transmission ramge switch: R |
| | | | 0 V | Other than R range |
| G55-5 | RED/BLK | Parking brake switch | 10 – 14 V | Release parking brake lever |
| | | | 0 V | Apply parking brake lever |
| G55-6 | – | – | – | – |
| G55-7 | WHT/RED | Generator “L” terminal | 10 – 14 V | Engine running |
| | | | 0 V | Ignition switch: ON |
| G55-8 | BLK/BLU | Driver side door switch | 10 – 14 V | All door is closed |
| | | | 0 V | Driver side door is opened |
| G55-9 | – | – | – | – |
| G55-10 | YEL | BCM-Meter communication line | 0 V<br>↑↓<br>10 – 14 V | Refer to “PCM-BCM (4 A/T model only) and BCM-METR Signal Circuit Construction” and “BCM-METER Signal Circuit (4 A/T Model)” in Section 8C. |
| G55-11 | BLU/YEL | VSS | 10 – 14 V | Ignition switch: ON |
| G55-12 | YEL/GRN | IG2 switch | 10 – 14 V | Ignition switch: ON |
| G55-13 | BLU/RED | Key reminder switch | 10 – 14 V | Insert key to key cylinder |
| G55-14 | RED/BLK | Brake fluid level switch | 10 – 14 V | Brake fluid level normal condition |
| G55-15 | PPL/GRN | Driver side seat belt switch | 10 – 14 V | Driver side seat belt: Unfastened |
| | | | 0 V | Driver side seat belt: Fastened |
| G55-16 | BLK/RED | Door switch (except driver side) | 10 – 14 V | All door is closed |
| | | | 0 V | Any one of the door is opened |

**Terminal “G56”**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G56-1 | PNK/BLK | Manual door lock switch | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.2) | Ignition switch: ON |
| | | | 0 V | Manual lock switch: ON |
| G56-2 | PNK | Door key cylinder lock switch | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.2) | Ignition switch: ON |
| | | | 0 V | Key lock switch: ON |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G56-3 | GRY | Auto-on headlight switch (vehicle with illumination control function model) | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.4) | Ignition switch: ON<br>Auto-on headlight switch: OFF |
| | | DRL selector line (vehicle with DRL function model) | 0 V | Ignition switch: ON |
| G56-4 | – | – | – | – |
| G56-5 | GRY | Rear washer switch | 10 – 14 V | Rear washer switch: ON |
| | | | 0 V | Rear washer switch: OFF |
| G56-6 | PNK | Rear wiper interval switch | 10 – 14 V | Rear wiper interval switch: ON |
| | | | 0 V | Rear wiper interval switch: OFF |
| G56-7 | PNK/GRN | Manual door unlock switch | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.1) | Ignition switch: ON |
| | | | 0 V | Manual unlock switch: ON |
| G56-8 | PNK/BLU | Door key cylinder unlock switch | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.1) | Ignition switch: ON |
| | | | 0 V | Door key cylinder unlock switch: ON |
| G56-9 | RED/BLK | Diagnosis switch (monitor connector) | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.5) | Ignition switch: ON<br>Diagnosis switch: OFF (monitor connector unconnected to ground circuit) |
| | | | 0 V | Diagnosis switch: ON (monitor connector short to ground circuit) |
| G56-10 | GRN | Windshield washer level switch (if equipped) | 10 – 14 V | Windshield washer level switch: OFF |
| | | | 0 V | Windshield washer level switch: ON |
| G56-11 | LT GRN/ BLK | Fog light switch | 10 – 14 V | Tail or head light: ON<br>Front fog lamp switch: ON |
| | | | 0 V | Except above condition |
| G56-12 | ORN/BLU | Rear wiper low switch | 10 – 14 V | Rear wiper low switch: ON |
| | | | 0 V | Rear wiper low switch: OFF |

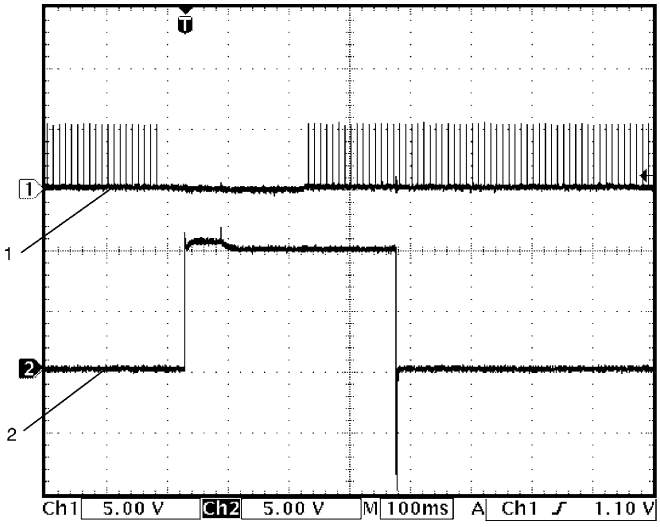
**Terminal "G57"**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G57-1 | RED/ WHT | DRL control & headlight low monitor (LH steering vehicle only) | 10 – 14 V | Headlight and DRL: OFF |
| | | | 0 V | Headlight or DRL: ON |
| G57-2 | BLK | Ground | – | – |

### 1. Reference waveform No.1

Passenger side or driver side door lock actuator UNLOCK signal (2) with manual unlock switch or door key cylinder unlock switch signal (1)

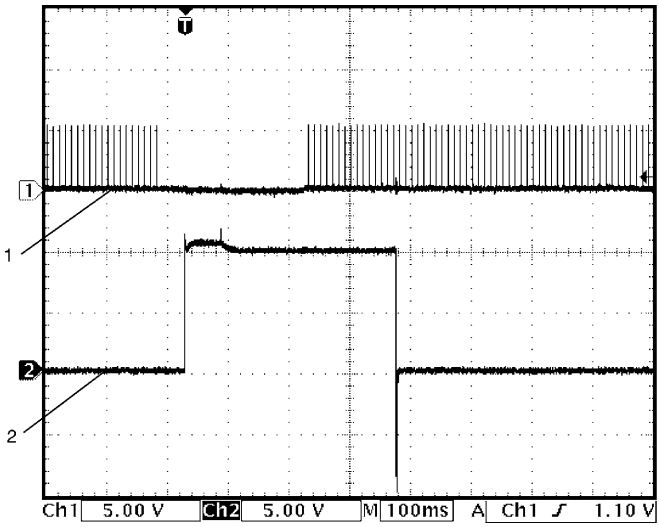
| | |
|---|---|
| Measurement terminal | CH1: “G56-7” or “G56-8” to “G53-3”<br>CH2: “G54-1” or “G54-2” to “G53-3” |
| Oscilloscope setting | CH1: 5 V/DIV<br>CH2: 5 V/DIV<br>TIME: 100 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |




### 2. Reference waveform No.2

Door lock actuator LOCK signal (2) with manual lock switch or door key cylinder lock switch signal (1)

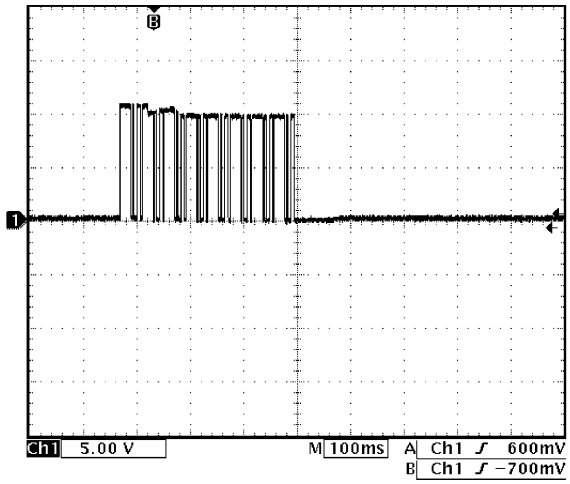
| | |
|---|---|
| Measurement terminal | CH1: “G56-1” or “G56-2” to “G53-3”<br>CH2: “G54-12” to “G53-3” |
| Oscilloscope setting | CH1: 5 V/DIV<br>CH2: 5 V/DIV<br>TIME: 100 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |



### 3. Reference waveform No.3

Keyless entry receiver LOCK/UNLOCK signal

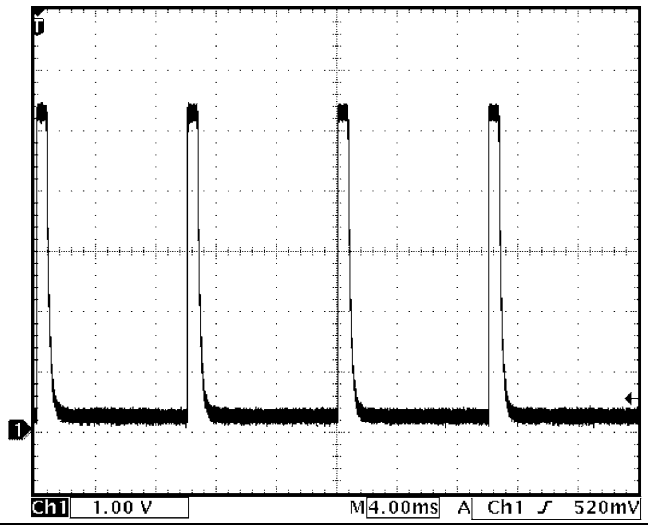
| | |
|---|---|
| Measurement terminal | CH1: “G54-10” to “G53-3” |
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 100 ms/DIV |
| Measurement condition | Ignition key: Pull off |




### 4. Reference waveform No.4

Auto-on headlight switch (if equipped) position signal

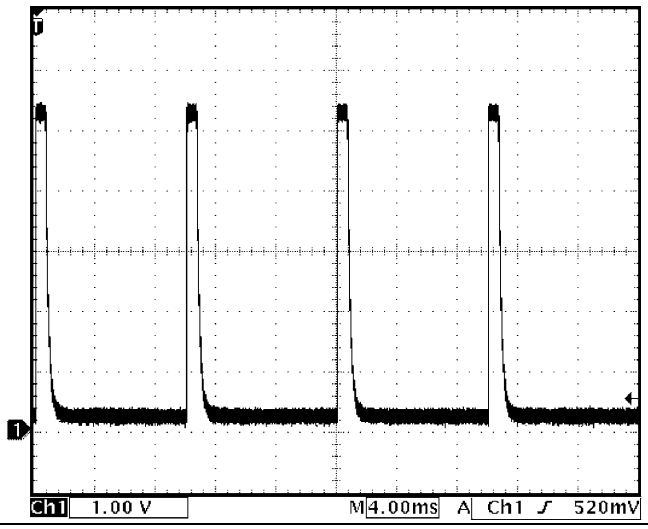
| | |
|---|---|
| Measurement terminal | CH1: “G56-3” to “G53-3” |
| Oscilloscope setting | CH1: 1 V/DIV<br>TIME: 4 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |



### 5. Reference waveform No.5

Diagnosis switch position signal

| | |
|---|---|
| Measurement terminal | CH1: “G56-9” to “G53-3” |
| Oscilloscope setting | CH1: 1 V/DIV<br>TIME: 4 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |



## SECTION 8H1

# BODY ELECTRICAL CONTROL MODULE (TYPE B and RHW ENGINE)

**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.**
- **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).**

**NOTE:**

- **For the items with asterisk (*) in the content below, refer to Section 8H of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**
- **Service information for two types of engine model, H27 engine model (TYPE B), and RHW engine model, is provided in this section. To distinguish TYPE B, refer to the foreword of this service manual.**

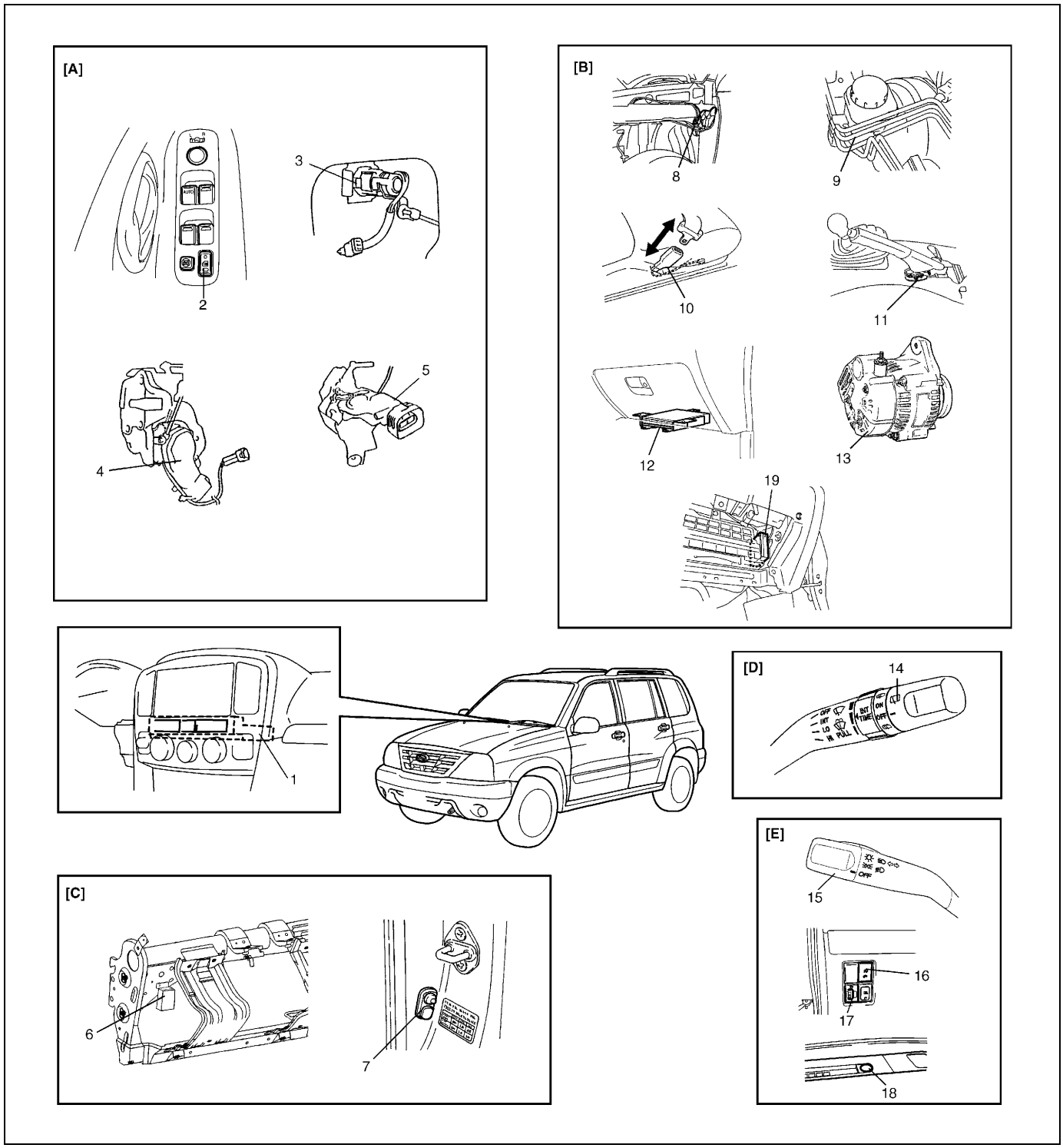
8H1

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# Component Locator

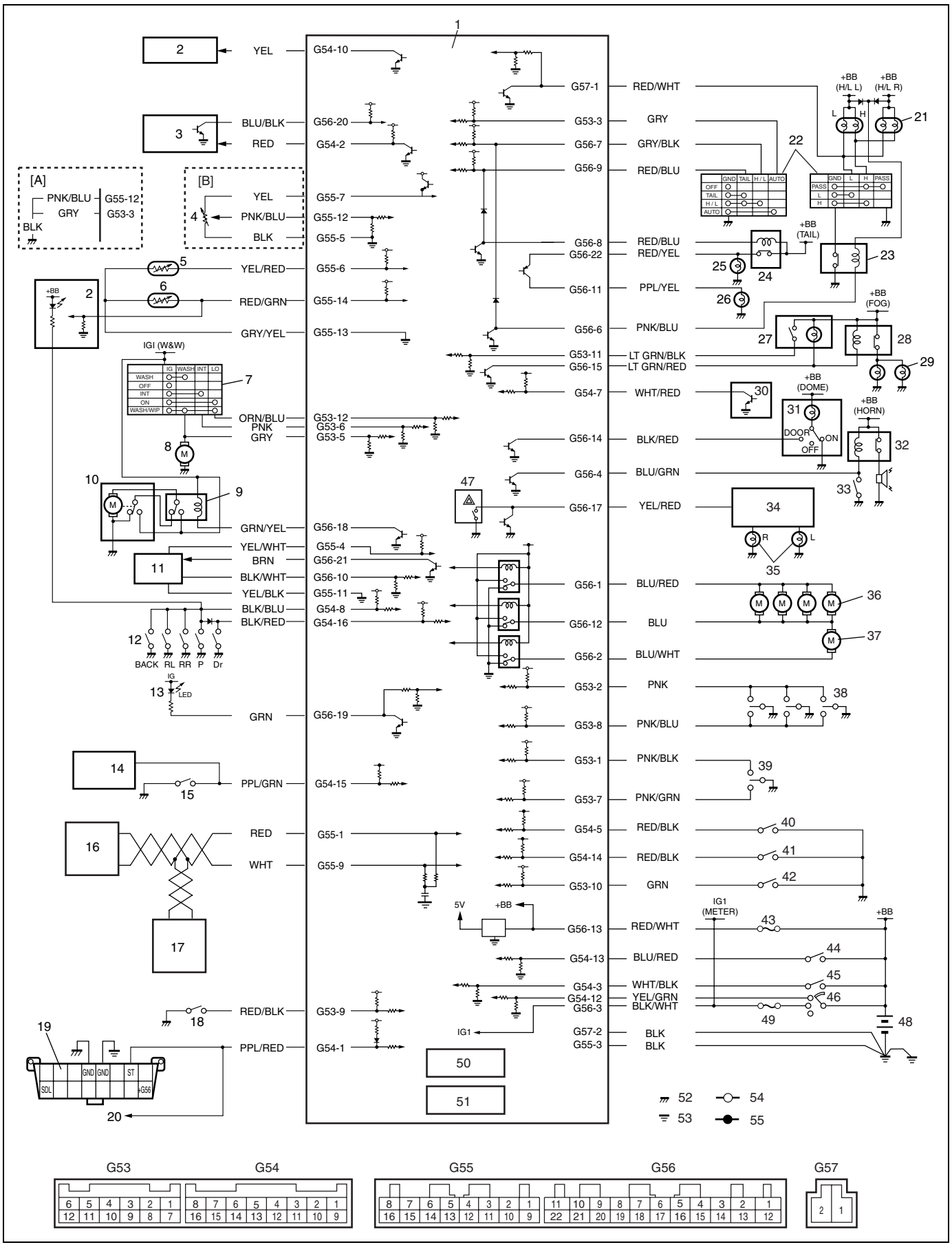
## BCM and Related System Locator




| | | |
|---|---|---|
| [A]: Power door lock system components | 4. Door lock actuator | 12. ECM |
| [B]: Combination meter control (input signal parts) | 5. Back door lock actuator | 13. Generator |
| [C]: Keyless entry system (input signal parts: 6, 7 and key remainder switch in ignition switch) | 6. Keyless entry receiver (if equipped) | 14. Rear wiper and washer switch |
| [D]: Rear wiper and washer control (input signal parts) | 7. Driver side door switch | 15. Headlight, tail light and auto-on headlight switch (if equipped with H27 engine) |
| [E]: Lighting system (input signal parts: 15, 16, 17, 18 and generator L terminal) | 8. Windshield washer level switch | 16. Front fog light switch (if equipped) |
| 1. BCM | 9. Brake fluid level switch | 17. Illumination controller (if equipped with H27 engine) |
| 2. Manual door lock switch | 10. Seat belt buckle switch (H27 engine only) | 18. Auto-on headlight sensor (if equipped with H27 engine) |
| 3. Key cylinder switch | 11. Parking brake switch | 19. TCM (5 A/T model) |

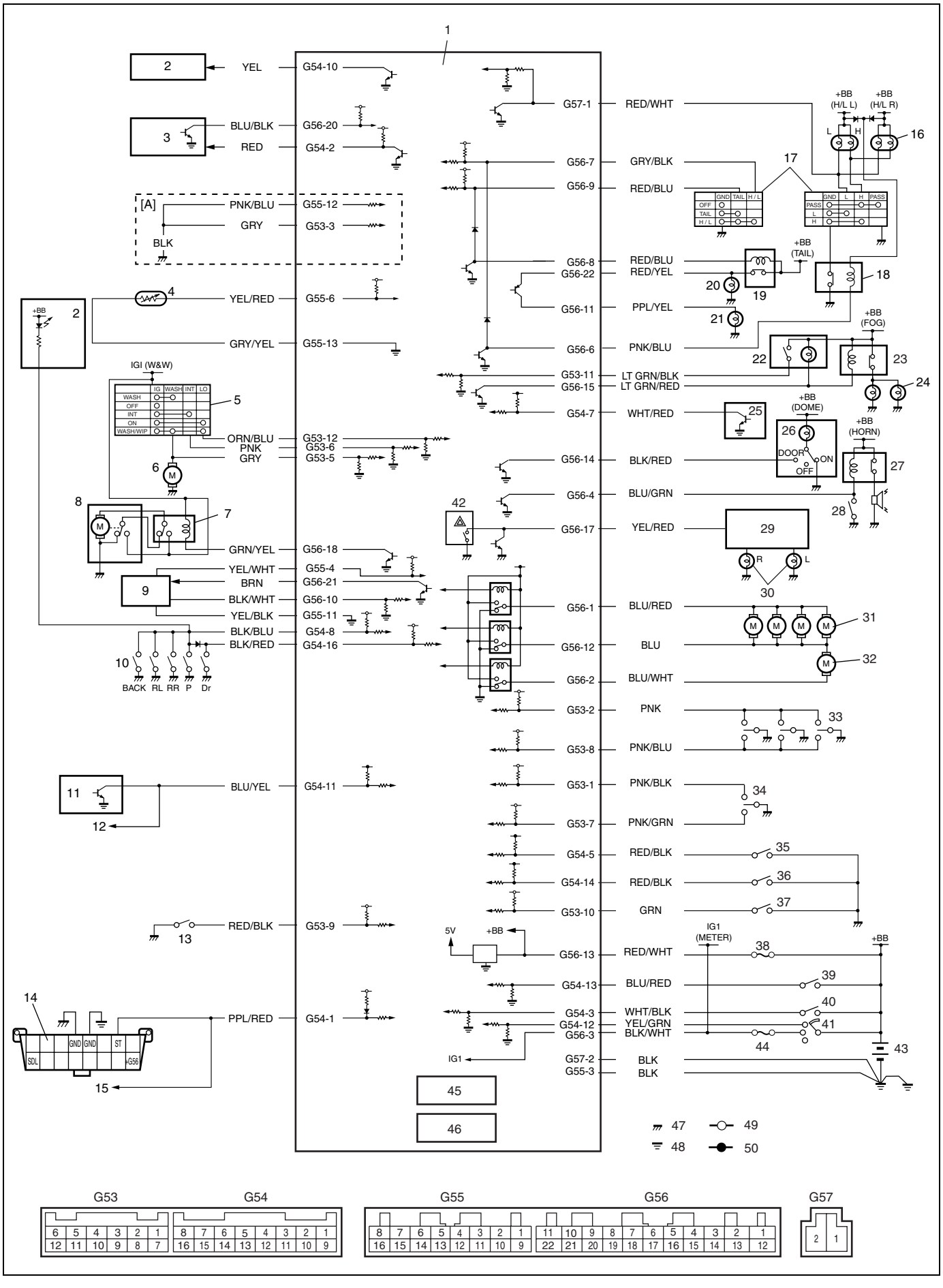
# System Wiring Circuit

## H27 engine



| | | |
|---|---|---|
| [A]: Vehicle equipped with DRL | 18. Diagnosis switch (BCM monitor connector) | 37. Driver side door lock actuator |
| [B]: Vehicle equipped with illumination control | 19. Data link connector | 38. Driver side key cylinder switch |
| 1. BCM | 20. To ECM, SDM, ABS control module, HVAC control module and Combination meter | 39. Manual door lock switch |
| 2. Combination meter | 21. Headlight bulb | 40. Parking brake switch |
| 3. HVAC control module | 22. Lighting switch | 41. Brake fluid level switch |
| 4. Auto light sensor (if equipped) | 23. Headlight relay | 42. Windshield washer level switch |
| 5. Outside air temperature sensor | 24. Clearance light relay | 43. DOOR LOCK fuse |
| 6. Illumination controller (if equipped) | 25. Clearance, tail, license plate and illumination lamp (Without illumination control model)<br>Clearance, tail and license plate lamp (With illumination control model) | 44. Key reminder switch |
| 7. Rear wiper and washer switch | 26. Radio dimmer (Without illumination control model)<br>Illumination lamp (With illumination control model) | 45. Accessory switch |
| 8. Rear washer motor | 27. Front fog light switch | 46. Ignition switch |
| 9. Rear wiper intermittent relay | 28. Front fog light relay | 47. Hazard warning switch |
| 10. Rear wiper motor | 29. Front fog light | 48. Battery |
| 11. Keyless entry receiver | 30. Generator | 49. METER fuse |
| 12. Door switch | 31. Interior light | 50. Clock/Temp. display |
| 13. Driver side seat belt indicator (in combination meter) | 32. Horn relay | 51. Warning buzzer |
| 14. SDM | 33. Horn switch | 52. Body ground |
| 15. Driver side seat belt buckle switch | 34. Turn signal and hazard warning relay | 53. Engine ground |
| 16. TCM | 35. Turn signal and hazard warning light | 54. 5 V |
| 17. ECM | 36. Door lock actuator (Except driver side) | 55. 12 V |

## RHW engine


1
2
YEL
G54-10
3
BLU/BLK
G56-20
RED
G54-2
[A]
PNK/BLU
G55-12
GRY
G53-3
BLK
4
YEL/RED
G55-6
GRY/YEL
G55-13
+BB
2
IGI (W&W)
IG WASH INT LO
WASH
OFF
INT
ON
WASH/WIP
5
ORN/BLU
G53-12
PNK
G53-6
GRY
G53-5
6
M
8
7
GRN/YEL
G56-18
YEL/WHT
G55-4
BRN
G56-21
9
BLK/WHT
G56-10
YEL/BLK
G55-11
BLK/BLU
G54-8
BLK/RED
G54-16
10
BACK RL RR P Dr
11
BLU/YEL
G54-11
12
RED/BLK
G53-9
13
14
GND GND ST
SDL
+G56
PPL/RED
G54-1
15
G57-1
RED/WHT
G56-7
GRY/BLK
G56-9
RED/BLU
G56-8
RED/BLU
G56-22
RED/YEL
G56-11
PPL/YEL
G56-6
PNK/BLU
G53-11
LT GRN/BLK
G56-15
LT GRN/RED
G54-7
WHT/RED
G56-14
BLK/RED
G56-4
BLU/GRN
42
G56-17
YEL/RED
G56-1
BLU/RED
G56-12
BLU
G56-2
BLU/WHT
G53-2
PNK
G53-8
PNK/BLU
G53-1
PNK/BLK
G53-7
PNK/GRN
G54-5
RED/BLK
G54-14
RED/BLK
G53-10
GRN
5V
+BB
G56-13
RED/WHT
G54-13
BLU/RED
G54-3
WHT/BLK
G54-12
YEL/GRN
G56-3
BLK/WHT
IG1
G57-2
BLK
G55-3
BLK
45
46
+BB (H/L L)
+BB (H/L R)
L
H
16
17
GND TAIL H/L
OFF
TAIL
H/L
GND L H PASS
PASS
L
H
+BB (TAIL)
18
20
19
21
+BB (FOG)
22
23
24
+BB (DOME)
25
26
DOOR
ON
OFF
+BB (HORN)
27
28
29
R
L
30
M
31
32
33
34
35
36
37
IG1 (METER)
38
39
40
41
44
+BB
43
47
48
49
50
G53
G54
G55
G56
G57
6 5 4 3 2 1
12 11 10 9 8 7
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
8 7 6 5 4 3 2 1
16 15 14 13 12 11 10 9
11 10 9 8 7 6 5 4 3 2 1
22 21 20 19 18 17 16 15 14 13 12
2 1

| | | | | | |
|---|---|---|---|---|---|
| [A]: | Vehicle equipped with DRL | 17. | Lighting switch | 34. | Manual door lock switch |
| 1. | BCM | 18. | Headlight relay | 35. | Parking brake switch |
| 2. | Combination meter | 19. | Clearance light relay | 36. | Brake fluid level switch |
| 3. | HVAC control module | 20. | Clearance, tail, license plate and illumination lamp | 37. | Windshield washer level switch |
| 4. | Outside air temperature sensor | 21. | Radio dimmer | 38. | DOOR LOCK fuse |
| 5. | Rear wiper and washer switch | 22. | Front fog light switch | 39. | Key reminder switch |
| 6. | Rear washer motor | 23. | Front fog light relay | 40. | Accessory switch |
| 7. | Rear wiper intermittent relay | 24. | Front fog light | 41. | Ignition switch |
| 8. | Rear wiper motor | 25. | Generator | 42. | Hazard warning switch |
| 9. | Keyless entry receiver | 26. | Interior light | 43. | Battery |
| 10. | Door switch | 27. | Horn relay | 44. | METER fuse |
| 11. | VSS | 28. | Horn switch | 45. | Clock/Temp. display |
| 12. | To ECM, METER | 29. | Turn signal and hazard warning relay | 46. | Warning buzzer |
| 13. | Diagnosis switch (BCM monitor connector) | 30. | Turn signal and hazard warning light | 47. | Body ground |
| 14. | Data link connector | 31. | Door lock actuator (Except driver side) | 48. | Engine ground |
| 15. | To ECM, SDM, ABS control module, HVAC control module and Combination meter | 32. | Driver side door lock actuator | 49. | 5 V |
| 16. | Headlight bulb | 33. | Driver side key cylinder switch | 50. | 12 V |

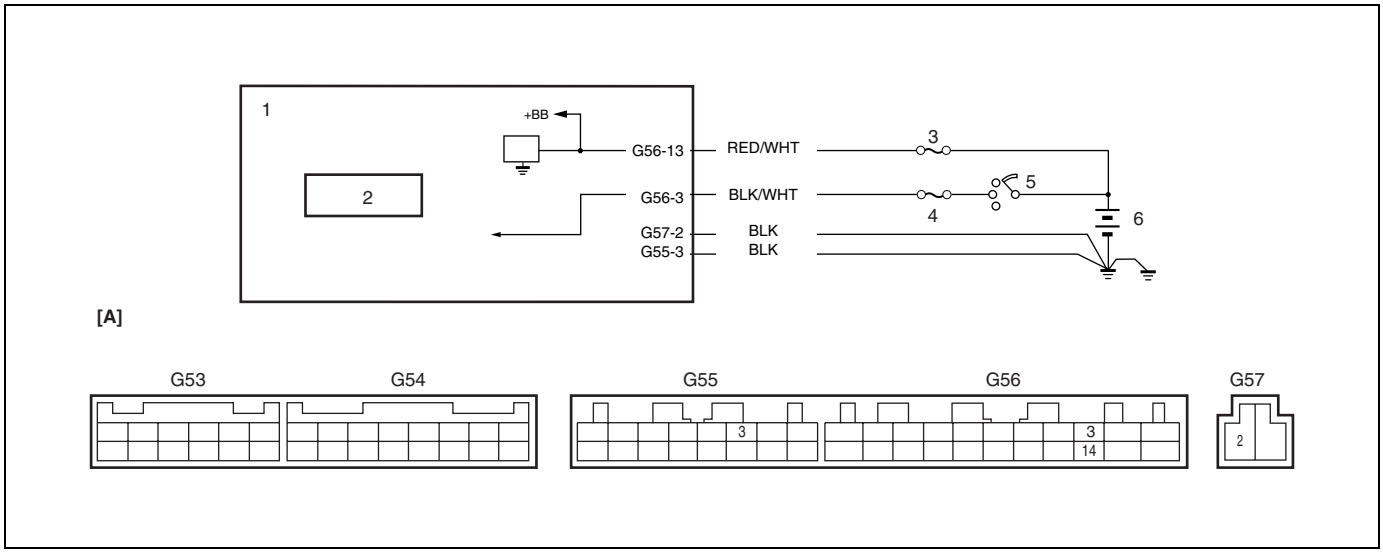
## BCM Input/Output Table

| System/Parts | Input signal | Controlled device |
|---|---|---|
| Power door lock system | • Key cylinder switch<br>• Manual door lock switch | • All of door lock actuator |
| Keyless entry system | • Key reminder switch (in ignition switch)<br>• Keyless entry receiver (if equipped)<br>• Driver side door switch | • All of door lock actuator<br>• Turn signal and hazard warning relay<br>• Interior light<br>• Keyless entry receiver (if equipped) |
| Lighting system | • Headlight switch<br>• Tail light switch<br>• Auto light switch (if equipped with H27 engine)<br>• Front fog light switch (if equipped)<br>• Auto light sensor (if equipped with H27 engine)<br>• Illumination controller (if equipped with H27 engine)<br>• Generator L terminal | • Headlight<br>• Tail light<br>• Front fog light (if equipped)<br>• Illumination lamp |
| Rear wiper and washer | • Rear wiper INT switch<br>• Rear wiper switch<br>• Rear washer switch | • Rear wiper motor<br>• Rear washer motor |
| Combination meter | • Headlight switch<br>• Tail light switch<br>• Auto light switch (if equipped with H27 engine)<br>• Brake fluid level switch<br>• Charging system monitor switch<br>• Washer level switch<br>• TCM (transmission range switch, A/T mode switch) (5 A/T model only) | • Combination meter |
| Interior light | • All of door switches<br>• Key reminder switch (in ignition switch) | • Interior light |
| Warning buzzer | • Key reminder switch (in ignition switch)<br>• Headlight switch<br>• Tail light switch<br>• Driver side seat belt switch (H27 engine only)<br>• Driver side door switch | • Warning buzzer (located in BCM) |

## Diagnostic Trouble Code (DTC) Table

| DTC (displayed on SUZUKI scan tool) | DTC (indicated by "Clock/Temp." display) | DETECTED PARTS ITEM | DETECTING CONDITION |
|---|---|---|---|
| NO DTC | 12 | Normal | Normal |
| B1121 | 21 | DRL circuit malfunction (Vehicle with DRL function model only) | DRL control circuit open or shorted to ground |
| B1131 | 31 | Illumination control input circuit open (Vehicle with illumination function of H27 engine) | Illumination control signal voltage is out of specification |
| B1141 | 41 | Outside air temperature (ambient temp.) sensor circuit open | Sensor output voltage too high |
| B1142 | 42 | Outside air temperature (ambient temp.) sensor circuit short to ground | Sensor output voltage too low |
| B1156 | 56 | CAN communication error (H27 engine only) | CAN communication circuit open or short |
| B1170 | 70 | Factory register error | Memory error |
| B1171 | 71 | Memory check sum error | |
| B1172 | 72 | Memory write error | |

# BCM Power Circuit and Ground Circuit Check



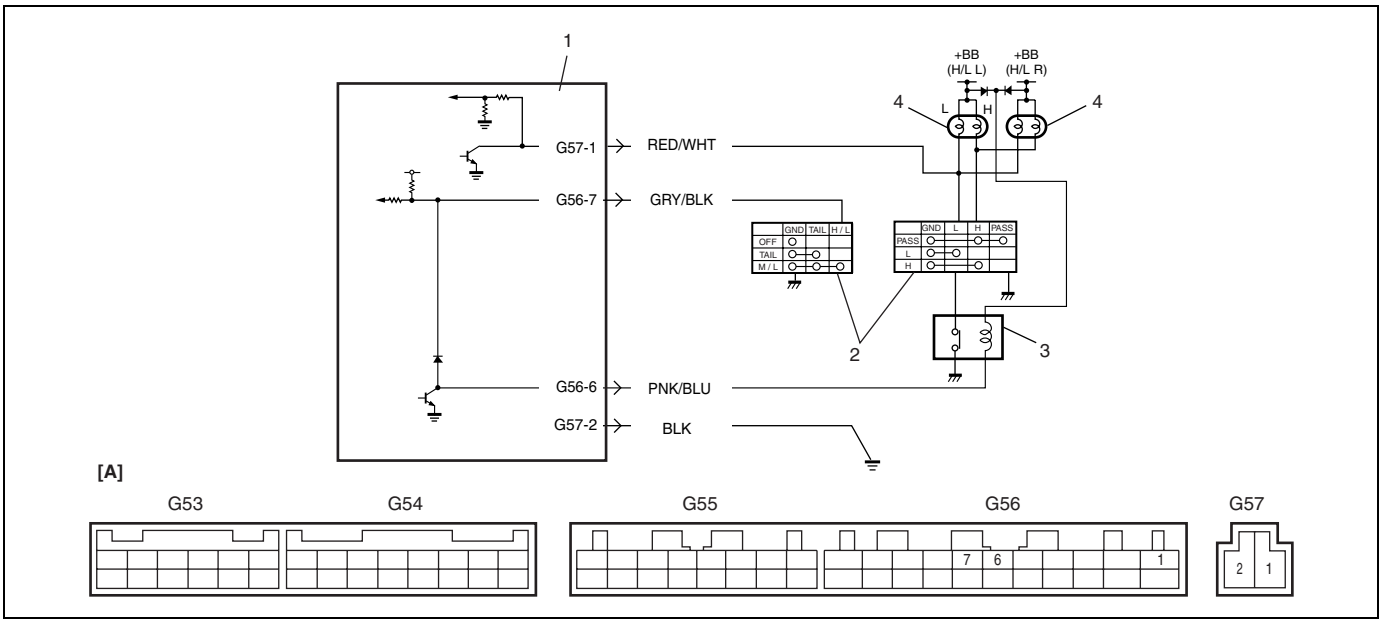

| | | | |
|---|---|---|---|
| [A]: Viewed from harness side | 2. Clock/Temp. display | 4. "METER" fuse | 6. Battery |
| 1. BCM | 3. "DOOR LOCK" fuse | 5. Ignition switch | |

## Inspection

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Fuse check:<br>Are "DOOR LOCK" and "METER" fuses in good condition. | Go to Step 2. | Check for short circuits connected to these fuses. |
| 2 | BCM power circuit check<br>1) Turn OFF ignition switch and disconnect connectors from BCM.<br>2) Check for proper connection to BCM at terminals "G56-13" and "G56-3".<br>3) If OK, then measure voltage between terminal "G56-13" and body ground, "G56-3" and body ground at ignition switch ON.<br>Is each voltage 10 – 14 V? | Go to Step 3. | "RED/WHT" and/or "BLK/WHT" circuit open. |
| 3 | BCM ground circuit check<br>Measure resistance between "G57-2" and body ground, "G55-3" and body ground.<br>Is resistance continuity? | Go to Step 4 | "BLK" circuit open. |
| 4 | 1) Make sure that battery voltage is about 11 V or higher.<br>2) Note "Clock/Temp. display" in BCM as ignition switch is tuned ON.<br>Does "Clock/Temp. display" come ON or keep flashing when ignition switch is tuned ON? | BCM power circuit and ground circuit are good condition. | Substitute a known-good BCM and recheck. |

# DTC B1121 – DRL Circuit Malfunction

## Wiring Diagram




| | | |
|---|---|---|
| [A]: View from harness side | 2. Headlight switch (in lighting switch) | 4. Headlight bulb |
| 1. BCM | 3. Headlight relay | |

| DTC DETECTING CONDITION | POSSIBLE CAUSE |
|---|---|
| • Low voltage at terminal “G57-1” when DRL is not active, headlight switch is OFF position and headlight relay is not active. | • Both headlight fuse blown<br>• Both headlight bulb burned out<br>• “RED/WHT” circuit open or shorted to ground<br>• “PNK/BLU” circuit shorted to ground<br>• BCM malfunction |

### Table Test Description

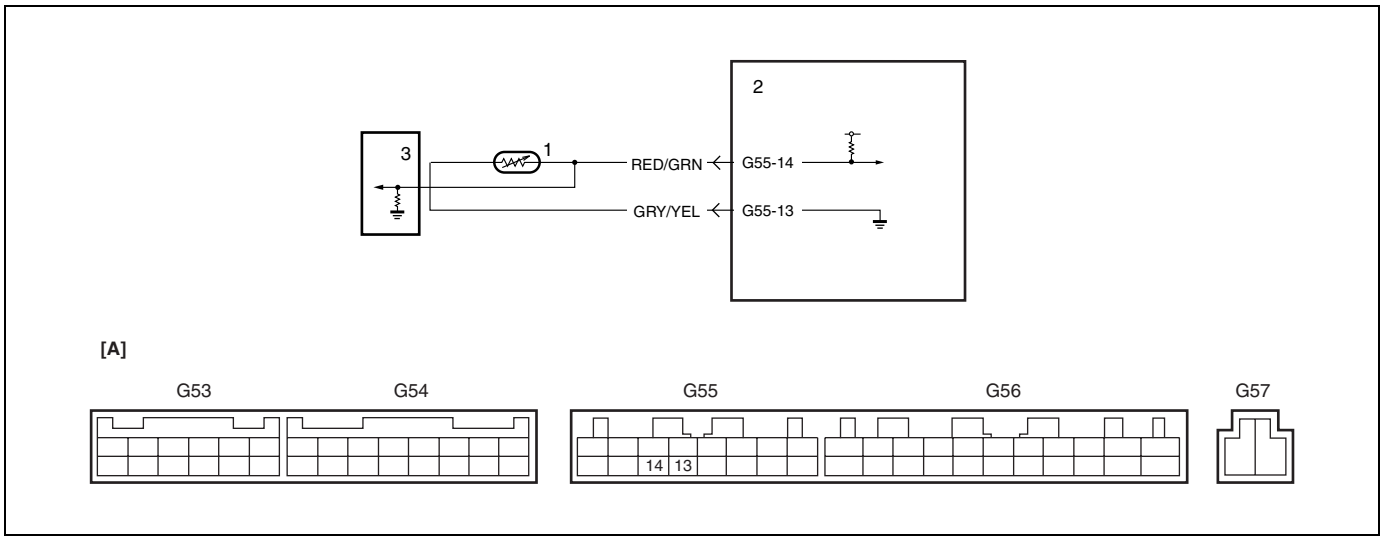
STEP 1: Check headlight bulb and fuse.
STEP 2: Check DRL control circuit.
STEP 3: Check headlight control circuit.

### Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | Check headlight bulb and headlight fuses “H/L, L” and “H/L, R”.<br>Are they in good condition? | Go to Step 2. | Replace headlight bulb. Check for short circuits connected to these fuses. |
| 2 | 1) Disconnect BCM connector “G57” with ignition switch OFF.<br>1) Measure voltage between “G57-1” and body ground.<br>Is voltage 10 – 14V? | Go to Step 3. | “RED/WHT” circuit open or short to ground. |
| 3 | 1) Disconnect BCM connector “G56” with ignition switch OFF.<br>2) Measure resistance between “G56-6” and body ground.<br>Is resistance infinity? | Replace BCM. | “PNK/BLU” wire shorted to ground circuit.<br>If wire and connection are OK, substitute a known-good BCM and recheck. |

# DTC B1131 Illumination Control Input Circuit Open (H27 Engine Only)

## Wiring Diagram




| | |
|---|---|
| [A]: View from harness side | 2. BCM |
| 1. Illumination controller | 3. Combination meter |

| DTC DETECTING CONDITION | POSSIBLE CAUSE |
|---|---|
| • High voltage at terminal "G55-14" when ignition switch on position | • "RED/GRN" circuit open<br>• "GRN/YEL" circuit open<br>• Illumination controller malfunction<br>• BCM malfunction |

## Table Test Description

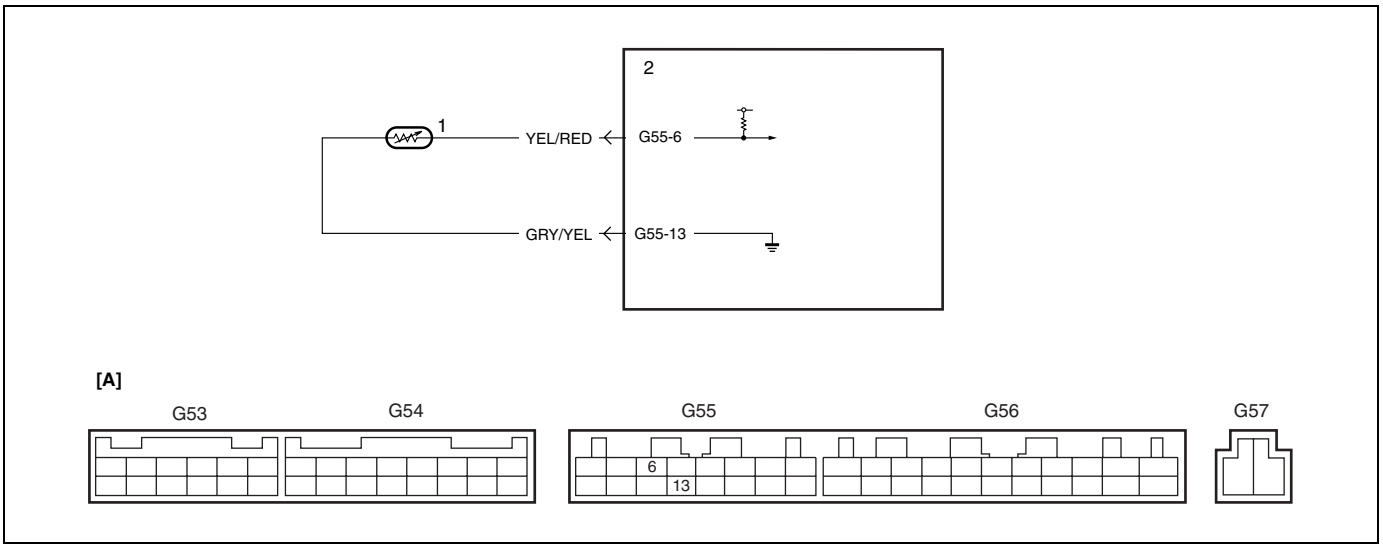
STEP 1: Check whether malfunction is in illumination controller.
STEP 2: Check illumination controller input circuit.
STEP 3: Check illumination controller ground circuit.

## Troubleshooting

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Disconnect illumination controller coupler from illumination controller.<br>2) Check illumination controller referring to "Illumination Controller" in Section 8C.<br>Is it good condition? | Go to Step 2. | Replace illumination controller. |
| 2 | With ignition switch ON, measure voltage between "RED/GRN" circuit terminal of illumination controller coupler and body ground.<br>Is voltage 4.5 – 5.5 V? | Go to Step 3. | "RED/GRN" circuit open or short to ground.<br>If wire and connection are OK, substitute a known-good BCM and recheck. |
| 3 | Measure resistance between illumination controller coupler and "G55-13" terminal of BCM connector.<br>Is resistance infinity? | "GRY/YEL" wire open. | Replace BCM. |

# DTC B1141 Outside Air Temperature (ambient temp.) Sensor Circuit Open
# DTC B1142 Outside Air Temperature (ambient temp.) Sensor Circuit Short To Ground

## Wiring Diagram




| | |
|---|---|
| [A]: View from harness side | 2. BCM |
| 1. Outside air temperature sensor | |

| DTC DETECTING CONDITION | POSSIBLE CAUSE |
|---|---|
| **DTC B1141:**<br>• High voltage at terminal “G55-14” when ignition switch on position | • “YEL/RED” circuit open<br>• “GRY/YEL” circuit open<br>• Illumination controller malfunction<br>• BCM malfunction |
| **DTC B1142:**<br>• Low voltage at terminal “G55-14” when ignition switch on position | • “YEL/RED” circuit short to ground<br>• Illumination controller malfunction<br>• BCM malfunction |

## Table 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 only)

## Troubleshooting

**DTC B1141:**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Disconnect outside air temperature sensor coupler.<br>2) Check outside air temperature sensor referring to “Outside Air Temperature Sensor Inspection” in this section.<br>Is it good condition? | Go to Step 2. | Replace outside air temperature sensor. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | With ignition switch ON, measure voltage between "YEL/RED" circuit terminal of outside temperature sensor coupler and body ground.<br>Is voltage 4.5 – 5.5 V? | Go to Step 3. | "YEL/RED" wire open or short to power circuit.<br>If wire and connection are OK, substitute a known-good BCM and recheck. |
| 3 | Measure resistance between outside air temperature sensor coupler and "G55-13" terminal.<br>Is resistance infinity? | "GRY/YEL" wire open. | Replace BCM. |

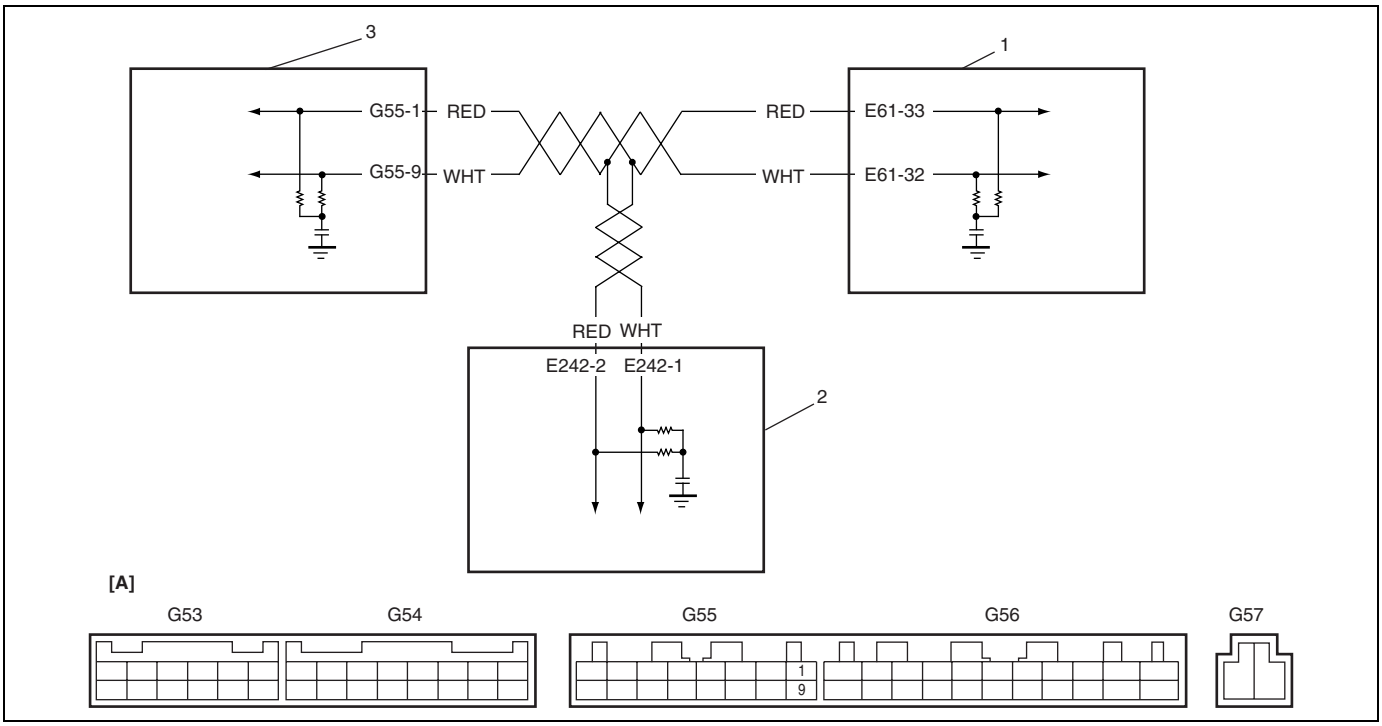
**Troubleshooting**

**DTC B1142:**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Disconnect outside air temperature sensor coupler.<br>2) Check outside air temperature sensor referring to "Outside Air Temperature Sensor Inspection" in this section.<br>Is it good condition? | Go to Step 2. | Replace outside air temperature sensor. |
| 2 | 1) Disconnect BCM connector "G55" from BCM.<br>2) Measure resistance between "G55-6" terminal and body ground.<br>Is resistance continuity? | "YEL/RED" wire short to ground. | Replace BCM. |

# DTC B1156 CAN Communication Error (H27 Engine Only)

## Wiring Diagram




| | |
|---|---|
| [A]: View from harness side | 2. TCM |
| 1. ECM | 3. BCM |

| DTC DETECTING CONDITION | POSSIBLE CAUSE |
|---|---|
| • No signal inputted from ECM or TCM to BCM for specified time continuously. | • "RED" or "WHT" wire circuit open or short<br>• BCM malfunction<br>• TCM malfunction<br>• ECM malfunction |

### TABLE TEST DESCRIPTION

STEP 1: Check CAN communication line for open circuit.
STEP 2: Check CAN communication line for open circuit.
STEP 3: Check CAN communication line for short circuit.
STEP 4: Check CAN communication line for short circuit

### TROUBLESHOOTING

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect couplers from BCM and TCM.<br>2) Check for proper connection to BCM and TCM at applicable terminals.<br>3) If OK, measure resistance between "G55-9" terminal of BCM coupler and "E242-1" terminal of TCM coupler, between "G55-1" terminal of BCM coupler and "E242-2" terminal of TCM coupler.<br>Is each resistance continuity? | Go to Step 2. | "WHT" wire circuit or "RED" wire circuit open or high resistance. |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | 1) Disconnect couplers from ECM.<br>2) Check for proper connection to ECM at applicable terminals.<br>3) If OK, measure resistance between “E61-32” terminal of ECM coupler and “G55-9” terminal of BCM coupler, between “E61-33” terminal of ECM coupler and “G55-1” terminal of BCM coupler.<br>Is each resistance continuity? | Go to Step 3. | “WHT” wire circuit or “RED” wire circuit open or high resistance. |
| 3 | With ignition switch ON, measure voltage between “G55-9” terminal of BCM coupler and vehicle body ground, between “G55-1” terminal of BCM coupler and vehicle body ground.<br>Is each voltage 0 – 1 V? | Go to Step 4. | “WHT” wire or “RED” wire short to power circuit. |
| 4 | With ignition switch OFF, measure resistance between “G55-9” terminal of BCM coupler and vehicle body ground, between “G55-1” terminal of BCM coupler and vehicle body ground.<br>Are they resistance infinity? | Substitute a known-good BCM and recheck.<br>If BCM is OK, substitute a known-good TCM and recheck.<br>If TCM is OK, substitute a known-good ECM and recheck. | “WHT” wire or “RED” wire short to ground circuit. |

# On-Vehicle Service

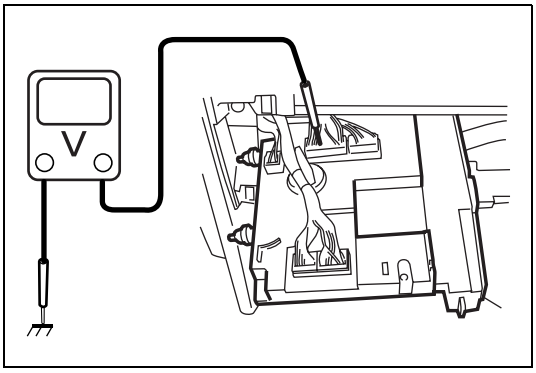
## Inspection of BCM and Its Circuits

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

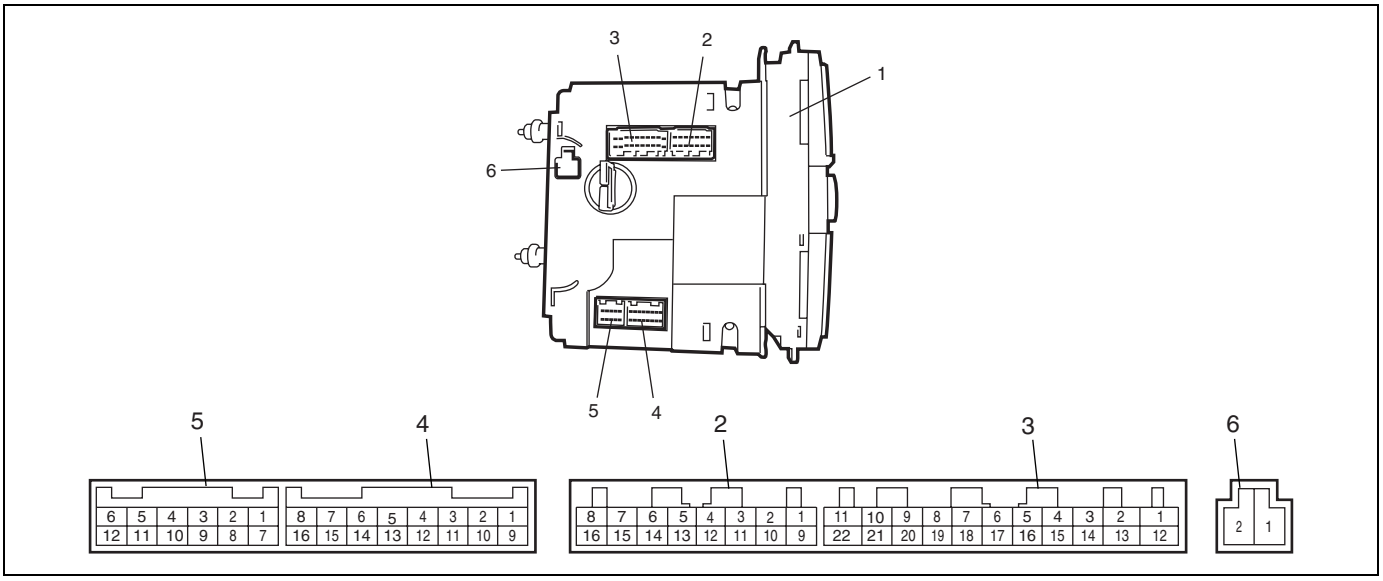
1) Disconnect negative cable (–) at battery.
2) Remove BCM referring to "BCM Removal and Installation" in this section.




3) Connect BCM connector as shown in figure.
4) Check voltage at each terminal of couplers connected.

**NOTE:**

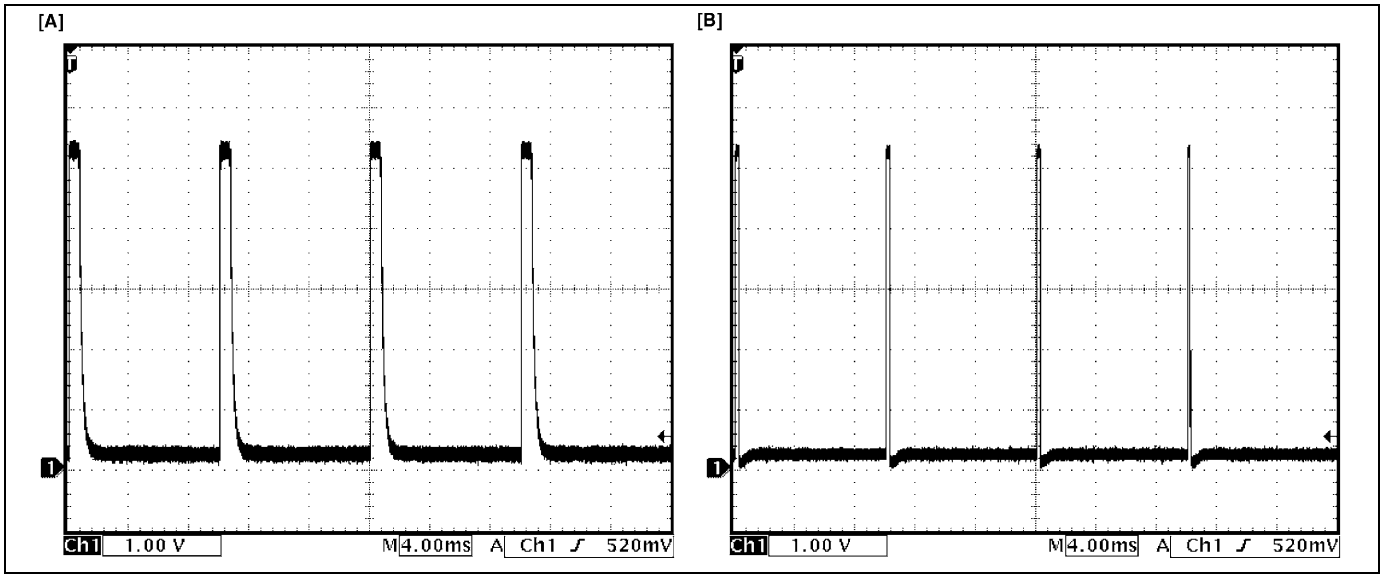
- **As each terminal voltage is affected by the battery voltage, confirm that it is 11 V or more when ignition switch is ON.**
- **Pulse signal cannot be measured by voltmeter. It can be measured by oscilloscope.**




| | | |
|---|---|---|
| 1. BCM | 3. G56 BCM connector (viewed from harness side) | 5. G53 BCM connector (viewed from harness side) |
| 2. G55 BCM connector (viewed from harness side) | 4. G54 BCM connector (viewed from harness side) | 6. G57 BCM connector (viewed from harness side) |

As the input signal of the switch described below repeats ON and OFF at every 10ms as shown in the figure below, measurement of the terminal voltage will indicate an abnormal voltage value.
Also, if no signal input/output occurs for 10seconds or longer while the ignition switch remains OFF, the stand-by current is controlled by reducing its ON time (Sleep mode).

**Applicable switch:**
**Manual door lock/unlock switch**
**Door key cylinder lock/unlock switch**
**Auto-on headlight switch (if equipped with H27 engine)**
**Diagnosis switch**
**Windshield washer level switch**




| [A]: Normal mode (Ignition switch: ON) | [B]: Sleep mode |
|---|---|

| | |
|---|---|
| Measurement terminal | CH1: “G53-1” or “G53-7” to “G55-3” (Manual door lock/unlock switch)<br>CH1: “G53-2” or “G53-8” to “G55-3” (Door key cylinder lock/unlock switch)<br>CH1: “G53-3” to “G55-3” (Auto-on headlight switch) (if equipped with H27 engine)<br>CH1: “G53-9” to “G55-3” (Diagnosis switch)<br>CH1: “G53-10” to “G55-3” (Windshield washer level switch) |
| Oscilloscope setting | CH1: 1 V/DIV<br>TIME: 4.0 ms/DIV |
| Measurement condition | Ignition switch turns to ON position. |

**Terminal “G55”**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G55-1 | RED | CAN communication line (active high signal) (5 A/T model only) | 2.5 – 3.6 V (Reference waveform No.6) | Ignition switch: ON |
| G55-2 | – | – | – | – |
| G55-3 | BLK | Ground | – | – |
| G55-4 | YEL/WHT | Power supply for keyless entry receiver | 4.75 – 5.25 V | Ignition switch: OFF and ON |
| G55-5 | BLK | Sensor ground for auto light sensor (vehicle with illumination control function of H27 engine) | – | – |
| G55-6 | YEL/RED | Outside air temperature sensor | 2.5 V | Ignition switch: ON<br>Outside air temperature at approx. 25 °C (77 °F) |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G55-7 | YEL | Power supply for auto light sensor (vehicle with illumination control function of H27 engine) | 4.75 – 5.25 V | Ignition switch turned ON |
| G55-8 | – | – | – | – |
| G55-9 | WHT | CAN communication line (active low signal) (5 A/T model only) | 1.6 – 2.5 V (Reference waveform No.6) | Ignition switch: ON |
| G55-10 | – | – | – | – |
| G55-11 | YEL/BLK | Sensor ground for keyless entry receiver | – | – |
| G55-12 | PNK/BLU | Auto-on headlight sensor (vehicle with illumination control function of H27 engine) | 0.2 V | Ignition switch: ON<br>Cover the sensor lens with hand |
| | | | 3 – 4 V | Ignition switch: ON<br>Light the sensor lens with light |
| | | DRL selector line (vehicle with DRL function model) | 0 V | Ignition switch: ON |
| G55-13 | GRY/YEL | Sensor ground | – | – |
| G55-14 | RED/GRN | Illumination volume resister (vehicle with illumination control function of H27 engine) | 0 – 0.5 V | Ignition switch: ON, Light switch: ON<br>Illumination volume: Full open |
| | | | 3.5 – 4.5 V | Ignition switch: ON, Light switch: ON<br>Illumination volume: Full close |
| G55-15 | – | – | – | – |
| G55-16 | – | – | – | – |

**Terminal "G56"**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G56-1 | BLU/RED | Door unlock control (except driver side) | 0 V | Ignition switch: ON |
| | | | 10 – 14 V (Reference waveform No.1) | Manual door unlock or door key cylinder unlock switch turned ON |
| G56-2 | BLU/WHT | Driver side door unlock control | 0 V | Ignition switch turned ON |
| | | | 10 – 14 V (Reference waveform No.1) | Manual door unlock or door key cylinder unlock switch turned ON |
| G56-3 | BLK/WHT | Power source (IG1) | 10 – 14 V | Ignition switch: ON |
| G56-4 | BLU/GRN | Horn control | 10 – 14 V | Horn switch: OFF |
| G56-5 | – | – | – | – |
| G56-6 | PNK/BLU | Headlight control | 10 – 14 V | Headlight switch: OFF |
| | | | 0 V | Headlight switch: ON |
| G56-7 | GRY/BLK | Headlight switch | 10 – 14 V | Headlight switch: OFF |
| | | | 0 V | Headlight switch: ON |
| G56-8 | RED/BLU | Tail light control | 10 – 14 V | Taillight switch: OFF |
| | | | 0 V | Taillight switch: ON |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G56-9 | RED/BLU | Tail light switch | 10 – 14 V | Taillight switch: OFF |
| | | | 0 V | Taillight switch: ON |
| G56-10 | BLK/WHT | Keyless entry system communication line | 0 – 1 V ↑↓ 4.75 – 5.25 V (Reference waveform No.3) | Unlock switch pushed ON of keyless entry transmitter |
| | | | 0 V | Ignition switch: ON |
| G56-11 | PPL/YEL | Illumination control (vehicle with illumination control function of H27 engine) | 10 – 14 V | Tail or head light switch: ON<br>Illumination control: Full open |
| | | | 4 – 6 V | Tail or head lamp switch: ON<br>Illumination control: Full close |
| | | | 0 V | Tail or head light switch: OFF |
| | | Illumination control (other than above model) | 10 – 14 V | Tail or head lamp switch: ON |
| | | | 0 V | Tail or head light switch: OFF |
| G56-12 | BLU | Door lock control | 10 – 14 V (Reference waveform No.2) | Manual door lock or door key cylinder lock switch: ON |
| | | | 0 V | Ignition switch: ON |
| G56-13 | RED/WHT | Backup power source | 10 – 14 V | – |
| G56-14 | BLK/RED | Interior light control | 10 – 14 V | Dome lamp switch DOOR position and all door is closed |
| | | | 0 V | Dome lamp: ON |
| G56-15 | LT GRN/RED | Fog light control | 10 – 14 V | Front fog lamp: OFF |
| | | | 0 V | Front fog lamp: ON |
| G56-16 | – | – | – | – |
| G56-17 | YEL/RED | Hazard warning light control | 10 – 14 V | Hazard warning switch: OFF |
| | | | 0 V | Hazard warning switch: ON |
| G56-18 | GRN/YEL | Rear wiper control | 10 – 14 V | Rear wiper switch: OFF |
| | | | 0 V | Rear wiper switch: ON |
| G56-19 | GRN | Driver seat belt warning indicator (H 27 engine only) | 10 – 14 V | Driver seat belt warning indicator turned OFF |
| | | | 0 V | Driver seat belt warning indicator turned ON |
| G56-20 | BLU/BLK | Rear defogger input | 10 – 14 V | Rear defogger switch: OFF |
| | | | 0 V | Rear defogger switch: ON |
| G56-21 | BRN | Keyless entry system communication | 0 V | Ignition switch: ON |
| G56-22 | RED/YEL | Power supply for illumination | 10 – 14 V | Tail or head light switch: ON<br>DRL or auto-on headlight: Active |
| | | | 0 V | Tail or head light switch: OFF |

**Terminal "G54"**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G54-1 | PPL/RED | Data link connector | 10 – 14 V | Scan tool not connected to DLC |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G54-2 | RED | Outside air temperature communication line | 0 V ↑↓ 4.75 – 5.25 V | Refer to "Reference waveform No.1" of "HVAC Control Module and Its Circuits Inspection" in Section 1B. |
| G54-3 | WHT/BLK | Accessory switch | 10 – 14 V | Ignition switch: ACC |
| G54-4 | – | – | – | – |
| G54-5 | RED/BLK | Parking brake switch | 10 – 14 V | Release parking brake lever |
| | | | 0 V | Apply parking brake lever |
| G54-6 | – | – | – | – |
| G54-7 | WHT/ RED | Generator "L" terminal | 10 – 14 V | Engine running |
| | | | 0 V | Ignition switch: ON |
| G54-8 | BLK/BLU | Driver side door switch | 10 – 14 V | All door is closed |
| | | | 0 V | Driver side door is opened |
| G55-9 | – | – | – | – |
| G54-10 | YEL | BCM-Meter communication line | 0 V ↑↓ 10 – 14 V | Refer to "TCM-BCM (5 A/T model only) and BCM-METR Signal Circuit Construction" and "BCM-METER Signal Circuit (5 A/T Model)" in Section 8C. |
| G54-11 | BLU/YEL | VSS (RHW engine only) | 10 – 14 V | Ignition switch: ON |
| G54-12 | YEL/GRN | IG2 switch | 10 – 14 V | Ignition switch: ON |
| G54-13 | BLU/RED | Key reminder switch | 10 – 14 V | Insert key to key cylinder |
| G54-14 | RED/BLK | Brake fluid level switch | 10 – 14 V | Brake fluid level normal condition |
| G54-15 | PPL/GRN | Driver side seat belt switch (H27 engine only) | 10 – 14 V | Driver side seat belt: Unfastened |
| | | | 0 V | Driver side seat belt: Fastened |
| G54-16 | BLK/RED | Door switch (except driver side) | 10 – 14 V | All door is closed |
| | | | 0 V | Any one of the door is opened |

**Terminal "G53"**

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G53-1 | PNK/BLK | Manual door lock switch | 0 V ↑↓ 4.75 – 5.25 V (Reference waveform No.2) | Ignition switch: ON |
| | | | 0 V | Manual lock switch: ON |
| G53-2 | PNK | Door key cylinder lock switch | 0 V ↑↓ 4.75 – 5.25 V (Reference waveform No.2) | Ignition switch: ON |
| | | | 0 V | Key lock switch: ON |

| Terminal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G53-3 | GRY | Auto-on headlight switch (vehicle with illumination control function of H27 engine) | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.4) | Ignition switch: ON<br>Auto-on headlight switch: OFF |
| | | DRL selector line (vehicle with DRL function model) | 0 V | Ignition switch: ON |
| G53-4 | – | – | – | – |
| G53-5 | GRY | Rear washer switch | 10 – 14 V | Rear washer switch: ON |
| | | | 0 V | Rear washer switch: OFF |
| G53-6 | PNK | Rear wiper interval switch | 10 – 14 V | Rear wiper interval switch: ON |
| | | | 0 V | Rear wiper interval switch: OFF |
| G53-7 | PNK/GRN | Manual door unlock switch | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.1) | Ignition switch: ON |
| | | | 0 V | Manual unlock switch: ON |
| G53-8 | PNK/BLU | Door key cylinder unlock switch | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.1) | Ignition switch: ON |
| | | | 0 V | Door key cylinder unlock switch: ON |
| G53-9 | RED/BLK | Diagnosis switch (monitor connector) | 0 V<br>↑↓<br>4.75 – 5.25 V<br>(Reference waveform No.5) | Ignition switch: ON<br>Diagnosis switch: OFF (monitor connector unconnected to ground circuit) |
| | | | 0 V | Diagnosis switch: ON (monitor connector short to ground circuit) |
| G53-10 | GRN | Windshield washer level switch | 10 – 14 V | Windshield washer level switch: OFF |
| | | | 0 V | Windshield washer level switch: ON |
| G53-11 | LT GRN/ BLK | Fog light switch | 10 – 14 V | Tail or head light: ON<br>Front fog lamp switch: ON |
| | | | 0 V | Except above condition |
| G53-12 | ORN/BLU | Rear wiper low switch | 10 – 14 V | Rear wiper low switch: ON |
| | | | 0 V | Rear wiper low switch: OFF |

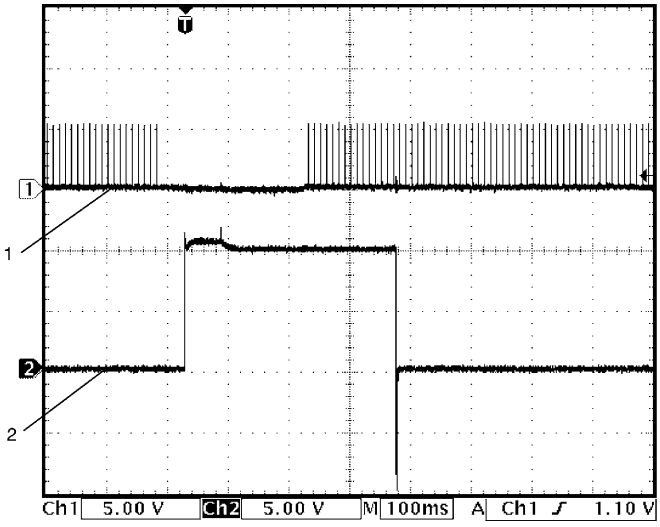
**Terminal "G57"**

| Termi-nal | Wire Color | Circuit | Normal Voltage | Condition |
|---|---|---|---|---|
| G57-1 | RED/ WHT | DRL control & headlight low monitor (LH steering vehicle only) | 10 – 14 V | Headlight and DRL: OFF |
| | | | 0 V | Headlight or DRL: ON |
| G57-2 | BLK | Ground | – | – |

### 1. Reference waveform No.1

Passenger side or driver side door lock actuator UNLOCK signal (2) with manual unlock switch or door key cylinder unlock switch signal (1)

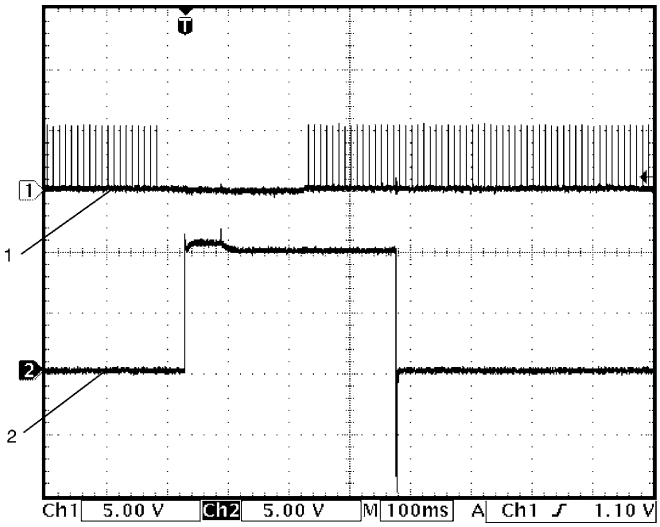
| | |
|---|---|
| Measurement terminal | CH1: “G53-7” or “G53-8” to “G55-3”<br>CH2: “G56-1” or “G56-2” to “G55-3” |
| Oscilloscope setting | CH1: 5 V/DIV<br>CH2: 5 V/DIV<br>TIME: 100 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |




### 2. Reference waveform No.2

Door lock actuator LOCK signal (2) with manual lock switch or door key cylinder lock switch signal (1)

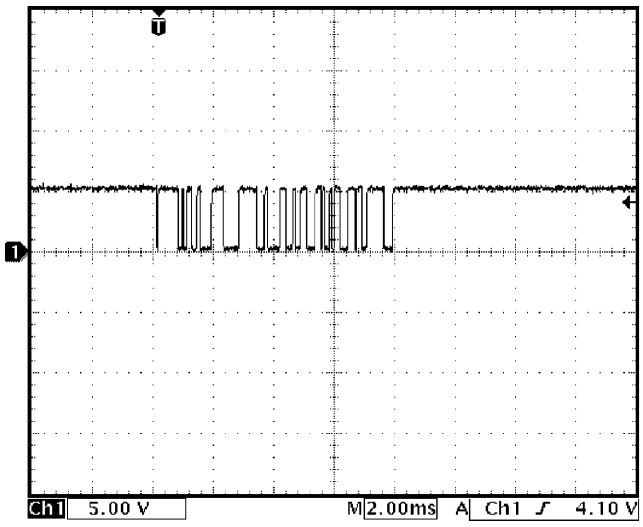
| | |
|---|---|
| Measurement terminal | CH1: “G53-1” or “G53-2” to “G55-3”<br>CH2: “G56-12” to “G55-3” |
| Oscilloscope setting | CH1: 5 V/DIV<br>CH2: 5 V/DIV<br>TIME: 100 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |



### 3. Reference waveform No.3

Keyless entry receiver LOCK/UNLOCK signal

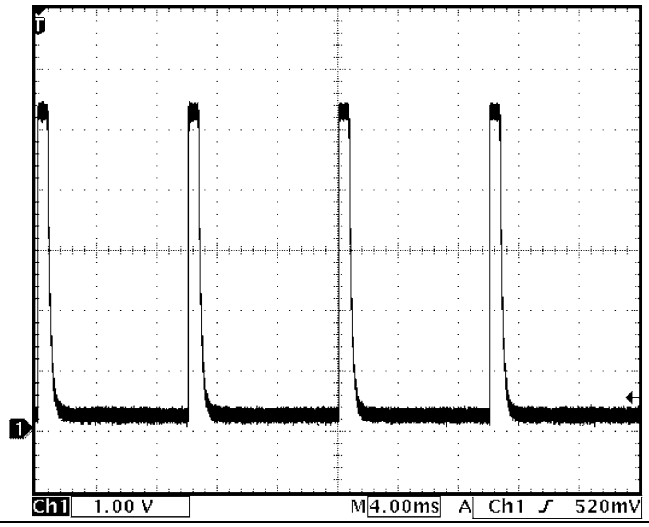
| | |
|---|---|
| Measurement terminal | CH1: “G56-10” to “G55-3” |
| Oscilloscope setting | CH1: 5 V/DIV<br>TIME: 2 ms/DIV |
| Measurement condition | Push “Unlock” button on transmitter |




### 4. Reference waveform No.4

Auto-on headlight switch (if equipped with H27 engine) position signal

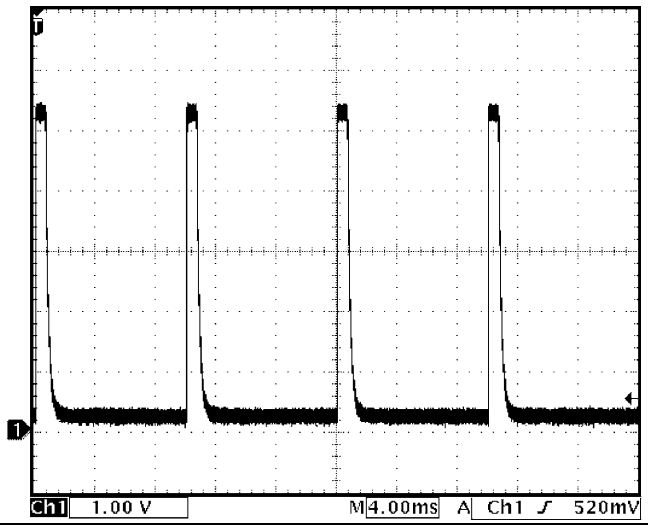
| | |
|---|---|
| Measurement terminal | CH1: “G53-3” to “G55-3” |
| Oscilloscope setting | CH1: 1 V/DIV<br>TIME: 4 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |



### 5. Reference waveform No.5

Diagnosis switch position signal

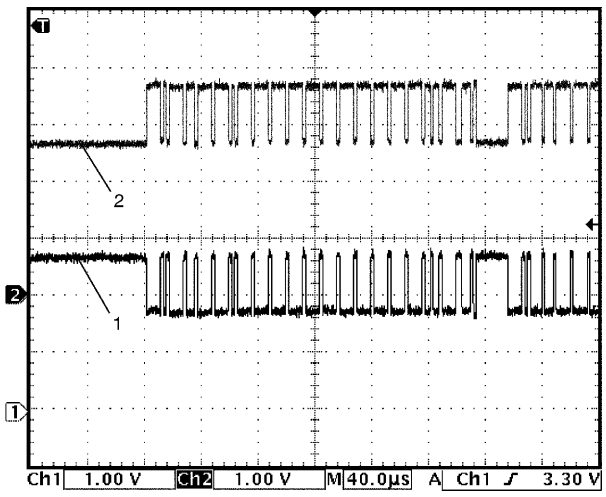
| | |
|---|---|
| Measurement terminal | CH1: “G53-9” to “G55-3” |
| Oscilloscope setting | CH1: 1 V/DIV<br>TIME: 4 ms/DIV |
| Measurement condition | Ignition switch turns to ON position |




### 6. Reference waveform No.6

BCM CAN communication line signal

| | |
|---|---|
| Measurement terminal | CH1: “G55-9” to “G55-3”<br>CH2: “G55-1” to “G55-3” |
| Oscilloscope setting | CH1: 1 V/DIV<br>CH2: 1 V/DIV<br>TIME: 40 μs/DIV |
| Measurement condition | Ignition switch turns to ON position |



# SECTION 9

# BODY SERVICE

**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.**
- **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).**
- **When body servicing, if shock may be applied to air bag system component parts, remove those parts beforehand. (Refer to Section 10B.)**

**NOTE:**

- **For the items with asterisk (*) in the content below, refer to the same section of the GRAND VITARA (99500-65D2#-01#) service manual mentioned in the foreword of this service manual.**
- **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 becomes 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.**
- **Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**

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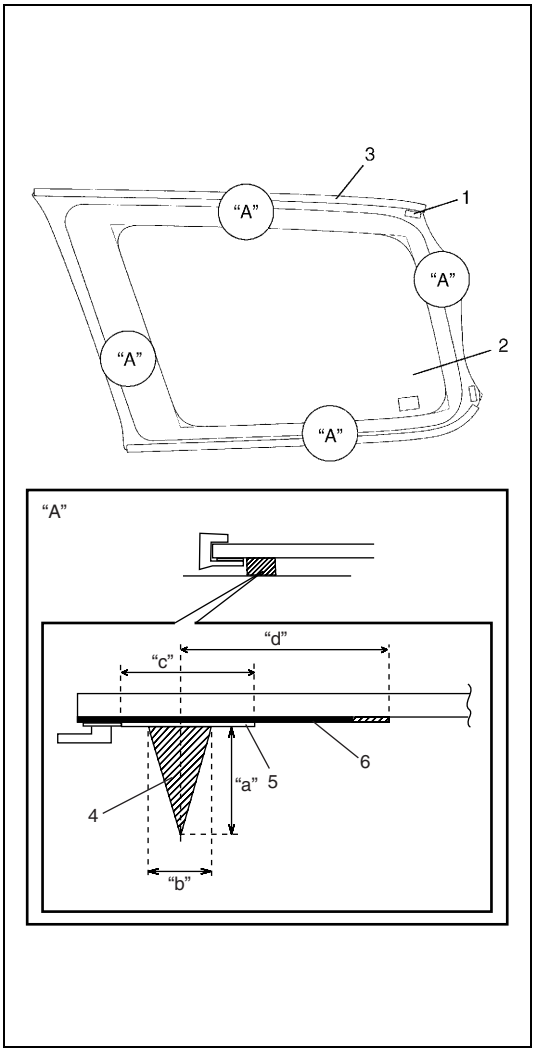

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# Glass, Windows and Mirror

## Quarter Window

### Removal and Installation




Refer to "WINDSHIELD" in this section as removal and installation procedures are basically the same. However, note the followings.

- Before applying primer to glass edge, install molding according to installing position shown in the figure.
- Observe the following precautions when applying adhesive along glass edge.
  - Adhesive should be applied evenly especially in height.
  - Be careful not to damage primer.
  - Press glass against body quickly after adhesive is applied.

**Adhesive amount specification (quarter window)**
**Height "a": 12 mm (0.47 in.)**
**Width "b": 8 mm (0.31 in.)**
**Width "c": 16 mm (0.63 in.) for glass front, rear and upper section.**
**Width "c": 14 mm (0.55 in.) for glass bottom section.**
**Position "d": 177 mm (6.97 in.) for left side glass front section.**
**Position "d": 75 mm (2.95 in.) for right side glass front section.**
**Position "d": 29 mm (1.15 in.) for glass rear section.**
**Position "d": 39 mm (1.54 in.) for glass upper section.**
**Position "d": 22 mm (0.87 in.) for glass bottom section.**

| | |
|---|---|
| 1. Spacer | 4. Adhesive |
| 2. Glass | 5. Primer |
| 3. Molding | 6. Ceramic print |

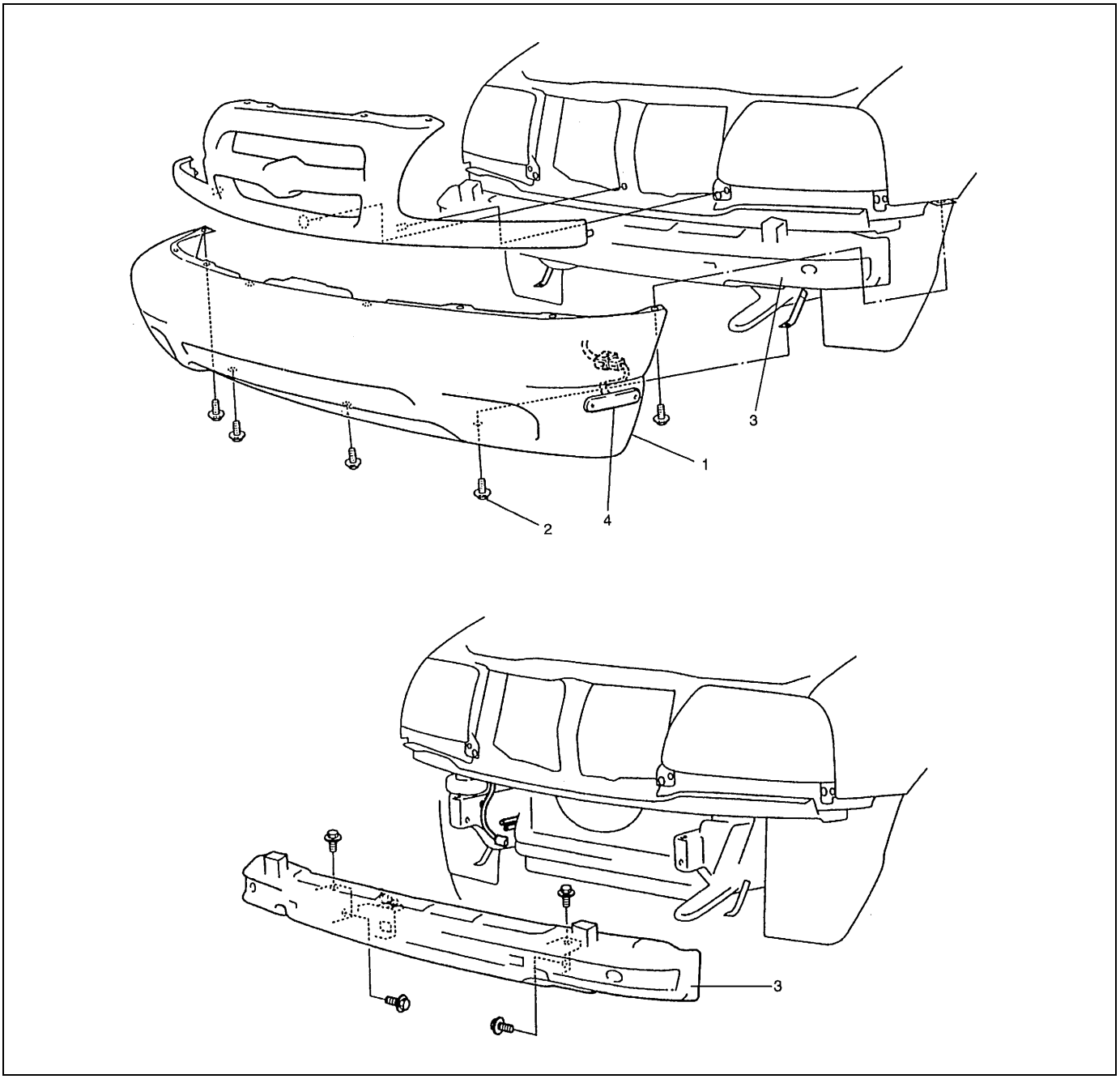
# Body Structure

## Front Bumper

**NOTE:**

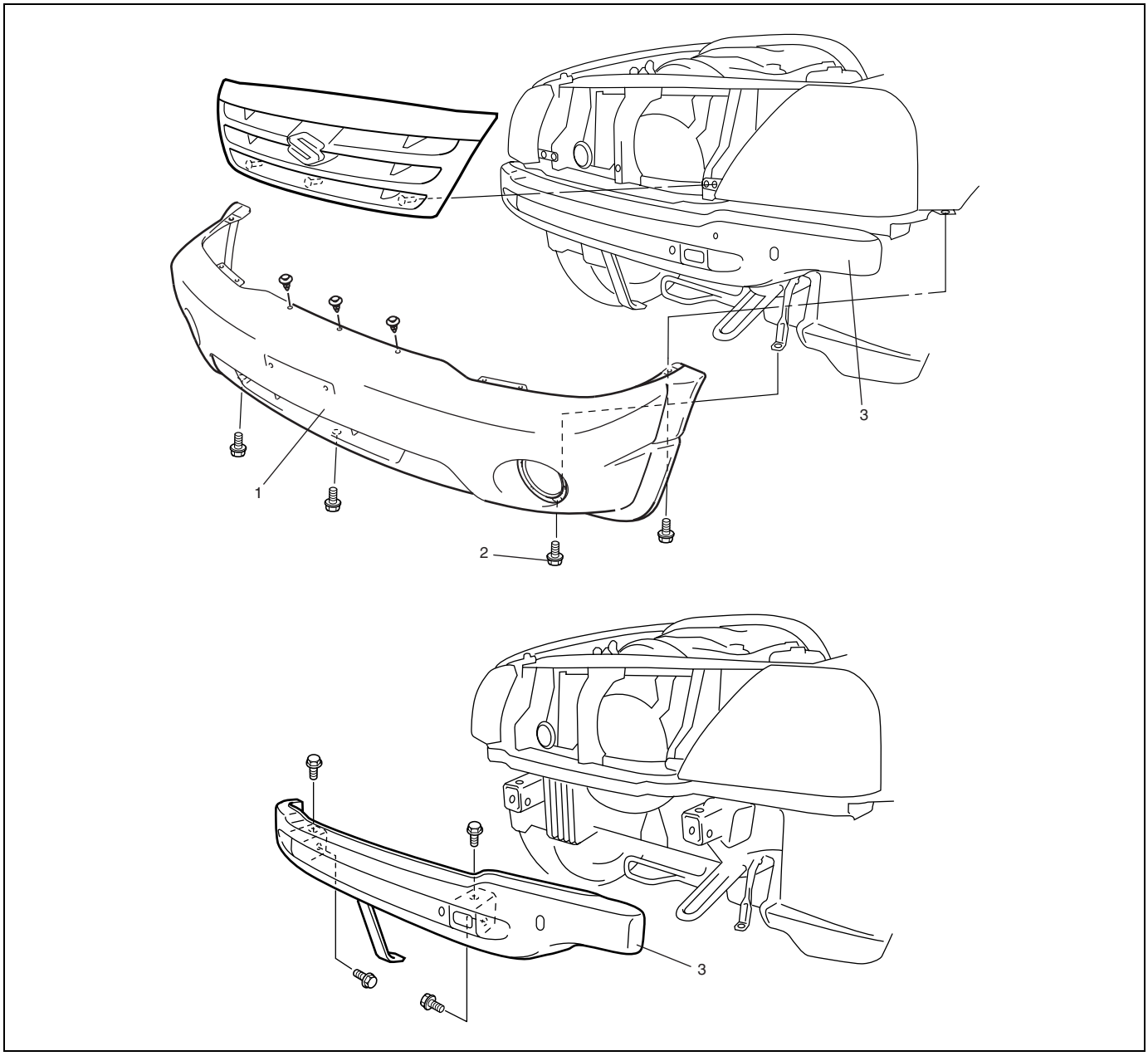
- **Fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary.**
  **Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.**
- **Before removing front bumper, remove fender lining and disconnect connector of side marker.**

### Type A




| | |
|---|---|
| 1. Front bumper | 3. Front bumper member |
| 2. Screws | 4. Side marker |

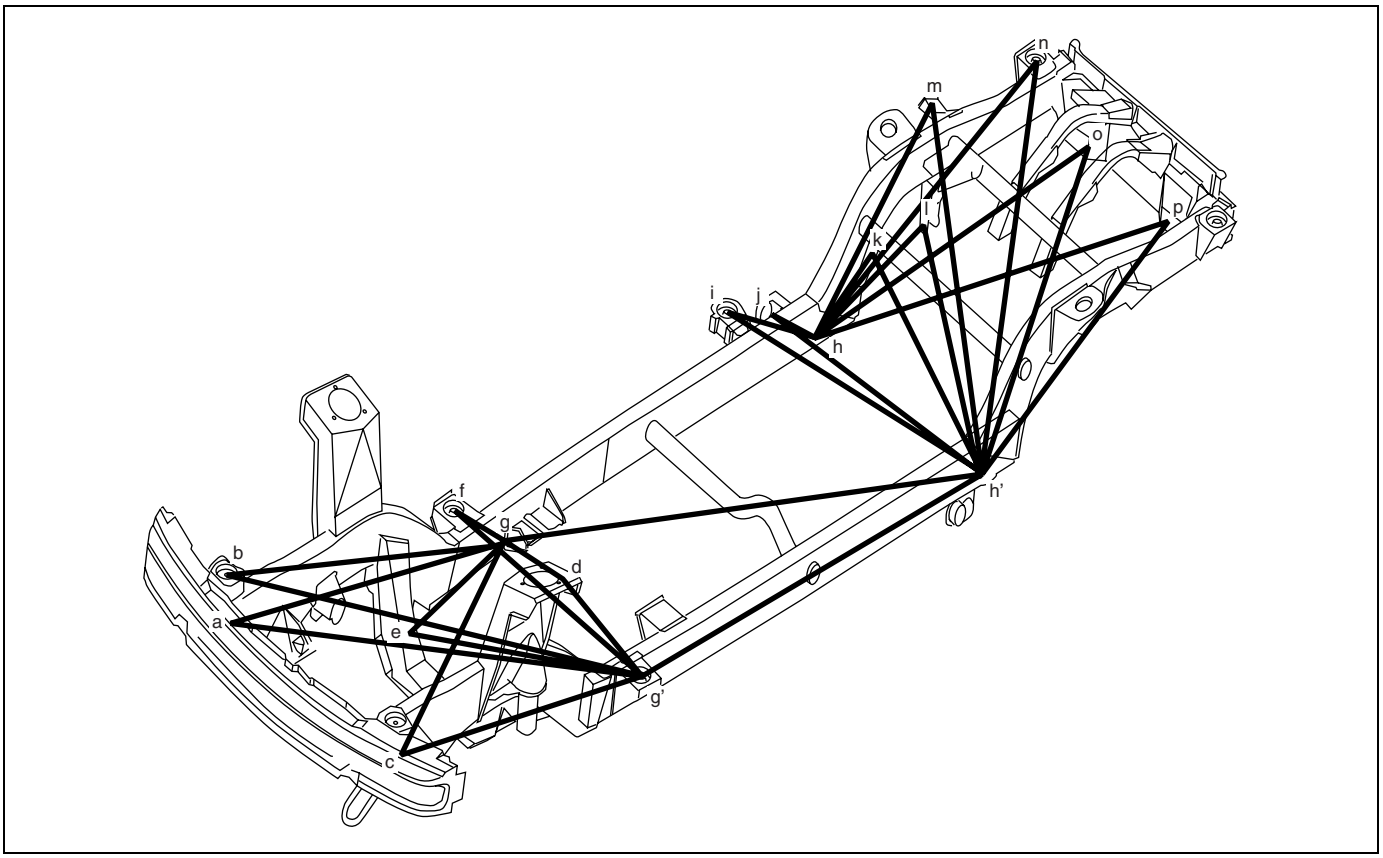
## Type B and RHW engine




| |
|---|
| 1. Front bumper |
| 2. Screws |
| 3. Front bumper member |

# Under Body Dimensions

## Type A

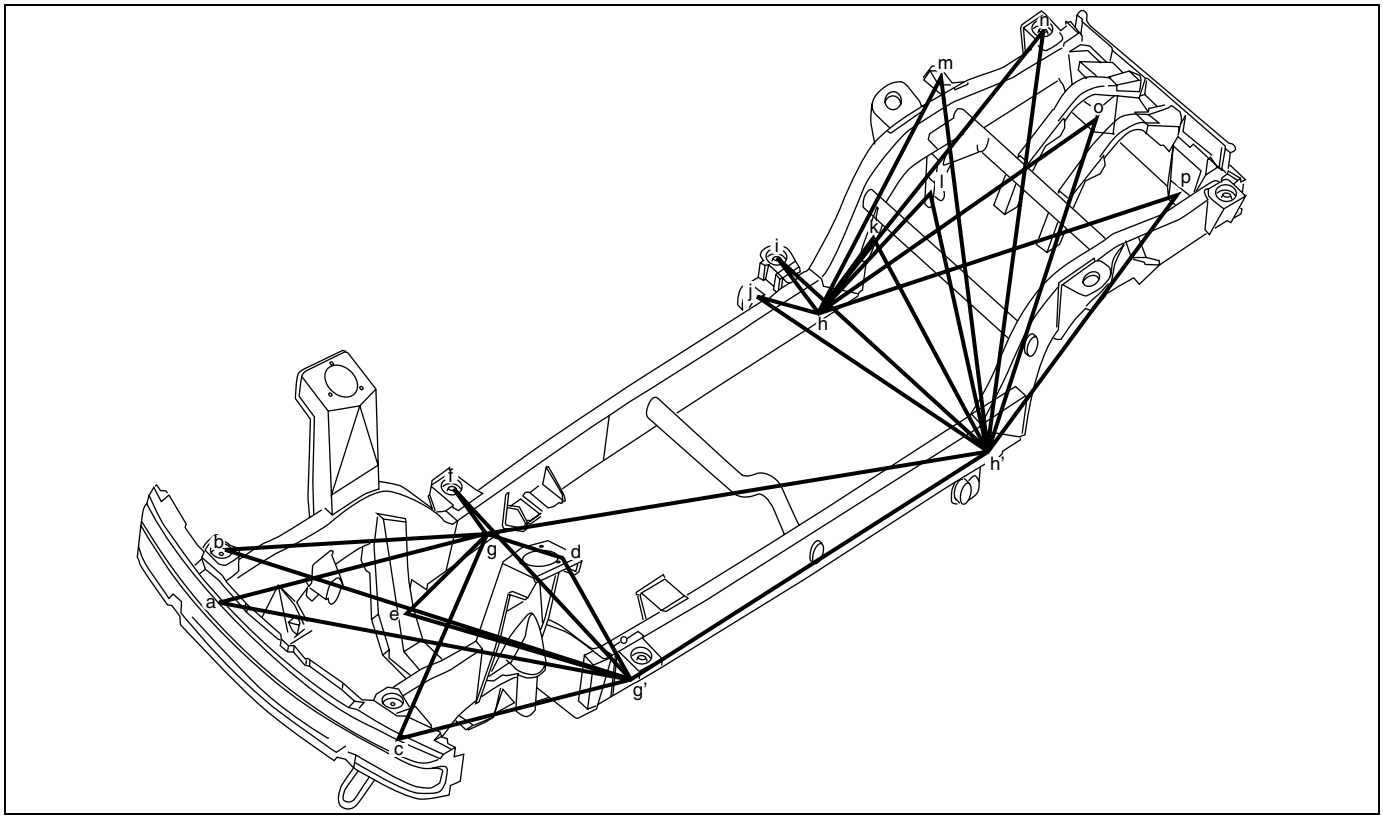



| | |
|---|---|
| a. Front bumper side installation hole | i. 3rd mounting installation hole |
| b. 1st mounting installation hole | j. Lower rod installation hole |
| c. Suspension frame front installation hole | k. Upper rod installation inside hole |
| d. Front strut installation outside hole | l. Lateral rod installation hole |
| e. Suspension arm installation rear side hole | m. Rear shock absorber installation hole |
| f. 2nd mounting installation hole | n. 4th mounting installation hole |
| g (g'). ϕ20 jig hole | o. Fuel tank installation rear right side hole |
| h (h'). Jig hole | p. Fuel tank installation rear left side hole |

### Hole to hole distance:

| | | |
|---|---|---|
| a – g: 1363 mm (53.66 in.) | f – g: 200 mm (7.87 in.) | h – p: 1770 mm (69.68 in.) |
| a – g': 1574 mm (61.97 in.) | f – g': 928 mm (36.54 in.) | i – h': 1073 mm (42.24 in.) |
| b – g: 1291 mm (50.83 in.) | g – h': 1488 mm (58.58 in.) | j – h': 1029 mm (40.51 in.) |
| b – g': 1554 mm (61.18 in.) | g' – h': 1225 mm (48.23 in.) | k – h': 970 mm (38.19 in.) |
| c – g: 1354 mm (53.31 in.) | h – i: 181 mm (7.13 in.) | l – h': 1353 mm (53.27 in.) |
| c – g': 1084 mm (42.68 in.) | h – k: 606 mm (23.86 in.) | m – h': 1477 mm (58.15 in.) |
| d – f: 1339 mm (52.72 in.) | h – l: 1004 mm (39.53 in.) | n – h': 1876 mm (73.86 in.) |
| d – g': 913 mm (35.94 in.) | h – m: 1110 mm (43.70 in.) | o – h': 1781 mm (70.12 in.) |
| e – g: 569 mm (22.40 in.) | h – n: 1633 mm (64.29 in.) | p – h': 1664 mm (65.51 in.) |
| e – g': 881 mm (34.68 in.) | h – o: 1660 mm (65.35 in.) | |

## Type B and RHW engine




| | | |
|---|---|---|
| a. Front bumper side installation hole | g (g'). ϕ20 jig hole | m. Rear shock absorber installation hole |
| b. 1st mounting installation hole | h (h'). Jig hole | n. 4th mounting installation hole |
| c. Suspension frame front installation hole | i. 3rd mounting installation hole | o. Fuel tank installation rear right side hole |
| d. Front strut installation outside hole | j. Lower rod installation hole | p. Fuel tank installation rear left side hole |
| e. Suspension arm installation rear side hole | k. Upper rod installation inside hole | |
| f. 2nd mounting installation hole | l. Lateral rod installation hole | |

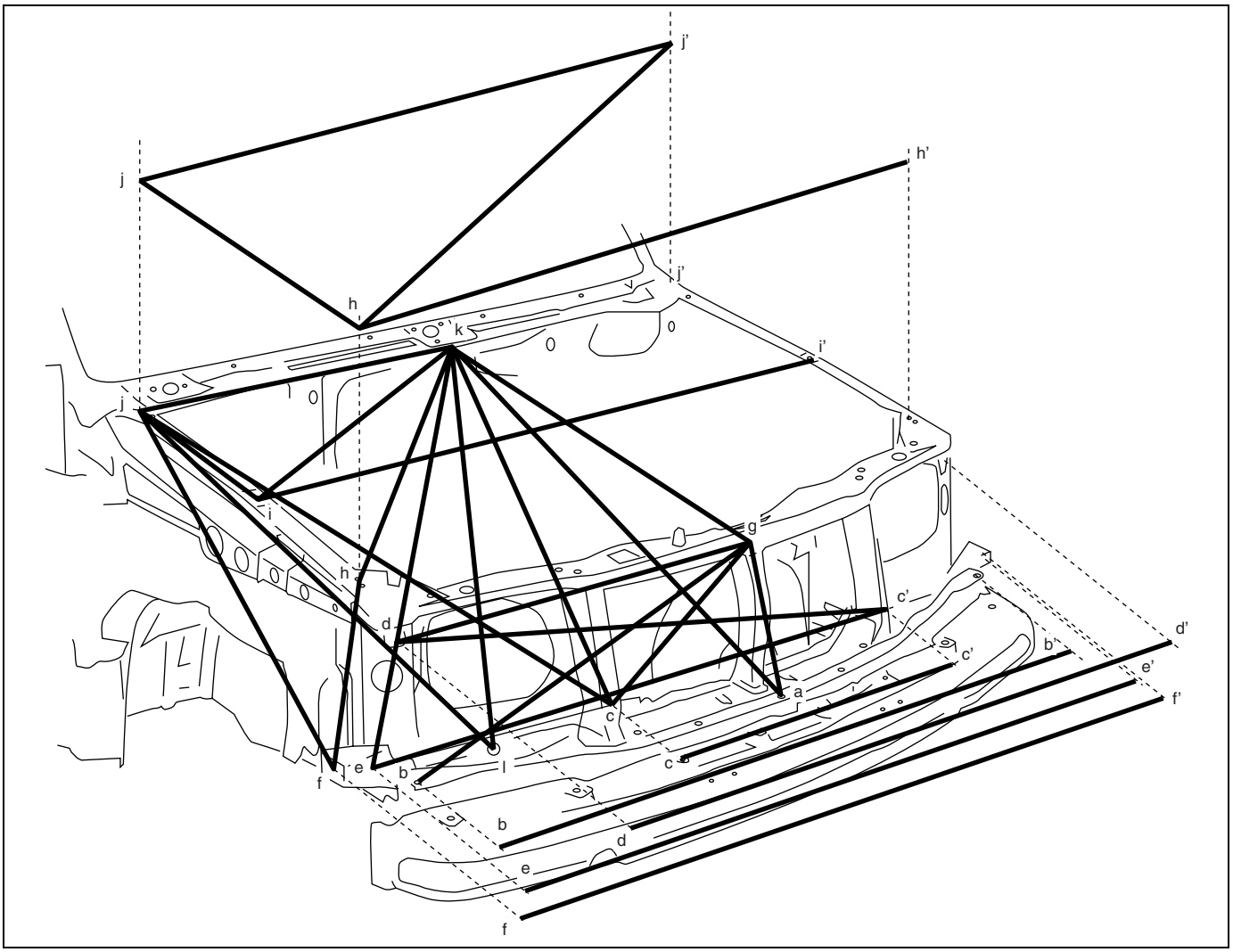
### Hole to hole distance:

| | | |
|---|---|---|
| a – g: 1452 mm (57.17 in.) | f – g: 275 mm (10.83 in.) | h – p: 1770 mm (69.68 in.) |
| a – g': 1652 mm (65.04 in.) | f – g': 952 mm (37.48 in.) | i – h': 1073 mm (42.24 in.) |
| b – g: 1381 mm (54.37 in.) | g – h': 1488 mm (58.58 in.) | j – h': 1029 mm (40.51 in.) |
| b – g': 1632 mm (64.25 in.) | g' – h': 1225 mm (48.23 in.) | k – h': 970 mm (38.19 in.) |
| c – g: 1429 mm (56.26 in.) | h – i: 181 mm (7.13 in.) | l – h': 1353 mm (53.27 in.) |
| c – g': 1174 mm (46.22 in.) | h – k: 606 mm (23.86 in.) | m – h': 1477 mm (58.15 in.) |
| d – f: 1300 mm (51.18 in.) | h – l: 1004 mm (39.53 in.) | n – h': 1876 mm (73.86 in.) |
| d – g': 982 mm (38.66 in.) | h – m: 1110 mm (43.70 in.) | o – h': 1781 mm (70.12 in.) |
| e – g: 661 mm (26.02 in.) | h – n: 1633 mm (64.29 in.) | p – h': 1664 mm (65.51 in.) |
| e – g': 945 mm (37.20 in.) | h – o: 1660 mm (65.35 in.) | |

# Body Dimensions

## Engine room

### Type A

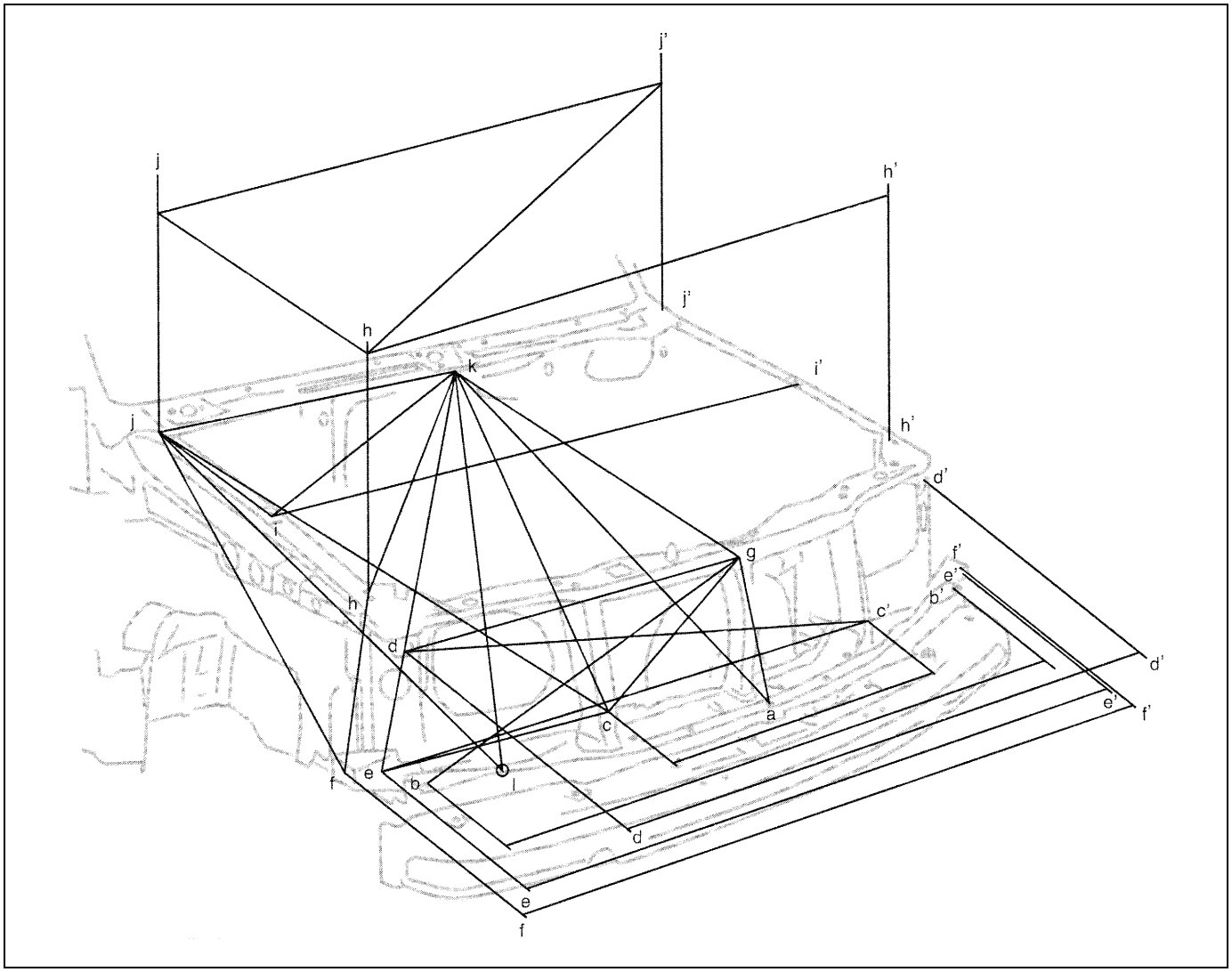



| | | | |
|---|---|---|---|
| a. | Front bumper installation clip hole | g. | Center member installation hole |
| b (b'). | Front bumper installation hole | h (h'). | Fender installation reference hole |
| c (c'). | Headlight installation hole | i (i'). | Fender installation hole |
| d (d'). | Headlight installation resin nut hole | j (j'). | Fender installation reference hole |
| e (e'). | Headlight installation bolt hole | k. | Cowl top panel center hole (ϕ6) |
| f (f'). | Front fender installation bolt hole | l. | Mounting installation hole |

**Hole to hole distance:**

| | | | | | |
|---|---|---|---|---|---|
| a – g: | 276 mm (10.87 in.) | d – d': | 1302 mm (51.26 in.) | h – j: | 677 mm (26.65 in.) |
| a – k: | 1000 mm (39.37 in.) | d – e: | 189 mm (7.44 in.) | h – j': | 1504 mm (59.21 in.) |
| b – b': | 1370 mm (53.94 in.) | d – g: | 672 mm (26.46 in.) | h – k: | 927 mm (36.50 in.) |
| b – g: | 730 mm (28.74 in.) | d – k: | 968 mm (38.11 in.) | i – i': | 1344 mm (52.91 in.) |
| c – c': | 668 mm (26.30 in.) | e – e': | 1456 mm (57.32 in.) | i – j: | 391 mm (15.39 in.) |
| c – e: | 414 mm (16.30 in.) | f – f': | 1550 mm (61.02 in.) | i – k: | 760 mm (29.92 in.) |
| c – g: | 406 mm (15.98 in.) | f – h: | 299 mm (11.77 in.) | j – j': | 1348 mm (53.07 in.) |
| c – j: | 1029 mm (40.51 in.) | f – j: | 811 mm (31.93 in.) | j – k: | 676 mm (26.61 in.) |
| c – k: | 1000 mm (39.37 in.) | g – k: | 854 mm (33.62 in.) | l – j: | 961 mm (37.83 in.) |
| d – c': | 1016 mm (40.00 in.) | h – h': | 1339 mm (52.72 in.) | l – k: | 1018 mm (40.08 in.) |

## Type B and RHW engine

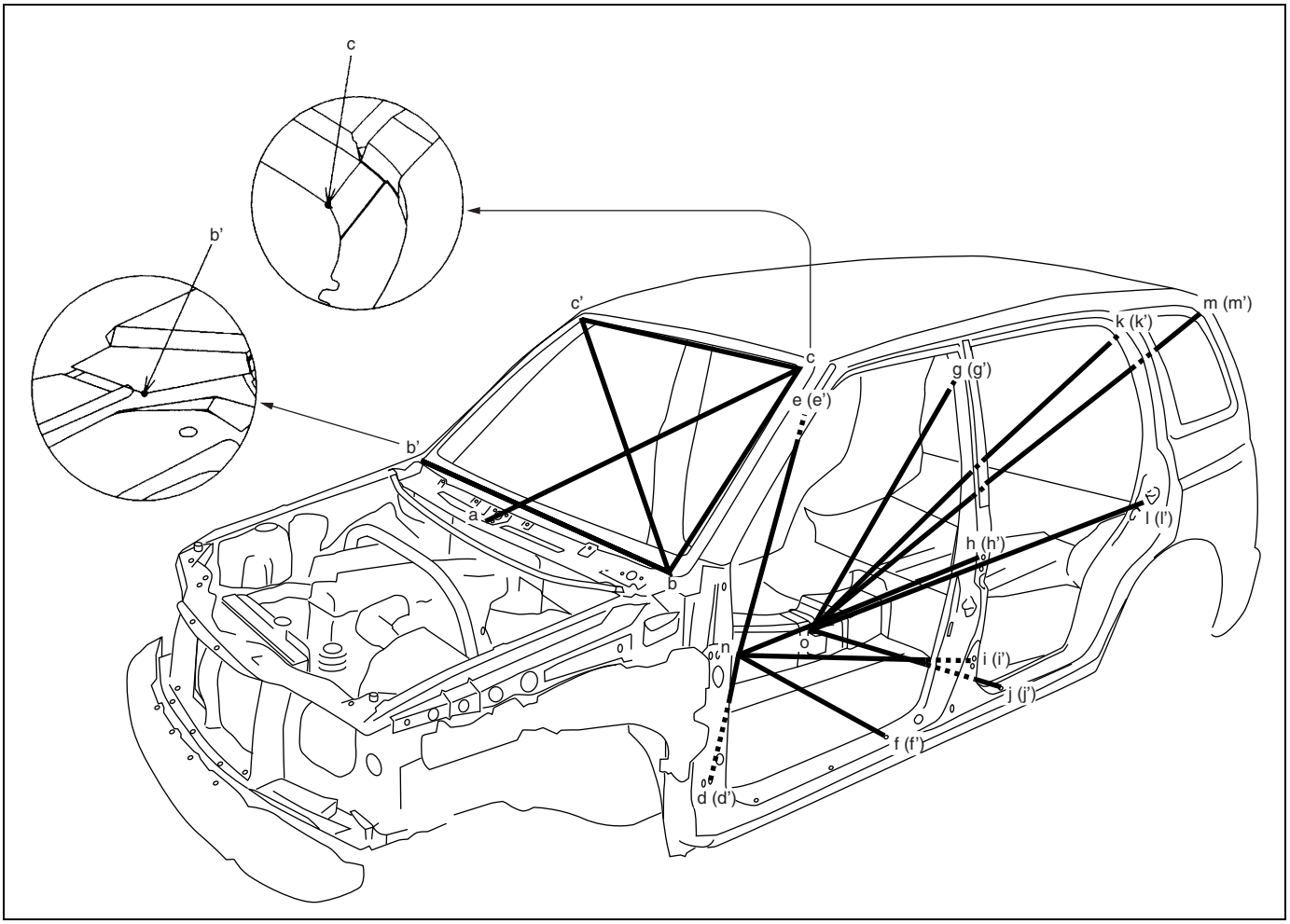



| | | |
|---|---|---|
| a. Lower member center hole (ϕ8) | e (e'). Headlight installation resin nut hole | i (i'). Fender installation bolt hole |
| b (b'). Front end bracket hole (inside) | f (f'). Front fender installation bolt hole | j (j'). Fender installation reference hole |
| c (c'). Headlight installation bolt hole | g. Center member installation bolt hole | k. Cowl top panel center hole (ϕ6) |
| d (d'). Headlight installation resin nut hole | h (h'). Fender installation reference hole | l. Mounting installation hole |

### Hole to hole distance:

| | | | | | |
|---|---|---|---|---|---|
| a – g: | 285 mm (11.22 in.) | d – d': | 1372 mm (54.02 in.) | h – j: | 677 mm (26.65 in.) |
| a – k: | 1028 mm (40.47 in.) | d – e: | 211 mm (8.31 in.) | h – j': | 1504 mm (59.21 in.) |
| b – b': | 940 mm (37.01 in.) | d – g: | 707 mm (27.83 in.) | h – k: | 927 mm (36.50 in.) |
| b – g: | 537 mm (21.14 in.) | d – k: | 978 mm (38.50 in.) | i – i': | 1344 mm (52.91 in.) |
| c – c': | 668 mm (26.30 in.) | e – e': | 1496 mm (58.90 in.) | i – j: | 391 mm (15.39 in.) |
| c – e: | 446 mm (17.56 in.) | f – f': | 1548 mm (60.94 in.) | i – k: | 760 mm (29.92 in.) |
| c – g: | 405 mm (15.94 in.) | f – h: | 299 mm (11.77 in.) | j – j': | 1348 mm (53.07 in.) |
| c – j: | 1053 mm (41.46 in.) | f – j: | 811 mm (31.93 in.) | j – k: | 676 mm (26.61 in.) |
| c – k: | 1023 mm (40.28 in.) | g – k: | 852 mm (33.54 in.) | l – j: | 963 mm (37.91 in.) |
| d – c': | 1061 mm (41.77 in.) | h – h': | 1339 mm (52.72 in.) | l – k: | 1020 mm (40.16 in.) |

## Inner body

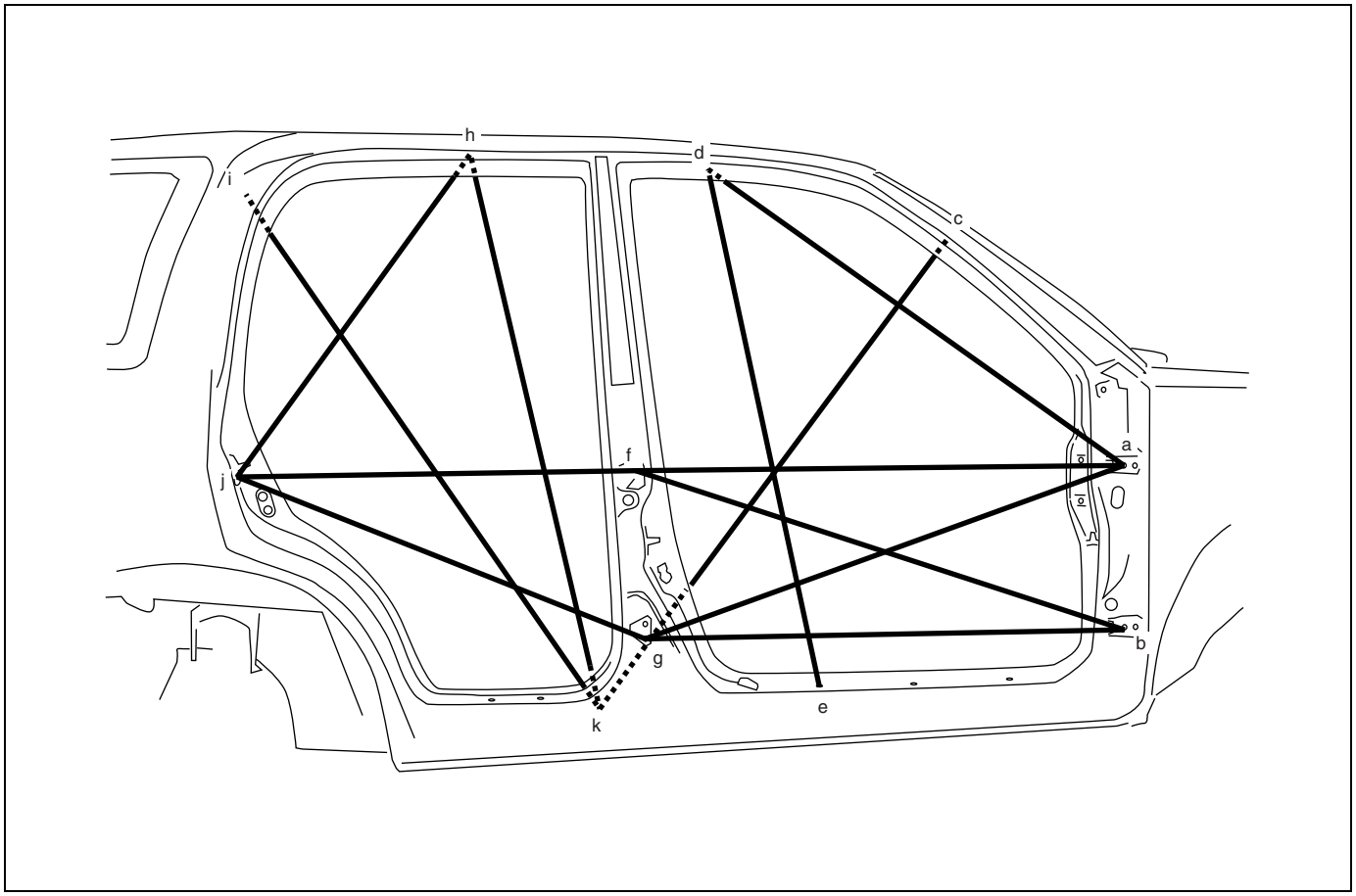



| | | | |
|---|---|---|---|
| a. | Garnish installation clip hole | i (i'). | Hole in rear door lower hinge in lower part |
| b (b'). | Front end of front windshield lower installation section | j (j'). | Rear scuff installation hole (at front end) |
| c (c'). | Front end of front windshield upper installation section | k (k'). | Trim installation hole |
| d. | Hole in front door lower hinge at rear | l (l'). | Rear door striker lower section installation hole |
| e. | Trim installation clip hole | m (m'). | Trim installation hole |
| f (f'). | Scuff installation hole (at rear end) | n. | Installation hole for front seat front inside |
| g (g'). | Trim installation hole | o. | Installation hole for front seat rear inside |
| h (h'). | Hole in rear door upper hinge in upper part | | |

### Hole to hole distance:

| | | | | | |
|---|---|---|---|---|---|
| a – c: | 982 mm (38.66 in.) | f – f': | 1511 mm (59.49 in.) | j – o: | 649 mm (25.55 in.) |
| b – b': | 1390 mm (54.72 in.) | f – n: | 620 mm (34.41 in.) | k – k': | 1095 mm (43.11 in.) |
| b – c: | 755 mm (29.72 in.) | g – g': | 1085 mm (42.72 in.) | k – o: | 1475 mm (58.07 in.) |
| b – c': | 1406 mm (55.35 in.) | g – o: | 1099 mm (43.27 in.) | l – l': | 1513 mm (59.57 in.) |
| c – c': | 1012 mm (39.84 in.) | h – h': | 1521 mm (59.88 in.) | l – o: | 1273 mm (50.12 in.) |
| d – d': | 1545 mm (60.83 in.) | h – o: | 901 mm (35.47 in.) | m – m': | 1110 mm (43.70 in.) |
| d – n: | 800 mm (31.50 in.) | i – i': | 1547 mm (60.91 in.) | m – o: | 2037 mm (80.20 in.) |
| e – e': | 1110 mm (43.70 in.) | i – n: | 806 mm (31.73 in.) | | |
| e – n: | 1036 mm (40.79 in.) | j – j': | 1511 mm (59.49 in.) | | |

## Side body

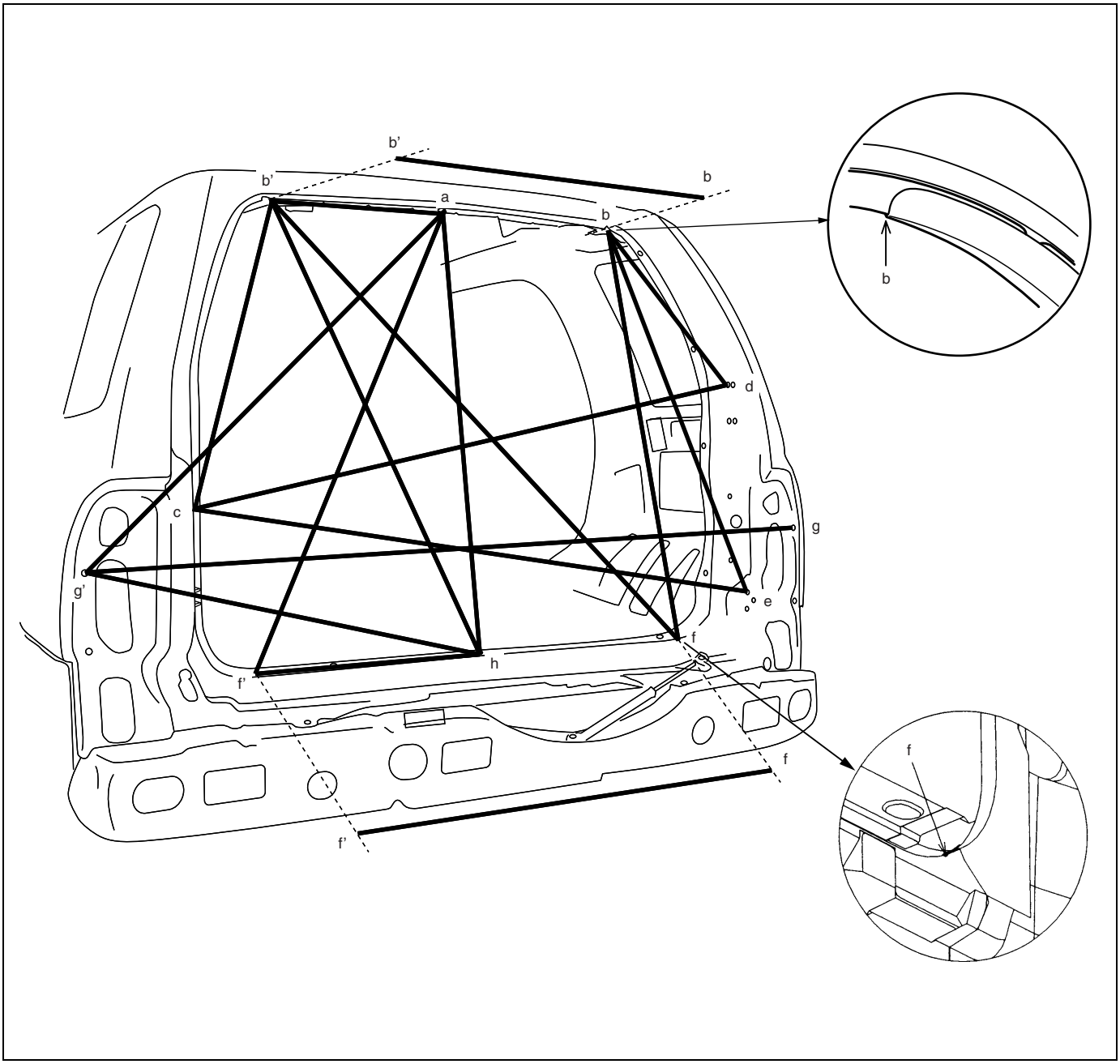



| | |
|---|---|
| a. Hole in front door upper hinge at rear | g. Hole in rear door lower hinge in lower part |
| b. Hole in front door lower hinge at rear | h. Assistant grip front installation hole |
| c. Trim installation clip hole | i. Trim installation hole |
| d. ϕ7 jig hole | j. Door striker lower section installation hole |
| e. Scuff installation hole (rear end) | k. Front seat belt installation hole |
| f. Hole in rear door upper hinge in upper part | |

### Hole to hole distance:

| | | | | | |
|---|---|---|---|---|---|
| a – d: | 1155 mm (45.47 in.) | b – g: | 1140 mm (44.88 in.) | g – j: | 1082 mm (42.60 in.) |
| a – f: | 1046 mm (41.18 in.) | c – k: | 1245 mm (49.02 in.) | h – j: | 879 mm (34.61 in.) |
| a – g: | 1090 mm (42.91 in.) | d – e: | 1174 mm (46.22 in.) | h – k: | 1282 mm (50.47 in.) |
| b – f: | 1120 mm (44.09 in.) | f – j: | 1029 mm (40.51 in.) | i – k: | 1435 mm (56.50 in.) |

## Rear-end Door



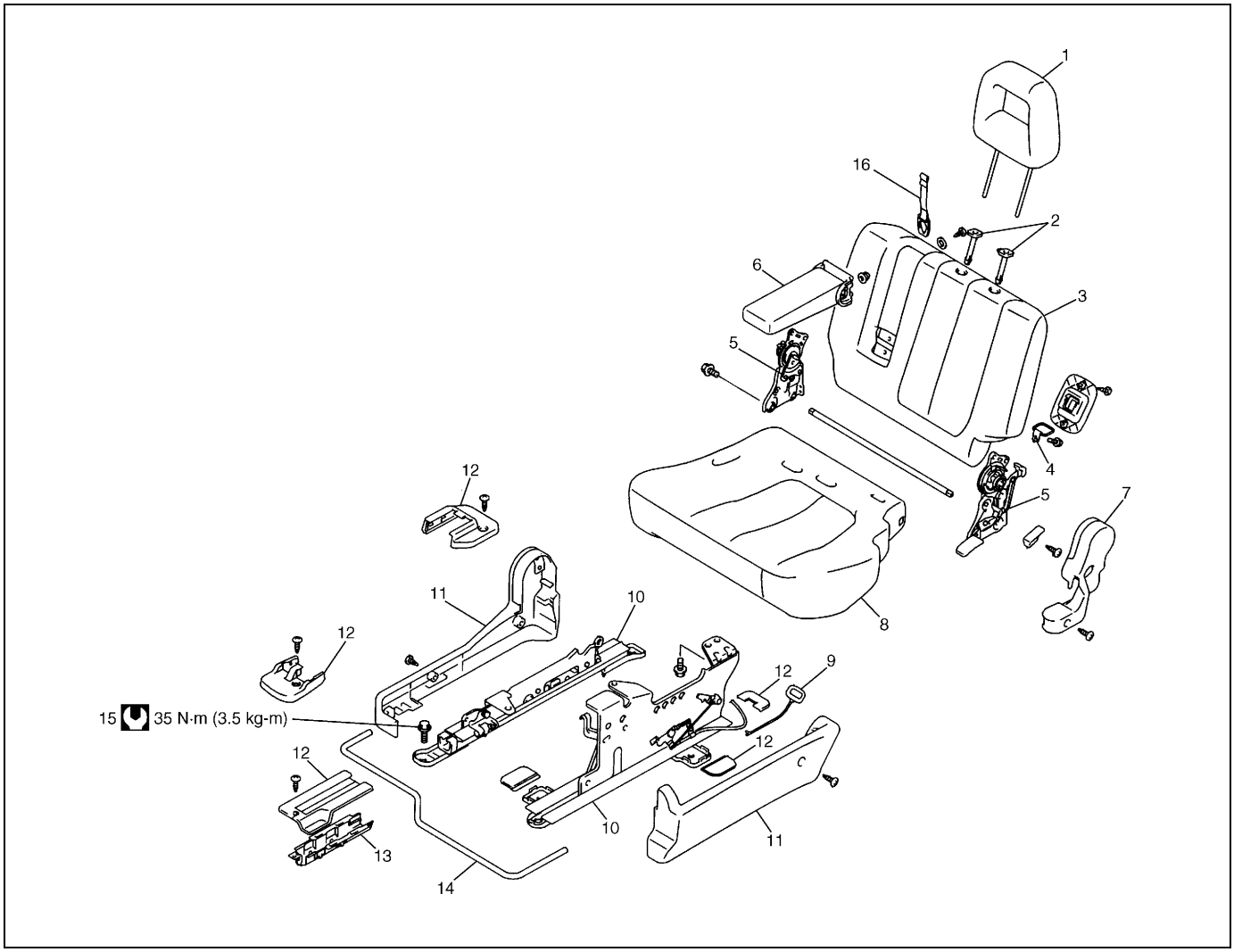

| | |
|---|---|
| a. Clip hole in the center of head lining rear installation section | e. Installation hole in uppermost part of lower hinge |
| b (b'). Innermost end of roof panel installation section | f (f'). Innermost end of rear floor tail member installation section |
| c. Installation hole in upper part of rear-end door striker | g (g'). Installation hole in outer upper section of rear combination right lamp |
| d. Installation hole in uppermost part of upper hinge | h. Nut hole |

### Hole to hole distance:

| | | |
|---|---|---|
| a – b': 448 mm (17.64 in.) | b – e: 837 mm (32.95 in.) | c – e: 1293 mm (50.90 in.) |
| a – f': 1054 mm (41.50 in.) | b – f: 892 mm (35.12 in.) | f – f': 1030 mm (40.55 in.) |
| a – g': 1050 mm (41.34 in.) | b' – c: 650 mm (25.59 in.) | f' – h: 512 mm (20.16 in.) |
| a – h: 921 mm (36.25 in.) | b' – f: 1314 mm (51.73 in.) | g – g': 1544 mm (60.79 in.) |
| b – b': 888 mm (34.96 in.) | b' – h: 996 mm (39.21 in.) | g' – h: 806 mm (31.73 in.) |
| b – d: 400 mm (15.75 in.) | c – d: 1245 mm (49.02 in.) | |

# Seat

## Second Seat for Type A




| | | | |
|---|---|---|---|
| 1. Head restraint | 6. Arm rest | 11. Seat adjuster cover | 16. Rod belt (if equipped) |
| 2. Head restraint guide | 7. Seat reclining assembly cover | 12. Cover | Tightening torque |
| 3. Seat back | 8. Seat cushion | 13. Adjuster extension bracket | |
| 4. Tether anchor hook | 9. Adjuster handle (back side) | 14. Adjuster handle (front side) | |
| 5. Seat reclining assembly | 10. Seat adjuster | 15. Second seat mounting bolt | |

### Removal

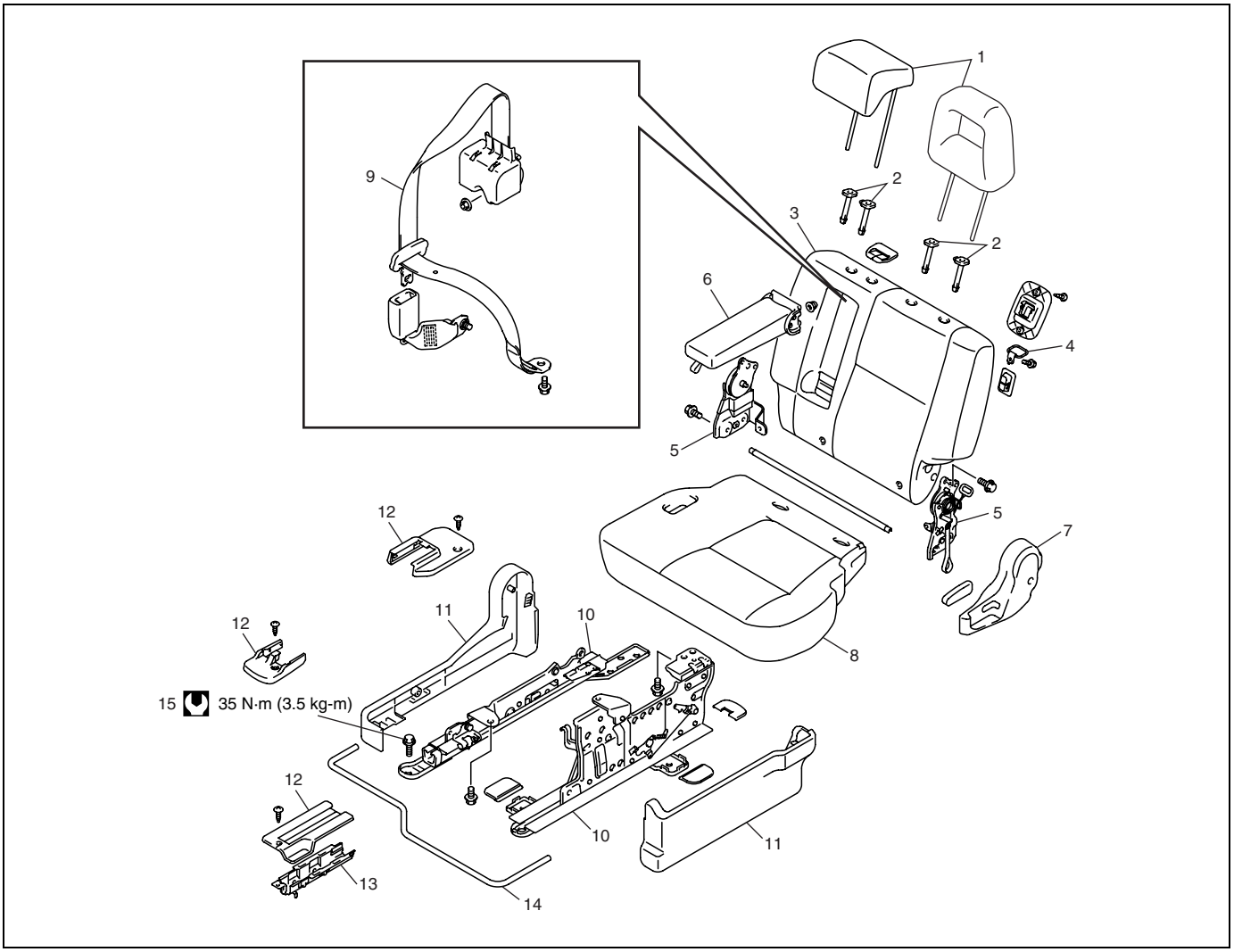
1) Remove adjuster extension cover.
2) Remove adjuster extension bracket.
3) Remove front and rear adjuster inside covers.
4) Remove adjuster outside covers.
5) Remove second seat mounting bolts.
6) Disassemble and repair seat as necessary.

### Installation

Reverse removal procedure to install second seat, noting the following instruction.

- Tighten second seat mounting bolts as specified torque.

# Second Seat for Type B and RHW Engine




| | | | |
|---|---|---|---|
| 1. Head restraint | 5. Seat reclining assembly | 9. Second rear seat belt (if equipped) | 13. Adjuster extension bracket |
| 2. Head restraint guide | 6. Arm rest | 10. Seat adjuster | 14. Adjuster handle (front side) |
| 3. Seat back | 7. Seat reclining assembly cover | 11. Seat adjuster cover | 15. Second seat mounting bolt |
| 4. Tether anchor hook | 8. Seat cushion | 12. Cover | Tightening torque |

### Removal

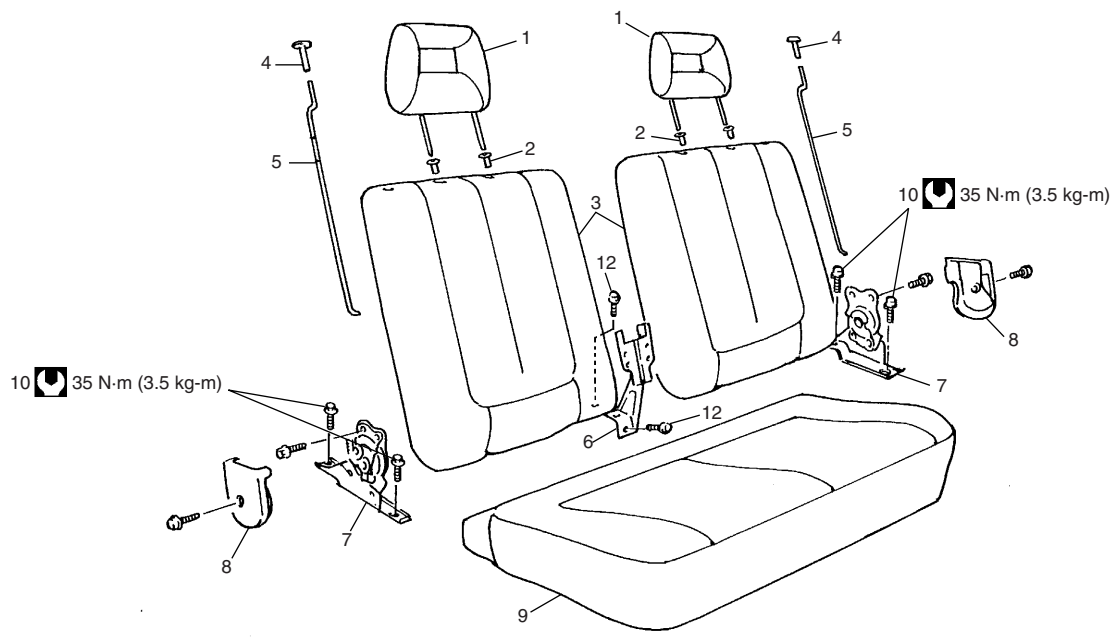
1) Remove adjuster extension cover.
2) Remove adjuster extension bracket.
3) Remove front and rear adjuster inside covers.
4) Remove adjuster outside covers.
5) Remove second seat mounting bolts.
6) Disassemble and repair seat as necessary.

### Installation

Reverse removal procedure to install second seat, noting the following instruction.

- Tighten second seat mounting bolts as specified torque.
- Tighten second rear seat belt bolt and nut as specified torque referring to “Second Rear Seat Belt” in Section 10A.

# Third Seat (If Equipped)




| | | |
|---|---|---|
| 1. Head restraint | 6. Reclining supporter | Tightening torque |
| 2. Head restraint guide | 7. Seat reclining assembly | |
| 3. Seat back | 8. Seat reclining assembly cover | |
| 4. Seat reclining knob | 9. Seat cushion | |
| 5. Seat reclining rod | 10. Third seat mounting bolt | |

### Removal

1) Raise the front portion of seat cushion to remove rear seat cushion.
2) Remove 6 mounting bolts to remove seat back.
3) Disassemble and repair seat if necessary.

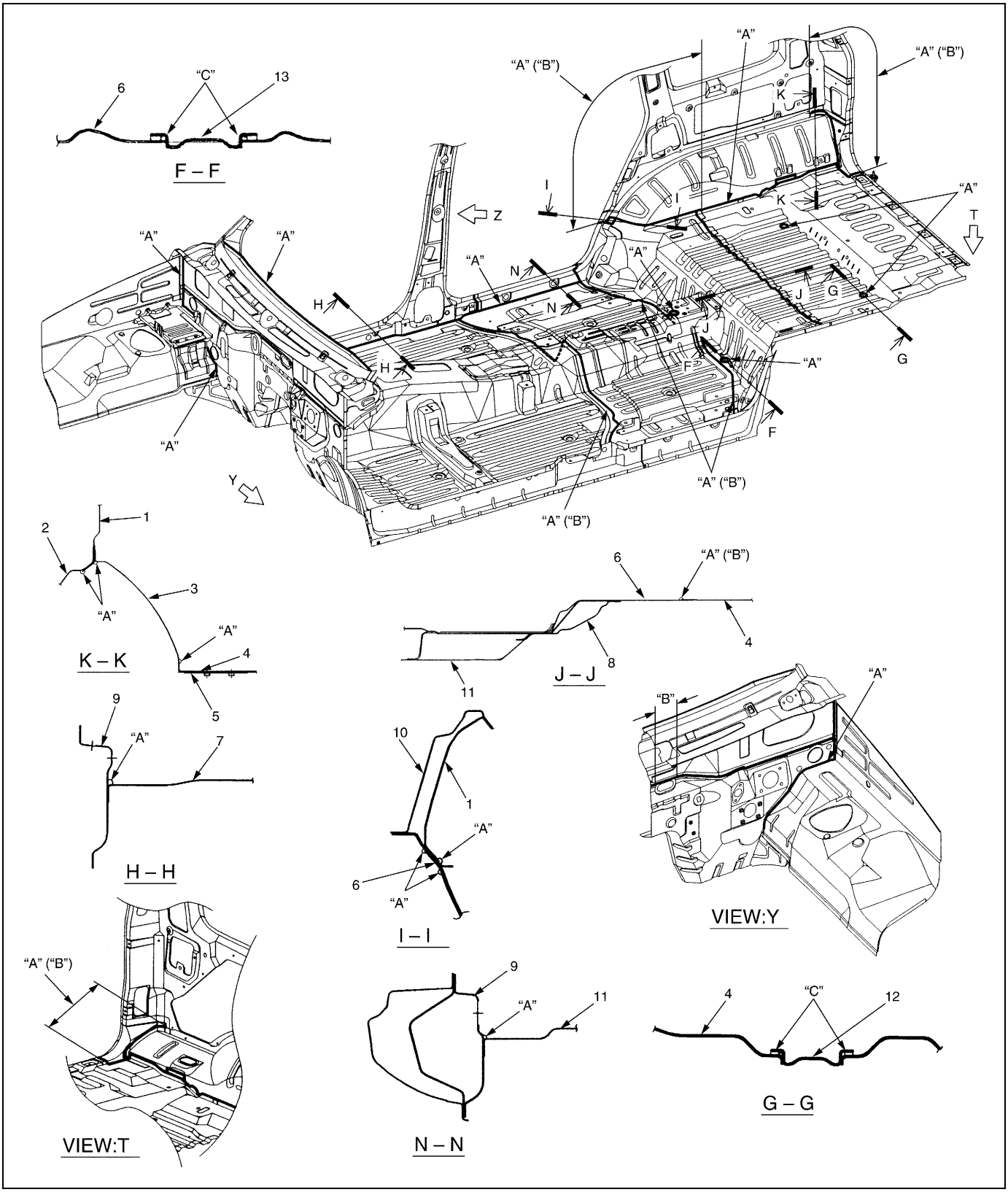
### Installation

Reverse removal procedure to install third seat noting the following instruction.

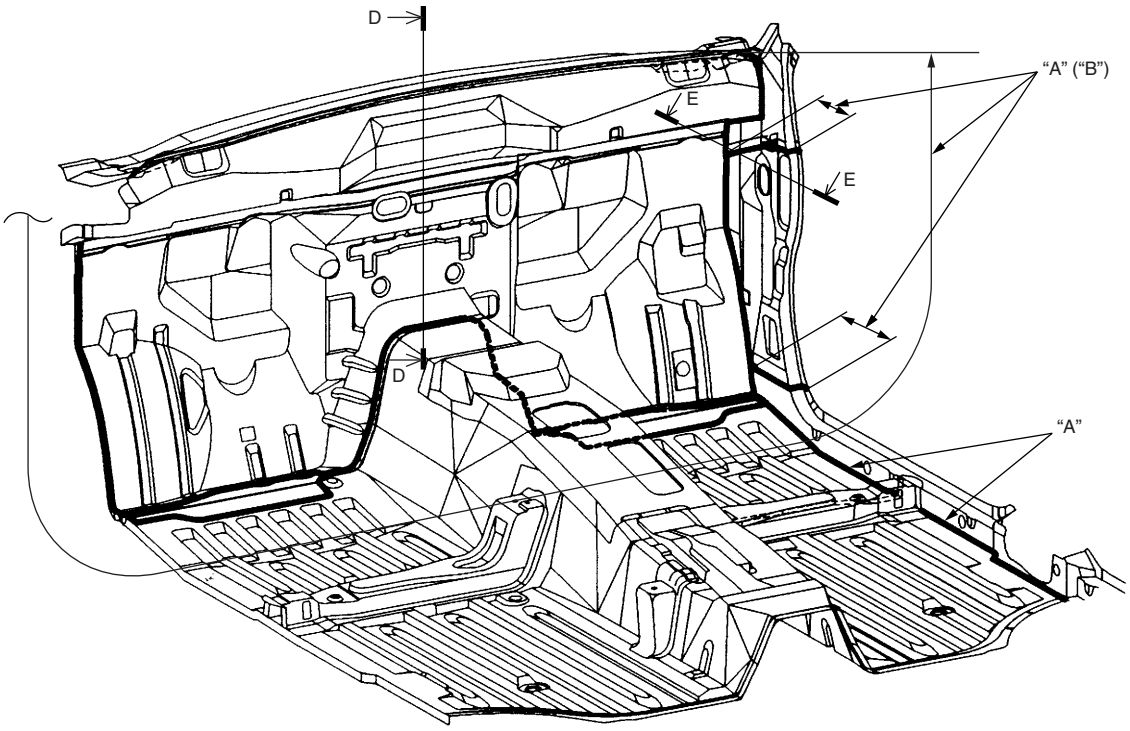
- Tighten third seat mounting bolts as specified torque.

# Paint and Coatings

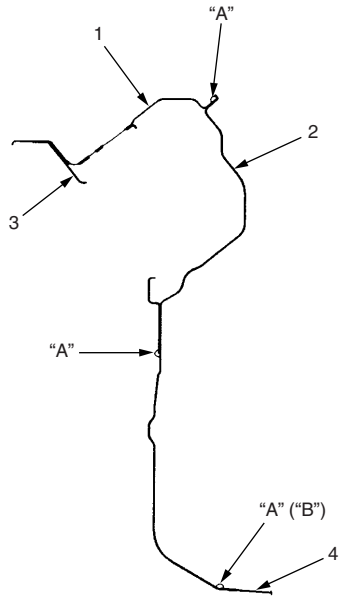
## Sealant Application Area



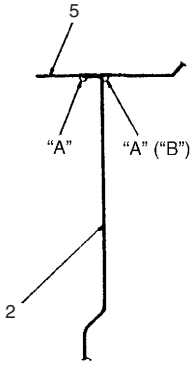

| | | | |
|---|---|---|---|
| 1. Side body inner panel | 5. Tail lower member | 9. Side sill inner panel | 13. Center floor cap |
| 2. Rear wheel housing outer rear panel | 6. Center floor panel | 10. Side outer panel | "A": Apply sealant |
| 3. Rear wheel housing panel | 7. Front floor panel | 11. Main floor extension panel | "B": Brush treatment |
| 4. Rear floor panel | 8. Center floor member | 12. Rear floor cap | "C": Apply sealant between cap and panel |




VIEW:Z

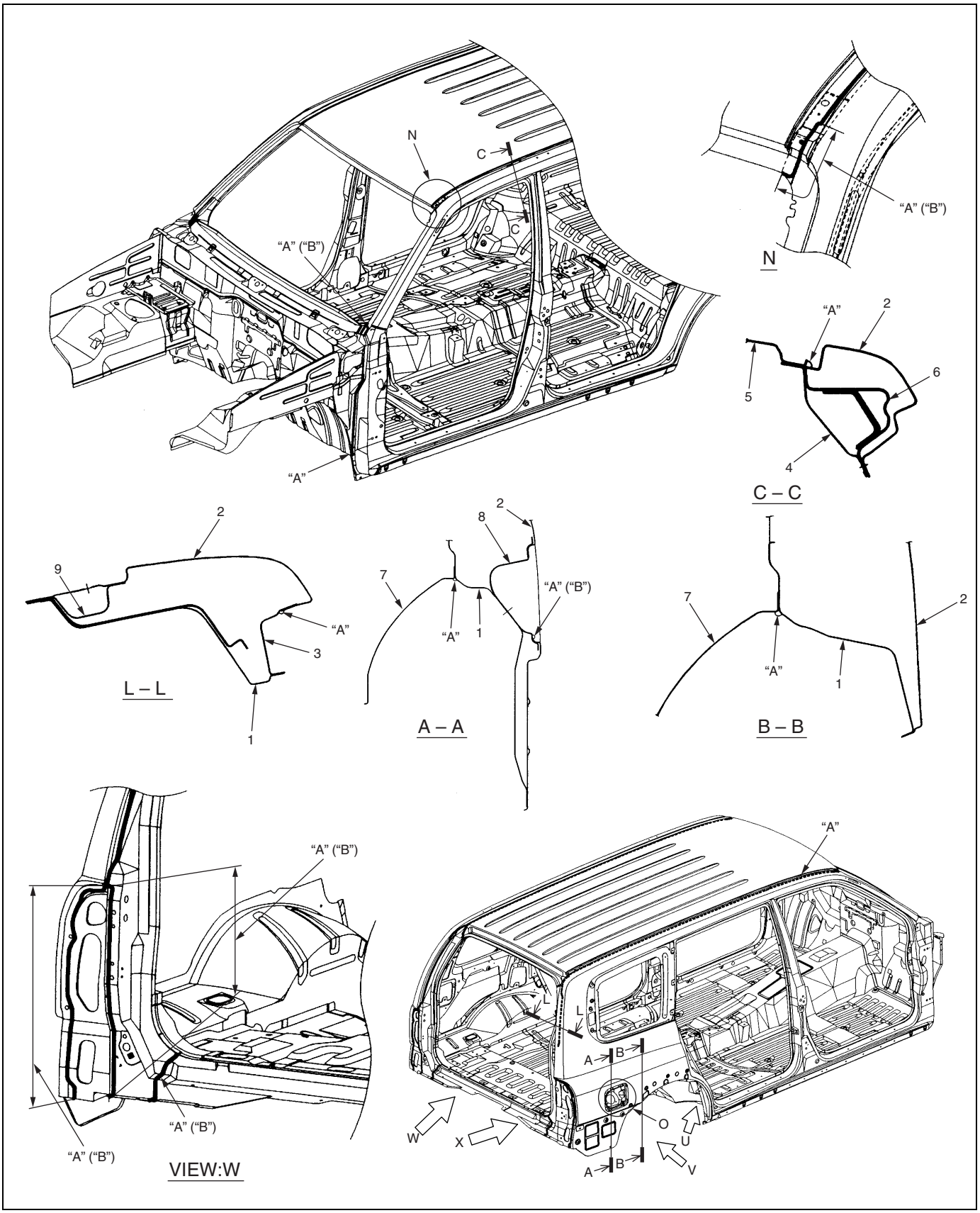



D – D

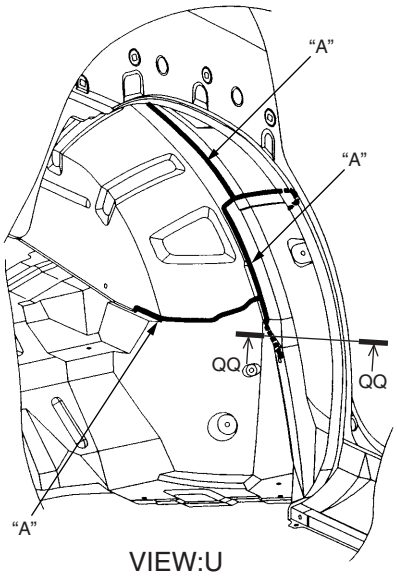



E – E

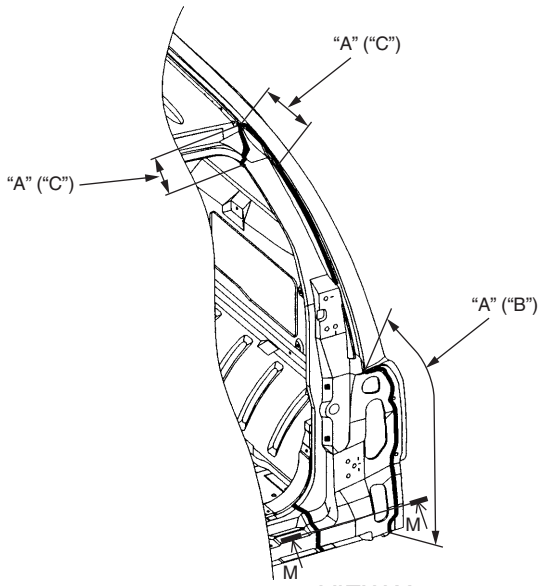
| | | | |
|---|---|---|---|
| 1. Cowl top panel | 3. Cowl front panel | 5. Front pillar inner lower panel | "B": Brush treatment |
| 2. Dash panel | 4. Front floor panel | "A": Apply sealant | |



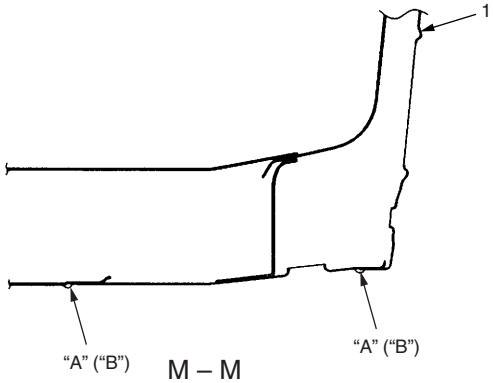

| | | |
|---|---|---|
| 1. Rear quarter inner panel | 5. Roof panel | 9. Air outlet panel |
| 2. Side body outer panel | 6. Front pillar upper reinforcement | "A": Apply sealant |
| 3. Back pillar outer panel | 7. Rear wheel housing panel | "B": Brush treatment |
| 4. Front pillar inner panel | 8. Fuel inlet box | |



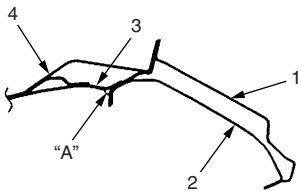

VIEW:U



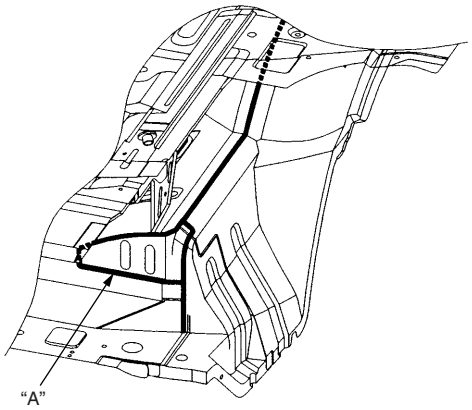

VIEW:X



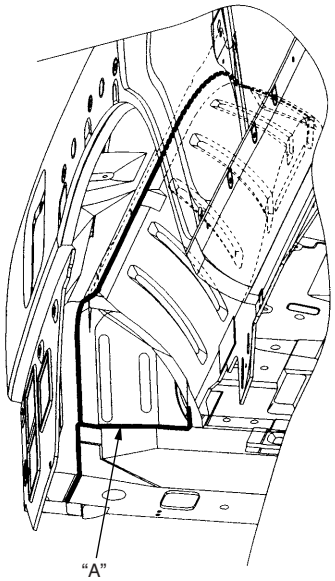

M – M



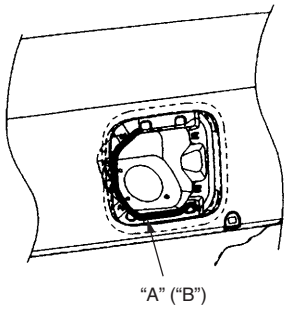

QQ – QQ




VIEW:V (LH)

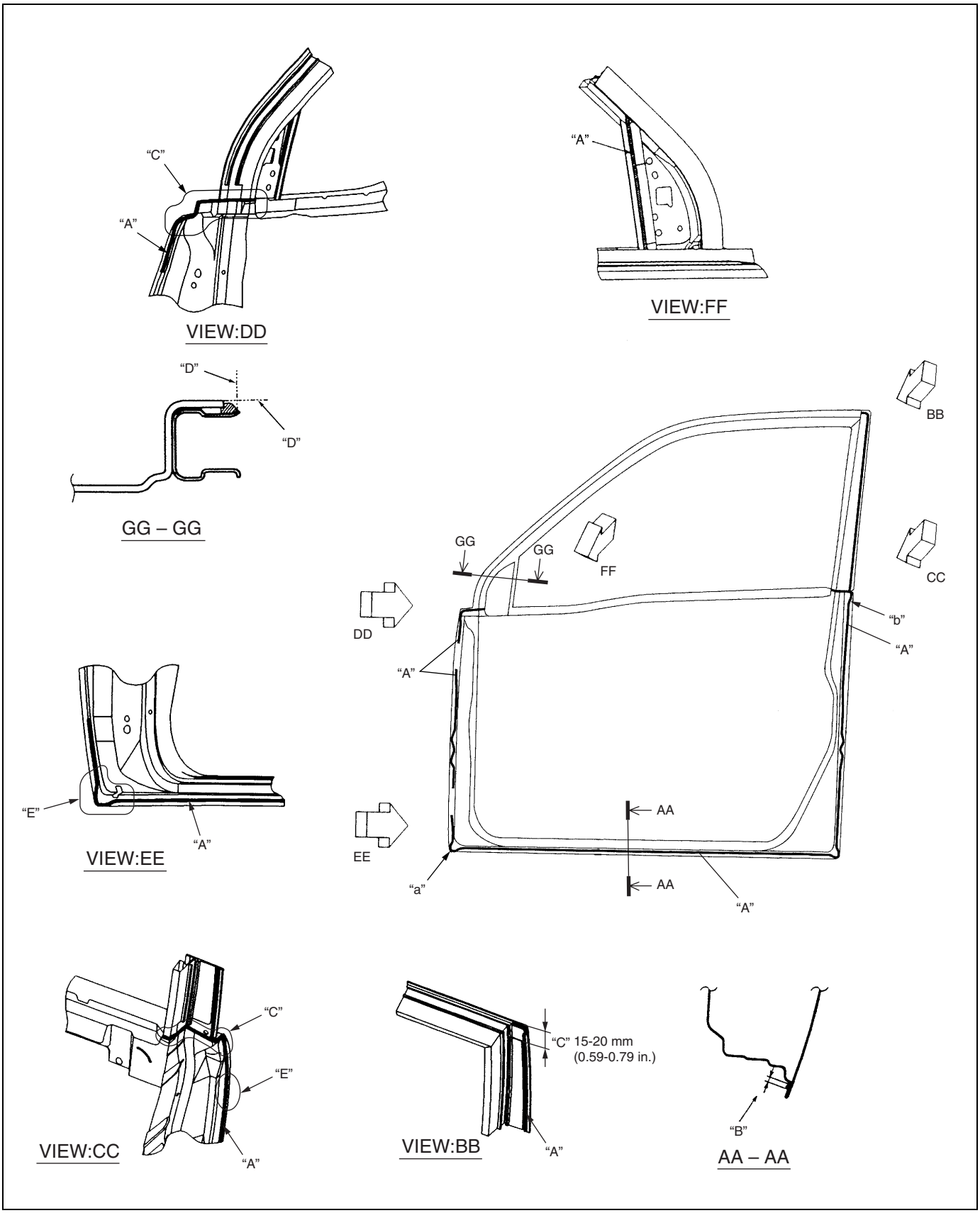



VIEW:V (RH)

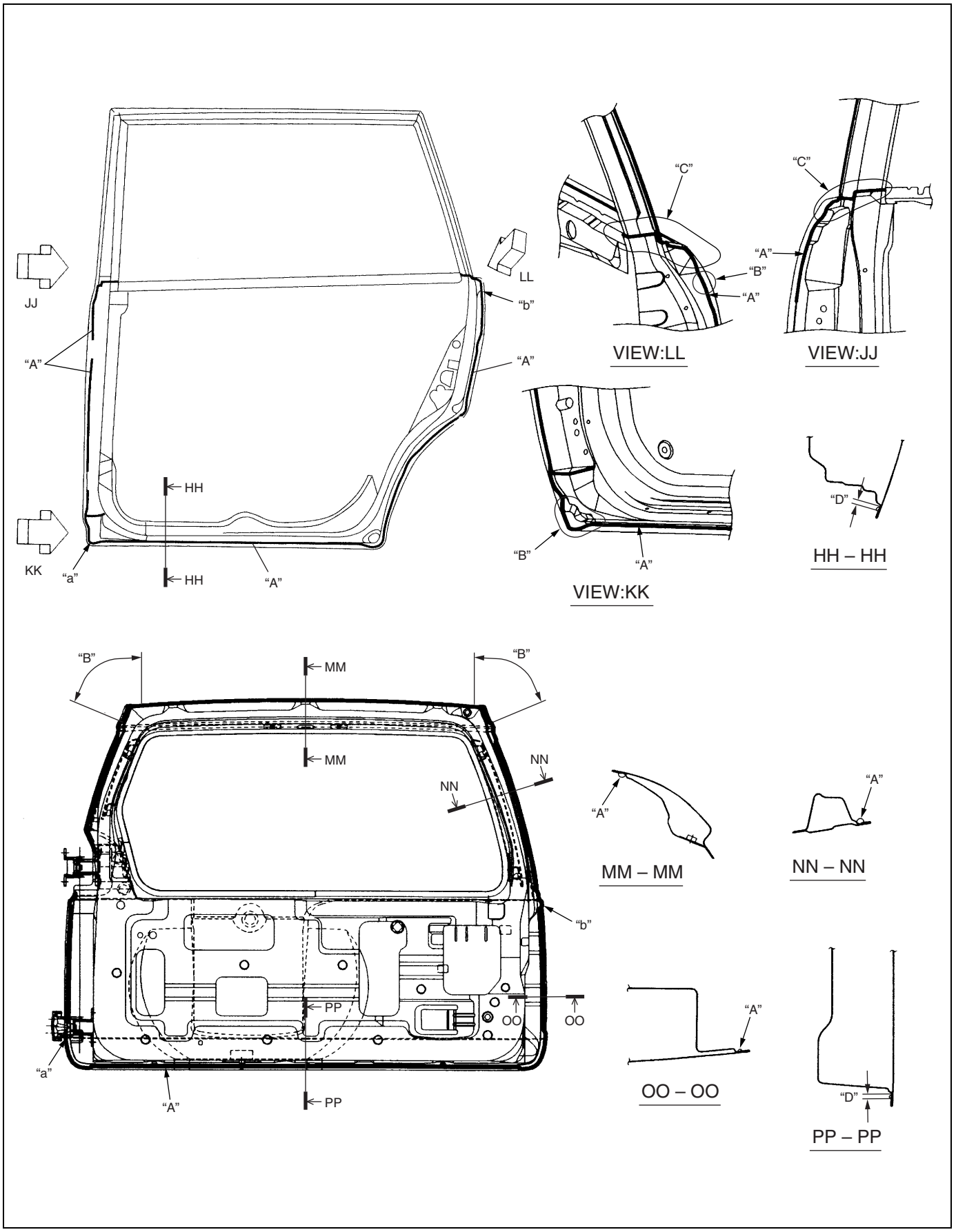



O

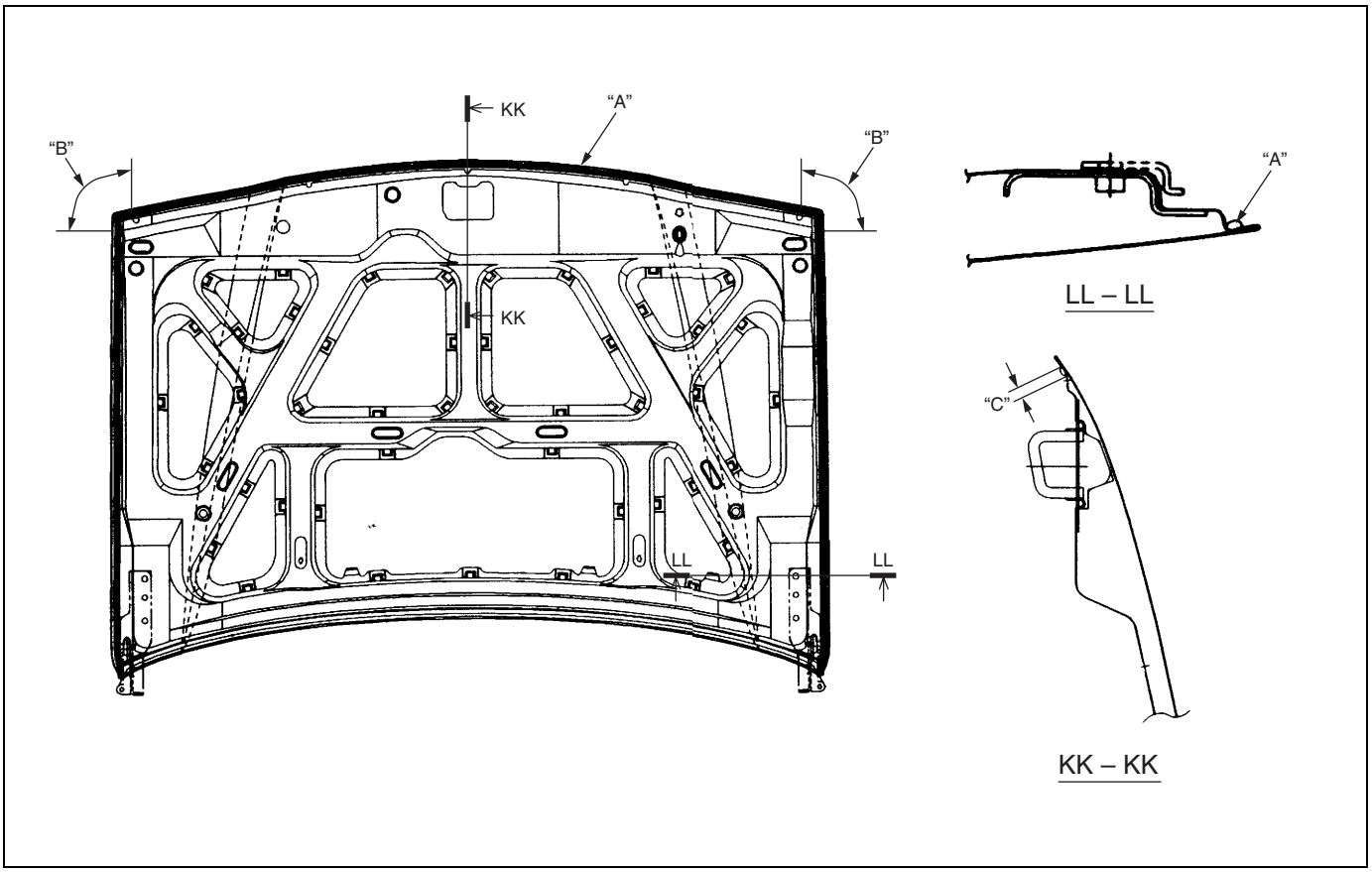
| | | | |
|---|---|---|---|
| 1. Side body outer panel | 3. Center floor gusset | "A": Apply sealant | "C": Wipe off swell sealant |
| 2. Rear wheel housing outer panel | 4. Center floor panel | "B": Brush treatment | |




| | |
|---|---|
| "A": Apply sealant | "D": Be free from protrude of sealant outside from this line |
| "B": Sealant width (more than 5 mm (0.20 in.) between "a" and "b") | "E": Smooth out sealant with a brush |
| "C": Wipe off sealant in this section | |

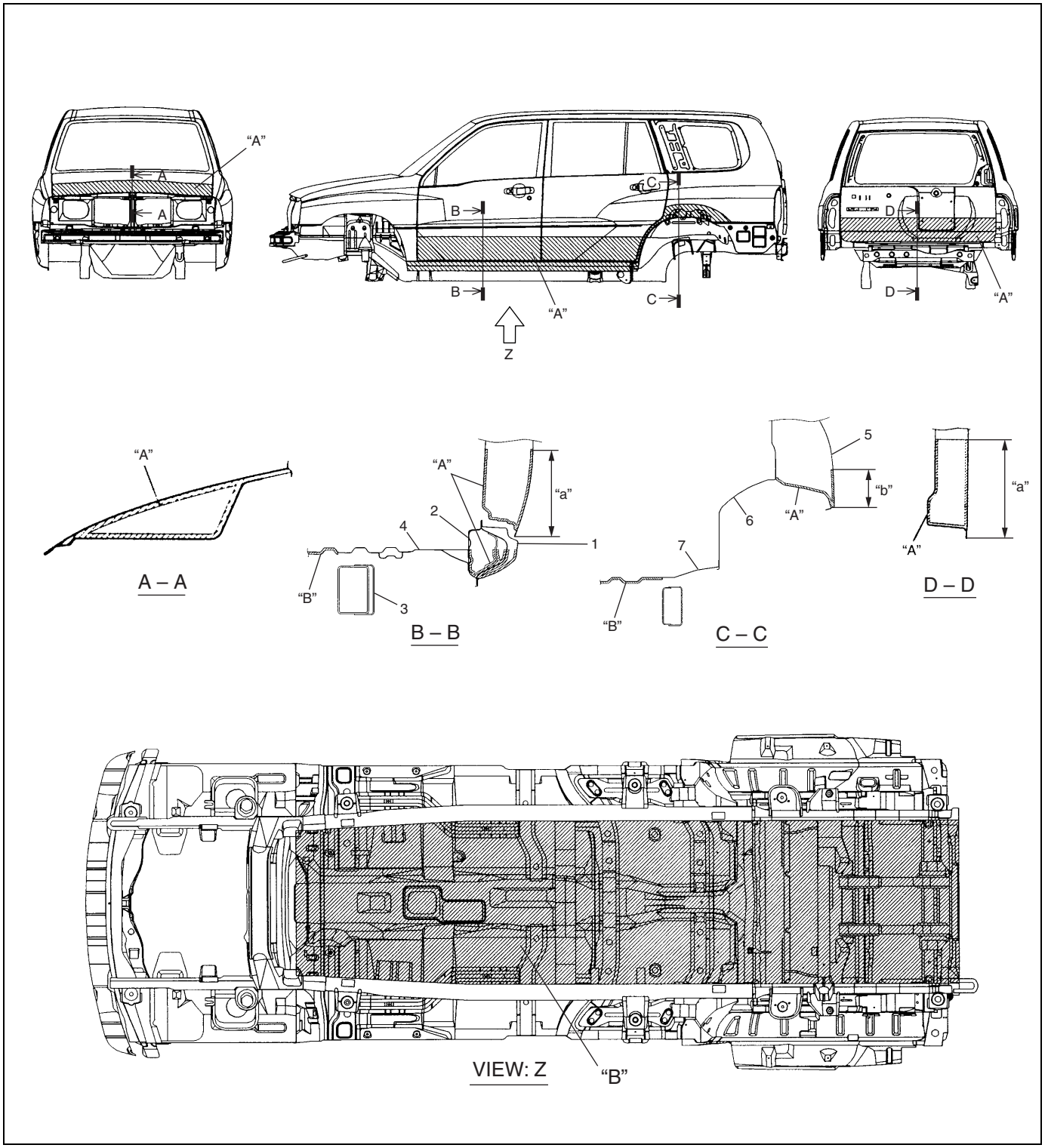



| | |
|---|---|
| "A": Apply sealant | "C": Wipe off sealant in this section |
| "B": Smooth out sealant with a brush | "D": Sealant width (more than 5 mm (0.20 in.) between "a" and "b") |

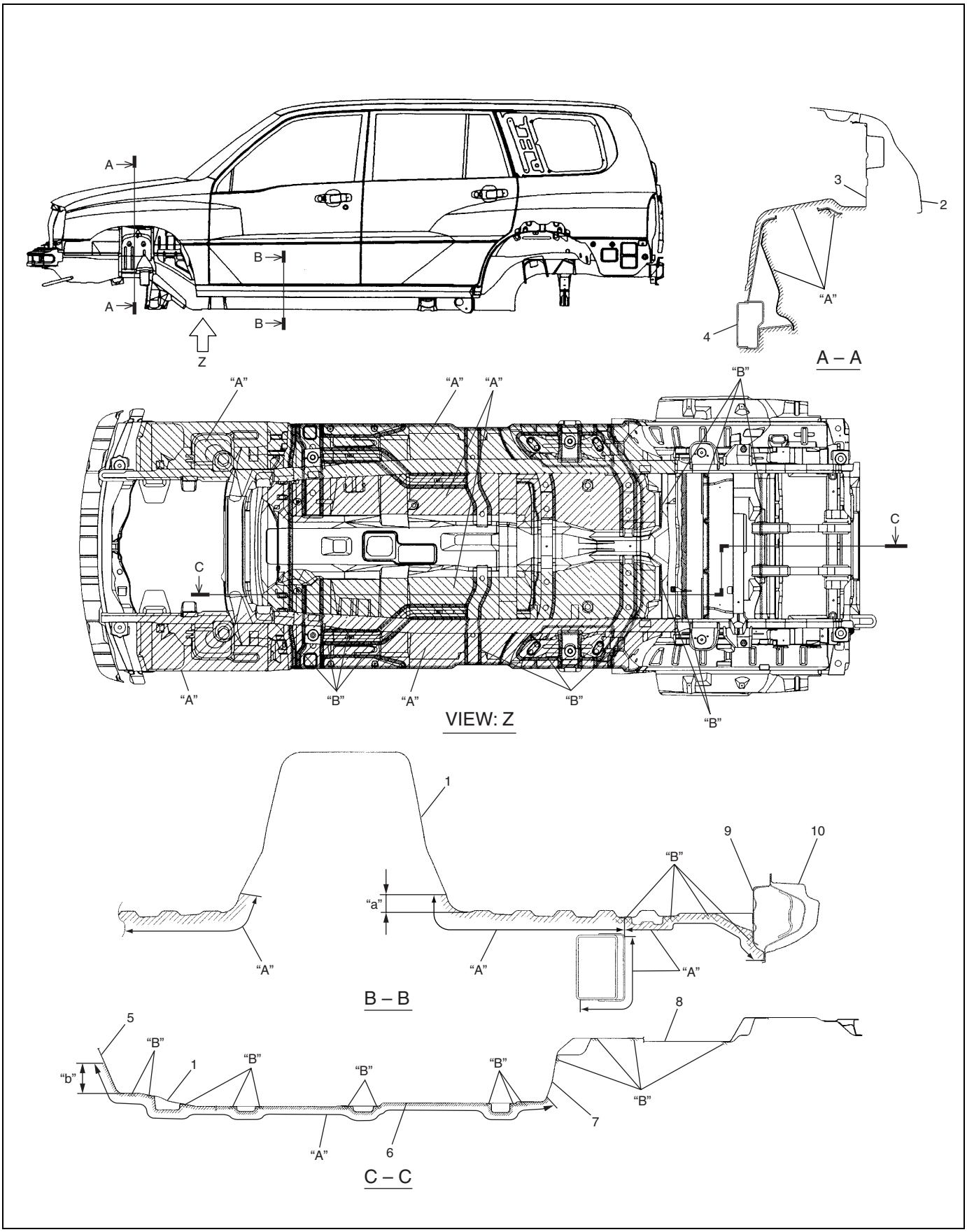



| | |
|---|---|
| "A": | Apply sealant |
| "B": | Smooth out sealant with a brush |
| "C": | Sealant width C more than 5 mm (0.20 in.) |

# Undercoating/Anti-corrosion Compound Application Area



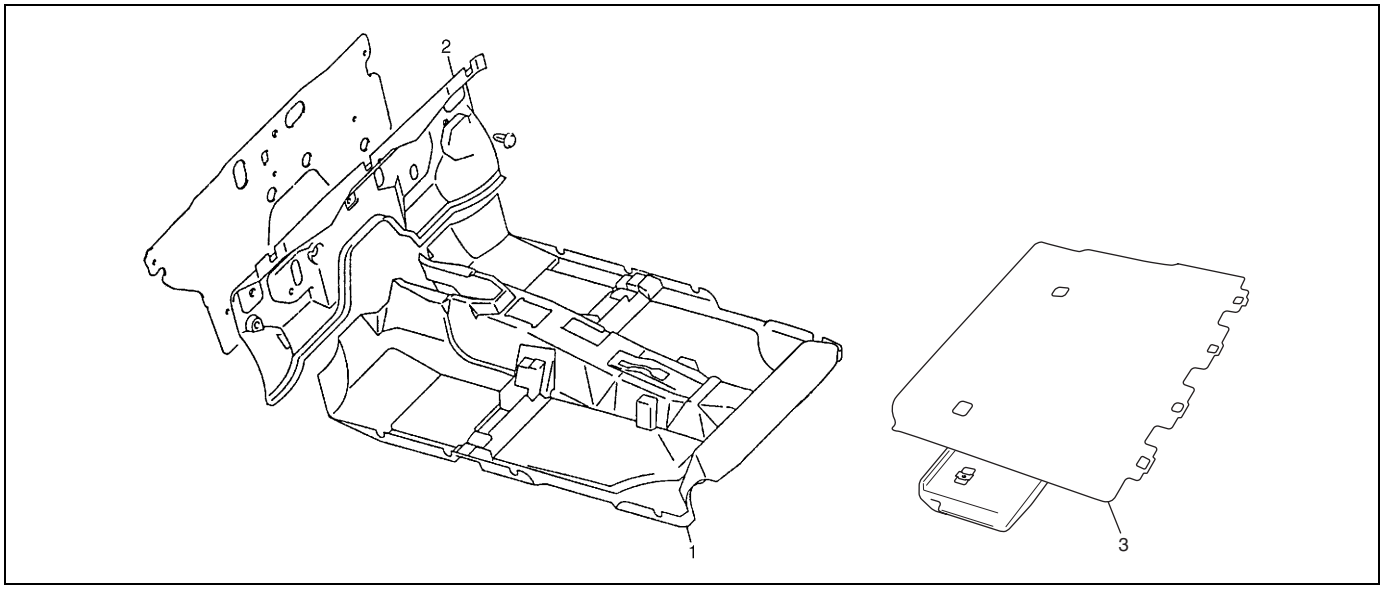

| | | |
|---|---|---|
| "a": 200 mm (7.87 in.) | 1. Side body outer | 5. Side body outer |
| "b": 100 mm (3.94 in.) | 2. Side sill inner | 6. Rear wheel housing |
| "A": Apply rust proof wax (hot wax 50 µm or more) | 3. Frame | 7. Center floor |
| "B": Apply rust proof wax (high viscosity wax 50 µm or more) | 4. Main floor | |




| | | | |
|---|---|---|---|
| "a": 30 mm (1.18 in.) | 1. Main floor | 5. Dash panel | 9. Side sill inner |
| "b": 100 mm (3.94 in.) | 2. Front fender | 6. Extension floor | 10. Side sill outer |
| "A": Apply undercoating (PVC, 400 µm or more) | 3. Front wheel housing | 7. Center floor | |
| "B": Add undercoating (PCV) to cover edges and mating parts | 4. Frame | 8. Rear floor | |

# Exterior and Interior Trim

## Floor Carpet

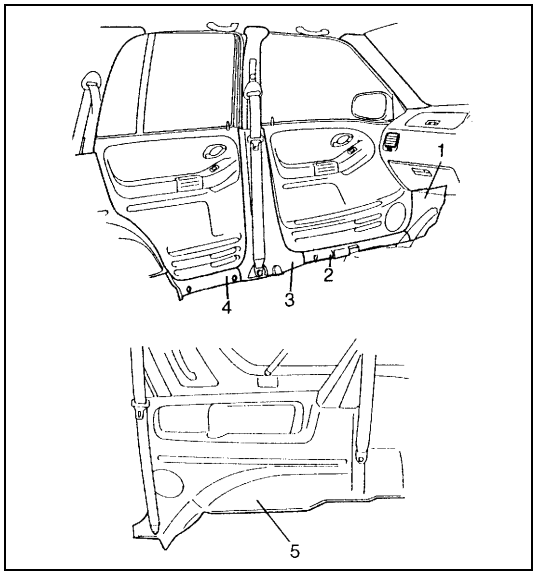



| | | |
|---|---|---|
| 1. Front floor carpet | 2. Dash panel insulation | 3. Rear floor carpet |

### Front floor carpet

#### Removal

1) Remove front and second seats.
2) Remove third seat cushion (if equipped).
3) Remove front and second seat belt lower anchor bolts.




4) Remove dash side trims (1), front side sill scuffs (2), center pillar inner lower trims (3), rear side sill scuffs (4) and rear quarter lower trims (5).
5) Remove parking brake lever cover, console box and console box front extension.
6) Remove front floor carpet.

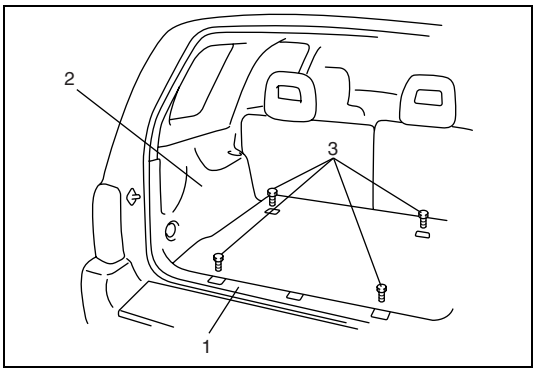
### Installation

Reverse removal sequence to install front floor carpet noting the following point.

- Tighten seat belt anchor bolts as specified torque referring to “Front Seat Belt” and “Second Rear Seat Belt” in Section 10A.

## Rear floor carpet (without third seat vehicle)

### Removal



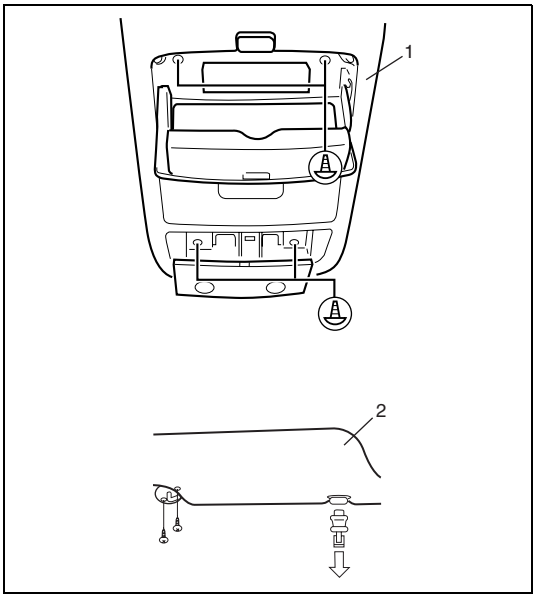

1) Remove rear luggage mat end garnish (1), rear side sill scuff and rear quarter lower trims (2).
2) Remove luggage hook plate nut (3).
3) Remove rear floor carpet.

### Installation

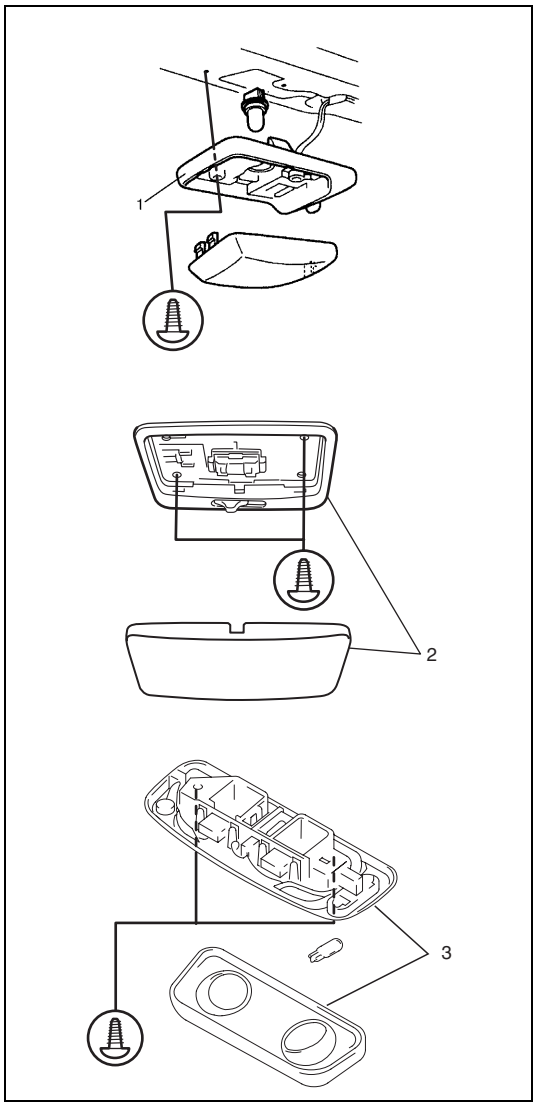
Reverse removal procedure for installation.

# Head Lining

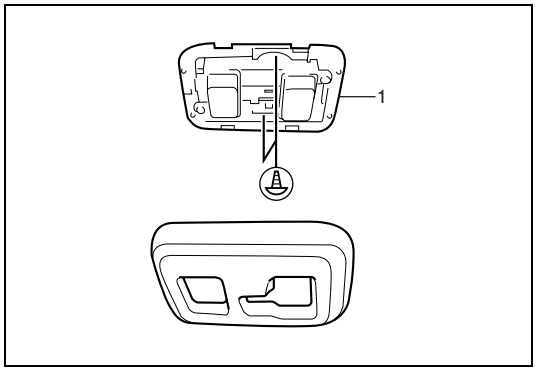
### Removal



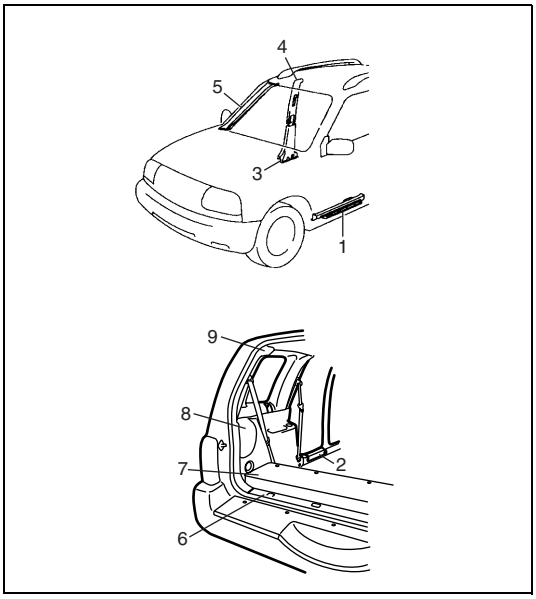

1) Remove overhead console (1) (if equipped) and sunvisor (2).



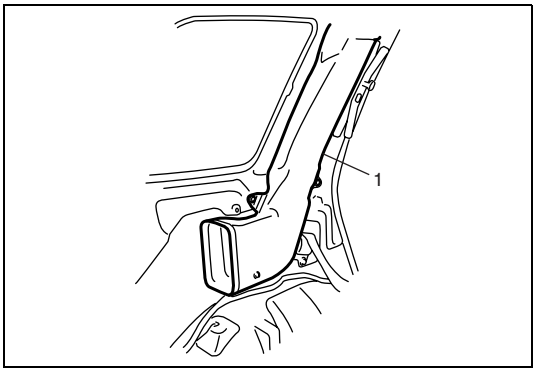

2) Remove room lamp (2), luggage lamp (1) and spot lamp (3) (if equipped).



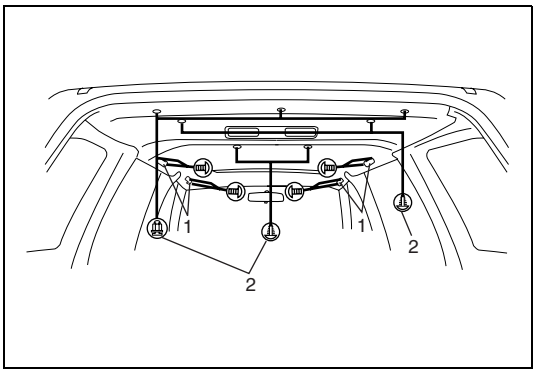

3) Remove sliding roof switch (1) and sliding roof trim (if equipped).



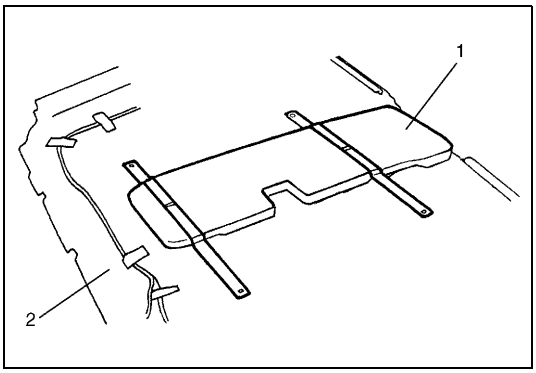

4) Remove front side sill scuffs (1), rear side sill scuffs (2), center pillar lower trims (3), center pillar upper trim (4), front pillar upper trims (5), rear luggage mat end garnish (6), rear luggage box (7), rear quarter lower trims (8) and rear quarter upper trims (9).




5) Remove rear A/C No.1 duct (1) and rear blower motor switch.



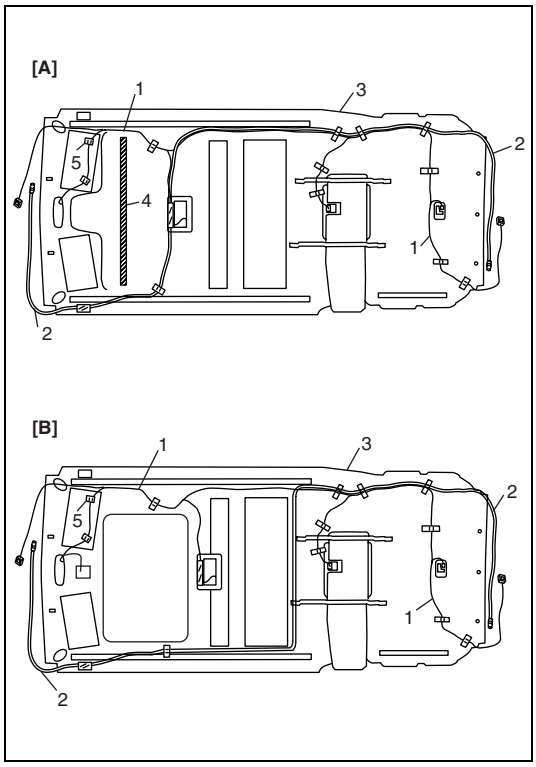

6) Remove assistant grips (1).
7) Disconnect rear washer hose and roof harness.
8) Remove head lining clips (2) and head lining.




**CAUTION:**
**Do not remove rear A/C No.2 duct (1) from head lining (2). If perform this prohibited service, head lining (2) will be broken.**

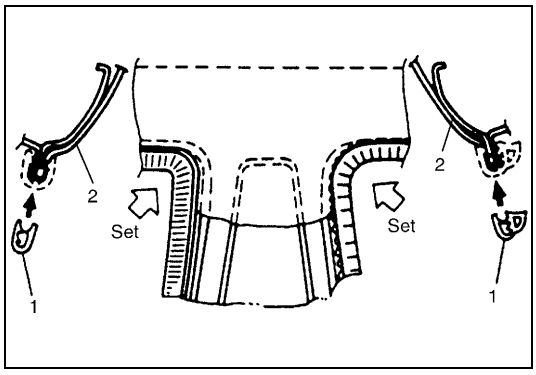
## Installation

Reverse removal procedure to install head lining noting the following instructions.




- Set roof harness (1) and rear washer hose (2) to head lining (3) with adhesive tape (5) as shown.
- For without sunroof model, apply double coated tape (4) to head lining as shown.

| | |
|---|---|
| [A]: | without sunroof |
| [B]: | with sunroof |




- Tighten seat belt anchor bolt as specified torque referring to “Front Seat Belt”, “Second Rear Seat Belt” and “Third Rear Seat Belt (If Equipped)” in Section 10A.
- Install door opening trim (1) as shown.

| | |
|---|---|
| 2. | Head lining |

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Second seat mounting bolt | 35 | 3.5 | 25.5 |
| Third seat mounting bolt | 35 | 3.5 | 25.5 |

# SECTION 10

# RESTRAINT SYSTEM

**WARNING:**

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

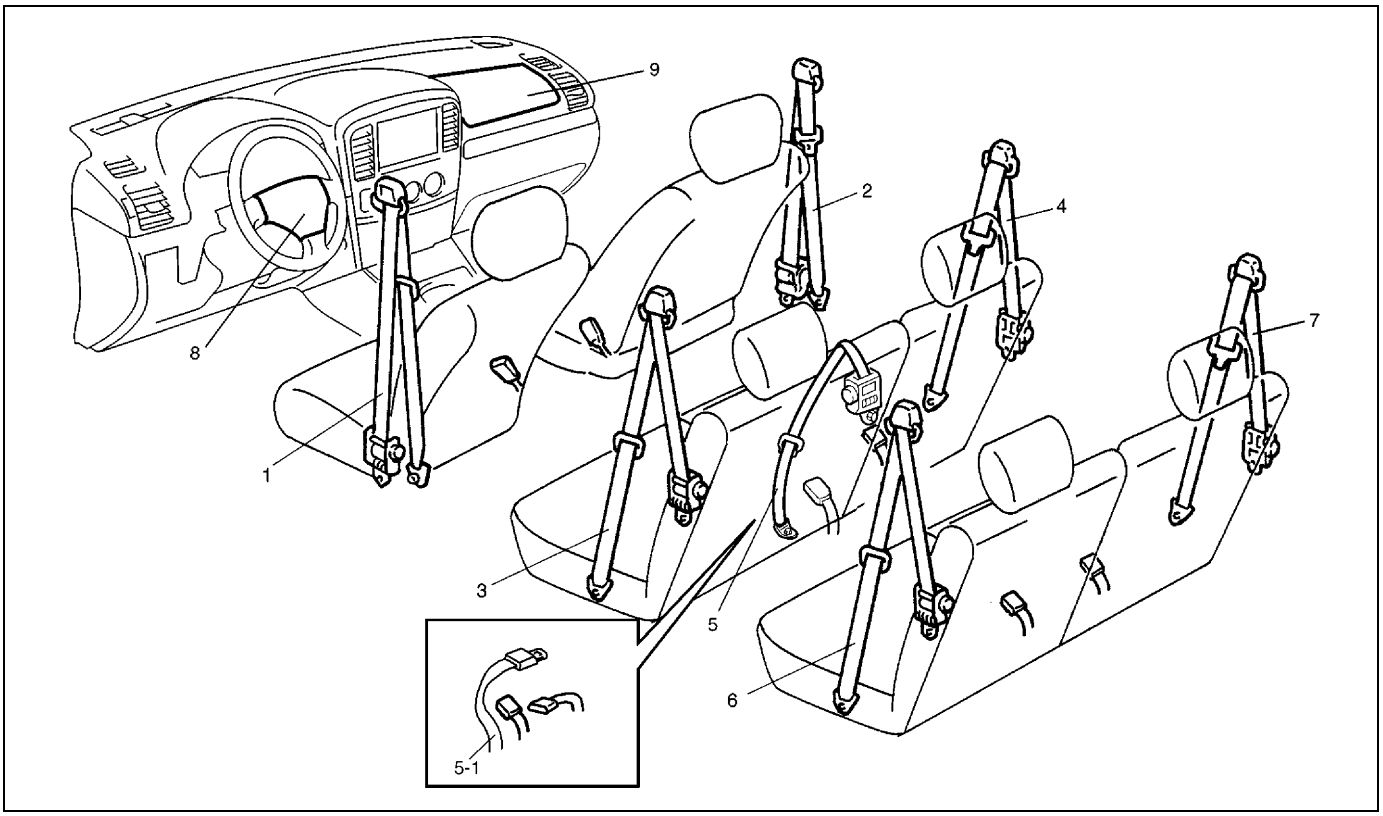
- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to "Air Bag System Components and Wiring Location View" under "General Description" in air bag system section in order to confirm whether you are performing service on or near 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.**
- **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).**

**Seat Belt ..... Section 10A**
**Air Bag System ..... Section 10B**

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# General Description




| | | | | | |
|---|---|---|---|---|---|
| 1. | Driver side seat belt with ELR and pretensioner (if equipped) | 5. | Second rear seat belt (center) with A-ELR | 8. | Driver side air bag |
| 2. | Front passenger side seat belt with ELR and pretensioner (if equipped) | 5-1. | Second rear seat belt (center) without ELR and A-ELR | 9. | Passenger side air bag |
| 3. | Second rear seat belt (LH) with A-ELR | 6. | Third rear seat belt (LH) with A-ELR (if equipped) | | |
| 4. | Second rear seat belt (RH) with A-ELR | 7. | Third rear seat belt (RH) with A-ELR (if equipped) | | |

### 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, and 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 Pretensioner (If equipped)

The seat belt with ELR and a pretensioner has a pretensioner mechanism which operates in linkage with the air bag in addition to the above described ELR. The pretensioner takes up the sag of the seat belt in occurrence of a front collision with an impact larger than a certain set value, thereby enhancing restraint performance.

### Driver and Front Passenger Side Air Bags

The driver and front passenger side air bags are components of the air bag system. In occurrence of a front collision with an impact larger than a certain set value, they are activated by the ignition signal from SDM to supplement protection offered by the driver and front passenger seat belts.

- the driver air bag (inflator) module is deployed from the center of the steering column
- the passenger air bag (inflator) module from the top of the instrument panel in front of the front passenger seat

# SECTION 10A

# SEAT BELT

**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.**
- **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).**

**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 above procedures are not followed, parts or system damage could result.**

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**Tightening Torque Specification.....10A-8**

# On-Vehicle Service

## Service Precautions

### Service and diagnosis

**WARNING:**

**If replacing seat belt is necessary, replace buckle and ELR (or webbing) 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 ELR (or webbing) in a set part.**

Before servicing or replacing seat belts, refer to 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, latch plate and ELR.
- Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
- When installing a seat belt anchor bolt, start bolt by hand to prevent cross-threading.
- Use only the correct seat belt anchor bolts and screws and tighten to the correct torque value.
- 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.

#### For Seat Belt with Pretensioner

Refer to “Service and Diagnosis” of “Service Precautions” in Section 10B.

**WARNING:**

**When performing service on or around air bag system components or air bag system wiring, disable the air bag system referring to “Disabling Air Bag System” in Section 10B.**
**Failure to follow procedures could result in possible air bag activation, personal injury or unneeded air bag system repairs.**

### Disabling air bag system

Refer to “Disabling Air Bag System” in Section 10B.

### Enabling air bag system

Refer to “Enabling Air Bag System” in Section 10B.

### Handling and storage

Refer to “Handling and Storage” in Section 10B.

### Disposal

Refer to “Disposal” in Section 10B.

# Front Seat Belt

## Inspection on Vehicle

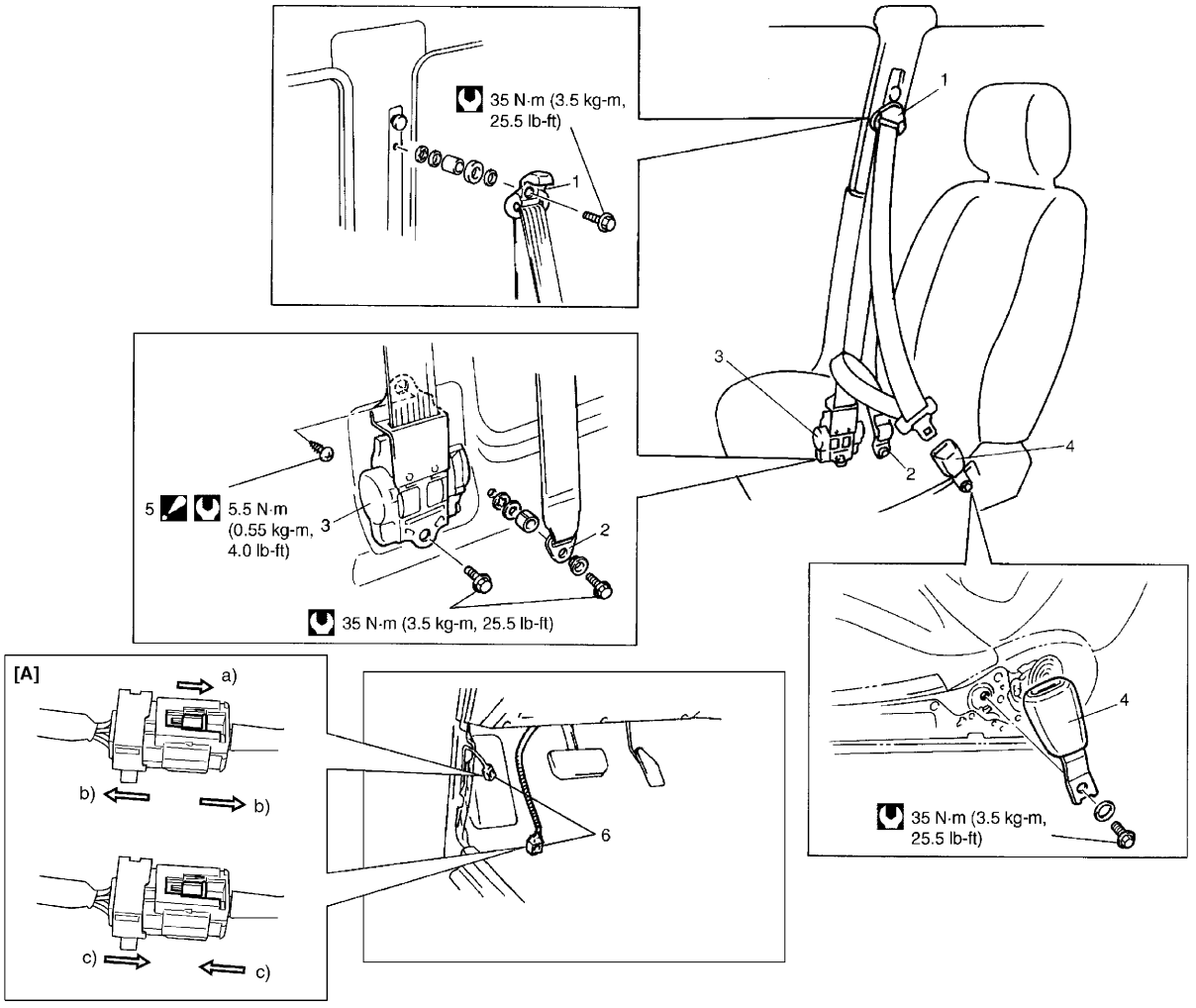
### Seat belts with ALR

As to seat belts with ALR (other than driver side seat belt), check them as follows in addition to above check.

- 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.

**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 "Service Precautions", before starting to work and observe every precaution during work. Neglecting them may result in personal injury or unactivation of the seat belt pretensioner, if necessary.**

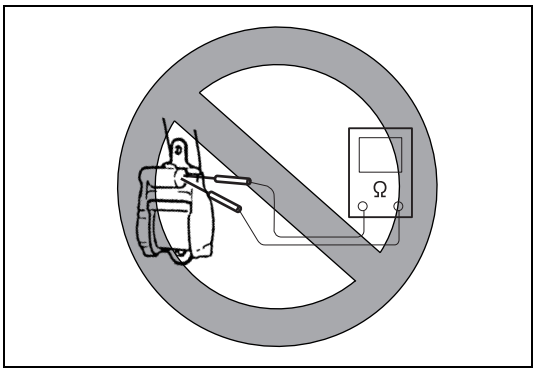



| | | | |
|---|---|---|---|
| 1. Upper anchor | 4. Buckle | Tightening Torque | a): Slide lock slider to release locking |
| 2. Lower anchor | 5. Retractor assembly upper mounting bolt : After tightening lower bolt, tightening upper bolt | [A] Removal | b): After unlocked, disconnect connector |
| 3. Retractor assembly | 6. Yellow connector for seat belt pretensioner (if equipped) | [B] Installation | c): Push connector till click is heard from it. |

### Removal

1) Disconnect negative cable at battery if equipped with pretensioner.
2) Disable air bag system if equipped with pretensioner referring to “Disabling Air Bag System” in Section 10B.
3) Remove lower anchor bolt.
4) Remove front pillar lower trim.
5) Disconnect Yellow connector for seat belt pretensioner (if equipped).
6) Remove front seat belts from the vehicle.

### Inspection




**WARNING:**

**Never measure resistance of pretensioner or disassemble it. Otherwise, personal injury may result.**

**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.
- Fully extend the seat belt to make sure there are no twists or tears in it.

#### Retractor assembly

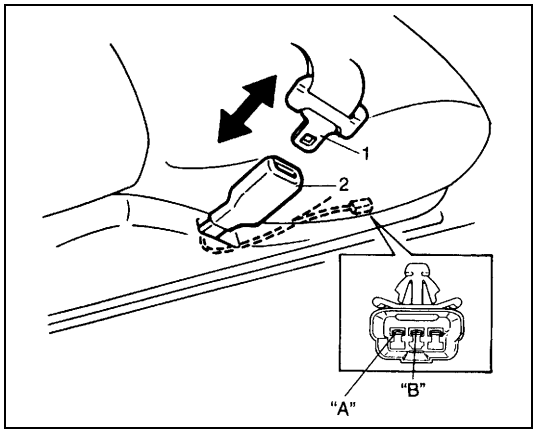
1) Let the seat belt retract fully to confirm its easy retraction.
   - The retractor assembly should lock webbing when pulled quickly.
   - The retractor assembly should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
2) Check retractor assembly with 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).
   - Wire harness or connector is damage.
   - Seat belt pretensioner (retractor assembly) is damaged or a strong impact (e.g., dropping) was applied to it.

#### Anchor bolt

- Inspect all seat belt anchor bolts to verify that they are secure.
- All anchor bolts should be secure and torqued to specification.

#### Belt latch

- Belt latch should be secure when latched.
- Inspect the seat belt buckle, ensuring that it locks and unlocks easily.
- After buckling the seat belt, tug sharply on the belt, checking that the buckle remains locked.




### Seat belt buckle switch

Check driver side seat belt buckle switch for continuity by using ohmmeter.

**Seat belt buckle 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 (∞Ω)**

| |
|---|
| 1. Buckle tongue |
| 2. Buckle catch |

### Installation

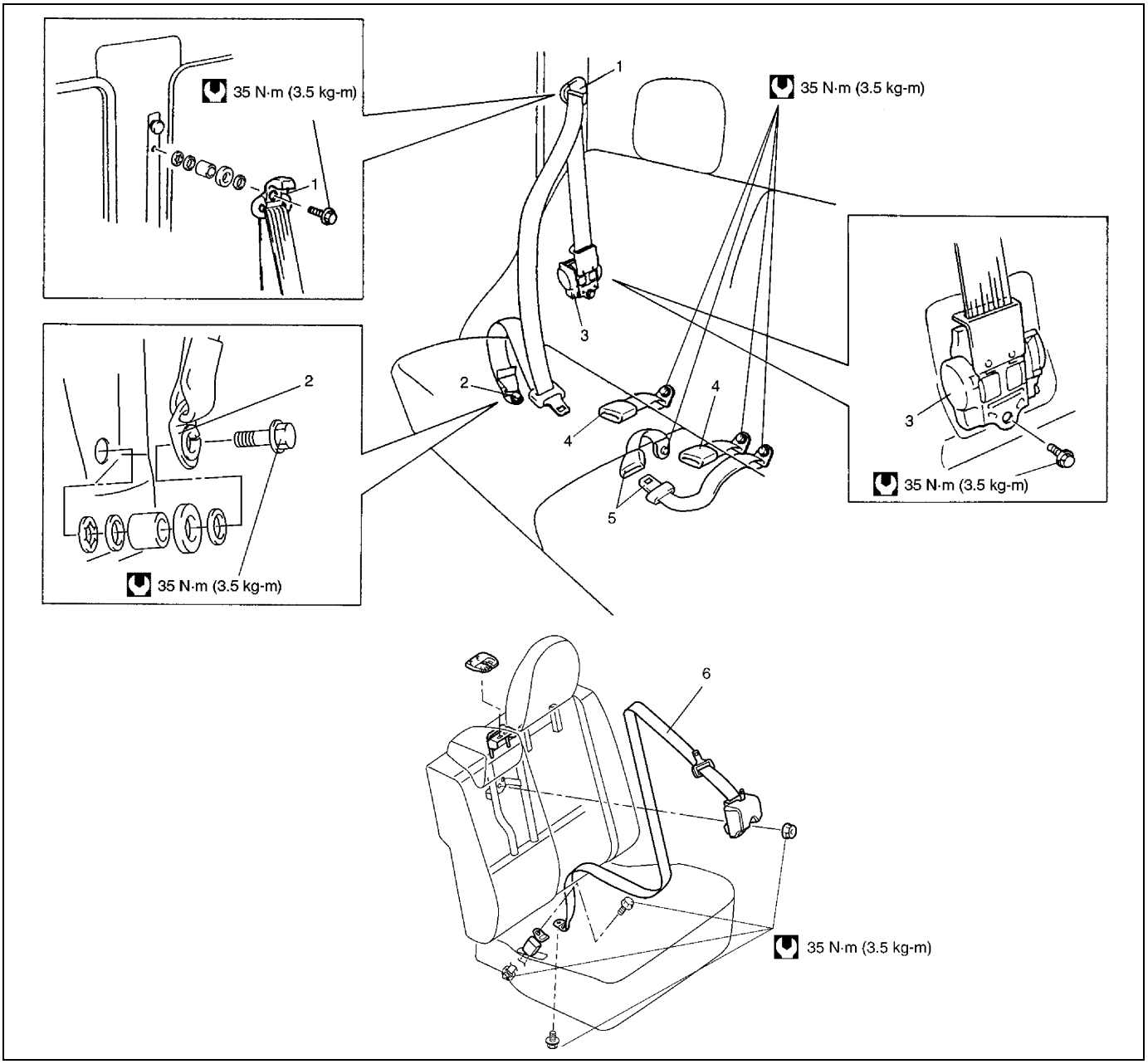
Install in reverse order of removal, noting the followings.

- 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 for seat belt pretensioner securely if equipped.
- Enable air bag system if equipped with pretensioner referring to "Enabling Air Bag System" in Section 10B.

# Second Rear Seat Belt

**WARNING:**

**Be sure to read "Service Precautions" in this section before starting to work and observe every precaution during work.**




| | | | | |
|---|---|---|---|---|
| 1. Upper anchor | 3. Retractor assembly | 5. | Second rear seat belt (center) without ELR and A-ELR | Tightening Torque |
| 2. Lower anchor | 4. Buckle | 6. | Second rear seat belt (center) with A-ELR | |

### Removal

Refer to the figure above to remove rear seat belts.

### Inspection

Check second rear seat belt in the same way as when inspecting front seat belt except pretesioner inspection. (Refer to "Front Seat Belt" in this section.)

### Installation

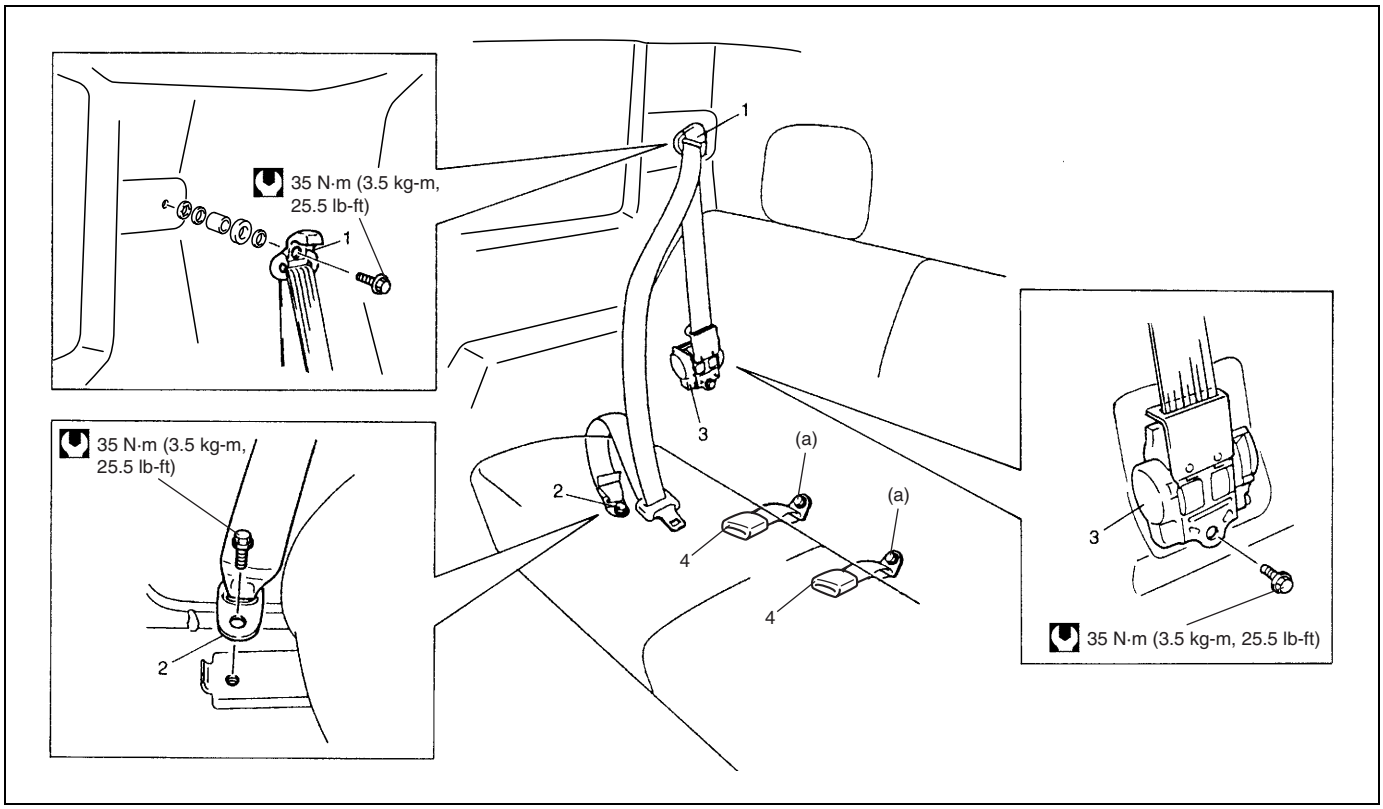
Install in reverse order of removal, noting the followings.

- 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.

## Third Rear Seat Belt (If Equipped)

**WARNING:**

**Be sure to read "Service Precautions" in this section before starting to work and observe every precaution during work.**




| | | |
|---|---|---|
| 1. Upper anchor | 3. Retractor assembly | Tightening Torque |
| 2. Lower anchor | 4. Buckle | |

### Removal

Refer to the figure above to remove rear seat belts.

### Inspection

Check third rear seat belt in the same way as when inspecting second rear seat belt. (Refer to "Second Rear Seat Belt" in this section.)

### Installation

Install in reverse order of removal, noting the followings.

- 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.

# Tightening Torque Specification

| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| Upper and lower anchor bolt | 35 | 3.5 | 25.5 |
| Retractor assembly bolt | 35 | 3.5 | 25.5 |
| Retractor assembly screw | 5.5 | 0.55 | 4.0 |
| Buckle bolt | 35 | 3.5 | 25.5 |

# SECTION 10B

# AIR BAG SYSTEM

**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 and "Service Precautions" under "On-Vehicle Service" in this section 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 this section must be followed in the order listed to disable the air bag system temporarily and prevent false diagnostic trouble codes 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.**

**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 above conditions are not followed, parts or system damage could result.**

**NOTE:**

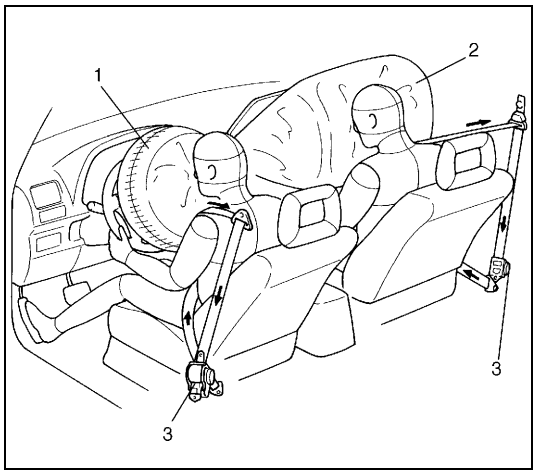
**Service information for three types of engine model, H27 engine model (TYPE A), H27 engine model (TYPE B), and RHW engine model, is provided in this section. To distinguish between TYPE A and TYPE B, refer to the foreword of this service manual.**

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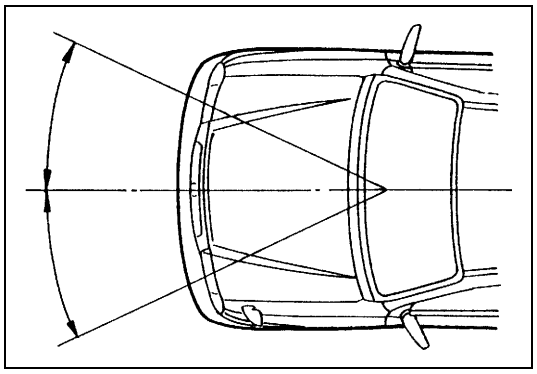
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**Tightening Torque Specification ..... 10B-90**
**Required Service Material ..... 10B-90**
**Special Tool ..... 10B-90**

# General Description



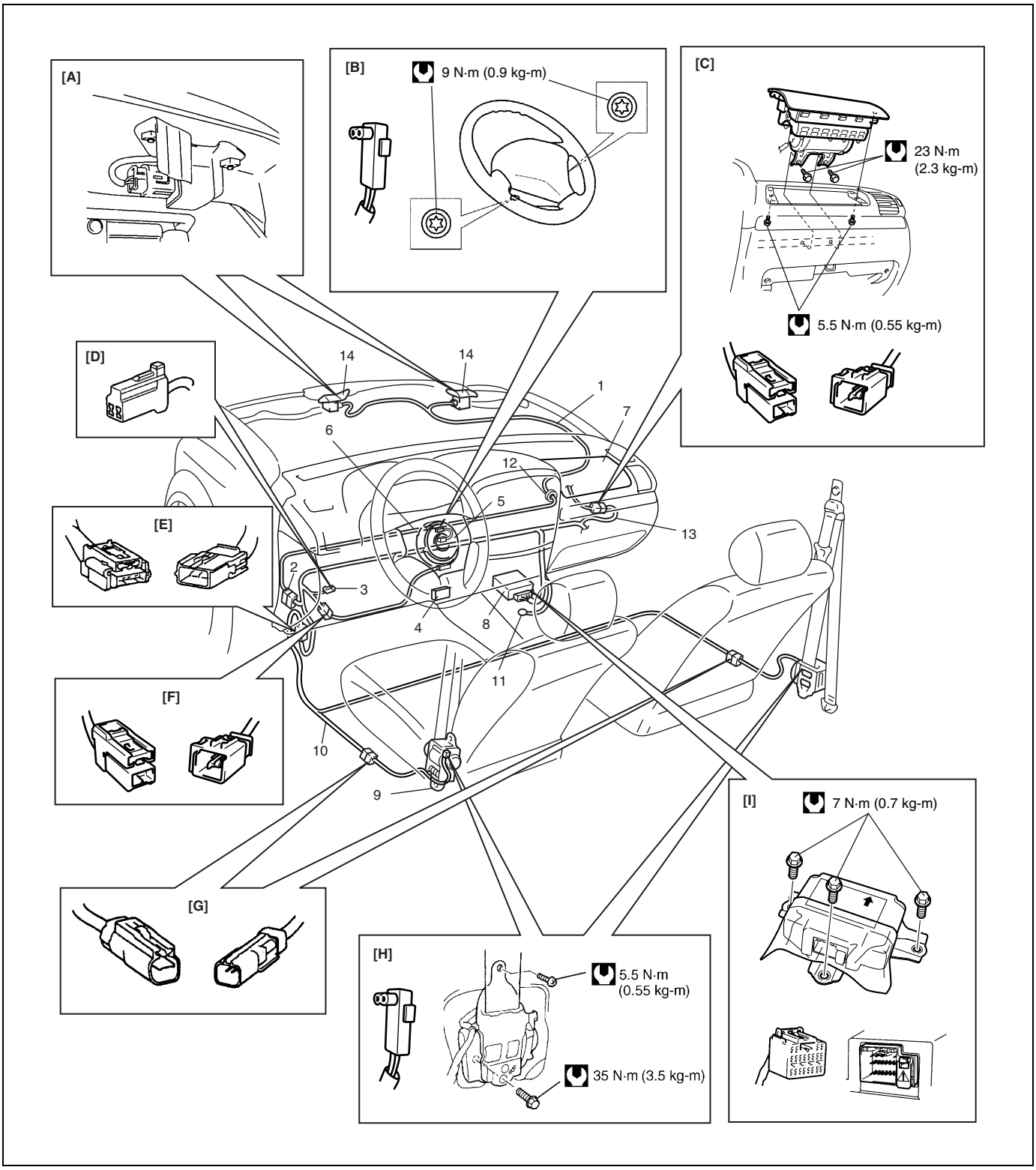

With the air bag system which includes air bags for both the driver's and passenger's sides as well as the seat belt pretensioners (3) (if equipped), the sag of the seat belt is taken up (for seat belt with pretensioner), the driver air bag (1) (inflator) module is deployed from the center of the steering column and the passenger air bag (2) (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.



The air bag system is designed to activate only in severe frontal collisions. It is not designed to activate in rear impacts, side impacts, rollovers, or minor frontal collisions, since it would offer no protection in those types of accidents.

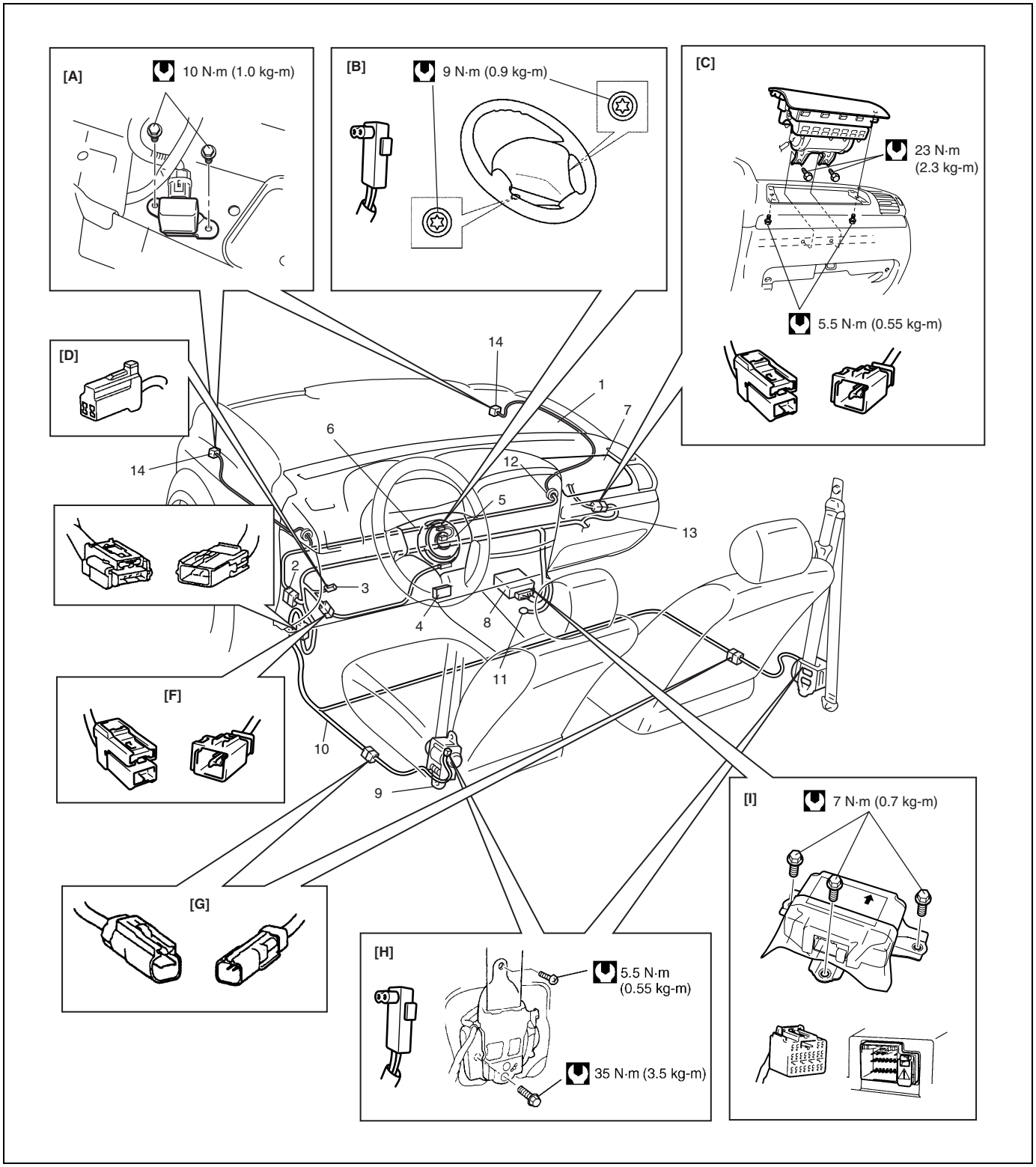
# System Components and Wiring Location View and Connectors

## Type A



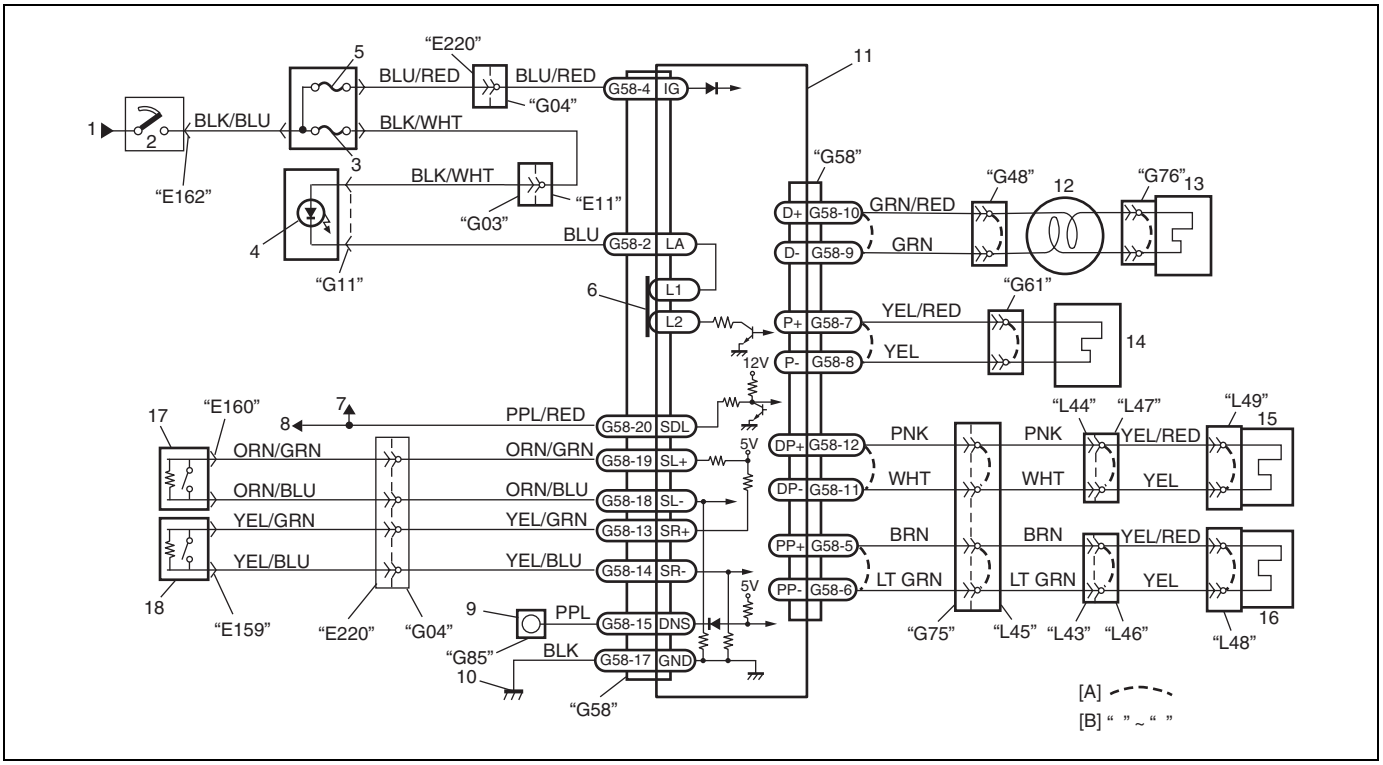

| | | |
|---|---|---|
| [A]: Connector “E160”, “E159” | [I]: Connector “G58” | 8. SDM |
| [B]: Connector “G76” | 1. Air bag harness in main harness | 9. Seat belt pretensioner (retractor assembly) (if equipped) |
| [C]: Connector “G61” | 2. Connector “G04”, “E220” | 10. Air bag harness in floor harness |
| [D]: Connector “G85” | 3. “AIR BAG” monitor coupler | 11. Ground for air bag system |
| [E]: Connector “G75”, “L45” | 4. DLC | 12. Grommet |
| [F]: Connector “G48” | 5. Contact coil assembly | 13. Air bag harness in instrument panel harness |
| [G]: Connector “L47”, “L44”, “L46”, “L43” | 6. Driver air bag (inflator) module | 14. Forward sensor |
| [H]: Connector “L49”, “L48” | 7. Passenger air bag (inflator) module | |

## Type B and RHW engine model



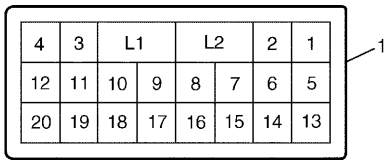

| | | |
|---|---|---|
| [A]: Connector “E160”, “E159” | [I]: Connector “G58” | 8. SDM |
| [B]: Connector “G76” | 1. Air bag harness in main harness | 9. Seat belt pretensioner (retractor assembly) (if equipped) |
| [C]: Connector “G61” | 2. Connector “G04”, “E220” | 10. Air bag harness in floor harness |
| [D]: Connector “G85” | 3. “AIR BAG” monitor coupler | 11. Ground for air bag system |
| [E]: Connector “G75”, “L45” | 4. DLC | 12. Grommet |
| [F]: Connector “G48” | 5. Contact coil assembly | 13. Air bag harness in instrument panel harness |
| [G]: Connector “L47”, “L44”, “L46”, “L43” | 6. Driver air bag (inflator) module | 14. Forward sensor |
| [H]: Connector “L49”, “L48” | 7. Passenger air bag (inflator) module | |

# System Wiring Diagram




| | | |
|---|---|---|
| [A]: Shorting bar | 6. Connection detection pin | 13. Driver air bag (inflator) module |
| [B]: Connector | 7. To other control module | 14. Passenger air bag (inflator) module |
| 1. From main fuse | 8. To data link connector (DLC) | 15. Driver seat belt pretensioner (if equipped) |
| 2. Ignition switch | 9. "AIR BAG" monitor coupler | 16. Passenger seat belt pretensioner (if equipped) |
| 3. "METER" fuse | 10. Ground for air bag system | 17. LH Forward sensor |
| 4. "AIR BAG" warning lamp in combination meter | 11. SDM | 18. RH Forward sensor |
| 5. "AIR BAG" fuse | 12. Contact coil assembly | |

## Terminal Arrangement of SDM (Viewed from Harness Side)




1. Connector "G58" (SDM Connector)

Connector “G58” (SDM connector)

| TERMINAL | CIRCUIT | | TERMINAL | CIRCUIT | |
|---|---|---|---|---|---|
| G58-1 | – | | G58-11 | Driver pretensioner (if equipped) | Low |
| G58-2 | “AIR BAG” warning lamp | | G58-12 | | High |
| G58-3 | – | | G58-13 | RH Forward sensor | High |
| G58-4 | Ignition switch (power source) | | G58-14 | | Low |
| G58-5 | Passenger pretensioner (if equipped) | High | G58-15 | Diagnosis switch | |
| G58-6 | | Low | G58-16 | – | |
| G58-7 | Passenger air bag (inflator) module | High | G58-17 | Ground | |
| G58-8 | | Low | G58-18 | LH Forward sensor | Low |
| G58-9 | Driver air bag (inflator) module | Low | G58-19 | | High |
| G58-10 | | High | G58-20 | Data link connector (DLC) | |

# Diagnosis

**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.**

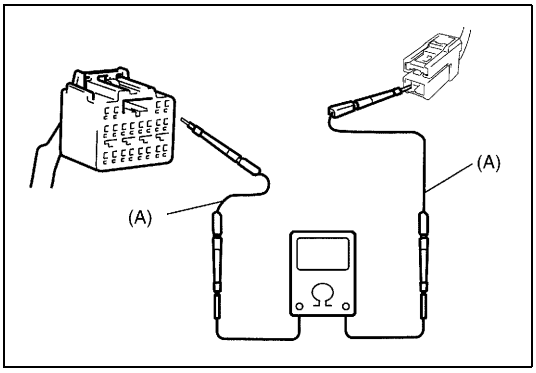
## Diagnostic Trouble Code (DTC)

The "Air Bag Diagnostic System Check" must always be the starting point of any air bag system diagnosis. "The Air Bag Diagnostic System Check" checks for proper "AIR BAG" warning lamp operation and checks for air bag diagnostic trouble codes (DTCs) using on-board diagnosis function or SUZUKI scan tool.

## Use of Special Tool

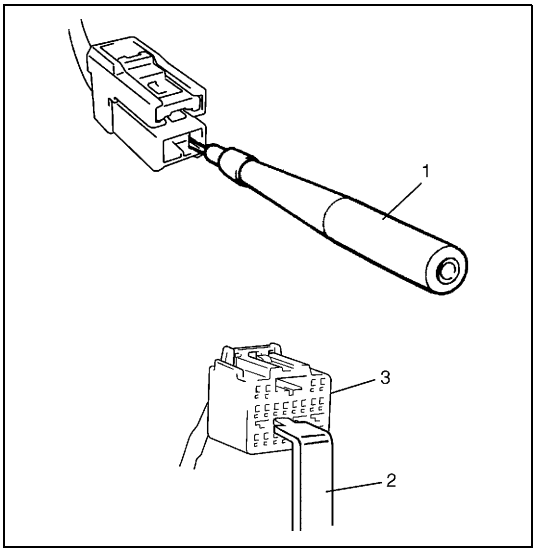
**WARNING:**
**To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester. Instructions in this manual must be followed carefully, otherwise personal injury may result.**

You should be familiar with the tools listed in this section under the heading "Special Tools". 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)**

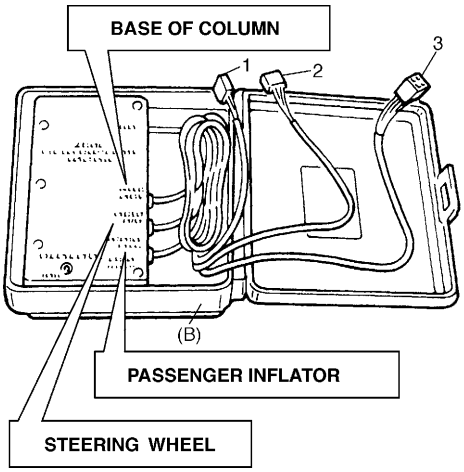
This must be used whenever a diagnostic procedure requests checking or probing a terminal.
Using the appropriate adapter in the special tool will ensure that no damage to the terminal will occur from the multimeter probe, such as spreading or bending.




The adapter (1) will also give an idea of whether 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 release the shorting bar.




**Special tool**
**(B): 09932-75010 (Air Bag Driver/Passenger Load Tool)**

This tool is used only when called for in this section. It 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 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 for passenger air bag (inflator) module.
- Each of driver and passenger seat belt pretensioners when it is connected to air bag harness connector for driver and passenger seat belt pretensioner (if equipped).

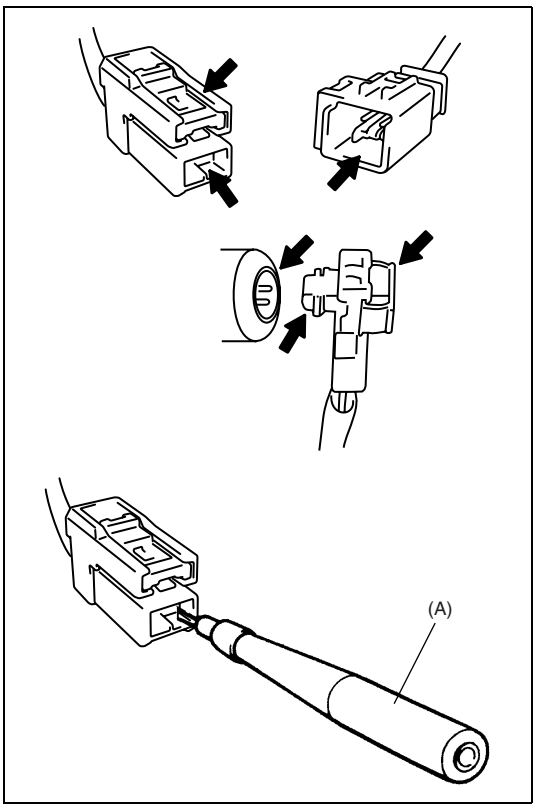
Another connector ("BASE OF COLUMN") is used to substitute the load of the driver air bag (inflator) module and the contact coil assembly when it is connected at the base of the column to the air bag wire harness.
The third connector ("PASSENGER INFLATOR") is not used.

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.

| |
|---|
| 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 and driver and passenger seat belt pretensioners |
| 3. Not used |

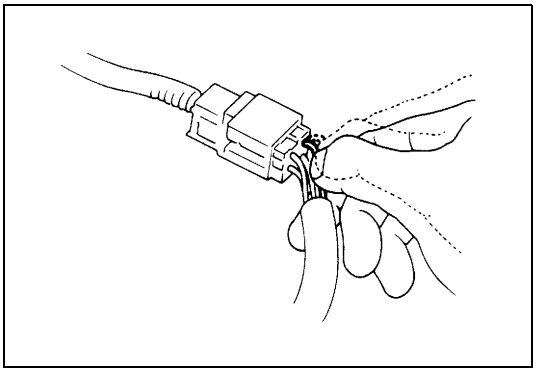
## Intermittents and Poor Connections

Most intermittents are caused by faulty electrical connections or wiring. When a check for proper connection is requested in a diagnostic flow table, perform careful check of suspect circuits for:

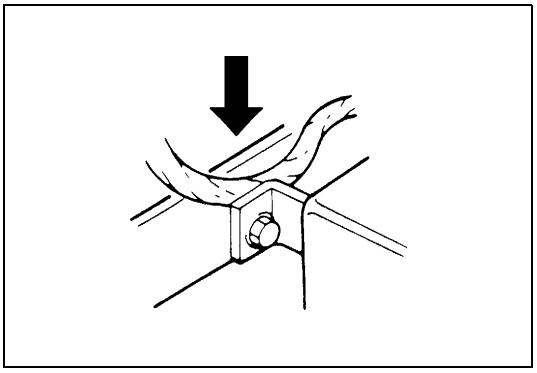



- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the 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.
- 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 it to increase contact tension or replace.

**Special tool**
**(A): 09932-76010 (Connector Test Adapter Kit)**



- 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.



- 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.

If any abnormality is found, repair or replace as a wire harness assembly.

## Air Bag Diagnostic System Check

**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 diagnostic trouble codes are diagnosed is very important. Failure to diagnose the diagnostic trouble codes in the order specified may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.**

The diagnostic procedures used in this section are designed to find and repair air bag system malfunctions. To get the best results, it is important to use the diagnostic flow tables and follow the sequence listed below.

1) Perform the “Air Bag Diagnostic System Check Flow Table” in this section.
   (The “Air Bag Diagnostic System Check Flow Table” must be the starting point of any air bag system diagnosis.
   The “Air Bag Diagnostic System Check Flow Table” checks for proper “AIR BAG” warning lamp operation through “AIR BAG” warning lamp and whether air bag diagnostic trouble codes exist.)
2) Refer to the proper diagnostic table as directed by the “Air Bag Diagnostic System Check Flow Table” in this section.
   (The “Air Bag Diagnostic System Check Flow Table” will lead you to the correct table 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 Table” after any repair or diagnostic procedures have been performed.
   (Performing the “Air Bag Diagnostic System Check Flow Table” after all repair or diagnostic procedures will ensure that the repair has been made correctly and that no other malfunctions exist.)

### Flow Table Test Description

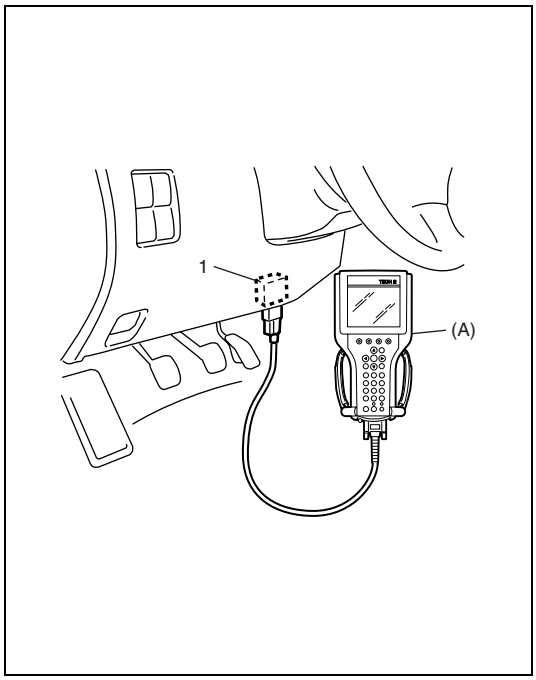
STEP 1: Check that “AIR BAG” warning lamp lights.
STEP 2: Check that “AIR BAG” warning lamp lights.
STEP 3: Check diagnosis switch circuit.
STEP 4: Check that “AIR BAG” warning lamp flashes 6 times after ignition switch is turned ON.
STEP 6: Check that history codes are in SDM memory. (using SUZUKI scan tool)
STEP 7: Check that history codes are in SDM memory. (using monitor coupler)
STEP 9: Check that current code is in SDM memory. (using SUZUKI scan tool)
STEP 10: Check that current code is in SDM memory. (using monitor coupler)

## Air Bag Diagnostic System Check Flow Table

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Make sure that battery voltage is about 11V or higher.<br>2) Note "AIR BAG" warning lamp as ignition switch is tuned ON.<br>Does "AIR BAG" warning lamp come ON when ignition switch is tuned ON? | Go to step 2. | Proceed to ""AIR BAG" Warning Lamp Does Not Come On" in this section. |
| 2 | Does "AIR BAG" warning lamp come ON steady? | Proceed to ""AIR BAG" Warning Lamp Comes On Steady" in this section. | Go to step 3. |
| 3 | Does "AIR BAG" warning lamp keep flashing (indicating DTC) when ignition switch is ON? | Proceed to ""AIR BAG" Warning Lamp Flashes" in this section. | Go to step 4. |
| 4 | Does "AIR BAG" warning lamp turn OFF, after flashing 6 times? | Go to step 5. | Go to step 8. |
| 5 | Do you have SUZUKI scan tool? | Go to step 6. | Go to step 7. |
| 6 | 1) Check DTC referring to "Using SUZUKI Scan Tool" under "DTC Check" in this section.<br>Is "NO CODES" displayed on SUZUKI scan tool? | Air bag system is in good condition. | An intermittent trouble has occurred at some place.<br>Check the connector harness, etc. related to the sensed DTC.<br>Refer to "Intermittent and Poor Connections" in this section.<br>Then clear DTC referring to "DTC Clearance" in this section, and repeat this table. |
| 7 | 1) Check DTC referring to "Not Using SUZUKI Scan Tool" under "DTC Check" in this section.<br>Is flashing pattern No.12 indicated on "AIR BAG" warning lamp? | Air bag system is in good condition. | An intermittent trouble has occurred at some place.<br>Check the connector harness, etc. related to the sensed DTC.<br>Refer to "Intermittent and Poor Connections" in this section.<br>Then clear DTC referring to "DTC Clearance" in this section, and repeat this table. |
| 8 | Do you have SUZUKI scan tool? | Go to step 9. | Go to step 10. |
| 9 | 1) Check DTC referring to "Using SUZUKI Scan Tool" under "DTC Check" in this section.<br>Is "NO CODES" displayed on SUZUKI scan tool? | Substitute a known-good SDM and recheck. | Check and repair according to corresponding DTC flow table. |
| 10 | 1) Check DTC referring to "Not Using SUZUKI Scan Tool" under "DTC Check" in this section.<br>Is flashing pattern No.12 indicated on "AIR BAG" warning lamp? | Substitute a known-good SDM and recheck. | Check and repair according to corresponding DTC flow table. |

# DTC Check

## Using SUZUKI scan tool

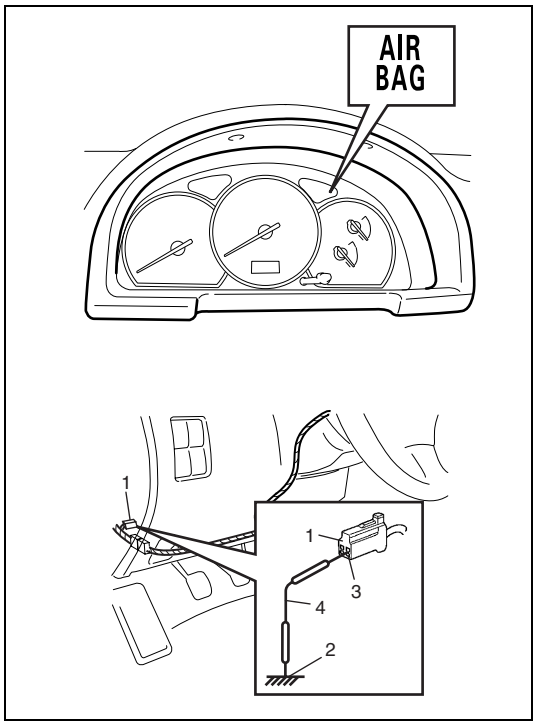



1) Turn ignition switch to OFF position.
2) After setting cartridge to SUZUKI scan tool, connect it to data link connector (DLC) located on underside of instrument panel at driver's seat side.

**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, proceed to "SDM Cannot Communicate through the Serial Data Circuit" in this section.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC) (1).

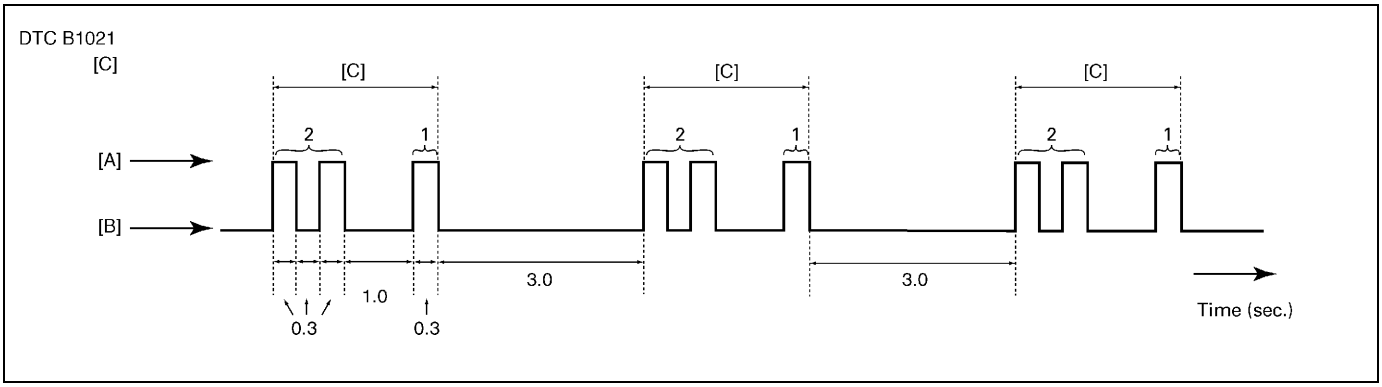
## Not using SUZUKI scan tool




1) Check that malfunction indicator lamp ("AIR BAG" warning lamp) comes ON when ignition switch is turned to ON position.
   If it does not come "ON", proceed to ""AIR BAG" Warning Lamp Does Not Come ON" in this section.
2) Using service wire (4), ground diagnosis switch terminal (3) in monitor coupler (1).
3) Read DTC from flashing pattern of malfunction indicator lamp ("AIR BAG" warning lamp). Refer to DTC TABLE in this section.
   If lamp does not indicate DTC, proceed to ""AIR BAG" Warning Lamp Cannot Indicate Flashing Pattern of DTC" in this section.
4) After completing the check, turn ignition switch to OFF position and disconnect service wire from "AIR BAG" monitor coupler.

| |
|---|
| 2. Body ground |

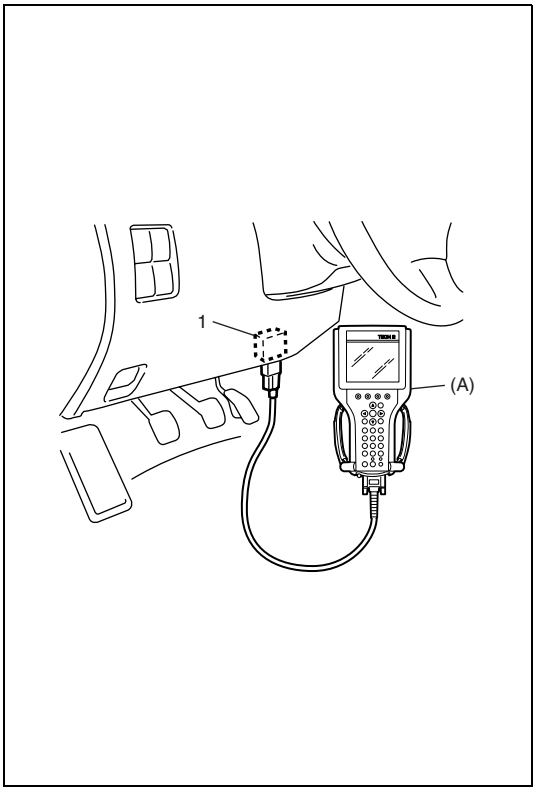
**EXAMPLE: When driver air bag initiator circuit resistance high (DTC B1021) is set**




| |
|---|
| [A]: "AIR BAG" warning lamp is turned ON |
| [B]: "AIR BAG" warning lamp is turned OFF |
| [C]: Code No.21 |

## DTC Clearance

### Using SUZUKI scan tool



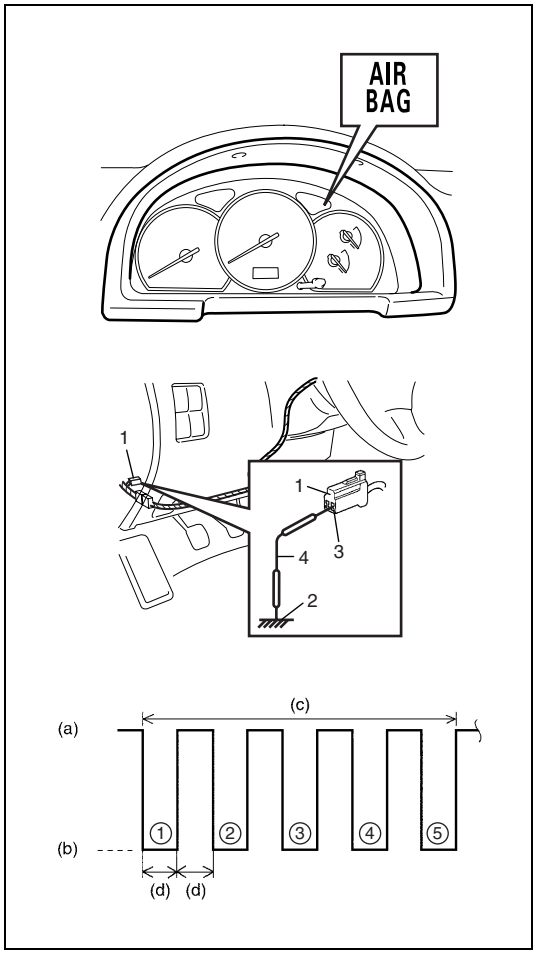

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) (1) in the same manner as when making this connection for DTC check.

**Special tool**
**(A): SUZUKI scan tool**

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 check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.
6) Perform "DTC Check" in this section, and confirm that normal DTC ("NO CODES") is displayed and not malfunction DTC.

**NOTE:**

**If DTC B1051 or DTC B1071 is stored in SDM, it is not possible to clear DTC.**




## Not using SUZUKI scan tool

1) Turn ignition switch to ON position and wait about 6 seconds or more.
2) Using service wire (4), repeat shorting and opening between diagnosis switch terminal (3) on “AIR BAG” monitor coupler (1) and body ground (2) 5 times at about 1 second intervals.
3) Perform “DTC Check” in this section, and confirm that normal DTC (DTC 12) is displayed and not malfunction DTC.

**NOTE:**

**If DTC B1051 or DTC B1071 is stored in SDM, it is not possible to clear DTC.**

| | |
|---|---|
| (a) | Open |
| (b) | Short |
| (c) | Max. 10 seconds |
| (d) | About 1 sec. |

## DTC Table

| DTC | "AIR BAG" warning lamp flashing pattern | | Diagnosis | | |
|---|---|---|---|---|---|
| | NO. | MODE | | | |
| – | 12 |  | Normal | | – |
| B1015 | 15 |  | Passenger air bag circuit | Resistance high | Diagnose trouble according to diagnostic flow table corresponding to each code No. |
| B1016 | 16 |  | | Resistance low | |
| B1018 | 18 |  | | Short to ground | |
| B1019 | 19 |  | | Short to power circuit | |
| B1021 | 21 |  | Driver air bag circuit | Resistance high | |
| B1022 | 22 |  | | Resistance low | |
| B1024 | 24 |  | | Short to ground | |
| B1025 | 25 |  | | Short to power circuit | |
| B1031 | 31 |  | Power source voltage | Too high | |
| B1032 | 32 |  | | Too low | |
| B1035 | 35 |  | RH Forward sensor circuit | Open or short to ground | |
| B1036 | 36 |  | | Short between two wires or short to power circuit | |
| B1037 | 37 |  | LH Forward sensor circuit | Open or short to ground | |
| B1038 | 38 |  | | Short between two wires or short to power circuit | |

| DTC | "AIR BAG" warning lamp flashing pattern | | Diagnosis | | |
|---|---|---|---|---|---|
| | NO. | MODE | | | |
| B1041 | 41 |  | Driver pretensioner circuit | Resistance high | Diagnose trouble according to diagnostic flow table corresponding to each code No. |
| B1042 | 42 |  | | Resistance low | |
| B1043 | 43 |  | | Short to ground | |
| B1044 | 44 |  | | Short to power circuit | |
| B1045 | 45 |  | Passenger pretensioner circuit | Resistance high | |
| B1046 | 46 |  | | Resistance low | |
| B1047 | 47 |  | | Short to ground | |
| B1048 | 48 |  | | Short to power circuit | |
| B1051 | 51 |  | SDM | Frontal crash detected | |
| B1061 | 61 |  | | "AIR BAG" warning lamp circuit failure | |
| B1071 | 71 |  | | Internal fault | |
| B1013 | 13 |  | | Specifications different between air bag system and SDM | |

**NOTE:**

- **When 2 or more codes are indicated, the lowest numbered code will appear first.**
- **Current DTC and history DTC can be identified by lighting and flashing of "AIR BAG" warning lamp as follows. However, if a multiple number of DTC's are set or even one of them is a current DTC, "AIR BAG" warning lamp remains on after ignition switch is turned ON. Therefore, it is not possible to identify any of them as to whether it is a current one or a history one. (But use of SUZUKI scan tool will make identification possible.)**

| | **Current DTC is set. (Abnormality exists at present.)** | **History DTC is set only. (Faulty condition occurred once in the past but normal condition is restored at present.)** |
|---|---|---|
| **"AIR BAG" warning lamp after ignition switch ON** | **Flashing 6 times and turns on.** | **Flashing 6 times and turns off.** |
| **"AIR BAG" warning lamp when grounding diagnosis switch** | **Current DTC is displayed.** | **History DTC is displayed.** |

## Scan Tool Data

As the data values given below are standard values estimated on basis of obatained from the normally operating vehicle by using a scan tool, use them as reference value. Even when the system 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 in the table that can be checked by scan tool re those output from SDM as commands and there may be cases where the air bag or pretensioner is not operating as indicated by the scan tool.

**NOTE:**

**When checking the data with the engine running at idle or racing, be sure to shift M/T 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, all electric loads, P/S and all the other necessary switches.**

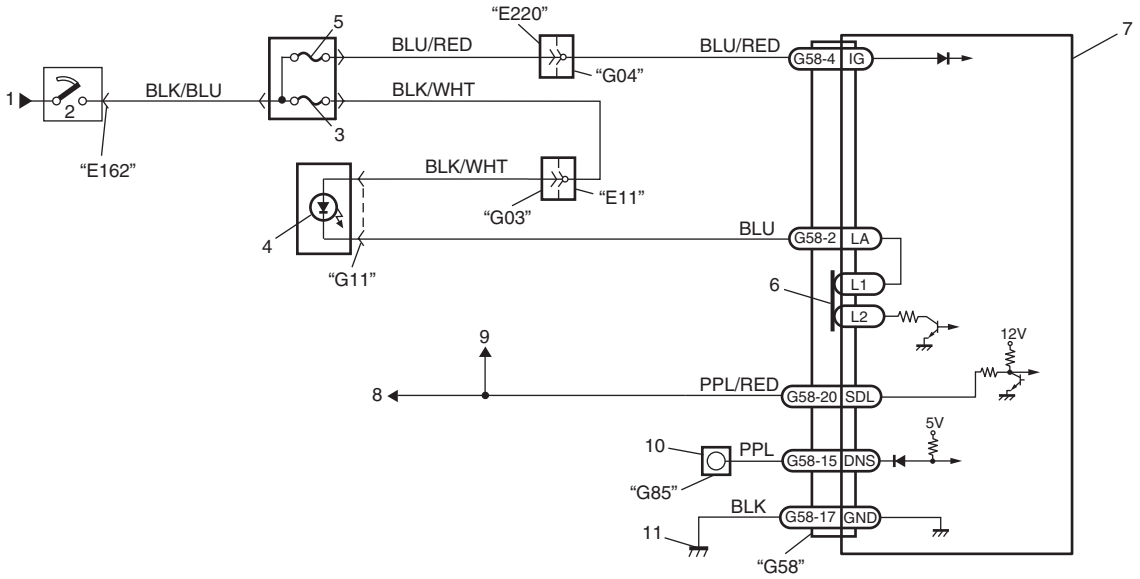
| Scan Tool Data | Normal Condition/Reference Value |
|---|---|
| Driv Air Bag Ini Res | 0.8 – 4.8 OHMS |
| Pass Air Bag Ini Res | 0.2 – 4.2 OHMS |
| Driv Preten Ini Res | 4 ch model: 0.2 – 4.2 OHMS<br>2 ch model: 7.7 OHMS |
| Pass Preten Ini Res | 4 ch model: 0.2 – 4.2 OHMS<br>2 ch model: 7.7 OHMS |
| Back Up Volt | 13.3 – 15.9 V |
| Battery Voltage | 10 – 14 V |
| System ID | 4 ch or 2 ch |

## Scan Tool Data Definition

Driv Air Bag Ini Res (OHMS (Ω)): This parameter indicates the resistance of the driver's air bag initiator circuit.
Pass Air Bag Ini Res (OHMS (Ω)): This parameter indicates the resistance of the passenger's air bag initiator circuit.
Driv Preten Ini Res (OHMS (Ω)): This parameter indicates the resistance of the driver's seatbelt pretensioner initiator circuit.
Pass Preten Ini Res (OHMS (Ω)): This parameter indicates the resistance of the passenger's seatbelt pretensioner initiator circuit.
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 that ignites the inflator is shut off.
Battery voltage (V): Battery voltage is an analog input signal read by the SDM.
System ID (2 ch/4 ch): This parameter indicates the number of initiator circuits.

# "AIR BAG" Warning Lamp Circuit Trouble Diagnosis Table

## Wiring Diagram




| | | |
|---|---|---|
| 1. From main fuse | 5. "AIR BAG" fuse | 9. To ECM (PCM) and ABS control module (if equipped) |
| 2. Ignition switch | 6. Connection detection pin | 10. "AIR BAG" monitor coupler |
| 3. "METER" fuse | 7. SDM | 11. Ground for air bag system |
| 4. "AIR BAG" warning lamp in combination meter | 8. To DLC | |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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.**

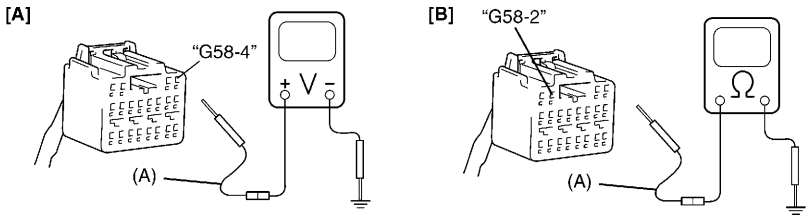
## "AIR BAG" warning lamp comes on steady

### Table Test Description

STEP 1: Check for "AIR BAG" fuse blown.
STEP 2: Check for loose connection between main wire harness and instrument panel wire harness.
STEP 3: Check for loose connection between SDM connector and SDM.
STEP 4: Check for power supply circuit.
STEP 5: Check for short circuit between "AIR BAG" warning lamp circuit and ground.

### Diagnostic Flow Table

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Ignition switch OFF.<br>2) Remove and inspect "AIR BAG" fuse.<br>Is fuse good? | Go to Step 2. | "BLU/RED" wire short to ground.<br>After repair, replace "AIR BAG" fuse. |
| 2 | 1) Check for loose connection between "E220" and "G04" connectors.<br>Is connection good? | Go to Step 3. | Clear up loose connection between "E220" and "G04" connectors. |
| 3 | 1) Check for loose connection between SDM connector "G58" and SDM.<br>Is connection good? | Go to Step 4. | Clear up loose connection between SDM connector "G58" and SDM. |
| 4 | 1) Disconnect SDM connector "G58".<br>2) Check proper connection to SDM at terminal "G58-4".<br>3) If OK then check voltage between "G58-4" terminal of SDM connector and body ground with ignition switch ON.<br>Is it 8 V or more? | Go to Step 5. | "BLU/RED" wire (between "AIR BAG" fuse and SDM connector) open "BLK/BLU" wire (between ignition switch and "AIR BAG" fuse) open or short to ground. |
| 5 | 1) Disconnect 20-pin connector "G11" from combination meter referring to.<br>2) Check resistance between "G58-2" terminal of SDM connector and body ground.<br>Is resistance 1 MΩ or more? | Substitute a known-good SDM and recheck. | "BLU" wire (between combination meter and SDM connector) short to ground. |




| |
|---|
| [A]: Fig. for Step 4 |
| [B]: Fig. for Step 5 |

**Special tool**
**(A): 09932-76010**

**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

## "AIR BAG" warning lamp does not come on

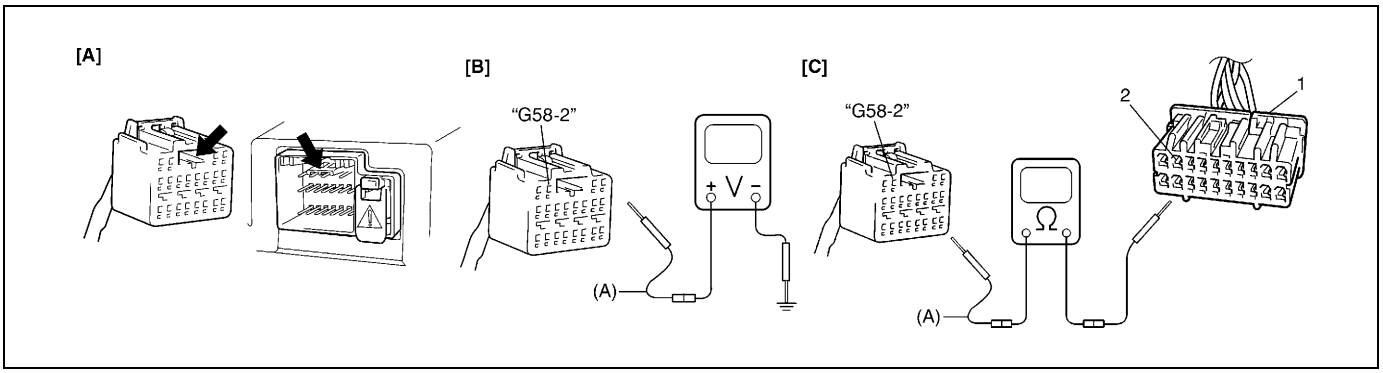
### Table Test Description

STEP 1: Check combination meter power feed circuit.
STEP 2: Check electrical connection check mechanism in SDM connector.
STEP 3: Check "AIR BAG" warning lamp circuit.
STEP 4: Check open in "AIR BAG" warning lamp circuit.
STEP 5: Check short from "AIR BAG" warning lamp circuit to power circuit.

### Diagnostic Flow Table

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Set parking brake.<br>2) Note combination meter when ignition switch is turned ON.<br>Does the "BRAKE" indicator (warning lamp) come ON? | Go to Step 2. | Check and clear up the following possible cause.<br>Open circuit in "BLK/BLU" or "BLK/WHT" wire.<br>Short circuit between "BLK/BLU" or "BLK/WHT" and ground.<br>"METER" fuse blown.<br>Poor connection of "E11" connector and "G03" connector. |
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check electrical connection check mechanism.<br>Is it in good condition? | Go to Step 3. | Repair electrical connection check mechanism. |
| 3 | 1) Check proper connection to SDM at terminal "G58-2".<br>2) If OK, then check voltage from "G58-2" terminal of SDM connector to body ground with ignition switch ON.<br>Is it 8 V or more? | Substitute a known-good SDM and recheck. | Go to Step 4. |
| 4 | 1) Remove combination meter referring to "Combination Meter Removal and Installation".<br>2) Check proper connection to combination meter at "BLU" terminal for "AIR BAG" warning lamp and to SDM at terminal "G58-2".<br>3) If OK, then check resistance between "BLU" wire terminal (2) of combination meter connector (20-pin connector) (1) and "G58-2" terminal of SDM connector.<br>Is resistance 1 Ω or less? | Go to Step 5. | Repair high resistance or open in "BLU" wire circuit (between combination meter and SDM). |

| Step | Action | Yes | No |
|---|---|---|---|
| 5 | 1) Measure voltage from “G58-2” terminal of SDM connector to body ground with ignition switch ON.<br>Is it 8 V or more? | Repair short from “BLU” wire circuit (between combination meter and SDM) to power circuit. | Replace combination meter. |




| |
|---|
| [A]: Fig. for Step 2 |
| [B]: Fig. for Step 3 |
| [C]: Fig. for Step 4 |

**Special tool**
**(A): 09932-76010**

**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” in this section to confirm that the trouble has been corrected.**

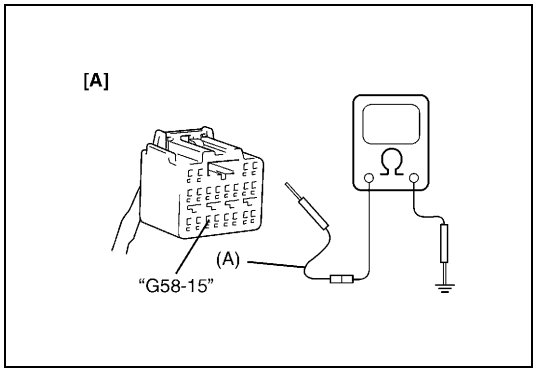
## "AIR BAG" warning lamp flashes

### Table Test Description

STEP 1: Check "AIR BAG" monitor coupler.
STEP 2: Check diagnosis switch circuit for air bag system.

### Diagnostic Flow Table

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Check "AIR BAG" monitor coupler.<br>Is it connected diagnosis switch terminal in "AIR BAG" monitor coupler and body ground by service wire? | Remove service wire. | Go to Step 2. |
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Measure resistance between "G58-15" terminal of SDM connector and body ground.<br>Is resistance infinity? | Substitute a known-good SDM and recheck. | Repair short from "PPL" wire circuit to ground. |




[A]: Fig. for Step 2

**Special tool**
**(A): 09932-76010**

**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

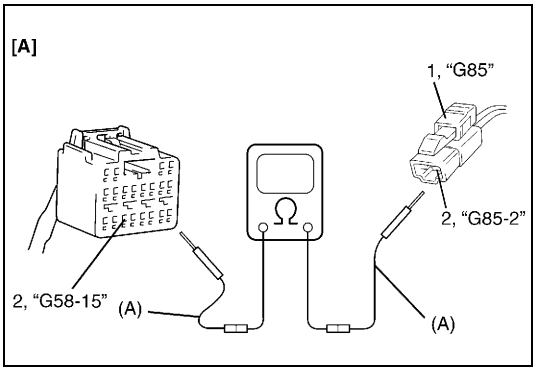
## "AIR BAG" warning lamp cannot indicate flashing pattern of DTC

### Table Test Description

STEP 1: Check "AIR BAG" monitor coupler.
STEP 2: Check diagnosis switch circuit for air bag system.

### Diagnostic Flow Table

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Inspect connection between diagnostic switch terminal on "AIR BAG" monitor coupler and body ground by service wire.<br>Is it securely connected between them by service wire? | Go to step 2. | Properly connection diagnostic switch terminal on "AIR BAG" monitor coupler and body ground by service wire. |
| 2 | 1) Disconnect SDM connector from SDM.<br>2) Check for proper connection at "PPL" wire ("G58-15" terminal of SDM connector and "G85-2" terminal of "AIR BAG" monitor coupler (1)) terminals.<br>3) If OK then measure resistance between "G58-15" terminal and "G85-2" terminal.<br>Is resistance 1Ω or more? | Check "PPL" wire terminals (2).<br>If OK, then "PPL" wire circuit high resistance or open. | Substitute a known good SDM and recheck |




[A]: Fig. for Step 2

**Special tool**
**(A): 09932-76010**

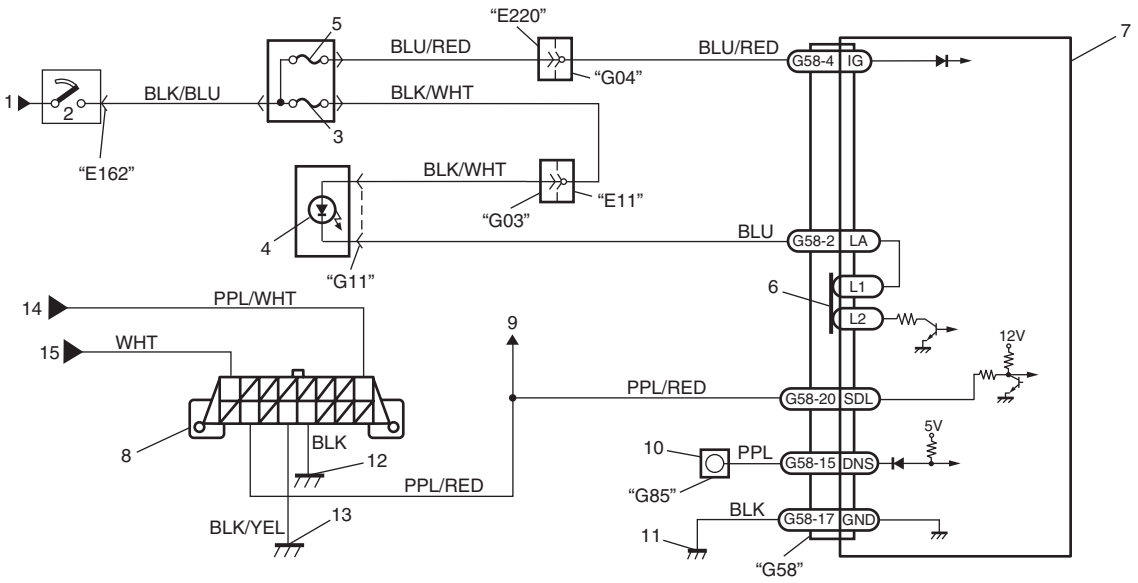
**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

# SDM Cannot Communicate Through the Serial Data Circuit

## Wiring Diagram




| | | |
|---|---|---|
| 1. From main fuse | 6. Connection detection pin | 11. Ground for air bag system |
| 2. Ignition switch | 7. SDM | 12. Ground on body |
| 3. "METER" fuse | 8. DLC | 13. Ground on Engine |
| 4. "AIR BAG" warning lamp in combination lamp | 9. To other control module | 14. From ECM (PCM) |
| 5. "AIR BAG" fuse | 10. "AIR BAG" monitor coupler | 15. From "RADIO DOME" fuse |

**CAUTION:**

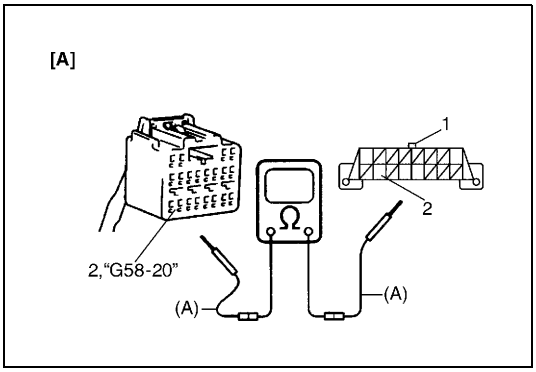
- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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.**

### Table Test Description

STEP 1: An improper connection to the data link connector (DLC) will prevent communications from being established.
STEP 2: This test checks whether it is possible to communicate with other control module.
STEP 3: This test checks for an open in "PPL/RED" circuit.

**Diagnostic Flow Table**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Make sure that SUZUKI scan tool is free from malfunction and air bag system is used.<br>2) Ignition switch OFF.<br>3) Check proper connection of SUZUKI scan tool to DLC.<br>Is connection in good condition? | Go to step 2. | Properly connect SUZUKI scan tool to DLC. |
| 2 | 1) Check if communication is possible by trying communication with other control module (ECM (PCM)) or ABS control module (if equipped)).<br>Is it possible to communicate with other control module? | Go to step 3. | Repair open in common section of serial data circuit (“PPL/RED” wire circuit) used by all controllers or short to ground or power circuit which has occurred some-where in serial data circuit (“PPL/RED” wire circuit). |
| 3 | 1) With ignition switch OFF, disconnect SDM connector “G58”.<br>2) Check proper connection at “G58-20” (“PPL/RED” wire) terminal of SDM connector.<br>3) If OK, then check resistance between “PPL/RED” wire terminal of DLC (1) and “G58-20” (“PPL/RED” wire) terminal of SDM connector.<br>Is resistance 1 Ω or less? | Substitute a known-good SDM and recheck. | Repair high resistance or open in “PPL/RED” wire (2) circuit. |




[A]: Fig. for Step 3

**Special tool**
**(A): 09932-76010**

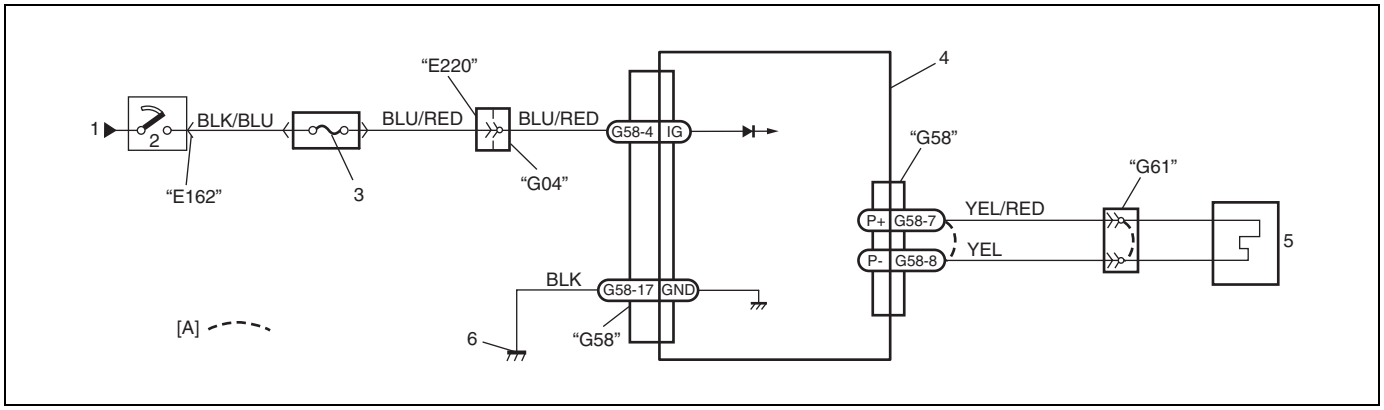
**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” in this section to confirm that the trouble has been corrected.**

# DTC B1015 – Passenger Air Bag Initiator Circuit Resistance High
# DTC B1016 – Passenger Air Bag Initiator Circuit Resistance Low
# DTC B1018 – Passenger Air Bag Initiator Circuit Short to Ground
# DTC B1019 – Passenger Air Bag Initiator Circuit Short to Power Circuit

### Wiring Diagram




| | | | |
|---|---|---|---|
| [A]: Shorting bar | 2. Ignition switch | 4. SDM | 6. Ground for air bag system |
| 1. From main fuse | 3. "AIR BAG" fuse | 5. Passenger air bag (inflator) module | |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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

**DTC B1015:**

The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is above a specified value for specified time.

**DTC B1016:**

The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is below a specified value for specified time.

**DTC B1018:**

The voltage measured at passenger air bag initiator circuit is below a specified value for specified time.

**DTC B1019:**

The voltage measured at passenger air bag initiator circuit is above a specified value for specified time.

### Table Test Description

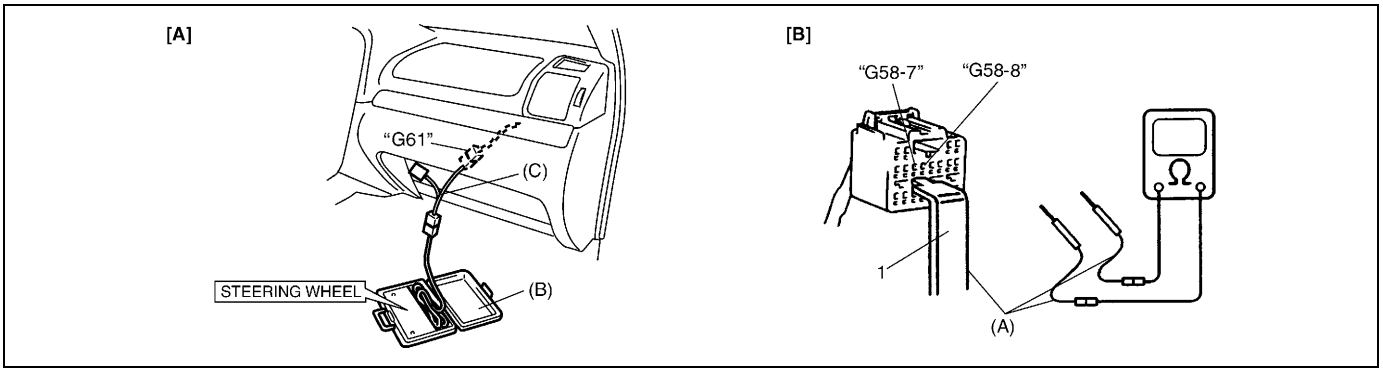
**DTC B1015, B1016, B1018 and B1019:**

STEP 1: Check whether malfunction is in passenger air bag (inflator) module.
STEP 2: Check passenger air bag (inflator) module initiator circuit.
STEP 3: Check passenger air bag (inflator) module initiator circuit. (for DTC B1019 only)

## Diagnostic Flow Table

### DTC B1015: PASSENGER AIR BAG INITIATOR CIRCUIT RESISTANCE HIGH

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box.<br>2) Check proper connection to passenger air bag (inflator) module at terminals in "G61" connector.<br>3) If OK then connect special tool (B) to passenger air bag (inflator) module connector disconnected at the Step 1).<br>With ignition switch ON, is DTC B1015 current? | Go to step 2. | Ignition switch OFF. Replace passenger air bag (inflator) module (Refer to "Passenger Air Bag (Inflator) Module" in this section). |
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at terminals "G58-7" and "G58-8".<br>3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>4) Measure resistance between "G58-7" and "G58-8" terminals with connected special tools (B) and (C).<br>Is resistance 4.5 Ω or less? | Substitute a known-good SDM and recheck. | Repair high resistance or open in "YEL/RED" or "YEL" wire circuit. |




| |
|---|
| [A]: Fig. for Step 1 and 2 |
| [B]: Fig. for Step 2 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78340**

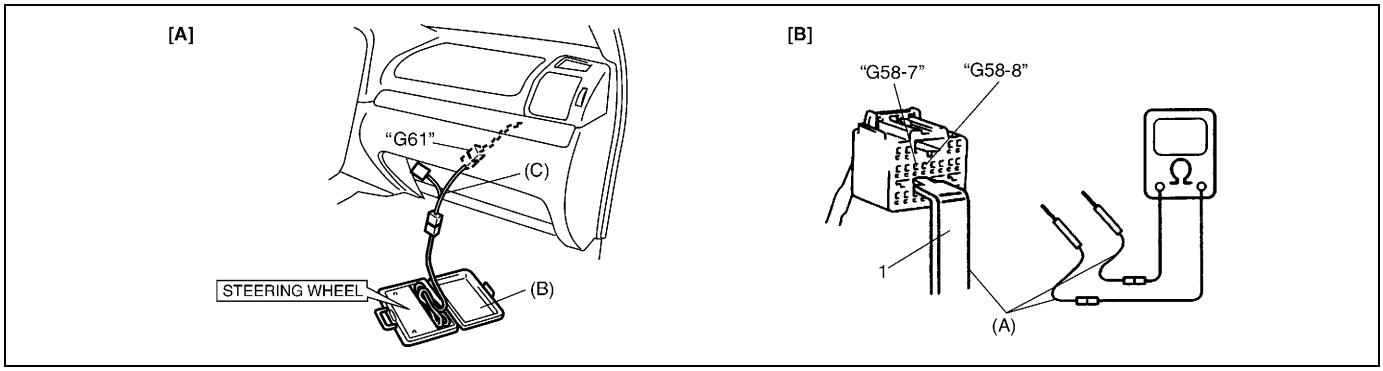
**NOTE:**

**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

## DTC B1016: PASSENGER AIR BAG INITIATOR CIRCUIT RESISTANCE LOW

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box.<br>2) Check proper connection to passenger air bag (inflator) module at terminals in "G61" connector.<br>3) If OK then connect special tools (B) and (C) to passenger air bag (inflator) module connector disconnected at the Step 1.<br>With ignition switch ON, is DTC B1016 current? | Go to step 2. | Ignition switch OFF. Replace passenger air bag (inflator) module (Refer to "Passenger Air Bag (Inflator) Module" in this section). |
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at terminals "G58-7" and "G58-8".<br>3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>4) Measure resistance between "G58-7" and "G58-8" terminals with connected special tools (B) and (C).<br>Is resistance 1.4 Ω or more? | Substitute a known-good SDM and recheck. | Repair short from "YEL/RED" wire circuit to "YEL" wire circuit or from "YEL/RED" or "YEL" wire circuit to other wire circuit. |




| |
|---|
| [A]: Fig. for Step 1 and 2 |
| [B]: Fig. for Step 2 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78340**

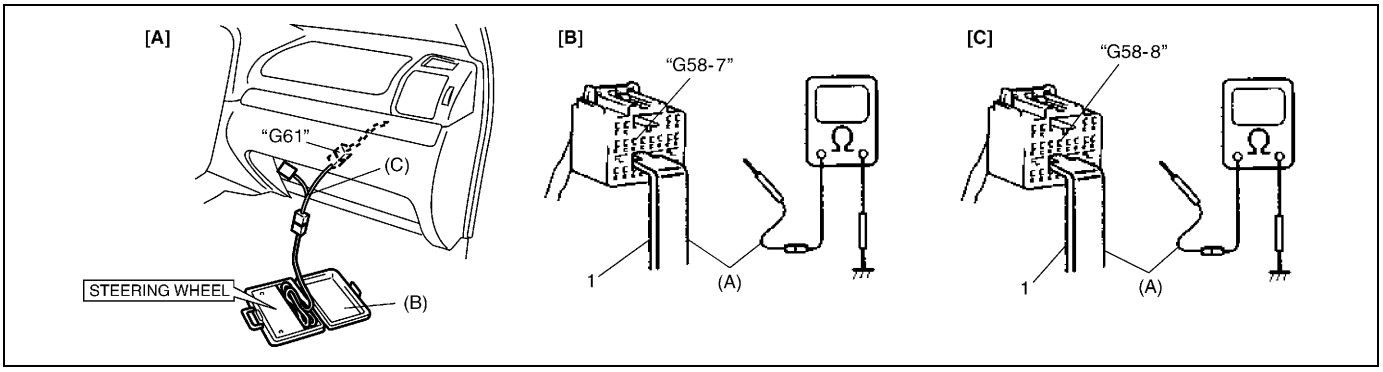
**NOTE:**

**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

## DTC B1018: PASSENGER AIR BAG INITIATOR CIRCUIT SHORT TO GROUND

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box.<br>2) Check proper connection to passenger air bag (inflator) module at terminals in "G61" connector.<br>3) If OK then connect special tools (B) and (C) to passenger air bag (inflator) module connector disconnected at the Step 1.<br>With ignition switch ON, is DTC B1018 current? | Go to step 2. | Ignition switch OFF. Replace passenger air bag (inflator) module (Refer to "Passenger Air Bag (Inflator) Module" in this section). |
| 2 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G61" connector and SDM connector "G58" from SDM respectively.<br>2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>3) Measure resistance between "G58-7" terminal and body ground.<br>Is resistance infinity? | Go to step 3. | Repair short from "YEL/RED" wire circuit to ground. |
| 3 | 1) Measure resistance between "G58-8" terminal and body ground.<br>Is resistance infinity? | Substitute a known-good SDM and recheck. | Repair short from "YEL" wire circuit to ground. |




| |
|---|
| [A]: Fig. for Step 1 and 2 |
| [B]: Fig. for Step 2 |
| [C]: Fig. for Step 3 |

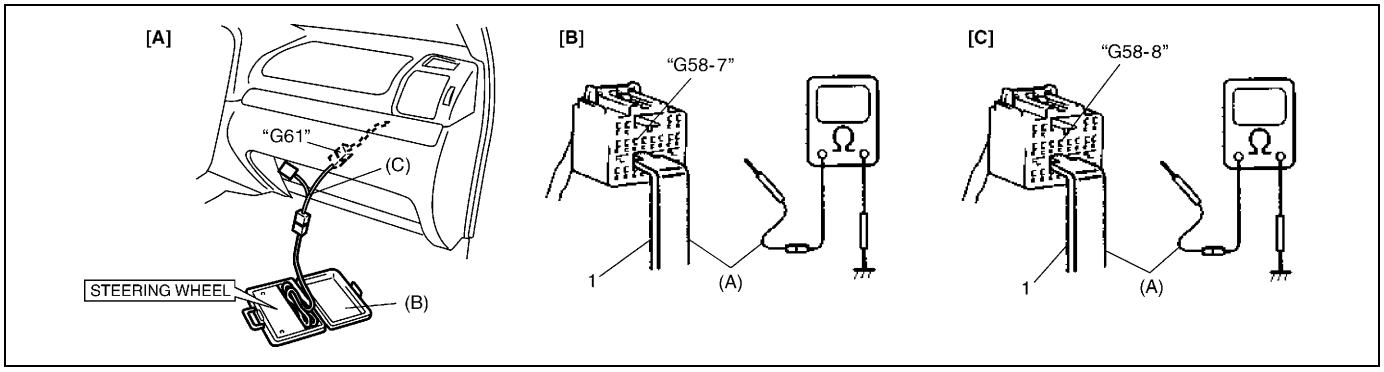
**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78340**

**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 diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

## DTC B1019: PASSENGER AIR BAG INITIATOR CIRCUIT SHORT TO POWER CIRCUIT

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box.<br>2) Check proper connection to passenger air bag (inflator) module at terminals in "G61" connector.<br>3) If OK then connect special tools (B) and (C) to passenger air bag (inflator) module connector disconnected at the Step 1.<br>With ignition switch ON, is DTC B1019 current? | Go to step 2. | Ignition switch OFF. Replace passenger air bag (inflator) module (Refer to "Passenger Air Bag (Inflator) Module" in this section). |
| 2 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G61" connector and SDM connector, "G58" from SDM respectively.<br>2) Release shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>3) Measure voltage from "G58-7" terminal to body ground.<br>With ignition switch ON, is voltage 1 V or less? | Go to step 3. | Repair short from "YEL/RED" wire circuit to power circuit. |
| 3 | 1) Measure voltage from "G58-8" terminal to body ground.<br>With ignition switch ON, is voltage 1 V or less? | Substitute a known-good SDM and recheck. | Repair short from "YEL" wire circuit to power circuit. |




| |
|---|
| [A]: Fig. for Step 1 and 2 |
| [B]: Fig. for Step 2 |
| [C]: Fig. for Step 3 |

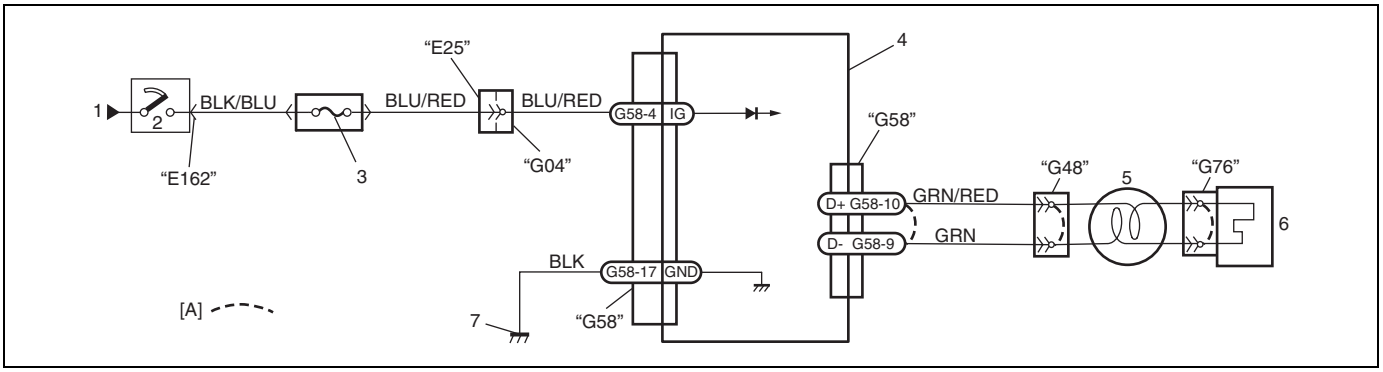
**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78340**

**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 diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

# DTC B1021 – Driver Air Bag Initiator Circuit Resistance High
# DTC B1022 – Driver Air Bag Initiator Circuit Resistance Low
# DTC B1024 – Driver Air Bag Initiator Circuit Short to Ground
# DTC B1025 – Driver Air Bag Initiator Circuit Short to Power Circuit

### Wiring Diagram




| | | |
|---|---|---|
| [A]: Shorting bar | 3. "AIR BAG" fuse | 6. Driver air bag (inflator) module |
| 1. From main fuse | 4. SDM | 7. Ground for air bag system |
| 2. Ignition switch | 5. Contact coil assembly | |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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

**DTC B1021:**

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.

**DTC B1022:**

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.

**DTC B1024:**

The voltage measured at driver air bag initiator circuit is below a specified value for specified time.

**DTC B1025:**

The voltage measured at driver air bag initiator circuit is above a specified value for specified time.

### Table Test Description

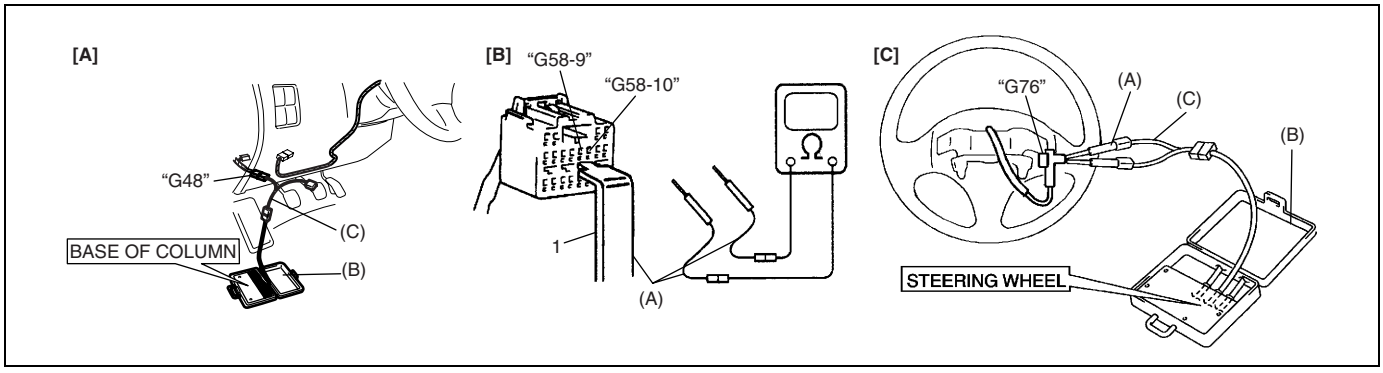
**DTC B1021, B1022, B1024 and B1025:**

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.

**Diagnostic Flow Table**

**DTC B1021: DRIVER AIR BAG INITIATOR CIRCUIT RESISTANCE HIGH**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column.<br>2) Check proper connection to contact coil at terminals in "G48" connector.<br>3) If OK then connect special tools (B) and (C) to contact coil connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1021 current? | Go to step 2. | Go to step 3. |
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at terminals "G58-9" and "G58-10".<br>3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>4) Measure resistance between "G58-9" and "G58-10" terminals with connected special tools (B) and (C).<br>Is resistance 4.5 Ω or less? | Substitute a known-good SDM and recheck. | Repair high resistance or open in "GRN" or "GRN/RED" wire circuit. |
| 3 | 1) With ignition switch OFF, disconnect special tool (B) and (C) from "G48" connector then reconnect contact coil connector located near the base of the steering column.<br>2) Remove driver air bag (inflator) module from steering wheel (Refer to "Driver Air Bag (Inflator) Module" in Section 3C1).<br>3) Check proper connection to driver air bag (inflator) module at terminals in "G76" connector.<br>4) If OK then connect special tools (B) and (C) to "G76" connector.<br>With ignition switch ON, is DTC B1021 current? | Ignition switch OFF. Replace contact coil assembly (Refer to "Contact Coil and Combination Switch Assembly" in Section 3C1). | Ignition switch OFF. Replace driver air bag (inflator) module (Refer to "Driver Air Bag (Inflator) Module" in Section 3C1). |




| |
|---|
| [A]: Fig. for Step 1, 2 and 3 |
| [B]: Fig. for Step 2 |
| [C]: Fig. for Step 3 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78310**

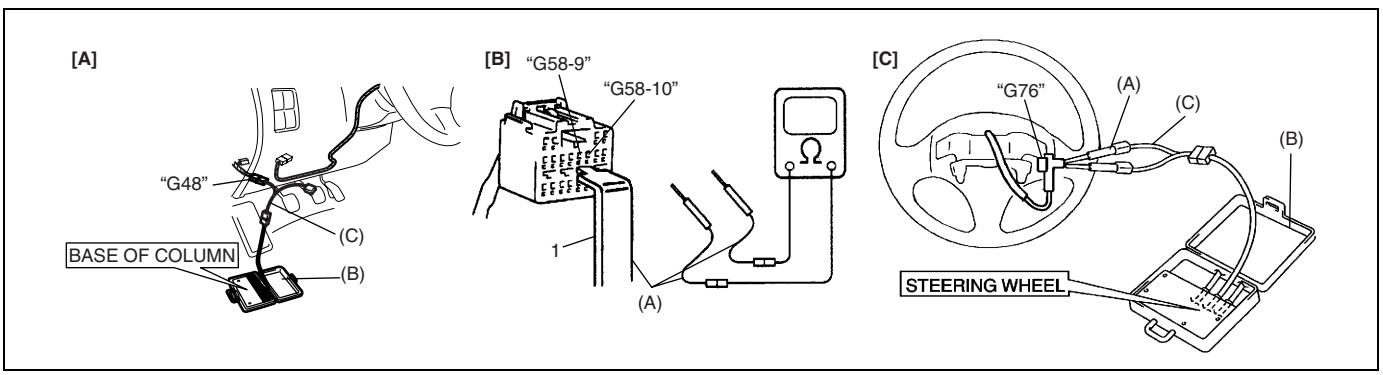
**NOTE:**

**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

## DTC B1022: DRIVER AIR BAG INITIATOR CIRCUIT RESISTANCE LOW

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column.<br>2) Check proper connection to contact coil at terminals in "G48" connector.<br>3) If OK then connect special tools (B) and (C) to contact coil connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1022 current? | Go to step 2. | Go to step 3. |
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at terminals "G58-9" and "G58-10".<br>3) If OK, release shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>4) Measure resistance between "G58-9" and "G58-10" terminals with connected special tool (B).<br>Is resistance 1.7 Ω or more? | Substitute a known-good SDM and recheck. | Repair short from "GRN" wire circuit to "GRN/RED" wire circuit or from "GRN" or "GRN/RED" wire circuit to other wire circuit. |
| 3 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G48" connector then reconnect contact coil connector located near the base of the steering column.<br>2) Remove driver air bag (inflator) module from steering column (Refer to "Driver Air Bag (Inflator) Module" in Section 3C1).<br>3) Check proper connection to driver air bag (inflator) module at terminals in "G76" connector.<br>4) If OK then connect special tools (B) and (C) to "G76" connector.<br>With ignition switch ON, is DTC B1022 current? | Ignition switch OFF. Replace contact coil assembly (Refer to "Contact Coil and Combination Switch Assembly" in Section 3C1). | Ignition switch OFF. Replace driver air bag (inflator) module (Refer to "Driver Air Bag (Inflator) Module" in Section 3C1). |




| [A]: Fig. for Step 1, 2 and 3 | [B]: Fig. for Step 2 | [C]: Fig. for Step 3 |
|---|---|---|

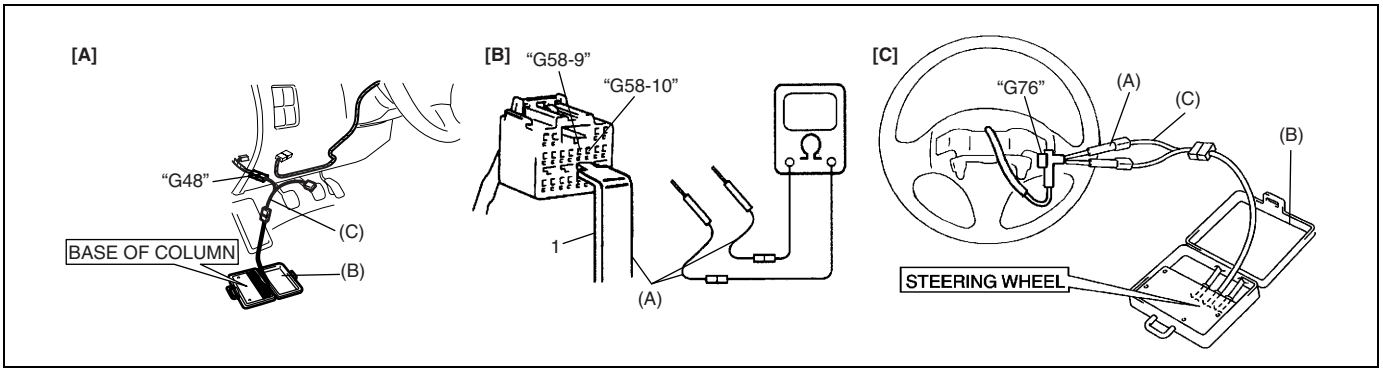
**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78310**

**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 diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1024: DRIVER AIR BAG INITIATOR CIRCUIT SHORT TO GROUND**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column.<br>2) Check proper connection to contact coil at terminals in "G48" connector.<br>3) If OK then connect special tools (B) and (C) to contact coil connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1024 current? | Go to step 2. | Go to step 3. |
| 2 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G48" connector and SDM connector "G58" from SDM respectively.<br>2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>3) Measure resistance between "G58-9" terminal and body ground and between "G58-10" terminal and body ground.<br>Are resistances infinity? | Substitute a known-good SDM and recheck. | Repair short from "GRN" or "GRN/RED" wire circuit to ground. |
| 3 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G48" connector then reconnect contact coil connector located near the base of the steering column.<br>2) Remove driver air bag (inflator) module from steering column referring to "Driver Air Bag (Inflator) Module Removal and Installation".<br>3) Check proper connection to driver air bag (inflator) module at terminals in "G76" connector.<br>4) If OK, then connect special tools (B) and (C) to "G76" connector.<br>With ignition switch ON, is DTC B1024 current? | Ignition switch OFF. Replace contact coil assembly (Refer to "Contact Coil and Combination Switch Assembly" in Section 3C1). | Ignition switch OFF. Replace driver air bag (inflator) module (Refer to "Driver Air Bag (Inflator) Module" in Section 3C1). |




| |
|---|
| [A]: Fig. for Step 1, 2 and 3 |
| [B]: Fig. for Step 2 |
| [C]: Fig. for Step 3 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 00932-78340**

**NOTE:**

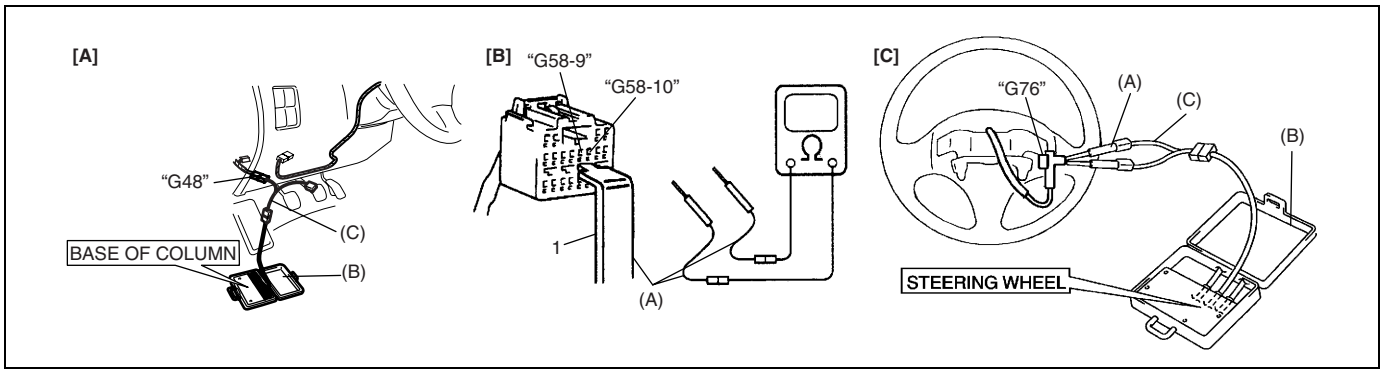
**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1025: DRIVER AIR BAG INITIATOR CIRCUIT SHORT TO POWER CIRCUIT**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column.<br>2) Check proper connection to contact coil at terminals in "G48" connector.<br>3) If OK then connect special tools (B) and (C) to contact coil connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1025 current? | Go to step 2. | Go to step 3. |
| 2 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G48" connector and SDM connector "G58" from SDM respectively.<br>2) Release Shorting bar in SDM connector inserting release tool (1) included in special tool (A).<br>3) Measure voltage from "G58" terminal to body ground and between "G58" terminal to body ground.<br>With ignition switch ON, are they 1 V or less? | Substitute a known-good SDM and recheck. | Repair short from "GRN" or "GRN/RED" wire circuit to power circuit. |

| Step | Action | Yes | No |
|---|---|---|---|
| 3 | 1) With ignition switch OFF, disconnect special tools (B) and (C) from "G48" connector then reconnect contact coil connector located near the base of the steering column.<br>2) Remove driver air bag (inflator) module from steering column referring to "Driver Air Bag (Inflator) Module Removal and Installation".<br>3) Check proper connection to driver air bag (inflator) module at terminal in "G76" connector.<br>4) If OK, then connect special tools (B) and (C) to "G76" connector.<br>With ignition switch ON, is DTC B1025 current? | Ignition switch OFF. Replace contact coil assembly (Refer to "Contact Coil and Combination Switch Assembly" in Section 3C1). | Ignition switch OFF. Replace driver air bag (inflator) module (Refer to "Driver Air Bag (Inflator) Module" in Section 3C1). |




| |
|---|
| [A]: Fig. for Step 1, 2 and 3 |
| [B]: Fig. for Step 2 |
| [C]: Fig. for Step 3 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78340**

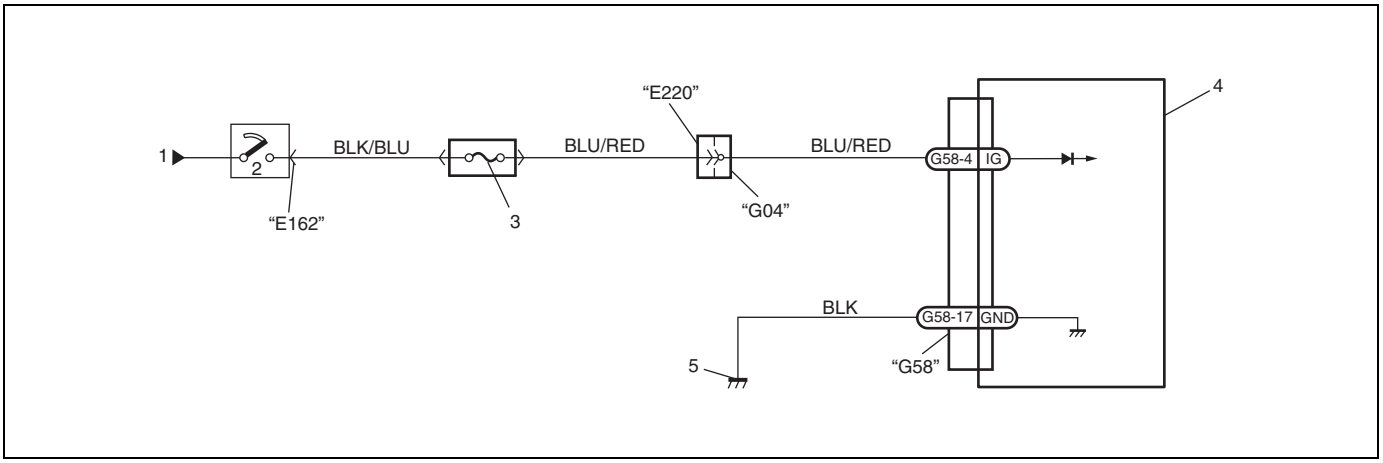
**NOTE:**

**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

# DTC B1031 – Power Source Voltage High
# DTC B1032 – Power Source Voltage Low

### Wiring Diagram




| | | |
|---|---|---|
| 1. From main fuse | 3. "AIR BAG" fuse | 5. Ground for air bag system |
| 2. Ignition switch | 4. SDM | |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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

**DTC B1031:**

The power source voltage to SDM is above specified value for specified time.

**DTC B1032:**

The power source voltage is below an approx. 8 V for specified time.

### Table Test Description

**DTC B1031:**

STEP 1: Check if voltage applied to SDM is within normal range.
STEP 2: Check if DTC B1031 still exists.

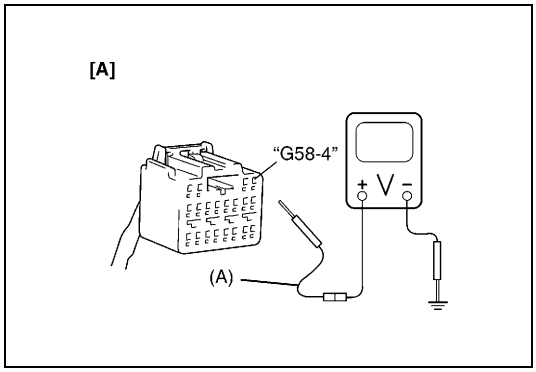
**DTC B1032:**

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 "E220" connector is within normal range.
STEP 4: Check if DTC B1032 still exists.

**Diagnostic Flow Table**

**DTC B1031: POWER SOURCE VOLTAGE HIGH**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at "G58-4" terminal.<br>3) If OK then ignition switch ON, and then check voltage from "G58-4" terminal on SDM connector to body ground.<br>Is voltage 14 V or less? | Go to step 2. | Check Charging System and repair as necessary. (Refer to "Generator (Overcharged battery)" in Section 6H) |
| 2 | 1) With ignition switch OFF, reconnect SDM connector.<br>With ignition switch ON, is DTC B1031 current? | Substitute a known-good SDM and recheck. | Intermittent trouble check for intermittent referring to "Intermittents and Poor Connections" in this section. |




[A]: Fig. for Step 1

**Special tool**
**(A): 09932-76010**

**NOTE:**

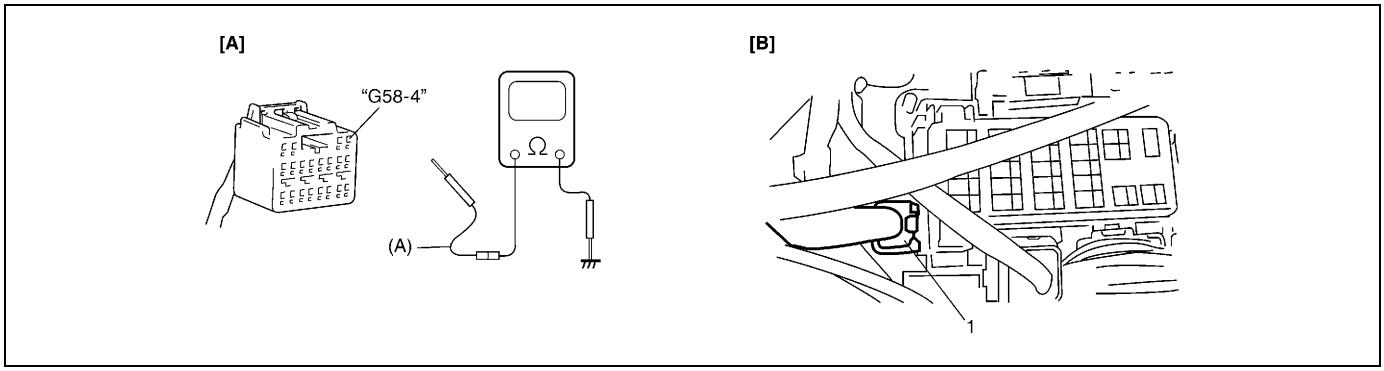
**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1032: POWER SOURCE VOLTAGE LOW**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Measure voltage on battery.<br>Is voltage 11 V or more? | Go to step 2. | Check Charging System and repair as necessary. (Refer to "Generator (undercharged battery)" in Section 6H) |

| Step | Action | Yes | No |
|---|---|---|---|
| 2 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at "G58-4" terminal.<br>3) If OK then ignition switch ON, and then check voltage from "G58-4" terminal on SDM connector to body ground.<br>Is voltage 8 V or more? | Go to step 4. | Go to step 3. |
| 3 | 1) With ignition switch OFF, disconnect "E25" connector (1) in main harness.<br>2) Check proper connection at "E25-1" ("BLU/RED" wire) terminal.<br>3) If OK, then ignition switch ON, and then check voltage from "E220-1" ("BLU/RED" wire) terminal to body ground.<br>Is voltage 8 V or more? | Go to Step 4. | Check circuit from battery to "E25" connector and charging system. |
| 4 | 1) With ignition switch OFF, reconnect SDM connector.<br>With ignition switch ON, does DTC B1032 exist? | Substitute a known-good SDM and recheck. | Intermittent trouble check for intermittent referring to "Intermittents and Poor Connections" in this section. |




| |
|---|
| [A]: Fig. for Step 2 |
| [B]: Fig. for Step 3 |

**Special tool**
**(A): 09932-76010**

**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 diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

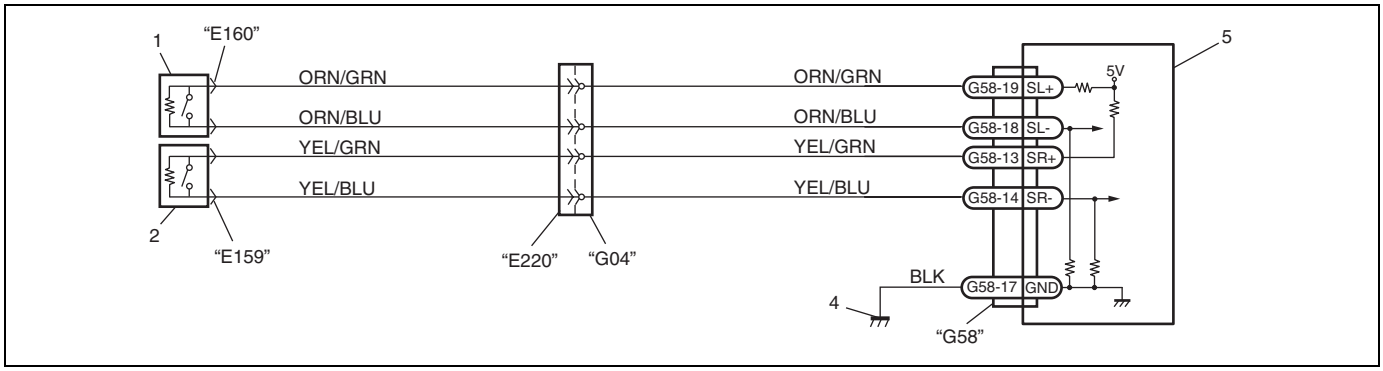
# DTC B1035 – RH Forward Sensor Circuit Open or Short to Ground

# DTC B1036 – RH Forward Sensor Circuit Short Between Two Wires or Short to Power Circuit

# DTC B1037 – LH Forward Sensor Circuit Open or Short to Ground

# DTC B1038 – LH Forward Sensor Circuit Short Between Two Wires or Short to Power Circuit

### Wiring Diagram




| | |
|---|---|
| 1. LH Forward sensor | 3. SDM |
| 2. RH Forward sensor | 4. Ground for air bag system |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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

**DTC B1035 and B1037:**

The voltage measured at forward sensor circuit (terminal G58-18, G58-14) is below a specified value for specified time.

**DTC B1036 and B1038:**

The voltage measured at forward sensor circuit (terminal G58-18, G58-14) is above a specified value for specified time.

### Table Test Description

**DTC B1035 and B1037:**

STEP 1: Check whether malfunction is in forward sensor.
STEP 2: Check if forward sensor circuit is open.
STEP 3: Check if forward sensor circuit is shorted to ground.

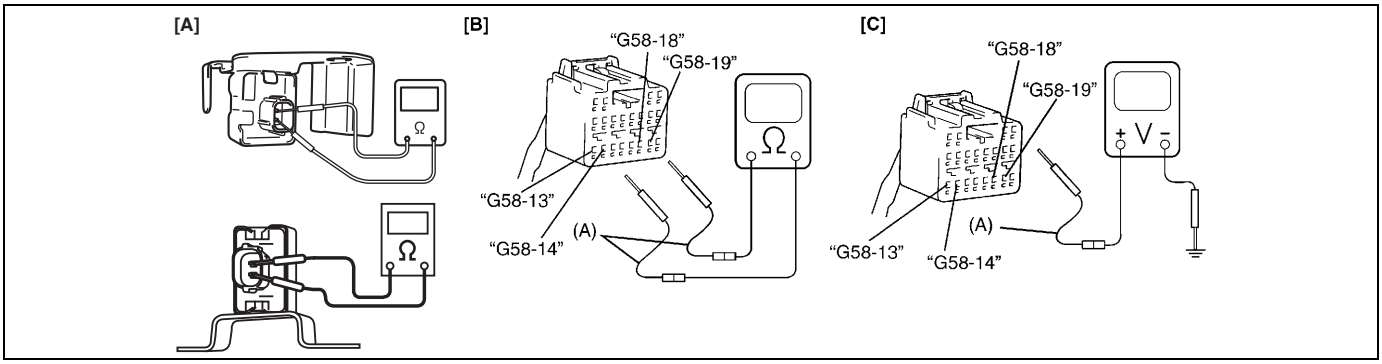
**DTC B1036 and B1038:**

STEP 1: Check whether malfunction is in forward sensor.
STEP 2: Check if forward sensor circuit is shorted between two wires.
STEP 3: Check if forward sensor circuit is shorted to power circuit.

### Diagnostic Flow Table

**DTC B1035: RH FORWARD SENSOR CIRCUIT OPEN OR SHORT TO GROUND**
**DTC B1037: LH FORWARD SENSOR CIRCUIT OPEN OR SHORT TO GROUND**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Ignition switch OFF.<br>2) Disconnect driver air bag (inflator) module connector, passenger air bag (inflator) module connector, driver pretensioner module connector, and passenger pretensioner module connector.<br>3) Disconnect forward sensor connector "E160" or "E159".<br>4) Check proper connection to forward sensor connector at "ORN/GRN" and "ORN/BLU" terminals or "YEL/GRN" and "YEL/BLU" terminals.<br>5) If OK then measure resistance between terminals of forward sensor.<br>Is resistance 738 – 905 Ω? | Go to step 2. | Replace forward sensor. |
| 2 | 1) Reconnect forward sensor connector "E160" or "E159".<br>2) Disconnect SDM connector "G58".<br>3) Check proper connection to SDM connector at terminals "G58-13" and "G58-14" or terminals "G58-18" and "G58-19".<br>4) If OK then measure resistance between terminal "G58-13" and "G58-14" or terminal "G58-18" and "G58-19".<br>Is resistance 739 – 905 Ω? | Go to step 3. | Repair open in "ORN/GRN" and "ORN/BLU" wire circuit (between forward sensor and SDM) or "YEL/GRN" and "YEL/BLU" wire circuit (between forward sensor and SDM). |
| 3 | 1) Disconnect forward sensor connector "E160" or "E159".<br>2) Measure resistance between "G58-13" terminal and body ground, "G58-14" terminal and body ground, or between "G58-18" terminal and body ground, "G58-19" terminal and body ground.<br>Are resistances infinity? | Substitute a known-good SDM and recheck. | Repair short from "ORN/GRN" or "ORN/BLU" wire circuit (between forward sensor and SDM) to ground, or from "YEL/GRN" or "YEL/BLU" wire circuit (between forward sensor and SDM) to ground. |




| |
|---|
| [A]: Fig. for Step 1 |
| [B]: Fig. for Step 2 |
| [C]: Fig. for Step 3 |

**Special tool**
**(A): 09932-76010**

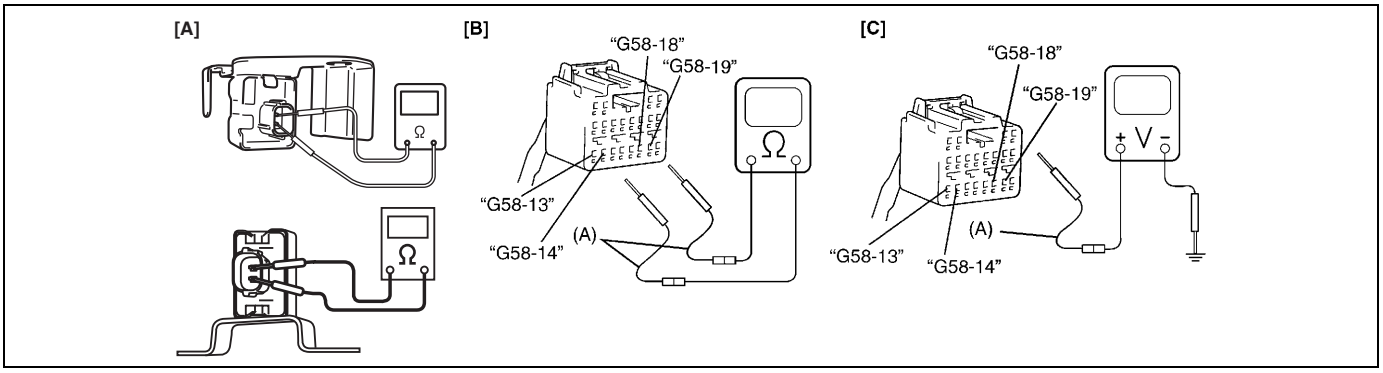
**NOTE:**

**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1036: RH FORWARD SENSOR CIRCUIT SHORT BETWEEN TWO WIRES OR SHORT TO POWR CIRCUIT**
**DTC B1038: LH FORWARD SENSOR CIRCUIT SHORT BETWEEN TWO WIRES OR SHORT TO POWER CIRCUIT**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Ignition switch OFF.<br>2) Disconnect driver air bag (inflator) module connector, passenger air bag (inflator) module connector, driver pretensioner module connector, and passenger pretensioner module connector.<br>3) Disconnect forward sensor connector "E160" or "E159".<br>4) Check proper connection to forward sensor connector at "ORN/GRN" and "ORN/BLU" terminals or "YEL/GRN" and "YEL/BLU" terminals.<br>5) If OK then measure resistance between terminals of forward sensor.<br>Is resistance 738 – 905 Ω? | Go to step 2. | Replace forward sensor. |
| 2 | 1) Disconnect SDM connector "G58".<br>2) Check proper connection to SDM connector at terminals "G58-13" and "G58-14" or terminals "G58-18" and "G58-19".<br>3) If OK then measure resistance between terminal "G58-13" and "G58-14" or terminal "G58-18" and "G58-19".<br>Is resistance infinity? | Go to step 3. | Repair short from "ORN/GRN" wire circuit (between forward sensor and SDM) to "ORN/BLU" wire circuit (between forward sensor and SDM), or from "YEL/GRN" wire circuit (between forward sensor and SDM) to "YEL/BLU" wire circuit (between forward sensor and SDM). |
| 3 | 1) Measure voltage from "G58-13" terminal to body ground and "G58-14" terminal to body ground, or from "G58-18" terminal to body ground and "G58-19" terminal to body ground.<br>With ignition switch ON, are they 1V or less? | Substitute a known-good SDM and recheck. | Repair short from "ORN/GRN" or "ORN/BLU" wire circuit (between forward sensor and SDM) to power circuit, or from "YEL/GRN" or "YEL/BLU" wire circuit (between forward sensor and SDM) to power circuit. |




| | |
|---|---|
| [A]: | Fig. for Step 1 |
| [B]: | Fig. for Step 2 |
| [C]: | Fig. for Step 3 |

**Special tool**
**(A): 09932-76010**

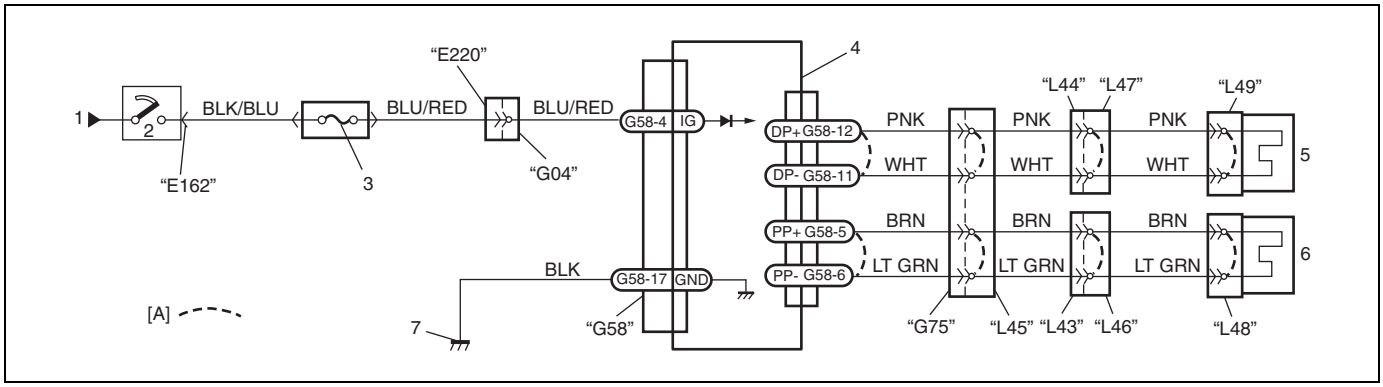
**NOTE:**

**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

# DTC B1041 – Driver Pretensioner Initiator Circuit Resistance High
# DTC B1042 – Driver Pretensioner Initiator Circuit Resistance Low
# DTC B1043 – Driver Pretensioner Initiator Circuit Short to Ground
# DTC B1044 – Driver Pretensioner Initiator Circuit Short to Power Circuit
# DTC B1045 – Passenger Pretensioner Initiator Circuit Resistance High
# DTC B1046 – Passenger Pretensioner Initiator Circuit Resistance Low
# DTC B1047 – Passenger Pretensioner Initiator Circuit Short to Ground
# DTC B1048 – Passenger Pretensioner Initiator Circuit Short to Power Circuit

**Wiring Diagram**




| | | |
|---|---|---|
| [A]: Shorting bar | 3. "AIR BAG" fuse | 6. Passenger seat belt pretensioner |
| 1. From main fuse | 4. SDM | 7. Ground for air bag system |
| 2. Ignition switch | 5. Driver seat belt pretensioner | |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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**

**DTC B1041 and B1045:**

The resistance of driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

**DTC B1042 and B1046:**

The resistance of driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

**DTC B1043 and B1047:**

The voltage measured at driver or passenger seat belt pretensioner initiator circuit is below a specified value for specified time.

**DTC B1044 and B1048:**

The voltage measured at driver or passenger seat belt pretensioner initiator circuit is above a specified value for specified time.

### Table Test Description

**DTC B1041, B1042, B1043, B1044, B1045, B1046, B1047 and B1048:**

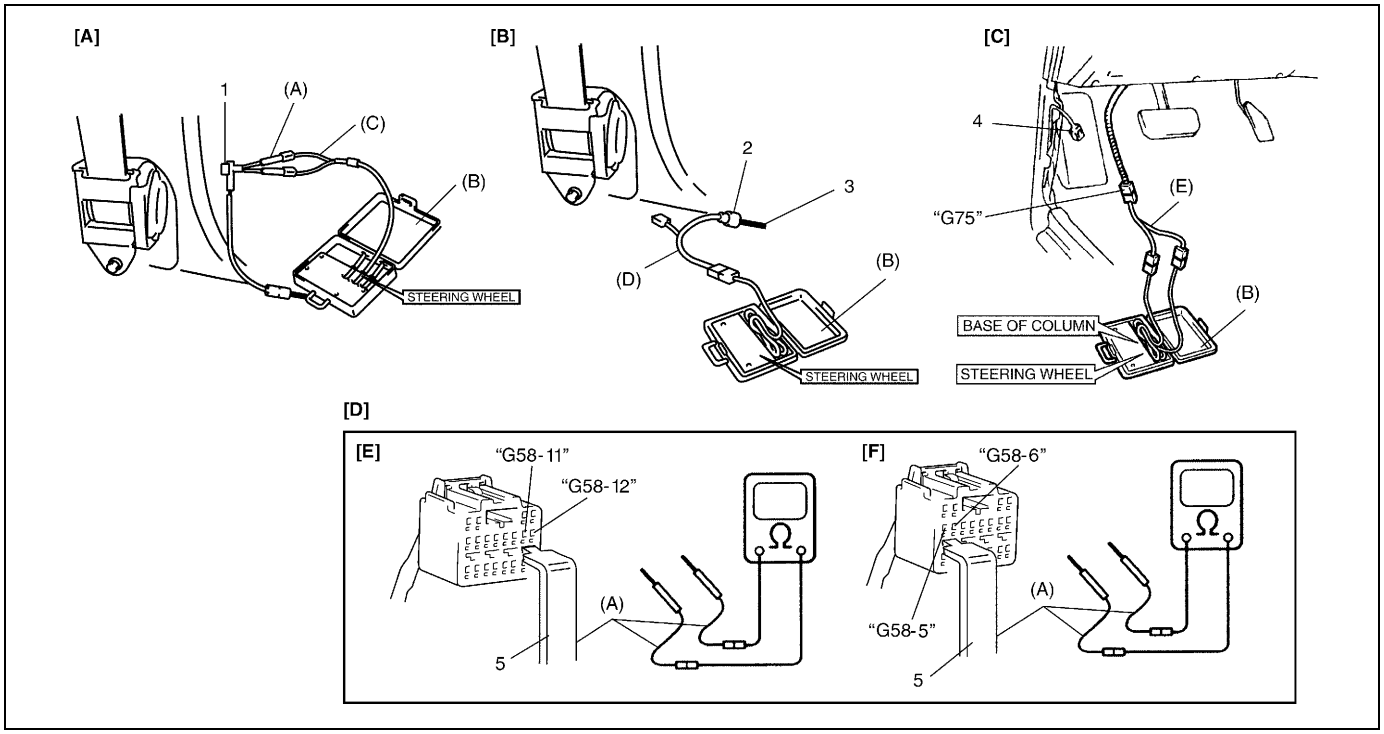
STEP 1: Check whether malfunction is in seat belt pretensioner.
STEP 2: Check seat belt pretensioner initiator circuit. (between “L47” and “L49” or “L46” and “L48”)
STEP 3: Check seat belt pretensioner initiator circuit. (between “L44” and “L45” or “L43” and “L45”)
STEP 4: Check seat belt pretensioner initiator circuit. (between “G75” and “G58”)

### Diagnostic Flow Table

**DTC B1041: DRIVER PRETENSIONER INITIATOR CIRCUIT RESISTANCE HIGH**
**DTC B1045: PASSENGER PRETENSIONER INITIATOR CIRCUIT RESISTANCE HIGH**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, remove center pillar lower trim of applicable side then disconnect seat belt pretensioner connector “L49” or “L48” (1).<br>2) Check proper connection to applicable seat belt pretensioner at terminals in “L49” or “L48” connector.<br>3) If OK, then connect special tools (A), (B) and (C) to seat belt pretensioner connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1041 or B1045 still current? | Go to step 2. | Ignition switch OFF.<br>Replace seat belt pretensioner (Refer “Front Seat Belt” to Section 10A). |
| 2 | 1) With ignition switch OFF, disconnect special tools from “L49” or “L48” connector.<br>2) Disconnect “L44” or “L43” connector (2) from air bag harness on floor harness (3).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “L44” or “L43” connector.<br>4) If OK, then connect special tools (B) and (D) to seat belt pretensioner connector disconnected at Step 2.<br>With ignition switch ON, is DTC B1041 or B1045 still current? | Go to step 3. | DTC B1041: Repair high resistance or open in “PNK” or “WHT” wire circuit. (Between “L47” and “L49” connector)<br>DTC B1045: Repair high resistance or open in “BRN” or “LT GRN” wire circuit. (Between “L46” and “L48” connector) |
| 3 | 1) With ignition switch OFF, disconnect special tools from “L44” or “L43” connector.<br>2) Remove left side front pillar trim then disconnect “G75” connector from air bag wire harness in floor harness (4).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “G75” connector.<br>4) If OK, then connect special tools (B) and (E) to “G75” connector.<br>With ignition switch ON, is DTC B1041 or B1045 still current? | Go to step 4. | DTC B1041: Repair high resistance or open in “PNK” or “WHT” wire circuit. (Between “L45” and “L44” connector)<br>DTC B1045: Repair high resistance or open in “BRN” or “LT GRN” wire circuit. (Between “L45” and “L43” connector) |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at terminals in "G58-11" and "G58-12" (for DTC B1041 [E]) or "G58-6" and "G58-5" (for DTC B1045 [F]).<br>3) If OK, release shorting bar in SDM connector inserting release tool (5) included in special tool (A).<br>4) Measure resistance between "G58-11" and "G58-12" terminals (for DTC B1041 [E]) or "G58-6" and "G58-5" terminals (for DTC B1045 [F]) with connected special tools (B) and (E).<br>Is resistance 4.5 Ω or less? | Substitute a known-good SDM and recheck. | DTC B1041: Repair high resistance or open in "PNK" or "WHT" wire circuit. (Between "G75" and "G58" connector)<br>DTC B1045: Repair high resistance or open in "BRN" or "LT GRN" wire circuit. (Between "G75" and "G58" connector) |




| | | |
|---|---|---|
| [A]: Fig. for Step 1 | [C]: Fig. for Step 3 and 4 | [E]: Fig. for DTC B1041 |
| [B]: Fig. for Step 2 | [D]: Fig. for Step 4 | [F]: Fig. for DTC B1045 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78310**
**(D): 09932-78340**
**(E): 09932-77320**

**NOTE:**

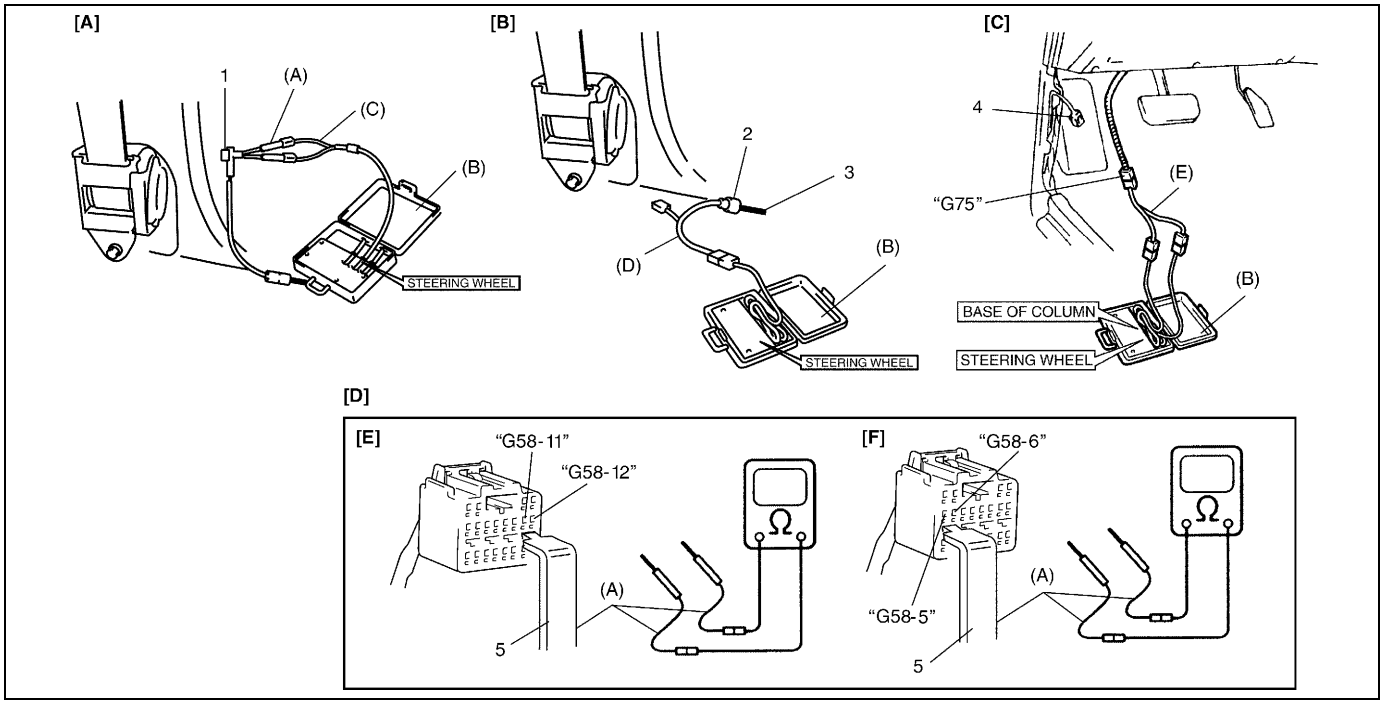
**Upon completion of inspection and repair work, perform the following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1042: DRIVER PRETENSIONER INITIATOR CIRCUIT RESISTANCE LOW**
**DTC B1046: PASSENGER PRETENSIONER INITIATOR CIRCUIT RESISTANCE LOW**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, remove center pillar lower trim of applicable side then disconnect seat belt pretensioner connector “L49” or “L48” (1).<br>2) Check proper connection to applicable seat belt pretensioner at terminals in “L49” or “L48” connector.<br>3) If OK, then connect special tools (A), (B) and (C) to seat belt pretensioner connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1042 or B1046 still current? | Go to step 2. | Ignition switch OFF.<br>Replace seat belt pretensioner (Refer to “Front Seat Belt” in Section 10A). |
| 2 | 1) With ignition switch OFF, disconnect special tools from “L49” or “L48” connector.<br>2) Disconnect “L44” or “L43” connector (2) from air bag harness on floor harness (3).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “L44” or “L43” connector.<br>4) If OK, then connect special tools (B) and (D) to seat belt pretensioner connector disconnected at Step 2.<br>With ignition switch ON, is DTC B1042 or B1046 still current? | Go to step 3. | DTC B1042: Repair short from “PNK” wire circuit to “WHT” wire circuit or from “PNK” or “WHT” wire circuit to other wire circuit. (Between “L47” and “L49” connector)<br>DTC B1046: Repair short from “BRN” wire circuit to “LT GRN” wire circuit or from “BRN” or “LT GRN” wire circuit to other wire circuit. (Between “L46” and “L48” connector) |
| 3 | 1) With ignition switch OFF, disconnect special tools from “L44” or “L43” connector.<br>2) Remove left side front pillar trim then disconnect “G75” connector from air bag wire harness in floor harness (4).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “G75” connector.<br>4) If OK, then connect special tools (B) and (E) to “G75” connector.<br>With ignition switch ON, is DTC B1042 or B1046 still current? | Go to step 4. | DTC B1042: Repair short from “PNK” wire circuit to “WHT” wire circuit or from “PNK” or “WHT” wire circuit to other wire circuit. (Between “L45” and “L44” connector)<br>DTC B1046: Repair short from “BRN” wire circuit to “LT GRN” wire circuit or from “BRN” or “LT GRN” wire circuit to other wire circuit. (Between “L45” and “L43” connector) |

| Step | Action | Yes | No |
|---|---|---|---|
| 4 | 1) With ignition switch OFF, disconnect SDM connector.<br>2) Check proper connection to SDM at terminals in "G58-11" and "G58-12" (for DTC B1041 [E]) or "G58-6" and "G58-5" (for DTC B1046 [F]).<br>3) If OK, release shorting bar in SDM connector inserting release tool (5) included in special tool (A).<br>4) If OK, then measure resistance between "G58-11" and "G58-12" terminals (for DTC B1042 [E]) or "G58-6" and "G58-5" terminals (for DTC B1046 [F]) with connected special tools (B) and (E).<br>Is resistance 1.4 Ω or less? | Substitute a known-good SDM and recheck. | DTC B1042: Repair short from "PNK" wire circuit to "WHT" wire circuit or from "PNK" or "WHT" wire circuit to other wire circuit. (Between "G75" and "G58" connector)<br>DTC B1046: Repair short from "BRM" wire circuit to "LT GRN" wire circuit or from "BRM" or "LT GRN" wire circuit to other wire circuit. (Between "G75" and "G58" connector) |




| [A]: Fig. for Step 1 | [B]: Fig. for Step 2 | [C]: Fig. for Step 3 and 4 | [D]: Fig. for Step 4 | [E]: Fig. for DTC B1042 | [F]: Fig. for DTC B1046 |
|---|---|---|---|---|---|

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78310**
**(D): 09932-78340**
**(E): 09932-77320**

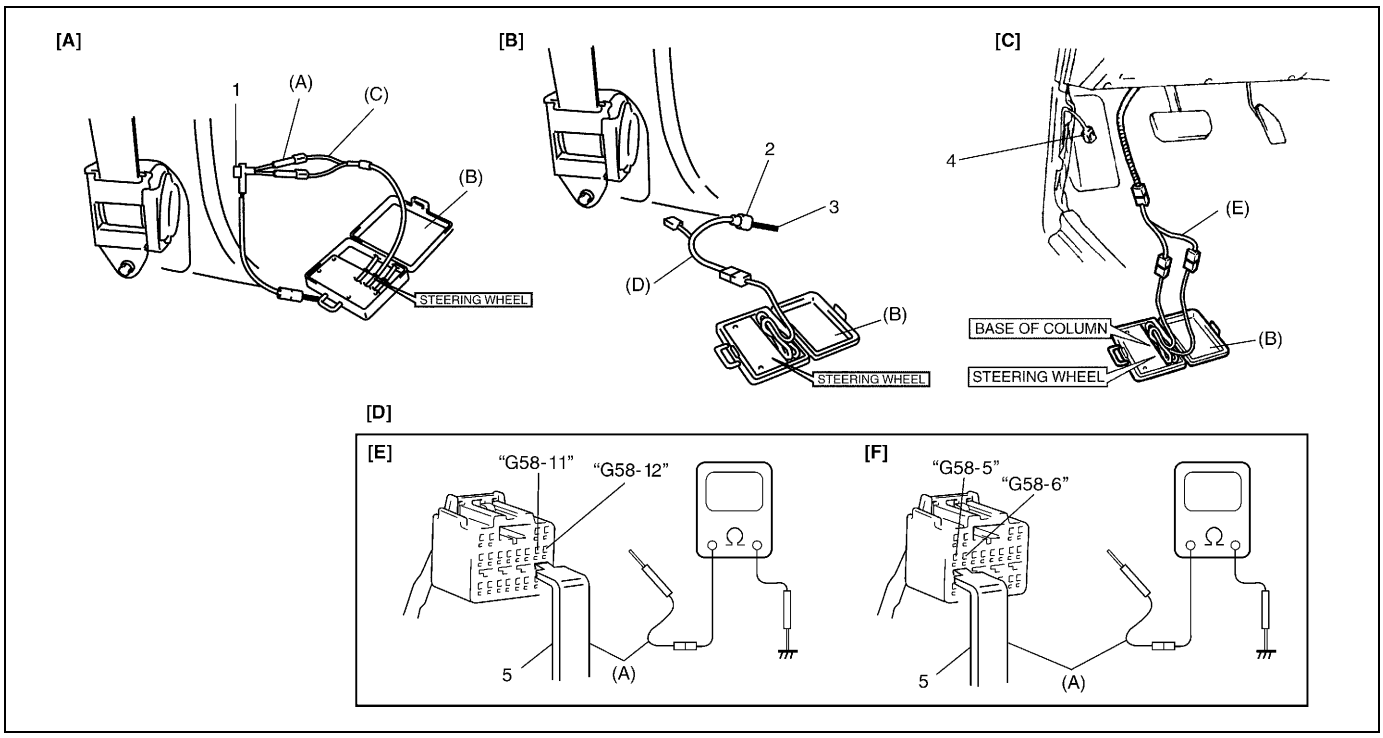
**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1043: DRIVER PRETENSIONER INITIATOR CIRCUIT SHORT TO GROUND**
**DTC B1047: PASSENGER PRETENSIONER INITIATOR CIRCUIT SHORT TO GROUND**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, remove center pillar lower trim of applicable side then disconnect seat belt pretensioner connector “L49” or “L48” (1).<br>2) Check proper connection to applicable seat belt pretensioner at terminals in “L49” or “L48” connector.<br>3) If OK, then connect special tools (A), (B) and (C) to seat belt pretensioner connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1043 or B1047 still current? | Go to Step 2. | Ignition switch OFF. Replace seat belt pretensioner (Refer to “Front Seat Belt” in Section 10A). |
| 2 | 1) With ignition switch OFF, disconnect special tools from “L49” or “L48” connector.<br>2) Disconnect “L44” or “L43” connector (2) from air bag harness in floor harness (3).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “L44” or “L43” connector.<br>4) If OK, then connect special tools (B) and (D) to seat belt pretensioner connector disconnected at Step 2.<br>With ignition switch ON, is DTC B1043 or B1047 still current? | Go to step 3. | DTC B1043: Repair short from “PNK” or “WHT” wire circuit to ground. (Between “L47” and “L49” connector)<br>DTC B1047: Repair short from “BRN” or “LT GRN” wire circuit to ground. (Between “L46” and “L48” connector) |
| 3 | 1) With ignition switch OFF, disconnect special tools from “L44” or “L43” connector.<br>2) Remove left side front pillar trim then disconnect “G75” connector from air bag wire harness in floor harness (4).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “G75” connector.<br>4) If OK, then connect special tools (B) and (E) to “G75” connector.<br>With ignition switch ON, is DTC B1043 or B1047 still current? | Go to step 4. | DTC B1043: Repair short from “PNK” or “WHT” wire circuit to ground. (Between “L45” and “L44” connector)<br>DTC B1047: Repair short from “BRN” or “LT GRN” wire circuit to ground. (Between “L45” and “L43” connector) |
| 4 | 1) With ignition switch OFF, disconnect special tools and SDM connector.<br>2) Release shorting bar in SDM connector inserting release tool (5) included in special tool (A).<br>3) Measure resistance between “G58-11” and body ground, and between “G58-12” and body ground (for DTC B1043 [E]) or between “G58-5” and body ground, and between “G58-6” and body ground (for DTC B1047 [F]).<br>Is resistance infinity? | Substitute a known-good SDM and recheck. | DTC B1043: Repair short from “PNK” or “WHT” wire circuit to ground. (Between “G75” and “G58” connector)<br>DTC B1047: Repair short from “BRN” or “LT GRN” wire circuit to ground. (Between “G75” and “G58” connector) |




| | | |
|---|---|---|
| [A]: Fig. for Step 1 | [C]: Fig. for Step 3 and 4 | [E]: Fig. for DTC B1043 |
| [B]: Fig. for Step 2 | [D]: Fig. for Step 4 | [F]: Fig. for DTC B1047 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78310**
**(D): 09932-78340**
**(E): 09932-77320**

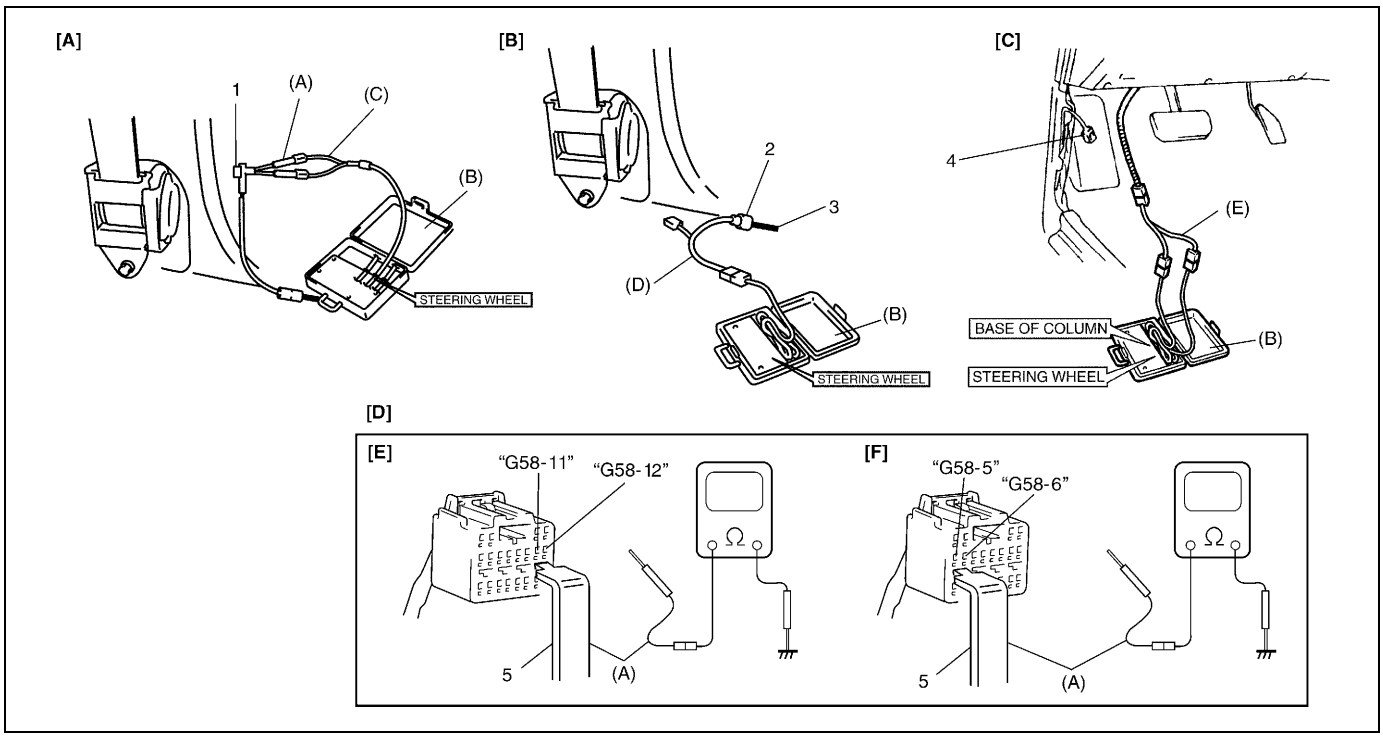
**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

**DTC B1044: DRIVER PRETENSIONER INITIATOR CIRCUIT SHORT TO POWER CIRCUIT**
**DTC B1048: PASSENGER PRETENSIONER INITIATOR CIRCUIT SHORT TO POWER CIRCUIT**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) With ignition switch OFF, remove center pillar lower trim of applicable side then disconnect seat belt pretensioner connector “L49” and “L48” (1).<br>2) Check proper connection to applicable seat belt pretensioner at terminals in “L49” or “L48” connector.<br>3) If OK, then connect special tools (A), (B) and (C) to seat belt pretensioner connector disconnected at Step 1.<br>With ignition switch ON, is DTC B1044 or B1048 still current? | Go to Step 2. | Ignition switch OFF. Replace seat belt pretensioner (Refer to “Front Seat Belt” in Section 10A). |
| 2 | 1) With ignition switch OFF, disconnect special tools from “L49” or “L48” connector.<br>2) Disconnect “L44” or “L43” connector (2) from air bag harness on floor harness (3).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “L44” or “L43” connector.<br>4) If OK, then connect special tools (B) and (D) to seat belt pretensioner connector disconnected at Step 2.<br>With ignition switch ON, is DTC B1044 or B1048 still current? | Go to step 3. | DTC B1044: Repair short from “PNK” or “WHT” wire circuit to power circuit. (Between “L47” and “L49” connector)<br>DTC B1048: Repair short from “BRN” or “LT GRN” wire circuit to power circuit. (Between “L46” and “L48” connector) |
| 3 | 1) With ignition switch OFF, disconnect special tools from “L44” or “L43” connector.<br>2) Remove left side front pillar trim then disconnect “G75” connector from air bag wire harness in floor harness (4).<br>3) Check proper connection to applicable seat belt pretensioner at terminal in “G75” connector.<br>4) If OK, then connect special tools (B) and (E) to “G75” connector.<br>With ignition switch ON, is DTC B1044 or B1048 still current? | Go to step 4. | DTC B1044: Repair short from “PNK” or “WHT” wire circuit to power circuit. (Between “L45” and “L44” connector)<br>DTC B1048: Repair short from “BRN” or “LT GRN” wire circuit to power circuit. (Between “L45” and “L43” connector) |
| 4 | 1) With ignition switch OFF, disconnect special tools and SDM connector.<br>2) Release shorting bar in SDM connector inserting release tool (5) included in special tool (A).<br>3) Measure voltage between “G58-11” and body ground, and between “G58-12” and body ground (for DTC B1044 [E]) or between “G58-5” and body ground, and between “G58-6” and body ground (for DTC B1048 [F]).<br>With ignition switch ON, is voltage 1 V or less? | Substitute a known-good SDM and recheck. | DTC B1044: Repair short from “PNK” or “WHT” wire circuit to power circuit. (Between “G75” and “G58” connector)<br>DTC B1048: Repair short from “BRN” or “LT GRN” wire circuit to power circuit. (Between “G75” and “G58” connector) |




| | | |
|---|---|---|
| [A]: Fig. for Step 1 | [C]: Fig. for Step 3 and 4 | [E]: Fig. for DTC B1044 |
| [B]: Fig. for Step 2 | [D]: Fig. for Step 4 | [F]: Fig. for DTC B1048 |

**Special tool**
**(A): 09932-76010**
**(B): 09932-75010**
**(C): 09932-78310**
**(D): 09932-78340**
**(E): 09932-77320**

**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Clear diagnostic trouble codes referring to "DTC Clearance" in this section, if any.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

# DTC B1051 – Frontal Crash Detected (System Activation Command Outputted)

### 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.)

### Table Test Description

STEP 1: Check that DTC B1051 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 table, be sure to perform "Air Bag Diagnostic System Check" in this section.**

| Step | Action | Yes | No |
|---|---|---|---|
| 1 | 1) Ignition switch OFF.<br>Has air bag deployed? | Replace components and perform inspections as directed in "Repairs and Inspections Required after an Accident" in this section. | Go to step 2. |
| 2 | 1) Inspect front of vehicle and undercarriage for signs of impact.<br>Are there signs of impact? | Replace components and perform inspections as directed in "Repairs and Inspections Required after an Accident" in this section. | Substitute a known-good SDM and recheck. |

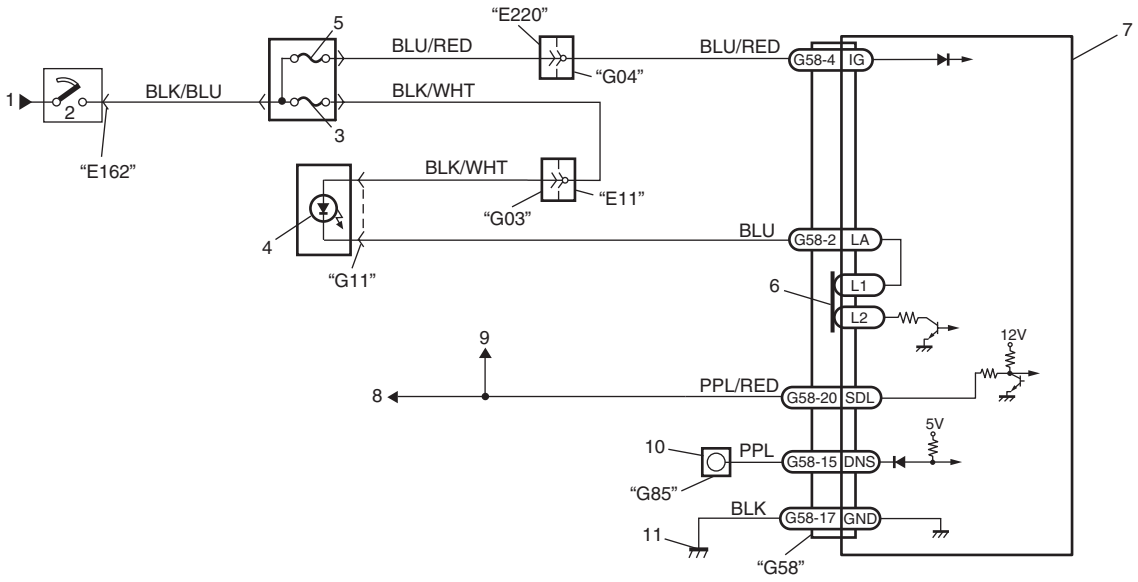
**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat "Air Bag Diagnostic System Check" in this section to confirm that the trouble has been corrected.**

# DTC B1061 – "AIR BAG" Warning Lamp Circuit Failure

## Wiring Diagram




| | | |
|---|---|---|
| 1. From main fuse | 5. "AIR BAG" fuse | 9. To other control module |
| 2. Ignition switch | 6. Connection detection pin | 10. "AIR BAG" monitor coupler |
| 3. "METER" fuse | 7. SDM | 11. Ground for air bag system |
| 4. "AIR BAG" warning lamp in combination meter | 8. To DLC | |

**CAUTION:**

- **Be sure to perform "Air Bag Diagnostic System Check" in this section before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a specified digital multimeter described in "Special Tool" in this section along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to "Intermittent and Poor Connections" in this section.**
- **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 "G58-2" does not match the commanded state of the warning lamp driver for specified time.

**Table Test Description**

STEP 1: This test rechecks “AIR BAG” warning lamp operation.
STEP 2: This test rechecks whether an abnormality is in SDM.

**DTC B1061:**

| 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” in this section may also result in misdiagnosis. Therefore, check “AIR BAG” warning lamp circuit again according to “Air Bag Diagnostic System Check” in this section.<br>Is “AIR BAG” warning lamp circuit in good condition? | Go to step 2. | Repair “AIR BAG” warning lamp circuit. |
| 2 | 1) Clear DTC (Refer to “DTC Clearance” in this section).<br>2) Check DTC (Refer to “DTC Check” in this section).<br>Is DTC B1061 set? | Substitute a known-good SDM and recheck. | Recheck air bag system. Refer to “Air Bag Diagnostic System Check” in this section. |

**NOTE:**

**Upon completion of inspection and repair work, perform following items.**

- **Reconnect all air bag system components, ensure all components are properly mounted.**
- **Repeat “Air Bag Diagnostic System Check” in this section to confirm that the trouble has been corrected.**

## DTC B1071 – Internal SDM Fault

**DTC Will Set When**

An internal SDM fault is detected by SDM.

**NOTE:**

**DTC B1071 can never be cleared once it has been set.**

1) Ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check” in this section.

## DTC B1013 – System Specifications Different from SDM Specifications

**DTC Will Set When**

Specifications of the air bag system differ from those of SDM.

**NOTE:**

**Before executing items below, be sure to perform “Air Bag Diagnostic System Check” in this section.**

1) Ignition switch OFF.
2) Replace SDM.
3) Repeat “Air Bag Diagnostic System Check” in this section.

# On-Vehicle Service

## Service Precautions

### Service and diagnosis

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.

**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 or any other on or around air bag system components. Modifications can adversely affect air bag system performance and lead to injury.**
- **Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.**

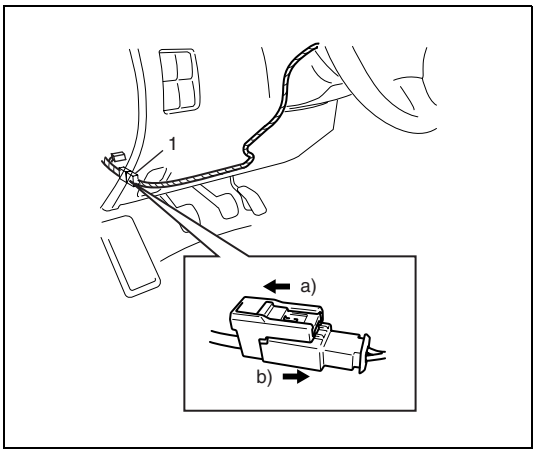
- Many of service procedures require disconnection of "AIR BAG" fuse and air bag (inflator) module(s) (driver and passenger) from initiator circuit to avoid an accidental deployment.
- Do not apply power to the air bag system unless all components are connected or a diagnostic chart requests it, as this will set a diagnostic trouble code (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 table 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 and passenger), seat belt pretensioners (driver and passenger) or SDM, be careful not to drop it or apply an impact to it. If an excessive impact was applied (e.g., SDM is 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 and passenger) 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:**

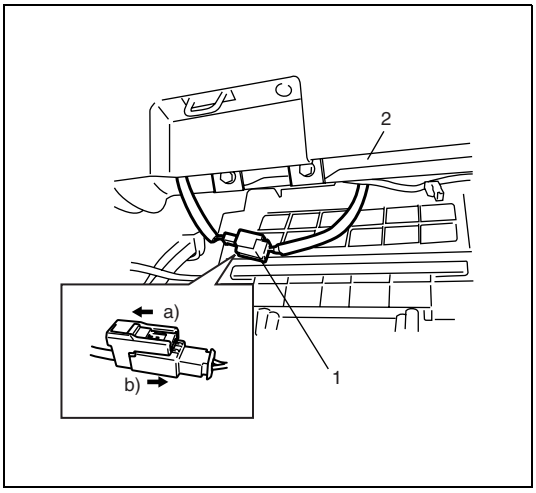
**When performing service on or around air bag system components or air bag wiring, disable the air bag system temporarily referring to "Disabling Air Bag System" in this section.**
**Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.**

## Disabling air bag system

1) Turn steering wheel so that vehicle's wheels (front tires) and pointing straight ahead.
2) Turn ignition switch to “LOCK” position and remove key.
3) Remove “AIR BAG” fuse from “AIR BAG” fuse box.




4) Disconnect Yellow connector (1) of contact coil and combination switch assembly.
   a) Release locking of lock slider.
   b) After unlocked, disconnect to connector.




5) Pull out glove box while pushing its stopper from both right and left sides and disconnect Yellow connector (1) of passenger air bag (inflator) module.
   a) Release locking of lock slider.
   b) After unlocked, disconnect to connector.

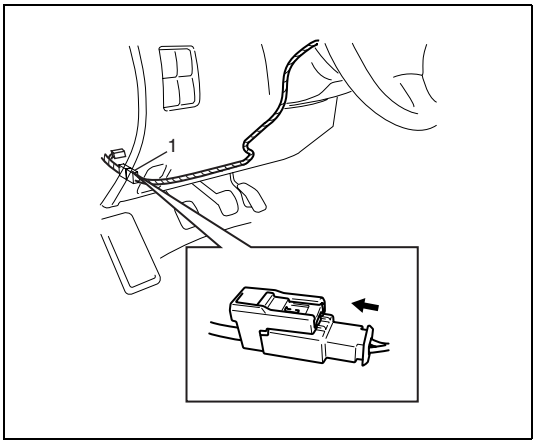
**NOTE:**

**With “AIR BAG” fuse removed and ignition switch ON, “AIR BAG” warning lamp will be ON.**
**This is normal operation and does not indicate an air bag system malfunction.**

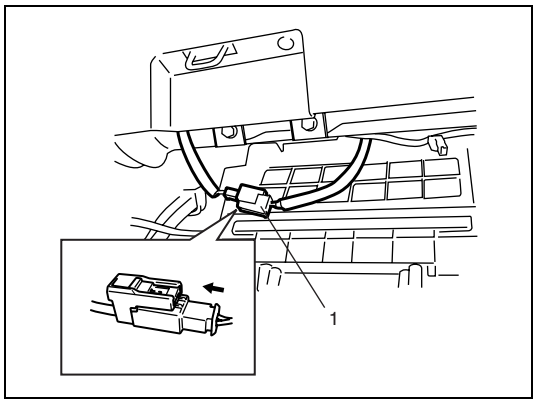
2. Steering support member

## Enabling air bag system

1) Turn ignition switch to “LOCK” and remove key.




2) Connect Yellow connector (1) of contact coil and combination switch assembly, by pushing connector till click is heard from it.

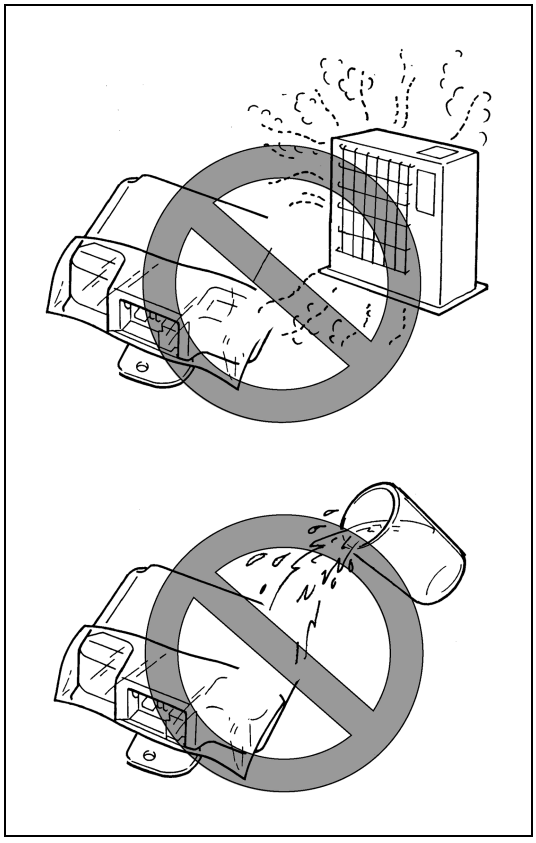



3) Connect Yellow connector (1) of passenger air bag (inflator) module by pushing connector till click is heard from it.

4) Install glove box.
5) Install "AIR BAG" fuse to fuse box.
6) Turn ignition switch to ON 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" in this section.

## Handling and storage

### SDM



**WARNING:**

**Never power up air bag system when SDM is not rigidly attached to the vehicle. Otherwise, personal injury may result.**

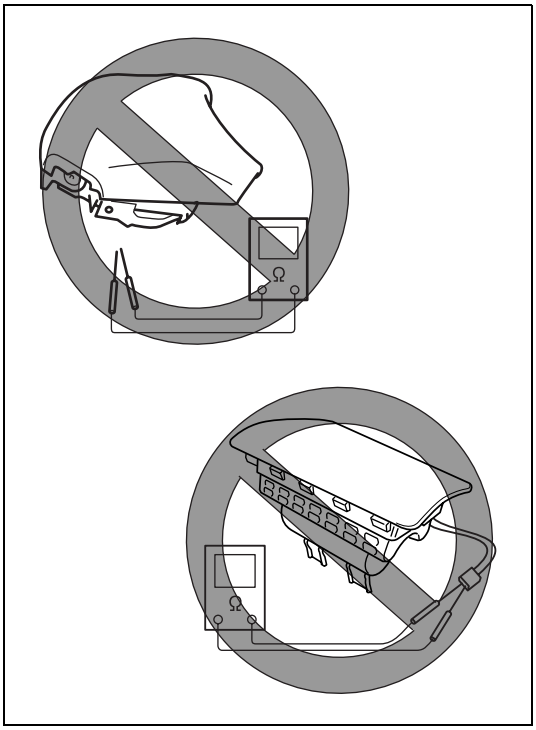
**CAUTION:**

**After detecting one time of such collision as to meet deployment conditions, the SDM must not be used. Refer to "Air Bag Diagnostic System Check" in this section when checking the 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.
- If SDM has been dropped, replace it with a new one.
- If installation part of SDM 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

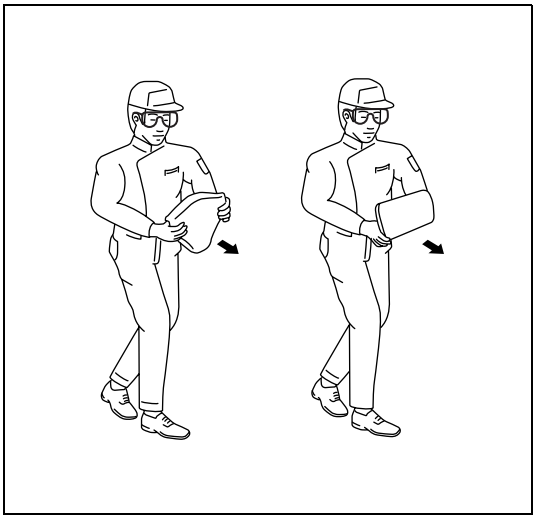
Special care is necessary when handling and storing a live (undeployed) air bag (inflator) modules.
The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.



**WARNING:**

**Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag.**

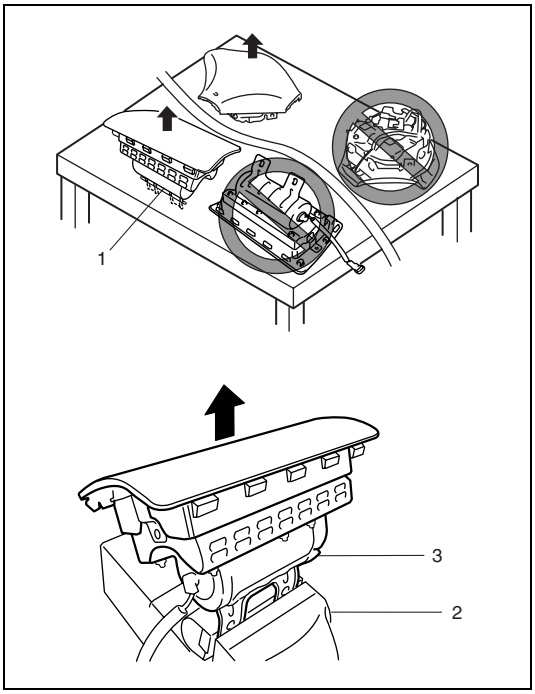
- Never attempt disassembly of the air bag (inflator) modules.
- If any abnormality is found, be sure to replace it with new one as an assembly.
- When an abnormality is noted as existing in the live (undeployed) air bag (inflator) module, be sure to deploy it before discarding it.
- When grease, cleaning agent, oil, water, etc., got on the air bag (inflator) modules (driver and passenger), 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.**

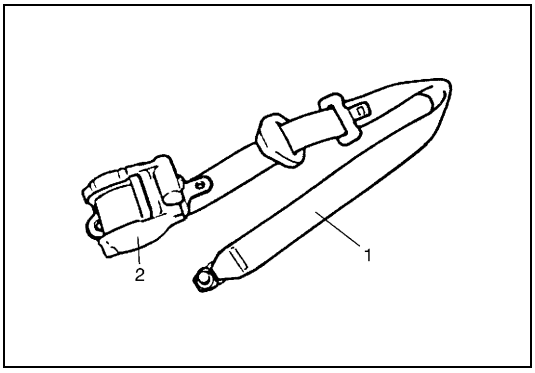
**Otherwise, personal injury may result.**




**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.**

### Live (Inactivated) Seat Belt Pretensioner



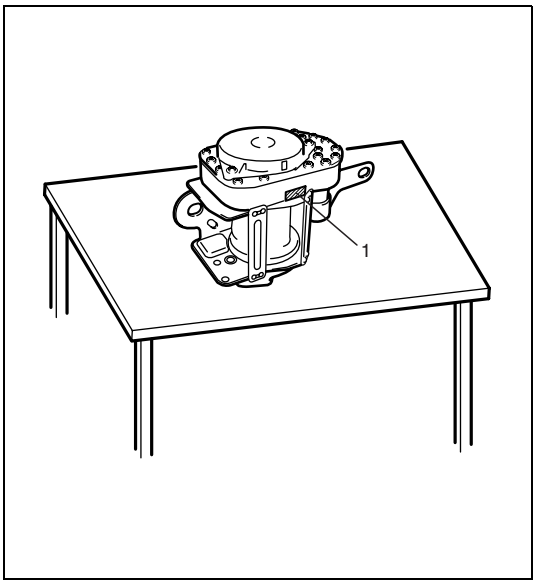

Special care is necessary when handling and storing a live (inactivated) seat belt pretensioners.
Also, when the seat belt pretensioners activate, gas is generated and the seat belt (1) is retracted into the retractor assembly (2) quickly.
Note, therefore, that if they activate accidentally, the seat belt pretensioners and other object(s) around them may be thrown through the air.




**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.**

- 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.**

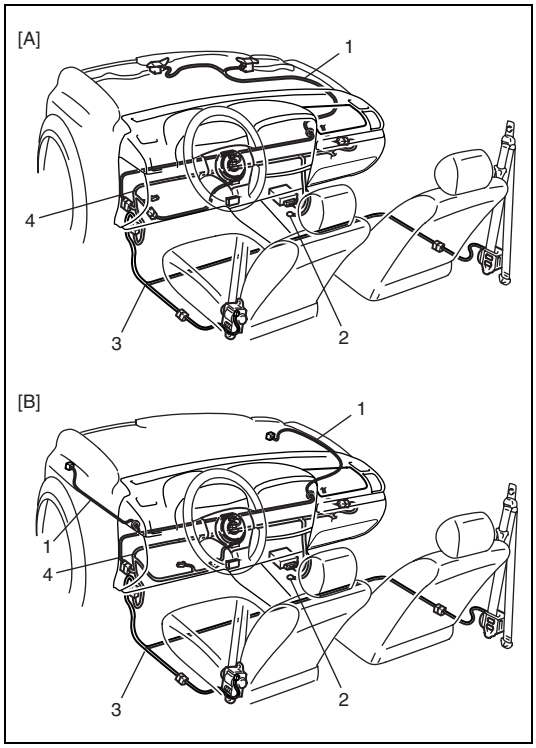
**Otherwise, personal injury may result.**

**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” in this section for disposal.




### Air Bag Wire Harness and Connector

Air bag wire harness is included in main harness (1), instrument panel harness (4) and floor harness (3). The part of connector side wire harness can be identified easily as it 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 all air bag system grounding points (2) is clean and grounds is securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.

| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |

### Disposal

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” in this section.

**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.**

## Repairs and Inspections Required After an Accident

**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 seat belt pretensioners (if equipped)**
  - **– Forward 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" in this section when checking the SDM.**

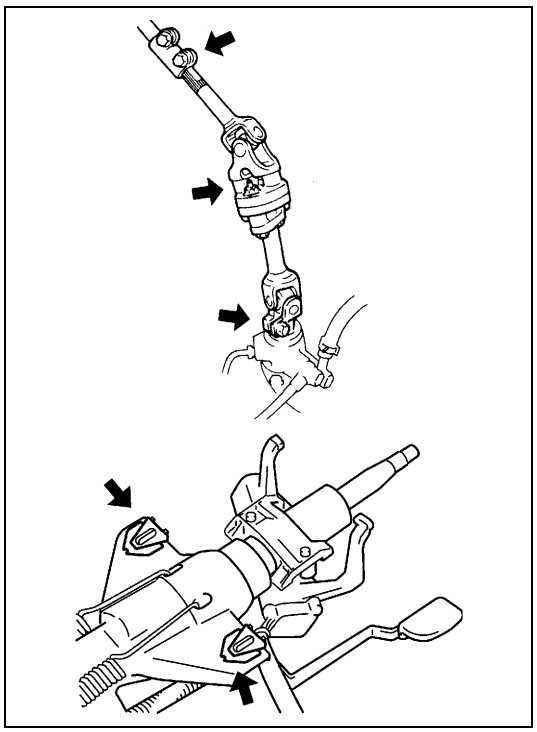
### Accident with deployment/activation – component replacement

Certain air bag system components must be replaced. Those components are:

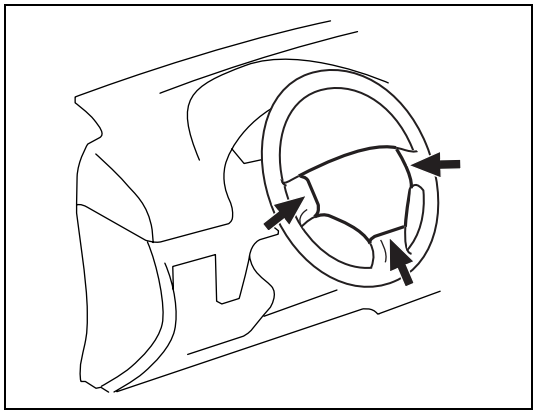
- Driver and passenger air bag (inflator) modules
  - – Replace with new one.
- Driver and Passenger seat belt pretensioners (if equipped)
  - – Replace with new one.
- SDM after detecting such collision as to meet deployment conditions
  - – Replace with new one.
- Forward sensors
  - – Replace with new one.

## Accident with or without deployment/activation - component inspections

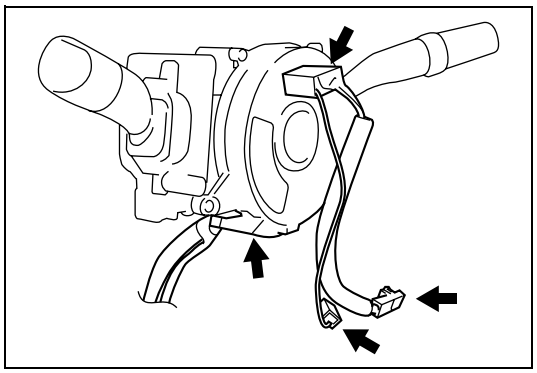
Certain air bag and restraint system components must be inspected after any crash, whether the air bag system activated or not.
Those components are:



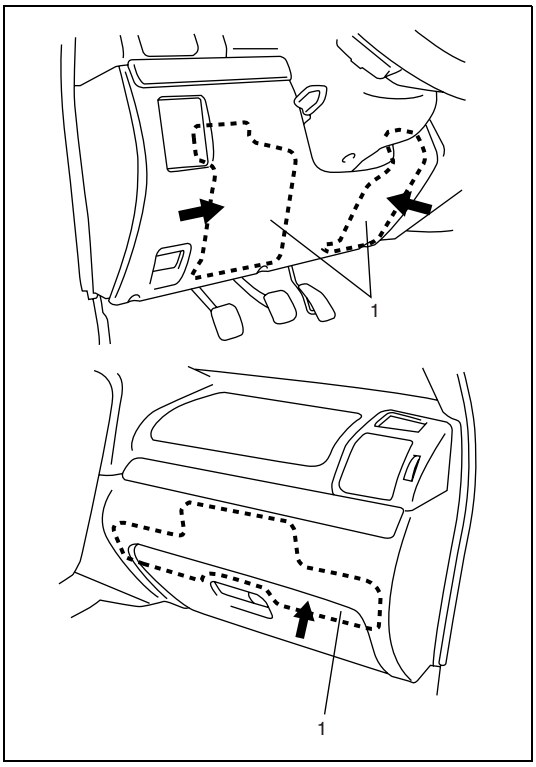
- Steering column and shaft joints
  – Check for length, damage and bend according to “Checking Steering Column for Accident Damage” in Section 3C1.
- Steering column bracket and capsules
  – Check for damage and bent.
- If any faulty condition is found in above checks, replace faulty part.



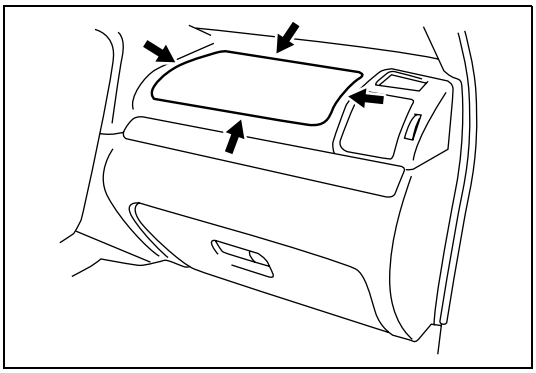
- Steering wheel and driver air bag (inflator) module
  – Check for damage or air bag (inflator) module fitness.
  – Check trim cover (pad surface) for cracks.
  – Check wire harness and connector for damage or tightness.
- If any faulty condition is found in above checks, replace faulty part.



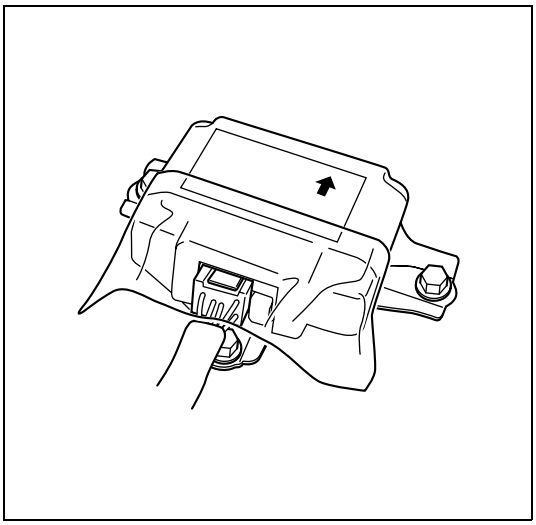
- Contact coil and combination switch assembly
  – Check wire harness and connectors for damage or tightness.
  – Check contact coil case for damage.
- If any faulty condition is found in above checks, replace.




- Instrument panel member, reinforcement and knee bolster and panel (1) (driver and passenger)
  - Check for any distortion, bending, cracking or other damage.
- If any faulty condition is found in above checks, replace.

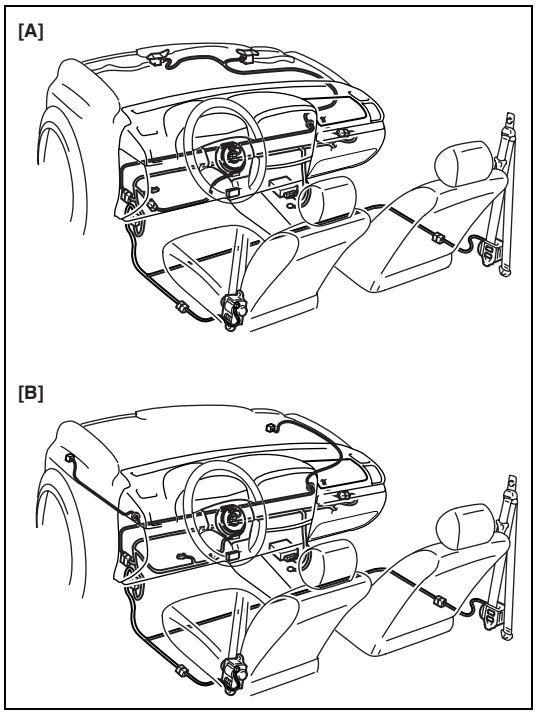


- Passenger air bag (inflator) module
  - Check for dents, cracks, damage or fitness.
  - Check trim cover for cracks or deformities.
  - Check harness and connector for damage or tightness.
- If any faulty condition is found in above checks, replace.



- SDM
  - Check for external damage such as deformation, scratch, crack, peeled paint, etc.
  - Check that SDM cannot be installed properly due to a cause in itself. (There is a gap between SDM and SDM plate, or it cannot be fixed securely.)
  - Check that connector or lead wire of SDM has a scorching, melting or damage.
  - Check SDM connector and terminals for tightness.
  - Check SDM sets a diagnostic trouble code referring to “DTC Check” in this section, and the diagnostic table leads to a malfunctioning SDM.

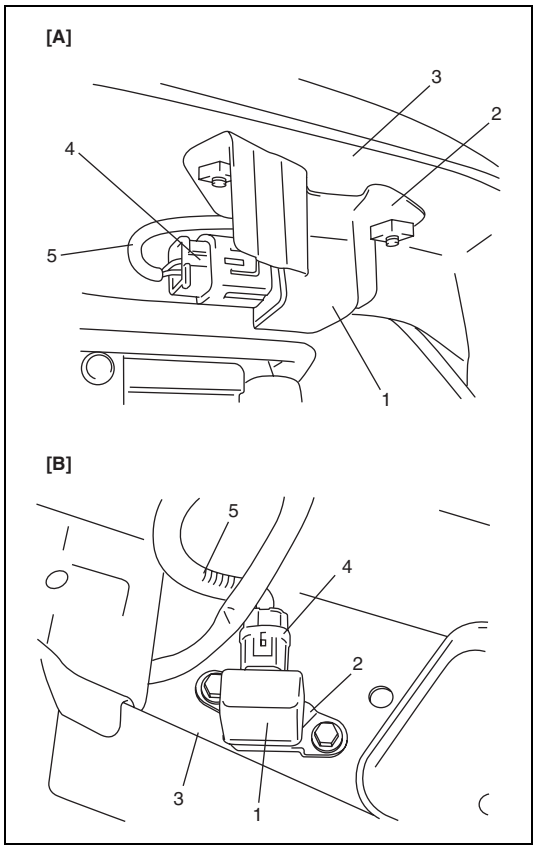
If any faulty condition is found in above checks, replace.




- Air bag wire harness and connections
  - Check for damages, deformities or poor connections referring to “Intermittents and Poor Connections” in this section.
  - Check wire harness clamps for tightness.

If any faulty condition is found, correct or replace.

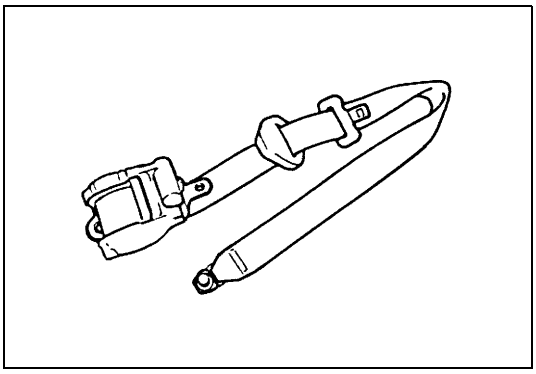
| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |




- Forward sensor
  - Check sensor (1), sensor bracket (2), and front panel (3) for damage bend or rust.
  - Check that connector (4) or lead wire (5) of forward sensor has a scorching, melting or damage.

If any faulty condition is found in above checks, replace.

| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |



- Seat belt pretensioner (if equipped)
  - Check for dents, cracks, damage or fitness
  - Check harness and connector for damage or tightness.

If any faulty condition is found in above checks, replace.

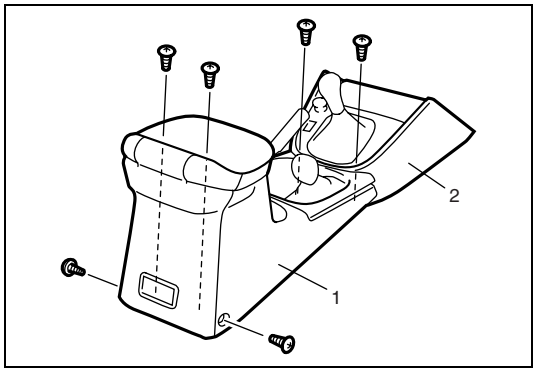
- Seat belts and mounting points
  - Refer to “Front Seat Belt” in Section 10.
- “AIR BAG” warning lamp
  - After vehicle is completely repaired, perform “Air Bag Diagnostic System Check” in this section.

# SDM

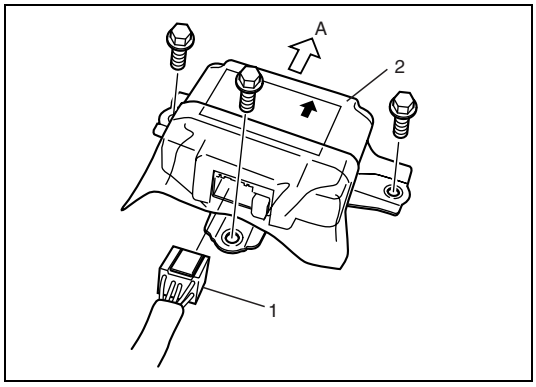
**WARNING:**
**During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).**
**Be sure to read "Service Precautions" in this section before starting to work and observe every precaution during work. Neglecting them may result in personal injury or inactivation of the air bag system when necessary.**

## Removal

1) Disconnect negative (–) cable at battery.
2) Disable air bag system referring to "Disabling Air Bag System" in this section.




3) Remove rear center console box (1) and front center console box (2) by removing screws.




4) Disconnect SDM connector (1) from SDM (2).
5) Remove SDM (2) from vehicle.

A: Forward

## Inspection

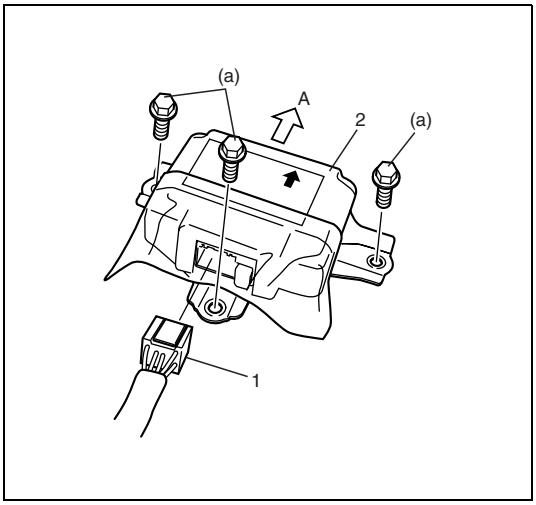
**CAUTION:**
- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM has been dropped, it should be replaced.**

- Check SDM and SDM plate for dents, cracks or deformation.
- Check SDM connector for damage, cracks or lock mechanism.
- Check SDM terminal for bent, corrosion or rust.

If any faulty condition is found in above checks, replace.

### Installation

1) Check that none of following faulty conditions exists.
   - Bend, scratch, deformity in vehicle body mounted on SDM
   - Foreign matter or rust on mating surface of vehicle body mounted on SDM




2) Install SDM (2) to vehicle.

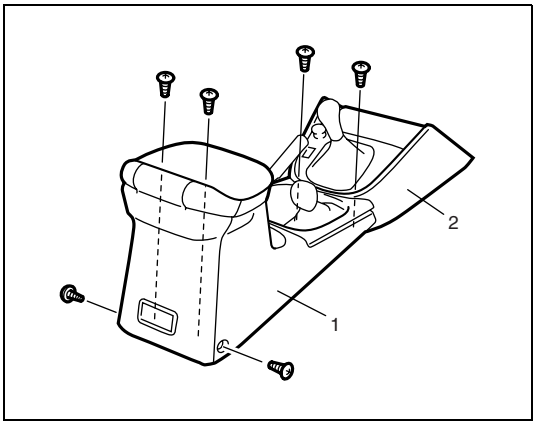
**CAUTION:**
**Ensure that arrow on the SDM is pointing toward the front of the vehicle.**

3) Tighten SDM bolts to specified torque.

**Tightening torque**
**SDM bolt (a): 7 N·m (0.7 kg-m, 5 lb-ft)**

4) Connect SDM connector (1) to SDM (2) securely.

A: Forward




5) Install front center console box (2) and rear center console box (1).

6) Connect negative cable to battery.
7) Enable air bag system. Refer to “Enabling Air Bag System” in this section.

## Forward Sensor

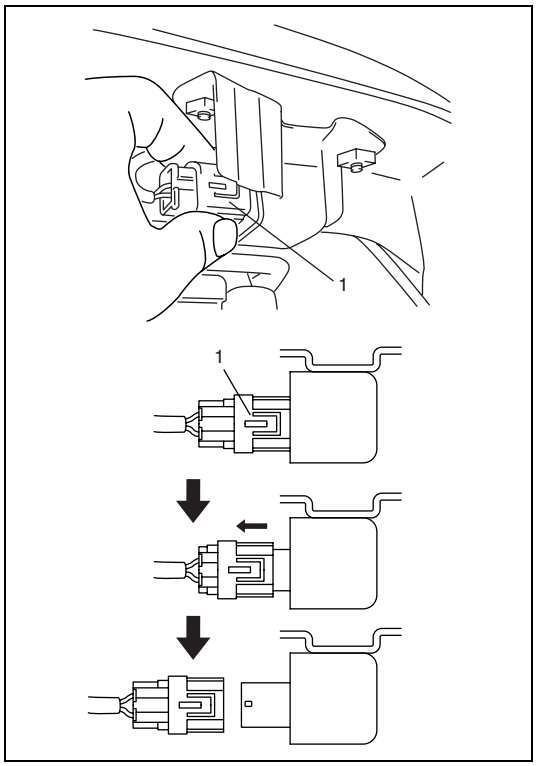
**WARNING:**

**During service procedures, be very careful when handling a sensor.**

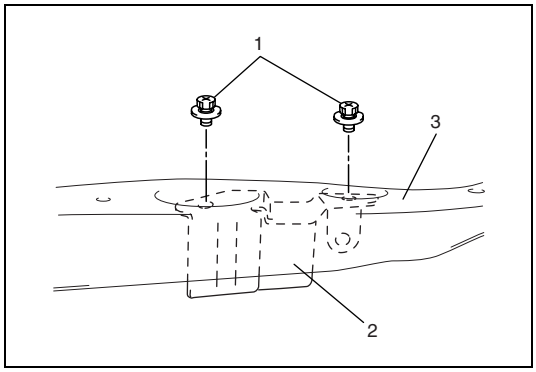
- **Never strike or jar a sensor.**
- **Under some circumstances, it could cause improper operation of the air bag system. A sensor and mounting bracket bolts must be carefully torqued to assure proper operation.**

### Removal

1) Disconnect negative cable at battery.
2) Disable air bag system referring to “Disabling Air Bag System” in this section.
3) Remove front grill referring to “Front Bumper” in Section 9.

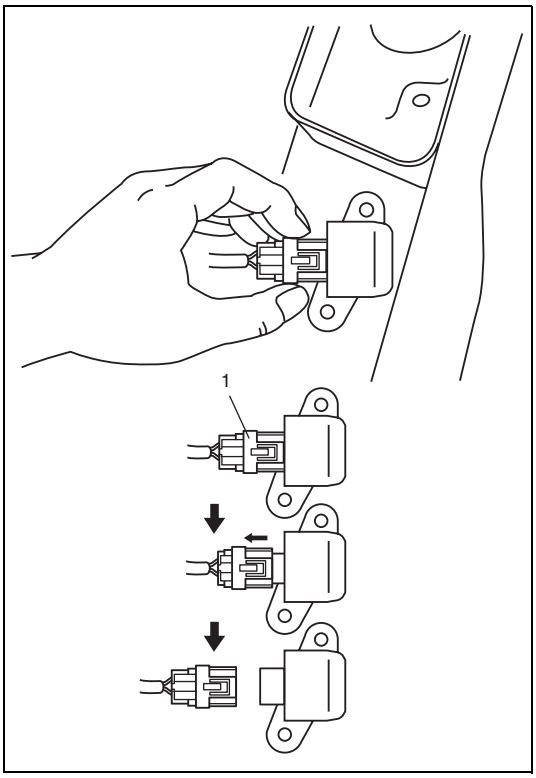



4) For type A model, perform following procedure.
   a) Disconnect forward sensor connector sliding connector outer (1) as shown.

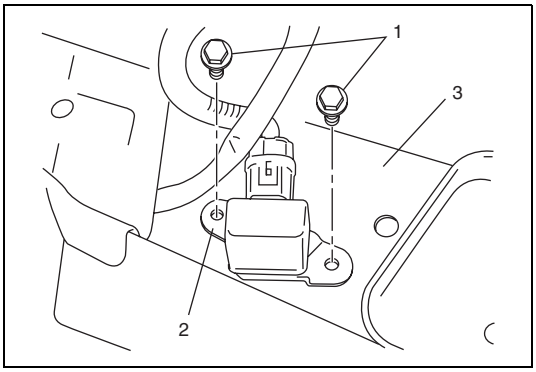



   b) Remove forward sensor bolts (1) and forward sensor (2) from front panel (3).

5) For type B and RHW engine model, perform following procedure.
   a) Remove headlight assembly referring to “Headlight Assembly” in Section 9.



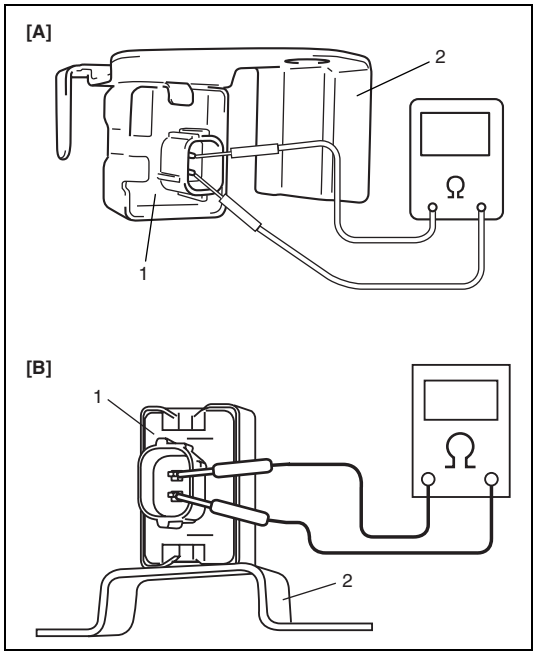

b) Disconnect forward sensor connector sliding connector outer (1) as shown.




c) Remove forward sensor bolts (1) and forward sensor (2) from front panel (3).

## Inspection

**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 (1) and its bracket (2) for dents, cracks, deformation or rust.
- Check sensor connector (sensor side and harness side) or lock mechanism for damage or crack.
- Check connector terminals for bent, corrosion or rust.
- Check sensor for resistance.

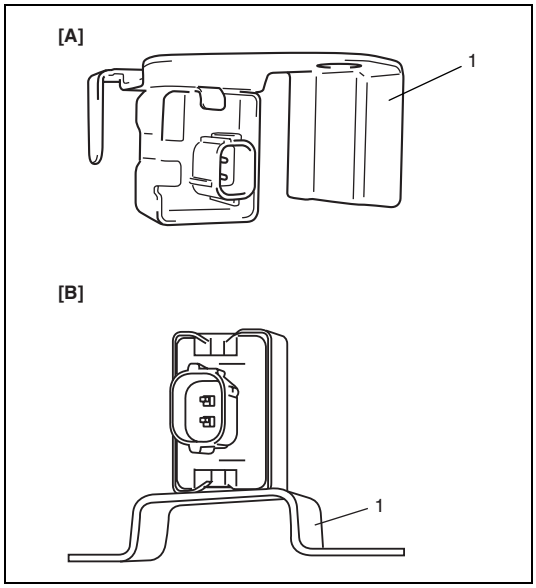
**Forward sensor resistance: 738 – 905 Ω**

| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |

## Installation

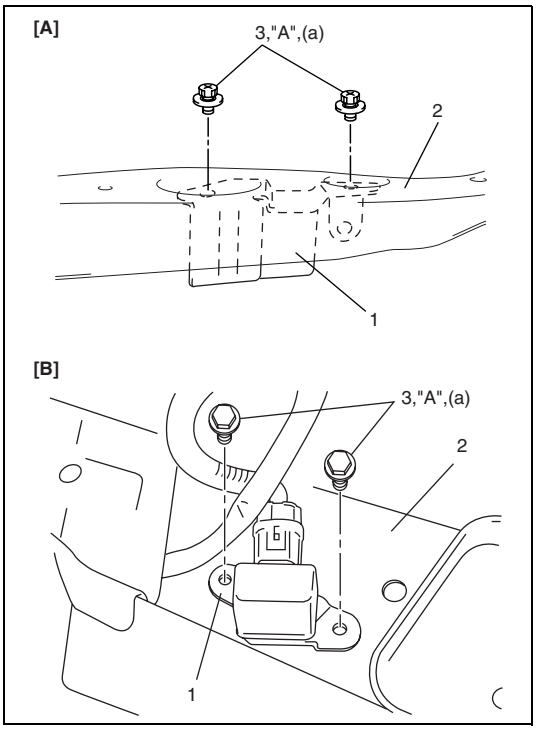
**CAUTION:**

**Proper operation of forward sensor requires sensor be rigidly attached to vehicle structure and that the arrow on sensor bracket be pointing toward the front of the vehicle.**




1) Check that none of following faulty conditions exists.
   - Bend or deformity of sensor bracket (1) and front panel.
   - Foreign matter on mating surface of sensor bracket (1) with sensor or excessive rust.

| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |

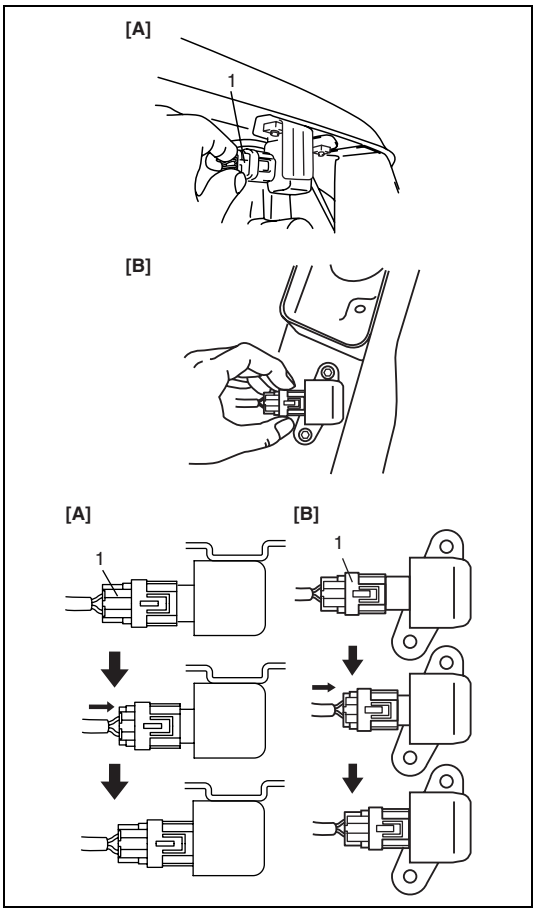



2) Apply thread lock cement to mounting bolts thread. Install forward sensor (1) on front panel (2) and tighten mounting bolts (3) to specified torque.

**"A": Thread lock cement 99000-32100**

**Tightening torque**
**Forward sensor mounting bolt**
**(a): 10 N·m (1.0 kg-m, 7.2 lb-ft)**

| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |




3) Connect forward sensor connector (1) by pushing connector till click is heard from it.

| |
|---|
| [A]: Type A |
| [B]: Type B and RHW engine model |

4) For type B and RHW engine model, install headlight assembly referring to "Headlight Assembly" in Section 9.
5) Install front grill referring to "Front Bumper" in Section 9.
6) Connect negative cable at battery.
7) Enable air bag system referring to "Enabling Air Bag System" in this section.

## Seat Belt Pretensioner

Refer to “Front Seat Belt” in Section 10A for removal, inspection and installation.

# 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 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) 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 modules and/or activate seat belt pretensioners installed on vehicle.

**WARNING:**

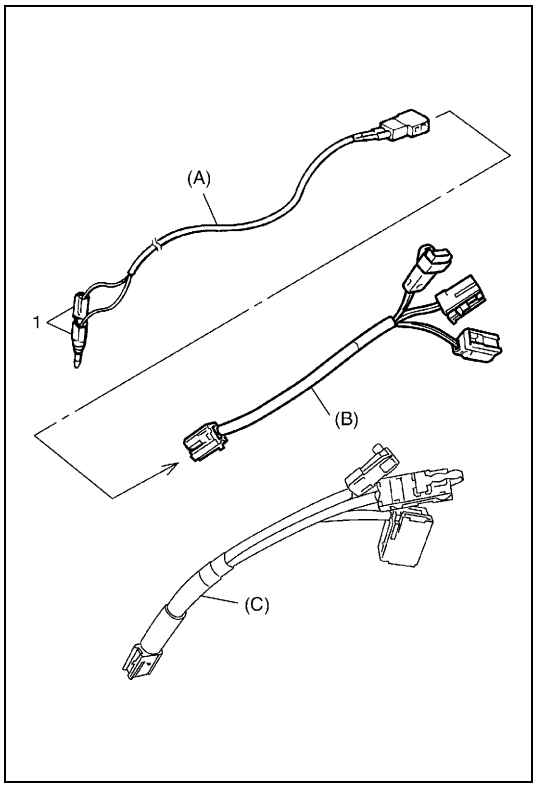
**The following precautions must be observed for this work. Failure to observe any of them may result in personal injury.**

- **Procedure should be followed strictly as described here.**
- **Be sure to read "Service Precautions" in this section 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), adapter cable (B) and adapter cable (C)). If any faulty is found, do not use it and be sure to use new special tool.

**Special tool**
**(A): 09932-75031**
**(B): 09932-78332**
**(C): 09932-78320**

**NOTE:**

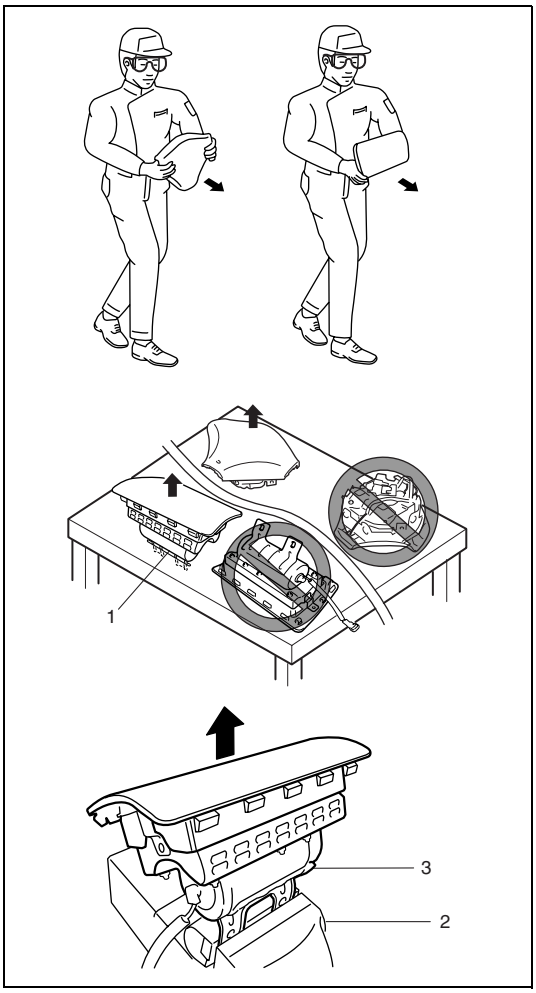
**If faulty seat belt pretensioner connector of adapter cable (C) is found, replace it to spare connector (special tool).**

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.**

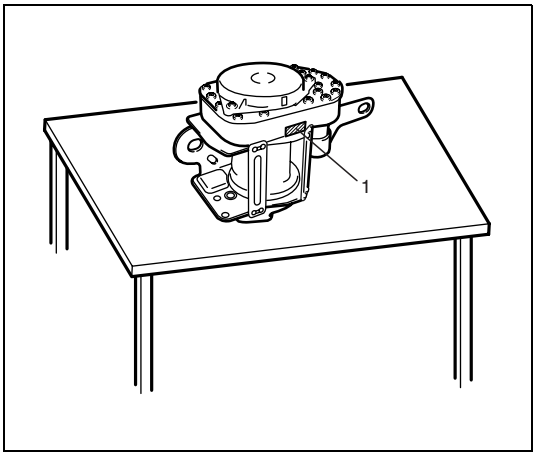
5) Remove applicable air bag (inflator) module or seat belt pretensioner as follows.
   - For driver air bag (inflator) module
     Remove driver air bag (inflator) module referring to "Driver Air Bag (Inflator) Module" in Section 3C.
   - For passenger air bag (inflator) module
     Remove passenger air bag (inflator) module referring to "Passenger Air Bag (inflator) Module" in this section.
   - For seat belt pretensioner
     Remove seat belt referring to "Front Seat Belt" in Section 10.




**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 work bench with a slit (1) or use the work bench 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.**

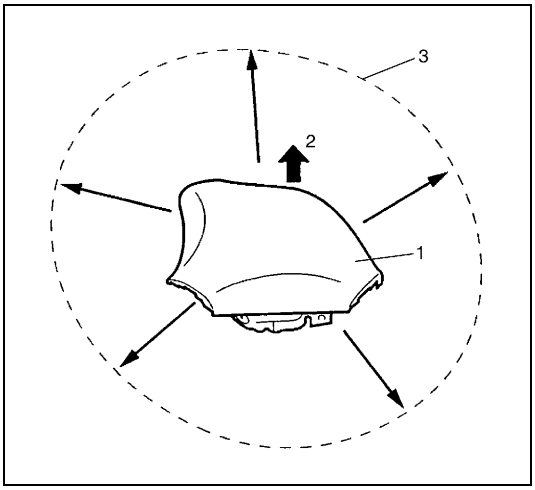



**WARNING:**

- **For handing and storage of seat belt pretensioner, select place where ambient temperature 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 side facing up. It is also prohibited to put something on seat belt pretensioner.**

**Otherwise, personal injury may result.**

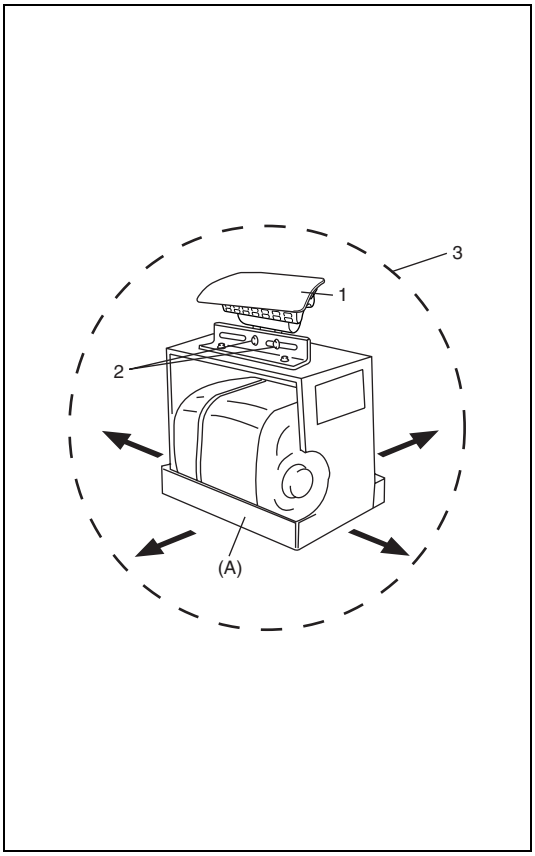
6) Set air bag (inflator) module or seat belt pretensioner as follows.




• 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) 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.

b) Place driver air bag (inflator) module (1) with its vinyl trim cover facing up (2) on ground in step a).




• 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) 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.

b) Place deployment fixture (A) on ground in step i).

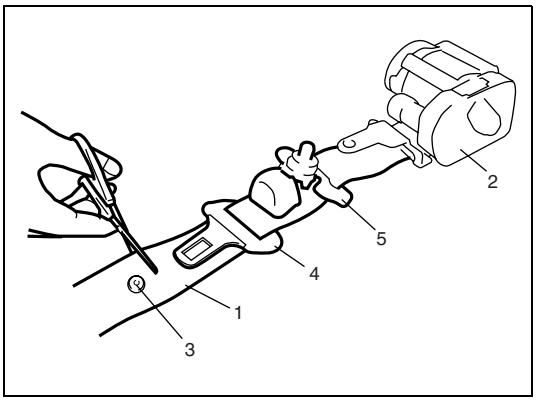
**Special tool**
**(A): 09932-75041**

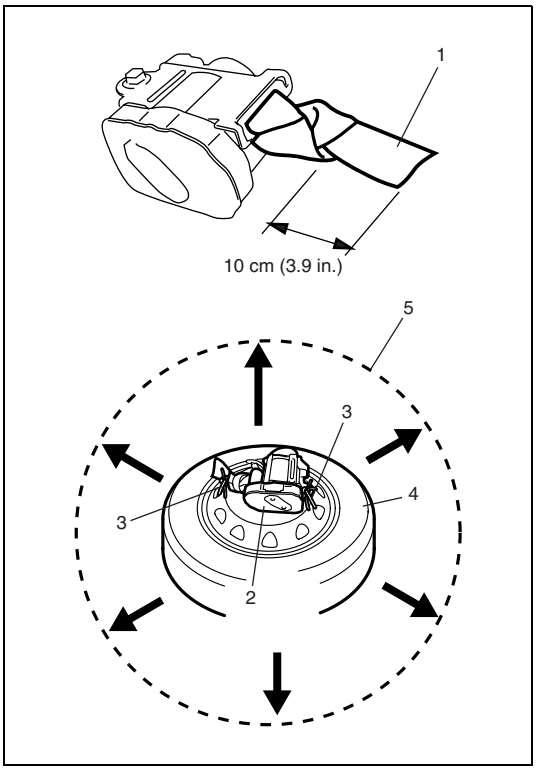
c) Fill plastic reservoir in deployment fixture (A) with water or sand. This is necessary to provide sufficient stabilization of fixture during deployment.

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).**




• 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.

d) Tie seat belt pretensioner (2) with wire harness (3) to wheel-installed tire (4) as shown.

**Wire harness specification:**

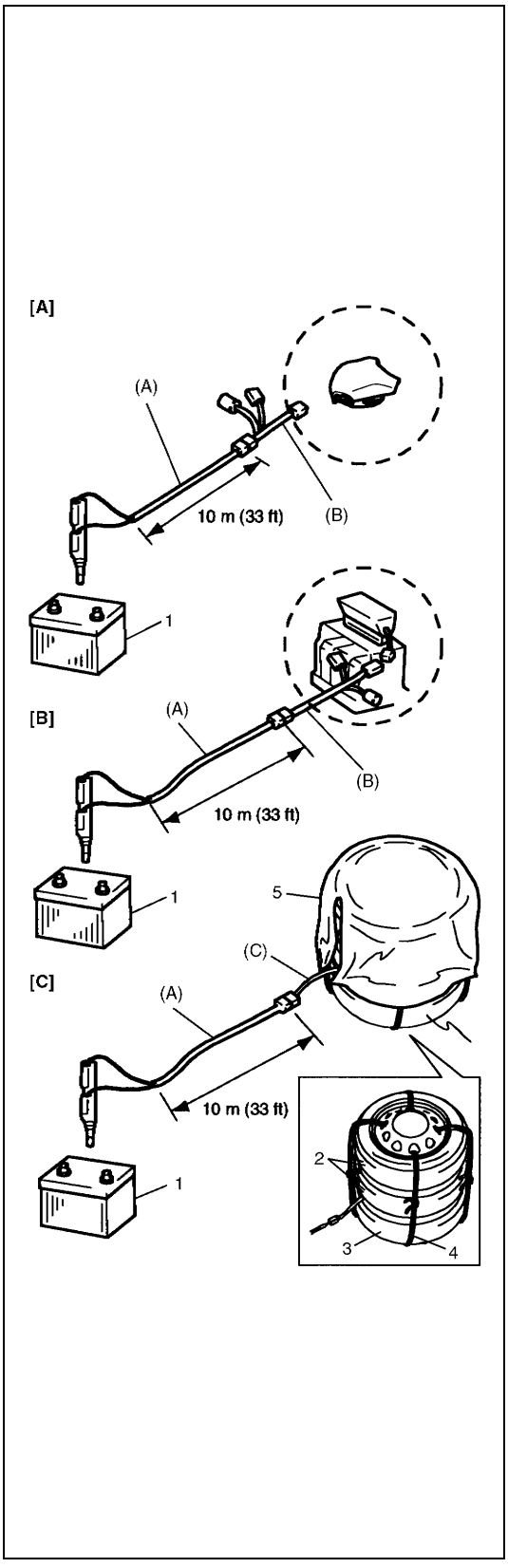
**Stripped wire harness section 1.25 $mm^2$ (0.0019 $in.^2$) or more (Stripped wire harness diameter 1.25 mm (0.05 in.) or more)**

**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, space on shop floor where there is no activity and provide sufficient ventilation. Ensure no loose or flammable objects are within activation area.

f) Place wheel-installed tire (4) with seat belt pretensioner (2) on ground in step e).




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 shorted end of deployment harness (A).
9) Verify 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) or (C) as follows.

**Special tool**
**(B): 09932-78332**
**(C): 09932-78320**

- For driver air bag (inflator) module
  Verify that driver air bag (inflator) module is resting with its vinyl trim cover facing up, and connect adapter cable (B) to driver air bag (inflator) module.
- For passenger air bag (inflator) module
  Verify 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 seat belt pretensioner

a) Connect adapter cable (C) to seat belt pretensioner.
b) Pile 2 wheel-installed tires (2) on top of tire with seat belt pretensioner (3), and tie them with wire harness (4) as shown.

**Wire harness specification:**

**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 around at least 2 times.**

c) Drape blanket (5) over those tires.
11) Connect adapter cable (B) or (C) to deployment harness (A) connector and lock connectors with lock lever.

| |
|---|
| [A]: For driver air bag (inflator) module |
| [B]: For passenger air bag (inflator) module |
| [C]: For seat belt pretensioner |

12) Notify all people in immediate area that you intend to deploy/ activate air bag (inflator) module or seat belt pretensioner.

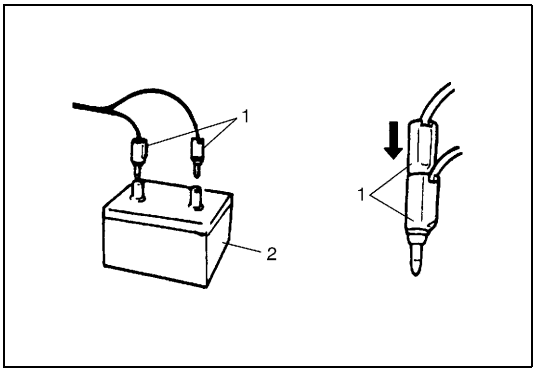
**NOTE:**

- **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 (inflater) 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.**

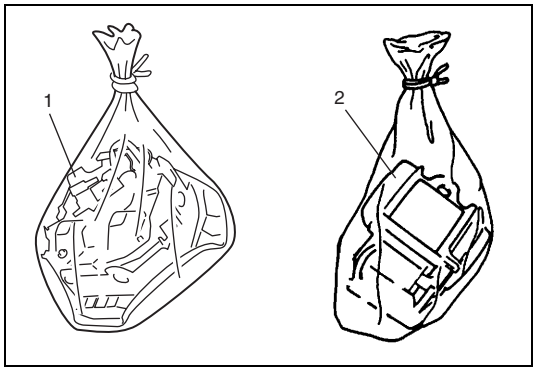



13) Separate two banana plugs (1) on deployment harness.
14) Connect deployment harness to 12 volts vehicle battery (2). This will immediately deploy or activate air bag (inflator) module or seat belt pretensioner.
15) Disconnect deployment harness from 12 volts vehicle battery (2) and short two deployment harness leads together by fully seating one banana plug into the other.

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 connector as follows.
    - For air bag (inflator) module
      Air bag (inflator) module connector of adapter cable (special tool) are designed to be reused. However they should be inspected for damage after deployment and replace it with new adapter cable (special tool), if necessary.
    - For seat belt pretensioner
      Seat belt pretensioner connector of adapter cable (special tool) should be inspected for damage when seat belt pretensioner is activated. Replace it with spare connector (special tool), if necessary.

**NOTE:**

**Do not reuse faulty seat belt pretensioner connector of adapter cable (special tool) because it can be destroyed by shock when seat belt pretensioner is activated.**



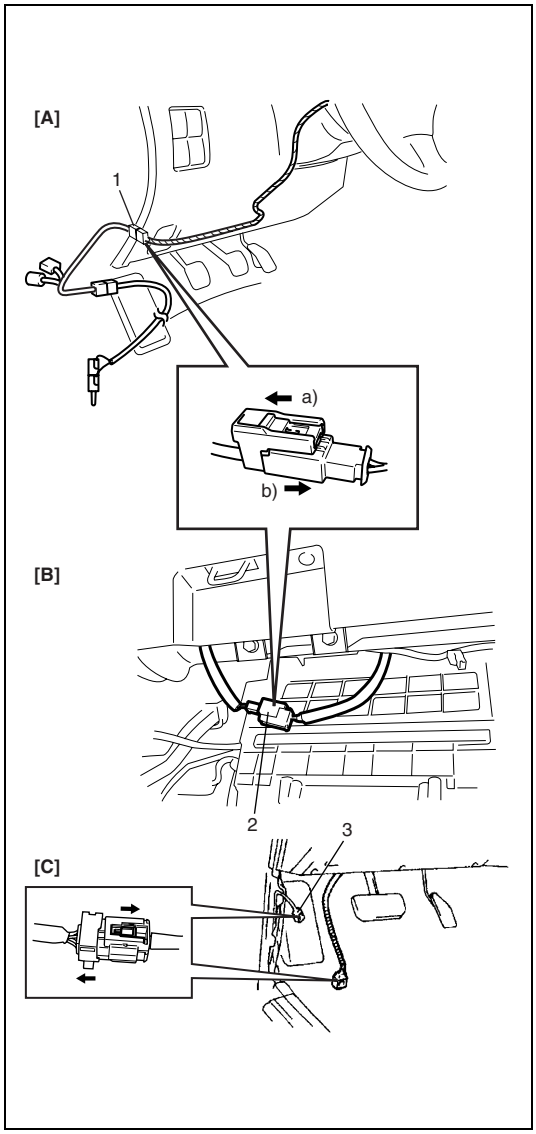

20) Dispose of deployed air bag (inflator) module (1) or activated seat belt pretensioner (2) through normal refuse channels after it has cooled for at least 30 minutes and tightly seal air bag (inflator) module (1) or seat belt pretensioner (2) in strong vinyl bag. (Refer to “Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal” in detail.)
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 or unactivated seat belt pretensioner referring to “Service Precautions” for details.
25) Contact your local distributor for further assistance.

## Deployment/Activation Inside Vehicle



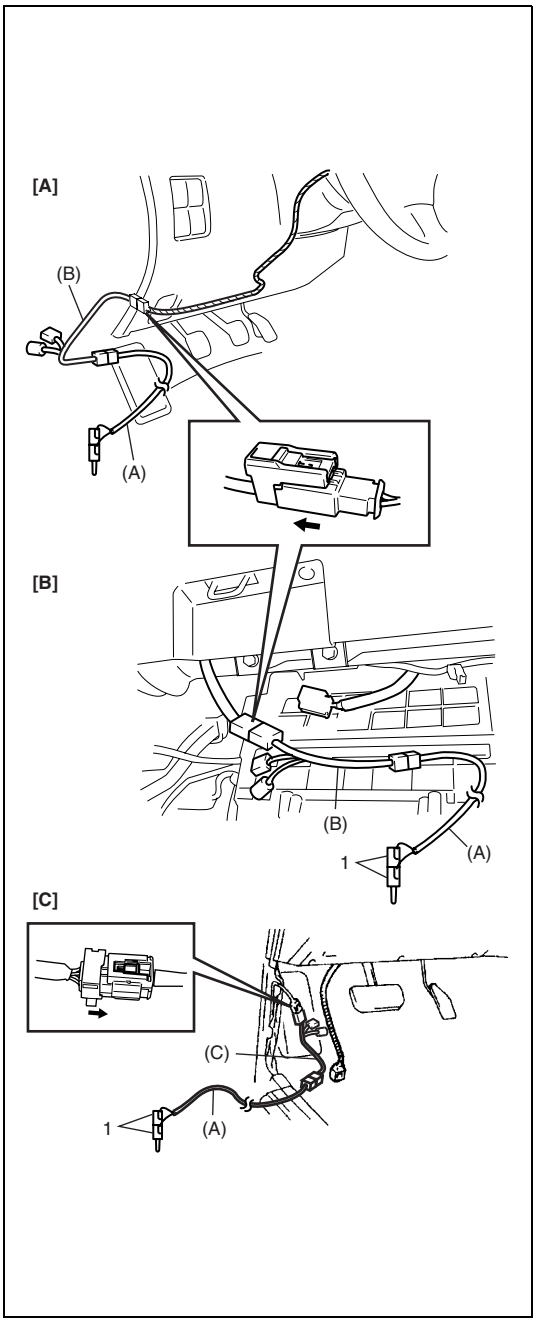

When the vehicle will be destroyed, or salvaged for component parts, deploy the air bag modules and/or activate seat belt pretensioners installed on vehicle.

**NOTE:**

**If equipped with the seat belt pretensioners, deploy both side seat belt pretensioners at the same time.**

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.
   a) For driver air bag (inflator) module
      Disconnect contact coil connector (1) located near base of steering column.
   b) For passenger air bag (inflator) module
      Remove glove box from instrument panel and disconnect passenger air bag (inflator) module connector (2).
   c) For seat belt pretensioners (right and left)
      Remove left side front pillar lower trim and disconnect seat belt pretensioner connector (3) for both side seat belt pretensioners.
4) Confirm that each air bag (inflator) module and/or seat belt pretensioners is securely mounted.

| | |
|---|---|
| [A]: | Driver Air Bag (Inflator) Module |
| [B]: | Passenger Air Bag (Inflator) Module |
| [C]: | Seat Belt Pretensioner |




5) Check that there is no open, short or damage in special tools (deployment harness (A), adapter cable (B) and adapter cable (C)). If any faulty condition is found, do not use it and be sure to use new special tool. And connect adapter cable (B) or (C) to deployment harness (A) and lock connectors with lock lever.

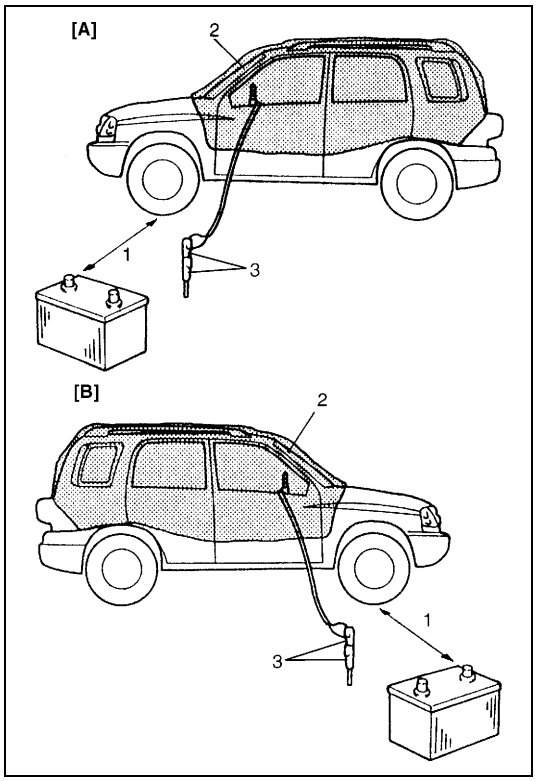
**Special tool**
**(A): 09932-75031**
**(B): 09932-78332**
**(C): 09932-77320**

6) 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 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.
   a) For air bag (inflator) module
      Connect adapter cable (B) in series with deployment harness (A) and push adapter cable (B) connector to air bag (inflator) module connector (driver or passenger) till click can be heard.
   b) For seat belt pretensioners (right and left)
      Connect adapter cable (C) in series with deployment harness (A) and push adapter cable (C) connector to seat belt pretensioner connector till click is heard.

| | |
|---|---|
| [A]: | Driver air bag (inflator) module |
| [B]: | Passenger air bag (inflator) module |
| [C]: | Seat belt pretensioner (right and left) |




8) Route deployment harness (1) out of vehicle.
9) Verify 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.

| |
|---|
| [A]: Driver side for left hand steering vehicle |
| [B]: Driver side for right hand steering vehicle |

13) Notify all people in immediate area that you intend to deploy air bag (inflator) module or activate seat belt pretensioner.

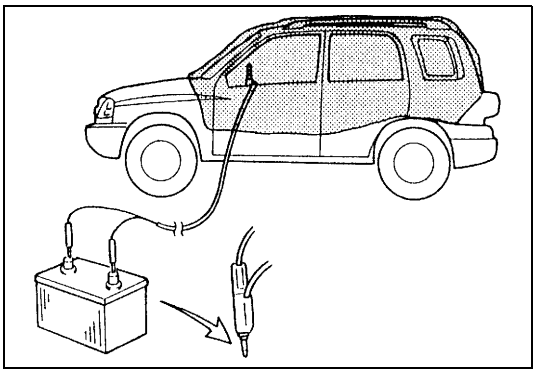
**NOTE:**

- **When air bag (inflator) module deploys or 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 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 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 (inflater) 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.**



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 pretensioner.
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.
17) Repeat Step 3) through Step 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 pretensioner.
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) are designed to be reused. However they 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 as follows.
    - For driver air bag (inflator) module
      Remove driver air bag (inflator) module referring to “Driver Air Bag (Inflator) Module” in Section 3C.
    - For passenger air bag (inflator) module
      Remove passenger air bag (inflator) module referring to “Passenger Air Bag (Inflator) Module” in this section.
    - For seat belt pretensioner
      Remove seat belt referring to “Front Seat Belt” in Section 10.

25) Temporarily store undeployed air bag (inflator) module and/or unactivated seat belt pretensioner referring to “Service Precautions” in this section.
26) Contact your local distributor for further assistance.

## Deployed Air Bag (Inflator) Module and Activated Seat Belt Pretensioner Disposal

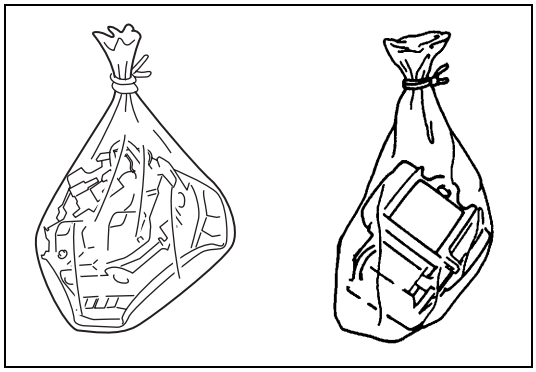
**WARNING:**

**Failure to follow proper air bag (inflator) module and seat belt pretensioner disposal procedures can result in air bag deployment and pretensioner activation which 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, 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.
- 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.
- 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 it.

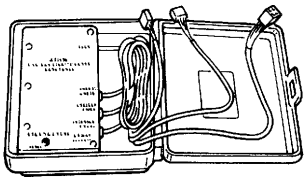
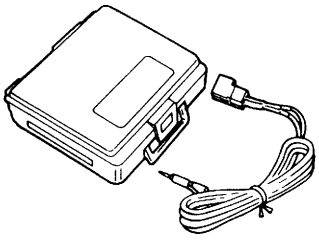
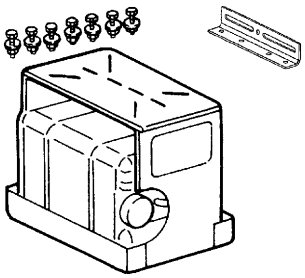
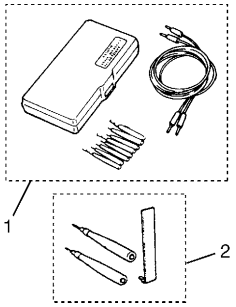
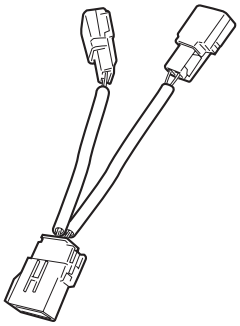
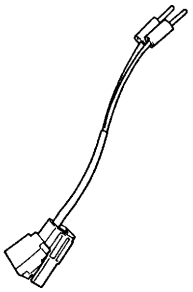
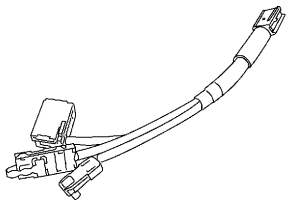
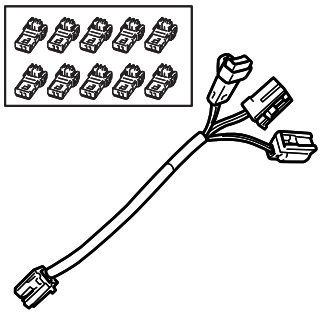
# Tightening Torque Specification

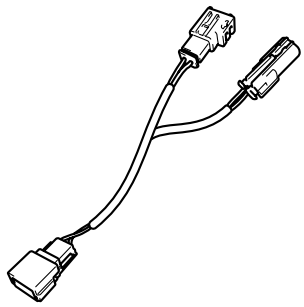
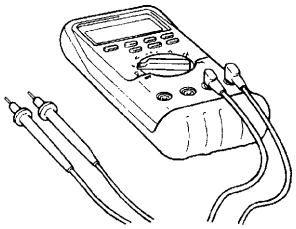
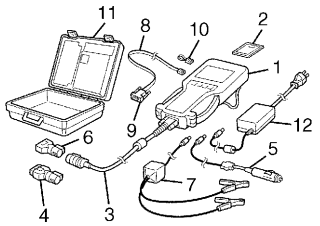
| Fastening part | Tightening torque | | |
|---|---|---|---|
| | N•m | kg-m | lb-ft |
| SDM bolt | 7 | 0.7 | 5 |
| Passenger air bag (inflator) module screw | 5.5 | 0.55 | 4.0 |
| Passenger air bag (inflator) module bolt | 23 | 2.3 | 16.5 |
| Forward sensor mounting bolt | 10 | 1.0 | 7.2 |
| Driver air bag (inflator) module bolt | Refer to Section 3C1. | | |
| Seat belt pretensioner (retractor assembly) bolt | Refer to Section 10A. | | |

# Required Service Material

| Material | Recommended SUZUKI Material (Part Number) | Use |
|---|---|---|
| Thread lock cement | THREAD LOCK CEMENT 1332B (99000-32100) | • Forward sensor mounting bolt |

# Special Tool

| | | | |
|---|---|---|---|
|  09932-75010 Air bag driver/passenger load tool |  09932-75031 Air bag deployment harness |  09932-75041 Passenger air bag (inflator) module deployment fixture |   09932-76010 Connector test adapter set (See NOTE “A”.) |
|  09932-77320 Diagnosis adapter cable 4P |  09932-78310 Adapter cable |  09932-78320 Adapter cable |  09932-78332 Adapter cable (See NOTE “D”.) |

| | | |
|---|---|---|
|  |  |  |
| 09932-78340<br>Adapter cable | Digital multimeter (See NOTE “B” and WARNING.) | Tech-2 kit (SUZUKI scan tool) (See NOTE “C”.) |

**WARNING:**

**Be sure to use the specified digital multimeter. Otherwise, air bag (inflator) module deployment or personal injury may result.**

**NOTE:**

- **“A”: This set includes the following items.**
  **1. Connector test adapter kit (09932-75020), 2. Connector test adapter & shorting bar release tool (09932-76020)**
- **“B”: Digital multimeter specification: Maximum test current is 10 mA or less at minimum range of resistance measurement.**
- **“C”: This kit includes the following items and substitutes for the Tech 2 kit.**
  **1. Tech 2, 2. PCMCIA card, 3. DLC cable, 4. SAE 16/19 adapter, 5. Cigarette cable, 6. DLC loopback adapter, 7. Battery power cable, 8. RS232 cable, 9. RS232 adapter, 10. RS232 loopback connector, 11. Storage case, 12. Power supply**
- **“D”: These connector are spare connector for adaptor cable (09932-78320).**

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