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 mechanics 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 Supplemental Restraint (Air Bag) System:

- **Service on or around the air bag system components must be performed only by an authorized SUZUKI dealer. Please observe all WARNINGS, CAUTIONS and "Service Precautions" under "On-Vehicle Service" in SECTION 10B 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 serve 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 unintentional activation of the air bag system.**
- **Do not modify the steering wheel, instrument panel or any other air bag system component. 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, SDM and seat belt pretensioner (if equipped)) beforehand to avoid component damage or unintended activation of the system.**

FOREWORD

This manual contains procedures for diagnosis, maintenance, adjustments, minor service operations, replacement of components and for disassembly and assembly of major components.

Applicable model: GA413

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

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

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

Related Manual

Manual Name	Manual Number
AIR CONDITIONING BASIC MANUAL	99520-02130
GA413 WIRING DIAGRAM MANUAL	99512-76A00-015

SUZUKI MOTOR CORPORATION
OVERSEAS SERVICE DEPARTMENT

NOTE:
The screen toned SECTION 8A WIRING DIAGRAM above is not contained in this manual.
The SECTION 8A is contained in WIRING DIAGRAM MANUAL in the table on the previous page.

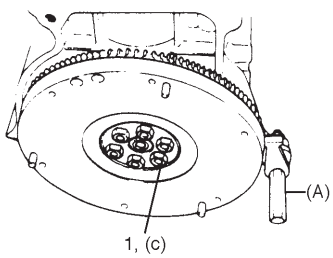
SECTION 0A

GENERAL INFORMATION

CONTENTS

HOW TO USE THIS MANUAL

1) There is a TABLE OF CONTENTS FOR THE WHOLE MANUAL on the third page of this manual, whereby you can easily find the section that offers the information you need. Also, there is a CONTENTS on the first page of EACH SECTION, where the main items in that section are listed.
2) Each section of this manual has its own pagination. It is indicated at the top of each page along with the Section name.
3) The SPECIAL TOOL usage and TORQUE SPECIFICATION are given as shown in figure below.



1. Flywheel bolts or drive plate bolts for A/T vehicle

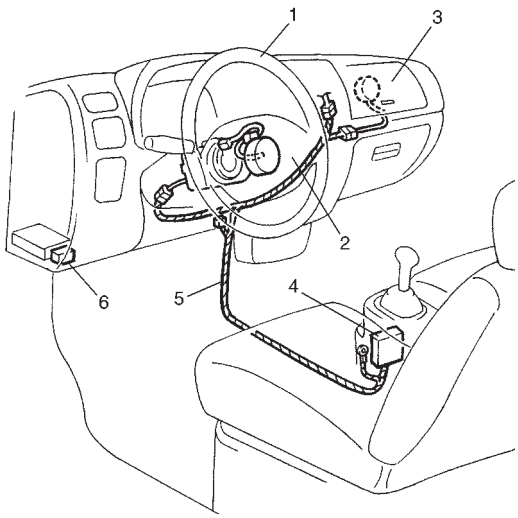
6) Install oil pump. Refer to OIL PUMP.
7) Install flywheel (for M/T vehicle) or drive plate (for A/T vehicle). Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specified torque.

Special Tool
(A): 09924-17810
Tightening Torque
(c): 78 N·m (7.8 kg-m, 56.0 lb-ft)

4) A number of abbreviations are used in the text.
   For their full explanations, refer to **ABBREVIATIONS MAY BE USED IN THIS MANUAL** of this section.
5) The SI, metric and foot-pound systems are used as units in this manual.
6) DIAGNOSIS are included in each section as necessary.
7) At the end of each section, there are descriptions of SPECIAL TOOLS, REQUIRED SERVICE MATERIALS and TIGHTENING TORQUE SPECIFICATIONS that should be used for the servicing work described in that section.

PRECAUTIONS

PRECAUTIONS FOR VEHICLE EQUIPPED WITH A SUPPLEMENTAL RESTRAINT (AIR BAG) SYSTEM



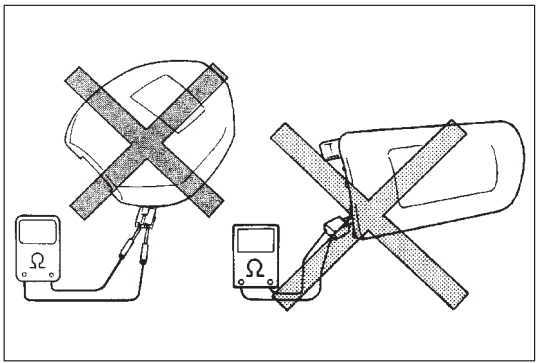
1. Steering wheel
2. Driver air bag (inflator) module
3. Passenger air bag (inflator) module (if equipped)
4. SDM
5. Air bag harness
6. DLC

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.**

DIAGNOSIS

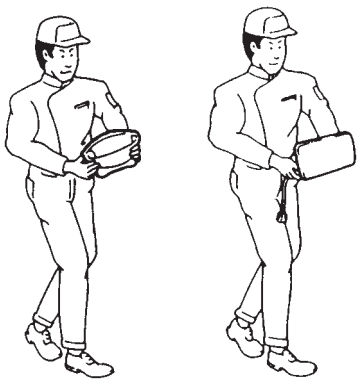
- **When troubleshooting air bag system, be sure to follow DIAGNOSIS in SECTION 10B. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis, and incorrect parts replacement.**
- **Never use electrical test equipment other than that specified in this manual.**



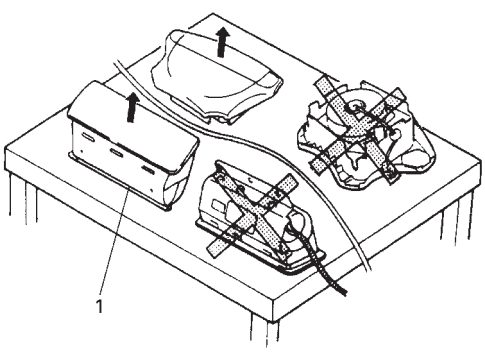
WARNING:

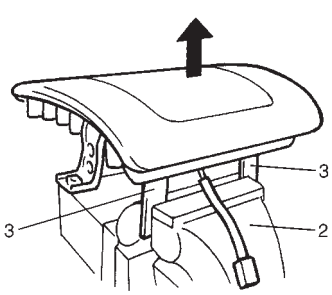
Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag.

ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.



ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.





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

SERVICING AND HANDLING

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.**

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 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.

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) 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 90 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 flow table requests it, as this will set a diagnostic trouble code.**
- **Never use air bag system component parts from another vehicle.**

CAUTION:

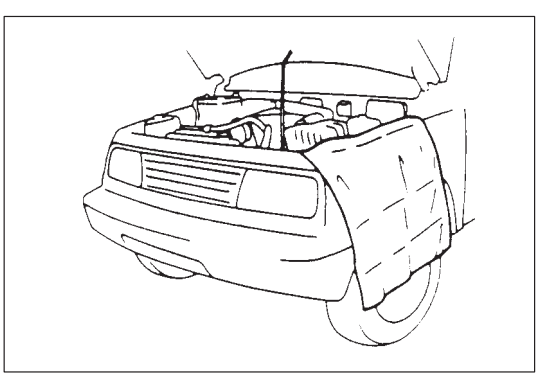
- **When using electric welding, be sure to temporarily disable air bag system. Refer to DISABLING AIR BAG SYSTEM under SERVICE PRECAUTIONS in SECTION 10B.**
- **Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.**
- **WARNING/CAUTION 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.

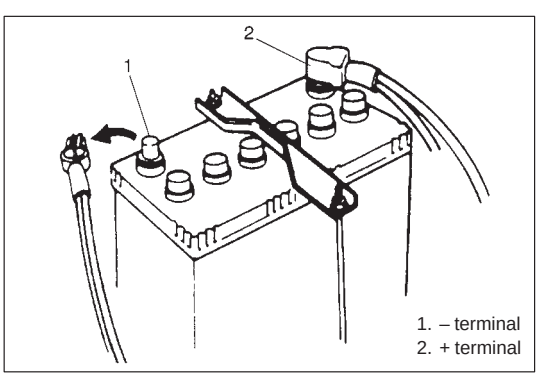
WARNING:

- **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 dish washing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil, recycle or properly dispose of used oil and filters.**
- **Make sure the bonnet (front hood) 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.**

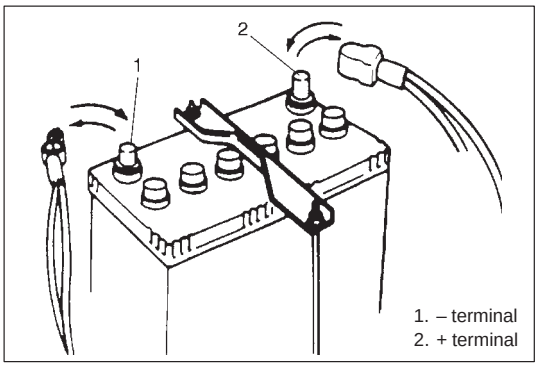


CAUTION:

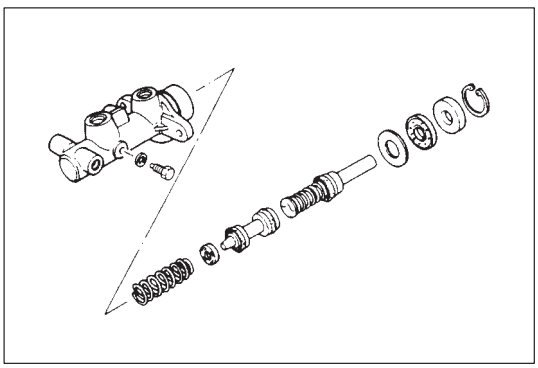
- **Before starting any service work, cover fenders, seats and any other parts that are likely to get scratched or stained during servicing. Also, be aware that what you wear (e.g. buttons) may cause damage to the vehicle's finish.**



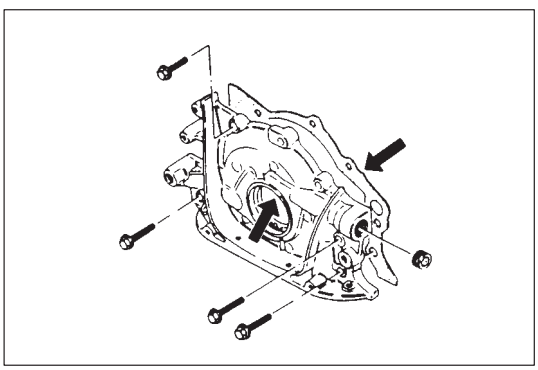
- **When performing service to electrical parts that does not require use of battery power, disconnect the negative cable of the battery.**



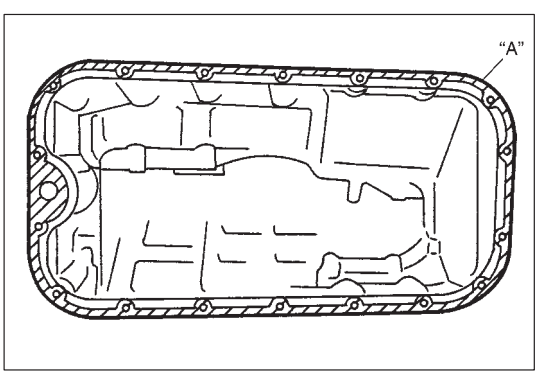
- **When removing the battery, be sure to disconnect the negative cable first and then the positive cable. When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover.**



- **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.**

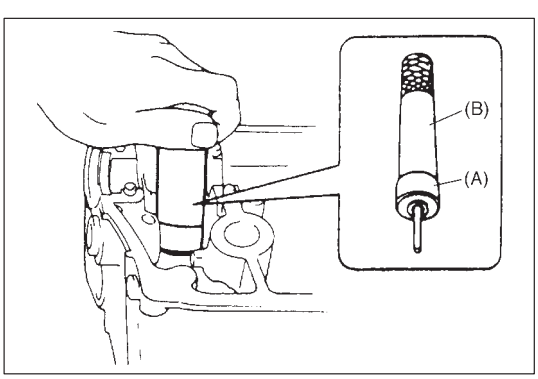


- **Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material from the mating surfaces.**



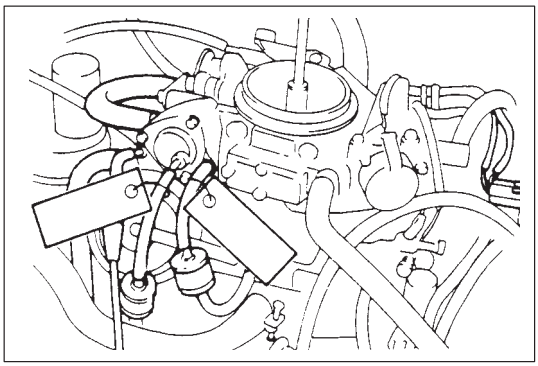
- **Make sure that all parts used in reassembly are perfectly clean.**
- **When use of a certain type of lubricant, bond or sealant is specified, be sure to use the specified type.**

  "A": Sealant 99000-31150

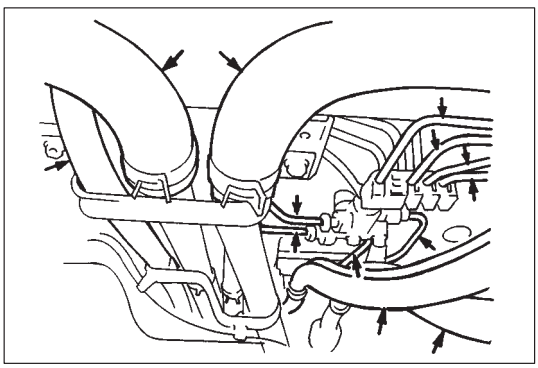


- **Be sure to use special tools when instructed.**

  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.



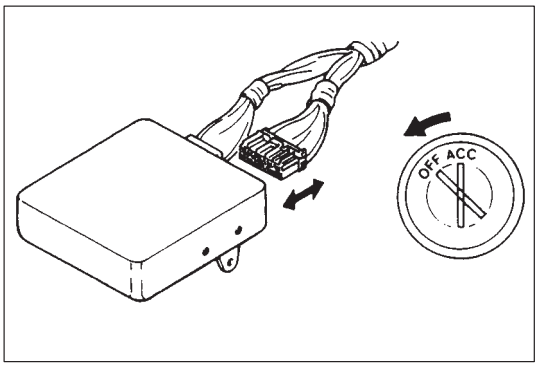
- After servicing fuel, oil, coolant, vacuum, exhaust or brake systems, check all lines related to the system for leaks.

- 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.

PRECAUTIONS FOR CATALYTIC CONVERTER

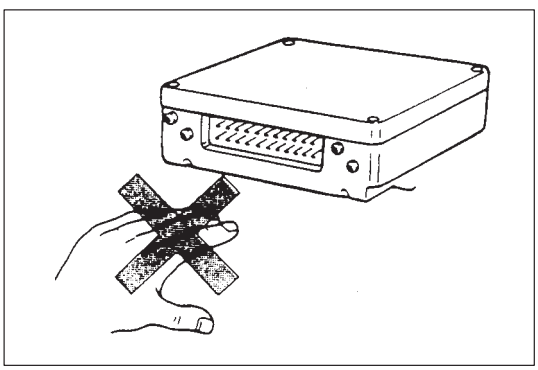
For vehicles equipped with a catalytic converter, use only unleaded gasoline and be careful not to let a large amount of unburned gasoline enter the converter or it can be damaged.

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



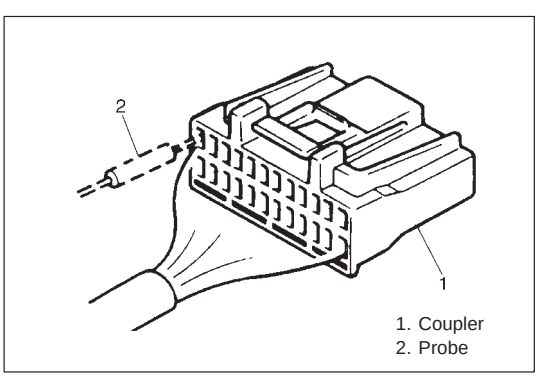
PRECAUTIONS FOR ELECTRICAL CIRCUIT SERVICE

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



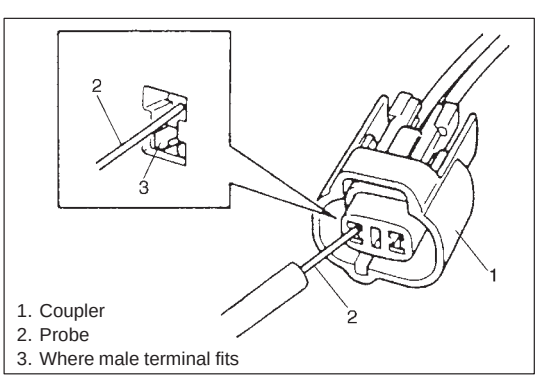
- **Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit like as ECM, PCM, P/S controller, etc.). The static electricity from your body can damage these parts.**

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



1. Coupler
2. Probe

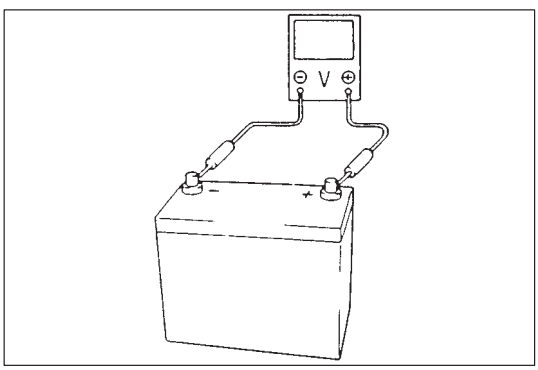
- **When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.**



1. Coupler
2. Probe
3. Where male terminal fits

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

- **When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.**



- **Before measuring voltage to check for electrical system, check to make sure that battery voltage is 11V or higher. Such terminal voltage check at low battery voltage will lead to erroneous diagnosis.**

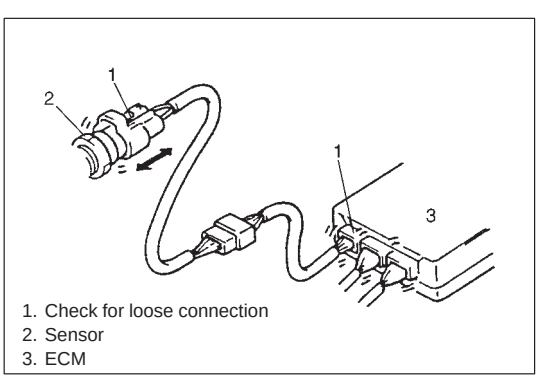
ELECTRICAL CIRCUIT INSPECTION PROCEDURE

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

OPEN CIRCUIT CHECK

Possible causes for the open circuit are as follows. As the cause is in the connector or terminal in many cases, they need to be checked particularly carefully.

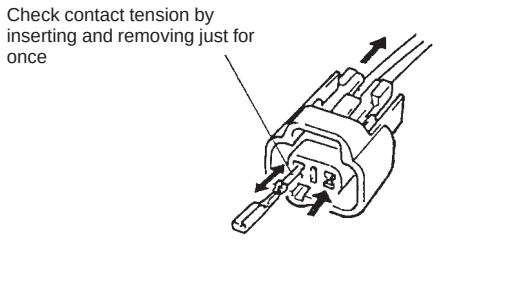
- Loose connection of connector
- Poor contact of terminal (due to dirt, corrosion or rust on it, poor contact tension, entry of foreign object etc.)
- Wire harness being open



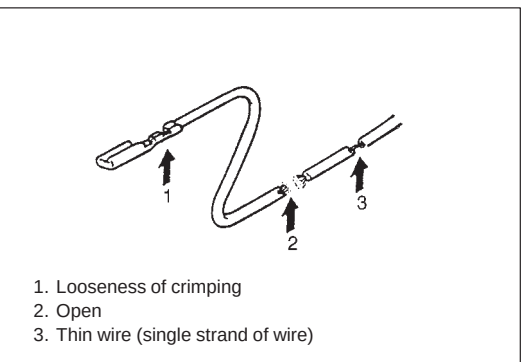
1. Check for loose connection
2. Sensor
3. ECM

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

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

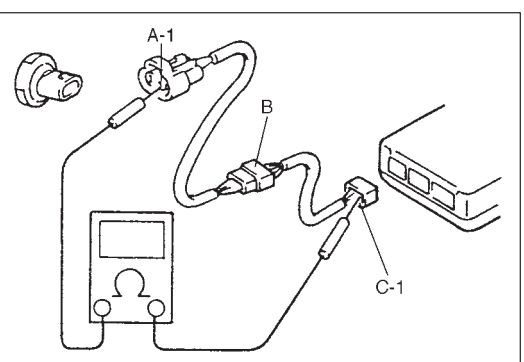


3) Using a test male terminal, check both terminals of the circuit being checked for contact tension of its female terminal.
Check each terminal visually for poor contact (possibly caused by dirt, corrosion, rust entry of foreign object, etc.).
At the same time, check to make sure that each terminal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



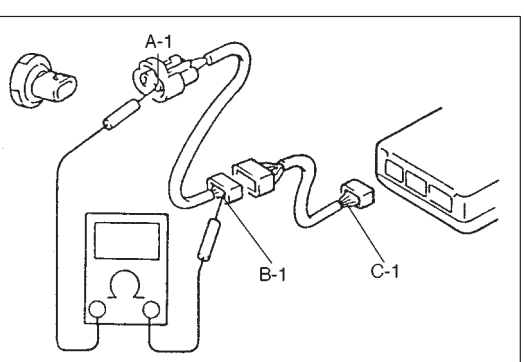
1. Looseness of crimping
2. Open
3. Thin wire (single strand of wire)

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



Continuity check

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

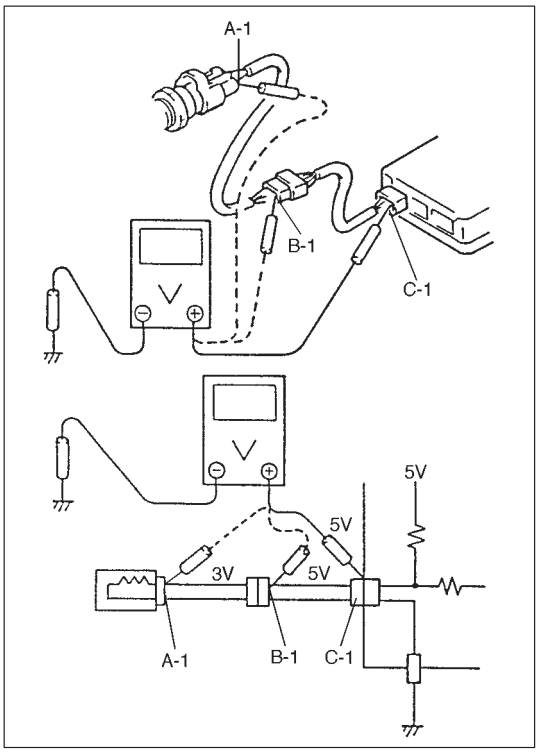


2) Disconnect the connector included in the circuit (connector-B in the figure) and measure resistance between terminals A-1 and B-1.
If no continuity is indicated, that means that the circuit is open between terminals A-1 and B-1. If continuity is indicated, there is an open circuit between terminals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

Voltage check

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

1) With all connectors connected and voltage applied to the circuit being checked, measure voltage between each terminal and body ground.

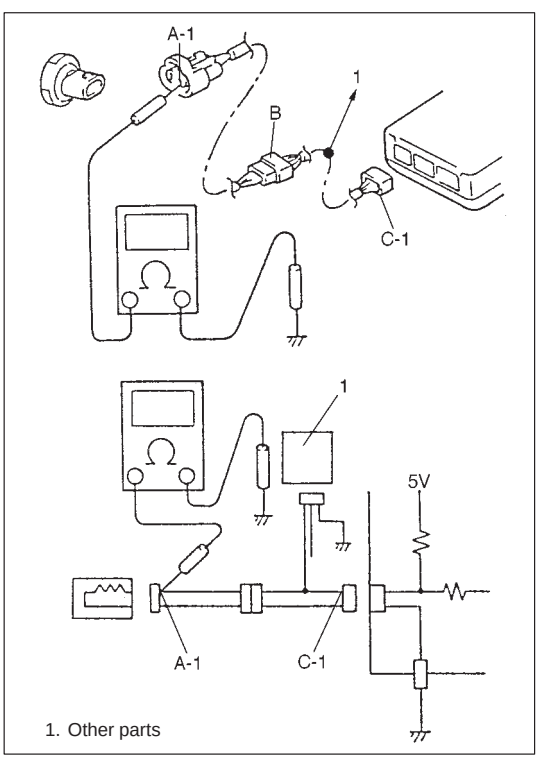


If measurements were taken as shown in the figure and results were as listed below, it means that the circuit is open between terminals B-1 and A-1.

Voltage Between:
C-1 and body ground: Approx. 5V
B-1 and body ground: Approx. 5V
A-1 and body ground: 0V

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

Voltage Between:
C-1 and body ground: Approx. 5V
B-1 and body ground: Approx. 5V
A-1 and body ground: Approx. 3V
2V voltage drop



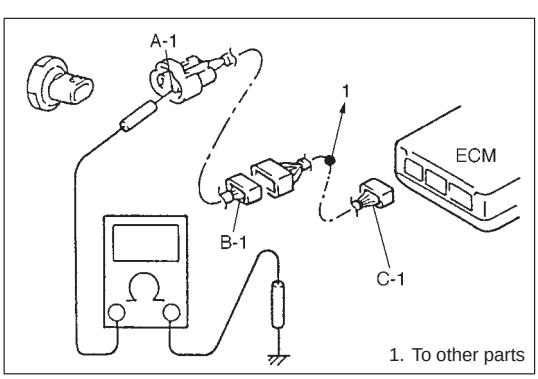
1. Other parts

Short circuit check (wire harness to ground)

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

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

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

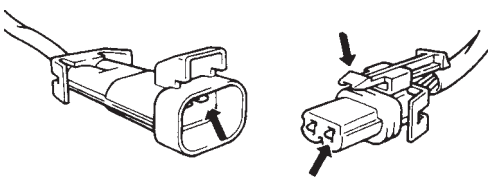


1. To other parts

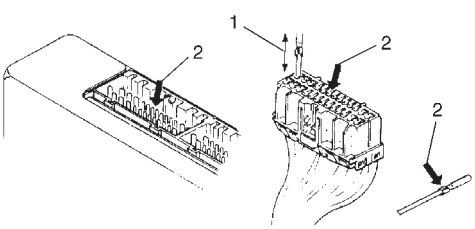
4) Disconnect the connector included in circuit (connector B) and measure resistance between A-1 and body ground.
   If continuity is indicated, it means that the circuit is shorted to the ground between terminals A-1 and B-1.

INTERMITTENT AND POOR CONNECTION

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

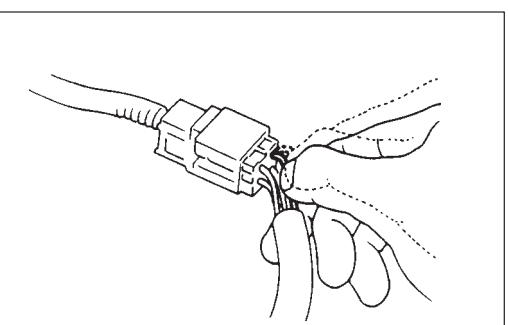


- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact. However, cleaning the terminal with a sand paper or the like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

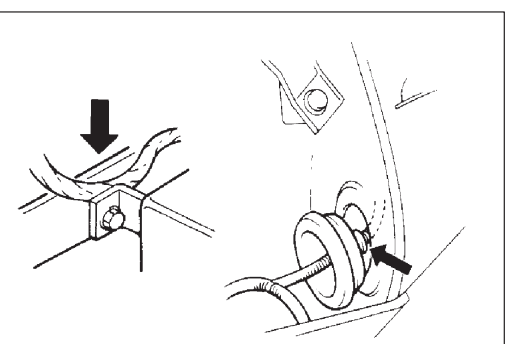


1. Check contact tension by inserting and removing just for once
2. Check each terminal for bend and proper alignment

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



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



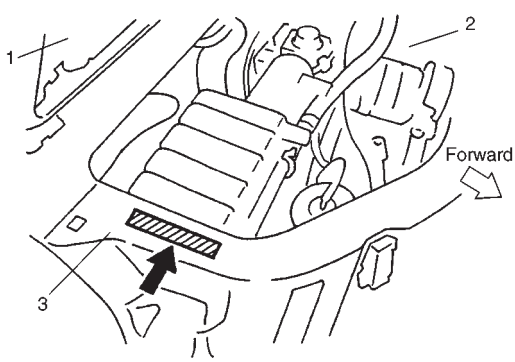
- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are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

PRECAUTIONS FOR INSTALLING MOBILE COMMUNICATION EQUIPMENT

When installing mobile communication equipment such as CB (Citizens-Band)-radio or cellular-telephone, be sure to observe the following precautions.

Failure to follow cautions may adversely affect electronic control system.

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

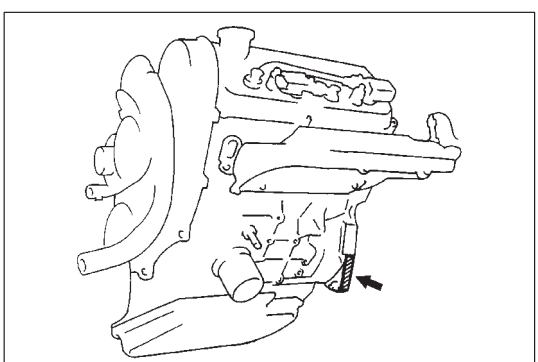


1. Seat
2. Engine compartment
3. Engine room right side panel

IDENTIFICATION INFORMATION

BODY NUMBER

The vehicle body number is punched on the upper surface of the engine room right side panel located under the seat.



ENGINE IDENTIFICATION NUMBER

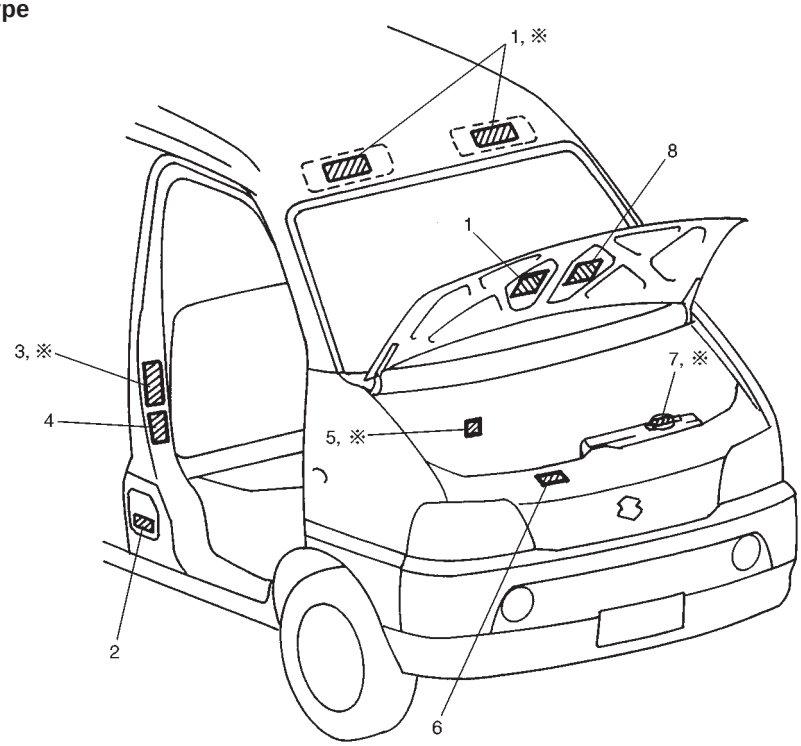
The number is punched on the cylinder block.

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.

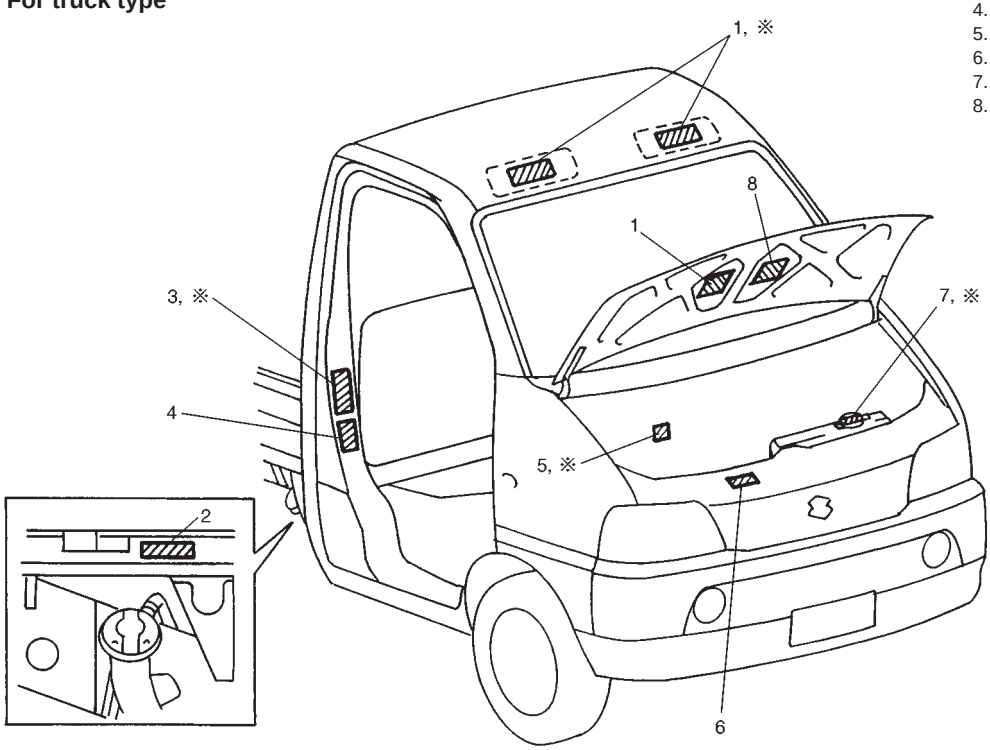
NOTE:
Air bag CAUTION/WARNING labels are attached on the vehicle equipped with air bag system only.

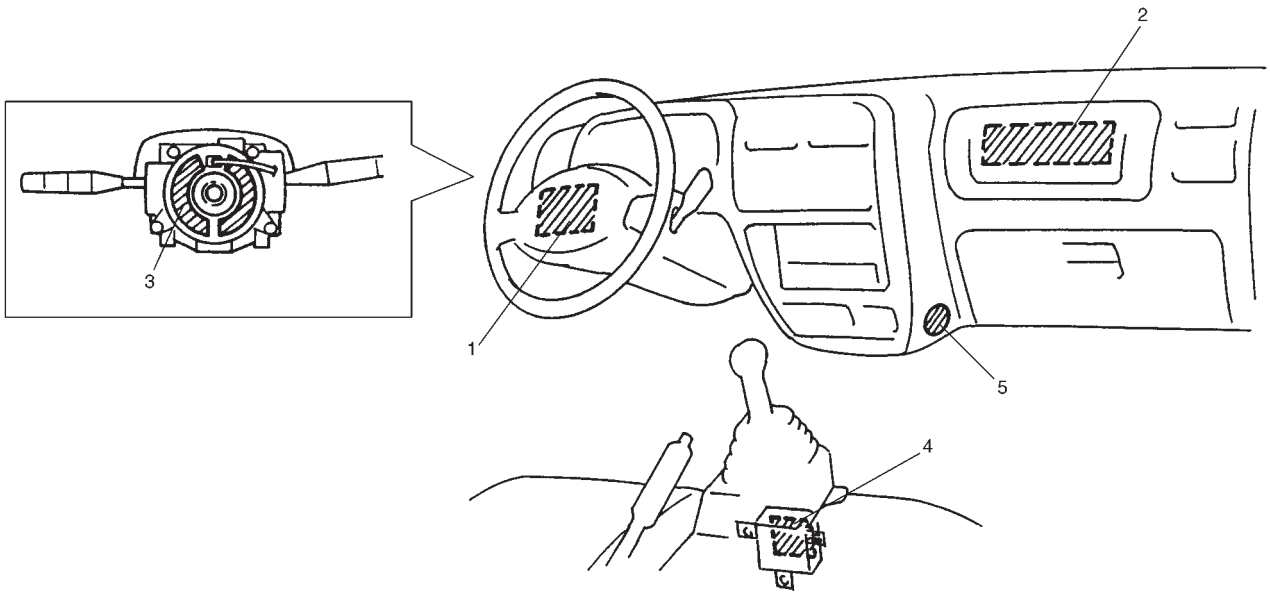
For van type



※: Attached on the other side of vehicle (LH steering vehicle)
1. Air bag caution label (if equipped)
2. Fuel limitation label (if equipped)
3. Tire placard
4. ID plate
5. LSPV label (if equipped)
6. Cooling fan label
7. Coolant warning label
8. Emission control label (if equipped)

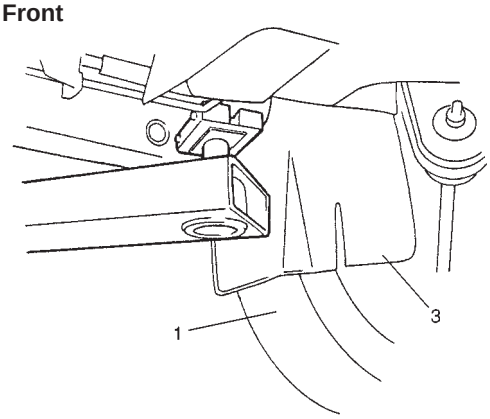
For truck type



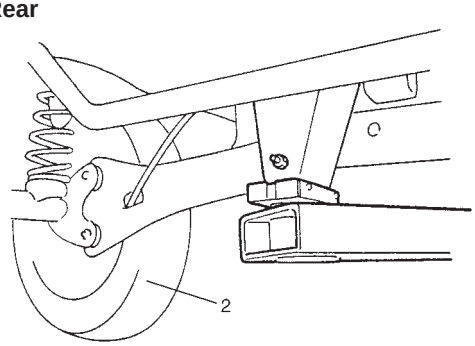


1. Air bag warning label on driver air bag (inflator) module
2. Air bag warning label on passenger air bag (inflator) module
3. Air bag warning label on contact coil and combination assembly
4. Air bag warning label on SDM
5. Child seat warning label

Front



Rear



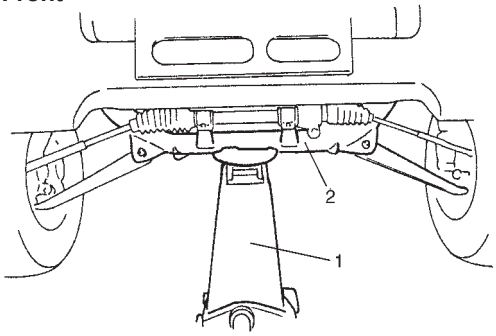
1. Front left tire
2. Rear left tire
3. Mud flap (Remove, if necessary.)

VEHICLE LIFTING POINTS

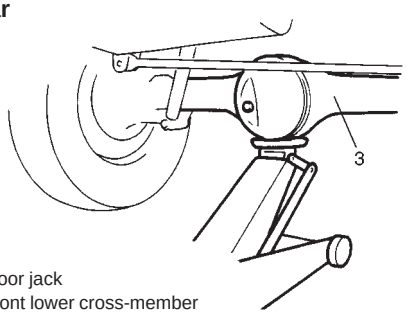
WARNING:

- **Before applying hoist to underbody, always take vehicle balance throughout service into consideration. Vehicle balance on hoist may change depending on what part to be removed.**
- **Before lifting up the vehicle, check to be sure that end of hoist arm is not in contact with brake pipe, fuel pipe, bracket or any other part.**
- **When using frame contact hoist, apply hoist as shown in figure (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.**

Front



Rear



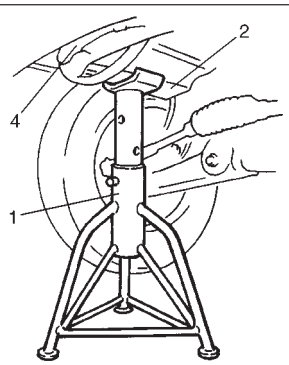
1. Floor jack
2. Front lower cross-member
3. Rear axle

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 lower cross-member or rear axle housing.

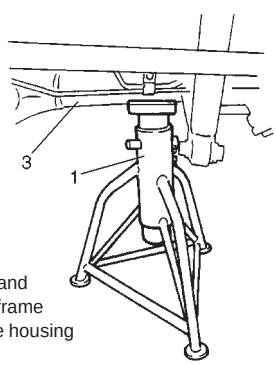
WARNING:

- **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.

Front



Rear



1. Safety stand
2. Chassis frame
3. Rear axle housing
4. Radiator

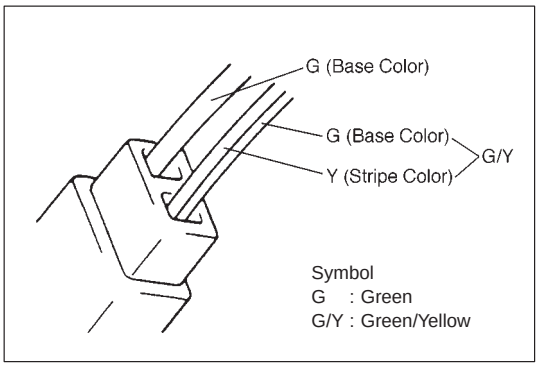
To perform service with either front or rear vehicle end jacked up, be sure to place safety stands under chassis frame (for front side) and rear axle housing (for rear side) so that body is securely supported. And then check to ensure that chassis frame and rear axle housing do not slide on safety stands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

NOTE:
For vehicle equipped with radiator splash guard, remove it before applying safety stand.

Symbol	Wire Color	Symbol	Wire Color
B	Black	Or	Orange
Bl	Blue	R	Red
Br	Brown	W	White
G	Green	Y	Yellow
Gr	Gray	P	Pink
Lbl	Light blue	V	Violet
Lg	Light green		

WIRE COLOR SYMBOLS IN THIS MANUAL

The wire color is abbreviated to the first (or first two) alphabet(s) of each color.



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

ABBREVIATIONS MAY BE USED IN THIS MANUAL

A

ABS	: Anti-lock Brake System
ATDC	: After Top Dead Center
API	: American Petroleum Institute
ATF	: Automatic Transmission Fluid
ALR	: Automatic Locking Retractor
AC	: Alternating Current
A/T	: Automatic Transmission
A/C	: Air Conditioning
ABDC	: After Bottom Dead Center
A/F	: Air Fuel Mixture Ratio
A-ELR	: Automatic-Emergency Locking Retractor

B

B+	: Battery Positive Voltage
BTDC	: Before Top Dead Center
BBDC	: Before Bottom Dead Center

C

CKT	: Circuit
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
ECM	: Engine Control Module
ECT Sensor	: Engine Coolant Temperature Sensor (Water Temp. Sensor, WTS)
EGR	: Exhaust Gas Recirculation
EGRT Sensor	: EGR Temperature Sensor (Recirculated Exhaust Gas Temp. Sensor, REGTS)
EFE Heater	: Early Fuel Evaporation Heater (Positive Temperature Coefficient, PTC Heater)
ELR	: Emergency Locking Retractor
EPS	: Electrical 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

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)
- Min : Minimum
- MIL : Malfunction Indicator Lamp (“CHECK ENGINE” Light)
- M/T : Manual Transmission

N

- NOx : Nitrogen Oxides

O

- OBD : On-Board Diagnostic System (Self-Diagnosis Function)
- O/D : Overdrive
- OHC : Over Head Camshaft

P

- PNP : Park/Neutral Position
- P/S : Power Steering
- PSP Switch : Power Steering Pressure Switch (P/S Pressure Switch)
- PCM : Powertrain Control Module
- PCV : Positive Crankcase Ventilation

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

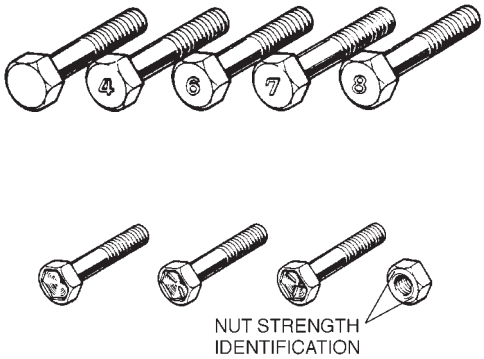
- TBI : Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)
- TCC : Torque Converter Clutch
- TCM : Transmission Control Module (A/T Controller, A/T Control Module)
- TP Sensor : Throttle Position Sensor
- TVV : Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching 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 BOLTS–IDENTIFICATION CLASS NUMBERS OR MARKS CORRESPOND TO BOLT STRENGTH–INCREASING NUMBERS REPRESENT INCREASING STRENGTH.

METRIC INFORMATION

METRIC FASTENERS

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

FASTENER STRENGTH IDENTIFICATION

Most commonly used metric fastener strength property classes are 4T, 7T and radial line with the class identification embossed on the head of each bolt. Some metric nuts will be marked with punch mark strength identification on the nut face. Figure shows the different strength markings.

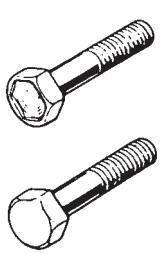
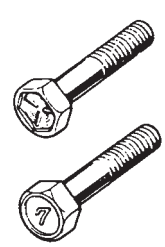
When replacing metric fasteners, be careful to use bolts and nuts of the same strength or greater than the original fasteners (the same number marking or higher). It is likewise important to select replacement fasteners of the correct size. Correct replacement bolts and nuts are available through the parts division.

STANDARD TIGHTENING TORQUE

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

NOTE:

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

STRENGTH / THREAD DIAMETER (mm)	 Conventional bolt		 "4T" bolt		 "7T" bolt	
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1.5	0.15	1.0	2.3	0.23	2.0
5	3.0	0.30	2.5	4.5	0.45	3.5
6	5.5	0.55	4.0	10	1.0	7.5
8	13	1.3	9.5	23	2.3	17.0
10	29	2.9	21.0	50	5.0	36.5
12	45	4.5	32.5	85	8.5	61.5
14	65	6.5	47.0	135	13.5	98.0
16	105	10.5	76.0	210	21	152.0
18	160	16	116.0	240	24	174.0

SECTION 0B

MAINTENANCE AND LUBRICATION

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

MAINTENANCE SCHEDULE

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

Interval: This interval should be judged by odometer reading or months, whichever comes first.			This table includes services 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.					
			km (x 1,000)	15	30	45	60	75	90
			miles (x 1,000)	9	18	27	36	45	54
			Months	12	24	36	48	60	72
ENGINE									
1-1. Drive belt	V-belt			I	R	I	R	I	R
	V-rib belt (Flat type)			–	–	I	–	–	R
1-2. Camshaft timing belt				Replace every 100,000 km (60,000 miles).					
1-3. Valve lash (clearance)				–	I	–	I	–	I
1-4. Engine oil and oil filter	Vehicle with HO2S (SG, SH, SJ)			R	R	R	R	R	R
	Vehicle with HO2S (SE, SF), Vehicle without HO2S			Replace every 10,000 km (6,000 miles) or 8 months					
1-5. Engine coolant				–	–	R	–	–	R
1-6. Exhaust pipes and mountings (except catalyst)				–	I	–	I	–	I
IGNITION SYSTEM									
2-1. Spark plugs	When unleaded fuel is used	Vehicle without HO2S		–	R	–	R	–	R
		Vehicle with HO2S		–	–	R	–	–	R
	When leaded fuel is used, refer to SEVERE DRIVING CONDITION schedule.								
FUEL SYSTEM									
3-1. Air cleaner filter element				I	I	R	I	I	R
3-2. Fuel tank				–	–	I	–	–	I
3-3. Fuel lines and connections				–	I	–	I	–	I
3-4. Fuel filter				Replace every 105,000 km (63,000 miles).					
EMISSION CONTROL SYSTEM									
4-1. Crankcase ventilation hoses and connections		Vehicle without HO2S		–	I	–	I	–	I
4-2. PCV valve		Vehicle without HO2S		–	–	I	–	–	I
		Vehicle with HO2S		–	–	–	–	–	I
4-3. Fuel evaporative emission control system		Vehicle without HO2S		–	I	–	I	–	I
		Vehicle with HO2S		–	–	–	–	–	I

NOTES:

"R": Replace or change

"I": Inspect and correct, replace or lubricate if necessary

- ***Item 2-1 SPARK PLUGS replace every 50,000 km (30,000 miles) if the local law requires.***

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services 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.						
	km (x 1,000)	15	30	45	60	75	90
	miles (x 1,000)	9	18	27	36	45	54
	Months	12	24	36	48	60	72
CHASSIS AND BODY							
6- 1. Clutch		–	I	–	I	–	I
6- 2. Brake discs and pads (front)		I	I	I	I	I	I
Brake drums and shoes (rear)		–	I	–	I	–	I
6- 3. Brake hoses and pipes		–	I	–	I	–	I
6- 4. Brake fluid		–	R	–	R	–	R
6- 5. Parking brake lever and cable		*I	–	–	–	–	–
6- 6. Tires		I	I	I	I	I	I
6- 7. Wheel discs		I	I	I	I	I	I
6- 8. Suspension system		–	I	–	I	–	I
6- 9. Manual transmission oil		I	–	R	I	–	R
6-10. Differential oil		*R or I	–	I	–	I	–
6-11. Steering system		–	I	–	I	–	I
6-12. All hinges, latches and locks		–	I	–	I	–	I

NOTES:

"R": Replace or change

"I": Inspect and correct, replace or lubricate if necessary

- ***Item 6-5 "*I" should be performed at 15,000 km only.***
- ***Item 6-10 "*R" should be performed at 15,000 km only.***

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/Taxi use
B – Driving on rough and/or muddy roads
C – Driving on dusty roads
D – Driving in extremely cold weather and/or salted roads
E – Repeated short trips in extremely cold weather
F – Leaded fuel use
G – ––
H – Trailer towing (if admitted)/Full load use

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— B C D — — — —	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 — C D E F — H	Engine oil and oil filter	R	Every 5,000 km (3,000 miles) or 4 months
A B C — E F — H	Spark plugs	R	Every 10,000 km (6,000 miles) or 8 months
— — C — — — — —	Air cleaner filter element *1	I	Every 2,500 km (1,500 miles)
		R	Every 30,000 km (18,000 miles) or 24 months
— B C D — — — H	Wheel bearings	I	Every 15,000 km (9,000 miles) or 12 months
A B — D — — — H	Propeller shaft	I	Every 15,000 km (9,000 miles) or 12 months
— B — — E — — H	Transmission (manual) oil	I	Every 15,000 km (9,000 miles) or 12 months
		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

NOTES:
"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.***

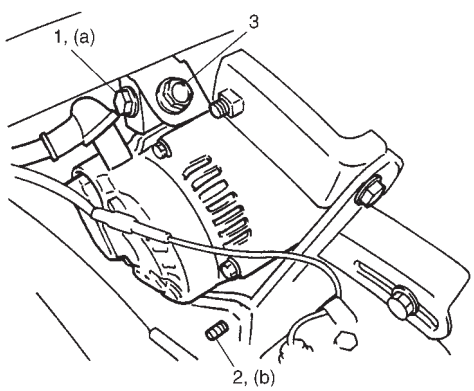
MAINTENANCE SERVICE

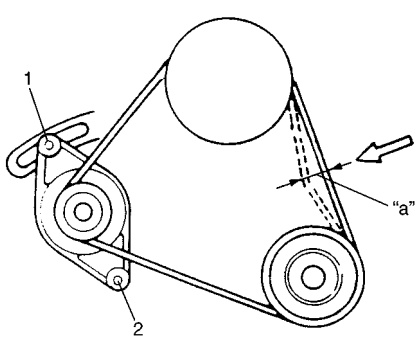
ENGINE

ITEM 1-1

Drive Belt Inspection and Replacement

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





1. Adjusting bolt
2. Pivot bolt
3. Belt adjusting bolt

Water pump and generator drive belt (V-rib 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": 6 – 8 mm (0.24 – 0.32 in.) deflection under 100 N (10 kg, 22 lb) pressure

   NOTE:
   When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.27 in.).

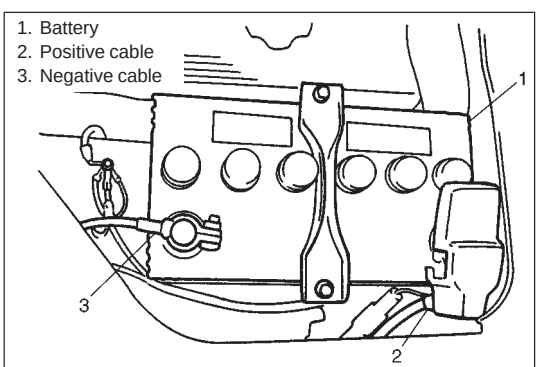
3) If belt is too tight or too loose, adjust it to specification by adjusting generator position.
4) Tighten bolt adjusting bolt and pivot bolt to specified torque.

   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 16.5 lb-ft)
   (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

5) Connect negative cable to battery.

Replacement

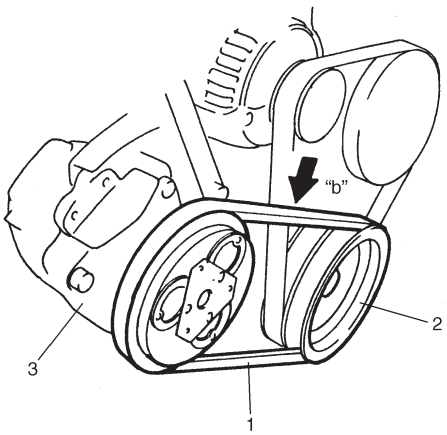
Replace belt. Refer to GENERATOR (WATER PUMP) BELT in SECTION 6H for replacement procedure.



A/C compressor drive belt (V-belt) (if equipped)

Inspection and Replacement

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



1. Drive belt
2. Crankshaft pulley
3. A/C compressor

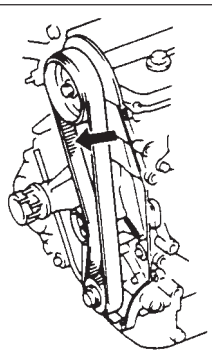
3) Check belt for tension.

A/C compressor drive belt tension
"b": 8 – 9 mm (0.32 – 0.35 in.) deflection under 100 N (10 kg, 22 lb) pressure.

4) If belt tension is out of above specification, adjust it by adjusting compressor position.

Tightening Torque for compressor mounting bolts
23 N·m (2.3 kg-m, 16.5 lb-ft)

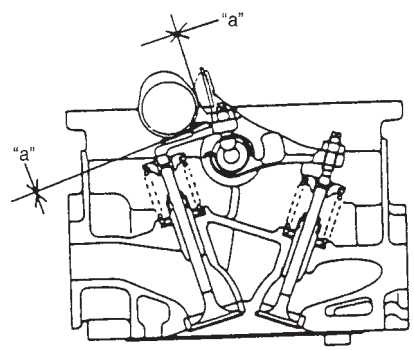
5) Connect negative cable at battery.



ITEM 1-2

Camshaft Timing Belt Replacement

Replace timing belt. Refer to TIMING BELT AND BELT TENSIONER in SECTION 6A.



ITEM 1-3

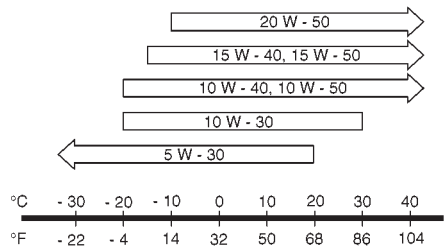
Valve Lash Inspection

1) Remove cylinder head cover.
2) Inspect intake and exhaust valve lash and adjust as necessary. Refer to VALVE LASH (CLEARANCE) in SECTION 6A for valve lash inspection and adjustment procedure.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve lash (gap "a") specification	Intake	0.13 – 0.17 mm (0.005 – 0.007 in)	0.17 – 0.21 mm (0.007 – 0.008 in)
	Exhaust	0.23 – 0.27 mm (0.009 – 0.011 in)	0.27 – 0.31 mm (0.011 – 0.012 in)

3) Install cylinder head cover and tighten bolts to specification. Refer to CYLINDER HEAD COVER in SECTION 6A for the details.

Proper Engine Oil Viscosity Chart

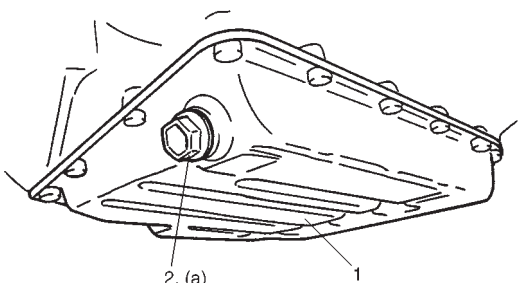


Temperature

ITEM 1-4
Engine Oil and Filter Change

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.

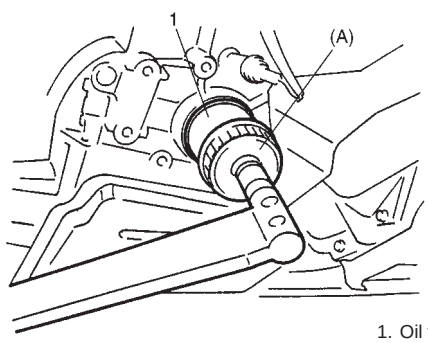
Before draining engine oil, check engine for oil leakage. If any evidence of leakage is found, make sure to correct defective part before proceeding to the following work.



1. Oil pan
2. Oil drain plug

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 torque.

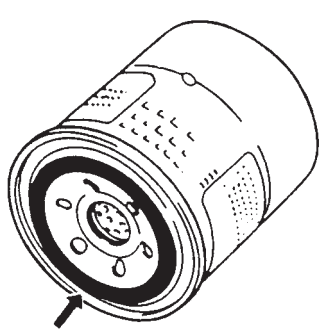
Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)



1. Oil filter

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

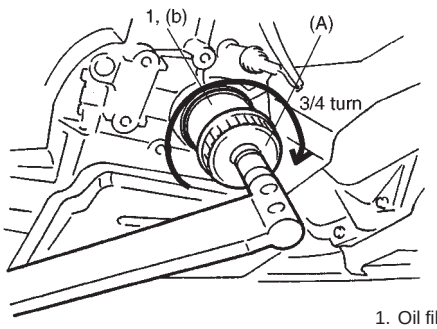
Special Tool
(A): 09915-40611



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 at filter O-ring first contacts the mounting surface.

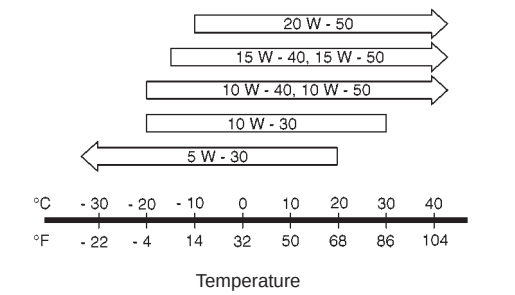


1. Oil filter

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

Special Tool
(A): 09915-40611

Tightening Torque
(b): 14 N·m (1.4 kg-m, 10.5 lb-ft)



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 SE, SF, SG, SH or SJ grade.

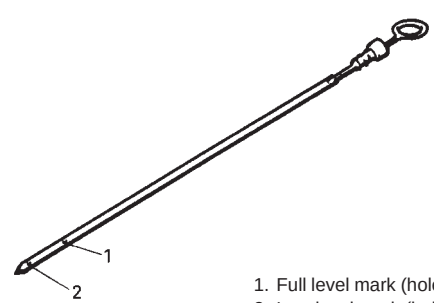
NOTE:
For temperature between –20°C (–4°F) and 30°C (86°F), it is highly recommended to use SAE 10W – 30 oil.

Engine oil capacity

Oil pan capacity	About 4.0 liters (8.5/7.0 US/Imp pt.)
Oil filter capacity	About 0.2 liters (0.4/0.35 US/Imp pt.)
Others	About 0.8 liters (1.7/1.4 US/Imp pt.)
Total	About 5.0 liters (10.6/8.8 US/Imp pt.)

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.



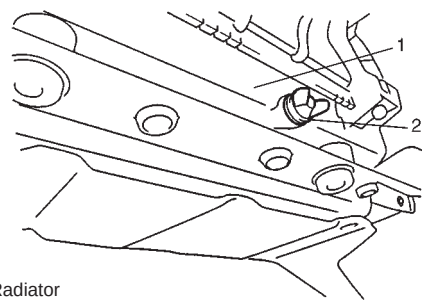
1. Full level mark (hole)
2. Low level mark (hole)

8) Start engine and run it for three minutes. Stop it and wait five minutes before checking oil level. Add oil, as necessary, to bring oil level to FULL level mark on dipstick.

NOTE:
Step 1) – 7) outlined above must be performed with ENGINE NOT RUNNING. For step 8), be sure to have adequate ventilation while engine is running.

ITEM 1-5
Engine Coolant 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.

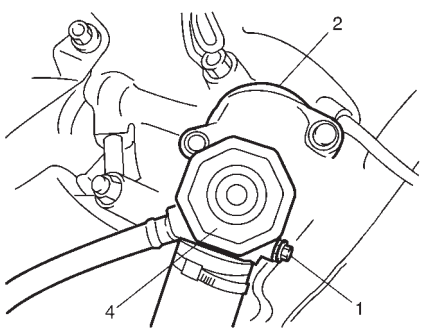


1. Radiator
2. Radiator drain plug

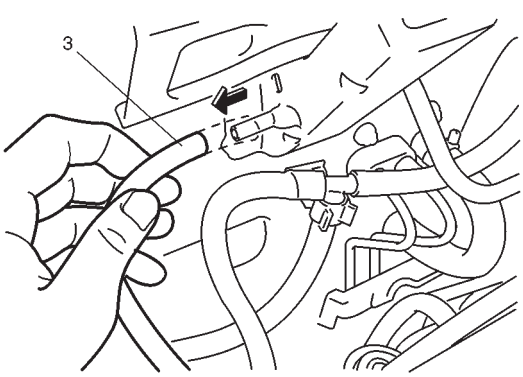
CAUTION:
The cap of thermostat cap must not be removed.

1) Remove radiator cap when engine is cool.
2) Loosen radiator drain plug to drain coolant.
3) Remove reservoir, which is on the side of radiator, and drain.
4) Tighten plug securely. Also reinstall reservoir.

Engine side

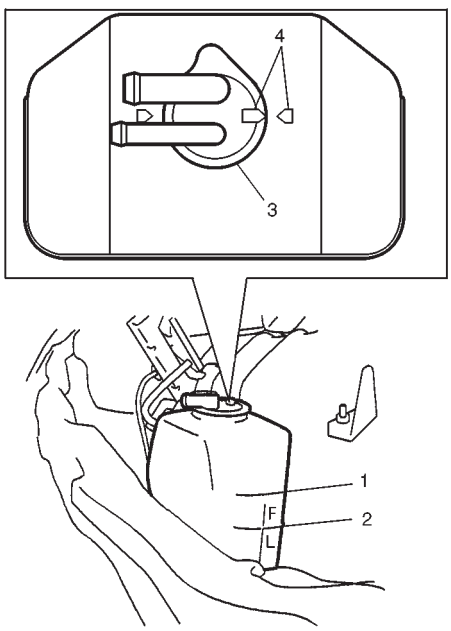


Radiator side



1. Thermostat cap bleeder bolt
2. Thermostat cap
3. Heater breather hose
4. Cap

5) Fill radiator with specified amount of coolant, bleed air from cooling system by disconnecting heater breather hose and loosening thermostat cap breeder bolt.
6) Fill reservoir with coolant, install radiator cap and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system.
7) STOP ENGINE. Add coolant as necessary until coolant level reaches filler throat of radiator when engine cold. Reinstall radiator cap.

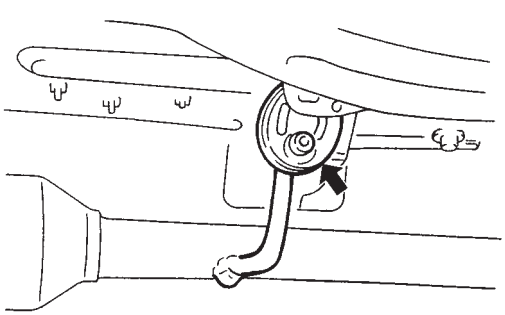


1. Full level mark
2. Low level mark
3. Tank cap
4. Match marks

8) Add coolant to reservoir so that its level aligns with FULL mark. Then, reinstall cap aligning arrow marks on reservoir and cap.

NOTE:
When installing reservoir cap, align arrow marks on reservoir and cap.

CAUTION:
When changing engine coolant, use mixture of 50% water and 50% ANTIFREEZE/ANTICORROSION COOLANT for the market where ambient temperature falls lower than –16°C (3°F) in winter, and mixture of 70% water and 30% ANTIFREEZE/ANTICORROSION COOLANT for the market where ambient temperature doesn't fall lower than –16°C (3°F).
Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ANTIFREEZE/ANTICORROSION COOLANT should be used for the purpose of corrosion protection and lubrication.



ITEM 1-6

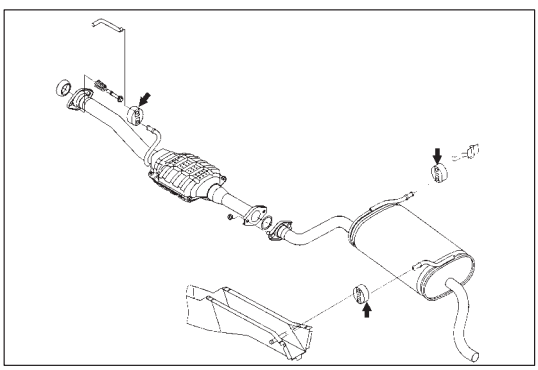
Exhaust Pipes and Mountings Inspection

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.



Mounting replacement

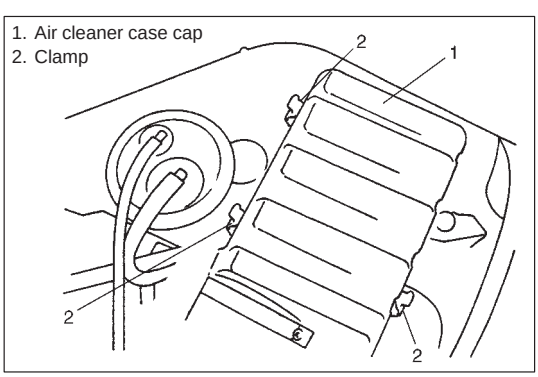
Replace muffler rubber mountings with new ones periodically.
Refer to ON-VEHICLE SERVICE in SECTION 6K for installation.

IGNITION SYSTEM

ITEM 2-1

Spark Plugs Replacement

Replace spark plugs with new ones. Refer to SPARK PLUG in SECTION 6F.



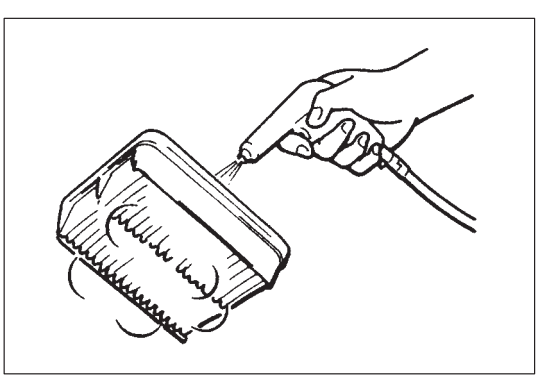
FUEL SYSTEM

ITEM 3-1

Air Cleaner Filter Element

Inspection

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



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

Replacement

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

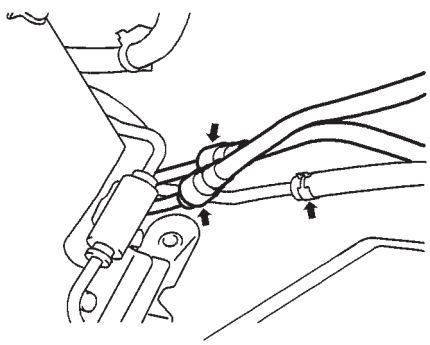
ITEM 3-2

Fuel tank

Inspection

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.

Replace any damaged or malconditioned parts.

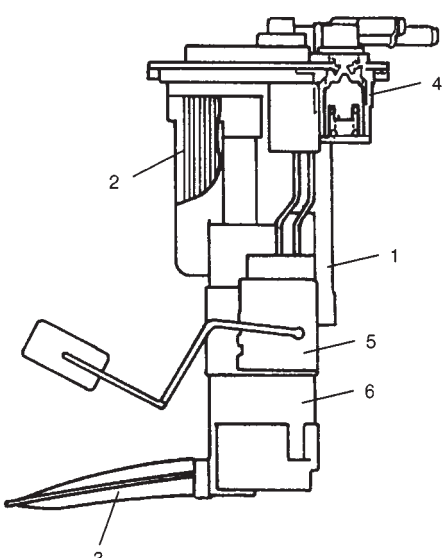


ITEM 3-3

Fuel Lines and Connections

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.
2) Visually inspect gasket of fuel tank cap. If it is damaged or deteriorated, replace it with new one.



1. Fuel pump assembly
2. Fuel filter
3. Suction filter (pump filter)
4. Fuel cut valve
5. Fuel sender (level) gauge
6. Fuel pump

ITEM 3-4

Fuel Filter 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 a part of fuel pump assembly which is installed on fuel tank.

Replace fuel filter with new one periodically. Refer to FUEL PUMP ASSEMBLY in SECTION 6C for proper procedure.

EMISSION CONTROL SYSTEM

ITEM 4-1

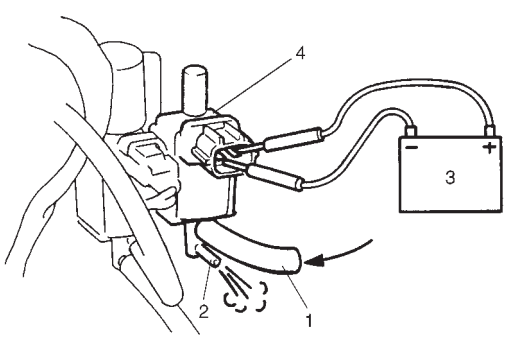
Crankcase Ventilation Hoses and Connections Inspection

Refer to following ITEM 4-2 PCV valve inspection.

ITEM 4-2

PCV (Positive Crankcase Ventilation) Valve Inspection

Check crankcase ventilation hose and PCV hose for leaks, cracks or clog, and PCV valve for stick or clog. Refer to PCV SYSTEM in SECTION 6E for PCV valve checking procedure.

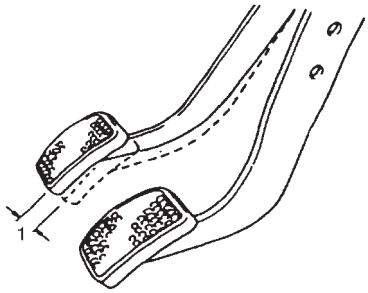


1. Hose “A”
2. Nozzle “B”
3. Battery
4. EVAP canister purge valve

ITEM 4-3

Fuel Evaporative Emission Control System Inspection

1) Visually inspect hoses for cracks, damage, or excessive bends. Inspect all clamps for damage and proper position.
2) Check evaporative emission control system for operation. Refer to EVAP EMISSION CONTROL SYSTEM in SECTION 6E.
3) Check EVAP canister for operation and clog. Refer to EVAP EMISSION CONTROL SYSTEM in SECTION 6E.
4) Check tank pressure control valve for operation. Refer to TANK PRESSURE CONTROL VALVE in SECTION 6E.



1. Clutch pedal free travel

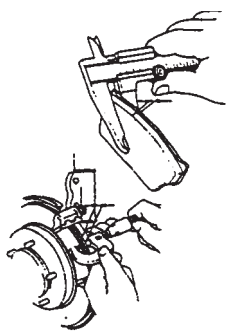
CHASSIS AND BODY

ITEM 6-1

Clutch

Pedal inspection

Check clutch pedal for height and free travel. Refer to CLUTCH PEDAL FREE TRAVEL in SECTION 7C. Adjust or correct if necessary.

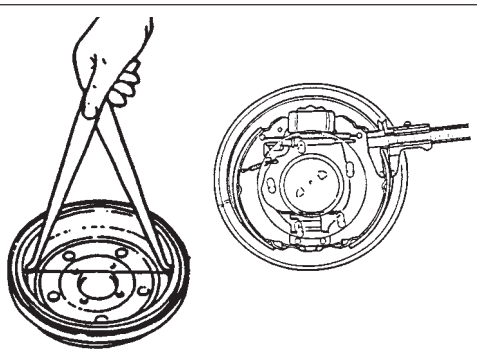


ITEM 6-2

Brake Discs, Pads, Brake Drums and Shoes Inspection

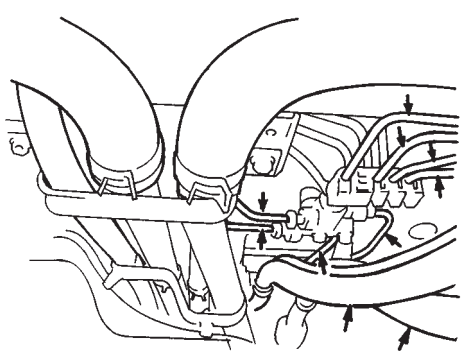
[Brake discs and pads (Front)]

1) Remove wheel and caliper but don't disconnect brake hose from caliper.
2) Check front disc brake pads and discs for excessive wear, damage and deflection. Replace parts as necessary. For details, refer to CHECK AND ADJUSTMENT in SECTION 5.
   Be sure to torque caliper pin bolts to specification.



[Brake drums and shoes (Rear)]

1) Remove wheel and brake drum.
2) Check rear brake drums and brake linings for excessive wear and damage, while wheels and drums are removed. At the same time, check wheel cylinders for leaks. Replace these parts as necessary.
   For details, refer to CHECK AND ADJUSTMENT in SECTION 5.

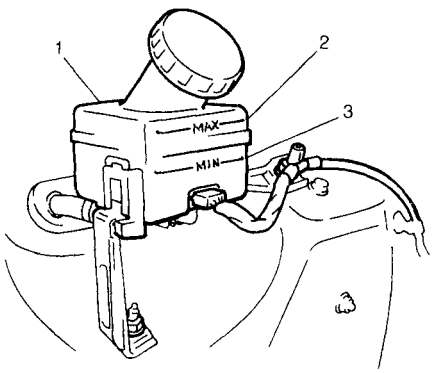


ITEM 6-3

Brake Hoses and Pipes Inspection

Check brake hoses and pipes for proper hookup, leaks, cracks, chafing and other damage.
Replace any of these parts as necessary.

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



1. Reservoir tank
2. Maximum level mark
3. Minimum level mark

ITEM 6-4

Brake Fluid

Inspection

1) Check around master cylinder and reservoir for fluid leakage. If found leaky, correct.
2) Check fluid level.
   If fluid level is lower than the minimum level of reservoir, refilling is necessary. Fill reservoir with specified brake fluid indicated on reservoir cap.
   For the details, refer to BRAKE FLUID LEVEL CHECK in SECTION 5.

CAUTION:
Since brake system of this vehicle is factory-filled with glycol-base brake fluid, do not use or mix different type of fluid when refilling system; otherwise serious damage will occur. Do not use old or used brake fluid, or one taken from unsealed container.

Change

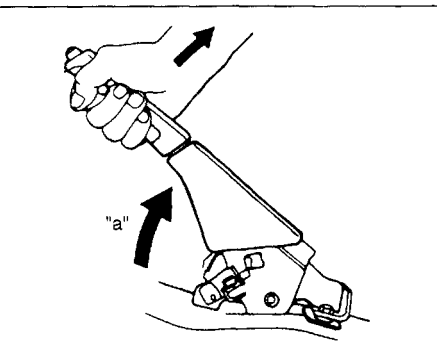
Change brake fluid as follows.
Drain existing fluid from brake system completely, fill system with above recommended fluid and carry out air purge operation.
For air purging procedure, refer to BLEEDING BRAKES in SECTION 5.

ITEM 6-5

Parking Brake Lever and Cable

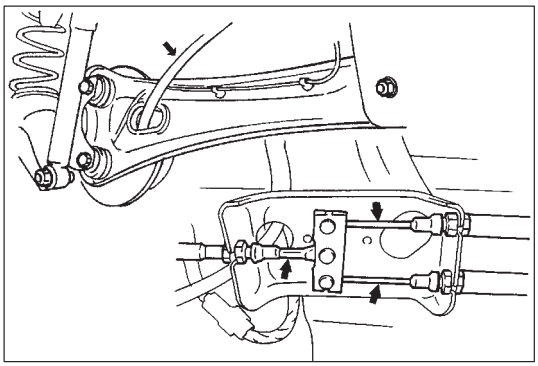
Parking brake lever inspection

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



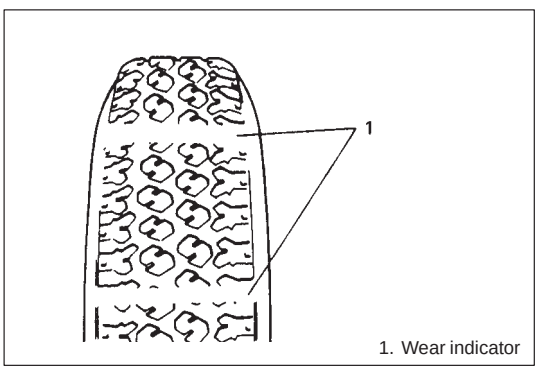
2) Check parking brake lever for proper operation and stroke, and adjust it if necessary.
   For checking and adjusting procedures, refer to PARKING BRAKE CHECK AND ADJUSTMENT in SECTION 5.

"a": Parking brake lever stroke 8 – 11 notches (with 20 kg (44lbs) of pull pressure)



Parking brake cable inspection

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



1. Wear indicator

ITEM 6-6

Tires

Inspection and Rotation

1) Check tires for uneven or excessive wear, or damage.
   If defective, replace.
   For the details, refer to TIRE DIAGNOSIS in SECTION 3.

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

   NOTE:
   - **Tire inflation pressure should be checked when tires are cool.**
   - **Specified tire inflation pressure should be found on tire placard or in owner's manual which came with the vehicle.**

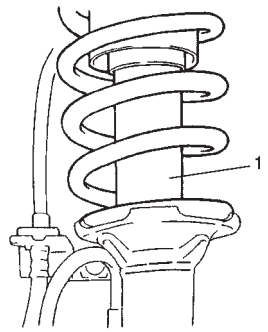
3) Rotate tires.
   For the details, refer to MAINTENANCE AND MINOR ADJUSTMENS in SECTION 3F.

ITEM 6-7

Wheel Discs

Inspection

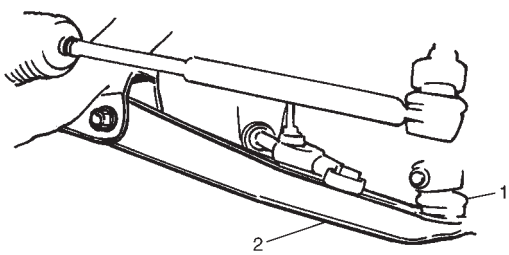
Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.



1. Strut

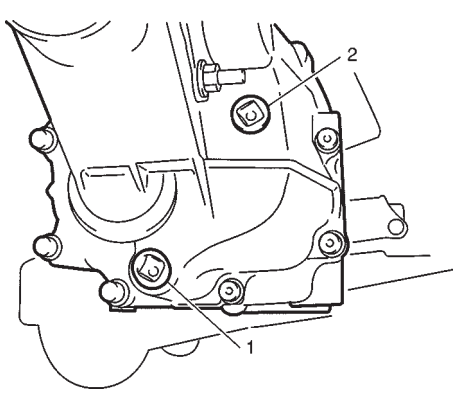
ITEM 6-8
Suspension System
Inspection

- Inspect front and rear shock absorber for evidence of oil leakage, dents or any other damage on sleeves; and inspect anchor ends for deterioration.
  Replace defective parts, if any.



1. Ball joint stud dust seal (boot)
2. Suspension arm

- Check front and rear suspension systems for damaged, loose or missing parts; also for parts showing signs of wear or lack of lubrication.
  Repair or replace defective parts, if any.
- Check front suspension arm ball joint stud dust seals for leakage, detachment, tear or any other damage.
  Replace defective boot, if any.
- Check suspension bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.



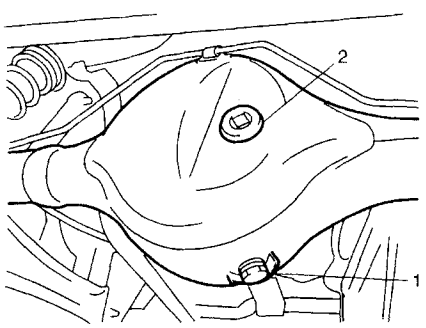
1. Drain plug
2. Filler level plug

ITEM 6-9
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 MAINTENANCE SERVICE in SECTION 7A.

Change

Change transmission oil with new specified oil. Refer to MAINTENANCE SERVICE in SECTION 7A.



1. Drain plug
2. Oil filler/level plug

ITEM 6-10

Differential Oil

Inspection

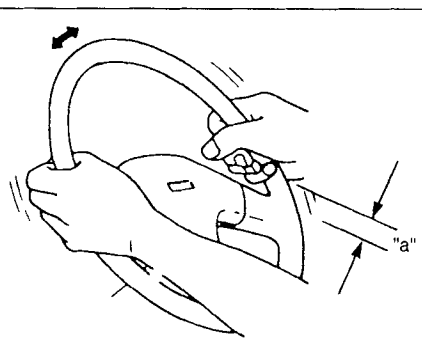
1) Check differential for evidence of oil leakage.
   Repair leaky point if any.
2) Make sure that vehicle is placed level for oil level check.
3) Remove level plug of differential and check oil level.
   Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level 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.

> **CAUTION:**
> **Specified gear oil must be used for differential.**

4) Tighten level plug to specified torque.
   Refer to OIL CHANGE in SECTION 7F.

Change

Change differential oil with new specified oil. Refer to OIL CHANGE in SECTION 7F respectively.



ITEM 6-11

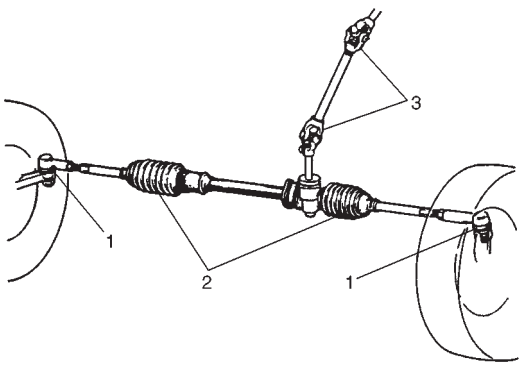
Steering System

Inspection

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

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

2) Check that steering wheel can be turned fully to the right and left. Repair or replace defective parts, if any.

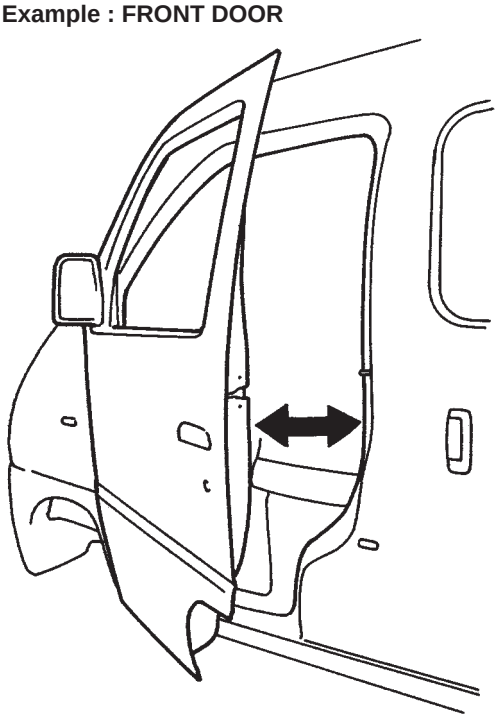


1. Tie-rod end boot
2. Steering gear case boot
3. Universal joint

3) Check universal joints of steering shaft for rattle and damage. If rattle or damage is found, replace defective part with a new one.
4) Check steering linkage for looseness and damage. Repair or replace defective parts, if any.
5) Check bolts and nuts for tightness and retighten them as necessary. Repair or replace defective parts, if any.
   Refer to TIGHTENING TORQUE SPECIFICATION in SECTION 3B and 3C for tightening torque.
6) Check boots of steering linkage and steering gear case for damage (leaks, detachment, tear, etc.). If damage is found, replace defective boot with new one.
7) Check wheel alignment.

NOTE:
For the details of wheel alignment, refer to GENERAL DESCRIPTION in SECTION 3A.

Example : FRONT DOOR



ITEM 6-12

All Hinges, Latches and Locks

Doors

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

Front Hood

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

FINAL INSPECTION

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

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

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

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

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

Engine Start
Check engine start for readiness.

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

On automatic transmission vehicles, try to start the engine in each select lever position. The starting motor should crank only in "P" (Park) or "N" (Neutral).
On manual transmission vehicles, place the shift lever in "Neutral," depress clutch pedal fully and try to start.

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

Clutch (For Manual Transmission)
Check for the following.
- Clutch is completely released when depressing clutch pedal,
- No slipping clutch occurs when releasing pedal and accelerating.
- Clutch itself is free from any abnormal condition.

Gearshift or Selector Lever (Transmission)
Check gear shift or selector lever for smooth shifting to all positions and for good performance of transmission in any position.
With automatic transmission equipped vehicle, also check that shift indicator indicates properly according to which position selector lever is shifted to.

CAUTION:
With automatic transmission equipped vehicle, make sure that vehicle is at complete stop when shifting selector lever to "P" range position and release all brakes.

Brake
[Foot brake]
Check the following:
- that brake pedal has proper travel,
- that brake works properly,
- that it is free from noise,
- that braking force is applied equally on all wheels,
- and that brake do not drag.

[Parking brake]
Check that lever has proper travel.

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

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

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

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

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

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

Lights
Check that all lights operate properly.

Windshield Defroster
Periodically check that air comes out from defroster outlet when operating heater or air conditioning.
Set fan switch lever to “HI” position for this check.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SE, SF, SG, SH or SJ (Refer to engine oil viscosity chart in ITEM 1-4 of MAINTENANCE SERVICE)
Engine coolant (Ethylene glycol base coolant)	Antifreeze / Anticorrosion coolant (Refer to ITEM 1-5 of MAINTENANCE SERVICE for detail.)
Brake fluid	An equivalent of DOT 3 or SAE J1703 or more
Manual transmission oil	API GL-4 (Refer to MAINTENANCE SERVICE in SECTION 7A for detail)
Differential oil	Hypoid gear oil API GL-5 (Refer to OIL CHANGE in SECTION 7F for detail.)
Clutch linkage pivot points	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil or water resistance chassis grease
Hood latch assembly	
Key lock cylinder	Spray lubricant

SECTION 1A

HEATER AND VENTILATION

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

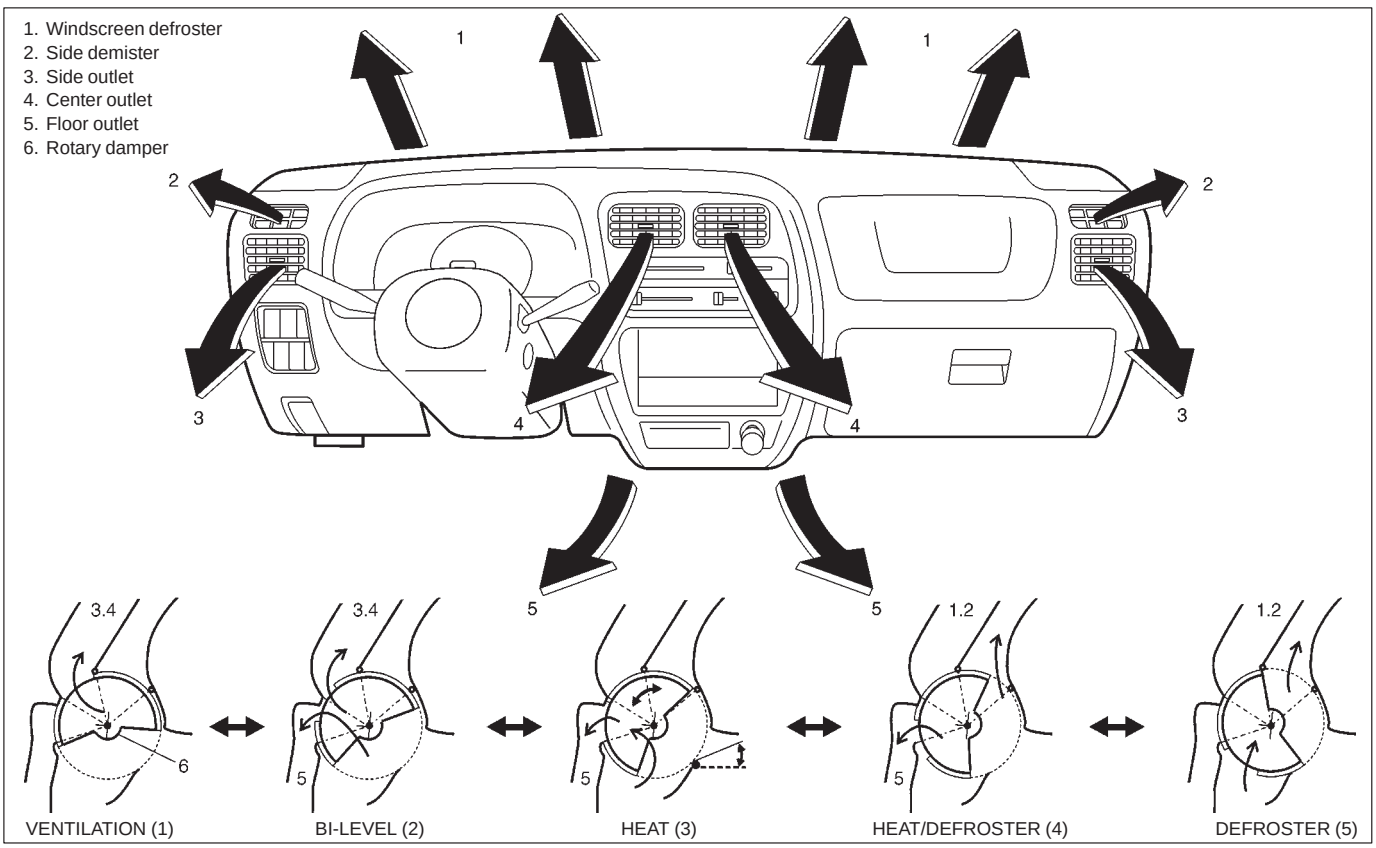
- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to AIR BAG SYSTEM COMPONENTS AND WIRING LOCATION VIEW of GENERAL DESCRIPTION in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and SERVICE PRECAUTIONS of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

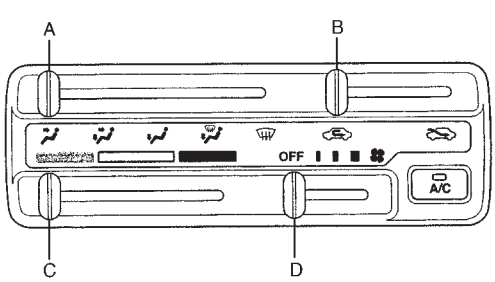
CONTENTS

GENERAL DESCRIPTION

HEATER

The heater and ventilation of this vehicle consist of such main components as control levers, blower motor, heater core and air ducts. The blower motor runs on electricity to send air inside. In the heater core, the cooling water warmed by the engine keeps circulating. Each control lever controls the blower motor speed, temperature and air outlets (operation of the damper in the heater unit) so that the air is delivered where necessary.





HEATER CONTROL OPERATION

A: Air control lever
B: Fresh air control lever
C: Temperature control lever
D: Blower motor speed selection lever

	VENTILATION (1)
	BI-LEVEL (2)
	HEAT (3)
	HEAT/DEFROSTER (4)
	DEFROSTER (5)

Air control lever

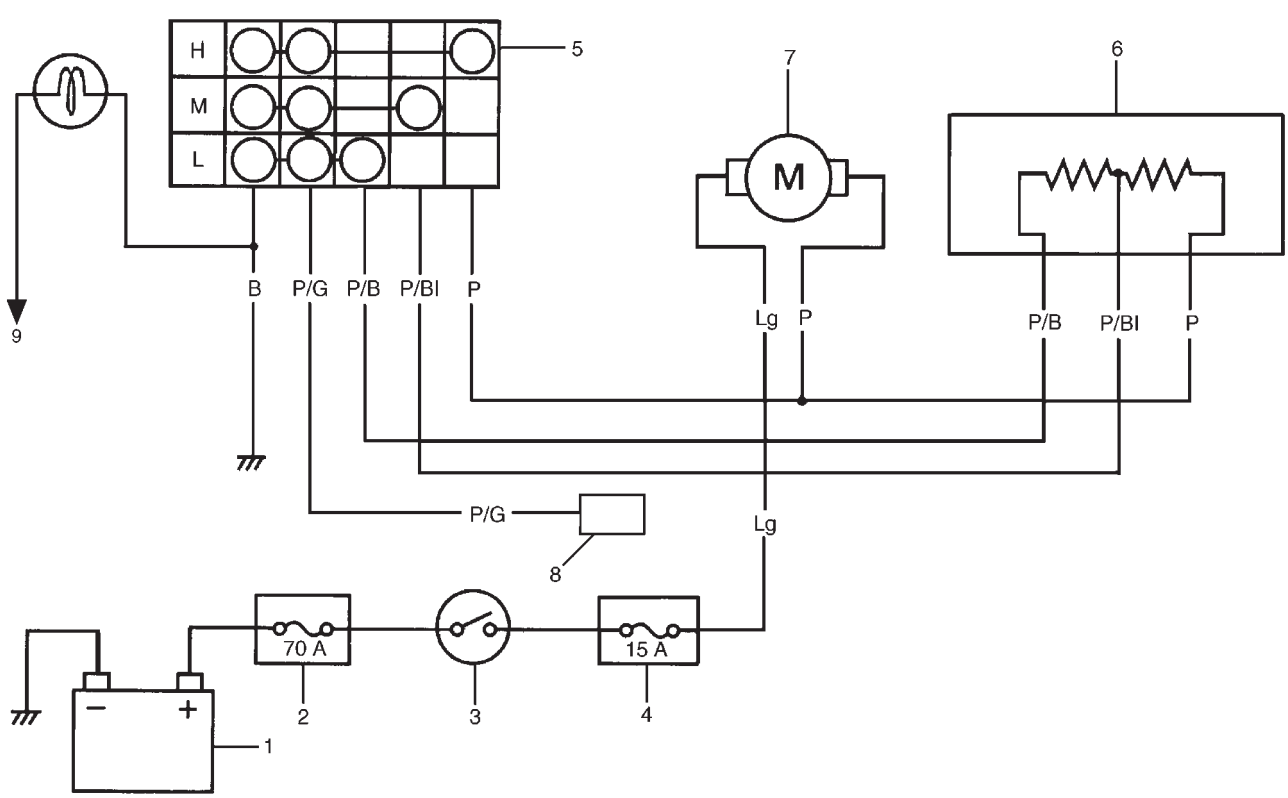
1. Air flows from center and side outlets.
2. Air flows from center, side and floor outlets.
3. Air flows from floor outlets.
4. Air flows from floor outlet, front defroster and side demister outlets.
5. Air flows from front defroster and side demister outlet.

DIAGNOSIS

Symptom	Possible Cause	Remedy
Heater blower won't work even when its switch is ON.	Blower fuse blown	Replace fuse to check for short.
	Blower resistor faulty	Check continuity.
	Blower motor faulty	Replace motor.
	Wiring or grounding faulty	Repair as necessary.
Incorrect temperature output	Control cables broken or binding	Check cables.
	Air damper broken	Repair damper.
	Air ducts clogged	Repair air ducts.
	Heater core leaking or clogged	Replace heater core.
	Heater hoses leaking or clogged	Replace hoses.

ON-VEHICLE SERVICE

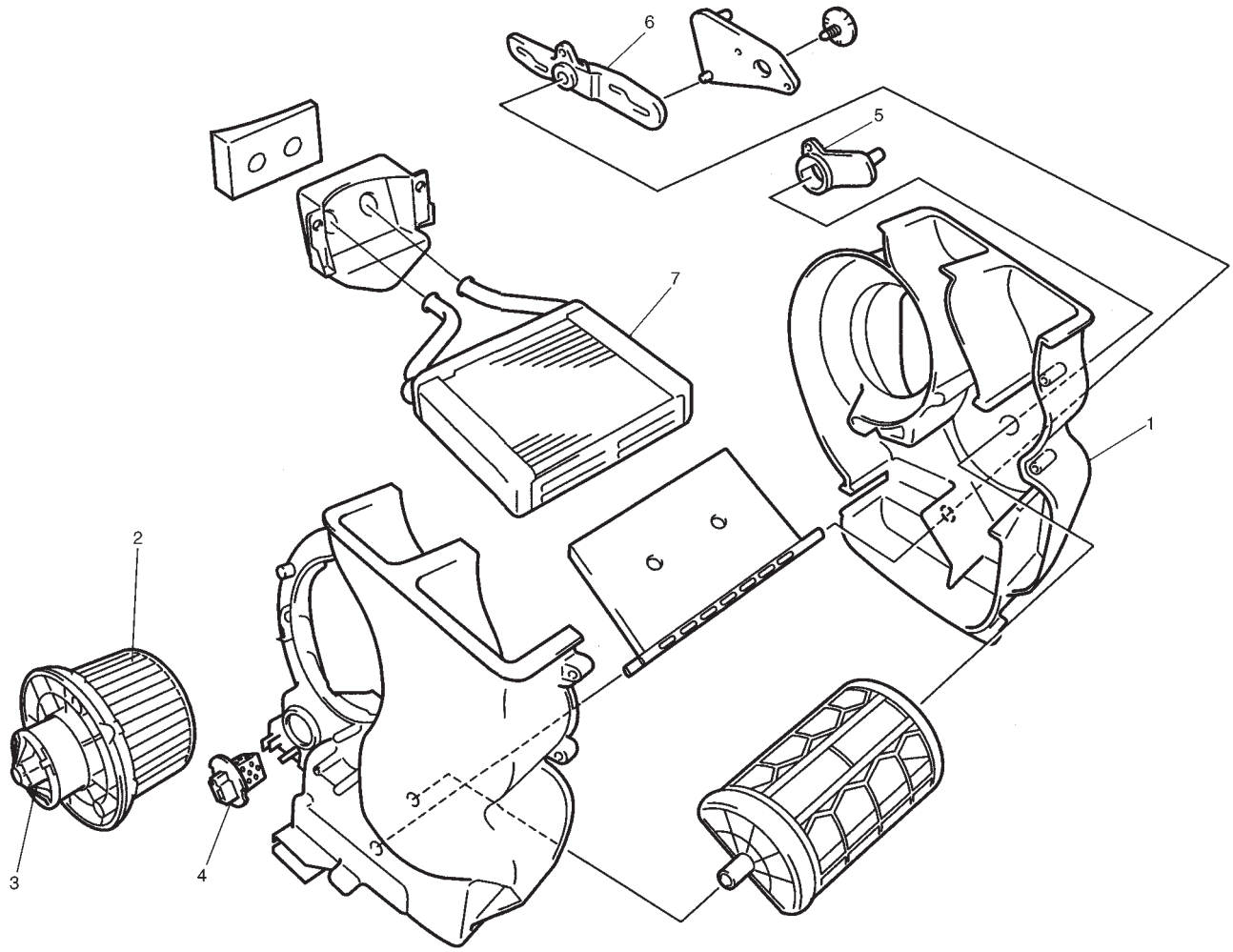
WIRING CIRCUIT



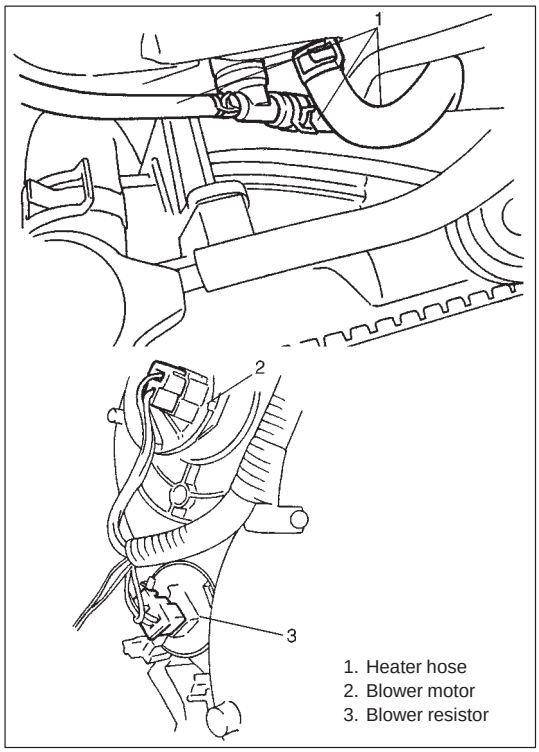
1. Battery
2. Main fuse
3. Ignition switch
4. J/B
5. Heater blower switch
6. Heater resistor
7. Blower motor
8. ECM
9. Combination switch

B :Black
Lg :Light green
P :Pink
P/B :Pink/Black
P/Bl :Pink/Blue
P/G :Pink/Green

HEATER UNIT



1. Heater unit assembly
2. Blower fan
3. Fan motor
4. Resistor
5. Mode lever
6. Air mix link
7. Heater core

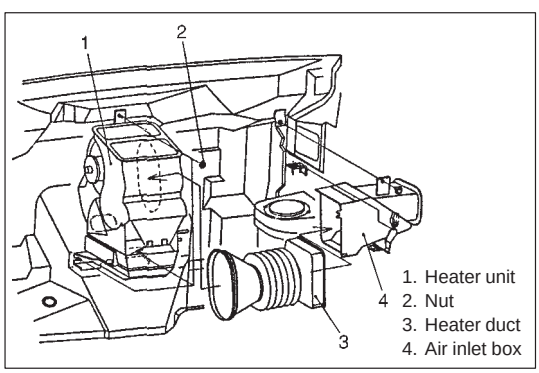


1. Heater hose
2. Blower motor
3. Blower resistor

REMOVAL

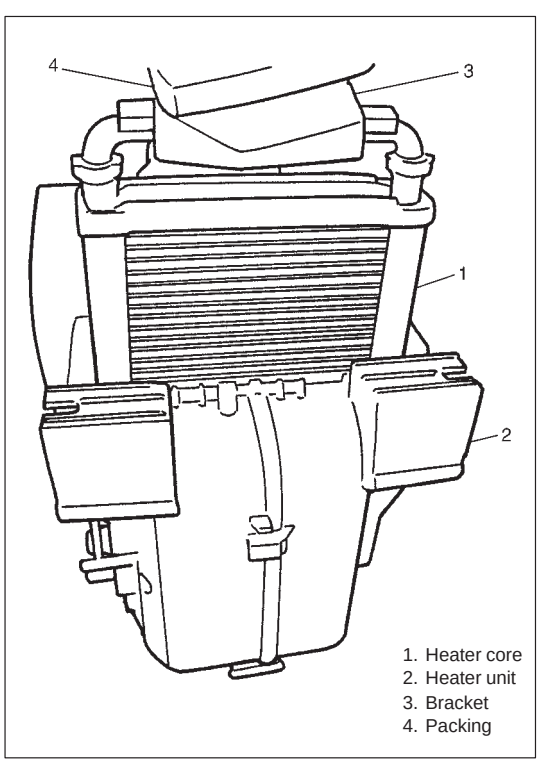
WARNING:
Please observe all WARNINGS, CAUTIONS, SERVICE PRECAUTIONS under ON VEHICLE SERVICE before performing service on Air Bag System Component. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two conditions may result in severe injury.

1) Disconnect negative (–) cable at battery.
2) Drain engine coolant and disconnect heater hoses from heater unit. For vehicle with air conditioner, recover refrigerant.
3) If equipped with air bag system, disable air bag system. Refer to DISABLING AIR BAG SYSTEM in Section 10B.
4) Remove instrument panel, refer to INSTRUMENT PANEL in Section 9.
5) Disconnect blower motor and resistor lead wires at coupler.



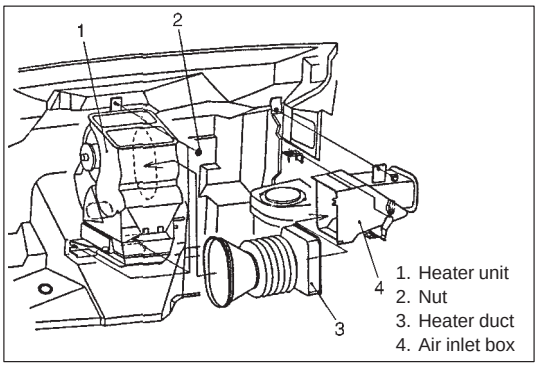
1. Heater unit
2. Nut
3. Heater duct
4. Air inlet box

6) Remove heater duct or cooling unit.
7) Remove heater unit.



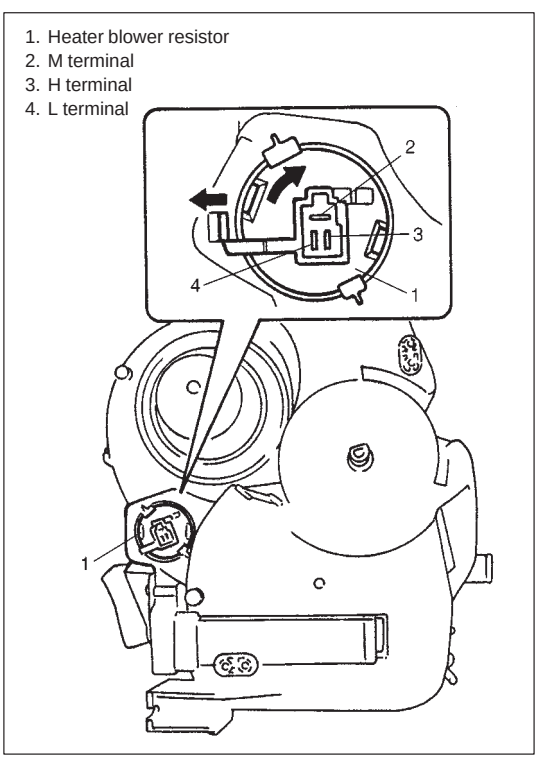
1. Heater core
2. Heater unit
3. Bracket
4. Packing

8) Pull out heater core from unit.



INSTALLATION

1) Install heater unit by reversing removal procedure, noting the following items.
   - When installing each part, be careful not to catch any cable or wiring harness.
   - When installing steering column assembly, refer to Section 3C.
2) Adjust control cables. (Refer to HEATER CONTROL CABLES in this section.)
3) Fill engine coolant to radiator and bleed air from cooling system, refer to Section 6B.
4) If equipped with air bag system, enable air bag system. Refer to ENABLING AIR BAG SYSTEM in Section 10B.



HEATER BLOWER RESISTOR

REMOVAL

1) Disconnect battery (–) cable at battery.
2) Disconnect blower resistor lead wire at coupler.
3) Remove heater blower resistor.

INSPECTION

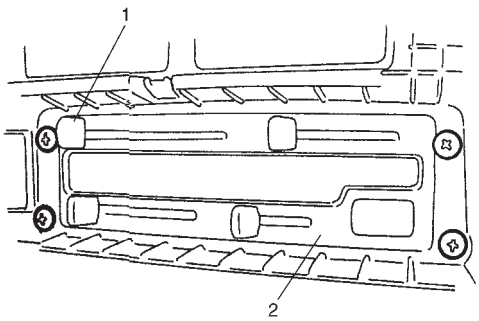
Measure the resistor for each terminal-to-terminal resistance.

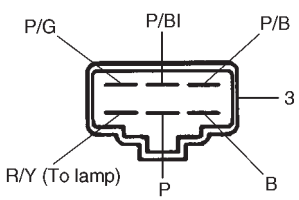
Terminal-to-terminal	Resistance (Ω)
H–M	1.1
H–L	3.3
M–L	2.2

If the measured resistor is incorrect, replace the heater blower resistor.

INSTALLATION

Reverse removal procedure for installation.





1. Control lever knob
2. Control panel
3. Heater blower motor switch connector

HEATER CONTROL LEVER ASSEMBLY

REMOVAL

1) Remove meter cluster and glove box.
2) Remove control cable from link.
3) Disconnect blower motor switch and A/C switch (if equipped) lead wires at coupler.
4) Disconnect instrument harness clamps from stay.
5) Remove control lever assembly.

INSPECTION

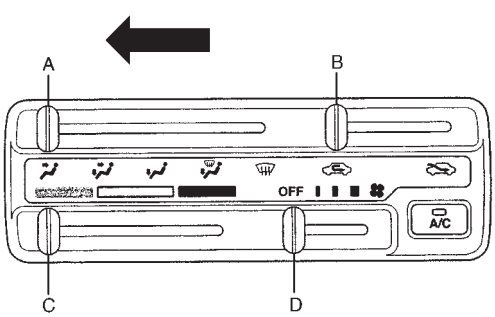
Check switch for each terminal-to-terminal continuity. If there is no continuity, replace control lever assembly.

	B	P/G	P/B	P/Bl	P
H	○	○			○
M	○	○		○	
L	○	○	○		

B : Black
P : Pink
P/B : Pink/Black
P/Bl : Pink/Blue
P/G : Pink/Green

INSTALLATION

Reverse removal procedure for installation.

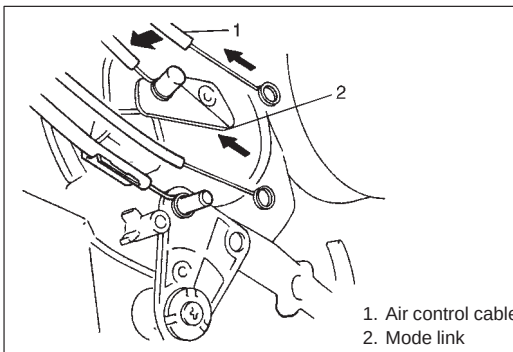


HEATER CONTROL CABLES

ADJUSTMENT

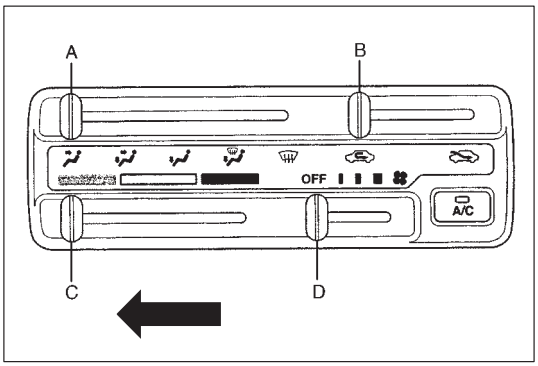
Air control cable

1) Set control lever to ventilation position.



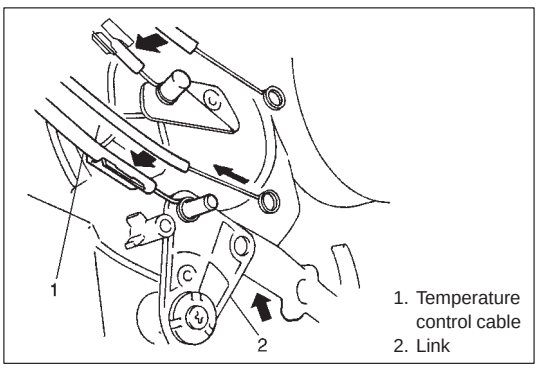
1. Air control cable
2. Mode link

2) Pull lever and link in arrow directions fully as shown in figure and fix cable there.



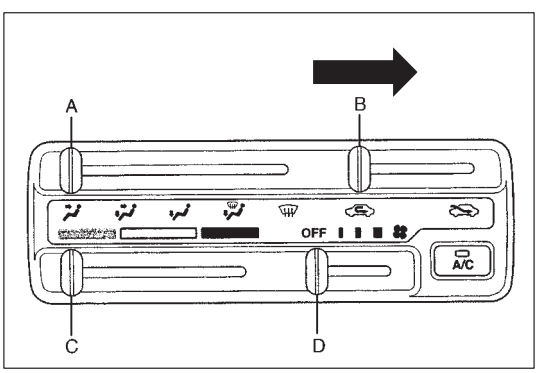
Temperature control cable

1) Set control lever to COOL position.



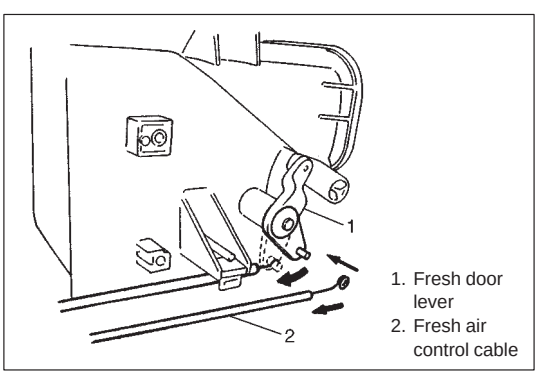
1. Temperature control cable
2. Link

2) Pull lever and link in arrow direction fully as shown in left figure and fix cable there.



Fresh air control cable

1) Set control lever to FRESH AIR position.



1. Fresh door lever
2. Fresh air control cable

2) Pull lever in arrow direction fully as shown in left figure and fix cable there.

SECTION 1B

AIR CONDITIONING

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

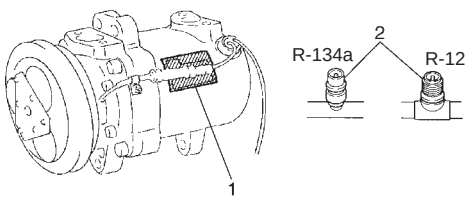
- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to AIR BAG SYSTEM COMPONENTS AND WIRING LOCATION VIEW of GENERAL DESCRIPTION in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and SERVICE PRECAUTIONS of 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 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 the description in page 1B-2.
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.

CONTENTS

GENERAL DESCRIPTION

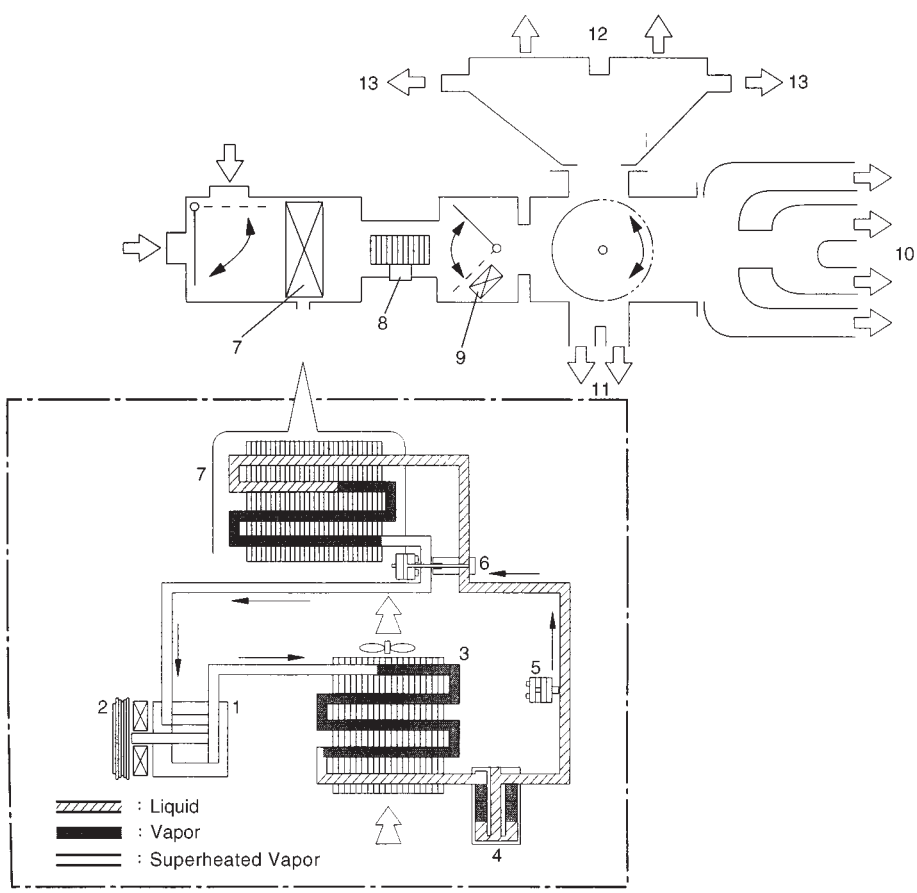
This section describes function of its main components, installation, servicing etc.
For basic servicing method of the air conditioning system that is not described in this section, refer to AIR CONDITIONING BASIC MANUAL (99520-02130).



1. Compressor label
2. Service valve

LABEL on the compressor shows whether the A/C system uses R-134a or R-12. Also, it can be distinguished by the shape of the service (charge) valve.

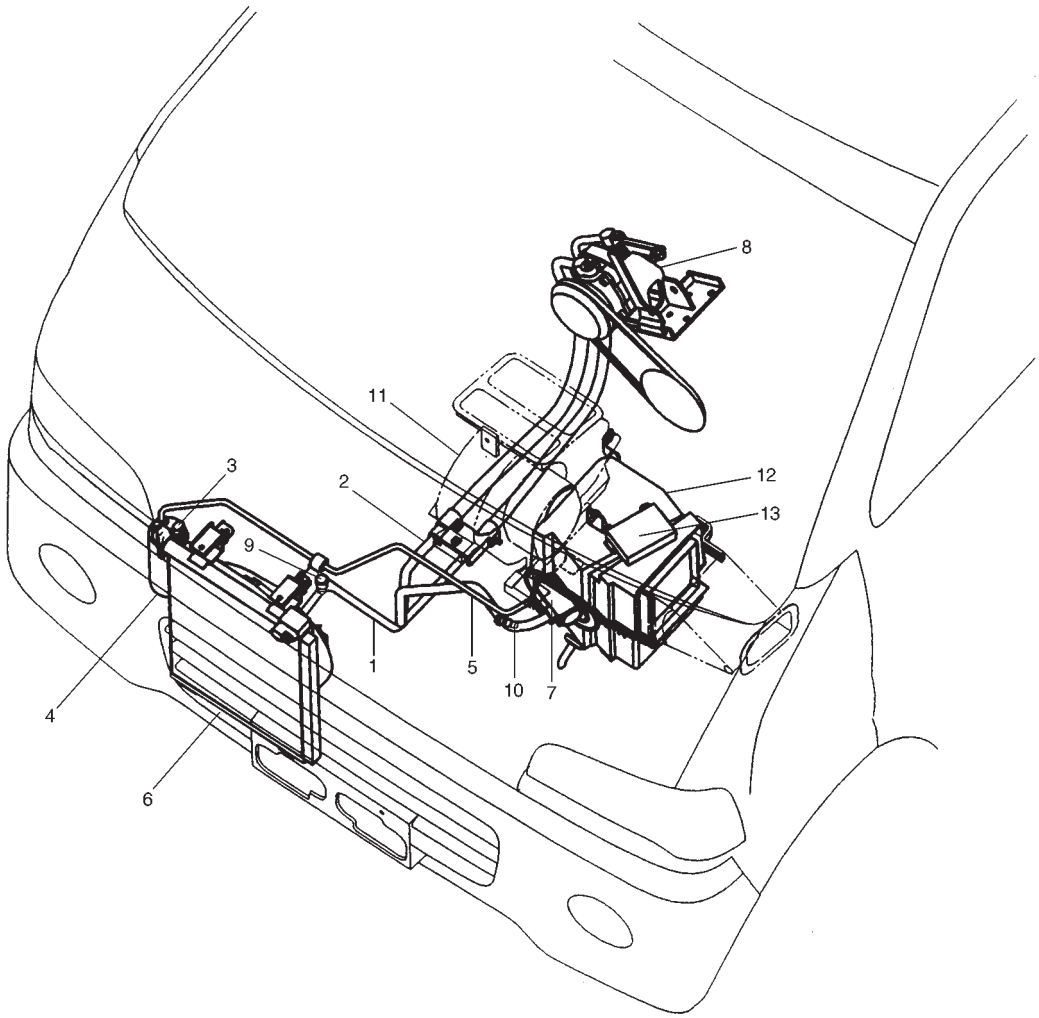
MAJOR COMPONENTS AND REFRIGERANT FLOW OF AIR CONDITIONING SYSTEM



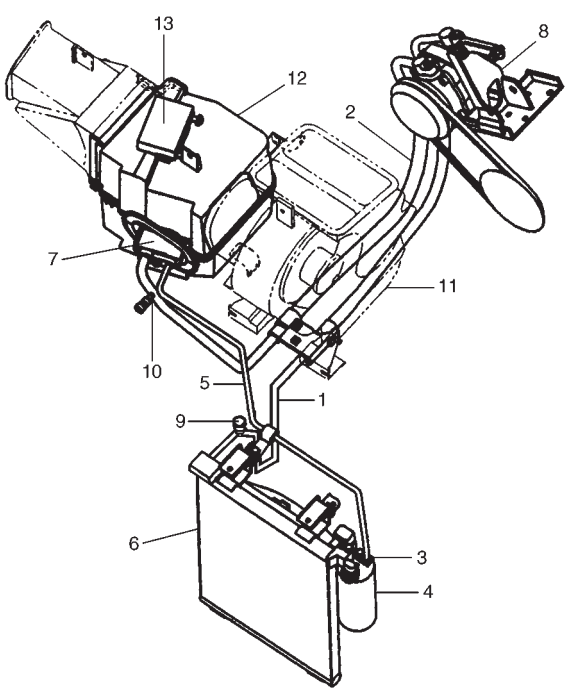
1. Compressor
2. Magnet clutch
3. Condenser
4. Receiver/dryer
5. Dual pressure switch
6. Expansion valve
7. Evaporator
8. Blower motor
9. Heater core
10. Ventilation
11. Foot
12. Defroster
13. Demister

COMPONENT LOCATION

[A]



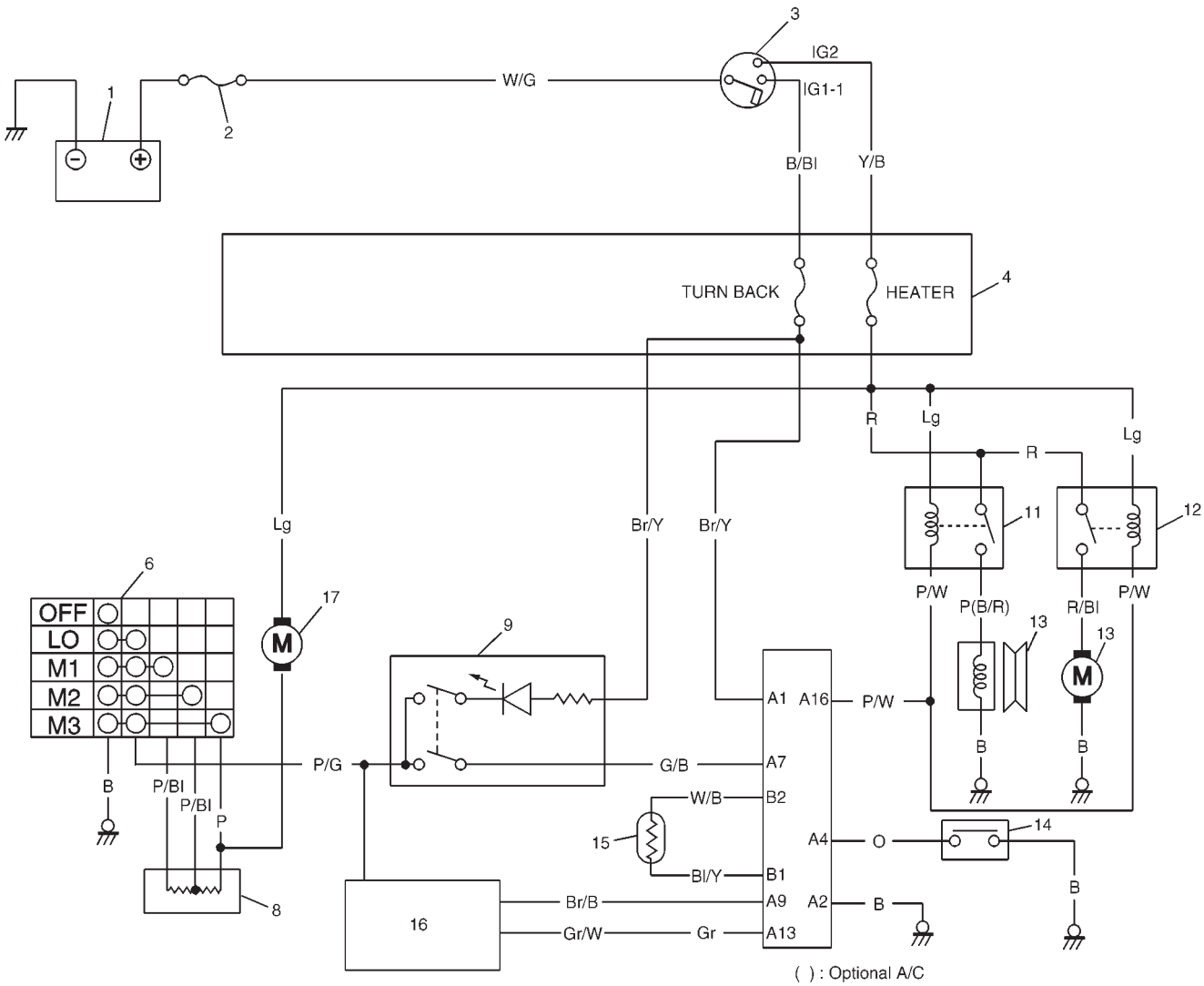
[B]



[A] : Right hand drive vehicle
[B] : Left hand drive vehicle

1. Compressor discharge hose
2. Compressor suction hose/pipe
3. Dual pressure switch
4. Receiver/Dryer
5. Evaporator inlet pipe
6. Condenser
7. Expansion valve
8. Compressor
9. High pressure service valve
10. Low pressure service valve
11. Heater unit
12. Cooling unit
13. A/C controller

WIRING CIRCUIT

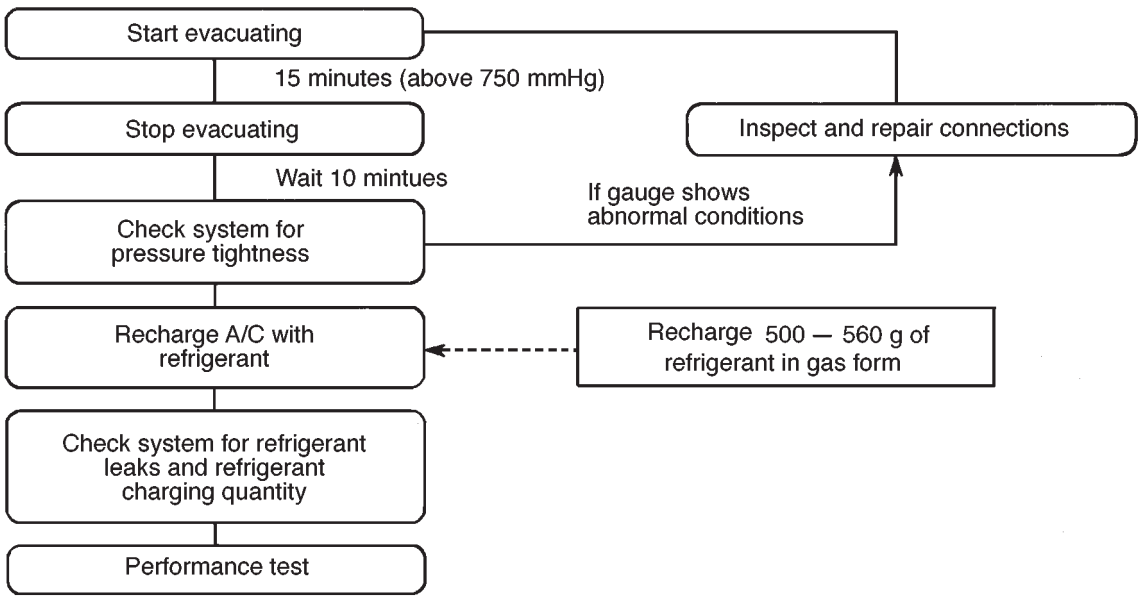


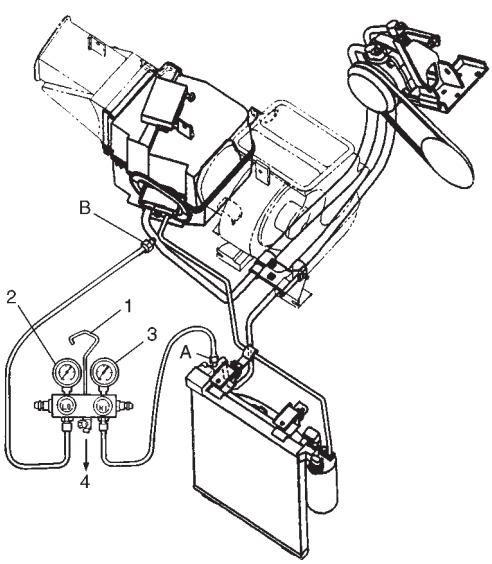
1. Battery
2. Main fuse
3. Ignition switch
4. Junction/Fuse block
5. Casette fuse
6. Heater blower motor switch
7. A/C amplifier
8. Heater resistor
9. A/C switch
10. Magnet clutch relay
11. Condenser fan motor relay
12. Condenser fan motor
13. Compressor
14. Dual pressure switch
15. Evaporator thermistor
16. ECM
17. Heater motor

B	:	Black
B/Bl	:	Black/Blue
B/R	:	Black/Red
Br/B	:	Brown/Black
Bl/Y	:	Blue/Yellow
G/B	:	Green/Black
Gr	:	Gray
Gr/W	:	Gray/White
Lg	:	Light green
P/G	:	Pink/Green
P/W	:	Pink/White
O	:	Orange
P	:	Pink
P/B	:	Pink/Black
P/Bl	:	Pink/Blue
R	:	Red
R/Bl	:	Red/Blue
R/Y	:	Red/Yellow
W/B	:	White/Black
W/G	:	White/Green

RECOVERY, EVACUATION AND CHARGING

OPERATION PROCEDURE FOR CHARGING A/C WITH REFRIGERANT





A: High pressure service valve
B: Low pressure service valve
1. Manifold gauge set
2. Low pressure gauge
3. High pressure gauge
4. Recovery equipment or vacuum pump

REFRIGERANT RECOVERY

When discharging refrigerant out of A/C system, always recover it by using refrigerant recovery and recycling equipment.
Discharging it 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.

EVACUATING AND CHARGING

Refer to AIR CONDITIONING BASIC MANUAL (99520-02130).

CAUTION:
Do not evacuate before recovering refrigerant in system.

SERVICE SPECIFICATION FOR CHARGING

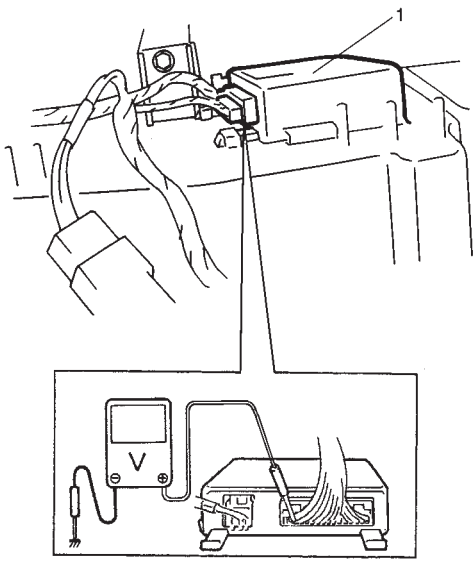
Specified amount of refrigerant: 500 – 560 g
Low pressure gauge
when charged with specified amount :
About 200 – 300 kPa (2 – 3 kg/cm^2, 29 – 43 psi)
(at air temperature 25 – 35°C (77 – 95°F))

High pressure gauge
when charged with specified amount :
About 1370 – 1670 kPa (13.7 – 16.7 kg/cm^2, 200 – 244 psi)
(at air temperature 25 – 35°C (77 – 95°F))

DIAGNOSIS

Symptom	Possible Cause	Remedy
Cool air won't come out (A/C system improper operative)	**A/C system inoperative**	
	● No refrigerant	Recover, evacuation and charging.
	● Fuse blown	Check "TURN BACK" fuse, "HEATER" fuse and "A/C FUSE" and check for short circuit.
	● A/C switch faulty	Check A/C switch.
	● Blower fan switch faulty	Check blower fan switch.
	● A/C thermistor faulty	Check A/C thermistor.
	● Dual pressure switch faulty	Check dual pressure switch.
	● Wiring or grounding faulty	Repair as necessary.
	● A/C cut signal from ECM faulty	Check A/C cut signal.
	● A/C controller faulty	Check A/C controller.
	Compressor inoperative (won't rotation)	
	● Magnet clutch faulty	Check magnet clutch.
	● Drive belt loose or broken	Tighten or replace drive belt.
	● Compressor faulty	Check compressor.
	● A/C cut signal from ECM faulty	Check A/C cut signal.
	● A/C controller faulty	Check A/C controller.
	Condenser cooling fan motor inoperative	
	● Condenser cooling fan relay faulty	Check condenser cooling fan relay.
	● Wiring or grounding faulty	Repair as necessary.
	● "A/C condenser fan relay" signal from ECM faulty	Check A/C condenser fan relay signal.
	● Condenser cooling fan motor faulty	Check condenser cooling fan motor.
	Blower motor inoperative	
	● Fuse blown	Check "HEATER" fuse and check for short circuit.
	● Blower resistor faulty	Check blower resistor.
	● Blower fan switch faulty	Check blower fan switch.
	● Wiring or grounding faulty	Repair as necessary.
	● Blower motor faulty	Check blower motor.
Cool air won't come out or insufficient cooling (A/C system normal operative)	● Insufficient or excessive charge of refrigerant	Check charge of refrigerant. Check system for leaks.
	● Condenser clogged	Check condenser.
	● Evaporator clogged or frosted	Check evaporator. Check A/C thermistor. Check A/C controller.
	● A/C thermistor faulty	Check A/C thermistor.
	● A/C controller faulty	Check A/C controller.
	● Expansion valve faulty	Check expansion valve.
	● Receiver/dryer clogged	Check receiver/dryer.
	● Drive belt slipping	Check or replace drive belt.
	● Magnetic clutch faulty	Check magnetic clutch.

Symptom	Possible Cause	Remedy
Cool air won't come out or insufficient cooling (A/C system normal operative)	● Compressor faulty	Check compressor.
	● Air in A/C system	Replace receiver/dryer, and evacuation and charging.
	● Air leaking from cooling unit or air duct	Repair as necessary.
	● Heater and ventilation system faulty	Check air inlet box Assy. Check heater control lever Assy. Check heater Assy.
	● Blower motor faulty	Check blower motor.
	● Excessive compressor oil existing in A/C system	Pull out compressor oil in A/C system circuit, and replace compressor.
Cool air won't comes out only intermittently	● Wiring connection faulty	Repair as necessary.
	● Expansion valve faulty	Check expansion valve.
	● Excessive moisture in A/C system	Replace receiver/dryer, and evacuation and charging.
	● A/C controller faulty	Check A/C controller.
	● Magnetic clutch faulty	Check magnetic clutch.
	● Compressor thermal protector faulty	Check compressor thermal protector.
	● Excessive charge of refrigerant	Check charge of refrigerant.
Cool air comes out only at high speeds	● Condenser clogged	Check condenser.
	● Insufficient charge of refrigerant	Check charge of refrigerant.
	● Air in A/C system	Replace receiver/dryer, and evacuation and charging.
	● Drive belt slipping	Check or replace drive belt.
	● Compressor faulty	Check compressor.
Cool air won't comes out only at high speeds	● Excessive charge of refrigerant	Check charge refrigerant.
	● Evaporator frosted	Check evaporator. Check A/C thermistor.
Insufficient velocity of cooled air	● Evaporator clogged or frosted	Check evaporator. Check A/C thermistor.
	● Air leaking from cooling unit or air duct	Repair as necessary.
	● Blower motor faulty	Check blower motor.
	● Wiring or grounding faulty	Repair as necessary.



1. A/C controller

A/C CONTROLLER AND ITS CIRCUITS INSPECTION

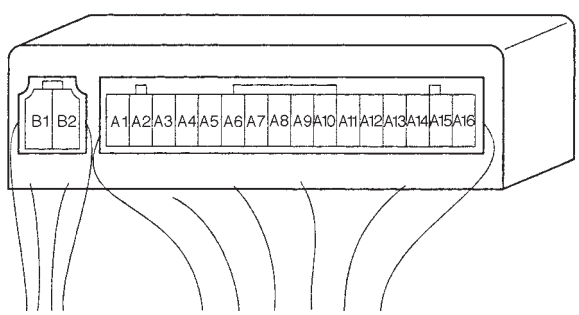
A/C controller and its circuits can be checked at couplers by measuring voltage with the couplers connected.

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

VOLTAGE CHECK

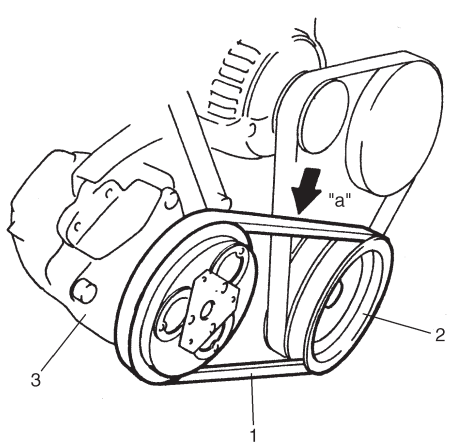
1) Remove A/C controller from cooling unit.
2) Connect A/C controller couplers to A/C controller.
3) Check voltage at each terminal with couplers connected and ignition switch ON.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.



TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Power Source	10 – 14 V	Ignition Switch ON
A2	Ground	0 – 1 V	Ignition Switch ON
A3	———	———	———
A4	Dual Pressure Switch	0 – 1 V	Ignition Switch ON
A5	———	———	———
A6	———	———	———
A7	A/C Switch	0 – 1 V	Blower fan Switch ON and A/C Switch ON at Ignition Switch ON (A/C indicator light ON)
		10 – 14 V	Blower fan or A/C Switch OFF at Ignition Switch ON (A/C indicator light OFF)
A8	———	———	———
A9	ECM (A/C cut signal)	———	Refer to “INSPECTION OF ECM AND ITS CIRCUIT” in “ENGINE AND EMISSION CONTROL SYSTEM” Section
A10	———	———	———

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A11	———	———	———
A12	———	———	———
A13	ECM (A/C signal)	———	Refer to “INSPECTION OF ECM AND ITS CIRCUIT” in “ENGINE AND EMISSION CONTROL SYSTEM” Section
A14	———	———	———
A15	———	———	———
A16	Compressor relay	0 – 1 V	Blower fan switch ON and A/C switch ON at engine running Terminal “A9” (A/C cut signal) at 5 V or more
		10 –14 V	Other than above at ignition switch ON
B1	Evaporator thermistor	0 – 1 V	Ignition switch ON
B2	Evaporator thermistor	0.9 – 1.1 V	Thermistor temperature 25°C, 77°F at ignition switch ON
		2.2 – 2.4 V	Thermistor temperature 0°C, 32°F at ignition switch ON



1. Drive belt
2. Crankshaft pulley
3. A/C compressor

A/C COMPRESSOR DRIVE BELT INSPECTION

1) Check belt tension by measuring how much it deflects when pushed at intermediate point between compressor pulley and crank pulley with about 100 N (10 kg, 22 lbs) force.

   “a” : 8 – 9 mm (0.31 – 0.35 in.) as deflection/100N (10 kg, 22 lbs)

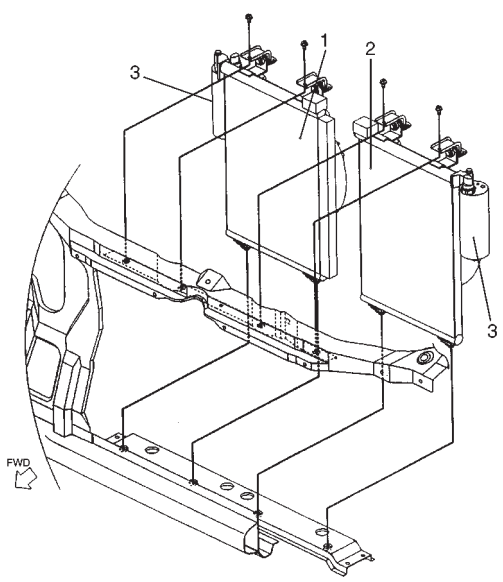
2) Check belt for wear and cracks, and replace as required.

ON-VEHICLE SERVICE

CAUTION:
When refrigerant line must be disconnected and connected to remove and reinstall any component of A/C system, be sure to observe following instructions.

- **When disconnecting any line from system, install a blind plug or cap to fitting of such line immediately.**
- **When connecting hoses and pipes to each other respectively, previously apply a few drops of refrigerating oil to seats of coupling nuts and O-ring.**
- **When tightening or loosening a fitting, use two wrenches, one for turn and the other for support.**
- **Tighten flared nuts according to following specifications.Tightening torque for coupling nut**

8 mm pipe:	**13 N·m (1.3 kg-m, 9.5 lb-ft)**
14.5mm pipe:	**32 N·m (3.2 kg-m, 23.0 lb-ft)**



1. A/C condenser assembly (RHD vehicle)
2. A/C condenser assembly (LHD vehicle)
3. Receiver/dryer

A/C CONDENSER ASSEMBLY

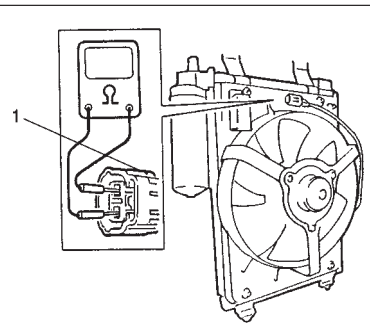
INSPECTION

Check the following.

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

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

NOTE:
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.

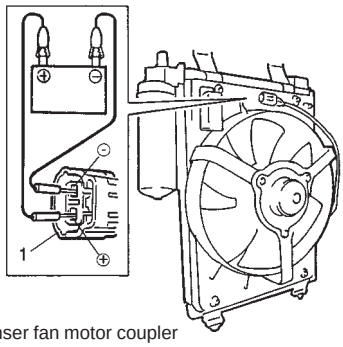


1. A/C condenser fan motor coupler

A/C CONDENSER COOLING FAN MOTOR

INSPECTION

Check continuity between each two terminals.
If check results are continuity, proceed to next operation check.
If not , replace.



1. A/C condenser fan motor coupler

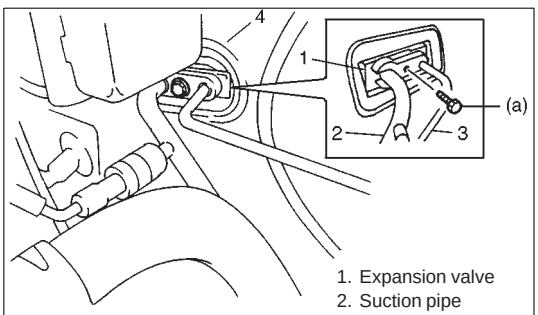
Connect battery to A/C condenser fan motor as shown, then check that the condenser fan motor operates smoothly.

Reference current : approx. 6.7 – 8.3 A at 12 V

COOLING UNIT (EVAPORATOR)

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) Disable air bag system, if equipped.



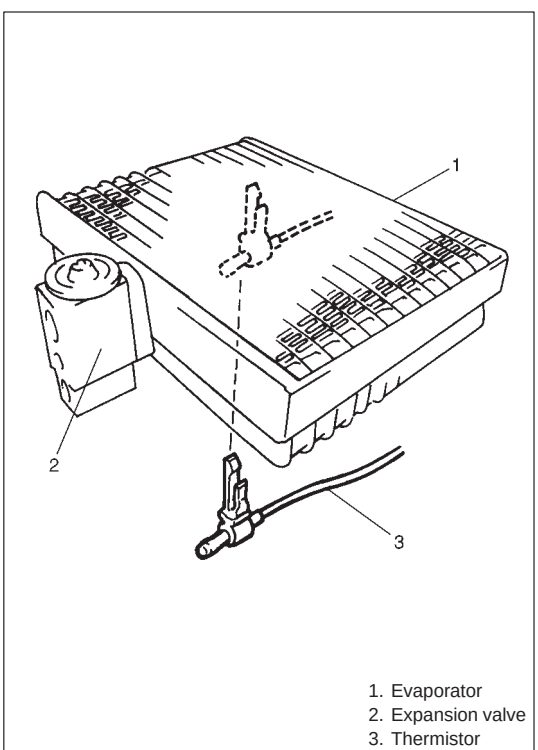
1. Expansion valve
2. Suction pipe
3. Evaporator inlet pipe
4. Dash panel

Tightening Torque
(a) : 10 N·m (1.0 kg, 7.5 lb-ft)

4) Disconnect pipes from evaporator (expansion valve).
   Detach air damper case and remove cooling unit by keeping away air damper case.

INSTALLATION

1) Install Cooling Unit by reversing removal procedure.
2) Attach pipes to evaporator (expansion valve) and tighten bolt to specified. Connect coupler of wire harness as they were.
3) Evacuate and charge system according to previously described procedure.
4) Enable air bag system, if equipped.



1. Evaporator
2. Expansion valve
3. Thermistor

Evaporator

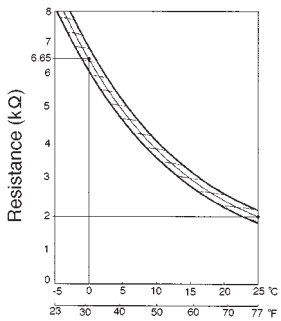
Check the following

- Evaporator fins for leakage, blockage and damage.
- Evaporator fitting for leakage.

Clogged evaporator fins should be washed with water, and should be dried with compressor air.

NOTE:

- **Be careful not to damage evaporator fins. If evaporator 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 evaporator.**
- **When the thermistor removed, its should be reinstalled in original position.**



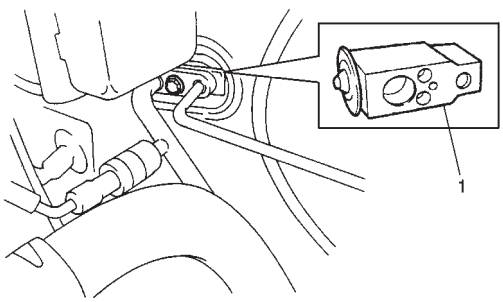
A/C evapo. thermistor

Check resistance between terminals.

Sensor Temperature (°C (°F))	Resistance (kΩ)
0 (32)	6.3 – 7.0
25 (77)	1.8 – 2.2

If it is not within specification, replace thermistor.

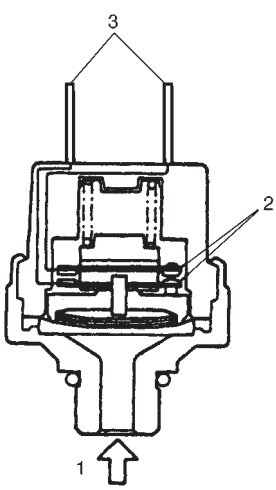
NOTE:
When the thermistor is removed, its should be reinstalled in original position.



1. Expansion valve

Expansion valve

Refer to TROUBLESHOOTING PROCEDURE USING MANIFOLD GAUGE SET earlier in AIR CONDITIONING BASIC MANUAL.



1. Pressure
2. Movable contact
3. Pressure switch terminal

DUAL PRESSURE SWITCH

INSPECTION

1) Check switches 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, switches should show proper continuity.
2) When pressure is following specified pressure, switch should show no continuity.

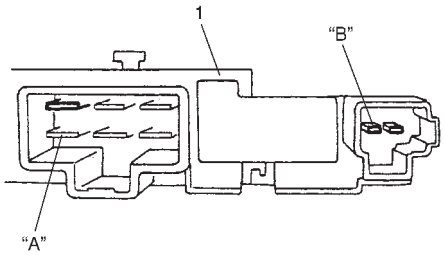
High side pressure	Dual pressure switch
200 kPa (2.0 kg/cm^2) or below	No continuity
3200 kPa (32 kg/cm^2) or above	No continuity

Tightening torque for dual pressure switch
11 N·m (1.1 kg-m, 8.0 lb-ft)

A/C SWITCH

REMOVAL AND INSTALLATION

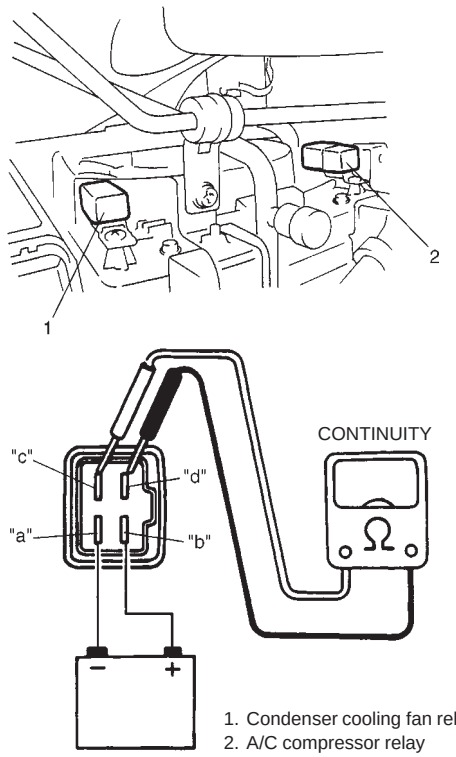
Refer to HEATER CONTROL LEVER ASSEMBLY in Section 1A.



1. Blower fan and A/C switch

INSPECTION

- Press A/C Switch button and set blower fan switch other than OFF and check if there is continuity between terminals “A” and “B”.
- With battery voltage (+) connected to terminal “B” and (–) to terminal “A”, press A/C Switch button and set blower fan switch other than OFF and check if indicator lamp lights.



1. Condenser cooling fan relay
2. A/C compressor relay

A/C COMPRESSOR RELAY AND CONDENSER COOLING FAN RELAY

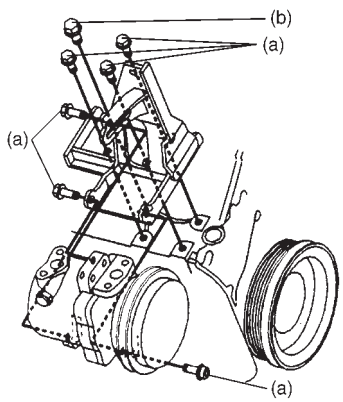
INSPECTION

1) Disconnect negative cable at battery.
2) Remove condenser cooling fan relay from vehicle.
3) Connect battery positive (+) terminal to terminal “b” of relay.
   Connect battery negative (–) terminal “a” of relay.
   Check continuity between terminal “c” and “d”.
   If there is no continuity when relay is connected to the battery, replace relay.

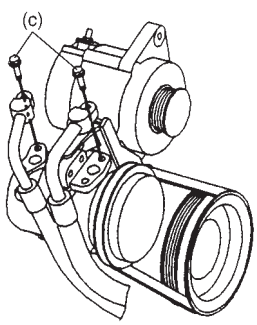
A/C COMPRESSOR

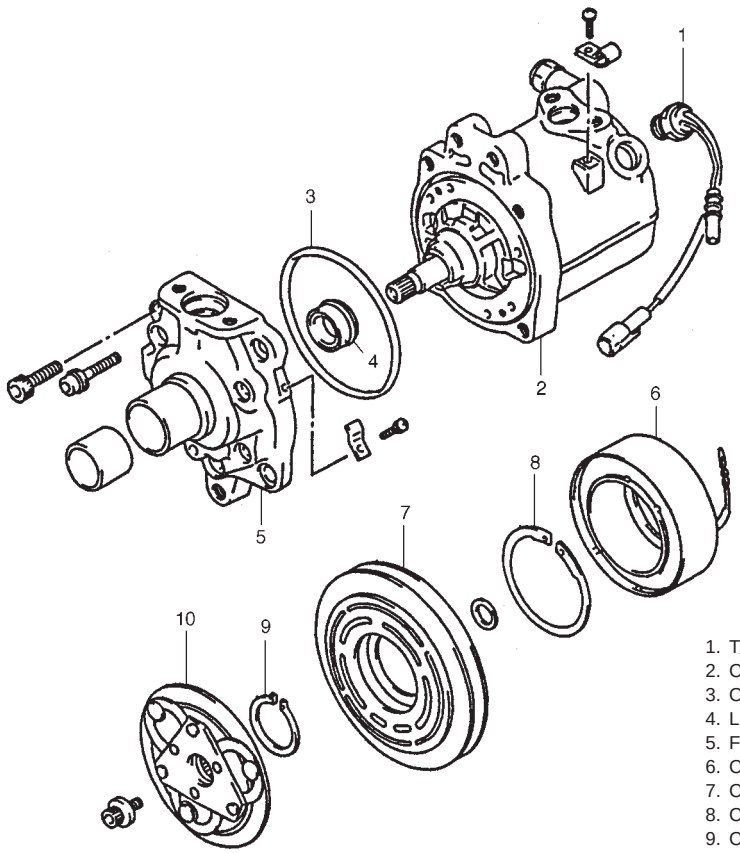
REMOVAL AND INSTALLATION

Refer to the figure as given below when removing and installing A/C compressor.
After installing, be sure to check and adjust drive belt tension, referring to BELT TENSION INSPECTION in Section 6H and A/C COMPRESSOR DRIVE BELT INSPECTION under DIAGNOSIS.

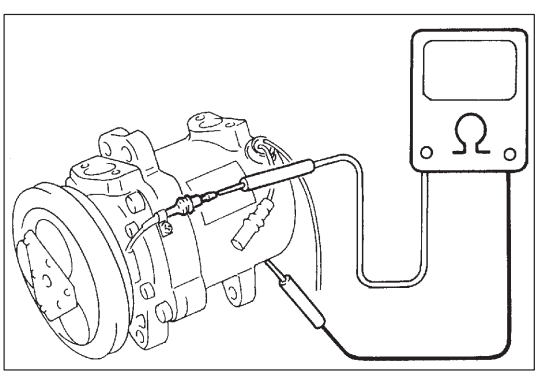


Tightening torque
(a) : 23 N·m (2.3 kg-m, 16.5 lb-ft)
(b) : 50 N·m (5.0 kg-m, 36.0 lb-ft)
(c) : 10 N·m (1.0 kg-m, 7.5 lb-ft)





1. Thermal switch
2. Compressor
3. O-ring
4. Lip type seal
5. Front head
6. Clutch coil
7. Compressor pulley
8. Circlip
9. Circlip
10. Armature plate

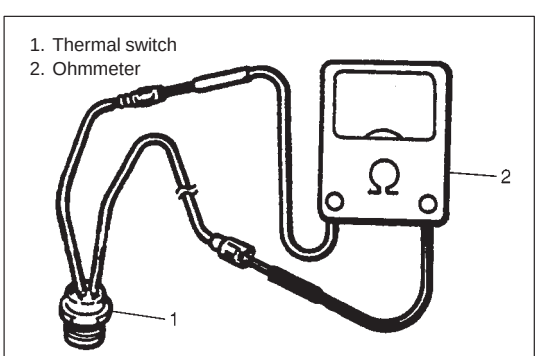


INSPECTION

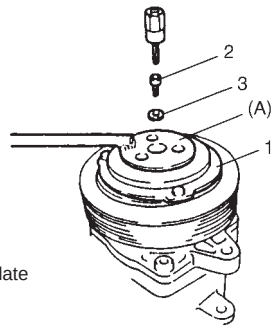
- Check pressure plate and rotor for wear and oil soaked conditions respectively.
- Check clutch bearing for noise, wear and grease leakage.
- Measure stator coil for resistance at 20°C.

  Standard Resistance: 2.9 – 3.8 Ω

  If the measured resistance does not remain within above tolerance, replace coil.



- Use an ohmmeter to check thermal switch for continuity. If it is no continuity, replace it.



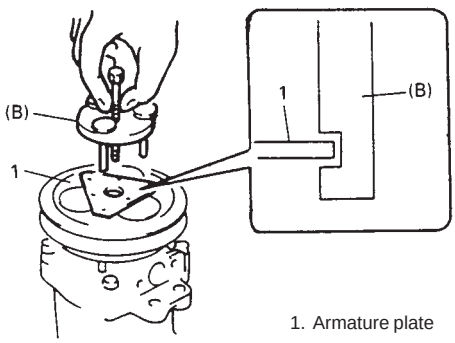
1. Armature plate
2. Screw
3. Washer

DISASSEMBLY

1) Remove compressor.
2) Fix armature plate with special tool (A) and remove armature plate screw.

Special Tool
(A): 09991-06060

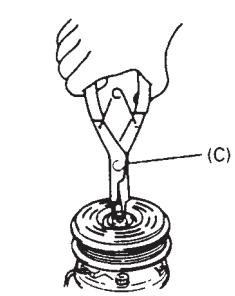
NOTE:
Do not reuse armature plate screw.



1. Armature plate

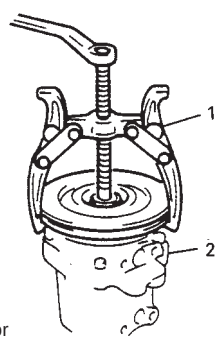
3) Using special tool (B), remove armature plate.

Special Tool
(B): 09991-06030



4) Remove lead wire clamp.
5) Remove felt ring and shims from shaft.
6) Using special tool (C), remove circlip.

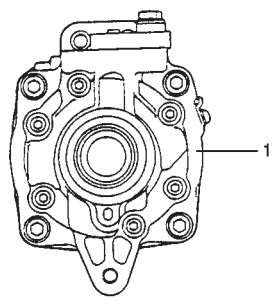
Special Tool
(C): 09900-06107



1. Puller
2. Compressor

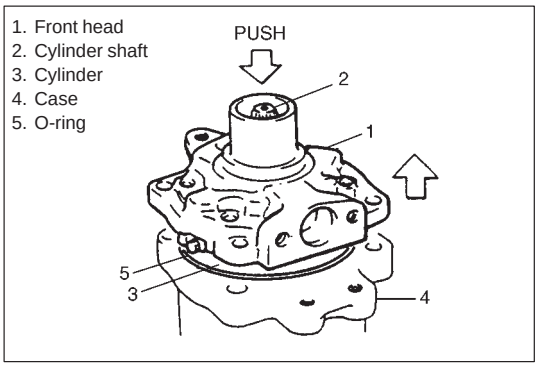
7) Remove magnet clutch lead wire clamp screw, and disconnect magnet clutch read wire.
8) Remove magnet clutch with puller.

NOTE:
Be careful not to damage pulley when removing magnet clutch.



1. Front head

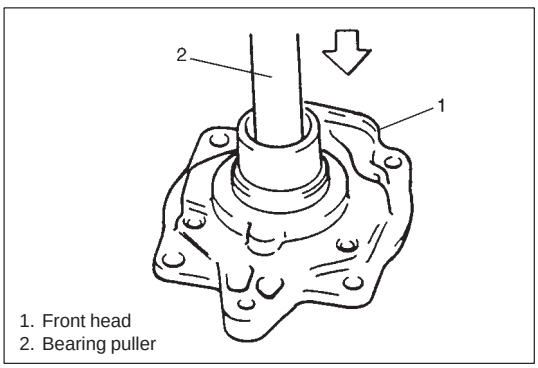
9) Remove circlip, then remove magnet clutch coil.
10) Remove front head mounting screw (10 pcs).



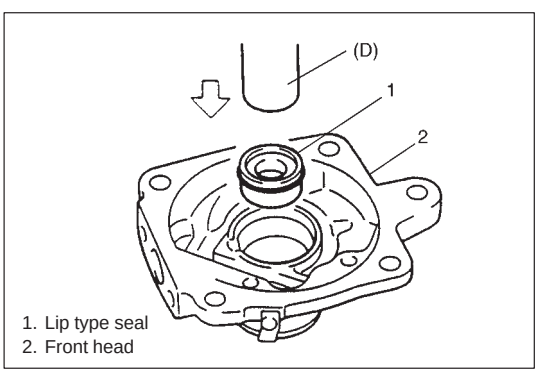
11) Remove front head by pushing cylinder shaft.

NOTE:
Be careful not to remove cylinder from case.

12) Remove O-ring.



13) Remove lip seal from front head.

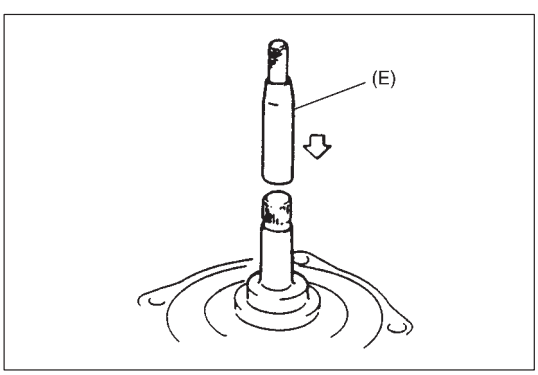


ASSEMBLY

1) Press-fit lip seal into front head using special tool (D).

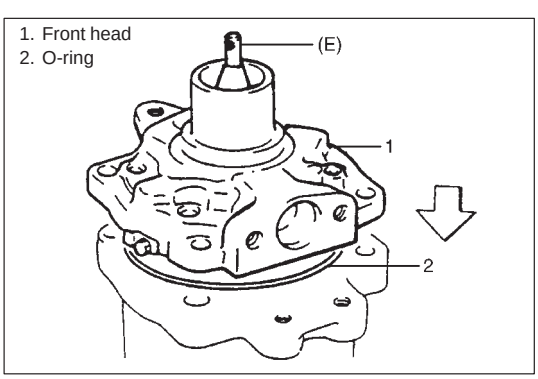
Special Tool
(D): 09991-06050

CAUTION:
Do not reuse mechanical seal once removed from compressor.

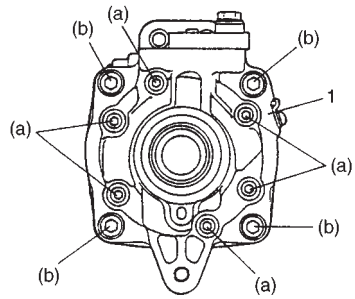


2) Coat special tool (E) surface with oil and place it on the shaft.

Special Tool
(E): 09991-06040



3) Install O-ring to case.
4) Apply A/C oil to lip seal and O-ring.
5) Install front head assembly.

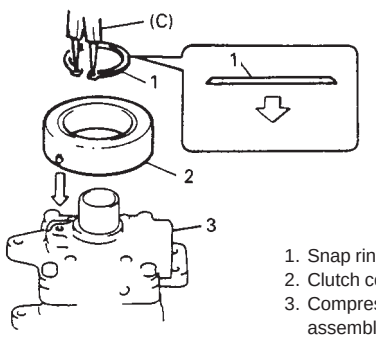


1. Front head

6) Tighten front head bolts.

Tightening Torque
(a): 14 N·m (1.4 kg-m, 10.5 lb-ft)
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:
- **Be sure to use new front head bolt washer.**
- **Tighten bolt (a) first, and next (b).**

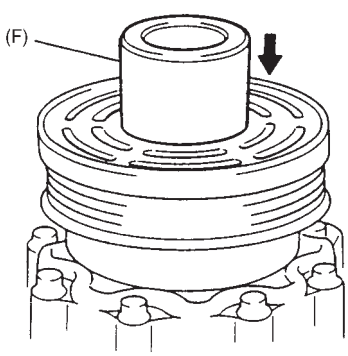


1. Snap ring
2. Clutch coil
3. Compressor assembly

7) Install magnet clutch coil.
Protrusion on lower side of coil ring must match hole in compressor assembly to prevent movement and correctly locate lead wire.
8) Using special tool (C), install snap ring as shown.

Special Tool
(C): 09990-06107

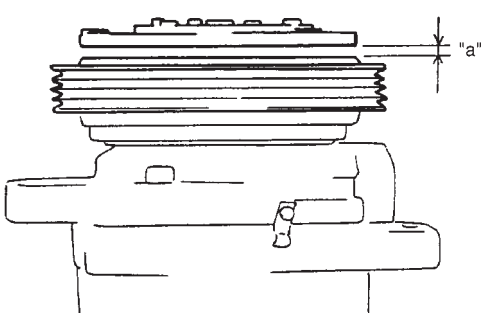
9) Clamp covering portion of lead wire.



10) Install magnet clutch.
(1) Set magnet clutch squarely over clutch installation boss.
(2) Place special tool (F) onto clutch bearing.
Ensure that edge rests only on inner race of bearing.
(3) Install snap ring.

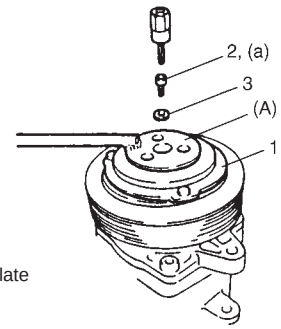
Special Tool
(F): 09991-06010

CAUTION:
Be careful not to scratch bearing seal.



11) Adjust clearance, between armature plate and magnet clutch by putting shim on compressor shaft.

Standard clearance "a": 0.3 – 0.6 mm (0.012 – 0.024 in.)

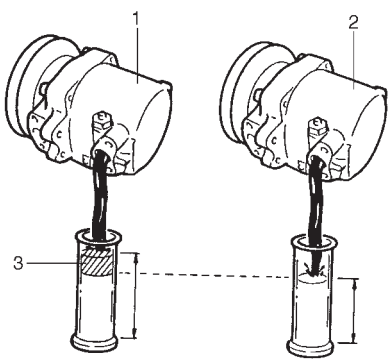


1. Armature plate
2. Screw
3. Washer

12) Tighten new armature plate nut as specified below.

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

Special Tool
(A): 09991-06060



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

REPLENISHING 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 100cc oil. When replenishing gas only, oil replenishment is not necessary.

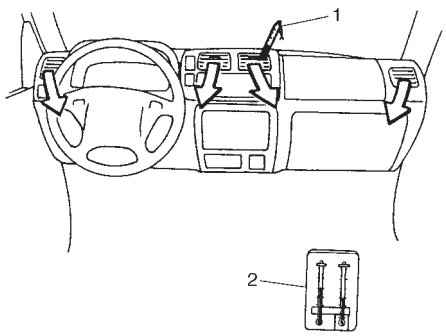
When replacing compressor

Compressor oil is sealed in each new compressor 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" = "D" – "E"
"C": Amount of oil to be drained
"D": Amount of oil sealed in a new compressor "A"
"E": Amount of oil remaining in removed compressor "B"

When replacing other part

Part replaced	Amount of compressor oil to be replenished
Evaporator	25 cc
Condenser	15 cc
Receiver/dryer	20 cc
Hoses	10 cc each
Pipes	10 cc each



1. Thermometer
2. Psychrometer

PERFORMANCE TEST

After finishing all repairs, make sure to carry out performance test of A/C system as follows.

PROCEDURE

1) Connect high and low side charging hose of manifold gauge set to hose fittings of compressor.
2) Run engine, and keep speed at 1500 rpm.
3) Set A/C and fan switch at high position.
4) Keep all windows and doors open.
5) Insert a dry bulb thermometer in cool air outlet, and place psychrometer (dry and wet bulb thermometer) close to inlet of cooling unit.
6) The high pressure gauge reading should be within specified pressure range.

   High pressure gauge reading:
   1.4 – 1.6 Mpa (14 – 16 kg/cm^2, 200 – 228 psi)
   NOTE:
   If the gauge indicates too high, pour water on condenser or if it is too low, cover front surface of condenser.

7) The dry bulb thermometer at air inlet should be within 25 to 35°C (77 to 95°F).

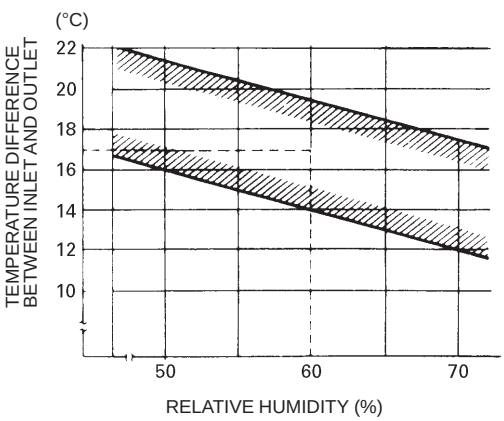
Under above conditions, operate A/C system until a stabilized condition on high and low pressure gauges and thermometers has been established.

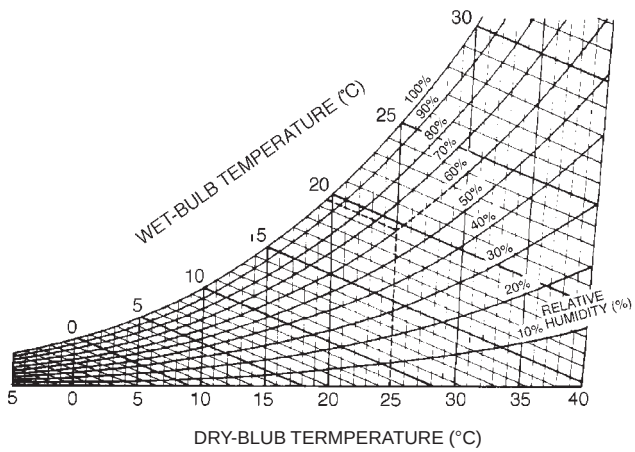
HOW TO READ THE STANDARD PERFORMANCE CURVE

1) Read psychrometer reading at the inlet, and get relative humidity from psychrometric chart. (See following figures.)
2) Measure dry bulb temperature at cool air outlet, then find out the difference between inlet and outlet temperatures.
3) Check the relative humidity-to-temperature difference relationship using the graph.
   As an example of 17°C (62.5°F) temperature difference and 60% relative humidity shown in it, if their crossing point falls within the area between two lines, cooling performance then is satisfactory and proper.

HOW TO READ RELATIVE HUMIDITY (°C)
Measure wet-bulb temperature and dry-bulb temperature on the psychrometer at the evaporator air inlet, follow lines at those temperatures and read the relative humidity curve at their intersection.

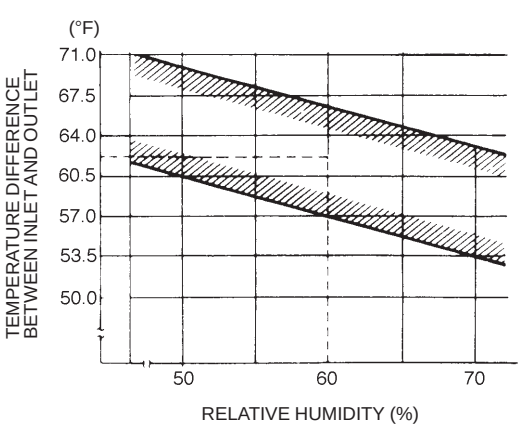
Example:
If dry-bulb temperature is 25°C and wet-bulb temperature is 19.5°C, the relative humidity is 60%.

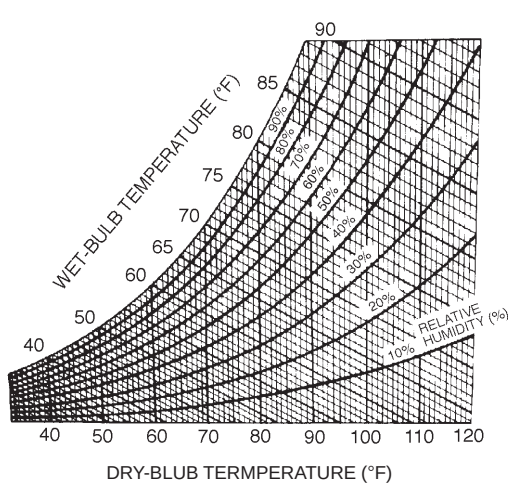




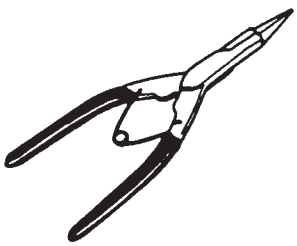
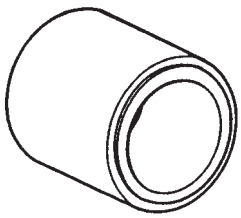
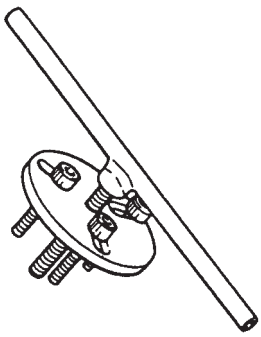
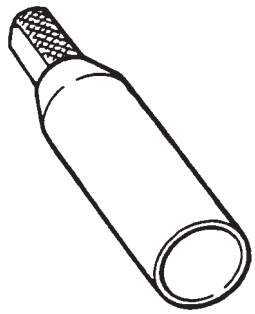
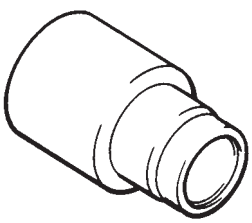
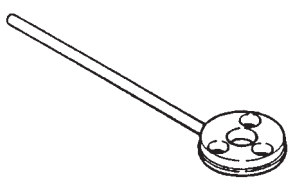
HOW TO READ RELATIVE HUMIDITY (°F)
Measure wet-bulb temperature and dry-bulb temperature on the psychrometer at the evaporator air inlet, follow lines at those temperatures and read the relative humidity curve at their intersection.

Example:
If dry-bulb temperature is 90°F and wet-bulb temperature is 78°F, the relative humidity is 60%.





SPECIAL TOOLS

 09900-06107 Snap ring pliers (Opening type)	 09991-06010 Magnet clutch pulley installer	 09991-06030 Armature plate remover	 09991-06040 Lip type seal protector
 09991-06050 Lip type seal installer	 09991-06060 Armature plate holder		

SECTION 3

STEERING, SUSPENSION, WHEELS AND TIRES

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

GENERAL DIAGNOSIS

Since the problems in steering, suspension, wheels and tires involve several systems, they must all be considered when diagnosing a symptom. To avoid misjudging the symptom, always road test the vehicle first. Proceed with the following preliminary inspection and correct any defects which are found.

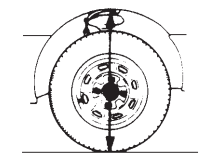
1) Inspect tires for proper pressure and uneven wear.
2) Raise vehicle on a hoist and inspect front and rear suspension and rack and pinion for loose or damaged parts.
3) Spin front wheels. Inspect for out-of-round tires, out-of-balance tires, bent rims, loosen and/or rough wheel bearings.

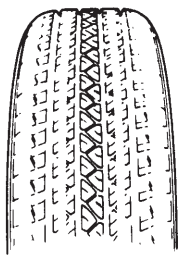
DIAGNOSIS TABLE

GENERAL DIAGNOSIS TABLE		
Symptom	**Possible Cause**	**Remedy**
Vehicle Pulls (Leads)	● Mismatched or uneven tires	Replace tire.
	● Tires not adequately inflated	Adjust tire pressure.
	● Broken or sagging springs	Replace spring.
	● Radial tire lateral force	Replace tire.
	● Disturbed front end alignment	Check front end alignment.
	● Disturbed rear wheel alignment	Check rear axle alignment.
	● Brake dragging in one road wheel	Repair front brake.
	● Loose, bent or broken front or rear suspension parts	Tighten or replace suspension part.
Abnormal or Excessive Tire Wear	● Sagging or broken springs	Replace spring.
	● Tire out of balance	Adjust balance or replace tire.
	● Disturbed front end alignment	Check front end alignment.
	● Faulty shock absorber	Replace shock absorber.
	● Hard driving	Replace tire.
	● Overloaded vehicle	Replace tire.
	● Tires not rotating	Replace or rotate tire.
	● Worn or loose road wheel bearings	Replace wheel bearing.
	● Wobbly wheel or tire	Replace wheel or tire.
	● Tires not adequately inflated	Adjust the pressure.
Wheel Tramp	● Blister or bump on tire	Replace tire.
	● Improper strut (shock absorber) action	Replace shock absorber.

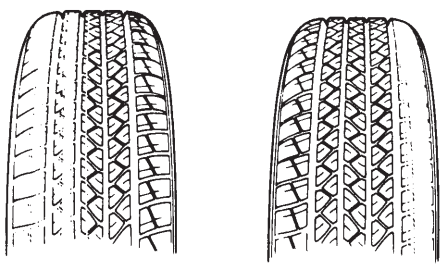
Symptom	Possible Cause	Remedy
Shimmy, Shake or Vibration	● Tire or wheel out of balance	Balance wheels or replace tire and/or wheel.
	● Loosen wheel bearings	Replace wheel bearing.
	● Worn tie rod ends	Replace tie rod end.
	● Worn lower ball joints	Replace front suspension control arm.
	● Excessive wheel runout	Repair or replace wheel and/or tire.
	● Blister or bump on tire	Replace tire.
	● Excessively loaded radial runout of tire/ wheel assembly	Replace tire or wheel.
	● Disturbed front end alignment	Check front end alignment.
	● Loose or worn steering linkage	Tighten or replace tie-rod end.
	● Loose steering gear case bolts	Tighten case bolts.
Hard Steering	● Tire not adequately inflated	Inflate tires to proper pressure.
	● Malfunctioning Electrical power steering system	Perform “Diagnosis” in Electrical power steering system section.
	● Bind in tie rod end ball studs or lower ball joints	Replace tie rod end or front suspension control arm.
	● Disturbed front end alignment	Check front end alignment.
	● Rack and pinion adjustment	Check and adjust steering gear box.
	● Bind in steering column	Repair or replace.
Too Much Play in Steering	● Wheel bearings worn	Replace wheel bearing.
	● Loose steering gear case bolts	Tighten.
	● Rack and pinion adjustments	Check and adjust rack and pinion torque.
	● Worn steering shaft joints	Replace joint.
	● Worn tie rod ends or tie rod inside ball joints	Replace tie rod end or steering gear case.
	● Worn lower ball joints	Replace front suspension control.
Poor Returnability	● Bind in tie rod end ball studs	Replace tie rod end.
	● Bind in ball joints	Replace ball joint.
	● Bind in steering column	Repair or replace.
	● Poorly lubricated rack and pinion	Check, repair or lubricate rack and pinion.
	● Disturbed front end alignment	Check and adjust front end alignment.
	● Rack and pinion adjustment	Check and adjust rack and pinion torque.
	● Tires not adequately inflated	Adjust pressure.

Symptom	Possible Cause	Remedy
Rack and Pinion Noise (Rattle or Chuckle)	● Loose steering gear case bolts ● Worn rack bush ● Rack and pinion adjustment	Retighten. Replace. Check and adjust rack and pinion torque.
Abnormal Noise, Front End	● Worn, sticky or loose tie rod ends, lower ball joints, tie rod inside ball joints or drive shaft joints ● Damaged struts or mountings ● Worn suspension arm bushings ● Loose or worn stabilizer bar mountings ● Loose wheel nuts ● Loose suspension bolts or nuts ● Broken or otherwise damaged wheel bearings ● Broken suspension springs ● Poorly lubricated or worn strut bearings	Replace tie rod end, control arm, steering gear case or drive shaft joint. Replace or repair. Replace. Tighten bolts or replace bushes. Tighten wheel nuts. Tighten suspension bolts or nuts. Replace wheel bearing. Replace spring. Lubricate or replace strut bearing.
Wander or Poor Steering Stability	● Mismatched or uneven tires ● Loosen ball joints and tie rod ends ● Faulty struts or mounting ● Loose stabilizer bar ● Broken or sagging springs ● Rack and pinion adjustment ● Front end alignment	Replace tire or inflate tires to proper pressure. Replace king pin bearing or tie rod end. Replace absorber or repair mounting. Tighten or replace stabilizer bar or bushes. Replace spring. Check or adjust steering gear box torque. Check and adjust front end alignment.
Erratic Steering When Braking	● Worn wheel bearings ● Broken or sagging springs ● Leaking wheel cylinder or caliper ● Warped discs ● Badly worn brake linings ● Drum is out of round in some brakes ● Wheel tires are inflated unequally ● Defective wheel cylinders ● Disturbed front end alignment	Replace wheel bearing. Replace spring. Repair or replace wheel cylinder or caliper. Replace brake disc. Replace brake shoe lining. Replace brake drum. Inflate tires to proper pressure. Replace or repair wheel cylinder. Check front end alignment.

Symptom	Possible Cause	Remedy
Low or Uneven Trim Height Right-to-left trim height (H) difference should be within 15 mm (0.6 in.) with curb weight.  *Same with rear side.	● Broken or sagging springs ● Over loaded ● Incorrect springs	Replace spring. Check loading. Replace spring.
Ride Too Soft	● Faulty struts (shock absorber)	Replace shock absorber.
Suspension Bottoms	● Overloaded ● Faulty struts (shock absorber) ● Incorrect broken or sagging springs	Check loading. Replace shock absorber. Replace spring.
Body Leans or Sways in Corners	● Loose stabilizer bar ● Faulty struts (shock absorbers) or mounting ● Broken or sagging springs ● Overloaded	Tighten stabilizer bar bolts or replace bushes. Replace shock absorber or tighten mounting. Replace spring. Check loading.
Cupped Tires	● Front struts defective ● Worn wheel bearings ● Excessive tire or wheel run-out ● Worn ball joints ● Tire out of balance	Replace strut. Replace wheel bearing. Replace tire or wheel disc. Replace front suspension control arm. Adjust tire balance.



- Hard Cornering
- Under Inflation
- Lack of Rotation



- Incorrect Wheel Alignment
- Tire Construction not Uniform
- Wheel Heavy Acceleration

TIRE DIAGNOSIS

IRREGULAR AND/OR PREMATURE WEAR

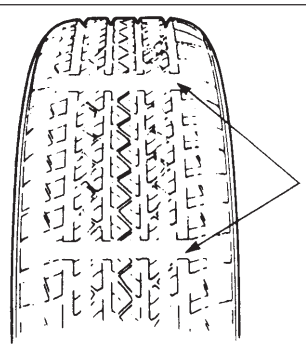
Irregular and premature wear has many causes. Some of them are: incorrect inflation pressures, lack of tire rotation, driving habits, improper alignment.

If the following conditions are noted, rotation is necessary:

1) Front tire wear is different from rear.
2) Uneven wear exists across the tread of any tire.
3) Front tire wear is unequal between the right and left.
4) Rear tire wear is unequal between the right and left.
5) There is cupping, flat spotting, etc.

A wheel alignment check is necessary if following conditions are noted:

1) Front tire wear is unequal between the right and left.
2) Wear is uneven across the tread of any front tire.
3) Front tire treads have scuffed appearance with “feather” edges on one side of tread ribs or blocks.

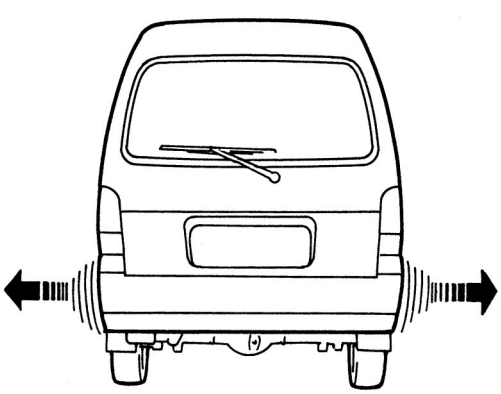


WEAR INDICATORS

Original equipment tires have built-in tread wear indicators to show when they need replacement.

These indicators will appear as 12 mm (0.47 in.) wide bands when the tire tread depth becomes 1.6 mm (0.063 in.).

When the indicators appear in 3 or more grooves at 6 locations, tire replacement is recommended.



RADIAL TIRE WADDLE

Waddle is side to side movement at the front and/or rear of the vehicle. It is caused by the steel belt not being straight within the tire. It is most noticeable at a low speed, 8 to 48 km/h (5 to 30 mph).

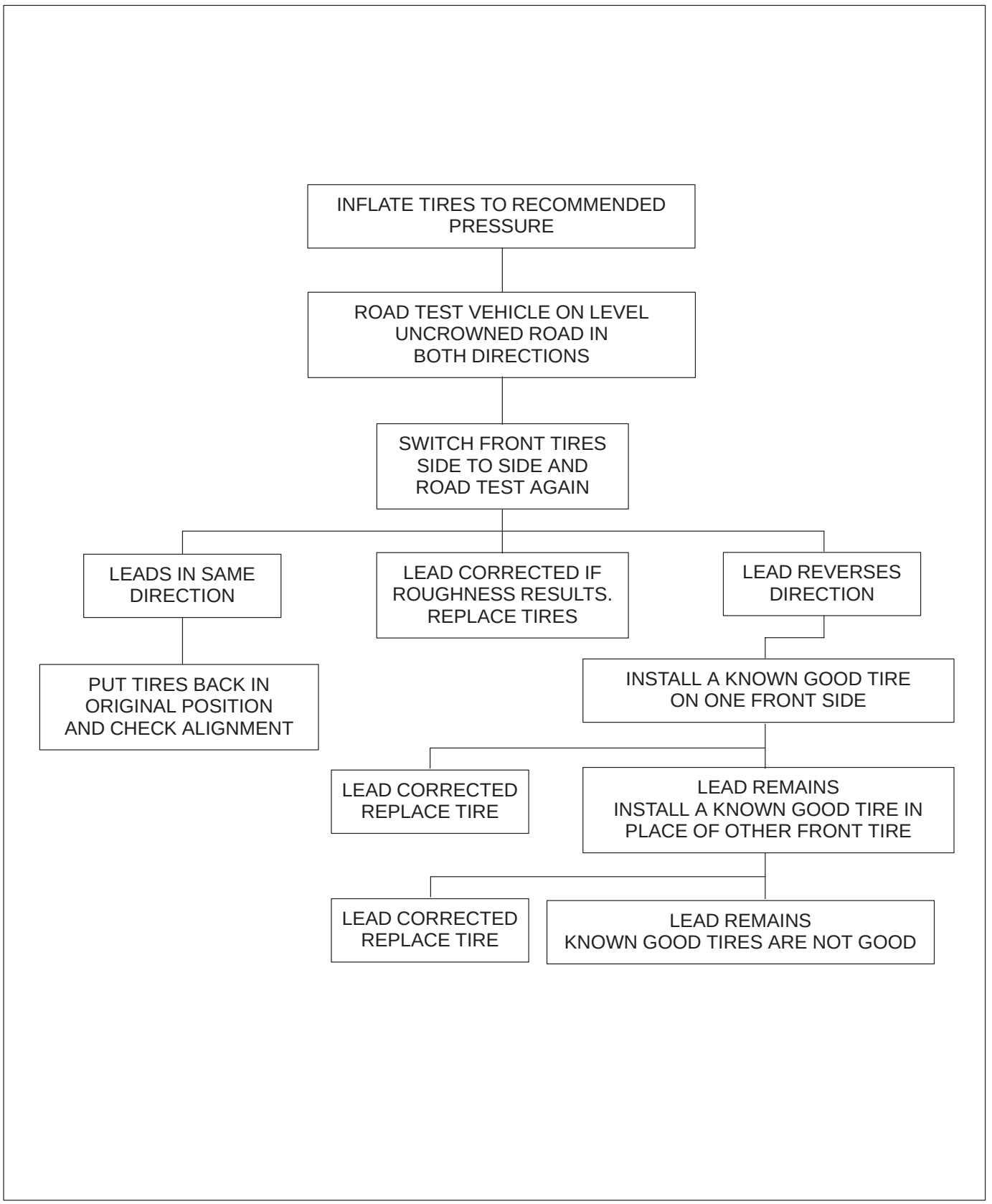
It is possible to locate the faulty tire by road testing the vehicle. If it is on the rear, the rear end of the vehicle shakes from side to side or “waddles”. To the driver in his seat, it feels as though someone is pushing on the side of vehicle.

If the faulty tire is on the front, waddling is more visual. The front sheet metal appears to be moving back and forth and the driver feels as though he is at the pivot point in vehicle.

Waddle can be quickly diagnosed by using Tire Problem Detector (TPD) and following the equipment manufacture’s recommendations.

If TPD is not available, an alternative method of substituting known good tire/wheel assemblies can be used as follows, although it takes a longer time.

1) Ride vehicle to determine whether the front or rear waddles.
2) Install tires and wheels that are known to be good (on similar vehicle) in place of those on waddling end of vehicle. If waddling end cannot be identified, substitute rear ones.
3) Road test again. If improvement is noted, reinstall originals one at a time till waddle causal tire is found. If no improvement is noted, install known good tires in place of all four. Then reinstall originals in the same manner as above.



RADIAL TIRE LEAD

"Lead" is the deviation of the vehicle from a straight path on a level road even with no pressure on the steering wheel. Lead is usually caused by:

1) Incorrect alignment
2) Uneven brake adjustment
3) Tire construction

The way in which a tire is built can produce lead in a vehicle. An example of this is placement of the belt. Off center belts on radial tires can cause the tire to develop a side force while rolling straight down the road. If one side of the tire has a little larger diameter than the other, the tire will tend to roll to one side. This will develop a side force which can produce vehicle lead.

The procedure in above figure (Lead Diagnosis) should be used to make sure that front alignment is not mistaken for tire lead.

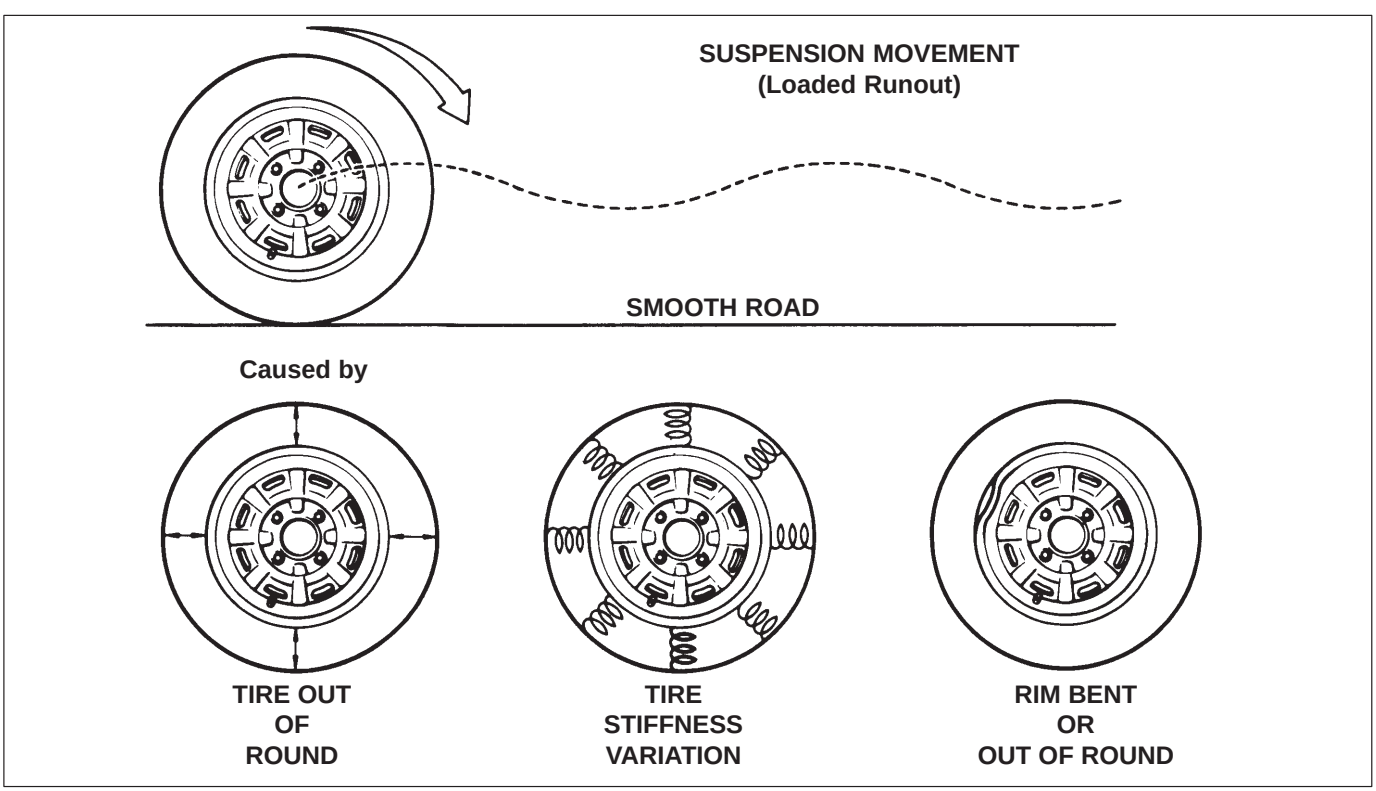
1) Part of the lead diagnosis procedure is different from the proper tire rotation pattern currently in the owner and service manuals. If a medium to high mileage tire is moved to the other side of the vehicle, be sure to check that ride roughness has not developed.
2) Rear tires will not cause lead.

VIBRATION DIAGNOSIS

Wheel unbalance causes most of the highway speed vibration problems. If a vibration remains after dynamic balancing, its possible causes are as follows.

1) Tire runout
2) Wheel runout
3) Tire stiffness variation

Measuring tire and/or wheel free runout will uncover only part of the problem. All three causes, known as loaded radial runout, must be checked by using a Tire Problem Detector (TPD). If TPD is not available, alternative method of substituting known good tire and wheel assemblies on the problem vehicle can be used, although it takes a longer time.

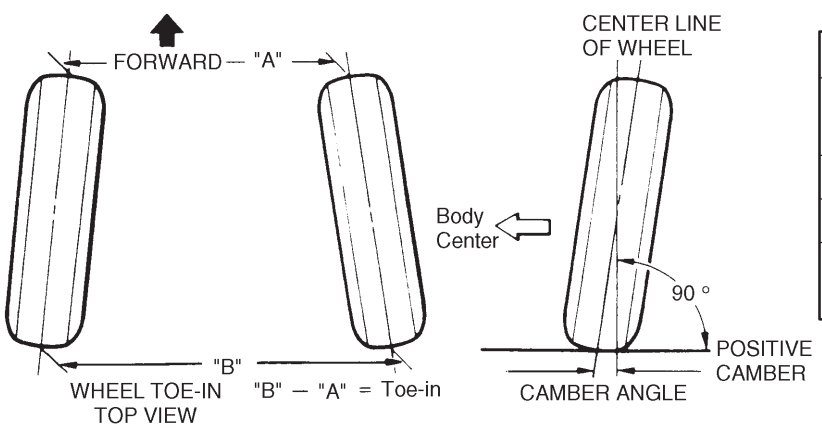


SECTION 3A

FRONT END ALIGNMENT

CONTENTS

GENERAL DESCRIPTION



Alignment service data	
Toe-in	+ 2 ∼ + 5 mm (–0.079 ∼ + 0.197 in.)
Camber	1°30’ ± 1°
Caster	3°00’ ± 1°
Kingpin inclination	9°40’ ± 3°

NOTE:
Toe-in value given above was measured by using a toe-in gauge.

Front alignment refers to the angular relationship between the front wheels, the front suspension attaching parts and the ground. Generally, the only adjustment required for front alignment is toe setting.
Camber and caster can’t be adjusted. Therefore, should camber or caster be out of specification due to the damage caused by hazardous road conditions or collision, whether the damage is in body or in suspension should be determined. If the body is damaged, it should be repaired and if suspension is damaged, it should be replaced.

TOE SETTING

Toe is the turning in or out of the front wheels. The purpose of a toe specification is to ensure parallel rolling of the front wheels (Excessive toe-in or toe-out may increase tire wear).
Amount of toe can be obtained by subtracting “A” from “B” as shown in above figure and therefore is given in mm (in.).

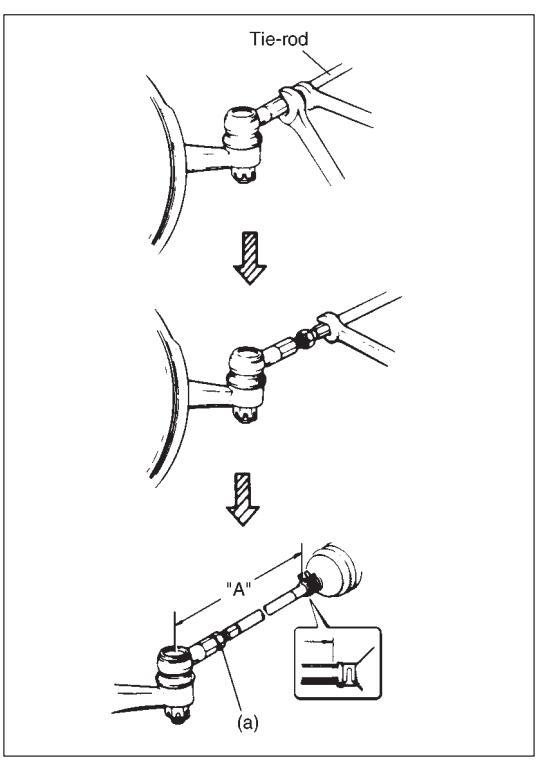
CAMBER

Camber is the tilting of the front wheels from the vertical, as viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive. When the wheels tilt inward at the top, the camber is negative. The amount of tilt is measured in degrees.

PRELIMINARY CHECKS PRIOR TO ADJUSTING FRONT ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. An additional item to be checked is the possibility of tire lead due to worn or improperly manufactured tires. “Lead” is the deviation of the vehicle from a straight path on a level road without hand pressure on the steering wheel. Section 3 of this manual contains a procedure for determining the presence of a tire lead problem. Before making any adjustment affecting toe setting, the following checks and inspections should be made to ensure correctness of alignment readings and alignment adjustments:

1) Check all tires for proper inflation pressures and approximately the same tread wear.
2) Check for loose of ball joints. Check tie rod ends; if excessive looseness is noted, it must be corrected before adjusting.
3) Check for run-out of wheels and tires.
4) Check vehicle trim heights; if out of limits and a correction is to be made, it must be made before adjusting toe.
5) Check for loose of suspension arms.
6) Check for loose or missing stabilizer bar attachments.
7) Consideration must be given to excess loads, such as tool boxes. If this excess load is normally carried in vehicle, it should remain in vehicle during alignment checks.
8) Consider condition of equipment being used to check alignment and follow manufacturer’s instructions.
9) Regardless of equipment used to check alignment, vehicle must be on a level surface both fore and aft and transversely.



TOE ADJUSTMENT

Toe is adjusted by changing the tie rod length. Loosen right and left tie rod end lock nuts first and then rotate right and left tie rods by the same amount to align toe-in to specification. In this adjustment, right and left tie rods should become equal in length (“A” in left figure).

Before rotating tie rods, apply grease between tie rods and rack boots so that boots won’t be twisted.

After adjustment, tighten lock nuts to specified torque and make sure that rack boots are not twisted.

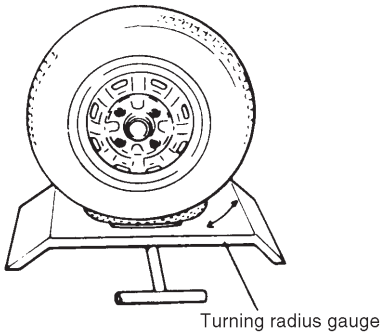
Tightening Torque

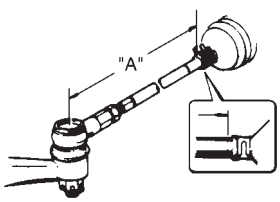
(a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

CAMBER AND CASTER ADJUSTMENT

Should camber or caster be found out of specifications upon inspection, locate its cause first. If it is in damaged, loose, bent, dented or worn suspension parts, they should be replaced. If it is in vehicle body, repair it so as to attain specifications.

To prevent possible incorrect reading of camber or caster, vehicle front end must be moved up and down a few times before inspection.





STEERING ANGLE

When tie rod or tie rod end was replaced, check toe and then also steering angle with turning radius gauge.
If steering angle is not correct, check if right and left tie rods are equal in length (“A” in left figure).

NOTE:
If tie rod lengths were changed to adjust steering angle, reinspect toe-in.

Steering angle	**inside**	**: 39°**
	outside	**: 35°**

Reference Information:
Side slip:
For inspecting front wheel side slip with side slip tester:

Side slip limit :	**0 – IN 2 mm/m**
	(0 – IN 0.078 in/3.3 ft)

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

SECTION 3B

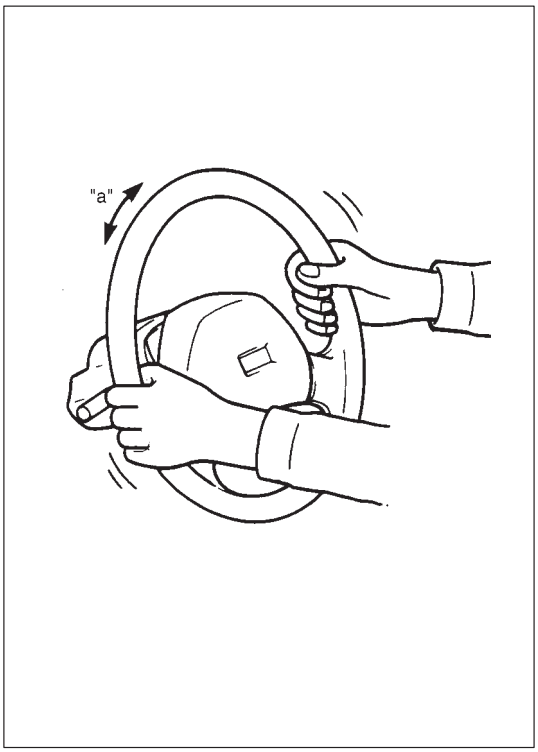
MANUAL RACK AND PINION

NOTE:
All steering gear fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.

CONTENTS

GENERAL DESCRIPTION

The rack and pinion steering system consists of two main components, the rack and the pinion. When the steering wheel is turned, the motion is transmitted to the steering shaft, shaft joint and then to the pinion.
Since the pinion teeth mesh with teeth on rack, the motion is further transferred to the rack and changed to linear motion. The force is then transmitted through the tie-rods to the steering knuckles which turn wheels.



DIAGNOSIS

DIAGNOSIS TABLE

See Section 3.

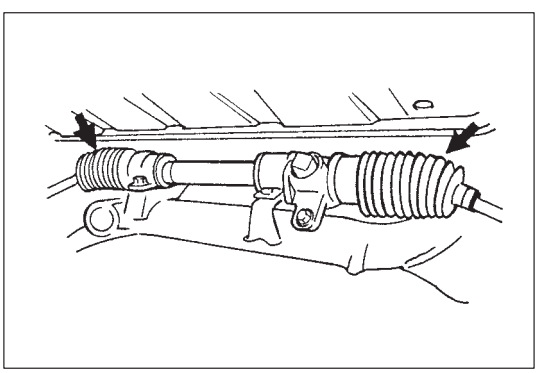
STEERING WHEEL PLAY CHECK

Check steering wheel for play and rattle, holding vehicle in straight forward condition on the ground.

Steering wheel play "a": 0 – 30 mm (0 – 1.18 in.)

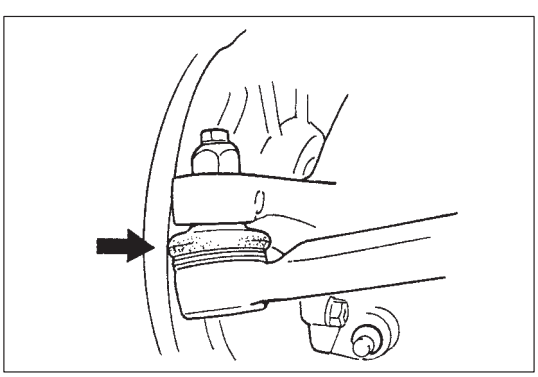
If steering wheel play is not within specification, inspect as follows and replace if found defective.

- Tie-rod end ball stud for wear (ball stud should move when more than 2 kg-cm torque is applied.)
- Lower ball joint for wear
- Steering shaft joint for wear
- Steering pinion or rack gear for wear or breakage
- Each part for looseness



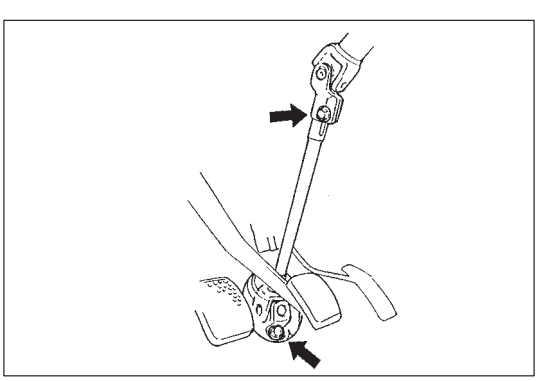
STEERING RACK BOOT

Inspect each boot for tear. A torn boot allows entry of dust and water which can cause wear to steering rack and pinion to produce noise as well as rust to result in malfunction of steering system.
If even a small tear is noted, replace with new one.
Boots should be visually inspected for any damage and tear during every periodical inspection at specified intervals and whenever vehicle is hoisted for any other purpose.



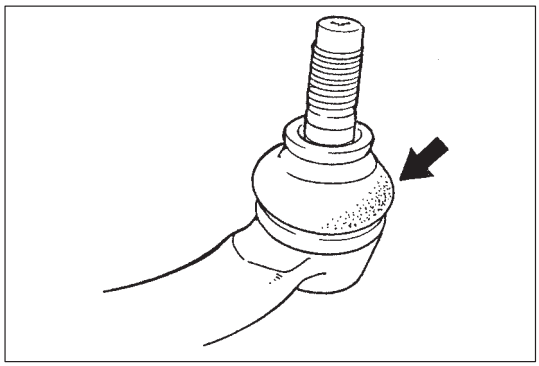
TIE-ROD END BOOT

Inspect each boot for tear. If even a small tear is noted, replace with new one.



STEERING SHAFT JOINT

Check shaft joint for wear, breakage and other damage and replace if any defect exists.



TIE-ROD END

- Inspect for play in ball joint.
- Inspect for play in rack end ball joint.

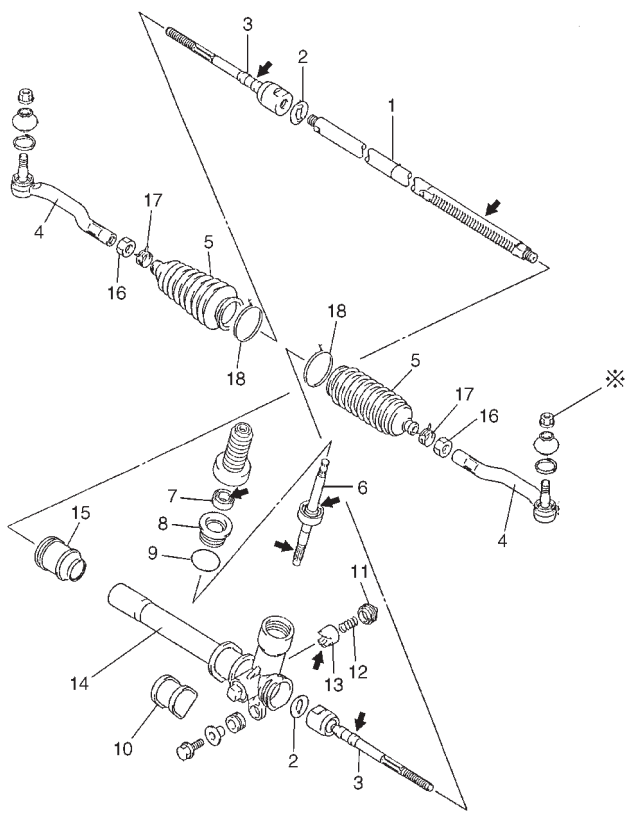
In either case, if found defective, replace.

ON-VEHICLE SERVICE

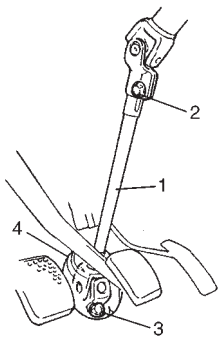
LUBRICATION

When inner parts of the steering gear case were disassembled, they should be washed clean before reassembly. It is recommended to use the grease to the indicated area as shown below.

GREASE: SUZUKI SUPER GREASE E (99000-25050) or Lithium grease (applicable for –40°C -130°C (104°F – 266°F))



※ : Use new nut when installing
1. Steering rack
2. Tie-rod lock washer
3. Steering tie-rod
4. Tie-rod end
5. Boot
6. Steering pinion
7. Steering gear case oil seal
8. Pinion bearing plug
9. O-ring
10. Steering pinion side mount
11. Rack damper screw
12. Rack plunger spring
13. Steering rack plunger
14. Steering gear case
15. Steering rack side mount
16. Tie-rod end lock nut
17. Rack boot clip
18. Wire

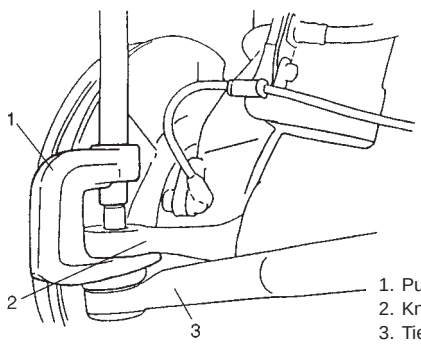


1. Steering lower shaft
2. Upper joint bolt
3. Lower joint bolt
4. Steering shaft seal

STEERING GEAR CASE

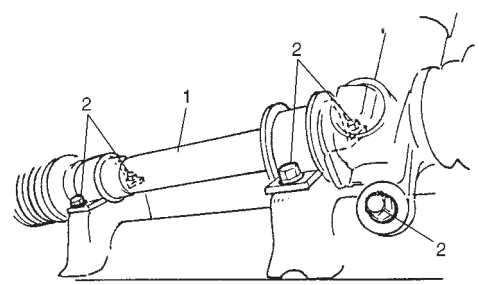
REMOVAL

1) Loosen steering lower shaft upper joint bolt.
2) Remove steering shaft seal from dash panel and then remove steering lower shaft lower joint bolt. Disconnect steering lower shaft from steering pinion.
3) Hoist vehicle and remove wheel.



1. Puller
2. Knuckle
3. Tie-rod end

4) Remove tie-rod end nut.
5) Disconnect both tie-rod ends from knuckles by using puller.

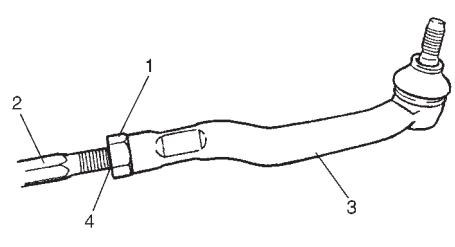


1. Steering gear case
2. Mounting bolt

6) Remove steering gear case.

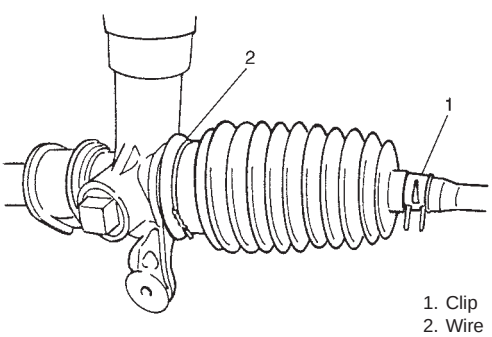
DISASSEMBLY

1) Remove steering gear case.
   For ease of adjustment after installation, make marking of tie-rod end lock nut position of tie-rod thread and then remove tie-rod end.

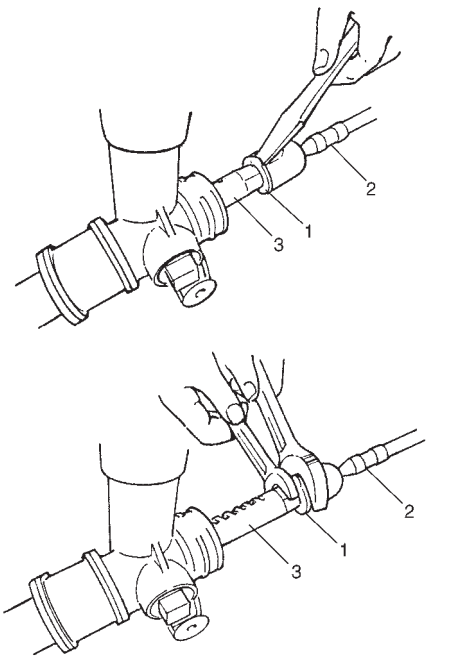


1. Lock nut
2. Tie-rod
3. Tie-rod end
4. Make marking

2) Loosen tie-rod end lock nut and remove tie-rod end and tie-rod end lock nut.
3) Remove boot wire and clip.

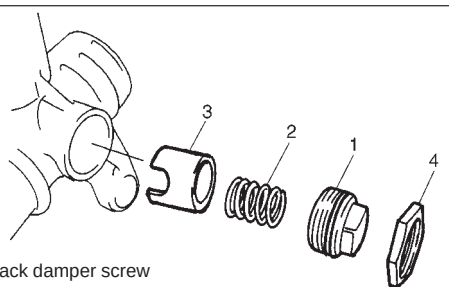


1. Clip
2. Wire



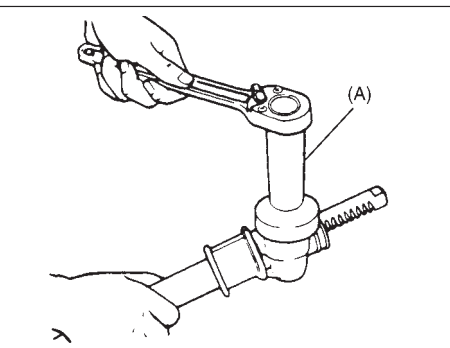
1. Lock washer
2. Tie-rod
3. Steering rack

4) Remove boot from tie-rod.
5) Unbend bent part of tie-rod lock washer and remove tie-rod from rack.



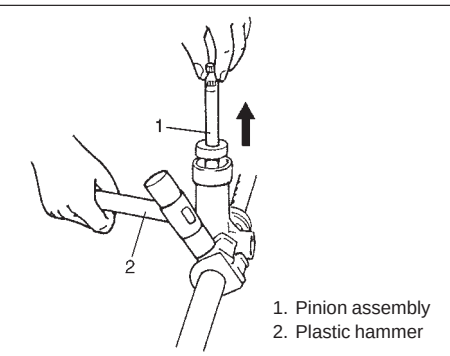
1. Rack damper screw
2. Rack plunger spring
3. Rack plunger
4. Rack plunger lock nut

6) Remove parts as shown.



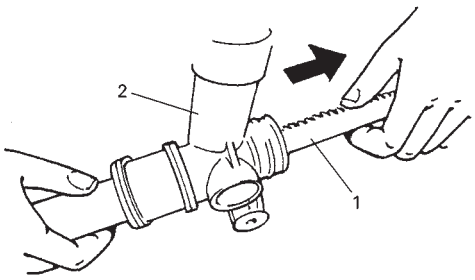
7) Remove steering gear case cover.
8) Remove pinion bearing plug with special tool.

Special Tool (43 mm socket)
(A): 09944-26011



1. Pinion assembly
2. Plastic hammer

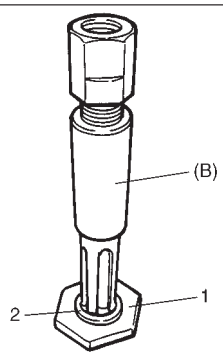
9) Tap on position as shown with plastic hammer to separate pinion assembly from housing.
10) Remove pinion assembly.



1. Rack
2. Gear case

11) Remove rack from gear case. Direction for rack removal is as shown.

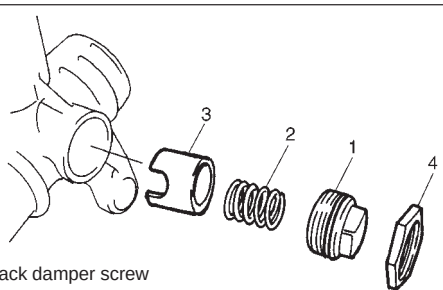
CAUTION:
Inside of steering rack bushing is coated with special coating. As it is damageable, be very careful not to cause damage to it when removing rack from steering gear case.



1. Pinion bearing plug
2. Oil seal

12) Remove oil seal with special tool.

Special Tool
(B): 09923-73210



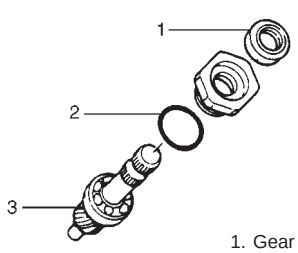
1. Rack damper screw
2. Rack plunger spring
3. Rack plunger
4. Rack plunger lock nut

INSPECTION

Rack Plunger

- Inspect rack plunger for wear or damage.
- Inspect rack plunger spring for deterioration.

In either case, if found defective, replace.



1. Gear case oil seal
2. O-ring
3. Steering pinion

Steering Pinion

- Inspect pinion teeth surface for wear or damage.
- Inspect oil seal for damage.
- Inspect gear case packing for damage.

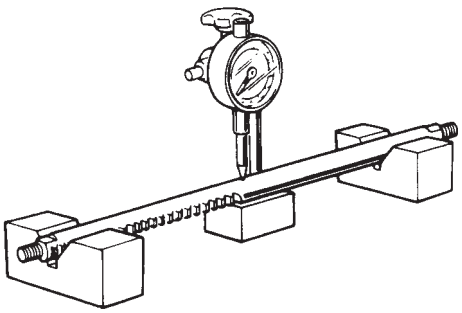
Replace any part found defective.

Steering Pinion Bearing

Check rotation condition of bearing and inspect for wear.
If found defective, replace as gear case assembly.

Steering Rack Bushing/Steering Pinion Bushing

Inspect rack bushing and pinion bushing for wear or damage.
If found defective, replace as gear case assembly.



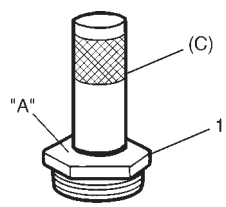
Steering Rack

Inspect for deflection, teeth wear, or damage, back surface wear or damage.

Limit of rack deflection: 0.35 mm (0.014 in.)

If deflection exceeds limit, replace rack.

CAUTION:
Do not use a wire brush when cleaning.



1. Pinion bearing plug

ASSEMBLY

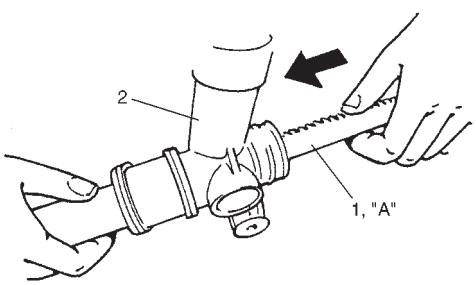
Install in reverse order of removal, nothing following points.

1) Install pinion bearing oil seal to pinion bearing plug with special tool.

   Special Tool
   (C): 09925-98220

2) Apply grease to oil seal lip.

   "A": Grease 99000-25050



1. Rack
2. Steering gear case

3) Apply grease to entire teeth surface of rack and its periphery.

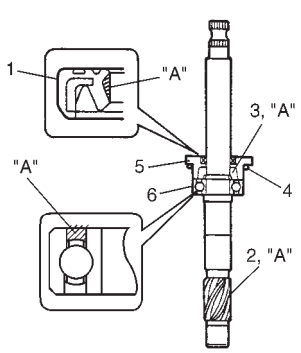
   "A": Grease 99000-25050

4) Slide rack into steering gear case in the direction as shown.

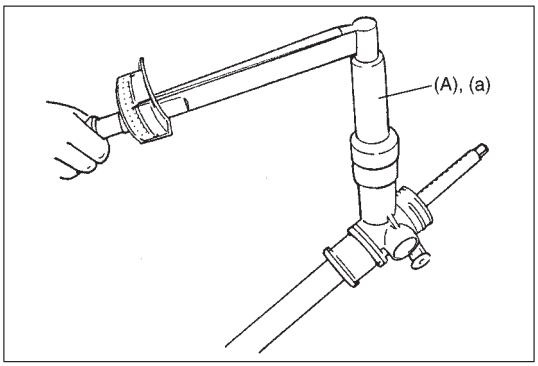
CAUTION:
Inside of steering rack bushing is coated with special coating. As it is damageable, be very careful not to cause damage to it when inserting rack into steering gear case.

5) Apply grease to all around pinion teeth, pinion bearing and gear case oil seal lip.

   "A": Grease 99000-25050



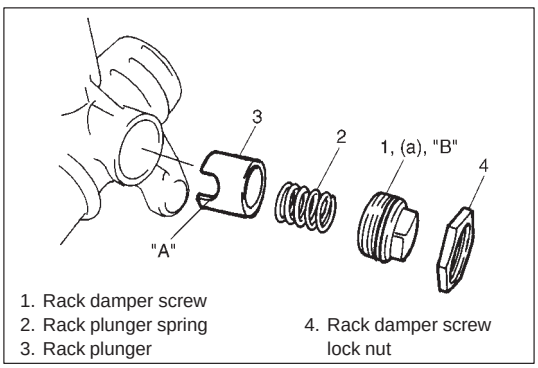
1. Gear case oil seal
2. Pinion teeth
3. Fill inside of pinion bearing plug with grease.
4. O-ring
5. Pinion bearing plug
6. Pinion bearing



6) Install pinion assembly and tighten pinion bearing plug to specified torque.

Special Tool (43 mm socket)
(A): 09944-26011

Tightening torque
(a): 95 N·m (9.5 kg-m, 69.0 lb-ft)



1. Rack damper screw
2. Rack plunger spring
3. Rack plunger
4. Rack damper screw lock nut

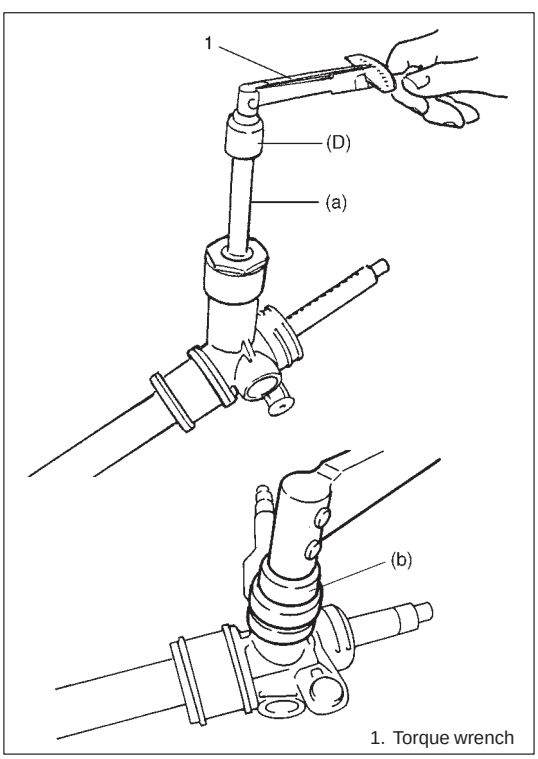
7) Apply grease lightly to sliding part of plunger against rack.

"A": Grease 99000-25050

8) Install parts as shown.
9) Apply sealant to all around thread part of rack damper screw and tighten to specified torque.

"B": Sealant 99000-31110

Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)



1. Torque wrench

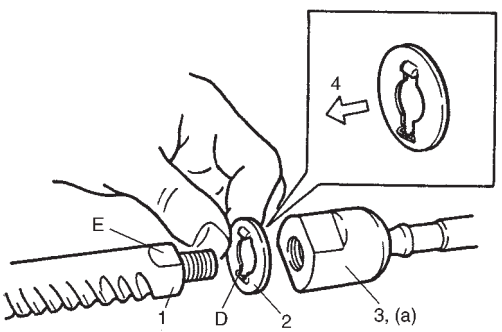
10) After tightening rack damper screw to above specified torque, turn it back by 40° – 75° and check for rotation torque of pinion. If it is not as specified below, adjust so that it will be within specified torque range.

Special Tool
(D): 09944-18211
Rotation torque of pinion
(a): 0.4 – 1.2 N·m (0.04 – 0.12 kg-m, 0.29 – 0.87 lb-ft)

Also, check if rack as a whole moves smoothly.

11) Tighten lock nut to specified torque.

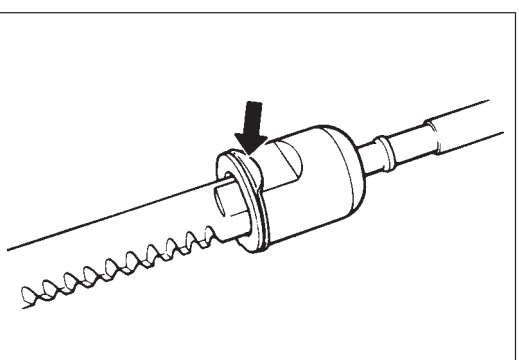
Tightening Torque
(b): 40 N·m (4.0 kg-m, 29.0 lb-ft)



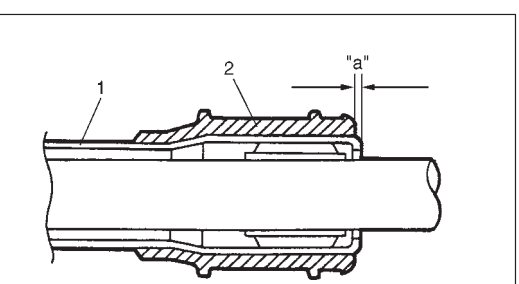
1. Steering rack
2. Tie-rod lock washer
3. Tie-rod
4. Rack side

12) Install steering gear case cover.
Fit lip of cover in pinion groove.
13) Install new tie-rod lock washer as shown and tie-rod to rack.
Align straight part “D” of washer with flat part “E” of rack.
14) Tighten tie-rod inside ball nut to specified torque.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



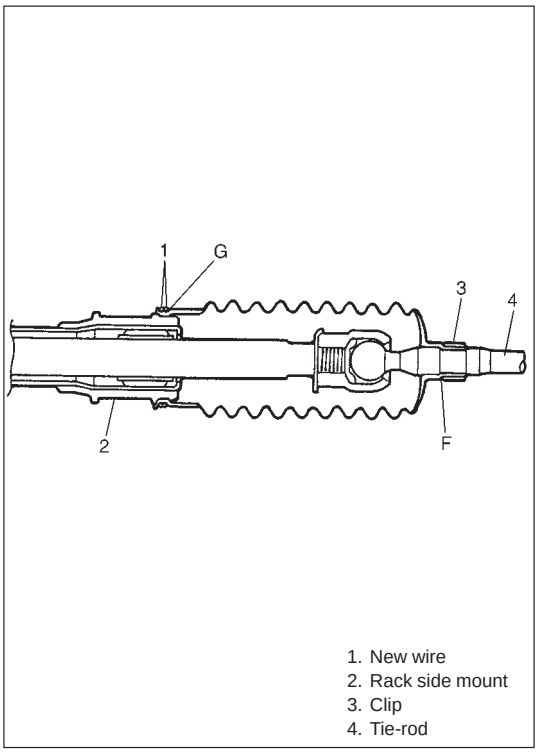
15) Bend lock washer to tie-rod side as shown.



1. Steering rack housing
2. Rack side mount

16) Before installing boot to steering rack housing, make sure that rack side mount is positioned as shown.

“a”: 1.3 – 2.3 mm (0.05 – 0.09 in.) . . RH steering vehicle
3.3 – 4.3 mm (0.13 – 0.16 in.) . . LH steering vehicle

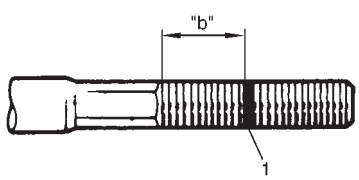


1. New wire
2. Rack side mount
3. Clip
4. Tie-rod

17) Apply grease to part which tie-rod side “F” of boot.

CAUTION:
Never apply grease to part which contacts steering gear case side “G” of boot.

18) Position boot properly in grooves of gear case and tie-rod and clamp it with new wire and clip.
Wire should be new and should go around twice and be tightened with its both ends twisted together. The twisted ends should be bent in the circumferential direction. After this, check to ensure that boot is free from twist and bent.



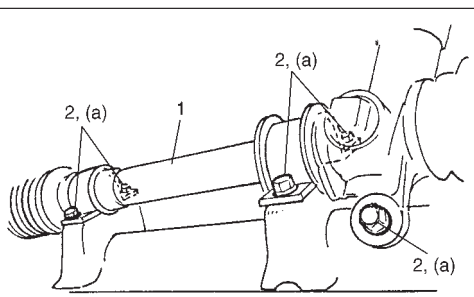
1. Marking

19) Install tie-rod end lock nut and tie-rod end to tie-rod. Position lock nut to marking made in removal.

NOTE:
When tie-rod was replaced, measure length “b” on removed tie-rod and use it on new replacement tie-rod so as to position lock nut properly.

INSTALLATION

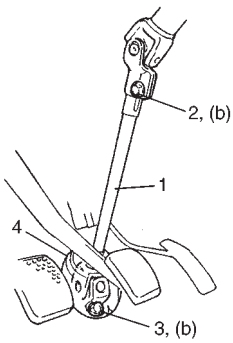
For installation, reverse removal procedure, observing the following instructions.
After installation check wheel alignment, referring to Section 3A.



1. Steering gear case
2. Mounting bolt

- Tighten gear case mounting bolt and nut to specified torque.

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

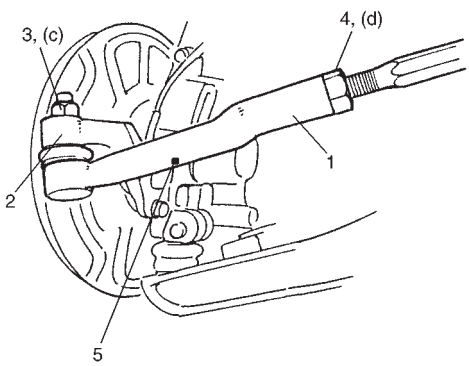


1. Steering lower shaft
2. Upper joint bolt
3. Lower joint bolt
4. Steering shaft seal

- Install steering lower shaft to steering pinion and then tighten lower joint bolt first and then upper joint bolt.

  Tightening Torque
  (b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

- Install steering shaft seal to dash panel securely.
  Apply grease to shaft seal lip.



1. Tie-rod end
2. Knuckle
3. Tie-rod end nut
4. Tie-rod end lock nut
5. Dent (for right side only)

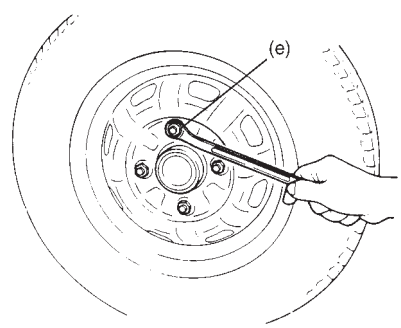
- Install tie-rod ends to knuckles. Tighten tie-rod end nut to specified torque.

  Tightening Torque
  (c): 43 N·m (4.3 kg-m, 31.5 lb-ft)

> **CAUTION:**
> **Removed tie-rod end nut must be replaced with new one.**

- Tighten tie-rod end lock nut to specified torque.

  Tightening Torque
  (d): 45 N·m (4.5 kg-m, 32.5 lb-ft)



- Tighten wheel nut to specified torque.

  Tightening Torque
  (e): 85 N·m (8.5 kg-m, 61.5 lb-ft)

- After completion of installation, check wheel alignment and toe setting. Adjust as required. (Refer to Section 3A.)

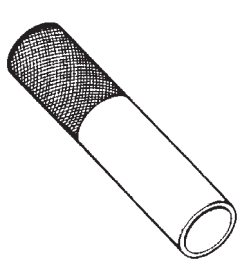
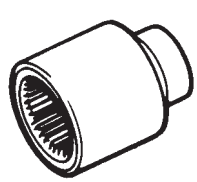
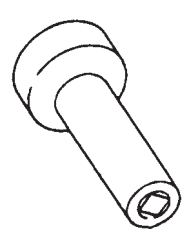
TIGHTENING TORQUE SPECIFICATIONS

Fastening Parts	Tightening Torque		
	N·m	Kg-m	lb-ft
Steering shaft joint bolt	25	2.5	18.0
Steering gear case bolt	25	2.5	18.0
Tie-rod end nut	43	4.3	31.5
Tie-rod end lock nut	45	4.5	32.5
Steering pinion bearing plug	95	9.5	69.0
Tie-rod inside ball nut	85	8.5	61.5
Wheel nut	85	8.5	61.5
Rack damper screw lock nut	40	4.0	29.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease (should be applicable for –40°C - 130°C)	SUZUKI SUPER GREASE E (99000-25050)	● Sliding part of rack against steering gear case (All around rack plunger, rack bushing and rack) ● Sliding part against steering pinion (Oil seal lip, needle bearing and pinion bearing) ● Steering rack and pinion gear teeth ● Contacting parts of tie-rod and rack boots ● Rack bushing inner surface
Sealant	SUZUKI BOND No.1215 (99000-31110)	● Thread part of rack damper screw

SPECIAL TOOLS

			
09923-73210 Oil seal remover	09925-98220 Bearing installer	09944-18211 Pinion torque checking socket	09944-26011 Pinion bearing plug socket (43 mm)

SECTION 3B1

ELECTRICAL POWER STEERING (P/S) SYSTEM

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

GENERAL DESCRIPTION

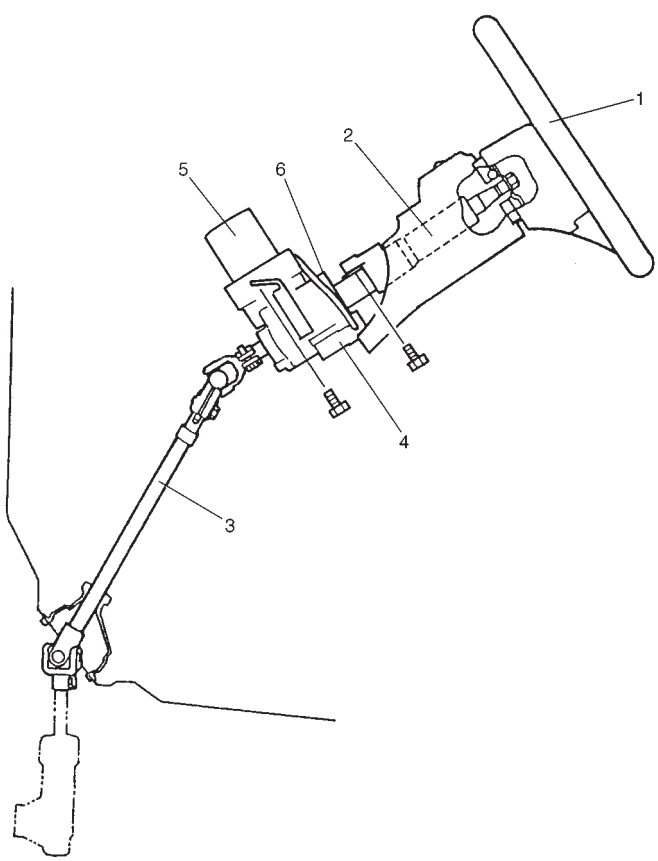
This power steering (P/S) system consists of a P/S control module, a torque sensor and a motor and clutch installed to the steering column.
In this system, the P/S control module determines the level and direction of the assist force for the steering wheel according to the signals from the torque sensor and the vehicle speed, runs the motor so as to assist operation of the steering wheel.

P/S control module diagnoses 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 with lighting of “EPS” light (malfunction indicator lamp) and stops the motor and clutch control.

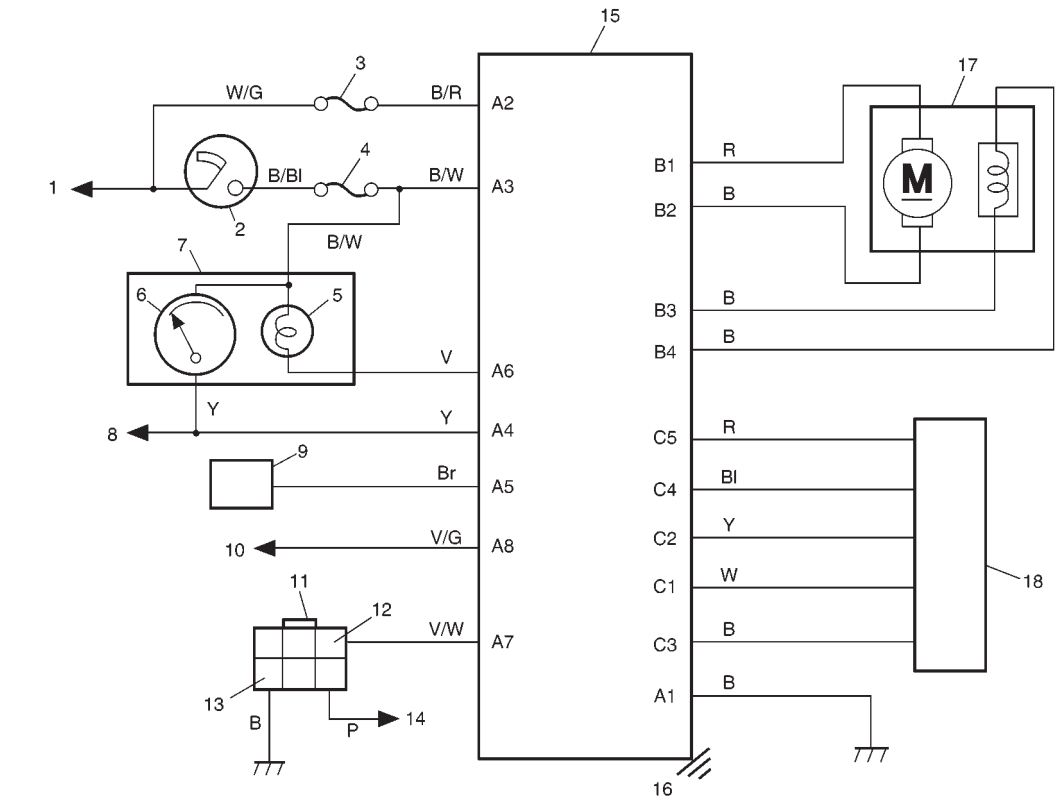
- Torque sensor
- Vehicle speed sensor (VSS) signal
- Engine speed signal
- Motor
- Clutch
- P/S control module

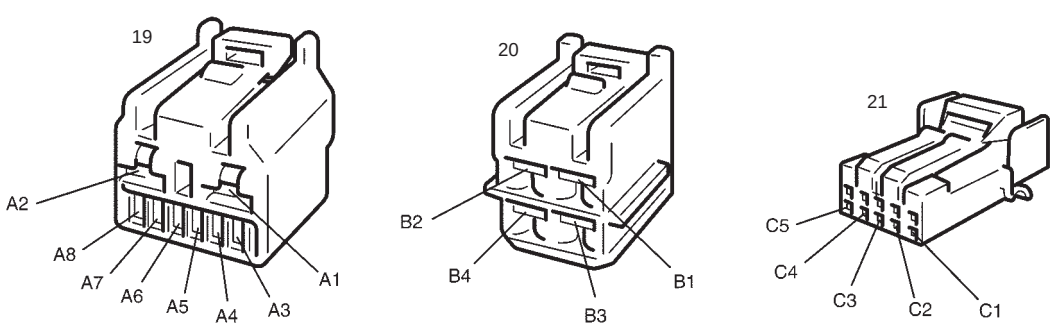
COMPONENTS

1. Steering wheel
2. Steering column assembly
3. Steering lower shaft
4. P/S control module
5. Motor and clutch
6. Torque sensor



WIRING DIAGRAM

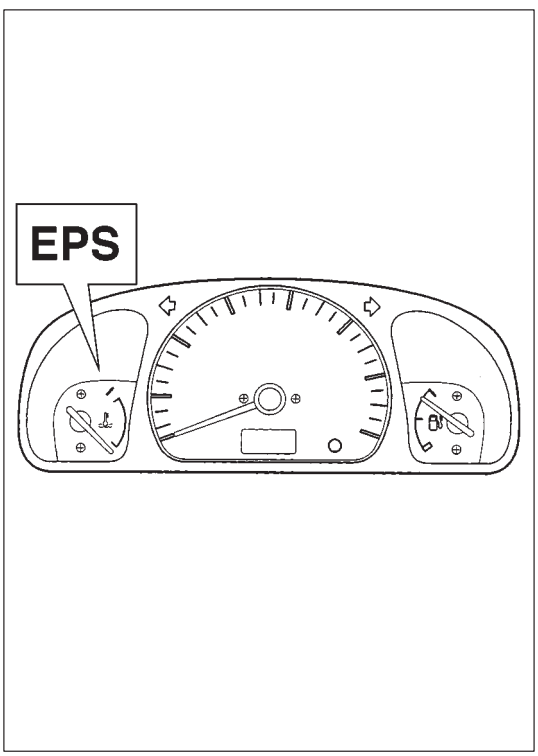




1. To main fuse
2. Ignition switch
3. “EPS” fuse (30A) in fuse box
4. “IG METER” fuse (15 A) in fuse box
5. Malfunction indicator lamp (MIL) (“EPS” light)
6. Speedometer
7. Combination meter
8. To vehicle speed sensor (VSS)
9. ECM
10. Data link connector (DLC)
11. Monitor coupler
12. Diagnosis switch terminal (for P/S system)
13. Ground terminal
14. To ABS control module (if equipped)
15. P/S control module
16. P/S control module body ground
17. Motor and clutch
18. Torque sensor
19. Connector “A”
20. Connector “B”
21. Connector “C”

DIAGNOSIS

The P/S system in this vehicle are controlled by P/S control module. P/S control module has an on-board diagnostic system which detects a malfunction in this system.
When diagnosing troubles, be sure to have full understanding of the outline of ON-BOARD DIAGNOSTIC SYSTEM and each item in PRECAUTION IN DIAGNOSING TROUBLE and execute diagnosis according to SYSTEM CHECK FLOW TABLE.



ON-BOARD DIAGNOSTIC SYSTEM

P/S control module performs on-board diagnosis (self-diagnosis) on the system and operates “EPS” light (malfunction indicator lamp (MIL)) as follows.

- MIL (“EPS” light) lights when the ignition switch is turned ON position (but the engine at stop) regardless of the condition of P/S system. This is only to check the MIL (“EPS” light) bulb and its circuit.
- If the areas monitored by P/S control module is free from any trouble after the engine start (while engine is running), MIL (“EPS” light) turns OFF.
- When P/S control module detects a trouble which has occurred in the areas, it makes MIL (“EPS” light) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the exact trouble area in P/S control module back-up memory.

PRECAUTIONS IN DIAGNOSING TROUBLES

- Take a note of DTC indicated first.
- Be sure to read PRECAUTIONS FOR ELECTRONIC CIRCUIT SERVICE in SECTION 0A before inspection and observe what is written there.
- When two or more troubles have occurred, their DTCs are indicated once each starting with the smallest code number and up.
- DTC C1122 (flashing pattern: 22) (engine speed signal fail) is indicated when ignition switch is ON position and engine is not running but if indication changes to a normal one when engine is started, it means nothing abnormal.
- As DTC is stored in backup memory of P/S control module, be sure to clear memory after repair by performing the procedure described in DTC CLEARANCE.

SYSTEM CHECK FLOW TABLE

STEP	ACTION	YES	NO
1	1) Make sure that battery voltage is about 11 V or higher. 2) Note MIL ("EPS" light) as ignition switch is turned to ON position. 3) Does MIL ("EPS" light) come ON when ignition switch is turned to ON position?	Go to STEP 2.	Proceed to TABLE A-MIL CIRCUIT CHECK (MIL DOES NOT LIGHT).
2	Does MIL ("EPS" light) flash?	Proceed to TABLE B - MIL CIRCUIT CHECK (MIL FLASHES).	Go to STEP 3.
3	1) Short diagnosis switch terminal and ground terminal on monitor coupler by using service wire. 2) Does MIL ("EPS" light) indicate DTC C1122 (flashing pattern: 22) and/or other code flashing pattern?	Go to STEP 4.	Proceed to TABLE C - MIL CIRCUIT CHECK (MIL REMAINS ON).
4	1) Turn ignition switch to OFF position. 2) Disconnect service wire from monitor coupler. 3) Apply chocks to wheels, set shift lever to neutral position and pull parking brake fully. 4) Check MIL ("EPS" light) comes ON when ignition switch is turned ON position. 5) If OK, start engine. 6) Is MIL ("EPS" light) turned to OFF when engine is started?	Go to STEP 5.	Go to STEP 6.
5	1) Check DTC. (Refer to DTC CHECK.) 2) Is DTC set in P/S control module?	See NOTE 1. An intermittent trouble has occurred at some place. Check the connector harness, etc. related to the sensed DTC (Refer to INTERMITTENT AND POOR CONNECTIONS in SECTION 0A). Then clear DTC (Refer to DTC CLEARANCE and repeat this flow table.	P/S system is in good condition.
6	1) Check DTC. (Refer to DTC CHECK.) 2) Is DTC set in P/S control module?	See NOTE 1. Check and repair according to flow table corresponding to that DTC.	Substitute a known-good P/S control module and recheck.

NOTE 1:
As execution of DTC CLEARANCE will clear all DTCs, be sure to record all DTCs before servicing.

Fig. for Step 1, 2, 3 and 4

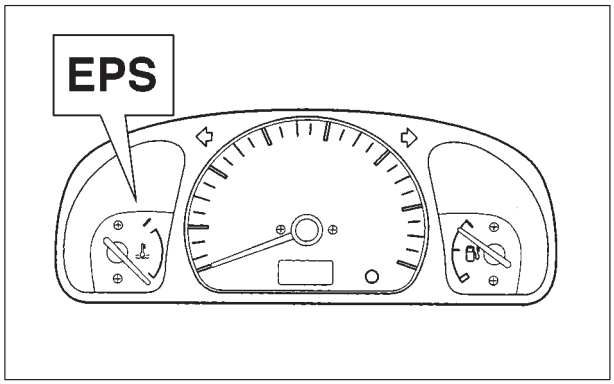
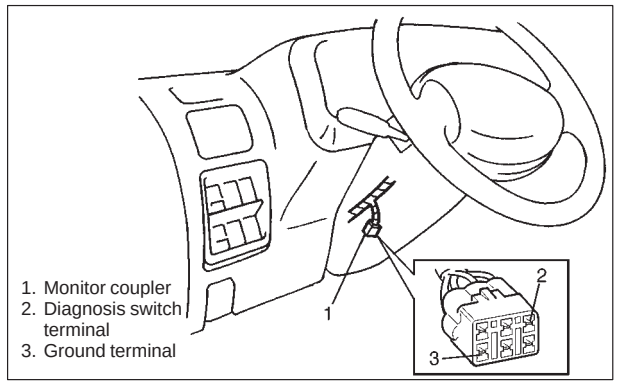


Fig. for Step 3

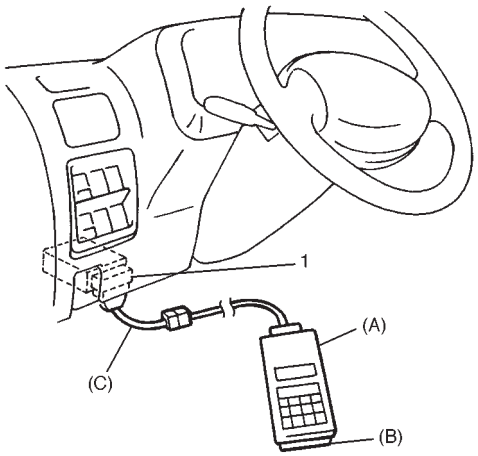


NOTE:

- **When 2 or more codes are indicated, the lowest numbered code will appear first.**
- **If a code not listed on the table is displayed, then the P/S control module is faulty.**
- **DTC C1122 (flashing pattern: 22) is indicated when ignition switch ON and engine not running but if flashing pattern 12 is indicated when engine is started, it means nothing abnormal.**
- **Current DTC and history DTC can be identified by lighting and flashing of "EPS" light as follows.**

	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.)
"EPS" light after engine started	Remains ON.	Turns OFF.
"EPS" light when starting diagnosis switch terminal and ground terminal	Current DTC is displayed.	History DTC is displayed.

However, if a multiple number of DTC's are set an even one of them is a current DTC, "EPS" light remains on after engine is started. 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.)



1. Data link connector (DLC)

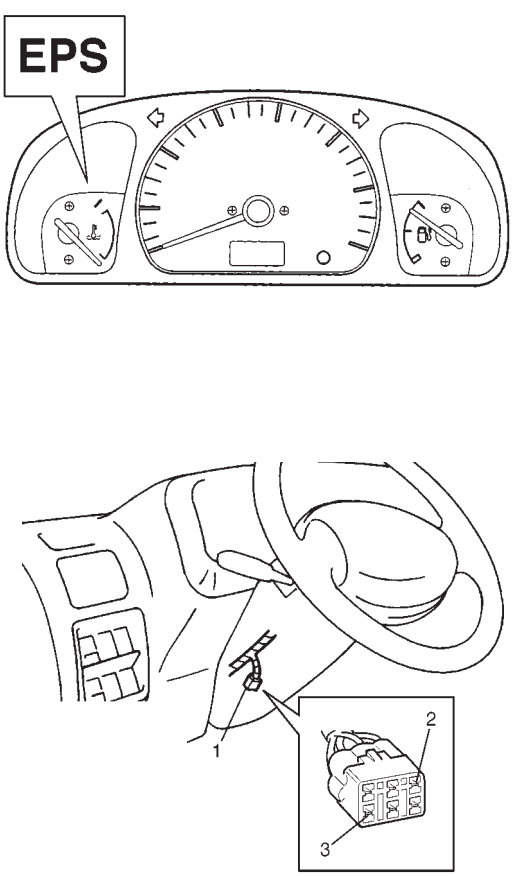
DTC CHECK

USING SUZUKI SCAN TOOL

1) Turn ignition switch to OFF position.
2) After setting cartridge to connect it to data link connector (DLC) located on underside of instrument panel at driver's seat side.

   Special Tool
   (A): 09931-76011
   (B): Mass storage cartridge
   (C): 09931-76030

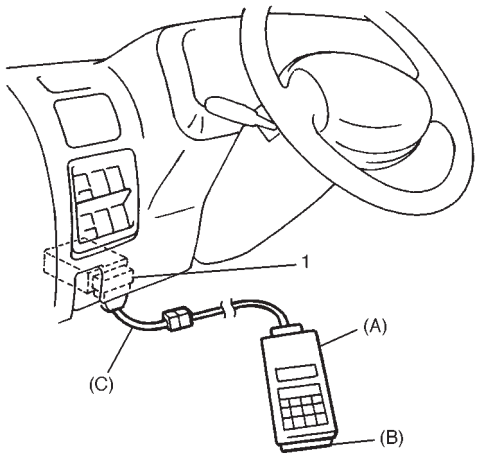
3) Turn ignition switch to ON position.
4) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC).



1. Monitor coupler
2. Diagnosis switch terminal
3. Ground terminal

NOT USING SUZUKI SCAN TOOL

1) Check that MIL ("EPS" light) comes ON when ignition switch is turned to ON position.
   If it does not come "ON", proceed to Table A- MIL CIRCUIT CHECK (MIL DOES NOT LIGHT).
2) Apply chocks to wheels, set shift lever to neutral position and pull parking brake fully.
3) Start engine.
4) Using service wire, short diagnosis switch terminal and ground terminal on monitor coupler.
5) Read DTC from flashing pattern of MIL ("EPS" light). (Refer to DTC TABLE.)
   If it cannot indicate flashing pattern of DTC, proceed to Table C -MIL CIRCUIT CHECK (MIL REMAINS ON).
6) After completing the check, turn ignition switch to OFF position disconnect service wire from monitor coupler.



1. Data link connector (DLC)

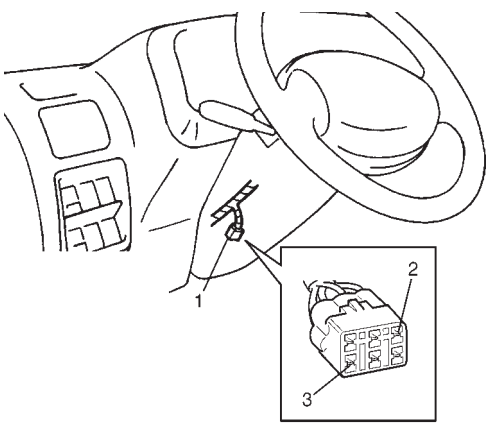
DTC CLEARANCE

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.

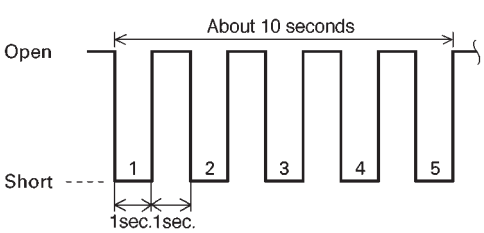
   Special Tool
   (A): 09931-76011
   (B): Mass storage cartridge
   (C): 09931-76030

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 data link connector (DLC).



1. Monitor coupler
2. Diagnosis switch terminal
3. Ground terminal

Condition between diagnosis switch terminal and ground terminal

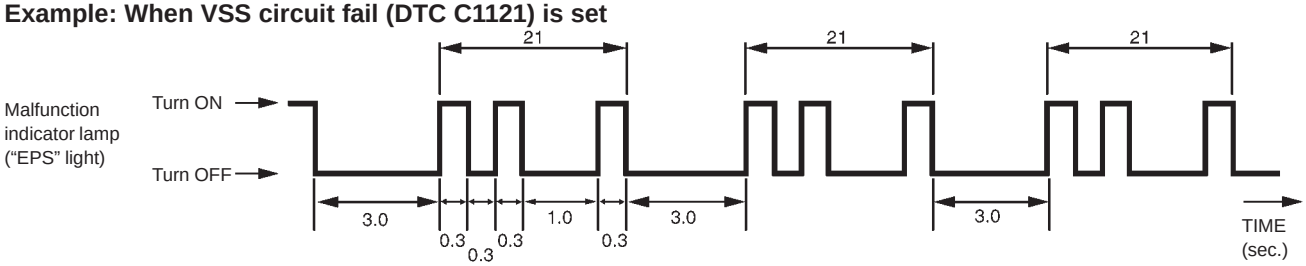


NOT USING SUZUKI SCAN TOOL

1) Turn ignition switch to ON position and wait about 2 seconds or more.
2) Using service wire, repeat shorting and opening between diagnosis switch terminal and ground terminal on monitor coupler 5 times at about 1 second intervals.
3) Perform DTC CHECK and confirm that normal DTC (flashing pattern: 12) is displayed and not malfunction DTC.

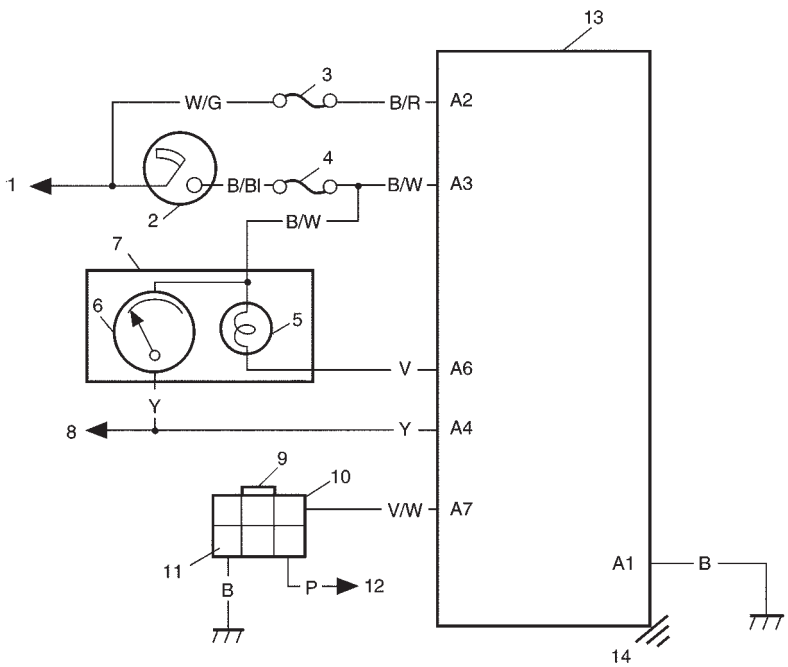
DTC TABLE

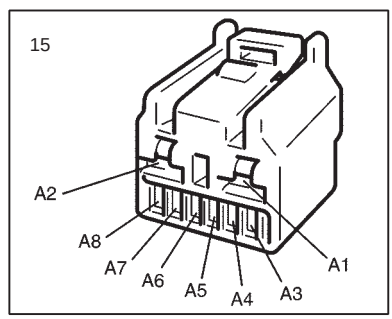
Example: When VSS circuit fail (DTC C1121) is set



DTC	"EPS" light flashing pattern		DIAGNOSTIC ITEM	DIAGNOSIS
	No.	Model		
——	12		Normal	This code appears when none of the other codes are identified.
C1111	11		Torque sensor	Diagnose trouble according to DIAGNOSTIC FLOW TABLE corresponding to each code No.
C1113	13			
C1114	14			
C1115	15			
C1116	16			
C1121	21		VSS signal	
C1123	23			
C1124	24			
C1122	22		Engine speed signal	
C1141	41		Motor	
C1142	42			
C1143	43			
C1144	44			
C1145	45			
C1151	51		Clutch	
C1152	52		P/S control module	
C1154	54			
C1155	55			
C1153	53		P/S control module power supply	

TABLE A - MIL CIRCUIT CHECK (MIL DOES NOT LIGHT)
TABLE B - MIL CIRCUIT CHECK (MIL FLASHES)
TABLE C - MIL CIRCUIT CHECK (MIL REMAINS ON)





1. To main fuse
2. Ignition switch
3. “EPS” fuse (30A) in fuse box
4. “IG METER” fuse (15A) in fuse box
5. Malfunction indicator lamp (MIL) (“EPS” light)
6. Speedometer
7. Combination meter
8. To VSS
9. Monitor coupler
10. Diagnosis switch terminal (for P/S system)
11. Ground terminal
12. To ABS control module (if equipped)
13. P/S control module
14. P/S control module body ground
15. Connector “A”

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table.

TABLE TEST DESCRIPTION:

Table A:

STEP 1: Check fuses.
STEP 2: Check power supply circuit for backup.
STEP 3: Check power supply circuit from ignition switch.
STEP 4: Check “EPS” bulb.
STEP 5: Check short to ground in “EPS” light circuit.
STEP 6: Check high resistance or open in “EPS” light circuit.
STEP 7: Check ground circuit for P/S system.

Table B:

STEP 1: Check monitor coupler.
STEP 2: Check diagnosis switch circuit for P/S system.

Table C:

STEP 1: Check ground circuit on monitor coupler.
STEP 2: Check high resistance or open in diagnosis switch circuit.
STEP 3: Check short to ground in “EPS” light circuit.

DIAGNOSTIC FLOW TABLE

Table A:

STEP	ACTION	YES	NO
1	Are “IG·METER” and “EPS” fuses in good condition?	Go to STEP 2.	Check short to ground in “B/W” (for “IG METER” fuse), “B/R” (for “EPS” fuse) wire, and then replace fuse.
2	1) Remove steering column lower cover. 2) Disconnect 8-pin (“A”) connector from P/S control module. 3) Check proper connection to P/S control module at terminal “A2”. 4) If OK, check voltage between “A2” and body ground. 5) Is it 10 – 14 V?	Go to STEP 3.	Repair high resistance or open in “B/R” wire circuit.
3	1) Check proper connection to P/S control module at terminal “A3”. 2) If OK, ignition switch ON. 3) Check voltage between “A3” and body ground. 4) Is it 10 – 14 V?	Go to STEP 4.	Repair high resistance or open in “B/W” wire circuit.
4	1) Ignition switch OFF. 2) Remove combination meter. 3) Remove and check “EPS” bulb. 4) Is “EPS” bulb in good condition?	Go to STEP 5.	Replace bulb.
5	1) Check voltage between “A6” terminal and body ground with “EPS” bulb disconnected. 2) Is it 10 – 14 V?	Repair short to power circuit in “EPS” light (“V” wire) circuit.	Go to STEP 6.
6	1) Install “EPS” bulb and combination meter. 2) Check proper connection to P/S control module at terminal “A6”. 3) If OK, short “A6” terminal to body ground with “A” connector disconnected. 4) Does “EPS” light turn ON at ignition switch ON?	Go to STEP 7.	Repair high resistance or open in “EPS” light (“V” wire) circuit.
7	1) Check P/S control module is installed to steering column assembly securely (check for body ground of P/S control module). 2) If OK, check resistance between “A1” terminal and body ground? 3) Is resistance 1 Ω or less?	Repair poor ground (“B” wire) circuit.	Substitute a known-good P/S control module and recheck.

Fig. for Step 2

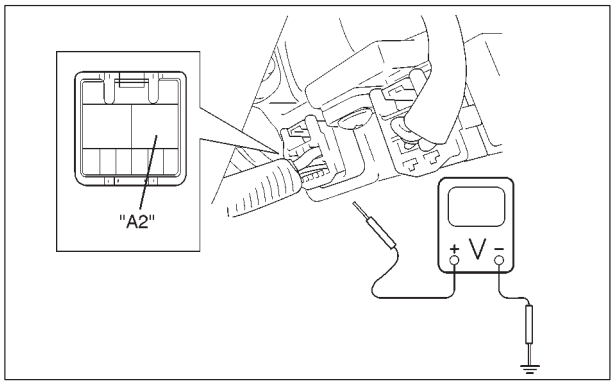


Fig. for Step 3

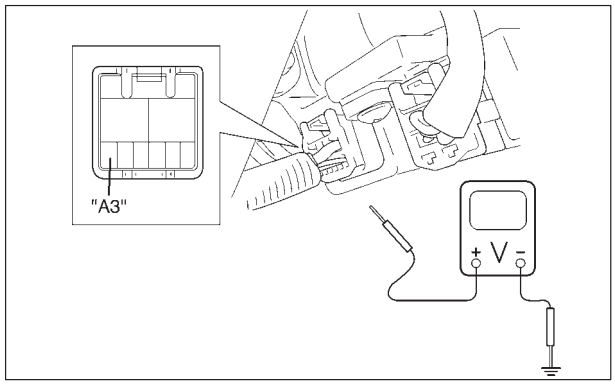


Fig. for Step 5

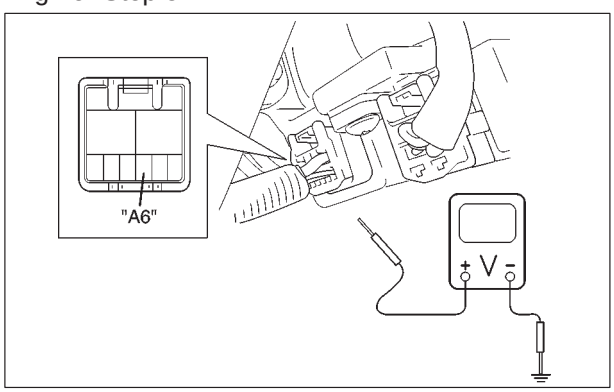


Fig. for Step 6

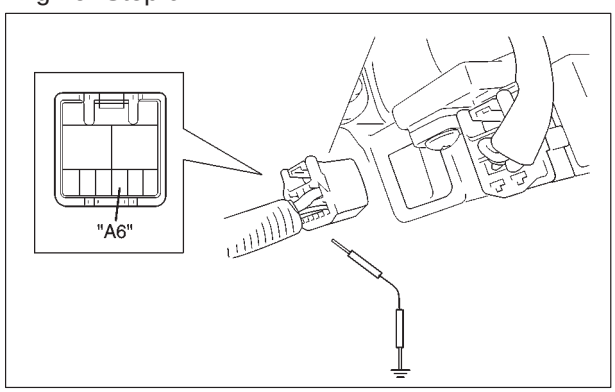
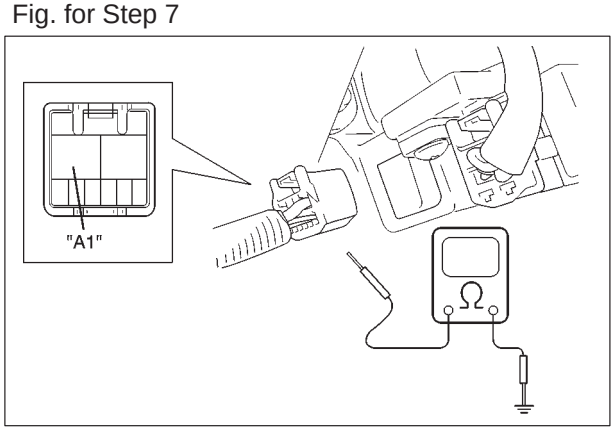


Fig. for Step 7



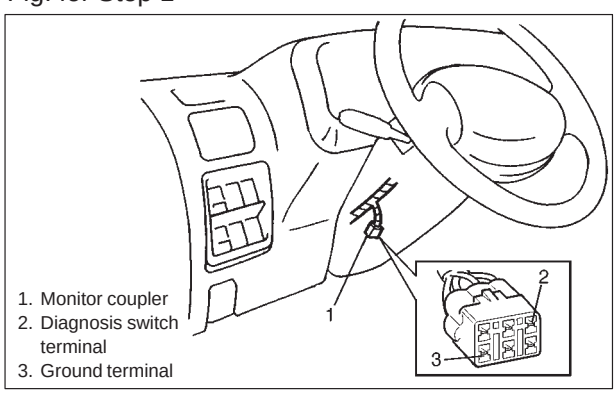
NOTE:

Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

Table B:

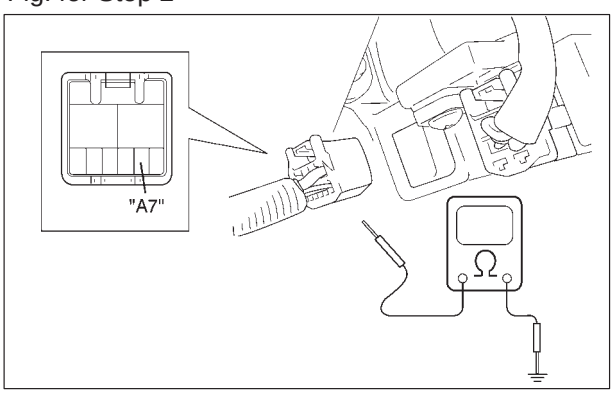
STEP	ACTION	YES	NO
1	1) Check monitor coupler for P/S system. 2) Is it connected diagnosis switch terminal for P/S system and ground terminal in monitor coupler by service wire?	Remove service wire.	Go to STEP 2.
2	1) With ignition switch OFF, disconnect 8-pin (“A”) connector from P/S control module. 2) Measure resistance between “A7” terminal of “A” connector and body ground. 3) Is resistance 1 Ω or less?	Substitute a known-good P/S control module and recheck	Repair short from “V/W” wire circuit to ground.

Fig. for Step 1



1. Monitor coupler
2. Diagnosis switch terminal
3. Ground terminal

Fig. for Step 2

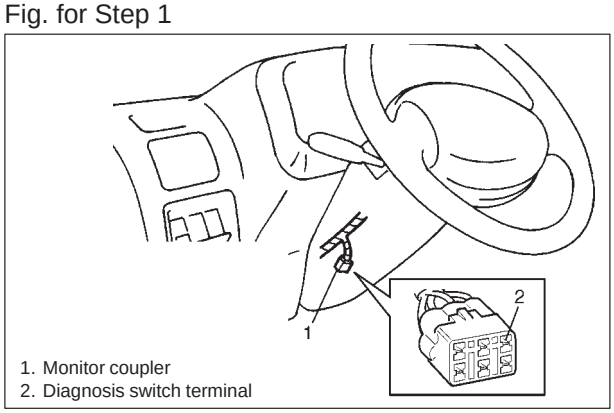


NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

Table C:

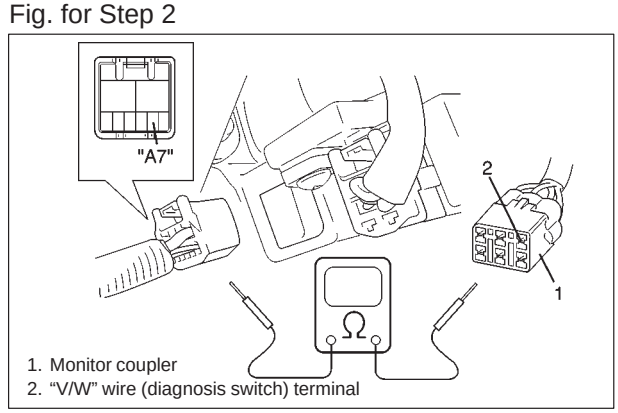
STEP	ACTION	YES	NO
1	1) Short diagnosis switch terminal to body ground by service wire. 2) Does “EPS” light turn ON flash at ignition switch ON?	Repair high resistance or open in ground (“B” wire) circuit on monitor coupler.	Go to STEP 2.
2	1) Ignition switch OFF. 2) Remove steering column lower cover. 3) Disconnect 8-pin (“A”) connector from P/S control module. 4) Check proper connection to P/S control module at terminal “A7”. 5) If OK, check resistance between “A7” terminal and “V/W” wire terminal on monitor coupler. 6) Is resistance 1 Ω or less?	Go to STEP 3.	Repair high resistance or open in “V/W” wire circuit.
3	1) Check proper connection to P/S control module at terminal “A6”. 2) If OK, ignition switch ON. 3) Check voltage between “A6” and body ground. 4) Is it 10 – 14 V?	Substitute a known-good P/S control module and recheck.	Repair short to ground in “EPS” light (“V” wire) circuit.

Fig. for Step 1



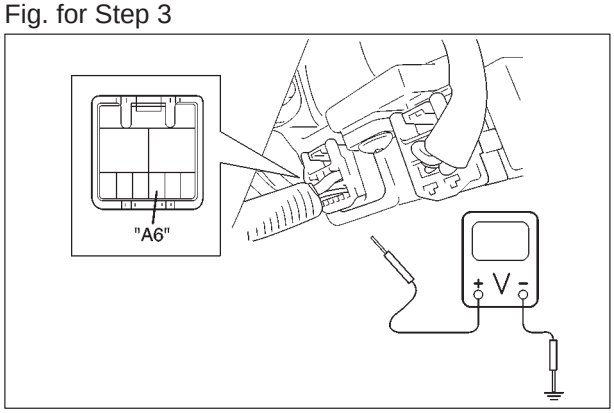
1. Monitor coupler
2. Diagnosis switch terminal

Fig. for Step 2



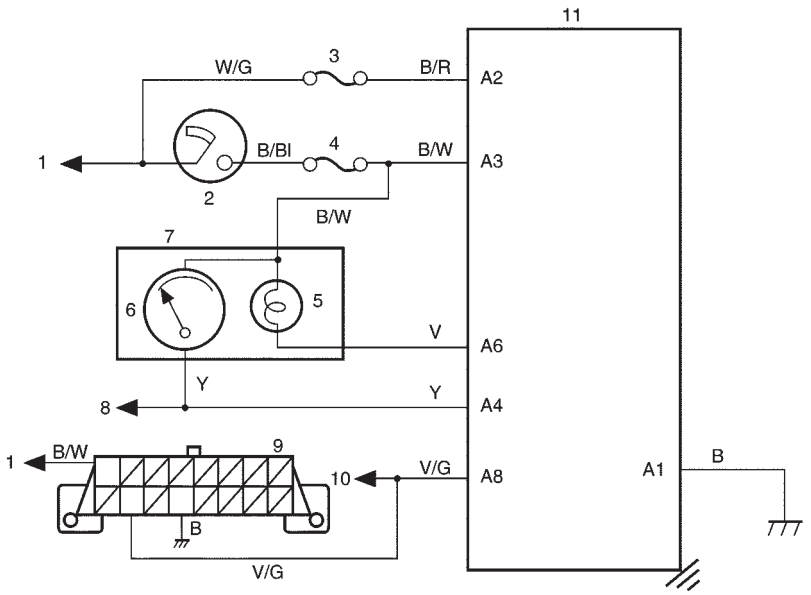
1. Monitor coupler
2. “V/W” wire (diagnosis switch) terminal

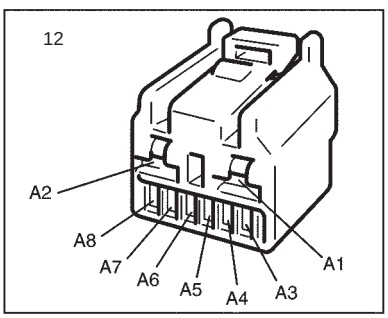
Fig. for Step 3



NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

TABLE D – P/S CONTROL MODULE CANNOT COMMUNICATE THROUGH THE SERIAL DATA CIRCUIT





1. To main fuse
2. Ignition switch
3. “EPS” fuse (30A) in fuse box
4. “IG METER” fuse (15A) in fuse box
5. Malfunction indicator lamp (MIL) (“EPS” light)
6. Speedometer
7. Combination meter
8. To VSS
9. Data link connector (DLC)
10. To ECM, SDM (if equipped) and ABS control module (if equipped)
11. P/S control module
12. Connector “A”

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

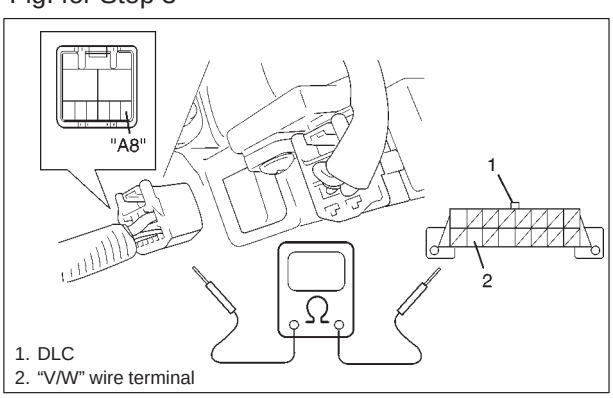
TABLE TEST DESCRIPTION

STEP 1: Check connection of SUZUKI scan tool to DLC.
STEP 2: Check serial data link circuit.
STEP 3: Check high resistance or open in serial data link circuit for P/S system.

DIAGNOSTIC FLOW TABLE

STEP	ACTION	YES	NO
1	1) Make sure that SUZUKI scan tool is free from malfunction and correct cartridge for P/S system is used. 2) Ignition switch OFF. 3) Check proper connection of SUZUKI scan tool to DLC. 4) 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 controller (ECM, ABS control module (if equipped) or SDM (if equipped)). 2) Is it possible to communicate with other controller?	Go to STEP 3.	Repair open in common section of serial data circuit (“V/G” wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit (“V/G” wire circuit).
3	1) With ignition switch OFF, disconnect 8-pin (“A”) connector from P/S control module. 2) Check proper connection at “A8” (“V/G” wire) terminal for serial data circuit. 3) If OK, then check resistance between “A8” (“V/G” wire) terminal and “V/G” wire terminal for serial data circuit in DLC. 4) Is resistance 1 Ω or less?	Substitute a known-good P/S control module and recheck.	Repair high resistance or open in “V/G” wire circuit for P/S system.

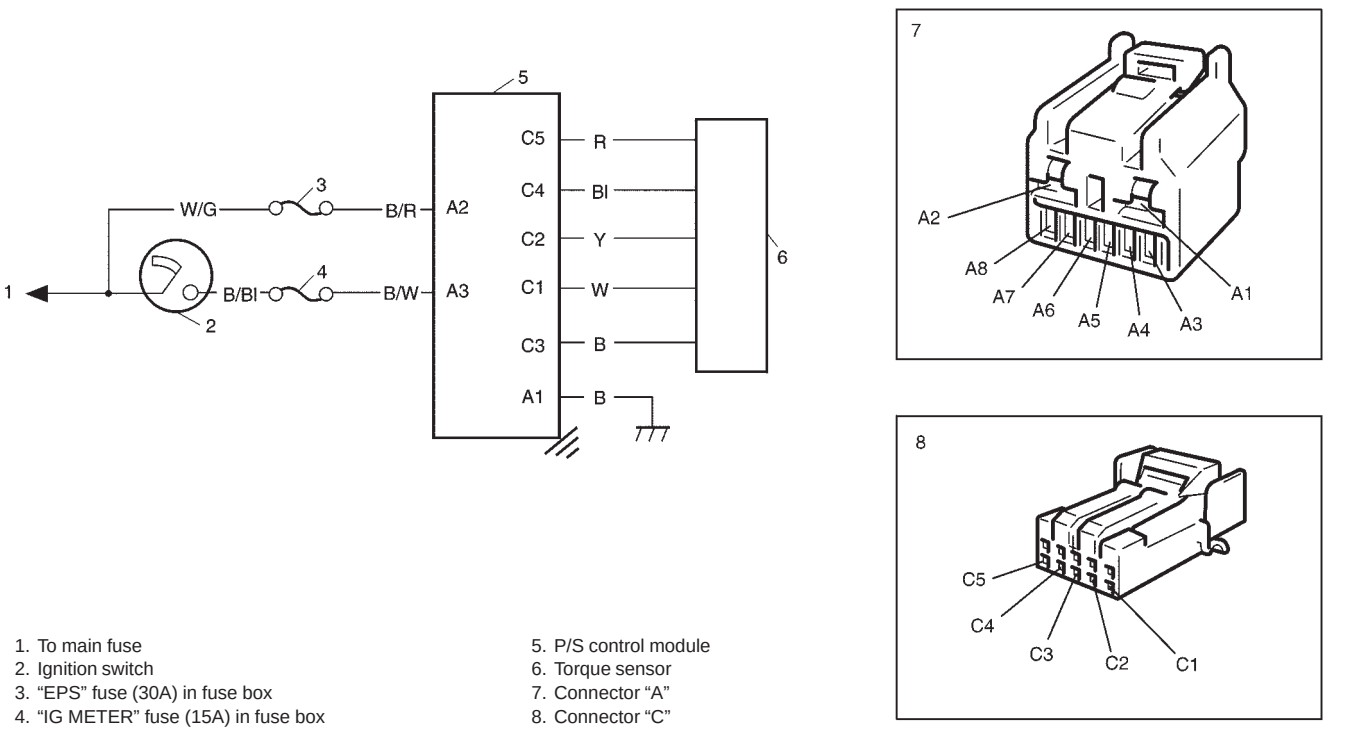
Fig. for Step 3



1. DLC
2. “V/W” wire terminal

NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1111 TORQUE SENSOR MAIN CIRCUIT FAIL
DTC C1113 TORQUE SENSOR MAIN AND SUB CIRCUIT FAIL
DTC C1115 TORQUE SENSOR SUB CIRCUIT FAIL



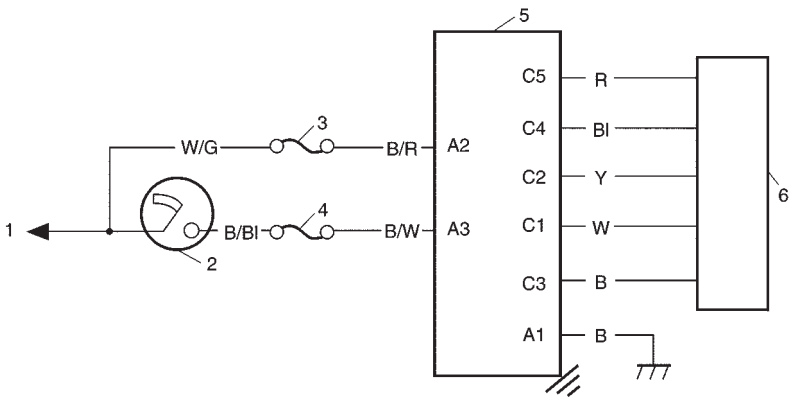
1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. P/S control module
6. Torque sensor
7. Connector "A"
8. Connector "C"

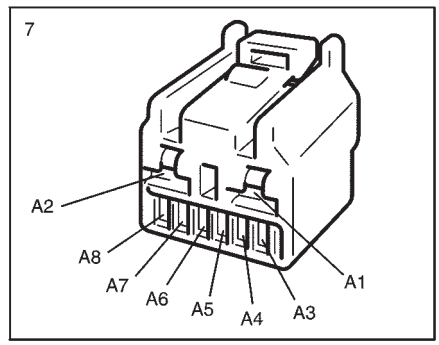
CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

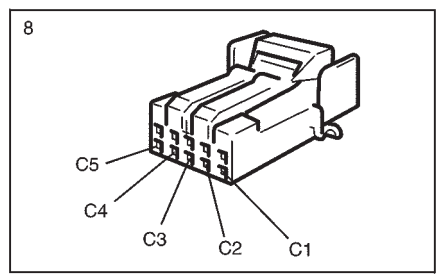
STEP	ACTION	YES	NO
1	Is DTC C1114 or C1116 indicated, too?	Go to flow table corresponding to each DTC No.	Go to STEP 2.
2	1) Check proper connection for 5-pin ("C") connector to P/S control module. 2) If OK, check torque sensor and its circuit. Refer to ON-VEHICLE INSPECTION of TORQUE SENSOR. 3) Is torque sensor in good condition?	Substitute a known-good P/S control module and recheck.	Replace torque sensor and recheck.

NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1114 TORQUE SENSOR 5V POWER SUPPLY CIRCUIT FAIL





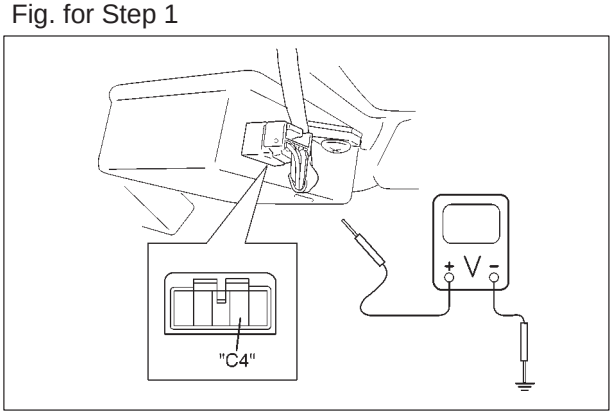


1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. P/S control module
6. Torque sensor
7. Connector "A"
8. Connector "C"

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

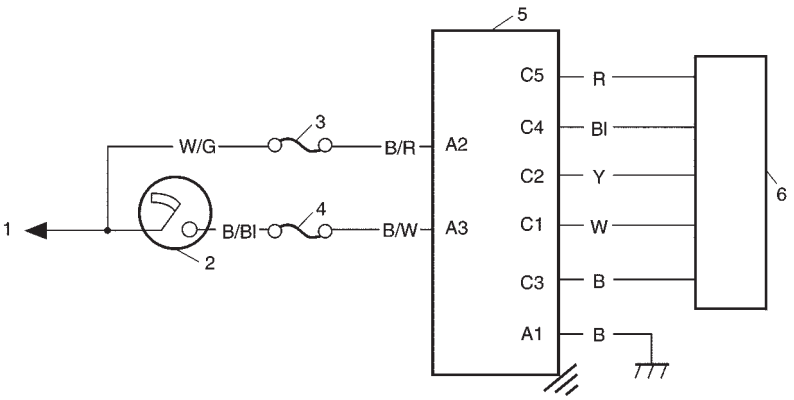
STEP	ACTION	YES	NO
1	1) Remove steering column lower cover. 2) Check proper connection for 5-pin ("C") connector to P/S control module. 3) If OK, ignition switch ON. 4) Check voltage between "C4" ("Bl" wire) terminal of 5-pin ("C") connector and body ground with "C" connector connected to P/S control module. 5) Is it about 5 V?	Go to STEP 2.	Repair high resistance, open or short to power circuit or ground in 5V power supply ("Bl" wire) circuit.
2	1) Check torque sensor and its circuit. Refer to ON-VEHICLE INSPECTION of TORQUE SENSOR. 2) Is torque sensor in good condition?	Substitute a known-good P/S control module and recheck.	Replace torque sensor and recheck.

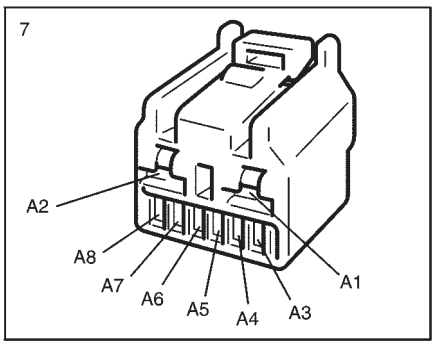
Fig. for Step 1

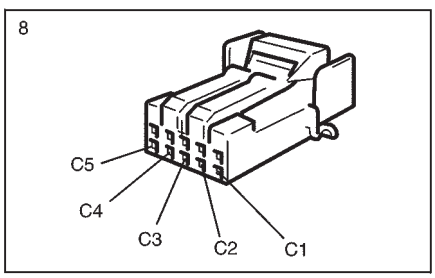


NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1116 TORQUE SENSOR 8V POWER SUPPLY CIRCUIT FAIL





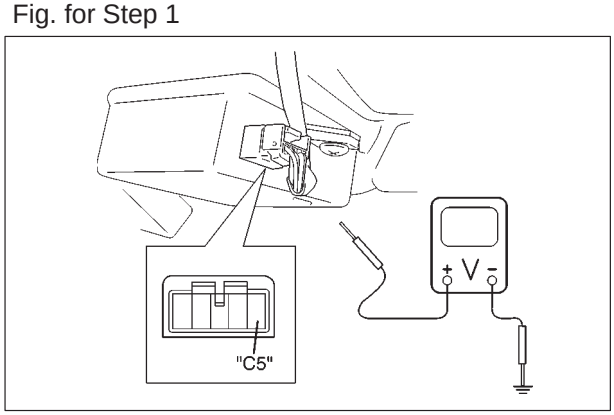


1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. P/S control module
6. Torque sensor
7. Connector "A"
8. Connector "C"

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

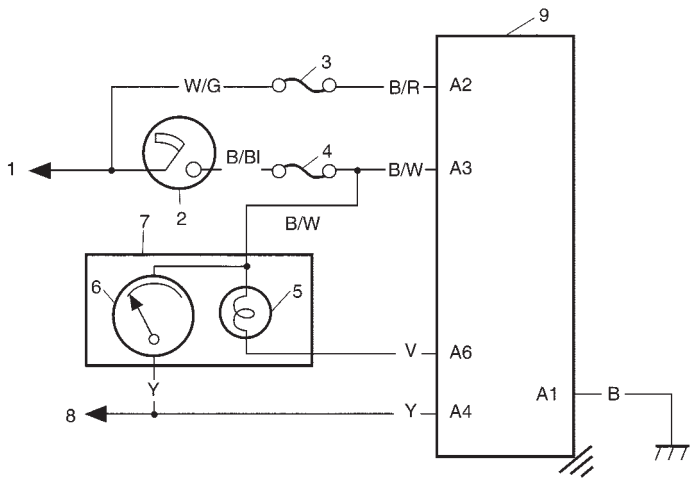
STEP	ACTION	YES	NO
1	1) Remove steering column lower cover. 2) Check proper connection for 5-pin ("C") connector to P/S control module. 3) If OK, ignition switch ON. 4) Check voltage between "C5" ("R" wire) terminal of 5-pin ("C") connector and body ground with "C" connector connected to P/S control module. 5) Is it about 8 V?	Go to STEP 2.	Repair high resistance, open or short to power circuit or ground in 8V power supply ("R" wire) circuit.
2	1) Check torque sensor and its circuit. Refer to ON-VEHICLE INSPECTION of TORQUE SENSOR. 2) Is torque sensor in good condition?	Substitute a known-good P/S control module and recheck.	Replace torque sensor and recheck.

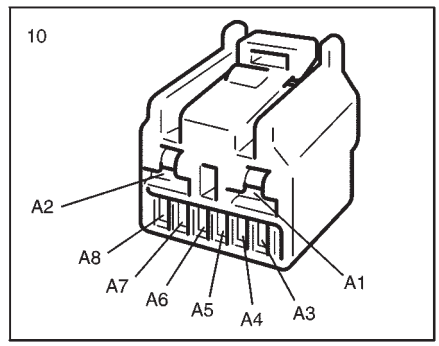
Fig. for Step 1



NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1121/C1123/C1124 VSS CIRCUIT FAIL



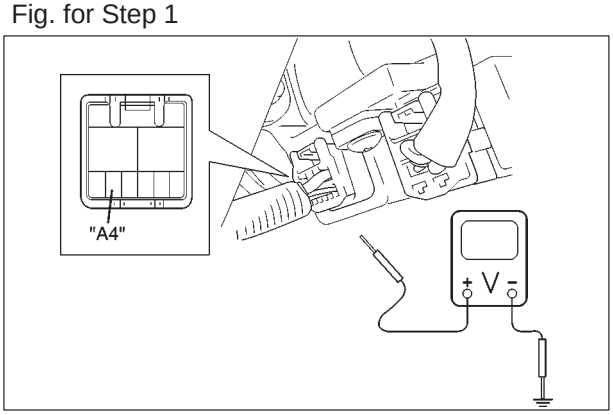


1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. Malfunction indicator lamp (MIL) ("EPS" light)
6. Speedometer
7. Combination meter
8. To VSS
9. P/S control module
10. Connector "A"

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

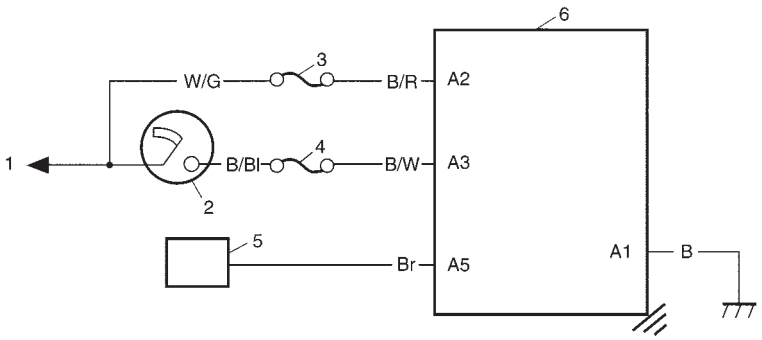
STEP	ACTION	YES	NO
1	1) Ignition switch OFF. 2) Remove steering column lower cover. 3) Disconnect 8-pin ("A") connector from P/S control module. 4) Check proper connection to P/S control module at terminal "A4" ("Y" wire). 5) If OK, connect voltmeter between "A4" ("Y" wire) terminal and body ground with "A" connector connected. 6) Hoist rear end of vehicle and lock rear right tire. 7) Turn rear left tire quickly with ignition switch ON. 8) Does voltmeter indicated deflection between 0 – 1 V and 9 – 11 V a few times while tire is turned one revolution?	Check intermittent trouble. Refer to INTERMITTENT TROUBLE in SECTION 0A. If OK, substitute a known-good P/S control module and recheck.	Repair VSS or its ("Y" wire) circuit.

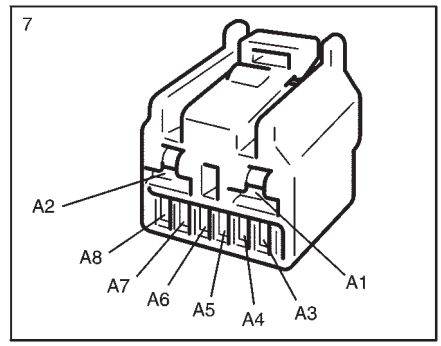
Fig. for Step 1



NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1122 ENGINE SPEED SIGNAL CIRCUIT FAIL





1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. ECM
6. P/S control module
7. Connector "A"

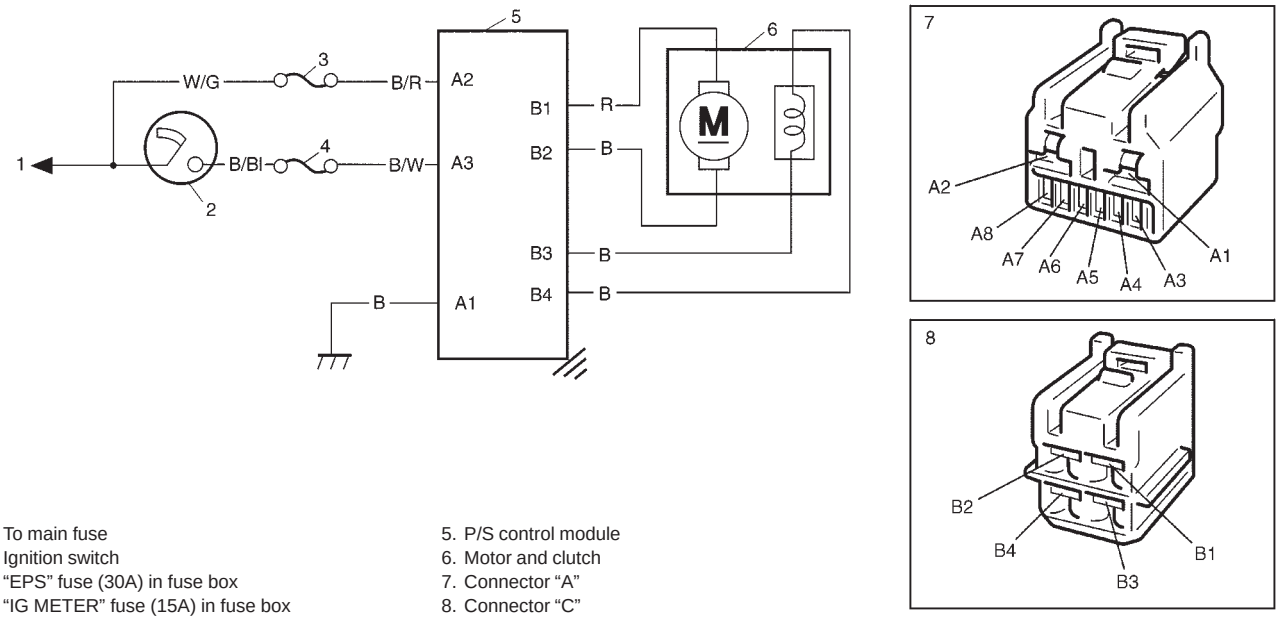
CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

NOTE 1:
It is necessary for SUZUKI scan tool to perform STEP 3 of this table.

STEP	ACTION	YES	NO
1	1) Recheck DTC with engine running. 2) Is DTC C1122 indicated?	Go to STEP 2.	It is nothing abnormal for DTC C1122. System is in normal condition.
2	1) Check proper connection to P/S control module and ECM at each "Br" wire terminal (P/S control module side: "A5" terminal, ECM side: Refer to WIRING DIAGRAM in SECTION 6E), then check intermittent trouble. Refer to INTERMITTENT TROUBLE in SECTION 0A. 2) Is check result in good condition?	Go to STEP 3.	Repair poor connection or intermittent trouble.
3	1) See NOTE 1 describe above. 2) Using SUZUKI scan tool, read data list for P/S system. Refer to SUZUKI scan tool operator's manual. 3) Check engine speed. 4) Is proper engine speed indicated?	Substitute a known-good P/S control module and recheck.	Repair high resistance, open or short to power circuit or ground in "Br" wire circuit.

NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1141/C1142/C1143/C1144/C1145 MOTOR CIRCUIT FAIL

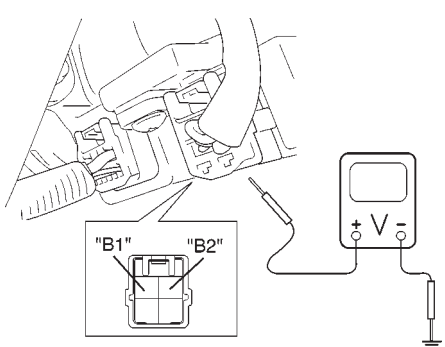


1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. P/S control module
6. Motor and clutch
7. Connector "A"
8. Connector "C"

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

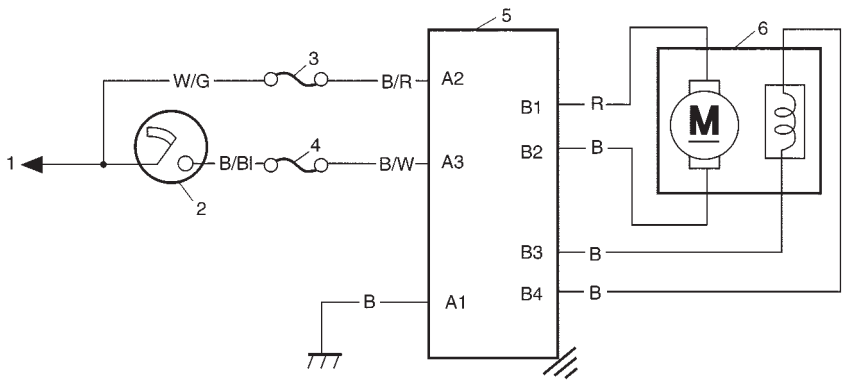
STEP	ACTION	YES	NO
1	1) Remove steering column lower cover. 2) Check proper connection for 4-pin ("B") connector to P/S control module. 3) If OK, start engine. 4) Check voltage between "B1" terminal and body ground and "B2" terminal and body ground with "B" connector connected to P/S control module. 5) Are they 5 – 7 V with steering wheel held at position for vehicle to run straight?	Go to STEP 2.	Repair poor connection, high resistance, open or short to power circuit or ground in "B1" or "B2" circuit.
2	1) Check motor and its circuit. Refer to ON-VEHICLE INSPECTION of MOTOR AND CLUTCH. 2) Is motor in good condition?	Substitute a known-good P/S control module and recheck.	Replace motor and recheck.

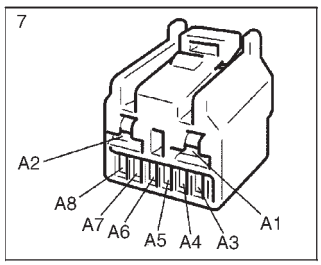
Fig. for Step 1

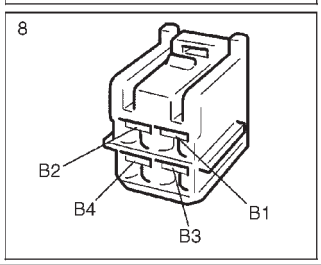


NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1151 CLUTCH CIRCUIT FAIL







1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. P/S control module
6. Motor and clutch
7. Connector "A"
8. Connector "C"

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

STEP	ACTION	YES	NO
1	1) Remove steering column lower cover. 2) Check proper connection for 4-pin ("B") connector to P/S control module. 3) If OK, start engine. 4) Check voltage between "B3" terminal and body ground with "B" connector connected to P/S control module. 5) Is it 0 V?	Go to STEP 2.	Repair poor connection, high resistance, open or short to power circuit or ground in "B3" circuit.
2	1) Check voltage between "B4" terminal and body ground with "B" connector connected to P/S control module. 2) Is it 10 – 14 V with steering wheel held at position for vehicle to run straight?	Go to STEP 3.	Repair poor connection, high resistance, open or short to power circuit or ground in "B4" circuit.
3	1) Check motor and its circuit. Refer to ON-VEHICLE INSPECTION of MOTOR AND CLUTCH. 2) Is clutch in good condition?	Substitute a known-good P/S control module and recheck.	Replace clutch and recheck.

Fig. for Step 1

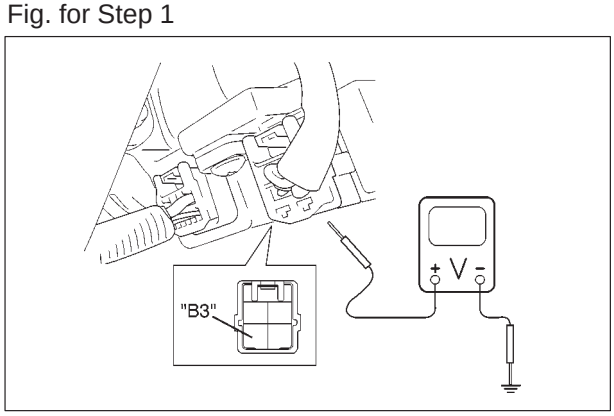
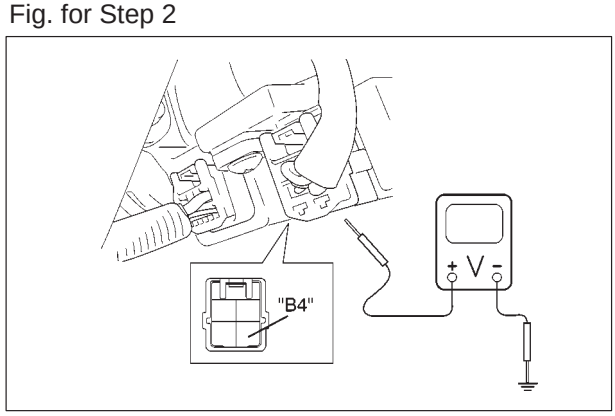
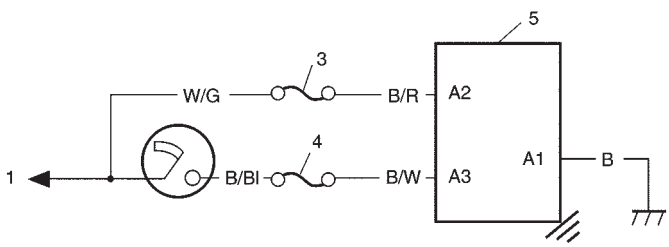


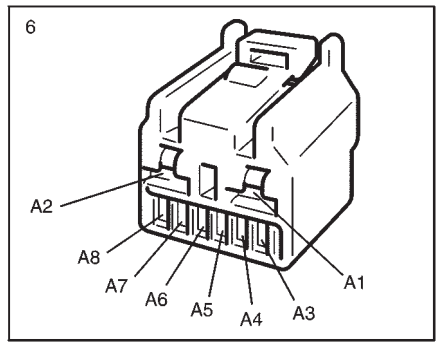
Fig. for Step 2



NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1153 P/S CONTROL MODULE POWER SUPPLY CIRCUIT FAIL



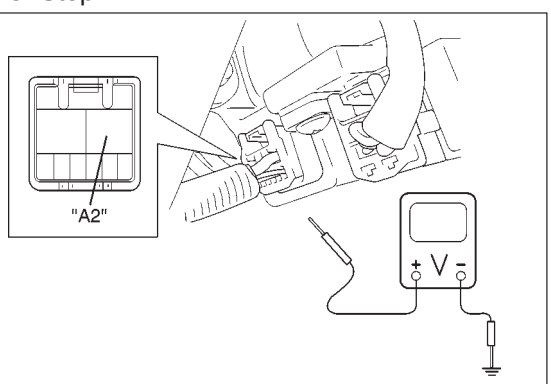


1. To main fuse
2. Ignition switch
3. "EPS" fuse (30A) in fuse box
4. "IG METER" fuse (15A) in fuse box
5. P/S control module
6. Connector "A"

CAUTION:
Be sure to perform SYSTEM CHECK FLOW TABLE before starting diagnosis according to flow table of each DTC.

STEP	ACTION	YES	NO
1	1) Remove steering column lower cover. 2) Check proper connection to P/S control module at "A2" ("BI/R" wire) terminal. 3) If OK, check voltage between "A2" terminal and body ground with "A" connector connected to P/S control module. 4) Is it 10 – 14 V?	Check intermittent trouble. Refer to INTERMITTENT TROUBLE in SECTION 0A. If OK, substitute a known-good P/S control module and recheck.	Repair poor connection or high resistance in "A2" ("BI/R" wire) circuit.

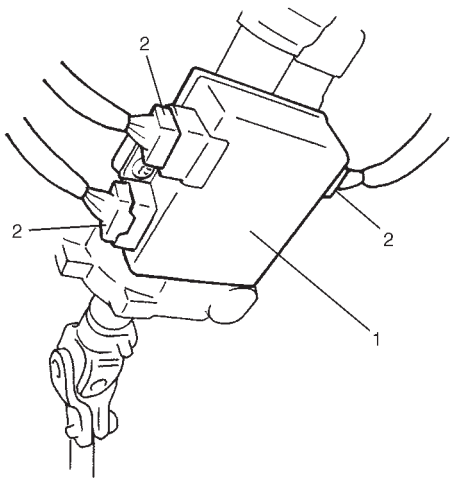
Fig. for Step 1



NOTE:
Upon completion of inspection and repair work, repeat SYSTEM CHECK FLOW TABLE to confirm that the trouble has been corrected.

DTC C1152/C1154/C1155 P/S CONTROL MODULE FAIL

Substitute a known-good P/S control module and recheck.



1. P/S control module
2. P/S control module coupler

INSPECTION OF P/S CONTROL MODULE AND ITS CIRCUITS

P/S control module and its circuits can be checked at P/S control module wiring couplers by measuring voltage and resistance.

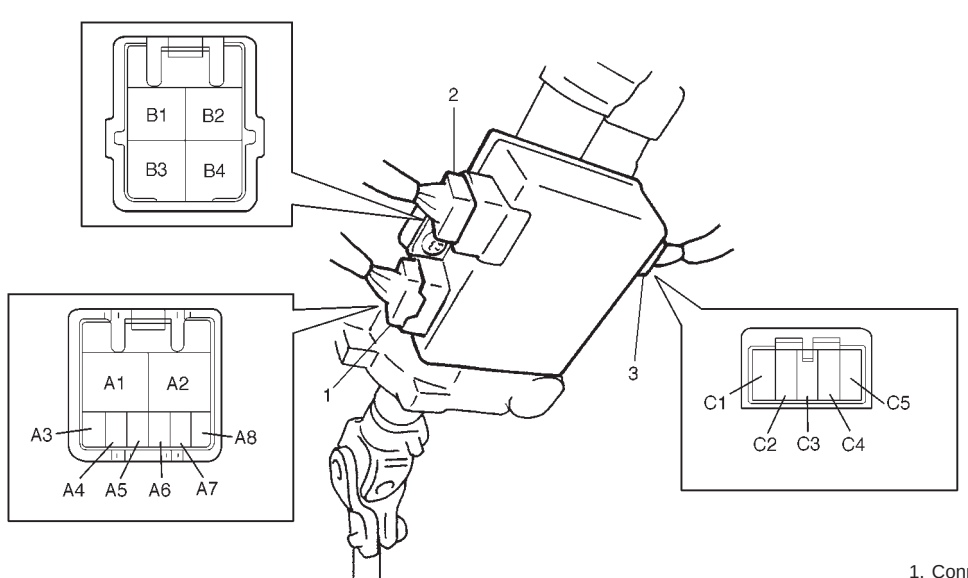
CAUTION:
P/S control module cannot be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to P/S control module with coupler disconnected from it.

Voltage Check

1) Remove steering column lower cover with ignition switch OFF.
2) Check voltage at each terminal of couplers connected.

NOTE:
As each terminal voltage is affected by the battery voltage, confirm that it is 11V or more when ignition switch is ON.

TERMINAL ARRANGEMENT OF P/S CONTROL MODULE COUPLERS (VIEWED FROM HARNESS)



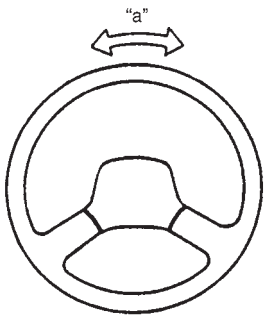
1. Connector "A"
2. Connector "B"
3. Connector "C"

TERMINAL NO.	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ground	–	–
A2	P/S control module power supply from battery	10 – 14V	Ignition switch ON
A3	P/S control module power supply from ignition switch	10 – 14V	Ignition switch ON
A4	VSS	Indicator deflection repeated 0 – 1V and 9 – 11V	Ignition switch ON Rear left tire turned quickly with right tire locked
A5	Engine speed signal	About 1V	Engine idling
A6	“EPS” light	0 – 2V	Engine idling “EPS” light ON
		10 – 14V	Engine idling “EPS” light OFF
A7	Diagnosis switch terminal	About 5V	Ignition switch ON
A8	SUZUKI scan tool	–	–
B1	Motor output 2	5 – 7V	Engine idling and steering wheel held at position for vehicle to run straight
B2	Motor output 1	5 – 7V	Engine idling and steering wheel held at position for vehicle to run straight
B3	Clutch output 2	0V	–
B4	Clutch output 1	10 – 14V	Engine idling and steering wheel held at position for vehicle to run straight
C1	Torque sensor (Main)	About 2.5V	Ignition switch ON and steering wheel held at position for vehicle to run straight Check voltage between “C1” and “C3” terminals.
C2	Torque sensor (Sub)	About 2.5V	Ignition switch ON and steering wheel held at position for vehicle to run straight Check voltage between “C2” and “C3” terminals.
C3	Torque sensor (GND)	0V	–
C4	5V power supply for torque sensor	About 5V	Ignition switch ON Check voltage between “C4” and “C3” terminals
C5	8V power supply for torque sensor	About 8V	Ignition switch ON

TROUBLE DIAGNOSIS (FOR TROUBLE NOT INDICATED BY ON BOARD DIAGNOSTIC SYSTEM)

This section describes trouble diagnosis of P/S system parts whose trouble is not indicated by the on-board diagnostic system (self-diagnostic function).
When DTC No.12 is indicated by the on-board diagnostic system (self-diagnosis function) and assuredly those steering basic parts as described in DIAGNOSIS CHART in SECTION 3 are all in good condition, check following power steering system parts which may be a possible cause for each symptom of the steering.

SYMPTOM	POSSIBLE CAUSE	INSPECTION
Steering wheel feels heavy	● Steering wheel installed improperly (twisted)	Install steering wheel correctly.
	● Poor performance of torque sensor	Check torque sensor. Refer to ON-VEHICLE INSPECTION of TORQUE SENSOR.
	● Poor performance of motor and clutch	Check motor and clutch. Refer to ON-VEHICLE INSPECTION of MOTOR AND CLUTCH.
	● Faulty steering column	Replace.
	● Poor performance of VSS	Check VSS. Refer to SECTION 6E.
Vehicle pulls to one side during straight driving	● Poor performance of torque sensor	Check torque sensor. Refer to ON-VEHICLE INSPECTION of TORQUE SENSOR.
Poor recovery from turns	● Poor performance of torque sensor	Check torque sensor. Refer to ON-VEHICLE INSPECTION of TORQUE SENSOR.
	● Faulty steering column	Replace.



INSPECTION OF STEERING WHEEL PLAY

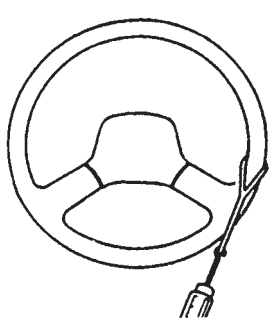
Check steering wheel for looseness or rattle by trying to move it in its shaft direction and lateral direction.
If found defective, repair or replace.

Check steering wheel for play, holding vehicle in straight forward condition on the ground and with engine stopped.

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

If steering wheel play is not within specification, inspect as follows and replace if found defective.

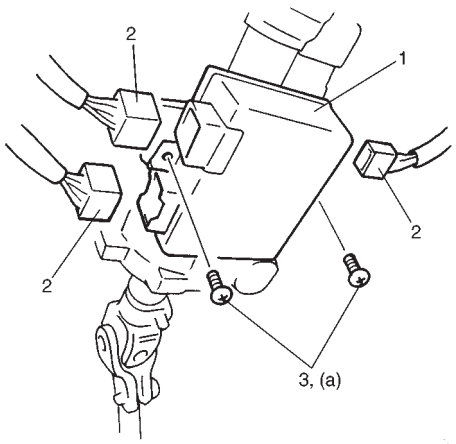
- Tie rod end ball stud for wear
- Lower ball joint for wear
- Steering shaft joint for wear
- Steering pinion or rack gear for wear or breakage
- Each part for looseness



INSPECTION OF STEERING FORCE

1) Place vehicle on level road and set steering wheel at straight-ahead position.
2) Check that tire inflation pressure is as specified. (Refer to tire placard.)
3) Start engine.
4) With engine idling, measure steering force by pulling spring balancer hooked on steering wheel in tangential direction.

   Steering force : Less than 35 N (3.5 kg)



1. P/S control module
2. Coupler
3. Screw

ON-VEHICLE SERVICE

P/S CONTROL MODULE

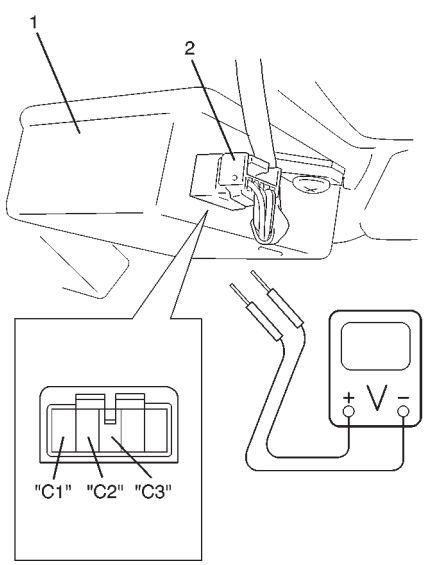
REMOVAL

1) Disconnect negative cable at battery.
2) Remove steering column lower cover.
3) Disconnect couplers from P/S control module.
4) Remove P/S control module from steering column assembly.

INSTALLATION

Reverse removal procedure for installation.

Tightening Torque
(a): 3 N·m (0.3 kg-m, 2.0 lb-ft)



1. P/S control module
2. Connector “C”

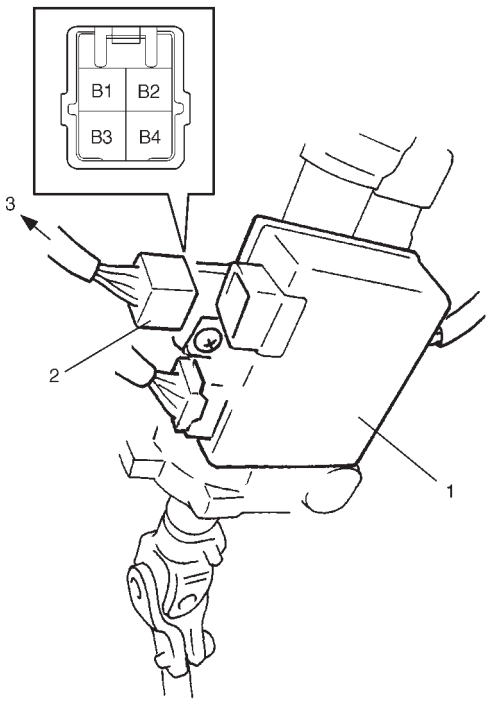
TORQUE SENSOR

ON-VEHICLE INSPECTION

1) Remove steering column lower cover.
2) Turn ignition switch to ON position.
3) Check voltage between terminals of torque sensor connector with connecting it to P/S control module and not running engine.

	Steering wheel turned fully left	Steering wheel held at position for vehicles torque straight	Steering wheel turned fully right
Main sensor (“C1” – “C3”)	About 1.5 V	About 2.5 V	About 4 V
Sub sensor (“C2” – “C3”)	About 1.5 V	About 2.5 V	About 4 V

If check result is not satisfactory, replace steering column assembly.



1. P/S control module
2. Motor and clutch coupler (Connector “B”)
3. To motor and clutch

MOTOR AND CLUTCH

ON-VEHICLE INSPECTION

1) Remove steering column lower cover.
2) Disconnect motor and clutch coupler from P/S control module with ignition switch OFF.
3) Check resistance between terminals of motor and clutch coupler.

“B1” and “B2” (For motor)	About 1 Ω
“B3” and “B4” (For clutch)	About 12 Ω (at 20°C (68°F))

If check result is not satisfactory, replace steering column assembly.

4) Check continuity between terminal of motor and clutch coupler and body ground.

“B1” and body ground	No continuity
“B3” and body ground	No continuity

If check result is not satisfactory, replace steering column assembly.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening Torque		
	N·m	kg-m	lb-ft
P/S control module screw	3	0.3	2.0

SECTION 3C

STEERING WHEEL AND COLUMN

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. Please observe all WARNINGS and SERVICE PRECAUTIONS of 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.**
- **The procedures in this section must be followed in the order listed to temporarily disable the air bag system and prevent false diagnostic codes from setting. Failure to follow procedures could result in possible air bag system activation, 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 procedures are not followed, parts or system damage could result.

CONTENTS

GENERAL DESCRIPTION

This double tube type steering column has following three important features in addition to the steering function:

- The column is energy absorbing, designed to compress in a front-end collision.
- The ignition switch and lock are mounted conveniently on this column.
- With the column mounted lock, the ignition and steering operations can be locked to inhibit theft of the vehicle.

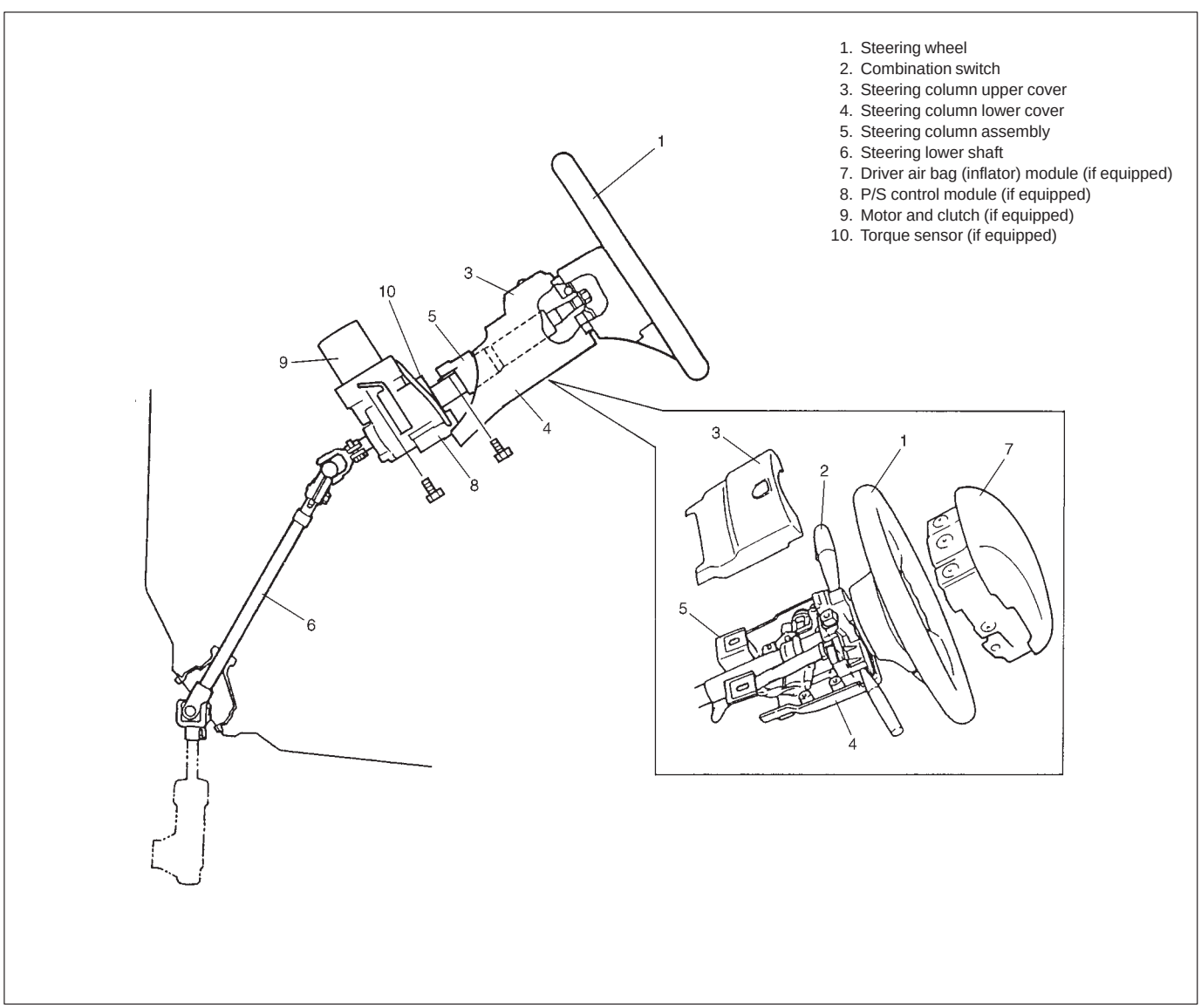
To insure the energy absorbing action, it is important that only the specified screws, bolts, and nuts be used as designated and that they are tightened to the specified torque.

When the column assembly is removed from the vehicle, special care must be taken in handling it. Use of a steering wheel puller other than the one recommended in this manual or a sharp blow on the end of the steering shaft, leaning on the assembly, or dropping the assembly could shear the plastic shear pins which maintain column length and position.

The driver air bag (inflator) module is one of the supplemental restraint (air bag) system components and is mounted to the center of the steering wheel. During certain frontal crashes, the air bag system supplements the restraint of the driver's and passenger's seat belts by deploying the air bags.

The air bag (inflator) module should be handled with care to prevent accidental deployment. When servicing, be sure to observe all WARNINGS, CAUTIONS and SERVICE PRECAUTIONS in this section.

COMPONENTS



DIAGNOSIS

Refer to SECTION 3 for diagnosis of the steering wheel and column.
Refer to SECTION 10B for diagnosis of the air bag system.

INSPECTION AND REPAIR REQUIRED AFTER ACCIDENT

[For vehicle without air bag system]
After an accident, be sure to perform checks, inspections and repairs described under CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE in this section.
[For vehicle with air bag system]
After an accident, whether the air bag has been deployed or not, be sure to perform checks, inspections and repairs described under CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE in this section as well as REPAIRS AND INSPECTIONS REQUIRED AFTER ACCIDENT in SECTION 10B.

ON-VEHICLE SERVICE

SERVICE PRECAUTIONS (FOR VEHICLE WITH AIR BAG SYSTEM)

Refer to SERVICE PRECAUTIONS in SECTION 10B for service precautions.

DIAGNOSIS AND SERVICING

Refer to DIAGNOSIS AND SERVICING of SERVICE PRECAUTIONS in SECTION 10B for diagnosis and servicing.

DISABLING AIR BAG SYSTEM

Refer to DISABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in SECTION 10B for disabling air bag system.

ENABLING AIR BAG SYSTEM

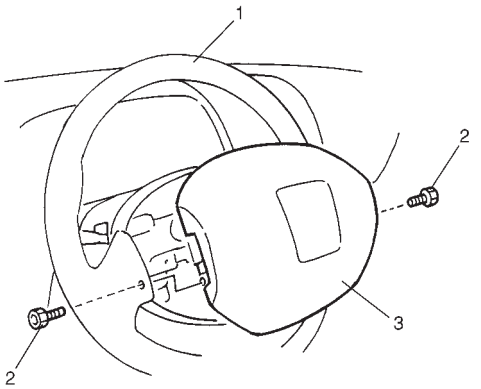
Refer to ENABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in SECTION 10B for enabling air bag system.

HANDLING AND STORAGE

Refer to HANDLING AND STORAGE of SERVICE PRECAUTIONS in SECTION 10B for handling and storage.

DISPOSAL

Refer to DISPOSAL of SERVICE PRECAUTIONS in SECTION 10B for disposal.



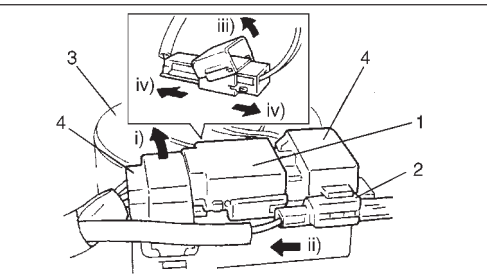
1. Steering wheel
2. Mounting bolt
3. Driver air bag (inflator) module

DRIVER AIR BAG (INFLATOR) MODULE (FOR VEHICLE WITH AIR BAG SYSTEM)

WARNING:
When handling an air bag (inflator) module, be sure to read SERVICE PRECAUTIONS in this section and observe each instruction. Failure to follow them could cause a damage to the air bag (inflator) module or result in personal injury.

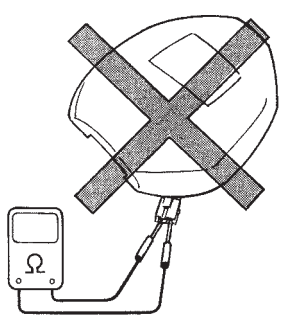
REMOVAL

1) Disconnect negative cable at battery.
2) Disable air bag system. Refer to DISABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.
3) Remove driver air bag (inflator) module mounting bolts at right and left side of steering wheel.



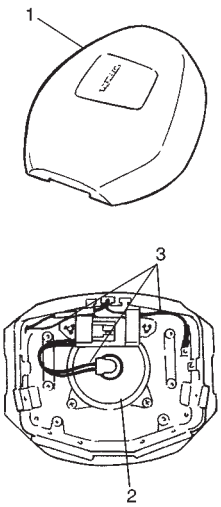
1. Driver air bag (inflator) module connector
2. Horn connector
3. Driver air bag (inflator) module
4. Connector clamp

4) Remove driver air bag (inflator) module from steering wheel.
5) Disconnect yellow connector of driver air bag (inflator) module and horn connector in order (i) → iv)) shown in the figure.



INSPECTION

WARNING:
Never disassemble driver air bag (inflator) module or measure its resistance. Otherwise, personal injury may result.

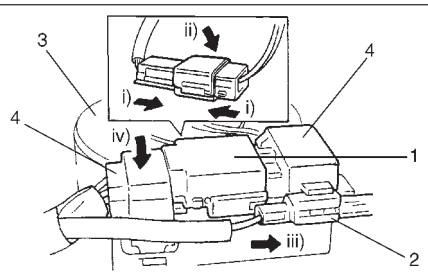


1. Trim cover (pad surface)
2. Inflator case
3. Wire harness

CAUTION:
If air bag (inflator) module was dropped from a height of 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module visually and if any of the following is found, replace it with a new one.

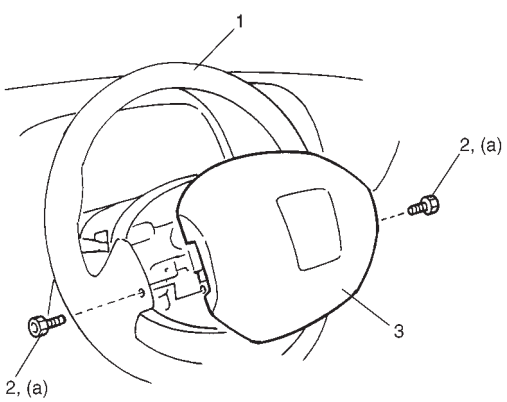
- Air bag being deployed
- Trim cover (pad surface) being cracked
- Wire harness or connector being damaged
- Air bag (inflator) module being damaged or having been exposed to strong impact (dropped)



1. Driver air bag (inflator) module connector
2. Horn connector
3. Driver air bag (inflator) module
4. Connector clamp

INSTALLATION

1) Check that horn wire is connected to horn terminal securely.
2) Connect yellow connector of driver air bag (inflator) module and horn connector in order (i) → iv)) shown in the figure securely.



1. Steering wheel
2. Mounting bolt
3. Driver air bag (inflator) module

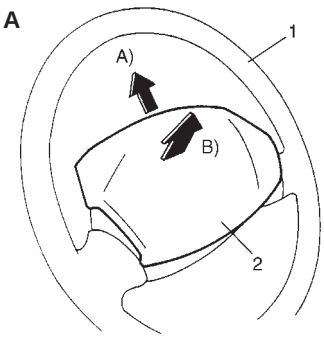
3) Install driver air bag (inflator) module to steering wheel, taking care so that no part of wire harness is caught between them.
4) Make sure that clearance between module and steering wheel is uniform all the way.
5) Tighten driver air bag (inflator) module mounting bolts to specified torque.

Tightening Torque
(a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

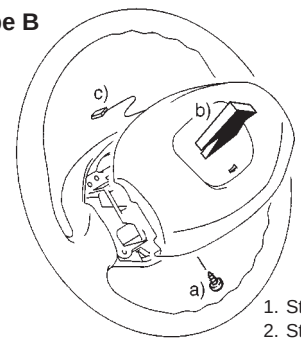
6) Connect negative cable at battery.
7) Enable air bag system. Refer to ENABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.

For vehicle without air bag system

Type A



Type B



1. Steering wheel
2. Steering wheel pad

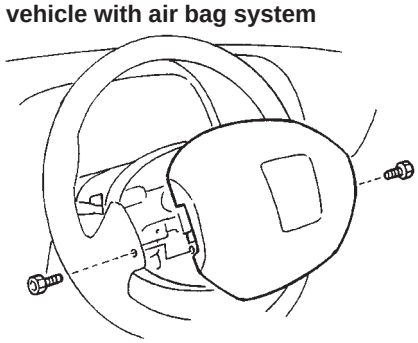
STEERING WHEEL

CAUTION:
For vehicle with air bag system
Removal of the steering wheel allows the contact coil to turn freely but do not turn the contact coil (on the combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

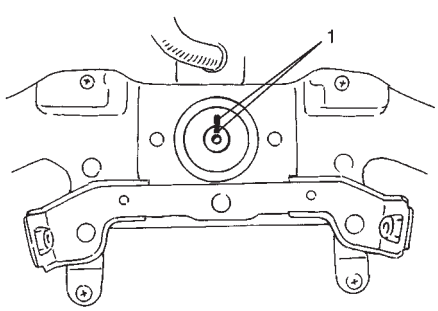
REMOVAL

1) For vehicle without air bag system
   i) Disconnect negative cable at battery.
   ii) Remove steering wheel pad in order (A) → B) or a) → c)) as shown in the figure.

For vehicle with air bag system

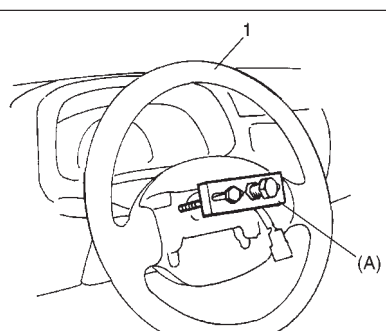


For vehicle with air bag system
Remove driver air bag (inflator) module from steering wheel. Refer to REMOVAL of DRIVER AIR BAG (INFLATOR) MODULE in this section.



1. Make alignment marks

2) Remove steering shaft nut.
3) Make alignment marks on steering wheel and shaft for a guide during reinstallation.

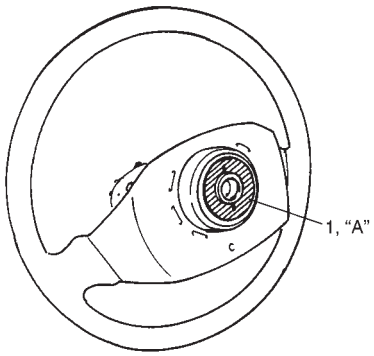


1. Steering wheel

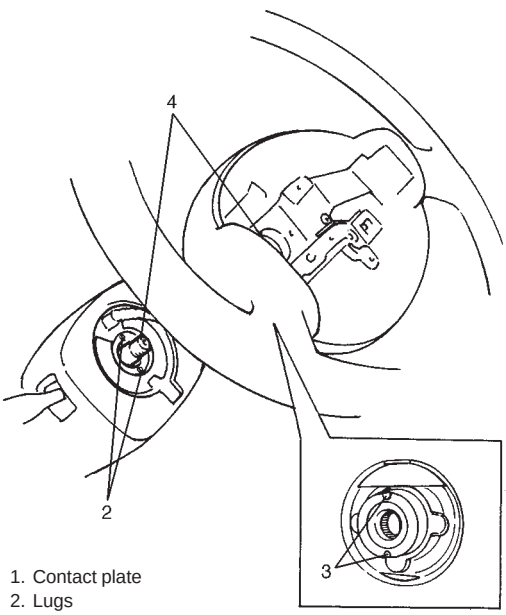
4) Remove steering wheel with special tool.
   Special Tool
   (A): 09944-36011

CAUTION:
Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.

For vehicle without air bag system



For vehicle with air bag system



1. Contact plate
2. Lugs
3. Grooves
4. Alignment marks

INSTALLATION

1) Check that vehicle's front tires are at straight-ahead position and if equipped with air bag system, contact coil is centered. Refer to CENTERING CONTACT COIL of STEERING WHEEL in this section.

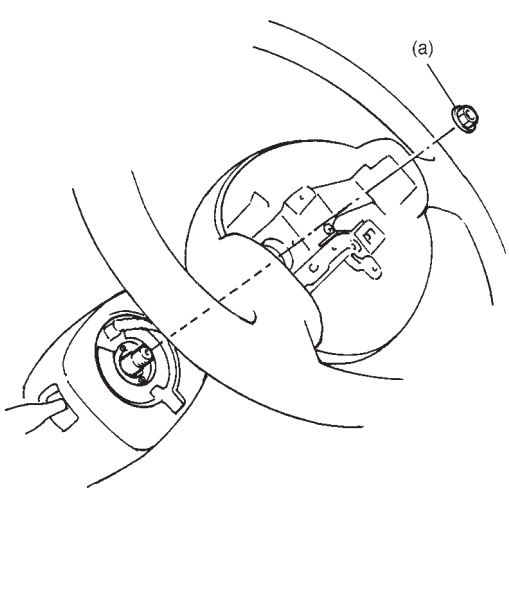
CAUTION:
For vehicle with air bag system
These two conditions are prerequisite for installation of steering wheel. If steering wheel has been installed without these conditions, contact coil will break when steering wheel is turned.

2) For vehicle without air bag system
   i) Apply grease to contact plate "A" of steering wheel.

   GREASE: SUZUKI GREASE CE-T (99000-25290)

   ii) Install steering wheel onto shaft, aligning them by matching marks.

   For vehicle with air bag system
   Install steering wheel to steering shaft with 2 lugs on contact coil fitted in two grooves in the back of steering wheel and also aligning marks on steering wheel and steering shaft.



3) Tighten steering shaft nut to specified torque.

   Tightening Torque
   (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)

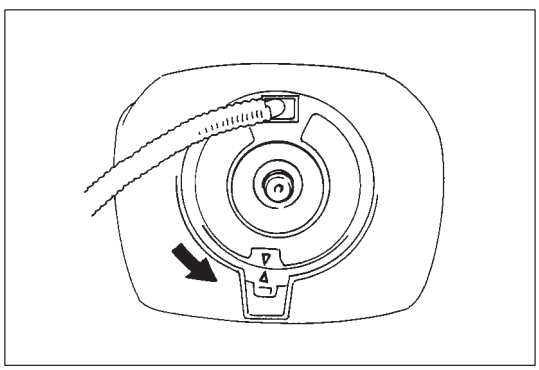
   NOTE:
   After installing the steering wheel, turn the steering wheel about 1 full rotation so that the cancel cam pin fits into the pin hole in the steering wheel and then check the turn signal lever for proper function.

4) For vehicle without air bag system
   i) Install steering wheel pad in reverse order of removal.
   ii) Connect negative cable at battery.

   For vehicle with air bag system
   Install driver air bag (inflator) module to steering wheel. Refer to INSTALLATION of DRIVER AIR BAG (INFLATOR) MODULE in this section.

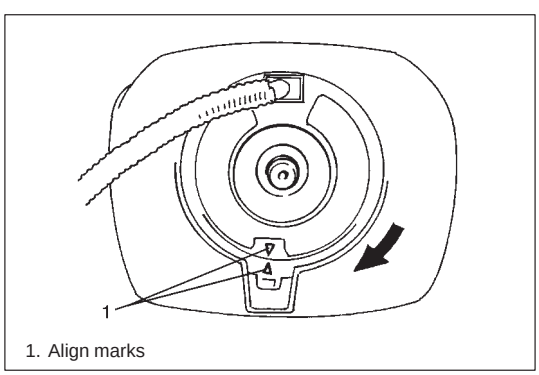
CENTERING CONTACT COIL (FOR VEHICLE WITH AIR BAG SYSTEM)

1) Check that vehicle's wheels (front tires) are set at straight-ahead position.
2) Check that ignition switch is at "LOCK" position.



3) Turn contact coil counterclockwise slowly with a light force till contact coil will not turn any further.

   NOTE:
   Contact coil can turn about 5 turns at maximum, that is, if it is at the center position, can turn about two and a half turns both clockwise and counterclockwise.



1. Align marks

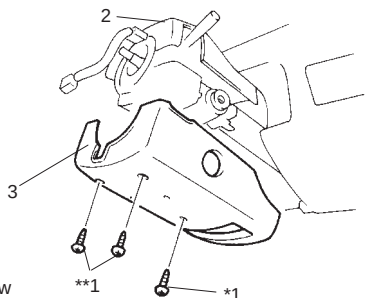
4) From the position where contact coil became unable to turn any further (it stopped), turn it back clockwise about two and a half rotations and align center mark with alignment mark.

COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

CAUTION:
For vehicle with air bag system
Do not turn contact coil (on combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counter-clockwise respectively), or coil will break.

REMOVAL

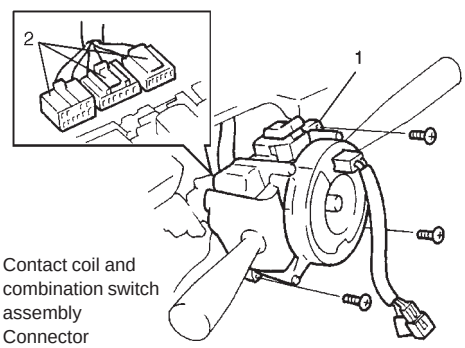
1) Remove steering wheel from steering column. Refer to REMOVAL of STEERING WHEEL in this section.



1. Screw
2. Steering column upper cover
3. Steering column lower cover

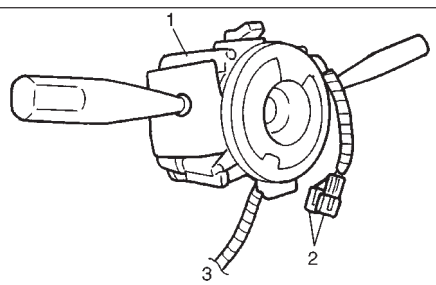
*: Standard screw
**: Tapping screw

2) Remove steering column cover screws (3 pcs).
3) Loosen steering column mounting bolts (Refer to STEERING COLUMN in this section).
4) Separate upper cover and lower cover, then remove them.
5) If equipped with air bag system, disconnect yellow connector and horn connector of contact coil from harness.



1. Contact coil and combination switch assembly
2. Connector

6) Remove combination switch/contact coil and combination switch assembly from steering column.
7) Disconnect 3 connectors from combination switch.

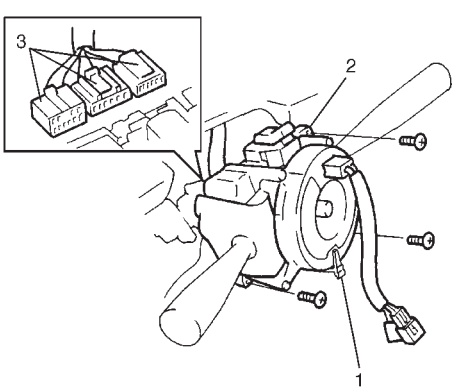


1. Contact coil and combination switch assembly
2. To horn and driver air bag (inflator) module
3. To air bag wire harness

INSPECTION

For vehicle with air bag system

Check contact coil and combination switch wire harness for any signs of scorching, melting or other damage. If it is damaged, replace it as an assembly.



1. Seal and lock pin if equipped, remove lock pin after installing contact coil and combination switch assembly.
2. Contact coil and combination switch assembly
3. Connector

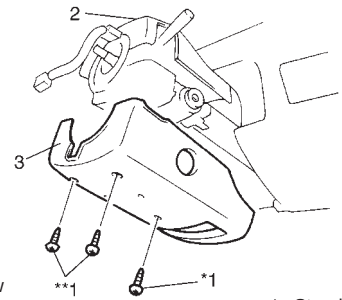
INSTALLATION

1) Check to make sure that vehicle's front tires are set at straight-ahead position and then ignition switch is at "LOCK" position.
2) Connect all connectors that have been disconnected in REMOVAL of COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in this section.
3) Install combination switch/contact coil and combination switch assembly to steering column.

NOTE:

For vehicle with air bag system

New contact coil and combination switch assembly is supplied with contact coil set and held at its center position with a lock pin and seal. Remove this lock pin after installing contact coil and combination switch assembly to steering column.

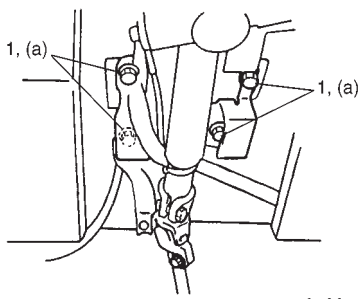


1. Screw
2. Steering column upper cover
3. Steering column lower cover

*: Standard screw
**: Tapping screw

4) Install steering column upper and lower, and then tighten steering column cover screws.

CAUTION:
When installing lower cover and upper cover, be careful so that combination switch/contact coil and combination switch lead wirer is not caught between covers.



1. Mounting bolt

5) Tighten steering column mounting bolts to specified torque.

Tightening Torque
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

6) Install steering wheel to steering column. Refer to INSTALLATION of STEERING WHEEL in this section.

STEERING COLUMN ASSEMBLY

CAUTION:
Once the steering column is removed from the vehicle, the column is extremely susceptible to damage.
- **Dropping the column assembly on its end could collapse the steering shaft or loosen the plastic shear pins which maintain column length.**
- **Leaning on the column assembly could cause it to bend or deform.**

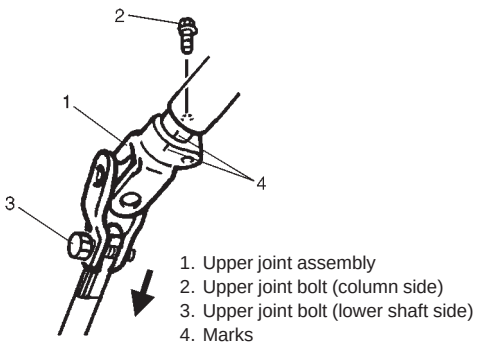
Any of the above damage could impair the column's collapsible design.

REMOVAL

WARNING:
For vehicle with air bag system
Never rest a steering column assembly on the steering wheel with the air bag (inflator) module face down and column vertical. Otherwise, personal injury may result.

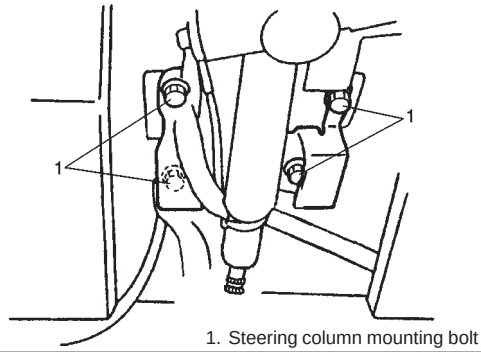
1) Disconnect negative cable at battery.
2) For vehicle with air bag system:
   Disable air bag system. Refer to DISABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.

3) Remove steering wheel and combination switch assembly, if necessary. Refer to REMOVAL of STEERING WHEEL and REMOVAL of COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in this section.
   Perform the following procedure if not removing steering wheel and/or combination switch assembly.
   i) Turn steering wheel so that vehicle's front tires are at straight
      ahead position.
   ii) turn ignition switch to "LOCK" position and remove key.
4) Make alignment marks on upper joint and shaft (column side) for a guide during installation.
5) Loosen upper joint bolt (lower shaft side) then remove upper joint bolt (column side).
6) Move upper joint assembly to lower shaft side (in arrow direction in the figure).



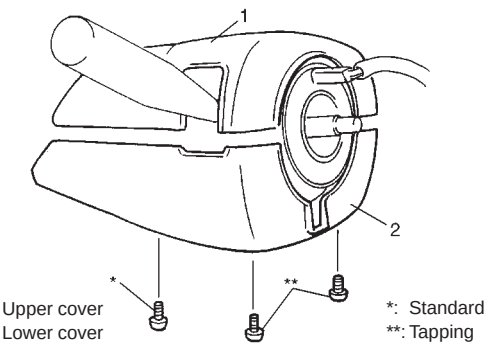
1. Upper joint assembly
2. Upper joint bolt (column side)
3. Upper joint bolt (lower shaft side)
4. Marks

7) Loosen steering column mounting bolts.



1. Steering column mounting bolt

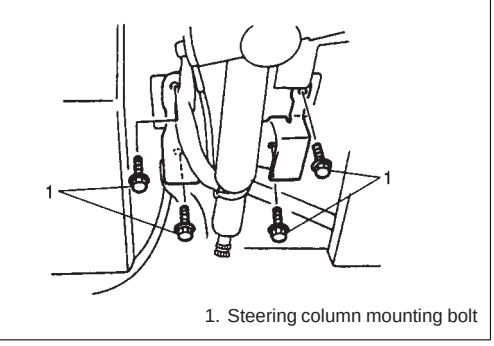
8) If not removing combination switch/contact coil and combination switch assembly, remove steering column lower and upper covers from steering column by removing 3 cover screws.
9) Disconnect all connectors of the following parts.
   - Combination switch/contact coil and combination switch assembly, if necessary
   - Ignition switch
   - P/S system parts (if equipped)



1. Upper cover
2. Lower cover

*: Standard
**: Tapping

10) Remove steering column mounting bolts. Then remove steering column.

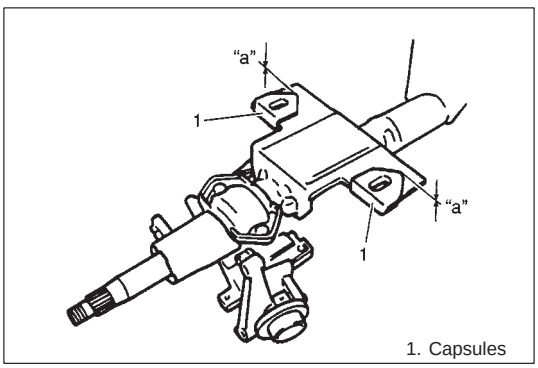


1. Steering column mounting bolt

INSPECTION

NOTE:

Vehicles involved in accidents resulting in body damage, where steering column has been impacted (or air bag deployed), may have a damaged or misaligned steering column.



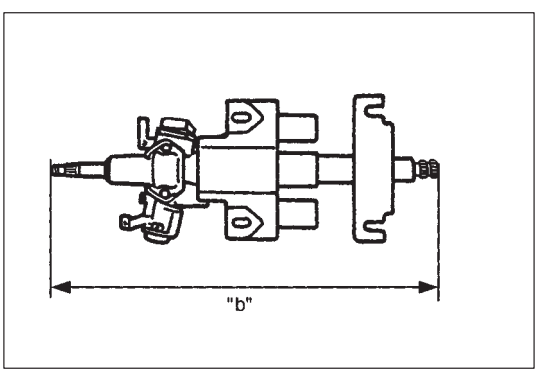
1. Capsules

CHECKING PROCEDURE

1) Check that two capsules are attached to steering column bracket securely. Check clearance between capsules and steering column bracket.

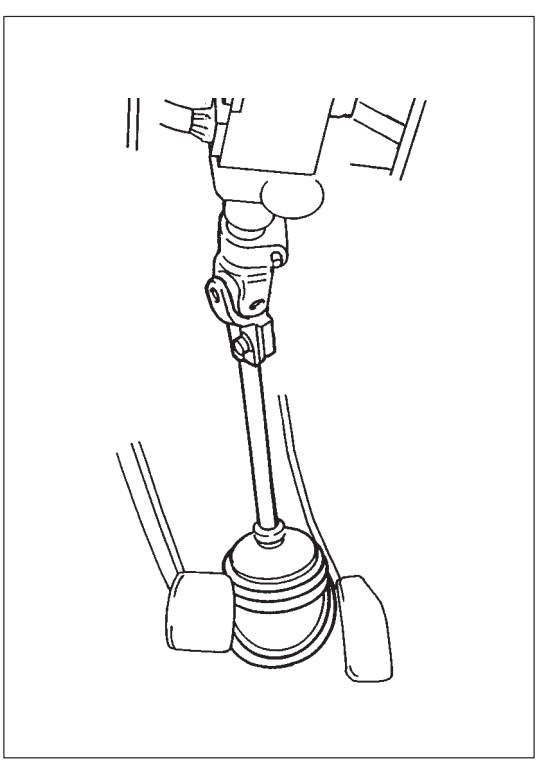
   Clearance "a": 0.0 mm (0.0 in.)

   If found loose or clearance, replace steering column assembly.
2) Check capsule for crack.
   If found defective, replace steering column assembly.

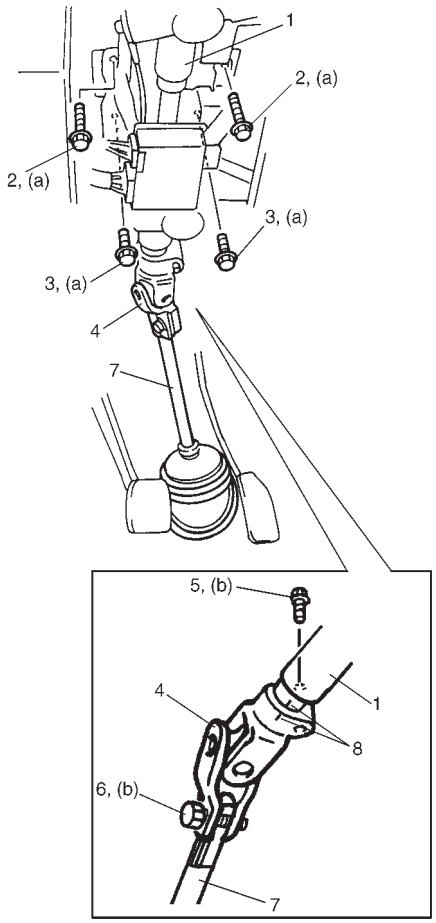


3) Take measurement "b" as shown.
   If it is shorter than specified length, replace column assembly.

   Length "b": 430.2 – 432.2 mm (16.94 – 17.02 in.)
   (for left-hand steering vehicle)
   409.5 – 411.5 mm (16.12 – 16.20 in.)
   (for right-hand steering vehicle)



4) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
   If anything is found faulty, replace as column assembly, upper joint assembly and/or lower shaft.
5) Check steering shaft for smooth rotation.
   If found defective, replace as column assembly.
6) Check steering shaft and column for bend, cracks or deformation.
   If found defective, replace.



1. Steering column
2. Mounting bolt (long)
3. Mounting bolt (short)
4. Upper joint assembly
5. Upper joint bolt (column side)
6. Upper joint bolt (lower shaft side)
7. Steering lower shaft
8. Marks

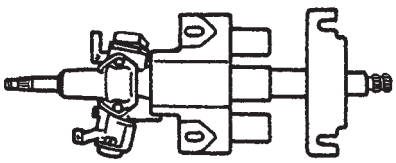
INSTALLATION

CAUTION:
After tightening steering column mounting bolts, upper joint bolts should be tightened.

1) Be sure that front wheels and steering wheel are in straightforward state.
2) Connect all connectors that have been disconnected in REMOVAL of STEERING COLUMN in this section.
3) Tighten steering column mounting bolts to specified torque.

   Tighten Torque
   (a): 15 N·m (1.5 kg-m, 11.0 lb-ft)
4) Install upper joint assembly to steering shaft (column side) by matching it to marks made before removal.
5) Tighten upper joint bolt (column side) to specified torque then tighten upper joint bolt (lower shaft side) to specified torque.

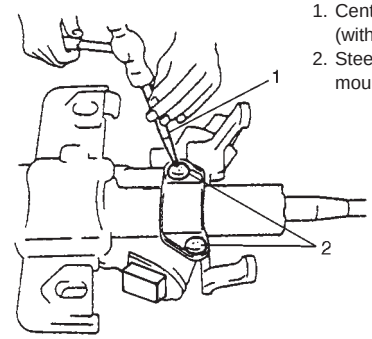
   Tighten Torque
   (b): 25 N·m (2.5 kg-m, 18.0 lb-ft)
6) If combination switch is not removed, install steering column upper and lower cover, and then tighten steering column cover screws.
7) If combination switch is removed, install combination switch/contact coil and combination switch. Refer to INSTALLATION of COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in this section.
8) If steering wheel is removed, install steering wheel. Refer to INSTALLATION of STEERING WHEEL in this section.
9) For vehicle with air bag system
   Enable air bag system. Refer to ENABLE AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.
10) Connect negative cable at battery.



STEERING LOCK ASSEMBLY (IGNITION SWITCH)

REMOVAL

1) Remove steering column. Refer to REMOVAL of STEERING COLUMN in this section.

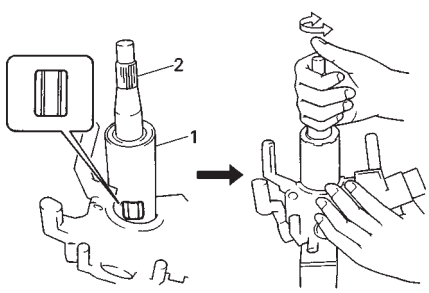


1. Center punch (with sharp point)
2. Steering lock mounting bolts

2) Using center punch as shown, loosen and remove steering lock mounting bolts.

NOTE:
Use care not to damage aluminum part of steering lock body with center punch.

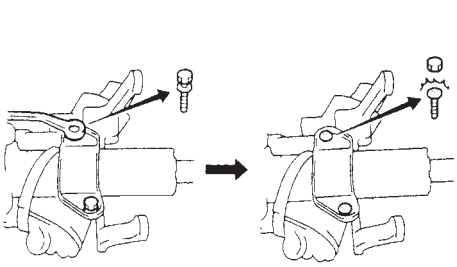
3) Turn ignition key to “ACC” or “ON” position and remove steering lock assembly from steering column.



1. Steering column
2. Steering shaft

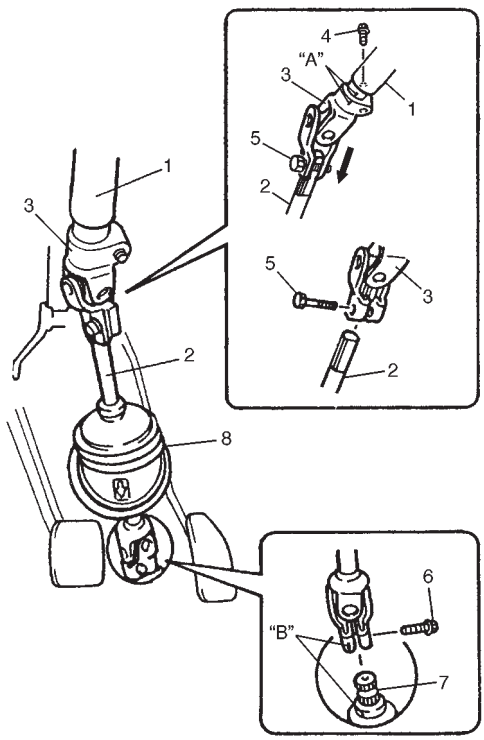
INSTALLATION

1) Position oblong hole of steering shaft in the center of hole in column.
2) Turn ignition key to “ACC” or “ON” position and install steering lock assembly onto column.
3) Now turn ignition key to “LOCK” position and pull it out.
4) Align hub on lock with oblong hole of steering shaft and rotate shaft to assure that steering shaft is locked.



5) Tighten new bolts until head of each bolt is broken off.
6) Turn ignition key to “ACC” or “ON” position and check to be sure that steering shaft rotates smoothly. Also check for lock operation.

7) Install steering column. Refer to INSTALLATION of STEERING COLUMN in this section.



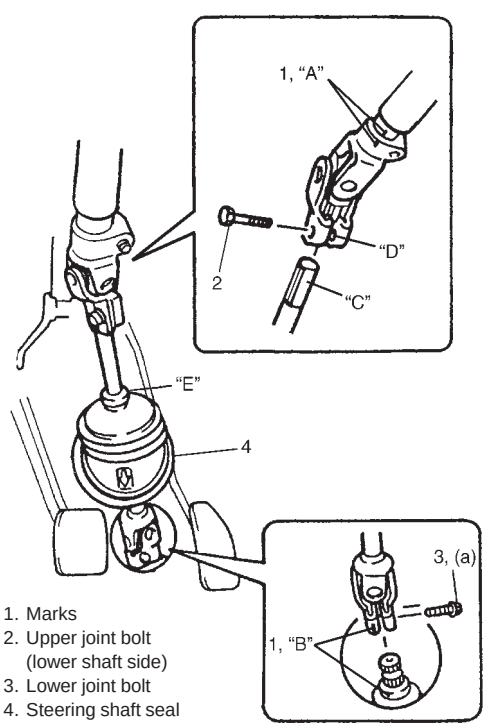
1. Steering column
2. Steering lower shaft
3. Upper joint assembly
4. Upper joint bolt (column side)
5. Upper joint bolt (lower shaft side)
6. Lower joint bolt
7. Steering pinion shaft
8. Steering shaft seal
9. Marks

STEERING LOWER SHAFT

CAUTION:
For vehicle with air bag system
Never turn steering wheel while steering shaft lower joint is removed.
Should it have been turned and contact coil (on combination switch) have got out of its centered position, it needs to be centered again. Also, turning steering wheel more than about two and a half turns will break contact coil.

REMOVAL

1) Turn steering wheel so that vehicle's front tires are at straight-ahead position.
2) Turn ignition switch to "LOCK" position and remove key.
3) Remove steering shaft seal from dash panel.
4) Make alignment marks on steering shaft and upper joint ("A") and steering lower shaft and pinion shaft ("B") for a guide during reinstallation.
5) Loosen upper joint bolt (lower shaft side) then remove upper joint bolt (column side).
6) Move upper joint assembly to lower shaft side (in arrow direction in the figure).
7) Remove lower joint bolt.
8) Remove steering lower shaft and upper joint assembly.



1. Marks
2. Upper joint bolt (lower shaft side)
3. Lower joint bolt
4. Steering shaft seal

INSTALLATION

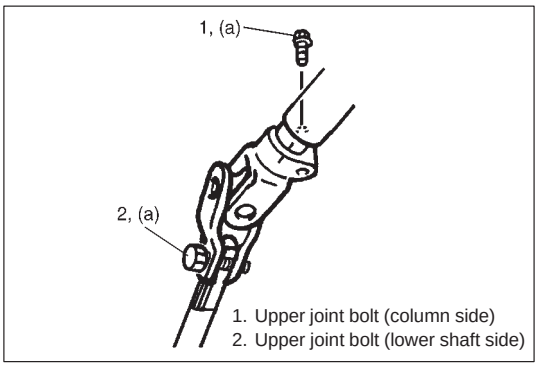
1) Be sure that front wheels and steering wheel are in straight forward state.
2) Align flat part "C" of steering lower shaft with bolt hole "D" of upper joint assembly as shown in the figure. Tighten upper joint bolt (lower shaft side) by hand.
3) Insert lower shaft to pinion shaft with matching marks ("B").
4) Tighten lower joint bolt (pinion side) to specified torque.

   Tightening Torque
   (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

5) Apply grease to "E" of steering shaft seal.

   Grease: SUZUKI SUPER GREASE A (99000–25010)

6) Install steering shaft seal to dash panel.
7) Insert upper joint assembly into steering shaft (column side) with matching marks ("A").



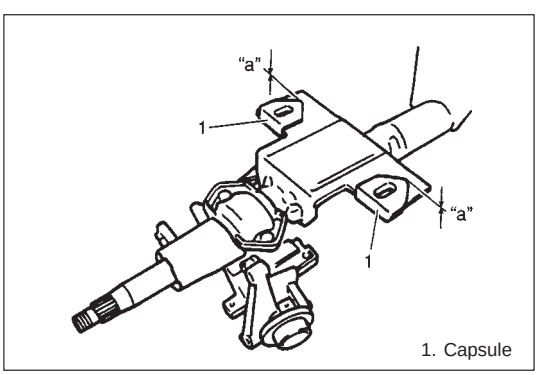
1. Upper joint bolt (column side)
2. Upper joint bolt (lower shaft side)

8) Tighten upper joint bolt (column side) to specified torque then tighten upper joint bolt (lower shaft side) to specified torque.

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

NOTE:
Vehicles involved in accidents resulting in body damage, where steering column has been impacted may have a damaged or misaligned steering column.



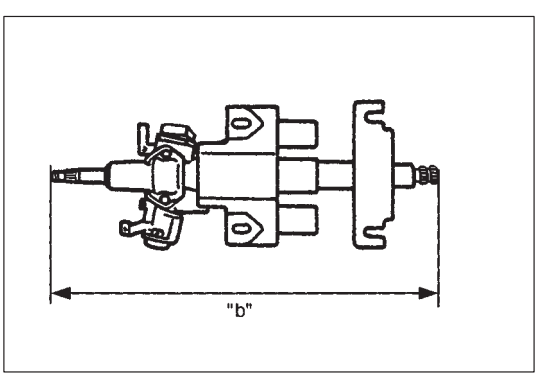
1. Capsule

CHECKING PROCEDURE

1) Check that two capsules are attached to steering column bracket securely. Check clearance between capsules and steering column bracket.

   Clearance "a": 0.0 mm (0.0 in.)

2) Check capsule for crack.
   If found defective, replace steering column assembly.



3) Take measurement "b" as shown.
   If it is shorter than specified length, replace column assembly.

   Length "b": 430.2 – 432.2 mm (16.94 – 17.02 in.)
   (for left-hand steering vehicle)
   409.5 – 411.5 mm (16.12 – 16.20 in.)
   (for right-hand steering vehicle)

4) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
   If anything is found faulty, replace as column assembly, upper joint assembly and/or lower shaft.
5) Check steering shaft for smooth rotation.
   If found defective, replace as column assembly.
6) Check steering shaft and column for bend, cracks or deformation.
   If found defective, replace as column assembly.

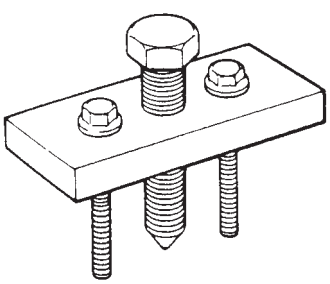
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Driver air bag (inflator) module (if equipped)	9	0.9	6.5
Steering shaft nut	33	3.3	24.0
Steering shaft joint bolt	25	2.5	18.0
Steering column mounting bolt	15	1.5	11.0
P/S control module (if equipped)	3	0.3	2.0

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Steering shaft seal
	SUZUKI GREASE CE–T (99000-25290)	Contact plate

SPECIAL TOOL



09944-36011
Steering wheel remover

SECTION 3D

FRONT SUSPENSION

NOTE:

- **All front 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 front suspension part. Replace it with a new part or damage to the part may result.**

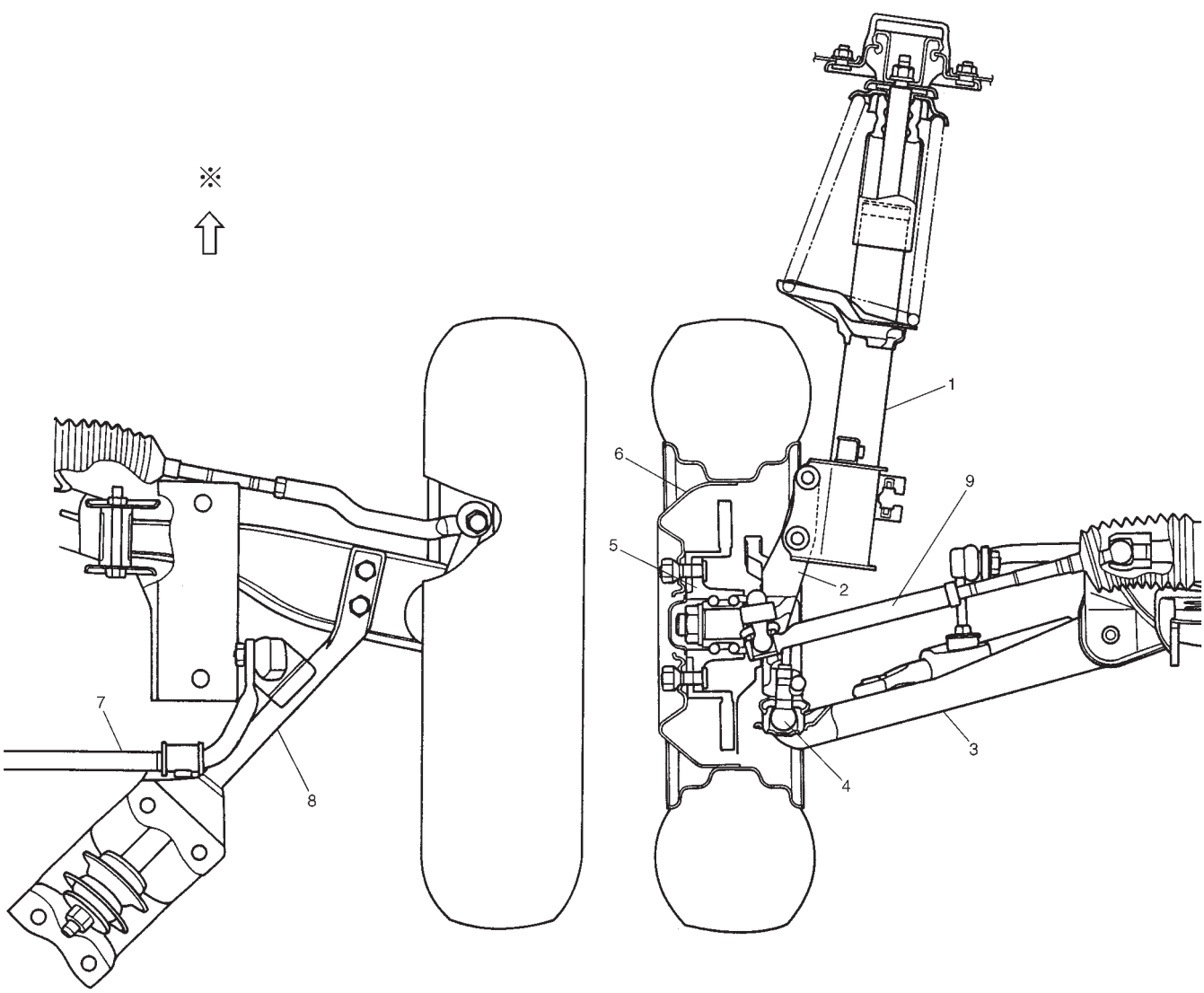
CONTENTS

GENERAL DESCRIPTION

The front suspension is the strut type independent suspension. The upper end of a strut is anchored to the vehicle body by a strut support. The strut and strut support are isolated by a strut rubber support. A strut bearing is also installed a little lower to the strut rubber support.

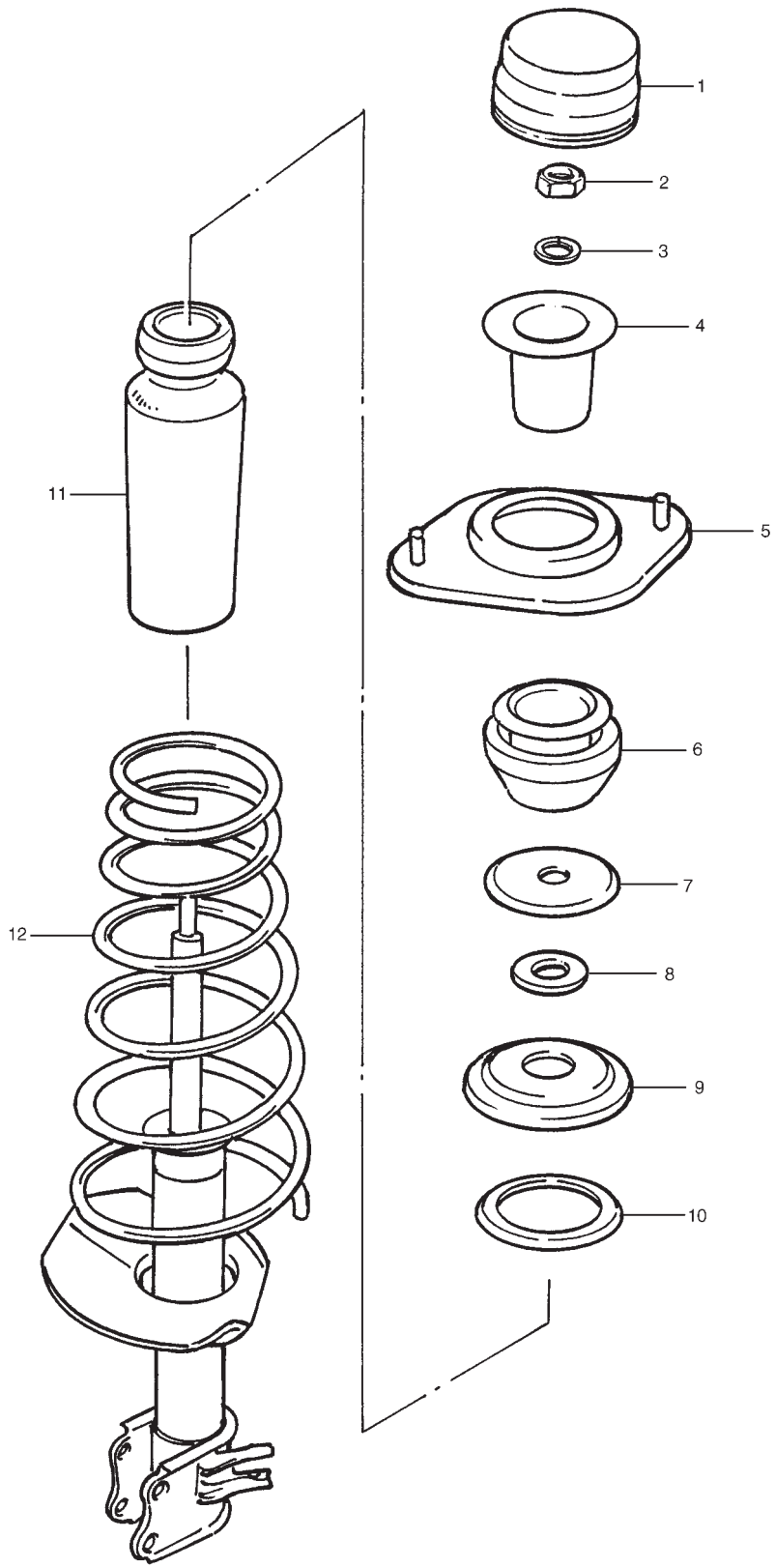
The lower end of the strut is connected to the upper end of a steering knuckle and lower end of knuckle is attached to the stud of a ball joint which is incorporated in a unit with a suspension control arm. And connected to this steering knuckle is the tie-rod end.

Thus, movement of the steering wheel is transmitted to the tie-rod end and then to the knuckle, eventually causing the wheel and tire to move. In this operation, with the movement of the knuckle, the strut also rotates by means of the strut bearing and lower ball joint.

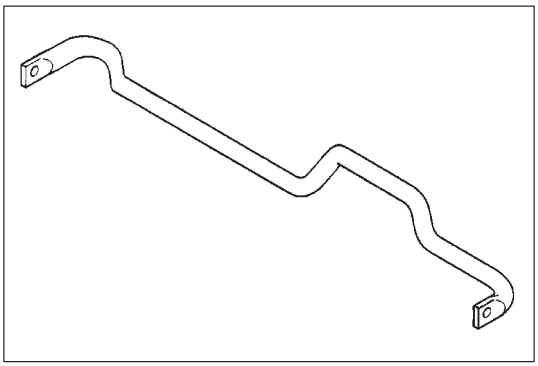


※ Forward
1. Strut assembly
2. Steering knuckle
3. Suspension control arm
4. Ball stud (lower joint)
5. Front wheel hub
6. Wheel
7. Stabilizer bar
8. Compression rod
9. Tie-rod end

STRUT ASSEMBLY



1. Strut support cap
2. Strut nut
3. Strut lock washer
4. Strut rebound stopper
5. Strut support
6. Strut rubber support
7. Strut bearing seat
8. Strut bearing
9. Spring upper seat
10. Spring seat
11. Bump stopper
12. Coil spring



DIAGNOSIS

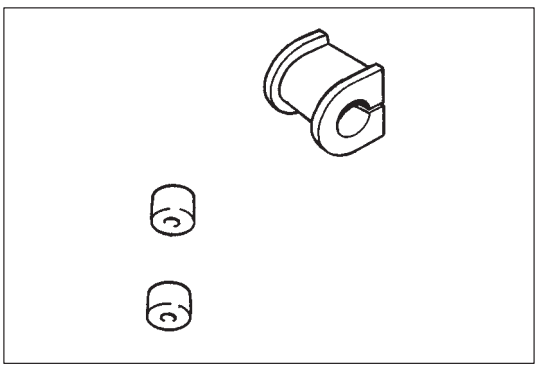
Refer to Section 3.

CHECK AND ADJUSTMENT

STABILIZER BAR AND/OR BUSHING CHECK

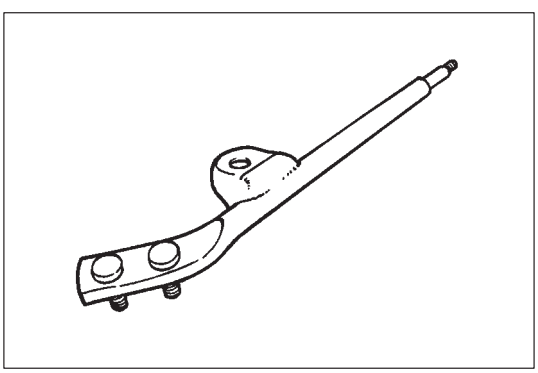
Bar

Inspect for damage or deformation. If defective, replace.



Bushing/Cushion

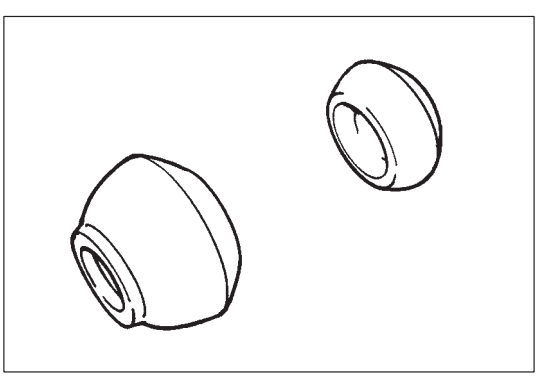
Inspect for damage, wear or deterioration. If defective, replace.



COMPRESSION ROD AND/OR BUSHING CHECK

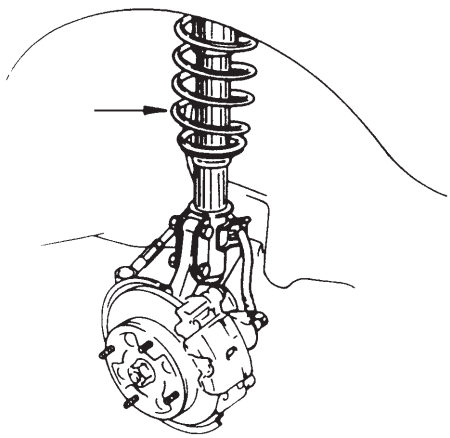
Rod

Inspect for damage or deformation. If defective, replace.



Bushing

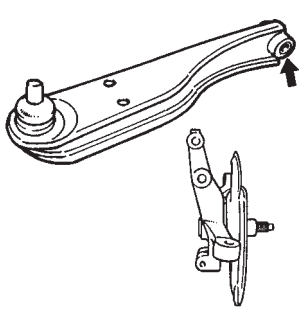
Inspect for damage, wear or deterioration. If defective, replace.



STRUT DAMPER CHECK

1) Inspect strut for oil leakage. If strut is found faulty, replace it as an assembly unit, because it can not be disassembled.
2) Strut function check
   Check and adjust tire pressures as specified on tire placard. Bounce vehicle body three or four times continuously by pushing front end on the side with strut to be checked. Apply the same amount of force at each push and note strut resistance both when pushed and rebounding.
   Also, note how many times vehicle body rebounds before coming to stop after hands are off. Do the same for strut on the other side.
   Compare strut resistance and number of rebound on the right with those on the left. And they must be equal in both. With proper strut, vehicle body should come to stop the moment hands are off or after only one or two small rebounds. If struts are suspected, compare them with known good vehicle or strut.
3) Inspect for damage or deformation.
4) Inspect bearing for wear, abnormal noise or gripping.
5) Inspect for cracks or deformation in the spring seat.
6) Inspect for deterioration of the bump stopper.
7) Inspect rebound stopper and strut mount for wear, cracks or deformation.

Replace any parts, if found defective in steps 2) – 7).

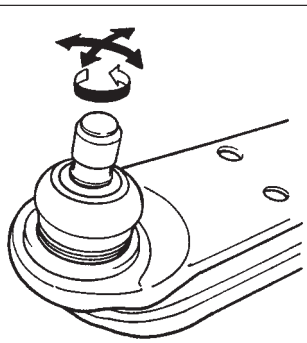


SUSPENSION CONTROL ARM/KNUCKLE CHECK

Inspect for cracks, deformation or damage.

SUSPENSION CONTROL ARM BUSHING CHECK

Inspect for damage, wear or deterioration.

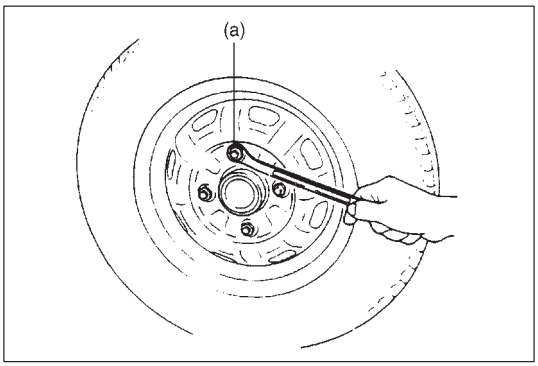


SUSPENSION CONTROL ARM JOINT CHECK

1) Check for smooth rotation.
2) Inspect ball stud for damage.
3) Inspect ball stud boot for tear.
4) Inspect for play in ball joint. If found defective, replace.

NOTE:
Suspension arm and arm joint cannot be separated.

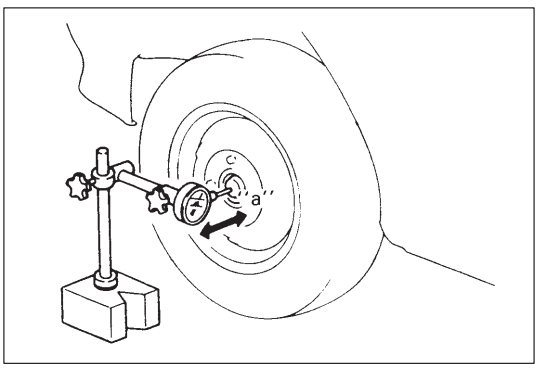
If there is any damage to either, control arm assembly must be replaced as a complete unit.



WHEEL DISC, NUT & BEARING CHECK

1) Inspect each wheel disc for dents, distortion and cracks. A disc in badly damaged condition must be replaced.
2) Check wheel nuts for tightness and, as necessary retighten them to specification.

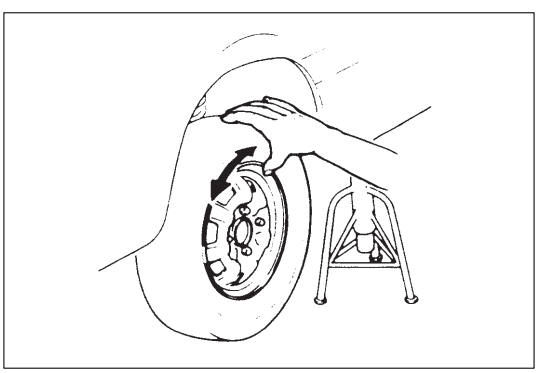
Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



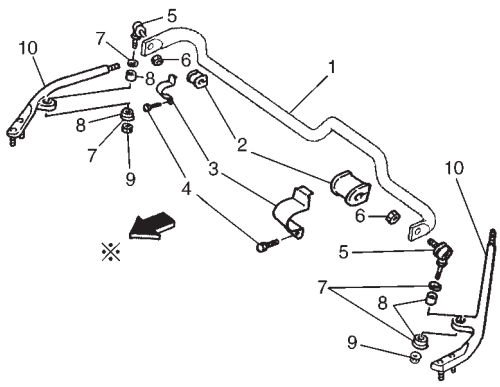
3) Check wheel bearing for wear. When measuring thrust play, apply a dial gauge to wheel hub center after removing wheel center cap from wheel disc.

Thrust play limit "a": 0.1 mm (0.004 in.)

When measurement exceeds the limit, replace wheel hub assembly.



4) By rotating wheel actually, check wheel bearing for noise and smooth rotation. If defective, replace wheel hub assembly.



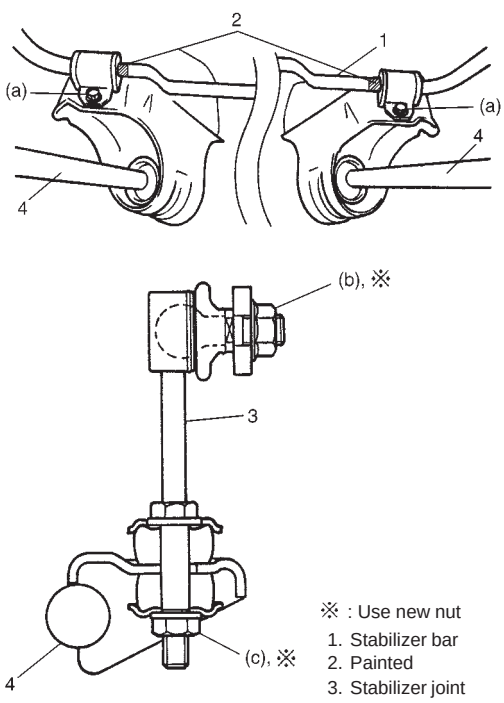
※ : Forward
1. Stabilizer bar
2. Mount bushing
3. Mount bracket
4. Mount bracket bolt
5. Stabilizer joint
6. Stabilizer joint nut
7. Washer
8. Cushion
9. Stabilizer link nut
10. Compression rod

ON-VEHICLE SERVICE

STABILIZER BAR AND/OR BUSHINGS

REMOVAL

1) Hoist vehicle and allow the front suspension control arms to hang free.
2) Remove stabilizer link nuts, washers and cushions.
   When loosening link nut, hold stud with a wrench.
3) Remove stabilizer bar mount bushing bracket bolts.
4) Remove stabilizer bar and its joints.
5) Remove stabilizer joints from stabilizer bar.
   When loosening joint nut, hold stud with a wrench.



※ : Use new nut
1. Stabilizer bar
2. Painted
3. Stabilizer joint
4. Compression rod

INSTALLATION

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

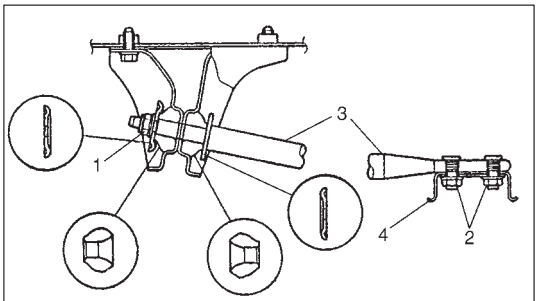
- When installing stabilizer, loosely assemble all components while insuring that stabilizer is centered, side-to-side.

NOTE:
For correct installation of stabilizer bar, side-to-side, be sure that color paint on stabilizer bar aligns with mount bushing, both right and left, as shown in figure.

- Tighten bolts and nuts to specified torque.

CAUTION:
- **When tightening stabilizer link nut, use care so that cushion is fitted to washer.**
- **Removed stabilizer nuts must be replaced with new ones.**

Tightening Torque
(a): 25 N·m (2.5 kg-m, 18.0 lb-ft)
(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)
(c): 23 N·m (2.3 kg-m, 17.0 lb-ft)

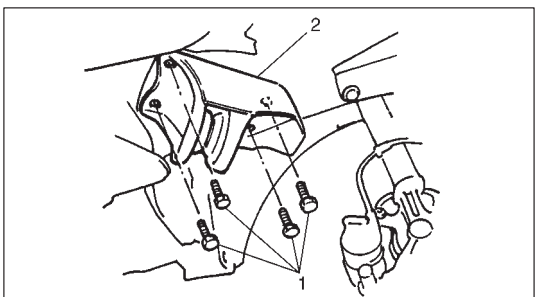


1. Compression rod lock nut
2. Compression rod stud nuts
3. Compression rod
4. Suspension arm

COMPRESSION ROD AND/OR BUSHINGS

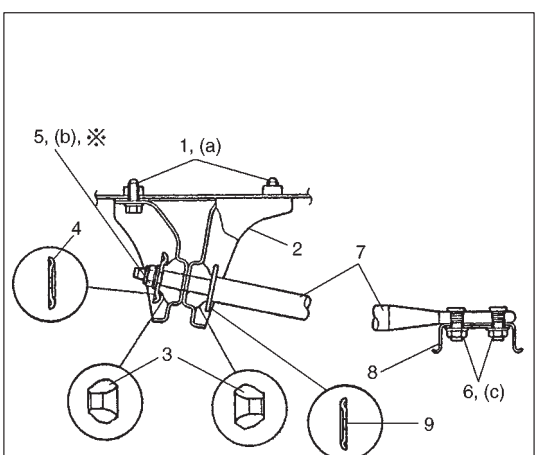
REMOVAL

1) Hoist vehicle, allow front suspension to hang free.
2) Remove stabilizer bar, refer to steps 2) to 4) of STABILIZER BAR AND/OR BUSHINGS REMOVAL.
3) Remove compression rod nuts.
4) Remove compression rod.



1. Compression rod bracket bolts
2. Compression rod bracket

5) Remove compression rod bracket from vehicle body.



※ : Use new nut

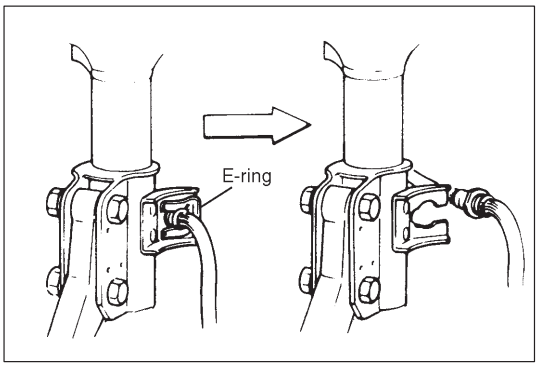
1. Compression rod bracket bolts
2. Compression rod bracket
3. Compression rod bushings
4. Compression rod washer
5. Compression rod lock nut
6. Compression rod stud nuts
7. Compression rod
8. Suspension control arm
9. Compression rod front washer

INSTALLATION

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

- For correct installation of compression rod bushings and compression rod washers, refer to the left figure.
- Use new compression rod lock nuts.
- Tighten each bolts and nuts to specified torque.

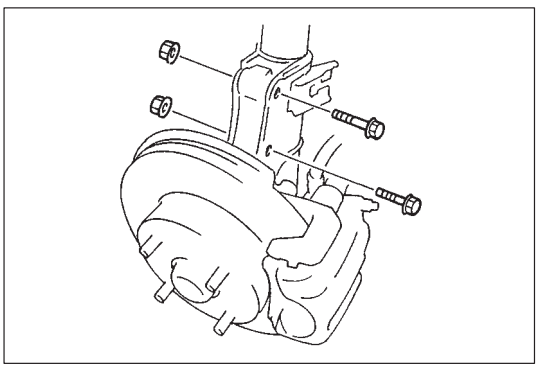
Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
(b): 65 N·m (6.5 kg-m, 47.0 lb-ft)
(c): 95 N·m (9.5 kg-m, 69.0 lb-ft)



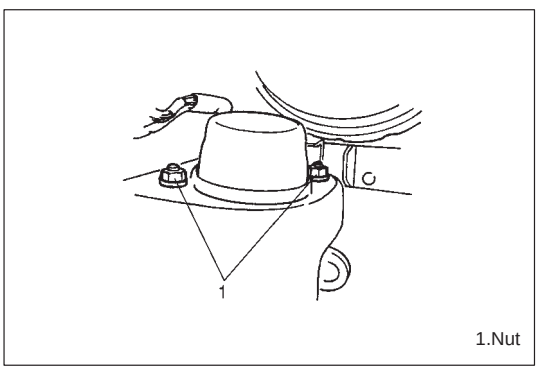
STRUT DAMPER ASSEMBLY

REMOVAL

1) Disconnect negative cable at battery.
2) Hoist vehicle, allowing front suspension to hang free.
3) Remove wheel.
4) Remove E-ring securing brake flexible hose and take brake flexible hose off strut bracket as shown.

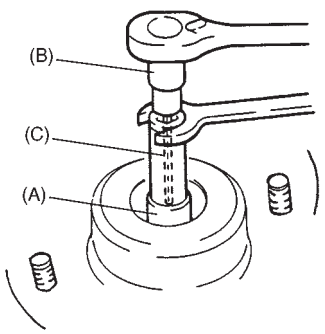


5) Remove wheel speed sensor harness clamp bolt from strut (if equipped with ABS).
6) Remove strut bracket bolts.



1.Nut

7) Remove strut support nuts.
   Hold strut by hand so that it will not fall off.
8) Remove strut assembly.

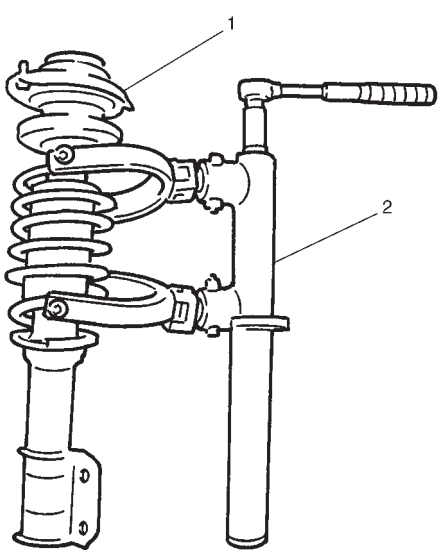


DISASSEMBLY

1) Remove strut support cap and loosen strut nut a little by using special tools.

Special Tool
(A): 09945-26010 (17 mm socket)
(B): 09900-00411 (Socket)
(C): 09900-00414 (6 mm)

NOTE:
When disassembling strut assembly, loosen strut nut a little before compressing strut spring. This will make disassembly easier. Note, however, nut must not be removed at this point.



1. Strut damper assembly
2. Spring compressor

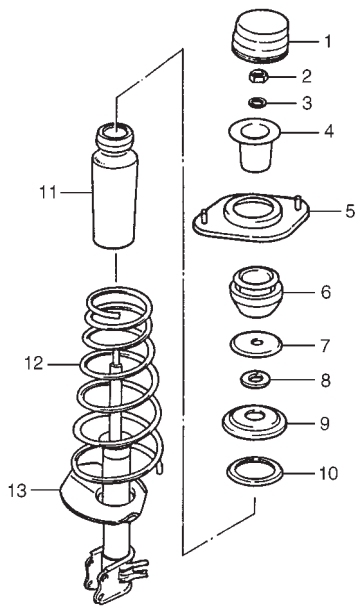
2) Using a spring compressor, compress strut spring till its force pressing the spring seat is released.

CAUTION:
Use a commercially available spring compressor and follow the operation procedure described in the Instruction Manual supplied with the spring compressor.

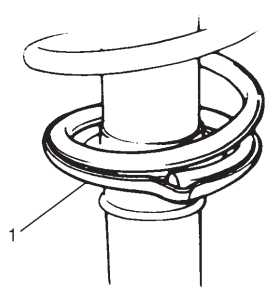
3) While keeping spring compressed with spring compressor, remove strut nut and then disassemble parts.

ASSEMBLY

For assembly, reverse disassembly procedure, observing the following instruction.

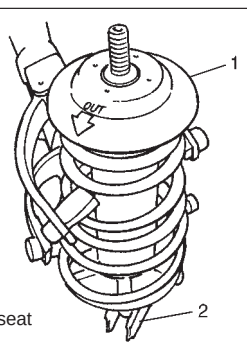


1. Strut support cap
2. Strut nut
3. Strut lock washer
4. Strut rebound stopper
5. Strut support
6. Strut rubber support
7. Strut bearing seat
8. Strut bearing
9. Spring upper seat
10. Spring seat
11. Bump stopper
12. Coil spring
13. Strut assembly



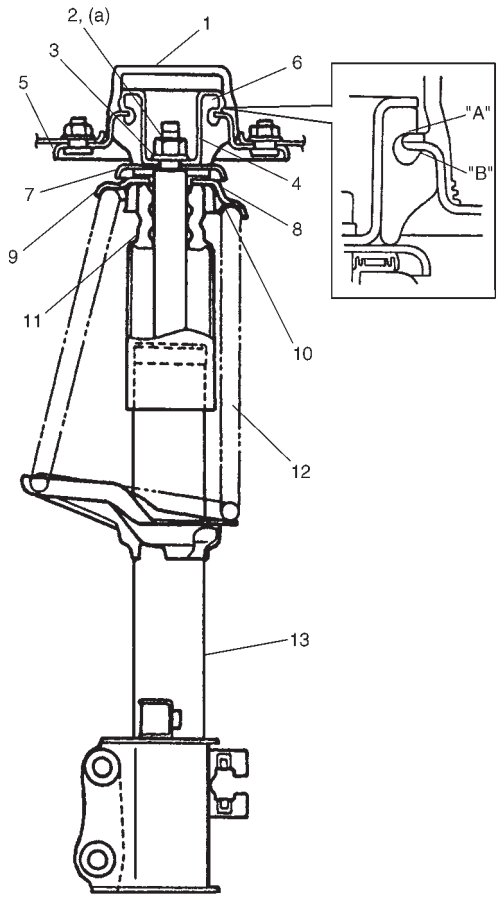
1. Strut lower seat

- Mate spring end with stepped part of lower seat as shown.



1. Spring upper seat
2. Spring seat

- With “OUT” mark on spring upper seat and the center of strut bracket aligned, place spring upper seat together with spring (rubber) seat on coil spring.



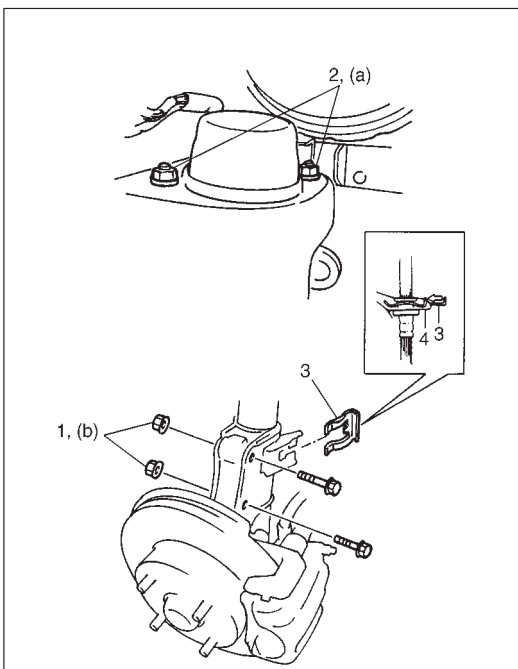
1. Strut support cap
2. Strut nut
3. Strut lock washer
4. Strut rebound stopper
5. Strut support
6. Strut rubber support
7. Strut bearing seat
8. Strut bearing
9. Spring upper seat
10. Spring seat
11. Bump stopper
12. Coil spring
13. Strut assembly

- Install bump stopper onto strut rod. Refer to the left figure for installing direction.
- Clean strut bearing and install it on spring upper seat. Refer to figure at left for installing direction.
- Wash bearing seat and install it as shown.
- On bearing seat, install rebound stopper, strut support and rubber support in this sequence. Refer to the figure for installing directions. Tighten strut nut to specified torque and then apply water-proof coating (paint or lacquer) all around nut and strut rod screw part.

NOTE:
As shown at the left, have sections "A" and "B" of strut support rubber caught by strut support securely.

Tightening Torque
(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

- Recheck that stepped part of spring seat and spring end are in place to each other as described.



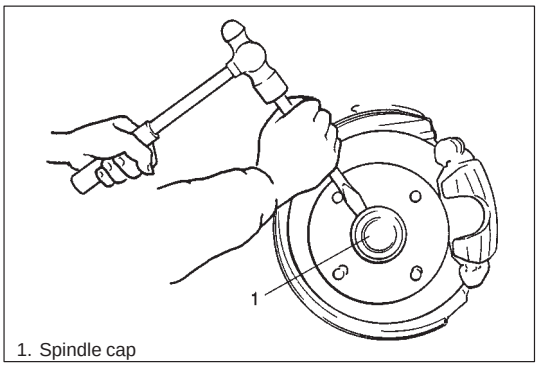
1. Strut bracket nut
2. Strut support nut
3. E-ring
4. Bracket end surface

INSTALLATION

1) Install strut by reversing REMOVAL Steps 1) – 8). Insert bolts in such a direction as shown.
2) Torque all fasteners to specification.

Tightening Torque
(a): 73 N·m (7.3 kg-m, 53.0 lb-ft)
(b): 95 N·m (9.5 kg-m, 69.0 lb-ft)

NOTE:
Don't twist brake hose when installing it.
Install E-ring as far as it fits to bracket as shown.

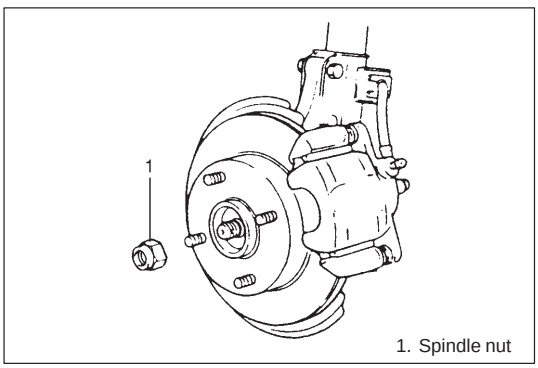


1. Spindle cap

WHEEL HUB/WHEEL STUD

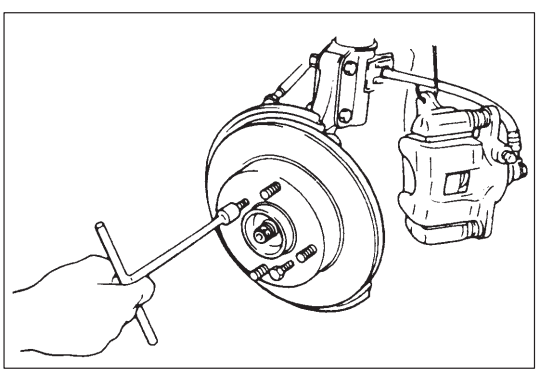
REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove spindle cap as shown (by hammering lightly at 3 locations around it using care not to deform or cause damage to seating part of cap).



1. Spindle nut

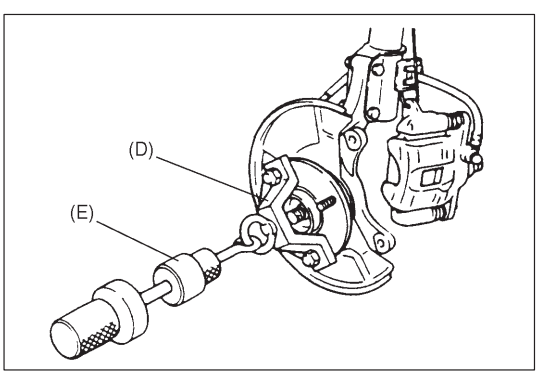
3) Uncalk spindle nut.
4) Remove spindle nut.



5) Remove caliper carrier bolts.
6) Remove caliper with carrier.

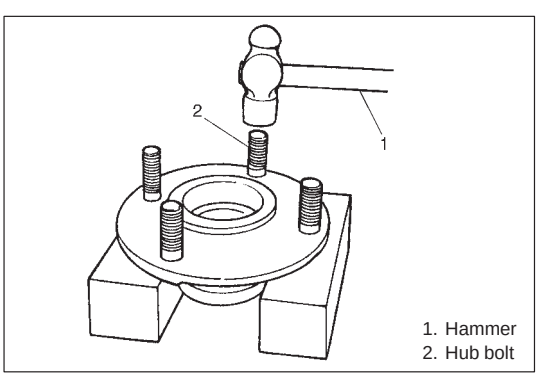
NOTE:
Hang removed caliper with a wire hook of the like so as to prevent brake hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

7) Pull brake disc off by using two 8 mm bolts.



8) Pull out wheel hub with special tools.

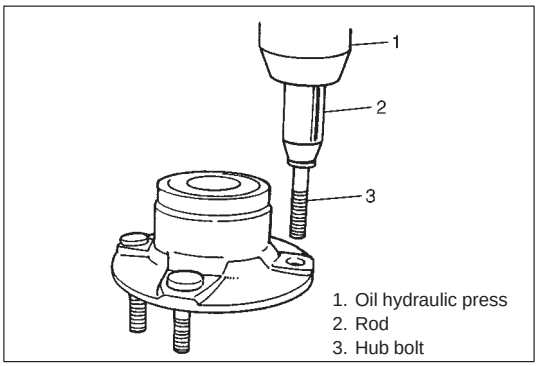
Special Tool
(D): 09943-17912
(E): 09942-15510



1. Hammer
2. Hub bolt

9) Remove hub bolts.

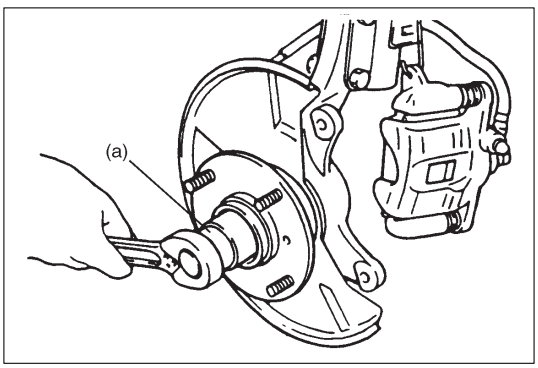
CAUTION:
Never remove bolt unless replacement is necessary.
Be sure to use a new bolt for replacement.



1. Oil hydraulic press
2. Rod
3. Hub bolt

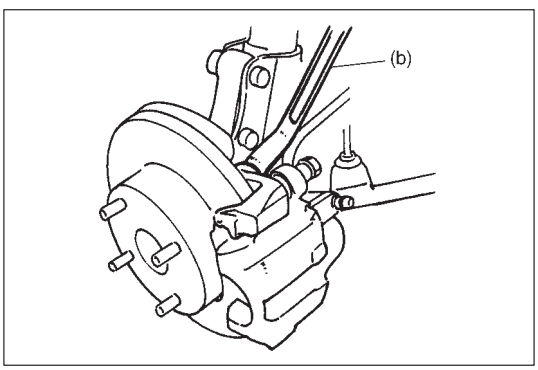
INSTALLATION

1) Insert new stud in hub hole. Rotate stud slowly to assure serrations are aligned with those made by original bolt.



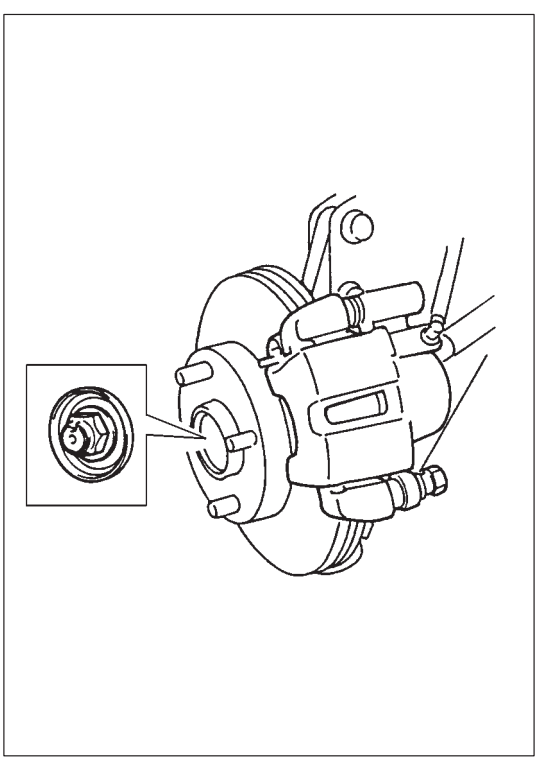
2) Install wheel hub to spindle, tighten new spindle nut to specified torque.

Tightening Torque
(a): 175 N·m (17.5 kg-m, 126.5 lb-ft)



3) Install brake disc.
4) Install brake caliper/caliper carrier.
Tighten caliper carrier bolts to specified torque.

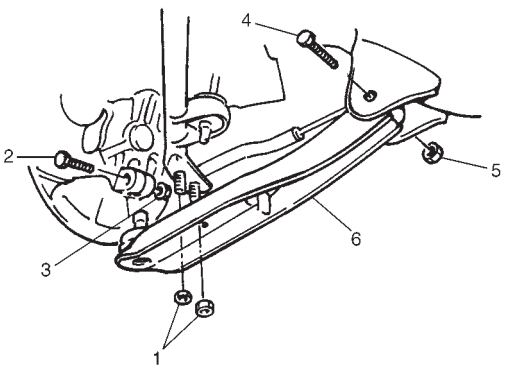
Tightening Torque
(b): 95 N·m (9.5 kg-m, 69.0 lb-ft)



5) Calk spindle nut as shown.

WARNING:
Be careful while calking nut so that no crack will occur in calked part of nut. Cracked nut must be replaced with new one.

6) Install spindle cap to wheel hub.
7) Install wheel and lower hoist.

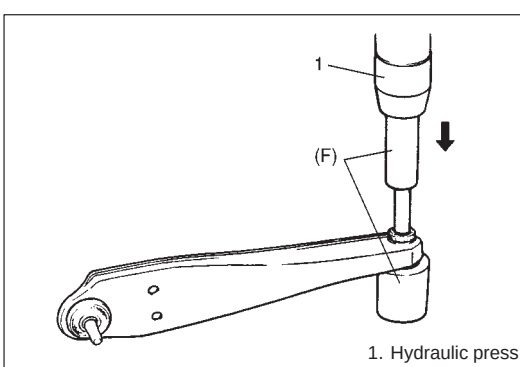


1. Compression rod stud nuts
2. Ball stud bolt
3. Ball stud lock nut
4. Control arm bolt
5. Control arm nut
6. Suspension control arm

SUSPENSION CONTROL ARM/BUSHING

REMOVAL

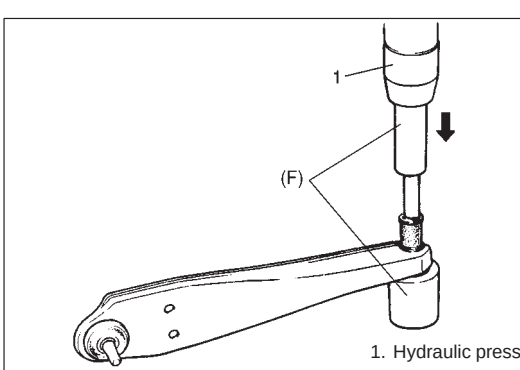
1) Hoist vehicle and remove wheel.
2) Remove compression rod stud nuts from suspension control arm.
3) Remove ball stud bolt and nut.
4) Remove suspension control arm bolt and nut.
5) Remove suspension control arm.



1. Hydraulic press

6) Remove bushing.
   Pull out bushing with special tool and hydraulic press as shown.

   Special Tool
   (F): 09943-77910



1. Hydraulic press

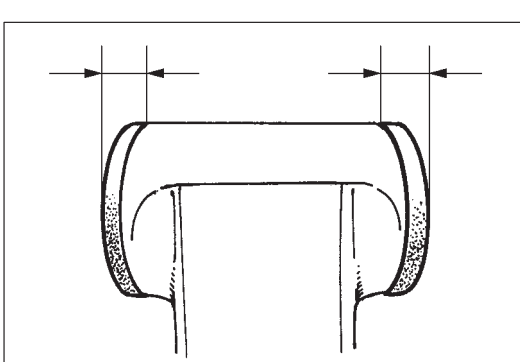
INSTALLATION

1) Install bushing.

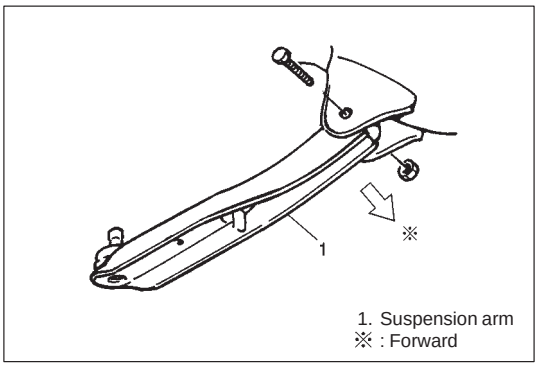
   Special Tool
   (F): 09943-77910

   NOTE:

   - **Before installing bushing, apply soap water on its circumference to facilitate installation.**



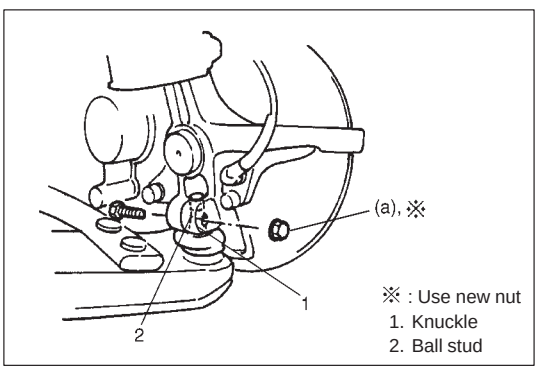
- **When installed, bush should be equal on the right and left of arm as shown.**



1. Suspension arm
※ : Forward

2) Install suspension control arm to suspension frame, referring to left figure for proper installing direction of bolt and nut.

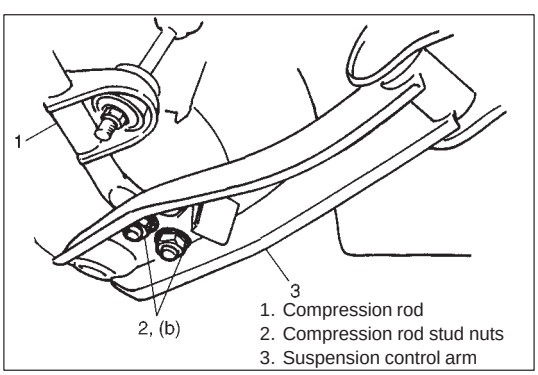
NOTE:
Nut should not be tightened.



※ : Use new nut
1. Knuckle
2. Ball stud

3) Install ball stud to knuckle. Align ball stud groove with knuckle bolt hole as shown.
Then drive in ball stud bolt from the direction as shown.
Tighten new ball stud nut to specified torque.

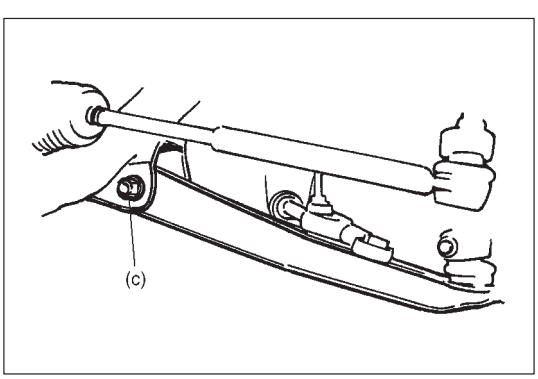
Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



1. Compression rod
2. Compression rod stud nuts
3. Suspension control arm

4) Tighten compression rod stud nuts to specified torque.

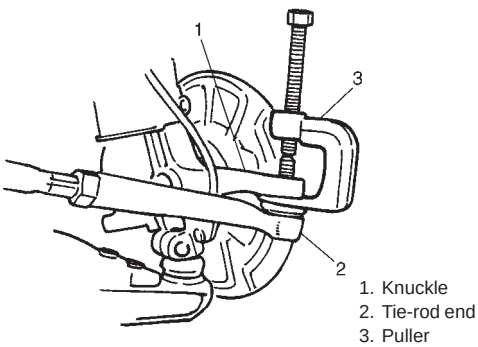
Tightening Torque
(b): 95 N·m (9.5 kg-m, 69.0 lb-ft)



5) Install wheel and tighten wheel nuts to specified torque, refer to TIGHTENING TORQUE SPECIFICATIONS of this section.
6) Lower hoist and with in non-loaded condition, tighten suspension control arm nut to specified torque.

Tightening Torque
(c): 68 N·m (6.8 kg-m, 49.5 lb-ft)

7) Check toe setting, adjust as required.

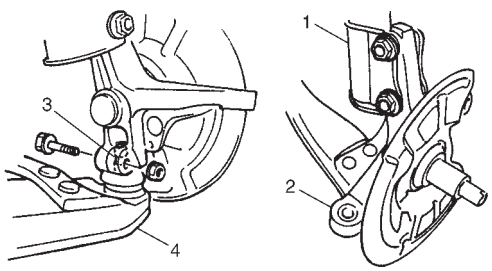


1. Knuckle
2. Tie-rod end
3. Puller

KNUCKLE

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove wheel hub. Refer to Steps 2) – 8) in WHEEL HUB/WHEEL STUD REMOVAL of this section.
3) Disconnect tie-rod end from knuckle with puller.
4) Remove wheel speed sensor from knuckle (if equipped with ABS).



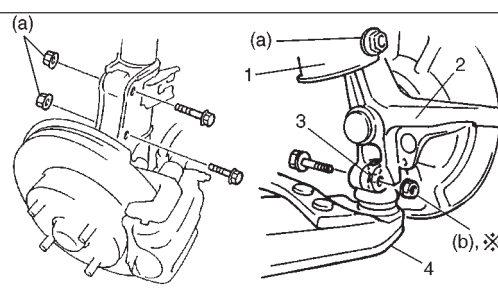
1. Strut
2. Knuckle
3. Ball stud
4. Suspension control arm

5) Remove ball stud bolt from knuckle and then strut bracket bolts from strut bracket.
6) Remove knuckle.

INSTALLATION

1) Install knuckle to ball stud on suspension arm and strut bracket. Installing direction of each bolt is as shown. Align knuckle bolt hole with ball stud groove as shown and install ball stud bolt. Tighten each bolt and nuts to specified torque. Use new ball stud nut.

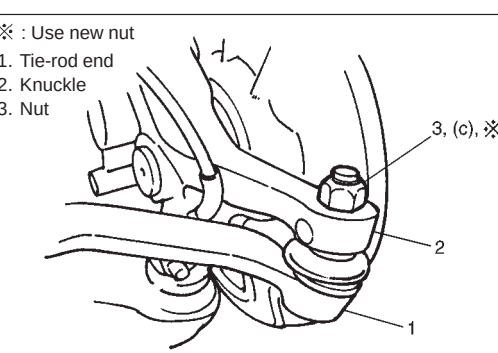
   Tightening Torque
   (a): 95 N·m (9.5 kg-m, 69.0 lb-ft)
   (b): 55 N·m (5.5 kg-m, 40.0 lb-ft)



※ : Use new nut
1. Strut
2. Knuckle
3. Ball stud
4. Suspension control arm

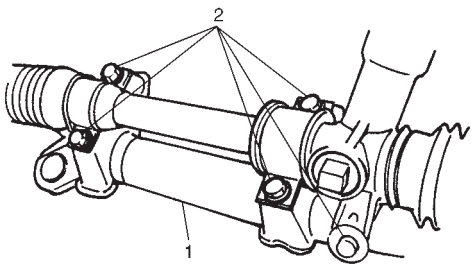
2) Install wheel speed sensor (if equipped with ABS).
3) Connect tie-rod end to knuckle and tighten new tie-rod end nut to specified torque.

   Tightening Torque
   (c): 43 N·m (4.3 kg-m, 31.5 lb-ft)



CAUTION:
Removed tie-rod end nut must be replaced with new one.

4) For installation procedures hereafter, refer to Steps 1) – 7) in WHEEL HUB/WHEEL STUD INSTALLATION on this section.

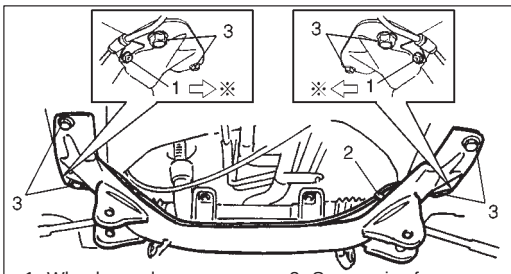


1. Suspension frame
2. Steering gear case mount bolts

SUSPENSION FRAME

REMOVAL

1) Hoist vehicle and remove wheels.
2) Remove suspension control arms (right & left), refer to steps 2) to 5) of SUSPENSION CONTROL ARM REMOVAL in this section.
3) Remove steering gear case mount bolts.



1. Wheel speed sensor harness clamp bolt
2. Wheel speed sensor harness clamp
3. Suspension frame bolts

*: Wheel side

4) Remove wheel speed sensor harness clamp bolts and clamps from suspension frame (if equipped with ABS).
5) Remove suspension frame bolts and suspension frame.

INSTALLATION

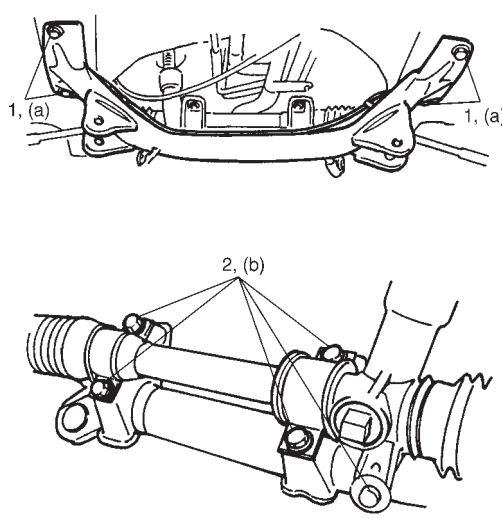
1) Install suspension frame and tighten suspension frame bolts to specified torque.

   Tightening Torque
   (a): 95 N·m (9.5 kg-m, 69.0 lb-ft)

2) Install wheel speed sensor harness clamp bolts and clamps to suspension frame (if equipped with ABS).
3) Install steering gear case mount bolts and tighten bolts to specified torque.

   Tightening Torque
   (b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

4) Install suspension control arms (right & left), refer to steps 2) to to 6) of SUSPENSION CONTROL ARM INSTALLATION in this section.
5) Confirm front end (wheel) alignment, refer to Section 3A.



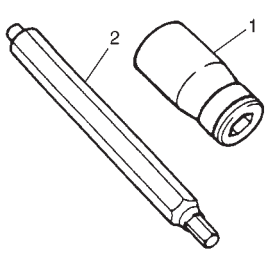
1. Suspension frame bolts
2. Steering gear case bolts

TIGHTENING TORQUE SPECIFICATIONS

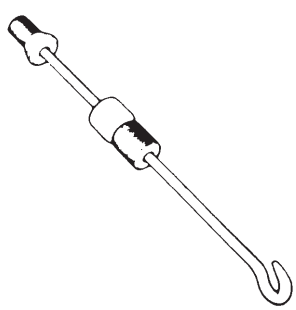
Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Compression rod bracket bolt	55	5.5	40.0
Compression rod stud nut	95	9.5	69.0
Compression rod lock nut*	65	6.5	47.0
Strut bracket nut	95	9.5	69.0
Strut nut	50	5.0	36.5
Strut support nut	73	7.3	53.0
Ball stud lock nut*	55	5.5	40.0
Suspension control arm nut	68	6.8	49.5
Stabilizer bar mount bracket bolt	25	2.5	18.0
Stabilizer link nut*	23	2.3	17.0
Stabilizer joint nut*	50	5.0	36.5
Spindle nut	175	17.5	126.5
Brake caliper carrier bolt	95	9.5	69.0
Tie-rod end nut*	43	4.3	31.5
Wheel nut	85	8.5	61.5
Suspension frame bolt	95	9.5	69.0
Steering gear case bolt	25	2.5	18.0

* : Use new nut when installing the nut.

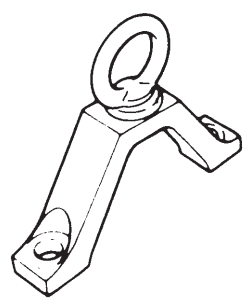
SPECIAL TOOLS



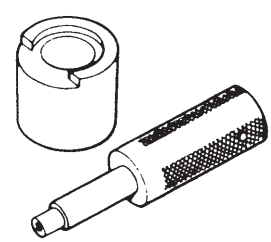
1. 09900-00411
   Hexagon wrench socket
2. 09900-00414
   Hexagon wrench bit 6 mm



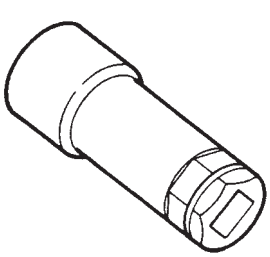
09942-15511
Sliding hammer



09943-17912
Front wheel hub remover
(Brake drum remover)



09943-77910
Front suspension lower
arm bush remover



09945-26010
Socket wrench 17 mm

SECTION 3E

REAR SUSPENSION

NOTE:

- **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.**

CONTENTS

GENERAL DESCRIPTION

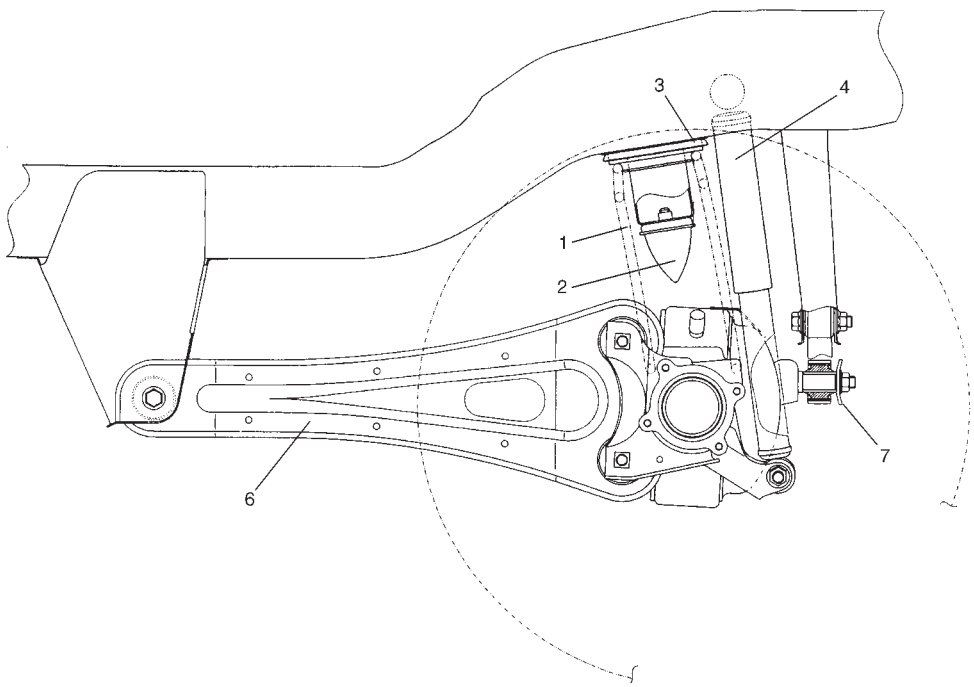
COIL SPRING TYPE

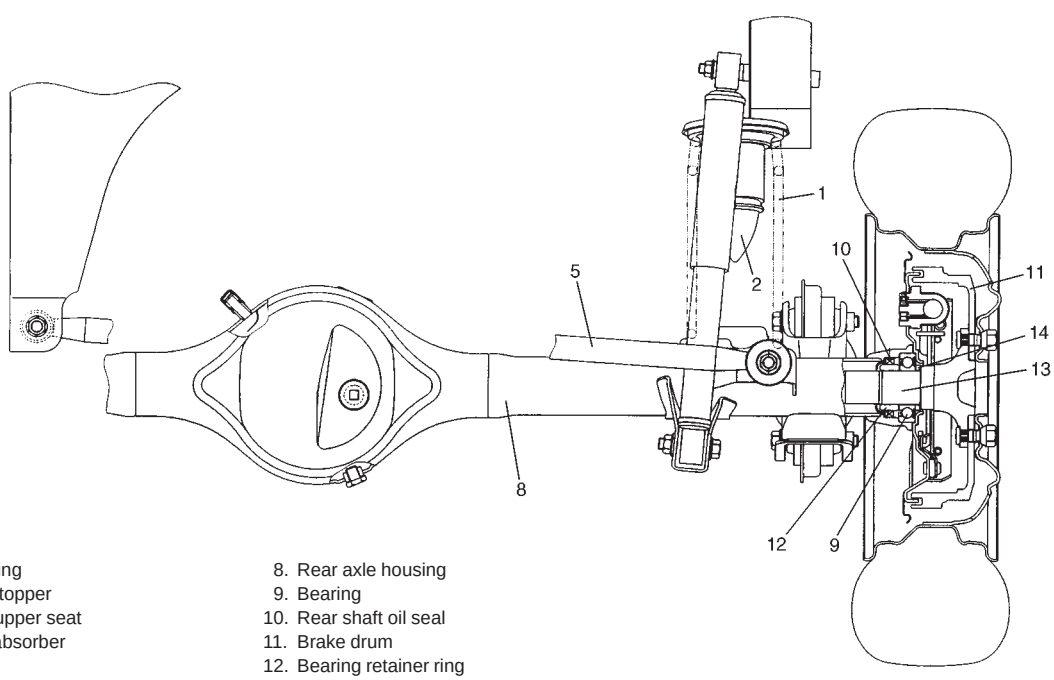
This suspension consists of coil springs, rear axle, shock absorbers, lateral rod and trailing arms.

The lateral rod is installed to the body and axle by using bushes so as to prevent axle movement in the lateral direction.

The trailing arms which are connected with the axle are installed to the body by using a bush so that axle moves up and down with the bush as its supporting point.

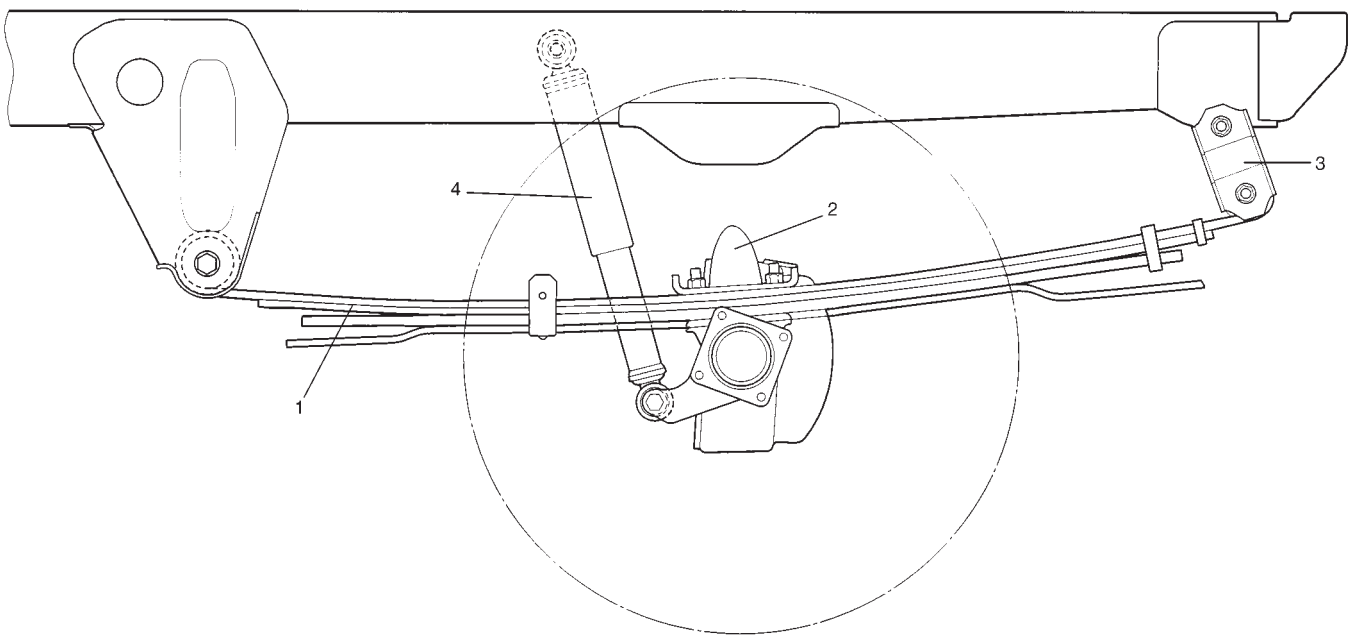
The shock absorber is installed between the body and axle to absorb up-and-down movement of the vehicle body.



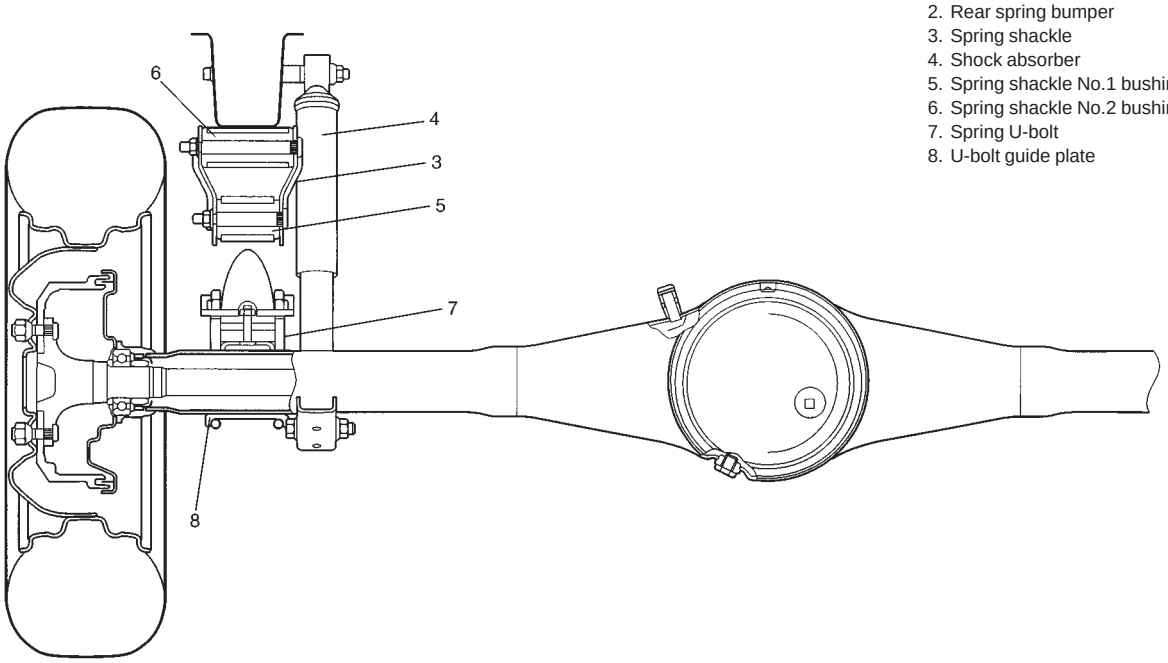


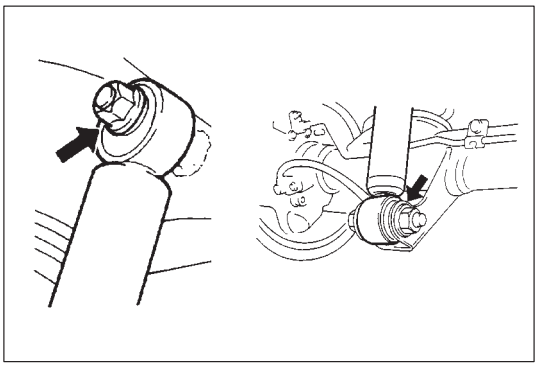
1. Rear coil spring
2. Rear bump stopper
3. Rear spring upper seat
4. Rear shock absorber
5. Lateral rod
6. Trailing arm
7. Lateral rod outer washer
8. Rear axle housing
9. Bearing
10. Rear shaft oil seal
11. Brake drum
12. Bearing retainer ring
13. Rear axle shaft
14. Wheel bearing spacer

LEAF SPRING TYPE



1. Rear spring assy
2. Rear spring bumper
3. Spring shackle
4. Shock absorber
5. Spring shackle No.1 bushing
6. Spring shackle No.2 bushing
7. Spring U-bolt
8. U-bolt guide plate





DIAGNOSIS

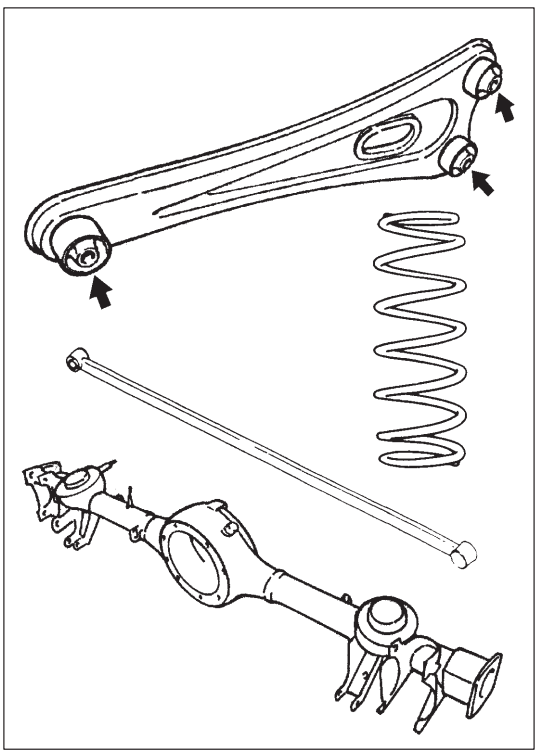
Refer to Section 3.

CHECK AND ADJUSTMENT

REAR SHOCK ABSORBER CHECK

- Inspect for deformation or damage.
- Inspect bushings for wear or damage.
- Inspect for evidence of oil leakage.

Replace any defective part.

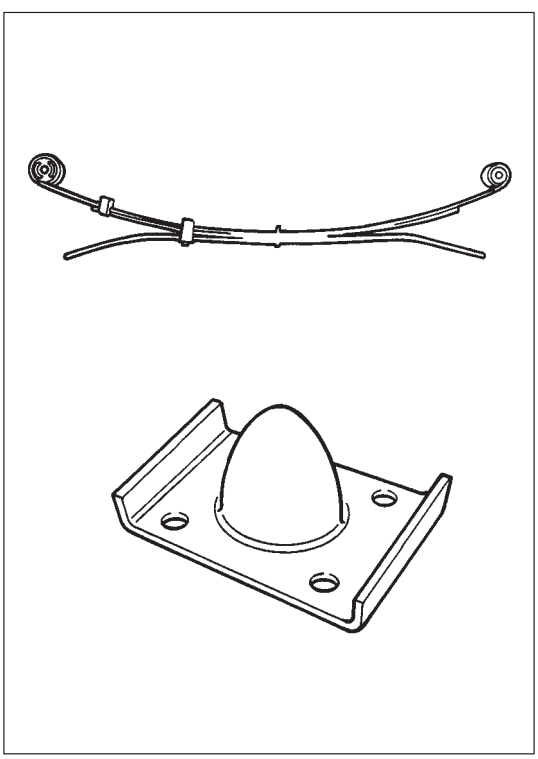


TRAILING ARM, LATERAL ROD, REAR AXLE AND COIL SPRING CHECK

- Inspect for cracks, deformation or damage.
- Inspect bushing for damage, wear or breakage.

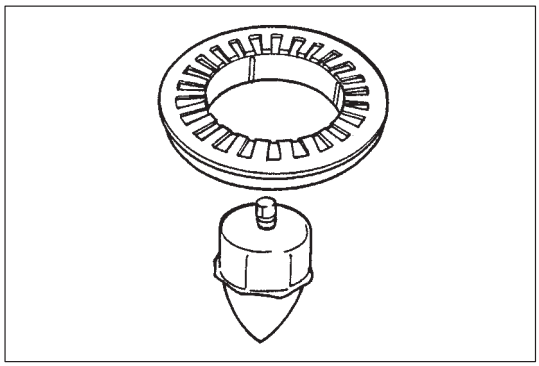
Replace any defective part.

NOTE:
Bushing can not be replaced. Replace lateral rod or trailing arm assembly.



LEAF SPRING AND SPRING BUMPER CHECK

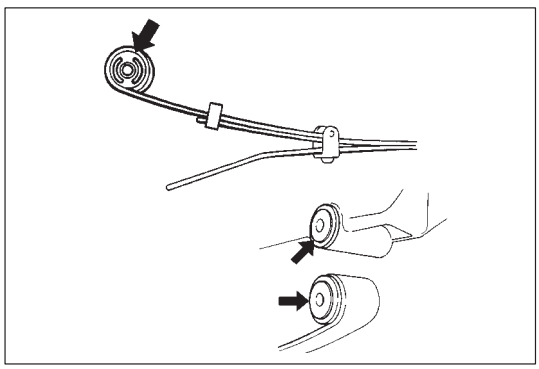
- Inspect leaf spring for crack and damage.
- Inspect leaf spring bushing for damage, wear or breakage.
- Inspect if spring bumper is seated properly.
  Replace any defective part.



BUMP STOPPER/SPRING UPPER SEAT CHECK

Inspect for cracks, deformation or damage.

Replace any defective part.

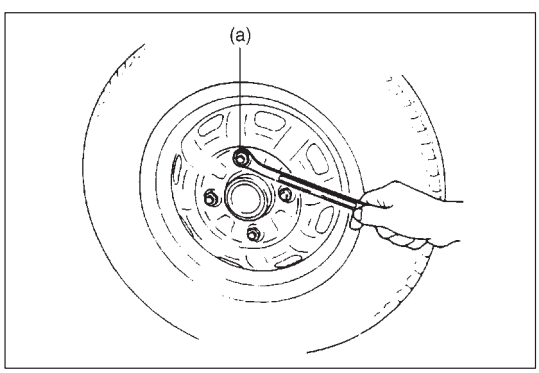


LEAF SPRING BUSHING AND SPRING SHACKLE BUSHING CHECK

- Inspect for wear and breakage.
  Replace if defective.
- When spring shackle bushings are not worn and yet abnormal sound is noted while driving, remove bushings and apply grease.

REAR SUSPENSION FASTENER CHECK

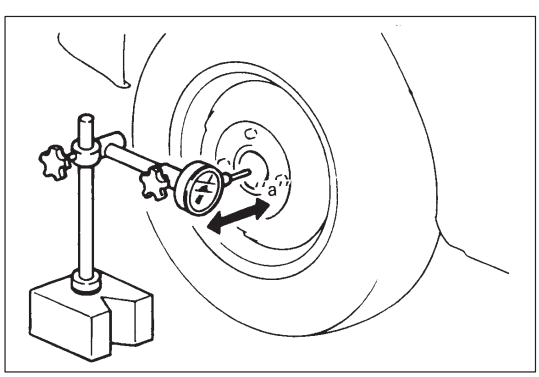
Check each bolt and nut fastening suspension parts for tightness. Tighten loose one, if any, to specified torque by referring to TIGHTENING TORQUE SPECIFICATIONS of this section.



WHEEL DISC, NUT & BEARING CHECK

- Inspect each wheel disc for dents, distortion and cracks.
  A disc in badly damaged condition must be replaced.
- Check wheel nuts for tightness and, as necessary, retighten to specification.

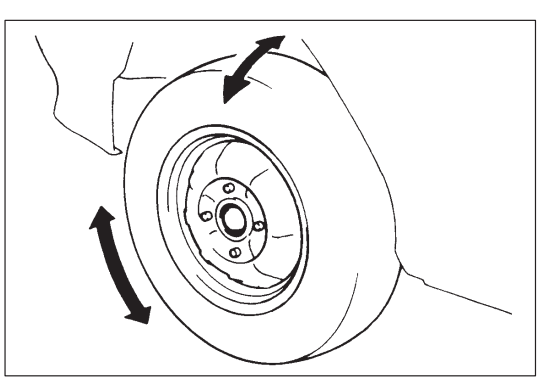
  Tightening Torque
  (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



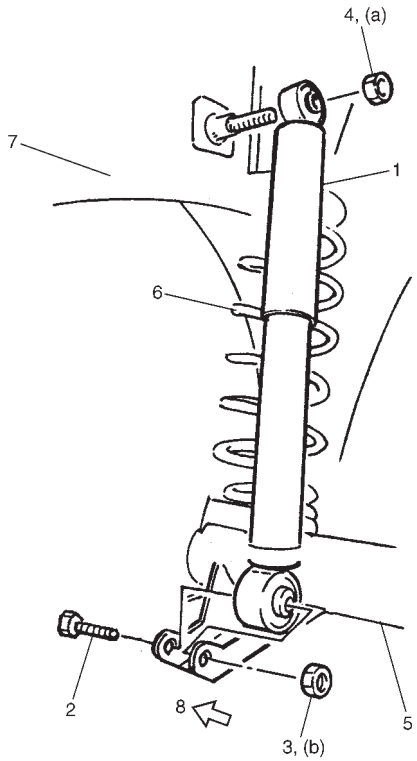
- Check wheel bearings for wear. When measuring thrust play, apply a dial gauge to axle shaft center.

  Thrust play limit “a”: 0.8 mm (0.03 in.)

  When measurement exceeds limit, replace bearing.



- By rotating wheel actually, check wheel bearing for noise and smooth rotation. If it is defective, replace bearing.



1. Rear shock absorber
2. Lower mounting bolt
3. Lower mounting nut
4. Upper mounting nut
5. Rear axle
6. Rear coil spring
7. Vehicle body
8. Vehicle out side

ON-VEHICLE SERVICE

REAR SHOCK ABSORBER

REMOVAL

1) Hoist vehicle.
2) Support rear axle housing by using floor jack to prevent it from lowering.
3) Remove lower mounting bolt and nut.
4) Remove upper mounting nut. Then remove shock absorber.

INSTALLATION

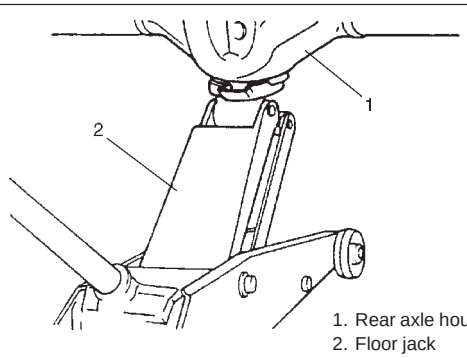
1) Install shock absorber, referring to left figure for proper installing direction of bolt.

   NOTE:
   Nut and bolt should not be tightened.

2) Remove floor jack from rear axle housing and lower hoist.
3) Tighten bolt and nuts to specified torque.

   NOTE:
   Tighten bolt and nuts with vehicle off hoist and in non-loaded condition.

   Tightening Torque
   (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)
   (b): 80 N·m (8.0 kg-m, 58.0 lb-ft)

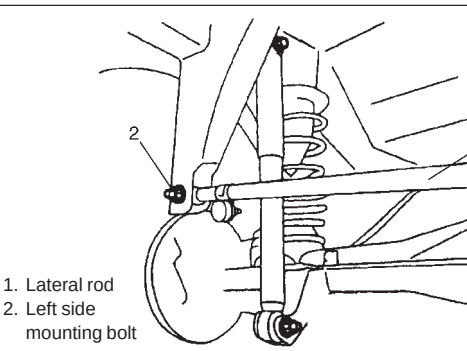


1. Rear axle housing
2. Floor jack

COIL SPRING

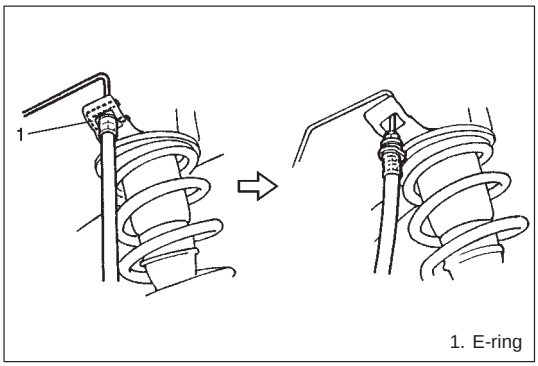
REMOVAL

1) Hoist vehicle and remove rear wheel (s).
2) Support rear axle housing by using floor jack to prevent it from lowering.



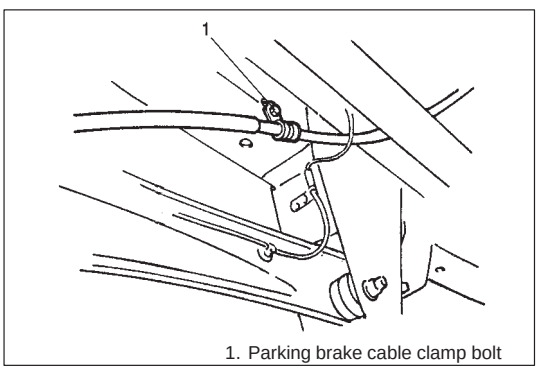
1. Lateral rod
2. Left side mounting bolt

3) Remove lateral rod left side mounting bolt and nut.



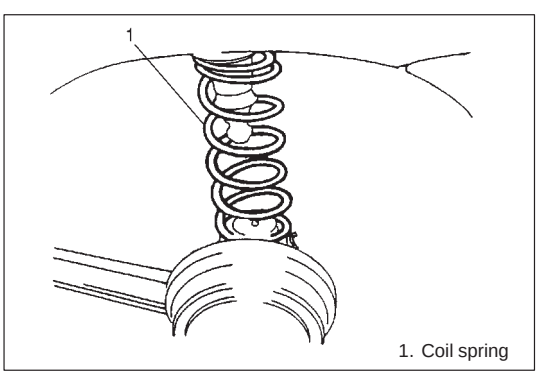
1. E-ring

4) Remove brake flexible hose E-ring.



1. Parking brake cable clamp bolt

5) Remove parking brake cable clamp bolt.

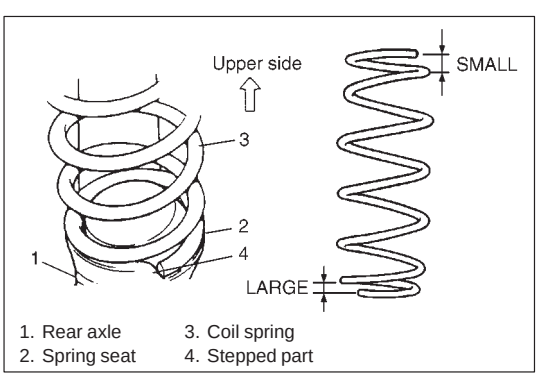


1. Coil spring

6) Remove shock absorber lower mounting bolt and nut.
7) Lower rear axle housing gradually as far down as where coil spring can be removed.

CAUTION:
Be careful not to let rear axle down too much.
It may cause damage to brake flexible hose.

8) Remove coil spring.

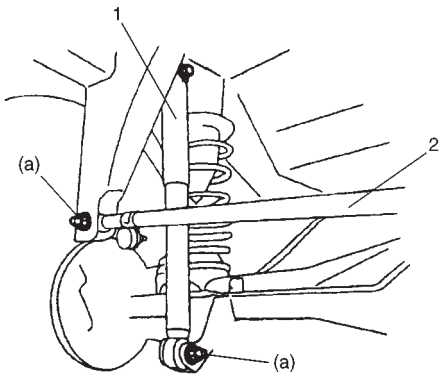


1. Rear axle
2. Spring seat
3. Coil spring
4. Stepped part

INSTALLATION

1) Install coil spring with its closed end facing up and open end (with paint marking) down and make sure that its bottom fits in spring seat securely. Then raise axle housing.

CAUTION:
Make spring end meet with stepped part of lower seat as shown.



1. Shock absorber
2. Lateral rod

2) Install shock absorber lower mounting bolt.
3) Remove floor jack from rear axle housing.
4) Install parking brake cable clamp bolt and brake flexible hose E-ring.
5) Install lateral rod to vehicle body.

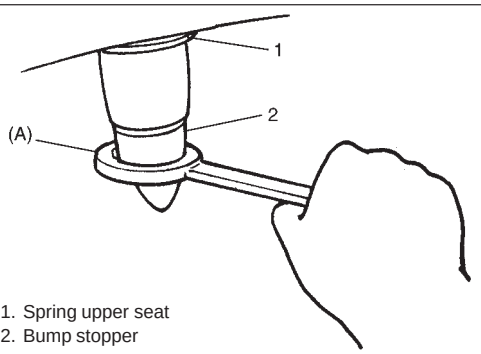
NOTE:
Nut should not be tightened.

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

Tightening Torque for wheel nuts
85 N·m (8.5 kg-m, 61.5 lb-ft)

7) Lower hoist and vehicle in non-loaded condition, tighten absorber lower mounting nut and lateral rod left mounting nut to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)



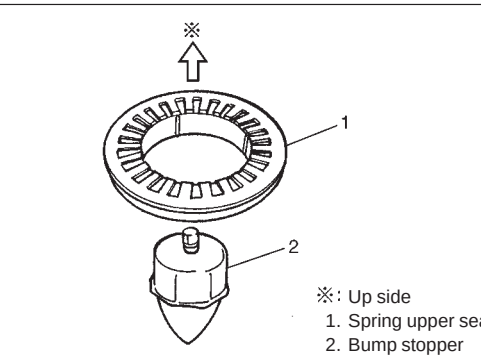
1. Spring upper seat
2. Bump stopper

BUMP STOPPER AND SPRING UPPER SEAT (COIL SPRING TYPE)

REMOVAL

1) Removal coil spring. For details, refer to steps 1) to 8) of COIL SPRING REMOVAL.
2) Remove spring upper seat.
3) Remove bump stopper by using special tool.

Special Tool
(A): 09941-66010



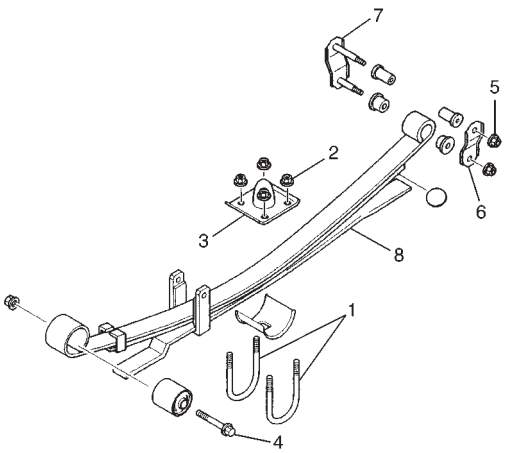
※: Up side
1. Spring upper seat
2. Bump stopper

INSTALLATION

1) Install bump stopper.

NOTE:
- **Before installing bushing, apply soap water on it.**
- **For proper installing direction of spring upper seat, refer to figure at left.**

2) Install spring upper seat.
3) Install coil spring. For details, refer to steps 1) to 7) of COIL SPRING INSTALLATION.

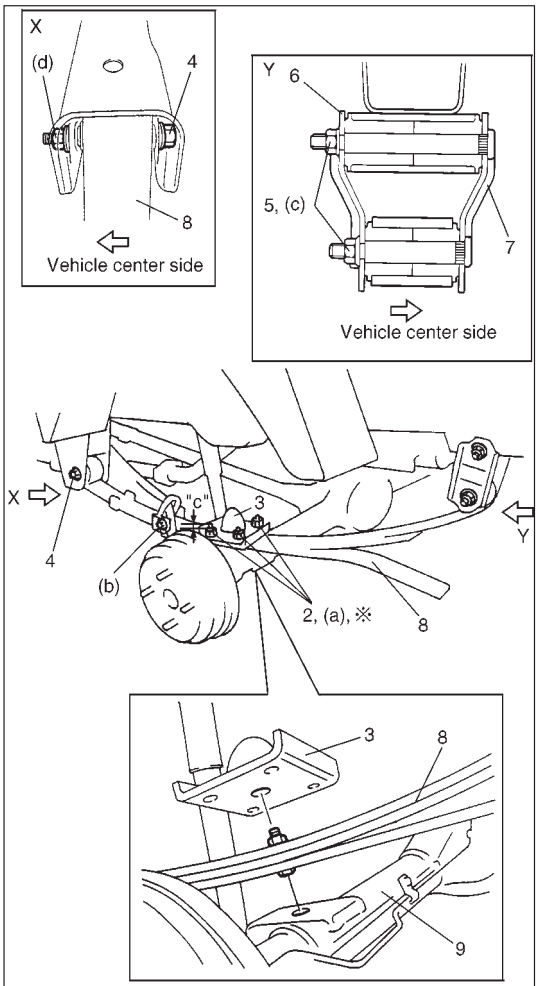


1. Spring U-bolt
2. Spring U-bolt nuts
3. Spring bumper
4. Spring front bolt
5. Spring shackle nuts
6. Spring shackle outer plate
7. Spring shackle
8. Leaf spring

LEAF SPRING AND SPRING BUMPER (LEAF SPRING TYPE)

REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Support rear axle housing by using floor jack to prevent it from lowering.
3) Remove parking brake cable clamp bolt.
4) Remove spring U-bolt nuts, guide plate, spring bumper and spring U-bolts.
5) Remove spring front nut.
6) Remove spring shackle nuts and remove spring shackle outer plate.
7) Pull out spring front bolt and remove leaf spring from spring shackle.
8) Remove spring shackle as necessary.



1. Parking brake cable clamp bolt
2. Spring U-bolt nuts
3. Spring bumper
4. Spring front bolt
5. Spring shackle nuts
6. Spring shackle outer plate
7. Spring shackle
8. Leaf spring
9. Rear axle housing

※ : Use new nut

INSTALLATION

1) Install leaf spring to vehicle body and spring shackle, referring to figure for proper installing direction of bolt and nuts.

   NOTE:
   Nuts should not be tightened.

2) Securely fit leaf spring center bolt in the hole of rear axle housing and spring bumper as shown in figure. Tighten new spring U-bolt nuts to specified torque.

   NOTE:
   - **Insert U-bolt guide plate between rear axle housing and spring U-bolts. Fit U-bolt to guide plate flange.**
   - **Tighten U-bolt nuts uniformly so that "c" is the same.**

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

3) Install and tighten parking brake cable clamp bolt.

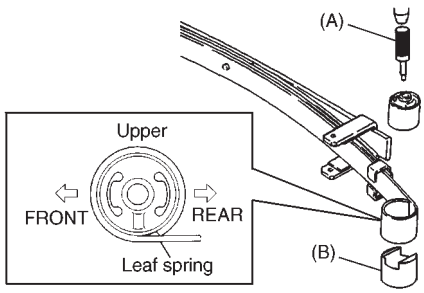
   Tightening Torque
   (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

4) Remove floor jack from rear axle housing.
5) Install rear wheel and tighten wheel nuts to specified torque.

   Tightening Torque for wheel nuts
   85 N·m (8.5 kg-m, 61.5 lb-ft)

6) Lower hoist and vehicle in non-loaded condition, tighten spring front nut and spring shackle nuts to specified torque.

   Tightening Torque
   (c): 55 N·m (5.5 kg-m, 40.0 lb-ft)
   (d): 80 N·m (8.0 kg-m, 58.0 lb-ft)



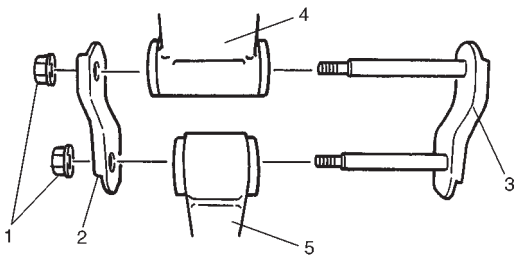
LEAF SPRING FRONT BUSHING

REPLACEMENT

1) Remove leaf spring as previously outlined.
2) Remove busing with special tool and hydraulic press.

Special Tool
(A): 09951-16040
(B): 09951-46020

3) Install new bushing and then leaf spring to vehicle by reversing removal procedure.

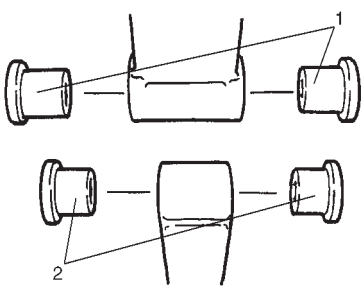


1. Spring shackle nuts
2. Spring shackle outer plate
3. Spring shackle
4. Vehicle body
5. Leaf spring

SPRING SHACKLE/SPRING SHACKLE BUSHINGS (LEAF SPRING TYPE)

REMOVAL

1) Hoist vehicle.
2) Support rear axle housing by using floor jack to prevent it from lowering.
3) Remove spring shackle nuts and remove spring shackle outer plate.
4) Pull out spring shackle from vehicle body and leaf spring.
5) Remove spring shackle bushings.



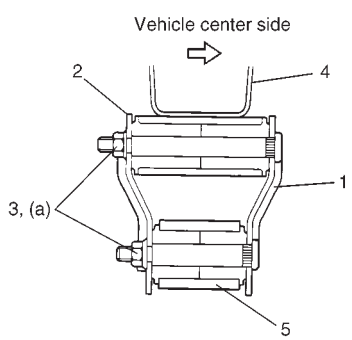
1. Spring shackle No.1 bushings
2. Spring shackle No.2 bushings

INSTALLATION

Reverse removal procedure for installation, noting following points.

- When installing bushing, apply soap water on its circumference to facilitate installation.
- Install spring shackle in direction as shown in figure.
- Lower hoist and vehicle in non-loaded condition, tighten spring shackle nuts to specified torque.

Tightening Torque
(a): 55 N·m (5.5 kg-m, 40.0 lb-ft)



1. Spring shackle
2. Spring shackle outer plate
3. Spring shackle nuts
4. Vehicle body
5. Leaf spring

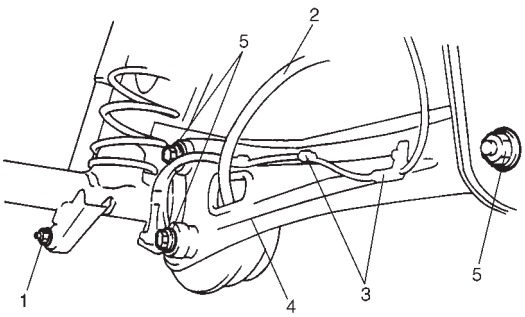
TRAILING ARM (COIL SPRING TYPE)

REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Support rear axle housing by using floor jack.

CAUTION:
Never apply floor jack against lateral rod as it may get deformed.

3) Remove shock absorber lower mounting bolt and nut.
4) Remove brake drum and brake shoe and disconnect parking brake cable from brake back plate, refer to PARKING BRAKE CABLE REMOVAL of Section 5.
5) For ABS equipped vehicle, disconnect wheel speed sensor lead wire clamps from trailing arm.
6) Remove trailing arm mounting bolts and nuts.



1. Shock absorber lower mounting bolt and nut
2. Parking brake cable
3. Wheel speed sensor lead wire clamps
4. Trailing arm
5. Trailing arm mounting bolt and nut

INSTALLATION

1) Install trailing arm to vehicle body and rear axle housing, referring to figure for proper installing direction of bolts.

NOTE:
Nut and bolts should not be tightened.

2) Install wheel speed sensor lead wire clamp, if equipped.
3) Connect parking brake cable to brake back plate and install brake shoe and brake drum, refer to PARKING BRAKE CABLE INSTALLATION of Section 5.
4) Install shock absorber to rear axle housing.

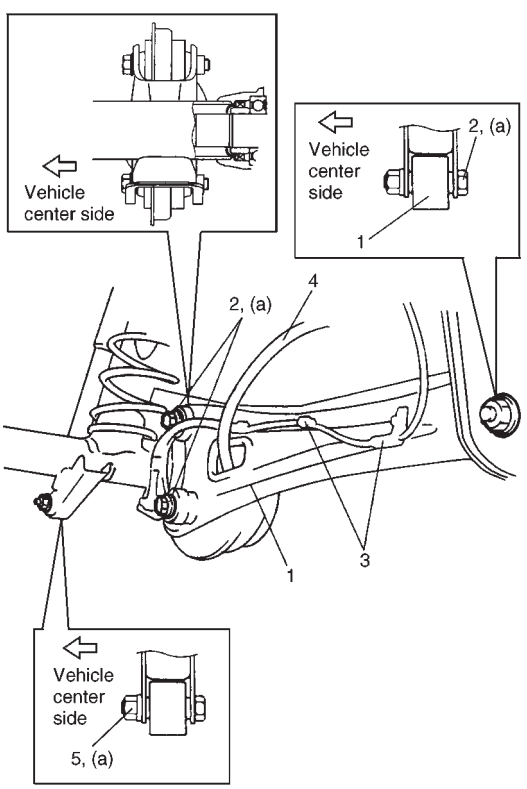
NOTE:
Nut and bolts should not be tightened.

5) Remove floor jack from rear axle housing.
6) Install wheel and tighten wheel nuts to specified torque.

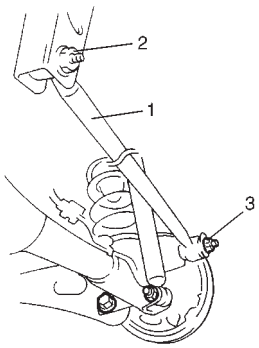
Tightening Torque for wheel nuts
85 N·m (8.5 kg-m, 61.5 lb-ft)

7) Lower hoist and vehicle in non loaded condition, tighten trailing arm mounting bolts and nuts and shock absorber lower mounting nut to specified torque.

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)



1. Trailing arm
2. Trailing arm mounting bolts
3. Wheel speed sensor lead wire clamps
4. Parking brake cable
5. Shock absorber lower mounting nut

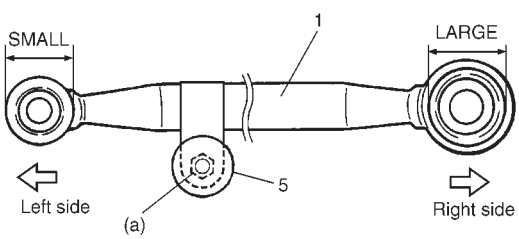


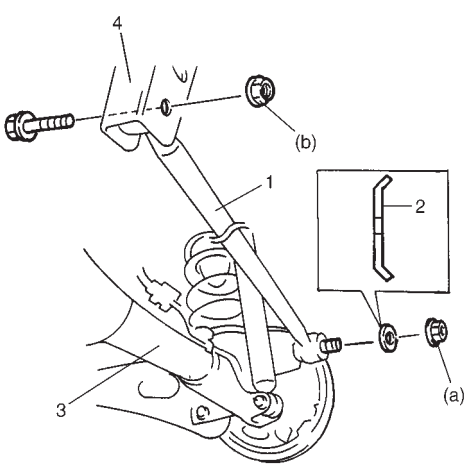
1. Lateral rod
2. Left side mounting bolt and nut
3. Right side mounting nut

LATERAL ROD (COIL SPRING TYPE)

REMOVAL

1) Hoist vehicle.
2) Remove lateral rod mounting bolt and nuts.
3) Remove lateral rod.





1. Lateral rod
2. Lateral rod outer washer
3. Rear axle housing
4. Vehicle body
5. Damper

INSTALLATION

1) Install damper to new lateral rod, if necessary. Tighten nut to specification,

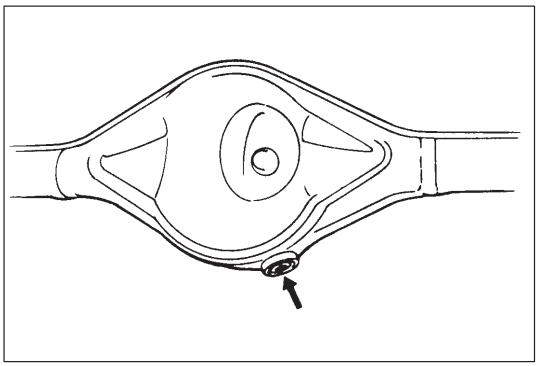
   Tightening Torque
   (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

2) Install lateral rod to vehicle body and rear axle housing, referring to figure for proper installing direction.

   NOTE:
   Nut should not be tightened.

3) Lower hoist and with vehicle in non-loaded condition, tighten lateral rod bolt and nuts to specified torque.

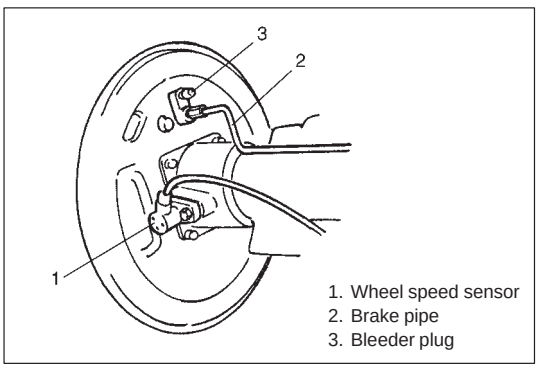
   Tightening Torque
   (b): 80 N·m (8.0 kg-m, 58.0 lb-ft)



REAR AXLE SHAFT AND WHEEL BEARING

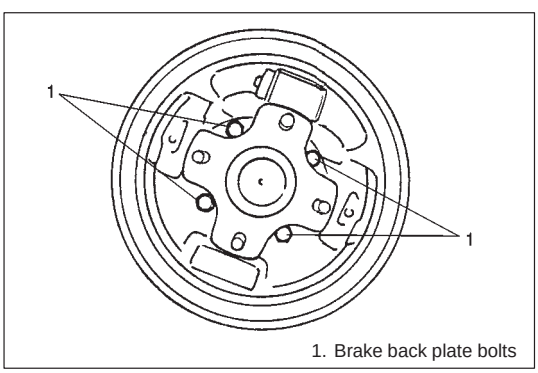
REMOVAL

1) Hoist vehicle and remove rear wheel.
2) Drain gear oil from rear axle housing by loosening drain plug.
3) Remove brake drum and brake shoe and disconnect parking brake cable from brake back plate, refer to steps 2) – 4) of PARKING BRAKE CABLE REMOVAL of Section 5.



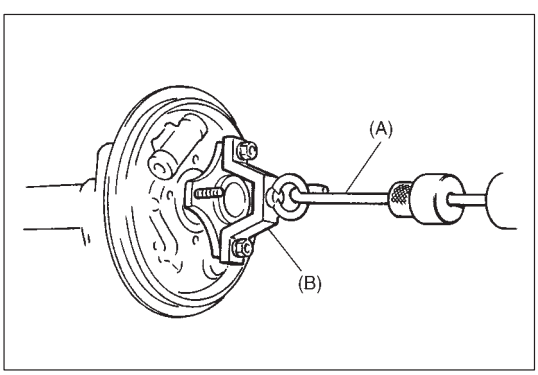
1. Wheel speed sensor
2. Brake pipe
3. Bleeder plug

4) Remove wheel speed sensor (if equipped with ABS).
5) Disconnect brake pipe(s) from wheel cylinder and put wheel cylinder bleeder plug cap onto pipe to prevent fluid from spilling.



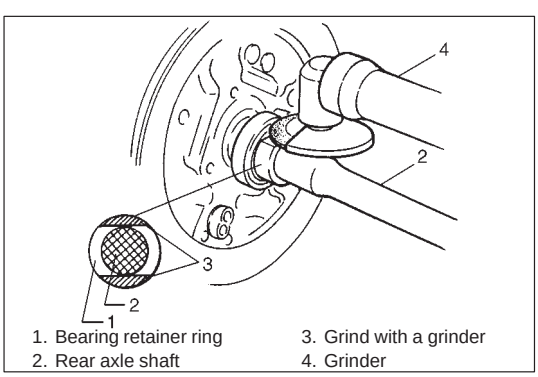
1. Brake back plate bolts

6) Remove brake back plate bolts.



7) Using special tools indicated, draw out axle shaft with brake back plate.

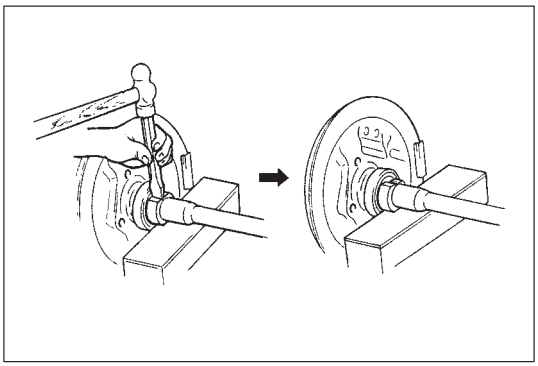
Special Tool
(A): 09942-15510
(B): 09943-17912



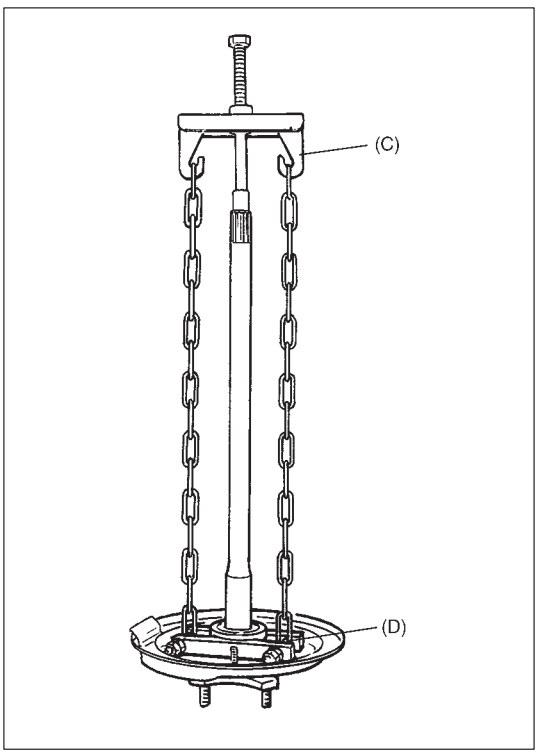
1. Bearing retainer ring
2. Rear axle shaft
3. Grind with a grinder
4. Grinder

8) Remove wheel sensor ring (if equipped with ABS). Refer to REAR WHEEL SENSOR RING REMOVAL of Section 5E.
9) In order to remove the retainer ring from the shaft, grind with a grinder two parts of the bearing retainer ring as illustrated till it becomes thin.

CAUTION:
Be careful not to go so far as to grind the shaft.

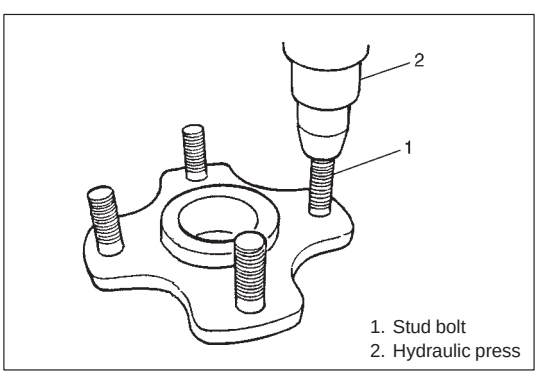


10) Break with a chisel the thin ground retainer ring, and it can be removed.

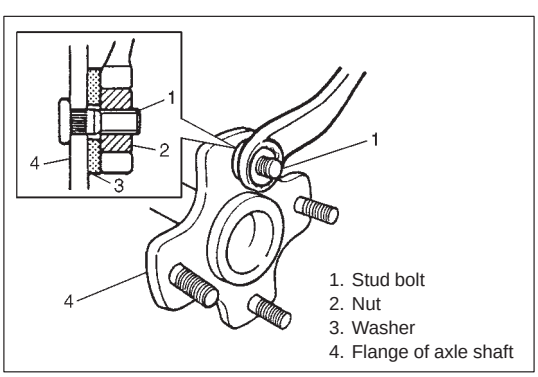


11) Using special tools, remove bearing from shaft and then remove brake back plate.

Special Tool
(C): 09927-18411
(D): 09921-57810

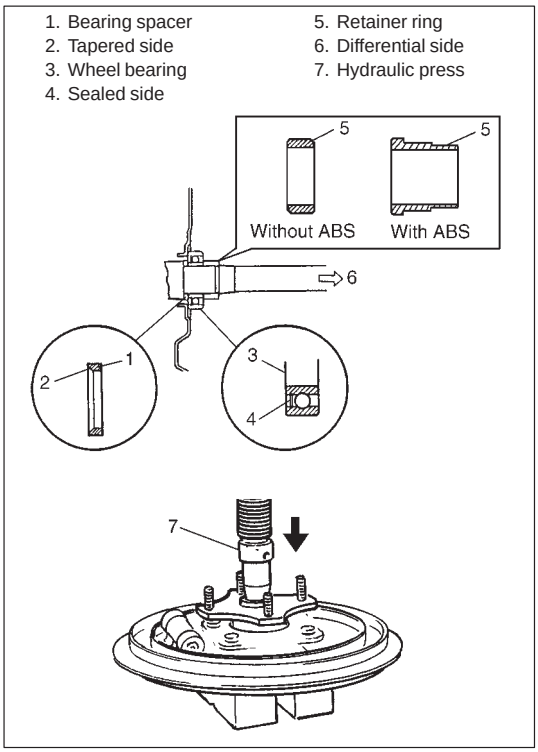


12) Remove stud bolts by using hydraulic press.



INSTALLATION

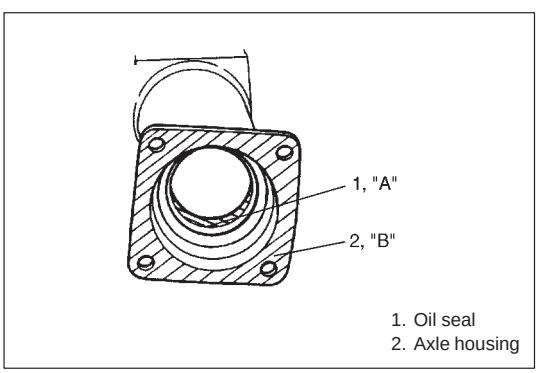
1) Aligning serrations between new stud bolt(s) and flange, install new stud bolt(s) by tightening nut as shown.



2) Press in a new bearing and retainer ring in order by using an hydraulic press.

NOTE:
- **Install wheel bearing spacer with the tapered side of its inner diameter directed toward outside, or brake drum side.**
- **Install wheel bearing with its sealed side directed toward brake drum side.**
- **Use care not to cause any damage to outside of retainer ring.**

3) Install wheel sensor ring (if equipped with ABS).
Refer to REAR WHEEL SENSOR RING INSTALLATION of Section 5E.



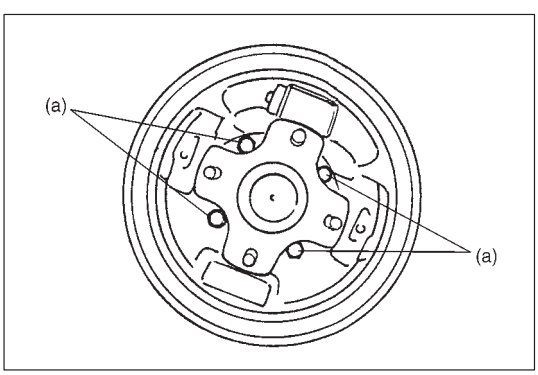
4) Apply grease to axle shaft oil seal lip as shown.

"A": Grease 99000-25010

5) Apply sealant to mating surface of axle housing with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

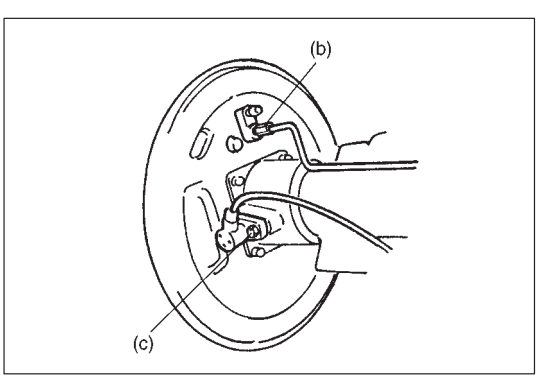
"B": Sealant 99000-31090



6) Install rear axle shaft to rear axle housing and tighten brake back plate bolts to specified torque.

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

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)



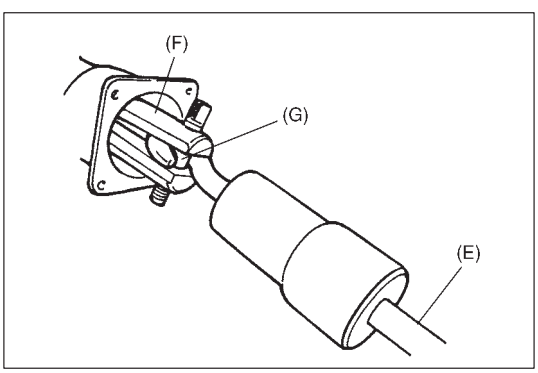
7) Connect brake pipe to wheel cylinder and tighten brake pipe flare nut to specified torque.

Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

8) Install wheel speed sensor (if equipped with ABS).

Tightening Torque
(c): 9 N·m (0.9 kg-m, 6.5 lb-ft)

9) Connect parking brake cable to brake back plate and install brake shoe and brake drum, refer to PARKING BRAKE CABLE INSTALLATION of Section 5.
10) Refill rear axle (differential) housing with new specified gear oil. Refer to Section 7F for refill.
11) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, see Section 5.)
12) Install wheel and tighten wheel nuts to specified torque.
13) Upon completion of all jobs, detach plug from brake back plate and turn adjuster upward by flat head screw driver and depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
    Adjust parking brake cable (for adjustment, see Section 5 of this manual).
14) Check to ensure that brake drum is free from dragging and proper braking is obtained.
15) Perform brake test (foot brake and parking brake). (For brake test, see Section 5).
16) Check each installed part for oil leakage.



REAR AXLE SHAFT INNER OIL SEAL

REMOVAL

1) Remove rear axle shaft. For details, refer to steps 1) to 7) of REAR AXLE SHAFT REMOVAL in this section.
2) Remove rear axle shaft inner oil seal, by using special tools.

Special Tool
(E): 09942-15510
(F): 09944-96010 (remover)
(G): 09921-26010 (collar)

INSTALLATION

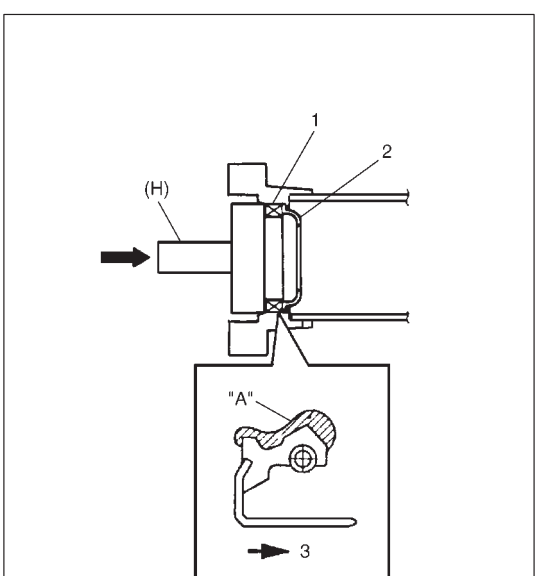
1) Using special tools drive in oil seal until it contacts oil seal protector in axle housing.

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

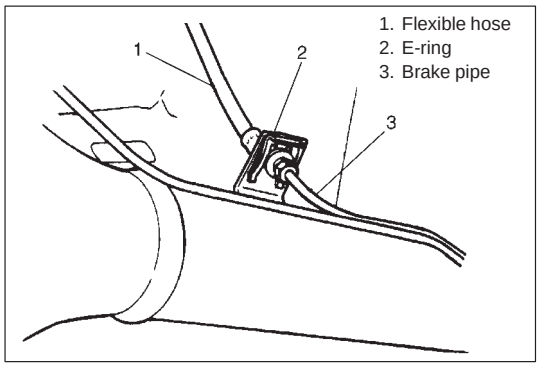
Special Tool
(H): 09913-75520

"A": Grease 99000-25010

2) For procedure hereafter, refer to steps 4) to 16) of REAR AXLE SHAFT INSTALLATION in this section.



1. Inner oil seal
2. Oil seal protector
3. Differential side

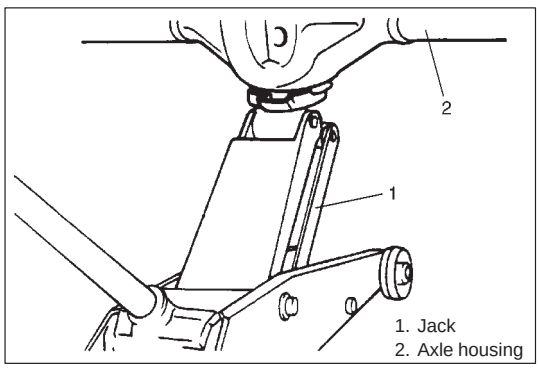


1. Flexible hose
2. E-ring
3. Brake pipe

REAR AXLE HOUSING

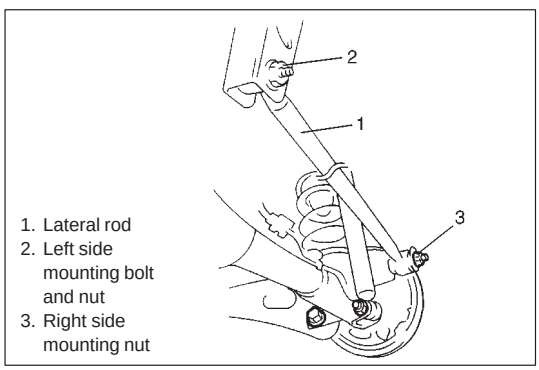
REMOVAL

1) Hoist vehicle and remove rear wheels (right & left).
2) Remove rear axle shafts, refer to steps 2) to 7) of REAR AXLE SHAFT REMOVAL in this section.
3) Disconnect brake pipe from flexible hose and remove E-ring.
4) Remove brake pipe clamps and pipes from axle housing.
5) Remove wheel speed sensor harness clamps from axle housing (if equipped with ABS).



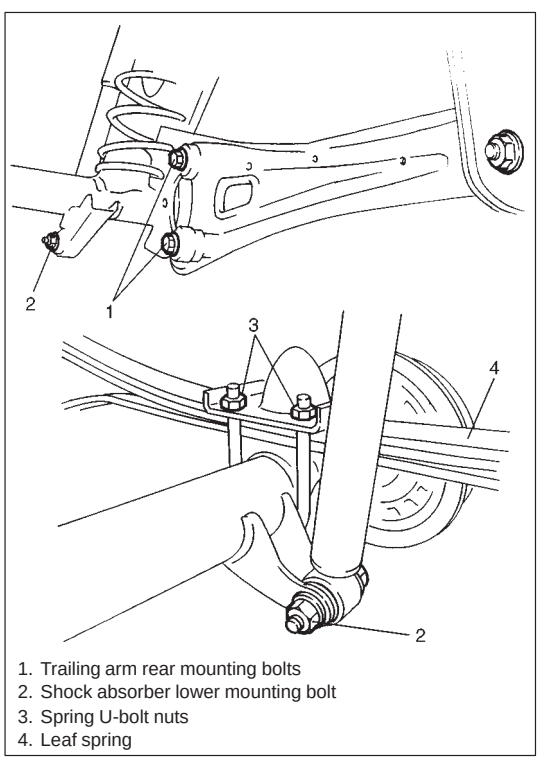
1. Jack
2. Axle housing

6) Remove differential carrier assembly, refer to Section 7F.
7) Detach LSPV stay from axle housing (if equipped with LSPV).
8) For jobs hereafter, support rear axle housing by using floor jack under axle housing.



1. Lateral rod
2. Left side mounting bolt and nut
3. Right side mounting nut

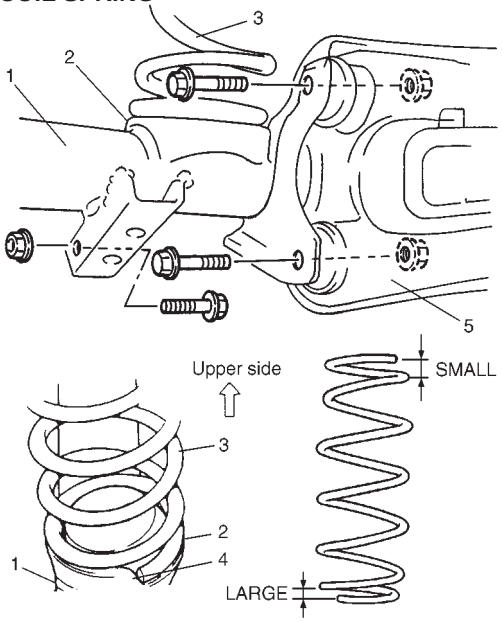
9) Remove lateral rod (Coil spring type).



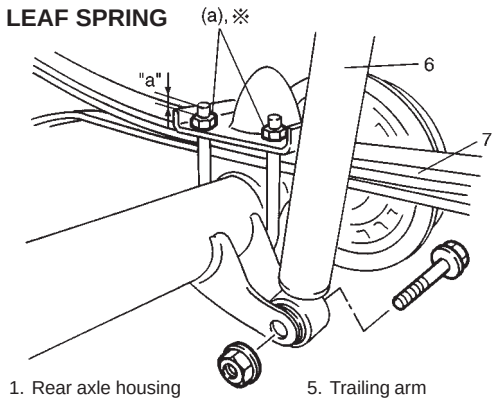
1. Trailing arm rear mounting bolts
2. Shock absorber lower mounting bolt
3. Spring U-bolt nuts
4. Leaf spring

10) Loosen front and rear mounting bolts and nuts of trailing arms but don't remove bolts (Coil spring type).
    Remove spring U-bolt nuts and spring U-bolt (Truck model).
11) Remove shock absorber lower mounting nuts and bolts.
12) Lower floor jack until tension of suspension coil spring or leaf spring becomes a little loose and remove trailing arm rear mount bolts.
13) Lower rear axle housing gradually.
14) Remove axle housing.

COIL SPRING



LEAF SPRING



1. Rear axle housing
2. Spring seat
3. Coil spring
4. Stepped part
5. Trailing arm
6. Shock absorber
7. Leaf spring

※ : Use new nut

INSTALLATION

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

1) Place rear axle on floor jack.
   Then install trailing arm rear mounting bolts (right & left). At this time, trailing arm nuts but don't tighten them (Coil spring type). Securely fit leaf spring center bolt in the hole of rear axle housing and spring bumper and U-bolts to guide plate flange (refer to LEAF SPRING/SPRING BUMPER INSTALLATION in this section). Tighten new spring U-bolt nuts to specified torque (Leaf spring type).

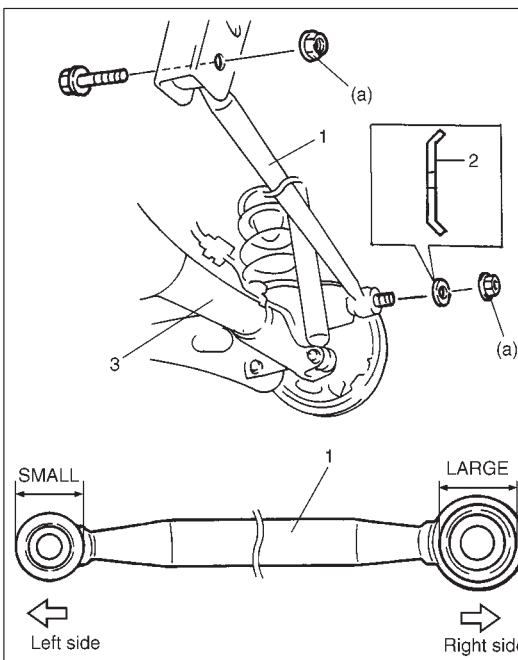
   NOTE:
   Tighten U-bolt nuts uniformly so that measurement "a" in figure is the same.

   Tightening Torque
   (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)

2) Install coil springs (right & left) on spring seat of rear axle as shown in figure and then raise rear axle (Coil spring type).

   NOTE:
   When seating coil spring, mate spring end with stepped part of rear axle spring seat as shown.

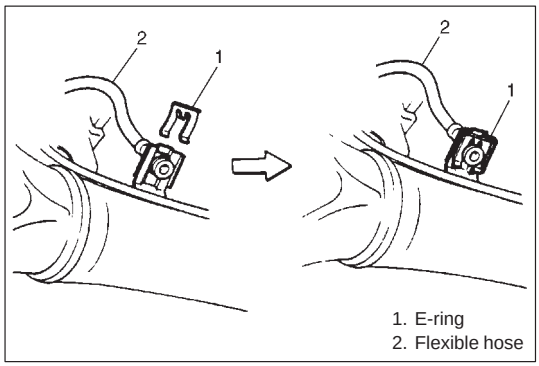
3) Install shock absorber lower mounting bolts and nuts (right & left).
4) Remove floor jack from rear axle housing.



1. Lateral rod
2. Lateral rod outer washer
3. Rear axle housing

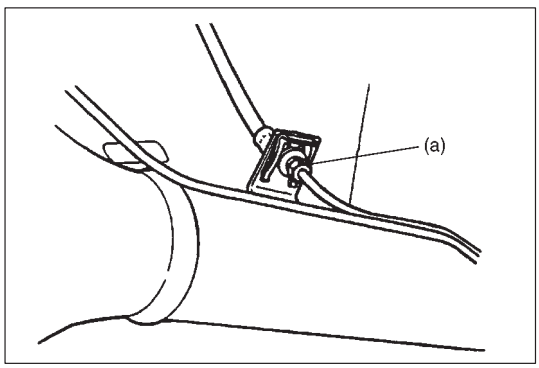
5) Install lateral rod to rear axle housing and vehicle body (Coil spring type).

   NOTE:
   Nut should not be tightened.



1. E-ring
2. Flexible hose

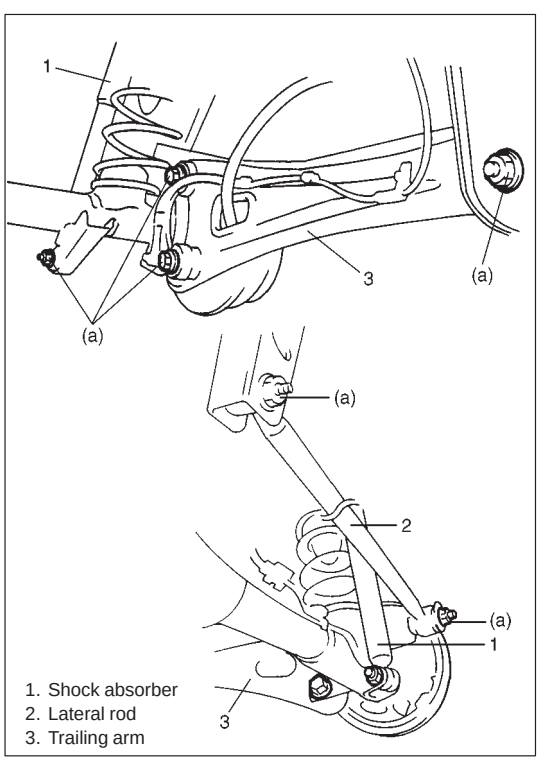
6) Install differential carrier assembly, refer to Section 7F.
7) Install wheel speed sensor harness clamps (if equipped with ABS).
8) Connect brake pipes onto axle housing and clamp them securely.
   For clamping positions, refer to Section 5 of this manual.
9) Connect brake flexible hose to bracket on axle housing and secure it with E-ring.



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

Tightening Torque
(a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

11) Perform steps 4) to 13) of REAR AXLE SHAFT INSTALLATION in this section.
12) Attach LSPV stay to axle housing for vehicle with LSPV.



1. Shock absorber
2. Lateral rod
3. Trailing arm

13) Lower hoist.
14) Tighten trailing arm front and rear nuts (coil spring type), shock absorber lower nut to specified torque.
    Tighten lateral rod nuts to specified torque (Coil spring type).

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

Tightening Torque
(a): 80 N·m (8.0 kg-m, 58.0 lb-ft)

15) Check to ensure that brake drum is free from dragging and proper braking is obtained.
16) If equipped with LSPV, check and adjust LSPV spring, refer to LSPV INSPECTION AND ADJUSTMENT and perform FLUID PRESSURE TEST in Section 5.
    Perform brake test (foot brake and parking brake).
    (For brake test, see Section 5.)
17) Check each installed part for oil leakage.

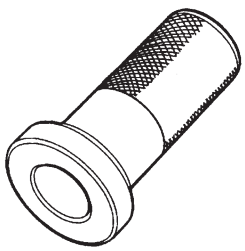
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Lateral rod mounting nut	80	8.0	58.0
Shock absorber upper mounting nut	55	5.5	40.0
Shock absorber lower mounting nut	80	8.0	58.0
Trailing arm front mounting nut	80	8.0	58.0
Trailing arm rear mounting nut	80	8.0	58.0
Brake back plate bolt	23	2.3	17.0
Brake flare nut	16	1.6	12.0
Wheel nut	85	8.5	61.5
Spring front bolt	80	8.0	58.0
Spring shackle nut	55	5.5	40.0
Spring U-bolt nut	60	6.0	43.5
Axle housing oil level plug	55	5.5	40.0
Axle housing oil drain plug	50	5.0	36.5
Lateral rod damper nut	25	2.5	18.0
Parking brake cable clamp bolt (Truck model)	11	1.1	8.0

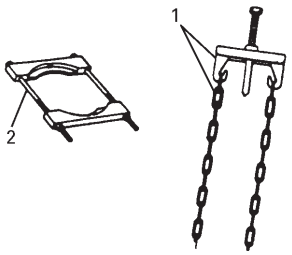
REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	DOT3	Brake reservoir tank
Water tight sealant	SEALING COMPOUND 366E (99000-31090)	Join seam of rear axle housing and brake back plate
Lithic wheel bearing grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lip

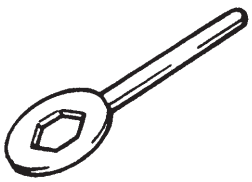
SPECIAL TOOLS



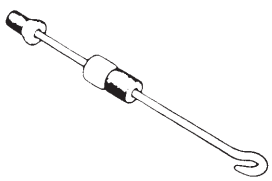
09913-75520
Bearing installer



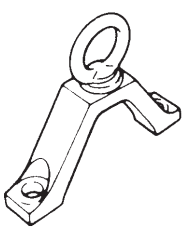
1. 09927-18411
   Universal puller
2. 09921-57810
   Bearing remover



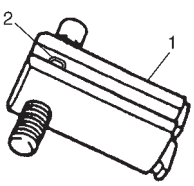
09941-66010
Bump stopper wrench



09942-15511
Sliding hammer



09943-17912
Brake drum remover



1. 09944-96010
   Bearing outer race remover
2. 09921-26010
   Bearing outer race remover collar

SECTION 3F

WHEELS AND TIRES

NOTE :
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.

CONTENTS

GENERAL DESCRIPTION

TIRES

This vehicle is equipped with 155 R13C-6PR.
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 wheel.
13×4.00 B

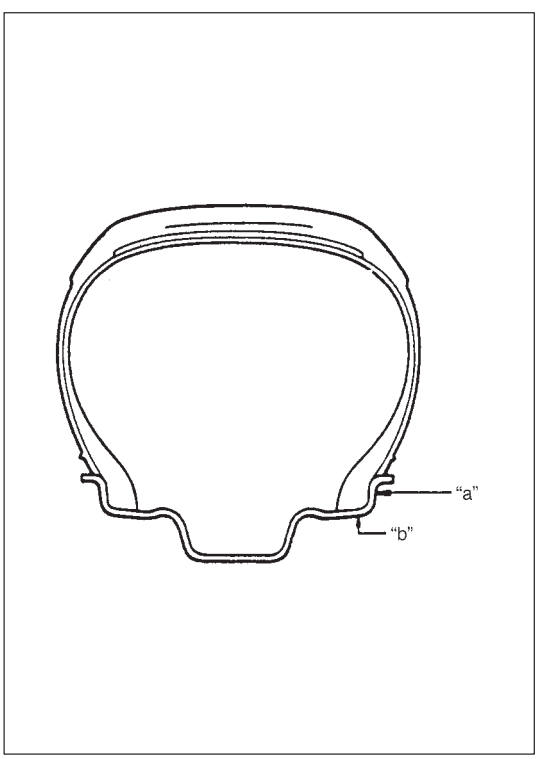
REPLACEMENT TIRES

When replacement is necessary, the original equipment type tire should be used. Refer to the Tire Placard. Replacement tires should be of the same size, load range and construction as those originally on the vehicle. Use of any other size or type tire may affect ride, handling, speedometer/odometer calibration, vehicle ground clearance and tire or snow chain clearance to the body and chassis.
It is recommended that new tires be installed in pairs on the same axle. If necessary to replace only one tire, it should be paired with the tire having the most tread, to equalize braking traction.

kPa	kgf/cm^2	psi
160	1.6	23
180	1.8	26
200	2.0	29
220	2.2	32
240	2.4	35
260	2.6	38
280	2.8	41
300	3.0	44
320	3.2	47
340	3.4	50
Conversion:	1 psi = 6.895 kPa 1 kgf/cm^2 = 98.066 kPa	

WARNING:
Do not mix different types of tires on the same vehicle such as radial, bias and bias-belted tires except in emergencies, because vehicle handling may be seriously affected and may result in loss of control.

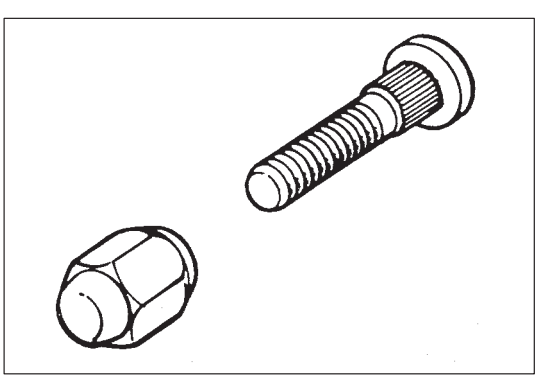
The metric term for tire inflation pressure is the kilopascal (kPa). Tire pressures will usually be printed in both kPa and psi on the Tire Placard. Metric tire gauges are available from tool suppliers. The chart, left table, converts commonly used inflation pressures from kPa to psi.



WHEELS REPLACEMENT

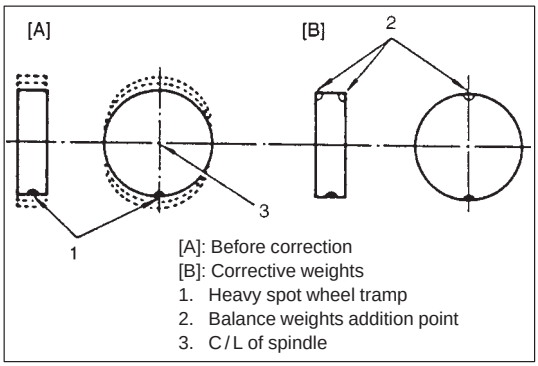
Wheels must be replaced if they are bent, dented, have excessive lateral or radial runout, leak air through welds, have elongated bolt holes, if lug nuts won't stay tight, or if they are heavily rusted. Wheels with greater runout than shown in left figure may cause objectionable vibrations.
Wheels for replacement must be equivalent to the originally equipped wheels in load capacity, diameter, rim width, off-set and mounting configuration. A wheel of improper size or type may affect wheel and bearing life, brake cooling, speedometer/odometer calibration, ground clearance to the body and chassis.
To measure the wheel runout, it is necessary to use accurate dial indicator. The tire may be on or off the wheel. The wheel should be installed to the wheel balancer of the like for proper measurement. Take measurements of both lateral runout and radial runout at both inside and outside of the rim flange. With dial indicator set in place securely, turn the wheel one full revolution slowly and record every reading of the indicator.
When the measured runout exceeds the specification and correction by the balancer adjustment is impossible, replace the wheel. If the reading is affected by welding, paint or scratch, it should be ignored.

Lateral runout limit "a" : 0.90 mm (0.035 in.)
Radial runout limit "b" : 0.70 mm (0.028 in.)

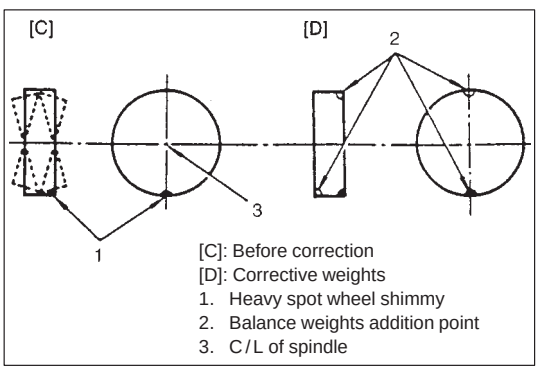


METRIC LUG NUTS AND WHEEL STUDS

All models use metric lug nuts and wheel studs (size M12 x 1.25).



[A]: Before correction
[B]: Corrective weights
1. Heavy spot wheel tramp
2. Balance weights addition point
3. C/L of spindle



[C]: Before correction
[D]: Corrective weights
1. Heavy spot wheel shimmy
2. Balance weights addition point
3. C/L of spindle

DIAGNOSIS

DIAGNOSIS TABLE

Refer to SECTION 3.

BALANCING WHEELS

There are two types of wheel and tire balance: static and dynamic. Static balance, as shown in left figure, is equal distribution of weight around wheel. Wheels that are statically unbalanced cause bouncing action called tramp. This condition will eventually cause uneven tire wear.

Dynamic balance, as shown in left figure, is equal distribution of weight on each side of wheel centerline so that when the tire spins there is no tendency for the assembly to move from side to side. Wheels that are dynamically unbalanced may cause shimmy.

GENERAL BALANCE PROCEDURE

Deposits of mud, etc. must be cleaned from inside of rim.

WARNING:
Stones should be removed from tread in order to avoid operator injury during spin balancing and to obtain good balance.

Tire should be inspected for any damage, then balanced according to equipment manufacturer's recommendation.

OFF-VEHICLE BALANCING

Most electronic off-vehicle balancers are more accurate than on-vehicle spin balancers. They are easy to use and give a dynamic (two plane) balance. Although they do not correct for drum or disc unbalance as does on-vehicle spin balancing, this is overcome by their accuracy, usually to within 1/8 ounce.

ON-VEHICLE BALANCING

ON-vehicle balancing methods vary with equipment and tool manufacturers. Be sure to follow each manufacturer's instructions during balancing operation.

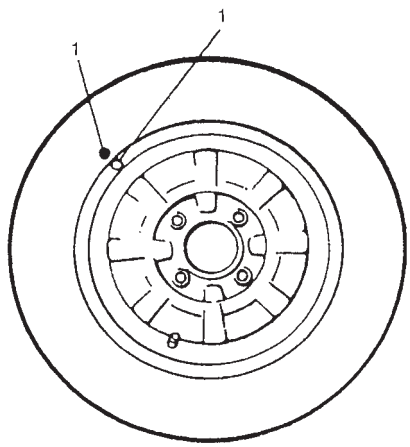
MAINTENANCE AND MINOR ADJUSTMENTS

WHEEL AND TIRE

Wheel repairs that use welding, heating, or peening are not approved. All damaged wheels should be replaced.

STUDS

If a broken stud is found, see Section 3E (rear) or Section 3D (front) for Note and Replacement procedure.



1. Paint

MATCHED TIRES AND WHEELS

(For vehicle equipped with steel wheels)

Tires and wheels are match mounted at the assembly plant.
This means that the radially stiffest part of the tire, or “high spot”, is matched to the smallest radius or “low spot” of the wheel.
This is done to provide the smoothest possible ride.
The “high spot” of the tire is originally marked by paint dot on the outboard sidewall. This paint dot will eventually wash off the tire.
The “low spot” of the wheel is originally marked by paint dot on the wheel rim-flange. Properly assembled, the wheel rims’ paint dot should be aligned with the tires’ paint dot as shown in left figure.
Whenever a tire is dismounted from its wheel, it should be re-mounted so that the tire and wheel are matched. If the tire’s paint dot cannot be located, a line should be scribed on the tire and wheel before dismounting to assure that it is remounted in the same position.

INFLATION OF TIRES

The pressure recommended for any model is carefully calculated to give a satisfactory ride, stability, steering, tread wear, tire life and resistance to bruises.
Tire pressure, with tires cold, (after vehicle has set for three hours or more, or driven less than one mile) should be checked monthly or before any extended trip. Set to the specifications on the tire located on the driver’s side door lock pillar.
It is normal for tire pressure increase when the tires become hot during driving. Do not bleed or reduce tire pressure after driving. Bleeding reduces the “Cold Inflation Pressure.”

Higher than Recommended Pressure Can Cause:

1. Hard ride
2. Tire bruising or carcass damage
3. Rapid tread wear at center of tire

Unequal Pressure on Same Axle Can Cause:

1. Uneven braking
2. Steering lead
3. Reduced handling
4. Swerve on acceleration

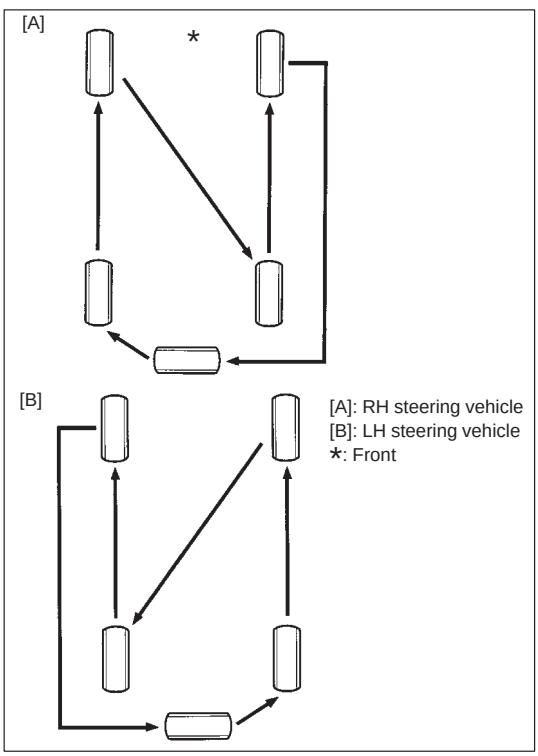
Valve caps should be kept on valves to keep dust and water out.

Lower than Recommended Pressure Can Cause:

1. Tire squeal on turns
2. Hard steering
3. Rapid and uneven wear on the edges of the tread
4. Tire rim bruises and rupture
5. Tire cord breakage
6. High tire temperatures
7. Reduced handling
8. High fuel consumption

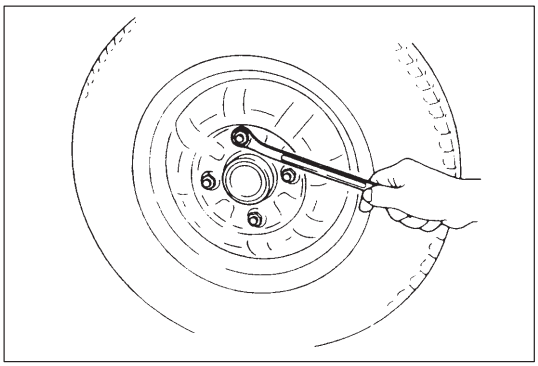
TIRE PLACARD

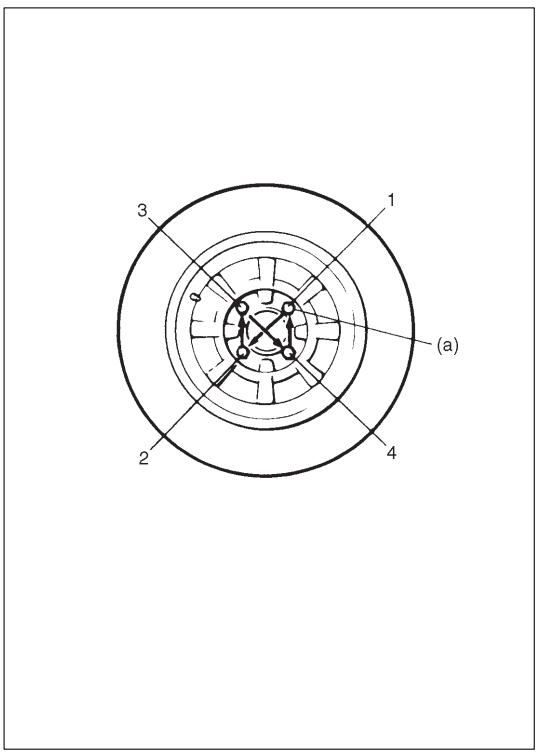
The tire placard is located on the driver's side door lock pillar and should be referred to for tire information. The placard lists the maximum load, tire size and cold tire pressure where applicable.



TIRE ROTATION

To equalize wear, rotate tires periodically as shown in figure.





ON-VEHICLE SERVICE

WHEEL

REMOVAL

1) Loosen wheel nuts by approximately 180° (half a rotation).
2) Hoist vehicle.
3) Remove wheel.

NOTE:
Never use heat to loosen tight wheel because application of heat to wheel can shorten life of wheel and damage wheel bearings.

INSTALLATION

Wheel nuts must be tightened in sequence and to proper torque to avoid bending wheel or brake drum or disc as in figure.

NOTE:
Before installing wheels, remove any build-up of corrosion on wheel mounting surface and brake drum or disc mounting surface by scraping and wire brushing. Installing wheels without good metal-to-metal contact at mounting surfaces can cause wheel nuts to loosen, which can later allow wheel to come off while vehicle is moving.

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

TIRE

MOUNTING AND DEMOUNTING

Use tire changing machine to mount or demount tires. Follow equipment manufacturer's instructions. Do not use hand tools or tire irons alone to change tires as they may damage tire beads or wheel rim.

Rim bead seats should be cleaned with wire brush or coarse steel wool to remove lubricants, old rubber and light rust. Before mounting or demounting tire, bead area should be well lubricated with approved tire lubricant.

After mounting, inflate to 240kPa (35 psi) so that beads are completely seated. Then adjust pressure to specified shown on tire placard.

WARNING:
Do not stand over tire when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.
Do not exceed 350 kPa (50 psi) pressure when inflating. If 350 kPa (50 psi) pressure will not seat beads, deflate, re-lubricate and reinflate. Over inflation may cause bead to break and cause serious personal injury.

Install valve core and inflate to proper pressure.

TIRE REPAIR

There are many different materials and techniques on the market to repair tires. As not all of these work on all types of tires, tire manufacturers have published detailed instructions on how and when to repair tires. These instructions can be obtained from the tire manufacturer.

TIGHTENING TORQUE SPECIFICATIONS

Fastening	Tightening torque		
	N·m	kg-m	lb-ft
Wheel nuts	85	8.5	61.5

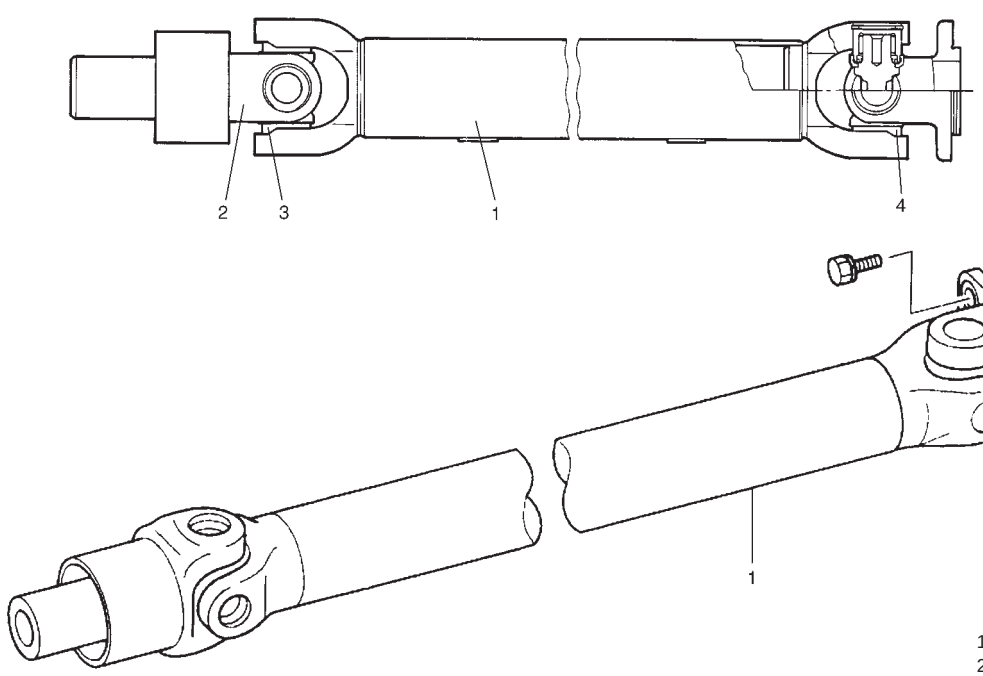
SECTION 4B

PROPELLER SHAFT

CONTENTS

GENERAL DESCRIPTION

The propeller shaft is a three-part combination consisting of a shaft and two universal joints. It is connected to the differential pinion through flanged connection and to the transmission output (main) shaft through a sliding spline joint.
The yoke of the front universal joint has its shank internally splined. The splined end of transmission shaft fits into the shank. The outer yoke of the rear joint is flanged; this flange is bolted to the flange, which is splined onto the forward end of the differential pinion.
The cross spider in each universal joint is fitted with four needle roller bearings.

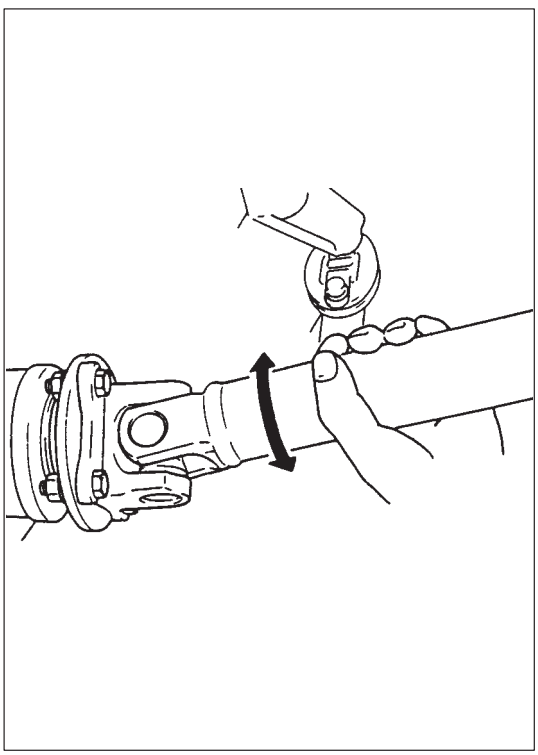


1. Propeller shaft
2. Yoke
3. Front universal joint
4. Rear universal joint

DIAGNOSIS

DIAGNOSIS TABLE

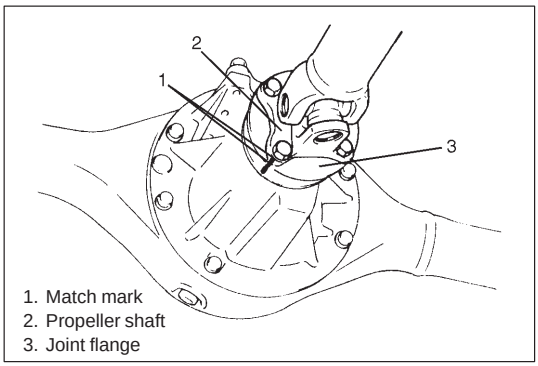
Condition	Possible Cause	Correction
Abnormal noise	● Loosen universal joint bolt. ● Spider bearing worn out or stuck. ● Worn spider.	Tighten universal joint bolt. Replace propeller shaft. Replace propeller shaft.
Vibration	● Deformed propeller shaft.	Replace propeller shaft.



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 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).

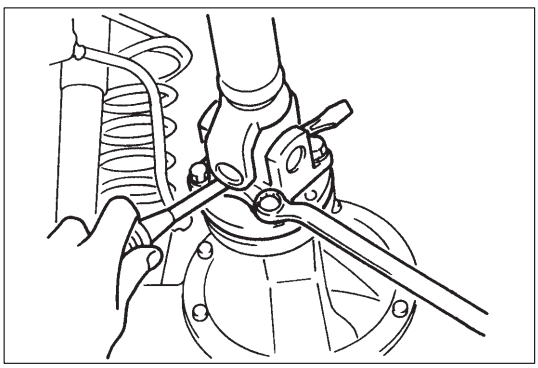


1. Match mark
2. Propeller shaft
3. Joint flange

ON-VEHICLE SERVICE

REMOVAL

1) Hoist vehicle.
2) Drain transmission oil.
3) Before removing propeller shaft, give match marks on each joint flange and propeller shaft as shown.

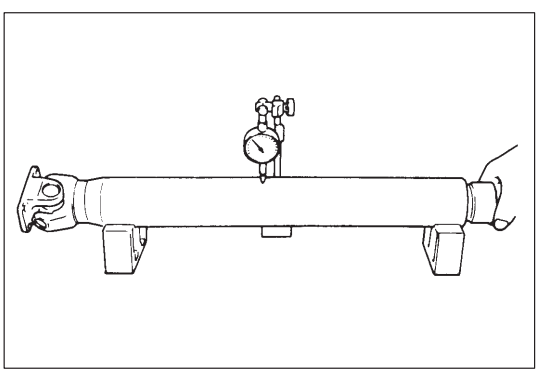


4) Loosen propeller shaft bolts.
5) Remove propeller shaft.

INSPECTION

Inspect propeller shaft and flange yoke for damage, and propeller shaft for runout.
If damage is found or shaft runout exceeds its limit, replace.

Runout limit: 0.7 mm (0.028 in.)

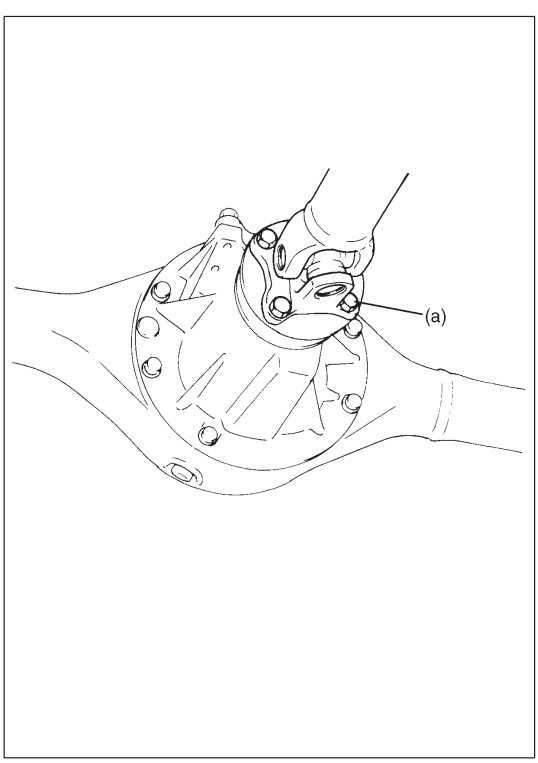


INSTALLATION

Install propeller shaft reversing removal procedure noting following points:

- When installing propeller shaft, align the match marks. Otherwise, vibration may occur during driving.
- Use following specification to torque universal joint flange.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 16.6 lb-ft)



- Apply grease to spline part of propeller shaft and transmission output shaft.

NOTE:
If transmission oil was drained for propeller shaft removal, pour specified gear oil into transmission case to specified level.

REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUPER GREASE C (99000-25030)	To apply to spline part of propeller shaft.

SECTION 5

BRAKES

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

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.**
- **When inspecting and servicing vehicle equipped with ABS, be sure to refer to Section 5E first.**

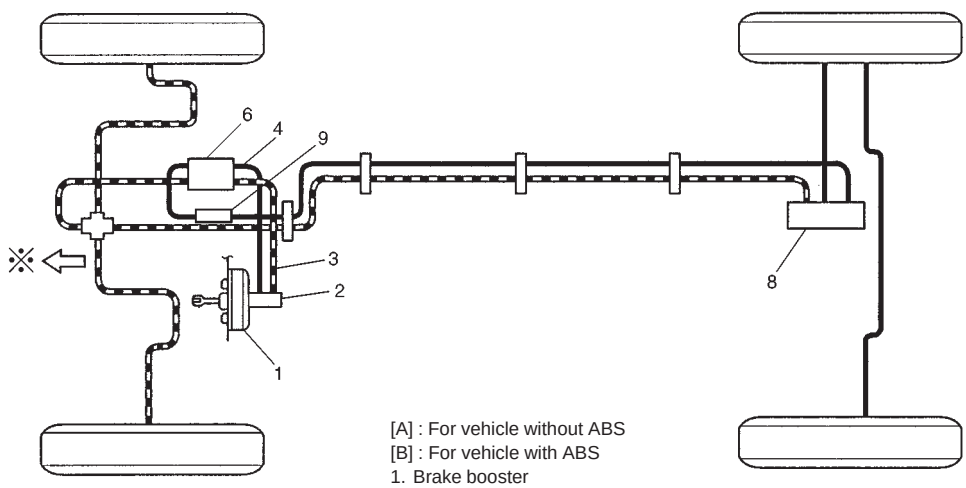
CONTENTS

GENERAL DESCRIPTION

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. The 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).
The blend proportioning valve (B.P. valve) or the load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and rear wheels. In brake system of this model, the disc brake type is used of the front wheel brake and a drum brake type (leading/trailing shoes) for the rear wheel brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

NOTE:
"B.P." valve in circuit diagram is installed on vehicle which is equipped with ABS and "LSPV" is installed on vehicle not equipped with ABS.

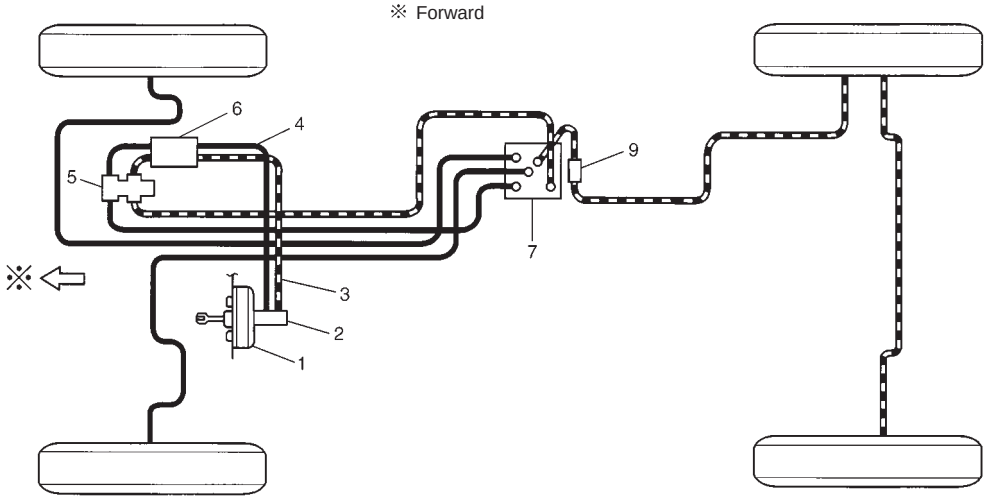
[A]



[A] : For vehicle without ABS
[B] : For vehicle with ABS
1. Brake booster
2. Master cylinder
3. Secondary side
4. Primary side
5. Blend proportioning valve
6. 4-way joint
7. ABS hydraulic unit (actuator)
8. LSPV
9. 2-way joint

※ Forward

[B]



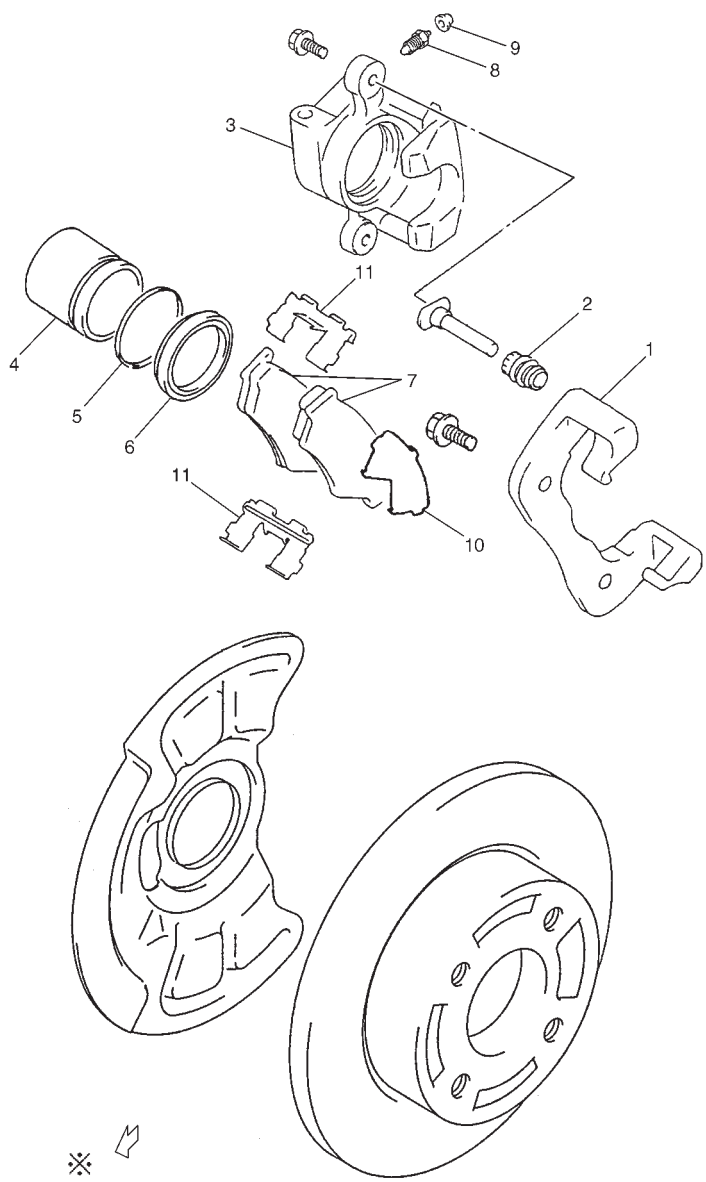
FRONT DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

This caliper has a single bore. 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.



1. Brake caliper carrier
2. Boot
3. Caliper
4. Disc brake piston
5. Piston seal
6. Cylinder boot
7. Brake pad
8. Bleeder Plug
9. Bleeder plug cap
10. Shim
11. Pad clip

※ Forward

REAR DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

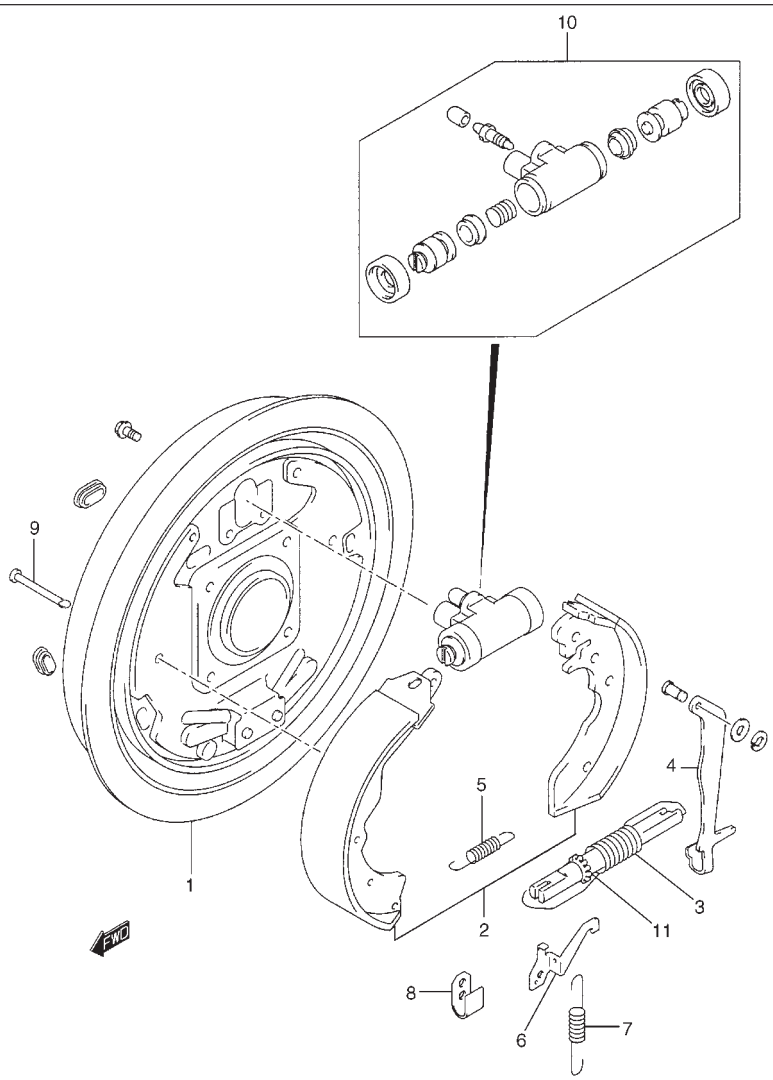
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained appropriate at all times.

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
2. Brake shoe
3. Shoe return upper spring
4. Parking brake shoe lever
5. Shoe return lower spring
6. Adjuster lever
7. Adjuster spring
8. Shoe hold down spring
9. Shoe hold down pin
10. Wheel cylinder
11. Adjuster

MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

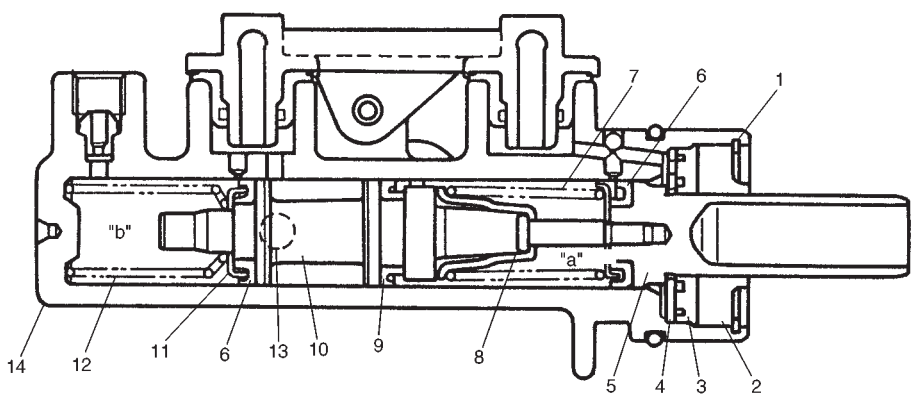
The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary (“a” in the figure below) and secondary (“b”) chambers. The hydraulic pressure produced in the primary chamber (“a”) acts on the rear wheel brakes (front wheel brakes for vehicle with ABS).

Also, the hydraulic pressure produced in the secondary chamber (“b”) acts on the front wheel brakes (rear wheel brakes for vehicle with ABS).

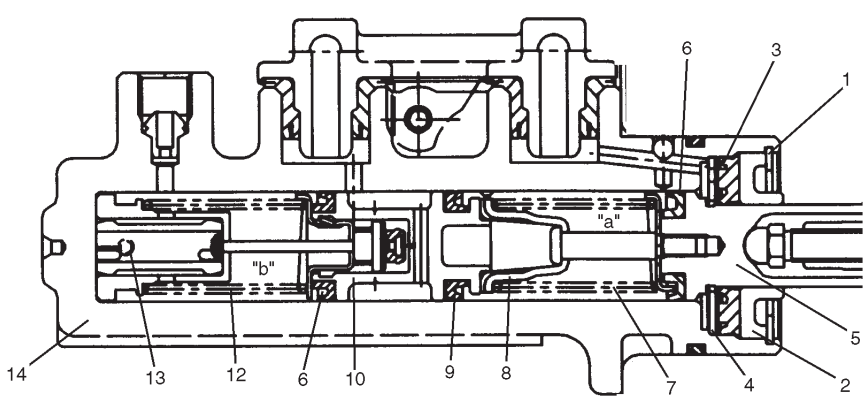
CAUTION:

Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do no use lubricated shop air on brake parts as damage to rubber components may result. If any hydraulic component is removed or brake line disconnected, bleed the brake system. The torque values specified are for dry, unlubricated fasteners.

[A]



[B]



[A] : For vehicle without ABS
[B] : For vehicle with ABS

1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup
4. Plate
5. Primary piston
6. Piston cup
7. Primary piston return spring
8. Primary spring retainer
9. Secondary piston pressure cup
10. Secondary piston
11. Return spring secondary seat
12. Secondary piston return spring
13. Secondary piston stopper bolt
14. Master cylinder body

BOOSTER ASSEMBLY

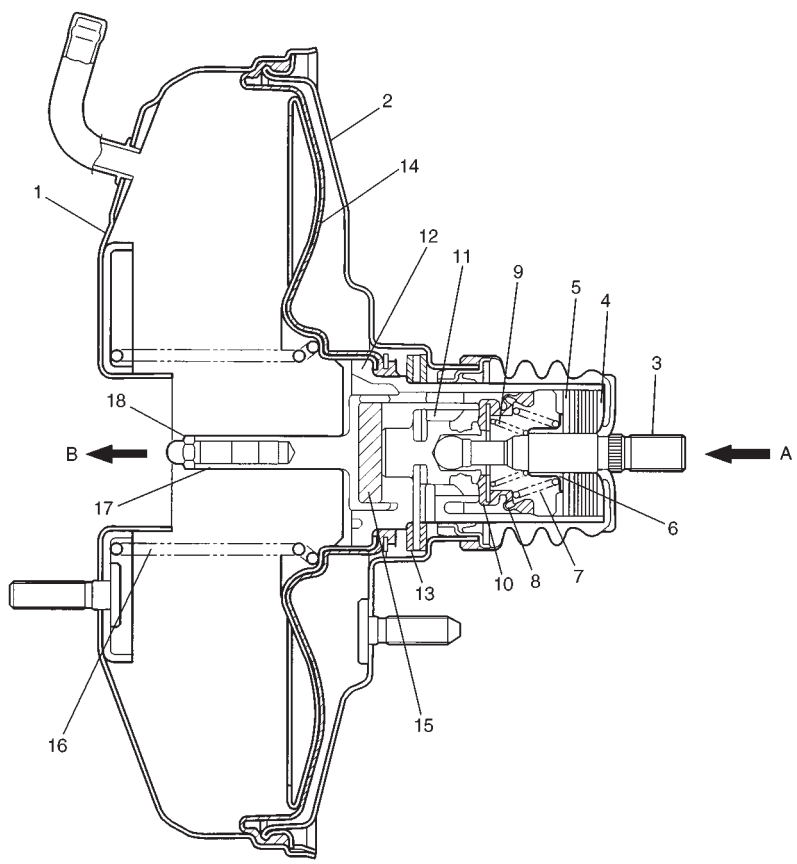
GENERAL DESCRIPTION

The booster is located between the master cylinder and the brake pedal. It is so designed that the force created when the brake pedal is depressed is mechanically increased combined with the engine vacuum.

CAUTION:
When and after removing booster, never drop or deform it.

WARNING:
Never disassemble brake booster assembly. If it is found faulty, replace it with new assembly.

CAUTION:
The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.

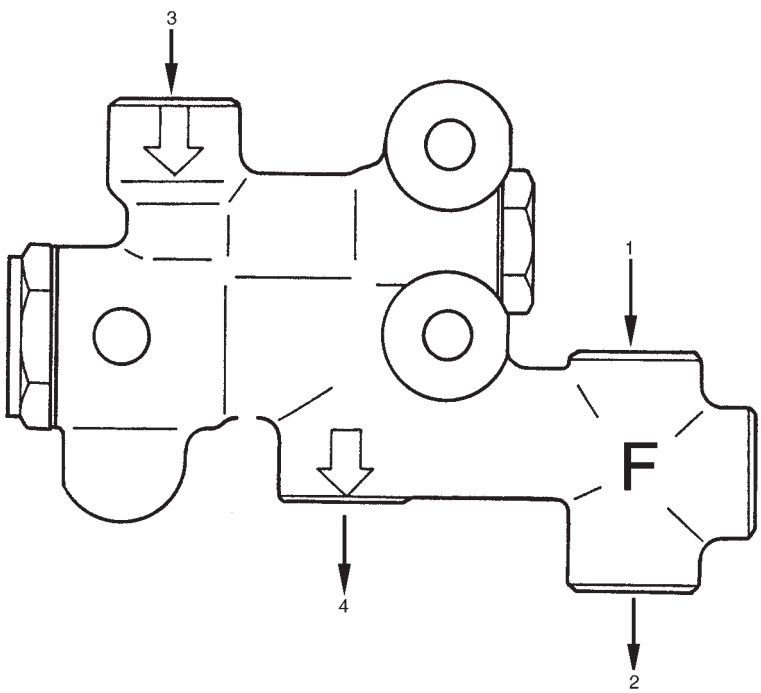


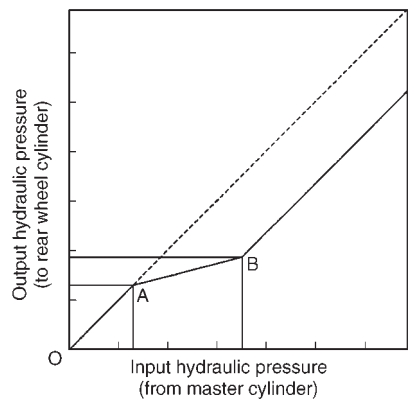
A. Brake pedal
B. Master cylinder
1. Booster No.1 body
2. Booster No.2 body
3. Valve operating rod
4. Air cleaner element
5. Air cleaner separator
6. Air valve spring retainer
7. Air valve return spring
8. Control valve spring retainer
9. Control valve spring
10. Booster control valve
11. Booster air valve
12. Booster piston
13. Valve stopper key
14. Booster diaphragm
15. Reaction disc
16. Booster piston return spring
17. Booster piston rod
18. Booster rod adjust screw

B.P. (BLEND PROPORTIONING) VALVE (If equipped with ABS)

The blend proportioning valve is included within the brake circuit which connects the master cylinder and the wheel brakes. It is installed on floor panel and controls the hydraulic pressure applied to the rear wheel brakes after predetermined pressure has been reached ("A" in figure below). And also it stops control of the rear brake pressure at the other predetermined pressure ("B" in figure).

CAUTION:
Never disassemble valve assembly. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



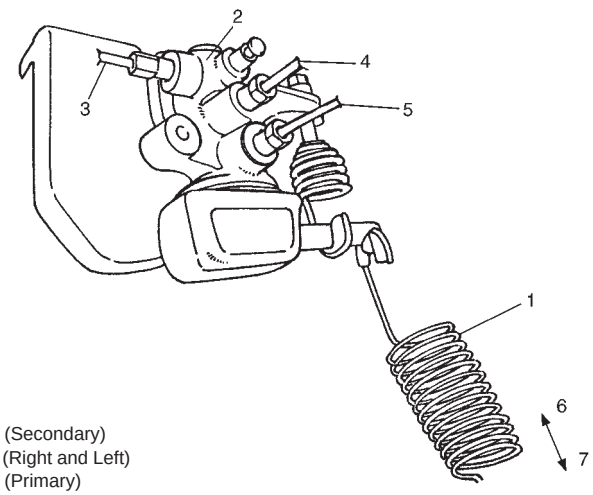


1. From master cylinder (Primary)
2. To ABS hydraulic unit
3. From master cylinder (Secondary)
4. To ABS hydraulic unit and rear wheel cylinders (right & left)

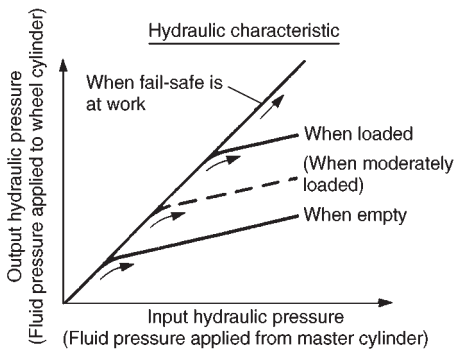
LSPV (Load Sensing Proportioning Valve) ASSEMBLY (If equipped)

As shown below, LSPV is included within the brake circuit which connects the master cylinder and the rear wheel brake. It controls the hydraulic pressure applied to the rear wheel brake according to the loaded state of the vehicle (or weight of the load), whereby preventing the rear wheels from getting locked prematurely. Also, it releases the above described control over the hydraulic pressure applied to the rear wheel brake, should any failure occur in the hydraulic circuit of the front wheel brake so that the hydraulic pressure produced in the master cylinder is applied to the rear wheel brake directly to operate it.

CAUTION:
Never disassemble LSPV. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



1. LSPV spring
2. LSPV assembly
3. From master cylinder (Secondary)
4. To rear wheel brakes (Right and Left)
5. From master cylinder (Primary)
6. Loaded
7. Empty



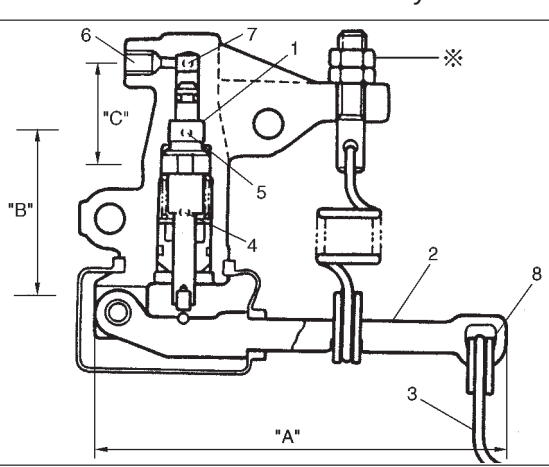
CONSTRUCTION

The LSPV components are grounded into 3 sections as follows.

"A": Sensor section
The main parts in this section are a lever and a spring which senses variation in the vehicle height as affected by the loaded condition and convert it into the load.

"B": Hydraulic pressure control section
Included in this section are a plunger and valve mechanism to execute proportional control.

"C": Fail-safe section
The main part in this section is a chamber which draws in the hydraulic pressure from the front wheel brake system and a fail-safe piston which releases the valve mechanism in the control section connected to the rear wheel brake, should any failure occur in the front wheel brake system.



1. Plunger
2. LSPV lever
3. Load sensing spring
4. From master cylinder primary chamber (Rear wheel brake)
5. To rear wheel brake
6. From master cylinder secondary chamber (Front wheel brake)
7. Bleeder plug
8. Collar

※ Never adjust

DIAGNOSIS

ROAD TESTING BRAKES

Brakes should be tested on dry, clean, smooth and reasonably level roadway which is not crowned. Road test brakes by making brake applications with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively.
Also drive vehicle to see if it leads to one side or the other without brake application. if it does, check the tire pressure, front end alignment and front suspension attachments for looseness. See diagnosis table for other causes.

BRAKE FLUID LEAKS

Check the master cylinder fluid levels. While a slight drop in reservoir level does result from normal lining wear, an abnormally low level indicates a leak in the system. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

SUBSTANDARD OR CONTAMINATED BRAKE FLUID

Improper brake fluid, mineral oil or water in the fluid may cause the brake fluid to boil or the rubber components in the hydraulic system to deteriorate.

If primary piston cups are swollen, then rubber parts have deteriorated. This deterioration may also be evidenced by swollen wheel cylinder piston cups on the drum brake wheels.

If deterioration of rubber is evident, disassemble all hydraulic parts and wash with alcohol. Dry these parts with compressed air before assembly to keep alcohol out of the system. Replace all rubber parts in the system, including hoses. Also, when working on the brake mechanisms, check for fluid on the linings. If excessive fluid is found, replace the pads.

If master cylinder piston seals are satisfactory, check for leakage or excessive heat conditions. If condition is not found, drain fluid, flush with brake fluid, refill and bleed system.

The system must be flushed if there is any doubt as to the grade of fluid in the system or if fluid has been used which contained parts that have been subjected to contaminated fluid.

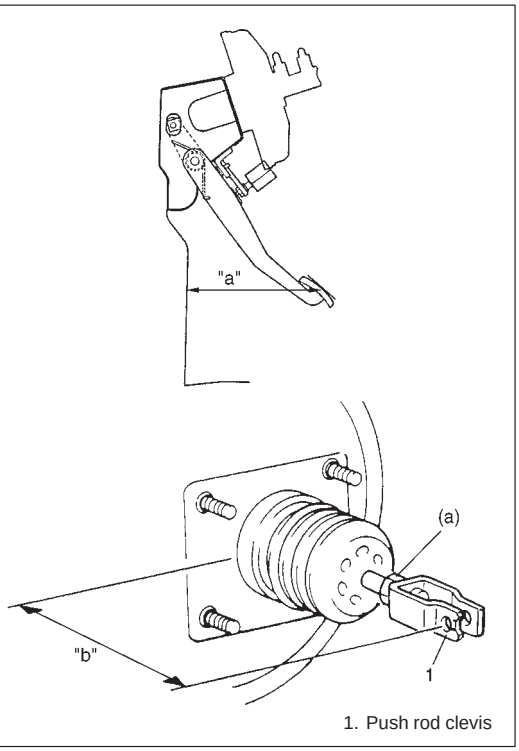
BRAKE DIAGNOSIS TABLE

Symptom	Possible Cause	Remedy
Not enough braking force	● Brake fluid leakage from brake lines.	Locate leaking point and repair.
	● Brake disc or pads stained with oil.	Clean or replace.
	● Overheated brakes.	Determine cause and repair.
	● Poor contact of shoes on brake drum.	Repair for proper contact.
	● Brake shoes linings stained with oil or wet with water.	Replace.
	● Badly worn brake pad linings.	Replace.
	● Defective wheel cylinders.	Repair or replace.
	● Malfunctioning caliper assembly.	Repair or replace.
	● Air in system.	Bleed system.
	● Maladjusted sensor spring length of LSPV (If equipped).	Check or adjust.
	● Broken sensor spring of LSPV (If equipped).	Replace.
	● Defective collar of LSPV (If equipped).	Replace.
	● Malfunctioning ABS (Anti-lock Brake System) (If equipped).	Check system referring to DIAGNOSIS of Section 5E.
	● Malfunctioning B.P. valve.	Replace.

Symptom	Possible Cause	Remedy
Brake pull (Brakes not working in unison)	● Pad linings and/or shoe linings are wet with water or stained with oil in some brakes.	Replace.
	● Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism)	Check for inoperative auto adjusting mechanism.
	● Disc and/or drum is out of round in some brakes.	Replace.
	● Wheel tires are inflated unequally.	Inflate equally.
	● Malfunctioning wheel cylinders.	Repair or replace.
	● Disturbed front end alignment.	Adjust as prescribed.
	● Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	● Restricted brake pipes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	● Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush. Caliper should slide.
	● Loose suspension parts.	Check all suspension mountings.
	● Loose calipers.	Check and torque bolts to specifications.
	● Maladjust brake booster push rod clevis.	Check or adjust.
Noise (high pitched squeak without brake applied)	● Front lining worn out.	Replace linings.
Rear brake locked prematurely (For vehicle equipped with LSPV)	● Maladjusted sensor spring length of LSPV.	Check or adjust.
	● Malfunctioning LSPV assembly.	Replace assembly.
Brake locked (For vehicle equipped with ABS)	● Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.
	● Malfunctioning B.P. valve.	Replace.

Symptom	Possible Cause	Remedy
Excessive pedal travel (Pedal stroke too large)	● Partial brake system failure.	Check brake systems and repair as necessary.
	● Insufficient fluid in master cylinder reservoirs.	Fill reservoirs with approved brake fluid. Check for leaks and air in brake systems. Check warning light. Bleed system if required.
	● Air in system (pedal soft/spongy).	Bleed system.
	● Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting mechanism. Adjust rear brakes.
	● Bent brake shoes.	Replace brake shoes.
	● Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all brakes immediately after pedal is released)	● Master cylinder pistons not returning correctly.	Repair master cylinder.
	● Restricted brake pipes or hoses.	Check for soft hoses or damaged pipes and replace with new hoses and/or new double-walled steel brake piping.
	● Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	● Weakened or broken return springs in the brake.	Replace.
	● Sluggish parking-brake cables or linkage.	Repair or replace.
	● Wheel cylinder or caliper piston sticking.	Repair as necessary.
	● Badly worn piston seal in the caliper.	Replace piston seal.
	● Malfunctioning ABS (Anti-lock Brake System).	Check system referring to DIAGNOSIS of Section 5E.
	● Maladjusted brake booster push rod clevis	Check or adjust
Pedal pulsation (Pedal pulsates when depressed for braking.)	● Damaged or loose wheel bearings.	Replace wheel bearings.
	● Distorted steering knuckle or rear wheel spindle.	Replace knuckle or rear wheel spindle.
	● Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine the disc.
	● Parallelism not within specifications.	Check per instructions. If not within specifications, replace or machine the disc.
	● Rear drums out of round.	Check runout. Repair or replace drum as necessary.

Symptom	Possible Cause	Remedy
Braking noise	● Glazed shoe linings, or foreign matters stuck to linings. ● Worn or distorted shoe linings. ● Loose front wheel bearings. ● Distorted backing plates or loose mounting bolts.	Repair or replace shoe linings. Replace shoe linings (or pads). Replace wheel bearing. Replace or retighten securing bolts.
Brake warning light turns on	● Parking brake applied. ● Insufficient amount of brake fluid. ● Brake fluid leaking from brake line. ● Brake warning light circuit faulty (shorted to ground).	Release parking brake and check that brake warning light turns off. Add brake fluid. Investigate leaky point, correct it and add brake fluid. Repair circuit.
Brake warning light fails to turn on even when parking brake is applied	● Brake warning light circuit faulty. ● Bulb burnt out.	Replace bulb or repair circuit. Replace.
ABS warning light won't turns on for 2 sec. after ignition switch has turned ON.	● Bulb burnt out. ● Malfunctioning ABS, if equipped with ABS.	Replace bulb. Check system referring to DIAGNOSIS of Section 5E.
ABS warning light remains on after ignition switch has turned on for 2 sec.	● Malfunctioning ABS, if equipped with ABS.	Check system referring to DIAGNOSIS of Section 5E.



1. Push rod clevis

CHECK AND ADJUSTMENT

BRAKE PEDAL FREE HEIGHT ADJUSTMENT

Check brake pedal free height (distance).
If it is not within specification, check and adjust following item 1) and 2).

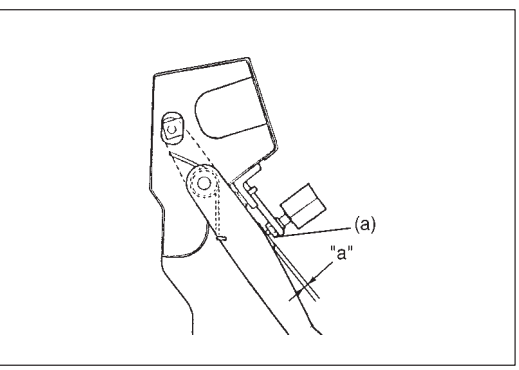
Brake pedal free distance "a"
from dash panel: 209–215 mm (8.23–8.46 in.) . . LHD vehicle
201–207 mm (7.90–8.15 in.) . . RHD vehicle

1) Check measurement between booster mounting surface and center of clevis pin hole. When booster push rod clevis has been reinstalled, it is important that the measurement is adjusted.

   Length "b": 99.5 – 100.5 mm (3.92 – 3.96 in.)

   Tightening Torque
   (a): 25 N·m (2.5 kg-m, 18.0 lb-ft)

2) Check stop light switch position. Adjust it if it is out of specification.

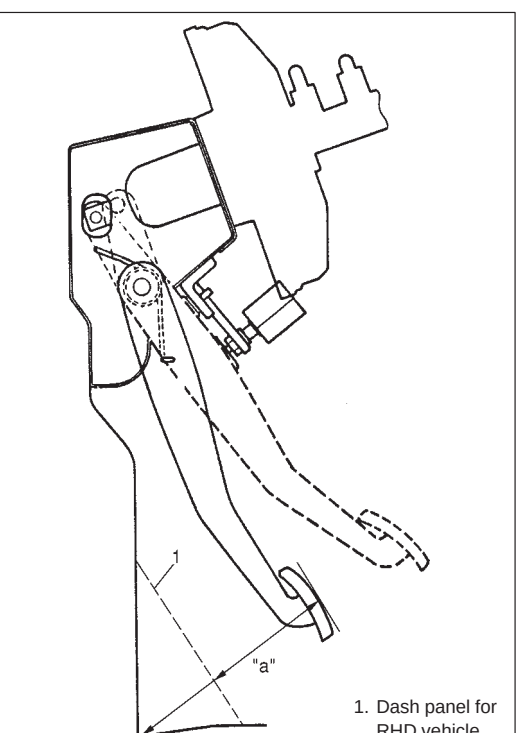


STOP LIGHT SWITCH ADJUSTMENT

Adjustment should be made as follows when installing switch. Pull up brake pedal toward you and while holding it there, adjust switch position so that clearance between end of thread and brake pedal is specified. Then tighten lock nut to specified torque.

Clearance "a": 1.5 – 2.0 mm (0.06 – 0.08 in.)

Tightening Torque
(a): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)



1. Dash panel for RHD vehicle

EXCESSIVE PEDAL TRAVEL CHECK

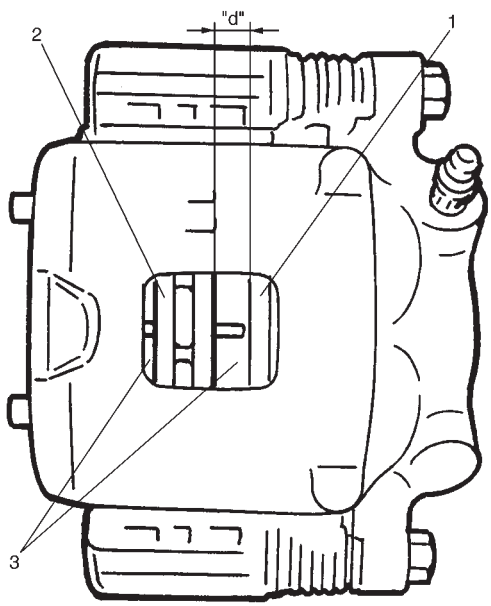
1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30kg (66 lbs) load, measure brake pedal to wall clearance "a".

   Clearance "a": Over 165 mm (6.50 in.) . . LHD vehicle
   Over 145 mm (3.71 in.) . . RHD vehicle

4) If clearance "a" is less than specification, the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines.
   Should clearance "a" remain less than specification even after replacement of brake shoes and bleeding of system, other possible but infrequent causes are malfunction or misadjusted of rear brake shoe adjusters or booster push rod length out of adjustment.
   - Refer to BLEEDING BRAKES for bleeding brake system.
   - Remove brake drums for adjuster inspection, (refer to BRAKE DRUM INSPECTION.) If defective, correct or replace.

FRONT BRAKE DISC CHECK

Refer to BRAKE PAD INSPECTION of this section for inspection point and procedure.



1. Pad rim
2. Disc
3. Lining

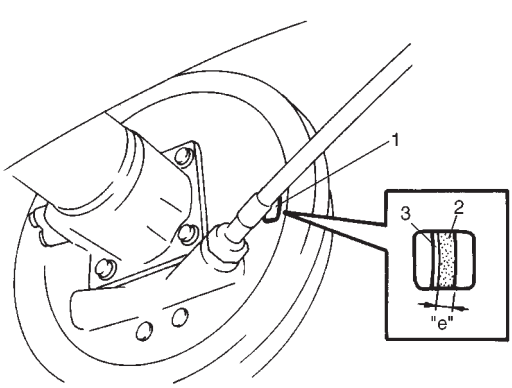
FRONT BRAKE PAD LINING CHECK

Inspect pad linings periodically according to maintenance schedule whenever wheels are removed (for tire rotation or other reason). Take a look through each end (or hole) of caliper and check lining thickness of outside and inside pads.
If lining is worn and its thickness ("d" in figure) is less than limit, all pads must be replaced at the same time.

Thickness "d"

Service limit: 1.5 mm (0.06 in.)

1. Rubber plug
2. Brake lining
3. Brake shoe rim

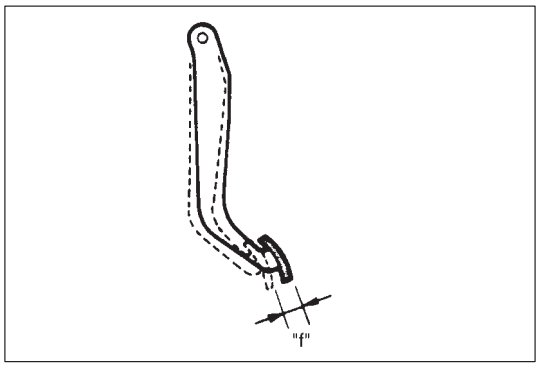


REAR BRAKE SHOE CHECK

Inspection should be carried out on following points after brake pedal travel (pedal to wall clearance) check, even when pedal travel is normal.
Amount of brake shoe wear can be checked as follows.

1) Hoist vehicle.
2) Remove rubber plug from brake back plate.
3) Through hole of back plate, visually check for thickness of brake shoe lining. If lining thickness "e" is found less than limit, replace all shoes with new ones at the same time.

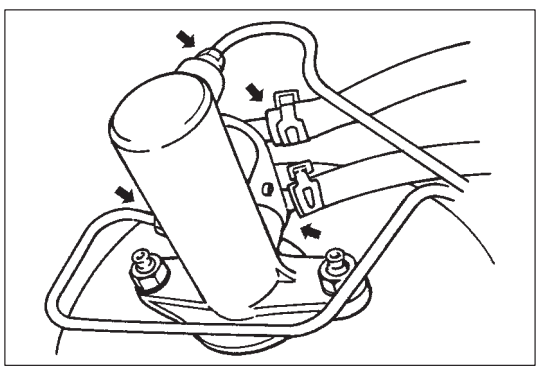
   Thickness "e"
   Service limit: 1.0 mm (0.04 in.)



BRAKE PEDAL PLAY CHECK

Pedal play should be within specification below.
If out of specification, check stop light switch for proper installation position and adjust if necessary.
Also check pedal shaft bolt and master cylinder pin installation for looseness and replace if defective.

Pedal play "f": 1 – 8 mm (0.04 – 0.31 in.)

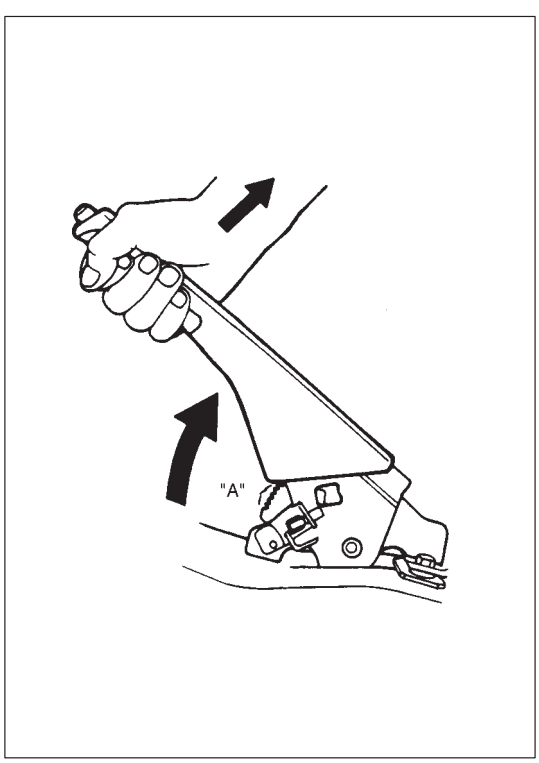


MASTER CYLINDER CHECK

Check master cylinder casting for crack or fluid leak. Leaks are indicated only if there is at least a drop of fluid. A damp condition is not normal.

REAR DRUM BRAKE SHOE ADJUSTMENT

Rear brake has self-adjusting mechanism but it does require adjustment for proper drum to shoe clearance when brake shoe has been replaced or brake drum has been removed for some other service.
Adjustment is automatically accomplished by depressing brake pedal about 30 times with approximately 30kg (66 lbs) load after all parts are installed.
Then check brake drum for dragging and brake system for proper performance. After lowering vehicle from hoist, brake test should be performed.



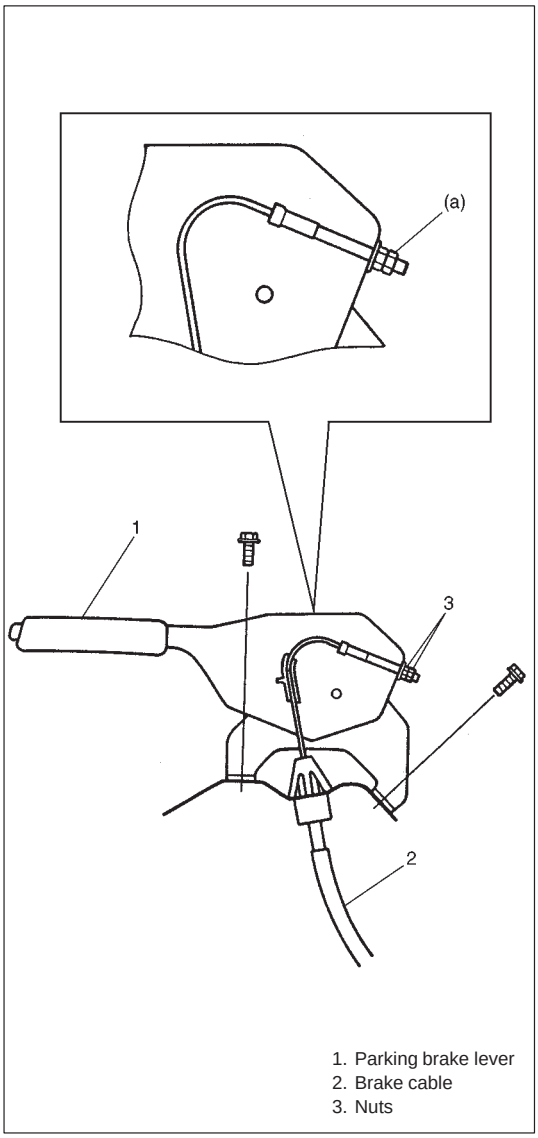
PARKING BRAKE CHECK AND ADJUSTMENT

CHECK

Hold center of parking brake lever grip and pull it up with 20 kg (44 lbs) force.
With parking brake lever pulled up as above, count ratchet notches in "A" as shown in figure.
There should be 8 to 11 notches.
Also, check if both right and left rear wheels are locked firmly. To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake level without pressing its button. One click sound corresponds to one notch.

If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following steps so as to obtain specified parking brake stroke.

NOTE:
Check tooth tip of each notch for damage or wear. If any damage or wear is found, replace parking brake lever.



1. Parking brake lever
2. Brake cable
3. Nuts

ADJUSTMENT

NOTE:
Make sure for the following conditions before cable adjustment.

- **No air is trapped in brake system.**
- **Brake pedal travel is proper.**
- **Brake pedal has been depressed a few times with about 30 kg (66 lbs) load.**
- **Parking brake lever has been pulled up a few times with about 20 kg force.**
- **Rear brake shoes are not worn beyond limit.**

After confirming that above 5 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening parking brake nuts (3 in left figure).

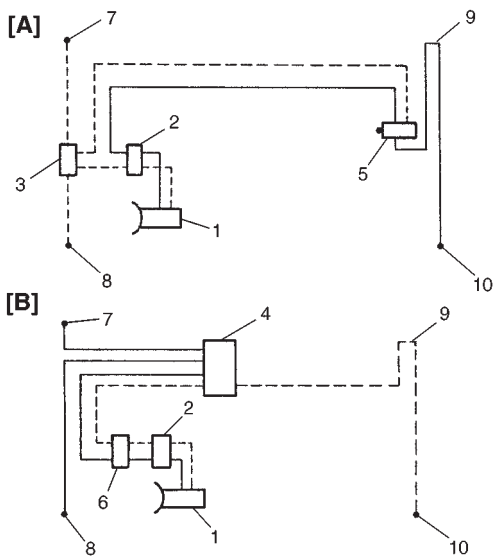
Tightening Torque
(a) : 6 N·m (0.6 kg-m, 4.5 lb-ft)

NOTE:
Check brake drum for dragging after adjustment.

Parking brake stroke: when lever is pulled up at 20 kg (44 lbs)	Within 8 – 11 notches

FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in hydraulic system.
Periodical change of brake fluid is also recommended.



1. Master cylinder
2. 4-way joint
3. 4-way cross joint
4. ABS actuator
5. LSPV
6. Blend proportioning valve
7. Right brake caliper
8. Left brake caliper
9. Right wheel cylinder
10. Left wheel cylinder

[A] : Without ABS
[B] : With ABS

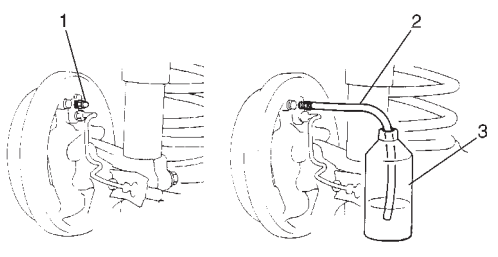
BLEEDING BRAKES

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:
Before performing bleeding operation, make sure that ABS warning light turns off after ignition switch has turned on (for vehicle equipped with ABS).

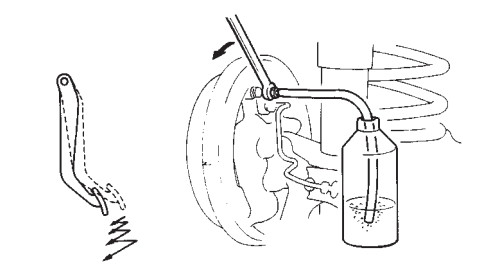
Bleeding operation is necessary to remove air whenever it entered hydraulic brake system.

Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. When a brake pipe or hose was disconnected at the wheel, bleeding operation must be performed at both ends of the line of the removed pipe or hose. When any joint part of the master cylinder of other joint part between the master cylinder and each brake (wheel) was removed, the hydraulic brake system must be bled at right and left brake caliper, left wheel cylinder and LSPV (if equipped).



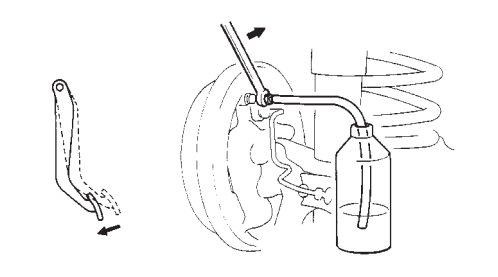
1. Plug cap
2. Vinyl tube (See-through tube)
3. Container

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.
   Attach a vinyl tube to bleeder plug, and insert the other end into container.



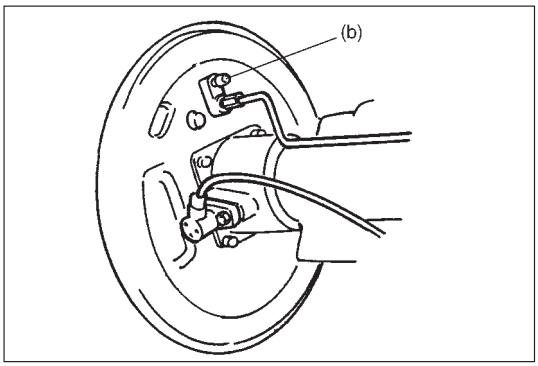
Depress brake pedal several times and with pedal depressed, loosen bleeder plug a little.

3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.



With brake pedal depressed, retighten bleeder plug.

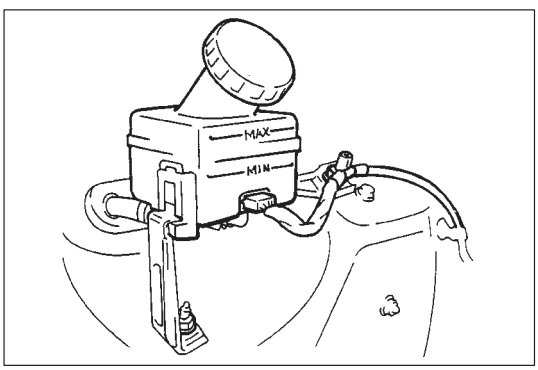
4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug.
5) Repeat this operation until there are no more air bubbles in hydraulic line.



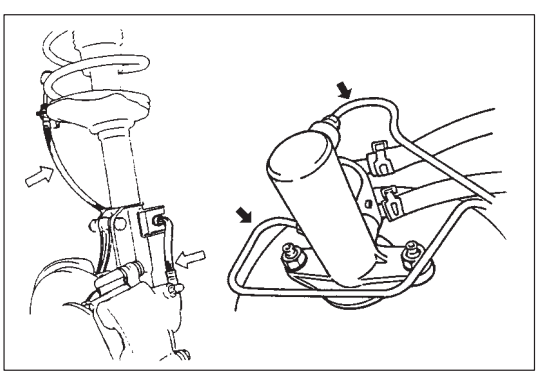
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

Tightening Torque
(b): 7.5 N·m (0.75 kg-m, 5.5 lb-ft) . For Rear brake, LSPV
11 N·m (1.1 kg-m, 8.0 lb-ft) . . . For Front brake

7) Then attach bleeder plug cap.
8) After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.



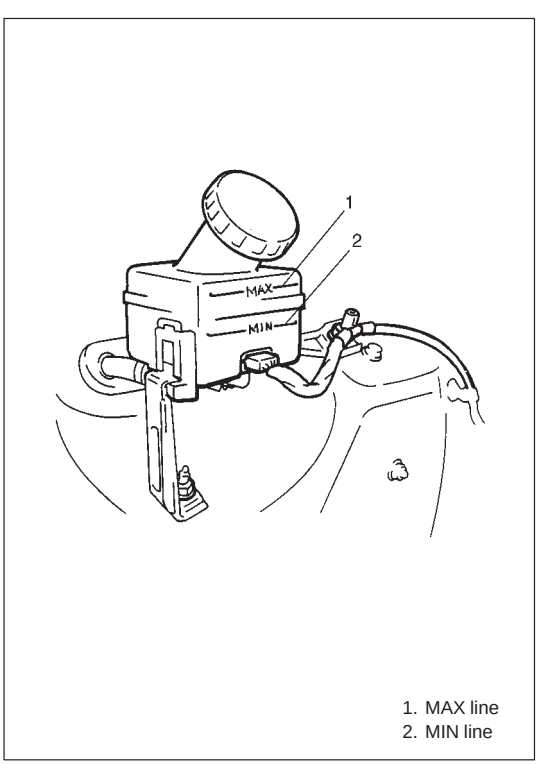
9) Replenish fluid into reservoir up to specified level.
10) Check brake pedal for “sponginess”. If found spongy, repeat entire procedure of bleeding.



BRAKE HOSE AND PIPE CHECK

The brake hose assembly should be checked for road hazard damage, for cracks and chafing of the outer cover, for leaks and blisters. A light and mirror may be needed for an adequate inspection. If any of the above conditions are observed on the brake hose, it is necessary to replace it.

Inspect the pipe for damage, cracks, dents and corrosion. If any defect is found, replace it.



1. MAX line
2. MIN line

BRAKE FLUID LEVEL CHECK

Be sure to use particular brake fluid either as indicated on reservoir cap of that vehicle or recommended in owner’s manual which comes along with that vehicle.
Use of any other fluid is strictly prohibited.
Fluid level should be between MIN and MAX lines marked on reservoir.
When warning light lights sometimes during driving, replenish fluid to MAX line.
When fluid decreases quickly, inspect brake system for leakage. Correct leaky points and then refill to specified level.

CAUTION:
Do not use shock absorber fluid or any other fluid which contains mineral oil. Do not use a container which has been used for mineral oil or a container which is wet from water. Mineral oil will cause swelling and distortion of rubber parts in hydraulic brake system and water mixed into brake fluid will lower fluid boiling point. Keep all fluid containers capped to prevent contamination.

BOOSTER OPERATION CHECK

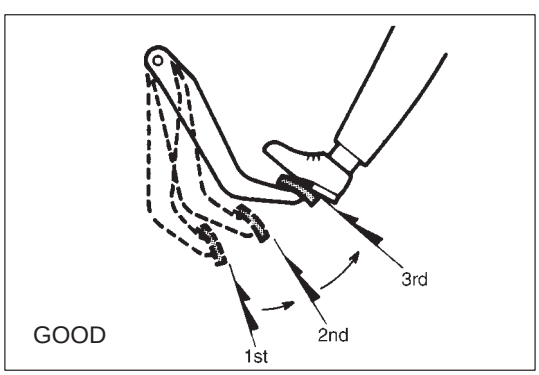
There are two ways to perform this inspection, with and without a tester. Ordinarily, it is possible to roughly determine its condition without using a tester.

NOTE:
For this check, make sure that no air is in hydraulic line.

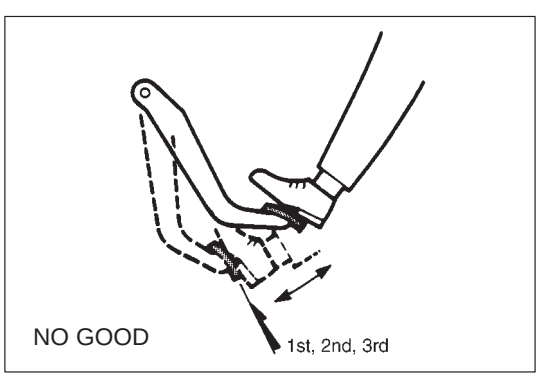
INSPECTION (WITHOUT TESTER)

Check Air Tightness

1) Start engine.
2) Stop engine after running for 1 to 2 minutes.

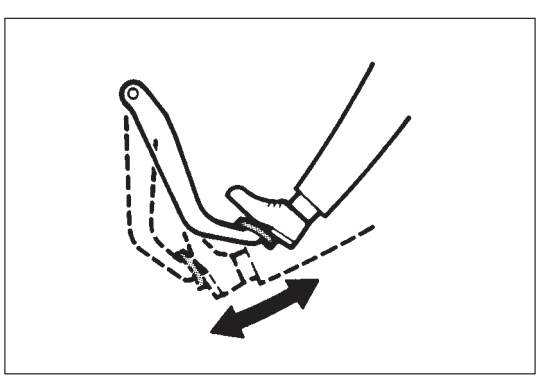


3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep at the first time but its travel decreases as it is depressed the second and more times, air tightness is obtained.



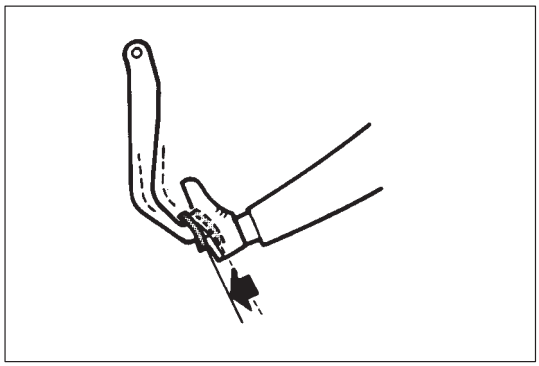
4) If pedal travel doesn't change, air tightness isn't obtained.

   NOTE:
   If defective, inspect vacuum lines and sealing parts, and replace any faulty part.
   When this has been done, repeat the entire test.

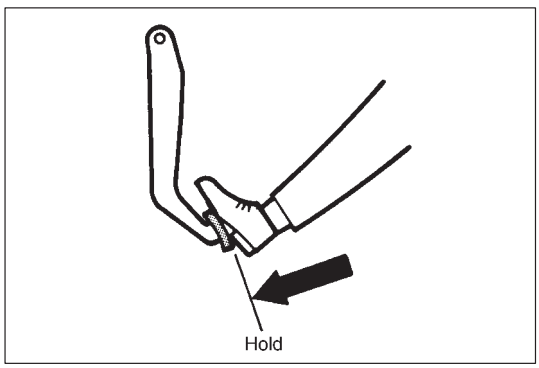


Check Operation

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel doesn't change.

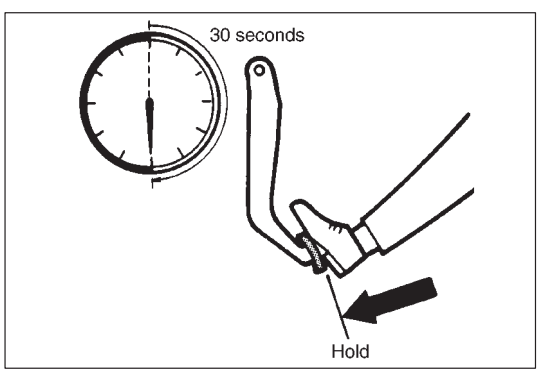


2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.

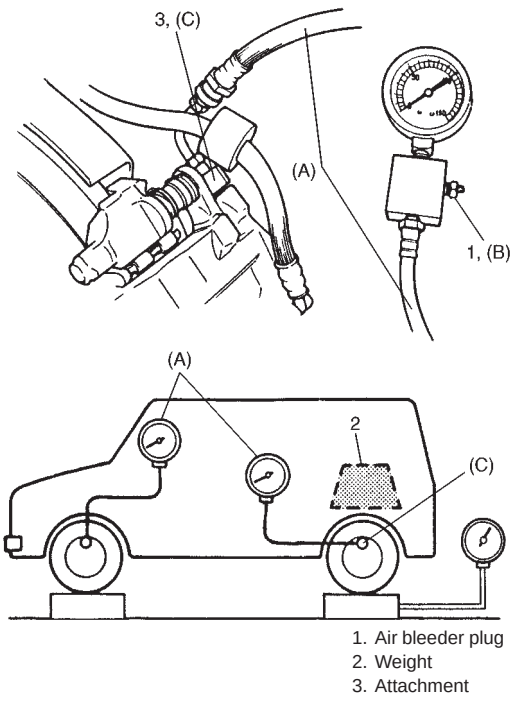


Check Air Tightness Under Load

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it isn't if pedal rises.



FLUID PRESSURE TEST (if equipped with LSPV)

Test procedure for LSPV assembly is as follows.
Before testing, confirm the following.

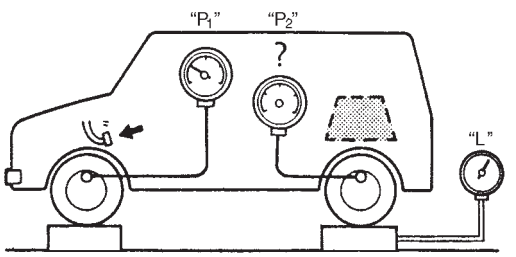
- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.

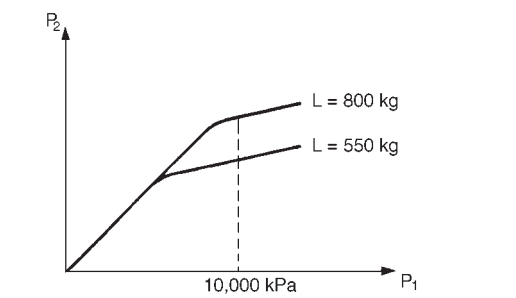
1) Install pressure gauges to front and rear brake.

NOTE:
Pressure gauge should be connected to bleeder plug hole of front (driver's side brake) and rear brakes.

Special Tool
(A) : 09956-02310
(B) : 55473-82030 (Bleeder plug (10 mm) supplied as a spare part)
(C) : 09952-46520 (Attachment for rear wheel cylinder)

NOTE:
Special tool (C) is used instead of thread diameter 10mm attachment included in special tool (A). So remove the attachment from (A) and install (C) for pressure gauge used for rear brake. For front brake caliper, install special tool (A) without changing its attachment.





2) Place weight (about 90 – 130 kg (200 – 285 lb)) slowly on rear floor (axle housing center) so that rear axle weight is measured as specified.
Depress brake pedal gradually till fluid pressure of front brake becomes as specified below and check corresponding pressure of rear brake then. It should be within specification given below.

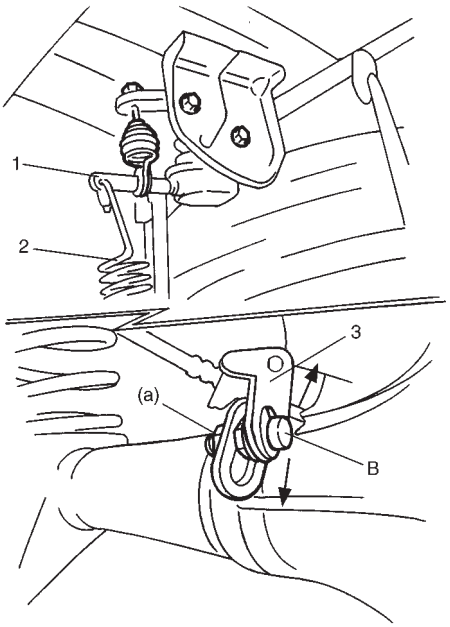
Front brake line pressure "P_1" : 10,000 kPa (100 kg/cm^2, 1,422psi)
Rear axle weight "L" : 550 kg (1,213 lb)

	Rear brake "P_2"
VAN model	4,000 – 5,400 kPa 40 – 54 kg/cm^2 569 – 768 psi
TRUCK model	4,900 – 6,300 kPa 49 – 63 kg/cm^2 697 – 896 psi

As done above, add weight (about 250 kg (550lb)) so that rear axle weight is as specified, and check that rear brake pressure is within specification as given below.

Rear axle weight "L" : 800 kg (1,764 lb)

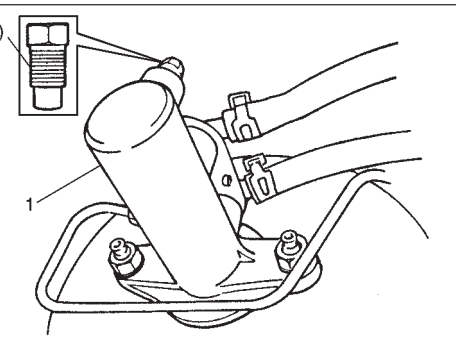
	Rear brake "P_2"
VAN model	5,300 – 6,700 kPa 53 – 67 kg/cm^2 754 – 953 psi
TRUCK model	5,900 – 7,300 kPa 59 – 73 kg/cm^2 839 – 1,038 psi



1. LSPV lever
2. LSPV spring
3. LSPV stay

3) If rear brake pressure is not within specification, adjust it by changing bolt B tightening position as follows.
   - If rear brake pressure is higher than specification, move bolt B (LSPV stay) downward and if it is lower, upward.
   - Repeat steps 2) and 3) until rear brake pressure is within specification.
   - After adjustment, be sure to torque nut to specification.

   Tightening Torque
   (a) : 23 N·m (2.3 kg-m, 17 lb-ft)



1. Master cylinder

4) Disconnect brake pipe (connecting between master cylinder and 4-way cross joint) from master cylinder.
   Attach plug (special tool) to master cylinder as shown in left figure.

   Special Tool
   (A) : 09956-02210

   Depress brake pedal. If rear brake pressure is 95 – 100 kg/cm^2 when front brake pressure is 100 kg/cm^2, it means that front fail-safe system functions properly.

Front brake	Rear brake
10,000 kPa 100 kg/cm^2 1,422 psi	9,500 – 10,000 kPa 95 – 100 kg/cm^2 1,350 – 1,422 psi

5) Upon completion of fluid pressure test, bleed brake system and perform brake test.

ON-VEHICLE SERVICE

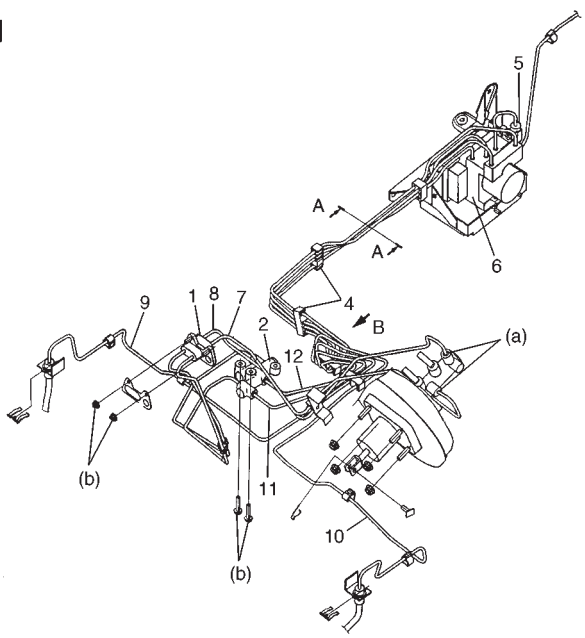
FRONT BRAKE HOSE/PIPE

REMOVAL AND INSTALLATION

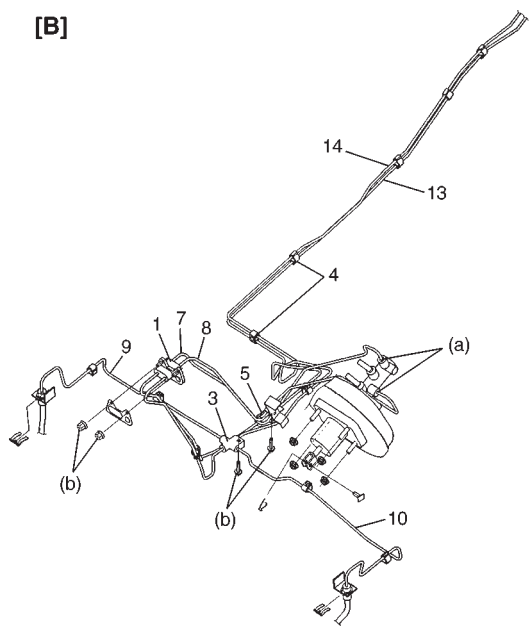
1) Raise and support vehicle properly. Remove wheel.
   This operation is not necessary when removing pipes connecting master cylinder and P valve.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings. Remove brake flexible hose or pipe.
3) Reverse brake flexible hose installation procedure.
   For installation, make sure that steering wheel is in straightforward position and flexible hose has not twist or kink. Check to make sure that flexible hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check installed part for fluid leakage.

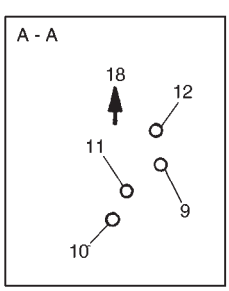
For left-steering vehicle

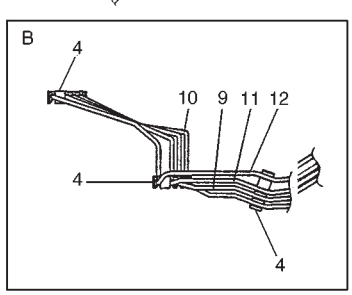
[A]



[B]







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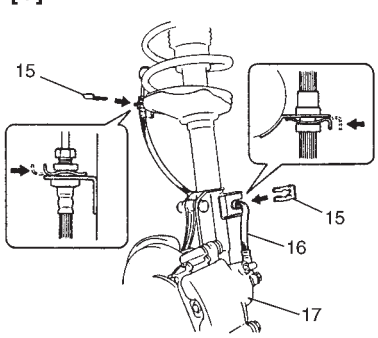
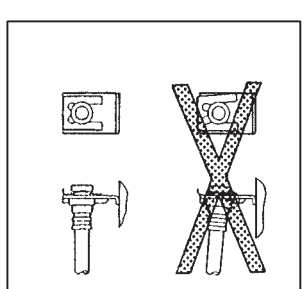




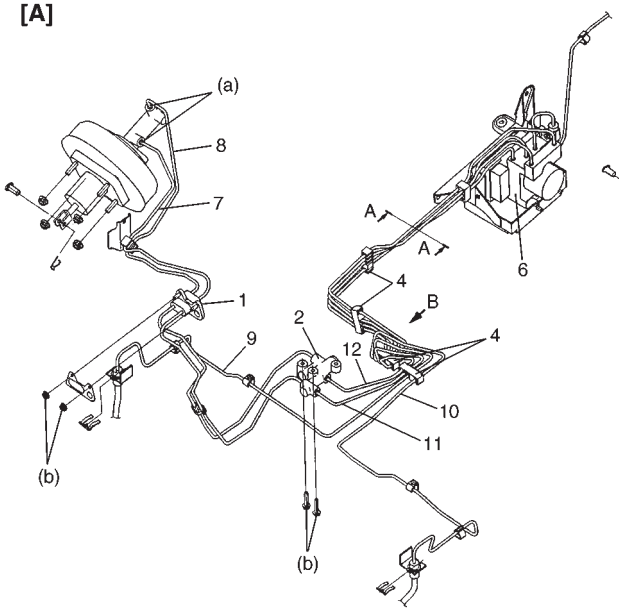
1. 4-way joint
2. Blend proportioning valve (B.P valve)
3. 4-way cross joint
4. Clamp
5. 2-way joint
6. ABS actuator
7. From master cylinder (Primary) to 4-way joint
8. From master cylinder (Secondary) to 4-way joint
9. To front brake (Right)
10. To front brake (Left)
11. From B.P valve to ABS actuator (Primary)
12. From B.P valve to ABS actuator (Secondary)
13. To rear brake or LSPV
14. From 4-way cross joint to LSPV
15. E-ring
16. Flexible hose
17. Brake caliper
18. Up side

[A] : For vehicle with ABS
[B] : For vehicle without ABS
[C] : For front brake flexible hose clamp

Tightening Torque
(a) : 16 N·m (1.6 kg-m, 12.0 lb-ft)
(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

For right-steering vehicle

[A]



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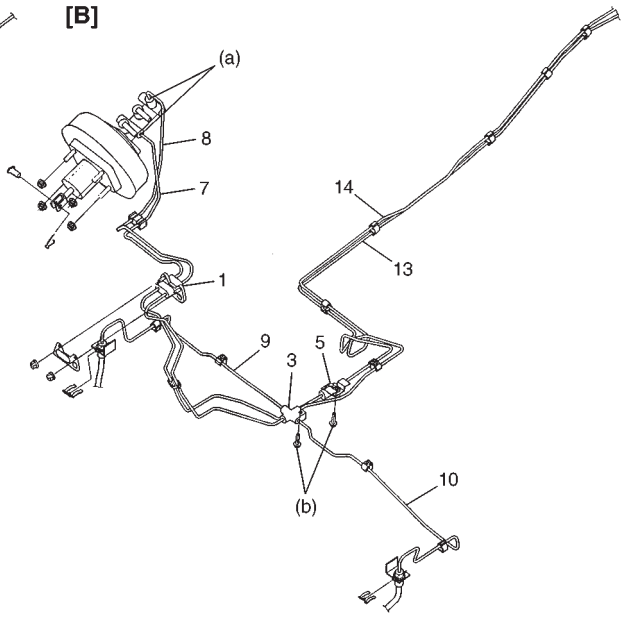
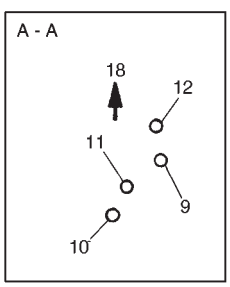
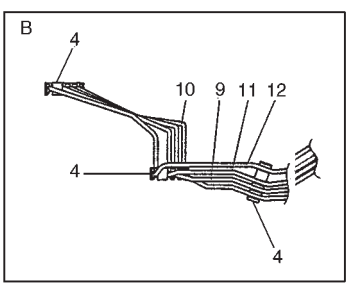
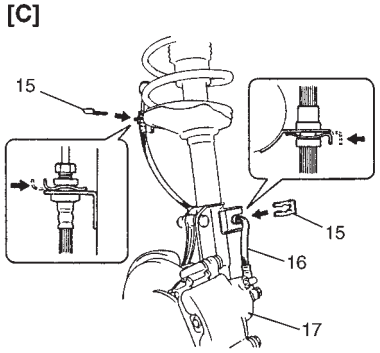
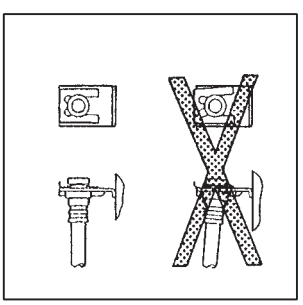






[C]





1. 4-way joint
2. Blend proportioning valve (B.P valve)
3. 4-way cross joint
4. Clamp
5. 2-way joint
6. ABS actuator
7. From master cylinder (Primary) to 4-way joint
8. From master cylinder (Secondary) to 4-way joint
9. To front brake (Right)
10. To front brake (Left)
11. From B.P valve to ABS actuator (Primary)
12. From B.P valve to ABS actuator (Secondary)
13. To rear brake or LSPV
14. From 4-way cross joint to LSPV
15. E-ring
16. Flexible hose
17. Brake caliper
18. Up side

[A] : For vehicle with ABS
[B] : For vehicle without ABS
[C] : For front brake flexible hose clamp

Tightening Torque
(a) : 16 N·m (1.6 kg-m, 12.0 lb-ft)
(b) : 11 N·m (1.1 kg-m, 8.0 lb-ft)

REAR BRAKE HOSE/PIPE

REMOVAL AND INSTALLATION

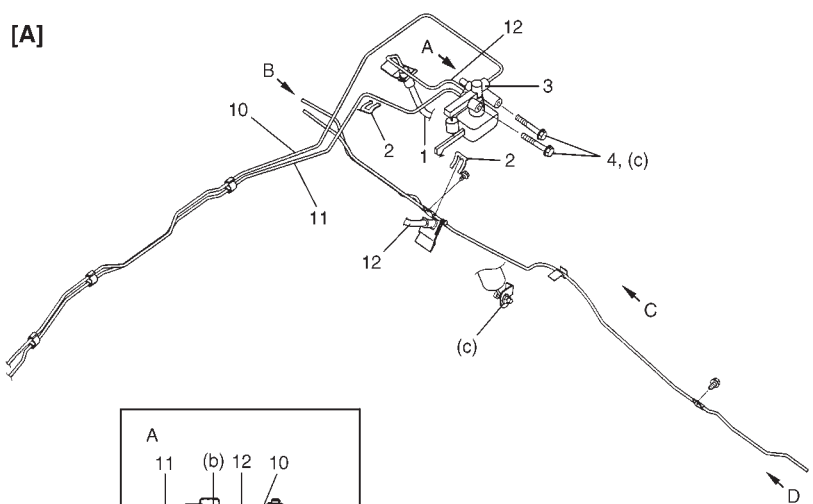
1) Raise and support vehicle properly. Remove wheel.
2) Clean dirt and foreign material from both flexible hose end and pipe end fittings. Remove brake flexible hose or pipe.
3) Reverse brake flexible hose installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check each installed part for fluid leakage.

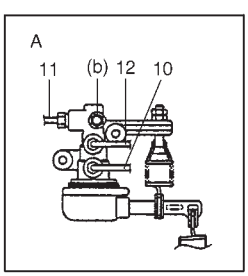
PRECAUTION FOR INSTALLATION

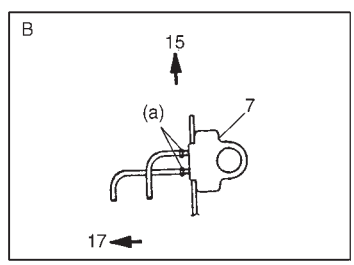
- Never reuse protector nut once removed. Be sure to use a new one.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.

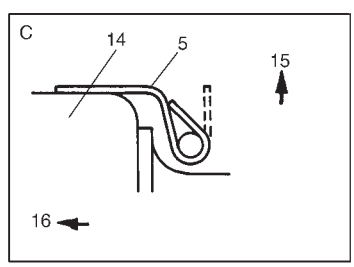
For VAN model

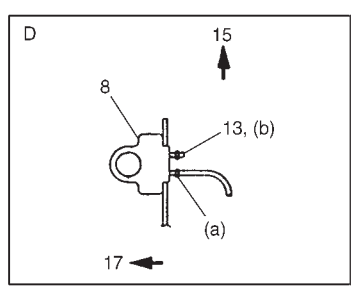
[A]











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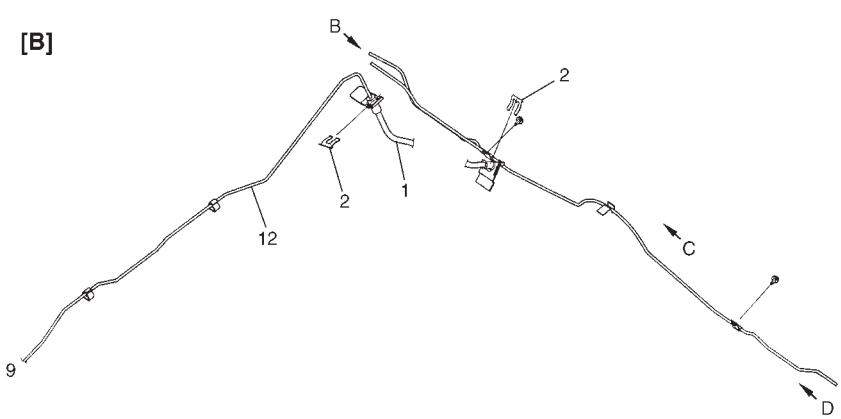
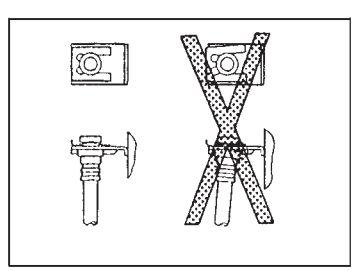


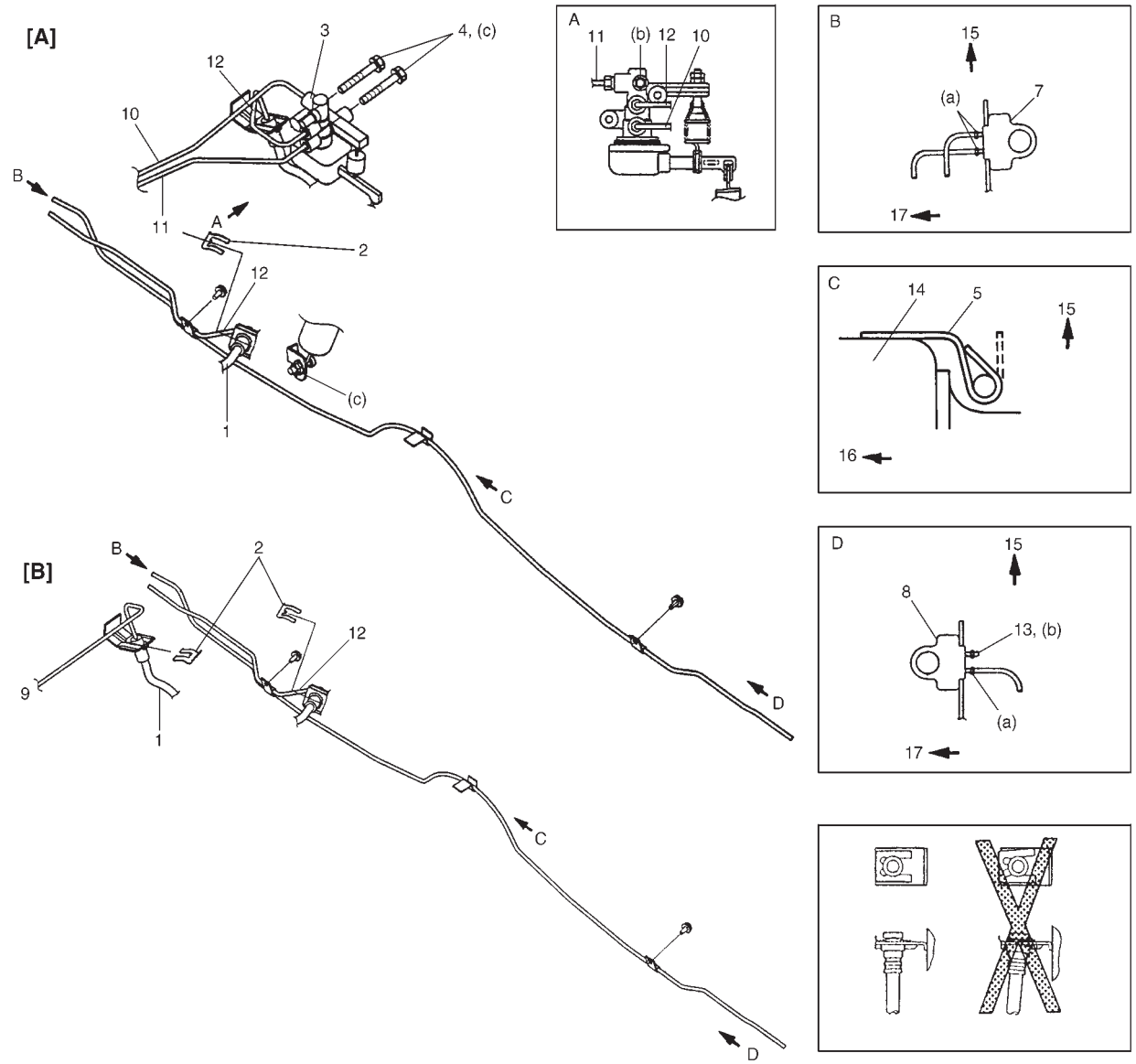


1. Flexible hose
2. E-ring
3. LSPV
4. LSPV bolt
5. Clamp
6. Tapping screw
7. Wheel cylinder (Right)
8. Wheel cylinder (Left)
9. From ABS actuator
10. From master cylinder (Primary)
11. From master cylinder (Secondary)
12. To wheel cylinder
13. Bleeder plug
14. Rear axle
15. Up side
16. Front side
17. Left side

[A] : For vehicle without ABS
[B] : For vehicle with ABS

Tightening Torque
(a) :16 N·m (1.6 kg-m, 12.0 lb-ft)
(b) :7.5 N·m (0.75 kg-m, 5.5 lb-ft)
(c) :23 N·m (2.3 kg-m, 17.0 lb-ft)

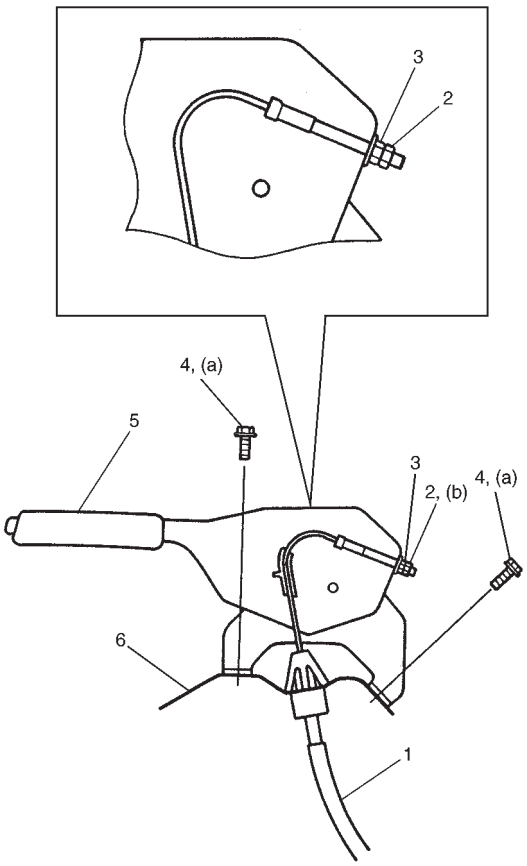
For TRACK model



1. Flexible hose
2. E-ring
3. LSPV
4. LSPV bolt
5. Clamp
6. Tapping screw
7. Wheel cylinder (Right)
8. Wheel cylinder (Left)
9. From ABS actuator
10. From master cylinder (Primary)
11. From master cylinder (Secondary)
12. To wheel cylinder
13. Bleeder plug
14. Rear axle
15. Up side
16. Front side
17. Left side

[A] : For vehicle without ABS
[B] : For vehicle with ABS

Tightening Torque
(a) : 16 N·m (1.6 kg-m, 12.0 lb-ft)
(b) : 7.5 N·m (0.75 kg-m, 5.5 lb-ft)
(c) : 23 N·m (2.3 kg-m, 17.0 lb-ft)



1. Parking brake cable
2. Parking cable locking nut
3. Parking cable adjusting nut
4. Parking brake lever bolt
5. Parking brake lever assembly
6. Center member

PARKING BRAKE LEVER

REMOVAL

1) Remove console box.
2) Disconnect lead wire of parking brake switch at coupler.

NOTE:
Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.

3) Release parking brake lever and remove parking brake cable nuts.
4) Remove parking brake lever bolts.

INSTALLATION

1) Install in reverse order of steps 2) to 4) of REMOVAL.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(b): 6 N·m (0.6 kg-m, 4.5 lb-ft)

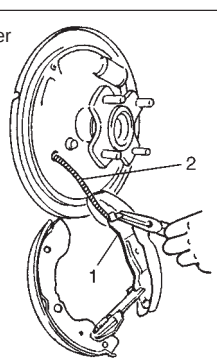
2) Adjust parking brake lever. Refer to PARKING BRAKE CHECK AND ADJUSTMENT in this section.
3) Check rear brakes for dragging and brake system for proper performance.
4) Install console box.

PARKING BRAKE CABLE

REMOVAL

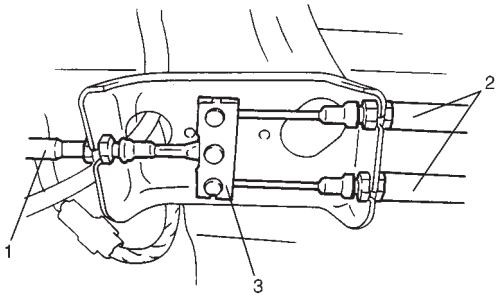
1) Remove cable from parking brake lever. (Refer to steps 1) and 3) of PARKING BRAKE LEVER REMOVAL.)
2) Remove brake drum. (Refer to steps 5) to 6) of BRAKE DRUM REMOVAL of this section.)

1. Parking brake shoe lever
2. Parking brake cable



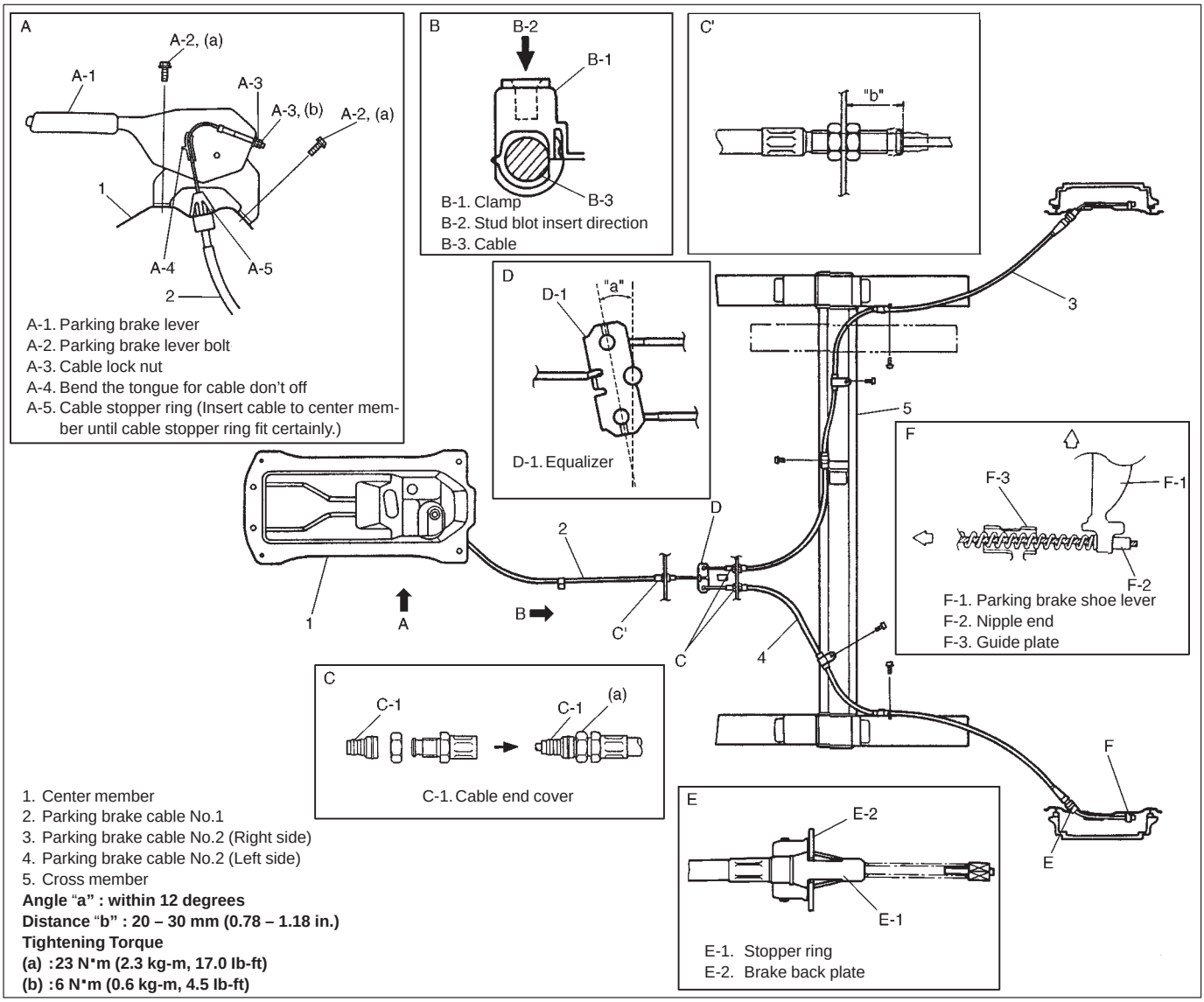
3) Remove shoe hold down springs and disconnect parking brake cable from brake shoe lever. (Refer to step 2) & 4) of BRAKE SHOE REMOVAL of this section.)
4) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL.)

NOTE:
When it is necessary to remove both right and left parking brake cable, repeat above steps 2) to 4) on right and left wheels.



1. Parking brake cable No.1
2. Parking brake cable No.2
3. Equalizer

5) Remove cable from vehicle body.



A-1. Parking brake lever
A-2. Parking brake lever bolt
A-3. Cable lock nut
A-4. Bend the tongue for cable don't off
A-5. Cable stopper ring (Insert cable to center member until cable stopper ring fit certainly.)

B-1. Clamp
B-2. Stud blot insert direction
B-3. Cable

D-1. Equalizer

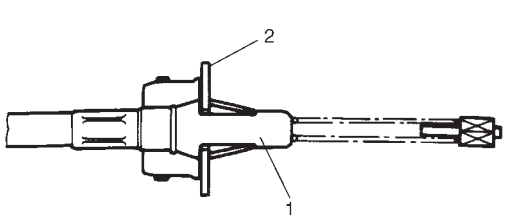
F-1. Parking brake shoe lever
F-2. Nipple end
F-3. Guide plate

C-1. Cable end cover

E-1. Stopper ring
E-2. Brake back plate

1. Center member
2. Parking brake cable No.1
3. Parking brake cable No.2 (Right side)
4. Parking brake cable No.2 (Left side)
5. Cross member

Angle "a" : within 12 degrees
Distance "b" : 20 – 30 mm (0.78 – 1.18 in.)
Tightening Torque
(a) :23 N•m (2.3 kg-m, 17.0 lb-ft)
(b) :6 N•m (0.6 kg-m, 4.5 lb-ft)



1. Stopper ring
2. Brake back plate

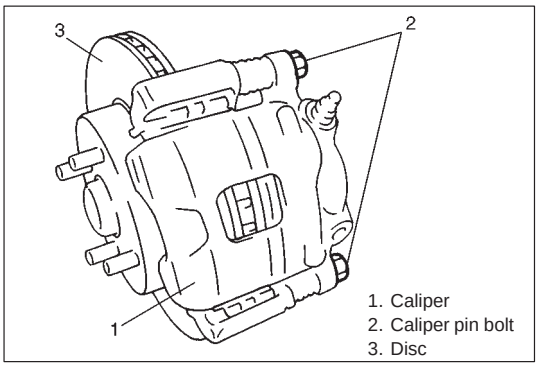
INSTALLATION

1) Install parking brake cable to brake back plate as shown in figure.

2) Connect cable to brake shoe lever and install brake shoes to back plate. (Refer to steps 1) to 3) of BRAKE SHOE INSTALLATION of this section.)
3) Install brake drum. (Refer to steps 1) to 2) of BRAKE DRUM INSTALLATION of this section.)
4) Connect cable to parking brake lever (Refer to step 1) of PARKING BRAKE LEVER INSTALLATION of this section.
   Don't make lever adjustment at this point yet.

   NOTE:
   Above steps 1) to 3) must be performed on both right and left wheels.

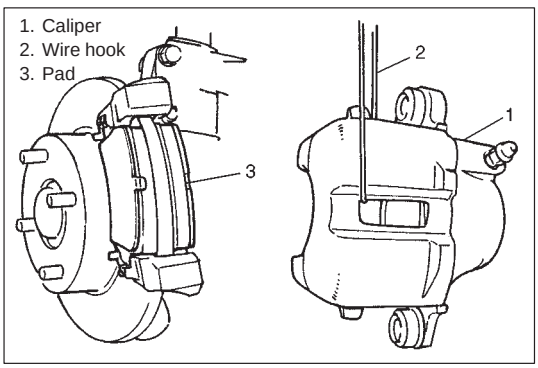
5) Clamp cable securely by referring to figure.
6) Upon completion of installation, adjust cable.
   (Refer to PARKING BRAKE CHECK AND ADJUSTMENT of this section.)
   Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.



BRAKE PAD

REMOVAL

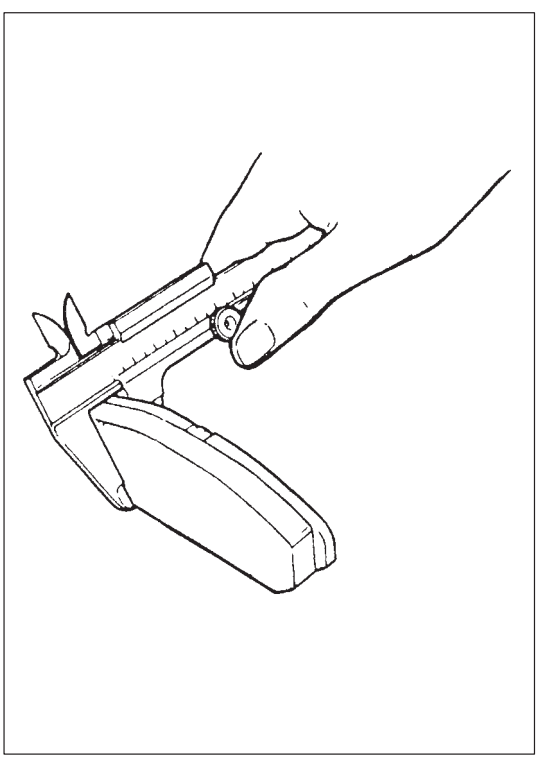
1) Hoist vehicle and remove wheel.
2) Remove caliper pin bolt.



3) Remove caliper from caliper carrier.

NOTE:
Hang removed caliper with a wire hook or the like so as to prevent brake flexible hose from bending and twisting excessively or being pulled.
Don't operate brake pedal with pads removed.

4) Remove pads.



INSPECTION

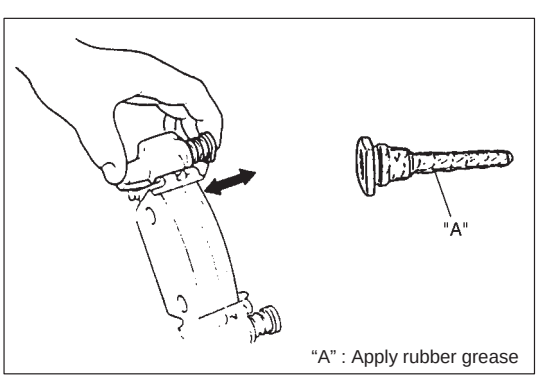
Brake Pad

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 + pad rim)
Standard : 15 mm (0.59 in.)
Limit : 6.5 mm (0.26 in.)

NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.

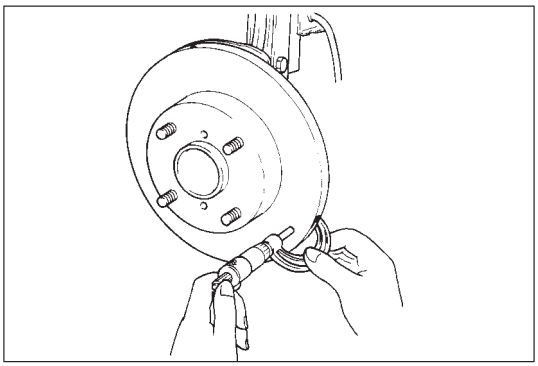


Cylinder Slide Pin

Check slide pin for smooth movement as shown.
If it is found faulty, correct or replace. Apply rubber grease to slide pin outer surface. Rubber grease should be the one whose viscosity is less affected by such low temperature as – 40°C (– 40°F).

Dust Boot

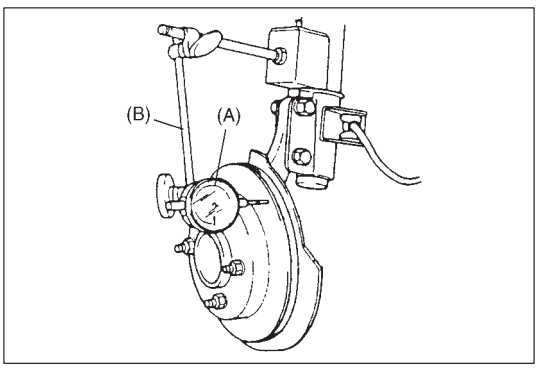
Check boot for breakage, crack and damage. If defective, replace



Brake Disc

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
Standard : 17.0 mm (0.669 in.)
Limit : 15.0 mm (0.591 in.)

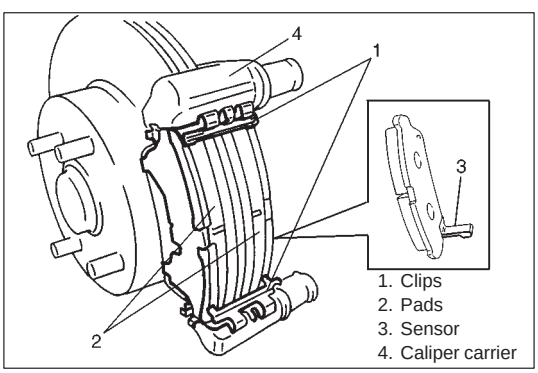


Use wheel nuts to hold the disc securely against the hub, then mount a dial indicator as shown.
To measure deflection of disc, take measurement at 2 points on its periphery and center with dial gauge while rotating it.

Limit on disc deflection: 0.15 mm (0.006 in.)

Special Tool
(A): 09900-20606
(B): 09900-20701

NOTE:
Check front wheel bearing for looseness before measurement.

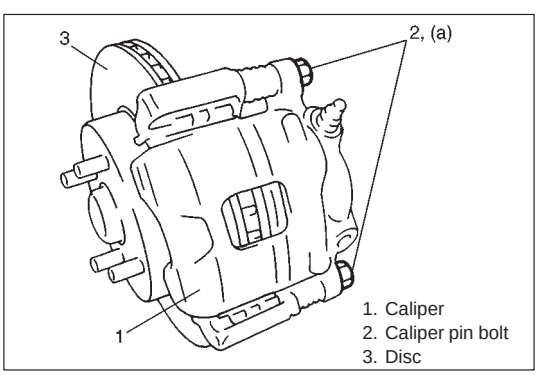


INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install shims to pads, then pad clips and pads to caliper carrier.

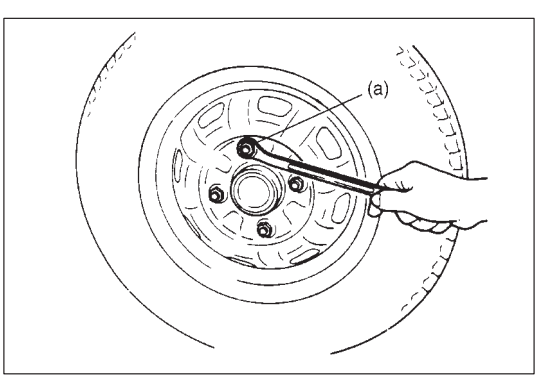
   NOTE:
   Install pad with sensor to body center side of caliper carrier.



2) Install caliper and torque caliper pin bolts to specification.

   NOTE:
   Make sure that boots are fit into groove securely.

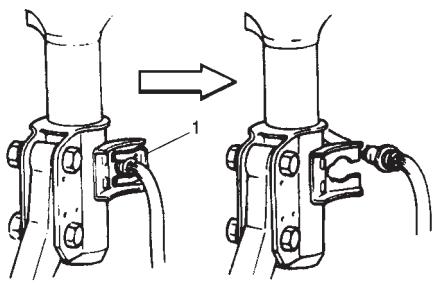
   Tightening Torque
   (a): 27 N·m (2.7 kg-m, 19.5 lb-ft)



3) Tighten front wheel nuts to specified torque.

   Tightening Torque
   (a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

4) Upon completion of installation, perform brake test.

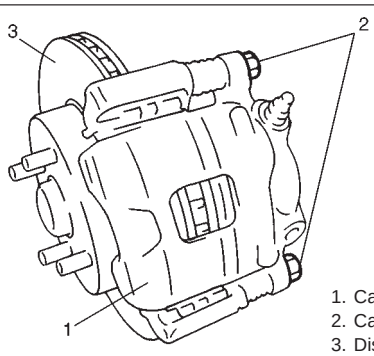


1. E-ring

CALIPER ASSEMBLY

REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove E-ring.



1. Caliper
2. Caliper pin bolt
3. Disc

3) Loosen flexible hose union bolt a little at caliper.

> **CAUTION:**
> **Be careful not to twist flexible hose while loosening the bolt.**

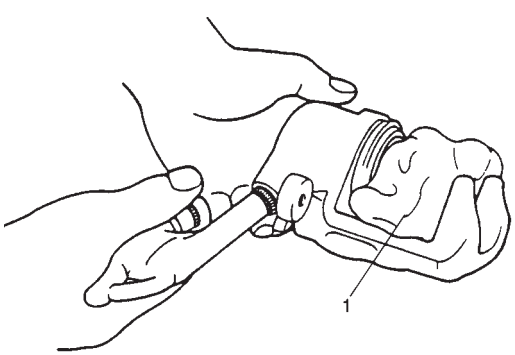
4) Remove caliper pin bolts.
5) Remove caliper from carrier.
6) Disconnect flexible hose from caliper by using care not to twist it. As this will allow fluid to flow out of flexible hose, have a container ready beforehand.

DISASSEMBLY

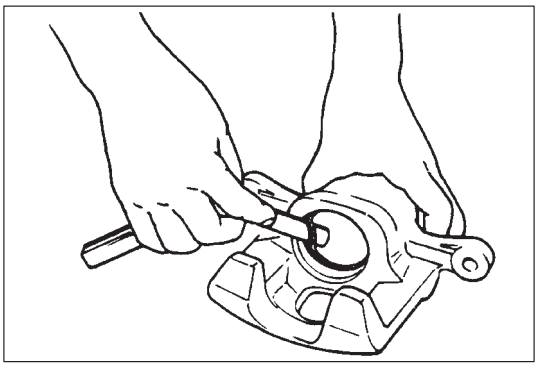
Before disassembly, clean all around caliper with brake fluid.

1) 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.**

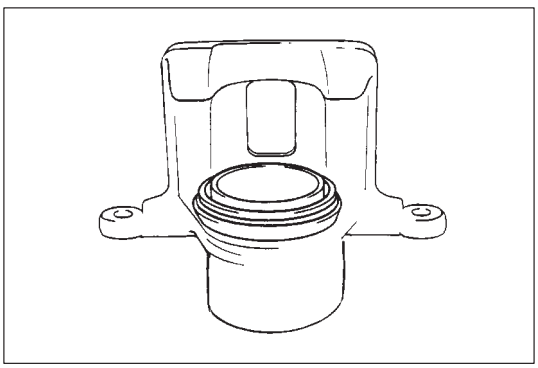


1. Cloth



2) Remove piston seal using a thin blade like a thickness gauge, etc.

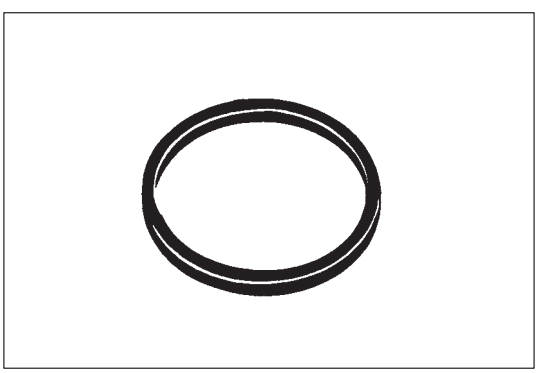
CAUTION:
Be careful not to damage inside (bore side) of cylinder.



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.

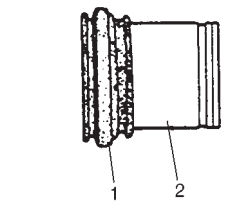
ASSEMBLY

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.**

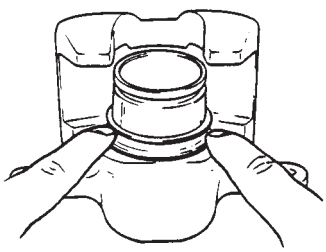
Piston Seal

1) Replace with a new one at every overhaul. Fit piston seal into groove in cylinder taking care not to twist it.

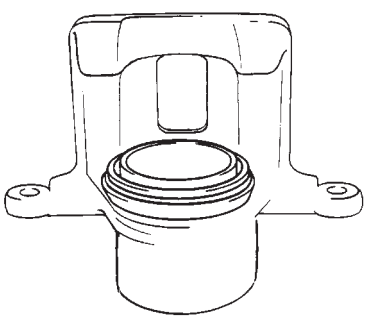


1. Boot
2. Piston

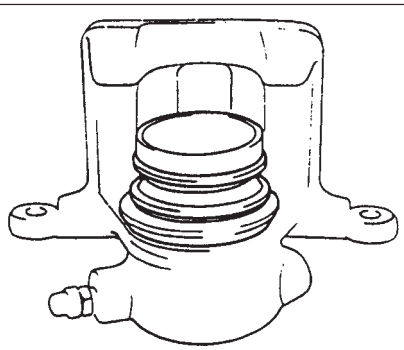
2) Before inserting piston into cylinder, install boot onto piston as shown.



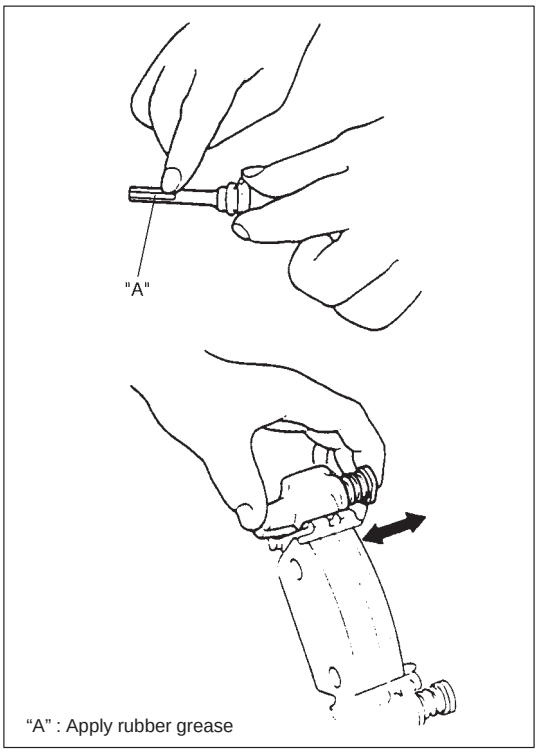
3) Fit boot as it is in figure into boot groove in cylinder with fingers. Check to make sure that boot is fitted into boot groove in cylinder completely in its circumference.



4) Insert piston into cylinder by hand and fit boot in boot groove in piston.



5) To confirm that boot is fitted in its groove in cylinder properly, pull piston out of cylinder a little but do not take it all out.
6) Insert piston into cylinder by hand.

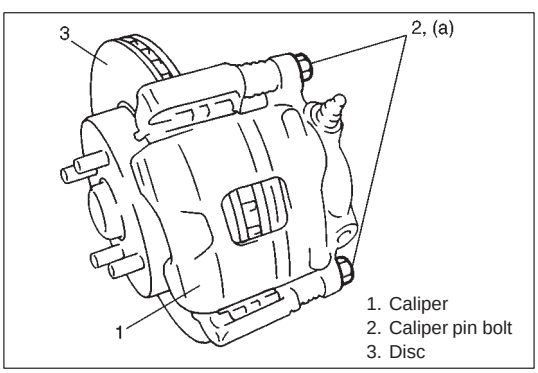


"A" : Apply rubber grease

INSTALLATION

1) Before installing caliper (cylinder body) to carrier, check to ensure that cylinder slide pin inserted in each caliper carrier hole can be moved smoothly in thrust direction.
   Apply rubber grease to slide pin.

   NOTE:
   Where temperature gets as low as – 30°C (– 22°F) in cold weather, use rubber grease whose viscosity varies very little even at – 40°C (– 40°F).

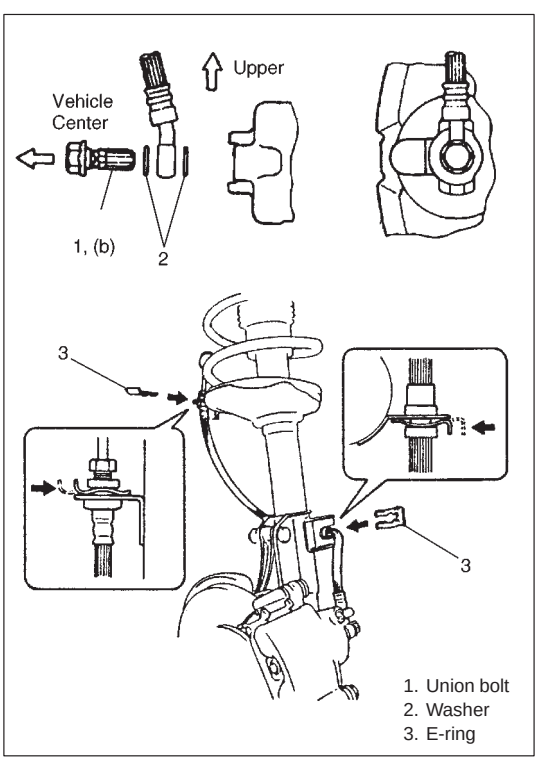


1. Caliper
2. Caliper pin bolt
3. Disc

2) Install caliper to caliper carrier.
   Tighten caliper pin bolts to specified torque.

   NOTE:
   Make sure that boots are fit into groove securely.

   Tightening Torque
   (a): 27 N·m (2.7 kg-m, 19.5 lb-ft)



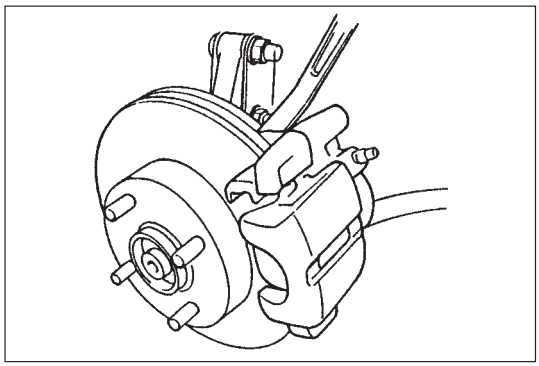
1. Union bolt
2. Washer
3. E-ring

3) Tighten union bolt to specified torque.

   Tightening Torque
   (b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

   WARNING:
   Make sure that flexible hose is not twisted when tightening joint bolt. If it is twisted, reconnect it using care not to twist it.

4) Install E-ring to strut securely.
5) Lower hoist.
6) Tighten wheel nuts to specified torque.
7) After completing installation, fill reservoir with brake fluid and bleed air from brake system. Perform brake test and check each installed part for oil leakage.

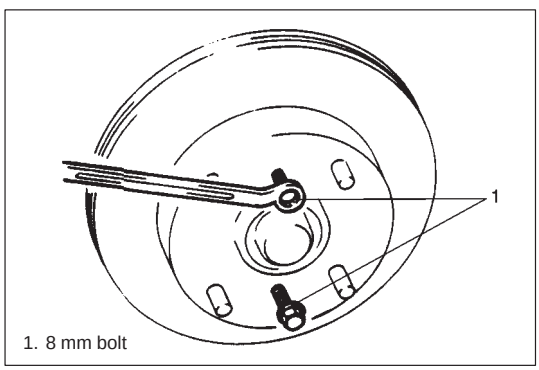


BRAKE DISC

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.

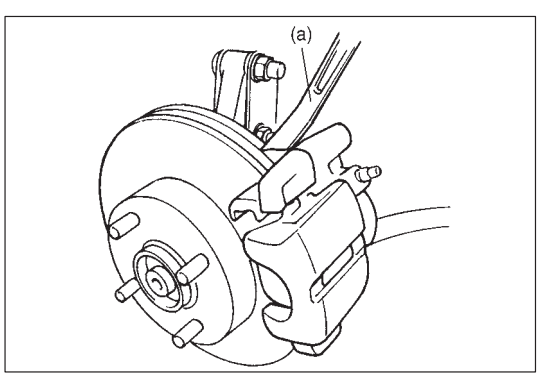


1. 8 mm bolt

3) Pull brake disc off by using 8 mm bolts (2 pcs).

INSPECTION

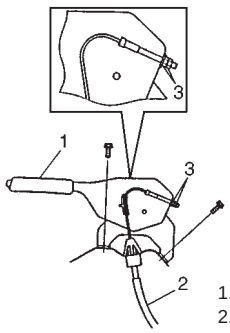
Refer to BRAKE PAD INSPECTION.



INSTALLATION

NOTE:
See NOTE at the beginning of this section.

1) Install disc to wheel hub.
2) Install caliper assembly to steering knuckle.
3) Tighten caliper carrier bolts to specified torque.
   Tightening Torque
   (a): 95 N·m (9.5 kg-m, 69.0 lb-ft)
4) Tighten front wheel nuts to specified torque.
5) Upon completion of installation, perform brake test.

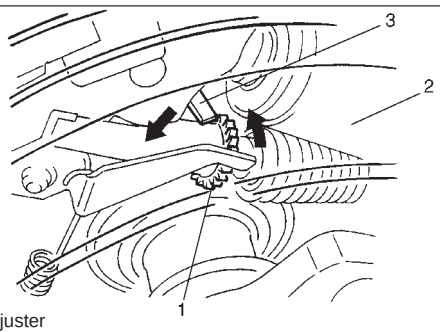


1. Parking brake lever
2. Brake cable
3. Nuts

BRAKE DRUM

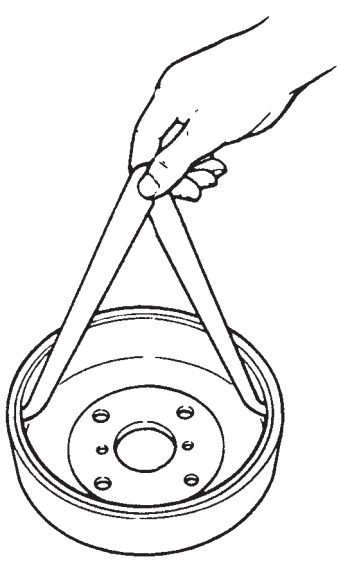
REMOVAL

1) Hoist vehicle and remove wheel.
2) Remove console box.
3) Release parking brake lever.
4) Loosen parking brake cable nuts.



1. Adjuster
2. Brake drum
3. Flat-head screw driver

5) To increase clearance between brake shoe and brake drum, remove rubber plug from brake back plate and turn adjuster downward with flat-head screw driver.
6) Pull brake drum off by using 8 mm bolts.



INSPECTION

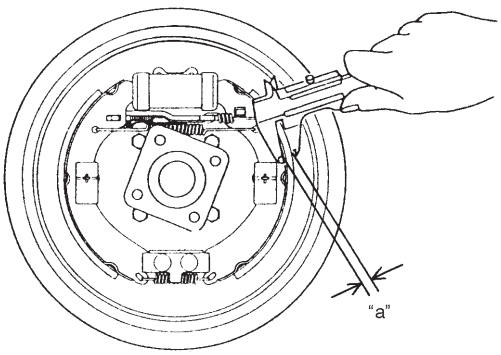
Brake Drum

Inspect drum for cleanliness. Check wear of its braking surface by measuring its inside diameter.

Brake drum ID
Standard : 220 mm (8.66 in.)
Service limit : 222 mm (8.74 in.)

Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves.
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 not be turned.

NOTE:
When drum is removed, visually inspect wheel cylinder for brake fluid leakage. Correct leaky point, if any.



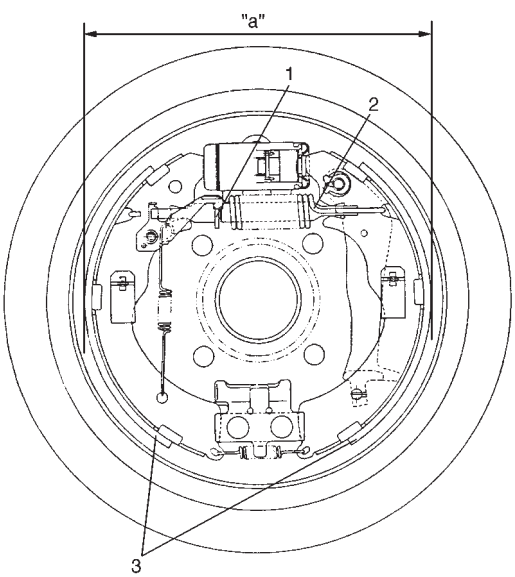
Brake Shoe

Where lining is worn out beyond service limit, replace shoe.

Brake lining thickness (lining + shoe rim) "a"
Standard : 6.5 mm (0.26 in.)
Service limit : 3.0 mm (0.12 in.)

If one of brake linings is worn to service limit, all linings must be replaced at the same time.

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.



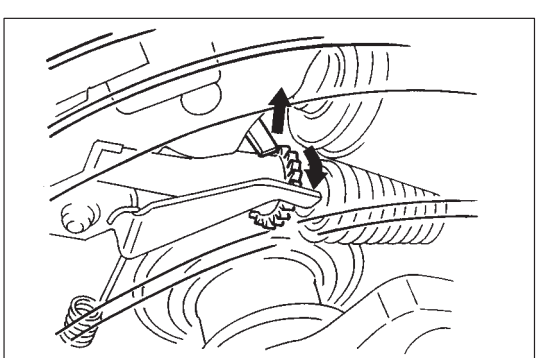
1. Adjuster
2. Return spring (upper)
3. Brake shoes

INSTALLATION

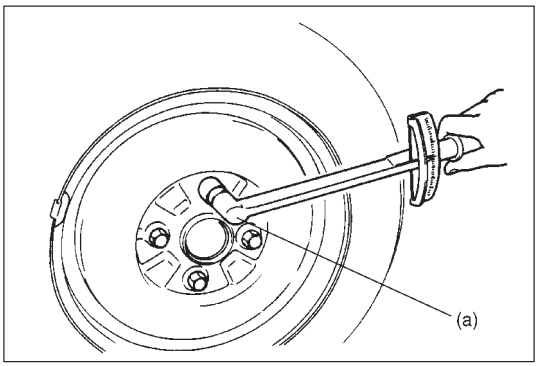
NOTE:
See NOTE at the beginning of this section.

1) Before installing brake drum, check outer diameter of brake shoes. If it is not within value as specified below, adjust it to specification by turning adjuster.

   Outer diameter of brake shoes
   "a" : 219.4 – 219.7 mm (8.638 – 8.650 in.)



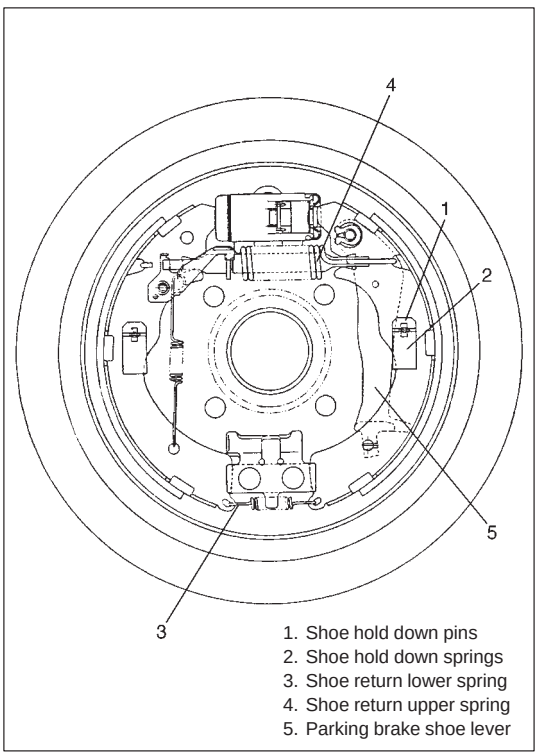
2) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
3) Upon completion of all jobs, remove rubber plug from brake back plate and turn adjuster upward with flat-head screw driver and then depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
4) Install console box.



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

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

6) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and preform brake test (foot brake and parking brake).



1. Shoe hold down pins
2. Shoe hold down springs
3. Shoe return lower spring
4. Shoe return upper spring
5. Parking brake shoe lever

BRAKE SHOE

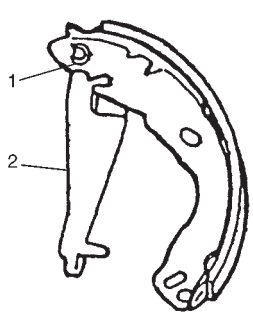
REMOVAL

1) Perform steps 1) to 6) of BRAKE DRUM REMOVAL.
2) Remove shoe return lower spring, upper spring and shoe hold down spring by turning shoe hold down pins.
3) Remove brake shoes.

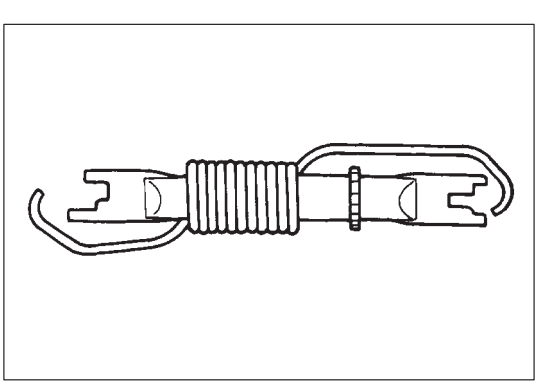
WARNING:
Use special care when removing brake shoe return spring. Failure in its proper installation may allow it to spring back and cause personal injury.

4) Disconnect parking brake shoe lever from parking brake cable.

1. Retainer ring
2. Parking brake shoe lever



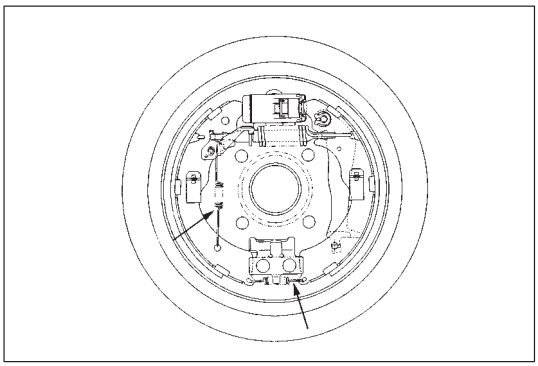
5) Remove retainer ring and disconnect parking brake shoe lever from shoe rim.



INSPECTION

Adjuster Assembly

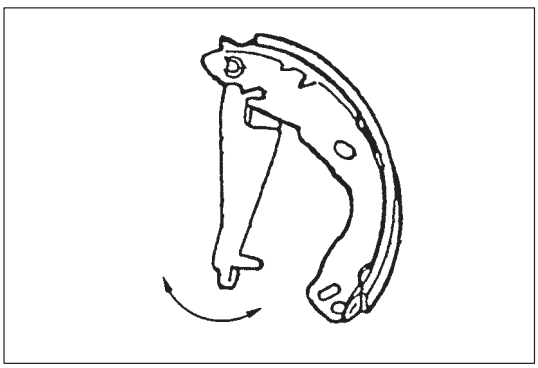
Inspect ratchet or thread rod part for wear, sticking and corrosion.



Springs

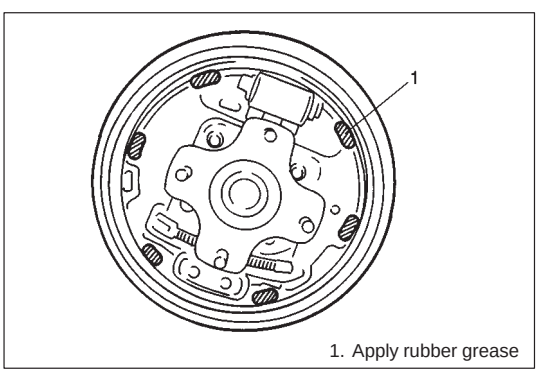
Inspect for damage, corrosion or weakening.

Inspect each part with arrow for rust. If found defective, replace.



Parking Shoe Lever

Inspect brake shoe lever for smooth movement along shoe rim. If defective, correct or replace.



1. Apply rubber grease

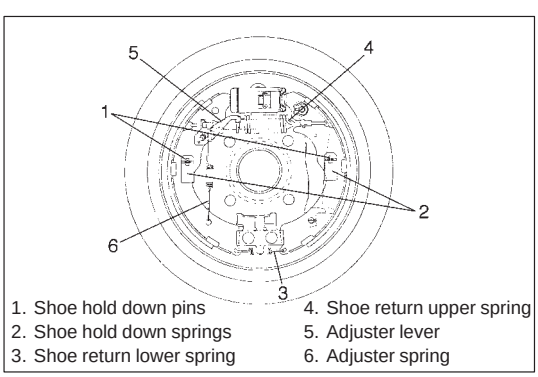
INSTALLATION

Assemble parts in reverse order of removal.

NOTE:

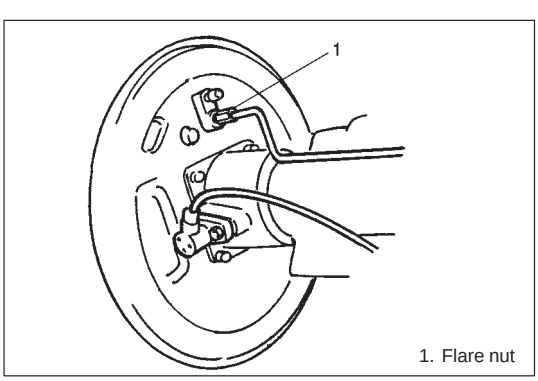
Removed retainer ring should be replaced with new one.

1) Apply rubber grease to brake back plate and parking brake shoe lever as shown in figure.



1. Shoe hold down pins
2. Shoe hold down springs
3. Shoe return lower spring
4. Shoe return upper spring
5. Adjuster lever
6. Adjuster spring

2) Install shoe hold down springs by pushing them down in place and turning hold down pins.
3) Install shoe return spring, adjuster lever and adjuster spring.
4) For procedure hereafter, refer to steps 1) to 6) of BRAKE DRUM INSTALLATION.

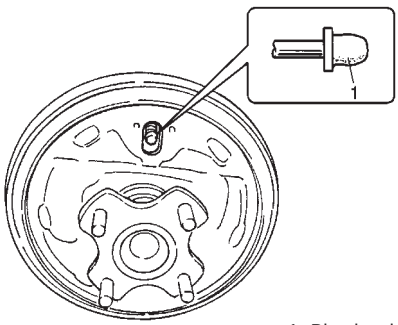


1. Flare nut

WHEEL CYLINDER

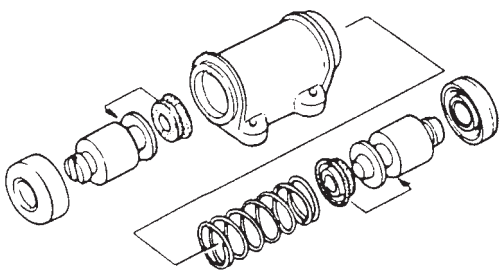
REMOVAL

1) Perform steps 1) to 6) of BRAKE DRUM REMOVAL.
2) Perform steps 2) to 4) of BRAKE SHOE REMOVAL.
3) Loosen brake pipe flare nut but only within the extent that fluid does not leak.



1. Bleeder plug cap

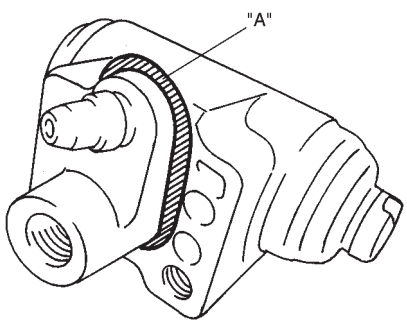
4) Remove wheel cylinder mounting bolts. Disconnect brake pipe from wheel cylinder and put bleeder plug cap onto pipe to prevent fluid from spilling.



INSPECTION

Inspect wheel cylinder disassembled parts for wear, cracks, corrosion or damage.

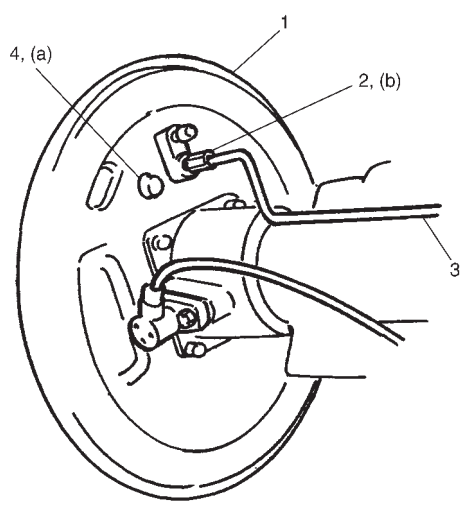
NOTE:
Clean wheel cylinder components with brake fluid.



INSTALLATION

1) Apply sealant to wheel cylinder. Then take off bleeder plug cap from brake pipe and connect pipe to wheel cylinder just enough to prevent fluid from leaking.

   "A": Sealant 99000-31090



1. Brake back plate
2. Brake pipe flare nut
3. Brake pipe
4. Wheel cylinder bolts

2) Tighten wheel cylinder to brake back plate to specified torque.

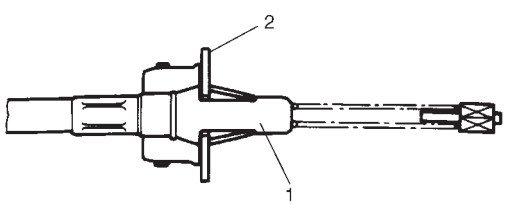
   Tightening Torque
   (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

3) Torque flare nut of brake pipe which was connected in step 1) to specification.

   Tightening Torque
   (b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

4) Install bleeder plug cap taken off from pipe back to bleeder plug.

5) Install brake shoes, referring to steps 1) to 3) of BRAKE SHOE INSTALLATION.
6) Install brake drum. (Refer to steps 1) and 2) of BRAKE DRUM INSTALLATION of this section.
7) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to BLEEDING BRAKES.)
8) Upon completion of all jobs, turn adjuster upward by flat-head screw driver and depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
9) Install console box.
10) Install wheel and tighten wheel nuts to specified torque. (Refer to TIGHTENING TORQUE SPECIFICATIONS.)
11) 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).
12) Check each installed part for oil leakage.

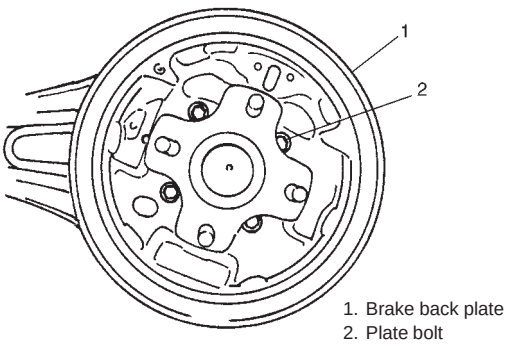


1. Stopper ring
2. Brake back plate

BRAKE BACK PLATE

REMOVAL

1) Perform steps 1) to 6) of BRAKE DRUM REMOVAL.
2) Perform steps 2) to 4) of BRAKE SHOE REMOVAL.
3) Perform steps 3) to 4) of WHEEL CYLINDER REMOVAL.
4) Remove parking brake cable from brake back plate by squeezing parking brake cable stopper ring.

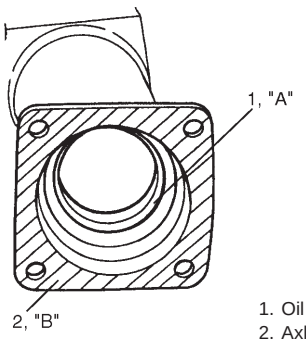


1. Brake back plate
2. Plate bolt

5) Drain rear differential gear oil.
6) Remove brake back plate bolts.
7) Draw out rear axle shaft with brake back plate, refer to REAR AXLE SHAFT REMOVAL in Section 3E.
8) Remove wheel bearing, refer to WHEEL BEARING REMOVAL in Section 3E.
9) Remove brake back plate from axle shaft.

INSTALLATION

1) Install brake back plate to axle shaft.
2) Press-fit wheel bearing and retainer ring, refer to WHEEL BEARING INSTALLATION in Section 3E.



1. Oil seal
2. Axle housing

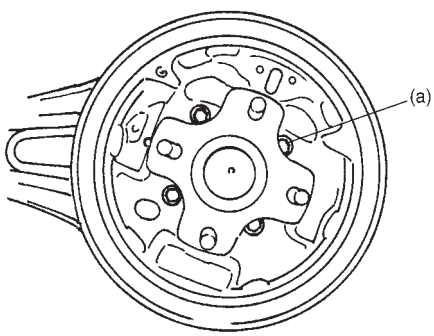
3) Apply grease to axle shaft oil seal lip as shown.

"A": Grease 99000-25010

4) Apply sealant to mating surface of axle housing with brake back plate.

NOTE:
Make sure that old sealant was removed before applying new one.

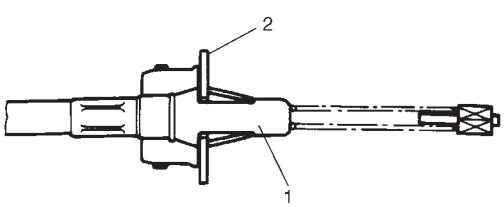
"B": Sealant 99000-31110 or 99000-31090



5) Install rear axle shaft to rear axle housing.
6) Tighten brake back plate bolts to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m,17.0 lb-ft)

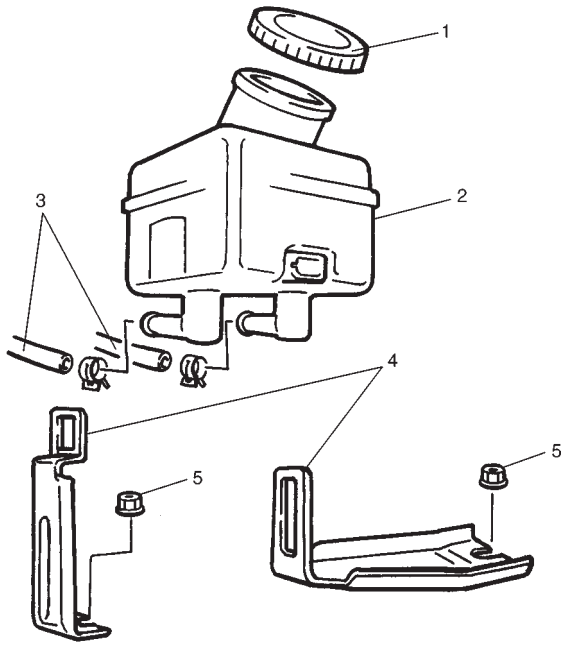
7) Install wheel cylinder, and tighten wheel cylinder bolts and brake pipe flare nut (or nuts) to specified torque. (Refer to steps 1) to 4) of WHEEL CYLINDER INSTALLATION).



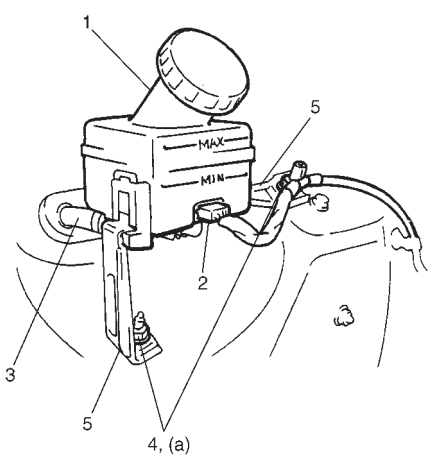
1. Stopper ring
2. Brake back plate

8) Install parking brake cable to brake back plate.
9) Install brake shoes, referring to steps 1) and 3) of BRAKE SHOE INSTALLATION.
10) Install brake drum. (Refer to steps 1) to 2) of BRAKE DRUM INSTALLATION.
11) Refill differential housing with new specified gear oil. Refer to MAINTENANCE SERVICE in Section 7F for refill.
12) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to BLEEDING BRAKES.)
13) Install wheel and tighten wheel nuts to specified torque.
14) Upon completion of all jobs, turn adjuster upward by flat-head screw driver, depress brake pedal with about 30 kg (66 lbs) load three to five times so as to obtain proper drum-to-shoe clearance.
    Adjust parking brake cable. (For adjustment, refer to PARKING BRAKE CHECK AND ADJUSTMENT.)
15) Install console box.
16) 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).
17) Check each installed part for oil leakage.

MASTER CYLINDER RESERVOIR



1. Reservoir cap
2. Reservoir
3. Reservoir hoses
4. Reservoir bracket
5. Nut



1. Reservoir
2. Wire coupler
3. Brake master hose
4. Nut
5. Clamp

REMOVAL

1) Disconnect reservoir lead wire at coupler.
2) Clean outside of reservoir.
3) Take out fluid with syringe or such.
4) Disconnect brake master hoses from reservoir.
5) Remove reservoir bracket nuts.
6) Remove reservoir with reservoir bracket.

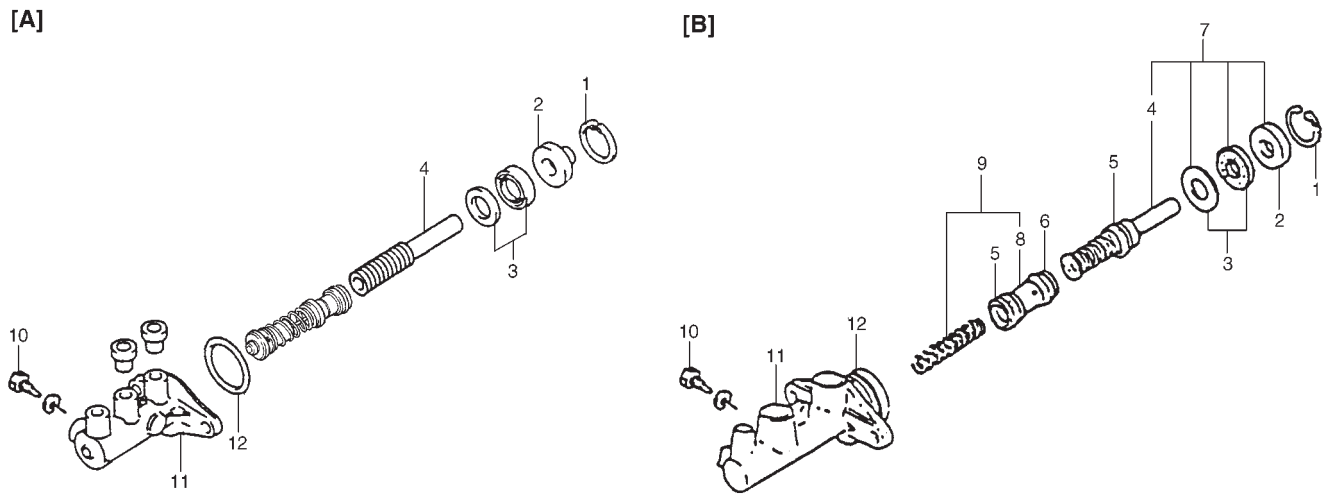
INSTALLATION

1) Install reservoir and tighten nuts to specified torque.

   Tightening Torque
   (a) : 11N·m (1.1 kg-m, 8.0 lb-ft)

2) Connect reservoir hoses to reservoir.
3) Connect reservoir lead wire.
4) Fill brake fluid up to MAX line.
5) Perform air bleeding, referring to BLEEDING BRAKES, and check for fluid leakage.

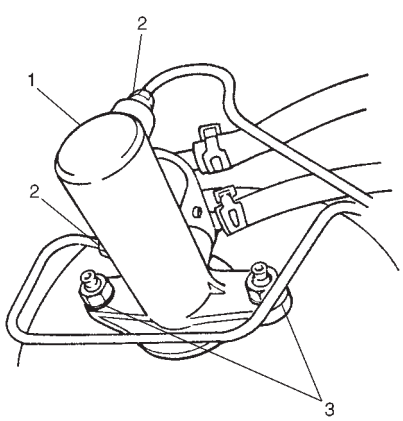
MASTER CYLINDER ASSEMBLY



[A] : with ABS
[B] : without ABS

1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup and plate
4. Primary piston
5. Piston cup
6. Secondary piston pressure cup
7. Primary piston Assy
8. Secondary piston
9. Secondary piston Assy
10. Secondary piston stopper bolt
11. Master cylinder body
12. O-ring

1. Master cylinder
2. Flare nuts
3. Attaching nuts

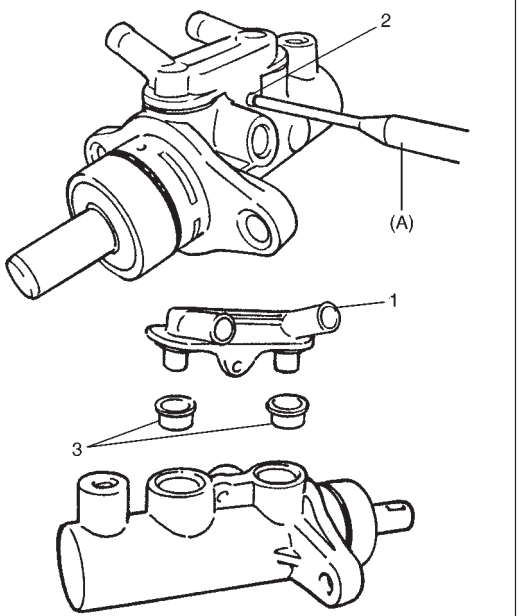


REMOVAL

1) Clean around reservoir cap and take out fluid with syringe or such.
2) Disconnect fuse box from steering support member.
3) Disconnect reservoir hose.
4) Disconnect brake pipes from master cylinder.

CAUTION:
Do not allow brake fluid to get on painted surfaces.

5) Remove two attaching nuts.
6) Remove master cylinder.



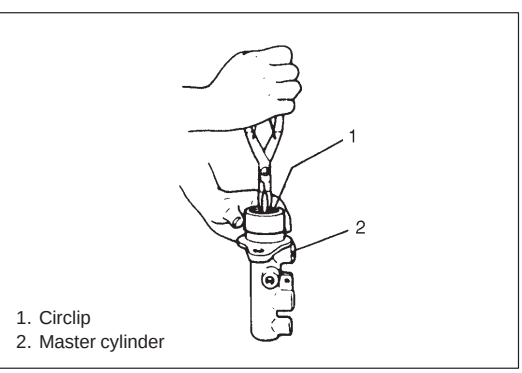
1. Connector
2. Pin
3. Grommets

DISASSEMBLY

1) Remove the pin that fixes cylinder body and connector by using special tool.

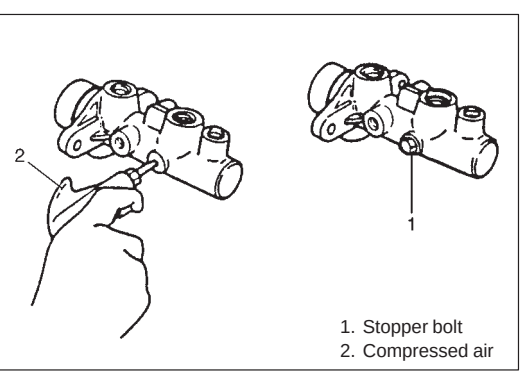
   Special Tool
   (A): 09922-85811

2) Remove connector and 2 grommets.



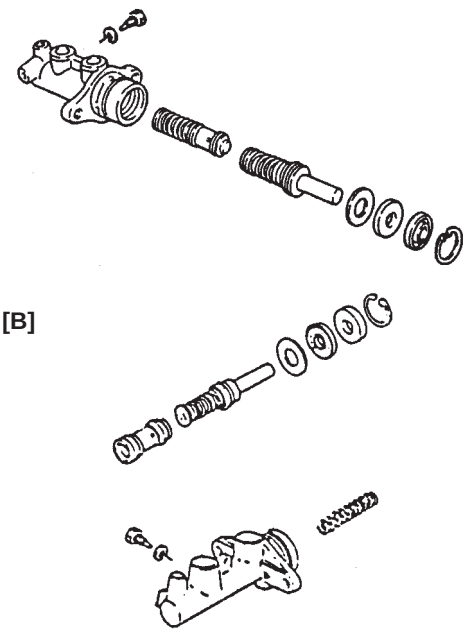
1. Circlip
2. Master cylinder

3) Remove circlip.



1. Stopper bolt
2. Compressed air

4) Remove primary piston.
   Remove piston stopper bolt. Then remove secondary piston by blowing compressed air into hole from which piston stopper bolt was removed.
   Be cautions during removal as secondary piston jumps out.



[A] : For vehicle with ABS
[B] : For vehicle without ABS

INSPECTION

Inspect all disassembled parts for wear or damage, and replace parts if necessary.

NOTE:

- **Wash disassembled parts with brake fluid.**
- **Do not reuse piston assembly.**

Inspect master cylinder bore for scoring or corrosion. It is best to replace corroded cylinder. Corrosion can be identified as pits or excessive roughness.

NOTE:

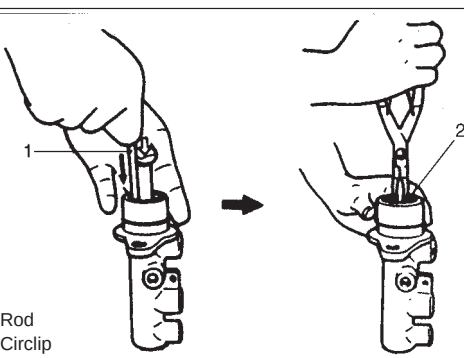
Polishing bore of master cylinder with cast aluminum body with anything abrasive is prohibited, as damage to cylinder bore may occur.

Rinse cylinder in clean brake fluid. Shake excess rinsing fluid from cylinder. Do not use a cloth to dry cylinder, as lint from cloth cannot be kept from cylinder bore surfaces.

ASSEMBLY

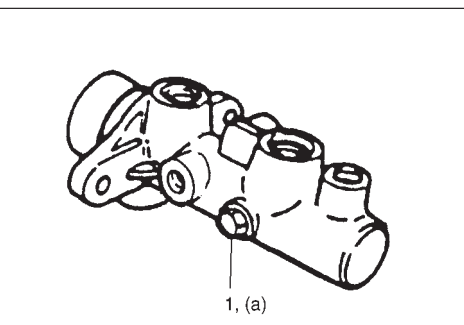
CAUTION:

- **Never use any mineral oil such as kerosene oil and gasoline when washing and assembling parts.**
- **Check inside of cylinder wall, pistons and cup seals are free from any foreign objects such as dust and dirt and use care not to cause any damage with a tool during assembly.**
- **Do not drop parts. Do not use any part which has been dropped.**



1. Rod
2. Circlip

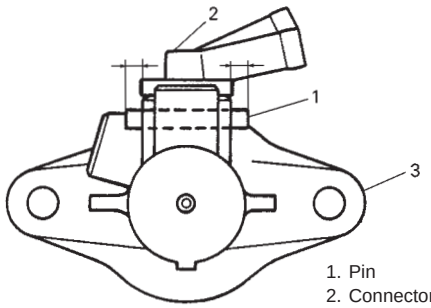
1) Apply brake fluid to inside of cylinder and contact surface of piston ass'y and insert secondary piston ass'y into cylinder body. Be sure to install piston cup in correct installation direction and straight into cylinder so that it is not caught.
   Install secondary piston assembly into cylinder.
2) Install primary piston in cylinder.
3) Depress, and install circlip.



1. Stopper bolt

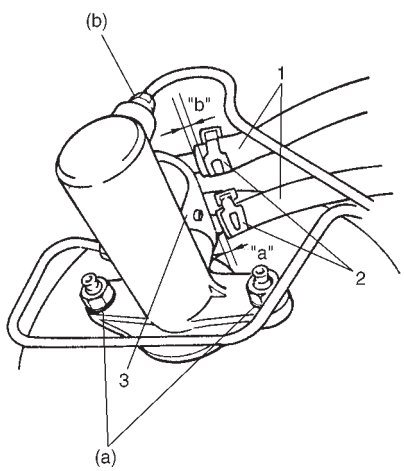
4) Install piston stopper bolt with pistons pushed in all the way and tighten it to specified torque.

   Tightening Torque
   (a) : 10N·m (1.0 kg-m, 7.5 lb-ft)



1. Pin
2. Connector
3. Master cylinder

5) Apply thin coat of brake fluid to all around new grommets (2pcs.) and install them to cylinder body, then install reservoir.
6) Set a new pin in connector hole and drive it in. At this time, make end of pin and end face margin of connector equal.



1. Reservoir hose
2. Clamp
3. Connector

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Check clearance between booster piston rod and master cylinder piston (Refer to BRAKE BOOSTER INSPECTION AND ADJUSTMENT).**
- **Adjust booster piston rod length with special tool (Refer to BRAKE BOOSTER INSPECTION AND ADJUSTMENT).**

1) Install master cylinder as shown and torque attaching nuts to specification.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

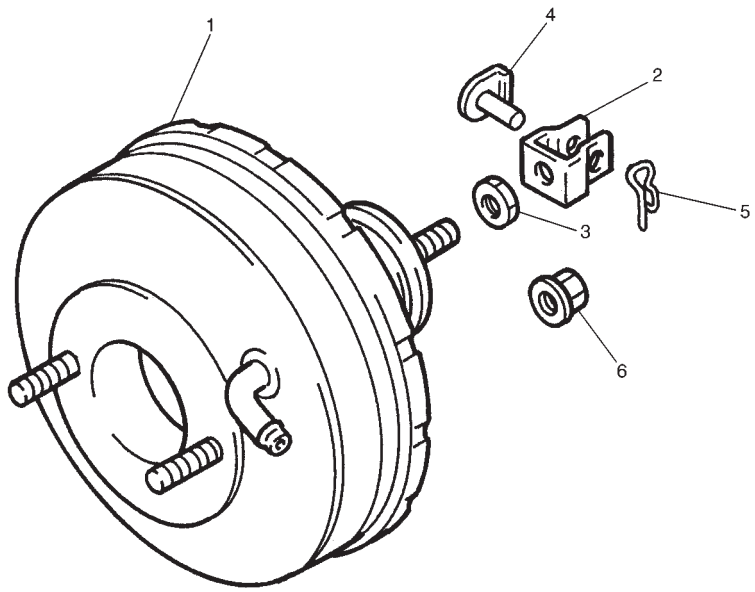
2) Attach hydraulic lines and torque flare nuts to specification.

   Tightening Torque
   (b): 16 N·m 1.6 kg-m, 12.0 lb-ft)

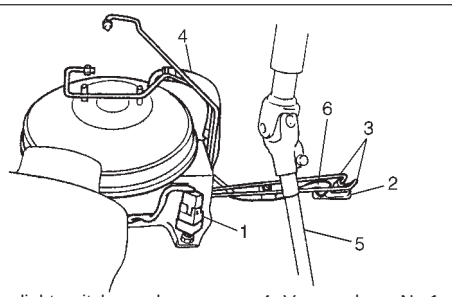
3) Connect reservoir hose.
   Distance
   “a” : 0 mm (0 in.)
   “b” : 3 - 6 mm (0.12 - 0.23 in.)

4) Fill reservoir with specified brake fluid.
5) After installing, check brake pedal play and bleed air from system (refer to BRAKE PEDAL PLAY CHECK and BLEEDING BRAKES).
6) Perform brake test and check each installed part for fluid leakage.

BRAKE BOOSTER



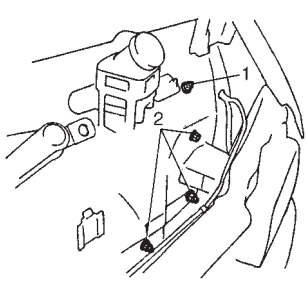
1. Brake booster ass'y
2. Push rod clevis
3. Nut
4. Clevis pin
5. Clip
6. Nut



1. Stop light switch coupler
2. 4-way joint
3. Brake pipes
4. Vacuum hose No.1
5. Steering lower shaft
6. Vacuum pipe

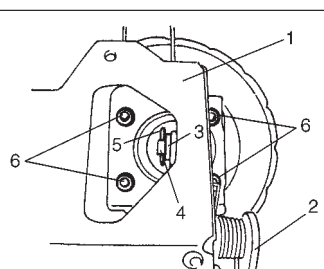
REMOVAL

1) Remove master cylinder assembly, by referring to step 1) to 6) of MASTER CYLINDER REMOVAL.
2) Disconnect stop light switch lead wire at coupler.
3) Remove pedal bracket extension (For RH steering vehicle).
4) Disconnect flare nuts from 4-way joint and remove brake pipes.
5) Disconnect vacuum hose No.1 from booster and vacuum hose No.2 from vacuum pipe at dash panel and remove vacuum pipe with hose No.1.
6) Disconnect clutch cable from clutch pedal arm.



1. Pedal bracket mounting bolt
2. Pedal bracket mounting nuts

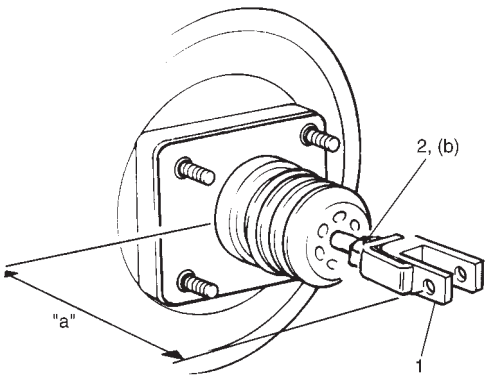
7) Remove steering lower shaft, refer to Section 3C.
8) Remove pedal bracket mounting bolt and nuts at dash panel.
9) Remove pedal bracket with brake booster.



1. Pedal bracket
2. Brake pedal arm
3. Push rod clevis
4. Clevis pin
5. Clip
6. Booster nuts

10) Disconnect push rod clevis from brake pedal arm.
11) Remove brake booster attaching nuts and disconnect brake booster from pedal bracket.

CAUTION:
Never disassemble brake booster. Disassembly will spoil its original function. If faulty condition is found, replace it with new one.



1. Push rod clevis
2. Nut

INSPECTION AND ADJUSTMENT

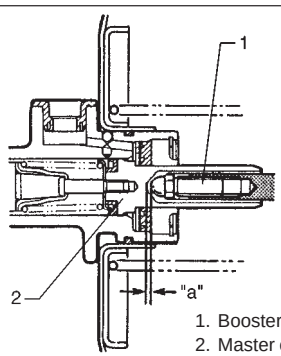
Push Rod Clevis Length

Check that dimension “a” as shown is within 99.5 – 100.5 mm (3.92 – 3.99 in.) and torque nut to specification.

Dimension “a”: 99.5 – 100.5 mm (3.92 – 3.99 in.)

Tightening Torque
(b): 25 N·m (2.5 kg-m, 18.0 lb-ft)

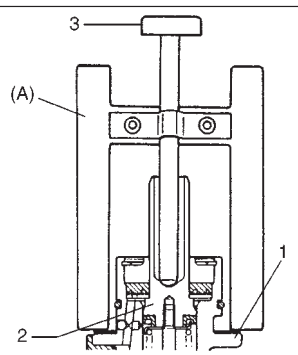
NOTE:
Whenever booster was removed, make sure to check clearance between piston rod and master cylinder piston. (For details, refer to following procedure.)



1. Booster piston rod
2. Master cylinder piston

Booster Piston Rod and Master Cylinder Piston Clearance

The length of booster piston rod is adjusted to provide specified clearance ”a” between piston rod end and master cylinder piston.

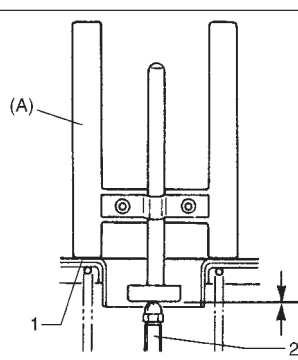


1. Master cylinder
2. Piston
3. Pin head

- Before measuring clearance, push piston rod several times so as to make sure reaction disc is in place.
- Keep inside of booster at atmospheric pressure for measurement.

1) Set special tool (A) on master cylinder and push pin until contacts piston.

Special Tool
(A) : 09950-96010



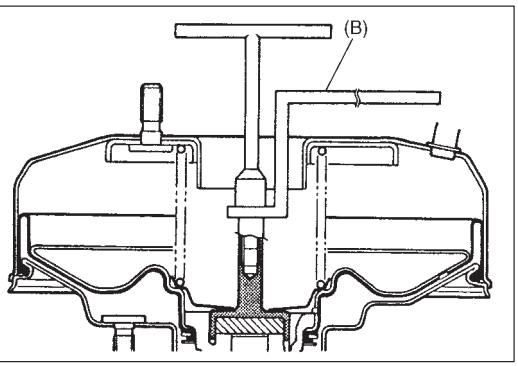
1. Booster body
2. Piston rod

2) Turn special tool upside down and place it on booster. Adjust booster piston rod length until rod end contacts pin head.

Special Tool
(A) : 09950-96010

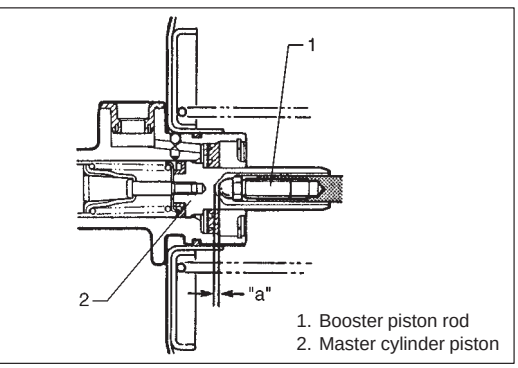
Clearance ”b” : 0 mm (0 in.)

NOTE:
Take measurement with booster set vertically and rod at the center, or with piston rod fixed by screw driver.



3) Adjust clearance by turning adjusting screw of piston rod.

Special Tool
(B) : 09952-16010

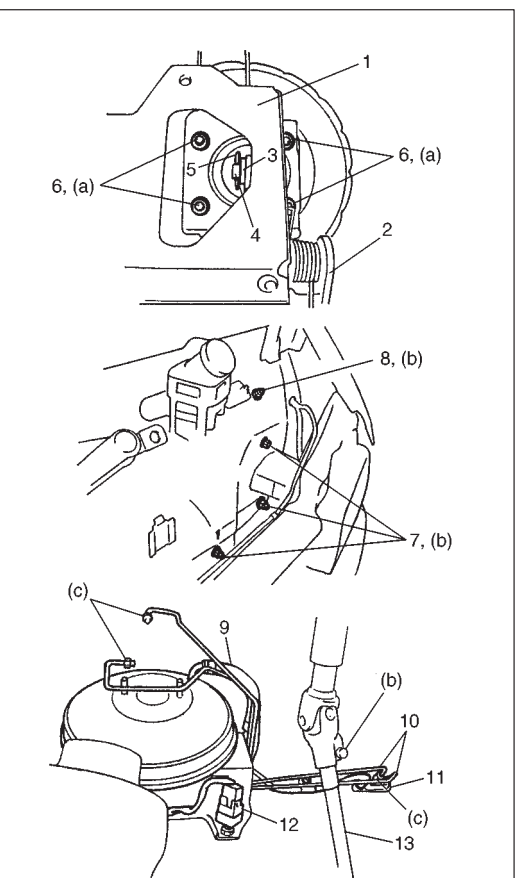


1. Booster piston rod
2. Master cylinder piston

Reference

When adjusted as above, its negative pressure is applied to booster with engine at idle, piston to piston rod clearance "a" should become below.

Clearance "a" : 0.25 - 0.5 mm (0.010 - 0.020 in.)



1. Pedal bracket
2. Brake pedal arm
3. Push rod clevis
4. Clevis pin
5. Clip
6. Booster nuts
7. Pedal bracket mounting nuts
8. Pedal bracket mounting bolt
9. Vacuum hose No.1
10. Brake pipes
11. 4-way joint
12. Stop light switch coupler
13. Steering lower shaft

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and master cylinder piston with special tool. (Refer to INSPECTION AND ADJUSTMENT.)**
- **Check length of push rod clevis. (Refer to INSPECTION AND ADJUSTMENT.)**

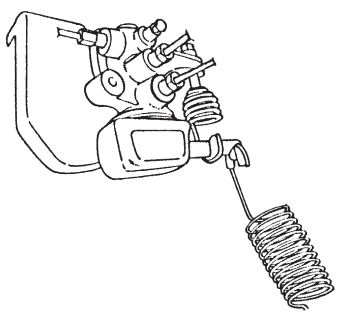
1) Install booster to pedal bracket. Then connect booster push rod clevis to pedal arm with clevis pin and clip.
2) Tighten booster attaching nuts to specified torque.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)
3) Install pedal bracket to dash panel.
   Tighten pedal bracket bolt and nuts to specified torque.

   Tightening Torque
   (b): 25 N·m (2.5 kg-m, 18.5 lb-ft)
4) Connect clutch cable to clutch pedal arm, refer to CLUTCH CABLE INSTALLATION of Section 7C.
5) Install vacuum pipe with vacuum hose No.1 and connect vacuum hose No.1 to booster and vacuum hose No.2 to vacuum pipe. Clamp hoses securely.
6) Connect brake pipes to 4 way joint. Flare nuts should not be tightened.
7) Install steering lower shaft.
   For detail, refer to Section 3C COMBINATION SWITCH, STEERING COLUMN AND STEERING LOWER SHAFT INSTALLATION.
8) Install pedal bracket extension (For RH steering vehicle).
9) Connect stop light switch lead wire at coupler.
10) Install master cylinder to booster. (Refer to MASTER CYLINDER ASSEMBLY INSTALLATION of this section.)
11) Tighten brake pipes flare nuts to specified torque.

    Tightening Torque
    (c) : 16 N·m (1.6 kg-m 12.0 lb-ft)

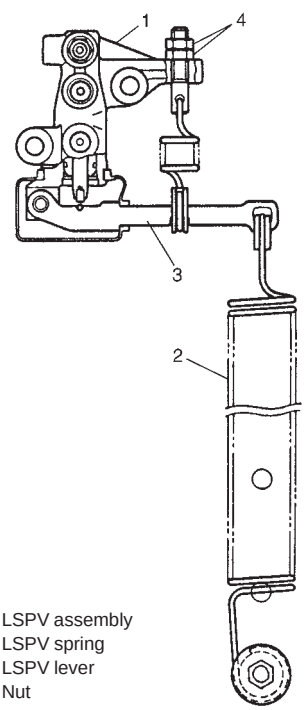
12) Fill reservoir with specified fluid.
13) Bleed air from brake system (refer to BLEEDING BRAKES).
14) After installing, check pedal height and play, refer to EXCESSIVE PEDAL TRAVEL CHECK and BRAKE PEDAL PLAY CHECK.
15) Perform brake test and check each installed part for fluid leakage.



LSPV (Load Sensing Proportioning Valve)

REMOVAL

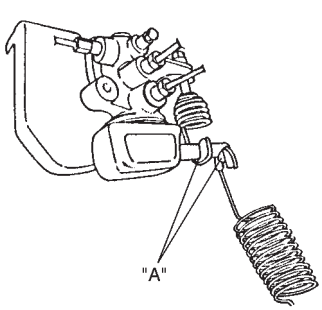
1) Clean around reservoir cap and take out fluid with syringe or such.
2) Hoist vehicle.
3) Disconnect brake pipes from LSPV.



1. LSPV assembly
2. LSPV spring
3. LSPV lever
4. Nut

4) Remove LSPV assembly with LSPV stay.
5) Remove spring from LSPV lever.

CAUTION:
- **Nuts of LSPV assembly should not be loosened or tightened.**
- **LSPV assembly must not be disassembled. Replace with new one if defective.**

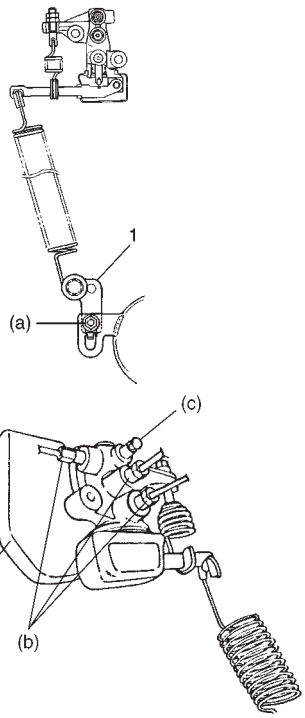


"A": Apply grease

INSTALLATION

CAUTION:
Refer to above CAUTION.

Install by reversing removal procedure, noting the following.
1) Apply multi-purpose grease to collar of coil spring.



1. LSPV stay
2. Floor panel

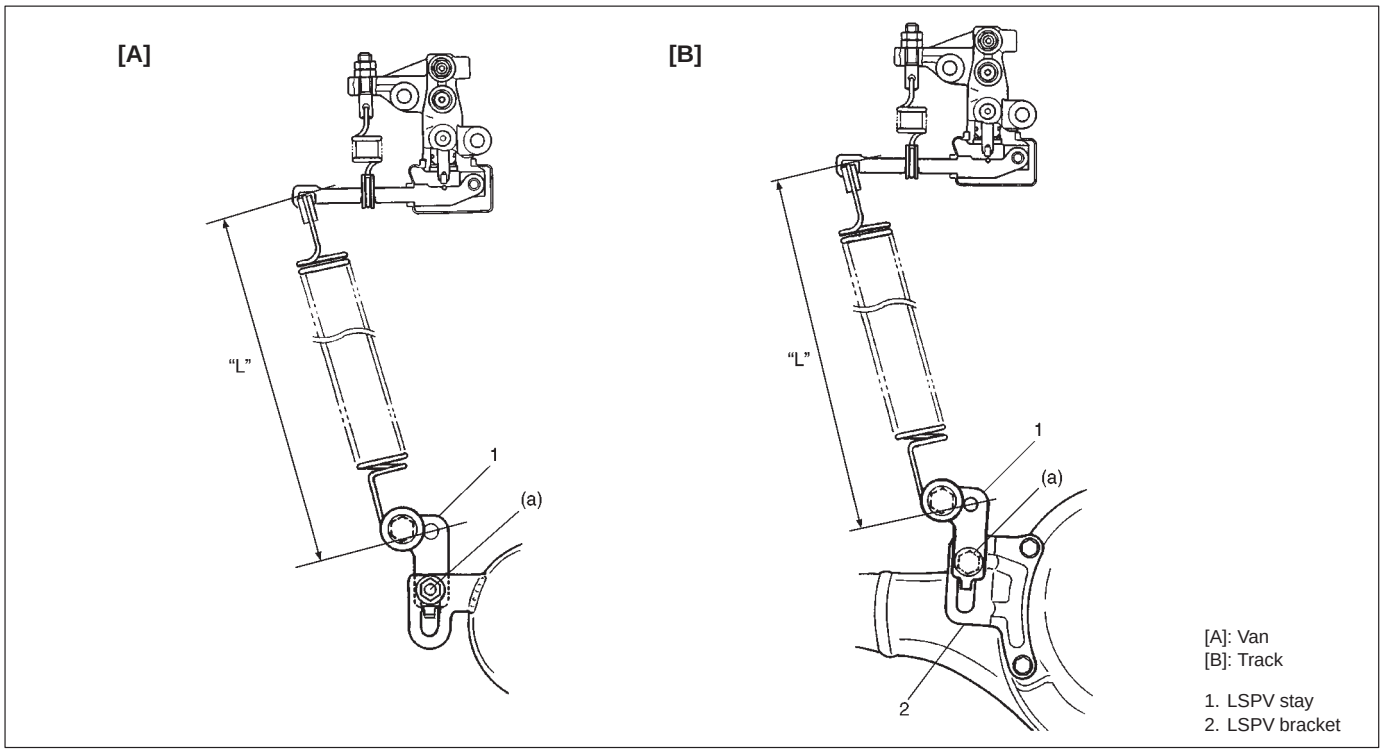
2) Torque each bolt and nut to specification as indicated respectively in figure.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)
(c): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

3) Upon completion of installation, fill reservoir tank with specified fluid and bleed air from brake system.

NOTE:
Make sure to bleed air from LSPV bleeder without fail.

4) After bleeding air, check that LSPV in installed properly by referring to following INSPECTION & ADJUSTMENT section and perform FLUID PRESSURE TEST.



INSPECTION & ADJUSTMENT

Confirm the following before inspection and adjustment.

- Fuel tank is filled with fuel fully.
- Vehicle is equipped with spare tire, tools, jack and jack handle.
- Vehicle is free from any other load.

With vehicle in above conditions;

1) Place it on level floor.
2) Measure length of coil spring "L" (between spring end and jig hole of LSPV stay).

3) Spring length "L" should be as specified below.

Spring length "L" : 299 mm (11.77 in.) ..... Van
291 mm (11.46 in.) ..... Track

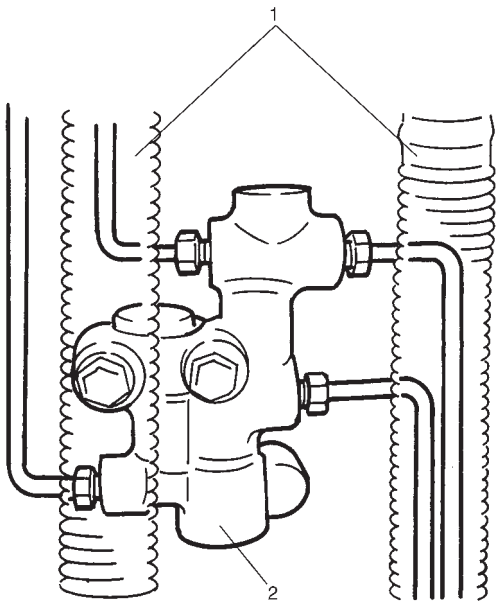
NOTE:
Don't depress brake pedal, when measuring spring length.

If it isn't, adjust it to specification by changing bolt tightening positions as shown in figure. After adjustment, tighten nut to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

NOTE:
Check to make sure that LSPV body and brake pipe joints are free from fluid leakage. Replace defective parts, if any.

4) Perform FLUID PRESSURE TEST under CHECK AND ADJUSTMENT to adjust LSPV spring for sufficient performance.



1. A/C hoses (if equipped)
2. B.P valve

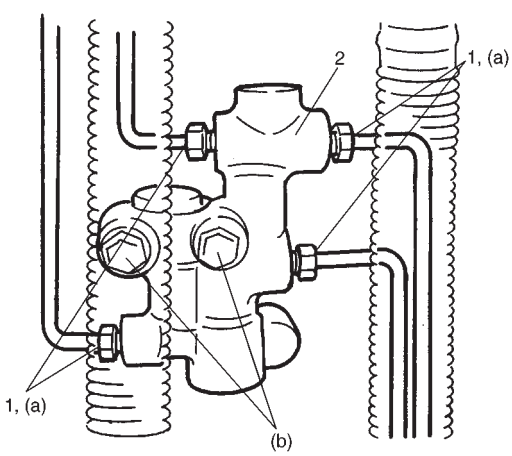
B.P. (BLEND PROPORTIONING) VALVE

REMOVAL

CAUTION:
Do not allow brake fluid to get on painted surfaces.

1) Remove engine lower cover.
2) Disconnect brake pipes from B.P. valve.
3) Remove B.P. valve.

WARNING:
Never disassemble B.P. valve assembly.
If it is found faulty, replace it with new one.



1. Flare nuts
2. B.P. valve

INSTALLATION

1) Install B.P. valve.

Tightening Torque
(a): 16 N·m (1.6 kg-m, 12.0 lb-ft)

2) Tighten flare nuts to specified torque.

Tightening Torque
(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)

3) Fill reservoir with specified brake fluid.
4) Bleed air from system.
5) Install engine lower cover.

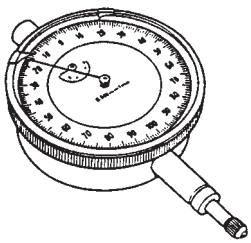
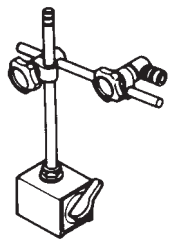
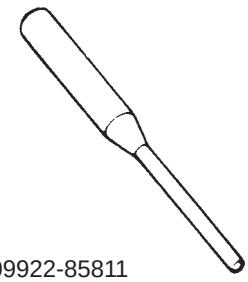
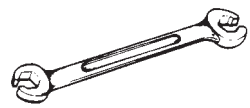
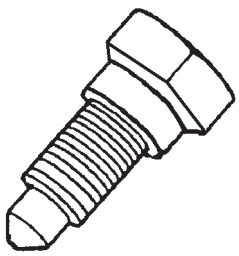
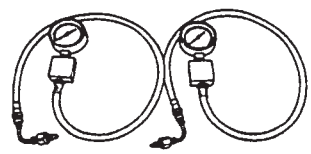
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
Brake caliper pin bolt		27	2.7	19.5
Brake caliper carrier bolt		85	8.5	61.5
Front brake flexible hose union bolt		23	2.3	17.0
Rear brake bolt (Brake back plate bolt)		23	2.3	17.0
Master cylinder nut or booster nut		13	1.3	9.5
Brake booster push rod nut		25	2.5	18.5
Brake pipe 4-way joint nut		11	1.1	8.0
Blend proportioning valve bolt/4-way cross joint bolt		11	1.1	8.0
Brake pipe flare nut		16	1.6	12.0
Brake pedal bracket bolt and nut		25	2.5	18.5
Brake bleeder plug	(Front caliper)	11	1.1	8.0
	(Rear cylinder/LSPV)	7.5	0.75	5.5
Wheel nut		85	8.5	61.5
Wheel cylinder bolt		9	0.9	6.5
Parking brake lever bolt		23	2.3	17.0
LSPV bolt		23	2.3	17.0
LSPV nut				

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir tank cap or described in owner's manual of vehicle	● To fill master cylinder reservoir. ● To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Water tight sealant	SEALING COMPOUND 366E 99000-31090	● To apply to mating surfaces of brake back plate and rear axle housing. ● To apply to mating surfaces of brake back plate and rear wheel cylinder.
Sealant	SUZUKI BOND NO.1215 99000-31110	● To apply to mating surfaces of brake back plate and rear axle housing.

SPECIAL TOOLS

 09900-20606 Dial gauge	 09900-20701 Magnetic stand	 09922-85811 Pin remover	 09950-78210 Flare nut wrench (10 mm)
 09952-16010 Booster piston rod adjuster	 09952-46520 Fluid pressure gauge	 09956-02210 Brake circuit plug	 09956-02310 Fluid pressure gauge

SECTION 5E

ANTILOCK BRAKE SYSTEM (ABS) (OPTIONAL)

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

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

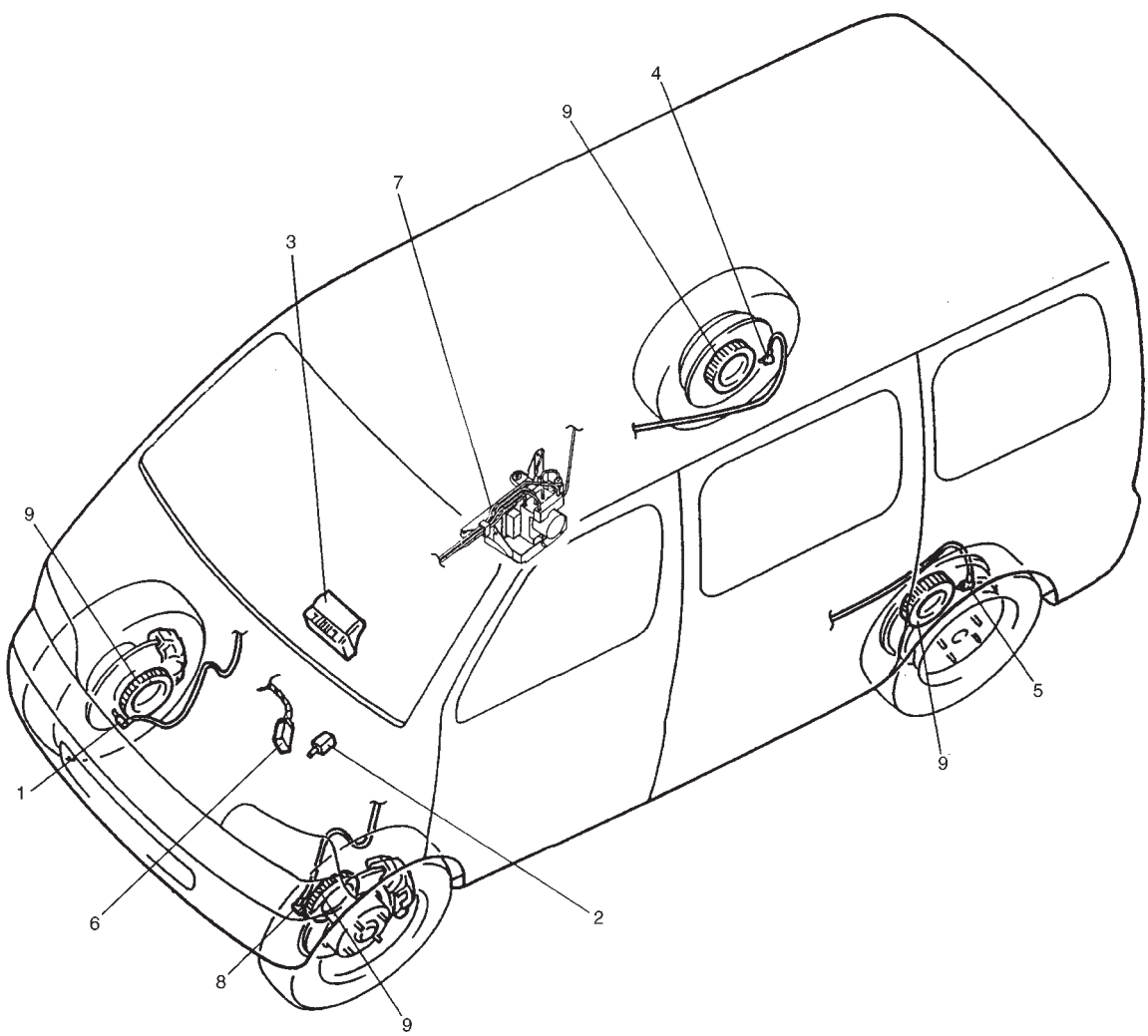
GENERAL DESCRIPTION

COMPONENTS AND PARTS LOCATION

The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied. This ABS is a 4-wheel type which controls the fluid pressure applied to the wheel cylinder of each of the four brakes to prevent each wheel from getting locked.

The component parts of this ABS includes following parts in addition to those of the conventional brake system.

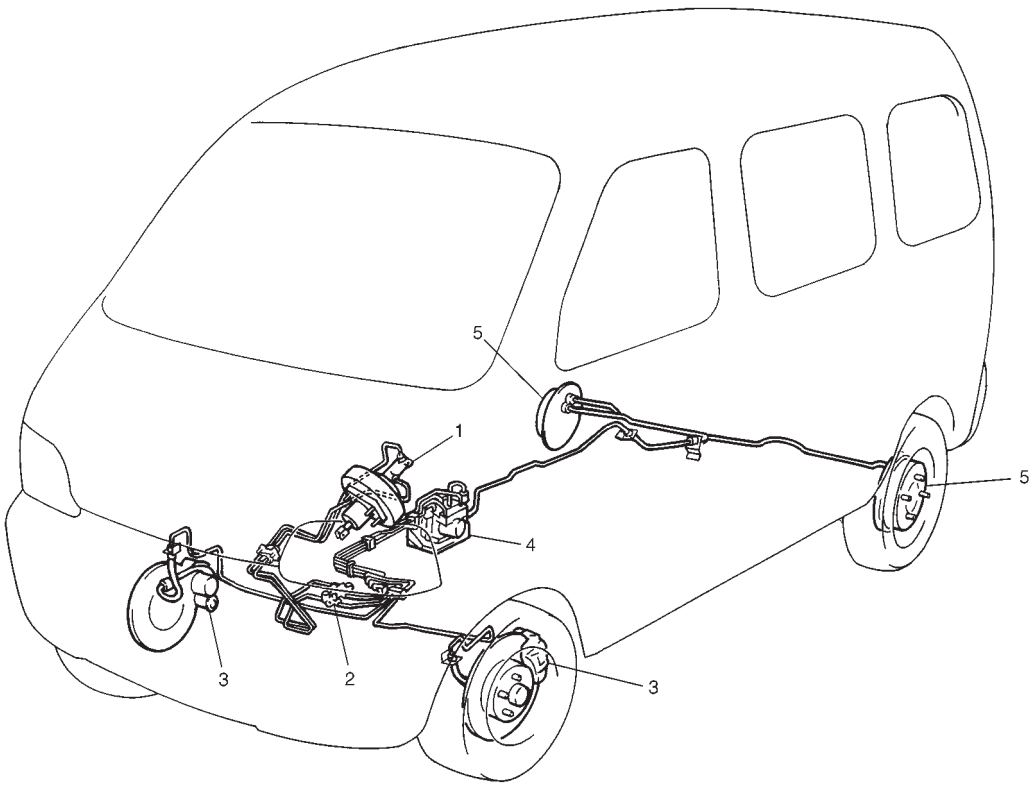
- Wheel speed sensor which senses revolution speed of each wheel and outputs its signal.
- In this ABS, ABS hydraulic unit (actuator assembly), ABS control module, pump motor relay and fail-safe relay are combined as one component.
- ABS control module which sends operation signal to ABS hydraulic unit to control fluid pressure applied to each wheel cylinder based on signal from each wheel speed sensor so as to prevent wheel from locking.
- ABS hydraulic unit which operates according to signal from ABS control module to control fluid pressure applied to wheel cylinder of each of 4 wheels.
- Fail-safe (solenoid valve) relay which supplies power to solenoid valve in ABS hydraulic unit and pump motor relay.
- Pump motor relay which supplies power to pump motor in ABS hydraulic unit.
- “ABS” warning lamp which lights to inform abnormality when system fails to operate properly.



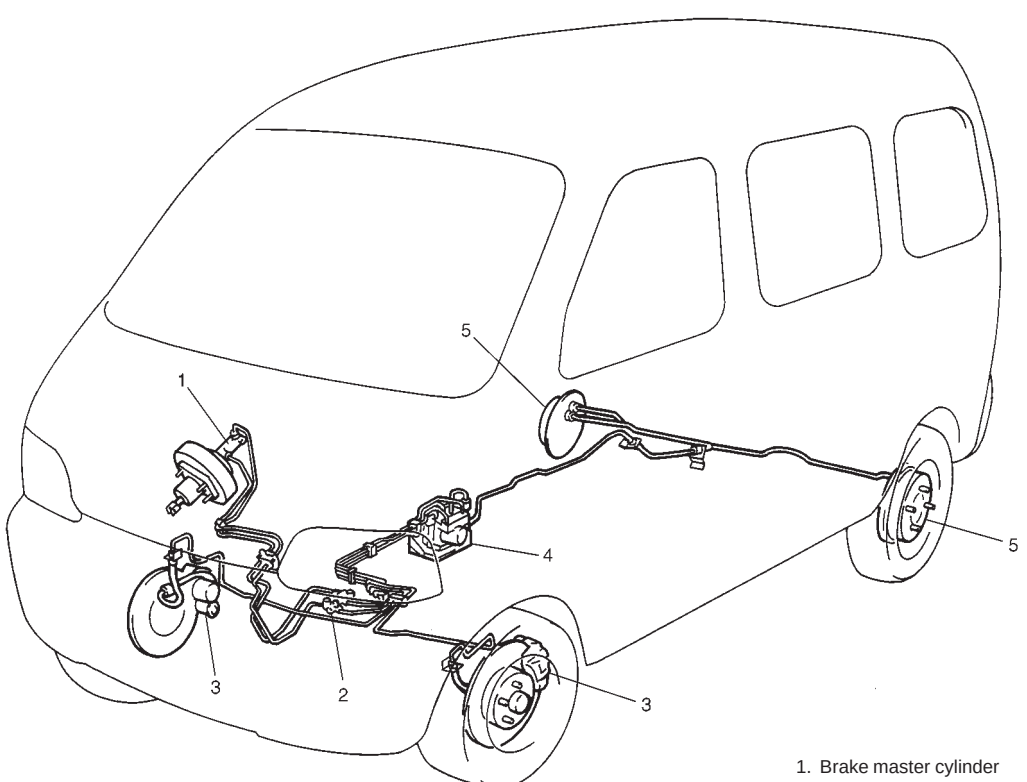
1. Wheel speed sensor (Right-front)
2. Stop lamp switch
3. “ABS” warning lamp (in combination meter)
4. Wheel speed sensor (Right-rear)
5. Wheel speed sensor (Left-rear)
6. Monitor coupler
7. ABS hydraulic unit/control module assembly (with ABS pump motor relay and fail-safe relay)
8. Wheel speed sensor (Left-front)
9. Wheel speed sensor rotor (ring)

BRAKE HOSE/PIPE ROUTING

For LH Steering Vehicle

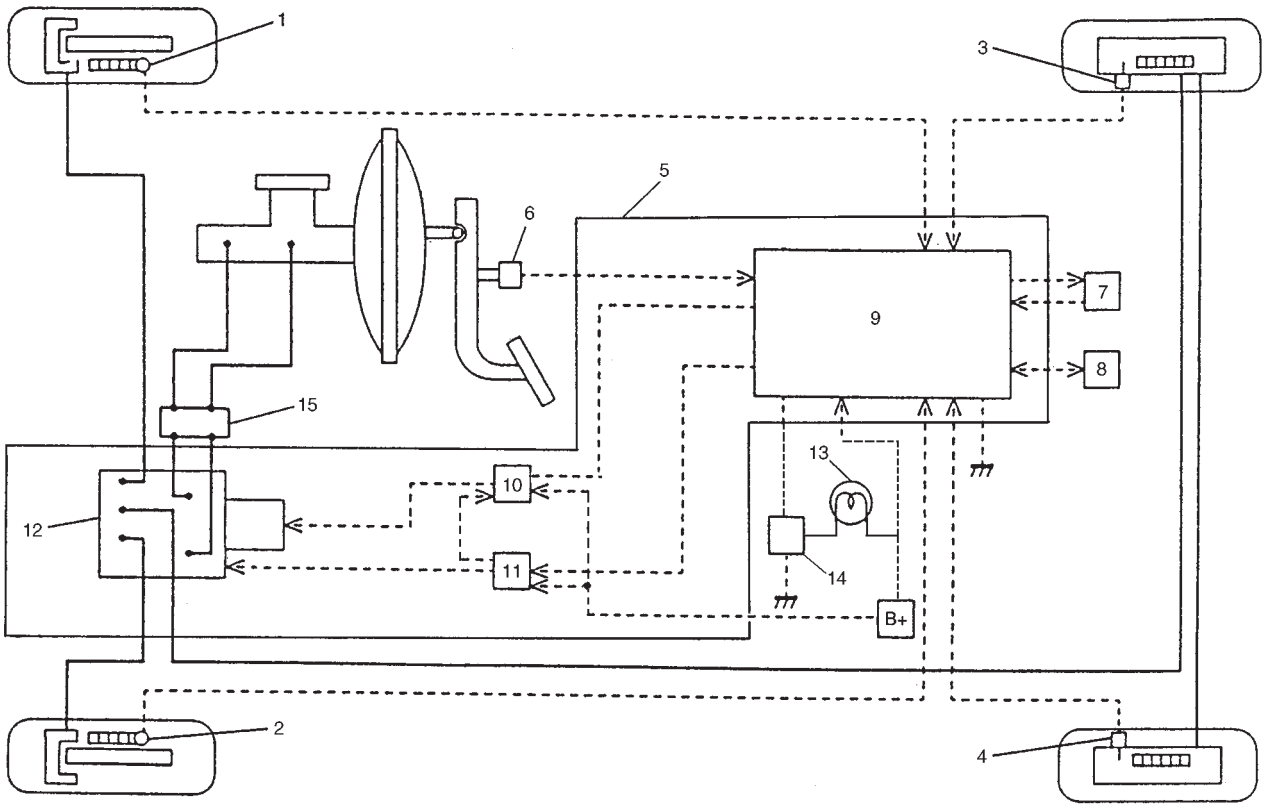


For RH Steering Vehicle

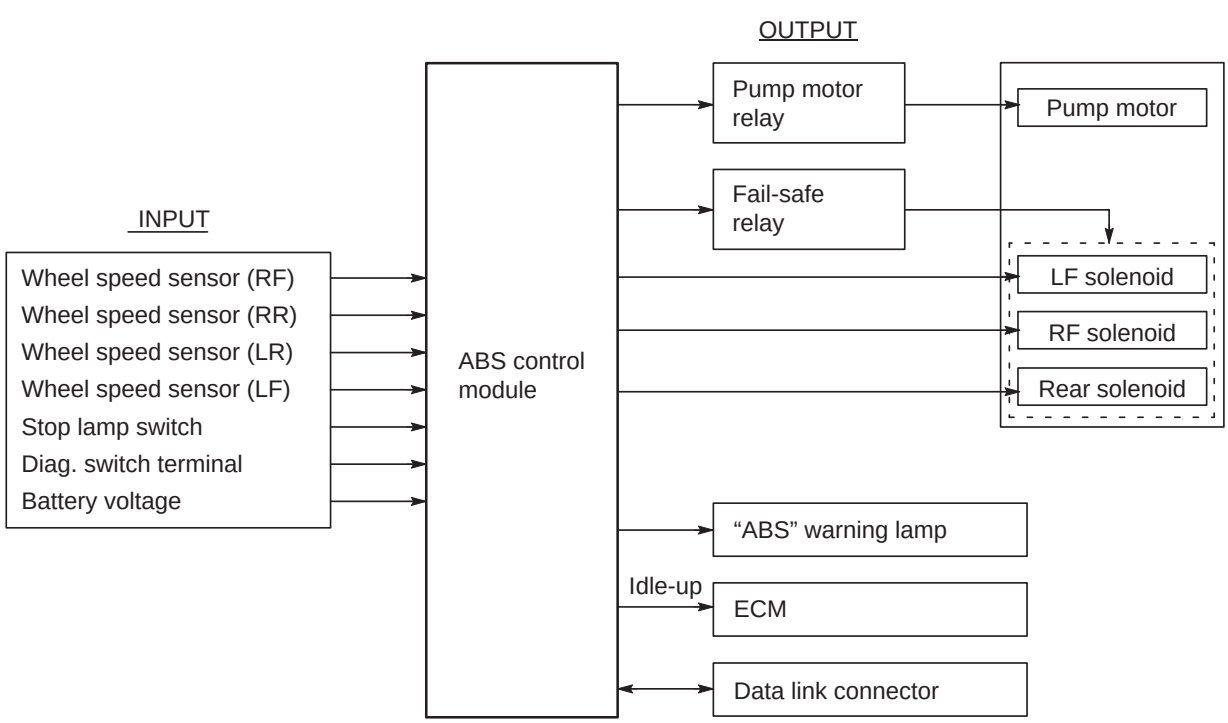


1. Brake master cylinder
2. Proportioning valve
3. Front disk brake
4. ABS hydraulic unit/control module assembly
5. Rear drum brake

SYSTEM SCHEMATIC



1. Wheel speed sensor (Right-front)
2. Wheel speed sensor (Left-front)
3. Wheel speed sensor (Right-rear)
4. Wheel speed sensor (Left-rear)
5. ABS hydraulic unit / control module assembly (with ABS pump motor and fail-safe relays)
6. Stop lamp switch
7. Diagnosis connector
8. Data link connector
9. ABS control module
10. ABS pump motor relay
11. ABS fail-safe relay (Solenoid valve relay)
12. ABS hydraulic unit
13. "ABS" warning lamp
14. ABS warning circuit (lamp driver module)
15. Proportioning valve



ABS CONTROL MODULE

Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through "ABS" warning lamp as described below.

NOTE:

If ABS hydraulic unit/control module assembly has been replaced by a new one, "ABS" warning lamp may flash when ignition switch is turned ON. In such case, perform "ABS Hydraulic Unit Operation Check" described in this section and make sure that it does not flash.

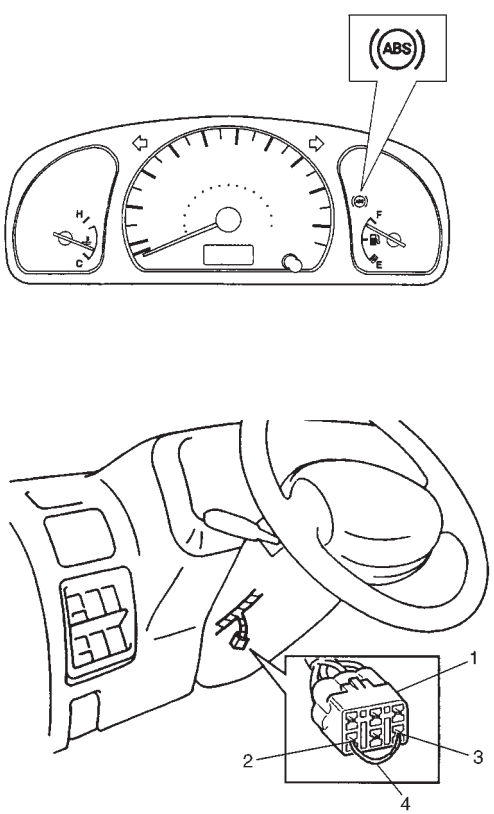
1) When ignition switch is turned ON, "ABS" warning lamp lights for 2 seconds to check its bulb and circuit.
2) When no abnormality has been detected (system is in good condition), "ABS" warning lamp turns OFF after 2 seconds.
3) When vehicle starts to move after ignition switch is turned ON (more than one wheel speed sensor signals are inputted), solenoid valves and motor of ABS hydraulic unit operate once one after another for electrical check.
   During this check, motor operation sound may be heard but that means nothing abnormal.
4) When an abnormality in the system is detected, "ABS" warning lamp lights and the area where that abnormality lies is stored in the memory in ABS control module.
5) When Diag. switch terminal of diagnosis connector (monitor connector) is grounded, the abnormal area is output as DTC. It is indicated by flashing of "ABS" warning lamp. (Refer to the table below.)

SYSTEM CONDITION		ABS WARNING LAMP	
		Diag. switch terminal is not grounded	Diag. switch terminal is grounded
In good condition at present	No trouble in the past	OFF	DTC 12
	Trouble occurred in the past	OFF	History DTC
Abnormality exists at present	No trouble in the past	ON	Current DTC
	Trouble occurred in the past	ON	Current and history DTCs

For procedure to clear all DTCs, refer to item "Diagnostic Trouble Code Clearance" in this section.

Fail-Safe Function

When an abnormality occurs (an abnormal DTC is detected), ABS control module turns OFF the fail-safe relay which supplies power to ABS hydraulic unit. Thus, with ABS not operating, brakes function just like the brake system of the vehicle not equipped with ABS.



1. Diagnosis connector (6 pins connector)
2. Ground terminal
3. Diag. switch terminal
4. Service wire

DIAGNOSIS

To ensure that the trouble diagnosis is done accurately and smoothly, observe “Precautions in Diagnosing Troubles” and follow “ABS Diagnostic Flow Table”.

PRECAUTION IN DIAGNOSING TROUBLES

- If the vehicle was operated in any of the following ways, “ABS” warning light may light momentarily but this does not indicate anything abnormal in ABS.
  – The vehicle was driven with parking brake pulled.
  – The vehicle was driven with brake dragging.
  – The vehicle was stuck in mud, sand, etc.
  – Wheel spin occurred while driving.
  – Wheel(s) was rotated while vehicle was jacked up.
- Be sure to read “Precautions for Electronic Circuit Service” in “GENERAL INFORMATION” section before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in the flow table. Failure to follow the flow table may result in incorrect diagnosis. (Some other diag. trouble code may be stored by mistake in the memory of ABS control module during inspection.)

ABS DIAGNOSTIC FLOW TABLE

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

STEP	ACTION	YES	NO
1	Perform “customer complaint analysis”, “problem symptom confirmation” and “diagnostic trouble code check, record and clearance”. Is there any trouble code?	Go to Step 2.	Go to Step 5.
2	Perform “driving test”. Is trouble symptom identified?	Go to Step 3.	Go to Step 6.
3	Check diagnostic trouble code. Is it malfunction code?	Go to Step 4.	Go to Step 5.
4	Inspect and repair referring to applicable diagnostic trouble code table in this section. Then perform “final confirmation test” after cleared diagnostic trouble code. Does trouble recur?	Go to Step 7.	END.
5	Inspect and repair referring to DIAGNOSIS in “BRAKES” section. Then perform “final confirmation test” after cleared diagnostic trouble code. Does trouble recur?	Go to Step 7.	END.
6	Check for intermittent problems referring to INTERMITTENT AND POOR CONNECTION in “GENERAL INFORMATION” section and related circuit of trouble code recorded in step 3. Then perform “final confirmation test” after cleared diagnostic trouble code. Does trouble recur?	Go to Step 7.	END.
7	Perform “diagnostic trouble code check, record and clearance”. Is there any trouble code?	Go to Step 2.	Go to Step 5.

1. MALFUNCTION ANALYSIS

i) Customer Complaint Analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such a questionnaire form as shown below will facilitate collecting information to the point required for proper analysis and diagnosis.

CUSTOMER QUESTIONNAIRE (EXAMPLE)

Customer's name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

Problem Symptoms	● "ABS" warning light abnormal: fails to turn on/fails to go off/flashes ● Abnormal noise while vehicle is running: from motor, from valve, other _____ ● Wheel is locked at braking: ● Pump motor does not stop (running): ● Braking does not work: ● Other:
Frequency of occurrence	● Continuous/Intermittent (times a day, a month)/ other _____
Conditions for Occurrence of Problem	● Vehicle at stop & ignition switch ON: ● When starting: at initial star only/at every start/Other _____ ● Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other _____ ● Road surface condition: Paved road/rough road/snow-covered road/ other _____ ● Chain equipment:
Environmental Condition	● Weather: fair/cloudy/rain/snow/other _____ ● Temperature: °F (°C)
Diagnostic Trouble Code	● First check: Normal code/malfunction code ( ) ● Second check after test drive: Normal code/malfunction code ( )

ii) Problem Symptom Confirmation

Check if what the customer claimed in CUSTOMER QUESTIONNAIRE is actually found in the vehicle and if that symptom is found, whether it is identified as a failure. (This step should be shared with the customer if possible.) When “ABS” warning light is not operated correctly, proceed to “Table-A or B”.

iii) Diagnostic Trouble Code (DTC) Check, Record and Clearance

Perform “Diagnostic Trouble Code Check” procedure in this section, record it and then clear it referring to “Diagnostic Trouble Code Clearance” in this section.

If the malfunction DTC which was once displayed and then cleared cannot be detected (indicated) again when the ignition switch is turned ON, attempt to diagnose the trouble based on the DTC recorded in this step may mislead the diagnosis or make diagnosing difficult. Proceed to Step 2 to check control module for proper self-diagnosis function.

If the malfunction DTC which was once displayed and then cleared can be detected (indicated) again when ignition switch is turned ON, proceed to Step 3.

2. DRIVING TEST

Test drive the vehicle at 40 km/h for more than a minute and check if any trouble symptom (such as abnormal lighting of “ABS” warning light) exists.

If the malfunction DTC is confirmed again at ignition switch ON, driving test as described in above is not necessary. Proceed to Step 3.

3. DIAGNOSTIC TROUBLE CODE CHECK

Recheck diagnostic trouble code referring to item “DTC CHECK” as shown in the following page.

4. DIAGNOSTIC TROUBLE CODE FLOW CHART

According to Diagnostic flow table for the diagnostic trouble code confirmation in Step 3, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator assembly or other part and repair or replace faulty parts.

5. “DIAGNOSIS” IN “BRAKE” SECTION

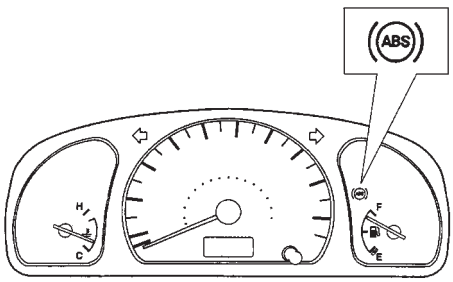
Check the parts or system suspected as a possible cause referring to “Diagnosis” in “BRAKE” section and based on symptoms appearing on the vehicle (symptom obtained through Steps 1-i, 1-ii and 2 and repair or replace faulty parts, if any).

6. CHECK FOR INTERMITTENT PROBLEM

Check parts where and intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to INTERMITTENT TROUBLE in “GENERAL INFORMATION” section and related circuit of trouble code recorded in Step 1-iii.

7. FINAL CONFIRMATION TEST

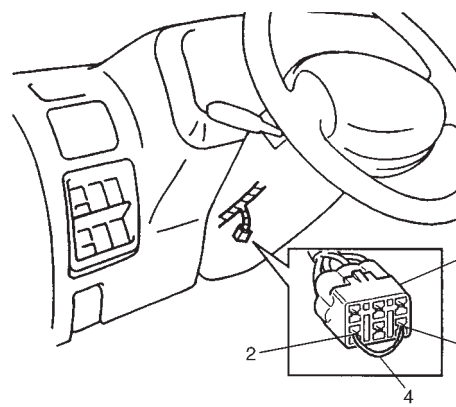
Confirm that the problem symptom has gone and the ABS is free from any abnormal conditions. If what has been repaired is related to the malfunction DTC, clear the DTC once and perform test driving and confirm that no DTC is indicated.



"ABS" WARNING LAMP CHECK

Turn ON the ignition switch and check that "ABS" warning lamp lights for about 2 seconds and then goes OFF.
If anything faulty is found, advance to Diagnostic table – A, B or C.

NOTE:
If ABS hydraulic unit/control module assembly has been replaced by a new one, "ABS" warning lamp may flash when ignition switch is turned ON. In such case, perform "ABS Hydraulic Unit Operation Check" described in this section and make sure that it does not flash.

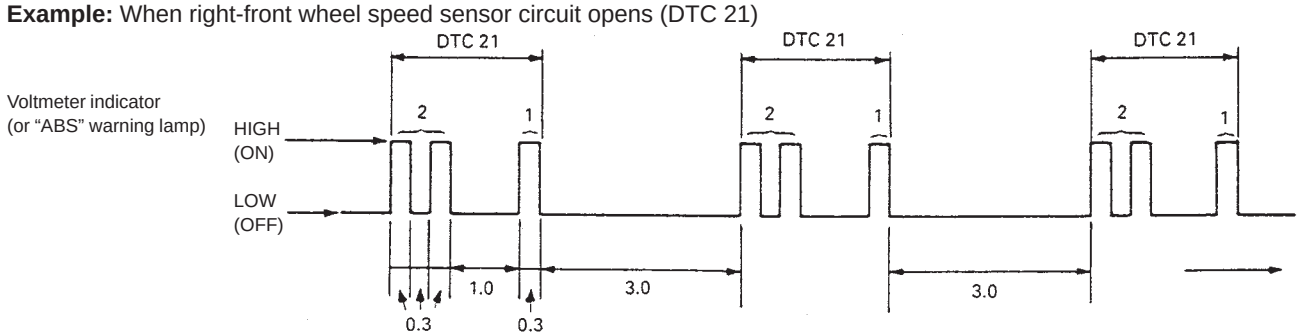


1. Diagnosis connector (6 pins connector)
2. Ground terminal
3. Diag. switch terminal
4. Service wire

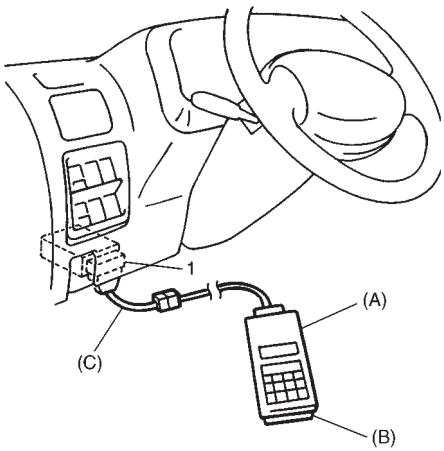
DIAGNOSTIC TROUBLE CODE (DTC) CHECK (USING "ABS" WARNING LAMP)

1) Using service wire, connect diag. switch terminal of diagnosis connector to ground.
2) Turn ignition switch ON.
3) Read flashing of "ABS" warning lamp which represents DTC as shown in example below and write it down. When more than 2 DTCs are stored in memory, deflection and flashing for each DTC is repeated three times starting with the smallest DTC number in increasing order.
   For details of DTC, refer to "DTC Table".

Example: When right-front wheel speed sensor circuit opens (DTC 21)



4) After completing the check, turn ignition switch off and disconnect service wire from DIAG. connector.



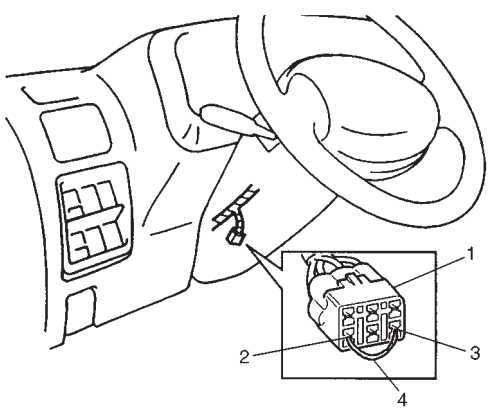
1. Data link connector (DLC)

DIAGNOSTIC TROUBLE CODE (DTC) CHECK (USING SUZUKI SCAN TOOL)

1) After setting cartridge for ABS to SUZUKI scan tool, connect SUZUKI scan tool to data link connector.

   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

2) Turn ignition switch ON.
3) 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.
4) After completing the check, turn ignition switch off and disconnect SUZUKI scan tool from DLC.



1. Diagnosis connector (6 pins connector)
2. Ground terminal
3. Diag. switch terminal
4. Service wire

DIAGNOSTIC TROUBLE CODE (DTC) CLEARANCE

WARNING:
When performing a driving test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurrence of an accident.

After repair or replace malfunction part(s), clear all DTCs by performing the following procedure.

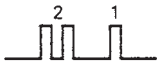
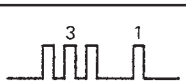
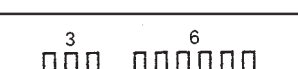
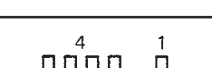
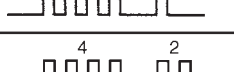
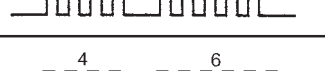
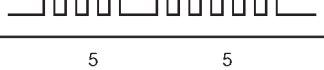
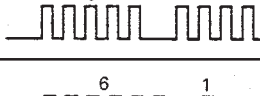
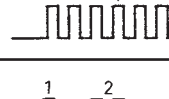
1) Turn ignition switch OFF.
2) Using service wire, connect diag. switch terminal of diag. connector to diag. ground terminal.
3) With connection described in above step 2) maintained, turn ignition switch ON.
4) Repeat on/off operation of service wire at diag. ground terminal at least 5 times within 10 seconds.

   NOTE:
   Service wire ON time must be for 0.1 second and more.

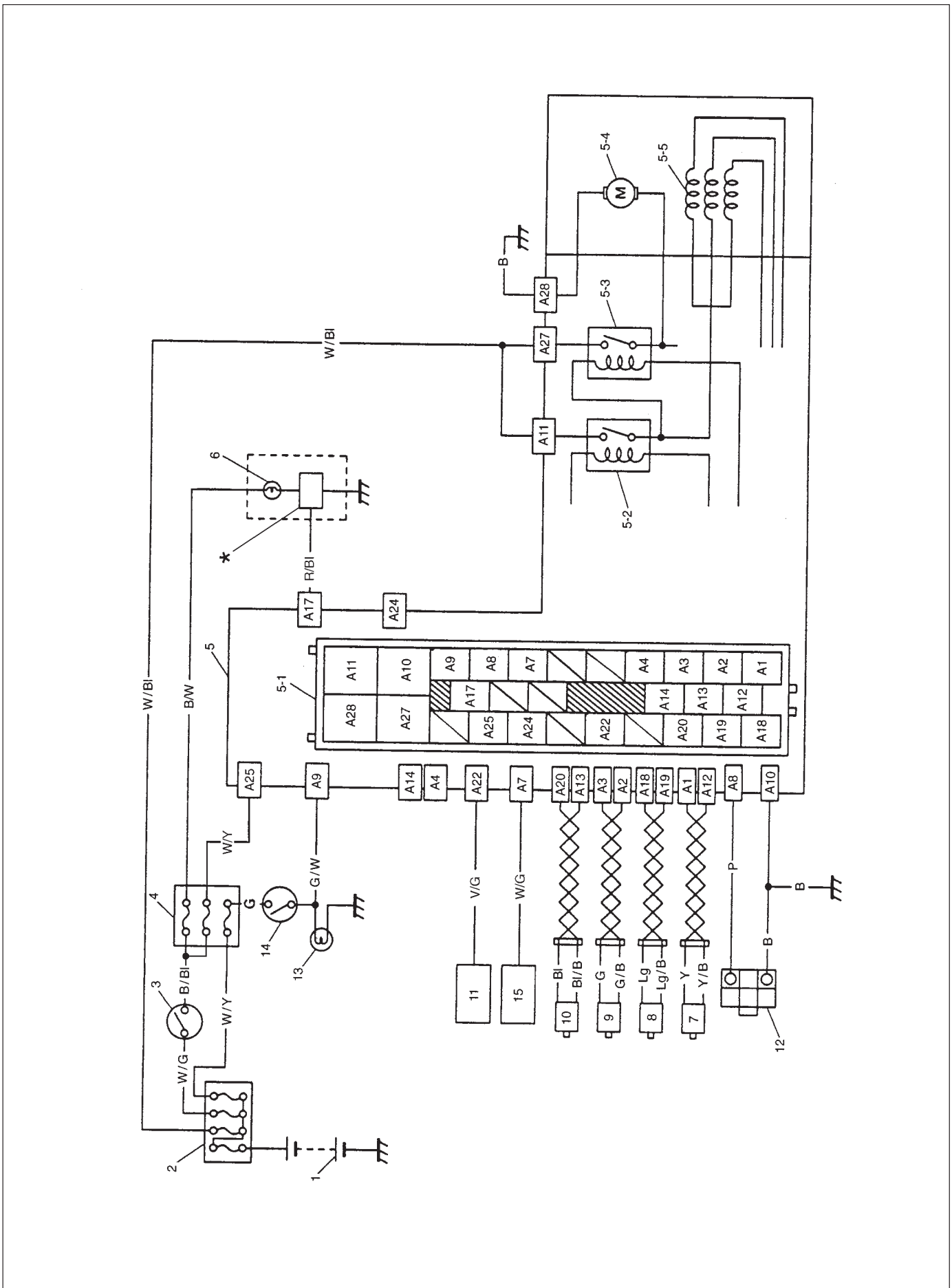
5) Turn ignition switch OFF and disconnect service wire from diag. connector.
6) Perform DRIVING TEST and DTC CHECK and confirm that normal DTC (DTC 12) is displayed; not malfunction DTC.

NOTE:
It is also possible to clear DTC by using SUZUKI scan tool. Refer to Cartridge Manual for procedure to clear DTC.

DIAGNOSTIC TROUBLE CODE (DTC) TABLE

DTC	VOLTMETER INDICATION (or "ABS" warning lamp flashing pattern)	DIAGNOSTIC AREA	
13		Wheel speed sensor and/or rotor or hydraulic unit	
21		Right-front	Wheel speed sensor circuit and rotor
22		Right-front	
25		Left-front	
26		Left-front	
31		Right-rear	
32		Right-rear	
35		Left-rear	
36		Left-rear	
41		Right-front	Solenoid (in hydraulic unit) circuit
42			
45		Left-front	
46			
55		Rear	
56			
57		Solenoid and pump motor power source circuit	
61		ABS pump motor or its circuit (in hydraulic unit)	
63		ABS fail-safe relay circuit	
71		ABS control module	
12		Normal	

SYSTEM CIRCUIT



1. Battery
2. Main fuses
3. Ignition switch
4. Circuit fuses
5. ABS hydraulic unit/control module
5-1. Terminal arrangement for ABS hydraulic unit/control module assembly
5-2. ABS fail-safe relay (Solenoid valve relay)
5-3. ABS pump motor relay
5-4. Pump motor
5-5. Solenoid valves
6. "ABS" warning lamp
7. Right-rear wheel speed sensor
8. Left-rear wheel speed sensor
9. Right-front wheel speed sensor
10. Left-front wheel speed sensor
11. Data link connector
12. Diagnosis connector
13. Stop lamp
14. Stop lamp switch
15. PCM (ECM+TCM) or ECM

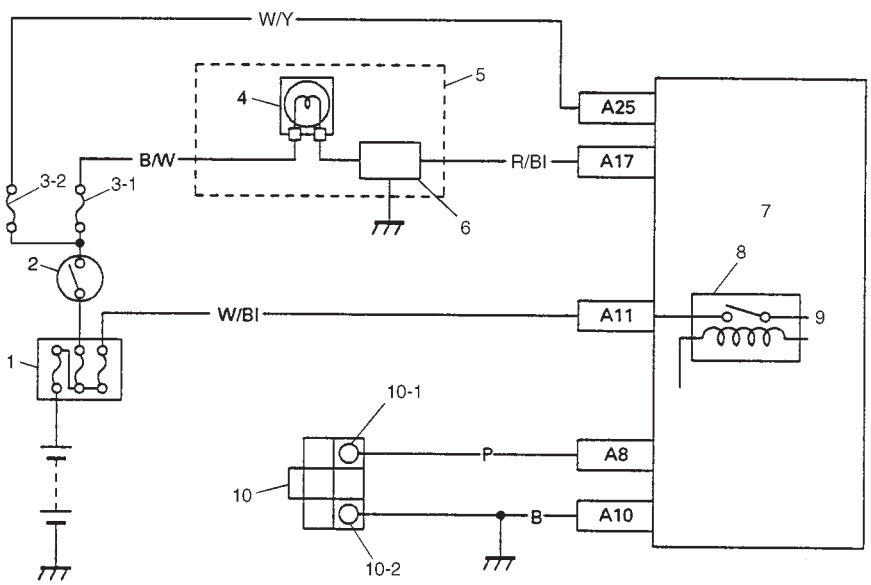
*: ABS lamp driver module
It is a module to turn on ABS warning lamp under the following conditions;
- each terminals "A25", "A17" and "A10" of ABS hydraulic unit/control module connector isn't connected,
- fuse has blown,
- each wire ("B/W", "R/Bl" and "B") is open.

Wire color

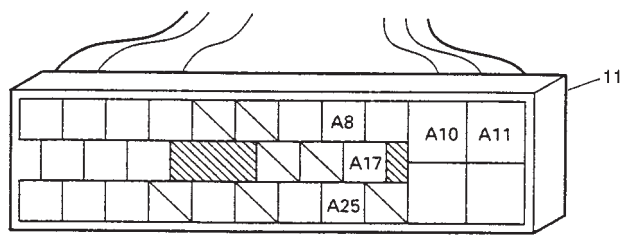
B : Black
B/Bl : Black/Blue
B/O : Black/Orange
B/W : Black/White
Bl : Blue
Bl/B : Blue/Black
Bl/O : Blue/Orange
G : Green
G/B : Green/Black
G/W : Green/White
Lg : Lightgreen
Lg/B : Lightgreen/Black
O/B : Orange/Black
O/G : Orange/Green
O/W : Orange/White
P : Pink
P/B : Pink/Black
V/W : Violet/White
W/Bl : White/Blue
W/G : White/Green
W/Y : White/Yellow
Y : Yellow
Y/B : Yellow/Black

TERMINAL	CIRCUIT
A1	Right-rear wheel speed sensor (+)
A2	Right-front wheel speed sensor (–)
A3	Right-front wheel speed sensor (+)
A4	———
A5	———
A6	———
A7	Idle up signal
A8	Diagnosis switch terminal
A9	Stop lamp switch
A10	Ground (For ABS control module)
A11	ABS fail-safe relay
A12	Right-rear wheel speed sensor (–)
A13	Left-front wheel speed sensor (–)
A14	———
A15	———
A16	———
A17	"ABS" warning lamp
A18	Left-rear wheel speed sensor (+)
A19	Left-rear wheel speed sensor (–)
A20	Left-front wheel speed sensor (+)
A21	———
A22	Data link connector
A23	———
A24	———
A25	Ignition switch
A26	———
A27	ABS pump motor relay
A28	Ground (For ABS pump motor)

TABLE – A "ABS" WARNING LAMP CIRCUIT CHECK – LAMP DOES NOT COME "ON" AT IGNITION SWITCH ON



1. Main fuse
2. Ignition switch
3-1. Circuit fuse (for IG)
3-2. Circuit fuse (for ABS)
4. "ABS" warning lamp in combination meter
5. Combination meter
6. ABS lamp driver module
7. ABS hydraulic unit / control module assembly
8. Fail-safe relay
9. To solenoid valves and pump motor relay (ABS hydraulic unit)
10. Diagnosis connector
10-1. Diag. switch terminal
10-2. Diag. ground terminal
11. ABS hydraulic unit/control module connector of harness



CIRCUIT DESCRIPTION

Operation (ON / OFF) of "ABS" warning lamp is controlled by ABS control module.
If the Antilock brake system is in good condition, ABS control module turns "ABS" warning lamp ON at the ignition switch ON, keeps it ON for 2 seconds only and then turns it OFF. If an abnormality in the system is detected, the lamp is turned ON by ABS control module. Also, it is turned ON by ABS lamp driver module when the connector of ABS control module was disconnected.

INSPECTION

STEP	ACTION	YES	NO
1	1) Turn ignition switch ON. Do other warning lamp come ON?	Go to step 2.	Go to step 4.
2	1) Disconnect ABS hydraulic unit/control module connector. Does ABS warning lamp light with ignition switch ON?	Replace ABS hydraulic unit/control module assembly.	Go to step 3.
3	1) Remove combination meter. Is bulb of ABS warning lamp in good condition?	"R/Bl" circuit shorted to ground. If OK, replace ABS lamp driver module.	Replace bulb.
4	Is IG fuse in good condition?	Open in "B / W" wire to combination meter or poor connection.	Repair and replace.

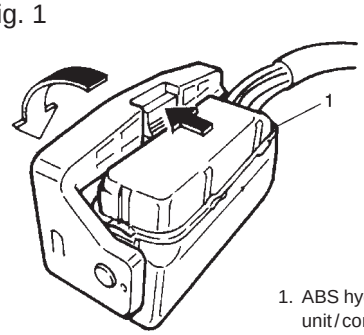
TABLE – B "ABS" WARNING LAMP CIRCUIT CHECK – LAMP COMES "ON" STEADY

Refer to TABLE – A for System Circuit Diagram and Circuit Description.

INSPECTION

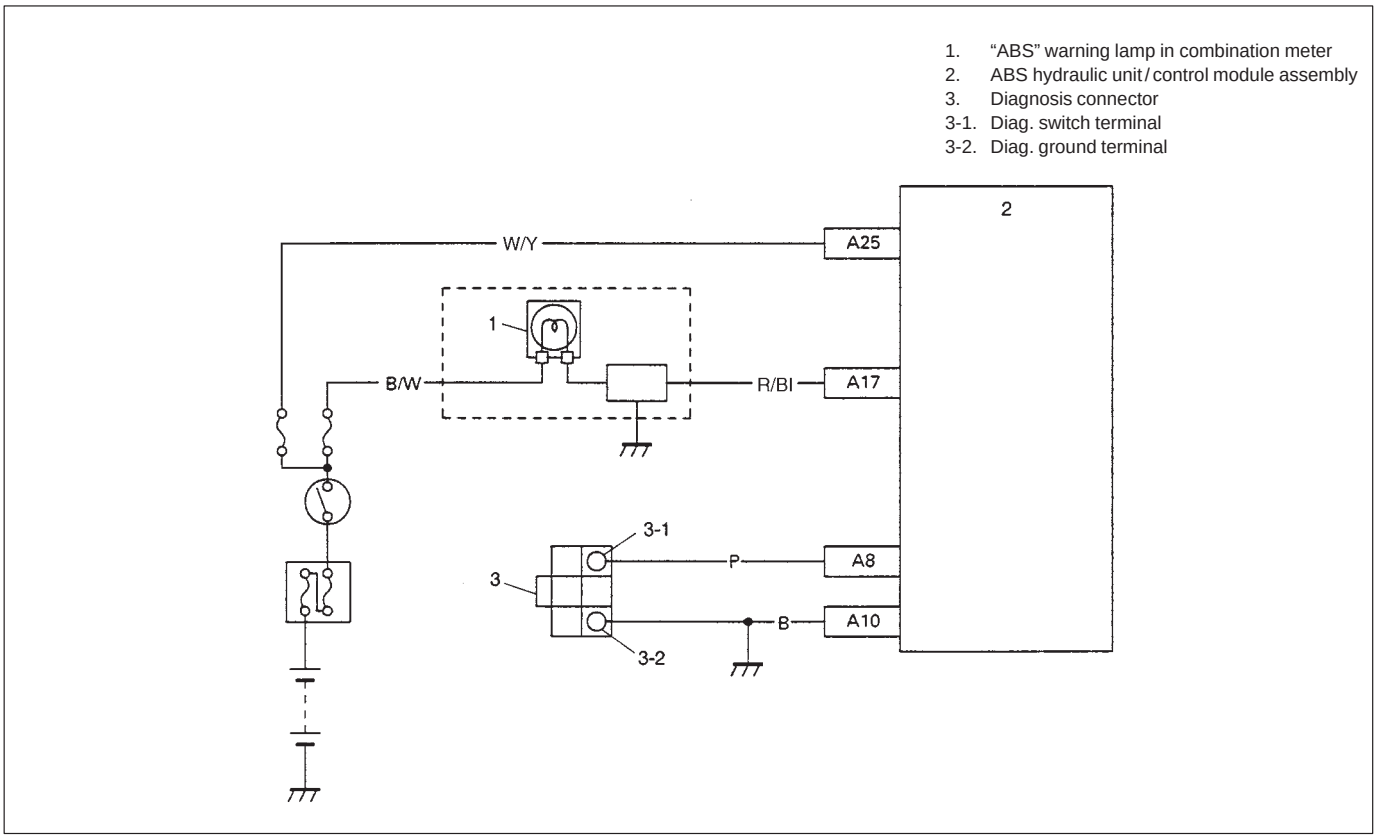
STEP	ACTION	YES	NO
1	Perform diagnostic trouble code check. Is there any DTC (including code No.12, NO CODES on SUZUKI scan tool) exists?	Go to step 2.	Go to step 3.
2	Is malfunction DTC (other than code No.12) exists at step 1?	Go to step 7 of "ABS diagnostic flow table" in this section.	Go to step 3.
3	1) Disconnect ABS hydraulic unit/control module connector. (See Fig. 1) 2) Check for proper connection to ABS hydraulic unit/control module connector at terminals "A17", "A25" and "A10". 3) If OK then ignition switch "ON" and measure voltage at terminal A25 of connector. Is it 10 – 14 V?	Go to step 4.	"B/W" circuit open.
4	1) With ABS control module connector disconnected, turn ignition switch ON and light ABS warning lamp. 2) Connect terminal "A17" of disconnected connector to ground using service wire. Does ABS warning lamp turn off?	Go to step 5.	"R/Bl" circuit open. If wire and connection are OK, replace ABS lamp driver module.
5	1) Measure resistance from connector terminal "A10" to body ground. Is continuity indicated?	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	"B" circuit open.

Fig. 1



1. ABS hydraulic unit/control module connector

TABLE – C "ABS" WARNING LAMP CIRCUIT CHECK – THE LAMP FLASHES CONTINUOUSLY WHILE IGNITION SWITCH IS ON



CIRCUIT DESCRIPTION

When diag. switch terminal is shorted or connected to the ground with ignition switch ON, diag. trouble code (DTC) is indicated by flashing of "ABS" warning lamp only in following cases.

- Normal DTC (12) is indicated if no malfunction DTC is detected in the ABS.
- A history malfunction DTC is indicated by flashing of the lamp if a current malfunction DTC is not detected at that point although a history malfunction DTC is stored in memory.

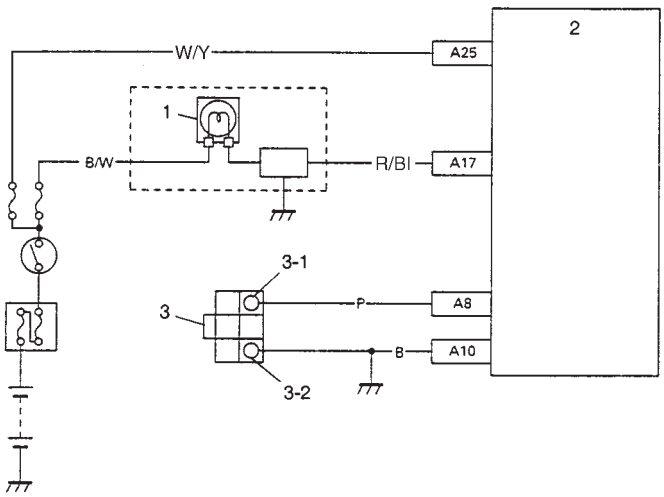
NOTE:

If ABS hydraulic unit/control module assembly has been replaced by a new one, "ABS" warning lamp may flash when ignition switch is turned ON. In such case, perform "ABS Hydraulic Unit Operation Check" described in this section and make sure that it does not flash.

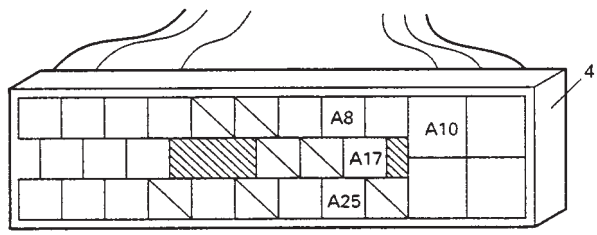
INSPECTION

STEP	ACTION	YES	NO
1	Is diag. switch terminal connected to ground via service wire?	Go to step 3.	Go to step 2.
2	1) Ignition switch ON. 2) Measure voltage between diag. switch terminal and ground. Is it 10 – 14 V	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	"P" wire circuit shorted to ground.
3	1) Ignition switch ON. 2) Does flashing of ABS warning lamp indicate DTC (DTC 12 or history DTC)?	Go to step 7 of ABS diagnostic flow table in this section.	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.

TABLE – D CODE (DTC) IS NOT OUTPUTTED EVEN WITH DIAG. SWITCH TERMINAL CONNECTED TO GROUND.



1. "ABS" warning lamp in combination meter
2. ABS hydraulic unit/control module assembly
3. Diagnosis connector
3-1. Diag. switch terminal
3-2. Diag. ground terminal
4. ABS hydraulic unit/control module connector of harness



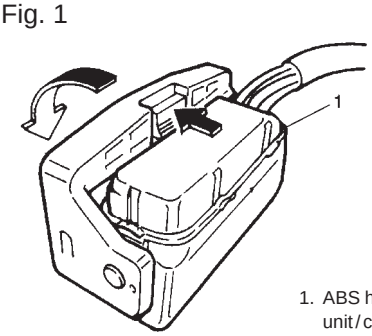
CIRCUIT DESCRIPTION

When diag. switch terminal is connected to ground with ignition switch turned ON, the ABS control module outputs diagnostic trouble code by flashing "ABS" warning lamp.

INSPECTION

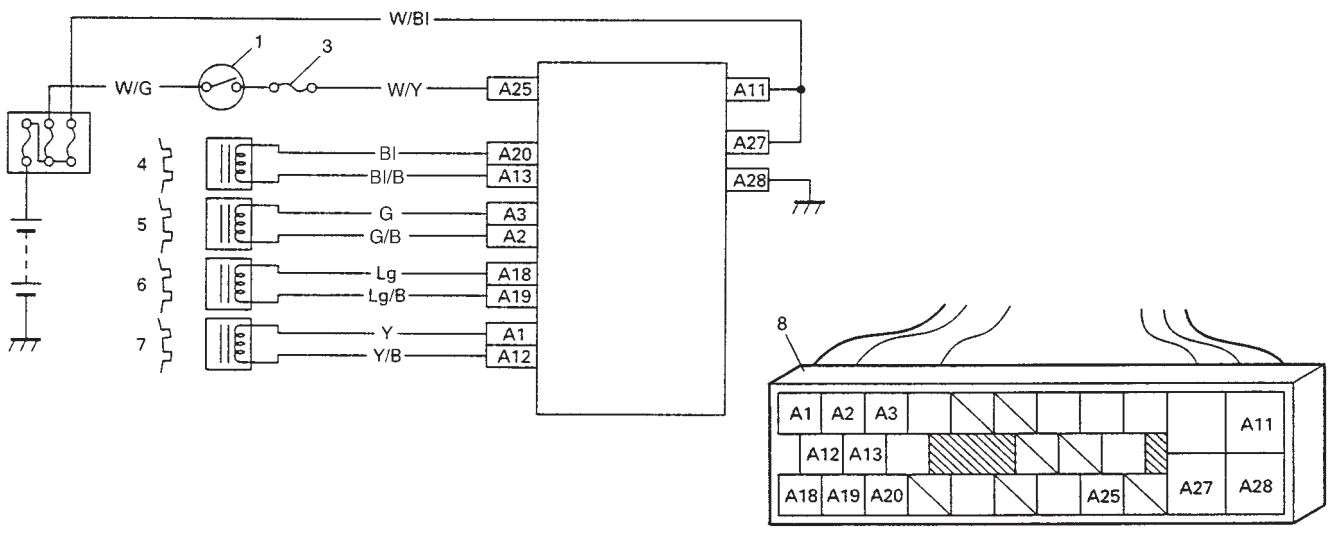
STEP	ACTION	YES	NO
1	Is it shorted diag. switch terminal and ground terminal by service wire properly?	Go to step 2.	Connect service wire securely.
2	1) Disconnect service wire. 2) Disconnect ABS hydraulic unit/control module connector. (See Fig. 1) 3) Measure resistance between diag. switch terminal and connector terminal "A8". Is it infinite (∞)?	"P" circuit open.	Go to step 3.
3	1) Measure resistance between ground terminal of monitor connector and body ground. Is continuity indicated?	Go to step 4.	"B" circuit open or poor connection.
4	1) Check for proper connection to ABS hydraulic unit/control module at terminal "A8" and "A10". 2) If OK, then check "ABS" warning lamp circuit referring to TABLE A, B and C. Is it in good condition?	Substitute a known-good ABS hydraulic with/control module assembly and recheck.	Repair "ABS" warning lamp circuit.

Fig. 1



1. ABS hydraulic unit/control module connector

DTC 13 – WHEEL SPEED SENSOR/ROTOR OR ABS HYDRAULIC UNIT



1. Ignition switch
2. ABS hydraulic unit / control module assembly
3. Circuit fuse for ABS
4. Left-front wheel speed sensor & rotor
5. Right-front wheel speed sensor & rotor
6. Left-rear wheel speed sensor & rotor
7. Right-rear wheel speed sensor & rotor
8. ABS hydraulic unit / control module connector of harness

DESCRIPTION

When abnormal sensor signal is inputted while running or wrong ABS hydraulic unit/control module is installed, this DTC will be set.

INSPECTION

STEP	ACTION	YES	NO
1	1) Remove all speed sensors. 2) Check each sensor for damage or foreign material being attached to it. Are they in good condition? (See Fig. 1.)	Go to step 2.	Clean or replace.
2	Check visually all wheel speed sensor installation hole for the following. ● Rotor serration (teeth) neither missing nor damaged. ● No foreign material attached. ● Rotor not being eccentric. ● Wheel bearing free from excessive play. Are they in good condition? (See Fig. 2.)	Go to step 3.	Clean, repair or replace.
3	1) Install each speed sensor to each knuckle and/or axle housing. 2) Tighten each sensor bolt to specified torque. Is there any clearance between sensor and knuckle or axle housing? (See Fig. 3)	Replace sensor.	Go to step 4.
4	Referring to item OUTPUT VOLTAGE INSPECTION of FRONT WHEEL SPEED SENSOR, check output voltage or waveform of each sensor. Is proper output voltage or waveform available?	Go to step 5.	Replace sensor and recheck.
5	Referring to item ABS HYDRAULIC UNIT OPERATION CHECK in this section, check ABS hydraulic unit. Is it in good condition?	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	Replace ABS, hydraulic unit/control module assembly.

Fig. 1

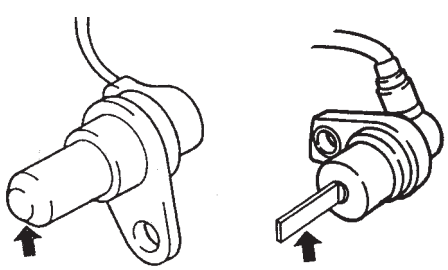


Fig. 2

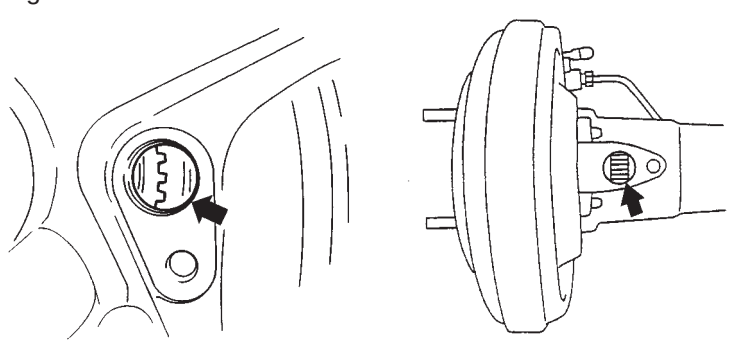
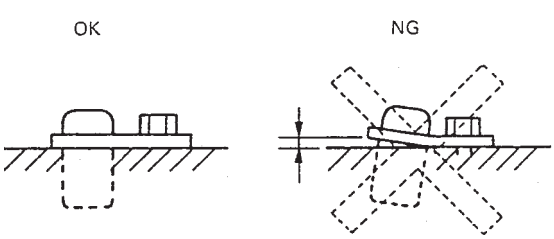
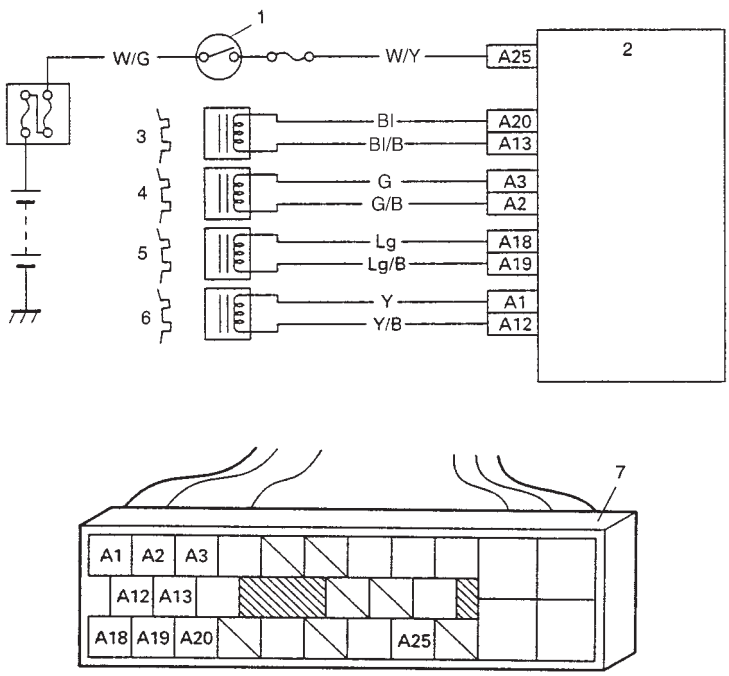


Fig. 3



DTC 21, 22 – RIGHT-FRONT WHEEL SPEED SENSOR CIRCUIT
25, 26 – LEFT-FRONT WHEEL SPEED SENSOR CIRCUIT
31, 32 – RIGHT-REAR WHEEL SPEED SENSOR CIRCUIT
35, 36 – LEFT-REAR WHEEL SPEED SENSOR CIRCUIT



1. Ignition switch
2. ABS hydraulic unit/control module assembly
3. Left-front wheel speed sensor
4. Right-front wheel speed sensor
5. Left-rear wheel speed sensor
6. Right-rear wheel speed sensor
7. ABS hydraulic unit/control connector of harness

DESCRIPTION

ABS control module monitors the voltage at positive (+) terminal of each sensor while ignition switch is ON. When the voltage is not within the specified range, applicable DTC will be set. Also, when no sensor signal is inputted at starting or while running, applicable DTC will be set.

NOTE:

When the vehicle was operated in any of the following ways, one of these DTCs may be set even when the sensor is in good condition. If such possibility is suspected, repair the trouble (dragging of brake, etc.) of the vehicle, clear DTC once and then after performing the driving test as described in Step 2 of "ABS DIAG. FLOW TABLE", check whether or not any abnormality exists.

– The vehicle was driven with parking brake pulled.

– The vehicle was driven with brake dragging.

– Wheel spin occurred while driving.

– Wheel(s) was turned while the vehicle was jacked up.

– The vehicle was stuck.

INSPECTION

STEP	ACTION	YES	NO
1	1) Disconnect applicable sensor connector with ignition switch OFF. 2) Measure resistance between sensor terminals. Resistance of wheel speed sensor: 1.2 – 1.6 kΩ (at 20 C, 68 F) 3) Measure resistance between each terminal and body ground. Insulation resistance: 1MΩ or higher Were measured resistance values in step 2) and 3) as specified? (See Fig. 1)	Go to step 2.	Replace sensor.
2	1) Ignition switch OFF. 2) Disconnect connector from ABS hydraulic unit/control module assembly. (See Fig. 2) 3) Check for proper connection to ABS hydraulic unit/control module assembly at each sensor terminal. 4) If OK then, turn ignition switch ON and measure voltage between sensor positive terminal of module connector and body ground. Is it 0V?	Go to step 3.	Sensor positive circuit shorted to power.
3	1) Ignition switch OFF. 2) Connect connector to sensor. 3) Measure resistance between sensor terminals at module connector. 4) Measure resistance between sensor positive terminal and negative terminal of module connector, between positive terminal and body ground. Are measured resistance values within each specified range described in above step 1)?	Go to step 4.	Circuit open or shorted to ground.
4	1) Remove wheel speed sensor. 2) Check sensor for damage or foreign material being attached. Is it in good condition? (See Fig. 3)	Go to step 5.	Clean or replace sensor.
5	Check visually through wheel speed sensor installation hole for following. ● Rotor serration (teeth) neither missing or damaged. ● No foreign material being attached. ● Rotor not being eccentric. ● Wheel bearing free from excessive play. Are they in good condition? (See Fig. 4)	Go to step 6.	Clean, repair or replace.
6	1) Install sensor to knuckle or axle housing. 2) Tighten sensor bolt to specified torque and check that there is not any clearance between sensor and knuckle or axle housing. (See Fig. 5) Replace sensor if any. Referring to item OUTPUT VOLTAGE INSPECTION of FRONT WHEEL SPEED SENSOR, check output voltage or waveform of sensor. Is proper output voltage or waveform obtained?	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	Replace sensor and recheck.

Fig. 1

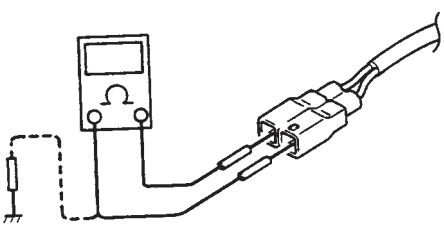
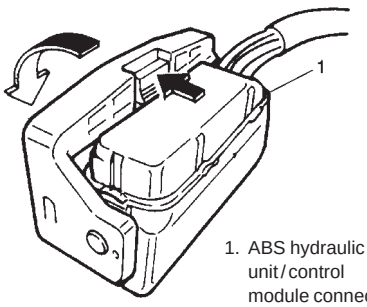


Fig. 2



1. ABS hydraulic unit / control module connector

Fig. 3

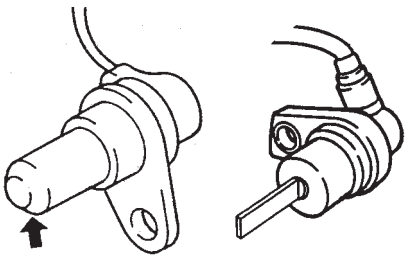


Fig. 4

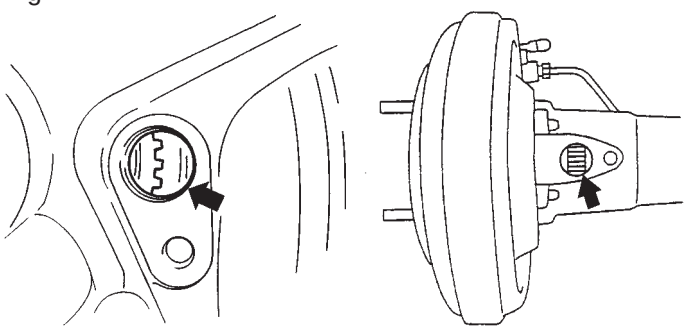
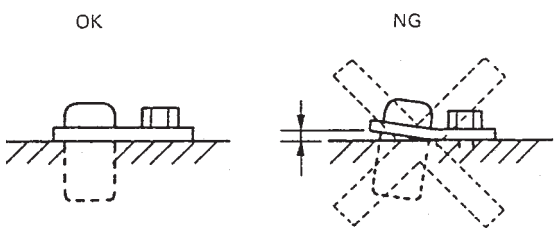
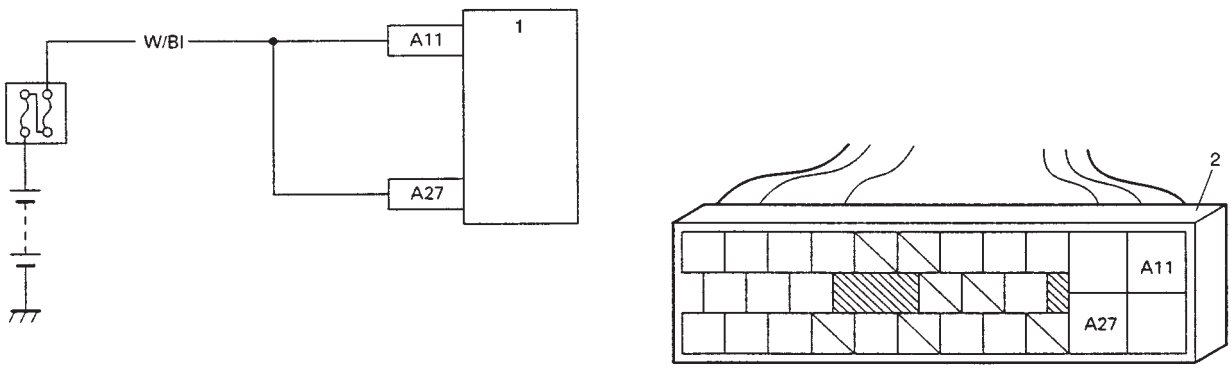


Fig. 5



DTC 41, 42 – RIGHT-FRONT SOLENOID CIRCUIT
45, 46 – LEFT-FRONT SOLENOID CIRCUIT
55, 56 – REAR SOLENOID CIRCUIT

1. ABS hydraulic unit/control module assembly
2. ABS hydraulic unit/control module connector of harness



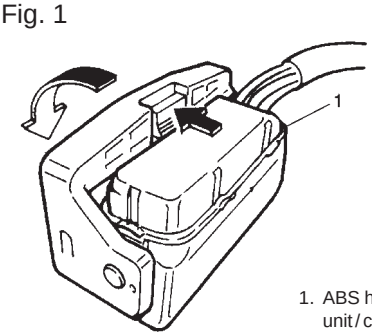
DESCRIPTION

ABS control module monitors the voltage of the terminal of solenoid circuit constantly with ignition switch turned ON. It sets this DTC when the terminal voltage does not become low/high for ON/OFF command to solenoid or the voltage difference between solenoid circuit terminals exceeds the specified value with solenoid turned OFF.

INSPECTION

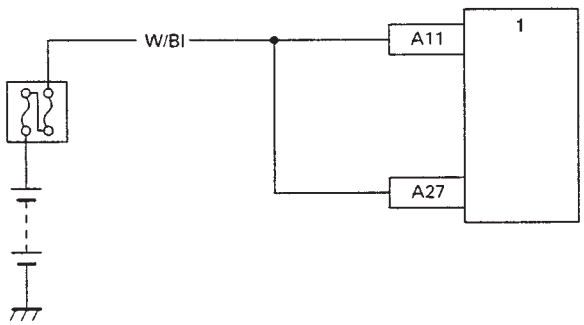
STEP	ACTION	YES	NO
1	1) Check solenoid operation referring to item "ABS HYDRAULIC UNIT OPERATION CHECK" in this section. Is it in good condition?	Check terminals "A11" and "A27" connection. If connections OK, substitute a known-good ABS hydraulic unit/control module assembly and recheck.	Go to step 2.
2	1) Ignition switch "OFF". 2) Disconnect ABS hydraulic unit/control module connector. (See Fig. 1) 3) Check for proper connection to ABS hydraulic unit/control module connector at terminal "A11". 4) If OK, then measure voltage between terminal "A11" of module connector and body ground. Is it 10 – 14 V?	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	"W/Bl" circuit open.

Fig. 1

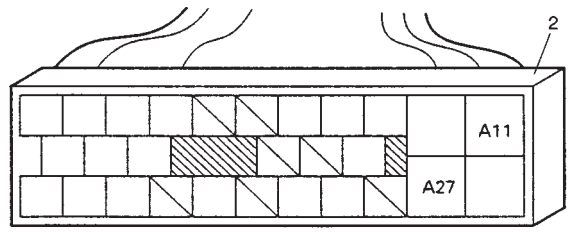


1. ABS hydraulic unit/control module connector

DTC 57 – SOLENOID AND PUMP MOTOR POWER SOURCE CIRCUIT



1. ABS hydraulic unit/control module assembly
2. ABS hydraulic unit/control module connector of harness



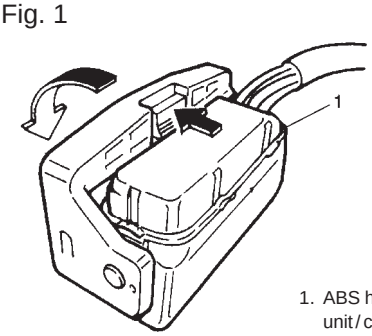
DESCRIPTION

ABS control module monitors the voltage at terminal ("A11" and "A27") of the fail-safe and pump motor relay circuits constantly with ignition switch turned ON. When all solenoid circuit voltages are below the specified value or the voltage at terminal "A27" became below the specified value while pump motor is operating, this DTC will be set. As soon as the voltage rises to the specified level, the set DTC will be cleared.

INSPECTION

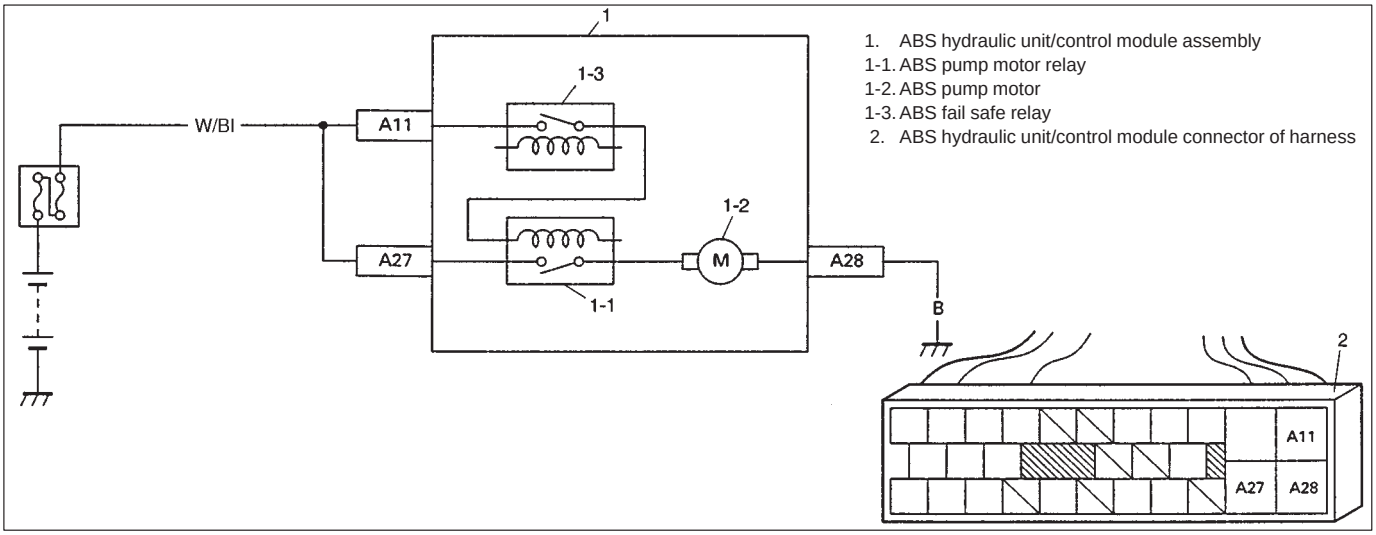
STEP	ACTION	YES	NO
1	Check battery voltage. Is it about 11 V or higher?	Go to step 2.	Check charging system referring to "CHARGING SYSTEM" section.
2	Check ABS main fuse and connection. Is it in good condition?	Go to step 3.	Repair and/or replace fuse.
3	1) Ignition switch OFF. 2) Disconnect ABS hydraulic unit/control module connector. (See Fig. 1) 3) Check proper connection to ABS hydraulic unit/control module connector at terminal A27. 4) If OK, then measure voltage between connector terminal A27 and body ground. Is it 10 – 14 V?	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	"W/Bl" circuit open.

Fig. 1



1. ABS hydraulic unit/control module connector

DTC 61 – ABS PUMP MOTOR CIRCUIT



1. ABS hydraulic unit/control module assembly
1-1. ABS pump motor relay
1-2. ABS pump motor
1-3. ABS fail safe relay
2. ABS hydraulic unit/control module connector of harness

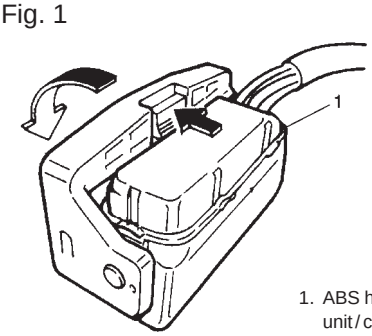
DESCRIPTION

ABS control module monitors the voltage at monitor terminal of pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal does not become high/low according to ON/OFF commands to the motor relay of the module (does not follow these commands).

INSPECTION

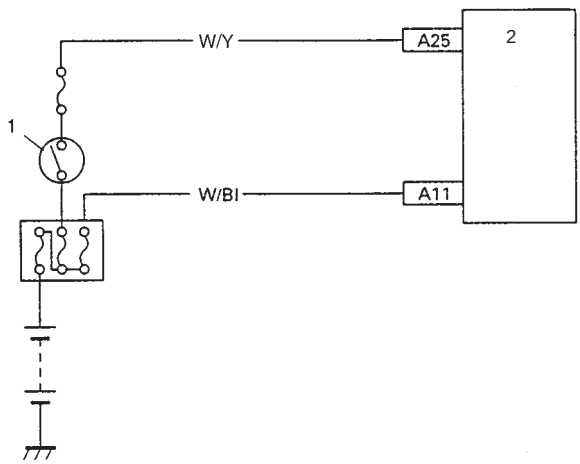
STEP	ACTION	YES	NO
1	1) Check pump motor referring to item "ABS HYDRAULIC UNIT OPERATION CHECK" in this section. Is it in good condition?	Check terminals "A11" and "A27" connection. If connections OK, substitute a known-good ABS hydraulic unit/control module assembly and recheck.	Go to step 2.
2	1) Ignition switch OFF. 2) Disconnect ABS hydraulic unit/control module connector. (See Fig. 1) 3) Check for proper connection to ABS hydraulic unit/control module connector at terminal "A27". 4) If OK, then measure voltage between terminal "A27" of module connector and body ground. Is it 10 – 14V?	Go to step 3.	"W/Bl" circuit open.
3	Measure resistance between connector terminal "A28" of ABS hydraulic unit/control module assembly and body ground. Is it infinite (∞)?	"B" circuit open.	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.

Fig. 1

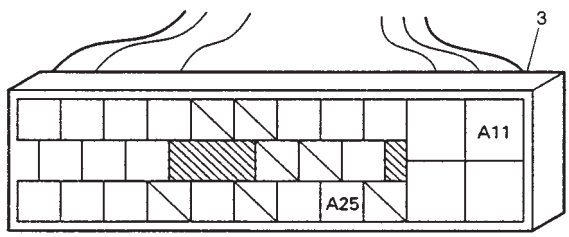


1. ABS hydraulic unit/control module connector

DTC 63 – ABS FAIL-SAFE RELAY CIRCUIT



1. Ignition switch
2. ABS hydraulic unit/control module assembly
3. ABS hydraulic unit/control module connector of harness



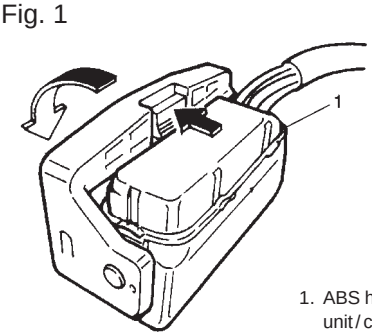
DESCRIPTION

ABS control module monitors the voltage at the terminal of solenoid circuit constantly with ignition switch turned ON. Also, immediately after ignition switch is turned "ON", perform initial check as follows.
Switch fail-safe relay in the order of ON → OFF → ON and check if voltage at 3 solenoid circuit terminals changes to High → Low → High. If anything faulty is found in the initial check and when voltage at all solenoid circuit terminals is low with ignition switch turned ON and ABS not operated, this DTC will be set.

INSPECTION

STEP	ACTION	YES	NO
1	Check battery voltage. Is it about 11 V or higher?	Go to step 2.	Check charging system referring to "CHARGING SYSTEM" section.
2	Check ABS main fuse and connection. Is it in good condition?	Go to step 3.	Repair and/or replace fuse.
3	1) Ignition switch OFF. 2) Disconnect ABS hydraulic unit/control module connector. (See Fig. 1) 3) Check proper connection to ABS hydraulic unit/control module at terminal "A11". 4) If OK, then measure voltage between connector terminal A11, and body ground. Is it 10 – 14 V?	Substitute a known-good ABS hydraulic unit/control module assembly and recheck.	"W/Bl" circuit open or short to ground.

Fig. 1



1. ABS hydraulic unit/control module connector

DTC 71 – ABS CONTROL MODULE

DESCRIPTION

This DTC will be set when internal fault is detected in ABS control module.

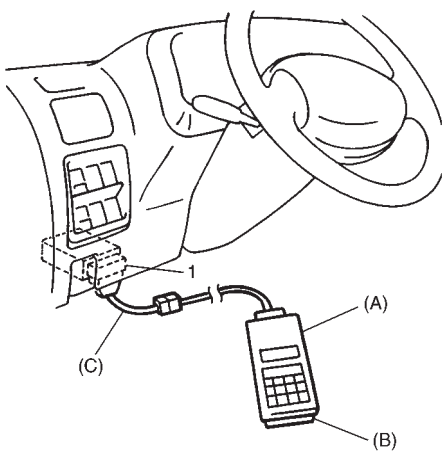
INSPECTION

STEP	ACTION	YES	NO
1	1) Ignition switch OFF. 2) Disconnect connectors from ABS control module. 3) Check for proper connection to ABS control module at all terminals. Are they in good condition?	Substitute a known-good ABS control module and recheck.	Repair or replace.

ON-VEHICLE SERVICE

PRECAUTION

When connector are connected to ABS hydraulic unit/control module assembly, do not disconnect connectors of sensors and turn ignition switch ON. Then DTC will be set in ABS control module.



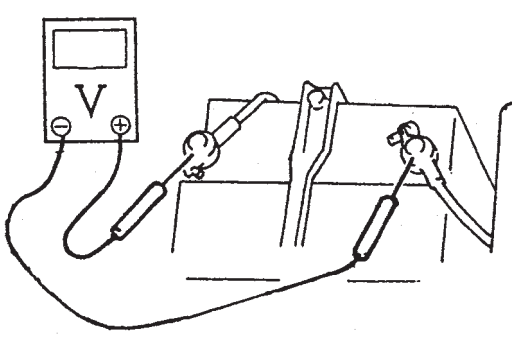
1. Data link connector (DLC)

ABS HYDRAULIC UNIT OPERATION CHECK (USING SUZUKI SCAN TOOL)

1) Connect SUZUKI scan tool (Tech-1) to DLC with ignition switch OFF.

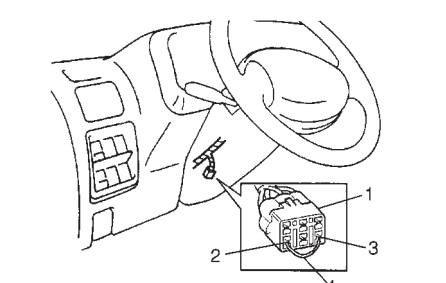
Special Tool
(A): 09931-76011 (SUZUKI scan tool)
(B): Mass storage cartridge
(C): 09931-76030 (16/14 pin DLC cable)

2) Turn ignition switch ON and check actuator operation by using "ABS HYDRAULIC CONTROL TEST" under "miscellaneous test" ("MISC. TEST") mode of SUZUKI scan tool.



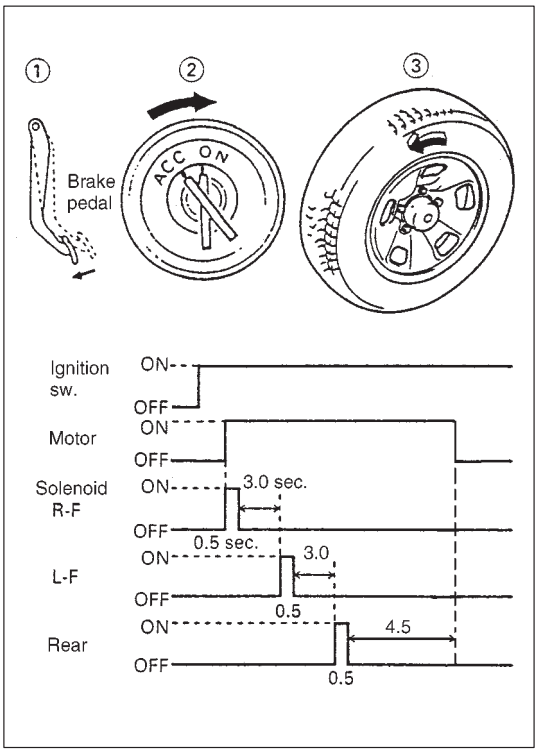
ABS HYDRAULIC UNIT OPERATION CHECK (NOT USING SUZUKI SCAN TOOL)

1) Check that basic brake system other than ABS is in good condition.
2) Check that battery voltage is 11V or higher.
3) With "ABS" warning lamp, check that no abnormality is detected in ABS. Refer to "DIAGNOSTIC TROUBLE CODE (DTC) CHECK" in this section.
4) Lift up vehicle.



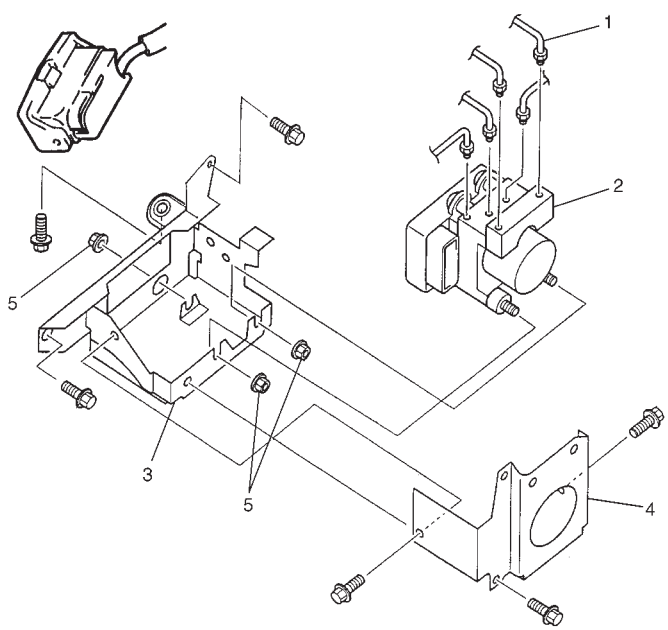
1. Diagnosis connector (6 pins connector)
2. Ground terminal
3. Diag. switch terminal
4. Service wire

5) Set transmission to neutral and release parking brake.
6) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.
7) With diag. switch terminal of diagnosis connector connected to ground by using service wire, turn ignition switch ON and check if "ABS" warning lamp indicates DTC 12.
8) Turn ignition switch "OFF".



9) Perform following checks with help of another person.
   Brake pedal should be depressed and then ignition switch turned ON by one person and wheel should be turned by another person's hand. At this time, check that:
   - Operation sound of solenoid is heard and wheel turns only about 0.5 sec. (Brake force is depressurized).
   - Operation sound of pump motor is heard and pulsation is felt at brake pedal.
10) If all 4-wheels cannot be checked during one ignition cycle (OFF → ON), repeat Steps 8) and 9) till all 4 wheels are checked.
    If a faulty condition is found in Steps 9) and 10), replace hydraulic unit/control module assembly.
11) Turn ignition switch "OFF" and remove service wire from diagnosis connector.

ABS HYDRAULIC UNIT/CONTROL MODULE ASSEMBLY

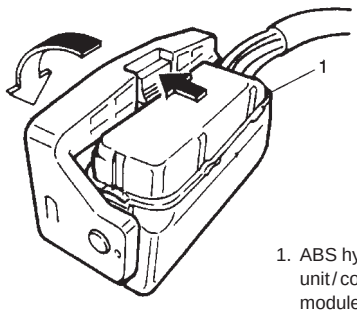


CAUTION:
Never disassemble ABS hydraulic unit/control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit/control module assembly.

1. Brake pipe
2. ABS hydraulic unit/control module assembly
3. Bracket
4. Cover
5. Nut

HYDRAULIC UNIT INSPECTION

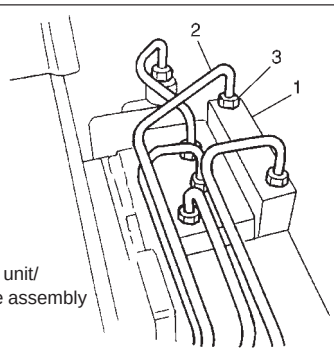
- Check hydraulic unit for fluid leakage.
  If any, repair or replace.



1. ABS hydraulic unit/control module connector

REMOVAL

1) Disconnect negative cable from battery.
2) Remove cover and disconnect ABS hydraulic unit/control module assembly connector.



1. ABS hydraulic unit/control module assembly
2. Brake pipe
3. Nut

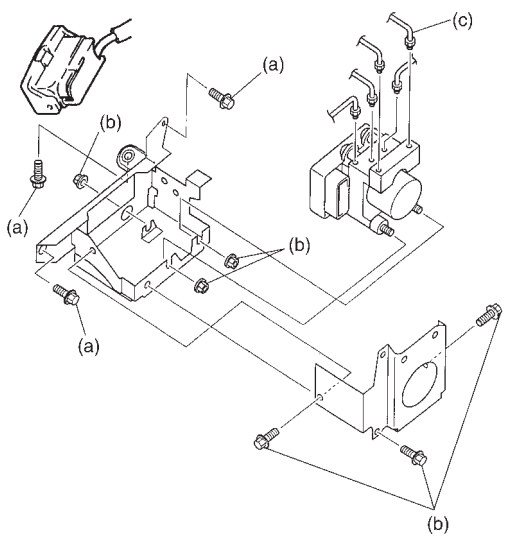
3) Using special tool, disconnect brake pipes from ABS hydraulic unit/control module assembly and loosen flare nuts as shown figure.

Special Tool
(A): 09950-78210

NOTE:
Put bleeder plug cap onto pipe to prevent fluid from spilling. Do not allow brake fluid to get on painted surfaces.

4) Remove three nuts and take out ABS hydraulic unit/control module assembly from bracket.

CAUTION:
- **Do not give an impact to hydraulic unit.**
- **Use care not to allow dust to enter hydraulic unit.**
- **Do not place hydraulic unit on its side or upside down. Handling it in inappropriate way will affect its original performance.**



INSTALLATION

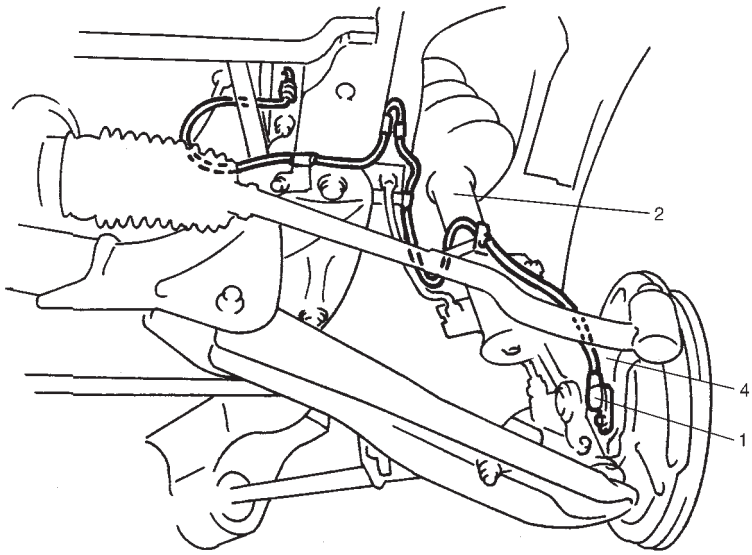
1) Install hydraulic unit by reversing removal procedure.

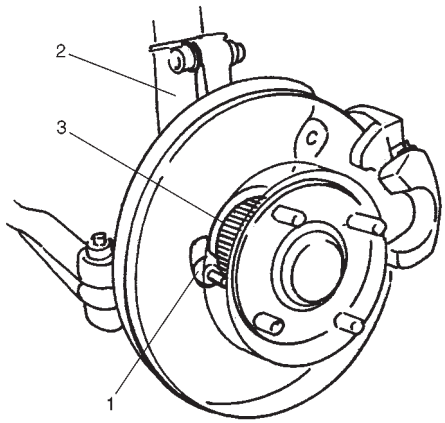
Tightening Torque
(a): 23 N·m (2.3 kg-m, 16.6 lb-ft)
(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)
(c): 16 N·m (1.6 kg-m, 12.0 lb-ft)

2) Bleed air from brake system referring to “BRAKE” section.
3) Check each installed part for fluid leakage and perform “ABS Hydraulic Unit Operation Check” procedure in this section.

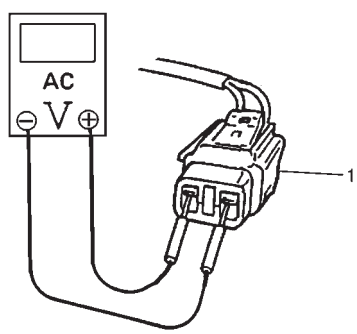
NOTE:
For new ABS hydraulic unit/control module assembly, if “ABS Hydraulic Unit Operation Check” procedure has not been performed, “ABS” warning lamp may flash when ignition switch is turned ON.

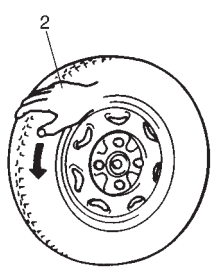
FRONT WHEEL SPEED SENSOR





1. Left front wheel speed sensor
2. Left front strut
3. Sensor ring
4. Knuckle





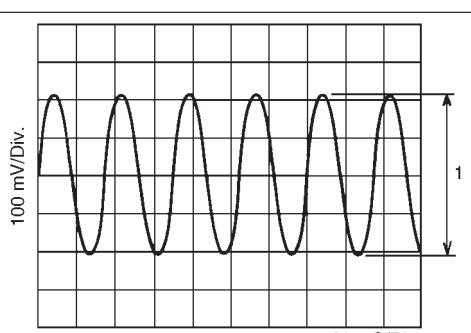
1. Wheel speed sensor connector
2. Rotate by hand

OUTPUT VOLTAGE INSPECTION

1) Turn ignition switch “OFF”.
2) Hoist vehicle a little.
3) Disconnect connector of wheel speed sensor.
4) Connect voltmeter between connector terminals.
5) While turning wheel at a speed of approximately 1 full rotation to 1 1/3 rotation per second, check AC voltage of sensor.

   Output AC voltage at 1 to 1 1/3 rotation per second : 100 mV or more

   If measured voltage is not as specified, check sensor, rotor and their installation conditions.

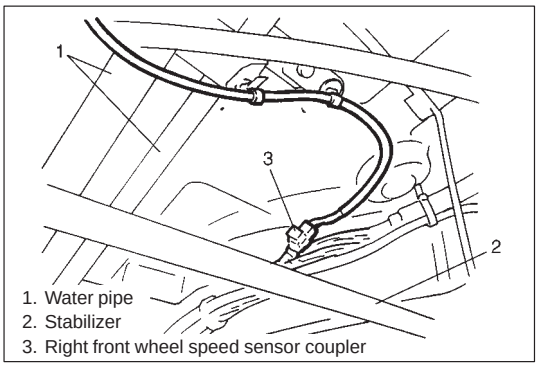


1. Peak-to-peak voltage

Reference

When using oscilloscope for this check, check if peak-to-peak voltage meets specification and waveform is complete.

Peak-to-peak voltage at 1 to 1 1/3 rotation per second : 280 mV or more at 42 – 54 Hz

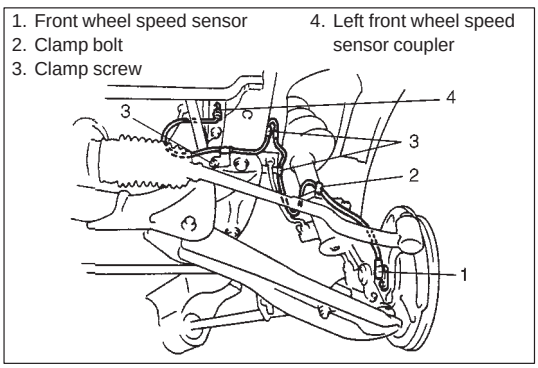


1. Water pipe
2. Stabilizer
3. Right front wheel speed sensor coupler

REMOVAL

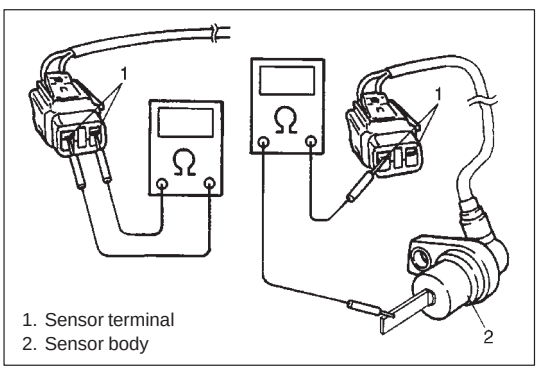
1) Disconnect negative cable from battery.
2) Disconnect front wheel speed sensor coupler.
3) Hoist vehicle and remove wheel.

1. Front wheel speed sensor
2. Clamp bolt
3. Clamp screw
4. Left front wheel speed sensor coupler



4) Remove harness clamp bolts and clamp screws and remove front wheel speed sensor from knuckle.

CAUTION:
- **Do not pull wire harness when removing front wheel speed sensor.**
- **Do not cause damage to surface of front wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



1. Sensor terminal
2. Sensor body

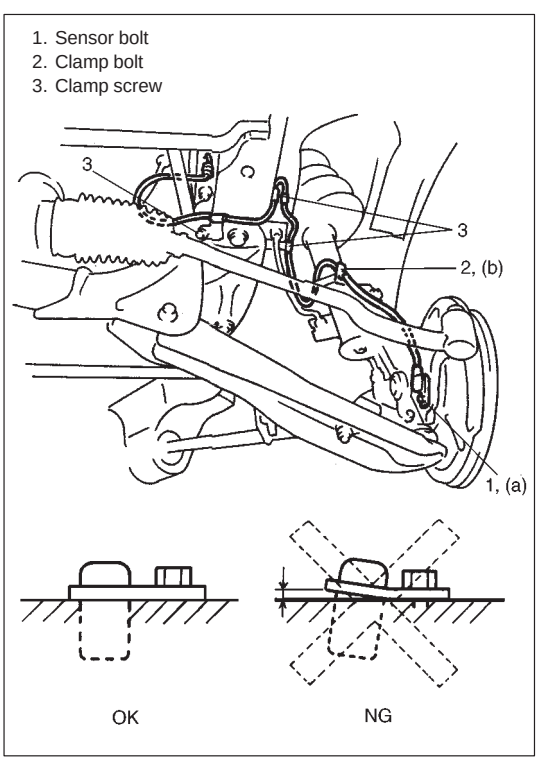
SENSOR INSPECTION

- Check sensor for damage.
- Check sensor for resistance and continuity.

Between both terminals of sensor : 1.2 – 1.6 kΩ at 20°C (68°F)
Between sensor terminal and sensor body: No continuity

If the check result is not as specified and any malcondition is found, replace.

1. Sensor bolt
2. Clamp bolt
3. Clamp screw



INSTALLATION

1) Check that no foreign material is attached to sensor and rotor.
2) Install it by reversing removal procedure.

Tightening Torque
(a): 26 N·m (2.6 kg-m, 18.8 lb-ft)
(b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

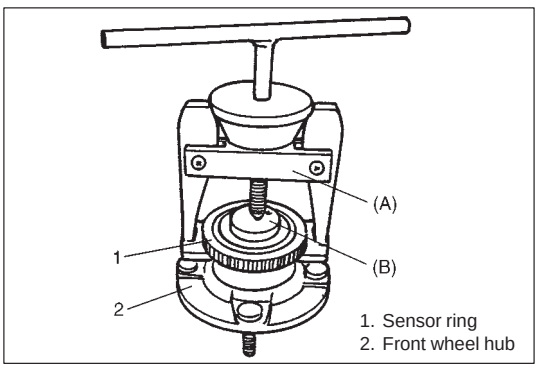
CAUTION:
Do not pull wire harness or twist more than necessary when installing front wheel speed sensor.

3) Check that there is no clearance between sensor and knuckle.

FRONT WHEEL SENSOR RING

REMOVAL

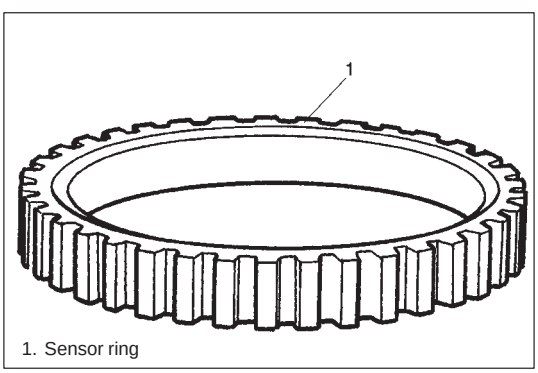
1) Remove ABS front wheel sensor from knuckle.
2) Remove front wheel hub referring to Section 3D of this manual.



3) Remove sensor ring from front wheel hub using special tool.

Special Tool
(A): 09913-61510
(B): 09913-85230

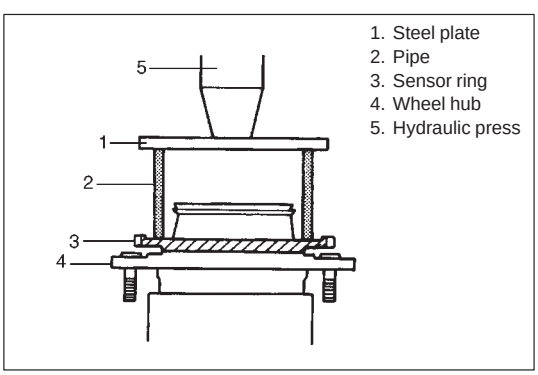
CAUTION:
Pull out sensor ring from front wheel hub gradually and evenly. Attempt to pull it out partially may cause it to be deformed.



INSPECTION

- Check ring serration (teeth) for being missing, damaged or deformed.
- Check sensor ring for being deformed (warped).
- Check that no foreign material is attached.

If any malcondition is found, repair or replace.



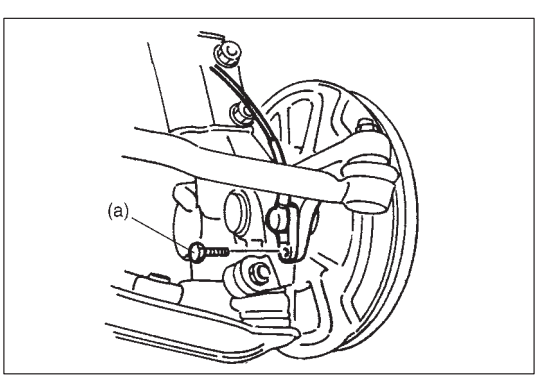
INSTALLATION

NOTE:
Do not reuse (reinstall) removed sensor ring.

1) Install new sensor ring as shown.

NOTE:

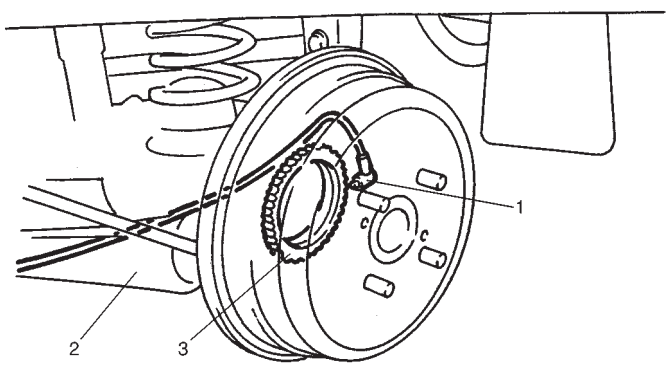
- **Pipe used here should have inner diameter of 65 mm (2.56 in.) – 71 mm (2.80 in.) and its outside should not contact teeth of sensor ring.**
- **Use care not to insert wheel hub diagonally.**

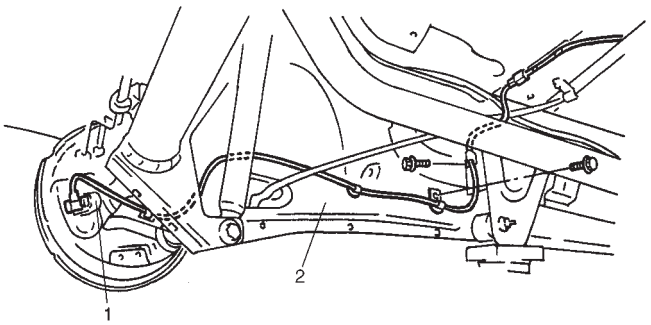


2) Install front wheel hub. Refer to Section 3D of this manual.
3) Install ABS front wheel speed sensor to the knuckle.

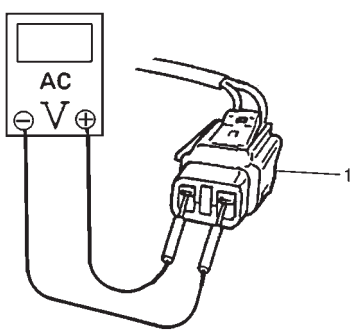
Tightening Torque
(a): 26 N·m (2.6 kg-m, 18.8 lb-ft)

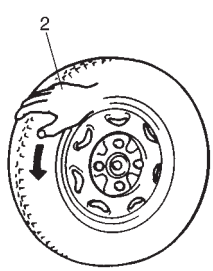
REAR WHEEL SPEED SENSOR





1. Left rear wheel sensor
2. Trailing arm
3. Sensor ring





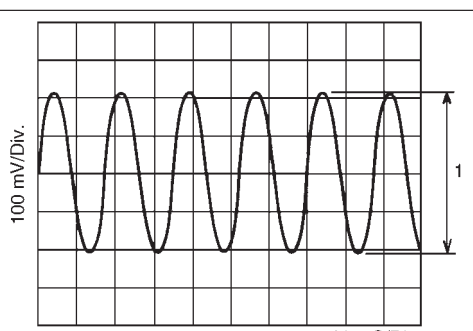
1. Wheel speed sensor connector
2. Rotate by hand

OUTPUT VOLTAGE INSPECTION

1) Turn ignition switch “OFF”.
2) Hoist vehicle a little.
3) Disconnect connector of wheel speed sensor.
4) Connect voltmeter between connector terminals.
5) While turning wheel at a speed of approximately 1 full rotation to 1 1/3 rotation per second, check AC voltage of sensor.

   Output AC voltage at 1 to 1 1/3 rotation per second
   : 100 mV or more

   If measured voltage is not as specified, check sensor, rotor and their installation conditions.

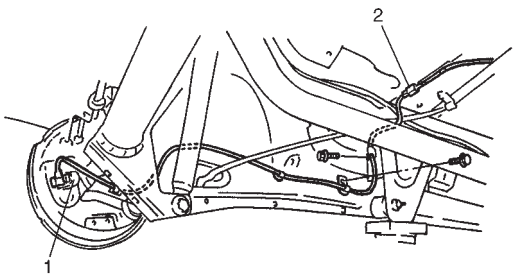


1. Peak-to-peak voltage

Reference

When using oscilloscope for this check, check if peak-to-peak voltage meets specification and waveform is complete.

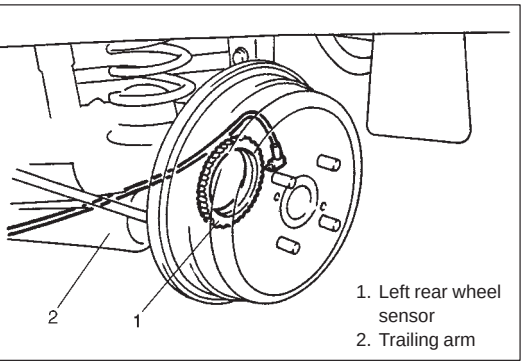
Peak-to-peak voltage at 1 to 1 1/3 rotation per second
: 280 mV or more at 38 – 49 Hz



1. Left rear wheel sensor
2. Left rear wheel sensor coupler

REMOVAL

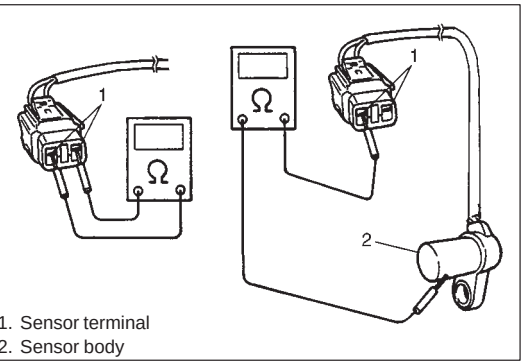
1) Disconnect negative cable from battery.
2) Hoist vehicle.
3) Disconnect rear wheel speed sensor coupler.
4) Detach ABS wheel sensor wire harness from suspension frame.



1. Left rear wheel sensor
2. Trailing arm

5) Remove rear wheel speed sensor from rear axle housing.

CAUTION:
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor and do not allow dust, etc. to enter its installation hole.**



1. Sensor terminal
2. Sensor body

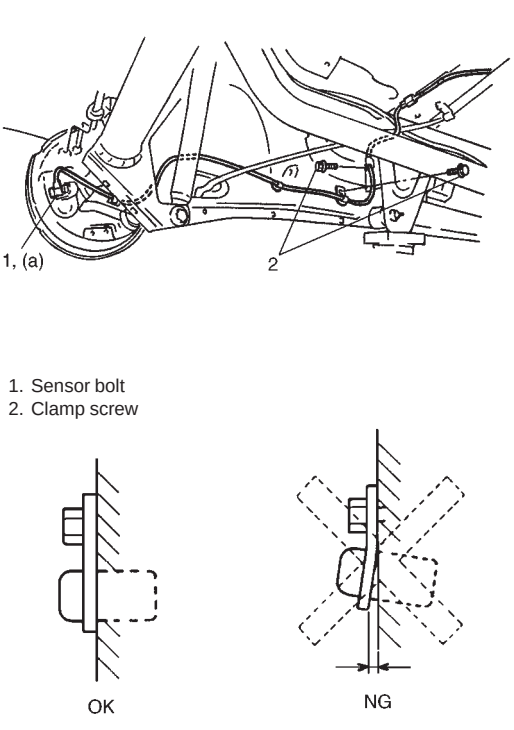
SENSOR INSPECTION

- Check sensor for damage.
- Check sensor for resistance and continuity.

Between both terminals of sensor: 1.4 – 1.8 kΩ at 20°C (68°F)

Between sensor terminal and sensor body: No continuity

If the check result is not as specified and any malcondition is found, replace.



1. Sensor bolt
2. Clamp screw

INSTALLATION

1) Check that no foreign material is attached to sensor and ring.
2) Install it by reversing removal procedure.

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.2 lb-ft)

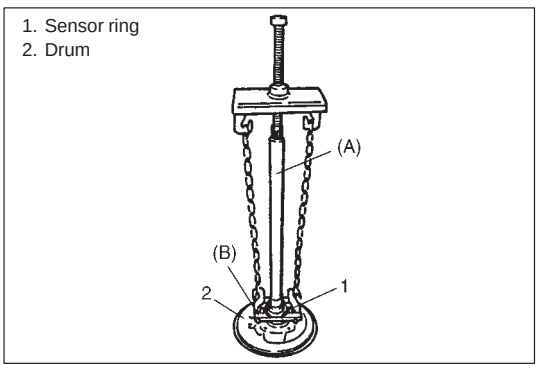
CAUTION:
Do not pull wire harness or twist more than necessary when installing rear wheel speed sensor.

3) Check that there is no clearance between sensor and rear axle housing.

REAR WHEEL SENSOR RING

REMOVAL

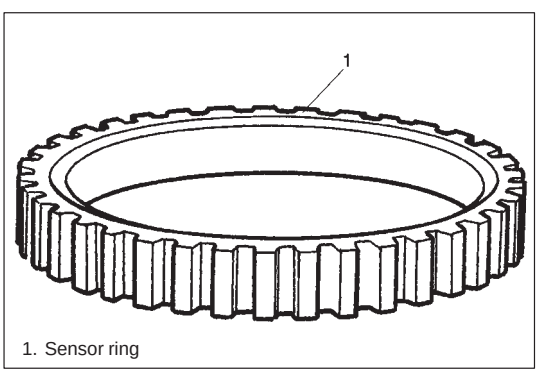
1) Remove ABS rear wheel sensor from rear axle housing.
2) Remove brake drum referring to Section 5 of this manual.



3) Remove sensor ring from brake drum using special tool.

Special Tool
(A): 09927-18411
(B): 09921-57810

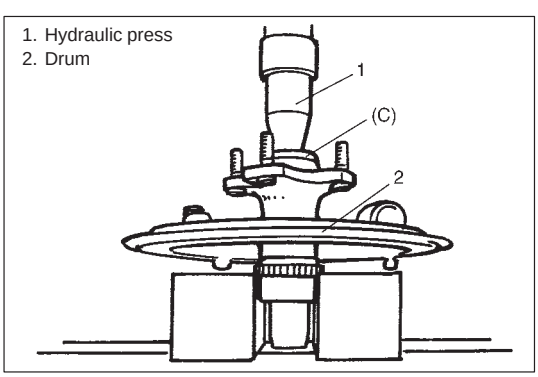
CAUTION:
Pull out sensor ring from brake drum gradually and evenly. Attempt to pull it out partially may cause it to be deformed.



INSPECTION

- Check ring serration (teeth) for being missing, damaged or deformed.
- Check sensor ring for being deformed (warped).
- Check that no foreign material is attached.

If any malcondition is found, repair or replace.

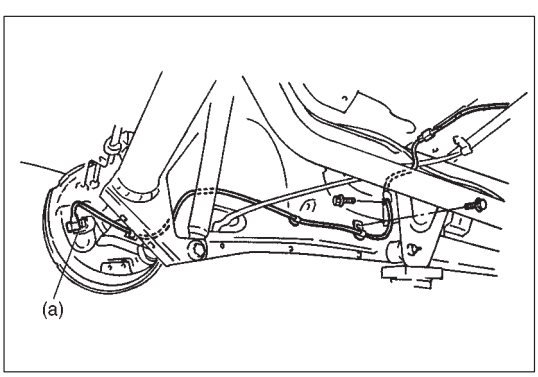


INSTALLATION

NOTE:
Do not reuse (reinstall) removed sensor ring.

1) Install new sensor ring to brake drum using special tool.

Special Tool
(C): 09941-34513-004



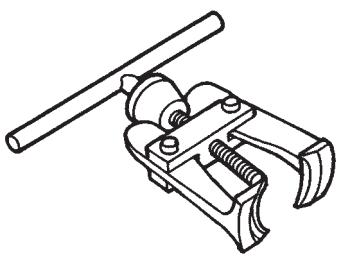
2) Install brake drum. Refer to Section 5 of this manual.
3) Install ABS rear wheel speed sensor to rear axle housing.

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.2 lb-ft)

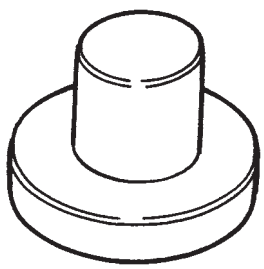
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening Torque		
	N·m	kg-m	lb-ft
Brake pipe flare nut	16	1.6	11.6
ABS hydraulic unit bracket bolt	23	2.3	16.6
ABS hydraulic unit nut	10	1.0	7.2
ABS hydraulic unit cover bolt	10	1.0	7.2
Front wheel speed sensor bolt	26	2.6	18.8
Front wheel speed sensor harness clamp bolt	11	1.1	8.0
Rear wheel speed sensor bolt	10	1.0	7.2
Rear wheel speed sensor harness clamp bolt	2.5	0.25	1.8

SPECIAL TOOLS

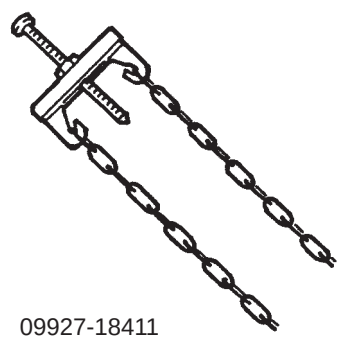


09913-61510
Bearing puller

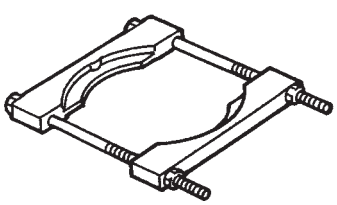


09913-85230
Differential gear side bearing removing jig

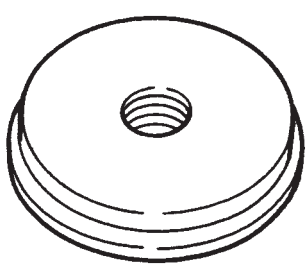
09950-78210
Flare nut wrench (10 mm)



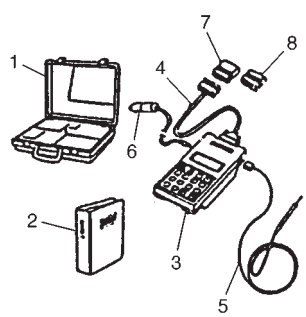
09927-18411
Universal puller



09921-57810
Counter shaft holder

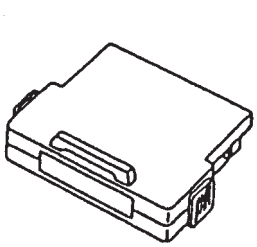


09941-34513-004
Bearing installer attachment

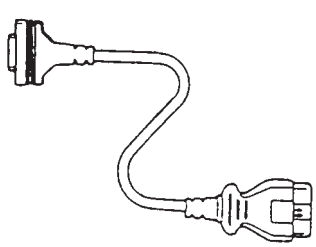


1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adapter
8. Self-test adapter

09931-76011
Tech-1 (scan tool) kit



Mass storage cartridge



09931-76030
16/14 pin DLC cable

Section 6

ENGINE

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

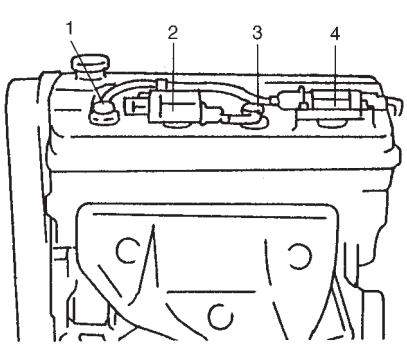
6

GENERAL INFORMATION

STATEMENT ON 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 surfaces on initial operation.
- Whenever valve train components, pistons, piston rings, connecting rods, rod bearings, and crankshaft journal bearings are removed for service, they should be retained in order. At the time of installation, they should be installed in the same locations and with the same mating surfaces as when removed.
- Battery cables should be disconnected before any major work is performed on the engine. Failure to disconnect cables may result in damage to wire harness or other electrical parts.



1. No.1 cylinder
2. No.2 cylinder
3. No.3 cylinder
4. No.4 cylinder

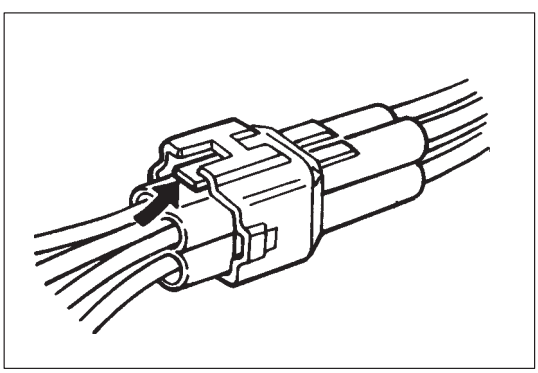
- Throughout this manual, the four cylinders of the engine are identified by numbers: No.1, No.2, No.3 and No.4 as counted from crankshaft pulley side to flywheel side.

GENERAL INFORMATION ON ENGINE SERVICE

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 intake hose, throttle body or intake manifold is removed, the intake opening should be covered. This will protect against accidental entrance of foreign material which could follow intake passage into cylinder and cause extensive damage when engine is started.
- When disconnecting 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.
- Do not crank the engine for more than 15 seconds at a time. If the engine doesn't start on the first try, wait about 15 seconds before try again.

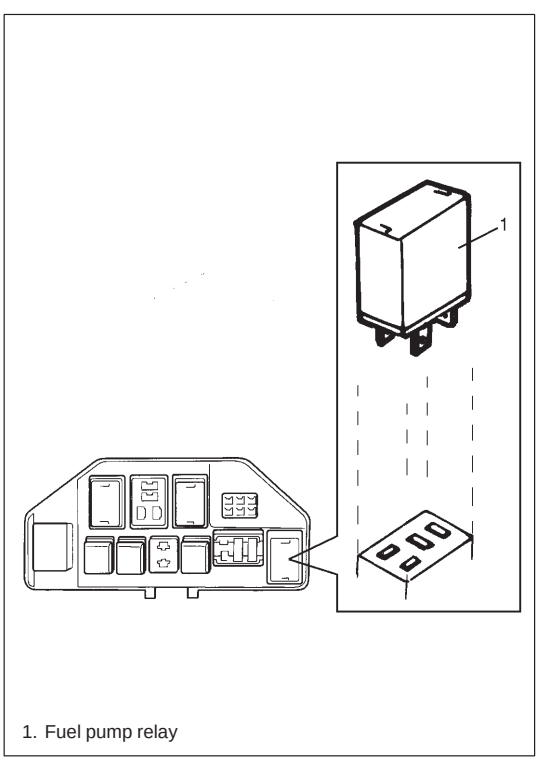


FUEL PRESSURE RELIEF PROCEDURE

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", set parking brake, and block drive wheels.
2) Remove fuel pump relay from main fuse box.
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 main fuse box.



1. Fuel pump relay

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 the ignition switch ON position for 3 seconds (to operate fuel pump) and then turn it OFF position.
   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.

ENGINE DIAGNOSIS

This vehicle is equipped with an engine and emission control system, which controls the A/F mixture, ignition timing, emission, etc. suitably to engine conditions by ECM. ECM has an On-Board Diagnostic system which detects a malfunction in this system.
When diagnosing a trouble in the engine including this system, be sure to have understanding of the outline of "On-Board Diagnostic system" and each item in "Precaution in Diagnosing Trouble" and follow "ENGINE DIAGNOSTIC FLOW TABLE" given below to obtain correct result smoothly.

ON-BOARD DIAGNOSTIC SYSTEM

Refer to "On-Board Diagnostic System" in Section 6E.

PRECAUTION IN DIAGNOSING TROUBLES

Be sure to read "Precaution in Diagnosing Troubles" in Section 6E and observe what is written there.

ENGINE DIAGNOSTIC FLOW TABLE

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

STEP	ACTION	YES	NO
1	Customer Complaint Analysis 1) Perform customer complaint analysis. Was customer complaint analysis performed?	Go to Step 2.	Perform customer complaint analysis.
2	Diagnostic Trouble Code (DTC) Check, Record and Clearance 1) Check for DTC. Refer to “DTC Check” in Section 6E. Is there any malfunction DTC(s)?	1) Print DTC or write it down and clear it. Refer to “DTC Clearance” in Section 6E. 2) Go to Step 3.	Go to Step 4.
3	Visual Inspection 1) Perform visual inspection. Refer to “Visual Inspection” in this section. Is there any faulty condition?	1) Repair or replace malfunction part. 2) Go to Step 11.	Go to Step 5.
4	Visual Inspection 1) Perform visual inspection. Refer to “Visual Inspection” in this section. Is there any faulty condition?		Go to Step 8.
5	Trouble Symptom Confirmation 1) Confirm trouble symptom. Refer to the “Trouble Symptom Confirmation” in this section. Is trouble symptom identified?	Go to Step 6.	Go to Step 7.
6	Rechecking and Record of DTC 1) Recheck for DTC. Refer to “DTC Check” in Section 6E. Is there any DTC(s)?	Go to Step 9.	Go to Step 8.
7	Rechecking and Record of DTC 1) Recheck for DTC. Refer to “DTC Check” in Section 6E. Is there any malfunction DTC(s)?		Go to Step 10.
8	Engine Basic Inspection and Engine Diagnosis Table 1) Check and repair according to “Engine Basic Inspection Flow Table” and “Engine Diagnosis Table” in this section. Are check and repair complete?	Go to Step 11.	1) Check and repair malfunction part(s). 2) Go to Step 11.
9	Trouble shooting for DTC 1) Check and repair according to applicable DTC diag. flow table in Section 6E. Are check and repair complete?		
10	Check for Intermittent Problems 1) Check for intermittent problems. Refer to “Check for Intermittent Problem” in this section. Is there any faulty condition?	1) Repair or replace malfunction part(s). 2) Go to Step 11.	Go to Step 11.
11	Final Confirmation Test 1) Clear DTC if any. 2) Perform final confirmation test. Refer to “Final Confirmation Test” in this section. Is there any problem symptom, malfunction DTC or abnormal condition?	Go to Step 6.	End.

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

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

Malfunction indicator lamp condition	☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition	
Diagnostic trouble code	First check:	☐ No code ☐ 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.

2. DIAGNOSTIC TROUBLE CODE (DTC) CHECK, RECORD AND CLEARANCE

First, check DTC. Refer to “DTC Check” in Section 6E. If DTC is indicated, print it or write it down and then clear it. Refer to “DTC Clearance” in Section 6E. 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 or 7.

Attempt to diagnose a trouble based on DTC in this step only or failure to clear the DTC in this step will lead to incorrect diagnosis, trouble diagnosis of a normal circuit or difficulty in troubleshooting.

3. and 4. VISUAL INSPECTION

Be sure to perform visual check of the following items that support proper function of the engine.

INSPECTION ITEM	REFERRING Section
● Engine oil – – – – – level, leakage	Section 0B
● Engine coolant – – – – – level, leakage	Section 0B
● Fuel – – – – – level, leakage	Section 0B
● Air cleaner element – – – – – dirt, clogging	Section 0B
● Battery – – – – – fluid level, corrosion of terminal	
● Water pump belt and/or cooling fan belt – – – – – tension, damage	Section 0B
● Throttle cable – – – – – play, installation	Section 6E
● Vacuum hoses of air intake system – – – – – disconnection, looseness, deterioration, bend	
● 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 (“CHECK ENGINE” lamp) – – – – operation	Section 6E
● Charge warning lamp – – – – operation	Section 6H
● Engine oil pressure warning lamp – – – – operation	Section 8
● 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	

5. TROUBLE SYMPTOM CONFIRMATION

Based on information obtained in Step 1 customer complaint analysis and Step 2 DTC check, confirm trouble symptoms. Also, reconfirm DTC according to “DTC Confirmation Procedure” in Section 6E.

6. and 7. RECHECKING AND RECORD OF DTC

Refer to “DTC Check” in Section 6E for checking procedure.

8. ENGINE BASIC INSPECTION AND ENGINE DIAGNOSIS TABLE

Perform basic engine check according to the “Engine Basic Inspection Flow Table” first. When the end of the flow table has been reached, check the parts of the system suspected as a possible cause. Refer to ENGINE DIAGNOSIS TABLE 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 FLOW TABLE

STEP	ACTION	YES	NO
1	Was “ENGINE DIAGNOSTIC FLOW TABLE” performed?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	Check battery voltage. Is it 11 V or more?	Go to Step 3.	Go to “DIAGNOSIS” in Section 6H.
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. Refer to “Idle Speed/IAC Duty Inspection” in Section 6E. Is check result as specified?	Go to Step 6.	Go to “DIAG. Flow Table B-4” in Section 6E.
6	Check ignition timing. Refer to “Ignition Timing Inspection” in Section 6F. Is check result as specified?	Go to Step 7.	Go to “DIAGNOSIS” in Section 6F.
7	Check fuel supply as follows: 1) Check to make sure that enough fuel is filled in fuel tank. 2) Turn the ignition switch ON position for 3 seconds and then turn it OFF position. Repeat this a few times. Is fuel return pressure (returning sounds) felt from fuel return hose when the ignition switch is turned ON position?	Go to Step 9.	Go to Step 8.
8	Check fuel pump for operating. 1) Was fuel pump operating sound heard from fuel filler for about 2 seconds after turning the ignition switch ON position and stop?	Go to “Diag. Flow Table B-3” in Section 6E.	Go to “Diag. Flow Table B-1” in Section 6E.
9	Check ignition plug and ignition spark. Refer to “Spark Plug Inspection” and “Ignition Spark Test” in Section 6F. Is it in good condition?	Go to Step 10.	Go to “DIAGNOSIS” in Section 6F.
10	Check fuel injector. Refer to “Fuel Injector On-vehicle Inspection” in Section 6E. Is it in good condition?	Go to “ENGINE DIAGNOSIS TABLE” in this section.	Go to “Diag. Flow Table B-2” in Section 6E.

9. TROUBLESHOOTING FOR DTC

Based on the DTC indicated in Step 6 or 7, 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. Refer to the applicable DTC diag. flow table in Section 6E.

10. CHECK FOR INTERMITTENT PROBLEM

Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.). Refer to "INTERMITTENT AND POOR CONNECTION" in Section 0A and related circuit of DTC recorded in Step 2.

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 in Section 6E and confirm that no malfunction DTC (a normal code) is indicated.

ENGINE DIAGNOSIS TABLE

Condition	Possible Cause	Reference Item
Hard starting (Engine cranks OK)	**Engine and emission control system out of order.**	
	● Faulty CMP sensing rotor or CKP sensing rotor	CMP sensing rotor or CKP sensing rotor inspection in Section 6E.
	● Faulty idle air control system	Diag. Flow Table B-4 in Section 6E.
	● Faulty ECT sensor, TP sensor, CKP sensor, CMP sensor or MAP sensor	ECT sensor, TP sensor, CKP sensor, CMP sensor or MAP sensor in Section 6E.
	● Faulty EGR system	Diag. Flow Table B-6 in Section 6E.
	● Fuel pressure out of specification	Diag. Flow Table B-3 in Section 6E.
	● Faulty fuel injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty ECM	Inspection of ECM and its circuit in Section 6E.
	● Malfunctioning PCV system	PCV system inspection in Section 6E.
	Low compression.	Compression check in Section 6A.
	● Improper valve lash	Valve lash in Section 6A.
	● Improper valve timing	Timing belt and belt tensioner in Section 6A.
	● Compression leak from valve seat	Valves inspection in Section 6A.
	● Sticky valve stem	Valves inspection in Section 6A.
	● Weak or damaged valve springs	Valves spring inspection in Section 6A.
	● Compression leak at cylinder head gasket	Cylinder head inspection in Section 6A.
	● Sticking or damaged piston ring	Piston ring inspection in Section 6A.
	● Worn piston, ring or cylinder	Cylinders, pistons and piston rings inspection in Section 6A.
	Ignition system out of order.	
	● Faulty ignition coil or high-tension cord	Diagnosis in Section 6F.

Condition	Possible Cause	Reference Item
Engine has no power	**Engine overheating.**	Refer to “Overheating” of this table.
	Ignition system out of order.	
	● Faulty ignition coil or high-tension cord	Diagnosis in Section 6F.
	Engine and emission control system out of order.	
	● Fuel pressure out of specification	Diag. Flow Table B-3 in Section 6E.
	● Faulty EGR system (if equipped)	Diag. Flow Table B-6 in Section 6E.
	● Faulty injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E.
	● Faulty ECM	Inspection of ECM and its circuit in Section 6E.
	Low compression.	Previously outlined.
	Others	
	● Dragging brakes	Diagnosis in Section 5.
	● Slipping clutch	Diagnosis in Section 7C.
Improper engine idling or engine fails to idle	**Ignition system out of order.**	
	● Faulty ignition coil or high-tension cord	Diagnosis in Section 6F.
	Engine overheating.	Refer to “Overheating” of this table.
	Engine and emission control system out of order.	
	● Fuel pressure out of specification	Diag. Flow Table B-3 in Section 6E.
	● Faulty idle air control system	Diag. Flow Table B-4 in Section 6E.
	● Faulty evaporative emission control system	Diag. Flow Table B-5 in Section 6E.
	● Faulty EGR system (if equipped)	Diag. Flow Table B-6 in Section 6E.
	● Faulty injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty ECT sensor, TP sensor or MAP sensor	ECT sensor, TP sensor or MAP sensor in Section 6E.
	● Malfunctioning PCV system	PCV system inspection in Section 6E.
	● Faulty ECM	Inspection of ECM and its circuit in Section 6E.
	Low compression	Previously outlined.
	Others	

Condition	Possible Cause	Reference Item
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.)	**Ignition system out of order.**	
	● Faulty ignition coil or high-tension cords	Diagnosis in Section 6F.
	Engine overheating	Refer to “Overheating” of this table.
	Engine and emission control system out of order.	
	● Fuel pressure out of specification	Diag. Flow Table B-3 in Section 6E.
	● Faulty EGR system (if equipped)	Diag. Flow Table B-6 in Section 6E.
	● Faulty injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E.
	● Faulty ECM .	Inspection of ECM and its circuit in Section 6E.
	Low compression	Previously outlined.
Surges (Engine power variation under steady throttle or cruise. Feels like the vehicle speeds up and down with no change in the accelerator pedal.)	**Ignition system out of order.**	
	● Faulty ignition coil or high-tension cord	Diagnosis in Section 6F.
	Engine and emission control system out of order.	
	● Variable fuel pressure	Diag. Flow Table B-3 in Section 6E.
	● Faulty EGR system (if equipped)	Diag. Flow Table B-6 in Section 6E.
	● Faulty MAP sensor	MAP sensor in Section 6E.
	● Faulty injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty ECM	Inspection of ECM and its circuit in Section 6E.
Excessive detonation (The engine makes sharp metallic knocks that change with throttle opening. Sounds like pop corn popping.)	**Engine overheating**	Refer to “Overheating” of this table.
	Ignition system out of order.	
	● Improper ignition timing	Ignition timing in Section 6F.
	Engine and emission control system out of order.	
	● Clogged fuel filter and fuel lines	Fuel pressure check in Section 6E.
	● Faulty EGR system (if equipped)	Diag. Flow Table B-6 in Section 6E.
	● Faulty ECT sensor or MAP sensor	ECT sensor or MAP sensor in Section 6E.
	● Faulty injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty ECM	Inspection of ECM and its circuit in Section 6E.
	Others	
	● Excessive combustion chamber deposits	Piston and cylinder head cleaning in Section 6A.

Condition	Possible Cause	Reference Item
Overheating	● Inoperative thermostat	Thermostat in Section 6B.
	● Faulty radiator fan motor or its circuit	Diag. Flow Table B-8 in Section 6E.
	● Loose or slip water pump belt	Water pump belt check 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 6A.
	● Poor oil pump performance	Oil pressure check in Section 6A.
	● Dragging brakes	Diagnosis in Section 5.
	● Slipping clutch	Diagnosis in Section 7C.
	● Blown cylinder head gasket	Cylinder head inspection in Section 6A.
Poor gasoline mileage	**Ignition system out of order.**	
	● Faulty ignition coil or high-tension cord	Diagnosis in Section 6F.
	Engine and emission control system out of order.	
	● Fuel pressure out of specification	Diag. Flow Table B-3 in Section 6E.
	● Faulty TP sensor, ECT sensor or MAP sensor	TP sensor, ECT sensor or MAP sensor in Section 6E.
	● Faulty EGR system (if equipped)	Diag. Flow Table B-6 in Section 6E.
	● Faulty injector	Fuel injector injection volume inspection in Section 6E.
	● Faulty ECM	Inspection of ECM and its circuit in Section 6E.
	Low compression	Previously outlined.
	Others	
	● Poor valve seating	Valves inspection in Section 6A.
	● Dragging brakes	Diagnosis in Section 5.
	● Slipping clutch	Diagnosis in Section 7C.
	● Thermostat out of order	Thermostat in Section 6B.
	● Improper tire pressure	

Condition	Possible Cause	Reference Item
Excessive engine oil consumption	**Oil entering combustion chamber**	
	● Sticky piston ring	Piston cleaning in Section 6A.
	● Worn piston and cylinder	Cylinders, pistons and piston rings inspection in Section 6A.
	● Worn piston ring groove and ring	Pistons and piston rings inspection in Section 6A.
	● Improper location of piston ring gap	Pistons installation in Section 6A.
	● Worn or damaged valve stem seal	Valves and cylinder head in Section 6A.
	● Worn valve stem	Valves inspection in Section 6A.
Low oil pressure	● Improper oil viscosity	Engine oil and oil filter change in Section 0B.
	● Malfunctioning oil pressure switch	Oil pressure switch inspection in Section 8.
	● Clogged oil strainer	Oil pan and oil pump strainer cleaning in Section 6A.
	● Functional deterioration of oil pump	Oil pump in Section 6A.
	● Worn oil pump relief valve	Oil pump in Section 6A.
	● Excessive clearance in various sliding parts	
Engine noise Note: Before checking the mechanical noise, make sure that: ● Ignition timing is properly adjusted. ● Specified spark plug is used. ● Specified fuel is used.	**Valve noise** ● Improper valve lash	Valve lash in Section 6A.
	● Worn valve stem and guide	Valves inspection in Section 6A.
	● Weak or broken valve spring	Valve springs inspection in Section 6A.
	● Warped or bent valve	Valves inspection in Section 6A.
	● Loose camshaft housing bolts	Camshafts in Section 6A.
	Piston, ring and cylinder noise	
	● Worn piston, ring and cylinder bore	Pistons and cylinders inspection in Section 6A.
	Connecting rod noise	
	● Worn crankpin bearing	Crankpin and connecting rod bearing inspection in Section 6A.
	● Worn crankpin	Crankpin and connecting rod bearing inspection in Section 6A.
	● Loose connecting rod nuts	Connecting rod installation in Section 6A.
	● Low oil pressure	Previously outlined.
	Crankshaft noise	
	● Low oil pressure	Previously outlined.
	● Worn crankshaft journal bearing	Crankshaft and bearing inspection in Section 6A.
	● Worn crankshaft journal	Crankshaft and bearing inspection in Section 6A.
	● Loose lower crankcase (bearing cap) bolts	Crankshaft installation in Section 6A.
	● Excessive crankshaft thrust play	Crankshaft inspection in Section 6A.

Condition	Possible Cause	Referring Item
Excessive hydrocarbon (HC) emission or Excessive carbon monoxide (CO) emission	**Ignition system out of order** ● Faulty ignition coil or high-tension cord **Engine and Emission control system out of order.** ● Fuel pressure out of specification ● Lead contamination of three way catalytic converter (if equipped) ● Malfunctioning PCV system ● Faulty EVAP control system ● Closed loop system (A/F feed back compensation) fails (vehicle with HO2S) – Faulty TP sensor – Faulty ECT sensor or MAP sensor – Faulty HO2S ● Maladjusted CO adjusting resistor (vehicle without HO2S) ● Faulty injector ● Faulty ECM **Low compression**	 Diagnosis in Section 6F. Fuel pressure check in Section 6E. Check for absence of filler neck restrictor. PCV system in Section 6E. EVAP control system check in Section 6E. Check oxygen sensor output voltage. Refer to DTC No.14 Heated Oxygen Sensor Circuit in Section 6E. Idle mixture adjustment in Section 6E. Fuel injector injection volume inspection in Section 6E. Inspection of ECM and its circuit in Section 6E. Previously outlined.
Excessive nitrogen oxides (NOx) emission	**Engine and emission control system** ● Fuel pressure out of specification ● Lead contamination of three way catalytic converter (if equipped) ● Faulty EGR system (if equipped) ● Closed loop system (A/F feed back compensation) fails (vehicle with HO2S) – Faulty TP sensor – Faulty ECT sensor or MAP sensor – Faulty HO2S ● Faulty injector ● Faulty ECM	 Fuel pressure check in Section 6E. Check for absence of filler neck restrictor. Diag. Flow Table B-6 in Section 6E. Check oxygen sensor output voltage. Refer to DTC No.14 Heated Oxygen Sensor Circuit in Section 6E. Fuel injector injection volume inspection in Section 6E. Inspection of ECM and its circuit in Section 6E.

SECTION 6A

ENGINE MECHANICAL

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

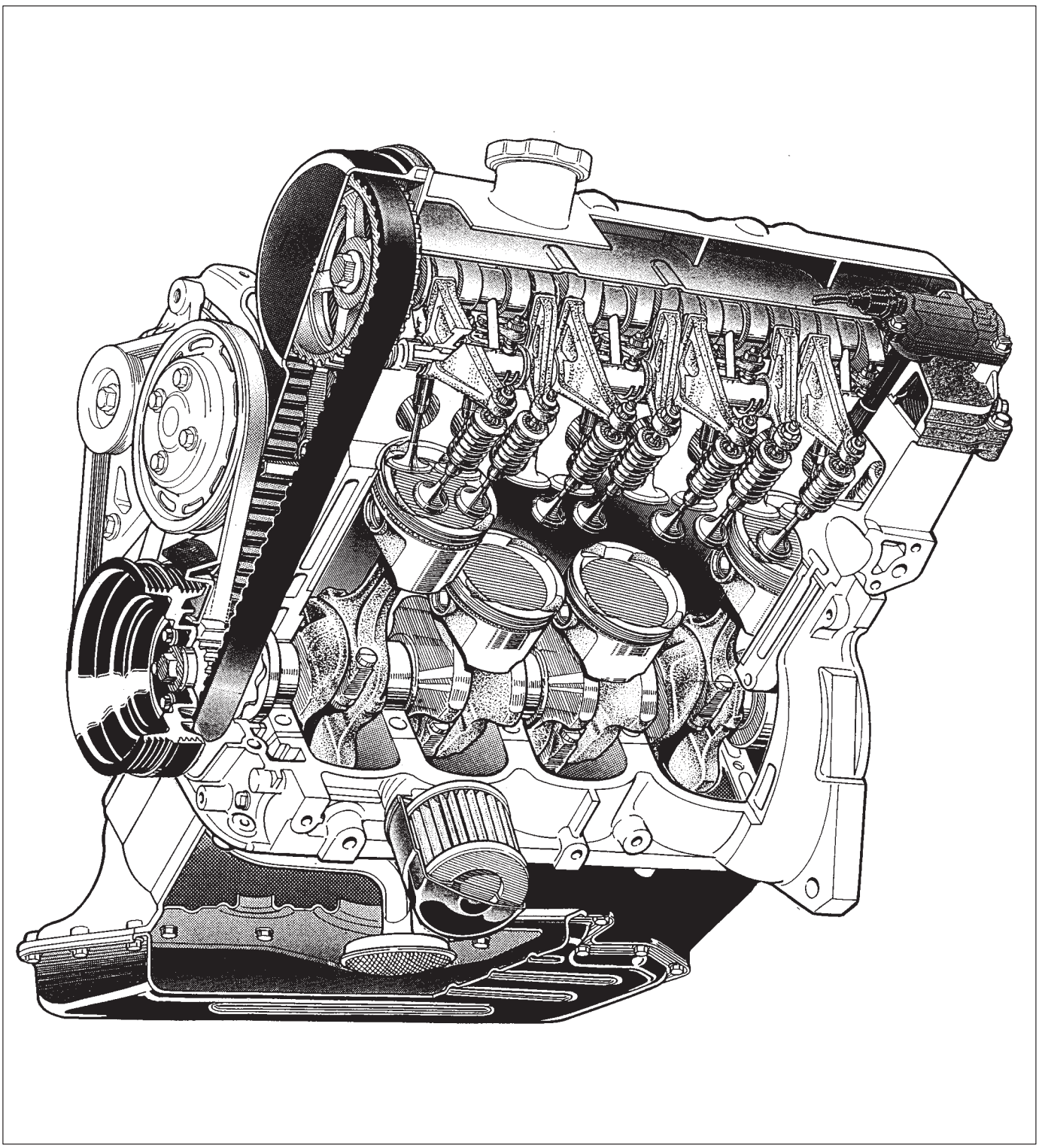
NOTE:
For what each abbreviation stands for (i.e., full term), refer to SECTION 0A.

GENERAL DESCRIPTION

ENGINE

The engine is a water-cooled, in line 4 cylinders, 4 stroke cycle gasoline unit equipped with its S.O.H.C. (Single Overhead Camshaft) valve mechanism arranged for “V”-type valve configuration and 16 valves (IN 2 and EX 2/one cylinder).

The single overhead camshaft is mounted over the cylinder head: it is driven from crankshaft through timing belt and opens and closes its valves via the rocker arms.

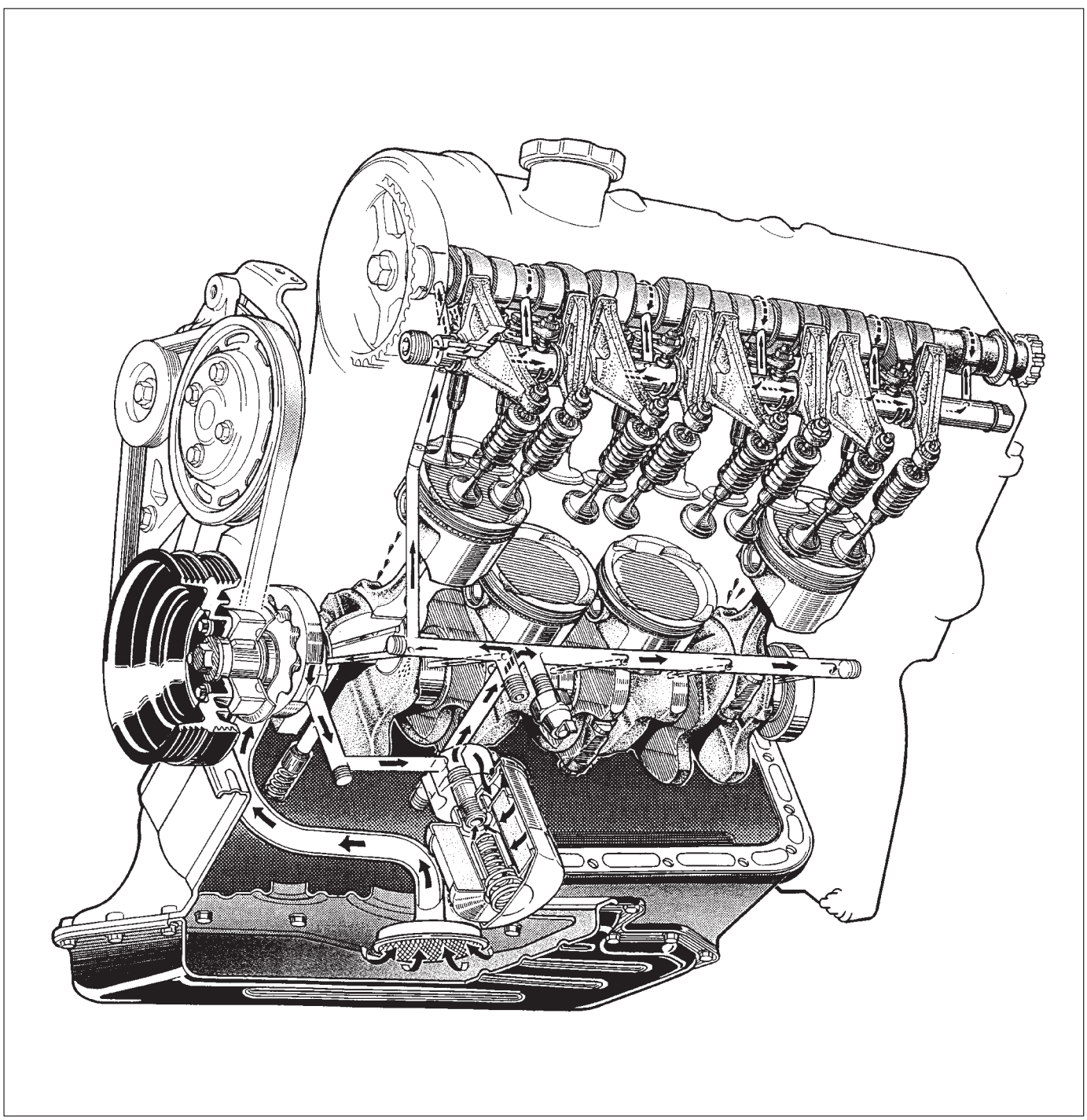


ENGINE LUBRICATION

The oil pump is of a trochoid type, and mounted on crankshaft at crankshaft pulley side.
Oil is drawn up through oil pump strainer and passed through pump to oil filter.
The filtered oil flows into two paths in cylinder block.
In one path, oil reaches crankshaft journal bearings.
Oil from crankshaft journal bearings is supplied to connecting rod bearings by means of intersecting passages drilled in crankshaft, and then injected from a small hole provided on big end of connecting rod to lubricate piston, rings, and cylinder wall.

In another path, oil goes up to cylinder head and lubricates camshaft journals, rocker arms, camshaft, etc., passing through oil gallery in rocker arm shaft.

An oil relief valve is provided on oil pump. This valve starts relieving oil pressure when the pressure comes over about 400 kPa (4.0 kg/cm^2, 56.9 psi). Relieved oil drains back to oil pan.



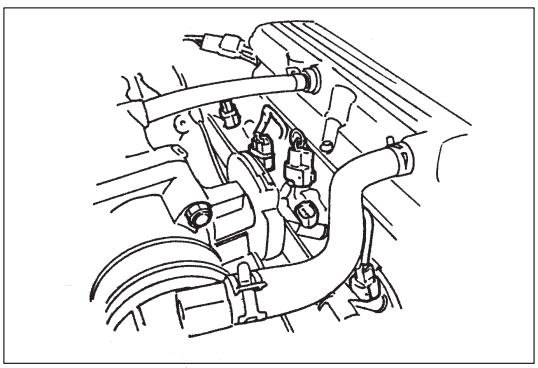
ON-VEHICLE SERVICE

COMPRESSION CHECK

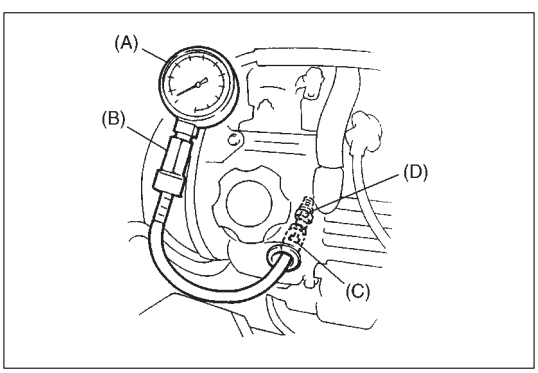
Check compression pressure on all four cylinders as follows:

1) Warm up engine.
2) Stop engine after warming up.

NOTE:
After warming up engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.

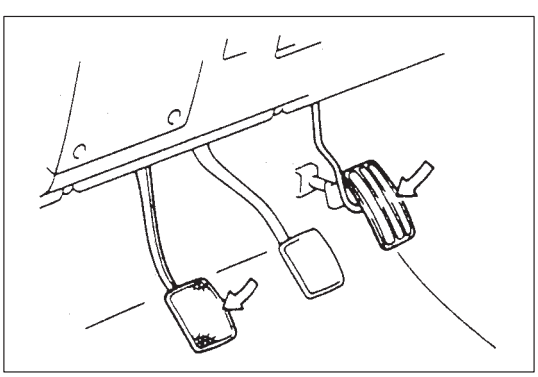


3) Disconnect fuel injector wire harness connector.



4) Remove ignition coil assemblies and all spark plugs referring to section 6F.
5) Install special tool (Compression gauge) into spark plug hole.

Special Tool
(A): 09915-64510-001
(B): 09915-64510-002
(C): 09915-64530
(D): 09915-67010



6) Disengage clutch (to lighten starting load on engine) for M/T model, and depress accelerator pedal all the way to make throttle valve full-open.

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

NOTE:
For measuring compression pressure, crank engine at least 250 r/min. by using fully charged battery.

	Compression pressure
Standard	1400 kPa (14.0 kg/cm^2, 199.0 psi)
Limit	1200 kPa (12.0 kg/cm^2, 170.0 psi)
Max. difference between any two cylinders	100 kPa (1.0 kg/cm^2, 14.2 psi)

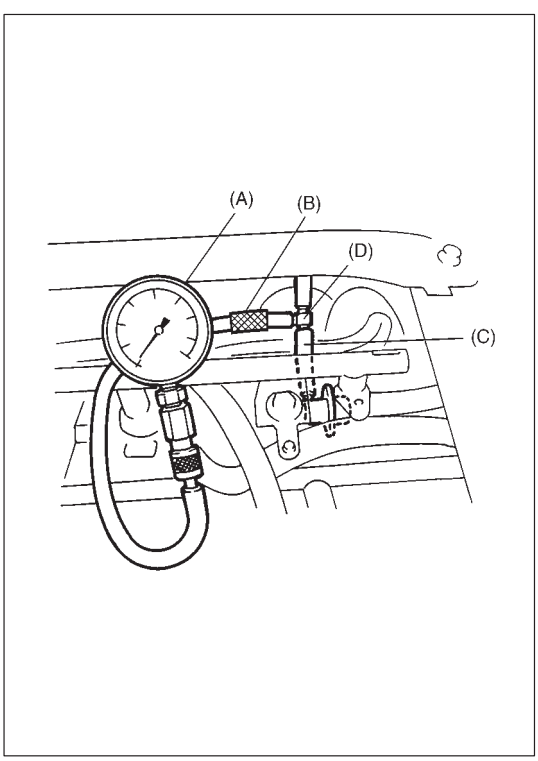
8) Carry out steps 5) through 7) on each cylinder to obtain four readings.
9) After checking, install spark plugs and ignition coil assemblies and connect injector wire harness connector securely.

ENGINE VACUUM CHECK

The engine vacuum that develops in the intake line is a good indicator of the condition of the engine. The vacuum checking procedure is as follows:

1) Warm up engine to normal operating temperature.

NOTE:
After warming up engine, place transmission gear shift lever in "Neutral" (shift selector lever to "P" range for A/T model), and set parking brake and block drive wheels.



2) With engine stopped, disconnect fuel pressure regulator vacuum hose from intake manifold and connect 3-way joint, hoses and special tool (vacuum gauge and joint) between intake manifold and vacuum hose disconnected.

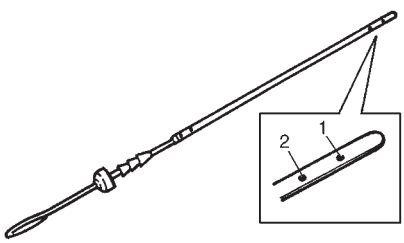
Special Tool
(A): 09915-67310
(B): 09918-08210

SUZUKI GENUINE PARTS
(C): Hose 09343-03087
(D): 3-way joint 09367-04002

3) Run engine at specified idle speed, and read vacuum gauge. Vacuum should be within following specification.

Vacuum specification (at sea level):
58.7 – 74.7 kPa (44 – 56 cmHg, 17.3 – 22.0 in.Hg) at specified idling speed

4) After checking, connect vacuum hose to intake manifold.



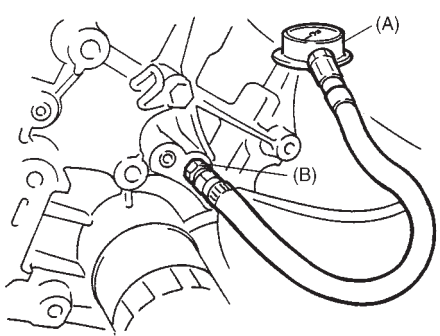
1. Low level mark
2. Full level mark

OIL PRESSURE CHECK

NOTE:

Prior to checking oil pressure, check following items.

- **Oil level in oil pan.**
  If oil level is low, add oil up to Full level mark on oil level gauge.
- **Oil quality.**
  If oil is discolored, or deteriorated, change it.
  For particular oil to be used, refer to the table in MAINTENANCE SERVICE in Section 0B.
- **Oil leaks.**
  If leak is found, repair it.

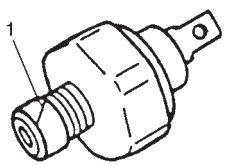


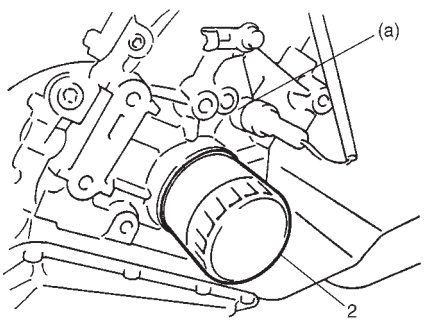
1) Remove oil pressure switch from cylinder block.
2) Install special tool (Oil pressure gauge) to vacated threaded hole.

   Special Tool
   (A): 09915-77310
   (B): 09915-78211
3) Set engine tachometer.
4) Start engine and warm it up to normal operating temperature.

   NOTE:
   Check oil level in oil pan. If oil level is low, add oil up to Full level hole on oil level gauge.
5) After warming up, raise engine speed to 4,000 r/min and measure oil pressure.

   Oil pressure specifications:
   330 – 430kPa (3.3 – 4.3 kg/cm^{2,} 46.9 – 61.1 psi)
   at 4,000 r/min (rpm)
6) After checking oil pressure, stop engine and remove oil pressure gauge.





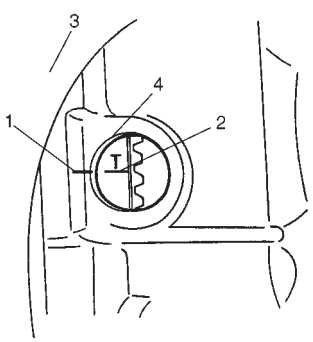
1. Sealing tape
2. Oil filter

7) Before reinstalling oil pressure switch, be sure to wrap its screw threads with a sealing tape and tighten switch to specified torque.

NOTE:
If sealing tape edge is bulged out from screw threads of switch, cut it off.

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

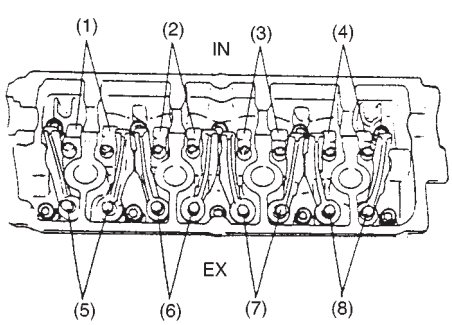
8) Start engine and check oil pressure switch for oil leakage.
9) Stop engine and connect terminal to pressure switch terminal and cover pressure switch by boot with certainty.



1. Match mark
2. "T" (TDC) mark
3. Floor
4. Ignition timing inspection hole

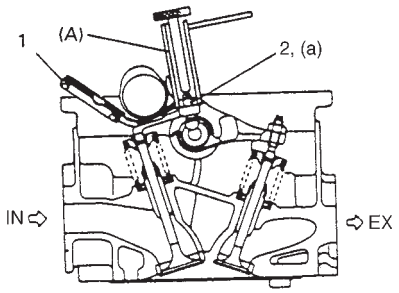
VALVE LASH (CLEARANCE)

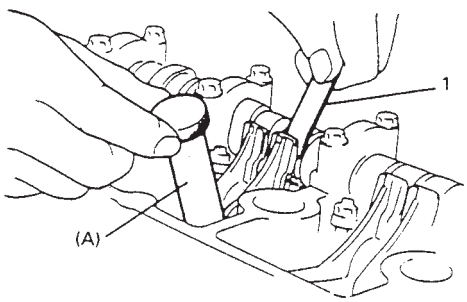
1) Disconnect negative cable at battery.
2) Remove cylinder head cover referring to item CYLINDER HEAD COVER.
3) Remove service lid, then remove ignition timing inspection plug from clutch housing of transmission case.
4) Turn crankshaft clockwise (viewing from crankshaft pulley side) to the extent that line below "T" mark punched on flywheel is aligned with match mark on transmission case as shown, i.e. No. 1 cylinder piston reaches TDC position.



5) Check if the rocker arms of No.1 cylinder are off the respective cam lobes (of camshaft); if so, valves (1), (2), (5) and (7) in left figure are ready for clearance checking and adjustment.
Check valve lashes at valves (1), (2), (5) and (7).
If the rocker arms of No.4 cylinder are off the respective cam lobes, check valve lashes at valves (3), (4), (6) and (8).

NOTE:
When checking valve clearance, insert thickness gauge between camshaft and cam-riding face of rocker arm.





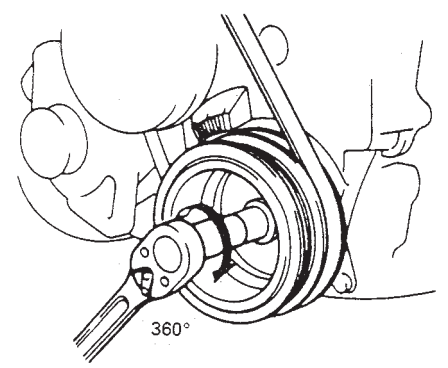
1. Thickness gauge
2. Lock nut

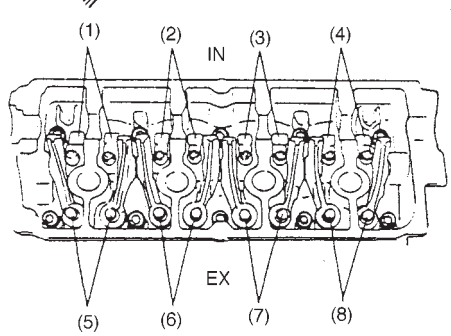
6) If valve lash is out of specification, adjust it to specification by turning adjusting screw after loosening lock nut.
After adjustment, tighten lock nut to specified torque while holding adjusting screw stationary, and then make sure again that valve lash is within specification.

		When cold (Coolant temperature is 15 – 25°C or 59 – 77°F)	When hot (Coolant temperature is 60 – 68°C or 140 – 154°F)
Valve clearance specification	Intake	0.13 – 0.17 mm (0.005 – 0.007 in.)	0.17 – 0.21 mm (0.007 – 0.008 in.)
	Exhaust	0.23 – 0.27 mm (0.009 – 0.011 in.)	0.27 – 0.31 mm (0.011 – 0.012 in.)

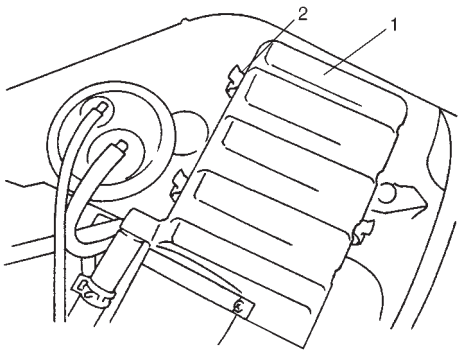
Special Tool
(A): 09917-18210

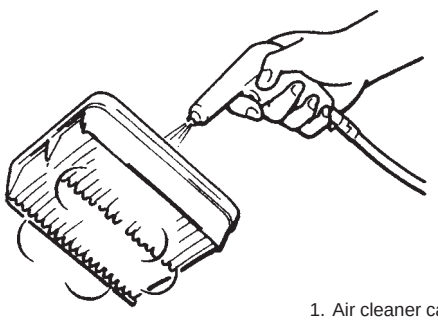
Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)





7) After checking and adjusting valve lashes at valves (1), (2), (5) and (7), (or (3), (4), (6) and (8)) rotate crankshaft exactly one full turn (360°) and check the same at valves (3), (4), (6) and (8) (or (1), (2), (5) and (7)). Adjust them as necessary.
8) After checking and adjusting all valves, reverse removal procedure for installation.





1. Air cleaner case
2. Clamp

AIR CLEANER ELEMENT

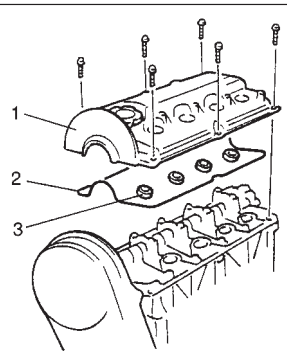
REMOVAL AND INSTALLATION

1) Remove air cleaner case clamps.
2) Remove air cleaner element from case.
3) Check air cleaner element for dirt.
4) If necessary, blow off dust by compressed air from air outlet side of element.
   If excessively dirty, replace element.
5) Reverse removal procedure for installation.

CYLINDER HEAD COVER

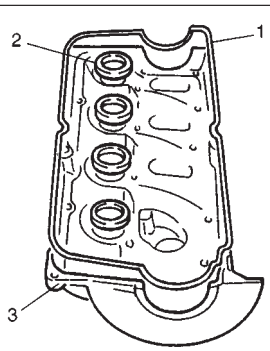
REMOVAL

1) Disconnect negative (–) and positive (+) battery cables at battery terminal and remove battery.
2) Remove ignition coil assemblies with high-tension cord.
3) Disconnect PCV valve and breather hose from head cover.



1. Cylinder head cover
2. Cylinder head cover gasket
3. O-rings

4) Remove cylinder head cover with cylinder head cover gasket and O-rings.

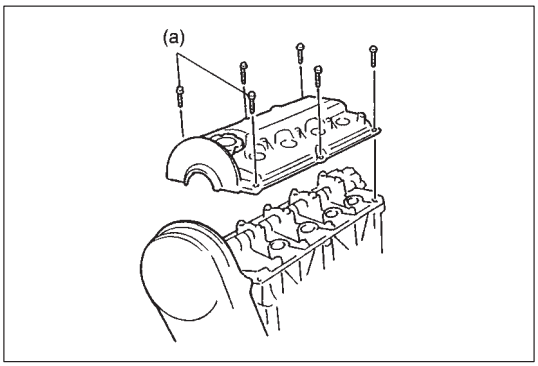


1 Cylinder head cover gasket
2. O-rings
3. Cylinder head cover

INSTALLATION

1) Install O-rings and cylinder head cover gasket to cylinder head cover.

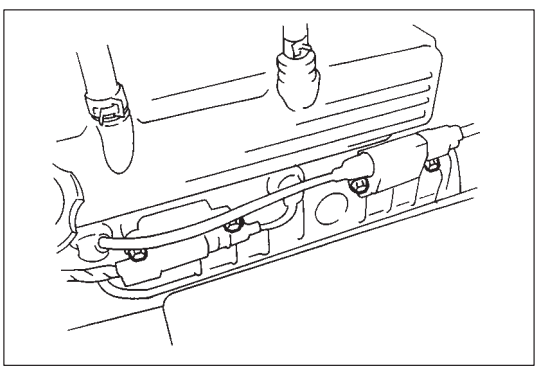
NOTE:
Be sure to check each of these parts for deterioration or any damage before installation and replace if found defective.



2) Install cylinder head cover to cylinder head and tighten cover bolts to specified torque.

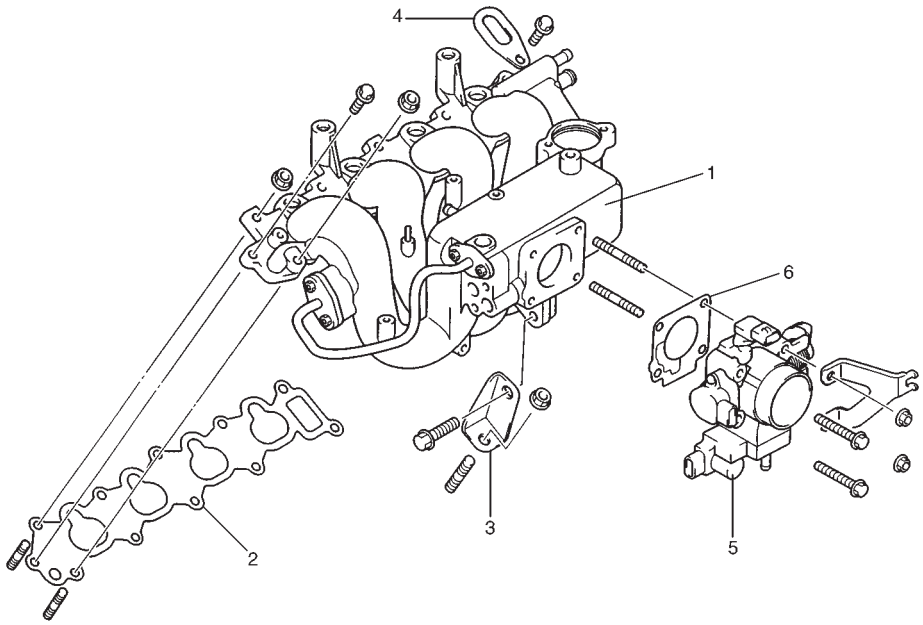
Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

NOTE:
When installing cylinder head cover, use care so that cylinder head cover gasket or O-rings will not get out of place or fall off.



3) Install ignition coil assemblies with high-tension cord.
4) Connect PCV valve and breather hose to head cover.
5) Connect positive (+) and negative (–) cable at battery.

THROTTLE BODY AND INTAKE MANIFOLD



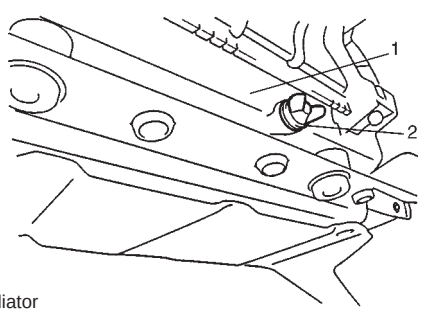
1. Intake manifold
2. Gasket
3. Intake manifold stiffener
4. Engine hook
5. Throttle body
6. Throttle body gasket

REMOVAL

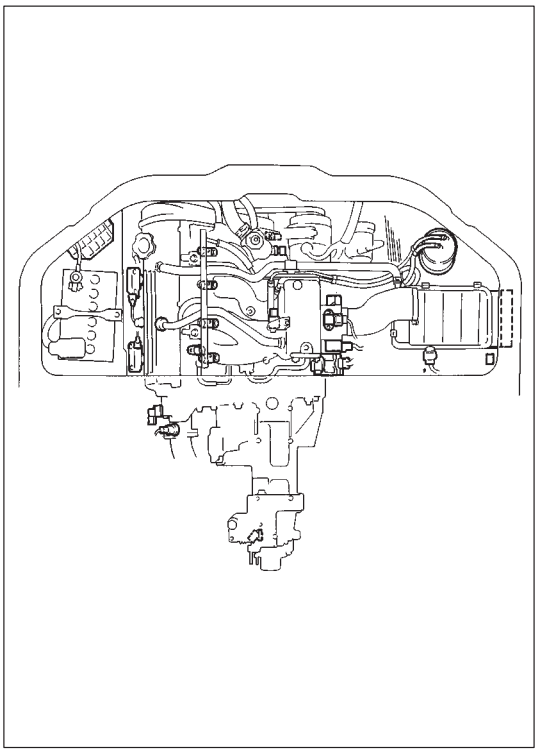
WARNING:

To help avoid danger of being burned, do not remove drain plug and radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if plug and cap are taken off too soon.

1) Relieve fuel pressure according to fuel pressure relief procedure described in section 6.
2) Disconnect negative cable at battery and remove engine room center member with shift control and parking brake lever.
3) Drain cooling system.

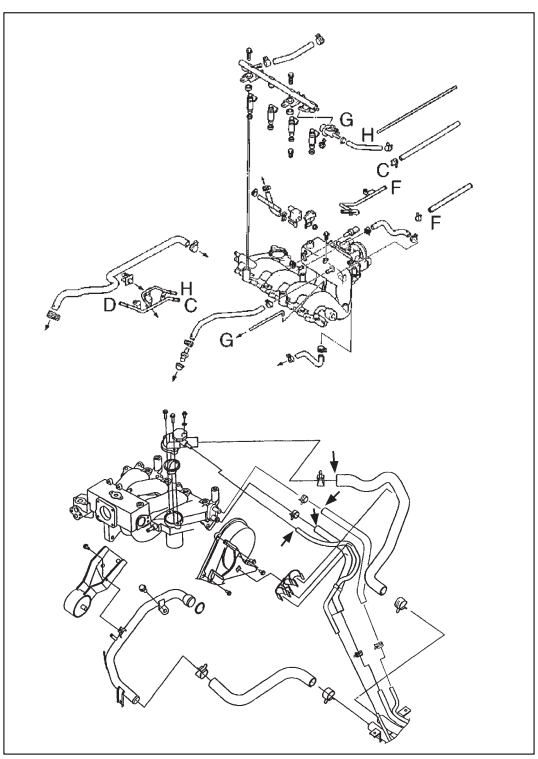


1 Radiator
2. Radiator drain plug



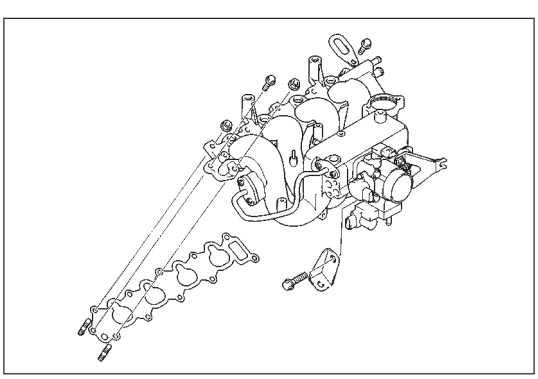
4) Remove air intake hose.
5) Disconnect following electric lead wires:
   - EGR valve (if equipped)
   - Ground wires from intake manifold
   - Engine coolant temperature sensor
   - Injectors lead wires at the coupler
   - EVAP canister purge valve
   - Throttle position sensor
   - Idle air control valve
   - MAP sensor
   - Engine oil pressure switch
   - CMP sensor
   - Heated oxygen sensor (if equipped)

   and release wire harness from clamp.

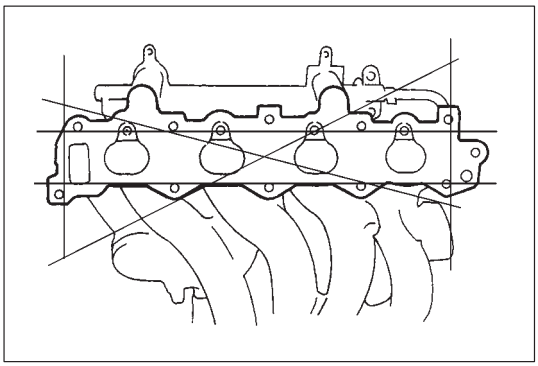


6) Disconnect accelerator cable from throttle body.
7) Disconnect following hoses:
   - Brake booster hose from intake manifold
   - Canister purge hose from EVAP canister purge valve
   - Heater inlet hose from throttle body
   - Radiator inlet hose and reservoir hose from thermostat cap
   - PCV hoses from intake manifold and throttle body
   - Fuel feed hose and return hose from each pipe

   NOTE:
   ALPHABET in the figure shows where each hose is connected.



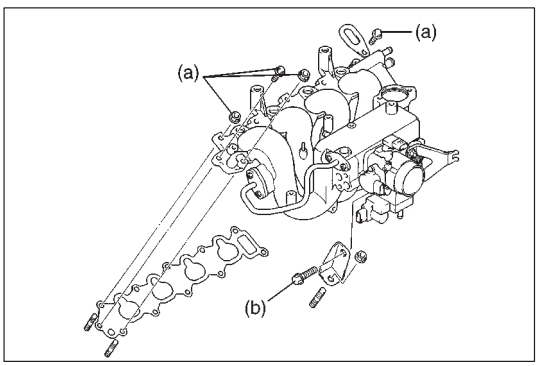
8) Remove intake manifold with throttle body from cylinder head, and then its gasket.



INSPECTION

- Using a straight edge and thickness gauge, check surface at a total of 6 locations. If distortion limit, given below, is exceeded, correct gasketed surface or replace intake manifold.

  Limit of distortion: 0.07 mm (0.003 in.)

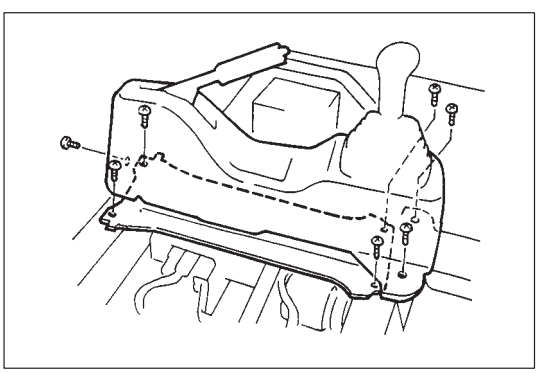


INSTALLATION

Reverse removal procedure for installation noting the followings.

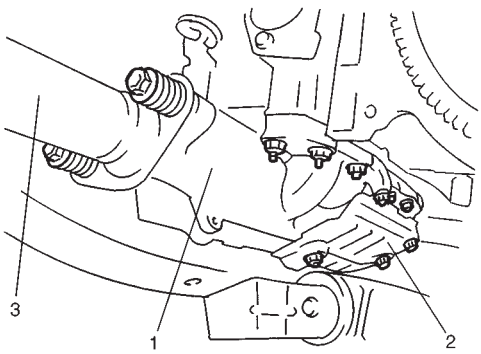
- Use new intake manifold gasket.
- Tighten bolts and nuts to specified torque.

  Tightening Torque
  (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
  (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)



- Connect gear shift cables to gear shift control lever, refer to GEAR SHIFT CONTROL INSTALLATION in Section 7A.
- Connect parking brake cable to parking brake lever and perform parking brake adjustment by referring PARKING BRAKE INSPECTION AND ADJUSTMENT in Section 5.
- Adjust accelerator cable play, referring to Section 6E.
- Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
- Install engine room center member.

- Refill cooling system and bleed air from system, referring to Section 6B.
- Adjust generator drive belt tension, referring to BELT TENSION INSPECTION in Section 6H.
- Upon completion of installation, turn ignition switch ON but engine OFF and check for fuel leaks.
- Finally, start engine and check for engine coolant leaks.



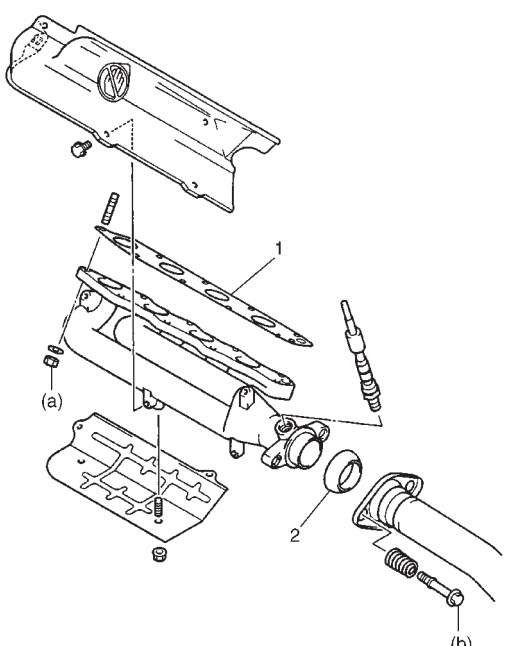
1. Exhaust manifold
2. Exhaust manifold lower cover
3. Exhaust pipe

EXHAUST MANIFOLD

WARNING:
To avoid danger of being burned, do not service exhaust system while it is still hot. Service should be performed after system cools down.

REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect heated oxygen sensor coupler (if equipped).
3) Remove exhaust manifold lower cover of exhaust manifold.
4) Remove or disconnect exhaust pipe from exhaust manifold.
5) Remove exhaust manifold and its gasket from cylinder head.



1. Gasket
2. Pipe gasket

INSTALLATION

1) Install new gasket to cylinder head.
2) Install exhaust manifold.
   Tighten bolts and nuts to specified torque.

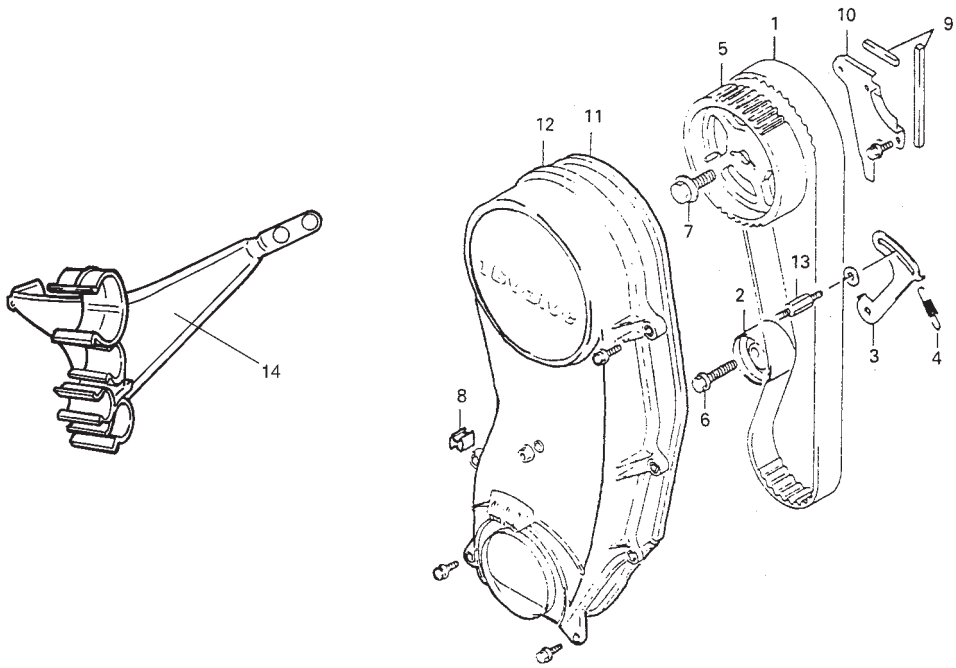
   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install pipe gasket and install exhaust pipe to exhaust manifold.
   Before installing pipe gasket, check it for deterioration or damage, and replace as necessary.
   Tighten pipe fasteners to specified torque.

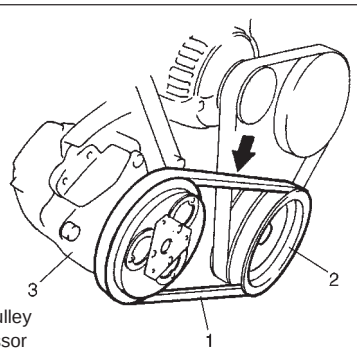
   Tightening Torque
   (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

4) Install lower cover to exhaust manifold.
5) Connect heated oxygen sensor connector and fit connector to bracket. (if equipped)
6) Connect negative cable at battery.
7) Check exhaust system for exhaust gas leakage.

TIMING BELT AND BELT TENSIONER



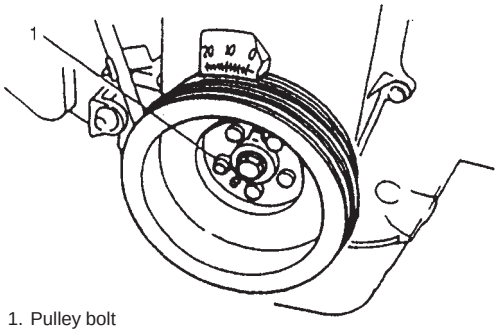
1. Timing belt
2. Tensioner
3. Tensioner plate
4. Tensioner spring
5. Camshaft timing pulley
6. Tensioner bolt
7. Pulley bolt
8. Seal
9. Inside cover seal
10. Inside cover
11. Outside cover seal
12. Outside cover
13. Tensioner stud
14. Water hose bracket



1. Drive belt
2. Crankshaft pulley
3. A/C compressor

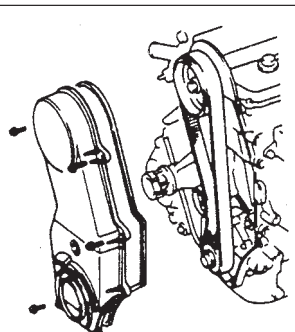
REMOVAL

1) Disconnect negative cable at battery.
2) Drain engine coolant and remove water hoses and brake booster hose from water hose bracket.
3) Remove generator belt and A/C compressor belt, if equipped.

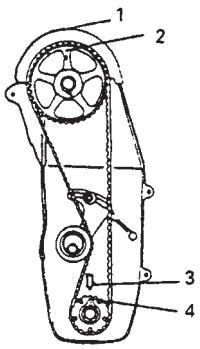


1. Pulley bolt

4) Remove water pump pulley.
5) Remove crankshaft pulley by removing 5 pulley bolts.

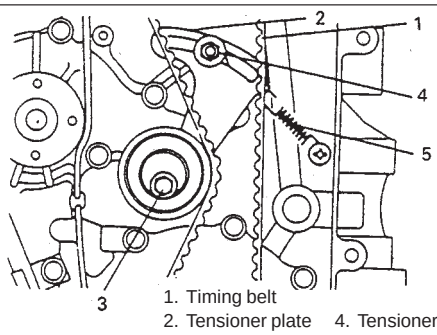


6) Remove water hose bracket with clamp and then timing belt outside cover.



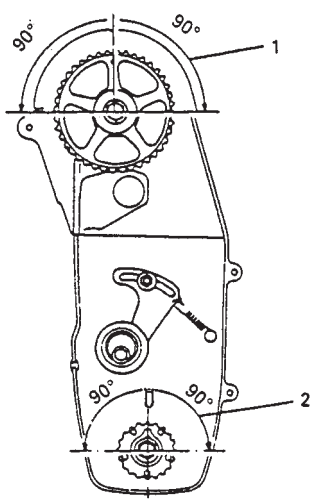
1. "V" mark on cylinder head cover
2. Timing mark by "E" on camshaft timing belt pulley
3. Arrow mark on oil pump case
4. Punch mark on crankshaft timing belt pulley

7) For installation of timing belt, align 4 timing marks as shown in figure by turning crankshaft.



1. Timing belt
2. Tensioner plate
3. Tensioner bolt
4. Tensioner stud
5. Spring

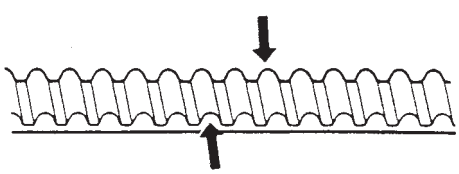
8) Remove timing belt tensioner, tensioner plate, tensioner spring and timing belt.



1. Camshaft allowable turning range - - - By timing mark, within 90° from "V" mark on head cover on both right and left.
2. Crankshaft allowable turning range - - - By punch mark, within 90° from arrow mark on oil pump case on both right and left.

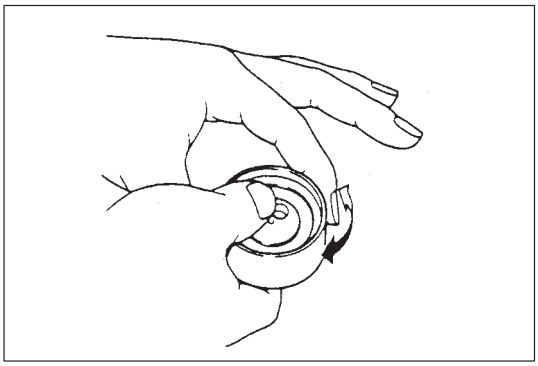
CAUTION:

- **After timing belt is removed, never turn camshaft and crankshaft independently more than such an extent as shown in figure. If turned, interference may occur among piston and valves, and parts related to piston and valves may be damaged.**
- **Never bend timing belt.**

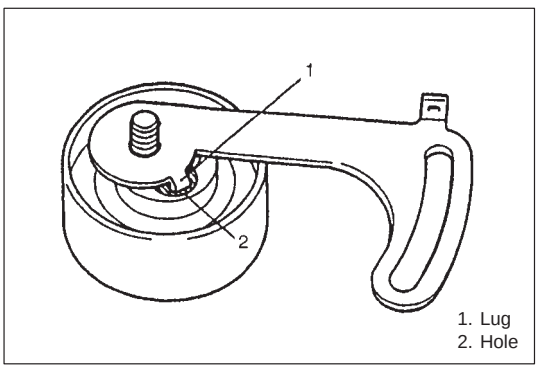


INSPECTION

- Inspect timing belt for wear or crack.
  Replace it as necessary.



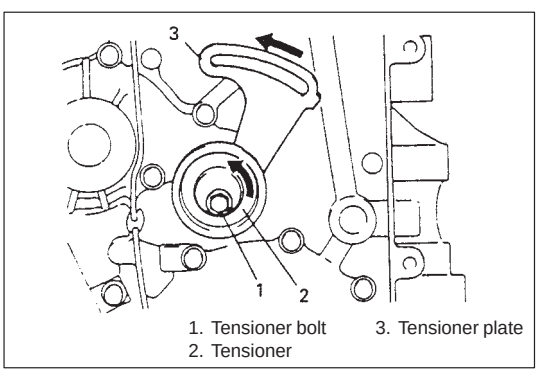
- Inspect tensioner for smooth rotation.



1. Lug
2. Hole

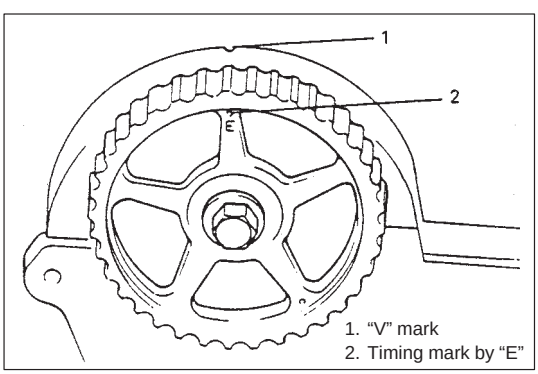
INSTALLATION

1) Install tensioner plate to tensioner.
   Insert lug of tensioner plate into hole in tensioner.



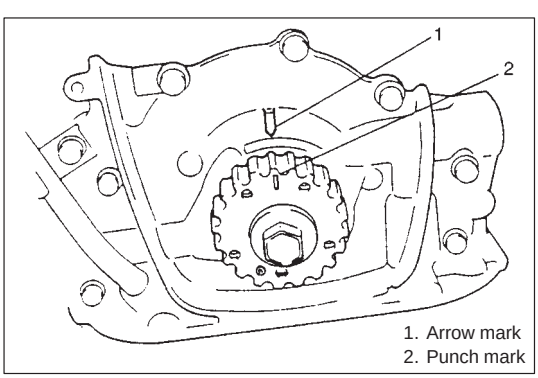
1. Tensioner bolt
2. Tensioner
3. Tensioner plate

2) Install tensioner and tensioner plate:
   Do not tighten tensioner bolt with wrench yet. Hand tighten only at this time.
   Check to ensure that plate movement in arrow direction as shown in figure causes tensioner to move in the same direction. If no associated movement between plate and tensioner occurs, remove tensioner and plate again and reinsert plate lug into tensioner hole.



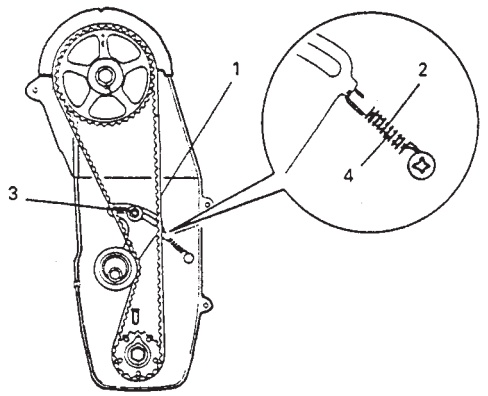
1. "V" mark
2. Timing mark by "E"

3) Check that timing mark on camshaft timing belt pulley is aligned with "V" mark on cylinder head cover. If not, align two marks by turning camshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



1. Arrow mark
2. Punch mark

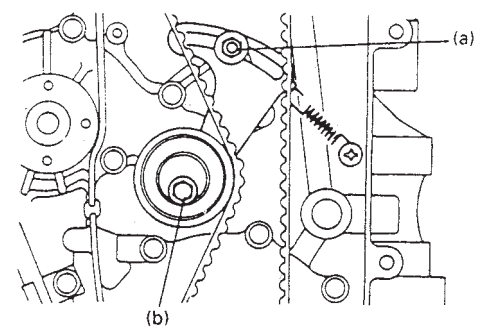
4) Check that punch mark on crankshaft timing belt pulley is aligned with arrow mark on oil pump case. If not, align two marks by turning crankshaft but be careful not to turn it more than its allowable turning range which is described on previous page.



1. Drive side of belt
2. Tensioner spring
3. Tensioner stud
4. Damper

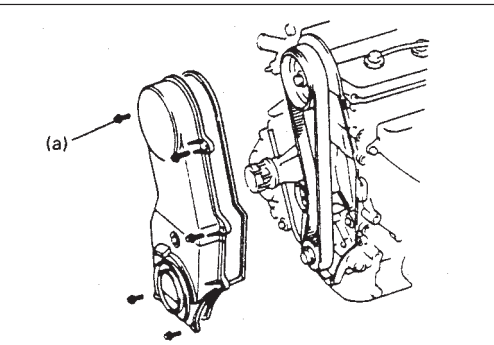
5) Install timing belt and tensioner spring.
With two sets of marks aligned and tensioner plate pushed up, install timing belt on two pulleys in such a way that drive side of belt is free from any slack.
And then install tensioner spring as shown in figure, and hand-tighten tensioner stud.

NOTE:
- **When installing timing belt, match arrow mark (➪) on timing belt with rotating direction of crankshaft.**
- **In this state, No. 4 piston is at top dead center of compression stroke.**



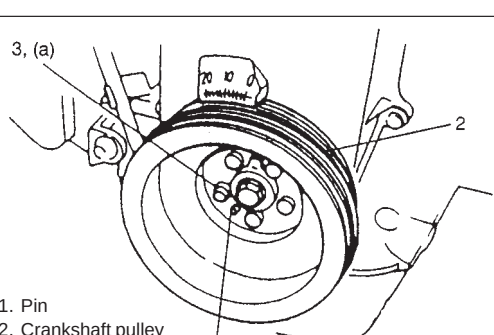
6) To take up slack of timing belt, turn crankshaft two rotations clockwise after installing it. After making sure that belt is free from slack, tighten tensioner stud first and then tensioner bolt to each specified torque.
Then confirm again that two sets of marks are aligned respectively.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)
(b): 25 N·m (2.5 kg-m, 18.0 lb-ft)



7) Install timing belt outside cover and water hose bracket.
Before installing, make sure that seal is between water pump and oil pump case.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



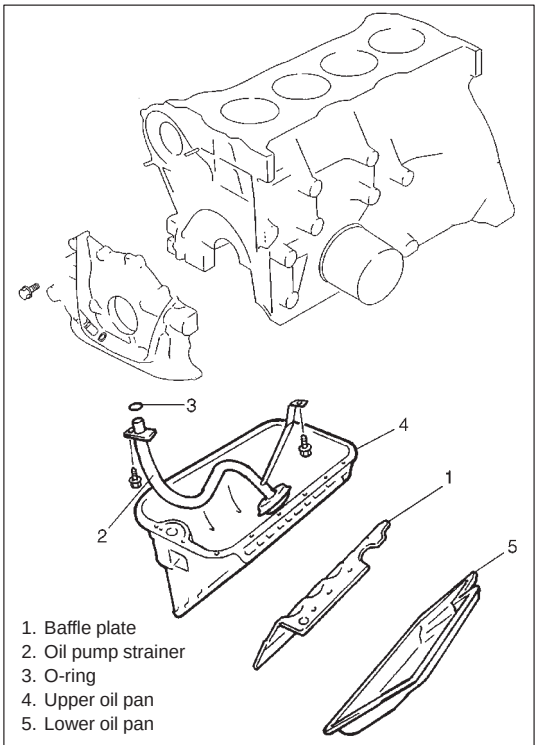
1. Pin
2. Crankshaft pulley
3. Pulley bolt

8) Install crankshaft pulley.
Fit hole of pulley to pin on crankshaft timing belt pulley, and tighten pulley bolts to specified torque.

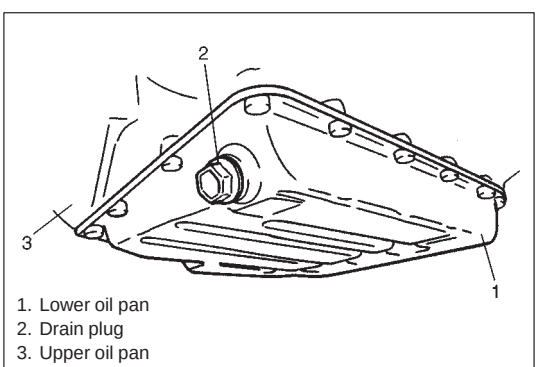
Tightening Torque
(a): 16 N·m (1.6 kg-m, 11.5 lb-ft)

9) Install water pump pulley and drive belt.
   Adjust generator drive belt tension, referring to BELT TENSION INSPECTION in Section 6H.
10) Install A/C compressor belt, if equipped.
    Adjust its belt tension, referring to Section 1B.
11) Connect brake booster hose and water hoses to intake manifold, thermostat cap and water floor pipe, clamp them securely.
12) Refill cooling system and bleed air from system, referring to Section 6B.
13) Install battery and connect negative cable to battery.
14) Verify that there is no coolant leakage at hose connection.

OIL PAN AND OIL PUMP STRAINER

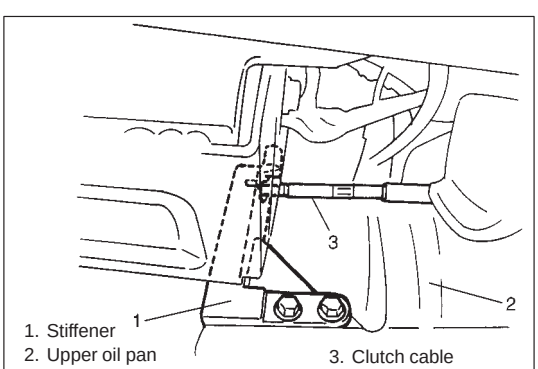


1. Baffle plate
2. Oil pump strainer
3. O-ring
4. Upper oil pan
5. Lower oil pan



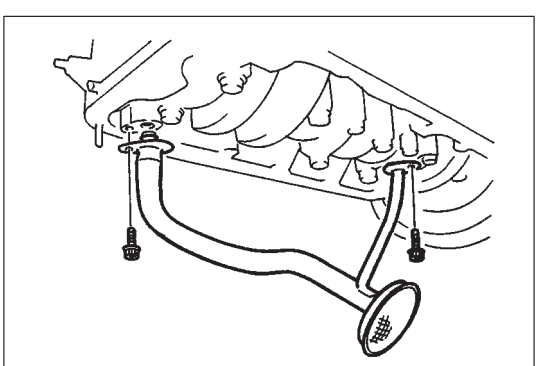
1. Lower oil pan
2. Drain plug
3. Upper oil pan

1) Drain engine oil by removing drain plug.
2) Remove lower oil pan.

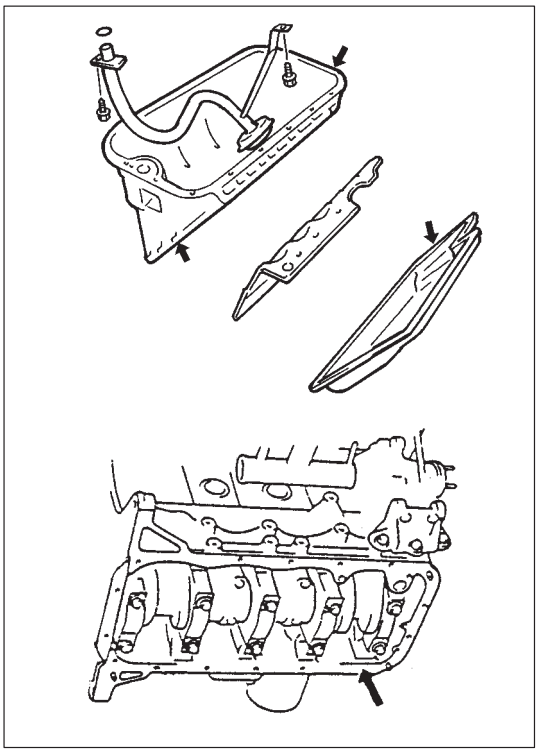


1. Stiffener
2. Upper oil pan
3. Clutch cable

3) Remove engine and transmission stiffener.

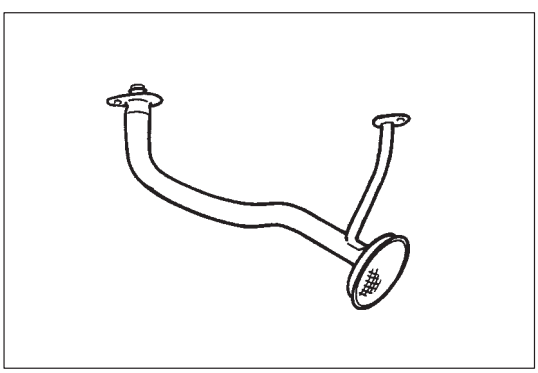


4) Remove CKP sensor.
5) Remove upper oil pan and then oil pump strainer.

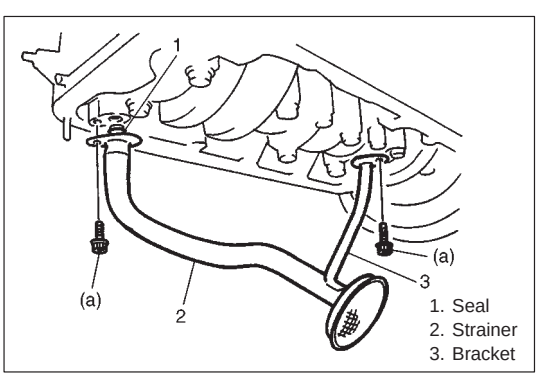


CLEANING

- Clean mating surfaces of oil pan and cylinder block.
  Remove oil, old sealant, and dusts from mating surfaces and oil pan inside.



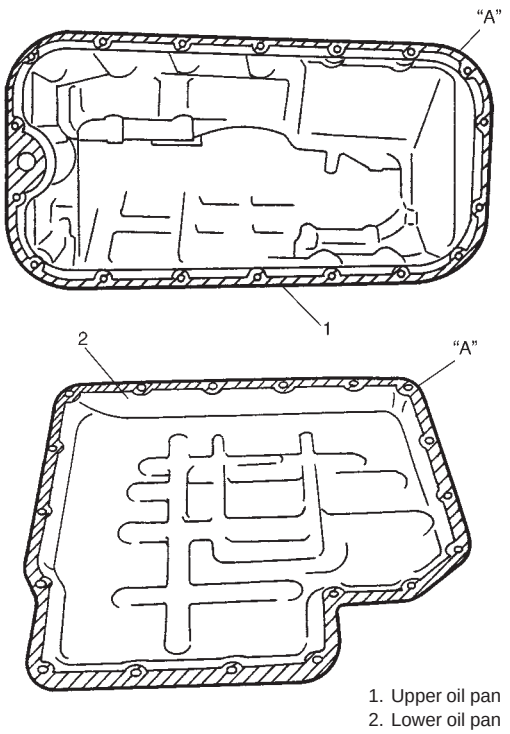
- Clean oil pump strainer screen.



INSTALLATION

1) Install oil pump strainer.
   Install seal in such position as shown in figure.
   Tighten strainer bolt first and then bracket bolt to specified torque.

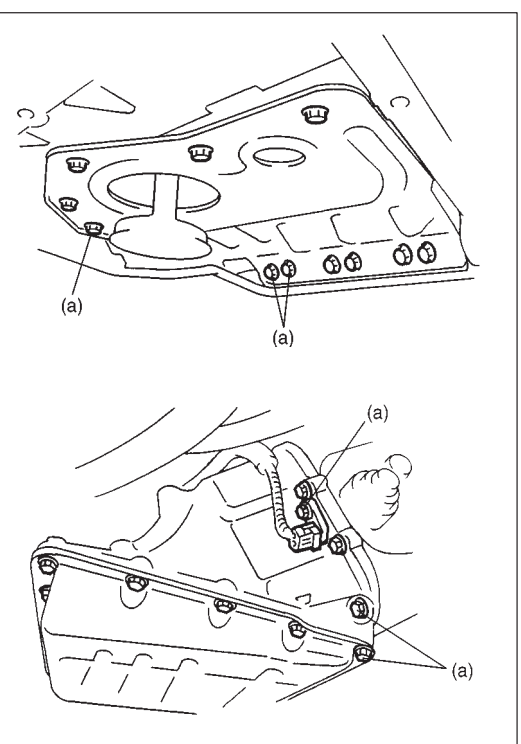
   Tightening Torque
   (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



1. Upper oil pan
2. Lower oil pan

2) Clean mating surfaces of upper and lower oil pan and cylinder block. Remove oil, old sealant, and dusts from mating surfaces. After cleaning, apply sealant to oil pan mating surface continuously as shown in figure.

"A": Sealant 99000-31150

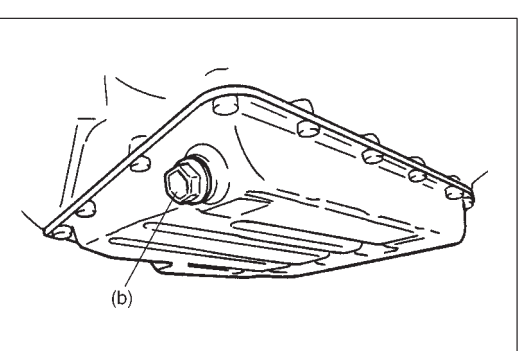


3) Install upper oil pan to cylinder block, baffle plate to upper oil pan and then lower oil pan to upper oil pan.
After fitting oil pan, run in securing bolts and start tightening at the center: move wrench outward, tightening one bolt at a time.
Install oil level gauge guide if it was removed.
Tighten bolts and nuts to specified torque.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

4) Install CKP sensor.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



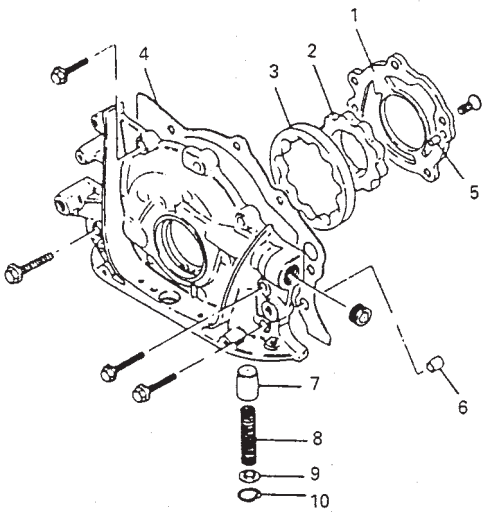
5) Install gasket and drain plug to oil pan.

Tightening Torque
(b): 35 N·m (3.5 kg-m, 25.5 lb-ft)

Refill engine with engine oil, referring to item ENGINE OIL CHANGE in Section 0B.

6) Verify that there is no engine oil leakage and differential oil leakage at each connection.

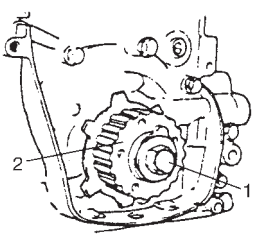
OIL PUMP



1. Rotor plate
2. Inner rotor
3. Outer rotor
4. Gasket
5. Pin
6. Pin
7. Relief valve
8. Spring
9. Retainer
10. Retainer ring

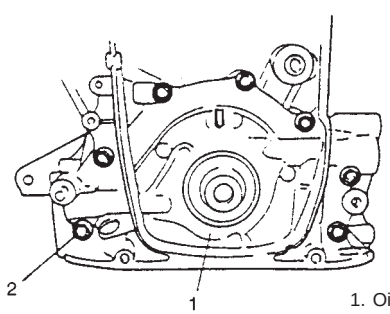
REMOVAL

1) Disconnect negative cable at battery.
2) Remove timing belt as previously outlined.
3) Remove crankshaft timing belt pulley.



1. Pulley bolt
2. Crank timing belt pulley

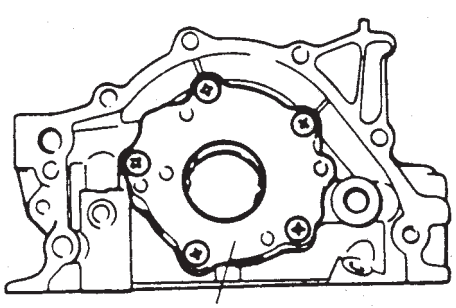
4) Remove oil pan and oil pump strainer as previously outlined.
5) Remove oil pump assembly after removing bolts.



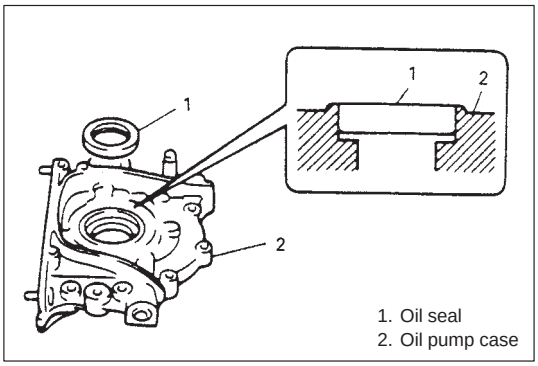
1. Oil pump
2. Bolt

DISASSEMBLY

Remove rotor plate.



1. Rotor plate

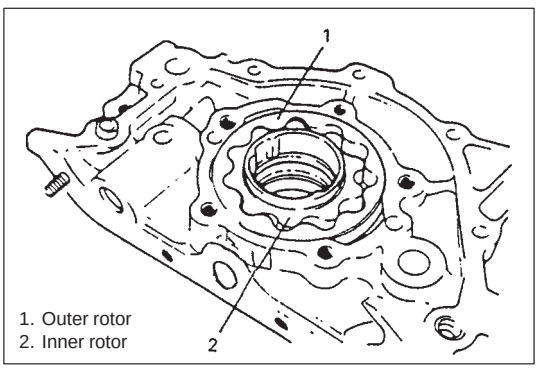


1. Oil seal
2. Oil pump case

INSPECTION

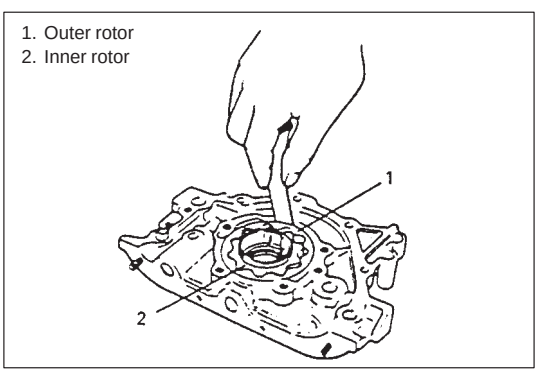
- Check oil seal lip for fault or other damage. Replace as necessary. Apply engine oil to oil seal lip before installing.

  NOTE:
  When installing oil seal, press-fit it till its end face is flush with oil pump case end face.



1. Outer rotor
2. Inner rotor

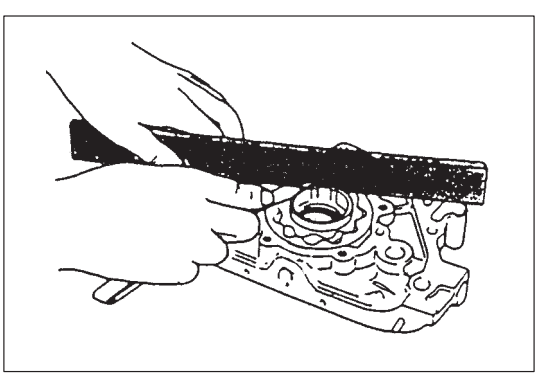
- Check outer and inner rotors, rotor plate, and oil pump case for excessive wear or damage.



MEASUREMENT

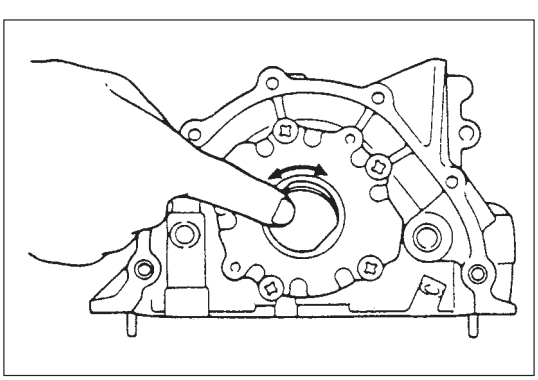
- **Radial clearance**
  Check radial clearance between outer rotor and case, using thickness gauge.
  If clearance exceeds its limit, replace outer rotor or case.

  Limit on radial clearance between outer rotor and case: 0.310 mm (0.0122 in.)



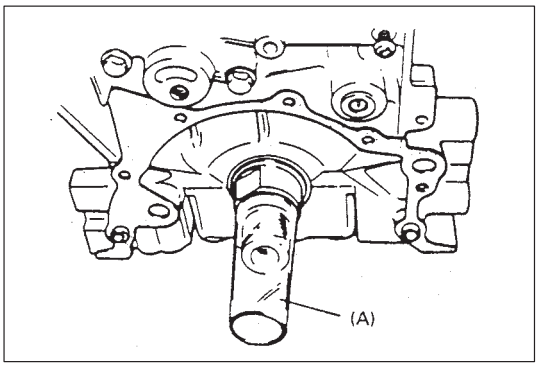
- **Side clearance**
  Using straight edge and thickness gauge, measure side clearance.

  Limit on side clearance: 0.15 mm (0.0059 in.)



ASSEMBLY

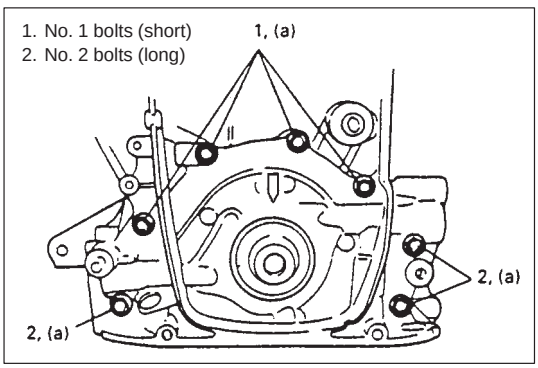
1) Wash, clean and then dry all disassembled parts.
2) Apply thin coat of engine oil to inner and outer rotors, oil seal lip portion, and inside surfaces of oil pump case and plate.
3) Install outer and inner rotors to pump case.
4) Install rotor plate. Tighten 5 screw securely.
   After installing plate, check to be sure that gears turn smoothly by hand.



INSTALLATION

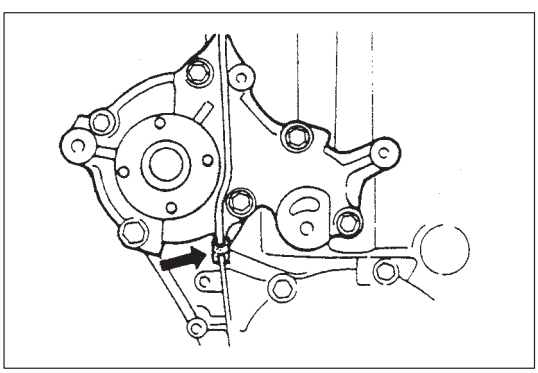
1) Install two oil pump pins and oil pump gasket to cylinder block. Use a new gasket.
2) To prevent oil seal lip from being damaged or upturned when installing oil pump to crankshaft, fit special tool (Oil seal guide) to crankshaft, and apply engine oil to special tool.

Special Tool
(A): 09926-18210

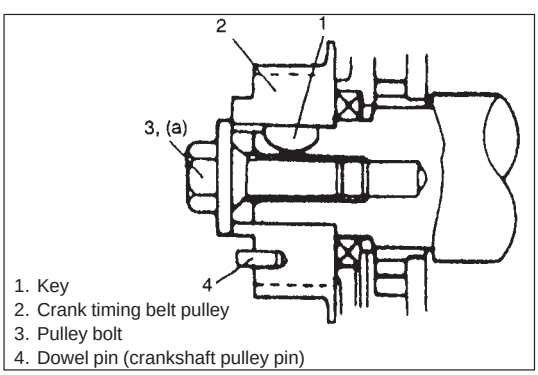


3) Install oil pump to cylinder block.
As there are 2 types of oil pump bolts, refer to figure for their correct use and tighten them to specified torque.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



4) Install rubber seal between oil pump and water pump.

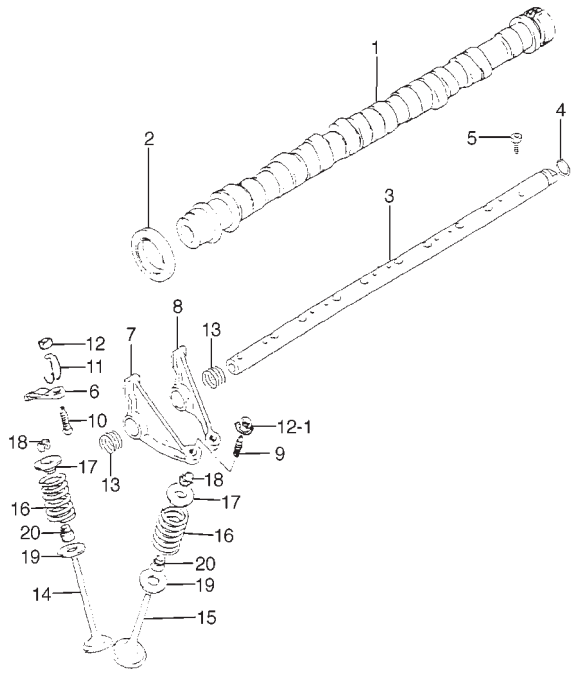


5) Install timing pulley key and crank timing belt pulley. Refer to figure for proper installation of these parts.
With crankshaft locked, tighten crank timing belt pulley bolt to specified torque.

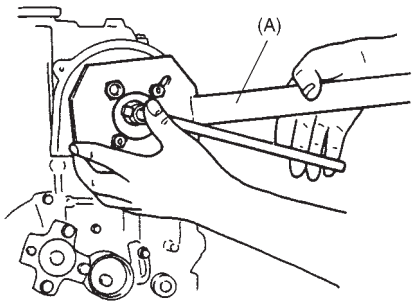
Tightening Torque
(a): 130 N·m (13.0 kg-m, 94.0 lb-ft)

6) Install timing belt, tensioner, oil pump strainer, oil pan and other parts as previously outlined.
7) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
8) Adjust generator drive belt (water pump drive belt) tension, referring to BELT TENSION INSPECTION in Section 6H.
9) Adjust A/C compressor belt tension, if equipped. Refer to Section 0B.
10) Refill engine with engine oil, referring to item ENGINE OIL CHANGE in Section 0B.
11) Refill cooling system and bleed air from system, referring to Section 6B.
12) Connect negative cable at battery.
13) Verify that there is no coolant leakage and each oil leakage at each connection.
14) After completing installation, check oil pressure by running engine.

ROCKER ARMS, ROCKER SHAFT AND CAMSHAFT



1. Camshaft
2. Camshaft oil seal
3. Rocker arm shaft
4. O-ring
5. Rocker shaft bolt
6. Rocker arm (IN)
7. Rocker arm No. 1 (EX)
8. Rocker arm No. 2 (EX)
9. Valve adjusting screw
10. Valve adjusting screw
11. Clip
12. Lock nut (without flange)
12-1. Lock nut (with flange)
13. Rocker arm spring
14. Intake valve
15. Exhaust valve
16. Valve spring
17. Valve spring retainer
18. Valve cotter
19. Valve spring seat
20. Valve stem seal

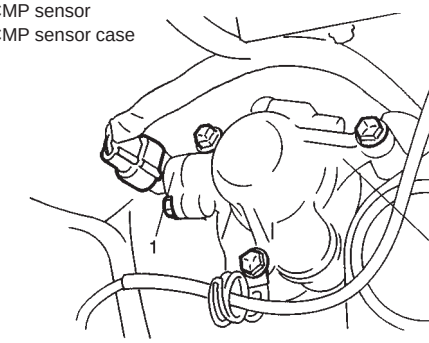


REMOVAL

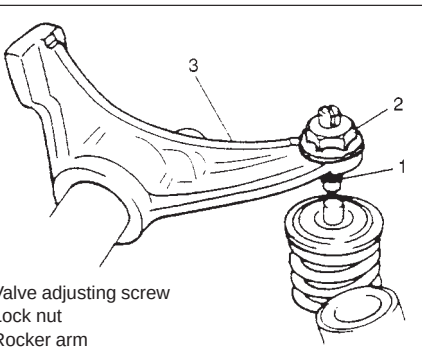
1) Disconnect negative (–) and positive (+) cable at battery and remove battery.
2) Drain coolant.
3) Remove water hoses and timing belt as previously outlined.
4) Remove camshaft timing belt pulley by using special tool.

   Special Tool
   (A): 09917-68221

5) Remove cylinder head cover as previously outlined.
6) Disconnect CMP sensor connector and remove CMP sensor case from cylinder head.
   Place a container or rag under CMP sensor case, for a small amount of oil flows out during removal of case.

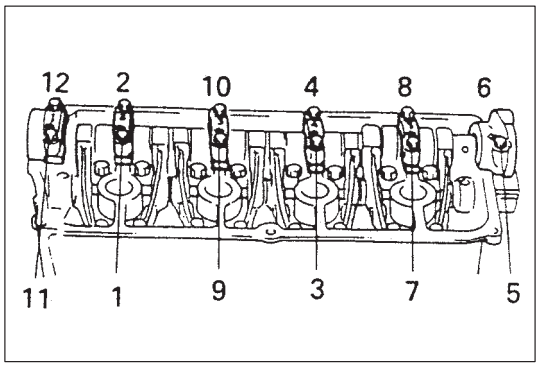


1. CMP sensor
2. CMP sensor case



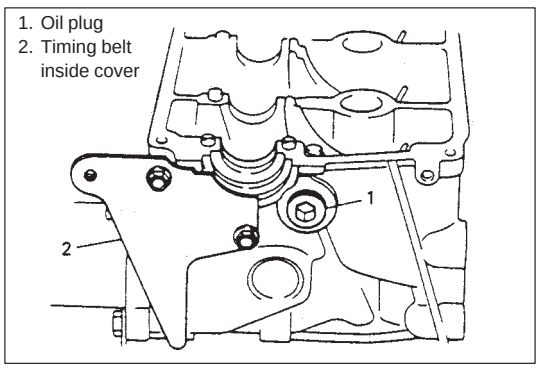
1. Valve adjusting screw
2. Lock nut
3. Rocker arm

7) After loosening all valve adjusting screw lock nuts, turn adjusting screws back all the way to allow all rocker arms to move freely.

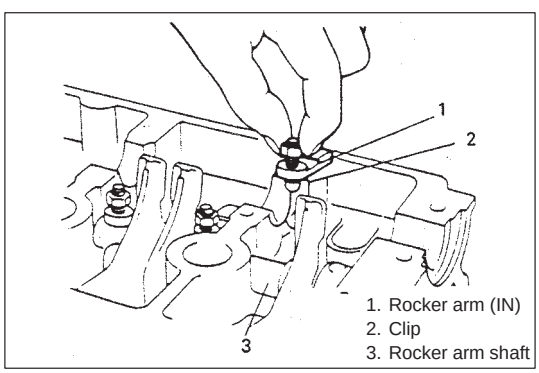


8) Remove camshaft housing and camshaft.

NOTE:
To remove camshaft housing bolts, loosen them in such order as indicated in figure, a little at a time.

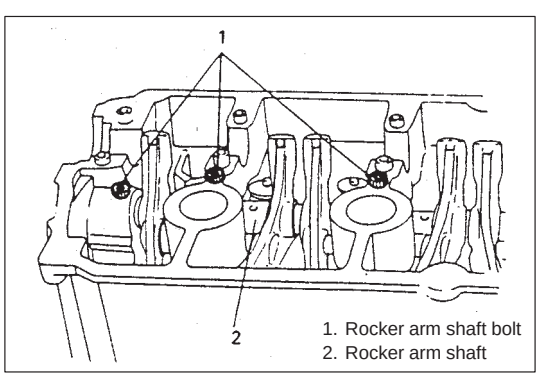


9) Remove oil plug and timing belt inside cover.

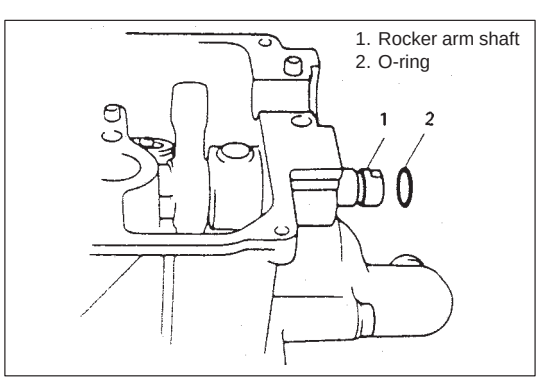


10) Remove intake rocker arm with clip from rocker arm shaft.

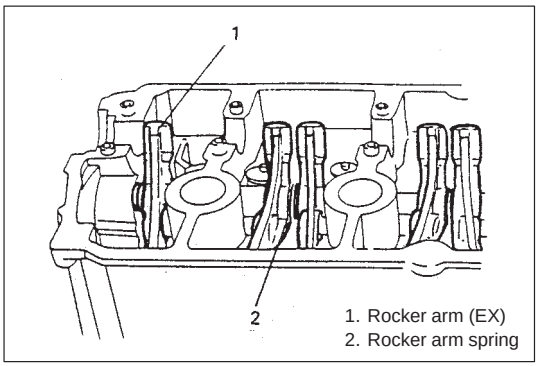
NOTE:
Do not bend clip when removing intake rocker arm.



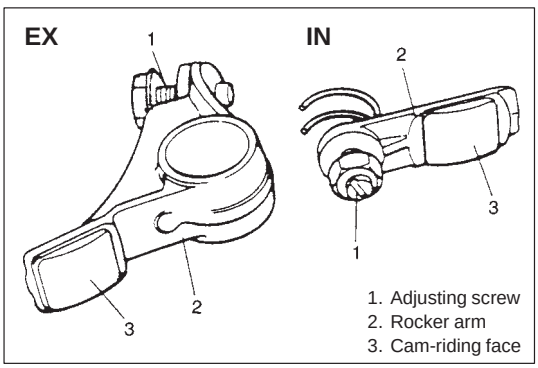
11) Remove rocker arm shaft bolts.



12) Push off rocker arm shaft end to CMP sensor case side and remove O-ring from shaft.



13) Remove exhaust rocker arms and rocker arm spring by pulling rocker arm shaft to CMP sensor side.

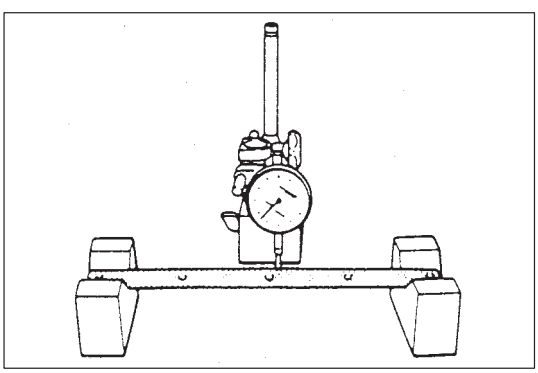


INSPECTION

Adjusting Screw and Rocker Arm

If tip of adjusting screw is badly worn, replace it.

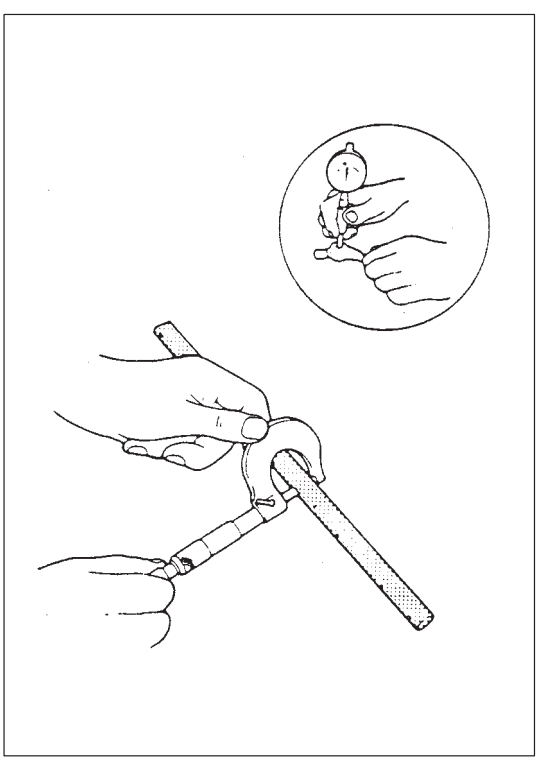
Rocker arm must be replaced if its cam-riding face is badly worn.



Rocker Arm Shaft Runout

Using "V" blocks and dial gauge, check runout. If runout exceeds its limit, replace rocker arm shaft.

Runout limit: 0.20 mm (0.008 in.)



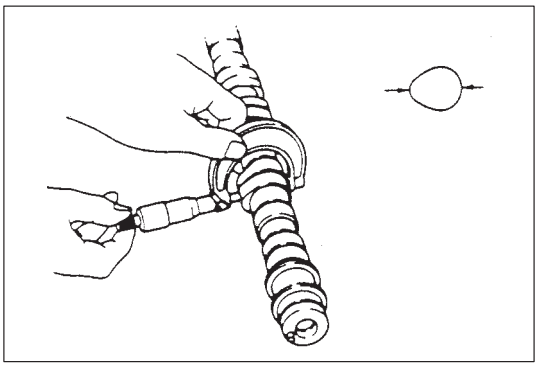
Rocker Arm-to-Rocker Arm Shaft Clearance

Using a micrometer and a bore gauge, measure rocker shaft dia. and rocker arm I.D.

Difference between two readings is arm-to-shaft clearance on which a limit is specified.

If limit is exceeded, replace shaft or arm, or both.

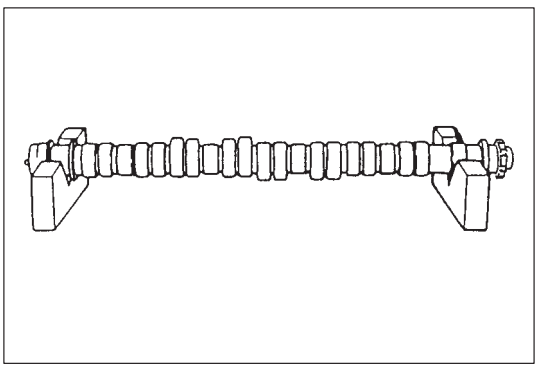
Item	Standard	Limit
Rocker arm I.D.	15.985 – 16.005 mm (0.629 – 0.630 in.)	———
Rocker arm shaft dia.	15.969 – 15.984 mm (0.6287 – 0.6293 in.)	———
Arm-to-shaft clearance	0.001 – 0.036 mm (0.0001 – 0.0014 in.)	0.09 mm (0.0035 in.)



Cam Wear

Using a micrometer, measured height of cam. If measured height is below limit, replace camshaft.

Cam height	Standard	Limit
Intake cam	36.184 – 36.344 mm (1.4246 – 1.4308 in.)	36.084 mm (1.4206 in.)
Exhaust cam	35.900 – 36.060 mm (1.4134 – 1.4197 in.)	35.800 mm (1.4094 in.)

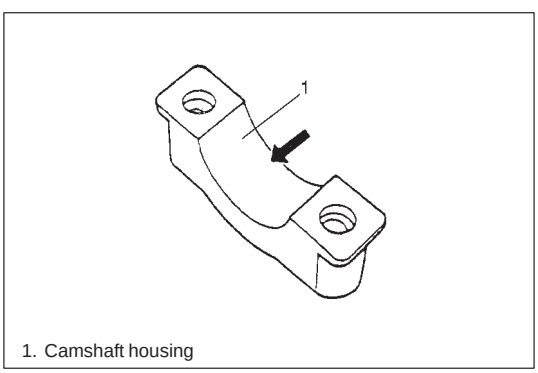


Camshaft Runout

Hold camshaft between two "V" blocks, and measure runout by using a dial gauge.

If runout exceeds the limit, replace camshaft.

Runout limit: 0.10 mm (0.0039 in.)

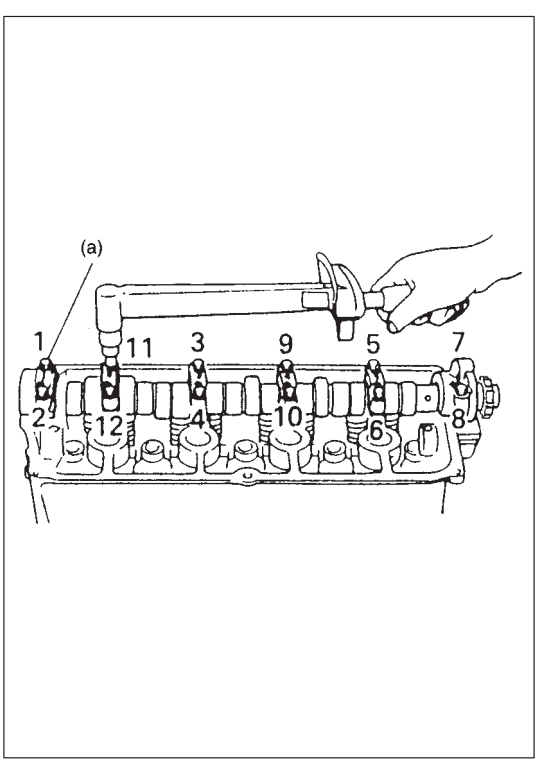


1. Camshaft housing

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 housing.



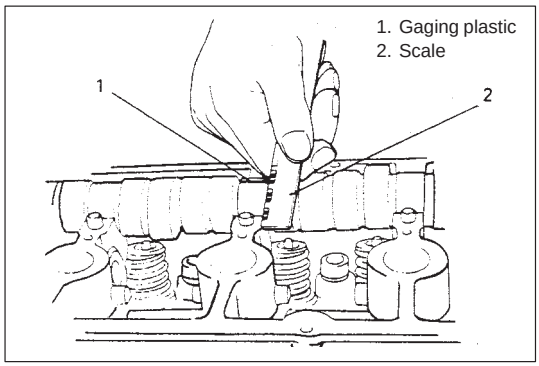
Check clearance by using gaging plastic.

The procedure is as follows.

1) Clean housing and camshaft journals.
2) 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, referring to page 6A-33.
5) Tighten camshaft housing bolts in such order as indicated in figure a little at a time till they are tightened to specified torque.

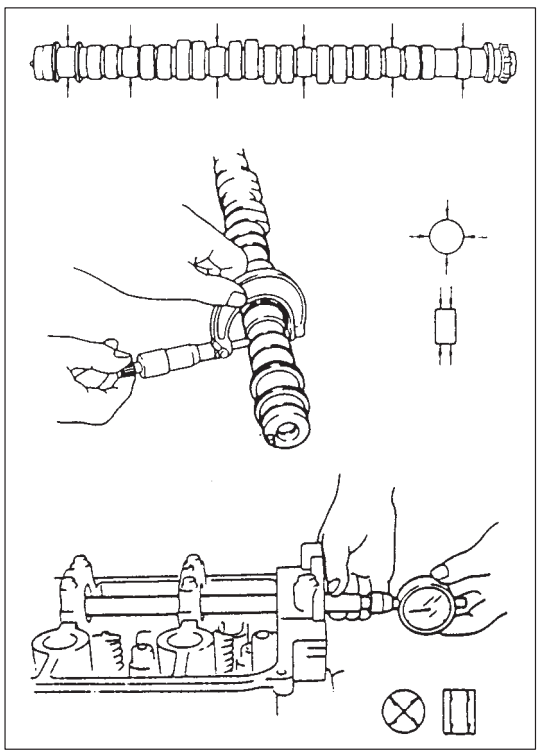
Tightening Torque
(a): 11 N·m (1.1kg-m, 8.0 lb-ft)

NOTE:
Do not rotate camshaft while gaging plastic is installed.



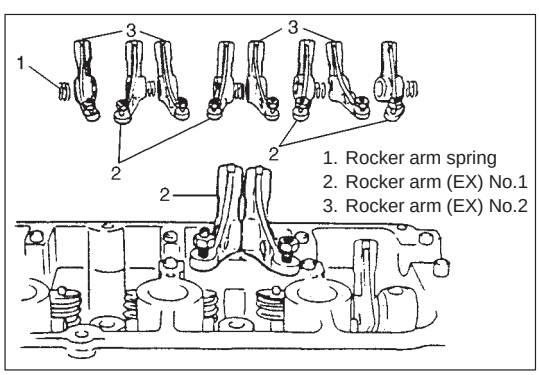
6) Remove housing and using scale on gaging plastic envelope, measure gaging plastic width at its widest point.

	Standard	Limit
Journal clearance	0.040 – 0.082 mm (0.0016 – 0.0032 in.)	0.12 mm (0.0047 in.)



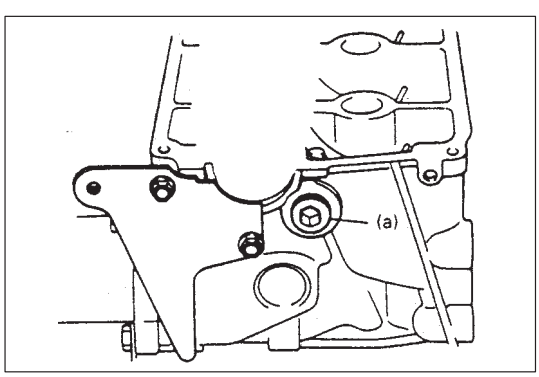
If measured camshaft journal clearance exceeds limit, measure journal (housing) bore and outside diameter of camshaft journal. Replace camshaft or cylinder head assembly whichever the difference from specification is greater.

Item	Standard
Camshaft Journal bore dia.	28.000 – 28.021 mm (1.1024 – 1.1031 in.)
Camshaft journal O.D.	27.939 – 27.960 mm (1.1000 – 1.1008 in.)



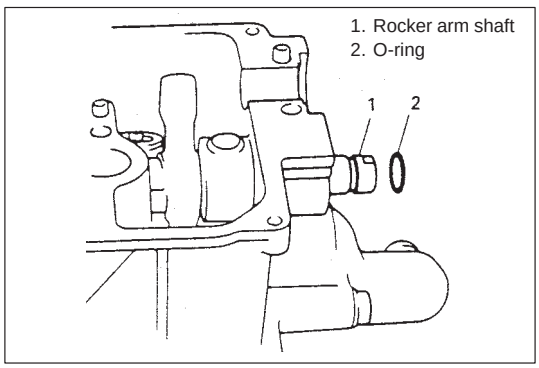
INSTALLATION

1) Apply engine oil to rocker arm shaft and rocker arms.
2) Install rocker arm shaft, rocker arm (exhaust side) and rocker arm spring.

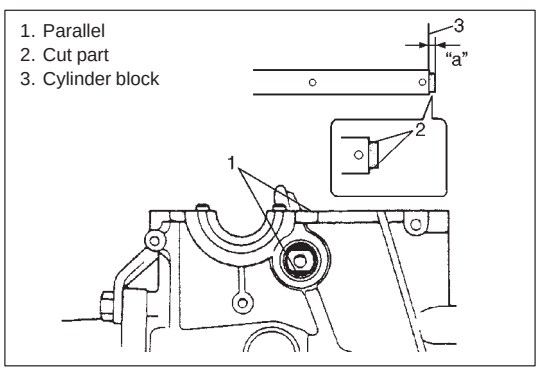


3) Install oil plug and timing belt inside cover.
   Then tighten oil plug to specified torque.

   Tightening Torque
   (a): 33 N·m (3.3 kg-m, 24.0 lb-ft)

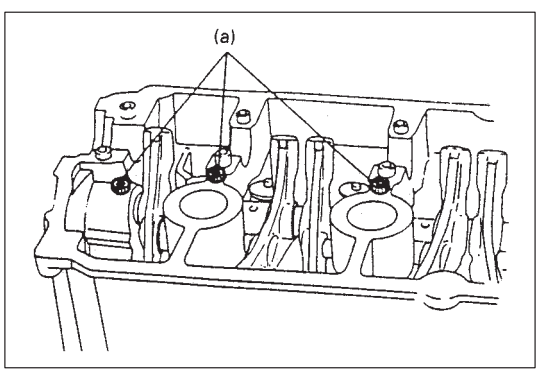


4) Check O-ring for damage or deterioration. With O-ring groove in rocker arm shaft exposed to transmission side once, install O-ring to rocker arm shaft.



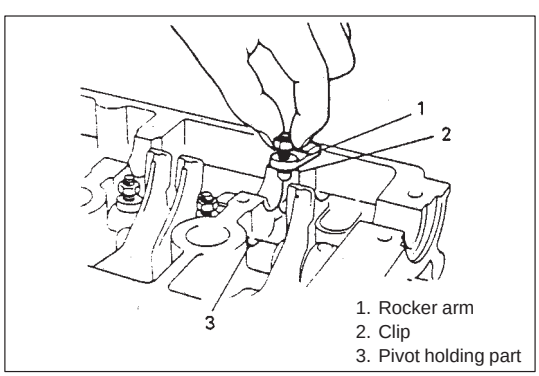
5) Set rocker arm shaft so that its cut part becomes in parallel with head cover mating surface.
Face rocker arm shaft pivot holding part (for intake rocker arm) up.

Dimension "a" : 5mm (0.20 in.)

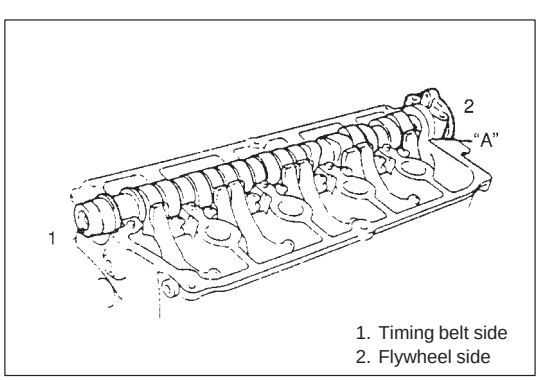


6) Install rocker arm shaft bolts and tighten them to specified torque.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

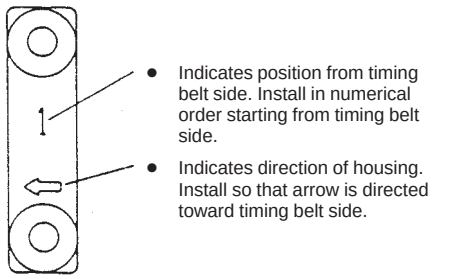


7) Fill small amount of engine oil into arm pivot holding part of rocker arm shaft. Install rocker arm (intake side) with clips to rocker arm shaft.

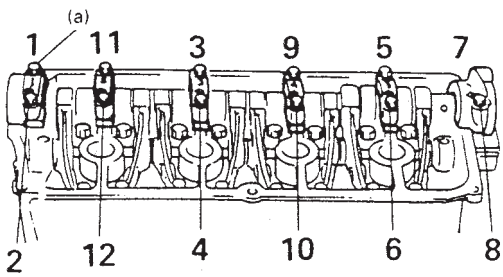


8) Apply engine oil to cams and journals on camshaft and put camshaft on cylinder head. Install camshaft housing to camshaft and cylinder head.
- Apply engine oil to sliding surface of each housing against camshaft journal.
- Apply sealant to mating surface of No.6 housing which will mate with cylinder head.

"A" Sealant: 99000-31110

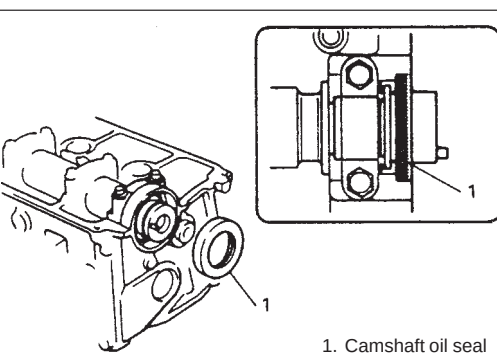


- Embossed marks are provided on each camshaft housing, indicating position and direction for installation.
  Install housing as indicated by these marks.
- As camshaft housing No. 1 retains camshaft in proper position as to thrust direction, make sure to first fit No. 1 housing to No. 1 journal of camshaft securely.



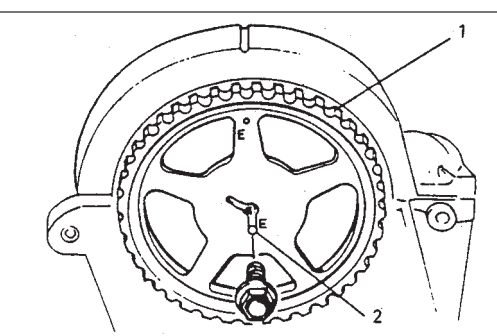
- After applying engine oil to housing bolts, tighten them temporarily first. Then tighten them by following sequence as indicated in figure.
  Tighten a little at a time and evenly among bolts and repeat tightening sequence three to four times before they are tightened to specified torque.

  Tightening Torque
  (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)



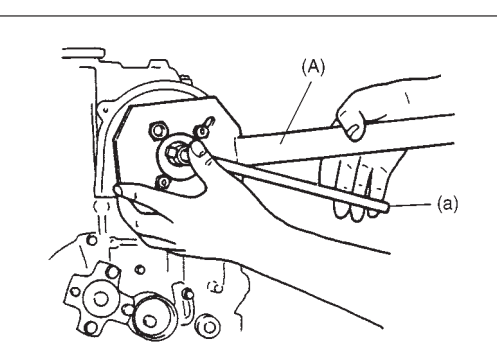
1. Camshaft oil seal

9) Install camshaft oil seal.
   After applying engine oil to oil seal lip, press-fit camshaft oil seal till oil seal surface becomes flush with housing surface.



1. Camshaft timing belt pulley 2. Dwell pin

10) Install camshaft timing belt pulley to camshaft while fitting pin on camshaft into slot at “E” mark.

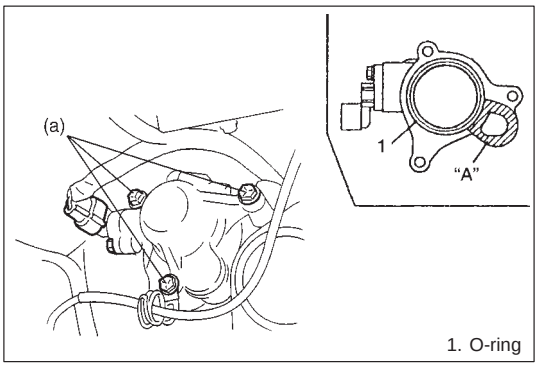


11) Using special tool, tighten pulley bolt to specified torque.

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

    Special Tool
    (A): 09917-68221

12) Install belt tensioner, timing belt, outside cover, crankshaft pulley and generator belt as previously outlined.



13) After applying sealant to part "A" as shown in figure at the left, install CMP sensor case to cylinder head and tighten its fixing bolts to specified torque.

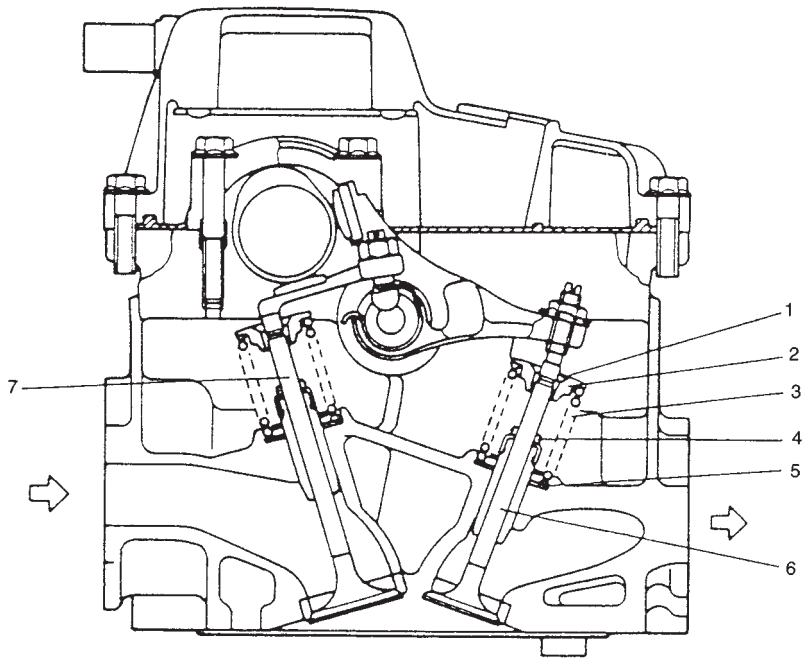
"A" Sealant: 99000-31110

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

Connect CMP sensor connector.

14) Adjust valve clearance as previously outlined.
15) Install cylinder head cover.
16) Refill cooling system and bleed air from system referring to Section 6B.
17) Adjust generator belt tension, referring to BELT TENSION INSPECTION in Section 6H.
18) Connect negative cable at battery.
19) Upon completion of installation, verify that there is no coolant leakage at each connection.
20) Confirm that ignition timing is within specification referring to Section 6F.

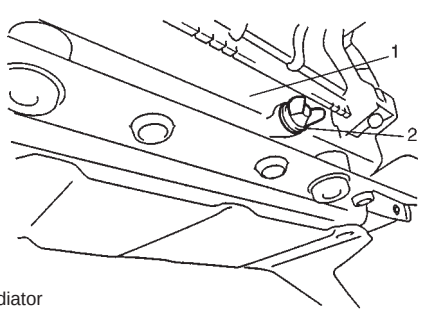
VALVES AND CYLINDER HEAD



1. Valve cotters
2. Valve spring retainer
3. Valve spring
4. Valve stem seal
5. Valve spring seat
6. Exhaust valve
7. Intake valve

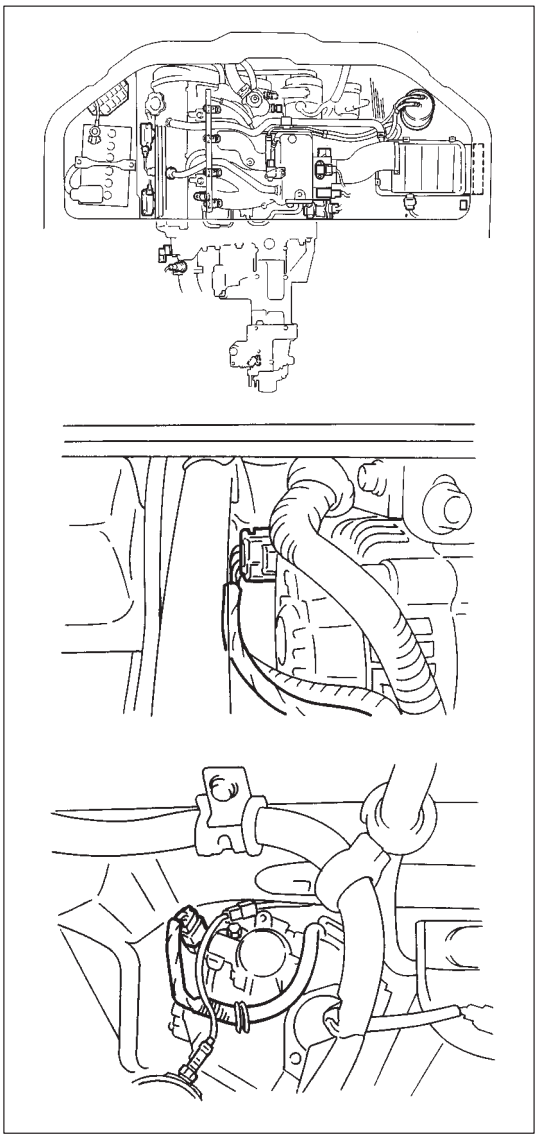
REMOVAL

1) Relieve fuel pressure according to fuel pressure relief procedure described in section 6.
2) Disconnect cables at battery and remove battery.
3) Release front seat lock handle and raise front seats, then remove engine room center member with shift control and parking brake lever.



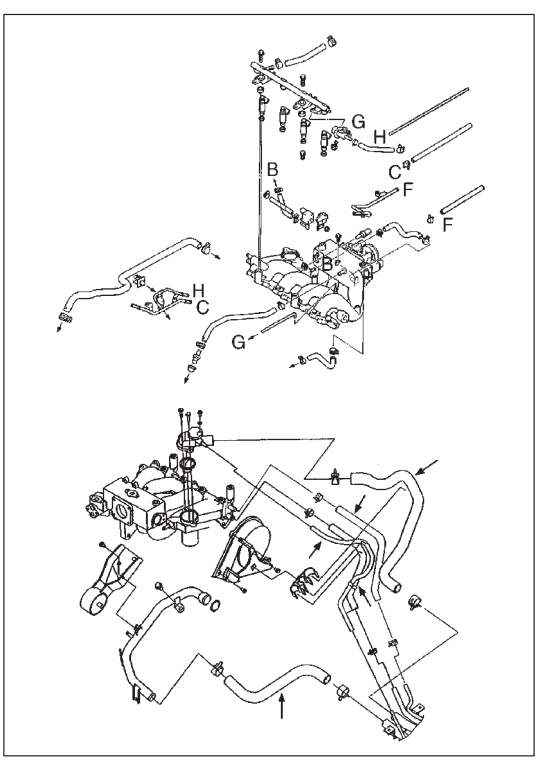
1 Radiator
2. Radiator drain plug

4) Drain cooling system.



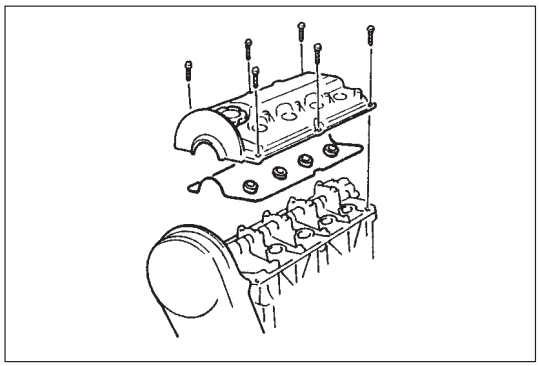
5) Remove air intake hose.
6) Disconnect following electric wires:
   - Ground wires from intake manifold
   - Camshaft position sensor
   - EGR valve (if equipped)
   - EVAP canister purge valve
   - Engine coolant temp. sensor
   - Throttle position sensor
   - Idle air control valve
   - Fuel injector wires at the connector
   - Generator
   - Ground cable from cylinder block
   - Heated oxygen sensor
   - Engine oil pressure switch
   - MAP sensor

   and then release wire harnesses from clamps.

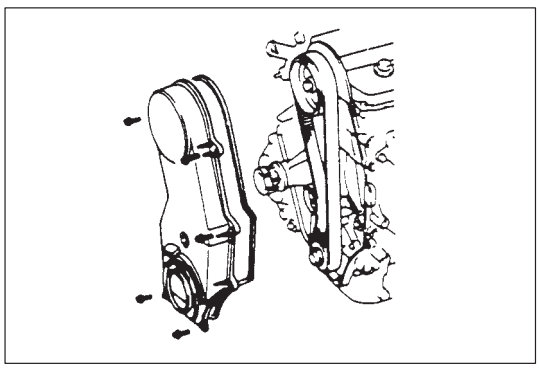


7) Disconnect following hoses:
   - Canister purge hose from EVAP canister purge valve
   - Radiator inlet hose and reservoir hose from thermostat cap
   - Brake booster hose from intake manifold
   - Heater inlet hose from pipe
   - Fuel feed hose and return hose from each pipe
   - Coolant hoses and brake booster hose from floor pipe

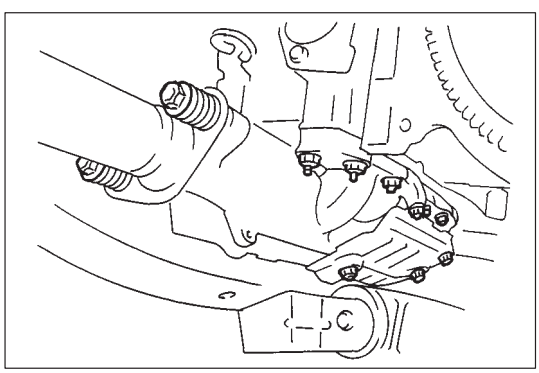
   NOTE:
   ALPHABET in the figure shows where each hose is connected.
8) Disconnect accelerator cable from throttle body and each clamp.
9) Remove intake manifold as previously outlined.



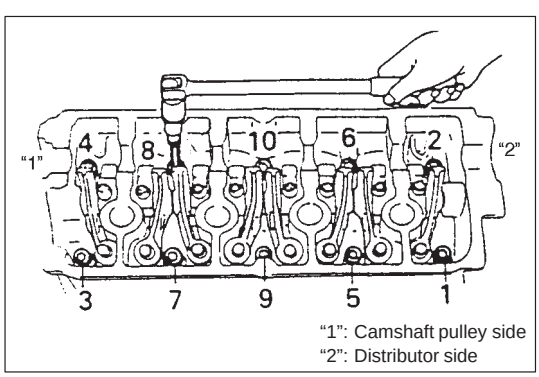
10) Remove cylinder head cover as previously outlined. Loosen all valve lash adjusting screws fully.



11) Remove timing belt and camshaft as previously outlined.



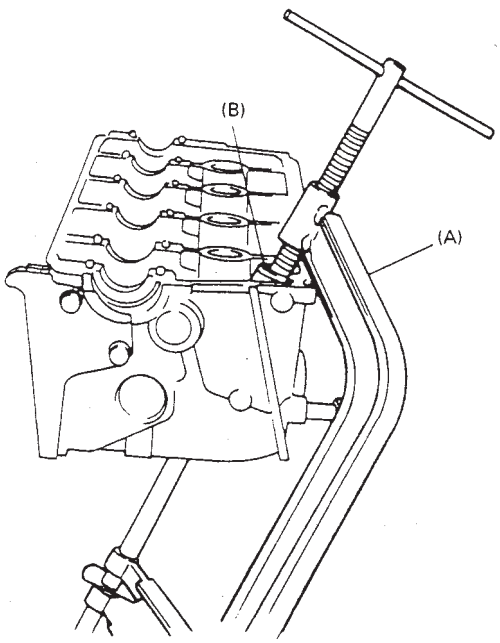
12) Remove exhaust manifold as previously outlined.

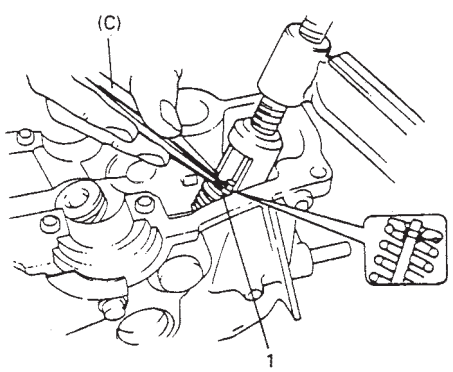


"1": Camshaft pulley side
"2": Distributor side

13) Loosen cylinder head bolts in such order as indicated in figure and remove them.
14) Check all around cylinder head for any other parts required to be removed or disconnected and remove or disconnect whatever necessary.

15) Remove cylinder head.





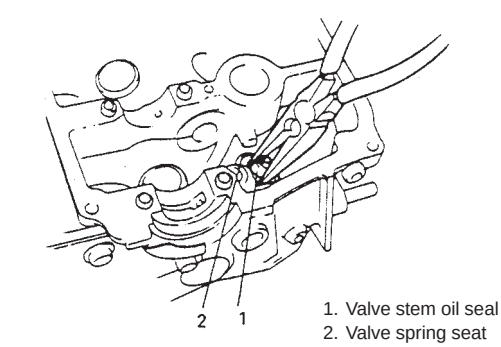
1. Valve cotters

DISASSEMBLY

1) Remove intake rocker arm with clip from rocker arm shaft, remove rocker arm shaft bolts and remove exhaust rocker arms and springs by pulling its shaft out to transmission side.
2) Using special tool (Valve lifter), compress valve springs and then remove valve cotters by using special tool (Forceps) as shown.

Special Tool
(A): 09916-14510
(B): 09916-14910
(C): 09916-84511

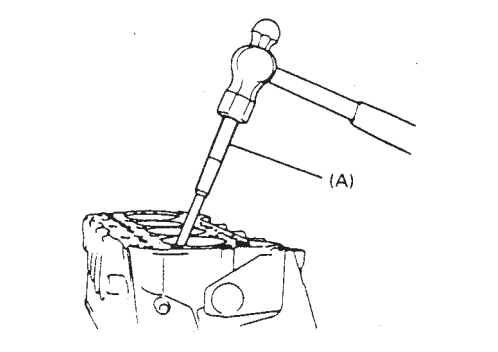
3) Release special tool, and remove spring retainer and valve spring.
4) Remove valve from combustion chamber side.



1. Valve stem oil seal
2. Valve spring seat

5) Remove valve stem oil seal from valve guide, and then valve spring seat.

NOTE:
Do not reuse oil seal once disassembled. Be sure to use new oil seal when assembling.

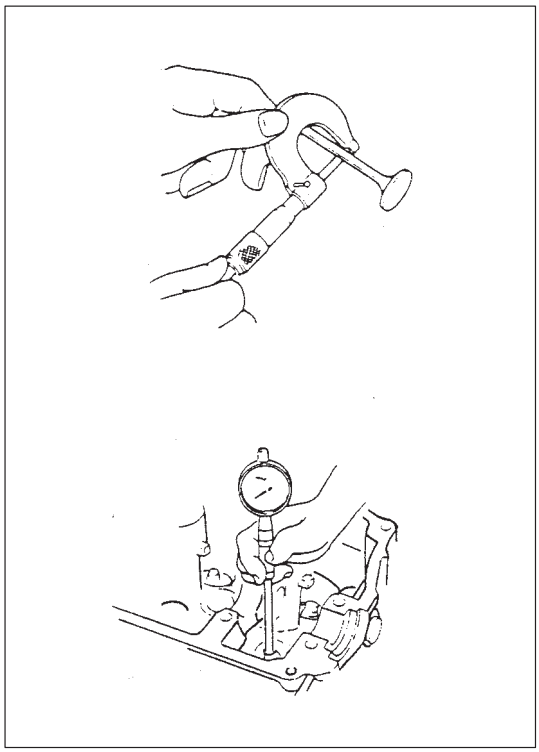


6) Using special tool (Valve guide remover), drive valve guide out from combustion chamber side to valve spring side.

Special Tool
(A): 09916-44910

NOTE:
Do not reuse valve guide once disassembled. Be sure to use new valve guide (Oversize) when assembling.

7) Place disassembled parts except valve stem seal and valve guide in order, so that they can be installed in their original position.



INSPECTION

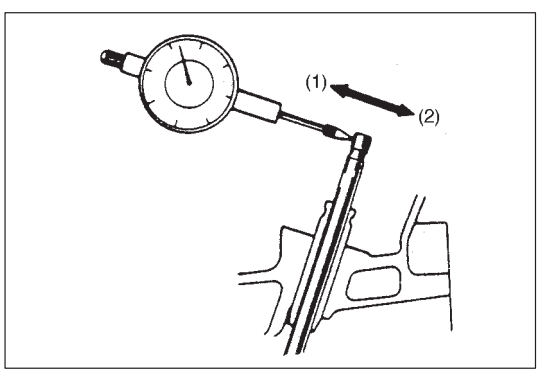
Valve Guides

Using a micrometer and bore gauge, take diameter readings on valve stems and guides to check stem-to-guide clearance.

Be sure to take reading at more than one place along the length of each stem and guide.

If clearance exceeds limit, replace valve and valve guide.

Item		Standard	Limit
Valve stem diameter	In	5.465 – 5.480 mm (0.2152 – 0.2157 in.)	—
	Ex	5.440 – 5.455 mm (0.2142 – 0.2148 in.)	—
Valve guide I.D.	In	5.500 – 5.512 mm (0.2166 – 0.2170 in.)	—
	Ex		
Stem-to-guide clearance	In	0.020 – 0.047 mm (0.0008 – 0.0018 in.)	0.07 mm (0.0027 in.)
	Ex	0.045 – 0.072 mm (0.0018 – 0.0028 in.)	0.09 mm (0.0035 in.)

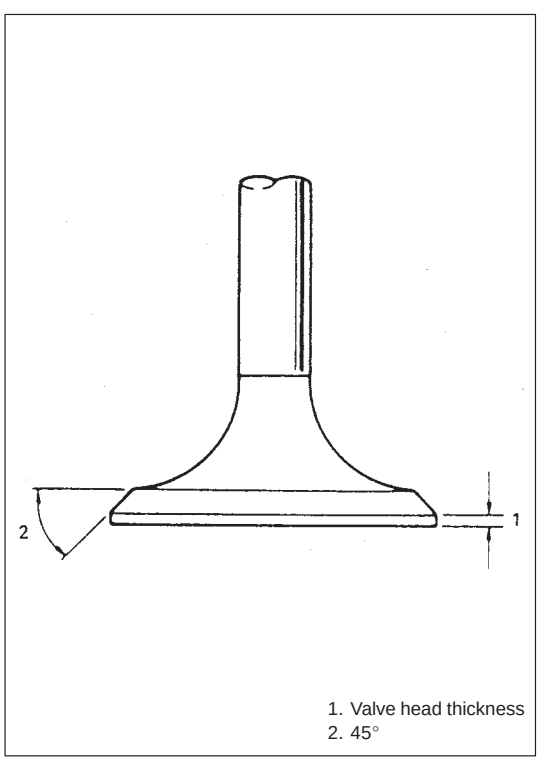


If bore gauge is not available, check end deflection of valve stem with a dial gauge instead.

Move stem end in directions (1) and (2) to measure end deflection.

If deflection exceeds its limit, replace valve stem and valve guide.

Valve stem end deflection limit	In	0.14 mm (0.005 in.)
	Ex	0.18 mm (0.007 in.)

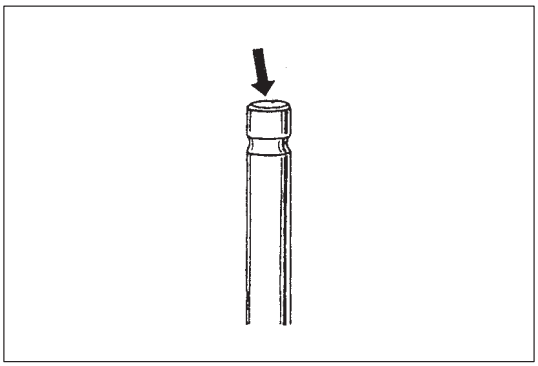


1. Valve head thickness
2. 45°

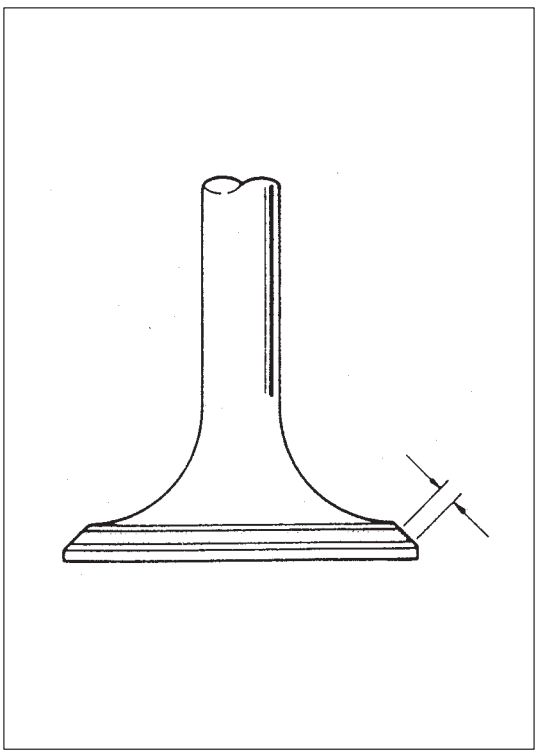
Valves

- Remove all carbon from valves.
- Inspect each valve for wear, burn or distortion at its face and stem and, as necessary, replace it.
- Measure thickness of valve head. If measured thickness exceeds limit, replace valve.

Valve head thickness		
	Standard	Limit
IN	0.8 – 1.2 mm (0.03 – 0.047 in.)	0.6 mm (0.024 in.)
EX		0.7 mm (0.027 in.)



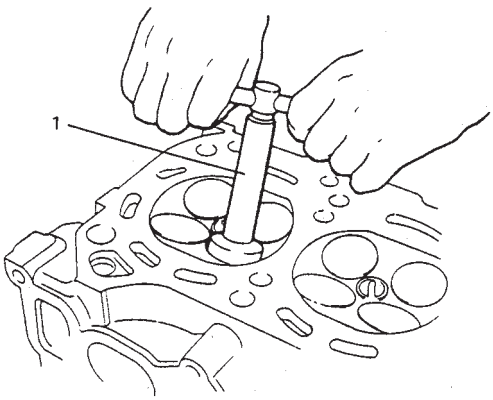
- Inspect valve stem end face for pitting and wear. If pitting or wear is found there, valve stem end may be resurfaced, but not so much as to grind off its chamfer. When it is worn so much that its chamfer is gone, replace valve.



- Seating contact width:
  Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and by rotatingly tapping seat with valve head. Valve lapper (tool used in valve lapping) must be used.

  Pattern produced on seating face of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

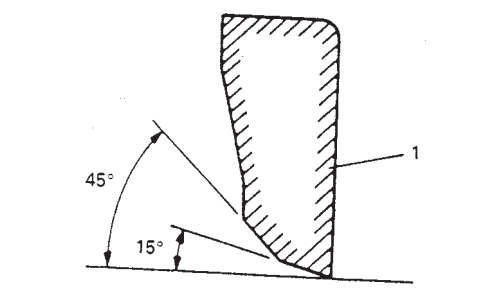
Standard seating width revealed by contact pattern on valve face	In	1.1 – 1.3 mm (0.0433 – 0.0512 in.)
	Ex	



1. Valve seat cutter

- Valve seat repair:
  A valve seat not producing a uniform contact with its valve or showing width of seating contact that is out of specified range must be repaired by regrinding or by cutting and regrinding and finished by lapping.
  1) EXHAUST VALVE SEAT: Use valve seat cutters to make two cuts as illustrated in figure. Two cutters must be used: the first for making 15° angle, and the second for making 45° angle. The second cut must be made to produce desired seat width.

     Seat width for exhaust valve seat:
     1.1 – 1.3 mm (0.0433 – 0.0512 in.)

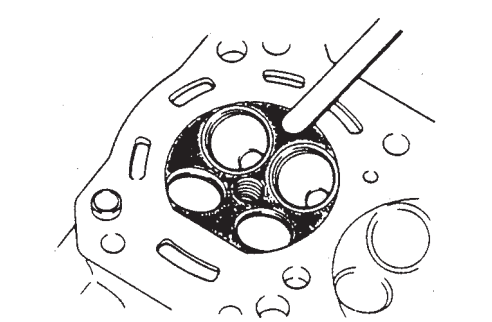


1. Valve seat

  2) INTAKE VALVE SEAT: Cutting sequence is the same as for exhaust valve seats.

     Seat width for intake valve seat:
     1.1 – 1.3 mm (0.0433 – 0.0512 in.)

  3) VALVE LAPPING: Lap valve on seat in two steps, first with coarse size lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.

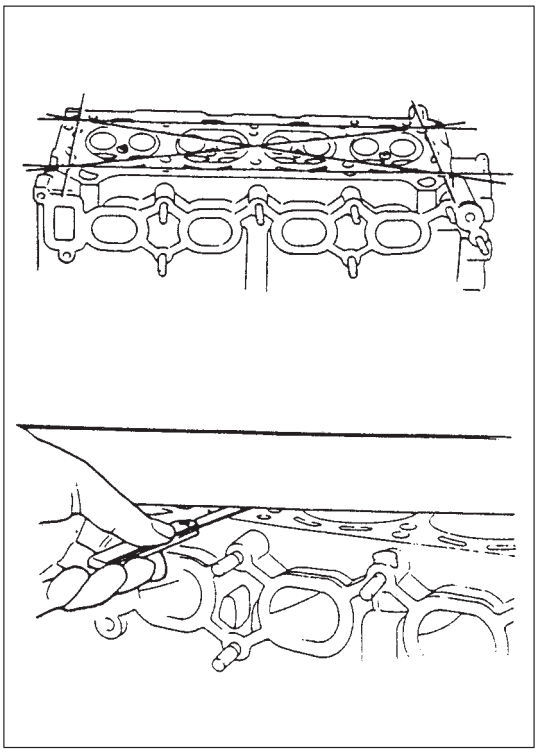


Cylinder Head

- Remove all carbon from combustion chambers.

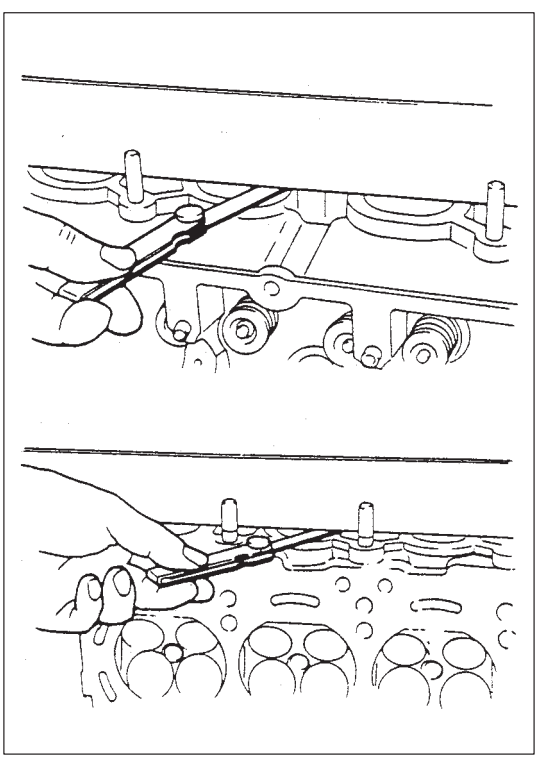
  NOTE:
  Do not use any sharp-edged tool to scrape off carbon. Be careful not to scuff or nick metal surfaces when decarbonoing. The same applies to valves and valve seats, too.

- Check cylinder head for cracks in intake and exhaust ports, combustion chambers, and head surface.



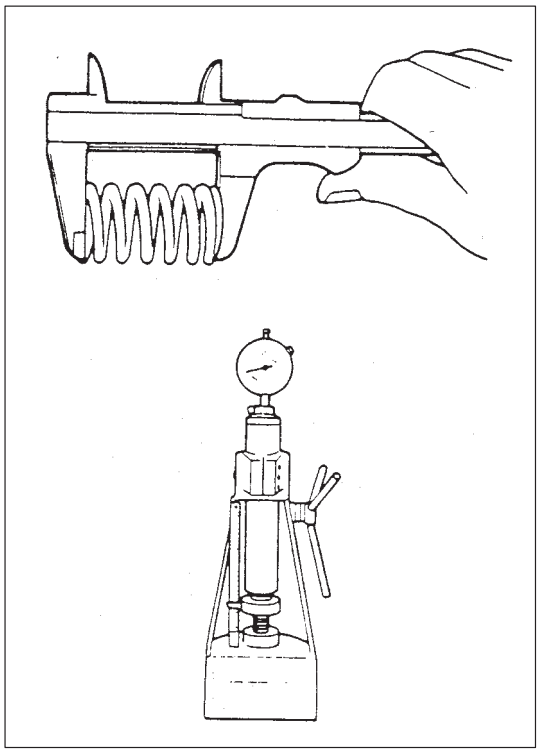
- Flatness of gasketed surface:
  Using a straightedge and thickness gauge, check surface at a total of 6 locations. If distortion limit, given below, is exceeded, correct gasketed surface with a surface plate and abrasive paper of about #400 (Waterproof silicon carbide abrasive paper): place paper on and over surface plate, and rub gasketed surface against paper to grind off high spots. Should this fail to reduce thickness gauge readings to within limit, replace cylinder head. Leakage of combustion gases from this gasketed joint is often due to warped gasketed surface: such leakage results in reduced power output.

  Limit of distortion: 0.05 mm (0.002 in.)



- Distortion of manifold seating faces:
  Check seating faces of cylinder head for manifolds, using a straightedge and thickness gauge, in order to determine whether these faces should be corrected or cylinder head replaced.

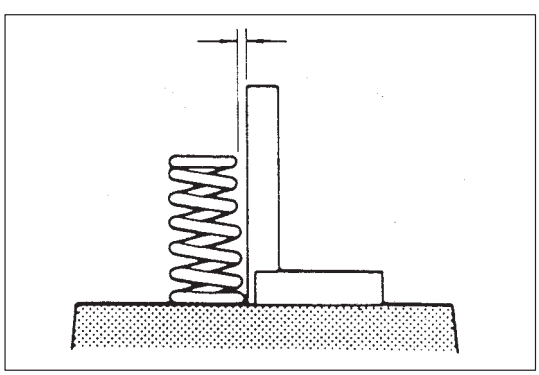
  Limit of distortion: 0.10 mm (0.004 in.)



Valve Springs

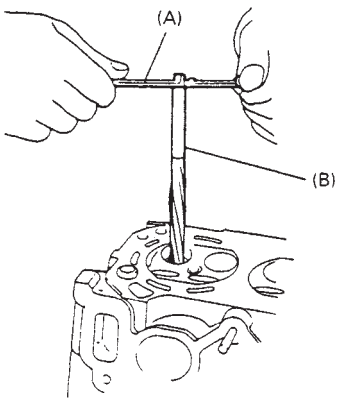
- Referring to data given below, check to be sure that each spring is in sound condition, free of any evidence of breakage or weakening. Remember, weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

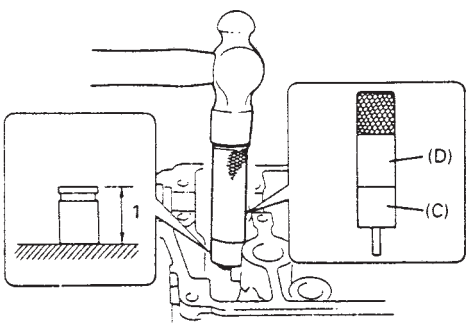
Item	Standard	Limit
Valve spring free length	36.83 mm (1.4500 in.)	35.67 mm (1.4043 in.)
Valve spring preload	10.7 – 12.5 kg for 31.5 mm (23.6 – 27.5 lb/1.24 in.)	9.3 kg for 31.5 mm (20.5 lb/1.24 in.)



- Spring squareness:
  Use a square and surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit given below must be replaced.

  Valve spring squareness limit: 2.0 mm (0.079 in.)





1. Valve guide protrusion (11.5 mm)

ASSEMBLY

1) Before installing valve guide into cylinder head, ream guide hole with special tool (11 mm reamer) so remove burrs and make it truly round.

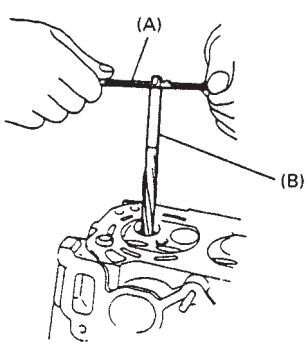
Special Tool
(A): 09916-34542
(B): 09916-38210

2) Install valve guide to cylinder head.
Heat cylinder head uniformly at a temperature of 80 to 100 C (176 to 212 F) so that head will not be distorted, and drive new valve guide into hole with special tools. Drive in new valve guide until special tool (Valve guide installer) contacts cylinder head. After installing, make sure that valve guide protrudes by 11.5 mm (0.45 in.) from cylinder head.

Special Tool
(C): 09916-56011
(D): 09916-58210

NOTE:
- **Do not reuse valve guide once disassembled. Install new valve guide (Oversize).**
- **Intake and exhaust valve guides are identical.**

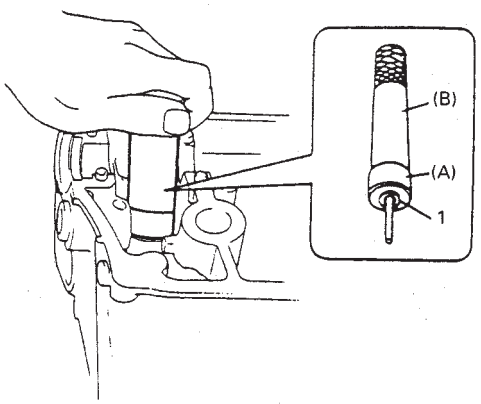
Valve guide oversize: 0.03 mm (0.0012 in.)
Valve guide protrusion (In and Ex): 11.5 mm (0.45 in.)



3) Ream valve guide bore with special tool (5.5 mm reamer). After reaming, clean bore.

Special Tool
(A): 09916-34542
(B): 09916-34550

4) Install valve spring seat to cylinder head.

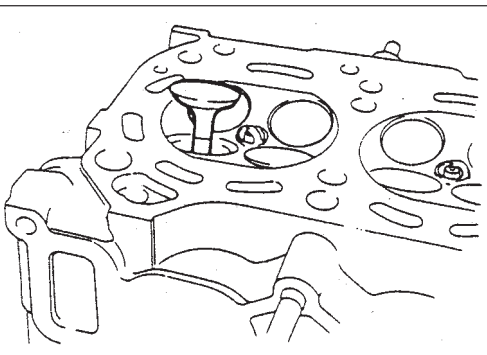


1. Valve stem seal

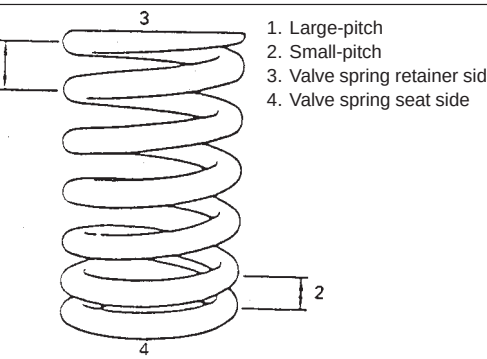
5) Install new valve stem seal to valve guide.
After applying engine oil to seal and spindle of special tool (Valve guide installer handle), fit oil seal to spindle, and then install seal to valve guide by pushing special tool by hand.
After installing, check to be sure that seal is properly fixed to valve guide.

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

NOTE:
- **Do not reuse seal once disassembled. Be sure to install new seal.**
- **When installing, never tap or hit special tool with a hammer or else. Install seal to guide only by pushing special tool by hand. Tapping or hitting special tool may cause damage to seal.**

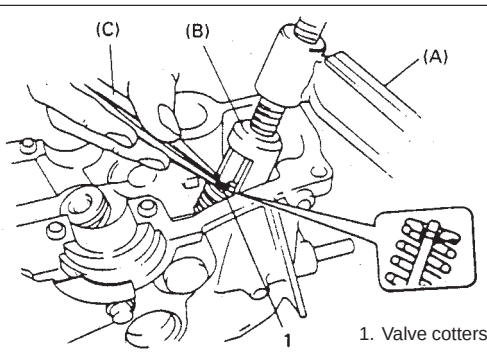


6) Install valve to valve guide.
Before installing valve to valve guide, apply engine oil to stem seal, valve guide bore, and valve stem.



1. Large-pitch
2. Small-pitch
3. Valve spring retainer side
4. Valve spring seat side

7) Install valve spring and spring retainer.
Each valve spring has top end (large-pitch end) and bottom end (small-pitch end). Be sure to position spring in place with its bottom end (small-pitch end) facing the bottom (valve spring seat side).

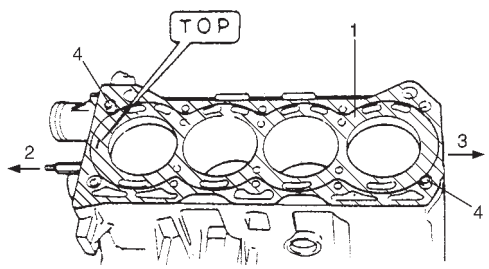


1. Valve cotters

8) Using special tool (Valve lifter), compress valve spring and fit two valve cotters into groove in valve stem.

Special Tool
(A): 09916-14510
(B): 09916-14910
(C): 09916-84511

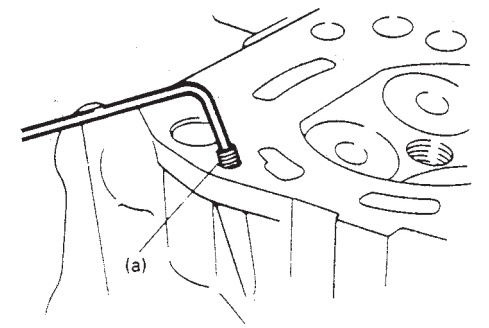
9) Install rocker arms, springs and rocker arm shaft as previously outlined.



1. Cylinder head gasket
2. Crankshaft pulley side
3. Flywheel side
4. Dowel pin

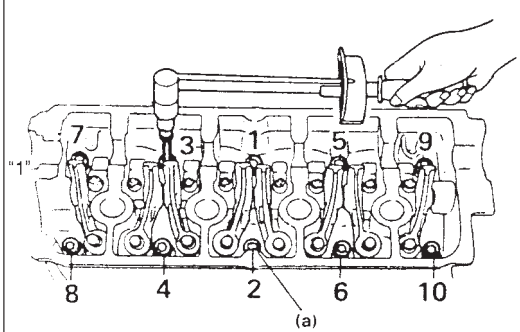
INSTALLATION

1) Remove old gasket and oil on mating surfaces and install new head gasket as shown in figure, that is, “TOP” mark provided on gasket comes to crankshaft pulley side, facing up (toward cylinder head side).



2) Check to make sure that oil jet (venturi plug) is installed and if it is, that it is not clogged.
When installing it, be sure to tighten to specified torque.

Tightening Torque
(a): 5 N·m (0.5 kg-m, 4.0 lb-ft)

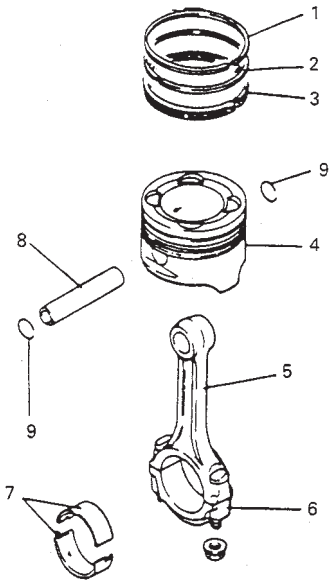


"1": Camshaft pulley side

3) Apply engine oil to cylinder head bolts and tighten them gradually as follows.
   (1) Tighten all bolts to 35 N·m (3.5 kg-m, 25.0 lb-ft) according to numerical order in figure.
   (2) In the same manner as in (1), tighten them to 55 N·m (5.5 kg-m, 40.0 lb-ft).
   (3) In the same manner as in (1) again, tighten them to specified torque.

Tightening Torque
(a): 68 N·m (6.8 kg-m, 49.5 lb-ft)

4) Reverse removal procedure for installation.
5) Adjust generator drive belt tension, referring to BELT TENSION INSPECTION in Section 6H.
6) Adjust A/C compressor belt tension, if equipped. Refer to Section 1B.
7) Adjust intake and exhaust valve lashes as previously outlined.
8) Adjust accelerator cable play. Refer to Section 6E.
9) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
10) Refill cooling system and bleed air from system referring to Section 6B.
11) Install battery and connect cables at battery.
12) Verify that there is no fuel leakage, coolant leakage and exhaust gas leakage at each connection.
13) Confirm that ignition timing is within specification referring to Section 6F.
14) Connect shift control cables to gear shift control lever, refer to GEAR SHIFT CONTROL INSTALLATION in Section 7A.
15) Perform parking brake adjustment, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT in Section 5.
16) Install engine room center member and hook front seat lock handle securely.

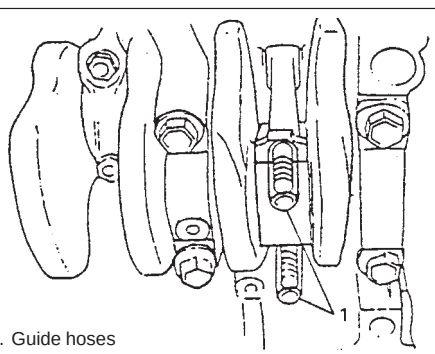


1. Top ring
2. 2nd ring
3. Oil ring
4. Piston
5. Connecting rod
6. Connecting rod bearing cap
7. Connecting rod bearing
8. Piston pin
9. Piston pin circlip

PISTON, PISTON RINGS, CONNECTING RODS AND CYLINDERS

REMOVAL

1) Remove cylinder head from cylinder block as previously outlined.
2) Drain engine oil.
3) Remove oil pans and oil pump strainer as previously outlined.
4) Mark cylinder number on all pistons, connecting rods and rod bearing caps, using silver pencil or quick drying paint.

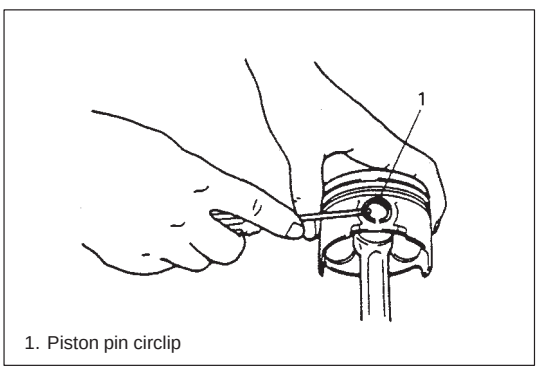


1. Guide hoses

5) Remove rod bearing caps.
6) Install guide hose over threads of rod bolts. This is to prevent damage to bearing journal and rod bolt threads when removing connecting rod.
7) Decarbon top of cylinder bore before removing piston from cylinder.
8) Push piston and connecting rod assembly out through the top of cylinder bore.

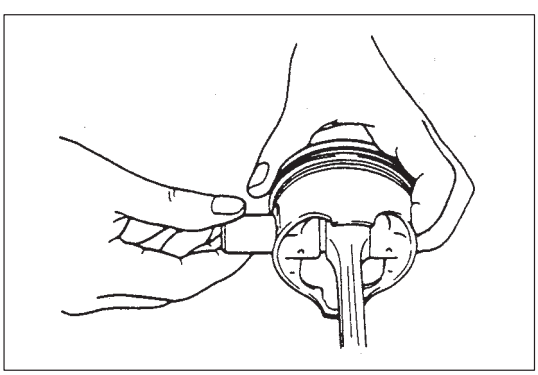
DISASSEMBLY

1) Using piston ring expander, remove two compression rings (Top and 2nd) and oil ring from piston.



1. Piston pin circlip

2) Remove piston pin from connecting rod.
   - Ease out piston pin circlips, as shown.



- Force piston pin out.

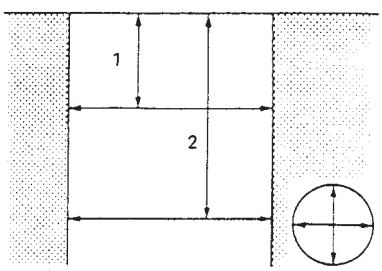
CLEANING

Clean carbon from piston head and ring grooves, using a suitable tool.

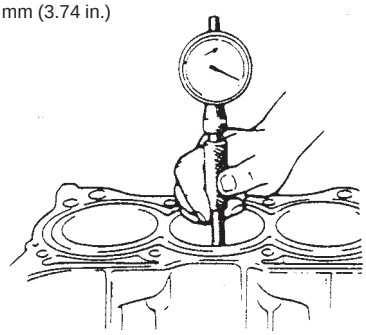
INSPECTION

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 oversize piston.



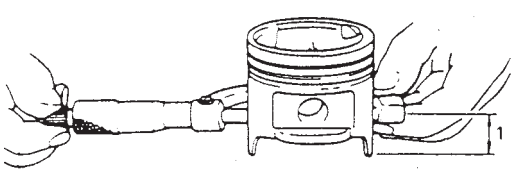
1. 50 mm (1.96 in.)
2. 95 mm (3.74 in.)



- Using a cylinder gauge, measure cylinder bore in thrust and axial directions at two positions as shown in figure.
  If any of following conditions is noted, rebore cylinder.
  1) Cylinder bore dia. exceeds limit.
  2) Difference of measurements at two positions exceeds taper limit.
  3) Difference between thrust and axial measurements exceeds out-of-round limit.

  Cylinder bore dia. limit: 74.15 mm (2.9196 in.)
  Taper and out-of-round limit: 0.10 mm (0.0039 in.)

  NOTE:
  If any one of four cylinders has to be rebored, rebore all four to the same next oversize. This is necessary for the sake of uniformity and balance.

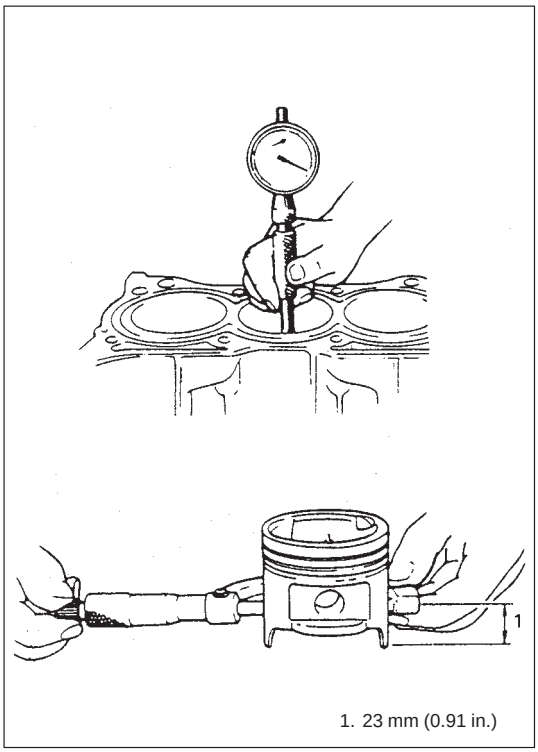


1. 23 mm (0.91 in.)

Pistons

- Inspect piston for faults, cracks or other damaged.
  Damaged or faulty piston should be replaced.
- Piston diameter:
  As indicated in figure, piston diameter should be measured at a position 23 mm (0.91 in.) from piston skirt end in the direction perpendicular to piston pin.

Piston diameter	Standard	73.970 – 73.990 mm (2.9122 – 2.9130 in.)
	Oversize: 0.25 mm (0.0098 in.)	74.220 – 74.230 mm (2.9220 – 2.9224 in.)
	0.50 mm (0.0196 in.)	74.470 – 74.480 mm (2.9318 – 2.9322 in.)

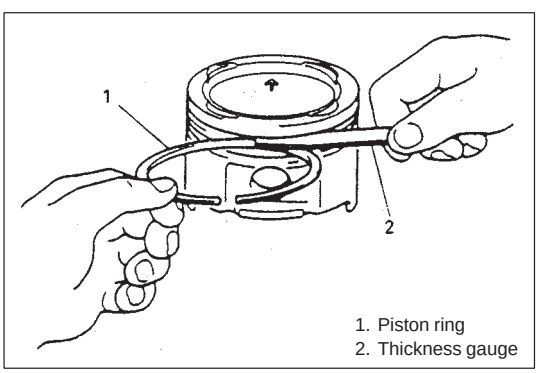


1. 23 mm (0.91 in.)

- 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, re-bore cylinder and use oversize piston.

  Piston clearance: 0.02 – 0.04 mm (0.0008 – 0.0015 in.)

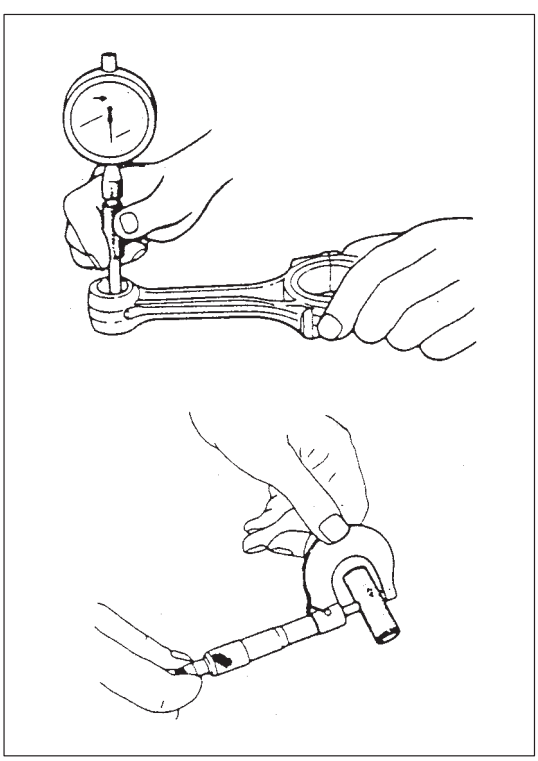
  NOTE:
  Cylinder bore diameters used here are measured in thrust direction at two positions.



1. Piston ring
2. Thickness gauge

- Ring groove clearance:
  Before checking, piston grooves must be clean, dry and free of carbon.
  Fit new piston ring into piston groove, and measure clearance between ring and ring land by using thickness gauge.
  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.)



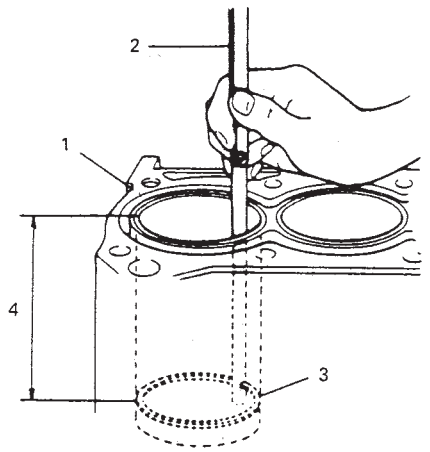
Piston Pin

- Check piston pin, connecting rod small end bore and piston bore for wear or damage, paying particular attention to condition of small end bore bush. If pin, connecting rod small end bore or piston bore is badly worn or damaged, replace pin, connecting rod or piston.
- Piston pin clearance:
  Check piston pin clearance in small end. Replace connecting rod if its small end is badly worn or damaged or if measured clearance exceeds limit.

Item	Standard	Limit
Piston clearance in small end	0.003 – 0.014 mm (0.0001 – 0.0006 in.)	0.05 mm (0.0020 in.)

Small-end bore:
19.003 – 19.011 mm (0.7482 – 0.7486 in.)

Piston pin dia.:
18.997 – 19.000 mm (0.7479 – 0.7480 in.)



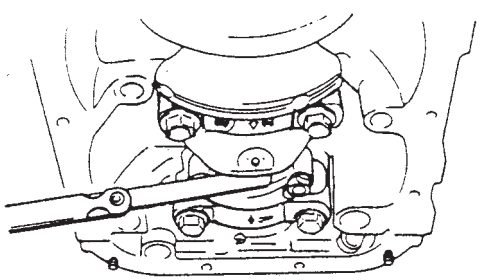
1. Cylinder block
2. Feeler gauge
3. Piston ring
4. 120 mm (4.72 in.)

Piston Rings

To measure end gap, insert piston ring into cylinder bore and then measure the gap by using thickness gauge.
If measured gap is out of specification, replace ring.

NOTE:
Decarbon and clean top of cylinder bore before inserting piston ring.

Item		Standard	Limit
Piston ring end gap	Top ring	0.15 – 0.30 mm (0.0059 – 0.0118 in.)	0.7 mm (0.0275 in.)
	2nd ring	0.20 – 0.35 mm (0.0079 – 0.0137 in.)	0.7 mm (0.0275 in.)
	Oil ring	0.20 – 0.60 mm (0.0079 – 0.0230 in.)	1.7 mm (0.0669 in.)



Connecting Rod

- Big-end side clearance:
  Check big-end of connecting rod for side clearance, with rod fitted and connected to its crank pin in the normal manner. If measured clearance is found to exceed its limit, replace connecting rod.

Item	Standard	Limit
Big-end side clearance	0.10 – 0.25 mm (0.0039 – 0.0098 in.)	0.35 mm (0.0137 in.)

- Connecting rod alignment:
  Mount connecting rod on aligner to check it for bow and twist and, if limit is exceeded, replace it.

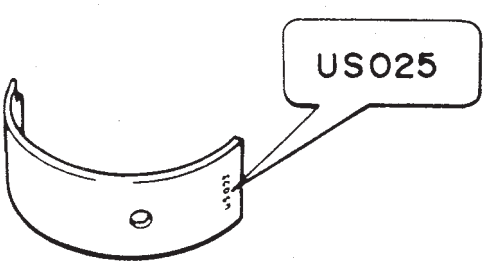
  Limit on bow: 0.05 mm (0.0020 in.)
  Limit on twist: 0.10 mm (0.0039 in.)

Crank Pin and Connecting Rod Bearings

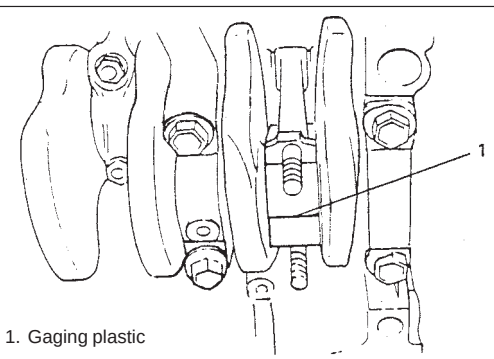
- Inspect crank pin for uneven wear or damage. Measure crank pin for out-of-round or taper with a micrometer. If crank pin is damaged, or out-of-round or taper is out of limit, replace crankshaft or regrind crank pin referring to following step 6).

Connecting rod bearing size	Crank pin diameter
Standard	41.982 – 42.000 mm (1.6528 – 1.6535 in.)
0.25 mm (0.0098 in.) undersize	41.732 – 41.750 mm (1.6430 – 1.6437 in.)

Out-of-round and taper limit: 0.01 mm (0.0004 in.)

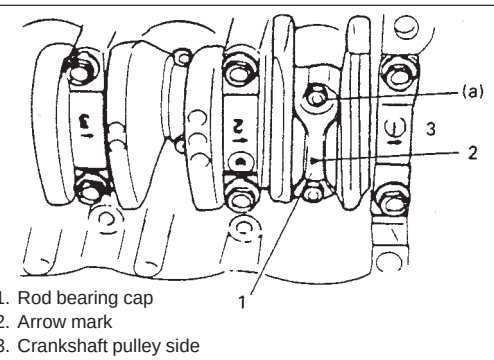


- Rod bearing:
  Inspect bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Bearing shells found in defective condition must be replaced.
  Two kinds of rod bearing are available; standard size bearing and 0.25 mm undersize bearing. To distinguish them, 0. 25 mm undersize bearing has the stamped number (US025) on its backside as indicated in figure, but standard size one has no number.



1. Gaging plastic

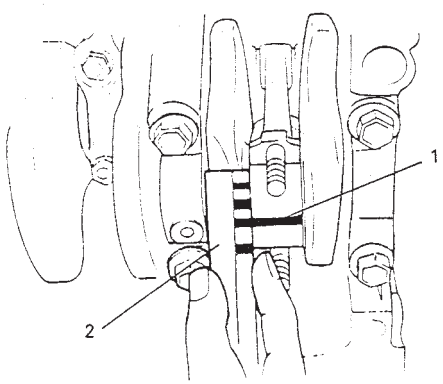
- Rod bearing clearance:
  1) Before checking bearing clearance, clean bearing and crank pin.
  2) Install bearing in connecting rod and bearing cap.
  3) Place a piece of gaging plastic to full width of crankpin as contacted by bearing (parallel to crankshaft), avoiding oil hole.



1. Rod bearing cap
2. Arrow mark
3. Crankshaft pulley side

  4) Install rod bearing cap to connecting rod.
     When installing cap, be sure to point arrow mark on cap to crankshaft pulley side, as shown in figure. After applying engine oil to rod bolts, tighten cap nuts to specified torque. DO NOT turn crankshaft with gaging plastic installed.

     Tightening Torque
     (a): 35 N·m (3.5 kg-m, 25.5 lb-ft)



1. Gaging plastic
2. Scale

5) Remove cap and using a scale on gaging plastic envelope, measure gaging plastic width at the widest point (clearance). If clearance exceeds its limit, use a new standard size bearing and remeasure clearance.

Item	Standard	Limit
Bearing clearance	0.020 – 0.050 mm (0.0008 – 0.0019 in.)	0.080 mm (0.0031 in.)

6) If clearance can not be brought to within its limit even by using a new standard size bearing, replace crankshaft or regrind crankpin to undersize as follows.
   – Install 0.25 mm undersize bearing to connecting rod big end.
   – Measure bore diameter of connecting rod big end.
   – Regrind crankpin to following finished diameter.

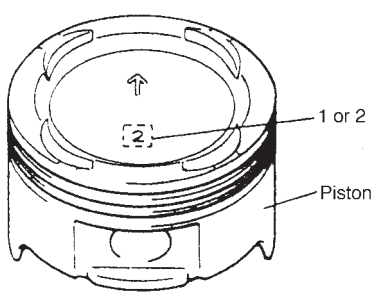
Finished crankpin dia.	=	Measured big end bore dia. (including undersize bearing)	–	0.035 mm (0.0014 in.)

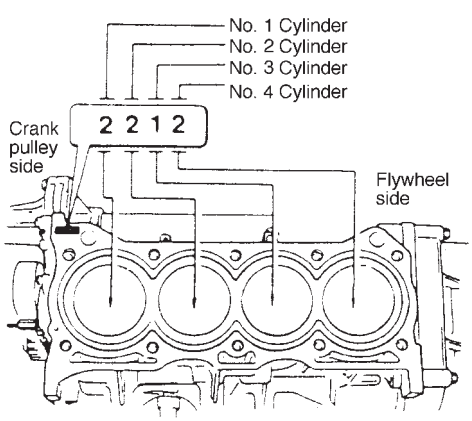
   – Confirm that bearing clearance is within above standard value.

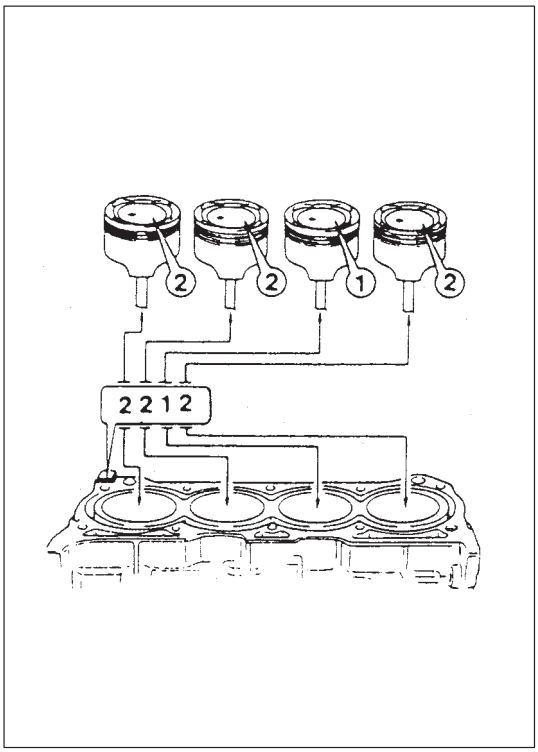
ASSEMBLY

NOTE:
Two 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 as shown. It represents outer diameter of piston.
b) There are also stamped numbers of 1 and 2 on the cylinder block as shown. The first number represents inner diameter of No.1 cylinder, the second number of No.2 cylinder, the third number of No.3 cylinder and the fourth number of No.4 cylinder.



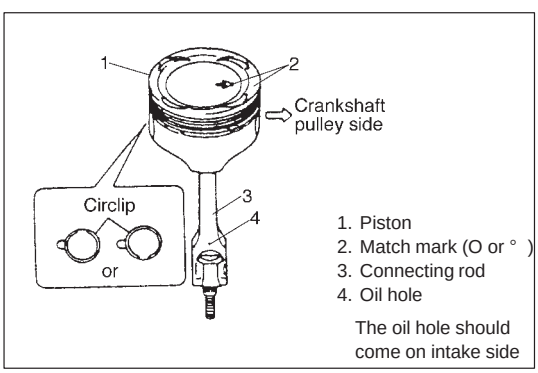




c) Stamped number on piston and that on cylinder block should correspond. That is, install number 2 stamped piston to cylinder which is identified with number 2 and a number 1 piston to cylinder with number 1.

Piston		Cylinder		Piston-to-cylinder clearance
Number at the top (mark)	Outer diameter	Number (mark)	Bore diameter	
1	73.98 – 73.99 mm (2.9126 – 2.9130 in.)	1	74.01 – 74.02 mm (2.9138 – 2.9141 in.)	0.02 – 0.04 mm (0.0008 – 0.0015 in.)
2	73.97 – 73.98 mm (2.9122 – 2.9126 in.)	2	74.00 – 74.01 mm (2.9134 – 2.9138 in.)	0.02 – 0.04 mm (0.0008 – 0.0015 in.)

Also, a letter A, B or C might be stamped on piston head but ordinarily it is not necessary to discriminate each piston by this letter.

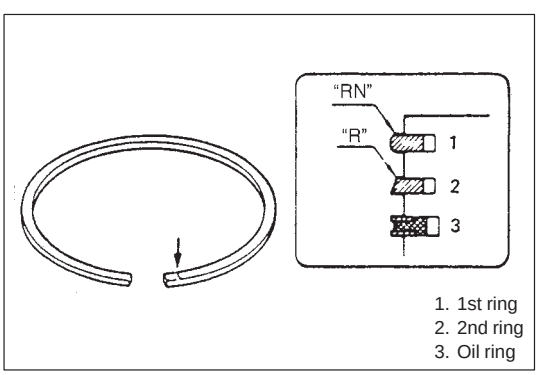


1. Piston
2. Match mark (O or °)
3. Connecting rod
4. Oil hole

The oil hole should come on intake side

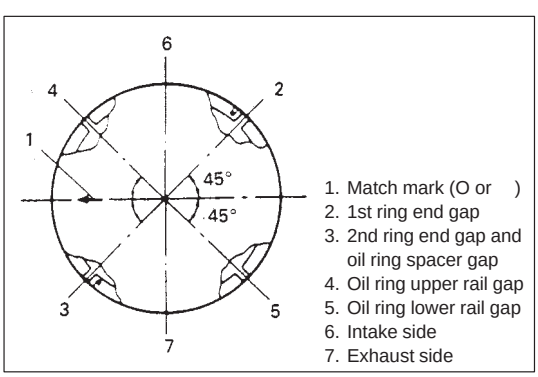
1) Install piston pin to piston and connecting rod:
After applying engine oil to piston pin and piston pin holes in piston and connecting rod, fit connecting rod to piston as shown in figure and insert piston pin to piston and connecting rod, and install piston pin circlips.

NOTE:
Circlip should be installed with its cut part facing either up or down as shown in figure.



1. 1st ring
2. 2nd ring
3. Oil ring

2) Install piston rings to piston:
- As indicated in figure at the left, 1st and 2nd rings have "RN", "T" or "R" mark respectively. When installing these piston rings to piston, direct marked side of each ring toward top of piston.
- 1st ring differs from 2nd ring in thickness, shape and color of surface contacting cylinder wall.
  Distinguish 1st ring from 2nd ring by referring to figure.
- When installing oil ring, install spacer first and then two rails.



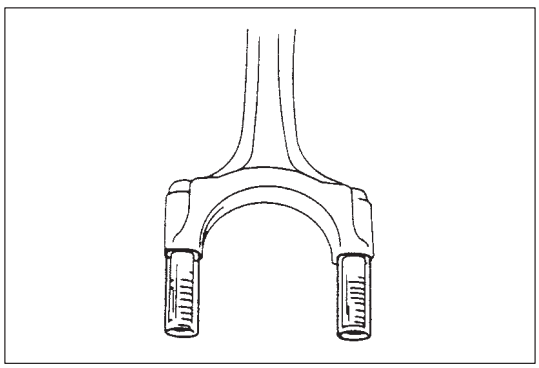
1. Match mark (O or)
2. 1st ring end gap
3. 2nd ring end gap and oil ring spacer gap
4. Oil ring upper rail gap
5. Oil ring lower rail gap
6. Intake side
7. Exhaust side

3) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in figure.

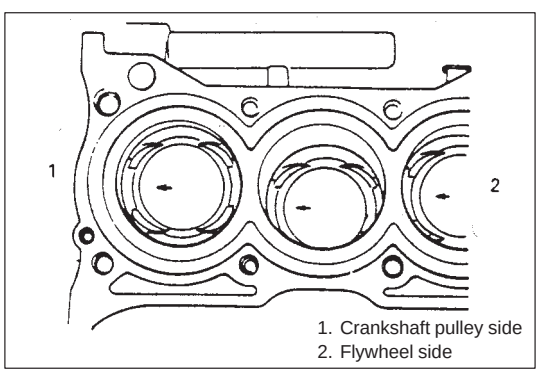
INSTALLATION OR CONNECTION

1) Apply engine oil to pistons, rings, cylinder walls, connecting rod bearings and crankpins.

NOTE:
Do not apply oil between connecting rod and bearing or between bearing cap and bearing.

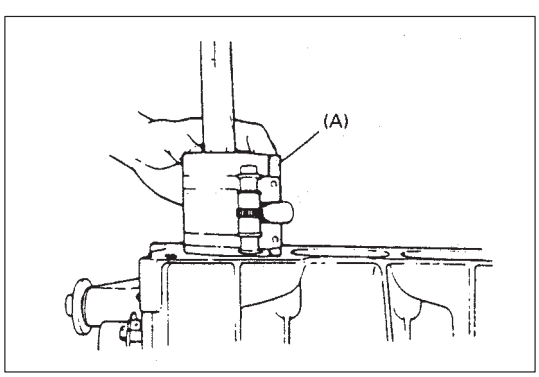


2) Install guide hoses over connecting rod bolts.
These guide hoses protect crankpin and threads of rod bolt from damage during installation of connecting rod and piston assembly.



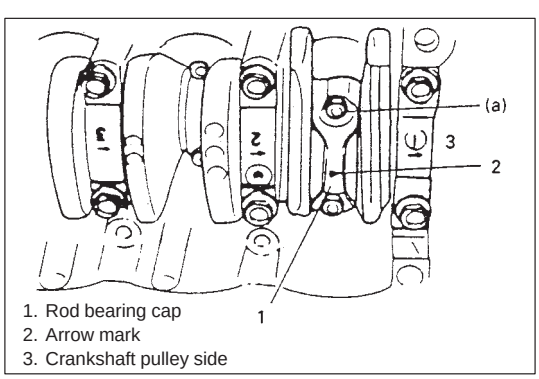
1. Crankshaft pulley side
2. Flywheel side

3) When installing piston and connecting rod assembly into cylinder bore, point match mark (O or) on piston head to crankshaft pulley side.



4) Install piston and connecting rod assembly into cylinder bore. Use special tool (Piston ring compressor) to compress rings. Guide connecting rod into place on crankshaft.
Using a hammer handle, tap piston head to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered cylinder bore.

Special Tool
(A): 09916-77310



1. Rod bearing cap
2. Arrow mark
3. Crankshaft pulley side

5) Install bearing cap:
Point arrow mark on cap to crankshaft pulley side.
Tighten cap nuts to specification.

Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)

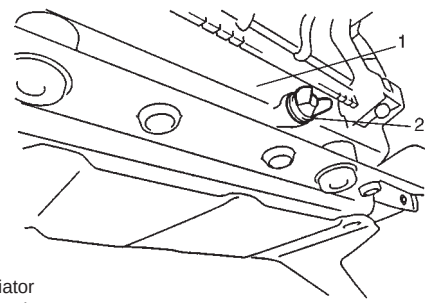
6) Reverse removal procedure for installation, as previously outlined.
7) Adjust generator drive belt tension, referring to Section 6H.
8) Adjust A/C compressor belt tension, if equipped. Refer to Section 1B.
9) Adjust intake and exhaust valve lashes as previously outlined.
10) Adjust accelerator cable play. Refer to Section 6E.
11) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
12) Refill engine with engine oil, referring to item ENGINE OIL CHANGE in Section 0B.
13) Refill cooling system and bleed air from system referring to Section 6B.
14) Connect negative cable at battery.
15) Verify that there is no fuel leakage, coolant leakage, oil leakage and exhaust gas leakage at each connection.
16) Verify that ignition timing is within specification referring to Section 6F.

UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

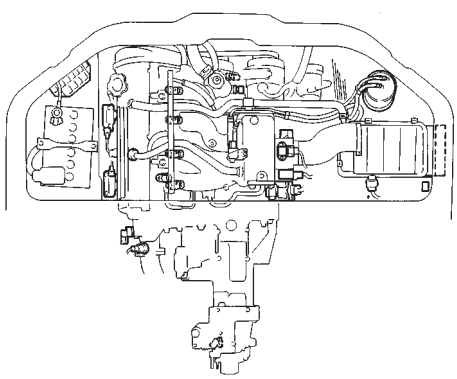
REMOVAL

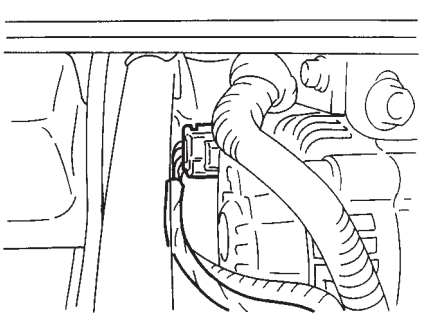
1) Release fuel pressure in fuel feed line by referring to Fuel Pressure Relief Procedure in section 6.
2) Remove front seats, then remove engine room center member with shift control and parking brake lever.
3) Remove battery and its tray.
4) Drain transmission oil.

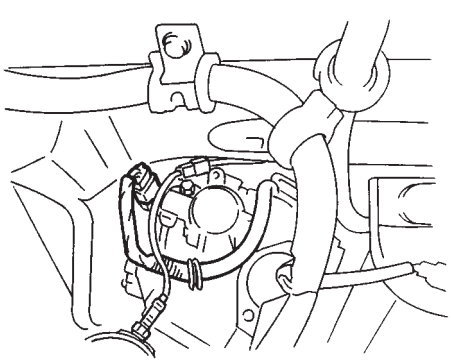


1. Radiator
2. Drain plug

5) Drain cooling system.

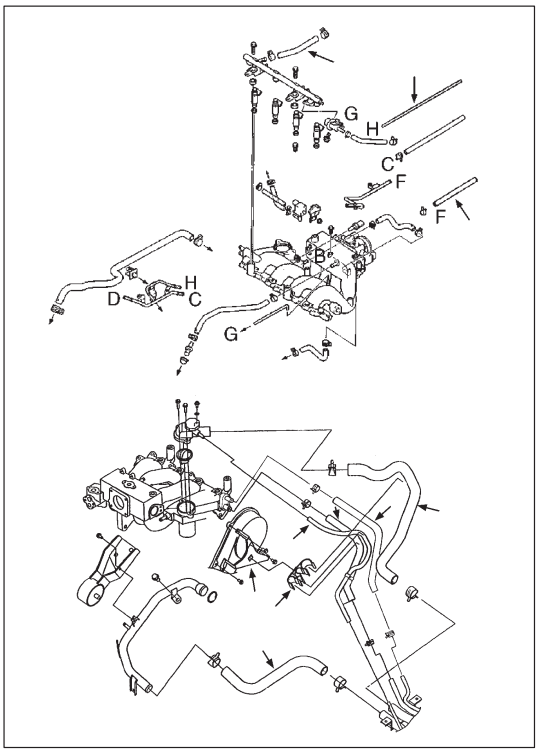






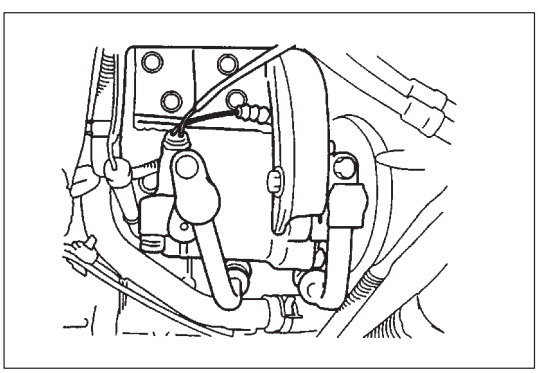
6) Remove air intake hose.
7) Disconnect following electric wires:
   - Ground wires from intake manifold, exhaust manifold and transmission
   - Camshaft position sensor
   - EGR valve (if equipped)
   - EVAP canister purge valve
   - Engine coolant temp. sensor
   - Throttle position sensor
   - Idle air control valve
   - Fuel injector wire at the connector
   - Generator
   - Ground cable from cylinder block
   - Heated oxygen sensor
   - Engine oil pressure switch
   - Ignition coil
   - MAP sensor
   - CKP sensor
   - Starter motor
   - Vehicle speed sensor
   - Back up light switch

   and then release wire harnesses from clamps.



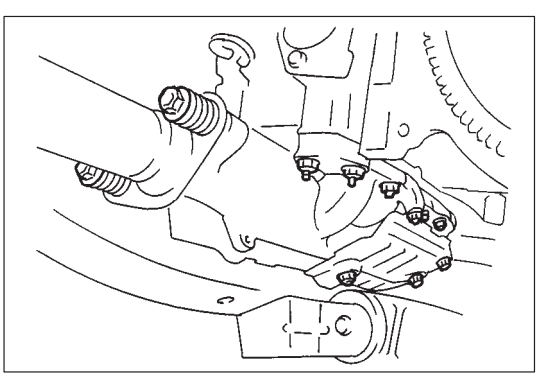
8) Remove under cover and its stay.
9) Disconnect following hoses:
   - Canister purge hose from EVAP canister purge valve
   - Radiator outlet hose from water floor pipe
   - Brake booster hose from intake manifold
   - Heater inlet and outlet hose from water floor pipe
   - Fuel feed hose and return hose from each pipe
   - Radiator inlet hose, brake booster hose and reservoir hose from water floor pipe

   NOTE:
   ALPHABET in the figure shows where each hose is connected.
10) Disconnect accelerator cable from throttle body and each clamp.

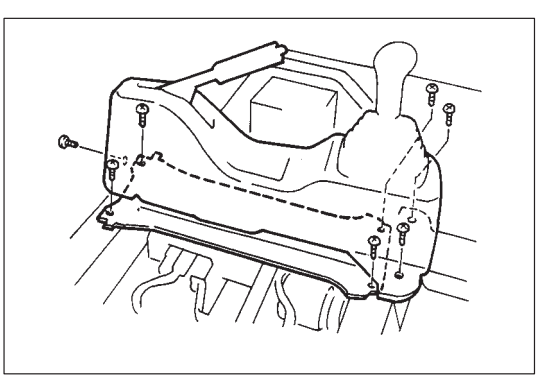


11) Remove generator.
12) With hose connected, detach A/C compressor and bracket from cylinder block if equipped.

    NOTE:
    Suspend removed compressor at a place where no damage will be caused during removal and installation of engine assembly.

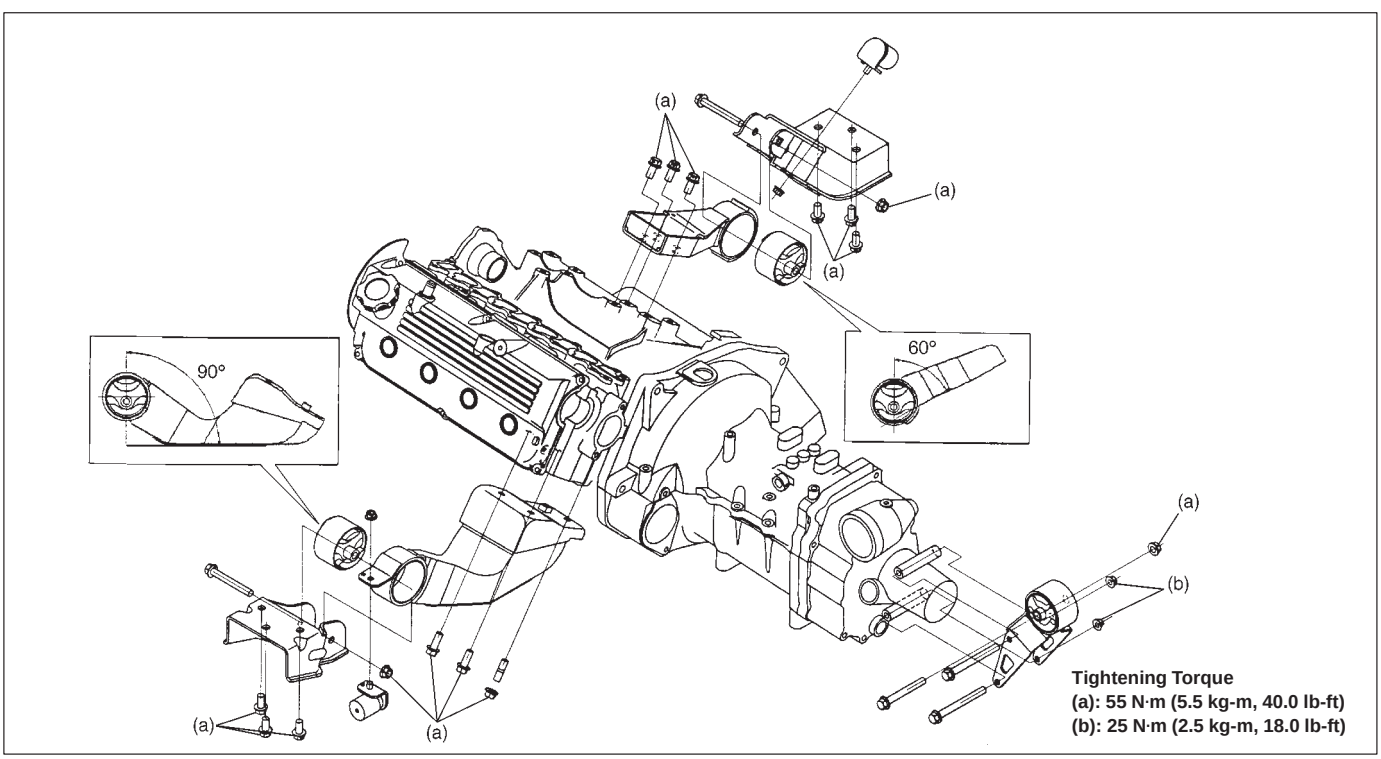


13) Hoist vehicle.
14) Drain engine oil if necessary.
15) Remove exhaust pipe bolts.



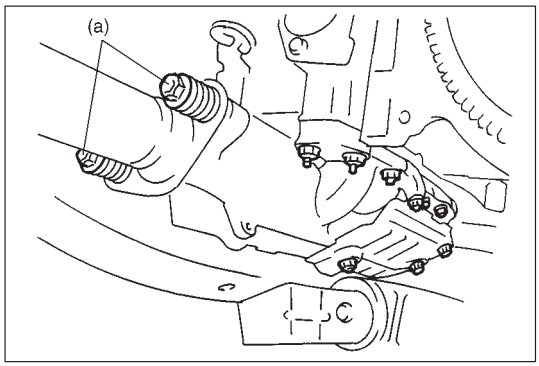
16) Disconnect clutch cable from clutch release arm and transmission case (engine and transmission stiffener).
    Remove propeller shaft.
17) Disconnect shift and select cable from transmission case.

18) Place transmission jack under engine with transmission. When applying the jack to the engine, make sure that its flat face will support the entire oil pan evenly. Engine with transmission should be held horizontally even when rear mounting bracket bolts are removed.
19) Remove engine mounting bracket bolts.
20) Before lowering engine with transmission, recheck to make sure all hoses, electric wires and cables are disconnected from engine and transmission.
21) Remove engine with transmission from body.
22) Remove transmission stiffener and separate engine from transmission.
23) Remove engine brackets and replace mount bushing, if necessary.



INSTALLATION

1) Combine engine with transmission.
2) Tighten engine mounting bracket bolts (R & L) and rear mounting nut as shown in the figure above.

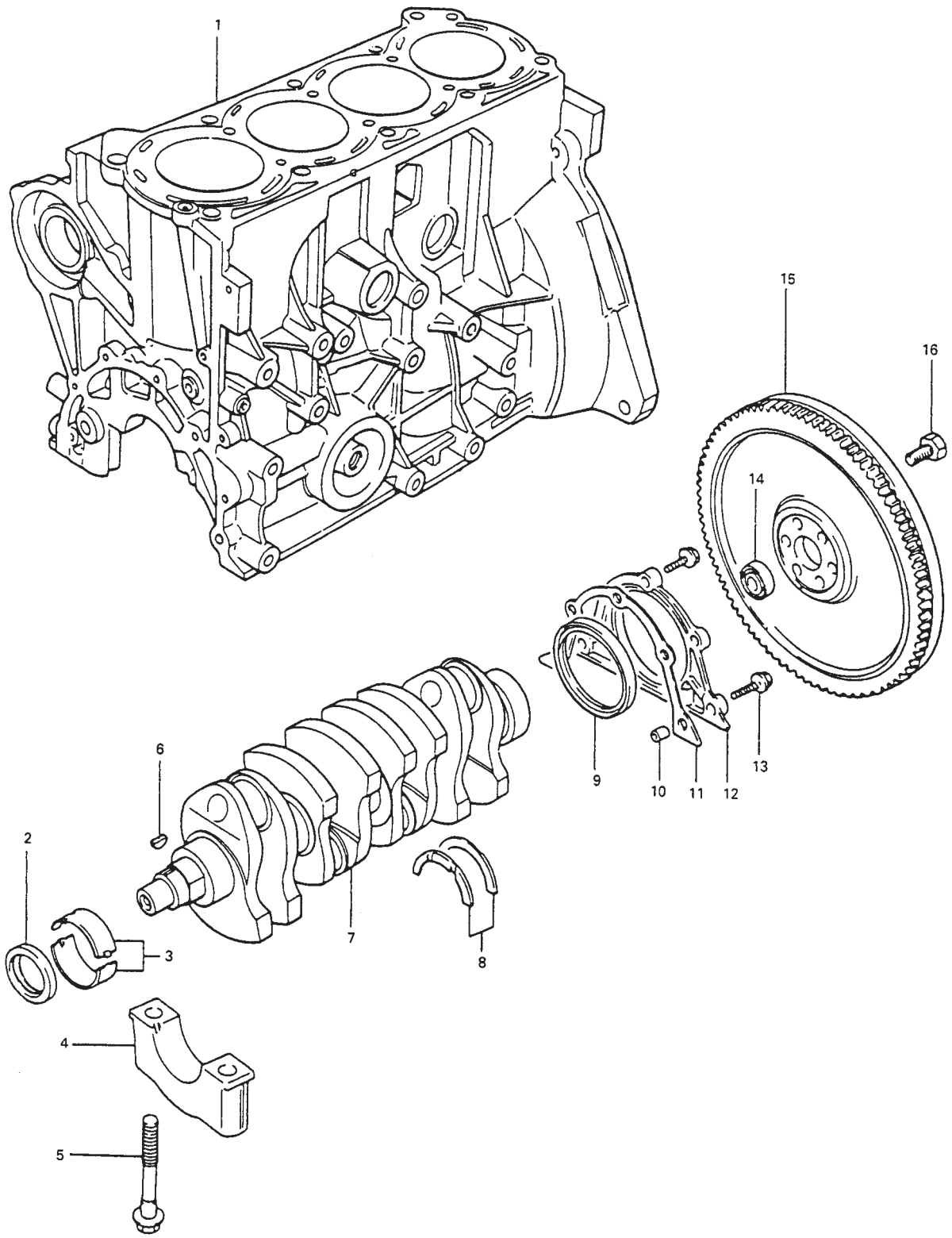


3) Reverse removal procedure for installation.
   - Install generator bracket, A/C compressor and generator referring to Section 1B and 6H.
   - Tighten bolts of exhaust pipes to specified torque.

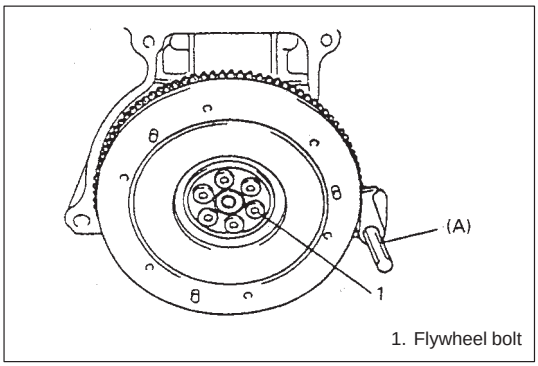
   Tightening Torque
   (a): 50 N·m (5.0 kg-m, 36.5 lb-ft)

4) Adjust generator drive belt tension, referring to BELT TENSION INSPECTION in Section 6H.
5) Adjust A/C compressor belt tension, if equipped. Refer to Section 1B.
6) Connect gear shift cables to gear shift control lever, refer to GEAR SHIFT CONTROL INSTALLATION in Section 7A.
7) Connect parking brake cable to parking brake lever. Perform parking brake adjustment, refer to PARKING BRAKE INSPECTION AND ADJUSTMENT in Section 5.
8) Install front seat, refer to FRONT SEAT INSTALLATION in Section 9.
9) Adjust clutch pedal free travel, referring to Section 7C.
10) Adjust accelerator cable play. Refer to Section 6E.
11) Check to ensure that all removed parts are back in place. Reinstall any necessary parts which have not been reinstalled.
12) Refill engine with engine oil, referring to item ENGINE OIL CHANGE in Section 0B.
13) Refill cooling system and bleed air from system referring to Section 6B.
14) Verify that there is no fuel leakage, coolant leakage and exhaust gas leakage at each connection.

MAIN BEARINGS, CRANKSHAFT AND CYLINDER BLOCK



1. Cylinder block
2. Front oil seal
3. Main bearing
4. Bearing cap
5. Cap bolt
6. Timing pulley key
7. Crankshaft
8. Thrust bearing
9. Rear oil seal
10. Pin
11. Oil seal housing gasket
12. Oil seal housing
13. Housing bolt
14. Input shaft bearing
15. Flywheel
16. Flywheel bolt

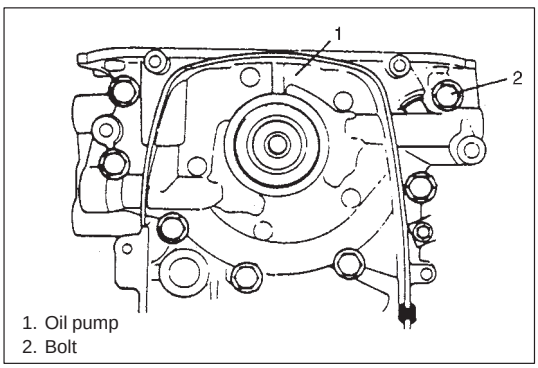


1. Flywheel bolt

REMOVAL

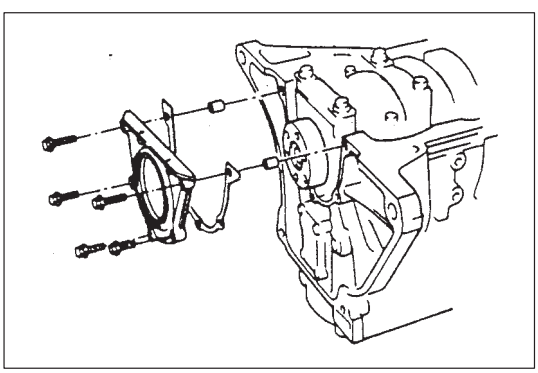
1) Remove engine assembly from body as previously outlined.
2) Separate transmission from engine, then remove clutch cover, clutch disc and flywheel.

Special Tool
(A): 09924-17810

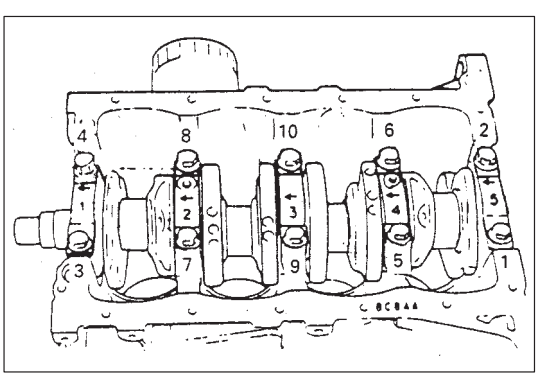


1. Oil pump
2. Bolt

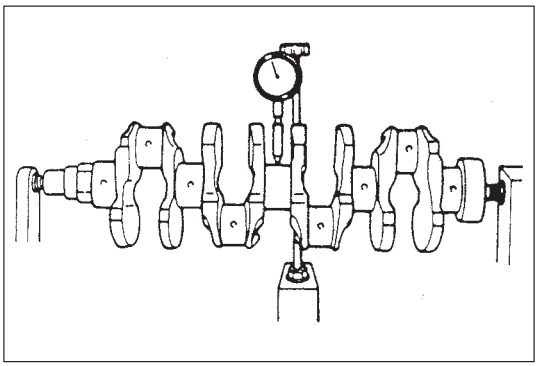
3) Remove crankshaft pulley, timing belt and crankshaft timing pulley.
4) Remove cylinder head assembly.
5) Remove upper oil pan with lower oil pan and oil pump strainer.
6) Remove oil pump.



7) Remove oil seal housing.
8) Remove connecting rod bearing caps.



9) Loosen crankshaft bearing cap bolts in such order as indicated in figure a little at a time and remove bearing caps.
10) Remove crankshaft from cylinder block.



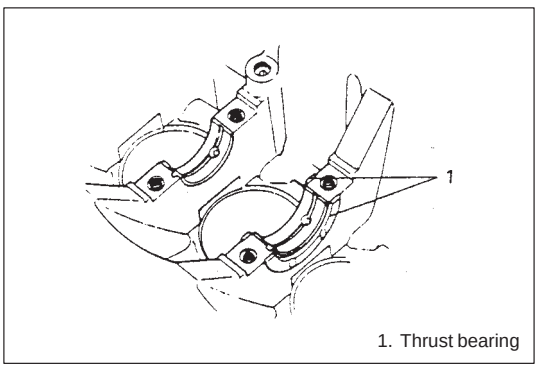
INSPECTION

Crankshaft

Crankshaft runout

Using a dial gauge, measure runout at center journal. Rotate crankshaft slowly. If runout exceeds its limit, replace crankshaft.

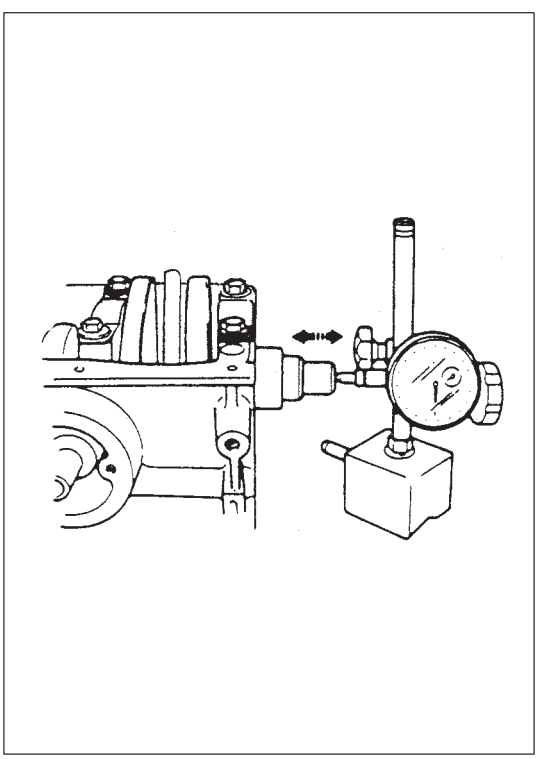
Limit on runout: 0.06 mm (0.0023 in.)



1. Thrust bearing

Crankshaft thrust play

Measure this play with crankshaft set in cylinder block in the normal manner, that is, with thrust bearing and journal bearing caps installed.

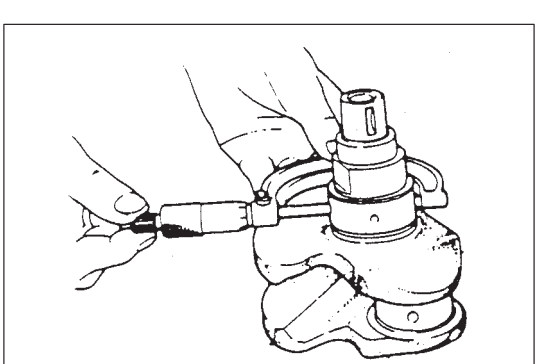


Use a dial gauge to read displacement in axial (thrust) direction of crankshaft.

If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.

Item	Standard	Limit
Crankshaft thrust play	0.11 – 0.31 mm (0.0044 – 0.0122 in.)	0.38 mm (0.0149 in.)

Thickness of crankshaft thrust bearing	Standard		2.500 mm (0.0984 in.)
	Oversize:	0.125 mm (0.0049 in.)	2.563 mm (0.1009 in.)

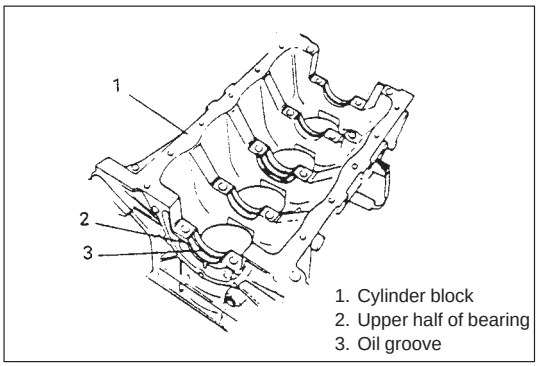


Out-of-round and taper (uneven wear) of journals

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.

Limit on out-of-round and taper: 0.01 mm (0.0004 in.)

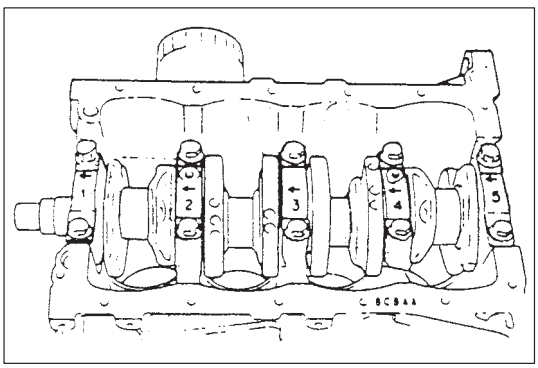


1. Cylinder block
2. Upper half of bearing
3. Oil groove

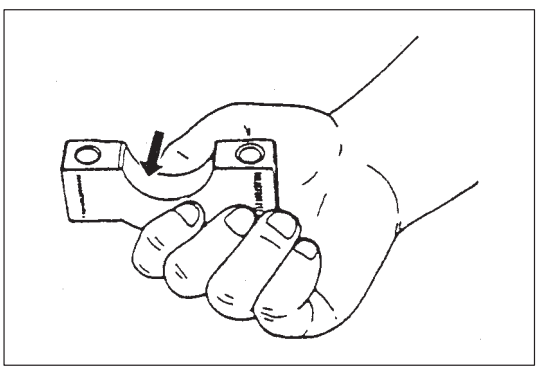
Main Bearings

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 has oil groove as shown in figure. Install this half with oil groove to cylinder block.

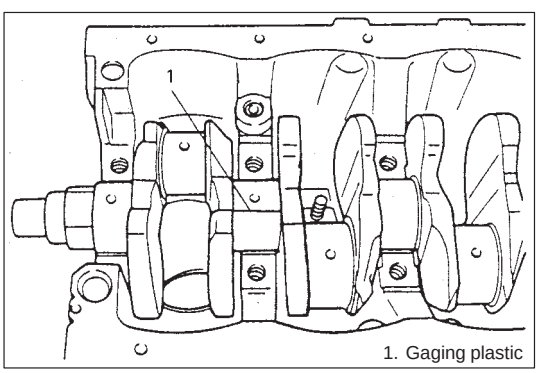


- On each main bearing cap, arrow mark and number are embossed as shown in figure.
  When installing each bearing cap to cylinder block, point arrow mark toward crankshaft pulley side and install each cap from that side to flywheel side in ascending order of numbers “1”, “2”, “3”, “4” and “5”. Tighten cap bolts to specified torque.



Inspection

Check bearings for pitting, scratches, wear or damage.
If any malcondition is found, replace both upper and lower halves.
Never replace one half without replacing the other half.

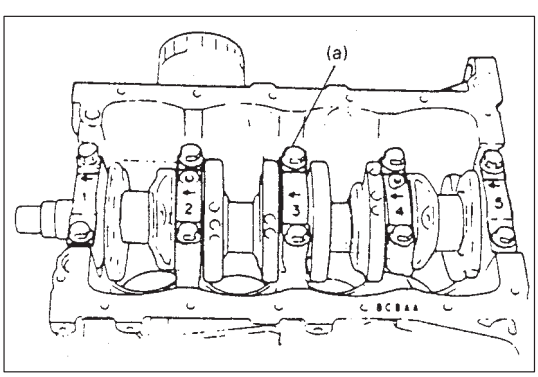


1. Gaging plastic

Main bearing clearance

Check clearance by using gaging plastic according to following procedure.

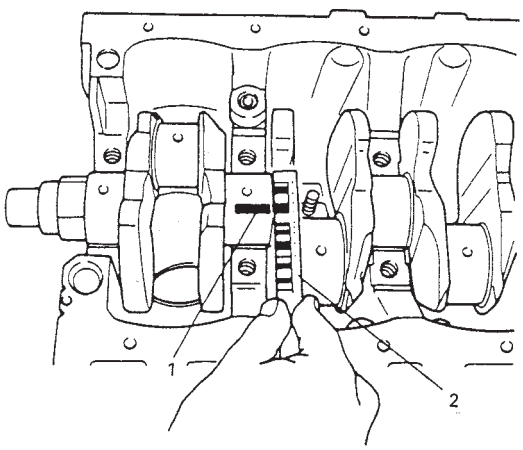
1) Remove bearing caps.
2) Clean bearings and main journals.
3) Place a piece of gaging plastic to full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.



4) Install bearing cap as previously outlined and evenly torque cap bolts to specified torque.
   Bearing cap MUST be torqued to specification in order to assure proper reading of clearance.

   Tightening Torque
   (a): 52 N·m (5.2 kg-m, 38.0 lb-ft)

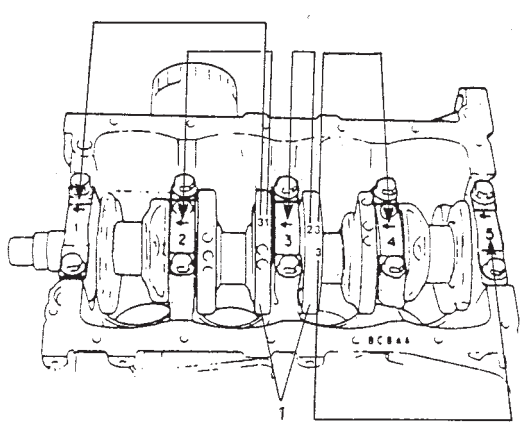
   NOTE:
   Do not rotate crankshaft while gaging plastic is installed.



1. Gaging plastic
2. Scale

5) Remove cap and using scale on gaging plastic envelope, measure gaging plastic width at its widest point. If clearance exceeds its limit, replace bearing. Always replace both upper and lower inserts as a unit.
A new standard bearing may produce proper clearance. If not, it will be necessary to regrind crankshaft journal for use of 0.25 mm undersize bearing.
After selecting new bearing, recheck clearance.

	Standard	Limit
Bearing clearance	0.014 – 0.034 mm (0.0006 – 0.0013 in.)	0.060 mm (0.0023 in.)



1. Crank webs of No.2 and No.3 cylinders

Selection of main bearings

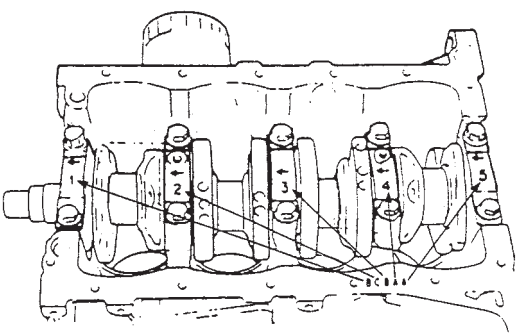
STANDARD BEARING:

If bearing is in malcondition, or bearing clearance is out of specification, select a new standard bearing according to following procedure and install it.

1) First check journal diameter by using following procedure.
As shown in figure, crank webs of No.2 and No.3 cylinders have five stamped numerals.
Three kinds of numerals (“1”, “2” and “3”) represent following journal diameters.

Numeral stamped	Journal diameter
1	44.994 – 45.000 mm (1.7714 – 1.7716 in.)
2	44.988 – 44.994 mm (1.7712 – 1.7714 in.)
3	44.982 – 44.988 mm (1.7709 – 1.7712 in.)

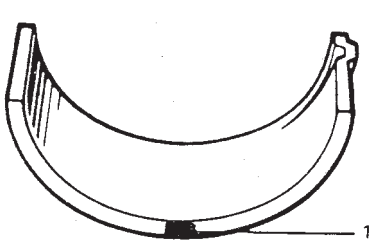
The first, second, third, fourth and fifth (left to right) stamped numerals represent journal diameters at bearing caps “1”, “2”, “3”, “4” and “5” respectively.
For example, in figure, the first (leftmost) numeral “3” indicates that journal dia. at bearing cap “1” is within 44.982 – 44.988 mm, and second one “1” indicate that journal dia. at cap “2” is within 44.994 – 45.000 mm.



2) Next, check bearing cap bore diameter without bearing. On mating surface of cylinder block, four alphabets are stamped as shown in figure.
Three kinds of alphabets (“A”, “B” and “C”) represent following cap bore diameters.

Alphabet stamped	Bearing cap bore diameter (without bearing)
A	49.000 – 49.006 mm (1.9291 – 1.9294 in.)
B	49.006 – 49.012 mm (1.9294 – 1.9296 in.)
C	49.012 – 49.018 mm (1.9296 – 1.9298 in.)

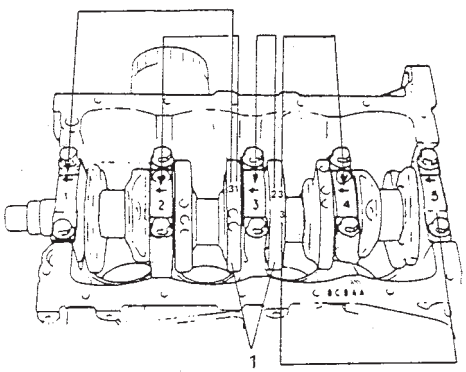
The first, second, third, fourth and fifth (left to right) stamped alphabets represent cap bore diameters of bearing caps “1”, “2”, “3”, “4” and “5”, respectively.
For example, in figure, the first (leftmost) alphabet “B” indicates that cap bore dia. of bearing cap “1” is within 49.006 – 49.012 mm, and the fifth (rightmost) alphabet “A” indicates that cap bore dia. of cap “5” is within 49.000 – 49.006 mm.



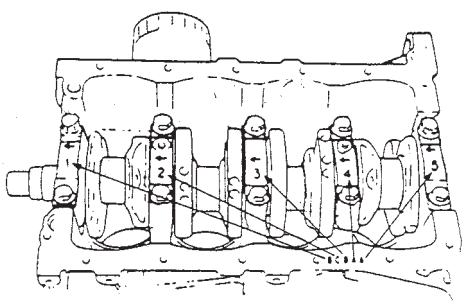
1. Paint

3) There are five kinds fo standard bearings differing in thickness. To distinguish them, they are painted in following colors at the position as indicated in figure.
Each color indicates following thickness at the center of bearing.

Color painted	Bearing thickness
Green	1.999 – 2.003 mm (0.0787 – 0.0789 in.)
Black	2.002 – 2.006 mm (0.0788 – 0.0790 in.)
Colorless (no paint)	2.005 – 2.009 mm (0.0789 – 0.0791 in.)
Yellow	2.008 – 2.012 mm (0.0791 – 0.0792 in.)
Blue	2.011 – 2.015 mm (0.0792 – 0.0793 in.)

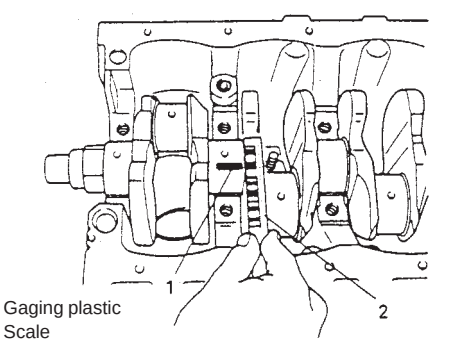


1. Crank webs of No.2 and No.3 cylinders



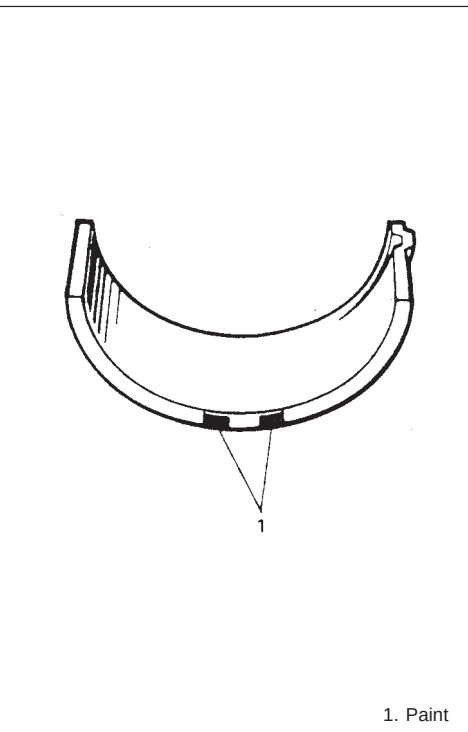
4) From numerals stamped on crank webs of No.2 and No.3 cylinders and the alphabets stamped on mating surface of cylinder block, determine new standard bearing to be installed to journal, by referring to table given below.
For example, if numeral stamped on crank web is "1" and alphabet stamped on mating surface is "B", install a new standard bearing painted in "Black" to its journal.

		Numeral stamped on crank web (Journal diameter)		
		1	2	3
Alphabet stamped on mating surface (Bearing cap bore dia.)	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue
		New standard bearing to be installed.		



1. Gaging plastic
2. Scale

5) Using gaging plastic, check bearing clearance with newly selected standard bearing.
If clearance still exceeds its limit, use next thicker bearing and recheck clearance.
6) When replacing crankshaft or cylinder block due to any reason, select new standard bearings to be installed by referring to numerals stamped on new crankshaft or alphabets stamped on mating surface of new cylinder block.



1. Paint

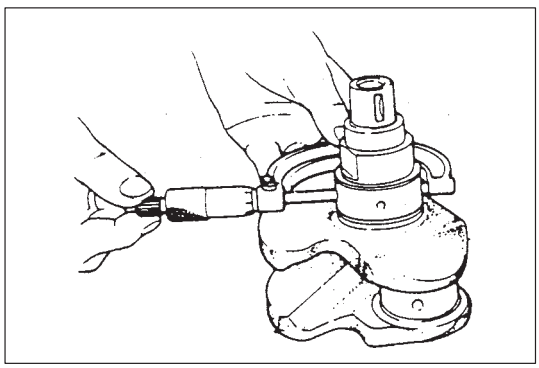
UNDERSIZE BEARING (0.25 mm):

- 0.25 mm undersize bearing is available, in five kinds varying in thickness.
To distinguish them, each bearing is painted in following colors at such position as indicated in figure.
Each color represents following thickness at the center of bearing.

Color painted	Bearing thickness
Green & Red	2.124 – 2.128 mm (0.0836 – 0.0838 in.)
Black & Red	2.127 – 2.131 mm (0.0837 – 0.0839 in.)
Red only	2.130 – 2.134 mm (0.0839 – 0.0840 in.)
Yellow & Red	2.133 – 2.137 mm (0.0840 – 0.0841 in.)
Blue & Red	2.136 – 2.140 mm (0.0841 – 0.0843 in.)

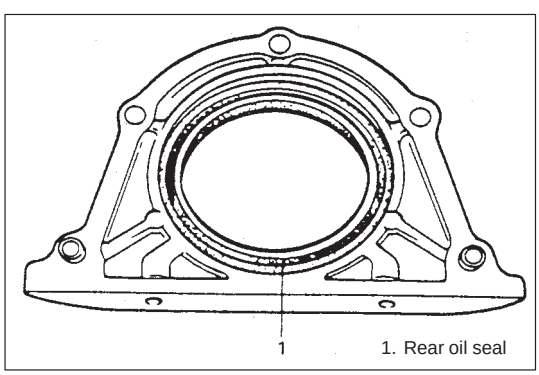
- If necessary, regrind crankshaft journal and select under-size bearing to use with it as follows.
  1) Regrind journal to following finished diameter.

     Finished diameter: 44.732 – 44.750 mm (1.7611 – 1.7618 in.)



  2) Using micrometer, measure reground journal diameter. Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.
  3) Using journal diameter measured above and alphabets stamped on mating surface of cylinder block, select an undersize bearing by referring to table given below.
     Check bearing clearance with newly selected undersize bearing.

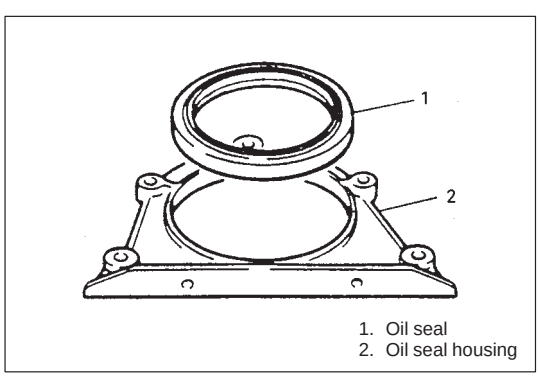
		Measured journal diameter		
		44.744 – 44.750 mm (2.0371 – 2.0373 in.)	44.738 – 44.744 mm (2.0369 – 2.0371 in.)	44.732 – 44.738 mm (2.0367 – 2.0369 in.)
Alphabet stamped on mating surface of cylinder block	A	Green & Red	Black & Red	Red only
	B	Black & Red	Red only	Yellow & Red
	C	Red only	Yellow & Red	Blue & Red
		Undersize bearing to be installed		



1. Rear oil seal

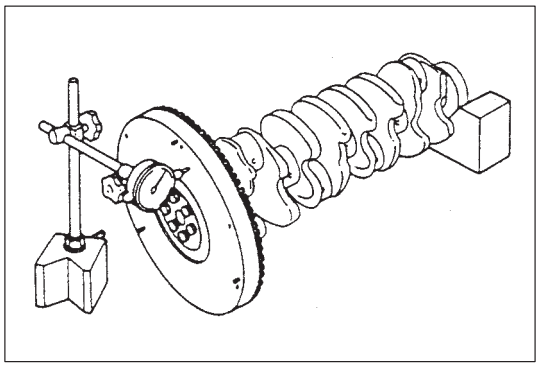
Rear Oil Seal

Carefully inspect oil seal for wear or damage. If its lip is worn or damaged, replace it.



1. Oil seal
2. Oil seal housing

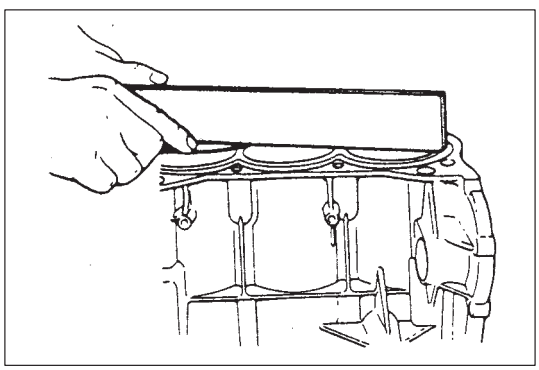
For oil seal installation, press-fit rear oil seal so that oil seal housing end face is flush with oil seal end face.



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 dial gauge.
  If runout exceeds its limit, replace flywheel.

  Limit on runout: 0.2 mm (0.0078 in.)



Cylinder Block

Distortion of gasketed surface

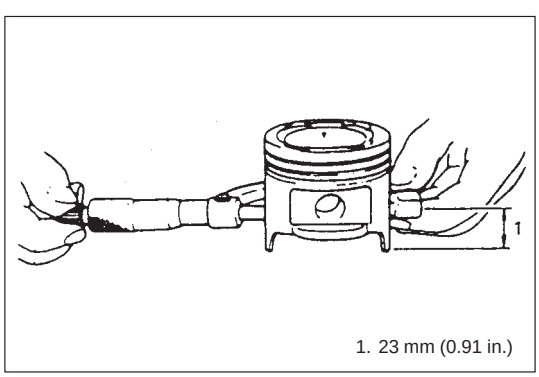
Using straightedge and thickness gauge, check gasketed surface for distortion and, if flatness exceeds its limit, correct it.

Item	Standard	Limit
Flatness	0.03 mm (0.0012 in.)	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.

Size	Piston diameter
O/S 0.25	74.220 – 74.230 mm (2.9220 – 2.9224 in.)
O/S 0.50	74.470 – 74.480 mm (2.9319 – 2.9323 in.)



1. 23 mm (0.91 in.)

3) Using micrometer, measure piston diameter.

4) Calculate cylinder bore diameter to be rebored.

   D = A + B – C

   D: 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.)

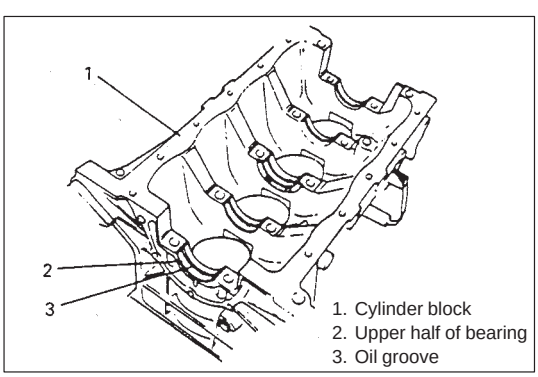
5) Rebore and hone cylinder to calculated dimension.

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.

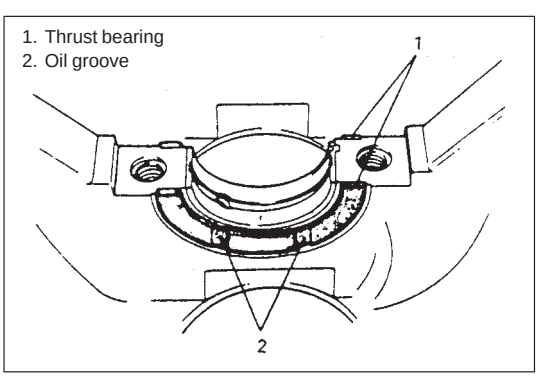
INSTALLATION

NOTE:
- **All parts to be installed must be perfectly clean.**
- **Be sure to oil crankshaft journals, journal bearings, thrust bearings, crankpins, connecting rod bearings, pistons, piston rings and cylinder bores.**
- **Journal bearings, bearing caps, connecting rods, rod bearings, rod bearing caps, pistons and piston rings are in combination sets. Do not disturb such combination and make sure that each part goes back to where it came from, when installing.**



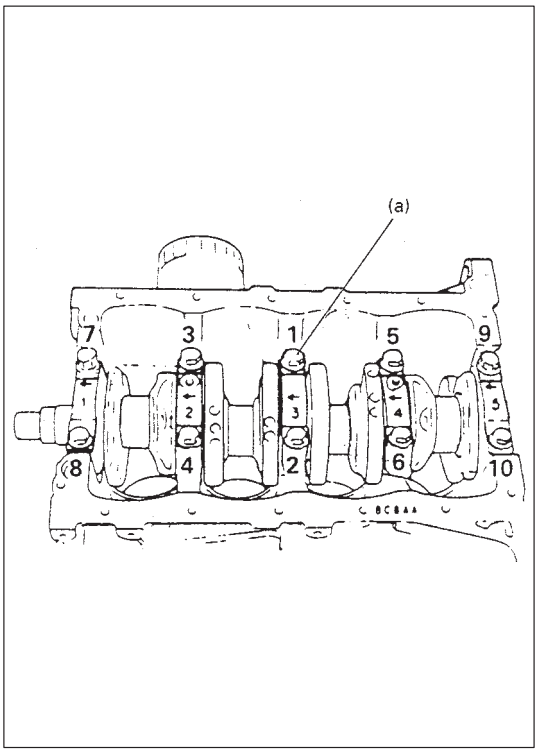
1. Cylinder block
2. Upper half of bearing
3. Oil groove

1) Install main bearings to cylinder block.
One of two halves of main bearing, has an oil groove. Install it to cylinder block, and the other half without oil groove to bearing cap.
Make sure that two halves are painted in the same color.



1. Thrust bearing
2. Oil groove

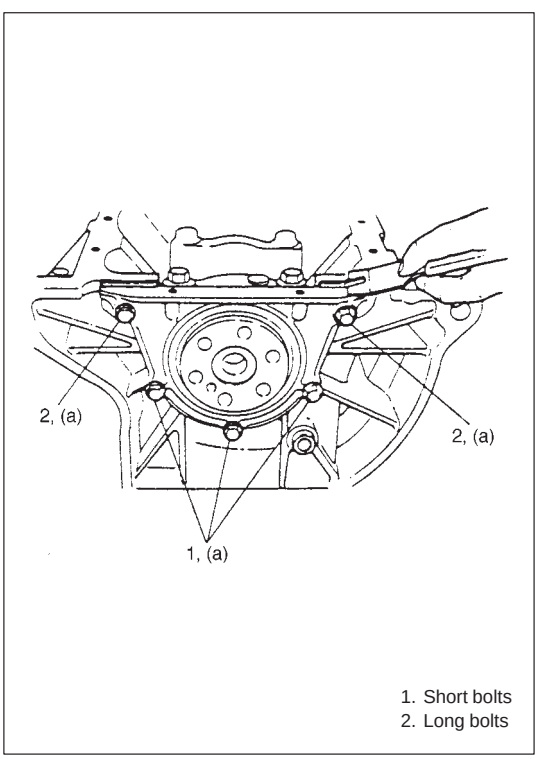
2) Install thrust bearings to cylinder block between No.2 and No.3 cylinders. Face oil groove sides to crank webs.



3) Install crankshaft to cylinder block.
4) Install bearing cap to cylinder block, making sure to point arrow mark (on each cap) to crankshaft pulley side. Fit them sequentially in ascending order, 1, 2, 3, 4 and 5, starting from pulley side.
   After installing bearing cap stiffeners, tighten bearing cap bolts in such order as shown in figure a little at a time and repeat it till they are tightened to specified torque.

   Tightening Torque
   (a): 54 N·m (5.4 kg-m, 39.0 lb-ft)

   NOTE:
   After tightening cap bolts, check to be sure that crankshaft rotates smoothly when turning it by 8.0 N·m (0.8 kg-m, 5.8 lb-ft) torque or below.



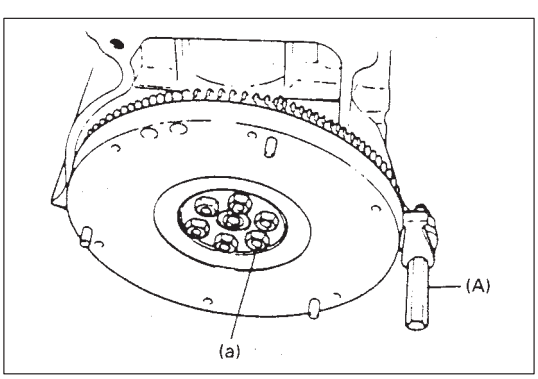
1. Short bolts
2. Long bolts

5) Install new gasket and oil seal housing.
   Do not reuse gasket removed in disassembly. Apply engine oil to oil seal lip before installation. Tighten housing bolts to specification.

   Tightening Torque
   (a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

   NOTE:
   As there are 2 types of housing bolts, refer to figure for their correct use.

   After installing oil seal housing, gasket edges might bulge out; if so, cut them off to make them flush with cylinder block and oil seal housing.
6) Install oil pump.
   Refer to item OIL PUMP for installation of oil pump.

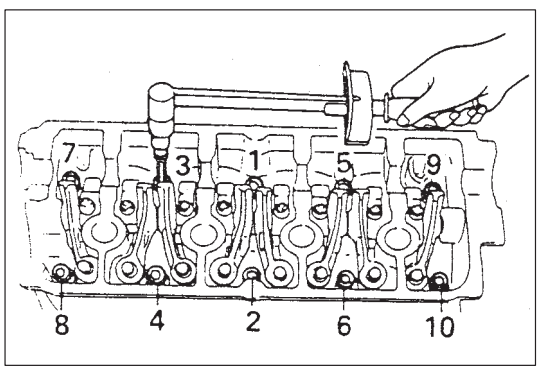


7) Install flywheel.
   Using special tool, lock flywheel or drive plate, and torque its bolts to specification.

   Special Tool
   (A): 09924-17810

   Tightening Torque
   (a): 78 N·m (7.8 kg-m, 56.5 lb-ft)

8) Install pistons and connecting rods as previously outlined.
9) Install oil pump strainer and oil pan as previously outlined.



10) Install cylinder head assembly to cylinder block as previously outlined.

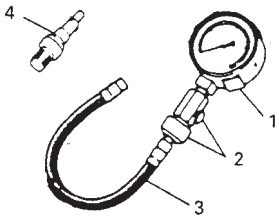
    NOTE:
    Tighten cylinder head bolts to specified torque as previously outlined and loosen them once till tightening torque becomes "zero". And then torque them to specification again.

11) Install camshaft, crankshaft timing belt pulley, timing belt, crankshaft pulley, water pump pulley, etc., as previously outlined.
12) Install clutch to flywheel. For clutch installation, refer to Section 7C.
13) Combine engine with transmission referring to Section 7A.
14) Install engine and transmission assembly to vehicle as previously outlined.

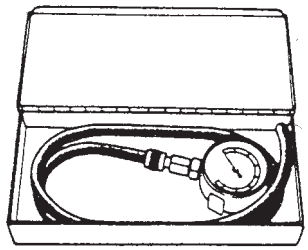
TIGHTENING TORQUE SPECIFICATIONS

FASTENING PARTS	TIGHTENING TORQUE		
	N·m	kg-m	lb-ft
Oil pressure switch	14	1.4	10.5
Valve adjusting screw lock nuts	12	1.2	9.0
Cylinder head cover bolts	11	1.1	8.0
Intake manifold nuts	23	2.3	17.0
Exhaust manifold nuts	23	2.3	17.0
Exhaust pipe bolts	50	5.0	36.5
Timing belt tensioner stud	11	1.1	8.0
Timing belt tensioner bolt	25	2.5	18.0
Timing belt cover bolts and nut	11	1.1	8.0
Crankshaft pulley bolt	16	1.6	11.5
Oil pump strainer bolt and stay bolt	11	1.1	8.0
Oil pan bolts and nuts			
Oil pan drain plug	35	3.5	25.5
Oil pump rotor plate screws	11	1.1	8.0
Oil pump case bolts			
Crankshaft timing belt pulley bolt	130	13.0	94.0
Camshaft housing bolts	11	1.1	8.0
Rocker arm shaft bolts			
Rocker arm shaft plug	33	3.3	24.0
Camshaft timing belt pulley bolt	60	6.0	43.5
CMP sensor bolts/CKP sensor bolts	11	1.1	8.0
Cylinder head venturi plug	5	0.5	4.0
Cylinder head bolts	68	6.8	49.5
Connecting rod bearing cap nuts	35	3.5	25.5
Bolt and nuts fastening T/M and cylinder block	50	5.0	36.5
Crankshaft main bearing cap bolts	54	5.4	39.0
Flywheel bolts	78	7.8	56.5
Engine mounting & bracket bolts and nuts	Refer to 6A-60.		
Oil level gauge guide bolt and nut	11	1.1	8.0

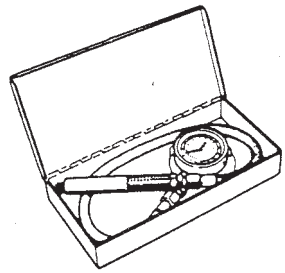
SPECIAL TOOLS



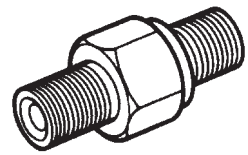
1. 09915-64510-001
   Compression gauge
2. 09915-64510-002
   Connector
3. 09915-64530
   Hose
4. 09915-67010
   Attachment



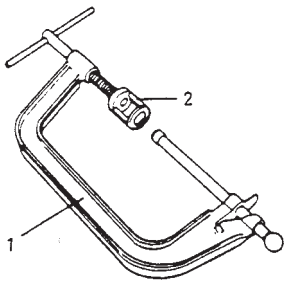
09915-67310
Vacuum gauge



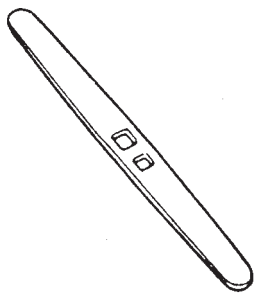
09915-77310
Oil pressure gauge



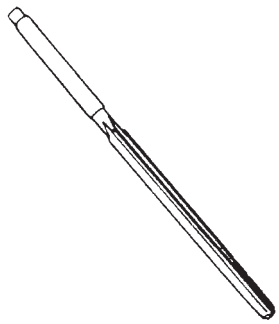
09915-78211
Oil pressure gauge attachment



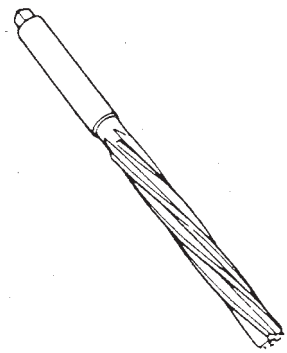
1. 09916-14510
   Valve lifter
2. 09916-14910
   Valve lifter attachment



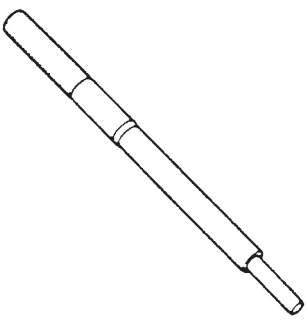
09916-34542
Reamer handle



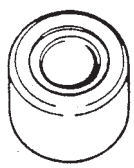
09916-34550
Reamer (5.5 mm)



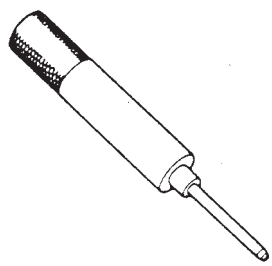
09916-38210
Reamer (11 mm)



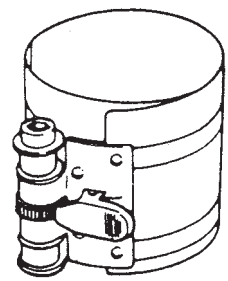
09916-44910
Valve guide remover



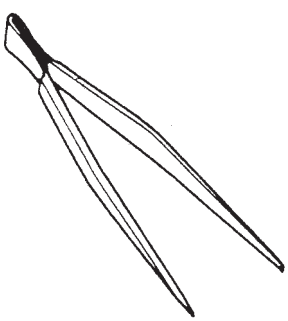
09916-56011
Valve guide installer attachment



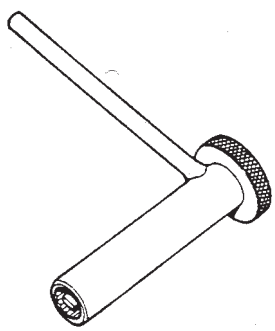
09916-58210
Valve guide installer handle



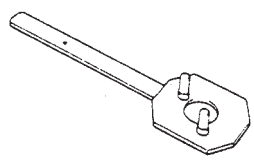
09916-77310
Piston ring compressor



09916-84511
Forceps

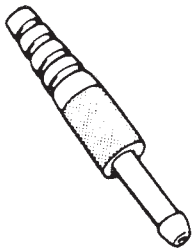
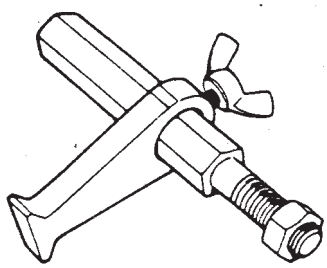
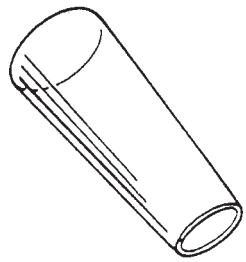


09917-18210
Tappet adjuster wrench



09917-68220
Camshaft pulley holder

09917-98221
Valve stem seal installer

		
09918-08210 Vacuum gauge hose joint	09924-17810 Flywheel holder	09926-18210 Oil seal guide (Vinyl resin)

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1207C (99000-31150)	● Mating surfaces of cylinder block and oil pan.
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	● Mating surfaces of camshaft housings (No.6). ● Mating surfaces of camshaft position sensor case and cylinder head.

SECTION 6B

ENGINE COOLING

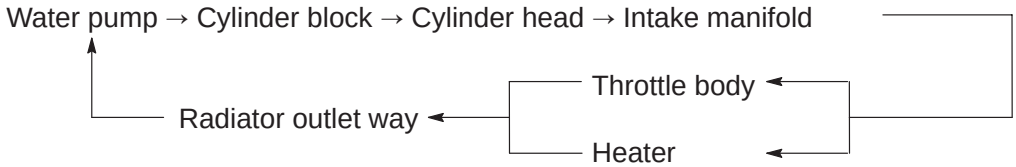
CONTENTS

GENERAL DESCRIPTION

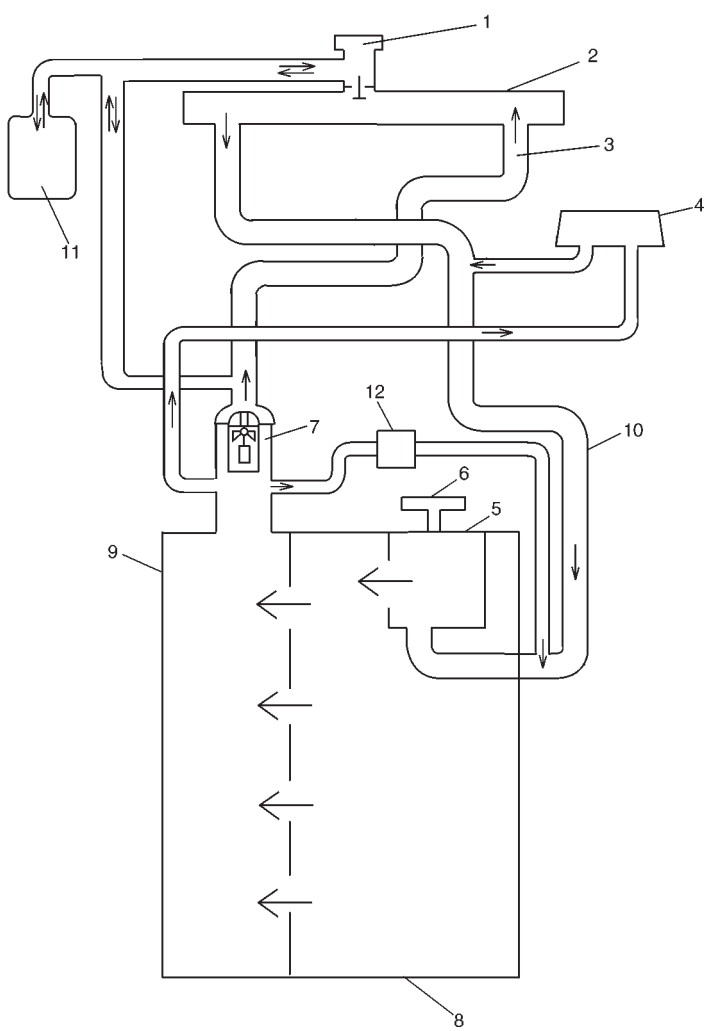
The cooling system consists of the radiator cap, radiator, coolant reservoir tank, hoses, water pump, cooling fan, thermostat. The radiator is of tube-and-fin type.

COOLING SYSTEM CIRCULATION

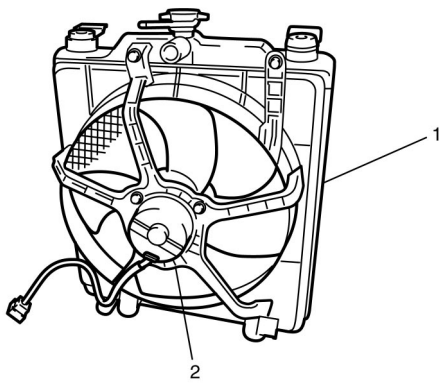
1) While the engine is warmed up (thermostat closed), coolant circulates as follows.



2) When coolant is warmed up to normal temperature and the thermostat opens, coolant passes through the radiator core to be cooled as follows.



1. Radiator cap
2. Radiator
3. Radiator inlet way
4. Heater
5. Water pump
6. Water pump pulley
7. Thermostat
8. Cylinder block
9. Cylinder head
10. Radiator outlet way
11. Reservoir tank
12. Throttle body

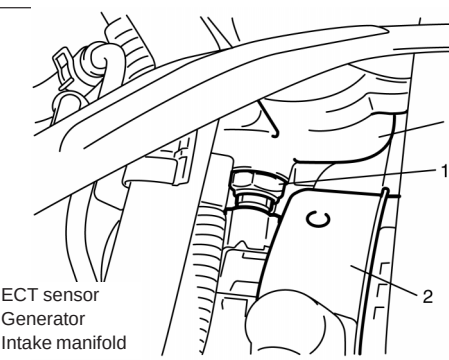


1. Radiator
2. Cooling fan

COOLING FAN

The cooling fan is driven by electric motor, and the motor is activated by ECM (and ECT sensor). For its details, refer to “ENGINE AND EMISSION CONTROL SYSTEM” section.

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 ECM (and ECT sensor) with the ignition switch in the “ON” position.



1. ECT sensor
2. Generator
3. Intake manifold

COOLANT (WATER) TEMP. GAUGE (ECT SENSOR)

Coolant temp. gauge is located at intake manifold. This gauge activates a water temp. meter in the instrument cluster.

DIAGNOSIS

Condition	Possible Cause	Correction
Engine overheats	● Loose or broken water pump belt	Adjust or replace.
	● Not enough coolant	Check coolant level and add as necessary.
	● Faulty thermostat	Replace.
	● Faulty water pump	Replace.
	● Dirty or bent radiator fins	Clean or remedy.
	● Coolant leakage on cooling system	Repair
	● Defective cooling fan motor or switch	Check and replace as necessary.
	● Plugged radiator	Check and replace radiator as necessary.
	● Faulty radiator cap	Replace.
	● Maladjusted ignition timing	Adjust.
	● Dragging brakes	Adjust brake.
	● Slipping clutch	Adjust or replace.

MAINTENANCE

COOLANT

The coolant recovery system is standard. The coolant in the radiator expands with heat, and the overflow is collected in the reservoir tank.
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 (70/30; in a market where no freezing temperature is anticipated).

This 50/50 mixture coolant solution provides freezing protection to – 36°C (– 33°F).

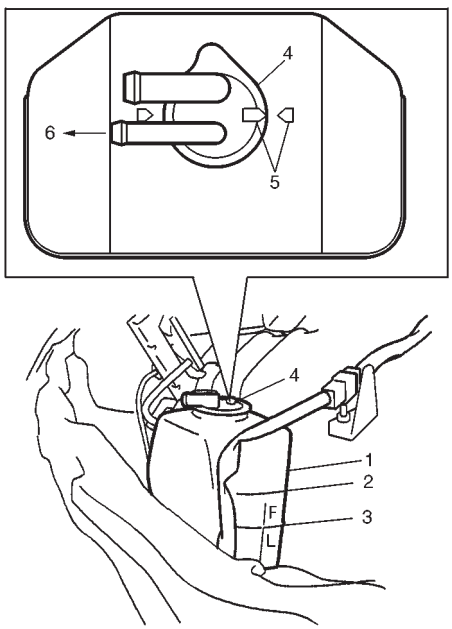
- Maintain cooling system freeze protection at – 36°C (– 33°F) to ensure protection against corrosion and loss of coolant from boiling. This should be done even if freezing temperatures are not expected.
- Add ethylene glycol base coolant when coolant has to be added because of coolant loss or to provide added protection against freezing at temperature lower than – 36°C (– 33°F).

NOTE:

- **Alcohol or methanol base coolant or plain water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Even in a market where no freezing temperature is anticipated, mixture of 70% water and 30% ethylene glycol antifreeze (Antifreeze/ Anticorrosion coolant) should be used for the purpose of corrosion protection and lubrication.**

ANTI-FREEZE PROPORTIONING CHART

ANTI-FREEZE PROPORTIONING CHART	Freezing temperature	°C	–16	–36
		°F	3	–33
	Anti-freeze/Anti-corrosion coolant concentration	%	30	50
	Ratio of compound to cooling water	ltr.	1.59/3.71	2.65/2.65
		US pt.	3.36/7.84	5.60/5.60
		Imp pt.	2.80/6.53	4.67/4.67
COOLANT CAPACITY	Engine radiator and heater		2.7 liters (5.71/4.75 US/Imp. pt.)	
	Reservoir tank		0.5 liters (1.06/0.88 US/Imp. pt.)	
	Other		2.1 liters (4.44/3.70 US/Imp. pt.)	
	Total		5.3 liters (11.20/9.33 US/Imp. pt.)	



1. Reservoir tank
2. FULL level mark
3. LOW level mark
4. Reservoir tank cap
5. Match mark
6. To water hose (3-way joint)

COOLANT LEVEL

Coolant Level

To check level, lift hood and look at "see-through" coolant reservoir tank.

It is not necessary to remove radiator cap to check coolant level.

WARNING:
To help avoid danger of being burned:
- **do not remove reservoir tank cap while coolant is "boiling", and**
- **do not remove radiator cap while engine and radiator are still hot.**

Scalding fluid and steam can be blown out under pressure if either cap is taken off too soon.

When engine is cool, check coolant level in reservoir tank.

A normal coolant level should be between "FULL" and "LOW" marks on reservoir tank.

If coolant level is below "LOW" mark, remove reservoir tank cap and add proper coolant to tank to bring coolant level up to "FULL" mark. Then, reinstall cap and align match marks on tank and cap.

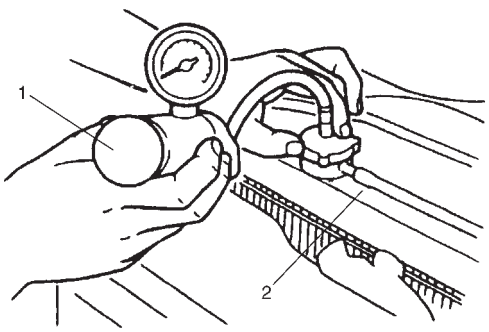
NOTE:
- **If proper quality antifreeze is used, there is no need to add extra inhibitors or additives that claim to improve system. They may be harmful to proper operation of system, and are unnecessary expense.**
- **When installing reservoir cap, align arrow marks on reservoir and cap.**

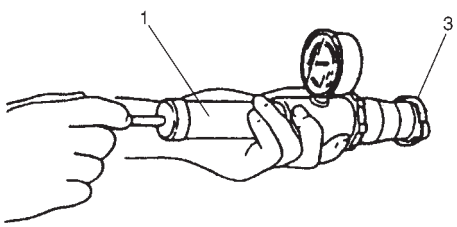
COOLING SYSTEM SERVICE

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.

Cooling system should be serviced as follows.

1) Check cooling system for leakage or damage.
2) Wash radiator cap and filler neck with clean water by removing radiator cap when engine is cold.
3) Check coolant for proper level and freeze protection.





1. Pressure tester
2. Radiator
3. Radiator cap/Cap (included in thermostat cap)

4) Using a pressure tester, check system, radiator cap 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.

NOTE:
After installing radiator cap to radiator, make sure that the ear of cap lines is parallel to radiator.

5) Tighten hose clamps and inspect all hoses. Replace hoses whenever cracked, swollen or otherwise deteriorated.
6) Clean frontal area of radiator core.
7) Using a pressure tester, check cap of thermostat cap for proper pressure holding capacity 90 kPa (0.9 kg/cm^2, 12.8 psi). If replacement of cap is required, use proper cap specified for this vehicle.

CAUTION:
When removing cap of thermostat cap, drain coolant from system in advance.

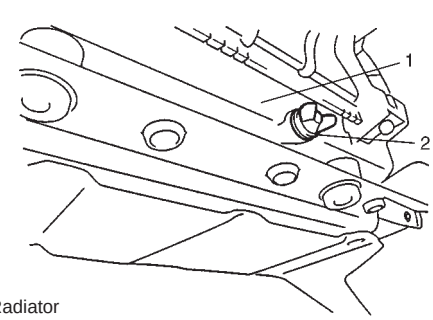
COOLING SYSTEM FLUSH AND REFILL

CAUTION:
The cap of thermostat cap must not be removed.

1) Remove radiator cap when engine is cool:
Turn cap counterclockwise slowly until it reaches a “stop”. (Do not press down while turning it.)
Wait until pressure is relieved (indicated by a hissing sound) then press down on cap and continue to turn it counterclockwise.

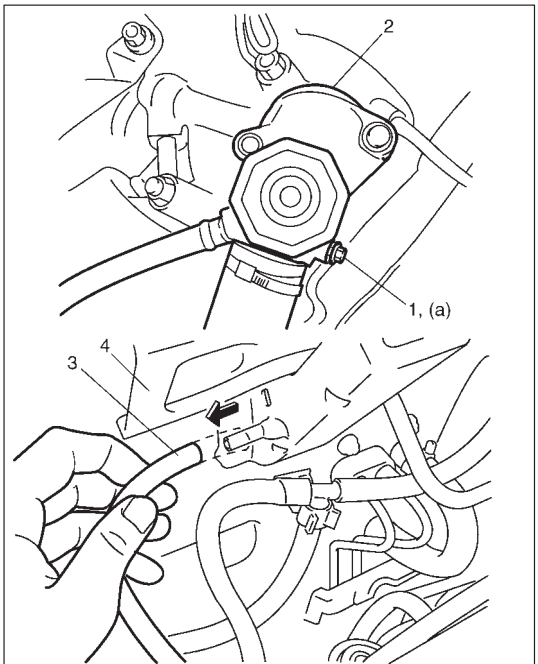
WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

2) With radiator cap removed, run engine until upper radiator hose is hot (this shows that thermostat is open and coolant is flowing through system).



1. Radiator
2. Radiator drain plug

3) Stop engine and drain coolant.
4) Close drain plug. Add water until system is filled and run engine until upper radiator hose is hot again.
5) Repeat steps 3) and 4) several times until drained liquid is nearly colorless.
6) Drain system and then close radiator drain plug tightly.



1. Thermostat cap bleeder bolt
2. Thermostat cap
3. Heater breather hose
4. Vehicle jack

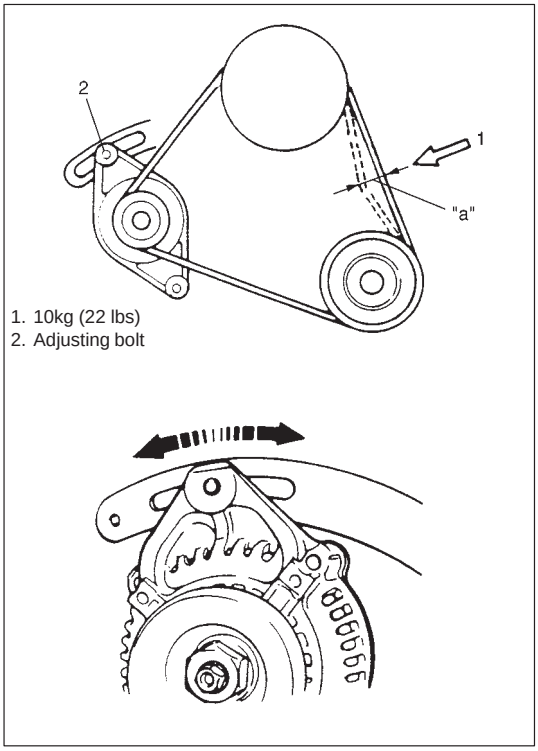
7) Remove reservoir tank and remove cap from reservoir tank and pour out any fluid, scrub and clean inside of tank with soap and water.
   Flush it well with clean water and drain. Reinstall tank.
8) Add 50/50 mixture of good quality ethylene glycol antifreeze and water to radiator and tank.
   Bleed air from cooling system by disconnecting heater breather hose and loosening thermostat cap bleeder bolt, and add coolant to radiator until coolant comes out from thermostat cap bleeder hole. Then tighten thermostat cap bleeder bolt.

   Tightening Torque
   (a): 3.0 N·m (0.3 kg-m, 2.2 lb-ft)
9) Fill radiator to the base of radiator filler neck and reservoir tank to "FULL" level mark. Reinstall reservoir tank cap.
10) Connect heater breather hose.
11) Run engine with radiator cap removed, until radiator upper hose is hot. Add coolant to radiator until level reaches the bottom of filler neck.
12) Stop engine and install radiator cap, making sure that the ear of cap lines is parallel to radiator. Add coolant to reservoir when engine cold.
13) Repeat step 8) to 12) accordingly when air is still in cooling system.

WATER PUMP BELT TENSION

WARNING:
- **Disconnect negative cable at battery before checking and adjusting belt tension.**
- **See "WARNING" described in "COOLING SYSTEM SERVICE".**

1) Inspect belt for cracks, cuts, deformation, wear and cleanliness. If it is necessary to replace belt, refer to "Generator (Water Pump) Belt" in CHARGING SYSTEM section for procedure.



1. 10kg (22 lbs)
2. Adjusting bolt

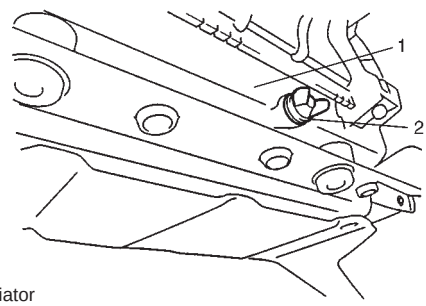
2) Check belt for tension. Belt is in proper tension when it deflects 6 to 8 mm (0.24 – 0.31 in.) under thumb pressure (about 10 kg or 22 lb.).

   Belt tension "a": 6 – 8mm (0.24 – 0.31 in.) as deflection

   NOTE:
   When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.28 in.).
3) If belt is too tight or too loose, adjust it to proper tension by displacing generator position (Refer to Section 6H).
4) Tighten belt adjusting bolt and generator pivot bolts.
5) Connect negative cable at battery terminal.

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 cable from battery terminal before removing any part.**

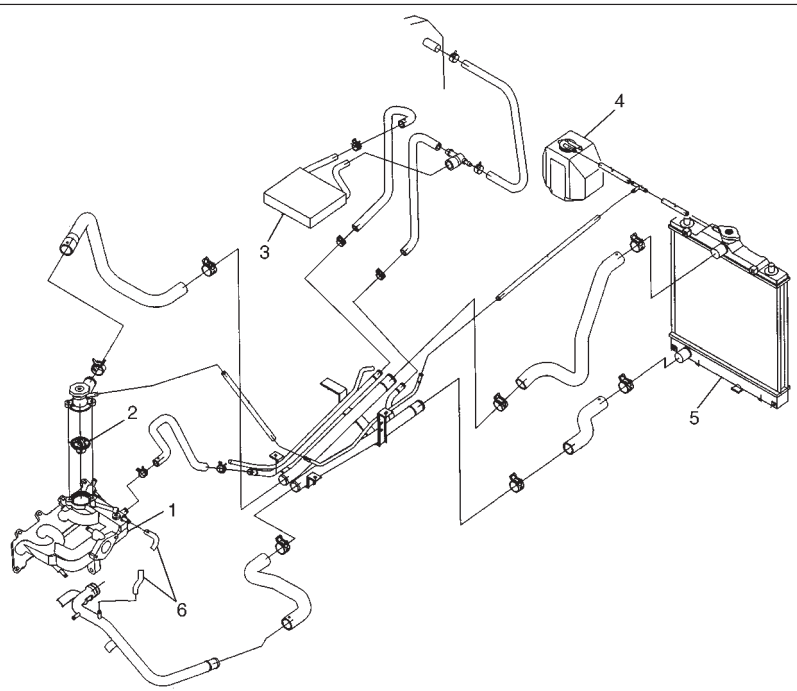


1. Radiator
2. Radiator drain plug

COOLING SYSTEM DRAINING

1) Remove radiator cap.
2) Loosen drain plug on radiator to drain coolant.
3) After draining coolant, be sure to tighten drain plug securely.
4) Fill cooling system. (Refer to Item COOLANT of MAINTENANCE.)

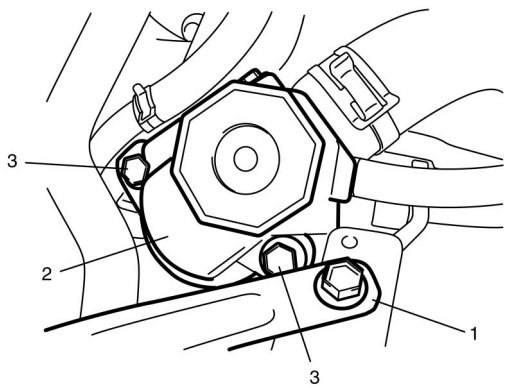
COOLING WATER PIPES OR HOSES



1. Intake manifold
2. Thermostat
3. Heater core
4. Reservoir tank
5. Radiator
6. To throttle body

REMOVAL
1) Drain cooling system.
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 description on COOLANT of MAINTENANCE.
- Use new O-ring when installing water pipe to water pump.



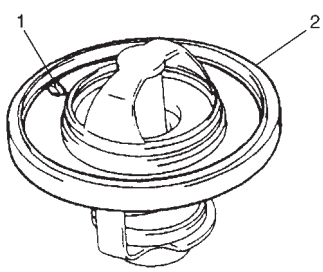
1. Generator adjusting arm reinforcement
2. Thermostat cap
3. Thermostat cap bolt

THERMOSTAT

CAUTION:
Do not remove cap part of thermostat cap.

REMOVAL

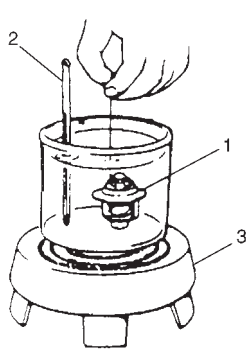
1) Drain coolant and tighten drain plug.
2) Remove engine room center member bolts and lift engine room center member.
3) Remove generator adjusting arm reinforcement and then disconnect thermostat cap from intake manifold.
4) Remove thermostat.



1. Air bleed valve
2. Thermostat seal

INSPECTION

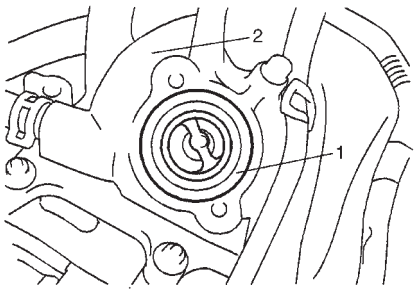
1) Make sure that air bleed valve of thermostat is clean.
   Should this valve be clogged, engine would tend to overheat.
2) Check to make sure that valve seat is free from foreign matters which would prevent valve from seating tight.
3) Check thermostat seal for breakage, deterioration or any other damage.



1. Thermostat
2. Thermometer
3. Heater

4) Check thermostatic movement of wax pellet as follows:
   a) Immerse thermostat in water, and heat water gradually.
   b) Check that valve starts to open at specific temperature.
   c) 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.

Thermostat functional spec. ± 2.8°C (5°F)	
Temp. at which valve begins to open	82°C (179°F)
Temp. at which valve becomes fully open	95°C (203°F)



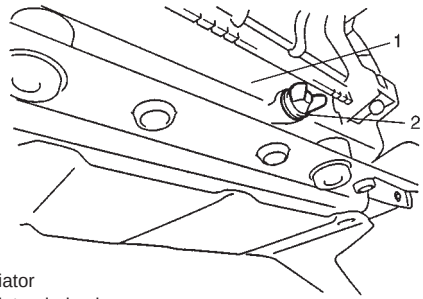
1. Thermostat
2. Intake manifold

INSTALLATION

1) Install thermostat.
2) Install thermostat cap to intake manifold.
3) Install generator adjusting arm reinforcement.
4) Install engine room center member.
5) Fill cooling system (refer to page 6B-6, 6B-7).
6) After installation, check each part for leakage.

WATER PUMP BELT

For removal, installation, inspection or adjustment, refer to “Generator (Water Pump) Belt” in CHARGING SYSTEM section.

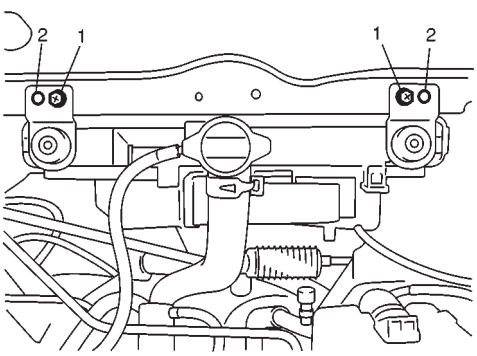


1. Radiator
2. Radiator drain plug

RADIATOR

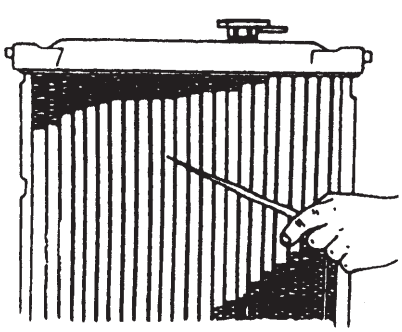
REMOVAL

1) Disconnect negative cable at battery.
2) Drain cooling system by loosening drain plug of radiator.
3) Disconnect coupler of cooling fan motor.
4) Remove front bumper (see Section 9).



1. Bolt
2. Radiator upper bracket

5) Disconnect radiator inlet and outlet hoses and reservoir tank hose from radiator.
6) Remove radiator upper bracket bolts.
7) Remove radiator with cooling fan motor.



INSPECTION

Check radiator for leakage or damage. Straighten bent fins, if any.

CLEANING

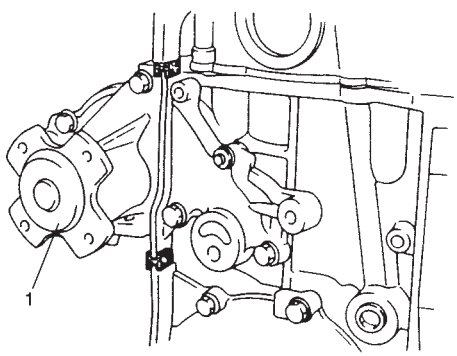
Clean frontal area of radiator cores.

INSTALLATION

Reverse removal procedures.

NOTE:

- **Refill cooling system with proper coolant referring to COOLANT item of MAINTENANCE.**
- **After installation, check each joint for leakage.**

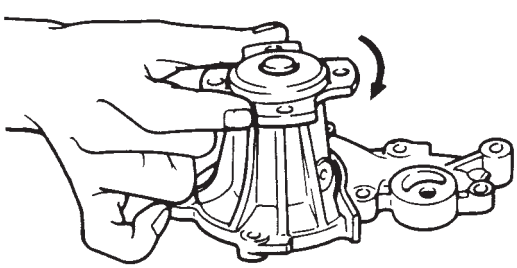


1. Water pump

WATER PUMP

REMOVAL

1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Remove front seats.
4) Remove engine room center member with gear shift control lever and parking brake lever.
5) Loosen water pump drive belt tension.
   Then remove water pump pulley and pump drive belt. When servicing vehicle equipped with A/C, remove compressor drive belt before removing water pump drive belt.
6) Remove timing belt and tensioner according to procedure described in SECTION 6A.
7) Remove water pump assembly.



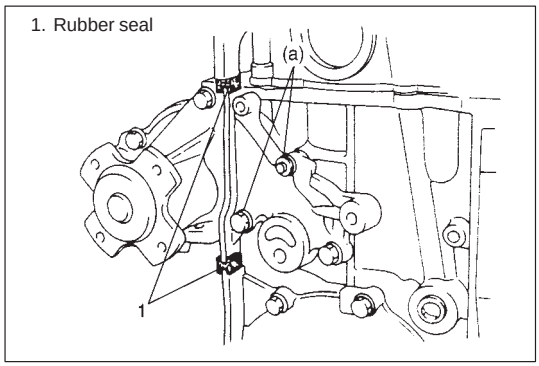
INSPECTION

NOTE:
Do not disassemble water pump.
If any repair is required on pump, replace it as assembly.

1) Rotate water pump by hand to check for smooth operation.
   If pump does not rotate smoothly or makes abnormal noise, replace it.

2) Inspect water pump impeller for damage.
   Replace as necessary.

   NOTE:
   Do not disassemble water pump to check the water pump impeller.



INSTALLATION

1) Install new pump gasket to cylinder block.
2) Install water pump to cylinder block.

Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

3) After installing water pump, install rubber seal between water pump and oil pump, and another between water pump and cylinder head.
4) Install timing tensioner plate, tensioner, tensioner spring, timing belt and timing belt outside covers, referring to SECTION 6A.
5) Install crankshaft pulley, water pump pulley, pump drive belt.
6) Adjust water pump belt tension as previously outlined.
   For vehicle equipped with A/C, adjust A/C drive belt referring to Section 0B.
7) Connect negative cable at battery.
8) Fill cooling system.
9) Install engine room center member, then perform parking brake adjustment (refer to Section 5) and gear shift control installation (refer to Section 7A).
10) Install front seats, refer to Section 9 “FRONT SEAT INSTALLATION”.
11) After installation, check each part for leakage.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening Torque		
	N·m	kg-m	lb-ft
Water pump bolts	11	1.1	8.0

REQUIRED SERVICE MATERIAL

MATERIALS	USE
Ethylene glycol base coolant (Anti-freeze/Anti-corrosion coolant)	Additive to engine cooling system for improving cooling efficiency and for protection against rusting.

SECTION 6C

ENGINE FUEL

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

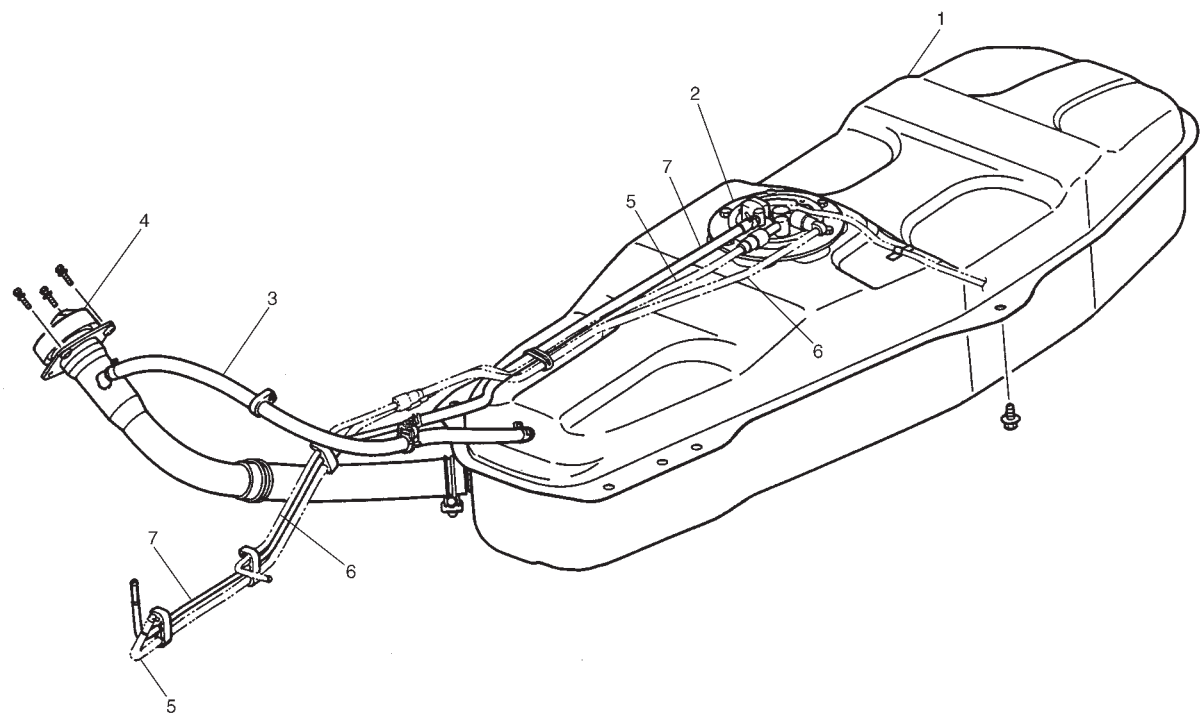
- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to AIR BAG SYSTEM COMPONENTS AND WIRING LOCATION VIEW of GENERAL DESCRIPTION in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and SERVICE PRECAUTIONS of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

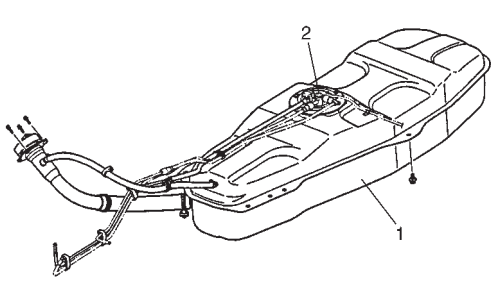
GENERAL DESCRIPTION

FUEL SYSTEM

Main components of fuel system are fuel tank, fuel pump assembly (with fuel filter and fuel level gauge and fuel cut valve), fuel feed line, fuel return line and fuel vapor line.
For the details of fuel flow and fuel vapor flow, refer to “ENGINE AND EMISSION CONTROL SYSTEM” section.



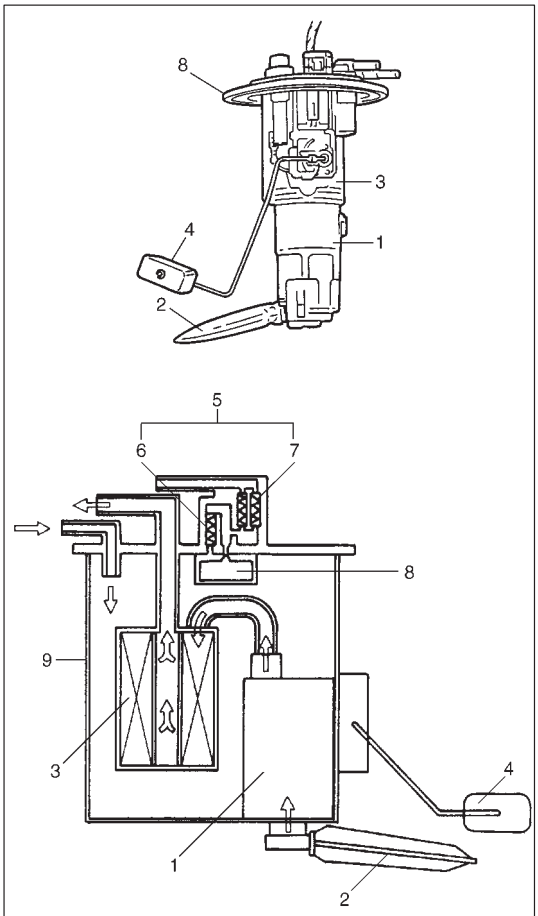
1. Fuel tank
2. Fuel pump assembly
3. Breather hose
4. Fuel filler cap
5. Fuel feed line
6. Fuel return line
7. Fuel vapor line



1. Fuel tank
2. Fuel pump assembly

FUEL TANK

Fuel tank is located under rear section of vehicle. Fuel pump assembly is installed in fuel tank. Whenever servicing fuel pump assembly, fuel tank must be removed from vehicle.



⇧ : Fuel flow

1. Fuel pump
2. Fuel suction filter
3. Fuel filter
4. Fuel level gauge
5. Tank pressure control valve
6. Relief valve
7. 2-way check valve
8. Fuel cut valve
9. Fuel pump ass'y

FUEL PUMP ASSEMBLY (WITH FUEL FILTER, LEVEL GAUGE, FUEL CUT VALVE AND TANK PRESSURE CONTROL VALVE)

Fuel pump assembly consists of fuel pump, fuel filter, fuel sender (level) gauge (sensor), fuel cut valve and tank pressure control valve.

Fuel Pump

When power is supplied to fuel pump, motor in pump assembly rotates impeller.

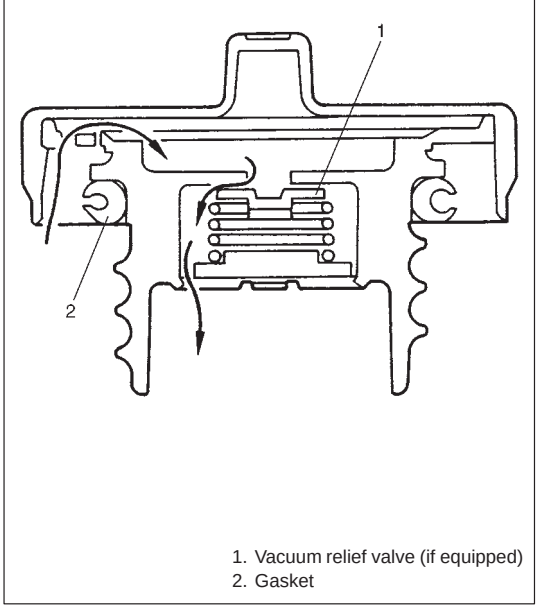
This causes a pressure difference to occur between both sides of impeller as there are many grooves around it. Then fuel is drawn through inlet port, and with its pressure increased it is discharged through outlet port.

Fuel Cut Valve

Fuel cut valve consists of float and spring. It allows only fuel vapor to flow into canister and prevents fuel from flowing into canister.

Tank pressure control valve (relief valve and 2-way check valve)

Tank pressure control valve maintains inner pressure of fuel tank constant to prevent fuel from blowing out and fuel tank from being deformed. Relief valve is provided to prevent discharged pressure in fuel tank from rising excessively and 2-way check valve is provided to maintain pressure in fuel tank at a constant level so that fuel will not blow out or tank will not be deformed.



1. Vacuum relief valve (if equipped)
2. Gasket

FUEL FILLER CAP

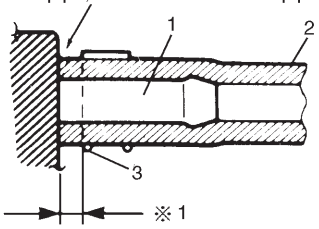
A ratchet tightening device on threaded fuel filler cap reduces the chances of incorrect installation, which would prevent sealing fuel vapors.

After gasket on fuel filler cap and filler neck flange contact, ratchet produces a loud clicking noise, indicating the seal has been set.

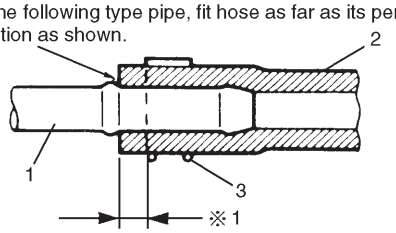
This cap has a vacuum relief valve inside (if equipped).

Vacuum relief valve opens to relieve vacuum created in fuel tank.

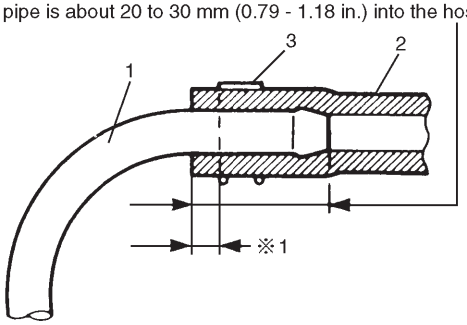
With short pipe, fit hose as it reaches pipe joint as shown.



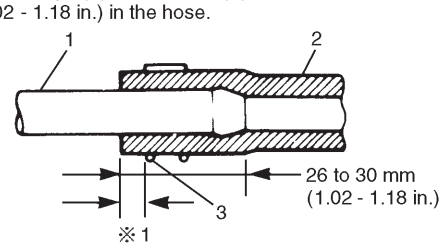
With the following type pipe, fit hose as far as its peripheral projection as shown.



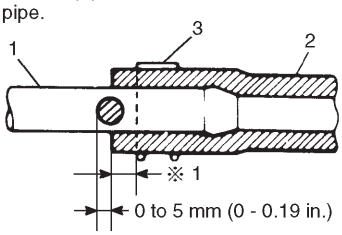
With bent pipe, fit hose as far as its bent part as shown or till pipe is about 20 to 30 mm (0.79 - 1.18 in.) into the hose.



With straight pipe, fit hose till pipe is about 26 to 30 mm (1.02 - 1.18 in.) in the hose.



With red marked pipe, fit hose till hose end reached red mark on pipe.



1. Pipe
2. Hose
3. Clamp

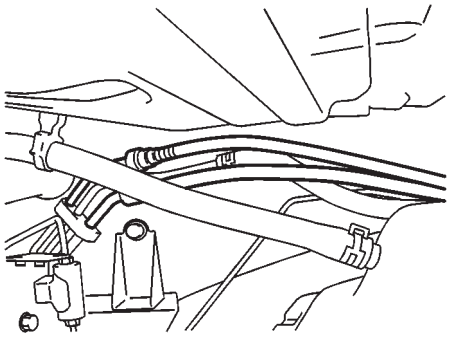
※1. Clamp securely at a position 3 to 7 mm (0.12 – 0.28 in.) from hose end.

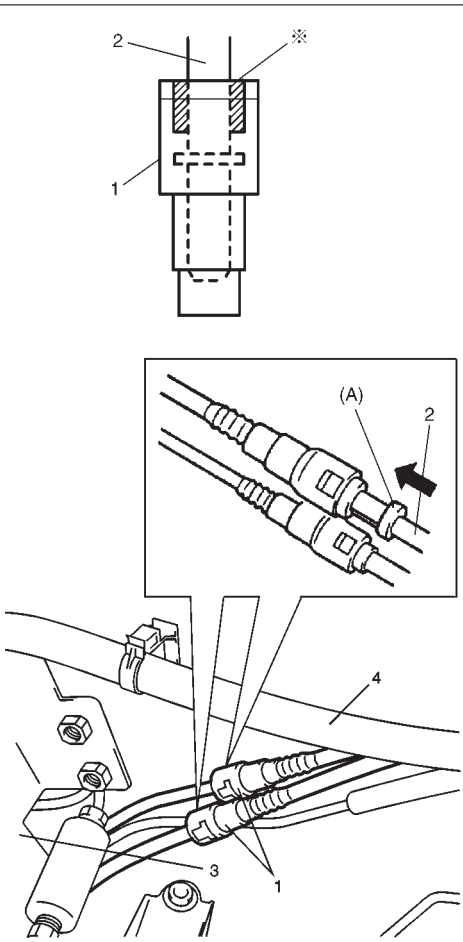
ON-VEHICLE SERVICE

WARNING:

Before attempting service of any type on fuel system, following cautions should be always observed.

- **Disconnect negative cable at battery.**
- **DO NOT smoke, and place "NO SMOKING" signs near work area.**
- **Be sure to have CO_2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after engine was stopped, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel to occur where loosened or disconnected. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure according to procedure described in "ENGINE" 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. Be sure to put that cloth in an approved container when disconnection is completed.**
- **Note that fuel hose connection varies with each type of pipe. Be sure to connect and clamp each hose correctly referring to the left figure.**





1. Quick joint
2. Pipe
3. Hydraulic unit (if equipped)
4. Breather hose

※ : Before disconnecting, blow off dust, etc. of this portion with compressed air.

FUEL LINES

Due to the fact that fuel feed line is under high pressure, use special care when servicing it.

INSPECTION

Visually inspect fuel lines for evidence of fuel leakage, hose crack and deterioration, or damage.
Make sure all clamps are secure.
Replace parts as needed.

FUEL PIPE

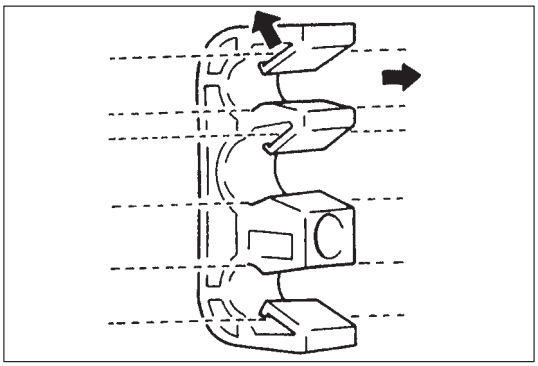
REMOVAL

1) Relieve fuel pressure in fuel feed line referring to “ENGINE” section.
2) Disconnect negative cable at battery.
3) Remove ABS hydraulic unit (if equipped with ABS).
4) Remove air cleaner case.
5) Disconnect fuel pipe joint and fuel hose from fuel pipe at the front and rear of each fuel pipe.
   For quick joint, disconnect it as follows:
   a) Remove mud, dust and/or foreign material between pipe and joint by blowing compressed air.
   b) Unlock joint lock by inserting special tool between pipe and joint.

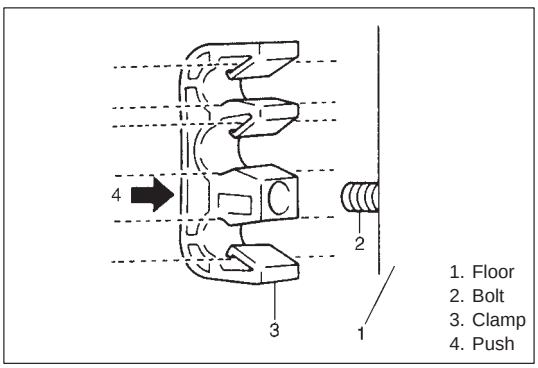
      Special Tool
      (A): 09919-47020

   c) Disconnect joint from pipe.

WARNING:
A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth.
Be sure to put that cloth in an approved container when disconnection is completed.



6) Mark the location of clamps on fuel pipes, so that clamps can be reinstalled to where they were.
7) Remove pipes with clamp from vehicle.
8) Remove clamp from pipes.



1. Floor
2. Bolt
3. Clamp
4. Push

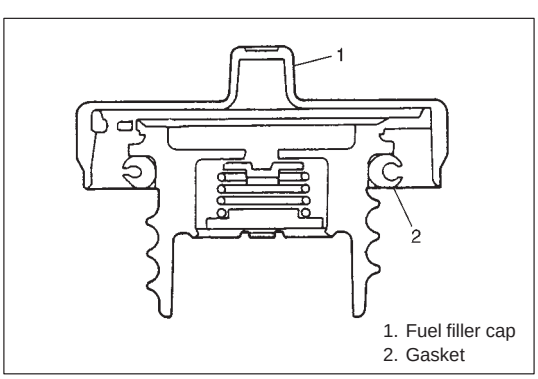
INSTALLATION

1) Install new clamps to marked location on pipes.
2) Install pipes with pipe clamps to vehicle.

3) Connect fuel hoses and pipes to each pipe.

CAUTION:
- **When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.**
- **When connecting hoses to rear end of pipes, secure them with clamps referring to 6C-4. And for hoses to front end of pipes, refer to "Engine" section.**

4) Install air cleaner case.
5) Install ABS hydraulic unit and bleed air from brake line (if equipped with ABS).
6) With engine "OFF" and ignition switch "ON", check for fuel leaks.



1. Fuel filler cap
2. Gasket

FUEL FILLER CAP

Remove cap, and check gasket for even filler neck imprint, and deterioration or any damage. If gasket is in malcondition, replace cap.

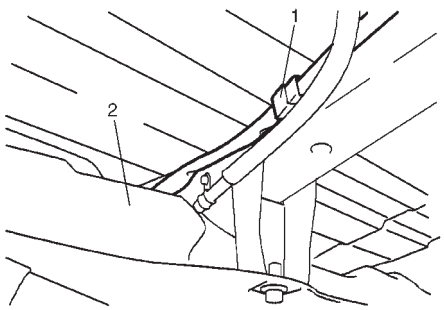
NOTE:
If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in critical malfunction of system.

FUEL TANK

REMOVAL

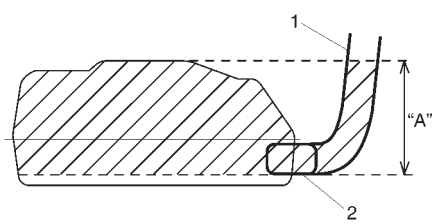
WARNING:
Refer to the WARNING at the beginning of ON-VEHICLE SERVICE in this section.

1) Relieve fuel pressure in fuel feed line referring to “ENGINE” section.
2) Disconnect negative cable at battery.



1. Fuel pump wire coupler
2. Fuel tank

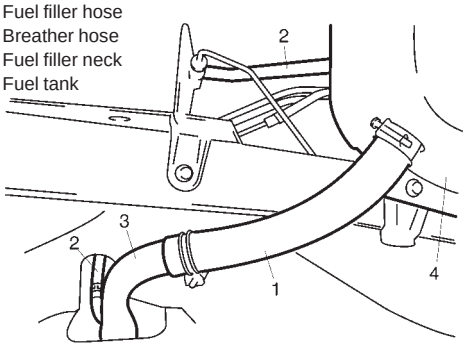
3) Hoist vehicle.
4) Disconnect fuel pump wire coupler.



1. Fuel filler hose
2. Fuel tank inlet (check) valve

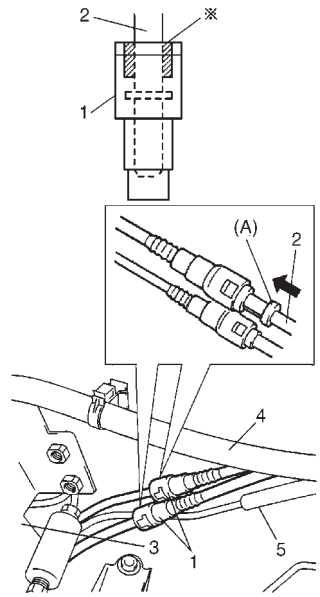
5) Due to absence of fuel tank drain plug, drain fuel tank by pumping fuel out through fuel tank filler.
Use hand operated pump device to drain fuel in space “A” in the figure.

CAUTION:
Never drain or store fuel in an open container due to possibility of fire or explosion.



1. Fuel filler hose
2. Breather hose
3. Fuel filler neck
4. Fuel tank

6) Disconnect fuel filler hose from filler neck, breather hose from tank.



1. Quick joint
2. Pipe
3. Hydraulic unit (if equipped)
4. Breather hose
5. Fuel vapor hose

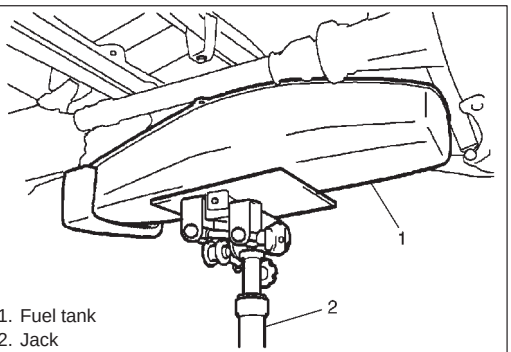
※ : Before disconnecting, blow off dust, etc. of this portion with compressed air.

7) Disconnect fuel feed hose and fuel return hose as previously outlined in “FUEL PIPE”.

Special Tool
(A): 09919-47020

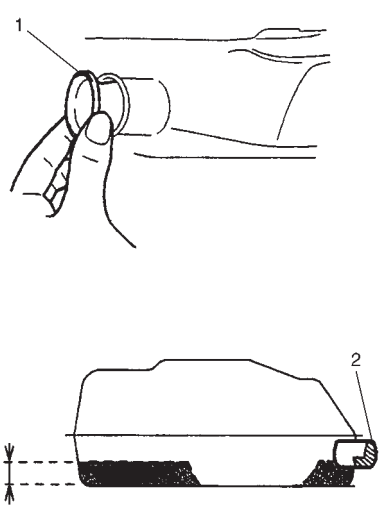
Disconnect fuel vapor hose from pipe.

WARNING:
A small amount of fuel may be released after fuel hose is disconnected. In order to reduce the chance of personal injury, cover hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.



1. Fuel tank
2. Jack

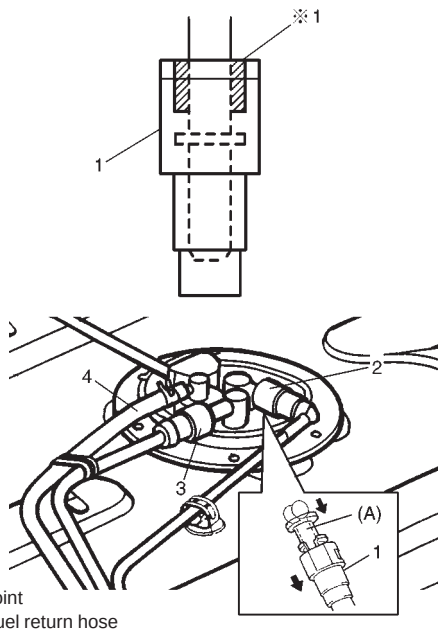
8) Support fuel tank with jack and remove 4 bolts.
9) Remove fuel tank from vehicle.



1. Fuel tank inlet valve
2. Cover inlet

10) Disconnect fuel tank filler hose from fuel tank, and drain fuel from fuel tank as follows.
    (1) Remove fuel tank inlet (check) valve from fuel tank.
    (2) Insert hose of a hand operated pump into fuel tank inlet and drain remaining fuel with hand operated pump till fuel stops.
    (3) Cover fuel tank inlet with moisture proof cloth adhesive tape or the like so as not to let fuel come out from it when removing fuel tank.

WARNING:
Be sure to cover fuel tank inlet. Fuel may remain in space “B” in fuel tank even after fuel drainage procedure. Working on tank without covering its inlet may cause personal injury or fire.



1. Joint
2. Fuel return hose
3. Fuel feed hose
4. Fuel vapor hose

※1: Before disconnecting, blow off dust, etc. of this portion with compressed air.

11) Disconnect fuel feed hose, fuel vapor hose and fuel return hose from fuel pump assembly.
When disconnecting joint of fuel feed line or return line from pipe, unlock joint by inserting special tool between pipe and joint lock first.

Special Tool
(A): 09919-47020

Disconnect joint from pipe.

WARNING:
A small amount of fuel may be released after the fuel hose is disconnected. In order to reduce the chance of personal injury, cover the hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

INSPECTION

After removing fuel tank, check hoses and pipes connected to fuel tank for leaks, loose connections, deterioration or damage. Also check fuel pump assembly gaskets for leaks, visually inspect fuel tank for leaks and damage.
Replace any damaged or malconditioned parts.

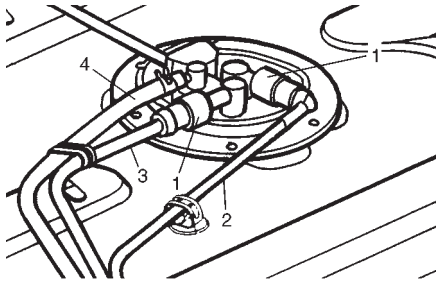
Fuel Tank Purging Procedure

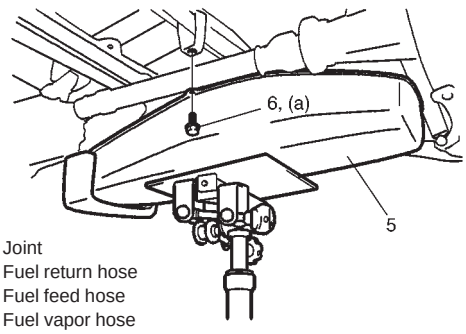
WARNING:
This purging procedure will NOT remove all fuel vapor. Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

Following procedure is used purging fuel tank.

1) After removing fuel tank, remove all hoses, pipes, fuel pump assembly from fuel tank.
2) Drain all remaining fuel from tank.
3) Move tank to flushing area.
4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean. Replace tank if its inside is rusty.
5) Completely flush out remaining water after washing.

CAUTION:
Never remain water in fuel tank after washing, or fuel tank inside will get corrosion.





1. Joint
2. Fuel return hose
3. Fuel feed hose
4. Fuel vapor hose
5. Fuel tank
6. Bolt

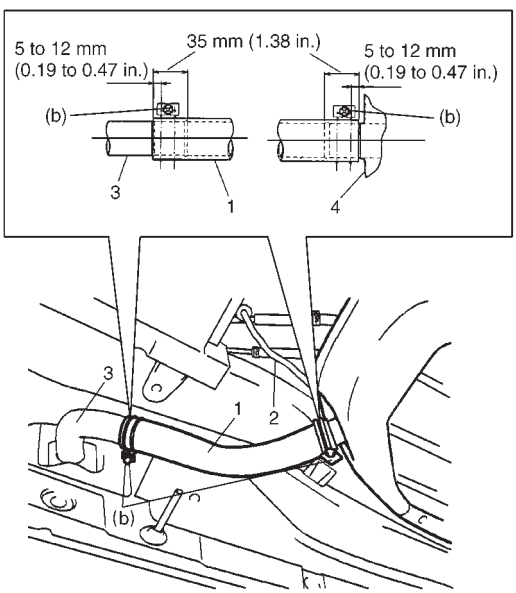
INSTALLATION

1) If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.
2) Connect fuel vapor hose and pipe joints to fuel pump assembly, and clamp vapor hose securely.

CAUTION:
When connecting joint, clean outside surfaces of pipe where joint is to be inserted, push joint into pipe till joint lock clicks and check to ensure that pipes are connected securely, or fuel leak may occur.

3) Install fuel tank to vehicle.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

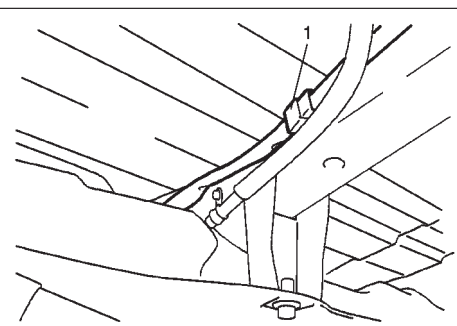


1. Fuel filler hose
2. Breather hose
3. Fuel filler neck
4. Fuel tank

4) Connect fuel filler hose to filler neck and breather hose to fuel tank and clamp hoses securely.

Tightening Torque
(b): 1.5 N·m (0.15 kg-m, 1.0 lb-ft)

5) Connect fuel hoses to each pipe and fuel vapor hose to fuel tank. Refer to 6C-3 for proper connection.



1. Fuel pump wire coupler

6) Connect fuel pump wire coupler.

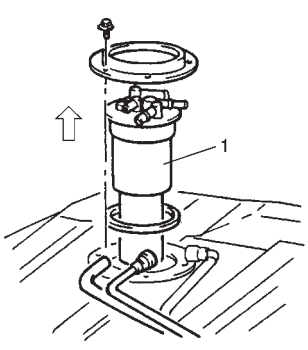
7) Connect negative cable at battery.
With engine “OFF” and ignition switch “ON”, check for fuel leaks.

FUEL PUMP ASSEMBLY (WITH FUEL FILTER, FUEL LEVEL GAUGE, FUEL CUT VALVE AND TANK PRESSURE CONTROL VALVE)

WARNING:
Refer to the WARNING at the beginning of ON-VEHICLE SERVICE in this section.

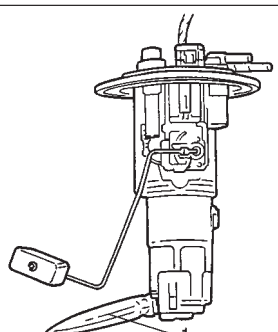
REMOVAL

1) Remove fuel tank from vehicle. Refer to FUEL TANK REMOVAL in this section.



1. Fuel pump assembly

2) Remove fuel pump assembly from fuel tank.

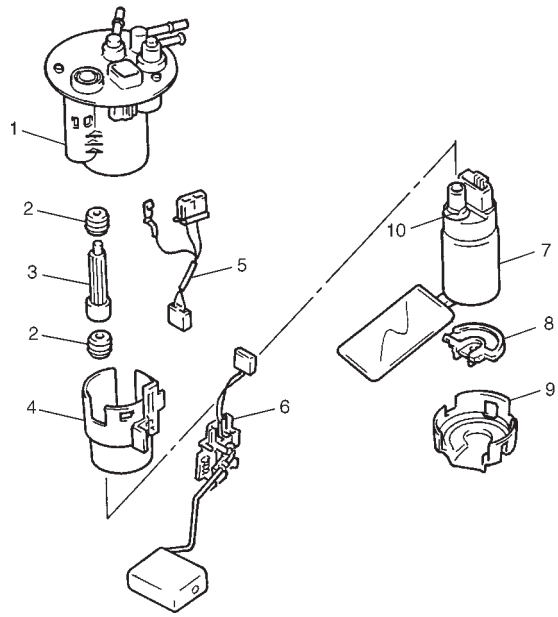


1. Fuel suction filter

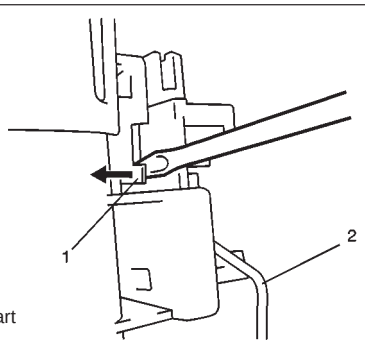
INSPECTION

Check fuel pump assembly for damage.
Check fuel suction filter for evidence of dirt and contamination. If present, replace or clean and check for presence of dirt in fuel tank.
For inspection of fuel level gauge, refer to “BODY ELECTRICAL” section of this manual.

DISASSEMBLY



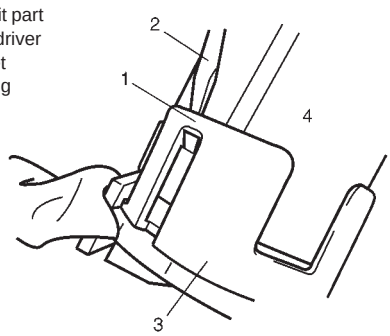
1. Bracket sub assembly (including fuel filter)
2. Grommet
3. Tube
4. Housing
5. Lead wire
6. Fuel level gauge (Fuel sender gauge)
7. Fuel pump
8. Cushion
9. Bracket
10. Spacer



1. Snap-fit part
2. Float arm

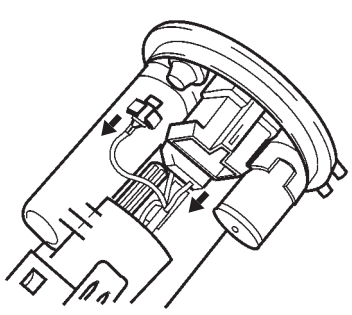
1) Disconnect gauge lead wire connector from bracket sub assembly.
2) While pressing snap-fit part, remove fuel level gauge (sender gauge) by sliding it in the arrow direction.

CAUTION:
While removing fuel level gauge, do not contact resistor plate or deform arm. It may cause fuel level gauge to fail.



1. Snap-fit part
2. Screwdriver
3. Bracket
4. Housing

3) Remove bracket located under fuel pump by opening its snap-fit parts with screwdriver.
Then remove cushion.



4) Disconnect fuel pump lead wire connector from bracket sub assembly.
5) Remove fuel pump with lead wire, fuel tube and grommets from bracket sub assembly.

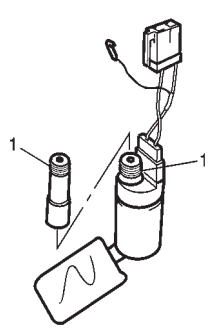
6) Remove lead wire, fuel tube and/or grommets as necessary.

CAUTION:
When removing grommet from fuel tube or bracket sub assembly, be very careful not to cause damage to grommet installed section (sealed section in bore). Should it be damaged, replace it with new one, or fuel will leak from that part.

7) Remove housing from bracket sub assembly by opening its snap-fit parts.

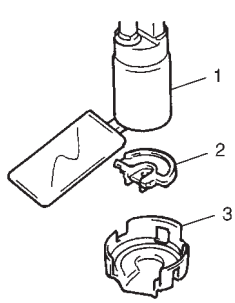
REASSEMBLY

NOTE:
Use of new parts is recommended for all parts other than fuel pump and fuel level gauge.
Also, be sure to use new grommets, or oil leakage may occur.



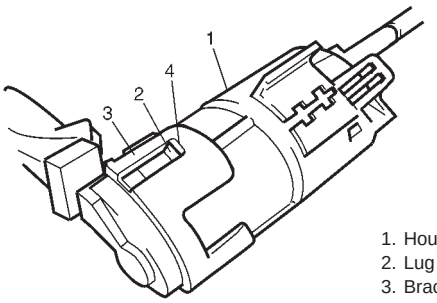
1. Apply oil

1) Install lead wire, spacer and new grommet to fuel pump. Check that no foreign object is caught between grommet and fuel pump.
2) Apply engine oil and around grommet and install fuel tube. Check that no foreign object is caught between grommet and fuel tube.



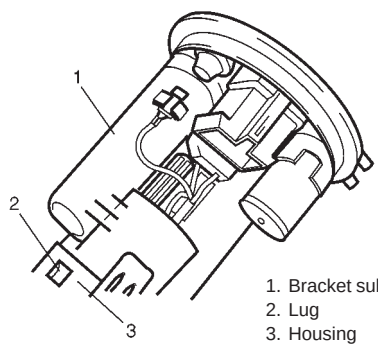
1. Fuel pump
2. Cushion
3. Bracket

3) Fit cushion and bracket to fuel pump.



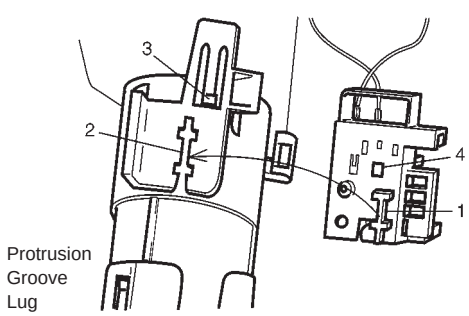
1. Housing
2. Lug
3. Bracket
4. Window

4) Install housing to assembly made in Step 3) above. Check that lug of housing fits in window of bracket securely.



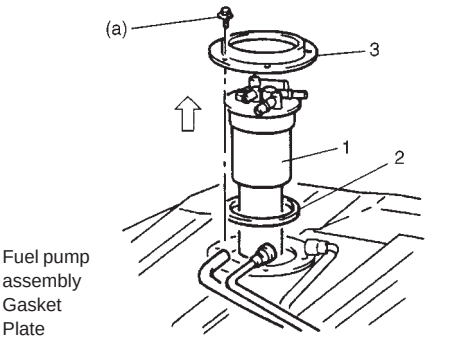
1. Bracket sub assembly
2. Lug
3. Housing

5) Install assembly made in Step 4) above to bracket sub assembly. Check that no foreign object is caught between grommet and bracket sub assembly.
   Also, check that lug of bracket sub assembly fits in window of housing.
6) Connect lead wire connector and terminal to bracket sub assembly. Check that wire is not twisted.



1. Protrusion
2. Groove
3. Lug
4. Window

7) Install fuel level gauge to housing. Fit protrusion of fuel level gauge in groove in housing and slide it up till lug fits in window securely.
8) Connect fuel level gauge connector to bracket sub assembly.

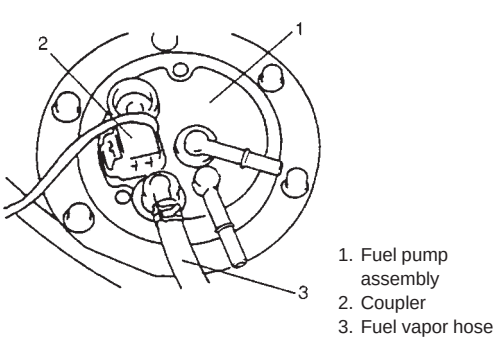


1. Fuel pump assembly
2. Gasket
3. Plate

INSTALLATION

1) Clean mating surfaces of fuel pump assembly and fuel tank.
2) Install new gasket and plate to fuel pump assembly then install fuel pump assembly to fuel tank.

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.5 lb-ft)



1. Fuel pump assembly
2. Coupler
3. Fuel vapor hose

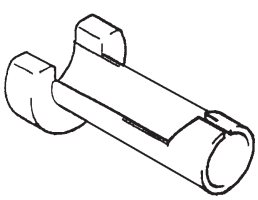
3) Connect wire harness coupler and fuel vapor hose to fuel pump assembly.

4) Install fuel tank to vehicle. Refer to FUEL TANK INSTALLATION in this section.

TIGHTENING TORQUE SPECIFICATION

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Fuel pump assembly bolt	10	1.0	7.5
Fuel tank bolt	23	2.3	17.0

SPECIAL TOOL



09919-47020
Quick joint remover

SECTION 6E

ENGINE AND EMISSION CONTROL SYSTEM

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 of 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 of 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 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.

- **Ignition timing adjusting resistor**
- **EGR valve**
- **Heated oxygen sensor or CO adjusting resistor**
- **Three way catalytic converter**

6E

CONTENTS

GENERAL DESCRIPTION

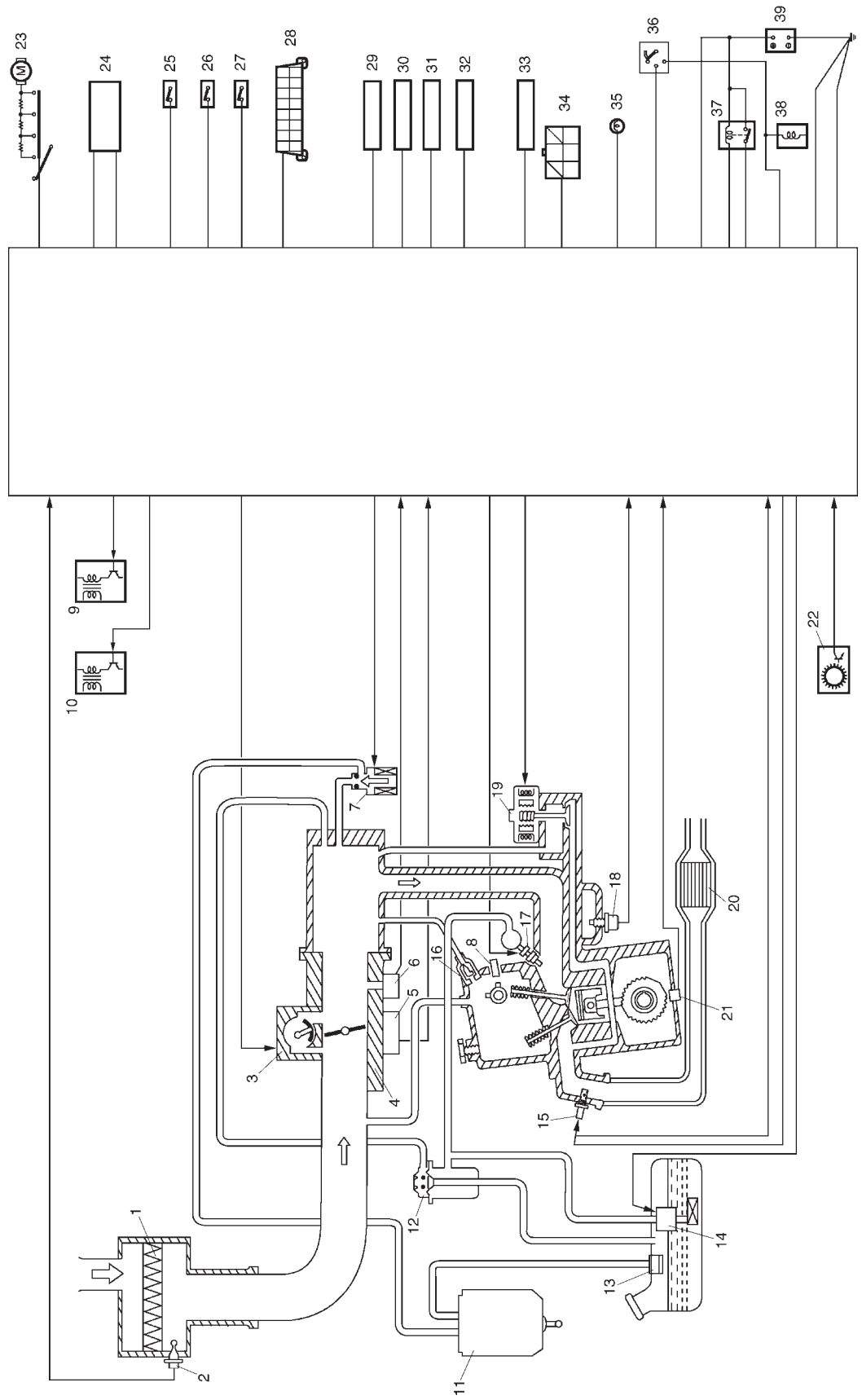
The engine and emission control system has 4 major sub-systems: air intake system, fuel delivery system, electronic control system and emission control system.

Air intake system includes air cleaner, throttle body, idle air control valve and intake manifold.

Fuel delivery system includes fuel pump, delivery pipe, fuel pressure regulator, fuel injectors, etc.

Electronic control system includes ECM, various sensors and controlled devices.

Emission control system includes EGR, EVAP and PCV systems.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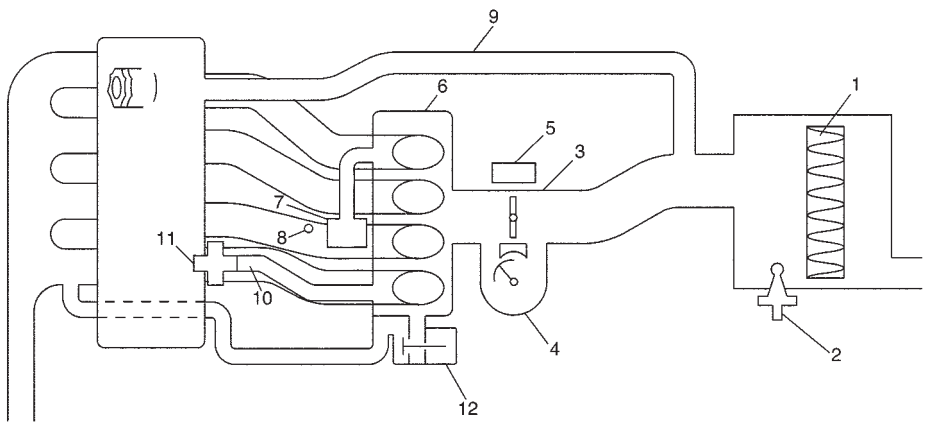
1. Air cleaner
2. Intake air temp. sensor
3. Idle air control valve
4. Throttle body
5. Throttle position sensor
6. Manifold absolute pressure sensor
7. EVAP canister purge valve
8. Camshaft position sensor
9. Ignition coil assembly for No.1 and No.4 spark plug
10. Ignition coil assembly for No.2 and No.3 spark plug
11. EVAP canister
12. Fuel pressure regulator
13. Tank pressure control valve
14. Fuel pump
15. Heated oxygen sensor (if equipped)
16. PCV valve
17. Fuel injector
18. Engine coolant temp. sensor
19. EGR valve (if equipped)
20. Three way catalytic converter (if equipped)
21. Crankshaft position sensor
22. Vehicle speed sensor
23. Heater blower fan switch
24. A/C control module (if equipped)
25. Lighting switch
26. Stop lamp switch
27. Rear defogger switch (if equipped)
28. Data link connector
29. ABS control module (if equipped)
30. Ignition timing adjusting resistor (if equipped)
31. CO adjusting resistor (if equipped)
32. Radiator fan relay
33. EPS control module (if equipped)
34. Monitor connector
35. Malfunction indicator lamp
36. Ignition switch
37. Main relay
38. Starter magnetic switch
39. Battery

AIR INTAKE SYSTEM

The main components of the air intake system are air cleaner, air cleaner outlet hose, throttle body, idle air control valve and intake manifold.

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, the air bypasses the throttle valve through bypass passage and is finally drawn into the intake manifold.



1. Air cleaner
2. IAT sensor
3. Throttle body
4. IAC valve
5. MAP sensor
6. Intake manifold
7. EVAP purge valve
8. Union (fuel pressure regulator)
9. Breather hose
10. PCV hose
11. PCV valve
12. EGR valve (if equipped)

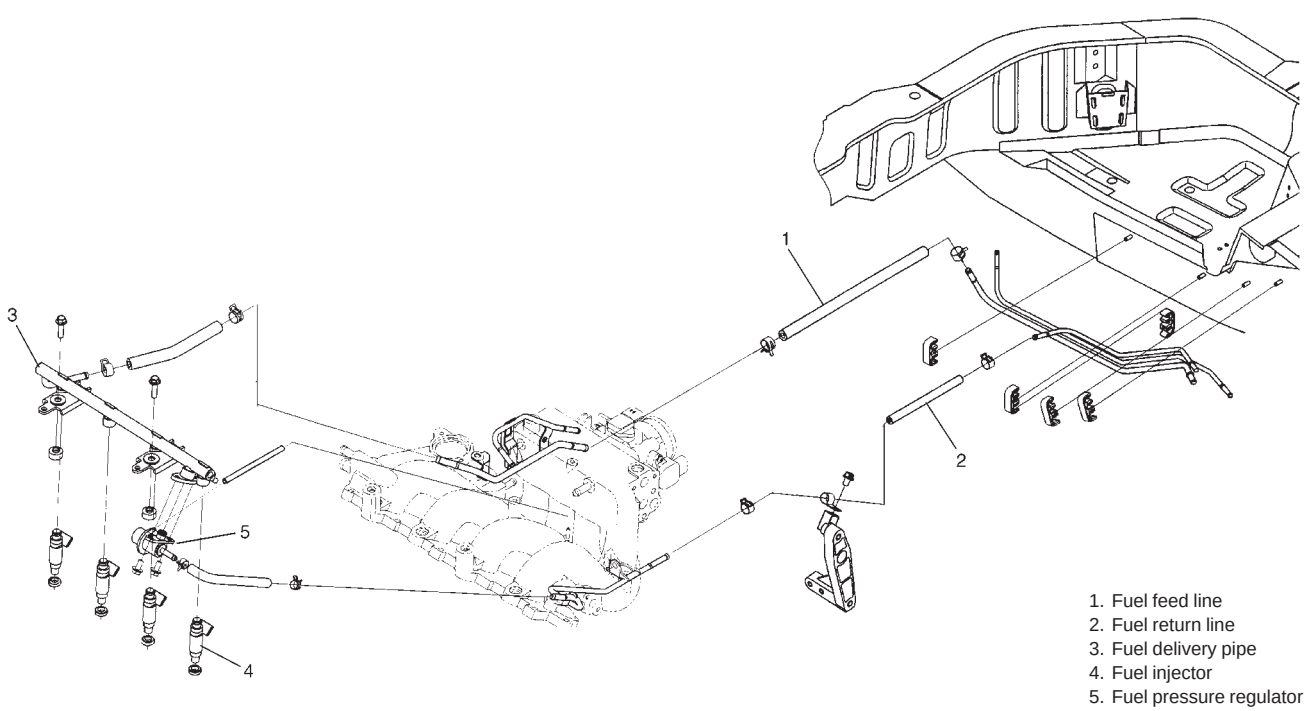
FUEL DELIVERY SYSTEM

The fuel delivery system consists of the fuel tank, fuel pump, fuel filter, fuel pressure regulator, delivery pipe and fuel injectors.

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) 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.

The fuel relieved by the fuel pressure regulator returns through the fuel return line to the fuel tank.



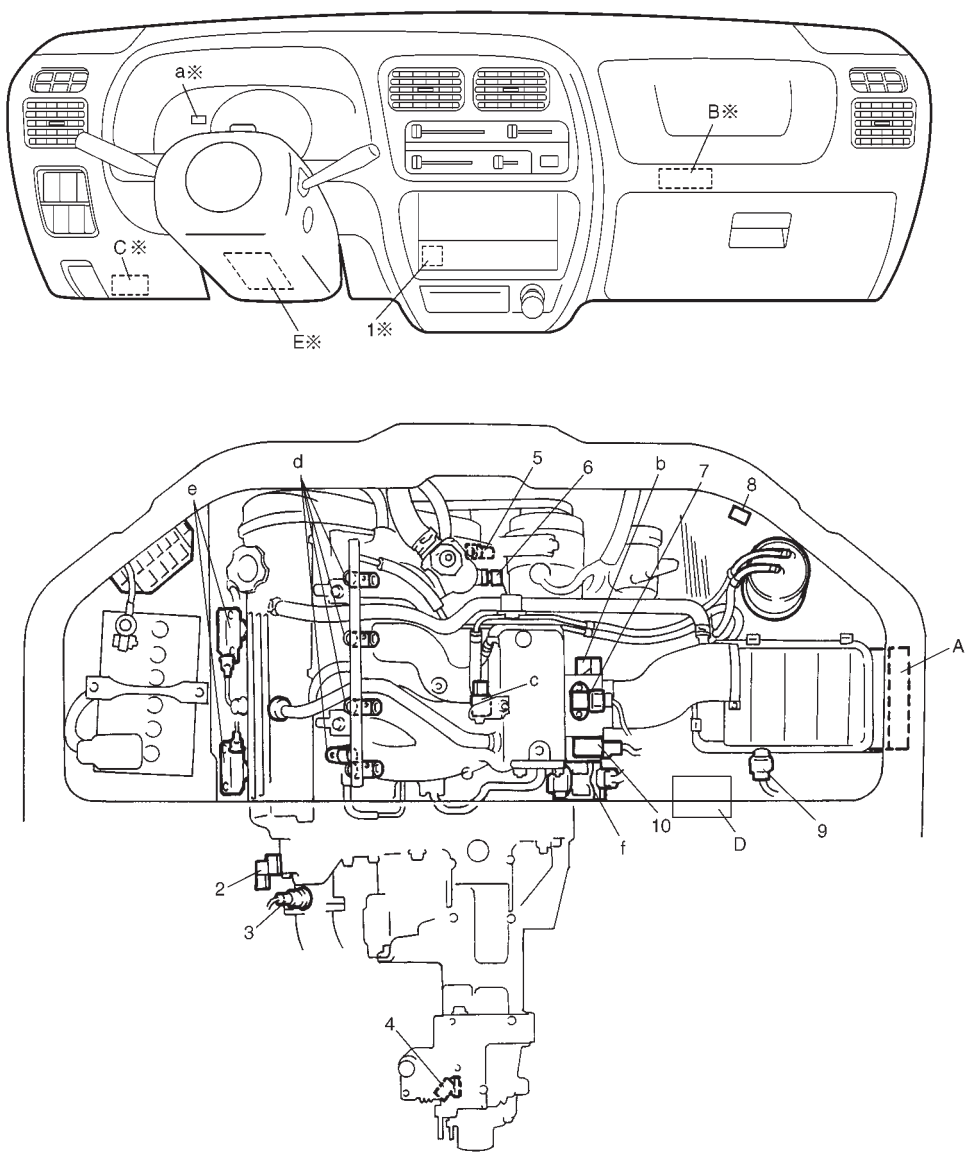
1. Fuel feed line
2. Fuel return line
3. Fuel delivery pipe
4. Fuel injector
5. Fuel pressure regulator

ELECTRONIC CONTROL SYSTEM

The electronic control system consists of 1) various sensors which detect the state of engine and driving conditions, 2) ECM which controls various devices according to the signals from the sensors and 3) various controlled devices.

Functionally, it is divided into the following sub systems:

- Main relay control system
- Fuel injection control system
- Idle air control system
- Fuel pump control system
- Evaporative emission control system
- Ignition control system
- EGR system (if equipped)
- Heated oxygen sensor heater control system (if equipped)

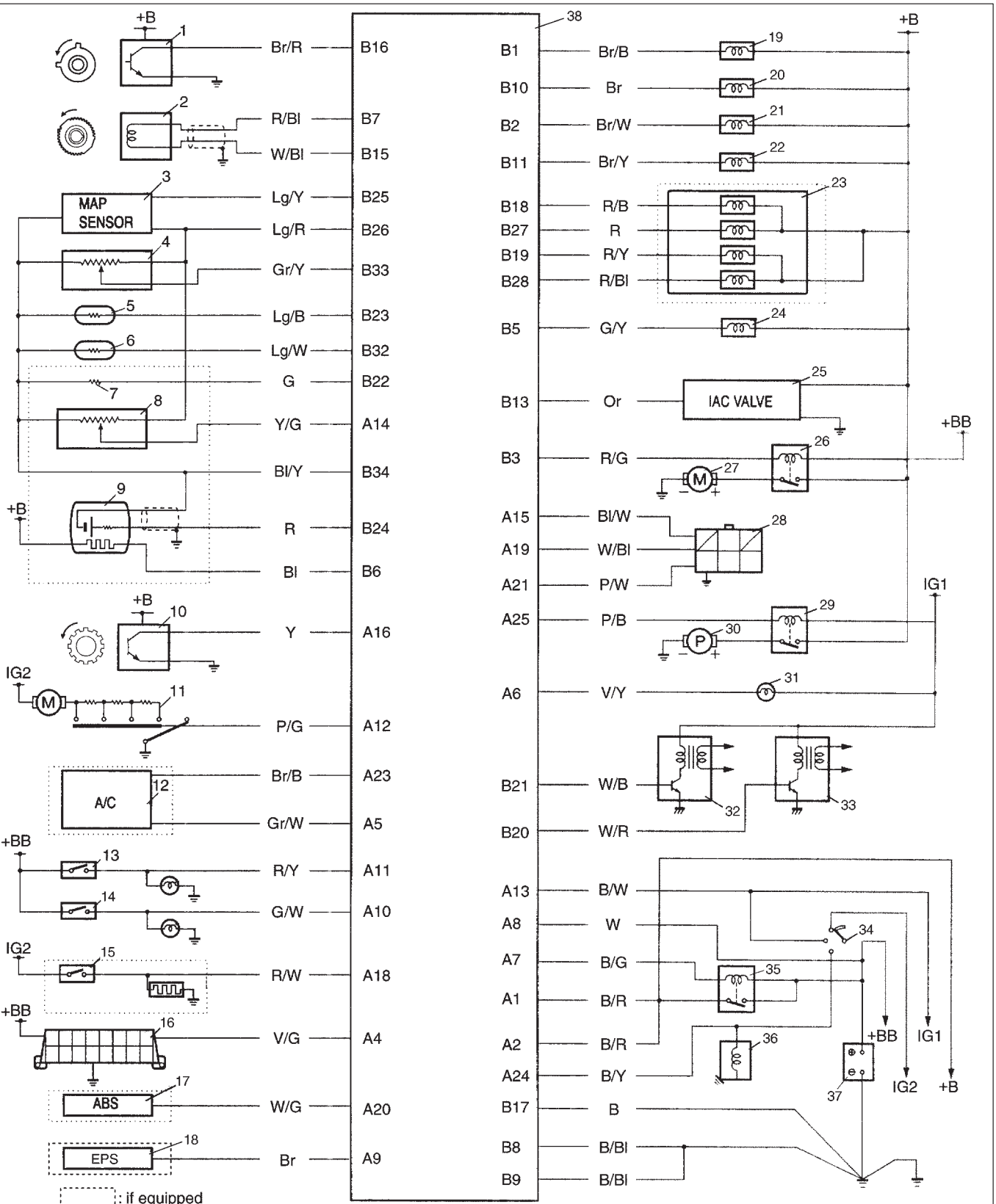


1. CO adjusting resistor (if equipped)
2. CMP sensor
3. HO2S (if equipped)
4. VSS
5. CKP sensor
6. ECT sensor
7. MAP sensor
8. Ignition timing adjusting resistor (if equipped)
9. IAT sensor
10. TP sensor

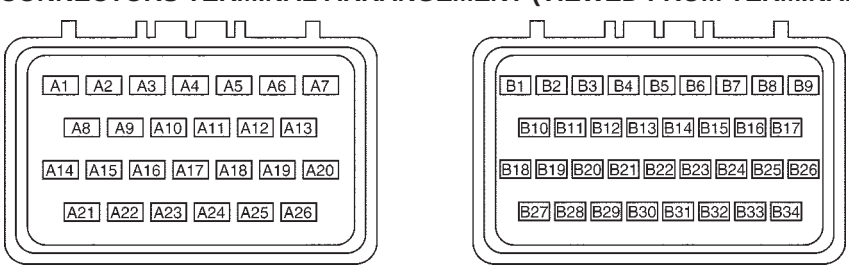
a MIL
b IAC valve
c EVAP canister purge valve
d Fuel injector
e Ignitor coil
f EGR valve (if equipped)

A ECM
B A/C control module (if equipped)
C DLC
D ABS control module (if equipped)
E EPS control module (if equipped)

NOTE:
Above figure shows left-hand steering vehicle. For right hand steering vehicle, parts with (※) are installed at the other side.

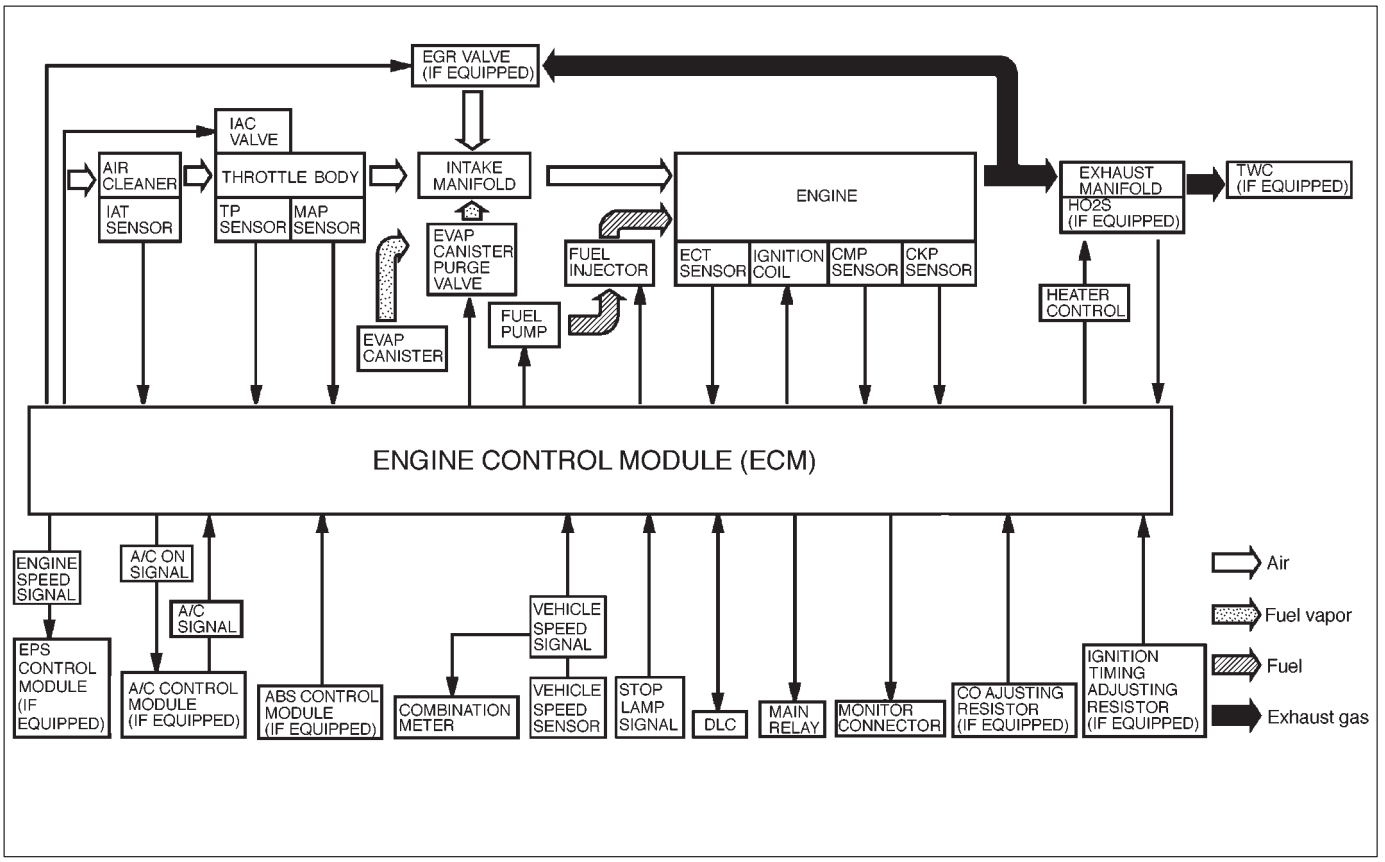


ECM CONNECTORS TERMINAL ARRANGEMENT (VIEWED FROM TERMINAL SIDE)



1. Camshaft position sensor
2. Crankshaft position sensor
3. Manifold absolute pressure sensor
4. Throttle position sensor
5. Engine coolant temp. sensor
6. Intake air temp. sensor
7. Ignition timing adjusting resistor (if equipped)
8. CO adjusting resistor (if equipped)
9. Heated oxygen sensor (if equipped)
10. Vehicle speed sensor
11. Heater blower switch
12. A/C control module (if equipped)
13. Lighting switch
14. Stop lamp switch
15. Rear defogger switch (if equipped)
16. Data link connector
17. ABS control module (if equipped)
18. EPS control module (if equipped)
19. Fuel injector No.1
20. Fuel injector No.2
21. Fuel injector No.3
22. Fuel injector No.4
23. EGR valve (if equipped)
24. EVAP canister purge valve
25. IAC valve
26. Radiator fan relay
27. Radiator fan motor
28. Monitor connector
29. Fuel pump relay
30. Fuel pump
31. Malfunction indicator lamp
32. Ignition coil assembly for No.1 and No.4
33. Ignition coil assembly for No.2 and No.3
34. Ignition switch
35. Main relay
36. Starter magnetic switch
37. Battery
38. ECM

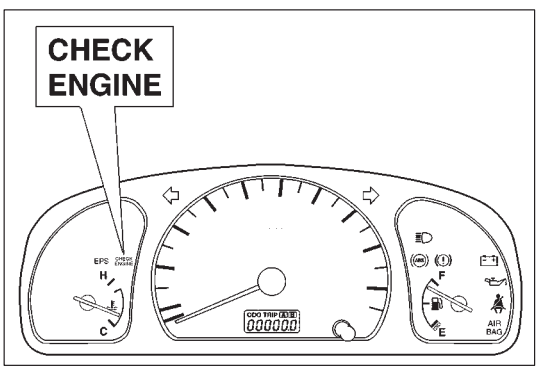
A1	B/R	Power source
A2	B/R	Power source
A3	–	blank
A4	V/G	Data link connector
A5	Gr/W	A/C ON signal (if equipped)
A6	V/Y	Malfunction indicator lamp (“CHECK ENGINE” light)
A7	B/G	Main relay
A8	W	Power source for back up
A9	Br	Electric power steering control module (if equipped)
A10	G/W	Stop lamp switch
A11	R/Y	Lighting switch
A12	P/G	Heater blower switch
A13	B/W	Ignition switch
A14	Y/G	CO adjusting resistor (if equipped)
A15	Bl/W	Diagnosis switch terminal
A16	Y	Vehicle speed sensor
A17	–	blank
A18	R/W	Rear defogger switch (if equipped)
A19	W/Bl	Monitor terminal
A20	W/G	ABS control module (if equipped)
A21	P/W	Test switch terminal
A22	–	blank
A23	Br/B	A/C signal (if equipped)
A24	B/Y	Starter signal
A25	P/B	Fuel pump relay
A26	–	blank
B1	Br/B	Fuel injector No.1
B2	Br/W	Fuel injector No.3
B3	R/G	Radiator fan relay
B4	–	blank
B5	G/Y	EVAP canister purge valve
B6	Bl	Heated oxygen sensor heater (if equipped)
B7	R/Bl	Crankshaft position sensor
B8	B/Bl	Ground
B9	B/Bl	Ground
B10	Br	Fuel injector No.2
B11	Br/Y	Fuel injector No.4
B12	–	blank
B13	Or	IAC valve
B14	–	blank
B15	W/Bl	Crankshaft position sensor
B16	Br/R	Camshaft position sensor
B17	B	Ground
B18	R/B	EGR valve (if equipped)
B19	R/Y	EGR valve (if equipped)
B20	W/R	Ignition coil assembly for No.2, 3
B21	W/B	Ignition coil assembly for No.1, 4
B22	G	Ignition timing adjusting resistor (if equipped)
B23	Lg/B	Intake air temp. sensor
B24	R	Heated oxygen sensor (if equipped)
B25	Lg/Y	Manifold absolute pressure sensor
B26	Lg/R	Power source for MAP sensor, TP sensor and CO adjusting resistor
B27	R	EGR valve (if equipped)
B28	R/Bl	EGR valve (if equipped)
B29	–	blank
B30	–	blank
B31	–	blank
B32	Lg/W	Engine coolant temp. sensor
B33	Gr/Y	Throttle position sensor
B34	Bl/Y	Ground
B35	–	blank
B36	–	blank



		SIGNAL FROM SENSOR, SWITCH AND CONTROL MODULE																			
		CKP SENSOR	CMP SENSOR	MAP SENSOR	TP SENSOR	ECT SENSOR	IAT SENSOR	HO2S (IF EQUIPPED)	CO ADJUSTING RESISTOR (W/O HO2S)	VSS	IGNITION TIMING ADJUSTING RESISTOR (IF EQUIPPED)	BLOWER FAN SWITCH	REAR DEFOGGER SWITCH (IF EQUIPPED)	LIGHTING SWITCH	IGNITION SWITCH	START SWITCH	STOP LAMP SWITCH	ABS CONTROL MODULE (IF EQUIPPED)	A/C CONTROL MODULE (IF EQUIPPED)	DIAGNOSIS SWITCH	TEST SWITCH
ELECTRIC CONTROL DEVICE	FUEL PUMP RELAY	○													○	○					
	FUEL INJECTOR	○	○	○	○	○	○	○	○							○		○			
	HO2S HEATER	○		○																	
	IAC VALVE	○	○	○	○	○	○			○		○	○	○			○	○	○		
	IGNITION COIL WITH IGNITER	○		○		○	○				○	○	○								○
	EGR VALVE	○		○	○	○	○														
	EVAP CANISTER PURGE VALVE	○		○	○	○															
	A/C CONTROL MODULE	○			○	○													○		
	RADIATOR FAN RELAY					○													○		
	MIL	○	○												○					○	
	MAIN RELAY														○						

DIAGNOSIS

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.
When diagnosing troubles, 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 "Engine Diagnostic Flow Table" in section 6.



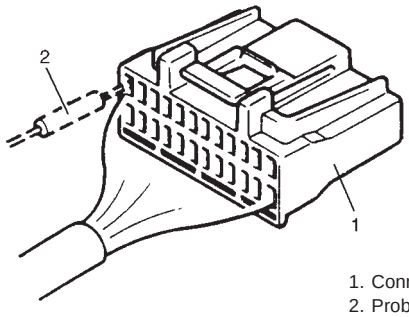
ON-BOARD DIAGNOSTIC SYSTEM

ECM performs on-board diagnosis (self-diagnosis) on the system and operates "CHECK ENGINE" lamp (malfunction indicator lamp) as follows.

- Malfunction indicator lamp ("CHECK ENGINE" light) lights when the ignition switch is turned ON position (but the engine at stop) regardless of the condition of Engine and emission control system. This is only to check the malfunction indicator lamp ("CHECK ENGINE" light) bulb and its circuit.
- If the areas monitored by ECM is free from any trouble after the engine start (while engine is running), malfunction indicator lamp ("CHECK ENGINE" light) turns OFF.
- When ECM detects a trouble which has occurred in the areas, it makes malfunction indicator lamp ("CHECK ENGINE" light) turn ON while the engine is running to warn the driver of such occurrence of trouble and at the same time it stores the exact trouble area in ECM back-up memory.

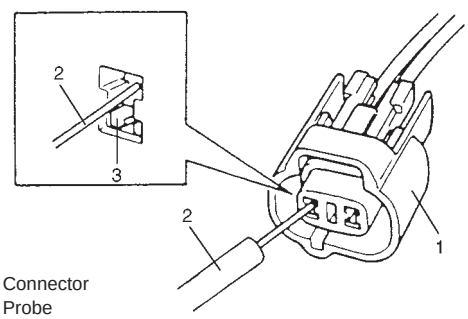
PRECAUTIONS IN DIAGNOSING TROUBLES

- Before identifying diagnostic trouble code, don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine. Such disconnection will erase memorized trouble in ECM memory.
- 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 the following conditions. Neglecting this check may cause damage to known-good ECM.
  – Resistance value of all relays, actuators is as specified respectively.
  – TP sensor and MAP sensor are in good condition and none of power circuits of these sensors is shorted to ground.



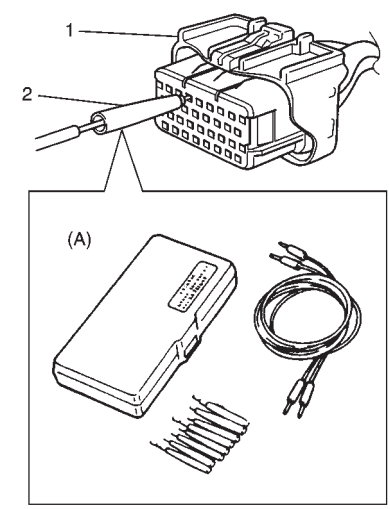
1. Connector
2. Probe

- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.



1. Connector
2. Probe
3. Where male terminal fits

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

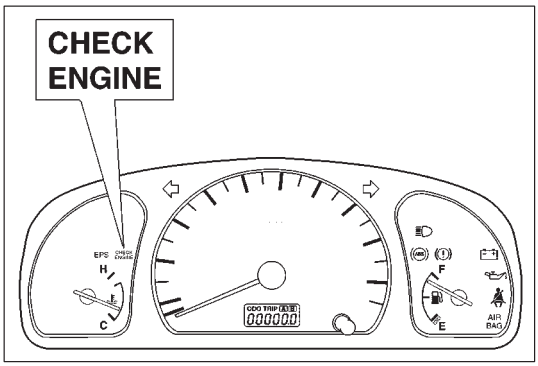


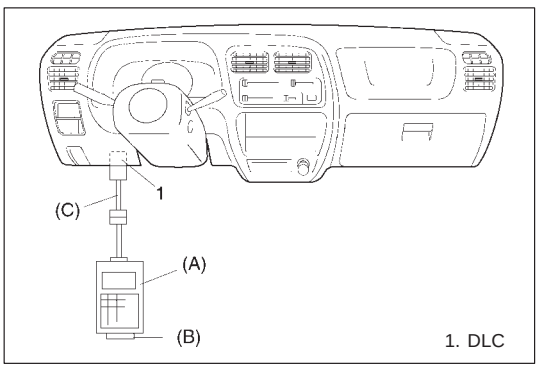
1. Connector
2. Probe

In case of such connector as shown, connect connector test adopter and probe.

Special tool
(A): 09932-76010
(Connector test adopter and shorting bar release tool)

- When checking connection of terminals, check its male half for bend and female half for excessive opening and both for locking (looseness), corrosion, dust, etc.





1. DLC

MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) CHECK

1) Turn ignition switch ON position, leaving engine OFF and check that malfunction indicator lamp ("CHECK ENGINE" light) lights. If lamp does not light up, go to "A-1 MIL Circuit Check" in this section. If lamp flushes, go to "A-2 MIL Circuit Check" in this section.
2) Start engine and check that malfunction indicator lamp ("CHECK ENGINE" light) turns OFF.
   If lamp remains ON, go to "Diagnostic Trouble Code Check" in this section.

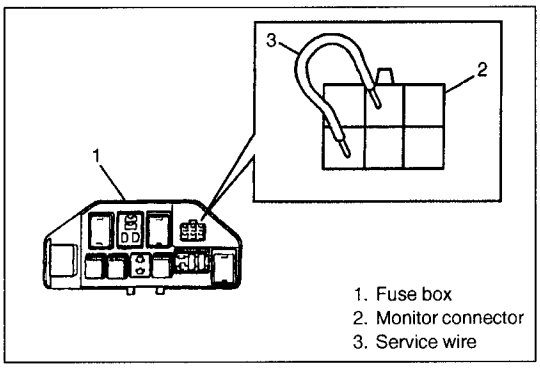
DIAGNOSTIC TROUBLE CODE (DTC) CHECK

[Using SUZUKI scan tool]

1) Check malfunction indicator lamp ("CHECK ENGINE" light). Refer to "Malfunction Indicator Lamp ("CHECK ENGINE" light) Check" in this section.
2) Turn ignition switch OFF position.
3) 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): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

4) Turn ignition switch ON position, leaving engine OFF.
5) Read DTC according to instructions displayed on SUZUKI scan tool and print it or write it down. Refer to SUZUKI scan tool operator's manual for further details.
   If communication between SUZUKI scan tool and ECM is not possible, check if SUZUKI scan tool is communicable by connecting it to ECM in another vehicle. If communication is possible in this case, SUZUKI scan tool is in good condition. Then check data link connector and serial data line (circuit) in vehicle with which communication was not possible.
6) After completing the check, turn ignition switch OFF position and disconnect SUZUKI scan tool from data link connector (DLC).



[In case no scan tool is available]

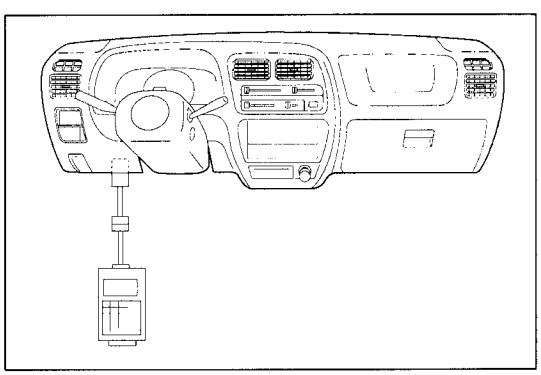
DTC will be indicated by flashing pattern of malfunction indicator lamp (MIL).

1) Connect monitor connector terminals as shwon with ignition switch in OFF position.
2) Turn ignition switch to ON position.
3) Read DTC.
   If MIL remains ON, go to "A-3 MIL Circuit Check" in this section.

NOTE:

- **If abnormality or malfunction lies in two or more areas, MIL ("CHECK ENGINE" light) indicates applicable codes three times each.**
- **Take a note of DTC indicated first.**

4) After completing check, turn ignition switch OFF position and disconnect service wire from monitor connector.



DIAGNOSTIC TROUBLE CODE (DTC) CLEARANCE

[Using SUZUKI scan tool]

1) Turn ignition switch OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) in the same manner as when making this connection for DTC check.
3) Turn ignition switch ON position, leaving engine OFF.
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 clearance, turn ignition switch OFF position and disconnect SUZUKI scan tool from data link connector (DLC).

[Not using SUZUKI scan tool]

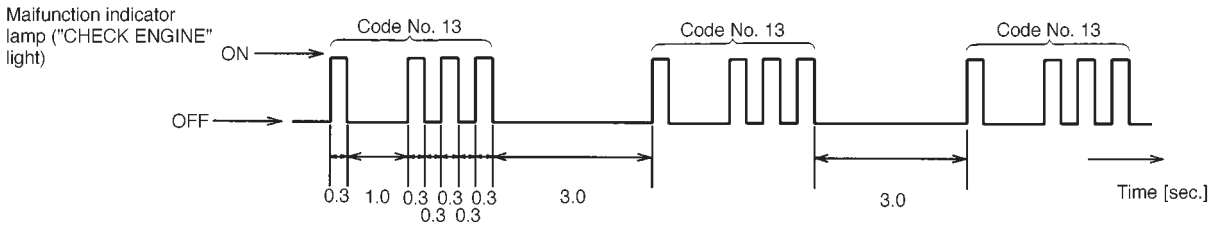
1) Turn ignition switch OFF position.
2) Disconnect battery negative cable for specified time below to erase diagnostic trouble code stored in ECM memory and reconnect it.

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 TABLE

EXAMPLE: When throttle position sensor is defective (Code No. 13)



DIAGNOSTIC TROUBLE CODE NO.		MALFUNCTION INDICATOR LAMP ("CHECK ENGINE" LIGHT) FLASHING PATTERN	DIAGNOSTIC ITEM	DIAGNOSIS
P0105	11		Manifold absolute pressure sensor	Go to DTC No.11 MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT in this section.
P0120	13		Throttle position sensor	Go to DTC No.13 THROTTLE POSITION SENSOR CIRCUIT in this section.
P1935	14		Heated oxygen sensor (if equipped)	Go to DTC No.14 HEATED OXYGEN SENSOR CIRCUIT in this section.
P0340	15		Camshaft position sensor	Go to DTC No.15 CAMSHAFT POSITION SENSOR CIRCUIT in this section.
P0500	16		Vehicle speed sensor	Go to DTC No.16 VEHICLE SPEED SENSOR CIRCUIT in this section.
P0110	18		Intake air temperature sensor	Go to DTC No.18 INTAKE AIR TEMPERATURE SENSOR CIRCUIT in this section.
P0115	19		Engine coolant temperature sensor	Go to DTC No.19 ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT in this section.
P1570	21		ABS signal (if equipped)	Go to DTC No.21 ABS SIGNAL CIRCUIT in this section.
P0335	23		Crankshaft position sensor	Go to DTC No.23 CRANKSHAFT POSITION SENSOR CIRCUIT in this section.
—	12		Normal	This code appears when none of the other codes (above codes) are identified.

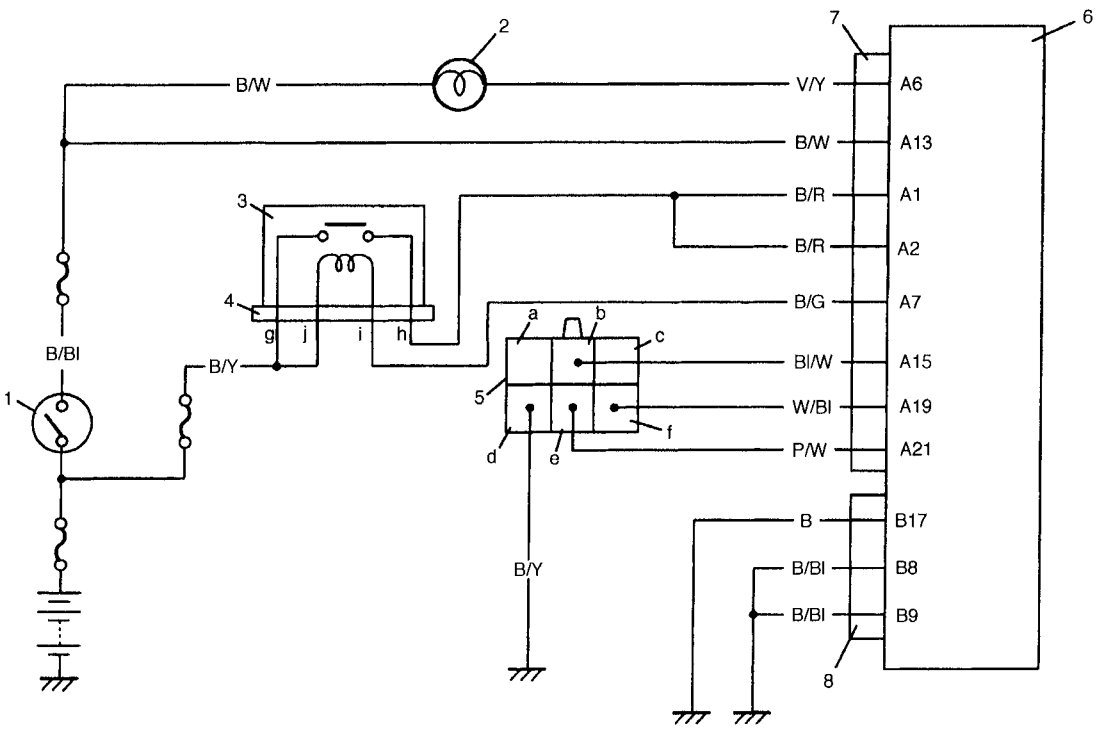
TABLE A-1 MALFUNCTION INDICATOR LAMP CIRCUIT CHECK
MIL DOES NOT COME ON AT IGNITION SWITCH ON LEAVING ENGINE OFF

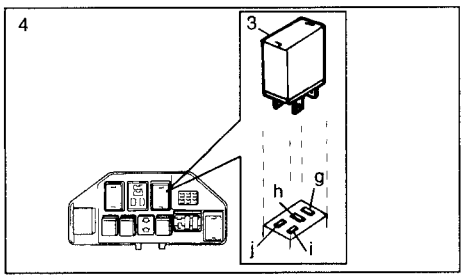
TABLE A-2 MALFUNCTION INDICATOR LAMP CIRCUIT CHECK
MIL FLASHES AT IGNITION SWITCH ON

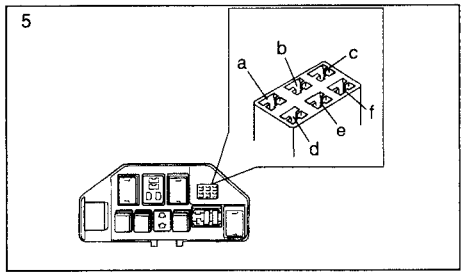
TABLE A-3 MALFUNCTION INDICATOR LAMP CIRCUIT CHECK
MIL DOES NOT FLASH, JUST REMAINS ON OR JUST REMAINS OFF EVEN WITH GROUNDING DIAGNOSIS SWITCH TERMINAL

TABLE A-4 ECM POWER AND GROUND CIRCUIT CHECK
MIL DOES NOT LIGHT AT IGNITION SWITCH ON AND ENGINE DOES NOT START THOUGH IT IS CRANKED UP

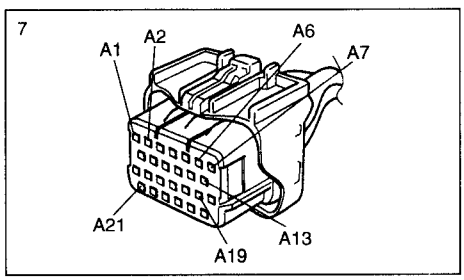
WIRING DIAGRAM

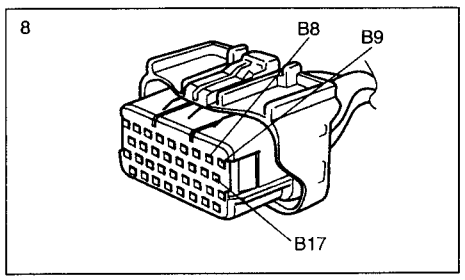






1. Ignition switch
2. Malfunction indicator lamp ("CHECK ENGINE" light)
3. Main relay
4. Main relay connector
5. Monitor connector
6. ECM
7. ECM connector (A)
8. ECM connector (B)





INSPECTION
TABLE A-1

STEP	ACTION	YES	NO
1	Did you perform "ENGINE DIAGNOSTIC FLOW TABLE" in Section 6?	Go to Step 2.	Go to "ENGINE DIAGNOSTIC FLOW TABLE".
2	Test switch terminal circuit check: 1) With ignition switch OFF position, disconnect ECM electrical connectors. 2) Check for continuity from "A21" terminal of ECM connector to ground. Is there continuity?	"P/W" wire shorted to ground circuit.	Go to Step 3.
3	MIL bulb and circuit check: 1) Turn ignition switch ON position, leaving engine OFF. 2) Measure voltage from "A6" terminal of ECM connector to ground. Is voltage within 10-14V?	Go to "A-4 ECM Power and Ground Circuit Check" in this section.	MIL bulb burned out. "V/Y" or "B/W" wire open or short.

Fig. for Step 2

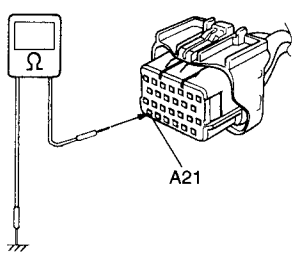


Fig. for Step 3

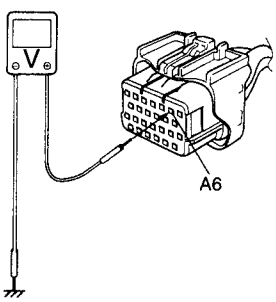


TABLE A-2

STEP	ACTION	YES	NO
1	Did you perform "ENGINE DIAGNOSTIC FLOW TABLE" in Section 6?	Go to Step 2.	Go to "ENGINE DIAGNOSTIC FLOW TABLE".
2	Diagnosis switch terminal circuit check: 1) With ignition switch OFF position, disconnect ECM electrical connectors. 2) Check for continuity from "A15" terminal of ECM connector to ground. Is there continuity?	"Bl/W" wire short.	Substitute a known-good ECM and recheck.

Fig. for Step 2

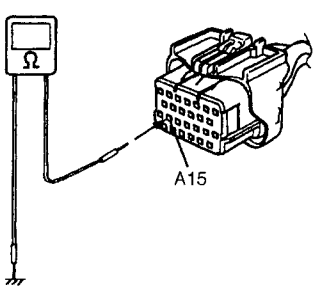


TABLE A-3

STEP	ACTION	YES	NO
1	Did you perform "ENGINE DIAGNOSTIC FLOW TABLE" in Section 6?	Go to Step 2.	Go to "ENGINE DIAGNOSTIC FLOW TABLE".
2	Diagnosis switch terminal circuit check: 1) With ignition switch OFF position, disconnect ECM electrical connectors. 2) Connect jumper wire from monitor connector "b" terminal to monitor connector "d" terminal. 3) Check for continuity from "A15" terminal of ECM connector to ground. Is there continuity?	Go to Step 3.	"Bl/W" or "B/Y" wire open.
3	Test switch terminal circuit check: 1) Check for continuity from "A21" terminal of ECM connector to ground. Is there continuity?	"P/W" wire short.	Poor connection of ECM connector. If OK, substitute a known-good ECM and recheck.

Fig. for Step 2

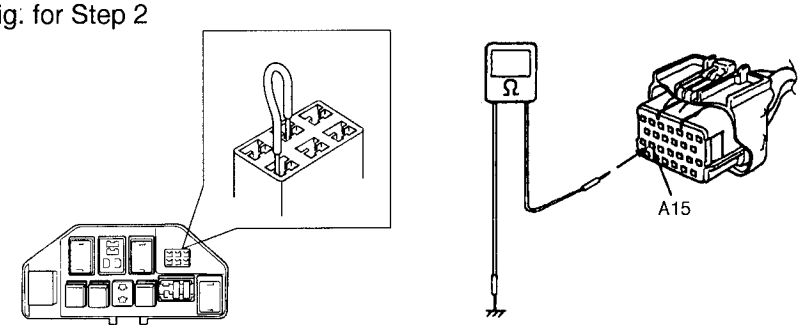


Fig. for Step 3

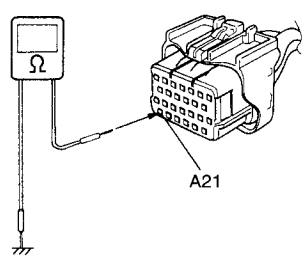


TABLE A-4

STEP	ACTION	YES	NO
1	Did you perform "A-1 Malfunction Indicator Lamp Circuit Check" in this section?	Go to Step 2.	Go to "A-1 Malfunction Indicator Lamp Circuit Check".
2	Ignition switch signal check: 1) With ignition switch OFF position, disconnect ECM electrical connectors. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from "A13" terminal of ECM connector to ground. Is voltage within 10-14V?	Go to step 3.	"B/W" wire open or short.
3	Main relay circuit check: 1) With ignition switch OFF position, remove main relay. 2) Measure voltage from "g" terminal of main relay connector to ground and from "j" terminal of main relay connector to ground. Is each voltage within 10-14V?	Go to Step 4.	"B/Y" wire open.
4	Main relay inspection: 1) Perform "Main Relay Inspection" in this section. Is main relay functioning normally?	Go to Step 5.	Faulty main relay.

STEP	ACTION	YES	NO
5	Main relay circuit check: 1) Install main relay. 2) Measure voltage from “A7” terminal of ECM connector to ground. Is voltage within 10-14V?	Go to Step 6.	“B/G” wire open.
6	ECM power circuit check: 1) Connect jumper wire from “A7” terminal of ECM connector to ground. 2) Measure voltage from “A1” terminal of ECM connector to ground and from “A2” terminal of ECM connector to ground. Is each voltage within 10-14V?	Go to Step 7.	“B/R” wire open.
7	ECM ground circuit check: 1) Check for continuity from “B8” terminal of ECM connector to ground, from “B9” terminal of ECM connector to ground and from “B17” terminal of ECM connector to ground. Are there continuity?	Poor connection of ECM connector. If OK, substitute a known-good ECM and recheck.	“B” or “B/Bl” wire open.

Fig. for Step 2

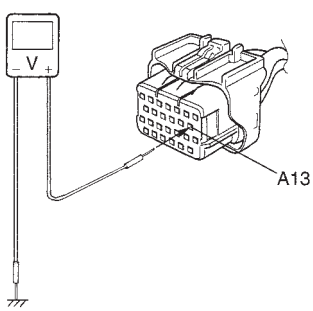


Fig. for Step 3

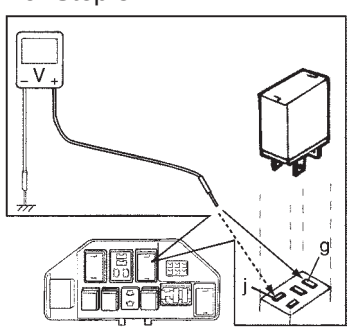


Fig. for Step 5

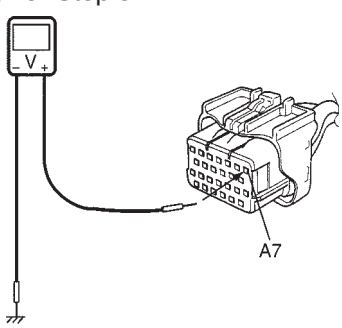


Fig. for Step 6

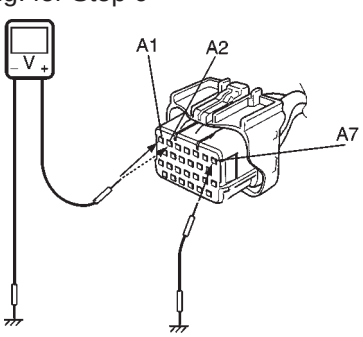
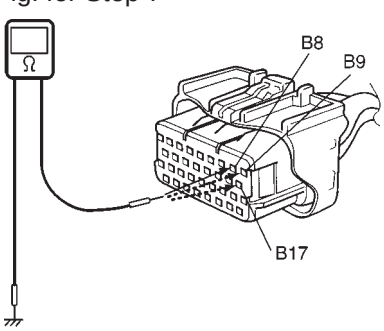


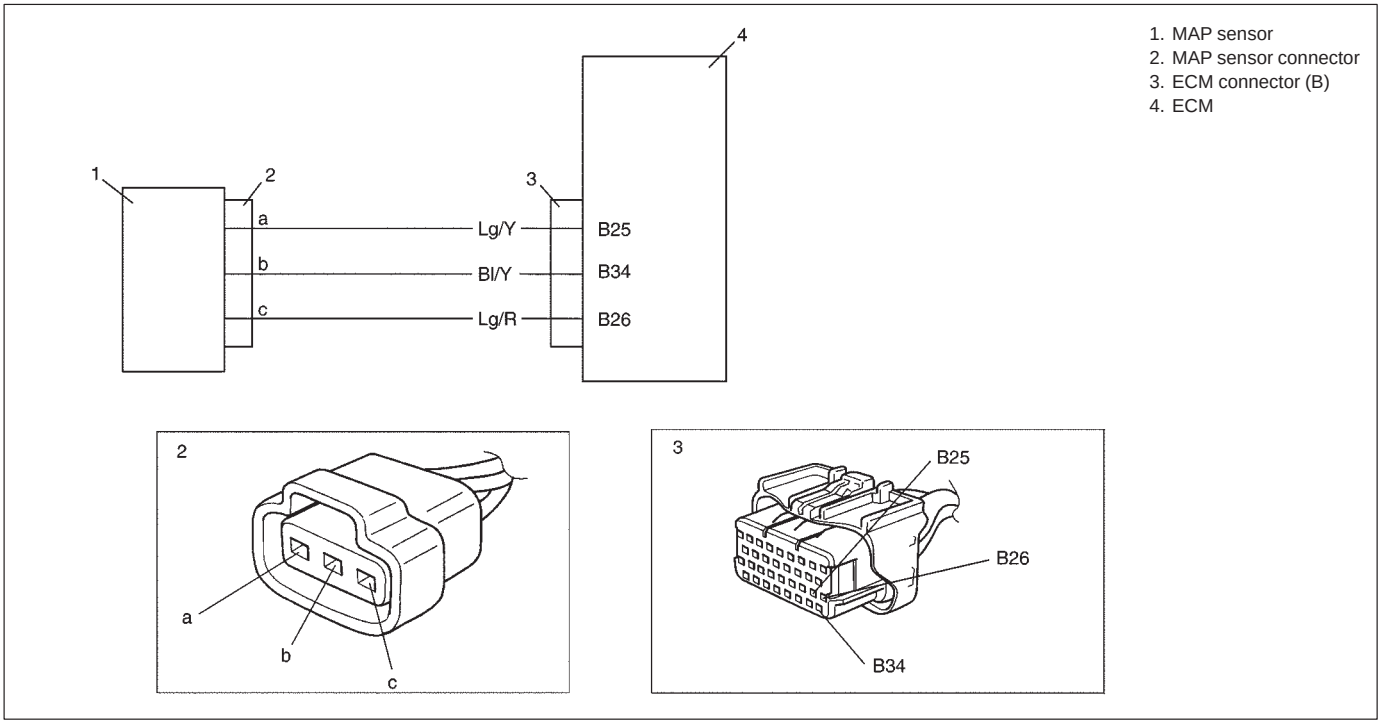
Fig. for Step 7



DTC NO.11 MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT

(SIGNAL VOLTAGE LOW, HIGH OR PERFORMANCE PROBLEM)

WIRING DIAGRAM



TROUBLE SHOOTING

CAUTION:
Do not connect from terminal "b" to "c" of MAP sensor connector.

STEP	ACTION	YES	NO
1	Did you perform "ENGINE DIAGNOSTIC FLOW TABLE" in Section 6?	Go to Step 2.	Go to "ENGINE DIAGNOSTIC FLOW TABLE".
2	1) With ignition switch OFF position, disconnect MAP sensor electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal "c" of MAP sensor connector to ground. Is voltage within 4-5V?	Go to Step 3.	"Lg/R" wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
3	1) Measure voltage from terminal "a" of MAP sensor connector to ground. Is voltage within 4-5V?	Go to Step 4.	"Lg/Y" wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
4	1) Connect jumper wire from terminal "a" to "b" of MAP sensor connector. 2) Measure voltage from terminal "a" of MAP sensor connector to ground. Is voltage below 0.15V?	Go to Step 5.	"Bl/Y" wire open. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.

STEP	ACTION	YES	NO
5	1) Remove MAP sensor. 2) Visually inspect MAP sensor air pressure inlet passage for clogging. Was any blockage found?	Clean air passage or replace as necessary.	Go to Step 6.
6	1) Perform “MAP sensor inspection” in this section. Is voltage within specified value?	Poor connection of MAP sensor connector terminal. If OK, substitute a known-good ECM and recheck.	Faulty MAP sensor.

NOTE:
Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

Fig. for Step 2

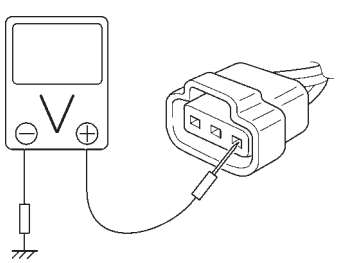


Fig. for Step 3

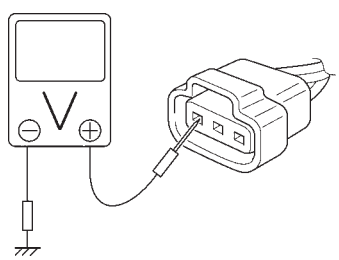


Fig. for Step 4

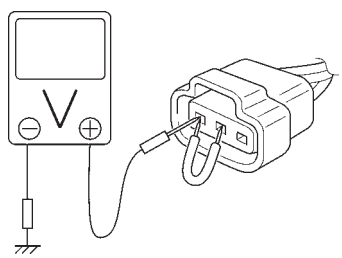
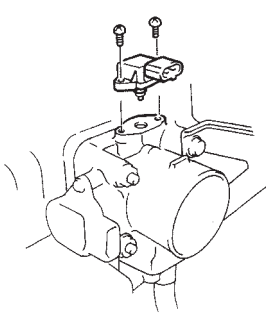


Fig. for Step 5

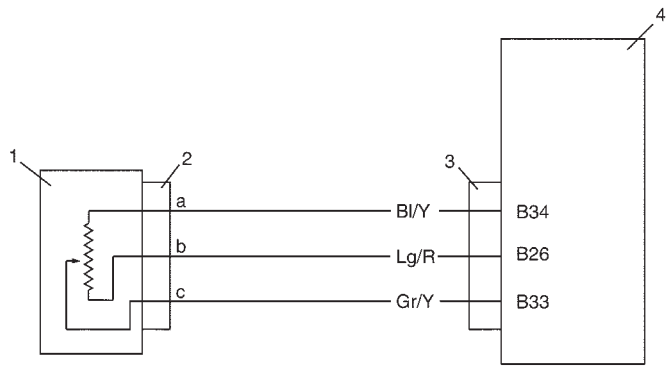


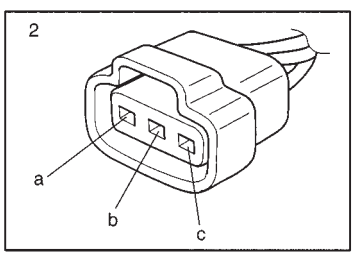
DTC NO.13 THROTTLE POSITION SENSOR CIRCUIT

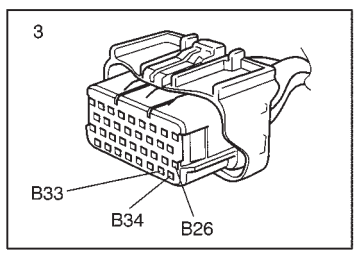
(SIGNAL VOLTAGE LOW OR HIGH)

WIRING DIAGRAM

1. TP sensor
2. TP sensor connector
3. ECM connector (B)
4. ECM







TROUBLE SHOOTING

CAUTION:
Do not connect from terminal “a” to “b” of TP sensor connector.

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, disconnect TP sensor electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal “b” of TP sensor connector to ground. Is voltage within 4-5V?	Go to Step 3.	“Lg/R” wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
3	1) Measure voltage from terminal “c” of TP sensor connector to ground. Is voltage within 4-5V?	Go to Step 4.	“Gr/Y” wire open. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.

STEP	ACTION	YES	NO
4	1) Connect jumper wire from terminal “a” to “c” of TP sensor connector. 2) Measure voltage from terminal “c” of TP sensor connector to ground. Is voltage below 0.15V?	Go to Step 5.	“Bl/Y” wire open. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
5	1) Perform “TP sensor inspection” in this section. Is resistance within specified value?	Poor connection of TP sensor connector terminal. If OK, substitute a known-good ECM and recheck.	Faulty TP sensor.

NOTE:
Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

Fig. for Step 2

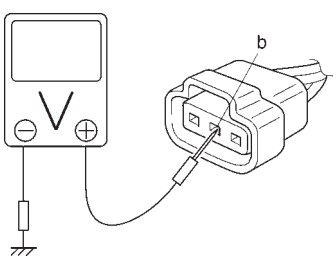


Fig. for Step 3

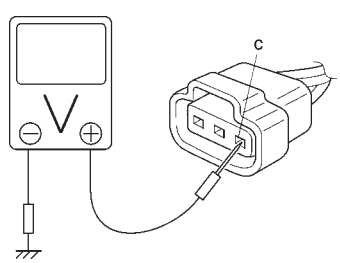
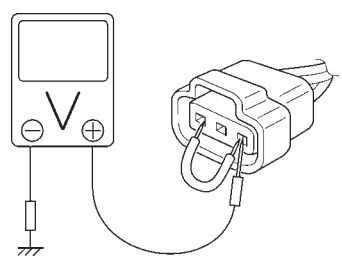


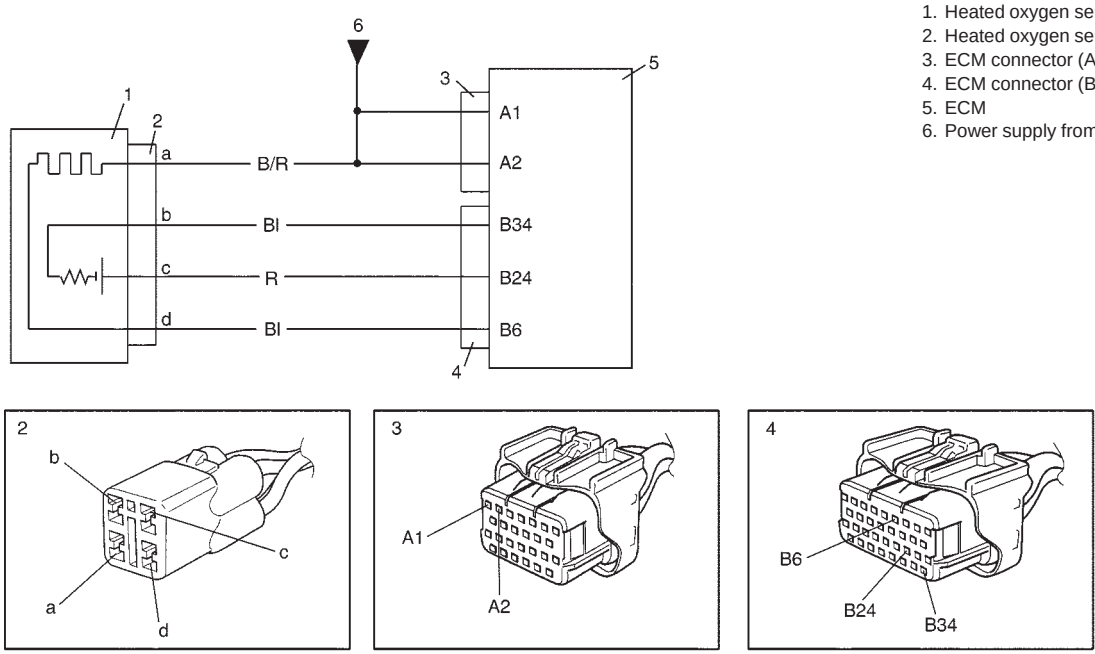
Fig. for Step 4



DTC NO.14 HEATED OXYGEN SENSOR CIRCUIT

(SIGNAL VOLTAGE LOW)

WIRING DIAGRAM



TROUBLE SHOOTING

NOTE:

- **Before diagnosing trouble according to flow table given below, check to make sure that following system and parts other than Electronic Fuel Injection system are in good condition.**
  - **Air cleaner (clogged)**
  - **Vacuum leaks (air inhaling)**
  - **Spark plugs (contamination, gap)**
  - **High-tension cords (crack, deterioration)**
  - **Ignition timing**
  - **Engine compression**
  - **Any other system and parts which might affect A/F mixture or combustion.**
- **If code No.14 and another code No. are indicated together, the latter has priority. Therefore, check and correct what is represented by that code No. first and then proceed to the following check.**

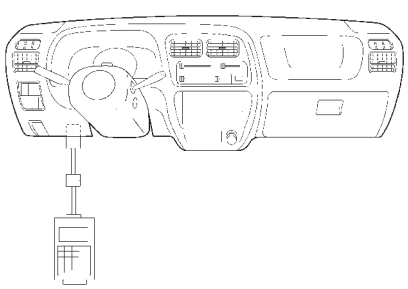
STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, install SUZUKI scan tool. 2) Start engine. 3) Run engine to normal operating temperature. 4) Maintain engine speed at 2000RPM for 60 seconds. 5) Using data list function of SUZUKI scan tool, monitor oxygen sensor output voltage “02S” with engine running at 2000RPM. Does voltage switch below and above 0.55V?	Intermittent trouble. If OK, substitute a known-good ECM and recheck.	Go to Step 3.

STEP	ACTION	YES	NO
3	1) Stop engine. 2) With ignition switch OFF position, disconnect ECM electrical connectors and oxygen sensor electrical connector. 3) Check “R” and “Bl” wires for open or short. Are “R” and “Bl” wires in good condition?	Go to Step 4.	Repair or replace.
4	1) Substitute a known-good oxygen sensor. Refer to “Oxygen Sensor Removal and Installation”. 2) Connect ECM electrical connectors and oxygen sensor electrical connector. 3) Install SUZUKI scan tool. 4) Start engine. 5) Run engine to normal operating temperature. 6) Maintain engine speed at 2000RPM for 60 seconds. 7) Using data list function of SUZUKI scan tool, monitor oxygen sensor output voltage “02S” with engine running at 2000RPM. Does voltage switch below and above 0.55V?	Faulty oxygen sensor.	Poor connection of ECM connector terminal or oxygen sensor connector terminal. If OK, substitute a known-good ECM and recheck.

NOTE:

Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

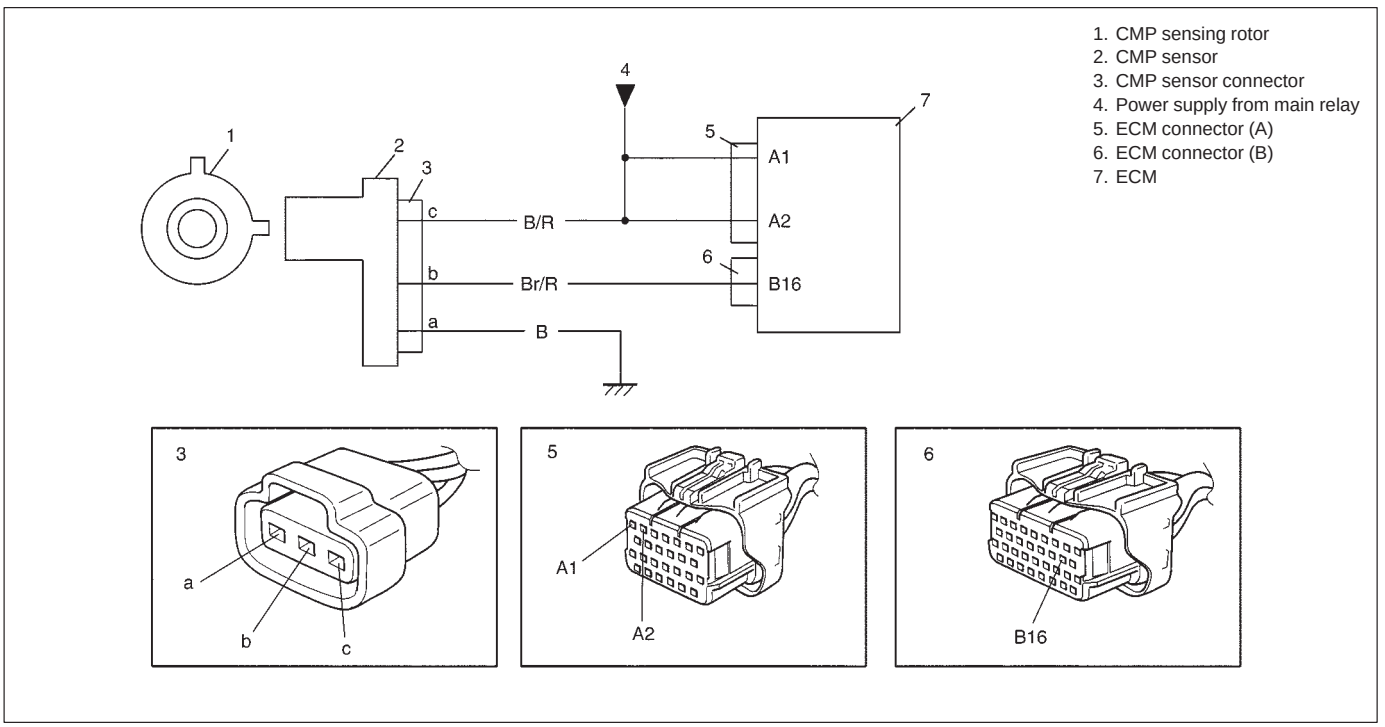
Fig. for Step 2, 4



DTC NO.15 CAMSHAFT POSITION SENSOR CIRCUIT

(NO SIGNAL FROM CMP SENSOR WITH ECM RECEIVING 30 PLUSES FROM CKP SENSOR)

WIRING DIAGRAM



TROUBLE SHOOTING

CAUTION:
Do not connect from terminal “a” to “c” of CMP sensor connector.

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, disconnect CMP sensor electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal “c” to “a” of CMP sensor connector. Is voltage within 10-14V?	Go to Step 3.	“B/R” or “B” wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
3	1) Measure voltage from terminal “b” of CMP sensor connector to ground. Is voltage within 4-5V?	Go to Step 4.	“Br/R” wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.

STEP	ACTION	YES	NO
4	1) Turn ignition switch OFF position. 2) Remove CMP sensor. 3) Visually inspect CMP sensor signal rotor for damage with turning crankshaft. Is CMP sensor signal rotor in good condition?	Go to Step 5.	Faulty CMP sensor signal rotor.
5	1) Install a known-good CMP sensor. Refer to "CMP Sensor Installation" in this section. 2) Start engine and run it for 5 seconds. 3) Stop engine and check for DTC. Is DTC NO.15 detected?	Poor connection of CMP sensor connector terminal. If OK, substitute a known-good ECM and recheck.	Faulty CMP sensor.

NOTE:
Upon completion of inspection and repair work, perform "DTC Confirmation Procedure" in this section and confirm that the trouble has been corrected.

Fig. for Step 2

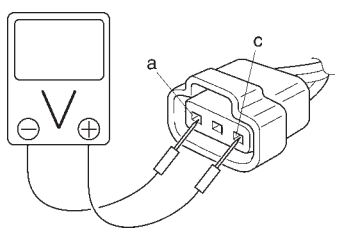


Fig. for Step 3

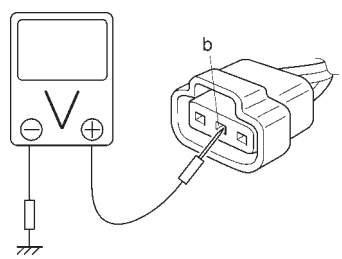
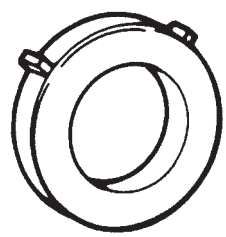


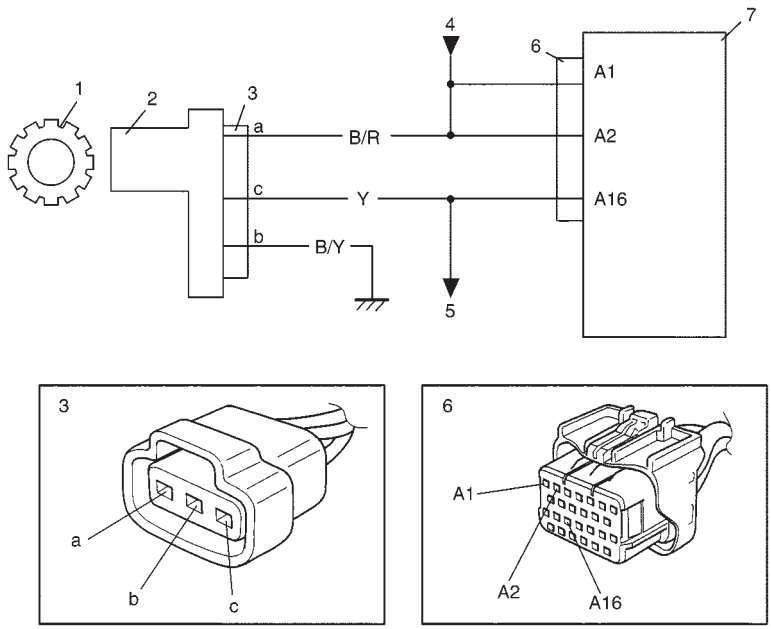
Fig. for Step 4



DTC NO.16 VEHICLE SPEED SENSOR CIRCUIT

(NO VEHICLE SPEED SENSOR SIGNAL EVEN THOUGH FUEL HAS BEEN CUT FOR MORE THAN 4 SECONDS)

WIRING DIAGRAM



1. VSS sensing rotor
2. VSS
3. VSS connector
4. Power supply from main relay
5. Speedometer, Speed warning buzzer, P/S control module
6. ECM connector (A)
7. ECM

TROUBLE SHOOTING

CAUTION:
Do not connect from terminal "a" to "b" of VSS connector.

STEP	ACTION	YES	NO
1	Did you perform "ENGINE DIAGNOSTIC FLOW TABLE" in Section 6?	Go to Step 2.	Go to"ENGINE DIAGNOSTIC FLOW TABLE".
2	Does speedometer indicate vehicle speed?	"Y" wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.	Go to Step 3.
3	1) With ignition switch OFF position, disconnect VSS electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal "a" to "b" of VSS connector. Is voltage within 10-14V?	Go to Step 4.	"B/R" or "B/Y" wire open or short.
4	1) Measure voltage from terminal "c" of VSS connector to ground. Is voltage more than 4V?	Go to Step 5.	Go to Step 6.

STEP	ACTION	YES	NO
5	1) Remove VSS. 2) Visually inspect VSS sensor signal rotor for damage. Was any damage found?	Faulty VSS signal rotor.	Poor connection of VSS connector terminal. If OK, substitute a known-good VSS and recheck.
6	1) Turn ignition switch OFF position. 2) Disconnect combination meter electrical connectors. Refer to Section 8. 3) Disconnect speed warning buzzer electrical connectors (if equipped). 4) Disconnect P/S control module connector (if equipped). 5) Turn ignition switch ON position, leaving engine OFF. 6) Measure voltage from terminal “c” of VSS connector to ground. Is voltage within 4-5V?	Faulty speedometer. Faulty speed warning buzzer. Faulty P/S control module.	“Y” wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.

NOTE:

Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

Fig. for Step 3

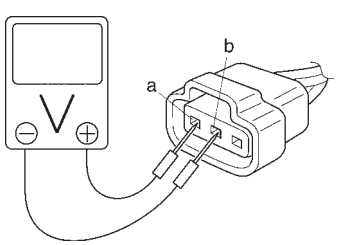
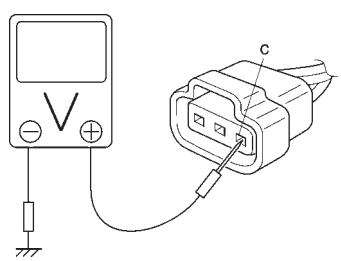


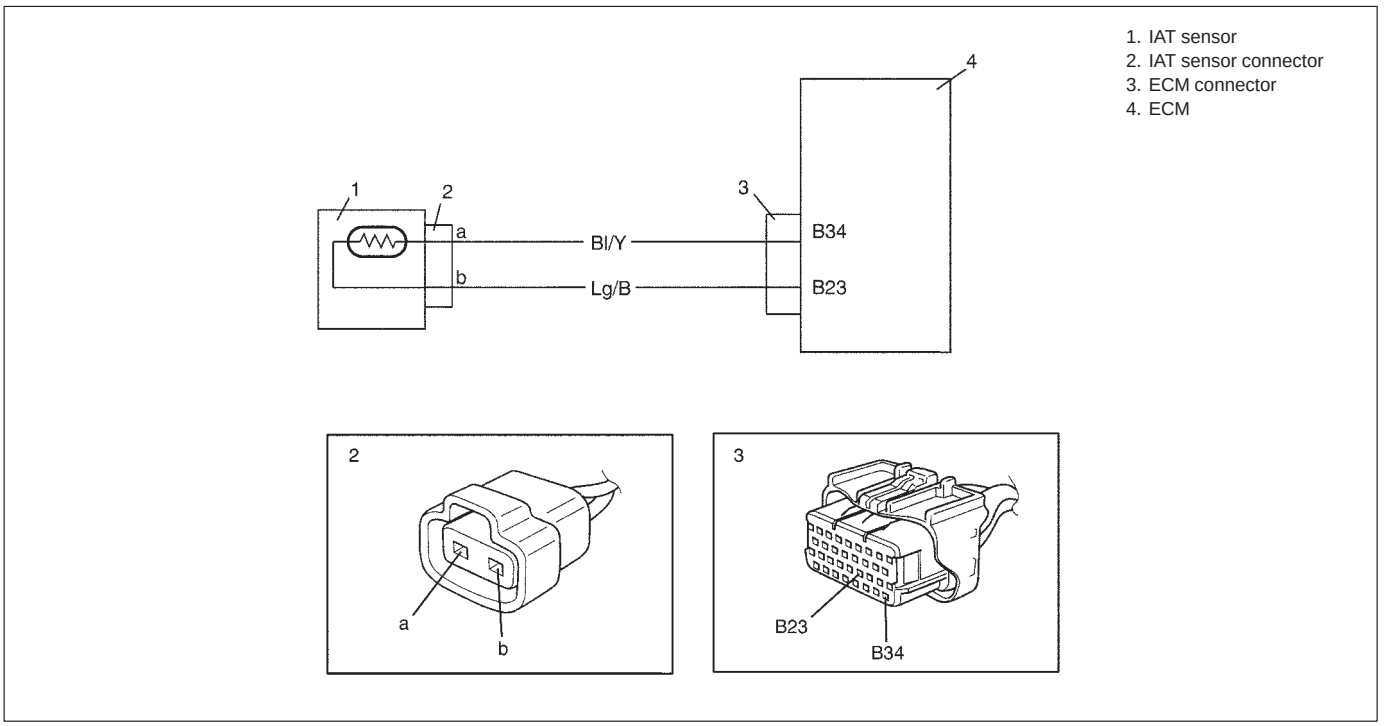
Fig. for Step 4, 6



DTC NO.18 INTAKE AIR TEMPERATURE SENSOR CIRCUIT

(SIGNAL VOLTAGE LOW OR HIGH)

WIRING DIAGRAM



TROUBLE SHOOTING

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, disconnect IAT sensor electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal “b” of IAT sensor connector to ground. Is voltage within 4-5V?	Go to Step 3.	“Lg/B” wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
3	1) Connect jumper wire from terminal “a” to “b” of IAT sensor connector. 2) Measure voltage from terminal “b” of IAT sensor connector to ground. Is voltage below 0.15V?	Go to Step 4.	“Bl/Y” wire open. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
4	1) Perform “IAT sensor inspection” in this section. Is resistance within specified value?	Poor connection of IAT sensor connector terminal. If OK, substitute a known-good ECM and recheck.	Faulty IAT sensor.

NOTE:

Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

Fig. for Step 2

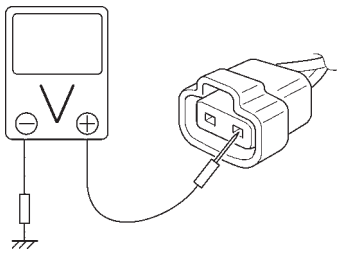
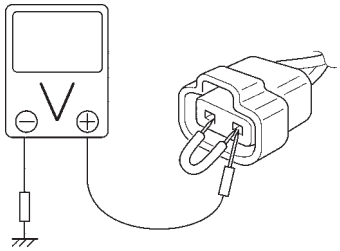


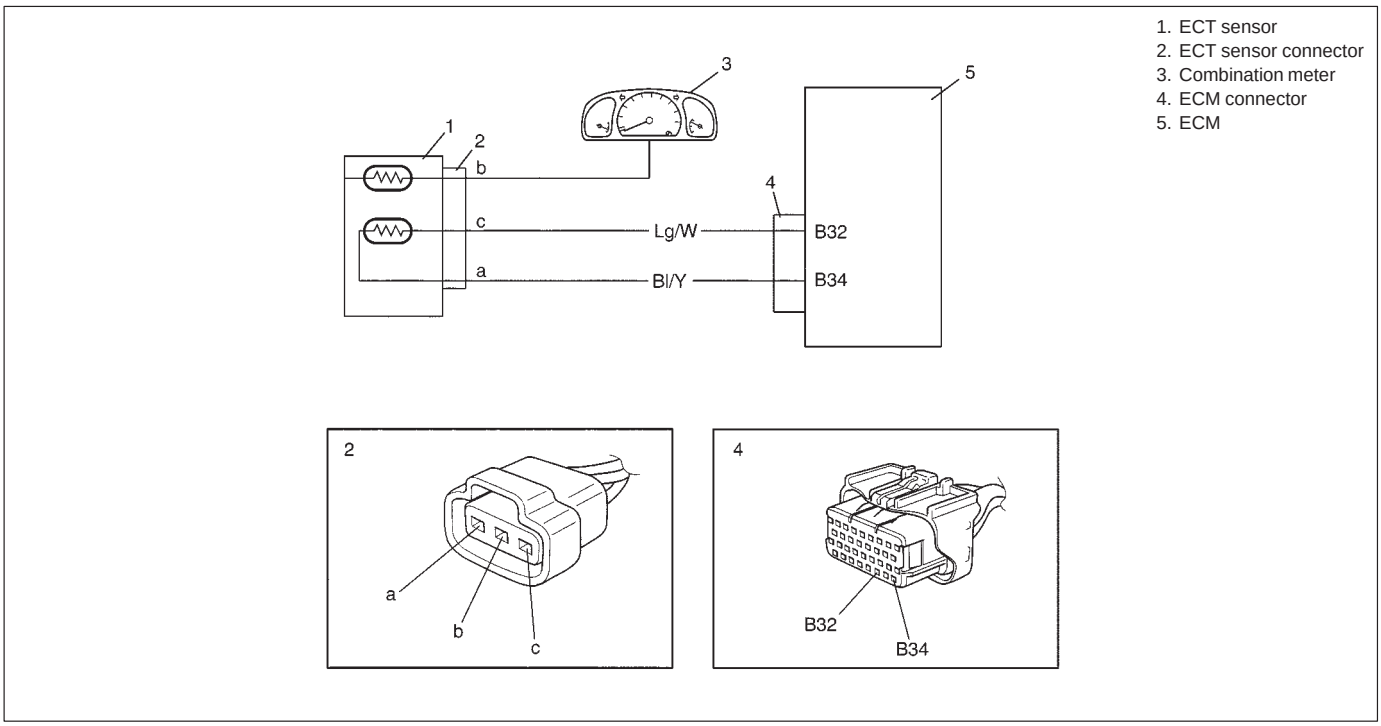
Fig. for Step 3



DTC NO.19 ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT

(SIGNAL VOLTAGE LOW OR HIGH)

WIRING DIAGRAM



TROUBLE SHOOTING

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, disconnect ECT sensor electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal “c” of ECT sensor connector to ground. Is voltage within 4-5V?	Go to Step 3.	“Lg/W” wire open or short. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
3	1) Connect jumper wire from terminal “a” to “c” of ECT sensor connector. 2) Measure voltage from terminal “c” of IAT sensor connector to ground. Is voltage below 0.15V?	Go to Step 4.	“BI/Y” wire open. Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck.
4	1) Perform “ECT sensor inspection” in this section. Is resistance within specified value?	Poor connection of ECT sensor connector terminal. If OK, substitute a known-good ECM and recheck.	Faulty ECT sensor.

NOTE:

Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

Fig. for Step 2

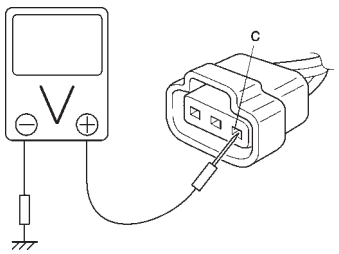
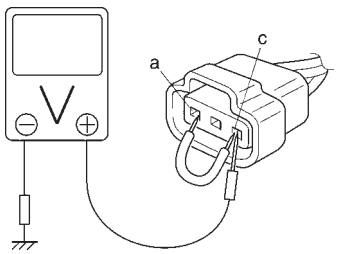


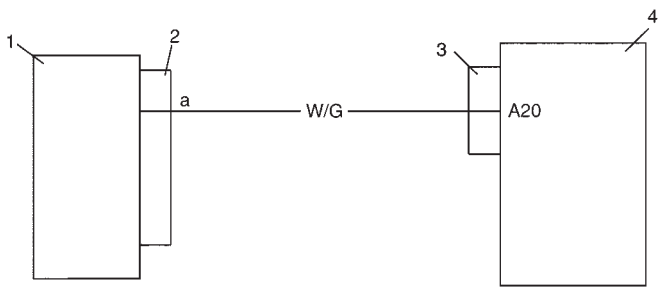
Fig. for Step 3



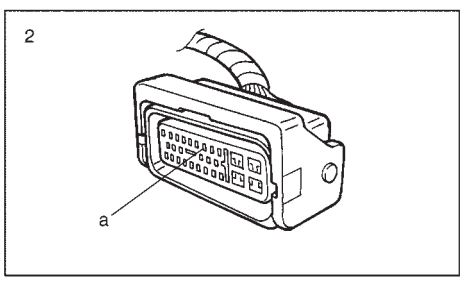
DTC NO.21 ABS SIGNAL CIRCUIT

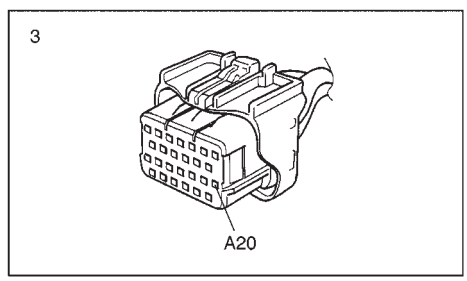
(ABS SIGNAL INPUTTED AT ENGINE STARTING)

WIRING DIAGRAM



1. ABS control module
2. ABS control module connector
3. ECM connector (A)
4. ECM





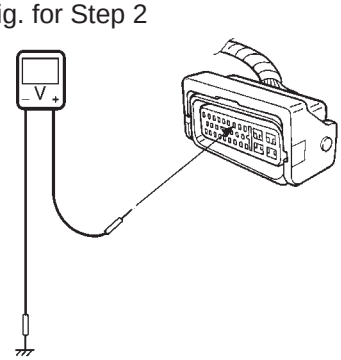
TROUBLE SHOOTING

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, disconnect ABS control module electrical connector. 2) Turn ignition switch ON position, leaving engine OFF. 3) Measure voltage from terminal “a” of ABS control module connector to ground. Is voltage within 10-14V?	Substitute a known-good ABS control module and recheck.	“W/G” wire open or short. If OK, substitute a known-good ECM and recheck.

NOTE:

Upon completion of inspection and repair work, perform “Diagnostic Trouble Code Clearance” in Section 5E for clearing DTC of ABS and “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

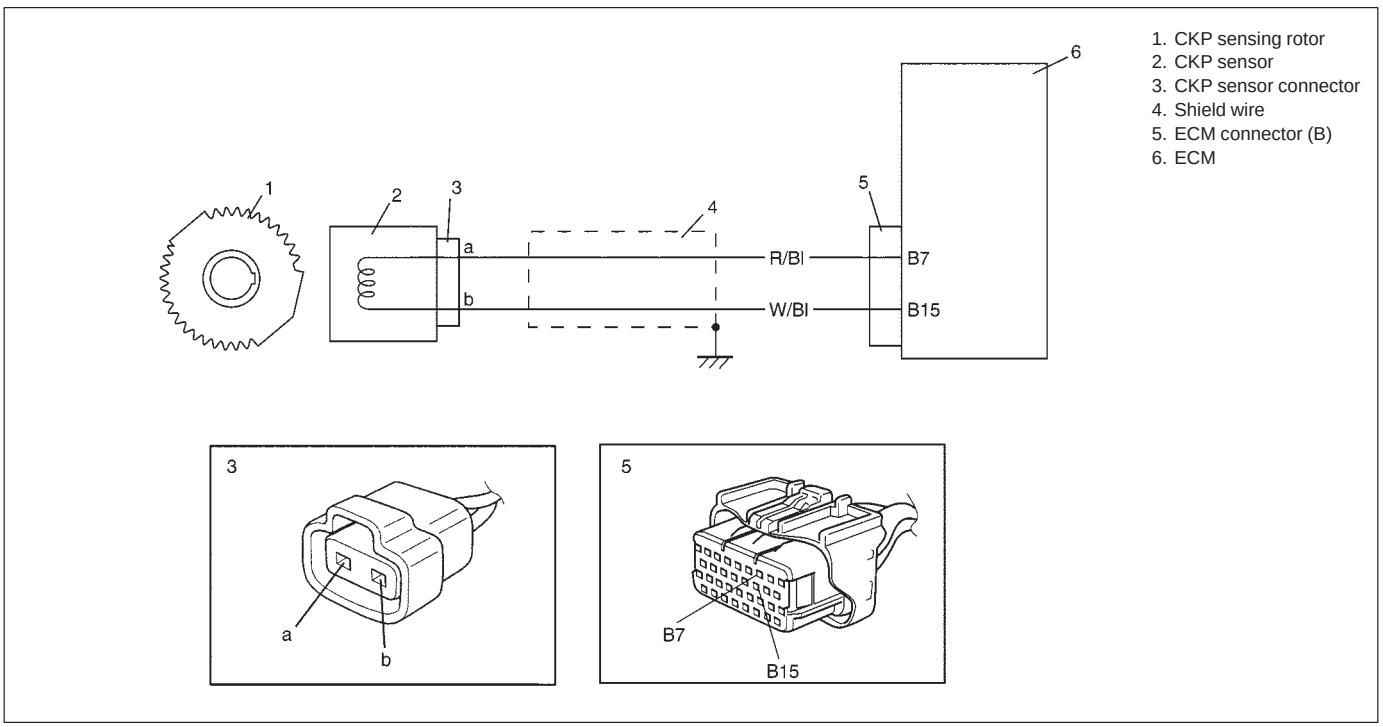
Fig. for Step 2



DTC NO.23 CRANKSHAFT POSITION SENSOR CIRCUIT

(NO SIGNAL FROM CKP SENSOR EVEN THOUGH ENGINE STARTER SIGNAL HAS BEEN INPUTTED FOR MORE THAN 2 SECONDS)

WIRING DIAGRAM



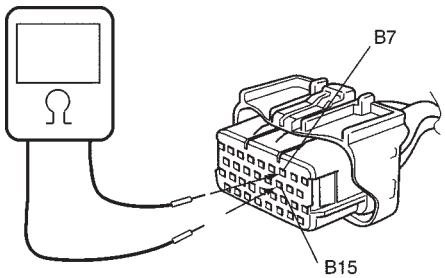
TROUBLE SHOOTING

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to“ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, disconnect ECM electrical connectors. 2) Measure resistance from terminal “a” to “b” of ECM connector. Is resistance within 360-460Ω at 20°C (68°F)?	Go to Step 3.	“W/Bl” or “R/Bl” wire open or short. Poor connection of CKP sensor connector terminal.
3	1) Perform “CKP Sensor On-vehicle Inspection” in this section. Is resistance within specified value?	Go to Step 4.	Faulty CKP sensor.
4	1) Remove CKP sensor. 2) Visually inspect CKP sensor signal rotor for damage. Was any damage found?	Faulty CKP sensor signal rotor.	Poor connection of ECM connector terminal. If OK, substitute a known-good ECM and recheck CKP.

NOTE:

Upon completion of inspection and repair work, perform “DTC Confirmation Procedure” in this section and confirm that the trouble has been corrected.

Fig. for Step 2



DIAGNOSTIC TROUBLE CODE (DTC) CONFIRMATION PROCEDURE

WARNING:
- **When carry out road test, select a safe place where no man or no running vehicle is seen so as to prevent any 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.**

DTC NO. 11

1) Clear DTC. Refer to “DTC Clearance” in this section.
2) Start engine.
3) Maintain engine speed at 2000RPM for 5 seconds.
4) Check DTC. Refer “DTC Check” in this section.

DTC NO. 13 18 19

1) Clear DTC. Refer to “DTC Clearance” in this section.
2) Turn ignition switch ON position for 5 seconds or more.
3) Check DTC. Refer “DTC Check” in this section.

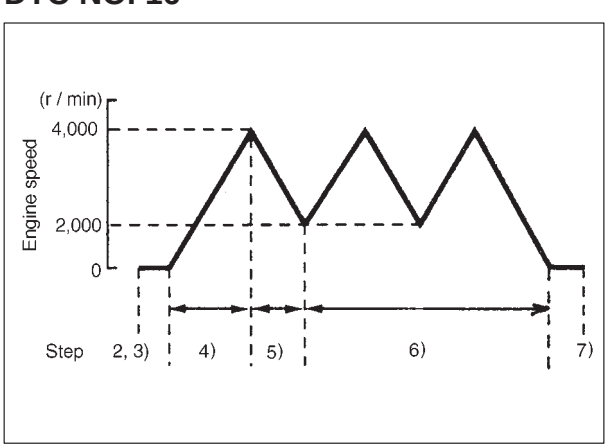
DTC NO. 14

1) Clear DTC. Refer to “DTC Clearance” in this section.
2) With ignition switch OFF position, install SUZUKI scan tool.
3) Start engine.
4) Run engine to normal operating temperature.
5) Maintain engine speed at 2000RPM for 60 seconds.
6) Using SUZUKI scan tool, monitor oxygen sensor output voltage with engine running at 2000RPM.
7) Confirm that oxygen sensor output voltage switches below and above 0.55V.

DTC NO. 15 21

1) Clear DTC. Refer to “DTC Clearance” in this section.
2) Start engine and run it for 5 seconds or more then stop.
3) Check DTC. Refer “DTC Check” in this section.

DTC NO. 16



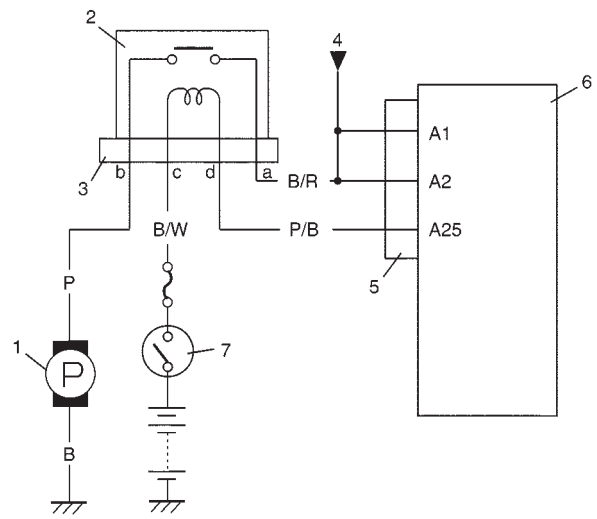
1) Clear DTC. Refer to “DTC Clearance” in this section.
2) Start engine.
3) Run engine to normal operating temperature.
4) Increase engine speed to 4,000 RPM in 3rd gear in case of M/T model and “2” range in case of A/T model.
5) Release accelerator pedal and with engine brake applied, keep vehicle coasting for 7 to 10 seconds till engine speed reaches 2,000RPM.
6) Repeat above step 4) and 5) 3 times or more.
7) Stop vehicle.
8) Check DTC. Refer to “DTC Check” in this section.

DTC NO. 23

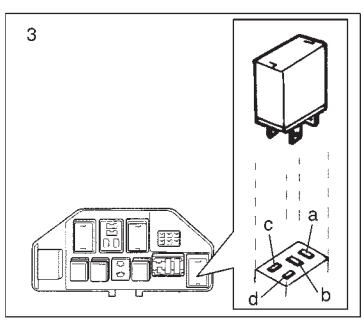
1) Clear DTC. Refer to “DTC Clearance” in this section.
2) Cranking engine for 3 seconds.
3) Check DTC. Refer to “DTC Check” in this section.

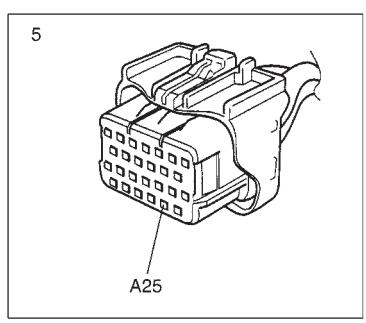
TABLE B-1 FUEL PUMP CIRCUIT CHECK

WIRING DIAGRAM



1. Fuel pump
2. Fuel pump relay
3. Fuel pump relay connector
4. Power supply from main relay
5. ECM connector (A)
6. ECM
7. Ignition switch





SYSTEM DESCRIPTION

Fuel pump relay is turned ON
- for 2 sec. after the ignition switch is turned ON position.
- while start engine signal is inputted.
- while engine is running.

INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	Fuel pump operation check: 1) Remove fuel filler cap. 2) Prepare to listen for fuel pump operation at fuel filler pipe. 3) Turn ignition switch ON position, leaving engine OFF. 4) Listen for fuel pump operation. Does fuel pump operate for approximately 2 seconds?	Fuel pump circuit is in good condition.	Go to Step 3.

STEP	ACTION	YES	NO
3	Fuel pump circuit check: 1) With ignition switch OFF position, remove fuel pump relay. 2) Connect jumper wire from "a" terminal of fuel pump relay connector to "b" terminal of fuel pump relay connector. 3) Turn ignition switch ON position, leaving engine OFF. 4) Listen for fuel pump operation. Does fuel pump operate?	Go to Step 4.	"B/R", "P" or "B" wire open or short. Faulty fuel pump.
4	Fuel pump relay inspection: 1) Perform "Fuel Pump Relay Inspection" in this section. Is main relay in good condition?	"B/W" or "P/B" wire open or short. If OK, substitute a known-good ECM and recheck.	Faulty fuel pump relay.

Fig. for Step 2

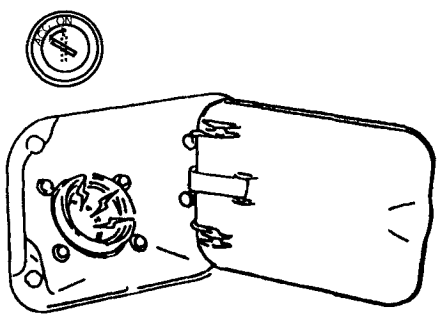


Fig. for Step 3

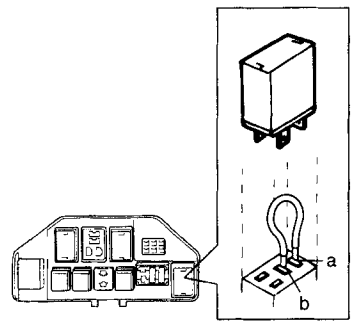
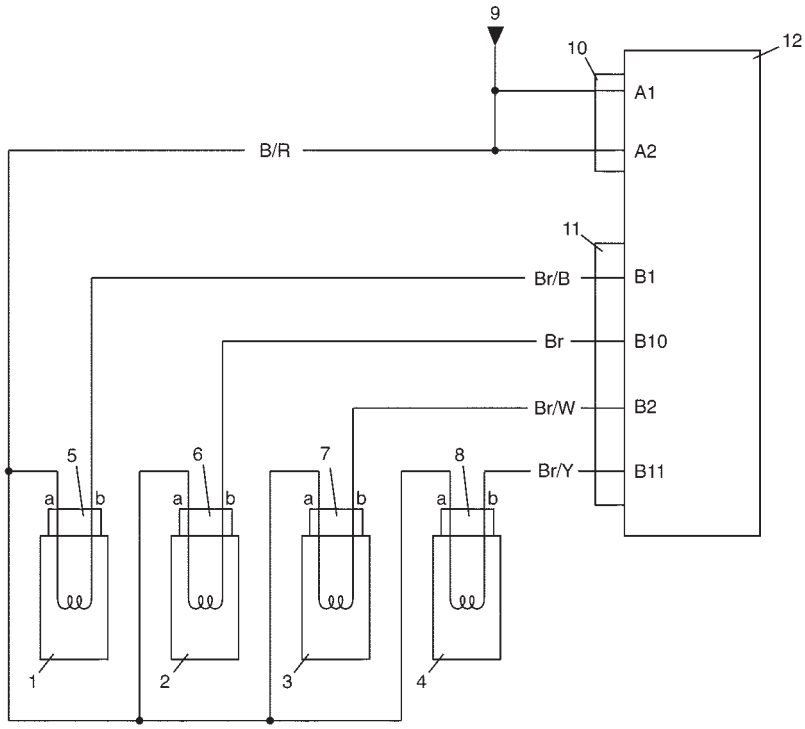
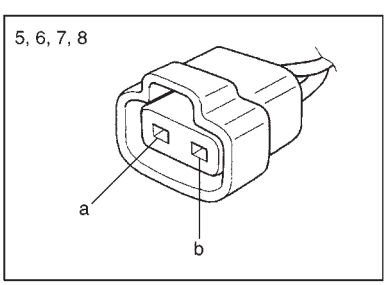


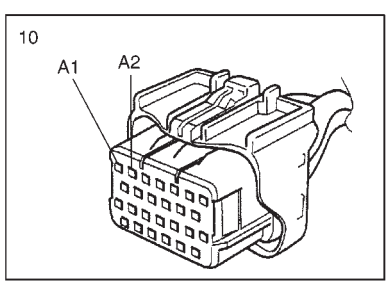
TABLE B-2 FUEL INJECTOR CIRCUIT CHECK

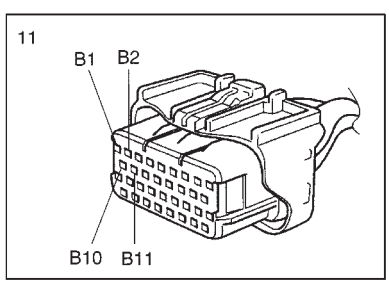
WIRING DIAGRAM



1. Fuel injector No.1
2. Fuel injector No.2
3. Fuel injector No.3
4. Fuel injector No.4
5. Fuel injector connector No.1
6. Fuel injector connector No.2
7. Fuel injector connector No.3
8. Fuel injector connector No.4
9. Power supply from main relay
10. ECM connector (A)
11. ECM connector (B)
12. ECM







INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	Fuel injector operation sound check: 1) Perform “Injector On-vehicle Inspection” in this section. Do all 4 injectors in good condition?	Go to Step 3.	Go to Step 4.
3	Fuel injection circuit check: 1) With ignition switch OFF position, disconnect ECM connectors. 2) Measure resistance between the following terminals. A1 and B1, A1 and B10 A1 and B2, A1 and B11 Is each resistance within 10-15Ω at 20°C (68°F)?	Fuel injector circuit is in good condition.	Faulty “Br/B”, “Br”, “Br/W”, “Br/Y” wire.

STEP	ACTION	YES	NO
4	Does none of 4 injectors make operation sound at Step 2?	Go to Step 5.	Faulty wire harness. Faulty injector. Poor connection of connector. If OK, substitute a known-good ECM and recheck.
5	Fuel injector circuit check: 1) With ignition switch OFF position, disconnect ECM connectors. 2) Check “B/R”, “Br/B”, “Br”, “Br/W”, “Br/Y” wire for open and short. Are all wires in good condition?	Poor connection of connector. If OK, substitute a known-good ECM and recheck.	Faulty wire harness.

Fig. for Step 3

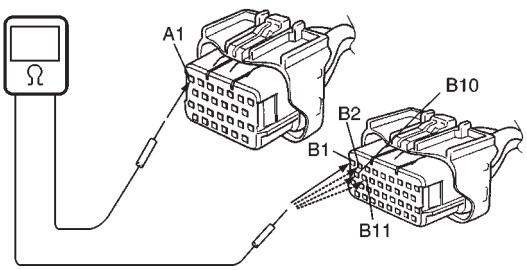
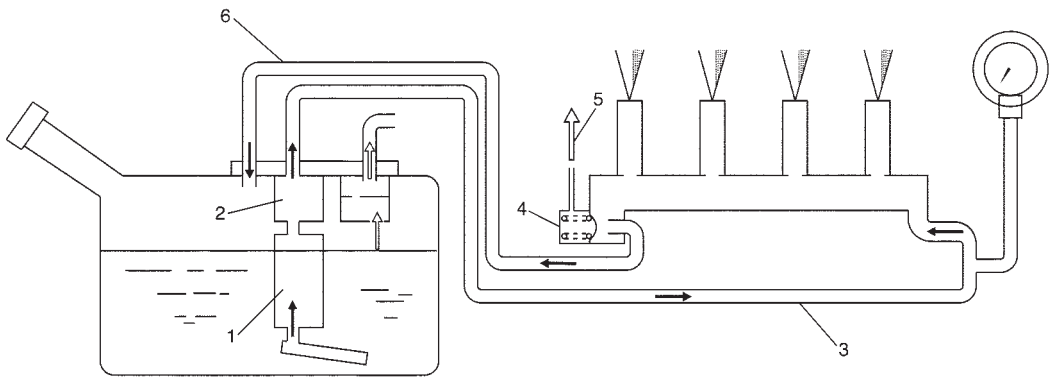


TABLE B-3 FUEL PRESSURE CHECK

SYSTEM DIAGRAM



1. Fuel pump
2. Fuel filter
3. Fuel feed line
4. Fuel pressure regulator
5. Vacuum passage for fuel pressure regulator
6. Fuel return line

SYSTEM DESCRIPTION

Fuel pressure regulator keeps the fuel pressure applied to injector 290kPa higher than that in intake manifold at all times.

INSPECTION

NOTE:
Before using following table, check to make sure that battery voltage is higher than 11V. 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	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) Install fuel pressure gauge. Refer to “Fuel Pressure Inspection” in this section. 2) Turn ignition switch ON position, leaving engine OFF. After 3 seconds turn ignition switch OFF position. Repeat this 3 or 4 times and observe fuel pressure with fuel pump running. Is fuel pressure indicated within 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)?	Go to Step 3.	Go to Step 6.
3	1) Turn ignition switch OFF position. 2) Observe fuel pressure gauge for one minute after fuel pump stops. Does fuel pressure hold at or above 200 kPa (2.0 kg/cm^2, 28.4 psi)?	Go to Step 4.	Fuel leaks from injector, fuel pressure regulator or fuel pump.
4	1) Start engine to normal operating temperature. 2) Keep it running at specified idle speed. Is fuel pressure indicated within 210 – 260 kPa (2.1 – 2.6 kg/cm^2, 29.8 – 37.0 psi)?	Go to Step 5.	Faulty vacuum passage from intake manifold to fuel pressure regulator. Faulty fuel pressure regulator.

STEP	ACTION	YES	NO
5	1) Turn ignition switch ON position, leaving engine OFF. 2) Check fuel pressure while blocking (pinching) fuel return hose. Is fuel pressure indicated within 441 – 637 kPa (4.5 – 6.5 kg/cm^2, 62.7 – 90.6 psi)?	Normal fuel pressure.	Faulty fuel pump.
6	Was fuel pressure above specified value in Step 2?	Go to Step 7.	Go to Step 8.
7	1) Disconnect fuel return hose from fuel pressure regulator. 2) Connect new fuel hose to fuel pressure regulator. 3) Turn ignition switch ON position, leaving engine OFF. Is fuel pressure indicated within 270 – 310 kPa (2.7 – 3.1 kg/cm^2, 38.4 – 44.0 psi)?	Restricted fuel return hose or pipe.	Faulty fuel pressure regulator.
8	1) Turn ignition switch ON position, leaving engine OFF. 2) Check fuel pressure while blocking (pinching) fuel return hose. Is fuel pressure applied then?	Faulty fuel pressure regulator.	Clogged fuel filter. Shortage of fuel. Restricted fuel feed hose or pipe. Faulty fuel pump. Fuel leakage from hose connection in fuel tank. Faulty fuel pump electrical circuit.

Fig. for Step 5, 8

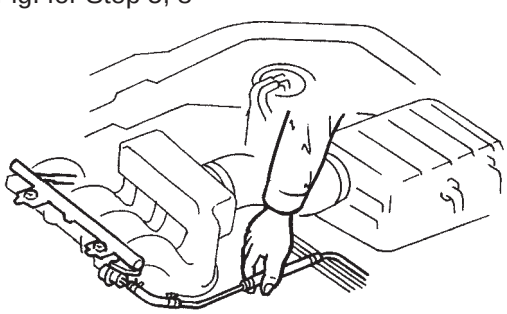


Fig. for Step 7

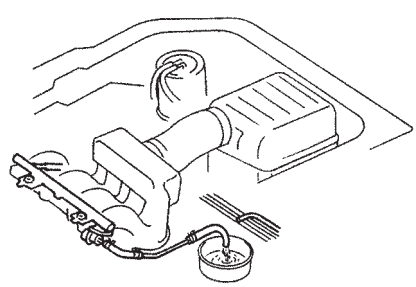
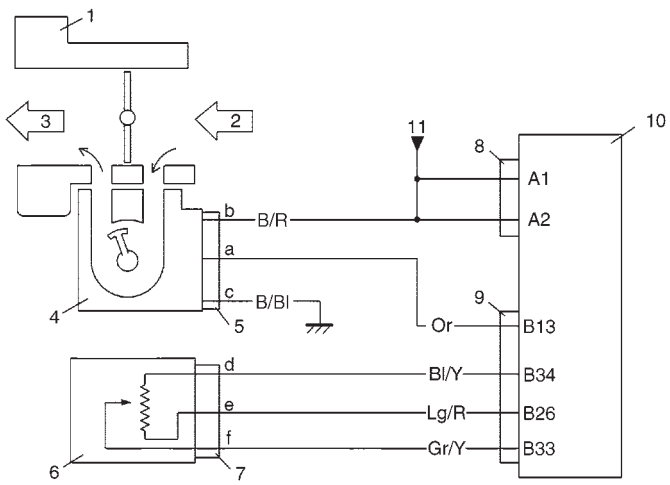
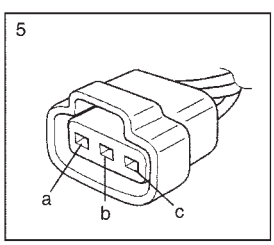


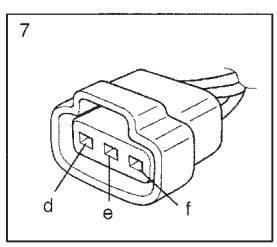
TABLE B-4 IDLE AIR CONTROL SYSTEM CIRCUIT CHECK

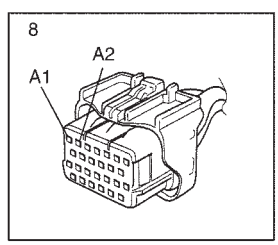
SYSTEM AND WIRING DIAGRAM

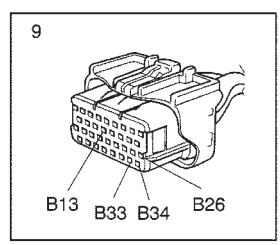
1. Throttle body
2. From air cleaner
3. To intake manifold
4. IAC valve
5. IAC valve connector
6. TP sensor
7. TP sensor connector
8. ECM connector (A)
9. ECM connector (B)
10. ECM
11. Power supply from main relay











SYSTEM DESCRIPTION

ECM transmits duty signal to IC in IAC valve. Then, the IC controls current of IAC valve coils.

INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) Perform “IAC Valve Inspection” in this section. Is IAC valve in good condition?	Go to Step 3.	Go to Step 6.
3	1) With ignition switch OFF position, install SUZUKI scan tool. 2) Turn ignition switch ON position, leaving engine OFF. 3) Monitor closed throttle position (“CLOSE THROT POS”) parameter on SUZUKI scan tool. Does scan tool indicate “ON” when throttle valve is fully closed and then “OFF” when throttle valve is opened?	Faulty EVAP canister purge valve. Faulty PCV valve. Faulty EGR system. Faulty A/C signal. Faulty engine accessory.	Go to Step 4.

STEP	ACTION	YES	NO
4	1) With ignition switch OFF position, disconnect negative cable at battery for 30 seconds and connect it. 2) With ignition switch OFF position, install SUZUKI scan tool. 3) Turn ignition switch ON position, leaving engine OFF. 4) Monitor closed throttle position (“CLOSE THROT POS”) parameter on SUZUKI scan tool. Does scan tool indicate “ON” when throttle valve is fully closed and then “OFF” when throttle valve is opened?	Recheck engine idle speed.	Go to Step 5.
5	1) Perform “TP Sensor Inspection” in this section. Is resistance within specified value?	Faulty “Gr/Y”, “Lg/R” or “Bl/Y” wire. Poor connector connection. If OK, substitute a known-good ECM and recheck.	Faulty TP sensor.
6	1) With ignition switch OFF position, disconnect ECM and IAC valve connectors. 2) Check “Or”, “B/R”, and “B/Bl” wire for open or short. Are they in good condition?	Go to Step 7.	Faulty “Or”, “B/R”, “B/Bl” wire.
7	1) With ignition switch OFF position, substitute a known-good IAC valve. 2) Perform “IAC Valve Inspection” in this section. Is IAC valve in good condition?	Faulty IAC valve.	Poor connection. If OK, substitute a known-good ECM and recheck.

Fig. for Step 3, 4

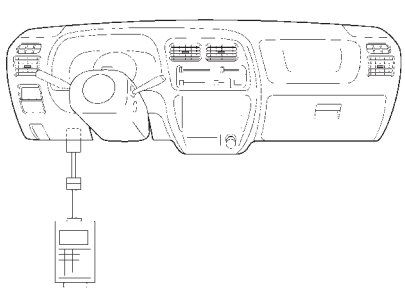
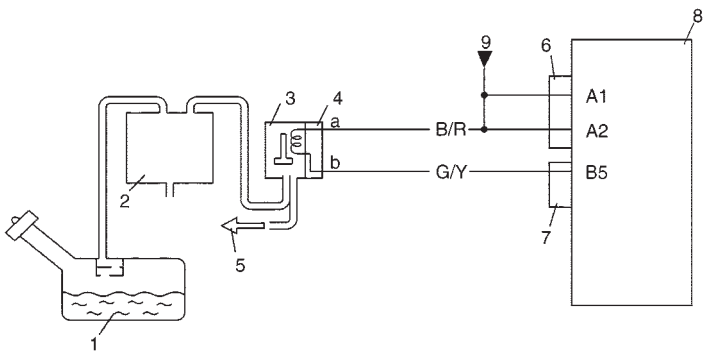
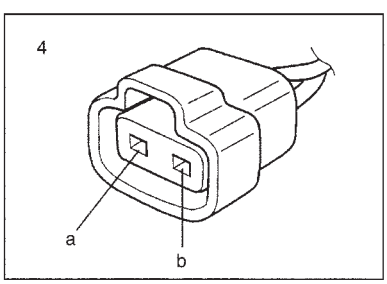


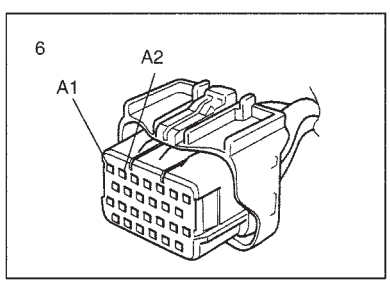
TABLE B-5 EVAPORATIVE EMISSION CONTROL SYSTEM CHECK

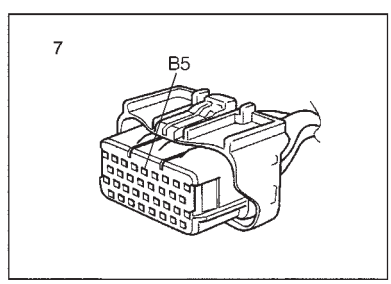
SYSTEM AND WIRING DIAGRAM



1. Fuel tank
2. EVAP canister
3. EVAP canister purge valve
4. EVAP canister purge valve connector
5. To intake manifold
6. ECM connector (A)
7. ECM connector (B)
8. ECM
9. Power supply from main relay







SYSTEM DESCRIPTION

ECM transmits duty signal to EVAP canister purge valve.

INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) Perform the following inspections. “EVAP System Hose and Pipes” “EVAP Canister Purge Valve” “EVAP Canister” Are they in good condition?	Go to Step 3.	Repair or replace.
3	1) Disconnect EVAP hose. 2) Start engine and run it at idle. 3) Place your thumb over end of hose in order to check for vacuum. Is vacuum felt?	Faulty “G/Y” wire. If OK, substitute a known-good ECM and recheck.	Go to Step 4.
4	1) Turn ignition switch OFF position. 2) Disconnect ECM connectors. 3) Measure resistance between “A1” to “B5” of ECM connectors. Is resistance within 30-34Ω at 20°C (68°F)?	Poor connection. If OK, substitute a known-good ECM and recheck.	Faulty “B/R”, “G/Y” wire. Poor connection of EVAP canister purge valve connector.

Fig. for Step 2

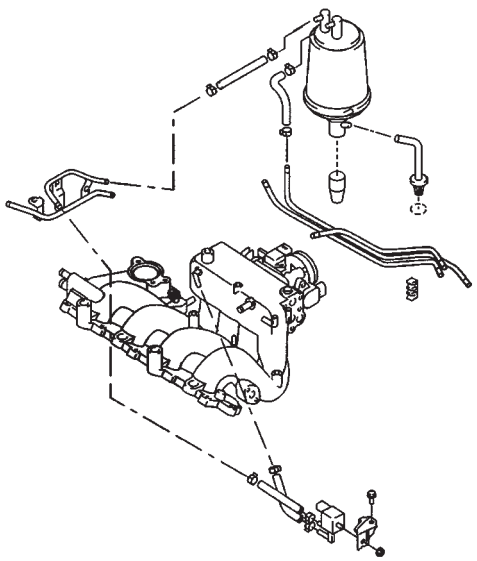
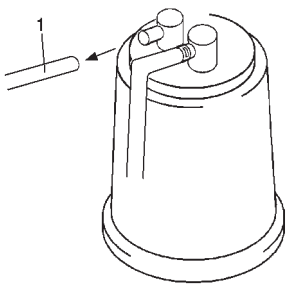


Fig. for Step 3



1. EVAP hose

Fig. for Step 4

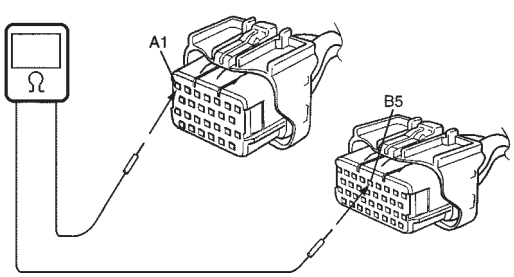
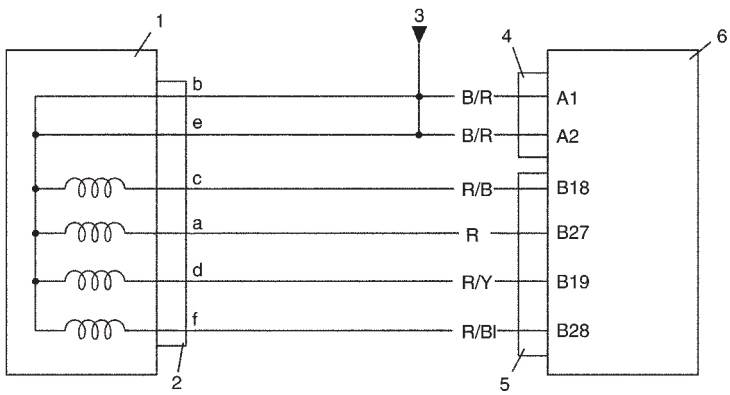
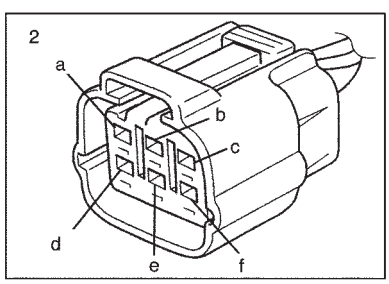


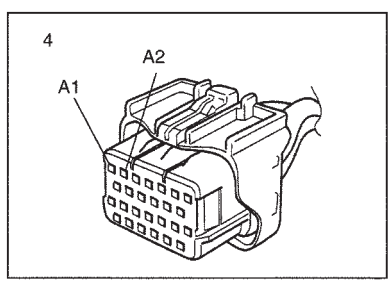
TABLE B-6 EGR SYSTEM CHECK (IF EQUIPPED)

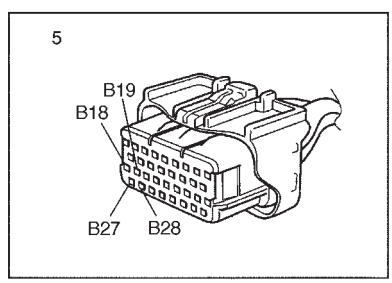
WIRING DIAGRAM

1. EGR valve
2. EGR valve connector
3. Power supply from main relay
4. ECM connector (A)
5. ECM connector (B)
6. ECM









SYSTEM DESCRIPTION

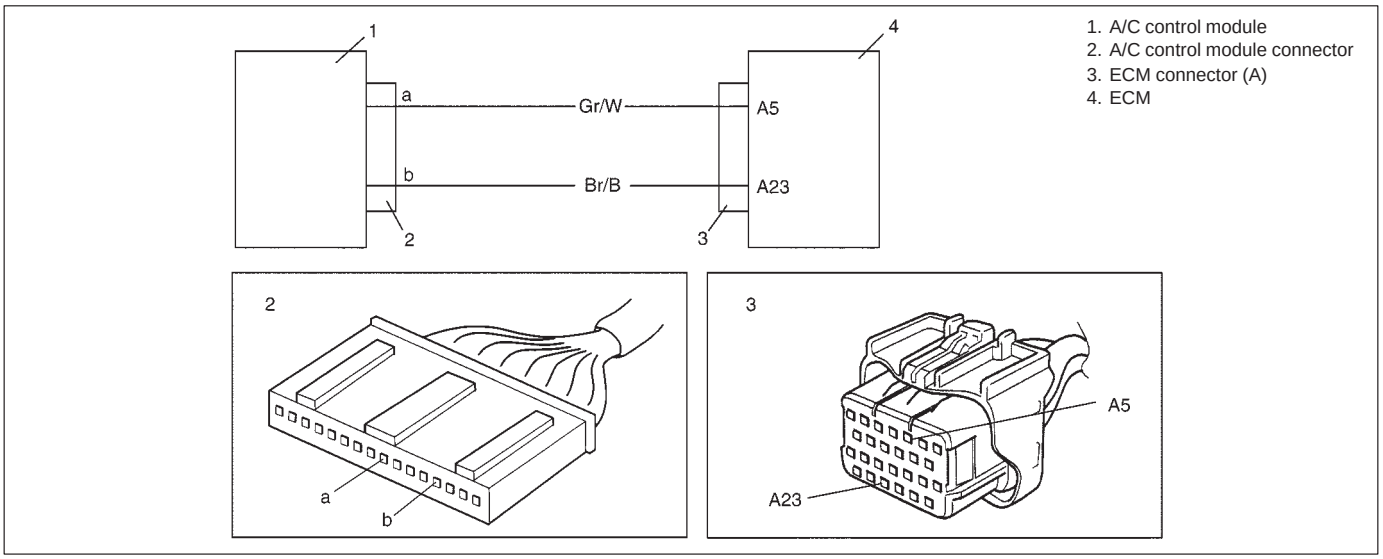
When EGR valve stepper motor receives open (close) signal from ECM, it turns in the open (close) direction according to the number of steps and pushes out (pulls up) the rod which is in mesh with the worm of the stepper motor. As the rod installed to the EGR valve opens by the amount corresponding to the number of steps of signal from ECM to let the exhaust gas flow from the exhaust manifold to the intake manifold.

INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) Perform “EGR Valve On-vehicle Inspection” and “EGR Valve Inspection” in this section. Is EGR valve in good condition?	Go to Step 3.	Faulty EGR valve.
3	1) Install EGR valve and connect EGR valve connector. 2) With ignition switch OFF position, disconnect ECM connectors. 3) Measure resistance from “A1” to “B18”, “B19”, “B27” and “B28” of ECM connectors. Is each resistance within 20-24Ω at 20°C (68°F)?	Restricted EGR passage. Poor connection of ECM connector. If OK, substitute a known-good ECM and recheck.	Faulty “B/R”, “R/B”, “R/Y”, “R”, “R/Bl” wire. Poor connection of EGR valve connector.

TABLE B-7 A/C SIGNAL AND A/C ON SIGNAL CIRCUIT CHECK (IF EQUIPPED)

WIRING DIAGRAM



1. A/C control module
2. A/C control module connector
3. ECM connector (A)
4. ECM

SYSTEM DESCRIPTION

A/C control module transmits “A/C signal” to ECM when A/C ON conditions are satisfied on the A/C control module side.

ECM transmits “A/C ON signal” to A/C control module when “A/C signal” inputted to ECM and A/C ON conditions are satisfied on the ECM side. Then, A/C is operated.

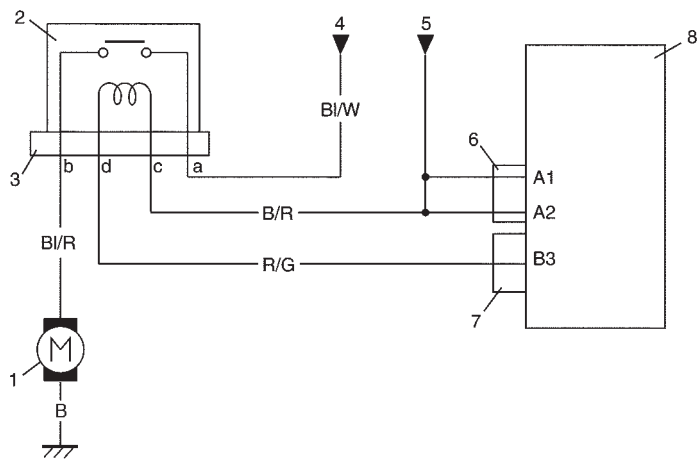
INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, install SUZUKI scan tool. 2) Start engine and run it at idle. 3) Monitor A/C signal (“A/C SWITCH”) parameter on SUZUKI scan tool. 4) Turn A/C switch OFF. Does scan tool indicate OFF?	Go to Step 3.	“Br/B” wire short. Faulty A/C control module. If OK, substitute a known-good ECM and recheck.
3	1) Run engine at idle. 2) Monitor A/C signal (“A/C SWITCH”) parameter on SUZUKI scan tool. 3) Turn A/C switch ON and blower speed selector switch to any position except OFF. Does scan tool indicate ON?	Go to Step 4.	“Br/B” wire open. Poor connection. Faulty A/C control module. If OK, substitute a known-good ECM and recheck.

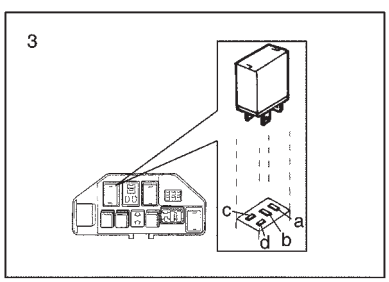
STEP	ACTION	YES	NO
4	1) Run engine at idle. 2) Monitor A/C ON signal (“A/C MAGNET CLUT”) parameter on SUZUKI scan tool. 3) Turn A/C switch OFF. Does scan tool indicate OFF?	Go to Step 5.	Substitute a known-good ECM and recheck.
5	1) Run engine at idle. 2) Monitor A/C ON signal (“A/C MAGNET CLUT”) parameter on SUZUKI scan tool. 3) Turn A/C switch ON and blower speed selector switch to any position except OFF. Does scan tool indicate ON with A/C operating?	A/C signal circuit and A/C ON signal circuit are functioning normally.	“Gr/W” wire open or short. Poor connection. Faulty A/C control module. If OK, substitute a known-good ECM and recheck.

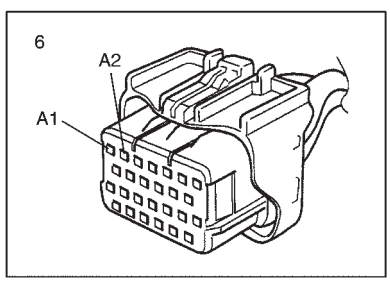
TABLE B-8 RADIATOR FAN CONTROL SYSTEM CIRCUIT CHECK

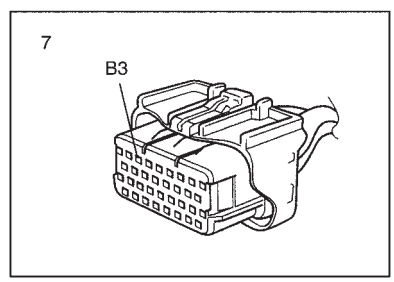
WIRING DIAGRAM



1. Radiator fan motor
2. Radiator fan relay
3. Radiator fan relay connector
4. Power supply from main fuse box
5. Power supply from main relay
6. ECM connector (A)
7. ECM connector (B)
8. ECM







INSPECTION

STEP	ACTION	YES	NO
1	Did you perform “ENGINE DIAGNOSTIC FLOW TABLE” in Section 6?	Go to Step 2.	Go to “ENGINE DIAGNOSTIC FLOW TABLE”.
2	1) With ignition switch OFF position, install SUZUKI scan tool. 2) Start engine and run it at idle. 3) Observe engine coolant temperature on scan tool. Does cooling fan turn ON when engine coolant temperature reaches above 90°C (194°F)?	Go to Step 3.	Go to Step4.
3	Does cooling fan turn OFF when engine coolant temperature drops below 85°C (185°F)?	Radiator fan control system is functioning normally.	Go to Step4.
4	1) Stop engine. 2) With ignition switch OFF position, disconnect radiator fan relay. 3) Inspect radiator fan relay. Refer to “Main Relay/Fuel Pump Relay/Radiator Fan Relay Inspection” in this section. Is radiator fan relay functioning normally?	Go to Step 5.	Faulty radiator fan relay.

STEP	ACTION	YES	NO
5	1) Turn ignition switch ON position, leaving engine OFF. 2) Measure voltage from “a” of radiator fan relay connector to ground, from “c” of radiator fan relay connector to ground. Is each voltage within 10-14V?	Go to Step 6.	Faulty “Bl/W”, “B/R” wire.
6	1) Turn ignition switch OFF position. 2) Connect jumper wire between “a” and “b” of radiator fan relay connector. Does cooling fan turn ON when ignition switch turns ON position, leaving engine OFF?	Faulty “R/G” wire. If OK, substitute a known-good ECM and recheck.	Faulty “Bl/R”, “B” wire. Faulty radiator fan motor. Poor connection.

Fig. for Step 5

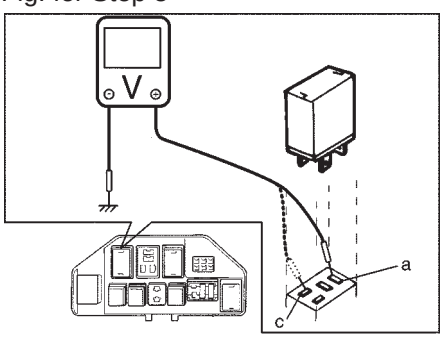


Fig. for Step 6

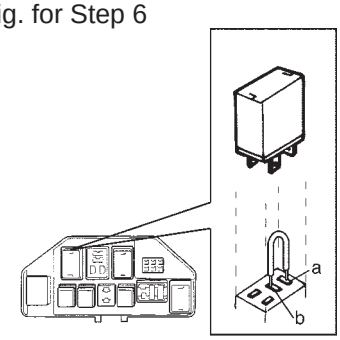
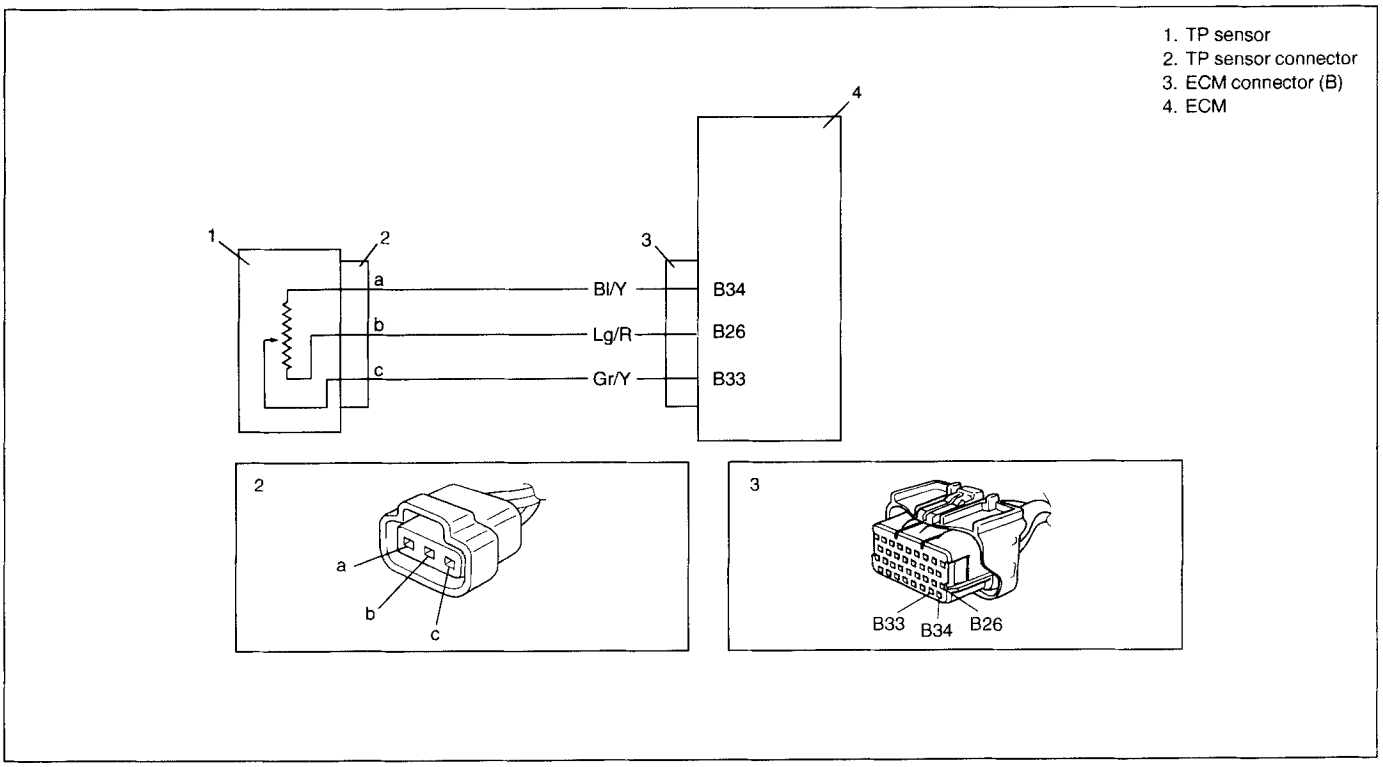


TABLE B-9 FUEL CUT OPERATION CHECK

WIRING DIAGRAM



SYSTEM DESCRIPTION

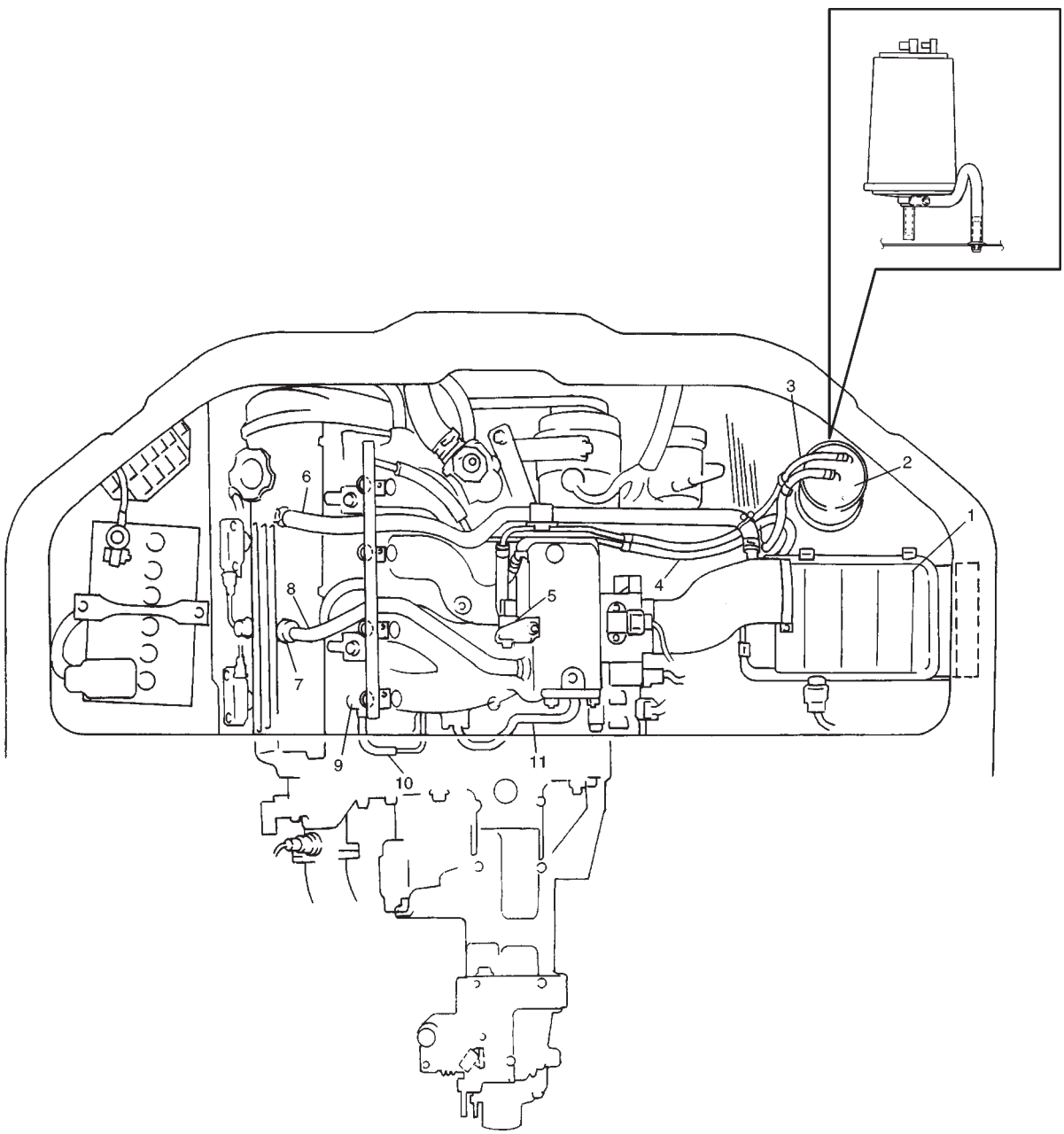
Fuel injector stops when decelerating, so that unburned gas will not be exhausted and it starts again when above conditions for fuel recovery are fulfilled.

INSPECTION

STEP	ACTION	YES	NO
1	Did you perform "ENGINE DIAGNOSTIC FLOW TABLE" in Section 6?	Go to Step 2.	Go to "ENGINE DIAGNOSTIC FLOW TABLE".
2	Check fuel cut operation referring to "Fuel Cut Operation Inspection" in this section. Does fuel injector operate as specified?	Fuel cut operation is in good condition.	Go to Step 3.
3	1) With ignition switch OFF position, install SUZUKI scan tool. 2) Turn ignition switch ON position, but engine at stop. 3) Monitor closed throttle position ("CLOSE THROT POS") parameter on SUZUKI scan tool. Does scan tool indicate "ON" when throttle valve is fully closed and then "OFF" when throttle valve is opened?	Substitute a known-good ECM and recheck.	Go to Step 4.

STEP	ACTION	YES	NO
4	1) With ignition switch OFF position, disconnect negative cable at battery for 30 seconds and connect it. 2) With ignition switch OFF position, install SUZUKI scan tool. 3) Turn ignition switch ON position, leaving engine OFF. 4) Monitor closed throttle position ("CLOSE THROT POS") parameter on SUZUKI scan tool. Does scan tool indicate "ON" when throttle valve is fully closed and then "OFF" when throttle valve is opened?	Recheck fuel cut operation.	Go to Step 5.
5	1) Perform "TP Sensor Inspection" in this section. Is resistance within specified value?	Faulty "Gr/Y", "Lg/R" or "Bl/Y" wire. Poor connector connection. If OK, substitute a known-good ECM and recheck.	Faulty TP senser.

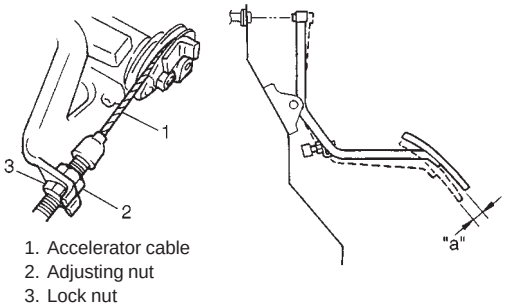
ON-VEHICLE SERVICE



1. Air cleaner case
2. EVAP canister
3. EVAP canister purge hose
4. Fuel feed hose
5. EVAP canister purge valve
6. Breather hose
7. PCV valve
8. PCV hose
9. Fuel pressure regulator
10. Fuel return hose
11. EGR pipe

GENERAL

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 on previous page for proper routing of hoses.



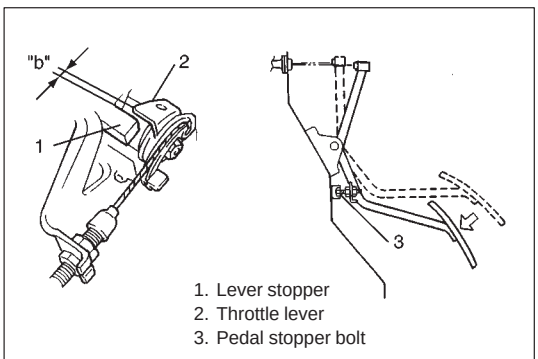
1. Accelerator cable
2. Adjusting nut
3. Lock nut

ACCELERATOR CABLE AND PEDAL ADJUSTMENT

1) With throttle valve closed, check accelerator pedal play which should be within the following specification.

   Pedal play "a": 2 – 7 mm (0.08 – 0.27 in.)

   If measured value is out of specification, adjust it to specification with cable adjusting nut.



1. Lever stopper
2. Throttle lever
3. Pedal stopper bolt

2) With accelerator pedal depressed fully, check clearance between throttle lever and lever stopper (throttle body) which should be within the following specification.

   Clearance "b" : 0.5 – 2.0 mm (0.02 – 0.07 in.)
   (With pedal depressed fully)

   If measured value is out of specification, adjust it to specification by changing height of pedal stopper bolt.

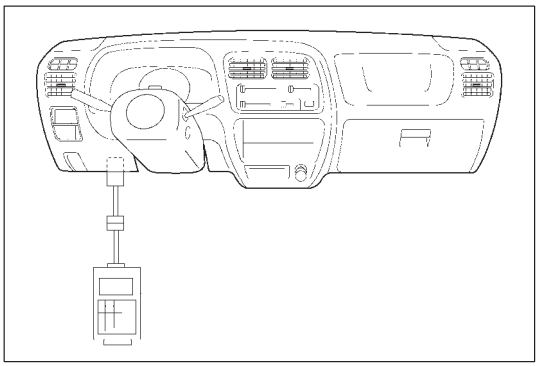
IDLE SPEED/IDLE AIR CONTROL (IAC) DUTY INSPECTION

Before idle speed/IAC duty check, make sure of the following.

- Lead wires and hoses of engine/emission control systems are connected securely.
- Air cleaner has been properly installed and is in good condition.
- Accelerator cable is adjusted.
- Valve lash is checked and adjusted according to maintenance schedule.
- Ignition timing is within specification.
- ECM does not detect any malfunction DTC.

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" and set parking brake and block drive wheels.



[Using SUZUKI scan tool]

1) Connect SUZUKI scan tool to DLC with ignition switch OFF position.

   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

2) Start engine and warm it up to normal operating temperature.
3) Confirm that all accessories (light, A/C, blower fan, etc.) are out of service.
4) Check idle speed and IAC duty by using “DATA LIST” mode of SUZUKI scan tool.

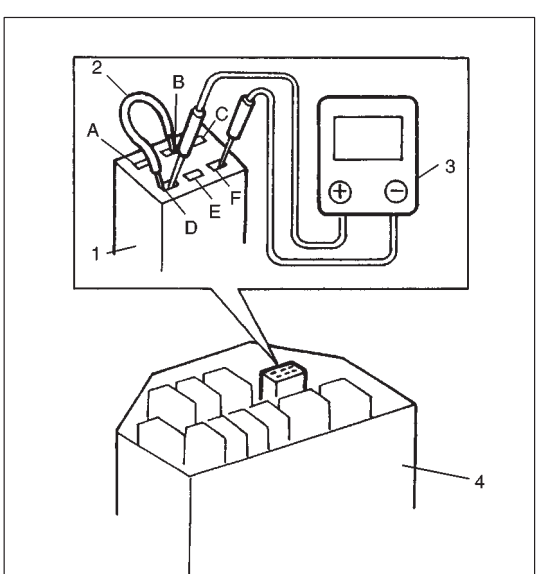
   NOTE:
   Check to ensure that radiator fan is not running and then measure IAC-duty.

Engine speed (A/C OFF)	700 – 800 [RPM]
IAC duty (A/C OFF)	3 – 40 [%]

With A/C equipped vehicle, check idle speed while A/C compressor is operating.

Engine speed (A/C ON)	850 – 950 [RPM]

If idle speed and/or duty is out of specifications, check idle air control system. Refer to “B-4 Idle Air Control System Check” in this section.



1. Monitor coupler
2. Service wire
3. Duty meter
4. Main fuse box

A: Blank
B: Diagnosis switch terminal
C: Blank
D: Ground terminal
E: Test switch terminal
F: Duty output terminal

[Not using SUZUKI scan tool]

1) Disconnect scan tool from DLC if connected.
2) Using service wire, ground diagnosis switch terminal in monitor connector.
3) Connect duty meter between duty output terminal and ground terminal of monitor connector.
4) Set tachometer.
5) Start engine and warm it up to normal operating temperature.
6) Confirm that all accessories (light, A/C, blower fan, etc.) are out of service.
7) Check idle speed and IAC duty.

   NOTE:
   Check to ensure that radiator fan is not running and then measure IAC-duty.

Engine speed (A/C OFF)	700 – 800 [RPM]
IAC duty (A/C OFF)	3 – 40 [%]

With A/C equipped vehicle, check idle speed while A/C compressor is operating.

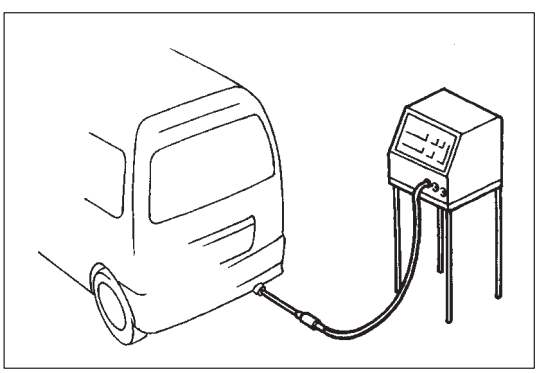
Engine speed (A/C ON)	850 – 950 [RPM]

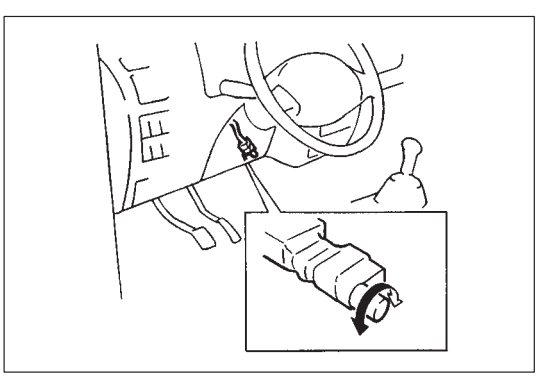
NOTE:
IAC duty can be checked roughly by using voltmeter. IAC duty to voltage relation is as follows.

ON DUTY METER INDICATION (%)	OFF DUTY METER INDICATION (%)	VOLTMETER INDICATION (V)
0	100	0
50	50	0.5 x V_B
100	0	V_B

- **"OFF DUTY METER" is such duty meter that indicates approx. 100% when terminal voltage is approx. "0V".**
- **"V_B" represents battery voltage while engine of vehicle being checked is running.**

8) If idle speed and/or duty is out of specifications, check idle air control system. Refer to "B-4 Idle Air Control System Check" in this section.





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, check indicates idle mixture to be cause of a driver performance complaint or emission failure, 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.

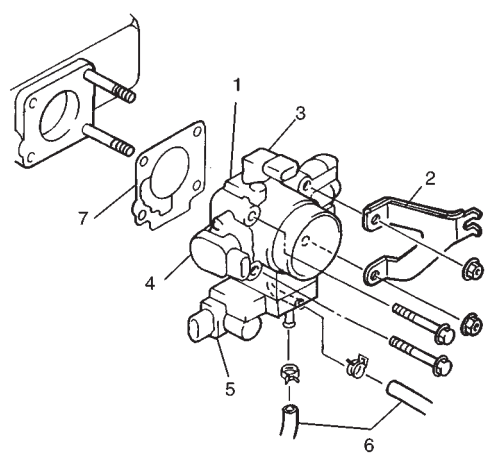
1) Check idle speed according to "Idle Speed/Idle Air Control Duty Inspection" in this section.
2) Using exhaust gas tester, check that idle mixture CO% is within above specification. If it is out of specification, adjust it to specification by turning resistor knob.
3) If idle mixture has been adjusted, confirm that idle speed and IAC duty are within specifications.

AIR INTAKE SYSTEM

THROTTLE BODY

ON-VEHICLE INSPECTION

- Check that throttle valve lever moves smoothly.



1. Throttle body
2. Accelerator cable bracket
3. MAP sensor
4. TP sensor
5. IAC valve
6. Coolant hoses
7. Gasket

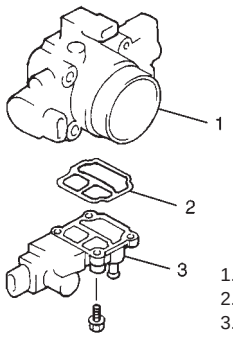
REMOVAL

1) Disconnect negative cable at battery.
2) Drain cooling system. Refer to section 6B.
3) Disconnect accelerator cable from throttle body.
4) Disconnect electric connectors from TP sensor, MAP sensor and IAC valve.
5) Disconnect air cleaner outlet hose and coolant hoses from throttle body.
6) Remove throttle body from intake manifold.

CAUTION:
TP sensor, MAP 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.

INSTALLATION

1) Clean mating surfaces and install throttle body gasket to intake manifold.
   Use new gasket.
2) Install throttle body and accelerator cable bracket to intake manifold and tighten bolts and nuts to specified torque.
3) Connect coolant hoses to throttle body.
4) Connect connectors to TP sensor, MAP sensor and IAC valve securely.
5) Install air cleaner outlet hose.
6) Connect accelerator cable and adjust cable play to specification. Refer to “Accelerator Cable Adjustment” in this section.
7) Refill cooling system. Refer to section 6B.
8) Connect negative cable at battery.

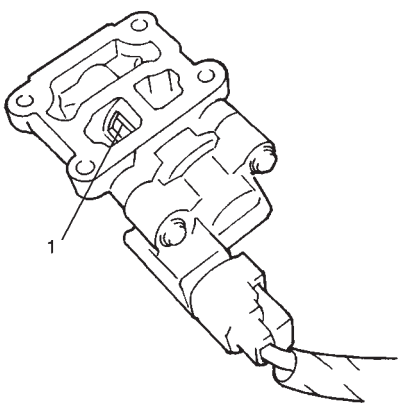


1. Throttle body
2. O-ring
3. IAC valve

IDLE AIR CONTROL VALVE (IAC VALVE)

REMOVAL

1) Remove throttle body.
2) Remove IAC valve from throttle body.



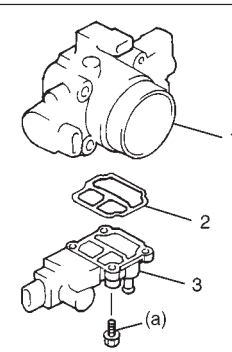
1. Rotary valve

INSPECTION

1) Connect each connector to IAC valve MAP sensor and TP sensor.
2) Check that rotary valve of IAC valve opens and closes once and then stops in about 60 ms as soon as ignition switch is turned ON position.

NOTE:

- **As valve operation is momentary, it may be overlooked. To prevent this, perform this operation check 3 times or more continuously.**
  If rotary valve of IAC valve does not operate at all, check wire harness for open and short. If wire harness are in good condition, replace IAC valve and recheck.
- **The built-in IC may brake when the battery is connected between terminals or installation resistance gauge is connected between terminals.**



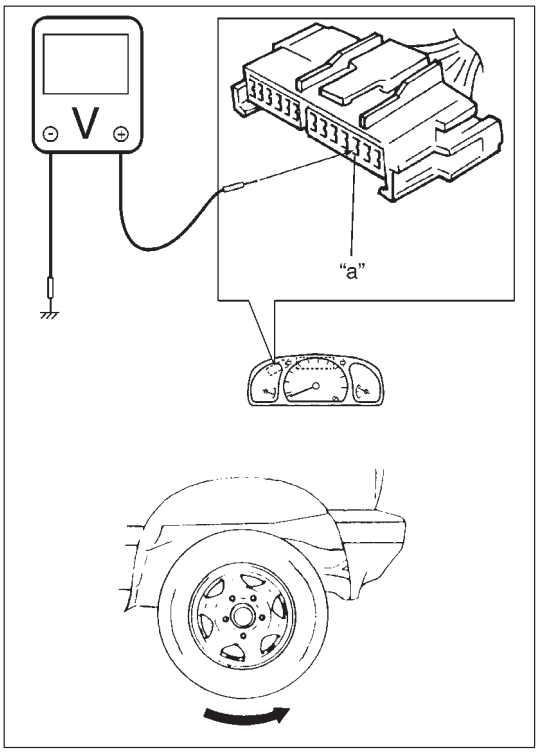
1. Throttle body
2. O-ring
3. IAC valve

INSTALLATION

1) Install new O-ring to IAC valve.
2) Install IAC valve to throttle body.
   Tighten IAC valve screws to specified torque.

   Tightening Torque
   (a): 3.3 N·m (0.33 kg-m, 2.5 lb-ft)

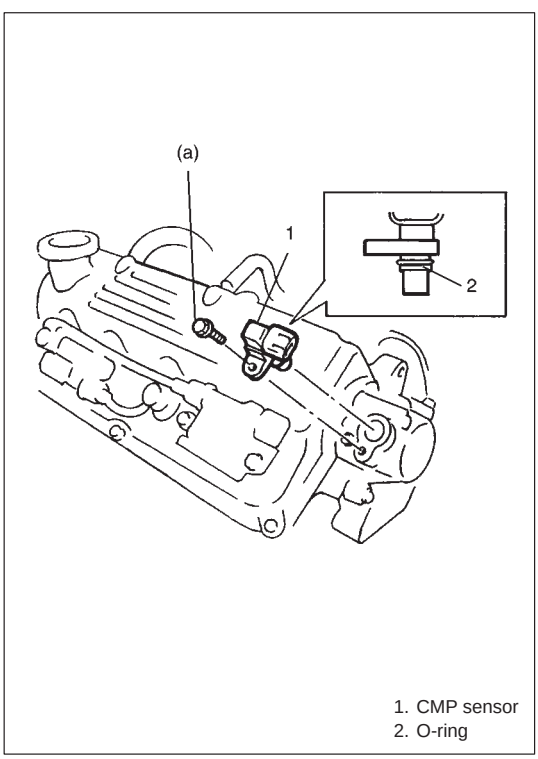
3) Install throttle body to intake manifold.



VEHICLE SPEED SENSOR (VSS)

ON-VEHICLE INSPECTION

1) Hoist vehicle.
2) Release parking brake lever, set transmission in neutral.
3) Remove combination meter and disconnect combination connectors.
4) Connector voltmeter between "a" terminal of combination meter connector and body ground.
5) Turn ignition switch ON position and turn rear right tire slowly with rear left tire locked.
   Voltmeter should indicate deflection between 0 – 1 V and 4 – 14 V a few times while tire is turned one revolution.
   If check result is not satisfactory, proceed to "DTC NO. 16 Vehicle Speed Sensor Circuit Check" in this section.



1. CMP sensor
2. O-ring

CAMSHAFT POSITION SENSOR (CMP SENSOR)

REMOVAL

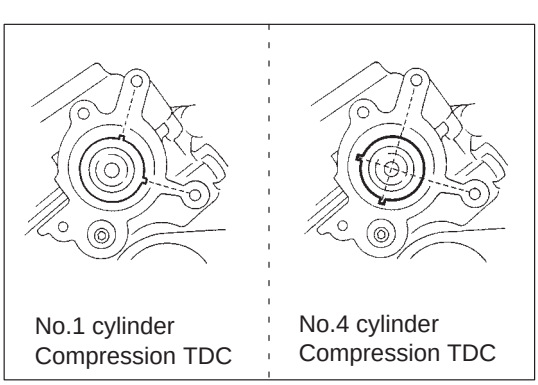
1) Disconnect negative cable at battery.
2) Disconnect connector from CMP sensor.
3) Remove CMP sensor from sensor case.

INSTALLATION

1) Check that O-ring is free from damage.
2) Check that CMP sensor and signal rotor tooth are free from any metal particles and damage.
3) Install CMP sensor to sensor case.

   Tightening Torque
   (a): 9 N·m (0.9 kg-m, 6.5 lb-ft)

4) Connect connector to it securely.
5) Connect negative cable to battery.



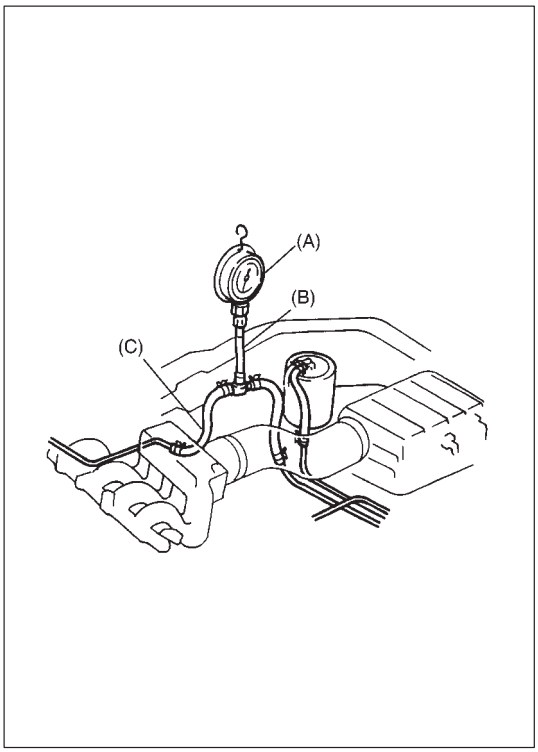
No.1 cylinder
Compression TDC

No.4 cylinder
Compression TDC

CMP SENSING ROTOR

INSPECTION

1) Remove CMP sensor case and cylinder head cover. Refer to Section 6A.
2) Turn crankshaft and align "V" mark on flywheel to "0" mark on transmission case.
   Then, confirm which cylinder is compression dead center and check CMP sensing rotor teeth and direction.
   If check result is not satisfied, replace camshaft.



FUEL DELIVERY SYSTEM

FUEL PRESSURE INSPECTION

1) Relieve fuel pressure in fuel feed line. Refer to “Fuel Pressure Relief Procedure” in Section 6.
2) Disconnect fuel feed hose from fuel delivery pipe.

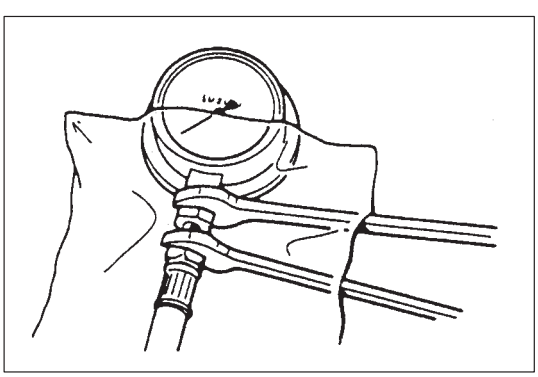
CAUTION:
A small amount of fuel may be released when hose is disconnected. Place container under hose or cover pipe with a shop cloth so that released fuel is caught in container or absorbed in cloth. Place that cloth in an approved container.

3) Connect fuel pressure gauge to fuel feed line.
Special Tool
(A): 09912-58441 (Fuel pressure gauge)
(B): 09912-58431 (Pressure hose)
(C): 09912-58490 (3way joint and hose)

CONDITION	FUEL PRESSURE
With fuel pump operating and engine stopped	270 – 310 kPa 2.7 – 3.1 kg/cm^2 38.4 – 44.0 psi
At specified idle speed	210 – 260 kPa 2.1 – 2.6 kg/cm^2 29.8 – 37.0 psi
With 1 min. after engine (fuel pump) stop (Pressure reduces as time passes)	over 200 kPa 2.0 kg/cm^2 28.4 psi

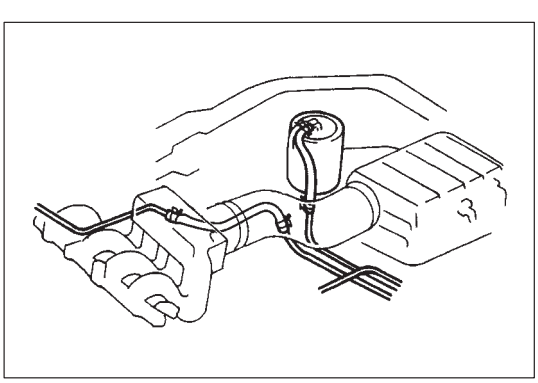
4) Turn ignition switch ON position to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel pressure.
NOTE:
Check that battery voltage is above 11V.
5) Start engine and measure fuel pressure at idling.
6) Stop engine, wait for 1 minute and then measure fuel pressure.

If measured pressure doesn’t satisfy specification, go to “B-3 Fuel Pressure Check” in this section.



7) After checking fuel pressure, remove fuel pressure gauge.

CAUTION:
As fuel feed line is still under high fuel pressure, make sure to release fuel pressure according to the following procedures.
- **Place fuel container under joint.**
- **Cover joint with rag and loosen joint nut slowly to release fuel pressure gradually.**

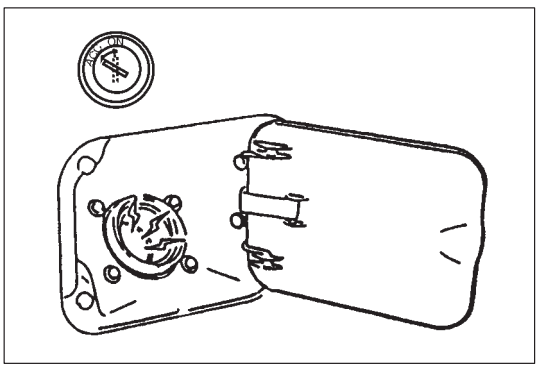


8) Install fuel feed hose and clamp it securely.
9) Turn ignition switch ON position to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check for fuel leaks.

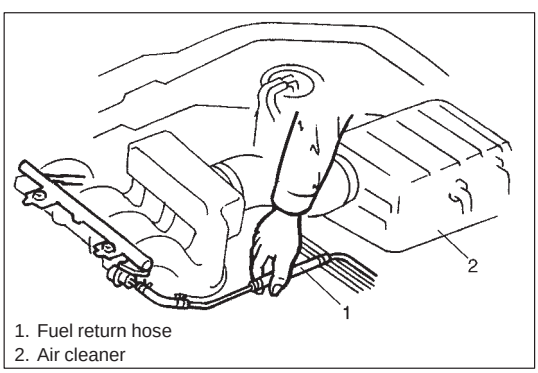
FUEL PUMP

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 ignition switch ON position. Then fuel pump operating sound be heard from fuel filler for about 2 seconds and stop. Be sure to reinstall fuel filler cap after checking. If above check result is not satisfactory, advance to “B-1 Fuel Pump Circuit Check” in this section.

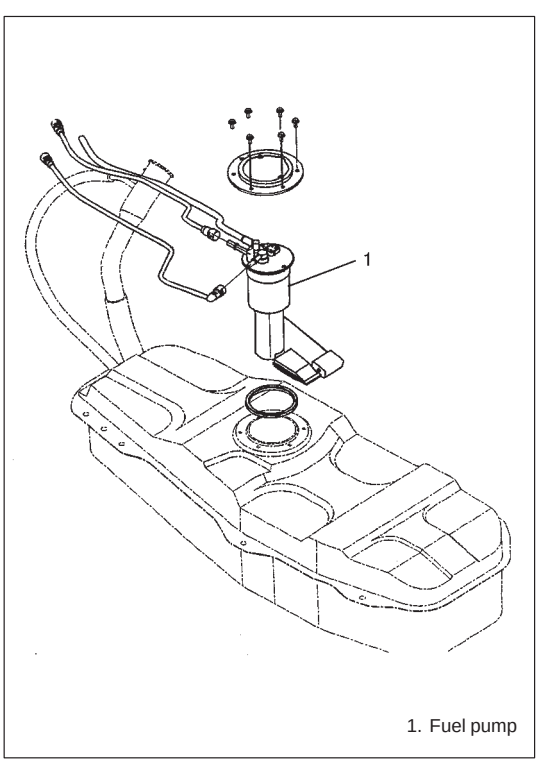


1. Fuel return hose
2. Air cleaner

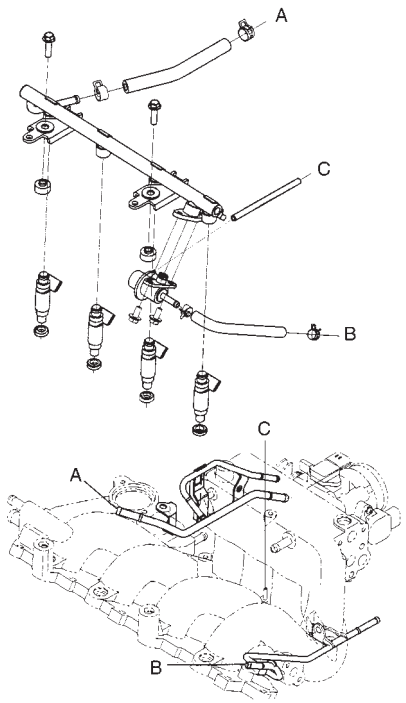
2) Fuel pressure should be felt at fuel return hose for 2 seconds after turning ignition switch ON position.
If fuel pressure is not felt, advance to “B-3 Fuel Pressure Check” in this section.

REMOVAL/INSPECTION/INSTALLATION

Refer to “FUEL PUMP ASSEMBLY” in Section 6C.



1. Fuel pump



FUEL PRESSURE REGULATOR

ON-VEHICLE INSPECTION

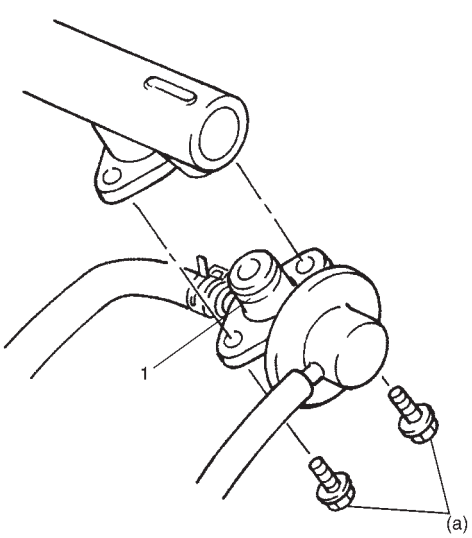
Perform fuel pressure inspection according to procedure described in “Fuel Pressure Inspection” in this section.

REMOVAL

1) Relieve fuel pressure in fuel feed line. Refer to “Fuel Pressure Relief Procedure” in Section 6.
2) Disconnect battery negative cable at battery.
3) Disconnect fuel injector connectors from injectors.
4) Disconnect vacuum hose from fuel pressure regulator.
5) Remove fuel delivery pipe from intake manifold.
6) Remove fuel injectors from fuel delivery pipe.

WARNING:
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.

7) Remove fuel pressure regulator from fuel delivery pipe.
8) Disconnect fuel return hose from fuel pressure regulator.



1. O-ring

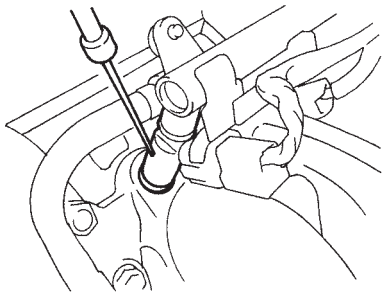
INSTALLATION

For installation, reverse removal procedure and note the following precautions.

- Use new O-ring.
- Apply thin coat of gasoline to O-ring to facilitate installation.
- Tighten fuel pressure regulator bolts to specified torque.

Tightening Torque
(a): 10 N·m (1.0 kg-m, 7.5 lb-ft)

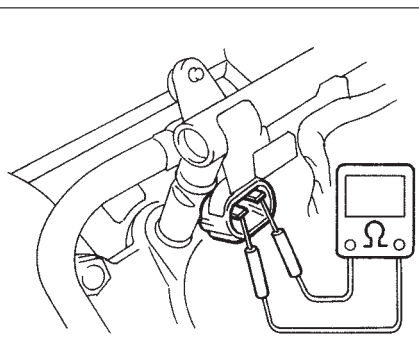
- Turn ignition switch ON position to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check fuel leakage.



FUEL INJECTOR

ON-VEHICLE INSPECTION

1) Using sound scope or such, check operating sound of injector when engine is running or cranking.
   Cycle of operating sound should vary according to engine speed.
   If no sound or an unusual sound is heard, go to "B-2 Fuel Injector Circuit Check" in this section.



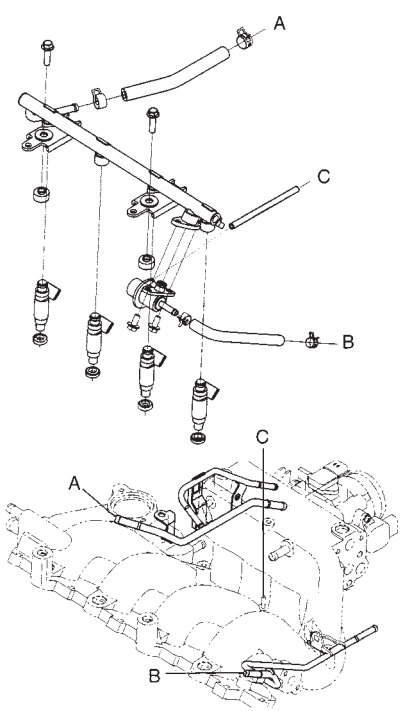
2) Disconnect connector from injector, connect ohmmeter between terminals of injector and check resistance.

   Resistance of injector: 10 – 15 Ω at 20°C, 68 °F

   If resistance is out of specification, replace.
3) Connect connector to injector securely.

REMOVAL

WARNING:
A small amount of fuel may be released when fuel injector is removed. In order to reduce the chance of personal injury, cover than with a shop cloth.

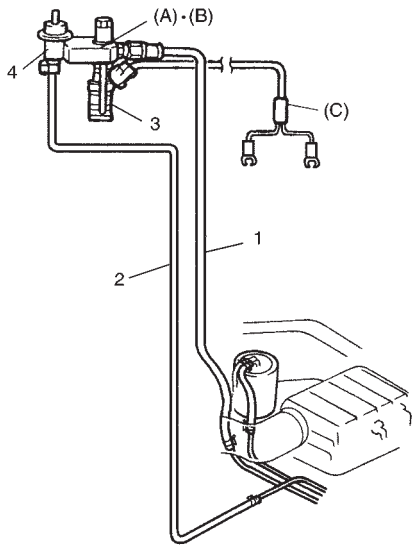


1) Relieve fuel pressure in fuel feed line. Refer to "Fuel Pressure Relief Procedure" in Section 6.
2) Disconnect battery negative cable at battery.
3) Disconnect connector from each injector.
4) Remove fuel delivery pipe bolts.
5) Remove fuel injector(s) from delivery pipe and intake manifold.

INJECTION VOLUME 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.

NOTE:
Confirm fuel pressure before this inspection.



1. Fuel feed line
2. Fuel return line
3. Fuel injector
4. Fuel pressure regulator

1) Install injector and fuel pressure regulator to special tool (injector checking tool).

Special Tool
(A): 09912-58421

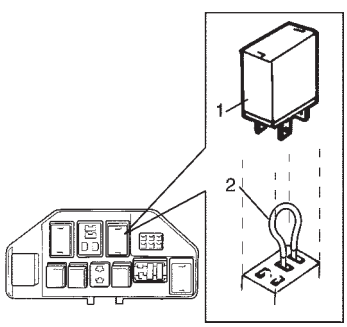
2) Connect special tools (hoses and attachment) to hose and pipe of vehicle.

Special Tool
(B): 09912-58431

3) Connect special tool (test lead) to injector.

Special Tool
(C): 09930-88530

4) Install suitable vinyl tube onto injector nozzle to prevent fuel from splashing out when injecting.
5) Remove fuel pump relay.



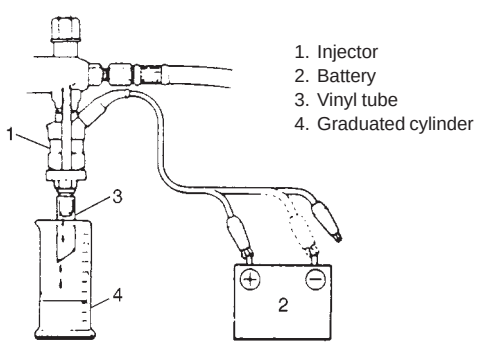
1. Main relay
2. Service wire

6) Connect two terminals of relay connector as shown in figure.

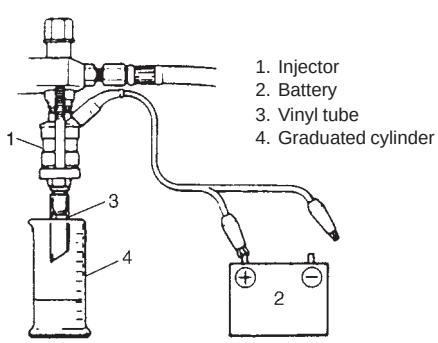
CAUTION:
Check to make sure that connection is made between correct terminals. Wrong connection can cause damage to ECM, wire harness, etc.

7) Put graduated cylinder under injector as shown.
Turn ignition switch ON position.
8) Apply battery 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:
43 – 47 cc/15 sec. (1.59/1.51 – 1.59/1.65 US/Imp. oz/15 sec.)



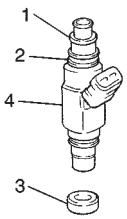
1. Injector
2. Battery
3. Vinyl tube
4. Graduated cylinder



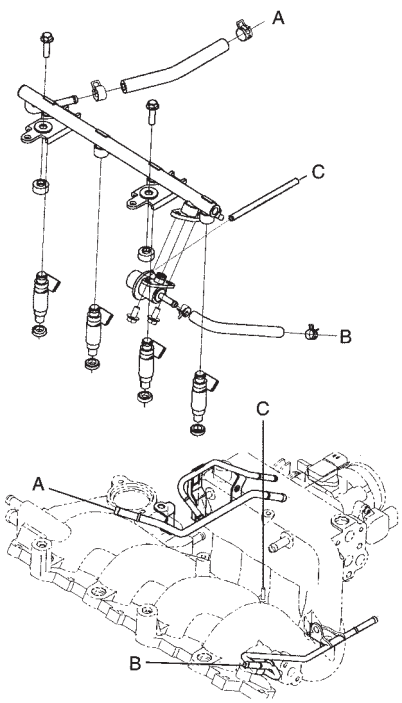
1. Injector
2. Battery
3. Vinyl tube
4. Graduated cylinder

9) Check fuel leakage from injector 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.



1. O-ring
2. Grommet
3. Cushion
4. Injector

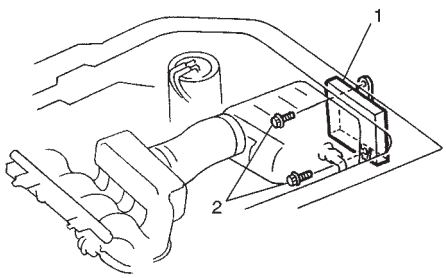


INSTALLATION

1) Replace injector O-ring with new one using care not to damage it. Install grommet to injector.
2) Check if cushion is scored or damaged. If it is, replace with new one.
   Install insulators and cushions to intake manifold.
3) Apply thin coat of fuel to O-rings and then install injectors into delivery pipe and intake manifold.
   Make sure that injectors rotate smoothly. If not, probable cause is incorrect installation of O-ring. Replace O-ring with new one.
4) Tighten delivery pipe bolts and make sure that injectors rotate smoothly.

   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

5) Connect connectors to injectors securely.
6) Connect battery negative cable.
7) Turn ignition switch ON position to operate fuel pump and after 3 seconds turn it OFF. Repeat this 3 or 4 times and then check for fuel leakage.



1. ECM
2. Bolt

ELECTRONIC CONTROL SYSTEM

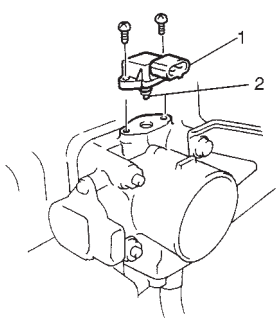
ENGINE CONTROL MODULE (ECM)

CAUTION:
As ECM consists of precision parts, be careful not to expose it to excessive shock.

REMOVAL/INSTALLATION

1) Disconnect battery negative cable at battery.
2) Disable air bag system (if equipped). Refer to “Disabling the Air Bag System” in Section 10B.
3) Remove air cleaner case.
4) Disconnect connectors from ECM.
5) Remove ECM.

Reverse above procedure in case of installation.



1. MAP sensor
2. O-ring

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

REMOVAL/INSTALLATION

1) Disconnect negative cable at battery.
2) Disconnect MAP sensor connector.
3) Remove MAP sensor from throttle body.

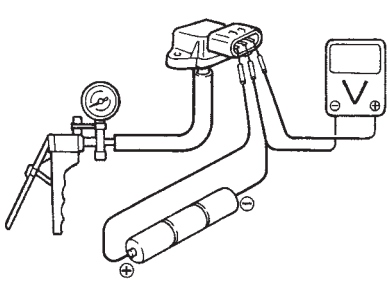
Reverse above procedure in case of installation.

NOTE:
Replace O-ring with new one.

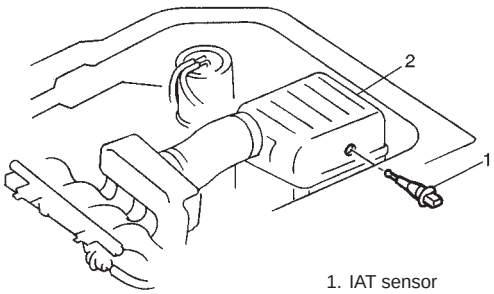
INSPECTION

1) Arrange 3 new 1.5V batteries in series (check that total voltage is 4.5–5.0V) and connect its positive terminal to “Vin” terminal of sensor and negative terminal to “Ground” terminal. Then check voltage between “Vout” and “Ground”.
   Also, check if voltage reduces when vacuum is applied up to 400mmHg by using vacuum pump.

Output voltage (Vin voltage 4.5 – 5.0V, ambient temp. 20 – 30°C, 68 – 86°F)



ALTITUDE (Reference)		BAROMETRIC PRESSURE		OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	(kPa)	(V)
0	0	760	100	3.5 – 3.7
2000	610	707	93	3.3 – 3.5
5000	1524	634	83	3.0 – 3.2
8000	2438	567	75	2.7 – 3.0
10000	3048	526	69	2.6 – 2.8



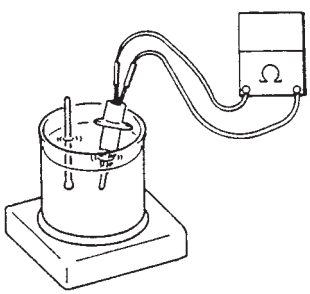
1. IAT sensor
2. Air cleaner case

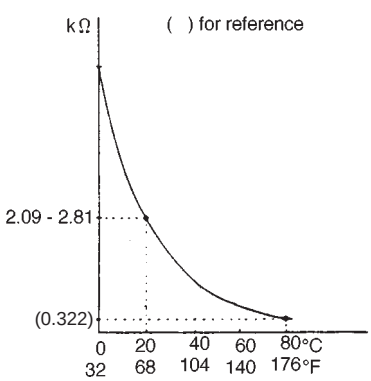
INTAKE AIR TEMPERATURE (IAT) SENSOR

REMOVAL/INSTALLATION

1) Disconnect negative cable at battery.
2) Disconnect IAT sensor connector.
3) Remove IAT sensor from air cleaner case.

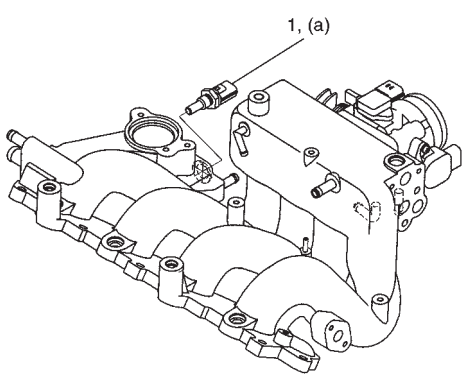
Reverse above procedure in case of installation.





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 figure, replace IAT sensor.



1. ECT sensor

ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

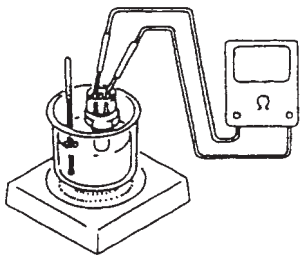
REMOVAL/INSTALLATION

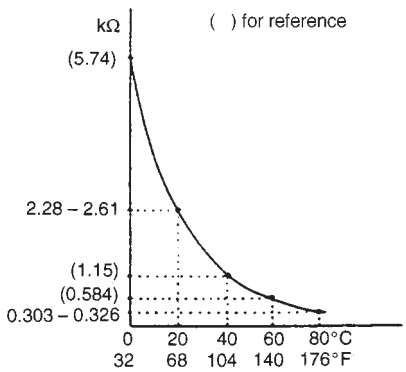
1) Disconnect negative cable at battery.
2) Drain cooling system.
3) Remove generator. Refer to Section 6H.
4) Disconnect connector from ECT sensor.
5) Remove ECT sensor from intake manifold.

Reverse removal procedure in case of installation noting the following.

- Clean mating surfaces of sensor and intake manifold.
- Replace O-ring with new one.
- Tighten ECT sensor to specified torque.

Tightening Torque
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

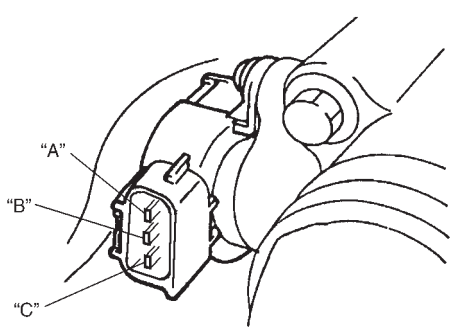




INSPECTION

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, replace ECT sensor.



TP SENSOR

INSPECTION

1) Disconnect negative cable at battery.
2) Disconnect TP sensor connector.
3) Using ohmmeter, check resistance between terminals under each condition given in table below.

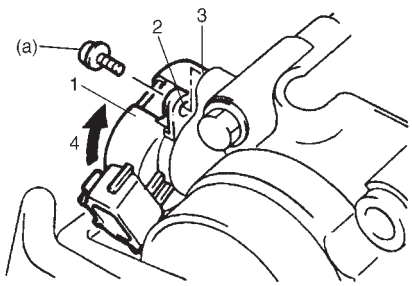
TERMINALS	RESISTANCE	
Between "A" and "B" terminals	2.5 – 6.0 kΩ	
Between "A" and "C" terminals	Throttle valve is at idle position	0.17 – 11.4 kΩ
	Throttle valve is fully opened	1.72 – 15.50 kΩ

NOTE:

There should be more than 1.5 kΩ resistance difference between when throttle valve is at idle position and when it is fully open.

If check result is not satisfactory, replace TP sensor.

4) Connect TP sensor connector securely.
5) Connect negative cable to battery.



1. TP sensor
2. TP sensor hole
3. TP sensor screw hole
4. Turn TP sensor after fitting and align holes

REMOVAL

1) Disconnect battery negative cable at battery.
2) Disconnect connector from TP sensor.
3) Remove TP sensor from throttle body.

INSTALLATION

1) Install TP sensor to throttle body.
   Fit TP sensor to throttle body in such way that its holes are a little away from TP sensor screw holes as shown in left figure and turn TP sensor clockwise so that those holes align.

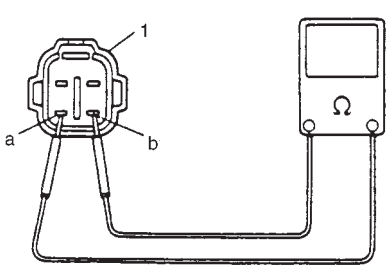
   Tightening Torque
   (a): 2 N·m (0.2 kg-m, 1.5 lb-ft)

2) Connect connector to TP sensor securely.
3) Connect battery negative cable to battery.

HEATED OXYGEN SENSOR (HO2S) (IF EQUIPPED)

ON-VEHICLE INSPECTION

Inspect oxygen sensor and its circuit. Refer to DTC No. 14 Heated Oxygen Sensor Circuit in this section. If malfunction is found, replace.



1. Sensor coupler (Viewed from terminal side)

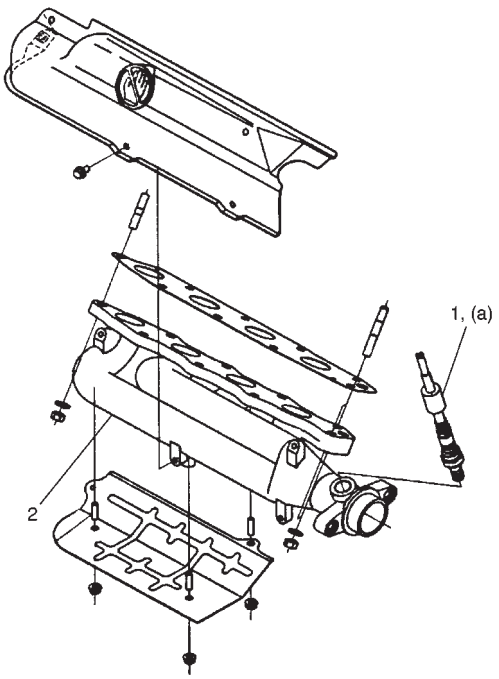
OXYGEN SENSOR HEATER INSPECTION

1) Disconnect oxygen sensor connector.
2) Using ohmmeter, measure resistance between terminals “a” and “b” of sensor connector.

   NOTE:
   Temperature of sensor affects resistance value largely. Make sure that sensor heater is at correct temperature.

   Resistance of oxygen sensor heater:
   11 – 15 Ω (at 20°C, 68°F)

   If found faulty, replace oxygen sensor.
3) Connect oxygen sensor connector securely.



1. Exhaust manifold
2. HO2S

REMOVAL

WARNING:
To avoid danger of being burned, do not touch exhaust system when system is hot. Oxygen sensor removal should be performed when system is cool.

1) Disconnect negative cable at battery.
2) Disconnect connector of heated oxygen sensor.
3) Remove heated oxygen sensor from exhaust manifold.

NOTE:
Be careful not to expose it to excessive shock.

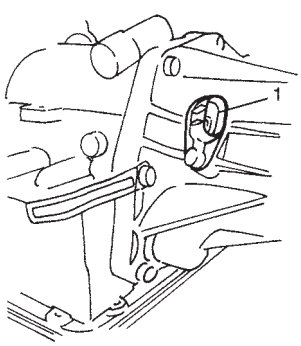
INSTALLATION

Reverse removal procedure noting the following.

- Tighten oxygen sensor to specified torque.

Tightening Torque
(a): 45 N·m (4.5 kg-m, 32.5 lb-ft)

- After installing oxygen sensor, start engine and check that no exhaust gas leakage exists.

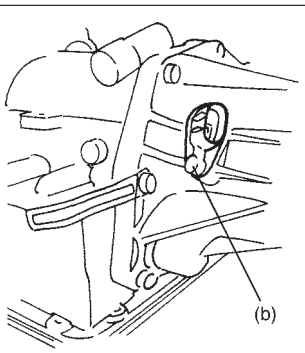


1. VSS

VEHICLE SPEED SENSOR

REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect VSS connector.
3) Remove VSS from transmission.

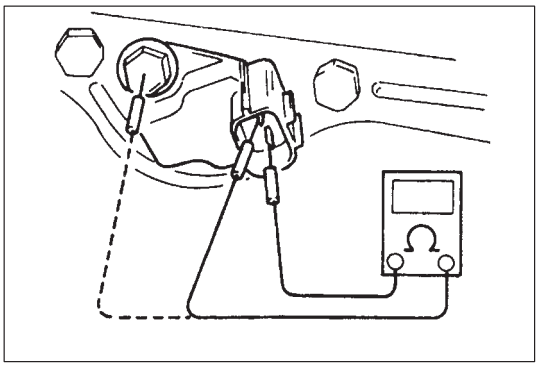


INSTALLATION

Reverse removal procedure noting the following.

- Tighten VSS to specified torque.

Tightening Torque
(b): 10 N·m (1.0 kg-m, 7.2 lb-ft)



CRANKSHAFT POSITION SENSOR (CKP SENSOR)

ON-VEHICLE INSPECTION

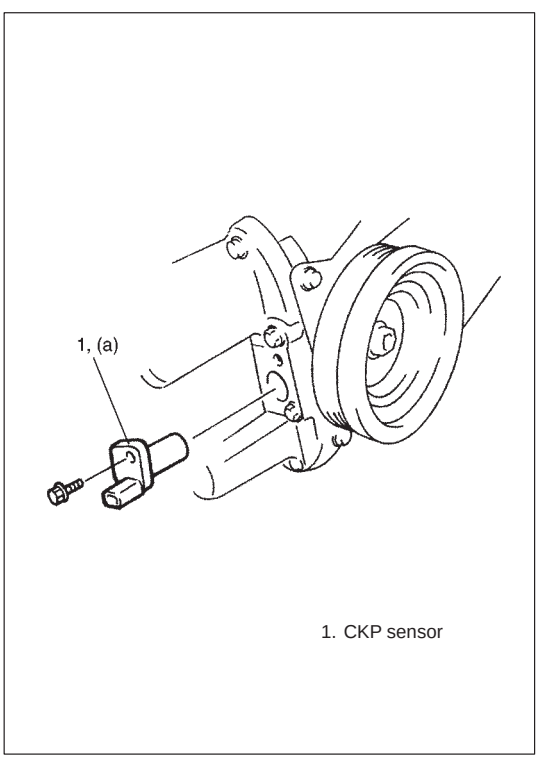
1) Disconnect negative cable at battery.
2) Disconnect connector from CKP sensor.
3) Measure resistance between each terminal of CKP sensor.

   Resistance: 360 – 460Ω at 20°C (68°F)

4) Measure resistance between each terminal and ground.

   Resistance: 1MΩ or more

5) If resistance is out of specification, replace.



1. CKP sensor

REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect connector from CKP sensor.
3) Remove CKP sensor from oil pan.

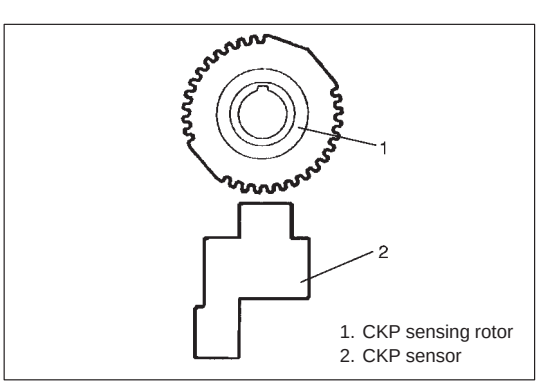
INSTALLATION

1) Check that CKP sensor is free from any metal particles.
2) Install CKP sensor to oil pan.

   Tightening Torque
   (a): 10 N·m (1.0 kg-m)

> **CAUTION:**
> **Be sure to tighten to specified torque. CKP sensor will be deformed if overtightened and correct CKP sensor signal will not be fed if loosened.**

3) Connect connector to CKP sensor.

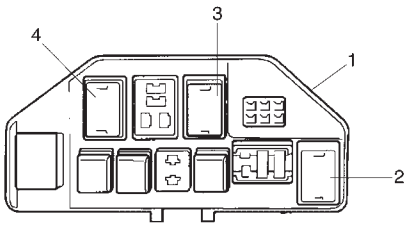


1. CKP sensing rotor
2. CKP sensor

CKP SENSING ROTOR

INSPECTION

1) Remove timing belt cover.
2) Check CKP sensing rotor for damage.
3) If found faulty, replace any defective parts.

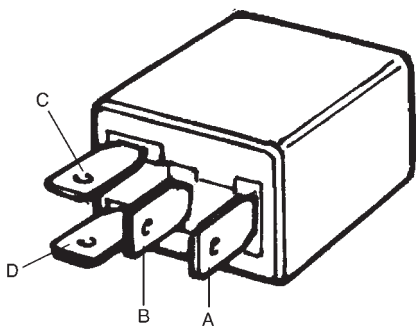


1. Main fuse box
2. Fuel pump relay
3. Main relay
4. Radiator fan relay

MAIN RELAY/FUEL PUMP RELAY/RADIATOR FAN RELAY

INSPECTION

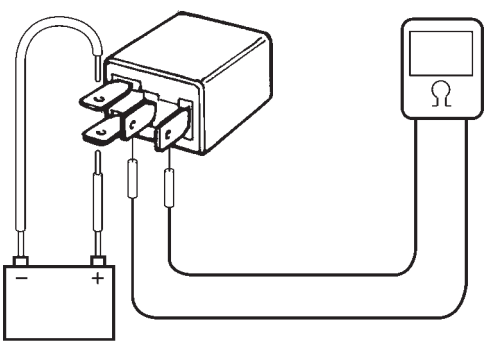
1) Disconnect negative cable at battery.
2) Remove each relay from main fuse.



3) Check resistance between each two terminals as in table below.

TERMINALS	RESISTANCE
Between A and B	∞ (Infinity)
Between C and D	56 – 146 Ω at 20°C, 68°F

If check results are as specified, proceed to next operation check. If not, replace.



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 CUT OPERATION

INSPECTION

NOTE:
Before inspection, check to make sure that gear shift lever is in Neutral position 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 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.
If not, go to “B-9 Fuel Cut Operation Check” in this section.

A/C SIGNAL, A/C ON SIGNAL CONTROL SYSTEM (IF A/C EQUIPPED)

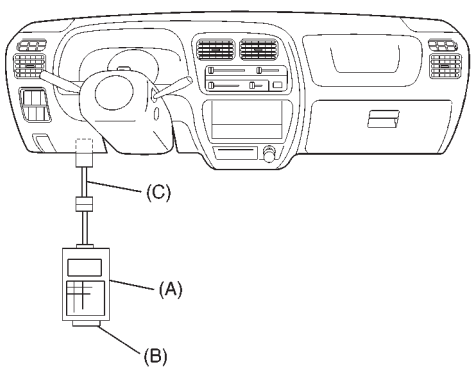
INSPECTION

Check A/C signal and A/C ON signal. Refer to “B-7 A/C Signal Circuit Check” in this section.

EMISSION CONTROL SYSTEM

EGR SYSTEM (IF EQUIPPED)

SYSTEM INSPECTION [Using SUZUKI scan tool]



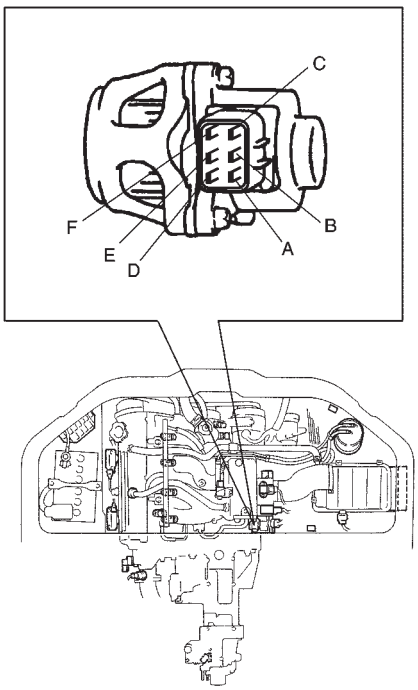
1) Connect SUZUKI scan tool to data link connector (DLC) with ignition switch OFF position.

   Special tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

   NOTE:
   For operation procedure of cartridge, refer to its cartridge operator’s manual.

2) Start engine and warm up it to normal operating temperature.

3) With engine speed between 1500 r/min and 3000 r/min, open EGR valve, using “MISC. TEST” mode.
   In this state, according as EGR valve opening increases engine idle speed drops. If not, go to “B-6 EGR System Check” in this section.



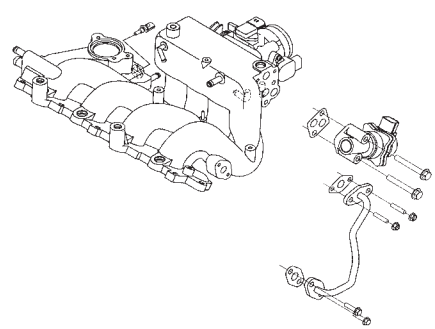
EGR VALVE

ON-VEHICLE INSPECTION

1) Disconnect negative cable at battery.
2) Disconnect EGR valve connector.
3) Check resistance between the following terminals of EGR valve in each pair.

Terminals	Standard resistance
A – B C – B F – E D – E	20 – 24 Ω at 20°C, 68F
B – valve body E – valve body	infinity (∞)

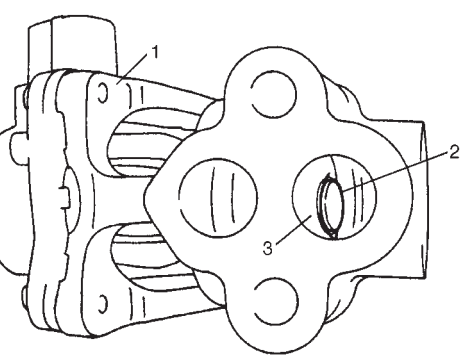
If found faulty, replace EGR valve assembly.



REMOVAL/INSTALLATION

1) Disconnect negative cable at battery.
2) Disconnect EGR valve connector.
3) Remove EGR valve and gasket from intake manifold.
4) Remove EGR pipe.

Reverse removal procedure noting the following.
- Clean mating surface of valve and intake manifold.
- Use new gasket.



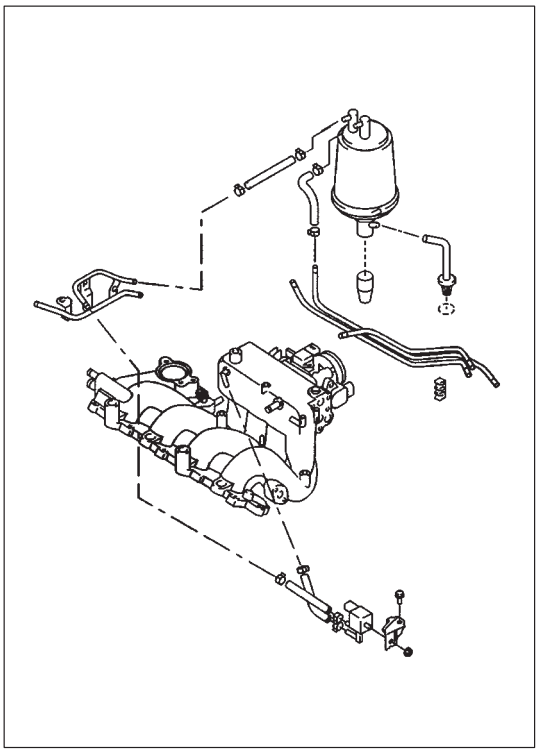
1. EGR valve
2. Valve
3. Valve seat

INSPECTION

1) 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.

2) Inspect valve, valve seat and rod for fault, cracks, bend or other damage.
   If found faulty, replace EGR valve assembly.
3) Inspect EGR passage for clogged or leak.
   If found faulty, repair or replace.

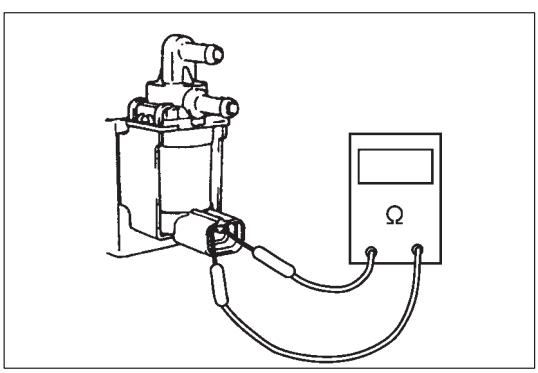


EVAP EMISSION CONTROL SYSTEM

EVAP SYSTEM HOSES AND PIPES INSPECTION

Check hoses and pipes for connection, leakage, clog and deterioration.

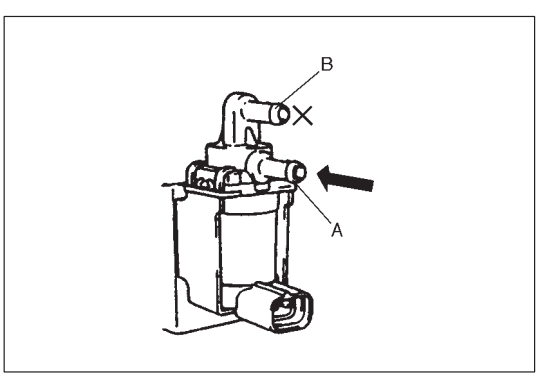
Replace as necessary.



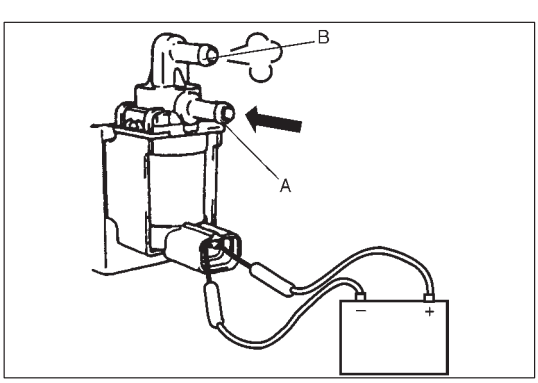
EVAP CANISTER PURGE VALVE

ON-VEHICLE INSPECTION

1) With the ignition switch OFF position, disconnect connector from EVAP canister purge valve.
2) Check resistance between two terminals of EVAP canister purge valve.
   Resistance of EVAP canister purge valve:
   30 – 34 Ω at 20°C (68°F)
   If resistance is as specified, proceed to next operation check.
   If not, replace.



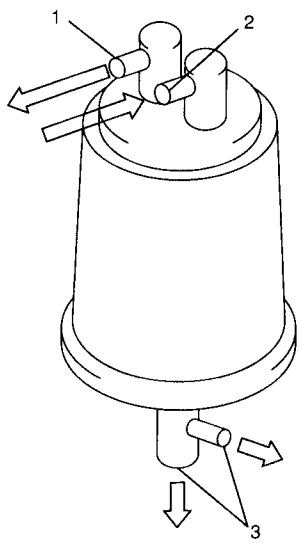
3) Disconnect hoses from intake manifold and its pipe.
4) With connector disconnected, blow into pipe “A”. Air should not come out of pipe “B”.
5) Connect 12V-battery to EVAP canister purge valve terminals. In this state, blow pipe “A”.
   Air should come out of pipe “B”.



> **WARNING:**
> **Do not suck the air through valve. Fuel vapor inside valve is harmful.**

If check result is not as described, replace canister purge valve.

6) Connect hoses.
7) Connect EVAP canister purge valve connector securely.

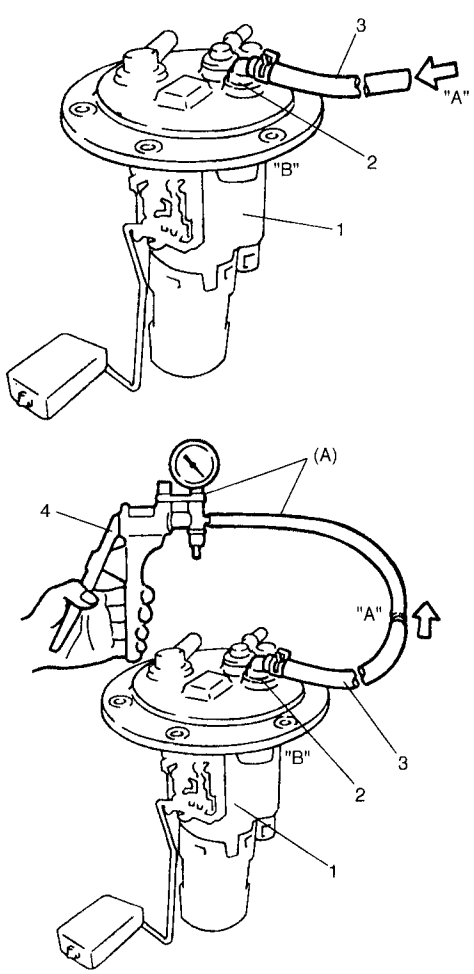


1. Purge pipe
2. Tank pipe
3. Air pipe

EVAP CANISTER INSPECTION

WARNING:
DO NOT SUCK nozzles on EVAP canister. Fuel vapor inside EVAP canister is harmful.

1) Disconnect hoses from EVAP canister and remove EVAP canister.
2) When air is blown into tank pipe, there should be no restriction of flow through purge pipe and air pipe.
   If operation differs from above description, EVAP canister must be replaced.
3) Install EVAP canister and connect hoses to canister.



1. Fuel pump assembly
2. Tank pressure control valve
3. Fuel vapor line hose
4. Vacuum pump

TANK PRESSURE CONTROL VALVE

INSPECTION

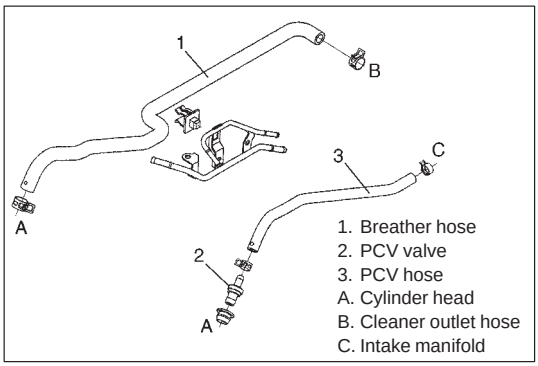
1) Remove fuel pump assembly installed on fuel tank. Refer to Section 6C.
2) Air should pass through valve smoothly from fuel vapor line hose "A" to "B" when blown hard.
3) Also, when vacuum pump is connected to fuel vapor hose and load is applied gradually, air should pass from "B" to "A".

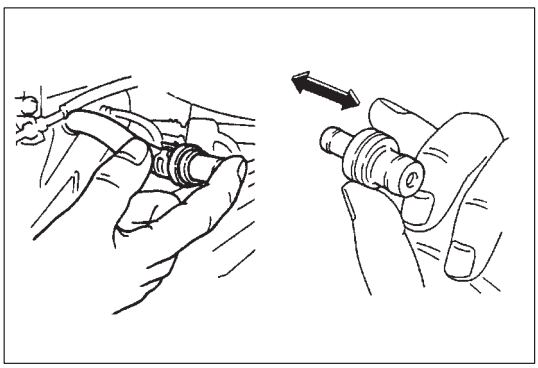
   Special Tool
   (A): 09917-47910

4) If air doesn't pass through valve in step 2) or vacuum is maintained in step 3), replace bracket sub assembly. Refer to Section 6C.

   WARNING:
   DO NOT SUCK air through fuel vapor line hose. Fuel vapor inside valve is harmful.

5) Install fuel pump assembly to fuel tank. Refer to Section 6C.





PCV SYSTEM

INSPECTION

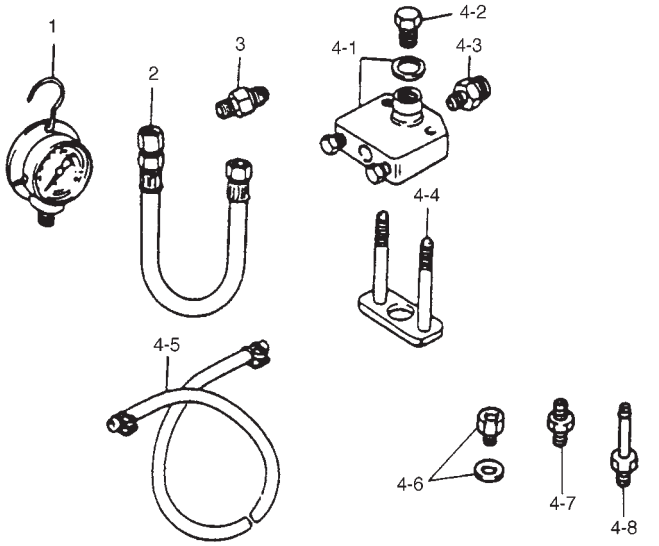
NOTE:
Be sure to check that there is no obstruction in PCV valve or its hoses before checking engine idle speed/IAC duty for obstructed PCV valve or hose hampers its accurate checking.

1) Check hoses for connection, leakage, clog, and deterioration. Replace as necessary.
2) Disconnect PCV valve from cylinder head cover and plug head cover hole.
3) Run engine at idle.
4) Place your finger over end of PCV valve to check for vacuum. If there is no vacuum, check for clogged valve and hose. Replace as necessary.
5) After checking vacuum, stop engine and remove PCV valve. Shake valve and listen for the rattle of check needle inside the valve. If valve does not rattle, replace valve.
6) After checking, connect PCV valve, PCV hose and clamp securely.

TIGHTENING TORQUE SPECIFICATIONS

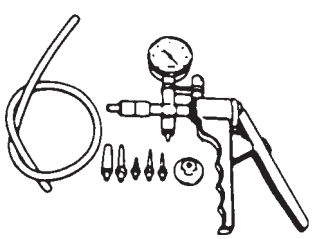
Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
Delivery pipe bolts	23	2.3	17.0
Camshaft position sensor bolt	9	0.9	6.5
Heated oxygen sensor	45	4.5	32.5
Fuel pressure regulator bolts	10	1.0	7.5
Engine coolant temp. (ECT) sensor	15	1.5	11.0
IAC valve	3.3	0.3	2.4
TP sensor	2.0	0.2	1.4
VSS	10	1.0	7.2
CKP sensor	10	1.0	7.2

SPECIAL TOOLS

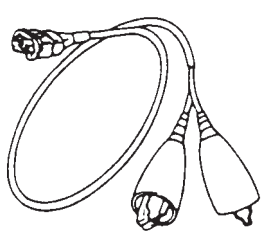


1. Pressure gauge
   09912-58441
2. Pressure hose
   09912-58431
3. Attachment
   09919-46010
4. Checking tool set
   09912-58421

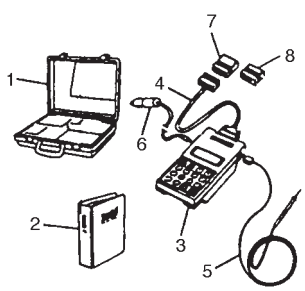
4-1. Tool body & washer
4-2. Body plug
4-3. Body attachment
4-4. Holder
4-5. Return hose & clamp
4-6. Body attachment-2 & washer
4-7. Hose attachment-1
4-8. Hose attachment-2



09917-47910
Vacuum pump gauge

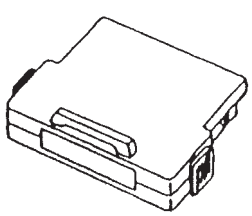


09930-88530
Injector test lead

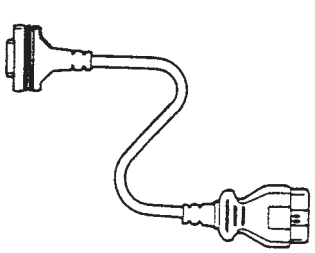


09931-76011
Tech 1A kit

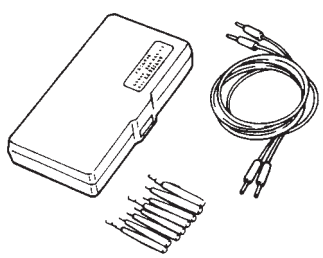
1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self–test adaptor



Mass storage cartridge



09931-76030
16/14 pin DLC cable



09932-76010
Connector test adapter kit

SECTION 6F

IGNITION SYSTEM

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS

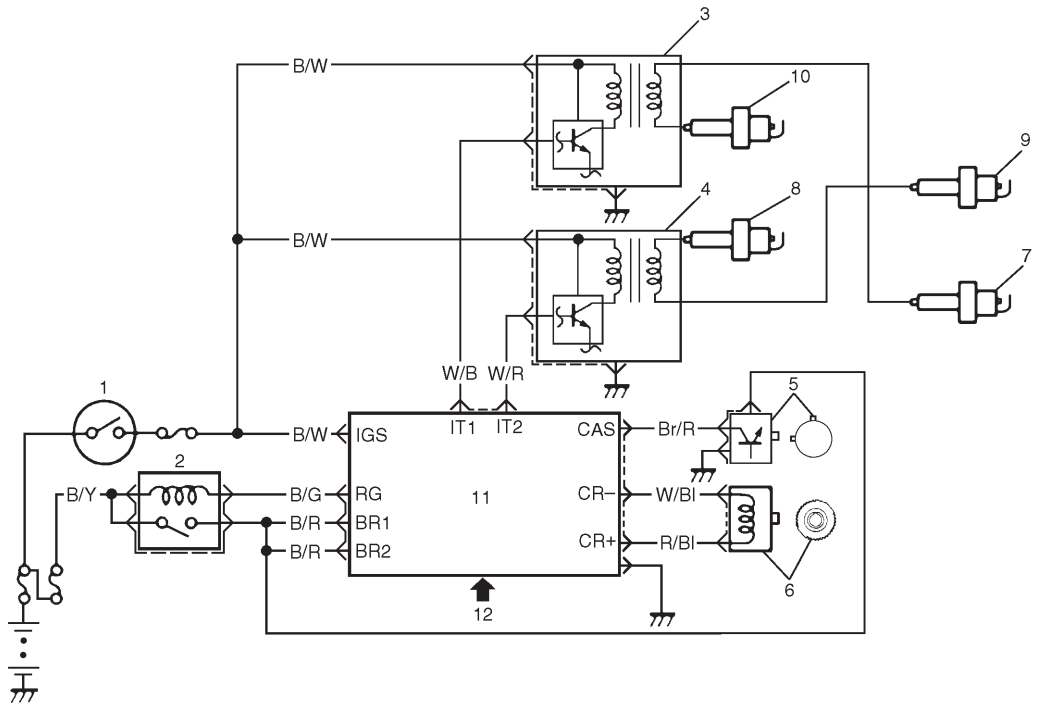
GENERAL DESCRIPTION

The ignition system is an electronic (distributorless) ignition system. It consists of the parts as described below and has an electronic ignition control system.

- ECM
  It detects the engine and vehicle conditions through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the ignitor (power unit) in the ignition coil assembly.
- Ignition coil assembly (including an ignitor)
  The ignition coil assembly has a built-in ignitor which turns ON and OFF the current flow to the primary coil according to the signal from ECM. When the current flow to the primary coil is turned OFF, a high voltage is induced in the secondary coil.
- High tension cords and spark plugs
- CMP sensor (Camshaft position sensor) and CKP sensor (Crankshaft position sensor)
  Using signals from these sensors, ECM identifies the specific cylinder whose piston is in the compression stroke and detects the crank angle.
- TP sensor, ECT sensor, MAP sensor and other sensors/switches
  Refer to SECTION 6E for details.

Although this ignition system does not have a distributor, it has two ignition coil assemblies (one is for No.1 and No.4 spark plugs and the other is for No.2 and No.3 spark plugs). When an ignition signal is sent from ECM to the ignitor in the ignition coil assembly for No.1 and No.4 spark plugs, a high voltage is induced in the secondary coil and cause No.1 and No.4 spark plugs to spark simultaneously. Likewise, when an ignition signal is sent to the ignitor in the other ignition coil assembly, No.2 and No.3 spark plugs spark simultaneously.

SYSTEM WIRING DIAGRAM



1. Ignition switch
2. Main relay
3. Ignition coil assembly for No.1 and No.4 spark plugs
4. Ignition coil assembly for No.2 and No.3 spark plugs
5. CMP sensor
6. CKP sensor
7. No.1 spark plug
8. No.2 spark plug
9. No.3 spark plug
10. No.4 spark plug
11. ECM
12. Sensed information
    - MAP sensor
    - ECT sensor
    - IAT sensor
    - TP sensor
    - VSS
    - Electric load signal
    - Engine start signal
    - Test switch terminal

DIAGNOSIS

Condition	Possible Cause	Correction
Engine cranks, but will not start or hard to start	**No spark or abnormal spark**	
	● Blown fuse for ignition coil	Replace.
	● Loose connection or disconnection of lead wire or high-tension cord(s)	Connect securely.
	● Faulty high-tension cord(s)	Replace.
	● Faulty spark plug(s)	Adjust, clean or replace.
	● Faulty ignition coil/ignitor	Replace ignition coil assembly.
	● Faulty CKP sensor or crankshaft timing belt pulley	Clean, tighten or replace.
	● Faulty ECM	Replace.
Poor fuel economy or engine performance	● Incorrect ignition timing	Check related sensors and crankshaft timing belt pulley.
	● Faulty spark plug(s) or high-tension cord(s)	Adjust, clean or replace.
	● Faulty ignition coil	Replace.
	● Faulty CKP sensor or crankshaft timing belt pulley	Clean, tighten or replace.
	● Faulty ECM	Replace.

DIAGNOSTIC FLOW TABLE

STEP	ACTION	YES	NO
1	Was ENGINE DIAG. FLOW CHART performed?	Go to Step 2.	Go to ENGINE DIAG. FLOW CHART in SECTION 6.
2	Ignition Spark Test 1) Check all spark plugs for condition and type, referring to SPARK PLUGS. 2) If OK, perform ignition spark test, referring to IGNITION SPARK TEST. Is spark emitted from all spark plugs?	Go to Step 11.	Go to Step 3.
3	Diagnostic Trouble Code (DTC) Check Is DTC stored in ECM referring to DTC CHECK in SECTION 6E?	Go to applicable flow Chart corresponding to that code No. in SECTION 6E.	Go to Step 4.
4	Electrical Connection Check 1) Check ignition coil assemblies and high-tension cords for electrical connection. Are they connected securely?	Go to Step 5.	Connect securely.
5	High-Tension Cord Check 1) Check high-tension cord for resistance referring to HIGH-TENSION CORD. Is check result satisfactory?	Go to Step 6.	Replace high-tension cord(s).

STEP	ACTION	YES	NO
6	Ignition Coil Assembly Power Supply and Ground Circuit Check 1) Check ignition coil assembly power supply ("B/W" wire) and ground circuit ("B" wire) for open and short. Are circuits in good condition?	Go to Step 7.	Repair or replace.
7	Ignition Coil Assembly Check 1) Check ignition coil for resistance referring to IGNITION COIL ASSEMBLY. Is check result satisfactory?	Go to Step 8.	Replace ignition coil assembly.
8	Crankshaft Position (CKP) Sensor Check 1) Check crankshaft position sensor referring to CKP SENSOR and CKP SENSING ROTOR in SECTION 6E. Is check result satisfactory?	Go to Step 9.	Tighten CKP sensor bolt, replace CKP sensor or crankshaft timing belt pulley.
9	CMP Sensor Check 1) Check CMP sensor and signal rotor, referring to DTC NO. 15 CMP SENSOR CIRCUIT in SECTION 6E. Is check result satisfactory?	Go to Step 10.	Tighten CMP sensor bolt, replace CMP sensor.
10	Ignition Trigger Signal Circuit Check 1) Check ignition trigger signal wires ("W/B" and "W/R" wire) for open, short and poor connection. Are circuits in good condition?	Go to Step 11.	Repair or replace.
11	A known-good Ignition Coil Assembly Substitution 1) Substitute a known-good ignition coil assembly and then repeat STEP 2. Is check result of STEP 2 satisfactory?	Go to Step 12.	Substitute a known-good ECM and then repeat STEP 2.
12	Ignition Timing Check 1) Check initial ignition timing and ignition timing advance referring to IGNITION TIMING. Is check result satisfactory?	System is in good condition.	Check CKP sensor, crankshaft timing belt pulley (signal rotor) and input signals related to this system.

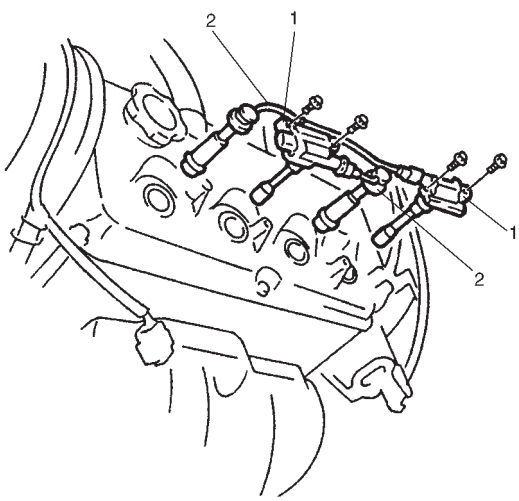
ON-VEHICLE SERVICE

IGNITION SPARK TEST

1) Place transmission gear shift lever in “Neutral”, set parking brake, and block drive wheels.
2) Disconnect injector couplers and ignition coil couplers.

WARNING:
If the injector couplers are not disconnected, combustible gas will come out of the spark plug holes during this test and the vehicle can get fire .

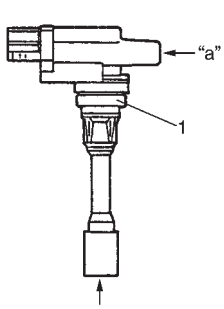
3) Remove spark plugs and check them for condition and type.
4) If OK, connect ignition coil couplers to ignition coil and connect spark plugs to ignition coil or high-tension cord. Ground spark plugs.
5) Crank engine and check if all spark plugs spark normally.
   If the spark plugs do not spark normally (no spark or abnormal spark), inspect the related parts as described under ”Diagnosis”.
6) After checking, install spark plugs and ignition coils.
7) Connect injector couplers.



1. Ignition coil assembly
2. High-tension cord

IGNITION COIL ASSEMBLY (INCLUDING IGNITOR)

1) Disconnect negative cable at battery.
2) Disconnect high-tension cords from ignition coil assembly.
3) Remove bolts and pull out ignition coil assemblies from cylinder head cover.

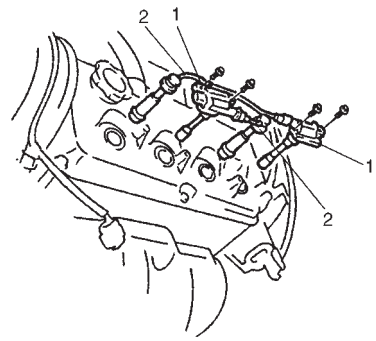


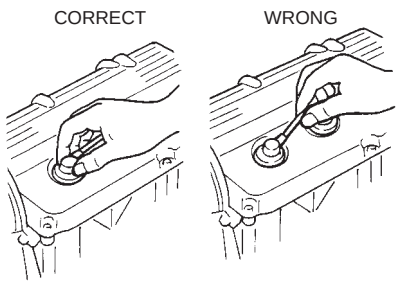
1. Ignition coil assembly

4) Measure secondary coil for resistance.

   Secondary coil resistance (“a” – “b”):
   11.1 – 15.0 kΩ at 20°C, 68°F

   If resistance is out of specification, replace ignition coil assembly.
5) Install ignition coil assemblies to cylinder head and connect high-tension cords to ignition coil assemblies. Connect negative cable to battery.





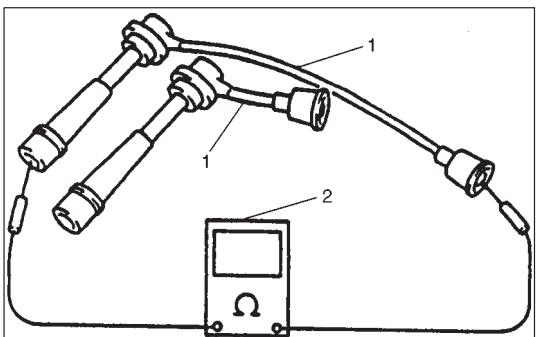
1. Ignition coil assembly
2. High-tension cord

HIGH-TENSION CORD

REMOVAL

1) Remove high-tension cord from ignition coil assembly while gripping its cap.
2) Pull out high-tension cord from spark plug while gripping its cap.

CAUTION:
Pull out each connection by gripping cap portion so as not to damage their inside wire (resistive conductor).



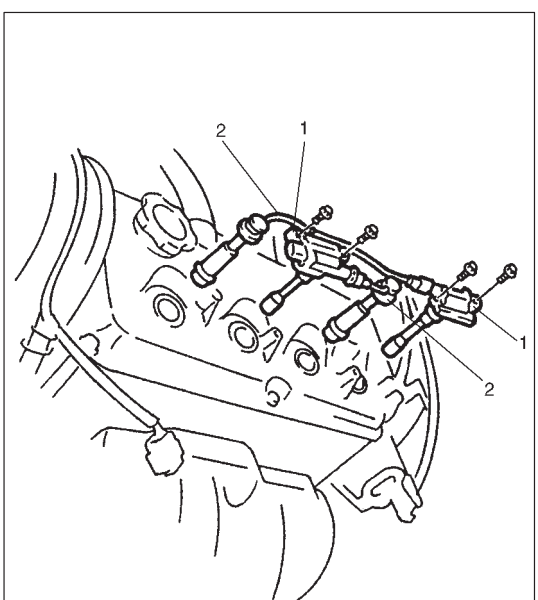
1. High-tension cord
2. Ohmmeter

INSPECTION

Measure resistance of high-tension cord by using ohmmeter.

High-tension cord resistance: 4 – 10 kΩ/m (1.2 – 3.0 kΩ/ft)

If resistance exceeds specification, replace high-tension cord(s).

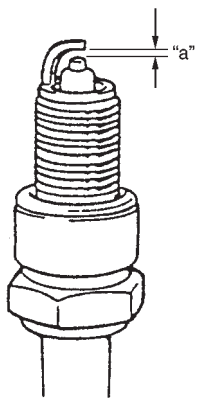


1. Ignition coil assembly
2. High-tension cord

INSTALLATION

Install high-tension cord to spark plug and ignition coil assembly while gripping its cap.

CAUTION:
- **Never attempt to use metal conductor high-tension cord(s) as replacing parts.**
- **Insert each cap potion fully when installing high-tension cords.**



SPARK PLUG

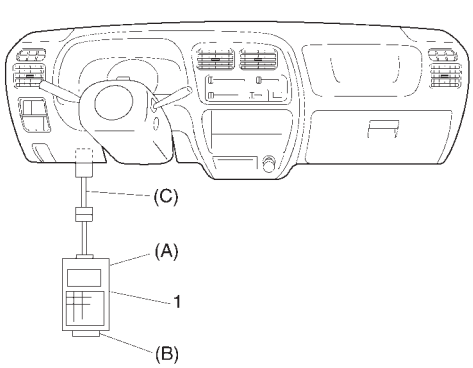
1) Pull out high-tension cord by gripping its cap and then remove spark plugs.
2) Inspect them for:
   - Electrode wear
   - Carbon deposits
   - Insulator damage
3) If any abnormality is found, adjust air gap, clean with spark plug cleaner or replace them with specified new plugs.

   Spark plug air gap "a" : 0.7 – 0.8 mm (0.028 – 0.031 in.)
   Spark plug type: NGK BKR6E
   DENSO K20PR-U
4) Install spark plug and torque them to specification .

   Tightening Torque for spark plug
   28 N·m (2.8 kg-m, 20.0 lb-ft)
5) Install high-tension cord securely by gripping its cap.

CKP SENSOR

Refer to SECTION 6E for removal, inspection and installation.



1. Scan tool

IGNITION TIMING

NOTE:

- **For vehicle without ignition timing adjusting resister connector, ignition timing is not adjustable. If ignition timing is out of specification, check system related parts.**
- **Before starting engine, shift transmission to "Neutral" and set parking brake.**

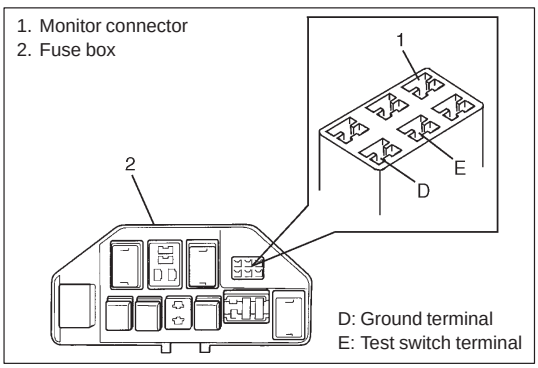
INSPECTION

1) When using SUZUKI scan tool, connect SUZUKI scan tool to DLC with ignition switch OFF.

   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)
2) Start engine and warm it up to normal operating temperature.
3) Make sure that all of electrical loads except ignition are switched off.
4) Check to be sure that idle speed is within specification. (Refer to SECTION 6E)

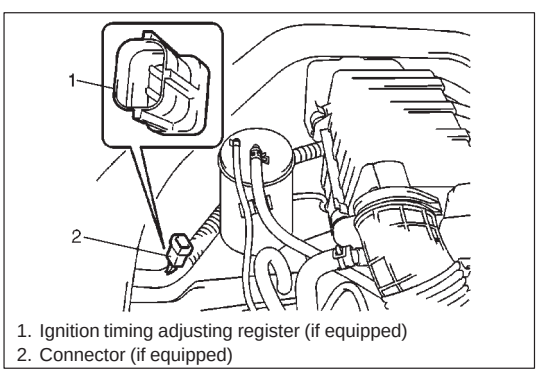
5) Fix ignition timing to initial one as follows:

[Using SUZUKI scan tool]
Select “MISC TEST” mode on SUZUKI scan tool and fix ignition timing to initial one.



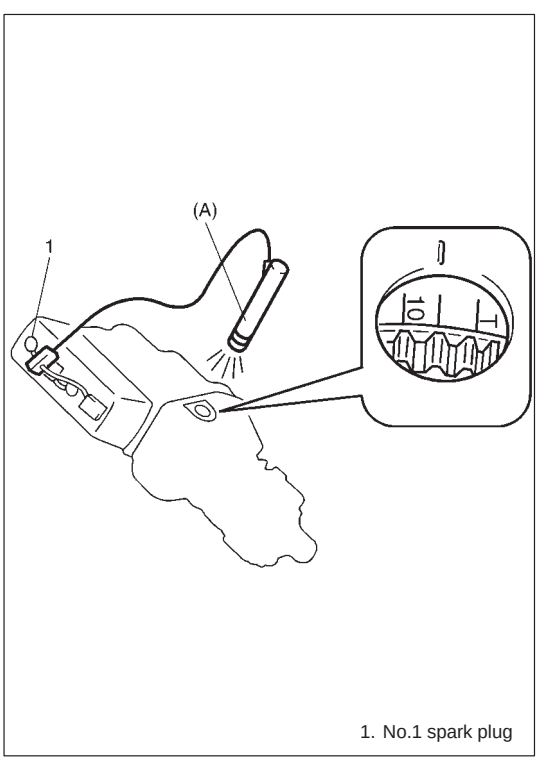
1. Monitor connector
2. Fuse box

[Not using SUZUKI scan tool]
Disconnect scan tool from DLC, and connect “D” and “E” terminals of monitor connector or “E” terminal to body ground by using service wire so that ignition timing is fixed on initial one.



1. Ignition timing adjusting register (if equipped)
2. Connector (if equipped)

6) Open the engine service hole cover behind the front seats and remove the inspection hole cap on the transmission case to observe ignition timing.
7) If equipped with ignition timing adjusting resister, remove the ignition timing adjusting resister.



1. No.1 spark plug

8) Using the timing light, check that ignition timing is within specification.

Initial ignition timing (Test switch terminal grounded or fixed with SUZUKI scan tool) : 5 ± 3° BTDC at idle speed
Ignition order : 1-3-4-2

Special Tool
(A): 09900-27301 or 09930-76420

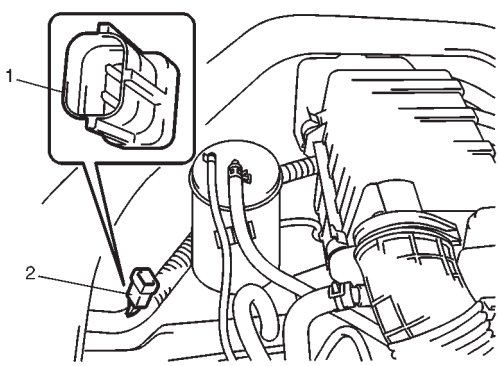
9) If ignition timing is out of specification, check the followings:
   - CKP sensor
   - Crankshaft timing belt pulley (signal rotor)
   - TP sensor
   - Test switch signal circuit
   - VSS

10) After checking Initial Ignition Timing, release ignition timing fixation by using SUZUKI scan tool or disconnect service wire from monitor connector.
11) With engine idling (test switch terminal ungrounded, throttle opening at closed position and car stopped), check that ignition timing fluctuates between 6° – 18° BTDC. (Constant variation within a few degrees from 6° – 18° indicates no abnormality but proves operation of electronic timing control system.) Also, check that increasing engine speed advances ignition timing.
    If above check results are not satisfactory, check CKP sensor, test switch terminal circuit and ECM.
12) Install the inspection hole cap and engine service hole cover and ignition adjusting resistor if equipped.

IGNITION TIMING COMPENSATION FOR ENGINE KNOCKING (FOR VEHICLE WITH IGNITION TIMING ADJUSTING RESISTER CONNECTOR)

The ignition system basically needs no adjustment for ignition timing. However, due to fuel quality or other reason (mainly countermeasure against knocking), the adjustment may be needed. If so, adjust the ignition timing as follows.

For vehicle with ignition timing adjusting resister connector



1. Ignition timing adjusting register (if equipped)
2. Connector (if equipped)

1) Replace the register with the smallest degree-change register (–1° or 1°) as your purpose. Check if the result if satisfactory. If not, replace the register with next larger degree-change register step by step until satisfactory result is obtained.

Characters printed on the ignition resistor	1	2	3	4
Difference in advance degrees as compared with the original condition	–5°	–4°	–3°	–2°

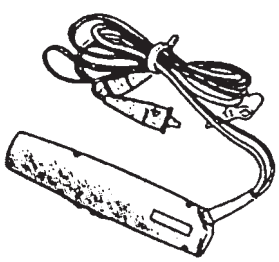
5	X	6	7	8	9	10	11
–1°	0°	1°	2°	3°	4°	5°	6°

2) Make sure that the initial ignition timing is within the specification with the resister removed.

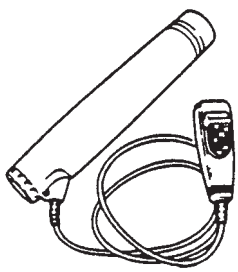
TIGHTENING TORQUE SPECIFICATION

Fastening Parts	Tightening Torque		
	N·m	kg-m	lb-ft
Spark plug	28	2.8	20.0

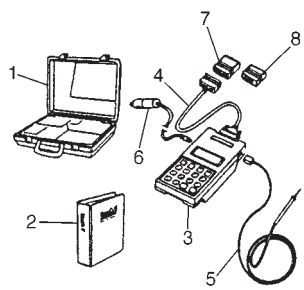
SPECIAL TOOLS



09900-27301
Timing light (DC 12V)

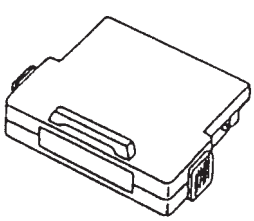


09930-76420
Timing light (Dry cell type)

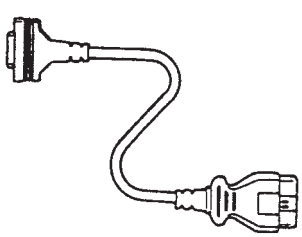


1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adapter
8. Self-test adapter

09931-76011
Tech 1A kit



Mass storage cartridge



09931-76030
16/14 pin DLC cable

SECTION 6G

CRANKING SYSTEM

CONTENTS

GENERAL DESCRIPTION

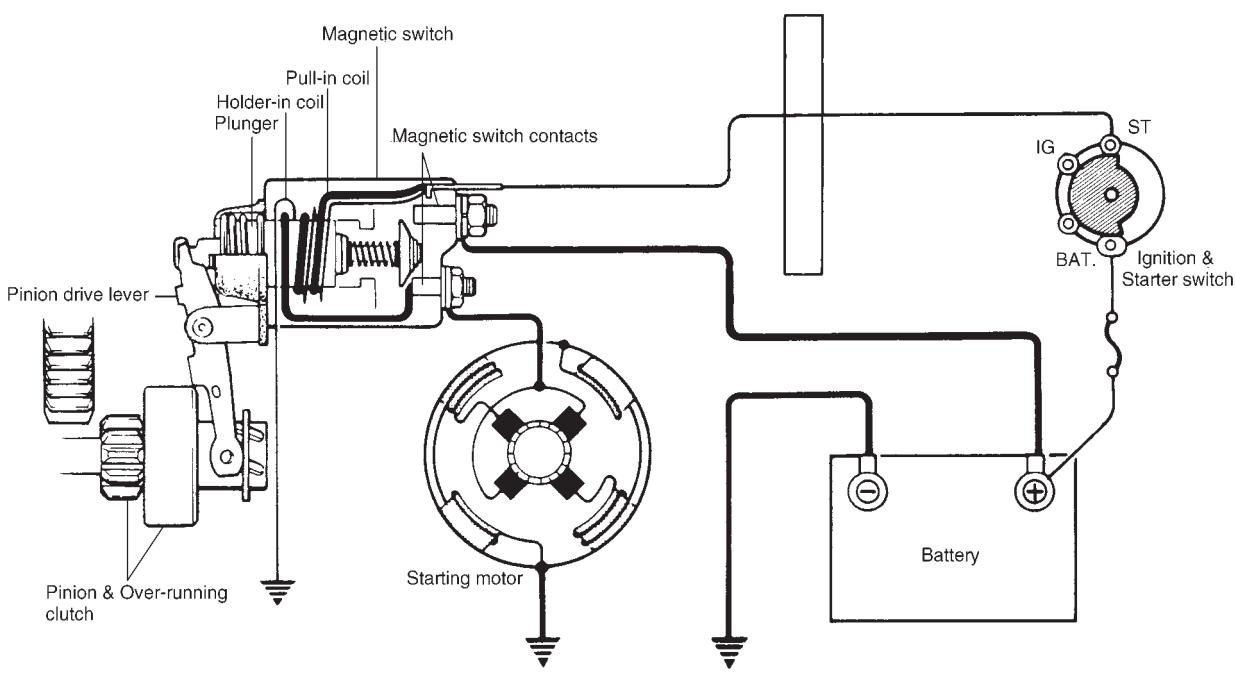
CRANKING CIRCUIT

The cranking circuit consists of the battery, starting motor, ignition switch, and related electrical wiring. These components are connected electrically.

Only the starting motor will be covered in this section.

STARTING MOTOR CIRCUIT

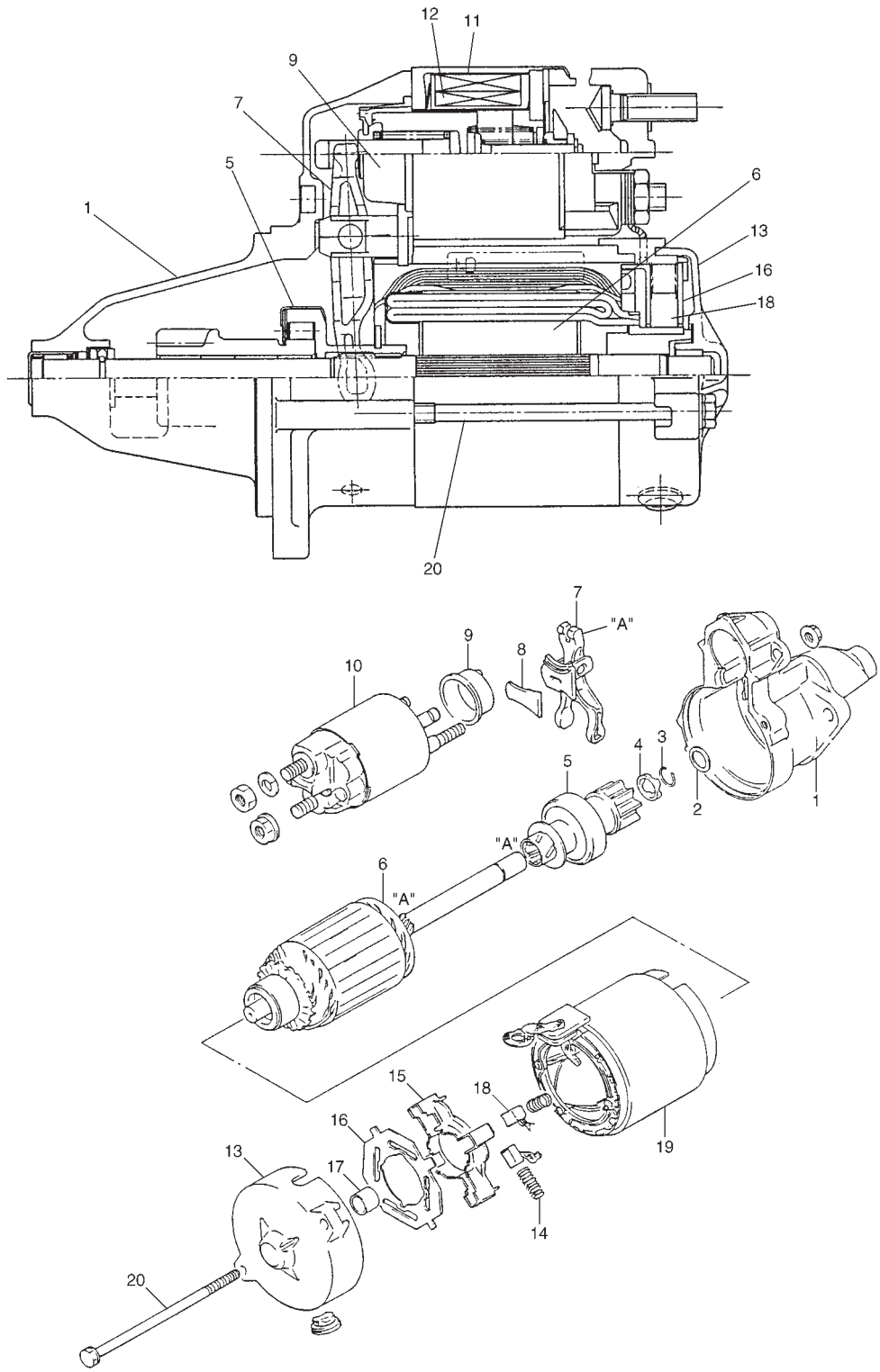
- The magnetic switch coils are magnetized when the ignition switch is closed.
- The resulting plunger and pinion drive lever movement causes the pinion to engage the engine flywheel gear and the magnetic switch main contacts to close, and cranking takes place.
- When the engine starts, the pinion over-running clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.



STARTING MOTOR

Both of them consist of yoke assembly, armature assembly, over-running clutch assembly, magnetic switch assembly, front housing, rear housing, brush holder and drive lever.
The magnetic switch assembly and parts in the starting motor are enclosed in the housings so that they will be protected against possible dirt and water splash.

NOTE:
Make sure to apply grease before assembly where so indicated “A” in the figure below.



1. Drive housing assembly
2. Washer
3. Snap ring
4. Pinion stop ring
5. Over-running clutch assembly
6. Armature
7. Pinion drive lever
8. Seal
9. Boot
10. Magnetic switch
11. Hold-in coil
12. Pull-in coil
13. Rear housing
14. Brush spring
15. Brush holder
16. Insulator
17. Bush
18. Brush
19. Yoke assembly
20. Housing bolt

“A”: Apply grease (99000-25010)

DIAGNOSIS

Possible symptoms due to starting system trouble would be as follows:

- Starting motor does not run (or runs slowly)
- Starting motor runs but fails to crank engine
- Abnormal noise is heard

Proper diagnosis must be made to determine exactly where the cause of each trouble lies ..... in battery, wiring harness, (including starting motor switch), starting motor or engine.

Do not remove motor just because starting motor does not run. Check following items and narrow down scope of possible causes.

1) Condition of trouble
2) Tightness of battery terminals (including ground cable connection on engine side) and starting motor terminals
3) Discharge of battery
4) Mounting of starting motor

Condition	Possible Cause	Correction
Motor not running	**No operating sound of magnetic switch**	
	● Battery run down	Recharge battery.
	● Battery voltage too low due to battery deterioration	Replace battery.
	● Poor contact in battery terminal connection	Retighten or replace.
	● Loose grounding cable connection	Retighten.
	● Fuse set loose or blown off	Tighten or replace.
	● Poor contacting action of ignition switch and magnetic switch	Replace.
	● Lead wire coupler loose in place	Retighten.
	● Open-circuit between ignition switch and magnetic switch	Repair.
	● Open-circuit in pull-in coil	Replace magnetic switch.
	● Brushes are seating poorly or worn down	Repair or replace.
	● Poor sliding of plunger and/or pinion	Repair.
	Operating sound of magnetic switch heard	
	● Battery run down	Recharge battery.
	● Battery voltage too low due to battery deterioration	Replace battery.
	● Loose battery cable connections	Retighten.
	● Burnt main contact point, or poor contacting action of magnetic switch	Replace magnetic switch.
	● Brushes are seating poorly or worn down	Repair or replace.
	● Weakened brush spring	Replace.
	● Burnt commutator	Replace armature.
	● Poor grounding of field coil	Repair.
	● Layer short-circuit of armature	Replace.
	● Crankshaft rotation obstructed	Repair.

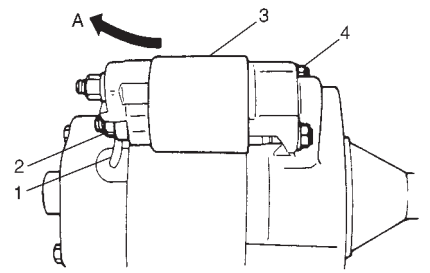
Condition	Possible Cause	Correction
Starting motor running but too slow (small torque)	**If battery and wiring are satisfactory, inspect starting motor**	
	● Insufficient contact of magnetic switch main contacts	Replace magnetic switch.
	● Layer short-circuit of armature	Replace.
	● Disconnected, burnt or worn commutator	Repair commutator or replace armature.
	● Poor grounding of field coil	Repair.
	● Worn brushes	Replace brush.
	● Weakened brush springs	Replace spring
	● Burnt or abnormally worn end bush	Replace bush.
Starting motor running, but not cranking engine	● Worn pinion tip	Replace over-running clutch.
	● Poor sliding of over-running clutch	Repair.
	● Over-running clutch slipping	Replace over-running clutch.
	● Worn teeth of pinion gear	Replace flywheel.
Noise	● Abnormally worn bush	Replace bush.
	● Worn pinion or worn teeth of pinion gear	Replace pinion or flywheel.
	● Poor sliding of pinion (failure in return movement)	Repair or replace.
	● Lack of oil in each part	Lubricate.
Starting motor does not stop running	● Fused contact points of magnetic switch	Replace magnetic switch.
	● Short-circuit between turns of magnetic switch coil (layer short-circuit)	Replace magnetic switch.
	● Failure of returning action in ignition switch	Replace.

UNIT REPAIR OVERHAUL

DISMOUNTING AND REMOUNTING

1) Disconnect negative (–) battery lead at battery.
2) Disconnect magnetic switch lead wire and battery cable from starting motor terminals.
3) Remove 2 mounting bolts.
4) Remove starting motor.
5) To remount, reverse above procedure.

DISASSEMBLY

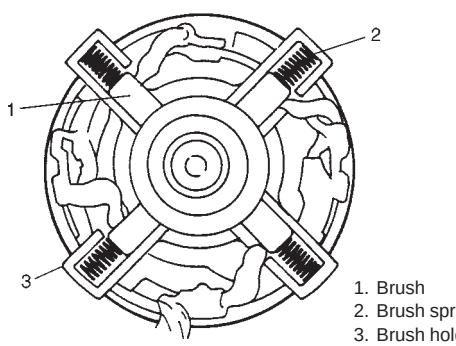


1. Lead wire
2. Nut
3. Magnetic switch
4. Nut

A: Pull up to disconnect hook

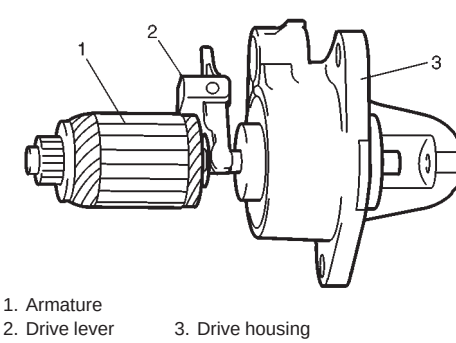
1) Remove nut and disconnect lead wire from magnetic switch.
2) Remove 2 nuts and then take out magnetic switch by pulling up its rear portion so as to inside hook is disconnected from drive lever.

NOTE:
Do not disassemble magnetic switch. Replace it as assembly, when required.



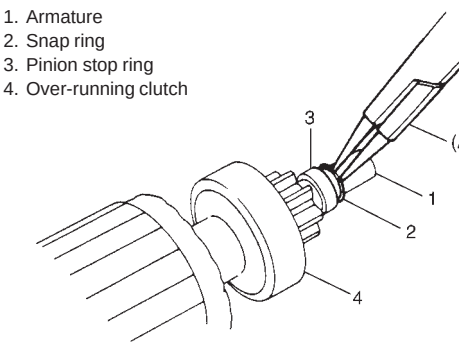
1. Brush
2. Brush spring
3. Brush holder

3) Remove housing bolts (through bolts) and then pull out commutator end housing.
4) Remove insulator, brush spring and then brush holder.



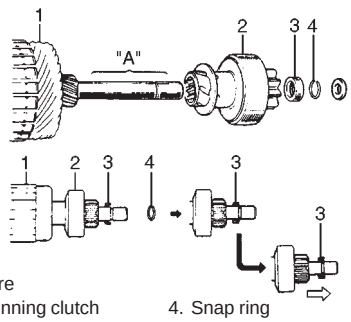
1. Armature
2. Drive lever
3. Drive housing

5) Remove yoke, armature and drive lever.



6) Remove armature snap ring by using snap ring pliers assisted with screwdriver, then pull out pinion stop ring and over-running clutch.

Special Tool
(A) : 09900-06107

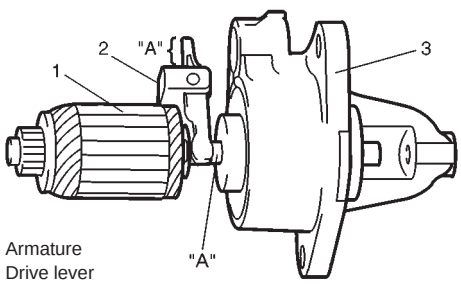


1. Armature
2. Over-running clutch
3. Pinion stop ring
4. Snap ring
"A": Apply grease

REASSEMBLY

1) Inspect component parts (Refer to INSPECTION) and replace with new ones as necessary.
2) Before installing over-running clutch, apply grease as shown in left figure and then fasten stop ring with snap ring.

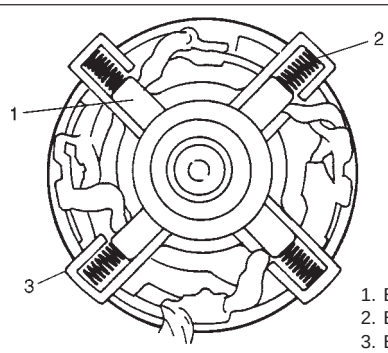
"A" : Grease 99000-25010



1. Armature
2. Drive lever
3. Drive housing
"A" : Apply grease

3) Apply grease to drive lever and combine it with armature. Then assemble them with drive housing.

"A" : Grease 99000-25010



1. Brush
2. Brush spring
3. Brush holder

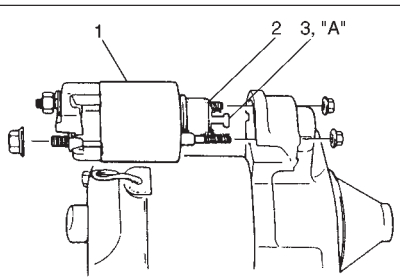
4) Install yoke and brush holder, then set 4 brushes with their springs. Install insulator.

NOTE:

- **When installing brushes, make sure that brushes and commutator have been degreased thoroughly.**
- **Check to confirm that brush parts do not have unnecessary contacts with others.**

5) Install rear housing applied with grease in its bush inside.

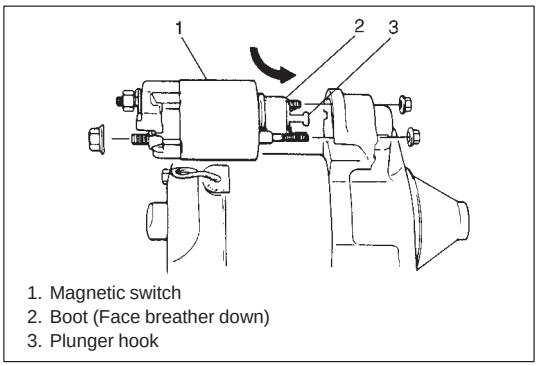
Grease 99000-25010



1. Magnetic switch
2. Boot (Face breather down)
3. Plunger
"A" : Apply grease

6) Replace magnetic switch or its boot with new one, if required, then apply grease to plunger.

"A" : Grease 99000-25010

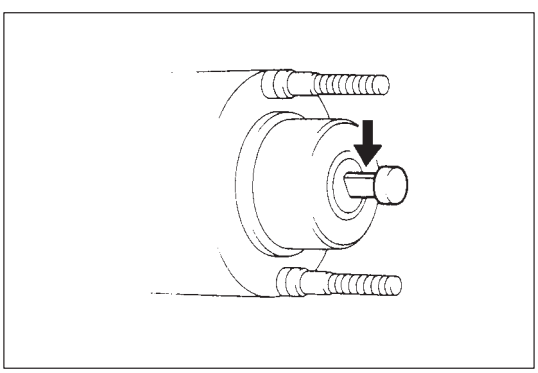


1. Magnetic switch
2. Boot (Face breather down)
3. Plunger hook

7) Hook magnetic switch plunger with drive lever and then fasten magnetic switch assembly with nuts.
8) Connect lead wire as it was and then check magnetic switch for operation.

NOTE:
- **Before installing nuts, make sure that plunger hook is connected with drive lever without fail.**
- **Face boot breather down.**

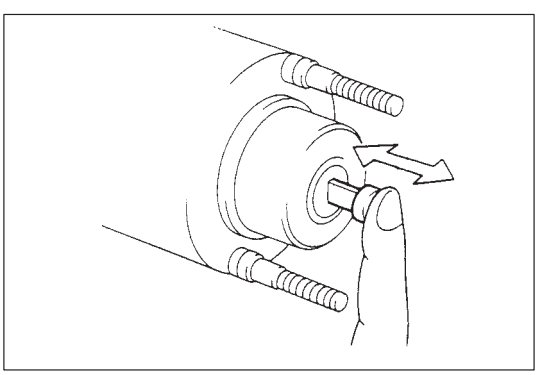
Upon completion of assembly, carry out PERFORMANCE TEST. (Refer to page 6G-11.)



INSPECTION

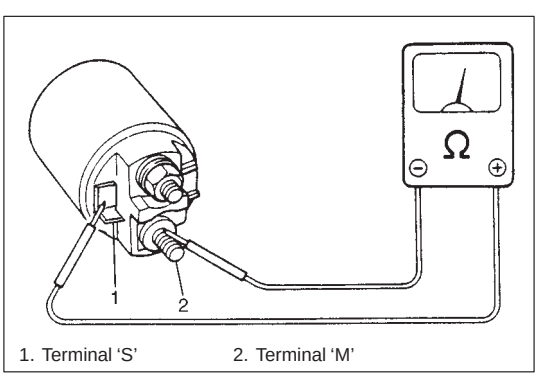
PLUNGER

Inspect plunger for wear. Replace if necessary.



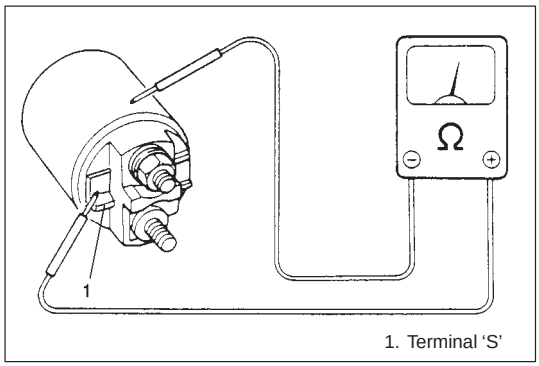
MAGNETIC SWITCH

Push in plunger and release it. The plunger should return quickly to its original position. Replace if necessary.



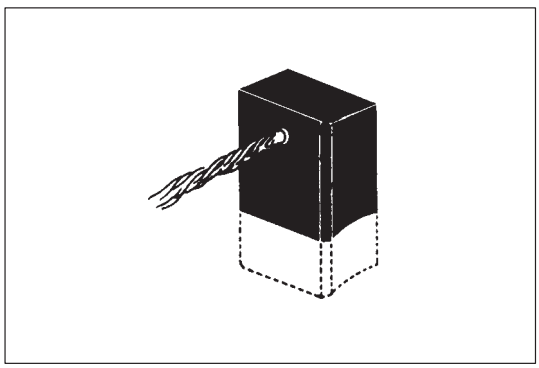
1. Terminal 'S'
2. Terminal 'M'

- **Pull-In Coil Open Circuit Test**
  Check for continuity across magnetic switch 'S' terminal and 'M' terminal. If no continuity exists, coil is open and should be replaced.



1. Terminal 'S'

- **Hold-In Coil Open Circuit Test**
  Check for continuity across magnetic switch 'S' terminal and coil case. If no continuity exists, coil is open and should be replaced.



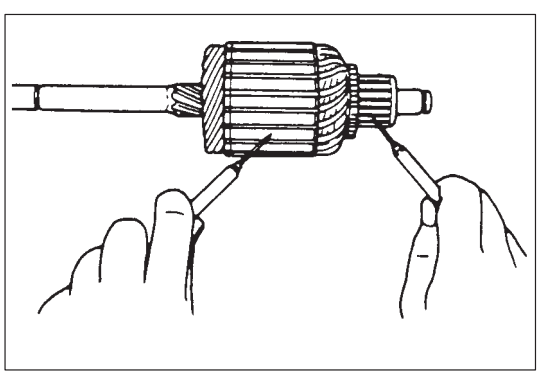
BRUSH

Measure length of brushes and replace them as necessary.

Brush length
Limit : 6.0 mm (0.236 in.)

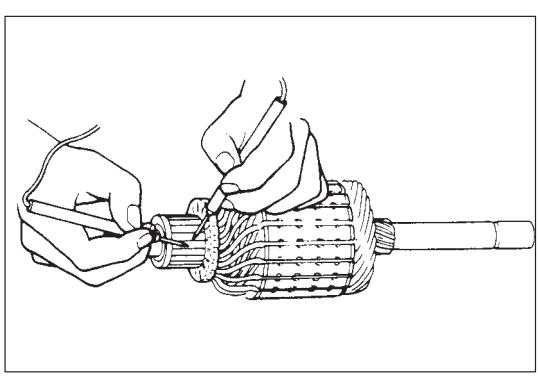
BRUSH HOLDER

Check brush springs for rust or breakage. Also check brush holder for rust and insulation. Replace it as assembly, if required.

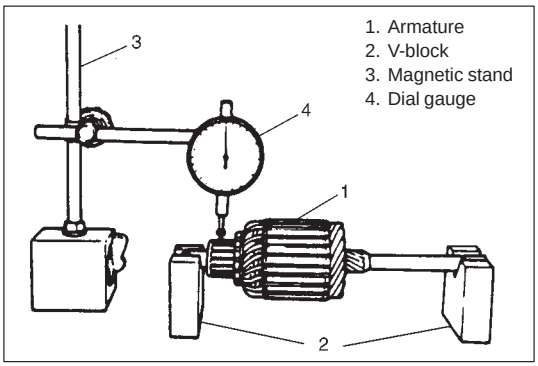


ARMATURE

- **Ground Test**
  Between commutator segment and armature core should be insulated. Use ohmmeter for inspection.

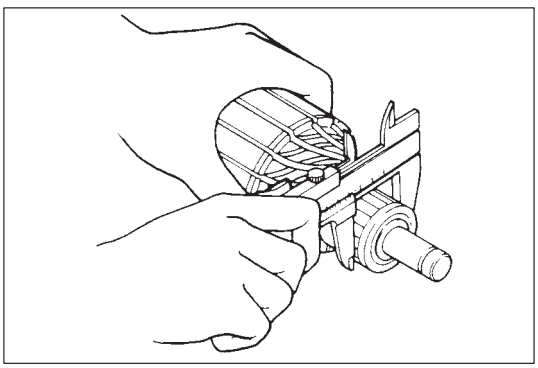


- **Open Circuit Test**
  Check for continuity between segments. If there is no continuity at any test point, there is an open circuit and armature must be replaced.



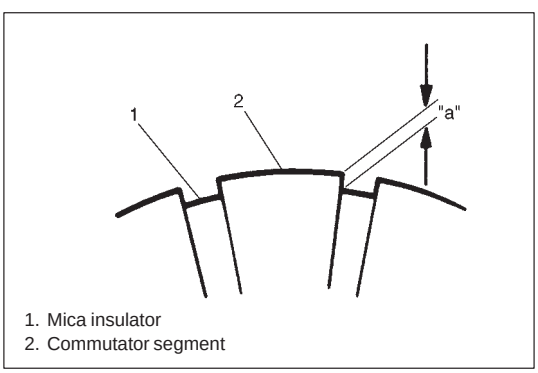
- Check commutator for run-out with armature supported on V-blocks. Correct it by using lathe, if required.

Commutator out of round
Limit (maximum value): 0.4 mm (0.015 in.)



- Check for wear and replace armature if diameter is below limit.

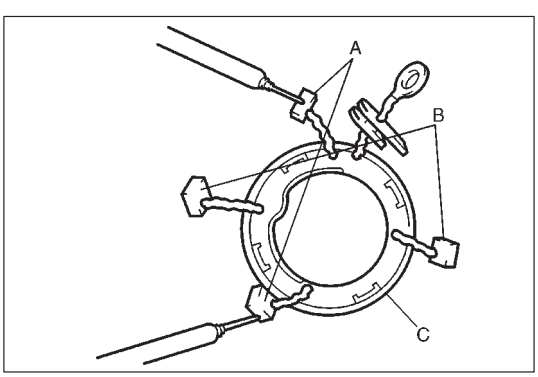
Commutator outside diameter
Limit (minimum value): 27 mm (1.063 in.)



1. Mica insulator
2. Commutator segment

- Correct and clean surface by using #400 emery cloth. Also check mica depth and correct it as required.

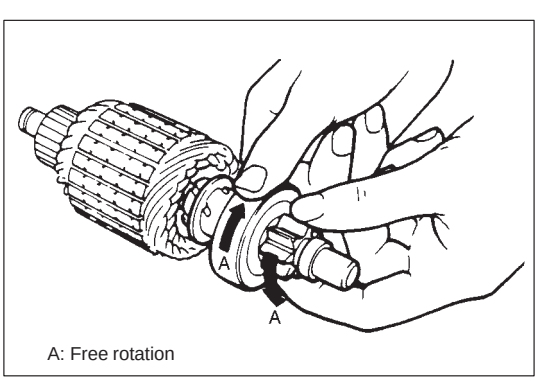
Commutator insulator depth "a"
Limit (minimum value): 0.2 mm (0.008 in.)



YOKE

Check field coil for continuity. There should be continuity between following terminals.

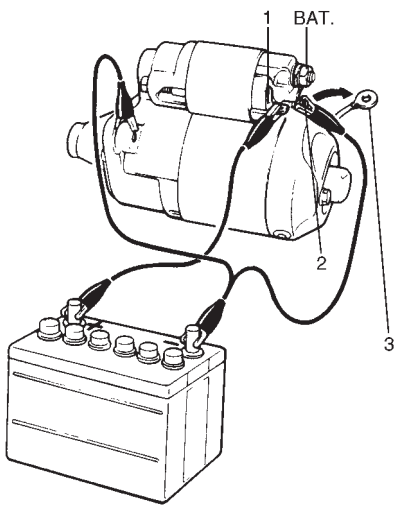
- Between A terminals.
- Between B terminals.
- Between B terminal and C (bare metal part of yoke body).



A: Free rotation

OVER-RUNNING CLUTCH

Inspect pinion for wear, damage or other abnormal conditions. Check that clutch locks up when turned in direction of drive and rotates smoothly in reverse direction. Replace if necessary.



1. Terminal 'S'
2. Terminal 'M'
3. Lead wire (Switch to motor)

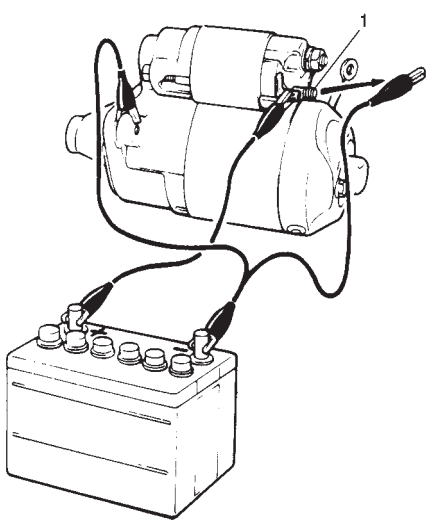
PERFORMANCE TEST

CAUTION:
Each test must be performed within 3 – 5 seconds to avoid coil from burning.

PULL-IN TEST

Connect test leads as shown in left figure and check that pinion (over-running clutch) move outward. If it does not, replace magnetic switch.

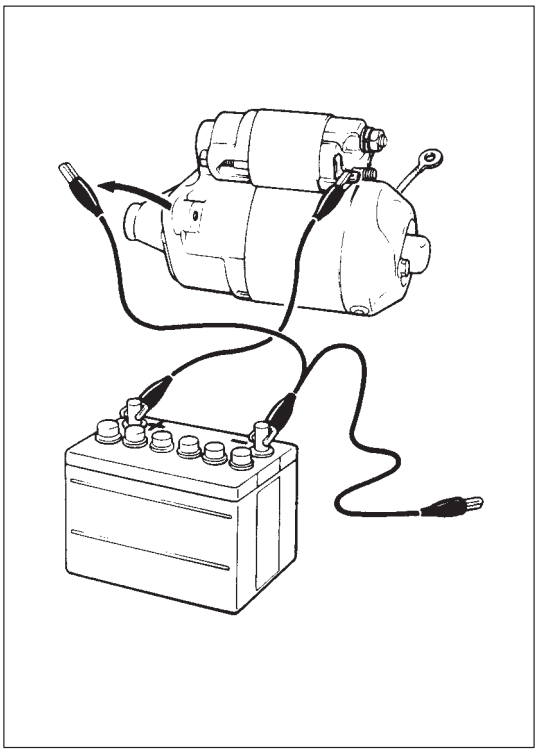
NOTE:
Before testing, disconnect field coil lead from terminal 'M'.



1. Terminal 'M'

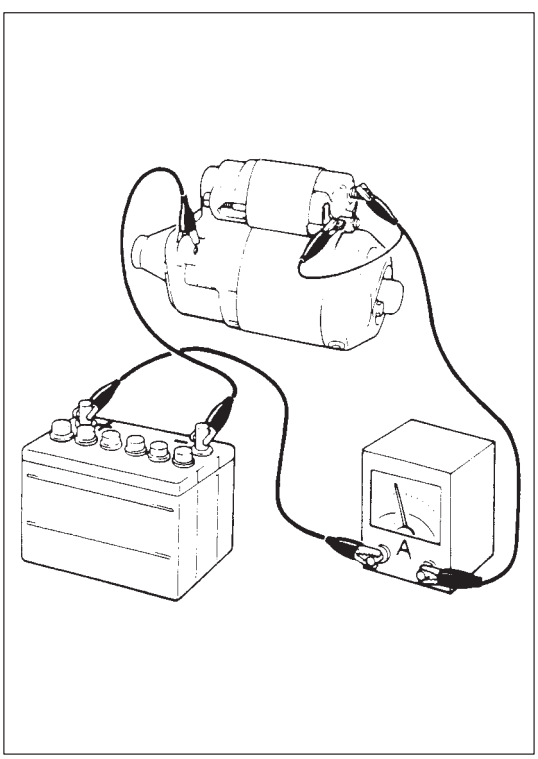
HOLD-IN TEST

While connected as the above with pinion out, disconnect negative lead from terminal 'M' and check that pinion remains out. If not, replace magnetic switch.



PINION (PLUNGER) RETURN TEST

As a next step to the above, disconnect negative lead and check to make sure that pinion returns inward quickly.



NO-LOAD PERFORMANCE TEST

Connect test leads as shown in left figure and check that motor runs without fail with pinion moved out. Also check that ammeter indicates specified current.

Specified Current: 50A at 11V

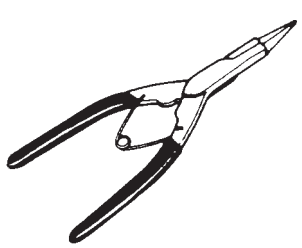
SPECIFICATIONS

Voltage			12 volts
Output			0.8 kW
Rating			30 seconds
Direction of rotation			Counterclockwise as viewed from pinion side
Brush length			10.0 mm (0.394 in.)
Number of pinion teeth			8
Performance		Condition	Guarantee
Around at 20°C (68°F)	No load characteristic	11.5 V	50 A maximum 6,000 rpm minimum
	Load characteristic	9 V 150 A	2.94 N m minimum 1,950 rpm minimum
	Locked rotor current	5.5 V	430 A maximum 6.5 N m (0.65 kg-m, 4.6 lb-ft) minimum
	Magnetic switch operating voltage		8 volts maximum

REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	● Armature shaft. ● Over-running clutch. ● Commutator end cap. ● Drive lever.

SPECIAL TOOL



09900-06107
Snap ring pliers
(Opening type)

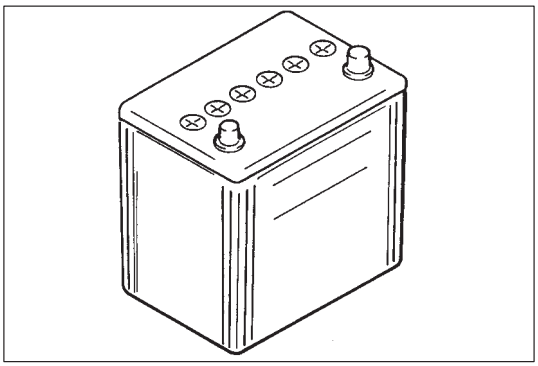
SECTION 6H

CHARGING SYSTEM

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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

CONTENTS



GENERAL DESCRIPTION

BATTERY

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of the generator.

The battery mounted in each vehicle is the following type.

38B20L TYPE

Rated capacity	28 AH/5HR, 12 Volts
Electrolyte S.G.	1.28 when fully charged at 20 °C (68 °F)

CARRIER AND HOLD-DOWN

The battery carrier should be in good condition so that it will support the battery securely and keep it level.

Before installing the battery, the battery carrier and hold-down clamp should be clean and free from corrosion and make certain there are no parts in carrier.

To prevent the battery from shaking in its carrier, the hold-down bolts should be tight enough but not over-tightened.

ELECTROLYTE FREEZING

The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin a battery, it should be protected against freezing by keeping it in a fully charged condition. If a battery is frozen accidentally, it should not be charged until it is warmed.

SULFATION

If the battery is allowed to stand for a long period in discharged condition, the lead sulfate becomes converted into a hard, crystalline substance, which will not easily turn back to the active material again during the subsequent recharging. “Sulfation” means the result as well as the process of that reaction.

Such a battery can be revived by very slow charging and may be restored to usable condition but its capacity is lower than before.

CARE OF BATTERY

WARNING:
- **Never expose battery to open flame or electric spark because of battery generate gas which is flammable and explosive.**
- **Do not allow battery fluid to contact eyes, skin, fabrics, or painted surfaces as fluid is a corrosive acid. Flush any contacted area with water immediately and thoroughly.**
- **Batteries should always be kept out of reach of children.**

1) The battery is a very reliable component, but needs periodical attentions.
   Keep the battery carrier clean; prevent rust formation on the terminal posts; keep the electrolyte up to the upper level uniformly in all cells.

   When keeping battery on vehicle over a long period of time, follow instructions given below.
   - Weekly, start the engine and run it until it reaches normal operating temperature with engine speed of 2000 to 3000 rpm. Make sure all electric switches are off before storing the vehicle.
   - Recharge the battery twice a month to prevent it from discharging excessively. This is especially important when ambient temperature is low.
     The battery discharges even when it is not used, while vehicles are being stored. Battery electrolyte can freeze and battery case can crack at cold ambient condition if battery is not properly charged.

2) Keep the battery cable connections clean.
   The cable connections, particularly at the positive (+) terminal post, tend to become corroded. The product of corrosion, or rust, on the mating faces of conductors resists the flow of current.
   Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

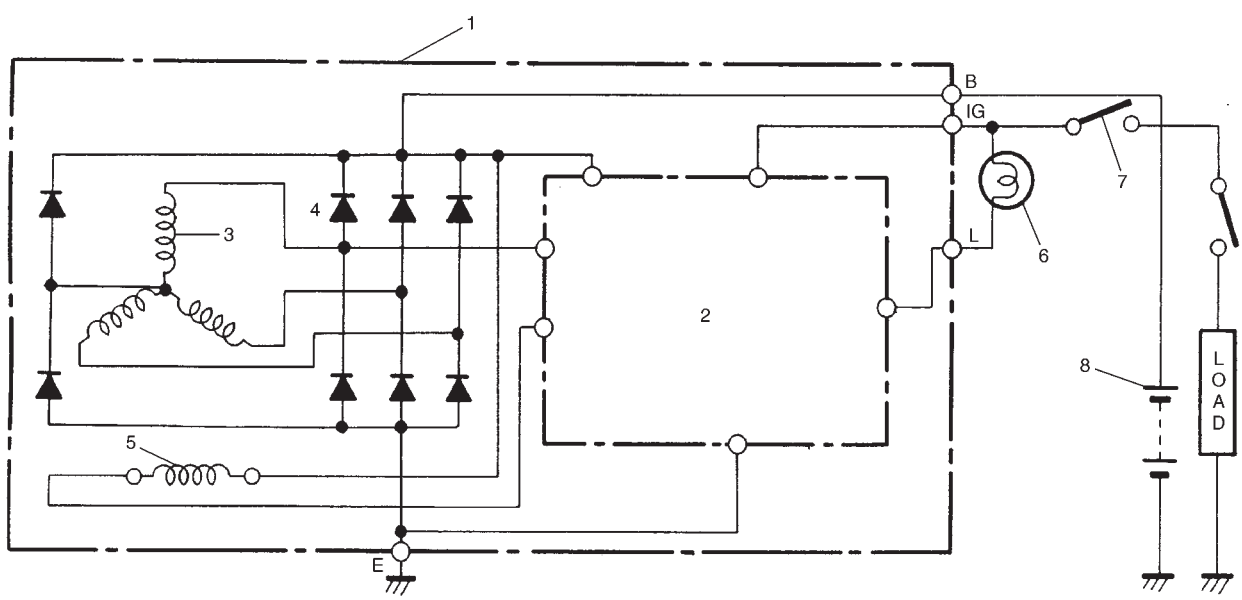
3) Be always in the know as to the state of charge of the battery. The simplest way to tell the state of charge is to carry out a hydrometer test. The hydrometer is an instrument for measuring the specific gravity (S.G.) of the battery electrolyte. The S.G. of the electrolyte is indicative of the state of charge. Refer to “BATTERY” of DIAGNOSIS in this section.

GENERATOR

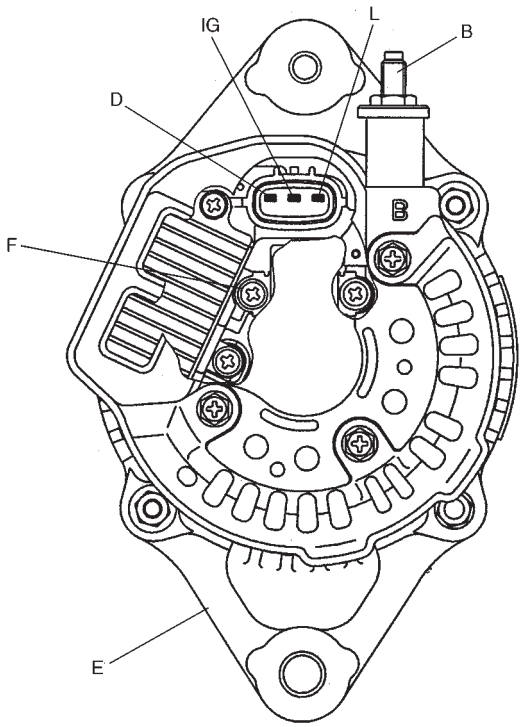
The generator is a small and high performance type with an IC regulator incorporated.
The internal components are connected electrically as shown below figure.

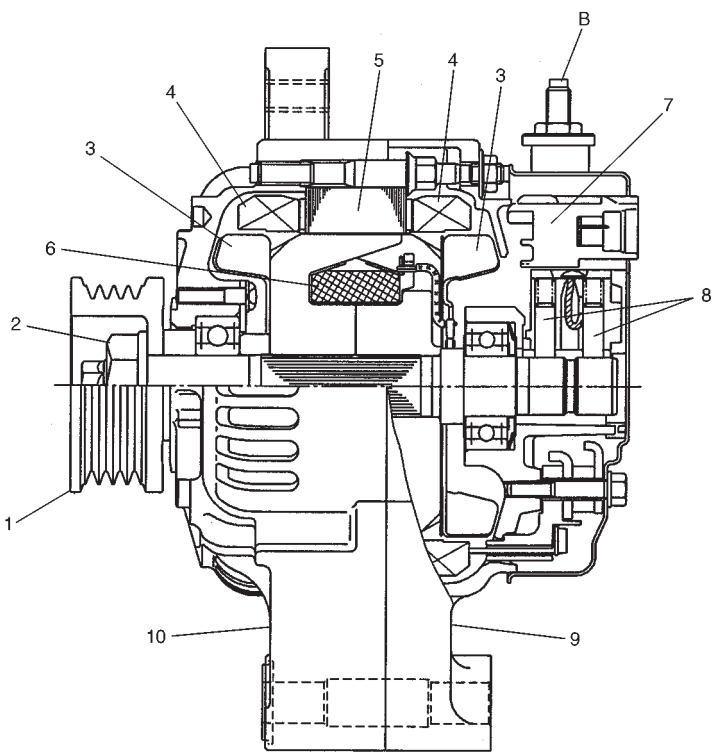
The generator features are as follows:

- Solid state regulator is mounted inside the generator.
- All regulator components are enclosed into a solid mold.
- This unit along with the brush holder assembly is attached to the rear housing.
- The IC regulator uses integrated circuits and controls the voltage produced by the generator, and the voltage setting cannot be adjusted.
- The generator rotor bearings contain enough grease to eliminate the need for periodic lubrication. Two brushes carry current through the two slip rings to the field coil mounted on the rotor, and under normal conditions will provide long period of attention-free service.
- The stator windings are assembled on the inside of a laminated core that forms part of the generator frame.



1. Generator with regulator ass'y
2. I.C. regulator
3. Stator coil
4. Diode
5. Field coil (rotor coil)
6. Charge indicator light
7. Main switch
8. Battery





1. Pulley
2. Pulley nut
3. Rotor fan
4. Stator coil
5. Stator core
6. Field coil
7. Regulator
8. Brush
9. Rear end frame
10. Drive end frame

B : Generator output (Battery terminal)
D : Dummy terminal
E : Ground
F : Field coil terminal
IG : Ignition terminal
L : Lamp terminal

DIAGNOSIS

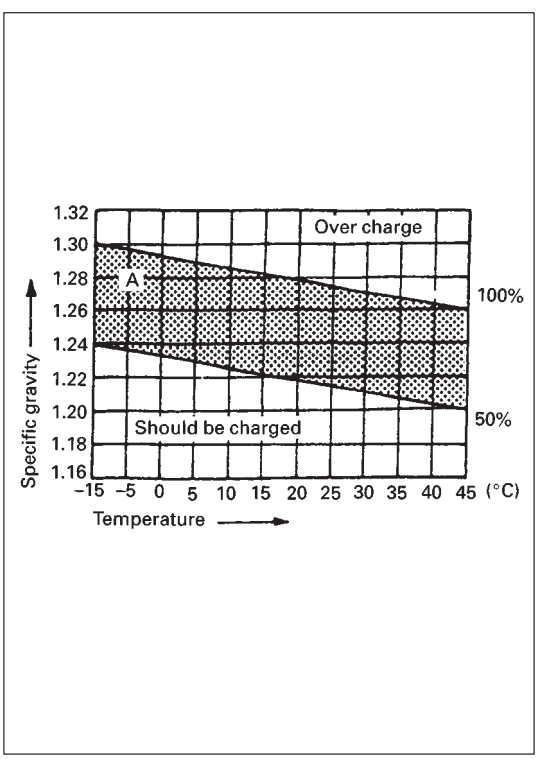
BATTERY

VISUAL INSPECTION

Check for obvious damage, such as cracked or broken case or cover, that could permit loss of electrolyte. If obvious damage is noted, replace battery. Determine cause of damage and correct as needed.

HYDROMETER TEST

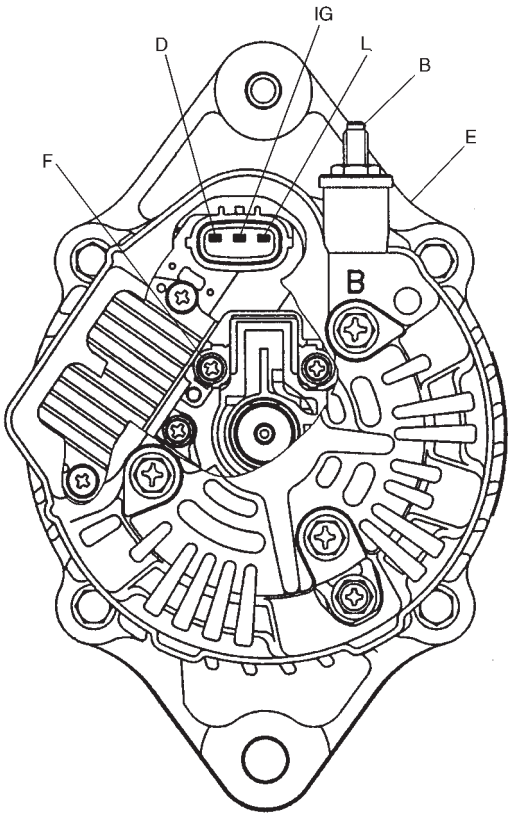
The direct method of checking the battery for state of charge is to carry out a high rate discharge test, which involves a special precise voltmeter and an expensive instrument used in the service shops, but not recommendable to the user of the vehicle.
At 20 °C of battery temperature (electrolyte temperature):
— The battery is in FULLY CHARGED STATE it the electrolyte S.G. is 1.280.
— The battery is in HALF CHARGED STATE if the S.G. is 1.220.
— The battery is in NEARLY DISCHARGED STATE if the S.G. is 1.150 and is in danger of freezing.



As the S.G. varies with the temperature, if battery temperature is not at 20°C (68°F), you have to correct your S.G. reading (taken with your hydrometer) to the value at 20°C (68°F) and apply the corrected S.G. value to the three-point guide stated value.
For the manner of correction, refer to the graph showing the relation between S.G. value and temperature at the left.

HOW TO USE THE TEMPERATURE-CORRECTED STAGE-OF-CHARGE GRAPH

Suppose your S.G. reading is 1.28 and the battery temperature is –5 °C (23°F). Locate the intersection of the –5 °C line and the 1.28 S.G. line.
The intersection is within the “A” zone (shaded area in the graph) and that means CHARGED STATE.
To know how much the battery is charged, draw a line parallel to the zone demarcation line and extend it to the right till it meets with the percentage scale. In the present example, the line meets at about 85% point on the percentage scale. Therefore, the battery is charged up to the 85% level.



B : Generator output (Battery terminal)
D : Dummy terminal
E : Ground
F : Field coil terminal
IG : Ignition terminal
L : Lamp terminal

GENERATOR

CAUTION:
- **Do not mistake polarities of IG terminal and L terminal.**
- **Do not create a short circuit between IG and L terminals. Always connect these terminals through a lamp.**
- **Do not connect any load between L and E.**
- **When connecting a charger or a booster battery to vehicle battery, refer to this section describing battery charging.**

Trouble in charging system will show up as one or more of following conditions:
1) Faulty indicator lamp operation.
2) Undercharged battery as evidenced by slow cranking or indicator dark.
3) Overcharged battery as evidenced by excessive spewing of electrolyte from vents.

Noise from generator may be caused by a loose drive pulley, loose mounting bolts, worn or dirty bearings, defective diode, or defective stator.

FAULTY INDICATOR LAMP OPERATION

PROBLEM	POSSIBLE CAUSE	CORRECTION
Charge light does not light with ignition ON and engine off	● Fuse blown ● Light burned out ● Wiring connection loose ● IC regulator or field coil faulty ● Poor contact between brush and slip ring	Check fuse. Replace light. Tighten loose connection. Check generator. Repair or replace.
Charge light does not go out with engine running (battery requires frequent recharging)	● Drive belt loose or worn ● IC regulator or alternator faulty ● Wiring faulty	Adjust or replace drive belt. Check charging system. Repair wiring.

UNDERCHARGED BATTERY

This condition, as evidenced by slow cranking can be caused by one or more of the following conditions even though indicator lamp may be operating normal.

Following procedure also applies to cars with voltmeter and ammeter.

1) Make sure that undercharged condition has not been caused by accessories left on for extended period of time.
2) Check drive belt for proper tension.
3) If battery defect is suspected, refer to Battery section.
4) Inspect wiring for defects. Check all connections for tightness and cleanliness, battery cable connections at battery, starter and ignition ground cable.
5) Connect voltmeter and ammeter as shown in left figure.

Voltmeter

Set between generator B terminal and ground.

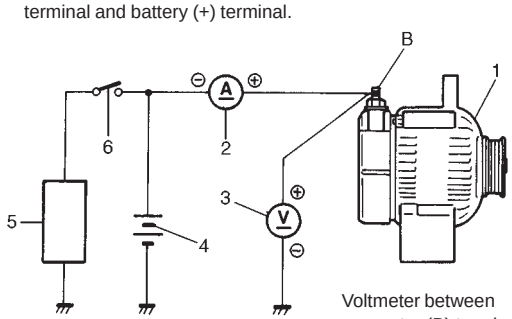
Ammeter

Set between generator B terminal and battery (+) terminal.

NOTE:
Use fully charged battery.

6) Measure current and voltage.

Ammeter between generator (B) terminal and battery (+) terminal.



Voltmeter between generator (B) terminal and ground.

1. Generator
2. Ammeter
3. Voltmeter
4. Battery
5. Load
6. Switch

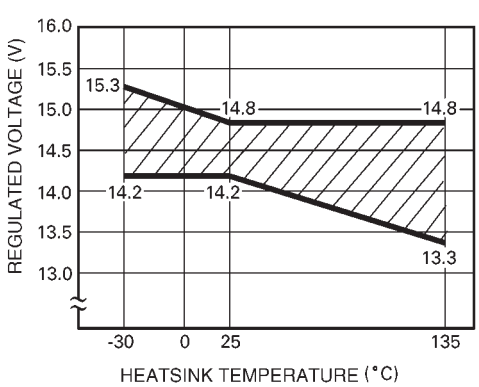
No-load Check

1) Run engine from idling up to 2,000 rpm and read meters.

NOTE:
Turn off switches of all accessories (wiper, heater etc.).

Standard current	10 A maximum
Standard voltage	14.2 – 14.8 v at 25 °C (68 °F)

NOTE:
Consideration should be taken that voltage will differ somewhat with regulator case temperature as shown in left figure.

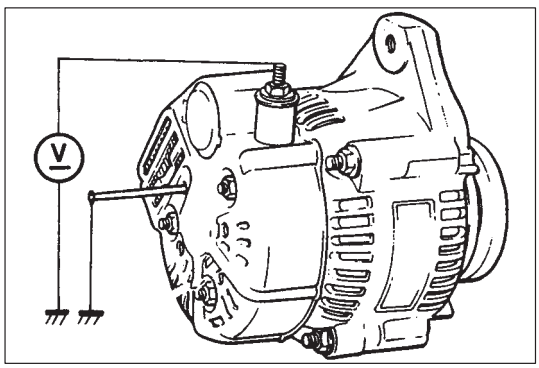


Higher Voltage

If voltage is higher than standard value, check ground of brush. If brush ground is correct, replace IC regulator.

Lower Voltage

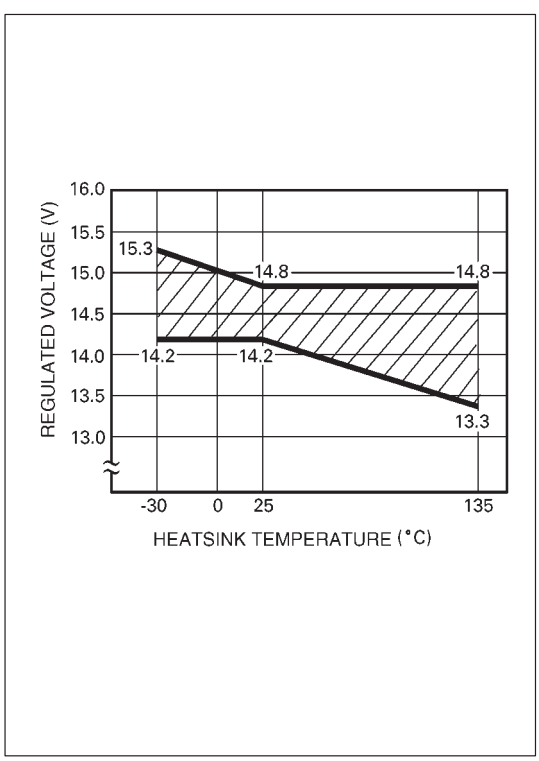
If voltage is lower than standard value, proceed to following check.



2) Ground F terminal and start engine, then measure voltage at B terminal as shown in left figure.
   - Voltage is higher than standard value
     It is considered that generator itself is good but IC regulator has been damaged, replace IC regulator.
   - Voltage is lower than standard value
     Generator itself has problem, check the generator.

Load Check

1) Run engine at 2,000 rpm and turn on head light and heater motor.
2) Measure current and if it is less than 20 A repair or replace generator.



OVERCHARGED BATTERY

1) To determine battery condition, refer to Battery section in this DIAGNOSIS.
2) If obvious overcharge condition exists as evidenced by excessive spewing of electrolyte, proceed to disassembly section of generator service and check field windings for grounds and shorts. If problem exists, replace rotor.
3) With engine running at 2,000 rpm, measure voltage.
4) If measured voltage is out of standard value, check brush ground or IC regulator.

ON-VEHICLE SERVICE

BATTERY

JUMP STARTING IN CASE OF EMERGENCY WITH AUXILIARY (BOOSTER) BATTERY

Both booster and discharged battery should be treated carefully when using jumper cables. Follow procedure outlined below, being careful not to cause sparks.

WARNING:
- **Departure from these conditions or procedure described below could result in:**
  1) **Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid, or electrical burns.**
  2) **Damage to electronic components of either vehicle.**
- **Remove rings, watches, and other jewelry. Wear approved eye protection.**
- **Be careful so that metal tools or jumper cables do not contact positive battery terminal (or metal in contact with it) and any other metal on vehicle, because a short circuit could occur.**

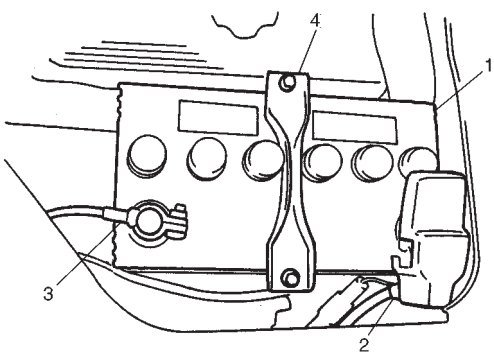
1) Set parking brake and place automatic transmission in PARK (NEUTRAL on manual transmission). Turn off ignition, turn off lights and all other electrical loads.
2) Check electrolyte level. If it is below low level line, add distilled water.
3) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
4) Attach one end of the remaining negative cable to negative terminal of booster battery, and the other end to a solid engine ground (such as exhaust manifold) at least 45 cm (18 in.) away from battery of vehicle being started.

   WARNING:
   Do not connect negative cable directly to negative terminal of dead battery.

5) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine of the vehicle with discharged battery.
6) Disconnect jumper cables in the exact reverse order.

With Charging Equipment

CAUTION:
When jump starting engine with charging equipment, be sure equipment used is 12-volt and negative ground. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.



1. Battery
2. Positive cable
3. Negative cable
4. Retainer

REMOVAL

1) Open engine room lid (front seat).
2) Disconnect negative cable.
3) Disconnect positive cable.
4) Remove retainer.
5) Remove battery.

HANDLING

When handling battery, following safety precautions should be followed:

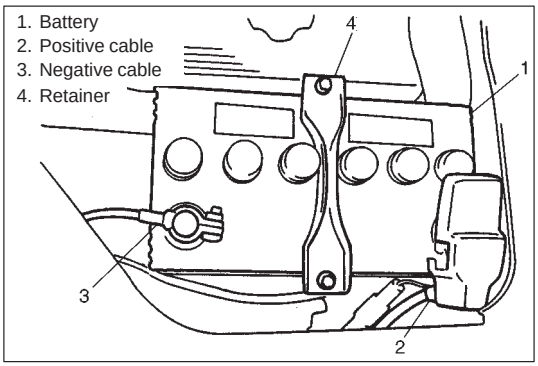
- Hydrogen gas is produced by battery. A flame or spark near battery may cause the gas to ignite.
- Battery fluid is highly acidic. Avoid spilling on clothing or other fabric. Any spilled electrolyte should be flushed with large quantity of water and cleaned immediately.

INSTALLATION

1) Reverse removal procedure.
2) Torque battery cables.

NOTE:

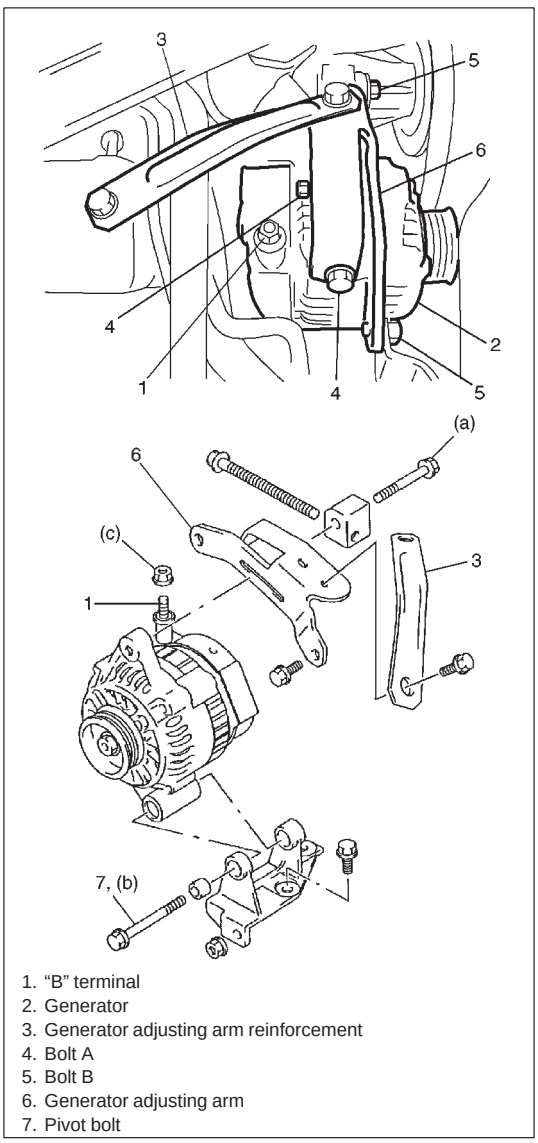
- **Check to be sure that ground cable has enough clearance to hood panel by terminal.**
- **Body and battery cable should not interfere with each other.**
- **After tightening positive terminal, be sure to put cap onto it securely.**



GENERATOR

REMOVAL

1) Disconnect negative cable at battery.



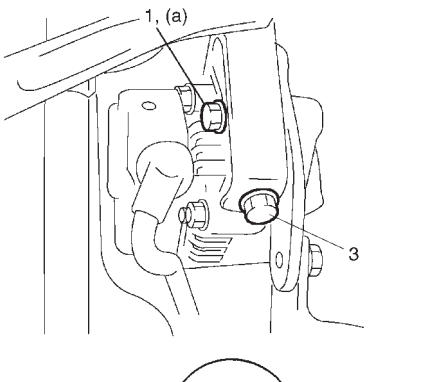
2) Disconnect "B" terminal wire and coupler from generator.
3) Remove generator adjusting arm reinforcement.
   Loosen bolts A and remove generator (water pump) belt.
4) Remove bolts B and pivot bolt.
5) Remove generator together with generator adjusting arm, and remove generator adjusting arm from generator.

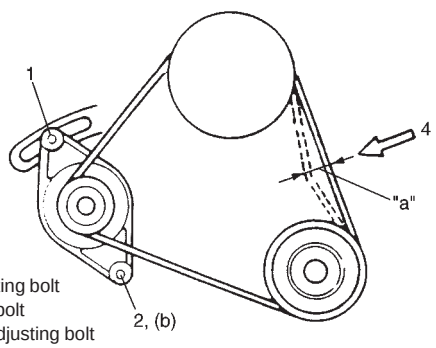
INSTALLATION

Reverse above procedure giving specified tension to drive belt. Refer to "Generator (Water Pump) Belt" for belt tension.

Tightening Torque

(a): 23 N·m (2.3 kg-m, 16.5 lb-ft)
(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)
(c): 8 N·m (0.8 kg-m, 6.0 lb-ft)





1. Adjusting bolt
2. Pivot bolt
3. Belt adjusting bolt
4. 10 kg (22 lbs)

GENERATOR (WATER PUMP) BELT

BELT TENSION INSPECTION

1) Inspect belt cracks, cuts, deformation, wear and cleanliness.
2) Check belt for tension. Belt is in proper tension when it deflects 6 to 8 mm (0.24 – 0.31 in.) under thumb pressure (about 10 kg or 22 lb.).

   Belt tension "a" : 6 – 8 mm (0.24 – 0.31 in.) as deflection

   NOTE:
   When replacing belt with a new one, adjust belt tension to 5 – 7 mm (0.20 – 0.28 in.).

3) If belt is too tight or too loose, loosen adjusting bolt and pivot bolt and adjust it to proper tension by turning belt adjusting bolt.
4) Tighten generator adjusting bolt and pivot bolt.

   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 16.5 lb-ft)
   (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)

5) Connect negative cable at battery terminal.

REMOVAL

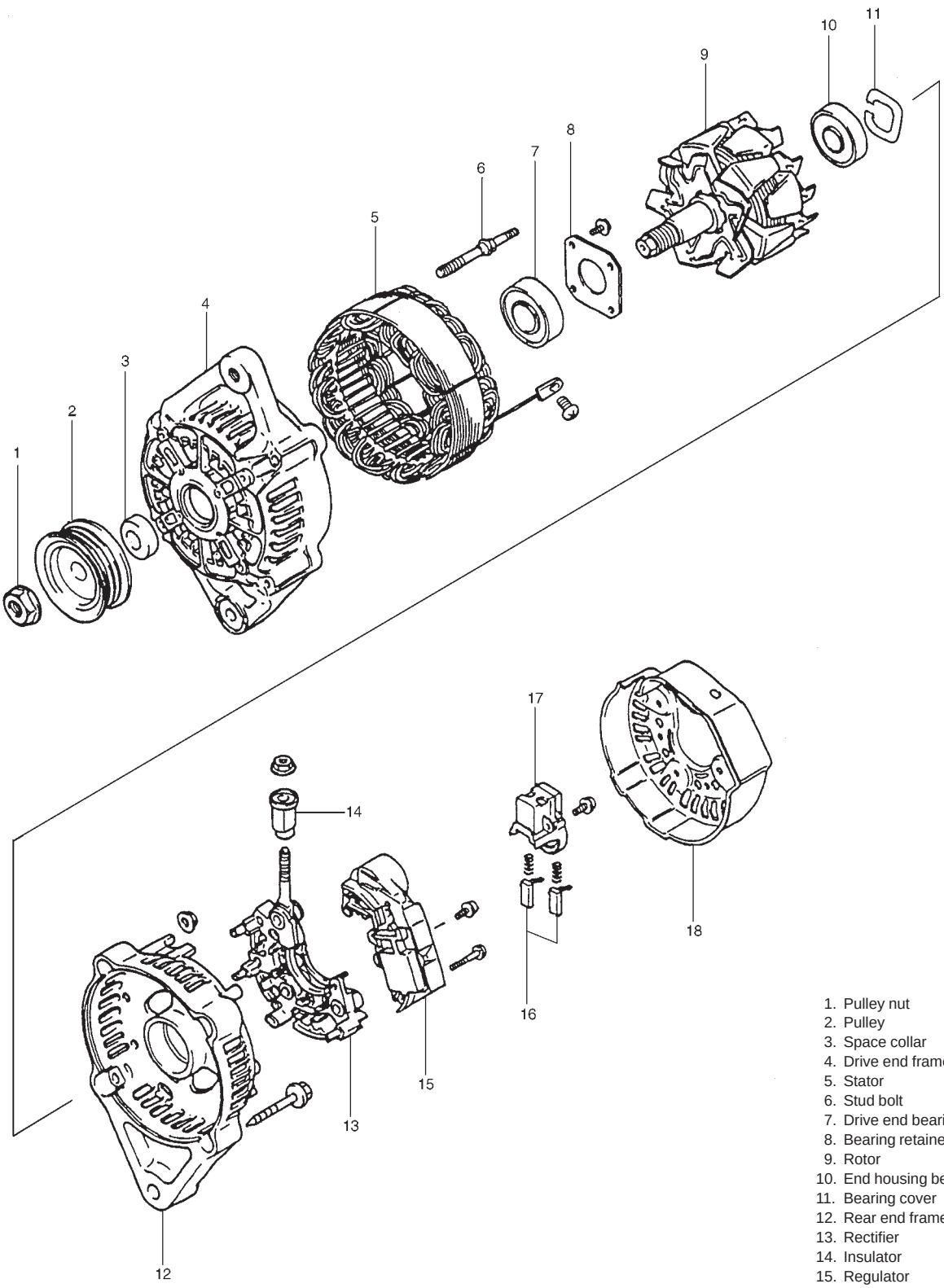
1) Disconnect negative cable at battery.
2) Loosen generator adjusting bolt, drive belt adjusting bolt and generator pivot bolts.
   When servicing vehicle equipped with A/C, remove compressor drive belt before removing water pump belt.
3) Slacken belt by displacing generator and then remove it.

INSTALLATION

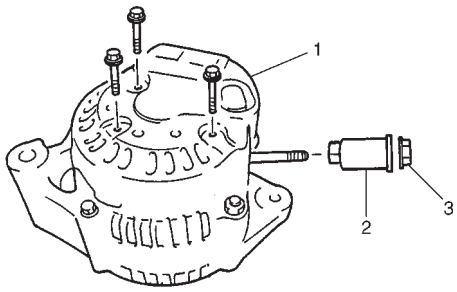
1) Install belt to water pump pulley, crankshaft pulley and generator pulley.
   When servicing vehicle equipped with A/C, install compressor drive belt, too.
2) Adjust belt tension.
   For Adjustment of compressor drive belt tension, refer to SECTION 0B of this manual.
3) Tighten water pump belt adjusting bolt and pivot bolts.
4) Connect negative cable at battery.

UNIT REPAIR OVER HAUL

GENERATOR



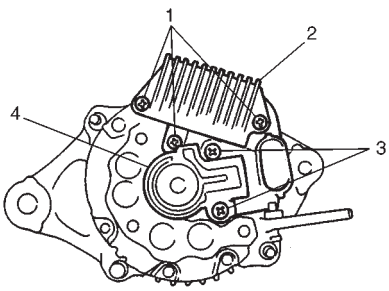
1. Pulley nut
2. Pulley
3. Space collar
4. Drive end frame
5. Stator
6. Stud bolt
7. Drive end bearing
8. Bearing retainer
9. Rotor
10. End housing bearing
11. Bearing cover
12. Rear end frame
13. Rectifier
14. Insulator
15. Regulator
16. Brush
17. Brush holder
18. Rear end cover



1. Rear end cover
2. Insulator
3. B terminal inner nut

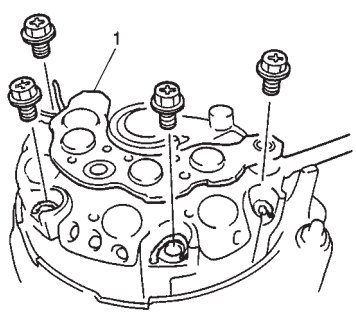
DISASSEMBLY

1) Remove B terminal inner nut and insulator.
2) Remove rear end cover.



1. IC regulator screws
2. IC regulator
3. Brush holder screws
4. Brush holder assembly

3) Remove 2 screws and pull out brush holder assembly.
4) Remove 3 screws and IC regulator.
5) Remove brush holder cover from brush holder.

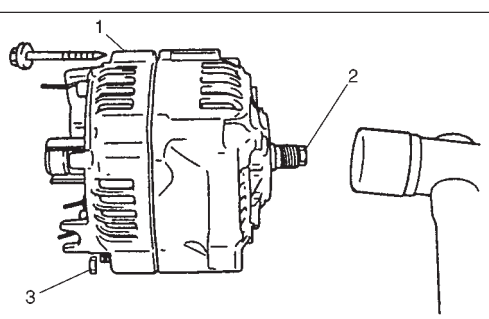


1. Rectifier holder

6) Remove rectifier holder.

7) Hold shaft by using hexagonal box wrench and remove pulley nut, and then pull out pulley.

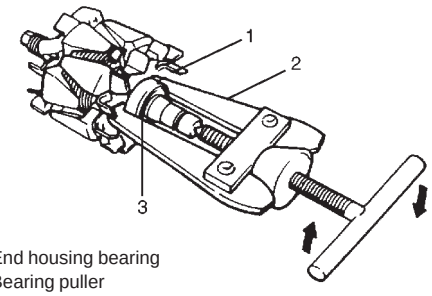
CAUTION:
- **To hold shaft, use hexagonal box. Duodecimal box may cause slipping and consequential shaft or tool damage.**
- **Do not attempt to hold pulley by using vise or pipe wrench so as not to distort it.**



1. Rear end frame
2. Rotor shaft
3. Rear end frame nut

8) Remove 2 rear end frame nuts and bolts.
9) Drive out rear end frame with rotor tapping shaft lightly by using plastic hammer.
10) Separate rear end frame from rotor evenly by using plastic hammer.

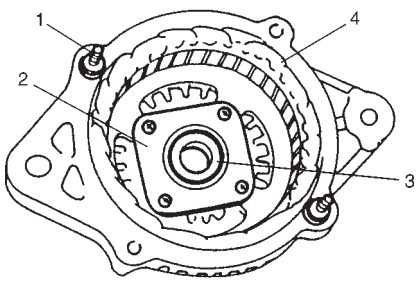
CAUTION:
Do not hit shaft at slip ring side, when separating rotor and rear end frame.



1. End housing bearing
2. Bearing puller
3. Bearing cover

11) If required, use bearing puller to remove end housing bearing and bearing cover.

CAUTION:
Care must be exercised so as not to distort cooling fan blade while applying puller.

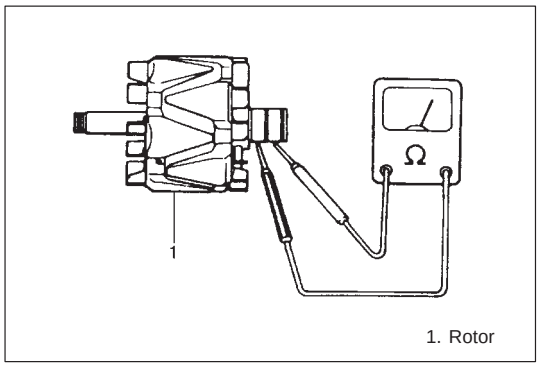


1. Stud bolt
2. Retaining plate
3. Drive end bearing
4. Stator

12) If required, remove 4 screws, retainer plate and then drive out drive end bearing.

13) If required, remove stud bolts and then pull out stator.

NOTE:
Heating drive end frame may facilitate removal of stator.



1. Rotor

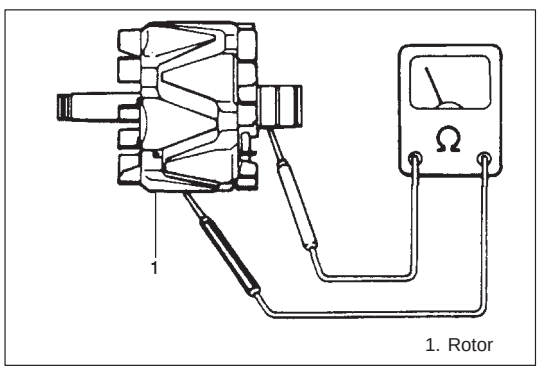
INSPECTION

Rotor

Open Circuit

Using ohmmeter, check for continuity between slip rings of rotor. If there is no continuity, replace rotor.

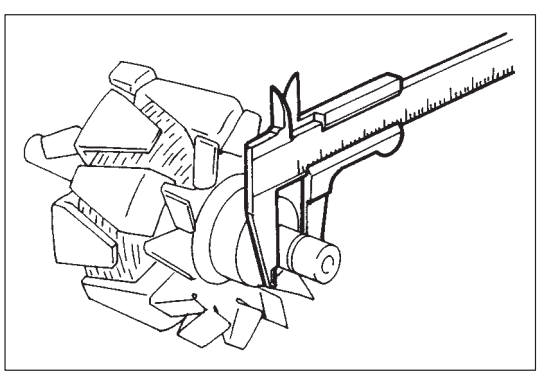
Standard resistance: About 2.9 Ω



1. Rotor

Ground

Using ohmmeter, check that there is no continuity between slip ring and rotor. If there is continuity, replace rotor.

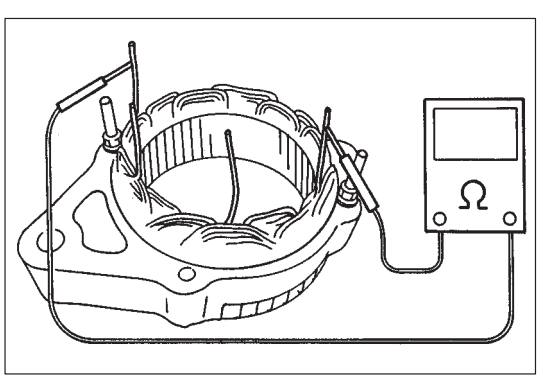


Slip Rings

- Check slip rings for roughness or scoring. If rough or scored, replace rotor.
- Using a vernier caliper, measure slip ring diameter.

  Standard diameter: 14.4 mm (0.567 in.)
  Minimum diameter: 14.0 mm (0.551 in.)

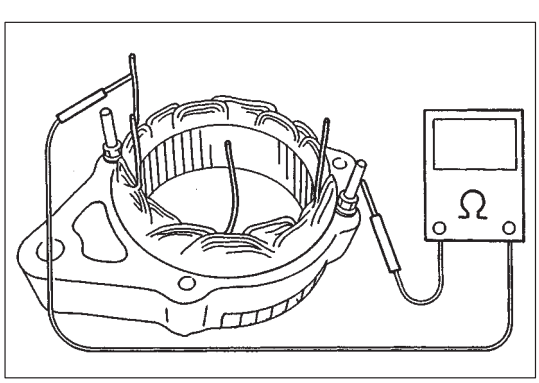
  If the diameter is less than minimum, replace the rotor.



Stator

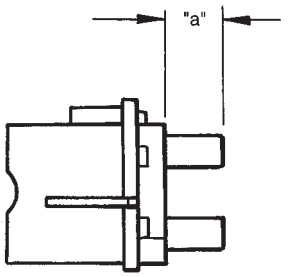
Open Circuit

Using ohmmeter, check all leads for continuity. If there is no continuity, replace stator.



Ground

Using ohmmeter, check that there is no continuity between coil leads and stator core. If there is continuity, replace stator.



Brush

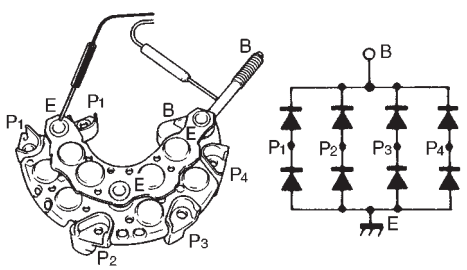
Exposed Brush Length

Check each brush for wear by measuring its length as shown. If brush is found worn down to service limit, replace brush. Refer to "Replace Brush" in this section.

Exposed brush length "a"

Standard : 10.5 mm (0.413 in.)

Limit : 4.5 mm (0.331 in.)

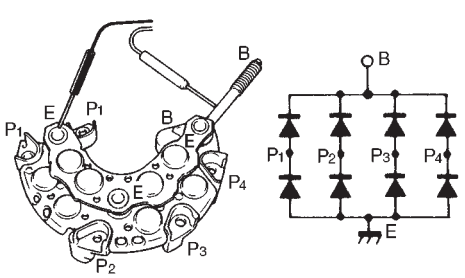


B : Positive terminal
E : Negative terminal
P_1-P_4 : Rectifier terminal

Rectifier

Positive Rectifier

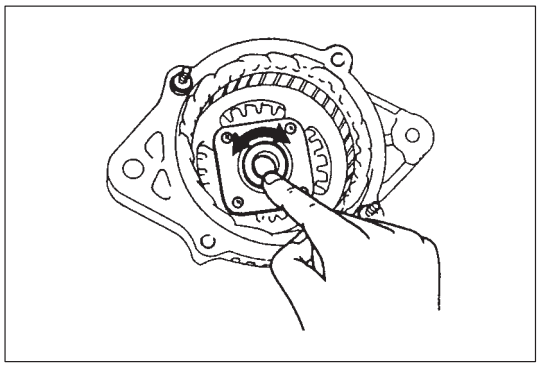
1) Using an ohmmeter, connect one tester probe to the B terminal and the other to each rectifier terminal (P_1–P_4).
2) Reverse the polarity of tester probes and repeat step 1).
3) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace rectifier holder.



B : Positive terminal
E : Negative terminal
P_1-P_4 : Rectifier terminal

Negative Rectifier

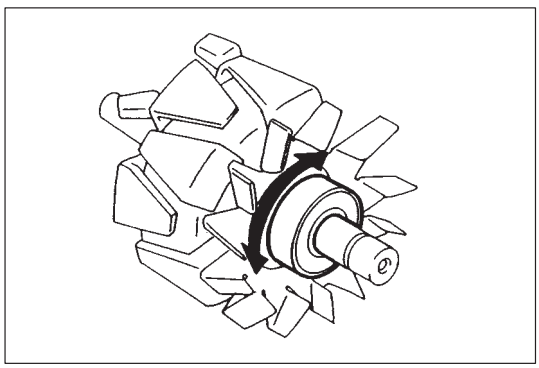
1) Using ohmmeter, connect one tester probe to each negative terminal (E) and the other to each rectifier terminal (P_1–P_4).
2) Reverse the polarity of tester probes and repeat step 1).
3) Check that one shows continuity and the other shows no continuity.
   If there is continuity, replace rectifier holder.



Bearing

Drive End Bearing

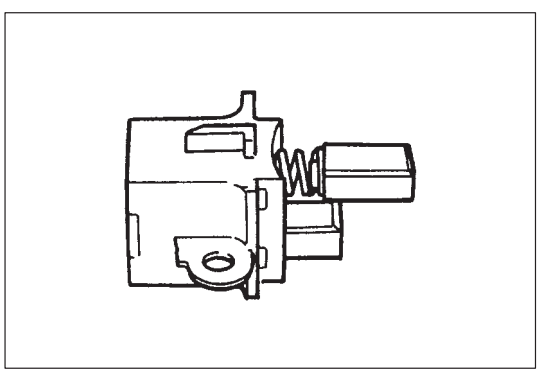
Check that bearing is not rough or worn.



End Housing Bearing

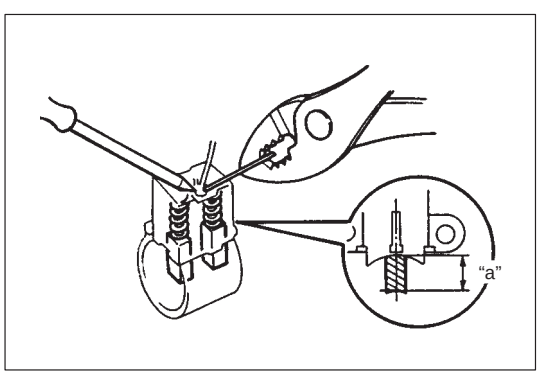
Check that bearing is not rough or worn.

When removal is necessary, refer to 6H-15.



REPLACE BRUSH

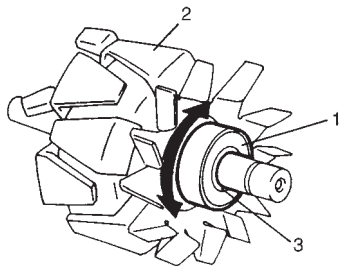
1) Unsolder and remove brush and spring.
2) Run wire of new brush through the hole in the brush holder, and insert spring and brush into brush holder.



3) Solder brush wire to brush holder at specified exposed length.

   Exposed length "a": 10.5 mm (0.413 in.)

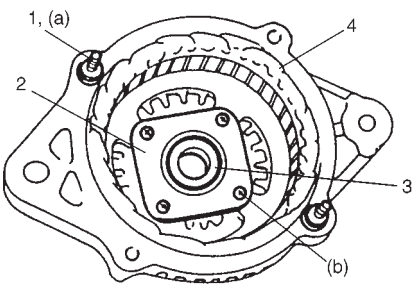
4) Check that brush moves smoothly in brush holder.
5) Cut off excess wire.
6) Apply insulation paint to the soldered area.



1. End housing bearing
2. Rotor
3. Bearing cover

ASSEMBLY

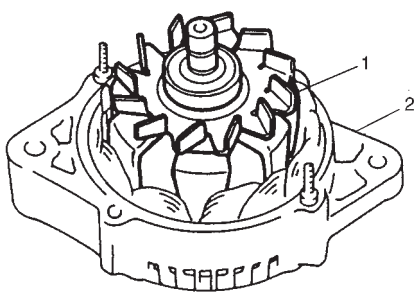
1) If end housing bearing is removed, install it.
2) Check end housing bearing turns smoothly.



1. Stud bolt
2. Retaining plate
3. Drive end bearing
4. Stator

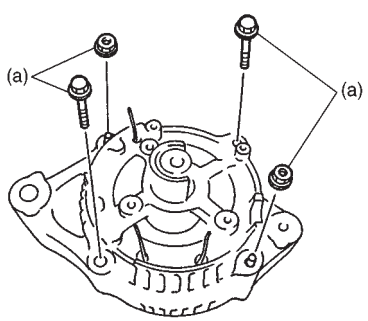
3) If stator is removed, install stator and tighten stud bolts.
4) If drive end bearing is removed, install it.
5) Check drive end bearing turns smoothly.

Tightening Torque
(a): 8.8 N·m (0.88 kg-m, 6.5 lb-ft)
(b): 2.6 N·m (0.26 kg-m, 2.0 lb-ft)



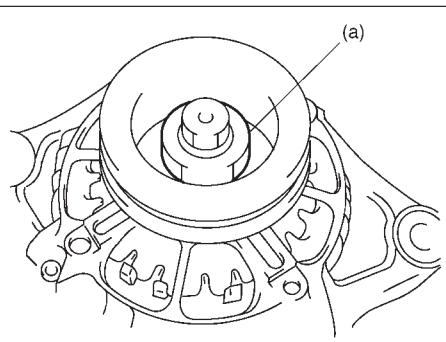
1. Rotor
2. Drive end frame

6) Place space collar and drive end frame on pulley, and then install rotor to drive end frame.



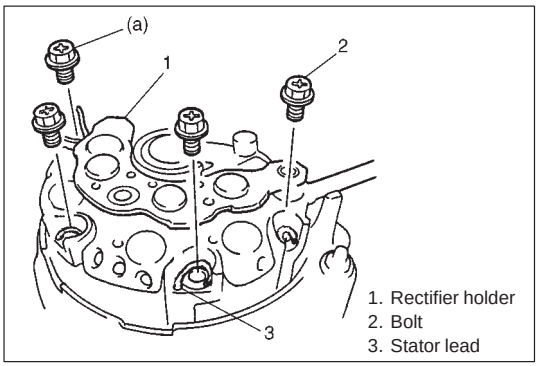
7) Install rear end frame to drive end frame.
8) Tighten bolts and nuts to specified torque.

Tightening Torque
(a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)



9) Install pulley and tighten pulley nut to specified torque.

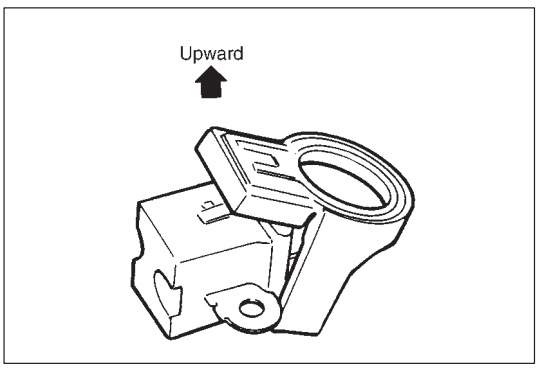
Tightening Torque
(a): 113 N·m (11.3 kg-m, 81.5 lb-ft)



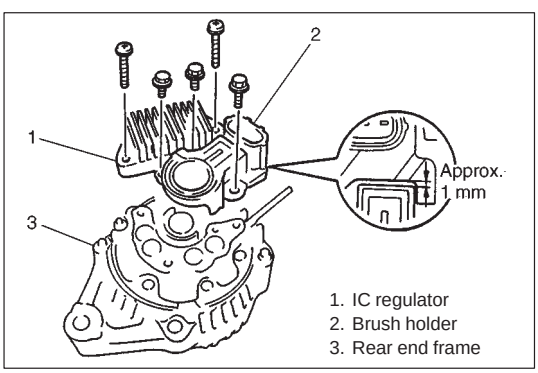
10) Install rectifier holder. Curl stator leads as shown in figure.

CAUTION:
When installing rectifier, check to confirm that stator leads have enough clearance with cooling fan blades.

Tightening Torque
(a): 2.0 N·m (0.2 kg-m, 1.5 lb-ft)

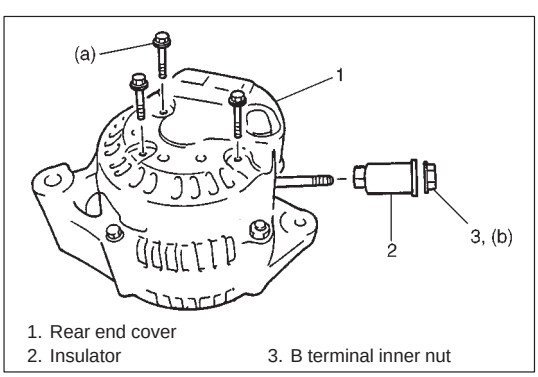


11) Install brush holder cover to brush holder.



12) Place IC regulator together with brush holder horizontally on rear end frame.
13) Install 5 screws until there is a clearance of approx. 1 mm (0.04 in.) between brush holder and connector.

Tightening Torque
2.0 N·m (0.2 kg-m, 1.5 lb-ft)

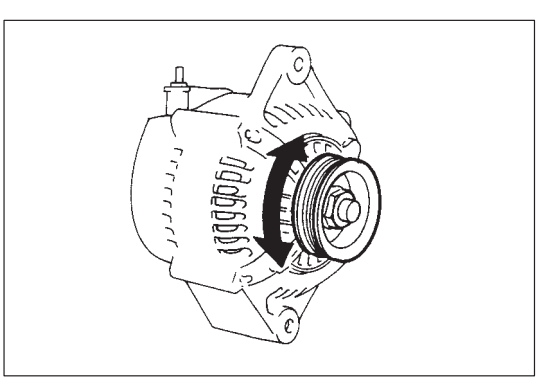


14) Install rear end cover.

Tightening Torque
(a): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

15) Install insulator and tighten B terminal inner nut to specified torque.

Tightening Torque
(b): 4.2 N·m (0.42 kg-m, 3.0 lb-ft)



16) Make sure that rotor turns smoothly.

SPECIFICATIONS

BATTERY

Rated capacity	28 AH/5 HR, 12 Volts
Electrolyte	2.1 L (4.44/3.70 US/Imp pt)
Electrolyte S.G.	1.28 when fully charged at 20°C (68°F)

GENERATOR

Rated voltage	12 V	Permissible ambient temperature	– 30 to 90 °C (– 22 to 194 °F)
Nominal output	60 A (at 13.5 V)		
Permissible max. speed	18,000 rpm	Polarity	Negative ground
No-load speed	1,180 rpm	Rotation	Clockwise viewed from pulley side
Setting voltage	14.2 to 14.8 V		

TIGHTENING TORQUE SPECIFICATIONS

Fastening	Tightening torque		
	N·m	kg-m	lb-ft
Body ground bolt	8	0.8	6.0
Generator drive belt adjusting bolt	23	2.3	16.5
Generator pivot bolt	50	5.0	36.5
“B” terminal inner nut	4.2	0.42	3.0
“B” terminal outer nut	8	0.8	6.0
Pulley nut	113	11.3	81.5
Rear end frame bolt and nut	4.5	0.45	3.5
Rear end cover nut			
Negative rectifier fin bolt	2.0	0.2	1.5
Generator stud bolt	8.8	0.88	6.5
Drive end bearing screw	2.6	0.26	2.0
IC regulator bolt	2.0	0.2	1.5

SECTION 6K

EXHAUST SYSTEM

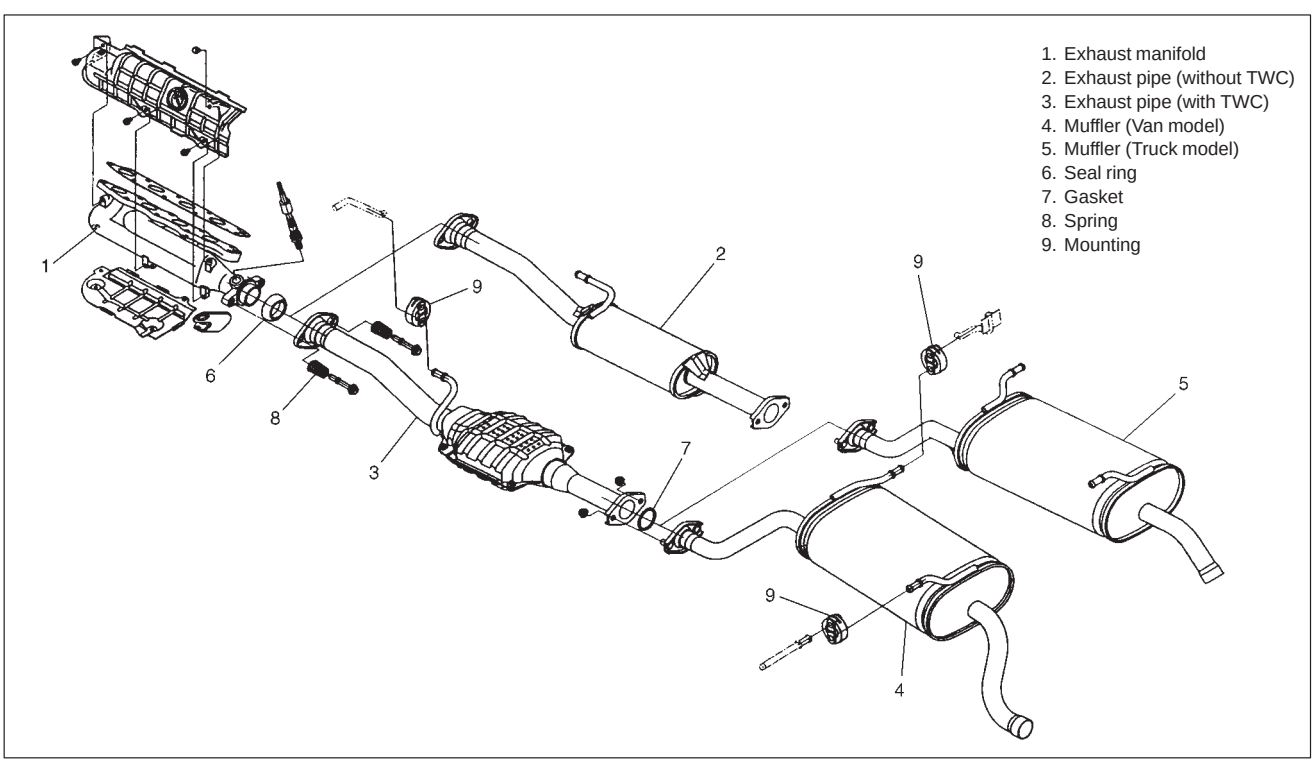
CONTENTS

NOTE:
Whether following parts are used in the particular vehicle or not depends on specification. Be sure to bear this in mind when performing service work.
- **Three Way Catalytic Converter (TWC) (in exhaust pipe)**

GENERAL DESCRIPTION

The exhaust system of this vehicle consists of the exhaust manifold, exhaust pipe, muffler, seals, etc. The catalytic converter is an emission control device added to the exhaust system to lower the level of Hydrocarbon (HC), Carbon Monoxide (CO) and Oxides of Nitrogen (NOx) pollutants in the exhaust gas. The catalyst in the catalytic converter is of “Three way” type.

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.



MAINTENANCE

WARNING:
To avoid danger of being burned, do not touch exhaust system when system is hot. Any service on exhaust system should be performed when system is cool.

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 "ON VEHICLE SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose 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.

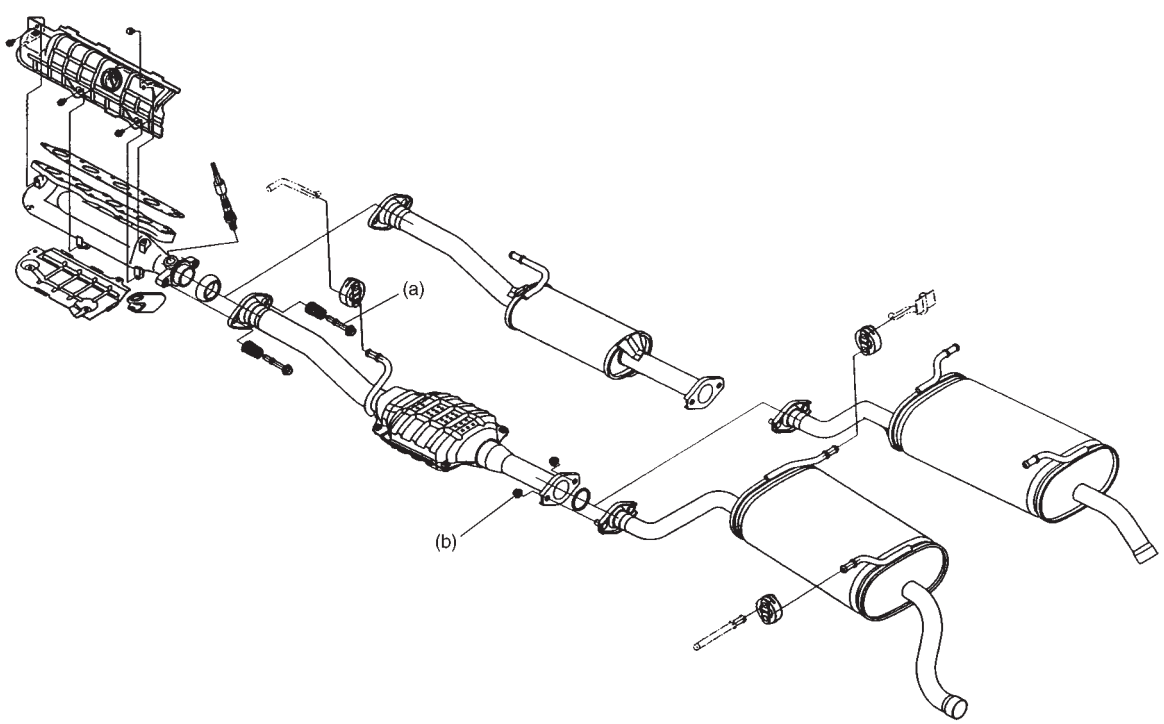
ON-VEHICLE SERVICE

- Refer to Section 6A for removal and installation procedures of exhaust manifold.
- For replacement of exhaust pipe, muffler or any part used to mount or connect them, be sure to hoist vehicle and observe WARNING given at the left of this page.

CAUTION
As exhaust pipe has three way catalytic converter in it (if equipped), it should not be exposed to any impulse. Be careful not to drop it or hit it against something.

- When exhaust manifold is removed, check seals for deterioration or damage.
- Tighten bolts and nuts to specified torques when reassembling. Refer to figure below for location of bolts and nuts.

Tightening Torque
(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)
(b): 40 N·m (4.0 kg-m, 29.0 lb-ft)

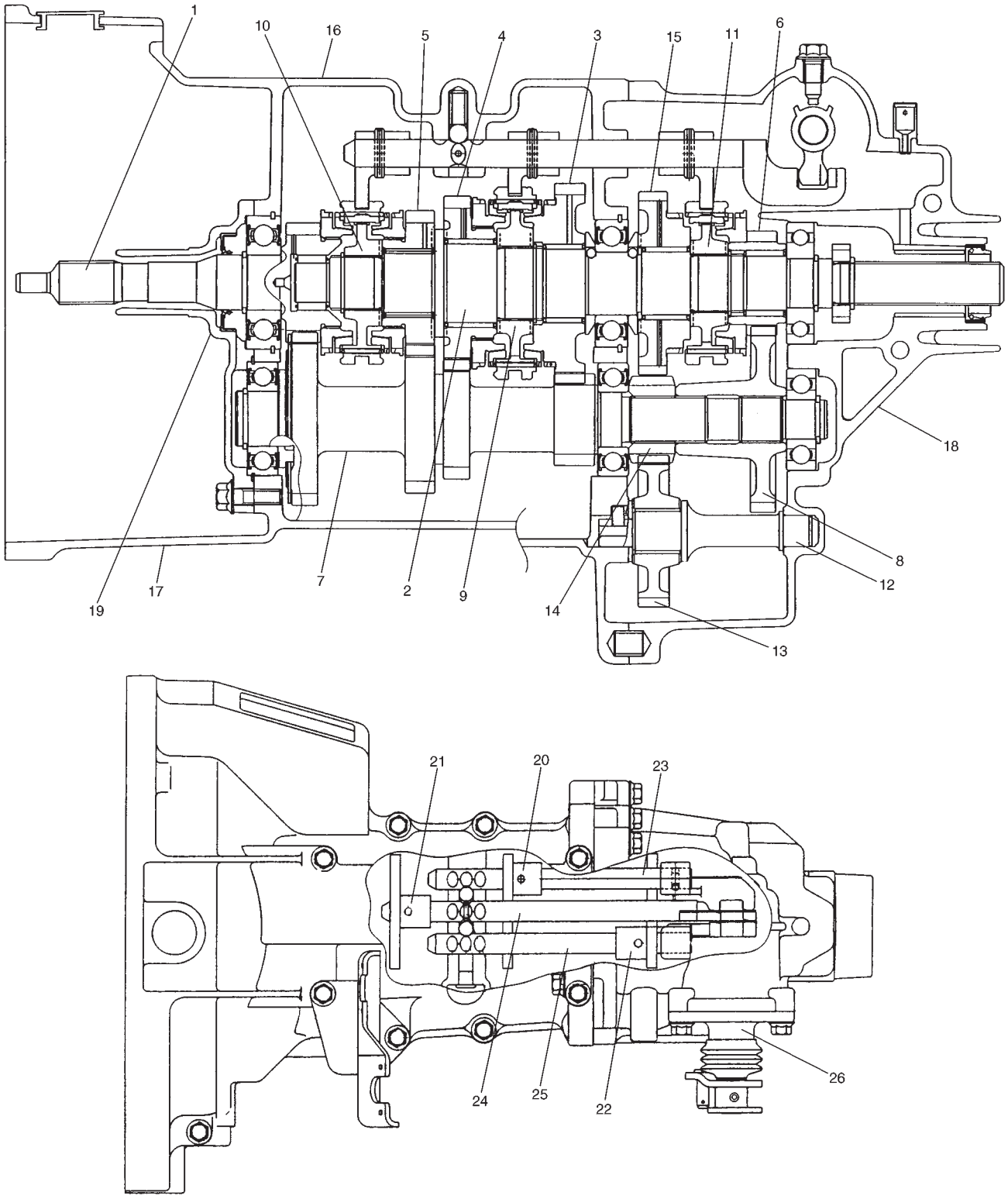


SECTION 7A

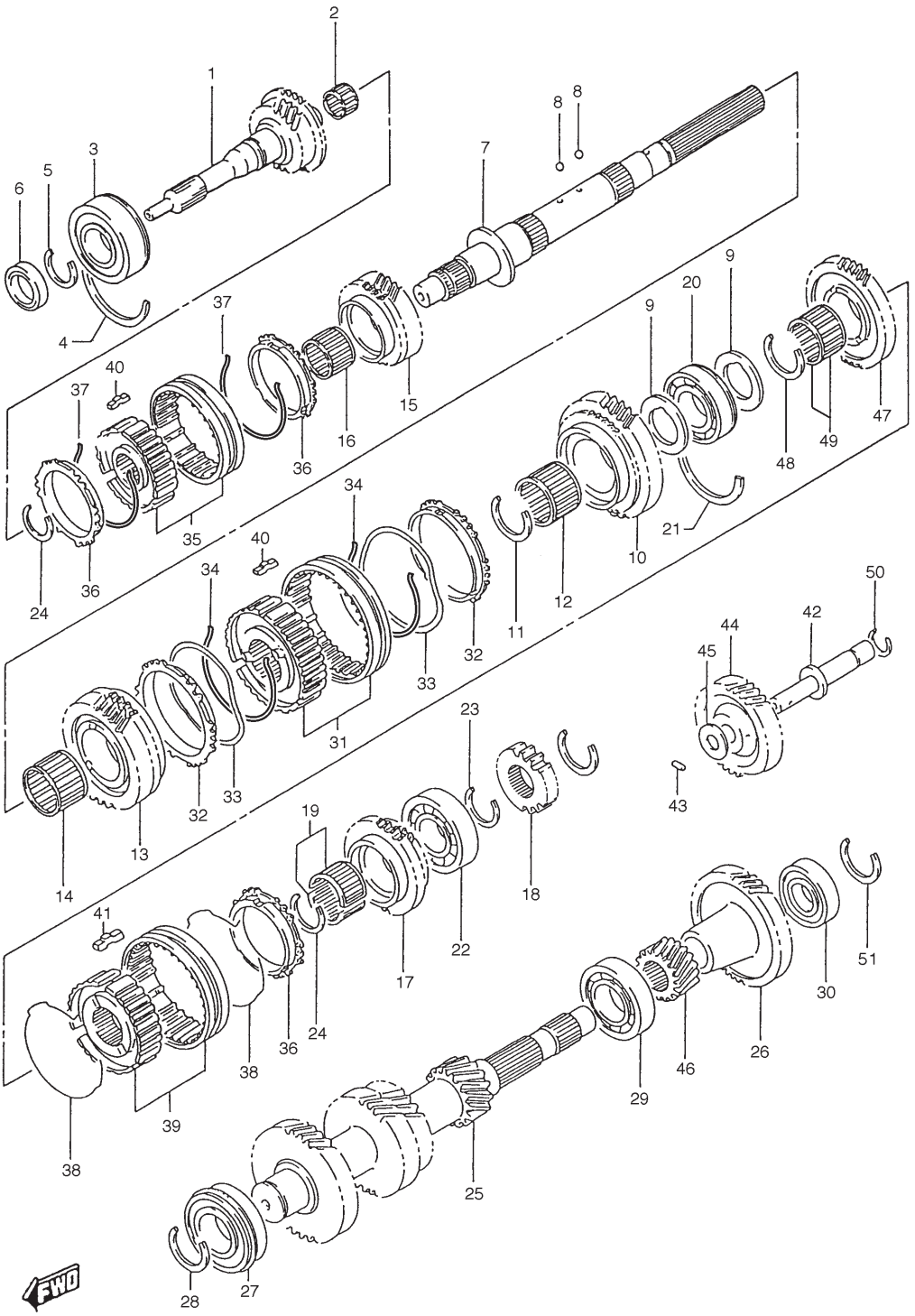
MANUAL TRANSMISSION

CONTENTS

GENERAL DESCRIPTION



1. Input shaft
2. Main shaft
3. Main shaft low gear
4. Main shaft 2nd gear
5. Main shaft 3rd gear
6. Main shaft 5th gear
7. Countershaft
8. Countershaft 5th gear
9. Low speed synchronizer hub
10. High speed synchronizer hub
11. 5th speed synchronizer hub
12. Reverse gear shaft
13. Reverse idle gear
14. Countershaft reverse gear
15. Main shaft reverse gear
16. Upper case
17. Lower case
18. Extension case
19. Input shaft bearing retainer
20. Low speed gear shift fork
21. High speed gear shift fork
22. Reverse gear shift fork
23. Low speed gear shift shaft
24. High speed gear shift shaft
25. Reverse gear shift shaft
26. Gear shift & select shaft assembly



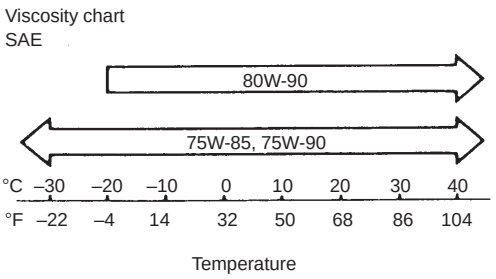
1. Input shaft
2. Input shaft bearing
3. Front bearing
4. C-ring
5. Circlip
6. Oil seal
7. Main shaft
8. Main shaft washer ball
9. Main shaft bearing washer
10. Low gear
11. Circlip
12. Needle bearing
13. 2nd gear
14. Needle bearing
15. 3rd gear
16. 3rd gear needle bearing
17. 5th gear
18. Speed sensor rotor
19. 5th gear needle bearing
20. Main shaft bearing
21. C-ring
22. Main shaft rear bearing
23. Circlip
24. Circlip
25. Countershaft
26. Countershaft 5th gear
27. Front bearing
28. Circlip
29. Center bearing
30. Rear bearing
31. Low speed synchronizer hub assembly
32. Low speed synchronizer ring
33. Low speed synchronizer spring
34. Synchronizer spring
35. High speed synchronizer hub assembly
36. High speed synchronizer ring
37. Synchronizer spring
38. Synchronizer spring
39. 5th speed synchronizer hub assembly
40. Synchronizer key
41. Synchronizer key
42. Reverse gear shaft
43. Pin
44. Reverse idle gear
45. Washer
46. Countershaft reverse gear
47. Main shaft reverse gear
48. Circlip
49. Needle bearing
50. Snap ring
51. Circlip

ON-VEHICLE SERVICE

MAINTENANCE SERVICE

OIL 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 and torque drain plug (1) as specified below after applying sealant to its thread.

   "A": Sealant 99000-31110

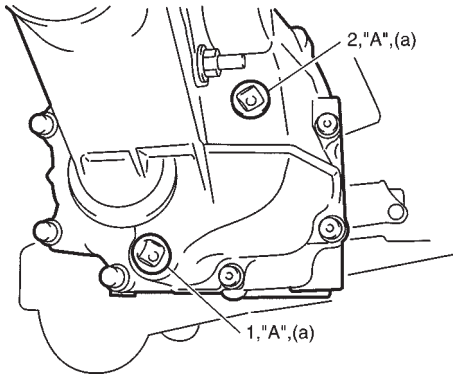
   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

4) Fill new specified oil as shown below by specified amount (roughly up to level hole).

   NOTE:
   - **It is highly recommended to use SAE 75W–90 gear oil.**
   - **Whenever vehicle is hoisted for any service work other than oil change, also be sure to check for oil leakage.**
   - **If water or rust is mixed in drained oil, be sure to check boot of transmission.**

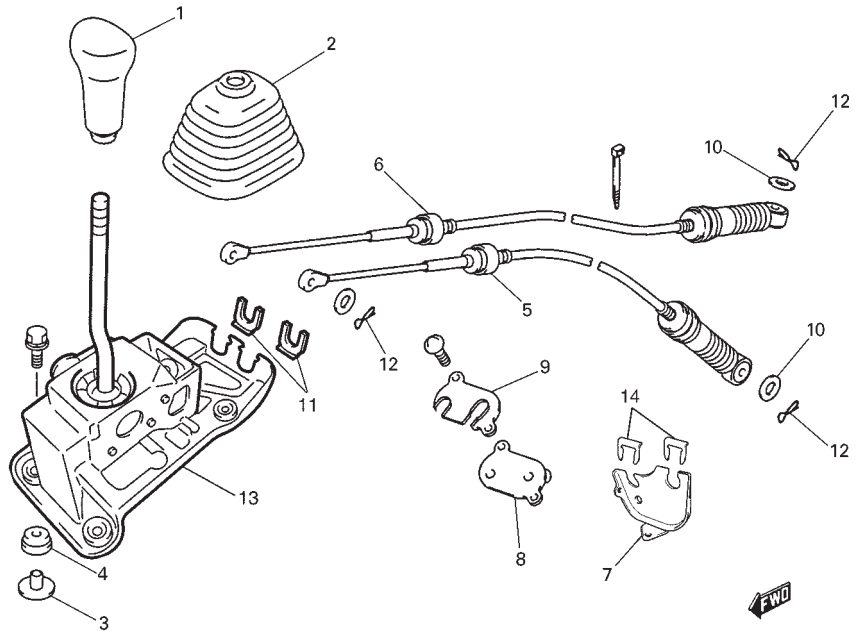
   Gear Oil Specification
   Oil grade: API GL-4
   Viscosity: SAE 75W–85, 75W–90 or 80W–90

   Oil Capacity:
   Transmission 1.3 liters (2.75/2.29 US/Imp. pt)



5) Torque level/filler plug (2) in the same manner as drain plug.

GEAR SHIFT CONTROL LEVER AND CABLE



1. Shift control knob
2. Boot
3. Spacer
4. Cushion
5. Shift control cable assembly
6. Select control cable assembly
7. Control cable bracket
8. Grommet
9. Grommet plate
10. Washer
11. Clip
12. Clip
13. Gear shift control lever assembly
14. Cable cap clip

REMOVAL

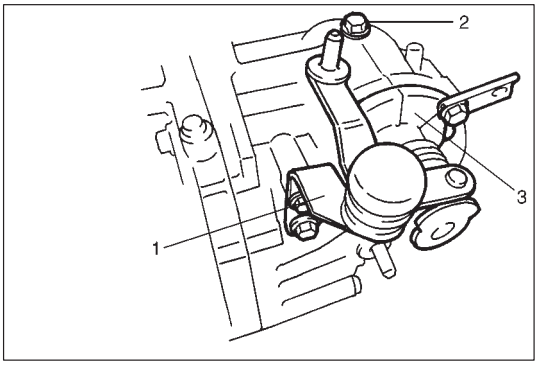
1) Remove T/M control cable end clips and washers.
2) Remove cable cap clips.
3) Remove T/M control cable from control cable bracket.
4) Remove console box and then control cable grommet plate.
5) Remove gear shift & select control cables from gear shift control lever assembly.
6) Loosen 4 bolts and take out gear shift control lever assembly.

INSTALLATION

1) Apply grease to turning or sliding portions.
2) If knob has been removed from lever, apply thread lock cement and then install knob to control lever. Make sure that knob is aligned with lever.
3) Install control lever assembly and related parts as they were.

NOTE:

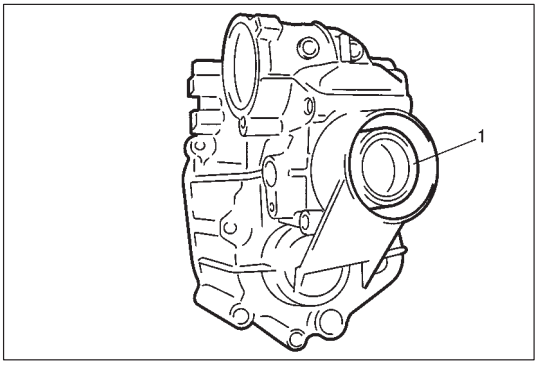
- **Make sure that boots are installed correctly.**
- **Check control lever for smooth movement after assembly.**



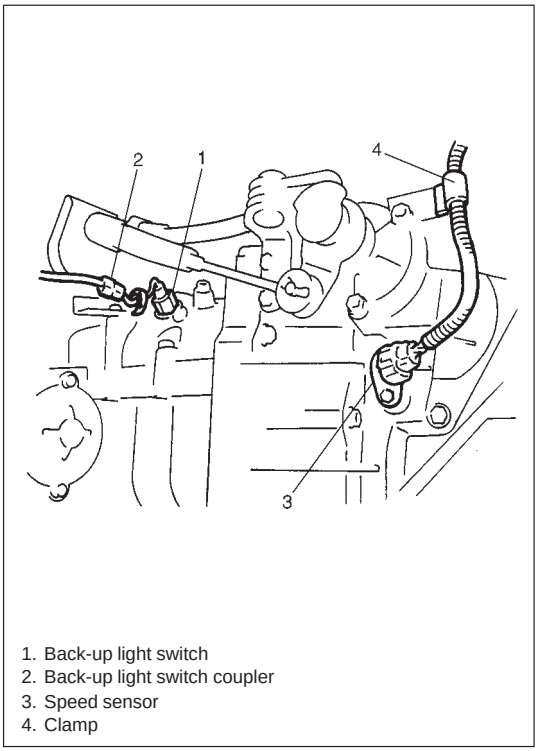
EXTENSION CASE

Removal/Installation

1) Remove select cable lever (1) and gear shift stop bolt (2).
2) Remove shift & select shaft assembly (3).
3) Support engine/transmission assy on jack.
4) Disconnect vehicle speed sensor coupler and remove engine rear mounting.



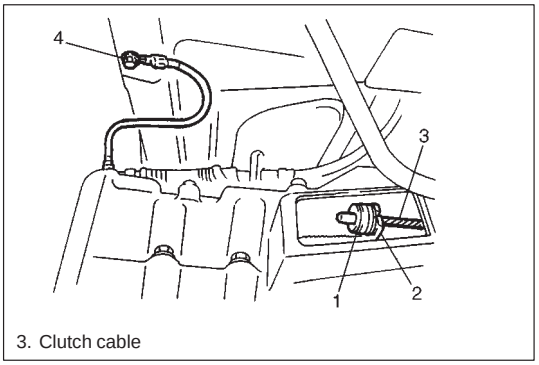
5) Remove bolts securing extension case to transmission case, and then take off extension case.
6) Remove extension case seal (1) as necessary.
   Reverse removal procedure for installation referring to 7A–24.



1. Back-up light switch
2. Back-up light switch coupler
3. Speed sensor
4. Clamp

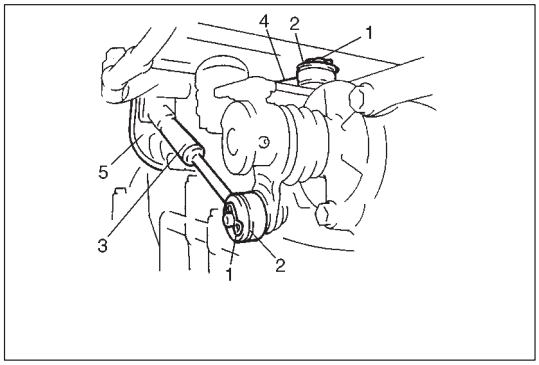
DISMOUNTING

1) Disconnect negative (–) cable from battery terminals and hoist vehicle.
2) Disconnect back-up light switch lead wire at coupler.
3) Disconnect Black/Yellow lead wire and positive (+) cord from starting motor. Remove starting motor from transmission case.
4) Disconnect coupler from speed sensor and free its harness from transmissions.
5) Remove drain plug to drain oil in transmission.

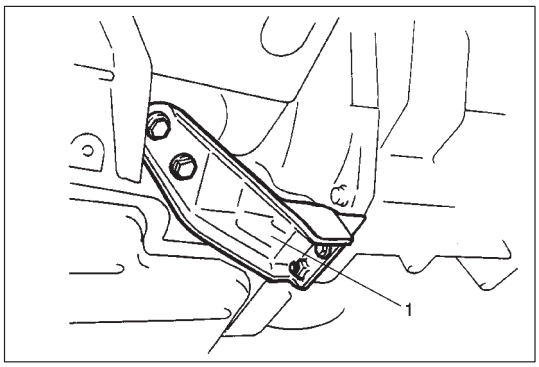


3. Clutch cable

6) Remove transmission front case cap and take off clutch cable end (1) from clutch release fork (2). Disconnect clutch cable assembly from transmission.
7) Remove transmission to body ground cable bolt (4).



8) Remove control cable end clips (1) and washers (2), and then disconnect gear shift cable (3) and select cable (4) from each lever.
9) Remove gear shift and select control cables from bracket (5).

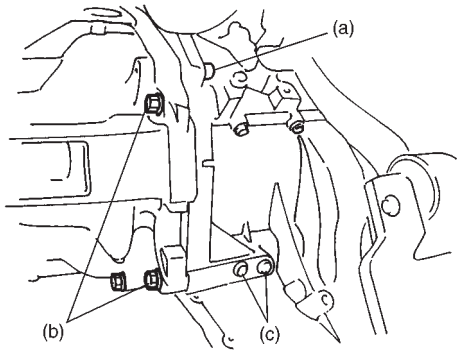


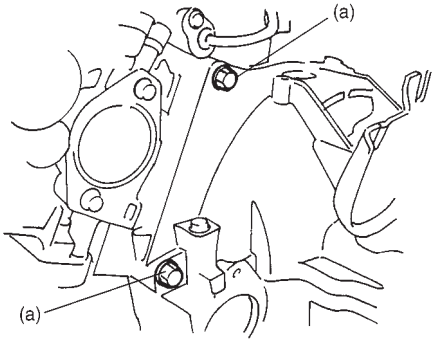
10) Remove propeller shaft referring to “PROPELLER SHAFTS” section.
11) With transmission supported on jack, remove stiffner (1).

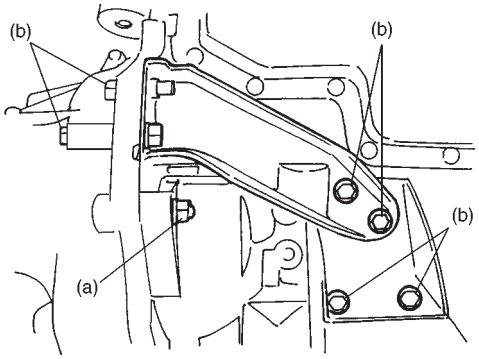
12) Remove bolts and nuts fastening engine cylinder block and transmission case.

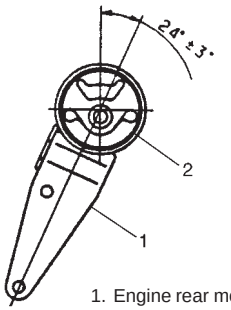
NOTE:
Before starting to remove transmission, check around once again to be sure that there is no connection left undone.

13) Remove transmission rear mounting bolt & nut from chassis.
14) Separate transmission from engine and remove clutch housing upper and lower plates.
15) Take down transmission.









1. Engine rear mounting bracket
2. Bush

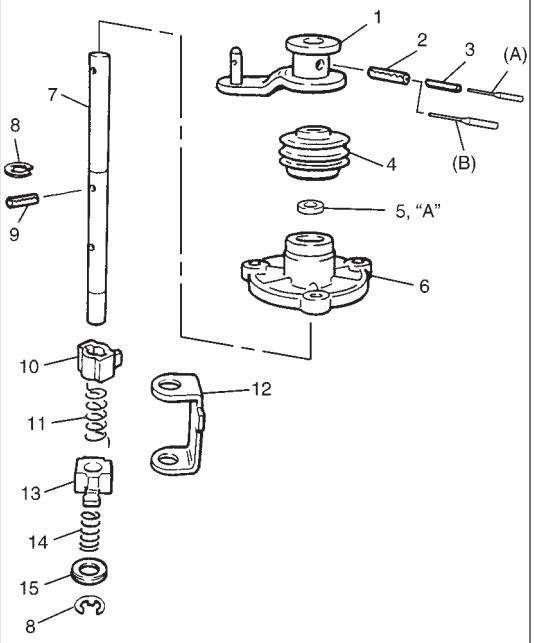
REMOUNTING

For remounting, reverse dismounting procedure.
Use specified torques as given below.

Tightening Torque
(a) : 61 N·m (6.1kg-m, 44.0 lb-ft)
(b) : 55 N·m (5.5kg-m, 40.0 lb-ft)
(c) : 25 N·m (2.5kg-m, 18.0 lb-ft)

NOTE:

- **To facilitate remounting, install rear mounting to transmission after inserting input shaft into clutch disc.**
- **For tightening torque of starting motor bolts, refer to section 6G.**
- **Refill specified amount of gear oil as previously outlined.**
- **After connecting clutch cable, be sure to adjust its play properly (refer to “CLUTCH” Section).**
- **Press-fit engine rear mounting bush to bracket as shown in figure, if removed.**



1. Shift cable lever
2. Shift cable lever outer pin
3. Shift cable lever inner pin
4. Boot
5. Gear shift shaft oil seal
6. Gear shift guide case
7. Gear shift & select shaft
8. E-ring
9. Rev. interlock shaft pin
10. 5th-rev. gear shift cam
11. Cam return spring
12. 5th-rev. interlock plate
13. Gear shift & select lever
14. Low select spring
15. Washer

UNIT REPAIR OVERHAUL

DISASSEMBLING UNIT

GEAR SHIFT & SELECT SHAFT ASSEMBLY

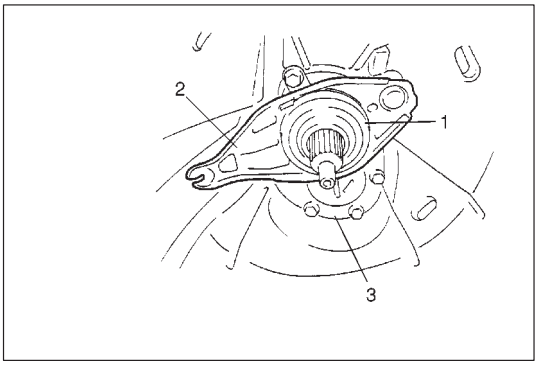
1) To disassembly component parts, use special tools (A) & (B) and 2.8 – 3.0 mm (0.11 in.) pin remover in addition.

   Special Tool
   (A): 09922-85811 (4.5 mm)
   (B): 09925-78210 (6.0 mm)

2) Clean all parts thoroughly, inspect them and replace with new ones as required.
3) Assemble component parts by reversing removal procedure.
4) If oil seal is replaced, apply grease to its lip.

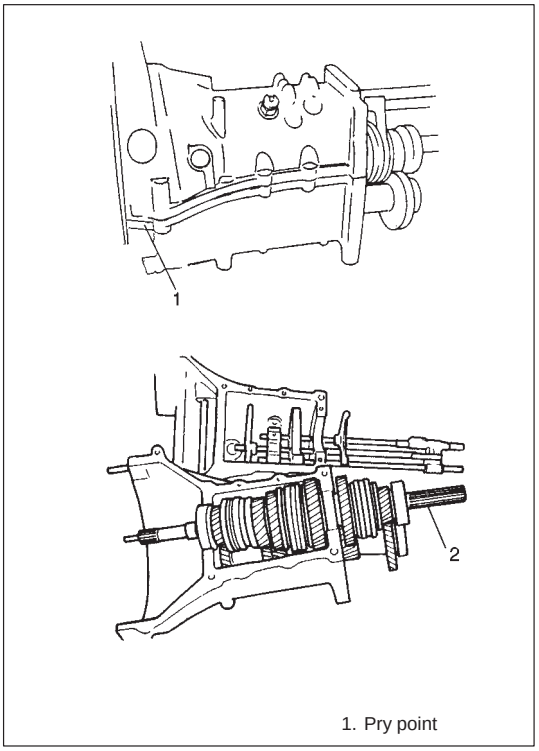
   "A" : Grease 99000-25010

   NOTE:
   - **When driving in spring pins, prevent shaft from being bent by supporting it with wood block.**
   - **Assemble 5th & REV gear shift cam by winding cam guide return spring, and then drive in spring pin.**
   - **Locate low speed select spring (Green) and reverse select spring (Yellow) correctly.**



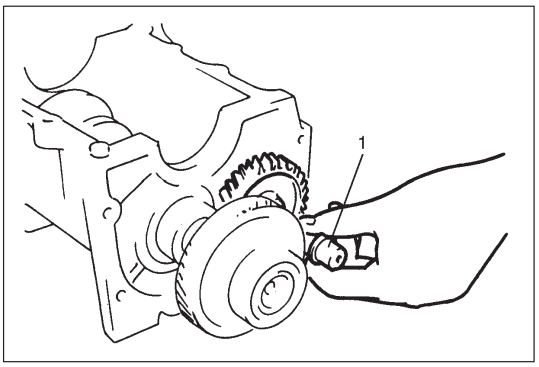
TRANSMISSION CASE

1) Remove clutch release bearing (1) and release fork (2).
2) Remove input shaft bearing retainer bolts and pull out retainer (3).
   Take out oil seal from input shaft bearing retainer as necessary.
3) Remove speed sensor from extension case.



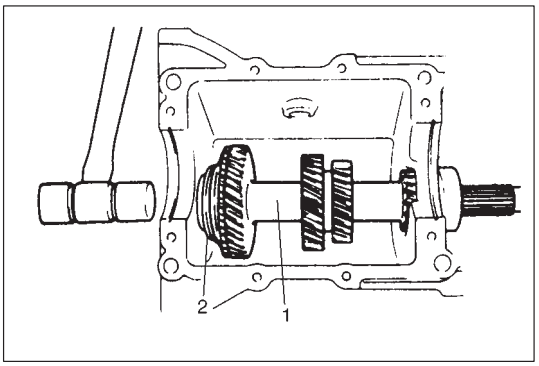
1. Pry point

4) Remove bolts fastening upper and lower cases together, separate the two, and take out main shaft assembly (2).
Screwdriver or the like can be used to pry two cases apart. In such a case, do not stick screwdriver too far into between two mating faces, or faces may get damaged.

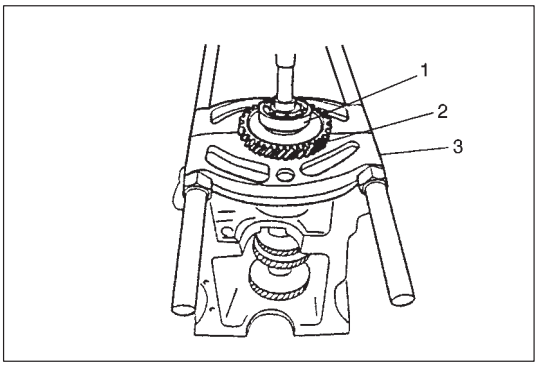


COUNTERSHAFT

1) Remove reverse idle gear shaft (1) with gear.

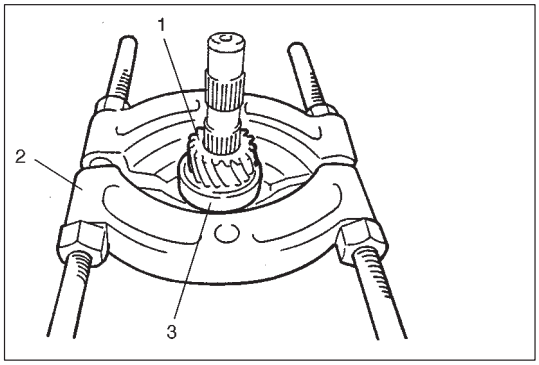


2) Remove outside circlip of countershaft front bearing (2).
3) Using plastic hammer, drive countershaft (1) rearward.

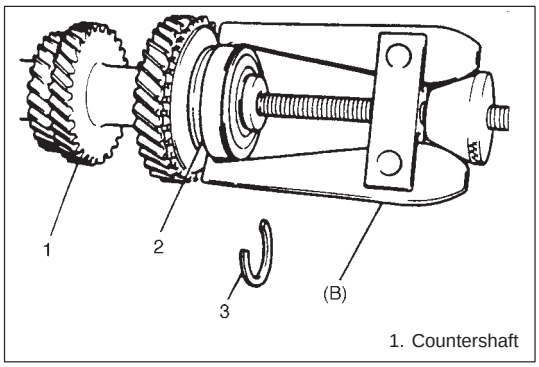


4) Remove circlip and then remove countershaft rear bearing (1) and 5th gear (2) with puller (3) and hydraulic press.

NOTE:
Be sure to set flat face of puller against 5th gear so as not to cause damage to teeth.



5) Remove countershaft reverse gear (1) and center bearing (3) with puller (2) and hydraulic press.
6) Remove countershaft from lower case.

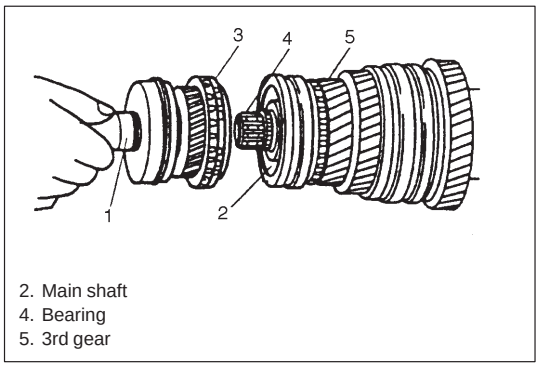


1. Countershaft

7) Remove circlip (3) from countershaft front end and pull out bearing (2) by using special tool.

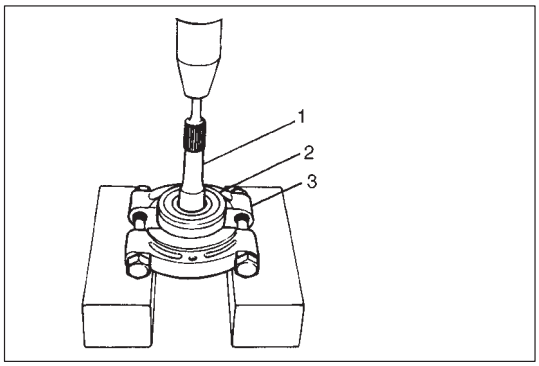
Special Tool
(B): 09913-60910

INPUT SHAFT AND MAIN SHAFT



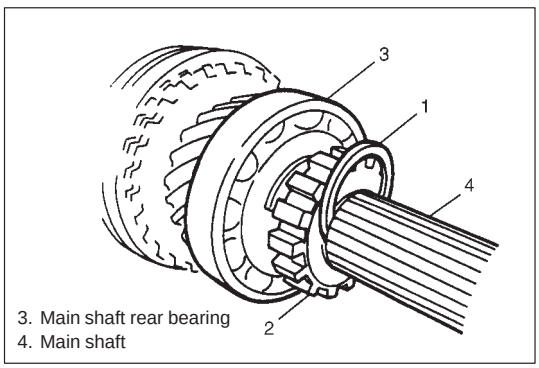
2. Main shaft
4. Bearing
5. 3rd gear

1) Take out input shaft (1) by hand, taking care not to let high-speed synchronizer ring (3) fall off.



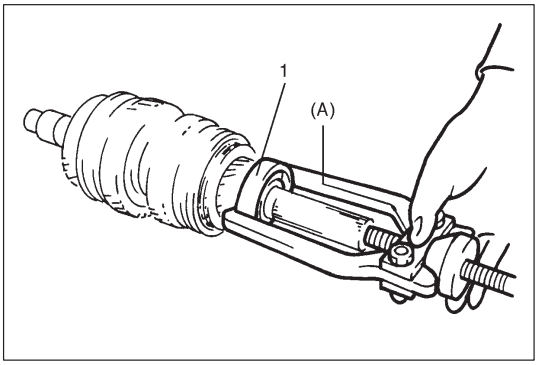
2) Remove circlip of input shaft (1) and pull out bearing (2) with puller (3) and hydraulic press as necessary.

NOTE:
Sealed bearing must not be washed. Replace it with new one when required.



3. Main shaft rear bearing
4. Main shaft

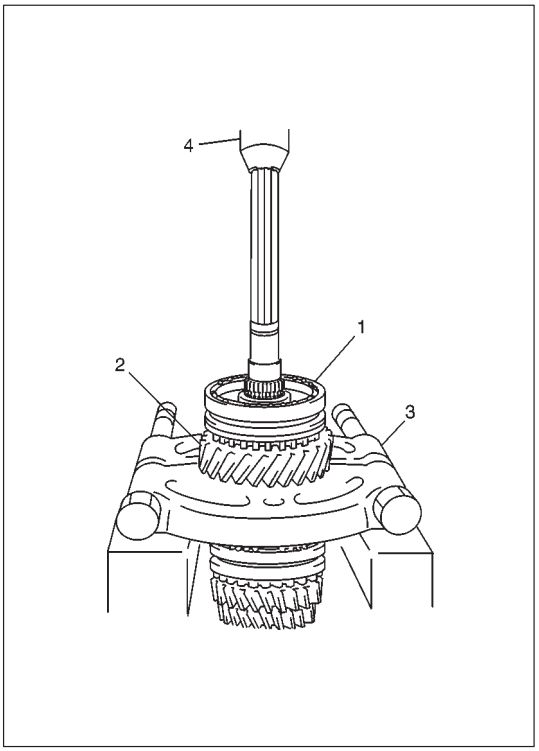
3) Remove circlip (1) and then speed sensor rotor (2) from main shaft.



4) Remove circlip retaining rear bearing (1) on main shaft. Remove main shaft bearing using special tool.

Special Tool:
(A): 09913-65135

5) From main shaft, take off 5th gear, 5th speed synchronizer ring and 5th gear needle bearing.



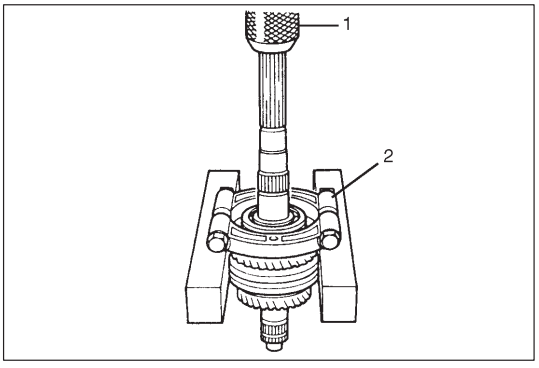
6) Remove circlip retaining 5th speed synchronizer hub on main shaft.
7) **[In the case of press-fitting hub]**

> **CAUTION:**
> **Make sure to use flat side of puller to avoid causing damage to reverse gear teeth.**

Drive out 5th speed synchronizer sleeve and hub assembly (1) together with reverse gear (2) by using puller (3) and hydraulic press (4).

[In the case of loose-fitting hub]
Remove 5th speed synchronizer sleeve and hub assembly (1), and reverse gear.

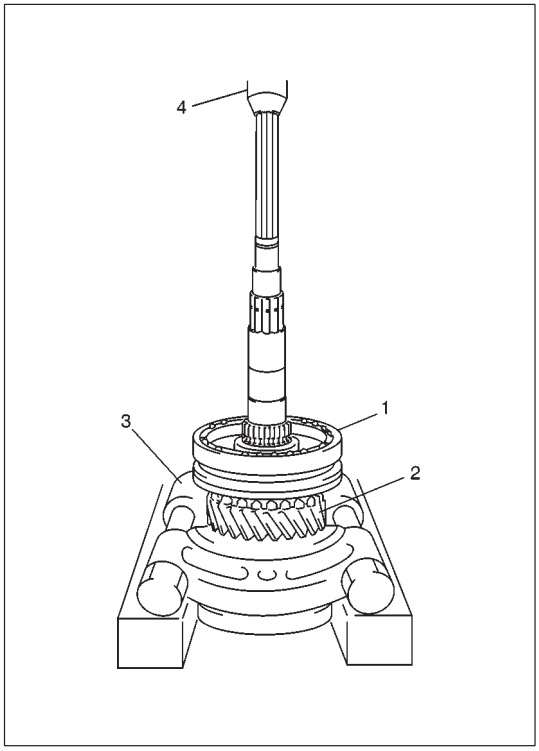
8) Take out reverse gear needle bearing from shaft.



9) Remove circlip and then bearing washer and ball. Pull out main shaft (center) bearing by using puller (2) and hydraulic press (1).

NOTE:
In the state as shown, there is a ball in washer which is located under bearing. Be sure to prevent it from falling off and getting lost.

10) Remove bearing washer, ball, low gear, low synchronizer ring and needle bearing from main shaft.



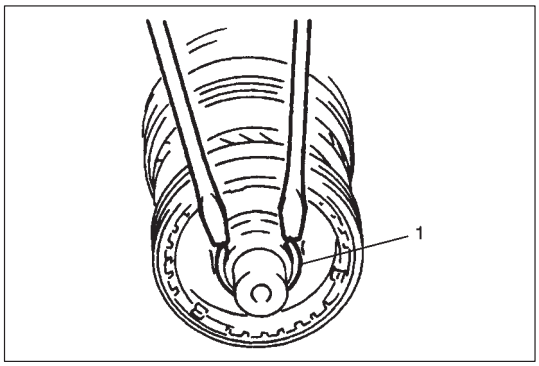
11) Remove circlip retaining low speed synchronizer hub on main shaft.
12) **[In the case of press-fitting hub]**

> **CAUTION:**
> **Make sure to use flat side of puller to avoid causing damage to reverse gear teeth.**

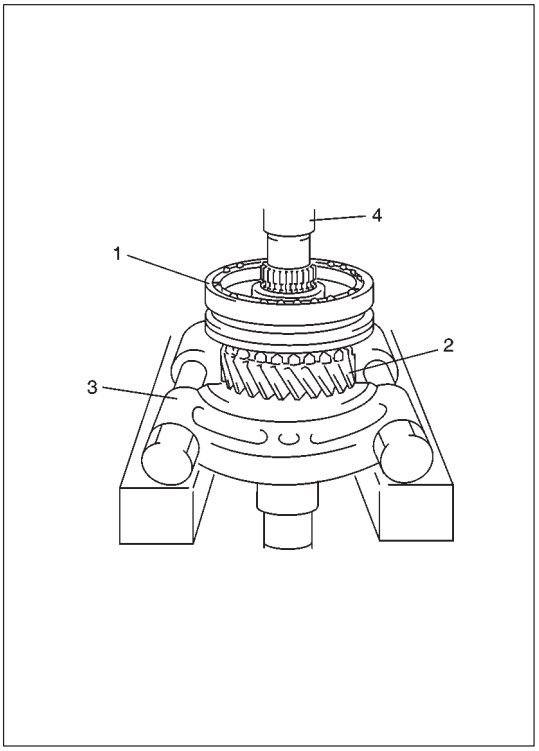
Drive out low speed synchronizer sleeve and hub assembly (1) together with 2nd gear (2) and low speed synchronizer ring by using puller (3) and hydraulic press (4).

[In the case of loose-fitting hub]
Remove low speed synchronizer sleeve and hub assembly (1), low speed synchronizer ring and 2nd gear.

13) Remove 2nd gear needle bearing.



14) Remove high-speed synchronizer hub circlip (1).



15) **[In the case of press-fitting hub]**

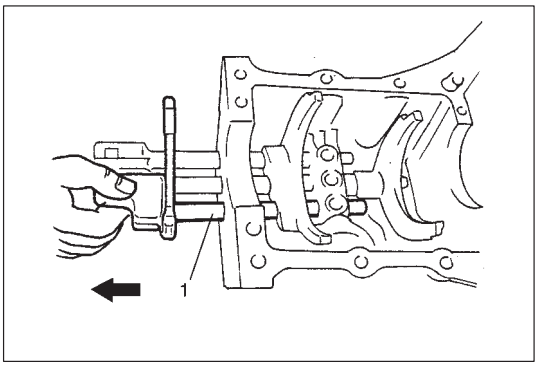
> **CAUTION:**
> **Make sure to use flat side of puller to avoid causing damage to reverse gear teeth.**

Drive out high speed synchronizer sleeve and hub assembly (1) together with 3rd gear (2) and high speed synchronizer ring by using puller (3) and hydraulic press (4).

[In the case of loose-fitting hub]
Remove high speed synchronizer sleeve and hub assembly (1), high speed synchronizer ring and 3rd gear (2).

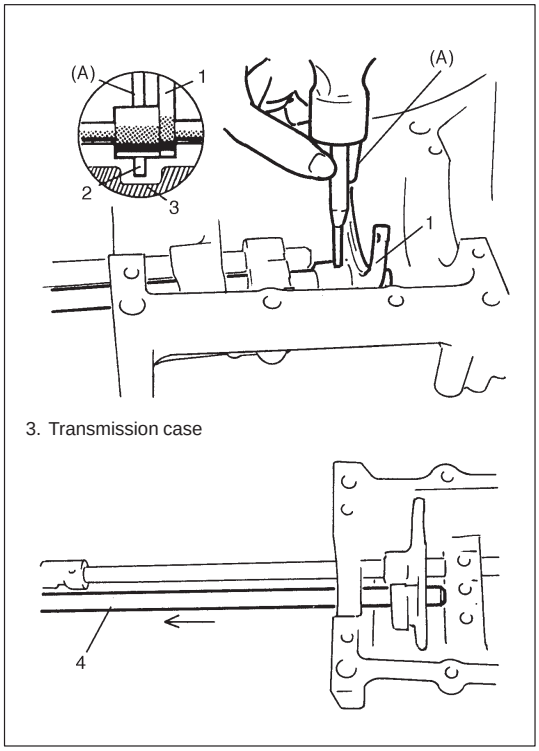
16) Take out 3rd gear needle bearing from main shaft.

17) Disassemble low, high and 5th speed synchronizer sleeve and hub assemblies.



SHIFT SHAFTS AND FORKS

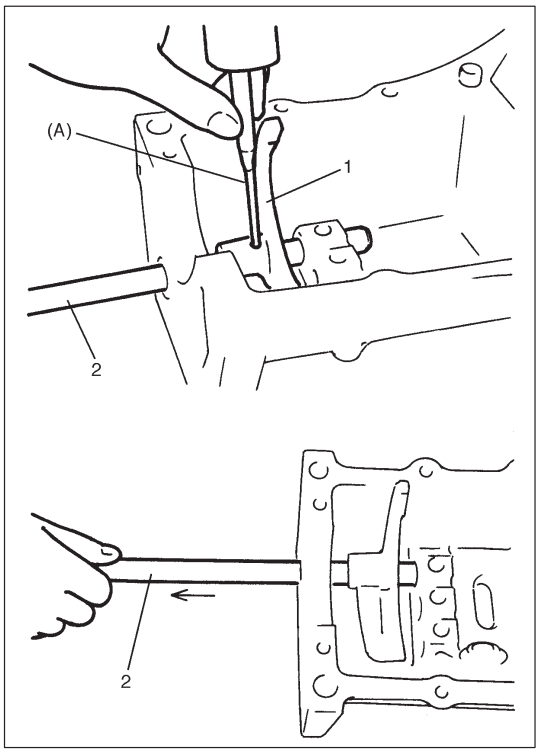
1) Pull out reverse gear shift shaft (1). As this shaft comes out, locating ball and spring will jump out of hole; do not let them fly away.



CAUTION:
When removing yoke pin, be sure not to drive it out so far as to contact case. Or it will cause damage to case.

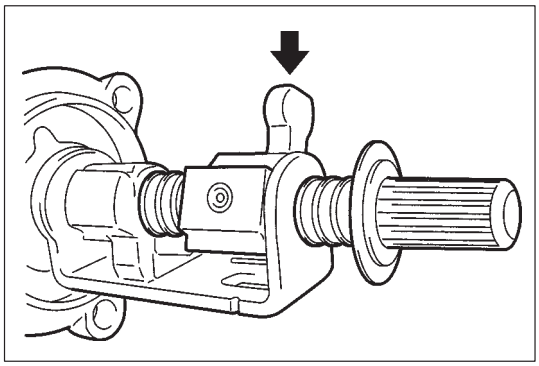
2) Using special tool, drive out spring pin (2) on high speed gear shift fork (1), and pull out shift shaft (4).
As in above case, be careful not to let locating ball, interlock ball and spring fly away.

Special Tool
(A): 09922-85811



3) Drive spring pin out of low speed gear shift fork (1) as in above step 2) and pull out shift shaft (2).

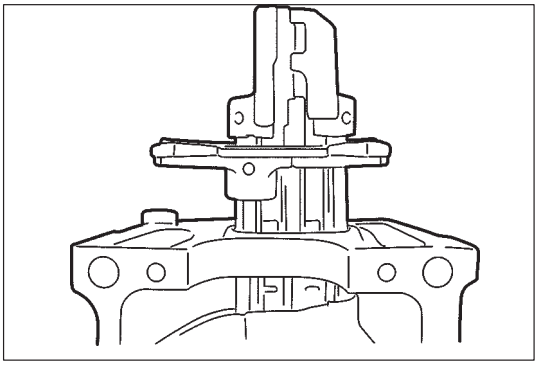
Special Tool
(A): 09922-85811



INSPECTION

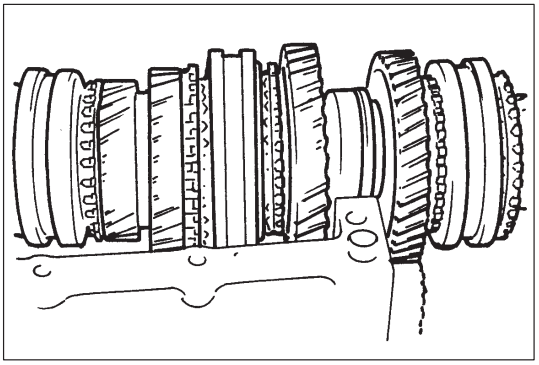
Gear Shift Lever

Check lower end of gear shift lever where gear shift fork shaft contact for wear and any kind of damage. Worn or damaged gear shift lever must be replaced with a new one.



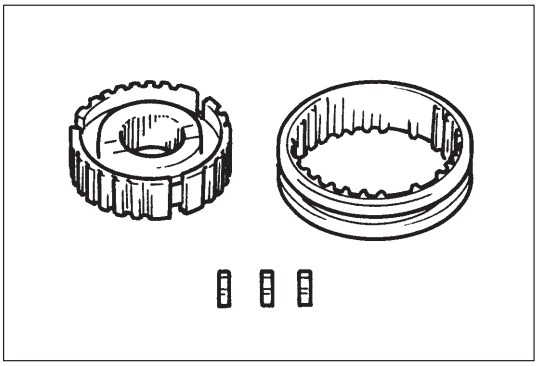
Gear Shift Fork Shaft

Visually check each gear shift fork shaft (High, Low and Reverse) where gear shift front arm contacts for wear. Worn shaft must be replaced.



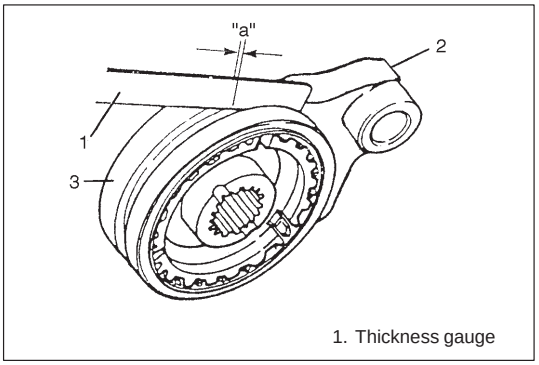
Gears

Check each part for wear, damage or discoloration. Replace if found defective.



Synchronizer Hubs, Sleeves and Keys

Check each part for wear or damage. Replace if found defective.

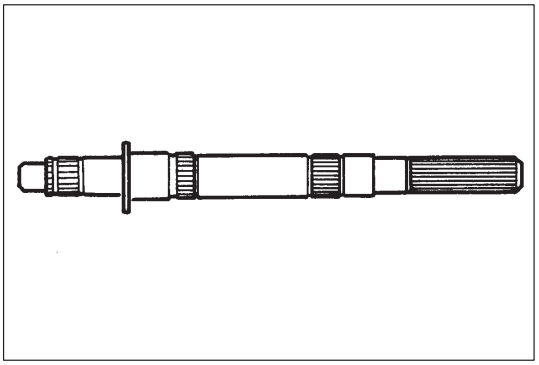


1. Thickness gauge

Shift Forks and Sleeves

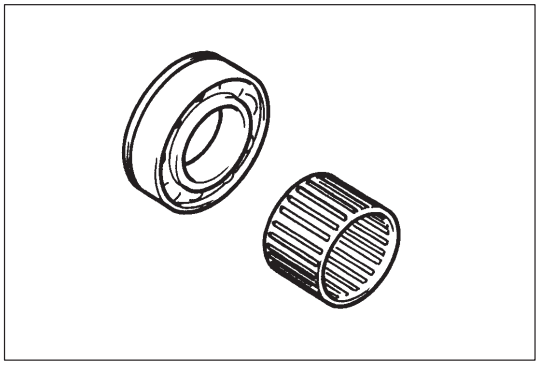
Check contact surfaces for wear or damage.
Measure clearance between fork (2) and sleeve (3).

Maximum clearance “a”: 1.0 mm (0.039 in.)



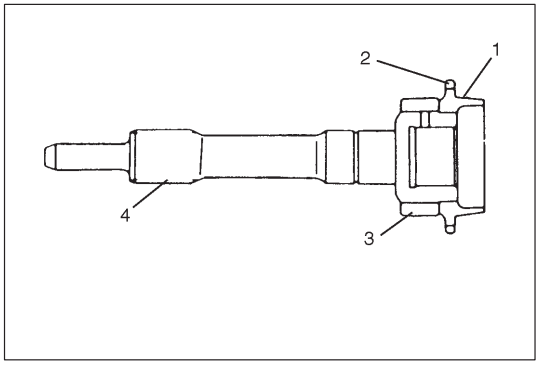
Main Shaft

Check each part of shaft for wear, discoloration or damage. Replace shaft if any part is found defective.



Bearing

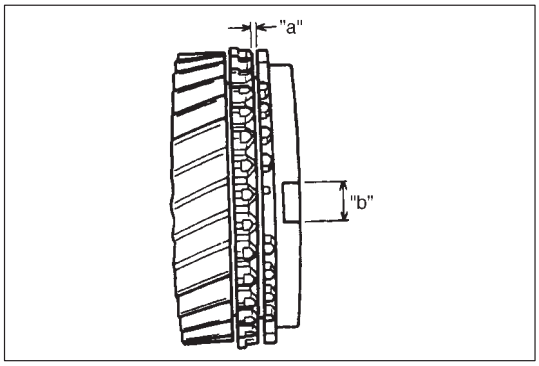
Check each part for wear, damage or discoloration. With ball bearing, check to ensure that it rotates smoothly and it does not make noise.
Replace if found defective.



Input Shaft

Inspect cone (1) and dog clutch (2) for wear and damage.

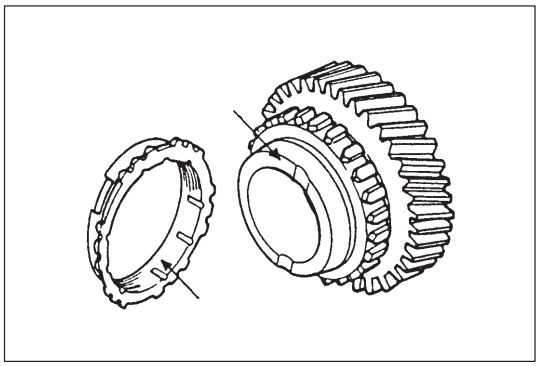
Inspect gear teeth (3) and splines (4) for wear and damage.
If any part of input shaft inspected as above is found excessively worn or badly damaged, replace shaft.



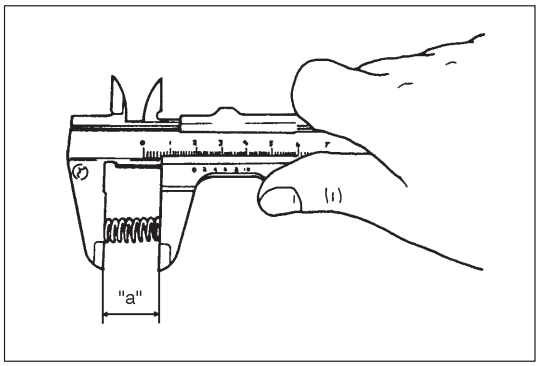
Combination of Gear and Synchronizer Ring

Check clearance “a” between synchronizer ring and gear, key slot width “b” in synchronizer ring and each chamfered teeth of gear and synchronizer ring and replace with new one, if necessary.
Also, check gear teeth.

Clearance “a”: Standard 1.0 – 1.4 mm (0.039 – 0.055 in.)
Service limit 0.5 mm (0.019 in.)
Slot width “b”: Standard 10.1 mm (0.397 in.)
Service limit 10.4 mm (0.409 in.)



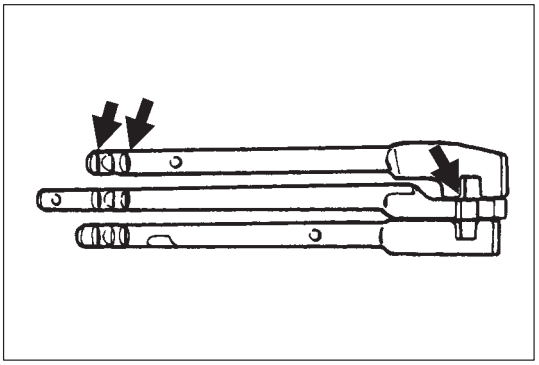
Inspect external cone (of gear) and internal cone (of ring) for abnormal wear. Be sure that contact patterns on these surfaces indicate uniform full-face contact, and that surfaces are free from any wavy wear. A badly worn member must be replaced.
Proper synchronizing action on gear shifting can be expected only when ring-to-gear clearance and condition of cone surfaces, among other things, are satisfactory.



Fork Shaft Locating Springs

If “gears slipping out of mesh” has been complained, check these springs for strength by measuring their free length, and replace them if their free lengths are less than service limit.

Free length “a”: Standard 25.0 mm (0.984 in.)
Service limit 22.5 mm (0.886 in.)



Gear Shift Shafts

Check the part of shaft as indicated in figure for uneven wear. Replace shaft if uneven wear is noted.

ASSEMBLING UNIT

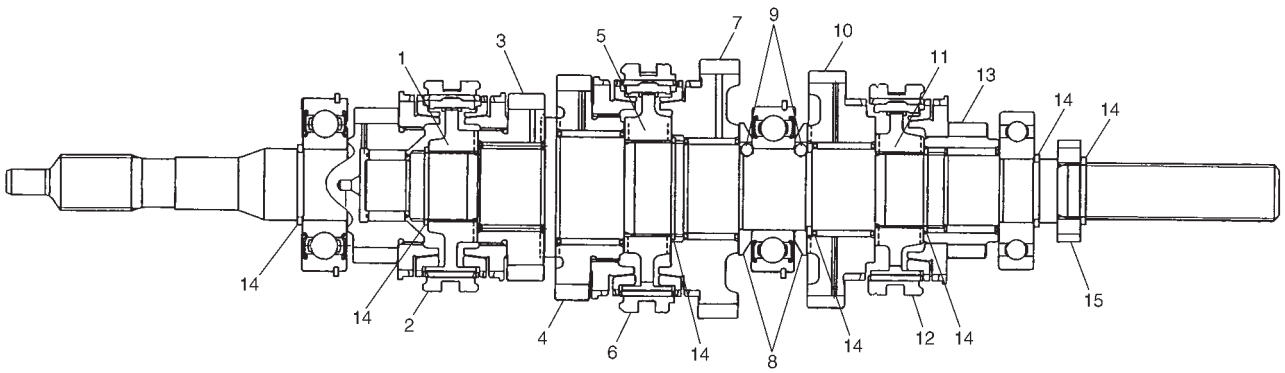
NOTE:

- **Before installation, wash each part and apply specified gear oil to sliding faces of bearing and gear.**
- **Use new circlips on shaft for reinstallation. Don't reuse used circlips.**
- **Tighten each fastening bolt and nut according to specified torque data listed on the last page of this section.**

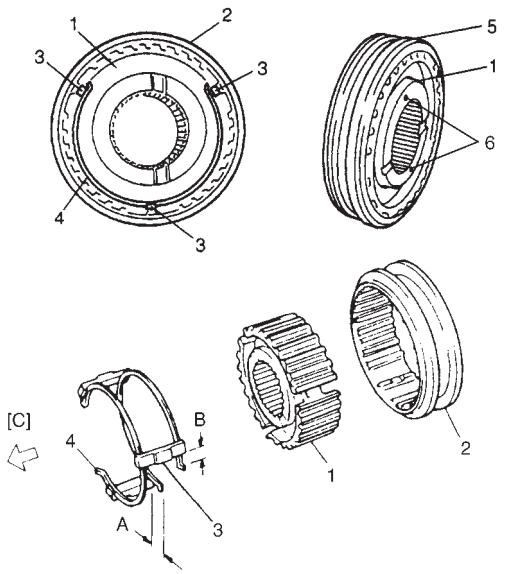
MAIN SHAFT AND INPUT SHAFT

Install each parts by reversing respective removal procedures. Be careful for installing direction of each washer, gear, synchronizer hub and sleeve.

Refer to figure. Make sure to install each ball and circlip on main shaft.



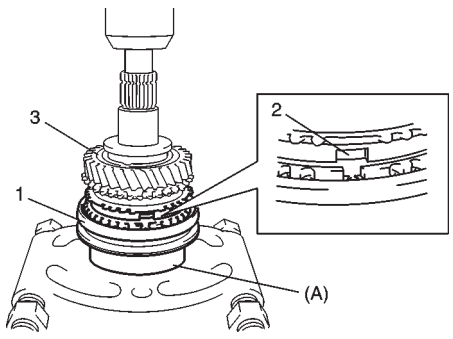
1. High speed synchronizer hub
2. High speed synchronizer sleeve
3. 3rd gear
4. 2nd gear
5. Low speed synchronizer hub
6. Low speed synchronizer sleeve
7. Low gear
8. Washer
9. Ball
10. Reverse gear
11. 5th speed synchronizer hub
12. 5th speed synchronizer sleeve
13. 5th gear
14. Circlip
15. Speed sensor rotor



5. Groove
6. Punch mark
[C]: 2nd gear side (forward)

1) Assemble low speed synchronizer hub (1), sleeve (2), springs (4) and keys (3).
   a) Slide hub in sleeve so that punch marked side of hub and groove machined side of sleeve face the same direction.
   b) Insert keys in hub slots with depression side of keys face center of hub.
   c) Install springs to internal circle of key locations with spring end gaps apart at angles about 120 degrees each other.

Synchronizer spring installation position
: A = B



2) Install needle bearing, 2nd gear (3) and 2nd synchronizer ring to main shaft.
3) **[In the case of press-fitting hub]**

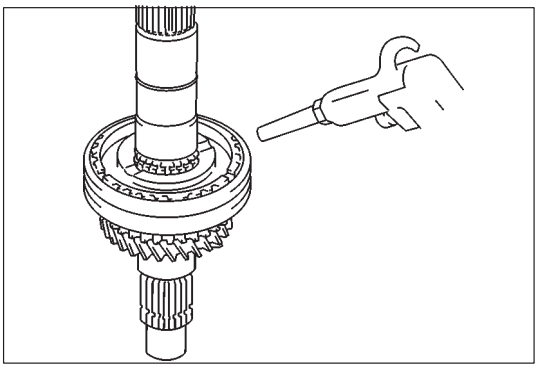
> **CAUTION:**
> **Make sure synchronizer ring key slots (2) must be aligned with keys while press-fitting sleeve and hub assembly. Otherwise synchronizer ring may be damaged.**

Using special tool, puller and hydraulic press, drive in low speed synchronizer sleeve and hub assembly (1) with punch marked side of hub directed to backward (low gear side).

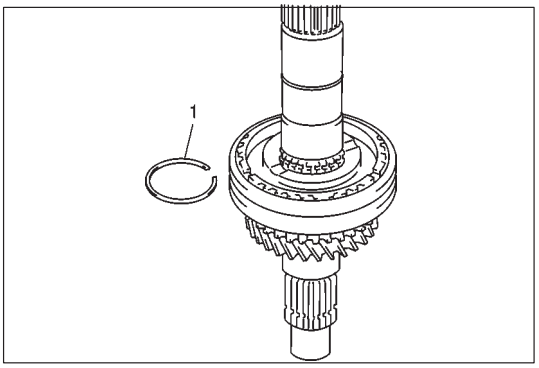
Special Tool
(A): 09924-07710

NOTE:
Check free rotation of 2nd gear after press-fitting sleeve and hub assembly.

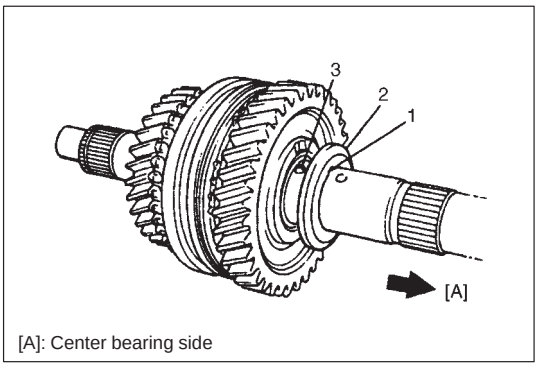
[In the case of loose-fitting hub]
Install low speed synchronizer sleeve and hub assembly (1) with punch marked side of hub directed to backward (low gear side).



4) If low speed sleeve and hub assembly is press-fitted, ensure that components are free from iron filings shaved off by press-fitting.
   Remove any iron filings from around the areas concerned by using compressed air, if necessary.

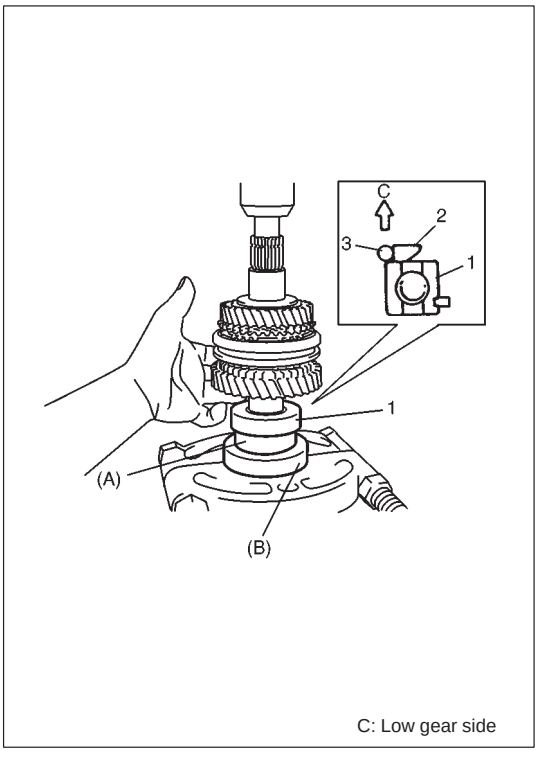


5) Fit low speed hub circlip (1) into groove in main shaft.



[A]: Center bearing side

6) Install low gear needle bearing, synchronizer ring, low gear, ball and washer onto main shaft.
   Fit ball into hole in shaft and install washer so that its slot (1) comes over ball (3).
   To direct washer correctly, bring its circumference chamfered side (2) to main shaft center bearing.

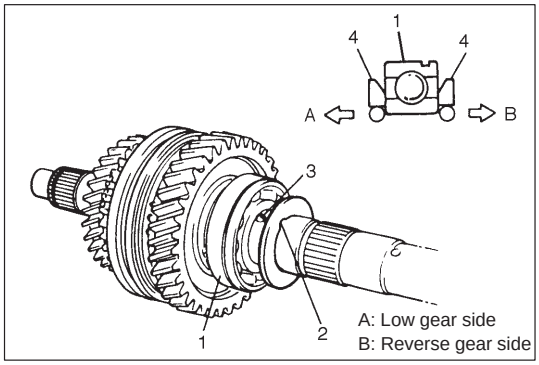


C: Low gear side

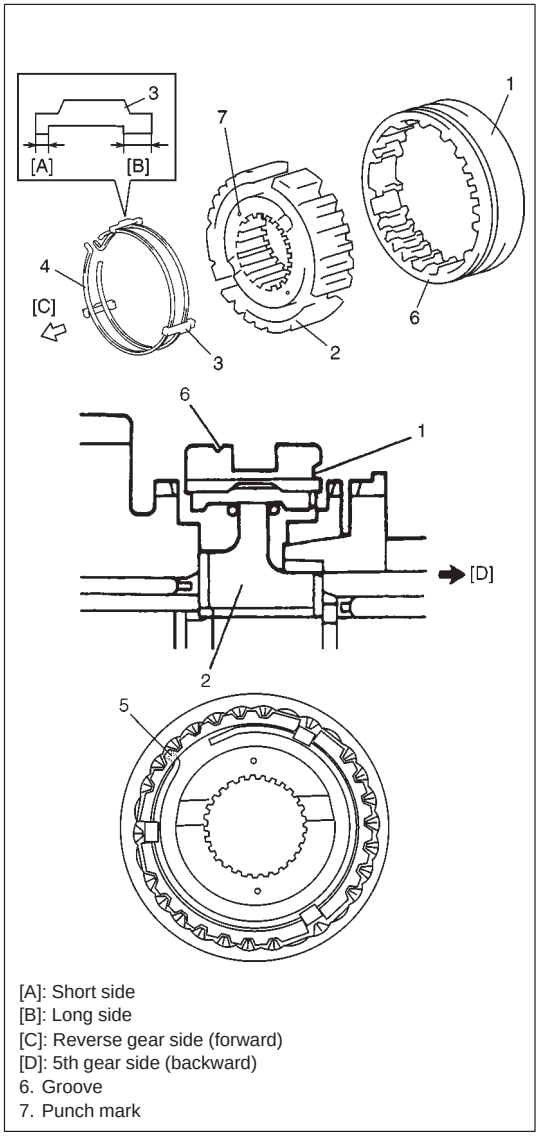
7) Press-fit center bearing (1) with special tools.

   NOTE:
   Hold washer (2) by hand while press-fitting to prevent washer and ball (3) from dropping off.

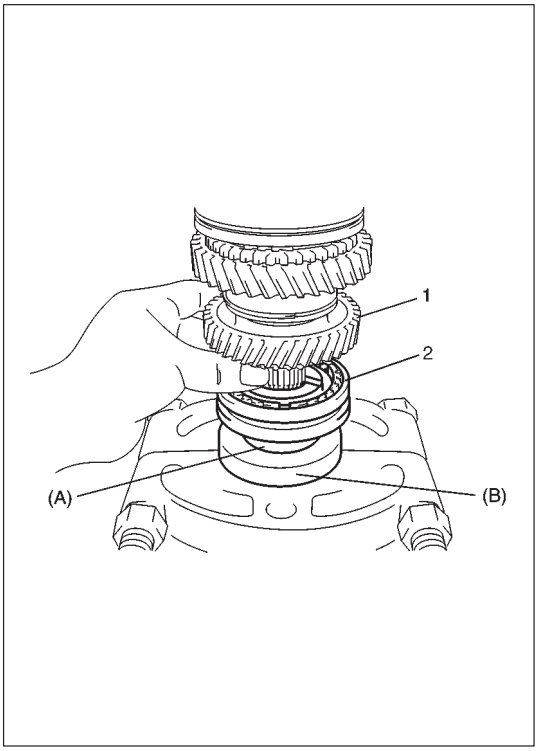
   Special Tool
   (A): 09924-07720
   (B): 09924-07710



8) Install ball (3) and washer (4).
As figure shows, install washer so that its circumference chamfered side faces center bearing (1) and its slot (2) comes over ball.
Fit center bearing circlip.



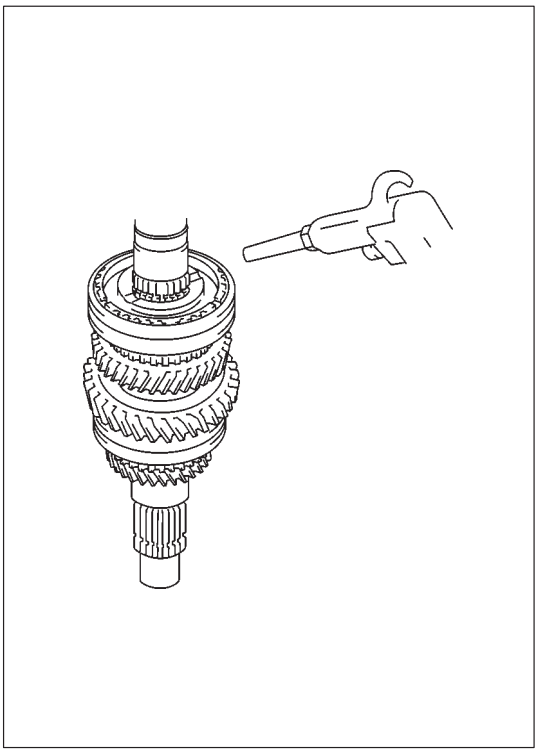
9) Assemble 5th speed synchronizer hub (2), sleeve (1), springs (4) and keys (3).
   a) Slide hub in sleeve so that punch marked side of hub and groove machined side of sleeve face the same (forward) direction.
   b) Insert keys in hub slots with depression side of keys face center of hub and short side [A] of keys face forward.
   c) Install springs to internal circle of key locations with hooked end of spring inserted into hole (5) on hub.



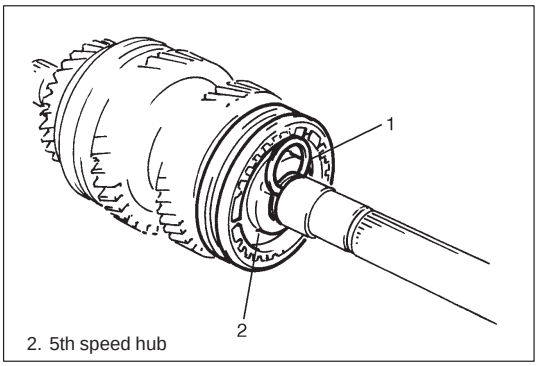
10) Install reverse gear needle bearing and reverse gear (1).
11) **[In the case of press-fitting hub]**
Using special tools, puller and hydraulic press, drive in 5th speed synchronizer sleeve and hub assembly (2) with punch marked side of hub directed to forward (reverse gear side).
NOTE:
- **Hold reverse gear in its installing position by hand to prevent washer and ball from dropping off.**
- **Check free rotation of reverse gear after press-fitting sleeve and hub assembly.**

Special Tool
(A): 09924-07720
(B): 09924-07710

[In the case of loose-fitting hub]
Install 5th speed synchronizer sleeve and hub assembly (2) with punch marked side of hub directed forward (reverse gear side).

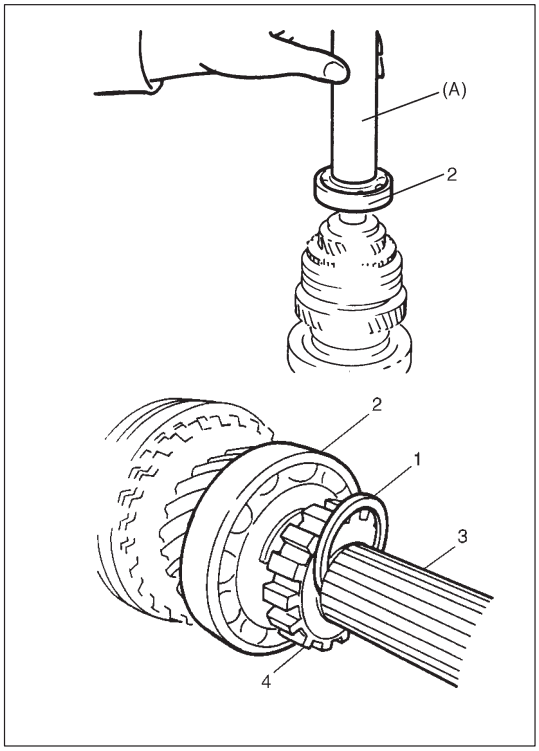


12) If 5th speed sleeve and hub assembly is press-fitted, ensure that components are free from iron filings shaved off by press-fitting.
Remove any iron filings from around the areas concerned by using compressed air, if necessary.



2. 5th speed hub

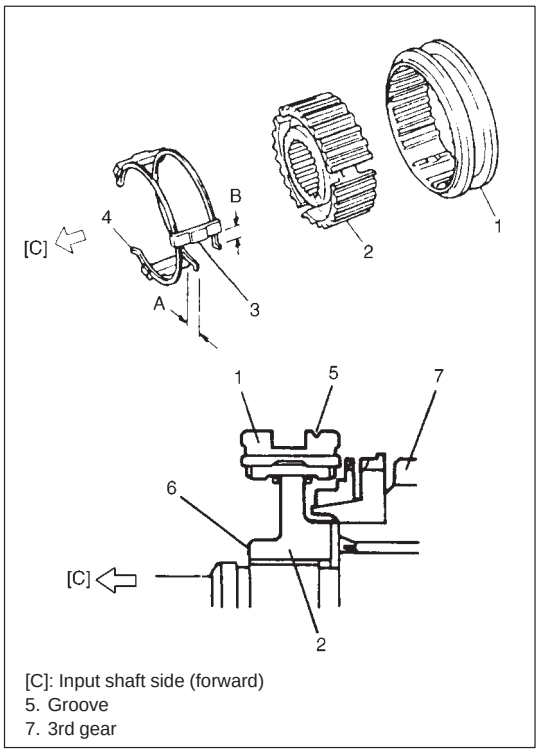
13) Fit 5th speed hub circlip (1) into groove in main shaft.
14) Install 5th gear needle bearing, 5th gear synchronizer ring and 5th gear.



15) Press-fit main shaft rear bearing (2) and fit circlip into groove in main shaft (3).

Special Tool
(A): 09925-18011

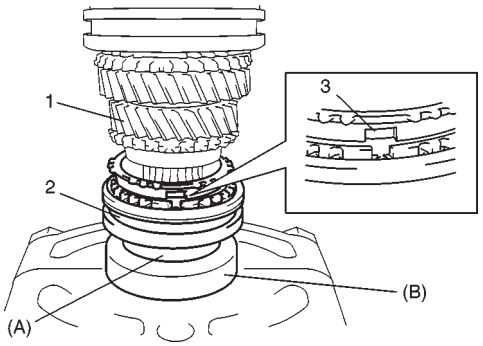
16) Install speed sensor rotor (4) and fit circlip (1).



[C]: Input shaft side (forward)
5. Groove
7. 3rd gear

17) Assemble high speed synchronizer hub (2), sleeve (1), springs (4) and keys (3).
   a) Slide hub in sleeve so that punch marked side (6) of hub and groove machined side of sleeve face opposite direction.
   b) Insert keys in hub slots with depression side of keys face center of hub.
   c) Install springs to internal circle of key locations with spring end gaps apart at angles about 120 degrees each other.

Synchronizer spring installation position
: A = B



18) Install 3rd gear bearing and 3rd gear (1).
19) **[In the case of press-fitting hub]**

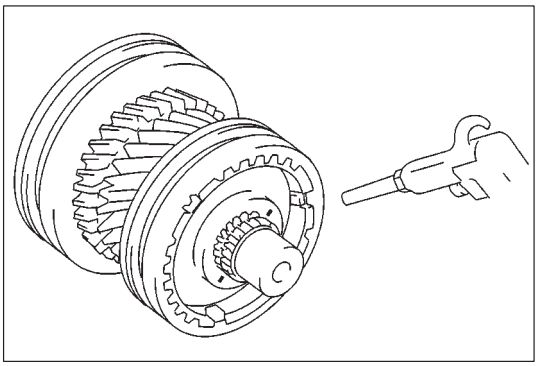
CAUTION:
Make sure synchronizer ring key slots (3) must be aligned with keys while press-fitting sleeve and hub assembly. Otherwise synchronizer ring may be damaged.

Using special tools, puller and hydraulic press, drive in high speed synchronizer sleeve and hub assembly (2) with punch marked side of hub directed to forward (input shaft side).

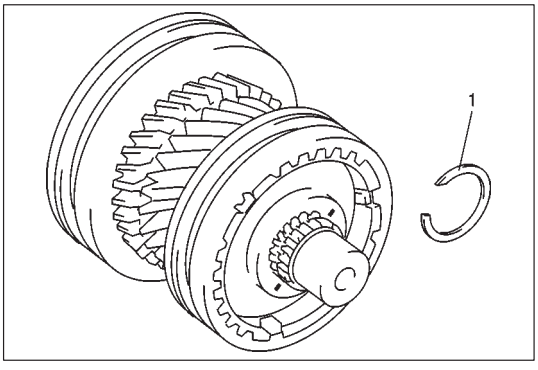
Special Tool
(A): 09924-07720
(B): 09924-07710

NOTE:
Check free rotation of 3rd gear after press-fitting sleeve and hub assembly.

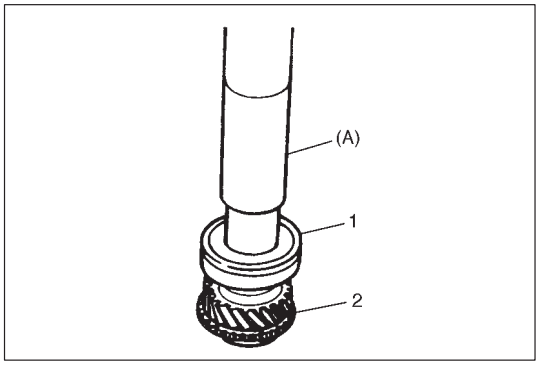
[In the case of loose-fitting hub]
Install high speed synchronizer sleeve and hub assembly (2) with punch marked side of hub directed to forward (input shaft side).



20) If high speed sleeve and hub assembly is press-fitted, ensure that components are free from iron filings shaved off by press-fitting.
Remove any iron filings from around the areas concerned by using compressed air, if necessary.

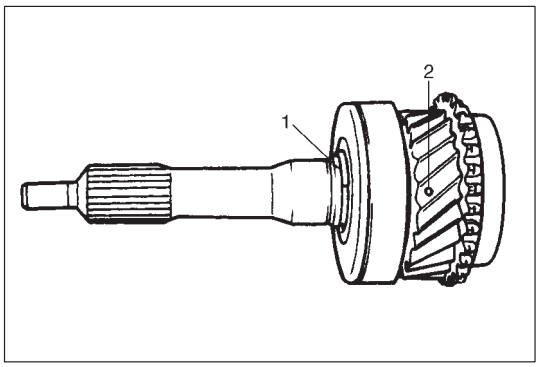


21) Fit high speed hub circlip (1) into groove in main shaft.

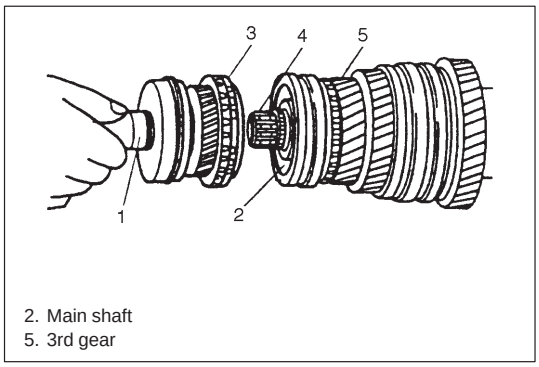


22) When installing bearing (1) to input shaft (2), bring it so that its groove for C-ring is in the rear and press-fit with special tool and press.

Special Tool
(A): 09925-18011



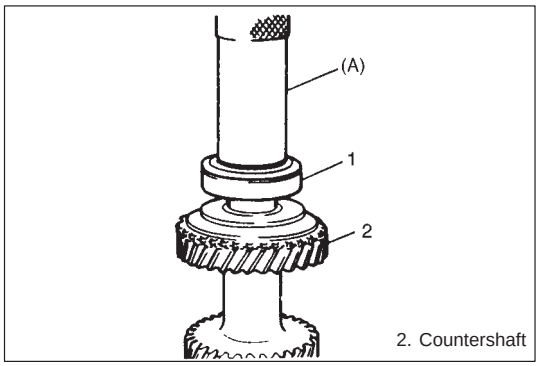
23) After fitting circlip (1), air-blow lubrication oil hole (2).



2. Main shaft
5. 3rd gear

24) Install synchronizer ring (3), needle bearing (4) and input shaft (1).

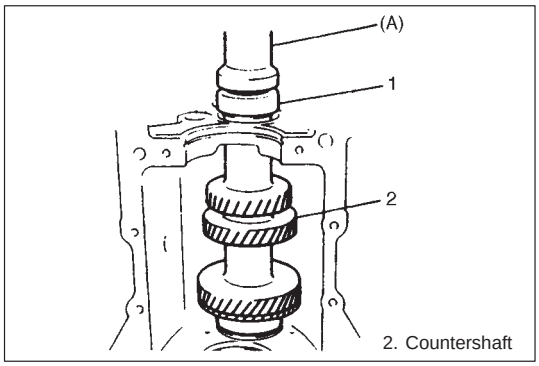
COUNTERSHAFT AND REVERSE IDLE GEAR



2. Countershaft

1) Press-fit front bearing (1) and fit circlip.

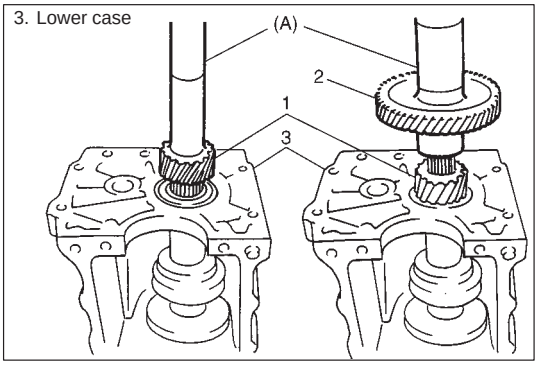
Special Tool
(A): 09925-18011



2. Countershaft

2) With shaft inserted into case, install center bearing (1) on it and then press-fit shaft by using special tool and hammer. Meanwhile case should be supported on wood blocks.

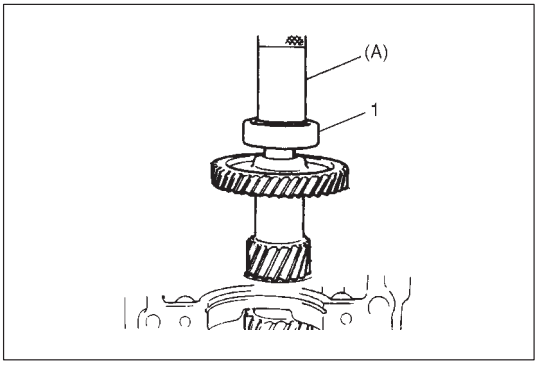
Special Tool
(A): 09925-18011



3) Press-fit reverse gear (1) and then 5th gear (2).

NOTE:
When press-fitting, hold countershaft with its front end set on wood blocks.

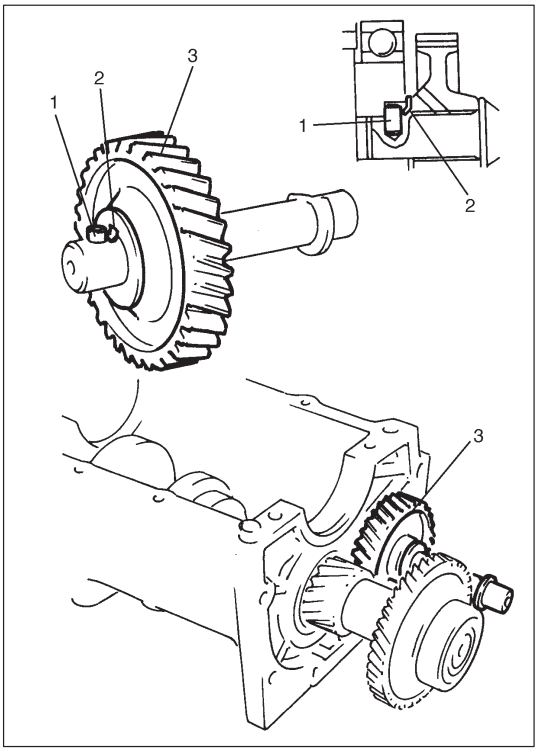
Special Tool
(A): 09913-80113



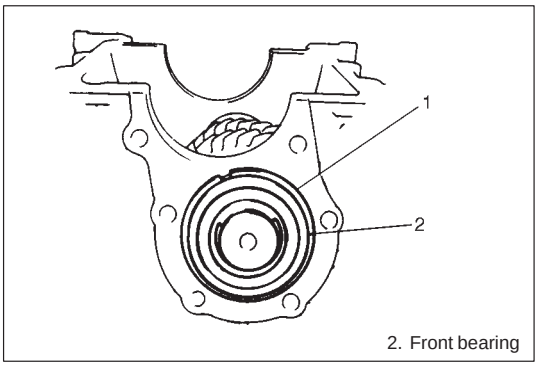
4) After press-fitting countershaft rear bearing (1), make sure to fit circlip securely.

NOTE:
When press-fitting, hold countershaft with its front end set on wood blocks.

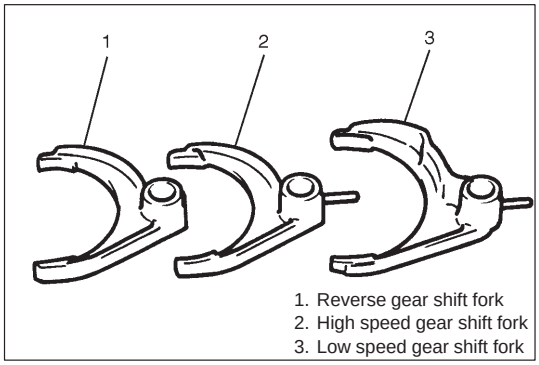
Special Tool
(A): 09913-80113



5) Install reverse idle gear (3) and washer onto reverse gear shaft and pin (1) into it.
Install above as assembled into lower case with pin and washer tongue (2) aligned as shown.

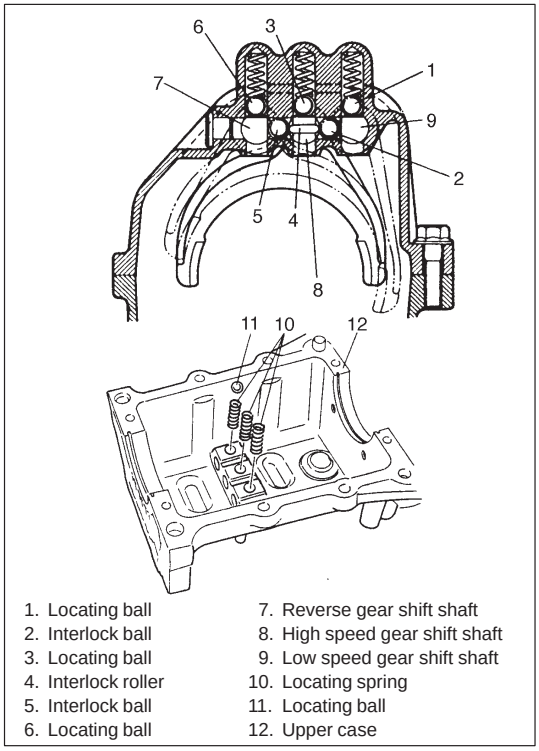


6) Fit circlip (1) around bearing and check to make sure that circlip just contacts with case surface.



1. Reverse gear shift fork
2. High speed gear shift fork
3. Low speed gear shift fork

SHIFT SHAFTS AND FORKS

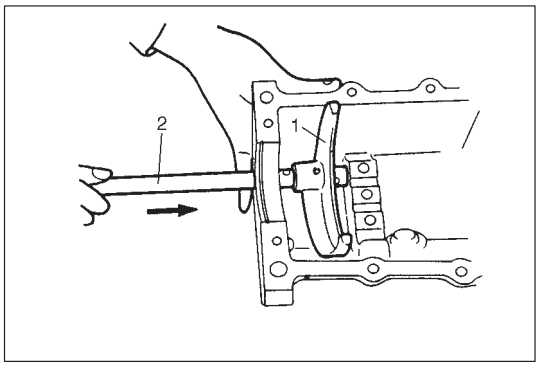


1. Locating ball
2. Interlock ball
3. Locating ball
4. Interlock roller
5. Interlock ball
6. Locating ball
7. Reverse gear shift shaft
8. High speed gear shift shaft
9. Low speed gear shift shaft
10. Locating spring
11. Locating ball
12. Upper case

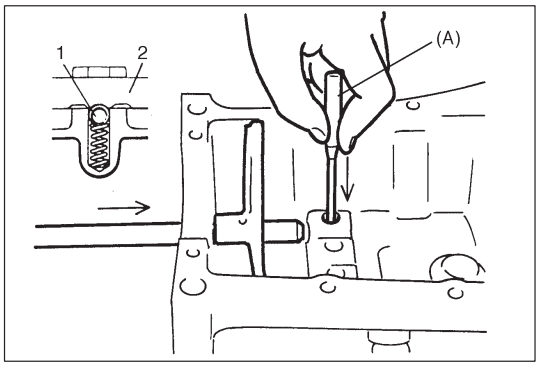
Note that 3 shift shafts individually have a locating ball and locating spring, and that 2 interlock balls and an interlock roller are used between shafts as shown.

Install low, high and reverse shafts in that order.

1) Install 3 locating springs into 3 holes in upper case. Fit locating ball on top of locating spring in hole.

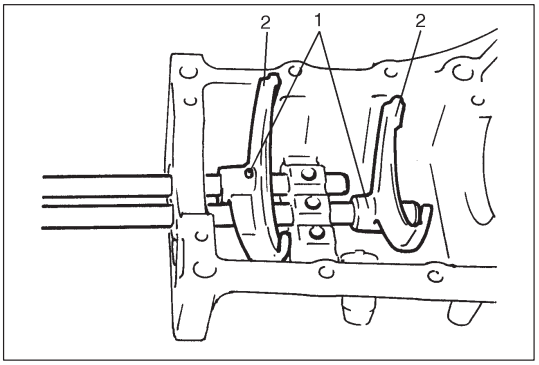


2) Insert low speed gear shift shaft (2) into upper case and low speed shift fork (1) in the direction as shown.

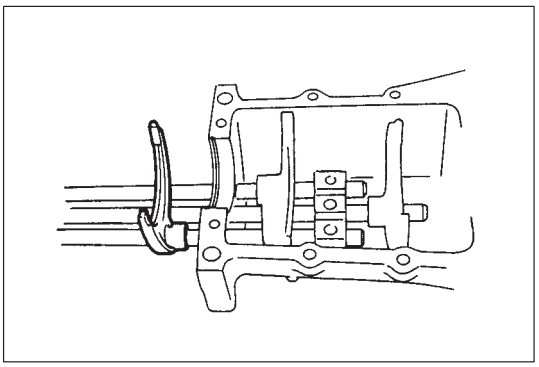


3) Push down low speed gear shift shaft locating ball (1) to pass shaft over it and keep inserting shaft until locating ball fits in center slot of 3 continuous slots in shaft (2).
Drive shift yoke pin into fork and shaft.

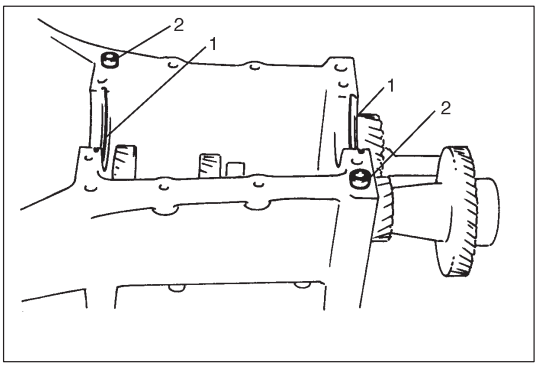
Special Tool
(A): 09922-85811



4) Install interlock ball and locating ball in upper case.
After installing interlock roller in high speed gear shift shaft and insert shaft into upper case as described in 2) and 3).
Fork (2) should installed in such direction as shown. Then drive shift spring pin (1) until it becomes flush with outer surface of fork.

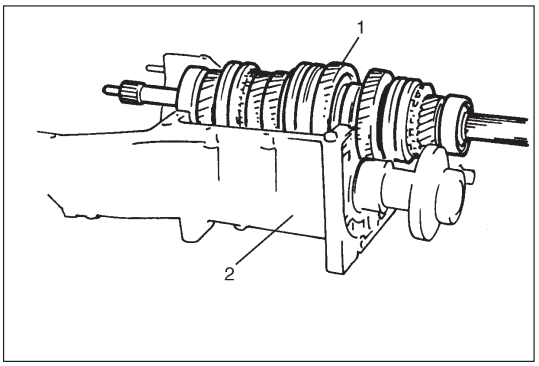


5) Install interlock ball and locating ball into upper case. Then insert reverse gear shift shaft into upper case as described in 2) and 3).

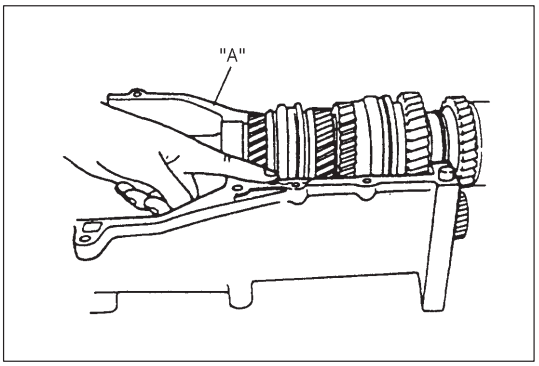


TRANSMISSION LOWER CASE AND UPPER CASE

1) With countershaft assembly, reverse idle gear and reverse gear shaft installed in lower case, check to ensure that bearing stopper rings (1) are fitted in both sides of lower case as shown.
Also check for 2 knock pins (2).

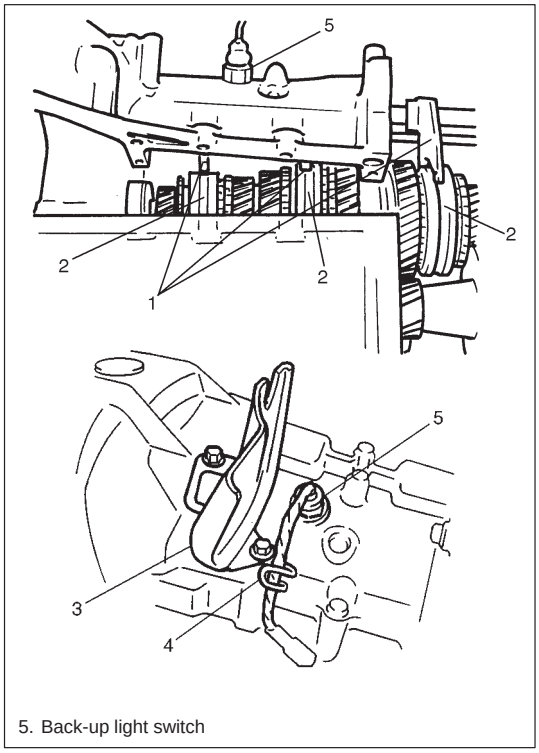


2) Make sure that mating surfaces of both lower and upper cases are clean.
3) Install main shaft and input shaft assembly (1) in lower case (2).



4) Uniformly apply sealant to mating surface of lower case.

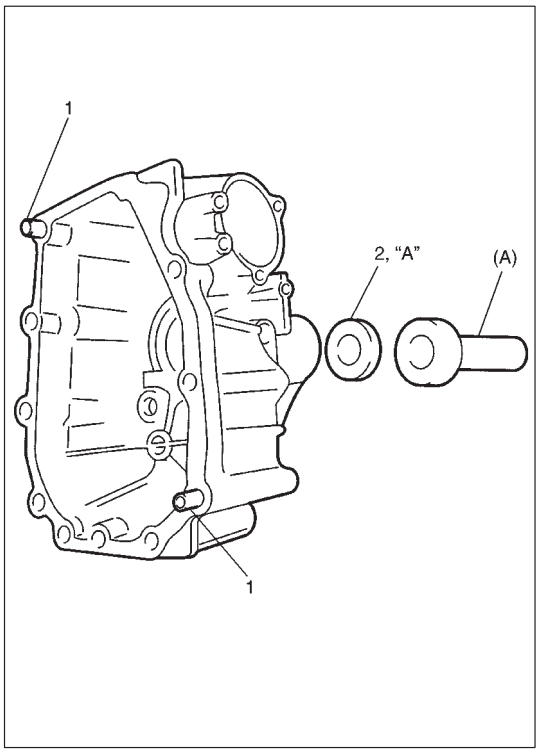
"A": Sealant 99000-31110



5. Back-up light switch

5) Install upper case to lower case by matching 3 shift forks (1) with 3 grooves in synchronizer sleeve (2) on main shaft respectively.
6) Tighten case bolts to specification. Install ground cable through right-rear case bolt. Install gear control cable bracket (3) and back-up light switch harness clamp (4).

Tightening Torque for transmission case bolt and back-up light switch:
23 N·m (2.3 kg-m, 17.0 lb-ft)



EXTENSION CASE

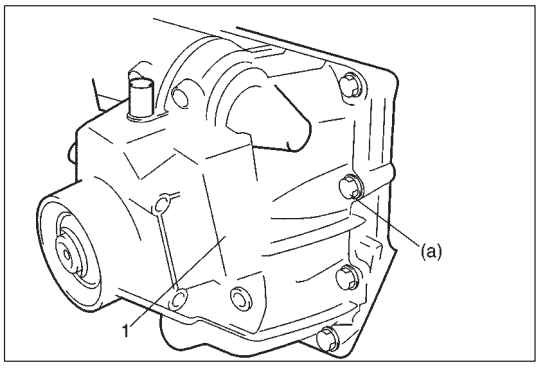
1) Check to ensure that knock pins (1) are fitted.
2) Install extension case seal (2) so that end surface of oil seal becomes flush with that case. Apply grease to extension case seal lip.

"A": Grease 99000-25010

Special Tool
(A): 09913-85210

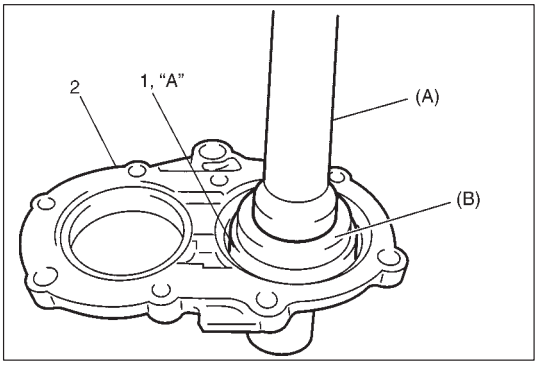
3) Clean surface of extension case to mate with transmission case and uniformly apply sealant.

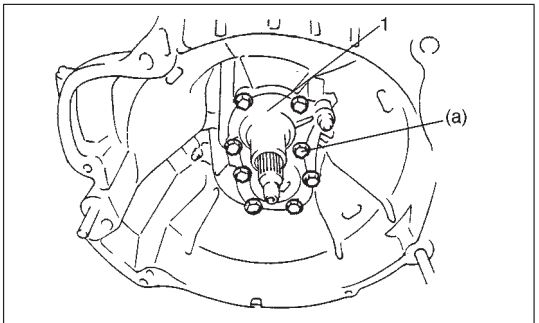
Sealant 99000-31110



4) Make sure that 3 shift shafts are in neutral position.
5) Install extension case (1) to transmission case.
6) Tighten case bolts to specification.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)





1. Input shaft bearing retainer

INPUT SHAFT BEARING RETAINER

1) Install new oil seal (1) with special tool and hammer up to case surface, apply grease to oil seal lip.

   Special Tool
   (A): 09913-75820
   (B): 09941-34513-004

   "A": Grease 99000-25010

2) Clean surface of retainer (2) to mate with transmission case and uniformly apply sealant.

   Sealant 99000-31110

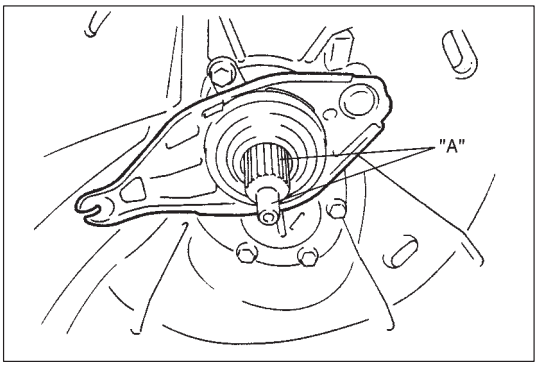
3) Tighten retainer bolts to specification.

   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

4) Check transmission input shaft for easy rotation by hand.
5) Check each select and shift shaft for operation.

CLUTCH RELEASE BEARING

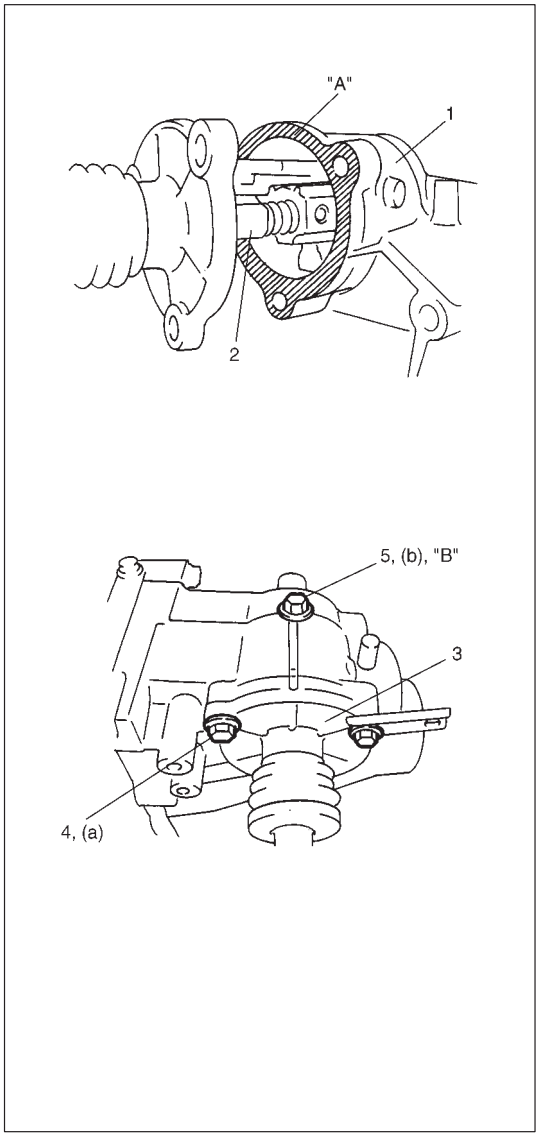
Before installing bearing, apply grease to inner surface of clutch release bearing. For detail, refer to "CLUTCH" section.



INPUT SHAFT

Before remounting transmission ass'y to engine and vehicle, apply grease to input shaft.

"A": Grease 99000-25210



GEAR SHIFT & SELECT SHAFT ASSEMBLY

1) Clean mating surface of both extension case (1) and gear shift guide case (3), coat mating surface of extension case with sealant evenly and install gear shift & select shaft assembly (2).

   "A" : Sealant 99000-31110

   NOTE:
   When installing gear shift & select shaft assembly, position gear in neutral so that gear shift lever will go in smoothly.

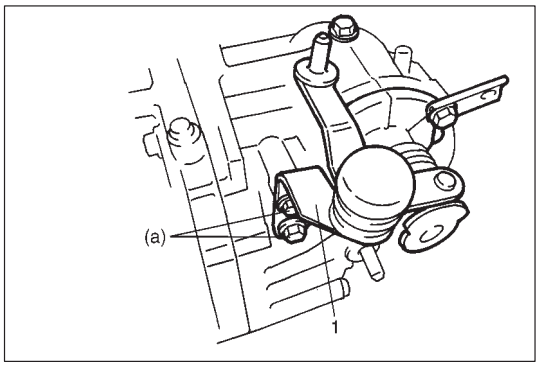
2) Tighten 3 bolts (4) to specification.

   Tightening Torque
   (a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install gear shift stop bolt (5) applied with thread lock cement.

   "B" : Thread lock 1322, 99000-32110

   Tightening Torque
   (b) : 23 N·m (2.3 kg-m, 17.0 lb-ft)



4) Place select cable lever (1) and fasten it with 2 bolts.

   Tightening Torque
   (a) : 23 N·m (2.3 kg-m, 17.0 lb-ft)

5) Check input shaft for rotation in each gear position.
   Also confirm function of back up light switch in reverse position by using ohmmeter. There should be continuity when gear is in reverse position.

TIGHTENING TORQUE SPECIFICATIONS

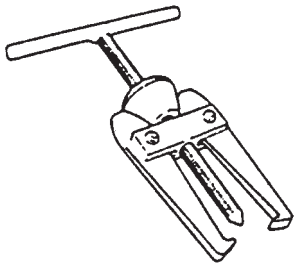
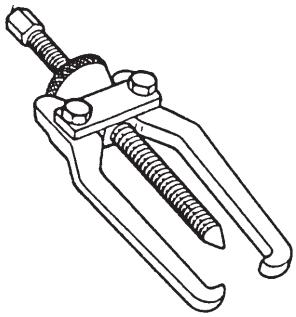
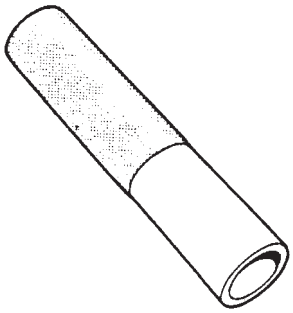
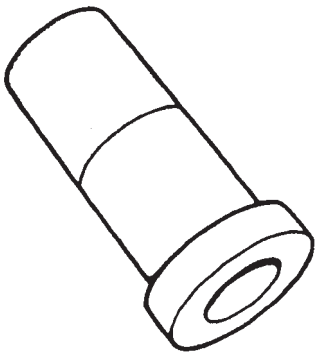
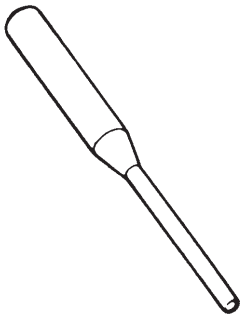
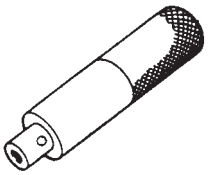
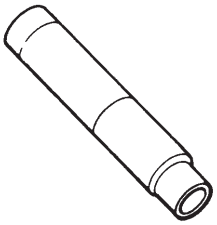
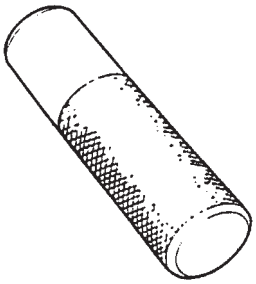
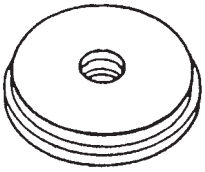
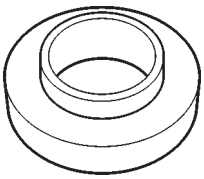
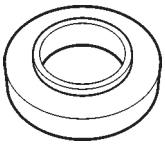
Be sure to torque each bolt and nut according to specification given below, whenever loosened.
If specified torque for particular bolt or nut is not included in the list, refer to Section 0A.

Fastening Parts	Tightening Torque		
	N·m	kg-m	lb-ft
Transmission case bolt	23	2.3	17.0
Extension case bolt	23	2.3	17.0
Transmission oil filler and drain plug	23	2.3	17.0
Input shaft bearing retainer bolt	23	2.3	17.0
Transmission bolt bracket bolt	25	2.5	18.0
Transmission to engine bolt and nut	61	6.1	44.5
Transmission stiffener bolt	55	5.5	40.0

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCTS	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	● Oil seal lips ● Gear shift control lever ● Gear shift control cable end
	SUZUKI SUPER GREASE I (99000-25210)	● Input shaft spline front end
Sealant	SUZUKI BOND NO.1215 (99000-31110)	● Oil drain and filler plug ● Mating surface of transmission case ● Mating surface of extension case ● Mating surface of input shaft bearing retainer ● Mating surface of gear shift & select shaft assembly
Thread lock cement	THREAD LOCK 1322 (99000-32110)	● Gear shift stop bolt

SPECIAL TOOLS

 09913-60910 Bearing puller	 09913-65135 Bearing puller	 09913-80113 Bearing installer	 09913-85210 Bearing installer
 09922-85811 Spring pin remover	 09924-74510 Oil seal installer handle	 09925-18011 Bearing installer	 09940-51710 Bearing installer
 09941-34513-004 Oil seal installer	 09924-07710 Synchronizer hub installer	 09924-07720 Synchronizer hub installer	

SECTION 7C

CLUTCH

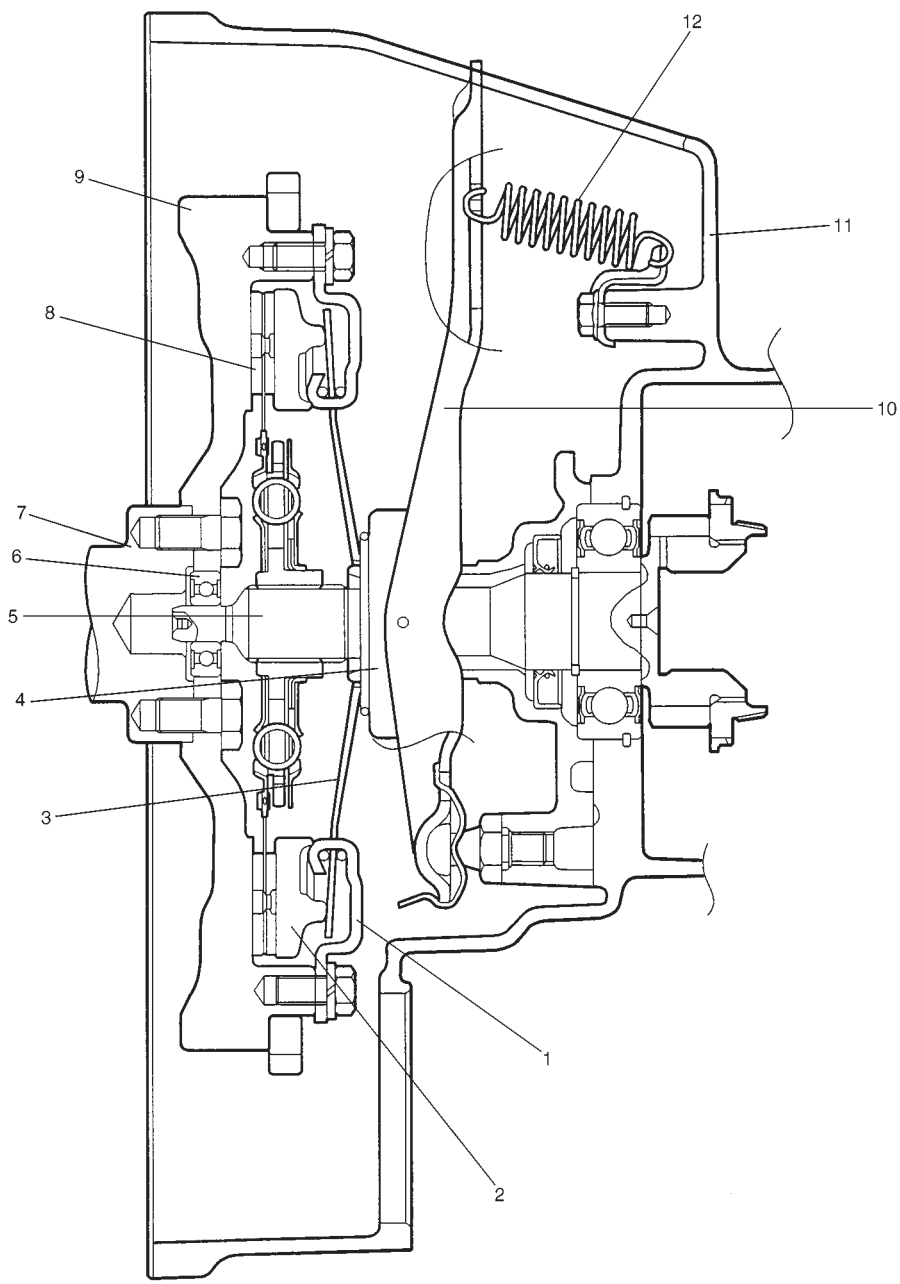
CONTENTS

GENERAL DESCRIPTION

The clutch is a diaphragm-spring clutch of a dry single disc type. The diaphragm spring is of a tapering-finger type, which is a solid ring in the outer diameter part, with a series of tapering fingers pointing inward.
The disc, carrying four torsional coil springs, is slidably mounted on the transmission input shaft with a serration fit.

The clutch cover is secured to the flywheel, and carries the diaphragm spring in such a way that the peripheral edge of the spring pushes on the pressure plate against the flywheel (with the disc in between), when the clutch release bearing is held back : This is the engaged condition of the clutch.

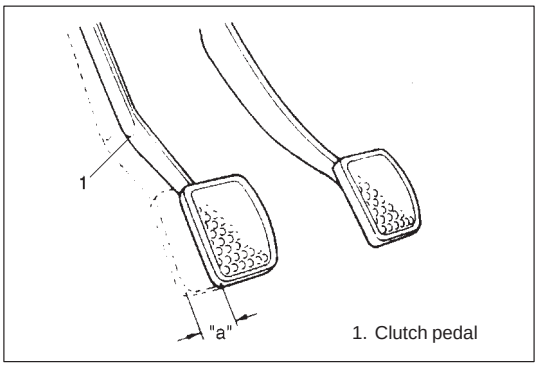
Depressing the clutch pedal causes the release bearing to advance and push on the tips of the tapering fingers of the diaphragm spring. When this happens, the diaphragm spring pulls the pressure plate away from the flywheel, thereby interrupting the flow of drive from flywheel through clutch disc to transmission input shaft.



1. Clutch cover
2. Pressure plate
3. Diaphragm spring
4. Release bearing
5. Input shaft
6. Input shaft bearing
7. Crankshaft
8. Clutch disc
9. Flywheel
10. Release fork
11. Transmission case
12. Release fork return spring

DIAGNOSIS

Condition	Possible Cause	Correction
Slipping	● Improper clutch pedal free travel.	Adjust free travel.
	● Worn or oily clutch disc facing.	Replace disc.
	● Warped disc, pressure plate or flywheel surface.	Replace disc, clutch cover or flywheel.
	● Weakened diaphragm spring.	Replace clutch cover.
	● Rusted clutch cable.	Replace cable.
Dragging clutch	● Improper clutch pedal free travel.	Adjust free travel.
	● Weakened diaphragm spring, or worn spring tip.	Replace clutch cover.
	● Rusted input shaft splines.	Lubricate.
	● Damaged or worn splines of transmission input shaft.	Replace input shaft.
	● Excessively wobbly clutch disc.	Replace disc.
	● Clutch facings broken or dirty with oil.	Replace disc.
Clutch vibration	● Glazed (glass-like) clutch facings.	Repair or replace disc.
	● Clutch facings dirty with oil.	Replace disc.
	● Release bearing slides unsmoothly on input shaft bearing retainer.	Lubricate or replace input shaft bearing retainer.
	● Wobbly clutch disc, or poor facing contact.	Replace disc.
	● Weakened torsion springs in clutch disc.	Replace disc.
	● Clutch disc rivets loose.	Replace disc.
	● Distorted pressure plate or flywheel surface.	Replace clutch cover or flywheel.
	● Weakened engine mounting or loosened mounting bolt or nut.	Retighten or replace mounting.
Noisy clutch	● Worn or broken release bearing.	Replace release bearing.
	● Input shaft front bearing worn down.	Replace input shaft bearing.
	● Excessive rattle of clutch disc hub.	Replace disc.
	● Cracked clutch disc.	Replace disc.
	● Pressure plate and diaphragm spring are rattling.	Replace clutch cover.
Grabbing clutch	● Clutch disc facings are soaked with oil.	Replace disc.
	● Clutch disc facings are excessively worn.	Replace disc.
	● Rivet heads are showing out of the facing.	Replace disc.
	● Torsion springs are weakened.	Replace disc.



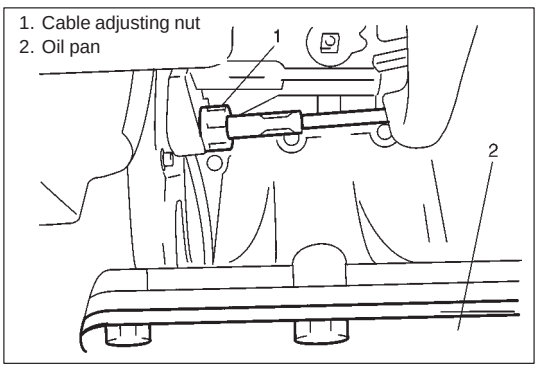
1. Clutch pedal

ON-VEHICLE SERVICE

CLUTCH PEDAL FREE TRAVEL

1) Depress clutch pedal, stop the moment clutch resistance is felt, and measure distance (clutch pedal free travel). Free travel should be within following specification.

   Pedal free travel “a”: 10 – 15 mm (0.4 – 0.6 in.)

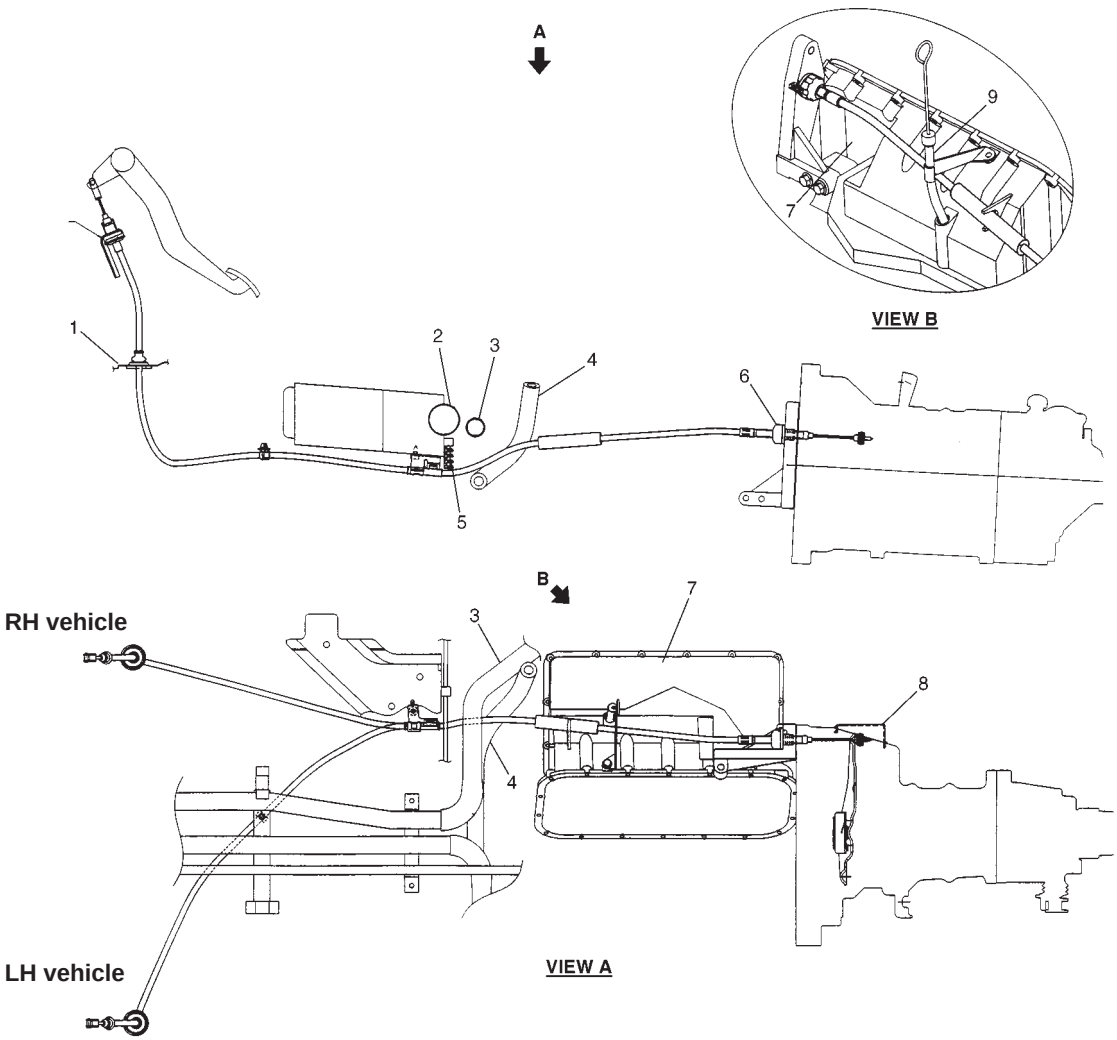


1. Cable adjusting nut
2. Oil pan

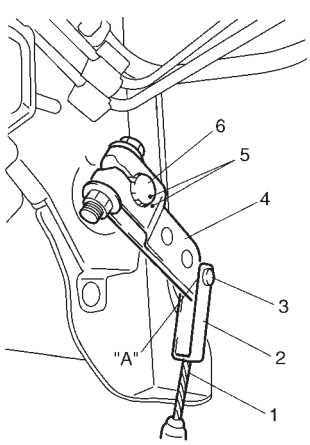
2) If free travel is out of specification, adjust it by turning cable adjusting nut.

3) After checking clutch pedal free travel, also check clutch for proper function with engine running.

CABLE ROUTING



1. Floor panel
2. Crossmember
3. Water hose
4. A/C hose (if equipped)
5. Brake pipe
6. Cable adjusting nut
7. Oil pan
8. Front case cap
9. Oil level gauge guide

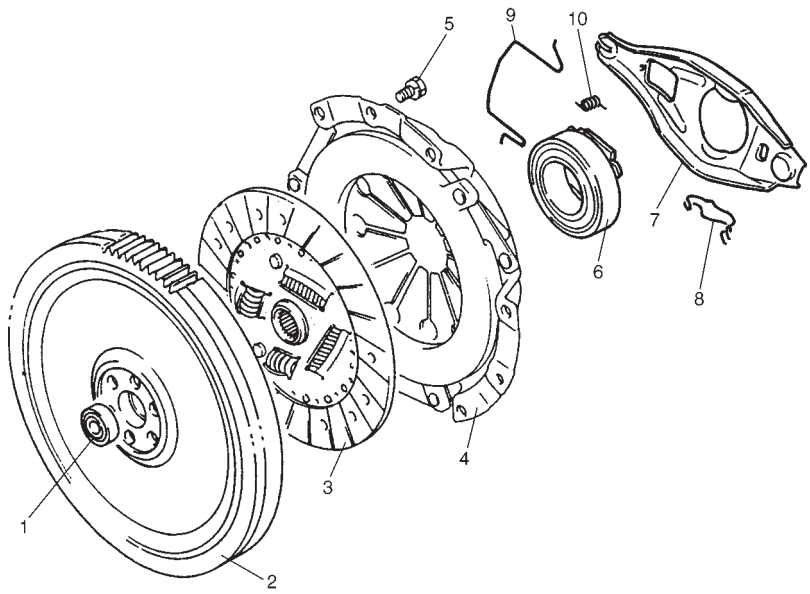


1. Clutch cable
2. Clevis
3. Pin
4. Clutch pedal shaft arm
5. Punch mark
6. Clutch pedal shaft

- When installing clutch pedal shaft arm to clutch pedal shaft, align punch marks as shown in figure.
- Apply grease to pin, clevis and arm before installing cable.

"A" : Grease 99000-25010

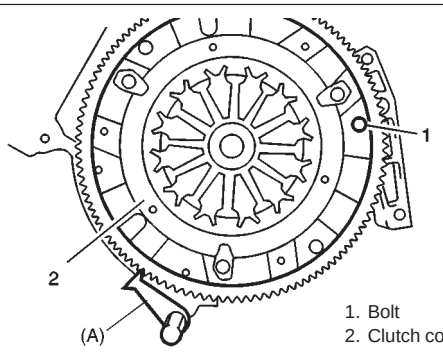
UNIT REPAIR



1. Input shaft bearing
2. Flywheel
3. Clutch disc
4. Clutch cover
5. Clutch cover bolt
6. Release bearing
7. Release fork
8. Release fork clip
9. Release bearing clip
10. Return spring

DISMOUNTING / REMOUNTING

Refer to “MANUAL TRANSMISSION” section for dismounting/re-mounting of manual transmission.



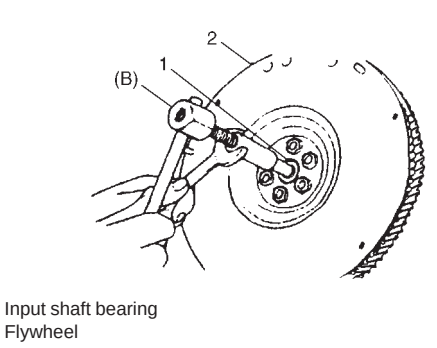
1. Bolt
2. Clutch cover

CLUTCH COVER, CLUTCH DISC AND FLY-WHEEL

REMOVAL

1) Hold flywheel stationary with special tool (A) and remove clutch cover bolts, clutch cover and clutch disc.

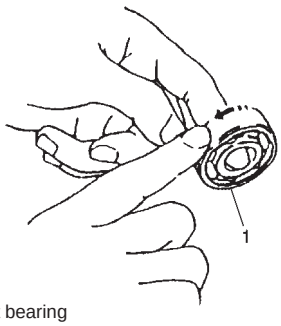
Special Tool
(A): 09924-17810



1. Input shaft bearing
2. Flywheel

2) Pull out input shaft bearing by using special tool (B) and wrench.

Special Tool
(B): 09917-58010

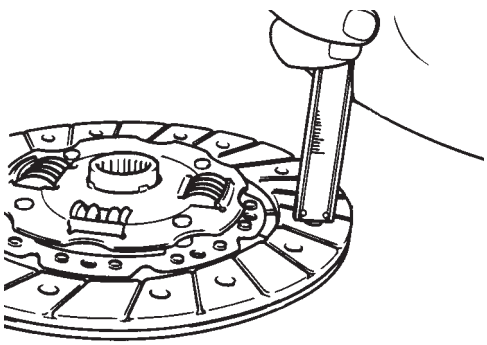


1. Input shaft bearing

INSPECTION

Input Shaft Bearing

Check bearing for smooth rotation and replace it if abnormality is found.

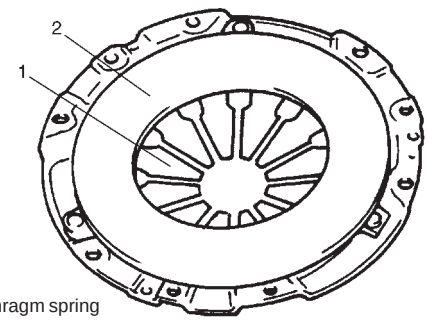


Clutch Disc

Measure depth of rivet head depression, i.e. distance between rivet head and facing surface. If depression is found to have reached service limit at any of holes, replace disc assembly.

Rivet head depth

Standard:	**1.2 mm (0.05 in.)**
Service limit:	**0.5 mm (0.02 in.)**



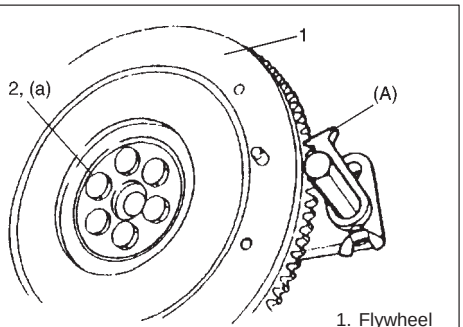
1. Diaphragm spring
2. Pressure plate

Clutch Cover

1) Check diaphragm spring for abnormal wear or damage.
2) Inspect pressure plate for wear or heat spots.
   If abnormality is found, replace it as assembly. Do not disassemble it into diaphragm and pressure plate.

Flywheel

Check surface contacting clutch disc for abnormal wear or heat spots. Replace or repair as required.



1. Flywheel
2. Bolt

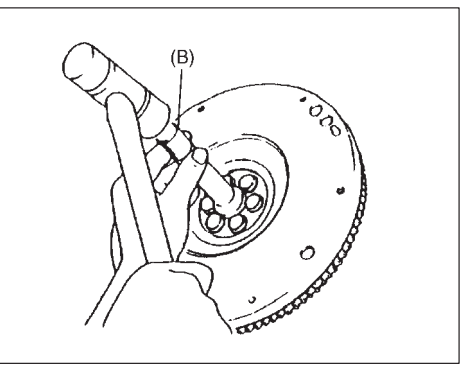
INSTALLATION

NOTE:

Before assembling, make sure that flywheel surface and pressure plate surface have been cleaned and dried thoroughly.

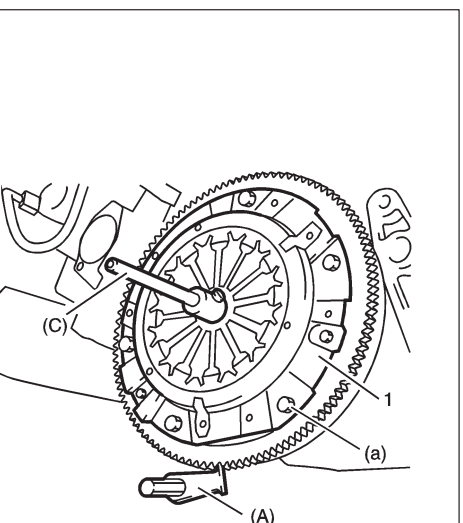
1) Install flywheel to crankshaft and tighten bolts to specification.

Special Tool
(A): 09924-17810
Tightening Torque
(a): 78 N·m (7.8 kg-m, 56.5 lb-ft)



2) Using special tool, install input shaft bearing to flywheel.

Special Tool
(B): 09925-98210



1. Clutch cover

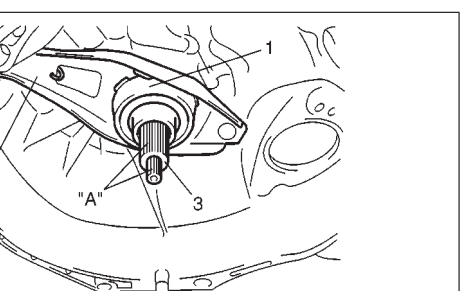
3) Aligning clutch disc to flywheel center by using special tool, install clutch cover and bolts. Then tighten bolts to specification.

NOTE:

- **While tightening clutch cover bolts, compress clutch disc with special tool (C) by hand so that disc centered.**
- **Tighten cover bolts little by little evenly in diagonal order.**

Special Tools
(A): 09924-17810
(C): 09923-36330

Tightening Torque
(a): 23 N·m (2.3 kg-m, 16.5 lb-ft)



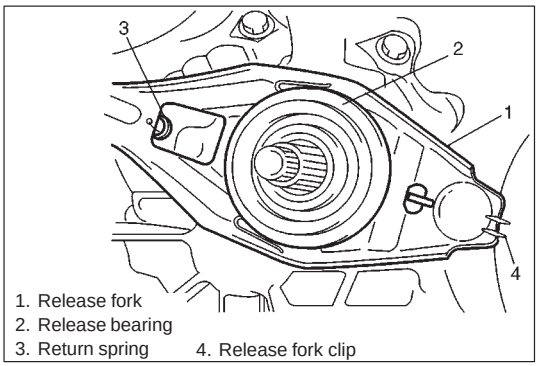
1. Release bearing
2. Clutch release fork
3. Input shaft

4) Slightly apply grease to input shaft, then join transmission assembly with engine. Refer to “MANUAL TRANSMISSION” section for remounting procedure.

“A”: Grease 99000-25210

NOTE:

Turn crankshaft with wrench from front while inserting transmission input shaft to clutch disc until splines mesh.

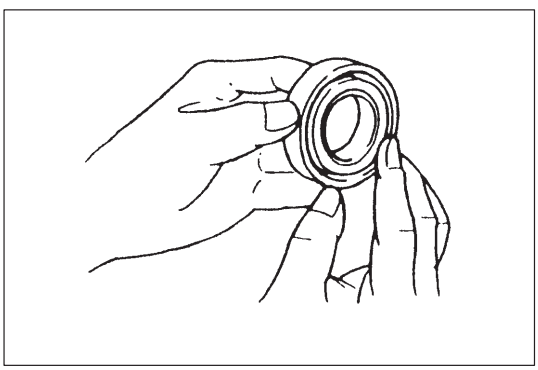


1. Release fork
2. Release bearing
3. Return spring
4. Release fork clip

CLUTCH RELEASE FORK

REMOVAL

1) Remove release fork return spring and release fork clip.
2) Remove release fork together with release bearing.



INSPECTION

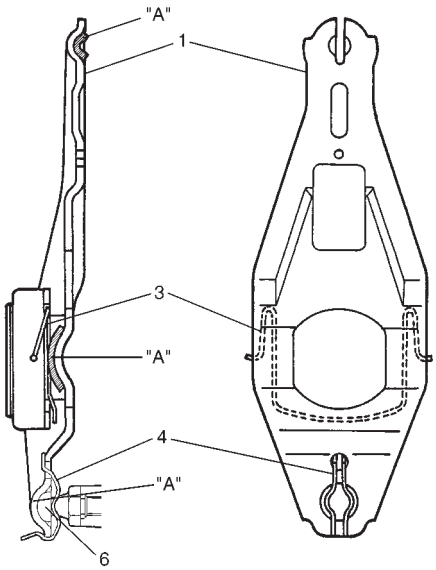
Clutch release bearing

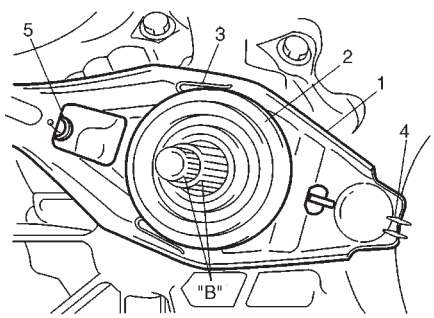
Check clutch release bearing for smooth rotation and its clip for deflection or damage.
If abnormality is found, replace it.

CAUTION:
Do not wash release bearing. Washing may cause grease leakage and consequential bearing damage.

Clutch release fork

Check clutch release fork and its clip for deflection or damage.
Check also release fork return spring.
If abnormality is found, replace it.





1. Release fork
2. Release bearing
3. Bearing clip
4. Fork clip
5. Return spring
6. Clutch release support

INSTALLATION

Reverse removal procedure for installation noting followings.

- Apply grease as shown in figure.

  “A” : Grease 99000-25010
  “B” : Grease 99000-25210

- Install release bearing, return spring and clips to release fork as shown in figure.

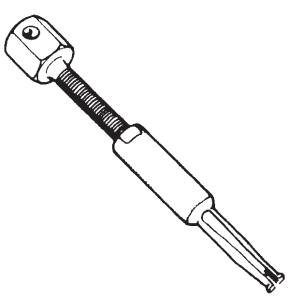
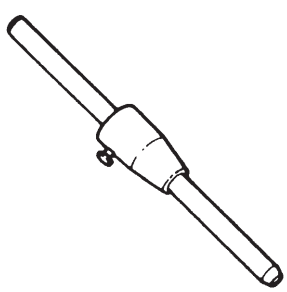
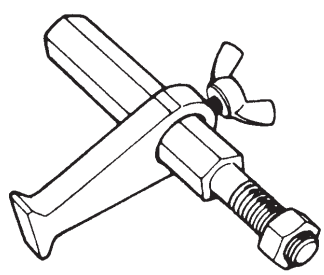
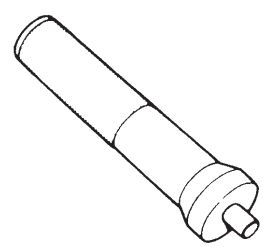
TIGHTENING TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Flywheel bolts	78	7.8	56.5
2. Clutch cover bolts	23	2.3	16.5

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	● Clutch pedal shaft arm. ● Clutch release fork.
	SUZUKI SUPER GREASE I (99000-25210)	Input shaft spline front end.

SPECIAL TOOLS

			
09917-58010 Bearing remover	09923-36330 Clutch center guide	09924-17810 Flywheel holder	09925-98210 Input shaft bearing installer

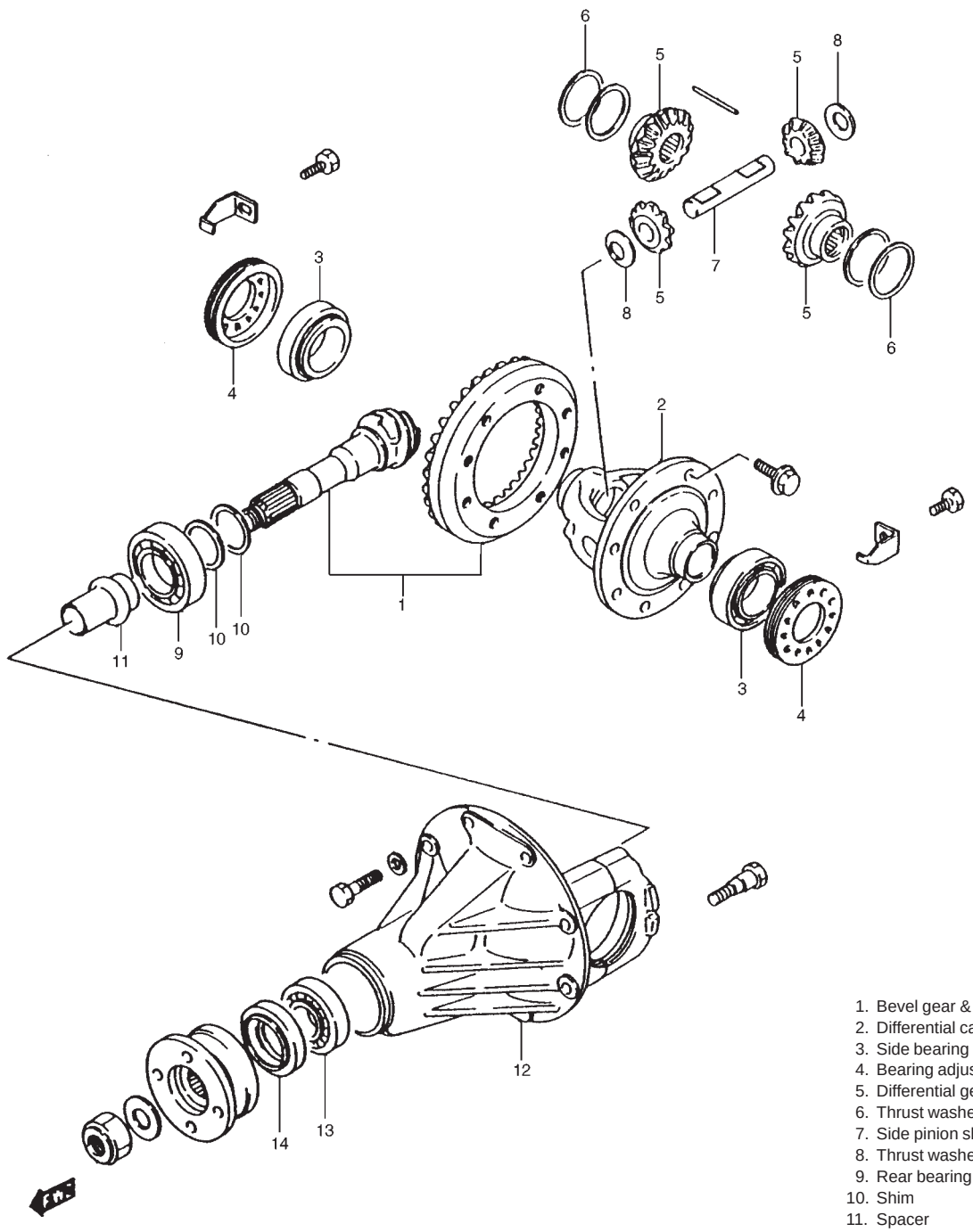
SECTION 7F

DIFFERENTIAL

CONTENTS

GENERAL DESCRIPTION

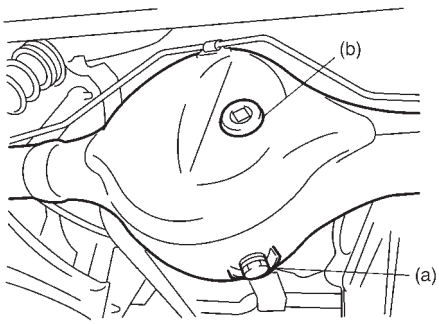
The components of the differential are shown in figure below. The bevel gear drive is of hypoid design; pinion and gear have hypoid gear teeth. This means that the pinion is located slightly below the center of the bevel gear to permit the car body to be lowered in design, and that some wiping or sliding action occurs in tooth meshing between pinion and gear. Here lies the reason why use of hypoid gear oil is specified for the differential.



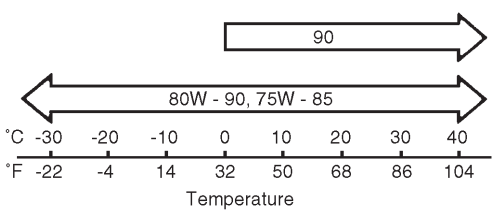
1. Bevel gear & pinion set
2. Differential case
3. Side bearing
4. Bearing adjuster
5. Differential gear set
6. Thrust washer
7. Side pinion shaft
8. Thrust washer
9. Rear bearing
10. Shim
11. Spacer
12. Differential carrier set
13. Front bearing
14. Oil seal

DIAGNOSIS

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 differential gear(s) or 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	● Clogged breather plug	Clean
	● Worn or damaged oil seal	Replace
	● Excessive oil	Adjust oil level



Viscosity chart SAE



ON-VEHICLE SERVICE

OIL CHANGE

1) Remove oil drain plug and drain oil.
2) Reinstall drain plug and tighten it to specified tightening torque.

   Tightening Torque
   (a): 55 N·m (5.5 kg-m, 40.0 lb-ft)

3) Remove oil level & filler plug and fill differential housing with new specified oil.
   About 1.3 liter of gear oil is required to fill up differential housing.

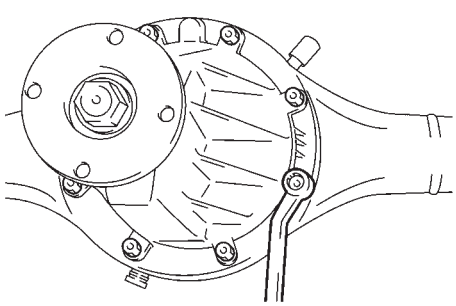
   Differential oil specification
   Hypoid gear oil API GL-5
   SAE 80W-90 or 75W-85

   Oil capacity:
   1.3 liters (2.8/2.3 US/Imp pt.)

   NOTE:
   - **Hypoid gear oil must be used for differential.**
   - **It is highly recommended to use SAE 80W-90 viscosity.**

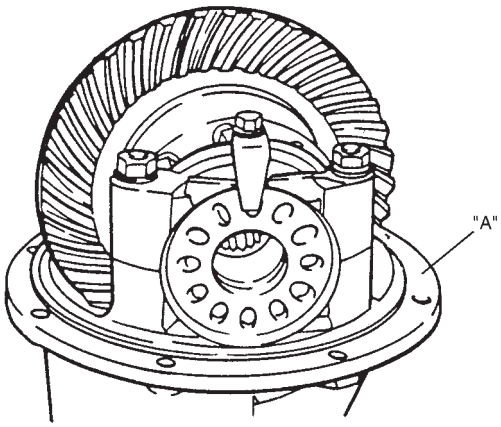
4) Install level/filler plug and torque it to specification.

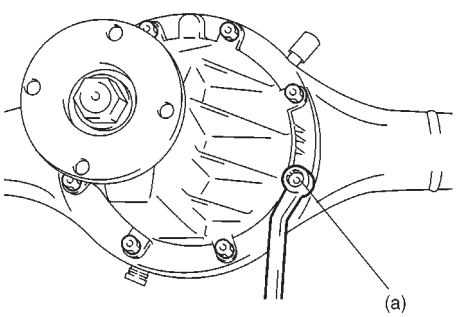
   Tightening Torque
   (b): 50 N·m (5.0 kg-m, 36.5 lb-ft)



REMOVAL

1) With vehicle rested steady on safety stands, draw out right and left rear axle shafts referring to “Rear axle shaft removal” in “REAR SUSPENSION” section of this manual.
2) At differential housing, disconnect propeller shaft by removing bolts securing flange yoke to companion flange. Refer to “Propeller Shafts” section. Remove differential assembly by removing its 10 fastening bolts.





INSTALLATION

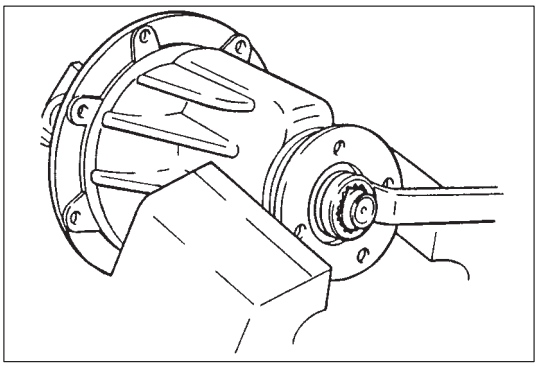
Reverse removal procedure for installation, noting the following.

- Before installing differential ass'y to axle housing, clean mating surfaces of differential carrier and housing and apply sealant to them. After installing it, tighten carrier bolts to specified torque.

  "A": Sealant 99000-31110

  Tightening Torque
  (a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

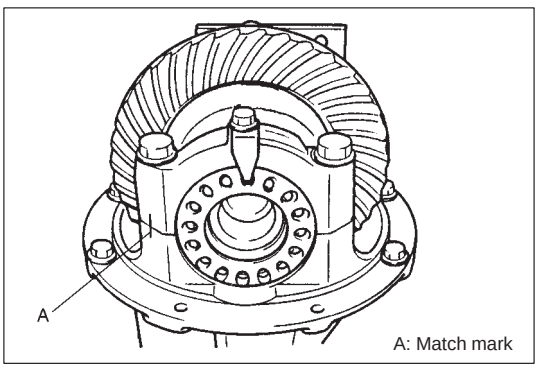
- For installation of rear suspension, refer to "Rear axle shaft installation" in "REAR SUSPENSION" section of this manual.
- Fill gear oil referring to "Oil Change".
- Make sure to purge air out of brake circuit.
  Refer to "BRAKES" section for "air bleeding" operation. Then check to ensure that joint seam of pipe is free from oil leak.
- Check differential and differential housing for oil leakage.



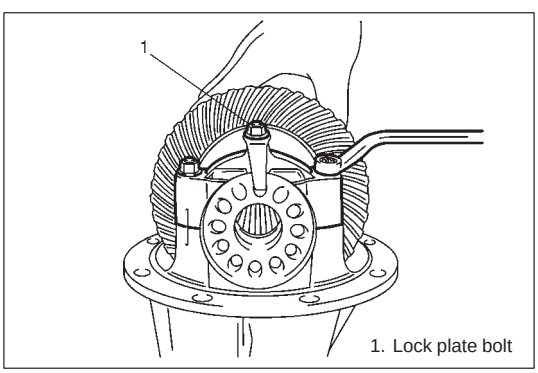
UNIT REPAIR

DISASSEMBLY

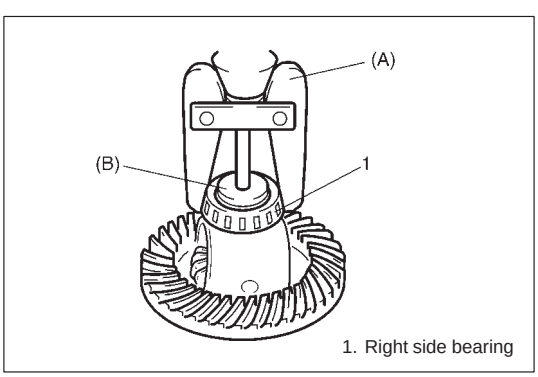
1) Lock the flange immovable, and remove nut from the end of the bevel pinion shank.



2) Scribe marks on each cap bolted to the saddle portion of carrier case and holding down side bearing. The marks are to identify cap. This means that there are right and left caps, so identified and so handled at the time of reassembly.

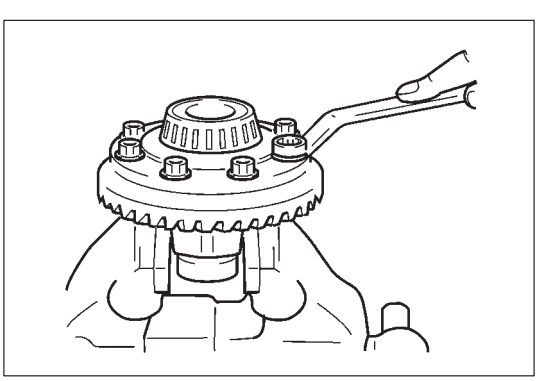


3) Remove the two bearing caps, right and left, and lift the differential case assembly off the carrier case, after loosening lock plate bolts and bearing cap bolts.

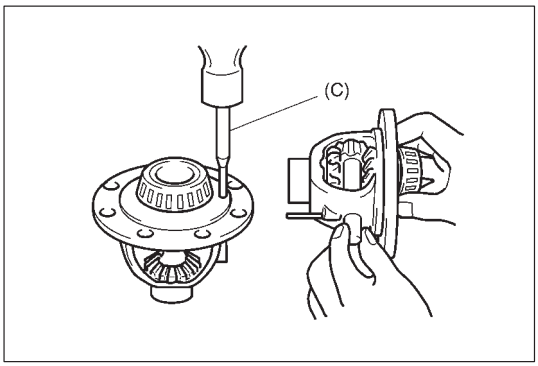


4) Using the special tools indicated below, extract right side bearing from differential case.

Special Tool
(A): 09913-60910
(B): 09913-85230



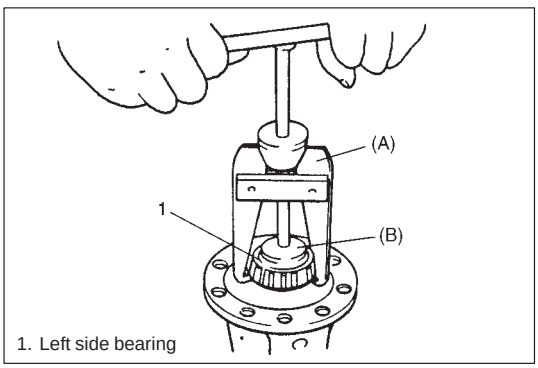
5) Remove bolts fastening bevel gear to differential case, and take off bevel gear.



6) Draw out side pinion shaft, as shown, and remove side pinions, side gears, spring washers and thrust washers.

Special Tool
(C): 09922-85811

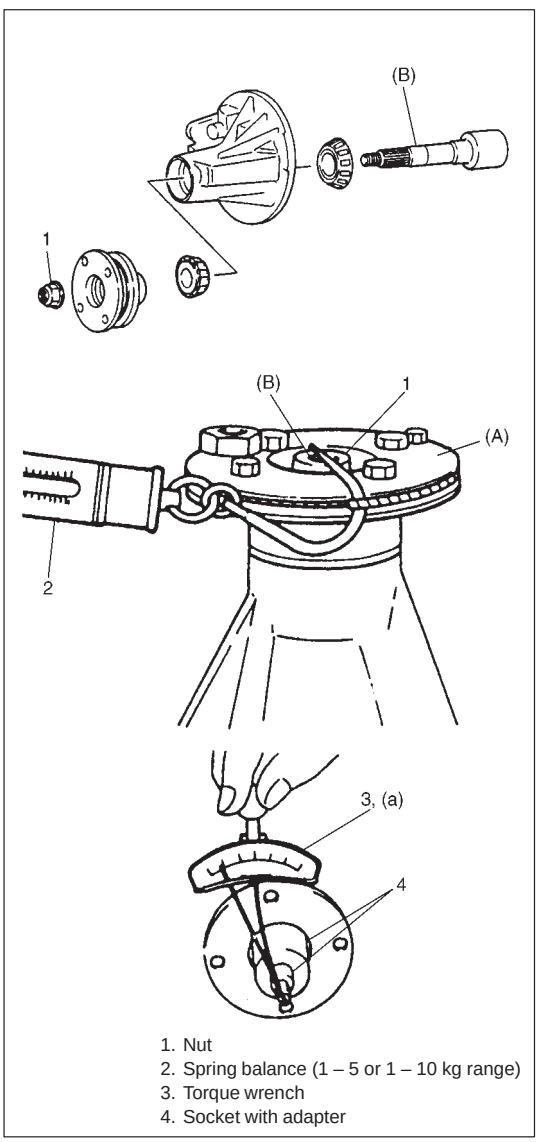
NOTE:
Do not mix up washers. Keep the original position in mind for installation.



1. Left side bearing

7) Using special tools indicated below, extract left side bearing from differential case.

Special Tool
(A): 09913-60910
(B): 09913-85230



1. Nut
2. Spring balance (1 – 5 or 1 – 10 kg range)
3. Torque wrench
4. Socket with adapter

ADJUSTMENT AND REASSEMBLY

Bevel Pinion and Bearing

To engage bevel pinion and gear correctly, it is prerequired to install bevel pinion to differential carrier properly by using adjusting shim as described on following pages. Shown in following page are relative positions of bevel pinion, differential carrier and mounting dummy.

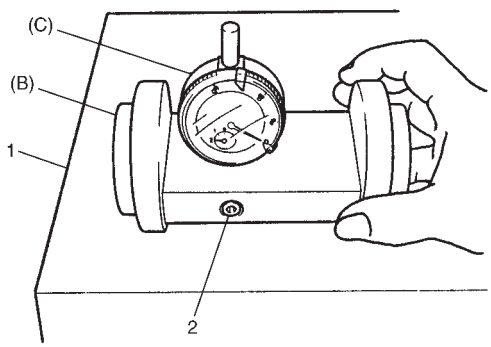
1) Install bevel pinion dummy with bearings into differential carrier and tighten flange nut so that specified bearing preload is obtained.

NOTE:
- **This installation requires no spacer or oil seal.**
- **Before taking measurement with spring balance or torque wrench, check for rotation by hand and apply small amount of oil to bearings.**

Special Tool
(A): 09922-75222
(B): 09924-36320

Pinion bearing preload
(a): 5.0 – 13.0 kg-cm (4.4 – 11.2 lb-in.)

Starting torque: 1.0 – 2.6 kg (2.3 – 5.7 lb)



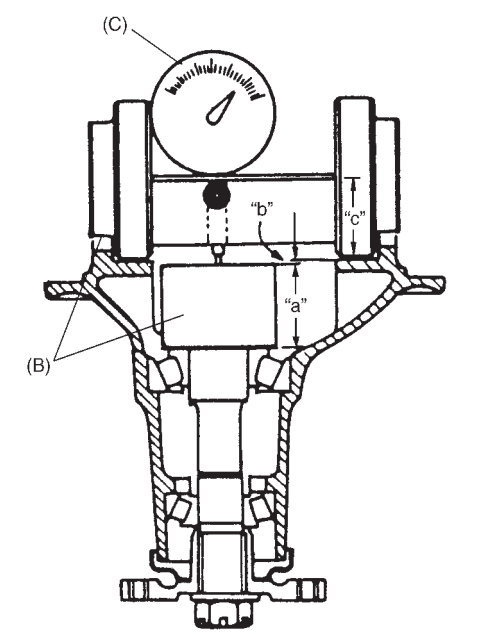
1. Surface plate
2. Screw

2) Set dial gauge to bevel pinion mounting dummy and make 0 (zero) adjustment on surface plate.

NOTE:

- **When setting dial gauge to mounting dummy, tighten screw lightly. Be careful not to overtighten it, which will cause damage to dial gauge.**
- **With dial gauge set, turn dummy back and forth by hand a couple of times and attain accurate 0 (zero) adjustment.**
- **It is desirable that short pointer indicates beyond 2 mm when long one is at 0 (zero).**

Special Tool
(B): 09924-36320
(C): 09900-20606



3) Place zero-adjusted mounting dummy and dial gauge set on pinion dummy and take measurement between zero position and extended dial gauge measuring tip.
The value of "b" is unknown, and is to be determined now for calculating the required thickness of shims. The value of "a" + "c" is 85 mm (3.35 in).

NOTE:

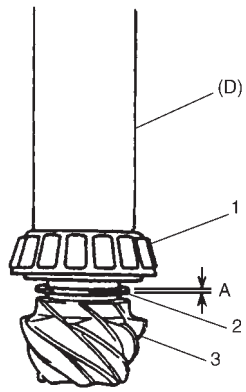
- **Repeat turning back and forth of dummy and measure distance as far as top surface of pinion dummy accurately.**
- **When dial gauge measuring tip extends from 0 (zero) position, pointer turns counterclockwise.**
- **Measured value may exceed 1 mm. Therefore, it is also necessary to know reading of short pointer.**

Special Tool
(B): 09924-36320
(C): 09900-20606

4) Obtain adjusting shim thickness by using measured value by dial gauge (which represents "b") in following equation.

Necessary shim thickness	= 85 +	Dial gauge measured value "b"	–	measurement printed on pinion

85 in above equation is A + B of mounting dummy (special tool).



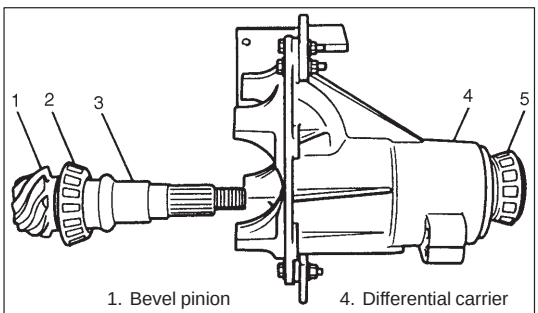
1. Rear bearing
2. Adjusting shim
3. Bevel pinion

A: Closest value to calculated value

5) Select adjusting shim(s) closest to calculated value from among following available sizes and put it in place and then press-fit rear bearings.

Special Tool
(D): 09940-51710

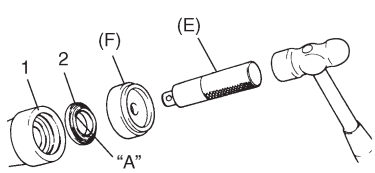
Available shim thickness	0.05, 0.1, 0.2, 0.3 and 0.5 mm (0.002, 0.004, 0.008, 0.012 and 0.02 in.)



1. Bevel pinion
2. Rear bearing
3. Spacer
4. Differential carrier
5. Front bearing

6) With new pinion spacer inserted as shown, install front bearing to differential carrier.

NOTE:
- **Make sure to use new spacer for reinstallation.**
- **Apply oil to bearings.**

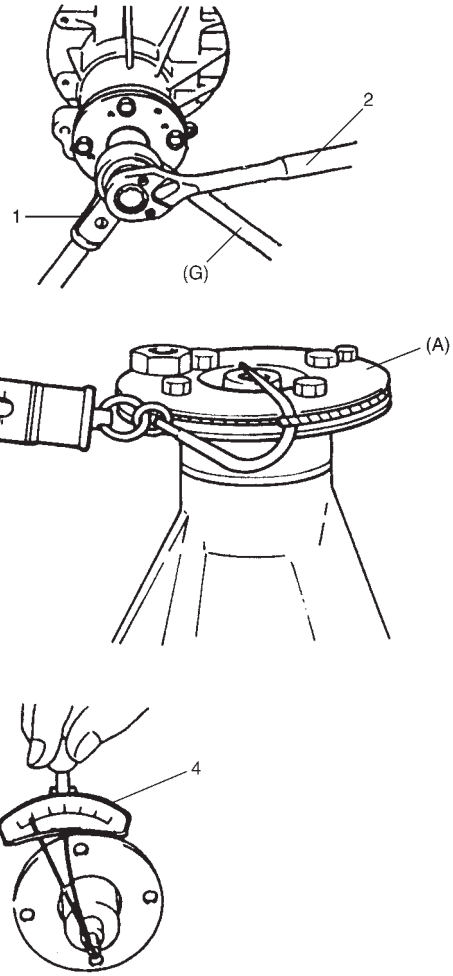


1. Differential carrier
2. Oil seal

7) Using special tool and plastic hammer, drive oil seal into differential carrier till it becomes flush with carrier end.
Then apply grease to oil seal lip.

Special Tool
(E): 09924-74510
(F): 09951-16090

"A": Grease 99000-25010



1. Power wrench (4 – 10 magnification)
2. Socket wrench
3. Spring balance
4. Torque wrench

8) While tightening flange nut gradually with flange holder (special tool) and power wrench, set preload of pinion to specification.

NOTE:

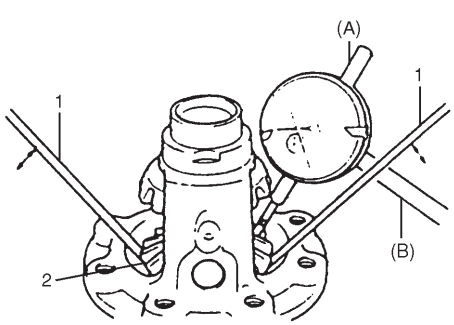
- **Before taking measurement with spring balance or torque wrench, check for smooth rotation by hand.**
- **Bevel pinion bearing preload is adjusted by tightening bevel pinion nut to crush spacer.**
  Therefore, be sure to use a new spacer for adjustment and tighten pinion nut step by step and check for starting torque (preload) as often as tightening to prevent over crushing of spacer.
  If exceeds specification given below during adjustment, replace spacer and repeat preload adjustment procedure. Attempt to decrease starting torque (preload) by loosening pinion nut will not do.

Pinion bearing preload: 5.0 – 13.0 kg-cm (4.4 – 11.2 lb-in.)

Spring balance reading: 1.0 – 2.6 kg (2.3 – 5.7 lb)

Special Tool
(A): 09922-75222
(G): 09922-66020

Left side



1. Screwdriver
2. Differential gear

Differential Case and Gears

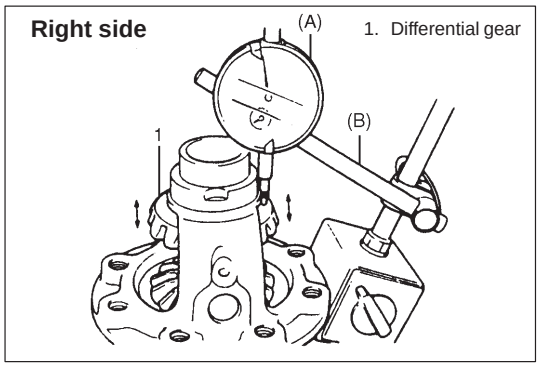
1) After applying differential oil to side gear, pinions, pinion shaft, washer and thrust washer, install them in differential case.
2) Measure thrust play of differential gear as follows.

Special Tool
(A): 09900-20606
(B): 09900-20701

Diff. gear thrust play: 0.01–0.37 mm (0.0004–0.014 in.)

Left side

- Hold differential assembly with soft jawed vise and apply measuring tip of dial gauge to top surface of gear.
- Using 2 screwdrivers, move gear up and down and read movement of dial gauge pointer.

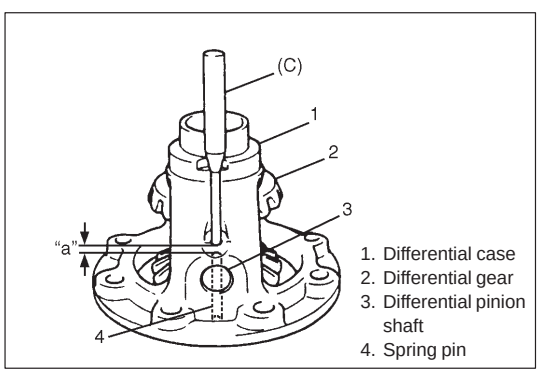


Right side

- Using similar procedure to the above, set dial gauge tip to gear shoulder.
- Move gear up and down by hand and read dial gauge.

3) If thrust play is out of specification, select suitable thrust washer from among following available size, install it and check again that specified gear play is obtained.

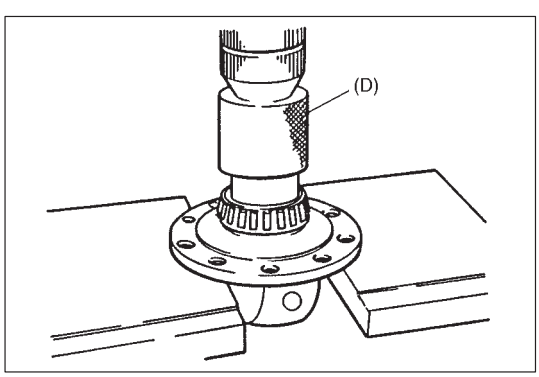
Available thrust washer thickness	0.9, 1.0, 1.1 and 1.2 mm (0.035, 0.039, 0.043 and 0.047 in.)



4) Drive in spring pin for differential side pinion shaft till it comes at the position with differential case surface as shown in figure.

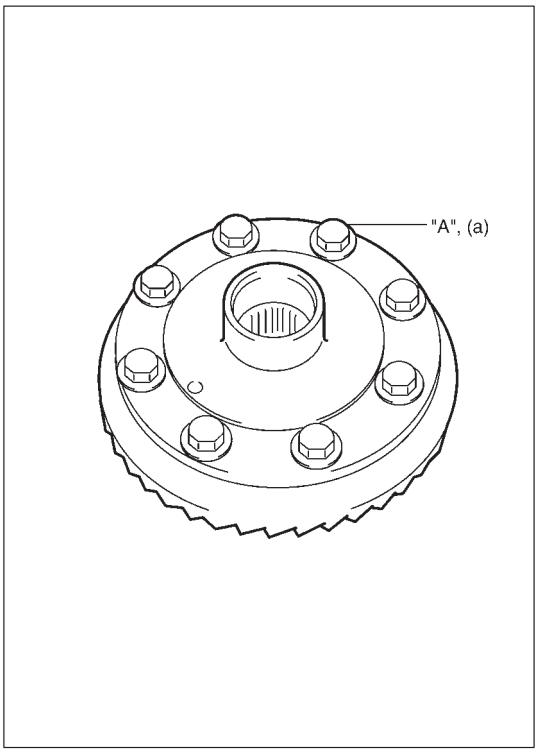
Special Tool
(C): 09922-85811

Spring pin depth "a": 9 mm (0.35 in.)



5) Press-fit these bearings into differential case by using special tool. Driving bearing into the case is not permitted.

Special Tool
(D): 09940-53111



6) Install bevel gear to differential case.
When mounting gear on case, be sure to apply thread lock cement to these bolts before running them in.

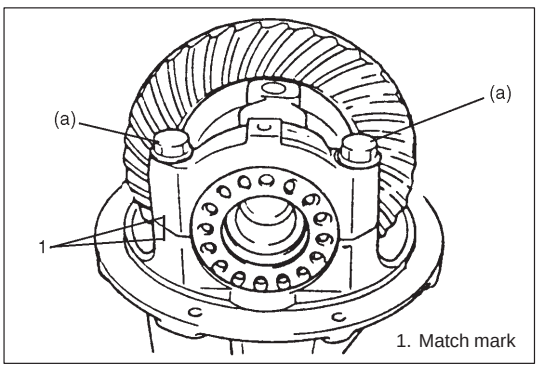
“A”: Cement 99000-32020

Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)

ASSEMBLING UNIT

1) Place bearing outer races on their respective bearings.
   Used left and right outer races are not interchangeable.
2) Install case assembly in carrier.
3) Install side bearing adjusters on their respective carrier, making sure adjuster are threaded properly.

NOTE:
Screw in each adjuster till it contacts bearing outer race so that outer race is prevented from inclining.



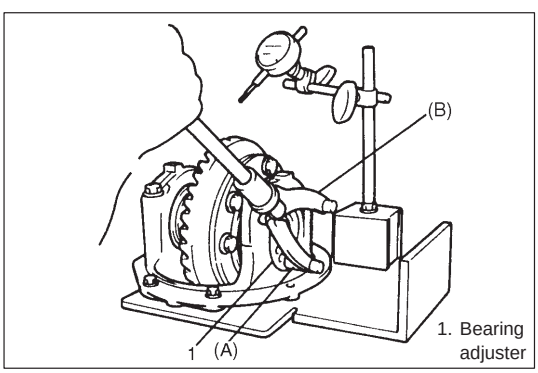
1. Match mark

4) Align match marks on cap and carrier. Screw in two side bearing cap bolts two or three turns and press down bearing cap by hand.

NOTE:
If bearing cap does not fit tightly on carrier, side bearing adjuster is not threaded properly. Reinstall adjuster.

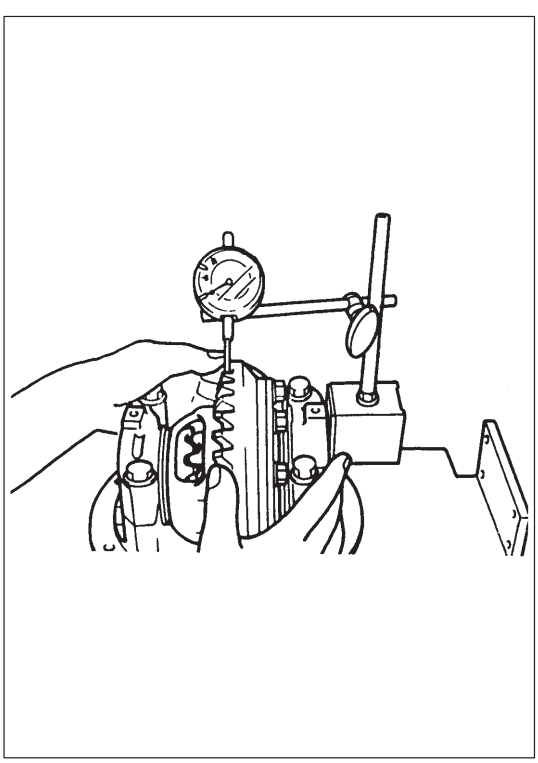
Tighten cap bolts.

Provisional Tightening Torque
(a): 15 N·m (1.5 kg-m, 11.0 lb-ft)

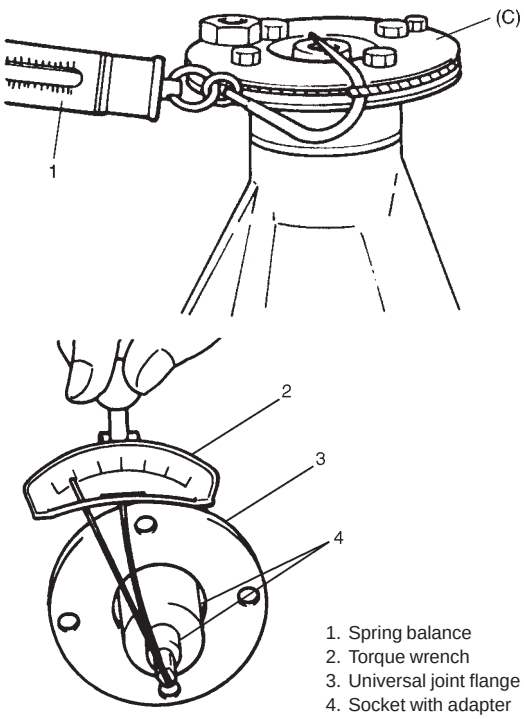


1. Bearing adjuster

5) Tighten both bearing adjusters so as to obtain specified gear backlash and at the same time, obtain preload of side bearing.
Special Tool
(A): 09930-40120 (Attachment)
(B): 09930-40113 (Rotor holder)
Bevel gear backlash: 0.10 – 0.20 mm (0.0039 – 0.0078 in.)



NOTE:
- **Be sure to apply measuring tip of dial gauge at right angles to convex side (drive side) of tooth.**
- **Measure at least 4 points on drive bevel gear periphery.**
- **As a practical measure following would be recommended to obtain specified backlash and side bearing preload at the same time.**
  (1) To increase or decrease backlash for adjustment, displace bevel gear toward or away from pinion by running in one adjuster and running out the other adjuster by equal amount.
  (2) Tighten both adjusters further by one notch at a time.



1. Spring balance
2. Torque wrench
3. Universal joint flange
4. Socket with adapter

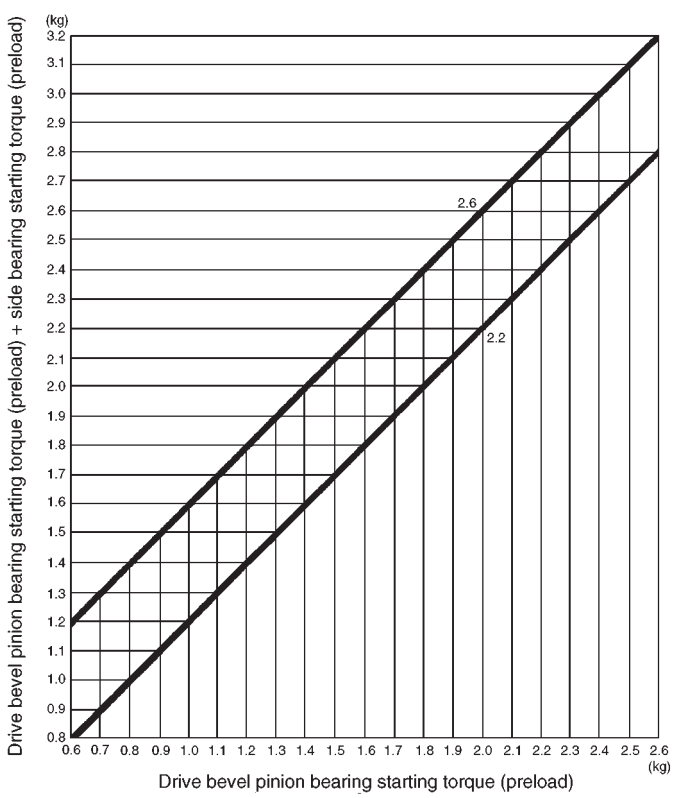
6) Measure preload of pinion with spring balance or torque wrench and check composite preload of pinion bearing and side bearing.

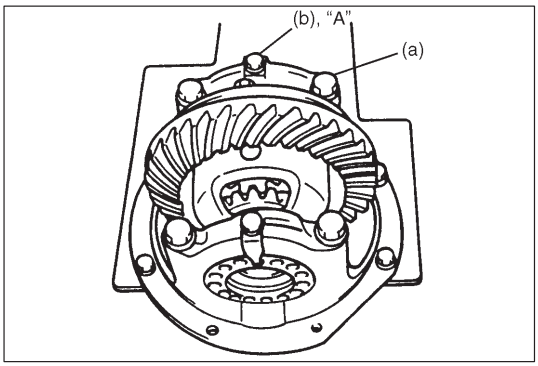
Special Tool
(C): 09922-75222

NOTE:

- **Standard preload is within the range given in graph below, which should be read as follows.**

Example:
When preload of bevel pinion is 2.6 kg/5.73 lb, acceptable composite preload of both pinion bearings and side bearings should be between 2.8 and 3.2 kg/6.17 and 7.05 lb.

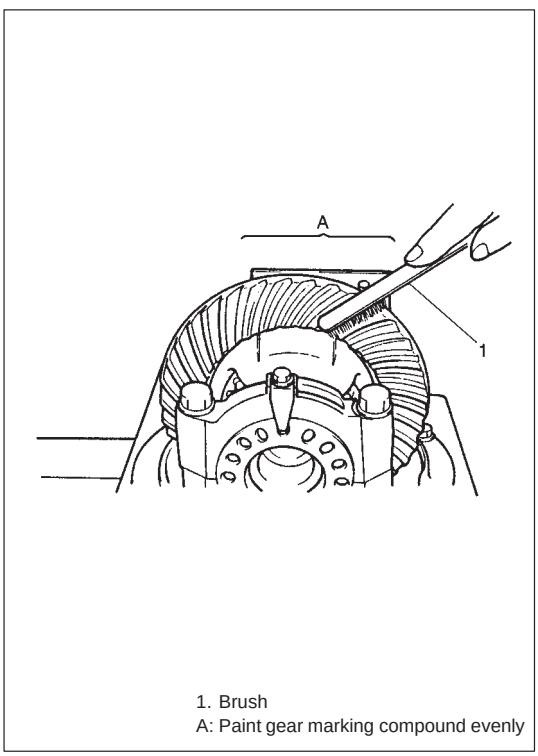




7) Torque bearing cap bolts to specification and install bearing lock plates. Apply thread lock cement to bearing lock plate bolt.

Tightening Torque
(a): 50 N·m (5.0 kg-m, 36.5 lb-ft)
(b): 11.5 N·m (1.15 kg-m, 8.5 lb-ft)

"A": Thread lock cement 99000-32050



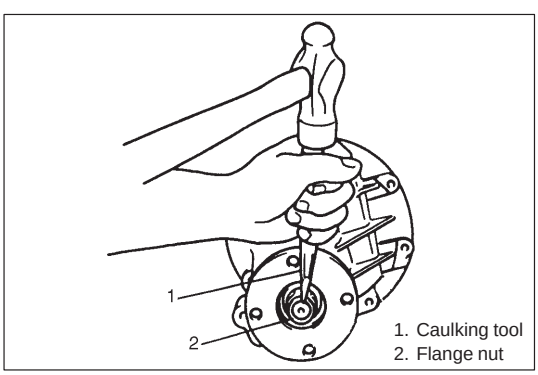
1. Brush
A: Paint gear marking compound evenly

8) As final step, check gear tooth contact as follows.
(1) After cleaning tooth surface of 10 bevel gears, paint them with gear marking compound evenly by using brush or sponge etc.

CAUTION:
When applying red lead paste to teeth, be sure to paint tooth surfaces uniformly. The paste must not be too dry or too fluid.

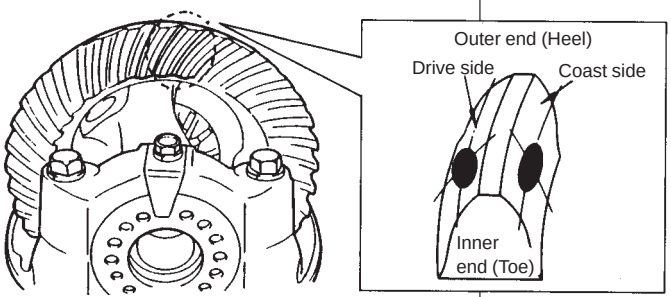
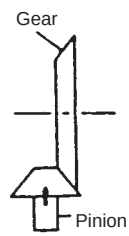
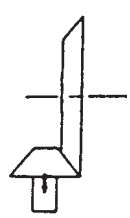
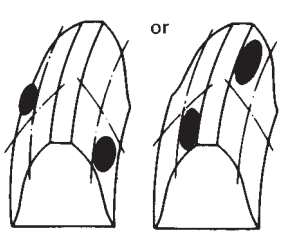
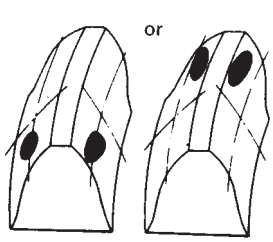
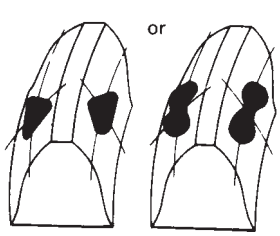
(2) Turn gear to bring its painted part in mesh with bevel pinion and turn it back and forth by hand to repeat their contact.
(3) Bring painted part up and check contact pattern, referring to following chart (next page). If contact pattern is not normal, readjust or replace as necessary according to instruction in chart.

NOTE:
Be careful not to turn bevel gear more than one full revolution, for it will hinder accurate check.



1. Caulking tool
2. Flange nut

9) Upon completion of gear tooth contact check in step 8, caulk flange nut with caulking tool and hammer.

TOOTH CONTACT PATTERN	DIAGNOSIS AND REMEDY
	NORMAL
	HIGH CONTACT Pinion is positioned too far from the center of drive bevel gear. 1. Increase thickness of pinion height adjusting shim and position pinion closer to gear center. 2. Adjust drive bevel gear backlash to specification. 
	LOW CONTACT Pinion is positioned too close to the center of drive bevel gear. 1. Decrease thickness of pinion height adjusting shim and position pinion farther from gear center. 2. Adjust drive bevel gear backlash to specification. 
	These contact patterns indicate that the “offset” of differential carrier is too much or too little. The remedy is to replace the carrier with a new one.
	These contact patterns, located on toe or heel on both drive and coast sides, mean that 1) both pinion and gear are defective, 2) carrier is not true and square, or 3) gear is not properly seated on differential case. The remedy is to replace the defective member.
	Irregular patterns: If the pattern is not oval, it means that bevel gear is defective. High or low spots on tooth surfaces or on the seat of bevel gear are the cause of irregular patterns appearing on some teeth. The remedy is to replace the pinion and gear set and, if the seat is defective, so is differential case.

BLANK

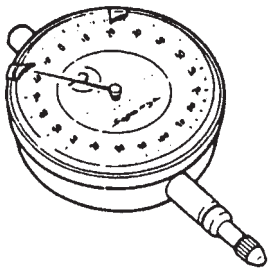
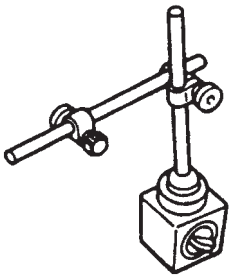
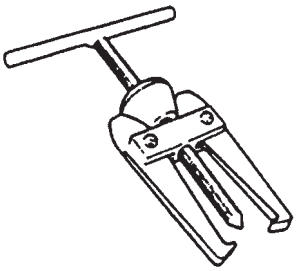
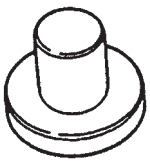
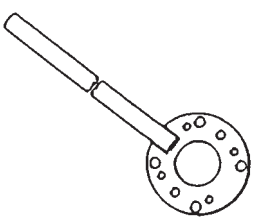
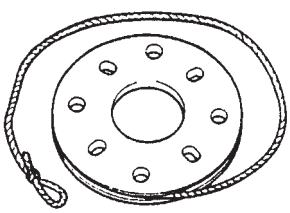
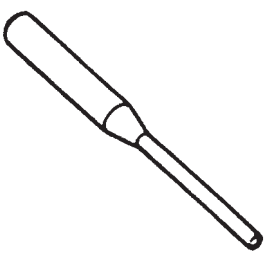
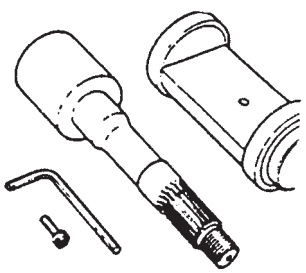
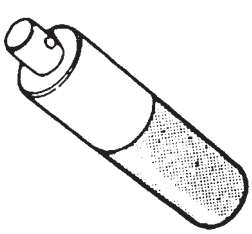
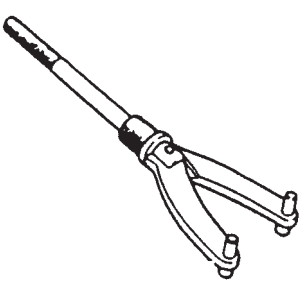
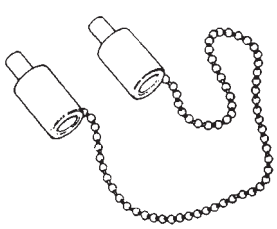
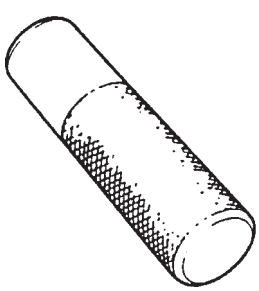
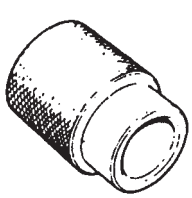
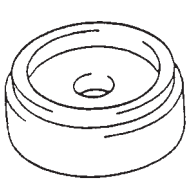
TIGHTENING TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
Differential oil filler/level plug	50	5.0	36.5
Differential oil drain plug	55	5.5	40.0
Propeller shaft flange bolts	23	2.3	17.0
Bevel gear bolts	85	8.5	61.5
Bearing cap bolts	50	5.0	36.5
Lock plate bolts	11.5	1.15	8.5
Rear differential carrier bolts	23	2.3	17.0

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCTS	USE
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	Bevel gear bolts
Thread lock cement	SUZUKI LOCK CEMENT “1342” (99000-32050)	Side gear lock plate bolts
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	● Rear differential drain plug ● Mating surface of differential housing

SPECIAL TOOLS

 09900-20606 Dial gauge	 09900-20701 Magnetic stand	 09913-60910 Bearing/Gear puller	 09913-85230 Bearing removing jig
 09922-66020 Flange holder	 09922-75222 Preload adjuster	 09922-85811 Spring pin remover	 09924-36320 (For Front Diff) Bevel pinion mounting dummy
 09924-74510 Installer attachment	 09930-40113 Rotor holder	 09930-40120 Attachment	 09940-51710 Bearing installer
 09940-53111 Bearing installer	 09951-16090 Oil seal installer		

SECTION 8

BODY ELECTRICAL SYSTEM

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 of 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 of 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 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 circuit diagram and unit parts location that is not described in this section, refer to WIRING DIAGRAM MANUAL in FOREWORD of this manual.

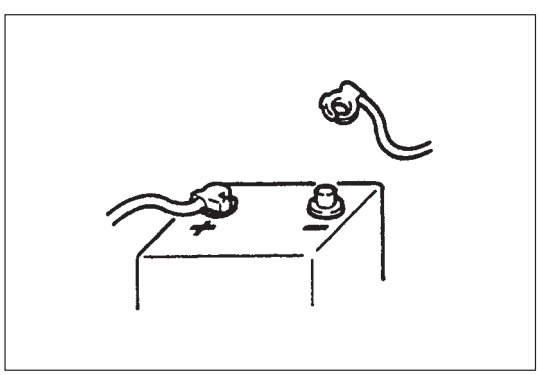
CONTENTS

GENERAL DESCRIPTION

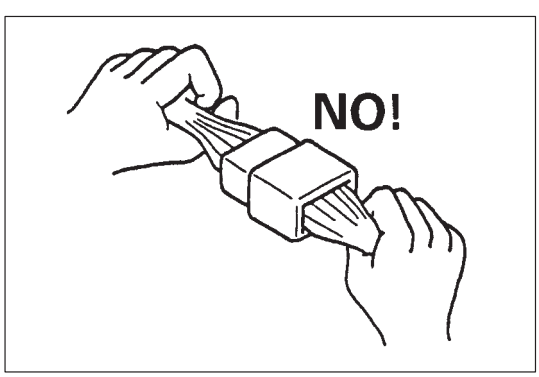
The body electrical components of this vehicle are designed to operate on 12 Volts power supplied by the battery. The electrical system utilizes negative ground polarity.

CAUTIONS IN SERVICING

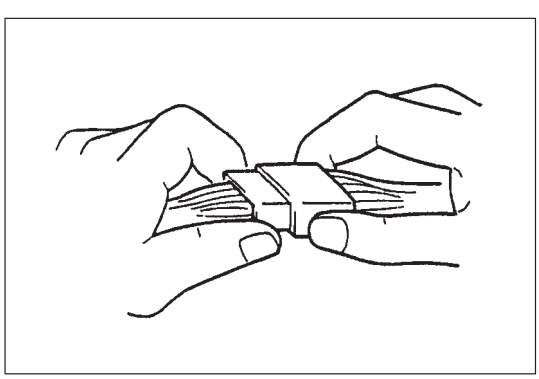
When performing works related to electric systems, observe following cautions for the purpose of protection of electrical parts and prevention of a fire from occurrence.



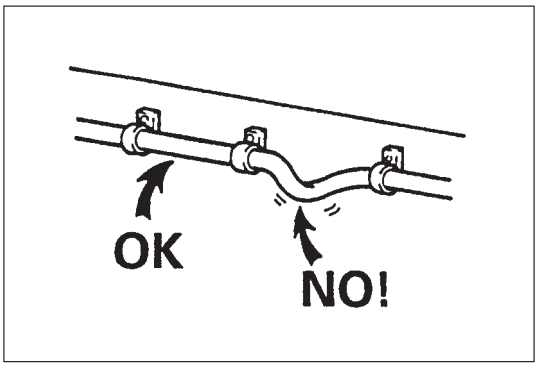
- When removing the battery from the vehicle or disconnecting the cable from the battery terminals for inspection or service works on the electric systems, always confirm first that the ignition switch and all the other switches have been turned OFF. Otherwise, the semi-conductor part may be damaged.
- When disconnecting cables from the battery, be sure to disconnect the one from the negative (–) terminal first and then the other from the positive (+) terminal.
- Reverse the above order when connecting the cables to the battery terminals.



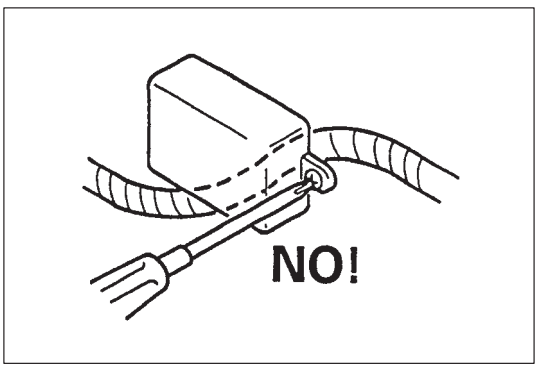
- When disconnecting connectors, never pull the wiring harnesses. Unlock the connector lock first and then pull them apart by holding connectors themselves.



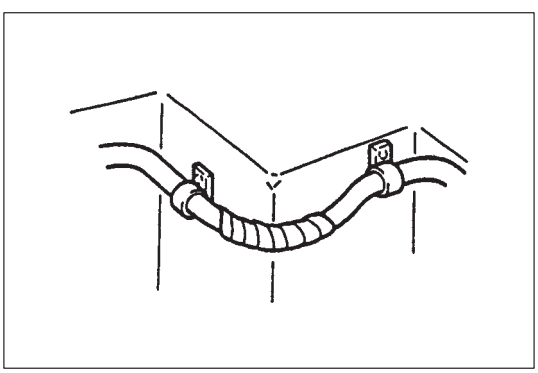
- When connecting connectors, also hold connectors and push them together until they lock securely (a click is heard).



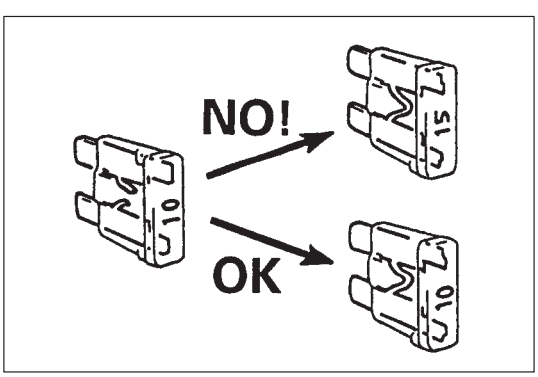
- When installing the wiring harness, fix it with clamps so that no slack is left.



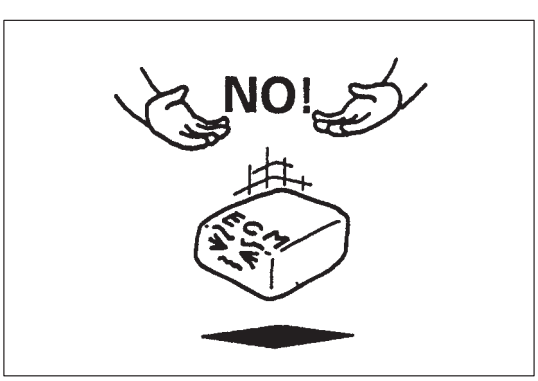
- When installing vehicle parts, be careful so that the wiring harness is not interfered with or caught by any other part.



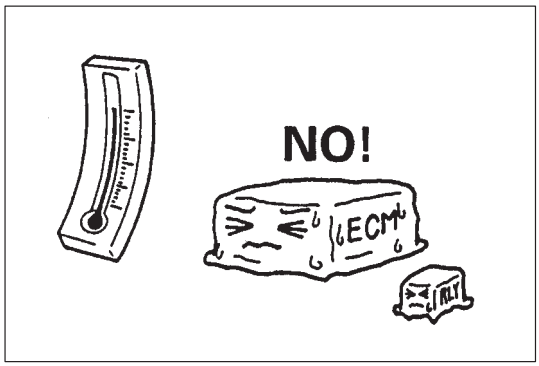
- To avoid damage to the harness, protect its part which may contact against a part forming a sharp angle by winding tape or the like around it.



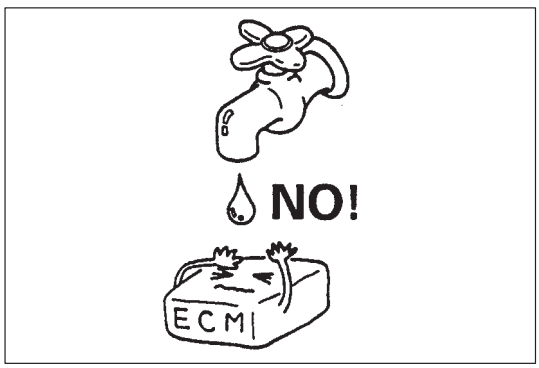
- When replacing a fuse, make sure to use a fuse of the specified capacity. Use of a fuse with a larger capacity will cause a damage to the electrical parts and a fire.



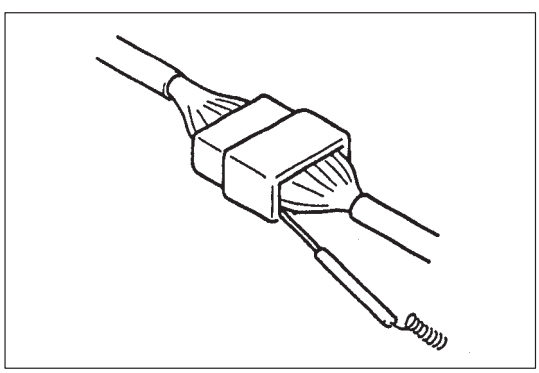
- Always be careful not to handle electrical parts (computer, relay, etc.) in a rough manner or drop them.



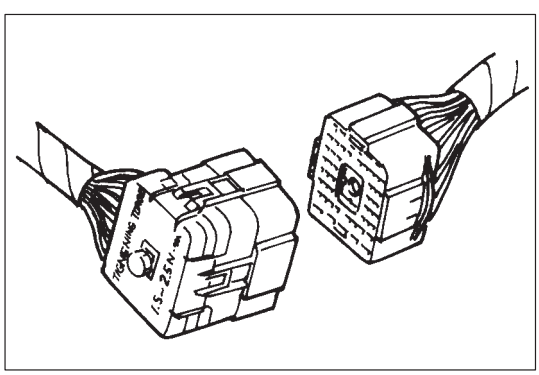
- When performing a work that produces a heat exceeding 80°C in the vicinity of the electrical parts, remove the heat sensitive electrical part(s) beforehand.



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



- When using a tester for checking continuity or measuring voltage, be sure to insert the tester probe from the wire harness side.

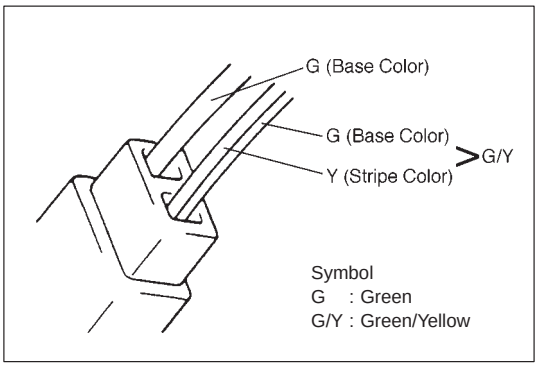


- When connecting JOINT CONNECTORS, make sure to tighten its bolt to the specified torque indicated on the housing of JOINT CONNECTOR.

Symbol	Wire Color	Symbol	Wire Color
B	Black	Or	Orange
Bl	Blue	R	Red
Br	Brown	W	White
G	Green	Y	Yellow
Gr	Gray	P	Pink
Lbl	Light blue	V	Violet
Lg	Light green		

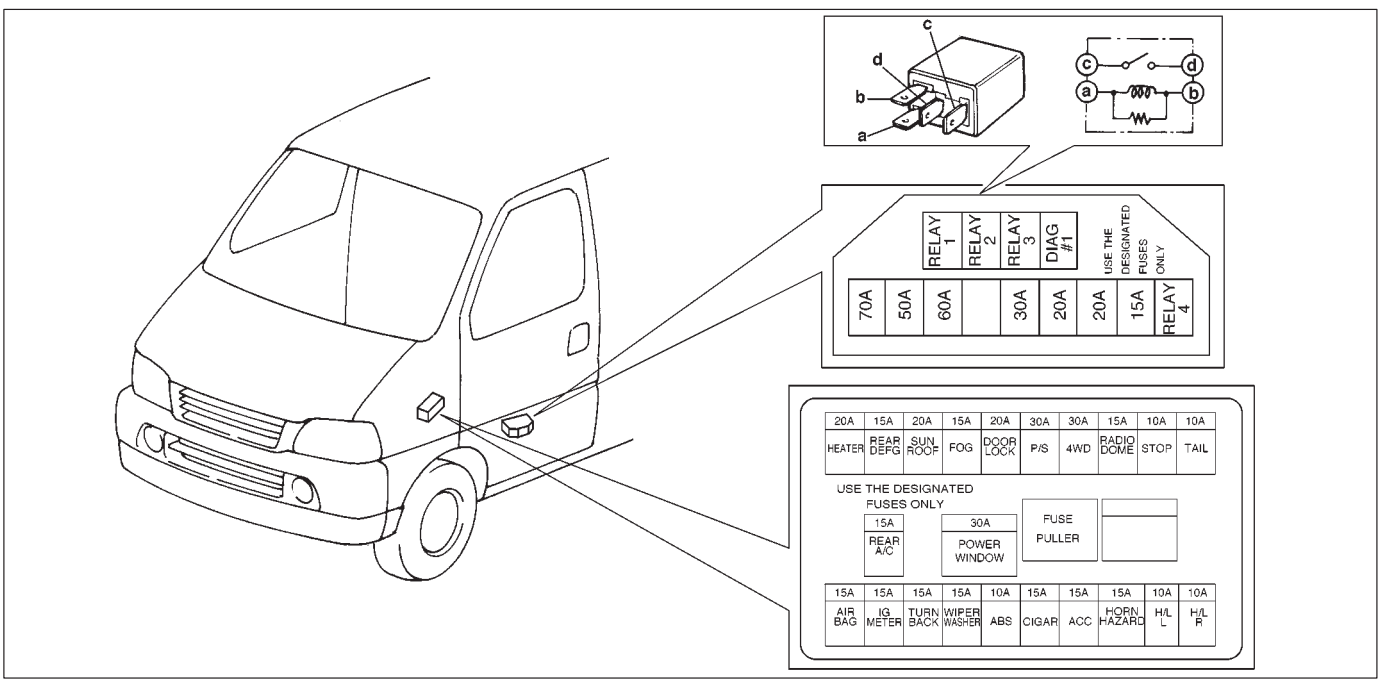
WIRE COLOR SYMBOLS

The wire color is abbreviated to the first (or first two) alphabet(s) of each color.



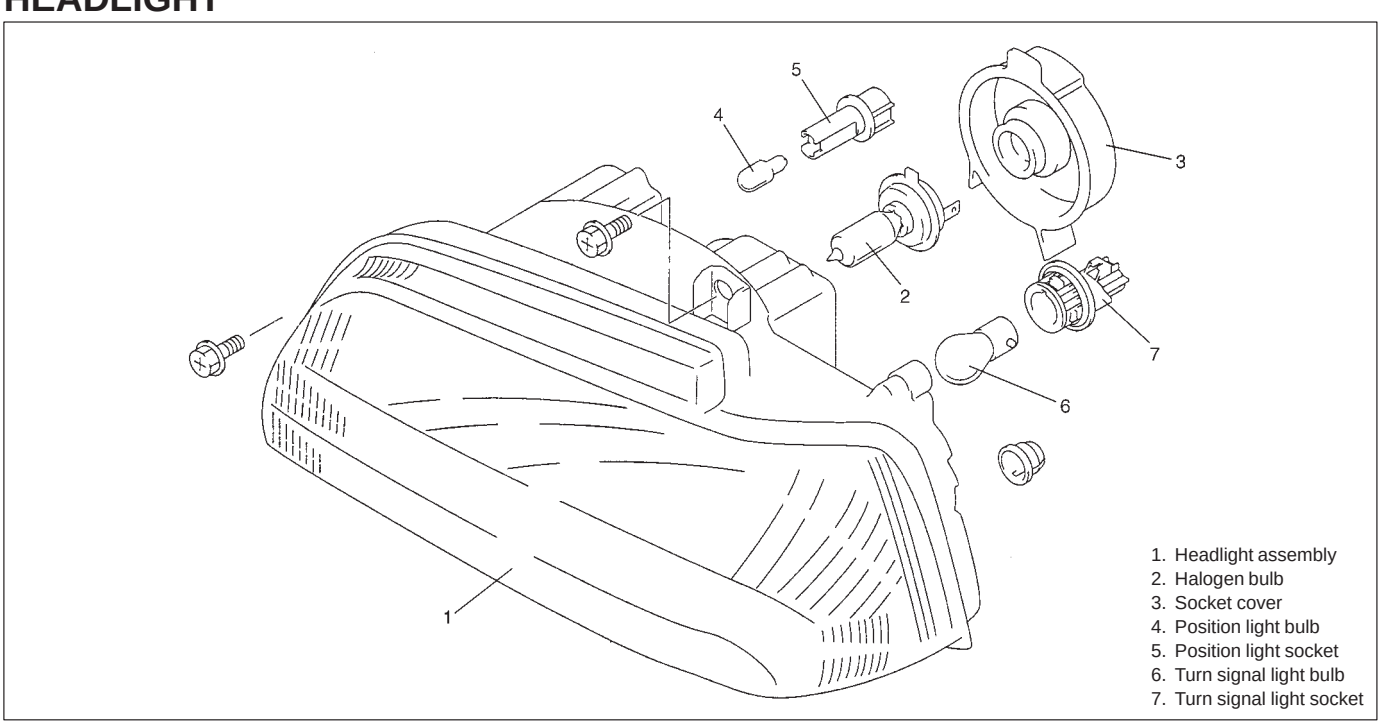
There are two kinds of colored wire used in this vehicle. One is single-colored wire and the other is dual-colored (striped) wire. The single-colored wire uses only one color symbol (i.e. “G”). The dual-colored wire uses two color symbols (i.e. “G/Y”). The first symbol represents the base color of the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

POWER SUPPLY CIRCUIT AND RELAY



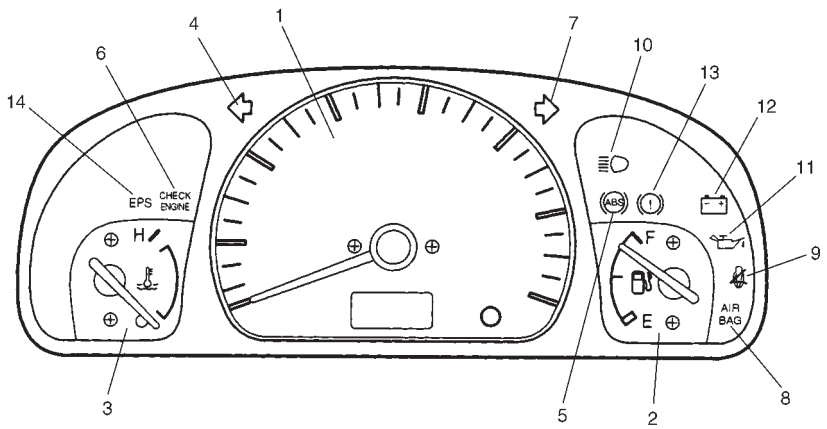
Refer to “WIRING DIAGRAM MANUAL” in FOREWORD of this manual.

HEADLIGHT

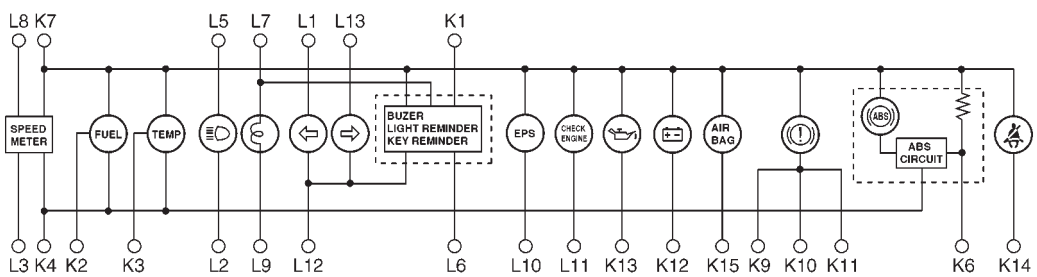


1. Headlight assembly
2. Halogen bulb
3. Socket cover
4. Position light bulb
5. Position light socket
6. Turn signal light bulb
7. Turn signal light socket

COMBINATION METER

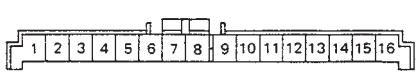


1. Speedometer
2. Fuel lever meter
3. Water temperature meter
4. Turn signal pilot light (LH)
5. ABS warning light (if equipped)
6. CHECK ENGINE light
7. Turn signal pilot light (RH)
8. AIR BAG warning light (if equipped)
9. Fasten seat belt light (if equipped)
10. High beam light
11. Oil pressure warning light
12. Charge warning light
13. Brake warning light
14. EPS warning light (if equipped)

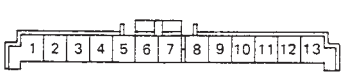


NOTE:
Terminal arrangement of coupler viewed from harness side.

Coupler K



Coupler L



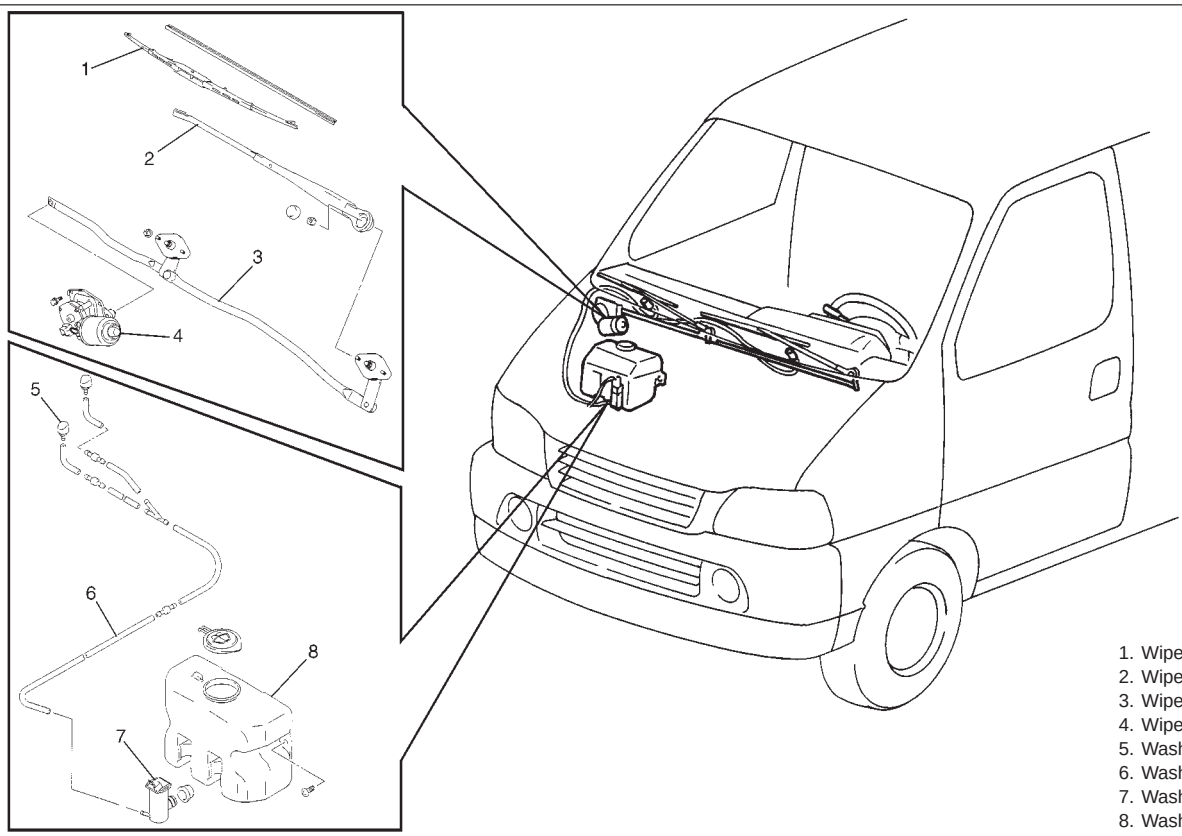
Coupler K

1.	To ignition switch (if equipped)	Bl/G
2.	To fuel level gauge	Y/R
3.	To ECT sensor	Y/W
4.	To ground	B/Y
5.	Blank	—
6.	To ABS controller (if equipped)	R/Bl
7.	To fuse box	B/W
8.	Blank	—
9.	To generator	B/G
10.	To brake fluid level switch	Bl
11.	To parking brake switch	R/B
12.	To generator	W/R
13.	To oil pressure switch	Y/B or Y/Bl
14.	To seat belt switch (if equipped)	Gr/B
15.	To air bag controller (if equipped)	Or
16.	Blank	—

Coupler L

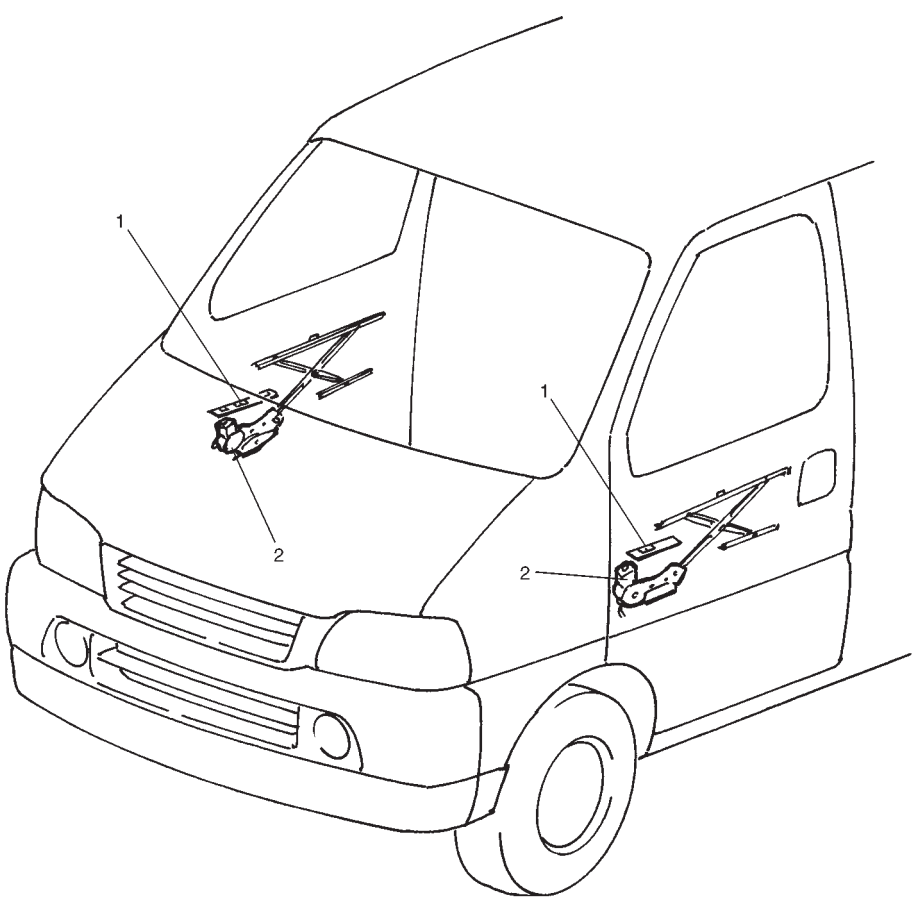
1.	To combination switch (turn L)	G/R
2.	To combination switch (dimmer sw)	R
3.	To VSS	Y
4.	Blank	—
5.	To fuse box	W/Bl
6.	To door switch (if equipped)	B/R
7.	To combination switch (dimmer sw)	R/Y
8.	To fuse box	W
9.	To ground	B
10.	To EPS controller (if equipped)	V
11.	To ECM	V/Y
12.	To ground	B
13.	To combination switch (turn R)	G/Y

WINDSHIELD WIPER AND WASHER



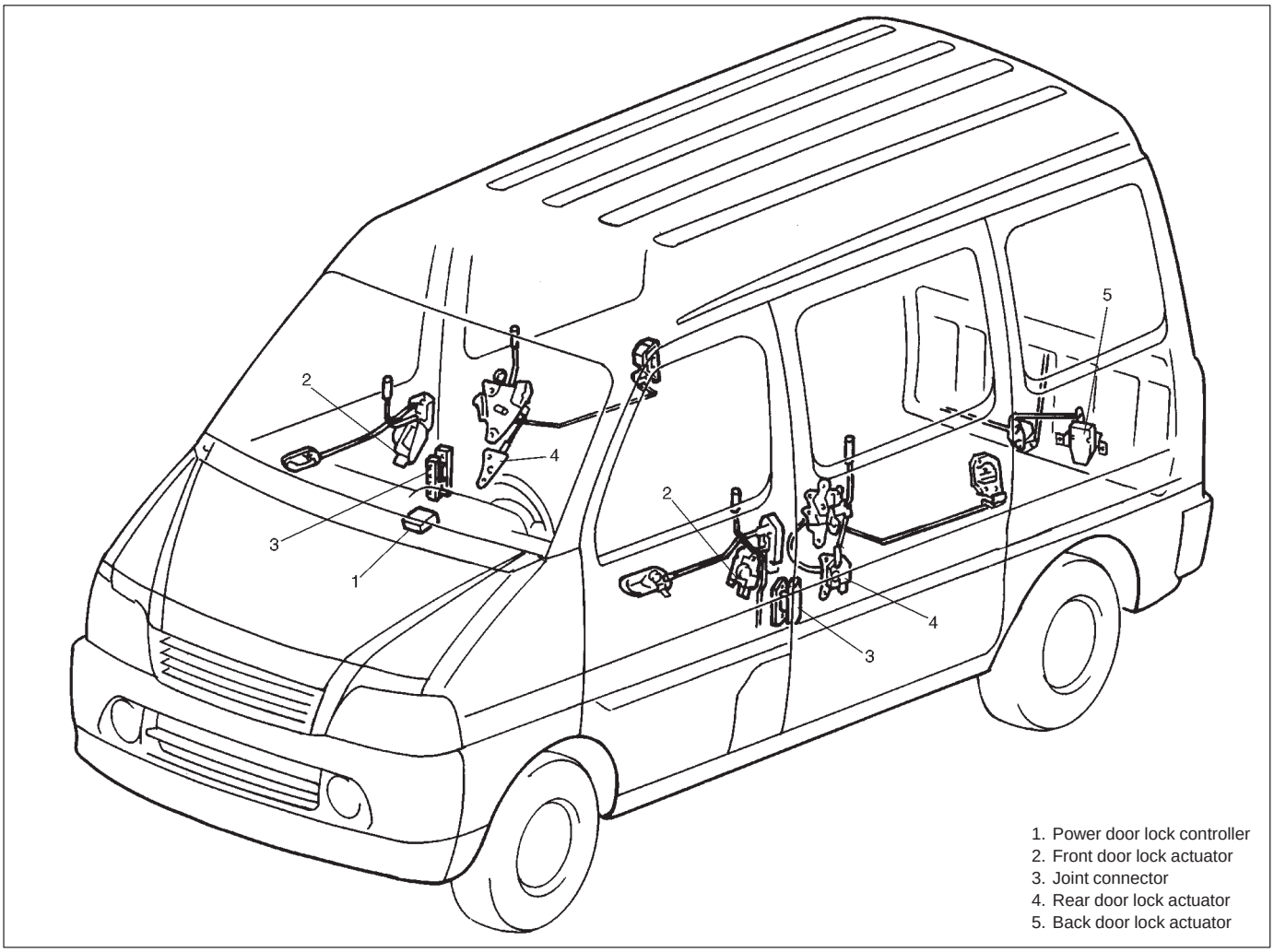
1. Wiper blade
2. Wiper arm
3. Wiper link
4. Wiper motor
5. Washer nozzle
6. Washer hose
7. Washer pump
8. Washer tank

POWER WINDOW SYSTEM



1. Power window switch
2. Window actuator

POWER DOOR LOCK SYSTEM



1. Power door lock controller
2. Front door lock actuator
3. Joint connector
4. Rear door lock actuator
5. Back door lock actuator

DIAGNOSIS

HEADLIGHT

Trouble	Possible Cause	Correction
Headlights do not light up	Bulb blown	Check bulb
	Lighting or dimmer switch faulty	Check headlight switch
	HEADLIGHT R and L fuses blown	Check fuses and replace as necessary
		(If replace, check short circuit to ground)
	Wiring or grounding faulty	Repair circuit
Only one headlight does not light up	Bulb blown	Check bulb
	HEADLIGHT R or L fuse blown	Check fuse and replace as necessary
		(If replace, check short circuit to ground)
	Wiring or grounding faulty	Repair circuit
Only one beam (“Hi” or “Lo”) does not light	Bulb burnt out	Replace bulb
	Lighting or dimmer switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit

HEADLIGHTS WITH LEVELING SYSTEM (IF EQUIPPED)

Trouble	Possible Cause	Correction
Both headlights do not move	Fuse blown	Check circuit and replace fuse
		(If replace, check short circuit to ground)
	Leveling switch faulty	Check switch or replace it as necessary
	Supply voltage too low	Recharge or replace battery
	Wiring or grounding faulty	Repair circuit
One of headlights (either Right or Left) does not move	Socket, wiring or grounding faulty	Repair as necessary
	Actuator faulty	Replace actuator
	Vehicle body around headlight deformed	Repair body
	Headlight assembly itself deformed	Replace headlight assembly

REAR FOG LIGHT (IF EQUIPPED)

Trouble	Possible Cause	Correction
Rear fog light does not come on	Fuses blown	Check fuse and replace as necessary
		(If replace, check short circuit to ground)
	Rear fog light switch faulty	Check fog light switch
	Combination switch (lighting switch) faulty	Check switch
	Wiring or grounding faulty	Repair as necessary
	Bulb burnt out	Replace

TURN SIGNAL AND HAZARD WARNING LIGHTS

Trouble	Possible Cause	Correction
Flash rate high or one side only flashes	Bulb blown on “flash rate high”-side Incorrect bulb Turn signal/hazard warning relay faulty Open circuit or high resistance existing between Combination switch (turn signal/hazard warning switch) and light on one side Wiring or grounding faulty	Check bulb Check bulb Check relay Repair circuit Repair circuit
No flashing	HAZARD HORN and/or TURN BACK fuse blown Open circuit or high resistance existing between battery and switch Turn signal/hazard relay faulty Combination switch (turn signal/hazard warning switch) faulty Wiring or grounding faulty	Check fuse and replace as necessary (If replace, check short circuit to ground) Check circuit Check relay Check switch Repair circuit
Flash rate low	Supply voltage low Turn signal/hazard relay faulty	Check charging system Check relay

CLEARANCE, TAIL AND LICENSE PLATE LIGHTS

Trouble	Possible Cause	Correction
All lights do not light up	Bulb(s) blown TAIL fuse blown Combination switch (lighting and dimmer switch) faulty Wiring or grounding faulty	Check bulb Check fuse and replace as necessary (If replace, check short circuit to ground) Check switch Repair circuit
Some lights do not light up	Bulb(s) blown Wiring or grounding faulty	Check bulb Repair circuit

BACK-UP LIGHT

Trouble	Possible Cause	Correction
Back-up lights do not light up	Bulb(s) blown TURN BACK fuse blown Back-up light switch faulty Wiring or grounding faulty	Check bulb Check fuse and replace as necessary (If replace, check short circuit to ground) Check switch Repair circuit
Back-up lights stay on	Back-up light switch faulty	Check or replace switch

BRAKE LIGHTS

Trouble	Possible Cause	Correction
Brake lights do not light up	Bulb(s) blown	Check bulb
	STOP fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Brake light switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit
Brake lights stay on	Brake light switch faulty	Check, adjust or replace switch

SPEEDOMETER AND VSS

Trouble	Possible Cause	Correction
Speedometer shows no operation or incorrect operation	IG METER and RADIO DOME fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	VSS faulty	Check VSS
	Printed plate in combination meter faulty	Check printed plate
	Wiring or grounding faulty	Repair
	Signal rotor on differential case faulty	Check signal rotor
	Speedometer faulty	Replace speedometer

FUEL METER AND FUEL GAUGE UNIT

Trouble	Possible Cause	Correction
Fuel meter shows no operation or incorrect operation	IG METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Fuel gauge unit faulty	Check fuel gauge unit
	Printed plate in combination meter faulty	Check printed plate
	Fuel meter faulty	Check fuel meter
	Wiring or grounding faulty	Repair circuit

ENGINE COOLANT TEMP. (ECT) METER AND ECT SENSOR

Trouble	Possible Cause	Correction
Engine coolant temp. meter shows no operation or incorrect operation	IG METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	ECT meter faulty	Check ECT meter
	Printed plate in combination meter faulty	Check printed plate
	ECT sensor faulty	Check ECT sensor
	Wiring or grounding faulty	Repair circuit

OIL PRESSURE LIGHT

Trouble	Possible Cause	Correction
Oil pressure warning light does not light up when turn the ignition switch to on position at engine off	Bulb in combination meter blown	Check bulb
	IG METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Printed plate in combination meter faulty	Check printed plate
	Oil pressure switch faulty	Check oil pressure switch
	Wiring or grounding faulty	Repair circuit

BRAKE AND PARKING BRAKE WARNING LIGHT

Trouble	Possible Cause	Correction
Brake warning light does not light up (when fluid low level and/or parking brake pull up)	Bulb in combination meter blown	Check bulb
	Printed plate in combination meter faulty	Check printed plate
	IG METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Brake fluid level switch faulty	Check brake fluid level switch
	Parking brake switch faulty	Check parking brake switch
	Wiring or grounding faulty	Repair circuit
Brake warning light does not light up when cranking (when turned ignition switch to ST position)	Ignition switch faulty	Check ignition switch
	Printed plate in combination meter faulty	Check printed plate
	Wiring or grounding faulty	Repair circuit
Brake warning light stay on	Brake fluid level switch and/or parking brake switch faulty	Check switch

SEAT BELT WARNING LIGHT

Trouble	Possible Cause	Correction
Seat belt warning light does not light up	Bulb in combination meter blown	Check bulb
	Printed plate in combination meter faulty	Check printed plate
	Seat belt switch faulty	Check seat belt switch
	IG METER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Wiring or grounding faulty	Repair circuit
Seat belt warning light stay on	Seat belt switch faulty	Check seat belt switch

REAR WINDOW DEFOGGER (IF EQUIPPED)

Trouble	Possible Cause	Correction
Defogger does not operate	REAR DEFG fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Heat wire faulty	Check heat wire
	Rear window defogger switch faulty	Check switch
	Wiring or grounding faulty	Repair circuit

WINDSHIELD WIPER AND WASHER

Trouble	Possible Cause	Correction
Wiper malfunctions or does not return to its original position	WIPER WASHER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Wiper motor faulty	Check wiper motor
	Combination switch (wiper switch) faulty	Check wiper switch
	Wiring or grounding faulty	Repair circuit
Washer malfunctions	Washer hose or nozzle clogged	Clean or repair clogged hose or nozzle
	WIPER WASHER fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Washer motor faulty	Check washer motor
	Combination switch (wiper switch) faulty	Check wiper switch
	Wiring or grounding faulty	Repair circuit

POWER WINDOW CONTROL SYSTEM (IF EQUIPPED)

Trouble	Possible Cause	Correction
All power windows do not operate	POWER WINDOW fuse blown	Check fuse and replace as necessary
	Ignition (main) switch faulty	Check ignition (main) switch
	Power window main switch faulty	Check power window main switch
	Window actuator faulty	Check window actuator
	Wiring or grounding faulty	Repair circuit
Only one power window does not operate	Wiring and/or coupler faulty	Check wiring and/or coupler
	Power window switch (main or sub) faulty	Check power window switch
	Window actuator faulty	Check window actuator
	Grounding faulty	Repair

POWER DOOR LOCK SYSTEM

Trouble	Possible Cause	Correction
Power door locks do not operate by power door lock switch (driver's side)	DOOR LOCK fuse blown	Check fuse and replace as necessary
	Power door lock switch faulty	Check switch
	Power door lock controller faulty	Check controller
	Wiring or grounding faulty	Repair as necessary
Only one power door lock does not operate	Actuator (door lock motor) faulty	Repair as necessary
	Wiring or grounding faulty	Repair as necessary

CIGARETTE LIGHTER

Trouble	Possible Cause	Correction
Cigarette lighter shows no operation	RADIO CIGAR fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Ignition switch faulty	Check ignition switch
	Cigarette lighter faulty	Check cigarette lighter
	Wiring or grounding faulty	Repair circuit

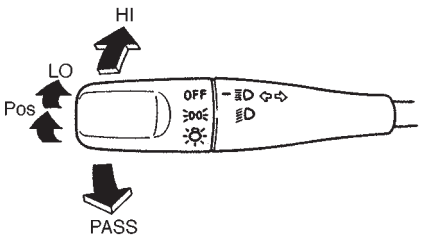
INTERIOR LIGHTS

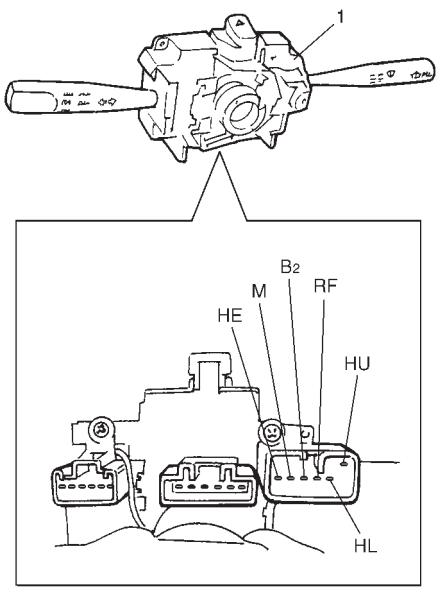
Trouble	Possible Cause	Correction
Interior lights do not light up	Bulbs blown	Replace
	RADIO DOME fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Interior light switch faulty	Check switch
	Door switch faulty	Check switch
	Wiring or grounding	Repair
One of interior light does not light up	Bulb blown	Replace
	Interior light switch faulty	Check switch
	Door switch faulty	Check switch
	Wiring or grounding	Repair

HORN

Trouble	Possible Cause	Correction
Horn does not operate	HORN HAZARD fuse blown	Check fuse and replace as necessary (If replace, check short circuit to ground)
	Horn switch faulty	Check horn switch
	Horn relay faulty (if equipped)	Check horn relay
	Horn faulty	Replace horn

LH steering vehicle shown





1. Combination switch assembly

ON-VEHICLE SERVICE

HEADLIGHT

HEADLIGHT SWITCH

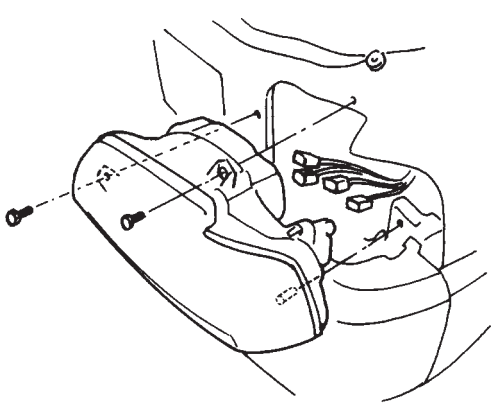
REMOVAL AND INSTALLATION

Refer to COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in “STEERING WHEEL AND COLUMN” section for details.

INSPECTION

Use an ohmmeter to check the continuity at each switch position shown below. If any continuity is not obtained, replace combination switch.

Switch Position \ Terminal / Wire Color		HE	HU	HL	RF	B_2	M
		B	R	R/W	G/B	R/G	R/Y
OFF							
	passing	○—○					
						○—○	
	passing	○—○				○—○	
	Low Beam	○		○	○	○—○	
	passing	○	○		○	○—○	
	High Beam	○	○		○	○—○	



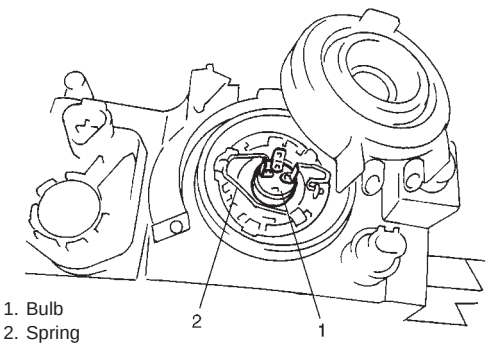
HEADLIGHT

REMOVAL

1) Disconnect negative cable at battery.
2) Remove front grill.
3) Disconnect couplers from headlight assembly.
4) Remove headlight mounting bolts.
5) Remove headlight assembly.

INSTALLATION

Reverse removal procedure for installation.

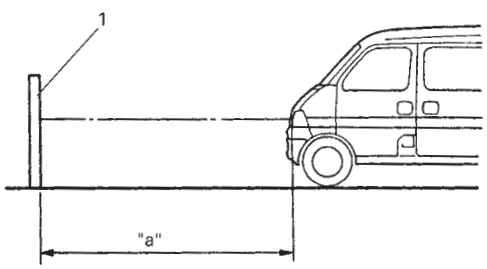


1. Bulb
2. Spring

BULB REPLACEMENT

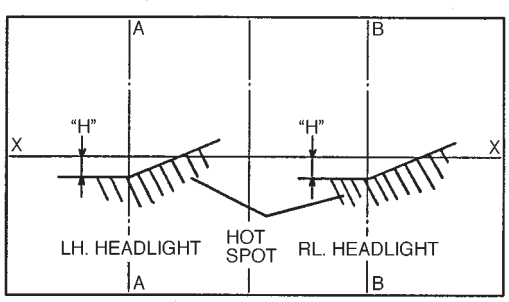
WARNING:
Don't touch when the bulb is hot.

1) Disconnect negative (–) cable at battery.
2) Disconnect harness from bulb.
3) Remove socket cover and bulb.
4) Replace bulb and assemble all removed parts.



1. Screen

LH steering vehicle shown



X - X: Horizontal center line of headlights bulb
A - A: Vertical center line of left headlight bulb
B - B: Vertical center line of right headlight bulb

HEADLIGHT AIMING WITH SCREEN

NOTE:

- **Unless otherwise obligated by local regulations, adjust headlight aiming according to following procedure.**
- **After replacing headlight, be sure to adjust aiming.**

Before adjustment, make sure the following.

a) Place vehicle on a flat surface in front of blank wall (screen) ahead of headlight surface.

Clearance "a": 10 m (32.8 ft.)

b) Adjust air pressure of all tires to a specified value respectively.
c) Bounce vehicle body up and down by hand to stabilize suspension.
d) Carry out with one driver aboard.

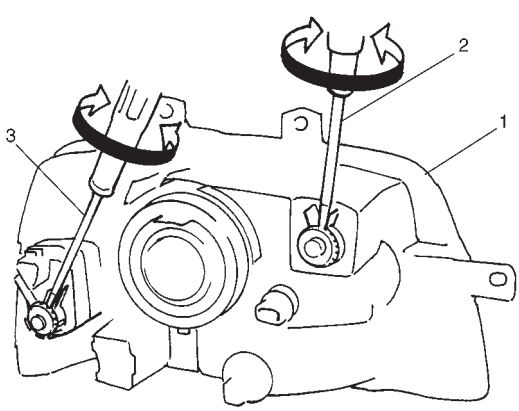
Driver's weight: 75 kg (165 lb)

Adjustment

1) Check to see if hot spot (high intensity zone) of each main (low) beam axis falls as illustrated.

Clearance "H": Approx. 130 mm (5.15 in.)

2) If headlight aiming is not set properly, align it to specification by adjusting aiming screw and aiming gear.

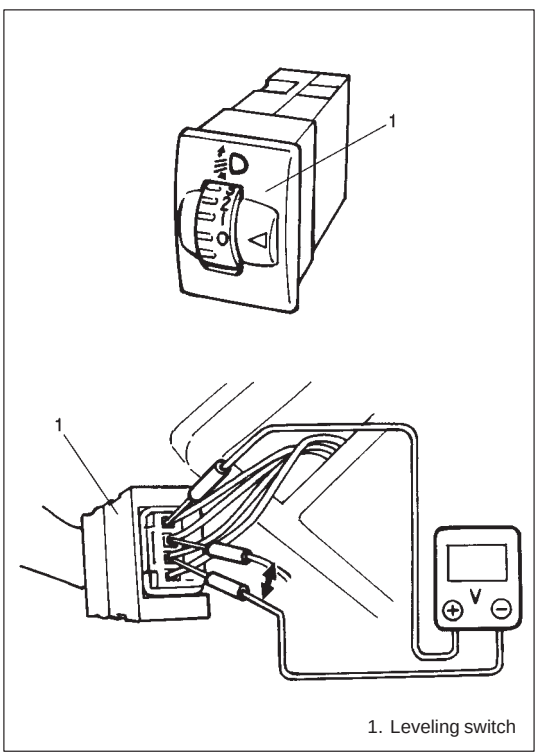


1. Headlight ass'y
2. Aiming (for right/left adjustment)
3. Aiming (for up/down adjustment)

HEADLIGHTS WITH LEVELING SYSTEM (IF EQUIPPED)

SYSTEM INSPECTION

CAUTION:
Leveling switch and leveling actuator can not be checked by itself. It is strictly prohibited to connect voltmeter or ohmmeter to leveling switch and leveling actuator with couplers disconnected from it.

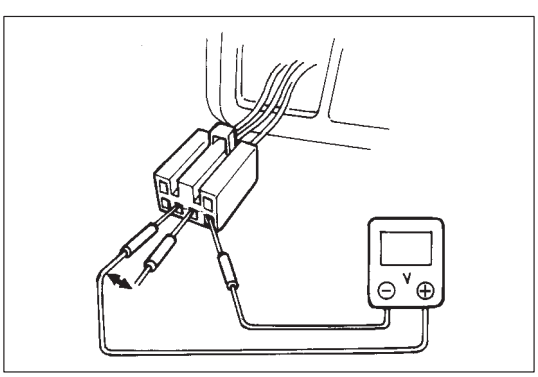


1. Leveling switch

1) Remove leveling switch at connected its coupler.
2) As shown in the figure, with the positive lead of the voltmeter connected with (Lg/Y) and (Lg/R) leads and the negative lead with (B) lead, turn the ignition switch to the ON position and check the voltage on the voltmeter.

Wire / Switch Position	Lg/Y (Left side leveling)	Lg/R (Right side leveling)
0	Approx. 6.2 V	Approx. 6.2 V
4	Approx. 9.0 V	Approx. 9.0 V

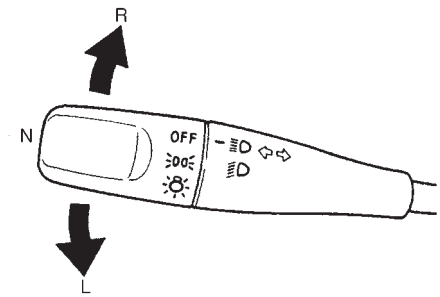
If the indicated voltage is as specified above, the leveling switch is in good condition. In this case, replace the leveling actuator. If indicated voltage is not as specified above, preform following steps.

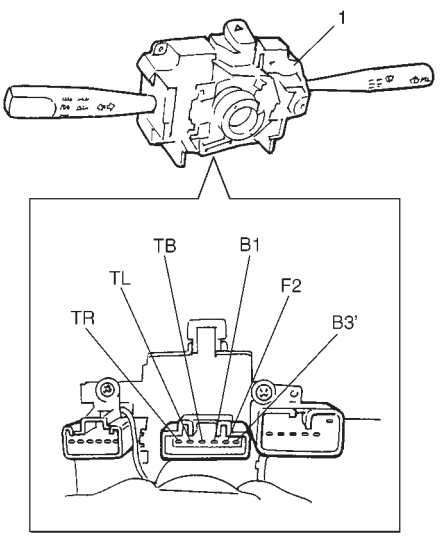


i) Remove wire harness coupler from leveling switch.
ii) connect voltmeter to wire harness coupler as shown.
iii) check that the voltmeter indicates at battery voltage.

If not, replace leveling actuator.
If so that, replace leveling switch.

LH steering vehicle shown





1. Combination switch assembly

TURN SIGNAL AND HAZARD WARNING LIGHT

TURN SIGNAL LIGHT SWITCH

REMOVAL AND INSTALLATION

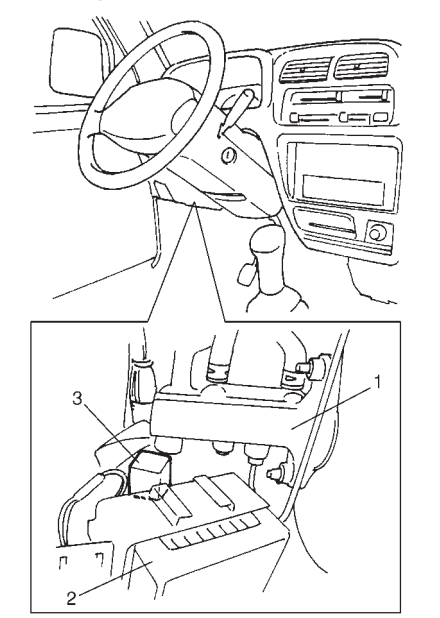
Refer to COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in “STEERING WHEEL AND COLUMN” section for details.

INSPECTION

Use an ohmmeter to check the continuity at each switch position shown below.

Hazard SW / Turn Signal SW		TL	TB	TR	B3’	B1	F2
Terminal / Wire Color		G/R	G	G/Y	Br/Y	Y/R	W/G
OFF	L	○	○				
	N				○	○	
	R		○	○			
ON		○	○	○		○	○

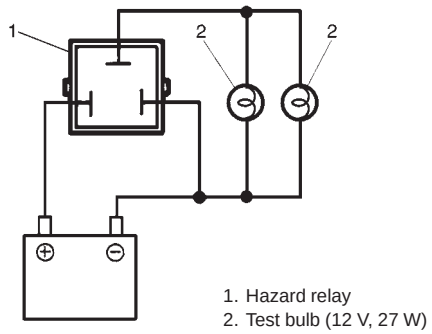
LH steering vehicle shown



1. Master cylinder
2. Fuse box
3. Hazard relay

HAZARD RELAY

The turn signal/hazard relay is located near the fuse box.

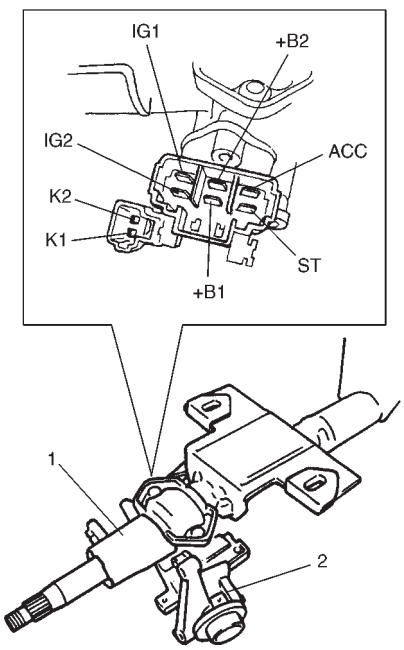


1. Hazard relay
2. Test bulb (12 V, 27 W)

INSPECTION

Connect battery and two test bulbs (12 V, 27 W) as shown.
Unless a continued flash on and off is visible, replace relay.

Reference flashing cycle: 60 – 120 cycle/minute



1. Steering column assembly
2. Ignition switch

IGNITION SWITCH

INSPECTION

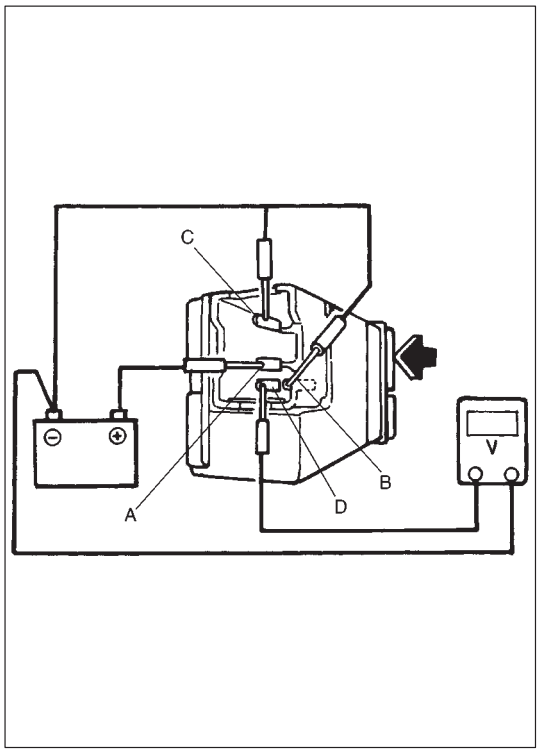
1) Disconnect negative cable at battery.
2) Remove steering column upper and lower cover.
3) Disconnect wiring main harness coupler from ignition switch.
4) Use an ohmmeter to check the continuity at each switch position. If any continuity is not obtained, replace main switch.

Terminal / key	Position	+B1	+B2	+ACC	IG1	IG2	ST	K1	K2
OUT	LOCK	○							
IN	LOCK	○						○	○
	ACC	○	—	○					
	ON	○	○	○	○	○			
	START	○	○	—	○	—	○		

ACC : Accessory

REMOVAL AND INSTALLATION

Refer to STEERING LOCK ASSEMBLY (IGNITION SWITCH) in Section 3C.

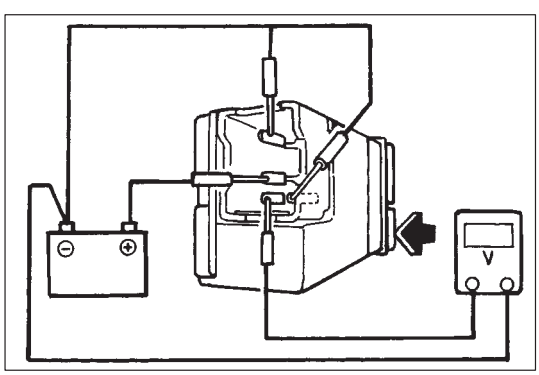


REAR FOG LIGHT (IF EQUIPPED)

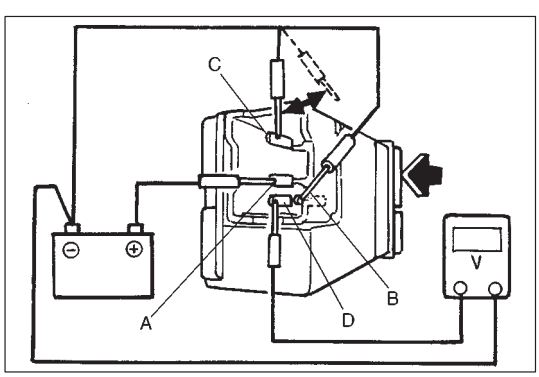
REAR FOG LIGHT SWITCH

INSPECTION

1) Connect battery positive (+) lead to terminal (A) and negative (–) lead to terminal (B), (C).
2) Connect voltmeter positive (+) lead to terminal (D) and negative lead to negative battery terminal.
3) Push the rear fog light switch to ON.
4) Check that the voltmeter indicates at the battery voltage and check light the indicator lamp.
   If not, replace switch.

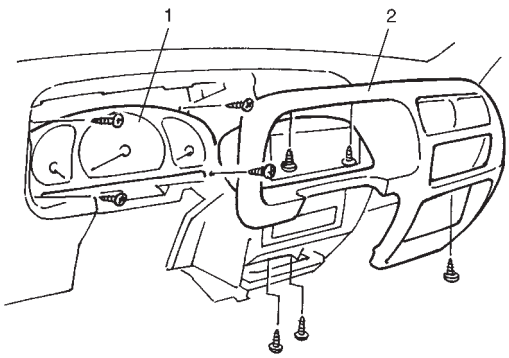


5) Push the OFF button of rear fog switch to off.
6) Check that the voltmeter indicates is 0 V.
   If not, replace switch.



7) Push the rear fog switch to ON.
8) Once disconnect negative lead from terminal (C) and make a second connect to it.
9) Check that the voltmeter indicates is 0 V.
   If not, replace switch.

LH steering vehicle shown



1. Combination meter
2. Cluster panel

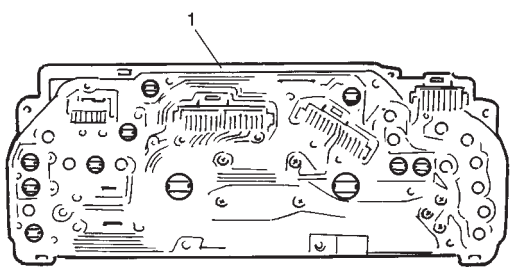
COMBINATION METER

REMOVAL

1) Disconnect negative cable at battery.
2) Loosen steering column mounting screws and nuts. (Refer to "STEERING WHEEL AND COLUMN" section.)
3) Remove meter cluster panel. Make sure to disconnect all couplers of switches and wires of cigarette lighter on meter cluster.
4) Disconnect couplers from combination meter.
   Remove combination meter.

INSTALLATION

Reverse removal procedure for installation.



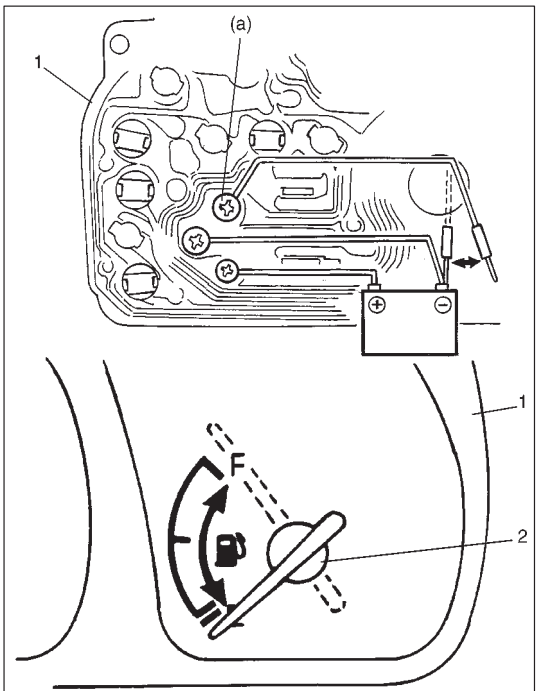
1. Combination meter

INSPECTION

Check printed plate visually for scratch, crack and discoloration. If any of such faulty conditions is found, replace the printed plate.

VEHICLE SPEED SENSOR

Refer to VEHICLE SPEED SENSOR in SECTION 6E of this manual.



1. Combination meter
2. Fuel meter

FUEL METER/FUEL GAUGE UNIT

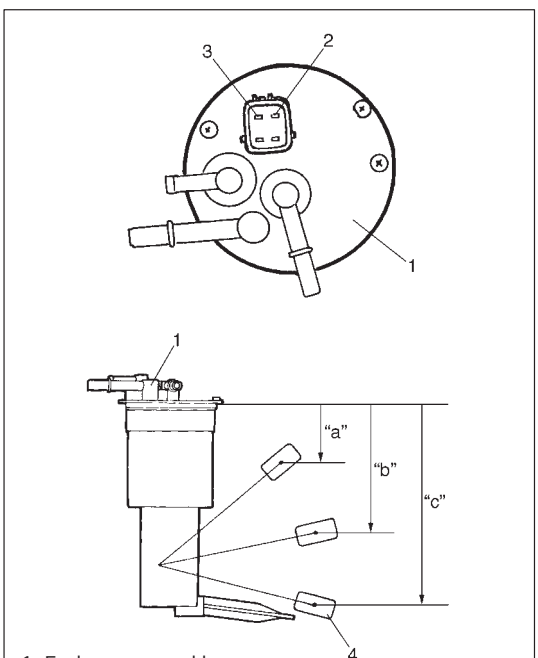
FUEL LEVEL METER

INSPECTION

1) Remove combination meter, refer to combination meter in this section.
2) Connect battery terminals to combination meter terminals as shown.
3) Check that the fuel level meter operates as shown.

Terminal (a)	meter indicates
open	“E” position
To negative battery terminals	“F” position

If not, replace fuel level meter.



1. Fuel pump assembly
2. Fuel level gauge ⊕ terminal
3. Fuel level gauge ⊖ terminal
4. Float

FUEL SENDER GAUGE

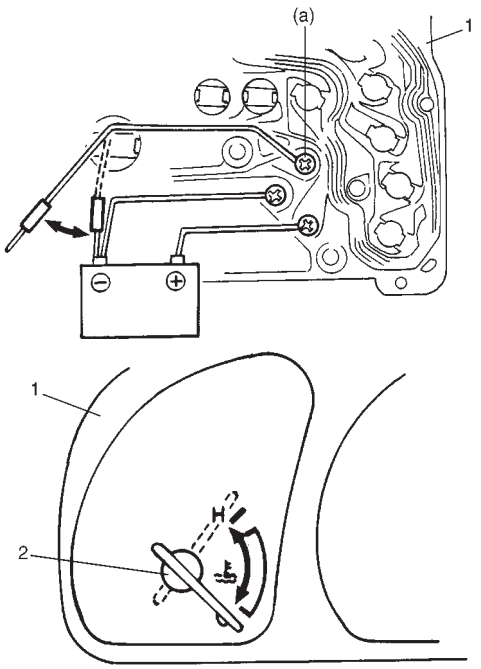
INSPECTION

Remove fuel pump assembly referring to Section 6C of this manual.

Use an ohmmeter to confirm that resistance of sender gauge unit changes with change of float position.

Float Position		Resistance (Ω)
Full Upper “a”	103.7 mm (4.08 in.)	2 - 4
Middle (1/2) “b”	153.9 mm (6.06 in.)	29.5 - 35.5
Full Lower “c”	218.1 mm (8.59 in.)	119 - 121

If the measured value is out of specification, replace.



1. Combination meter
2. Temperature meter

ENGINE COOLANT TEMPERATURE METER AND SENSOR UNIT

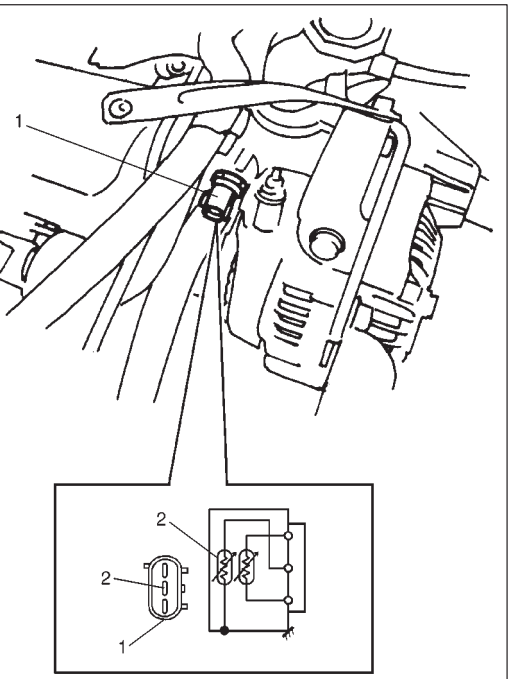
ENGINE COOLANT TEMPERATURE METER

INSPECTION

1) Remove combination meter, refer to combination meter in this section.
2) Connect battery terminals to combination meter terminals as shown.
3) Check that the engine coolant temperature meter operates as shown.

Terminal (a)	meter indicates
open	“C” position
To negative battery terminals	“H” position

If not, replace engine coolant temperature meter.



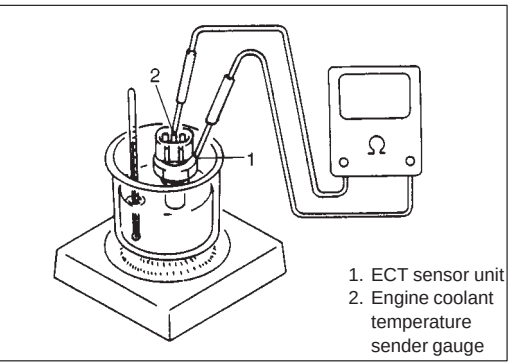
1. ECT sensor unit
2. Engine coolant temperature sender gauge

ENGINE COOLANT TEMPERATURE SENSOR

REMOVAL

WARNING:
- **Make sure that engine coolant temperature is cold before removing any part of cooling system.**
- **Also be sure to disconnect negative cable from battery terminal before removing any part.**

1) Drain coolant.
2) Remove ECT sensor.

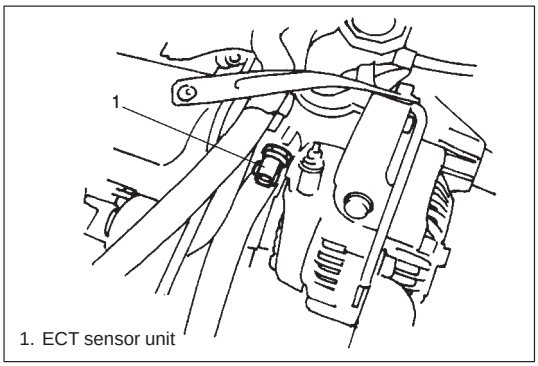


1. ECT sensor unit
2. Engine coolant temperature sender gauge

INSPECTION

Warm up sender gauge. Thus make sure its resistance is decreased with increase of its temperature.

Temperature	Resistance
50°C (122°F)	136 - 216 Ω
120°C (248°F)	16.4 - 19.4 Ω

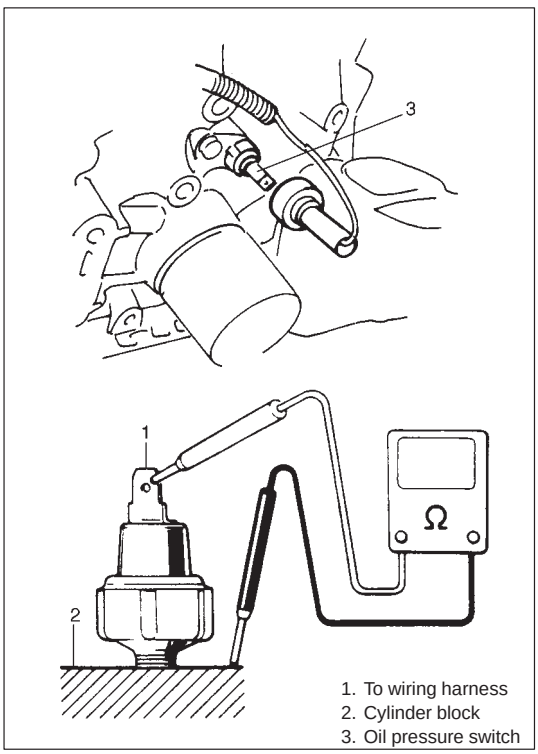


1. ECT sensor unit

INSTALLATION
Reverse removal procedure for installation noting the following:
Apply sealant to the thread of ECT sensor.

Sealant 99000 - 31150

Tightening Torque
(a) : 15 N·m (1.5 kg-m, 10.8 lb-ft)



1. To wiring harness
2. Cylinder block
3. Oil pressure switch

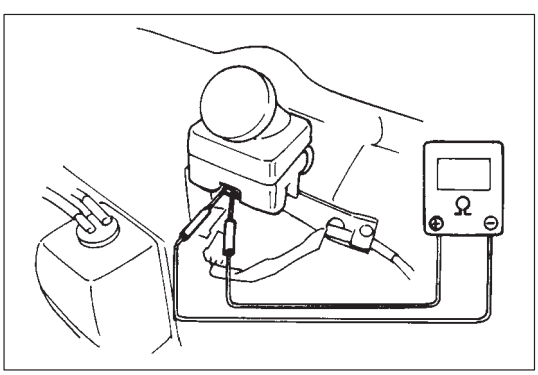
OIL PRESSURE WARNING LIGHT

OIL PRESSURE SWITCH

INSPECTION
Use an ohmmeter to check switch continuity.

During Engine Running	No continuity (∞ Ω)
At Engine Stop	Continuity (0 Ω)

REMOVAL AND INSTALLATION
Refer to Section 6A OIL PRESSURE CHECK in this manual.

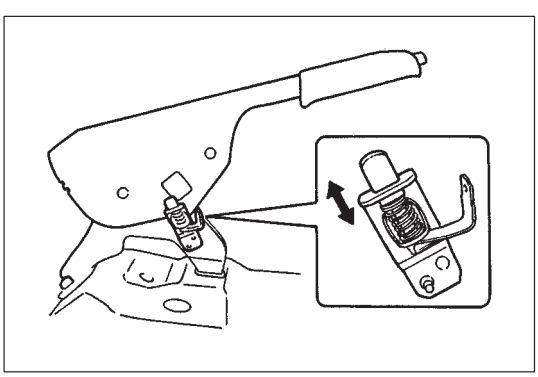


BRAKE AND PARKING BRAKE WARNING LIGHT

BRAKE FLUID LEVEL SWITCH

INSPECTION
Use an ohmmeter to check switch for continuity.
If found defective, replace switch.

OFF position (float up)	No continuity
ON position (float down)	Continuity



PARKING BRAKE SWITCH

INSPECTION
Use an ohmmeter to check switch for continuity.
If found defective, replace switch.

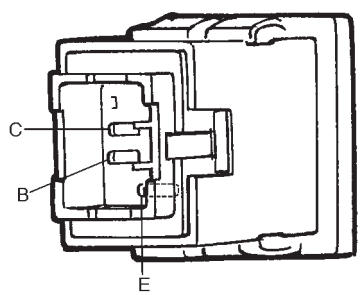
OFF position (parking brake released)	No continuity
ON position (parking brake lever pulled up)	Continuity

SEAT BELT WARNING LIGHT (IF EQUIPPED)

SEAT BELT SWITCH

INSPECTION

Refer to “SEAT BELT” section.



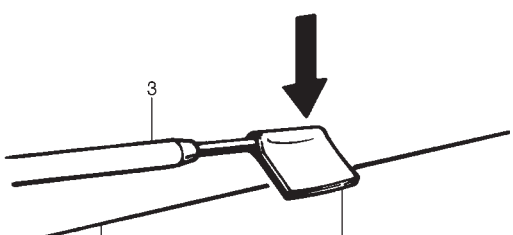
REAR WINDOW DEFOGGER (IF EQUIPPED)

DEFOGGER SWITCH

INSPECTION

Use a circuit tester to check defogger switch for continuity.
If switch has no continuity between terminals, replace it.

Terminal / Defogger SW	C	B	E
OFF		○ — (M)	○
ON	○	○ — (M)	○



1. Heat wire
2. Tin foil
3. Tester probe

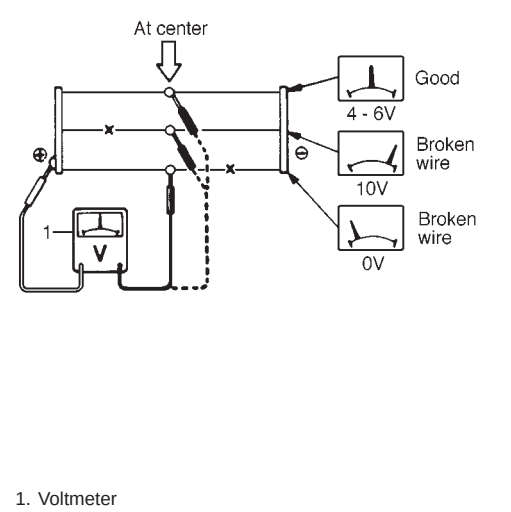
DEFOGGER WIRE

INSPECTION

NOTE:

- **When cleaning rear window glass, use a dry cloth to wipe it along wire direction.**
- **When cleaning glass, do not use detergent or abrassive-containing glass cleaner.**
- **When measuring wire voltage, use a tester with negative probe wrapped with a tin foil which should be held down on wire by finger pressure.**

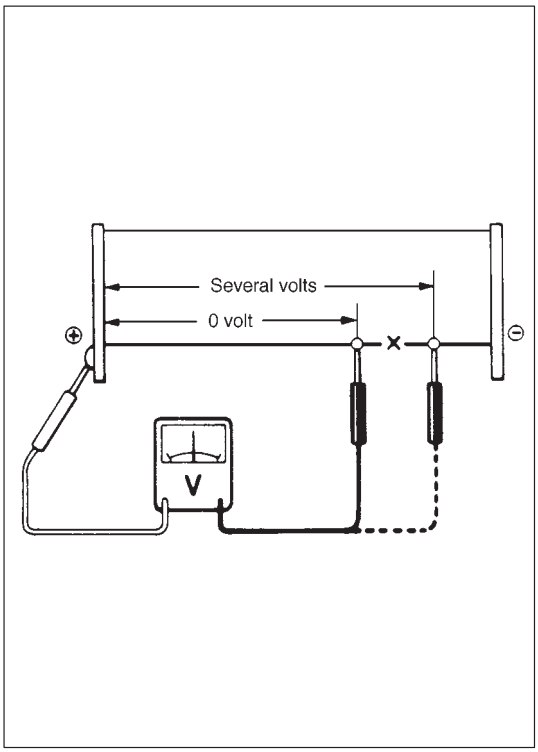
1) Checking wire damage
   a. Turn ignition switch ON.
   b. Turn defogger switch ON.
   c. Use a voltmeter to check voltage at the center of each heat wire, as shown.



1. Voltmeter

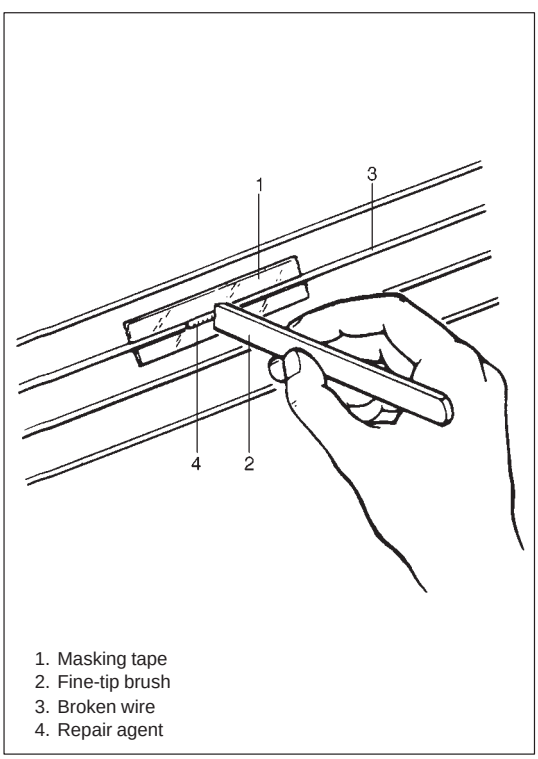
Voltage	Criteria
Approx. 5V	Good (No break in wire)
Approx. 10V or 0V	Broken wire

If measured voltage is 10V, wire must be damaged between its center and positive end. If voltage is zero, wire must be damaged between its center and ground.



2) Locating damage in wire
   a. Touch voltmeter positive (+) lead to heat wire positive terminal end.
   b. Touch voltmeter negative (–) lead with a foil strip to heat wire positive terminal end, then move it along wire to the negative terminal end.
   c. The place where voltmeter fluctuates from zero to several volts is where there is damage.

NOTE:
If heat wire is free from damage, voltmeter should indicate 12V at heat wire positive terminal end and its indication should decrease gradually toward zero at the other terminal (ground).



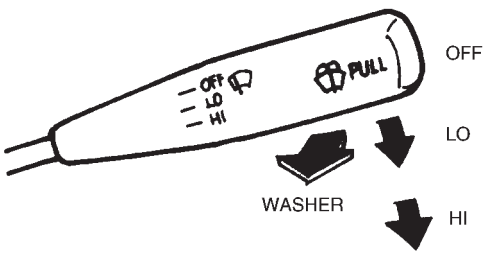
1. Masking tape
2. Fine-tip brush
3. Broken wire
4. Repair agent

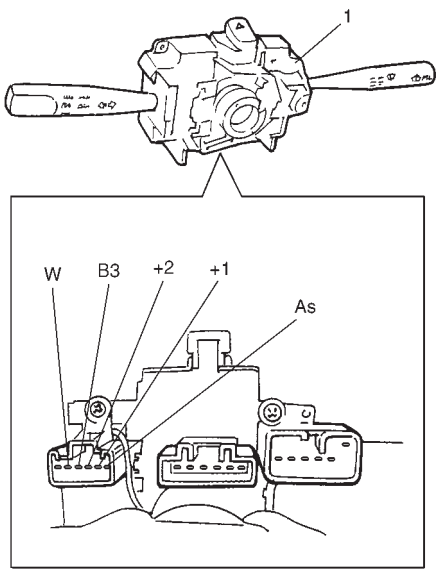
DEFOGGER CIRCUIT

REPAIR

1) Clean glass with white gasoline.
2) Apply masking tape at both upper and lower sides of heat wire to be repaired.
3) Apply commercially-available repair agent with a fine-tip brush.
4) Two to three minutes later, remove masking tapes previously applied.
5) Leave repaired heat wire as it is for at least 24 hours before operating defogger again.

LH steering vehicle shown





1. Combination switch assembly

WINDSHIELD WIPER AND WASHER

WIPER/WASHER SWITCH

Removal and Installation

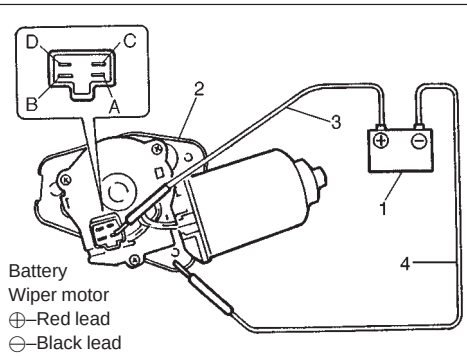
Refer to “STEERING WHEEL AND COLUMN” section for details.

Inspection

Use a circuit tester to check the continuity at each switch position as shown below.

Terminal / Wire Color / Wiper SW	B3	+2	+1	As
	Y/BI	BI/R	BI	BI/W
OFF			○——○	
LO	○———		○———	
HI	○———	○———		

Terminal / Wire Color / Washer SW	B3	W
	Y/BI	BI/B
OFF		
ON	○———	○———

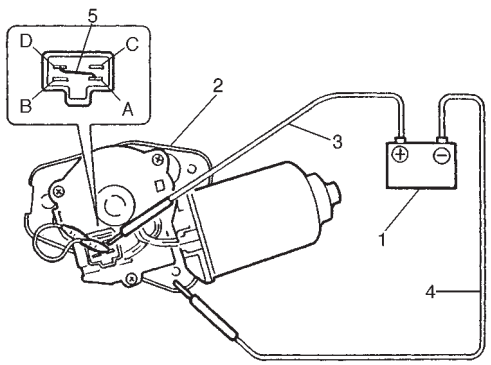


1. Battery
2. Wiper motor
3. ⊕–Red lead
4. ⊖–Black lead

WIPER MOTOR

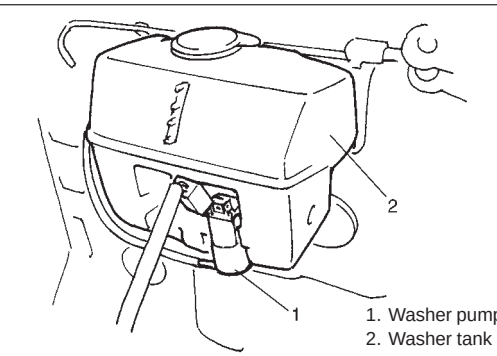
Inspection

1) As illustrated left, have a 12V battery and connect its (+) terminal to terminal “A”, and its (–) terminal to bracket (wiper ground). If motor rotates at a low revolution speed of 44 to 52 rpm, it is proper. As for high speed check, connect battery (+) terminal to terminal “B”, and its (–) terminal to bracket (wiper ground). If motor rotates at a high revolution speed of 64 to 78 rpm, it is proper.



1. Battery
2. Wiper motor
3. ⊕–Red lead
4. ⊖–Black lead
5. Jumper

2) Testing automatic stop action
   a) Connect 12V battery (+) terminal to terminal "A" of wiper motor and (–) terminal to bracket (wiper ground) and let the motor turn.
   b) Disconnect terminal "A" from battery, and let the motor stop.
   c) Connect terminal "A" and "D" with a jumper wire, and connect terminal "C" to battery (+) terminal. Observe the motor turns once again then stops at a given position.
   d) Repeat a) thru c) several times and inspect if the motor stops at the given position every time.

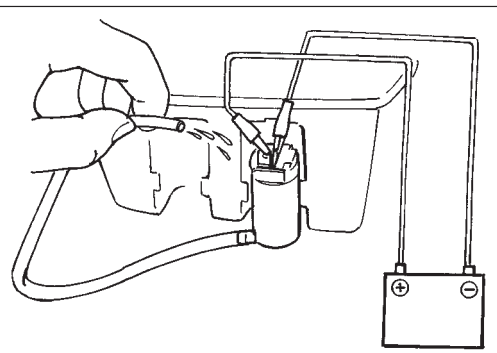


1. Washer pump
2. Washer tank

WASHER PUMP

Removal

1) Disconnect battery (–) cable.
2) Remove washer tank fitting screws.
3) Disconnect pump lead wire coupler and hose.
4) Remove washer tank.
5) Remove pump from tank.



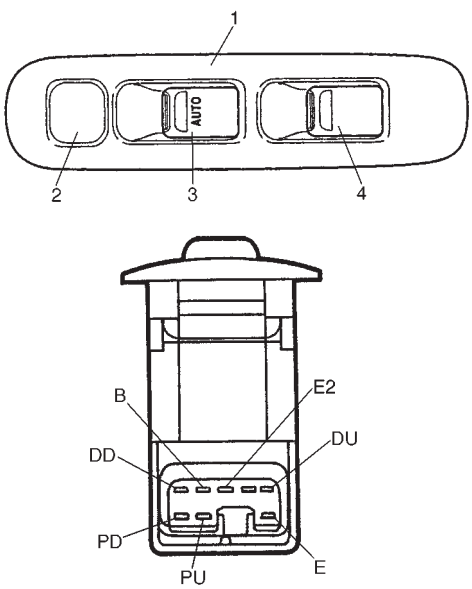
Inspection

Connect battery (+) and (–) terminals to pump (+) and (–) terminals respectively to check pumping rate.
Check for washer pump.
Reference pumping Rate: more than 1.0 l/min
(2.1 US pt./min, 1.76 Imp pt./min)

Installation

Reverse removal procedure for installation.

POWER WINDOW CONTROL SYSTEM (IF EQUIPPED)

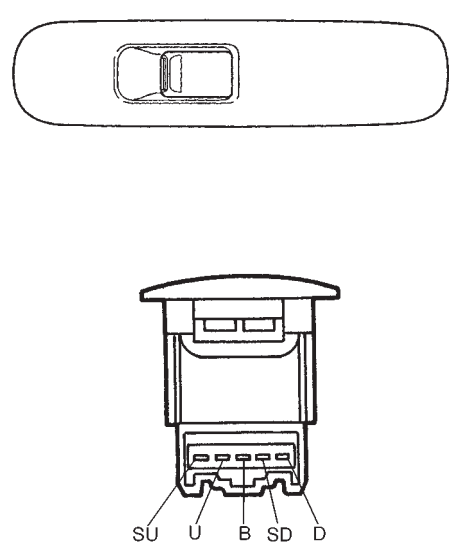


1. Power window main switch
2. Power window lock switch
3. Driver side window switch
4. Passenger side window switch

Power Window Main Switch

Inspect switch continuity between terminals.

Switch Position			Driver Side Window Switch				Passenger Side Window Switch			
Terminal			B	E	DU	DD	B	E	PU	PD
Power Window Lock Switch	OFF	UP	○	○	○	○	○	○	○	○
		OFF		○	○	○		○	○	○
		DOWN	○	○	○	○	○	○	○	○
	ON	UP	○	○	○	○	○	○	○	
		OFF		○	○	○			○	○
		DOWN	○	○		○	○			○

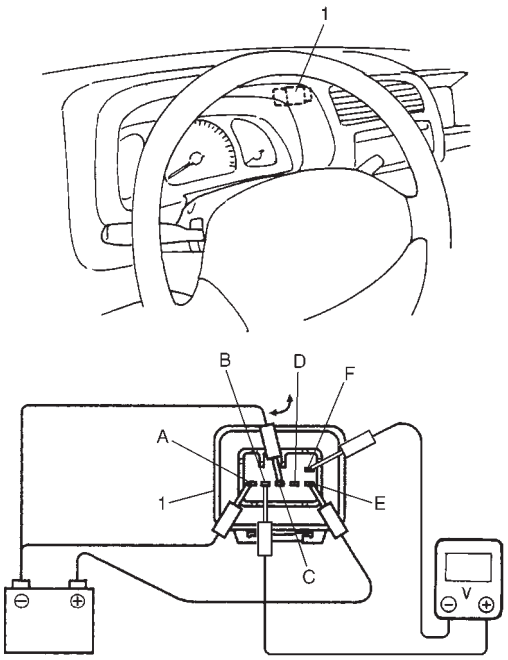


Power Window Sub Switch

Inspect switch continuity between terminal.

Switch Position \ Terminal	B	SD	SU	D	U
UP		○		○	
	○				○
OFF		○		○	
			○		○
DOWN	○			○	
			○		○

LH steering vehicle shown



1. Power door lock controller

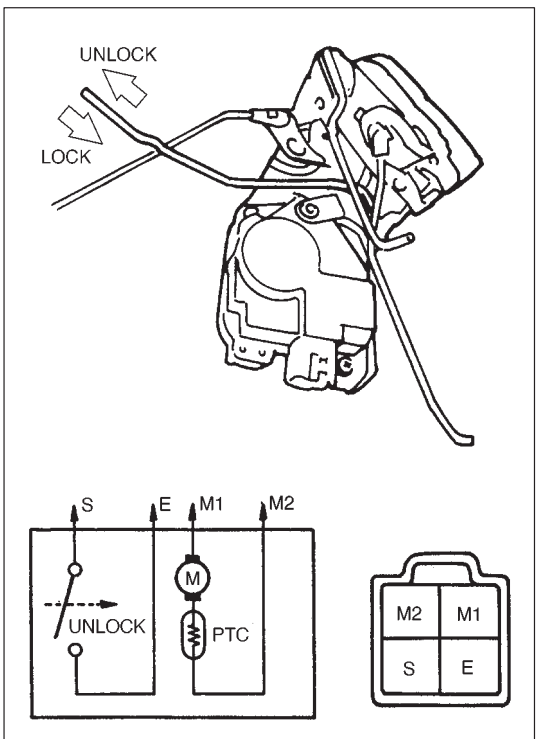
POWER DOOR LOCK SYSTEM

Power Door Lock Controller

INSPECTION

1) Remove door lock controller from vehicle. Disconnect coupler from door lock controller. Connect door lock controller terminal to 12V battery as shown.
2) Connect voltmeter as shown.
3) Connect the terminal (C) with the negative battery terminal and check the voltage indicated on the voltmeter at the moment of connection. Also, disconnect it and check the voltage at the moment of disconnection.
   The voltage values should be as listed in the table below.

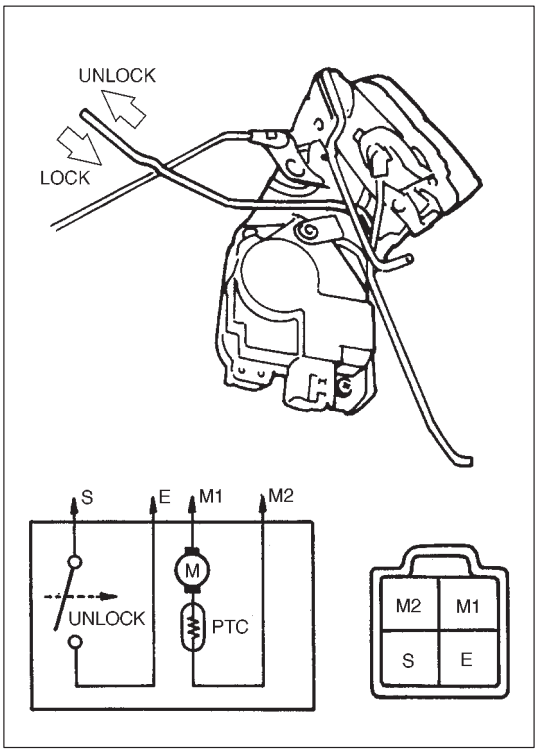
Terminal C	Open	Ground
Indication	+	–



KEY CYLINDER SWITCH (Drivers side)

Inspect continuity at terminals according to the key action.

Key \ Terminal	S	E
LOCK		
UNLOCK	○	○

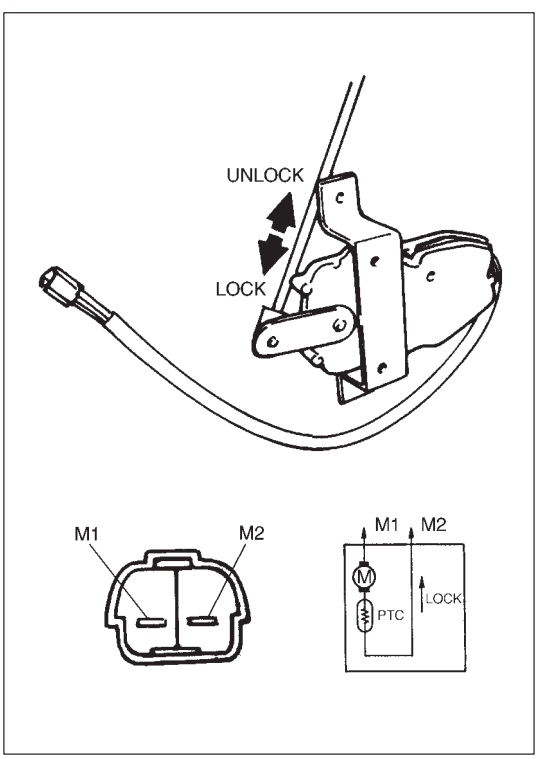


POWER DOOR LOCK ACTUATOR

1) Disconnect power door lock actuator coupler.
2) Connect 12V battery positive and negative terminals to the door lock actuator terminals shown below.
   If it does not follow the table's operation, replace the faulty door lock actuator.

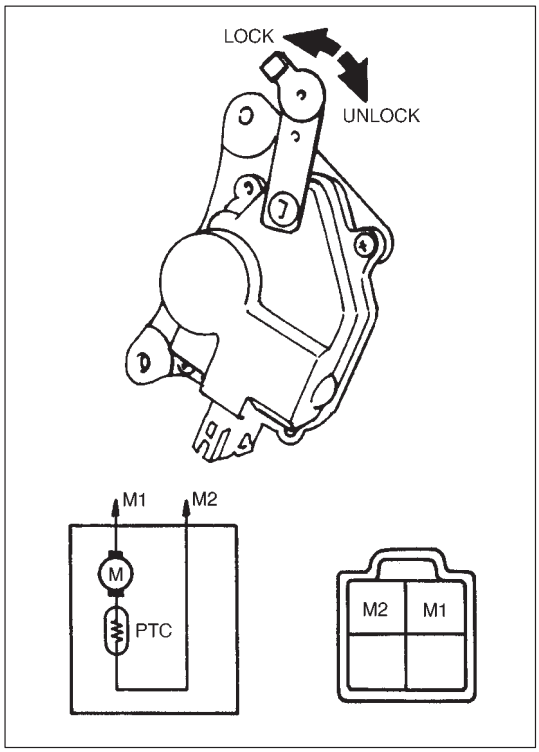
Front Door

Operation / Terminal	UNLOCK		LOCK	
	RH	LH	RH	LH
M1	⊕	⊖	⊖	⊕
M2	⊖	⊕	⊕	⊖



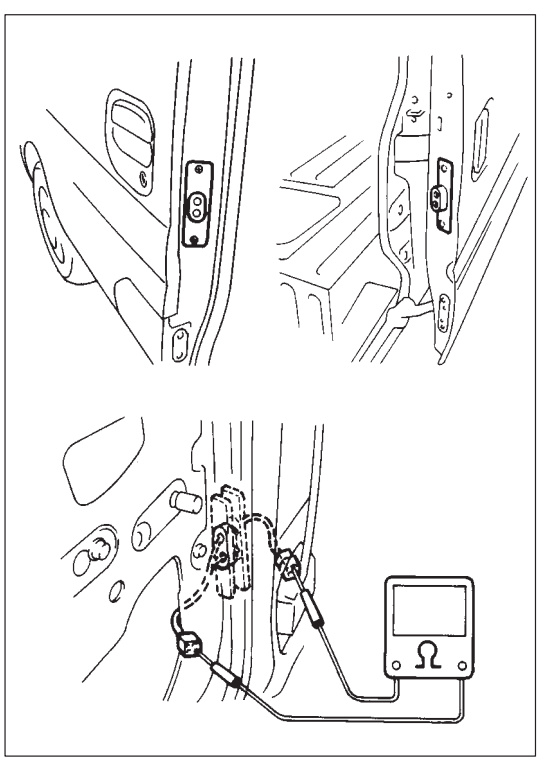
Back Door

Operation / Terminal	UNLOCK	LOCK
M1	⊖	⊕
M2	⊕	⊖



Rear Door

Terminal \ Operation		UNLOCK	LOCK
RIGHT SIDE Door	M1	–	+
	M2	+	–
LEFT SIDE Door	M1	+	–
	M2	–	+

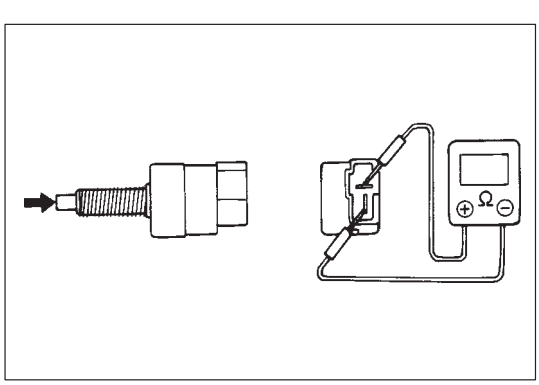


REAR DOOR JUNCTION SWITCH

INSPECTION

1) Disconnect negative (–) cable at battery.
2) Remove door trim and center pillar lower trim as necessary.
3) Disconnect body side coupler and door side coupler of rear door junction switch.
4) Close rear door.
5) As shown in the figure, check that there is continuity between terminals of the same wire color.

   If not, replace junction switch.

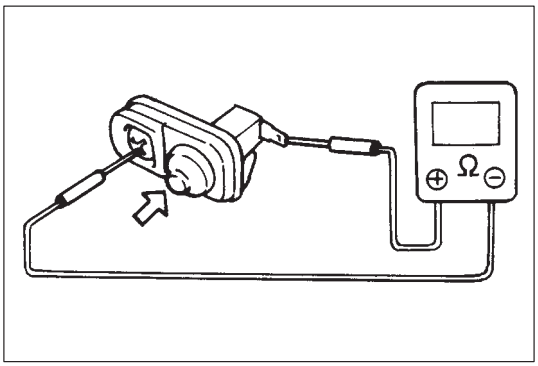


STOP LAMP SWITCH

INSPECTION

Use an ohmmeter to check switch for continuity.
If found defective, replace switch.

Switch slider pushed ON	No continuity
Switch slider released OFF	Continuity



DOOR SWITCH

INSPECTION

Disconnect door switch coupler and check switch for continuity. If found defective, replace switch.

ON position (door switch released OFF)	Continuity
OFF position (door switch pushed ON)	No continuity

SECTION 9

BODY SERVICE

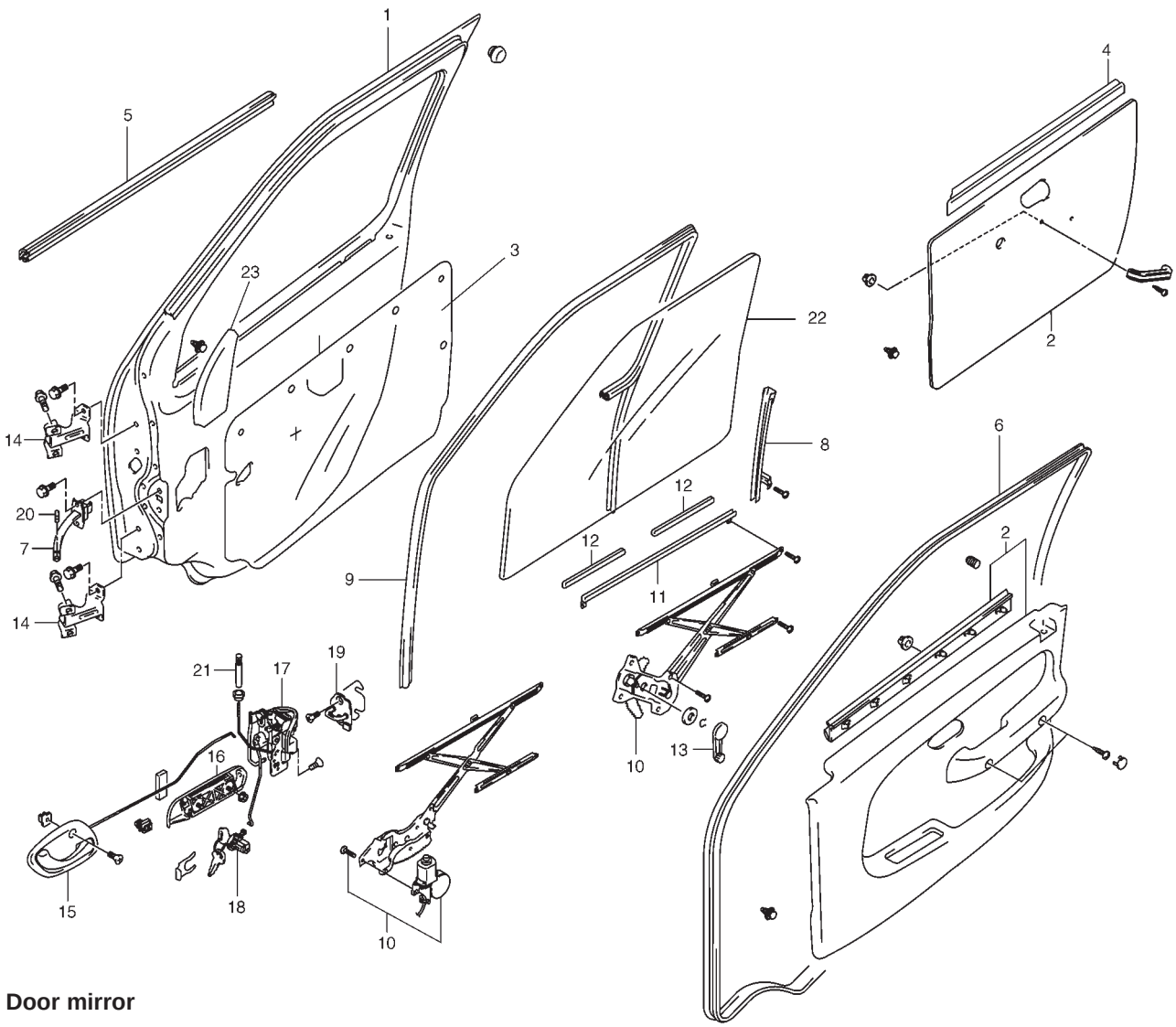
WARNING:
For vehicles equipped with Supplemental Restraint (Air Bag) System:

- **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 of 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 of 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 negative cable is disconnected from the battery. Otherwise, the system may be activated by reserve energy in the Sensing and Diagnostic Module (SDM).**

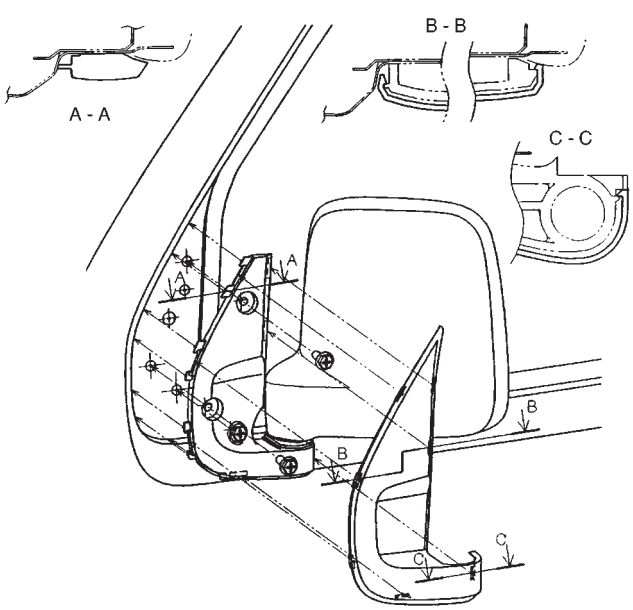
CONTENTS

ON-VEHICLE SERVICE

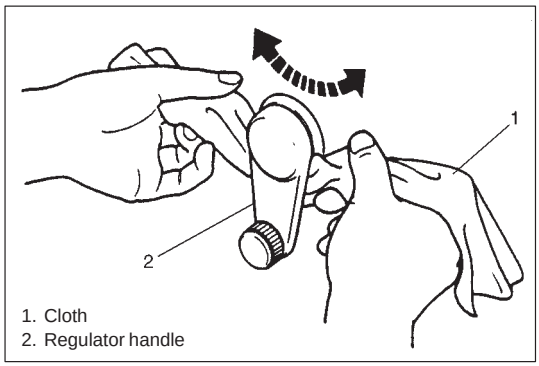
FRONT DOOR



Door mirror



1. Door panel
2. Door trim
3. Door sealing cover
4. Door inner weatherstrip
5. Door outer weatherstrip
6. Door opening weatherstrip
7. Door opening stopper
8. Door rear sash
9. Glass run
10. Window regulator assembly
11. Bottom channel
12. Channel rubber
13. Window regulator handle
14. Door hinge
15. Door inside handle assembly
16. Door outside handle assembly
17. Door latch assembly
18. Door lock key cylinder
19. Door striker
20. Door open stopper pin
21. Inside lock knob
22. Window glass
23. Door inner garnish

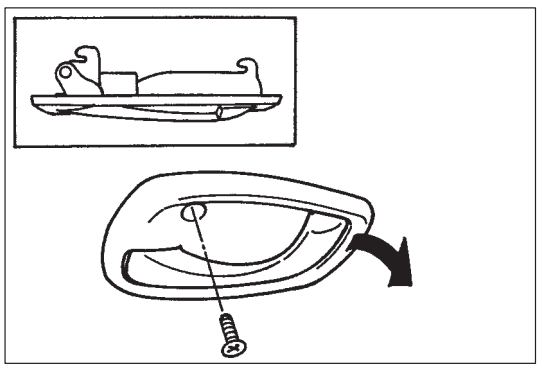


1. Cloth
2. Regulator handle

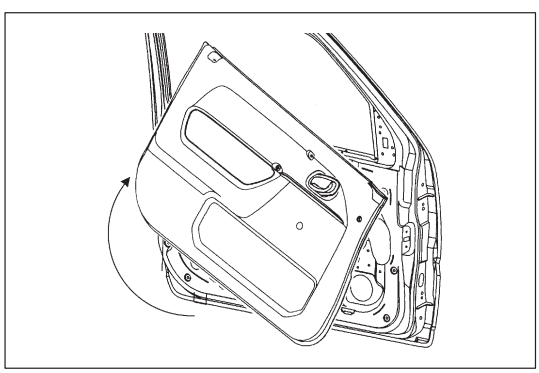
FRONT DOOR GLASS AND WINDOW REGULATOR

REMOVAL

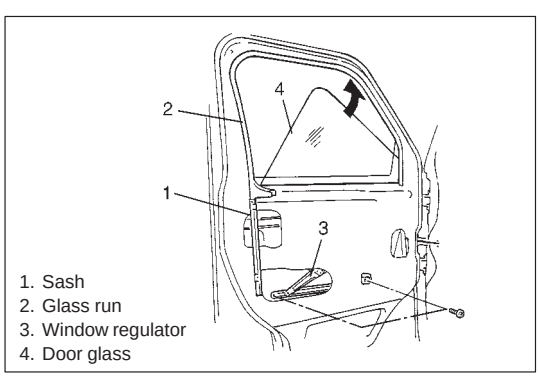
1) Remove window regulator handle (if equipped).
   For its removal, pull off snap by using a cloth as shown.
2) Lower door glass fully.



3) Remove screw and then inside handle assembly from door trim by sliding it forward.
4) Remove door inner weatherstrip (if equipped).
5) Remove door mirror garnish and clips.
6) Remove inside lock knob, door handle or armrest fitting screw (if necessary).

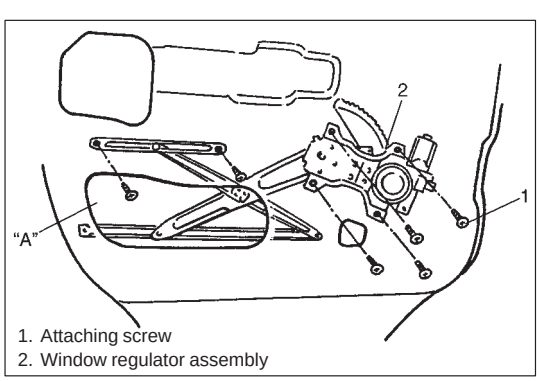


7) With inside handle bezel tilted as shown in the figure, turn door trim 90° to remove it.
   And disconnect power window switch lead wire at coupler (if equipped).



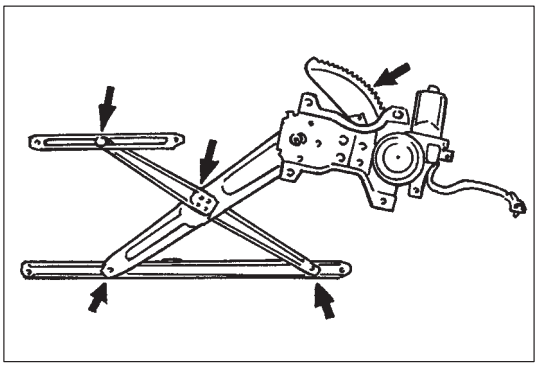
1. Sash
2. Glass run
3. Window regulator
4. Door glass

8) Remove door sealing cover.
9) Remove glass run rear part.
10) Remove glass bottom channel attaching screws.
11) Take out door glass.



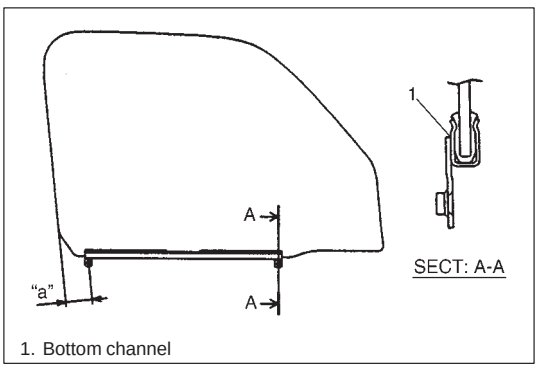
1. Attaching screw
2. Window regulator assembly

12) Remove window regulator attaching screws (six pcs.).
    Then, take out regulator through hole "A".



INSPECTION

- Check regulator sliding and rotating parts for greasing.
- Check gear for wear or damage.
- Check links for damage.



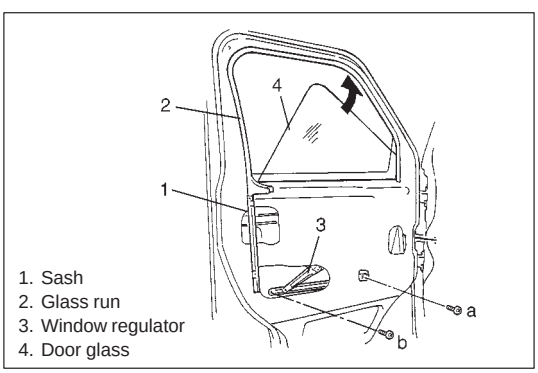
1. Bottom channel

INSTALLATION

Reverse removal procedure to install front door glass and window regulator noting following points.

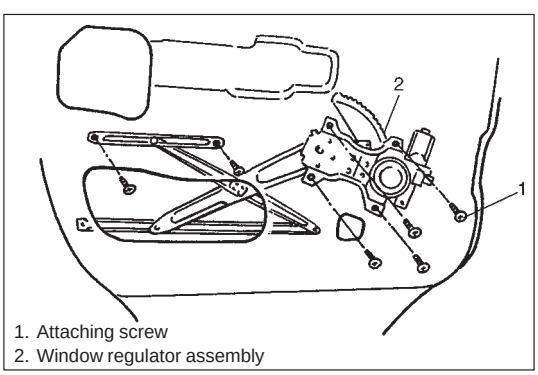
- When installing glass to bottom channel, coat channel with soap water and tap it with a plastic hammer.
  Glass-fitted position of bottom channel is as shown in the figure.

  Length "a": 56.5 – 60.5 mm (2.22 – 2.38 in.)



1. Sash
2. Glass run
3. Window regulator
4. Door glass

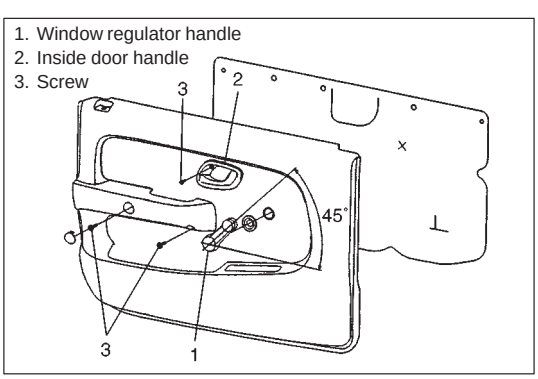
- Tighten channel attaching screw in alphabetical order as shown in the figure.



1. Attaching screw
2. Window regulator assembly

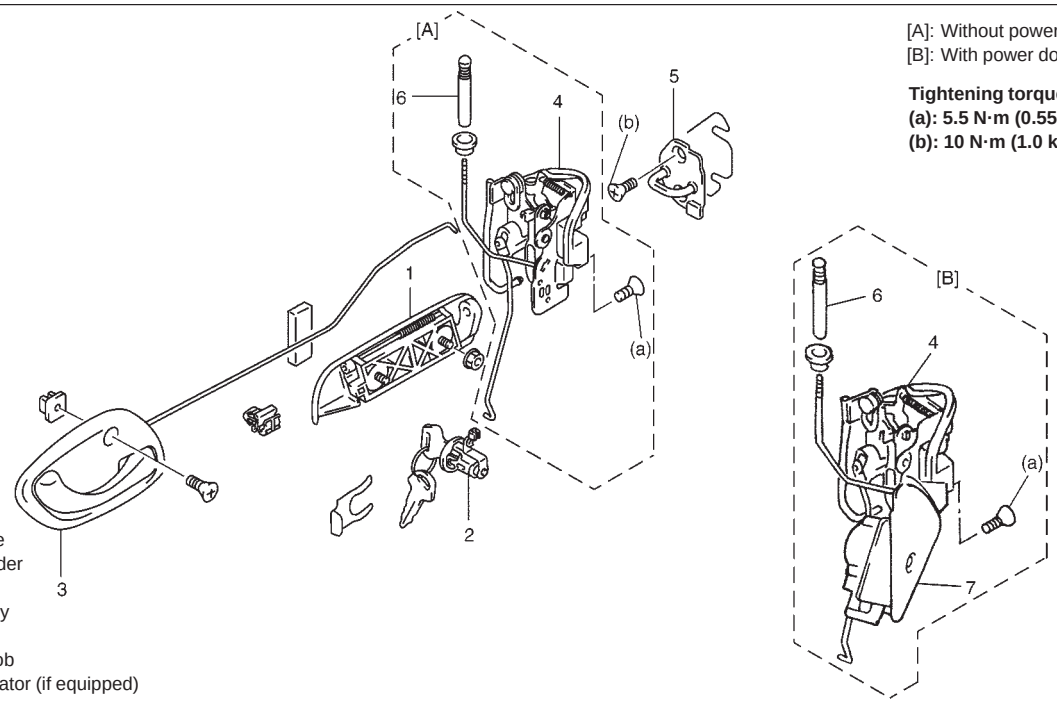
- When installing glass, check that the top part of the glass contacts the glass run evenly and that the glass moves up and down smoothly.
  If the glass is tilted with respect to the glass run, make a fine adjustment with the screws in the figure.
- Securely seal door sealing cover with adhesive.

1. Window regulator handle
2. Inside door handle
3. Screw



- Install door window regulator handle so that it has a 45° angle when glass is fully closed.

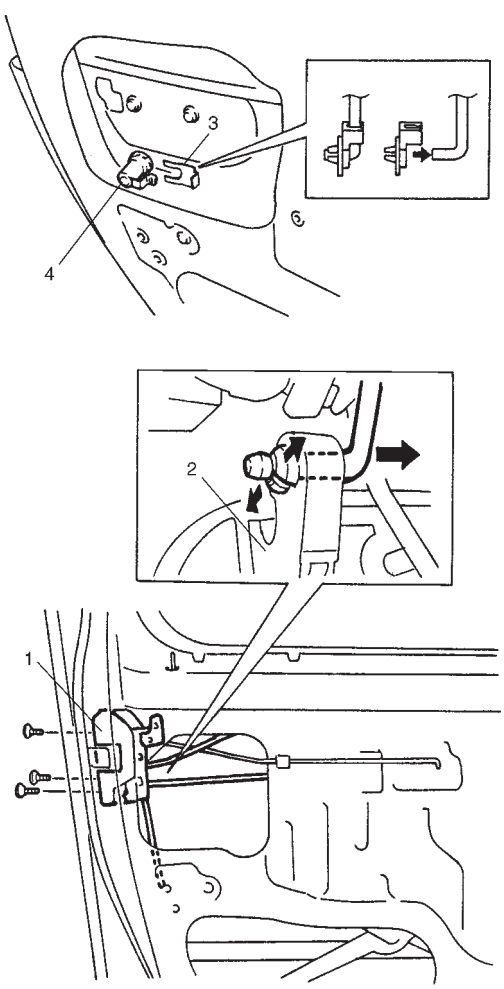
FRONT DOOR LOCK



[A]: Without power door lock
[B]: With power door lock

Tightening torque:
(a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)
(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)

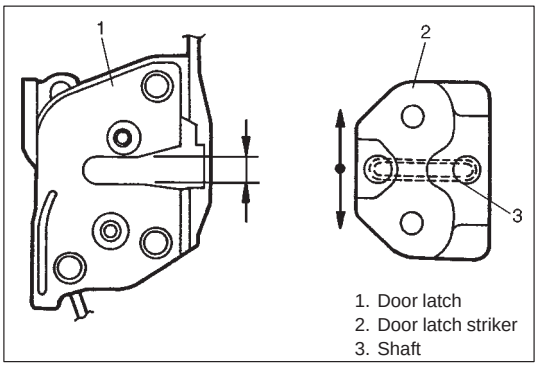
1. Outside handle
2. Lock key cylinder
3. Inside handle
4. Latch assembly
5. Latch striker
6. Inside look knob
7. Door lock actuator (if equipped)



1. Door latch
2. Outside handle
3. Retainer
4. Key cylinder

REMOVAL

1) Raise window all the way up.
2) Remove window regulator handle (if equipped), door inner garnish, door trim, power window switch (if equipped), door sealing cover and door rear sash (refer to FRONT DOOR GLASS AND WINDOW REGULATOR REMOVAL).
3) After disconnecting each joint of control link and connector of door lock actuator, remove door outside handle and door latch ass'y.



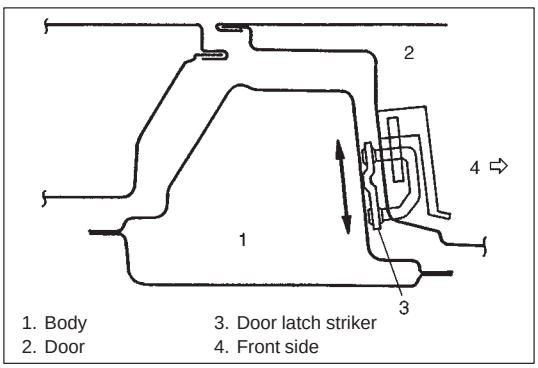
1. Door latch
2. Door latch striker
3. Shaft

INSTALLATION

Reverse removal sequence for installation while using care for following items.

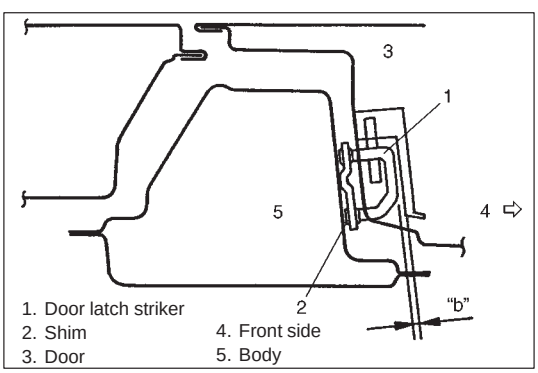
- Install door latch striker.
  Move door latch striker up and down so that its shaft approximately aligns with the center of groove of door latch.

  NOTE:
  Striker should be placed level and moved vertically. Do not adjust door latch.



1. Body
2. Door
3. Door latch striker
4. Front side

- Tighten screws to specified torque by referring to the figure on previous page.
- Move door latch striker sideways to adjust to 0 mm (0 in.) the door surface-to-body surface difference with door closed.

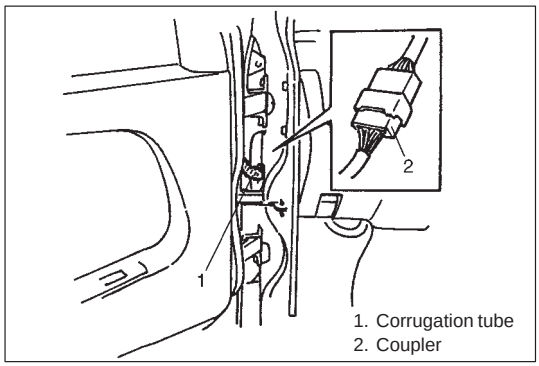


1. Door latch striker
2. Shim
3. Door
4. Front side
5. Body

- In order to correctly obtain door striker position in fore-and-aft direction, increase or decrease number of spacers inserted between body and striker to adjust it. Dimension "b" should be adjusted to specified value.

  Dimension "b": 3.3 – 5.3 mm (0.12 – 0.2 in.)

  NOTE:
  Apply oil or grease to striker joints periodically.

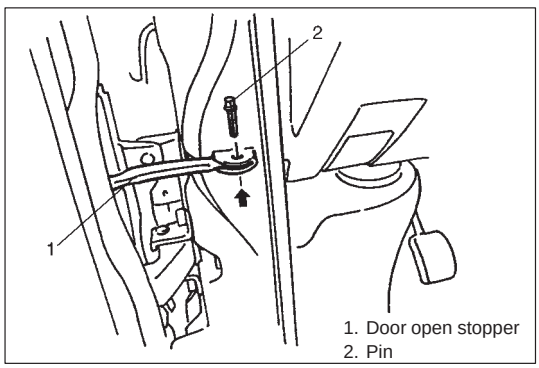


1. Corrugation tube
2. Coupler

FRONT DOOR ASSEMBLY

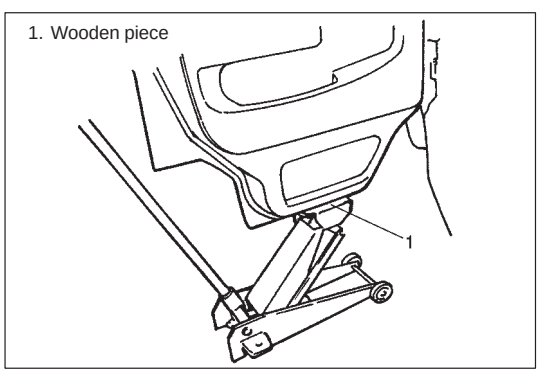
REMOVAL

1) Disconnect door harness couplers, and remove corrugation tube from body (if equipped).

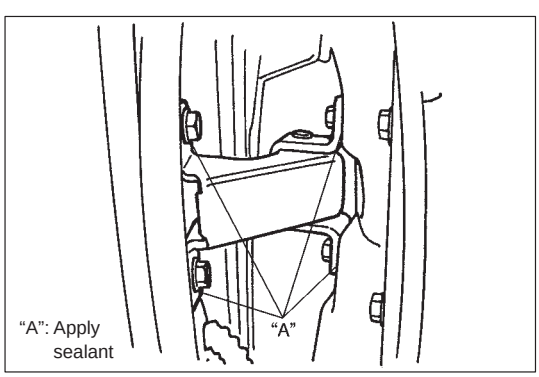


1. Door open stopper
2. Pin

2) Remove stopper pin upward by tapping it with hammer.



3) Using a jack, support door panel with a piece of wood placed between jack and panel.
4) Remove door ass'y by loosening hinge mounting bolts.



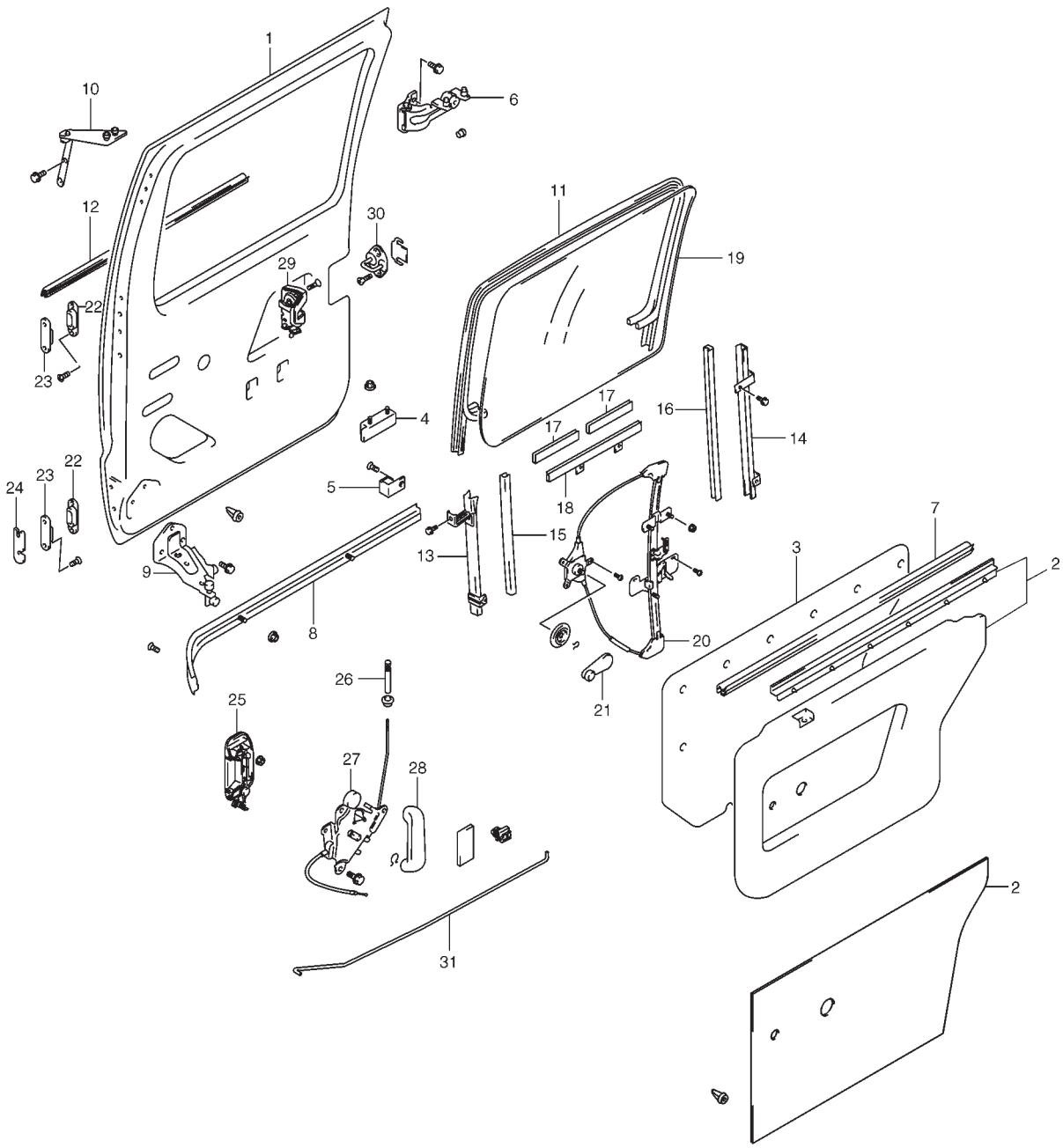
INSTALLATION

Reverse removal sequence to install front door.

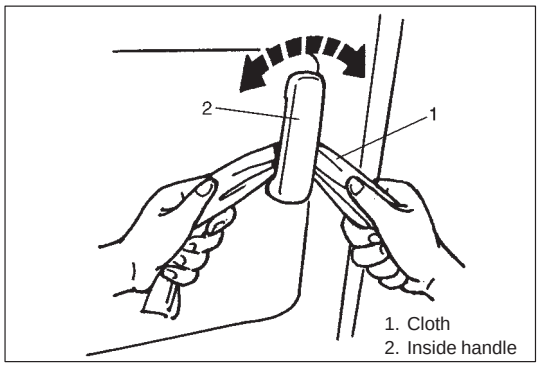
NOTE:
When replacing door, coat replacement door inside with wax for proper anticorrosion treatment.
Refer to RUST PROOF TREATMENT AREA in this section.

- Apply rust proof sealant to hinge installation face shown in the figure and grease to rotating part.
- When weatherstrip is hardened, water leak may develop. In such case, replace it with new one.
- By referring PANEL CLEARANCE, position door correctly then tighten hinge bolts.
- Adjust door latch striker position by referring to FRONT DOOR LOCK INSTALLATION section so that door is positioned correctly.
- Adjust front door cushion so that door contacts body when closed.
- After installation, open and close the door to check looseness. Replace door open stopper pin when there is looseness.

REAR (SLIDING) DOOR



1. Door panel
2. Door trim
3. Door sealing cover
4. Door open stopper
5. Door hinge stopper
6. Door slide hinge
7. Door inner weather strip
8. Door center guide rail
9. Door lower arm
10. Door upper arm
11. Door upper glass run
12. Door outer weather strip
13. Door front sash
14. Door rear sash
15. Door front glass run
16. Door rear grass run
17. Channel rubber
18. Bottom channel
19. Door glass
20. Window regulator assembly
21. window regulator handle
22. Door stopper (door)
23. Door stopper (body)
24. Door stopper spacer (body)
25. Door outside handle assembly
26. Door lock knob
27. Door link
28. Door inside handle assembly
29. Door latch assembly
30. Door striker
31. Door lock control rod

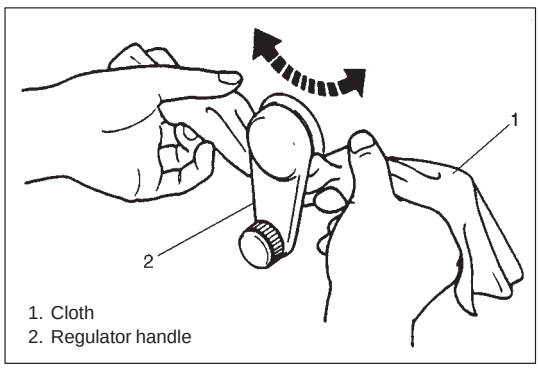


1. Cloth
2. Inside handle

REAR DOOR GLASS AND WINDOW REGULATOR

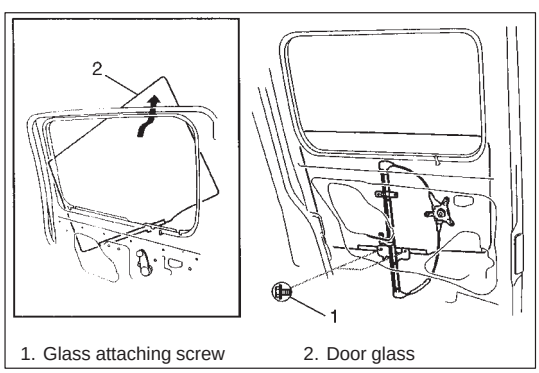
REMOVAL

1) Remove inside handle. For its removal, pull off snap by using a cloth as shown in figure.
2) Remove inside lock knob.
3) Lower glass fully and remove outer weatherstrip.



1. Cloth
2. Regulator handle

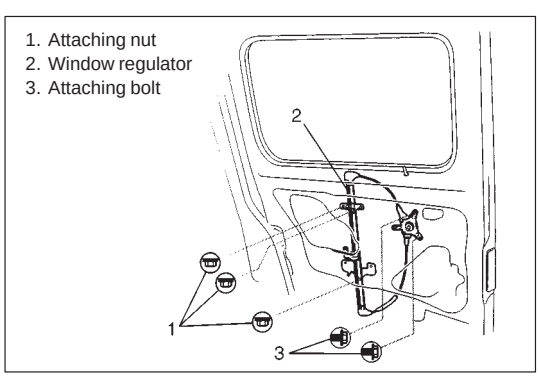
4) Remove window regulator handle (refer to FRONT DOOR GLASS REMOVAL).
5) Remove door trim and inner weather strip (if equipped).
6) Remove door sealing cover.



1. Glass attaching screw
2. Door glass

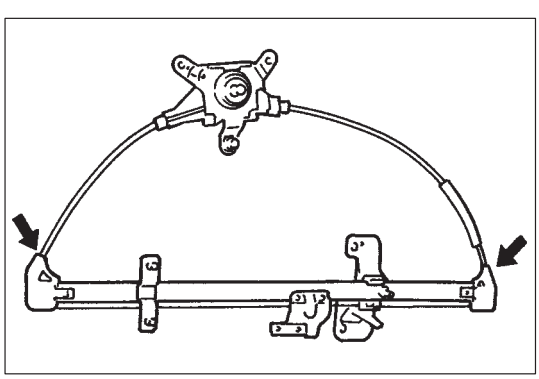
7) Remove door sash.
8) Remove glass run.
9) Remove glass attaching screws.
10) Take out door glass.

NOTE:
Be careful not to damage to the glass.



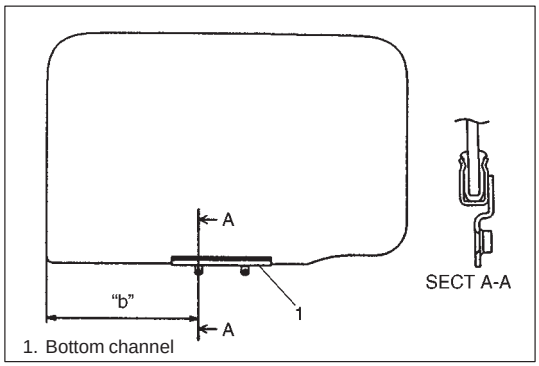
1. Attaching nut
2. Window regulator
3. Attaching bolt

11) Remove window regulator attaching nuts and bolts (six pcs.). Then, take out regulator through hole “A”.



INSPECTION

1) Check regulator sliding and rotating parts for greasing.
2) Check rollers for wear and damage.
3) Check wire for damage.



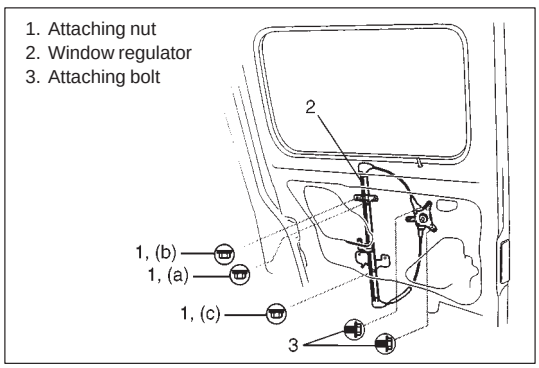
1. Bottom channel

INSTALLATION

Reverse removal procedure to install rear door glass and window regulator noting following points.

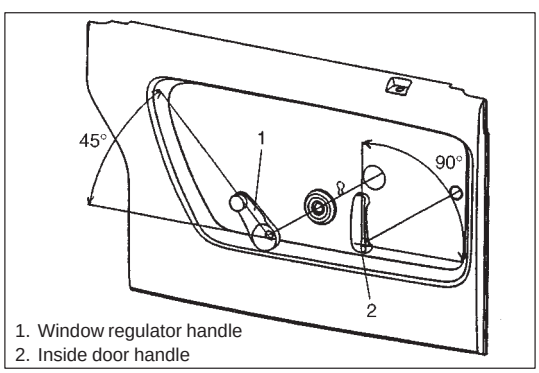
- When installing glass to bottom channel, coat channel with soap water and tap it with a plastic hammer.
  Glass-fitted position of bottom channel is as shown in the figure.

  Length "b": 331.5 – 335.5 mm (13.05 – 13.2 in.)



1. Attaching nut
2. Window regulator
3. Attaching bolt

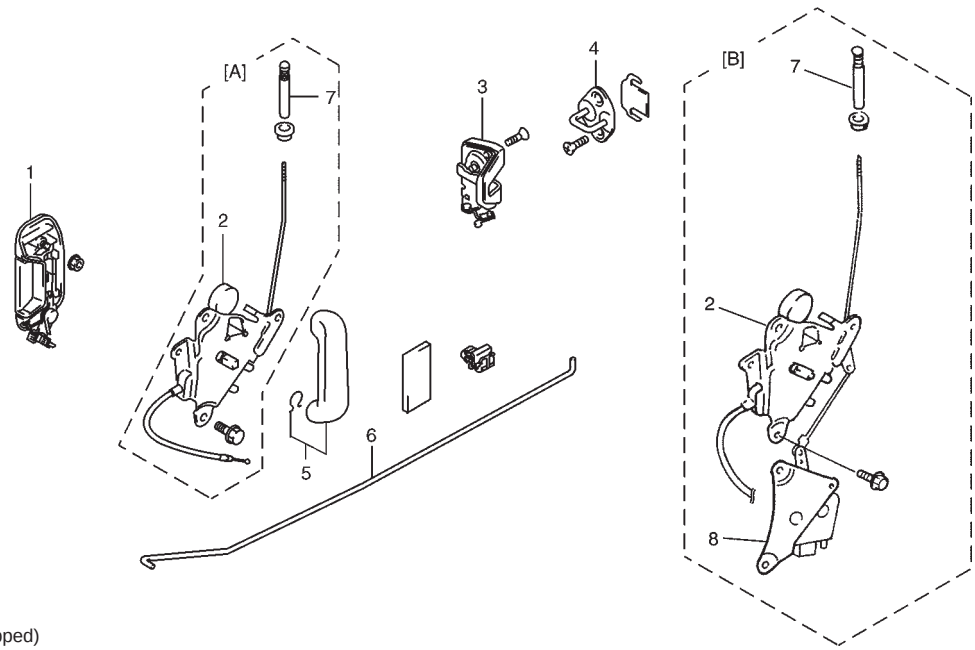
- When installing glass, check that the top part of the glass contacts the glass run evenly and that the glass moves up and down smoothly.
  If the glass is tilted with respect to the glass run, make a fine adjustment with the bolts and nuts in the figure.
- Securely seal door sealing cover with adhesive.
- Tighten nuts in alphabetical order shown in the figure.



1. Window regulator handle
2. Inside door handle

- Install door window regulator handle so that it has a 45° angle when glass is fully closed.

REAR DOOR LOCK

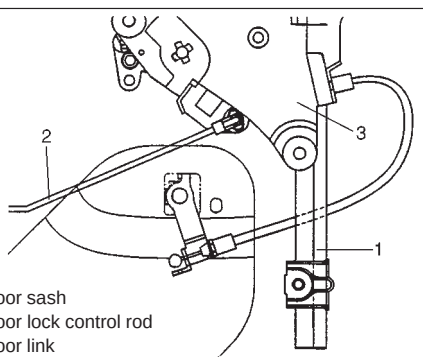


[A]: Without power door lock
[B]: With power door lock

1. Door outside handle
2. Door link ass'y
3. Door latch assembly
4. Door latch striker
5. Door inside handle
6. Door lock control rod
7. Door lock knob
8. Door lock actuator (if equipped)

REMOVAL

1) Raise door glass all the way up.
2) Remove inside handle, window regulator handle, door trim and door sealing cover (refer to REAR DOOR GLASS).
3) After disconnecting each joint of control link and connector of door lock actuator, remove outside handle and door latch ass'y.

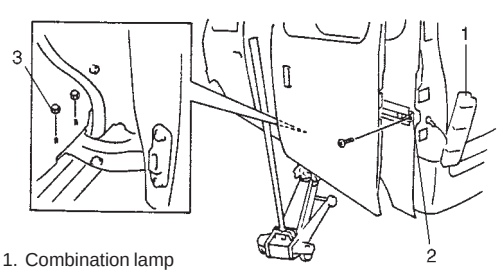


1. Door sash
2. Door lock control rod
3. Door link

INSTALLATION

Reverse removal procedure to install rear door lock.

- Adjust door latch striker (refer to FRONT DOOR LOCK INSTALLATION).
- When install door link ass'y, set cable as shown in the figure and make sure that door opens by pulling outside handle. If it doesn't function properly, loosen door link ass'y bolts and adjust its position to obtain proper cable tension. Tighten door link ass'y bolts.

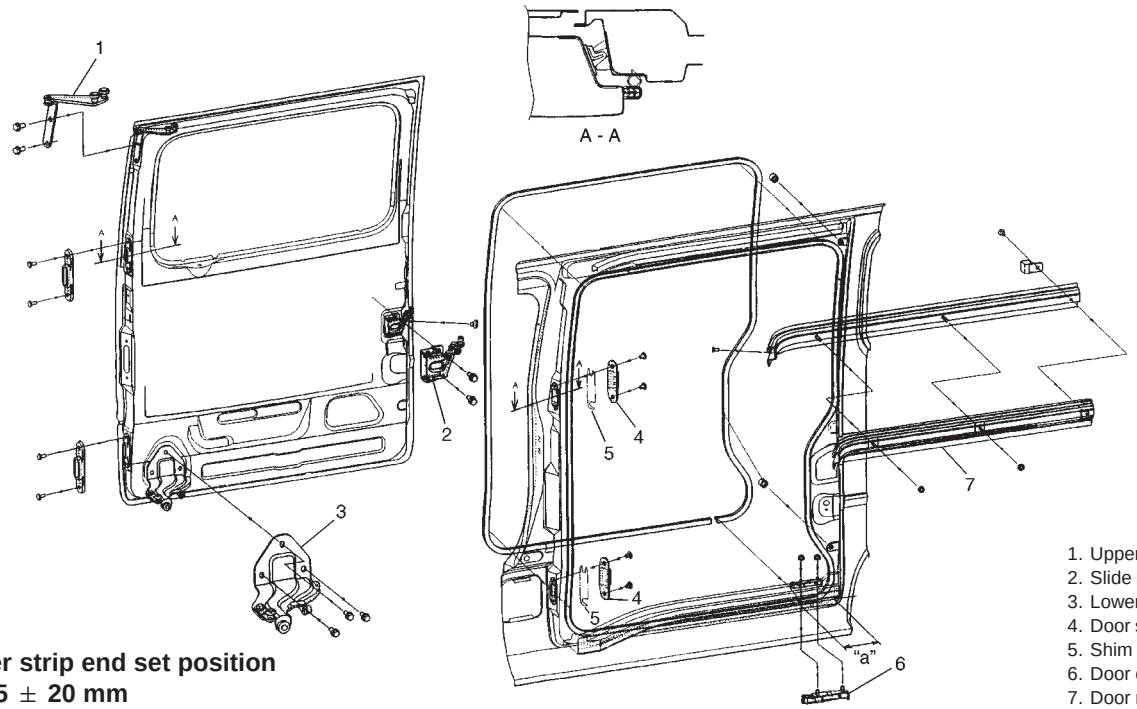


1. Combination lamp
2. Door hinge stopper
3. Door open stopper nut

REAR DOOR ASSEMBLY

REMOVAL

1) Remove rear combination lamp and door hinge stopper.
2) Remove door open stopper.
3) Remove door ass'y by sliding door ass'y rearward.



Weather strip end set position
"a": 115 ± 20 mm

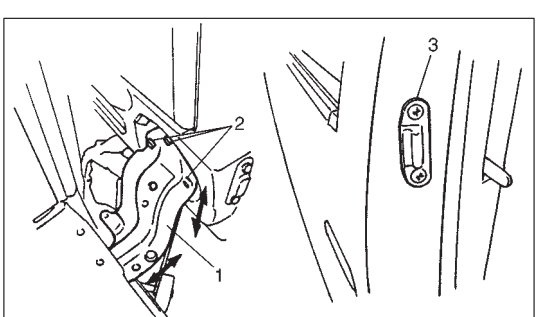
1. Upper arm
2. Slide hinge
3. Lower arm
4. Door stopper
5. Shim
6. Door open stopper
7. Door rail

INSTALLATION

Reverse the removal sequence to install rear door.

NOTE:
When replacing door, coat replacement door inside with wax for proper anticorrosion treatment.
Refer to RUST PROOF TREATMENT AREA in this section.

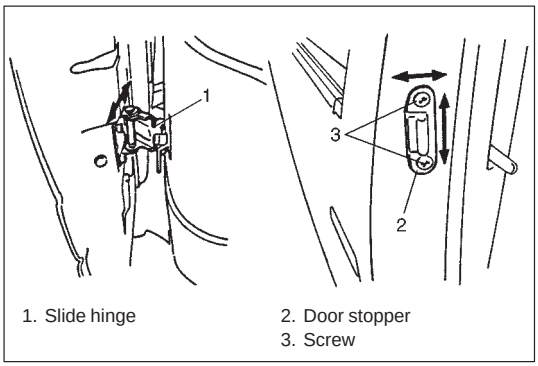
- When weatherstrip is hardened, water leak may develop. In this case, replace it if possible.
- After installing, adjust door fitting and door latch striker position as described below and apply grease to greasing point.
- For correct installation of door, refer to PANEL CLEARANCE of this section.



1. Lower arm
2. Bolt
3. Door stopper

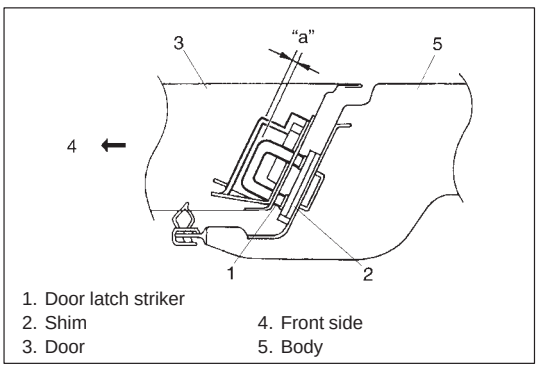
Door fitting adjustment

1) Unfix rear door stoppers by loosening screws.
2) Adjust lower arm so that door front surface and body surface align each other with the door closed.



1. Slide hinge
2. Door stopper
3. Screw

3) Adjust slide hinge so that door rear surface and body surface align each other and at the same time clearance between door rear end and body is equal to clearance between rear door front end and front door rear end with the door closed.
4) Adjust the rear door stoppers and tighten the screws.
Insert or adjust the number of spacer between stopper and body if necessary.

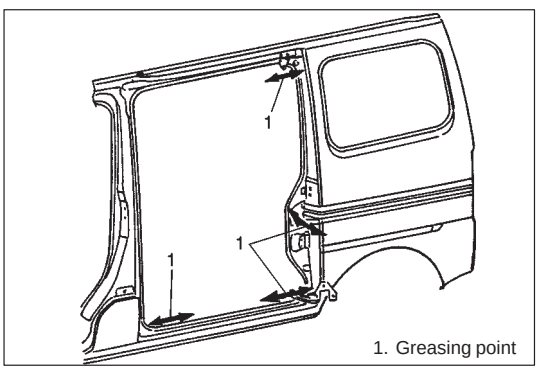


1. Door latch striker
2. Shim
3. Door
4. Front side
5. Body

Door latch striker position adjustment

Adjust striker position by referring to FRONT DOOR LOCK INSTALLATION.

Dimension "a": 3.25 – 5.25 mm (0.13 – 0.21 in.)



1. Greasing point

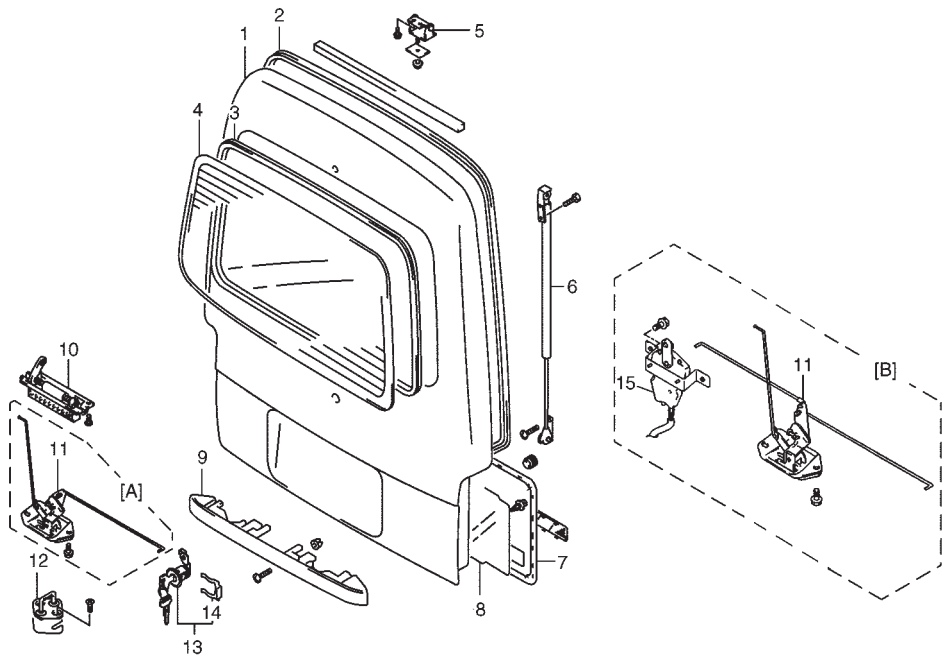
Greasing point

Apply multi-purpose grease to sliding parts as shown in the figure.

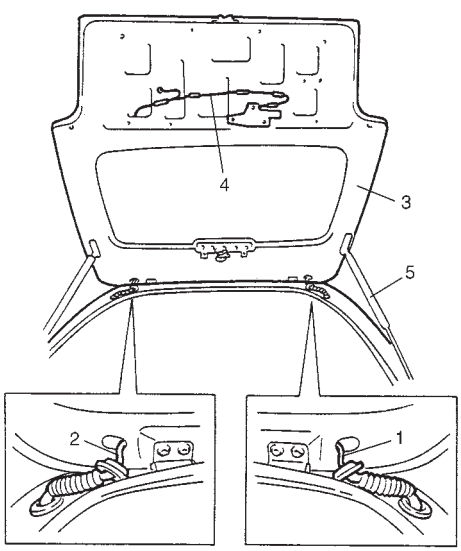
BACK DOOR

[A]: Without power door lock
[B]: With power door lock

1. Door panel
2. Door opening weatherstrip
3. Door window weatherstrip
4. Door window glass
5. Door hinge
6. Back door balancer
7. Door trim
8. Door sealing cover
9. Back door licence lamp cover
10. Door outside handle
11. Door latch assembly
12. Door latch striker
13. Door lock key cylinder
14. retainer
15. Door lock actuator (if equipped)



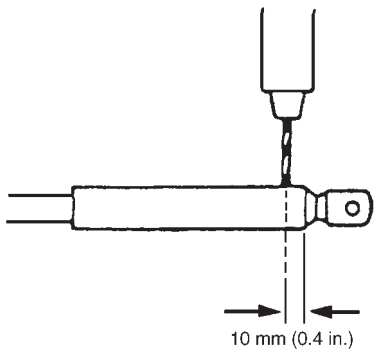
Harness location



1. Washer hose
2. Wire harness
3. Back door panel
4. Back door harness
5. Balancer

REMOVAL

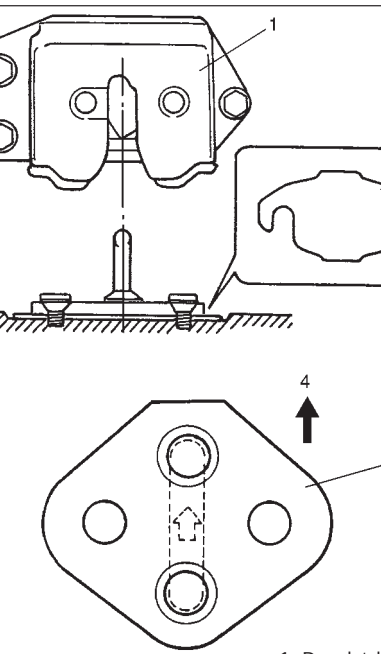
1) Remove back door trim and sealing cover.
2) Disconnect wire harness connector and harness clip inside back door to take it out from door.
   As to vehicle provided with back window washer, disconnect washer hose.



3) Remove back door balancer (first at its door-side and next at its body-side).

WARNING:
Handling of Back Door Balancer (Damper)
- **Do not disassemble balancer because its cylinder is filled with gas.**
- **The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggle.**
- **When discarding removed back door balancer (damper), use a 2 to 3 mm (0.08 to 0.12 in.) drill to make a hole as shown.**
- **Handle balancer carefully. Do not scar or scratch exposed surface of its piston rod, and never allow any paint or oil to stick to its surface.**
- **Do not turn piston rod with balancer fully extended.**

4) Remove door hinge bolts and door.



1. Door latch
2. Shim
3. Door latch striker
4. Forward

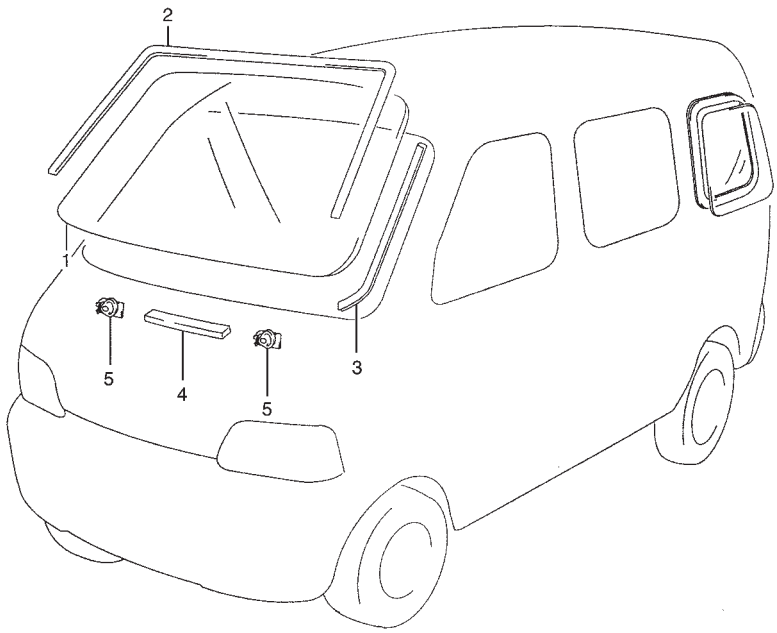
INSTALLATION

Reverse removal procedure to install back door by note the following procedure.

NOTE:
When replacing back door, coat replacement door inside with wax for proper anticorrosive treatment. Refer to RUST PROOF TREATMENT AREA in this section.

- Install back door with applying rust proof sealant to hinge fitting surface.
- Secure wiring harness and connect couplers.
- Install door latch striker with its arrow mark indicating front side of vehicle.
- Adjust the door latch striker so that striker center aligns with the center of grove in door latch base.
  To adjust door latch and striker each other, insert proper number of shims below the bottom of striker.
- For correct installation, see PANEL CLEARANCE and adjust door hinge properly.

WINDSHIELD



1. Windshield
2. Molding
3. Windshield trim
4. Spacer
5. Stopper

The windshield is installed by using a special type of adhesive (that is, one component urethane adhesive used with primer). For windshield glass replacement, it is important to use an adhesive which provides sufficient adhesion strength and to follow the proper procedure.

CAUTION:

- **Described in this section is the glass replacement by using 2 types of primers and 1 type of adhesive made by YOKOHAMA (one component urethane adhesive to be used with primer in combination). When using primer and adhesive made by other manufacturers, be sure to refer to handling instructions supplied with them. Negligence in following such procedure or misuse of the adhesive in any way hinders its inherent adhesive property. Therefore, before the work, make sure to read carefully the instruction and description given by the maker of the adhesive to be used and be sure to follow the procedure and observe each precaution throughout the work.**
- **Should coated surface be scratched or otherwise damaged, be sure to repair damaged part, or corrosion may start from there.**

Use an adhesive of above mentioned type which has following property.

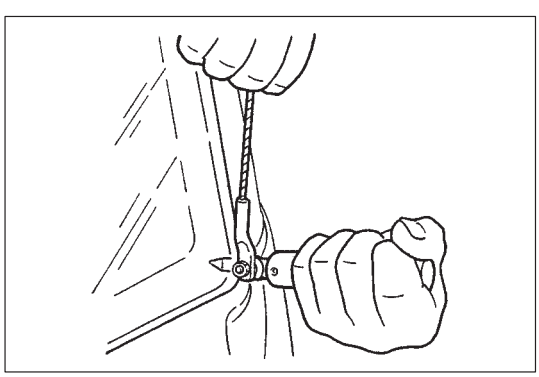
Shearing strength: 40 kg/cm^2 (569 lb/in^2) or more

Adhesive materials and tools required for removal and installation.

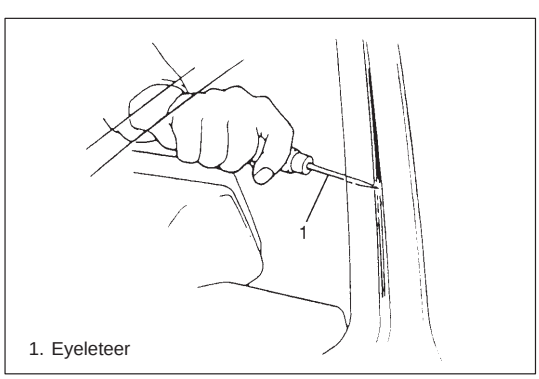
- One component urethane adhesive and primers used in combination (For one sheet of windshield).
  Adhesive (300 g (14.1 oz.))
  Primer for glass (15 g (0.5 oz.))
  Primer for body (15 g (0.5 oz.))
- Eyeleteer
- Piano string
- Brush for primer application (2 pcs)
- Knife
- Rubber sucker grip
- Sealant gun (for filling adhesive)
- Putty spatula (for correcting adhered parts)

REMOVAL

1) Clean both inside and outside of glass and around it.
2) Remove wiper arms.
3) Remove garnish and stoppers.
4) Using tape, cover body surface around glass to prevent any damage.
5) Remove instrument panel and head lining.

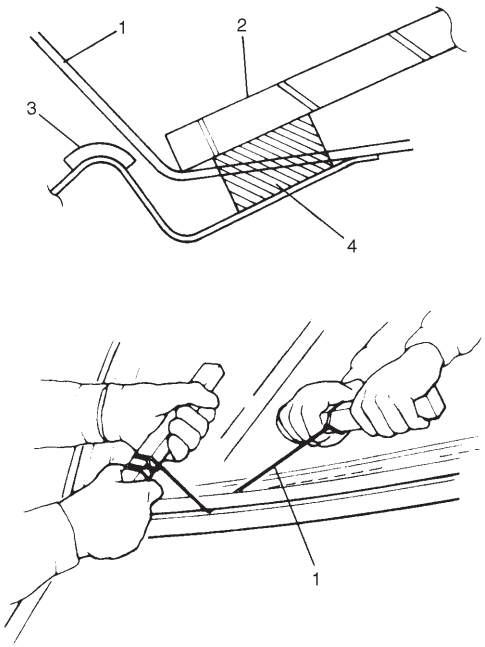


6) Remove rear view mirror, sunvisor, front pillar trims and then windshield trims from front pillars (right & left).
7) Remove (or cut) windshield molding all around until windshield edge comes out.
8) Cut adhesive all around glass with windshield knife.
   If cut with piano string, follow step 9) and 10).



1. Eyeleteer

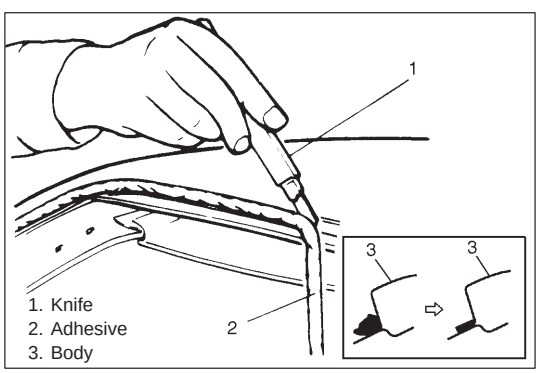
9) Drill hole with eyeleteer through adhesive and let piano string through it.



1. Piano string
2. Glass
3. Tape
4. Adhesive

10) Cut adhesive all around glass with piano string.

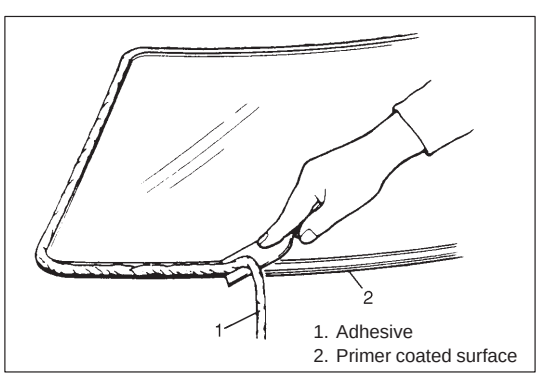
NOTE:
Use piano string as close to glass as possible so as to prevent damage to body.



1. Knife
2. Adhesive
3. Body

11) Using knife, smooth adhesive remaining on body side so that it is 1 – 2 mm (0.04 to 0.08 in.) thick all around.

NOTE:
Before using knife, clean it with alcohol or the like to remove oil from it.

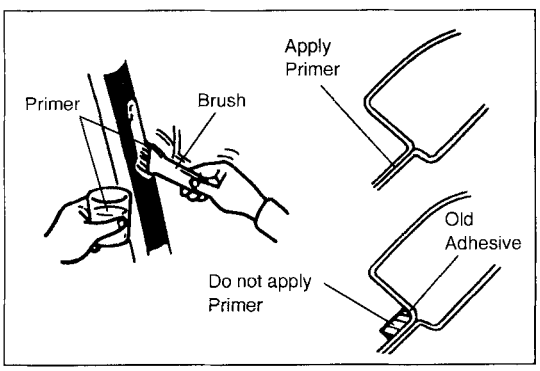


1. Adhesive
2. Primer coated surface

12) When re-using glass, remove spacer and adhesive from glass completely.

INSTALLATION

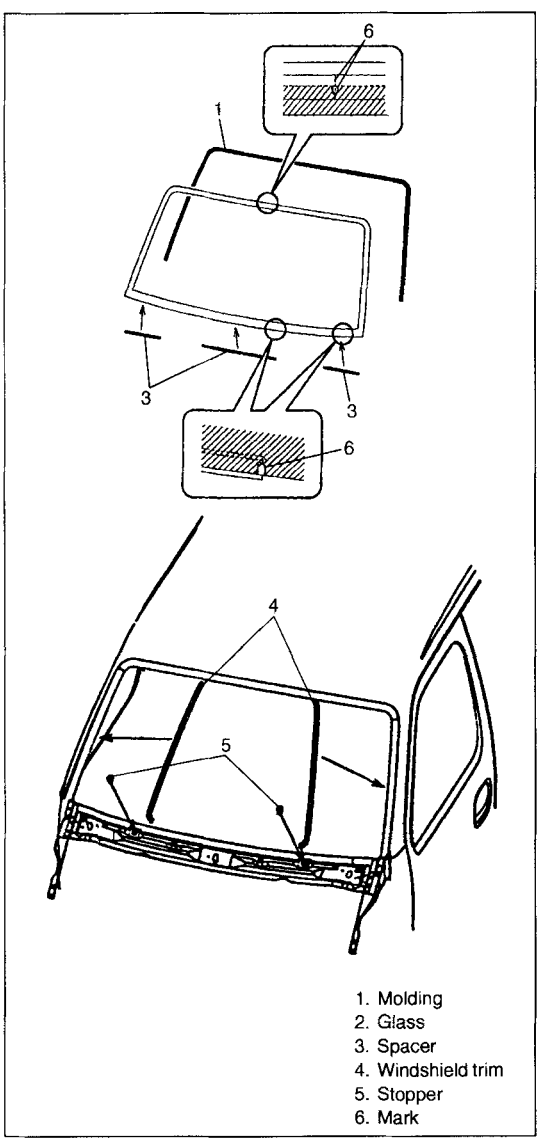
1) Using cleaning solvent (white gasoline), clean surface of adhesive remaining on body (or windshield edge) where windshield glass is to be adhered. (Let it dry for more than 10 minutes.)



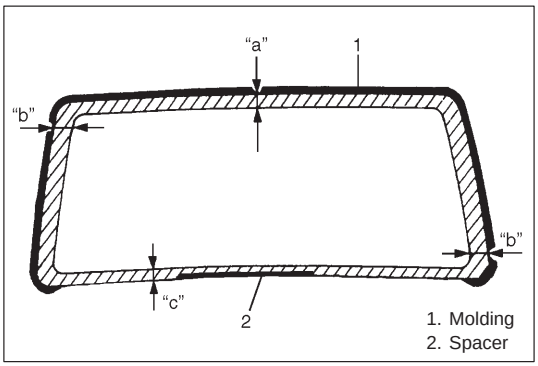
2) Clean contact surfaces of old adhesive, paint or bare metal thoroughly.
   If surfaces of paint or bare metal come out, apply primer for body with caution not to apply primer to surface of adhesive remaining on body.

   NOTE:
   - **Be sure to refer to primer maker's instruction for proper handling and drying time.**
   - **Do not touch body and old adhesive surfaces where glass is to be adhered.**

3) Install new molding and spacers to glass with marks on the molding, marks on glass and edge of spacers aligned.
   Warming molding for over half an hour at 35°C (95°F) temperature will facilitate work.
4) Clean glass surface to be adhered to body with clean cloth.
   If cleaning solvent is used, let it dry for more than 10 minutes.
5) Install windshield trims to front pillars.
   Install stopper.



1. Molding
2. Glass
3. Spacer
4. Windshield trim
5. Stopper
6. Mark



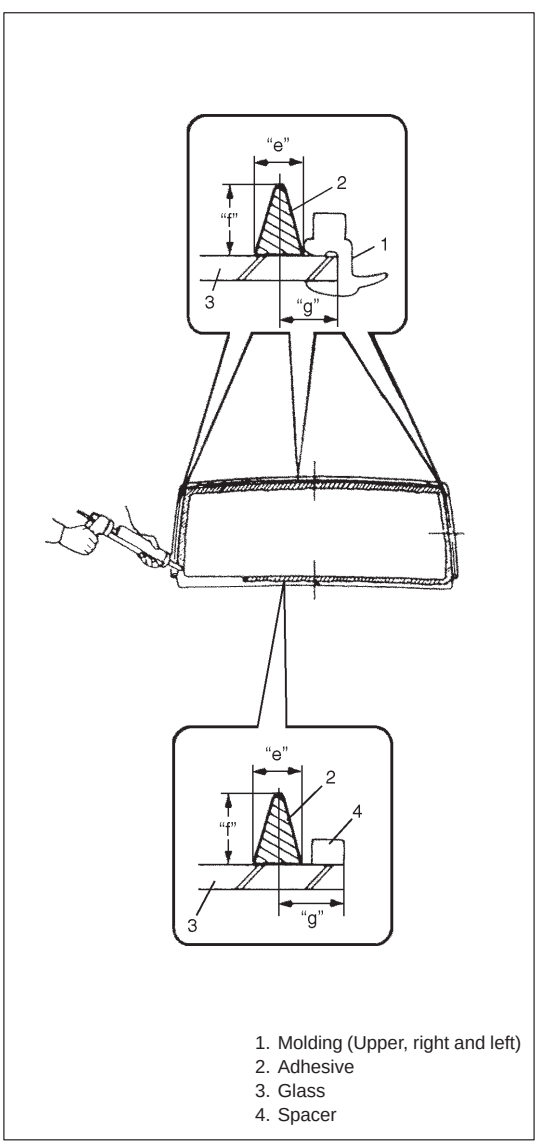
1. Molding
2. Spacer

6) Using new brush, apply sufficient amount of primer for glass along glass surface to be adhered to body.

NOTE:

- **Be sure to refer to maker's instruction for proper handling and drying time.**
- **Do not apply primer on outside of ceramic coated surface.**
- **Do not touch primer coated surface.**

Width "a": Approx. 20 mm (0.78 in.)
"b": Approx. 15 mm (0.59 in.)
"c": Approx. 18 mm (0.70 in.)



1. Molding (Upper, right and left)
2. Adhesive
3. Glass
4. Spacer

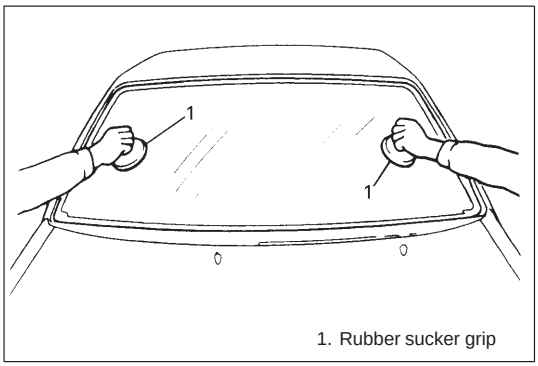
7) Apply adhesive referring to figure at the left.

NOTE:

- **Start from bottom side of glass.**
- **Be careful not to damage primer.**
- **Apply specified amount of adhesive as given.**

Width "e" : Approx. 8 mm (0.31 in.)
Height "f" : Approx. 14 mm (0.55 in.)
Clearance "g" : Approx. 10 mm (0.39 in.)

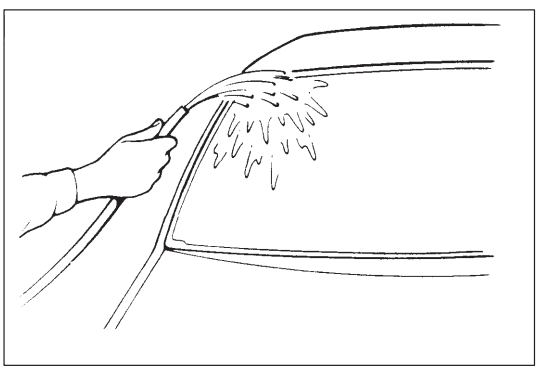
- **Press glass against body quickly after adhesive is applied.**
- **Use of rubber sucker grip is helpful to hold and carry glass after adhesive is applied.**
- **Perform step 7) to 9) within 10 min. to ensure sufficient adhesion.**
- **Be sure to refer to adhesive maker's instruction for proper handling and drying time.**



1. Rubber sucker grip

8) Peel remaining paper from molding.
9) Holding rubber sucker grips, press glass onto body and place the glass securely by tapping glass surface and molding all around.

NOTE:
Use care not to damage glass surface or body.



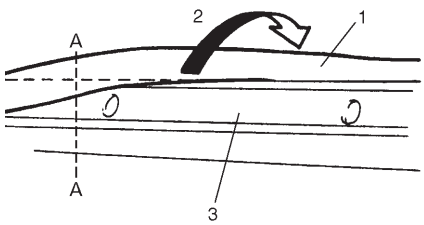
10) Check for water leakage by running water from hose over window. If leakage is found, dry window and fill leaky point with adhesive. If water still leaks even after that, remove glass and start installation procedure all over again.

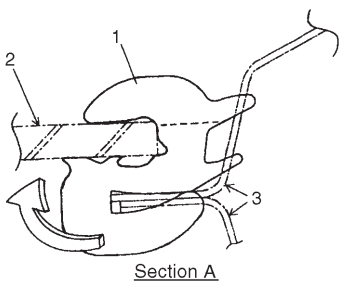
NOTE:
- **Do not use high pressure water.**
- **Do not blow compressed air directly at adhesive applied part when drying.**
- **Do not use infrared lamp or the like for drying.**

CAUTION:
Upon completion of installation, note the following.
- **Sudden closing of door before adhesive is completely set may cause glass to become loose or to come off. Therefore, if door is opened or closed before adhesive is completely set, make sure to open all door glasses and use proper care.**
- **If molding is not securely in place, hold it down with a tape until adhesive is completely set.**
- **Each adhesive has its own setting time. Be sure to refer to maker's instruction, check setting time of adhesive to be used and observe precautions to be taken before adhesive is set.**
- **Refrain form driving till adhesive is completely set so as to ensure proper and sufficient adhesion.**

11) Install rear view mirror, roof molding, front pillar trims, sunvisor, garnish and wipers.

Vehicle outside





Section A

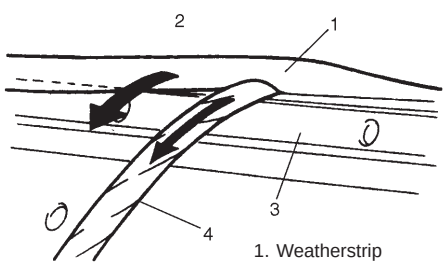
1. Weatherstrip
2. Glass
3. Back door panel/side panel

BACK DOOR/QUARTER WINDOW GLASS

REMOVAL

1) Disconnect rear defogger coupler.
2) As window glass is fixed by means of window weatherstrip, remove glass and weatherstrip together by removing end of weatherstrip little by little while pushing the entire glass from inside toward outside as shown in the figure.

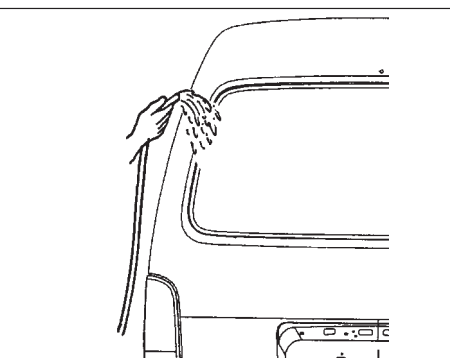
NOTE:
Do not apply an excessive force to glass locally.



1. Weatherstrip
2. Glass
3. Back door panel/side panel
4. String

INSTALLATION

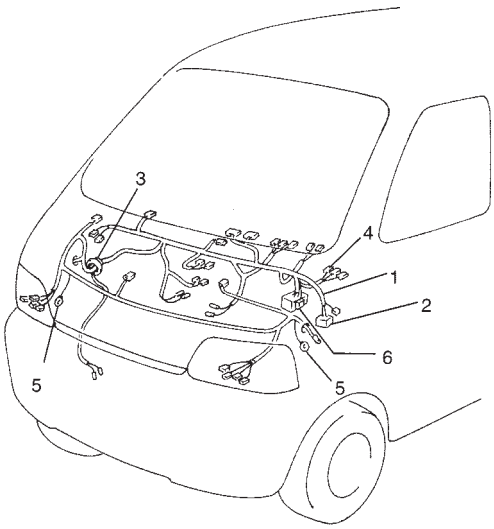
1) Install weatherstrip to glass.
2) Pass string through outer groove of weatherstrip (groove where panel fits in) so that weatherstrip can be installed with ease.
3) Apply soap water to outer edge of back door panel or side panel and install glass and weatherstrip together to back door or side panel by pulling the string little by little.
4) Connect rear defogger coupler. (if equipped)

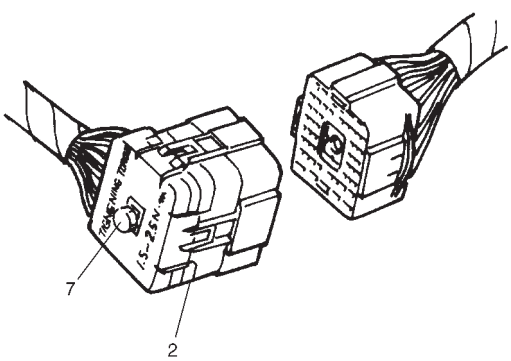


5) Check for water leakage by running water from hose over window. If leakage is found, complete the installation of leaky point. If water still leaks even after that, remove glass and start installation procedure all over again.

NOTE:
Do not use high pressure water.

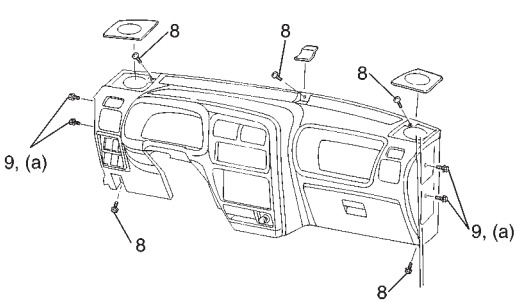
[Harness Location]





1. Instrument panel harness
2. Connector with bolt
3. Dash panel hole
4. Connector
5. Body ground
6. Fuse box
7. Wire harness connector bolt

[Instrument Panel Fastener Location]



8. Screw
9. Bolts

Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

INSTRUMENT PANEL

WARNING:
See WARNING at the beginning of this section.

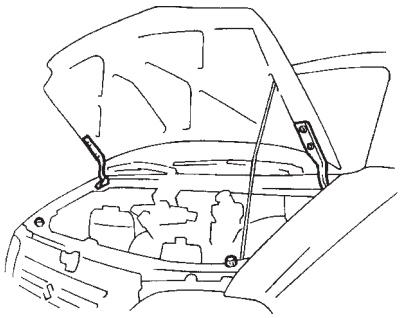
REMOVAL

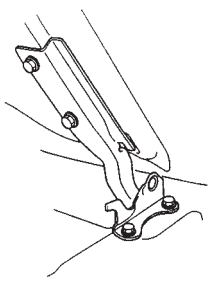
1) Disconnect negative (–) cable at battery.
2) Disable air bag system, if equipped. Refer to DISABLING AIR BAG SYSTEM in Section 10B.
3) Remove glove box and column hole cover.
4) Disconnect wires and cables from heater unit and air inlet box assembly.
5) Remove steering column assembly. Refer to Section 3C.
6) Disconnect speedometer connector and remove speedometer assembly.
7) Remove front hood opener.
8) Disconnect couplers which need to be disconnected for removal for instrument panel (refer to the left figure) and pull wire harness out of dash panel.
9) Remove instrument panel mounting screws.
10) Remove instrument panel mounting bolt.
11) Remove instrument panel with steering support member.

CAUTION:
For vehicle with Air Bag, instrument panel could not be removed with SDM coupler connected.
Use care not to damage Air Bag harness.

INSTALLATION

1) Install instrument panel by reversing removal procedure, noting the following items.
   - When installing each part, be careful not to catch any cable or wiring harness.
   - Connect wire harness connector with bolt securely and tighten its bolt to specified torque shown on the connector.
   - When installing steering column assembly, refer to Section 3C STEERING COLUMN INSTALLATION.
2) Adjust control cables. (Refer to Section 1A HEATER CONTROL CABLES.)
3) Enable air bag system if equipped. Refer to ENABLING AIR BAG SYSTEM in Section 10B.





HOOD

REMOVAL

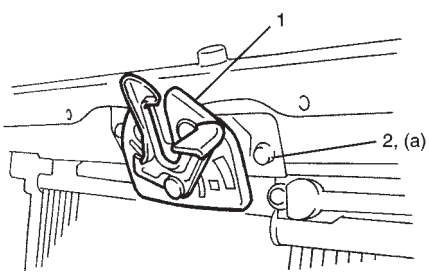
1) Remove mounting bolts to detach hood.
2) When removing hood hinge, remove cowl top garnish.

INSTALLATION

Reverse removal procedure to install hood.

ADJUSTMENT

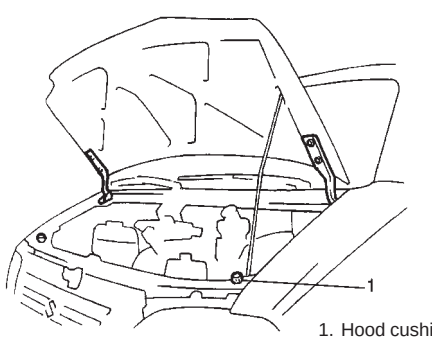
- Fore-and-aft and right-and-left adjustment
  Loosen mounting bolts for adjustment.



1. Hood latch
2. Hood latch bolts

- Hood latch adjustment
  When installing hood latch, bring bolt at highest position of oblong hole and move it in vertical direction for adjustment by referring PANEL CLEARANCE.

  Tightening Torque
  (a): 8.0 N·m (0.80 kg-m, 6.0 lb-ft)



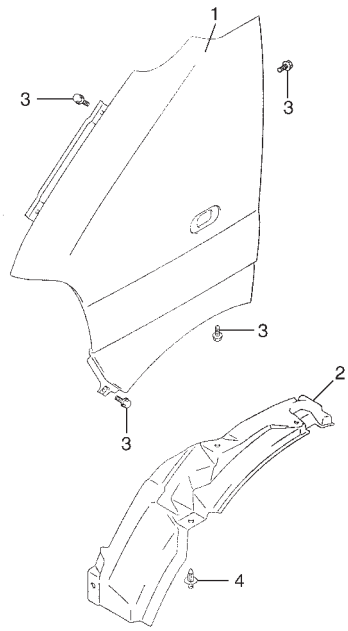
1. Hood cushion

- Vertical adjustment
  If only one side (right or left) of hood is not level with front fender, make it level by tightening or loosening hood cushion.

INSPECTION

Check that hood opens and closes smoothly and properly. Lubricate it necessary. Also check that secondary latch operates properly (check that secondary latch keeps hood from opening all the way) and hood locks securely when closed.

FRONT FENDER



1. Front fender
2. Front fender lining
3. Fender attaching bolts
4. Fender lining attaching clip

REMOVAL

1) Remove radiator grille.
2) Remove front bumper.
3) Disconnect connector of side turn signal lamp.
4) Remove front fender lining.
5) Remove front fender.

INSTALLATION

Reverse removal procedure to installation.

NOTE:

If paint on fender bolt is peeled off, be sure to apply paint again.

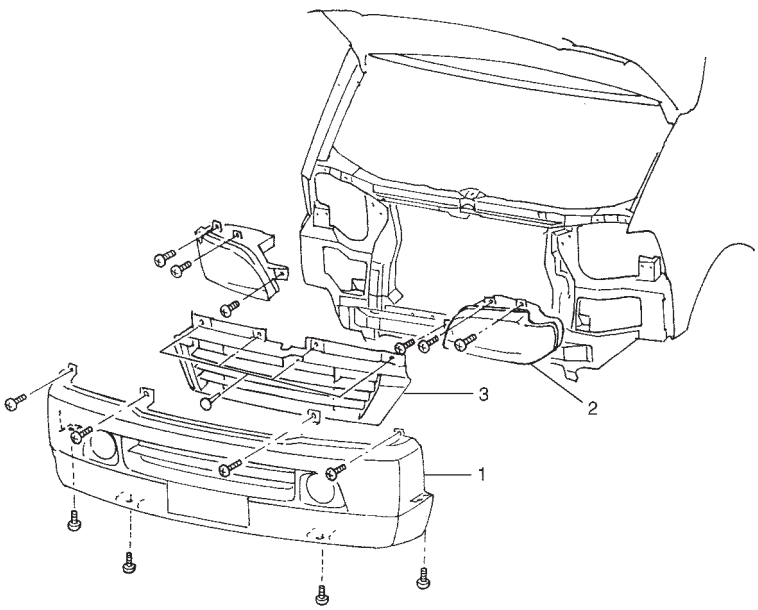
BUMPERS

NOTE:

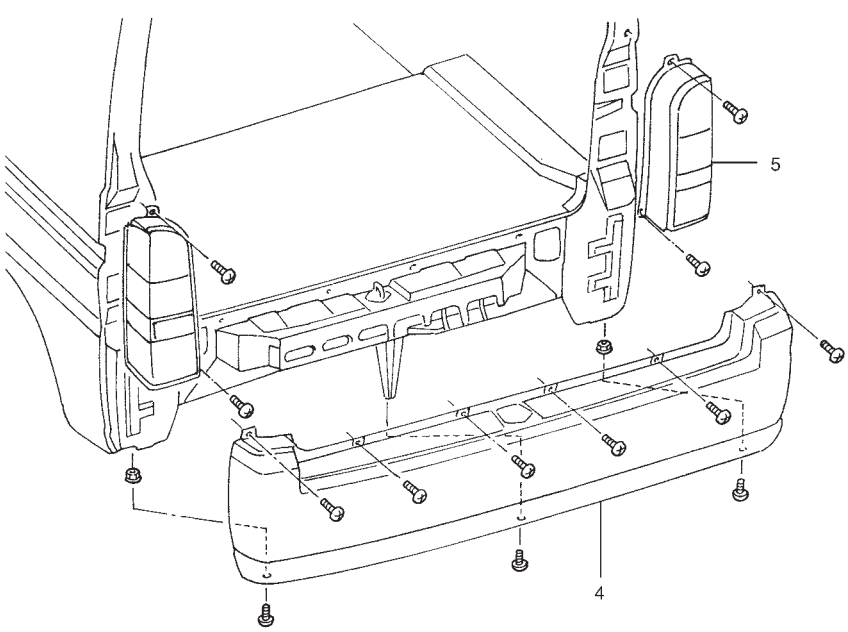
Fasteners are important attaching parts in that they could affect the performance of vital components and systems, an/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary.

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.

[A]



[B]



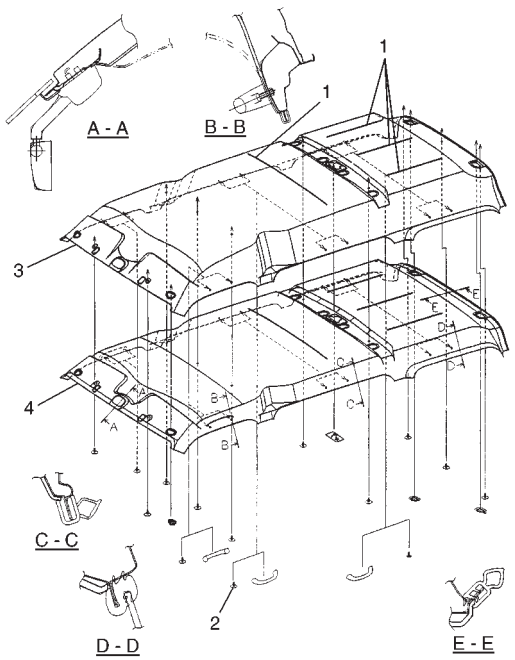
[A]: Front
[B]: Rear

1. Front bumper
2. Head light
3. Grille
4. Rear bumper
5. Tail light

HEAD LINING

REMOVAL

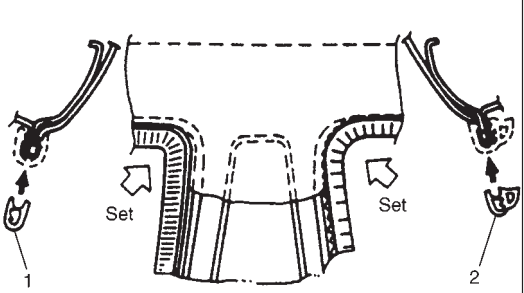
1) Remove spot light.
2) Remove sunshade assembly.
3) Remove room light.
4) Remove assistant grips.
5) Remove inner trims covering head lining and door opening trim.
6) Remove head lining.



1. Recess for adhesive
2. Clip
3. Head lining (High roof)
4. Head lining (Low roof)

INSTALLATION

1) Clean roof where adhesive of head lining will be attached.
2) Apply adhesive on recess of head lining and install it to body.
3) Install assistant grips and clips from front side of vehicle to rear side.



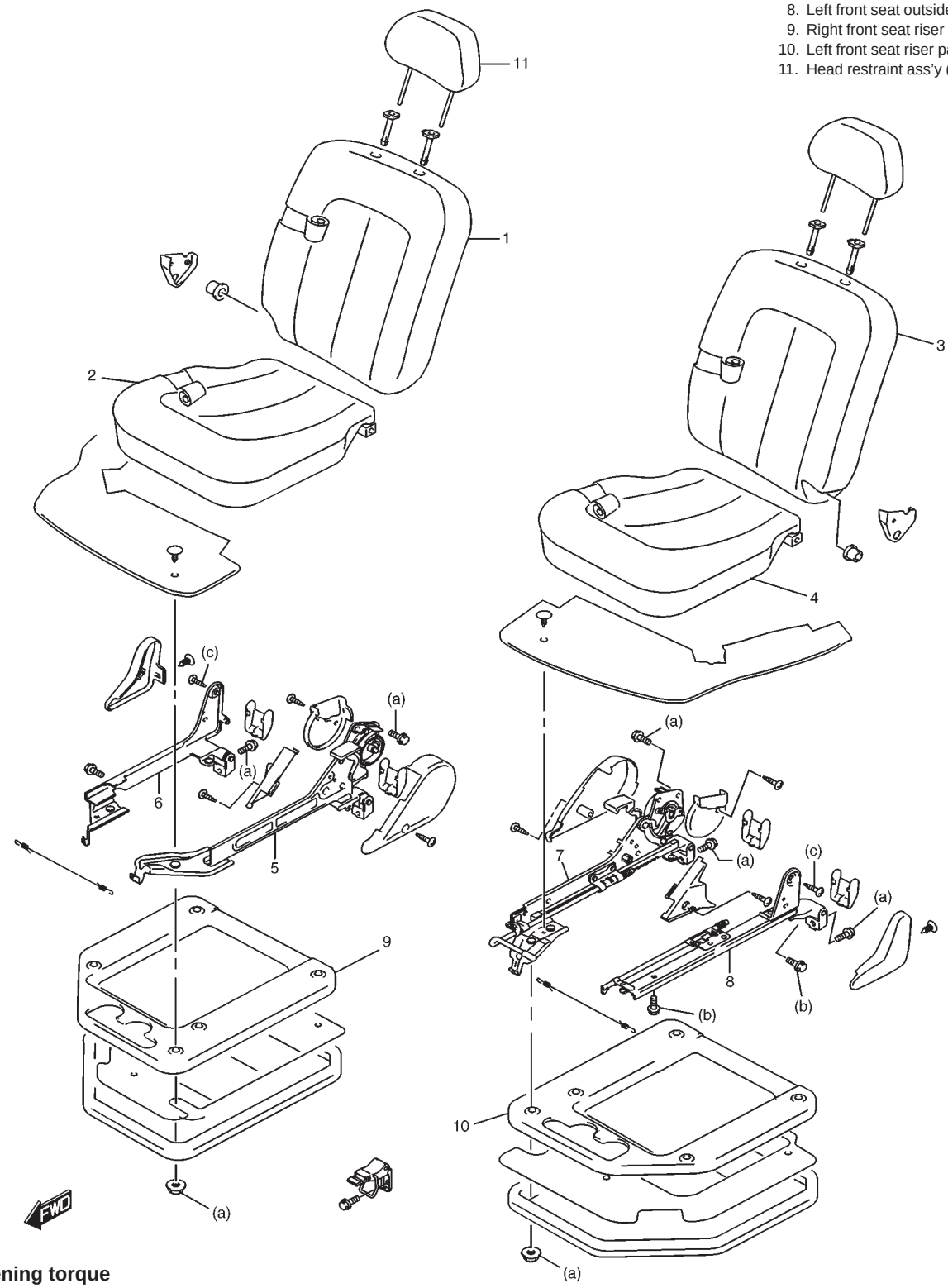
1. Door opening trim
2. Rear door opening trim

4) Install door opening trim.
5) Install spot light, sunshade assembly, room light and inner trims covering head lining.

SEATS

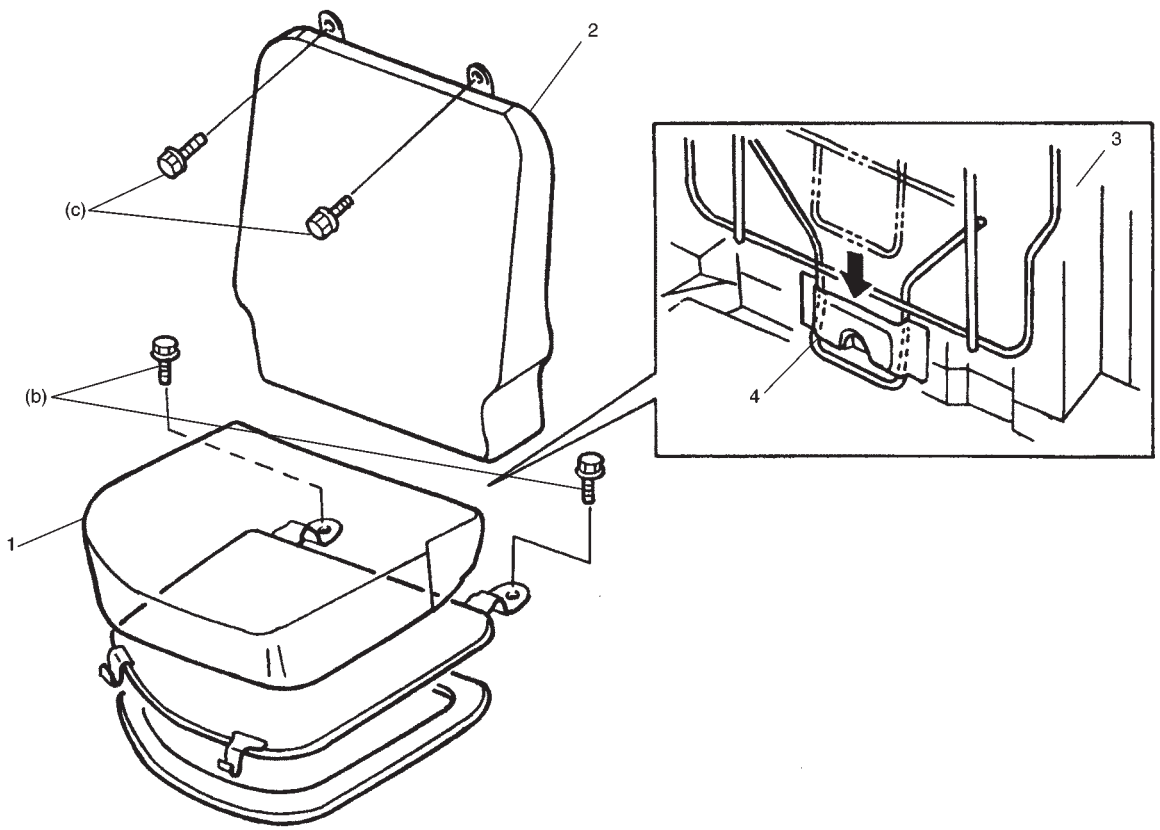
FRONT SEAT (VAN model)

1. Right front seat back ass'y
2. Right front seat cushion ass'y
3. Left front seat back ass'y
4. Left front seat cushion ass'y
5. Right front seat inside adjuster
6. Right front seat outside adjuster
7. Left front seat inside adjuster
8. Left front seat outside adjuster
9. Right front seat riser panel
10. Left front seat riser panel
11. Head restraint ass'y (if equipped)



Tightening torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(c): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

FRONT SEAT (TRUCK model)

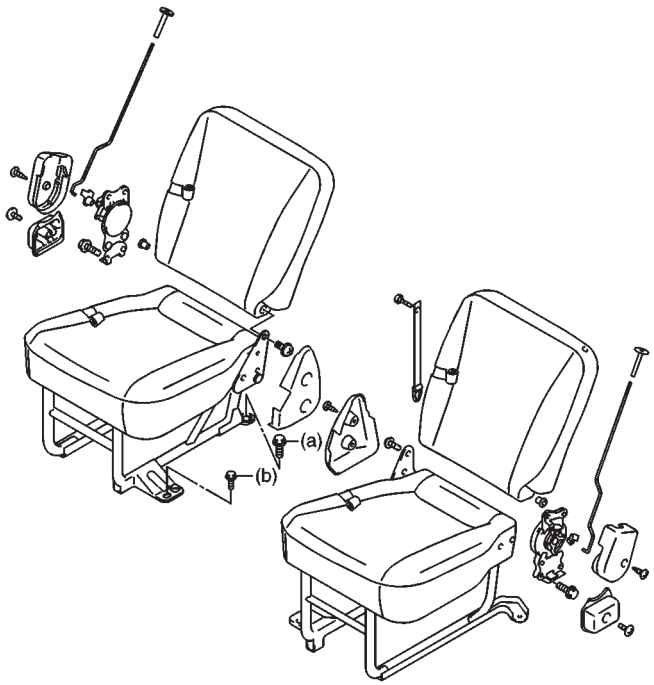


1. Seat cushion
2. Seat back
3. Seat back frame
4. Bracket

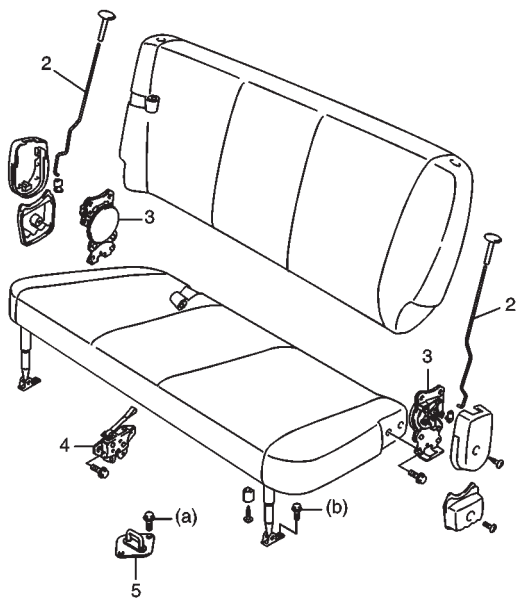
NOTE:
Insert seat back frame into bracket surely.

Tightening torque
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(c): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

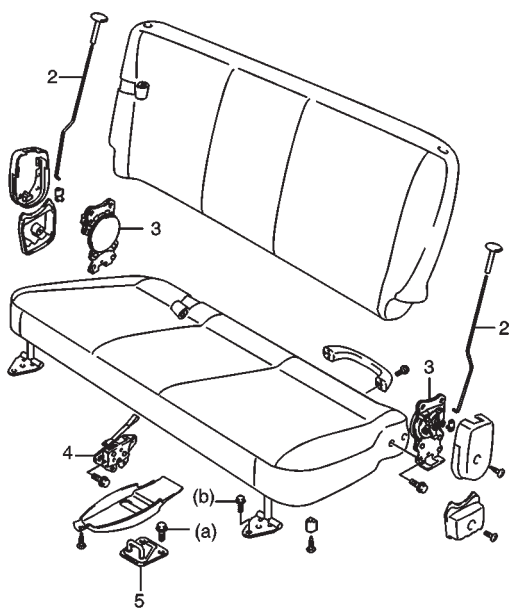
2ND SEAT
(for vehicle equipped with third seat)



2ND SEAT
(for vehicle without third seat)



3RD SEAT



1. Blank
2. Reclining rod
3. Reclining ass'y
4. Seat lock
5. Striker

Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)

REMOVAL

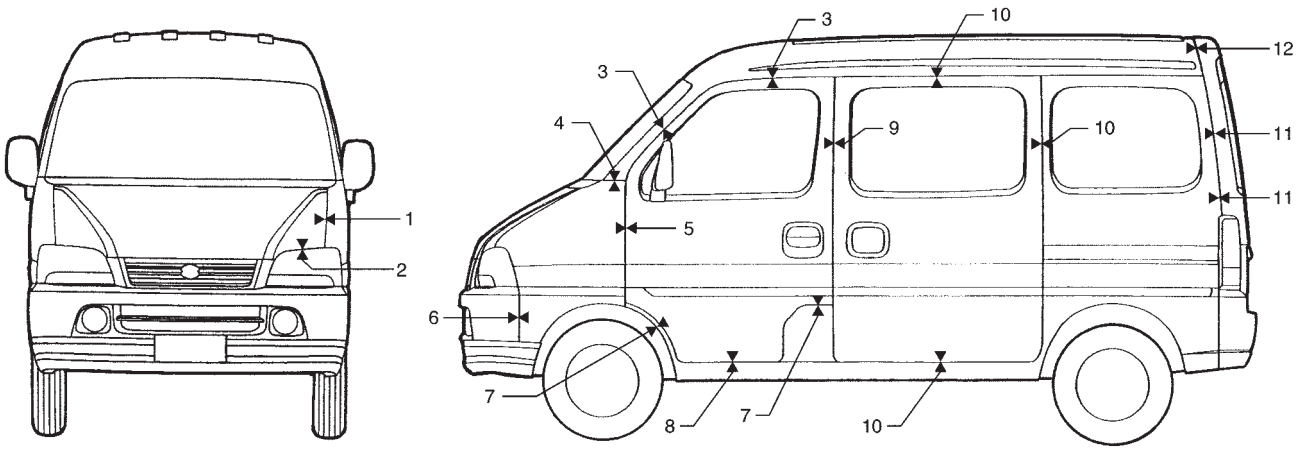
1) Remove seat rail mounting bolts. Then, remove seat ass'y with seat rail (front seats).
2) Disassemble and repair seat as necessary.

INSTALLATION

Reverse removal procedure to install front seat.
Torque it to specifications, as given.

PANEL CLEARANCE

[A]



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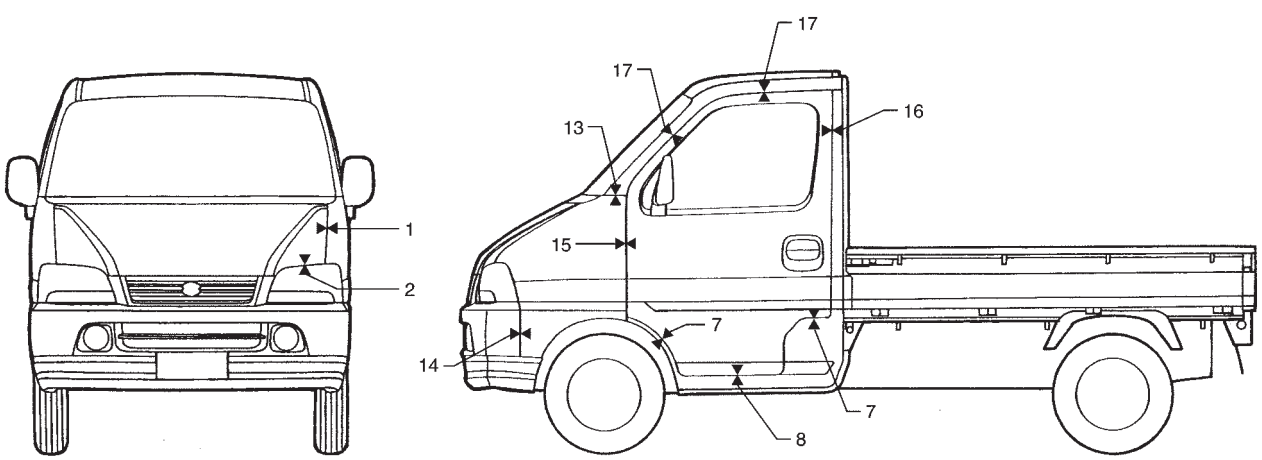


1. Hood – Fender : 2.7 – 4.7 mm (0.11 – 0.19 in.)
2. Hood – Head lamp : 5.4 – 7.4 mm (0.21 – 0.29 in.)
3. Front door – Side body outer panel : 4.6 – 6.6 mm (0.18 – 0.26 in.)
4. Fender – Front pillar : 2.8 – 3.6 mm (0.11 – 0.14 in.)
5. Fender – Front door : 3.6 – 5.6 mm (0.14 – 0.22 in.)
6. Fender – Front bumper : 3.0 – 5.0 mm (0.12 – 0.20 in.)
7. Front door – Side body outer panel : 3.6 – 5.6 mm (0.14 – 0.22 in.)
8. Front door – Side body outer panel : 4.6 – 6.6 mm (0.18 – 0.26 in.)
9. Front door – Rear door : 4.6 – 6.6 mm (0.18 – 0.26 in.)
10. Rear door – Side body outer panel : 4.6 – 6.6 mm (0.18 – 0.26 in.)
11. Back door – Side body outer panel : 4.6 – 6.6 mm (0.18 – 0.26 in.)
12. Back door – Roof (Hi) : 12.1 – 14.1 mm (0.48 – 0.56 in.)
    Back door – Roof (Low) : 9.3 –11.3 mm (0.37 – 0.44 in.)
13. Fender – Front pillar : 3.8 – 4.8 mm (0.15 – 0.19 in.)
14. Fender – Front bumper : 3.4 – 5.4 mm (0.13 – 0.21 in.)
15. Fender – Front door : 3.7 – 5.7 mm (0.15 – 0.22 in.)
16. Front door – Cabin side panel : 3.6 – 5.6 mm (0.14 – 0.22 in.)
17. Front door – Cabin side panel : 4.6 – 6.6 mm (0.18 – 0.26 in.)

[A]: Van model
[B]: Truck model

ANTI-CORROSION TREATMENT

WARNING:
Standard shop practices, particularly eye protection, should be followed during the performance of the below-itemized operations to avoid personal injury.

As rust proof treatment, steel sheets are given corrosion resistance on the interior and/or exterior.

These corrosion resistance steel sheet materials are called one of two-side galvanized steel sheets.

It is for the sake of rust protection that these materials are selected and given a variety of treatments as described below.

1) Steel sheets are treated with cathodic electroprimer which is excellent in corrosion resistance.
2) Rust proof wax coatings are applied to door and side sill insides where moisture is liable to stay.
3) Vinyl coating is applied to body underside and wheel housing inside.
4) Sealer is applied to door hem, engine compartment steel sheet-to-steel sheet joint, and the like portions to prevent water penetration and resulting in rust occurrence.

In panel replacement or collision damage repair, leaving the relevant area untreated as it is in any operation which does disturb the above-mentioned rust proof treatment will cause corrosion to that area. Therefore, it is the essential function of any repair operation to correctly recoat the related surfaces of the relevant area.

All the metal panels are coated with metal conditioners and primer coating during vehicle production. Following the repair and/or replacement parts installation, every accessible bare metal surface should be cleaned and coated with rust proof primer. Perform this operation prior to the application of sealer and rust proof wax coating.

Sealer is applied to the specific joints of a vehicle during production. The sealer is intended to prevent dust from entering the vehicle and serves also as an anti-corrosion barrier. The sealer is applied to the door and hood hem areas and between panels. Correct and reseal the originally sealed joints if damaged. Reseal the attaching joints of a new replacement panel and reseal the hem area of a replacement door or hood. Use a quality sealer to seal the flanged joints, overlap joints and seams. The sealer must have flexible characteristics and paintability after it's applied to repair areas.

For the sealer to fill open joints, use caulking material. Select a sealer in conformance with the place and purpose of specific use. Observe the manufacturer's label-stand instructions when using the sealer. In many cases, repaired places require color painting. When this is required, follow the ordinary techniques specified for the finish preparation, color painting and undercoating build-up.

Rust proof wax, a penetrative compound, is applied to the metal-to-metal surfaces (door and side sill insides) where it is difficult to use ordinary undercoating material for coating. Therefore, when selecting the rust proof wax, it may be the penetrative type.

During the undercoating (vinyl coating) application, care should be taken that sealer is not applied to the engine-related parts and shock absorber mounting or rotating parts. Following the under coating, make sure that body drain holes are kept open.

The sequence of the application steps of the anti-corrosion materials are as follows:

1) Clean and prepare the metal surface.
2) Apply primer.
3) Apply sealer (all joints sealed originally).
4) Apply color in areas where color is required such as hem flanges, exposed joints and under body components.
5) Apply anticorrosion compound (penetrative wax).
6) Apply undercoating (rust proof material).

When the welding or heating operation causes the original galvanization or other anticorrosive materials to be burnt, the interior and under-body panel surfaces must be cleaned.
Removal of residues of the burning should be carried out carefully when the relevant place has boxtype construction or has shape which limits the access to the interior surfaces. In general, the following method can be used satisfactorily for the removal of those residues.

Scrape the accessible places. If a standard putty knife or scraper does not fit to the relevant place, consider to use a more flexible scraper to a place narrowly enclosed by sheet metals.
A jet of compressed air can remove most residues, and is effective to limited areas.
However, this type of operation absolutely requires eye protection.

METAL REPLACEMENT PARTS FINISHING

The metal service replacement parts (or assemblies) are coated with electro-deposition primer.
For the proper adhesion of a paint, the following finish process (refinish steps) becomes necessary.

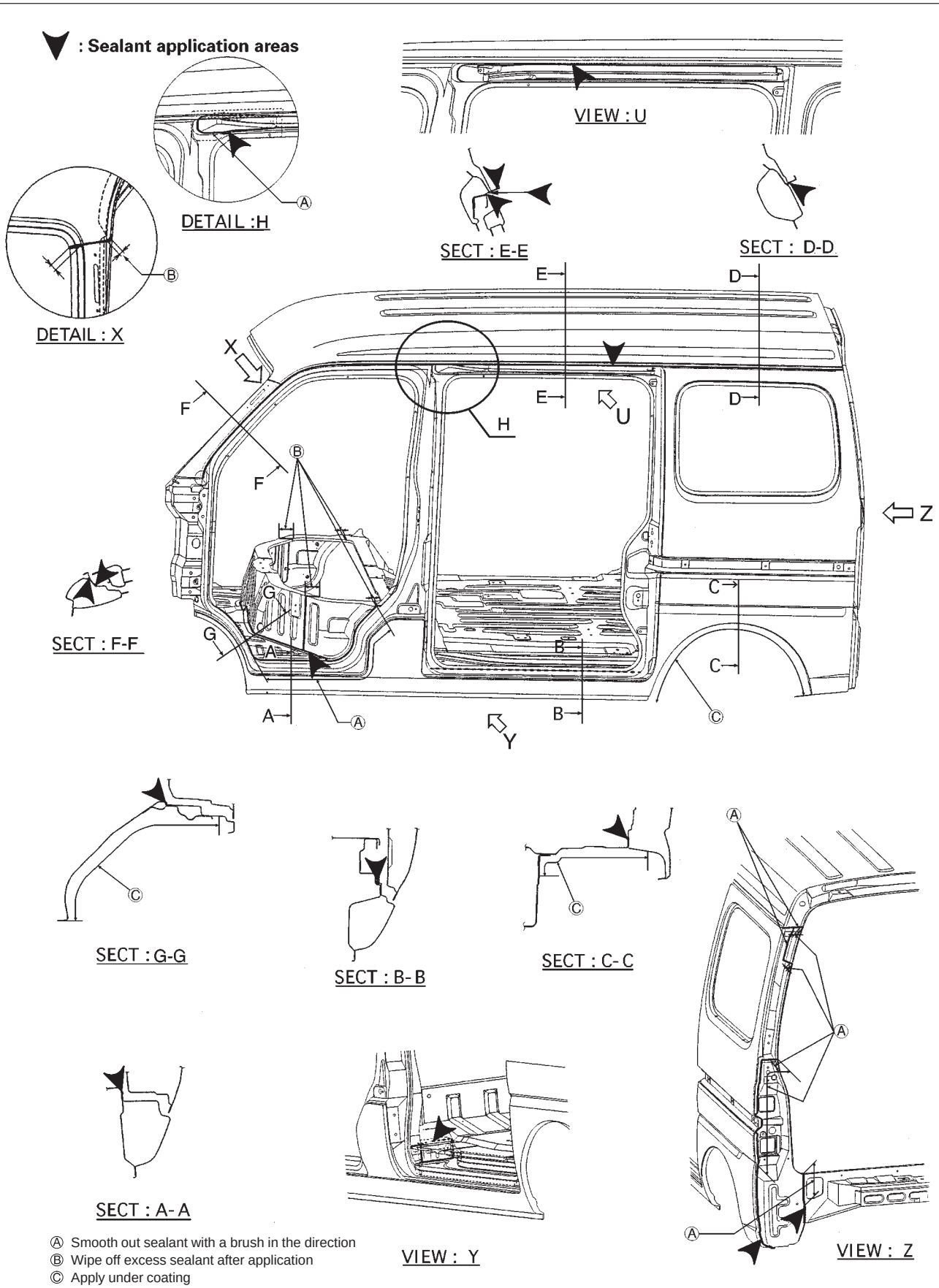
1) Use wax or grease-removing solvent to clean the part.
2) Use a wet or dry sand-paper (No. 400) to polish the panel lightly. DO not polish it forcibly to produce any scratch. Clean the part again.
3) If factory-applied primer coating is cut through to the bare metal, apply metal conditioner to the bare metal exposed to open air. As for method of use of the metal conditioner, follow directions on the container.
4) Apply primer-surfacer to the part completely dry before starting sand-paper polishing. As for drying time, follow directions advised on the primer-surfacer container.
5) Use a wet or dry sand-paper (No. 400) and water to polish the panel lightly.
6) Wash the part again.
7) Apply color, coating to the part.
8) Different paints demand different drying methods. Hence, follow directions advised on the pertinent paint container.
9) When lacquer coating (quick-drying paint coating) is applied, dry coated surface and polish it with compound.
   In the case of the melamine or acrylic coating, compound polishing can be omitted after drying.
10) If the case of lacquer coating, wax should not be applied to coated surface until the surface has dried completely (for approx. tow months).

Before replacing exterior parts or assemblies, check paint conditions of all the covered or hidden interior surfaces. If any rust scale is found at these places, proceed as follows:

1) Use a proper wire brush, adhesive or liquid rust removing agent to remove rust. As for the method of use, follow directions advised for respective materials.
2) If necessary, wash parts with detergent, rinse, and dry them.
3) Before installing exterior body parts, apply anticorrosive compound to all cleaner surfaces of exterior body parts. Also, apply anticorrosive compound to inner surfaces of exterior body parts to be installed.

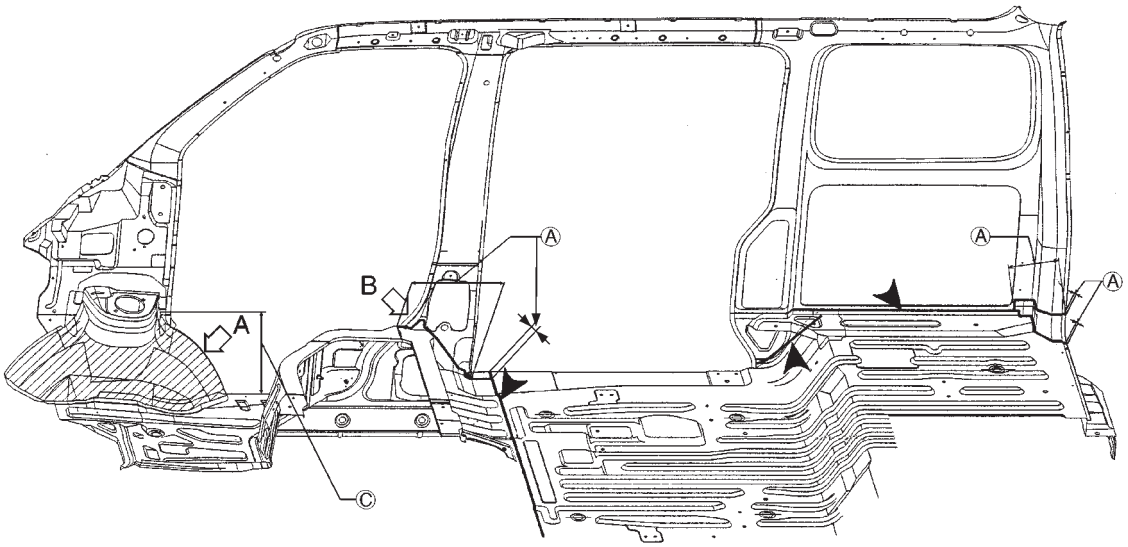
SEALANT APPLICATION AREA

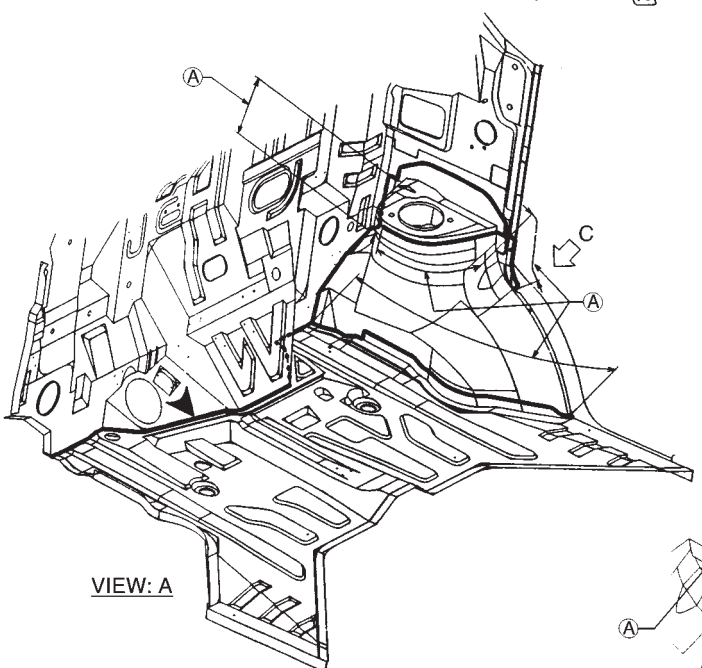
Van model



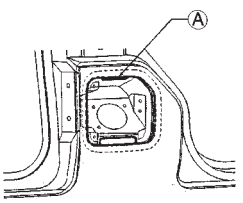
▼ : Sealant application areas

Ⓐ Smooth out sealant with a brush in the direction
Ⓑ Wipe off excess sealant after application
Ⓒ Apply under coating



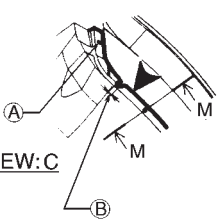


VIEW: A

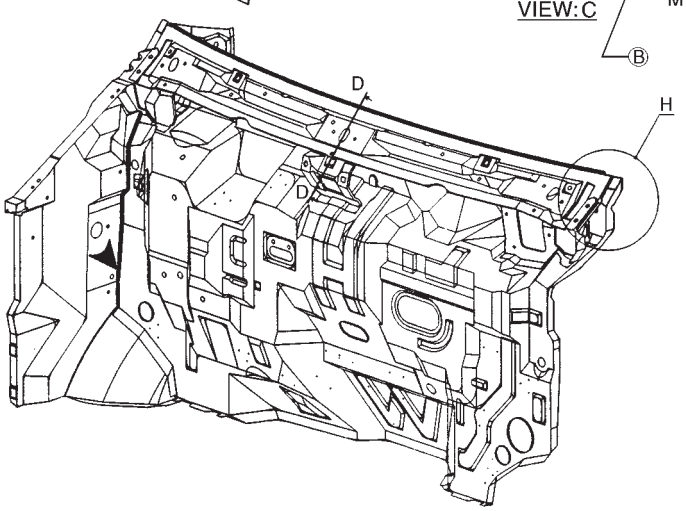


VIEW:B
(RH ONLY)

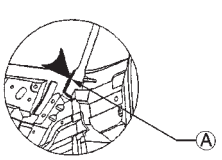
SECT:M-M



VIEW: C



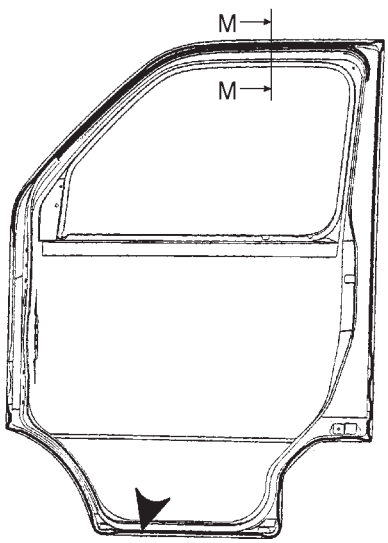
SECT:D-D



DETAIL:E

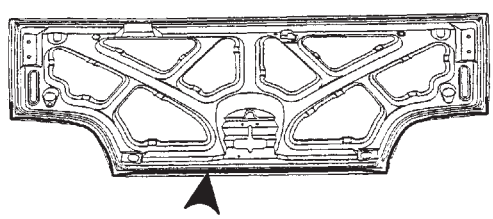
: Apply sealant

FRONT DOOR

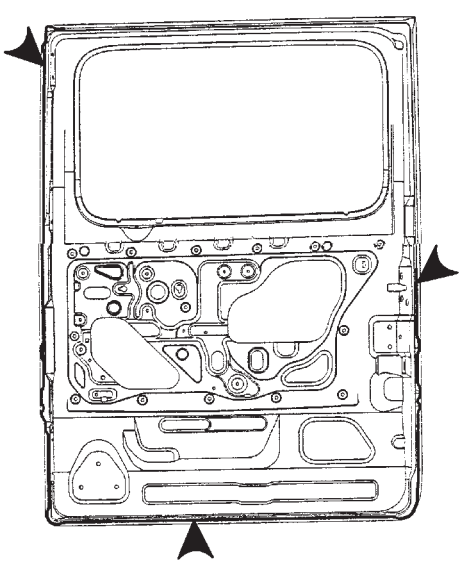


SECT : M-M

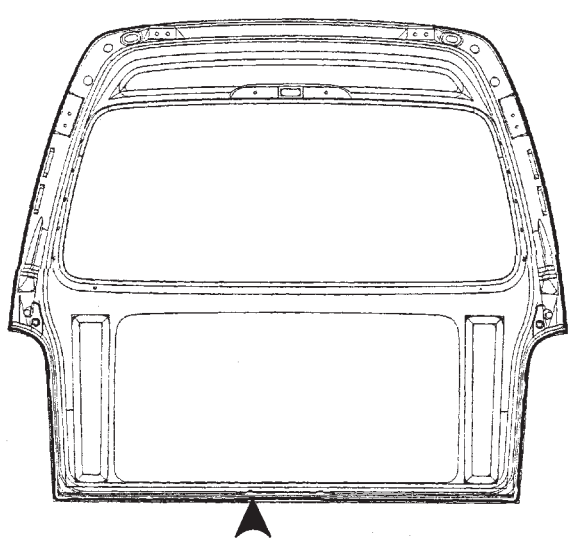
HOOD



REAR DOOR



BACK DOOR

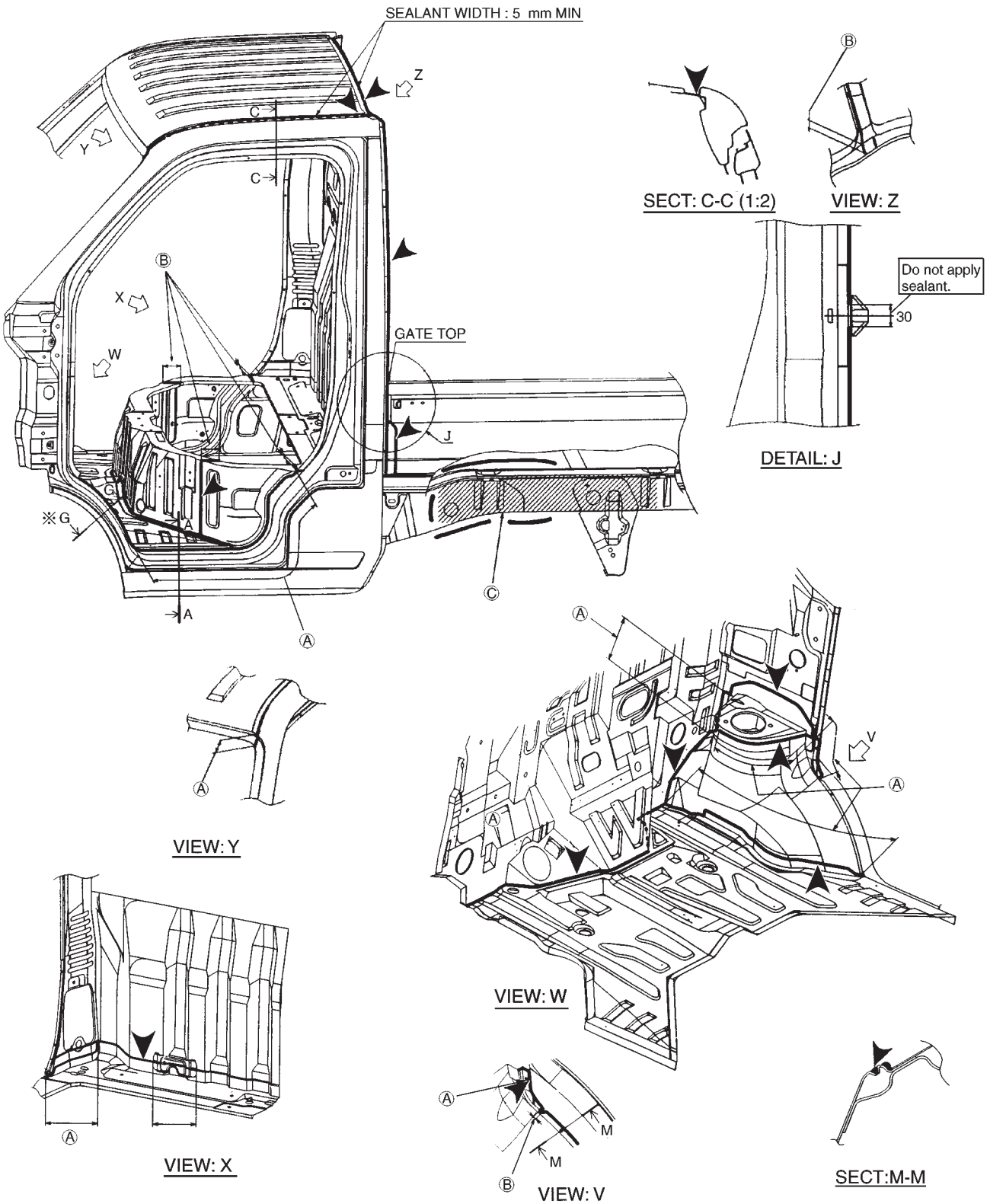


Truck model

▼: Sealant application areas

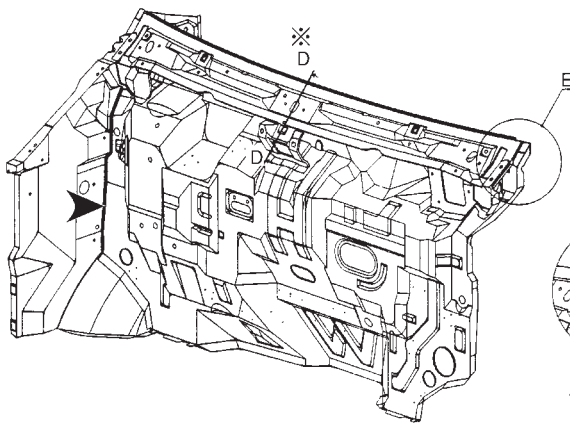
※ : Refer to the figure of van model

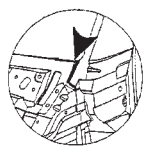
Ⓐ Smooth out sealant with a brush in the direction
Ⓑ Wipe off excess sealant after application
Ⓒ Apply under coating



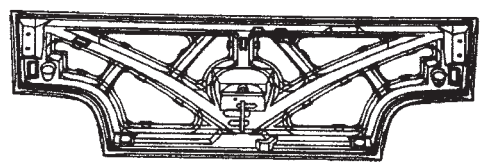
: Sealant application areas

※ : Refer to the figure of van model



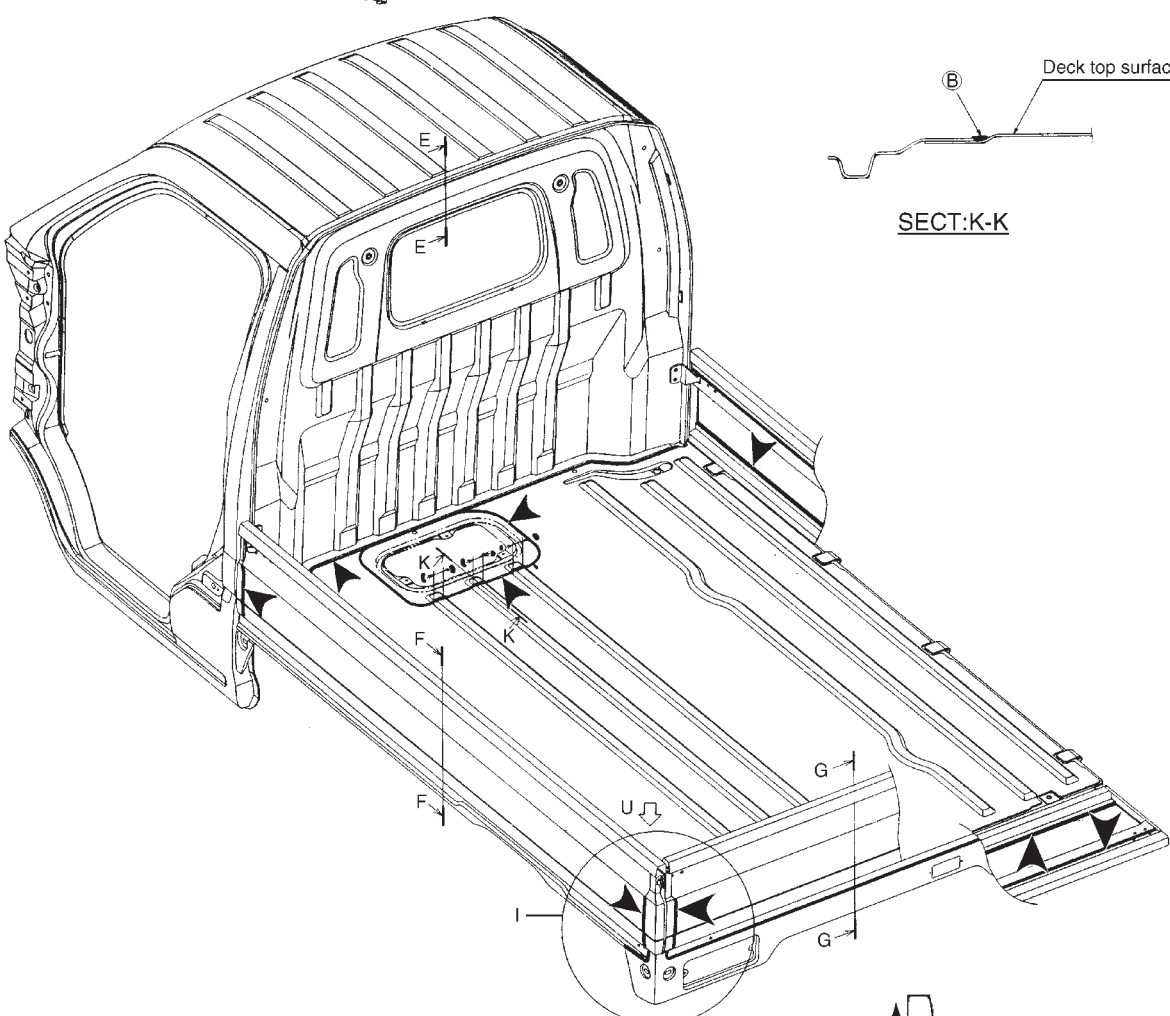


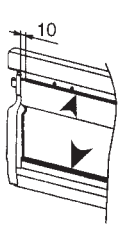
DETAIL:E



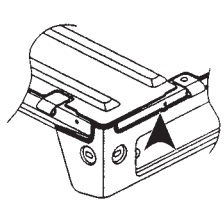
HOOD

SECT:K-K





VIEW:U



DETAIL: I

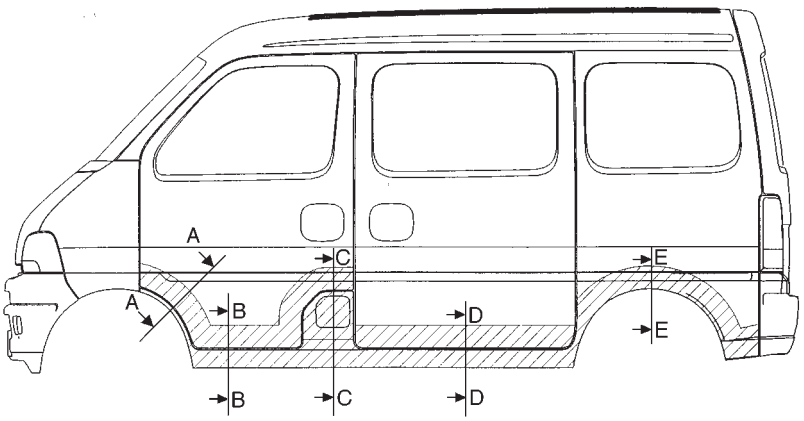
SECT: F-F

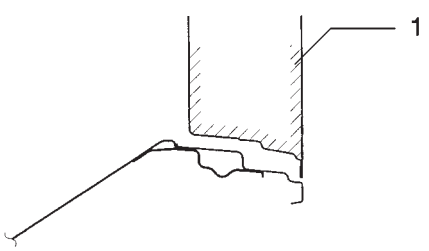
SECT: B-B

RUST-PROOF TREATMENT AREA

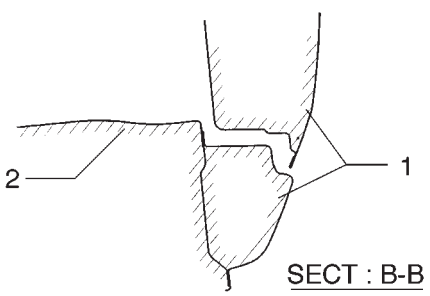
: Apply rust preventive to shaded area.

1 : Hot wax
2 : Underbody coat wax

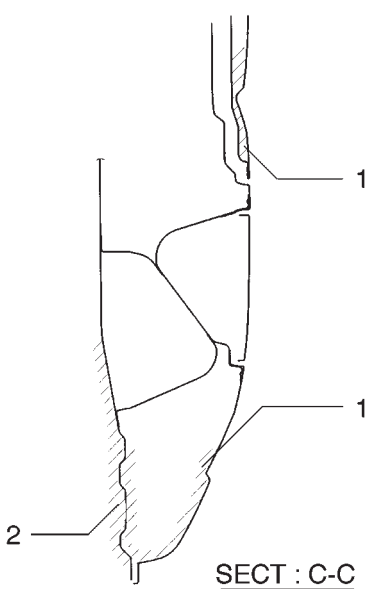




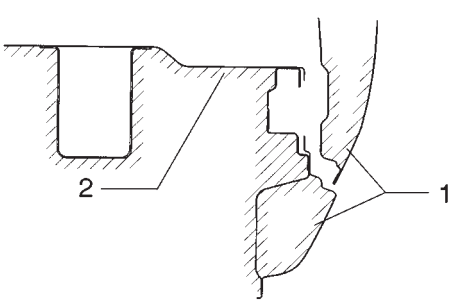
SECT : A-A



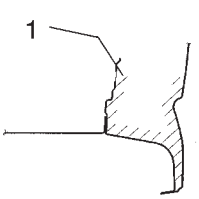
SECT : B-B



SECT : C-C



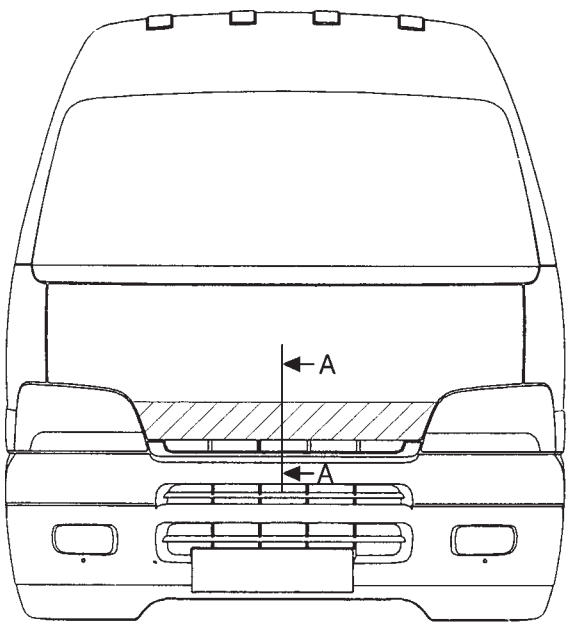
SECT : D-D

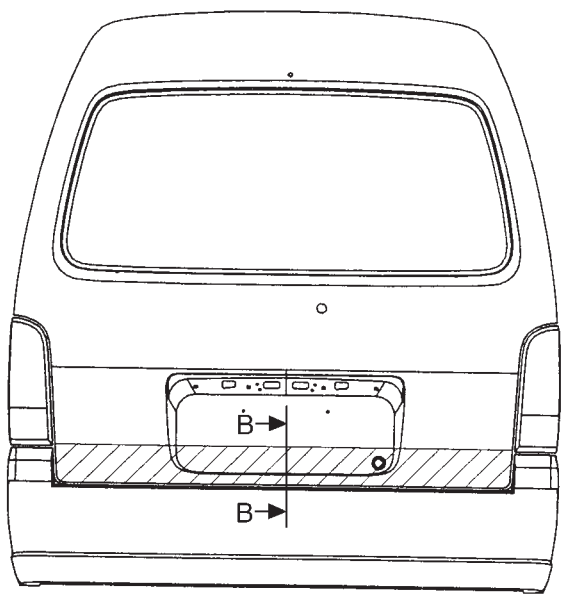


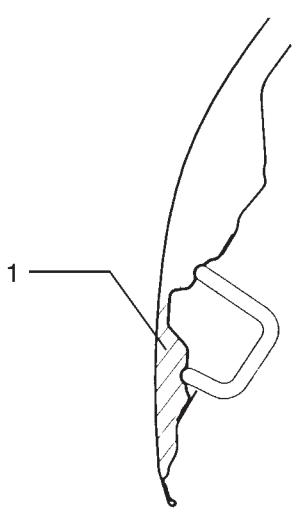
SECT : E-E

: Apply rust preventive to shaded area.

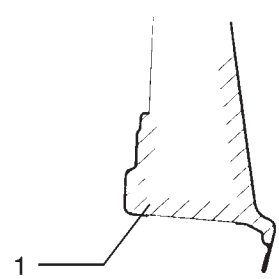
1 : Hot wax







SECT : A-A



SECT : B-B

PLASTIC PARTS FINISHING

Paintable plastic parts are ABS plastic parts.

Painting

Rigid or hard ABS plastic needs no primer coating.

General acrylic lacquers can be painted properly over hard ABS plastic in terms of adherence.

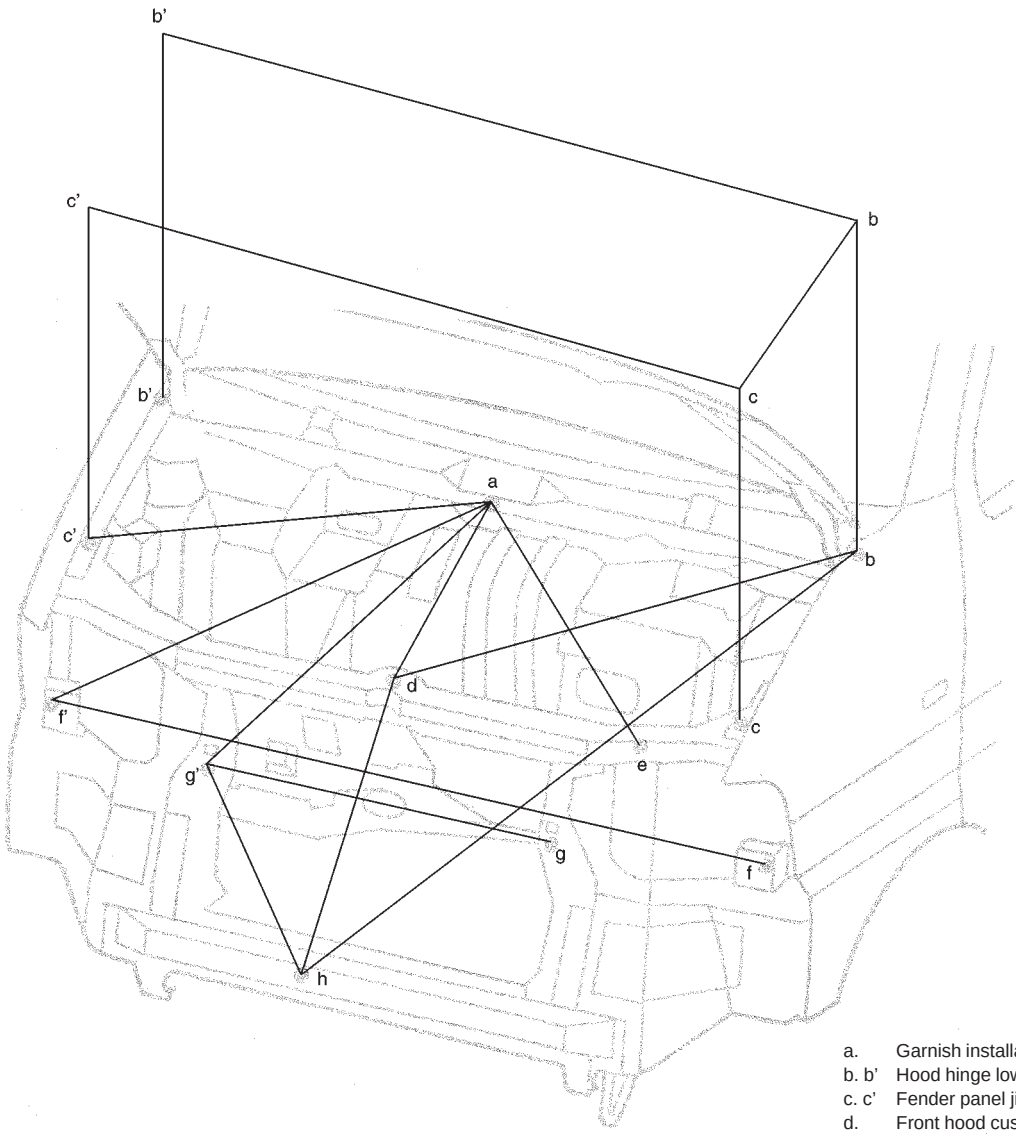
1) Use cleaning solvent for paint finish to wash each part.
2) Apply conventional acrylic color lacquer to part surface.
3) Follow lacquer directions for required drying time. (Proper drying temperature range is 60 to 70°C).

Reference

Plastic parts employ not only ABS (Acrylonitrile Butadiene Styrene) plastic but also polypropylene, vinyl, or the like plastic. Burning test method to identify ABS plastic is described below.

1) Use a sharp blade to cut off a plastic sliver from the part at its hidden backside.
2) Hold sliver with pincers and set it on fire.
3) Carefully observe condition of the burning plastic.
4) ABS plastic must raise readily distinguishable back smoke while burning with its residue suspended in air temporarily.
5) Polypropylene must raise no readily distinguishable smoke while burning.

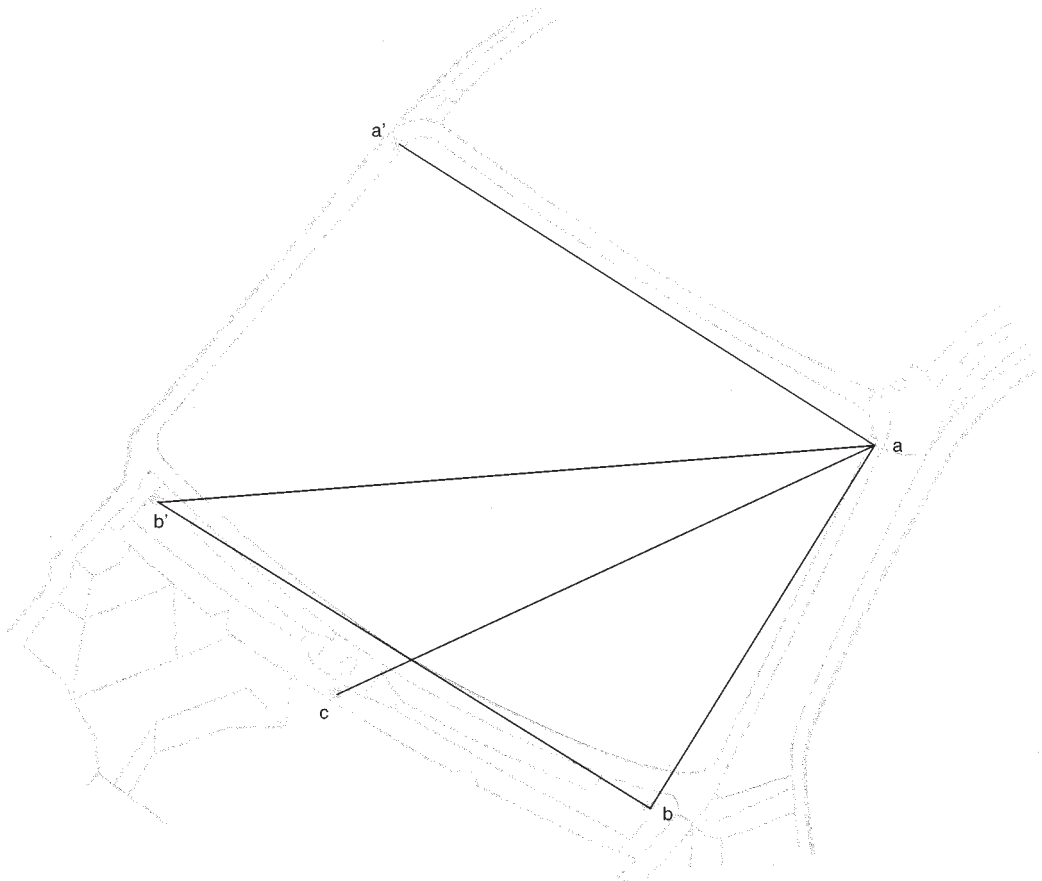
BODY DIMENSIONS



a. Garnish installation clip hole
b. b' Hood hinge lower installation hole
c. c' Fender panel jig hole
d. Front hood cushion installation hole
e. Headlight installation hole
f. f' Front bumper installation hole
g. g' Front bumper installation hole
h. Front lower crossmember jig hole

Measurement Dimension

Measurement Position	Length mm (in.)		Measurement Position	Length mm (in.)	
a – c'	729.5	(28.72)	c – c'	1224.0	(48.19)
a – d	431.3	(16.98)	f – f'	1307.0	(51.46)
a – e	692.5	(27.26)	f – h	568.9	(22.40)
a – f'	872.2	(34.34)	g – g'	620.0	(24.41)
a – g'	683.5	(26.91)	g' – h	327.0	(12.87)
b – b'	1233.0	(48.54)	h – d	551.8	(21.72)
b – c	355.3	(13.99)			
b – d	774.0	(30.47)			
b – h	973.6	(38.33)			



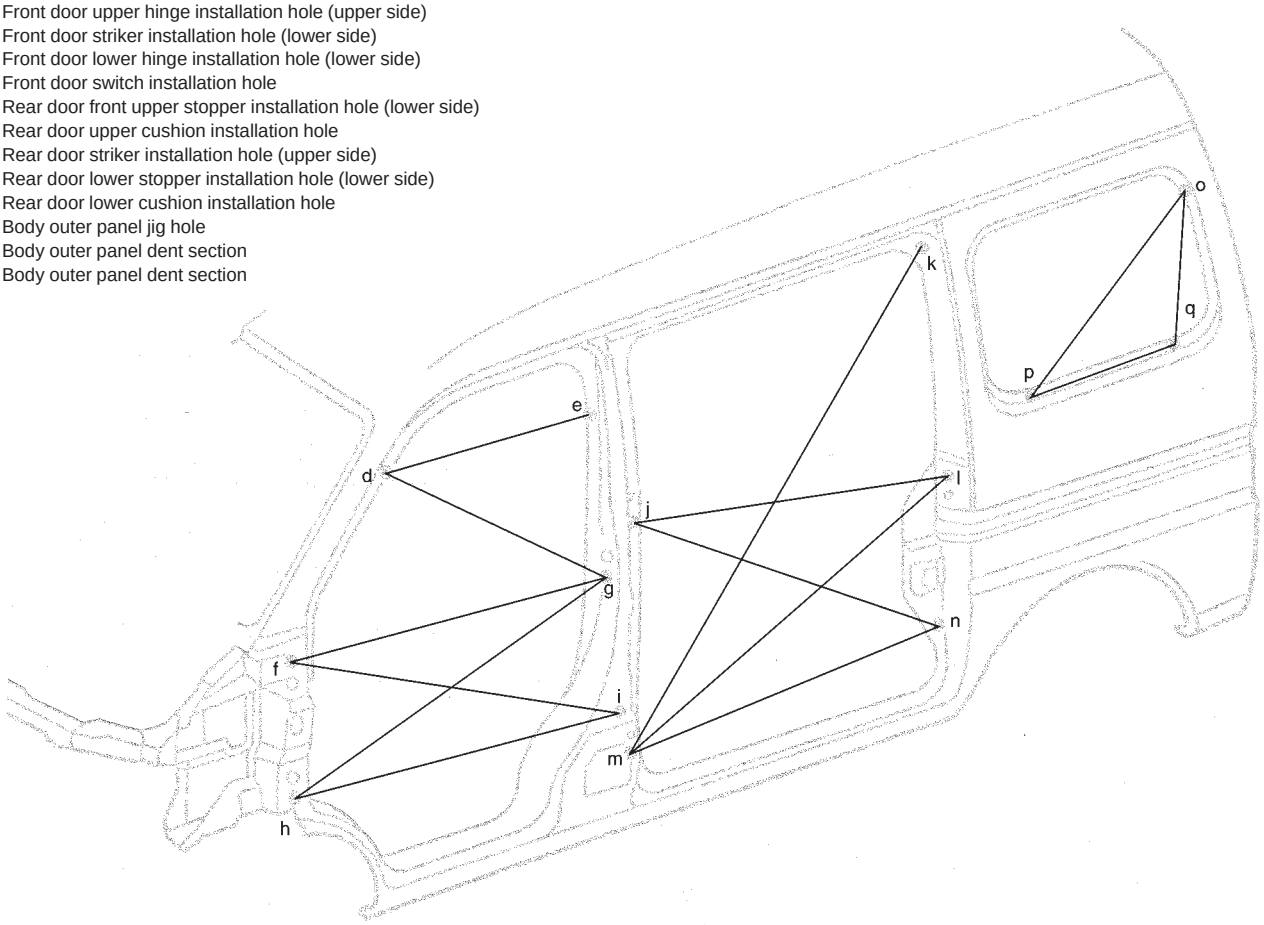
a. a' Roof panel front inner most end
b. b' Front hood hinge installation hole (upper side)
c. Garnish installation clip hole

Measurement Dimension

Van **Truck**

Measurement Position	Length mm (in.)		Measurement Position	Length mm (in.)	
a – a'	1099.9	(43.30)	a – a'	1082.4	(42.61)
a – b	610.1	(24.02)	a – b	624.0	(24.57)
a – b'	1270.0	(50.00)	a – b'	1269.0	(49.96)
a – c	827.3	(32.57)	a – c	832.8	(32.79)
b – b'	1127.9	(44.41)	b – b'	1127.9	(44.41)

d. Body outer panel jig hole
e. Body outer panel jig hole
f. Front door upper hinge installation hole (upper side)
g. Front door striker installation hole (lower side)
h. Front door lower hinge installation hole (lower side)
i. Front door switch installation hole
j. Rear door front upper stopper installation hole (lower side)
k. Rear door upper cushion installation hole
l. Rear door striker installation hole (upper side)
m. Rear door lower stopper installation hole (lower side)
n. Rear door lower cushion installation hole
o. Body outer panel jig hole
p. Body outer panel dent section
q. Body outer panel dent section



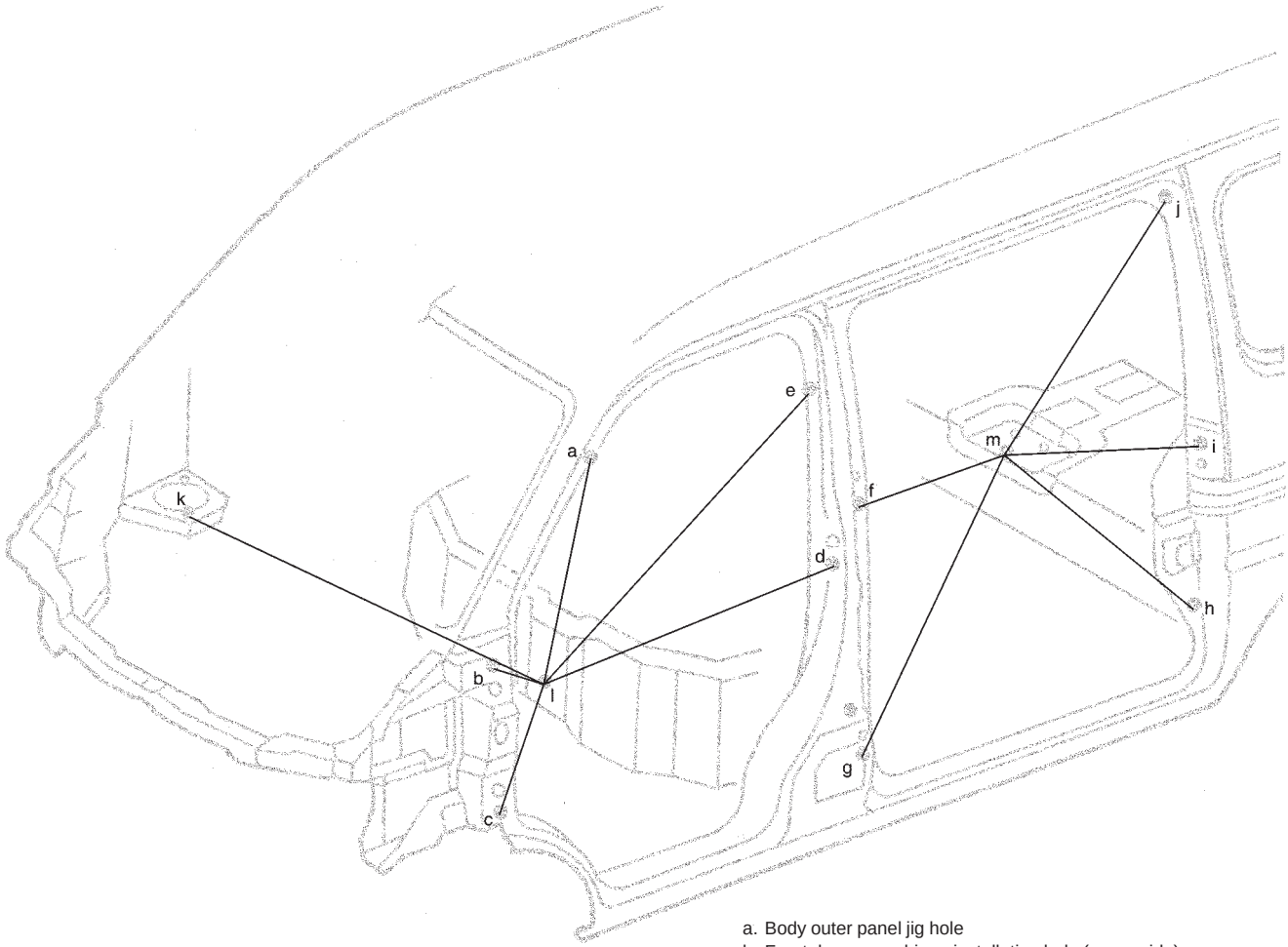
Measurement Dimension

Van

Measurement Position	Length mm (in.)	
d – e	581.4	(22.89)
d – g	767.2	(30.20)
d – i	1024.0	(40.31)
f – g	936.4	(36.87)
f – i	1018.7	(40.11)
h – g	983.9	(38.74)
h – i	916.4	(36.08)
j – l	944.0	(37.17)
j – n	1079.7	(42.51)
m – k	1418.1	(55.83)
m – l	1039.5	(40.93)
m – n	899.9	(35.43)
p – o	620.0	(24.41)
p – q	400.0	(15.75)
q – o	359.9	(14.17)

Truck

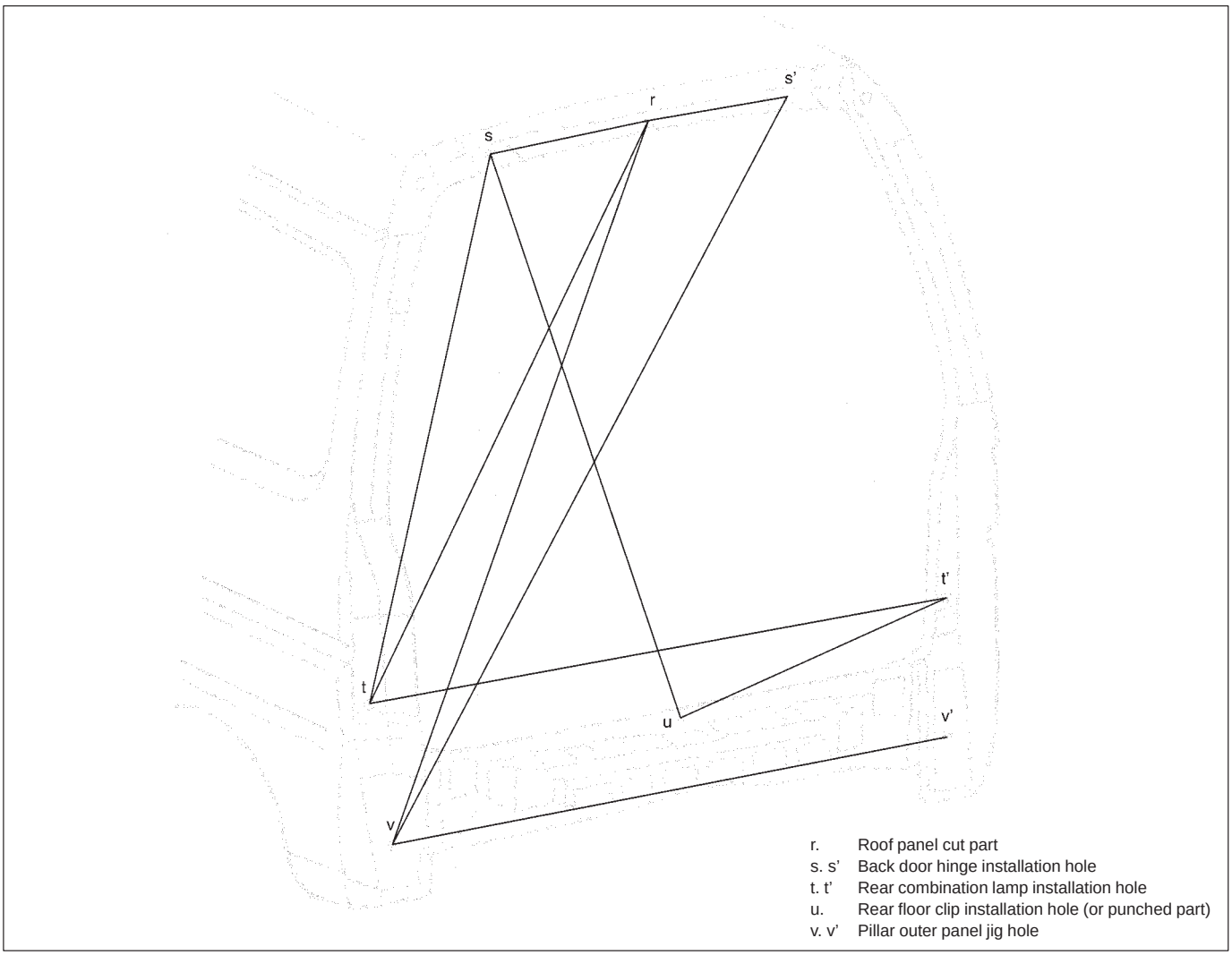
Measurement Position	Length mm (in.)	
d – e	313.7	(12.35)
d – g	663.3	(26.11)
d – i	998.0	(39.29)
f – g	936.4	(36.87)
f – i	1018.7	(40.11)
h – g	983.9	(38.74)
h – i	916.4	(36.08)



a. Body outer panel jig hole
b. Front door upper hinge installation hole (upper side)
c. Front door lower hinge installation hole (lower side)
d. Front door striker installation hole (lower side)
e. Body outer panel jig hole
f. Rear door front upper stopper installation hole (lower side)
g. Rear door front lower stopper installation hole (lower side)
h. Rear door rear lower stopper installation hole
i. Rear door striker installation hole (upper side)
j. Rear door rear upper stopper installation hole
k. Front suspension strut installation hole (front side)
l. Engine room front panel, air bag controller lower installation hole
m. Rear floor, front upper panel installation hole (or punched part)

Measurement Dimension (The * mark shows the Truck model)

Measurement Position	Length mm (in.)		Measurement Position	Length mm (in.)	
l – a	1134.9	(44.68)	m – f	1048.8	(41.29)
*l – a	*1255.1	*(49.41)	m – g	942.5	(37.11)
l – b	948.5	(37.34)	m – h	727.3	(28.63)
l – c	778.4	(30.65)	m – i	815.8	(32.12)
l – d	1035.0	(40.75)	m – j	1151.6	(45.34)
l – e	1263.2	(49.73)			
l – k	674.5	(26.56)			



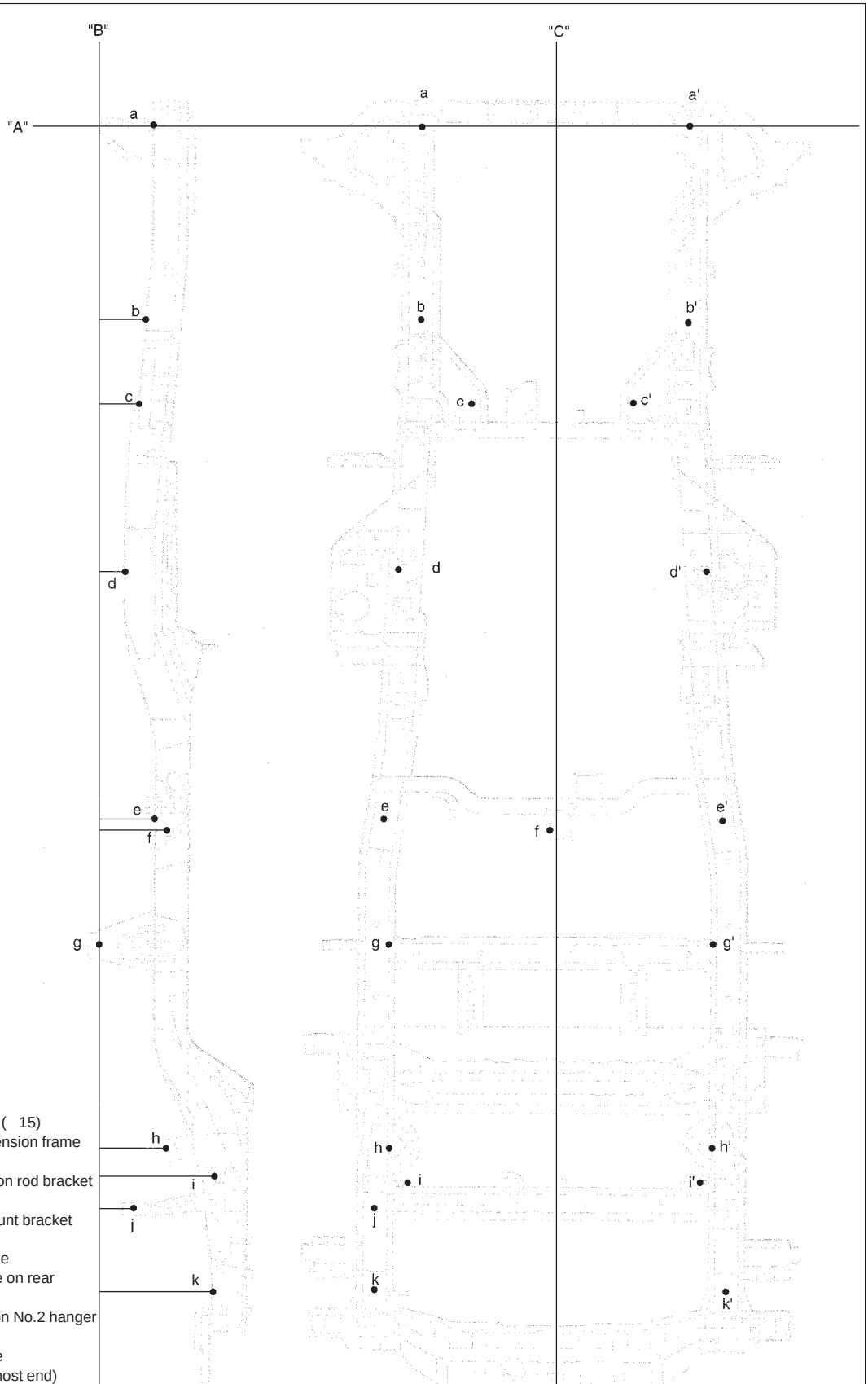
r. Roof panel cut part
s. s' Back door hinge installation hole
t. t' Rear combination lamp installation hole
u. Rear floor clip installation hole (or punched part)
v. v' Pillar outer panel jig hole

Measurement Dimension (The * mark shows the low roof model)

Measurement Position	Length mm (in.)	
r – t	1196.1	(47.09)
*r – t	*1112.2	*(43.79)
r – v	1394.2	(54.89)
*r – v	*1298.6	*(51.13)
s – s'	660.0	(25.98)
s – t	1049.5	(41.32)
*s – t	* 954.8	*(37.59)
s – u	1200.2	(47.25)
*s – u	*1103.0	*(43.43)
t – t'	1370.0	(53.94)
u – t'	704.9	(27.75)
v – v'	1096.0	(43.15)
v – s'	1560.0	(61.42)
*v – s'	*1477.3	*(58.16)

UNDERBODY DIMENSIONS

FOR VAN MODEL



a. a' Drain hole of floor front frame (15)
b. b' Installation hole of front suspension frame (rear side) (15)
c. c' Installation hole of compression rod bracket (inside)
d. d' Installation hole of engine mount bracket (outside) (15)
e. e' Drain hole of floor center frame
f. Engine mount installation hole on rear crossmember
g. g' Trailing arm installation hole on No.2 hanger (inside)
h. h' Bump stopper installation hole
i. i' Shock absorber pivot (inner most end)
j. Lateral rod installation hole on No.2 bracket (front side)
k. k' Drain hole of floor center frame

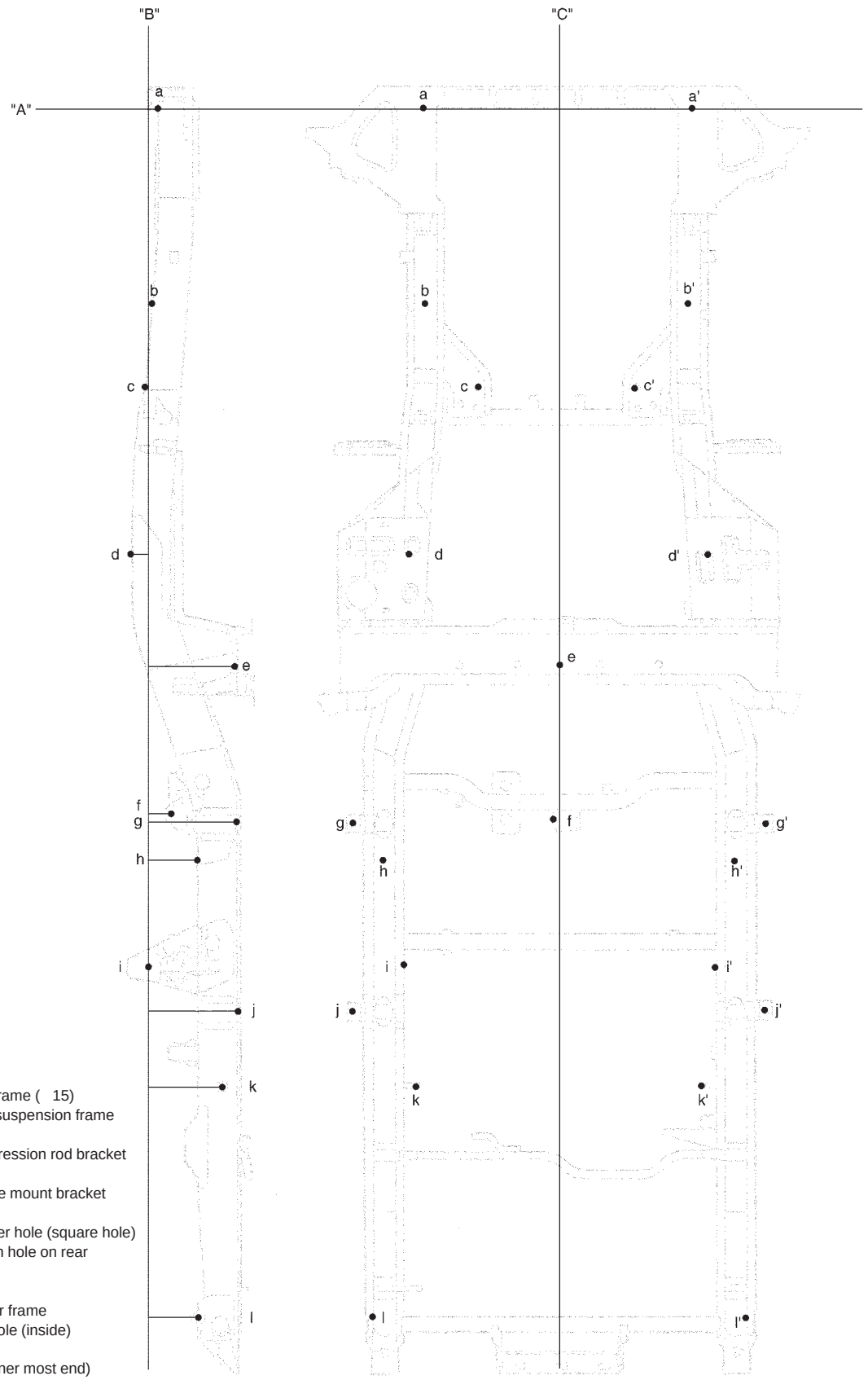
Projection Dimension

Measurement Position	Length from standard line "A" mm (in.)		Length from standard line "B" mm (in.)		Length from standard line "C" mm (in.)	
a	0	(0)	135.4	(5.33)	369.0	(14.53)
b	562.0	(22.13)	119.0	(4.69)	369.0	(14.53)
c	783.6	(30.85)	103.3	(4.07)	222.2	(8.75)
d	1231.5	(48.48)	60.5	(2.38)	416.0	(16.38)
e	1916.5	(75.45)	145.0	(5.71)	463.8	(18.26)
f	1942.9	(76.49)	165.5	(6.52)	—	(—)
g	2287.0	(90.04)	0	(0)	454.0	(17.87)
h	2827.9	(111.33)	187.7	(7.39)	440.0	(17.32)
i	2891.5	(113.84)	325.7	(12.82)	400.1	(15.75)
j	2963.5	(116.67)	83.0	(3.27)	—	(—)
k	3196.5	(125.85)	312.0	(12.28)	487.0	(19.17)

Measurement Dimension

Measurement Position	Length mm (in.)		Measurement Position	Length mm (in.)	
a – a'	738.0	(29.06)	h – h'	880.0	(34.65)
a – b'	927.8	(36.53)	h' – e'	912.7	(35.93)
a – c	797.9	(31.41)	e' – i	1315.1	(51.78)
b – b'	738.0	(29.06)	h – e'	1284.2	(50.56)
b – d	673.7	(26.52)	e' – j	1420.3	(55.92)
c – c'	444.5	(17.50)	e – k	1291.0	(50.83)
c – d	489.9	(19.29)	i – i'	800.2	(31.50)
d – d'	832.0	(32.76)	k – k'	974.0	(38.35)
d – e	691.8	(27.24)	k – e'	1603.2	(63.12)
d – e'	1118.2	(44.02)			
d – f	825.8	(32.51)			
d – g	1057.9	(41.65)			
e – e'	927.5	(36.52)			
e – f	455.0	(17.91)			
e – g	398.0	(15.67)			
g – g'	908.0	(35.68)			
g – e'	1000.3	(39.38)			

FOR TRUCK MODEL



a. a' Drain hole of floor front frame (15)
b. b' Installation hole of front suspension frame (rear side) (15)
c. c' Installation hole of compression rod bracket (inside)
d. d' Installation hole of engine mount bracket (outside)
e. Cabin back lower member hole (square hole)
f. Engine mount installation hole on rear crossmember (left side)
g. g' Deck mounting hole
h. h' Drain hole on floor center frame
i. i' Leaf spring installation hole (inside)
j. j' Deck mounting hole
k. k' Shock absorber pivot (inner most end)
l. l' Leaf spring shackle installation hole (outside)

Projection Dimension

Measurement Position	Length from standard line "A" mm (in.)		Length from standard line "B" mm (in.)		Length from standard line "C" mm (in.)	
a	0	(0)	30.9	(1.22)	369.0	(14.53)
b	562.0	(22.13)	14.54	(0.57)	369.0	(14.53)
c	783.6	(30.85)	1.13	(0.04)	222.2	(8.75)
d	1231.5	(48.48)	–44.0	(1.73)	416.0	(16.38)
e	1484.5	(58.44)	292.6	(11.52)	0	(0)
f	1942.9	(76.49)	61.0	(2.40)	—	(—)
g	1971.5	(77.62)	250.4	(9.86)	578.3	(22.77)
h	—	(—)	—	(—)	492.0	(19.37)
i	2353.8	(92.67)	0	(0)	458.5	(18.05)
j	2481.5	(97.70)	250.4	(9.84)	576.7	(22.70)
k	2681.5	(105.57)	208.5	(8.21)	392.3	(15.44)
l	3306.5	(130.18)	137.5	(5.41)	530.5	(20.89)

Measurement Dimension

Measurement Position	Length mm (in.)		Measurement Position	Length mm (in.)	
a – a'	738.0	(29.06)	h – j'	1153.8	(45.43)
a – b'	927.8	(36.53)	h – k'	1082.4	(42.61)
a – c	797.9	(31.41)	h – l'	1611.1	(63.43)
b – b'	738.0	(29.06)	i – i'	917.0	(36.10)
b – d	673.7	(26.52)	j – j'	1153.3	(45.40)
c – c'	444.5	(17.50)	k – k'	784.7	(30.90)
c – d	489.9	(19.29)	l – l'	1061.0	(41.77)
d – d'	832.0	(32.76)			
d – e	591.9	(23.30)			
e – f	513.7	(20.22)			
e – g	757.2	(29.81)			
e – h	774.1	(30.48)			
g – g'	1156.5	(45.53)			
h – h'	984.0	(38.74)			
h – i'	1003.8	(39.52)			

SECTION 10

RESTRAINT SYSTEM

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

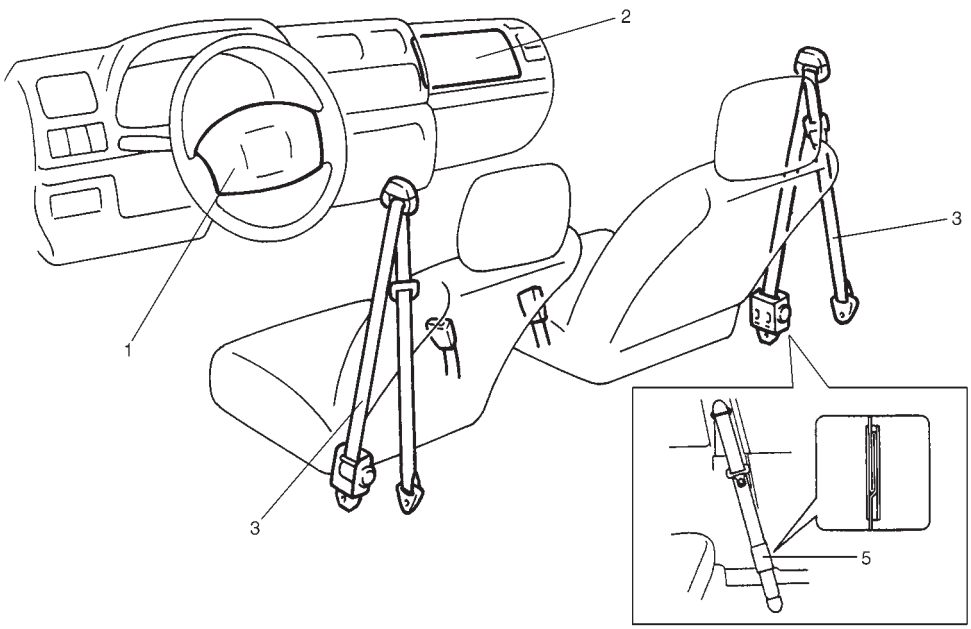
- **Service on and around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Refer to AIR BAG SYSTEM COMPONENTS AND WIRING LOCATION VIEW in air bag system section in order to confirm whether you are performing service on or near the air bag system components or wiring. Please observe all WARNINGS and SERVICE PRECAUTIONS 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 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.

CONTENTS

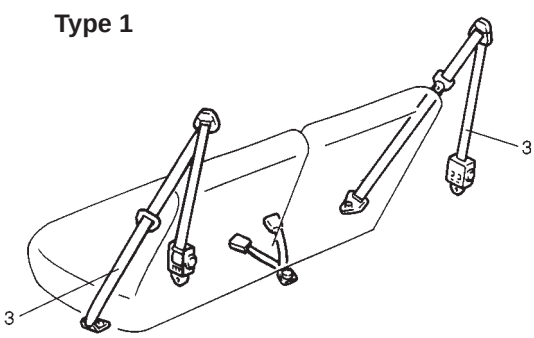
GENERAL DESCRIPTION

FRONT SEAT

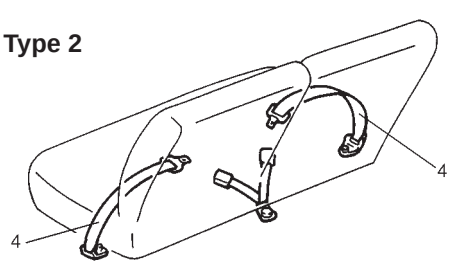


2ND SEAT (IF EQUIPPED)

Type 1

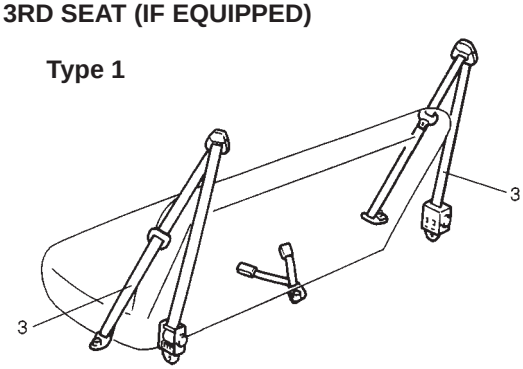


Type 2

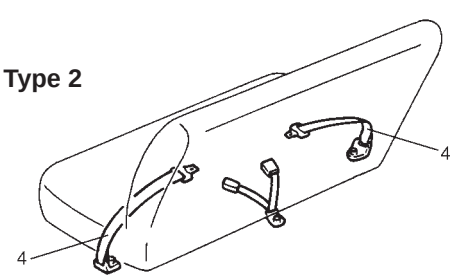


3RD SEAT (IF EQUIPPED)

Type 1



Type 2



1. Driver side air bag (if equipped)
2. Passenger side air bag (if equipped)
3. Lap-shoulder seat belt with Emergency Locking Retractor (ELR)
4. Lap seat belt
5. Energy Management Loop (EML) (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 ELR AND EML

The seat belt with ELR and EML includes both an ELR mechanism described above and an Energy Management Loop (EML).

An EML is a small loop of webbing lightly stitched into the shoulder belt under the plastic sleeve. When the loop is pulled by a force exceeding a specified value, the seam of the loop is torn so that the instantaneous load applied to the driver and passenger wearing that seat belt is reduced.

DRIVER AND FRONT PASSENGER SIDE AIR BAGS

With the air bag system which includes air bags for both the driver's and passenger's sides, the driver air bag (inflator) module is deployed from the center of the steering column and the passenger air bag (inflator) module from the top of the instrument panel in front of the front passenger seat in occurrence of a front collision with an impact larger than a certain set value to supplement protection offered by the driver and front passenger seat belts.

SEAT BELT

ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

WARNING:
If replacing seat belt is necessary, replace buckle and retractor assembly (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 retractor assembly (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 or latch plate.
- Do not bleach or dye belt webbing. (Use only mild soap and lukewarm water to clean it.)
- When installing a seat belt anchor bolt by hand to prevent cross-threading.
- 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.

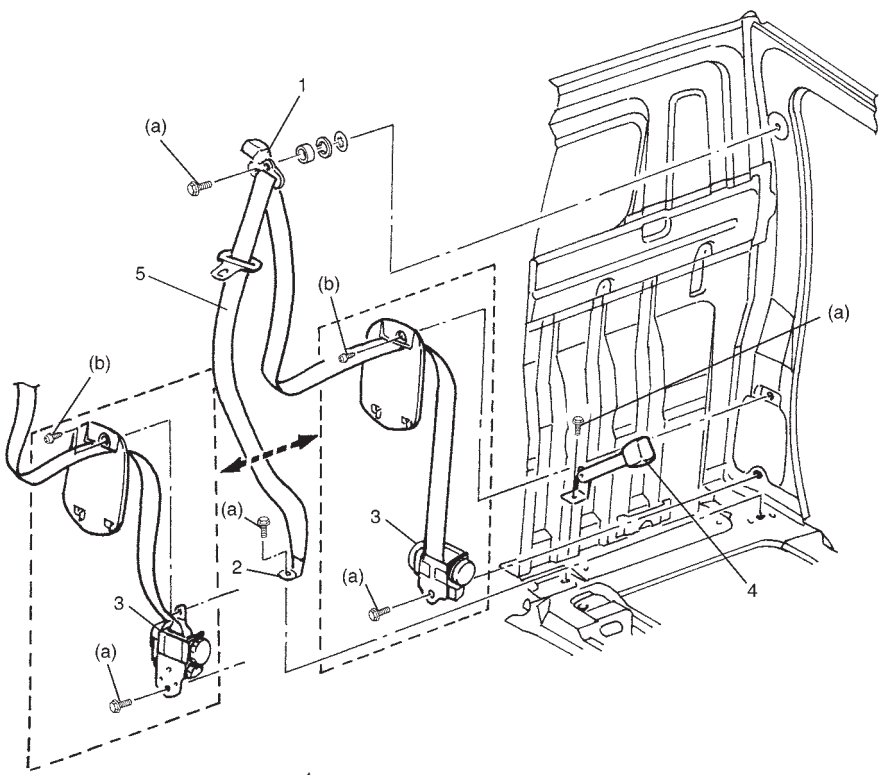
FRONT SEAT BELT

WARNING:
Be sure to read SERVICE PRECAUTIONS in this section before starting to work and observe every precaution during work.

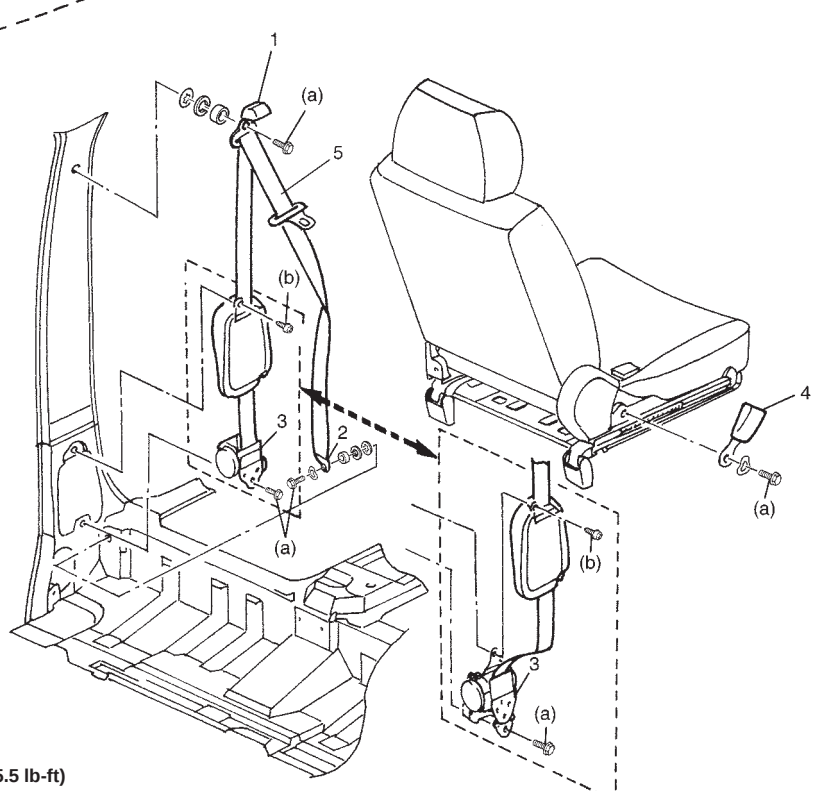
REMOVAL

Remove front seat belts.

Truck



Van



Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)
(b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

1. Upper anchor
2. Lower anchor
3. Retractor assembly
4. Buckle
5. Front seat belt

INSPECTION

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
  Its webbing or strap should be free from damage.
- Retractor assembly with ELR
  It should lock webbing when pulled quickly.
  The front seat belt retractor assembly should pass the above inspection and should lock webbing even when tilted (approx. 15°) toward the fore and aft or right and left directions.
- Anchor bolt
  Anchor bolts should be torqued to specification.
- Belt latch
  It should be secure when latched.

INSTALLATION

Install in reverse order of removal, noting the following.

- Seat belt anchor bolts should have an unified fine thread (7/16–20 UNF). Under no circumstances should any different sized or metric screw threads be used.
- Be sure to tighten seat belt anchor bolts (a) and screw (b) to specified torque.

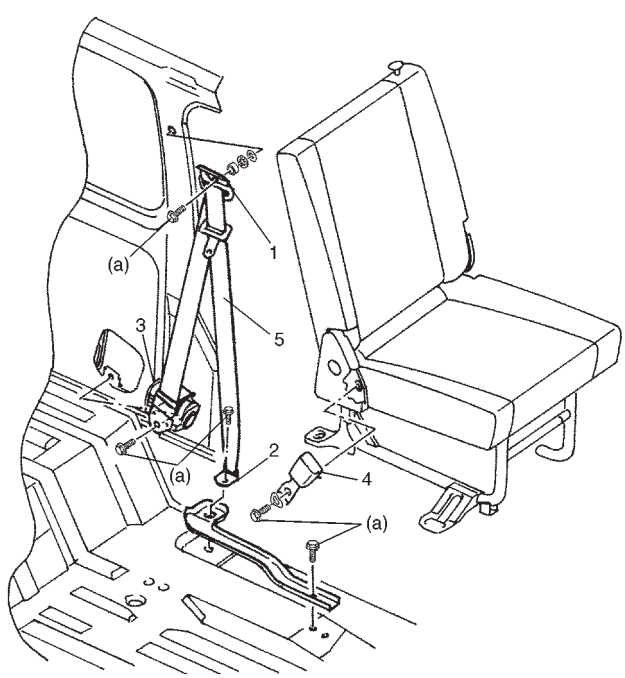
2ND SEAT BELT (IF EQUIPPED)

WARNING:
Be sure to read SERVICE PRECAUTIONS in this section before starting to work and observe every precaution during work.

REMOVAL

Remove 2nd seat belts.

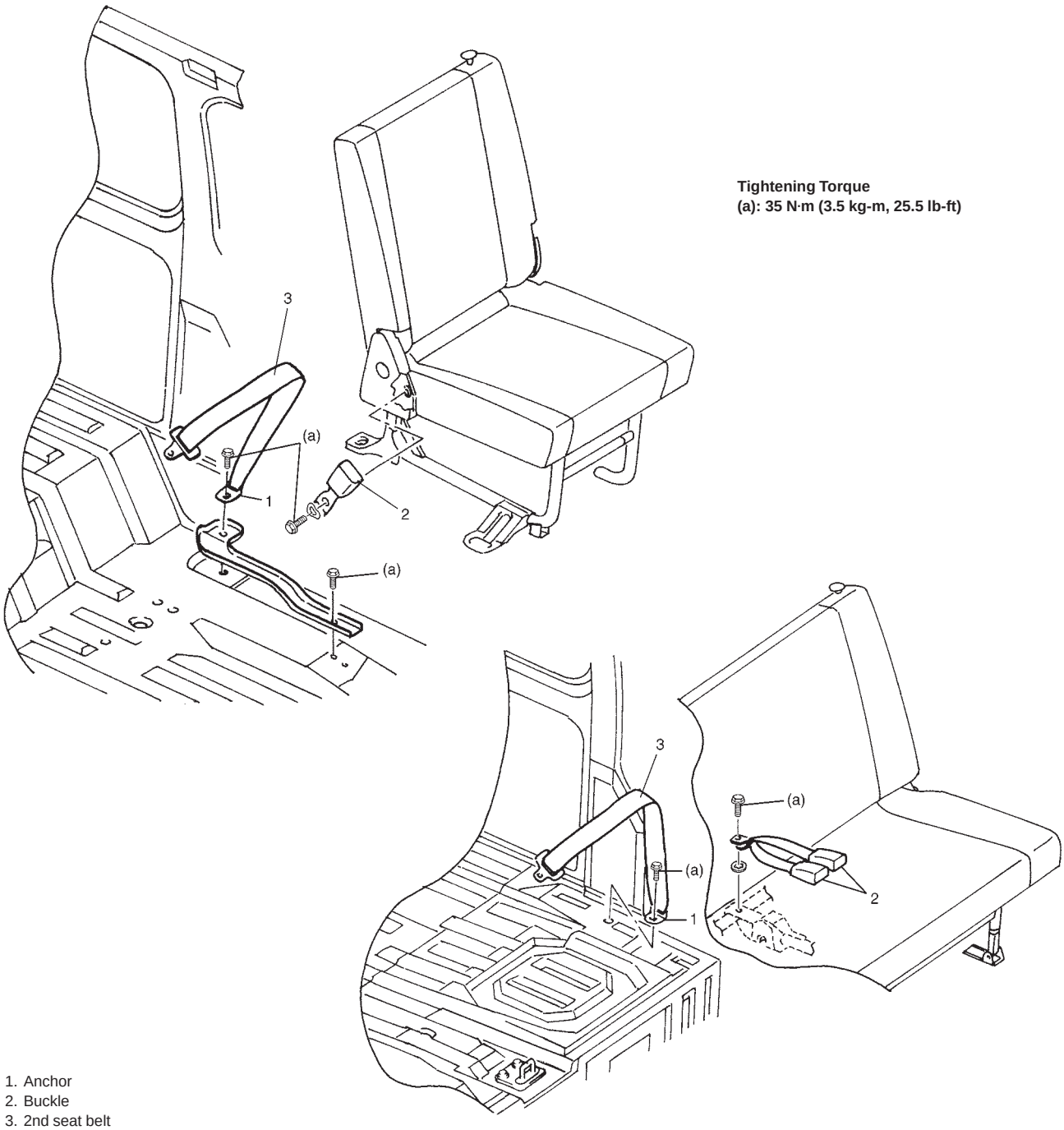
Lap-shoulder belt type



1. Upper anchor
2. Lower anchor
3. Retractor assembly
4. Buckle
5. 2nd seat belt

Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)

Lap belt type



1. Anchor
2. Buckle
3. 2nd seat belt

INSPECTION

Check the 2nd seat belt in the same way as when inspecting front seat belt. (Refer to INSPECTION of FRONT SEAT BELT in this section.)

INSTALLATION

Install the 2nd seat belt observing the same precautions as when installing front seat belt. (Refer to INSTALLATION of FRONT SEAT BELT in this section.)

- Be sure to tighten seat belt anchor bolts (a) to specified torque.

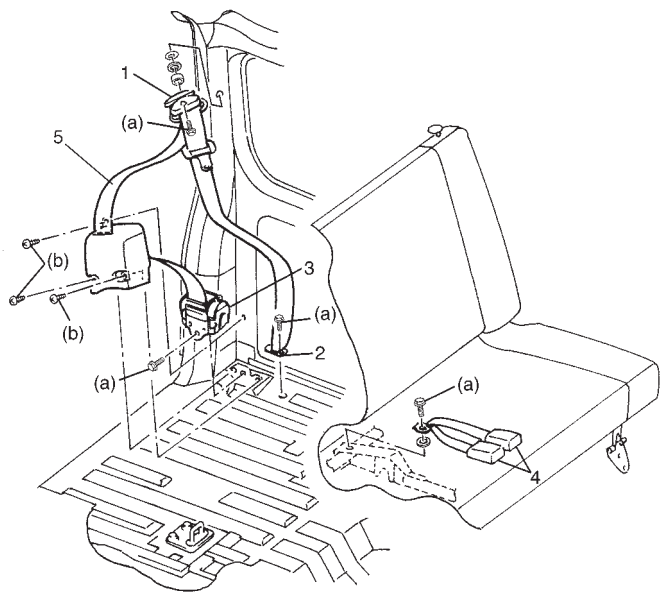
3RD SEAT BELT (IF EQUIPPED)

WARNING:
Be sure to read SERVICE PRECAUTIONS in this section before starting to work and observe every precaution during work.

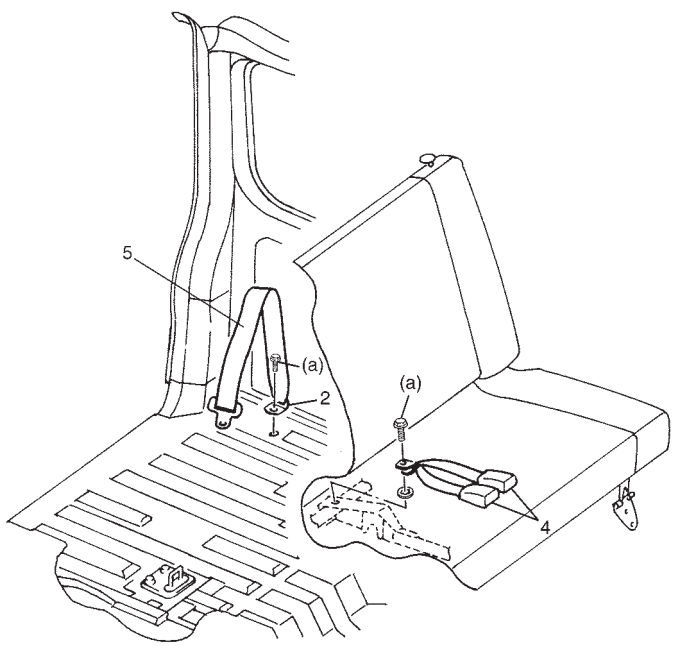
REMOVAL

Remove 3rd seat belts.

Lap-shoulder belt type



Lap belt type



1. Upper anchor
2. Lower anchor
3. Retractor assembly
4. Buckle
5. 3rd seat belt

Tightening Torque
(a): 35 N·m (3.5 kg-m, 25.5 lb-ft)
(b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

INSPECTION

Check the 3rd seat belt in the same way as when inspecting front seat belt. (Refer to INSPECTION of FRONT SEAT BELT in this section.)

INSTALLATION

Install the 3rd seat belt observing the same precautions as when installing front seat belt. (Refer to INSTALLATION of FRONT SEAT BELT in this section.)

- Be sure to tighten seat belt anchor bolts (a) and screws (b) to specified torque.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	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:

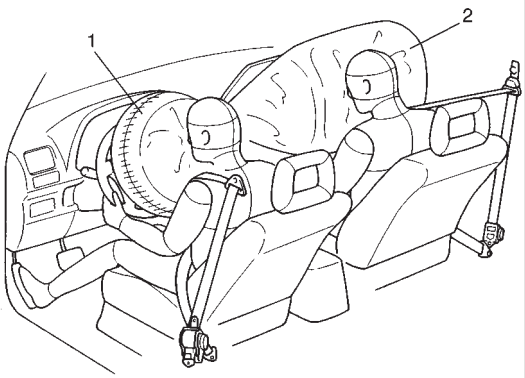
- **Service on or around the air bag system components or wiring must be performed only by an authorized SUZUKI dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS of ON-VEHICLE SERVICE in this section before performing service on or around the air bag system components or wiring. Failure to 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.

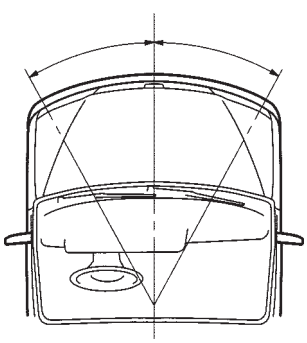
CONTENTS

GENERAL DESCRIPTION



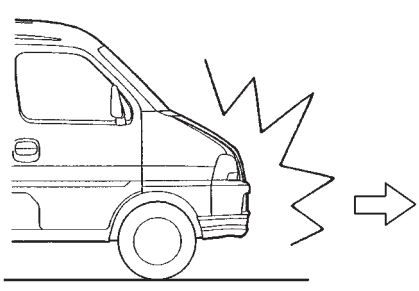
1. Driver side air bag
2. Passenger side air bag (if equipped)

With the air bag system which includes air bag(s) for the driver's and passenger's (if equipped) sides, the driver air bag (inflator) module is deployed from the center of the steering column and the passenger air bag (inflator) module from the top of the instrument panel in front of the front passenger seat (if equipped) 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 (if equipped) seat belts.

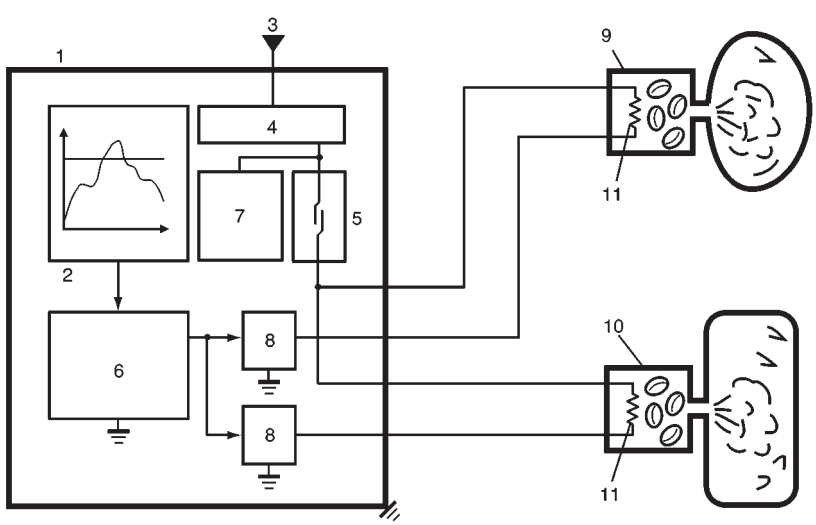


The air bag system is designed to activate only in severe frontal collisions. It is not designed to activate in rear impacts, side impacts, rollovers, or minor frontal collisions, since it would offer no protection in those types of accidents.

OPERATION OF AIR BAG SYSTEM AT COLLISION

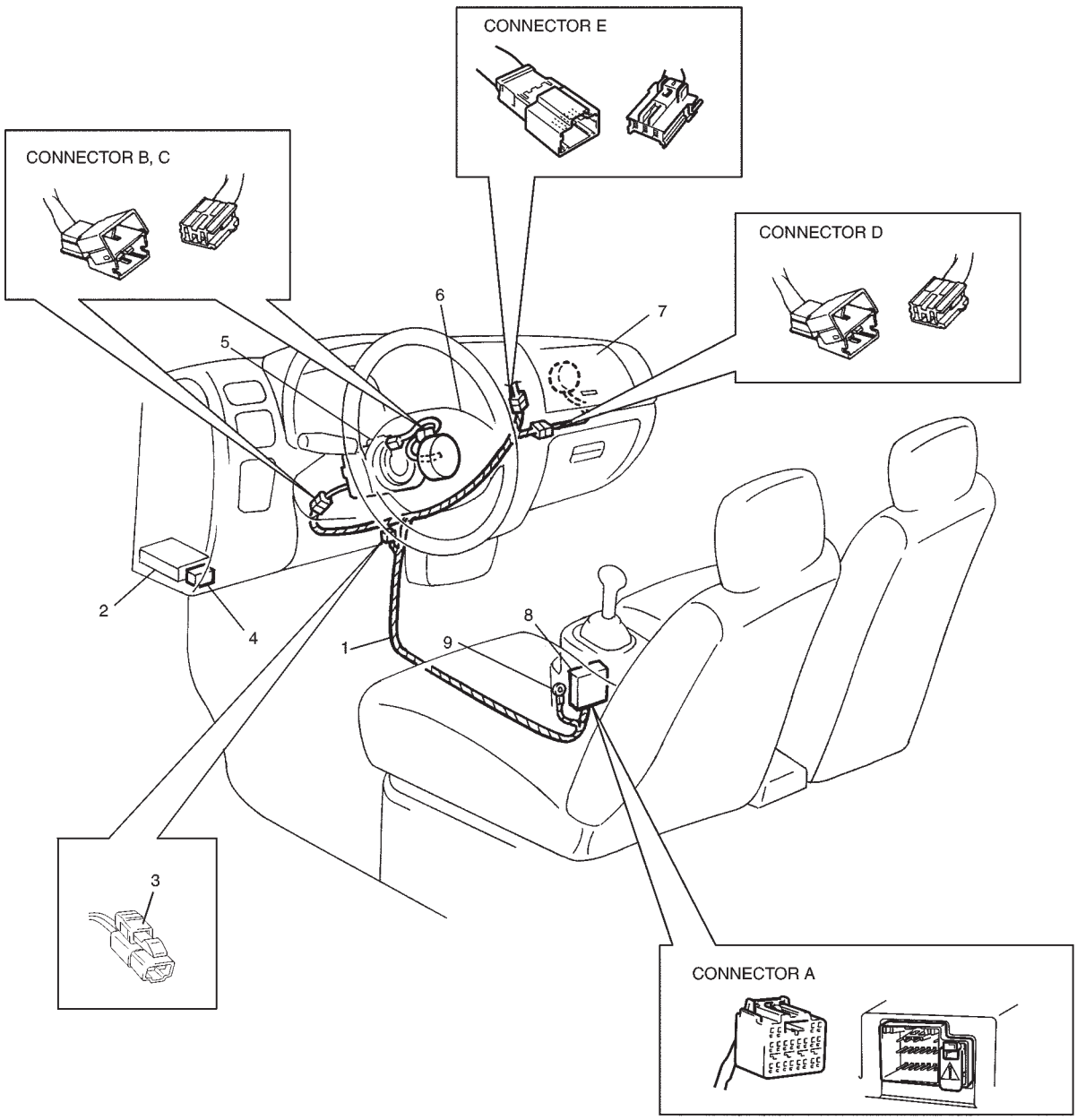


Frontal crash



1. SDM
2. Sensor
3. Power source
4. Voltage converter
5. Safing sensor
6. Micro-controller
7. Energy reserve circuit
8. Ignition driver circuit
9. Driver air bag
10. Passenger air bag (if equipped)
11. Squib circuit

SYSTEM COMPONENTS AND WIRING LOCATION VIEW AND CONNECTORS

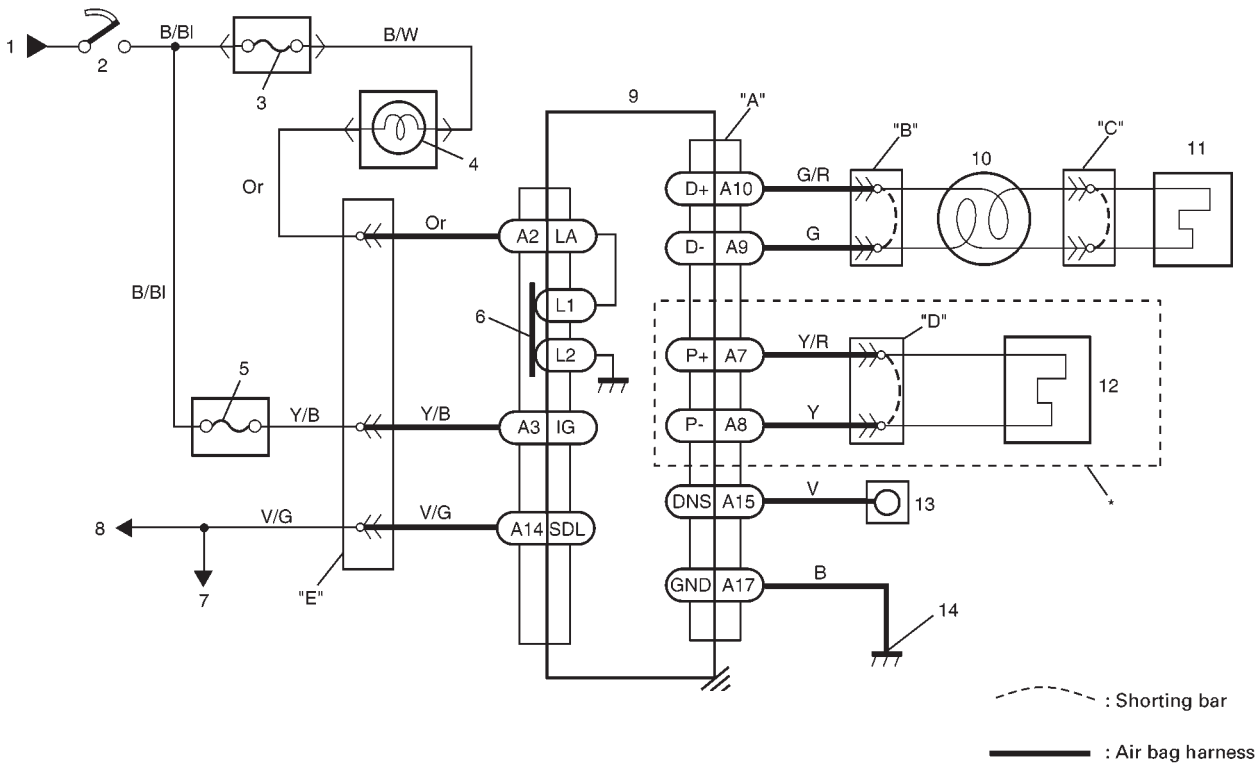


1. Air bag harness
2. Fuse box
3. “AIR BAG” monitor coupler
4. DLC
5. Contact coil assembly
6. Driver air bag (inflator) module
7. Passenger air bag (inflator) module (if equipped)
8. SDM
9. Ground for air bag system

SYSTEM WIRING DIAGRAM

WIRE HARNESS COLOR

B	: Black	G/R	: Green/Red	Y	: Yellow
B/W	: Black/White	Or	: Orange	Y/B	: Yellow/Black
B/Bl	: Black/Blue	V	: Violet	Y/R	: Yellow/Red
G	: Green	V/G	: Violet/Green	W	: White



"A" ~ "E" : Connector
* : If equipped

TERMINAL ARRANGEMENT OF SDM
(VIEWED FROM HARNESS SIDE)

A4	A3	L2		L1		A2	A1
A12	A11	A10	A9	A8	A7	A6	A5
A20	A19	A18	A17	A16	A15	A14	A13

1. From main fuse
2. Ignition switch
3. "IG METER" fuse in fuse box
4. "AIR BAG" warning lamp in combination meter
5. "AIR BAG" fuse in fuse box
6. Connection detection pin
7. To ECM, P/S control module (if equipped) and ABS control module (if equipped)
8. To data link connector (DLC)
9. SDM
10. Contact coil assembly
11. Driver air bag (inflator) module
12. Passenger air bag (inflator) module (if equipped)
13. "AIR BAG" monitor coupler
14. Ground for air bag system

CONNECTOR "A" (SDM connector)

TERMINAL	CIRCUIT
A1	————
A2	"AIR BAG" warning lamp
A3	Ignition switch
A4	————
A5	————
A6	————
A7	Passenger air bag (inflator) module High
A8	Passenger air bag (inflator) module Low
A9	Driver air bag (inflator) module Low
A10	Driver air bag (inflator) module High
A11	————
A12	————
A13	————
A14	Data link connector (DLC)
A15	Diagnosis switch
A16	————
A17	Ground
A18	————
A19	————
A20	————

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.

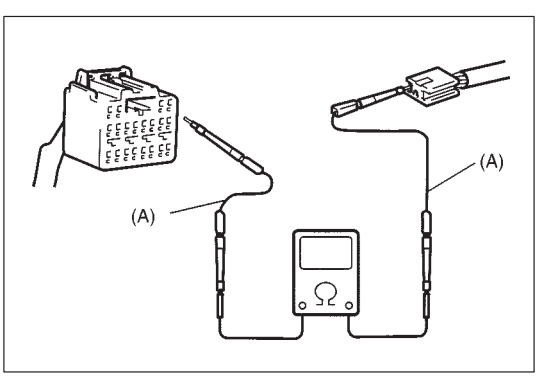
DIAGNOSTIC TROUBLE CODES

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 TOOLS

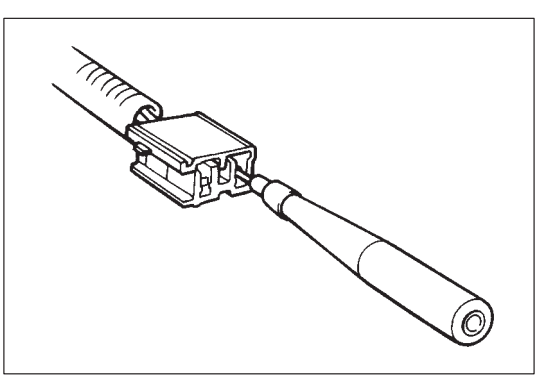
WARNING:
To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester. Instructions 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.

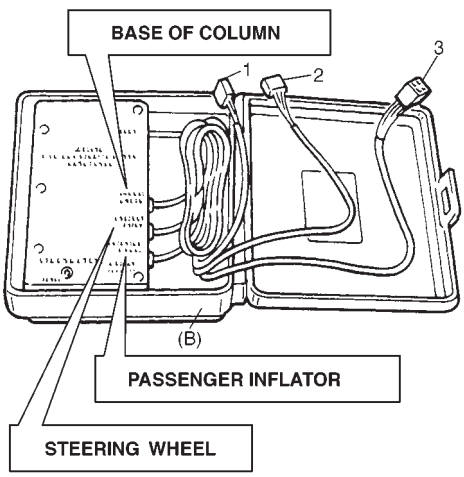


Special Tool (Connector Test Adapter Kit)
(A): 09932-76010

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 will also give an idea of whether contact tension is sufficient, helping to find an open or intermittent open due to poor terminal contact.



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

Special Tool (Air Bag Driver/Passenger Load Tool) (B): 09932-75010

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.

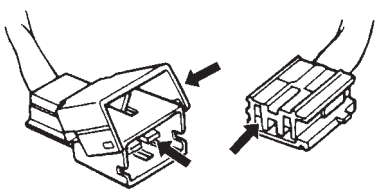
- driver air bag (inflator) module when it is connected at the top of the column to the contact coil assembly.
- passenger air bag (inflator) module when it is connected to the air bag harness connector for passenger air bag (inflator) module.

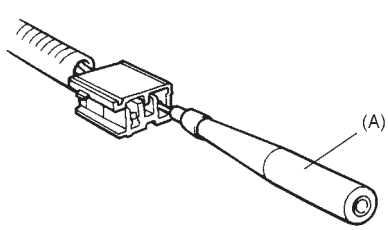
Another connector ("BASE OF COLUMN") is used to substitute the load of the driver air bag (inflator) module and the contact coil assembly when it is connected at the base of the column to the air bag wire harness.
The third connector ("PASSENGER INFLATOR") is not used.

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.

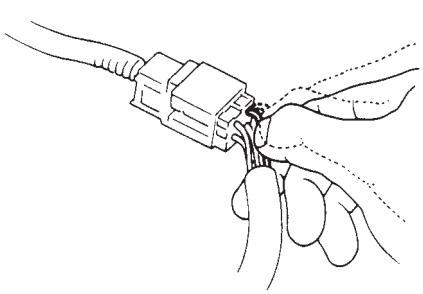
INTERMITTENTS AND POOR CONNECTIONS

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:

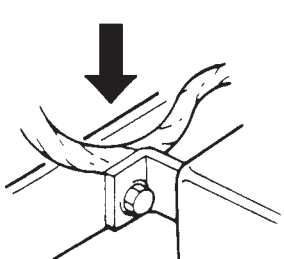




- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the 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 (Connector Test Adapter Kit)
  (A): 09932-76010



- 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.
   (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.
   (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.)

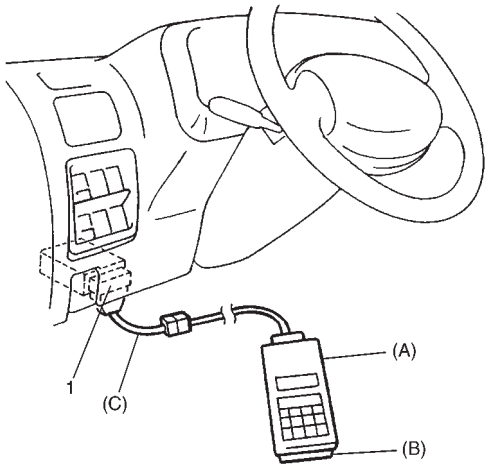
FLOW TABLE TEST DESCRIPTION

STEP1: Check that “AIR BAG” warning lamp lights.
STEP2: Check that “AIR BAG” warning lamp lights.
STEP3: Check diagnosis switch circuit.
STEP4: Check that “AIR BAG” warning lamp flashes 6 times after ignition switch is turned ON.
STEP5: Check that history codes are in SDM memory.
STEP6: Check that current code is in SDM memory.

AIR BAG DIAGNOSTIC SYSTEM CHECK FLOW TABLE

STEP	ACTION	YES	NO
1	1) Make sure that battery voltage is about 11V or higher. 2) Note “AIR BAG” warning lamp as ignition switch is tuned ON. 3) Does “AIR BAG” warning lamp come ON when ignition switch is tuned ON?	Go to step 2.	“AIR BAG” warning lamp does not come ON Proceed to Table B.
2	Does “AIR BAG” warning lamp come ON steady?	“AIR BAG” warning lamp come ON steady Proceed to Table A.	Go to step 3.
3	Does “AIR BAG” warning lamp keep flashing (indicating DTC) when ignition switch is ON?	“AIR BAG” warning lamp flashes Proceed to Table C.	Go to step 4.
4	Does “AIR BAG” warning lamp turn OFF, after flashing 6 times?	Go to step 5.	Go to step 6.
5	1) Check DTC. Refer to DTC CHECK. 2) Not using SUZUKI scan tool: Is flashing patten no. 12 indicated? **NOTE:** **See NOTE1 described below.** Using SUZUKI scan tool: Is “NO CODES” displayed? **NOTE:** **See NOTE2 described below.**	Air bag system is in good condition.	**NOTE:** **See NOTE3 described below.** An intermittent trouble has occurred at some place. Check the connector harness, etc. related to the sensed DTC. Refer to INTERMITTENT AND POOR CONNECTIONS in this section. Then clear DTC (Refer to DTC CLEARANCE.) and repeat this table.
6	1) Check DTC. Refer to DTC CHECK. 2) Not using SUZUKI scan tool: Is flashing patten no. 12 indicated? **NOTE:** **See NOTE1 described below.** Using SUZUKI scan tool: Is “NO CODES” displayed? **NOTE:** **See NOTE2 described below.**	Substitute a known-good SDM and recheck.	**NOTE:** **See NOTE3 described below.** Check and repair according to Flow Table corresponding to that DTC.

NOTE1:
When “AIR BAG” warning lamp doesn’t indicate flashing pattern of DTC while diagnosis switch terminal on “AIR BAG” monitor coupler is grounded, proceed to TABLE D.
NOTE2:
If SDM cannot communicate through serial data circuit, proceed to TABLE E.
NOTE3:
As execution of the DTC clearance will clear all DTCs, be sure to record all DTCs before servicing.



1. Data link connector (DLC)

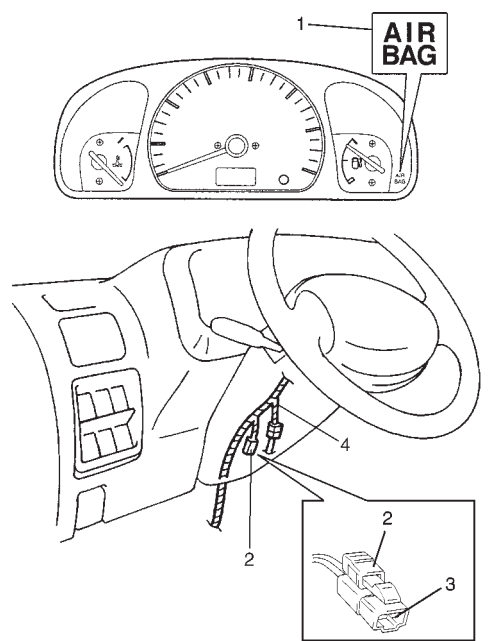
DTC CHECK

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): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

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.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from data link connector (DLC).

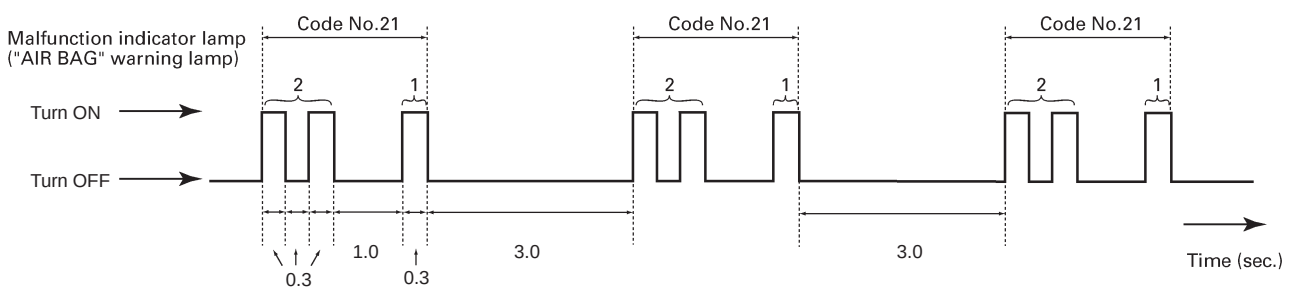


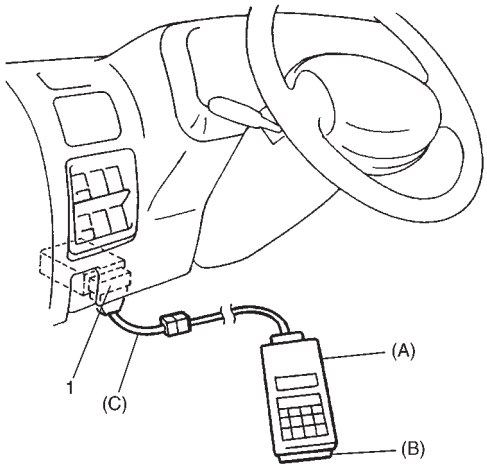
1. "AIR BAG" warning lamp
2. "AIR BAG" monitor coupler
3. Diagnostic switch terminal
4. Air bag harness (covered yellow tube)

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 TABLE B.
2) Using service wire, ground diagnosis switch terminal in monitor coupler.
3) Read DTC from flashing pattern of malfunction indicator lamp ("AIR BAG" warning lamp). (Refer to DTC TABLE.)
4) After completing the check, turn ignition switch to OFF position and disconnect service wire from "AIR BAG" monitor coupler.

EXAMPLE: When driver air bag initiator circuit resistance high (DTC B1021) is set





1. Data link connector (DLC)

DTC CLEARANCE

Using SUZUKI scan tool

1) Turn ignition switch to OFF position.
2) Connect SUZUKI scan tool to data link connector (DLC) in the same manner as when making this connection for DTC check.

   Special Tool
   (A): 09931-76011 (SUZUKI scan tool)
   (B): Mass storage cartridge
   (C): 09931-76030 (16/14 pin DLC cable)

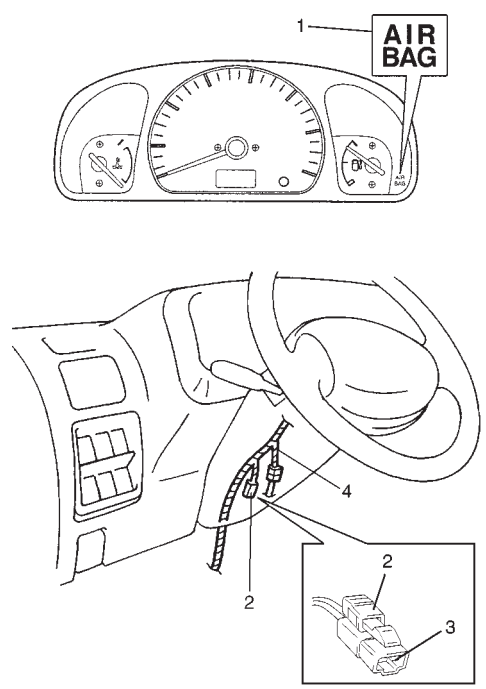
3) Turn ignition switch to ON position.
4) Erase DTC according to instructions displayed on SUZUKI scan tool.
   Refer to SUZUKI scan tool operator's manual for further details.
5) After completing the check, turn ignition switch to OFF position and disconnect SUZUKI scan tool from DLC.
6) Perform DTC CHECK 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.

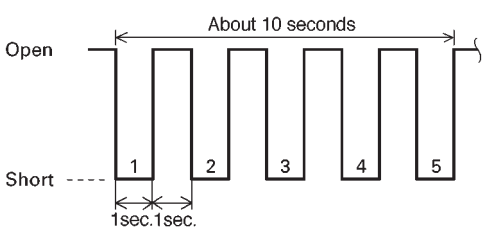
Not using SUZUKI scan tool

1) Turn ignition switch to ON position and wait about 6 seconds or more.
2) Using service wire, repeat shorting and opening between diagnosis switch terminal on "AIR BAG" monitor coupler and body ground 5 times at about 1 second intervals.
3) Perform DTC CHECK and confirm that normal DTC (DTC 12) is displayed and not malfunction DTC.

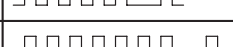
   NOTE:
   If DTC B1051 or DTC B1071 is stored in SDM, it is not possible to clear DTC.



1. "AIR BAG" warning lamp
2. "AIR BAG" monitor coupler
3. Diagnostic switch terminal
4. Air bag harness (covered yellow tube)



DTC TABLE

DTC	"AIR BAG" warning lamp flashing pattern		Diagnosis		
	NO.	MODE			
–	12		Normal		———
B1015	15		Passenger air bag circuit (if equipped)	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	
B1032	32		Power source voltage	Too low	
B1051	51		SDM	Frontal crash detected	
B1071	71			Internal fault	
B1013	13			Specifications different between air bag system and SDM	

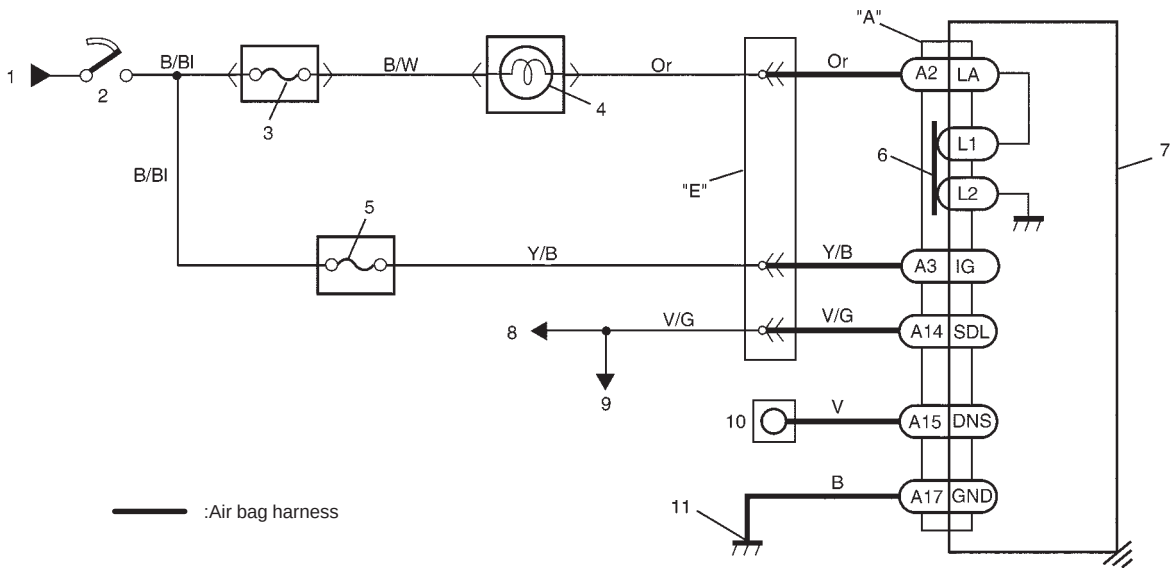
NOTE:

- **When 2 or more codes are indicated, the lowest numbered code will appear first.**
- **If a code not listed on the table is displayed, then the SDM is faulty.**
- **Current DTC and history DTC can be identified by lighting and flashing of "AIR BAG" warning lamp as follows.**

	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.**

However, if a multiple number of DTC's are set an 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.)

TABLE A – "AIR BAG" WARNING LAMP COMES ON STEADY
TABLE B – "AIR BAG" WARNING LAMP DOES NOT COME ON
TABLE C – "AIR BAG" WARNING LAMP FLASHES
TABLE D – "AIR BAG" WARNING LAMP CANNOT INDICATE FLASHING PATTERN OF DTC



1. From main fuse
2. Ignition switch
3. "IG METER" fuse in fuse box
4. "AIR BAG" warning lamp in combination meter
5. "AIR BAG" fuse in fuse box
6. Connection detection pin
7. SDM
8. To DLC
9. To ECM, P/S control module (if equipped) and ABS control module (if equipped)
10. "AIR BAG" monitor coupler
11. Ground for air bag system

CAUTION:

- **Be sure to perform AIR BAG DIAGNOSTIC SYSTEM CHECK before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to 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:

Table A:

STEP1: Check "AIR BAG" fuse.
STEP2: Check power source circuit.
STEP3: Check "AIR BAG" warning lamp circuit.

Table B:

STEP1: Check combination meter power feed circuit.
STEP2: Check electrical connection check mechanism in SDM connector.
STEP3: Check "AIR BAG" warning lamp circuit.
STEP4: Check open in "AIR BAG" warning lamp circuit.
STEP5: Check short from "AIR BAG" warning lamp circuit to power circuit.
STEP6: Check "AIR BAG" bulb.

Table C and D:

STEP1: Check "AIR BAG" monitor coupler.
STEP2: Check diagnosis switch circuit for air bag system.

DIAGNOSTIC FLOW TABLE

Table A:

STEP	ACTION	YES	NO
1	1) Ignition switch OFF. 2) Remove and inspect “AIR BAG” fuse. 3) Is fuse good?	Go to step 2.	“Y/B” wire short to ground. After repair, replace “AIR BAG” fuse.
2	1) Disconnect SDM. 2) Check proper connection to SDM at terminal “A3”. 3) If OK then check voltage between “A3” terminal of SDM connector and body ground with ignition switch ON. 4) Is it 8 V or more?	Go to step 3.	“Y/B” wire (between “AIR BAG” fuse and SDM connector) open “B/Bl” wire (between ignition switch and “AIR BAG” fuse) open or short to ground
3	1) Disconnect 16-pin connector from combination meter. Refer to COMBINATION METER in SECTION 8. 2) Check resistance between “A2” terminal of SDM connector and body ground. 3) Is resistance 10 Ω or more?	Substitute a known-good SDM and recheck.	“Or” wire (between combination meter and SDM connector) short to ground

Fig. for STEP 2

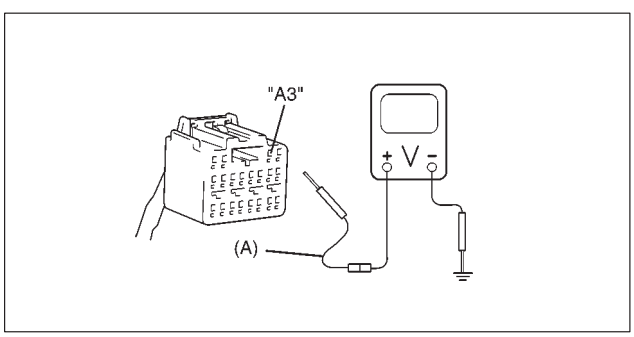
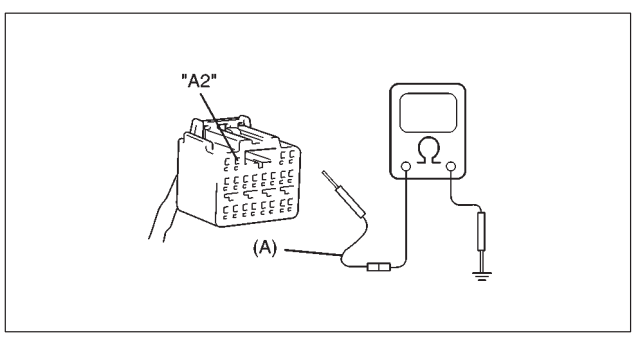


Fig. for STEP 3



Special Tool
(A): 09932-76010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

Table B:

STEP	ACTION	YES	NO
1	1) Set parking brake. 2) Note combination meter when ignition switch is turned ON. 3) Does the “BRAKE” indicator (warning lamp) come ON?	Go to step 2.	“B/W” wire, “IG METER” fuse or J/B (between ignition switch and combination meter) open or short to ground
2	1) With ignition switch OFF, disconnect SDM. 2) Check electrical connection check mechanism. 3) Is it in good condition?	Go to step 3.	Repair electrical connection check mechanism.
3	1) Disconnect SDM. 2) Check proper connection to SDM at terminal “A2”. 3) If OK then check voltage from “A2” terminal of SDM connector to body ground with ignition switch ON. 4) Is it 8 V or more?	Substitute a known-good SDM and recheck.	Go to step 4.
4	1) Remove combination meter. Refer to COMBINATION METER in SECTION 8. 2) Check proper connection to combination meter at “Or” terminal for “AIR BAG” warning lamp and to SDM at terminal “A2”. 3) If OK then check resistance between “Or” wire terminal of combination meter connector (16-pin connector) and “A2” terminal of SDM connector. 4) Is resistance 1 Ω or less?	Go to step 5.	Repair high resistance or open in “Or” wire circuit (between combination meter and SDM).
5	1) Measure voltage from “A2” terminal of SDM connector to body ground with ignition switch ON. 2) Is it 8 V or more?	Repair short from “Or” wire circuit (between combination meter and SDM) to power circuit.	Go to step 6.
6	1) Remove and inspect “AIR BAG” bulb. 2) Is bulb good?	Substitute a known-good combination meter and recheck.	Replace bulb.

Fig. for STEP 2

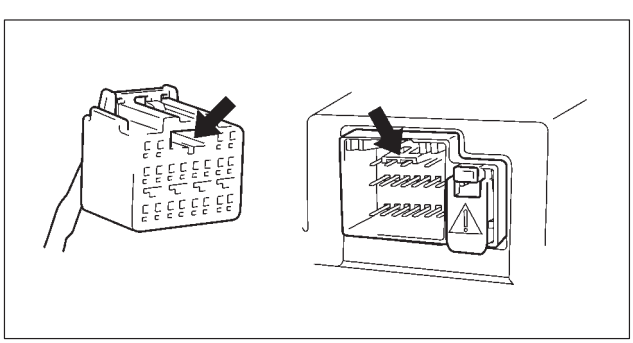
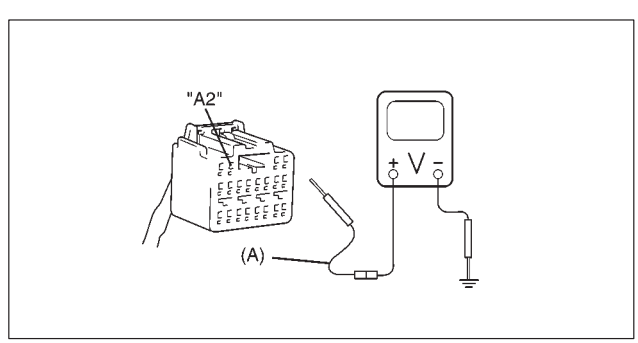
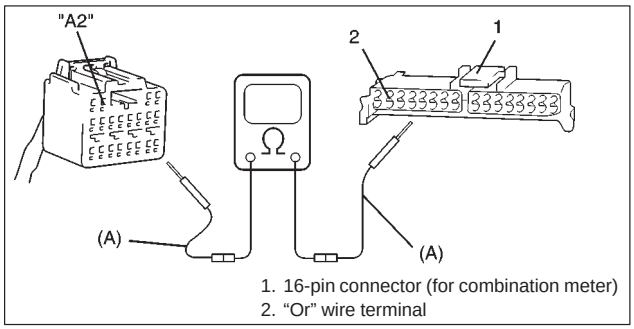


Fig. for STEP 3 and 5



Special Tool
(A): 09932-76010

Fig. for STEP 4



1. 16-pin connector (for combination meter)
2. “Or” wire terminal

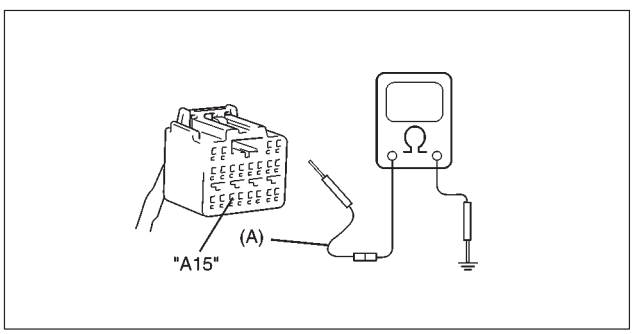
Special Tool
(A): 09932-76010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

Table C:

STEP	ACTION	YES	NO
1	1) Check “AIR BAG” monitor coupler. 2) Is it connected diagnosis switch terminal and ground terminal in “AIR BAG” monitor coupler by service wire?	Remove service wire.	Go to step 2.
2	1) With ignition switch OFF, disconnect SDM. 2) Measure resistance between “A15” terminal of SDM connector and body ground. 3) Is resistance 1 Ω or more?	Substitute a known-good SDM and recheck.	Repair short from “V” wire circuit to ground.

Fig. for STEP 2



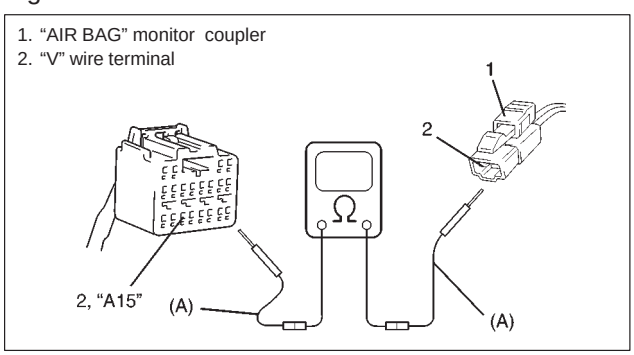
Special Tool
(A): 09932-76010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

Table D:

STEP	ACTION	YES	NO
1	1) Inspect connection between diagnostic switch terminal on “AIR BAG” monitor coupler and body ground by service wire. 2) 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. 2) Check for proper connection at “V” wire (“A15” terminal of SDM connector and terminal on “AIR BAG” monitor coupler) terminals. 3) If OK then measure resistance between “V” wire circuit terminals. 4) Is resistance 1 Ω or more?	Check “V” wire terminals. If OK then “V” wire circuit high resistance or open.	Substitute a known good SDM and recheck

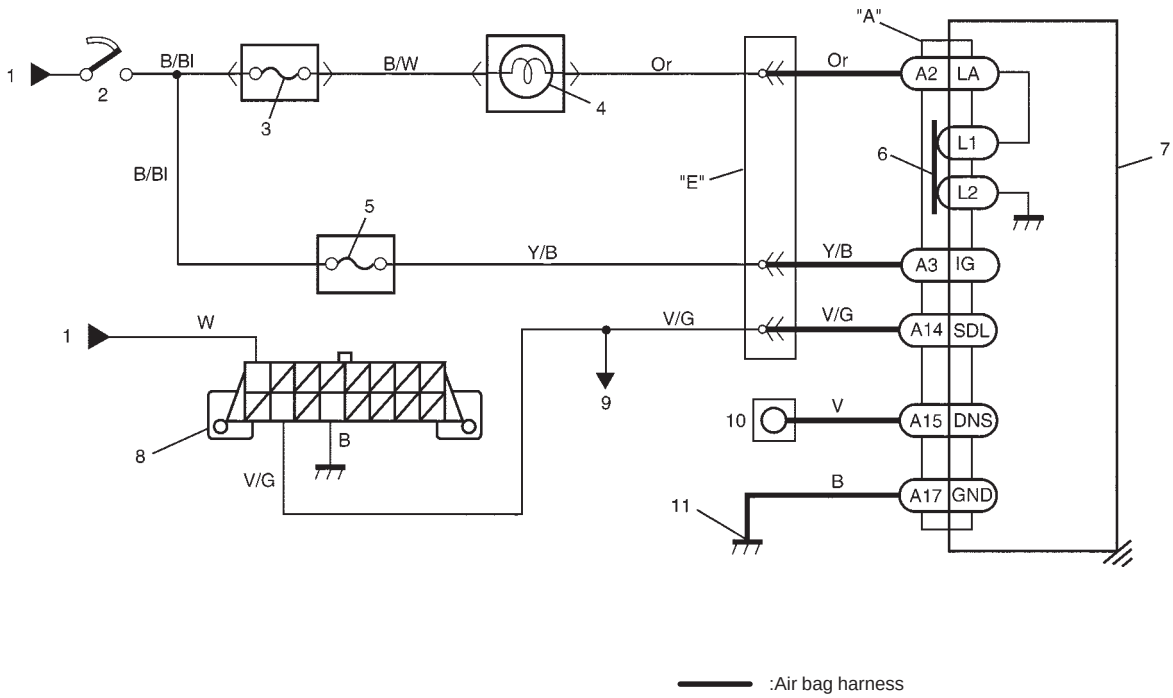
Fig. for STEP 2



Special Tool
(A): 09932-76010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

TABLE E – SDM CANNOT COMMUNICATE THROUGH THE SERIAL DATA CIRCUIT



1. From main fuse
2. Ignition switch
3. "IG METER" fuse in fuse box
4. "AIR BAG" warning lamp in combination lamp
5. "AIR BAG" fuse in fuse box
6. Connection detection pin
7. SDM
8. DLC
9. To ECM, P/S control module (if equipped) and ABS control module (if equipped)
10. "AIR BAG" monitor coupler
11. Ground for air bag system

CAUTION:

- **Be sure to perform AIR BAG DIAGNOSTIC SYSTEM CHECK before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to 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:

STEP1: An improper connection to the data link connector (DLC) will prevent communications from being established.

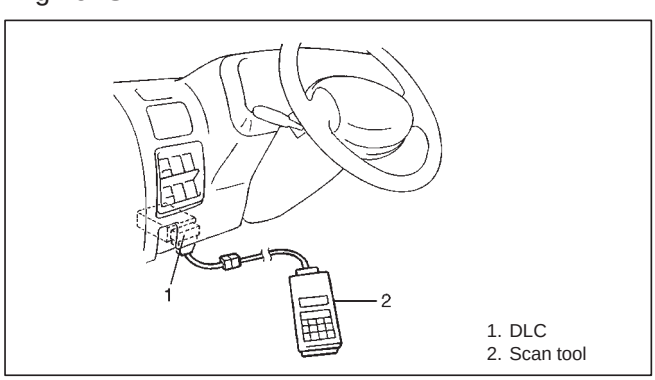
STEP2: This test checks whether it is possible to communicate with other control module.

STEP3: This test checks for an open in "V/G" circuit (in air bag harness).

DIAGNOSTIC FLOW TABLE

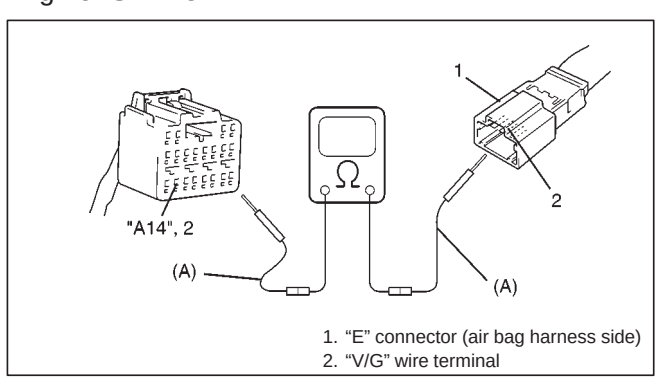
STEP	ACTION	YES	NO
1	1) Make sure that SUZUKI scan tool is free from malfunction and correct cartridge for air bag system is used. 2) Ignition switch OFF. 3) Check proper connection of SUZUKI scan tool to DLC. 4) Is connection in good condition?	Go to step 2.	Properly connect SUZUKI scan tool to DLC.
2	1) Check if communication is possible by trying communication with other control module (ECM, P/S control module (if equipped) or ABS control module (if equipped)). 2) Is it possible to communicate with other control module?	Go to step 3.	Repair open in common section of serial data circuit (“V/G” wire circuit) used by all controllers or short to ground or power circuit which has occurred somewhere in serial data circuit (“V/G” wire circuit).
3	1) With ignition switch OFF, disconnect SDM and “E” connector. 2) Check proper connection at “V/G” wire terminal for DLC in “E” connector. 3) If OK, then check resistance between “V/G” wire terminal in “E” connector and “A14” terminal of SDM connector. 4) Is resistance 1 Ω or less?	Substitute a known-good SDM and recheck.	Repair high resistance or open in “V/G” wire circuit (in air bag harness).

Fig. for STEP1



1. DLC
2. Scan tool

Fig. for STEP3

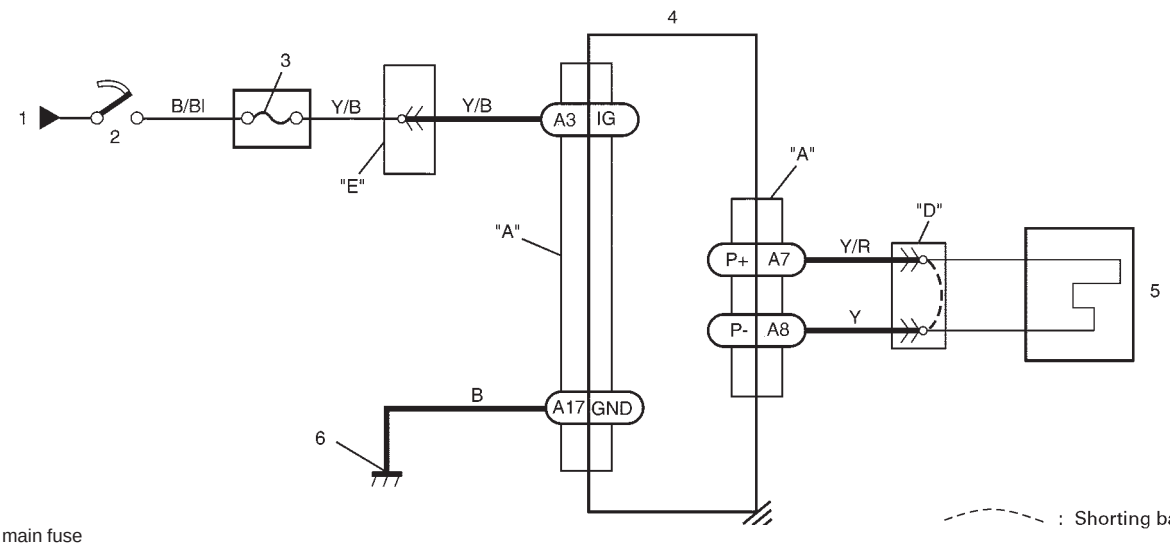


1. “E” connector (air bag harness side)
2. “V/G” wire terminal

Special Tool
(A): 09932-76010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK 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



1. From main fuse
2. Ignition switch
3. "AIR BAG" fuse in fuse box
4. SDM
5. Passenger air bag (inflator) module
6. Ground for air bag system

CAUTION:

- **Be sure to perform AIR BAG DIAGNOSTIC SYSTEM CHECK before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a tester along with a correct terminal adaptor from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to 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 in air bag harness.

STEP 3: Check passenger air bag (inflator) module initiator circuit in air bag harness. (for DTC B1019 only)

DIAGNOSTIC FLOW TABLE

DTC B1015:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box. 2) Check proper connection to passenger air bag (inflator) module at terminals in “D” connector. 3) If OK then connect Special Tool (B) to passenger air bag (inflator) module connector disconnected at the step 1). 4) With ignition switch ON, is DTC B1015 current?	Go to step 2.	1) Ignition switch OFF. 2) Replace passenger air bag (inflator) module (Refer to PASSENGER AIR BAG (INFLATOR) MODULE in this section).
2	1) With ignition switch OFF, disconnect SDM. 2) Check proper connection to SDM at terminals “A7” and “A8”. 3) If OK then measure resistance between “A7” and “A8” terminals with connected Special Tool (B). 4) Is resistance 4.5 Ω or less?	Substitute a known-good SDM and recheck.	Repair high resistance or open in “Y” or “Y/R” wire circuit.

Fig. for STEP 1 and 2

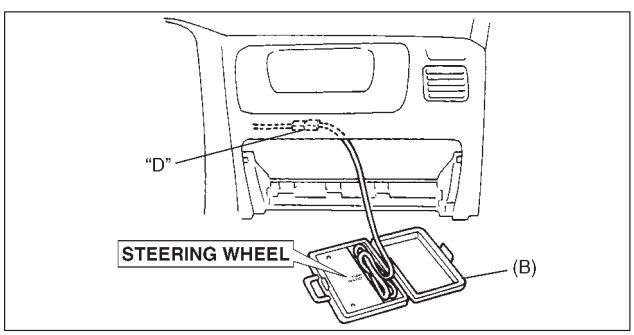
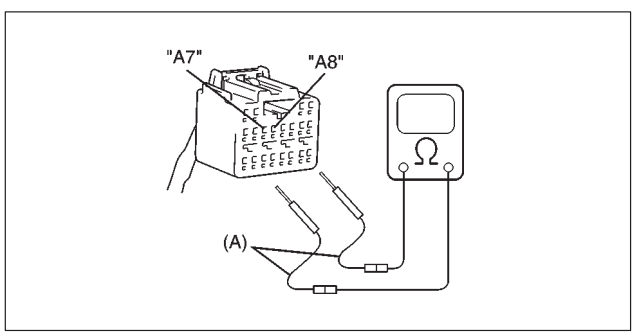


Fig. for STEP 2



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1016:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box. 2) Check proper connection to passenger air bag (inflator) module at terminals in “D” connector. 3) If OK then connect Special Tool (B) to passenger air bag (inflator) module connector disconnected at the step 1). 4) With ignition switch ON, is DTC B1016 current?	Go to step 2.	1) Ignition switch OFF. 2) Replace passenger air bag (inflator) module (Refer to PASSENGER AIR BAG (INFLATOR) MODULE in this section).
2	1) With ignition switch OFF, disconnect SDM. 2) Check proper connection to SDM at terminals “A7” and “A8”. 3) If OK then measure resistance between “A7” and “A8” terminals with connected Special Tool (B). 4) Is resistance 1.4 Ω or more?	Substitute a known-good SDM and recheck.	Repair short from “Y” wire circuit to “Y/R” wire circuit or from “Y” or “Y/R” wire circuit to other wire circuit.

Fig. for STEP 1 and 2

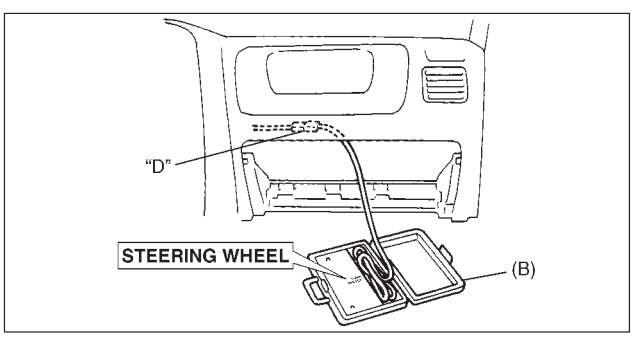
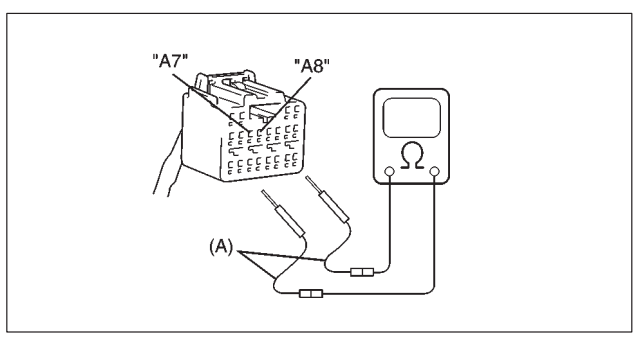


Fig. for STEP 2



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1018:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box. 2) Check proper connection to passenger air bag (inflator) module at terminals in "D" connector. 3) If OK then connect Special Tool (B) to passenger air bag (inflator) module connector disconnected at the step 1). 4) With ignition switch ON, is DTC B1018 current?	Go to step 2.	1) Ignition switch OFF. 2) Replace passenger air bag (inflator) module (Refer to PASSENGER AIR BAG (INFLATOR) MODULE in this section).
2	1) With ignition switch OFF, disconnect Special Tool (B) and SDM. 2) Measure resistance between "A7" terminals and body ground. 3) Is resistance 10 Ω or more?	Go to step 3.	Repair short from "Y/R" wire circuit to ground.
3	1) Measure resistance between "A8" terminal and body ground. 2) Is resistance 10 Ω or more?	Substitute a known-good SDM and recheck.	Repair short from "Y" wire circuit to ground.

Fig. for STEP 1, 2 and 3

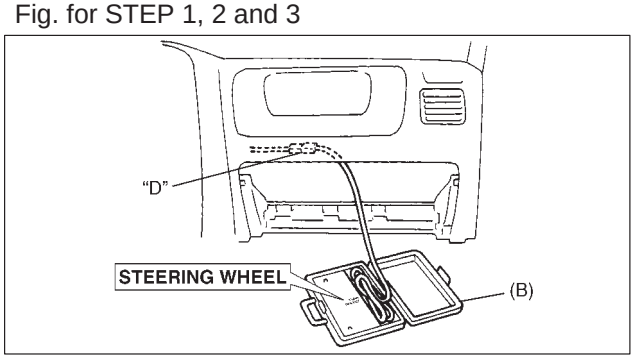


Fig. for STEP 2

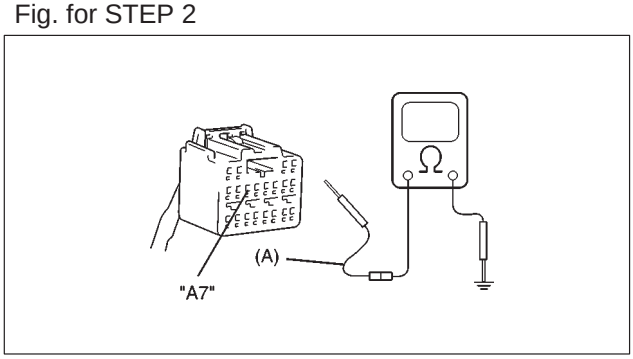
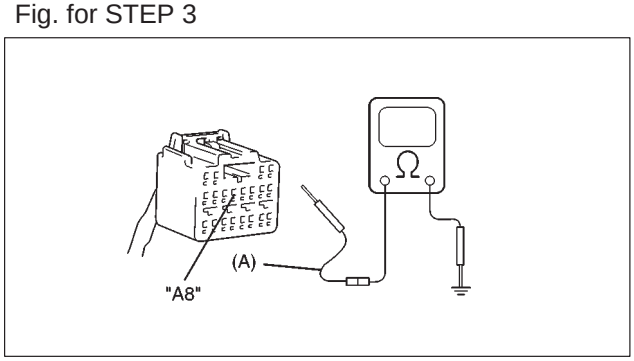


Fig. for STEP 3



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1019:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect passenger air bag (inflator) module connector behind the glove box. 2) Check proper connection to passenger air bag (inflator) module at terminals in “D” connector. 3) If OK then connect Special Tool (B) to passenger air bag (inflator) module connector disconnected at the step 1). 4) With ignition switch ON, is DTC B1019 current?	Go to step 2.	1) Ignition switch OFF. 2) Replace passenger air bag (inflator) module (Refer to PASSENGER AIR BAG (INFLATOR) MODULE in this section).
2	1) With ignition switch OFF, disconnect Special Tool (B) and SDM. 2) Measure voltage from “A7” terminal to body ground. 3) With ignition switch ON, is voltage 1 V or less?	Go to step 3.	Repair short from “Y/R” wire circuit to power circuit.
3	1) Measure voltage from “A8” terminal to body ground. 2) With ignition switch ON, is voltage 1 V or less?	Substitute a known-good SDM and recheck.	Repair short from “Y” wire circuit to power circuit.

Fig. for STEP 1, 2 and 3

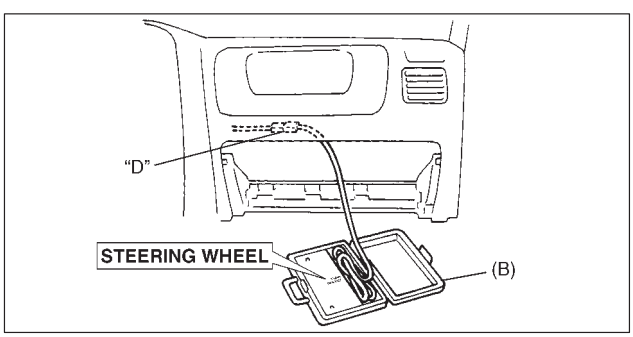


Fig. for STEP 2

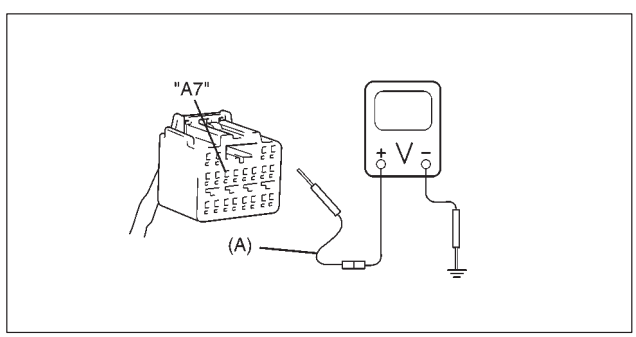
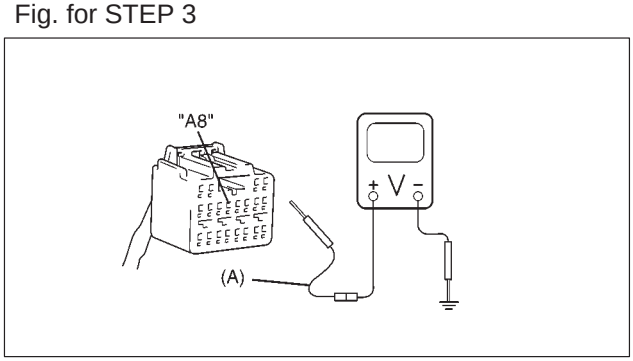


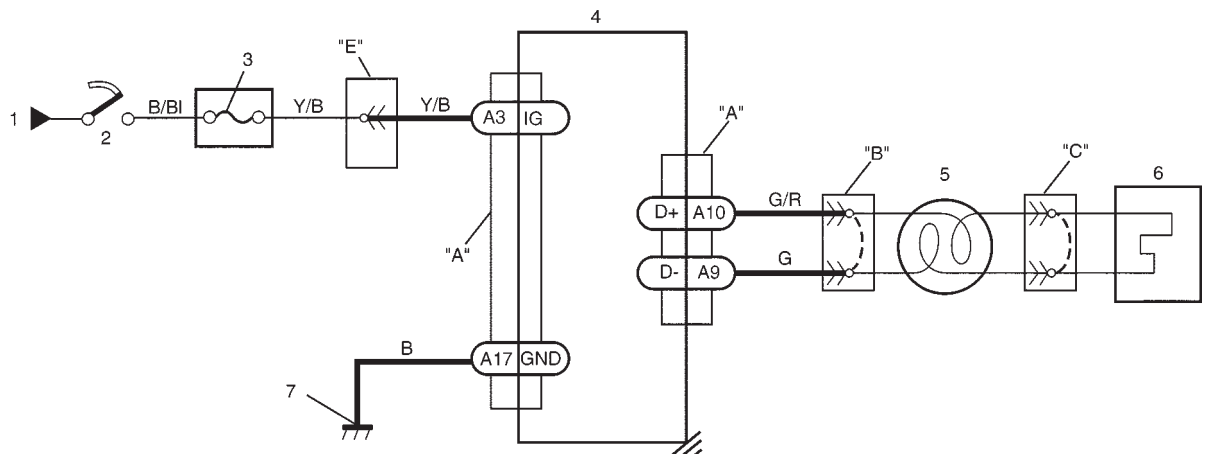
Fig. for STEP 3



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK 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



1. From main fuse
2. Ignition switch
3. "AIR BAG" fuse in fuse box
4. SDM
5. Contact coil assembly
6. Driver air bag (inflator) module
7. Ground for air bag system

CAUTION:

- **Be sure to perform AIR BAG DIAGNOSTIC SYSTEM CHECK before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to 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 in air bag harness.

STEP 3: Check whether malfunction is in contact coil or driver air bag (inflator) module.

DIAGNOSTIC FLOW TABLE

DTC B1021:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column. 2) Check proper connection to contact coil at terminals in “B” connector. 3) If OK then connect Special Tool (B) to contact coil connector disconnected at step 1). 4) With ignition switch ON, is DTC B1021 current?	Go to step 2.	Go to step 3.
2	1) With ignition switch OFF, disconnect SDM. 2) Check proper connection to SDM at terminals “A9” and “A10”. 3) If OK then measure resistance between “A9” and “A10” terminals with connected Special Tool (B). 4) Is resistance 4.5 Ω or less?	Substitute a known-good SDM and re-check.	Repair high resistance or open in “G” or “G/R” wire circuit.
3	1) With ignition switch OFF, disconnect Special Tool (B) then reconnect contact coil connector located near the base of the steering column. 2) Remove driver air bag (inflator) module from steering wheel (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C). 3) Check proper connection to driver air bag (inflator) module at terminals in “C” connector. 4) If OK then connect Special Tool (B) to “C” connector. 5) With ignition switch ON, is DTC B1021 current?	1) Ignition switch OFF. 2) Replace contact coil assembly (Refer to COMBINATION SWITCH/ CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in SECTION 3C).	1) Ignition switch OFF. 2) Replace driver air bag (inflator) module (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C).

Fig. for STEP 1 and 2

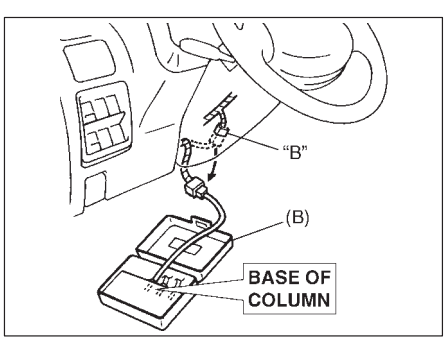


Fig. for STEP 2

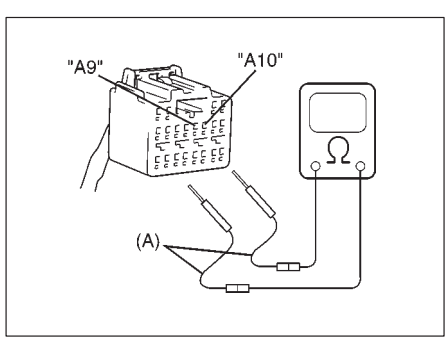
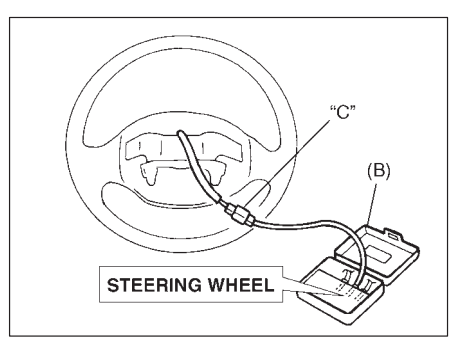


Fig. for STEP 3



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1022:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column. 2) Check proper connection to contact coil at terminals in “B” connector. 3) If OK then connect Special Tool (B) to contact coil connector disconnected at step 1). 4) With ignition switch ON, is DTC B1022 current?	Go to step 2.	Go to step 3.
2	1) With ignition switch OFF, disconnect SDM. 2) Check proper connection to SDM at terminals “A9” and “A10”. 3) If OK then measure resistance between “A9” and “A10” terminals with connected Special Tool (B). 4) Is resistance 1.7 Ω or more?	Substitute a known-good SDM and re-check.	Repair short from “G” wire circuit to “G/R” wire circuit or from “G” or “G/R” wire circuit to other wire circuit.
3	1) With ignition switch OFF, disconnect Special Tool (B) then reconnect contact coil connector located near the base of the steering column. 2) Remove driver air bag (inflator) module from steering wheel (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C). 3) Check proper connection to driver air bag (inflator) module at terminals in “C” connector. 4) If OK then connect Special Tool (B) to “C” connector. 5) With ignition switch ON, is DTC B1022 current?	1) Ignition switch OFF. 2) Replace contact coil assembly (Refer to COMBINATION SWITCH/ CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in SECTION 3C).	1) Ignition switch OFF. 2) Replace driver air bag (inflator) module (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C).

Fig. for STEP 1 and 2

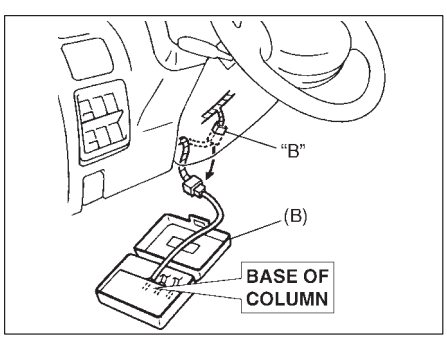


Fig. for STEP 2

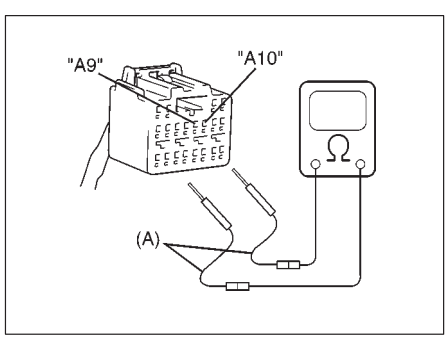
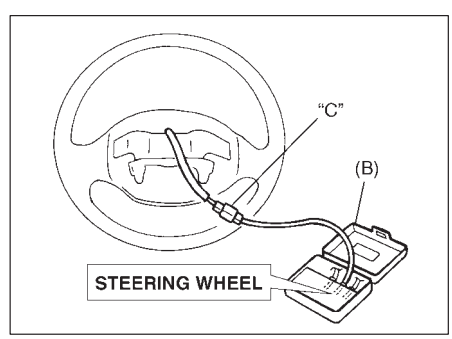


Fig. for STEP 3



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1024:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column. 2) Check proper connection to contact coil at terminals in "B" connector. 3) If OK then connect Special Tool (B) to contact coil connector disconnected at step 1). 4) With ignition switch ON, is DTC B1024 current?	Go to step 2.	Go to step 3.
2	1) With ignition switch OFF, disconnect Special Tool (B) and SDM. 2) Measure resistance between "A9" terminal and body ground and between "A10" terminal and body ground. 3) Are they 10 Ω or more?	Substitute a known-good SDM and re-check.	Repair short from "G" or "G/R" wire circuit to ground.
3	1) With ignition switch OFF, disconnect Special Tool (B) then reconnect contact coil connector located near the base of the steering column. 2) Remove driver air bag (inflator) module from steering wheel (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C). 3) Check proper connection to driver air bag (inflator) module at terminals in "C" connector. 4) If OK then connect Special Tool (B) to "C" connector. 5) With ignition switch ON, is DTC B1024 current?	1) Ignition switch OFF. 2) Replace contact coil assembly (Refer to COMBINATION SWITCH/ CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in SECTION 3C).	1) Ignition switch OFF. 2) Replace driver air bag (inflator) module (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C).

Fig. for STEP 1 and 2

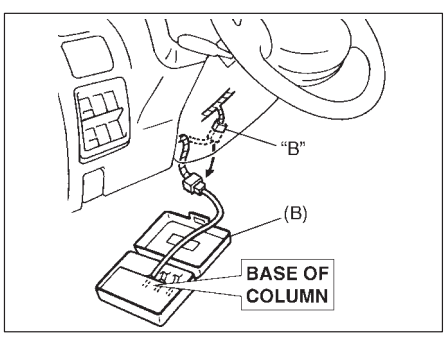


Fig. for STEP 2

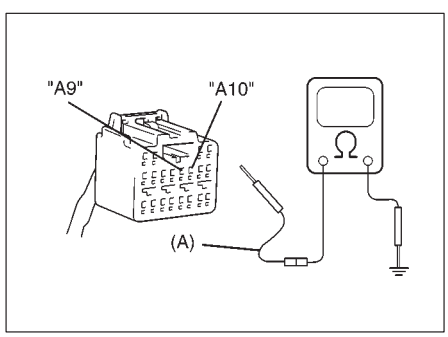
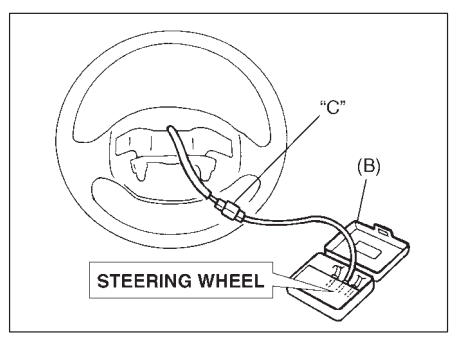


Fig. for STEP 3



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1025:

STEP	ACTION	YES	NO
1	1) With ignition switch OFF, disconnect contact coil connector located near the base of the steering column. 2) Check proper connection to contact coil at terminals in "B" connector. 3) If OK then connect Special Tool (B) to contact coil connector disconnected at step 1). 4) With ignition switch ON, is DTC B1025 current?	Go to step 2.	Go to step 3.
2	1) With ignition switch OFF, disconnect Special Tool (B) and SDM. 2) Measure voltage from "A9" terminal to body ground and from "A10" terminal to body ground. 3) With ignition switch ON, are they 1 V or less?	Substitute a known-good SDM and recheck.	Repair short from "G" or "G/R" wire circuit to power circuit.
3	1) With ignition switch OFF, disconnect Special Tool (B) then reconnect contact coil connector located near the base of the steering column. 2) Remove driver air bag (inflator) module from steering wheel (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C). 3) Check proper connection to driver air bag (inflator) module at terminals in "C" connector. 4) If OK then connect Special Tool (B) to "C" connector. 5) With ignition switch ON, is DTC B1025 current?	1) Ignition switch OFF. 2) Replace contact coil assembly (Refer to COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in SECTION 3C).	1) Ignition switch OFF. 2) Replace driver air bag (inflator) module (Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C).

Fig. for STEP 1 and 2

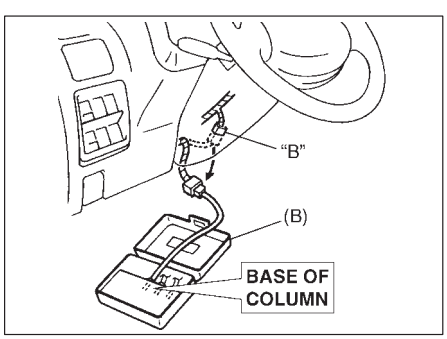


Fig. for STEP 2

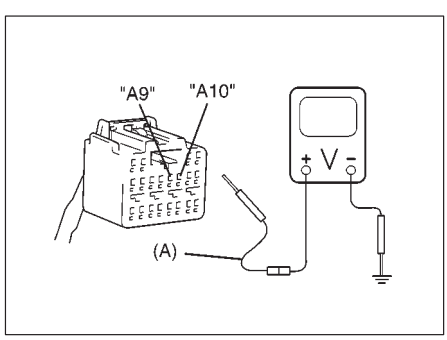
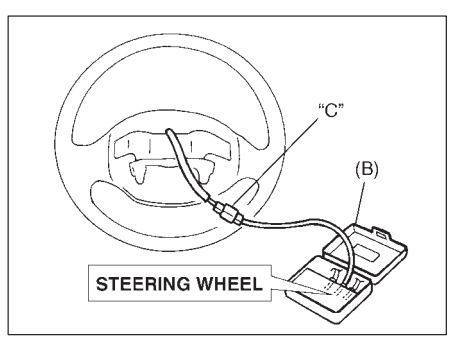


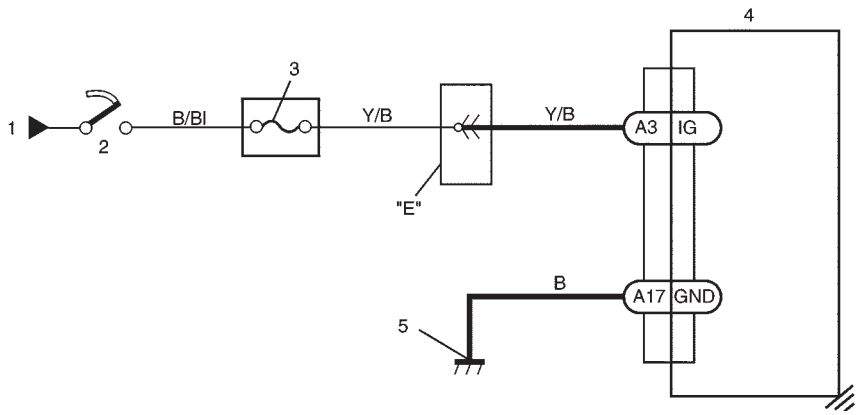
Fig. for STEP 3



Special Tool
(A): 09932-76010
(B): 09932-75010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK to confirm that the trouble has been corrected.

DTC B1032 – POWER SOURCE VOLTAGE LOW



1. From main fuse
2. Ignition switch
3. "AIR BAG" fuse in fuse box
4. SDM
5. Ground for air bag system

: Air bag harness

CAUTION:

- **Be sure to perform AIR BAG DIAGNOSTIC SYSTEM CHECK before starting diagnosis according to flow table.**
- **When measurement of resistance or voltage is required in this table, use a tester along with a correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is required, refer to 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 power source voltage is below an approx. 8 V for specified time.

TABLE TEST DESCRIPTION:

STEP 1: Check if voltage applied to SDM is within normal range.

STEP 2: Check if DTC B1032 still exists.

DIAGNOSTIC FLOW TABLE

STEP	ACTION	YES	NO
1	1) Measure voltage on battery. 2) Is voltage 11 V or more?	Go to step 2.	Check Charging System and repair as necessary. (Refer to DIAGNOSIS in SECTION 6H)
2	1) With ignition switch OFF, disconnect SDM. 2) Check proper connection to SDM at “A3” terminal. 3) If OK then ignition switch ON, and then check voltage from “A3” terminal on SDM connector to body ground. 4) Is voltage 8 V or more?	Go to step 4.	Go to step 3.
3	1) With ignition switch OFF, disconnect “E” connector. 2) Check proper connection at “Y/B” wire terminal in “E” connector. 3) If OK then ignition switch ON, and then check voltage from “Y/B” wire terminal in “E” connector on main harness to body ground. 4) Is voltage 8 V or more?	Repair poor connection, high resistance in “Y/B” or “B/Bl” circuit of air bag harness or “AIR BAG” fuse.	Possibly faulty points are as follows. Check each of them and repair as necessary. ● Circuit from battery to “E” connector ● Charging System (Refer to DIAGNOSIS in SECTION 6H)
4	1) With ignition switch OFF, reconnect SDM 2) With ignition switch ON, is DTC B1032 current?	Substitute a known-good SDM and recheck.	Check Charging System and repair as necessary. (Refer to DIAGNOSIS in SECTION 6H)

Fig. for STEP 2

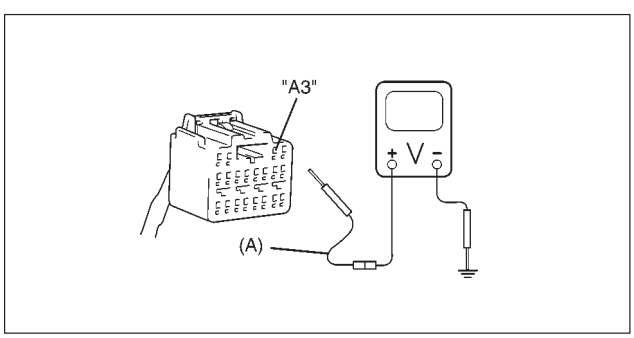
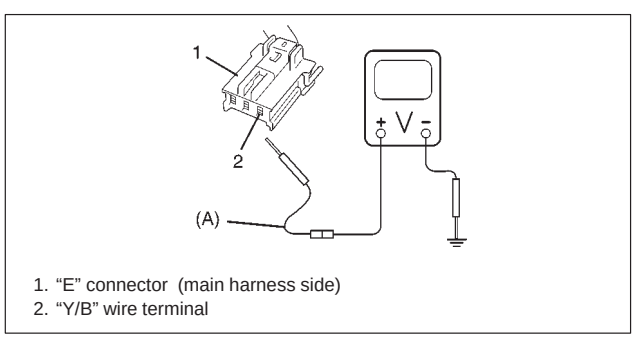


Fig. for STEP 3



1. “E” connector (main harness side)
2. “Y/B” wire terminal

Special Tool
(A): 09932-76010

NOTE:
Upon completion of inspection and repair work, perform following items.
1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Clear diagnostic trouble codes (Refer to DTC CLEARANCE), if any.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK 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.

STEP	ACTION	YES	NO
1	1) Ignition switch OFF. 2) Has air bag system 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. 2) 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.

1) Reconnect all air bag system components, ensure all components are properly mounted.

2) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK 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:

Before executing items below, be sure to perform AIR BAG DIAGNOSTIC SYSTEM CHECK.

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.

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.

1) Ignition switch OFF.
2) Replace SDM.
3) Repeat AIR BAG DIAGNOSTIC SYSTEM CHECK.

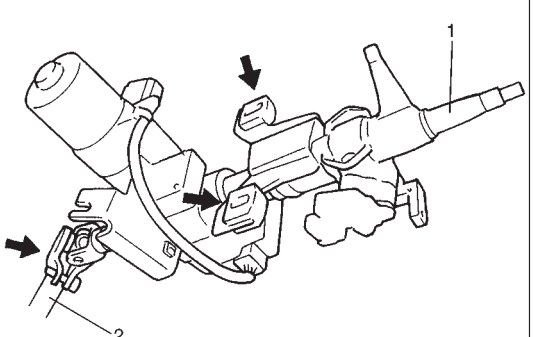
REPAIRS AND INSPECTIONS REQUIRED AFTER AN ACCIDENT

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 air bag (inflator) module/Passenger air bag (inflator) module (if equipped)**
  - **– SDM**
  - **– Contact coil and combination switch assembly**
  - **– Air bag wire 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 air bag (inflator) module and passenger air bag (inflator) module (if equipped)
  – Replace with new one.
- SDM after detecting such collision as to meet deployment conditions
  – Replace with new one.



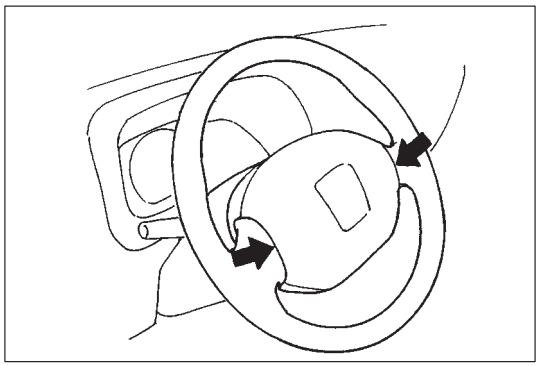
1. Steering column
2. Steering lower shaft

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 deployed 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 3C.

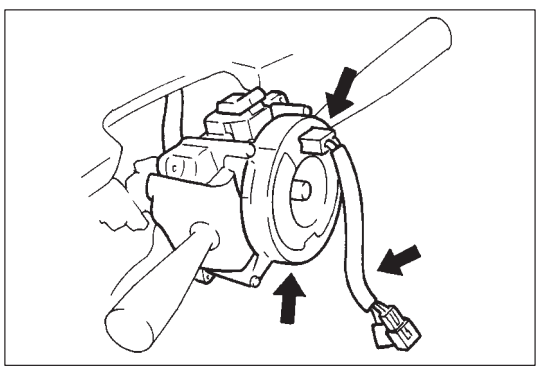
  If any faulty condition is found in above checks, replace faulty part.
- Steering column bracket and capsules
  – Check for damage and bent.

  If any faulty condition is found in above checks, replace faulty part.



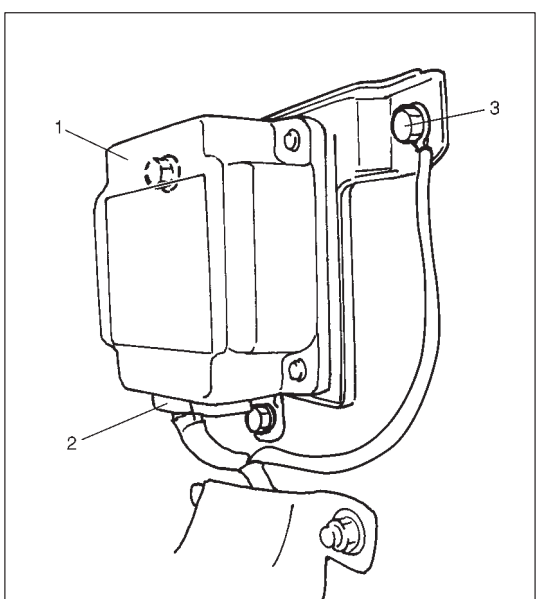
- Steering wheel and driver air bag (inflator) module
  - – Check for damage or air bag (inflator) module fitness.
  - – Check trim cover (pad surface) for cracks.
  - – Check wire harness and connector for damage or tightness.

  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.



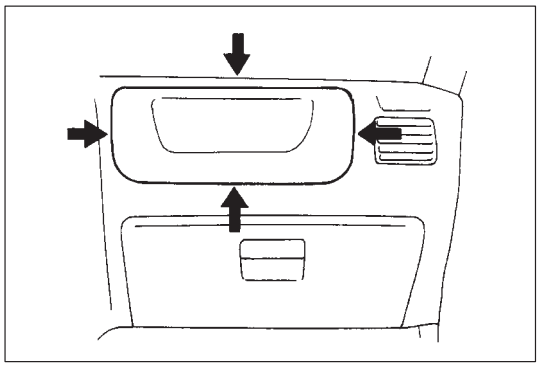
1. SDM
2. SDM connector
3. Ground for air bag system

- SDM and SDM plate
  - – 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 that connector is connected securely or locked.
  - – Check SDM connector and terminals for tightness.
  - – Check SDM sets a diagnostic trouble code (Refer to AIR BAG DIAGNOSTIC SYSTEM CHECK in this section.) and the diagnostic table leads to a malfunctioning SDM.

  If any faulty condition is found in above checks, replace.

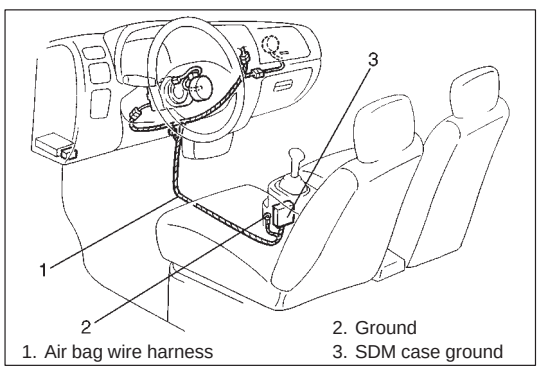
- Instrument panel member and reinforcement
  - – Check for any distortion, bending, cracking or other damage.

  If any faulty condition is found in above checks, replace.



- Passenger air bag (inflator) module (if equipped)
  - – 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.



1. Air bag wire harness
2. Ground
3. SDM case ground

- Air bag wire harness and connections
  - – Check for damages, deformities or poor connections. (Refer to INTERMITTENTS AND POOR CONNECTIONS in this section.)
  - – Check wire harness clamps for tightness.

  If any faulty condition is found, correct or replace.

- Seat belts and mounting points
  - – Refer to FRONT SEAT BELT in SECTION 10A.
- “AIR BAG” warning lamp (air bag system)
  - – After vehicle is completely repaired, perform AIR BAG DIAGNOSTIC SYSTEM CHECK in this section.

ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

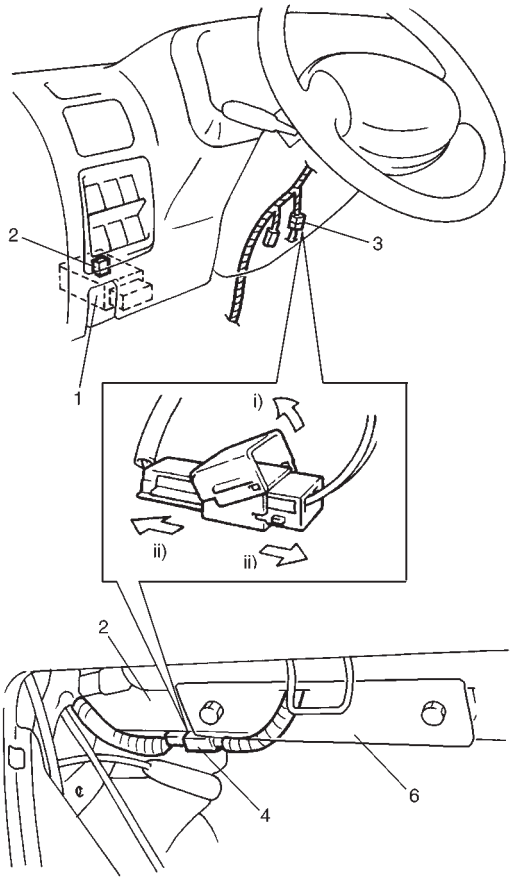
SERVICE AND DIAGNOSIS

WARNING/CAUTION labels are attached on each part of air bag system components (SDM, air bag (inflator) modules). 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 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 (if equipped)) 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.
- 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 chart 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 servicing, if shocks may be applied (e.g., dropped from a height of 90 cm (3 ft) or more) to air bag system component parts, remove those parts beforehand.
- When using electric welding, be sure to disconnect air bag (inflator) module connectors (driver and passenger) respectively.
- When applying paint around the air bag system related parts, use care so that the harness or connector will not be exposed to the paint mist.
- Never expose air bag system component parts directly to hot air (drying or baking the vehicle after painting) or flames.

WARNING:
When performing service on or around air bag system components or air bag wiring, follow the procedures listed in the following pages to temporarily disable the air bag system.
Failure to follow procedures could result in possible air bag system activation, personal injury or unneeded air bag system repairs.

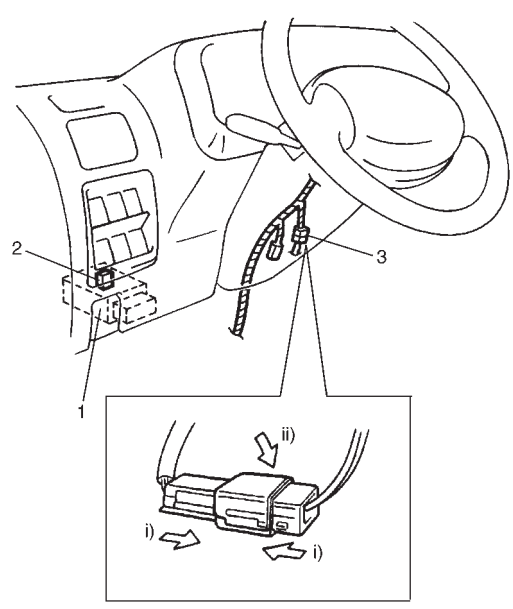


1. Fuse box
2. "AIR BAG" fuse
3. Yellow connector of contact coil and combination switch assembly
4. Yellow connector of passenger air bag (inflator) module (if equipped)
5. Steering support member
6. Harness cover

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 fuse box.
4) Disconnect Yellow connector of contact coil and combination switch assembly.
   i) Release locking of lock lever.
   ii) After unlocked, disconnect connector.
5) If equipped with passenger air bag (inflator) module, pull out glove box while pushing its stopper from both right and left sides and disconnect Yellow connector of passenger air bag (inflator) module.
   i) Release locking of lock lever.
   ii) After unlocked, disconnect connector.

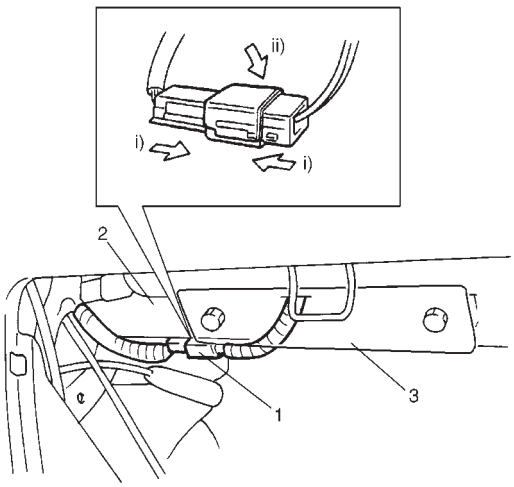
NOTE:
With "AIR BAG" fuse removed and ignition switch ON, "AIR BAG" warning lamp will be ON.
This is normal operation and does not indicate a air bag system malfunction.



1. Fuse box
2. "AIR BAG" fuse
3. Yellow connector of contact coil and combination switch assembly

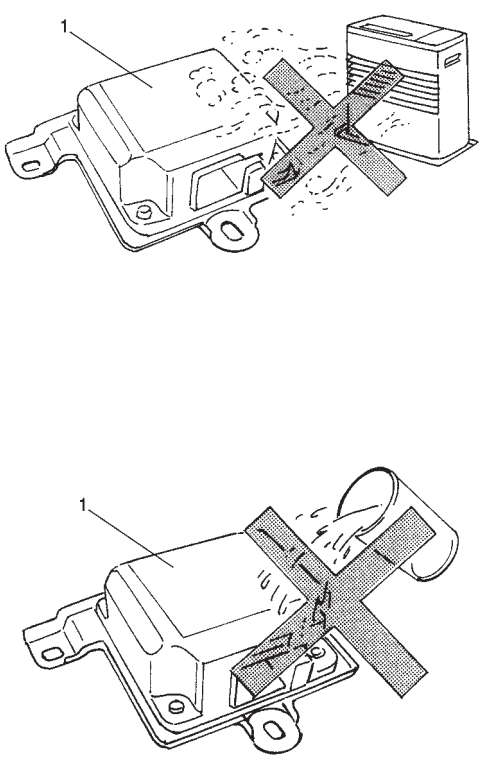
ENABLING AIR BAG SYSTEM

1) Turn ignition switch to "LOCK" position and remove key.
2) Connect Yellow connector of contact coil and combination switch assembly, and be sure to lock connector with lock lever.
   i) Connect connector.
   ii) Lock connector with lock lever.



1. Yellow connector of passenger air bag (inflator) module (if equipped)
2. Steering support member
3. Harness cover

3) If equipped with passenger air bag (inflator) module, connect Yellow connector of passenger air bag (inflator) module, and be sure to lock connector with lock lever.
   i) Connect connector.
   ii) Lock connector with lock lever.
4) Install glove box.
5) Install “AIR BAG” fuse to fuse box.
6) Turn ignition switch to ON position and verify that “AIR BAG” warning lamp flashes 6 times and then turns OFF.
   If it does not operate as described, perform AIR BAG DIAGNOSTIC SYSTEM CHECK in this section.



1. SDM

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.

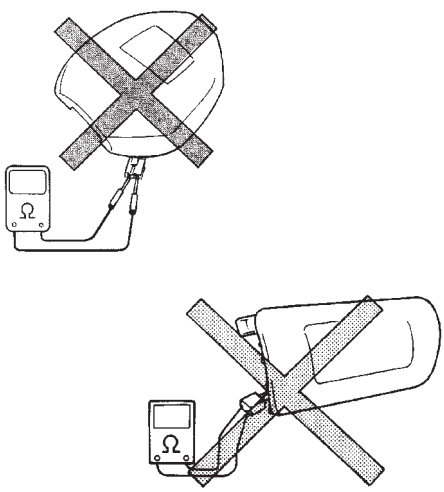
CAUTION:
After detecting one time of such collision as to meet deployment conditions, the SDM must not be used.
Refer to AIR BAG DIAGNOSTIC SYSTEM CHECK when checking the SDM.

- 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 was dropped from a height of 90 cm (3 ft) or more or if it is found to be damaged or deformed, 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.

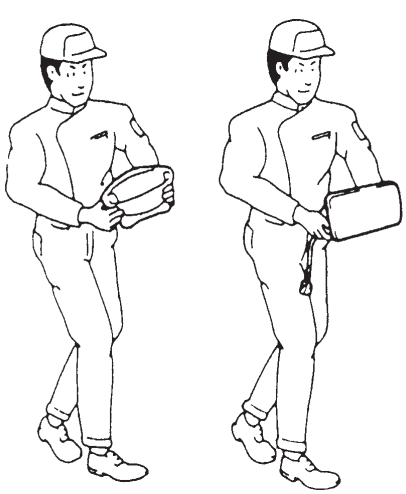
The rapid gas generation produced during deployment of the air bag could cause the air bag (inflator) module, or an object in front of the air bag (inflator) module, to be thrown through the air in the unlikely event of an accidental deployment.



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.

ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.

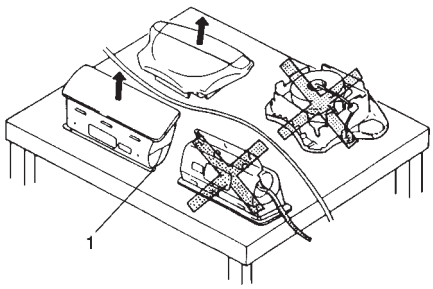


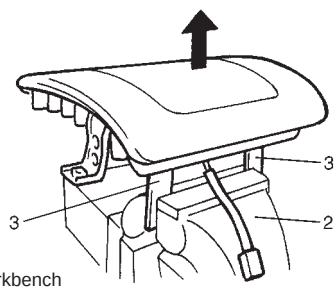
WARNING:

- **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.

ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.





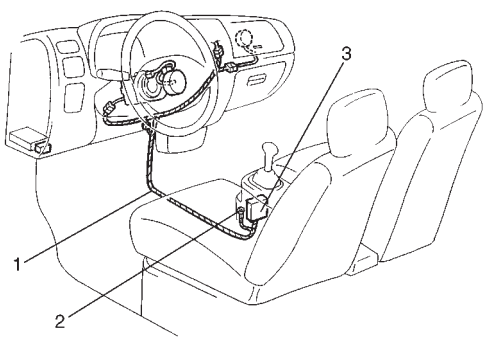
1. Slit on workbench
2. Workbench vise
3. Lower mounting bracket

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 or use the workbench vise to hold it securely at its lower mounting bracket.
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.

DEPLOYED AIR BAG (INFLATOR) MODULES

WARNING:
- **The air bag (inflator) module immediately after deployment 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.**
- **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 byproducts 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 DISPOSAL in this section.



1. Air bag wire harness
2. Ground
3. SDM case ground

AIR BAG WIRE HARNESS AND CONNECTORS

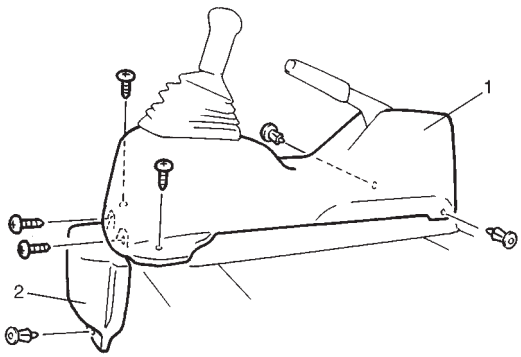
Air bag wire harness can be identified easily as it is covered with a yellow and black protection tube. Be very careful when handling it.

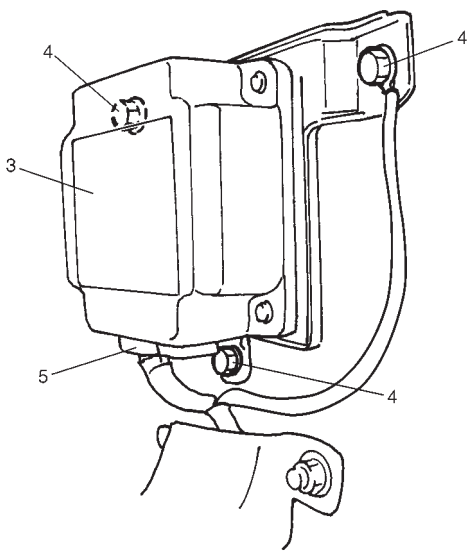
- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- When installing it, be careful so that the air bag wire harness is not caught or does not interfere with other parts.
- Make sure all air bag system grounding points are clean and grounds are securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.

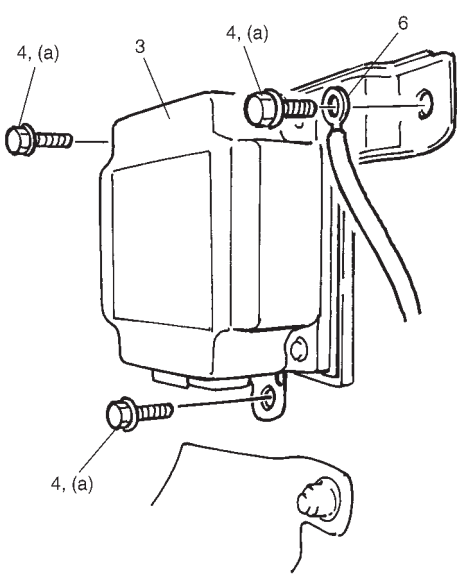
DISPOSAL

Do not dispose of the live (undeployed) air bag (inflator) module(s). When disposal is necessary, be sure to deploy the air bag according to deployment procedure described under AIR BAG (INFLATOR) MODULE DISPOSAL.

WARNING:
Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which could cause personal injury. Undeployed air bag (inflator) module must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module contain substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.







1. Console box
2. SDM cover
3. SDM
4. SDM bolt
5. SDM connector
6. Ground for air bag system

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. Refer to DISABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.
3) Remove console box by removing screws and clips.
4) Remove SDM cover.
5) Disconnect SDM connector from SDM.
6) Remove SDM (with SDM plate) as an assembly from vehicle.

NOTE:
Do not separate SDM and SDM plate.

INSPECTION

CAUTION:
- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM was dropped from a height of 90 cm (3 ft) or more, 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

For installation, reverse removal procedure, nothing following points.

- Tighten SDM bolts to specified torque.

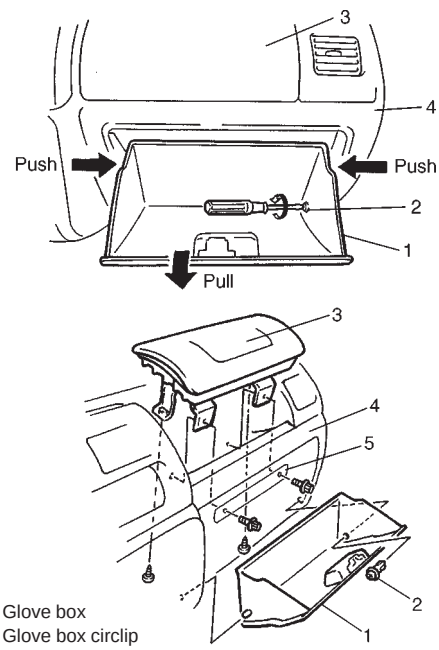
Tightening Torque
(a): 6 N·m (0.6 kg-m, 4.5 lb-ft)

- Connect SDM connector to SDM securely.
- Enable air bag system. Refer to ENABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.

PASSENGER AIR BAG (INFLATOR) MODULE (IF EQUIPPED)

WARNING:

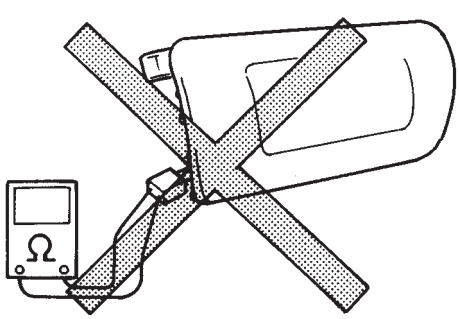
- **Never attempt to disassemble or repair the passenger air bag (inflator) module. If any abnormality is found, be sure to replace it with new one as an assembly.**
- **Be sure to read SERVICE PRECAUTIONS in this section before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**



1. Glove box
2. Glove box circlip
3. Passenger air bag (inflator) module
4. Instrument panel
5. Harness cover

REMOVAL

1) Disconnect negative cable at battery.
2) Open glove box, then while pressing glove box stopper, pull out glove box from instrument panel and then remove glove box circlip and glove box from instrument panel.
3) Disable air bag system. Refer to DISABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.
4) Remove passenger air bag (inflator) module attaching bolts and screws and passenger air bag (inflator) module from vehicle.



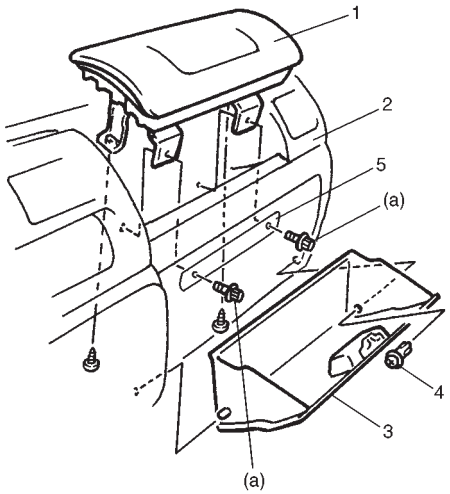
INSPECTION

WARNING:
Never measure resistance of passenger air bag (inflator) module or disassemble it. Otherwise personal injury may result.

CAUTION:
If air bag (Inflator) module was dropped from a height or 90 cm (3 ft) or more, it should be replaced.

Check air bag (inflator) module appearance visually for following symptoms and if any one of them is applicable, replace with a new one.

- Air bag has deployed.
- There is a crack in trim cover (pad surface).
- Wire harness or connector is damaged.
- Air bag (inflator) module is damaged or a strong impact (e.g., dropping) was applied to it.



1. Passenger air bag (inflator) module
2. Instrument panel
3. Glove box
4. Glove box clip
5. Harness cover

INSTALLATION

1) Install passenger air bag (inflator) module to vehicle.
2) Tighten passenger air bag (inflator) module attaching bolts to specified torque.

   Tightening Torque
   (a): 23 N·m (2.3 kg-m, 16.5 lb-ft)

3) Tighten passenger air bag (inflator) module attaching screws.
4) Connect negative cable to battery.
5) Enable air bag system. Refer to ENABLING AIR BAG SYSTEM of SERVICE PRECAUTIONS in this section.

DRIVER AIR BAG (INFLATOR) MODULE

Refer to DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C for removal, inspection and installation.

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

Refer to COMBINATION SWITCH/CONTACT COIL AND COMBINATION SWITCH ASSEMBLY in SECTION 3C for removal, inspection and installation.

AIR BAG (INFLATOR) MODULE DISPOSAL

WARNING:
Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which may cause personal injury.
Undeployed air bag (inflator) module must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module contain substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

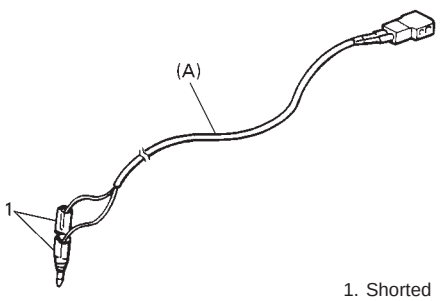
Do not dispose of the live (undeployed) air bag (inflator) module(s).
The method employed depends upon the final disposition of the particular vehicle, as noted in DEPLOYMENT OUTSIDE VEHICLE and DEPLOYMENT INSIDE VEHICLE in this section.

Deployment Outside Vehicle . . . . . disposing of the air bag (inflator) module(s) only (i.e., the vehicle itself will be used again).
Deployment Inside Vehicle . . . . . scrapping the entire vehicle including the air bag (inflator) module(s).

WARNING:
Following precautions must be observed for this work. Failure to observe any of them may result in personal injury.
- **To avoid an accidental deployment, this work should be performed by no more than one person.**
- **The procedure should be followed strictly as described here.**
- **Be sure to read SERVICE PRECAUTIONS in this section beforehand.**
- **Never connect deployment harness to any power source before connecting deployment harness to the air bag (inflator) module. Deployment harness shall remain shorted and not be connected to a power source until the air bag is to be deployed.**
- **Since the smoke is produced when air bag is deployed, select a well-ventilated area.**
- **The air bag (inflator) module will immediately deploy when a power source is connected to it. Wear safety glasses throughout this entire deployment and disposal procedure.**
- **Wear suitable ear protection when deploying air bag. Also, advise those who are in the area close to deployment site to wear suitable ear protection.**
- **Do not deploy two or more air bag system components (air bag (inflator) modules) at the same time.**

DEPLOYMENT OUTSIDE VEHICLE

Use this procedure when the vehicle itself is used again (only the air bag (inflator) module(s) are disposed of).



1. Shorted

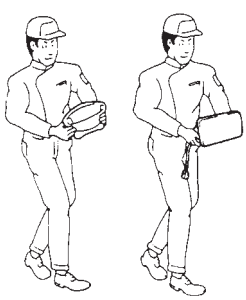
1) Turn ignition switch to “LOCK” position, remove key and put on safety glasses.
2) Check that there is no open, short or damage in special tool (deployment harness). If any faulty is found, do not use it and be sure to use new deployment harness.

Special Tool
(A): 09932-75030

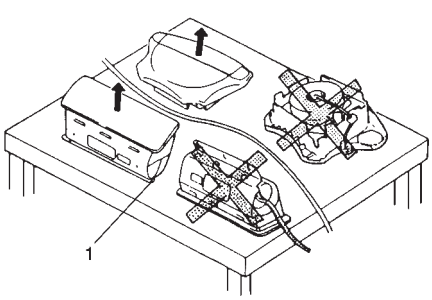
3) Short the two deployment harness leads together by fully seating one banana plug into the other.

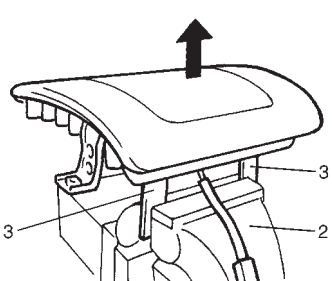
WARNING:
Deployment harness shall remain shorted and not be connected to a power source until the air bag is to be deployed.

ALWAYS CARRY AIR BAG (INFLATOR) MODULE WITH TRIM COVER (AIR BAG OPENING) AWAY FROM BODY.



ALWAYS PLACE AIR BAG (INFLATOR) MODULE ON WORKBENCH WITH TRIM COVER (AIR BAG OPENING) UP, AWAY FROM LOOSE OBJECTS.



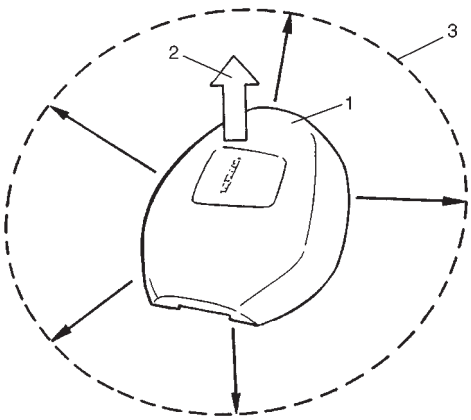


1. Slit on workbench
2. Workbench vise
3. Lower mounting bracket

4) Remove air bag (inflator) module(s) from vehicle, referring to SECTION 3C and 10B (if equipped with passenger air bag (inflator) module).

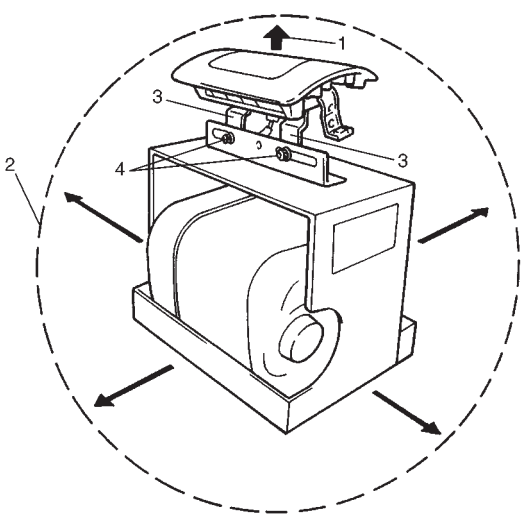
WARNING:
- **Always carry live air bag (inflator) module with trim cover away from you.**
- **When storing a live air bag (inflator) module or when leaving a live air bag (inflator) module unattended on a bench or other surface, always face the bag and trim cover up and away from the surface. As the 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.

Failure to follow procedures may result in personal injury.



1. Driver air bag (inflator) module
2. Trim cover must face up
3. 185 cm (6 feet) of clearance

5) In case of driver air bag (inflator) module:
   i) Clear a space on the ground about 185 cm (6 feet) in diameter where the driver air bag (inflator) module is to be deployed. A paved, outdoor location where there is no activity is preferred. If an outdoor location is not available, a space on the shop floor where there is no activity and sufficient ventilation is recommended.
   Ensure no loose or flammable objects are within the deployment area.
   ii) Place the driver air bag (inflator) module, with its vinyl trim cover facing up, on the ground in the space just cleared.



1. Trim cover must face up
2. 185 cm (6 feet) of clearance
3. Mounting attachment
4. M8 bolt and nut

In case of passenger air bag (inflator) module
   i) Clear a space on the ground about 185 cm (6 feet) in diameter where the fixture (special tool) with attached air bag (inflator) module is to be placed for deployment. A paved outdoor location where there is no activity is preferred. If an outdoor location is not available, a space on the shop floor where there is no activity and sufficient ventilation is recommended. Ensure that no loose or flammable objects are within the deployment area.
   ii) Place special tool (passenger air bag (inflator) module deployment fixture) on the ground in the space cleared in step i), if it has not already been placed there.

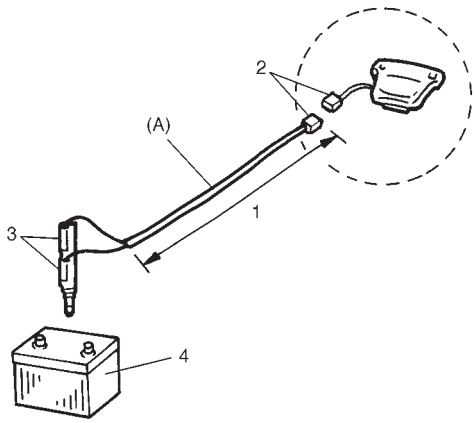
Special Tool
(B): 09932-75041 or 09932-75040 and 09932-75050

   iii) Fill plastic reservoir in fixture (special tool) with water or sand. This is necessary to provide sufficient stabilization of the fixture during deployment.
   iv) Attach the passenger air bag (inflator) module in the fixture (special tool) using mounting attachment, hold-down bolts and nuts and M8 bolts and nuts.

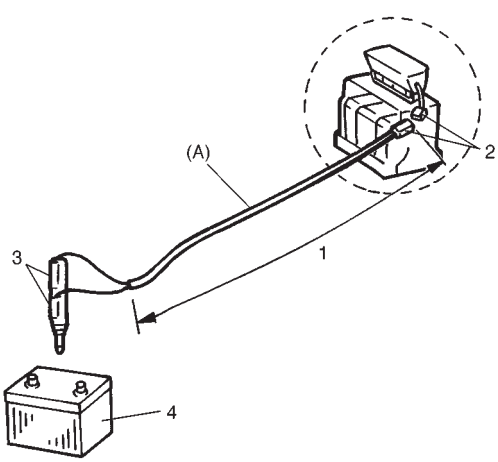
CAUTION:
Be sure to use the following bolt and nut for fixing passenger air bag (inflator) module to mounting attachment. Size: M8, Strength: 7T

Securely hand-tighten all fastener prior to deployment.

For driver air bag (inflator) module



For passenger air bag (inflator) module (if equipped)



1. Stretch deployment harness to full length 10 m (33 ft).
2. Connect connectors.
3. Power source (12V vehicle battery)
4. Short the two deployment harness leads.

6) Stretch the deployment harness from the driver or passenger air bag (inflator) module to its full length 10 m (33 ft).

   Special Tool
   (A): 09932-75030

7) Place a power source near the shorted end of the deployment harness. Recommended application: 12 Volts minimum, 2 amps minimum. A vehicle battery is suggested.
8) Verify that the area around the driver or passenger air bag (inflator) module is clear of all people and loose or flammable objects.
9) In case of driver air bag (inflater) module:
   Verify that the driver air bag (inflator) module is resting with its vinyl trim cover facing up.

   In case of passenger air bag (inflator) module (if equipped):
   Verify that the passenger air bag (inflator) module is firmly and properly secured in passenger air bag (inflator) module deployment fixture (special tool).
10) Connect the air bag (inflator) module to the deployment harness connector and lock connector with lock lever.
11) Notify all people in the immediate area that you intend to deploy the air bag (inflator) module.

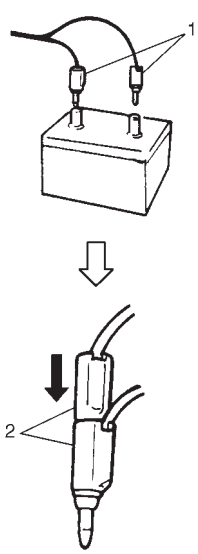
NOTE:

- **When the air bag deploys, the rapid gas expansion will create a substantial report. Wear suitable ear protection. Notify all people in the immediate area that you intend to deploy the air bag (inflator) module and suitable ear protection should be worn.**
- **When the driver air bag deploys, driver air bag (inflator) module may jump about 30 cm (1 ft) vertically. This is a normal reaction of them to the force of the rapid gas expansion inside the air bag.**
- **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 byproducts of the chemical reaction.**

WARNING:

- **After deployment, the metal surfaces of the air bag (inflator) module will be very hot. Do not touch the metal areas of them for about 30 minutes after deployment.**
- **Do not place the deployed air bag (inflator) module near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module.**
- **If the deployed air bag (inflator) module must be moved before it is cool, wear gloves and handle it by using nonmetal material such as the air bag and vinyl trim.**

Failure to follow procedures may result in fire or personal injury.



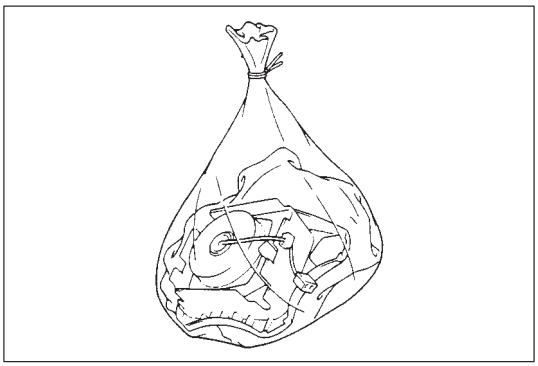
1. Connect one banana plug to positive terminal of power source (12V vehicle battery) and then the other to negative terminal to immediately deploy.
2. Short to two deployment harness leads.

12) Separate the two banana plugs on the deployment harness.
13) Connect the deployment harness to the power source (12V vehicle battery) to immediately deploy the air bag.
14) Disconnect the deployment harness from power source (12V vehicle battery) and short the two deployment harness leads together by fully seating one banana plug into the other.
15) In the unlikely event that the air bag (inflator) module did not deploy after following these procedures, proceed immediately with Steps 20) through 23). If the air bag (inflator) module did deploy, proceed with Steps 16) through 19).

16) Put on a pair of shop gloves to protect your hands from possible irritation and heat when handling the deployed air bag (inflator) module.
17) Disconnect the deployment harness from the air bag (inflator) module as soon after deployment as possible.

NOTE:

This will prevent damage to the deployment harness due to possible contact with the hot air bag (inflator) module. The deployment harness are designed to be reused. They should, however, be inspected for damage after each deployment and replaced if necessary.

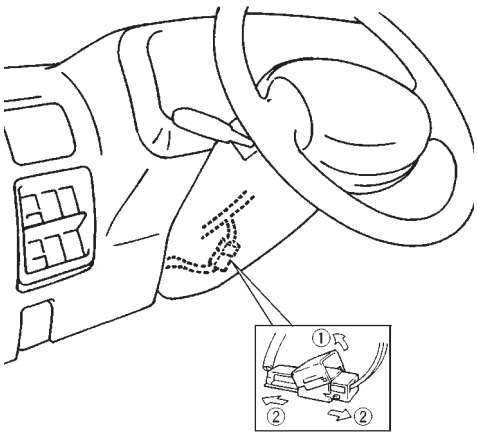


18) Dispose of the deployed air bag (inflator) module through normal refuse channels after it has cooled for at least 30 minutes and tightly seal the air bag (inflator) module in a strong vinyl bag. (Refer to DEPLOYED AIR BAG (INFLATOR) MODULE DISPOSAL in this section for details.)
19) Wash your hands with mild soap and water afterward.

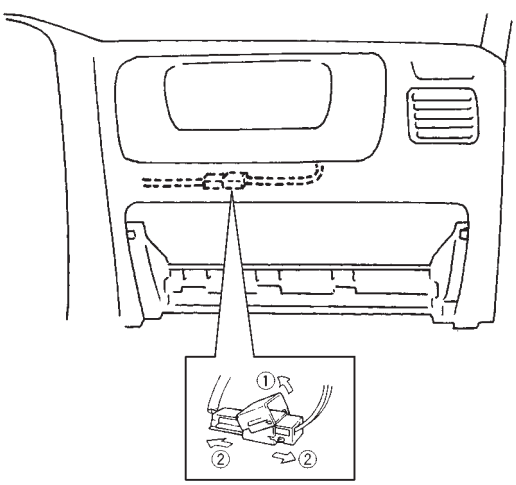
NOTE:
The remaining steps are to be followed in the unlikely event that the air bag (inflator) module did not deploy after following these procedures.

20) Ensure that the deployment harness has been disconnected from the power source and that its two banana plugs have been shorted together by fully seating one banana plug into the other.
21) Disconnect the deployment harness from the air bag (inflator) module.
22) Temporarily store the air bag (inflator) module with its vinyl trim cover facing up, away from the surface upon which it rests. Refer to SERVICE PRECAUTIONS in this section for details.
23) Contact your local distributor for further assistance.

For driver air bag (inflator) module



For passenger air bag (inflator) module (if equipped)



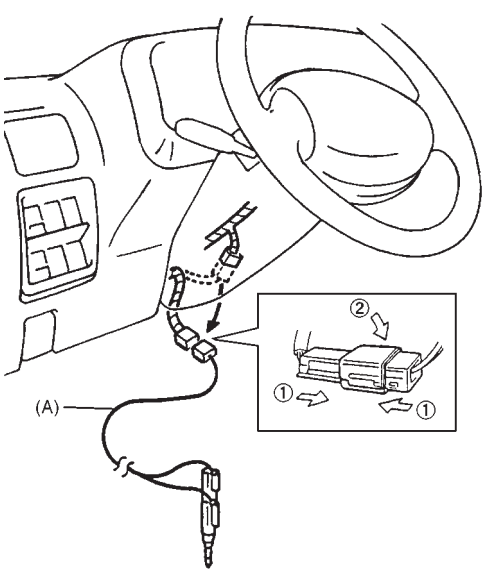
DEPLOYMENT INSIDE VEHICLE

Use this procedure when scrapping the entire vehicle including the air bag (inflator) module(s).

CAUTION:
When vehicle itself will be used again, deploy the air bag outside vehicle according to DEPLOYMENT OUTSIDE VEHICLE, for deploying it inside will cause the instrument panel, glove box and their vicinity to be deformed. Failure to observe this CAUTION may require unneeded vehicle inspection and repair.

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) For driver air bag (inflator) module:
   Disconnect contact coil connector (Yellow connector) located near the base of the steering column.
   For passenger air bag (inflator) module (if equipped):
   Remove glove box from instrument panel and disconnect passenger air bag (inflator) module connector (Yellow connector).
4) Confirm that each air bag (inflator) module is securely mounted.

For driver air bag (inflator) module



1. Short deployment harness leads.

5) Check that there is no open, short or damage in special tool (deployment harness). If any faulty condition is found, do not use it and be sure to use new deployment harness.

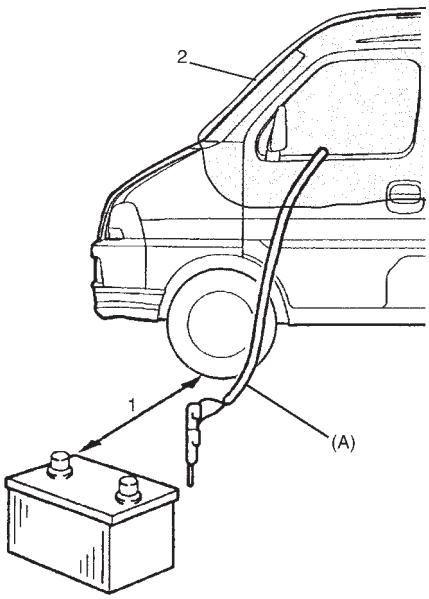
   Special Tool
   (A): 09932-75030

6) Short the two deployment harness leads together by fully seating one banana plug into the other.

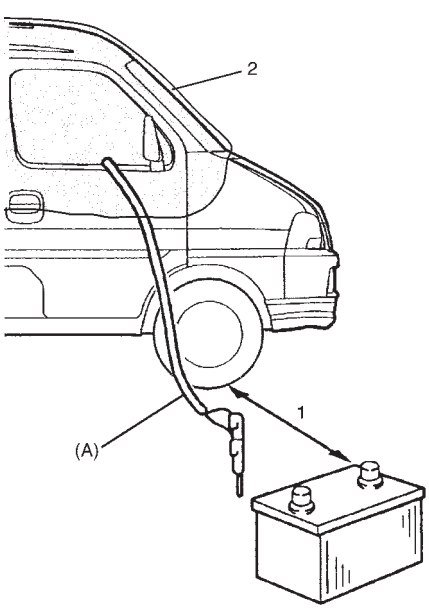
   WARNING:
   Deployment harness shall remain shorted and not be connected to a power source until the air bag is to be deployed.

7) Connect deployment harness connector to air bag (inflator) module (driver or passenger (if equipped)) and lock connector with lock lever.

Driver side for left hand steering vehicle



Driver side for right hand steering vehicle



1. Stretch deployment harness to its full length 10 m (33 ft).
2. Drop cloth, blanket or similar item.

8) Route deployment harness out the vehicle.
9) Verify that the inside of the vehicle and the area surrounding the vehicle are clear of all people and loose or flammable objects.
10) Stretch the deployment harness to its full length 10 m (33 ft).

Special Tool
(A): 09932-75030

11) Place a power source near the shorted end of the deployment harness. Recommended application: 12 Volts minimum, 2 amps minimum. A vehicle battery is suggested.
12) Completely cover windshield area and front door window openings with a drop cloth, blanket to similar item. This reduces the possibility of injury due to possible fragmentation of the vehicle's glass or interior.
13) Notify all people in the immediate area that you intend to deploy the air bag (inflator) module.

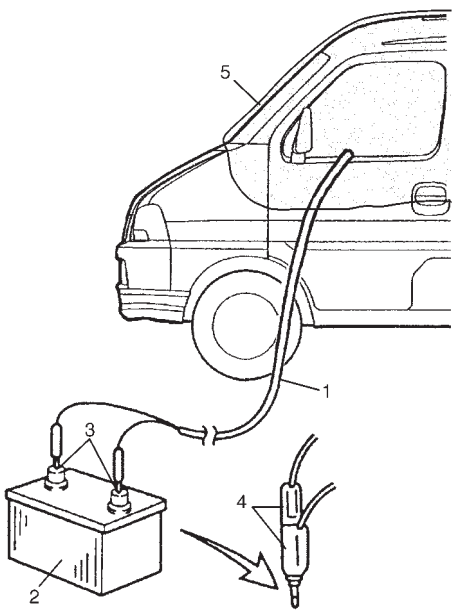
NOTE:

- **When the air bag deploys, the rapid gas expansion will create a substantial report. Wear suitable ear protection. Notify all people in the immediate area that you intend to deploy the air bag (inflator) module and suitable ear protection should be worn.**
- **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 byproducts of the chemical reaction.**

WARNING:

- **After deployment, the metal surfaces of the air bag (inflator) module will be very hot. Do not touch the metal areas of them for about 30 minutes after deployment.**
- **Do not place the deployed air bag (inflator) module near any flammable objects.**
- **Do not apply water, oil, etc. to deployed air bag (inflator) module.**
- **If the deployed air bag (inflator) module must be moved before it is cool, wear gloves and handle it by using nonmetal material such as the air bag and vinyl trim.**

Failure to follow procedures may result in fire or personal injury.



1. Stretch it to full length 10m (33 ft).
2. Power source (12V vehicle battery)
3. Connect one banana plug to positive terminal of power source (12V vehicle battery) and then the other to negative terminal to immediately deploy.
4. Short harness leads after deployment.
5. Drop cloth, blanket or similar them.

14) Separate the two banana plugs on the deployment harness.
15) Connect the deployment harness to the power source (12 V vehicle battery) to immediately deploy the air bag.
16) Disconnect the deployment harness from the power source (12 V vehicle battery) and short the two deployment harness leads together by fully seating one banana plug into the other.
17) Put on a pair of shop gloves to protect your hands from possible irritation and heat when handling the deployed air bag (inflator) module.
18) Disconnect the deployment harness from the air bag (inflator) module as soon after deployment as possible.
    This will prevent damage to the deployment harness due to possible contact with the hot air bag (inflator) module. The deployment harness are designed to be reused. They should, however, be inspected for damage after each deployment and replaced if necessary.
19) Carefully remove drop cloth from vehicle and clean off any fragments or discard drop cloth entirely.
20) Repeat Steps 2) through 19) to deploy air bag (inflator) modules which has not been deployed, if any.
21) In the unlikely event that the air bag (inflator) module proceed immediately with Steps 23) through 25). If the air bag (inflator) module did deploy, proceed with Steps 22).

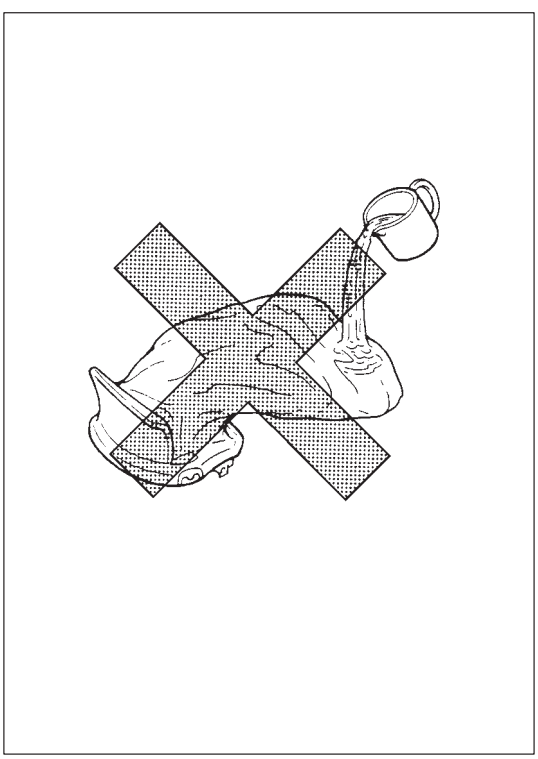
22) With air bags deployed the vehicle may be scrapped in the same manner as a non-air bag system equipped vehicle.

23) Remove the undeployed air bag (inflator) module(s) from the vehicle. For driver air bag (inflator) module refer to REMOVAL of DRIVER AIR BAG (INFLATOR) MODULE in SECTION 3C, for passenger air bag (inflator) module (if equipped) refer to REMOVAL of PASSENGER AIR BAG (INFLATOR) MODULE in this section.
24) Temporarily store the air bag (inflator) module with its vinyl trim cover facing up, away from the surface upon which it rests. Refer to SERVICE PRECAUTIONS in this section for details.
25) Contact your local distributor for further assistance.

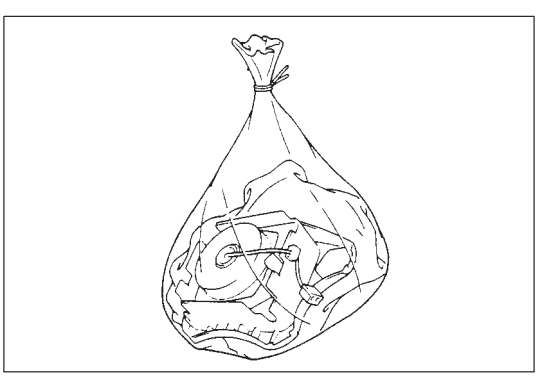
DEPLOYED AIR BAG (INFLATOR) MODULE DISPOSAL

WARNING:
Failure to follow proper air bag (inflator) module disposal procedures can result in air bag deployment which may cause personal injury. The undeployed air bag (inflator) module must not be disposed of through normal refuse channels.
The undeployed air bag (inflator) module contains substances that can cause severe illness or personal injury if the sealed container is damaged during disposal.

Deployed air bag (inflator) module 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 immediately after deployment 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 to cool it off and be careful so that water, oil etc. does not get on the deployed air bag (inflator) module.
- 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 byproducts of the chemical reaction. As with many service procedures, you should wear gloves and safety glasses.

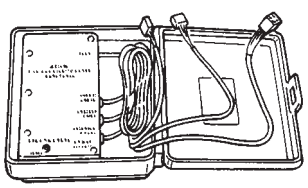


- When disposing of the deployed air bag (inflator) module, be sure to seal it in a vinyl bag.
- When air bag (inflator) module have been deployed inside the vehicle which is going to be scrapped, leave them as installed to the vehicle.
- Be sure to wash your hands with mild soap and water after handling it.

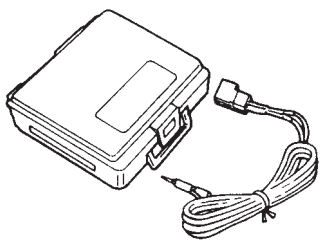
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
SDM bolt	6	0.6	4.5
Passenger air bag (inflator) module bolt (if equipped)	23	2.3	16.5
Driver air bag (inflator) module bolt	Refer to TIGHTENING TORQUE SPECIFICATIONS in SECTION 3C.		

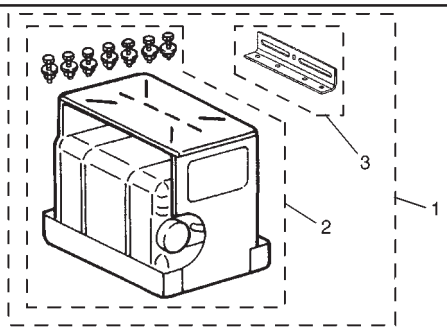
SPECIAL TOOLS



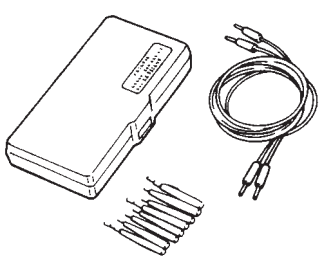
09932-75010
Air bag driver/passenger load tool



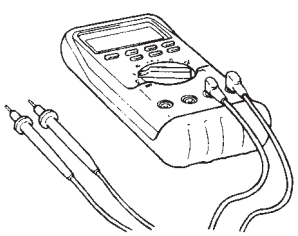
09932-75030
Air bag deployment harness



1. 09932-75041 PAB deployment fixture
   or
2. 09932-75040 PAB deployment fixture and
3. 09932-75050 PAB deployment fixture bracket
   PAB : Passenger air bag (inflator) module

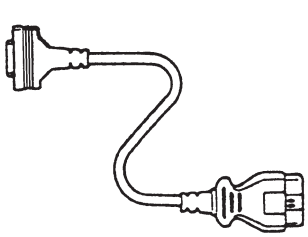


09932-76010
Connector test adapter kit



Digital multimeter for which the maximum test current is 10 mA or less at the minimum range of resistance measurement.

WARNING:
Be sure to use the specified digital multimeter. Otherwise, air bag deployment or personal injury may result.



09931-76030
16/14 pin DLC cable

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