SUZUKI

VITARA

SUPPLEMENTARY SERVICE MANUAL

USE THIS SUPPLEMENTARY SERVICE MANUAL WITH MANUALS MENTIONED IN THE FOREWORD OF THIS MANUAL.

SUZUKI
Caring for Customers
99501-61A10-01E
(英)

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 a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around air bag system components or wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around air bag system components or wiring. 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.
- **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 deployment.**
- **Do not modify the steering wheel, dashboard, or any other air bag system component (on or around air bag system components or wiring). Modifications can adversely affect air bag system performance and lead to injury.**
- **If the vehicle will be exposed to temperatures over 93°C, 200°F (for example, during a paint baking process), remove the air bag system components (air bag inflator module, sensing and diagnostic module) beforehand to avoid component damage or unintended deployment.**

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to VITARA (SE416) series SERVICE MANUALs (SERVICE MANUAL 99500-60A10, SUPPLEMENTARY SERVICE MANUALs 99501-60A60 • 99501-60A70) and VITARA (SV620) SERVICE MANUAL (99500-85F00).

Applicable model:

- VITARA (SE416):
  On and after following body No.s.

JSAETA01C0 1110001	TA01C – 160001	JS3TA01V T4140001
JSAETA01CST100001	TA01V – 160001	JS3TA01C T4140001
JSAETA01V0 1110001	TD01V – 160001	
JSAETA01VST100001		
JSAETA02C0 1120001		
JSAETA02V0 1120001		
JSAETD01V0 1100001		
JSAETD01VST100001		

- VITARA (SV620) equipped with antilock brake system (ABS) and/or air bag system.

Therefore, whenever servicing SE416 with a body number on and after the above listed numbers or SV620 with ABS and/or air bag system, consult this supplement first. And for any section, item or description not found in this supplement, refer to the SERVICE MANUALs and SUPPLEMENTARY SERVICE MANUALs mentioned in next page.

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.

SUZUKI MOTOR CORPORATION
OVERSEAS SERVICE DEPARTMENT

Related Service Manual

Service manuals listed below are in the chronological order with the latest one at the top.
For efficient use of manuals, start with the one at the top of the list (i.e., the latest one). If desired section, item or description is not found in it, try next one in the list and do the same one by one till what is being searched is found.

SE416

SERVICE MANUAL RELATED TO THIS MANUAL	APPLICABILITY
VITARA (SE416) SUPPLEMENTARY SERVICE MANUAL (99501-60A70)	This manual describes the items that should be updated (modified and added) in the Service Manual (99500-60A10) below after it was issued.
VITARA (SE416) SUPPLEMENTARY SERVICE MANUAL FOR 5-DOOR MODEL WITH SLIDING ROOF (99501-60A60)	This manual describes the sliding roof only.
VITARA (SE416) SERVICE MANUAL (99500-60A10)	This manual is the base manual for the above manual.

SV620

SERVICE MANUAL RELATED TO THIS MANUAL	APPLICABILITY
SV620 SERVICE MANUAL (99500-85F00)	This manual describes the only different service information of SV620 as compared with the Service Manuals (99500-60A10, 99501-60A70) below.
VITARA (SE416) SUPPLEMENTARY SERVICE MANUAL (99501-60A70)	This manual describes the items that should be updated (modified and added) in the Service Manual (99500-60A10) below after it was issued.
VITARA (SE416) SUPPLEMENTARY SERVICE MANUAL FOR 5-DOOR MODEL WITH SLIDING ROOF (99501-60A60)	This manual describes the sliding roof only.
VITARA (SE416) SERVICE MANUAL (99500-60A10)	This manual is the base manual for the above manual.

FOR SE416 FOR SV620

0A

SECTION 0A

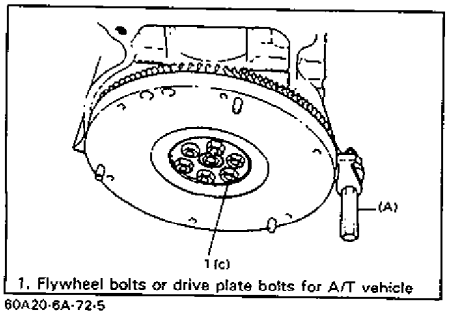
GENERAL INFORMATION

CONTENTS

61A10-0A-1-1

HOW TO USE THIS MANUAL

1) There is a TABLE OF CONTENTS FOR THE WHOLE MANUAL on the first page of this manual, whereby you can easily find the section that offers the information you need. Also, there is a TABLE OF 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

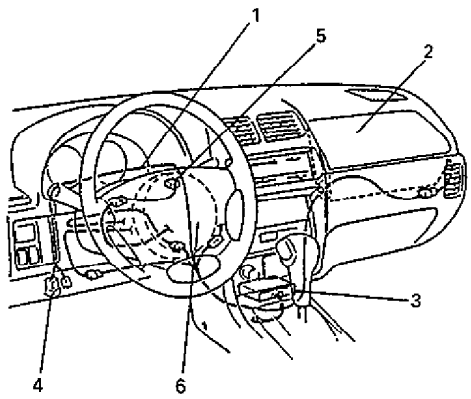
60A20-6A-72-5

6) Install oil pump. Refer to Item "Oil pump" for installation of oil pump.
7) Install flywheel (M/T vehicle) or drive plate (A/T vehicle). Using special tool, lock flywheel or drive plate, and tighten flywheel or drive plate bolts to specification.

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 and CORRECTION 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.



1. Air bag wire harness
2. Passenger air bag (inflator) module
3. SDM
4. "AIR BAG" fuse box
5. Contact coil
6. Driver air bag (inflator) module

61A10-0A-3-1

PRECAUTIONS

PRECAUTION FOR VEHICLES EQUIPPED WITH A SUPPLEMENTAL INFLATABLE RESTRAINT AIR BAG SYSTEM

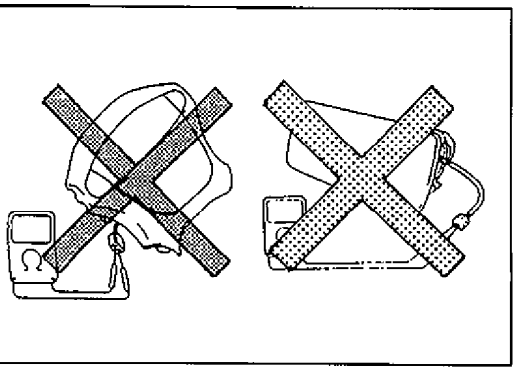
WARNING:

- **The configuration of air bag system parts are as shown in the figure. When it is necessary to service (remove, reinstall and inspect) these parts, be sure to follow procedures described in Section 9J. Failure to follow proper procedures could result in possible air bag deployment, personal injury, damage to parts or air bag being unable to deploy 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 deployment.**
- **Do not modify the steering wheel, dashboard, 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, sensing and diagnostic module) beforehand to avoid component damage or unintended deployment.**

DIAGNOSIS

- **When troubleshooting air bag system, be sure to follow "DIAGNOSIS" in Section 9J. 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.**

50G00-0A-3-3

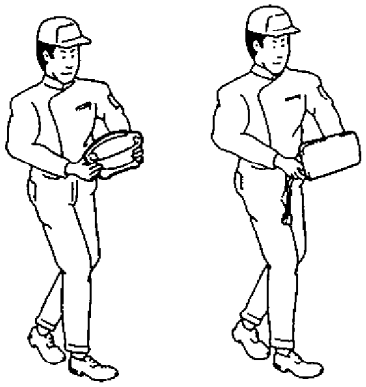


60A50-0A-2-5

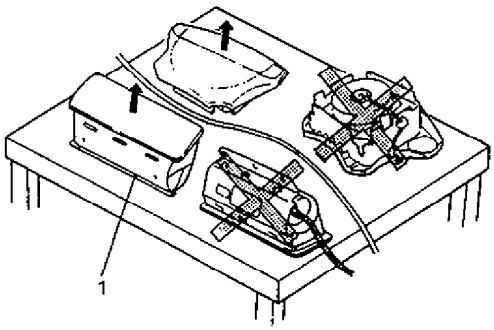
WARNING:

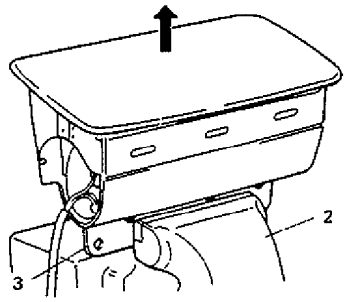
Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag.

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

HANDLING AND SERVICING

WARNING:

- **Many of service procedures require disconnection of "AIR BAG" fuse and air bag (inflator) modules (driver and passenger) from deployment loop 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 9J 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.**

SDM

- **During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM). Never strike or jar the SDM. Never power up the air bag system when the SDM is not rigidly attached to the vehicle. All SDM and mounting bracket fasteners must be carefully torqued and the arrow must be pointing toward the front of the vehicle to ensure proper operation of the air bag system. The SDM could be activated when powered while not rigidly attached to the vehicle which could cause deployment and result in personal injury.**

CAUTION:

- Even when the accident was light enough not to cause air bags to deploy, be sure to inspect system parts and other related parts according to instructions under "Repair and Inspection Required after an Accident" in Section 9J.
- 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 91.4 cm (3 feet) or more), never attempt disassembly or repair but replace it with a new one.
- When grease, cleaning agent, oil, water, etc. has got onto air bag (inflator) modules (driver and passenger), wipe off immediately with a dry cloth.
- Air bag wire harness can be identified easily as it is covered with a yellow protection tube. Be very careful when handling it.
- When an open in air bag wire harness, damaged wire harness, connector or terminal is found, replace wire harness, connectors and terminals as an assembly.
- Do not apply power to the air bag system unless all components are connected or a diagnostic chart requests it, as this will set a diagnostic trouble code.
- Never use air bag system component parts from another vehicle.
- When using electric welding, be sure to temporarily disable air bag system referring to "Disabling Air Bag System" under "Service Precaution" in Section 9J.
- 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" described in "Diagnosis" in Section 9J.

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 moisuture-proof gloves (such as dishwashing gloves) when changing engine oil. If engine oil contacts your skin, wash thoroughly with soap and water. Launder any clothing or rags if wet with oil, recycle or properly dispose of used oil and filters.

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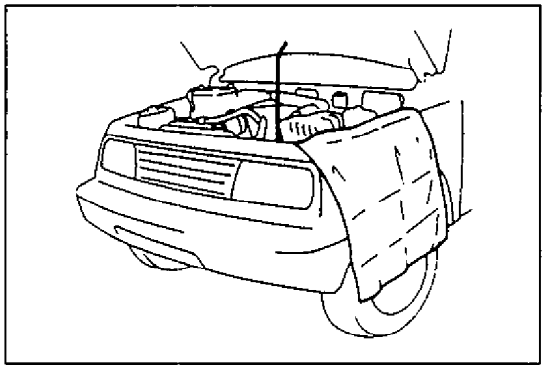
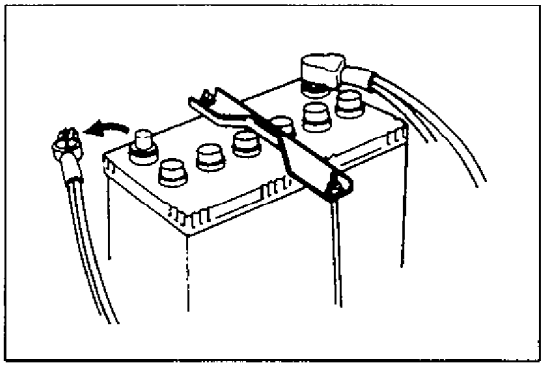


64B40-0A-4-3

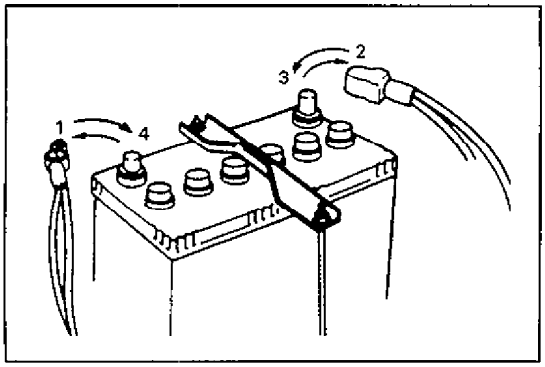
CAUTION:

- **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.**



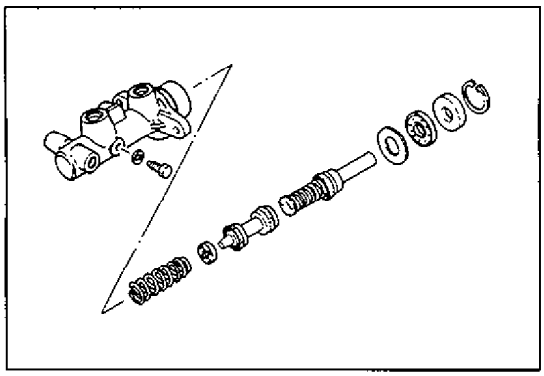
64B40-0A-4-4

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



60G00-0A-6-5

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



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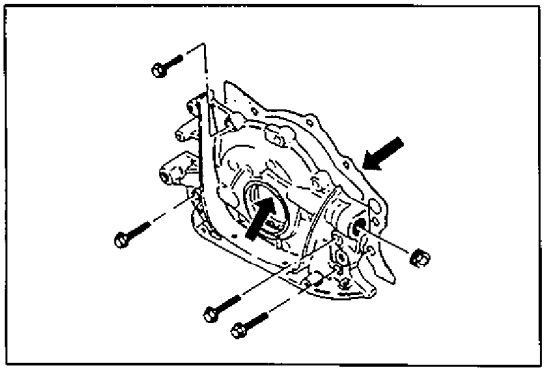
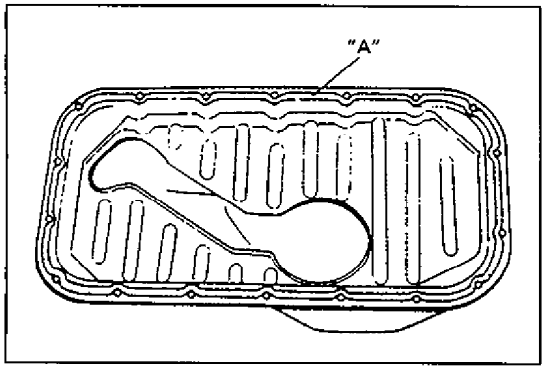
- When removing parts that are to be reused, be sure to keep them arranged in an orderly manner so that they may be reinstalled in the proper order and position.



64B40-0A-5-2

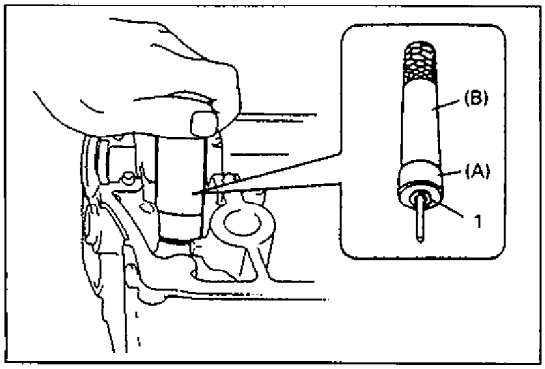
- Whenever you use oil seals, gaskets, packing, O-rings, locking washers, split pins, self-locking nuts, and certain other parts as specified, be sure to use new ones. Also, before installing new gaskets, packing, etc., be sure to remove any residual material form the mating surfaces.



64B40-0A-5-3

- 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.

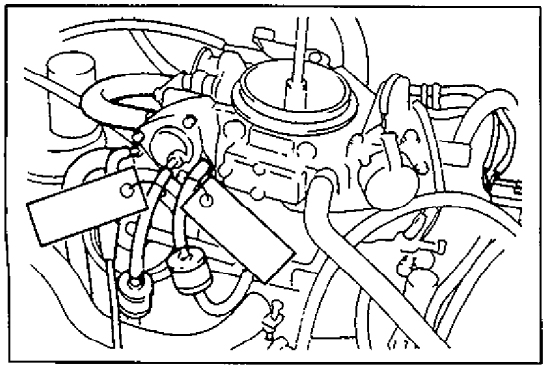
  "A": Sealant 99000-31150



60G00-0A-7-4

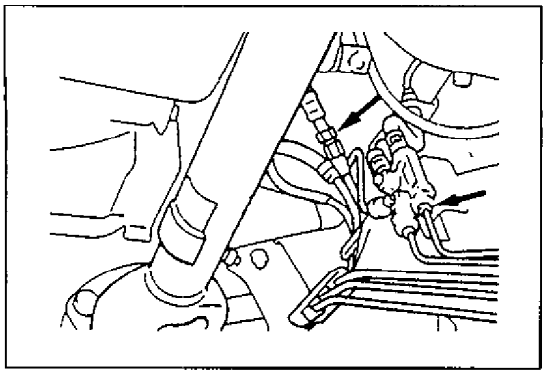
- Be sure to use special tools when instructed.

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



64B40-0A-5-5

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



50G00-0A-8-1

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

- For vehicles equipped with fuel injection systems, 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.

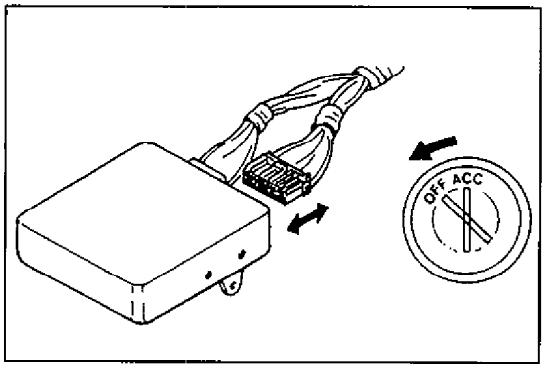
50G00-0A-8-4

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

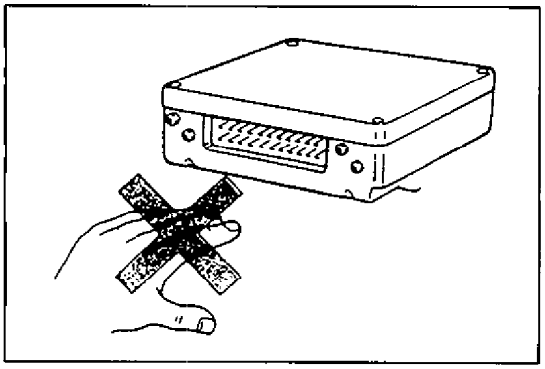
50G00-0A-8-5



60G00-0A-8-4

PRECAUTIONS FOR ELECTRICAL CIRCUIT SERVICE

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

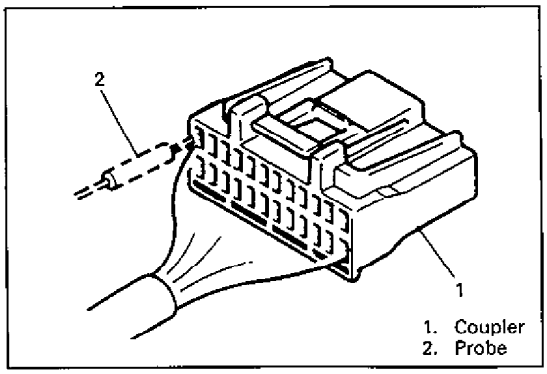


60G00-0A-8-5

- Be careful not to touch the electrical terminals of parts which use microcomputers (e.g. electronic control unit like as ECM, TCM, ABS control module, SDM 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.

60G00-0A-9-1



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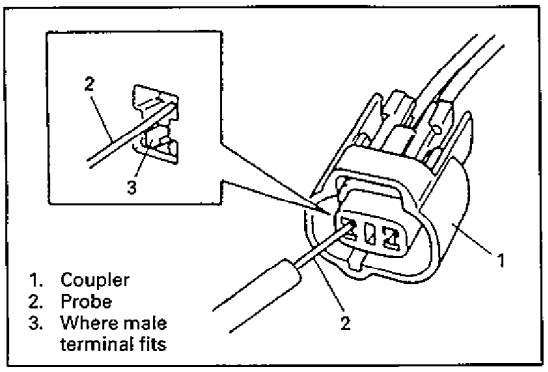
- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector.

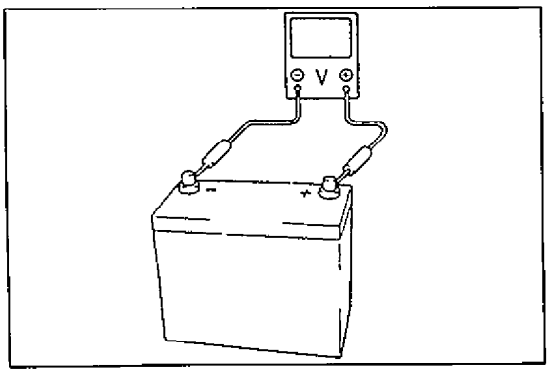


60G00-0A-9-3

- 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.

60G00-0A-9-4



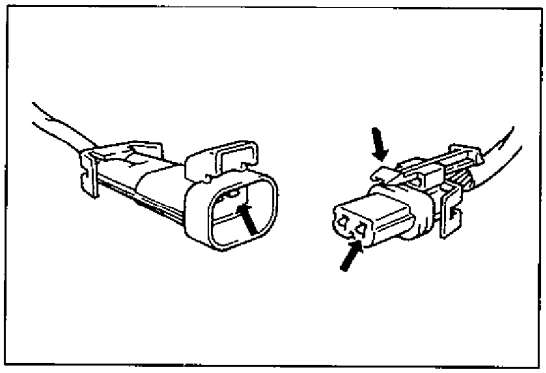
60G00-0A-9-5

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

INTERMITTENTS AND POOR CONNECTION

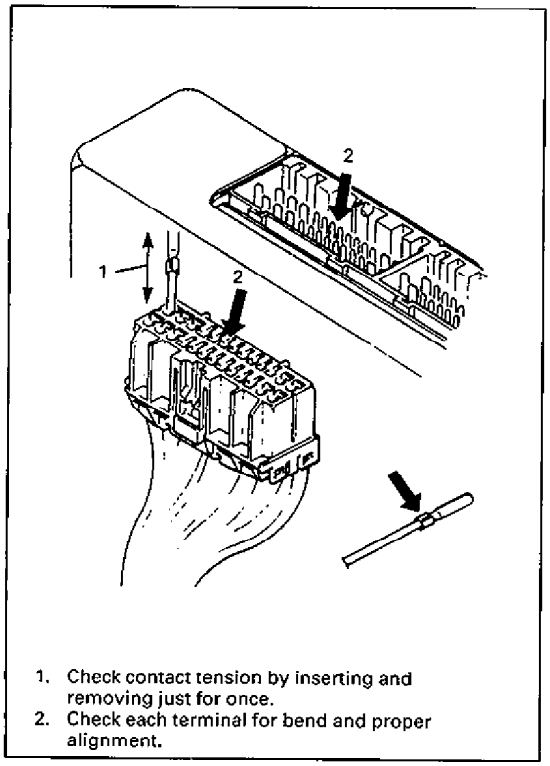
Most intermittents are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be at fault. When checking it for proper connection, perform careful check of suspect circuits for:

60G00-0A-10-1



50G00-9J-14-6

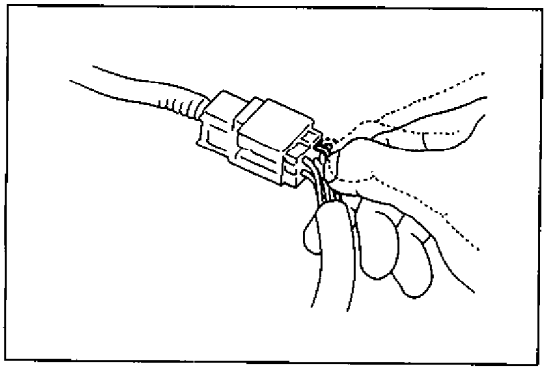
- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals. The terminals must be clean and free of any foreign material which could impede proper terminal contact.
  However, cleaning the terminal with a sand paper or the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



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

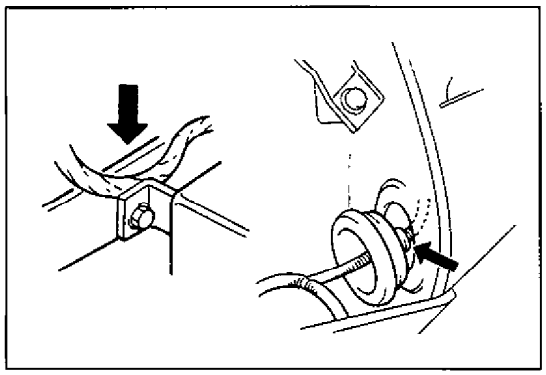
60G00-0A-10-3

- 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.
  If contact tension is not enough, reform it to increase contact tension or replace.



60G00-0A-10-5

- 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.



60G00-0A-11-1

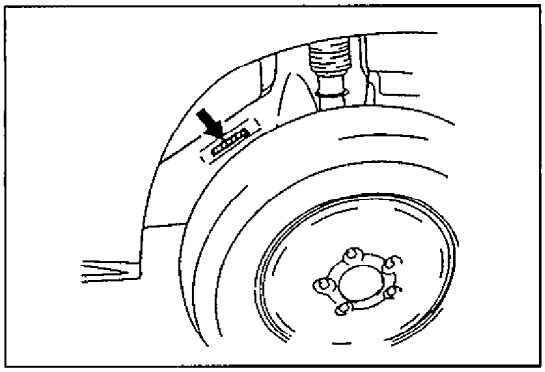
- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause continuity check to show a good circuit, but if only 1 or 2 strands of a multi-strand-type wire are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

  If any abnormality is found, repair or replace.

IDENTIFICATION INFORMATION

BODY NUMBER

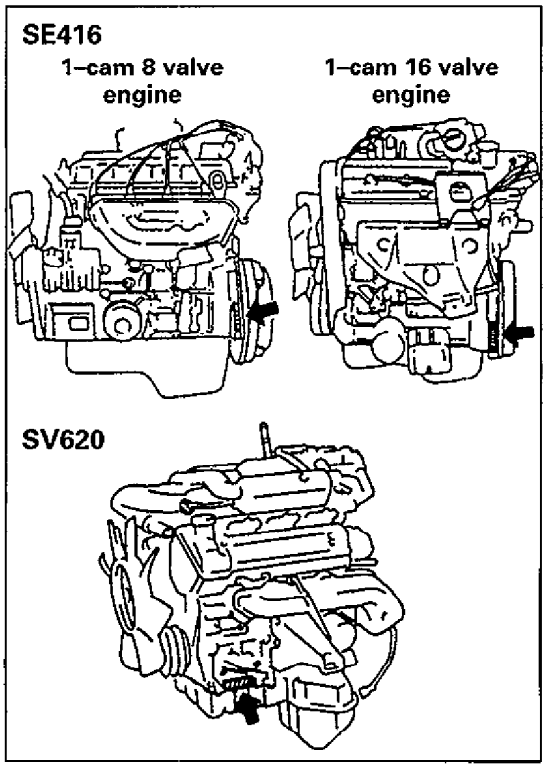
The vehicle body number is punched on the chassis inside the tire housing on the right front side.



85F00-0A-9-1

ENGINE IDENTIFICATION NUMBER

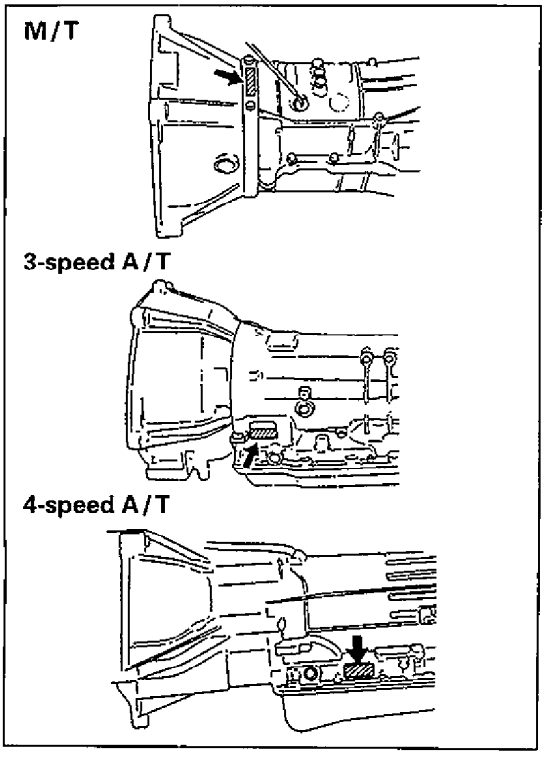
The number is punched on the cylinder block.



61A10-0A-12-2

TRANSMISSION IDENTIFICATION NUMBER

The number is located on the transmission case.

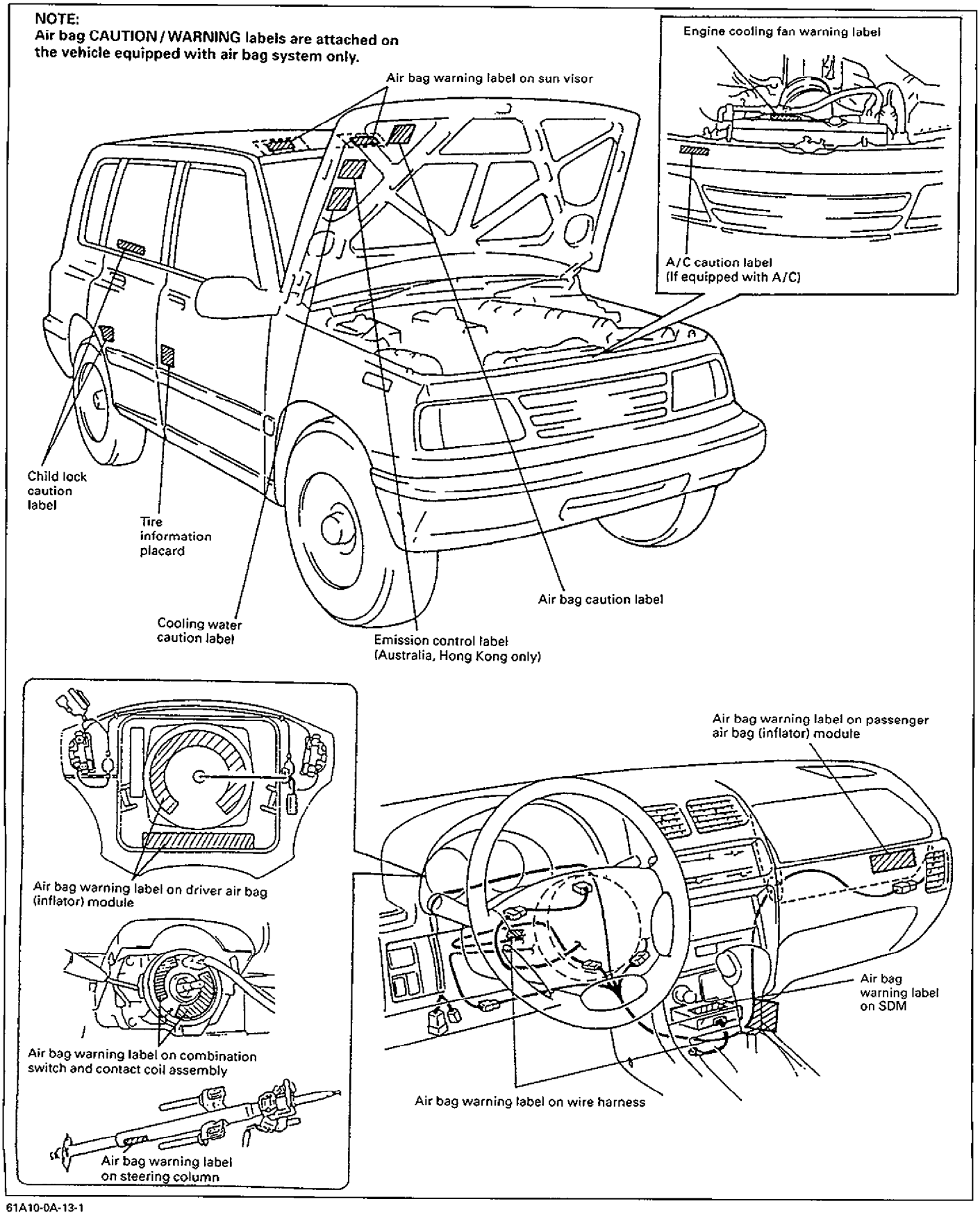


61A10-0A-12-4

WARNING, CAUTION AND INFORMATION LABELS

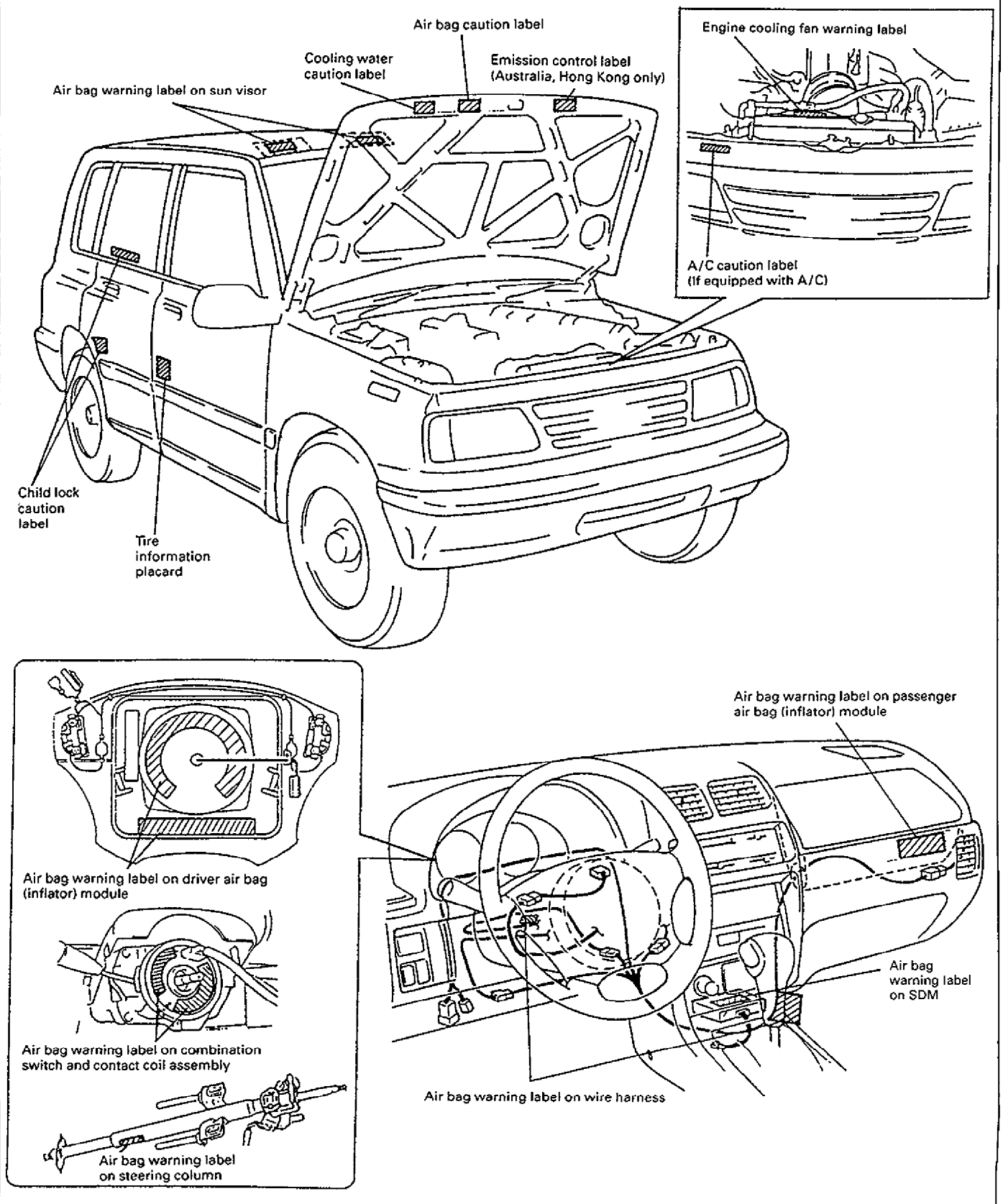
The figure below shows main labels among others that are attached to vehicle component parts. When servicing and handling parts, refer to WARNING/CAUTION instructions printed on labels. If any WARNING/CAUTION label is found stained or damaged, clean or replace it as necessary.

SE416



SV620

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

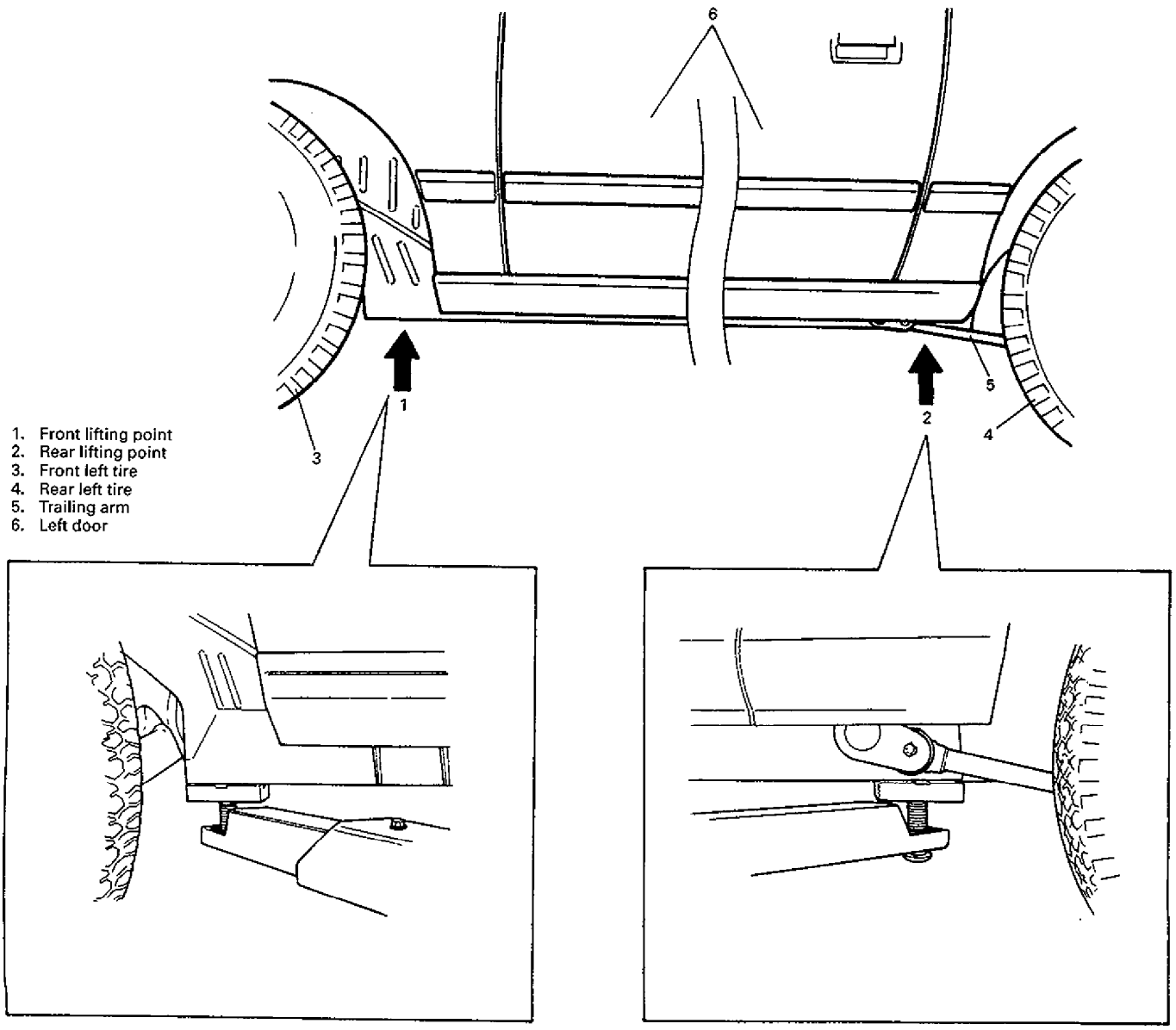


VEHICLE LIFTING POINTS

WARNING

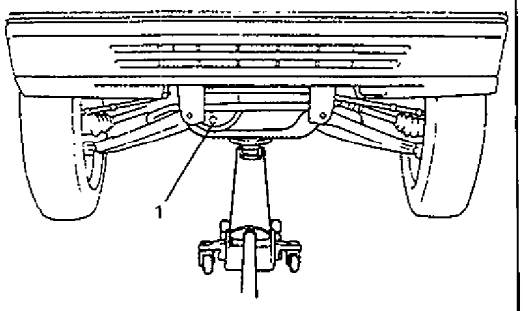
- **When using frame contact hoist, apply hoist as shown (right and left at the same position). Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by trying to move vehicle body in both ways. Work can be started only after this confirmation.**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

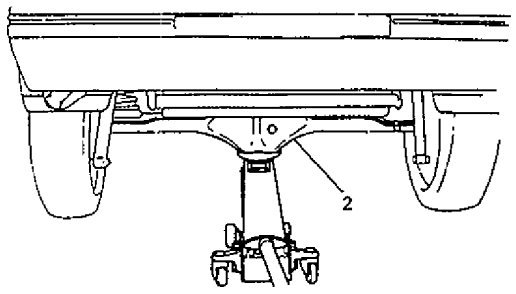


1. Front lifting point
2. Rear lifting point
3. Front left tire
4. Rear left tire
5. Trailing arm
6. Left door

When using floor jack:



1. Front differential housing



2. Rear axle

60A20-0A-12-1

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

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

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.

85F00-0A-11-3

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)

85F00-0A-12-1

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
- EGR Pressure Transducer : EGR Modulator
- 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
- EVAP : Evaporative Emission
- EVAP Canister : Evaporative Emission Canister (Charcoal Canister)
- EVAP Canister Purge Valve : EVAP Solenoid Purge Valve (SP Valve)

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)
- IG : Ignition
- ISC Actuator : Idle Speed Control Actuator (Motor)

L

LH : Left Hand

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
O2S : Oxygen Sensor

P

PNP : Park/Neutral Position
P/S : Power Steering
PSP Switch : Power Steering Pressure Switch (P/S Pressure Switch)
PCV : Positive Crankcase Ventilation

R

RH : Right Hand

S

SAE : Society of Automotive Engineers
SDM : Sensing and Diagnostic Module
SFI : Sequential Multiport Fuel Injection
SIR : Supplemental Inflatable Restraint
SOHC : Single Over Head Camshaft

85F00-0A-13-1

T

TBI : Throttle Body Fuel Injection (Single-Point Fuel Injection, SPI)
TCC : Torque Converter Clutch
TCM : Transmission Control Module (A/T Controller, A/T Control Module)
TP Sensor : Throttle Position Sensor
TVV : Thermal Vacuum Valve (Thermal Vacuum Switching Valve, TVSV, Bimetal Vacuum Switching Valve, BVSV)
TWC : Three Way Catalytic Converter (Three Way Catalyst)
2WD : 2 Wheel Drive

V

VIN : Vehicle Identification Number
VSS : Vehicle Speed Sensor

W

WU-OC : Warm Up Oxidation Catalytic Converter
WU-TWC : Warm Up Three-Way Catalytic Converter

METRIC INFORMATION

METRIC FASTENERS

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

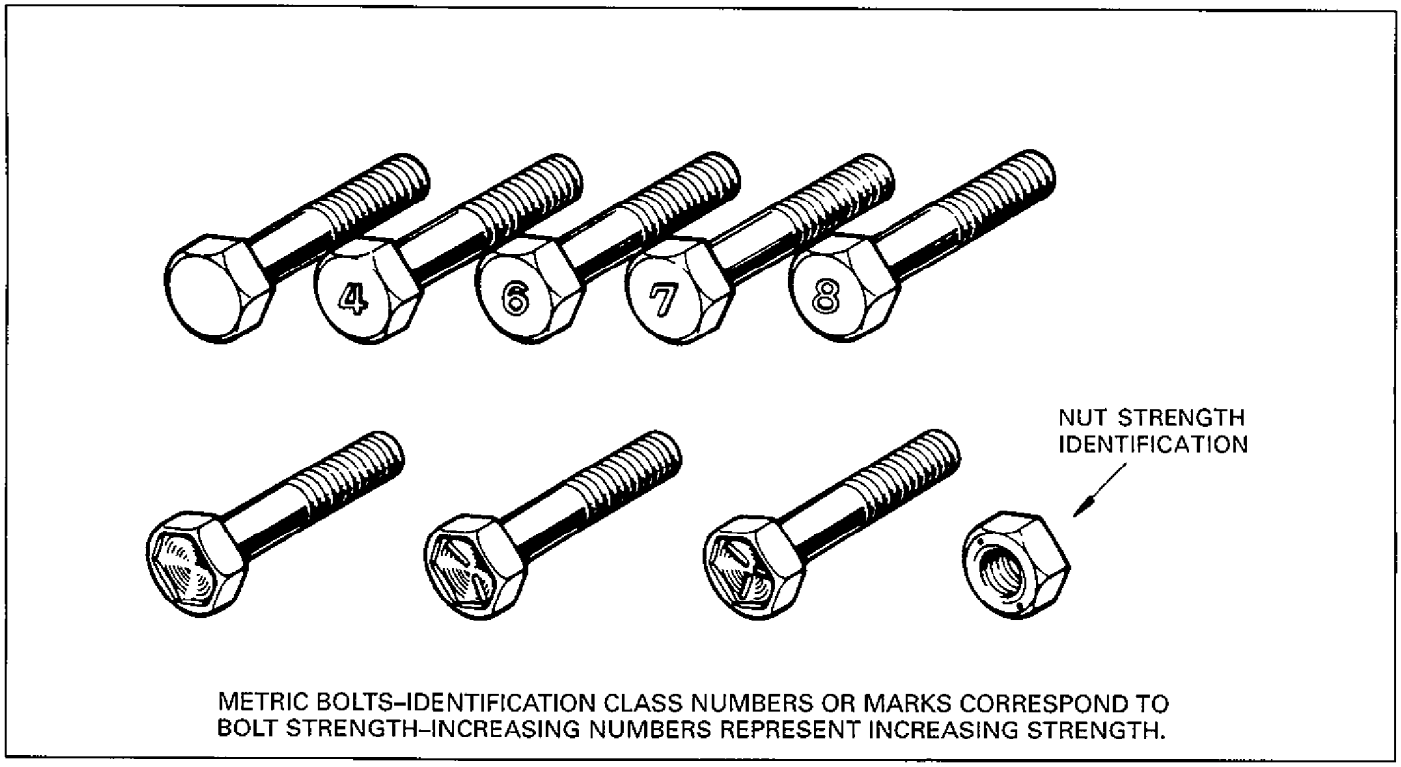
64B40-0A-8-1

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.

64B40-0A-8-2



METRIC BOLTS–IDENTIFICATION CLASS NUMBERS OR MARKS CORRESPOND TO BOLT STRENGTH–INCREASING NUMBERS REPRESENT INCREASING STRENGTH.

64B40-0A-8-3

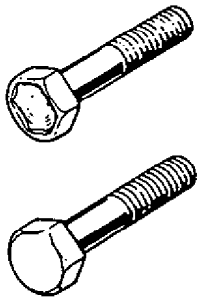
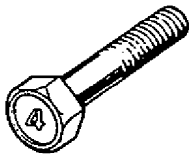
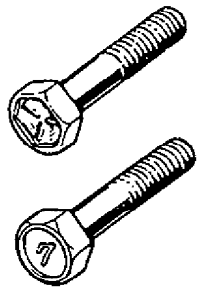
STANDARD TIGHTENING TORQUE

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.**

Tightening torque chart

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

85F00-0A-15-1

SECTION 0B

MAINTENANCE AND LUBRICATION

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

61A10-0B-1-1

CONTENTS

61A10-0B-1-2

MAINTENANCE SCHEDULE

MAINTENANCE SCHEDULE UNDER NORMAL DRIVING CONDITIONS

For Electronic Fuel Injection Model with Oxygen Sensor

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
ENGINE									
1-1. Drive belt (tension, damage)		–	–	–	I	–	–	–	R
1-2. Camshaft timing belt		Replace every 100,000 km (60,000 miles)							
1-3. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-4. Engine oil and oil filter		R	R	R	R	R	R	R	R
1-5. Engine coolant		–	–	–	R	–	–	–	R
1-6. Cooling system hoses and connections		–	–	–	I	–	–	–	I
1-7. Exhaust pipes and mountings (except catalyst)		–	–	–	I	–	–	–	I&(R)
IGNITION SYSTEM									
2-1. Spark plugs	When unleaded fuel is used	–	–	–	–	R	–	–	–
	When leaded fuel is used, refer to "Severe Driving Condition" schedule								
2-2. Ignition wiring (high tension cords)		–	–	–	–	–	–	–	R
2-3. Distributor cap and rotor (crack, wear)		–	–	–	I	–	–	–	I
FUEL SYSTEM									
3-1. Air cleaner filter element		I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections		–	–	–	I	–	–	–	I&(R)
3-3. Fuel filter		–	–	–	**R	–	–	–	R
EMISSION CONTROL SYSTEM									
4-1. Oxygen sensor (If equipped)		Replace every 80,000 km or 60 months							
4-2. PCV valve		Inspect every 80,000 km or 60 months							
4-3. Fuel vapor storage (Evaporative Emission control) system		Inspect every 80,000 km or 60 months							
ELECTRICAL SYSTEM									
5-1. Wiring harness connections and headlights		–	–	–	I	–	–	–	I

NOTE:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

- ***Item 1-7 (R) is applicable to exhaust mounting rubber only.***
- ***Item 3-2 (R) is applicable to fuel tank cap only.***
- ***Item 3-3 **R is recommended maintenance item.***
- ***For Sweden, item 2-2, 4-1, 4-2 and 4-3 should be performed by odometer reading only.***

For Electronic Fuel Injection Model not Equipped with Oxygen Sensor

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
ENGINE									
1-1. Drive belt (tension, damage)		–	–	–	I	–	–	–	R
1-2. Camshaft timing belt		Replace every 100,000 km (60,000 miles)							
1-3. Valve lash (clearance)		–	I	–	I	–	I	–	I
1-4. Engine oil filter		R	R	R	R	R	R	R	R
1-4-1. Engine oil	API Grade SD, SE, SF, SG or SH	Replace every 10,000 km (6,000 miles)							
	API Grade SC	Replace every 5,000 km (3,000 miles)							
1-5. Engine coolant		–	–	–	R	–	–	–	R
1-6. Cooling system hoses and connections		–	I	–	I	–	I	–	I
1-7. Exhaust pipes and mountings (leakage, damage, tightness)		–	I	–	I	–	I	–	I
IGNITION SYSTEM									
2-1. Spark plugs	When unleaded fuel is used	–	R	–	R	–	R	–	R
	When leaded fuel is used, refer to "Severe Driving Condition" schedule								
2-2. Ignition wiring (high tension cords)		–	I	–	I	–	I	–	I
2-3. Distributor cap and rotor (crack, wear)		–	I	–	I	–	I	–	I
FUEL SYSTEM									
3-1. Air cleaner filter element		I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections		–	–	–	I	–	–	–	I&(R)
3-3. Fuel filter		–	–	–	R	–	–	–	R
EMISSION CONTROL SYSTEM									
4-1. Crankcase ventilation hoses and connections		–	I	–	I	–	I	–	I
4-2. PCV valve		–	–	–	I	–	–	–	I
4-3. Fuel vapor storage system, hoses and connections		–	I	–	I	–	I	–	I
ELECTRICAL SYSTEM									
5-1. Wiring harness connections and headlights		–	I	–	I	–	I	–	I

NOTE:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

- ***Item 3-2 (R) is applicable to fuel tank cap only.***

61A10-0B-3-1

For Carburetor Model

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
km (x 1,000)	10	20	30	40	50	60	70	80
miles (x 1,000)	6	12	18	24	30	36	42	48
Months	6	12	18	24	30	36	42	48
ENGINE								
1-1. Drive belt (tension, damage)	–	–	–	I	–	–	–	R
1-2. Camshaft timing belt	Replace every 100,000 km (60,000 miles)							
1-2-1. Engine bolts (All cylinder head and manifold fixings)	–	–	–	T	–	–	–	T
1-3. Valve lash (clearance)	–	I	–	I	–	I	–	I
1-4. Engine oil filter	R	R	R	R	R	R	R	R
1-4-1. Engine oil: API Grade SD, SE, SF, SG or SH	Replace every 10,000 km (6,000 miles)							
1-4-1. Engine oil: API Grade SC	Replace every 5,000 km (3,000 miles)							
1-5. Engine coolant	–	–	–	R	–	–	–	R
1-6. Cooling system hoses and connections	–	I	–	I	–	I	–	I
1-7. Exhaust pipes and mountings (leakage, damage, tightness)	–	I	–	I	–	I	–	I
IGNITION SYSTEM								
2-1. Spark plugs: When unleaded fuel is used	–	R	–	R	–	R	–	R
2-1. Spark plugs: When leaded fuel is used, refer to "Severe Driving Condition" schedule								
2-2. Ignition timing	I	I	I	I	I	I	I	I
2-3. Distributor advancer	–	I	–	I	–	I	–	I
FUEL SYSTEM								
3-1. Air cleaner filter element	I	I	I	R	I	I	I	R
3-2. Fuel tank cap, fuel lines and connections	–	–	–	I	–	–	–	I&(R)
3-3. Fuel filter	–	–	–	R	–	–	–	R
3-4. Carburetor choke system	I&L	I&L	I&L	I&L	I&L	I&L	I&L	I&L
3-5. Idle speed and idle mixture	–	I	–	I	–	I	–	I
EMISSION CONTROL SYSTEM								
4-1. Crankcase ventilation hoses and connections	–	I	–	I	–	I	–	I
4-2. PCV valve	–	–	–	I	–	–	–	I
4-3. Fuel vapor storage system, hoses and connections	–	I	–	I	–	I	–	I
4-4. Canister (if equipped)	–	I	–	I	–	I	–	I
4-5. Fuel cut system (Australia only)	–	–	–	I	–	–	–	I
ELECTRICAL SYSTEM								
5-1. Wiring harness connections and headlights	–	I	–	I	–	I	–	I

NOTE:
"R" : Replace or change
"I" : Inspect and correct or replace if necessary
"L" : Lubricate

For All Models

Interval: This interval should be judged by odometer reading or months, whichever comes first.		This table includes services as scheduled up to 80,000 km (48,000 miles) mileage. Beyond 80,000 km (48,000 miles), carry out the same services at the same intervals respectively.							
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	Months	6	12	18	24	30	36	42	48
CHASSIS AND BODY									
6- 1. Clutch (pedal and fluid level)		–	I	–	I	–	I	–	I
6- 2. Brake discs and pads (front) Brake drums and shoes (rear)		–	I	–	I	–	I	–	I
6- 3. Brake hoses and pipes		–	I	–	I	–	I	–	I
6- 4. Brake fluid		–	I	–	R	–	I	–	R
6- 5. Brake pedal		–	I	–	I	–	I	–	I
6- 6. Brake lever and cable		–	I	–	I	–	I	–	I
6- 7. Tires		I	I	I	I	I	I	I	I
6- 8. Wheel discs and free wheeling hubs (if equipped)		I	I	I	I	I	I	I	I
6- 9. Wheel bearings		–	I	–	*I	–	I	–	*I
6-10. Suspension system		*I	I	–	I	–	I	–	I
6-11. Propeller shafts		–	I	–	I	–	I	–	I
6-12. Manual transmission oil		I	I	I	R	I	I	I	R
6-13. Automatic transmission	Fluid level	I	I	I	I	I	I	I	I
	Fluid change	Replace every 160,000 km (100,000 miles)							
	Fluid hose	–	–	–	–	–	R	–	–
6-14. Transfer and differential oil		I	I	I	R	I	I	I	R
6-15. Steering system		I	I	I	I	I	I	I	I
6-16. Power steering (if equipped)		I	I	I	I	I	I	I	I
6-17. Door hinges		L	L	L	L	L	L	L	L

NOTE:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

"L" : Lubricate

"T" : Tighten to the specified torque

- ***Item 6-9 *I is applicable to not only rattled wear but also their grease.***
- ***Item 6-10 *I should be performed at 10,000 km only.***

61A10-0B-5-1

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 – Towing a trailer**
- **B – Repeated short trips**
- **C – Driving on rough and/or muddy roads**
- **D – Driving on dusty roads**
- **E – Driving in extremely cold weather and/or salted roads**
- **F – Repeated short trips in extremely cold weather**
- **G – Leaded fuel use**

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
— — C D — —	Drive belt	I	Every 12,000 miles (20,000 km) or 12 months
		R	Every 24,000 miles (40,000 km) or 24 months
A — — D E F	Engine oil and oil filter	R	Every 3,000 miles (5,000 km) or 3 months
A B C — E —	Exhaust pipes and mountings	I	Every 6,000 miles (10,000 km) or 6 months
— — — D — —	Air cleaner filter element *1	I	Every 1,500 miles (2,500 km)
		R	Every 12,000 miles (20,000 km) or 12 months
A B C D — F G	Spark plugs	R	Every 6,000 miles (10,000 km) or 6 months
A B C D — —	Brake discs and pads (Front) Brake drums and shoes (Rear)	I	Every 6,000 miles (10,000 km) or 6 months
A B C — E —	Propeller shafts	I	Every 6,000 miles (10,000 km) or 6 months
A — C — — F	Manual transmission, transfer and differential oil	R	Every 12,000 miles (20,000 km) or 12 months
A — C — — F	Automatic transmission fluid	R	Every 12,000 miles (20,000 km) or 12 months
— — C — — —	Drive axle shaft boots	I	Every 6,000 miles (10,000 km) or 6 months
— — C — — —	Bolts and nuts on chassis	T	Every 6,000 miles (10,000 km) or 6 months

NOTE:

"I" : Inspect and correct or replace if necessary

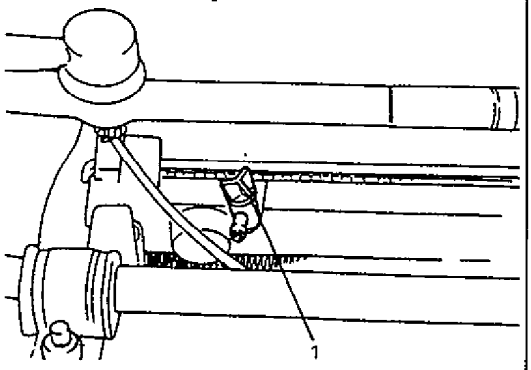
"R" : Replace or change

"T" : Tighten to the specified torque

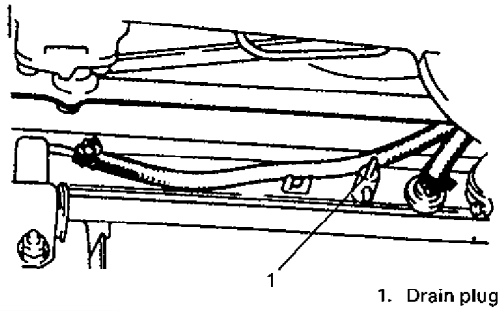
- ****1: Inspect or replace more frequently if the vehicle is used under dusty conditions.***

85F00-0B-4-1

1-cam 8 valve engine model



1-cam 16 valve engine model



1. Drain plug

61A10-0B-7-1

MAINTENANECE SERVICE

ENGINE

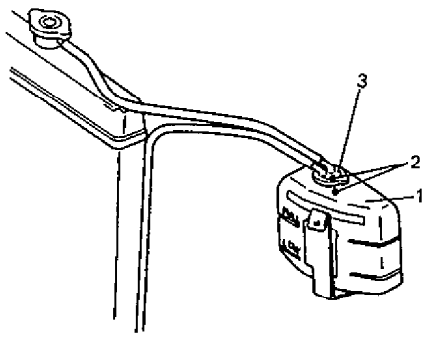
ITEM 1-5

Engine Coolant Change

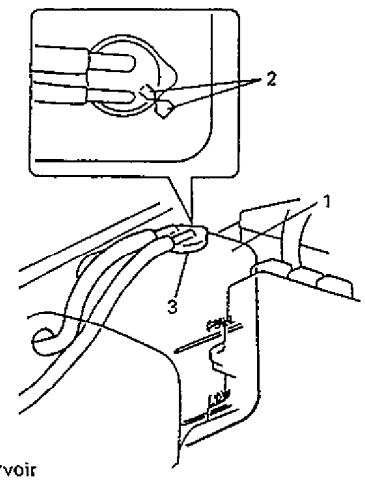
WARNING:
To help avoid danger of being burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) 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.

1-cam 8 valve engine model



1-cam 16 valve engine model



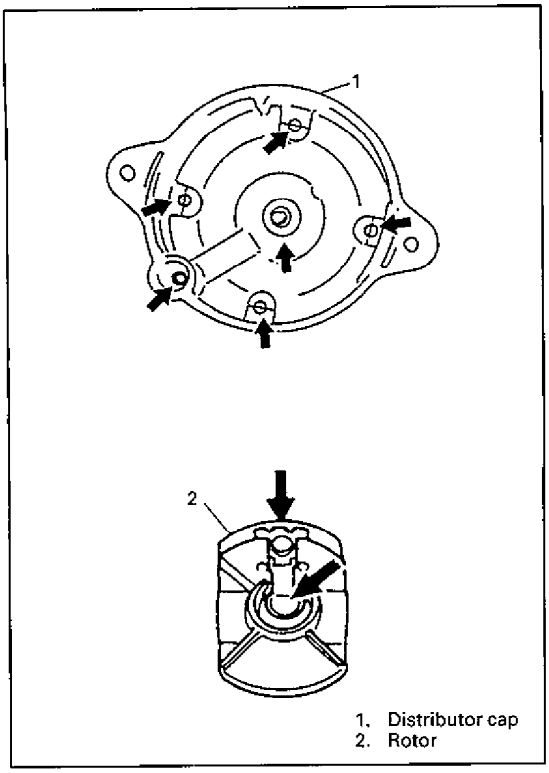
1. Reservoir
2. Arrow marks
3. Reservoir cap

61A10-0B-7-3

5) Fill radiator with specified amount of coolant, and run engine for 2 or 3 minutes at idle. This drives out any air which may still be trapped within cooling system. STOP ENGINE. Add coolant as necessary until coolant level reaches the filler throat of radiator. Reinstall radiator cap.
6) 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% ETHYLENE GLYCOL BASE COOLANT (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% ETHYLENE GLYCOL BASE COOLANT (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% ETHYLENE GLYCOL BASE COOLANT (ANTIFREEZE / ANTICORROSION COOLANT) should be used for the purpose of corrosion protection and lubrication.



1. Distributor cap
2. Rotor

61A10-0B-8-1

IGNITION SYSTEM

ITEM 2-2

Distributor Cap and Rotor Inspection

1) Inspect distributor cap and rubber caps for cracks.
2) Inspect center electrode and terminals for wear.
3) Inspect rotor for cracks, and its electrode for wear.
4) Repair or replace as necessary any component which is found to be in malcondition as described above.

NOTE:
Dust and stains found within distributor can be cleaned by using a dry, soft cloth.

CHASSIS AND BODY

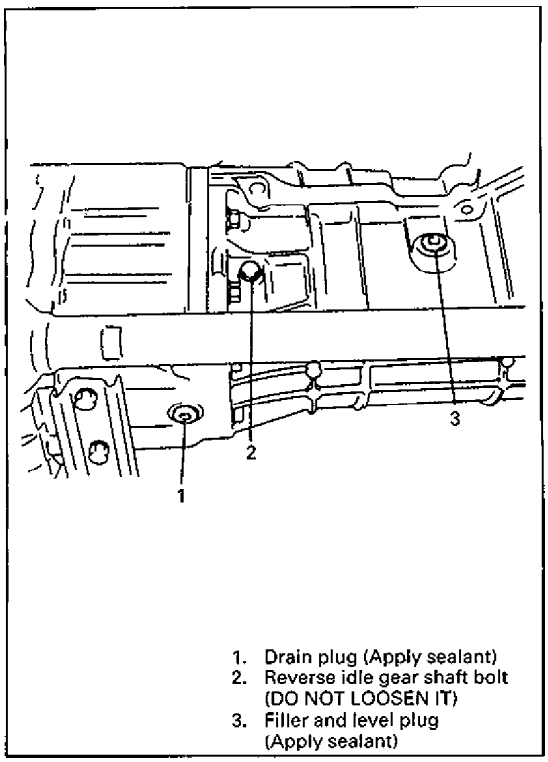
ITEM 6-12 (Manual transmission)

Transmission Oil Inspection and Change

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.

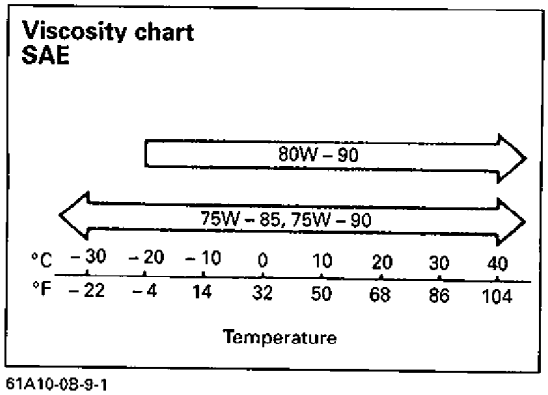
61A10-0B-8-3



1. Drain plug (Apply sealant)
2. Reverse idle gear shaft bolt (DO NOT LOOSEN IT)
3. Filler and level plug (Apply sealant)

60A90-0B-31-1S

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 SECTION 7A for tightening torque.

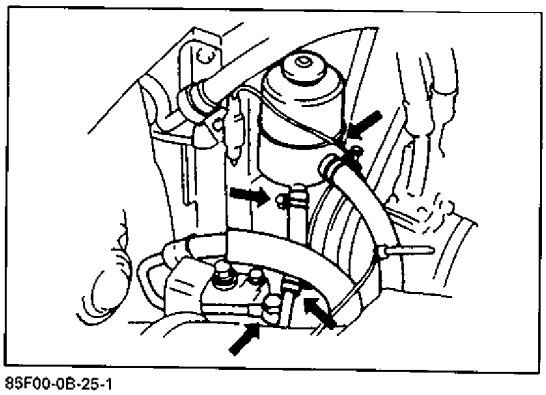


61A10-0B-9-1

Change

1) Place vehicle level and drain oil by removing drain plug.
2) Tighten drain plug to specified torque. Pour specified amount of specified oil and tighten filler plug to specifid torque.

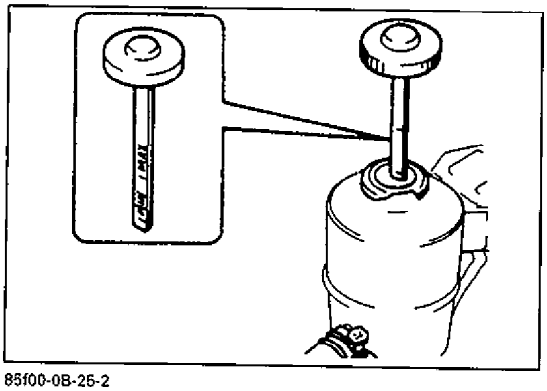
NOTE:
It is highly recommended to use SAE 75W-90 gear oil.


85F00-0B-25-1

ITEM 6-16

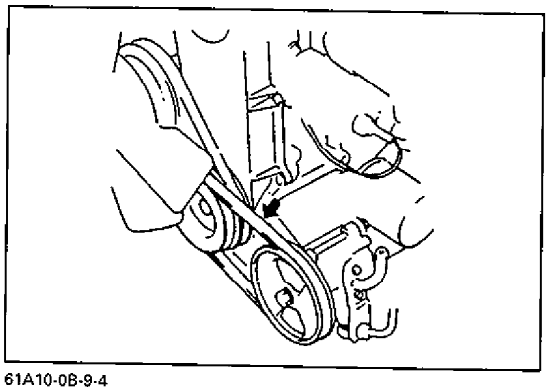
Power Steering (P/S) System Inspection (if equipped)

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


85f00-0B-25-2

2) Remove oil tank cap and check fluid level indicated on level gauge, which should be between MAX and MIN marks. If it is lower than MIN, fill fluid up to MAX mark.

NOTE:
- **Be sure to use an equivalent of DEXRON®-II, DEXRON®-IIE or DEXRON®-III for P/S fluid.**
- **Fluid level should be checked when fluid is cool.**


61A10-0B-9-4

3) Visually check pump drive belt for cracks and wear.
4) Check belt for tension, referring to ITEM 6-1 of "ENGINE". If necessary, have belt adjusted or replaced.

RECOMMENDED FLUIDS AND LUBRICANTS

Engine oil	SE, SF, SG or SH, SAE 5W-30 (1-cam 8 valve engine model) or SAE 10W-30 (1-cam 16 valve engine model.)
Engine coolant (Ethylene glycol base coolant)	"Antifreeze/Anticorrosion coolant"
Brake fluid	DOT 3 or SAE J1703
Manual transmission oil	API GL-4, SAE 75W-90
Transfer oil	
Differential oil (front & rear)	API GL-5, SAE 80W-90 Hypoid gear oil
Automatic transmission fluid and Power steering fluid	An equivalent of DEXRON®-II, DEXRON®-IIE or DEXRON®-III
Clutch linkage pivot points	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Gear shift control lever and shaft	Water resistance chassis grease (SUZUKI SUPER GREASE A 99000-25010)
Door hinges	Engine oil
Hood latch assembly	Engine oil
Key lock cylinder	Spray lubricant

61A10-0B-10-1

SECTION 1A

HEATER AND VENTILATION

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either of these two counditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.

61A10-1A-1-1

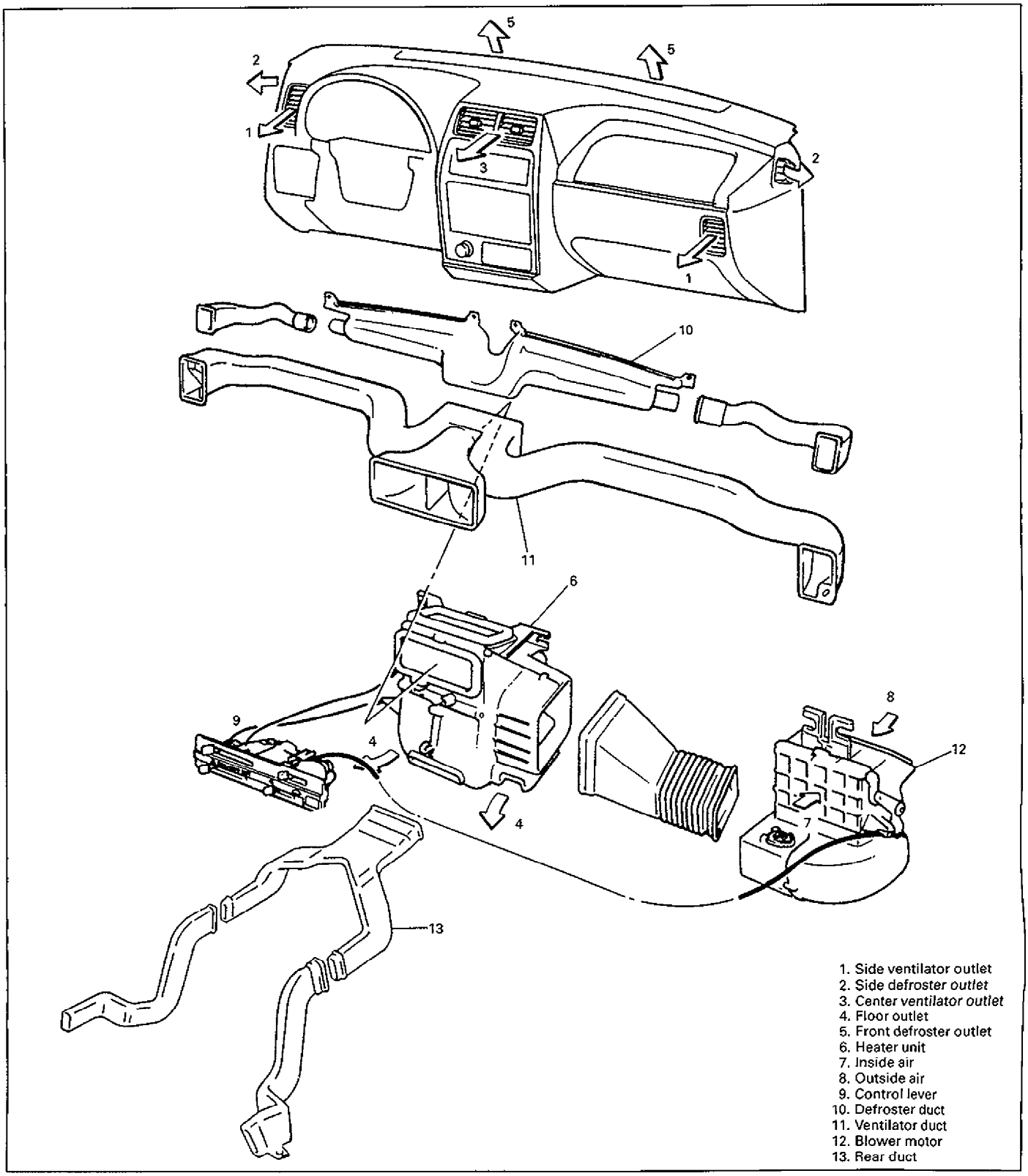
CONTENTS

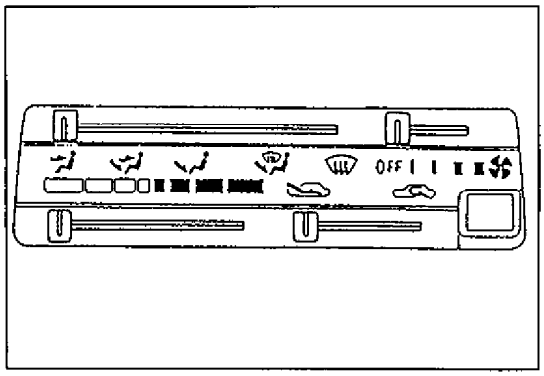
61A10-1A-1-2

GENERAL DESCRIPTION

HEATER

The heater, an in and out air selectable-type hot water heater, is so constructed that it is possible to assure an agreeable ventilation at all times by providing the ventilator air outlets at the center and both sides (right and left) of the instrument panel, the hot air outlet at a place close to the feet of front passengers, and the defroster air outlets at places, right and left, along the windshield glass.
The heater and ventilation consist of following parts.



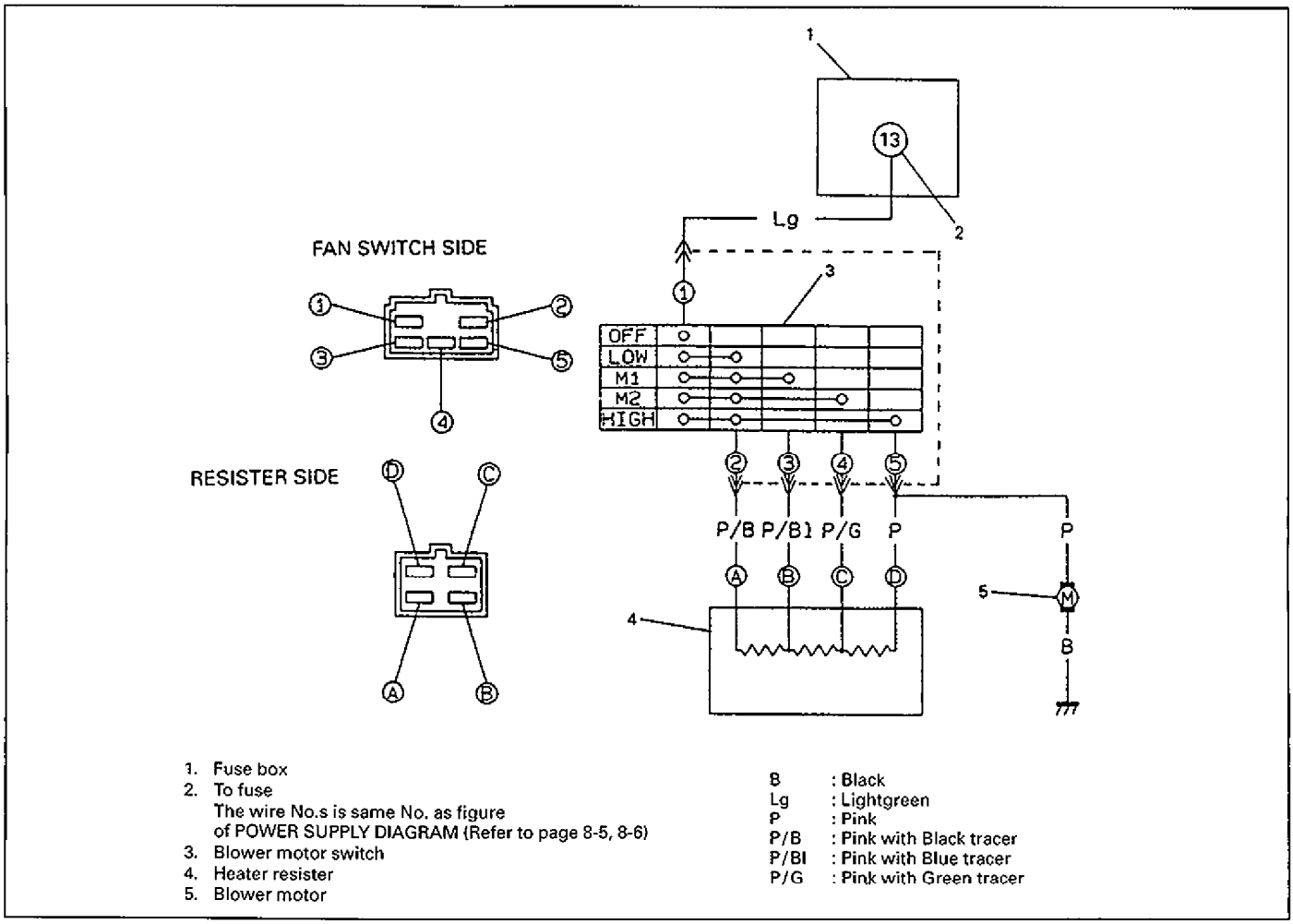


85F00-1A-3-1

HEATER CONTROL OPERATION

For control lever operation, refer to SECTION 1A of Service Manual mentioned in FOREWORD of this manual.

WIRING CIRCUIT



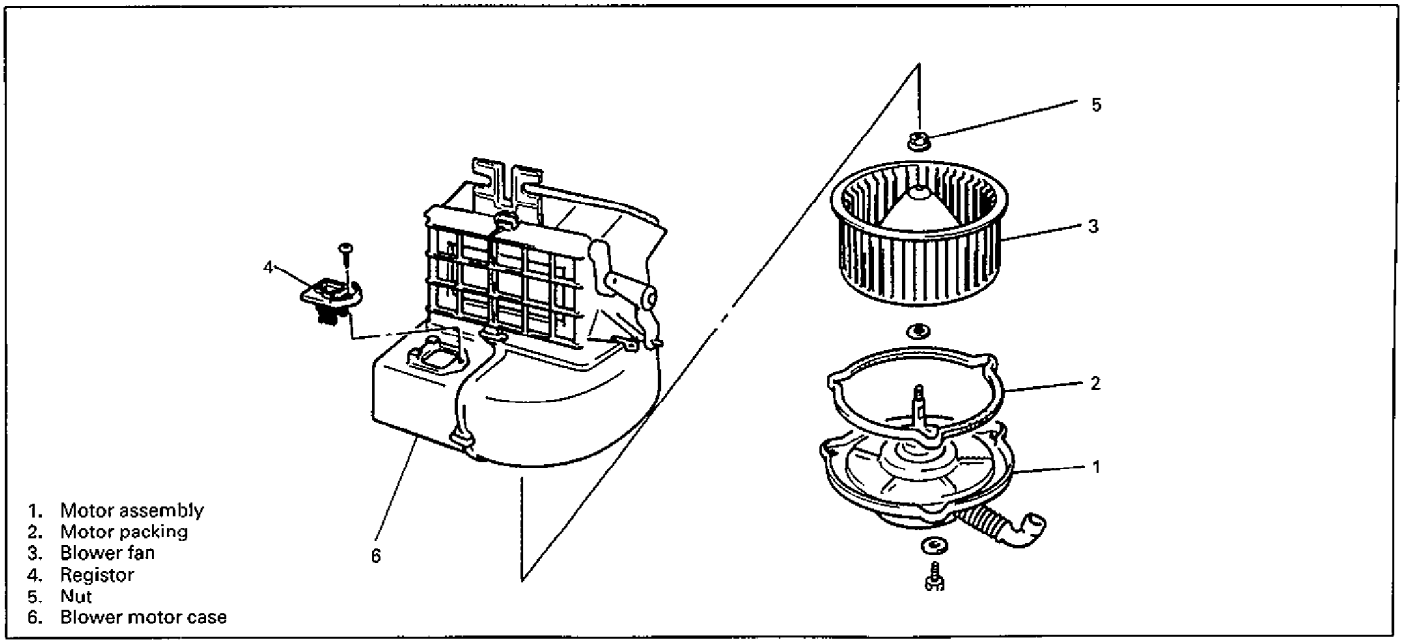
1. Fuse box
2. To fuse
   The wire No.s is same No. as figure of POWER SUPPLY DIAGRAM (Refer to page 8-5, 8-6)
3. Blower motor switch
4. Heater resister
5. Blower motor

B	: Black
Lg	: Lightgreen
P	: Pink
P/B	: Pink with Black tracer
P/Bl	: Pink with Blue tracer
P/G	: Pink with Green tracer

61A10-1A-3-2

ON VEHICLE SERVICE

HEATER BLOWER MOTOR

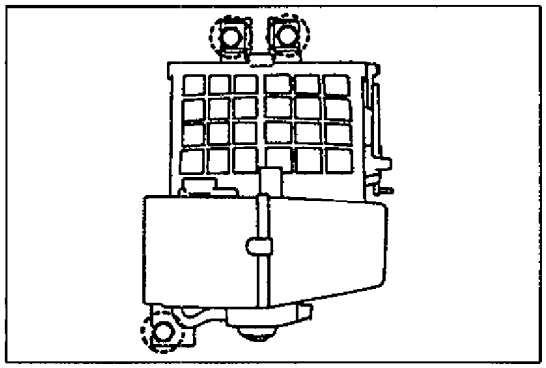


85F00-1A-4-1

REMOVAL

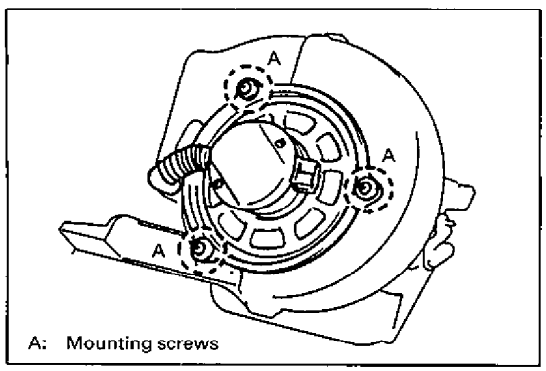
1) Disconnect negative (–) cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.
3) Remove glove box and glove box holder stay.
4) Remove relays and relay bracket from blower motor case.
5) Disconnect blower motor and registor lead wires at couplers.
6) Disconnect fresh air control cable from blower motor case.

61A10-1A-4-3



61A10-1A-4-4

7) Remove blower motor unit.

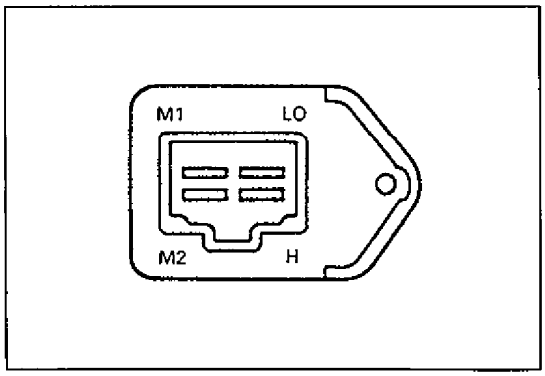


61A10-1A-4-5

8) Remove blower motor.

INSTALLATION

1) Install in the reverse order of removal
2) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.

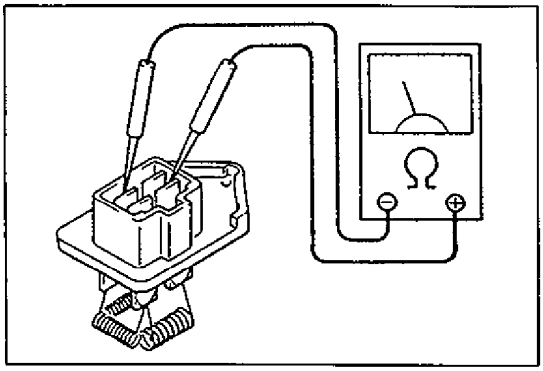


61A10-1A-5-1

HEATER BLOWER RESISTOR

REMOVAL

1) Disconnect negative (–) cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disable Air Bag System" in Section 9J.
3) Remove heater blower resistor by loosening its fastening screw.



61A10-1A-5-2

INSPECTION

Measure each terminal-to-terminal resistance on resistor.

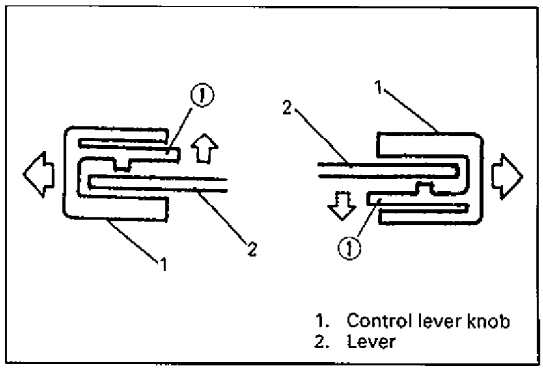
Resistance H-LO: Approx 2.8 Ω
H-M1: Approx 1.6 Ω
H-M2 Approx 0.5 Ω

If measured resistance is incorrect, replace heater blower resistor.

INSTALLATION

1) Install heater blower resistor with screws.
2) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.

61A10-1A-5-3



1. Control lever knob
2. Lever

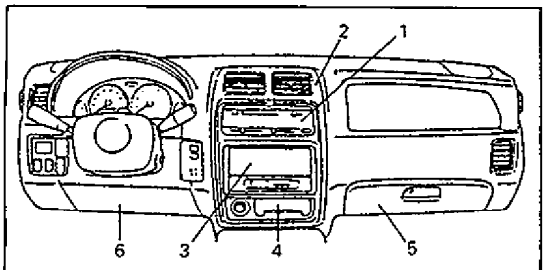
61A10-1A-5-4

HEATER CONTROL LEVER ASSEMBLY

REMOVAL

1) Disconnect negative (–) cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.
3) Remove control lever knobs.

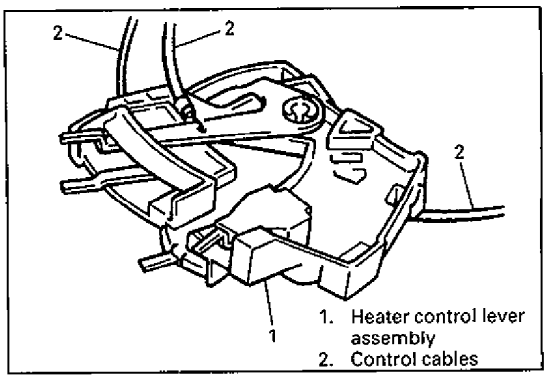
NOTE:
Remove control lever knob by pulling up / down lever①



1. Heater control lever panel
2. Center garnish
3. Instrument glove box compartment
4. Ashtray
5. Glove box
6. Column hole cover

61A10-1A-5-5

4) Remove heater control lever panel.
5) Remove ashtray and center garnish mounting screws (3pcs).
6) Remove center garnish.
7) Remove glove box and column hole cover.
8) Remove instrument glove box compartment.
9) Disconnect control cables from blower motor unit and heater unit.
10) Disconnect heater blower motor switch connector.



61A10-1A-6-1

11) Remove heater control lever assembly.

INSPECTION OF HEATER BLOWER MOTOR SWITCH

Check heater blower motor switch for each terminal-to-terminal continuity. For the detail refer to "WIRING CIRCUIT" earlier in this section.

	Lg	P/B	P/Bl	P/G	P
LOW	○	○			
M1	○	○	○		
M2	○	○		○	
HIGH	○	○			○

Lg : Lightgreen P/Bl : Pink with Blue tracer
P : Pink P/B : Pink with Black tracer
P/G : Pink/Green tracer

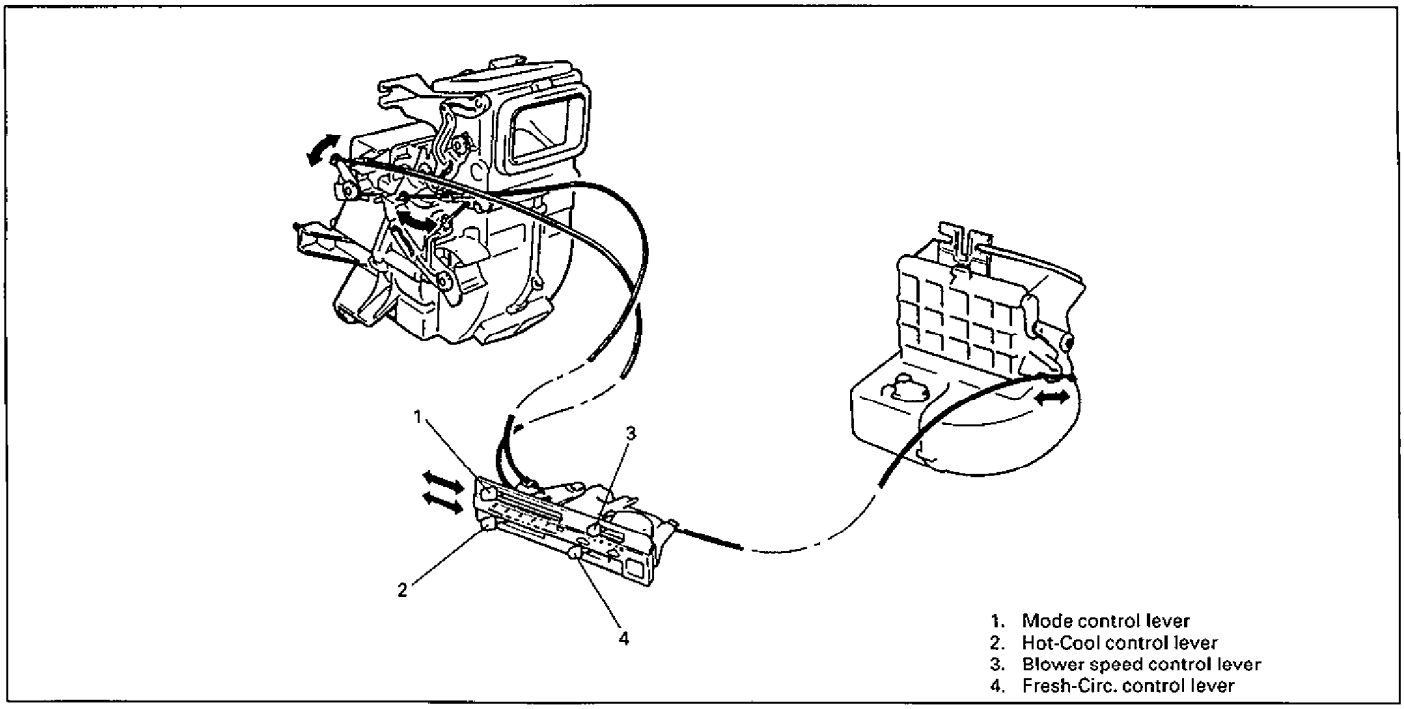
61A10-1A-6-3

INSTALLATION

1) Install in reverse order of removal.
2) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.

61A10-1A-6-4

CONTROL CABLES

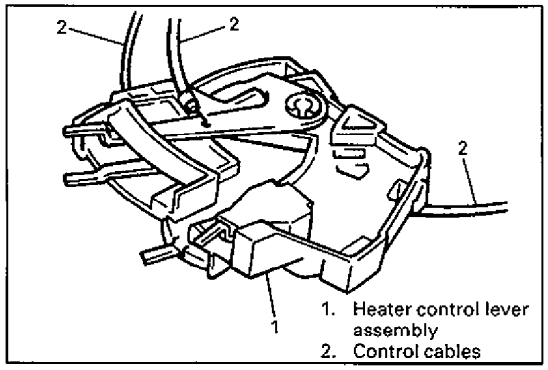


85F00-1A-6-1

REMOVAL

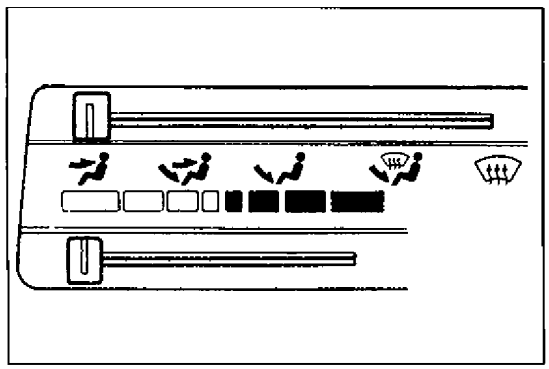
1) Remove heater control lever assembly.
   Refer to "Heater Control Lever Assembly" earlier in this section.

61A10-1A-6-3



85F00-1A-6-4

2) Disconnect control cables from control lever.

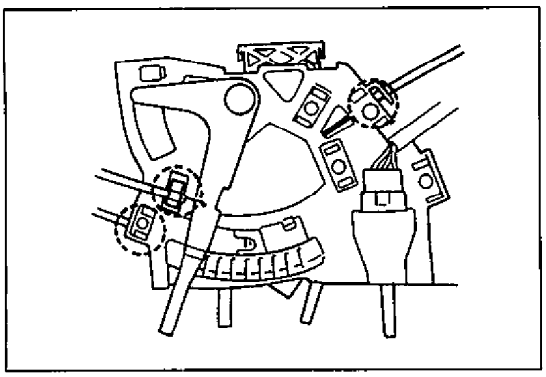


85F00-1A-6-5

ADJUSTMENT

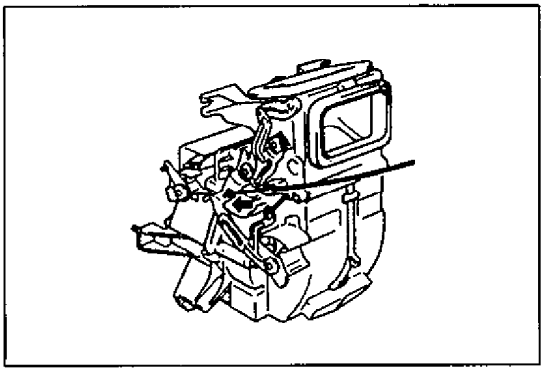
A. Air Control Cable

1. Move control lever to VENT position.



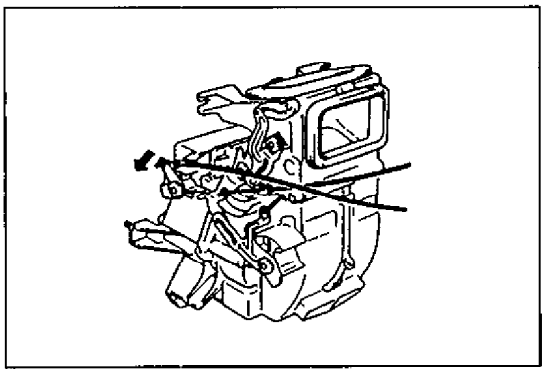
85F00-1A-7-1

2. At its control lever-side, clamp outer cable with touching stopper of cable holder.
3. Place outer cable in cable guide of control lever assembly properly and clamp it securely.



85F00-1A-7-2

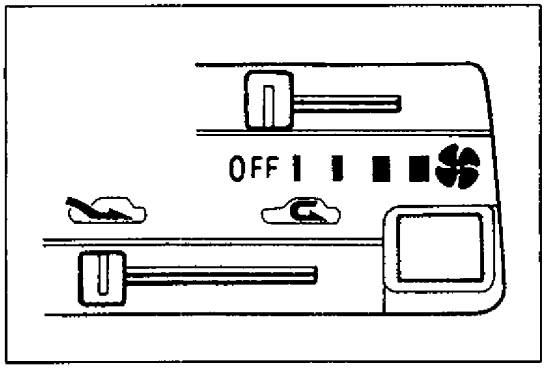
4. As shown, push lever fully in arrow direction to fix cable and rod in position.



85F00-1A-7-3

B. Heater Control (COOL-HOT Selector) Cable

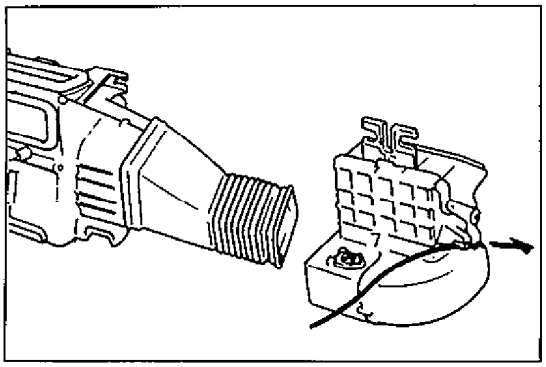
1. Move control lever to COOL position.
2. Push lever fully in arrow direction and fix cable with clamp in position, as shown in left figure.



85F00-1A-10-4

C. Fresh Air Control (FRESH-CIRC Selector) Cable

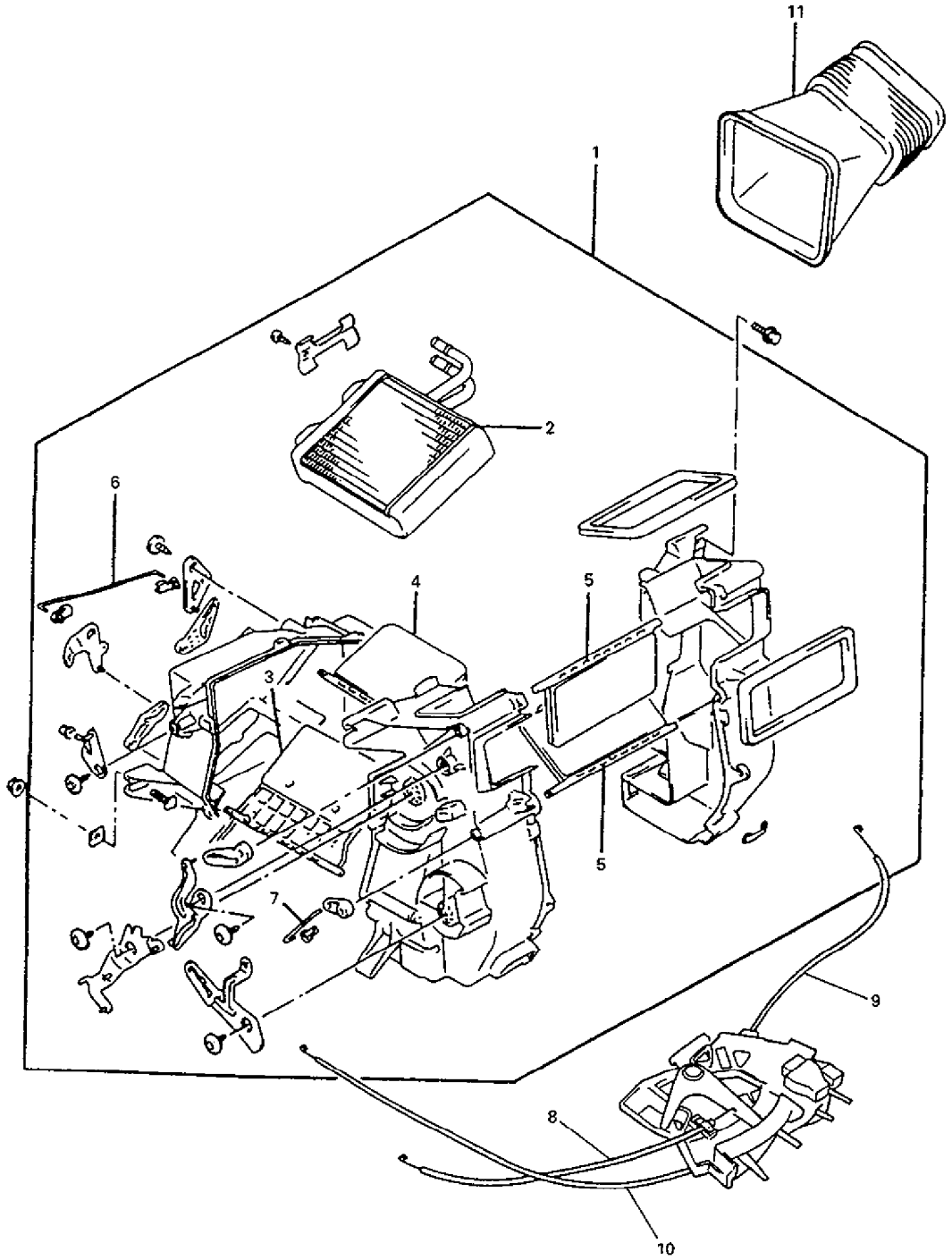
1. Move control lever to FRESH position.



85F00-1A-7-5

2. Push lever fully in arrow direction and fix cable with clamp in position as shown in left figure.

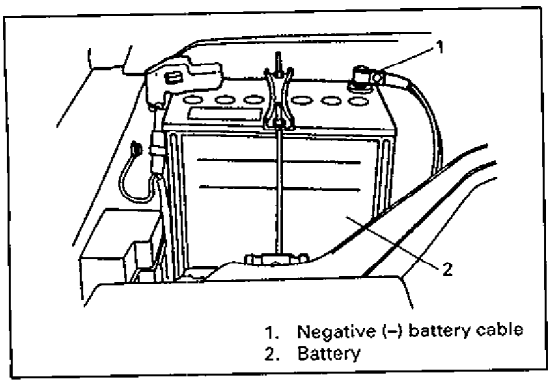
HEATER UNIT



1. Heater ass'y
2. Radiator core
3. Damper
4. Damper
5. Damper
6. Shaft
7. Shaft
8. Mode control cable
9. Fresh-Circ. control cable
10. Hot-cool control cable
11. Heater duct (without A/C)

REMOVAL

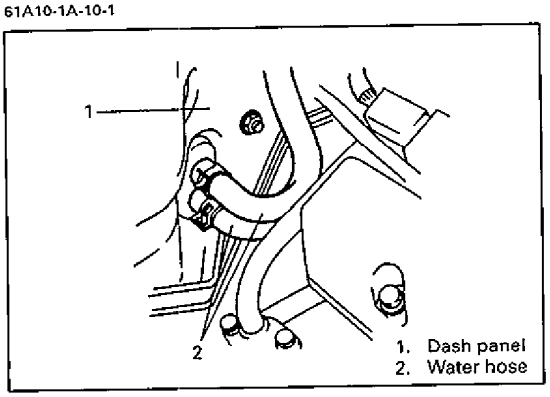
1) Disconnect negative (–) cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.



1. Negative (–) battery cable
2. Battery

61A10-1A-10-1

3) Drain engine coolant and disconnect water hoses from heater unit.



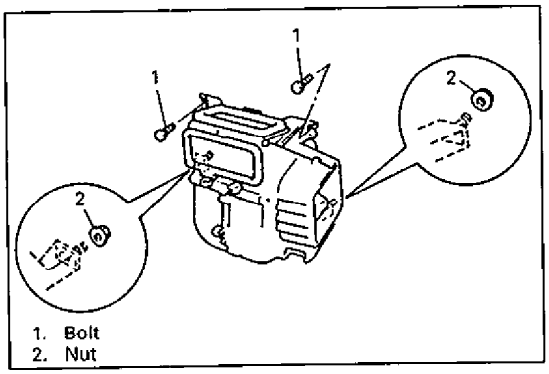
1. Dash panel
2. Water hose

61A10-1A-9-2

4) Remove instrument panel its related parts. Refer to "Instrument Panel" in Section 9.

61A10-1A-10-3

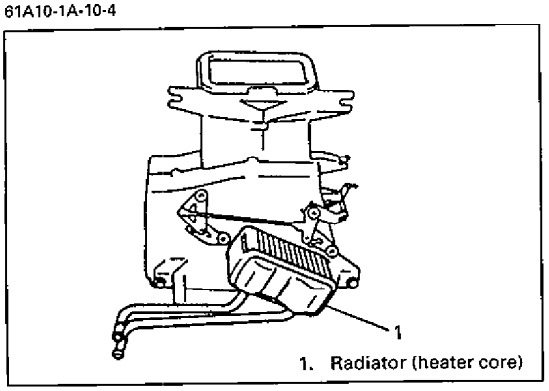
5) Remove heater unit.



1. Bolt
2. Nut

61A10-1A-10-4

6) Pull out heater core from heater unit.



1. Radiator (heater core)

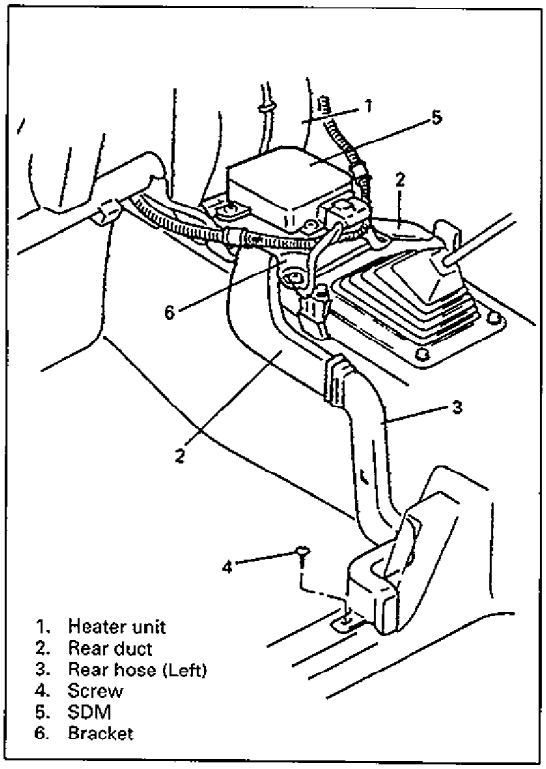
61A10-1A-10-5

INSTALLATION

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.
- Adjust control cables. (Refer to "Control Cables" earlier in this section)
- Fill engine coolant to radiator.
- If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.

61A10-1A-11-1



1. Heater unit
2. Rear duct
3. Rear hose (Left)
4. Screw
5. SDM
6. Bracket

61A10-1A-11-2

REAR DUCT

Through the rear duct, air is drawn into the rear seat foot space.

REMOVAL

1) Disconnect negative (–) cable at battery.
2) Remove front seat.
3) Remove console box.
4) Take off carpet till rear duct is totally exposed.
5) If equipped with air bag system, remove SDM and bracket. Refer to "SDM" in Section 9J.
6) Remove rear duct and rear hoses.

INSTALLATION

Reverse removal sequence to install rear duct noting following points.

- If equipped with air bag system, install SDM and bracket, refer to "SDM" in Section 9J.

SECTION 3C1

AIR BAG STEERING WHEEL AND COLUMN

WARNING:
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 deployment, personal injury or otherwise un needed 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 (or stronger) may be used. Fasteners that are not reused, and those requiring thread-locking compound, will be called out. The correct torque values must be used when installing fasteners that require them. If the above procedures are not followed, parts or system damage could result.

61A10-3C1-1-1

CONTENTS

61A10-3C1-1-2

GENERAL DESCRIPTION

STEERING COLUMN

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 coveniently 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.

60A50-3C1-2-1

STEERING WHEEL AND DRIVER AIR BAG (INFLATOR) MODULE

The driver air bag (inflator)module is one of the supplemental inflatable 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/or passenger's seat belts by deploying the air bag in each air bag (inflator) module.
The air bag (inflator) module should be handled with care to prevent accidental deployment.
When servicing, be sure to observe all WARNINGS and CAUTIONS. Refer to "Service Precautions" and "Handling Precautions" under "On-Vehicle Service" later in this section, and to SECTION 9J.

61A10-3C1-2-2

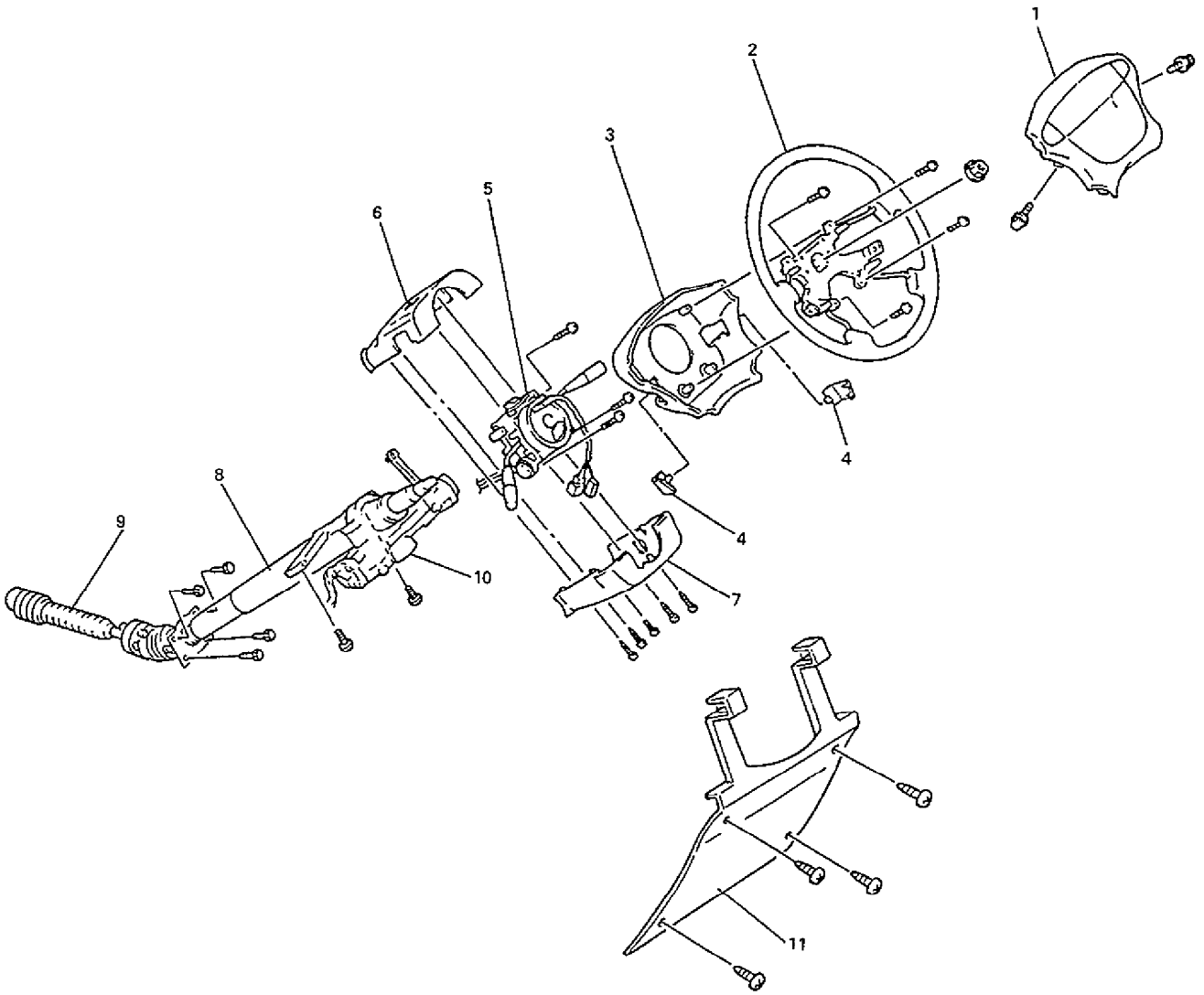
DIAGNOSIS

For diagnosis of the steering wheel and steering column, refer to SECTION 3. For diagnosis of the air bag system, refer to SECTION 9J.

INSPECTION AND REPAIR REQUIRED AFTER ACCIDENT

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 9J.

61A10-3C1-2-3



1. Air bag (inflator) module
2. Steering wheel
3. Steering wheel lower cover
4. Steering wheel side cap
5. Contact coil and combination switch assembly
6. Steering column upper cover
7. Steering column lower cover
8. Steering column assembly
9. Steering lower shaft
10. Steering lock assembly
11. Steering column hole cover

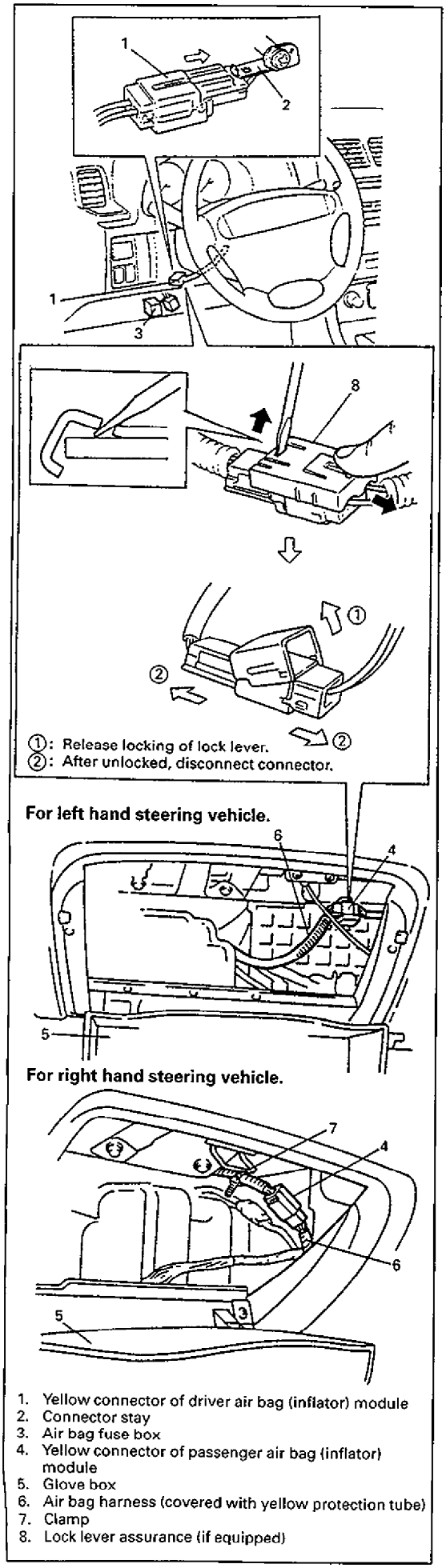
ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

- WARNING/CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.

> **WARNING:**
> **When performing service on or around air bag system components or air bag system wiring, follow the procedures listed below to temporarily disable the air bag system. Refer to appropriate service manual procedures. Failure to follow procedures could result in possible air bag deployment, personal injury or unneeded air bag system repairs.**

- Many of the service procedures require disconnection of the "AIR BAG" fuse and air bag (inflator) modules (driver and passenger) from the deployment loop to avoid an accidental deployment.
- 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.
- When servicing, if shocks may be applied to air bag system component parts, remove those parts beforehand.

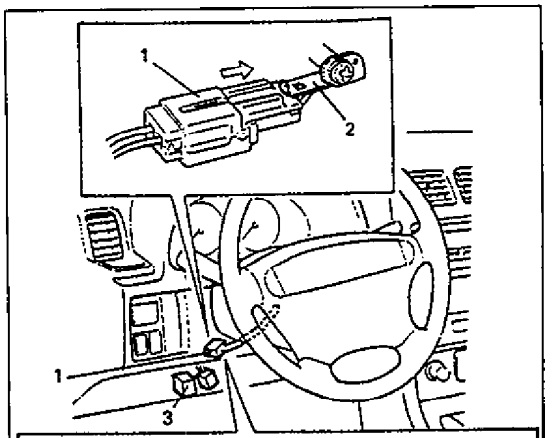


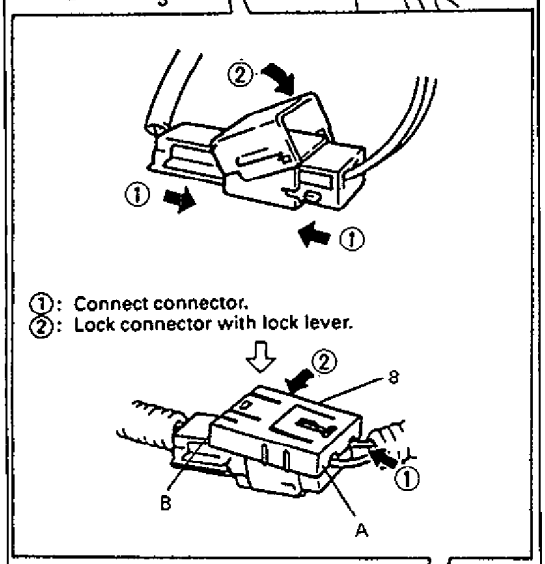
1. Yellow connector of driver air bag (inflator) module
2. Connector stay
3. Air bag fuse box
4. Yellow connector of passenger air bag (inflator) module
5. Glove box
6. Air bag harness (covered with yellow protection tube)
7. Clamp
8. Lock lever assurance (if equipped)

DISABLING AIR BAG SYSTEM

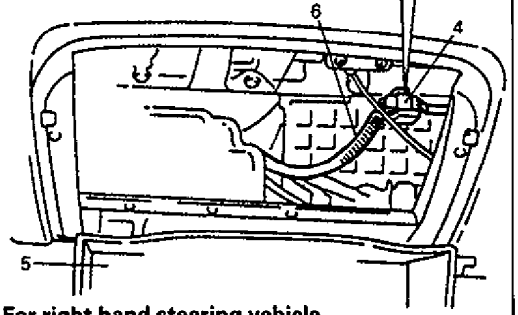
1) Turn steering wheel so that vehicle's wheels (front tires) are pointing straight ahead.
2) Turn ignition switch to "LOCK" position and remove key.
3) Remove "AIR BAG" fuse from the air bag fuse box.
   Driver side:
   Remove steering wheel side cap (left) and disconnect Yellow connector of driver air bag (inflator) module.
   Passenger side:
   Pull out glove box while pushing its stopper from both right and left sides and disconnect Yellow connector of passenger air bag (inflator) module.

NOTE:
If equipped with lock lever assurance, to release the lock pin of lock lever assurance, use screwdriver as shown in left figure, and remove lock lever assurance.

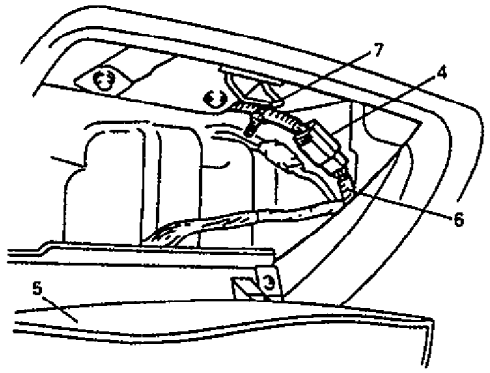




For left hand steering vehicle.



For right hand steering vehicle.



1. Yellow connector of driver air bag (inflator) module
2. Connector stay
3. Air bag fuse box
4. Yellow connector of passenger air bag (inflator) module
5. Glove box
6. Air bag harness (covered with yellow protection tube)
7. Clamp
8. Lock lever assurance (if equipped)

ENABLING AIR BAG SYSTEM

1) Turn ignition switch to "LOCK" and remove key.
2) Connect Yellow connector of passenger air bag (inflator) module and yellow connector of driver air bag (inflator) module respectively, and be sure to lock each connector with lock lever and lock lever assurance (if equipped).

NOTE:
If equipped with lock lever assurance, insert pin on A side as shown in left figure into the hole of back of connector and then lock the lock lever with lock pin on B side as shown in left figure.

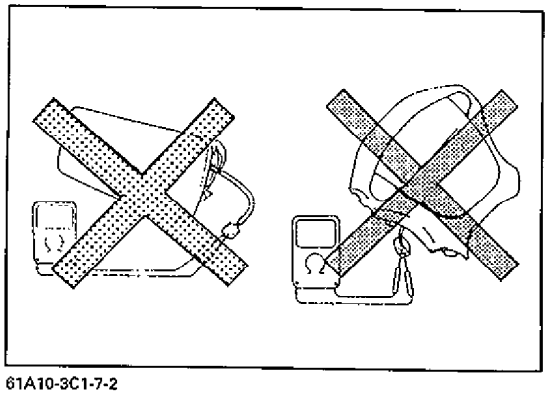
3) Fix connectors. (driver and passenger) respectively.
   Driver air bag (inflator) module connector :
   Fit onto connector stay.
   Passenger air bag (inflator) module connector :
   For left hand steering vehicle, fit onto connector stay.
   For right hand steering vehicle, tighten air bag harness with clamp.
4) Install glove box and steering wheel side cap.
5) Install "AIR BAG" fuse to air bag fuse box.
6) Turn ignition switch to "ON" and verify that "AIR BAG" warning lamp comes on about 6 seconds and then turns off.
   If it does not operate as described, perform the "Air Bag Diagnostic System Check" in this section.

HANDLING PRECAUTIONS

Live (Undeployed) Air Bag (Inflator) Module (Driver and Passenger)

Special care is necessary when handling and storing a live (undeployed) air bag (inflator) module. 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 deployement.

61A10-3C1-7-1

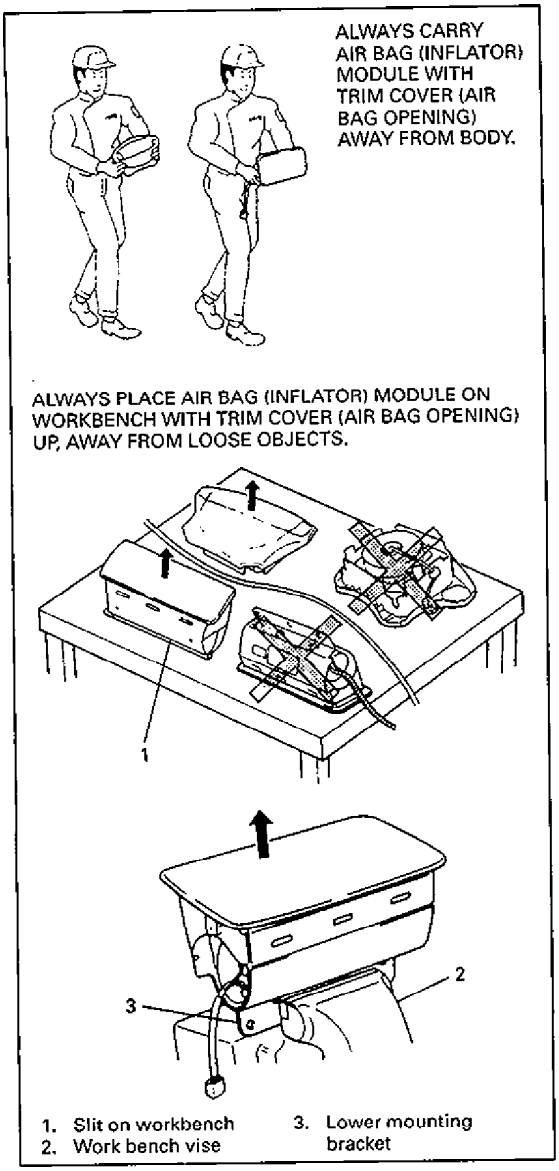


61A10-3C1-7-2

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) module.
- 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. (Refer to "Air Bag (Inflator) Modules Disposal" in SECTION 9J.)
- 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.
- When handling an air bag (inflator) module, be very careful not to allow it to undergo any impact such as dropping. If a strong impact was applied to an air bag (inflator) module (For exmple, it has been dropped from a height of 91.4 cm (3 ft).), it must be replaced with a new one.

61A10-3C1-7-3



61A10-3C1-8-1

WARNING:

- **For handling and storing an 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 infury. 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.**
  If 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.

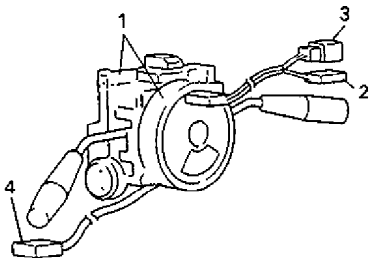
Otherwise, personal injury may result.

Deployed Air Bag (Inflator) Module (Driver and Passenger)

WARNING:

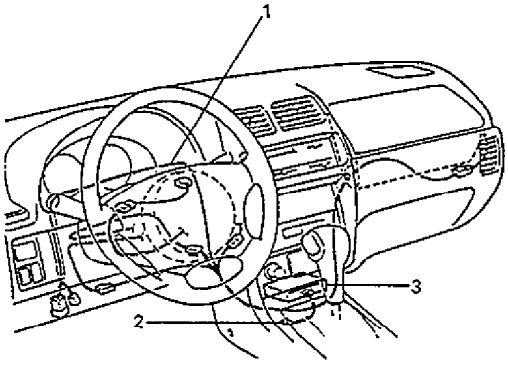
- **Immediately after deployment, the air bag (inflator) module is very hot. Wait for at least 30 minutes to cool it off before starting servicing (handling) it.**
- **Do not apply water, etc. to deployed air bag (inflator) module.**
- **After an air bag (inflator) module has been deployed, the surface 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 SECTION 9J, for details.



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

60A50-3C1-7-1



1. Air bag wire harness
2. Ground
3. SDM case ground

60A10-3C1-9-2

Contact Coil and Combination Switch Assembly

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 counterclockwise respectively), or coil will break.

Air Bag Wire Harness and Connectors

Air bag wire harness can be identified easily as it is covered with a yellow protection tube. Be very careful when handling it.

CAUTION:
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 matal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.

DISPOSAL PRECAUTIONS

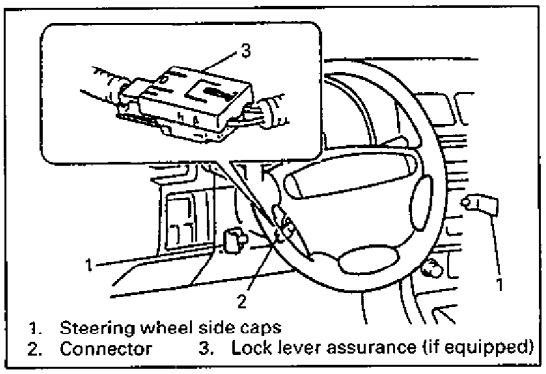
Do not dispose of live (undeployed) air bag (inflator) modules (driver and passenger). When disposal is necessary, be sure to deploy it first according to the procedure described in SECTION 9J and then dispose it. Refer to SECTION 9J for disposal procedure.

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) modules 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.

DRIVER AIR BAG (INFLATOR) MODULE

WARNING:
When handling an air bag (inflator) module, be sure to read "HANDLING PRECAUTIONS" given earlier 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.

50G00-3C1-8-3

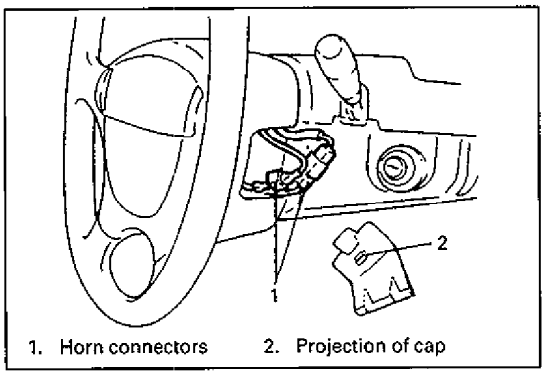


1. Steering wheel side caps
2. Connector 3. Lock lever assurance (if equipped)

REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.

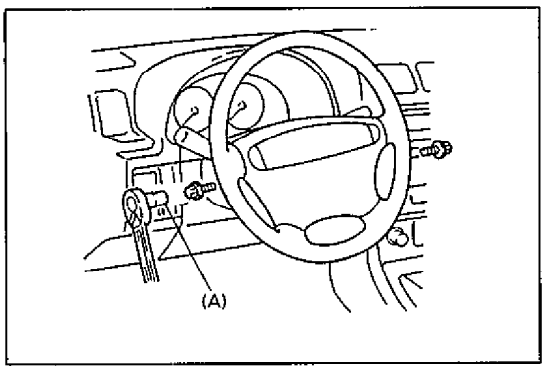
61A10-3C1-10-2



1. Horn connectors 2. Projection of cap

3) Remove steering wheel side cap of right side and disconnect horn connectors.

60G00-3C1-7-3

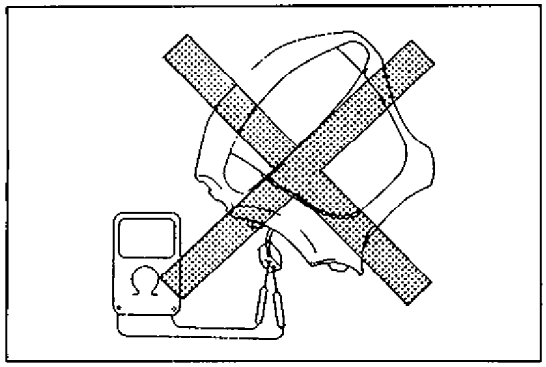


4) Remove air bag (inflator) module bolts (2 pcs).

Special Tool
(A): 09944-18230

5) Remove air bag (inflator) module from steering wheel.

60A50-3C1-8-4

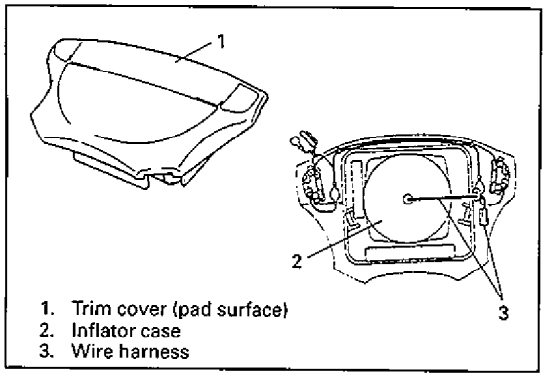


INSPECTION

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

CAUTION:
If air bag (inflator) module was dropped from a height of 91.4 cm (3 ft) or more, it should be replaced.

60A50-3C1-8-5

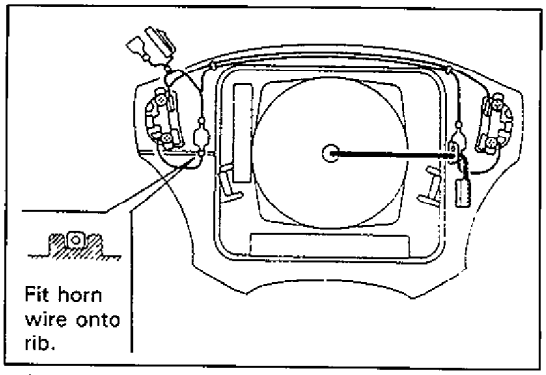


1. Trim cover (pad surface)
2. Inflator case
3. Wire harness

60G00-3C1-8-1

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

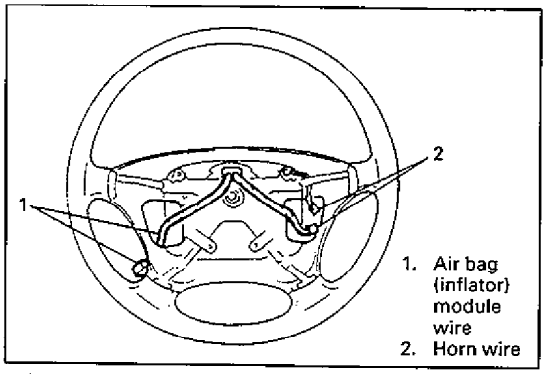
- Air bag being deployed
- Trim cover (pad surface) being cracked
- Wire harness or connector being damaged
- Air bag (inflator) module being damaged or having been exposed to strong impact (dropped)



60G00-3C1-8-2

INSTALLATION

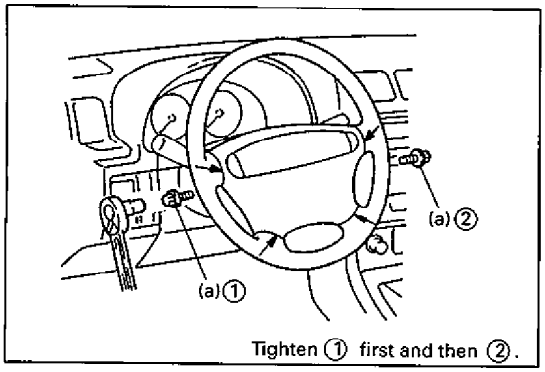
1) Making sure that wire harness at the back of air bag (inflator) module is arranged as shown in figure.



1. Air bag (inflator) module wire
2. Horn wire

60G00-3C1-8-3

2) Making sure that contact coil lead wires and horn wire is arranged as shown in figure.
3) Install air bag (inflator) module to steering wheel, taking care so that no part of wire harness is caught between them.

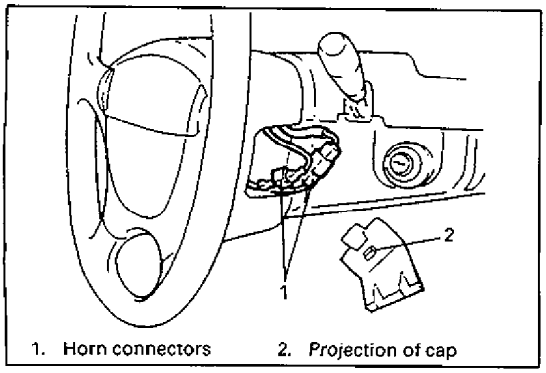


60G00-3C1-8-4

4) Make sure that clearance between module and steering wheel is uniform all the way.
5) Tighten air bag (inflator) module left side bolt first and then its right side bolt to specified torque.

Special Tool
(A): 09944-18230

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



1. Horn connectors
2. Projection of cap

60G00-3C1-8-5

6) Connect horn connectors securely, fit connector onto projection of steering wheel right side cap and then install right side cap on steering wheel lower cover.
7) Connect negative battery cable.
8) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

STEERING WHEEL

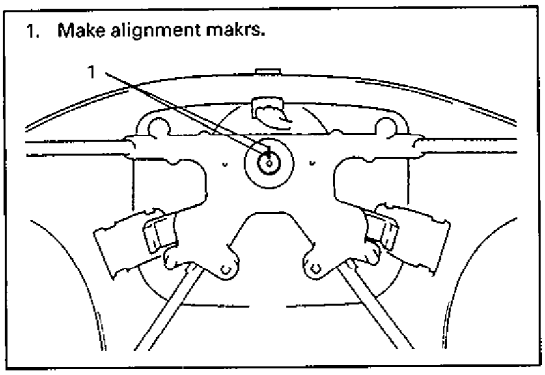
CAUTION:
Removal of the steering wheel allows the contact coil to turn freely but do not turn the contact coil (on the combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

60G00-3C1-9-1

REMOVAL

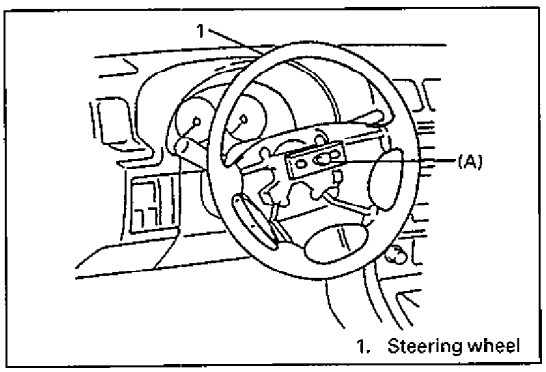
1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove air bag (inflator) module from steering wheel referring to "Driver Air Bag (Inflator) Module" earlier in this section.

60G00-3C1-9-2



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

60G00-3C1-10-2



60A50-3C1-10-4

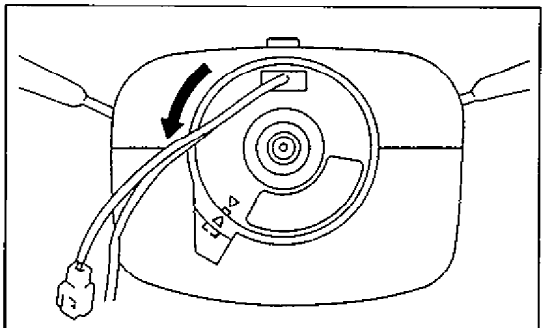
6) Remove steering wheel with special tool (A).

Special Tool
(A): 09944-36010 or 09944-36011

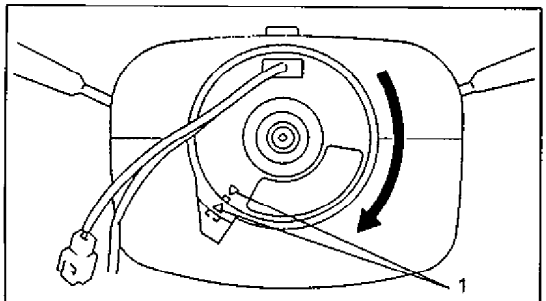
CAUTION:
Do not hammer the end of the shaft. Hammering it will loosen the plastic shear pins which maintain the column length and impair the collapsible design of the column.

CENTERING CONTACT COIL

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

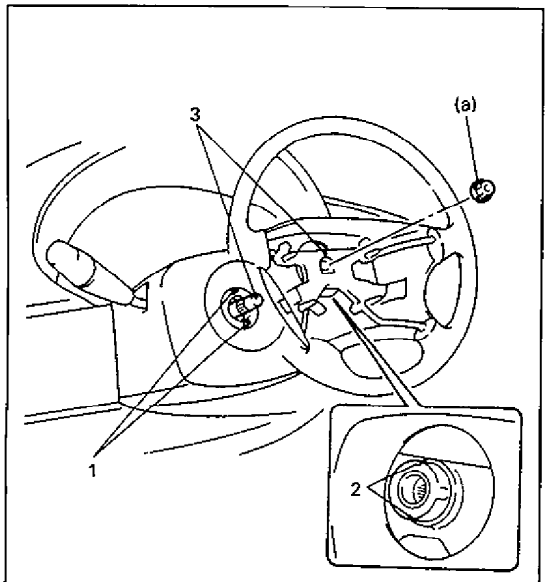

Turn slowly till coil stops.

60G00-3C1-10-1



Turn contact coil back about 2 and a half turns.
1. Align marks

60G00-3C1-10-2



1. Lugs
2. Grooves
3. Alignment marks

60G00-3C1-10-3

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.

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.

INSTALLATION

1) Check that vehicle's front tires are at straight-ahead position and contact coil is centered. Refer to "Centering Contact Coil" earlier in this section.

CAUTION:
These two conditions are prerequisite for installation of steering wheel. If steering wheel has been installed without these conditions, conatct coil will break when steering wheel is turned.

2) Install steering wheel to steering shaft with 2 lugs 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, 23.5 lb-ft)

4) Install air bag (inflator) module to steering wheel. Refer to "Driver Air Bag (Inflator) Module" earlier in this section.
5) Connect negative battery cable.
6) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

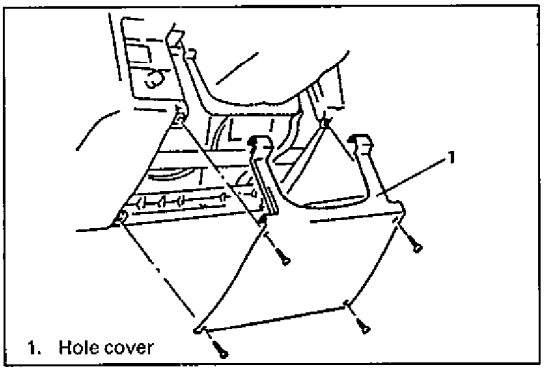
CAUTION:
Do not turn contact coil (on combination switch) more than allowable number of turns (about two and a half turns from the center position clockwise or counterclockwise respectively), or coil will break.

60G00-3C1-11-1

REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove steering wheel from steering column shaft. Refer to "Steering Wheel" earlier in this section.

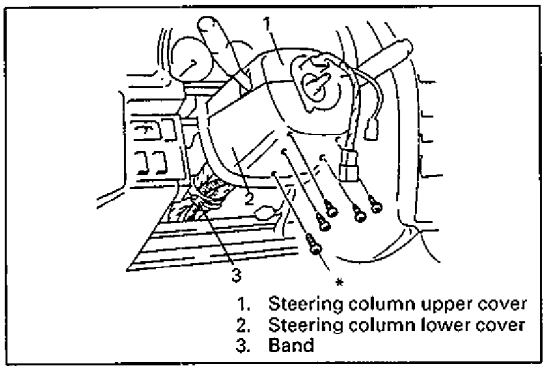
60G00-3C1-11-2



1. Hole cover

4) Remove hole cover.

61A10-3C1-14-3



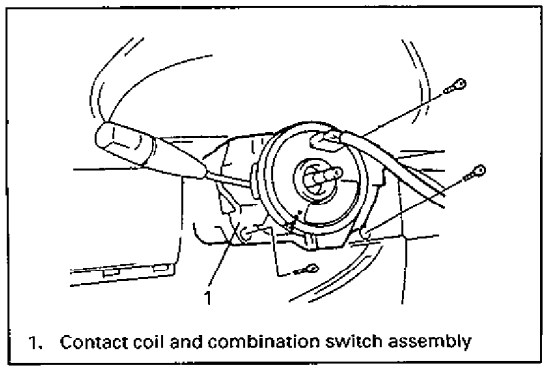
1. Steering column upper cover
2. Steering column lower cover
3. Band

5) Remove steering column cover screws (5 pcs).

NOTE:
Marked with *are standard screw. The rest are tapping screws.

6) Separate upper cover and lower cover, then remove them.
7) Loosen band for contact coil and combination switch wire harness, and disconnect its connectors.

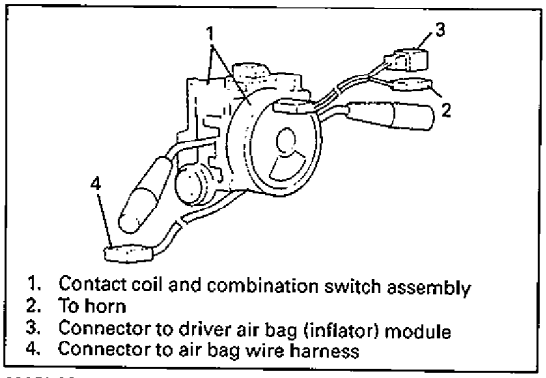
60A50-3C1-12-4



1. Contact coil and combination switch assembly

8) Remove contact coil and combination switch assembly from steering column.

60A50-3C1-12-5



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

60A50-3C1-13-1

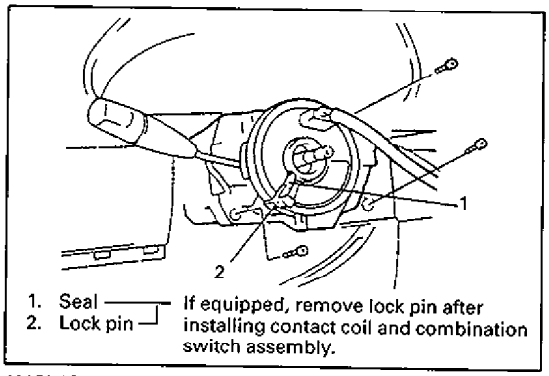
INSPECTION

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

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.

60G00-3C1-12-4



1. Seal
2. Lock pin

If equipped, remove lock pin after installing contact coil and combination switch assembly.

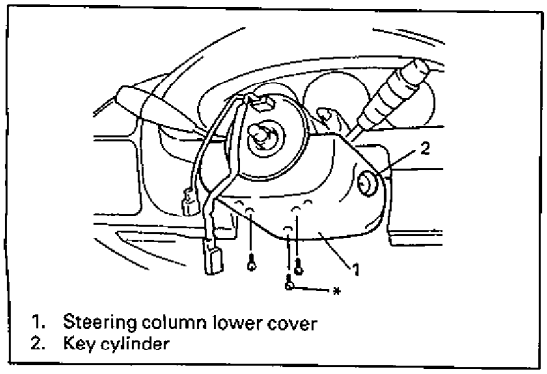
60A50-3C1-13-3

2) Install contact coil and combination switch assembly to steering column.

NOTE:
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.

3) Connect contact coil and combination switch connectors and tighten its wire harness with band.

60A50-3C1-13-4

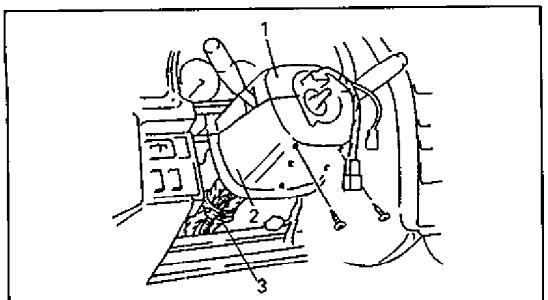


1. Steering column lower cover
2. Key cylinder

60A50-3C1-13-5

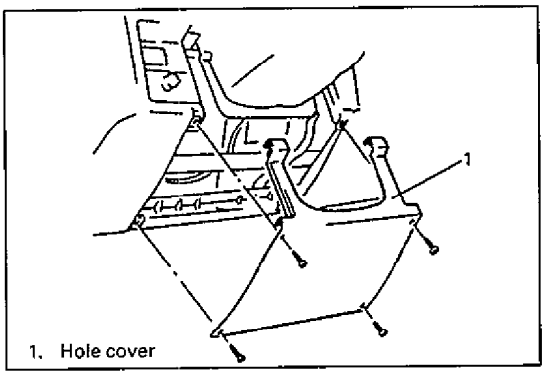
4) Install lower cover to key cylinder.
5) Tighten steering column lower cover screw.

NOTE:
Marked with *are standard screw. The rest are tapping screws.



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

60A50-3C1-14-1



1. Hole cover

61A10-3C1-16-2

6) Install upper cover to lower cover.
7) Install hole cover.
8) Install steering wheel to its shaft. Refer to "Steering Wheel" earlier in this section.
9) Connect battery negative cable.
10) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

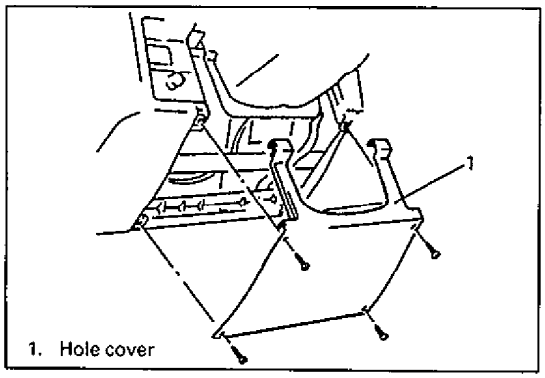
STEERING COLUMN

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. If it is necessary to remove the steering wheel, use steering wheel remover. Under no condition should the end of the shaft be hammered, as such action could loosen the plastic shear pins which maintain column length.

NOTE:
When servicing steering column or any column-mounted component, remove steering wheel. But when removing steering column simply to gain access to instrument panel components, leave steering wheel installed on steering column.

REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove steering wheel and contact coil and combination switch assembly, if necessary. Refer to "Steering Wheel" and "Contact Coil and Combination Switch Assembly" earlier in this section.

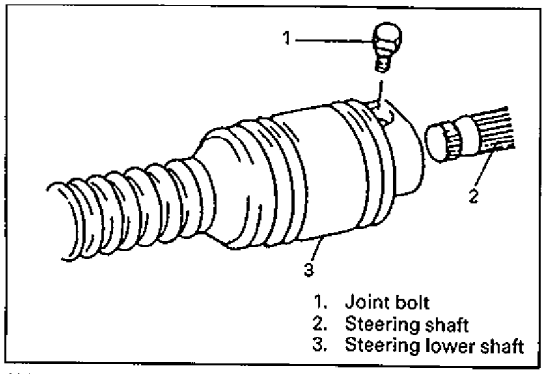


61A10-3C1-17-1

4) Remove hole cover.

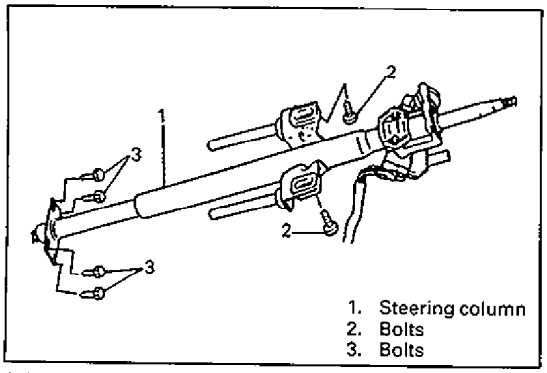
5) Disconnect connectors for ignition switch and contact coil & combination switch assembly after loosening its wire harness clamp.

60A50-3C1-15-2



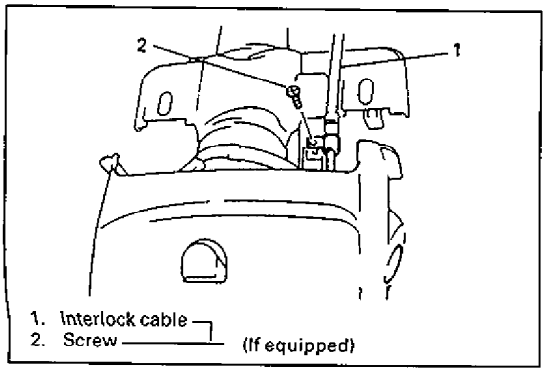
60A50-3C1-15-3

6) Disconnect steering joint by removing joint bolt.



60A50-3C1-15-4

7) Remove steering column bolts.



61A10-3C1-17-5

8) If equipped with shift (key) interlock cable, remove shift (key) interlock cable screw and then disconnect its cable from ignition switch.

9) Remove steering column from vehicle.

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

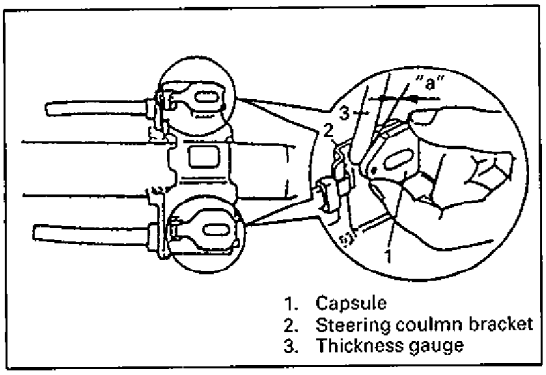
NOTE:
Steering shaft and column are not serviced separately.
If either steering shaft or column is found to be defective, replace both as an assembly.

60G00-3C1-16-1

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.

60G00-3C1-16-2



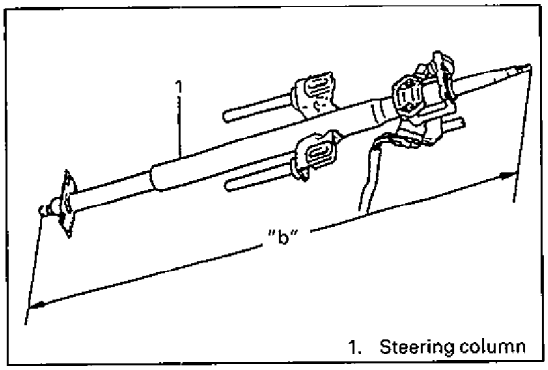
1. Capsule
2. Steering coulmn bracket
3. Thickness gauge

CHECKING PROCEDURE

1) Check clearance between capsules and steering column bracket as shown. Clearance should be 0.0 mm (0.0 in.) on both sides.

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

85F00-3C2-3-2



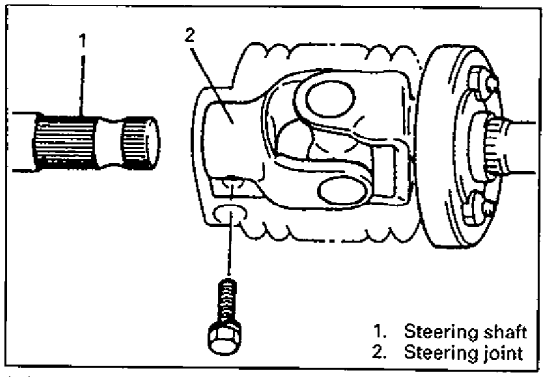
1. Steering column

60A50-3C1-16-4

2) Take measurement "b" as shown. If it is shorter than specified length, replace column assembly with new one.

Specified length "b": 750.6 ± 0.8 mm (29.55 ± 0.03 in.)

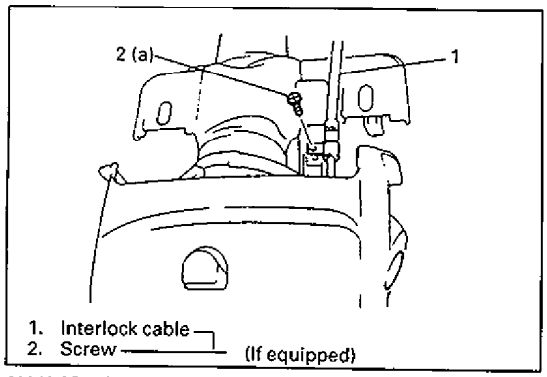
3) Check steering shaft for smooth rotation.
If found defective, replace as column assembly.
4) Check steering shaft and column for bend, cracks or deformation.
If found defective, replace as column assembly.



60A50-3C1-17-1

INSTALLATION

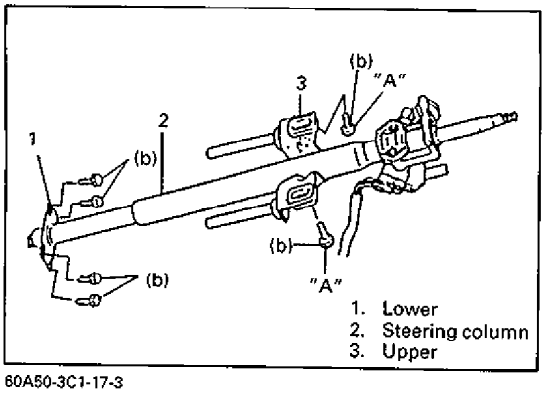
1) Install steering joint cover and insert steering shaft into steering joint.



61A10-3C1-19-2

2) If equipped with shift (key) interlock cable, connect shift (key) interlock cable to ignition switch.
3) Tighten its cable screw.

Tightening Torque
(a): 2.2 N·m (0.22 kg-m, 1.5 lb-ft)

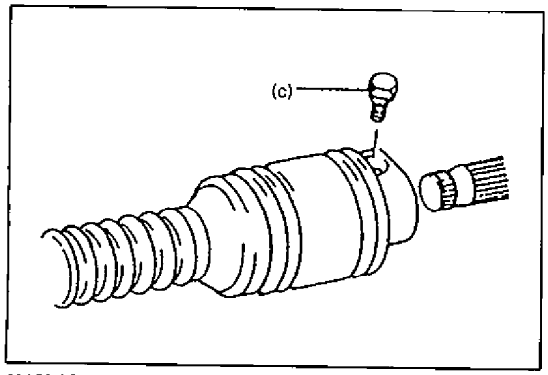


60A50-3C1-17-3

4) Install steering column assembly to lower and upper brackets. Tighten steering column bolts to specified torque.

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

NOTE:
After tightening lower column bolts, upper column bolts "A" should be tightened.

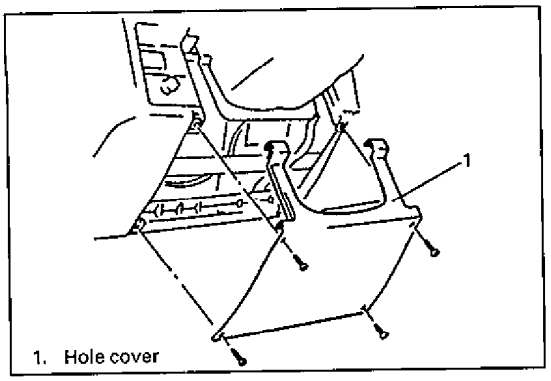


60A50-3C1-17-4

5) Install bolt to steering shaft upper joint and tighten it to specified torque.

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

6) Connect connectors for ignition switch wire harness.
7) If contact coil and combination swith assembly is removed, install contact coil and combination switch assembly. Refer to "Contact Coil and Combination switch Assembly" earlier in this section.
8) Fix wire harness with band.



1. Hole cover

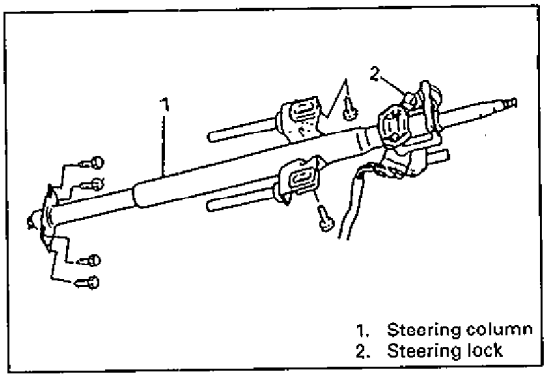
61A10-3C1-20-1

9) Install hole cover.
10) If steering wheel is removed, install steering wheel. Refer to "Steering Wheel" earlier in this section.
11) Connect negative battery cable.
12) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.

STEERING LOCK (IGNITION SWITCH)

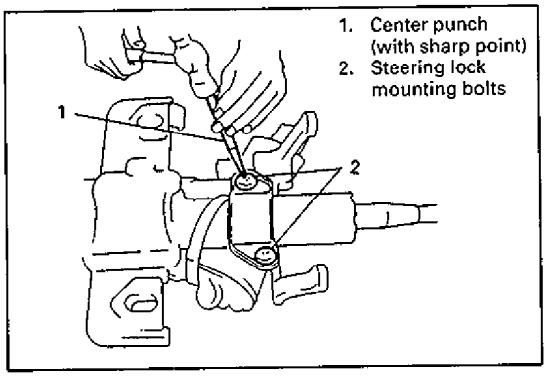
REMOVAL

1) Disconnect negative battery cable at battery terminal.
2) Disable air bag system. Refer to "Disabling Air Bag System" under "Service Precautions" earlier in this section.
3) Remove steering column. Refer to "Steering Column" earlier in this section.



1. Steering column
2. Steering lock

60A50-3C1-18-2



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

60G00-3C1-19-2

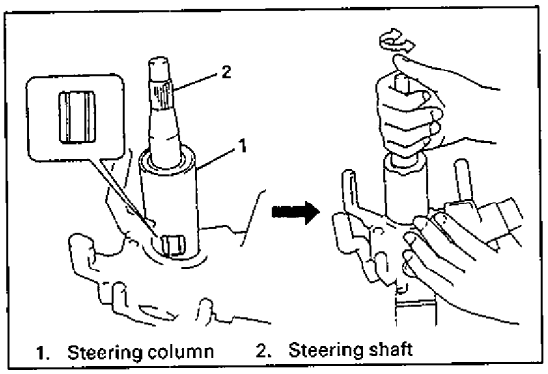
4) Using center punch as shown, loosen and remove steering lock mounting bolts.

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

5) Turn ignition key to "ACC" or "ON" position and remove steering lock assembly from steering column.

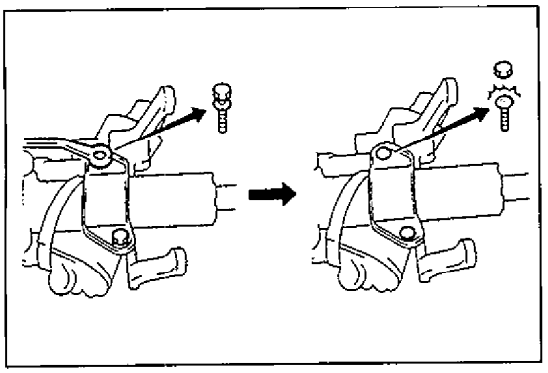
INSTALLATION

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.



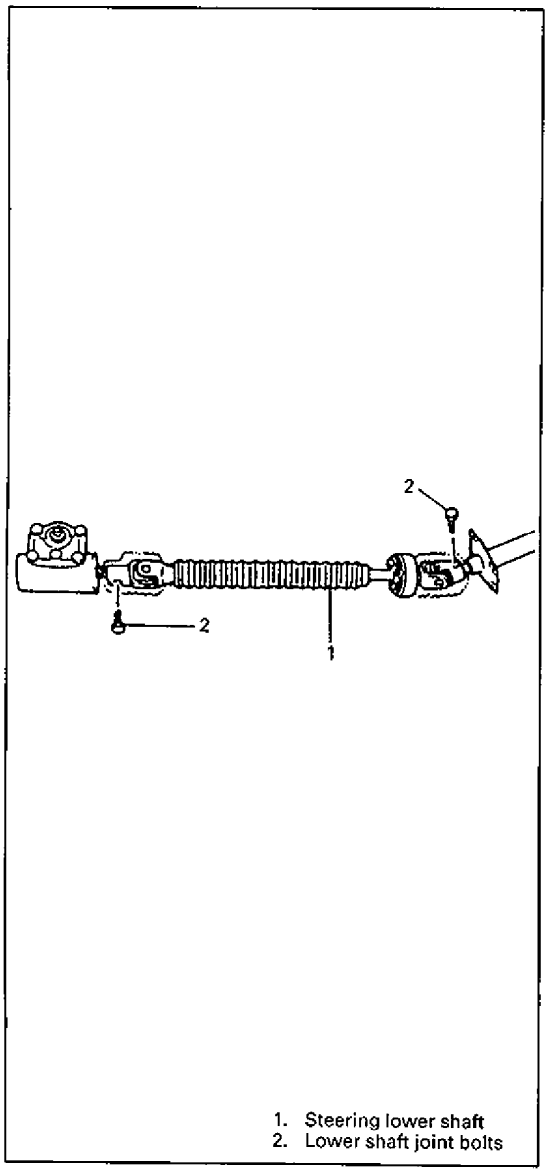
1. Steering column
2. Steering shaft

60G00-3C1-19-3



60A50-3C1-18-5

5) Tighten two 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 "Steering Column" earlier in this section.
8) Connect negative battery cable.
9) Enable air bag system. Refer to "Enabling Air Bag System" under "Service Precautions" earlier in this section.



1. Steering lower shaft
2. Lower shaft joint bolts

60A50-3C1-21-1

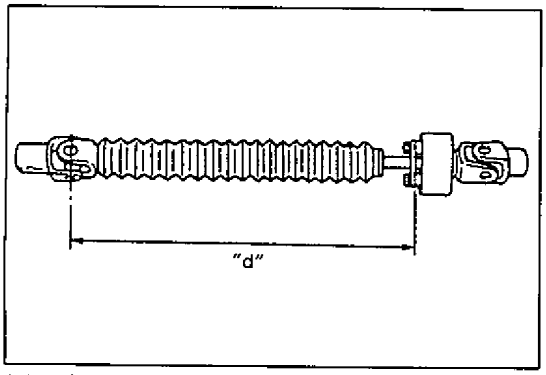
STEERING LOWER SHAFT

REMOVAL

1) Turn steering wheel so that vehicle's wheels (front tires) are at straight-ahead position.
2) Turn ignition switch to "LOCK" position and remove key.

CAUTION:
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.

3) Remove steering hole cover.
4) Remove lower shaft joint bolts.
5) Loosen steering column upper (2 pcs) and lower (4 pcs) bolts.
   Then move steering column rearward.
6) Remove steering lower shaft.

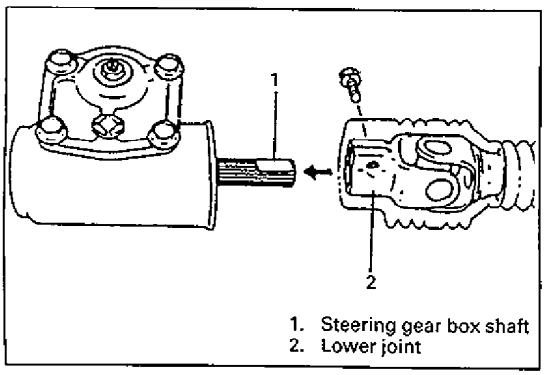


61A10-3C1-21-4

INSPECTION

- Check steering lower shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
  If anything is found faulty, replace as shaft assembly.
- Check steering lower shaft for specified length.
  If it is shorter than specified length, replace it with new one.

Length "d": 262 mm (10.3 in.)

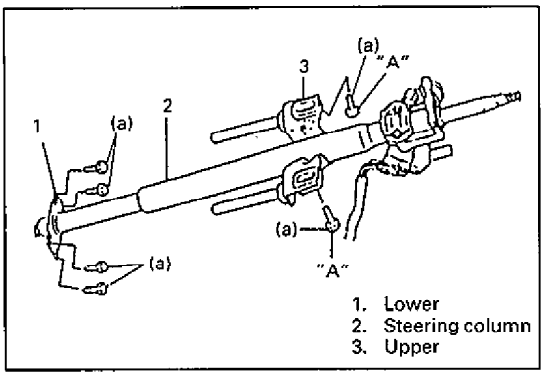


1. Steering gear box shaft
2. Lower joint

60A50-3C1-19-5

INSTALLATION

1) Align flat part of steering gear box shaft with bolt hole in lower joint as shown. Then insert lower joint onto steering gear box shaft.
2) Be sure that front wheels and steering wheel are in straight-forward state and insert upper joint onto steering shaft.



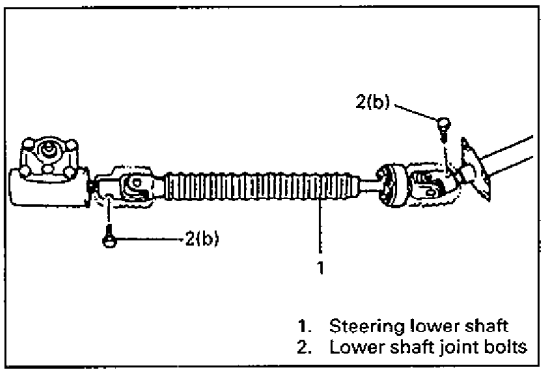
1. Lower
2. Steering column
3. Upper

60A50-3C1-20-1

3) Tighten steering column bolts to specified torque.

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

NOTE:
After tightening lower column bolts, upper column bolts "A" should be tightened.



1. Steering lower shaft
2. Lower shaft joint bolts

60A50-3C1-20-2

4) Tighten steering shaft joint bolts to specified torque.

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

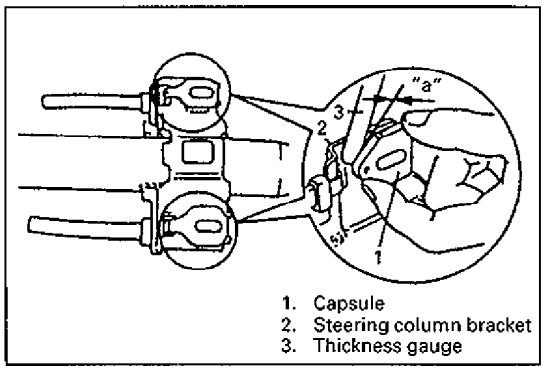
5) Install steering hole cover.

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

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

In such a case, following steps should be performed.

61A10-3C1-22-3



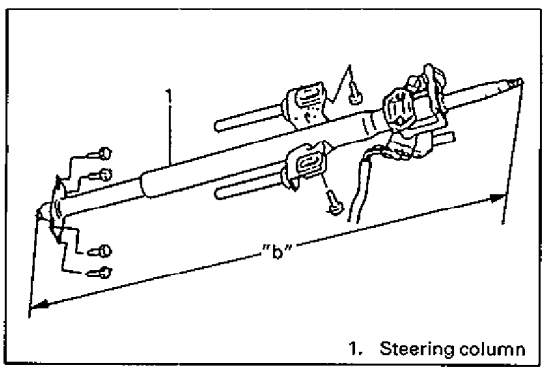
1. Capsule
2. Steering column bracket
3. Thickness gauge

85F00-3C2-3-2

CHECKING PROCEDURE

1) Check clearance between capsules and steerng column bracket as shown. Clearance should be 0.0 mm (0.0 in.) on both sides.

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

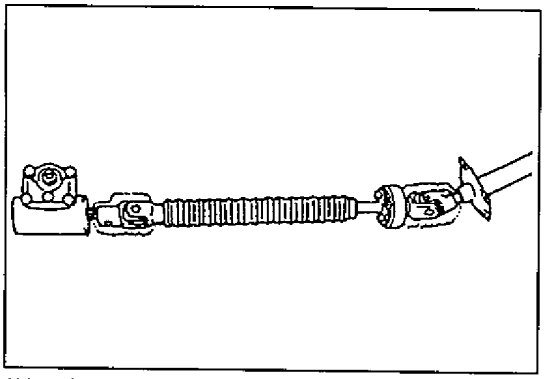


1. Steering column

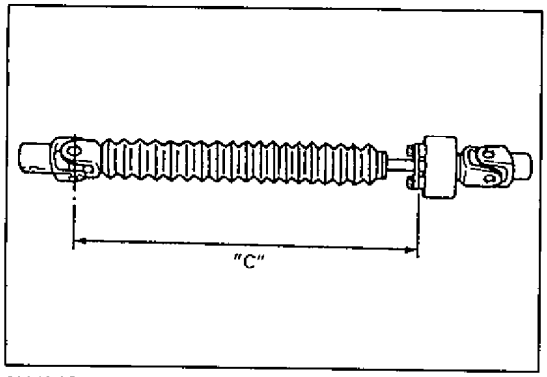
60A50-3C1-20-5

2) Take measurement "b" as shown. If it is shorter than specified length, replace column assembly with new one.

Specified length "b": 750.6 ± 0.8 mm (29.55 ± 0.03 in.)


60A50-3C1-21-1

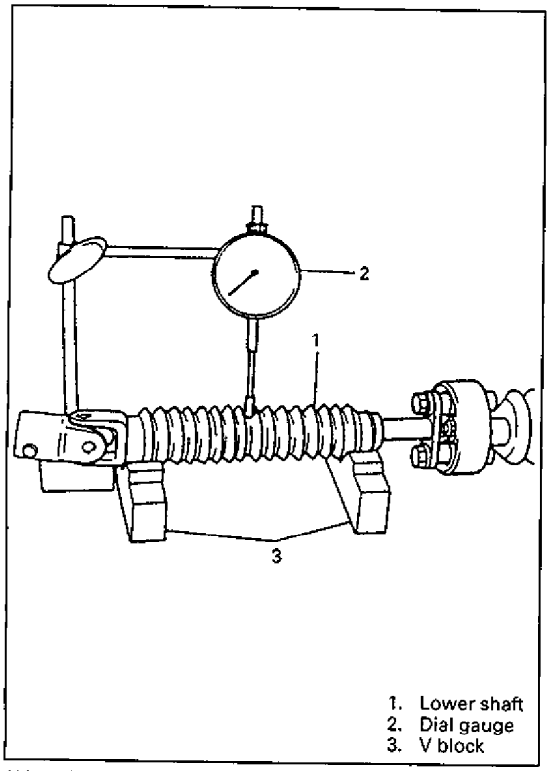
3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play.
If anything is found faulty, replace as shaft assembly.
4) Check steering shaft for smooth rotation.
If found defective, replace as column assembly.



61A10-3C1-23-2

5) Check steering lower shaft for specified length.
If it is shorter than specified length, replace it with new one.

Length "c": 262 mm (10.3 in.)



1. Lower shaft
2. Dial gauge
3. V block

60A50-3C1-21-3

6) Check steering lower shaft runout. If it exceeds its specified limit, replace it with new one.

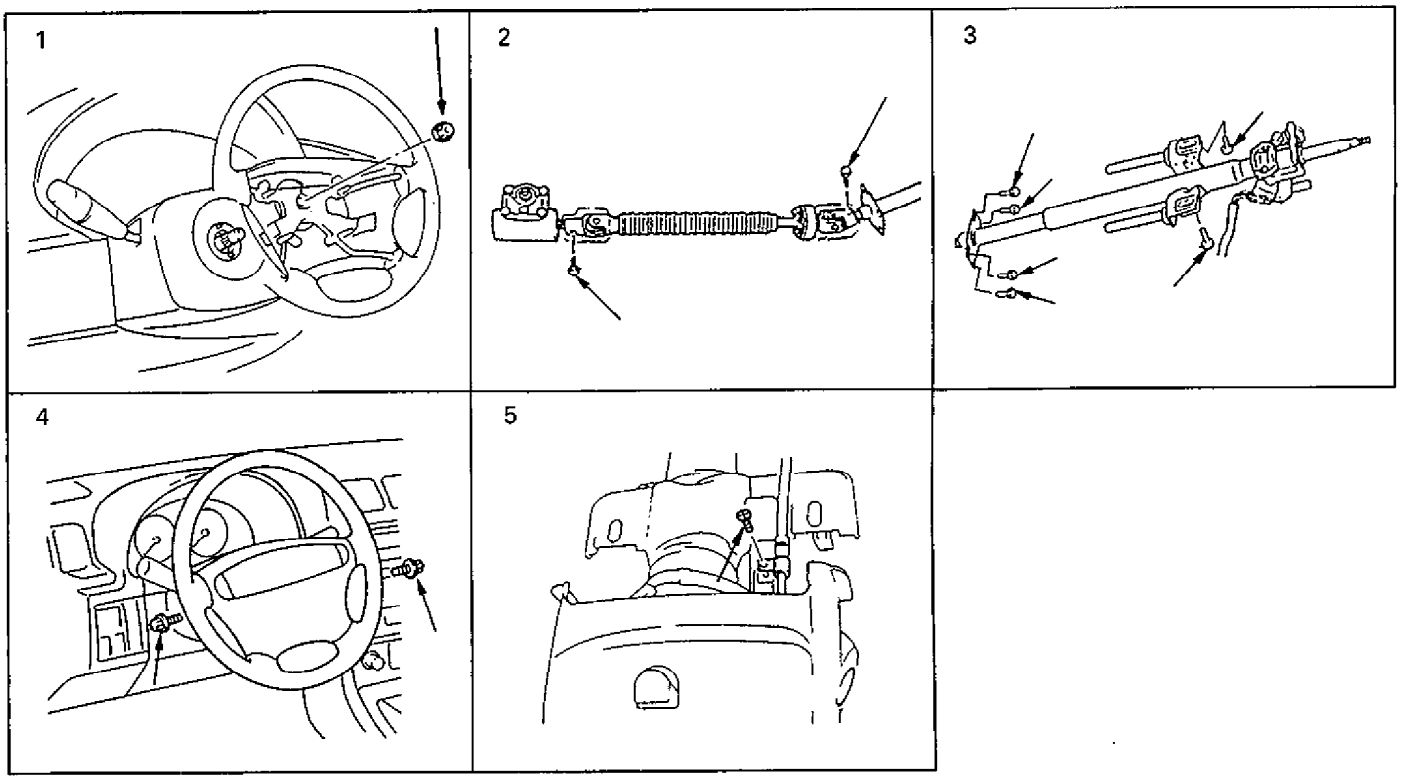
NOTE:
To obtain accurate measurement, be sure to clean surface where runout is measured beforehand and turn steering lower shaft gradually while taking measurement.

Runout limit: 1.5 mm (0.059 in.)

WARNING:
Never disassemble steering lower shaft assembly.
If it is found faulty, replace it with new assembly.

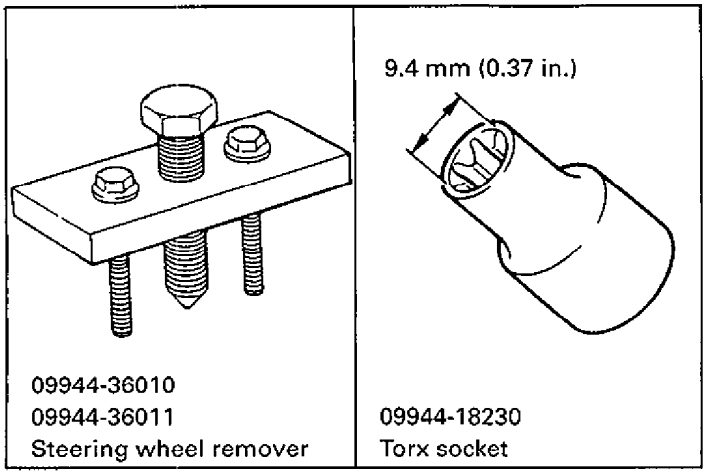
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft nut	33	3.3	23.5
2. Steering shaft joint bolts	25	2.5	18.0
3. Steering column bolts	23	2.3	17.0
4. Driver air bag (inflator) module bolts	23	2.3	17.0
5. Shift (key) interlock cable clamp screw	2.2	0.22	1.6



61A10-3C1-24-1

SPECIAL TOOLS



09944-36010 09944-36011 Steering wheel remover	09944-18230 Torx socket

60G00-3C1-23-2

SECTION 3C2

STEERING WHEEL, COLUMN AND SHAFT
(NOT EQUIPPED WITH AIR BAG)

NOTE:

- **For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.**
- **All steering wheel and column fasteners are important parts in that they could affect the performance of vital parts and systems, and / or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.**

85F00-3C2-1-1

CONTENTS

61A10-3C2-1-2

GENERAL DESCRIPTION

The double tube type steering column includes three important features in addition to the steering function.

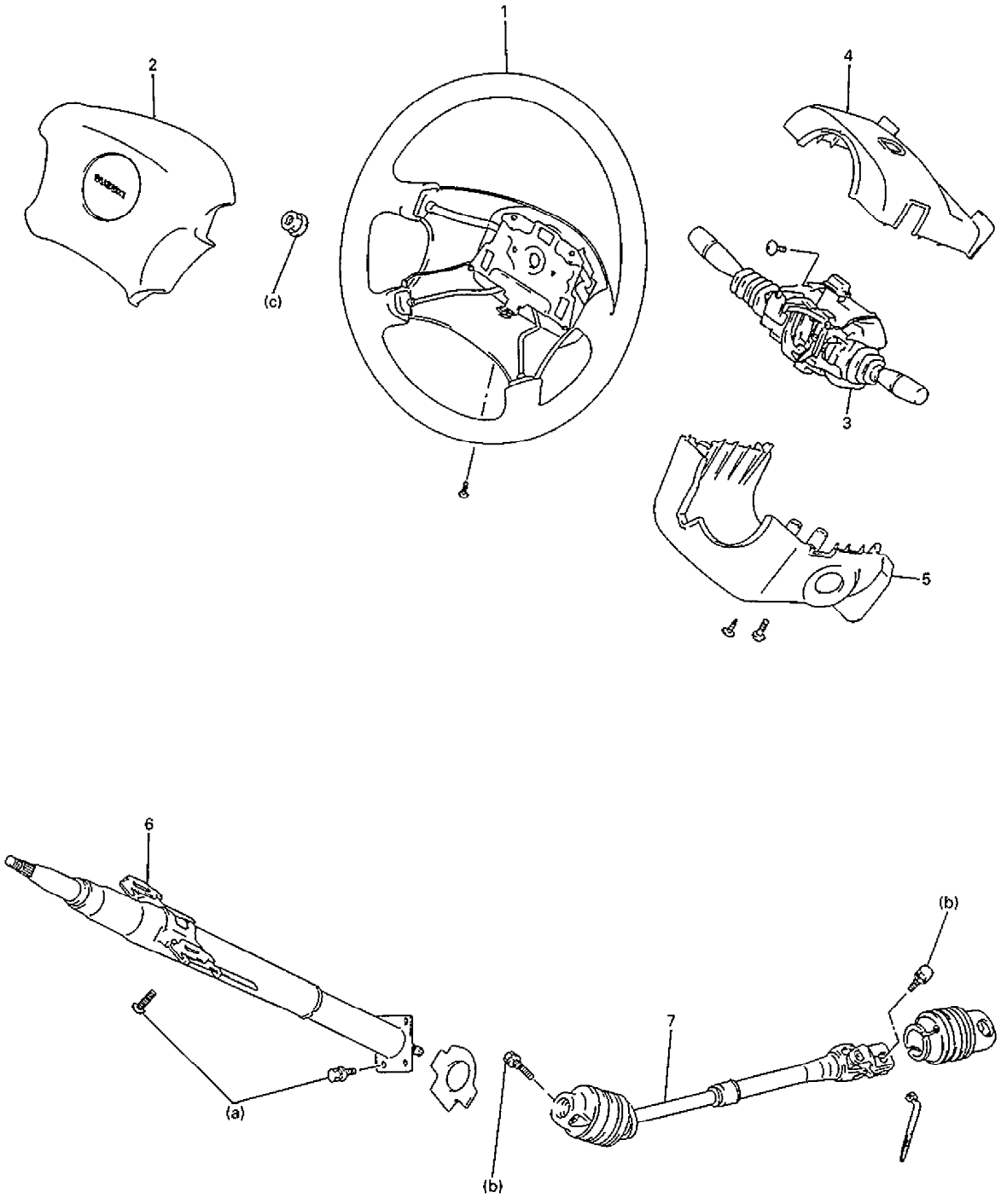
1. The column is energy absorbing designed to compress in a front end collision to minimize the possibility of injury to the driver of the vehicle.
2. The ignition switch and lock are mounted conveniently on this column.
3. With the column mounted lock, the ignition and steering operations can be locked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

61A10-3C2-1-3

To insure the energy absorbing action, it is important that only the specified screws, bolts and nuts to 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.

The tilt type steering column has been used in some vehicles, depending on specifications.



1. Steering wheel
2. Horn button
3. Combination switch ass'y
4. Steering column upper cover
5. Steering column lower cover
6. Steering column ass'y
7. Steering lower shaft

Tightening Torque
(a): 23 N·m (2.3 kg–m, 17.0 lb–ft)
(b): 25 N·m (2.5 kg–m, 18.5 lb–ft)
(c): 33 N·m (3.3 kg–m, 24.0 lb–ft)

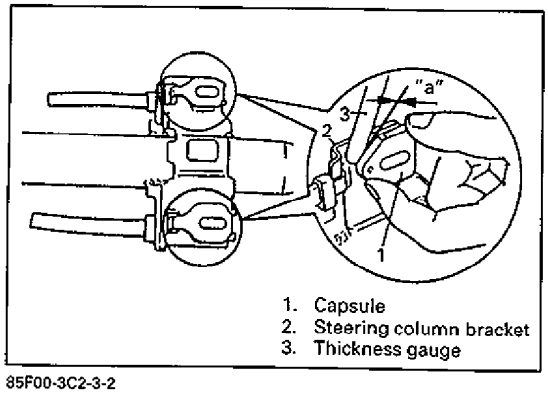
All vehicles with the double tube type steering column are equipped with the steering lock.

CHECKING STEERING COLUMN FOR ACCIDENT DAMAGE

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

In such a case, following steps should be performed.

60A20-3C2-9-1



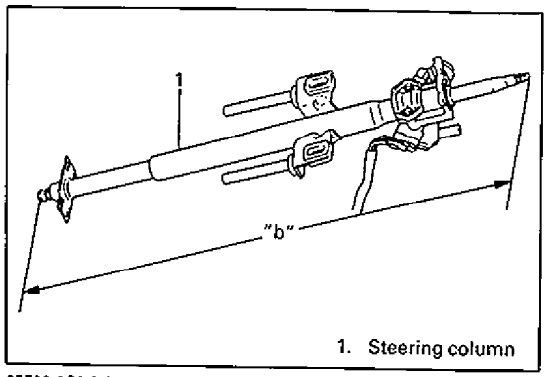
1. Capsule
2. Steering column bracket
3. Thickness gauge

85F00-3C2-3-2

CHECKING PROCEDURE

1) Check clearance between capsules and steering column bracket as shown. Clearance should be 0.0 mm (0.0 in.) on both sides.

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

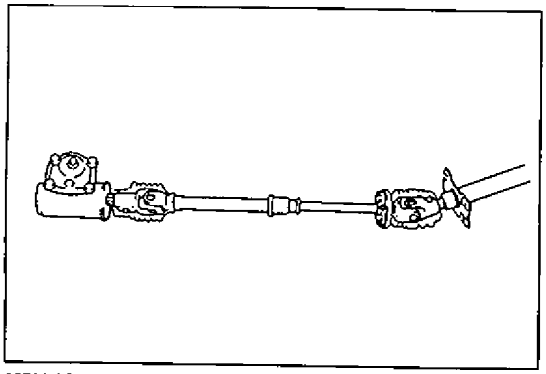


1. Steering column

85F00-3C2-3-3

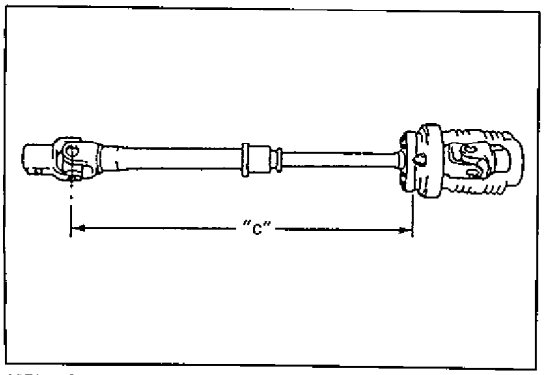
2) Take measurement "b" as shown. If it is shorter than specified length, replace column assembly with new one.

Specified length "b": 764.6 ± 0.8 mm (30.10 ± 0.03 in.)



85F00-3C2-3-4

3) Check steering shaft joints and shaft for any damages such as crack, breakage, malfunction or excessive play. If anything is found faulty, replace as shaft assembly.
4) Check steering shaft for smooth rotation. If found defective, replace as column assembly.



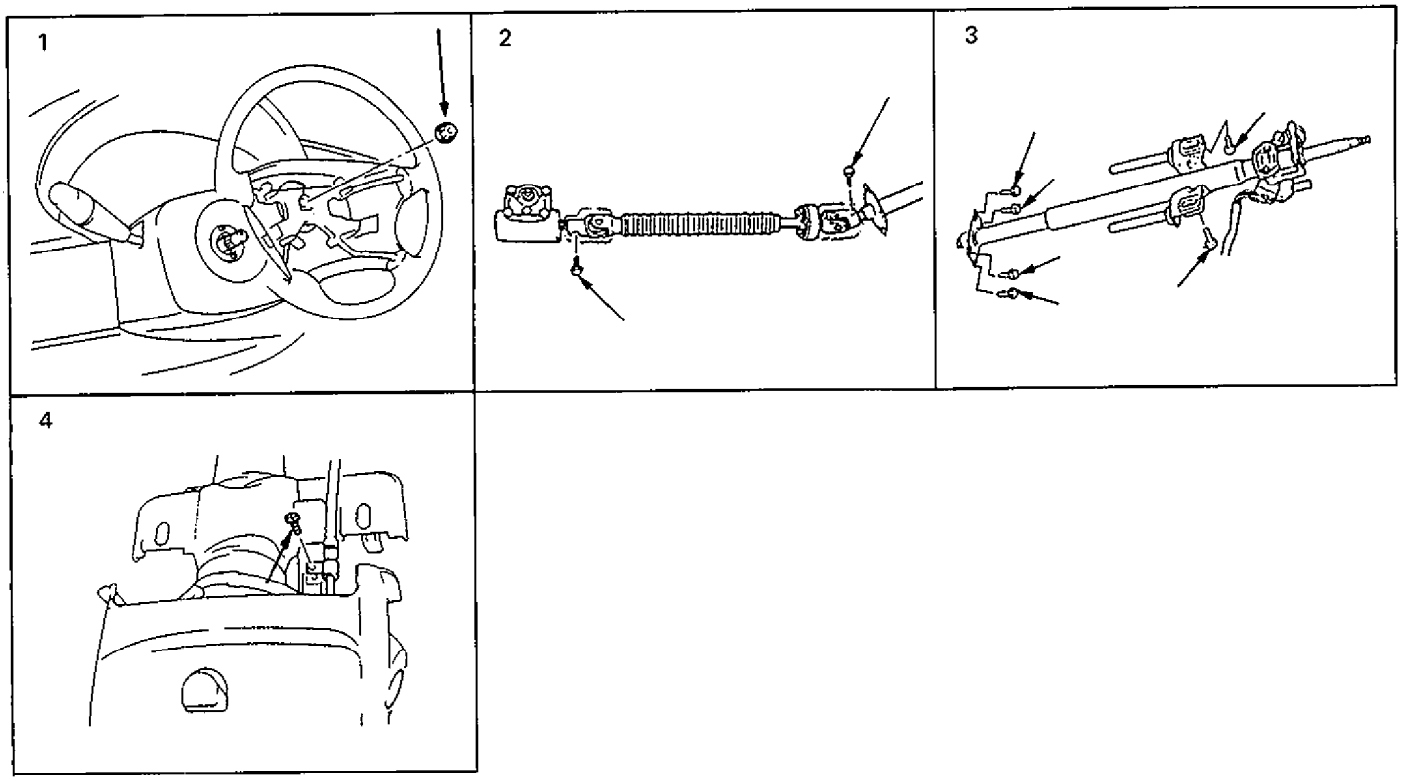
85F00-3C2-3-5

5) Check steering lower shaft for specified length.
If it is shorter than specified length, replace it with new one.

Length "c": *273 mm (10.7 in.)
314 mm (12.4 in.)
***For vehicle with power steering system**

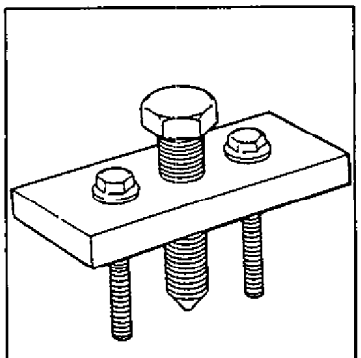
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Steering shaft nut	33	3.3	23.5
2. Steering shaft joint bolts	25	2.5	18.0
3. Steering column bolts	23	2.3	17.0
4. Shift (key) interlock cable clamp screw	2.2	0.22	1.6



61A10-3C2-4-1

SPECIAL TOOL



09944-36010
09944-36011
Steering wheel remover

61A10-3C2-4-2

SECTION 3E

REAR SUSPENSION

NOTE:

- For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.
- All suspension fasteners are an important attaching part in that it could affect the performance of vital parts and systems, and / or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of this part.
- Never attempt to heat, quench or straighten any suspension part. Replace it with a new part, or damage to the part may result.

85F00-3E-1-1

CONTENTS

61A10-3E-1-2

GENERAL DESCRIPTION

Rear suspension is coil spring type of rigid axle which consists of coil springs, rear axle, shock absorbers, upper arm and trailing rods.

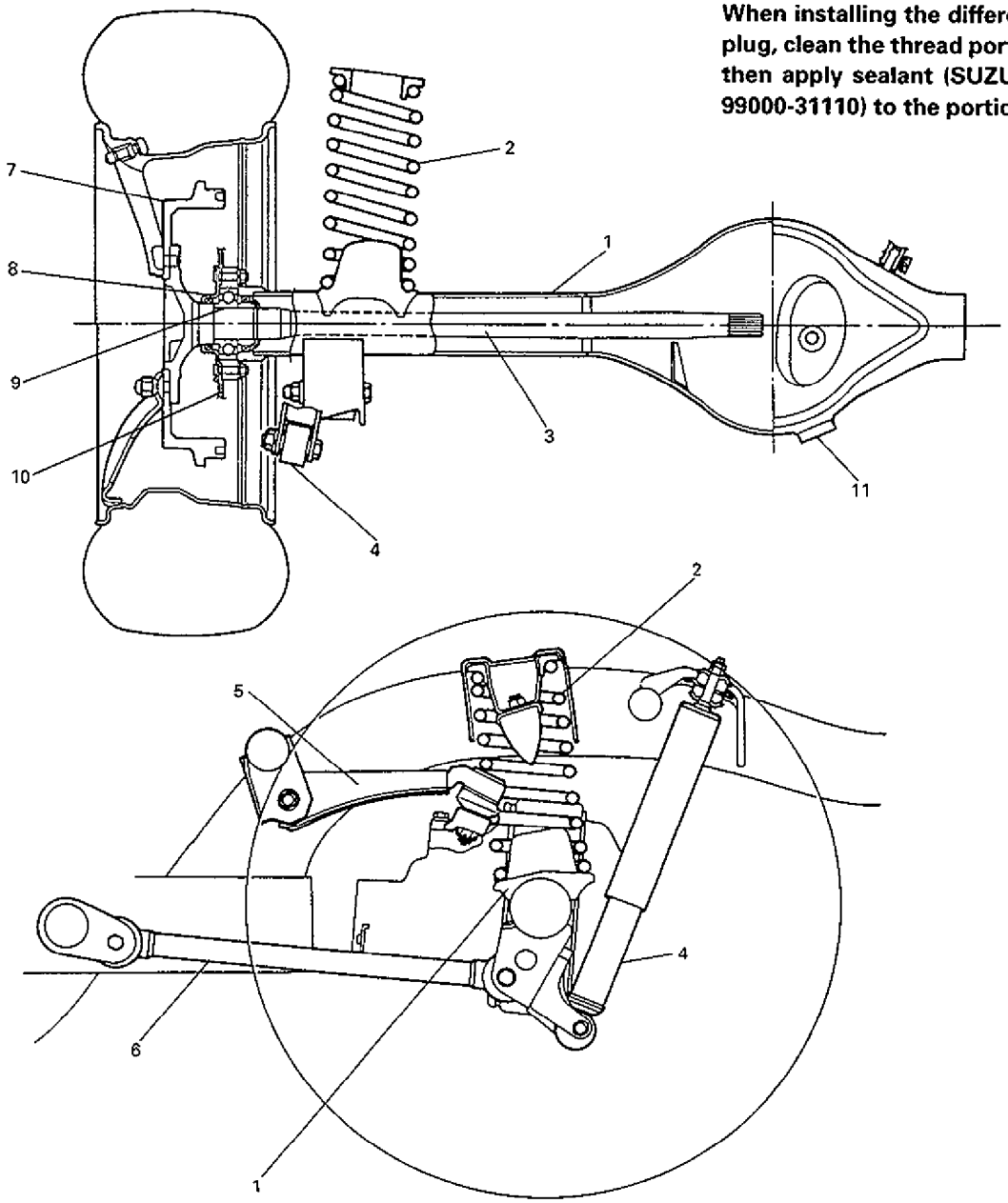
The trailing rod is connected with the axle and body by using bushes so that axle moves up and down with bushes as their supporting points.

The upper arm is installed to the body and the axle (differential carrier) by using bushes and ball joint so as to prevent axle movement in the lateral direction.
It also prevents axle from turning in forward and backward direction, which occurs due to reaction when brake is applied and when engine is driven.

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

For SE416

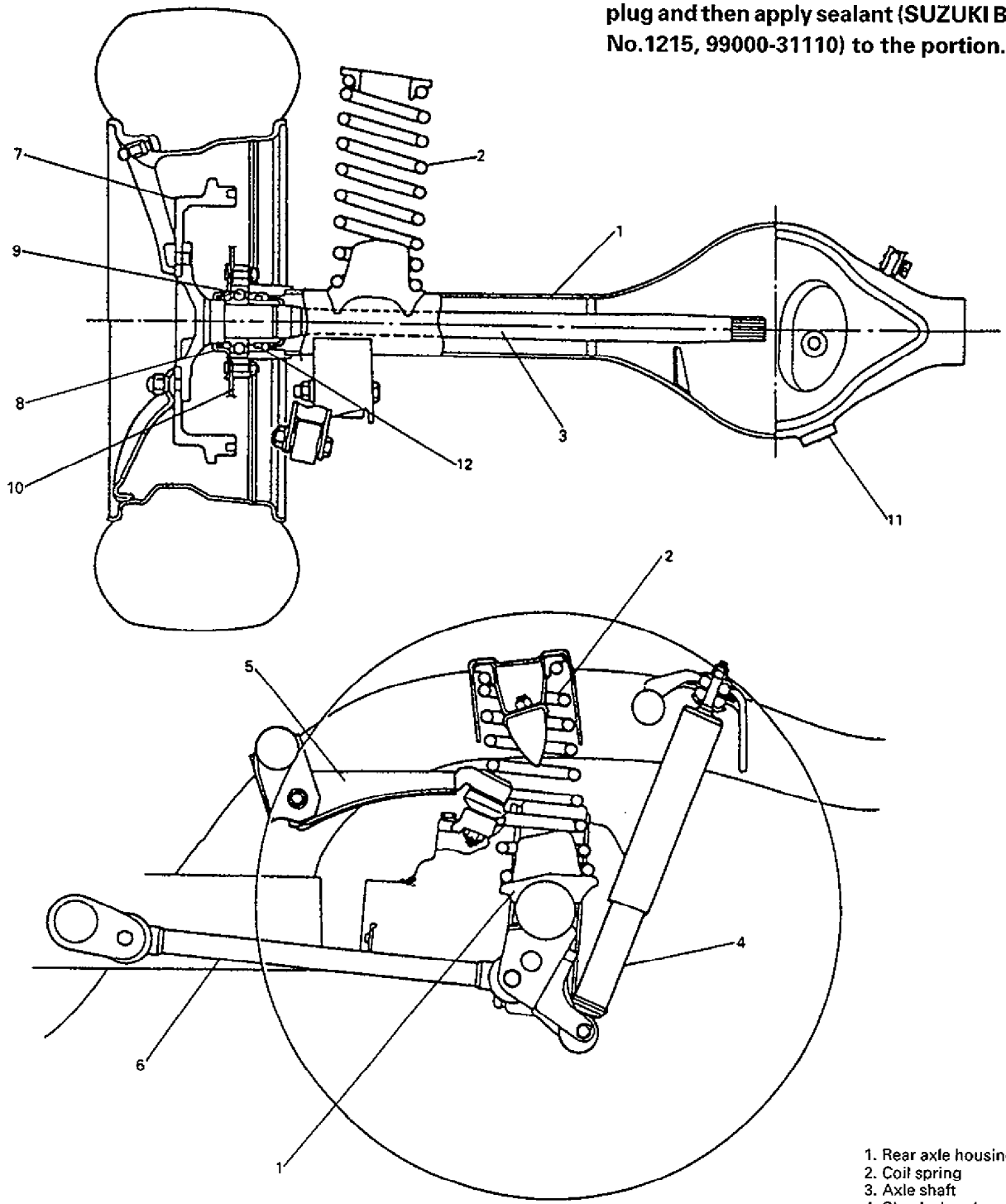
NOTE:
When installing the differential gear oil drain plug, clean the thread portion of the plug and then apply sealant (SUZUKI BOND No.1215, 99000-31110) to the portion.



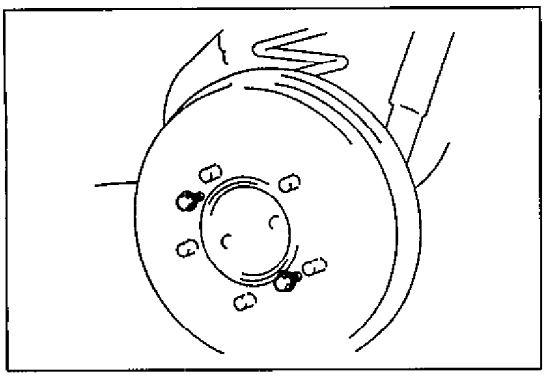
1. Rear axle housing
2. Coil spring
3. Axle shaft
4. Shock absorber
5. Upper arm
6. Trailing rod
7. Brake drum
8. Wheel bearing retainer
9. Rear wheel bearing
10. Brake back plate
11. Oil drain plug

For SV620 equipped with ABS
(For SV620 not equipped with ABS, refer to Service manual metioned in FOREWORD of this manual.)

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



1. Rear axle housing
2. Coil spring
3. Axle shaft
4. Shock absorber
5. Upper arm
6. Trailing rod
7. Brake drum
8. Wheel bearing retainer
9. Rear wheel bearing
10. Brake back plate
11. Oil drain plug
12. ABS Sensor Rotor



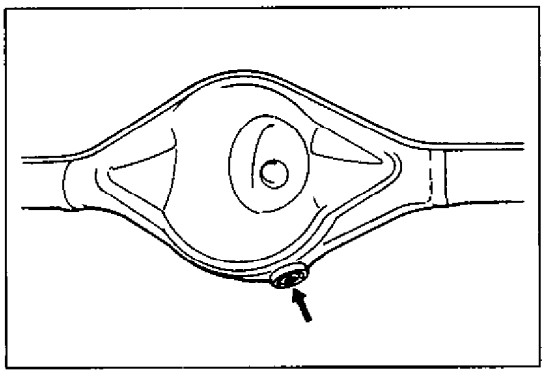
61A10-3E-4-1

ON VEHICLE SERVICE

REAR AXLE SHAFT AND WHEEL BEARING

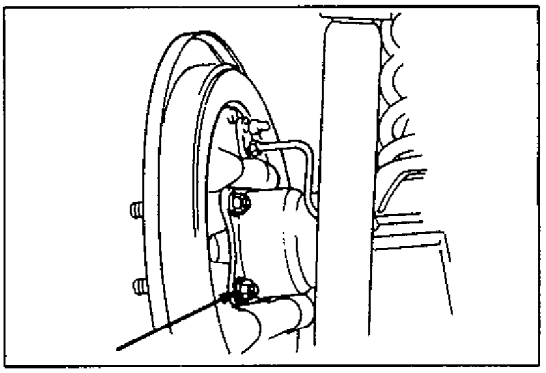
REMOVAL

1) Remove rear brake drum.
   For SE416, refer to BRAKE DRUM INSTALLATION of Section 5 in this manual.
   For SV620, refer to Section 5 of service manual mentioned in FOREWORD of this manual.



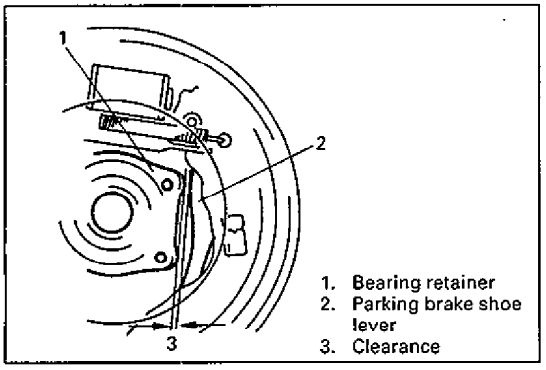
60A20-3E-12-2

2) Drain gear oil from rear axle housing by loosening drain plug.



60A20-3E-12-3

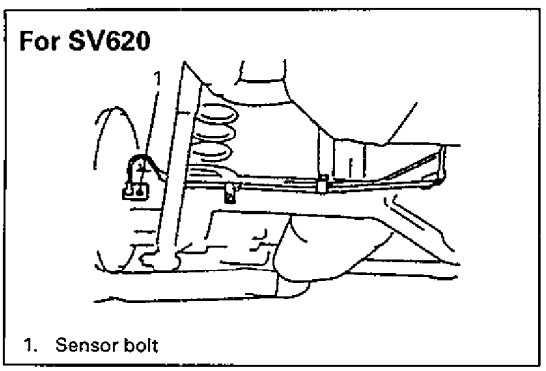
3) Remove rear wheel bearing retainer nuts from axle housing.



85F00-3E-5-4

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

For SV620



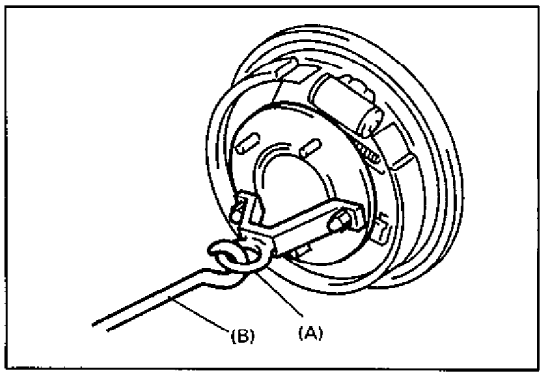
1. Sensor bolt

61A10-3E-4-5

For SV620 equipped with ABS

5) Remove rear wheel speed sensor from rear axle.

CAUTION:
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor or pole piece and do not allow dust, etc. to enter its installation hole.**

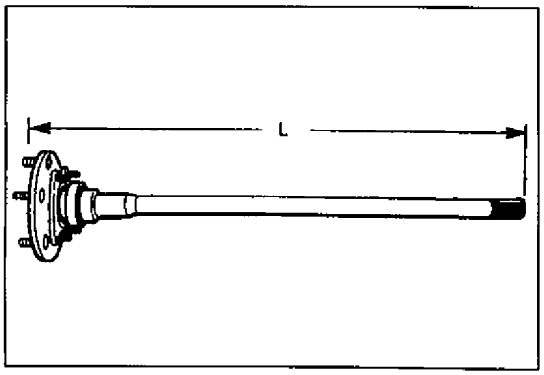


61A10-3E-5-1

6) Using special tools (A) & (B) indicated below, draw out axle shaft.

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

Special Tool
(A): 09943-35511
(B): 09942-15510



61A10-3E-5-2

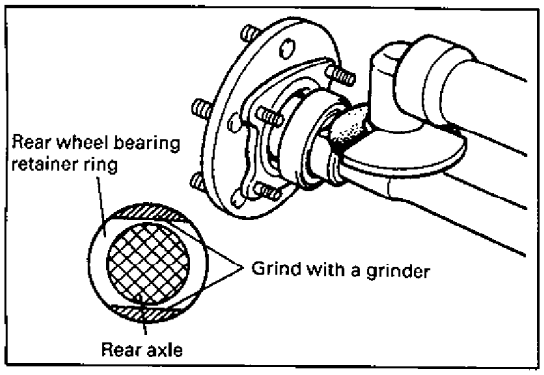
7) Rear axle shaft that was drawn out.

SE416

Shaft length "L"	
Left side	683.5 mm (26.9 in.)
Right side	726.5 mm (28.6 in.)

SV620

Shaft length "L"	
Left side	708.5 mm (27.9 in.)
Right side	751.5 mm (29.6 in.)

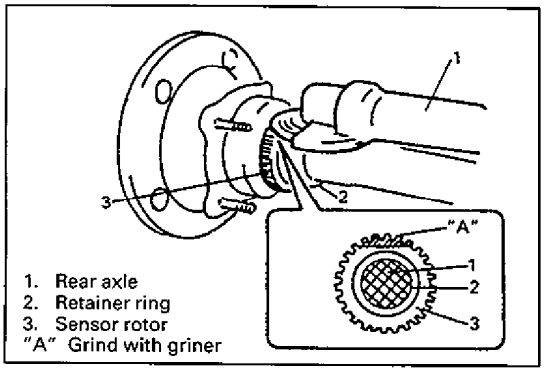


61A10-3E-5-3

For SE416

8) 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.

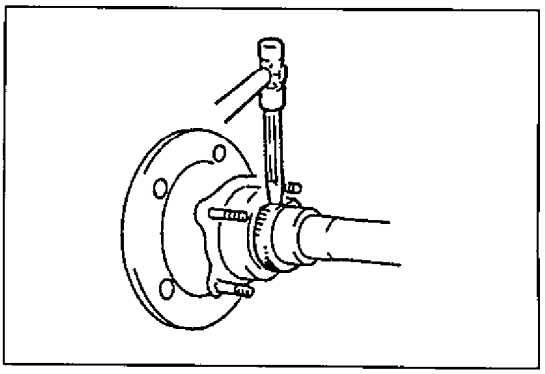
CAUTION:
Be careful not to grind too far not to damage the shaft.



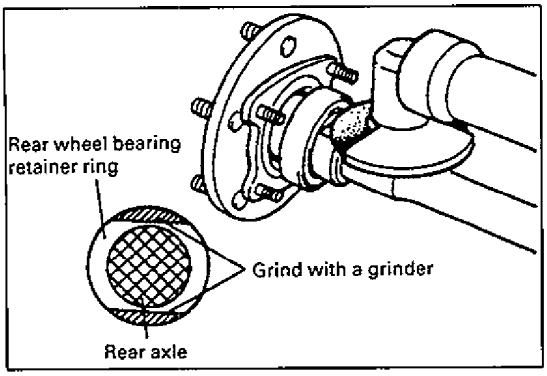
61A10-3E-5-4

For SV620 equipped with ABS

8) ① In order to remove sensor rotor from retainer ring, grind with a grinder one part of the sensor rotor as illustrated till it becomes thin.


61A10-3E-5-5

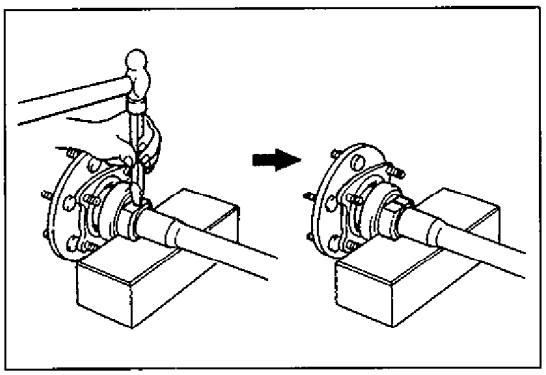
② Break with a chisel the thin ground sensor rotor, and it can be removed.



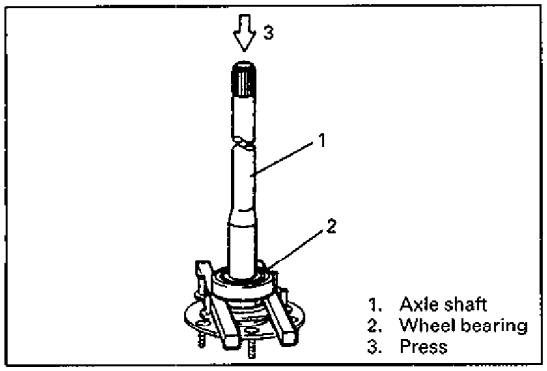
61A10-3E-6-1

③ 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 grind too far not to damage the shaft.

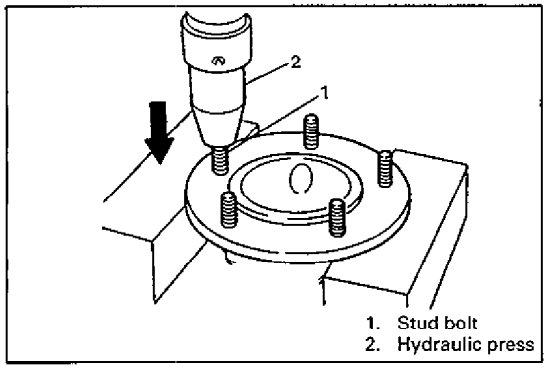

61A10-3E-6-2

9) Break with a chisel the thin ground retainer ring, and it can be removed.



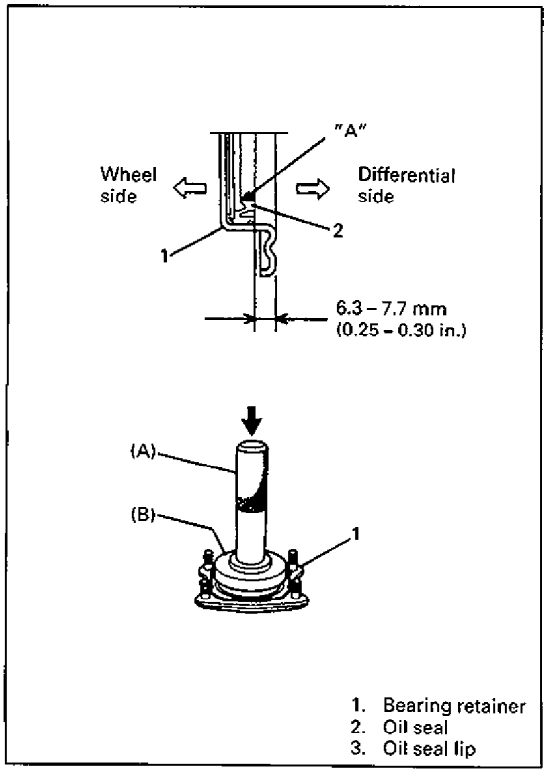
61A10-3E-6-3

10) Remove bearing from shaft by using hydraulic press.
11) Remove bearing retainer.



61A10-3E-6-4

12) Remove stud bolt(s) by using hydraulic press.



1. Bearing retainer
2. Oil seal
3. Oil seal lip

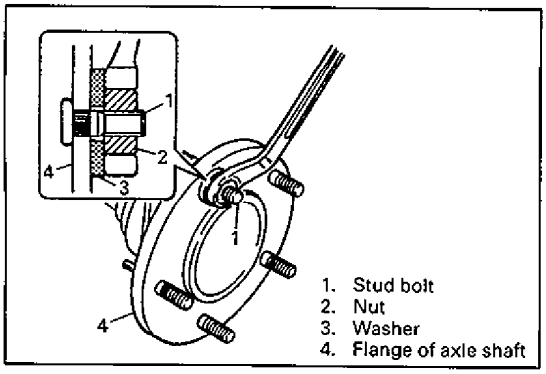
85F00-3E-7-1

INSTALLATION

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

1) To install bearing retainer oil seal, be sure to apply small amount of grease to its periphery and press-fit it by using special tools (A & B). Be careful to press-fit in proper direction, to proper extent and evenly. For its proper installing direction and extent, refer to figure.
Apply grease to oil seal lip as shown and install it to axle shaft.

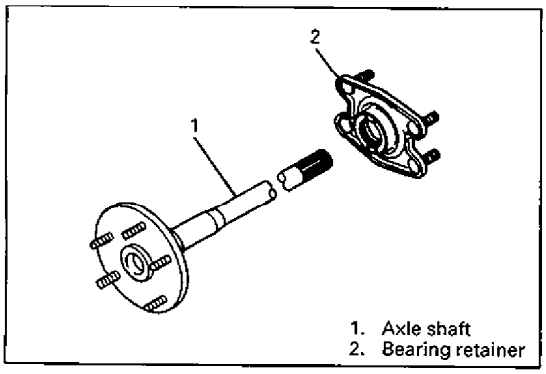
Special Tool
(A): 09924-74510
(B): 09926-88310
"A": Grease 99000-25010



1. Stud bolt
2. Nut
3. Washer
4. Flange of axle shaft

85F00-3E-7-3

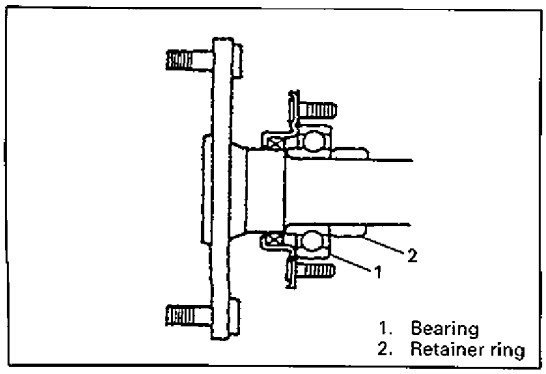
2) Aligning serrations between new stud bolt(s) and flange, install new stud bolt(s) by tightening nut as shown.



1. Axle shaft
2. Bearing retainer

85F00-3E-7-4

3) Install bearing retainer to shaft.



1. Bearing
2. Retainer ring

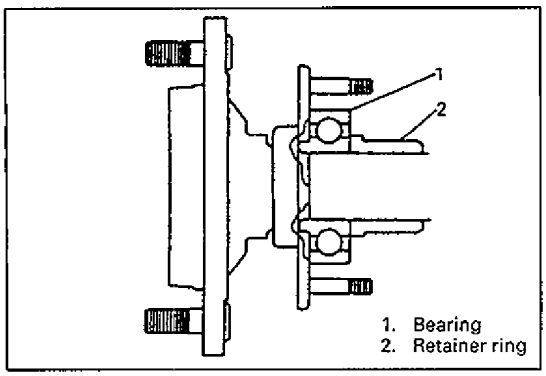
61A10-3E-7-5

For SE416

4) Press-fit wheel bearing and retainer ring as shown.

NOTE:

- **Use care not to cause any damage to outside of retainer ring.**
- **Refer to figure so that wheel bearing is installed in proper direction.**

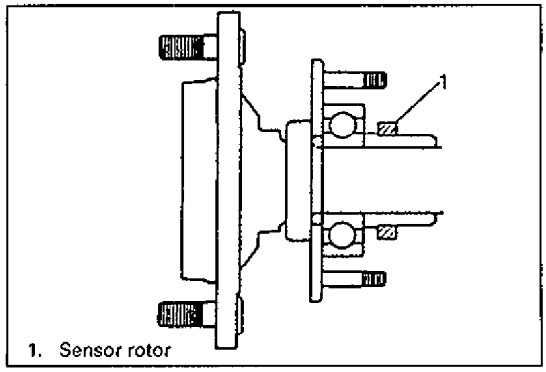


61A10-3E-8-1

For SV620 equipped with ABS

4) ① Press-fit wheel bearing and retainer ring as shown.

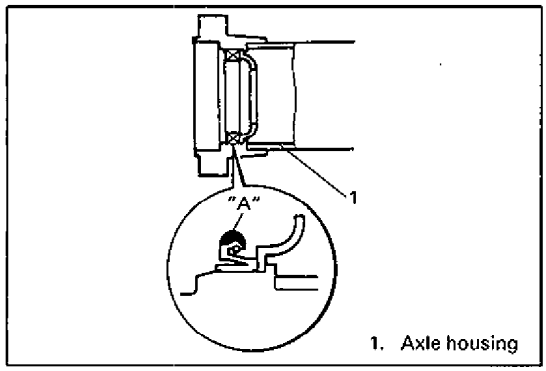
NOTE:
- **Use care not to cause any damage to outside of retainer ring.**
- **Refer to figure so that wheel bearing and are retainer ring installed in proper direction.**



61A10-3E-8-2

② Press-fit new sensor rotor as shown.

NOTE:
Use care not to cause any damage to outside of retainer ring.

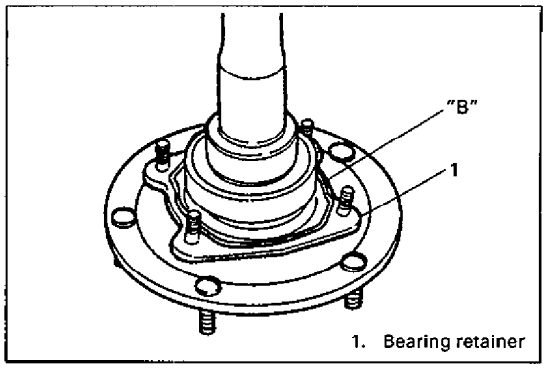


61A10-3E-8-3

5) If rear axle shaft inner oil seal is removed, install it.
For SE416, refer to Section 3E of service manual mentioned in FOREWARD of this manual.
For SV620, refer to REAR AXLE SHAFT INNER OIL SEAL in this section.

6) Apply grease to rear axle shaft inner oil seal lip as shown.

"A": Grease 99000-25010

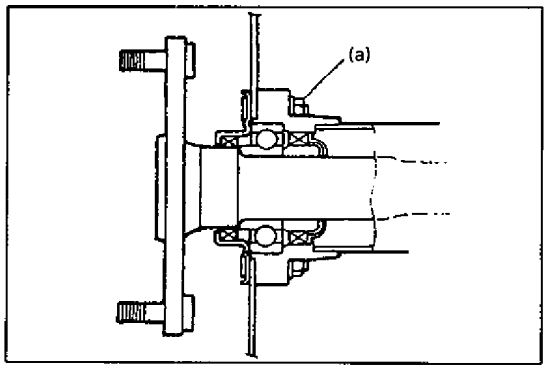


61A10-3E-8-4

7) Apply sealant to mating surface of bearing retainer with brake back plate.

NOTE:
Make sure to remove old sealant before applying it anew.

"B": Sealant 99000-31110

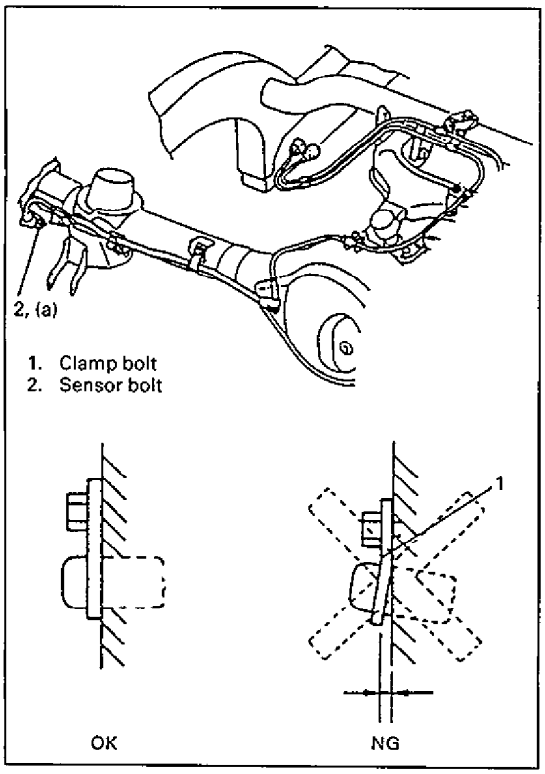


61A10-3E-8-5

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

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

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



61A10-3E-9-1

For SV620 equipped with ABS

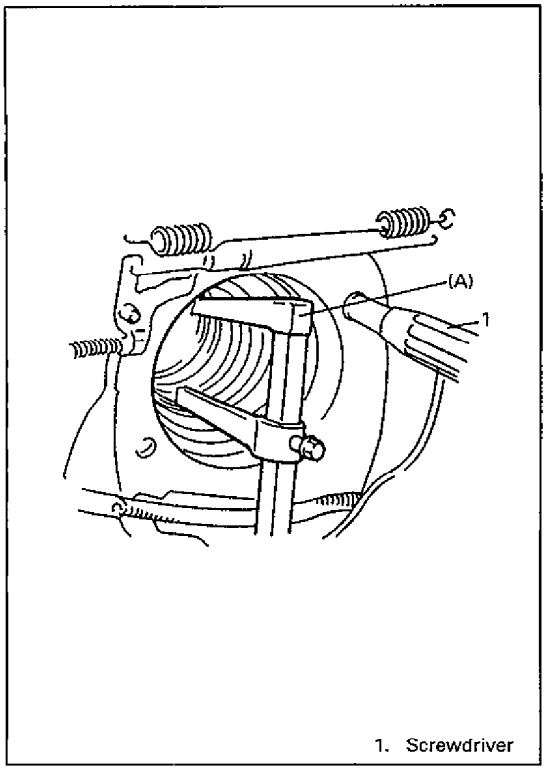
9) ① Check that no foreign material is attached to sensor and rotor.
② Install sensor by reversing removal procedure.

Tightening Torque
(a): 21 N·m (2.1 kg-m, 15.0 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 knuckle.

10) Refill rear axle (differential) housing with new specified gear oil.
For SE416, refer to MAINTEMANCE SERVICE of Section 7E in this manual.
For SV620, refer to Section 7E of service manual mentioned in FOREWORD of this manual.
11) Install brake drum and wheel.
For SE416, refer to BRAKE DRUM INSTALLATION of Section 5 in this manual.
For SV620, refer to Section 5 of service manual mentioned in FOREWORD of this manual.



1. Screwdriver

61A10-3E-10-1

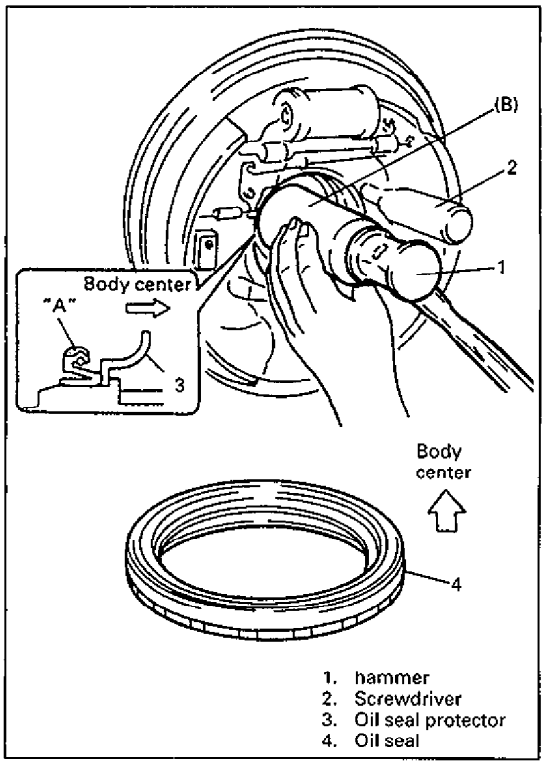
REAR AXLE SHAFT INNER OIL SEAL (For SV620 equipped with ABS)

REMOVAL

1) Remove rear axle shaft. For details, refer to steps 1) to 6) of REAR AXLE SHAFT AND WHEEL BEARING in this section.
2) Fix brake back plate by inserting screwdriver to the hole for bearing retainer mounting.
3) Remove rear axle shaft inner oil seal.

Special Tool
(A): 09913-50121

NOTE:
Take cure not to bend the brake pipe.



1. hammer
2. Screwdriver
3. Oil seal protector
4. Oil seal

61A10-3E-10-3

INSTALLATION

1) Using special tools (B) 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
(B): 09913-85210
"A": Grease 99000-25010

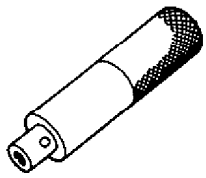
2) For procedure hereafter, refer to steps 6) to 11) of REAR AXLE SHAFT INSTALLATION in this section.

REQUIRED SERVICE MATERIALS

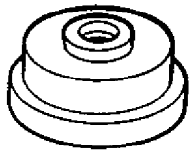
MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lip
Brake fluid	DOT 3	Brake reservoir
Sealant	SUZUKI BOND NO.1215 (99000-31110)	• Joint seam of bearing retainer and brake back plate • Drain plug
Gear oil	For gear oil information, refer to SECTION 7E.	Differential gear (Rear axle housing)

85F00-3E-10-1

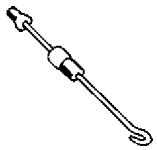
SPECIAL TOOLS



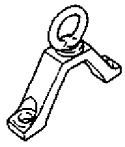
09924-74510
Bush remover handle



09926-88310
Oil seal installer

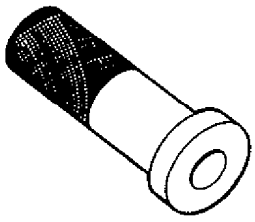


09942-15510
Sliding hammer



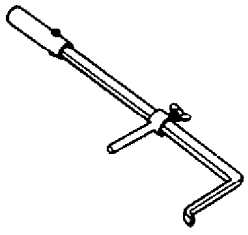
09943-35511
Axle shaft remover
(Brake drum remover)

For SV620 equipped with ABS



09913-85210
Oil seal installer

For SV620 equipped with ABS



09913-50121
Oil seal remover

61A10-3E-11-2

SECTION 5

BRAKES

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag system:
- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

5

NOTE:
- **For the descriptions (items) not found in this section, refer to the same section of Service Manual mentioned in FOREWORD of this manual.**
- **All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and / or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.**

61A10-5-1-1

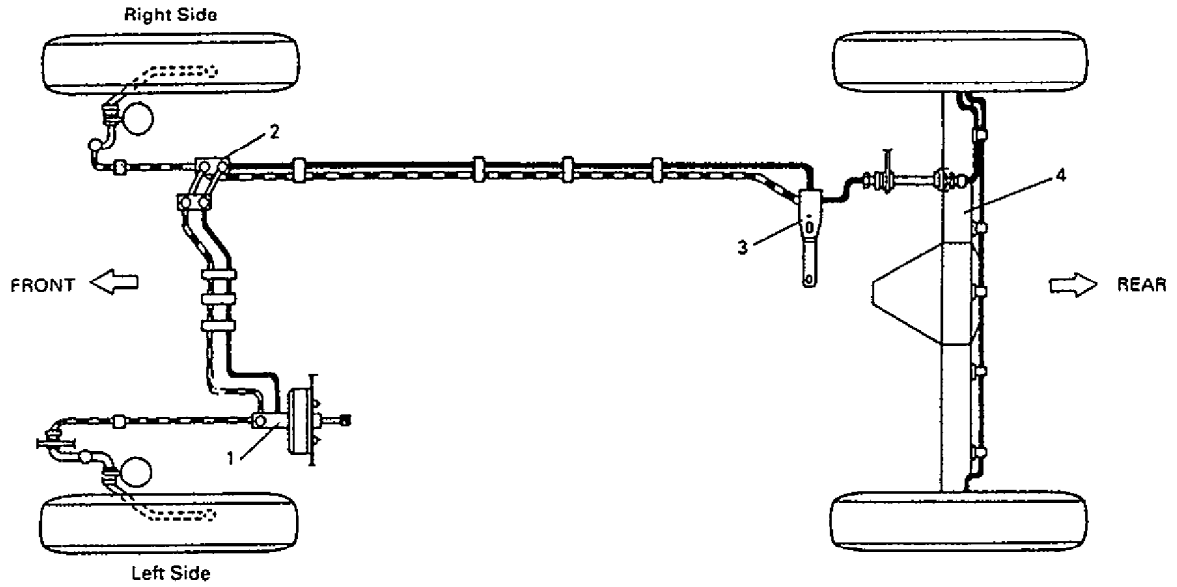
CONTENTS

61A10-5-1-2

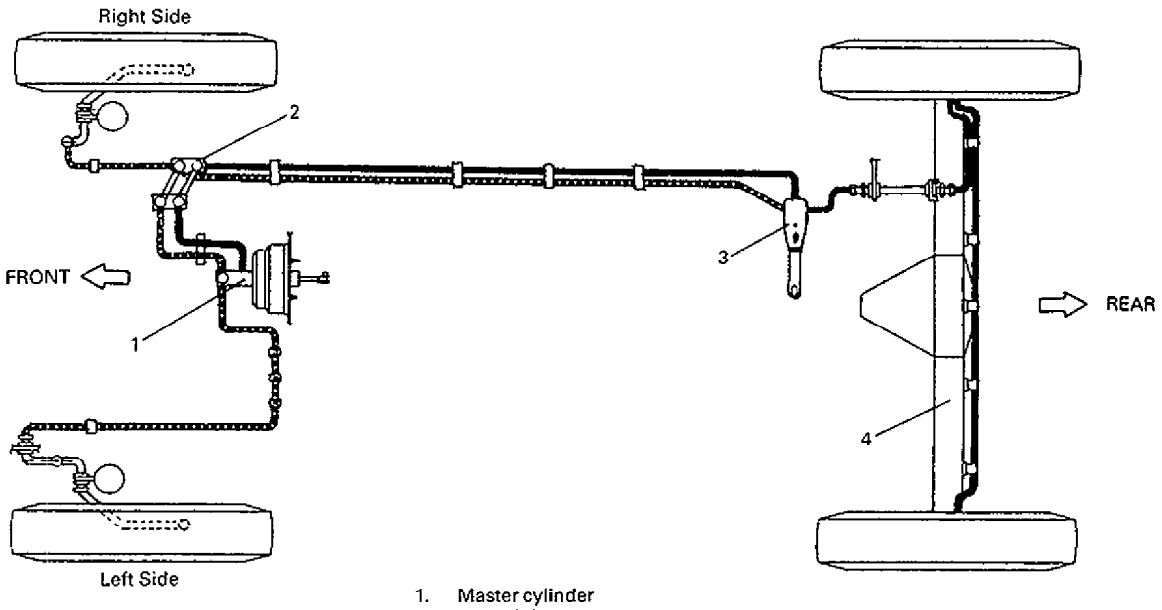
GENERAL DESCRIPTION

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. Three 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 load sensing proportioning valve (LSPV) is included in these circuits between the master cylinder and the rear brake.
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading/trailing shoes) for the rear brake.
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.

[LEFT HAND STEERING VEHICLE]



[RIGHT HAND STEERING VEHICLE]



1. Master cylinder
2. 5-way joint
3. LSPV (Load Sensing Proportioning Valve)
4. Rear axle housing

DISC BRAKE CALIPER ASSEMBLY

GENERAL DESCRIPTION

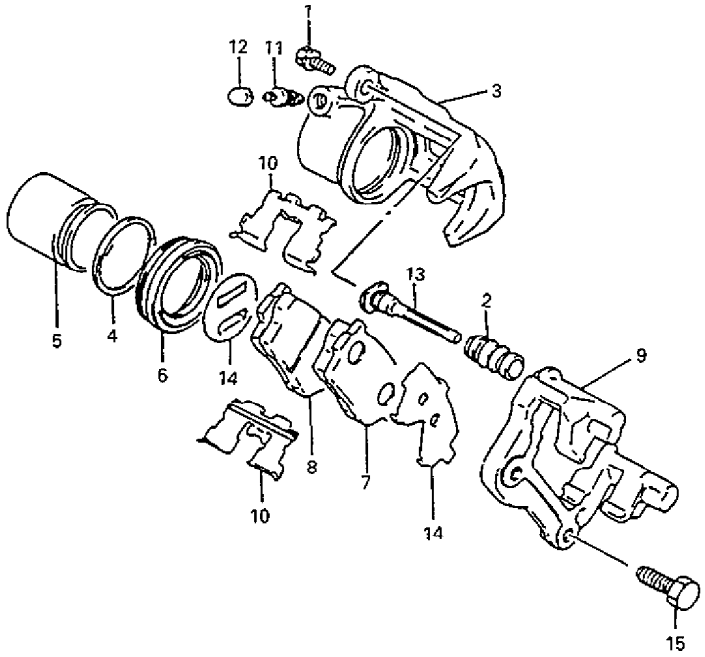
This caliper is mounted to the brake caliper carrier with two caliper pin bolts. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (slide) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the vehicle.

NOTE:

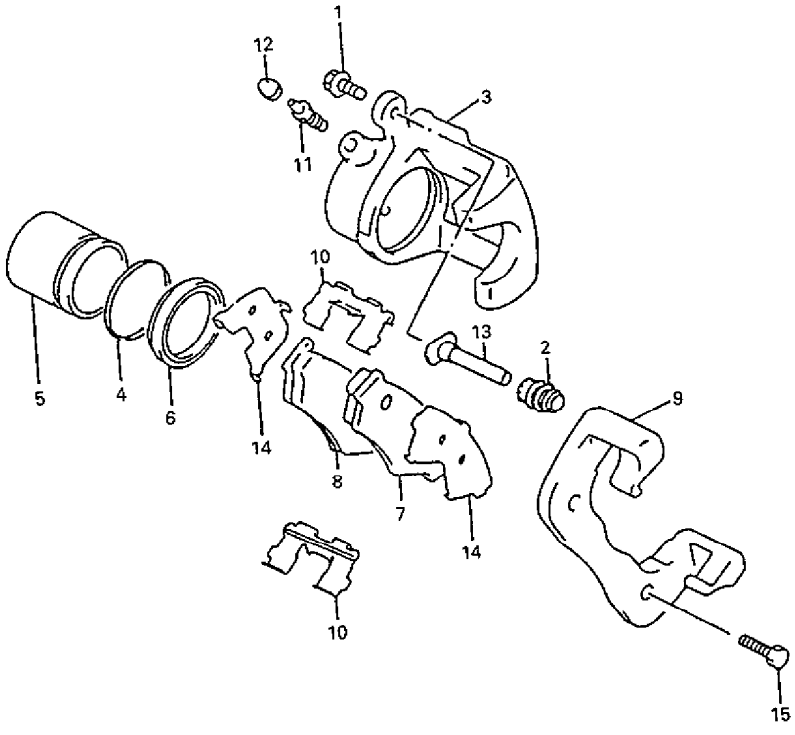
Lubricate parts as specified. Do not use lubricated shop air on brake parts as damage to rubber components may result. If any component is removed or line disconnected, bleed the brake system.

Replace pads in axle sets only. The torque values specified are for dry, unlubricated fasteners.

3-DOOR MODEL



5-DOOR MODEL



1. Caliper pin bolt
2. Boot
3. Disc brake caliper (Disc brake cylinder)
4. Piston seal
5. Disc brake piston
6. Cylinder boot
7. Disc brake inner pad
8. Disc brake outer pad
9. Brake caliper carrier
10. Pad spring
11. Bleeder plug
12. Bleeder plug cap
13. Caliper pin
14. Anti noise shim
15. Caliper bolt

DRUM BRAKE ASSEMBLY

GENERAL DESCRIPTION

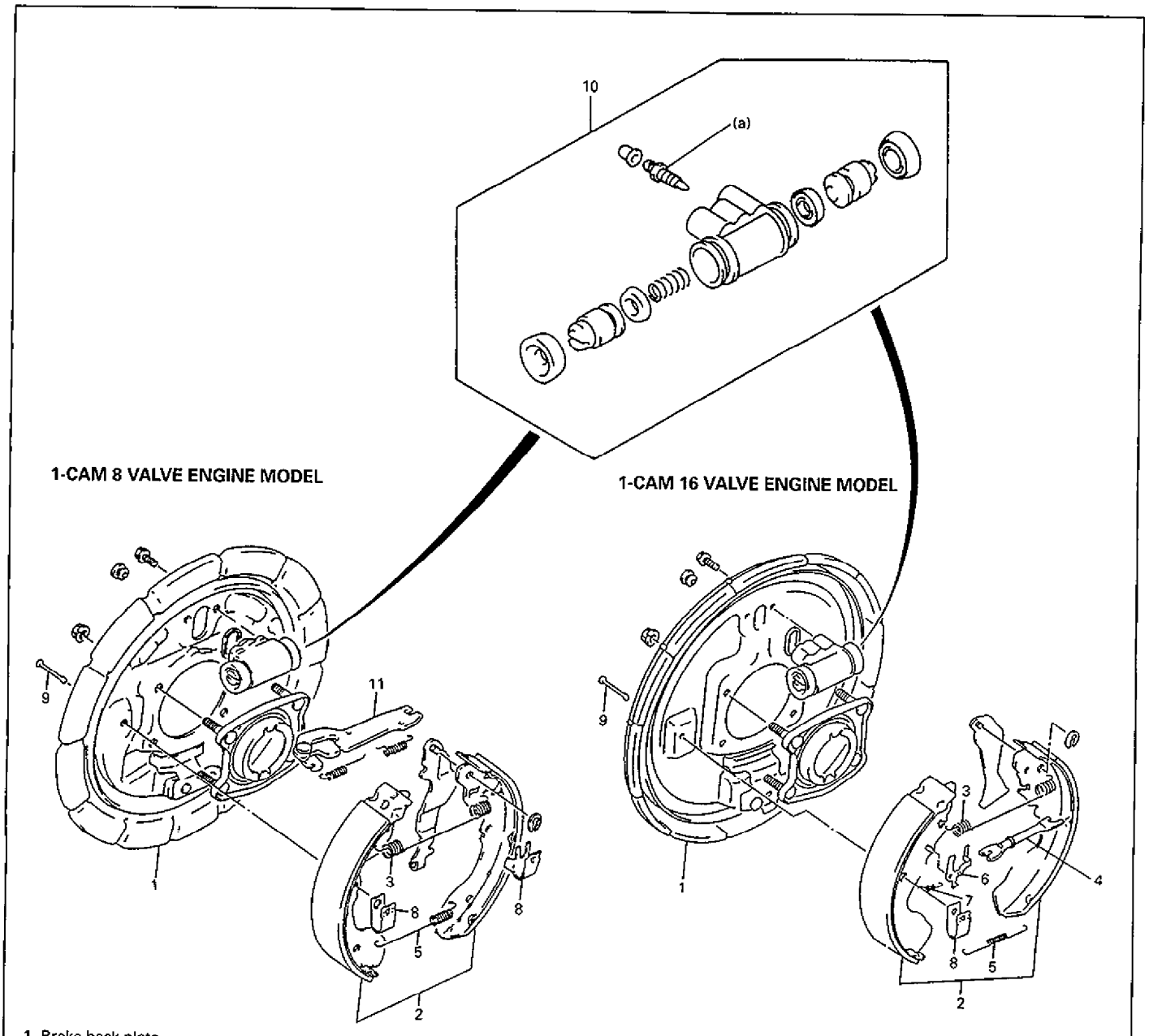
The drum brake assembly has a self shoe clearance adjusting system so that drum-to-shoe clearance is maintained apporpriate at all times. For details, refer to next page.

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. Adjuster
5. Shoe return lower spring
6. Pawl lever
7. Adjuster spring
8. Shoe hold down spring
9. Shoe hold down pin
10. Wheel cylinder
11. Brake strut

Tightening Torque
(a): 8.0 N·m (0.8 kg-m, 6.0 lb-ft)

For 1-cam 8 valve engine model

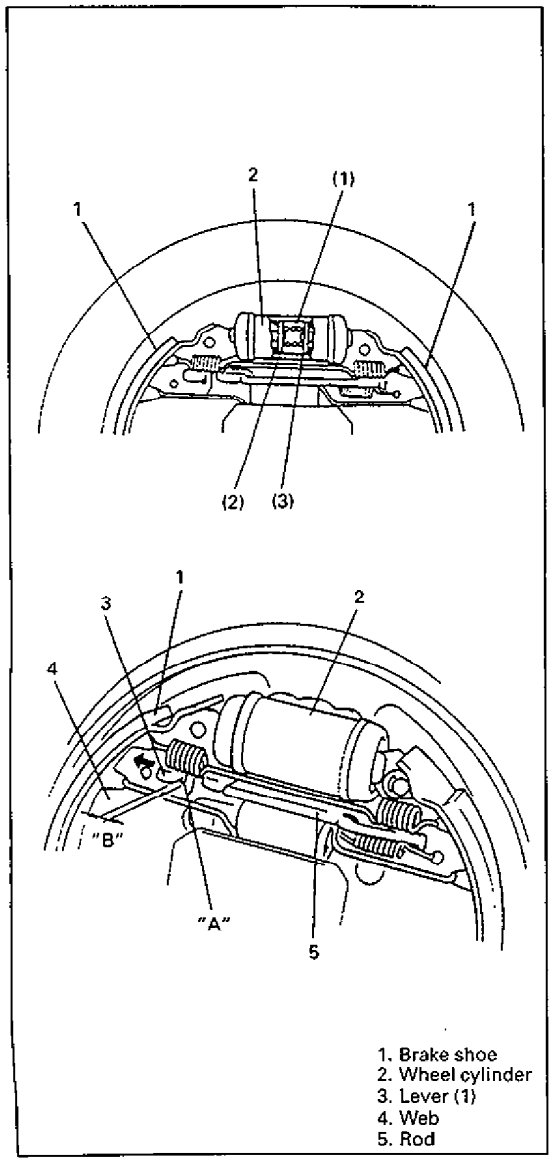
Rear Brake OPERATION

With the general drum brake type, when the brake pedal is depressed, two pistons in the wheel cylinder force the brake shoes outward, restraining the turn of the drum.

The more the brake shoes get worn, the longer distance the pistons must move. As a result, the brake pedal travel (pedal-to-wall clearance) increases. Then the shoe clearance must be adjusted by the shoe adjusting screws. Thus periodical adjustment is required for the drum brake type in general.

This rear brake is provided with a self-adjusting system which automatically adjusts the shoe-to-drum clearance (pedal-to-wall clearance) caused by such brake shoe wear.

61A10-5-5-1



1. Brake shoe
2. Wheel cylinder
3. Lever (1)
4. Web
5. Rod

60A70-5-6-2S

Clearance correction

In each rear wheel cylinder, pistons, piston cups, and a piston spring (1) are installed. When the brake pedal is depressed, fluid pressure is applied to the inside of the chamber on the pistons (2) and (3).

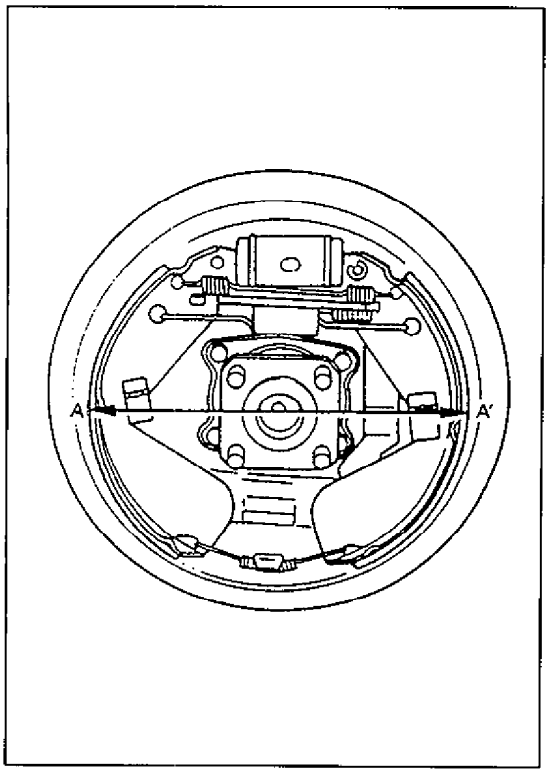
Being actuated by this pressure, the piston (2) moves to the left (piston (3) moves to the right) in the following figure and presses the brake shoe against the brake drum, thus producing brake force.

At this time, the distance the brake shoe moves is "B", that is, the distance that "A" (the end of the long hole made in the brake shoes web) moves till it contacts the lever (1) which is fitted in the long hole.

When the brake pedal is depressed, the piston and brake shoe move toward the brake drum side by the aforementioned distance "B" and "A" of the brake shoe web contacts the lever (1).

As the brake shoe gets worn and the brake shoe clearance becomes larger, the force applied to the lever (1) at the time of such a contact becomes larger. When it exceeds 31 – 36 kg (68 – 79 lbs), the "A" of the brake shoe web moves the lever (1) as much as the amount of the brake shoe lining wear toward the direction as shown with an arrow in the figure.

Thus the shoe is forced against the drum and the brake force is produced.

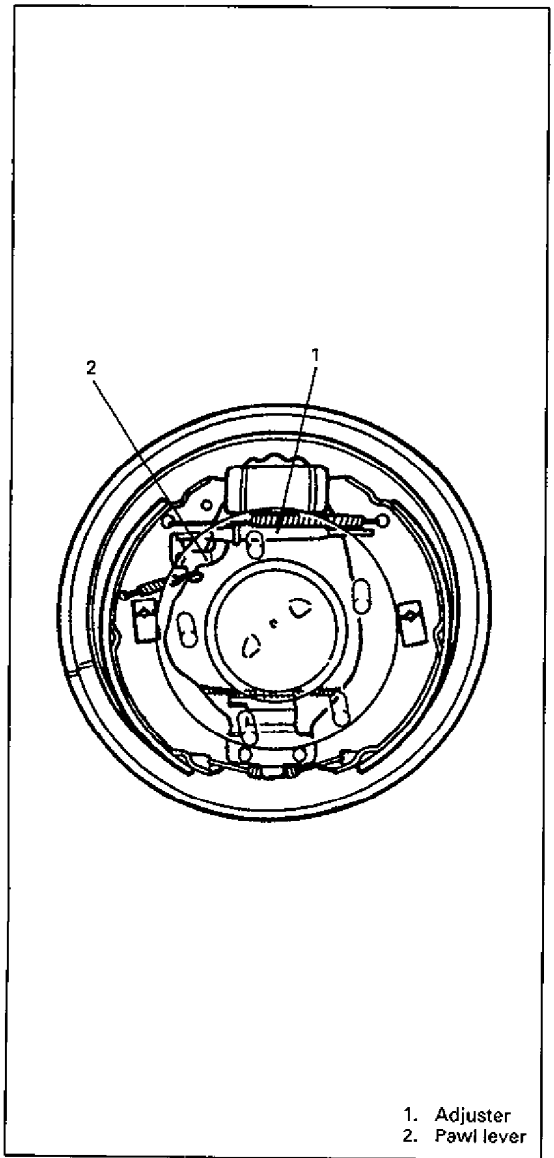


60A50-5-7-1S

The distance the lever (1) moves corresponds to the amount of wear. In accordance with the lever (1) movement, the fan-shaped ratchet (2) also moves, for they are assembled as a unit. The lever (1) and ratchet (2) remain in the positions as they moved until the shoe-to-drum clearance becomes even larger.
When the brake pedal is released, the brake shoe is allowed to move back by the amount of clearance "B" by means of the return spring. In this way, the brake shoe-to-drum clearance is automatically adjusted constant every time the brake pedal is depessed.

The brake shoe-to-drum clearance "B" corresponds to 0.5 – 0.6 mm (0.0196 – 0.0236 in.) in terms of the brake drum diameter A ↔ A'. And the amount adjusted by one notch of the ratchet corresponds to 0.20 mm (0.008 in.) in terms of the brake drum diameter A ↔ A'.

The spring provided in the wheel cylinder prevents the piston from moving back more than the specified brake shoe-to-drum clearance.



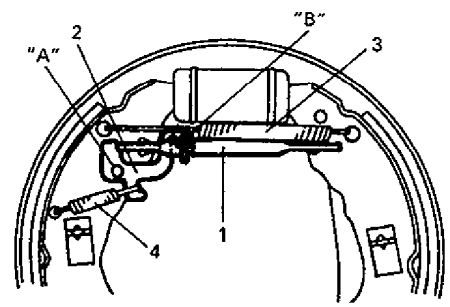
1. Adjuster
2. Pawl lever

61A10-5-6-3

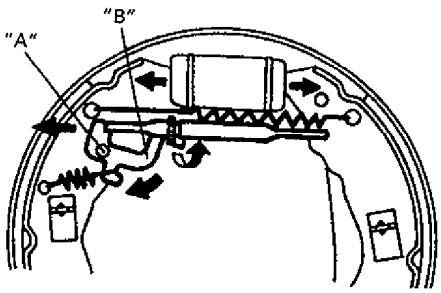
For 1-cam 16 valve engine model

Compensation of rear brake clearance

The brake is equipped with an auto-adjust mechanism which consists of an adjuster, pawl lever, etc.. When the brake pedal is depressed, shoe clearance is adjusted automatically.



1. Adjuster
2. Pawl lever
3. Shoe return spring
4. Adjuster return spring



85F00-5-5-3

The pawl lever supported by pin "A" is subject to the turning force caused by the spring but prevented from turning by the end of the adjuster. In this state, when the brake pedal is depressed, the gap between shoes increases while the length of the adjuster remains unchanged. As a result, the pawl lever moves in the direction as shown in the figure. At this time, with the tip "B" of the pawl lever engaged with the gear of the adjuster, the gear turns in the direction as indicated in the figure and the overall length of the adjuster increases. This is because the external thread of the adjuster gear is in mesh with the internal thread of the adjuster body and the gear turns in the unscrewing direction.

When the shoe clearance is large, every time the brake pedal is depressed, the gear turns by one notch. Once the clearance has reached the appropriate level, even when the brake pedal is depressed, the shoe stroke is not enough to cause the gear to turn by 1 notch (i.e., pawl lever does not move) and thus the clearance remains unchanged.

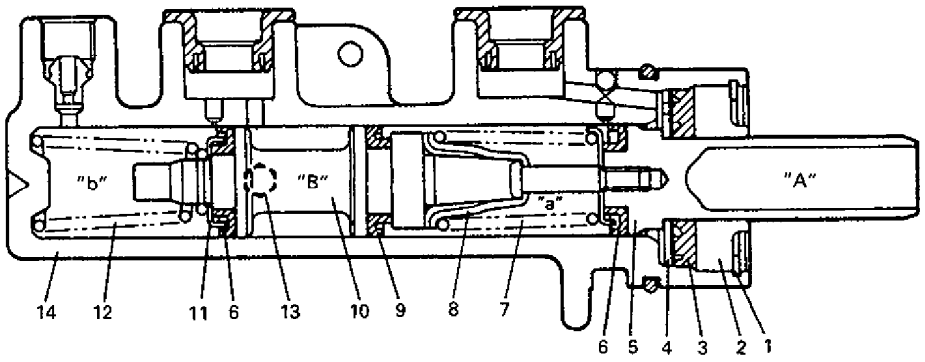
MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

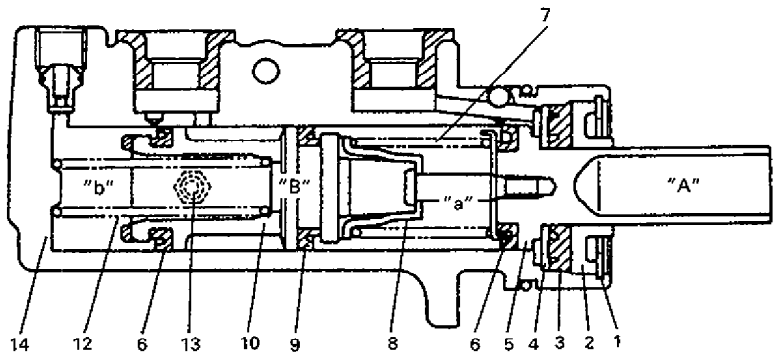
The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the below figure) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes (left and right).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes (left and right).

NOTE:
Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not 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.

For 1-cam 8 valve engine model



For 1-cam 16 valve engine model



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

"A": Primary piston
"B": Secondary piston

61A10-5-8-1

BOOSTER ASSEMBLY

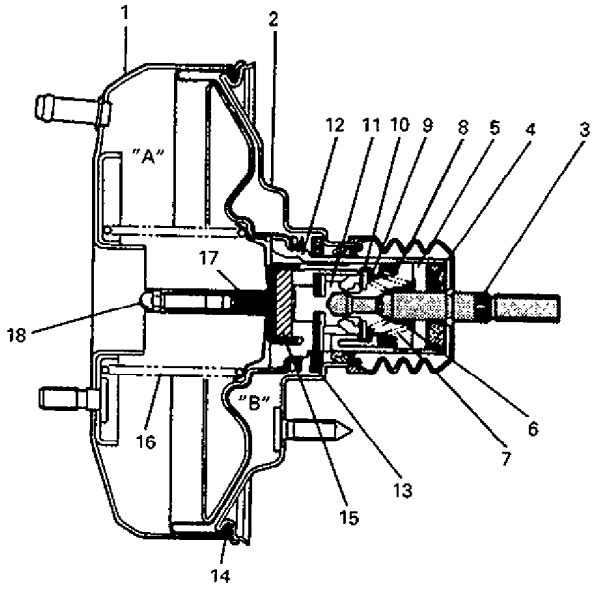
GENERAL DESCRIPTION

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:

- **Never disassemble brake booster assembly. If it is found faulty, replace it with new assembly.**
- **The torque values specified are for dry, unlubricated fasteners. If any hydraulic component is removed or brake line disconnected, bleed the brake system.**

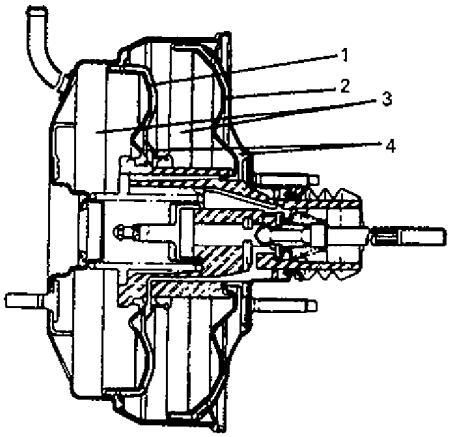
For 1-cam 8 valve engine model (8 in. Booster)



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. 8 in. diaphragm
15. Reaction disc
16. Booster piston return spring
17. Booster piston rod
18. Booster rod adjust screw

61A10-5-9-1

For 1-cam 16 valve engine model (7 & 8 in. Booster)



1. 7 in. diaphragm
2. 8 in. diaphragm
3. Chamber "A"
4. Chamber "B"

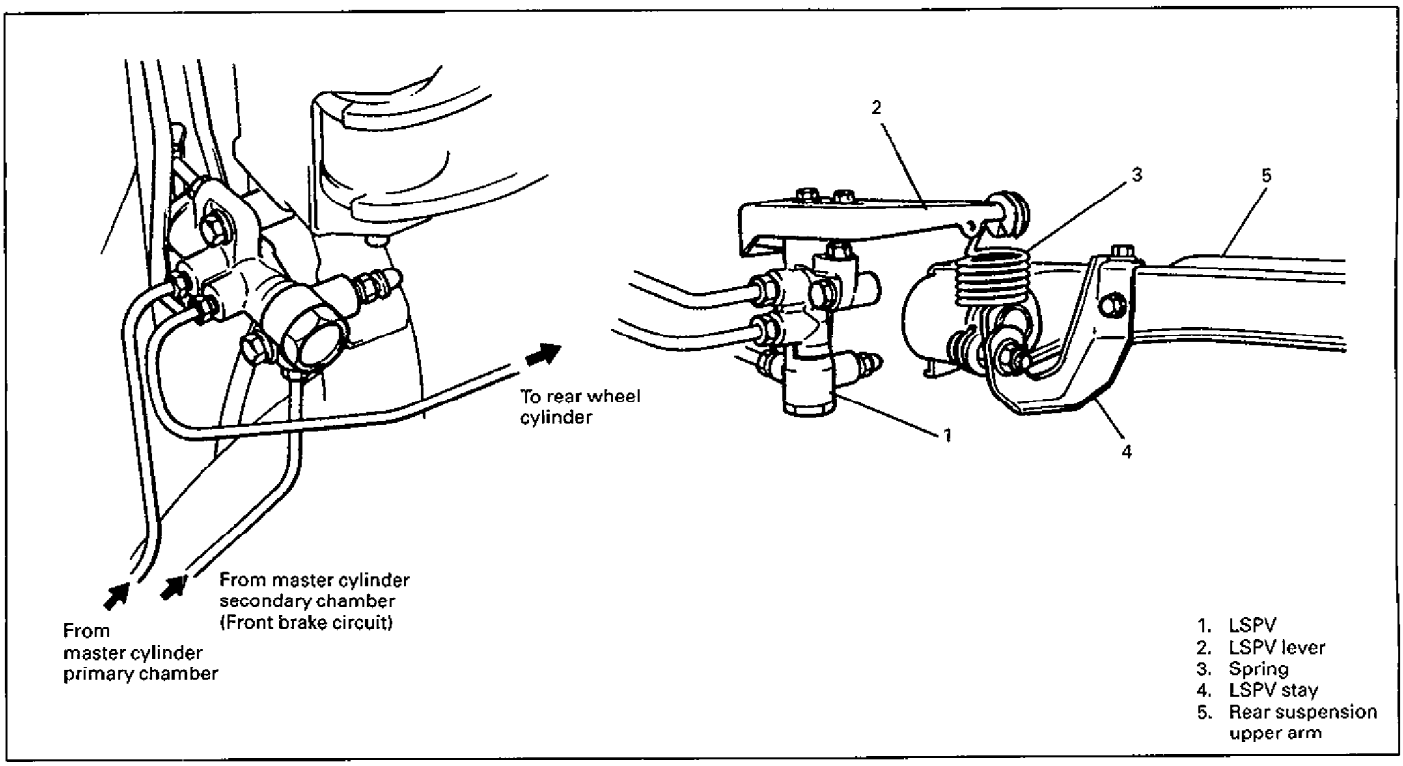
61A10-5-9-2

LSPV (Load Sensing Proportioning Valve) ASSEMBLY [3-Door Vehicle]

GENERAL DESCRIPTION

As shown in figure 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.



61A10-5-10-1

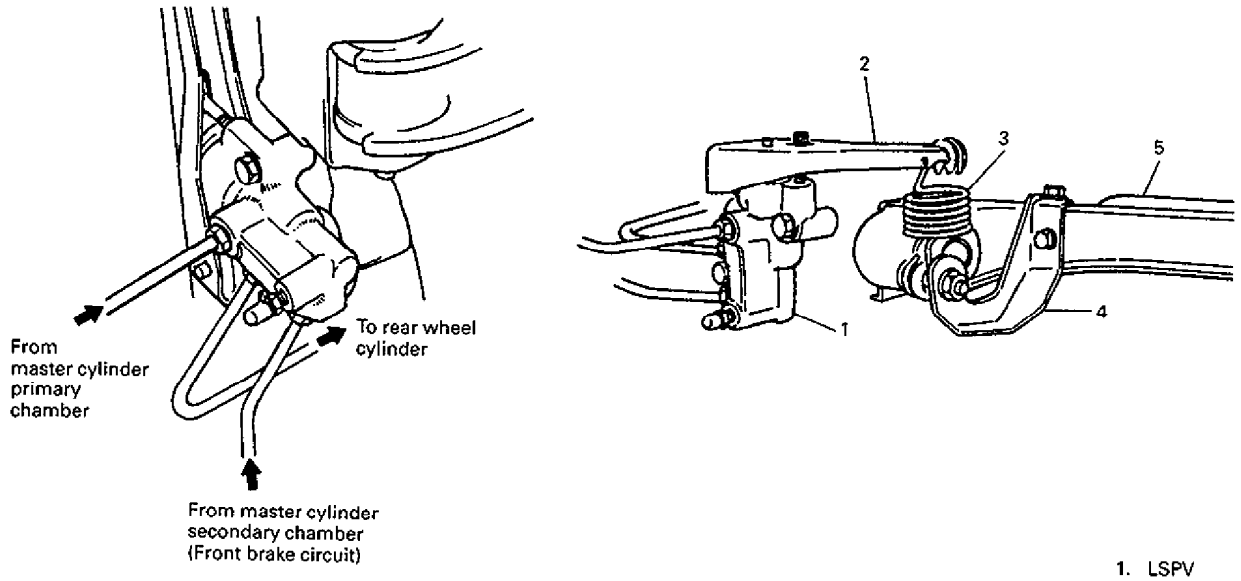
For CONSTRUCTION and OPERATION, refer to Section 5 of the Service Manual mentioned in FOREWORD of this manual.

[5-Door Vehicle]

GENERAL DESCRIPTION

As shown in figure 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.

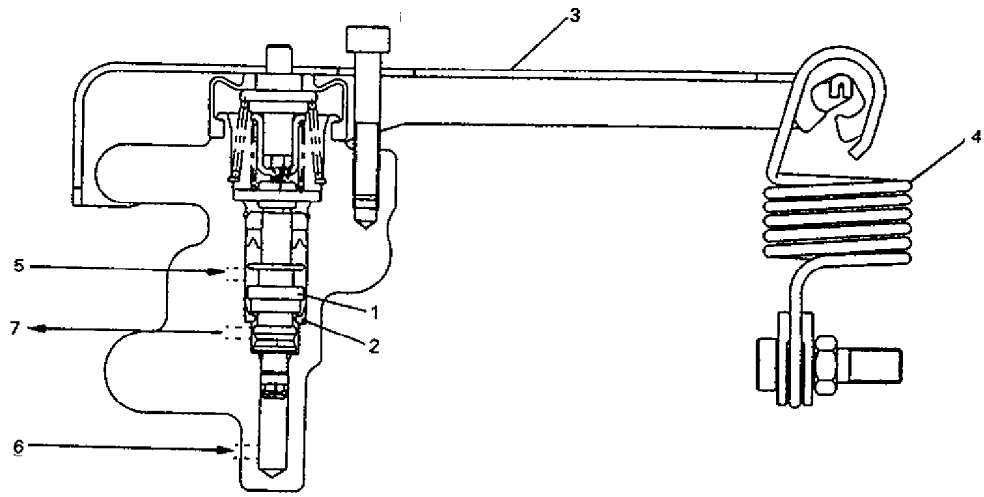
If the front hydraulic pressure fail to increase (failure in the front brake circuit), it is so designed that the fail-safe mechanism works and a hydraulic pressure higher than in normal condition is applied to rear wheel cylinders.



1. LSPV
2. LSPV lever
3. Spring
4. LSPV stay
5. Rear suspension upper arm

61A10-5-11-1

CONSTITUTION



1. Plunger
2. Lip seal
3. LSPV lever
4. Sensor spring
5. From master cylinder primary chamber (Rear wheel brake)
6. From master cylinder secondary chamber (Front wheel brake)
7. To rear wheel brake

61A10-5-11-2

OPERATION

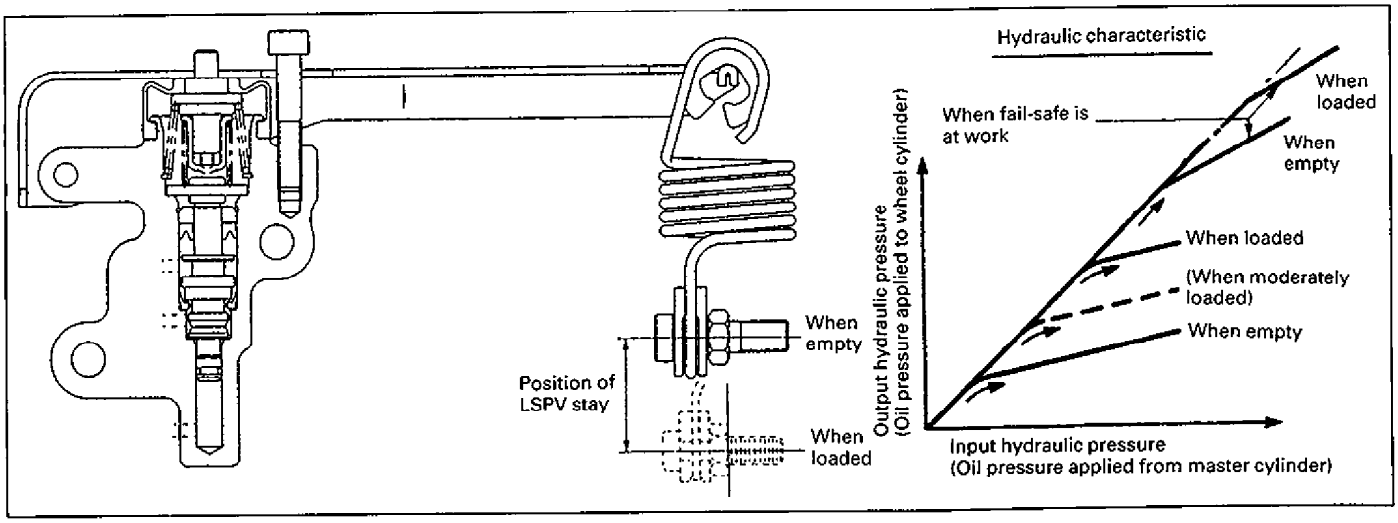
LSPV is installed to the vehicle body, with the end of the lever at its top connected to the upper arm of the rear suspension by way of the sensor spring and the LSPV stay.
When some load is placed on the vehicle, the distance between the axle housing of the rear suspension and the vehicle body (chassis) (i.e. coil spring height) changes, whereby the sensor spring length also changes.
As the sensor spring length changes, the force affecting the plunger in LSPV by way of the lever changes so that the hydraulic characteristic suitable for the load weight becomes available.

When empty

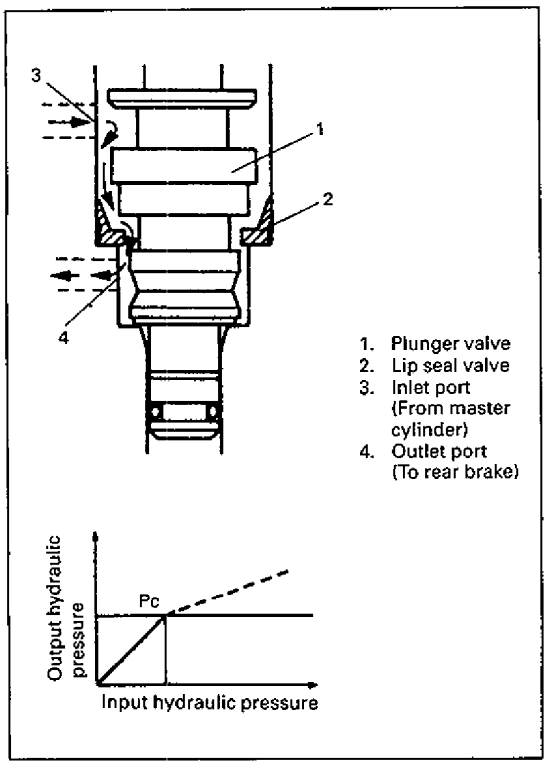
As the sensor spring is pulled by comparatively weak force, the force applied to the plunger is also small and the hydraulic characteristic takes a low bend point as shown in the graph below.

When loaded

As the sensor spring is pulled by comparatively strong force, a larger force is applied to the plunger so that the hydraulic characteristic takes a higher bend point in the graph below.
The relationship between the force applied to the plunger and the bend point in the hydraulic characteristic graph is described on the following page.



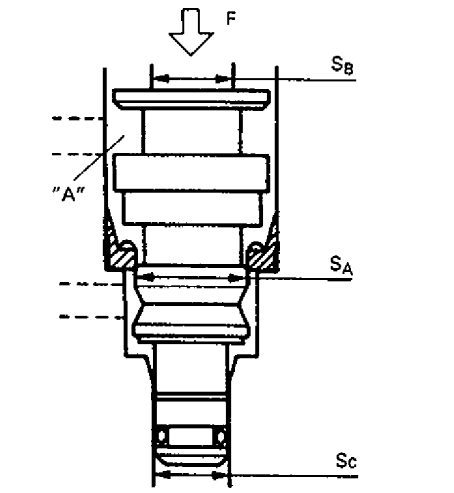
85F00-5-14-1

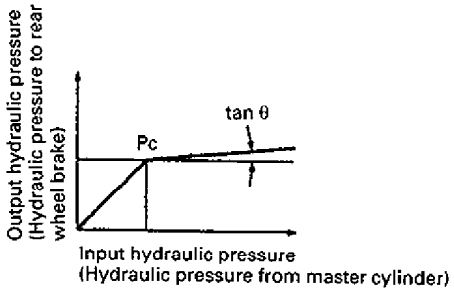


85F00-5-14-4

When LSPV not at work

Operation from the inoperative state till the input hydraulic pressure (fluid pressure from the master cylinder) reaches the bend point Pc in the graph as shown.
The input hydraulic pressure passes between the plunger and lip seal (valve) and without receiving any control, it is discharged through the outlet port.





Reference:
The bend point Pc and gradient tan θ are obtained by using the following equations.

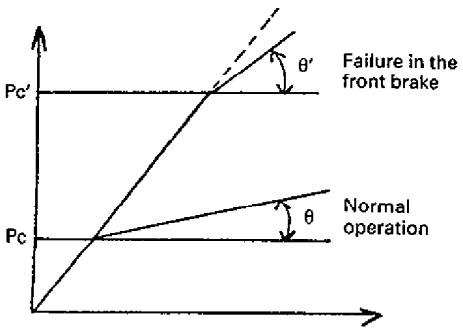
$$Pc = \frac{F}{S_B} \qquad \tan\theta = \frac{S_A - S_B - Sc}{S_A - Sc}$$

F : Force from sensor spring
S_A : Larger diameter sectional area of plunger
S_B : Smaller diameter sectional area of plunger
Sc : Sectional area of plunger to lip seal contact

85F00-5-15-1

When LSPV at work

As the input hydraulic pressure increases, the force applied to the plunger grows stronger than the sensor spring force and moves the plunger upward in the figure and as a result, the valve closes the fluid passage. Then the hydraulic pressure is represented by the bend point Pc in the graph.
As the incoming hydraulic pressure rises even higher, the hydraulic pressure "A" increases and pushes down the plunger, opening the fluid passage.
By repeating this operation (open/close), the valve controls the output hydraulic pressure (hydraulic pressure to the rear brake).
Therefore its characteristic is represented as a line with a certain gradient.



$$Pc' = \frac{F}{S_B - Sc} \qquad \tan\theta' = \frac{S_A - S_B}{S_A - Sc}$$

$Pc < Pc'$
$\tan\theta < \tan\theta'$

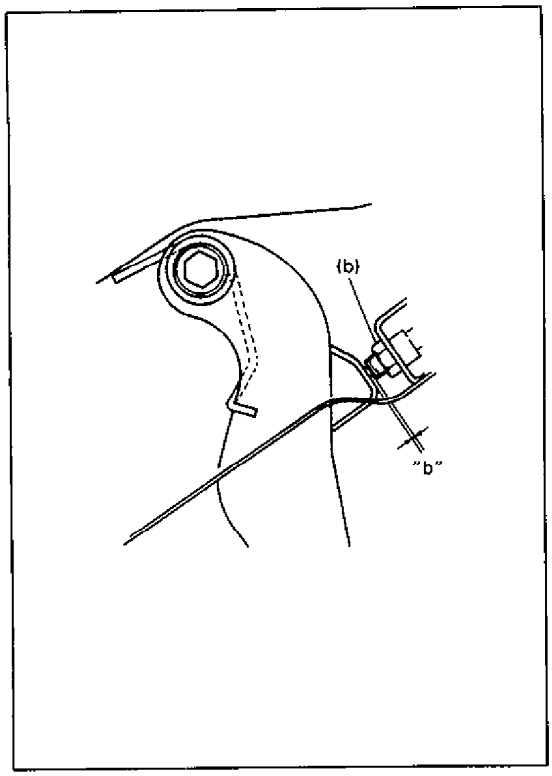
85F00-5-15-4

When fail-safe at work

When the hydraulic pressure is not applied to the front brake (secondary), the force to push up the plunger reduces by the amount corresponding to that of the front brake. This means that in order for the plunger to operate, a higher than normal hydraulic pressure is required for the rear brake (primary).
Thus, a hydraulic pressure exceeding the normal level is supplied to the rear brake (rear wheel cylinder).

ON VEHICLE SERVICE

BRAKE LIGHT SWITCH ADJUSTMENT

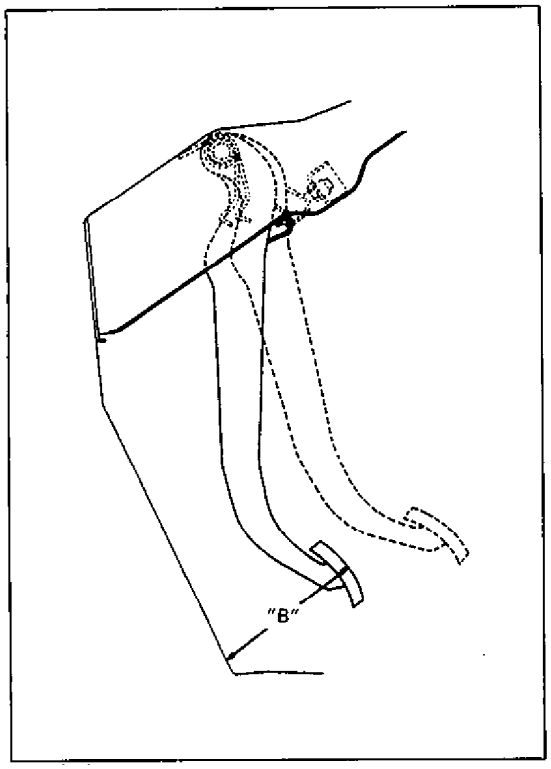


61A10-5-14-1

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 return cushion (shown as "a" in figure). Then tighten lock nut to specified torque.

Clearance "b": 1.5 – 2.0 mm (0.06 – 0.08 in.)
Tightening Torque
(b): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

EXCESSIVE PEDAL TRAVEL CHECK



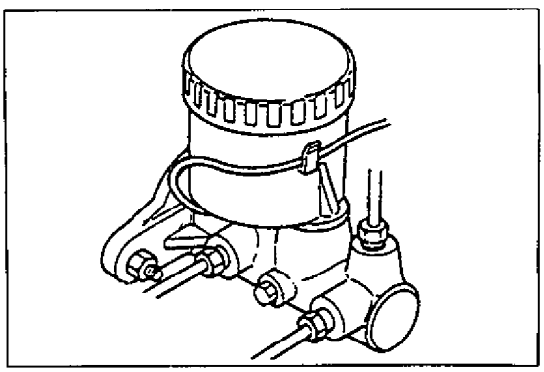
61A10-5-14-3

1) Start engine.
2) Depress brake pedal a few times.
3) With brake pedal depressed with approximately 30 kg (66 lbs) load, measure pedal arm to wall clearance "B". It mustn't be less than 80 mm (3.15 in.).

   Clearance "B": 80 mm (3.15 in.)

4) If clearance "B" is less than 80 mm (3.15 in.), the most possible cause is either rear brake shoes are worn out beyond limit or air is in lines.
   Should clearance "B" remain less than 80 mm (3.15 in.) even after replacement of brake shoes and bleeding of system, other possible but infrequent cause is malfunction of rear brake shoe adjusters or booster push rod length out of adjustment for the vehicle with brake booster.

MASTER CYLINDER INSPECTION

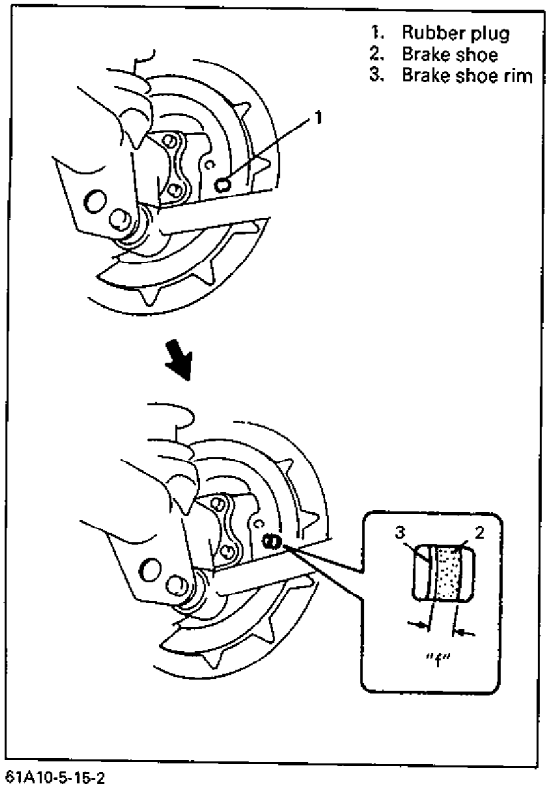

85F00-5-17-2

Check for a cracked master cylinder casting or brake fluid around the master cylinder. Leaks are indicated only if there is at least a drop of fluid. A damp condition is not abnormal.

DISC INSPECTION

Refer to item DISC BRAKE INSPECTION of this section for inspection point and procedure.

85F00-5-17-3



61A10-5-15-2

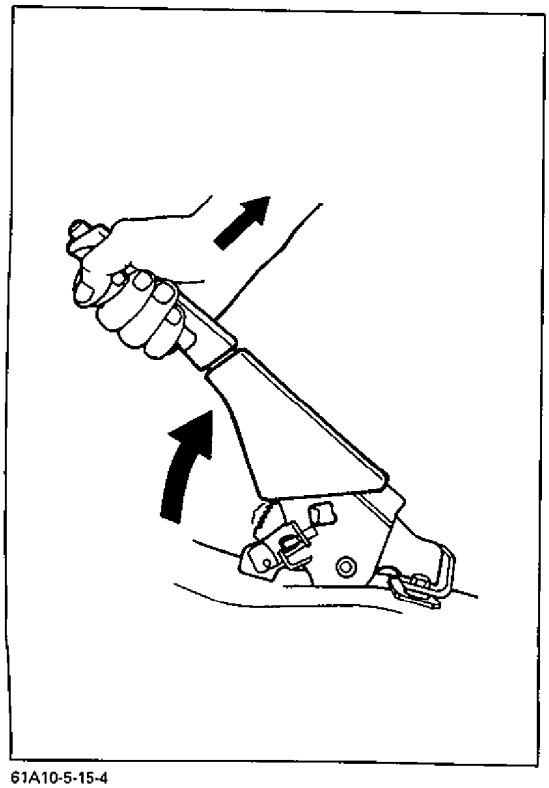
REAR BRAKE SHOE INSPECTION

Inspection should be carried out on following points after brake pedal travel "B" (pedal arm to wall clearance) check as described on previous page of this section, even when it is more than 80 mm (3.15 in.).

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 "f" is found less than below specified wear limit, replace with new brake shoes.

Thickness "f"
Service Limit: 1.0 mm (0.04 in.)



61A10-5-15-4

PARKING BRAKE INSPECTION AND ADJUSTMENT

a) Inspection

Hold center of parking brake lever grip and pull it up with 20 kg (40 lbs) force.

With parking brake lever pulled up as shown, count ratchet notches.

There should be 6 to 8 notches.

Also, check if both right and left rear wheels are locked firmly.

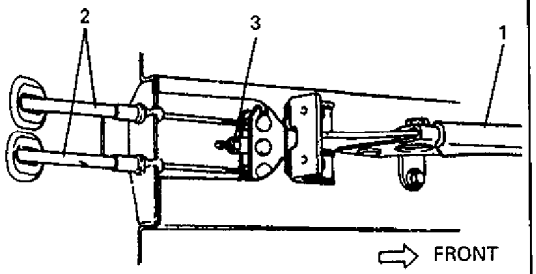
To count number of notches easily, listen to click sounds that ratchet makes while pulling parking brake lever without pressing its button.

One click sound corresponds to one notch.

If number of notches is out of specification, adjust cable by referring to adjustment procedure described on the following step b) 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. Self locking nut

60A00-5-23-1

b) Adjustment

NOTE:
Make sure for 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 (44 lbs) force.**
- **Rear brake shoes are not worn beyond limit, and self adjusting mechanism operates properly.**
- **To slacken parking brake cable, loosen selflocking nut as far as end of bolt. Then depress brake pedal a few times with about 30 kg (66 lbs) load.**

After confirming that above 6 conditions are all satisfied, adjust parking brake lever stroke by loosening or tightening locking nut.

NOTE:
Check brake drum for dragging after adjustment.

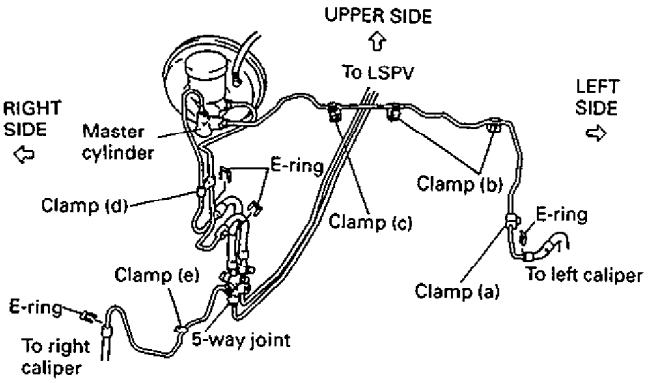
Parking brake stroke; when lever is pulled up at 20 kg (44 lbs)	6 to 8 notches

BRAKE HOSE/PIPE R & I

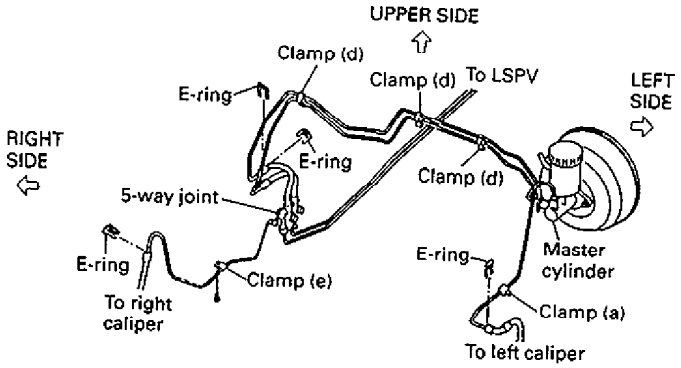
REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and suitably support vehicle. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and flexible hose.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation procedure.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check installed part for fluid leakage.

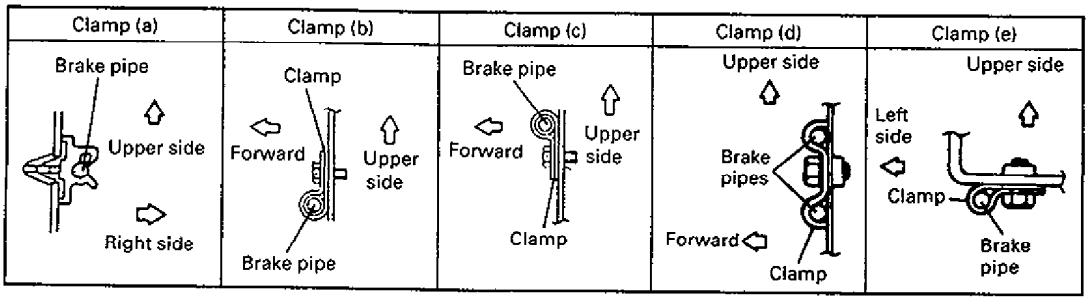
FOR RIGHT HAND STEERING VEHICLE



FOR LEFT HAND STEERING VEHICLE

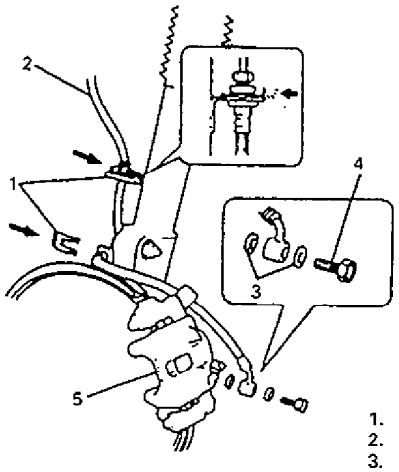


NOTE: Viewed from arrow "A"



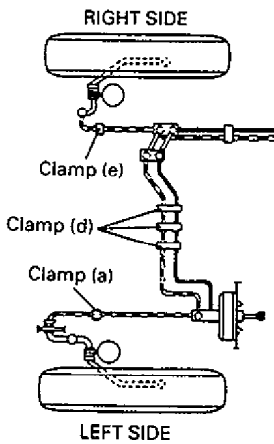
NOTE:
Insert E-ring till its end surface is flush with or lower than bracket and surface.

Tightening torque for	N·m	kg-m	lb-ft
brake pipe flare nuts	16	1.6	12.0
Tightening torque for 5-way joint bolt	10	1.0	7.5

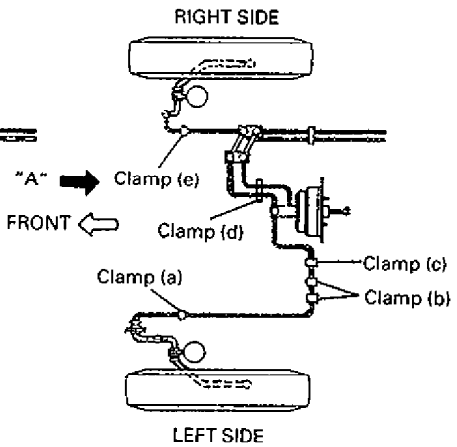


"A" ➡
FRONT ⇦

FOR LEFT HAND STEERING VEHICLE



FOR RIGHT HAND STEERING VEHICLE



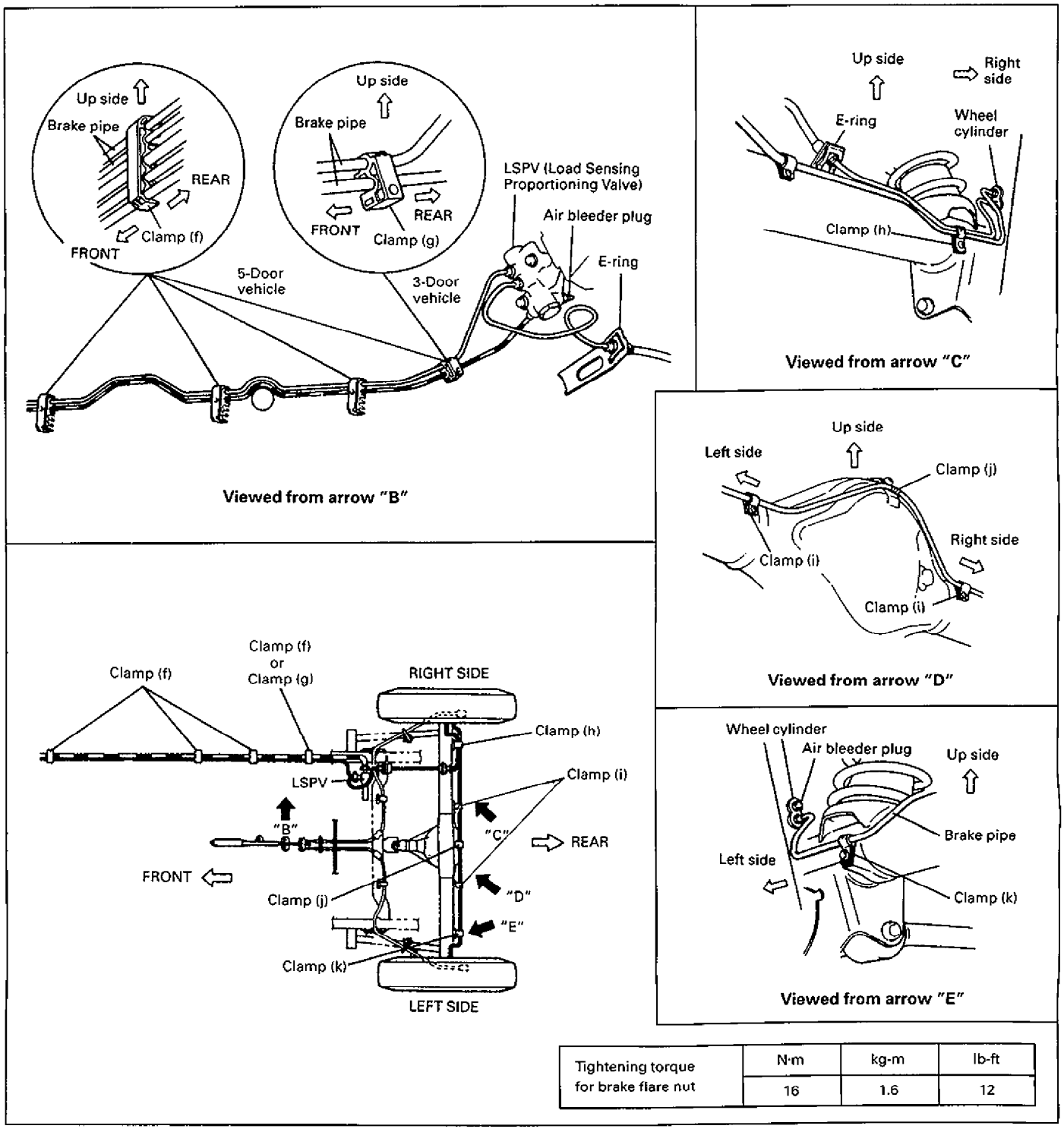
1. E-ring
2. Flexible hose
3. Hose washer
4. Hose bolt
5. Brake caliper

REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

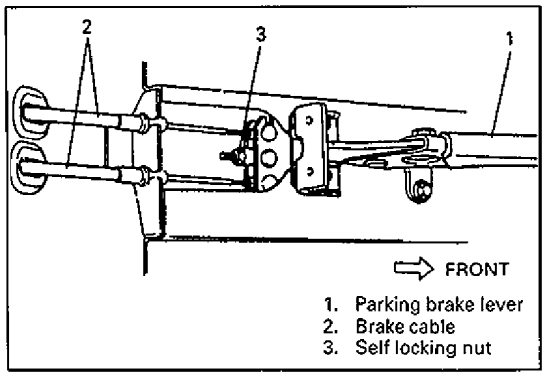
1) Raise and suitably support vehicle. Remove tire and wheel.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check each installed part for fluid leakage.

PRECAUTION FOR INSTALLATION

- Be sure to obtain more than 3 mm (0.118 in.) clearance between axle housing and brake pipe.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



Tightening torque for brake flare nut	N·m	kg-m	lb-ft
	16	1.6	12



1. Parking brake lever
2. Brake cable
3. Self locking nut

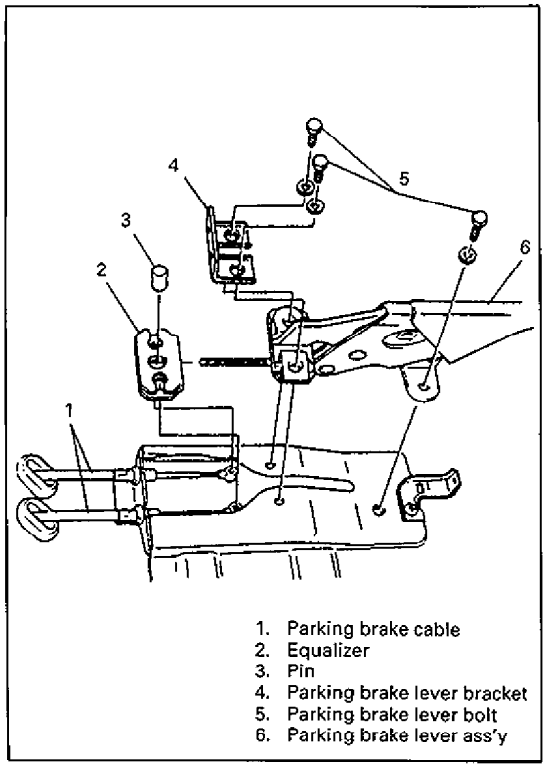
61A10-5-19-1

PARKING BRAKE LEVER/CABLE R & I

REMOVE AND INSTALL PARKING BRAKE LEVER

REMOVAL

1) Disconnect negative (–) cable at battery.
2) Block vehicle wheels and release parking brake lever.
3) Remove parking brake lever cover.
4) Disconnect lead wire of parking brake switch at coupler.
5) Remove parking brake cable locking nut.

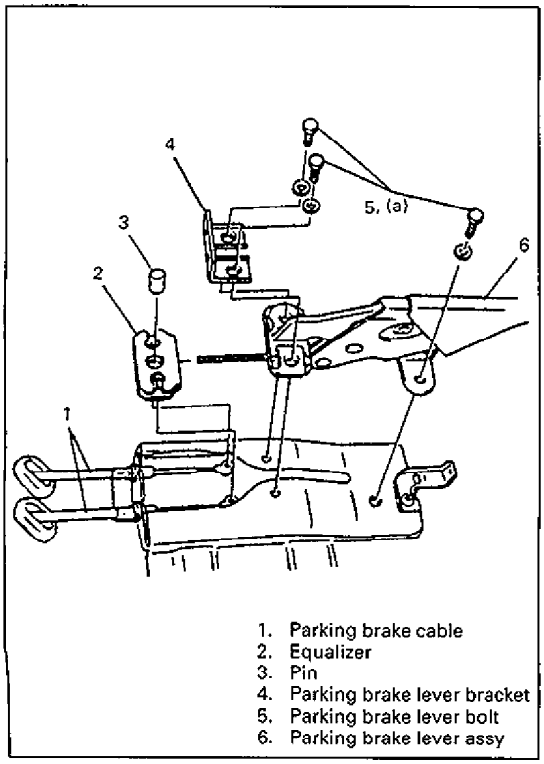


1. Parking brake cable
2. Equalizer
3. Pin
4. Parking brake lever bracket
5. Parking brake lever bolt
6. Parking brake lever ass'y

61A10-5-19-2

6) Remove parking brake lever bolts and then remove parking brake lever assembly from equalizer.
7) Remove equalizer from parking brake cable.

NOTE:
Don't disassemble parking brake lever switch. It must be removed and installed as a complete switch assembly.



1. Parking brake cable
2. Equalizer
3. Pin
4. Parking brake lever bracket
5. Parking brake lever bolt
6. Parking brake lever assy

61A10-5-19-4

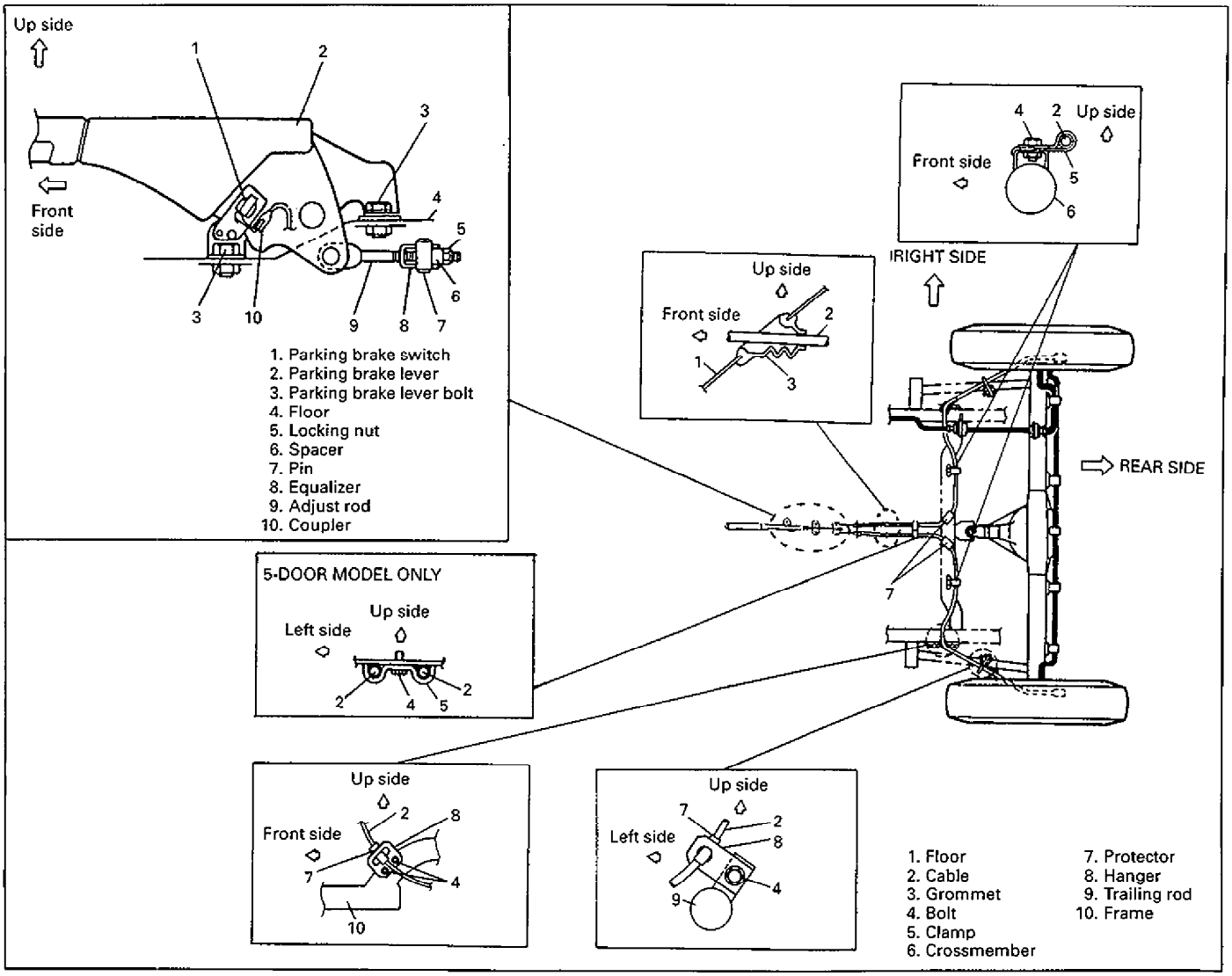
INSTALLATION

1) Install in reverse order of REMOVAL procedure.

Tightening Torque for parking brake lever bolts.
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

2) After all parts are installed, parking brake lever needs to be adjusted. Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT in this section (Page 5-15, 16).
3) Check brake drum for dragging and brake system for proper performance.

REMOVE AND INSTALL PARKING BRAKE CABLE



61A10-5-20-1

REMOVAL

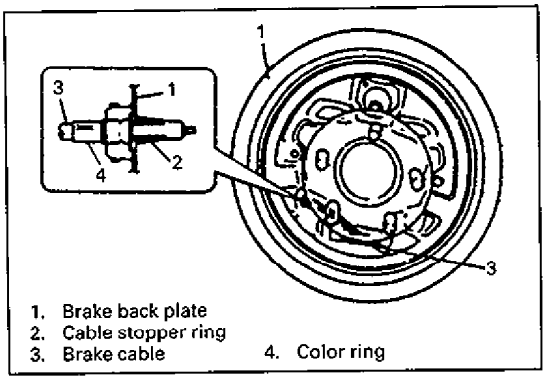
1) Remove brake drum. (Refer to BRAKE DRUM REMOVAL of this section, page 5-23.)
2) Check the color of ring for reinstallation.

NOTE:
Color ring on brake cable is for the purpose of identification.

3) Disconnect parking brake cable from brake shoe lever. (Refer to steps 2) & 3) of BRAKE SHOE REMOVAL of this section, page 5-26.)
4) Disconnect brake cable from brake back plate. (Refer to step 4) of BRAKE BACK PLATE REMOVAL section, page 5-29.)

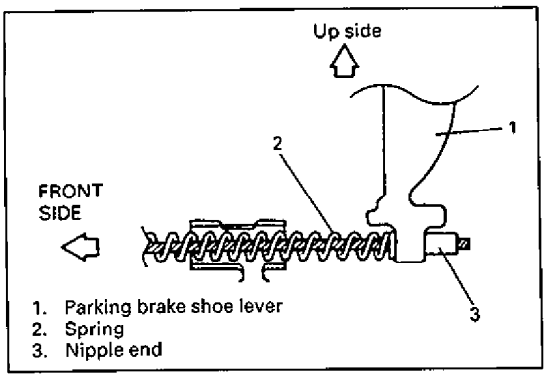
NOTE:
When it is necessary to remove both right and left parking brake cables, repeat above steps 1) to 4) on right and left wheels.

5) Remove cable from parking brake lever. (Refer to steps 1) to 5) of PARKING BRAKE LEVER REMOVAL of this section, page 5-19.)



1. Brake back plate
2. Cable stopper ring
3. Brake cable
4. Color ring

61A10-5-21-1



1. Parking brake shoe lever
2. Spring
3. Nipple end

60A40-5-33-2

INSTALLATION

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

1) Install brake cable stopper ring to brake back plate securely as shown in figure.

NOTE:
Color ring on brake cable is for the purpose of identification. Use cable with the same colored ring as before removal.

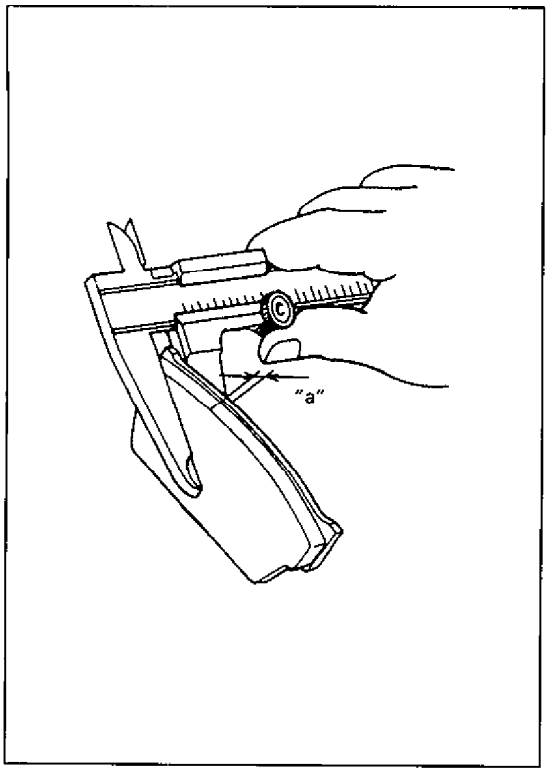
2) Instal brake cable spring and nipple end to parking brake shoe lever securely as shown in figure.

3) For brake shoe installation, refer to steps 1) and 2) of BRAKE SHOE INSTALLATION of this section, page 5-27.
4) For brake drum installation, refer to steps 1) and 2) of BRAKE DRUM INSTALLATION of this section, page 5-24.
5) For proper routing and secure clamping of parking brake cable.
6) For installation of cable to parking brake lever, refer to PARKING BRAKE LEVER INSTALLATION of this section, page 5-19.

61A10-5-21-3

7) Upon completion of installation, adjust cable. (Refer to PARKING BRAKE INSPECTION AND ADJUSTMENT of this section, page 5-15.) Then check brake drum for dragging and brake system for proper performance. After removing vehicle from hoist, brake test should be performed.

61A10-5-21-4



61A10-5-22-1

DISC BRAKE INSPECTION

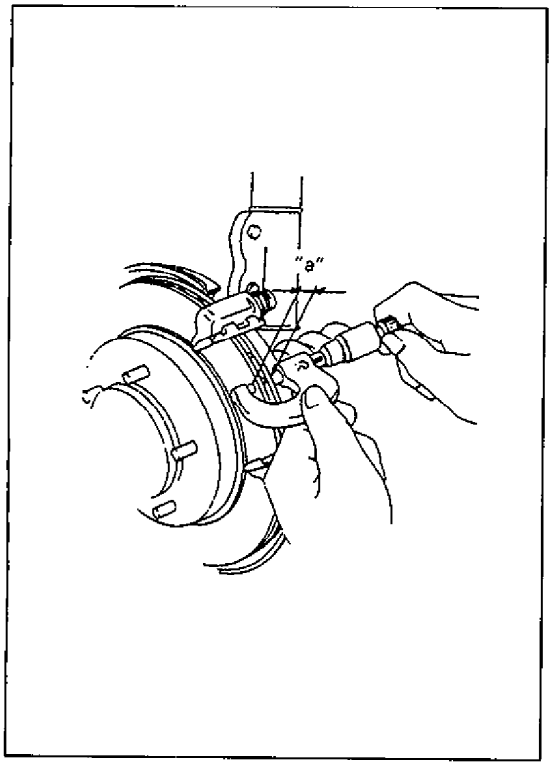
INSPECT BRAKE PAD LINING

Check pad lining for wear. When wear exceeds limit, replace with new one.

CAUTION:
Never polish pad lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage disc. When pad lining requires correction, replace it with a new one.

Pad thickness (lining + rim) "a"
Standard: 15.0 mm (0.590 in.) For 3-door vehicle
15.5 mm (0.610 in.) For 5-door vehicle
Service limit: 8.0 mm (0.315 in)

NOTE:
When pads are removed, visually inspect caliper for brake fluid leak. Correct leaky point, if any.

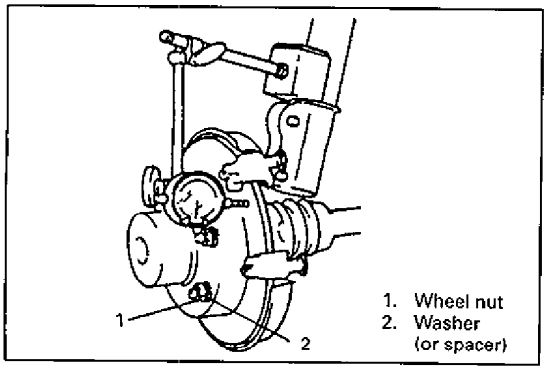


61A10-5-22-3

INSPECT BRAKE DISC

Before this inspection, brake pads must be removed.
Check disc surface for scratches in wearing parts. Scratches on disc surface noticed at the time of specified inspection or replacement are normal and disc is not defective unless they are serious.
But when there are deep scratches or scratches all over disc surface, replace it. When only one side is scratched, polish and correct that side.

Disc thickness "a"
Standard: 10 mm (0.394 in.) For 3-door vehicle
17 mm (0.670 in.) For 5-door vehicle
Service limit: 8 mm (0.315 in.) For 3-door vehicle
15 mm (0.590 in.) For 5-door vehicle



85F00-5-24-5

Use wheel nuts and suitable plain washers to hold the disc securely against the hub, then mount a dial indicator as shown and measure the runout at 25 mm (0.98 in.) from the outer edge of the disc.

Limit on disc deflection: 0.15 mm (0.006 in.)

NOTE:
Check front wheel bearing for looseness before measurement.

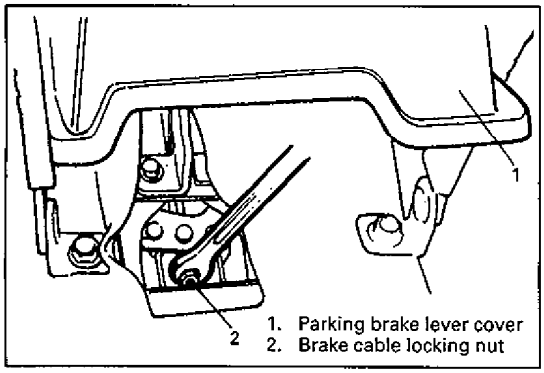
DRUM AND COMPONENTS R & I

REMOVE AND INSTALL BRAKE DRUM

REMOVAL

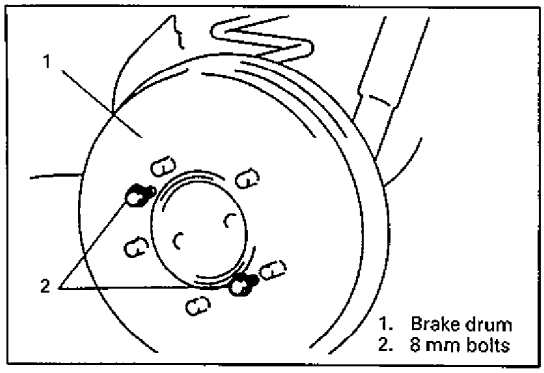
1) Hoist vehicle and pull up parking brake lever.
2) Remove wheel.

85F00-5-25-1



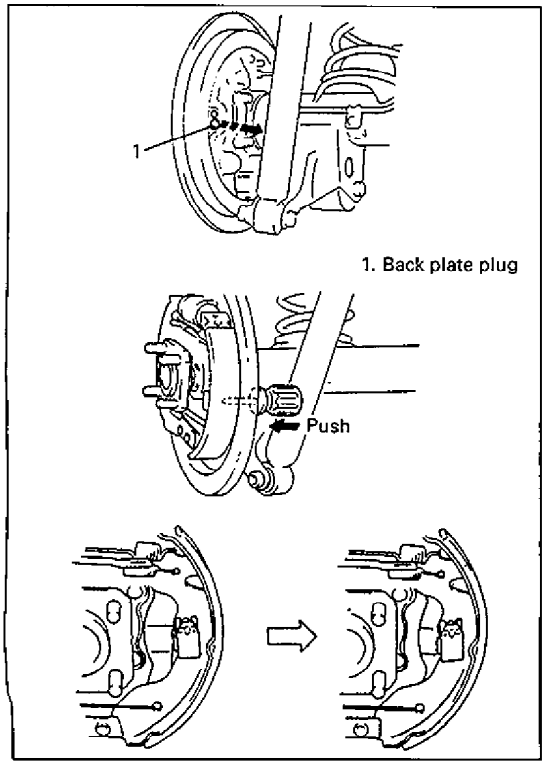
3) Release parking brake lever.
4) Remove parking brake lever cover screws and with rear part of brake lever cover lifted a little, loosen parking brake cable locking nut.

85F00-5-25-2



5) Remove brake drum by using 8 mm bolts (2 pcs).

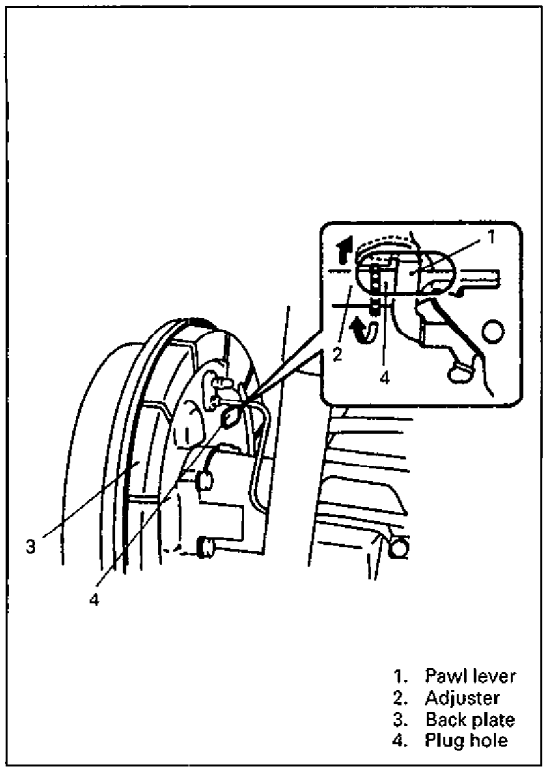
85F00-5-25-3



For 1-cam 8 valve engine model

NOTE:
Remove back plate plug attached to the back side of brake back plate so as to increase clearance between brake shoe and brake drum.
Insert screwdriver into plughole till its tip contacts shoe hold down spring and push it in arrow direction.
With this push, hold down spring is pushed up and releases parking shoe lever from hold down spring, resulting in larger clearance.

61A10-5-23-4

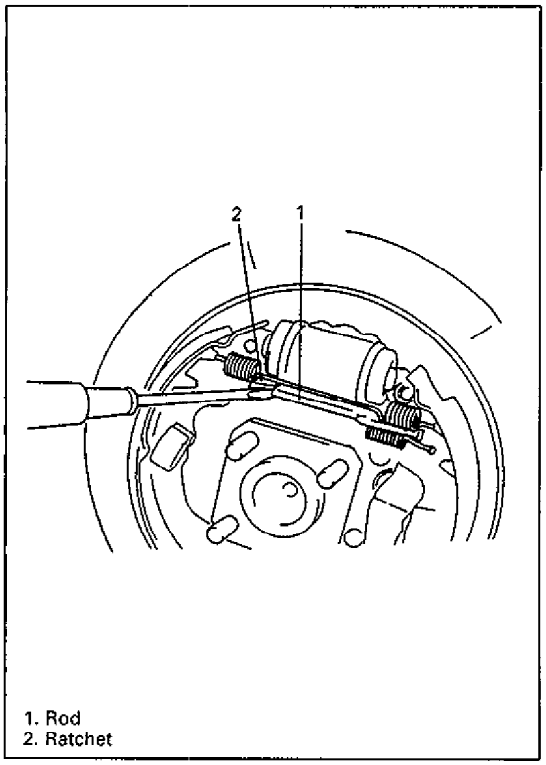


1. Pawl lever
2. Adjuster
3. Back plate
4. Plug hole

61A10-5-24-1

For 1-cam 16 valve engine model

NOTE:
If brake shoe is in the way and makes brake drum removal difficult, increase clearance between brake shoes and brake drum as follows.
Remove back plate plug installed to backside of brake back plate and insert 2 screwdrivers into plug hole. Then push up pawl lever with one screwdriver and turn adjuster with another in such direction as indicated in figure so as to obtain larger clearance.



1. Rod
2. Ratchet

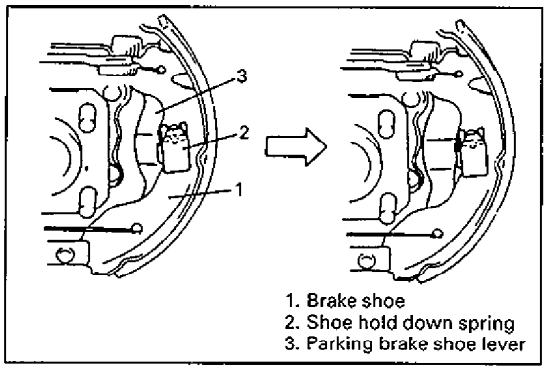
61A10-5-24-3

INSTALLATION

NOTE:
See NOTE at the beginning of the section.

For 1-cam 8 valve engine model

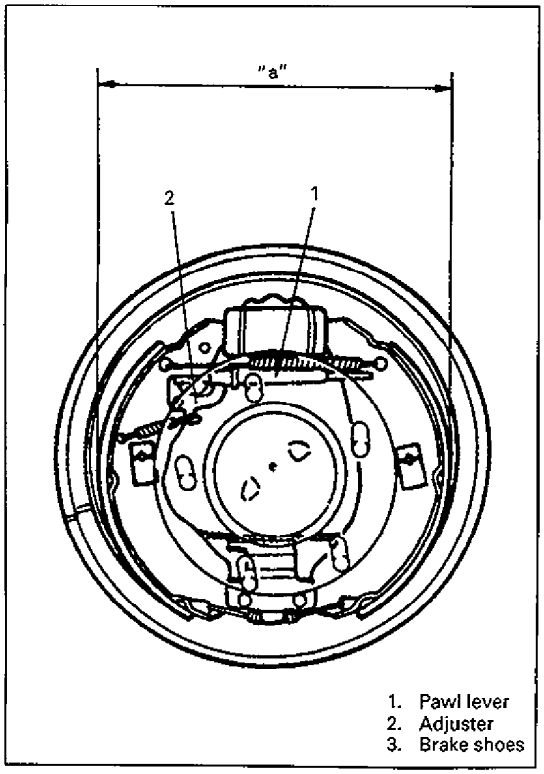
1) ① Before installing brake drum, to maximize brake shoe-to-drum clearance, put screwdriver between rod and ratchet and push down ratchet as shown in left figure.



1. Brake shoe
2. Shoe hold down spring
3. Parking brake shoe lever

61A10-5-24-5

② Put brake shoe hold down spring back to its original position as shown. (Put shoe hold down spring in place by moving shoe lever so that shoe lever comes to the side of shoe hold down spring.)



61A10-5-25-1

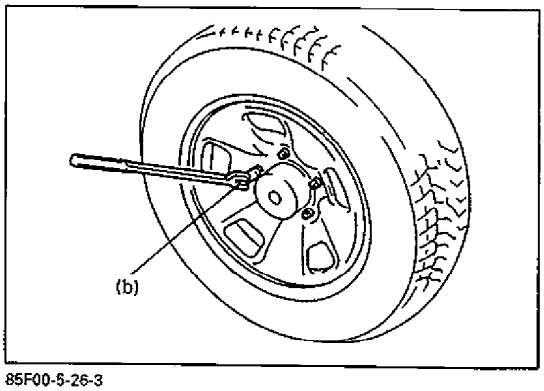
For 1-cam 16 valve engine model

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 ± 0.3 mm (8.638 ± 0.012 in.) For 3-door vehicle
253.5 ± 0.2 mm (9.980 ± 0.0079 in.) For 5-door vehicle

2) Install brake drum after making sure that inside of brake drum and brake shoes are free from dirt and oil.
3) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to ten times so as to obtain proper drum-to-shoe clearance.
   Adjust parking brake cable. (For adjustment, see page 5-15)
4) Tighten parking brake lever cover screws.

61A10-5-25-3

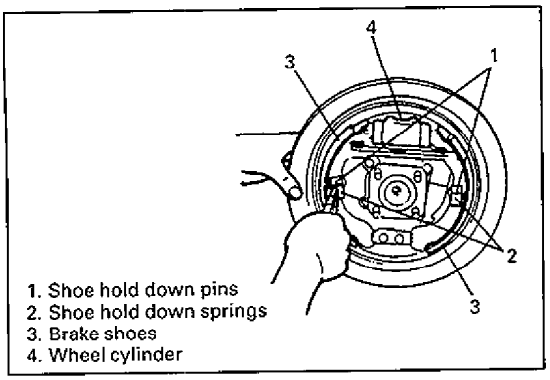


85F00-5-26-3

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

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

6) Check to ensure that brake drum is free from dragging and proper braking is obtained. Then remove vehicle from hoist and perform brake test (foot brake and parking brake).



61A10-5-26-1

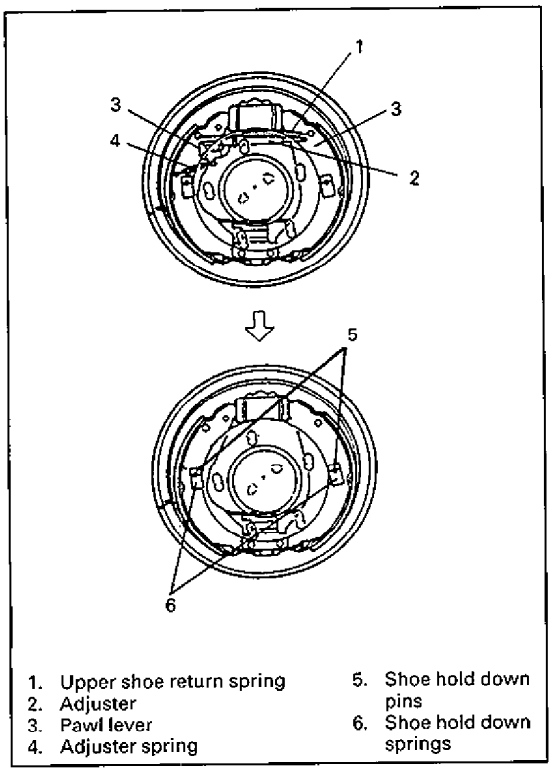
REMOVE AND INSTALL BRAKE SHOE

REMOVAL

1) Perform BRAKE DRUM REMOVAL (See page 5-23).

For 1-cam 8 valve engine model

2) Remove shoe hold down springs by turning shoe hold down pins as shown.



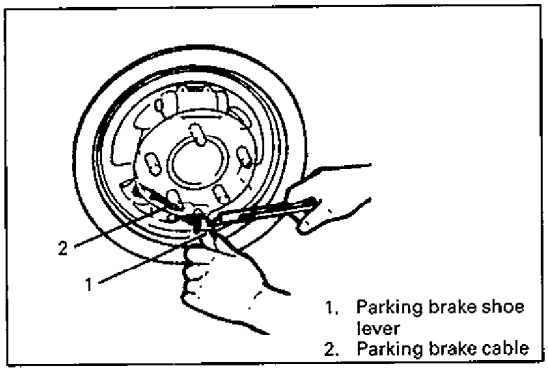
61A10-5-26-2

For 1-cam 16 valve engine model

2) ① Remove pawl lever and adjuster spring.
② Remove upper shoe return spring and adjuster.

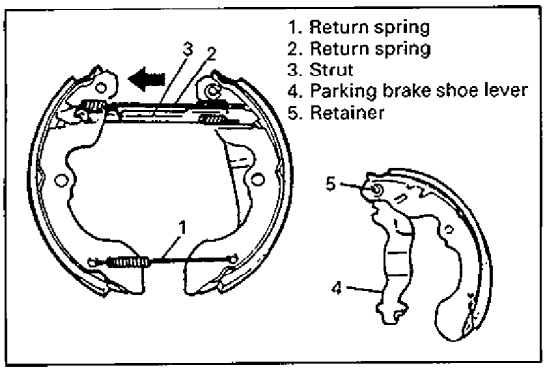
WARNING:
Use special care when installing brake shoe return spring.
Failure in its proper installation may allow it to spring-back and cause personal injury.

③ Remove shoe hold down springs by turning shoe hold down pins.
④ Remove brake shoes and lower shoe return spring.



61A10-5-26-4

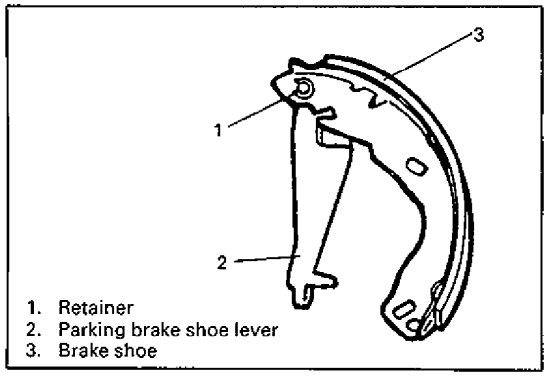
3) Remove brake shoes and disconnect parking brake cable from parking brake shoe lever.



61A10-5-26-5

For 1-cam 8 valve engine model

4) ① Remove strut and springs.
② Remove parking brake shoe lever from shoe rim.



61A10-5-27-1

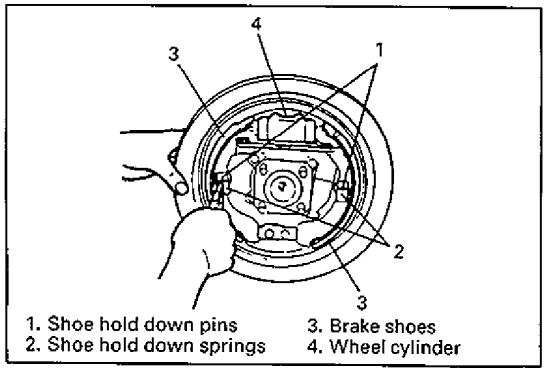
For 1-cam 16 valve engine model

4) Remove parking brake shoe lever from brake shoe.

INSTALLATION

1) Assemble parts as shown in reverse order of removal.

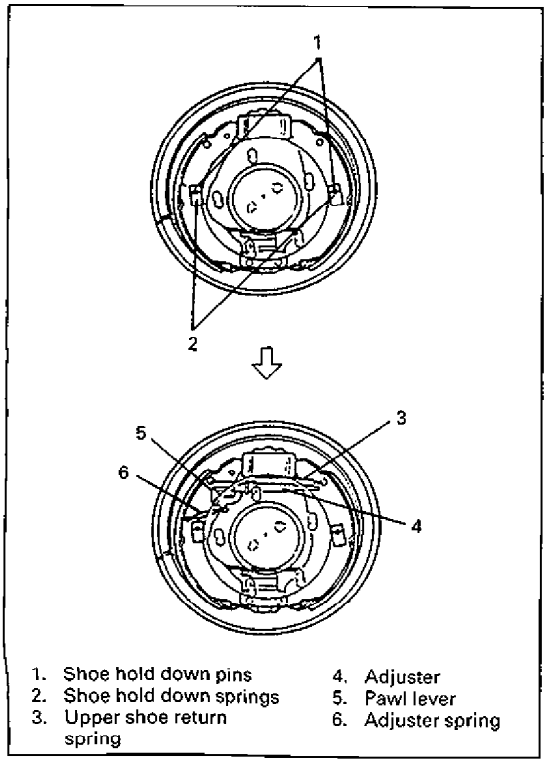
61A10-5-27-2



61A10-5-27-3

For 1-cam 8 valve engine model

2) Install shoe hold down springs by pushing them down in place and turning hold down pins.

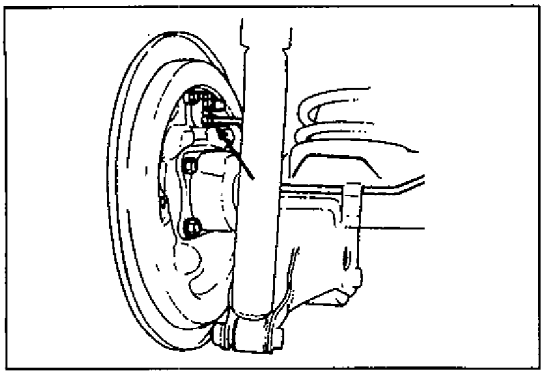


61A10-5-27-5

For 1-cam 16 valve engine model

2) ① Install shoe hold down springs by pushing them down in place and turning hold down pins.
   ② Install adjuster and upper shoe return spring.
   ③ Install pawl lever and adjuster spring.

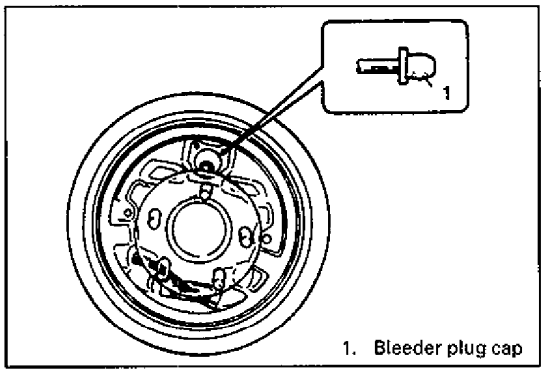
3) For procedure hereafter, refer to BRAKE DRUM INSTALLATION on page 5-24.


61A10-5-28-1

REMOVE AND INSTALL WHEEL CYLINDER

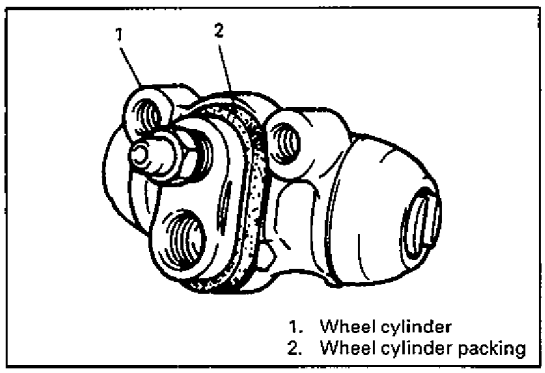
REMOVAL

1) Perform BRAKE DRUM REMOVAL (See page 5-23).
2) Perform steps 2) and 5) of BRAKE SHOE REMOVAL (See page 5-26).
3) Loosen brake pipe flare nut (or nuts) but only within the extent that fluid does not leak.



85F00-5-29-2

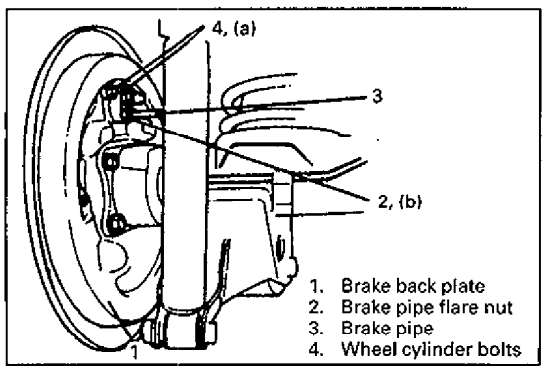
4) Remove wheel cylinder mounting bolts. Disconnect brake pipe (or pipes) from wheel cylinder and put wheel cylinder bleeder plug cap onto pipe to prevent fluid from spilling.



85F00-5-29-3

INSTALLATION

1) Install wheel cylinder packing. Then take off bleeder plug cap from brake pipe and connect pipe (for pipes) to wheel cylinder just enough to prevent fluid from leaking.



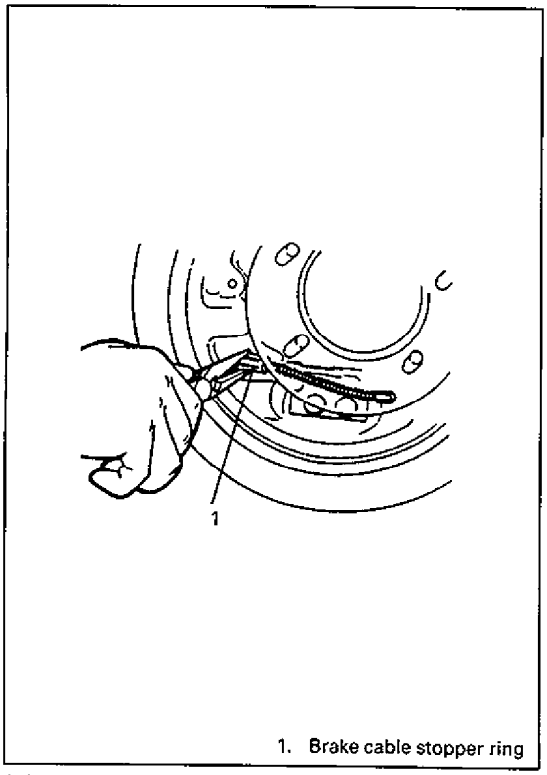
85F00-5-29-4

2) Tighten wheel cylinder to brake back plate to specified torque.
3) Torque flare nut (or nuts) of brake pipe which was connected in step 1) to specification.

Tightening Torque
(a): 12 N·m (1.2 kg-m, 9.0 lb-ft)
(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) For procedure hereafter, refer to BRAKE SHOE INSTALLATION (See page 5-27).

NOTE:
Be sure to bleed brake system. (for bleeding operation, refer to the same section of Service Manual mentioned in FOREWORD of this manual.



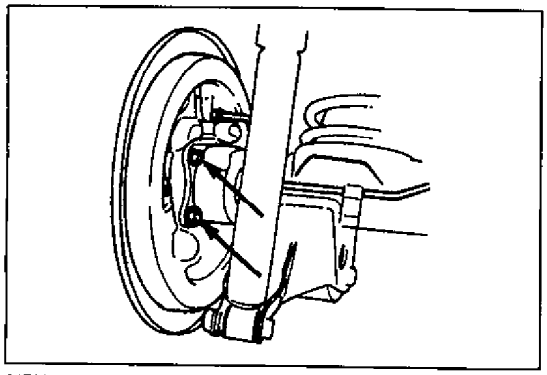
1. Brake cable stopper ring

61A10-5-29-1

REMOVE AND INSTALL BRAKE BACK PLATE

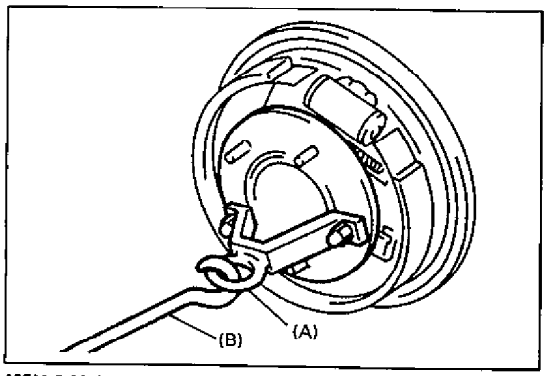
REMOVAL

1) Perform BRAKE DRUM REMOVAL on page 5-23.
2) Perform steps 2) of BRAKE SHOE REMOVAL on page 5-26.
3) Perform steps 3) and 4) of WHEEL CYLINDER REMOVAL on page 5-28.
4) Remove cable from brake back plate by squeezing parking brake cable stopper ring.



85F00-5-30-3

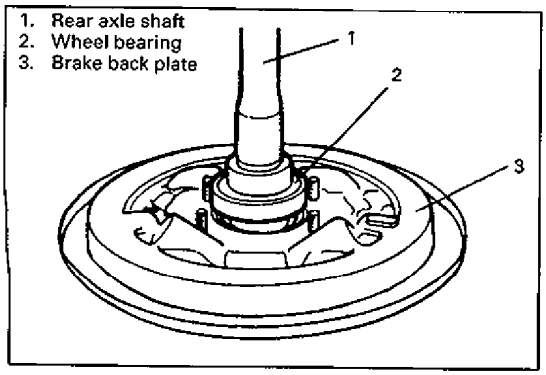
5) Drain rear differential gear oil.
6) Remove wheel bearing retainer nuts from rear axle housing.



85F00-5-30-4

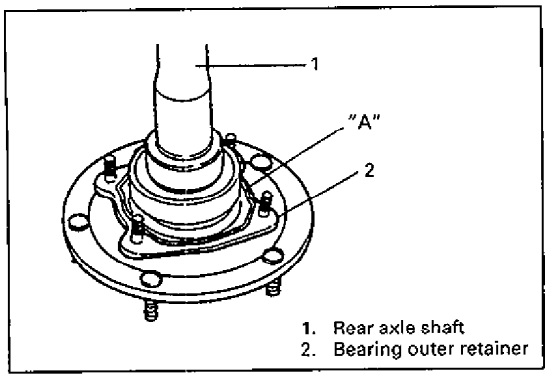
7) Using special tools, draw out rear axle shaft with brake back plate.

Special Tool
(A): 09943-35511
(B): 09942-15510



85F00-5-30-5

8) Remove brake back plate from rear axle shaft.



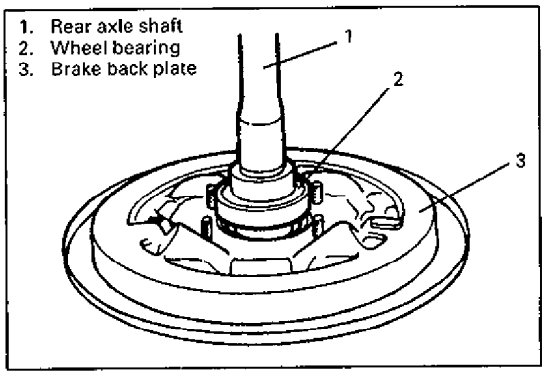
85F00-5-31-1

INSTALLATION

1) Apply sealant to mating surface of bearing retainer with brake back plate.

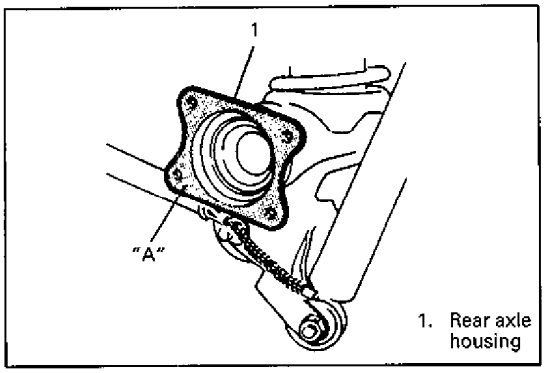
"A": Sealant 99000-31110

NOTE:
Make sure to remove old sealant before applying it anew.



60A40-5-50-2

2) Install brake back plate to rear axle shaft.

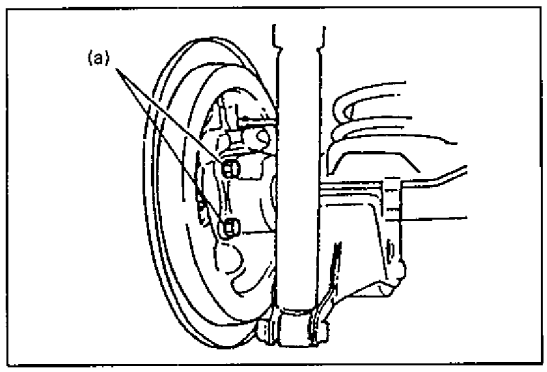


60A40-5-50-3

3) Apply sealant to joint seam of rear axle housing and brake back plate.

"A": Sealant 99000-31110

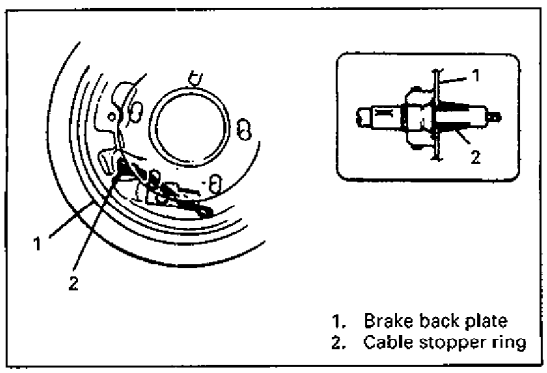
NOTE:
Make sure to remove old sealant before applying it anew.



85F00-5-31-4

4) Install rear axle shaft to rear axle housing.
5) Tighten brake back plate nuts to specified torque.

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

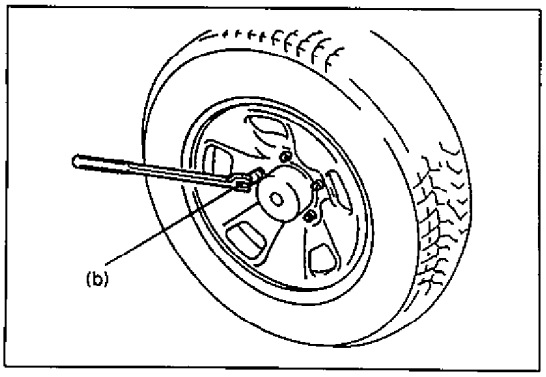


61A10-5-30-5

6) 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 on page 5-28 of this section.)
7) Install parking brake cable to brake back plate.

8) Install brake shoes, referring to steps 1) and 2) of its INSTALLATION on page 5-27.
9) Install brake drum. Refer to steps 1) to 2) of its INSTALLATION on page 5-24 in this section.
10) Refill differential housing with new specified gear oil. Refer to "ON VEHICLE SERVICE" in SECTION 7E for refill.
11) Fill reservoir with brake fluid and bleed brake system. (For bleeding operation, refer to the same section of Service Manual mentioned FOREWORD of this manual.)

61A10-5-31-1



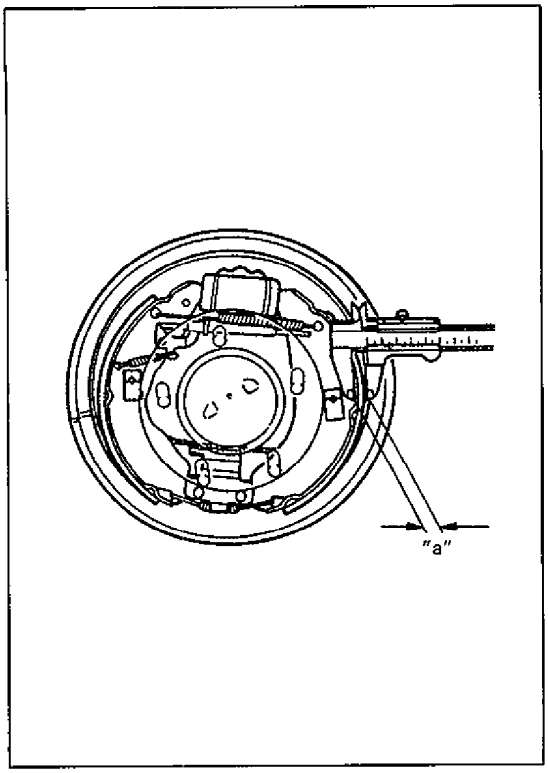
85F00-5-32-2

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

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

13) Upon completion of all jobs, depress brake pedal with about 30 kg (66 lbs) load three to ten times so as to obtain proper drum-to shoe clearance.
Adjust parking brake cable. (For adjustment, see page 5-15)
14) Tighten parking brake lever cover screws.
15) 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).
16) Check each installed part for oil leakage.

61A10-5-31-3



61A10-5-32-1

BRAKE DRUM AND COMPONENTS INSPECTION

INSPECT BRAKE SHOE & LINING

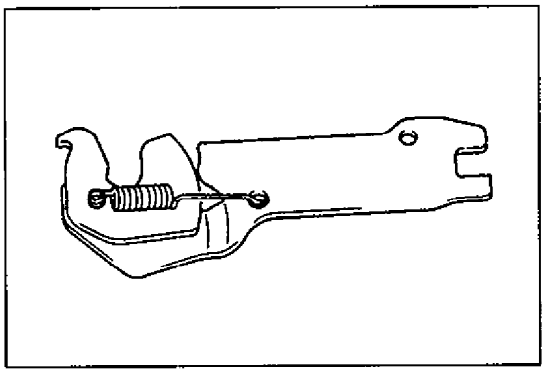
Where lining is worn out beyond service limit, replace shoe.

Thickness "a"

Standard:	**6.5 mm (0.26 in.)**	**For 1-cam 16 valve engine model**
	8.0 mm (0.32 in.)	**For 1-cam 8 valve engine model**
Service limit:	**3.0 mm (0.12 in.)**	**For 1-cam 16 valve engine model**
	3.5 mm (0.14 in.)	**For 1-cam 8 valve engine model**

If one of brake linings is to service limit, all linings must be replaced at the same time.

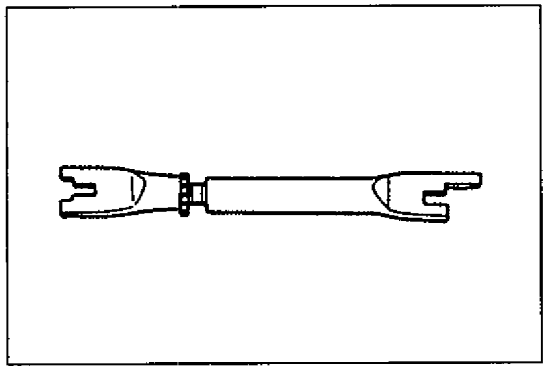
CAUTION:
Never polish lining with sandpaper. If lining is polished with sandpaper, hard particles of sandpaper will be deposited in lining and may damage drum. When it is required to correct lining, replace it with a new one.



61A10-5-32-3

INSPECT BRAKE STRUT (If equipped)

Inspect ratchet of strut for wear or damage.

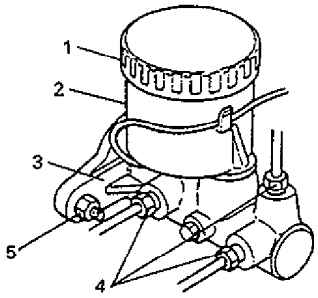


85F00-5-34-4

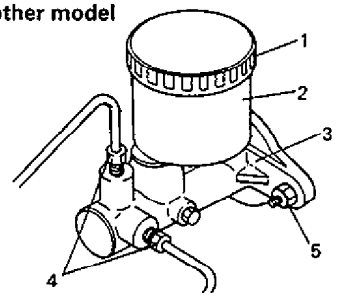
INSPECT ADJUSTER (If equipped)

Check thread of adjuster for sticking and corrosion.

For left hand steering model with 1-cam 16 valve engine

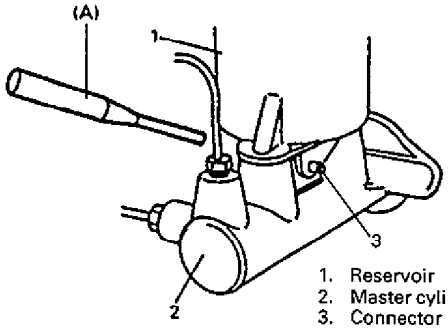


For other model



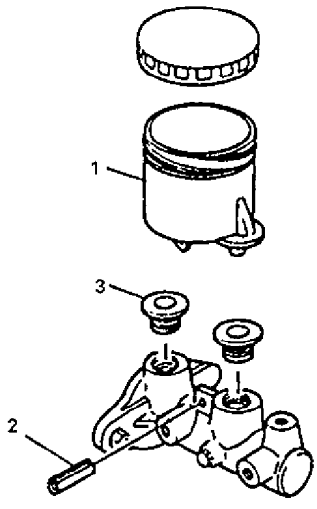
1. Reservoir cap
2. Reservoir
3. Master cylinder
4. Flare nuts
5. Attaching nut

61A10-5-33-1



1. Reservoir
2. Master cylinde
3. Connector pin

61A10-5-33-3



1. Reservoir
2. Connector pin
3. Grommets

85F00-5-35-3

MASTER CYLINDER REPAIR

REMOVE AND INSTALL MASTER CYLINDER RESERVOIR

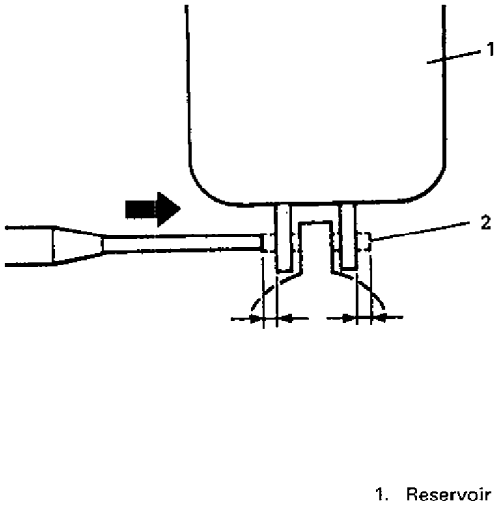
REMOVAL

1) Remove air intake pipe if necessary.
2) Disconnect reservoir lead wire at coupler.
3) Clean outside of reservoir.
4) Take out fluid with syringe or such.
5) Remove reservoir connector pin by using special tool.

Special Tool
(A): 09922-85811

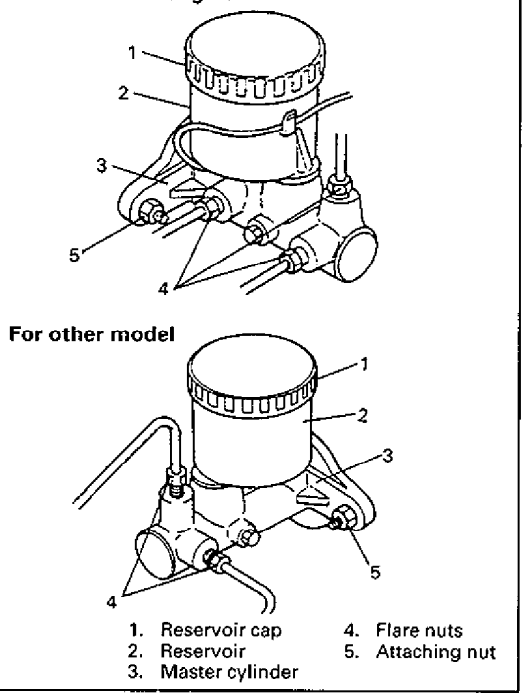
6) Remove reservoir.

NOTE:
Do not allow brake fluid to get on painted surfaces.



1. Reservoir
2. Pin

85F00-5-36-1



1. Reservoir cap
2. Reservoir
3. Master cylinder
4. Flare nuts
5. Attaching nut

61A10-5-34-3

INSTALLATION

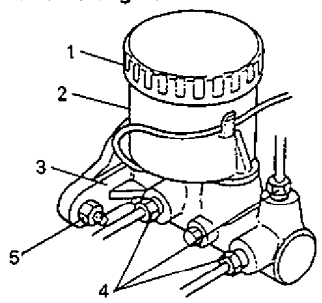
NOTE:
See NOTE at the beginning of this section.

1) When using new grommets, lubricate them with the same fluid as the one to fill reservoir with. Then press-fit grommets to master cylinder. Grommets must be seated in place.
2) Install reservoir and drive in reservoir pin.

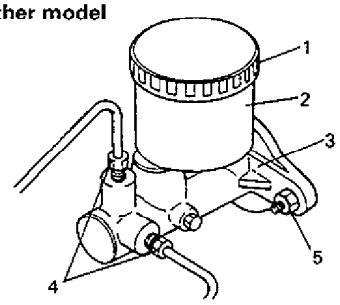
   NOTE:
   Drive in reservoir pin till both of its ends at the right and left or reservoir becomes the same length.

3) Connect reservoir lead wire.
4) Fill reservoir with specified fluid.
5) Upon completion of installation, check for fluid leakage.

For left hand steering model with 1-cam 16 valve engine



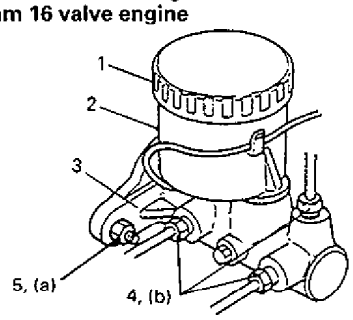
For other model



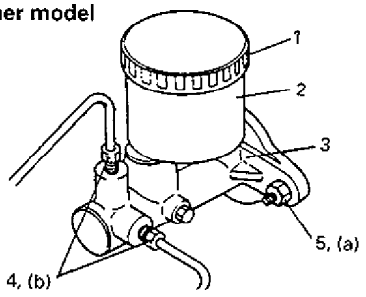
1. Reservoir cap
2. Reservoir
3. Master cylinder
4. Flare nuts
5. Attaching nut

61A10-5-35-1

For left hand steering model with 1-cam 16 valve engine



For other model



1. Reservoir cap
2. Reservoir
3. Master cylinder
4. Flare nuts
5. Attaching nut

61A10-5-35-3

REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

NOTE:
Do not allow brake fluid to get on painted surfaces.

1) Disconnect reservoir lead wire at coupler.
2) Clean around reservoir cap and take out fluid with syringe or such.
3) Disconnect brake pipes from master cylinder.
4) Remove attaching nuts/washers.
5) Remove master cylinder from brake booster.

INSTALLATION

NOTE:

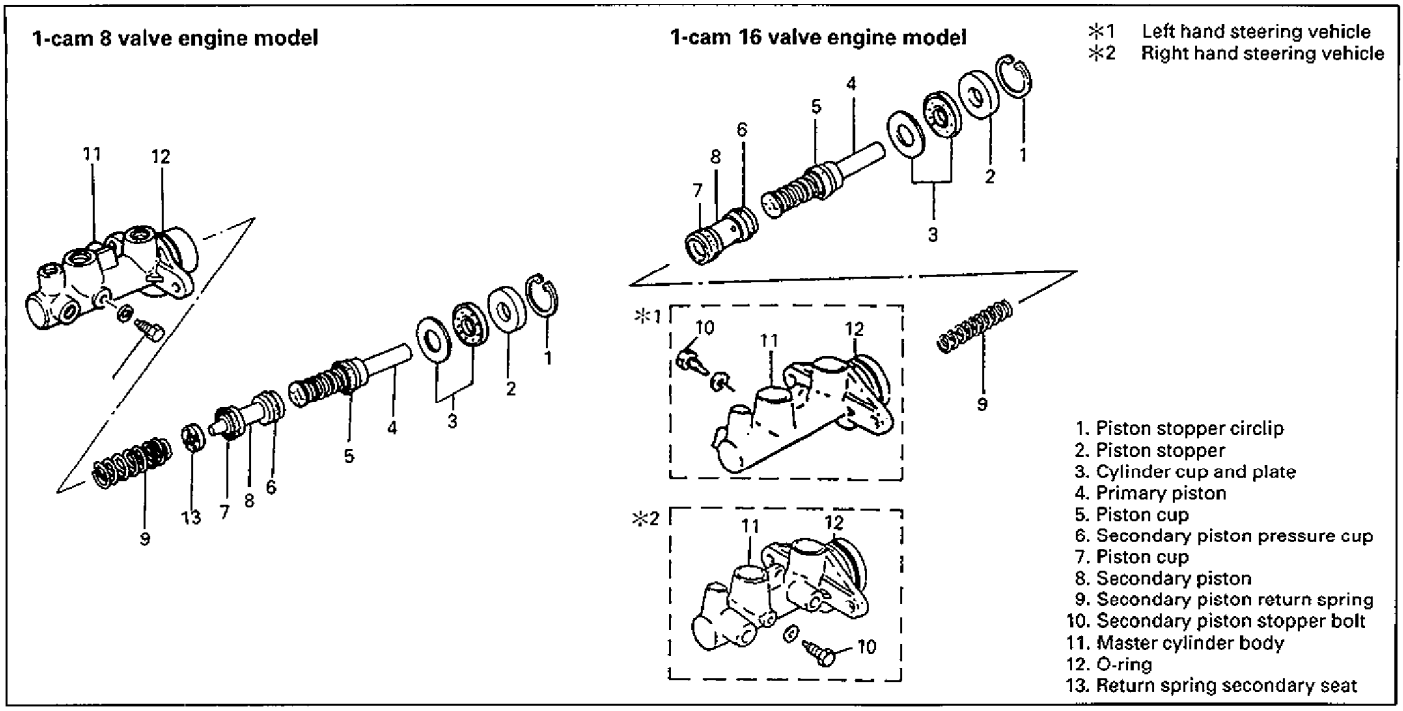
- **See NOTE at the begining of this section.**
- **Adjust clearance between booster piston rod and primary piston with special tool (See page 5-38).**

1) Install master cylinder to brake booster.
2) Torque master cylinder attaching nuts to specification.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)
3) Connect hydraulic lines and torque flare nuts to specification.

   Tightening Torque
   (b): 16 N·m (1.6 kg-m, 12.0 lb-ft)
4) Connect reservoir lead wire.
5) Fill reservoir with specified brake fluid.
6) After installing, check brake pedal play and bleed air from system (Refer to the same section of Service Manual mentioned in FOREWORD of this manual).
7) Perform brake test and check each installed part for fluid leakage.

DISASSEMBLE AND ASSEMBLE MASTER CYLINDER

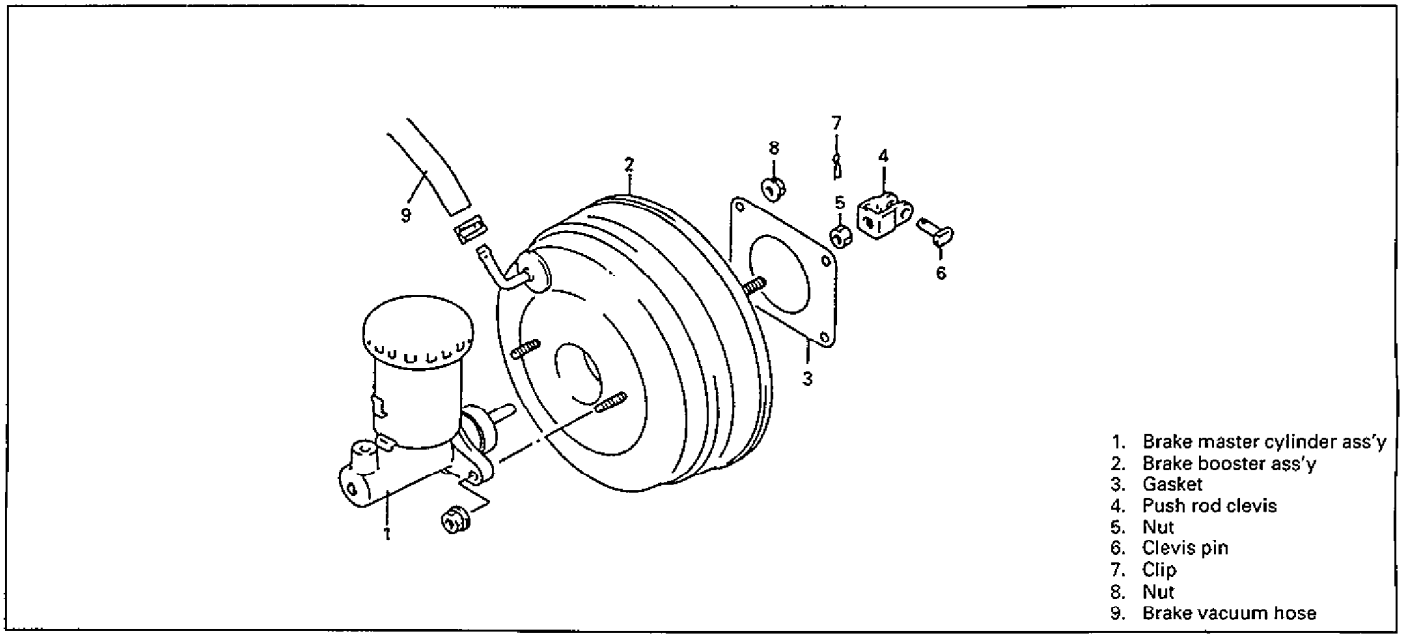


61A10-5-36-1

For disassembly and assembly, use the procedure described in the same section of Service Manual mentioned in FOREWORD of this manual.

BRAKE BOOSTER R & I

REMOVE AND INSTALL BOOSTER

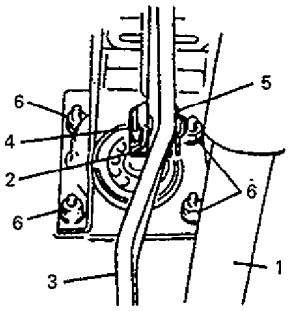


60A50-5-62-1

REMOVAL

1) Remove master cylinder assembly, referring to its REMOVAL on page 5-35.
2) Disconnect brake vacuum hose from brake booster.

61A10-5-37-1

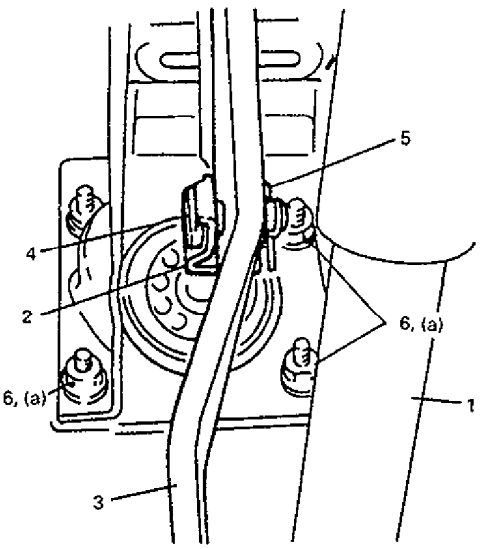


1. Steering column
2. Push rod clevis
3. Brake pedal arm
4. Clevis pin
5. Clip
6. Nut

3) Disconnect push rod clevis from brake pedal arm.
4) Remove attaching nuts and then booster as shown.

CAUTION:
Never disassemble brake booster. Disassembly will spoil its original function. If is found faulty, replace it with new one.

60A50-62-4



1. Steering column
2. Push rod clevis
3. Brake pedal arm
4. Clevis pin
5. Clip
6. Nut

61A10-5-37-3

INSTALLATION

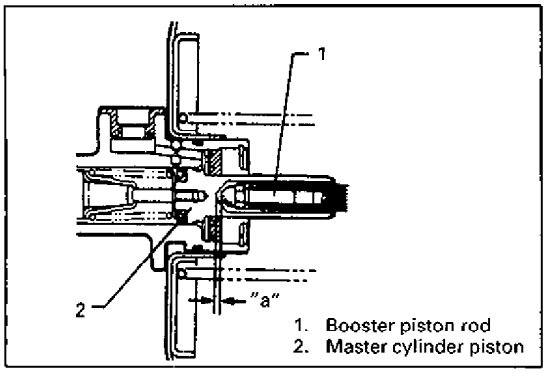
NOTE:

- **See NOTE at the beginning of this section.**
- **Check length of push rod clevis. (Refer to item "BRAKE BOOSTER INSPECTION AND ADJUSTMENT")**
- **Before installing master cylinder, adjust booster piston rod. (Refer to item "INSPECTION / ADJUSTMENT OF CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON ADJUSTMENT" on page 5-38).**
- **Apply silicone grease to master cylinder piston.**

1) Install booster to dash panel as shown. Then connect booster push rod clevis to pedal arm with clevis pin and clip.
2) Tighten booster attaching nuts to the specified torque.

Tightening Torque
(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Connect brake vacuum hose to brake booster.
4) Install master cylinder, referring to its INSTALLATION on page 5-35.
5) After installing, check pedal height and play. (Refer to the same section of Service Manual mentioned in FOREWORD of this manual.)



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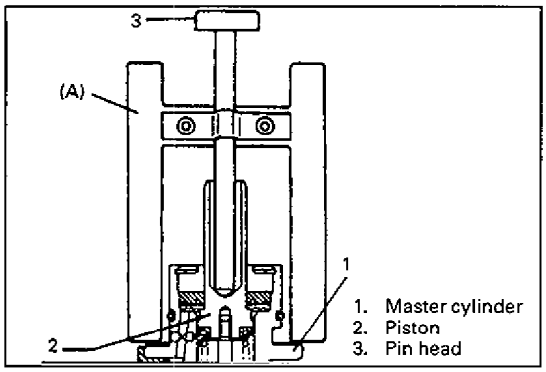

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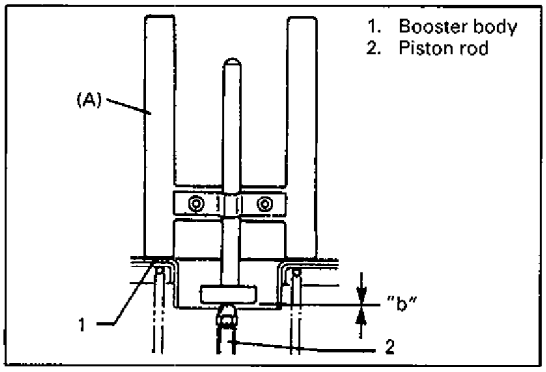

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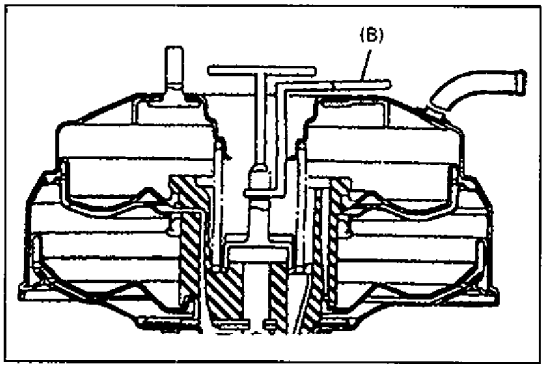
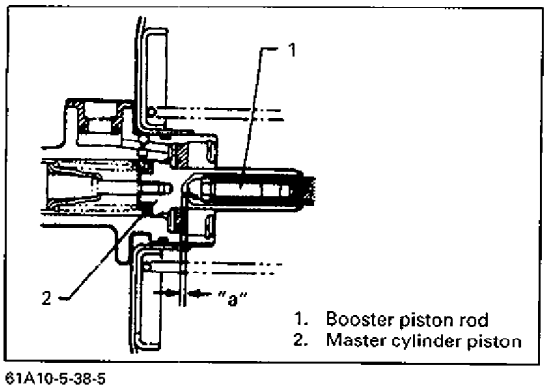


85F00-5-44-4



61A10-5-38-5

BRAKE BOOSTER INSPECTION AND ADJUSTMENT

INSPECTION / ADJUSTMENT OF CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON ADJUSTMENT

The length of booster piston rod is adjusted to provide specified clearance "a" between piston rod end and master cylinder piston.

- 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

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.)

3) Adjust clearance by turning adjusting screw of piston rod.

Special Tool
(B): 09952-16010

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.) For 1-cam 8 valve engine model
0.14 – 0.35 mm (0.006 – 0.014 in.) For 1-cam 16 valve engine model

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts				Tightening torque		
				N·m	kg-m	lb-ft
1.	Brake caliper carrier bolt			85	8.5	61.5
2.	Brake caliper pin bolt			27	2.7	19.5
3.	Front brake flexible hose bolt			23	2.3	17.0
4.	Rear brake nut (Brake back plate nut)			23	2.3	17.0
5.	Master cylinder nut			13	1.3	9.5
	Master cylinder piston stopper bolt			10	1.0	7.5
6.	Booster nut			13	1.3	9.5
	Crevis nut			25	2.5	18
7.	Brake pipe 5-way joint bolt			10	1.0	7.5
8.	Brake pipe flare nut			16	1.6	11.5
9.	Rear brake wheel cylinder bolt			12	1.2	9.0
	Brake bleeder plug	Front caliper		9.0	0.9	6.5
		Rear Cylinder		8.0	0.8	6.0
		LSPV	3-Door	12	1.2	9.0
			5-Door	8.0	0.8	6.0
10.	LSPV mounting bolt			23	2.3	17.0
11.	LSPV stay bolt					
	LSPV spring bolt					
12.	Wheel nut			95	9.5	69.0
13.	Clamp bolt (Refer to page 5-17, 18)	(b), (c), (d), (e)		10	1.0	7.5
		(h), (i), (j), (k)		5.5	0.55	4.0

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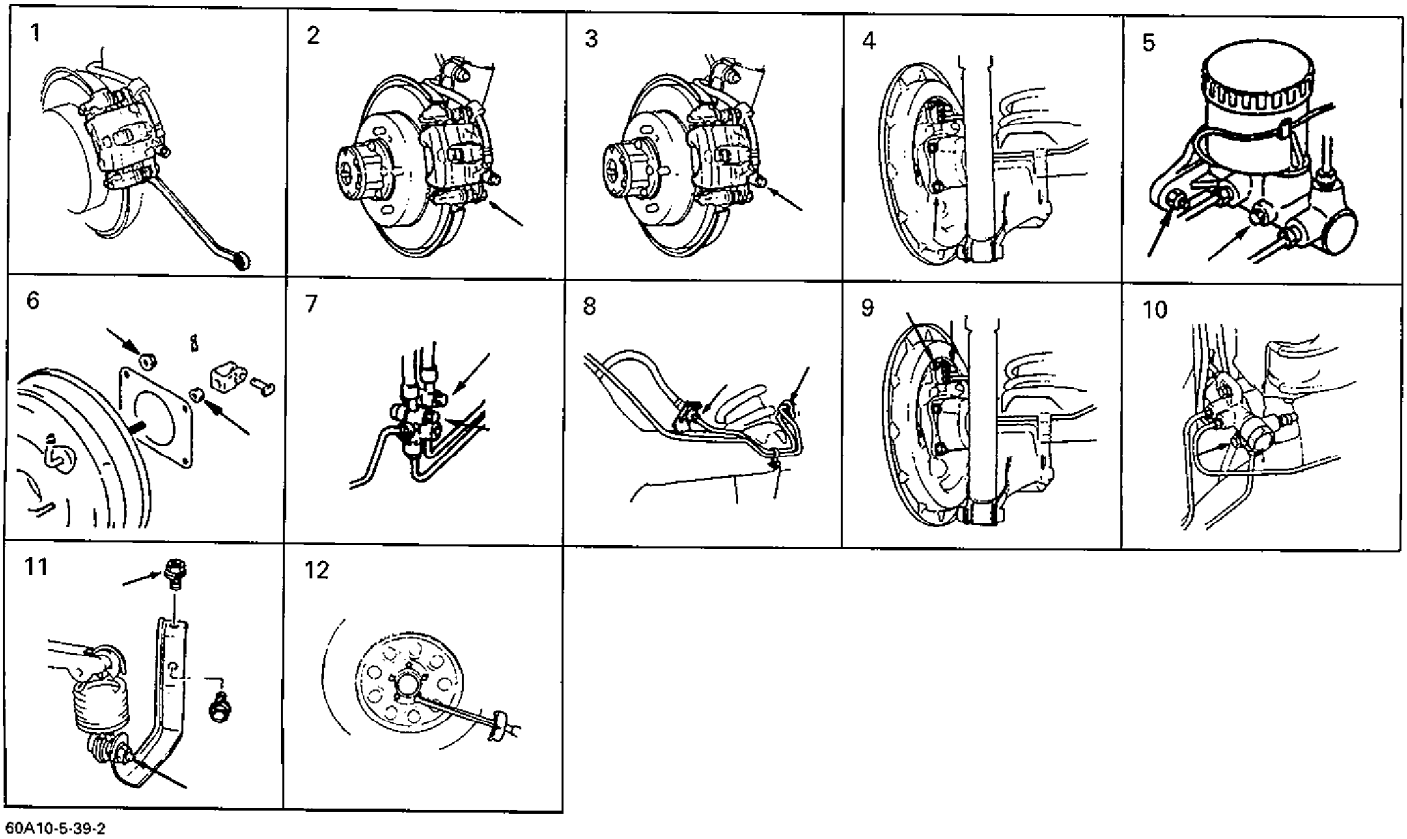


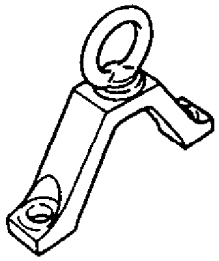
60A10-5-39-2

REQUIRED SERVICE MATERIALS

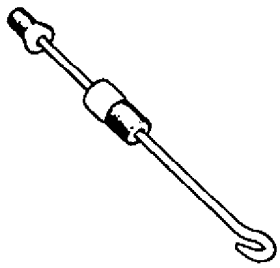
MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir cap or described in owner's manual of vehicle	• To fill master cylinder reservoir. • To clean and apply to inner parts of master cylinder caliper and wheel cylinder when they are disassembled.
Water tight sealant	SEALING COMPOUND 366E 99000-31090	• To apply to mating surfaces of brake back plate and rear wheel cylinder.
Sealant	SUZUKI BOND NO. 1215 99000-31110	• To apply to mating surfaces of brake back plate and rear axle housing. • To apply mating surfaces of brake back plate and rear wheel bearing retainer.

60A50-5-51-1

SPECIAL TOOLS

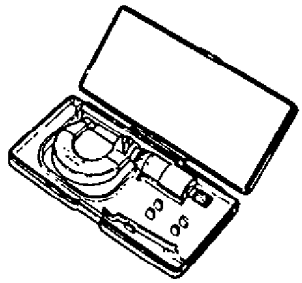


09943-35511
Brake drum remover
(Front wheel hub remover)

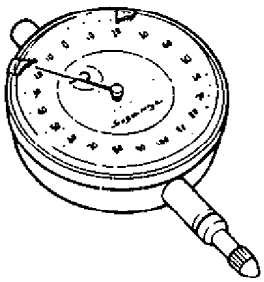


09942-15510
Sliding hammer

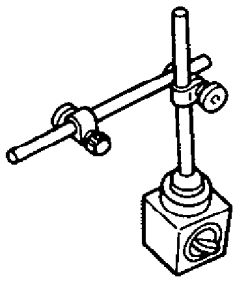
09950-78210
Flare nut wrench (10 mm)



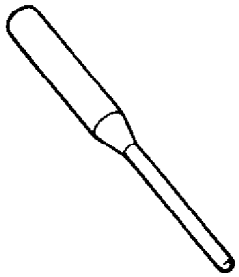
09900-20205
Micrometer (0 – 25 mm)



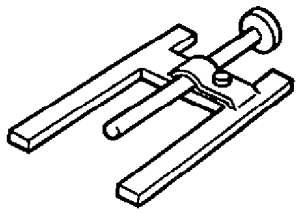
09900-20602
Dial gauge (1) (1/1000 mm)



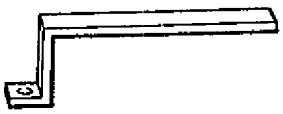
09900-20701
Magnetic stand



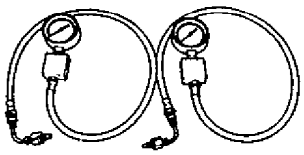
09922-85811
Connector pin remover



09950-96010
Booster piston rod gauge



09952-16010
Booster piston rod adjuster



09956-02310
Fluid pressure gauge

09956-02210
Brake circuit plug

60A50-5-51-2

SECTION 5A1

BRAKES (Equipped with ABS)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:

- **When inspecting and servicing vehicle equipped with ABS, be sure to refer to Section 5B first.**
- **For the descriptions (items) not found in this section, refer to Section 5 of this manual.**
- **All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and / or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.**

61A10-5A1-1-1

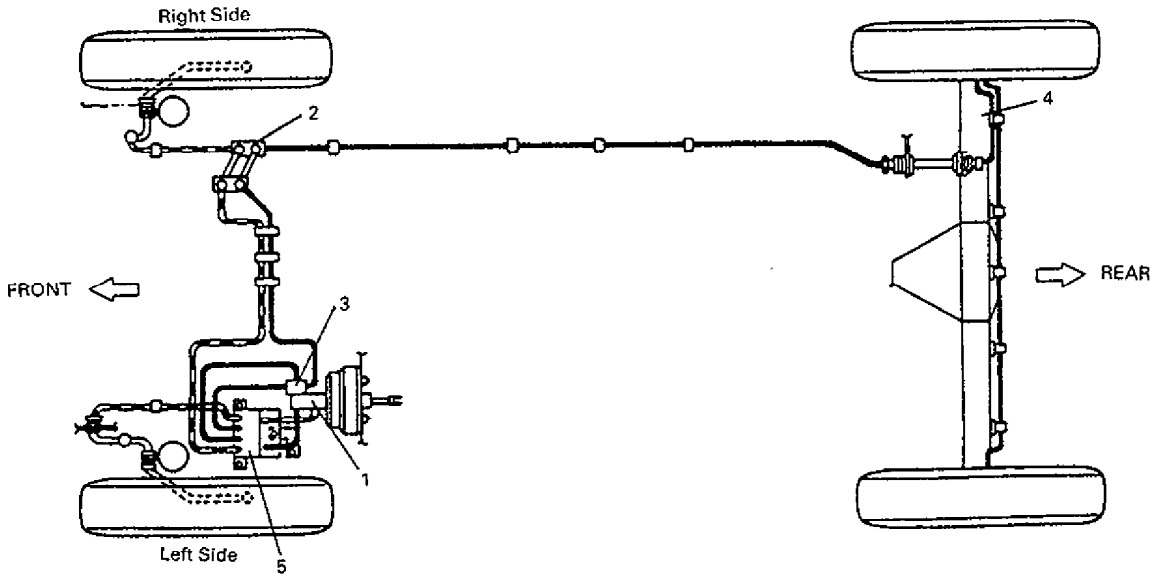
CONTENTS

61A10-5A1-1-2

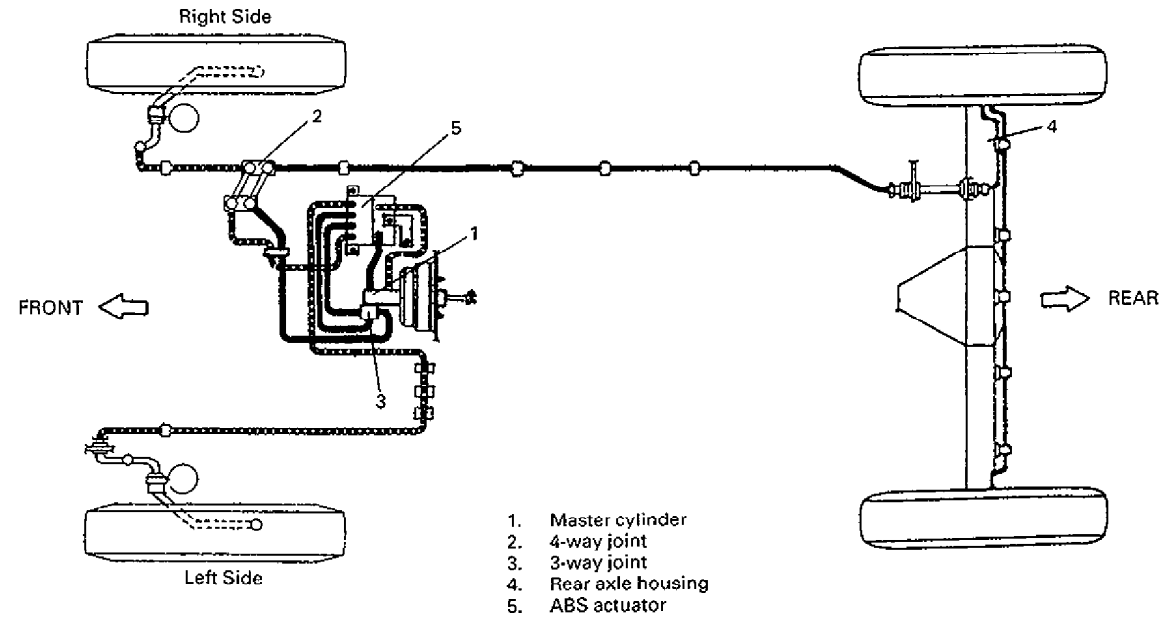
GENERAL DESCRIPTION

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. Three brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes (right and left) and the other connects rear brakes (right and left).
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading/trailing shoes) for the rear brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

Left hand steering vehicle



Right hand steering vehicle

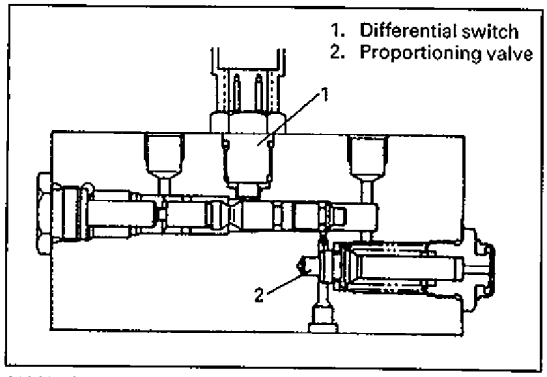


1. Master cylinder
2. 4-way joint
3. 3-way joint
4. Rear axle housing
5. ABS actuator

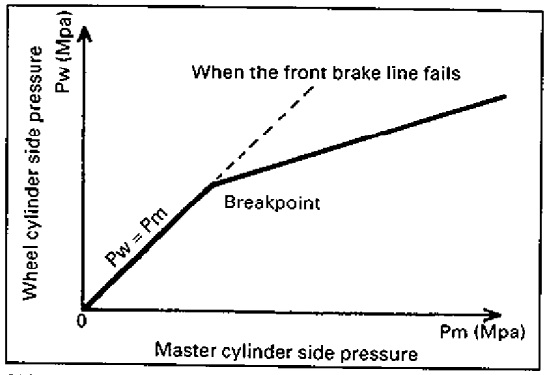
ABS (Antilock Brake System)

For general description and operation of this system, refer to SECTION 5B of this manual.

61A10-5A1-3-1



61A30-5A1-2-2



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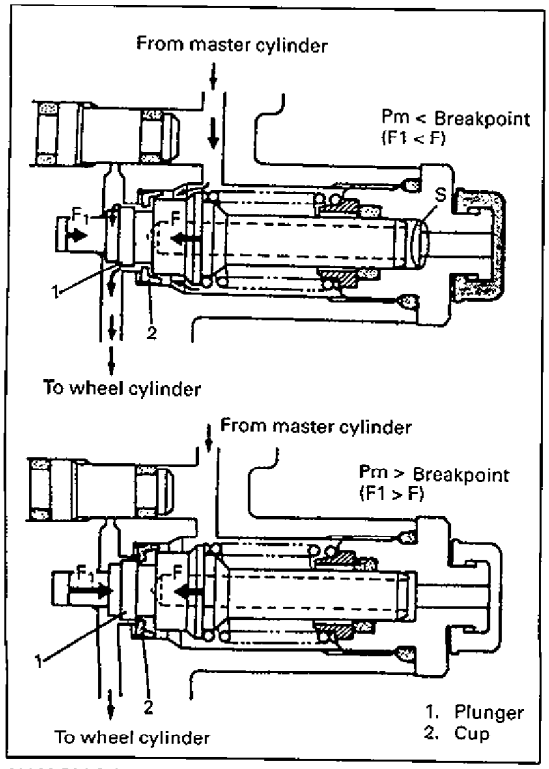


61A30-5A1-2-4

P (Proportioning) & DIFFERENTIAL VALVE (Included in ABS actuator)

STRUCTURE OF P & DIFFERENTIAL VALVE

The P & Differential valve consists of a proportioning valve and differential switch.

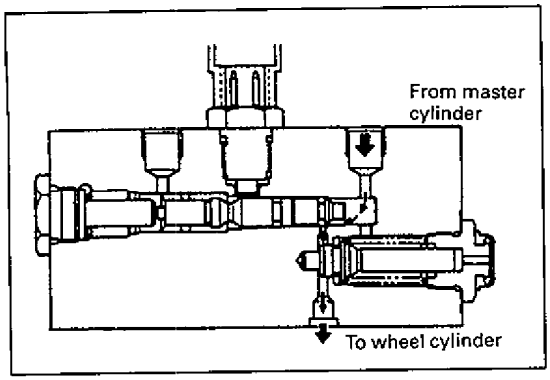
PURPOSE AND OPERATION OF PROPORTIONING VALVE

The proportioning valve regulates the brake fluid pressure in the rear brake line, which is the same both on the master cylinder side and wheel cylinder side up to the breakpoint in the graph but once the fluid pressure on the master cylinder side exceeds that point, that on the wheel cylinder side increases as shown by the graph.

its operation is as follows. Till the master cylinder side pressure (Pm) reaches breakpoint, the spring force (F) is higher than the force caused pressure ($F^1 = Pm \cdot S$) and so Pm is transmitted to the wheel cylinder side as it is through the opening between the plunger and cup. As Pm rises higher than breakpoint, F_1 exceeds F and the plunger moves to the right as shown in the figure to close the above opening.

When Pm rises even higher, the plunger moves to allow the opening. Then the wheel cylinder side pressure (Pw) increases and the opening is closed.

Such operation cycle is repeated and Pm is transmitted to the wheel cylinder as Pw as shown by the above graph.



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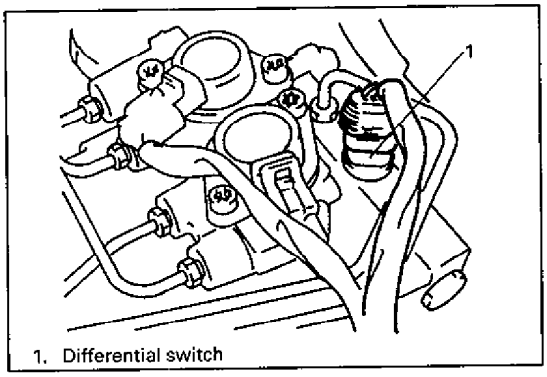
When the front brake line fails (when bleeding fluid from the brake line), the bypass line is opened to stop the proportioning valve so as to increase effect of the rear brake.



1. Differential switch

61A30-5A1-3-2

PURPOSE AND OPERATION OF DIFFERENTIAL SWITCH

For purpse and operation of this switch, refer to SECTION 5B of this manual.

DIAGNOSIS

BRAKE DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Not enough braking force	1. Brake oil leakage from brake lines.	Locate leaking point and repair.
	2. Brake disc or pads stained with oil.	Clean or replace.
	3. Overheated brakes.	Determine cause and repair.
	4. Poor contact of shoes on brake drum.	Repair for proper contact.
	5. Brake shoes linings stained with oil or wet with water.	Replace.
	6. Badly worn brake shoe linings.	Replace.
	7. Defective wheel cylinders.	Repair or replace.
	8. Malfunctioning caliper assembly.	Repair or replace.
	9. Air in system.	Bleed system.
	10. Malfunctioning ABS.	Check system and replace as necessary.
Brake pull (Brakes not working in unison)	1. Pad or shoe linings are wet with water or stained with oil in some brakes.	Replace.
	2. Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism).	Check for inoperative auto adjusting mechanism.
	3. Drum is out of round in some brakes.	Replace.
	4. Wheel tires are inflated unequally.	Inflate equally.
	5. Malfunctioning wheel cylinders.	Repair or replace.
	6. Disturbed front end alignment.	Adjust as prescribed.
	7. Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	8. Restricted brake tubes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	9. Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush.
		Caliper should slide.
	10. Loose suspension parts.	Check all suspension mountings.
	11. Loose calipers.	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	1. Front lining worn out.	Replace linings.
Brake locked	1. Malfunctioning ABS.	Check system and replace as necessary.

BRAKE DIAGNOSIS CHART B

Condition	Possible Cause	Correction
Excessive pedal travel (Pedal stroke too large)	1. Partial brake system failure.	Check brake systems and repair as necessary.
	2. 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.
	3. Air in system. (pedal soft/spongy)	Bleed system.
	4. Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting machanism. Adjust rear brakes.
	5. Bent brake shoes.	Replace brake shoes.
	6. Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all disc brakes immediately after pedal is released)	1. Master cylinder pistons not returning correctly.	Replace master cylinder.
	2. Restricted brake tubes or hoses.	Check for soft hoses or damaged tubes and replace with new hoes and/or new brake tubes.
	3. Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	4. Weakened or broken return springs in the brake.	Replace.
	5. Sluggish parking-brake cables or linkage.	Repair or replace.
	6. Wheel cylinder or caliper piston sticking.	Repair as necessary.
	7. Malfunctioning ABS.	Check system and replace as necessary.
Pedal pulsation (Pedal pulsates when depressed for braking.)	1. Damaged or loose wheel bearings.	Replace wheel bearings.
	2. Distorted steering knuckle or rear axle shafts.	Replace knuckle or rear exle shaft.
	3. Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine the disc.
	4. Parallelism not within specifications.	Check per instructions. If not with specifications, replace or machine the disc.
	5. Rear drums out of round.	Check runout. Repair or replace drum as necessary.
Braking noise	1. Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe lining.
	2. Worn or distorted shoe linings.	Replace shoe lining (or pad).
	3. Loose front wheel bearings.	Replace wheel bearing.
	4. Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.

BRAKE DIAGNOSIS CHART C

Condition	Possible Cause	Correction
Brake warning light turns on after engine start	1. Parking brake applied.	Release parking brake and check that brake warning light turns off.
	2. Insufficient amount of brake fluid	Add brake fluid.
	3. Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	4. Brake warning light circuit faulty.	Check system referring to "DIAGNOSIS" in Section 5B.
	5. Malfunctioning ABS	Check system referring to "DIAGNOSIS" in Section 5B.
Brake warning light turns on when brake is applied	1. Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	2. Insufficient amount of brake fluid.	Add brake fluid.
Brake warning light fails to turn on even when parking brake is applied	1. Bulb burnt out.	Replace bulb.
	2. Brake warning light circuit open.	Repair circuit.
ABS warning light does not turn on for 3 sec. after ignition switch has turned ON.	1. Bulb burnt out.	Replace bulb.
	2. ABS warning light circuit open. (including check relay)	Check system referring to "DIAGNOSIS" in Section 5B.
ABS warning light remains on after ignition switch has turned on for 3 sec.	1. Malfunctioning ABS.	Check system referring to "DIAGNOSIS" in Section 5B.

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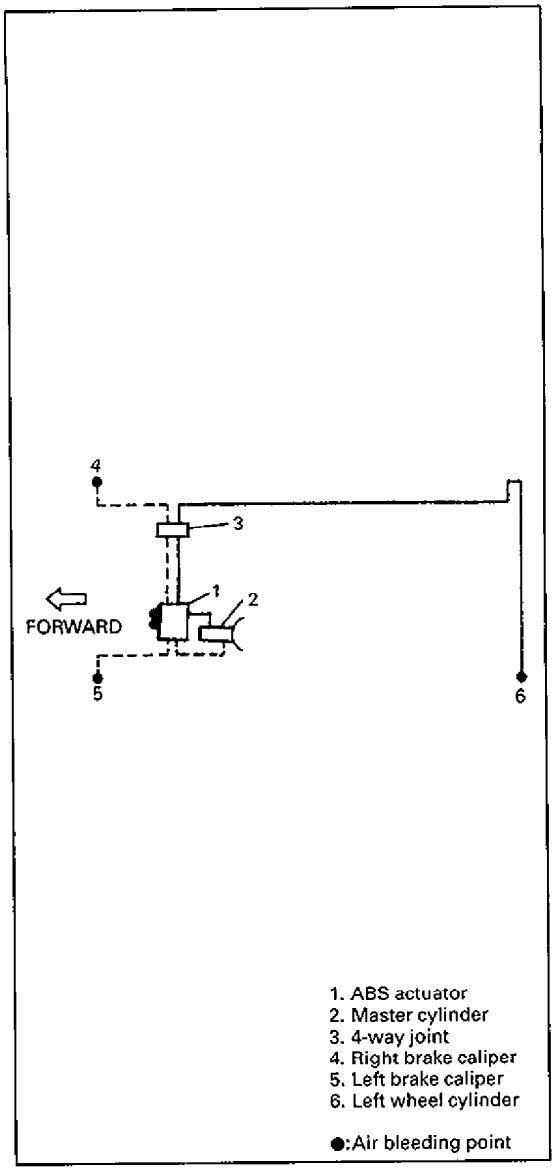


61A10-5A1-8-1

ON VEHICLE SERVICE

BLEEDING BRAKES

CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentially touch painted surface, immediately wipe fluid from paint and clean painted surface.

NOTE:
For vehicle equipped with ABS, bleed air according to procedure described in Section 5B.

ABS (Antilock Brake System)

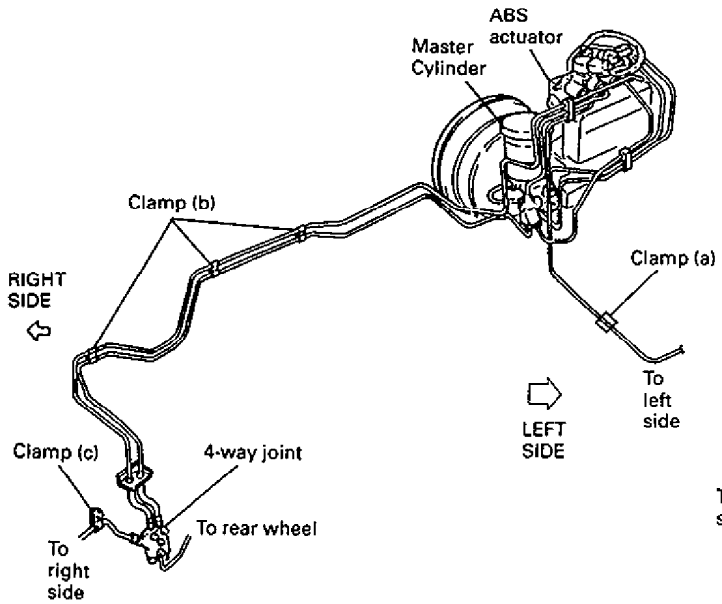
For removal, installation and inspection procedures of this system (ABS control module, ABS hydraulic Unit, wheel speed sensor and etc.), refer to Section 5B of this manual.

BRAKE HOSE/PIPE R & I

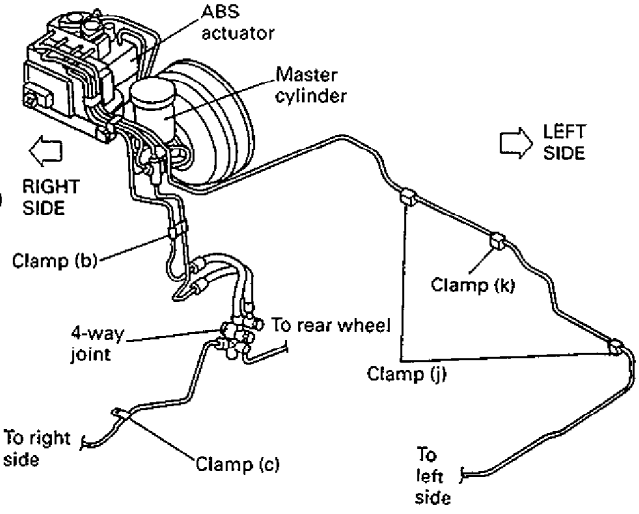
REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and suitably support vehicle. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and flexible hose.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check installed part for fluid leakage.

Left hand steering vehicle

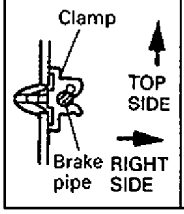
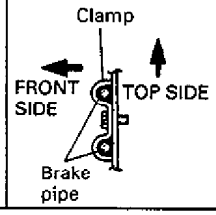
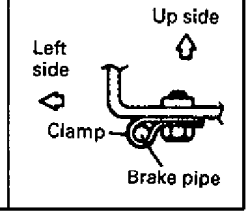


Right hand steering vehicle



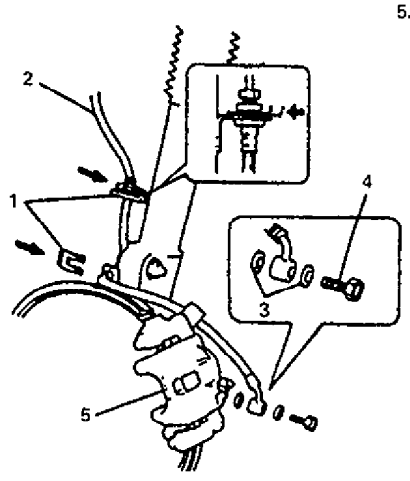
NOTE: Viewed from arrow "A"

	N·m	kg-m	lb-ft
Tightening torque for brake pipe flare nuts	16	1.6	12
Tightening torque for 4-way joint bolt and clamp bolt (b), (c), (j), (k)	10	1.0	7.5

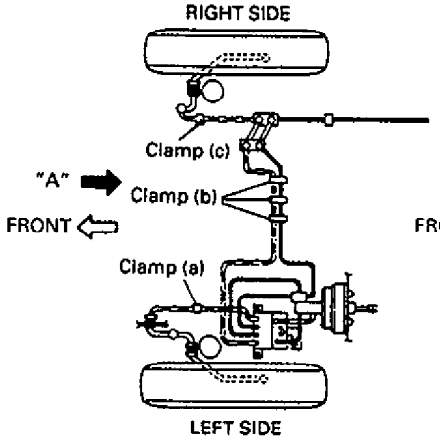
Clamp (a)	Clamp (b)	Clamp (c)
		

NOTE:
Insert E-ring till its end surface is flush with or lower than bracket end surface.

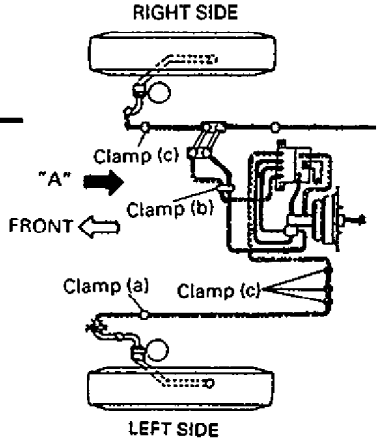
1. E-ring
2. Flexible hose
3. Hose washer
4. Hose bolt
5. Brake caliper



Left hand steering vehicle



Right hand steering vehicle

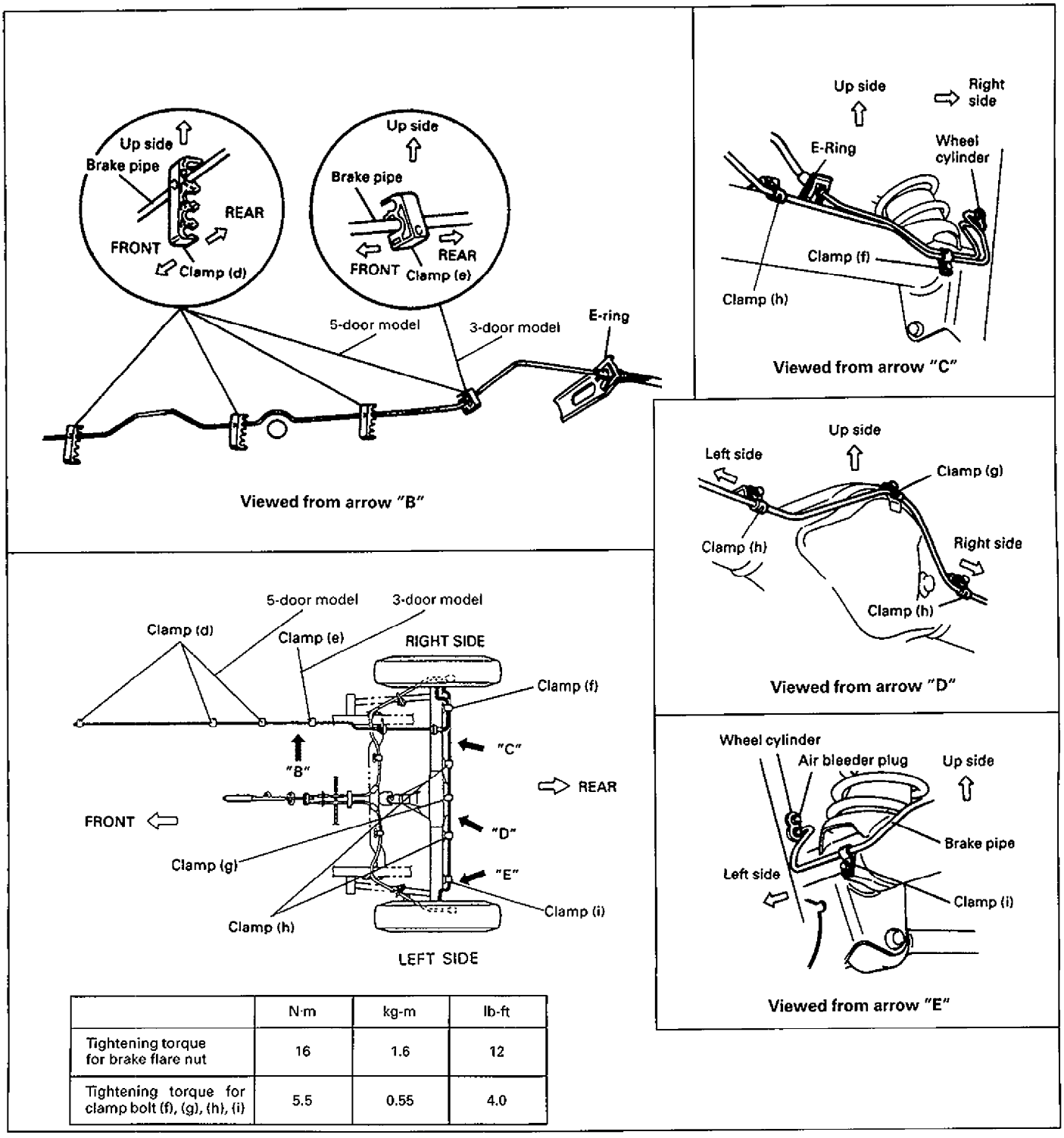


REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

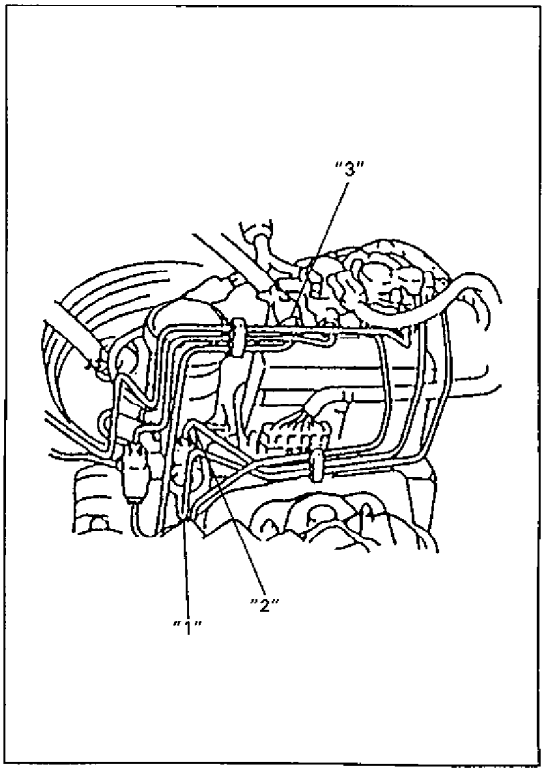
1) Raise and suitably support vehicle. Remove tire and wheel.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check each installed part for fluid leakage.

PRECAUTION FOR INSTALLATION

- Be sure to obtain more than 3 mm (0.118 in.) clearance between axle housing and brake pipe.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



	N·m	kg-m	lb-ft
Tightening torque for brake flare nut	16	1.6	12
Tightening torque for clamp bolt (f), (g), (h), (i)	5.5	0.55	4.0



61A10-5A1-11-1

MASTER CYLINDER REPAIR

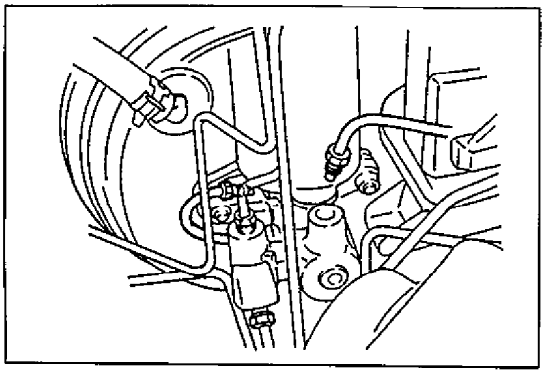
REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

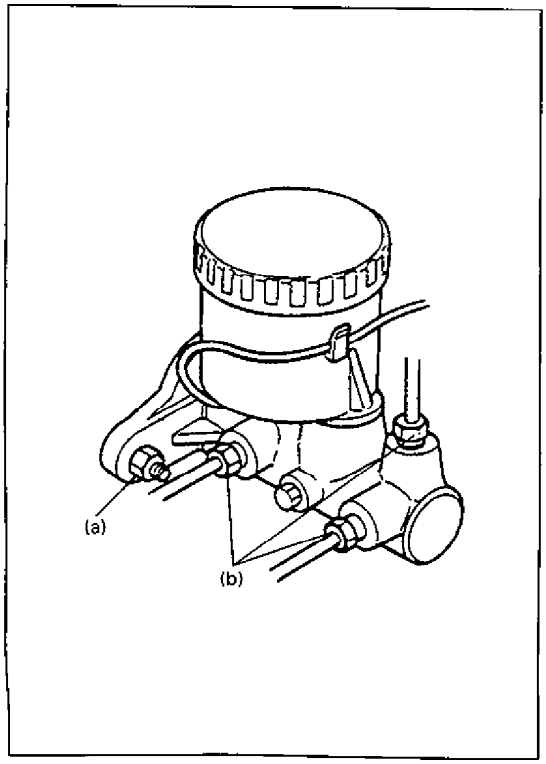
NOTE:

Do not allow brake fluid to get on painted surfaces.

1) Disconnect reservoir lead wire at coupler.
2) Clean around reservoir cap and take out fluid with syringe or such.
3) Disconnect pipes "1" and "2" from master cylinder and ABS actuator, and pipe "3" from ABS actuator.
4) Remove attaching nuts/washers.


60A50-5-54-3

5) Remove master cylinder from brake booster.



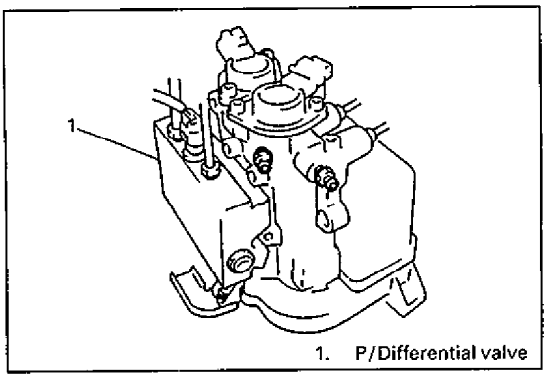
61A10-5A1-11-4

INSTALLATION

NOTE:

- **See NOTE at the begining of this section.**
- **Adjust clearance between booster piston rod and primary piston with special tool (Refer to "INSPECTION / ADJUSTMENT OF CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON ADJUSTMENT" in Section 5).**

1) Install master cylinder to brake booster.
2) Torque master cylinder attaching nuts to specification.
   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)
3) Connect hydraulic lines and torque flare nuts to specification.
   Tightening Torque
   (b): 16 N·m (1.6 kg-m, 12.0 lb-ft)
4) Connect reservoir lead wire.
5) Fill reservoir with specified brake fluid.
6) After installing, check brake pedal play and bleed air from system, refer to "BLEEDING BRAKES" in this section.
7) Perform brake test and check each installed part for fluid leakage.



1. P/Differential valve

61A30-5A1-3-5

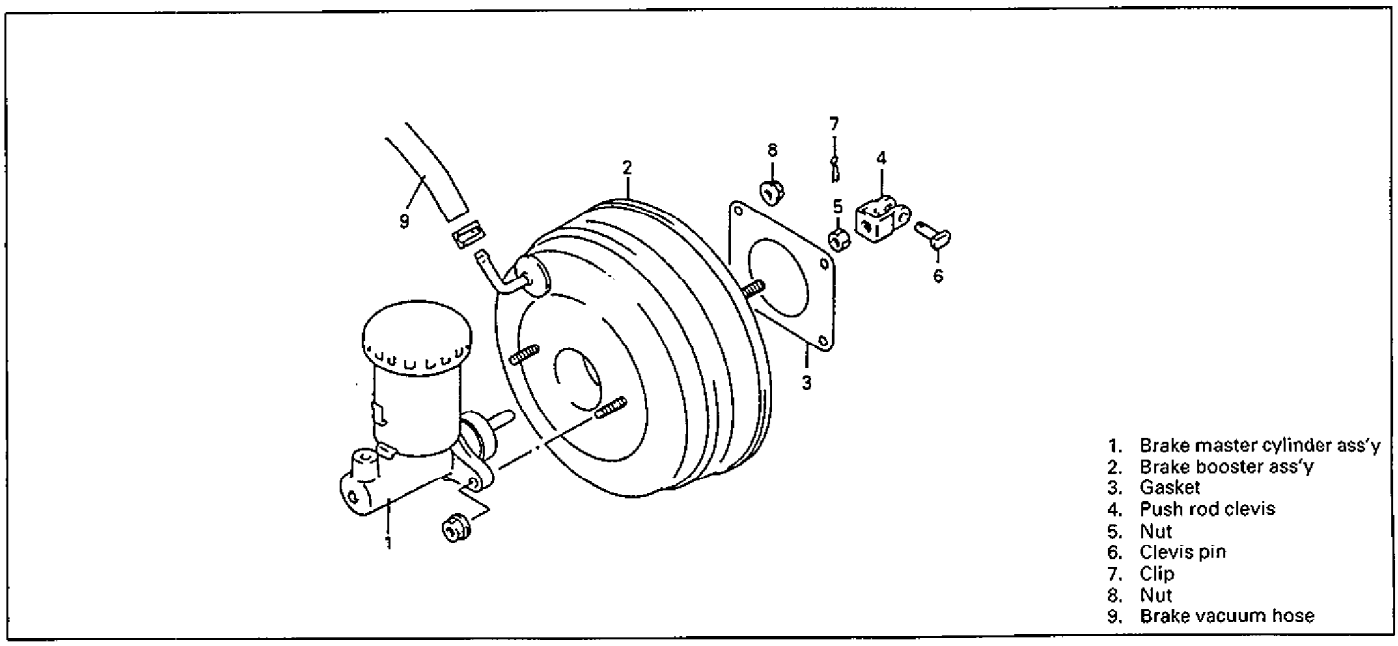
P (Proportioning) & DIFFERENTIAL VAVLE (Included in ABS actuator)

REMOVAL & INSTALLATION

P&D Differential valve, which is one of ABS actuator component and unremovable, must be serviced as ABS actuator. For removal and installation of ABS actuator, refer to Section 5B of this manual.

BRAKE BOOSTER R & I

REMOVE AND INSTALL BOOSTER



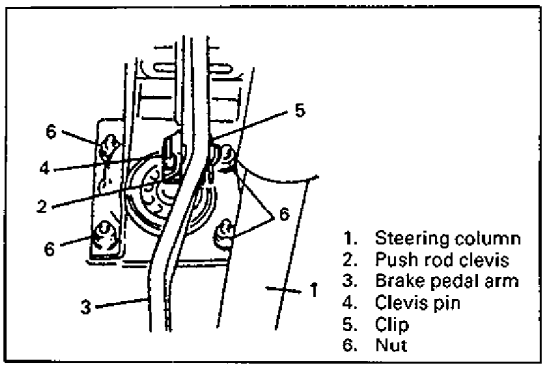
1. Brake master cylinder ass'y
2. Brake booster ass'y
3. Gasket
4. Push rod clevis
5. Nut
6. Clevis pin
7. Clip
8. Nut
9. Brake vacuum hose

61A10-5A1-12-2

REMOVAL

1) Remove ABS actuator from vehicle body referring to section 5B and then remove master cylinder assembly, referring to steps 1) to 5) of its REMOVAL on page 5A1-11.
2) Disconnect brake vacuum hose from brake booster.

61A10-5A1-12-4

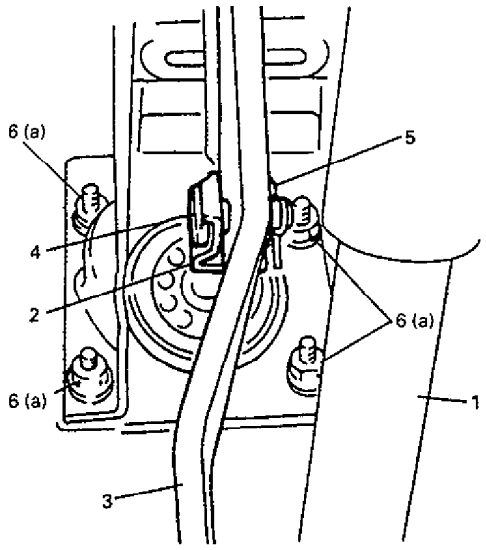


1. Steering column
2. Push rod clevis
3. Brake pedal arm
4. Clevis pin
5. Clip
6. Nut

60A50-5-62-4

3) Disconnect push rod clevis from brake pedal arm.
4) Remove attaching nuts and then booster as shown.

CAUTION:
Never disassemble brake booster. Disassembly will spoil its original function. If is found faulty, replace it with new one.



1. Steering column
2. Push rod clevis
3. Brake pedal arm
4. Clevis pin
5. Clip
6. Nut

61A10-5A1-13-1

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Check length of push rod clevis. (Refer to "BRAKE BOOSTER INSPECTION AND ADJUSTMENT" in Section 5)**
- **Before installing master cylinder, adjust booster piston rod. (Refer to "INSPECTION / ADJUSTMENT OF CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON ADJUSTMENT" in Section 5).**
- **Apply silicone grease to master cylinder piston.**

1) Install booster to dash panel as shown. Then connect booster push rod clevis to pedal arm with clevis pin and clip.
2) Tighten booster attaching nuts to the specified torque.

Tightening Torque
(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Connect brake vacuum hose to brake booster.
4) Install master cylinder, referring to steps 1) to 4) of its INSTALLATION in this section.
5) Install ABS actuator referring to Section 5B.
6) Fill reservoir with specified brake fluid.
7) After installing, check brake pedal play and bleed air from system, refer to "BLEEDING BRAKES" in this section.
8) Perform brake test and check each installed part for fluid leakage.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Brake pipe 4-way joint bolt		10	1.0	7.5
2. Clamp bolt (Refer to page 5A1-9, 10)	(b), (c), (j), (k)	10	1.0	7.5
	(f), (g), (h), (i)	5.5	0.55	4.0

SECTION 5A2

BRAKES (Equipped with ABS)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deplyment or could render the air bag inoperative. Either of these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:

- **When inspecting and servicing vehicle equipped with ABS, be sure to refer to Section 5B1 first.**
- **For the descriptions (items) not found in this section, refer to Section 5 of Service Manual mentioned in FOREWORD of this manual.**
- **All brake fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts. There is to be no welding as it may result in extensive damage and weakening of the metal.**

61A10-5A2-1-1

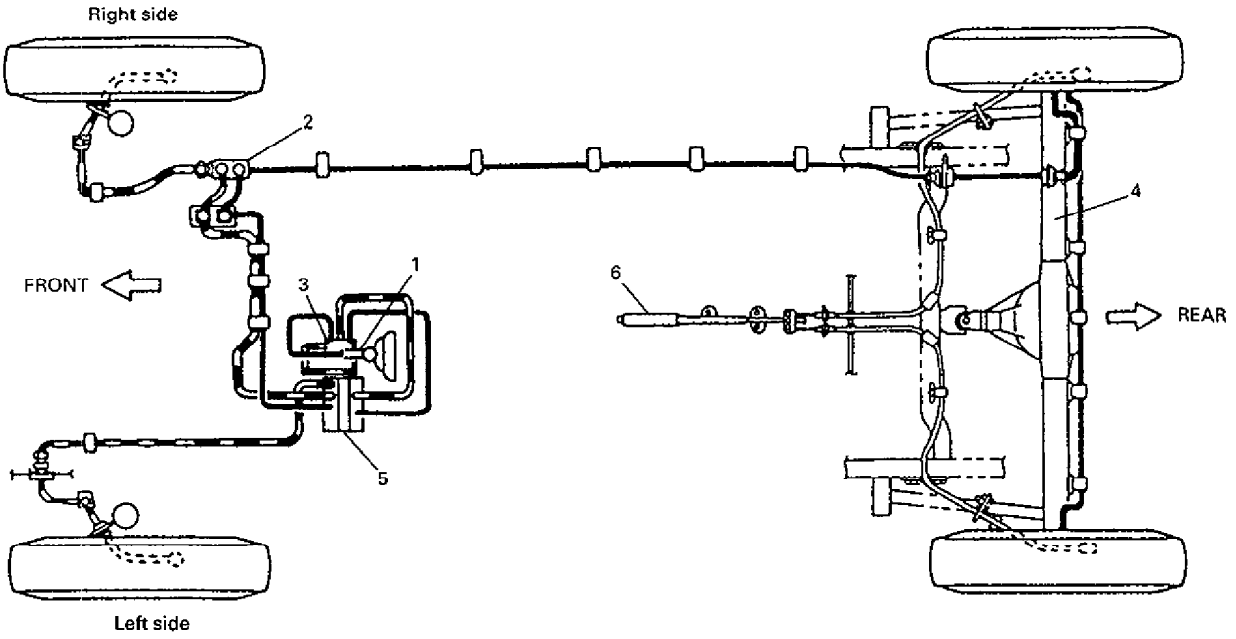
CONTENTS

61A10-5A2-1-2

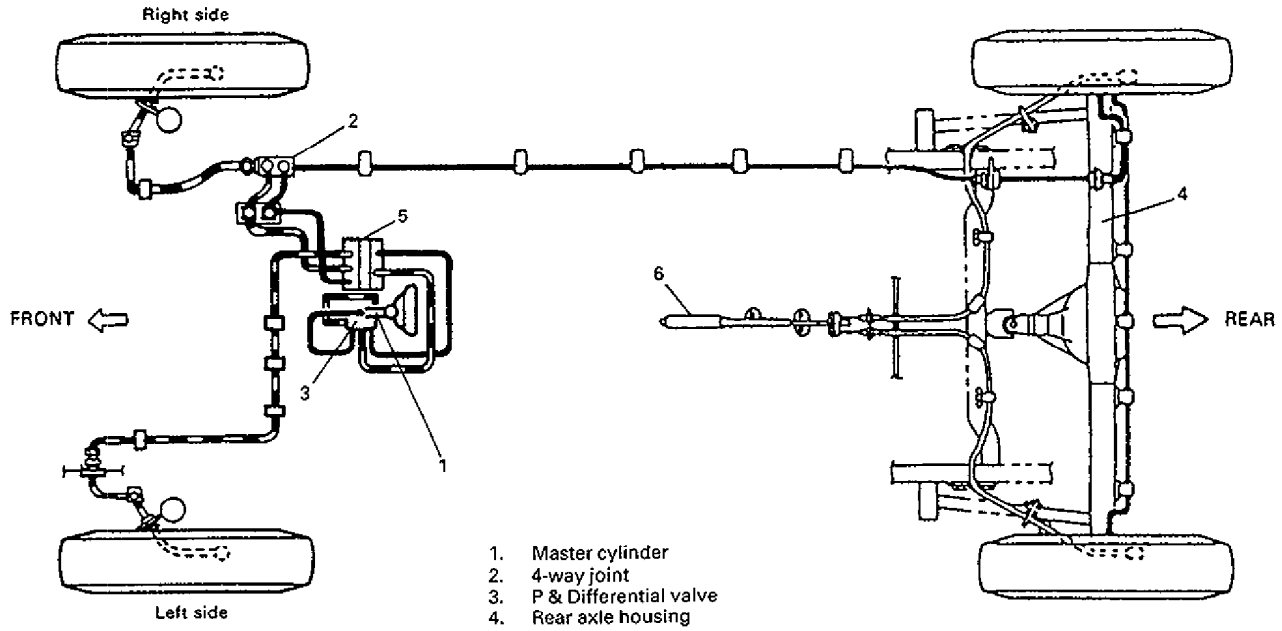
GENERAL DESCRIPTION

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. Three brake pipes are connected to the master cylinder and they make two independent circuits. One connects front brakes (right and left) and the other connects rear brakes (right and left).
In this brake system, the disc brake type is used for the front wheel brake and a drum brake type (leading/trailing shoes) for the rear brake.
The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake shoes are used for both parking and foot brakes.

Left hand steering vehicle



Right hand steering vehicle



1. Master cylinder
2. 4-way joint
3. P & Differential valve
4. Rear axle housing
5. ABS actuator
6. Parking brake

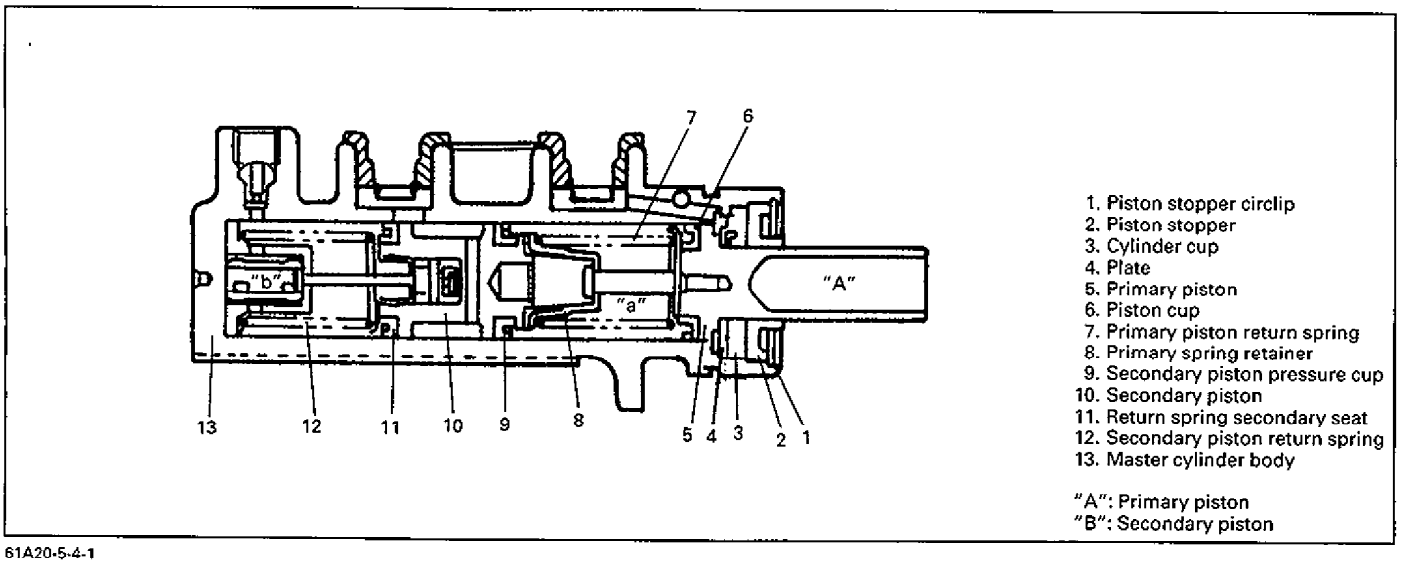
MASTER CYLINDER ASSEMBLY

GENERAL DESCRIPTION

The master cylinder has two pistons and three piston cups. Its hydraulic pressure is produced in the primary ("a" in the below figure) and secondary ("b") chambers. The hydraulic pressure produced in the primary chamber ("a") acts on the rear wheel brakes (left and right).
Also, the hydraulic pressure produced in the secondary chamber ("b") acts on the front wheel brakes (left and right).

NOTE:

Replace all components included in repair kits to service this master cylinder. Lubricate rubber parts with clean, fresh brake fluid to ease assembly. Do not 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.

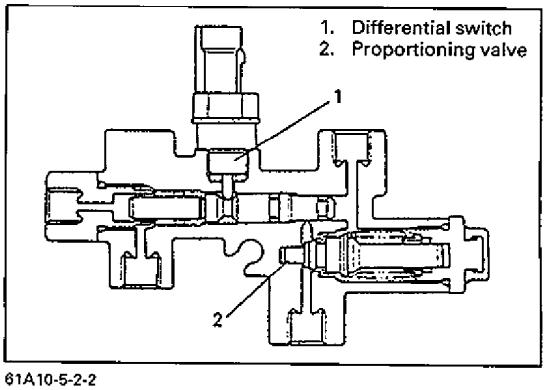


61A20-5-4-1

ABS (Antilock Brake System)

For general description and operation of this system, refer to SECTION 5B1 of this manual.

61A10-5A2-3-4



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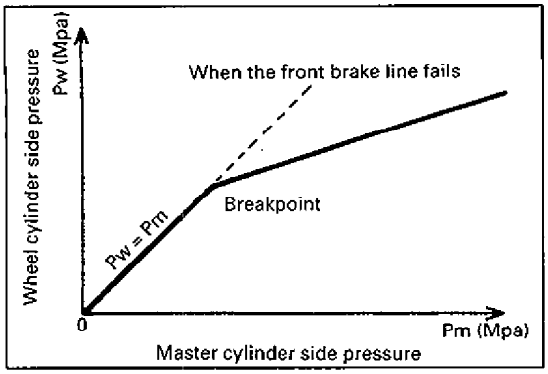
P (Proportioning) & DIFFERENTIAL VALVE

STRUCTURE OF P & DIFFERENTIAL VALVE

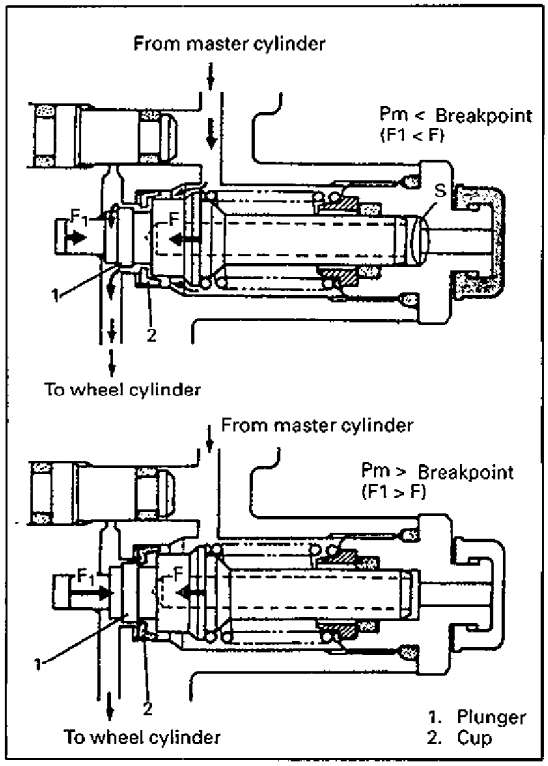
The P & Differential valve consists of a proportioning valve and differential switch.



61A10-5A1-3-3

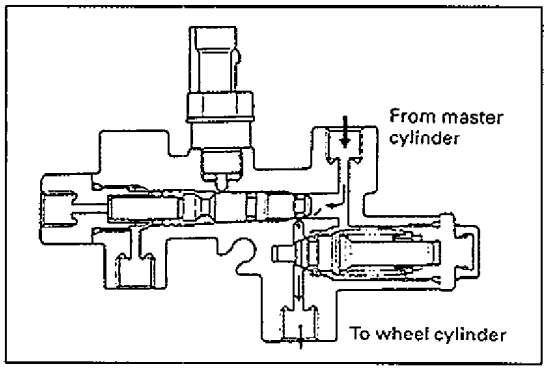
PURPOSE AND OPERATION OF PROPORTIONING VALVE

The proportioning valve regulates the brake fluid pressure in the rear brake line, which is the same both on the master cylinder side and wheel cylinder side up to the breakpoint in the graph but once the fluid pressure on the master cylinder side exceeds that point, that on the wheel cylinder side increases as shown by the graph.



61A10-5A2-4-2

Its operation is as follows. Till the master cylinder side pressure (Pm) reaches breakpoint, the spring force (F) is higher than the force caused pressure ($F^1 = Pm \cdot S$) and so Pm is transmitted to the wheel cylinder side as it is through the opening between the plunger and cup. As Pm rises higher than breakpoint, F_1 exceeds F and the plunger moves to the right as shown in the figure to close the above opening.
When Pm rises even higher, the plunger moves to allow the opening. Then the wheel cylinder side pressure (Pw) increases and the opening is closed.
Such operation cycle is repeated and Pm is transmitted to the wheel cylinder as Pw as shwon by the above graph.



61A10-5-3-1

When the front brake line fails (when bleeding fluid from the brake line), the bypass line is opened to stop the proportioning valve so as to increase effect of the rear brake.

PURPOSE AND OPERATION OF DIFFERENTIAL SWITCH

When a failure occurs in either the front or rear brake line, the differential switch, detecting a pressure difference in the brake line, turns ON to transmit the failure to the ABS control module.
After the brake system is repaired, depressing the brake pedal will apply pressure to set the switch automatically (at OFF position).

DIAGNOSIS

BRAKE DIAGNOSIS CHART A

Condition	Possible Cause	Correction
Not enough braking force	1. Brake oil leakage from brake lines.	Locate leaking point and repair.
	2. Brake disc or pads stained with oil.	Clean or replace.
	3. Overheated brakes.	Determine cause and repair.
	4. Poor contact of shoes on brake drum.	Repair for proper contact.
	5. Brake shoes linings stained with oil or wet with water.	Replace.
	6. Badly worn brake shoe linings.	Replace.
	7. Defective wheel cylinders.	Repair or replace.
	8. Malfunctioning caliper assembly.	Repair or replace.
	9. Air in system.	Bleed system.
	10. Malfunctioning ABS.	Check system and replace as necessary.
Brake pull (Brakes not working in unison)	1. Pad or shoe linings are wet with water or stained with oil in some brakes.	Replace.
	2. Drum-to-shoe clearance out of adjustment in some brakes. (Malfunctioning auto adjusting mechanism).	Check for inoperative auto adjusting mechanism.
	3. Drum is out of round in some brakes.	Replace.
	4. Wheel tires are inflated unequally.	Inflate equally.
	5. Malfunctioning wheel cylinders.	Repair or replace.
	6. Disturbed front end alignment.	Adjust as prescribed.
	7. Unmatched tires on same axle.	Tires with approximately the same amount of tread should be used on the same axle.
	8. Restricted brake tubes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
	9. Malfunctioning caliper assembly.	Check for stuck or sluggish pistons and proper lubrication of caliper slide bush.
		Caliper should slide.
	10. Loose suspension parts.	Check all suspension mountings.
	11. Loose calipers.	Check and torque bolts to specifications.
Noise (high pitched squeak without brake applied)	1. Front lining worn out.	Replace linings.
Brake locked	1. Malfunctioning ABS.	Check system and replace as necessary.

BRAKE DIAGNOSIS CHART B

Condition	Possible Cause	Correction
Excessive pedal travel (Pedal stroke too large)	1. Partial brake system failure.	Check brake systems and repair as necessary.
	2. 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.
	3. Air in system. (pedal soft/spongy)	Bleed system.
	4. Rear brake system not adjusted (malfunctioning auto adjusting mechanism).	Repair auto adjusting machanism. Adjust rear brakes.
	5. Bent brake shoes.	Replace brake shoes.
	6. Worn rear brake shoes.	Replace brake shoes.
Dragging brakes (A very light drag is present in all disc brakes immediately after pedal is released)	1. Master cylinder pistons not returning correctly.	Replace master cylinder.
	2. Restricted brake tubes or hoses.	Check for soft hoses or damaged tubes and replace with new hoes and/or new brake tubes.
	3. Incorrect parking brake adjustment on rear brakes.	Check and adjust to correct specifications.
	4. Weakened or broken return springs in the brake.	Replace.
	5. Sluggish parking-brake cables or linkage.	Repair or replace.
	6. Wheel cylinder or caliper piston sticking.	Repair as necessary.
	7. Malfunctioning ABS.	Check system and replace as necessary.
Pedal pulsation (Pedal pulsates when depressed for braking.)	1. Damaged or loose wheel bearings.	Replace wheel bearings.
	2. Distorted steering knuckle or rear axle shafts.	Replace knuckle or rear exle shaft.
	3. Excessive disc lateral runout.	Check per instructions. If not within specifications, replace or machine the disc.
	4. Parallelism not within specifications.	Check per instructions. If not with specifications, replace or machine the disc.
	5. Rear drums out of round.	Check runout. Repair or replace drum as necessary.
Braking noise	1. Glazed shoe linings, or foreign matters stuck to linings.	Repair or replace shoe lining.
	2. Worn or distorted shoe linings.	Replace shoe lining (or pad).
	3. Loose front wheel bearings.	Replace wheel bearing.
	4. Distorted backing plates or loose mounting bolts.	Replace or retighten securing bolts.

BRAKE DIAGNOSIS CHART C		
Condition	**Possible Cause**	**Correction**
Brake warning light turns on after engine start	1. Parking brake applied.	Release parking brake and check that brake warning light turns off.
	2. Insufficient amount of brake fluid	Add brake fluid.
	3. Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	4. Brake warning light circuit faulty.	Check system referring to "DIAGNOSIS" in Section 5B1.
	5. Malfunctioning ABS	Check system referring to "DIAGNOSIS" in Section 5B1.
Brake warning light turns on when brake is applied	1. Brake fluid leaking from brake line.	Investigate leaky point, correct it and add brake fluid.
	2. Insufficient amount of brake fluid.	Add brake fluid.
Brake warning light fails to turn on even when parking brake is applied	1. Bulb burnt out.	Replace bulb.
	2. Brake warning light circuit open.	Repair circuit.
ABS warning light does not turn on for 3 sec. after ignition switch has turned ON.	1. Bulb burnt out.	Replace bulb.
	2. ABS warning light circuit open. (including check relay)	Check system referring to "DIAGNOSIS" in Section 5B1.
ABS warning light remains on after ignition switch has turned on for 3 sec.	1. Malfunctioning ABS.	Check system referring to "DIAGNOSIS" in Section 5B1.

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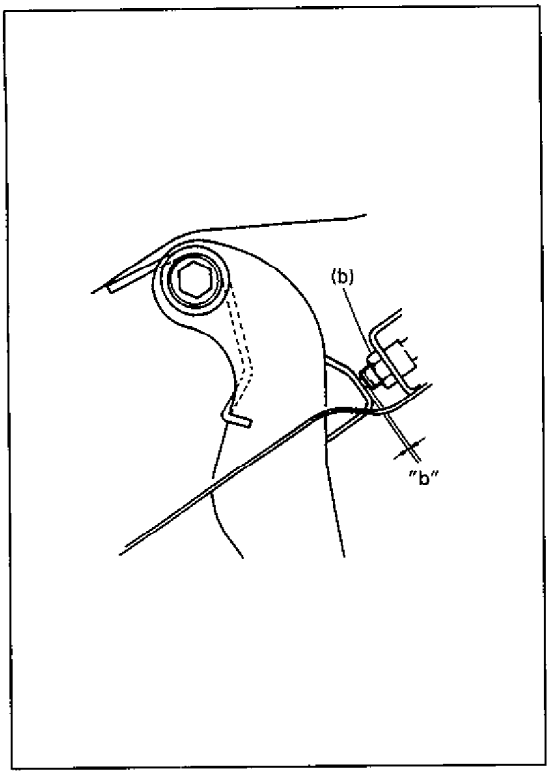


61A10-5A2-8-1

ON VEHICLE SERVICE

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 return cushion (shown as "b" in figure). Then tighten lock nut to specified torque.

Clearance "b": 1.5 – 2.0 mm (0.06 – 0.08 in.)
Tightening Torque
(b): 7.5 N·m (0.75 kg-m, 5.5 lb-ft)

BLEEDING BRAKES

CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentially touch painted surface, immediately wipe fluid from paint and clean painted surface.

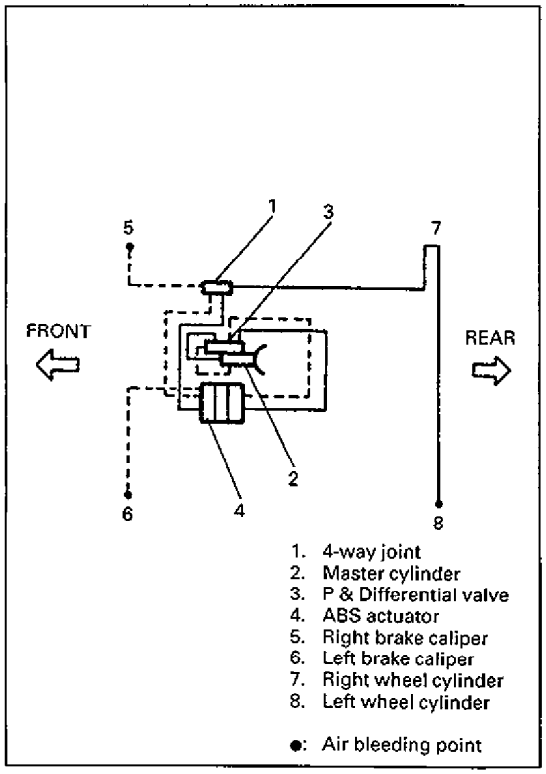
NOTE:
When master cylinder has removed or disassembled, or brake pipe has been disconnected from master cylinder, bleed air from master cylinder to facilitate bleeding air of brake system. Then proceed to following operation.

Bleeding operation is necessary to remove air whenever it entered hydraulic brake system. Refer to Section 5 of Service Manual mentioned in FOREWORD of this manual.

61A10-5A2-8-3

ABS (Antilock Brake System)

For removal, installation and inspection procedures of this system (ABS control module, ABS hydraulic Unit, wheel speed sensor and etc.), refer to Section 5B1 of this manual.



61A10-5A2-9-1

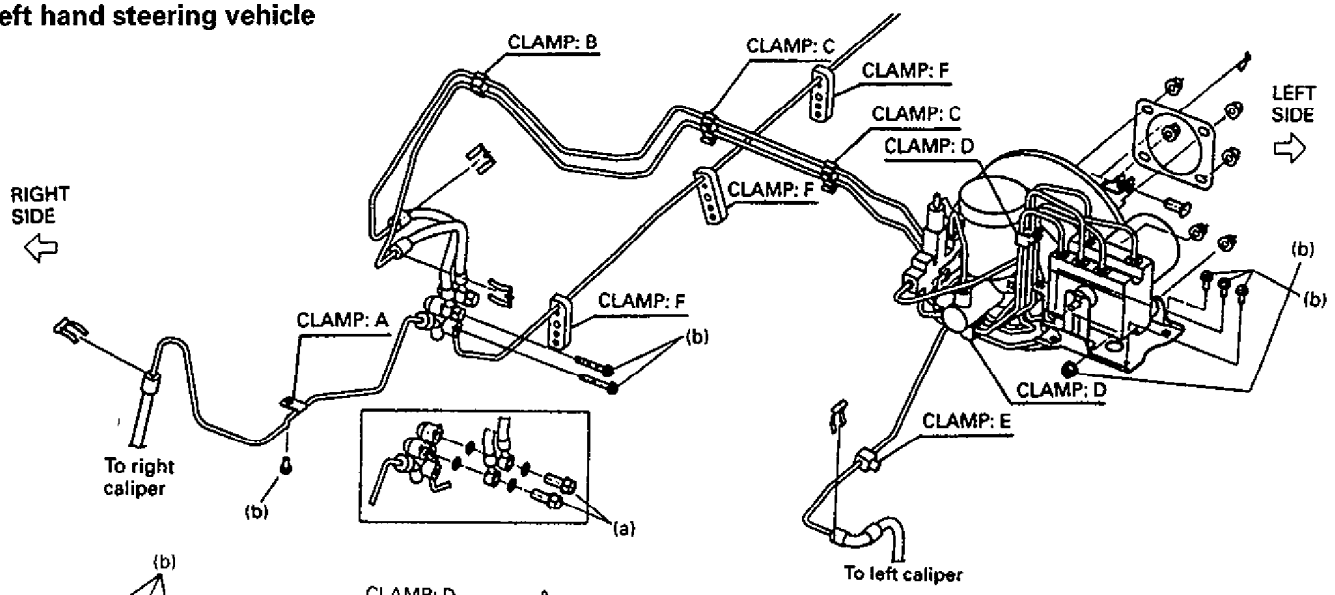
Hydraulic lines of brake system consists of two separate lines, one for front wheel brakes and the other for rear wheel brakes. Air bleeding is necessary at right and left front wheel brakes and left rear wheel brake, i.e. 3 places in all.
Be sure to bleed air of brake system according to procedure when its oil hydraulic circuit has been disconnected. Refer to Section 5 of Service Manual mentioned in FOREWORD of this manual.

BRAKE HOSE/PIPE R & I

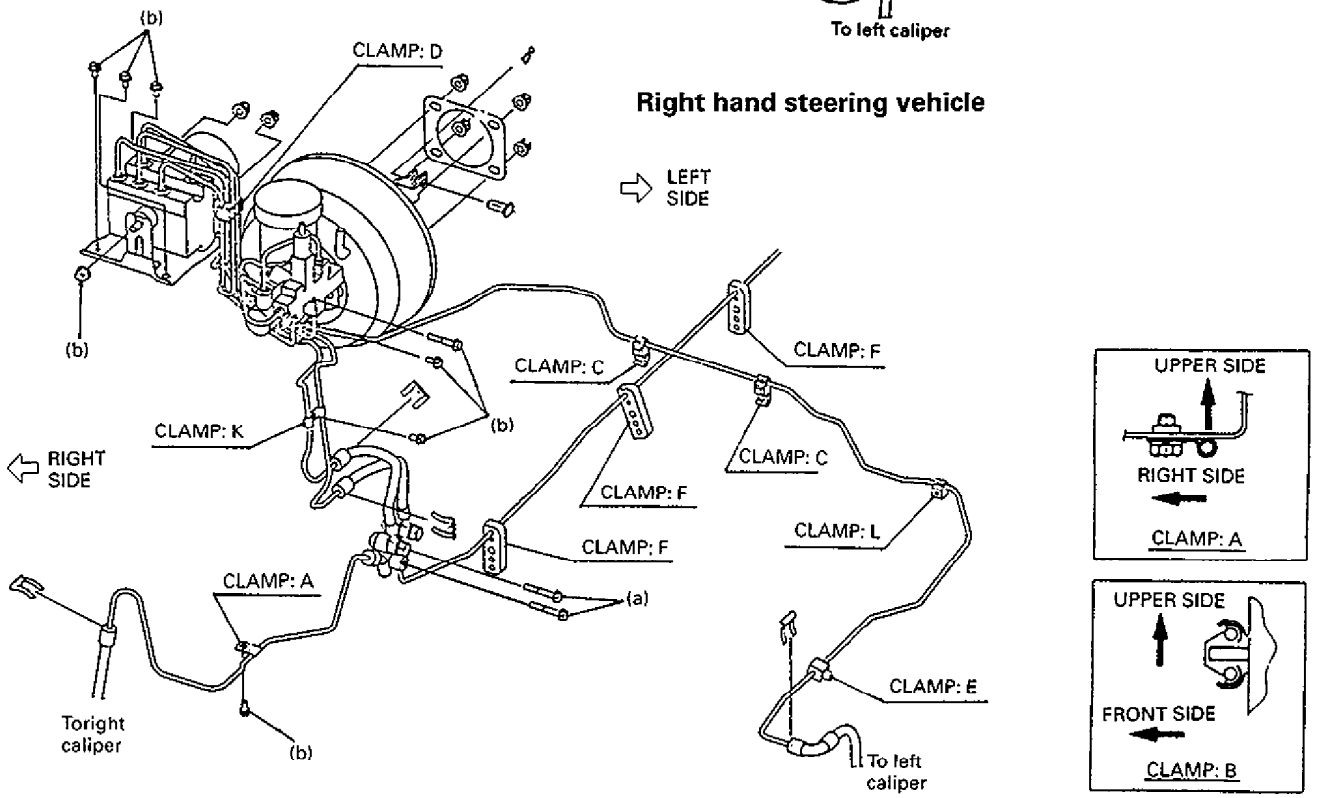
REMOVE AND INSTALL FRONT BRAKE HOSE/PIPE

1) Raise and suitably support vehicle. Remove tire and wheel.
   This operation is not necessary when removing pipes connecting master cylinder and flexible hose.
2) Drain coolant and disconnect heater hoses from body side connection. This operation is necessary when removing pipes connecting master cylinder and flexible hose.
3) Remove P & Differential valve refering to steps 2) to 4) of its REMOVAL on page 5A2-15.
4) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
5) Reverse removal procedure for brake hose or pipe installation.
   For installation, make sure that steering wheel is in straightforward position and hose has no twist or kink. Check to make sure that hose doesn't contact any part of suspension, both in extreme right and extreme left turn conditions. If it does at any point, remove and correct. Fill and maintain brake fluid level in reservoir. Bleed brake system.
6) Perform brake test and check installed part for fluid leakage.

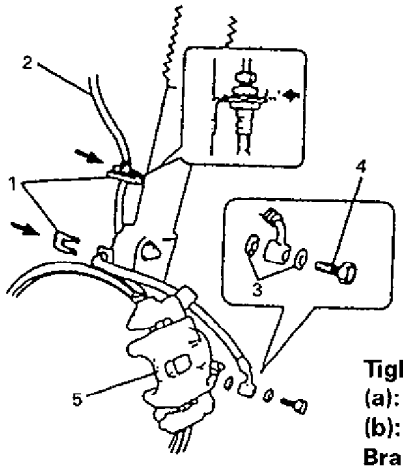
Left hand steering vehicle



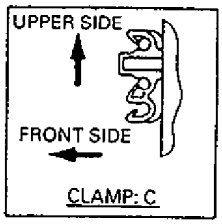
Right hand steering vehicle

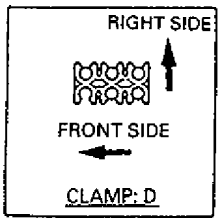


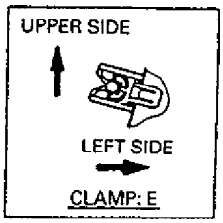
NOTE:
Insert E-ring till its end surface is flush with or lower than bracket end surface.

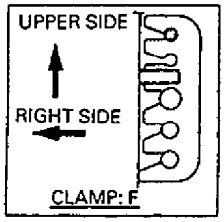


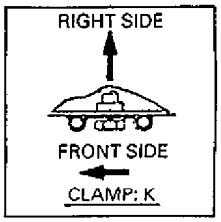
1. E-ring
2. Flexible hose
3. Hose washer
4. Hose bolt
5. Brake caliper

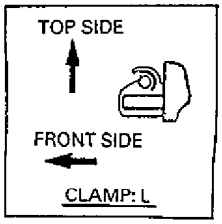












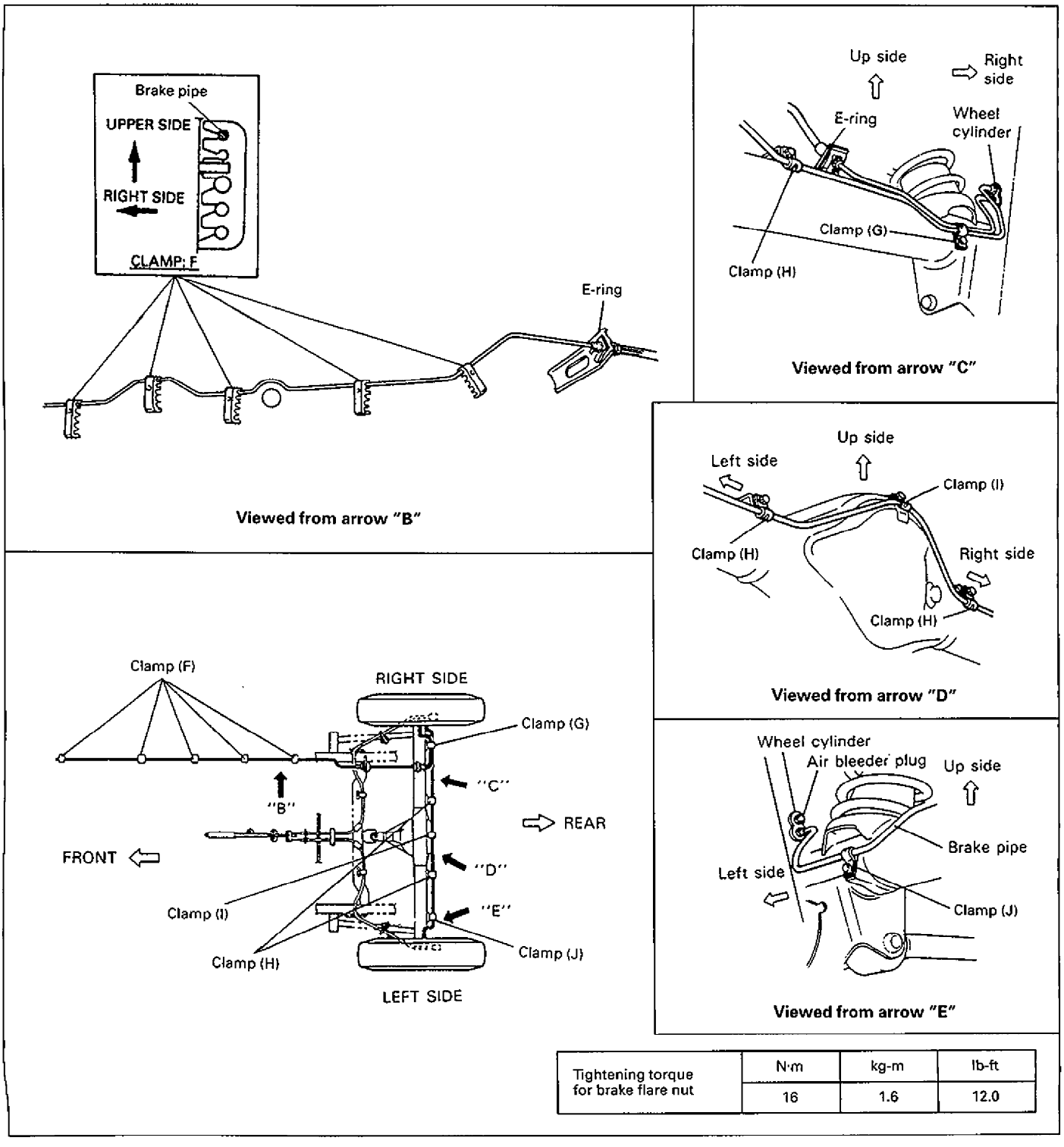
Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)
Brake pipe flare nuts: 16 N·m (1.6 kg-m, 11.5 lb-ft)

REMOVE AND INSTALL REAR BRAKE HOSE/PIPE

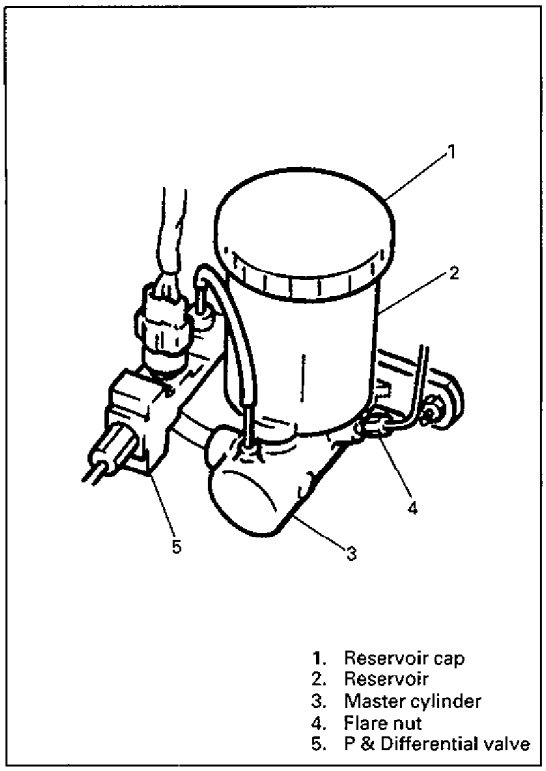
1) Raise and suitably support vehicle. Remove tire and wheel.
2) Clean dirt and foreign material from both hose end or pipe end fittings. Remove brake hose or pipe.
3) Reverse removal procedure for brake hose or pipe installation procedure. Fill and maintain brake fluid level in reservoir. Bleed brake system.
4) Perform brake test and check each installed part for fluid leakage.

PRECAUTION FOR INSTALLATION

- Be sure to obtain more than 3 mm (0.118 in.) clearance between axle housing and brake pipe.
- Install clamps properly referring to figure below and tighten bolts.
- When installing hose, make sure that it has no twist or kink.



Tightening torque for brake flare nut	N·m	kg-m	lb-ft
	16	1.6	12.0



1. Reservoir cap
2. Reservoir
3. Master cylinder
4. Flare nut
5. P & Differential valve

61A10-5A2-12-1

MASTER CYLINDER REPAIR

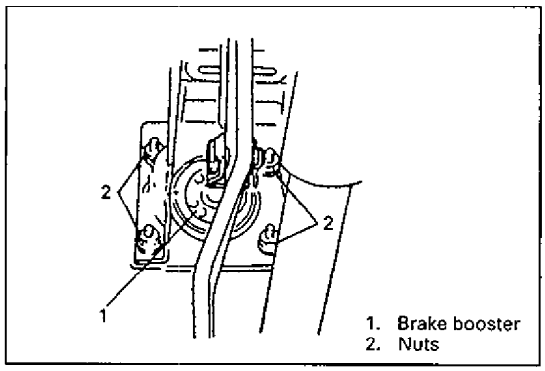
REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY

REMOVAL

NOTE:

Do not allow brake fluid to get on painted surfaces.

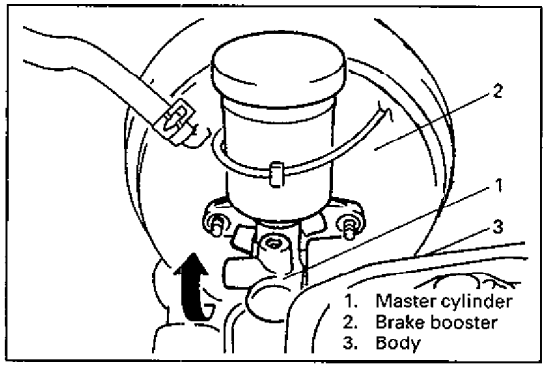
1) Clean around reservoir cap and take out fluid with syringe or such.
2) Remove P & Differential valve refering to steps 2) to 4) of its REMOVAL on page 5A2-15.
3) Disconnect reservoir lead wire at coupler.
4) Disconnect brake pipes from master cylinder.
5) Remove attaching nuts/washers.



1. Brake booster
2. Nuts

61A20-5-14-3

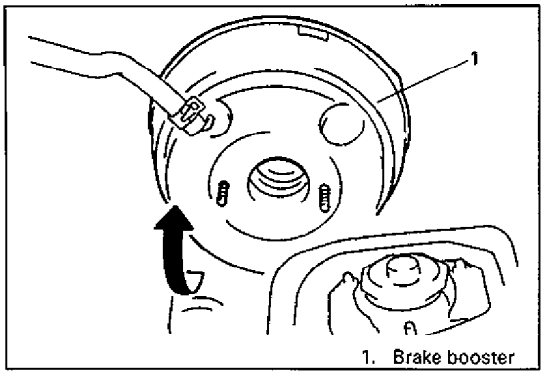
6) Loosen brake booster attaching nuts to such extent as to allow brake booster to move.



1. Master cylinder
2. Brake booster
3. Body

61A20-5-14-4

7) Move brake booster and master cylinder together as shown in figure and remove master cylinder only.



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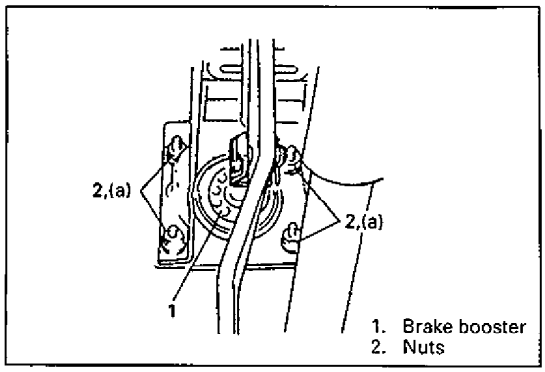

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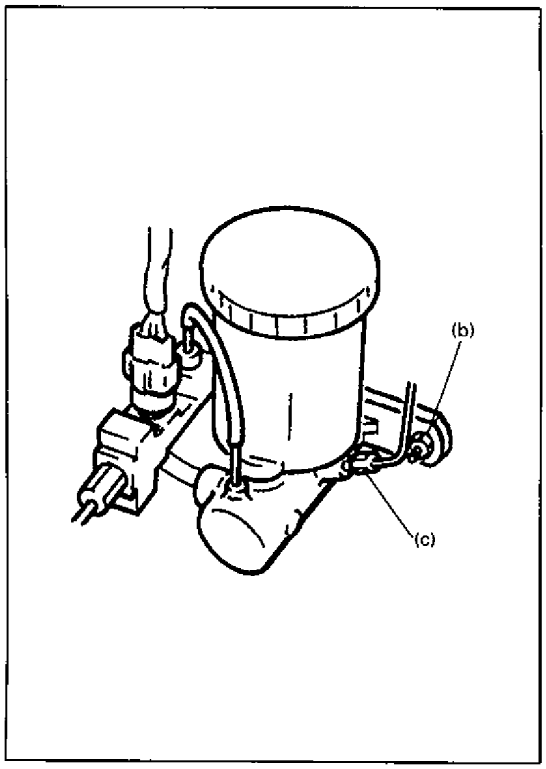


61A10-5A2-13-3

INSTALLATION

NOTE:

- **See NOTE at the beginning of this section.**
- **Adjust clearance between booster piston rod and primary piston with special tool. Refer to "CLEARANCE BETWEEN BOOSTER PISTON ROD AND MASTER CYLINDER PISTON ADJUSTMENT" of Service Manual mentioned in FOREWORD of this Manual.**

1) After moving brake booster a little as shown in figure, install master cylinder to brake booster.

2) Torque booster attaching nuts to specification.

Tightening Torque
(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)

3) Torque master cylinder attaching nuts to specification.

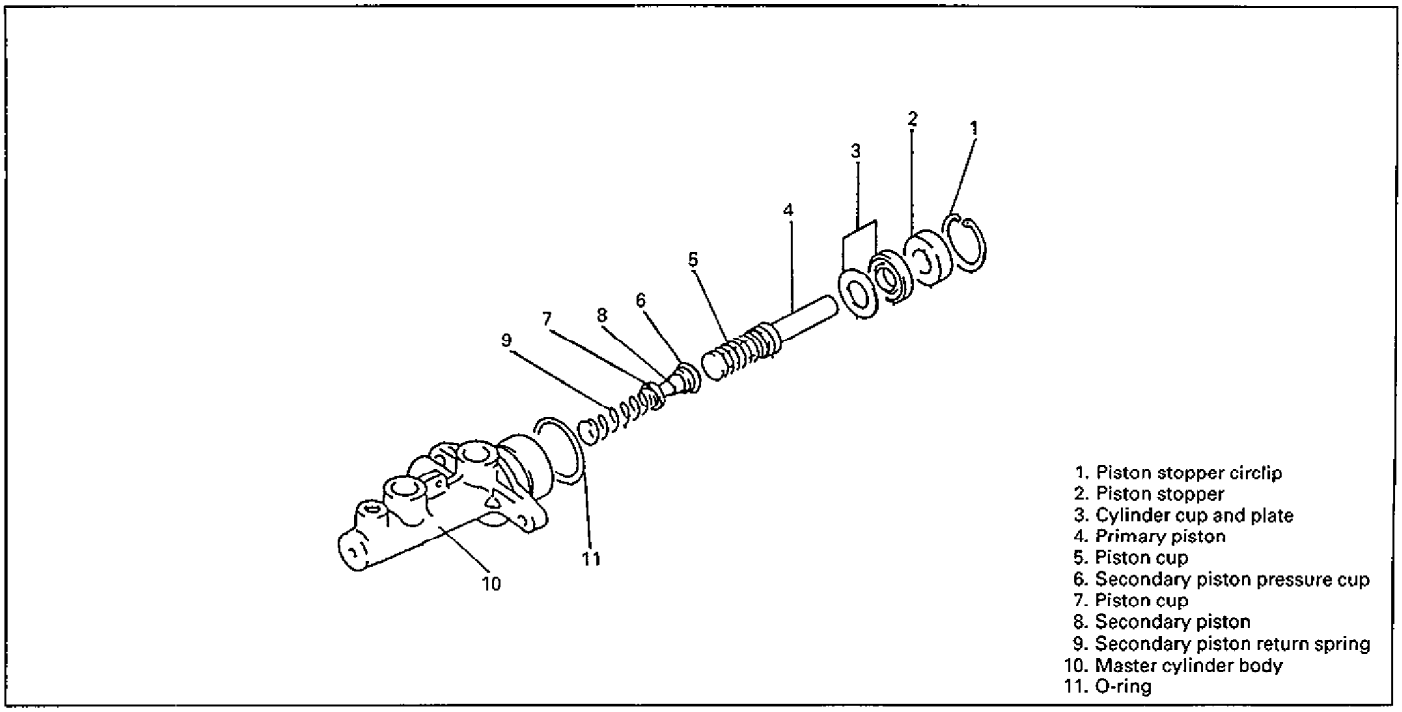
Tightening Torque
(b): 13 N·m (1.3 kg-m, 9.5 lb-ft)

4) Install P & Differential valve, refering to steps 1) to 3) of its INSTALLATION on page 5-16.
5) Connect hydraulic lines and torque flare nuts to specification.

Tightening Torque
(c): 16 N·m (1.6 kg-m, 12.0 lb-ft)

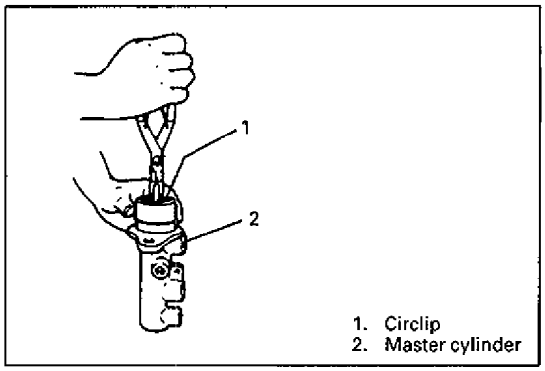
6) Connect reservoir lead wire.
7) Fill reservoir with specified brake fluid.
8) After installing, check brake pedal play and bleed air from system. Refer to "BLEEDING BRAKES" in this section.
9) Perform brake test and check each installed part for fluid leakage.

DISASSEMBLE AND ASSEMBLE MASTER CYLINDER



1. Piston stopper circlip
2. Piston stopper
3. Cylinder cup and plate
4. Primary piston
5. Piston cup
6. Secondary piston pressure cup
7. Piston cup
8. Secondary piston
9. Secondary piston return spring
10. Master cylinder body
11. O-ring

61A20-5-16-1

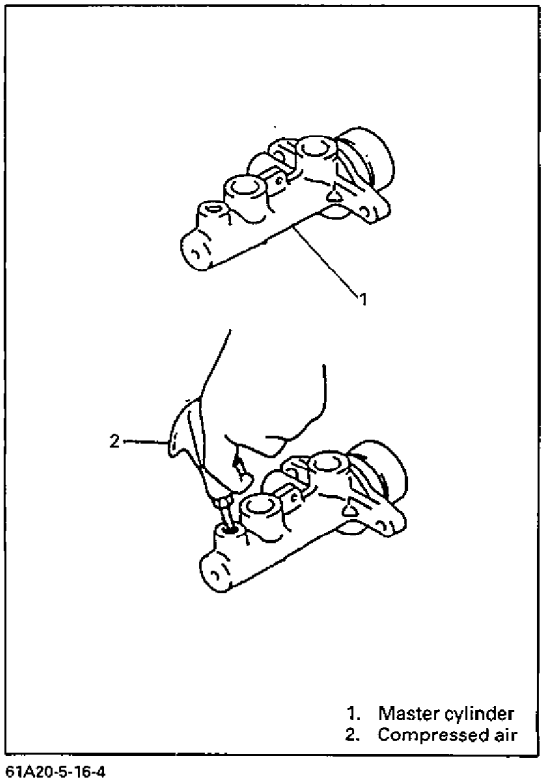


1. Circlip
2. Master cylinder

64B40-5-51-3

DISASSEMBLY

1) Remove circlip.
2) Remove primary piston.



1. Master cylinder
2. Compressed air

61A20-5-16-4

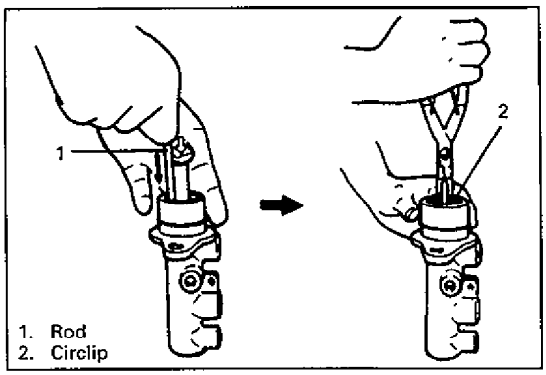
3) Remove secondary piston by blowing compressed air into hole for rear brake pipe.
   Be cautious during removal as secondary piston jumps out.

ASSEMBLY

NOTE:
- **See NOTE at the beginning of this section.**
- **Before assembling, wash each part in fluid recommended to use for that vehicle.**

1) Assemble secondary piston as shown on previous page.
2) Install secondary piston assembly into cylinder.
3) Install primary piston in cylinder.

64B40-5-52-1



4) Depress, and install circlip.
5) For installation on vehicle, refer to "REMOVE AND INSTALL MASTER CYLINDER ASSEMBLY" on page 5A2-12.

61A10-5A2-15-2

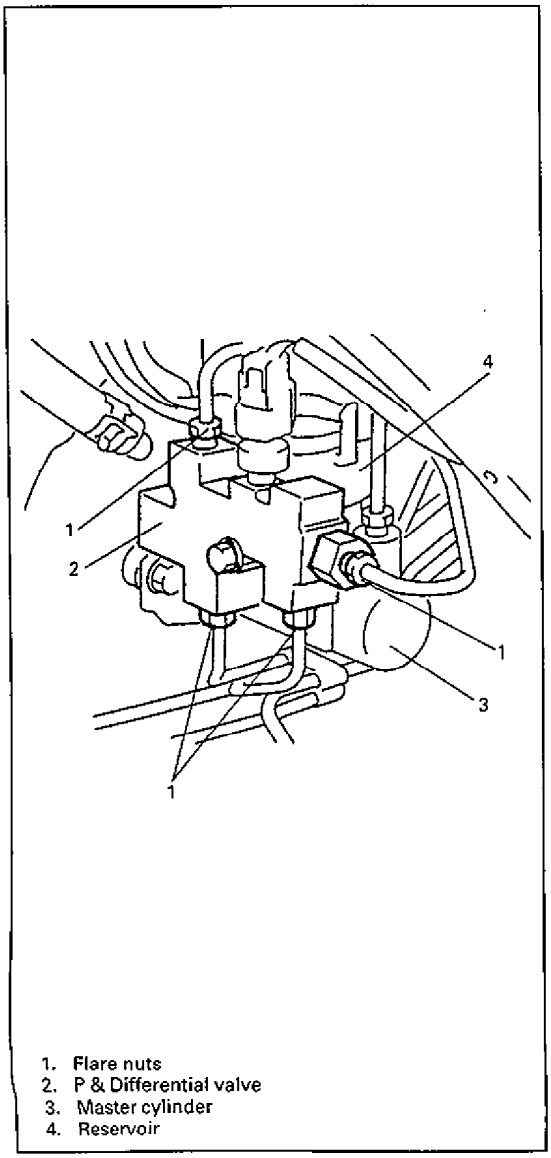
P (Proportioning) & DIFFERENTIAL VALVE R&I

REMOVAL

CAUTION:
Do not allow brake fluid to get on painted surfaces.

1) Clean around reservoir cap and take out fluid with syrings or such.
2) Disconnect P & Differential lead wire at coupler.
3) Disconnect brake pipes from P & Differential valve.
4) Remove P & Differential valve.

WARNING:
Never disassemble P & Differential valve assembly.
If it is found faulty, replace it with new assembly.



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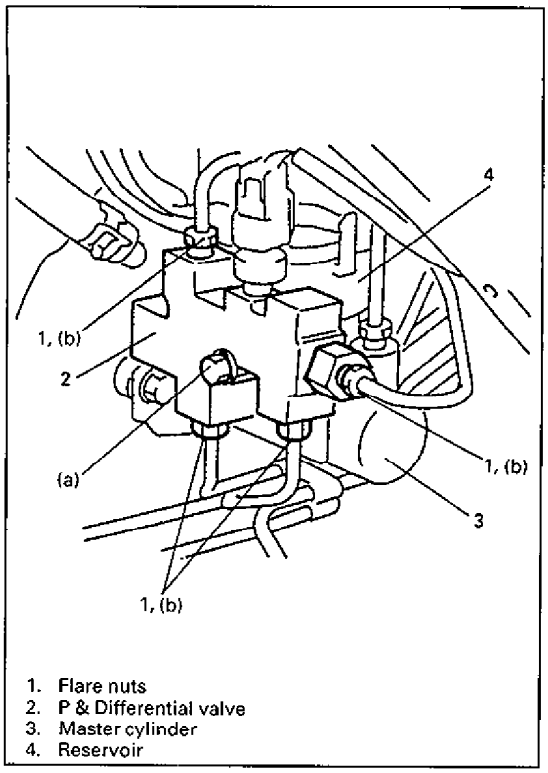


1. Flare nuts
2. P & Differential valve
3. Master cylinder
4. Reservoir

61A10-5-16-1

INSTALLATION

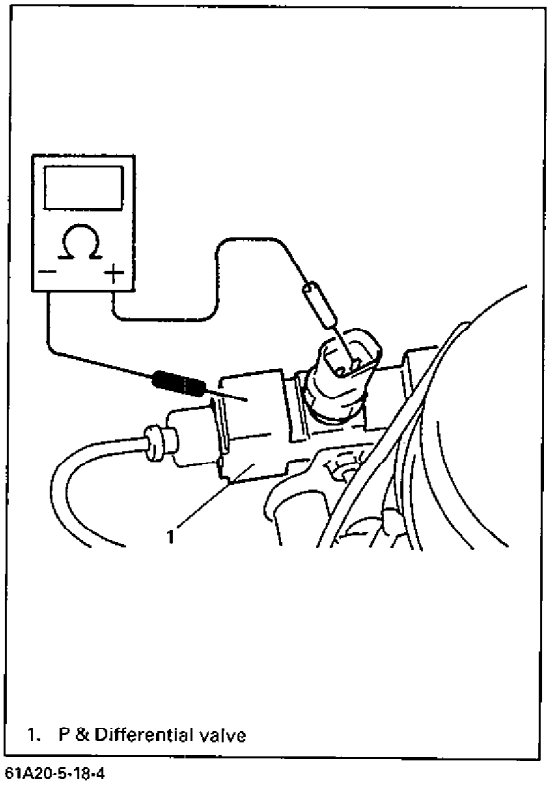
1) Install P&Differential valve.

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

2) Connect P & Differential lead wire at coupler.
3) Tighten flare nuts to specified torque.

Tightening Torque
(b): 16 N·m (1.6 kg-m, 12.0 lb-ft)

4) Fill reservoir with specified brake fluid.
5) After installing, check brake pedal play and bleed air from system. Refer to "BLEEDING BRAKES" in this section.
6) Perform brake test and check each installed part for fluid leakage.



1. P & Differential valve

61A20-5-18-4

INSPECTION

Differential switch

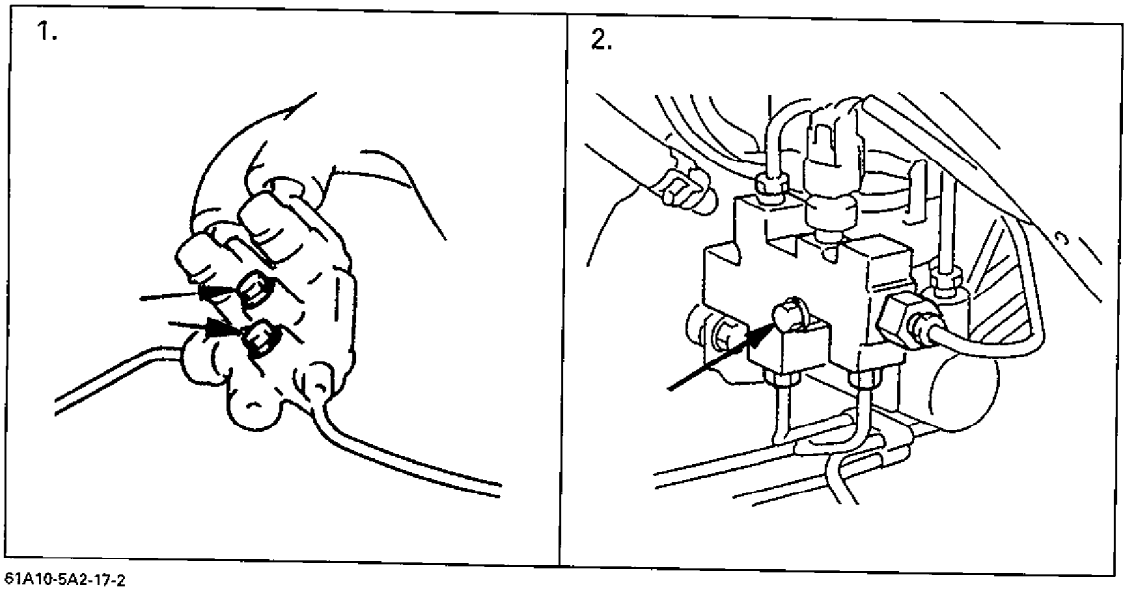
NOTE:
See NOTE at the beginning of this section.

1) Make sure to turn ignition switch OFF and check for leaks in brake system.
2) Disconnect switch coupler.
3) With brake pedal depress, check that there is no continuity between terminal and valve body. If ohmmeter indicates continuity, check brake circuits for fluid leakage or replace P & Differential valve.

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. Brake pipe 4-way joint bolt		10	1.0	7.5
2. P & Differntial valve bolt		10	1.0	7.5
3. Clamp bolt (Refer to page 5A2-10, 11)	(A), (K)	10	1.0	7.5
	(G), (H), (I), (J)	5.5	0.55	4.0

61A10-5A2-17-1



61A10-5A2-17-2

SECTION 5B

ANTILOCK BRAKE SYSTEM (ABS) (OPTIONAL)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. Failure to follow WARNINGS could result in unintended air bag deployment or could render the air bag inoperative. Either or these two conditions may result in severe injury.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

5B

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.

61A30-5B-1-1

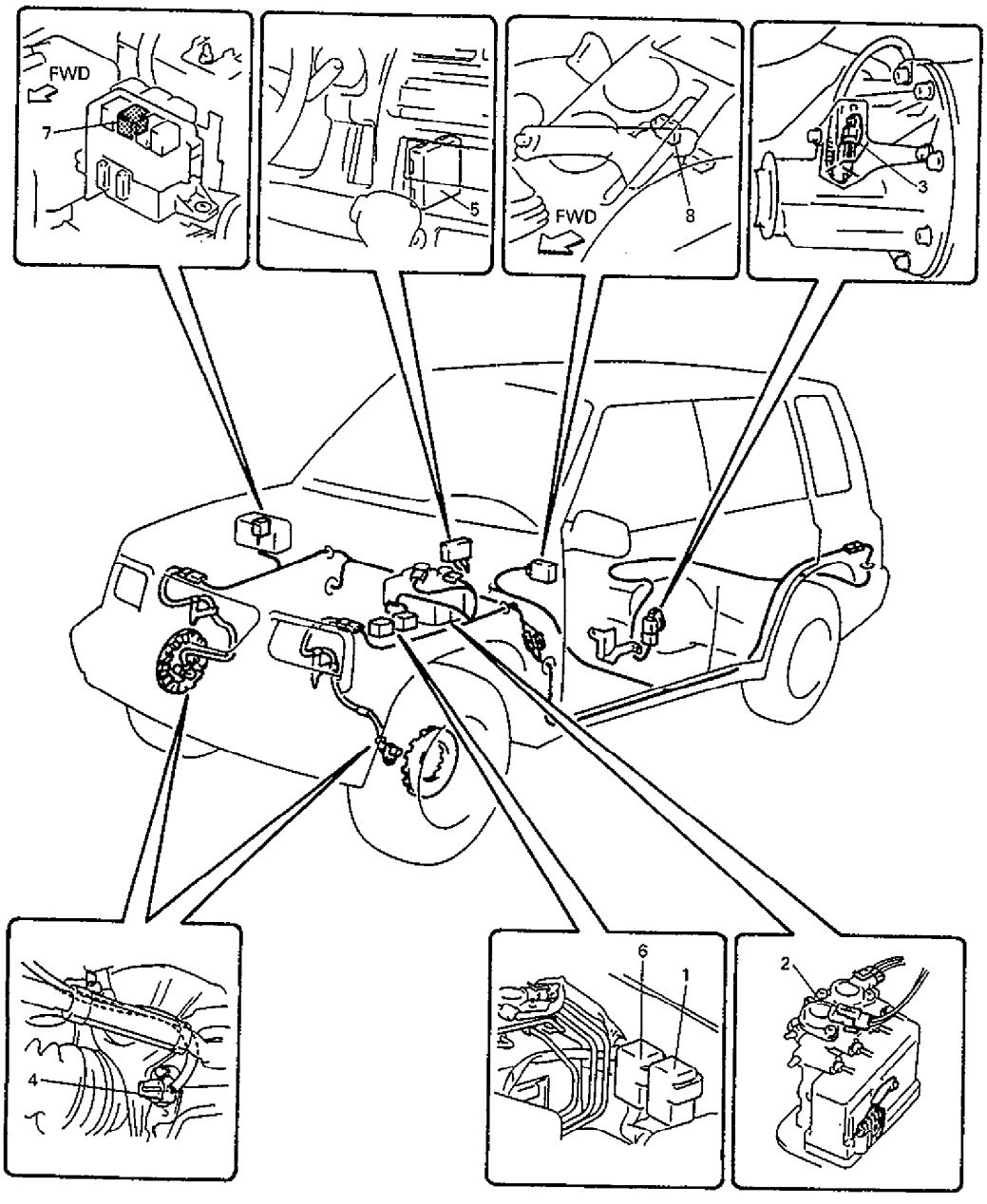
CONTENTS

GENERAL DESCRIPTION

Antilock Brake System (ABS) has been designed to improve the controllability and steerability of a vehicle during braking that would cause at least one of the wheels to lock. ABS accomplishes this by controlling the hydraulic brake pressure applied to each front caliper and the rear wheel cylinders. Antilock braking occurs only when EBCM monitors wheel speeds and determines that at least one wheel is about to lose traction during braking. If required, EBCM will allow hydraulic modulator to change the brake pressures to provide the driver with maximum vehicle controllability.
ABS operation is available from approximately 5 km/h (3 mph) to the maximum vehicle speed.

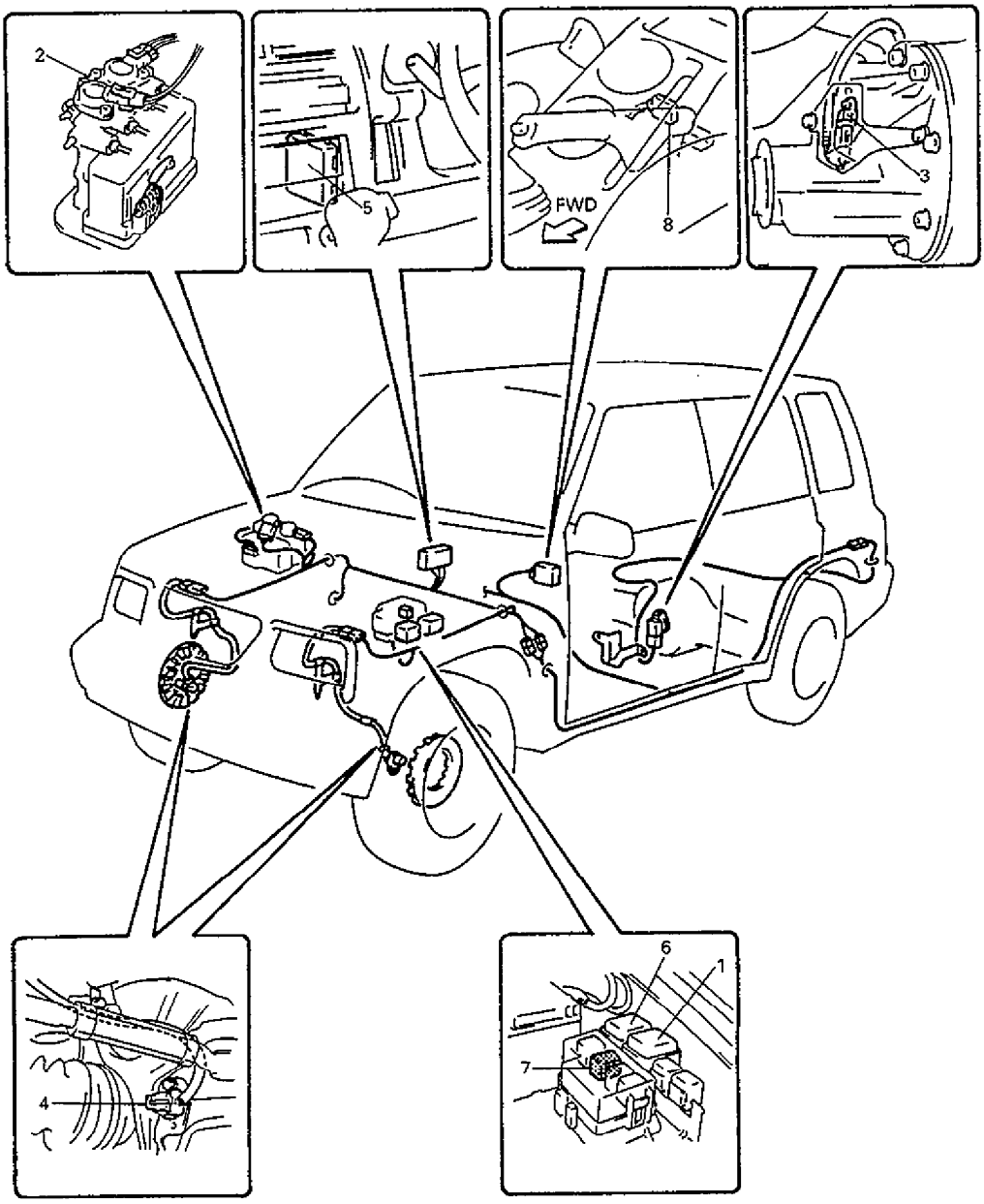
NOTE:
ABS installed to this model cannot increase brake pressure above master cylinder pressure applied by the driver and cannot apply the brake by itself.

LH steering vehicle

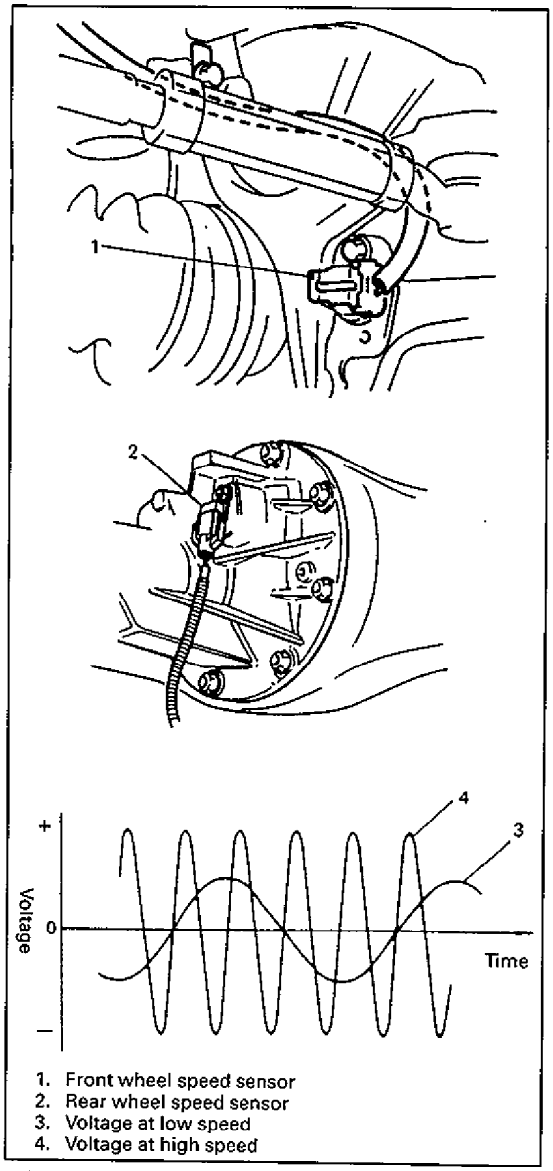


1. ABS enable relay
2. ABS actuator assembly (Hydraulic modulator/motor pack assembly)
3. Rear wheel speed sensor
4. Front wheel speed sensor
5. Electronic brake control module (EBCM)
6. ABS check relay
7. ABS fuse
8. G sensor (Accelerometer)

RH steering vehicle

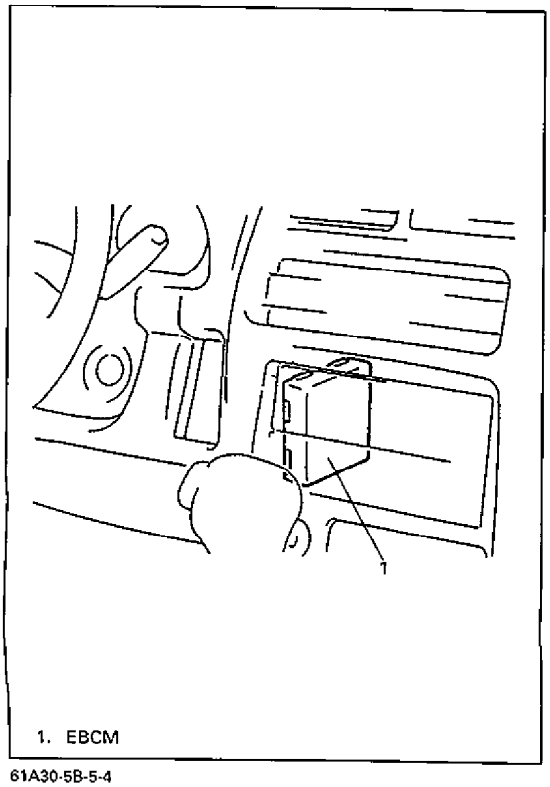


1. ABS enable relay
2. ABS actuator assembly (Hydraulic modulator/motor pack assembly)
3. Rear wheel speed sensor
4. Front wheel speed sensor
5. Electronic brake control module (EBCM)
6. ABS check relay
7. ABS fuse
8. G sensor (Accelerometer)



1. Front wheel speed sensor
2. Rear wheel speed sensor
3. Voltage at low speed
4. Voltage at high speed

61A30-5B-5-1



1. EBCM

61A30-5B-5-4

ABBREVIATIONS

ABS	Antilock Brake System
B+ or +B	Battery Voltage
CKT	Circuit
DLC	Data Link Connector
DTC(s)	Diagnostic Trouble Code(s)
EBCM	Electronic Brake Control Module
EEPROM	Electrically Erasable Programmable Read Only Memory
ESB	Expansion Spring Brake
MDI	Multiple Driver Interface
I/P	Instrument Panel

SYSTEM COMPONENTS

FRONT & REAR WHEEL SPEED SENSOR / SENSOR RING

The front wheel speed sensor is installed to the front suspension knuckle and the rear wheel speed sensor to the rear differential carrier.

The front wheel sensor ring is press-fitted into the wheel hub and the rear wheel sensor ring into the differential case.

When the magnetic flux generated from the magnet included in the sensor varies as the sensor ring turns, an AC voltage of proportionate frequency to the wheel speed occurs in the coil also included in the sensor due to the function of electromagnetic induction. The magnitude of the voltage and frequency increase with increasing speed.

As both sensors on the front and rear wheels are unrepairable, they must be replaced when they are found in faulty condition. If the sensor ring is found faulty, replace it.

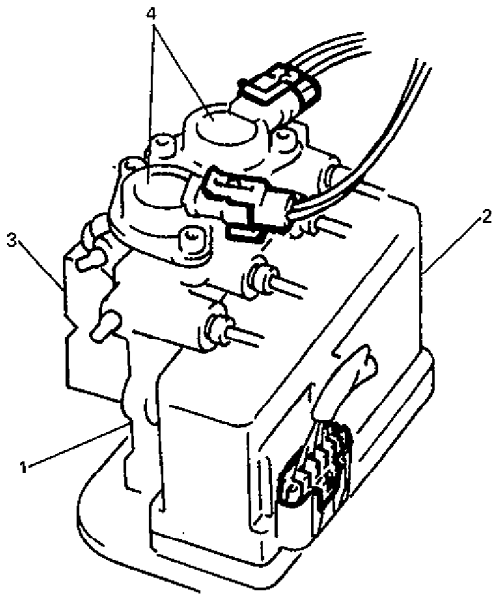
ELECTRONIC BRAKE CONTROL MODULE (EBCM)

The EBCM is located on the underside of the instrument panel on the driver's seat side.

NOTE:

There is no serviceable or removable PROM. The EBCM must be replaced as an assembly.

The EBCM monitors the speed of each wheel. If any wheel begins to approach lock-up and the brake switch is closed (brake pedal depressed), the EBCM controls the motors and solenoids to reduce brake pressure to the wheel approaching lock-up. Once the wheel regains traction, brake pressure is increased until the wheel again begins to approach lock-up. This cycle repeats until either the vehicle comes to a stop, the brake pedal is released or no wheels approach lock-up. Additionally, the EBCM monitors itself, each input (except the serial data link) and each output for proper operation. If any system malfunction is detected, the EBCM will store a DTC in nonvolatile memory (DTCs will not disappear if the battery is disconnected). Refer to "Self-Diagnostics" later in this section for more detailed information.



1. ABS actuator (Hydraulic modulator)
2. Motor pack
3. Proportioning & Differential valve
4. Solenoids

61A30-5B-6-1

ABS ACTUATOR ASSEMBLY

(Hydraulic Modulator / Motor Pack Assembly)

The ABS actuator assembly is located on the right or left side front wheel housing panel in the engine room and controls the brake fluid pressure to the front calipers and rear wheel cylinders to prevent wheel(s) lock-up.

It consists of the following two major components whose functions are described below.

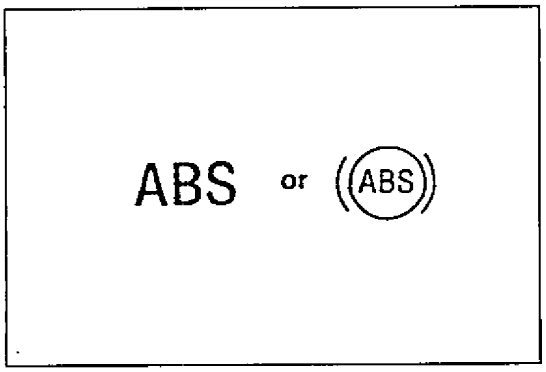
- Hydraulic modulator (included proportioning & differential valve)
- Motor pack

The hydraulic modulator consists of a solenoid and check-ball which shut off the brake circuit, a piston and ball screws which are driven by the motor pack.

For structure and operation of P & Differential valve, refer to SECTION 5A1 of this manual.

The motor pack drives the ball screw included in the hydraulic modulator with three DC motors which can rotate in both directions.

Two motors are used to drive the ball screws for the front brakes respectively and the third one to drive the ball screw for the rear right and left brakes simultaneously.



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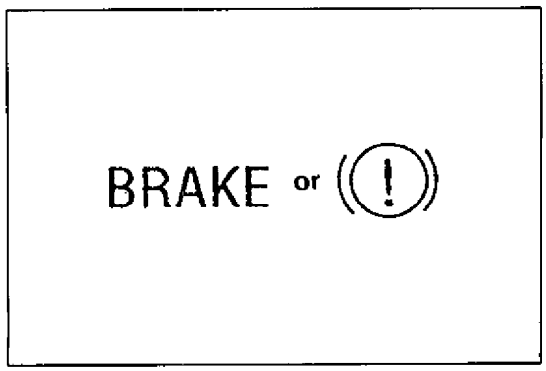


50G00-5B-5-5S

INDICATOR LIGHT

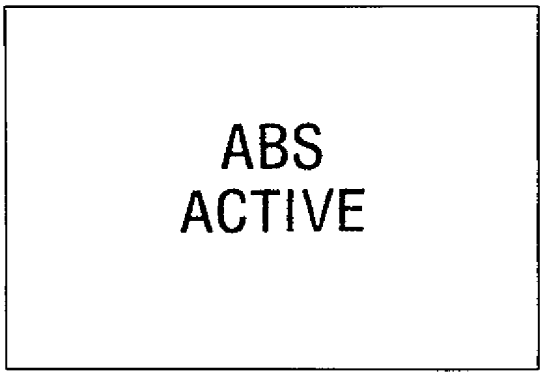
- **ABS Warning Light**

  The EBCM continuously monitors itself and the other ABS components. If the EBCM detects a problem with the system, the amber "ABS" warning light will either light or flash continuously to alert the driver of the problem.

  A solid "ABS" warning light indicates that a problem has been detected that affects the operation of ABS. No antilock braking will be available. Normal, non-antilock brake performance will remain. In order to regain ABS braking ability, the ABS must be serviced.

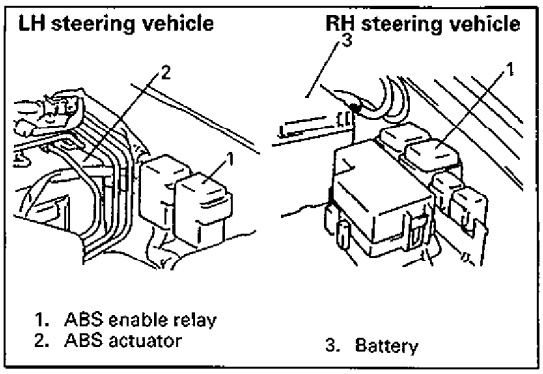
- **Brake Warning Light**

  The red "BRAKE" warning light will be illuminated when a low brake fluid level in the master cylinder is sensed, the parking brake switch is closed (parking brake engaged), the ignition switch is in "ON" and the engine is not running or under control of the EBCM when certain ABS DTCs are set. This indicates to the driver a base brake problem may exist. Refer to SECTION 8 for diagnosis of the "BRAKE" warning light.



61A30-5B-7-1

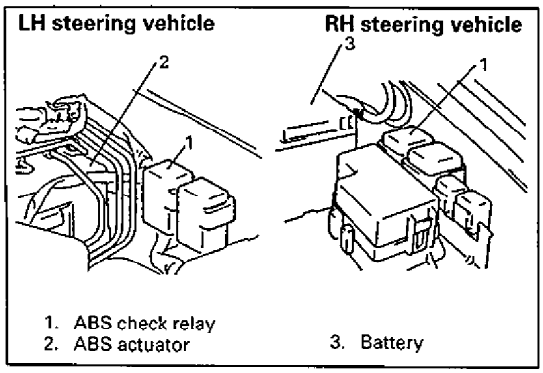
- **ABS ACTIVE Light (If equipped)**
  The blue "ABS ACTIVE" light identifies when the system is working to provide antilock braking.



61A30-5B-7-2

ABS ENABLE RELAY

The enable relay is a normally-open contact type. For ABS operation, the relay allows the battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids. The enable relay is located on the left-side or right-side of the engine compartment, mounted to the relay bracket on the front fender apron.



61A30-5B-7-3

ABS CHECK RELAY (LAMP DRIVE RELAY)

The ABS check relay contains electronic components that receive a signal from the EBCM to turn off the "ABS" warning light. Unless the EBCM commands the "ABS" warning light off, it will remain illuminated.

BRAKE FLUID LEVEL SWITCH

The brake fluid level switch is contained within the master cylinder reservoir, refer to SECTION 5 of the Service Manual mentioned in FOREWORD of this manual.

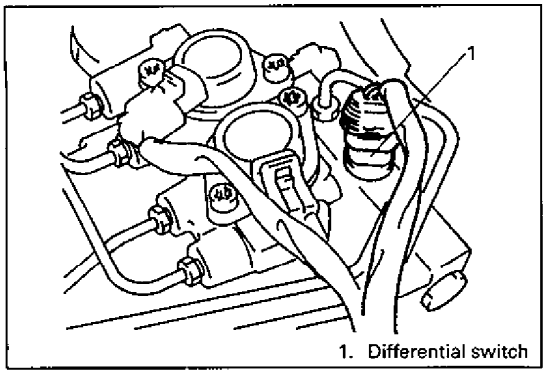
50G00-5B-6-4S

4WD SWITCH (4WD Model only)

This switch, mounted on the transfer case, turns "ON" when the transfer shift lever is in either four-wheel drive position: "4H" or "4L".

At the same time, the indicator light in combinatin meter comes on when ignition switch is in the "ON" position.

ABS control module uses this signal as one of the signals for ABS control.



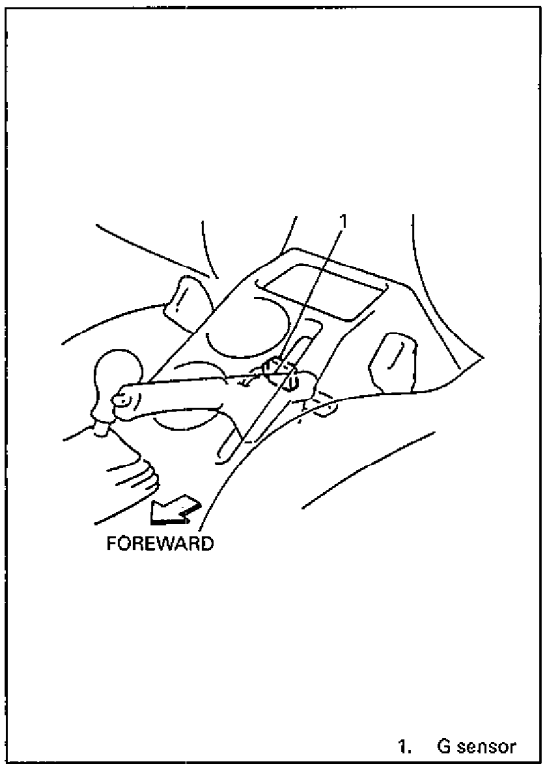
1. Differential switch

61A30-5B-8-1

DIFFERENTIAL SWITCH

When a failure occurs in either the front or rear brake line, the differential switch, detecting a pressure difference in the brake line, turns ON the brake warning light in the combination meter.

ABS will be disabled and the ABS warning light is turned ON. After the brake system is repaired, depressing the brake pedal will apply pressure to set the switch automatically (at OFF position).



1. G sensor

61A30-5B-8-2

G SENSOR (Accelerometer)

(4WD Model only)

The wheel speed sensors are supplemented with G sensor to detect wheel lock-up during four-wheel-drive operation.

The G sensor sends a signal to the EBCM ranging from 1 volt up to 5 volts, depending on vehicle motion. The G sensor gives a reference voltage of approximately 2.5 volts when the vehicle is standing still or cruising at one set speed. During acceleration, the signal voltage coming from the G sensor will drop from 2.5 volts to about 1 volt, depending on the amount of acceleration. The heavier the acceleration, the lower the voltage reading.

During deceleration, the signal voltage coming from the G sensor will increase from 2.5 volts to about 4 volts.

The G sensor is located inside the rear console, right rear of the parking brake handle assembly.

IDLE-UP CIRCUIT (4WD Model only)

The EBCM is linked to the Engine Control Module (ECM) through an Idle-up circuit.

During an ABS stop on icy road conditions, the EBCM commands the ECM to increase idle speed.

This will reduce "engine braking", thus preventing early wheel lock-up and enhance brake modulation.

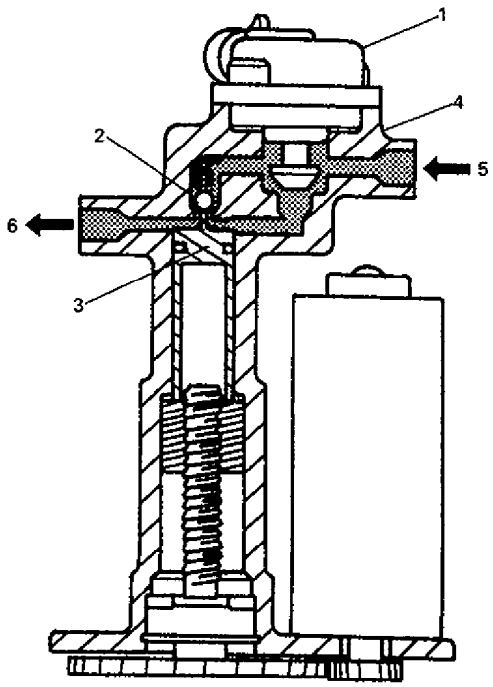
An increase in idle speed occurs when the transfer case is any of the 4WD ranges.

61A30-5B-8-4

WIRING HARNESS

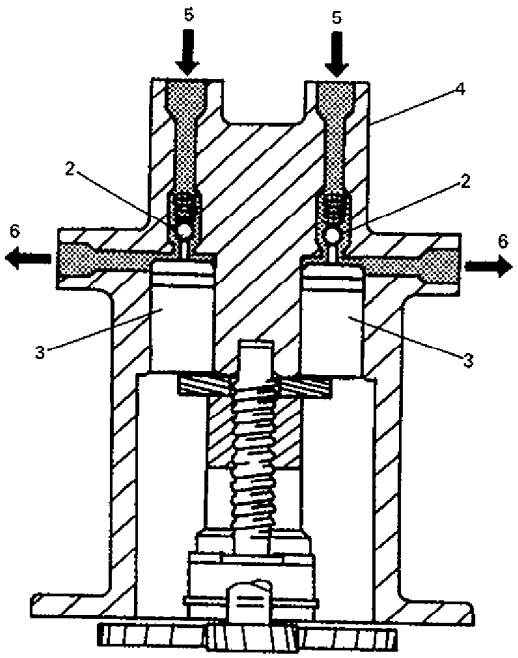
The wiring harness is the mechanism by which the EBCM is electrically connected to power and ground, wheel speed sensors, motors, solenoids, fuses, switches, indicators the enable relay and the serial communications port. The components, considered part of the wiring harness, are the wires that provide electrical interconnection and connectors (terminals, pins, contacts or lugs) that provide an electrical/mechanical interface from the wire to a system component.

Front section



1. Solenoid (Open)
2. Check valve (Open)
3. Piston
4. ABS actuator assembly (Hydraulic modulator/Motor pack assembly)
5. From master cylinder
6. To brake caliper or wheel cylinder

Rear section



50G00-5B-7-1S

SYSTEM OPERATION

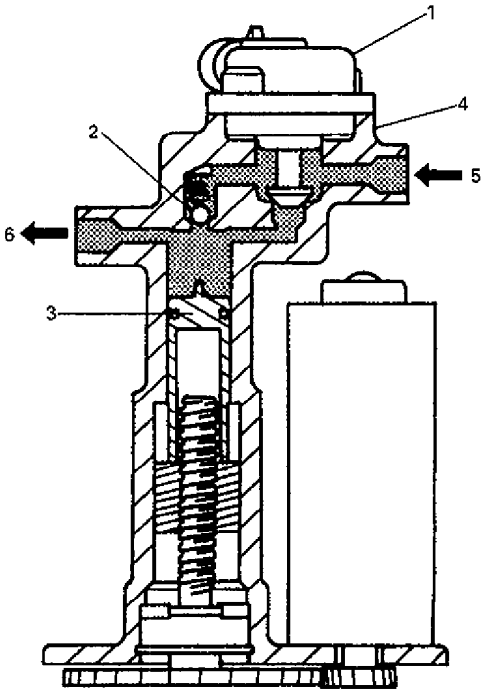
BASE BRAKING MODE (NON ANTILOCK BRAKE MODE)

Under normal operating conditions, the brake system will operate using conventional braking by means of brake pedal force, the vacuum booster and the master cylinder. Each front channel consists of a motor, solenoid, ESB, ball screw, piston and check valve.

As illustrated in Figures, under normal operating conditions (base braking), the piston is held in the upmost or "home" position and the solenoid is open (not energized). This is accomplished by the ball screw via the motor to drive the nut upwards. Once at the upmost position, the piston is held by an ESB.

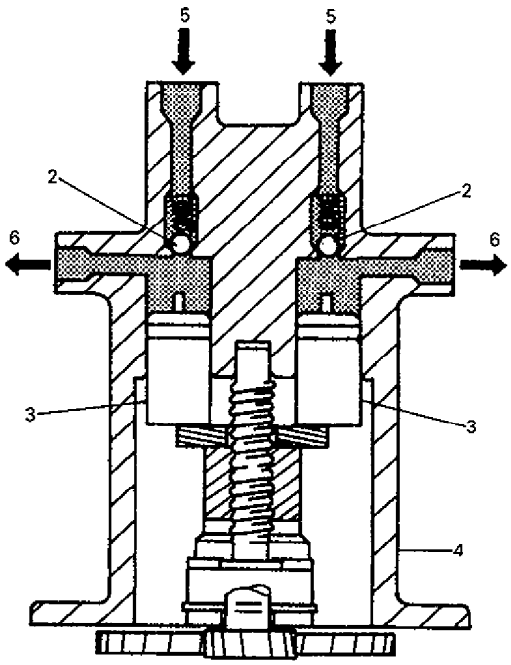
Two paths are available to transfer brake fluid to the calipers: (1) through the modulator, around the open check valve and out to the caliper, and (2) through the modulator, through the normally open solenoid and out to the caliper. The solenoid in the front circuits provides an alternate brake fluid pressure path to the caliper. With this arrangement, if the ABS were to lose power or malfunction with the piston out of the "home" position, a redundant brake fluid path is available. The rear channel operates in a similar manner except no solenoid is used.

Front section



1. Solenoid (Closed)
2. Check valve (Closed)
3. Piston
4. ABS actuator assembly (Hydraulic modulator/Motor pack assembly)
5. From master cylinder
6. To brake caliper or wheel cylinder

Rear section



ANTILOCK BRAKING MODE

If any wheel begins to approach lock-up, the EBCM will control the three motors and two solenoids, appropriately, to control brake pressure to the affected wheel(s). During front wheel ABS operation, the solenoids are turned on to eliminate that brake pressure path to the caliper (Left figure). The EBCM then provides controlled current to the motors to regulate the speed and amount of backward motion.

As the motor moves backwards, the piston follows the nut downward, allowing the check valve to seat. To reduce brake pressure, the motor drives the nut further downward. To reapply or increase brake pressure, the motor drives the nut and piston upward. If ABS was entered during low brake pressure, such as on ice, and dry pavement is then encountered during reapply, the piston is driven all the way to the top.

This results in the unseating of the check valve, and a return to base braking until sufficient brake pressure exists to cause the wheel to approach lock-up again. Total brake pressure during ABS is limited to the brake pressure present when ABS was entered. Also, any time wheel brake pressure exceeds the brake pressure at the master cylinder (caused by reduced force on the brake pedal), the check valve unseats and this volume of brake fluid is returned to the master cylinder.

When ABS is no longer required, the pistons are returned to their upmost (or home) position and are held by the ESBs.

The solenoids on the front channels are simultaneously opened to again provide a redundant base braking path.

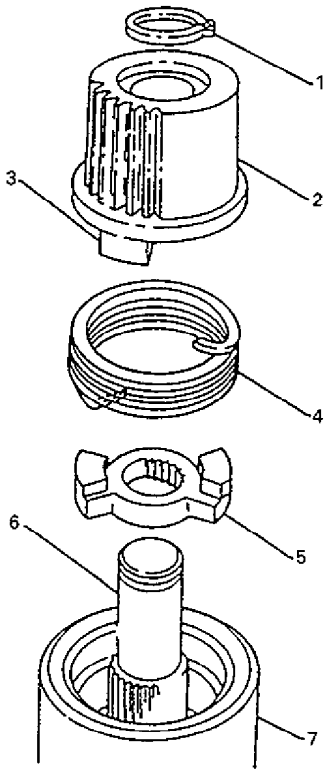
The rear channels operate in a similar manner except: (1) both rear circuits are controlled together and (2) no solenoid exists. Both rear channels are controlled by one motor.

If either rear wheel begins to lock, brake pressure to both rear wheels is reduced to maximize vehicle stability.

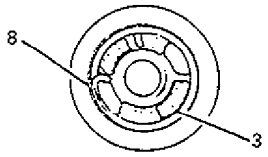
If an ABS failure were to occur that affected the operation of the rear base brakes, a diagnostic trouble code (DTC) would be stored and the EBCM would illuminate both the "ABS" and "BRAKE" warning lights.

NOTE:

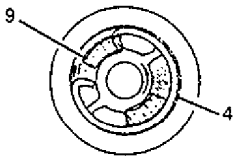
In this manner, ABS installed to this model cannot increase brake pressure above master cylinder pressure applied by the driver and cannot apply the brakes by itself.



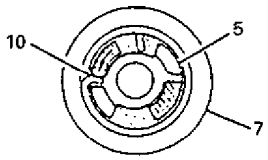
MOTOR DRIVES CLOCKWISE



MOTOR DRIVES COUNTERCLOCKWISE



PINION STOPPED FROM TURNING COUNTERCLOCKWISE



1. Circlip
2. Motor pinion
3. Pinion drive dog
4. Expansion spring
5. Motor drive dog
6. Motor shaft
7. Steel sleeve
8. Motor drive dog releases spring brake and drives pinion
9. Motor drive dog releases spring brake (Spring leg beneath pinion dog) and drives pinion
10. Pinion dog expands spring and locks against sleeve

50G00-5B-9-1S

EXPANSION SPRING BRAKE (ESB)

Operation

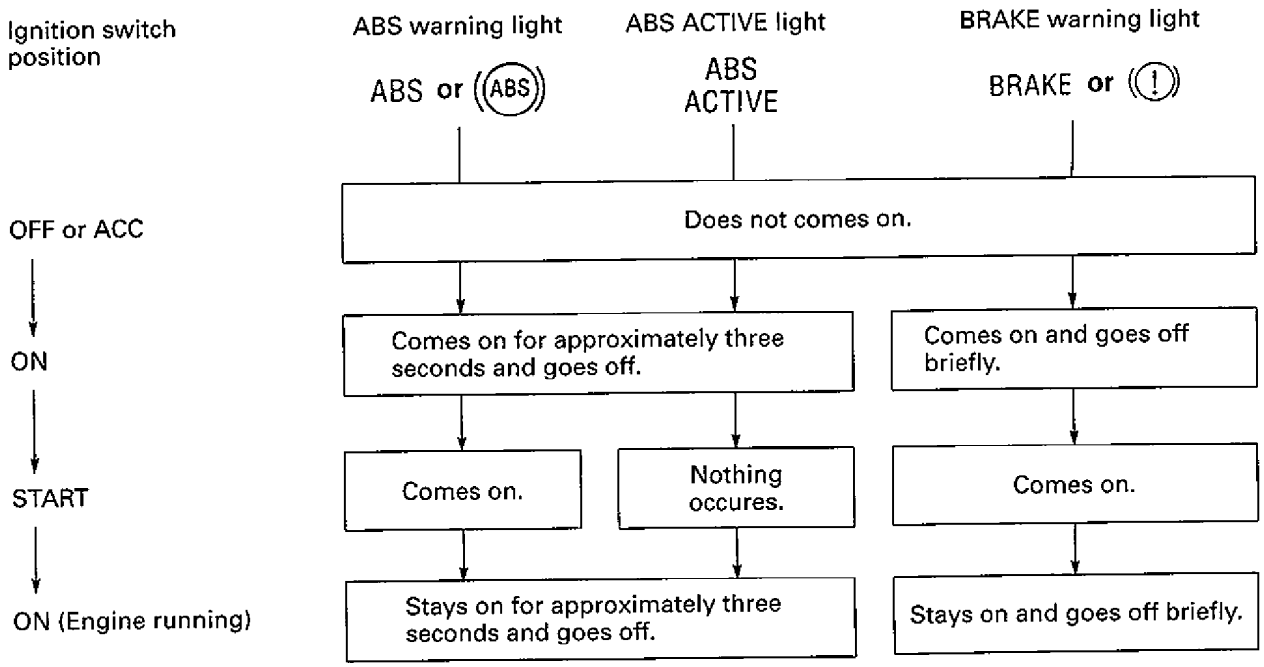
The expansion spring brake (ESB) is used to hold the piston in the upmost (or home) position. An ESB is a spring that is retained in a housing at a close tolerance. One end of the spring is in contact with the motor drive dog and the other end is in contact with the pinion drive dog. In normal braking, brake pressure is present on the top of the piston, applying a downward force. The force applies a counterclockwise torque to the motor pinion which tries to rotate the spring counterclockwise. The counterclockwise torque expands the spring outward within the housing and prevents gear rotation.

When the motor is activated and tries to drive the ball screw nut, the end of the ESB in contact with the motor drive dog rotates inward causing the spring to contract in its housing, allowing the motor to rotate the modulator gear. The most common application of this principle is in window crank mechanisms, where a small amount of force on the crank handle allows the window to be lowered or raised, but the weight of the window or force on the window will not allow the window to move downward. For the ESB, brake pressure on the top of the pistons corresponds to the weight of the window and the motor corresponds to the window crank handle.

INDICATOR LIGHT OPERATION

The ABS uses two or three lights, the amber ABS warning light, a blue ABS ACTIVE light (If equipped) and a red BRAKE warning light.

Normal Indicator Light Operation



NOTE:
When performing the above check, be sure to release the parking brake and apply wheel stoppers to the tires, or the BRAKE warning light will stay ON.

61A30-5B-12-1

INITIALIZATION

During initialization, the EBCM will not only perform self-diagnostics, but will also verify motor, modulator, solenoid, relay and indicator light operation to ensure all components are functioning properly. If the EBCM detects a malfunction in either itself or other ABS components, it will store a diagnostic trouble code (DTC) and illuminate the "ABS" warning light if applicable.

The "ABS" warning light and "ABS ACTIVE" light (If equipped) will be illuminated for about tree seconds when the ignition switch is first turned to "ON". A slight mechanical noise may be heard during system initialization. This is a normal occurrence – it is the result of the hydraulic modulator pistons returning to their upmost (or home) position. System initialization will occur when the vehicle speed reaches approximately 5 km/h (3 mph). If the driver has their foot on the brake pedal during system initialization, they may feel a slight pedal bump. When this occurs, system initialization is interrupted.

TIRES AND ABS

Spare Tire

Using the compact spare tire supplied with the vehicle will not affect the operation of the ABS. The EBCM can compensate for this smaller tire. However, increased stopping distance may occur due to reduced tread depth.

50G00-5B-11-1S

Replacement Tires

Tire size is important for proper performance of the ABS. Replacement tires should be the same size, load range and construction as the original tires. Replace tires in axle sets and only with tires of the same tire performance criteria (TPC) specification N·m ber. Use of any other size or type may seriously affect the ABS operation. For more information on original equipment and replacement tires, refer to SECTION 3F of the Service Manual mentioned in FOREWORD of this manual.

50G00-5B-11-2S

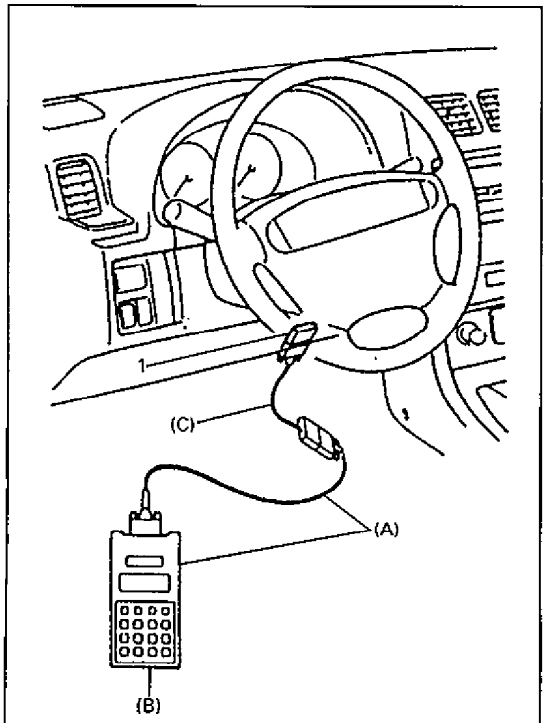
DIAGNOSIS

DIAGNOSTIC PROCESS

Tool Required: TECH-1

When servicing the ABS, the following steps should be followed in order. Failure to follow these steps may result in the loss of important diagnostic data and may lead to difficult and time-consuming diagnosis procedures:

1) Using the TECH-1, read all current and history Diagnostic Trouble Codes (DTCs). Be certain to note which DTCs are current malfunctions. DO NOT CLEAR DTCs unless directed to do so.
2) Using the TECH-1, read the DTC HISTORY data. Note the DTCs stored and their frequency of failure. Specifically, note the last failure that occurred and the conditions present when this failure occurred. This "last failure" is what brought the customer in for service, and should be the starting point for diagnosis and repair.
3) Perform a vehicle preliminary diagnosis inspection.
   This should include:
   - Inspection of the master cylinder fluid reservoir for proper brake fluid level and for any signs of contamination.
   - Inspection of the hydraulic modulator for any leaks or wiring damage.
   - Inspection of brake components at all four wheels, Verify no drag exists. Also, verify proper brake apply operation.
   - Inspection for worn or damaged wheel bearings that may allow a wheel to "wobble".
   - Inspection of the wheel speed sensors and their wiring. Verify solid sensor attachment, undamaged sensor toothed ring and undamaged wiring, especially at vehicle attachment points.
   - Verify proper wheel-side constant velocity joint alignment and operation.
   - Verify tires meet legal tread depth requirements.
4) If no DTC, or mechanical component malfunctions are present, perform the "Modulator Test" later in this section using the TECH-1 to isolate the cause of the problem.
   If the failure is intermittent and not reproducible, test drive the vehicle while using the automatic snapshot feature of the TECH-1. Perform normal acceleration, stopping and turning maneuvers. If this does not reproduce the malfunction, perform an ABS stop, on a low coefficient surface such as gravel, from approximately 48 to 80 km/h (30 to 50 mph) while triggering the snapshot mode on any ABS DTC. If the failure is still not reproducible, use the enhanced diagnostic information found in DTC HISTORY to determine whether or not this malfunction should be diagnosed further.
5) Once all system malfunctions have been corrected, clear the ABS DTCs.



1. Data link connector

61A30-5B-15-1

SELF-DIAGNOSTICS

The EBCM contains sophisticated on-board diagnostics that, when accessed with a TECH-1, are designed to identify the source of any system malfunction as specifically as possible, including whether or not the malfunction is intermittent.
When using the TECH-1 with ABS, the last DTC is specifically identified, and specific ABS data is stored at the time of this malfunction. Also, in addition to the last DTC set, there is information about the first five DTCs set. Using the TECH-1, each input and output can be monitored, thus enabling malfunction confirmation and repair verification. Manual control of components and automated functional tests are also available when using the TECH-1. Details of many of these functions are contained in the following sections.

Special Tool
(A): 09931-76011 (TECH-1, scan tool)
(B): ABS / AIR BAG cartridge
(C): 09931-76030
(16 / 14 pin DLC cable) .... For North American market only

DISPLAYING DIAGNOSTIC TROUBLE CODES (DTCs)

DTCs can be read through the use of the TECH-1. There are no provisions for "Flash Code" diagnostics.

CLEARING DIAGNOSTIC TROUBLE CODES (DTCs)

The DTCs in EBCM memory are erased in one of two ways:
1) TECH-1 "Clear DTCs" selection.
2) Ignition cycle default.
These two methods are detailed below. Be sure to verify proper system operation and absence of DTCs when the clearing procedure is completed.
The EBCM will not permit DTC clearing until all DTCs have been displayed. Also, DTCs cannot be cleared by disconnecting the EBCM, disconnecting the battery cables or turning the ignition switch to "LOCK" (except on an ignition cycle default).

TECH-1 METHOD

1) Select F2 for "TROUBLE CODES-DTC(s)".
2) After DTCs have been viewed completely, the TECH-1 will prompt, "CLEAR CODES?"; press "YES".
3) TECH-1 will then read, "HISTORY DATA WILL BE LOST. CLEAR CODES?" Press "YES" and DTCs will be cleared.

IGNITION CYCLE DEFAULT

If no DTC occurs for 100 drive cycles (a drive cycle occurs when the ignition switch is turned to "ON" and the vehicle is driven faster than 16 km/h [10 mph]), any existing DTCs are cleared from the EBCM memory. This is not an acceptable method for clearing ABS DTCs.

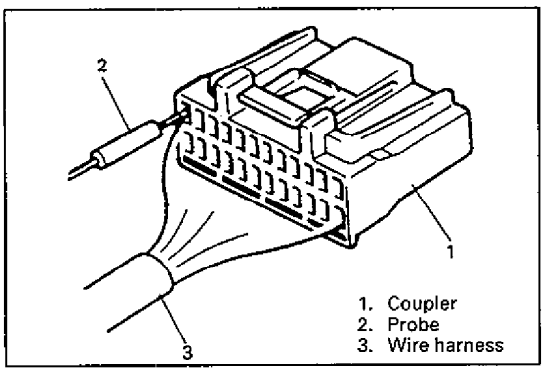
INTERMITTENTS AND POOR CONNECTIONS

As with most electronic systems, intermittent malfunctions may be difficult to accurately diagnose. The following is a method to try to isolate an intermittent malfunction, especially wheel speed circuitry.
If an ABS malfunction occurs, the "ABS" indicator will illuminate during the ignition cycle in which the malfunction was detected. If it is an intermittent problem which seems to have corrected itself ("ABS" indicator off), a DTC will be stored. Also stored will be the history data of the DTC at the time the malfunction occurred. The TECH-1 tester must be used to read ABS history data.
Most intermittents are caused by faulty electrical connections or wiring, although a sticking relay or solenoid can occasionally be at fault. Refer to "Intermittents and Poor Connections" in SECTION 0A of this manual for a very detailed explanation of how to locate and repair intermittent conditions.

NOTE ON SYSTEM CIRCUIT INSPECTION

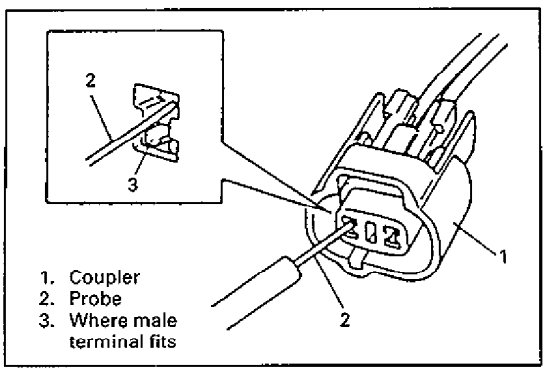
- Never connect any tester (voltmeter, ohmmeter, or whatever) to EBCM when its coupler is disconnected. Attempt to do it may cause damage to EBCM.
- Never connect an ohmmeter to EBCM with its coupler connected to it. Attempt to do it may cause damage to EBCM and sensors.
- Be sure to use a voltmeter with high impedance (MΩ/V minimum) or a digital type voltmeter. Any other voltmeter should not be used because accurate measurements are not obtained.
- When disconnecting and connecting coupler, make sure to turn ignition switch OFF.
- 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.

61A10-5B-16-1



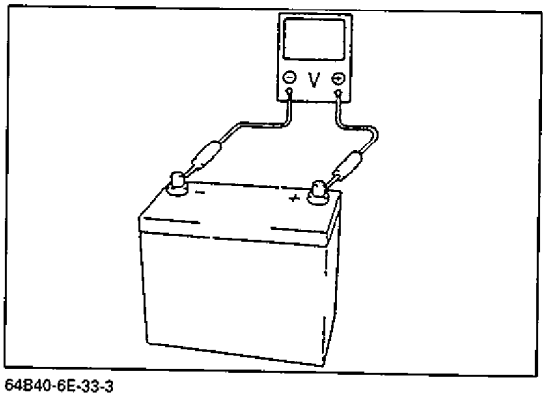
50G00-5B-14-4S

- When connecting a probe of any tester to coupler terminal, be sure to connect it from wire harness side of coupler.



50G00-5B-14-5S

- When connecting tester 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.



64B40-6E-33-3

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

GENERAL TECH-1 KEY FUNCTIONS

YES & NO	Answer questions asked by the TECH-1 and scroll through data parameters.
EXIT	Return to previous stop.
↑ & ↓	Used to control data display and output parameters.
0 / F0	Function keys (F0 – F9): used to select the operating mode or perform functions which are unique to operating mode, Or Numeric keys (0 – 9): used for entering DTC designations.
9 / F9	
F8	Print data in DATA LIST or SNAPSHOT mode.
ENTER	Used at end of a numeric key sequence or to inform TECH-1 that a requested action has been completed.

TECH-1 DIAGNOSTICS

The TECH-1, when connected to the DLC, becomes part of the vehicle's electronic system. The TECH-1 can perform the following functions:

- Display ABS data.
- Display and clear ABS DTCs.
- Control ABS components.
- Perform extensive ABS diagnostics.
- Provide diagnostic testing for intermittent ABS conditions.

Each test mode has specific diagnosis capabilities which depend upon various keystrokes. In general, five keys control sequencing: "YES," "NO," "EXIT," "," "▲," (up arrow) and "▼" (down arrow). The "F0" through "F9" keys select operating modes, perform functions within an operating mode, or enter DTC or model year designations.

In general, the TECH-1 has six test modes for diagnosing the antilock brake system.

MODE F0: DATA LIST – In this test mode, the TECH-1 continuously monitors wheel speed data, brake switch status and other inputs and outputs.

MODE F1: CODE HISTORY – In this test mode, DTC history data is displayed. This data includes how many drive cycles since the DTC occurred, along with other ABS information.

The first five and last DTC set are included in the ABS history data.

MODE F2: TROUBLE CODES – In this test mode, DTCs stored by the EBCM, both current ignition cycle and history, may be displayed or cleared. When a DTC is displayed with a "C," it is an indication that the DTC is current. When a DTC is displayed with an "H," that means that it is a history DTC.

MODE F3: SNAPSHOT – In this test mode, the TECH-1 captures ABS data before and after a fault occurrence, manual key press or system malfunction (auto trigger).

MODE F4: MISC. TESTS – In this test mode, the TECH-1 performs various tests to assist in problem isolation during troubleshooting.

MODE F5: MOTOR REHOME – In this mode, the TECH-1 commands the EBCM to rehome the motors and piston in the hydraulic modulator assembly. This mode should ALWAYS be used prior to bleeding the brake system.

ENHANCED DIAGNOSTICS

Enhanced diagnostic information, found in the CODE HISTORY function of the TECH-1, is designed to provide the service technician with specific malfunction occurrence information. For each of the first five and the very last DTCs stored, data is stored to identify the specific DTC, the number of occurrences and the number of drive cycles since the malfunction first and last occurred. A normal drive cycle consists of starting the engine, driving the vehicle over 8 km/h (5 mph) and keying down. These first five DTCs are also stored in the order of occurrence. The order in which the first five DTCs occurred can be useful in determining if a previous malfunction is linked to the most recent malfunction, such as an intermittent open in a wheel speed sensor circuit which later becomes completely open. However, if a malfunction is present, the drive cycle counter will increase by turning the ignition switch to "ON" and "LOCK".

During difficult diagnosis situations, this information can be used to identify malfunction occurrence trends. Does the malfunction occur more frequently now than it did during the last customer visit? Did the malfunction only occur once over a large number of driving cycles, indicating an unusual condition present when it occurred? Does the malfunction occur infrequently over a large number of drive cycles, indicating that special diagnosis techniques may be required to identify the source of the malfunction?

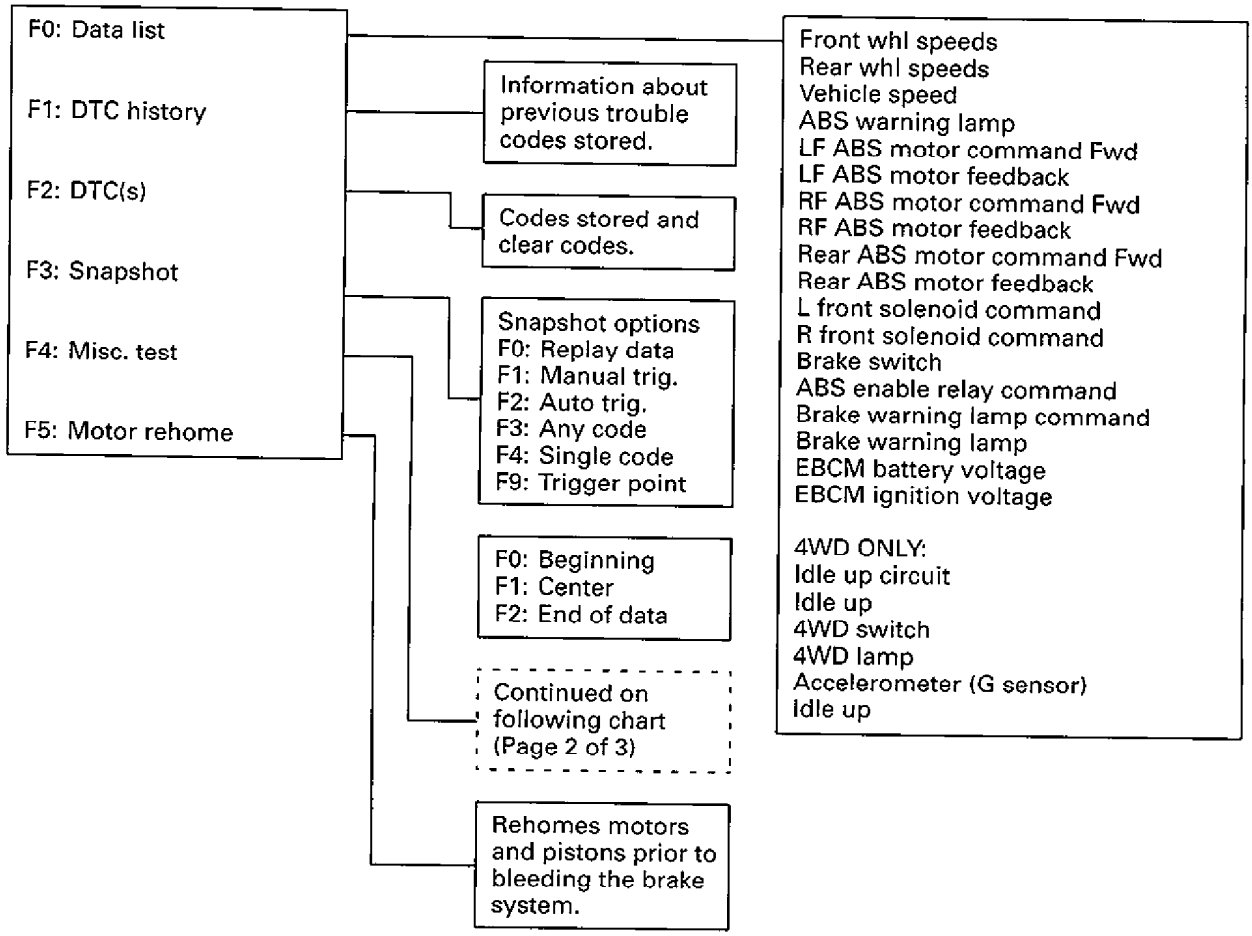
If, for example, a malfunction occurred one out of 20 drive cycles, the malfunction is intermittent and has not recurred for 19 drive cycles. This malfunction may be difficult or impossible to duplicate and may have been caused by a severe vehicle impact (large pot hole, speed bump at high speed, etc.) that momentarily opened an electrical connector or caused unusual vehicle suspension movement. Problem resolution is unlikely, and the problem may never recur (check diagnostic aids provided for that DTC). If, for example, the malfunction occurred three out of 15 drive cycles, the odds of finding the cause are still not good, but you know how often it occurs and you can determine whether or not the malfunction is becoming more frequent based on an additional or past customer visit if the source of the problem cannot or could not be found. If the malfunction occurred 10 out of 20 drive cycles, the odds of finding the cause are very good.

By using the additional malfunction data, you can also determine if a malfunction is randomly intermittent or if it has not recurred for long periods of time due to weather changes or a repair prior to this visit. Say a DTC occurred 10 out of 20 drive cycles but has not recurred for 10 drive cycles. This means the malfunction occurred 10 out 10 drive cycles but has not recurred since. A significant environmental change or repair may have occurred 10 drive cycles ago. A repair may not be necessary if customer information can confirm a recent repair. If no repair was made, the service technician can focus on diagnosis techniques used to locate difficult-to-recreate problems.

DIAGNOSTIC PROCESS

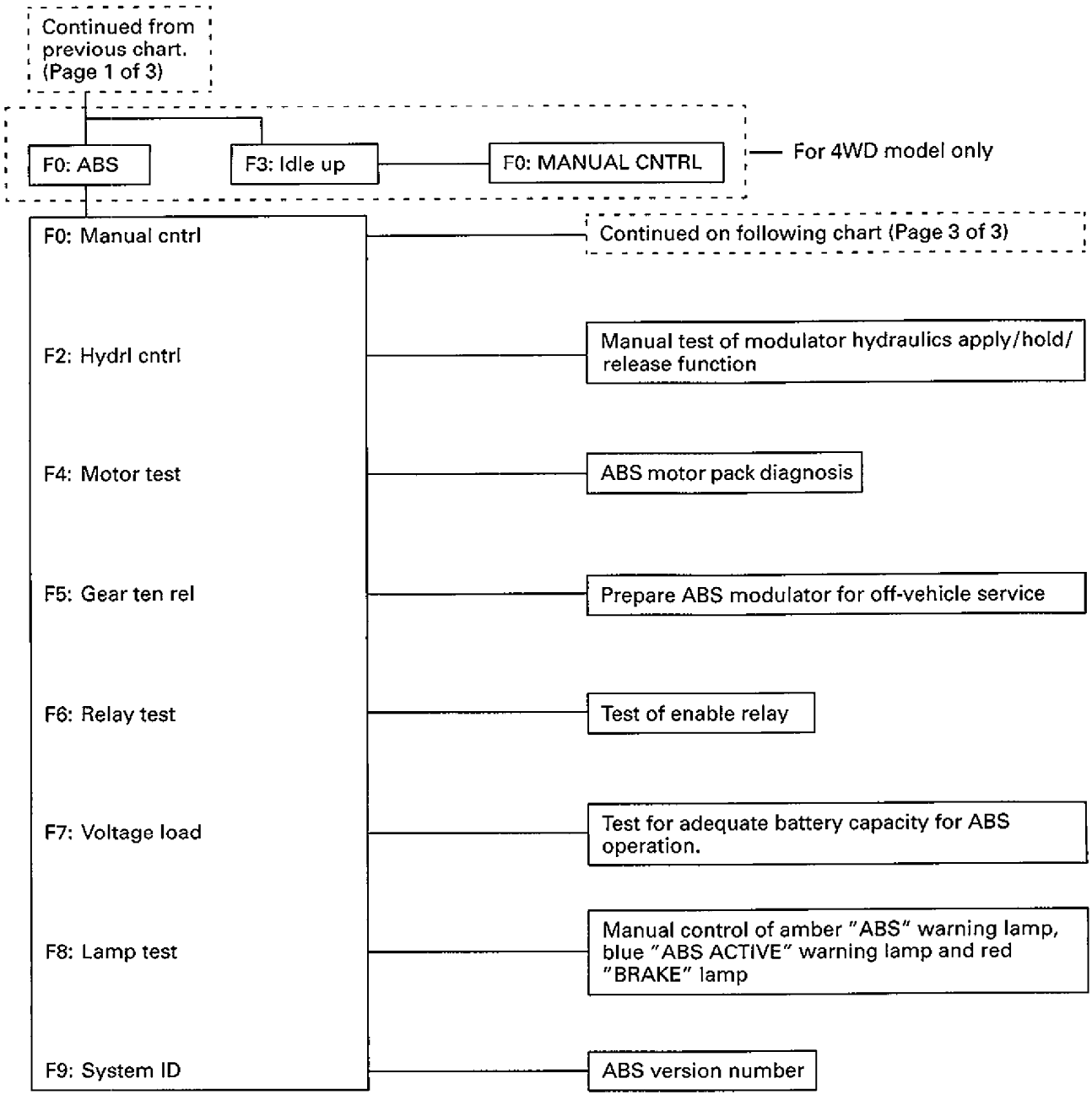
(Page 1 of 3)

ABS cartridge section	TECH-1 screen display
STEP 1 Select system	ABS
STEP 2 Select ABS type	2WD/4WD-3WSS
STEP select mode (First Screen)	



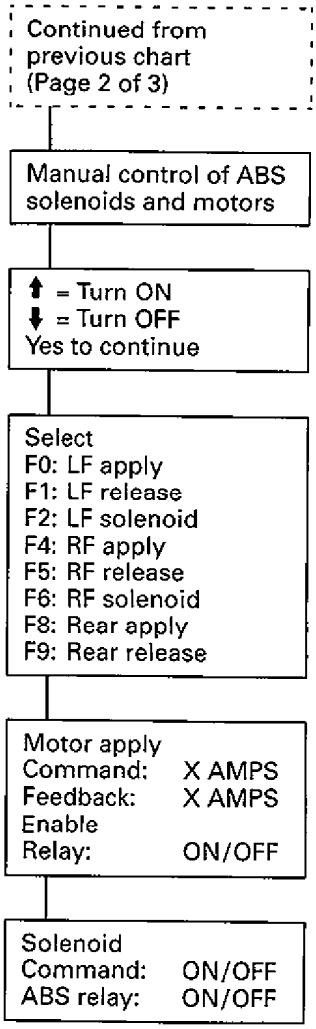
DIAGNOSTIC PROCESS

(Page 2 of 3)



DIAGNOSTIC PROCESS

(Page 3 of 3)



DIAGNOSTIC CIRCUIT CHECK

CAUTION:
A TECH-1 THAT DISPLAYS FAULTY DATA SHOULD NOT BE USED, AND THE PROBLEM SHOULD BE REPORTED TO THE MANUFACTURER. THE USE OF A MALFUNCTIONING TECH-1 CAN RESULT IN MISDIAGNOSIS AND UNNECESSARY PARTS REPLACEMENT.

The "Diagnostic Circuit Check" is an organized approach to identifying a problem created by an ANTILOCK BRAKE SYSTEM (ABS) (OPTIONAL) malfunction. It must be the starting point for any ABS complaint diagnosis, because it directs the service technician to the next logical step in diagnosing the complaint.
The "Scan Data" listed in the table may be used after completing the "Diagnostic Circuit Check" and finding the on-board diagnostics functioning properly and diagnostic trouble codes (DTCs) displayed.
Only the parameters listed below are used in this manual for diagnosing. If a scan tool other than TECH-1 is used and reads other parameters, the values are not recommended by Suzuki Motor Corporation for use in diagnosing.

50G00-5B-20-1S

SCAN DATA

SCAN POSITION	**UNITS DISPLAYED**
FRONT WHL SPEEDS	MPH/KPH
REAR WHL SPEEDS	MPH/KPH
VEHICLE SPEED	MPH/KPH
ABS WARNING LAMP	ON/OFF
ACCELEROMETER (G SENSOR)*	VOLTS
IDLE UP CIRCUIT*	ACTIVE/INACTIVE
LF MOTOR COMMAND FWD/REV	AMPERES
LF MOTOR FEEDBACK	AMPERES
RF MOTOR COMMAND FWD/REV	AMPERES
RF MOTOR FEEDBACK	AMPERES
REAR MOTOR CMD FWD/REV	AMPERES
REAR MOTOR FDBK	AMPERES
L FRONT SOLENOID	ON/OFF
R FRONT SOLENOID	ON/OFF
BRAKE SWITCH	ON/OFF/CIRCUIT OPEN
ENABLE RELAY CMD	ON/OFF
BRAKE TELLTALE CMD	ON/OFF
BRAKE TELLTALE	ON/OFF/CIRCUIT OPEN
ABS BATT VOLTAGE	VOLTS
ABS IGN VOLTAGE	VOLTS
4WD SWITCH*	ON/OFF

*: For 4WD vehicle only

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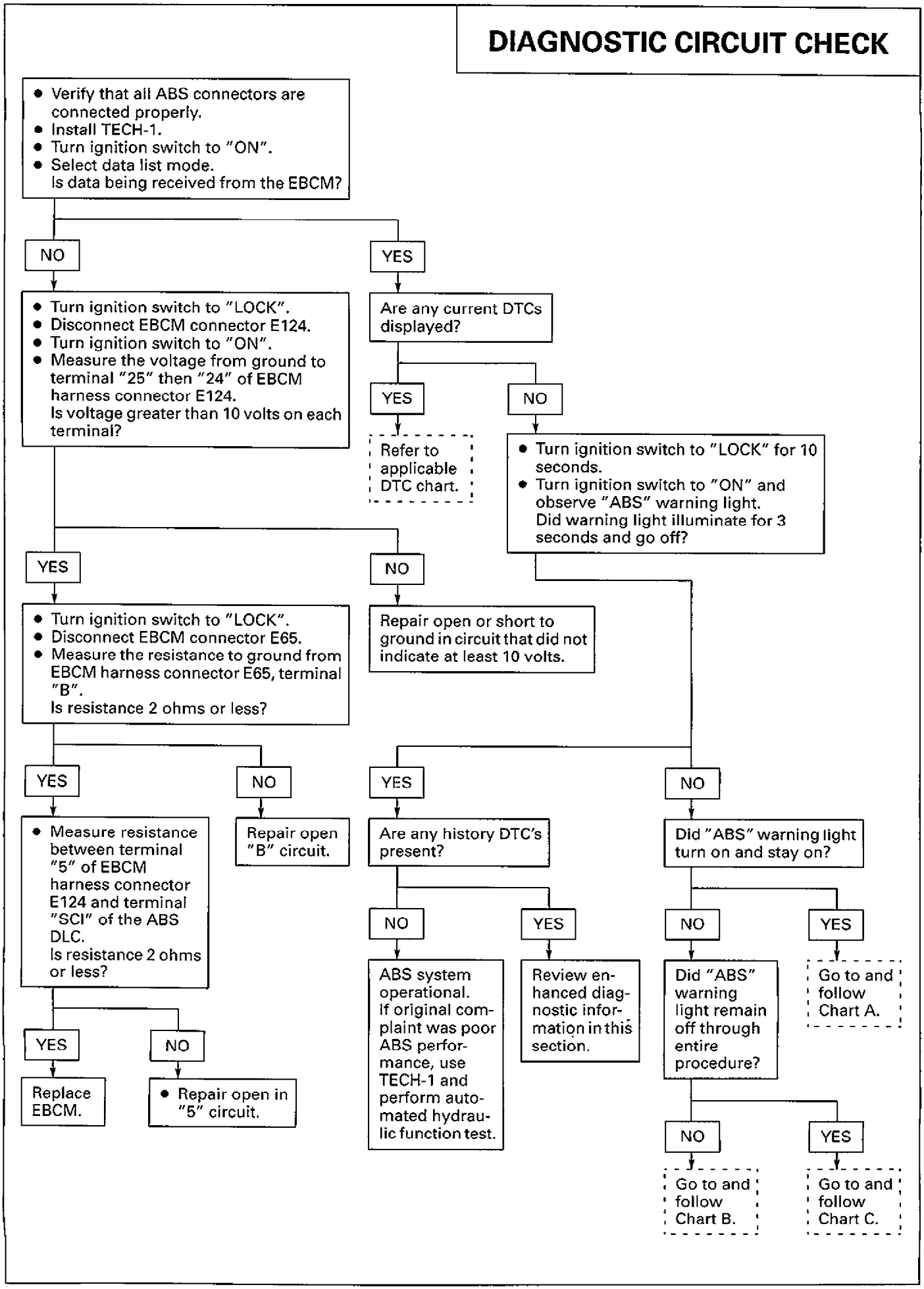
DIAGNOSTIC CIRCUIT CHECK



DIAGNOSTIC TROUBLE CODE AND SYMPTOM TABLE

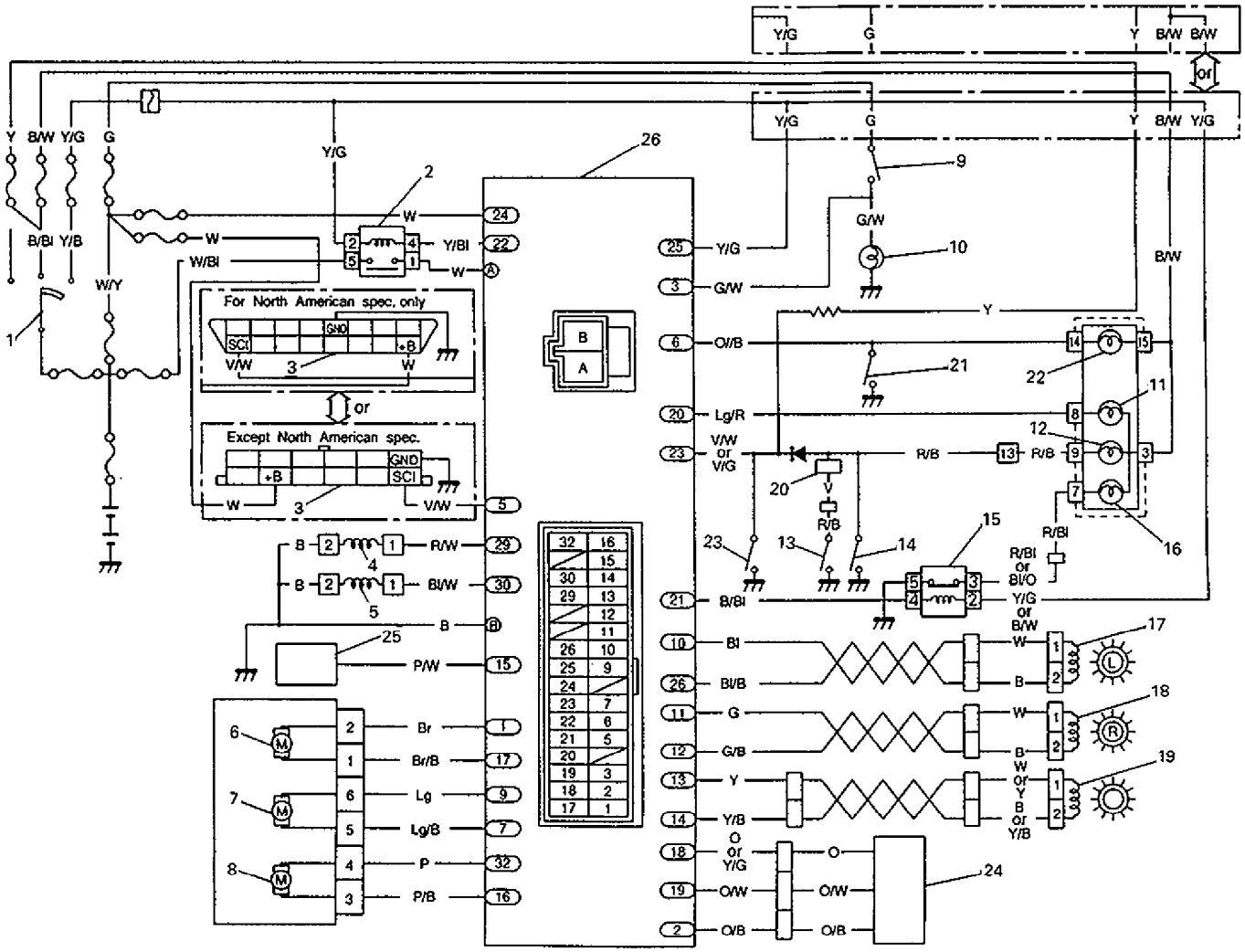
CHART	SYMPTOM			
A	ABS (Amber) warning light ON constantly, no DTCs stored			
B	ABS (Amber) warning light ON intermittently, no DTCs stored			
C	ABS (Amber) warning light OFF constantly, no DTCs stored			
D	TECH-1 displays undefined DTCs			
E	ABS ACTIVE light malfunctioning (If equipped with ABS ACTIVE light)			
DIAGNOSTIC TROUBLE CODE	**DESCRIPTION**	**ABS Operate: ○ Not operate: X**	**ABS Warning light**	**BRAKE Warning light**
14	ABS enable relay contact circuit open	X	ON NOTE 2	OFF NOTE 1
15	ABS enable relay circuit shorted to battery or always closed	○	OFF	OFF
16	ABS enable relay coil circuit open	X	ON NOTE 2	OFF NOTE 1
17	ABS enable relay coil circuit shorted to ground	○	OFF	OFF
18	ABS enable relay coil circuit shorted to battery	X	ON NOTE 2	OFF NOTE 1
21	Left front wheel speed – 0 or unreasonable	X	ON	OFF
22	Right front wheel speed – 0 or unreasonable	X	ON	OFF
24	Rear wheel speed – 0 or unreasonable	X	ON	OFF
25	Left front excessive wheel speed variation	X	ON	OFF
26	Right front excessive wheel speed variation	X	ON	OFF
28	Rear excessive wheel speed variation	X	ON	OFF
32	Left front wheel speed sensor circuit open or shorted to battery or ground	X	ON	OFF
33	Right front wheel speed sensor circuit open or shorted to battery or ground	X	ON	OFF
35	Rear wheel speed sensor circuit open or shorted to battery or ground	X	ON	OFF
36	Low system voltage	X	ON NOTE 2	OFF NOTE 1
37	High system voltage	X	ON	OFF
38	Left front ESB will not hold motor	X	ON	OFF
41	Right front ESB will not hold motor	X	ON	OFF
42	Rear ESB will not hold motor	X	ON NOTE 2	ON
44	Left front channel will not move	X	ON	OFF
45	Right front channel will not move	X	ON	OFF
46	Rear channel will not move	X	ON NOTE 2	ON
47	Left front motor free spin	X	ON	OFF
48	Right front motor free spin	X	ON	OFF
51	Rear motor free spin	X	ON NOTE 2	ON
52	Left front channel in release too long	X	ON	OFF
53	Right front channel in release too long	X	ON	OFF
54	Rear channel in release too long	X	ON	OFF
55	EBCM malfunction	X	ON NOTE 2	OFF NOTE 1
56	Left front motor circuit open	X	ON	OFF
57	Left front motor circuit shorted to ground	X	ON	OFF
58	Left front motor circuit shorted to battery	X	ON	OFF

DIAGNOSTIC TROUBLE CODE	DESCRIPTION	ABS Operate: ○ Not operate: X	ABS Warning light	BRAKE Warning light
61	Right front motor circuit open	X	ON	OFF
62	Right front motor circuit shorted to ground	X	ON	OFF
63	Right front motor circuit shorted to battery	X	ON	OFF
64	Rear motor circuit open	X	ON NOTE 2	OFF NOTE 1
65	Rear motor circuit shorted to ground	X	ON NOTE 2	OFF NOTE 1
66	Rear motor circuit shorted to battery	X	ON NOTE 2	OFF NOTE 1
76	Left front solenoid circuit open or shorted to battery	X	ON	OFF
77	Left front solenoid circuit shorted to ground	X	ON	OFF
78	Right front solenoid circuit open or shorted to battery	X	ON	OFF
81	Right front solenoid circuit shorted to ground	X	ON	OFF
82	Calibration malfunction	X	ON	OFF
83	Idle up circuit malfunction	○	OFF	OFF
85	Base brake malfunction (Brake warning light turns ON)	X	ON	ON
86	EBCM turned on red brake warning light	X	OFF NOTE 2	ON
87	Brake warning light circuit open	X	ON	OFF
88	Brake warning light circuit shorted to battery	X	ON	OFF
91	Open brake switch during deceleration	X	ON	OFF
92	Open brake switch when ABS was required	X	ON	OFF
93	Code 91 or 92 set in current or previous ignition cycle	X	ON	OFF
94	Brake switch contacts always closed	○	OFF	OFF
95	Brake switch circuit open	X	ON	OFF
96	4WD switch circuit open	○	OFF	OFF
97	G sensor circuit shorted to ground	X	ON	OFF
98	G sensor circuit open or shorted to battery or ground	X	ON	OFF

NOTE 1: If the rear piston is not in the home position, the BRAKE warning light will be illuminated.
NOTE 2: The ABS warning light will flash if the EBCM cannot illuminate the BRAKE warning light.

61A30-5B-25-1

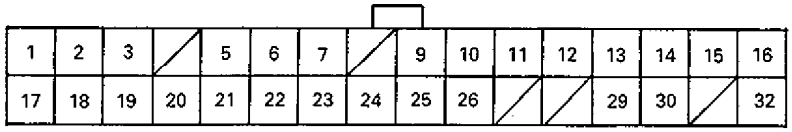
ABS WIRING DIAGRAM



1. Ignition switch
2. Enable relay
3. Data link connector
4. Right front solenoid
5. Left front solenoid
6. Right front actuator motor
7. Left front actuator motor
8. Rear actuator motor
9. Stop light switch
10. Stop light
11. ABS active light (If equipped)
12. Brake warning (Parking) light
13. Parking brake switch
14. Brake fluid level switch
15. ABS check relay (Lamp drive relay)
16. ABS warning light
17. Left front wheel speed sensor
18. Right front wheel speed sensor
19. Rear wheel speed sensor
20. DRL controller (For North American spec. only)
21. 4WD switch
22. 4WD indicator light
23. Differential switch
24. G sensor
25. ECM
26. EBCM

EBCM HARNESS CONNECTORS

Connector E124

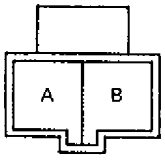


View from terminal side.

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
1	Right front motor high	17	Right front motor low
2	G sensor	18	G sensor
3	Stop light switch (Brake switch terminal)	19	G sensor
		20	ABS active light
—	—	21	ABS warning light relay
5	Serial data	22	Enable relay
6	4WD switch	23	Brake warning light
7	Left front motor low	24	Backup power supply
—	—	25	Ignition power supply
9	Left front motor high	26	Left front wheel speed sensor (low)
10	Left front wheel speed sensor (high)	—	—
11	Right front wheel speed sensor (high)	—	—
12	Right front wheel speed sensor (low)	29	Right front solenoid
13	Rear wheel speed sensor (high)	30	Left front solenoid
14	Rear wheel speed sensor (low)	—	—
15	Engine control module (ECM)	32	Rear motor high
16	Rear motor low		

61A30-5B-27-1

Connector E65



View from terminal side

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A	Battery power supply	B	Ground

50G00-5B-25-2S

CHART A – ABS (AMBER) WARNING LIGHT ON CONSTANTLY, NO DTCs STORED

NOTE:
Diagnostic circuit check must be completed first before using this chart.

- Using TECH-1, flash "ABS" (Amber) warning light. Is indicator flashing?

NO

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Connect a jumper wire to ground and probe terminal "21" of EBCM harness connector E124. Does "ABS" warning light go off?

NO

- Turn ignition switch to "LOCK".
- Remove "IG" fuse.
- Turn ignition switch to "ON".
- Measure voltage between terminal "21" of EBCM harness connector E124 and ground. Is voltage 1 volt or less?

YES

- Turn ignition switch to "LOCK" and install "IG" fuse.
- Disconnect ABS check relay from harness.
- Turn ignition switch to "ON". Is "ABS" warning light off?

YES

- Turn ignition switch to "LOCK".
- Measure resistance from EBCM harness connector E124, terminal "21" to ABS check relay harness connector terminal "4". Is resistance 2 ohms or less?

NO

- Check for open in CKT "B/BI".
- If no open, then replace ABS check relay.

YES

- Reconnect all connections.
- Turn ignition switch to "ON".
- If "ABS" warning light is on, then replace EBCM.

NO

- Repair short to ground in CKT "BI/O" and/or "R/BI".

YES

- Malfunction is not present at this time.

NO

- Repair short to B+ in CKT "B/BI".

YES

- Inspect EBCM harness connector E124, terminal "21" for poor contact.
- If OK, then reconnect all connections.
- Turn ignition switch to "ON".
- If "ABS" warning light is ON, then replace EBCM.

NOTE:
Connector terminal position:
(View from terminal side)
For check relay harness connector

CHART B – ABS (AMBER) WARNING LIGHT ON INTERMITTENTLY, NO DTCs STORED

NOTE:
Diagnostic circuit check must be completed before using this chart.

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124, connect a test light to ground and probe terminal "24" of EBCM harness connector E124. Observe test light when moving wire harness and connectors.
  Does test light remain on steady?

YES

- Connect test light between ground and EBCM harness connector E124 terminal "25". Turn ignition switch to "ON" and observe test light when moving wire harness and connectors.
  Does test light remain on steady?

YES

Problem is not present at this time. Intermittents could be caused by incorrect wiring harness routing or loose ground connections.

NO

Repair intermittent connection in CKT "Y/G".

NO

Repair intermittent connection in CKT "W".

NOTE:
Diagnostic circuit check must be completed first before using this chart.

CHART C – ABS (AMBER) WARNING LIGHT OFF CONSTANTLY, NO DTCs STORED (Page 1 of 2)

- Turn ignition switch to "ON".
- Using TECH-1, select LAMP TEST and command the ABS warning light "ON".
  Is ABS warning light on?

YES → Malfunction is not present at this time.

NO

- Turn ignition switch to "LOCK".
- Disconnect ABS check relay from harness connector.
- Turn ignition switch to "ON".
- With a fused jumper, with a 3 amp fuse, connect terminal "3" of ABS check relay harness connector to ground.
  Is "ABS" warning light on?

YES

- Turn ignition switch to "LOCK".
- Measure resistance between terminal "5" of ABS check relay harness connector and chassis ground.
  Is resistance 2 ohms or less?

YES

- Turn ignition switch to "ON".
- Measure voltage between terminal "3" of ABS check relay harness connector and chassis ground.
  Is voltage 10 volts or less?

YES

- Check for short to ground in CKT "B/Bl".
- If OK, then replace ABS check relay.

NO

Repair open or high resistance in CKT "Bl/O" and/or "R/Bl".

NO

- Repair open from terminal "5" of ABS check relay harness connector to chassis ground.

NO

- Turn ignition switch to "LOCK".
- Disconnect combination meter harness connector G11.
- Measure resistance between terminal "3" of ABS check relay harness connector and terminal "7" of combination meter harness connector G11.
  Is resistance 2 ohms or less?

YES

- Inspect ABS warning light bulb.
  Is bulb open?

NO

- Repair open or high resistance in CKT "Bl/O" and/or "R/Bl".

YES

Replace bulb.

NO

- Turn ignition switch to "ON".
- Connect test light between ground and terminal "3" of ABS check relay harness connector.
  Is test light on?

NO

Go to following page of this chart (Page 2 of 2).

YES

- Repair short to B+ on CKT "Bl/O" and/or "R/Bl".
- Replace ABS check relay.

NOTE:
Connector terminal position: (View from terminal side)
For ABS check relay harness connector.

For combination meter harness connector G11.

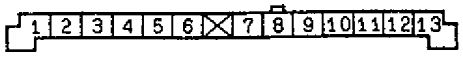


CHART C – ABS (AMBER) WARNING LIGHT OFF CONSTANTLY, NO DTCs STORED (Page 2 of 2)

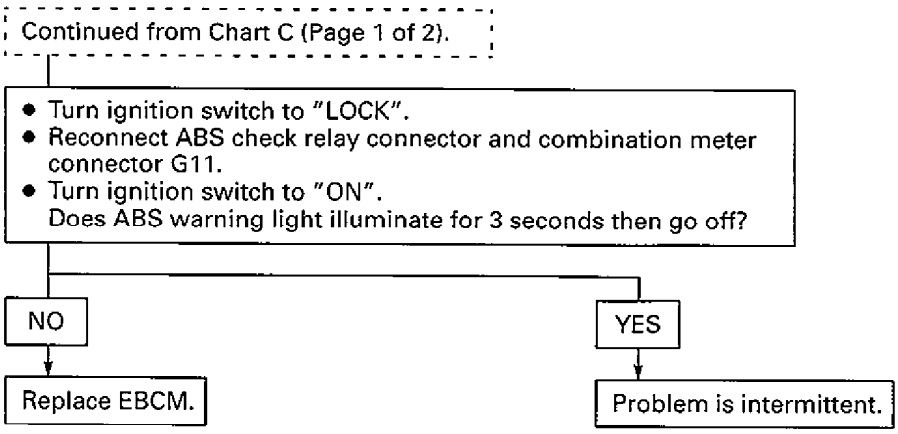


CHART D – TECH-1 DISPLAYS UNDEFINED DTCs

NOTE:
Use this chart if any of the following undefined DTCs are set – 11, 12, 13, 31, 43, 67, 68, 71, 72, 73, 74, 75 or 84.

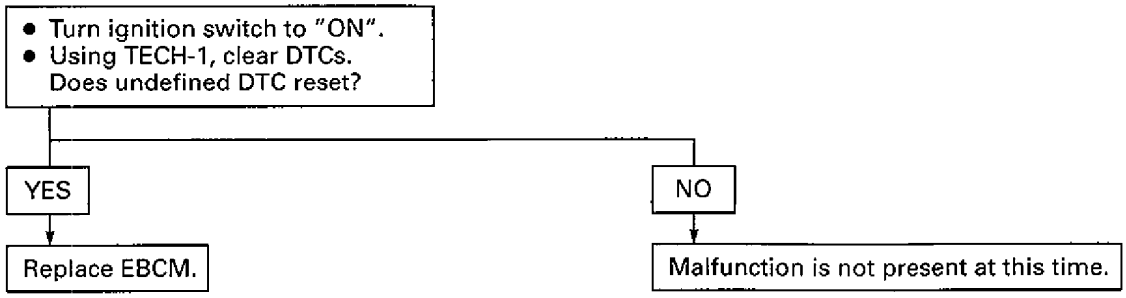


CHART E – ABS ACTIVE LIGHT MALFUNCTIONING (If equipped with ABS ACTIVE light)

NOTE:
Diagnostic circuit check must be completed first before using this chart.

- Turn ignition switch to "ON".
  Is "ABS ACTIVE" light on constantly?

NO

Are the "BRAKE" and "ABS" warning lights operating properly?

YES

- Turn ignition switch to "LOCK".
- Check for proper connection to EBCM at connector E124, terminal "20" to combination meter at connector G11, terminal "8".
- If OK, then inspect "ABS ACTIVE" bulb.
  Is bulb open?

NO

- Disconnect EBCM connector E124 and combination meter connector G11.
- Measure resistance between combination meter harness connector G11, terminal "8" and EBCM harness connector E124, terminal "20".
  Is resistance 2 ohms or less?

YES

- Remove and inspect combination meter printed circuit.
- If OK, then replace EBCM.

NO

Check "BRAKE" and/or "ABS" warning light circuit.

YES

Replace bulb.

NO

Repair open or high resistance in CKT "Lg/R".

YES

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
  Is "ABS ACTIVE" light on?

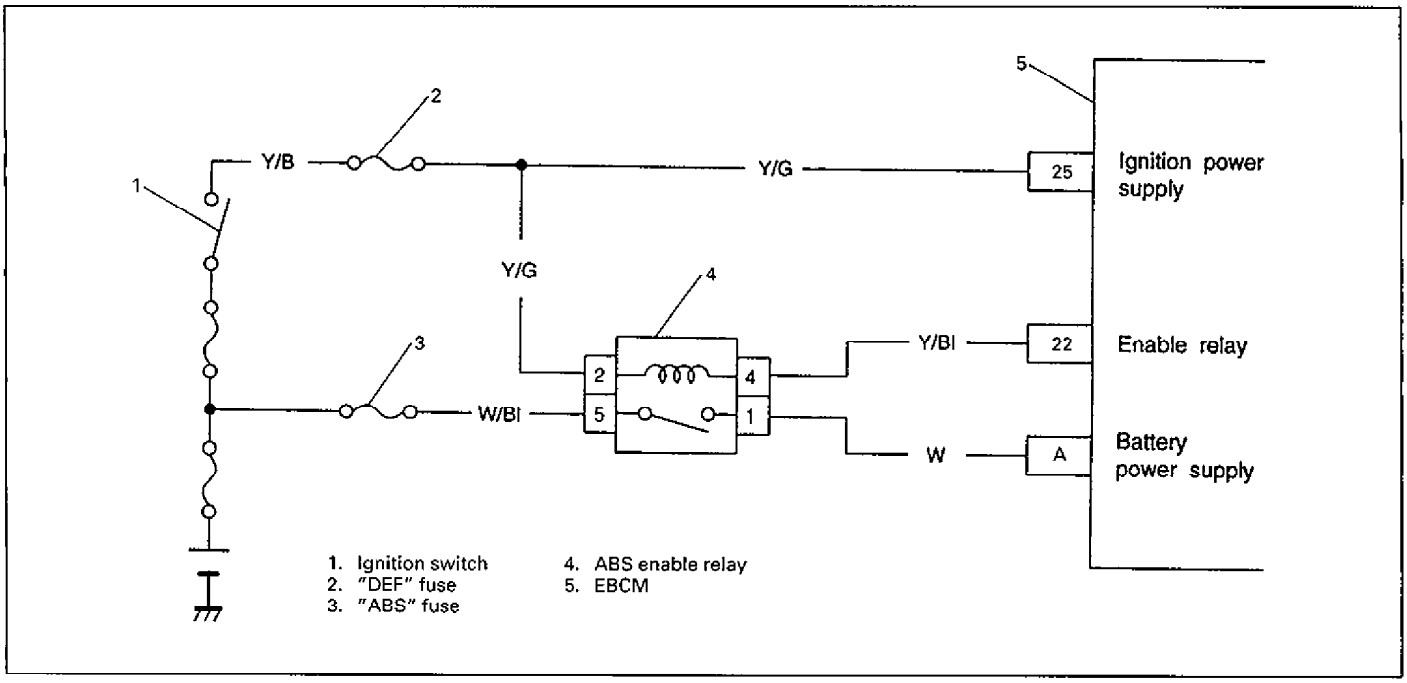
YES

- Check for short to ground in CKT "Lg/R".
- If OK, then replace combination meter printed circuit.

NO

Replace EBCM.

DTC 14 – ABS ENABLE RELAY CONTACT CIRCUIT OPEN



CIRCUIT DESCRIPTION:
Ignition voltage is supplied through terminal "2" of the ABS enable relay. Then the EBCM is able to energize the pull-in coil by completing the ground circuit at pin "22" of the EBCM. The magnetic field created closes the ABS enable relay contacts and allows battery voltage and current to be supplied to the EBCM, which supplies power to the motors and solenoids.

FAILURE CONDITION:
DTC 14 can be set anytime after the EBCM commands the ABS enable relay on (the relay is first commanded on during initialization). This test monitors the availability of current/voltage to the motors and solenoids. This malfunction indicates voltage is not available and would therefore not allow ABS operation if required.

DIAGNOSTIC AIDS:
An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "Enhanced Diagnostics" earlier in this section.
Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

VIBRATION AND TEMPERATURE EFFECTS:
Check for vibration effects by performing the relay test function of the TECH-1. With the relay commanded on, lightly tap the top and sides of the relay while monitoring relay voltage. If the relay voltage changes significantly, replace the relay.
If DTC 14 only occurs when the vehicle is initially started in cold ambient conditions (temperature less than 0°C [32°F]), replace the relay.

61A30-5B-34-1

DTC 14 – (Page 1 of 3)

Is DTC 16 also present in history?

YES → Proceed to DTC 16 chart first.

NO →

- Turn ignition switch to "ON".
- Using TECH-1, select data list and observe ABS battery voltage.

Does TECH-1 indicate that ABS battery voltage is greater than 10 volts?

YES → Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

NO →

- Turn ignition switch to "LOCK".
- Disconnect both EBCM harness connectors.
- Connect a fused jumper between ground and EBCM harness connector E124, terminal "22".
- Turn ignition switch to "ON".
- Using specified digital multimeter, measure voltage between ground and EBCM harness connector E65, terminal "A".

Is voltage greater than 10 volts.

NO → Go to DTC 14 (Page 2 of 3) – ②.

YES →

- Turn ignition switch to "LOCK.
- Disconnect ABS enable relay harness connector.
- Using specified digital multimeter, measure resistance between ABS enable relay harness connector terminal "1" and EBCM harness connector E65, terminal "A".

Is resistance less than 2 ohms?

NO → Repair high resistance in CKT "W".

YES →

- Disconnect positive (+) and negative (–) battery cables.
- Using specified digital multimeter, measure resistance between positive (+) battery cable terminal and ABS enable relay harness connector terminal "5".

Is resistance less than 2 ohms?

NO → Repair high resistance in CKT "W/BI".

YES → Go to DTC 14 (Page 2 of 3) – ①.

DTC 14 – (Page 2 of 3)

①

Continued from chart DTC 14 (Page 1 of 3).

- Inspect ABS enable relay and harness connector for a poor connection. Inspect EBCM and harness connectors for poor terminal contact. Inspect positive (+) battery cable terminal for a poor connection. Is poor terminal contact or a poor connection evident?

NO

- Reconnect all connectors.
- Turn ignition switch to "ON". Does DTC 14 reset?

YES

Repair terminals or repair connection integrity (if poor contact exists at battery terminal) that exhibit(s) poor contact.

YES

Replace EBCM.

NO

Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

②

Continued from DTC 14 (Page 1 of 3).

- Using specified digital multimeter, measure voltage between the negative (–) and positive (+) battery terminals. Is voltage greater than 10 volts?

YES

- Disconnect ABS enable relay harness connector.
- Using specified digital multimeter, measure voltage between ABS enable relay harness connector terminal "5" and ground. Is voltage greater than 10 volts?

NO

Refer to SECTION 6H of Service Manual mentioned in FOREWORD of this manual to correct low voltage conditions.

YES

Go to DTC 14 (Page 3 of 3)

NO

Repair open in CKT "W/Bl".

DTC 14 – (Page 3 of 3)

Continued from chart DTC 14 (Page 2 of 3)

- Using specified digital multimeter, measure resistance between ABS enable relay harness connector terminal "1" and EBCM harness connector E65, terminal "A".
  Is resistance less than 2 ohms?

YES

- Using a jumper wire, connect ABS enable relay terminal "4" to ground. Then using a fused jumper wire, connect ABS enable relay terminal "2" to B+.
- Using specified digital multimeter, measure resistance between ABS enable relay terminals "1" and "5".
  Is resistance less than 2 ohms?

YES

- Disconnect ABS enable relay.
- Using specified digital multimeter, measure resistance between ABS enalbe relay terminal "2" and terminal "4".
  Is resistance less than 95 ohms when measured at approximately 24°C (75°F)?

YES

- Using specified digital multimeter, measure resistance between ABS enable relay harness connector terminal "4" and EBCM harness connector E124, terminal "22".
  Is resistance less than 2 ohms?

YES

Malfunction was due to a poor connection. Test for poor terminal contact between ABS enable relay and harness connector. Replace terminals that exhibit poor terminal contact.

NO

Repair open or high resistance in CKT "W".

NO

Replace ABS enable relay.

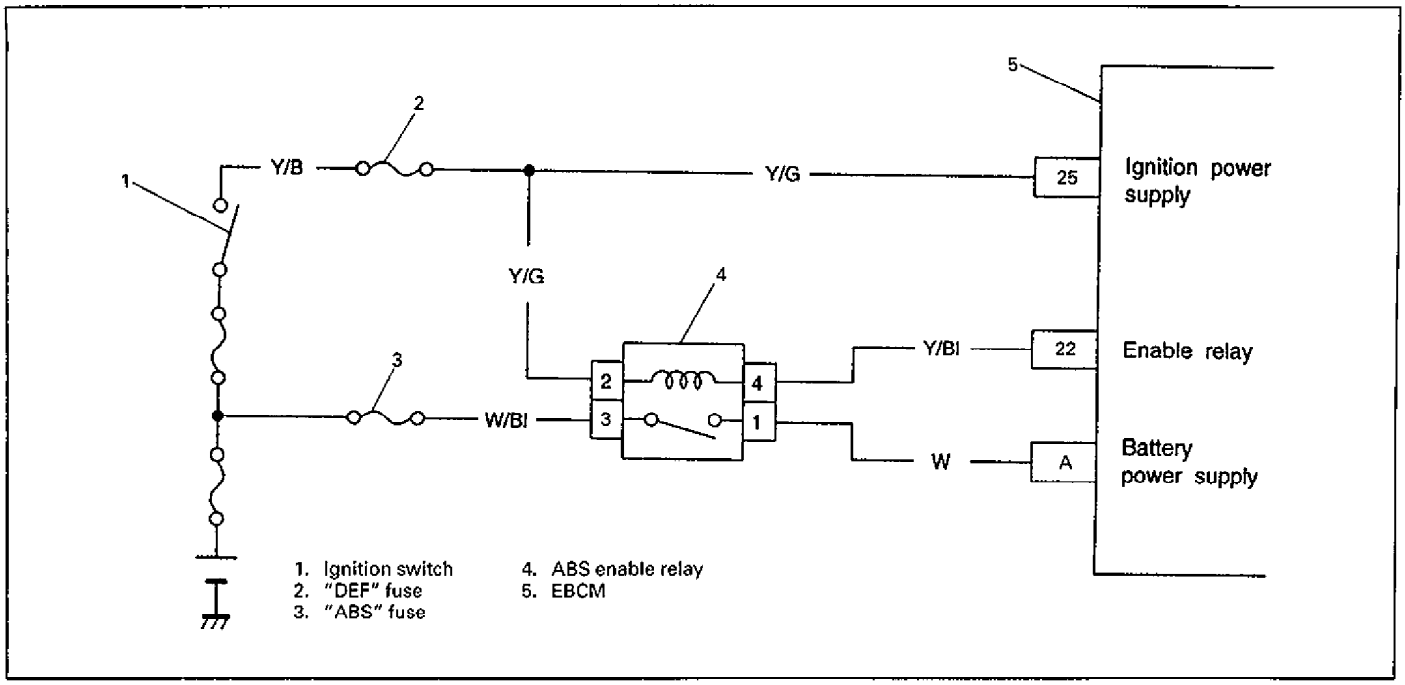
NO

Replace ABS enable relay.

NO

Repair high resistance in CKT "Y/G".

DTC 15 – ABS ENABLE RELAY CIRCUIT SHORTED TO BATTERY OR ALWAYS CLOSED



CIRCUIT DESCRIPTION:
Refer to DTC 14.

FAILURE CONDITION:
DTC 15 can be set only before the EBCM commands the relay on. This test determines if the ABS enable relay is energized when it should not be. This malfunction would not allow the ABS enable relay to remove power to the ABS system. If a second malfunction were to occur that requires the ABS enable relay to be turned off, that malfunction can not be removed if the relay can not be controlled. The malfunction must be present for three consecutive drive cycles before the DTC is set.

DIAGNOSTIC AIDS:
Refer to DTC 14.

61A30-5B-38-1

DTC 15

NOTE:
- **After diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify DTC does not reset. A drive cycle consists of starting the vehicle, driving above 16 km/h (10 mph) and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

- Turn ignition switch to "ON".
- Use relay test function of TECH-1 and command ABS enable relay "OFF".
  Does TECH-1 indicate that ABS enable relay is "OFF" and battery voltage is less than 5 volts?

NO

- Turn ignition switch to "LOCK".
- Disconnect both EBCM connectors.
- Measure voltage between ground and terminal "A" of EBCM harness connector E65.
  Is voltage less than 2 volts?

NO

- Measure voltage between terminal "22" of EBCM harness connector E124 and B+.
  Is voltage less than 2 volts?

YES

- Turn Ignition switch to "LOCK".
- Disconnect ABS enable relay.
- Turn ignition switch to "ON".
- Measure voltage between ground and terminal "A" of EBCM harness connector E65.
  Is voltage less than 2 volts?

YES

Replace ABS enable relay.

NO

Repair short to voltage in CKT "W".

NO

Repair short to ground in CKT "Y/Bl".

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

- Turn ignition switch to "LOCK".
- Reconnect both EBCM connectors.
- Turn ignition switch to "ON".
- Using TECH-1, clear DTCs.
- Using relay test function of TECH-1, command ABS enable relay "OFF".
  Does TECH-1 indicate that ABS enable relay is "OFF" and battery voltage is less than 5 volts?

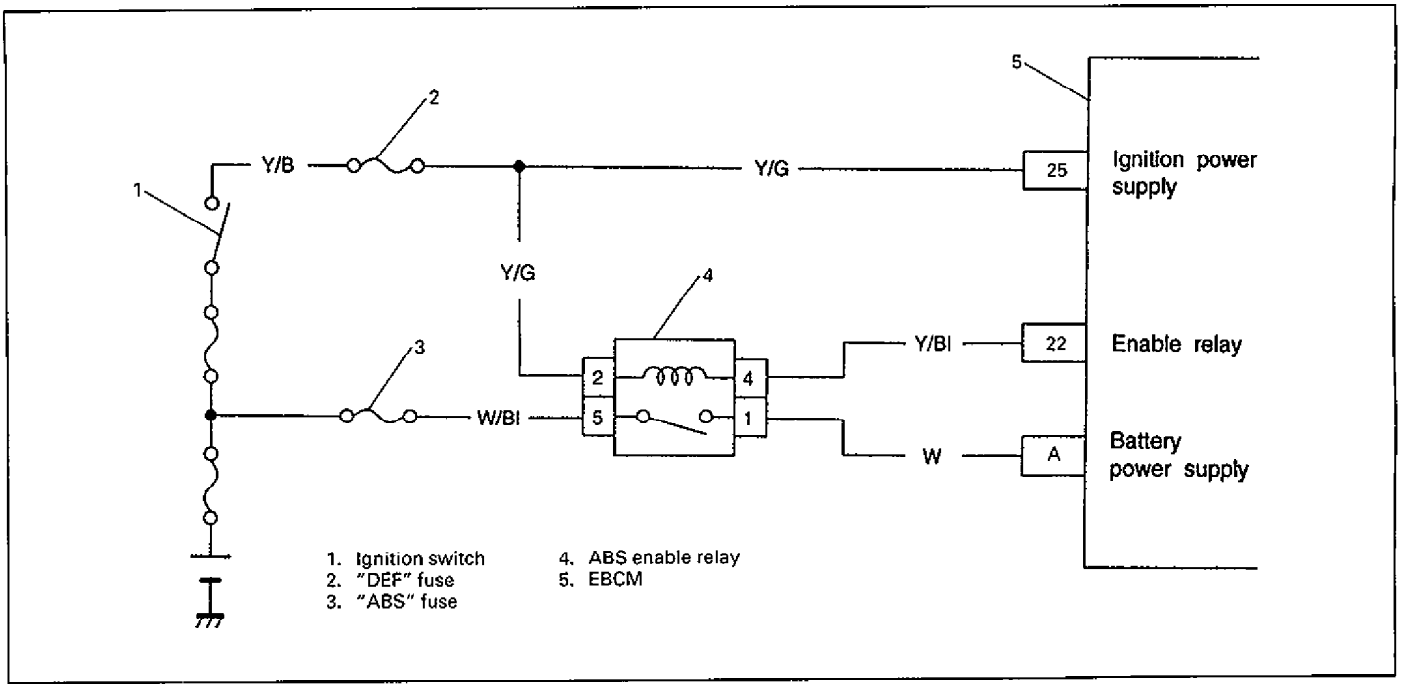
NO

Replace EBCM.

YES

Malfunction is intermittent. Refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.

DTC 16 – ABS ENABLE RELAY COIL CIRCUIT OPEN



CIRCUIT DESCRIPTION:
Refer to DTC 14.

FAILURE CONDITION:
DTC 16 can be set only after DTC 14 has been set. This test detects an open in the ABS enable relay coil circuit. An open in this circuit will not allow the relay to be energized thus preventing voltage/current to the motors and solenoids. If this malfunction is present and the ignition switch is turned to "LOCK" before 5 km/h (3 mph) is reached, DTC 14 is set alone.

DIAGNOSTIC AIDS:
Refer to DTC 14.

61A30-5B-40-1

DTC 16

NOTE:
After diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify DTC does not reset. A drive cycle consists of starting the vehicle, driving above 16 km/h (10 mph) and then keying down.

- Turn ignition switch to "ON".
- Using relay test function of TECH-1, command ABS enable relay "ON".
  Does TECH-1 indicate ABS enable relay "ON", and battery voltage above 10 volts?

NO

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Using specified digital multimeter, measure voltage between ground and terminal "22" of EBCM harness connector E124.
  Is voltage above 10 volts?

NO

- Turn ignition switch to "LOCK".
- Disconnect ABS enable relay.
- Turn ignition switch to "ON".
- Using specified digital multimeter, measure voltage between ground and terminal "2" of the ABS enable relay harness connector.
  Is voltage above 10 volts?

YES

- Using specified digital multimeter, measure resistance between terminal "22" of EBCM harness connector E124 and terminal "4" of the ABS enable relay harness connector.
  Is resistance less than 2 ohms?

YES

Replace ABS enable relay.

NO

Repair open in CKT "Y/Bl".

NO

- Check DEF fuse.
- If OK, then repair open or high resistance in CKT "Y/G".

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

- Turn ignition switch to "LOCK".
- Inspect EBCM connector E124, terminal "22" for poor contact.
- Reconnect all connectors.
- Turn ignition switch to "ON".
  Does DTC reset?

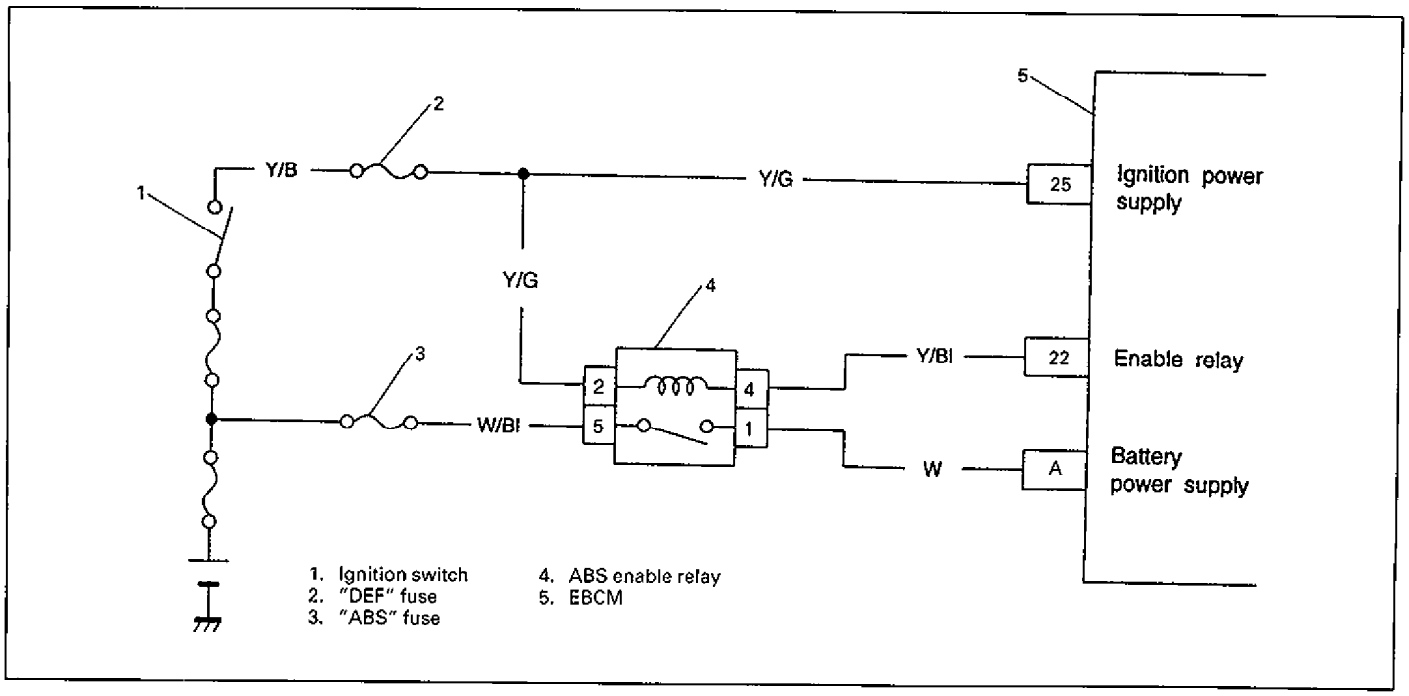
NO

Replace EBCM.

YES

Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

DTC 17 – ABS ENABLE RELAY COIL CIRCUIT SHORTED TO GROUND



CIRCUIT DESCRIPTION:
Refer to DTC 14.

FAILURE CONDITION:
DTC 17 can be set before the EBCM commands the ABS enable relay on. This test determines if the relay is energized when it should not be. This malfunction would not allow the ABS enable relay to remove power to the ABS. If a second malfunction were to occur that requires the relay to be turned off were to occur, that malfunction can not be removed if the relay can not be controlled.

DIAGNOSTIC AIDS:
Refer to DTC 14.

61A30-5B-42-1

DTC 17

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Turn ignition switch to "ON".
- Using relay test function of TECH-1, command ABS enable relay "OFF".
  Does TECH-1 indicate ABS enable relay is "OFF", and battery voltage less than 5 volts?

NO

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Connect specified digital multimeter between B+ and terminal "22" of EBCM harness connector.
  Is voltage less than 2 volts?

NO

- Turn ignition switch to "LOCK".
- Disconnect ABS enable relay.
- Connect specified digital multimeter between B+ and terminal "4" of ABS enable relay connector.
  Is voltage less than 2 volts?

YES

Replace ABS enable relay.

NO

Repair short to ground in CKT "Y/Bl".

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

- Turn ignition switch to "LOCK".
- Inspect EBCM connector E124, terminal "22" for poor contact.
- Reconnect all connectors.
- Turn ignition switch to "ON".
  Does DTC reset?

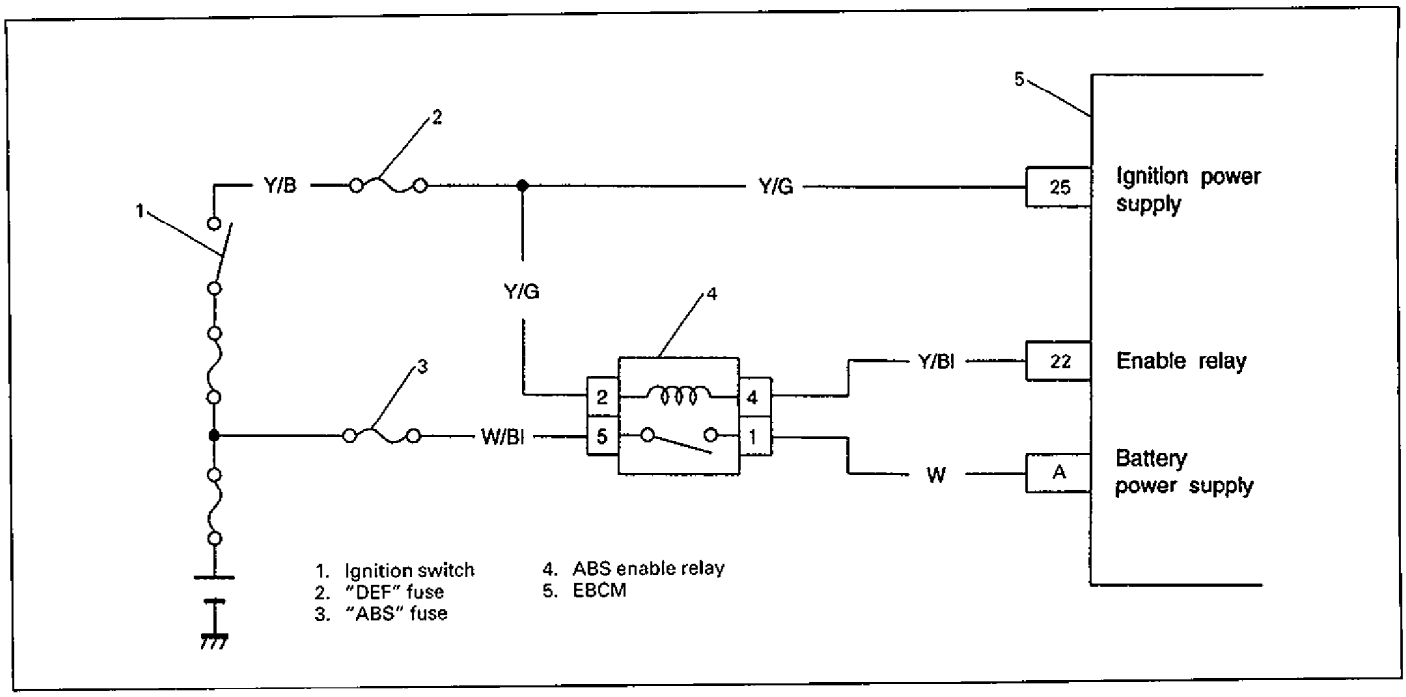
YES

Replace EBCM.

NO

Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

DTC 18 – ABS ENABLE RELAY COIL CIRCUIT SHORTED TO BATTERY



CIRCUIT DESCRIPTION:
Refer to DTC 14.

FAILURE CONDITION:
DTC 18 can be set after the EBCM commands the ABS enable relay on. This test monitors the availability of current/voltage to the motors and solenoids; therefore, ABS operation would not be allowed if required.

DIAGNOSTIC AIDS:
Refer to DTC 14.

61A30-5B-44-1

DTC 18

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Turn ignition switch to "ON".
- Using relay test function of TECH-1, command ABS enable relay "ON".
  Does TECH-1 indicate ABS enable relay is "ON" and battery voltage above 10 volts?

NO

- Turn ignition switch to "LOCK".
- Disconnect ABS enable relay.
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Connect specified digital multimeter between terminal "4" of ABS enable relay harness connector and ground.
  Is voltage less than 2 volts?

YES

- Using specified digital multimeter, measure resistance between ABS enable relay terminals "2" and "4".
  Is resistance greater than 40 ohms?

YES

- Turn ignition switch to "LOCK".
- Inspect terminal "22" of EBCM connector E124 for poor contact to EBCM.
- Reconnect all connectors.
- Turn ignition switch to "ON".
  Does DTC reset?

YES

Replace EBCM.

NO

Malfunction is intermittent, refer to "DIAGNOSTIC AIDS" on facing page.

NO

Replace ABS enable relay.

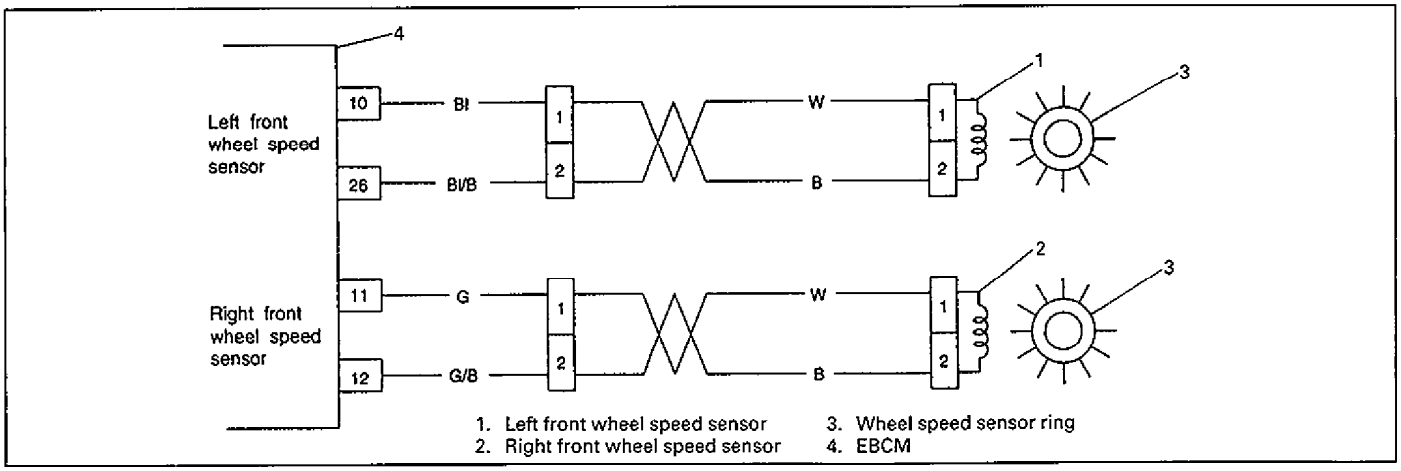
NO

Repair short to voltage on CKT "Y/Bl".

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

DTC 21 – LEFT FRONT WHEEL SPEED = 0 OR UNREASONABLE
DTC 22 – RIGHT FRONT WHEEL SPEED = 0 OR UNREASONABLE
DTC 32 – LEFT FRONT WHEEL SPEED SENSOR CIRCUIT OPEN OR SHORT TO BATTERY OR GROUND
DTC 33 – RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT OPEN OR SHORT TO BATTERY OR GROUND



CIRCUIT DESCRIPTION:

DTCs 21 and 22

As a toothed ring passes by the wheel speed sensor, changes in the electromagnetic field cause the wheel speed sensor to produce a sinusoidal (AC) voltage signal whose frequency is proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and the proximity of the wheel speed sensor to the toothed ring (often referred to as the air gap).

DTCs 32 and 33

The toothed wheel generates a voltage pulse as it moves past the sensor; each tooth-gap-tooth series on the wheel generates these pulses. The frequency of these pulses in used by the EBCM to determine wheel speed. The amount of voltage generated in each pulse depends on the air gap between the sensor and the toothed wheel, and on wheel speed.

FAILURE CONDITION:

DTCs 21 and 22 can be set when the vehicle is not in an ABS stop. If the left front wheel speed is less than 1/2 of the vehicle's reference speed and the vehicle's reference speed is greater than 8 km/h (5 mph), a malfunction exists.

DTCs 32 and 33 can be set anytime. If the EBCM detects an open, or short to voltage or ground in CKT "BI", "BI/B", "G" or "G/B", a malfunction exists.

DIAGNOSTIC AIDS:

An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1, as described in "Enhanced Diagnostics" earlier in this section.

If the customer's comments reflect that the "ABS" warning light is on only during moist environmental changes (rain, snow, vehicle wash, etc.), all wheel speed sensor circuitry should be thoroughly inspected for signs of water intrusion. Use the following procedure:

1) Spray down the suspected area with 5 % salt water solution (10 ml [2 teaspoons] of salt to 355 ml [12 fl.oz.] of water).
2) Start vehicle and allow it to run for ten seconds.
3) If the DTC returns immediately, replace the suspected harness.

Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

When measuring wheel speed sensor resistance, ensure vehicle is at room temperature (approximately 20°C [68°F]). Wheel speed sensor resistance will vary with temperature.

When replacing a wheel speed sensor, inspect the sensor terminals and harness connector for corrosion and/or water intrusion. If evidence of corrosion or water intrusion exists, replace the wheel speed sensor.

DTC 21, 22, 32 or 33 – (Page 1 of 3)

NOTE:
- **Wheel speed sensor intermittent malfunctions may be difficult to locate. Care should be taken not to disturb any electrical connections prior to an indicated step of this chart. This will insure that an intermittent connection will not be corrected before the source of the malfunction is found.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

- Test drive vehicle.
- Using TECH-1, select data list.
- Monitor applicable front wheel speed while slowly decelerating from 56 km/h (35 mph) to 0 km/h (0 mph).
  Does wheel speed match remaining wheel speed inputs?

NO

- Turn ignition switch to "LOCK".
- Physically inspect applicable wheel speed sensor, wiring and connections for damage. Is physical damage indicated?

NO

- Disconnect connector from applicable front wheel speed sensor.
- Measure resistance between terminals "1" and "2" of the sensor.
  Is measured resistance between 920 and 1220 ohms at 20°C (68°F)?

YES

- With specified digital multimeter connected, select A/C voltage scale.
- Spin applicable wheel by hand while monitoring voltage.
  Is voltage at least 100 mV (Voltage will increase as wheel speed increases)?

YES

- Using specified digital multimeter, measure resistance between applicable sensor terminal "2" and ground.
  Does specified digital multimeter display "OL" (infinite)?

YES

Go to following page of this DTC chart (page 2 of 3).

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

Correct physical damage, clear DTCs and recheck.

NO

Replace applicable wheel speed sensor, clear DTCs and recheck.

NO

Replace applicable wheel speed sensor, clear DTCs and recheck.

NO

Replace applicable wheel speed sensor, clear DTCs and recheck.

DTC 21, 22, 32 or 33 – (Page 2 of 3)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 21, 22, 32 or 33 chart (Page 1 of 3).

- Disconnect EBCM harness connector E124.
- Using specified digital multimeter, measure the resistance between terminal "10" or "11" of EBCM harness connector E124 and wheel speed sensor harness connector terminal "1".
  Is resistance less than 2 ohms?

YES

- Using specified digital multimeter, measure the resistance between terminal "26" or "12" of EBCM harness connector E124 and wheel speed sensor harness connector terminal "2".
  Is resistance less than 2 ohms?

YES

- Using specified digital multimeter, measure the resistance between terminal "10", "11", "12" or "26" of EBCM harness connector E124 and ground.
  Does specified digital multimeter display "OL" (Infinite)?

YES

Go to following page of this DTC chart (Page 3 of 3).

NO

Repair open circuit or high resistance in CKTs "BI" and "W" or CKTs "G" and "W".

NO

Repair open circuit or high resistance in CKTs "BI/B" and "B" or CKTs "G/B" and "B".

NO

Was resistance less than "OL" in terminal "10" or "11"?

NO

Repair short to ground in CKTs "BI/B" and "B" or CKTs "G/B" and "B".

YES

Repair short to ground in CKTs "BI" and "W" or CKTs "G" and "W".

DTC 21, 22, 32 or 33 – (Page 3 of 3)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 21, 22, 32 or 33 chart (page 2 of 3).

- Turn ignition to "ON".
- Using specified digital multimeter, measure the voltage between terminal "10", "11", "12" or "26" of EBCM harness connector E124 and ground.

Is voltage less than 2 volts on each terminal?

YES

- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminals "10" and "26" or terminals "11" and "12".

Does specified digital multimeter display "OL" (Infinite)?

YES

- Inspect EBCM connector E124 for poor connection.
- Reconnect all connectors and repeat first step.

If DTC(s) resets, or front wheel speed is not within 8 km/h (5 mph) of remaining wheel speed inputs, replace EBCM.

NO

Repair shorted front wheel speed sensor CKTs "BI", "W", "BI/B" and "B" or CKTs "G", "W", "G/B" and "B".

NO

Was voltage less than 2 volts in terminal "10" or terminal "11"?

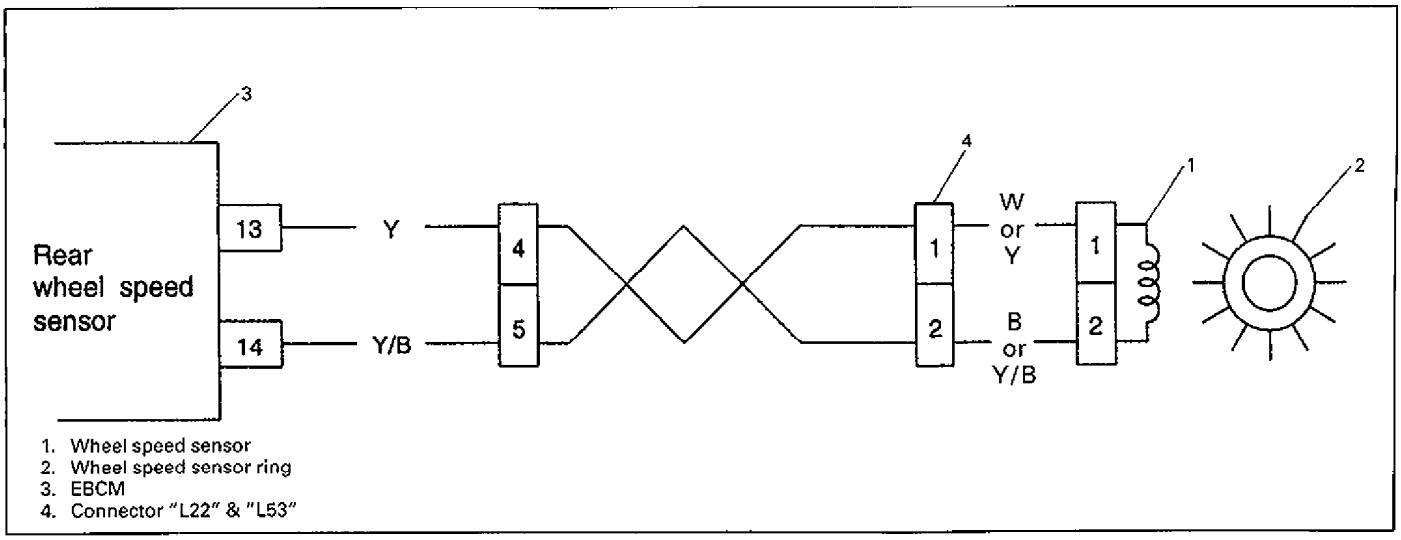
YES

Repair short to voltage in CKTs "BI/B" and "B" or CKTs "G/B" and "B".

NO

Repair short to voltage in CKT "BI" and "W" or CKTs "G" and "W".

DTC 24 – REAR WHEEL SPEED = 0 OR UNREASONABLE
DTC 28 – REAR EXCESSIVE WHEEL SPEED VARIATION
DTC 35 – REAR WHEEL SPEED SENSOR CIRCUIT OPEN OR SHORTED TO BATTERY OR GROUND



CIRCUIT DESCRIPTION:

DTCs 24 and 28

Refer to DTCs 21 and 22.

DTC 35

Refer to DTCs 32 and 33.

FAILURE CONDITION:

DTC 24 can be set when the vehicle is not in an ABS stop. If the right rear wheel speed is less than 1/2 of the vehicle's reference speed and the vehicle's reference speed is greater than 8 km/h (5 mph), a malfunction exists.

DTC 28 can be set when the brake is off. The purpose of this test is to detect a situation in which the right rear wheel acceleration or deceleration is beyond specified limits.

DTC 35 can be set anytime. If the EBCM detects an open, or short to voltage or ground in CKT(s) "Y" (and "W") or CKT(s) "Y/B" (and "B"), a malfunction exists.

DIAGNOSTIC AIDS:

Refer to DTCs 21, 22, 32 and 33.

61A30-5B-50-1

DTC 24, 28 or 35 – (Page 1 of 3)

NOTE:
- **Wheel speed sensor intermittent malfunctions may be difficult to locate. Care should be taken not to disturb any electrical connections prior to an indicated step of this chart. This will insure that an intermittent connection will not be corrected before the source of the malfunction is found.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

- Test drive vehicle.
- Using TECH-1, select data list.
- Monitor rear wheel speed while slowly decelerating from 56 km/h (35 mph) to 0 km/h (0 mph).
  Does wheel speed match remaining wheel speed inputs?

YES → Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

NO →
- Turn ignition switch to "LOCK".
- Physically inspect wheel speed sensor, wiring, and connectors for damage.
  Is physical damage indicated?

YES → Correct physical damage, clear DTC(s) and recheck.

NO →
- Disconnect rear wheel speed sensor harness connector.
- Using specified digital multimeter, measure the resistance between terminals "1" and "2" of rear wheel speed sensor.
  Is measured resistance approximately 1300 ohms?

NO → Replace rear wheel speed sensor.

YES →
- With specified digital multimeter still connected to rear wheel speed sensor terminals, select A/C scale.
- Place transmission in neutral and release parking brake.
- Spin one of the rear wheels by hand while monitoring voltage.
  Is voltage at least 100 mV? (Voltage increases as wheel speed increases.)

YES →
- Using specified digital multimeter, measure the resistance between rear wheel speed sensor terminal "1" then "2" to ground.
  Does the specified digital multimeter display "OL" (Infinite)?

NO → Replace rear wheel speed sensor.

YES → Go to following page of this DTC chart (Page 2 of 3).

DTC 24, 28 or 35 – (Page 2 of 3)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 24, 28 or 35 chart (Page 1 of 3).

- Disconnect EBCM harness connector E124.
- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminal "13" and wheel speed sensor harness connector L22 (EBCM side) terminal "1".
  Is resistance less than 2 ohms?

YES

- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminal "14" and wheel speed sensor harness connector terminal L22 (EBCM side) "2".
  Is resistance less than 2 ohms?

YES

- Disconnect EBCM harness connector E124.
- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminal "13" and ground, then terminal "14" and ground.
  Does specified digital multimeter display "OL" (Infinite)?

YES

Go to following page of this DTC chart (Page 3 of 3).

NO

Repair open circuit or high resistance in CKT(s) "Y" (and "W").

NO

Repair open circuit or high resistance in CKT(s) "Y/B" (and "B").

NO

Was resistance less than "OL" in terminal "13"?

YES

Repair short to ground in CKT(s) "Y/B" (and "B").

NO

Repair short to ground in CKT(s) "Y" (and "W").

DTC 24, 28 or 35 – (Page 3 of 3)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 24, 28 or 35 chart (Page 2 of 3).

- Turn ignition to "ON".
- Using specified digital multimeter, measure the voltage between EBCM harness connector E124, terminal "13" to ground, then terminal "14" to ground.
  Is voltage less than 2 volts on each terminal?

YES

- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminals "13" and "14".
  Does specified digital multimeter display "OL" (infinite)?

YES

- Inspect EBCM connector E124 for poor connection.
- Reconnect all connectors and repeat first step.
  If DTC(s) resets, or wheel speed is not within 8 km/h (5 mph) of remaining wheel speed inputs, replace EBCM.

NO

Repair shorted rear wheel speed sensor CKT(s) "Y/B" (and "B") or CKT(s) "Y" (and "W").

NO

Was voltage less than 2 volts in terminal "13"?

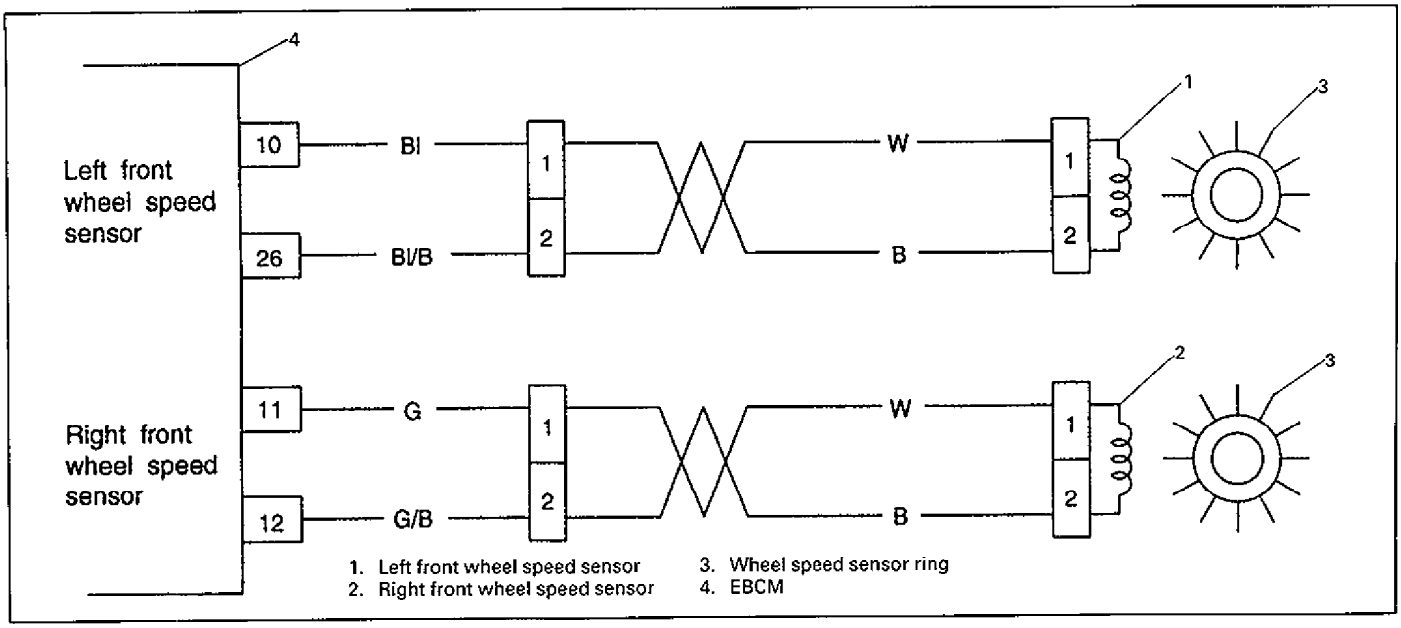
YES

Repair short to voltage in CKT(s) "Y/B" (and "B").

NO

Repair short to voltage in CKT(s) "Y" (and "W").

DTC 25 – LEFT FRONT EXCESSIVE WHEEL SPEED VARIATION
DTC 26 – RIGHT FRONT EXCESSIVE WHEEL SPEED VARIATION



CIRCUIT DESCRIPTION:
Refer to DTCs 21 and 22.

FAILURE CONDITION:
DTCs 25 and 26 can be set when the brake is off. The purpose of this test is to detect a situation in which the front wheel acceleration or deceleration is beyond specified limits.

DIAGNOSTIC AIDS:
Refer to DTCs 21, 22, 32 and 33.

61A30-5B-54-1

DTC 25 or 26 – (Page 1 of 3)

NOTE:
- **Wheel speed sensor intermittent malfunctions may be difficult to locate. Care should be taken not to disturb any electrical connections prior to an indicated step of this chart. This will insure that an intermittent connection will not be corrected before the source of the malfunction is found.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

- Test drive vehicle.
- Using TECH-1, select data list.
- Monitor applicable front wheel speed while slowly decelerating from 56 km/h (35 mph) to 0 km/h (0 mph).
  Does wheel speed match remaining wheel speed inputs?

NO

- Turn ignition switch to "LOCK".
- Remove tire and measure applicable wheel bearing end play, refer to SECTION 3D of the Service Manual mentioned in FOREWORD of this manual.
  Is end play greater than 0.05 mm (0.002 in)?

NO

- Physically inspect applicable wheel speed sensor, wiring, and connectors for damage.
  Is physical damage indicated?

NO

- Disconnect connector from applicable front wheel speed sensor.
- Measure resistance between terminals "1" and "2" of the sensor.
  Is measured resistance between 920 and 1220 ohms?

YES

- With specified digital multimeter connected, select A/C voltage scale.
- Spin applicable wheel by hand while monitoring voltage.
  Is voltage at least 100 mV (Voltage will increase as wheel speed increased)?

YES

- Using specified digital multimeter, measure resistance between sensor terminal "2" and ground.
  Does specified digital multimeter display "OL" (infinite)?

YES

Go to following page of this DTC chart (page 2 of 3).

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

Replace wheel bearing, refer to SECTION 3D of the Service Manual mentioned in FOREWORD of this manual.

YES

Correct physical damage, clear DTCs and recheck.

NO

Replace wheel speed sensor, clear DTCs and recheck.

NO

Replace wheel speed sensor, clear DTCs and recheck.

NO

Replace wheel speed sensor, clear DTCs and recheck.

DTC 25 or 26 – (Page 2 of 3)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 25 or 26 chart (Page 1 of 2).

- Disconnect EBCM harness connector E124.
- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminal "10" or "11" and wheel speed sensor harness connector terminal "1".
  Is resistance less than 2 ohms?

YES

- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminal "26" or "12" and wheel speed sensor harness connector terminal "2".
  Is resistance less than 2 ohms?

YES

Go to following page of this DTC chart (Page 3 of 3).

NO

Repair open circuit or high resistance in CKTs "BI" and "W" or CKTs "G" and "W".

NO

Repair open circuit or high resistance in CKTs "BI/B" and "B" or CKTs "G/B" and "B".

DTC 25 or 26 – (page 3 of 3)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 25 or 26 chart (Page 2 of 3).

- Using specified digital multimeter, measure the resistance between terminal "10", "11", "12" or "26" of EBCM harness connector E124 and ground.
  Does specified digital multimeter display "OL" (Infinite)?

YES

- Turn ignition to "ON".
- Using specified digital multimeter, measure the voltage between terminal "10", "11", "12" or "26" of EBCM harness connector E124 and ground.
  Is voltage less than 2 volts on each terminal?

YES

- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminals "10" and "26" or terminals "11" and "12".
  Does specified digital multimeter display "OL" (infinite)?

YES

- Inspect EBCM connector E124 for poor connection.
- Reconnect all connectors and repeat step 1.
  If DTC 25 or 26 resets, or wheel speed is not within 8 km/h (5 mph) of remaining wheel speed inputs, replace EBCM.

NO

Was resistance less than "OL" in terminal "10" or "11"?

NO

Repair short to ground in CKTs "BI/B" and "B" or CKTs "G/B" and "B".

YES

Repair short to ground in CKTs "BI" and "W" or CKTs "G" and "W".

NO

Was voltage less than 2 volts in terminal "10" or "11"?

YES

Repair short to voltage in CKTs "BI/B" and "B" or CKTs "G/B" and "B".

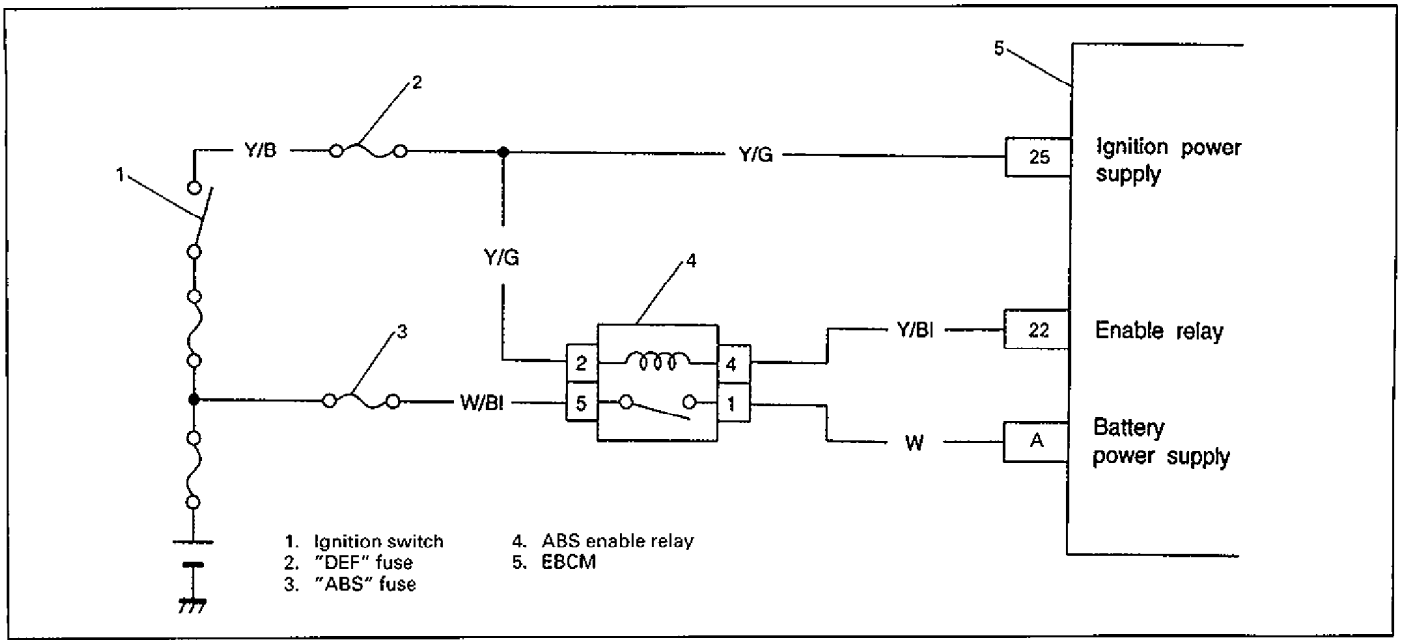
NO

Repair short to voltage in CKTs "BI" and "W" or CKTs "G" and "W".

NO

Repair shorted front wheel speed sensor CKTs "BI", "W", "BI/B" and "B" or CKTs "G", "W", "G/B" and "B".

DTC 36 – LOW SYSTEM VOLTAGE



CIRCUIT DESCRIPTION:

This DTC is used to monitor the voltage level available to the EBCM. If the voltage drops below 11 volts, full performance of the ABS cannot be guaranteed. During ABS operation, there are several current requirements that will cause battery voltage to drop. Because of this, voltage is monitored prior to ABS operation to indicate good charging system condition and also during ABS operation when voltage may drop significantly.

FAILURE CONDITION:

DTC 36 can only be set if the vehicle's speed is greater than 8 km/h (5 mph). If the switched battery voltage is less than 11.8 volts before ABS operation or 9.3 volts during ABS operation, a malfunction exists.

DIAGNOSTIC AIDS:

An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1, as described in "Enhanced Diagnostics" earlier in this section.

Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

While performing a voltage load test, if it is noted that only ignition voltage drops below acceptable voltage levels, CKT "W/Bl" should be checked for high resistance or an open condition.

61A30-5B-58-1

DTC 36

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Start engine.
- With engine running, select data list and monitor system voltage.
  Is voltage 11.5 volts or above?

NO

- Turn ignition switch to "LOCK".
- Disconnect both EBCM connectors.
- Jumper terminal "22" of EBCM harness connector E124 to ground.
- Start engine.
- Using specified digital multimeter, measure the voltage between ground and terminal "A" of EBCM harness connector E65.

NO

- Turn ignition switch to "LOCK".
- Reconnect both EBCM connectors.

- Start engine.
- Perform voltage load test using TECH-1.
- Monitor battery and ignition voltage.

Ignition and battery voltages less than 10 volts.

Inspect connections at EBCM connector E124, terminal "22" and connector E65, terminal "A" for corrosion or poor contact. If OK, refer to SECTION 6H to correct low voltage condition.

YES

- Perform voltage load test using TECH-1.
  Are ignition and battery voltages greater than 10 volts?

NO

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

- Turn ignition switch to "LOCK".
- Reconnect the EBCM connectors.
- Turn ignition switch to "ON".
- Connect a test light between ground and terminal "A" of EBCM harness connector E65 (Backprobe terminal "A", careful not to damage terminal).
- Observe test light while using TECH-1 to perform voltage load test.
  Did test light turn ON?

NO

YES

Check for poor connection at terminal "A" of EBCM harness connector E65.
If OK, replace EBCM.

Battery voltage only less than 10 volts.

With specified digital multimeter connected to ground and ABS enable relay terminal "1" observe voltage.
Is voltage above 10 volts?

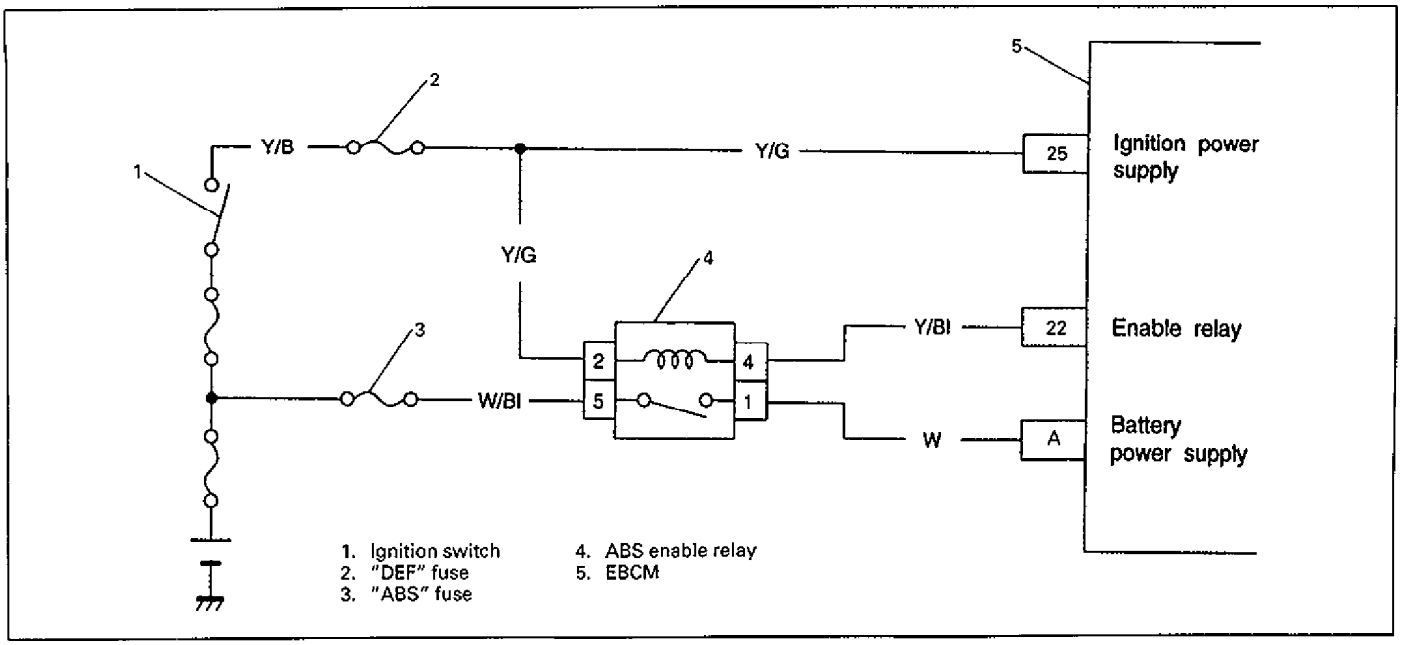
YES

Repair high resistance or open CKT "W".

NO

Check for open ABS fuse.
If OK, repair high resistance or open in CKT "W/BI".

DTC 37 – HIGH SYSTEM VOLTAGE



CIRCUIT DESCRIPTION:

This DTC is designed to detect high vehicle voltage levels prior to any required motor movement (initialization or ABS operation). If excessive voltage exists, demagnetization of the motor magnets may occur, which would eventually affect or eliminate ABS performance.

FAILURE CONDITION:

DTC 37 can only be set if the vehicle's speed is greater than 8 km/h (5 mph). If the switched battery voltage is greater than 17 volts, a malfunction exists.

DIAGNOSTIC AIDS:

An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1, as described in "Enhanced Diagnostics" earlier in this section.

Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

61A30-5B-60-1

DTC 37

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Start engine.
- Using TECH-1, select data list and monitor system voltage.
  Is voltage less than 16 volts?

NO

- Connect specified digital multimeter between terminal "A" of EBCM harness connector E65 and ground.
  Is voltage less than 16 volts?

NO

Check charging system operation.

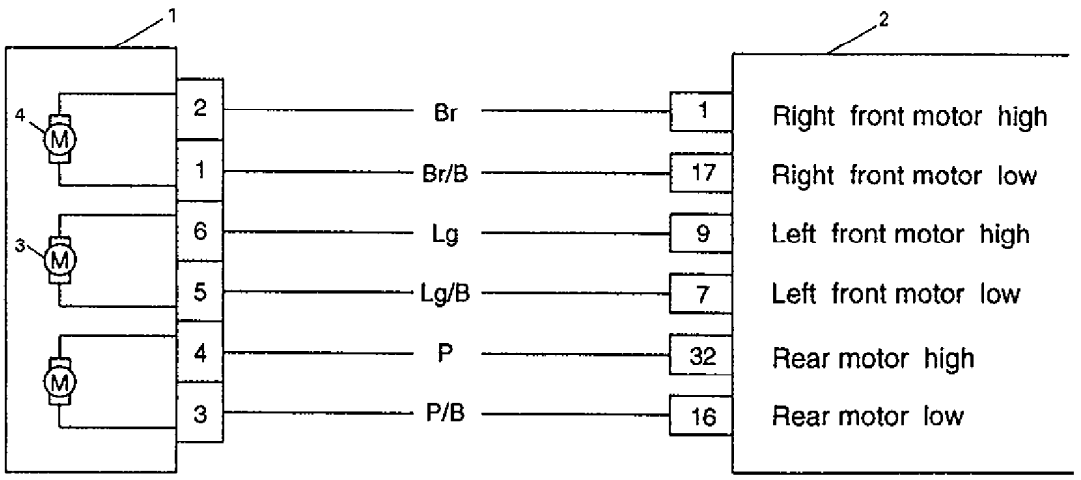
YES

Replaced EBCM and recheck.

YES

Malfunction not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

DTC 38 – LEFT FRONT ESB WILL NOT HOLD MOTOR
DTC 41 – RIGHT FRONT ESB WILL NOT HOLD MOTOR



1. Motor pack
2. EBCM
3. Left front motor
4. Right front motor

CIRCUIT DESCRIPTION:

These DTCs are designed to detect a slipping front ESB. During initialization and braking, the front motor is rehomed. If the ESB slips, the motor/piston will move. During the next ignition "ON" initialization, a re-home of the motor verifies that the motor/piston remained at the home position. If motor movement is detected, the ESB must be slipping.

FAILURE CONDITION:

DTCs 38 and 41 can be set during initialization. If the EBCM detects that the ESB could not hold the piston in the home position, a malfunction exists.

DIAGNOSTIC AIDS:

An "intermittent" malfunction of this DTC may be caused by a sticking, binding or slipping mechanical part of the system.

The frequency of the malfunction can be checked by using the enhanced diagnostic feature of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section.

The hydraulic control test function of the TECH-1 may be used to locate an intermittent malfunction associated with the ESB.

61A30-5B-62-1

DTC 38 or 41

NOTE:
After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.

- Inspect motor pack harness connector and EBCM harness connector E124 for proper wire color and terminal locations, refer to schematic.
- If OK, then turn ignition switch to "ON".
- Pump brake pedal.
- Using TECH-1, select ABS tests.
- Using manual control, select applicable front motor apply and apply the motor.
- Wait 5 seconds and then apply firm pressure on brake pedal.

Did the brake pedal fall?

YES → Replace motor pack.

NO →

- Turn ignition switch to "LOCK".
- Disconnect motor pack connector and EBCM connector E124.
- Using specified digital multimeter, measure resistance between following applicable terminals.

DTC	EBCM harness connector E124 terminal	—	Motor pack harness connector terminal
38	9	———	6
41	1	———	2

Is resistance less than 1.5 ohms?

NO → Repair high resistance in CKT "Lg" or "Br".

YES →

- Using specified digital multimeter, measure resistance between following applicable terminals.

DTC	EBCM harness connector E124 terminal	—	Motor pack harness connector terminal
38	7	———	5
41	17	———	1

Is resistance less than 1.5 ohms?

NO → Repair high resistance in CKT "Lg/B" or "Br/B".

YES →

- Using specified digital multimeter, measure resistance of motor pack between terminals "6" and "5" or terminals "2" and "1".

Is resistance less than 1.5 ohms?

NO → Replace moor pack.

YES →

- Inspect the motor pack harness connector and EBCM harness connector E124 for poor terminal contact or corrosion.

Do any terminals exhibit poor contact or evidence of corrosion?

YES → Replace terminals that exhibit poor terminal contact or evidence of corrosion.

NO →

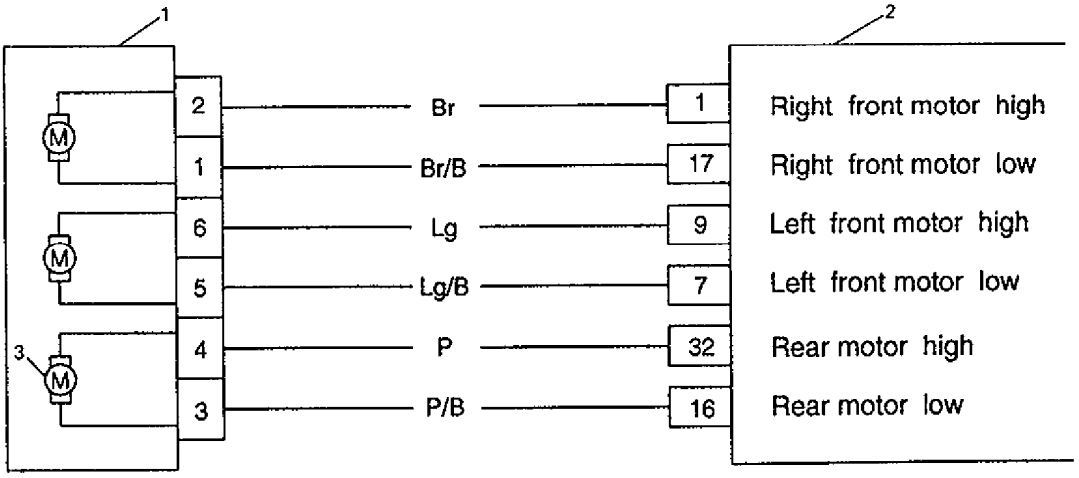
- Reconnect all connectors.
- Drive vehicle for 2 drive cycles.

Does DTC 38 or 41 reset?

YES → Replace EBCM.

NO → Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

DTC 42 – REAR ESB WILL NOT HOLD MOTOR



1. Motor pack
2. EBCM
3. Rear motor

CIRCUIT DESCRIPTION:

This DTC is designed to detect a slipping rear ESB. During initialization and braking, the rear motor is re-homed. If the ESB slips, the motor/piston will move. During the next ignition "ON" initialization, a rehome of the motor verifies that the motor/piston remained at the home position. If motor movement is detected, the ESB must be slipping.

FAILURE CONDITION:

DTC 42 can be set during initialization. If the EBCM detects that the ESB could not hold the piston in the home position, a malfunction exists. DTC 86 is always set with DTC 42.

DIAGNOSTIC AIDS:

Refer to DTCs 38 and 41.

61A30-5B-64-1

DTC 42

NOTE:
After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.

- Inspect motor pack harness connector and EBCM harness connector E124 for proper wire color and terminal locations, refer to schematic.
- If OK, then raise and support vehicle.
- Turn ignition switch to "ON".
- Pump brake pedal.
- Apply firm pressure on brake pedal and release.
- Reapply firm pressure on brake pedal and have an assistant try to spin the rear wheels by hand.
  Could assistant spin the rear wheels?

YES → Replace motor pack.

NO →

- Turn ignition switch to "LOCK".
- Disconnect motor pack connector and EBCM connector E124.
- Using specified digital multimeter, measure resistance between motor pack harness connector terminal "4" and EBCM harness connector E124, terminal "32".
  Is resistance less than 1.5 ohms?

NO → Repair high resistance in CKT "P".

YES →

- Using specified digital multimeter, measure resistance between motor pack harness connector terminal "3" and EBCM harness connector E124, terminal "16".
  Is resistance less than 1.5 ohms?

NO → Repair high resistance in CKT "P/B".

YES →

- Using specified digital multimeter, measure resistance of motor pack between terminal "3" and terminal "4".
  Is resistance less than 1.5 ohms?

NO → Replace motor pack.

YES →

- Inspect the motor pack harness connector and EBCM harness connector E124 for poor terminal contact or corrosion.
  Do any terminals exhibit poor contact or evidence of corrosion?

YES → Replace terminals that exhibit poor terminal contact or evidence of corrosion.

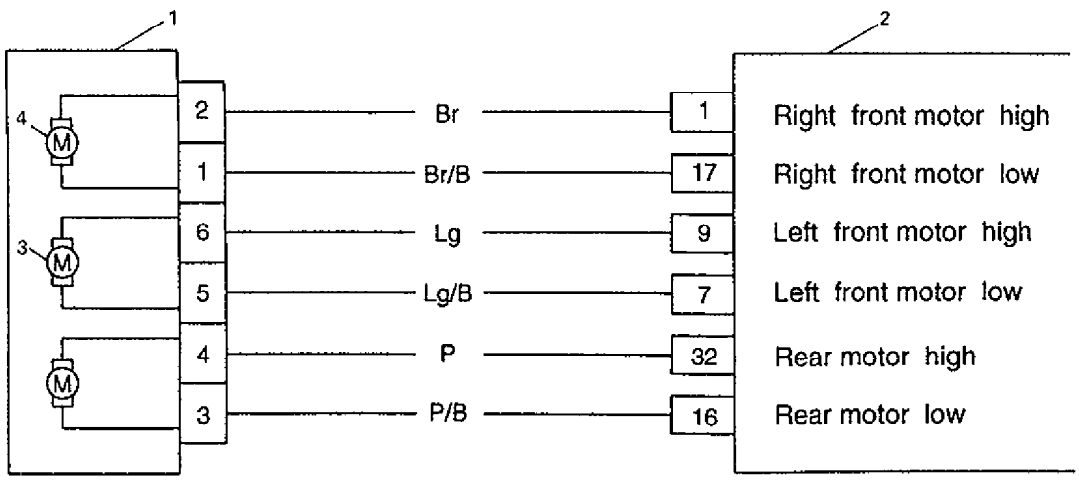
NO →

- Reconnect all connectors.
- Drive vehicle for 2 drive cycles.
  Does DTC 42 reset?

NO → Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

YES → Replace EBCM.

DTC 44 – LEFT FRONT CHANNEL WILL NOT MOVE
DTC 45 – RIGHT FRONT CHANNEL WILL NOT MOVE



1. Motor pack
2. EBCM
3. Left front motor
4. Right front motor

CIRCUIT DESCRIPTION:

These DTCs are designed to detect a bound-up ESB, a stuck motor or a seized hydraulic modulator. When the release is commanded during initialization, the ESB should release the motor, resulting in sensed current being less than commanded current (motor is spinning freely). If the motor is not moving, sensed current will be equal to stall current.

FAILURE CONDITION:

DTCs 44 and 45 can be set during normal operation. If the EBCM detects a condition in which it cannot move the motor in either direction, a malfunction exists.

DIAGNOSTIC AIDS:

An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1, as described in "Enhanced Diagnostics" earlier in this section. DTC 44 or 45 may be set after modulator disassembly if the modulator pistons are positioned at the bottom of their bore. Any circuitry that is suspected of causing the intermittent complaint should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

61A30-5B-66-1

DTC 44 or 45

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

- Turn ignition switch to "ON".
- Pump brake pedal.
- Using TECH-1 ABS misc. tests, select manual control function.
- Select applicable front motor apply function and apply the motor.
- Apply firm pressure on brake pedal.
- Select applicable front motor release function and release motor.

Did brake pedal fall?

NO

YES

- Firm pressure still on brake pedal.
- Select applicable front motor apply function and apply the motor.

Did brake pedal rise?

NO

YES

Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

- Remove foot from brake pedal.
- Select applicable front motor apply function and apply the motor while carefully observing the commanded current and the feedback current on the TECH-1.

Was the feedback current higher than the commanded current?

NO

- Using TECH-1 ABS tests, perform gear tension relief function.
- Turn ignition switch to "LOCK".
- Remove hydraulic modulator/motor pack assembly from vehicle.
- Separate motor pack from hydraulic modulator.
- Grasp and attempt to move the front hydraulic modulator gear.

Can the gear be rotated at least 5 full turns lock to lock?

NO

Replace hydraulic modulator.

YES

Replace motor pack.

YES

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124 and motor pack connector.
- Using specified digital multimeter, measure the resistance between terminals "9" and "7" or terminals "1" and "17" of EBCM harness connector E124.

Does specified digital multimeter display resistance as "OL" (Infinite)?

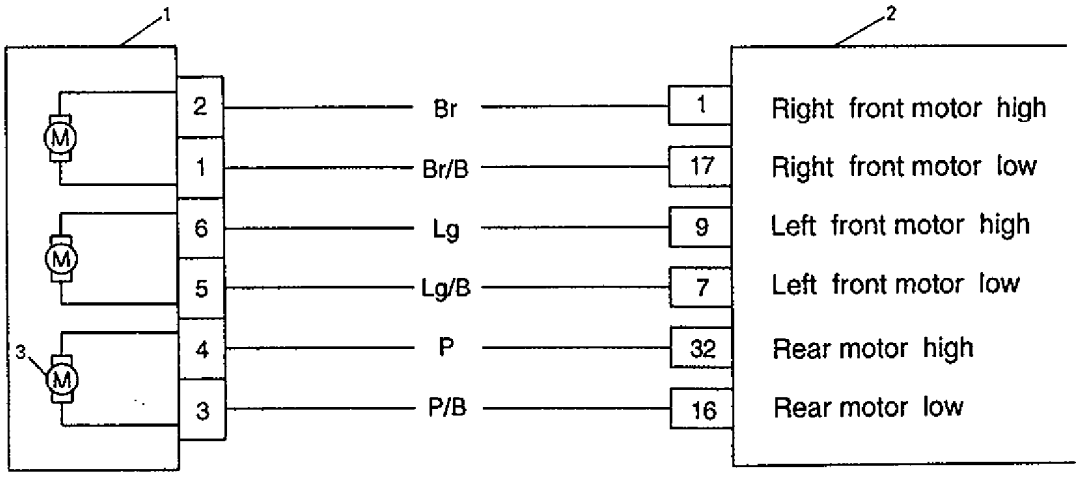
YES

- Reconnect all connections.
- Test drive vehicle for 3 drive cycles.
- If DTC 44 or 45 resets, replace EBCM.

NO

Repair short between CKTs "Lg" and "Lg/B" or CKTs "Br" and "Br/B".

DTC 46 – REAR CHANNEL WILL NOT MOVE



1. Motor pack
2. EBCM
3. Rear motor

CIRCUIT DESCRIPTION:
Refer to DTCs 44 and 45.

FAILURE CONDITION:
DTC 46 can only be set during normal operation. If the EBCM detects a condition in which it cannot move the motor in either direction, a malfunction exists.

DIAGNOSTIC AIDS:
An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1, as described in "Enhanced Diagnostics" earlier in this section. DTC 46 may set after modulator disassembly if the modulator pistons are positioned at the bottom of their bore.
Depending on the frequency of the malfunction, a physical inspection of the suspected mechanical parts may be necessary.
Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

61A30-5B-68-1

DTC 46 – REAR CHANNEL WILL NOT MOVE

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

- Raise and support the vehicle.
- Turn ignition switch to "ON".
- Pump brake pedal.
- Apply firm pressure on brake pedal.
- Using TECH-1 ABS tests, select manual control function.
- Select rear motor apply function and apply the motor.
- Have an assistant try to spin the rear wheels by hand.

Could assistant spin the rear wheels?

YES

NO

- Firm pressure still on brake pedal.
- Select rear motor release function and release the motor.
- Have an assistant try to spin the rear wheels by hand.

Could assistant spin the rear wheels?

NO

YES

Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

- Remove foot from brake pedal.
- Select rear motor apply function and apply the motor while carefully observing the commanded current and the feedback current on the TECH-1.

Was the feedback current higher than the commanded current?

NO

- Using TECH-1 ABS tests, perform gear tension relief function.
- Turn ignition switch to "LOCK".
- Remove hydraulic modulator/motor pack assembly from vehicle.
- Separate motor pack from hydraulic modulator.
- Grasp the middle gear on the hydraulic modulator and attempt to move the gear.

Can the gear be rotated at least 5 full turns lock to lock?

NO

Replace hydraulic modulator.

YES

Replace motor pack.

YES

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124 and motor pack connector.
- Using specified digital multimeter, measure the resistance between terminal "16" and terminal "32" of EBCM harness connector E124.

Does specified digital multimeter display resistance as "OL" (Infinite)?

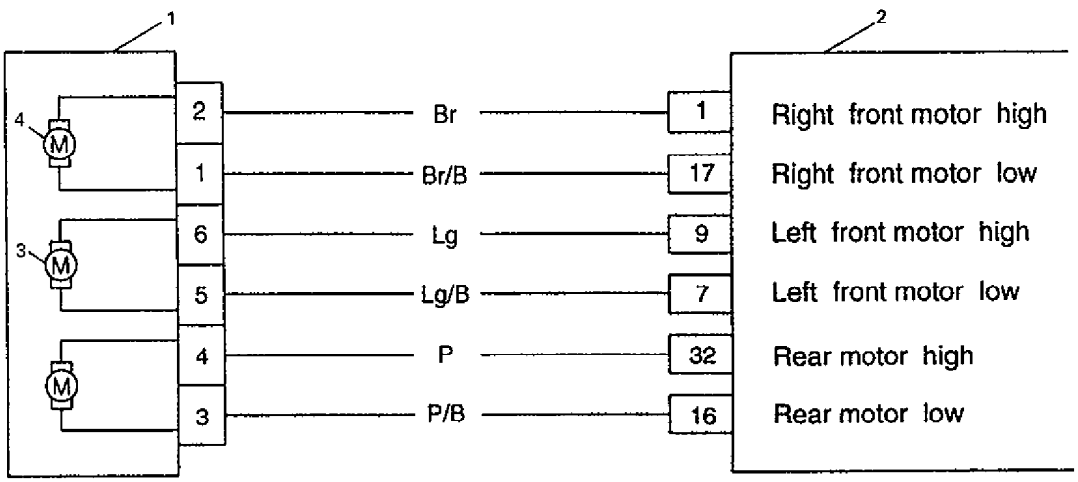
YES

- Reconnect all connections.
- Test drive vehicle for 3 drive cycles.
- If DTC 46 resets, replace EBCM.

NO

Repair short between CKT "P" and CKT "P/B".

DTC 47 – LEFT FRONT MOTOR FREE SPINS
DTC 48 – RIGHT FRONT MOTOR FREE SPINS



1. Motor pack
2. EBCM
3. Left front motor
4. Right front motor

CIRCUIT DESCRIPTION:
These DTCs are designed to detect a stripped nut or gear assembly during initialization. During the homing sequence, the piston should reach the top of the bore resulting in a stalled motor. If this does not occur, the motor must be spinning with little or no resistance. This indicates a nut/screw or gear malfunction.

FAILURE CONDITION:
DTCs 47 and 48 can only be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

DIAGNOSTIC AIDS:
An "intermittent" malfunction of this DTC may be caused by a sticking, binding or slipping mechanical part of the system.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section. If the DTC only fails once and DTC 56 or 61 also fails, refer to DTC 56 or 61. If intermittent and enhanced diagnostics show this DTC fails during ABS operation, refer to DTC 56 or 61.
Depending on the frequency of the malfunction, a physical inspection of the suspected mechanical parts may be necessary.

61A30-5B-70-1

DTC 47 or 48 – (Page 1 of 3)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is preset.**

Is DTC 56 or 61 also currently set?

YES → Proceed to DTC 56 or 61 chart first.

NO →
- Turn ignition switch to "ON".
- Pump brake pedal.
- Using TECH-1 ABS misc. tests, select manual control function.
- Select applicable front motor apply function and apply the motor while carefully observing the command current and feedback current on the TECH-1.

Were both command and feedback current 10 amps?

NO → Was the command current or feedback current 0 amps?

YES →
- Apply firm pressure on brake pedal.
- Select applicable motor release function and release the motor.

Did the brake pedal fall and were both command and feedback current 6 amps?

NO →

YES →
- Firm pressure still on brake pedal.
- Select applicable motor apply function and apply the motor (This moves the piston to the top of its bore.)

Did brake pedal rise?

YES → Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

NO →
- Using TECH-1 ABS misc. tests, perform gear tension relief function.
- Turn ignition switch to "LOCK".
- Disconnect motor pack connector and both solenoid connectors.
- Remove hydraulic modulator/motor pack assembly.
- Remove gear cover.
- Check for stripped gear on motor pack; motor pack gear is the smaller of the two gears.

Is the motor pack gear stripped?

YES → Replace motor pack.

NO → Go to following page of this DTC chart (Page 2 of 3).

Was the command current or feedback current 0 amps?

NO → YES → Replace EBCM.

DTC 47 or 48 – (Page 2 of 3)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is preset.**

Continued from DTC 47 or 48 (Page 1 of 3).

- Check for a stripped gear on hydraulic modulator (Modulator is the unit with three large gears.)
  Is larger gear stripped?

YES → Replace hydraulic modulator.

NO →

- Reconnect electrical connectors.
- Securely position hydraulic modulator assembly with cover removed so that the gear set can be observed. Be careful not to damage gear set or allow the hydraulic modulator to move while testing.
- Turn ignition switch to "ON".
- Using TECH-1 ABS misc. tests, select manual control function.
- Select applicable front motor apply and apply the motor while observing the gear set.
- Select applicable front motor release function and release the motor while still observing the gear set.
- Select applicable front motor apply function and apply the motor.
  Did gear set move in both directions for at least one revolution?

NO → Replace motor pack.

YES →

- Turn ignition switch to "LOCK".
- Disconnect motor pack connector and EBCM connector E124.
- Using specified digital multimeter, measure resistance between following applicable terminals.

DTC	EBCM harness connector E124 terminal	—	Motor pack harness connector terminal
47	9	—	6
48	1	—	2

Is resistance less than 1.5 ohms?

NO → Repair high resistance in CKT "Lg" or "Br".

YES →

Go to following page of this chart (Page 3 of 3).

DTC 47 or 48 – (Page 3 of 3)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is preset.**

Continued from DTC 47 or 48 (Page 2 of 3).

- Measure resistance between motor pack harness connector terminal "5" and EBCM harness connector E124, terminal "7".

DTC	EBCM harness connector E124 terminal	—	Motor pack harness connector terminal
47	7	—	5
48	17	—	1

Is resistance less than 1.5 ohms?

YES

- Measure resistance of motor pack between terminal "5" and terminal "6" or terminal "1" and terminal "2".
  Is resistance less than 1.5 ohms?

YES

Replace hydraulic modulator.

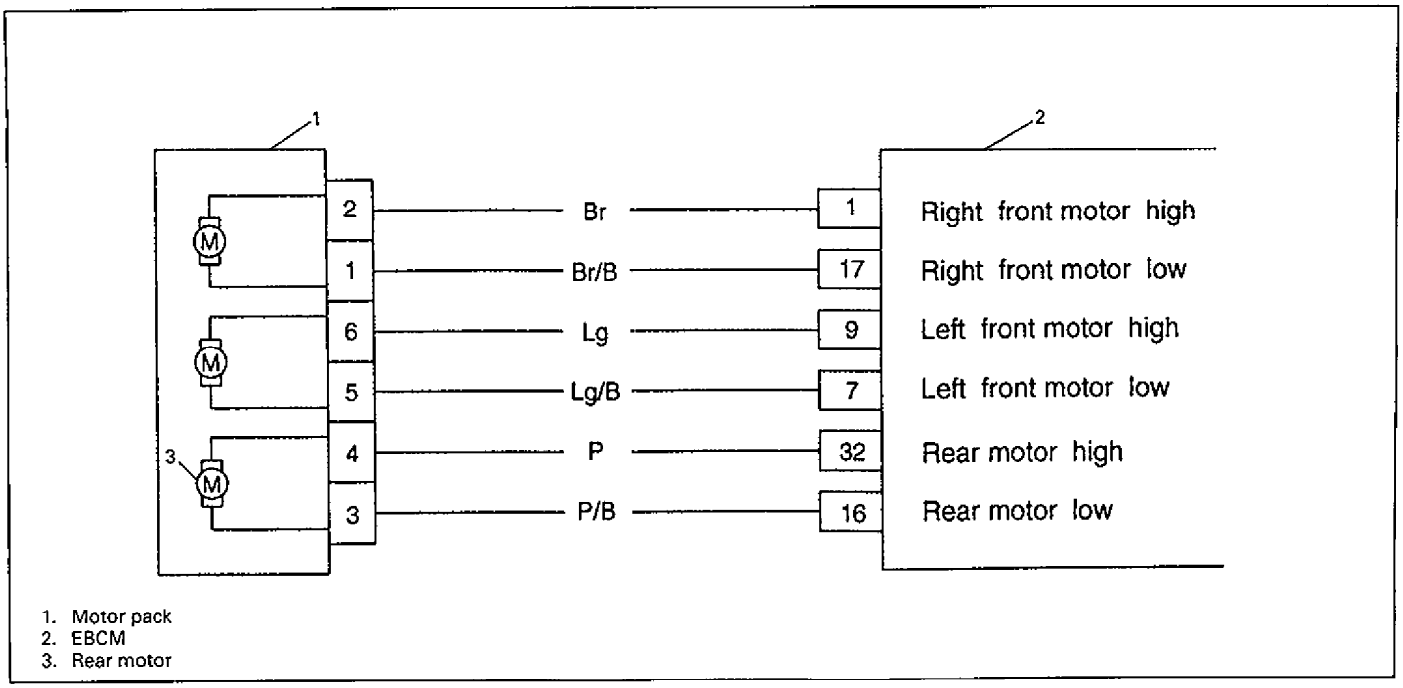
NO

Replace motor pack.

NO

Repair high resistance in CKT "Lg/B" or "Br/B".

DTC 51 – REAR MOTOR FREE SPINS



1. Motor pack
2. EBCM
3. Rear motor

CIRCUIT DESCRIPTION:
Refer to DTCs 47 and 48.

FAILURE CONDITION:
DTC 51 can only be set during initialization. If the feedback current is less than the command current for a specified period of time, a malfunction exists.

DIAGNOSTIC AIDS:
An "intermittent" malfunction of this DTC may be caused by a sticking, binding or slipping mechanical part of the system.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section. If the DTC only fails once and DTC 64 also fails, refer to DTC 64. If intermittent and enhanced diagnostics show this DTC fails during ABS operation, refer to DTC 64.
Depending on the frequency of the malfunction, a physical inspection of the suspected mechanical parts may be necessary.

61A30-5B-74-1

DTC 51 – (Page 1 of 3)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is preset.**

Is DTC 64 also currently set?

YES → Proceed to DTC 64 chart first.

NO →
- Turn ignition switch to "ON".
- Pump brake pedal.
- Using TECH-1 ABS misc. tests, select manual control function.
- Select rear motor apply function and apply the motor while carefully observing the command current and feedback current on the TECH-1.

Were both command and feedback current 10 amps?

NO → Was the command current or feedback current 0 amps?

Was the command current or feedback current 0 amps?

NO → YES → Replace EBCM.

YES → Malfunction is intermittent. Refer to "DIAGNOSTIC AIDS" on facing page.

YES →
- Apply firm pressure on brake pedal.
- Select rear motor release function and release the motor.

Did the brake pedal fall and were both command and feedback current 6 amps?

NO → Was the command current or feedback current 0 amps?

YES →
- Firm pressure still on brake pedal.
- Select rear motor apply function and apply the motor (This moves the piston to the top of its bore.)

Did brake pedal rise?

NO →
- Using TECH-1 ABS misc. tests, perform gear tension relief function.
- Turn ignition switch to "LOCK".
- Disconnect motor pack connector and both solenoid connectors.
- Remove hydraulic modulator/motor pack assembly.
- Remove gear cover.
- Check for stripped gear on motor pack; motor pack gear is the smaller of the two gears.

Is the motor pack gear stripped?

NO → Go to following page of this DTC chart (Page 2 of 3).

YES → Replace motor pack.

DTC 51 – (Page 2 of 3)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is preset.**

Continued from DTC 51 (Page 1 of 3).

- Check for a stripped gear on hydraulic modulator (Modulator is the unit with three large gears.)
  Is larger gear stripped?

YES → Replace hydraulic modulator.

NO →
- Reconnect electrical connectors.
- Securely position hydraulic modulator assembly with cover removed such that the gear set can be observed, be careful not to damage gear set or allow the hydraulic modulator to move while testing.
- Turn ignition switch to "ON".
- Using TECH-1 ABS misc. tests, select manual control function.
- Select rear motor apply and apply the motor while observing the gear set.
- Select rear motor release function and release the motor while still observing the gear set.
- Select rear motor apply function and apply the motor.
  Did gear set move in both directions for at least one revolution?

NO → Replace motor pack.

YES →
- Turn ignition switch to "LOCK".
- Disconnect motor pack connector and EBCM connector E124.
- Using specified digital multimeter, measure resistance between motor pack harness connector terminal "4" and EBCM harness connector E124, terminal "32".
  Is resistance less than 1.5 ohms?

NO → Repair high resistance in CKT "P".

YES → Go to following page of this DTC chart (Page 3 of 3).

DTC 51 – (Page 3 of 3)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is preset.**

Continued from DTC 51 (Page 2 of 3).

- Measure resistance between motor pack harness connector terminal "3" and EBCM harness connector E124, terminal "32". Is resistance less than 1.5 ohms?

YES

- Measure resistance of motor pack between terminal "3" and terminal "4". Is resistance less than 1.5 ohms?

YES

Replace hydraulic modulator.

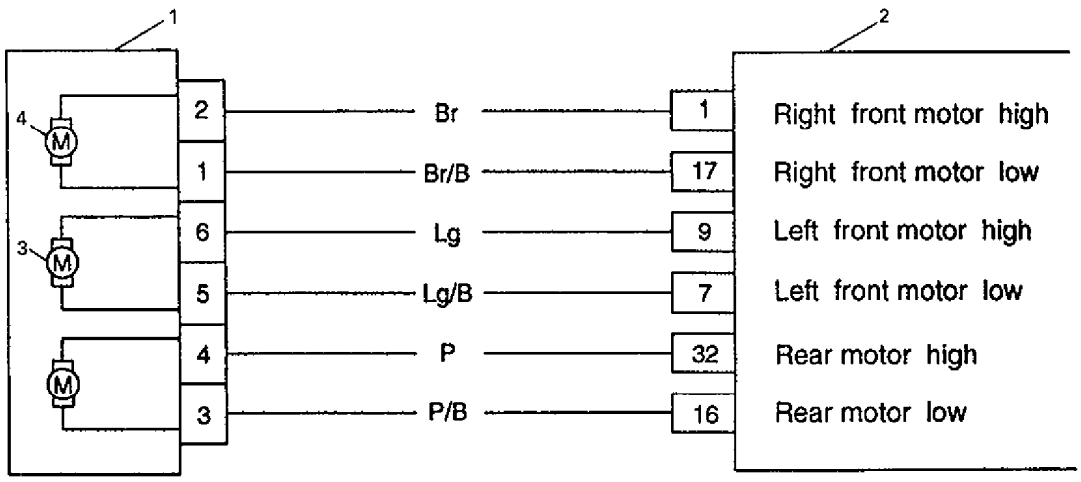
NO

Repair high resistance in CKT "P/B".

NO

Replace motor pack.

DTC 52 – LEFT FRONT CHANNEL IN RELEASE TOO LONG
DTC 53 – RIGHT FRONT CHANNEL IN RELEASE TOO LONG



1. Motor pack
2. EBCM
3. Left front motor
4. Right front motor

CIRCUIT DESCRIPTION:
These DTCs will diagnose a motor that is energized longer than expected. This could occur if a wheel speed sensor is malfunctioning, the motor does not turn, the front solenoid mechanically fails to open or the motor wires are crossed.

FAILURE CONDITION:
DTCs 52 and 53 can be set only during an ABS stop. If the EBCM commands the front channel in release for three seconds, a malfunction exists.

DIAGNOSTIC AIDS:
An "intermittent" malfunction may be caused by a sticking, binding or slipping mechanical part of the system.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section. DTCs 52 and /or 53 may fail if on ice and the steering wheel is turned to lock during braking. Using the TECH-1, perform the hydraulic test to ensure that the total brake system is functional.
Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

61A30-5B-78-1

DTC 52 or 53

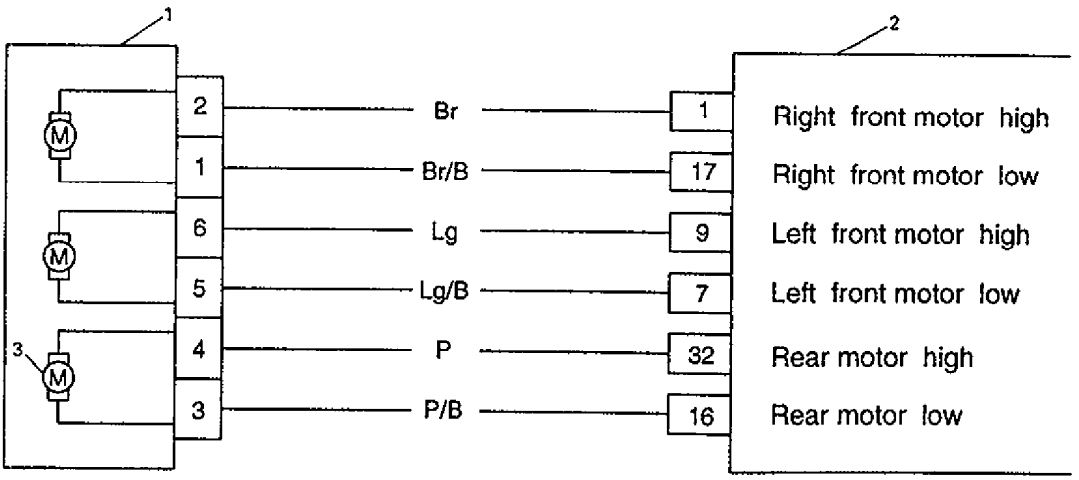
IMPORTANT:
Excessive drag or high resistance in the base brake or suspension system must be inspected and corrected before proceeding with DTC diagnosis.

Are there any wheel speed DTCs, DTC 56 or 61 currently set?

- YES → Proceed to that DTC chart first.
- NO →
  - Test vehicle during a steady decel condition from 56 km/h (35 mph) to 0 km/h (0 mph) while monitoring all wheel speed on TECH-1 data list.
    Do any of the wheel speeds indicate erratic or intermittent operation?
    - YES → Proceed to wheel speed = 0 DTC for affected wheel.
    - NO →
      - Stop engine and return ignition switch to "ON".
      - Using the manual control function of TECH-1, select applicable front motor apply and apply motor.
      - Apply firm pressure on brake pedal.
      - Select applicable front motor release and command release of motor.
        Did brake pedal fall?
        - NO →
          - Brake pedal did not move.
            - Using TECH-1, perform gear tension relief function.
            - Separate motor pack from hydraulic modulator.
            - Grasp the applicable front gear on the hydraulic modulator and attempt to move the gear in either direction.
              Can gear be moved by hand?
              - YES → Replace motor pack.
              - NO → Replace hydraulic modulator.
          - Brake pedal rose. → Repair crossed wires to applicable front ABS motor circuit.
        - YES →
          - Remove foot from brake pedal.
          - Select applicable front solenoid apply function of TECH-1 and energize solenoid.
          - Apply firm pressure to brake pedal.
            Did brake pedal fall?
            - YES →
              - Firm pressure still applied to brake pedal.
              - Using TECH-1, command applicable front solenoid "OFF".
                Did brake pedal fall?
                - YES → Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.
                - NO →
                  - Switch applicable front solenoid with other front solenoid and repeat previous test.
                    Did brake pedal fall?
                    - YES →
                      - Using TECH-1, perform gear tension relief function.
                      - Replace hydraulic modulator.
                    - NO → Replace applicable solenoid.
            - NO → Refer to "DIAGNOSTIC AIDS" on facing page.

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

DTC 54 – REAR CHANNEL IN RELEASE TOO LONG



1. Motor pack
2. EBCM
3. Rear motor

CIRCUIT DESCRIPTION:

This DTC will diagnose a motor that is energized longer than expected. This could occur if a wheel speed sensor is malfunctioning, the motor does not turn or the motor wires are crossed.

FAILURE CONDITION:

DTC 54 can be set only during an ABS stop. If the EBCM commands the rear channel in release for three seconds, a malfunction exists.

DIAGNOSTIC AIDS:

An "intermittent" malfunction may be caused by a sticking or binding mechanical part of the system. The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section. Using the TECH-1, perform the hydraulic test to ensure that the total brake system is functional.

Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to wiring connections or physical damage to the wiring harness.

61A30-5B-80-1

DTC 54 – (Page 1 of 2)

IMPORTANT:
Excessive drag or high resistance in the base brake or suspension system must be inspected and corrected before proceeding with DTC diagnosis.

Are there any wheel speed DTCs or DTC 64 currently set?

NO

- Test vehicle during a steady decel condition from 56 km/h (35 mph) to 0 km/h (0 mph) while monitoring all wheel speed on TECH-1 data list.
  Do any of the wheel speeds indicate erratic or intermittent operation?

NO

- Turn ignition switch to "LOCK".
- Raise rear of vehicle and support as indicated in SECTION 0A of the Service Manual mentioned in FOREWORD of this manual.
  For 4WD model, check if transfer shift position is 2H.
- Spin both rear wheels and confirm physical condition of base brake system.
  Could both rear wheels be spun freely by hand?

YES

- Turn ignition switch to "ON".
- Using manual control function of TECH-1, select rear motor apply.
- Apply firm pressure on brake pedal.
- Command apply of rear motor and have assistant try to spin rear wheels by hand.
  Could rear wheels be spun by hand?

YES

Go to following page of this chart (Page 2 of 2).

YES

Proceed to that DTC chart first.

YES

Proceed to wheel speed = 0 DTC for affected wheel.

NO

Repair source of resistance in brake system.

NO

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

DTC 54 – (Page 2 of 2)

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

Continued from DTC 54 (Page 1 of 2).

- With firm pressure on brake pedal still applied, command a release of the rear motor. Can wheels be moved?

YES

- Using TECH-1, perform gear tension relief function.
- Turn ignition switch to "LOCK".
- Remove hydraulic modulator/motor pack assembly.
- Separate motor pack from hydraulic modulator.
- Connect motor pack wiring.
- Turn ignition switch to "ON".
- Using TECH-1, perform motor test. Do all three motor pack gears (Small gears) spin freely?

NO

Replace motor pack.

NO

Repair crossed wires at rear motor circuit.

YES

Replace hydraulic modulator.

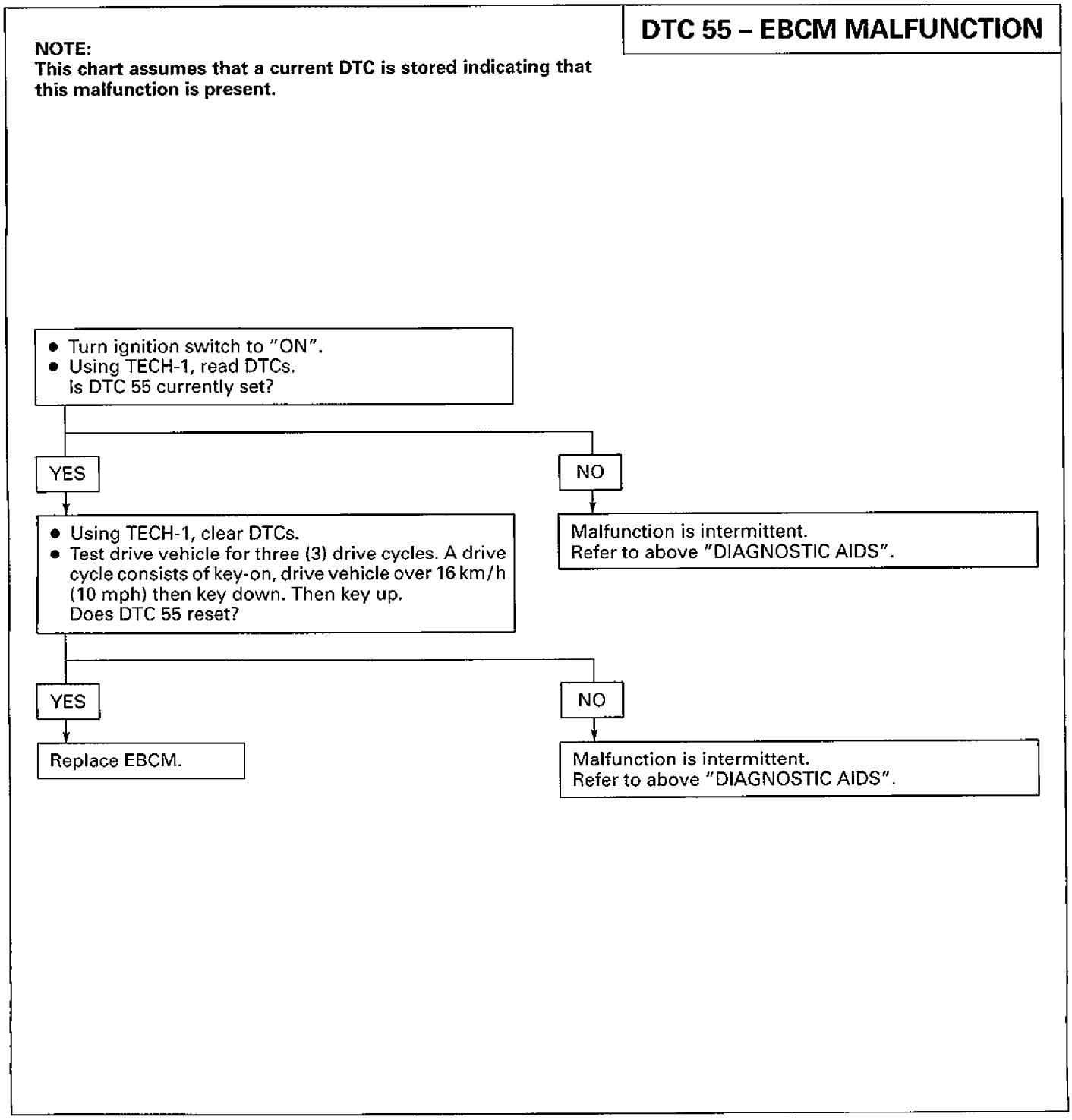
DTC 55 – EBCM MALFUNCTION

CIRCUIT DESCRIPTION:

This DTC identifies a malfunction detected by the MDI custom IC. It also insures the cause of the malfunction is not a result of a problem with the ABS Enable Relay under a DTC 55 malfunction.

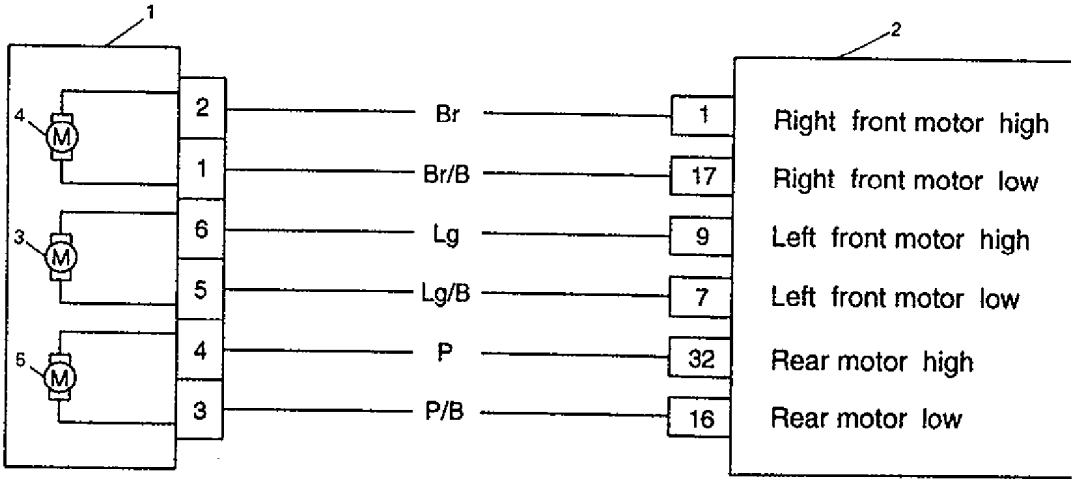
DIAGNOSTIC AIDS:

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section.



61A30-5B-83-1

DTC 56 – LEFT FRONT MOTOR CIRCUIT OPEN
DTC 61 – RIGHT FRONT MOTOR CIRCUIT OPEN
DTC 64 – REAR MOTOR CIRCUIT OPEN



1. Motor pack
2. EBCM
3. Left from motor
4. Right front motor
5. Rear motor

CIRCUIT DESCRIPTION:
These DTCs identify a motor that cannot be energized due to an open in its circuitry.

FAILURE CONDITION:
DTCs 56, 61 and 64 can be set only when the motor is commanded off. If the EBCM detects an out of range voltage on either of the motor circuits (indicating an open circuit), a malfunction exists.

DIAGNOSTIC AIDS:
Using TECH-1, select manual control function and exercise motor movement of affected channel in both directions while applying light pressure on the brake pedal.
If erratic or "jumpy" brake pedal movement is detected while performing an "apply" or "release" function of the motor, an intermittent malfunction may be indicated.
An "intermittent" malfunction may be caused by a poor connection, rubber through wire insulation or a wire that is broken inside the insulation.
If the malfunction is not current, wiggle the wires of the affected channel and check if the DTC resets. This will help to pinpoint an intermittent malfunction in the motor circuitry or connections.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section.
Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

61A30-5B-84-1

DTC 56, 61 or 64

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

Does DTC 56, 61 or 64 occur intermittently?

YES

Refer to "DIAGNOSTIC AIDS" on facing page.

NO

- Turn ignition switch to "LOCK".
- Disconnect 6-way connector from motor pack.
- Using specified digital multimeter, measure resistance across applicable motor pack terminals.

DTC	Motor pack terminals
56	5 — 6
61	1 — 2
64	3 — 4

Is resistance below 2000 Ω?

NO

Replace motor pack.

YES

- Disconnect EBCM connector E124.
- Using specified digital multimeter, measure resistance between following applicable terminals.

DTC	EBCM harness connector E124 terminal	—	Motor pack harness connector terminal
56	9	—	6
61	1	—	2
64	32	—	4

Is resistance 2 Ω or less?

NO

Repair open or high resistance in CKT "Lg" "Br" or "P".

YES

- Using specified digital multimeter, measure resistance between following applicable terminals.

DTC	EBCM harness connector E124 terminal	—	Motor pack harness connector terminal
56	7	—	5
61	17	—	1
64	16	—	3

Is resistance 2 Ω or less?

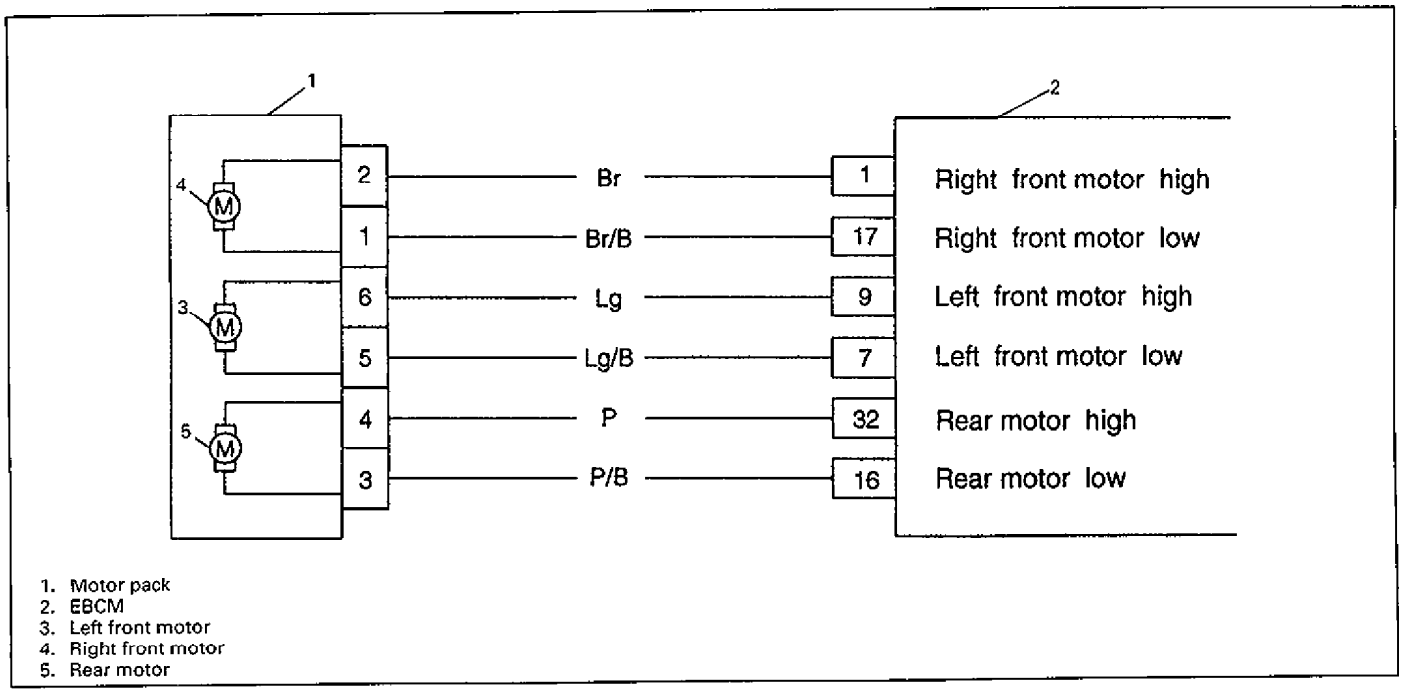
NO

Repair open or high resistance in CKT "Lg/B" "Br/B" or "P/B".

YES

Check for poor contact or corrosion at EBCM connector E124 and motor pack 6-way connector. If OK, replace EBCM.

DTC 57 – LEFT FRONT MOTOR CIRCUIT SHORTED TO GROUND
DTC 62 – RIGHT FRONT MOTOR CIRCUIT SHORTED TO GROUND
DTC 65 – REAR MOTOR CIRCUIT SHORTED TO GROUND



1. Motor pack
2. EBCM
3. Left front motor
4. Right front motor
5. Rear motor

CIRCUIT DESCRIPTION:
These DTCs identify a motor circuit that is shorted to ground. This malfunction will not allow the motor to be controlled at the commanded current rate or will cause the driver circuit to allow current directly to ground.

FAILURE CONDITION:
DTCs 57, 62 and 65 can be set anytime. If the EBCM detects an out of range voltage on either of the motor circuits (indicating a circuit shorted to ground), a malfunction exists.

DIAGNOSTIC AIDS:
Refer to DTCs 56, 61 and 64.

61A30-5B-86-1

DTC 57, 62 or 65

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km / h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

Does DTC 57, 62 or 65 occur intermittently?

NO

- Turn ignition switch to "LOCK".
- Disconnect 6-way connector from motor pack and EBCM connector E124.
- Using specified digital multimeter, measure the resistance between ground and terminal "6", "2" or "4" of the 6-way motor pack harness connector. Does specified digital multimeter display resistance as "OL" (Infinite)?

YES

- Measure the resistance between ground and terminal "5", "1" or "3" of the 6-way motor pack harness connector. Does specified digital multimeter display resistance as "OL" (Infinite)?

YES

- Measure the resistance between ground and terminal "6", "2" or "4" of the motor pack. Does specified digital multimeter display resistance as "OL" (Infinite)?

YES

Replace EBCM and recheck ABS system.

NO

Replace motor pack.

NO

Repair short to ground in CKT "Lg/B", "Br/B" or "P/B".

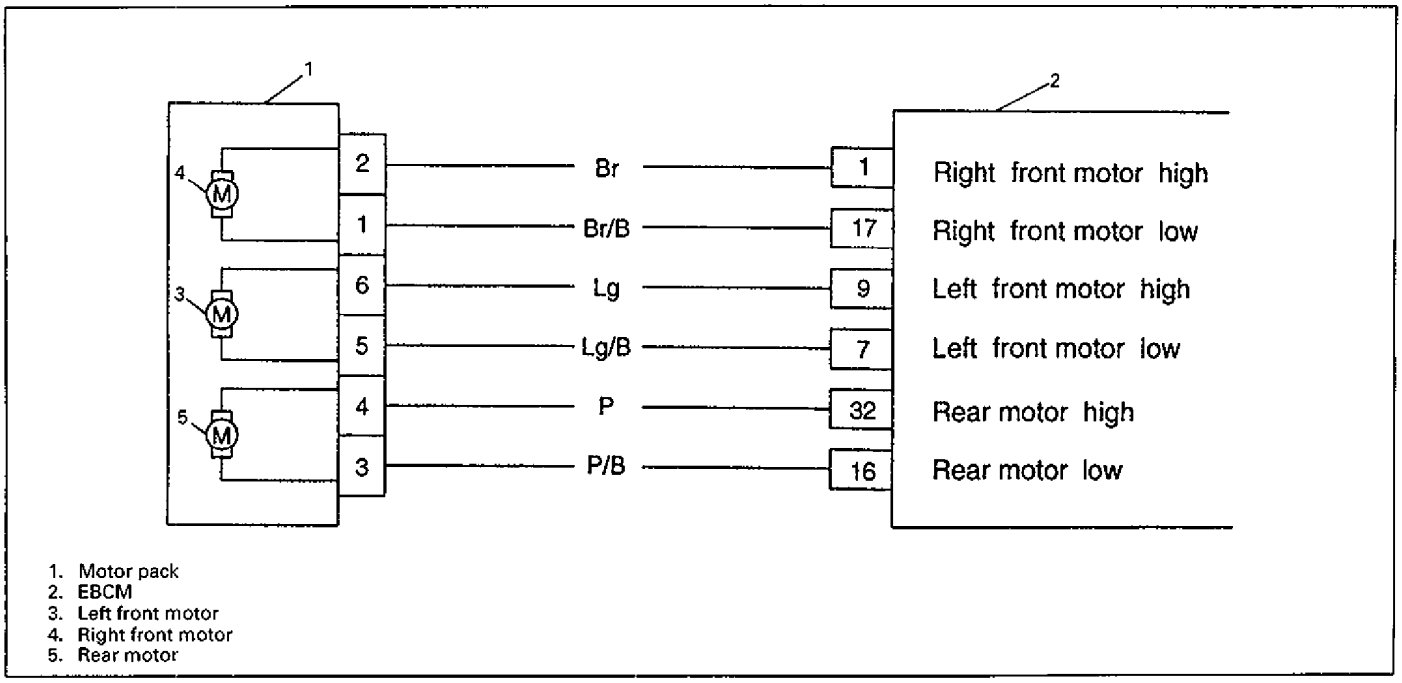
NO

Repair short to ground in CKT "Lg", "Br" or "P".

YES

Refer to "DIAGNOSTIC AIDS" on facing page.

DTC 58 – LEFT FRONT MOTOR CIRCUIT SHORTED TO BATTERY
DTC 63 – RIGHT FRONT MOTOR CIRCUIT SHORTED TO BATTERY
DTC 66 – REAR MOTOR CIRCUIT SHORTED TO BATTERY



1. Motor pack
2. EBCM
3. Left front motor
4. Right front motor
5. Rear motor

CIRCUIT DESCRIPTION:

These DTCs identify a motor circuit that is shorted to battery or a motor that has low or no resistance. This malfunction will not allow the motor to be controlled at the commanded current rate or will cause the motor to turn in the opposite direction or not at all.

FAILURE CONDITION:

DTCs 58, 63 and 66 can be set only when the motor is commanded off. If the EBCM detects an out of range voltage on either of the motor circuits (indicating a circuit shorted to battery or a motor shorted), a malfunction exists.

DIAGNOSTIC AIDS:

Refer to DTCs 56, 61 and 64.

61A30-5B-88-1

DTC 58, 63 or 66

NOTE:
- **After all diagnosis is complete, clear DTCs and test drive vehicle for three (3) drive cycles to verify that DTC does not reset. A drive cycle consists of starting the vehicle, driving over 16 km/h (10 mph), and then keying down.**
- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

Does DTC 58, 63 or 66 occur intermittently?

NO

Is DTC 36 also set?

NO

- Turn ignition switch to "LOCK".
- Disconnect 6-way connector from motor pack and EBCM connector E124.
- Turn ignition switch to "ON".
- Using specified digital multimeter, measure the voltage between ground and terminal "6", "2" or "4" of the 6-way motor pack harness connector.

Is voltage 1 volt or less?

YES

- Measure the voltage between ground and terminal "5", "1" or "3" of the 6-way motor pack harness connector.

Is voltage 1 volt or less?

YES

- Turn ignition switch to "LOCK".
- Using specified digital multimeter, measure the resistance between following applicable terminals.

DTC	Motor pack terminals
58	5 ——— 6
63	1 ——— 2
66	3 ——— 4

Is resistance greater than 0.4 ohms?

YES

Replace EBCM.

NO

Replace motor pack.

NO

Repair short to voltage in CKT "Lg", "Br" or "P".

NO

Repair short to voltage in CKT "Lg/B", "Br/B" or "P/B".

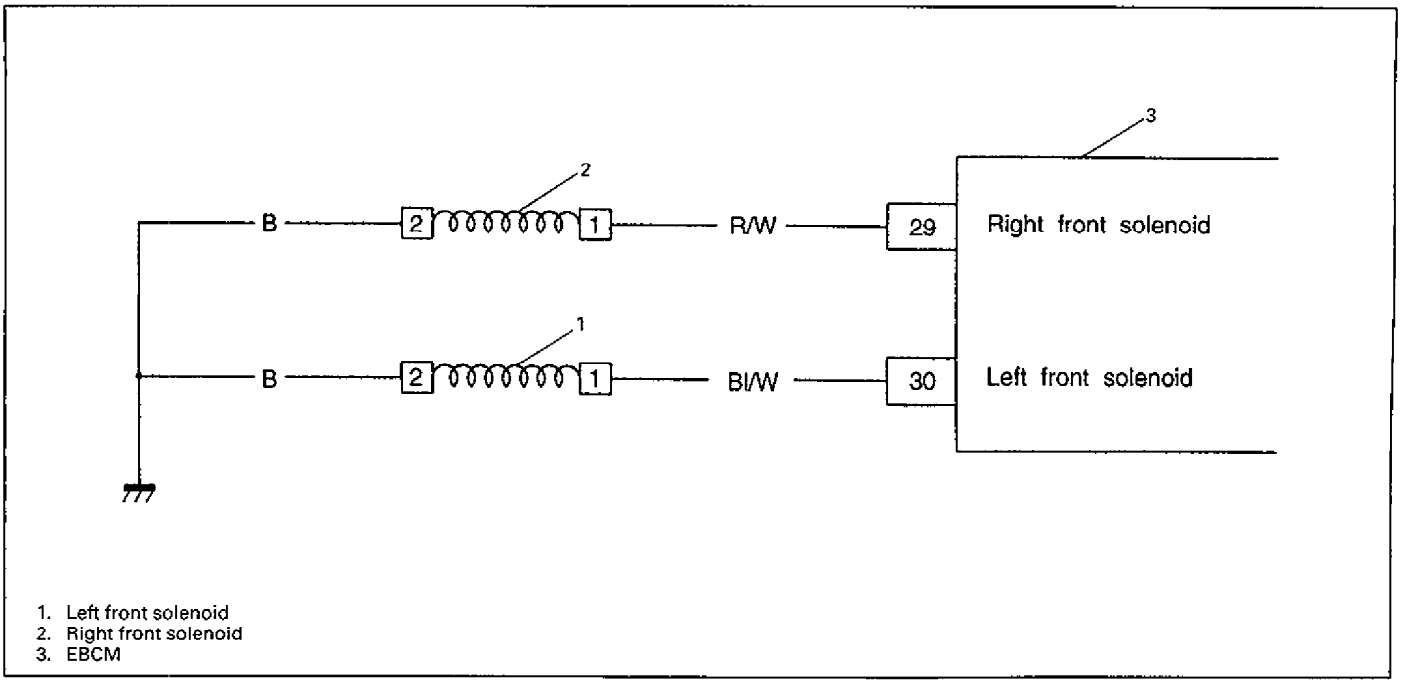
YES

Refer to "DIAGNOSTIC AIDS" on facing page.

YES

Proceed to that DTC chart first.

DTC 76 – LEFT FRONT SOLENOID CIRCUIT OPEN OR SHORTED TO BATTERY
DTC 78 – RIGHT FRONT SOLENOID CIRCUIT OPEN OR SHORTED TO BATTERY



1. Left front solenoid
2. Right front solenoid
3. EBCM

CIRCUIT DESCRIPTION:
These DTCs identify a solenoid that cannot be energized due to an open in its circuitry, or a solenoid that is always energized due to a short to battery in its circuitry between the driver and solenoid. An open will not allow proper ABS operation, but the short to battery simply turns the solenoid on. A path for base brakes is still allowed once the motor re-homes and the check ball is lifted off its seat during initialization.

FAILURE CONDITION:
DTCs 76 and 78 can be set only when the solenoid is commanded off. If the EBCM detects an excessive voltage in the solenoid control circuit, a malfunction exists.

DIAGNOSTIC AIDS:
An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.
The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section.
Any circuitry that is suspected of causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

61A30-5B-90-1

DTC 76 or 78

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Using specified digital multimeter, measure the voltage between ground and terminal "30" or "29" of EBCM harness connector E124.

Is voltage 1 volt or less?

YES

- Turn ignition switch to "LOCK".
- Disconnect front solenoid connector.
- Using specified digital multimeter, measure the resistance between terminal "30" or "29" of EBCM harness connector E124 and terminal "1" of applicable front solenoid harness connector.

Is resistance 2 ohms or less?

YES

- Measure the resistance between terminal "1" and terminal "2" of applicable solenoid.

Is resistance between 2.5 and 5 ohms?

YES

- Measure the resistance between ground and terminal "2" of applicable solenoid harness connector.

Is resistance 2 ohms or less?

YES

- Reconnect solenoid connector and EBCM connector E124.
- Turn ignition switch to "ON".
- Using TECH-1, clear DTCs.

Does DTC 76 or 78 reset?

YES

Replace EBCM.

NO

Malfunction is intermittent.
Refer to "DIAGNOSITIC AIDS" or facing page.

NO

Repair open or high resistance in CKT "B".

NO

Replace solenoid.

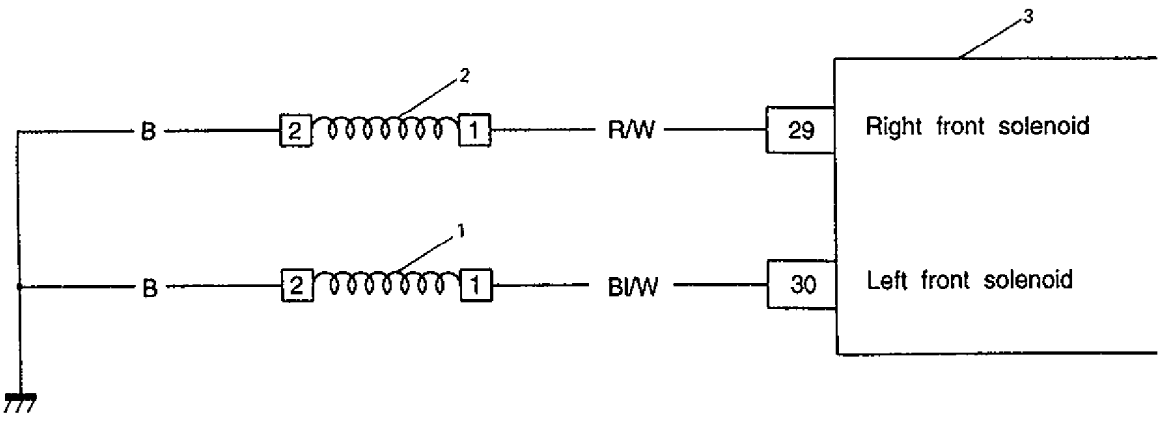
NO

Repair open or high resistance in CKT "BI/W" or "R/W".

NO

Repair short to voltage in CKT "BI/W" or "R/W".

DTC 77 – LEFT FRONT SOLENOID CIRCUIT SHORTED TO GROUND
DTC 81 – RIGHT FRONT SOLENOID CIRCUIT SHORTED TO GROUND



1. Left front solenoid
2. Right front solenoid
3. EBCM

CIRCUIT DESCRIPTION:
These DTCs identify a solenoid that cannot be energized due to an open in its driver circuitry, or a short to ground between the solenoid driver and the solenoid. These malfunctions can affect ABS operation since the flow of brake fluid to the caliper cannot be stopped, making ABS operation for that channel impossible.

FAILURE CONDITION:
DTCs 77 and 81 can be set only when the solenoid is commanded on. If the EBCM detects the solenoid control circuit voltage is out of specification, a malfunction exists.

DIAGNOSTIC AIDS:
Refer to DTCs76 and 78.

61A30-5B-92-1

DTC 77 or 81

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Turn ignition switch to "LOCK".
- Disconnect applicable solenoid connector.
- Using specified digital multimeter, measure the resistance between ground and terminal "1" of applicable solenoid.
  Does specified digital multimeter display resistance as "OL" (Infinite)?

YES

- Using specified digital multimeter, measure the resistance between terminal "1" and terminal "2" of the applicable solenoid.
  Is resistance between 2.5 and 5.0 ohms?

YES

- Disconnect EBCM connector E124.
- Measure the resistance between ground and terminal "30" or "29" of EBCM harness connector E124.
  Does specified digital multimeter display resistance as "OL" (Infinite)?

YES

- Measure the resistance between terminal "30" or "29" of EBCM harness connector E124 and terminal "1" of the applicable solenoid harness connector.
  Is resistance 2 ohms or less?

YES

- Reconnect solenoid connector and EBCM connector E124.
- Turn ignition switch to "ON".
- Using TECH-1, clear DTCs.
  Does DTC 77 or 81 reset?

YES

Replace EBCM.

NO

Malfunction is intermittent.
Refer to "DIAGNOSTIC AIDS" on facing page.

NO

Repair open or high resistance in CKT "BI/W" or "R/W".

NO

Repair short to ground in CKT "BI/W" or "R/W".

NO

Replace solenoid.

NO

Replace solenoid.

DTC 82 – CALIBRATION MALFUNCTION

CIRCUIT DESCRIPTION:

This DTC allows the EBCM to check for a calibration malfunction by comparing the calibration value to a known value stored in the EEPROM. This DTC is also used a security measure to prevent improper use of calibrations or changes to these calibrations that may alter the designed function of ABS.

FAILURE CONDITION:

DTC 82 can be set at key-up. If the program identifier is incorrect or the memory checksum is incorrect, a malfunction exists.

DIAGNOSTIC AIDS:

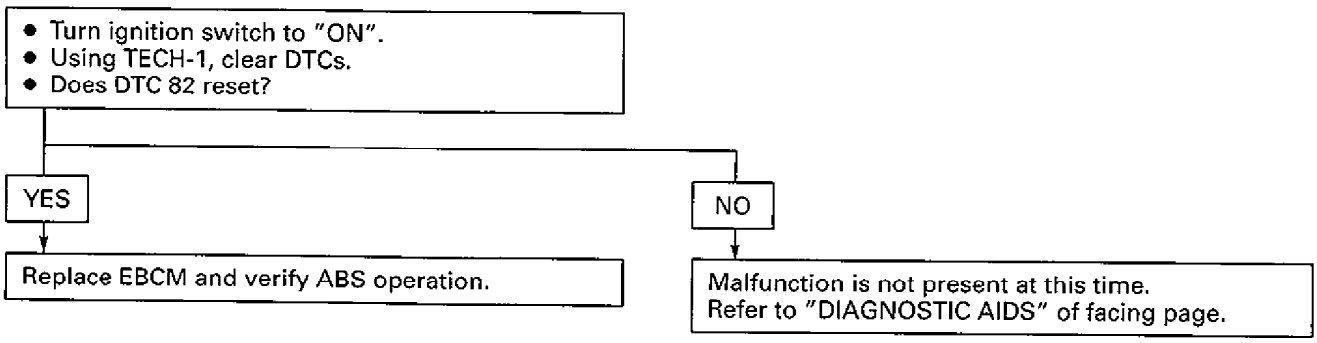
An intermittent DTC 82 may be caused by a bad cell in the EEPROM that is sensitive to temperature changes. If DTC 82 failed more than once, but is intermittent, replace the EBCM.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section.

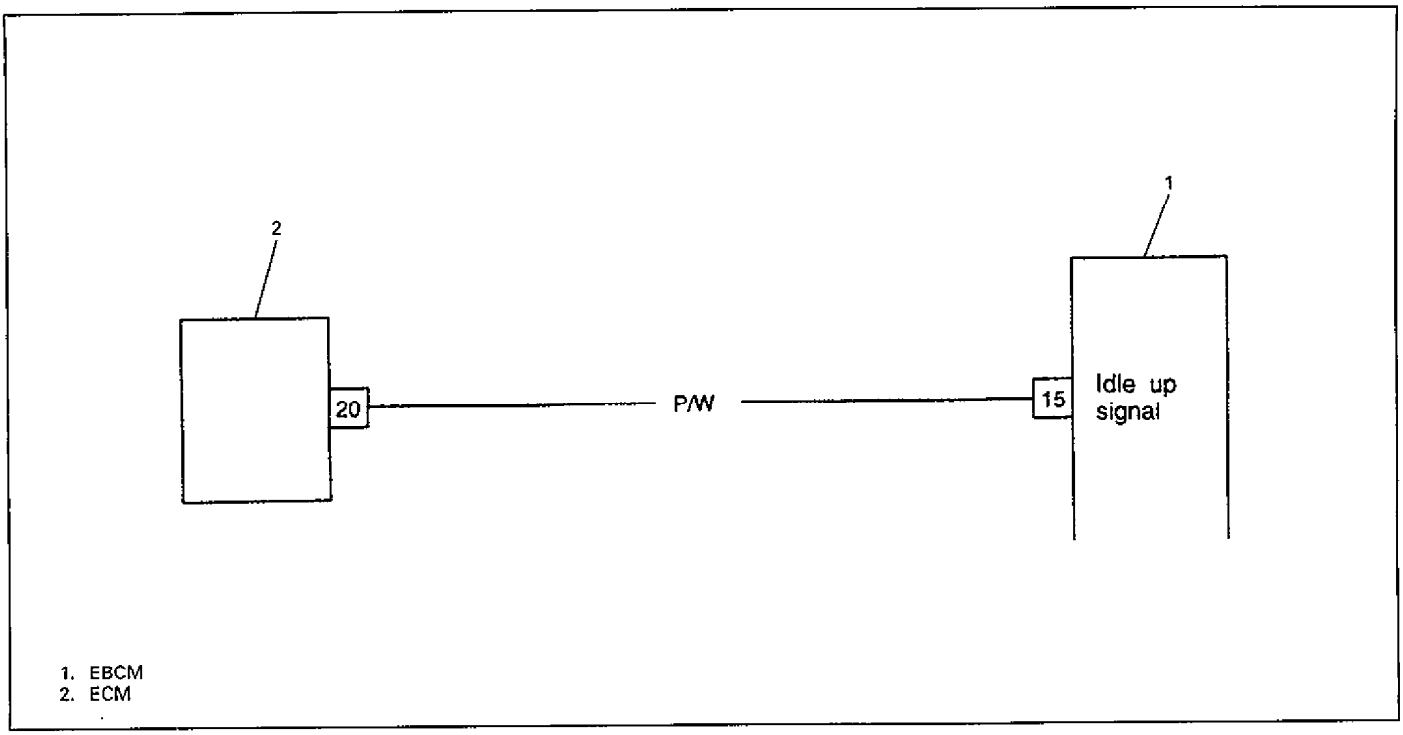
61A30-5B-94-1

DTC 82

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.



DTC 83 – IDLE-UP CIRCUIT OPEN OR SHORTED TO BATTERY OR GROUND



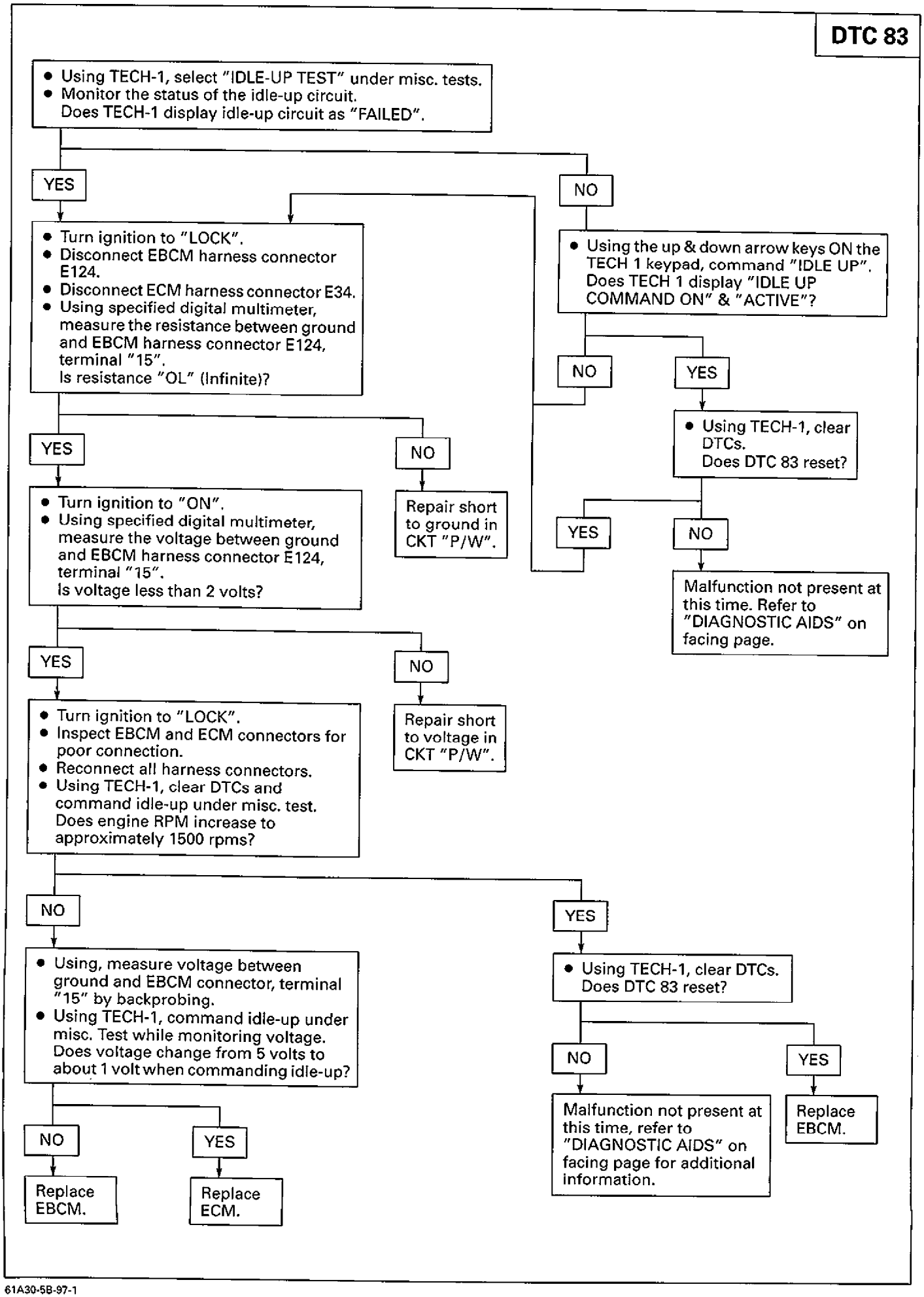
1. EBCM
2. ECM

CIRCUIT DESCRIPTION:
The EBCM and the Engine Control Module (ECM) are connected through CKT "P/W". If an open or short to battery occurs in CKT "P/W", the EBCM is unable to signal the ECM to increase engine speed. If a short to ground occurs in CKT "P/W", the ECM will receive a false signal and will raise engine's idle speed constantly.

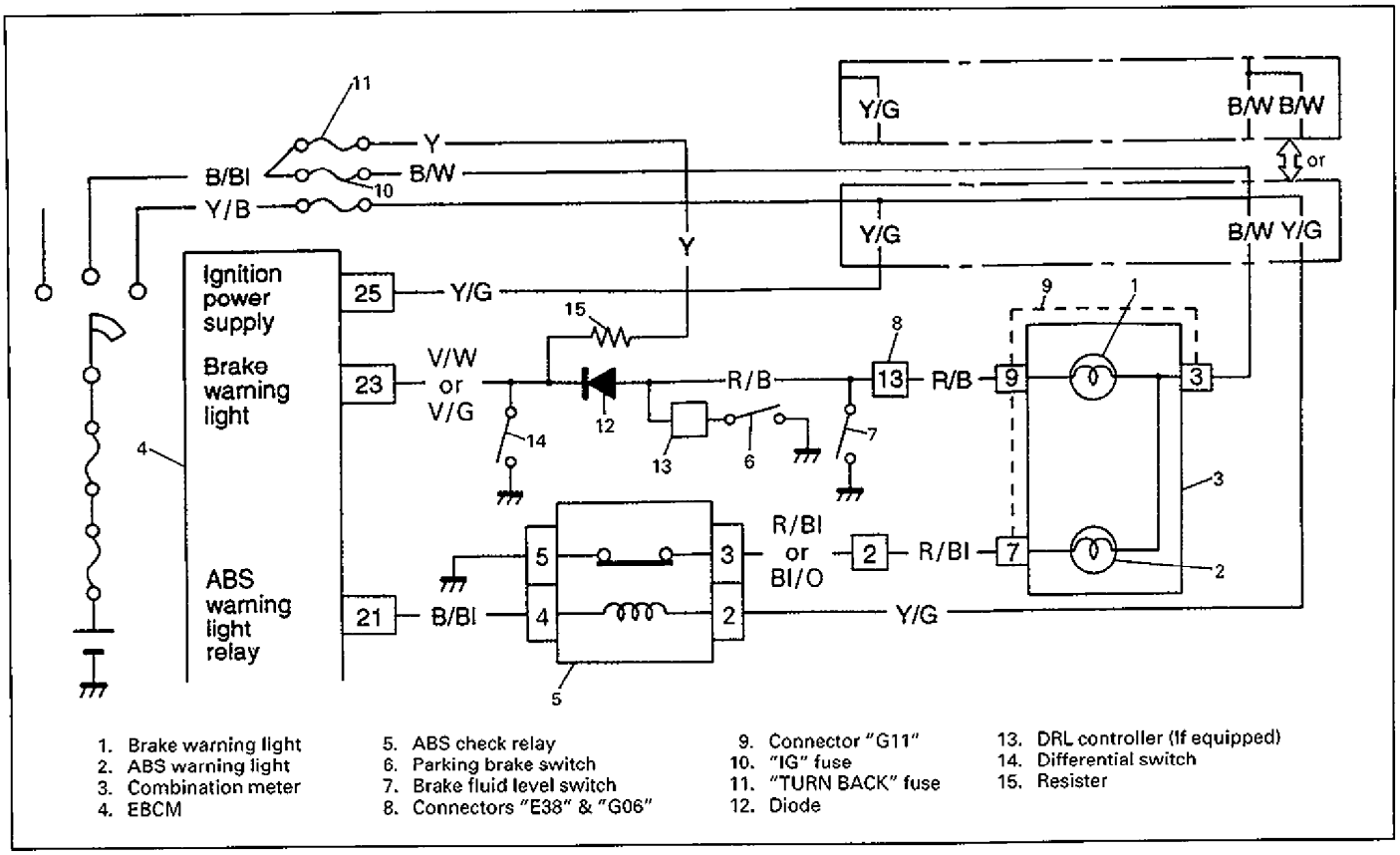
FAILURE CONDITION:
DTC 83 can be set anytime only when the EBCM detects an open or short to ground in CKT "P/W". The EBCM will set DTC 83 due to a short to battery in CKT "P/W" only when idle-up command is active.

DIAGNOSTIC AIDS:
Refer to DTCs 76 and 78.

61A30-5B-96-1



DTC 85 – EBCM TURNED ON THE BRAKE WARNING LIGHT DUE TO BASE BRAKE FAILURE



1. Brake warning light
2. ABS warning light
3. Combination meter
4. EBCM
5. ABS check relay
6. Parking brake switch
7. Brake fluid level switch
8. Connectors "E38" & "G06"
9. Connector "G11"
10. "IG" fuse
11. "TURN BACK" fuse
12. Diode
13. DRL controller (If equipped)
14. Differential switch
15. Resister

CIRCUIT DESCRIPTION:

The proportioning valve contains a normally open differential switch. This switch closes when there is a loss of pressure in the front brakes hydraulic circuit.

When differential switch closes, it grounds CKT "R/B" and "V/W" (or "V/G"); turning on the "BRAKE" warning light and it signals the EBCM to shut down the ABS.

The function of the diode between CKT "R/B" and "V/W" is to prevent a grounded signal to the EBCM when either the parking brake is applied or the brake fluid level switch is closed, thus preventing a false DTC 85.

FAILURE CONDITION:

DTC 85 can be set anytime. If the EBCM detects a loss of front base brake pressure, a faulty differential switch, or a short in the "BRAKE" warning light CKT "R/B", a malfunction exists.

DIAGNOSTIC AIDS:

Refer to DTCs 76 and 78.

61A30-5B-98-1

DTC 85

- Turn ignition to "LOCK".
- Disconnect differential switch connector.
- Using specified digital multimeter, measure the resistance between differential switch terminals.
  Does specified digital multimeter display "OL" (infinite)?

YES

- With specified digital multimeter still, connected to differential switch, depress firmly on brake pedal while observing specified digital multimeter.
  Does the specified digital multimeter display "OL" (infinite)?

YES

- Disconnect EBCM harness connector E124.
- Remove "IG" fuse.
- Using specified digital multimeter, measure the resistance between ground and EBCM harness connector E124, terminal "23".
  Is resistance less than 2 ohms?

NO

- Reconnect "IG" fuse.
- Turn ignition to "ON".
- Using specified digital multimeter, measure the voltage between ground and EBCM harness connector E124, terminal "23".
  Is voltage approximately 10 volts?

YES

- Turn ignition to "LOCK".
- Reconnect EBCM harness connector E124 and differential switch connector.
- Using TECH-1, clear DTCs and recheck.
  Does DTC 85 reset?

YES

Replace the EBCM.

NO

Malfunction not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page for additional information.

NO

Replace ABS resistor.

NO

Diagnose for loss of base brake hydraulic pressure in one of the circuits between the master cylinder and the hydraulic modulator. If base brake system OK, replace the hydraulic modulator.

YES

- Apply the parking brake.
- Disconnect diode.
- Using specified digital multimeter, measure the resistance between ground and EBCM harness connector E124, terminal "23".
  Is resistance less than 2 ohms?

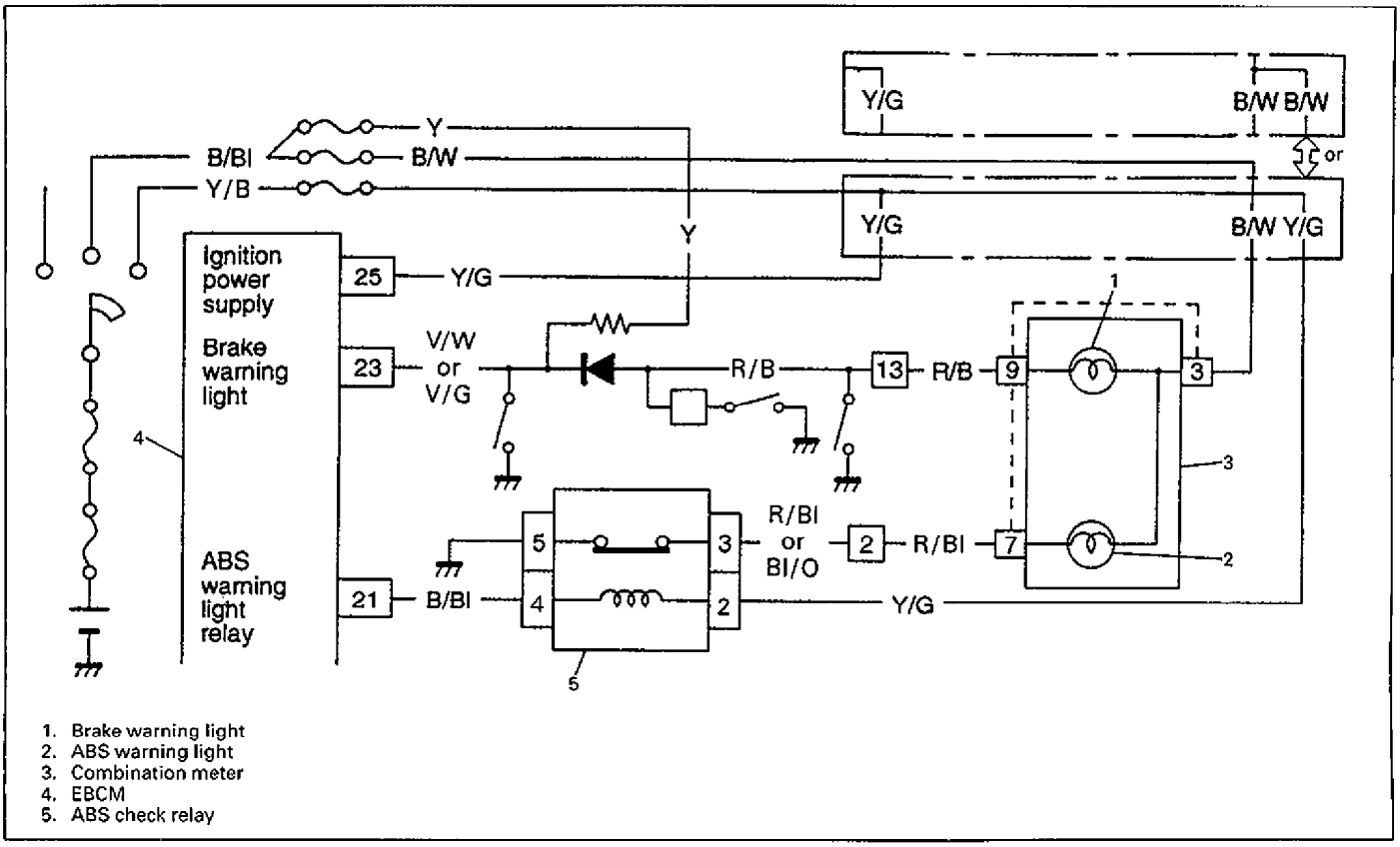
YES

Repair short to ground in CKT "V/W" (or "V/G").

NO

Replace diode.

DTC 86 – EBCM TURNED ON THE BRAKE WARNING LIGHT



CIRCUIT DESCRIPTION:

This DTC is provided as an informational only DTC, and reflects the status of the command issued by the EBCM to illuminate the "BRAKE" warning light. If another DTC issues a command to illuminate the "BRAKE" warning light, DTC 86 will be stored in EEPROM as a history DTC at the conclusion of the ignition cycle.

DIAGNOSTIC AIDS:

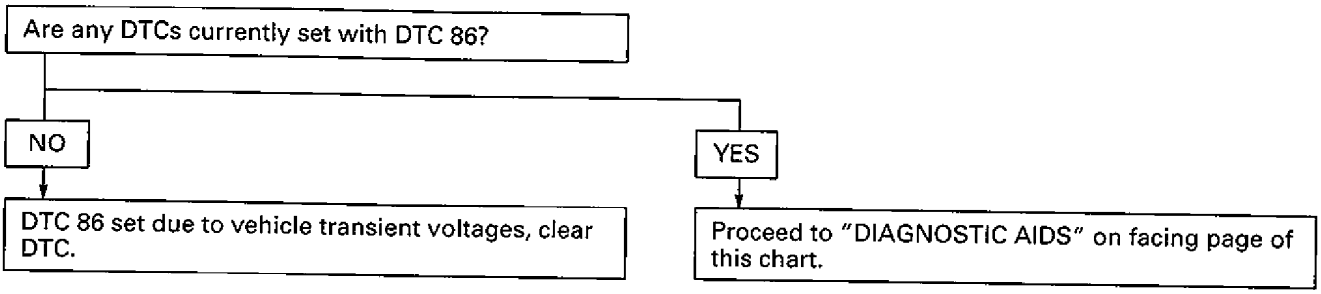
Any ABS mechanical DTC that issues a command to illuminate the "BRAKE" warning light will also result in DTC 86 being stored in EEPROM during shut down. These DTCs are: 42, 46 and 51. If the motors are not in their home position, certain electrical DTCs will also command the "BRAKE" warning light on. These DTCs are: 14, 16, 18, 36, 55, 64, 65 and 66.

If any of these DTCs are indicated along with DTC 86, they must be corrected prior to addressing a DTC 86 malfunction.

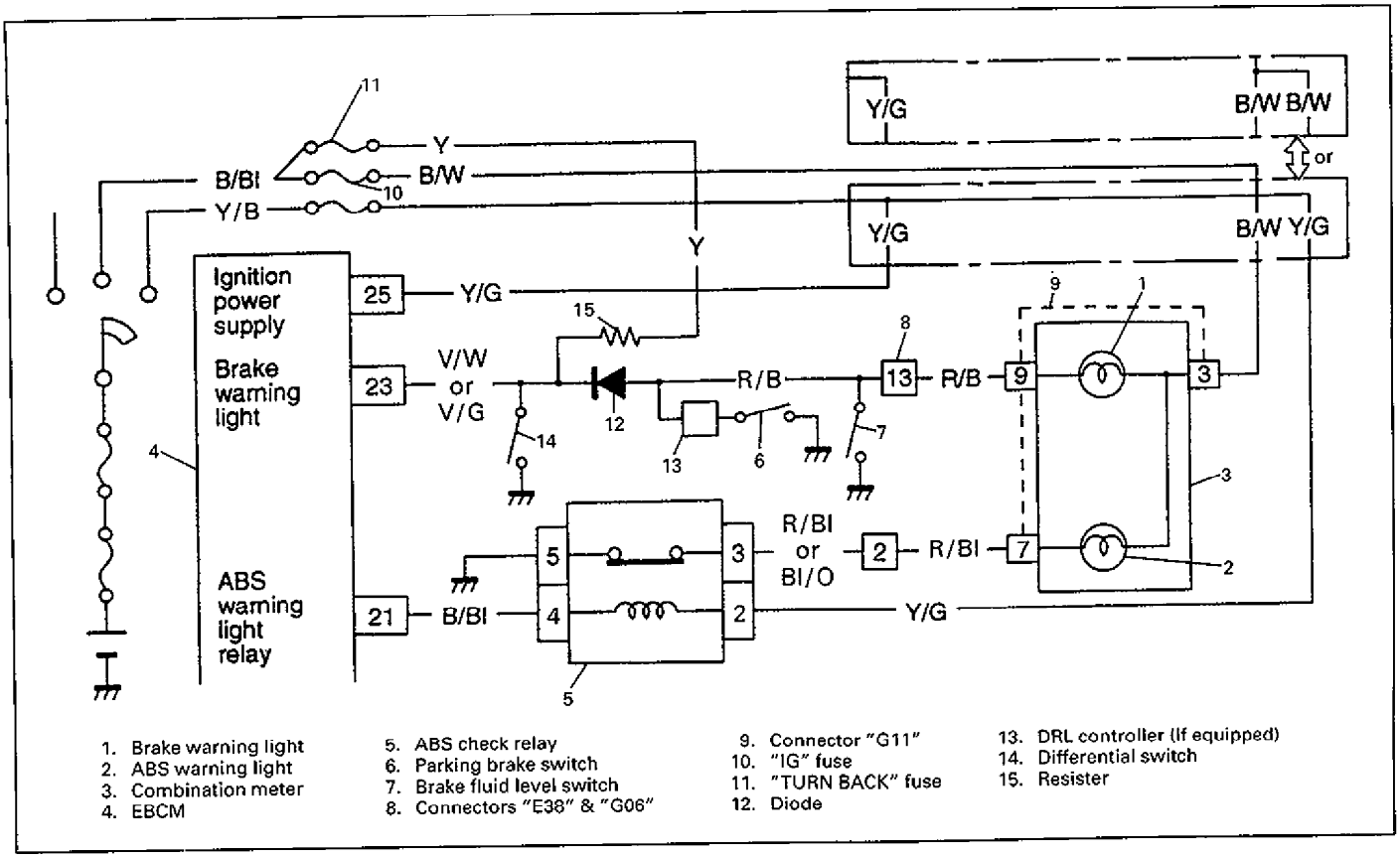
61A30-5B-100-1

DTC 86

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.



DTC 87 – BRAKE WARNING LIGHT CIRCUIT OPEN



CIRCUIT DESCRIPTION:
This DTC is used to verity the EBCM has continuity to the "BRAKE" warning light in case the EBCM must turn it on. This will only occur if an ABS malfunction is detected that may degrade base brake operation. Because ABS is not the only device controlling the "BRAKE" warning light (parking brake switch and brake fluid level switch may also turn it on), a short to ground in this circuit cannot be detected.

FAILURE CONDITION:
DTC 87 can be set after vehicle speed exceeds 8 km/h (5 mph). If the "BRAKE" warning light circuit voltage is out of specification (indicating an open circuit), a malfunction exists.

DIAGNOSTIC AIDS:
Refer to DTCs 76 and 78.

61A30-5B-102-1

DTC 87 – (Page 1 of 2)

- Turn ignition switch to "ON".
- Release parking brake.
- Select data list function of TECH-1.
- Monitor "BRAKE" warning light status.
  Does TECH-1 indicate "CIRCUIT OPEN"?

YES

- Select lamp test function of TECH-1.
- Command "BRAKE" warning light "ON".
  Is "BRAKE" warning light "ON"?

NO

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Apply parking brake.
- Using specified digital multimeter, measure the voltage between ground and terminal "23" of EBCM harness connector E124.
  Is voltage 1 volt or less?

YES

- Turn ignition switch to "LOCK".
- Using a TECH-1, clear DTCs.
- Turn ignition switch to "ON".
  Does DTC 87 reset?

YES

Replace the EBCM

NO

Malfunction is not present at this time.
Refer to "DIAGNOSTIC AIDS" on facing page.

NO

Go to following page of this chart (Page 2 of 2).

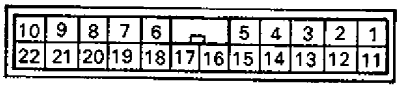
YES

- Check connectors "E38" & "G06", terminal "13" and cluster connector "G11", terminal "9" for poor connection.
- If OK, then repair poor terminal contact for high resistance in CKTs "R/B" and "V/W" (or "V/G").

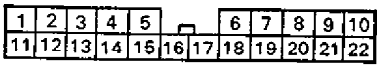
NOTE:

- **Connector terminal position (View from terminal side)**

Connector E38



Connector G06



Connector G11

- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

DTC 87 – (Page 2 of 2)

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

Continued from DTC 87 (Page 1 of 2).

Are instrument panel indicators working properly?

YES

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- With jumper connected to ground, probe terminal "23" of EBCM harness connector E124.
  Does "BRAKE" warning light illuminate?

YES

- Check for poor terminal contact at terminal "23" of EBCM harness connector E124.
- If OK, replace EBCM.

NO

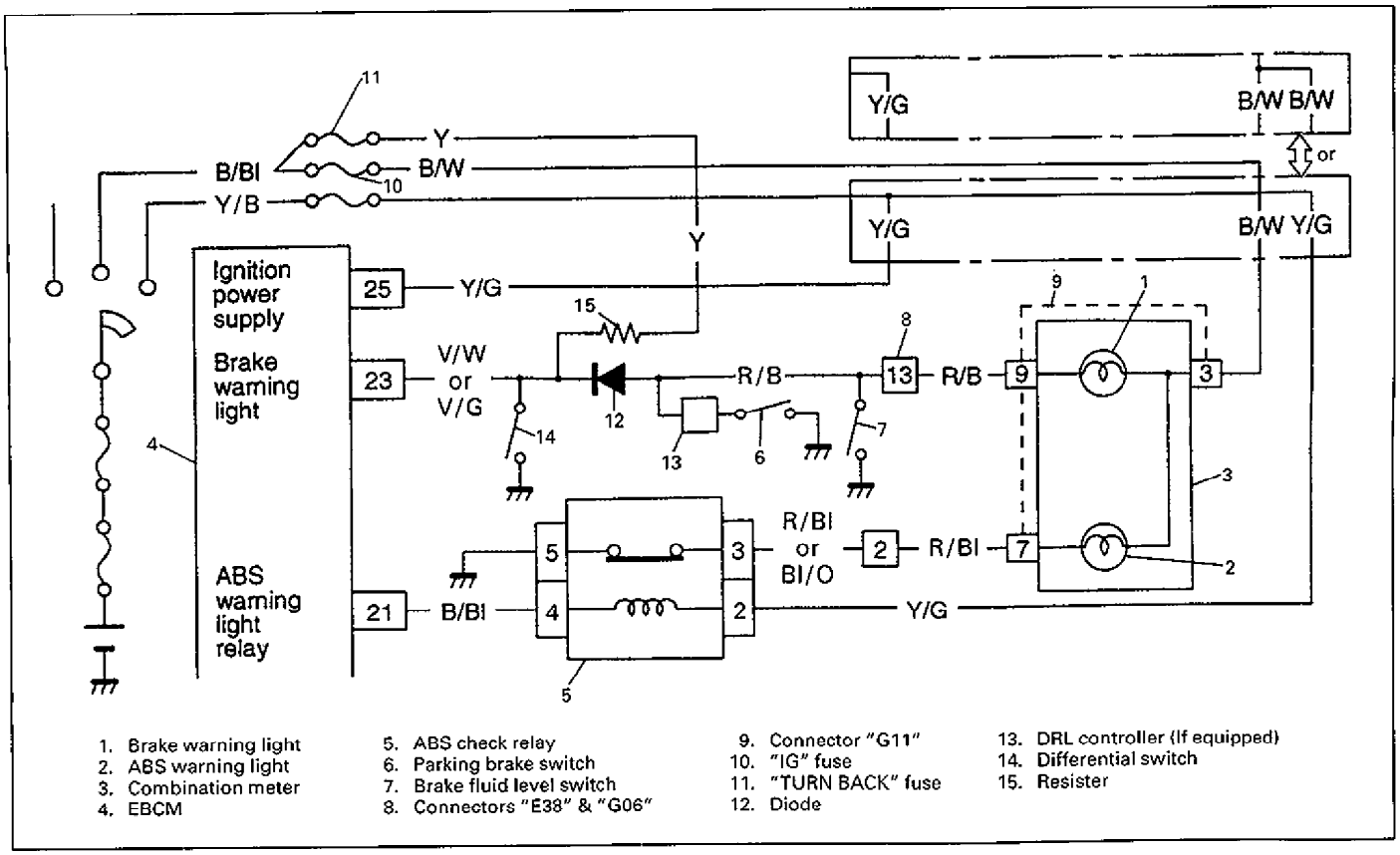
- Check connectors "E38" & "G06", terminal "13" and I/P cluster connector "G11", terminal"9" for poor
  connection.
- If OK, then repair open CKTs "R/B" and "V/W" (or "V/G"), open "BRAKE"
  warning light bulb or open instrument panel circuitry.

NO

Refer to SECTION 8 of the Service Manual mentioned in FOREWORD of this manual to diagnose I/P cluster malfunction.

BLANK

DTC 88 – BRAKE WARNING LIGHT CIRCUIT SHORTED TO BATTERY



1. Brake warning light
2. ABS warning light
3. Combination meter
4. EBCM
5. ABS check relay
6. Parking brake switch
7. Brake fluid level switch
8. Connectors "E38" & "G06"
9. Connector "G11"
10. "IG" fuse
11. "TURN BACK" fuse
12. Diode
13. DRL controller (If equipped)
14. Differential switch
15. Resister

CIRCUIT DESCRIPTION:

This DTC identifies a short to battery between the EBCM and the "BRAKE" warning light or an open driver that does not allow the "BRAKE" warning light to be illuminated by the EBCM. This will only occur if an ABS fault is detected that may degrade base brake performance.

FAILURE CONDITION:

DTC 88 can be set only at the beginning of the three second bulb check or when the EBCM turns on the "BRAKE" warning light because of another DTC. If the EBCM detects battery voltage on the "BRAKE" warning light control circuit, a malfunction exists.

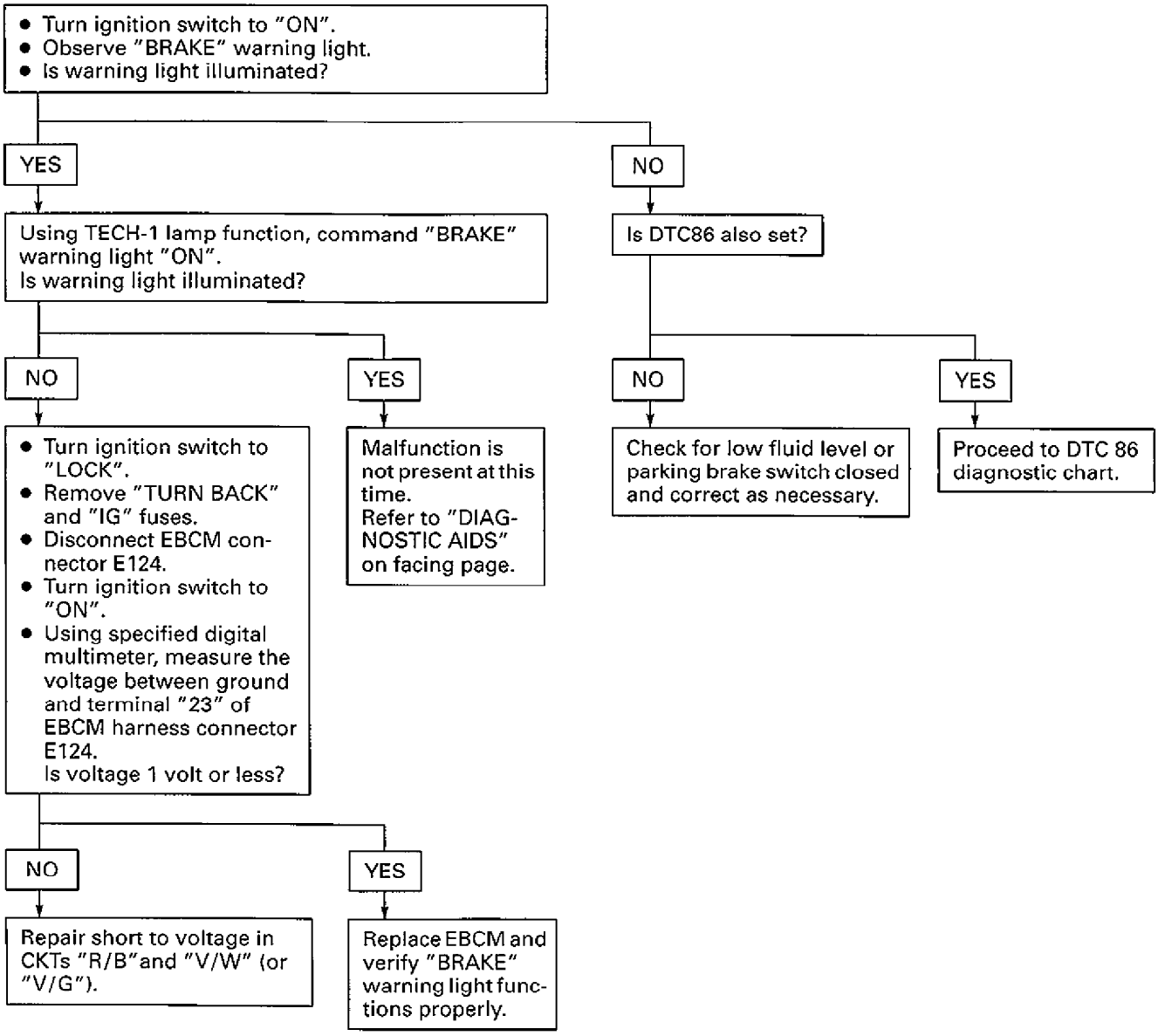
DIAGNOSTIC AIDS:

Refer to DTCs 76 and 78.

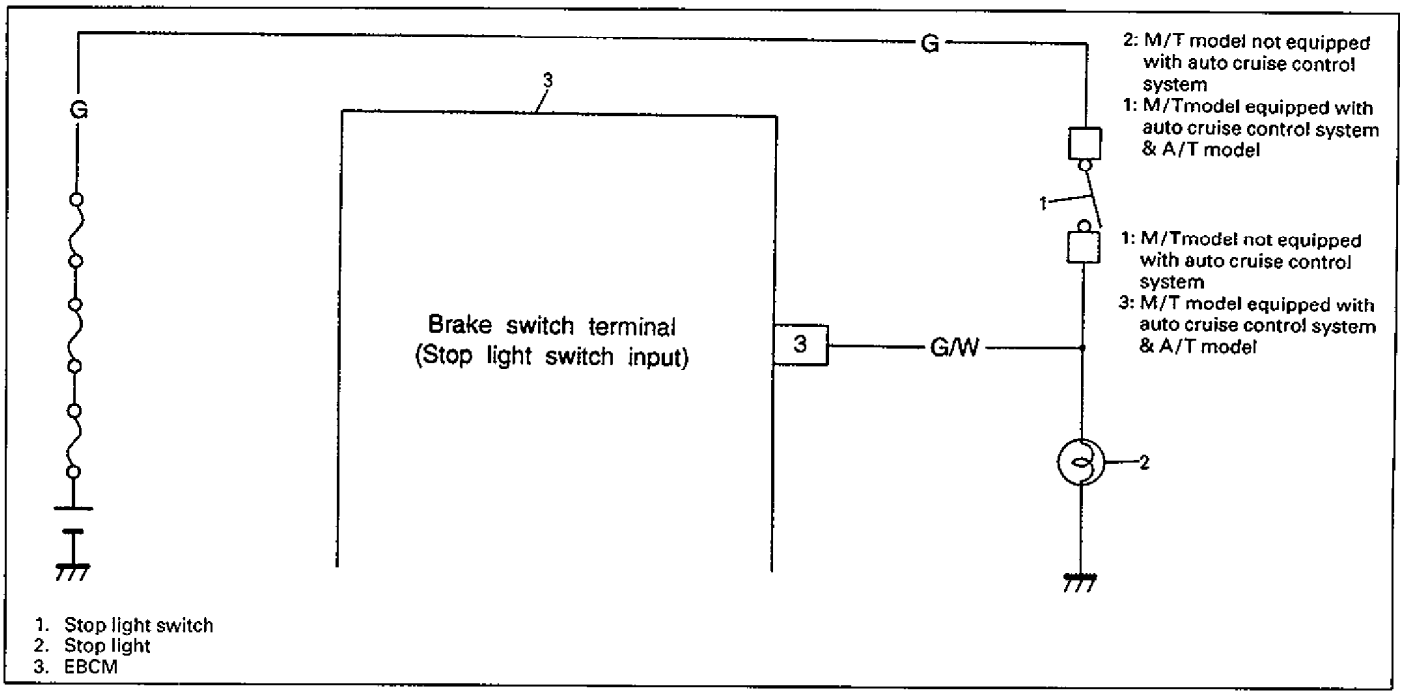
61A30-5B-106-1

DTC 88

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.



DTC91 – OPEN STOP LIGHT SWITCH (BRAKE SWITCH) DURING DECELERATION
DTC92 – OPEN STOP LIGHT SWITCH (BRAKE SWITCH) WHEN ABS WAS REQUIRED



CIRCUIT DESCRIPTION:

DTC91

This DTC is used to detect an open stop light switch in the non-ABS mode. The EBCM looks for deceleration rates that would indicate braking action and verifies this assumption by requiring several repeats of this detection method. In each case, ABS will not be available since no stop light switch input is seen.

DTC92

This DTC is run to determine the proper operation of the stop light switch. This is important because ABS is activated when the stop light switch is closed. If the stop light switch is open, ABS will never be activated. Since this malfunction is difficult to detect under normal braking conditions, this malfunction is only detected when ABS is required.

FAILURE CONDITION:

DTC 91 can be set if three deceleration cycles occur without a stop light switch input to the EBCM.
DTC 92 can be set if the vehicle's speed is greater than 8km/h (5 mph). If the stop light switch was not closed and a release was required on two channels for 0.5 seconds, a malfunction exists.

DIAGNOSTIC AIDS:

Refer to DTCs 76 and 78.

61A30-5B-108-1

DTC 91 or 92

Is DTC 95 currently set?

NO

- Turn ignition switch to "ON".
- Using TECH-1, select ABS data list.
- Apply light pressure on brake pedal, while monitoring stop light switch on TECH-1. Does TECH-1 indicate stop light switch "ON" within 25 mm (1 in.) of travel?

NO

- With pressure still applied to brake pedal, observe stop lights. Are stop lights illuminated?

YES

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Using specified digital multimeter, measure the voltage between ground and terminal "3" of EBCM harness connector E124 while applying firm pressure on brake pedal. Is voltage 10 volts or greater?

NO

Repair short to ground or open in CKT "G/W".

YES

- Check for poor contact at EBCM connector E124, terminal "3".
- If OK, replace EBCM.

YES

Proceed to DTC 95 Diagnostic Chart.

YES

Malfunction is not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

NO

- Using specified digital multimeter, measure the voltage between ground and terminal "2" of the stop light switch (terminal "1" if automatic trans.). Is voltage 10 volts or greater?

YES

- Measure the voltage between ground and terminal "1" of the stop light switch (terminal "3" if automatic trans.) while applying firm pressure on brake pedal. Is voltage 10 volts or greater?

NO

Misadjusted or faulty stop light switch. Adjust or replace switch as necessary.

YES

- Repair open in CKT "G/W".
- Refer to SECTION 8 of this manual for additional diagnosis.

NO

- Repair open or short to ground in CKT "G".
- Replace stop fuse if necessary.

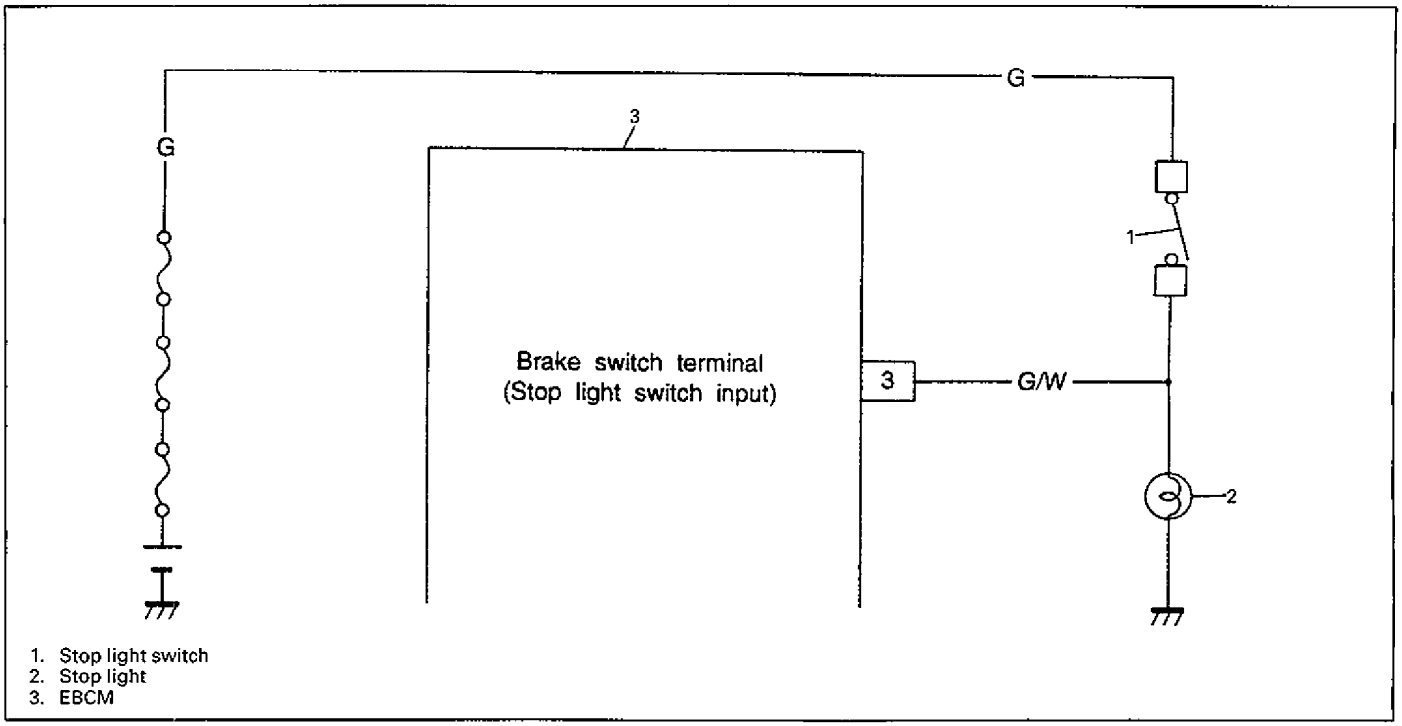
NOTE:

- **Connector terminal position:**
  (View from terminal side)
  For stop light switch harness connector
  Manual transmission model not equipped with auto cruise control system.

Manual transmission model equipped with auto cruise control system & Automatic transmission model

- **This chart assumes that a current DTC is stored indicating that this malfunction is present.**

DTC 93 – DTC 91 OR DTC 92 SET IN CURRENT OR PREVIOUS IGNITION CYCLE



1. Stop light switch
2. Stop light
3. EBCM

CIRCUIT DESCRIPTION:

This DTC is the second portion of DTCs 91 and 92. If DTCs 91 or 92 failed during the last ignition cycle, DTC 93 becomes a current failure during the next ignition cycle, keeping ABS disabled until a stop light switch input is seen. When a change is seen during an ignition cycle in which DTC 93 is a current malfunction, DTC 91 or 92 will clear itself and the end of the current ignition cycle and ABS will enable itself at the start of the next ignition cycle. DTC 93 alone indicates DTCs 91 or 92 failed previously, but is intermittent or has been corrected.

DIAGNOSTIC AIDS:

An "intermittent" malfunction may be caused by a poor connection, rubbed through wire insulation or a wire that is broken inside the insulation.

The frequency of the malfunction can be checked by using the enhanced diagnostic function of the TECH-1 as described in "TECH-1 Diagnostics" earlier in this section.

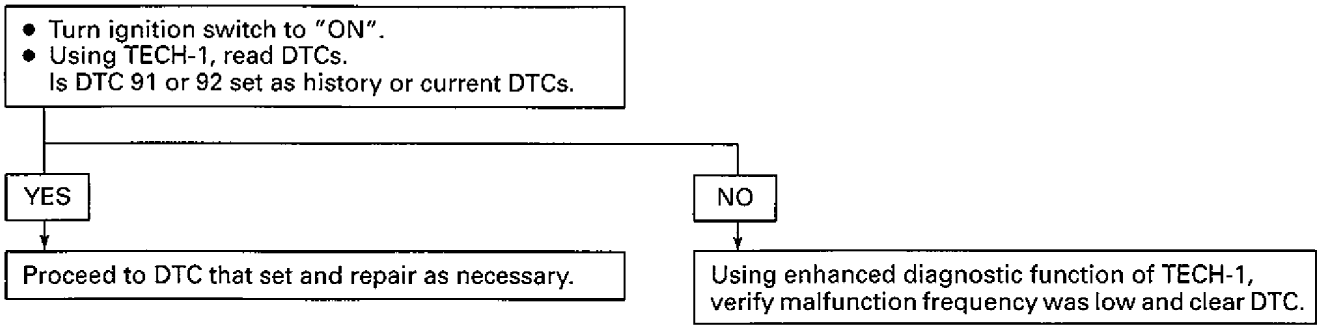
Any circuitry that is suspected as causing the intermittent malfunction should be thoroughly checked for backed out terminals, improper mating, broken locks, improperly formed or damaged terminals, poor terminal-to-wiring connections or physical damage to the wiring harness.

Also, verify proper stop light switch operation using the data list of the TECH-1. As the brake is applied, the data list should display the brake switch "ON" within 25 mm (1-inch) of travel.

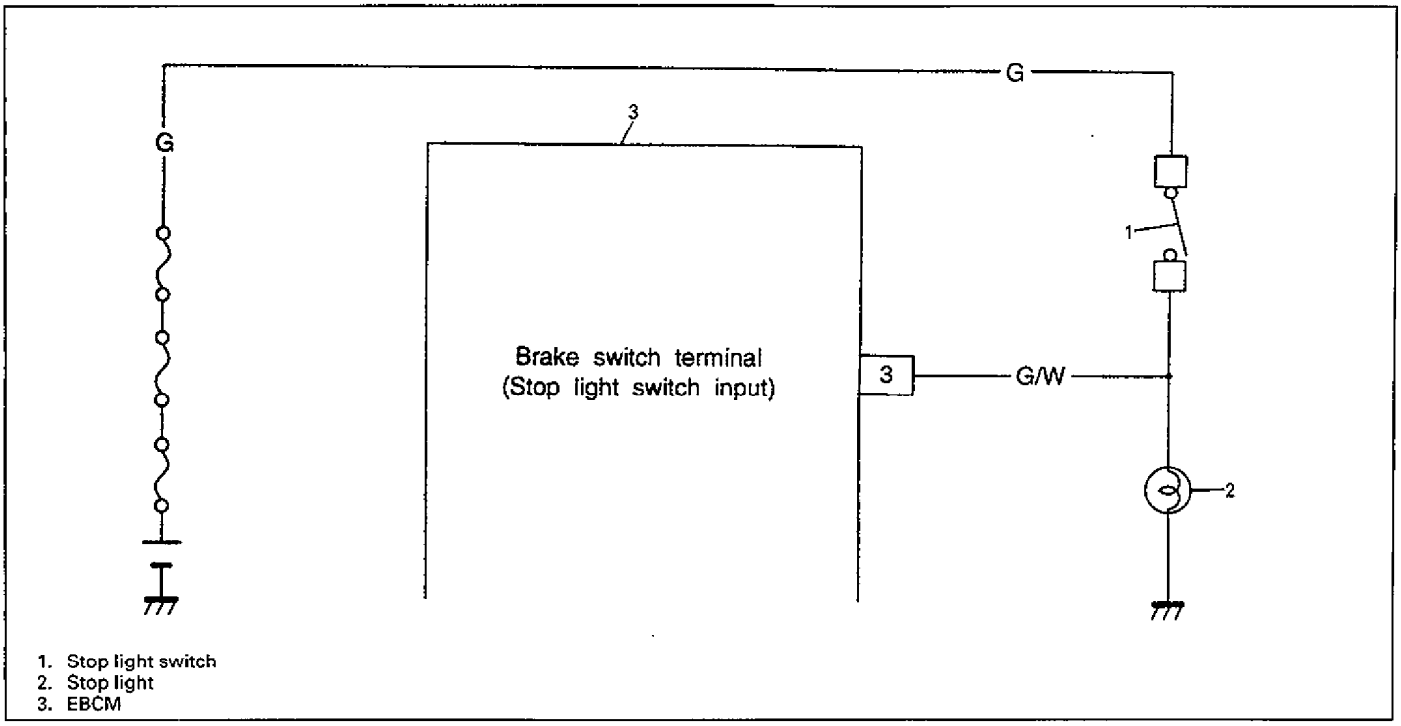
61A30-5B-110-1

DTC 93

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.



DTC 94 – STOP LIGHT SWITCH (BRAKE SWITCH) CONTACTS ALWAYS CLOSED



1. Stop light switch
2. Stop light
3. EBCM

CIRCUIT DESCRIPTION:
This DTC is run to determine the proper operation of the stop light switch. This is important because ABS is activated when the stop light switch is closed and deactivated when the switch is open. If the stop light switch is always closed, ABS operation will always be requested, resulting in potential hydraulic modulator cycling (ABS cycling) on rough roads. Additionally, this malfunction will most likely result in a discharged battery (due to the stop lights remaining illuminated) if the driver is not informed of this malfunction.

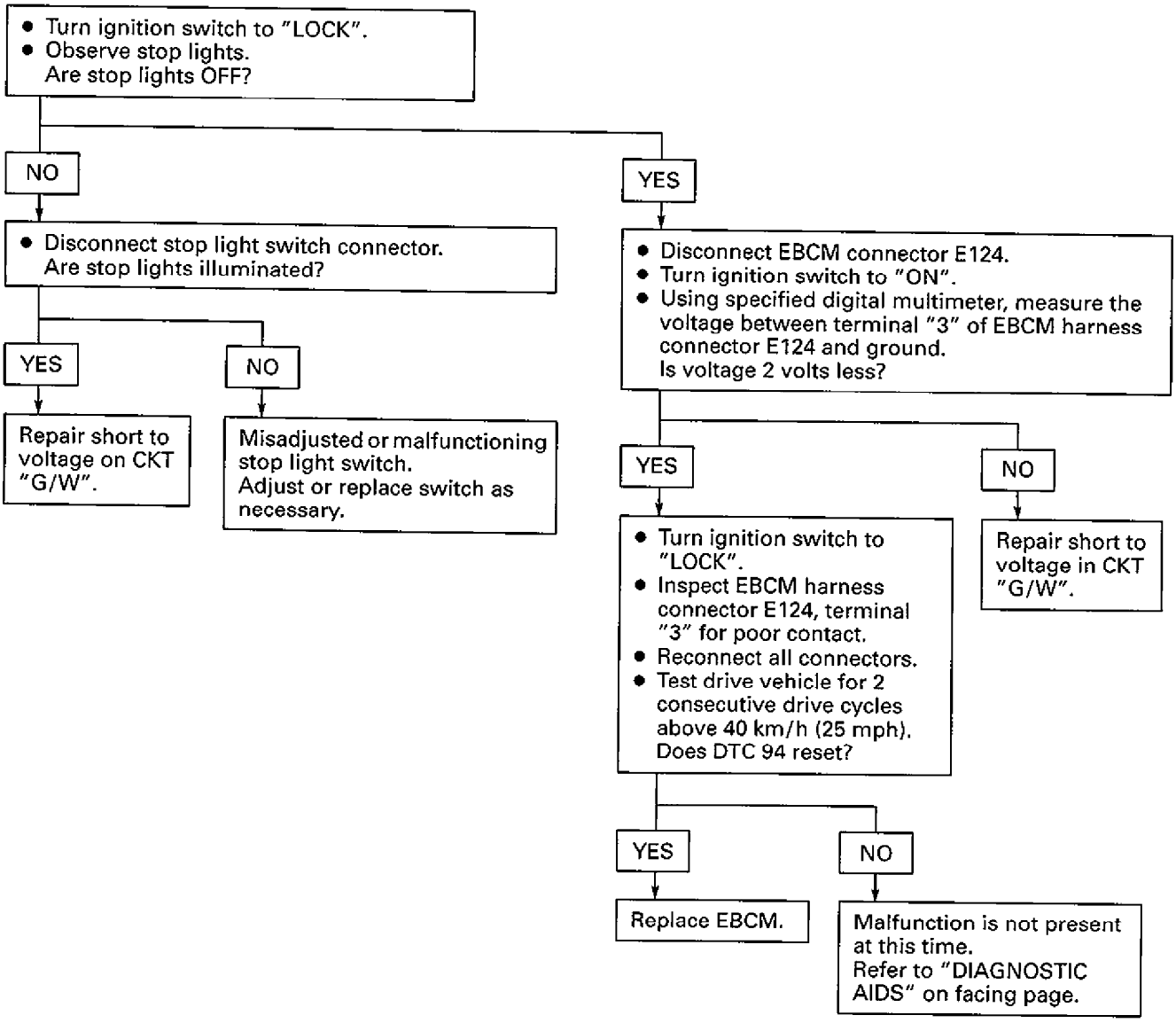
FAILURE CONDITION:
DTC 94 can be set when the vehicle reaches at least 40 km/h (25 mph). If the stop light switch was never open during two consecutive drive cycles, a malfunction exists.

DIAGNOSTIC AIDS:
Refer to DTCs 76 and 78.

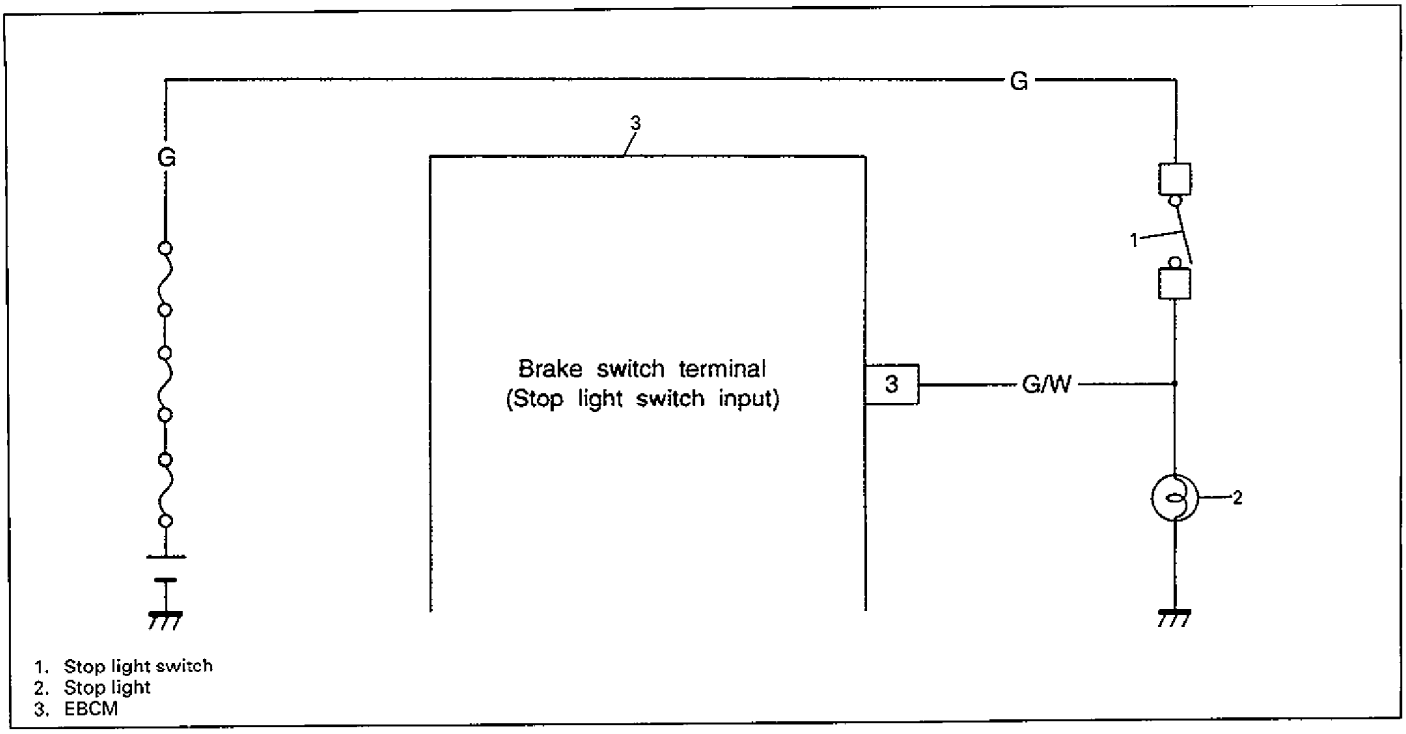
61A30-5B-112-1

DTC 94

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.



DTC 95 – STOP LIGHT SWITCH (BRAKE SWITCH) CIRCUIT OPEN



1. Stop light switch
2. Stop light
3. EBCM

CIRCUIT DESCRIPTION:
This DTC is used to identify open stop light switch circuitry that prevent the stop light switch input to the EBCM from changing states when the brake is applied. This DTC is used in conjunction with DTCs 91 and 92 to determine the cause of an open stop light switch malfunction.

FAILURE CONDITION:
DTC 95 can be set after initialization is completed. If the stop light switch input voltage is out of specification for one second (indicating an open circuit), a malfunction exists.

DIAGNOSTIC AIDS:
Refer to DTCs 76 and 78.

61A30-5B-114-1

DTC 95

NOTE:
This chart assumes that a current DTC is stored indicating that this malfunction is present.

- Turn ignition switch to "ON".
- Using TECH-1, select ABS data list, and monitor stop light switch status.
  Does TECH-1 indicate that stop light switch is open?

YES

- Apply light pressure on brake pedal while monitoring stop light switch status on TECH-1.
  Does TECH-1 indicate stop light switch "ON" within 25 mm (1 in.) of travel?

NO

- Apply firm pressure to brake pedal and observe stop lights.
  Are stop lights illuminated?

YES

- Turn ignition switch to "LOCK".
- Disconnect EBCM connector E124.
- Turn ignition switch to "ON".
- Using specified digital multimeter measure the voltage between ground and terminal "3" of EBCM harness connector E124 while applying firm pressure on brake pedal.
  Is voltage 10 volts or greater?

NO

Repair open in CKT "G/W".

YES

Check for poor terminal contact at EBCM.
If OK, replace EBCM.

NO

Repair open stop light circuit as directed in SECTION 8 of this manual.

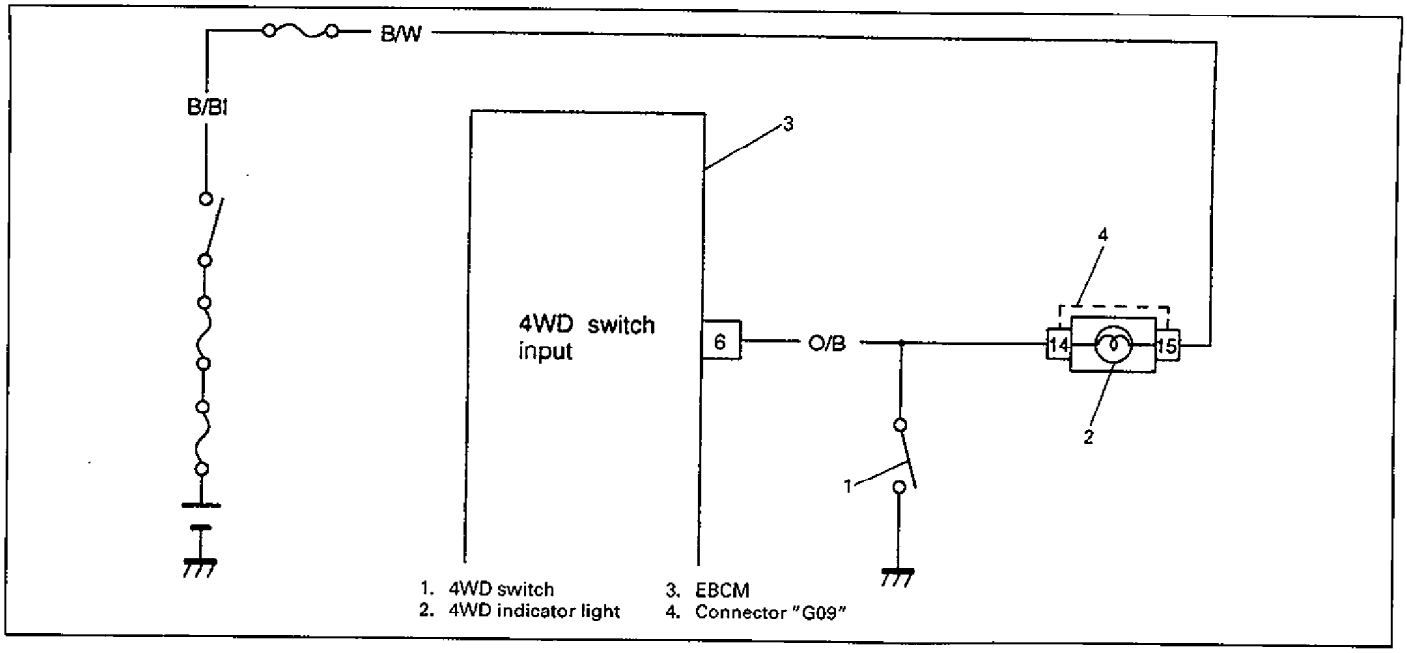
YES

Malfunction is not present at this time.
Refer to "DIAGNOSTIC AIDS" on facing page.

NO

YES

DTC 96 – 4WD SWITCH CIRCUIT OPEN



CIRCUIT DESCRIPTION:

Ignition voltage is supplied to the "4WD" indicator lamp through the "IG COIL" fuse. The 4WD switch is open when the transfer case is set in Two-Wheel-Drive (2WD) or "Neutral" range.

In 2WD mode, CKT "O/B" is supplied with current flowing through the "4WD" indicator lamp bulb filament. The EBCM senses this current through connector E124, terminal "6" and determines the vehicle is in 2WD mode.

In 4WD mode, CKT "O/B" is grounded by the 4WD switch. This causes to turn on the "4WD" indicator lamp and signals the EBCM determines the vehicle is in 4WD.

FAILURE CONDITION:

DTC 96 can be set anytime when the EBCM detects an open in CKT "C/B", open 4WD indicator lamp bulb filament, or open "IG COIL" fuse.

DIAGNOSTIC AIDS:

Refer to DTCs 76 and 78.

61A30-5B-116-1

DTC 96 (Page 1 of 3)

- Turn ignition switch to "LOCK".
- Check "IG" fuse.
  Is "IG" fuse open?

NO

- Turn ignition to "ON".
- Using TECH-1, select DATA LIST and monitor 4WD switch status while shifting transfer case from "2WD" to "4WD".
  Does TECH-1 display show "4WD switch ON" and "4WD light circuit ON"?

NO

- Observe the "4WD" indicator light.
  Is 4WD indicator light "ON"?

NO

Go to following page of this chart (page 2 of 3).

YES

- Using TECH-1, clear DTCs and recheck.
  Does DTC 96 reset?

YES

NO

Malfunction not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page for additional information.

YES

Replace "IG" fuse, clear DTC and recheck.

YES

- Turn ignition to "LOCK".
- Disconnect EBCM connector E124.
- Go to step equipped with * mark at page 3 of 3.

DTC 96 (Page 2 of 3)

Continued from DTC 96 chart (Page 1 of 3).

- Turn ignition to "LOCK".
- Remove combination meter.
- Remove 4WD indicator light bulb and inspect filament.

Is filament open?

YES → Replace 4WD indicator bulb.

NO →

- Inspect combination meter connector G09 for poor contact.
- Inspect combination meter printed circuit for open 4WD indicator light circuit.
- Check for an open or high resistance in circuit between the fuse and combination meter.

Do any of the above tests show an indication of an open circuit?

YES → Repair open or high resistance. Refer to SECTION 8 of the service manual mentioned in FOREWORD of this manual.

NO →

- Disconnect 4WD switch connector.
- Make certain transfer case is set in "4WD".
- Using specified digital multimeter, measure the resistance between 4WD switch terminals.

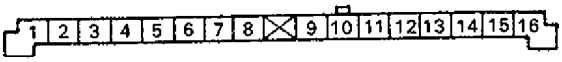
Is resistance less than 2 ohms?

NO → Replace 4WD switch.

YES →

Go to following page of this chart (Page 3 of 3).

NOTE:
Connector terminal position:
(View from terminal side)
For combination meter connector G09



DTC 96 (Page 3 of 3)

Continued from DTC 96 chart (Page 2 of 3).

* • Using, measure the resistance between 4WD switch harness connector, terminal "1" and EBCM connector E124, terminal "6."
Is resistance less than 2 ohms?

YES

- Install combination meter.
- Turn ignition to "ON".
- Using specified digital multimeter, measure the voltage between ground and EBCM harness connector E124, terminal "6."
Is voltage less than 10 volt?

NO

- Reconnect EBCM connector E124, 4WD switch connector, clear DTCs and recheck.
- If DTC resets, replace EBCM.

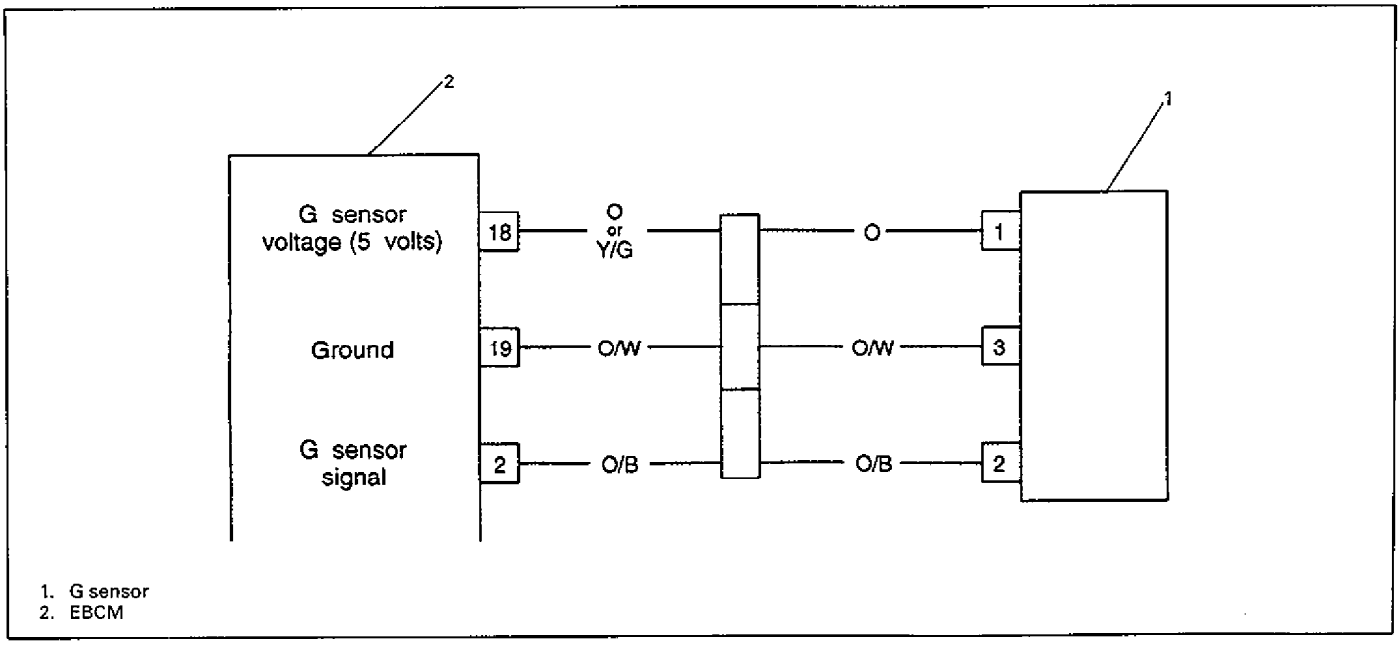
NO

Repair open or high resistance in CKT "O/B".

YES

Repair open or high resistance in CKT "O/B".

DTC 97 – G SENSOR (ACCELEROMETER) CIRCUIT SHORTED TO GROUND



1. G sensor
2. EBCM

CIRCUIT DESCRIPTION:

The EBCM provides power (5 volts) and ground to the G sensor through CKT "O" (or "O" & "Y/G") and CKT "O/W" respectively. The G sensor converts the change in vehicle motion, or inertia, into a voltage signal. This signal which is sent to the EBCM through CKT "O/B".

The G sensor provides additional vehicle speed reference to the EBCM which is needed when the vehicle is in four-wheel-drive mode. The voltage signal ranges, from 2.5 volts at zero speed change (or constant motion), to about 0 volts under heavy acceleration, to near 5 volts under heavy braking.

FAILURE CONDITION:

DTC 97 can be set anytime when the EBCM detects a short to ground in CKT "O/W", EBCM connector E124, terminal "2" and G sensor connector terminal "2".

DIAGNOSTIC AIDS:

Refer to DTCs 76 and 78.

61A30-5B-120-1

DTC 97

- Turn ignition to "ON".
- Using TECH-1, read DTCs.
  Is DTC 97 set as current?

NO

- Using TECH-1, clear DTCs and test drive vehicle.
  Does DTC 97 reset?

YES

- Turn ignition to "LOCK".
- Disconnect EBCM connector E124.
- Disconnect G sensor connector.
- Using specified digital multimeter, measure the resistance between ground and EBCM harness connector E124, terminal "2."
  Is resistance less than 2 ohms?

NO

- Using specified digital multimeter, measure the resistance between ground and EBCM harness connector E124, terminal "18."
  Is resistance less than 2 ohms?

NO

- Reconnect all connectors.
- Turn ignition to "ON".
- Using TECH-1, select DATA LIST and monitor G sensor voltage.
  Is G sensor voltage output approximately 2.5 volts?
  (Vehicle not in motion).

YES

- Using a TECH-1, clear DTCs and recheck.
  Does DTC 97 reset?

YES

Replace the EBCM.

NO

Malfunction not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

NO

Replace the G sensor.

YES

Repair short to ground in CKT "O" (or "O" & Y/G").

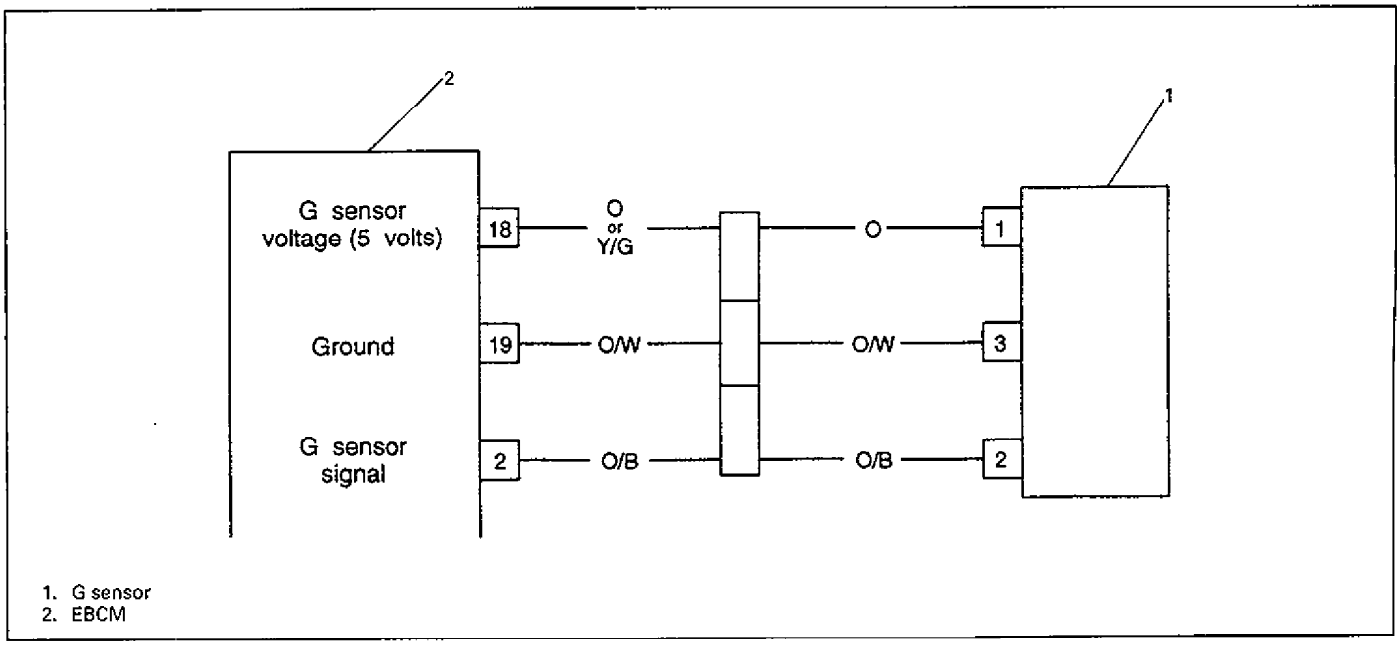
YES

Repair short to ground in CKT "O/B".

NO

Malfunction not present at this time, refer to "DIAGNOSTIC AIDS" on facing page.

DTC 98 – G SENSOR (ACCELEROMETER) CIRCUIT OPEN OR SHORTED TO BATTERY OR GROUND



1. G sensor
2. EBCM

CIRCUIT DESCRIPTION:
Refer to DTC 97.

FAILURE CONDITION:
DTC 98 can be set anytime when the EBCM detects a short to battery in G sensor signal circuit.

DIAGNOSTIC AIDS:
Refer to DTCs 76 and 78.

61A30-5B-122-1

DTC 98

- Turn ignition to "ON".
- Using TECH-1, read DTCs.
  Is DTC 98 set as current?

NOTE:
Connector terminal position
(View from terminal side)
For G sensor harness connector

YES

- Turn ignition to "LOCK".
- Disconnect EBCM connector E124.
- Disconnect G sensor connector.
- Using specified digital multimeter, measure the resistance between ground and EBCM harness connector E124, terminal "2."
  Is resistance less than 2 ohms?

NO

- Turn ignition to "ON".
- Using specified digital multimeter, measure the voltage between ground and EBCM harness connector E124, terminal "2".
  Is voltage less than 1 volt?

YES

- Using specified digital multimeter, measure the resistance between EBCM harness connector E124, terminal "2" and G sensor harness connector terminal "2."
  Is resistance less than 2 ohms?

YES

- Reconnect all electrical connectors.
- Using a TECH-1, clear DTCs and recheck.
  Does DTC 98 reset?

YES

- Using TECH-1, select DATA LIST and monitor accelerator voltage.
  Is acceleration voltage output approximately 2.5 volts? (Vehicle not in motion.)

NO

Replace the G sensor.

YES

Replace the EBCM.

NO

- Using TECH-1, clear DTCs and test drive vehicle.
  Does DTC 98 reset?

YES

NO

Malfunction not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

YES

Repair short to ground in CKT "O/B".

NO

Repair short to voltage in CKT "O/B".

NO

Repair open in CKT "O/B".

NO

Malfunction not present at this time. Refer to "DIAGNOSTIC AIDS" on facing page.

HYDRAULIC DIAGNOSIS / MISCELLANEOUS TEST (F4)

When selecting Miscellaneous Test (F4) on the TECH-1 for a four-wheel-drive vehicle, the next screen will give you the following choices:

1. ABS test (F0)
2. Idle-Up test (F3)

By selecting ABS test (F0), the user can perform these functions: Manual Control (F0), Motor Test (F4), Gear Tension Relief (F5), Relay Test (F6), Voltage Load Test (F7), Lamp Test (F8), and System ID (F9).
As you noted, these are the same functions that are available on two-wheel-drive models after selecting Miscellaneous Test (F4).

MANUAL CONTROL (F0)
This function can be used to manually control the ABS motors and solenoids.

Motor Test (Apply / Release)
Each motor can be manually turned on for up to 5 seconds, at a current of 10 amps applied (forward) or 6 amps released (reverse). After running the motors, the command and feedback currents will be stored in a snapshot buffer. This information can be reviewed, when instructed to do so by the trouble tree, to determine if the motors are operating properly.
The test below describes how the front motors will normally operate; the rear motor can be tested in a similar manner, except there will be only a slight pedal drop (bump) and rise during the test.

1) Turn ignition switch to "LOCK".
2) Install TECH-1 with ABS/Air Bag Cartridge.
3) Turn ignition switch to "ON".
4) Pump brake pedal until firm to deplete vacuum from power booster.
5) Depress and hold brake pedal.
6) Using the TECH-1, "Release" one of the motors. The brake pedal should move smoothly toward the floor. As the pedal drops, the feedback current should momentarily drop to only a few amps (indicating motor movement) and then become equal to command current (6 amps). This indicates the motor is no longer moving since the piston has reached the bottom of the bore.
7) With the brake pedal still depressed and at the floor, "Apply" the same motor. The brake pedal should now smoothly rise back to the top of its travel. The feedback current should momentarily drop to a few amps, then quickly increase to the command current (10 amps). This indicates the motor is no longer moving since the piston has reached the top of the bore ("home" position).

Solenoid Test (On / Off)
Only use this test when no DTCs are stored and you suspect a leaky solenoid or check valve.

1) Turn ignition switch to "LOCK".
2) Install TECH-1 with ABS/Air Bag Cartridge.
3) Turn ignition switch to "ON".
4) Pump brake pedal and deplete vacuum from power booster.
5) Select manual control (F0).
6) Select left front or right front motor release.
7) Release the motor for the channel being tested. Review the motor command and feedback currents to be sure the motor released properly. Refer to "Motor Test (Apply/Release)" earlier in this section.
8) Select the solenoid for the same channel as that being tested.
9) With no brake pedal pressure applied, turn the solenoid on.
10) Depress the brake pedal. It should be very high and firm.

NOTE:
If the pedal goes nearly to the floor, the solenoid is leaking or not closing and / or the check valve is leaking, proceed to Step 12).

11) With brake pressure still applied, turn the solenoid off. The brake pedal should move toward the floor. This verifies normal solenoid operation. END OF TEST.

NOTE:
If the pedal does not, the solenoid is stuck on, proceed to Step 12).

12) Verify that the solenoid connectors are connected to the proper solenoids, (the right front solenoid is the one on the rear of the modulator, closest to the brake booster). If the wiring is incorrect, move the connectors to the proper solenoid and repeat this entire test starting with Step 1).

A. Physically switch the two solenoids.
B. Repeat the entire test starting at Step 1) for the channel in question.

- If the test now works properly, test the other channel. If the test fails for this channel, replace the solenoid currently installed in this channel. Refer to "ABS Solenoid" under "On-Vehicle Service" later in this section.
- If the test fails for the same channel, the check valve is leaking. Replace hydraulic modulator. Refer to "Hydraulic Modulator" under "Unit Repair" later in this section.

WARNING:
After performing Step 12) it is necessary to bleed the brake system. Refer to "Bleeding System" later in this section.

HYDRAULIC CONTROL TEST (F2)

This test is used to verify base brake apply and ABS release, hold and apply function.

1) Turn ignition switch to "LOCK".
2) Raise the vehicle such that all wheels to be tested are off the ground. Refer to SECTION 0A of the Service Manual mentioned in FOREWORD of this manual.
3) Install TECH-1 with ABS/Air Bag Cartridge.
4) Turn ignition switch to "ON". Place transaxle into neutral.
5) Select a channel to test; left front, right front, or rear. When testing the rear brakes, both rear wheels should rotate and not rotate together at the various points in the test; this is true because both rear brake pressures are controlled together.
6) Firmly depress brake pedal. Pedal should remain high and firm.
7) Have an assistant attempt to rotate the wheel being tested. If the wheel does not rotate, base brake apply is working properly.
8) With the brake pedal still depressed, press the "▲" key on the TECH-1 to start the test. The TECH-1 will display "Release" on the screen. Your assistant should be able to rotate the wheel being tested during the release portion of the test (approximately 2 seconds long). This verifies ABS pressure release. The brake pedal should remain high and firm. (If the brake pedal moves toward the floor, verify the solenoid electrical connectors are connected to the correct solenoids).
9 The TECH-1 will switch to the "Hold" mode and display the word "Hold" on the screen along with an 18 seconds decrement counter. With the brake pedal still depressed, have your assistant attempt to rotate the wheel. The wheel should rotate for the full 18 seconds of the test. This verifies ABS pressure hold.
10) When the hold portion of the test is complete, brake pressure will be applied and a slight bump may be felt in the pedal. This is normal. The assistant should not be able to rotate the wheel at the point. This verifies ABS apply.

IDLE-UP TEST (F3)

(4WD Models Only)

This test is used to verify the idle-up function of the EBCM and circuit to the ECM. The TECH-1 display will show the EBCM status of the idle-up feature as active or inactive.

Once the user has selected Idle-Up Test (F3), it can triggered by pressing the up/down arrow keys on the TECH-1 keypad.

In addition, the TECH-1 will display the condition of the idle-up circuit between the EBCM and ECM as "OK" or "FAILED" as when the circuit is either open and/or shorted to battery or ground.

MOTOR TEST (F4)

Once the motor pack has been separated from the ABS actuator (hydraulic modulator), this test will help to determine if the motor pack is operating properly.

The TECH-1 will rotate the motors in one direction, then the other.

- If any motor does not turn in both directions, the motor pack is malfunctioning and must be replaced. The motor pack is not serviceable and must be replaced as an assembly. Refer to "Motor Pack" under "Unit Repair" later in this section.
- If all three motors rotate, try to rotate each gear on the ABS actuator, refer to "No Gear Movement" next in this section.

NO GEAR MOVEMENT

After the motor pack has been removed, rotate each gear by hand on the ABS actuator (unit with large gears). The front gears (non-center gears) should be able to be rotated approximately five full turns lock to lock. If the gear does not turn freely or at least five turns are not possible, replace the ABS actuator.

The rear gear (center gear) should rotate approximately four turns. If the gear does not turn freely or at least four turns are not possible, replace the hydraulic modulator.

Refer to "ABS Actuator" under "Unit Repair" later in this section if replacement of the ABS actuator is indicated above.

GEAR TENSION RELIEF (F5)

When the displacement cylinder pistons are in the "home" position, each motor has prevailing torque. This torque results in "gear tension", or force on each gear that makes motor pack separation difficult. To avoid injury, or damage to the gears, the "Gear Tension Relief Function" briefly reverses each motor to eliminate the prevailing torque.

Always perform the "Gear Tension Relief Function" prior to removing ABS actuator assembly (the hydraulic modulator/motor pack assembly) from the vehicle.

RELAY TEST (F6)

This test allows the user to turn the relay on and off using the "▲" and "▼" keys on the TECH-1.

The battery voltage supplied to the EBCM through the relay contacts is displayed on the screen during the test.

When the relay is commanded on, the voltage should be equal to the battery voltage. When the relay is off, the voltage should drop below 2 volts.

NOTE:

Voltage will not drop to zero when the relay contacts are open due to capacitors in the EBCM. If voltage drops below 2 volts, the relay is operating properly.

VOLTAGE LOAD TEST (F7)

This ABS can draw significant amounts of current when operating. This test turns on many of the system components to load-test the vehicle's electrical system.

If low voltage malfunctions or intermittent ABS operations are occurring, this test will allow you to monitor the ignition and switched battery inputs to the EBCM. If only one of these two inputs drops below 10 volts during testing, a high resistance may be present in that power feed circuit. If both inputs drop below 10 volts, the vehicle's electrical system needs to be diagnosed. In either case, the TECH-1 will display that the "Voltage Load Test" failed.

LAMP TEST (F8)
This test allows the user to control the indicator light associated with ABS. It can be used to check the lamp circuit including the ABS check relay (lamp driver relay). The amber "ABS" indicator light can be turned on, off, or flashed. The red "BRAKE" indicator light and the purple "ABS ACTIVE" indicator light can be turned on and off.

SYSTEM ID (F9)
This feature is used to determine the ABS version.

MOTOR REHOME (F5)
The motor rehome function is initiated by pressing the F5 key from the TECH-1 "Select Mode" menu. The motor rehome function must ALWAYS be used prior to bleeding the brake system. This function will return all of the hydraulic modulator pistons to their upmost or "home" position. This allows all fluid paths within the modulator to be open so that the modulator can be properly bled.

CAUTION:
The motor rehome function cannot be performed if any current DTCs are present. If current DTCs are present, the vehicle must be repaired and DTCs cleared before performing the motor rehome function.

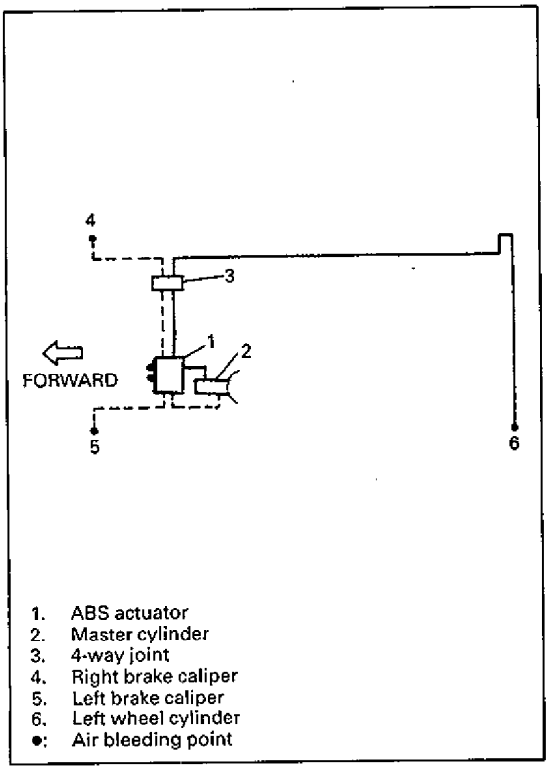
61A30-5B-127-1

ON-VEHICLE SERVICE

WARNING:
Brake fluid may irritate eyes and skin. In case of contact, take the following actions;
- **Eye contact – rinse thoroughly with water.**
- **Skin contact – wash with soap and water.**
- **If ingested – consult a physician immediately.**

CAUTION:
Brake fluid is extremely damaging to paint. If fluid should accidentally touch painted surface, immediately wipe fluid from paint and clean painted surface.

61A30-5B-128-1



1. ABS actuator
2. Master cylinder
3. 4-way joint
4. Right brake caliper
5. Left brake caliper
6. Left wheel cylinder
●: Air bleeding point

BLEEDING BRAKES

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. Air bleeding is necessary at right and left front wheel brakes, left rear wheel brake and ABS actuator assembly(2 places), i.e. 5 places in all.
Be sure to bleed air of brake system according to following procedure when its hydraulic circuit has been disconnected.

PRECAUTIONS FOR BLEEDING BRAKES

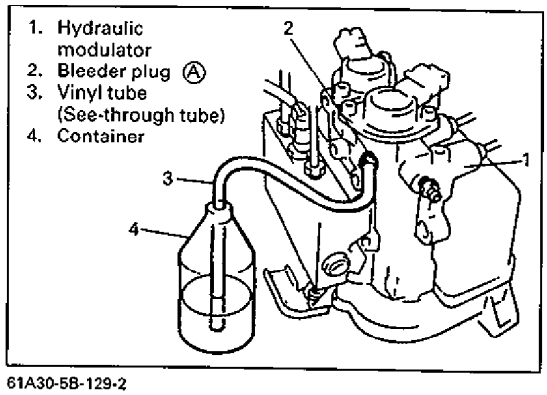
Prior to bleeding brakes, front and rear displacement cylinder pistons must be returned to top-most (home) position. Using a TECH-1, select "F5" (motor rehome). Motor rehome function cannot be performed if current DTCs are present.
If DTCs are present, vehicle must be repaired and DTCs cleared before performing the motor rehome function/as shown procedure below.

1) Raise and suitably support front end of vehicle so that the drive wheels are off the ground. Refer to SECTION 0A.
2) Start the engine, engage the transaxle and run the vehicle above 5 km/h (3 mph) for at least ten seconds.
3) Observe the "ABS" indicator. Make sure that the indicator goes out after approximately three seconds.
   - If the "ABS" indicator remains illuminated, a TECH-1 must be used to diagnose the malfunction.
   - If the "ABS" indicator goes out and stays off, stop the engine and repeat steps 2) and 3).
4) Using a TECH-1, enter the manual control function and "Apply" the front and rear motors.

BLEEDING PROCEDURE

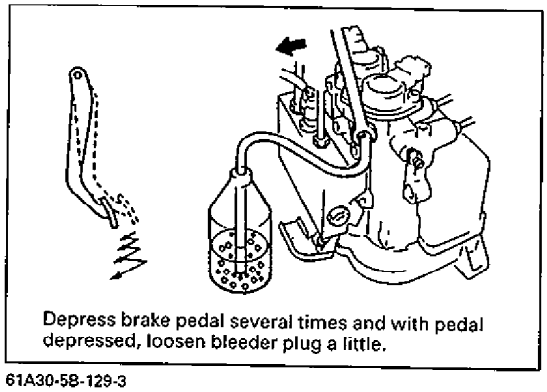
NOTE:
In the following procedure, use a suitable container and / or shop cloths to catch brake fluid and prevent it from contacting any painted surfaces.

50G00-5B-186-1S



61A30-5B-129-2

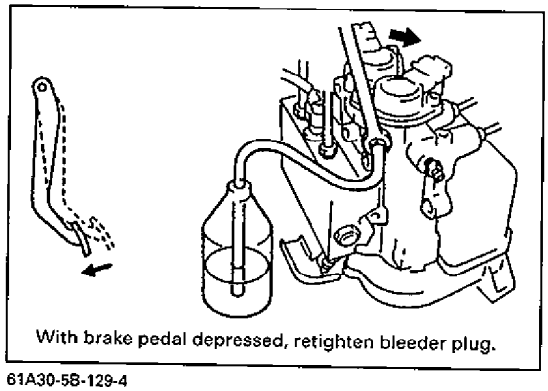
1) Fill master cylinder reservoir with brake fluid and keep at least one-half full fluid during bleeding operation.
2) Attach a vinyl tube to bleeder plug Ⓐ of ABS actuator assembly and insert the other end into container.



Depress brake pedal several times and with pedal depressed, loosen bleeder plug a little.

61A30-5B-129-3

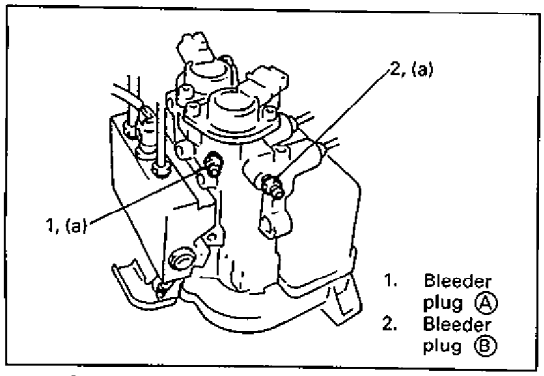
3) Depress brake pedal several times and then while holding it depressed, loosen bleeder plug Ⓐ about one-third to one-half turn.



With brake pedal depressed, retighten bleeder plug.

61A30-5B-129-4

4) When fluid pressure in the cylinder is almost depleted, retighten bleeder plug Ⓐ.

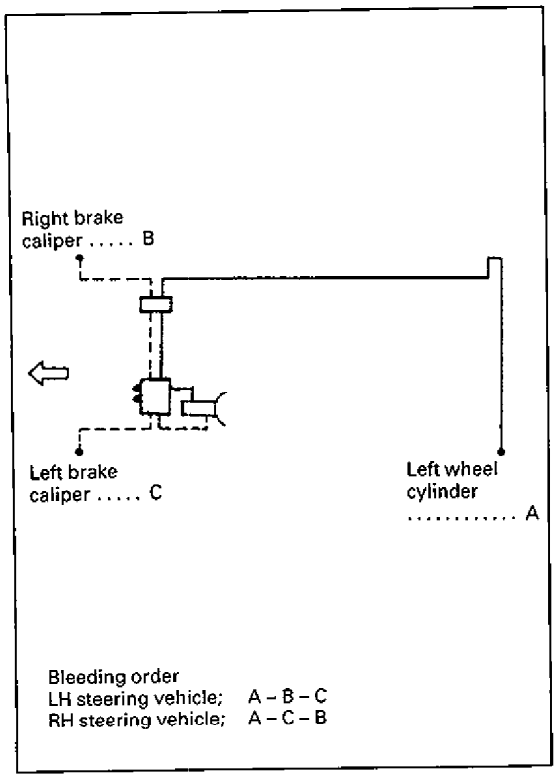


61A30-5B-129-5

5) Repeat this operation 3) and 4) until there are no more air bubbles in hydraulic line.
6) When bubbles stop, depress and hold brake pedal and tighten bleeder plug Ⓐ.

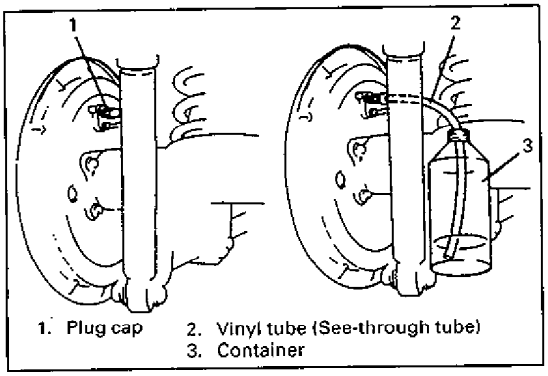
Tightening Torque
(a): 11 N·m (1.1 kg-m, 8.0 lb-ft)

7) Repeat steps 1) through 6) for bleeder plug Ⓑ.



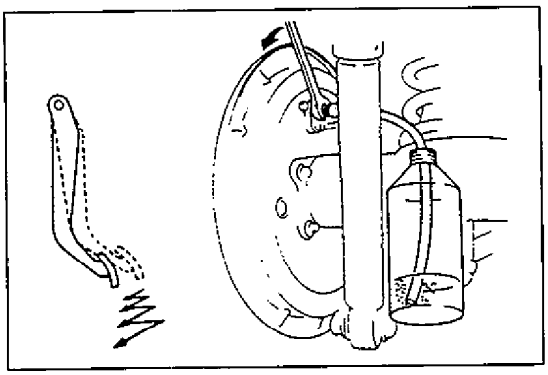
61A30-5B-130-1

8) Bleed from brake calipers/wheel cylinders as shown procedure below.

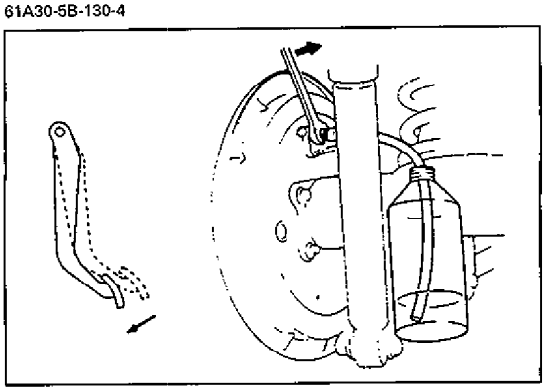


61A30-5B-130-3

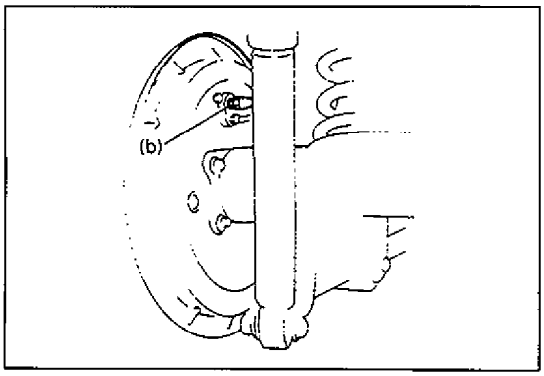
1. Fill master cylinder reservoir with brake fluid and keep at least one-half full of fluid during bleeding operation.
2. Remove bleeder plug cap.
   Attach a vinyl tube to bleeder plug, and insert the other end into container.


61A30-5B-130-4

3. Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-third to one-half turn.


61A30-5B-130-5

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.



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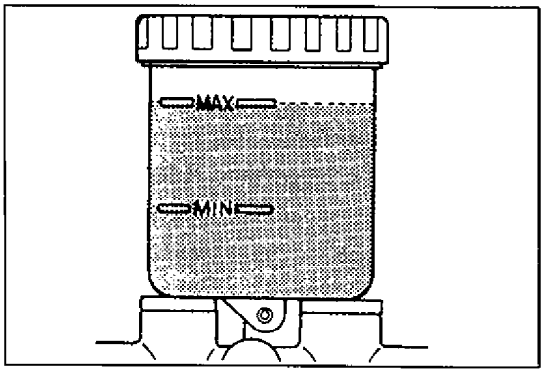


61A30-5B-131-2

6. When bubbles stop, depress and hold brake pedal and tighten bleeder plug.

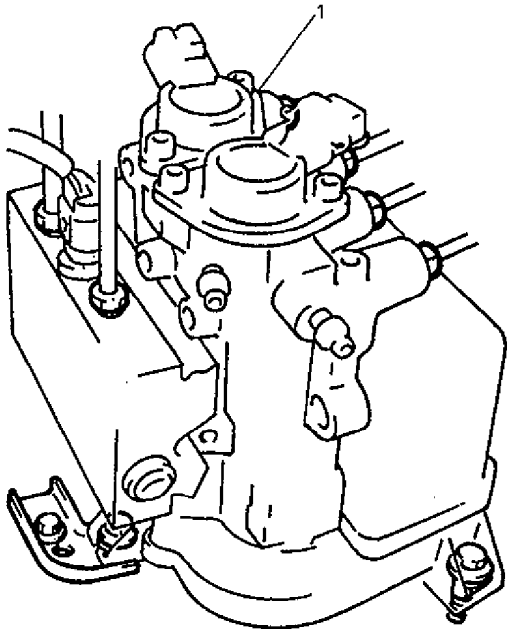
   Tightening Torque
   (b): 11 N·m (1.1 kg-m, 8.0 lb-ft)

7. Then attach bleeder plug cap.
8. After completing bleeding operation, apply fluid pressure to pipe line and check for leakage.
9. Replenish fluid into reservoir up to specified level.

9) Perform above Steps 1) to 7) again to bleed air from ABS actuator assembly.
10) Check brake pedal for "sponginess". If found spongy, repeat entire procedure of bleeding.
11) Road test the vehicle. Make several normal (non ABS) stops from a moderate speed at ensure proper brake system function.

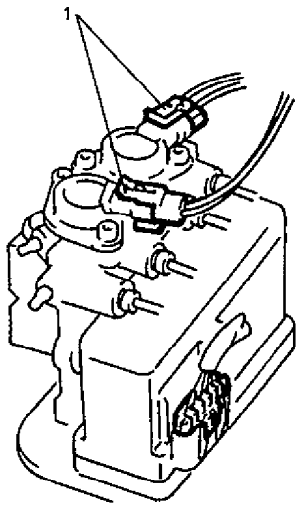
61A30-5B-131-3

ABS ACTUATOR ASSEMBLY (HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY)



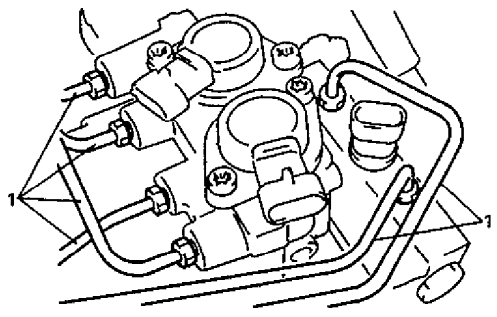
1. ABS actuator assembly

61A30-5B-132-1



1. Solenoid couplers

61A30-5B-132-3



1. Brake pipes

61A30-5B-132-5

REMOVAL

WARNING:
To help avoid prersonal injury, due to a retained load on the hydraulic modulator/motor pack assembly, the gear tension relief function of the TECH-1 must be performed prior to removal of the hydraulic modulator.

1) Using the TECH-1, perform the gear tension relief sequence. Refer to "Gear Tension Relief" earlier in this section.
2) Disconnect battery negative cable from battery.
3) Drain brake fluid in reservoir, master cylinder and ABS actuator assembly.
4) Disconnect solenoid, differential switch and motor pack connectors.

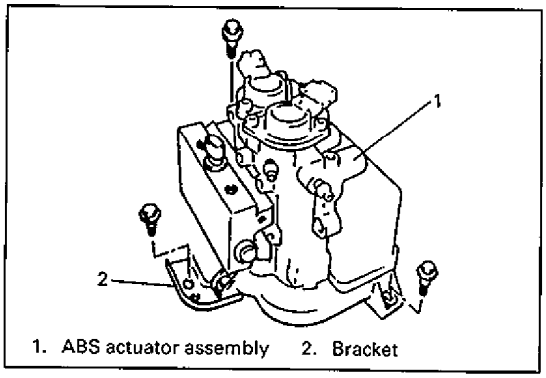
NOTE:
Place a shop towel beneath the hydraulic modulator brake pipes to prevent brake fluid from contaminating motor pack or electrical connectors.

5) Remove clamps from brake pipes.

6) Detach brake pipes from ABS actuator and loosen flare nuts at master cylinder with special tool (A) (Flare nut wrench).

Special Tool
(A): 09950-78210

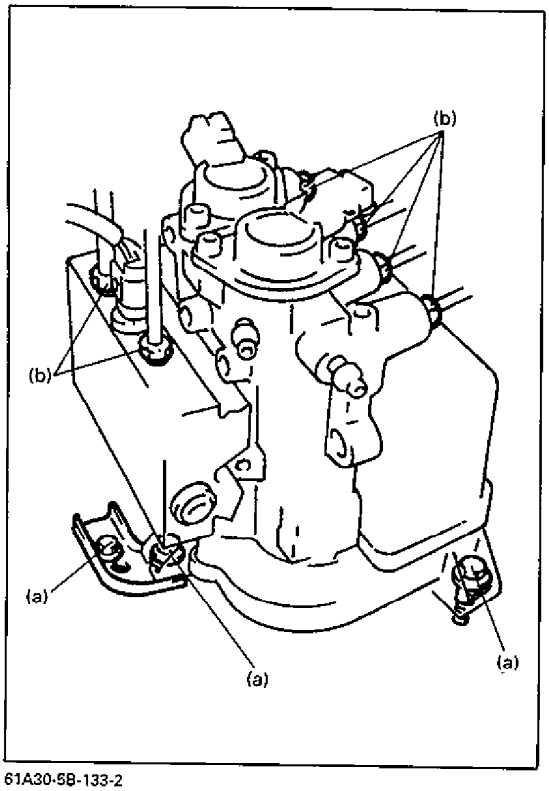
NOTE:
Do not allow brake fluid to contact painted surface, motor or electrical couplers.



1. ABS actuator assembly 2. Bracket

61A30-5B-133-1

7) Remove ABS actuator assembly from vehicle.
8) Remove bracket from ABS actuator assembly.



61A30-5B-133-2

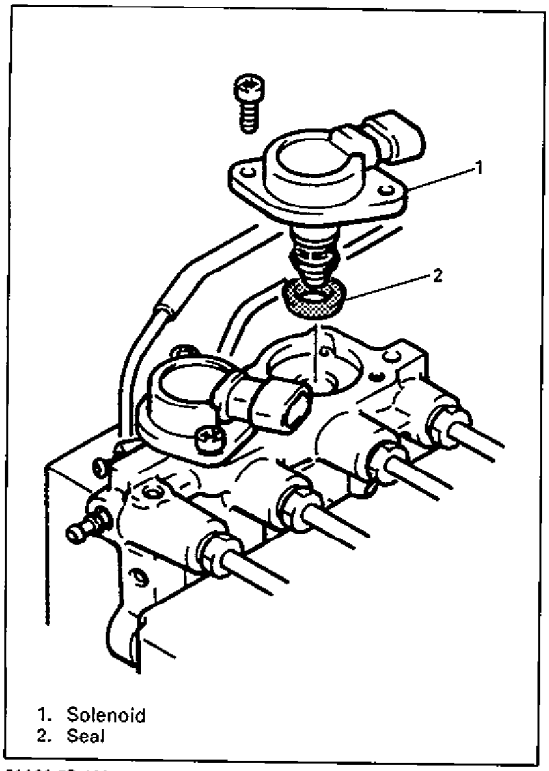
INSTALLATION

Install ABS actuator assembly in reverse order of REMOVAL procedure, noting the following points:

- Torque all fasteners to specifications.

  Tightening Torque
  (a): 10 N·m (1.0 kg-m, 7.5 lb-ft)
  (b): 16 N·m (1.6 kg-m, 11.5 lb-ft)

- After installing, bleed air from brake system.
  Refer to "BLEEDING BRAKES" earlier in this section.



1. Solenoid
2. Seal

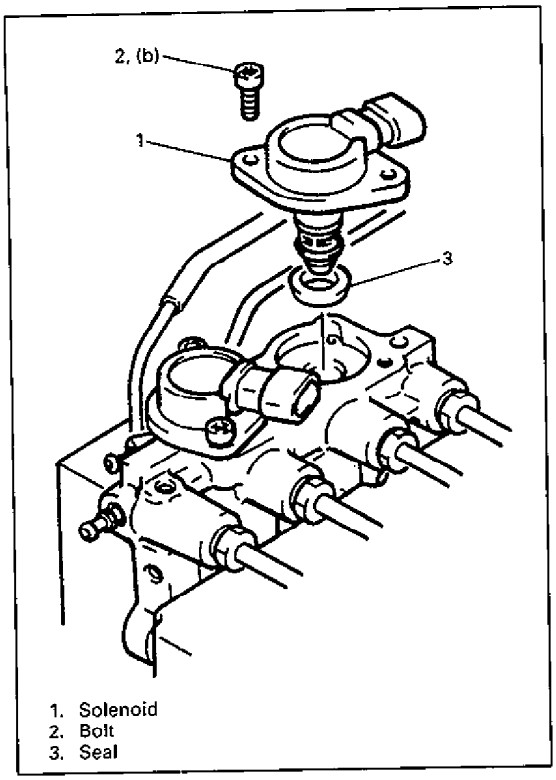
61A30-5B-133-4

ABS SOLENOID

REMOVAL

1) Disconnect battery negative cable from battery.
2) Disconnect solenoid harness connector(s).
3) Remove solenoid(s).

NOTE:
Be sure that the seal is still attached to the solenoid when it is removed. If not, check the solenoid bore in the ABS actuator.



1. Solenoid
2. Bolt
3. Seal

61A30-5B-134-1

INSTALLATION

1) Install solenoid on ABS actuator.

NOTE:

- **Lubricate solenoid seal with clean brake fluid.**
- **Verify that the solenoid lip seal is properly positioned before solenoid is installed in the ABS actuator.**
- **Position solenoid so that its electrical connector faces the same direction as prior to removal.**
- **Press the solenoid down firmly by hand until its flange seats on the ABS actuator.**

2) Tighten solenoid mounting bolts.

Tightening Torque
(b): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

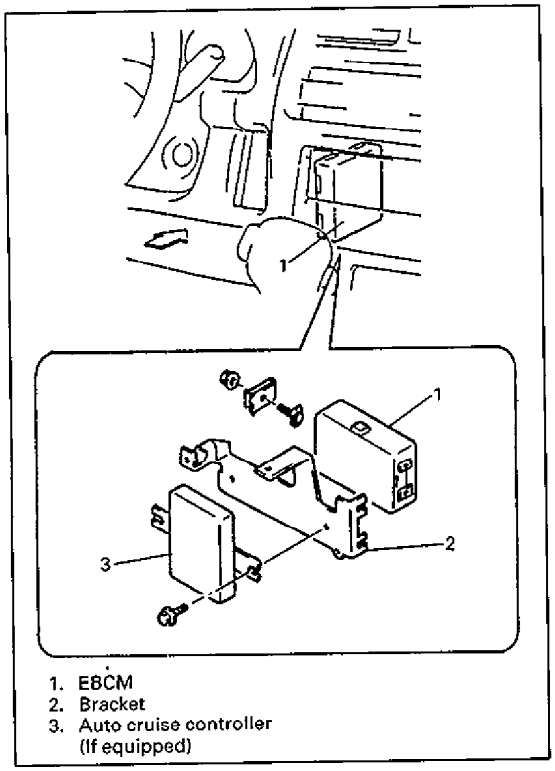
3) Connect solenoid harness connector.
4) Connect battery negative cable to battery.
5) Bleed brake system. Refer to "Bleeding System" earlier in this section.

ELECTRONIC BRAKE CONTROL MODULE (EBCM)

CAUTION:
As EBCM has many delicate parts, be careful not to subject it to excessive shock.

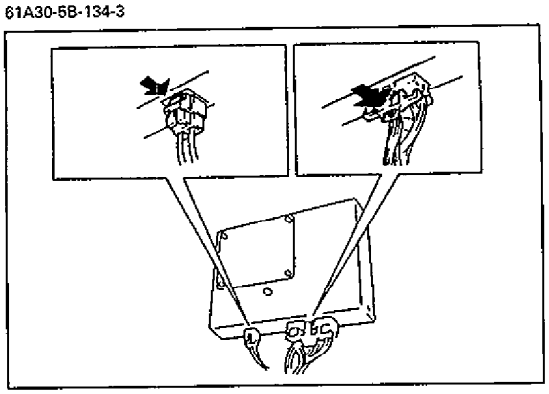
REMOVAL

1) Disconnect battery negative cable from battery.
2) Remove steering column hole cover.
3) Remove auto cruise controller (If equipped).



1. EBCM
2. Bracket
3. Auto cruise controller (If equipped)

61A30-5B-134-3

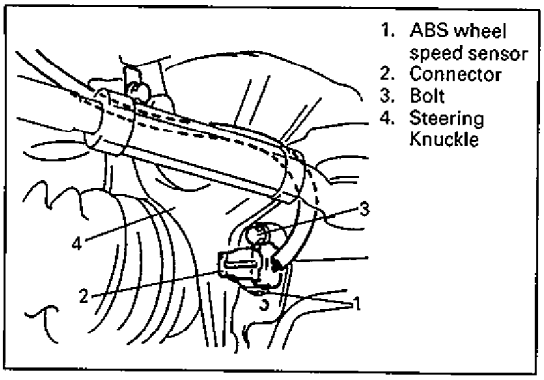


61A30-5B-134-5

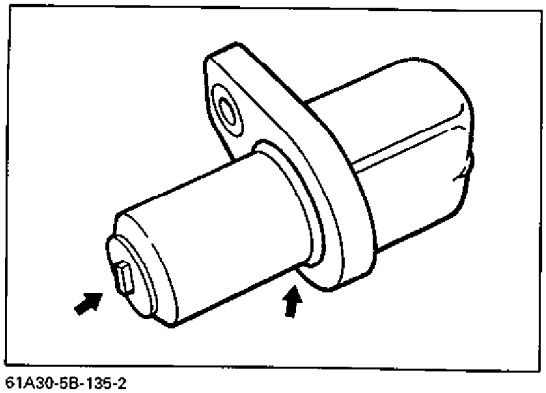
4) Disconnect EBCM connectors.
5) Remove EBCM with bracket.

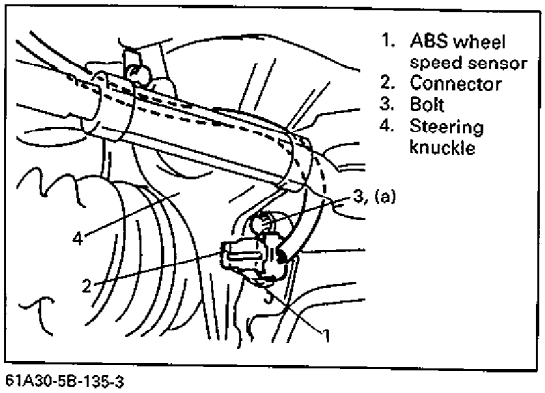
INSTALLATION

Install parts in reverse order of REMOVAL procedure.

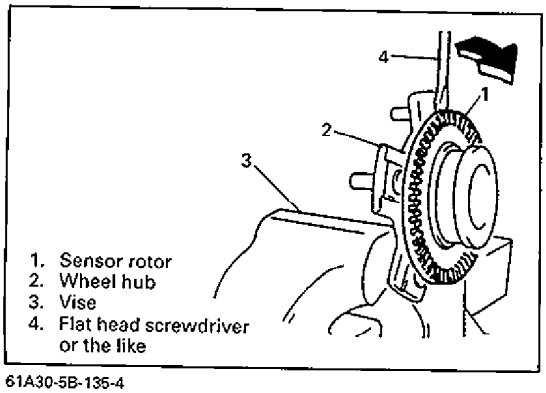


61A30-5B-135-1

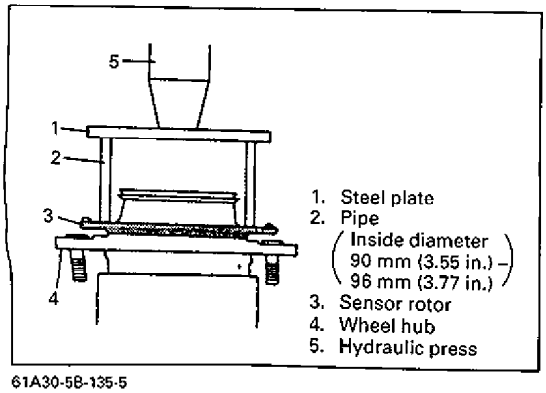

61A30-5B-135-2



61A30-5B-135-3



61A30-5B-135-4



61A30-5B-135-5

FRONT WHEEL SPEED SENSOR

NOTE:
Front wheel speed sensor is serviceable only as an assembly.

REMOVAL

1) Disconnect battery negative cable from battery.
2) Hoist vehicle.
3) Disconnect sensor connector.
4) Remove front wheel speed sensor from steering knuckle.

INSTALLATION

1) Before installation, check following:
   - Check to make sure that sensor tooth is free form any metal particles.
2) Install front wheel sensor to steering knuckle.
3) Tighten sensor bolt to specified torque.

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

4) Connect sensor connector securely.
5) Lower hoist and connect battery negative cable to battery.

FRONT WHEEL SPEED SENSOR RING

REMOVAL

1) Remove wheel hub with sensor rotor. Refer to SECTION 3D FRONT SUSPENSION of service manual mentioned in FOREWORD of this manual.
2) Remove sensor rotor from wheel hub as shown.

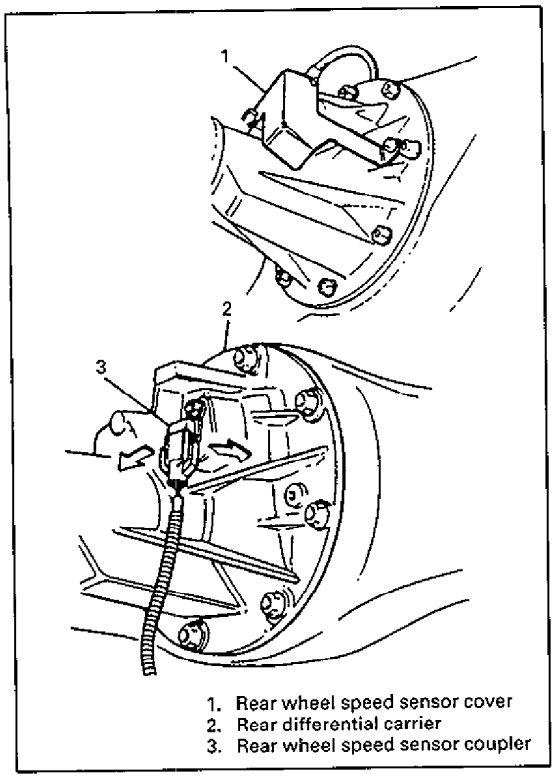
CAUTION:
Pull sensor rotor out from wheel hub gradually and evenly. Attempting to pull it out partially may deform it.

INSTALLATION

1) Install sensor rotor as shown.

   NOTE:
   - **Pipe used here should have inner diameter of 90 mm (3.55 in.) – 96 mm (3.77 in.) and its outside should not contact teeth of sensor rotor.**
   - **Use care not to insert wheel hub diagonally.**

2) Install wheel hub, brake disc, brake caliper, locking hub and wheel. Refer to SECTION 3D FRONT SUSPENSION of service manual mentioned in FOREWORD of this manual.



1. Rear wheel speed sensor cover
2. Rear differential carrier
3. Rear wheel speed sensor coupler

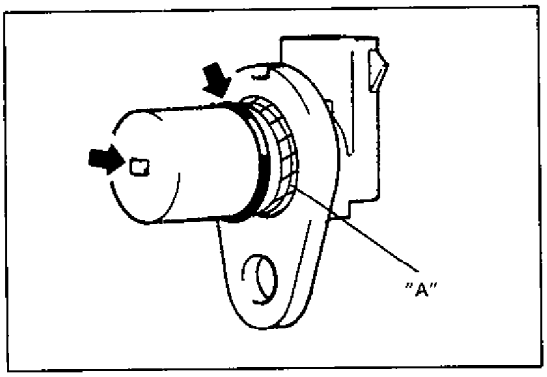
61A30-5B-136-1

REAR WHEEL SPEED SENSOR

NOTE:
Rear wheel speed sensor is serviceable only as an assembly.

REMOVAL

1) Disconnect battery negative cable from battery and hoist vehicle.
2) Remove sensor cover.
3) Disconnect connector and remove sensor from differential carrier.

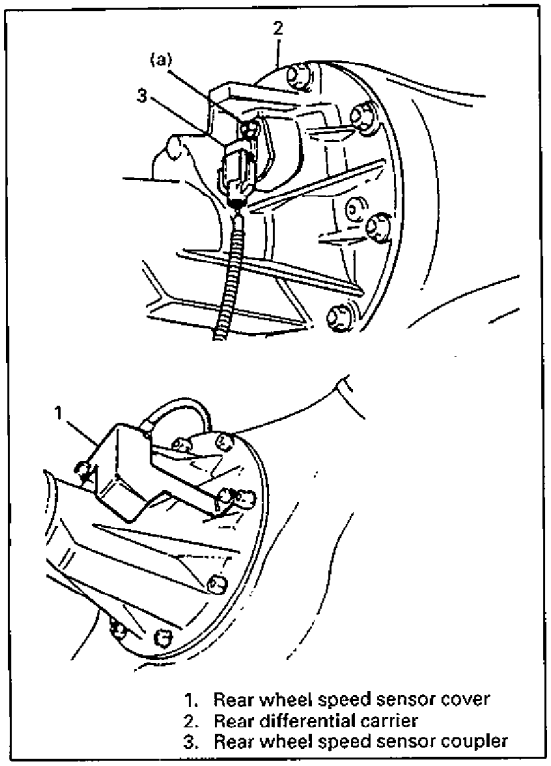


61A30-5B-136-3

INSTALLATION

1) Before installation, check followings:
   - Check O ring for damage and deterioration. Replace if necessary.
   - Check to make sure that sensor tooth is free from any metal particles.
2) Install sensor to differential carrier. Apply sealant to sensor as shown and coat O ring with thin film of differential oil.

   "A": Sealant 99000-31110



1. Rear wheel speed sensor cover
2. Rear differential carrier
3. Rear wheel speed sensor coupler

61A30-5B-136-4

3) Tighten sensor bolt to specified torque.

   Tightening Torque
   (a): 21 N·m (2.1 kg-m, 15.5 lb-ft)

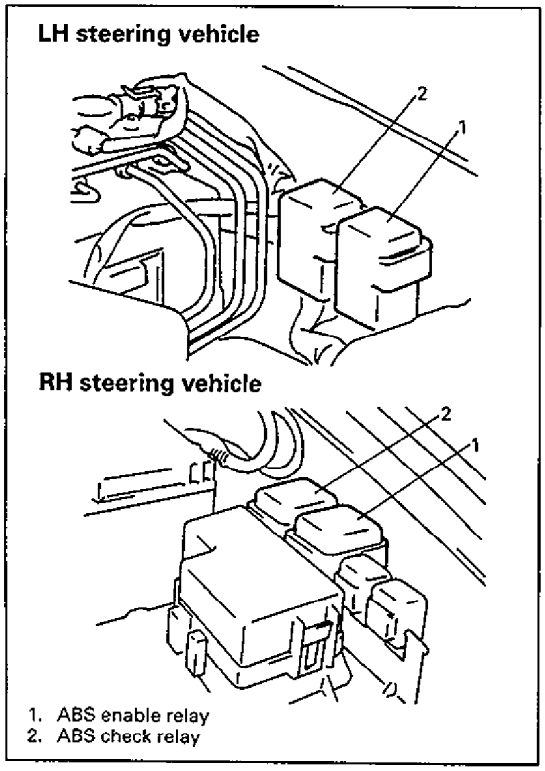
4) Connect connector securely.
5) Install sensor cover.
6) Lowe hoist and connect battery negative cable to battery.

REAR WHEEL SPEED SENSOR RING (EXCITER RING)

REMOVAL & INSTALLATION

For removal & installation of rear wheel speed sensor ring, refer to SECTION 7E DIFFERENTIAL(FRONT & REAR) of this manual.

61A10-5B-137-1



1. ABS enable relay
2. ABS check relay

61A30-5B-137-2

ABS ENABLE RELAY / ABS CHECK RELAY (LAMP DRIVE RELAY)

REMOVAL

1) Disconnect battery negative cable.
2) Remove relay(s) from bracket.
3) Disconnect relay(s) at connector.

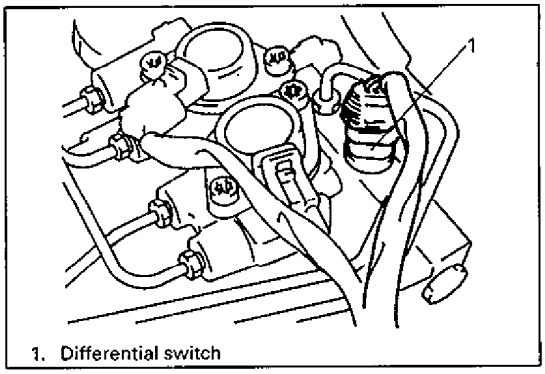
INSTALLATION

Install parts in reverse order of REMOVAL procedure.

4WD SWITCH

For removal, inspection and installation of this switch, refer to SECTION 7D of Service Manual mentioned in FOREWORD of this manual.

61A10-5B-138-1



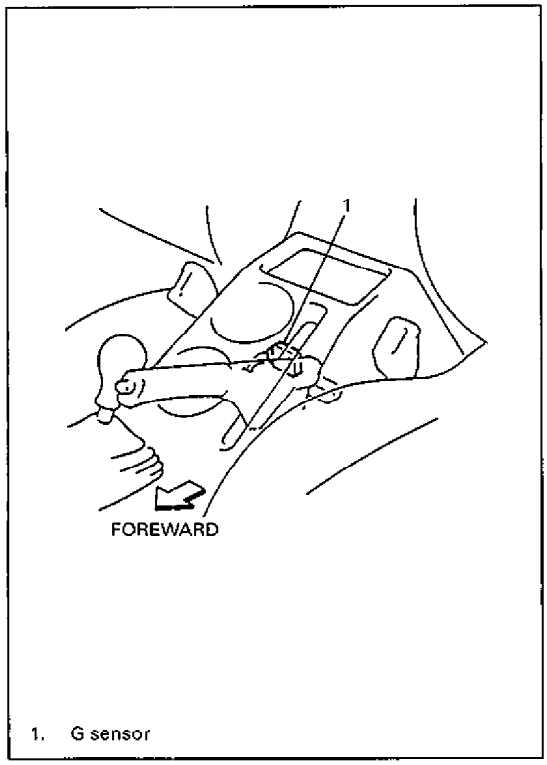
1. Differential switch

DIFFERENTIAL SWITCH

(included in P/Differential valve ass'y)

Differential switch, which is one of ABS actuator component and unremovable, must be serviced as ABS actuator. For removal and installation of ABS actuator, refer to item "ABS ACTUATOR ASSEMBLY REPAIR" of this section.

61A30-5B-138-2



1. G sensor

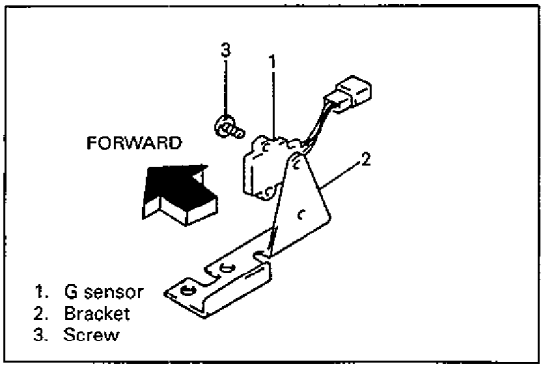
G SENSOR (ACCELEROMETER)

REMOVAL

1) Turn ignition switch "OFF" and disconnect battery negative cable.
2) Remove rear center console box.
3) Disconnect sensor connector.
4) Remove sensor from bracket.

CAUTION:
Sensor must not be dropped or shocked. It will affect its original performance.

61A30-5B-138-5

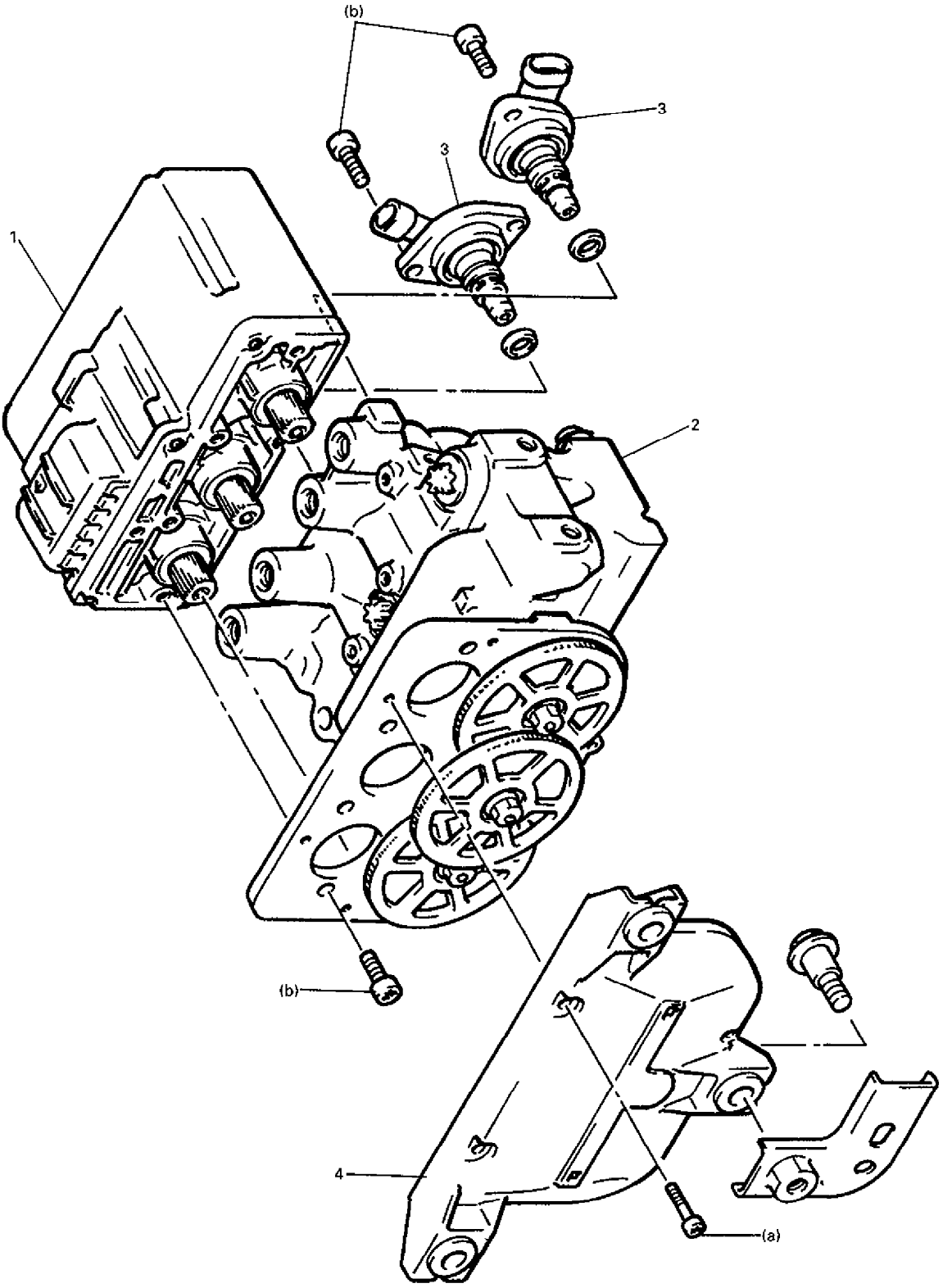


1. G sensor
2. Bracket
3. Screw

INSTALLATION

1) Install sensor to bracket as shown figure.
2) Connect sensor connector securely.
3) Install rear console box.
4) Connect battery negative cable.

ABS ACTUATOR ASSEMBLY (HYDRAULIC MODULATOR/MOTOR PACK ASSEMBLY) REPAIR



1. Motor pack
2. ABS actuator (Hydraulic modulator)
3. Solenoid
4. Under cover

Tightening Torque
(a): 4 N·m (0.4 kg-m, 3.0 lb-ft)
(b): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

WARNING:
To help avoid personal injury, due to a retained load on the ABS actuator assembly, the gear tension relief function of the TECH-1 must be performed prior to removal of the ABS actuator.

50G00-5B-196-1S

UNDER COVER

REMOVAL

Remove under cover mounting bolts and under cover.

50G00-5B-196-2S

INSTALLATION

Install under cover and mounting bolt, referring to above figure.

Tightening Torque
(a): 4 N·m (0.4 kg-m, 3.0 lb-ft)

50G00-5B-196-3S

MOTOR PACK

REMOVAL

1) Remove under cover.
2) Remove motor pack mounting bolts and motor pack from ABS actuator.

NOTE:
- **Use care when handling motor pack to ensure motor pack connector is not damaged, or accidental intrusion of brake fluid into the motor pack does not occur. This may result in failure of the motor pack.**
- **Take care in handling the motor pack. If dropped or damaged during handling, the motor pack must be replaced.**
- **If disassembly of the ABS actuator assembly was due to a ABS hydraulic functional test (Hydraulic control test) that did not pass, the "Automated Motor Pack Diagnosis Test (Motor Test)" described earlier in this section should be performed at this time to isolate the motor pack or ABS actuator.**
- **No repair of the motor pack is authorized. Replace as an assembly.**

INSTALLATION

NOTE:
With the ABS actuator upside down, and the gears facing you, rotate each ABS actuator gear counterclockwise until movement stops. This procedure will position the pistons very close to the top of the modulator bore, simplifying the brake bleeding procedure.

50G00-5B-197-1S

1) Install motor pack to ABS actuator, referring to above figure.

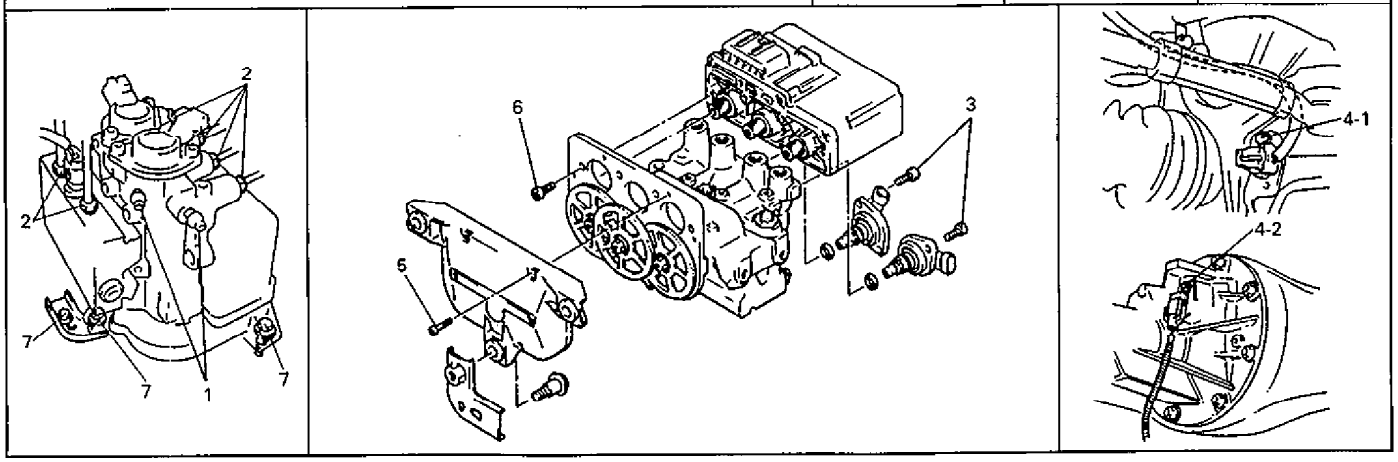
   Tightening Torque
   (b): 4.5 N·m (0.45 kg-m, 3.5 lb-ft)

2) Install under cover.
   Refer to item "UNDER COVER".

50G00-5B-197-2S

TIGHTENING TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Brake bleeder plug	11	1.1	8.0
2. Brake pipe flare nut	16	1.6	11.5
3. ABS solenoid mounting bolt	4.5	0.45	3.5
4-1. Front wheel speed sensor mounting bolt	10	1.0	7.5
4-2. Rear wheel speed sensor mounting bolt	21	2.1	15.5
5. ABS actuator under cover mounting bolt	4.0	0.4	3.0
6. ABS motor pack mounting bolt	4.5	0.45	3.5
7. ABS actuator assembly mounting bolt	10	1.0	7.5



61A30-5B-142-1

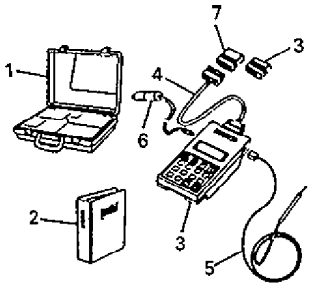
REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Brake fluid	Indicated on reservoir cap or described in owner's manual of vehicle	• To fill master cylinder reservoir. • To clean and apply to solenoid seal when it is removed

50G00-5B-198-2S

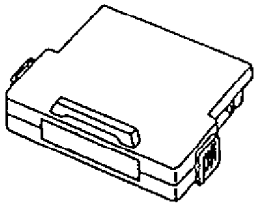
SPECIAL TOOLS

09950-78210
Flare nut wrench
(10 mm)

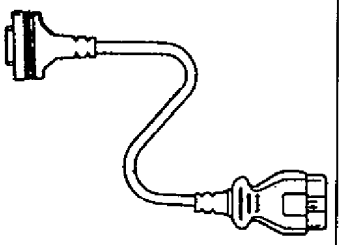


09931-76011
Tech-1 (scan tool) kit

1. Storage case
2. Operator's manual
3. Tech 1A
4. DLC cable (14/26 pin) 09931-76040
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor



Tech-1 cartridge for ABS/ AIR BAG



09931-76030
16/14 pin DLC cable

61A30-5B-143-1

SECTION 5B1

ANTILOCK BRAKE SYSTEM (ABS) (OPTIONAL)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed 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.

5B1

CONTENTS

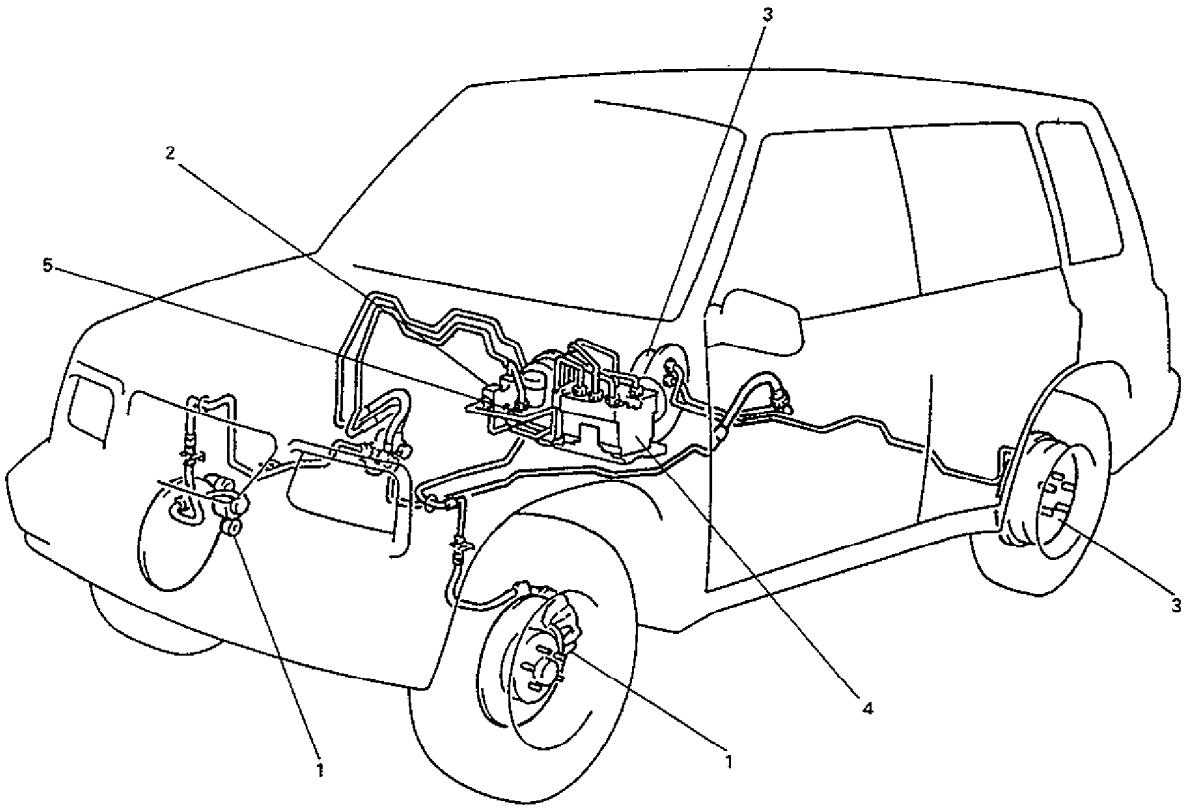
61A10-5B1-2-1

GENERAL DESCRIPTION

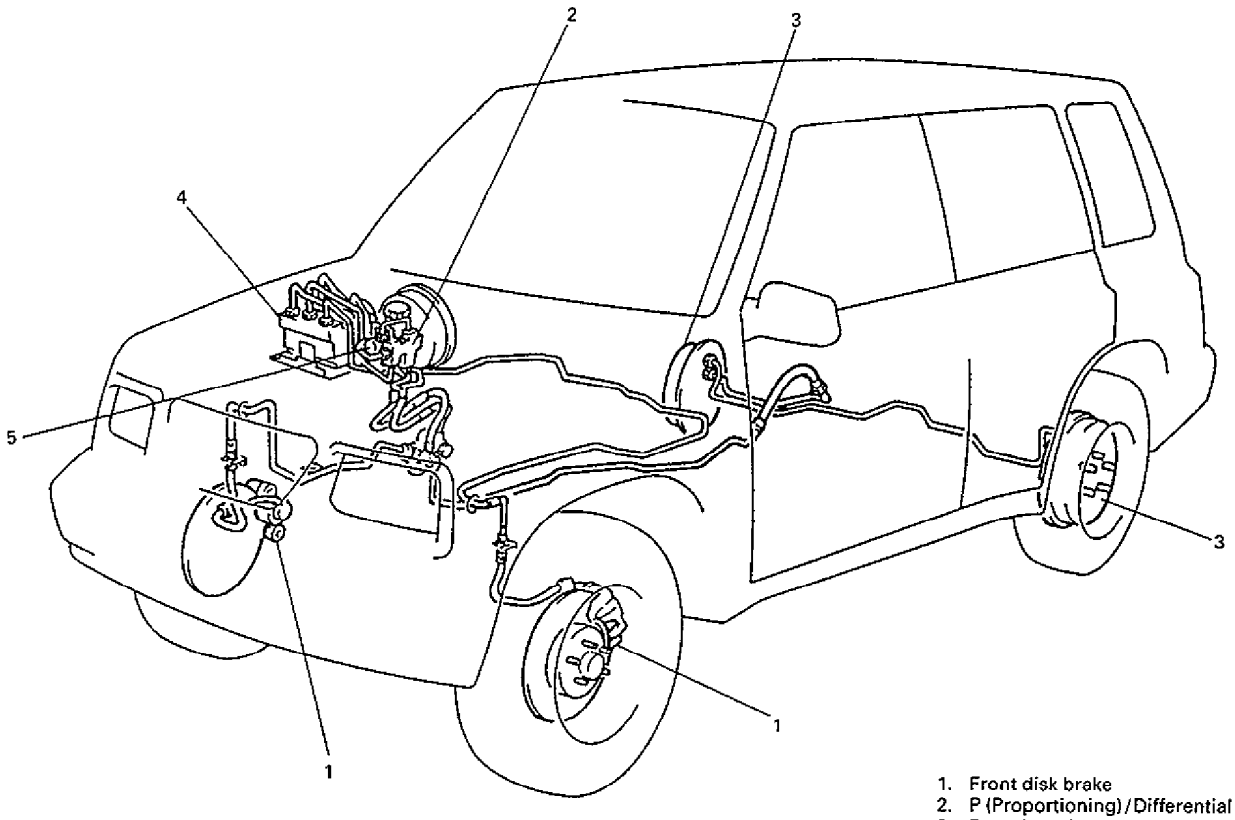
The ABS (Antilock Brake System) controls the fluid pressure applied to the wheel cylinder of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied. This ABS is a 4-wheel type which controls the fluid pressure applied to the wheel cylinder of each of the 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.
- 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.
- G sensor which detects body deceleration speed.

For LH Steering Vehicle

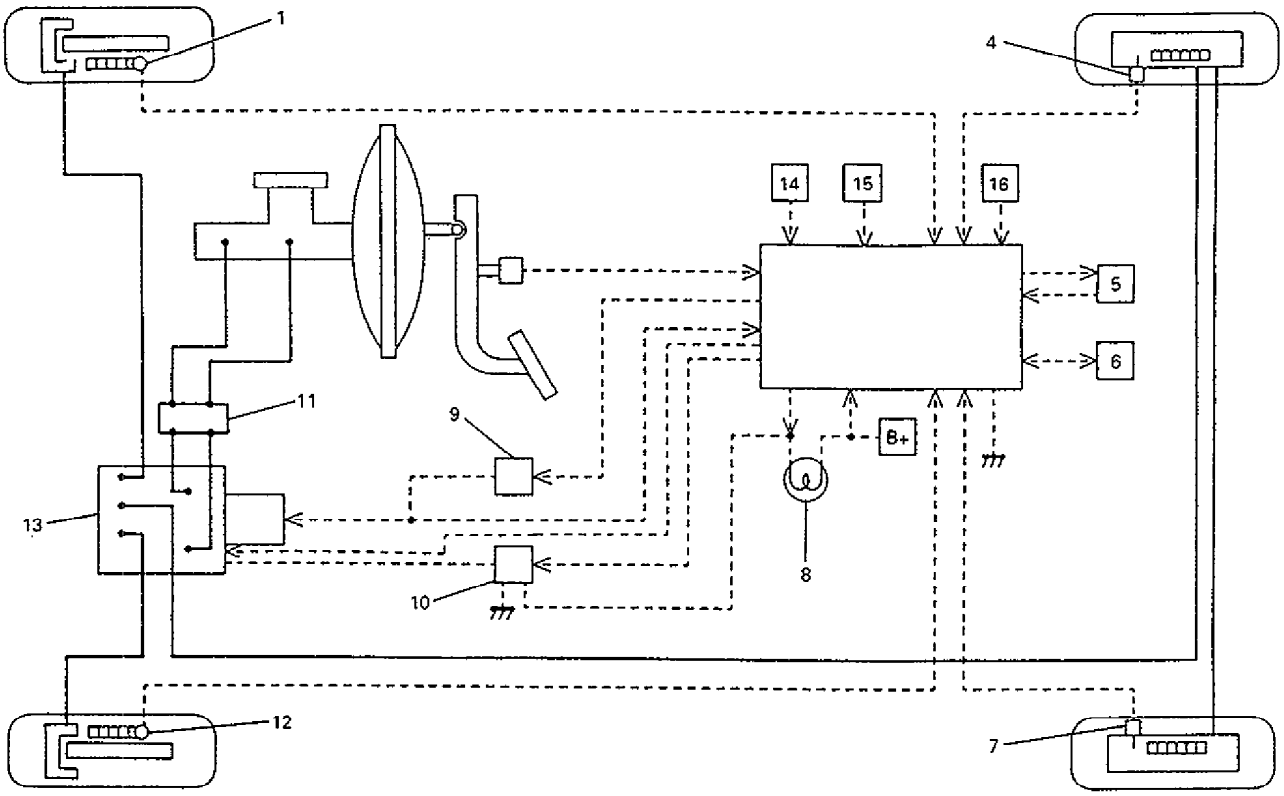


For RH Steering Vehicle

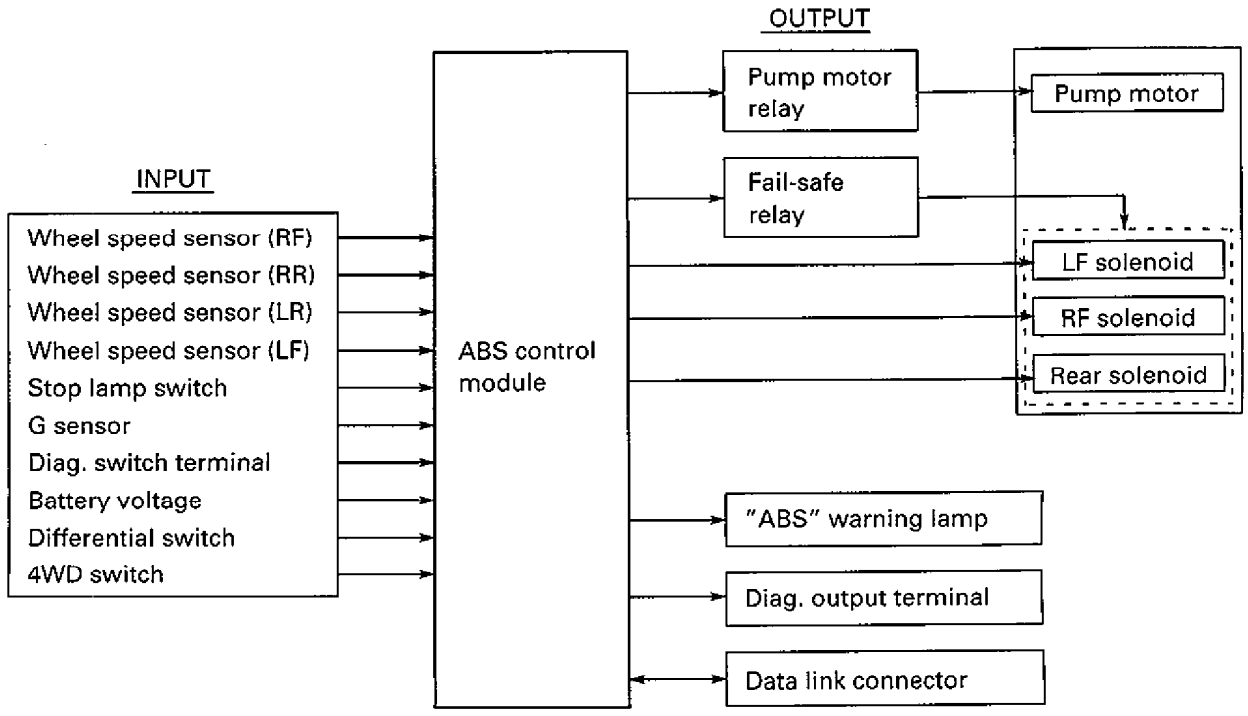


1. Front disk brake
2. P (Proportioning) / Differential valve
3. Rear drum brake
4. ABS hydraulic unit
5. Brake master cylinder / Reservoir

SYSTEM SCHEMATIC

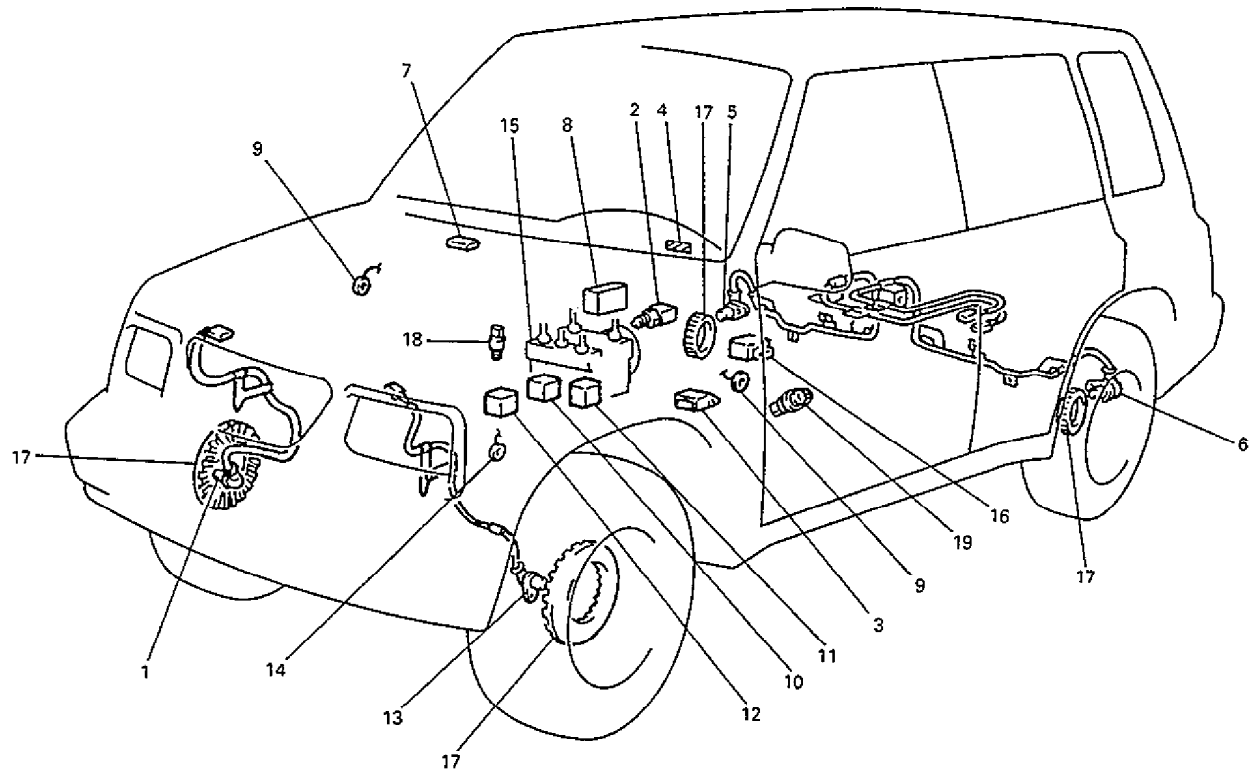


1. Wheel speed sensor (Right-front)
2. Stop lamp switch
3. ABS control module
4. Wheel speed sensor (Right-rear)
5. DIAG-2 connector
6. Data link connector
7. Wheel speed sensor (Left-front)
8. "ABS" warning lamp
9. ABS pump motor relay
10. ABS fail-safe relay (Solenoid valve relay)
11. P&differential valve
12. Wheel speed sensor (Left-front)
13. ABS hydraulic unit
14. G sensor
15. Differential switch
16. 4WD switch

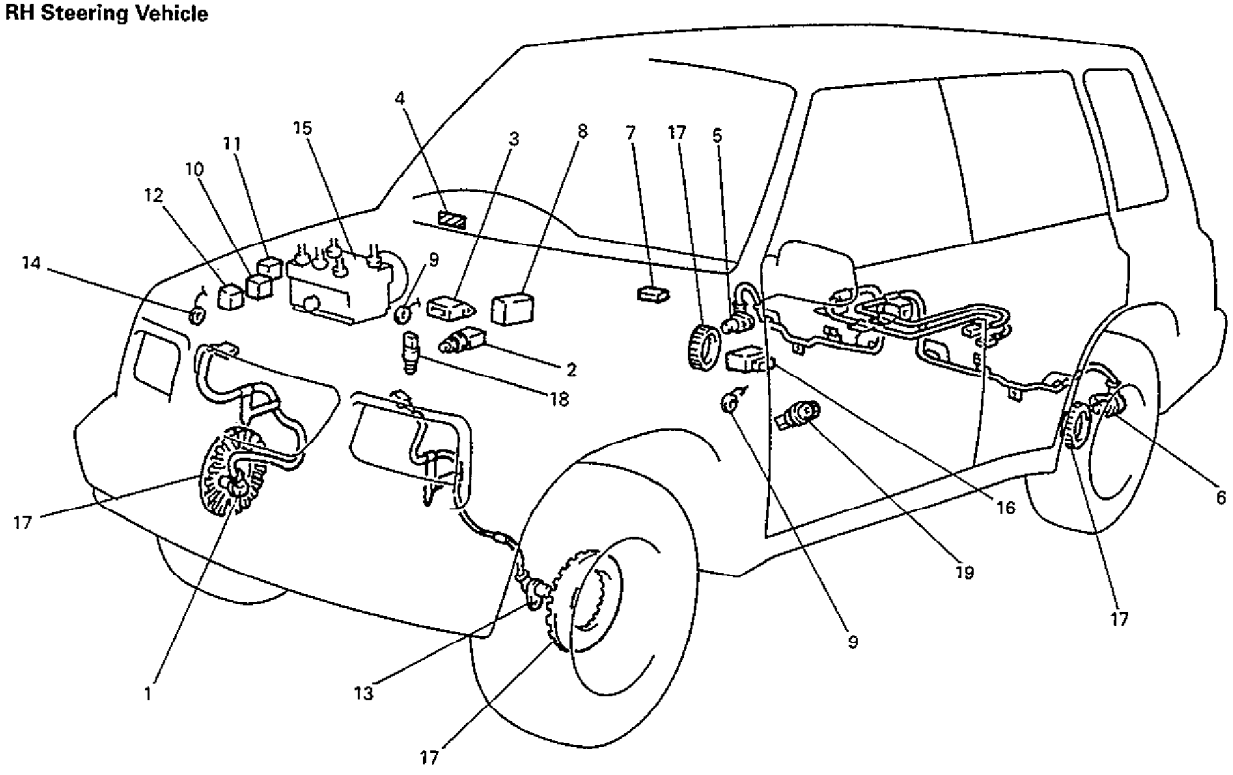


ABS COMPONENT PARTS LOCATION

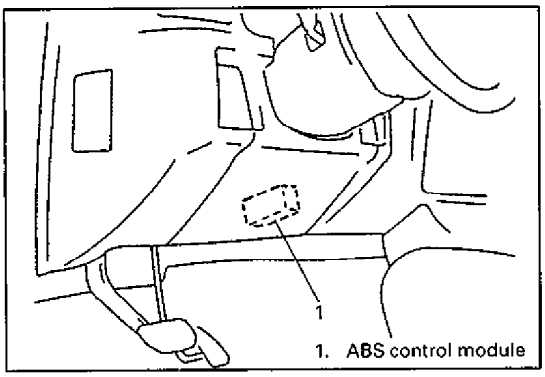
For LH Steering Vehicle



For RH Steering Vehicle



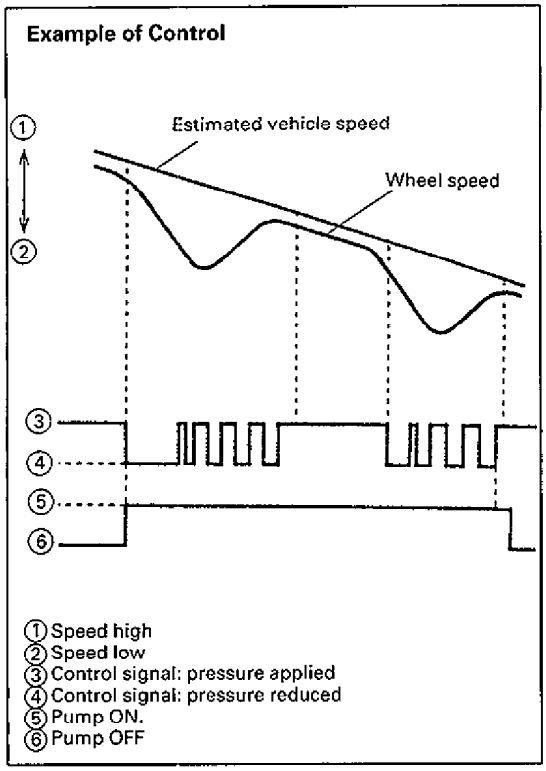
1. Wheel speed sensor (Right-front)
2. Stop lamp switch
3. Data link connector
4. "ABS" warning lamp
5. Wheel speed sensor (Right-rear)
6. Wheel speed sensor (Left-rear)
7. Diode
8. ABS control module
9. Ground for ABS control module and 4WD switch
10. ABS fail-safe relay (Solenoid valve relay, Connected 5 wire harness)
11. DIAG-2 connector (Black connector)
12. ABS pump motor relay (Connected 4 wire harness)
13. Wheel speed sensor (Left-front)
14. Ground for ABS pump motor
15. ABS hydraulic unit
16. G sensor
17. Wheel speed sensor rotor (ring)
18. Differential switch
19. 4WD switch



61A10-5B1-6-1

ABS CONTROL MODULE

ABS control module is installed under the instrument panel at the driver's side.
Its main function is to control ABS hydraulic unit to prevent the wheel from getting locked when braking but it also has a self-diagnosis function and fail-safe function.



60G00-5B-6-2

Hydraulic Unit Control (Wheel Speed Control)

ABS control module monitors the speed of each of 4 wheels, deceleration speed of each of 4 wheels and the vehicle deceleration speed through signals from 4 wheel speed sensors and outputs control signal to each solenoid valve of the hydraulic unit to prevent it from getting locked. Also, it operates the pump motor all the time while the anti-lock control function is working.

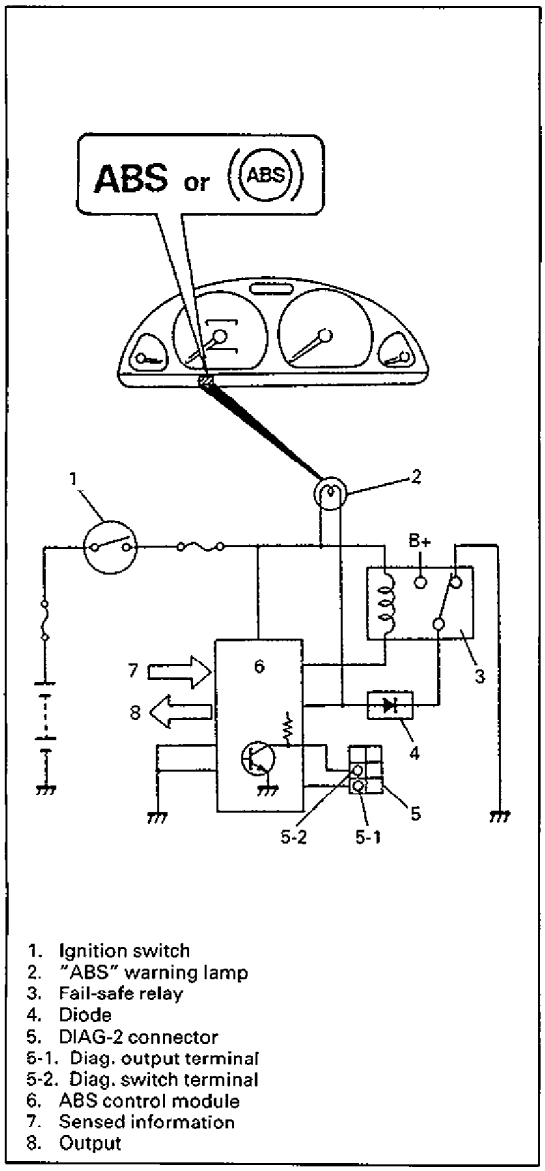
Self-Diagnosis Function

ABS control module diagnoses conditions of the system component parts (whether or not there is any abnormality) all the time and indicates the results (warning of abnormality occurrence and DTC) through the "ABS" warning lamp and outputs it through the Diag. output terminal as described below.

60G00-5B-6-4

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 (the system is in good condition), "ABS" warning lamp turns OFF after 2 seconds.
3) When the vehicle starts to move after the ignition switch is turned ON (more than one wheel speed sensor signals are inputted), solenoid valves and motors 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.

60G00-5B-6-5



1. Ignition switch
2. "ABS" warning lamp
3. Fail-safe relay
4. Diode
5. DIAG-2 connector
5-1. Diag. output terminal
5-2. Diag. switch terminal
6. ABS control module
7. Sensed information
8. Output

61A10-5B1-7-1

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 of EEPROM in ABS control module.
5) When Diag. switch terminal of DIAG-2 connector (monitor connector) is grounded, the abnormal area is output as DTC from Diag. output terminal. When DTC output is normal DTC 12 or history DTC only, it is also indicated by flashing of "ABS" warning lamp. (Refer to the table below.)

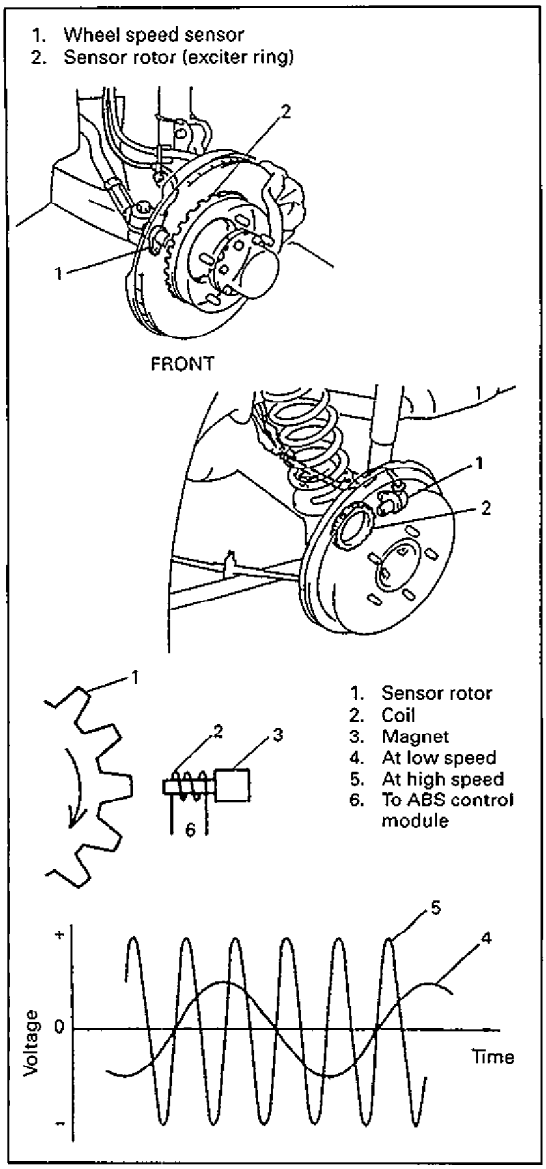
SYSTEM CONDITION		DTC OUTPUT	
		"DIAG" OUTPUT TERMINAL	"ABS" WARNING LAMP
In good condition at present	No trouble in the past	DTC 12	DTC 12
	Trouble occurred in the past	History DTC	History DTC
Abnormality exists at present	No trouble in the past	Current DTC	Lighting
	Trouble occurred in the past	Current and history DTCs	Lighting

For procedure to clear all DTC's, refer to the 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.

60G00-5B-7-4

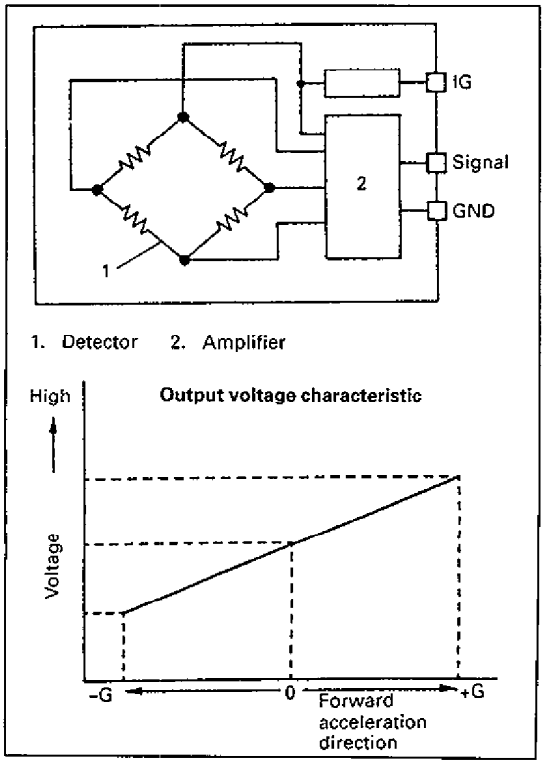


61A10-5B1-8-1

WHEEL SPEED SENSOR AND ROTOR

The wheel speed sensor consisting of a magnet and a coil is installed to each of the knuckles (front) and axle housing (rear). The sensor rotor (exciter ring) is installed to each of the right and left wheel hub (front) as well as to the right and left rear axle shaft (rear). A specified amount of clearance (air gap) is provided between the sensor and rotor for their installation. When the rotor with serration (tooth) turns, the magnetic flux emitted from the magnet of the speed sensor varies and an alternate current voltage occurs in the coil. As the frequency of this alternate current voltage varies in proportion with the revolution speed of wheels, each wheel speed is detected from it.

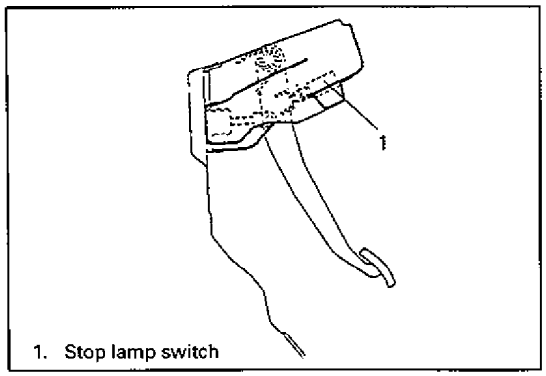
NOTE:
Clearance between the sensor and the rotor (ring) cannot be adjusted.



61A10-5B1-8-4

G SENSOR

The G sensor installed to the floor beside the parking brake lever detects the vehicle deceleration speed.
It is a distortion gauge type semi-conductor sensor consisting of a detector and an amplifier circuit. As the vehicle speed changes, distortion occurs and the resistance of the distortion gauge varies according to that distortion. This resistance is converted into voltage in the bridge circuit and in this way, deceleration speed of the vehicle body is detected. (ABS control module detects whether the vehicle stops or moves).



1. Stop lamp switch

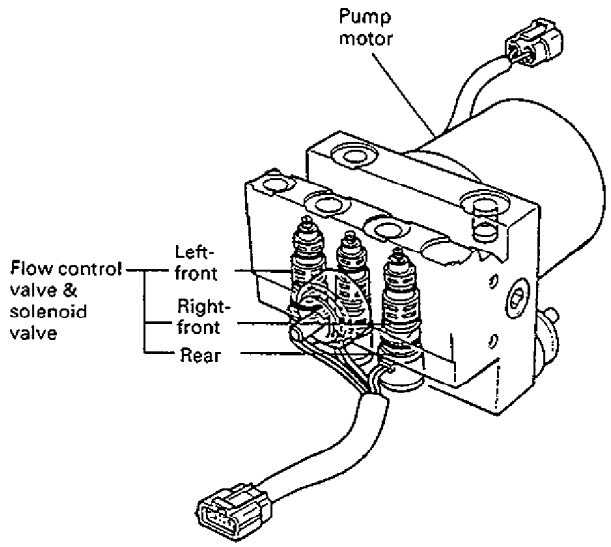
60G00-5B-9-1

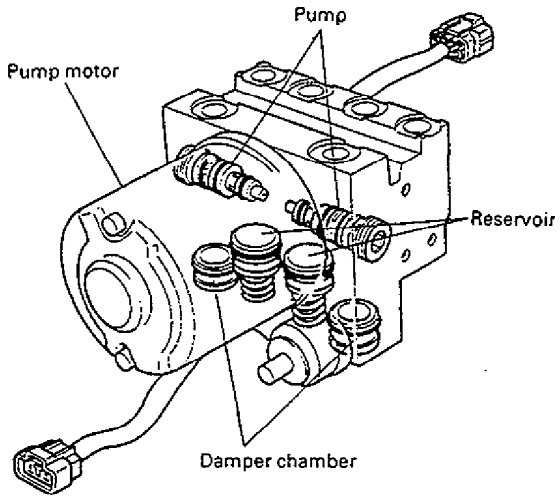
STOP LAMP SWITCH

The switch turns ON when the brake pedal is depressed. The ABS control module uses this signal as one of the signals for ABS hydraulic operation check.

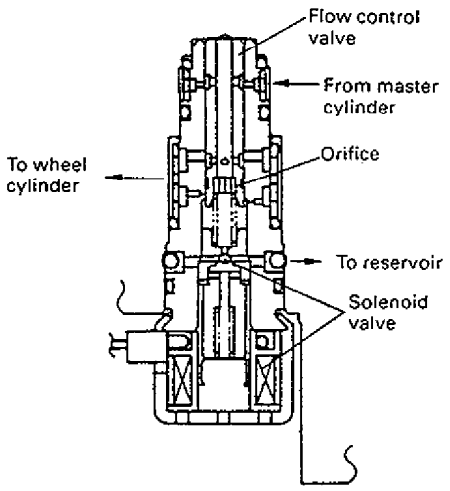
ABS HYDRAULIC UNIT

The ABS hydraulic unit consists of solenoid valves, flow control valves, reservoirs, pumps, pump motor, etc. Based on signals from the ABS control module, it controls the fluid pressure applied to the wheel cylinder of each brake.

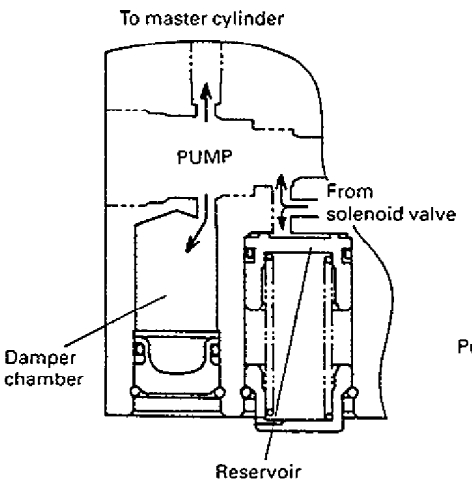




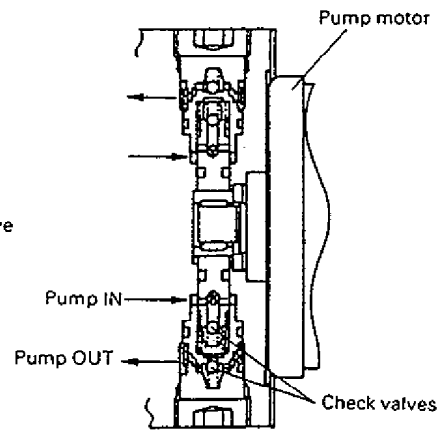
FLOW CONTROL VALVE & SOLENOID VALVE



RESERVOIR / DAMPER CHAMBER



PUMP

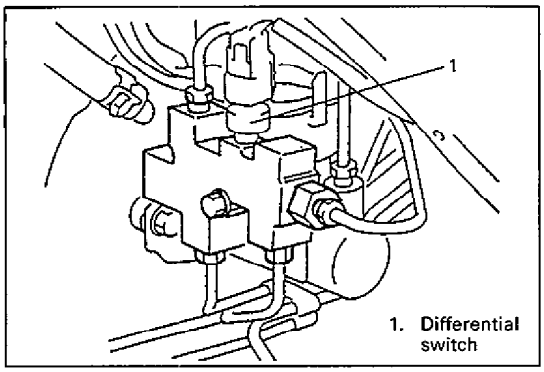


61A10-5B1-9-2

4WD SWITCH

This switch, mounted on the transfer case, turns "ON" when the transfer shift lever is in either four-wheel drive position: "4H" or "4L". At the same time, the indicator light in combination meter comes on when ignition switch is in the "ON" position.
ABS control module uses this signal as one of the signals for ABS control.

61A10-5B1-10-1



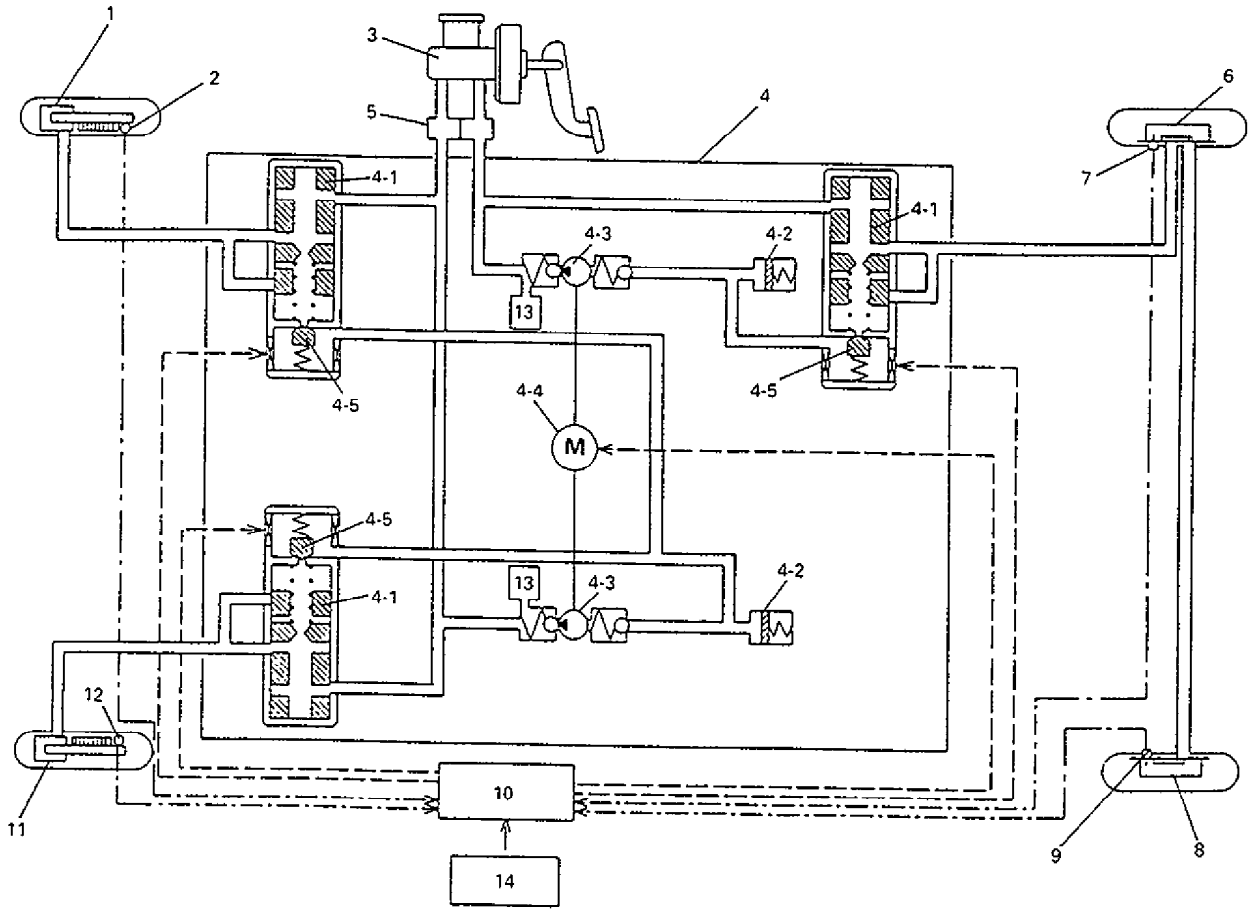
1. Differential switch

61A10-5B1-10-2

DIFFERENTIAL SWITCH

For general description and operation of this switch, refer to SECTION 5A2 of this manual.

SYSTEM OPERATION

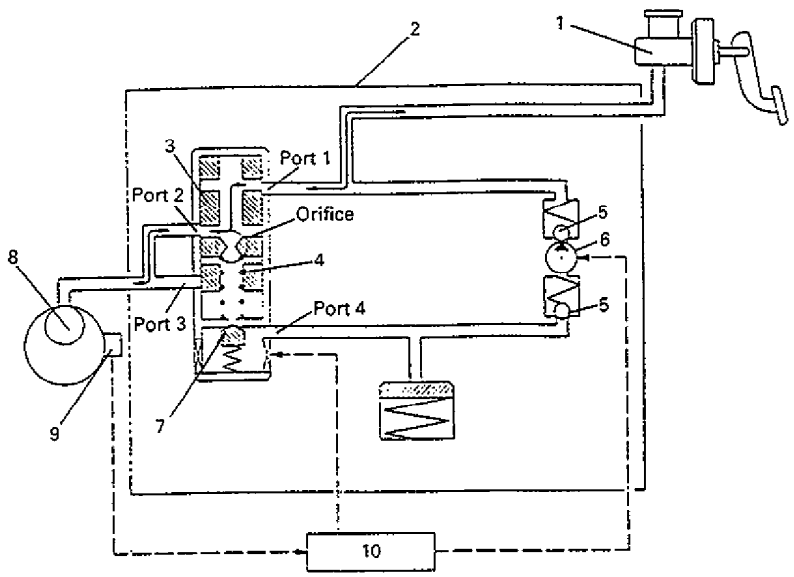


1. Right-front disc brake
2. Wheel speed sensor (Right-front)
3. Master cylinder
4. ABS hydraulic unit
4-1. Flow control valve
4-2. Reservoir
4-3. Pump
4-4. Pump motor
4-5. Solenoid valve
5. Proportioning valve (equipped with differential valve)
6. Right-rear drum brake
7. Wheel speed sensor (Right-rear)
8. Left-rear drum brake
9. Wheel speed sensor (Left-rear)
10. ABS control module
11. Left-front disc brake
12. Wheel speed sensor (Left-front)
13. Damper chamber
14. G sensor

All four wheels at right-front, left-front, right-rear and left-rear are subject to anti-lock control of this ABS. The following description of operation, however, describes only one of four wheels which are controlled independently and it is applicable to other three wheels.

When ABS is not Operating (Normal braking operation)

As no signal is fed from ABS control module and the solenoid valve is not energized, the solenoid valve and the flow control valve are pushed by the spring and prevented from operating. In this state, the fluid pressure from the master cylinder passes through the passage in the flow control valve (through Port 1 and Port 2) to the wheel cylinder as it is.

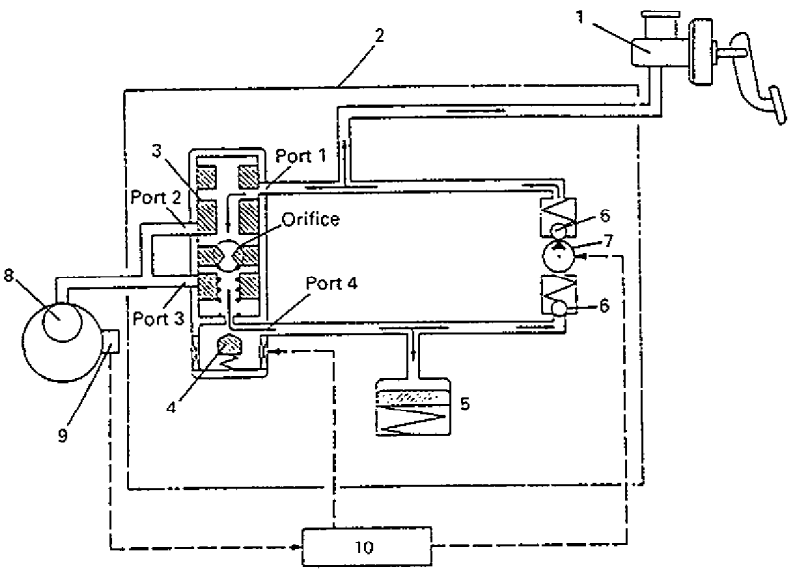


1. Master cylinder
2. ABS hydraulic unit
3. Flow control valve
4. Spring
5. Check valve
6. Pump
7. Solenoid valve
8. Wheel cylinder
9. Wheel speed sensor
10. ABS control module

60G00-5B-11-1

When ABS is Operating (Reduced pressure mode)

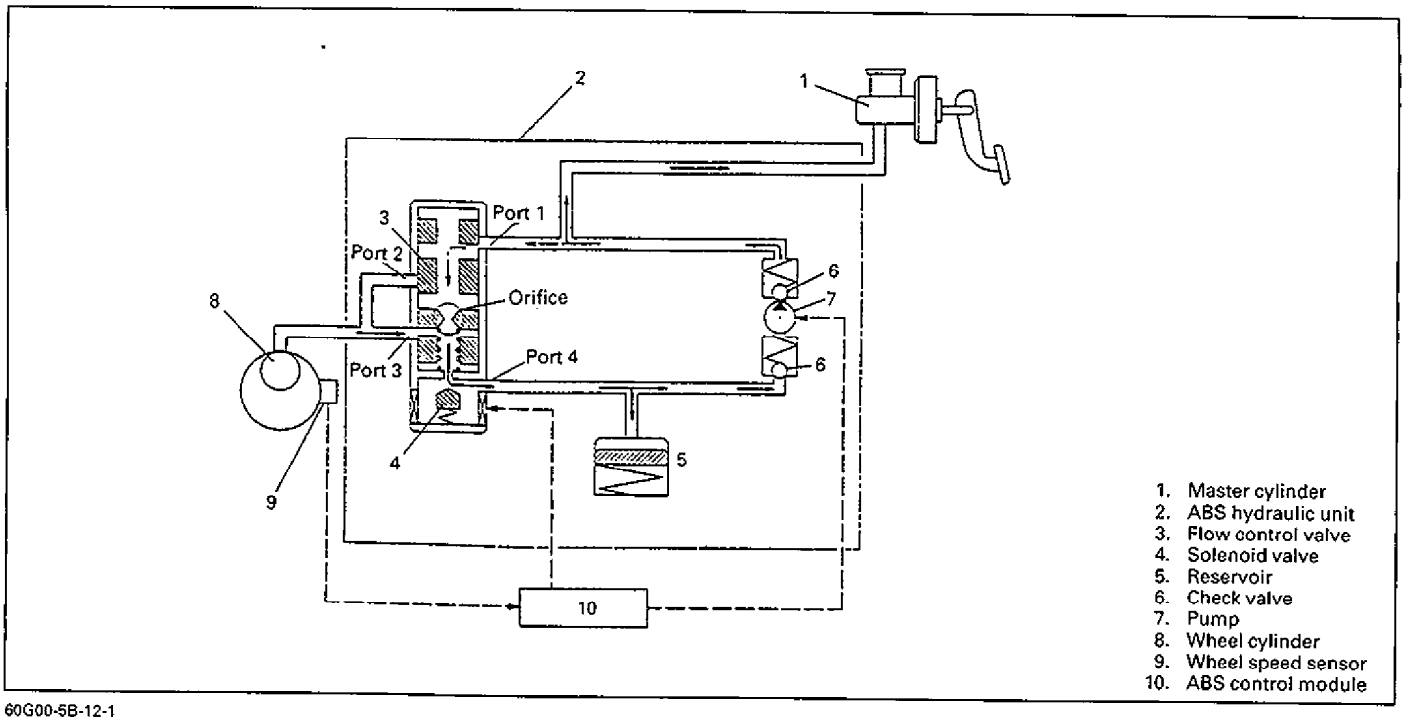
When the wheel is about to lock, ABS control module opens the solenoid valve. At this time the brake fluid which remained under the orifice flows through Port 4 into the reservoir. Then, the pressure under the orifice becomes lower than that above it and the flow control valve is pushed down. As a result, Port 2 is closed to shut off the fluid pressure (fluid flow) to the wheel cylinder for an instant.



1. Master cylinder
2. ABS hydraulic unit
3. Flow control valve
4. Solenoid valve
5. Reservoir
6. Check valve
7. Pump
8. Wheel cylinder
9. Wheel speed sensor
10. ABS control module

60G00-5B-11-2

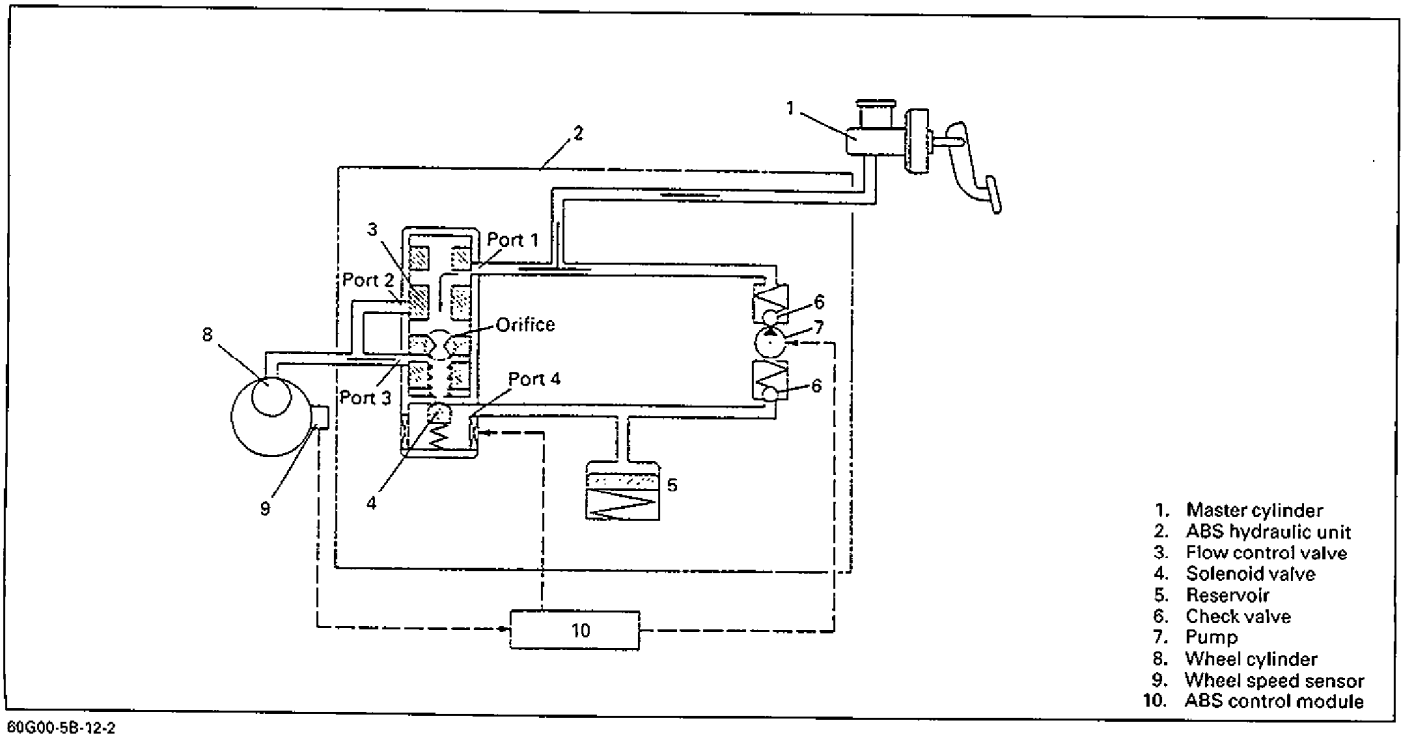
And, when the difference between pressures under and above the orifice continues to increase further than that in previous state, the flow control valve is pushed lower and Port 3 opens. Then the brake fluid in the wheel cylinder flows through Port 3 and Port 4 into the reservoir. (The fluid pressure in the wheel cylinder is reduced.) As the pump is constantly operating while ABS is operating, the brake fluid stored in the reservoir is drawn out by the pump and sent back to the master cylinder.



60G00-5B-12-1

When ABS is Operating (Increased pressure mode)

When a higher pressure of the fluid in the wheel cylinder is needed, ABS control module closes the solenoid valve. As the flow control valve is at a lower position (as shown below) at this time, the brake fluid from the master cylinder passes through Port 1 and Port 3 into the wheel cylinder and increases the fluid pressure in it. At this time, the flow control valve operates so that the pressure difference between above and below the orifice will become constant. In this way, opening of the passage Port 1 from the master cylinder varies and the fluid pressure to the wheel cylinder is increased at a constant rate.



60G00-5B-12-2

DIAGNOSIS

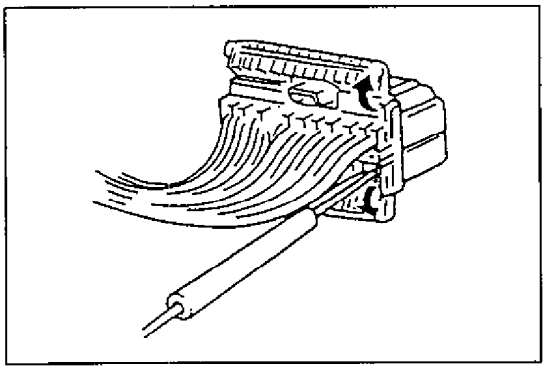
To ensure that the trouble diagnosis is done accurately and smoothly, observe "Precautions in Diagnosing Troubles" and follow "ABS Diagnostic Flow Chart".

60G00-5B-13-1

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 the vehicle was jacked up.
- Be sure to read "Precautions for Electronic Circuit Service" in Section OA before inspection and observe what is written there.
- Be sure to use the trouble diagnosis procedure as described in the flow chart. Failure to follow the flow chart may result in incorrect diagnosis. (Some other diag. trouble code may be stored by mistake in the memory of ABS control module during inspection.)

60G00-5B-13-2

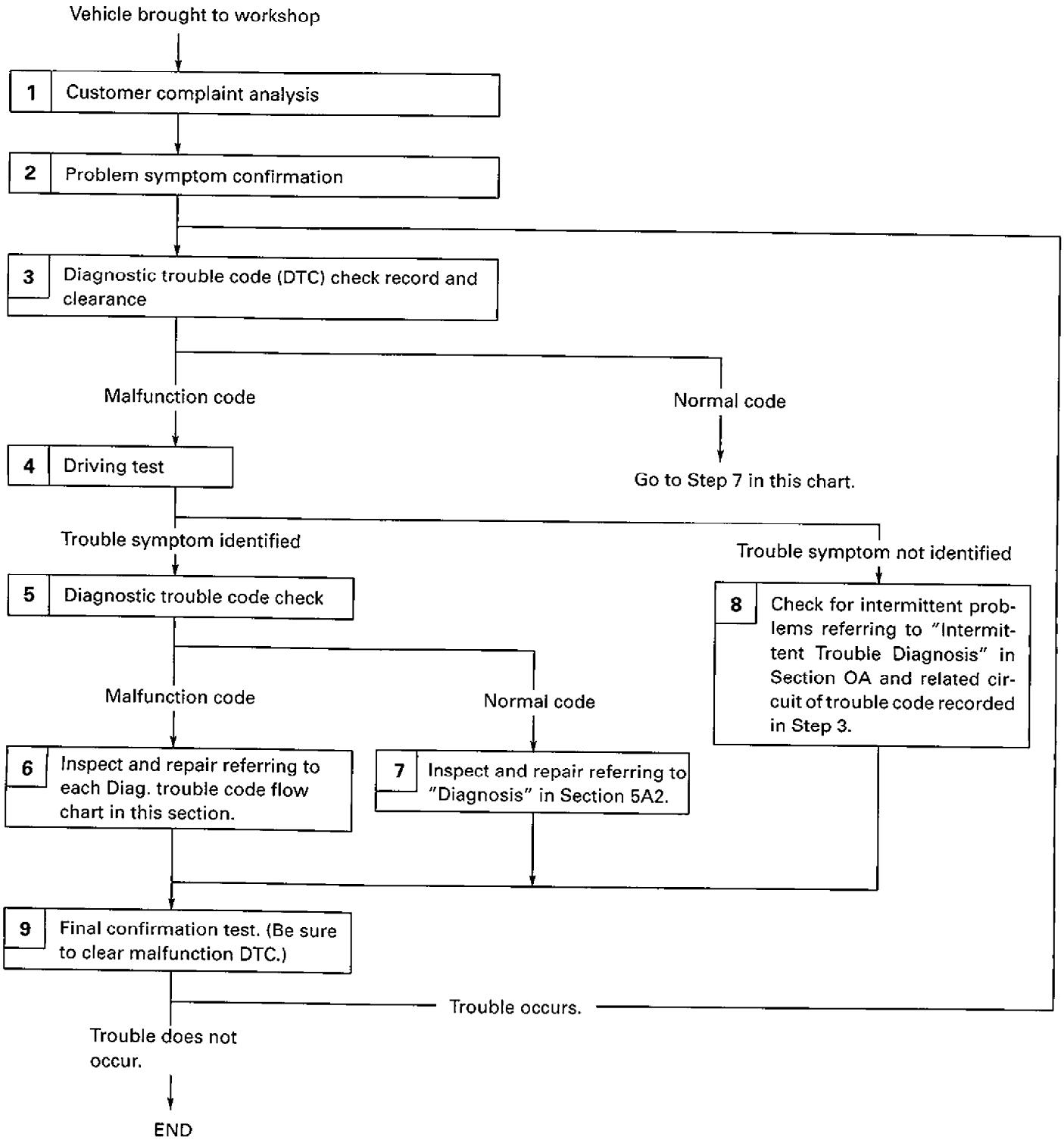


60G00-5B-13-4

- When connecting a probe of ohmmeter or voltmeter to each terminal of ABS control module connector, be sure to connect it from wire harness side of connector.

ABS DIAGNOSTIC FLOW CHART

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



1. CUSTOMER COMPLAINT ANALYSIS

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of such a questionnaire form as shown 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 start only/at every start/Other_____ • Vehicle speed: while accelerating/while decelerating/at stop/ while turning/while running at constant speed/ other_____ • Road surface condition: Paved road/rough road/snow-covered road/other_____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/rain/snow/other_____ • Temperature: °F (°C)
Diagnostic Trouble Code	• First check: Normal code/malfunction code ( ) • Second check after test drive: Normal code/malfunction code ( )

61A10-5B1-16-1

2. **PROBLEM SYMPTOM CONFIRMATION**
   Check if what the customer claimed in Step 1 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 lamp is not operated correctly, proceed to "Diagnostic Flow Chart-A, B or C".

3. **DIAGNOSTIC TROUBLE CODE (DTC) CHECK, RECORD AND CLEARANCE**
   Perform "Diagnostic Trouble Code Check" in p. 5B1-I8 or 5B1-19, 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 4 to check ABS 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 5.

4. **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 lamp) exists.
   If the malfunction DTC is confirmed again at ignition switch ON, driving test as described in above is not necessary. Proceed to Step 5.

5. **DIAGNOSTIC TROUBLE CODE CHECK**
   Recheck diagnostic trouble code referring to p. 5B1-18 or p. 5B1-19.

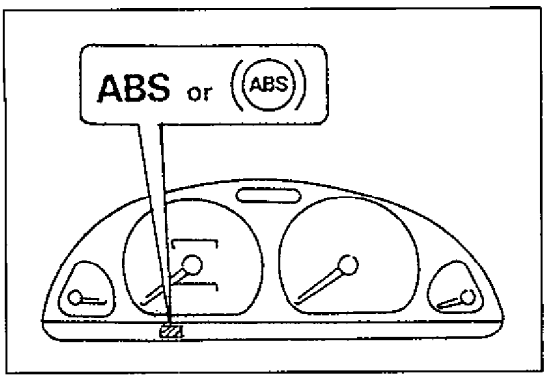
6. **DIAGNOSTIC TROUBLE CODE FLOW CHART**
   According to Diagnostic flow chart for the diagnostic trouble code confirmed in Step 5, locate the cause of the trouble, namely in a sensor, switch, wire harness, connector, actuator, ABS control module or other part and repair or replace faulty parts.

7. **"DIAGNOSIS" IN SECTION 5A2**
   Check the parts or system suspected as a possible cause referring to "Diagnosis" in Section 5A2 and based on symptoms appearing on the vehicle (symptoms obtained through Steps 1, 2 and 4) and repair or replace faulty parts, if any.

8. **CHECK FOR INTERMITTENT PROBLEM**
   Check parts where an intermittent trouble is easy to occur (e.g., wire harness, connector, etc.), referring to INTERMITTENT TROUBLE in Section OA and related circuit of trouble code recorded in Step 3.

9. **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 a normal code is indicated.

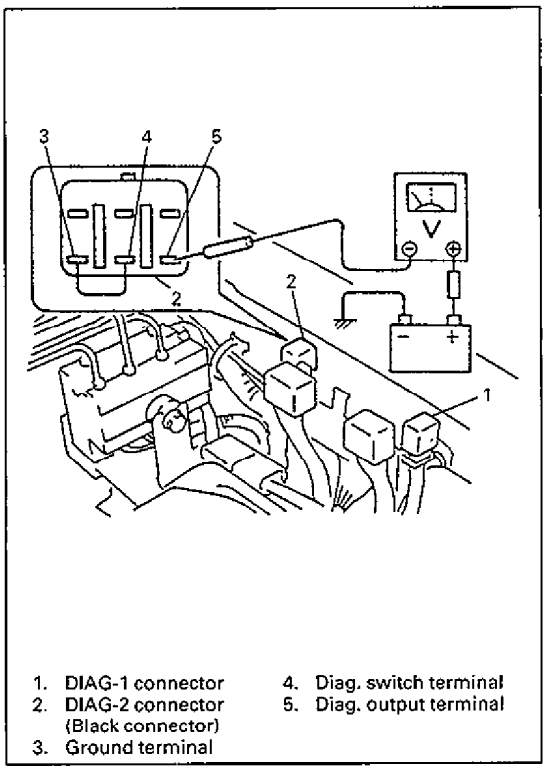
61A10-5B1-17-1



61A10-5B1-18-1

"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 flow chart – A, B or C.



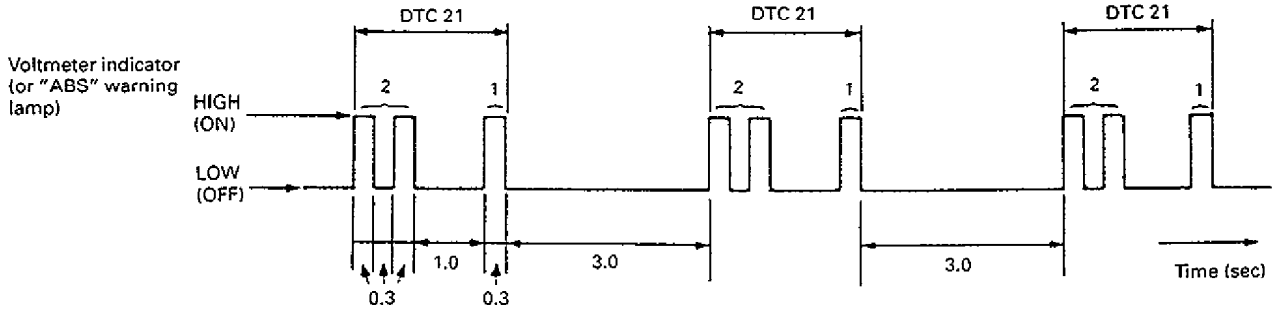
1. DIAG-1 connector
2. DIAG-2 connector (Black connector)
3. Ground terminal
4. Diag. switch terminal
5. Diag. output terminal

61A10-5B1-18-2

DIAGNOSTIC TROUBLE CODE (DTC) CHECK (USING ANALOG TYPE VOLTMETER AND/OR "ABS" WARNING LAMP)

1) Using service wire, connect diag. switch terminal of DIAG-2 connector to ground.
2) For using analog type voltmeter:
   Connect positive probe of analog type voltmeter to positive terminal of battery and negative probe to diag. output terminal of DIAG-2 connector.
3) Turn ignition switch ON.
4) Read deflection of voltmeter indicator or frashing of "ABS" warning lamp which represents DTC as shown in example below and write it down. When more than 2 DTC's 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".
   If no DTC output is available (signal in voltage change is not output from diag. output terminal), check according to Diag. Flow Chart-D.

Example: When right-front wheel speed sensor circuit opens (DTC 21)

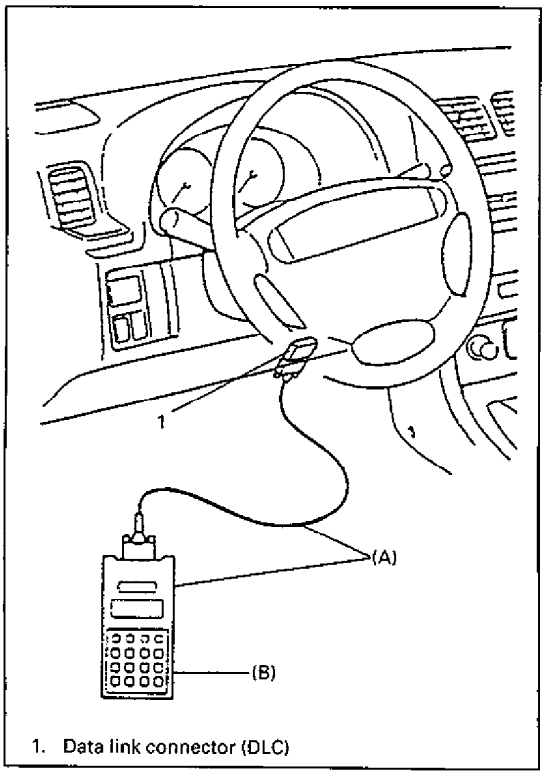


60G00-5B-17-14

NOTE:

- **"ABS" warning lamp indicates only following DTC's, DTC 12 which means that no malfunction DTC is stored and history DTC which indicates history trouble area. When there is a current trouble, "ABS" warning lamp remains ON and therefore DTC is not indicated.**
- **When the voltmeter indicates DTC as described above, it indicates all current and history DTC's.**

5) After completing the check, turn ignition switch off and disconnect service wire from DIAG. connector.



1. Data link connector (DLC)

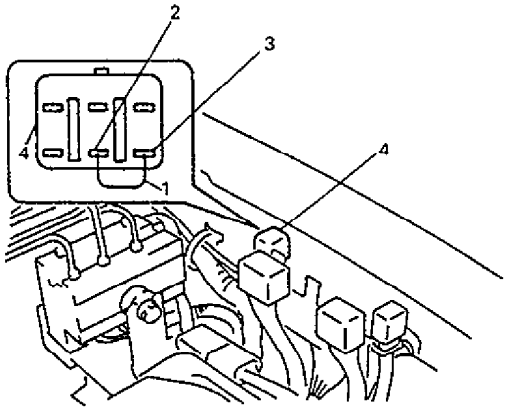
61A10-5B1-19-1

DTC CHECK (USING SCAN TOOL, TECH-1)

1) After setting cartridge for ABS to Tech-1, connect Tech-1 to data link connector.

Special Tool
(A): 09931-76011 (Tech-1, scan tool)
(B): 09932-66020-001 (Cartridge for ABS, English)
09932-66020-003 (Cartridge for ABS, German)
09932-66020-004 (Cartridge for ABS, French)

2) Turn ignition switch ON.
3) Read DTC according to instructions displayed on Tech-1 and print it or write it down. Refer to Tech-1 operator's manual for further details.
4) After completing the check, turn ignition switch off and disconnect Tech-1 from DLC.

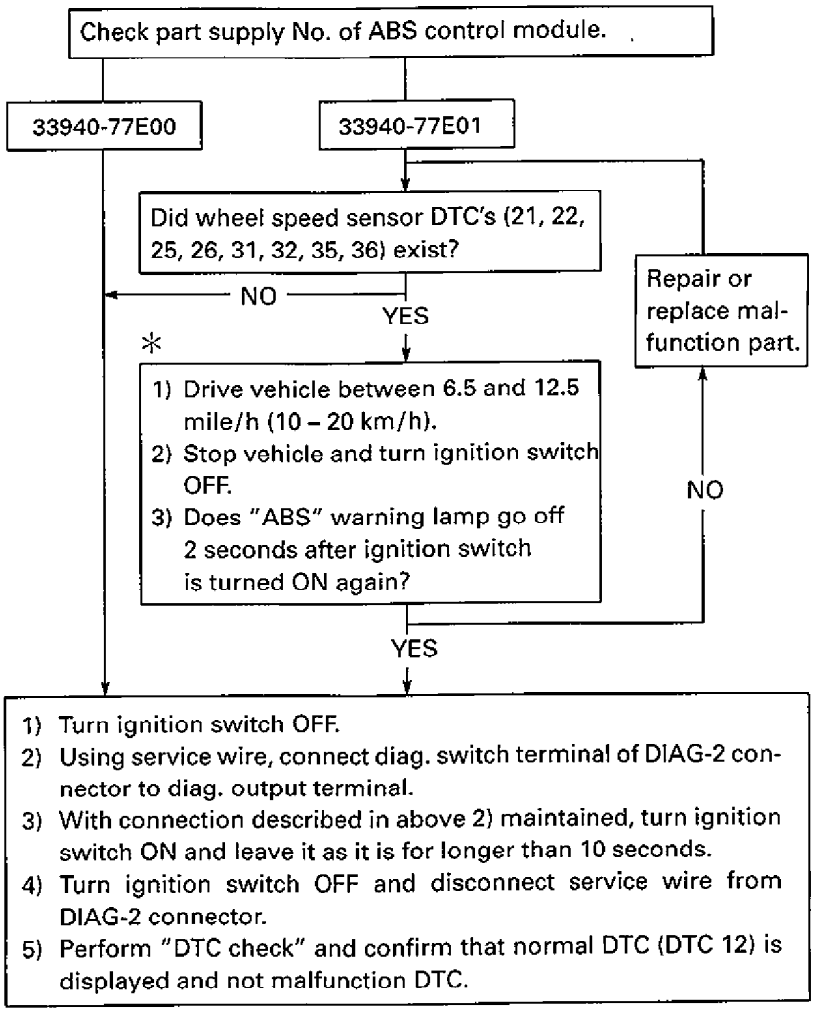


1. Service wire
2. Diag. switch terminal
3. Diag. output terminal
4. DIAG-2 connector (Black connector)

DIAGNOSTIC TROUBLE CODE (DTC) CLEARANCE

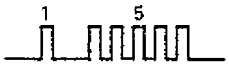
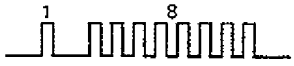
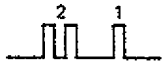
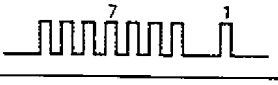
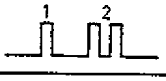
WARNING:
- **When performing a road test, select a safe place where there is neither any traffic nor any traffic accident possibility and be very careful during testing to avoid occurence of an accident.**
- **Road test should be carried out with 2 persons, a driver and a tester, on a level road to avoid accident.**

After repair or replace malfunction part(s), clear all DTC's by performing described procedure below.



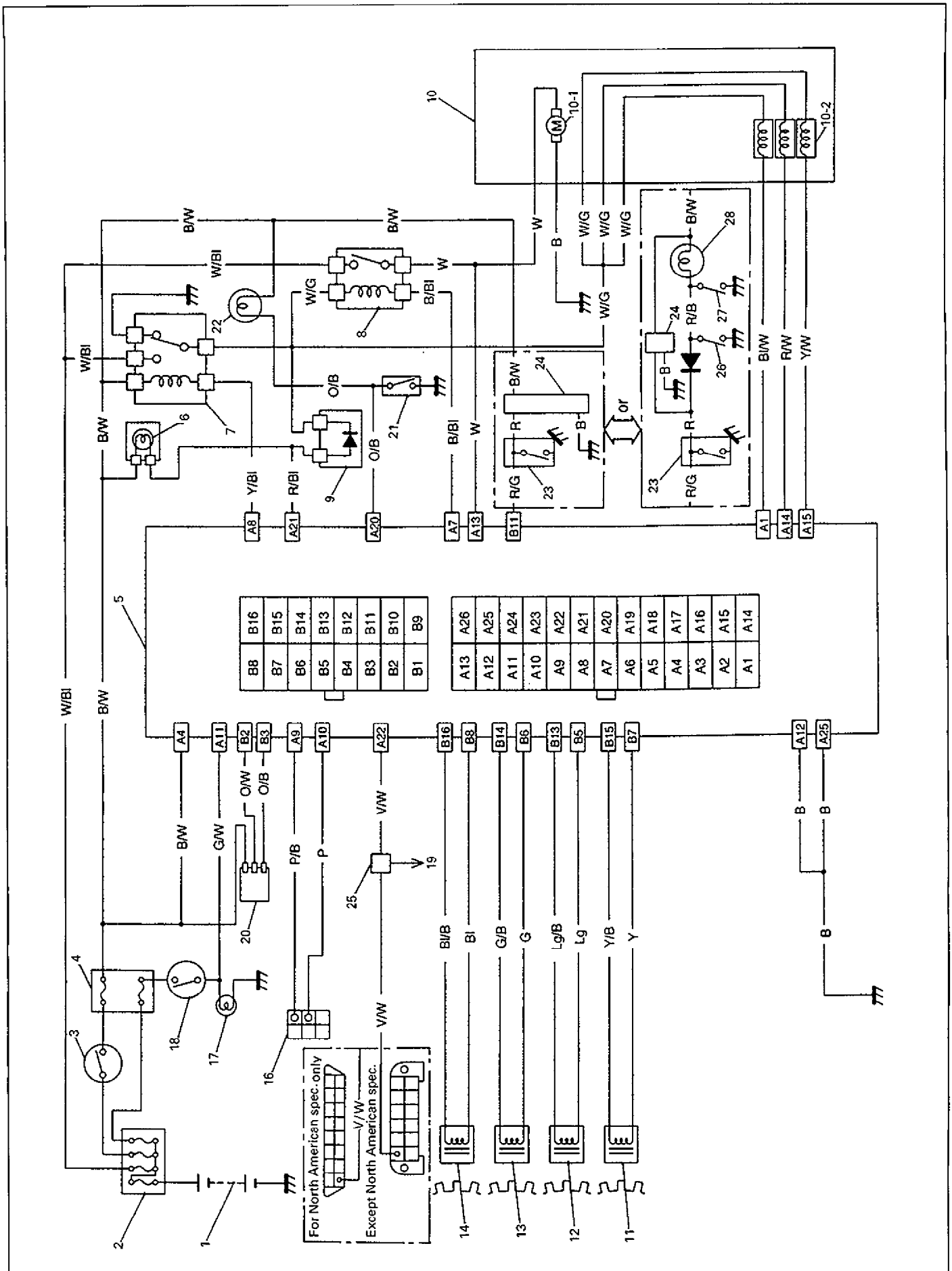
NOTE:
- **When a trouble with wheel speed sensor is detected in vehicle equipped with ABS control module of Part Supply No.33940-77E01, ABS warning lamp will not turn OFF unless above ✳marked steps are performed. This is to keep ABS warning lamp ON till ABS control module is confirmed to be in good condition.**
- **DTC can be cleared by using Tech-1, too. For procecure refer to Cartridge Manual. But if wheel speed sensor DTCs exited in vehicle equipped with ABS control module of Parts Supply No.33940-77E01, first perform steps marked as ✳ above, and the next clear DTC referring to Cartridge Manual.**

DIAGNOSTIC TROUBLE CODE (DTC) TABLE

DTC	VOLTMETER INDICATION (or "ABS" warning lamp flashing pattern)	DIAGNOSTIC AREA	
15		G sensor (if equipped) or ABS control module	
18		Wheel speed sensor and/or rotor or hydraulic unit	
21		Right-front	Wheel speed sensor circuit and rotor
25		Left-front	
31		Right-rear	
35		Left-rear	
22		Right-front	
26		Left-front	
32		Right-rear	
36		Left-rear	
41		Right-front	Solenoid (in hydraulic unit) circuit
45		Left-front	
56		Rear	
57		Solenoid and pump motor power circuit	
61		ABS pump motor (in hydraulic unit) circuit	
63		ABS fail-safe relay circuit	
71		ABS control module	
12		Normal	

61A10-5B1-21-1

SYSTEM CIRCUIT



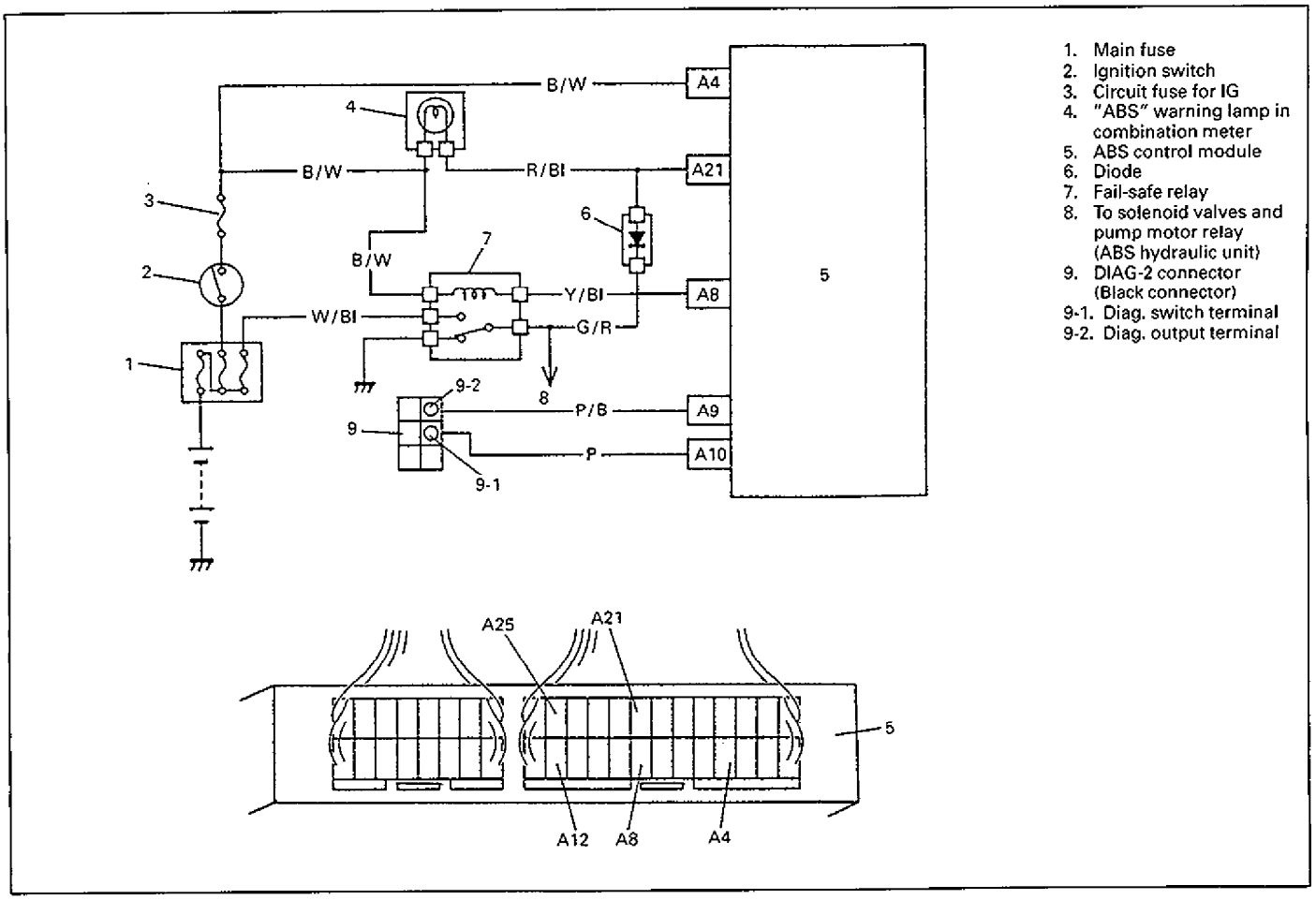
1. Battery
2. Main fuses
3. Ignition switch
4. Circuit fuses
5. ABS control module
5-1. Terminal arrangement for ABS control module
6. "ABS" warning lamp
7. ABS fail-safe relay (Solenoid valve relay)
8. ABS pump motor relay
9. Diode
10. ABS hydraulic unit
10-1. Pump motor
10-2. Solenoid valves
11. Right-rear wheel speed sensor
12. Left-rear wheel speed sensor
13. Right-front wheel speed sensor
14. Left-front wheel speed sensor
15. Data link connector
16. Diagnosis-2 connector (DIAG-2)
17. Stop lamp
18. Stop lamp switch
19. To ECM, TCM and SDM (if equipped)
20. G sensor
21. 4WD switch
22. 4WD indicator lamp
23. Differential switch
24. Filter
25. Connector
26. Parking brake switch
27. Brake fluid level switch
28. Brake warning (parking) light

Wire color

B : Black
B/W : Black/White
Bl : Blue
Bl/B : Blue/Black
Bl/W: Blue/White
G : Green
G/B : Green/Black
G/W : Green/White
Lg : Lightgreen
Lg/B : Lightgreen/Black
O/B : Orange/Black
O/W : Orange/White
P : Pink
P/B : Pink/Black
R/Bl : Red/Blue
R/G : Red/Green
R/W : Red/White
V/W : Violet/White
W : White
W/Bl: White/Blue
W/G : White/Green
Y : Yellow
Y/B : Yellow/Black
Y/Bl : Yellow/Blue

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A1	Left-front solenoid valve	A23	———
A2	———	A24	———
A3	———	A25	Ground
A4	Ignition switch	A26	———
A5	———		
A6	———	B1	———
A7	ABS pump motor relay	B2	G sensor signal
A8	ABS fail-safe relay	B3	G sensor ground
A9	Diagnosis switch terminal	B4	———
A10	Diagnosis output terminal	B5	Left-rear wheel speed sensor (–)
A11	Stop lamp switch	B6	Right-front wheel speed sensor (–)
A12	Ground	B7	Right-rear wheel speed sensor (–)
A13	Motor voltage monitor	B8	Left-front wheel speed sensor (–)
A14	Right-front solenoid valve	B9	———
A15	Rear solenoid valve	B10	———
A16	———	B11	Differential switch
A17	———	B12	———
A18	———	B13	Left-rear wheel speed sensor (+)
A19	———	B14	Right-front wheel speed sensor (+)
A20	4WD switch	B15	Right-rear wheel speed sensor (+)
A21	"ABS" warning lamp	B16	Left-front wheel speed sensor (+)
A22	Data link connector		

CHART – A "ABS" WARNING LAMP CIRCUIT CHECK – LAMP DOES NOT COME "ON" AT IGNITION SWITCH ON



1. Main fuse
2. Ignition switch
3. Circuit fuse for IG
4. "ABS" warning lamp in combination meter
5. ABS control module
6. Diode
7. Fail-safe relay
8. To solenoid valves and pump motor relay (ABS hydraulic unit)
9. DIAG-2 connector (Black connector)

9-1. Diag. switch terminal
9-2. Diag. output terminal

CIRCUIT DESCRIPTION

Operation (ON/OFF) of the "ABS" warning lamp is controlled by the ABS control module and the failsafe relay. When the ignition switch is turned ON, the ABS control module switches the contact point of the fail-safe relay from the lamp circuit side (relay OFF) to the hydraulic unit circuit side (relay ON).
(Immediately after the ignition switch was turned ON, however, the relay is switched from OFF in the order of ON → OFF → ON as the initial check of the fail-safe relay.)

If the Antilock brake system is in good condition, the ABS control module turns the "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 both ABS control module and fail-safe relay. Also, it is turned ON by the fail-safe relay when the connector of the ABS control module was disconnected.

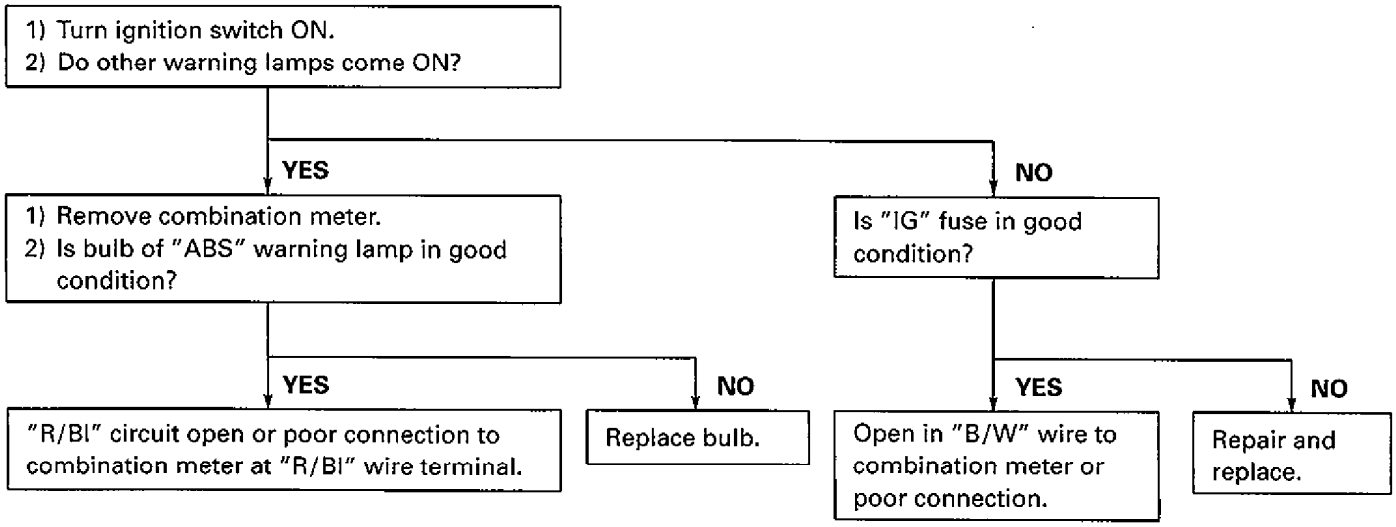
When the lamp drive circuit A21 of the ABS control module becomes open, the lamp flashes twice and turns OFF as the initial check of the relay.

The lamp is turned ON when the ABS control module is in the mode to clear the diagnostic trouble code (the diag. switch terminal and the diag. output terminal are connected or when the "P/B" circuit and "P" circuit are shorted).

61A10-5B1-24-1

CHART – A "ABS" WARNING LAMP CIRCUIT CHECK – LAMP DOES NOT COME "ON" AT IGNITION SWITCH ON

INSPECTION



60G00-5B-23-1

CHART – B "ABS" WARNING LAMP CIRCUIT CHECK – LAMP COMES "ON" STEADY

Refer to CHART – A for System Circuit Diagram and Circuit Description.

INSPECTION

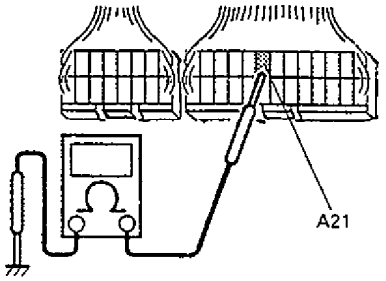
Perform "Diagnostic Trouble Code (DTC) check".

Normal Code 12 indicated at diag. output terminal (and "NO CODES" displayed on Tech-1)

1) Ignition switch "OFF".
2) Disconnect ABS control module connector.
3) Remove ABS fail-safe relay from connector.
4) Does "ABS" warning lamp light at ignition switch ON?

YES

1) Ignition switch "OFF".
2) With ABS control module and relay connectors disconnected, disconnect 13P connector from combination meter.
3) Measure resistance from module connector terminal "A21" to body ground.
Is it infinite (∞)?



YES

Substitute a known-good ABS control module and recheck.

NO

"R/Bl" circuit shorted to ground.

NO

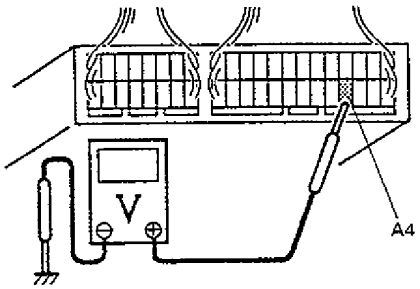
"P/B" circuit shorted to "P" circuit.

Malfunction code indicated

Go to Step 3 of ABS Diagnostic Flow Chart in this section.

No code indicated at diag. output terminal (and "TURN KEY TO RUN" displayed on Tech-1)

1) Ignition switch "ON"
2) Measure voltage from "A4" terminal to body ground.
3) Is it 10 – 14V?



NO

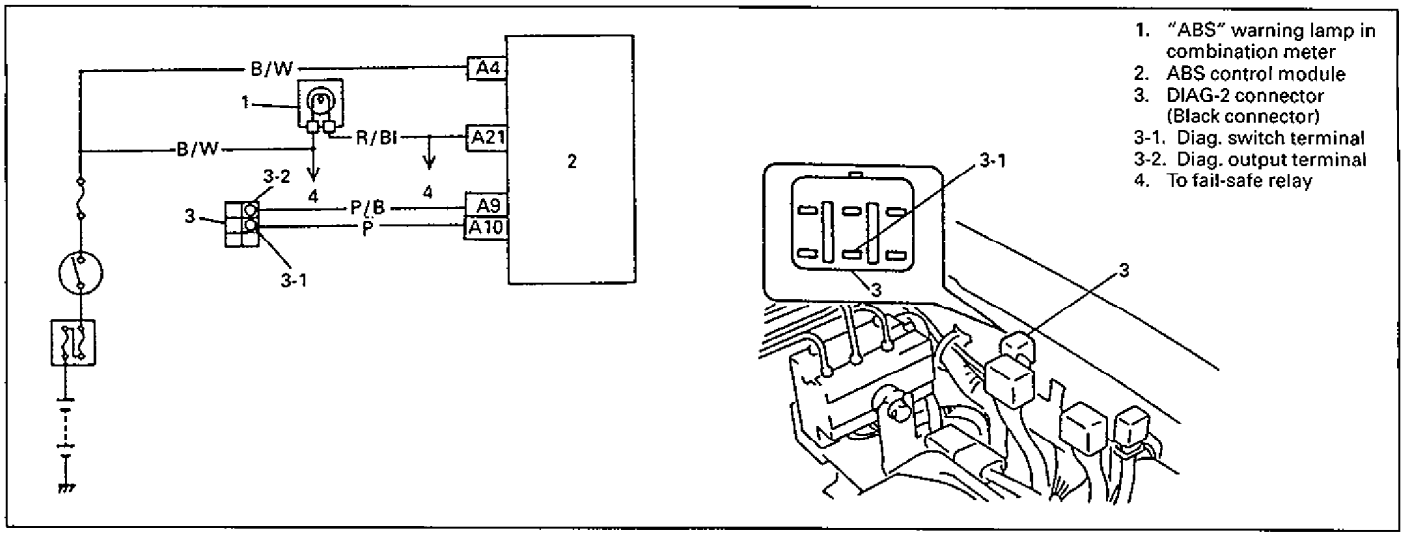
"B/W" circuit open

YES

Poor "A4" connection.
If connection is OK, substitute a known-good ABS control module and recheck.

61A10-5B1-26-1

CHART – C "ABS" WARNING LAMP CIRCUIT CHECK – THE LAMP FLASHES CONTINUOUSLY WHILE IGNITION SWITCH IS ON



1. "ABS" warning lamp in combination meter
2. ABS control module
3. DIAG-2 connector (Black connector)
3-1. Diag. switch terminal
3-2. Diag. output terminal
4. To fail-safe relay

CIRCUIT DESCRIPTION

When the diag. switch terminal is shorted or connected to the ground with the ignition switch ON, the diag. trouble code (DTC) is indicated by flashing of the "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.

INSPECTION

Is diag. switch terminal connected to ground via service wire?

NO

1) Ignition switch "ON".
2) Measure voltage between diag. switch terminal and ground.
3) Is it 10 – 14V?

YES

NO

"P/B" circuit shorted to ground.

YES

1) Ignition switch "ON".
2) Does flashing of "ABS" warning lamp indicate DTC (DTC 12 or history DTC)?

YES

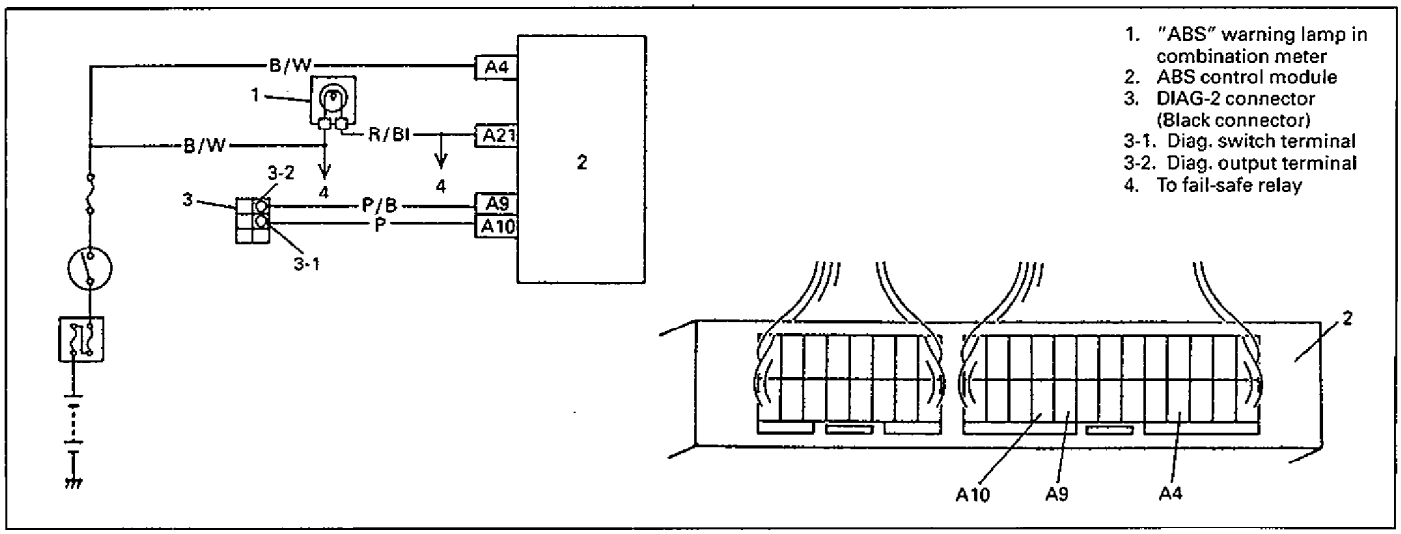
Go to Step 3 of ABS Diag. Flow Chart in p. 5B1-15.

NO

Substitute a known good ABS control module and recheck.

61A10-5B1-27-1

CHART – D CODE (DTC) IS NOT OUTPUTTED FROM DIAG. OUTPUT TERMINAL EVEN WITH DIAG. SWITCH TERMINAL CONNECTED TO GROUND. (Page 1 of 2)

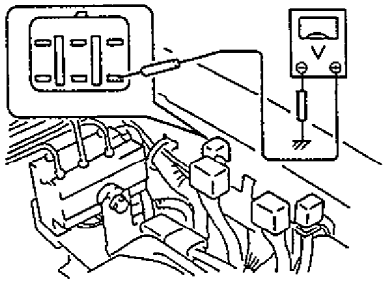


CIRCUIT DESCRIPTION

When the diag. switch terminal is connected to the ground with the ignition switch turned ON, the ABS control module outputs a diagnostic trouble code (DTC, voltage change signal) from the diag. output terminal. Connecting or shorting the diag. switch terminal and the output terminal will set the mode to clear DTC.

INSPECTION

1) Unground diag. switch terminal.
2) Ignition switch "ON".
3) Measure voltage between diag. output terminal and body ground.
4) Is it 1V or less?

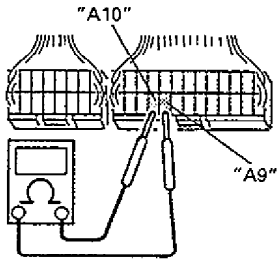


YES

NO

"P" circuit shorted to power circuit.
If circuit is OK, substitute a known-good ABS control module and recheck.

1) Ignition switch "OFF"
2) Disconnect connectors from ABS control module.
3) Measure resistance between A9 and A10 terminals of module connector.
4) Is it infinite (∞)?

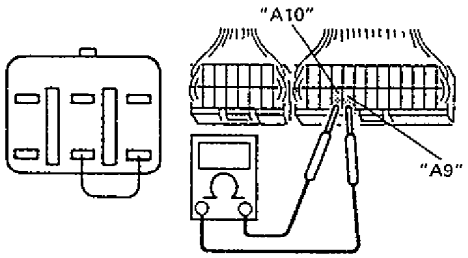


YES

NO

"P/B" circuit shorted to "P" circuit.

1) Using service wire, connect diag. switch terminal to output terminal.
2) Measure resistance between A9 and A10 terminals of module connector.
3) Is continuity indicated?



YES

NO

"P/B" circuit open or "P" circuit open.

Go to Chart – D (Page 2 of 2).

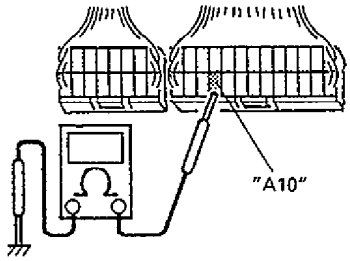
CHART – D (Page 2 of 2)

Were you sent here from Chart – D (Page 1 of 2)?

NO → Go to Chart – D (Page 1 of 2).

YES

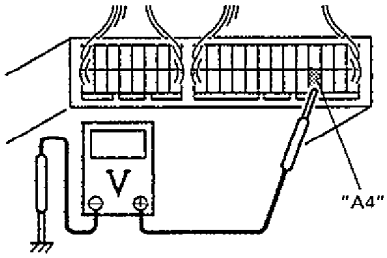
1) Disconnect service wire from DIAG-2 connector.
2) Measure resistance between A10 terminal and body.
3) Is it infinite (∞)?



NO → "P" circuit shorted to ground.

YES

1) Ignition switch "OFF".
2) Connect connectors to ABS control module.
3) Ignition switch "ON".
4) Measure voltage between "A4" terminal and body ground.
5) Is it 10 – 14V ?

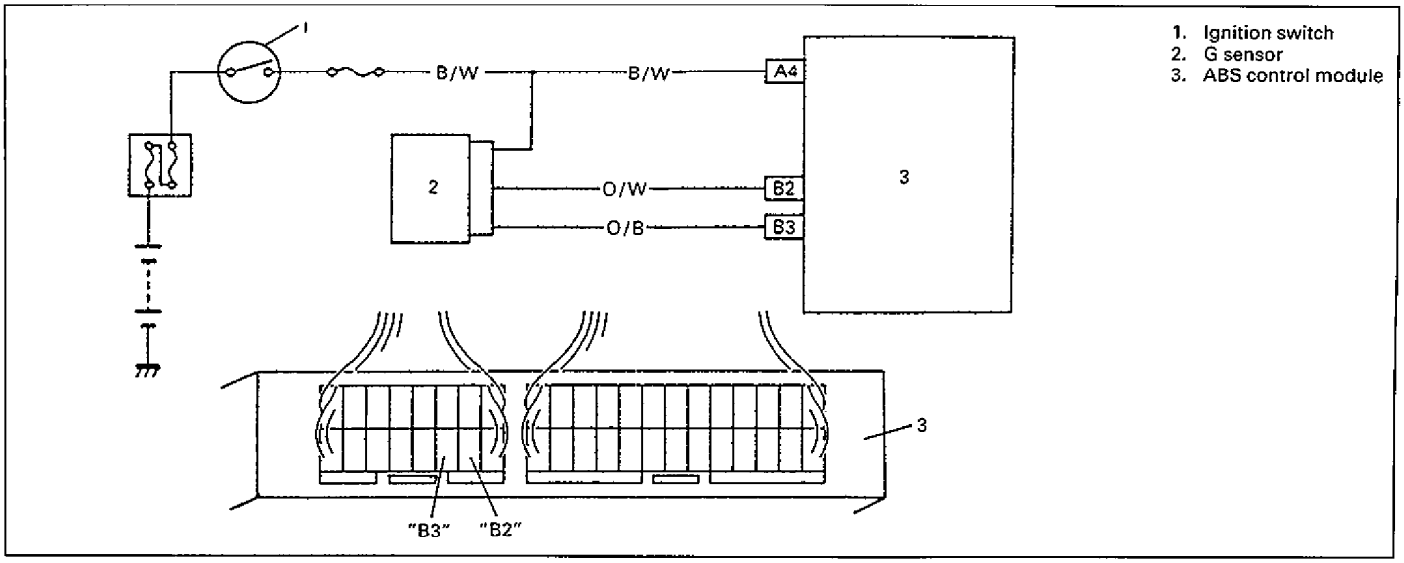


NO → "B/W" circuit open or poor connection.

YES → Poor "A4", "A9" or "A10" connection. If connections are OK, substitute a known-good ABS control module and recheck.

61A10-5B1-29-1

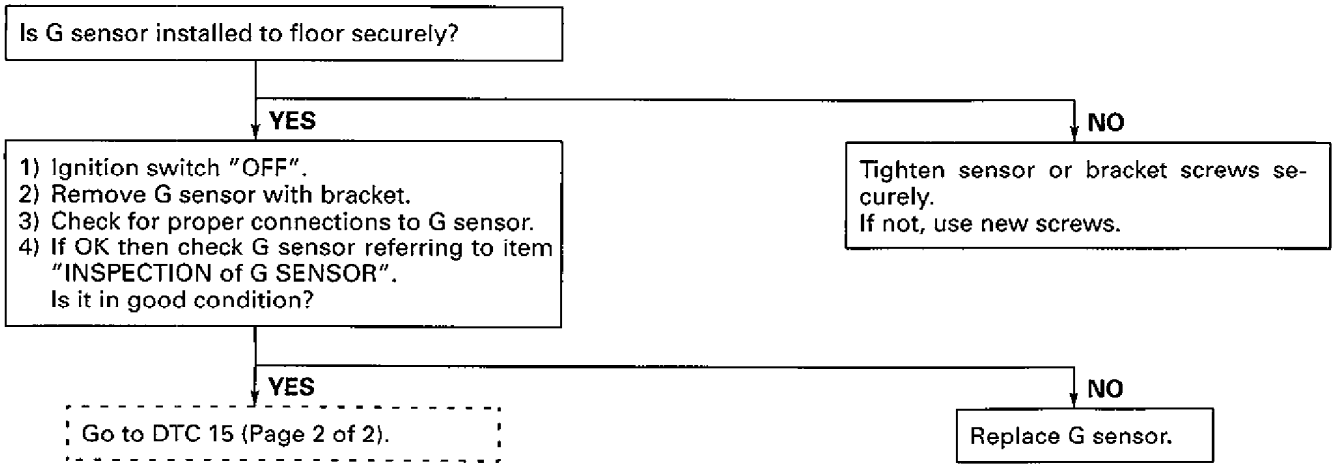
DTC 15 – G SENSOR CIRCUIT (Page 1 of 2)



DESCRIPTION

While a vehicle is at stop or running, if the potential difference between the sensor signal terminal "B2" and the sensor ground terminal "B3" is not within the specified voltage value, or if the signal voltage while at a stop does not vary from that while running, this DTC is set.
Therefore, this DTC may be set when a vehicle is lifted up and its wheel(s) is turned. In such case, clear the DTC and check again.

INSPECTION



61A10-5B1-30-1

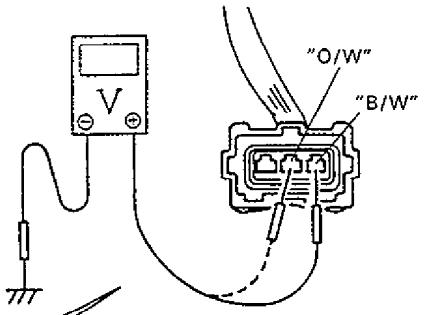
DTC 15 – G SENSOR CIRCUIT (Page 2 of 2)

Were you sent here from DTC 15 (Page 1 of 2)?

NO → Go to DTC 15 (Page 1 of 2).

YES

1) Disconnect connectors from ABS control module and G sensor.
2) Check for proper connection to ABS control module at terminals "B2" and "B3".
3) If OK then turn ignition switch ON and measure voltage between "B/W" terminal of sensor connector and body ground.
Is it 10 – 14V?



NO → "B/W" circuit open.

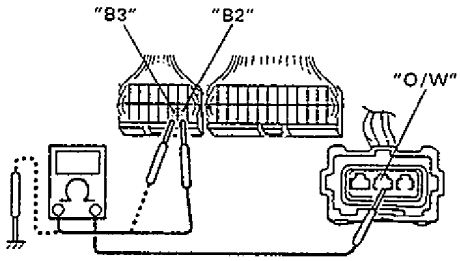
YES

Measure voltage between "O/W" terminal of sensor connector and body ground.
Is it 0V?

NO → "O/W" circuit shorted to power circuit.

YES

1) Ignition switch "OFF".
2) Check that "O/W" circuit is free from open or short to ground and "O/B" circuit.
Is it in good condition?

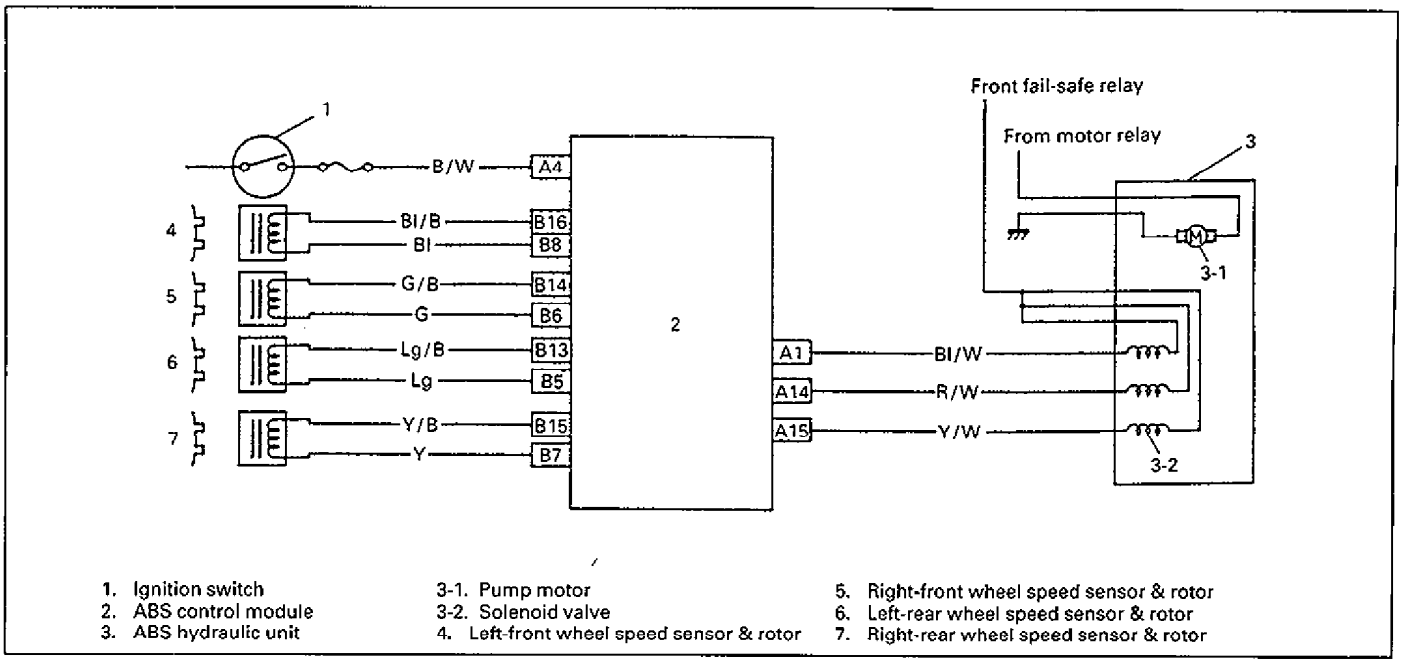


NO → "O/W" circuit open or shorted to ground or "O/B" circuit.

YES → "O/B" circuit open.
If circuit is OK, substitute a known-good ABS control module.

61A10-5B1-31-1

DTC 18 – WHEEL SPEED SENSOR/ROTOR OR ABS HYDRAULIC UNIT (Page 1 of 2)



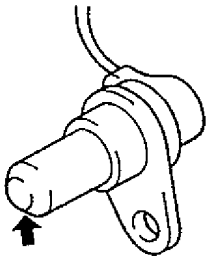
1. Ignition switch
2. ABS control module
3. ABS hydraulic unit
3-1. Pump motor
3-2. Solenoid valve
4. Left-front wheel speed sensor & rotor
5. Right-front wheel speed sensor & rotor
6. Left-rear wheel speed sensor & rotor
7. Right-rear wheel speed sensor & rotor

DESCRIPTION

When no other malfunction DTC is detected and ABS control is performed for longer than approx. 1 minute continuously (high and low voltage repetition was detected for longer than approx. 1 minute continuously at the solenoid monitor terminal "A1", "A14" or "A15 ") this DTC will be set.

INSPECTION

1) Remove all wheel speed sensors.
2) Check each sensor for damage or foreign material being attached to it.
Are they in good condition?

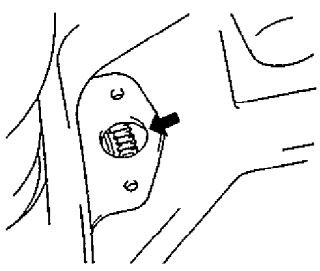


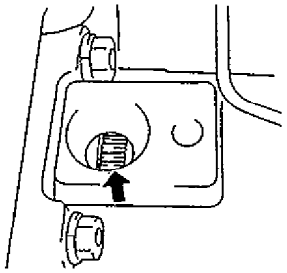
YES

NO → Clean or replace.

Check visually through each 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?





YES

Go to DTC 18 (Page 2 of 2).

NO → Clean, repair or replace.

DTC 18 – WHEEL SPEED SENSOR/ROTOR OR ABS HYDRAULIC UNIT (Page 2 of 2)

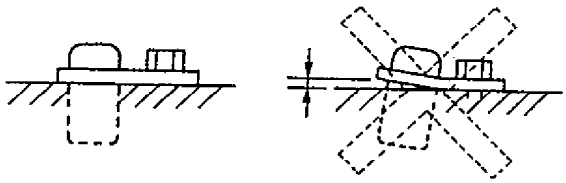
Were you sent here from DTC 18 (Page 1 of 2)?

YES

1) Install each speed sensor to each knuckle and/or axle housing.
2) Tighten each sensor bolt to specified torque and check that there is not any clearance between sensor and knuckle or axle housing. Replace sensor if any.

NO

Go to DTC 18 (Page 1 of 2).



OK NG

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?

YES

Referring to item "ABS HYDRAULIC UNIT OPERATION CHECK" in this section, check ABS hydraulic unit for operation.
Is it in good condition?

NO

Replace sensor and recheck.

YES

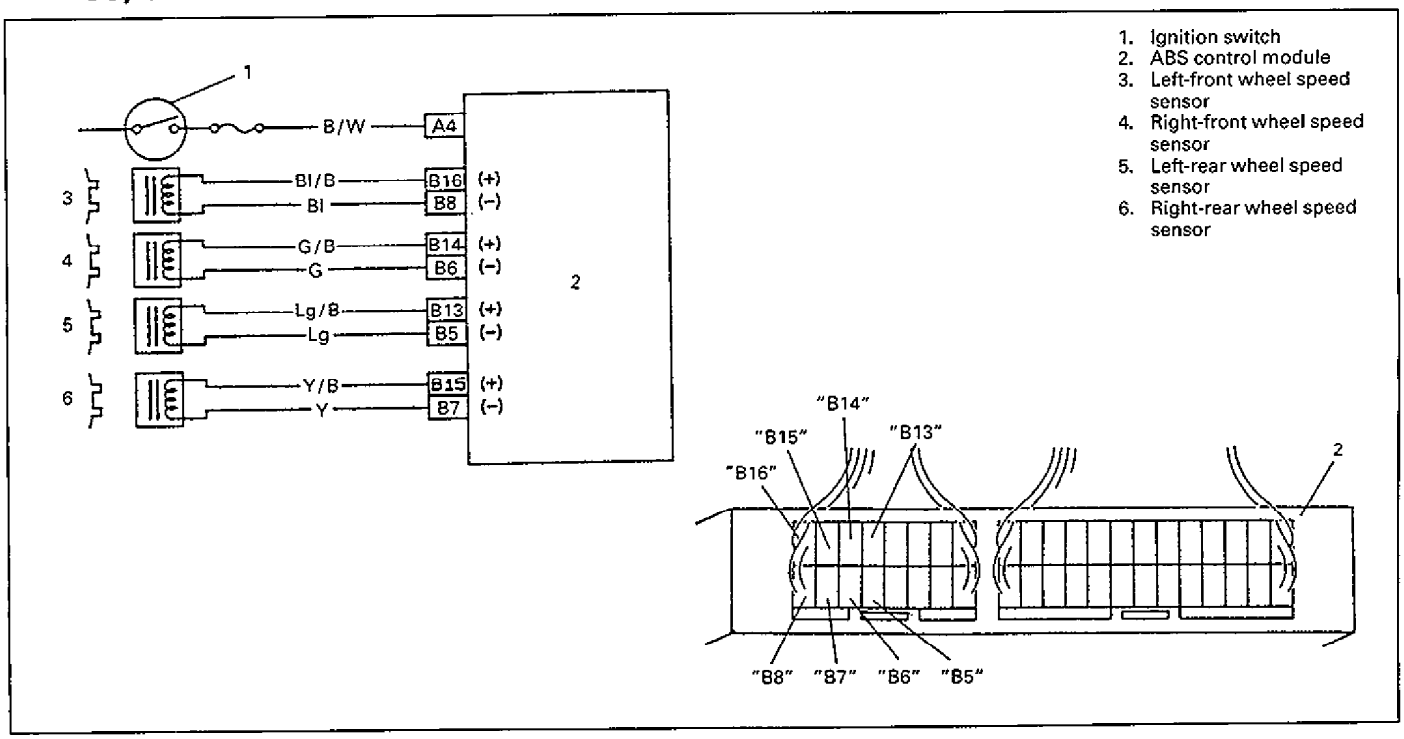
Substitute a known-good ABS control module and recheck.

NO

Repair or replace malfunction part.

61A10-5B1-33-1

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



DESCRIPTION

The ABS control module monitors the voltage at the positive (+) terminal of each sensor while the ignition switch is ON. When the voltage is not within the specified range, an applicable DTC will be set. Also, when no sensor signal is inputted at starting or while running, an applicable DTC will be set.

NOTE:

When the vehicle was operated in any of the following ways, one of these DTC's 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 4 of "ABS DIAG. FLOW CHART", 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.**

61A10-5B1-34-1

DTC 21, 22, 25, 26, 31, 32, 35 OR 36 (Page 1 of 2)

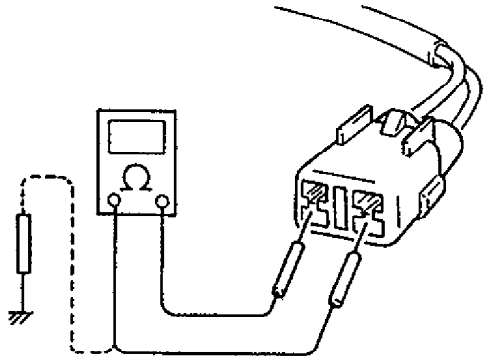
INSPECTION

1

1) Disconnect the applicable sensor connector with ignition switch "OFF".
2) Measure resistance between sensor terminals.

Resistance of wheel speed sensor at 20°C, 68°F.	Front	1.2 – 1.6 kΩ
	Rear	1.2 – 1.6 kΩ

3) Measure resistance between each terminal and body ground.
   Insulation resistance: 1 MΩ or higher
   Were measured resistance values in Step 2) and 3) as specified?

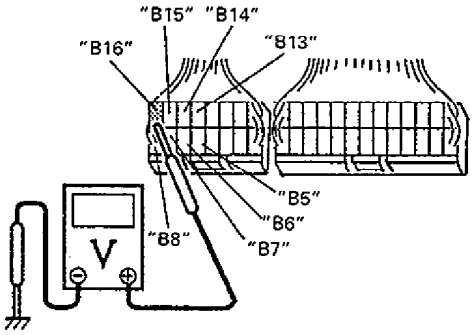


YES ↓

NO → Replace sensor.

2

1) Ignition switch "OFF".
2) Disconnect connector from ABS control module.
3) Check for proper connection to ABS control module at each sensor terminal.
4) If OK then turn ignition switch "ON" and measure voltage between sensor positive terminal of module connector and body ground.
   Is it 0V?

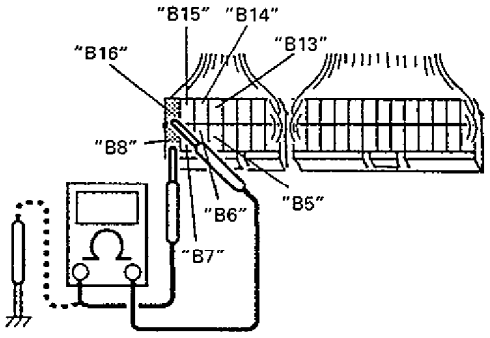


YES ↓

NO → 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] ?



YES ↓

Go to this DTC (Page 2 of 2).

NO → Circuit open or shorted to ground.

DTC 21, 22, 25, 26, 31, 32, 35 OR 36 (Page 2 of 2)

Were you sent here from this DTC (Page 1 of 2)?

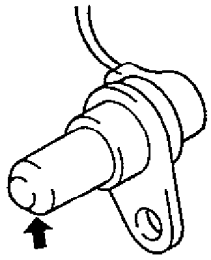
4

YES

1) Remove wheel speed sensor.
2) Check sensor for damage or foreign material being attached.
   Is it in good condition?

NO

Go to this DTC (Page 1 of 2).



5

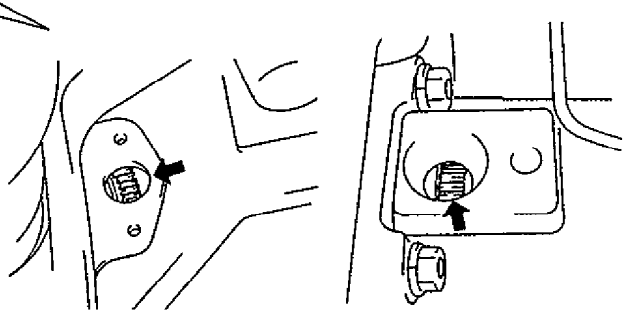
YES

Check visually through wheel speed sensor installation hole for the following.
- Rotor serration (teeth) neither missing nor damaged.
- No foreign material being attached.
- Rotor not being eccentric.
- Wheel bearing free from excessive play.

Are they in good condition?

NO

Clean or replace sensor.



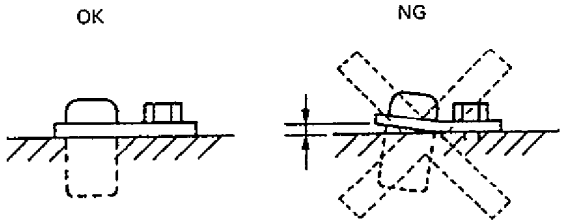
6

YES

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.
   Replace sensor if any.

NO

Clean, repair or replace.



7

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?

YES

Substitute a known-good ABS control module and recheck.

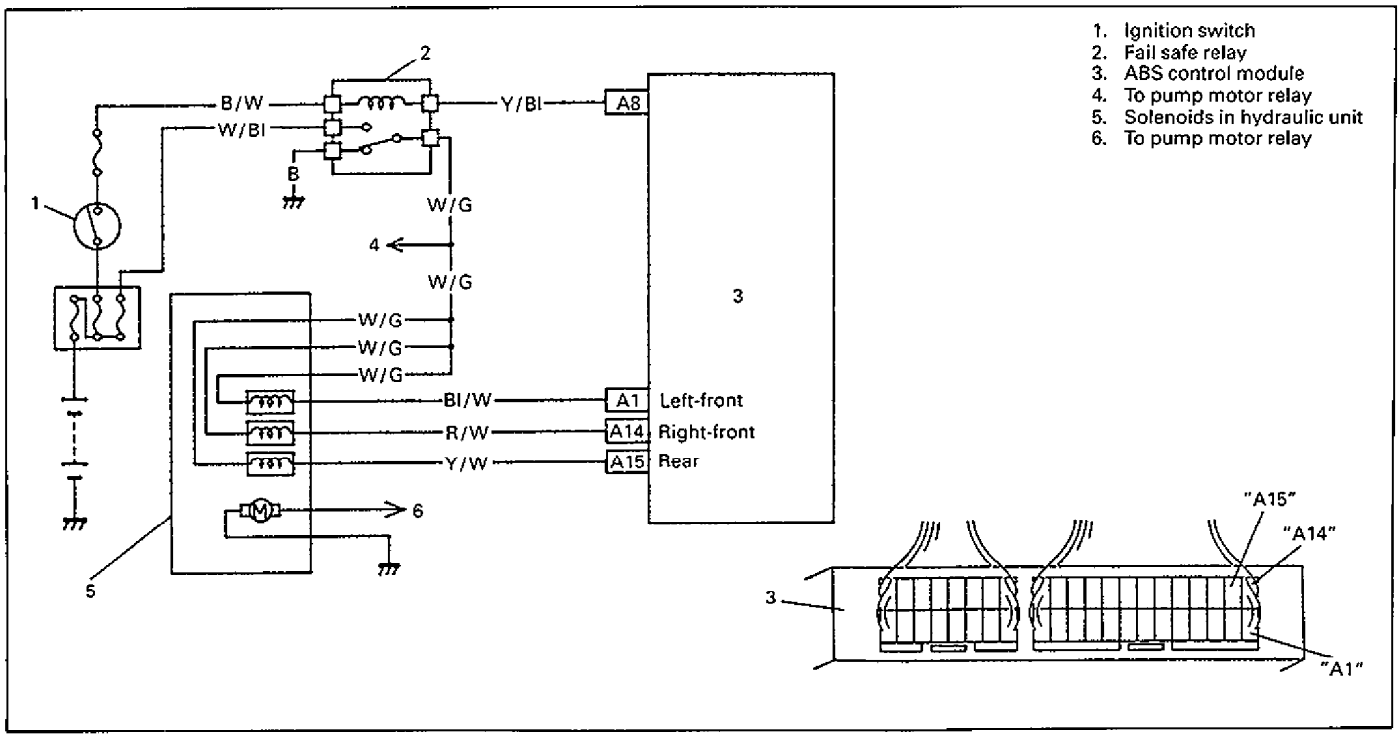
NO

Replace sensor and recheck.

61A10-5B1-36-1

BLANK

DTC 41 – RIGHT-FRONT SOLENOID CIRCUIT
45 – LEFT-FRONT SOLENOID CIRCUIT
56 – REAR SOLENOID CIRCUIT



DESCRIPTION

The ABS control module monitors the voltage of each terminal ("A1", "A14" and "A15") of the solenoid circuit constantly with the ignition switch turned ON. It sets this DTC when the terminal voltage does not become low/high for the ON/OFF command from the module to the solenoid or the voltage difference between solenoid circuit terminals exceeds the specified value with the solenoid turned OFF.

INSPECTION

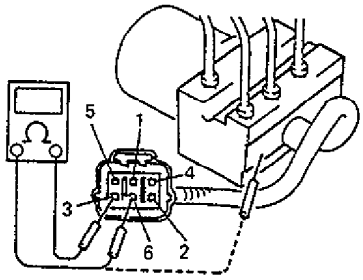
Check in each step of the flow chart as described below.
Step 1 – Check resistance of the solenoid and short-circuit to the ground in the hydraulic unit.
Step 2 – Check that the circuit between the solenoid and fail-safe relay is open.
Step 3 – Check that the circuit between the solenoid and ABS control module is shorted to the power.
Step 4 – Check that the circuit between the solenoid and ABS control module is open and shorted to the ground.

61A10-5B1-38-1

DTC 41, 45, 56 – SOLENOID CIRCUIT

1

1) Disconnect solenoid connector of hydraulic unit with ignition switch "OFF".
2) Check for proper connection to solenoid.
3) If OK then check the applicable solenoid for resistance and short to ground referring to item "SOLENOID VALVE INSPECTION" in this section.
Is it in good condition?



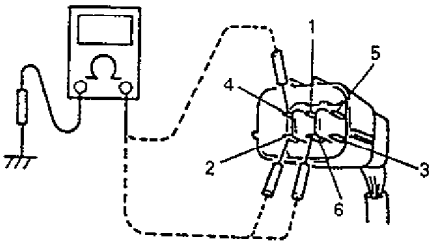
1 – 2: Right-front solenoid
3 – 4: Left-front solenoid
5 – 6: Rear solenoid

YES

NO → Replace hydraulic unit.

2

1) Ignition switch "OFF".
2) Measure resistance between solenoid connector terminal "W/G" of harness side and body ground.
Is there continuity?

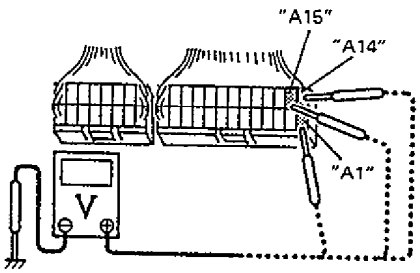


YES

NO → "W/G" circuit open.

3

1) Disconnect connectors from ABS control module.
2) Check for proper connection to ABS control module at solenoid circuit terminal "A1", "A14" or " A15 ".
3) If OK then measure voltage between terminal "A1", "A14" or "A15" of module connector and body ground with ignition switch ON.
Is it 0V?

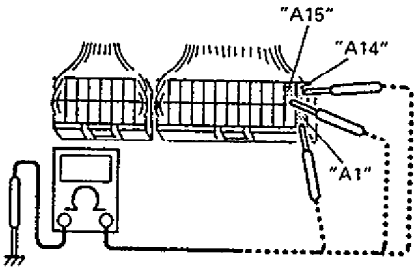


YES

NO → "Bl/W", "R/W" or "Y/W" circuit shorted to power circuit.

4

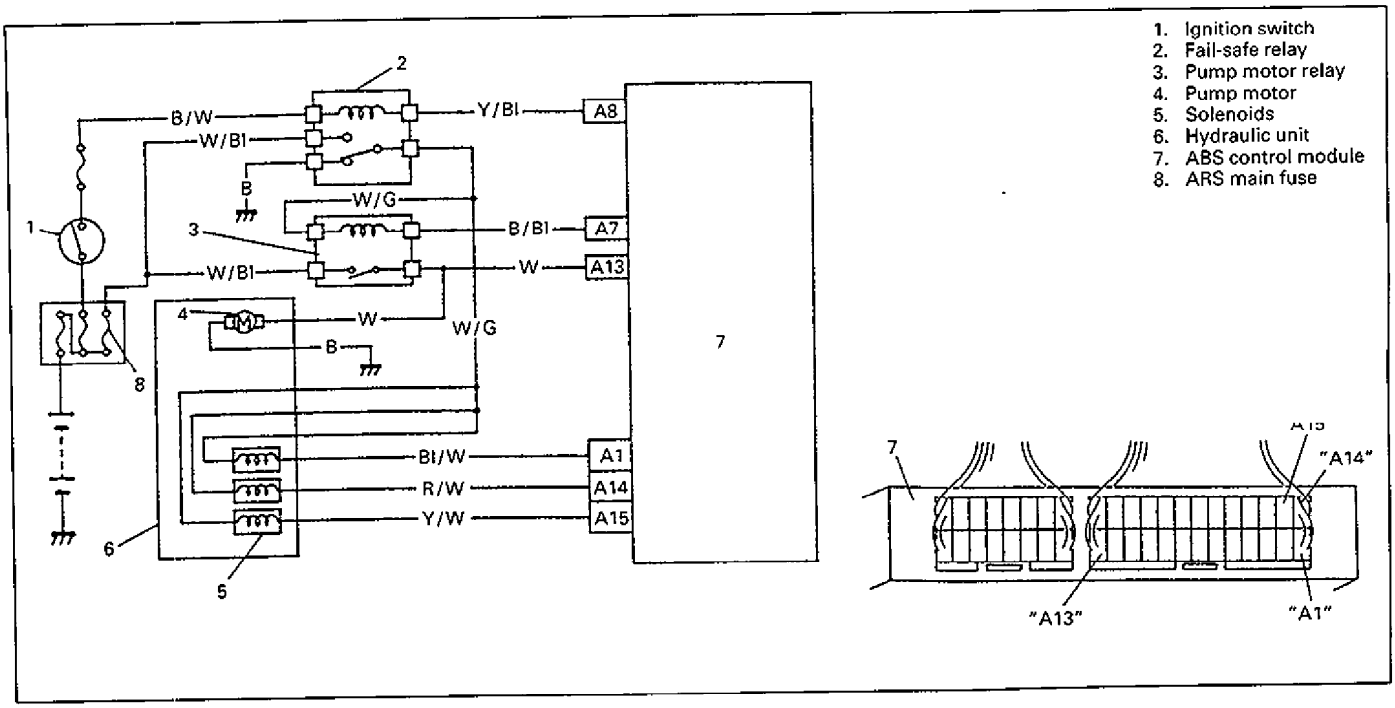
1) Ignition switch "OFF".
2) Connect solenoid connector of hydraulic unit.
3) Measure resistance between terminal "A1", "A14" or "A15" of module connector and body ground.
Is it about specified solenoid resistance?



YES → Substitute a known-good ABS control module and recheck.

NO → "Bl/W", "R/W" or "Y/W" circuit open, poor connection or shorted to ground.

DTC 57 – SOLENOID AND PUMP MOTOR POWER SOURCE CIRCUIT (Page 1 of 2)



DESCRIPTION

The ABS control module monitors the voltage at each terminal ("A1", "A14" and "A15") of the solenoid circuit constantly with the ignition switch turned ON as well as the voltage at the monitor terminal "A13" of the pump motor circuit. When all four solenoid terminal voltages are below the specified value or the voltage at the motor monitor terminal became below the specified value while the 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

Check battery voltage.
Is it about 11V or higher

NO → Check charging system referring to Section 6H of service manual mentioned in FOREWORD of this manual.

YES → Check ABS main fuse and connection.
Is it in good condition?

NO → Repair and/or replace fuse.

YES → 1) Turn ignition switch "OFF" and then "ON".
2) Is DTC 57 detected?

NO → Go to DTC 57 (Page 2 of 2).

YES → 1) Ignition switch "OFF".
2) Check for proper connection to pump motor relay.
3) If OK then check motor relay referring to item "ABS PUMP MOTOR RELAY" in this section.
Is it in good condition?

NO → Replace relay.

YES → Poor "A13" connection of faulty "W" or "W/Bl" circuit. If connection and wires are OK, substitute a known-good ABS control module and recheck.

DTC 57 – SOLENOID AND PUMP MOTOR POWER SOURCE CIRCUIT (Page 2 of 2)

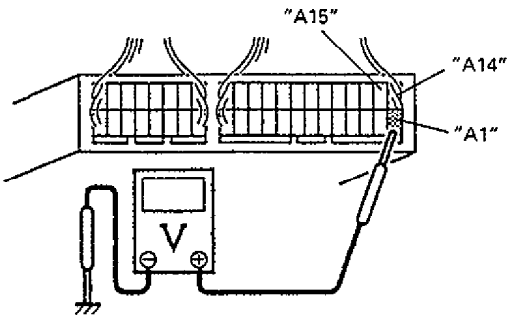
Were you sent here from DTC 57 (Page 1 of 2)?

YES

1) Ignition switch "ON".
2) Measure voltage between ABS control module connector terminal "A1", "A14" and "A15" and body ground.
   Is it about 9V or less at all 3 terminals?

NO

Go to DTC 57 (Page 1 of 2)



YES

1) Ignition switch "OFF".
2) Remove fail-safe relay.
3) Check for proper connection to relay.
4) If OK then check fail-safe relay referring to item "ABS FAIL-SAFE RELAY" in this section.
   Is it in good condition?

NO

Check for proper connection to ABS control module at terminals "A1", "A14" and "A15". If OK then substitute a known-good ABS control module.

YES

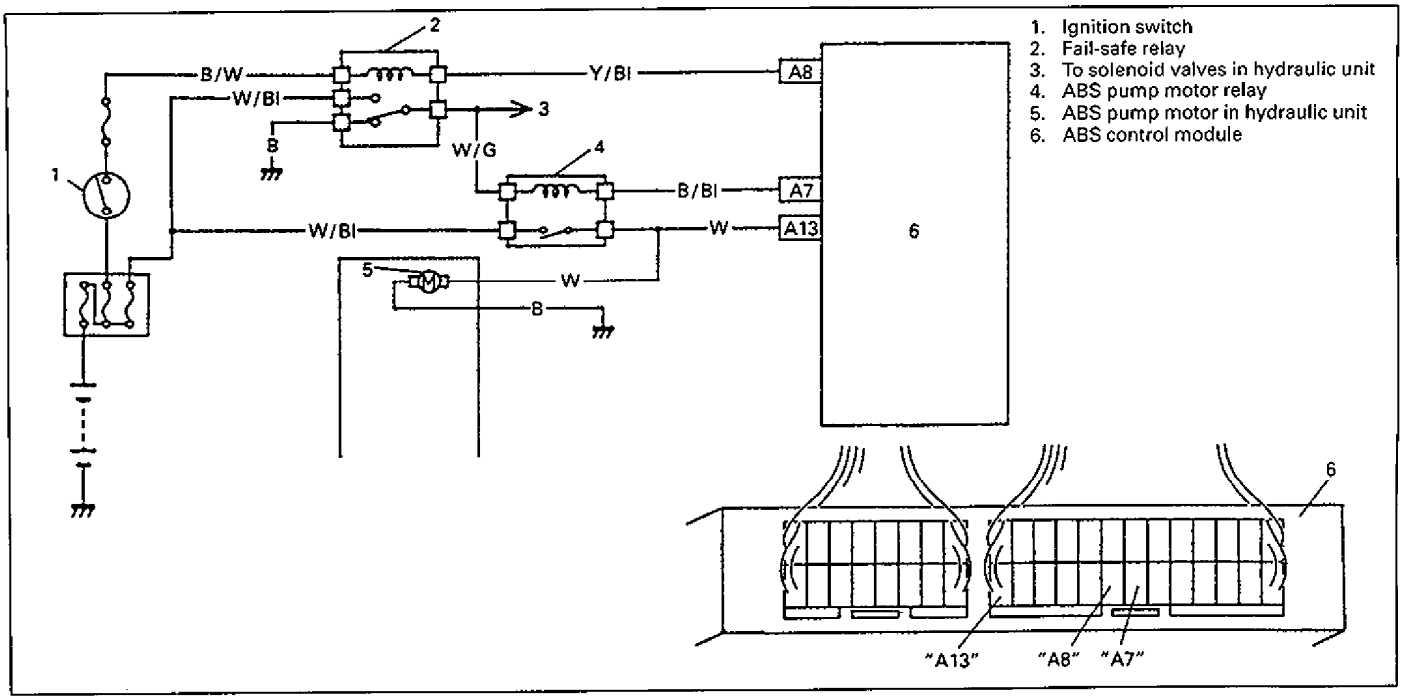
Faulty "W/Bl" or "W/G" circuit. If wires are OK, substitute a known-good ABS control module and recheck.

NO

Replace relay.

61A10-5B1-41-1

DTC 61 – ABS PUMP MOTOR CIRCUIT (Page 1 of 2)



DESCRIPTION

The ABS control module monitors the voltage at the monitor terminal "A13" of the pump motor circuit constantly with the ignition switch turned ON. It sets this DTC when the voltage at the monitor terminal "A13" does not become high/low according to ON/OFF commands to the motor relay of the module (does not follow these commands).

INSPECTION

Does (or Did) pump motor remain running at ignition switch "ON" or "OFF"?

YES

Check pump motor relay referring to item "ABS PUMP MOTOR RELAY" in this section.
Is it in good condition?

YES

1) Ignition switch "OFF".
2) Install motor relay.
3) Disconnect ABS control module connector and turn ignition switch ON.
   Does motor run then?

YES

"W" circuit shorted to power circuit.

NO

Substitute a known-good ABS control module and recheck.

NO

Replace relay

NO

Go to DTC 61 (Page 2 of 2).

61A10-5B1-42-1

DTC 61 – ABS PUMP MOTOR CIRCUIT (Page 2 of 2)

Were you sent here from DTC 61 (Page 1 of 2)?

YES

1) Ignition switch "OFF".
2) Check for proper connection to motor relay.
3) If OK then check motor relay referring to item "ABS MOTOR RELAY" in this section.
Is it in good condition?

NO

Go to DTC 61 (Page 1 of 2).

YES

1) Check for proper connection to pump motor.
2) If OK then check pump motor referring to item "PUMP MOTOR INSPECTION" in this section.
Is it in good condition?

NO

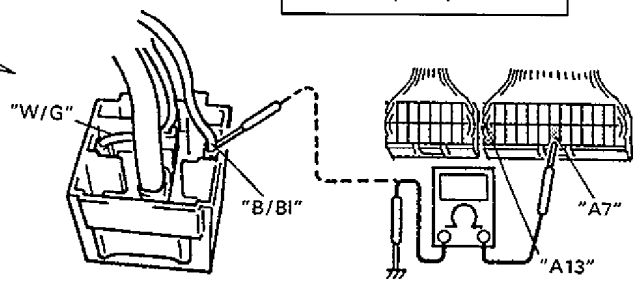
Replace motor relay.

YES

1) Disconnect ABS control module connectors.
2) Check for proper connection to module at terminals "A7" and "A13".
3) Disconnect fail safe relay.
4) If OK then check "B/Bl" and "W/G" circuit for open and short to ground.
Is it in good condition?

NO

Replace pump motor.

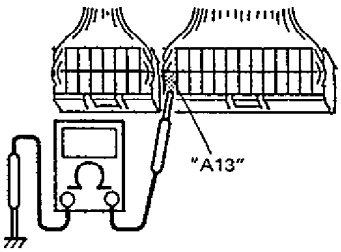


YES

1) Connect pump motor connector.
2) Measure resistance between terminal "A13" of module connector and body ground.
Is there continuity?

NO

"B/Bl" or "W/G" circuit open, or "B/Bl" circuit shorted to ground.



YES

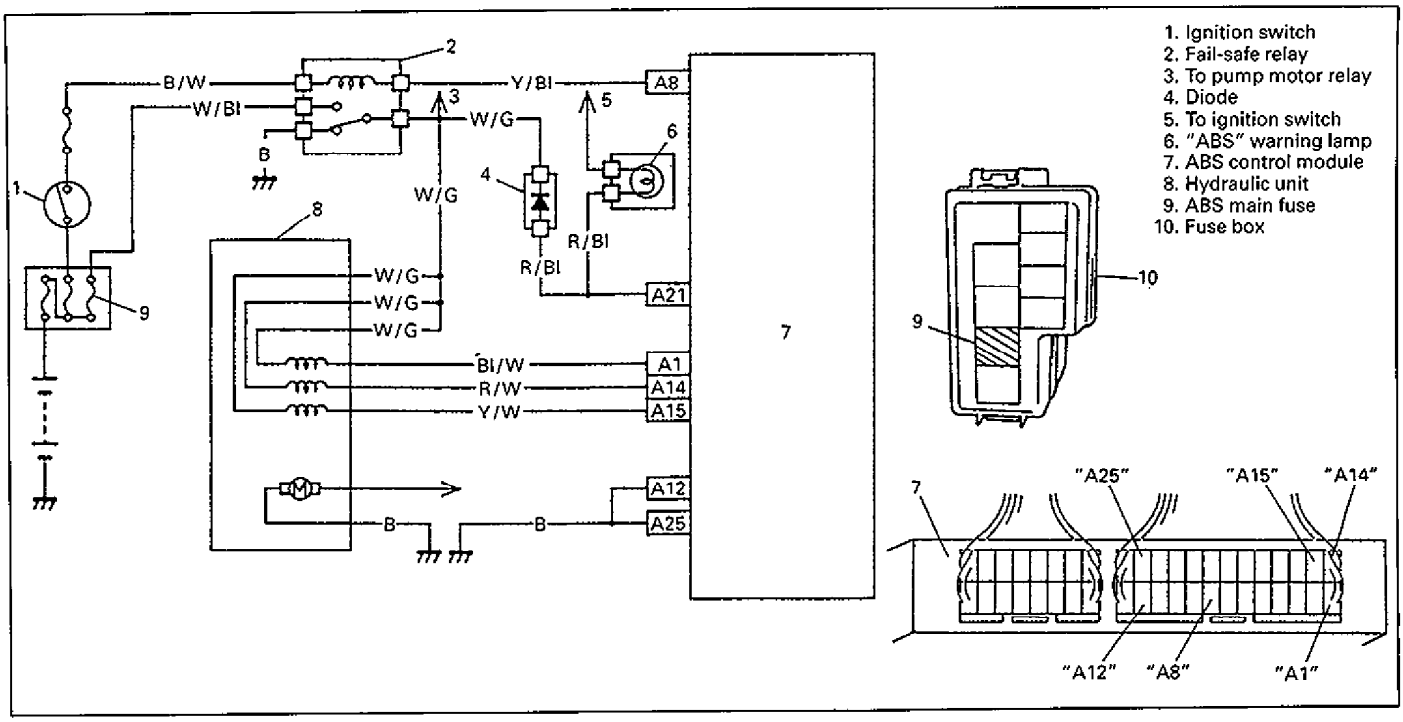
Substitute a known-good ABS control module and recheck.

NO

"W" circuit open or motor "B" circuit open.

61A10-5B1-43-1

DTC 63 – ABS FAIL-SAFE RELAY CIRCUIT (Page 1 of 2)



DESCRIPTION

The ABS control module monitors the voltage at each terminal ("A1", "A14" and "A15") of the solenoid circuit constantly with the ignition switch turned ON. Also, immediately after the ignition switch is turned "ON", perform an initial check as follows.

Switch the fail-safe relay in the order of ON → OFF → ON and check if the voltage at 3 solenoid circuit terminals changes to High → Low → High. If anything faulty is found in the initial check and when the voltage at all solenoid circuit terminals is low with the ignition switch turned ON and ABS not operated, this DTC will be set.

INSPECTION

Check battery voltage.
Is it about 11V or higher?

YES → Check ABS main fuse and connection.
Is it in good condition?

NO → Check charging system referring to Section 6H of Service Manual mentioned in FOREWORD of this manual.

YES → 1) Ignition switch "OFF".
2) Remove fail-safe relay.
3) Check for proper connection to fail-safe relay.
4) If OK then check fail-safe relay referring to item "ABS FAIL-SAFE RELAY" in this section.
Is it in good condition?

NO → Repair or replace.

YES → Go to DTC 63 (Page 2 of 2).

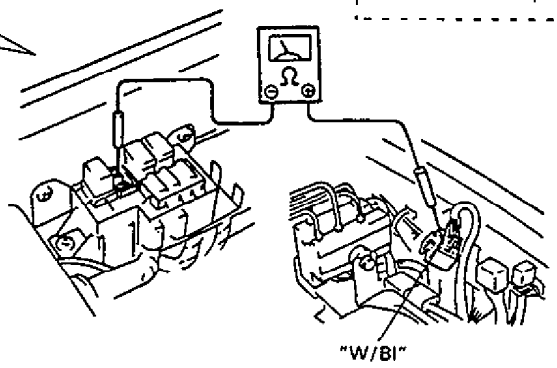
NO → Replace relay.

DTC 63 – ABS FAIL-SAFE RELAY CIRCUIT (Page 2 of 2)

Were you sent here from DTC 63 (Page 1 of 2)?

YES

1) Measure "W/Bl" circuit for resistance.
Is there continuity?

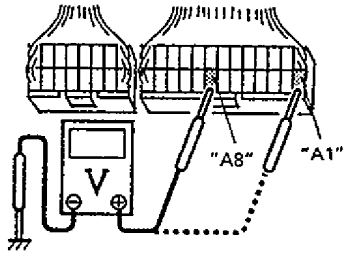


NO

Go to DTC 63 (Page 1 of 2).

YES

1) Install ABS main fuse and fail-safe relay.
2) Disconnect ABS control module connector.
3) Check for proper connection to ABS control module at terminals "A1", "A8", "A14" and " A15 ".
4) If OK then measure voltage between module connector terminal "A8" and body ground with ignition switch "ON".
Is it 10 – 14V?



NO

"W/Bl" circuit open.

YES

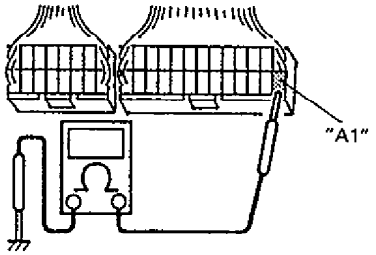
Measure voltage between module connector terminal "A1" and body ground with ignition switch "ON".
Is it about 0V?

NO

"Y/Bl" circuit open or shorted to ground.

YES

1) Ignition switch "OFF".
2) Measure resistance between module connector terminal "A1" and body ground.
Is there continuity?



NO

"Bl/W", "R/W" or "Y/W" circuit shorted to power circuit.

YES

Substitute a known-good ABS control module and recheck.

NO

"W/G" circuit open.

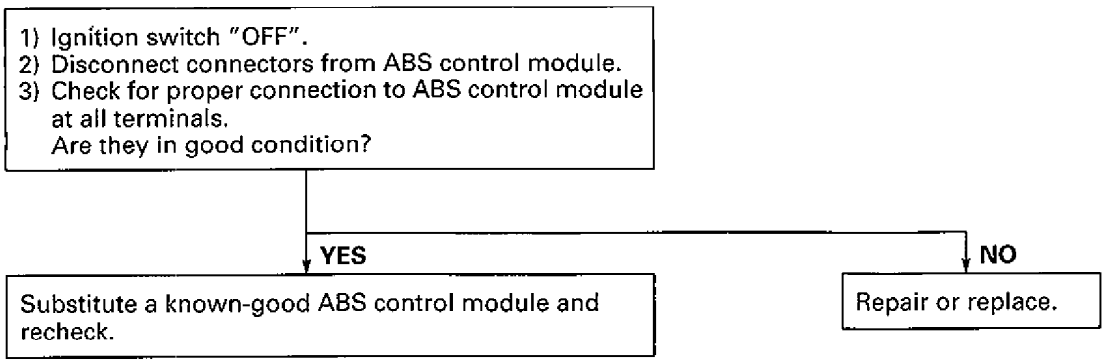
61A10-5B1-45-1

DTC71 – ABS CONTROL MODULE

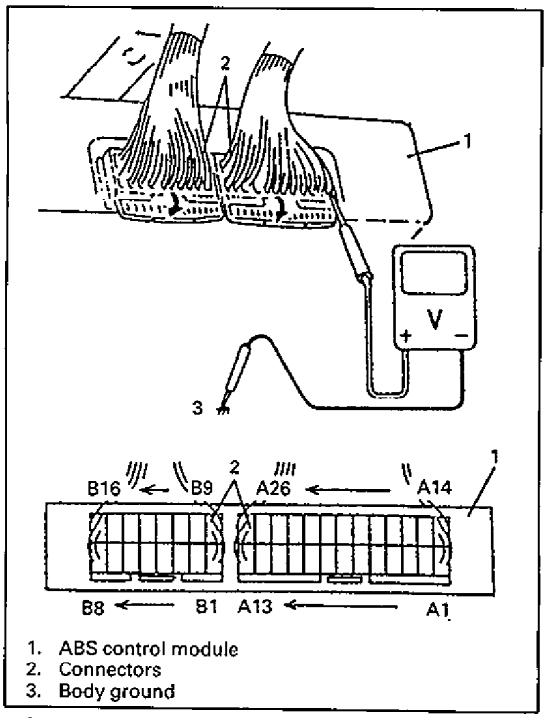
DESCRIPTION

This DTC will be set when an internal fault is detected in the ABS control module.

INSPECTION



61A10-5B1-46-1



1. ABS control module
2. Connectors
3. Body ground

60G00-5B-45-1

STANDARD VOLTAGE AT ABS CONTROL MODULE CONNECTOR TERMINALS

Voltage between each terminal of module connector and body ground is as follows.

CAUTION:
Never connect voltmeter or ohmmeter to ABS control module with connector disconnected from it. Attempt to do it may cause damage to ABS control module.

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

TERMINAL	CIRCUIT	STANDARD VOLTAGE	CONDITION
A1	Left-front solenoid valve	10 – 14V	Ignition switch ON, ABS not operated
A4	Ignition switch		Ignition switch ON
A7	Pump motor relay	10 – 14V	Ignition switch ON, Pump motor not operated
A8	Fail-safe relay	Below 1V	After 2 sec. with ignition switch ON
A9	Diag. switch terminal	10 – 14V	Ignition switch ON
A10	Diag. output terminal	Below 1V	
A11	Stop lamp switch	Below 1V	Brake pedal released
		10 – 14V	Brake pedal depressed
A13	Motor voltage monitor	Below 1V	Ignition switch ON, Pump motor not operated
A14	Right-front solenoid valve	10 – 14V	Ignition switch ON, ABS not operated
A15	Rear solenoid valve		
A20	4WD switch	10 – 14V	Ignition switch ON and Transfer gear shift control lever position "2H"
		Below 1V	Ignition switch ON and Transfer gear shift control lever position "4H" or "4L"
A21	"ABS" warning lamp	Below 1V	ABS warning lamp ON (For 2 sec. after ignition switch ON)
		10 – 14V	ABS warning lamp OFF (After the above time)
A22	Data link connector	4 – 5V	Ignition switch ON
B2	G sensor signal	1.8 – 3.2V	Ignition switch ON and vehicle stopped
B5	Left-rear wheel speed sensor ⊖	Below 1V	
B6	Right-front wheel speed sensor ⊖		
B7	Right-rear wheel speed sensor ⊖		
B8	Left-front wheel speed sensor ⊖		
B11	Differential switch	7.5 – 10.3V	Ignition switch ON
B13	Left-rear wheel speed sensor ⊕	0.5 – 1.0V	Ignition switch ON and vehicle stopped
B14	Right-front wheel speed sensor ⊕		
B15	Right-rear wheel speed sensor ⊕		
B16	Left-front wheel speed screw ⊕		

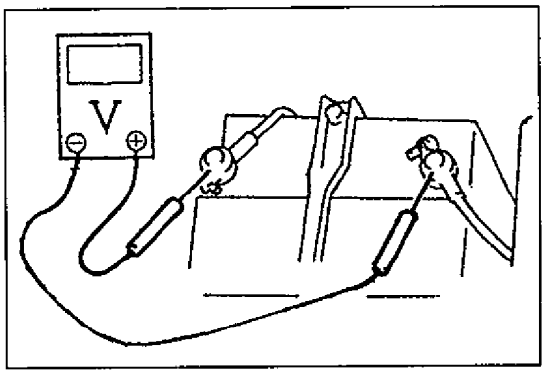
61A10-5B1-47-2

ON-VEHICLE SERVICE

PRECAUTION

When connectors are connected to ABS control module, do not disconnect connectors of hydraulic unit, sensors, relay, fuse etc. and turn ignition switch ON. Then DTC will be set in ABS control module.

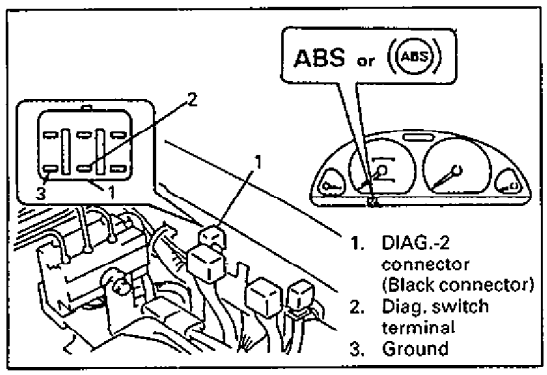
60G00-5B1-46-1



ABS HYDRAULIC UNIT OPERATION CHECK

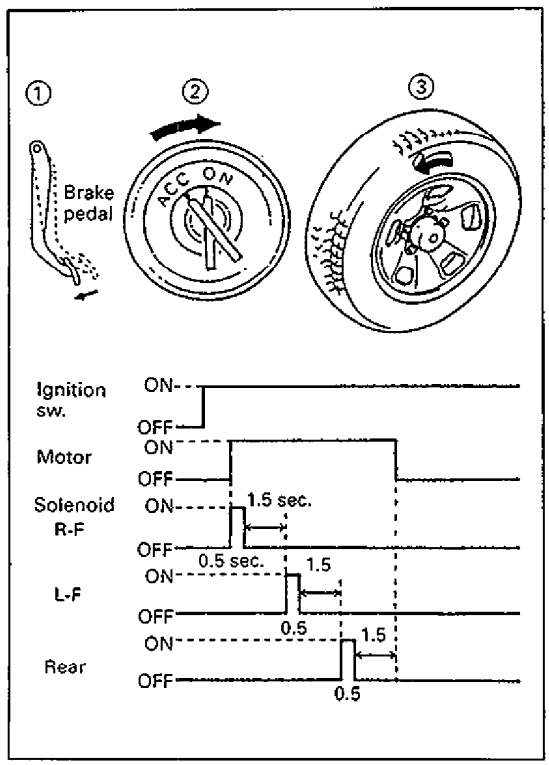
1) Check that basic brake system other than ABS is in good condition.
2) Check that battery voltage is 11V or higher.
3) With "ABS" warning lamp, check that no abnormality is detected in ABS. Refer to p. 5B1-17.
4) Lift up vehicle.
5)Set transmission to neutral and release parking brake.
6) Turn each wheel gradually by hand to check if brake dragging occurs. If it does, correct.

60G00-5B-46-2



7) With diag. switch terminal of DIAG.-2 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".

61A10-5B1-48-3

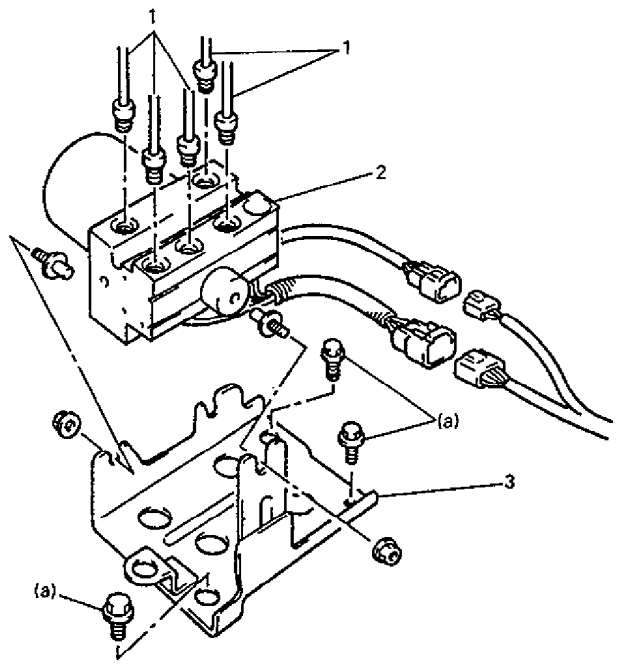


9) Perform following checks with help of another person.
Brake pedal should be depressed and then ignition switch turned ON by one person and wheel should be turned by another person's hand. At this time, check that:
- Operation sound of solenoid is heard and wheel turns only about 0.5 sec. (Brake force 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 Step 8) and 9) till all 4 wheels are checked.
If a faulty condition is found in Steps 9) and 10), replace hydraulic unit.
11) Turn ignition switch "OFF" and remove service wire from DIAG.-2 connector.

61A10-5B1-48-4

ABS HYDRAULIC UNIT



CAUTION:
Never disassemble ABS hydraulic unit, loosen blind plug or remove motor. Performing any of these prohibited services will affect original performance of ABS hydraulic unit.

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

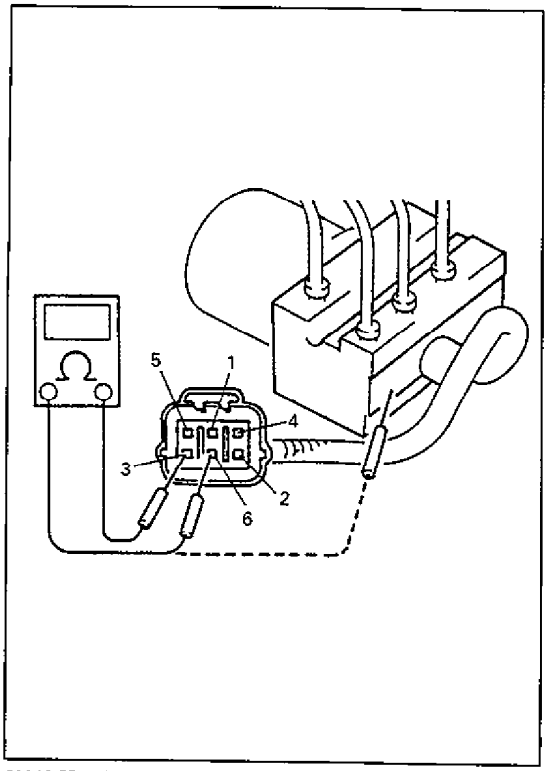
1. Brake pipe
2. ABS hydraulic unit
3. Bracket

61A10-5B1-49-1

HYDRAULIC UNIT INSPECTION

- Check hydraulic unit for fluid leakage.
  If any, repair or replace.

60G00-5B1-47-3



61A10-5B1-49-4

SOLENOID VALVE INSPECTION

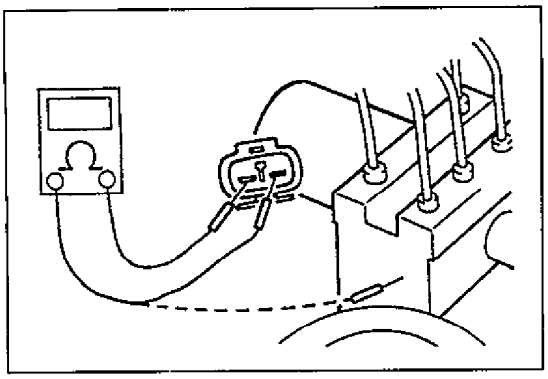
1) Turn ignition switch "OFF".
2) Disconnect solenoid connector.
3) Check resistance between terminals and whether or not short-circuit between each terminal and hydraulic unit body exists.

Between terminals:

1 and 2
3 and 4 — **2.9 – 3.2 Ω at 20°C (68°F)**
5 and 6

Between each terminal and unit body: ∞ (infinity)

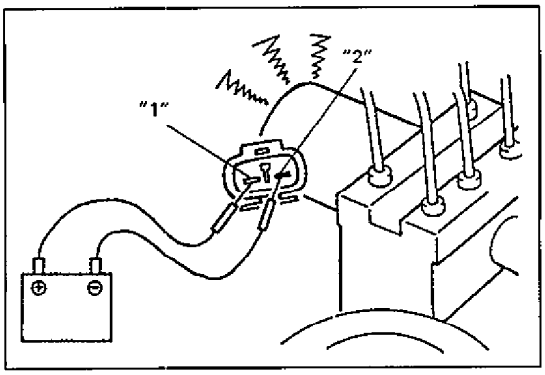
If faulty condition was found, replace hydraulic unit.


85F00-5B-49-1

PUMP MOTOR INSPECTION

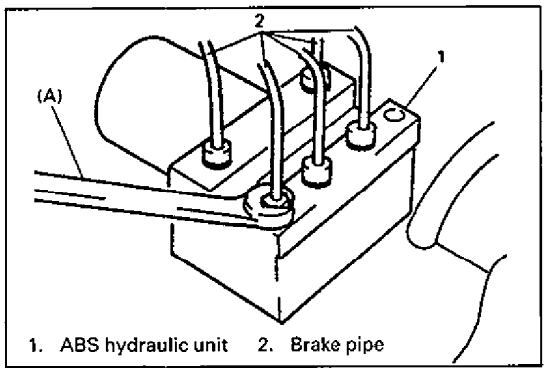
1) Turn ignition switch "OFF".
2) Disconnect motor connector.
3) Check motor for resistance.

Between motor terminals: Less than 1 Ω at 20°C (68°F)
Between terminal and motor body : 1 MΩ or more



85F00-5B-49-2

4) Connect 12V battery positive terminal to motor connector terminal "1" and negative terminal to "2".
Then check if operation sound is heard from motor.
If faulty condition was found in Steps 3) or 4), replace hydraulic unit.



1. ABS hydraulic unit 2. Brake pipe

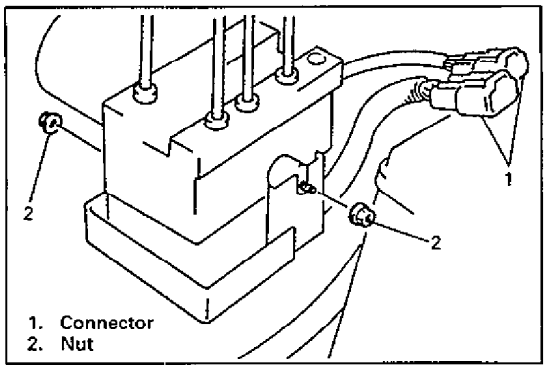
61A10-5B1-50-3

REMOVAL

1) Disconnect negative cable from battery.
2) Using special tool, disconnect brake pipes from ABS hydraulic unit.

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.

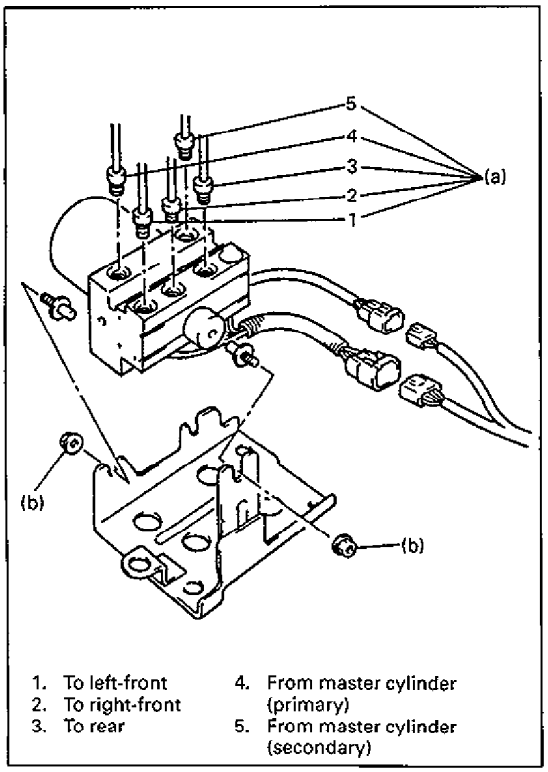


1. Connector
2. Nut

61A10-5B1-50-4

3) Disconnect ABS hydraulic unit connectors.
4) Remove three nuts and take out ABS hydraulic unit 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.**



1. To left-front
2. To right-front
3. To rear
4. From master cylinder (primary)
5. From master cylinder (secondary)

61A10-5B1-51-1

INSTALLATION

Install hydraulic unit by reversing removal procedure.

Tightening Torque

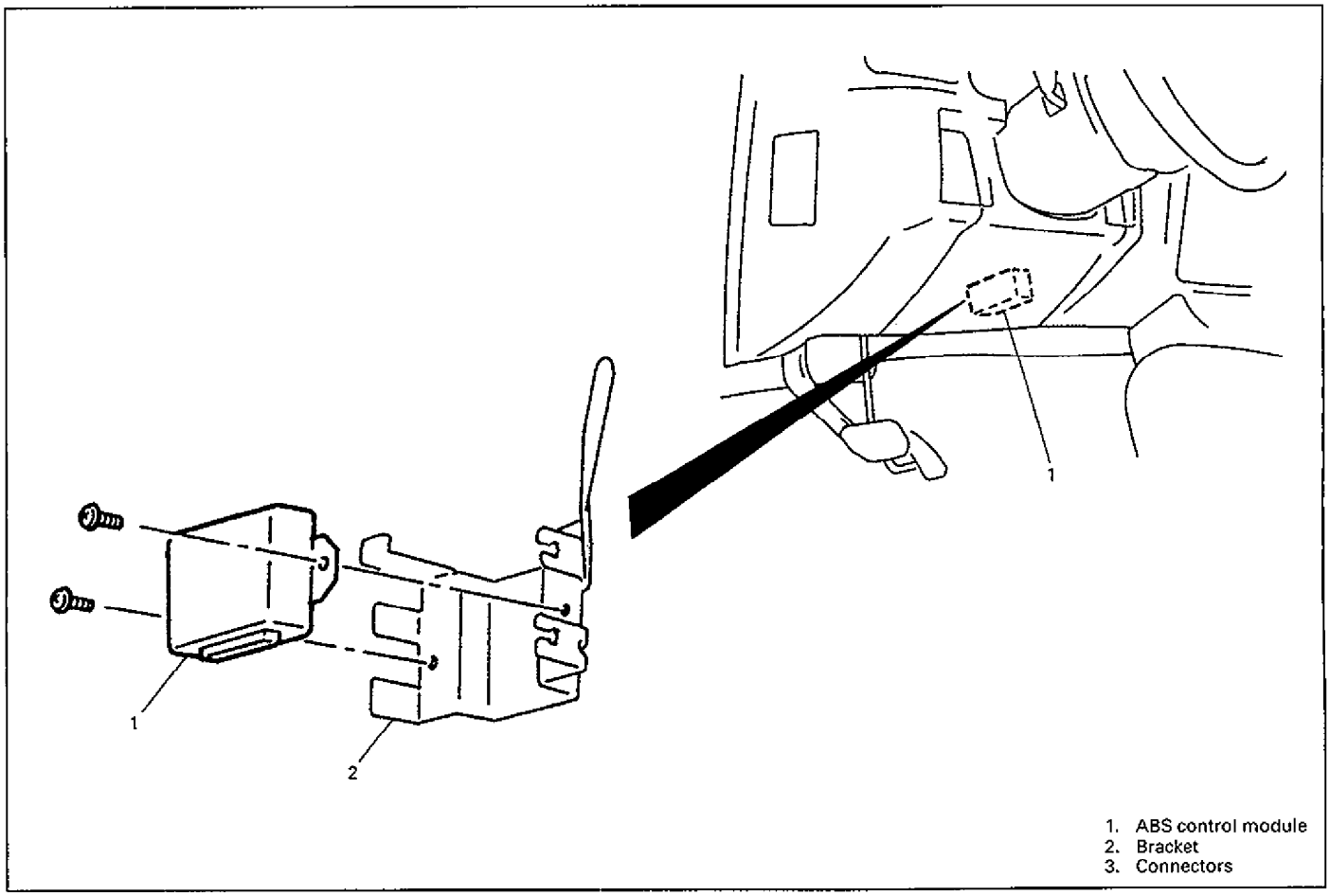
(a): 16 N·m (1.6 kg-m, 12.0 lb-ft)

(b): 21 N·m (2.1 kg-m, 15.5 lb-ft)

2) Bleed air from brake system referring to SECTION 5 of service manual mentioned in FOREWORD of this manual.
3) Check each installed part for fluid leakage and perform hydraulic unit operation check.

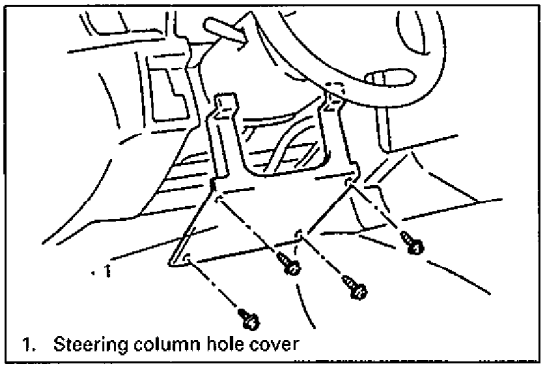
ABS CONTROL MODULE

CAUTION:
As ABS control module consists of precision parts, be careful not to expose it to excessive shock.



1. ABS control module
2. Bracket
3. Connectors

85F00-5B1-51-1



1. Steering column hole cover

85F00-5B-51-4

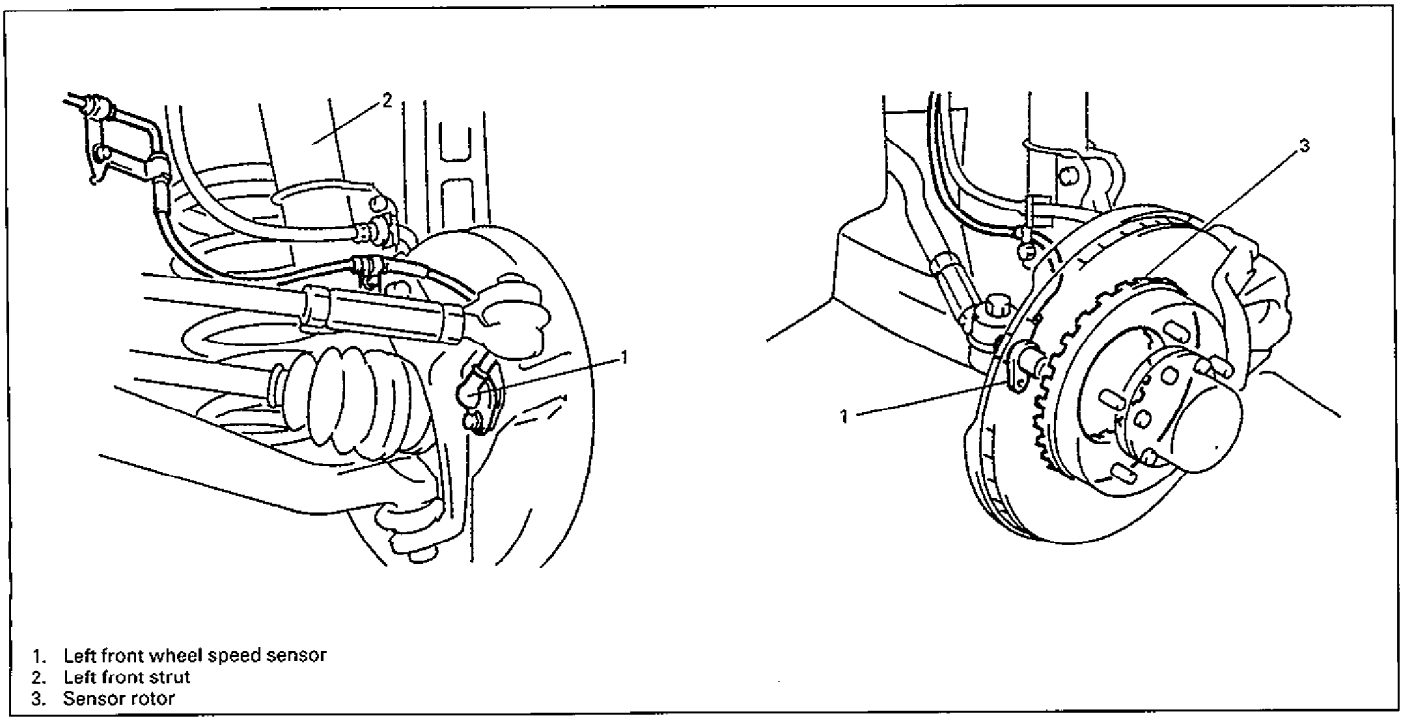
REMOVAL

1) Disconnect negative cable from battery.
2) Remove steering column hole cover from instrument panel.
3) Disconnect ABS control module connectors.
4) Remove bolts and take out ABS control module.

INSTALLATION

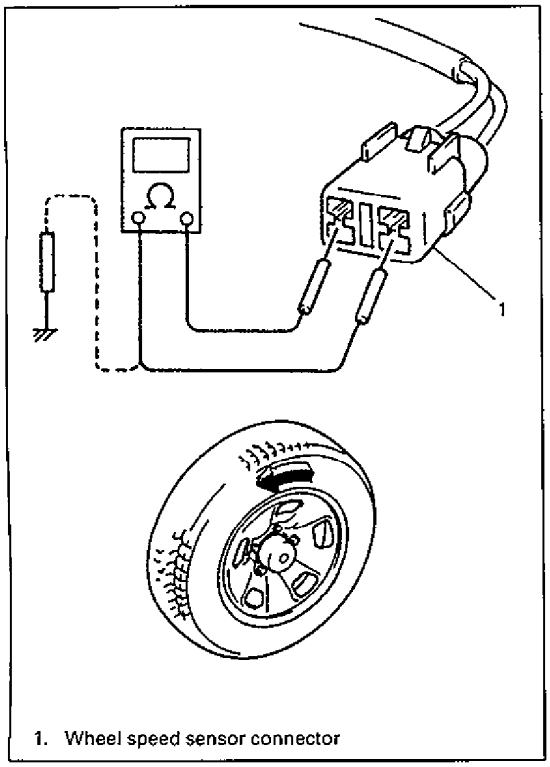
Install it by reversing removal procedure.

FRONT WHEEL SPEED SENSOR



1. Left front wheel speed sensor
2. Left front strut
3. Sensor rotor

85F00-5B-52-1



1. Wheel speed sensor connector

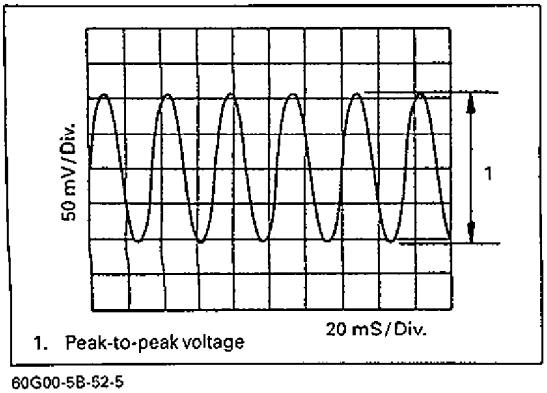
85F00-5B-52-3

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 2/3 to 1 full rotation per second, check AC voltage of sensor.

Output AC voltage at 2/3 to one rotation per second (35 – 53 Hz): 106 mV or more

If measured voltage is not as specified, check sensor, rotor and their installation conditions.



1. Peak-to-peak voltage

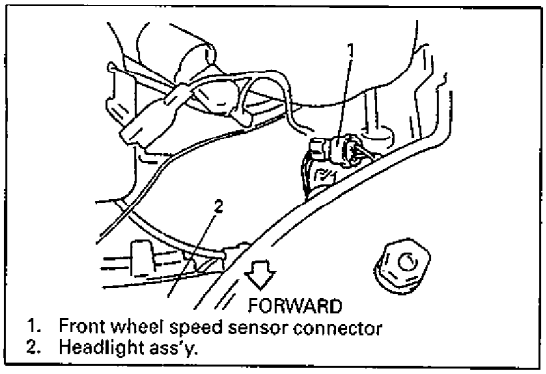
60G00-5B-52-5

Reference

When using oscilloscope for this check, check if peak-to-peak voltage meets specification and waveform is complete.

Peak-to-peak voltage

at 2/3 to one rotation per second (35 – 53 Hz): 150 mV or more

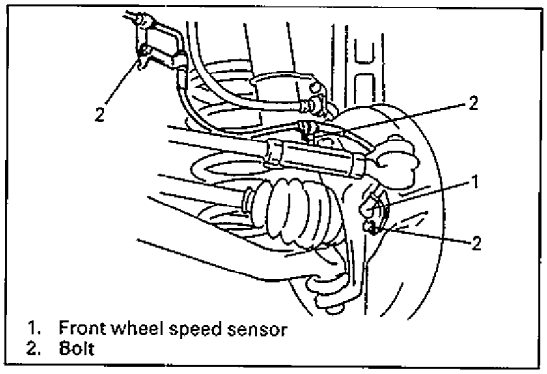


1. Front wheel speed sensor connector
2. Headlight ass'y.

61A10-5B1-54-1

REMOVAL

1) Disconnect negative cable from battery.
2) Hoist vehicle and remove wheel.
3) Disconnect front wheel speed sensor connector.

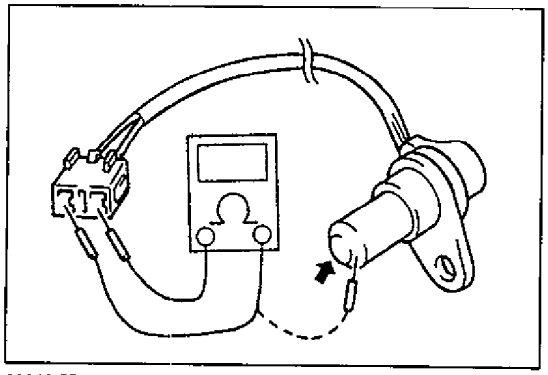


1. Front wheel speed sensor
2. Bolt

85F00-5B-53-2

4) Remove harness clamp bolts 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.**



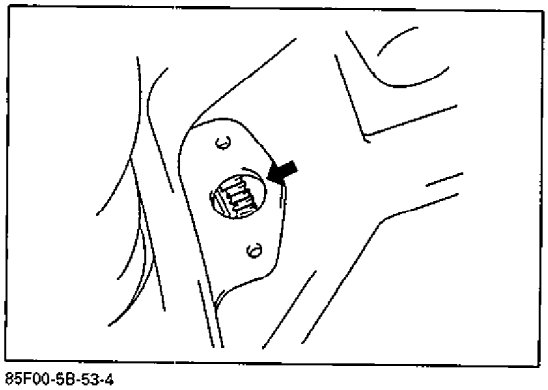
61A10-5B1-54-3

SENSOR INSPECTION

- Check sensor for damage.
- Check sensor for resistance.

Resistance between terminals: 1.2 – 1.6 kΩ at 20°C (68°F)
Resistance between terminal and sensor body: 1 MΩ or more

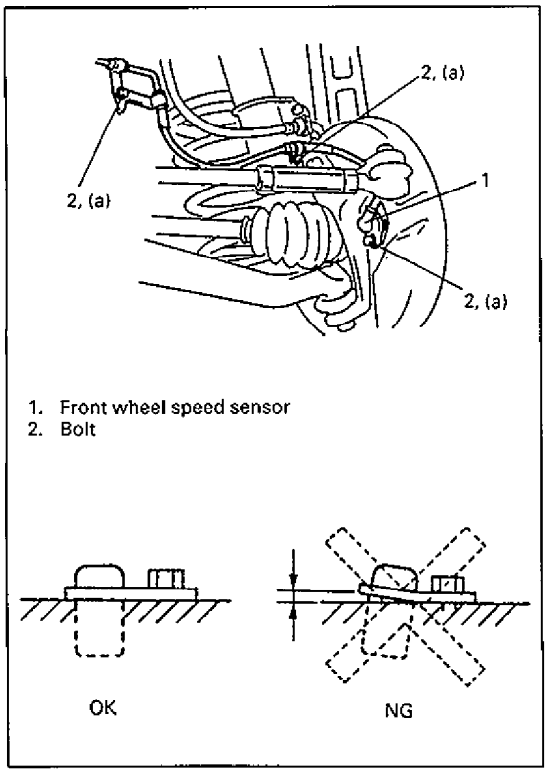
If any faulty is found, replace.



85F00-5B-53-4

SENSOR ROTOR INSPECTION

- Check rotor serration (teeth) for being missing, damaged or deformed.
- Turn drive shaft and check if rotor rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.
  If any faulty is found, repair or replace.



61A10-5B1-55-1

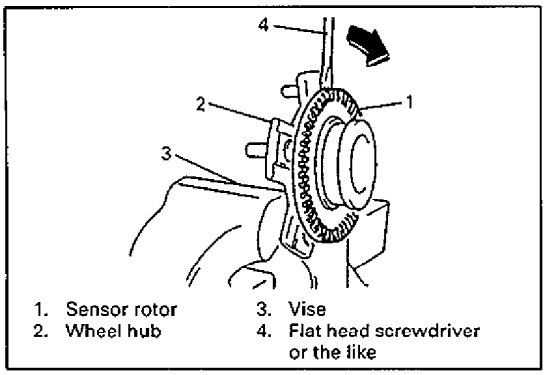
INSTALLATION

1) Check that no foreign material is attached to sensor and rotor.
2) Install it by reversing removal procedure.

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

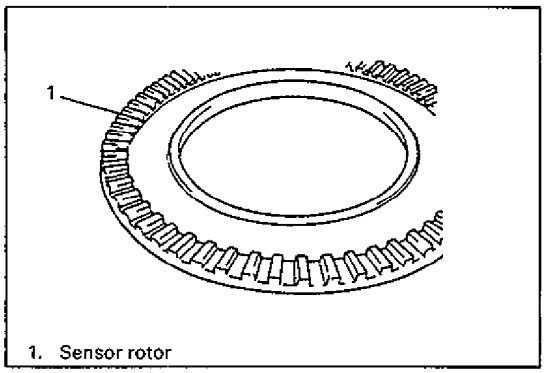
CAUTION:
- **Do not pull wire harness or twist more than necessary when installing front wheel speed sensor.**
- **Fit harness grommet to inner fender securely.**

3) Check that there is no clearance between sensor and knuckle.



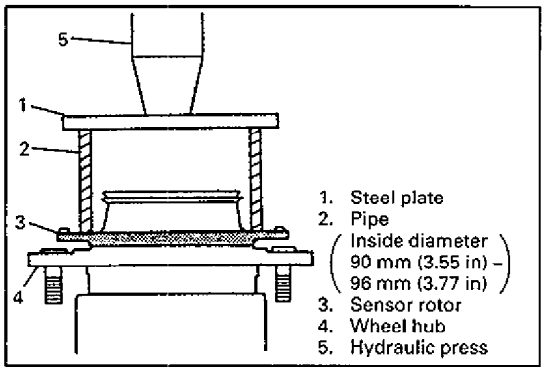
1. Sensor rotor
2. Wheel hub
3. Vise
4. Flat head screwdriver or the like

61A10-5B1-56-1



1. Sensor rotor

61A10-5B1-56-2



1. Steel plate
2. Pipe
   (Inside diameter 90 mm (3.55 in) – 96 mm (3.77 in))
3. Sensor rotor
4. Wheel hub
5. Hydraulic press

85F00-5B-55-3

FRONT SENSOR ROTOR

REMOVAL

1) Remove wheel hub with sensor rotor. Refer to SECTION 3D FRONT SUSPENSION of service manual mentioned in FOREWORD of this manual.
2) Remove sensor rotor from wheel hub as shown.

CAUTION:
Pull out sensor rotor from wheel hub gradually and evenly. Attempt to pull it out partially may cause it to be deformed.

INSPECTION

- Check rotor serration (teeth) for being missing, damaged or deformed.
- Check sensor rotor for being deformed (warped).
- Check that no foreign material is attached.
  If any faulty is found, repair or replace.

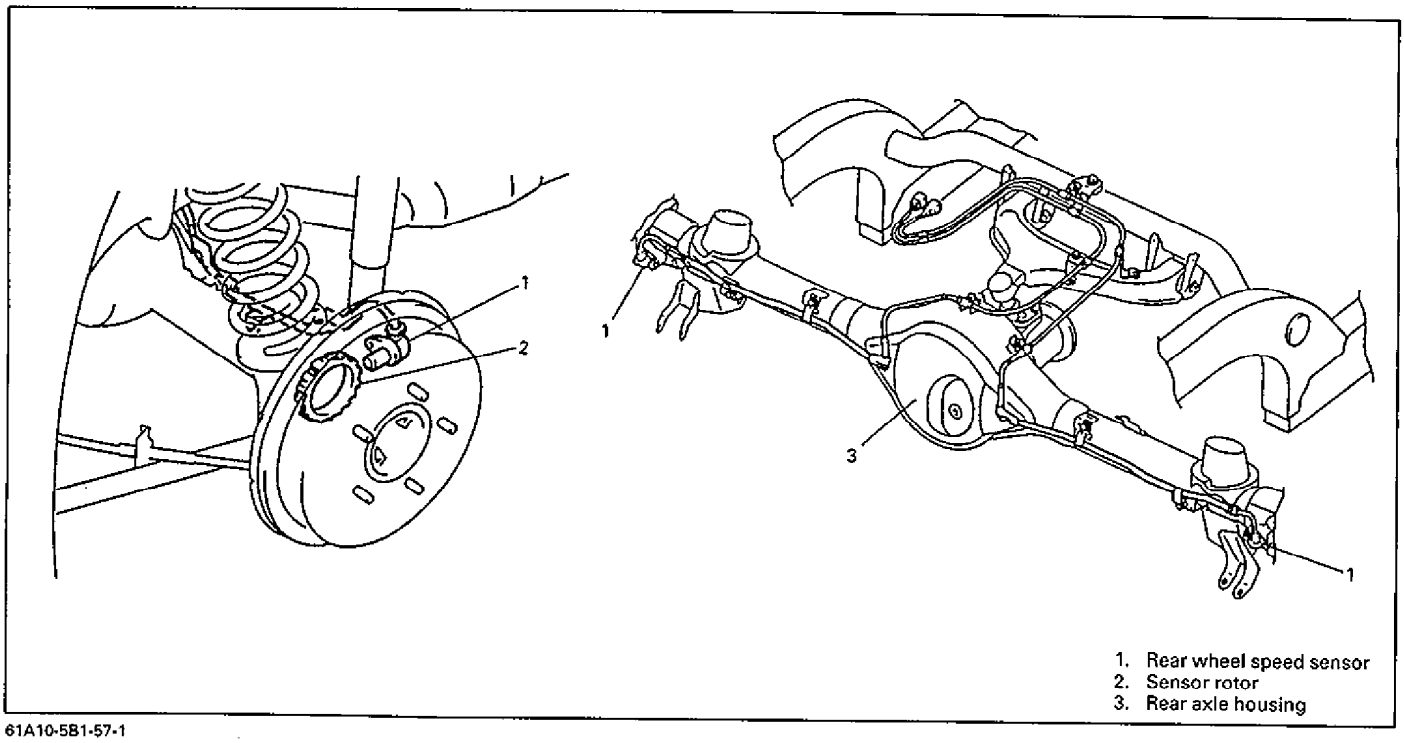
INSTALLATION

1) Install sensor rotor as shown.

NOTE:
- **Pipe used here should have inner diameter of 90 mm (3.55 in) – 96 mm (3.77 in) and its outside should not contact teeth of sensor rotor.**
- **Use care not to insert wheel hub diagonally.**

2) Install wheel hub, brake disc, brake caliper, locking hub and wheel.
   Refer to SECTION 3D FRONT SUSPENTION of service manual mentioned in FOREWORD of this manual.

REAR WHEEL SPEED SENSOR



1. Rear wheel speed sensor
2. Sensor rotor
3. Rear axle housing

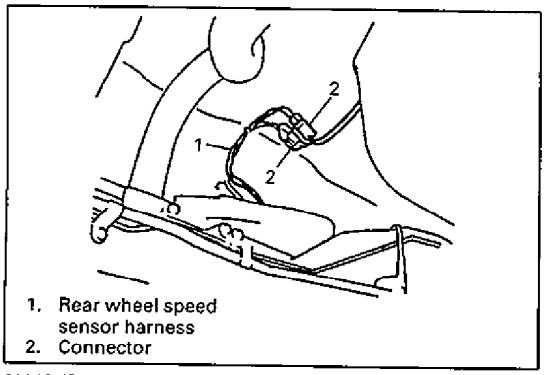
61A10-5B1-57-1

OUTPUT VOLTAGE INSPECTION

Check in the same procedure as that used of front wheel speed sensor check.

Output AC voltage at 2/3 to one rotation per second (25 – 38 Hz): 106 mV or more
Reference
When using oscilloscope, peak-to-peak voltage at 2/3 to one rotation per second (25 – 38 Hz): 150 mV or more

60G00-5B1-54-3

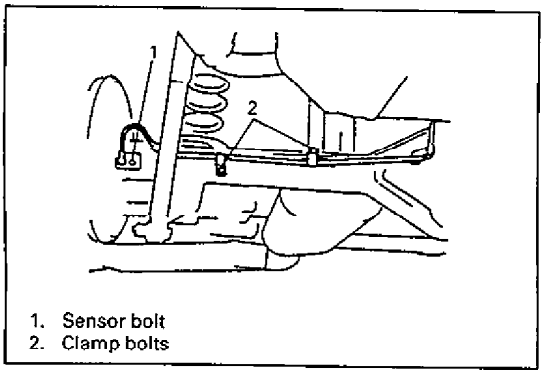


1. Rear wheel speed sensor harness
2. Connector

61A10-5B1-57-4

REMOVAL

1) Disconnect negative cable from battery.
2) Hoist vehicle.
3) Disconnect rear wheel speed sensor connector and detach wire harness from vehicle body and rear axle.

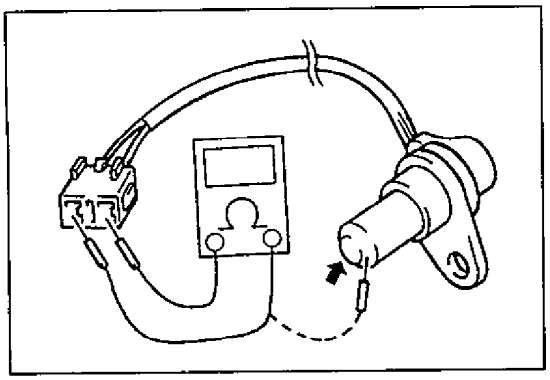


1. Sensor bolt
2. Clamp bolts

61A10-5B1-57-5

4) Remove harness clamp bolts and remove rear wheel speed sensor from rear axle.

CAUTION:
- **Do not pull wire harness when removing rear wheel speed sensor.**
- **Do not cause damage to surface of rear wheel speed sensor or pole piece and do not allow dust, etc. to enter its installation hole.**


61A10-5B1-58-1

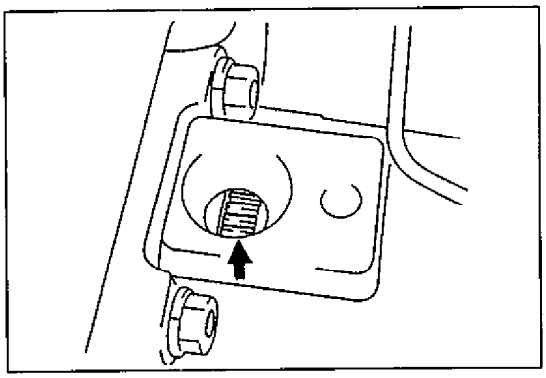
SENSOR INSPECTION

- Check sensor (pole piece) for damage or bent.
- Check sensor for resistance.

Resistance between terminals : 1.2 – 1.6 kΩ at 20°C, 68°F

Resistance between terminal and sensor body: 1 MΩ or more

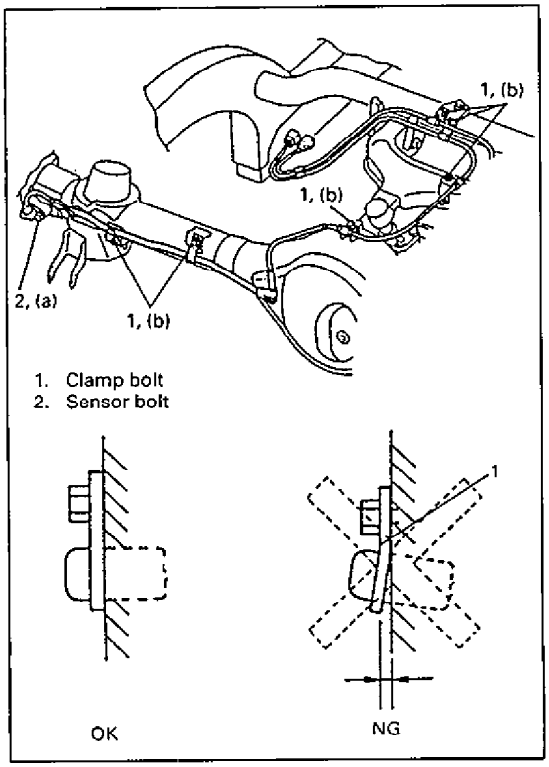
If any faulty is found, replace.


61A10-5B1-58-2

SENSOR ROTOR INSPECTION

- Check rotor serration (teeth) for being missing, damaged or deformed.
- Turn wheel and check if rotor rotation is free from eccentricity and looseness.
- Check that no foreign material is attached.

If any faulty is found, repair or replace.



61A10-5B1-58-3

INSTALLATION

1) Check that no foreign material is attached to sensor and rotor.
2) Install it by reversing removal procedure.

Tightening Torque
(a): 21 N·m (2.1 kg-m, 15.0 lb-ft)
(b): 10 N·m (1.0 kg-m, 7.5 lb-ft)

CAUTION:
Do not pull wire harness or twist more than necessary when installing rear wheel speed sensor.

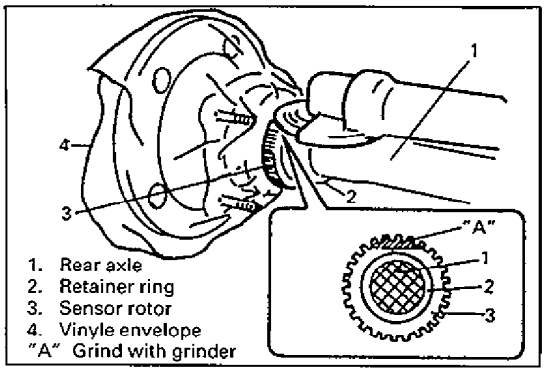
3) Check that there is no clearance between sensor and knuckle.

REAR SENSOR ROTOR

REMOVAL

1) Remove rear axle shaft. Refer to SECTION 3E REAR SUSPENSION of service manual mentioned in FOREWORD of this manual.

85F00-5B1-57-1



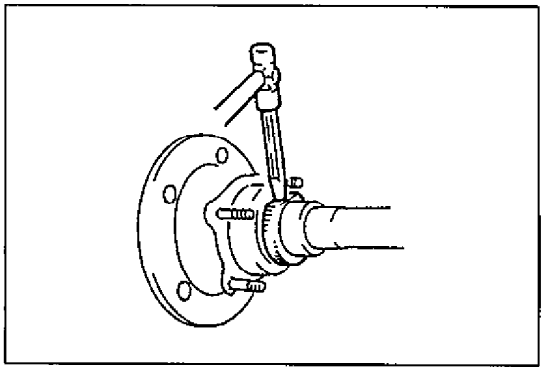
1. Rear axle
2. Retainer ring
3. Sensor rotor
4. Vinyle envelope

"A" Grind with grinder

61A10-5B1-59-2

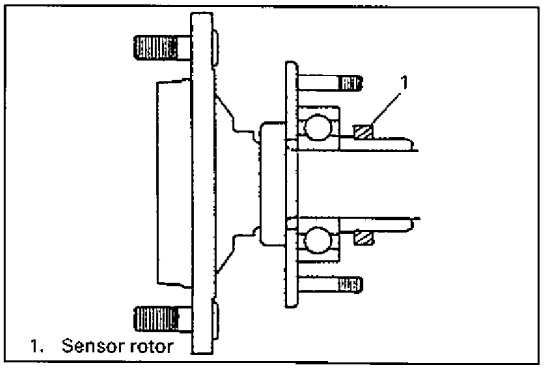
2) In order to remove sensor rotor from retainer ring, grind with a grinder one part of the sensor rotor as illustrated till it becomes thin.

CAUTION:
- **Cover vinyl sheet or the like over wheel bearing so that fine grains from grinding will not enter there.**
- **Be careful not to go so far as to grind the ritainer ring.**



61A10-5B1-59-3

3) Break with a chisel the thin ground sensor rotor, and it can be removed.



1. Sensor rotor

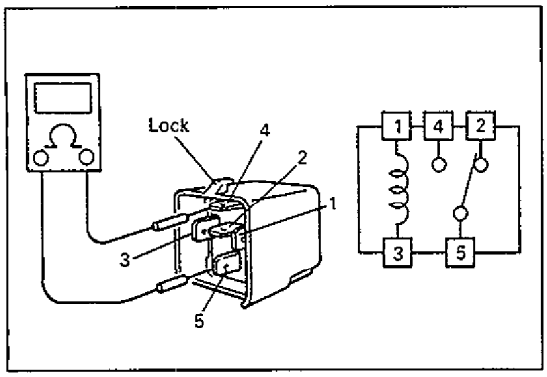
61A10-5B1-59-4

INSTALLATION

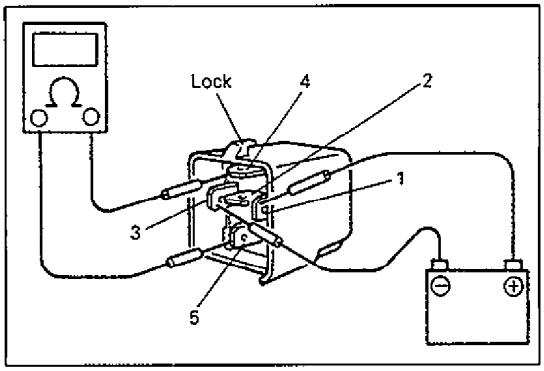
1) Press-fit sensor rotor as shown.

NOTE:
Use care not to cause any damage to outside of retainer ring.

2) Install rear axle shaft referring to SECTION 3E REAR SUSPENSION of service manual mentioned in FOREWORD of this manual.
3) Install brake drum and wheel.
Refer to SECTION 5 BRAKES of service manual mentioned in FOREWORD of this manual.



61A10-5B1-60-1



61A10-5B1-60-2

ABS FAIL-SAFE RELAY/ABS PUMP MOTOR RELAY

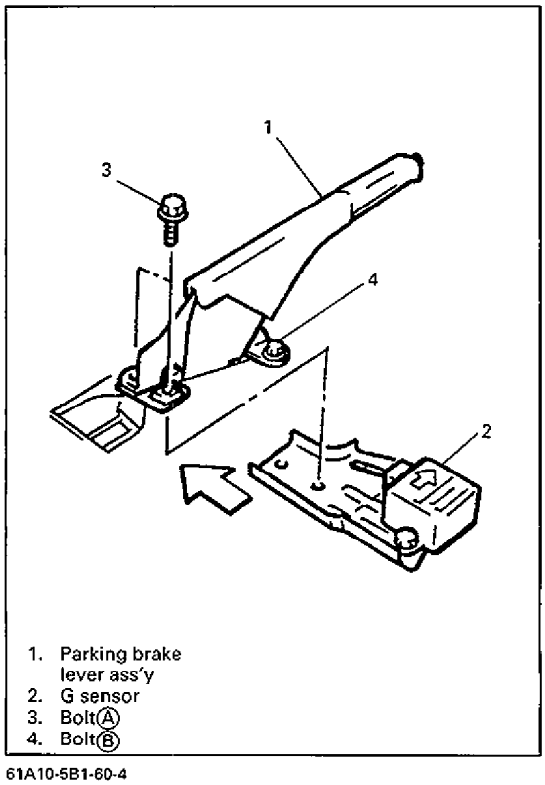
INSPECTION

1) Disconnect negative cable from battery.
2) Remove fail-safe relay or pump motor relay from bracket.
3) Check resistance between each two terminals.

   Between "1" and "3": 70 – 90 Ω at 20°C, 68°F
   Between "2" and "5": Continuity
   Between "4" and "5": No continuity

4) Check that there is continuity between terminals "4" and "5" when battery is connected to terminals " 1" and "3".

   If check result is not as specified in Step 3) and 4), replace.



1. Parking brake lever ass'y
2. G sensor
3. Bolt Ⓐ
4. Bolt Ⓑ

61A10-5B1-60-4

G SENSOR

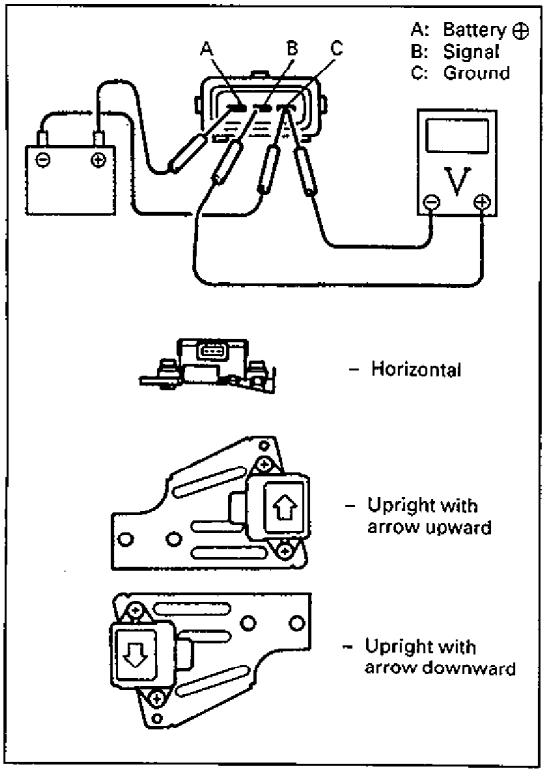
REMOVAL

1) Turn ignition switch "OFF" and disconnect battery negative cable.
2) Remove rear center console box.
3) Remove parking brake lever bolts Ⓐ and G sensor with bracket from floor.

   NOTE:
   Loosen only bolt Ⓑ.

4) Remove sensor with bracket from floor.
5) Disconnect connector from sensor.

CAUTION:
- **Do not separate sensor and bracket. It will lead to erroneous assembly.**
- **Sensor must not be dropped or shocked. It will affect its original performance.**



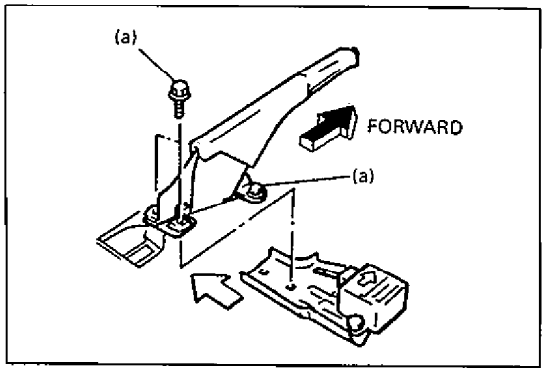
61A10-5B1-61-1

INSPECTION

1) Check sensor bracket for bend.
2) Connect positive cable of 12 volt battery to "A" terminal of sensor and ground cable to "C" terminal. Then using voltmeter, check voltage between "B" terminal and "C" terminal.

When placed horizontally: 2 – 3V
When placed upright with arrow upward: 3 – 4V
When placed upright with arrow downward: 1 – 2V

If measured voltage is not as specified, replace sensor with bracket.



61A10-5B1-61-3

INSTALLATION

1) Connect connector to sensor securely.
2) Install sensor with bracket and parking lever assy onto floor so that arrow mark directs vehicle forward.

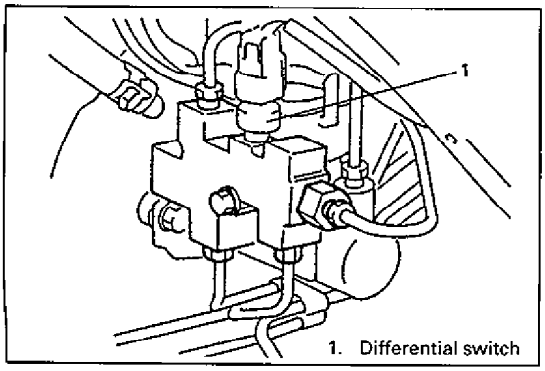
Tightening Torque
(a): 23 N·m (2.3 kg-m, 17.0 lb-ft)

3) Install rear console box.

4WD SWITCH

For removal, inspection and installation of this switch, refer to SECTION 7D of service manual mentioned in FOREWORD of this manual.

61A10-5B1-61-4



61A10-5B1-61-5

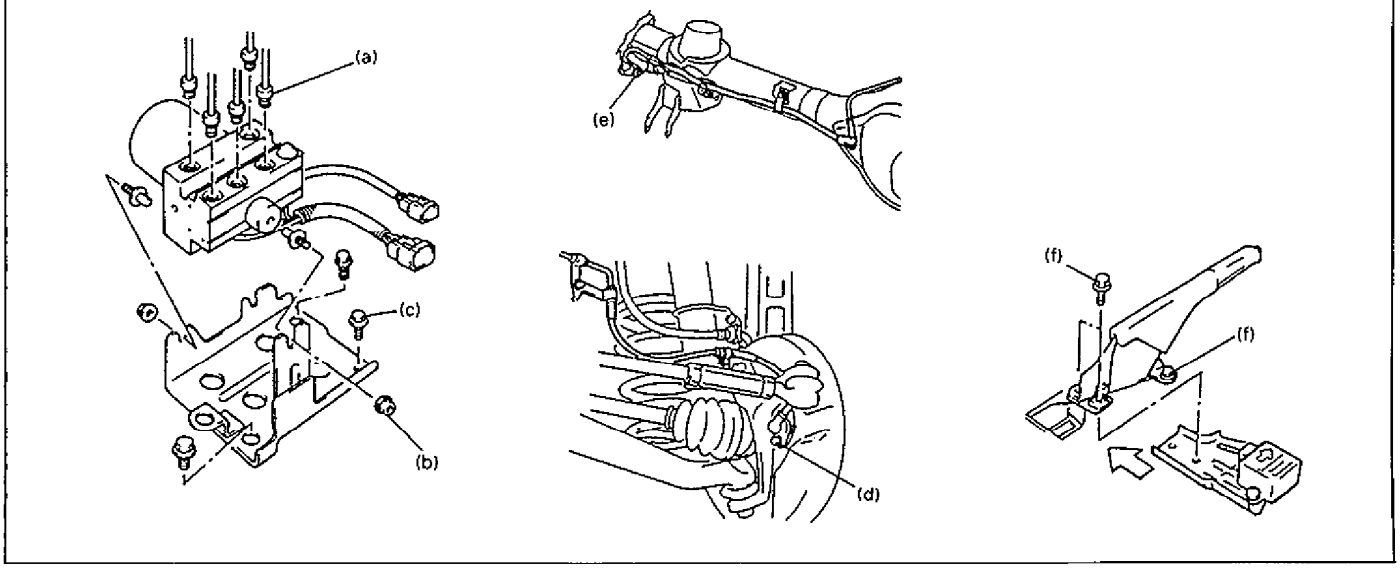
DIFFERENTIAL SWITCH

(included in P/Differential valve ass'y)

For removal, inspection and installation of this switch, refer to SECTION 5A2 of this manual.

TIGHTENING TORQUE SPECIFICATIONS

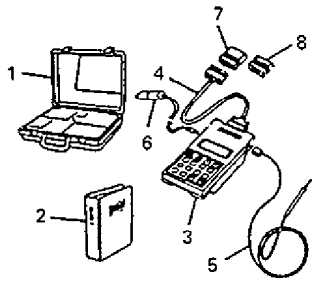
Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
Brake pipe flare nut: (a)		16	1.6	11.5
ABS hydraulic unit nut: (b)		21	2.1	15.5
ABS hydraulic unit bracket bolt: (c)		10	1.0	7.5
Wheel speed sensor bolt	(Front): (d)			
	(Rear): (e)	21	2.1	15.5
Parking lever assy mounting bolt: (f)		23	2.3	17.0



61A10-5B1-62-1

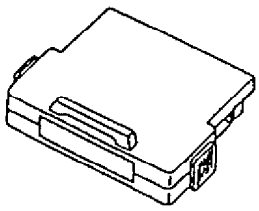
SPECIAL TOOLS

09950-78210
Flare nut wrench
(10 mm)



1. Storage case
2. Operator's manual
3. Tech-1 A
4. DLC cable
5. Test lead/probe
6. Power source cable
7. DLC cable adaptor
8. Self-test adaptor

09931-76011
Tech-1 (scan tool) kit



09932-66020-001 (English)
09932-66020-003 (German)
09932 66020-004 (French)
Tech-1 cartridge for ABS

60G00-5B-53-2

SECTION 6B

ENGINE COOLING

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

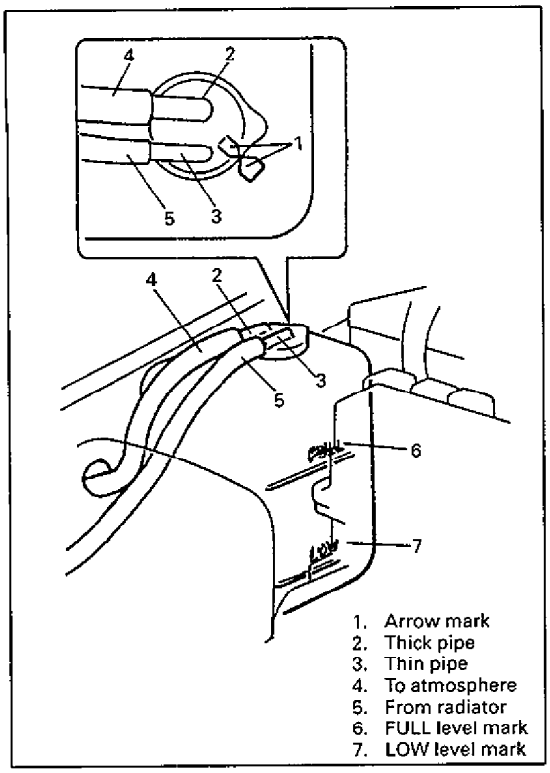
NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

61A10-6B-1-1

6B

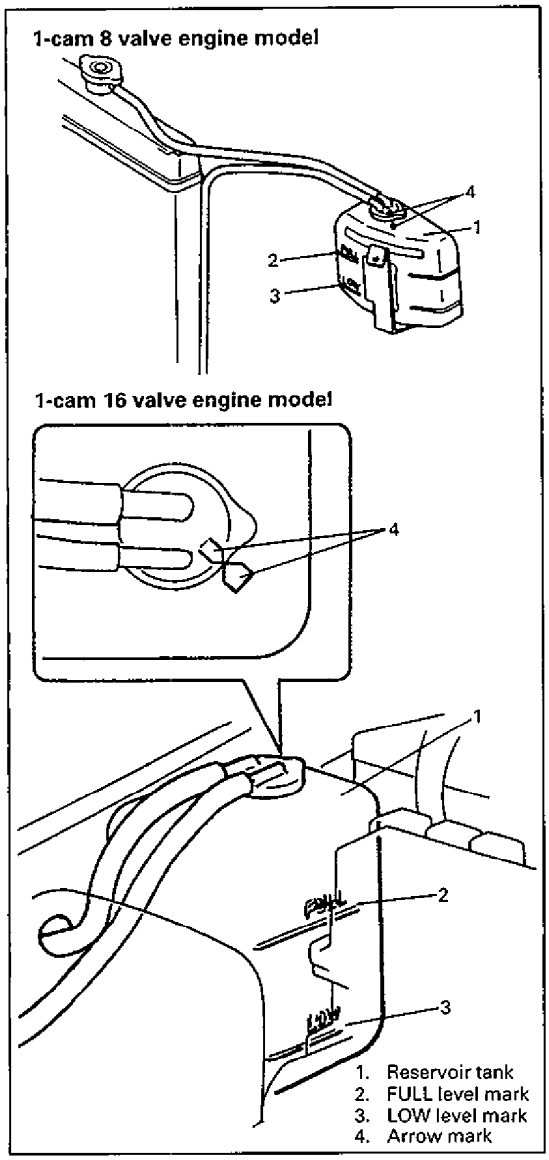
CONTENTS

61A10-6B-1-2



1. Arrow mark
2. Thick pipe
3. Thin pipe
4. To atmosphere
5. From radiator
6. FULL level mark
7. LOW level mark

61A10-6B-2-1



1. Reservoir tank
2. FULL level mark
3. LOW level mark
4. Arrow mark

61A10-6B-2-3

GENERAL DESCRIPTION

COOLANT (WATER) RESERVOIR TANK

A "see-through" plastic reservoir tank is connected to the radiator by a hose. As the vehicle is driven, the coolant is heated and expands. The portion of the coolant displaced by this expansion flows from the radiator into the reservoir tank. When the vehicle is stopped and the coolant cools and contracts, the displaced coolant is drawn back into the radiator by vacuum. Thus, the radiator is kept filled with coolant to the desired level at all times, resulting in increased cooling efficiency.
Coolant level should be between "FULL" and "LOW" marks on the reservoir tank.
Coolant should be added only to the reservoir tank as necessary.

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

MAINTENANCE

COOLANT LEVEL

To check level, look at "see-through" 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".**
- **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.

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 tank cap, align arrow marks on tank and cap.**

SECTION 6E

ELECTRONIC FUEL INJECTION SYSTEM (SINGLE-POINT THROTTLE BODY FUEL INJECTION)

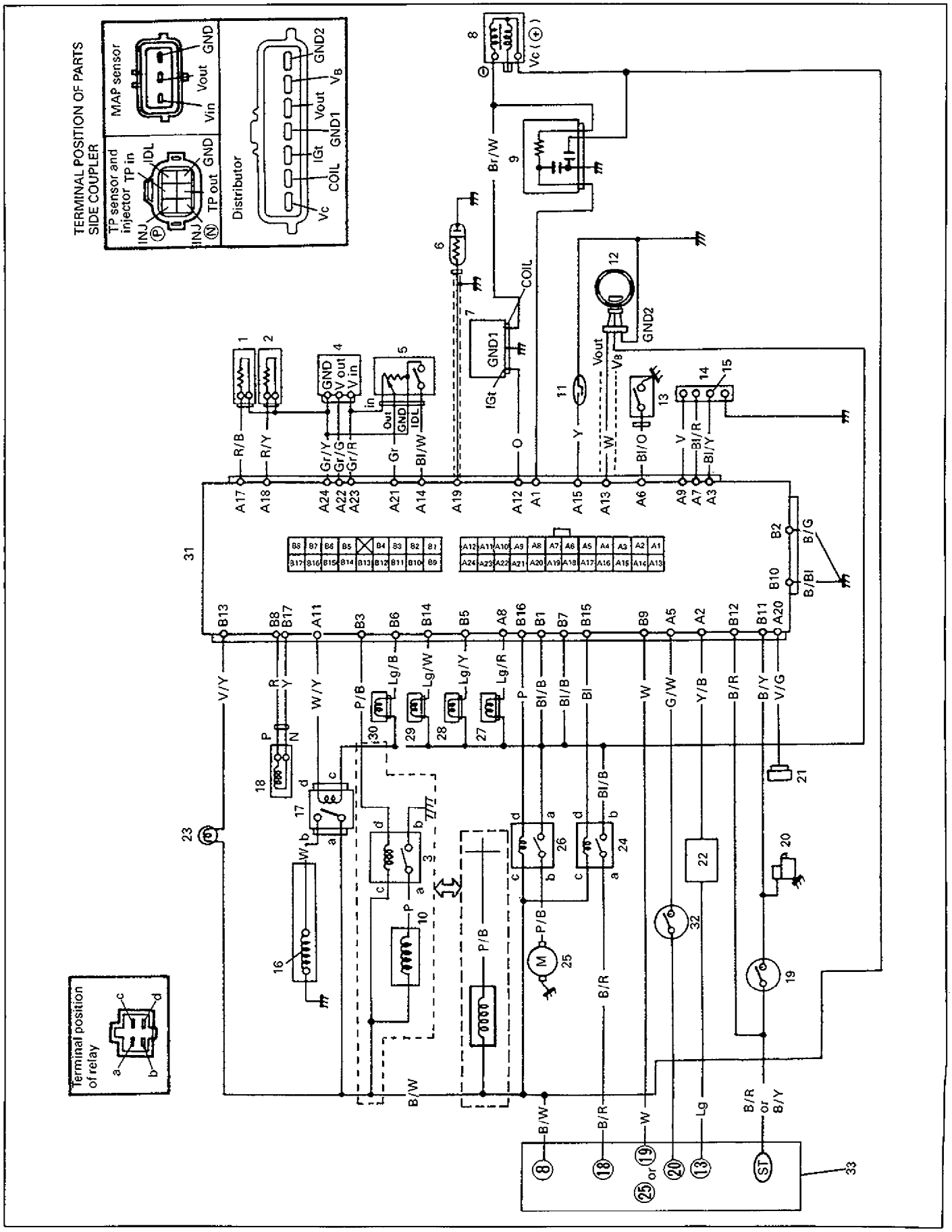
NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

61A10-6E-1-1

GENERAL DESCRIPTION

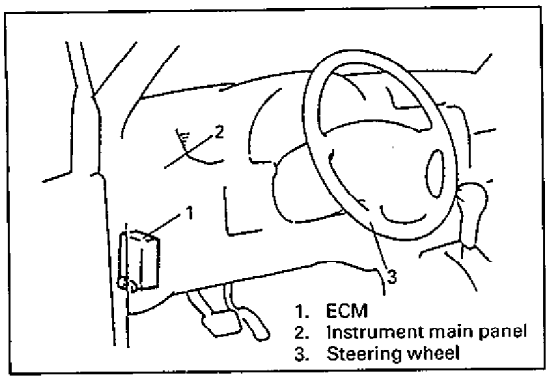
ELECTRONIC CONTROL SYSTEM



1. IAT sensor
2. ECT sensor
3. Heated oxygen sensor heater relay (if equipped)
4. MAP sensor
5. TP sensor
6. Heated oxygen sensor
7. Igniter (Power unit) (in distributor)
8. Ignition coil (in distributor)
9. Noise suppressor
10. Heated oxygen sensor heater
11. VSS
12. CMP sensor (in distributor)
13. Power steering pressure switch (if equipped)
14. Moniter coupler
15. Diag. switch terminal
16. Torque converter clutch (TCC) solenoid valve (3 A/T)
17. TCC relay (3 A/T only)
18. Fuel injector
19. Shift switch (3 A/T only)
20. Starter magnetic switch
21. Data link connector
22. A/C amplifier (if equipped)
23. Malfunction indicator lamp ("CHECK ENGINE" light)
24. Main relay
25. Fuel pump
26. Fuel pump relay
27. EVAP canister purge valve
28. EGR SV valve
29. Throttle opener SV valve
30. Idle air control valve
31. ECM
32. Brake pedal switch (3 A/T)
33. To fuses
    The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Refer to page 8-5, 8-6)

Wire color

B/Bl ..... Black/Blue
B/G ..... Black/Green
B/R ..... Black/Red
B/W ..... Black/White
B/Y ..... Black/Yellow
Bl ..... Blue
Bl/B ..... Blue/Black
Bl/R ..... Blue/Red
Bl/W ..... Blue/White
Bl/Y ..... Blue/Yellow
Bl/O ..... Blue/Orange
G/W ..... Green/White
Gr ..... Gray
Gr/G ..... Gray/Green
Gr/R ..... Gray/Red
Gr/Y ..... Gray/Yellow
Lg ..... Lightgreen
Lg/B ..... Lightgreen/Black
Lg/R ..... Lightgreen/Red
Lg/W ..... Lightgreen/White
Lg/Y ..... Lightgreen/Yellow
O ..... Orange
P ..... Pink
P/B ..... Pink/Black
R ..... Red
R/B ..... Red/Black
R/Y ..... Red/Yellow
R/Bl ..... Red/Blue
V ..... Violet
V/G ..... Violet/Green
V/Y ..... Violet/Yellow
W ..... White
W/Y ..... White/Yellow
Y ..... Yellow
Y/B ..... Yellow/Black

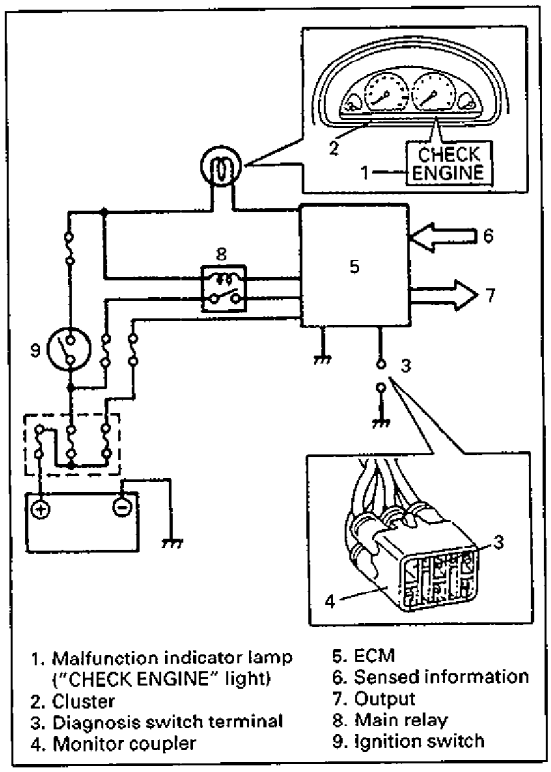


1. ECM
2. Instrument main panel
3. Steering wheel

61A10-6E-4-1

Engine Control Module (ECM)

ECM is installed to the underside of the instrument panel at the driver's seat side.
ECM is a precision unit consisting of microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit and etc..
It is an essential part of the electronic control system, for its functions include not only such a major function as to control fuel injector, idle air control valve, fuel pump relay, etc., but also on-board diagnostic system (self-diagnosis function) as described in the following section.



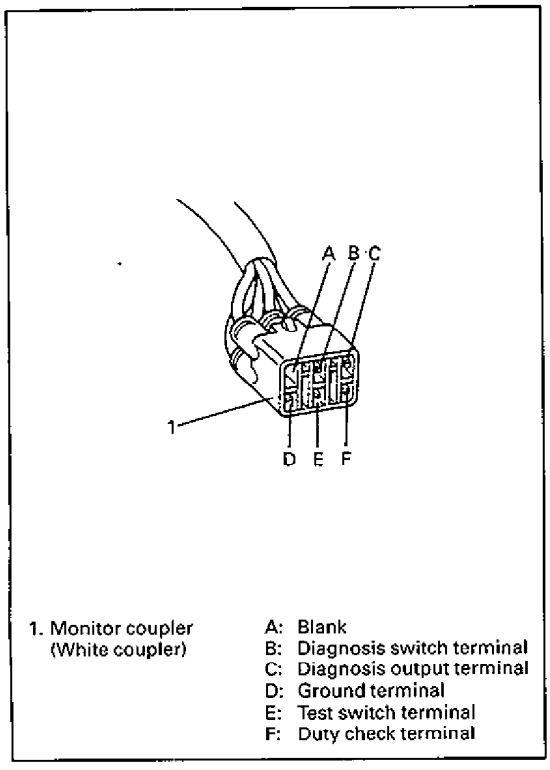
1. Malfunction indicator lamp ("CHECK ENGINE" light)
2. Cluster
3. Diagnosis switch terminal
4. Monitor coupler
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

61A10-6E-4-2

On-board diagnostic system (Self-diagnosis function)

[Malfunction indicator lamp ("CHECK ENGINE" light)]
Malfunction indicator lamp ("CHECK ENGINE" light) is located among the instrument cluster. It indicates each result of diagnosis done by on-board diagnostic system.
It also lights under the conditions as described below regardless of Electronic Fuel Injection system condition.

- When ignition switch is turned ON, engine is at a stop (When engine speed is lower than 500 r/min.) and diagnosis switch terminal is ungrounded, malfunction indicator lamp ("CHECK ENGINE" light) turns ON for the purpose of light and its circuit check but turns OFF once engine is started (When engine speed is higher than 500 r/min.) as far as Electronic Fuel Injection system is in good condition.



1. Monitor coupler (White coupler)

A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty check terminal

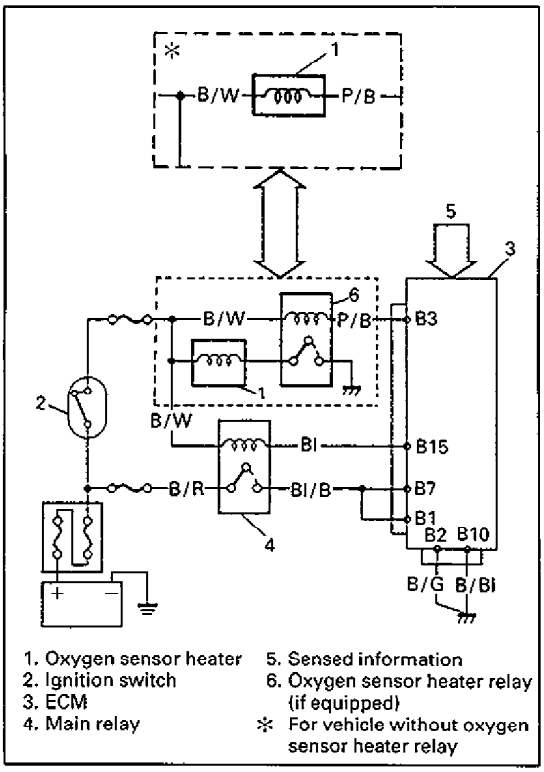
61A-10-6E-4-4

Diagnosis Switch Terminal

The diagnosis switch terminal is included in the monitor coupler behind the right side headlight. When diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs diagnostic trouble code and at the same time outputs idle air control duty through duty check terminal.

Test Switch Terminal

The test switch terminal is included in the monitor coupler.
When this terminal is grounded, ECM sets the ignition timing to the initial one.
When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty check terminal.

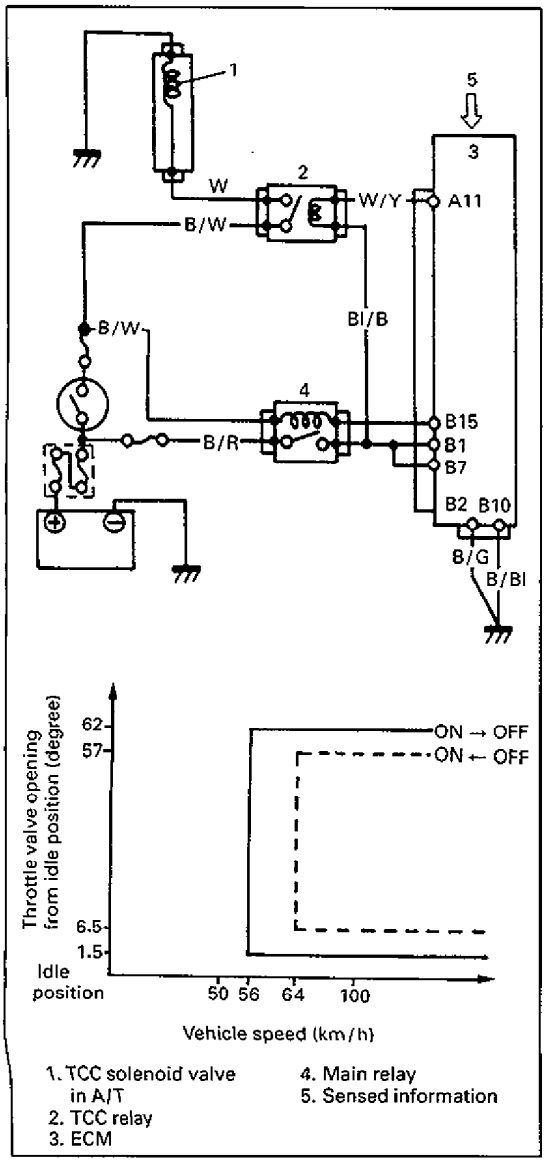


1. Oxygen sensor heater
2. Ignition switch
3. ECM
4. Main relay
5. Sensed information
6. Oxygen sensor heater relay (if equipped)
✻ For vehicle without oxygen sensor heater relay

61A10-6E-5-1

HEATED OXYGEN SENSOR HEATER CONTROL SYSTEM

The heater included in oxygen sensor is turned ON or OFF by ignition switch to assist activation of the oxygen sensor.
The electric current flows to the heater as long as ignition switch turns ON.



1. TCC solenoid valve in A/T
2. TCC relay
3. ECM
4. Main relay
5. Sensed information

61A10-6E-5-3

LOCK-UP RELAY CONTROL SYSTEM (3 A/T VEHICLE ONLY)

This system controls the TCC relay which is one of the parts for controlling A/T torque converter clutch. Its circuit construction is as shown in left figure below.
The TCC solenoid valve, under the control of the brake pedal switch (stop light switch) and TCC relay, opens and closes the A/T oil passage to lock and unlock torque converter clutch.
The factors which ECM uses to control the relay are the signals from the throttle position sensor (throttle opening), the CMP sensor, brake pedal switch and the ECT sensor (engine coolant temperature).
It turns ON the relay only when the throttle valve opening and vehicle speed are in the left figure, provided that the engine is warmed up (i.e. the engine coolant temperature is 60°C (140°F) or higher).
For operation of the A/T torque converter clutch, refer to Section 7B "Automatic Transmission (3 A/T)"

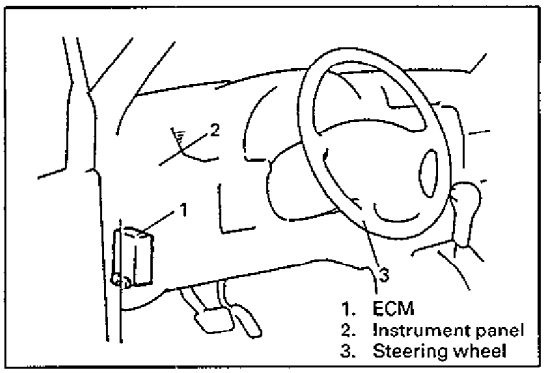
DIAGNOSIS

INSPECTION OF ECM AND ITS CIRCUITS

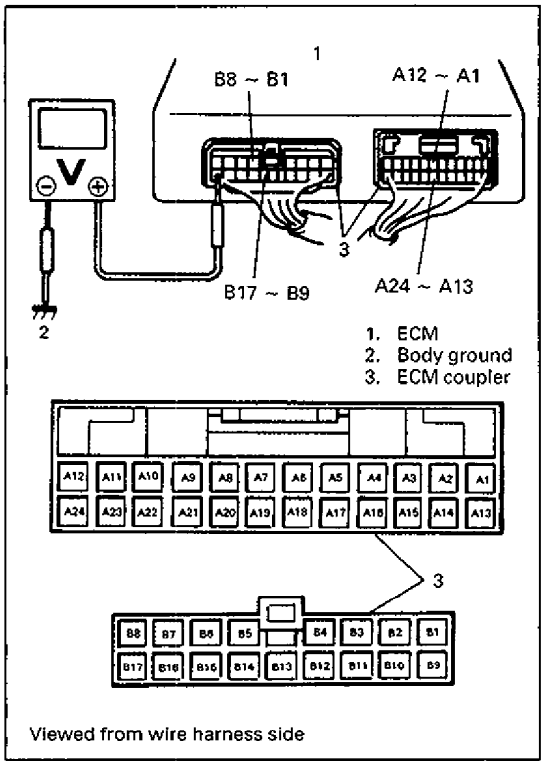
ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

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

61A10-6E-6-1



61A10-6E-6-2



61A10-6E-6-3

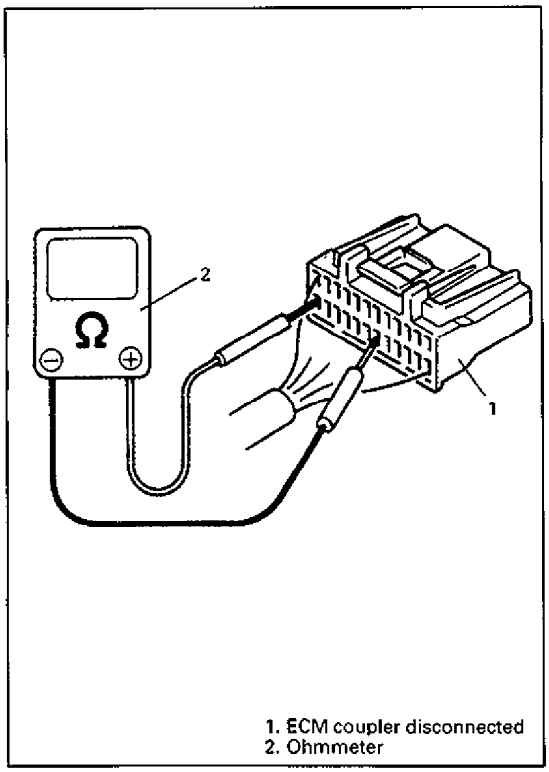
Voltage Check

1) Disconnect battery negative cable from battery.
2) Disconnect couplers from ECM.
3) Remove ECM.
4) Connect couplers to ECM securely.
5) Connect battery negative cable to battery.
6) 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.

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Ignition (fail safe) signal	10 – 14V	Ignition switch ON
A2	Air-conditioner circuit (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running, Air-conditioner ON
A3	Diagnosis switch terminal	10 – 14V	Ignition switch ON
		0V	Ignition switch ON Diagnosis switch terminal grounded
A4	Blank	—	—
A5	Brake pedal switch	0V	Ignition switch ON Brake pedal is released
		10 – 14V	Ignition switch ON Brake pedal is depressed
A6	Power steering pressure switch (if equipped)	10 – 14V	Ignition switch ON
		0 – 1V	With engine running at idle speed, turning steering wheel to the right and left as far as it stops, repeating it a few times
A7	Test switch terminal	10 – 14V	Ignition switch ON
		0V	Ignition switch ON Test switch terminal grounded
A8	EVAP canister purge valve	10 – 14V	Ignition switch ON
A9	Duty check terminal	—	—
A10	Blank	—	—
A11	TCC relay for A/T	10 – 14V	Ignition switch ON
		0 – 1V	With "D" range position, driving vehicle at 77 km/h (48 mile/h) on flat road and keeping it for 4 seconds or more
A12	Ignition output signal	0 – 1V	Ignition switch ON
		0 – 3V	While engine cranking
A13	CMP sensor	Indicator deflection repeated between 0V and about 5V	Ignition switch ON Crankshaft turned slowly
A14	Idle switch of TP sensor	0 – 1V	Ignition switch ON Throttle valve is at idle position (with throttle opener rod drawn in by vacuum pump gauge)
		4 – 5V	Ignition switch ON Throttle valve opens larger than idle position
A15	VSS	Indicator deflection repeated between 0V and 4 – 5V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
A16	Blank	—	—
A17	IAT sensor	2.2 – 3.0V	Ignition switch ON Sensor ambient temperature: 20°C (68°F)
A18	ECT sensor	0.5 – 0.9V	Ignition switch ON Cooling water temperature: 80°C (176°F)

TER-MINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A19	Heated oxygen sensor	Refer to Diagnostic Flow Chart for Code No. 13	
A20	Data link connector (Serial data terminal)	4 – 5V	Ignition switch ON
A21	TP sensor	0.5 – 1.2V	Ignition switch ON Throttle valve at idle position (with throttle opener rod drawn in by vacuum gauge)
		3.4 – 4.7V	Ignition switch ON Throttle valve at full open position
A22	MAP sensor	3.6 – 4.4V	Ignition switch ON Barometric pressure: 760 mmHg
A23	Power source of sensors	4.75 – 5.25V	Ignition switch ON
A24	Ground of sensors	—	—
B1	Power source	10 – 14V	Ignition switch ON
B2	Ground	—	—
B3	Oxygen sensor heater	10 – 14V	Ignition switch ON
		0 – 1V	Over 3 min. after engine started Engine running at idle speed
B4	Blank	—	—
B5	EGR SV valve	10 – 14V	Ignition switch ON
B6	IAC valve	—	—
B7	Power source	10 – 14V	Ignition switch ON
B8	Injector ⊕	—	—
B9	Power source for back-up circuit	10 – 14V	Ignition switch OFF and ON
B10	Ground	—	—
B11	Engine start switch (Engine start signal)	6 – 12V	While engine cranking
		0V	Other than above
B12	Shift switch (A/T only)	0 – 1V	Ignition switch ON Selector lever in "P" or "N" range
		10 – 14V	Ignition switch ON Selector lever in any other range than "P" and "N"
B13	Malfunction indicator lamp ("CHECK ENGINE" light)	0 – 1V	Ignition switch ON
		10 – 14V	When engine running
B14	Throttle opener SV valve	10 – 14V	Ignition switch ON
B15	Main relay ground	0 – 1V	Ignition switch ON
B16	Fuel pump relay ground	0 – 1V	For 3 sec. after ignition switch ON
		10 – 14V	When over 3 sec. after ignition switch ON
B17	Injector ⊖	—	—



1. ECM coupler disconnected
2. Ohmmeter

61A10-6E-9-1

Resistance Check

1) Disconnect ECM couplers from ECM with ignition switch OFF.

CAUTION:
Never touch terminals of ECM itself or connect voltmeter or ohmmeter.

2) Check resistance between each pair of terminals disconnected couplers as listed in following table.

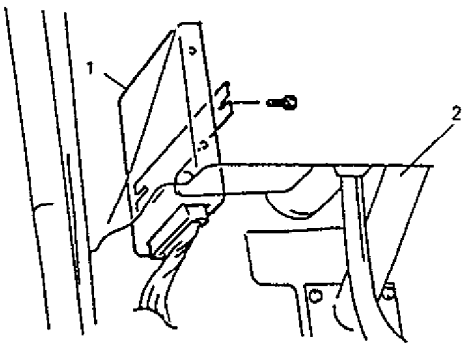
CAUTION:
- **Be sure to connect ohmmeter probe from wire harness side of coupler.**
- **Be sure to turn OFF ignition switch for this check.**
- **Resistance in table represents that when parts temperature is 20°C (68°F).**

TERMINALS	CIRCUIT	STANDARD RESISTANCE	CONDITION	
A3 – Body ground	Diagnosis swtich terminal	∞ (infinity)	—	
A5 – Body ground	Brake pedal switch	0 Ω	Brake pedal is depressed	
		∞ (infinity)	Brake pedal is released	
A7 – Body ground	Test switch terminal	∞ (infinity)	—	
A8 – B1	EVAP canister purge valve	30 – 38 Ω	—	
A9 – Body ground	Duty check terminal	∞ (infinity)	—	
A11 – B1	TCC relay	90 – 110 Ω	—	
A14 – A24	Idle switch	Continuity	Throttle valve is at idle position	
		∞ (infinity)	Throttle valve opens larger than idle position	
A15 – Body ground	VSS	Ohmmeter indicator deflects between 0 and ∞	Rear left tire turned slowly with rear right tire locked	
A17 – A24	IAT sensor	2.28 – 2.87 kΩ	Sensor ambient temp. 20°C (68°F)	
A18 – A24	ECT sensor	0.29 – 0.35 kΩ	Engine cooling water temp. 80°C (176°F)	
A21 – A24	TP sensor	0.3 – 2 kΩ	Throttle valve at idle position	with MAP sensor coupler disconnected
		2.0 – 6.5 kΩ	Throttle valve at full open position	

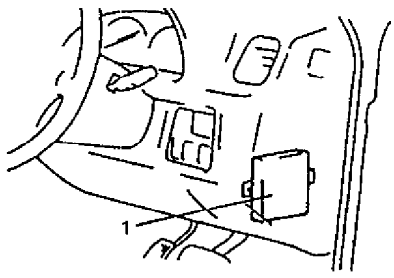
TERMINALS	CIRCUIT	STANDARD RESISTANCE	CONDITION
B5 – B1	EGR SV valve	33 – 39 Ω	—
B6 – B1	IAT valve	11 – 14 Ω	—
B8 – B17	Fuel injector	0.8 – 1.8 Ω	—
B12 – Body ground	Shift switch (A/T only)	Continuity	Select lever in "P" or "N" range
		∞ (infinity)	Select lever in any other range than "P" and "N"
B14 – B1	Throttle opener SV valve	33 – 39 Ω	—
B15 – B16	Main and fuel pump relay	112 – 168 Ω	—

61A10-6E-10-1

For left hand steering vehicle



For right hand steering vehicle



1. ECM
2. Steering column

61A10-6E-10-3

ON VEHICLE SERVICE

ELECTRONIC CONTROL SYSTEM

ENGINE CONTROL MODULE (ECM)

CAUTION:
As ECM consists of precision parts, be careful not to expose it to excessive shock.

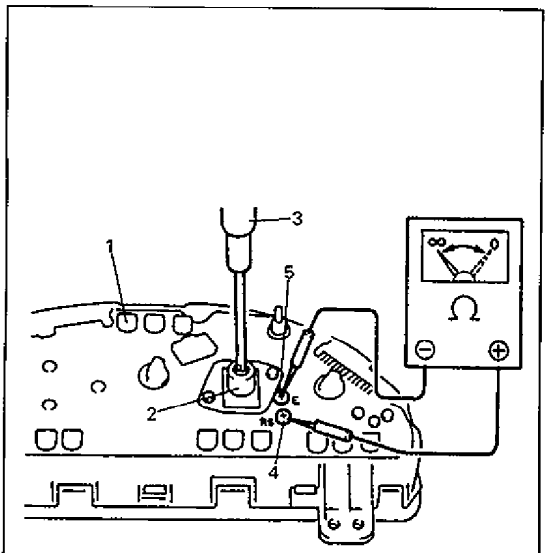
Removal

1) Disconnect battery negative cable from battery.
2) Disconnect couplers from ECM.
3) Remove ECM.

Installation

Reverse removal procedure noting the following.

- Connect couplers to ECM securely.



1. Combination meter
2. Speedometer cable joint
3. Screwdriver
4. "RS" screw
5. "E" screw

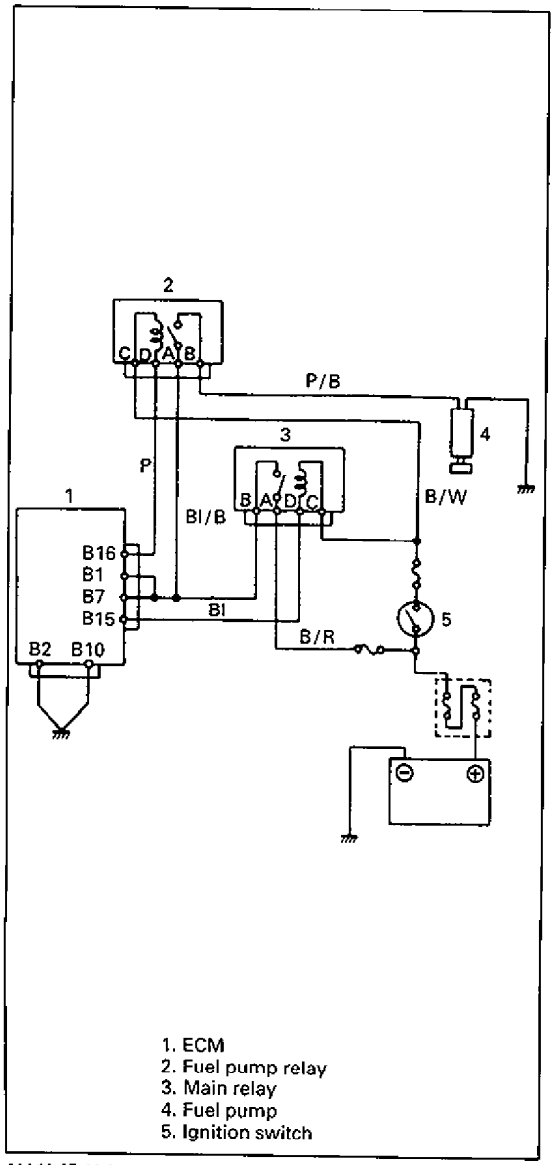
85F00-6E2-105-5

VEHICLE SPEED SENSOR (VSS)

Inspection

1) Disconnect negative cable at battery.
2) Remove combination meter from instrument panel.
3) Connect ohmmeter between "RS" screw (VSS signal terminal) and "E" screw (ground terminal) of combination meter and turn cable joint of speedometer with a screwdriver.
   Ohmmeter indicator should move back and forth between 0 (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution.

   Replace speedometer if check result is not satisfactory.
4) Install combination meter to instrument panel.
5) Connect negative cable to battery.



1. ECM
2. Fuel pump relay
3. Main relay
4. Fuel pump
5. Ignition switch

61A10-6E-11-3

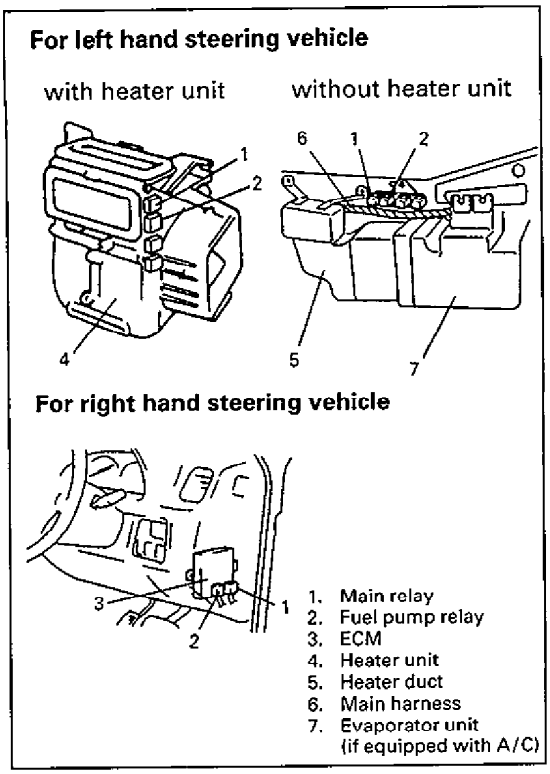
MAIN RELAY

NOTE:

- **For left hand steering vehicle with heater unit, main relay and fuel pump relay are installed in front of heater unit.**
- **For left hand steering vehicle without heater unit, main relay and fuel pump relay are installed on dash panel.**
- **For right hand steering vehicle, main relay and fuel pump relay are installed side of ECM.**
- **Distinguish between main relay and fuel pump relay by wire colors.**

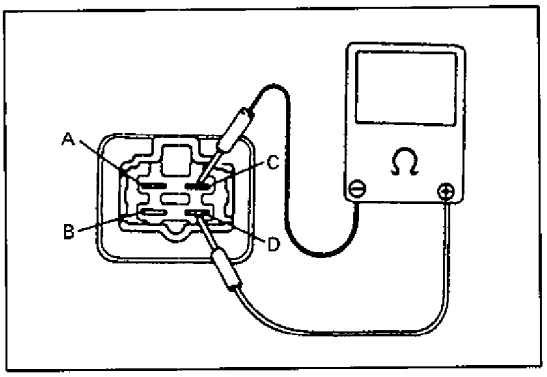
Inspection

1) Disconnect negative cable at battery.



61A10-6E-12-1

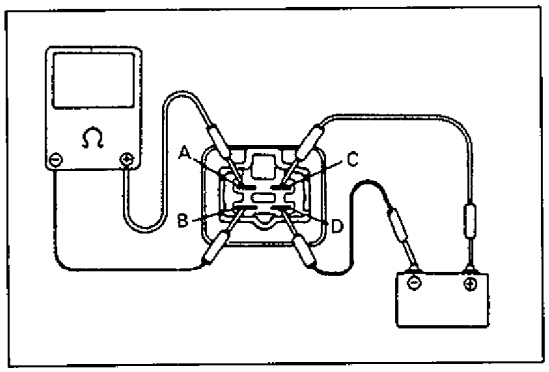
2) Remove main relay from its bracket after disconnecting its coupler.



61A10-6E-12-3

3) Check resistance between each two terminals as in table below.
If check results are as specified, proceed to next operation check. If not, replace.

TERMINALS	RESISTANCE
Between A and B	∞ (infinity)
Between C and D	56 – 84 Ω at 20°C (68°F)



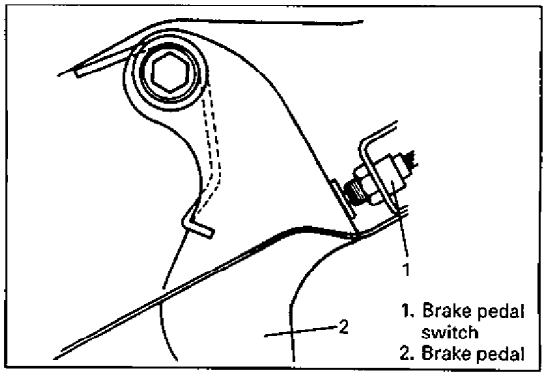
85F00-6E2-106-5

4) Check that there is continuity between terminals "A" and "B" when battery is connected to terminals "C" and "D". If found defective, replace.
5) Install relay and connect its coupler securely.

FUEL PUMP RELAY

Inspection

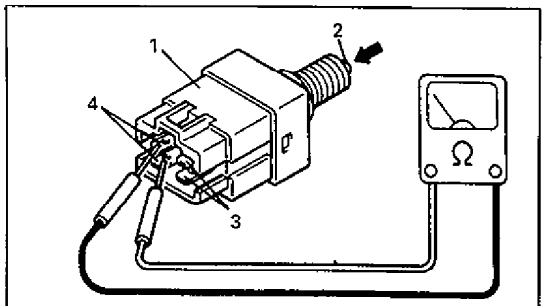
1) Remove fuel pump relay in the same way as main relay.
2) Structure of fuel pump relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.
If found detective, replace.



61A10-6E-13-1

BRAKE PEDAL SWITCH (INCLUDING STOP LIGHT SWITCH)

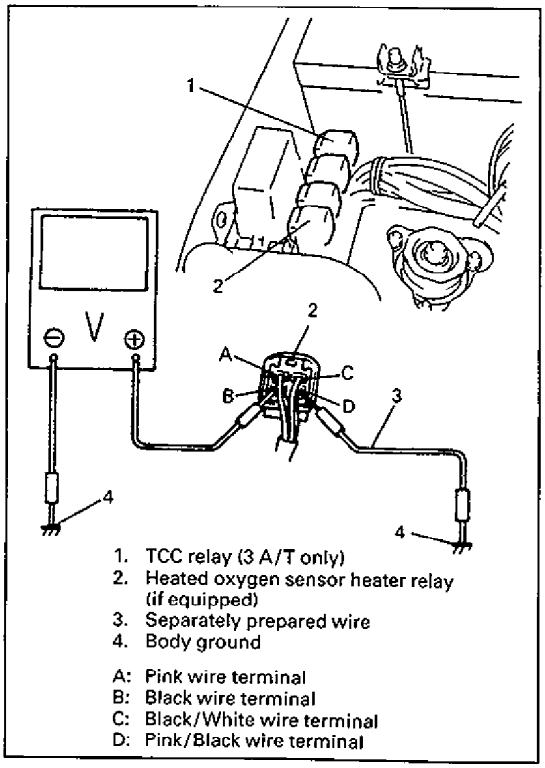
1) Disconnect brake pedal switch coupler and remove it from pedal bracket.



61A10-6E-13-2

2) Connect ohmmeter to terminals for ECM in brake pedal switch.
   Ohmmeter should indicate continuity when switch button is pushed and ∞ (infinity) when it is released.
   If check result is not satisfactory, replace.
3) Install brake pedal switch to pedal bracket and adjust installing position according to procedure described in Section 5 "BRAKE".

HEATED OXYGEN SENSOR HEATER RELAY (IF EQUIPPED)

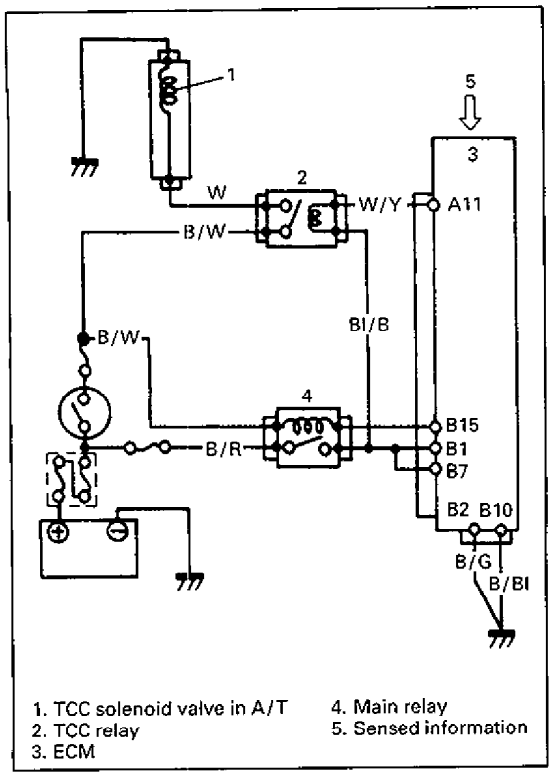


61A10-6E-13-3

1) With coupler connected to heatd oxygen sensor heater relay and ignition switch ON, check if battery voltage (about 12V) is applied to TCC relay terminals "A" and "C".
   If no voltage is applied, check electric circuit of each terminal.
2) Using wire harness as thick as the one used for relay circuit, connect "D" terminal and body (ground).
   At this time, relay should be heard to operate and battery voltage (about 12V) should be applied to terminal "B".

CAUTION:
Make absolutely sure to ground properly. Grounding wrong terminal will blow fuse.

If check result is not satisfactory, replace heated oxygen sensor heater relay.



1. TCC solenoid valve in A/T
2. TCC relay
3. ECM
4. Main relay
5. Sensed information

61A10-6E-14-1

LOCK-UP RELAY CONTROL SYSTEM (3 A/T VEHICLE ONLY)

SYSTEM CIRCUIT INSPECTION

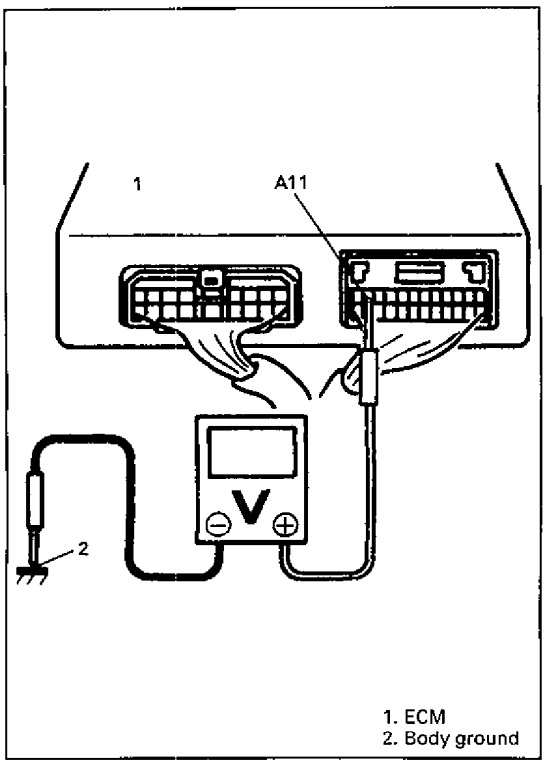
This inspection is to check if ECM turns ON TCC relay at specified throttle valve opening while actually driving vehicle.

NOTE:

- **The inspection requires 2 persons, a driver and a checker.**
- **Use a level and flat road for the inspection.**

1) Remove ECM according to previously outline and connect couplers to ECM securely.
2) Warm up engine to normal operating temperature.

61A10-6E-14-3



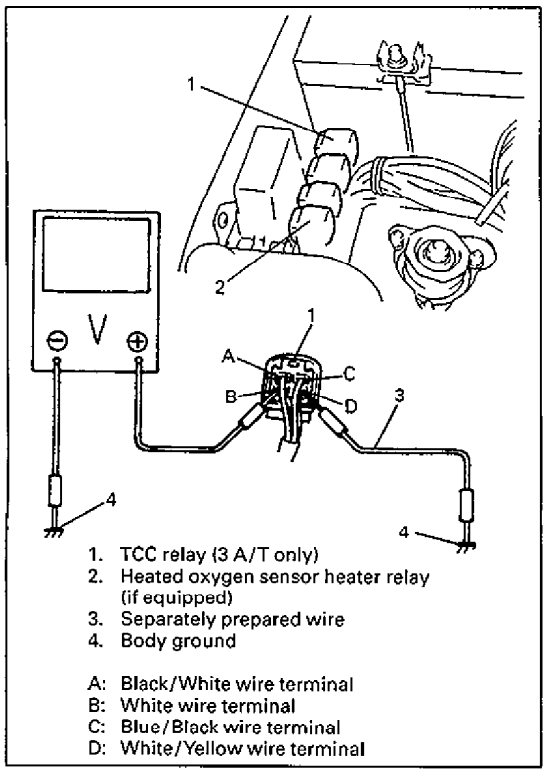
1. ECM
2. Body ground

61A10-6E-14-4

3) Connect voltmeter between ECM coupler terminal "A11" and ground.
4) While engine running, shift selector lever to "D" range position. Under this condition, take reading of voltmeter. If should be 10 – 14 V.
   Then increase vehicle speed to 77 km/h (48 mile/h) or more and maintain that speed for 4 seconds or more. Voltmeter then should indicate 0 – 1 V.

NOTE:
When maintaining the speed, be sure that throttle valve opening is between 10% and 60%.

If checked voltage is not as specified above, check TCC relay and wire harness. If relay are all in good condition, possibility is that ECM is defective.



1. TCC relay (3 A/T only)
2. Heated oxygen sensor heater relay (if equipped)
3. Separately prepared wire
4. Body ground

A: Black/White wire terminal
B: White wire terminal
C: Blue/Black wire terminal
D: White/Yellow wire terminal

61A10-6E-15-1

TCC Relay and Its Circuit

1) With coupler connected to TCC relay and ignition switch ON, check if battery voltage (about 12V) is applied to TCC relay terminals "A" and "C".
   If no voltage is applied, check electric circuit of each terminal.
2) Using wire harness as thick as the one used for relay circuit, connect "D" terminal and body (ground).
   At this time, relay should be heard to operate and battery voltage (about 12V) should be applied to terminal "B".

CAUTION:
Make absolutely sure to ground properly. Grounding wrong terminal will blow fuse.

If check result is not satisfactory, replace TCC relay.

SECTION 6E1

ELECTRONIC FUEL INJECTION SYSTEM (SEQUENTIAL MULTIPORT FUEL INJECTION)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

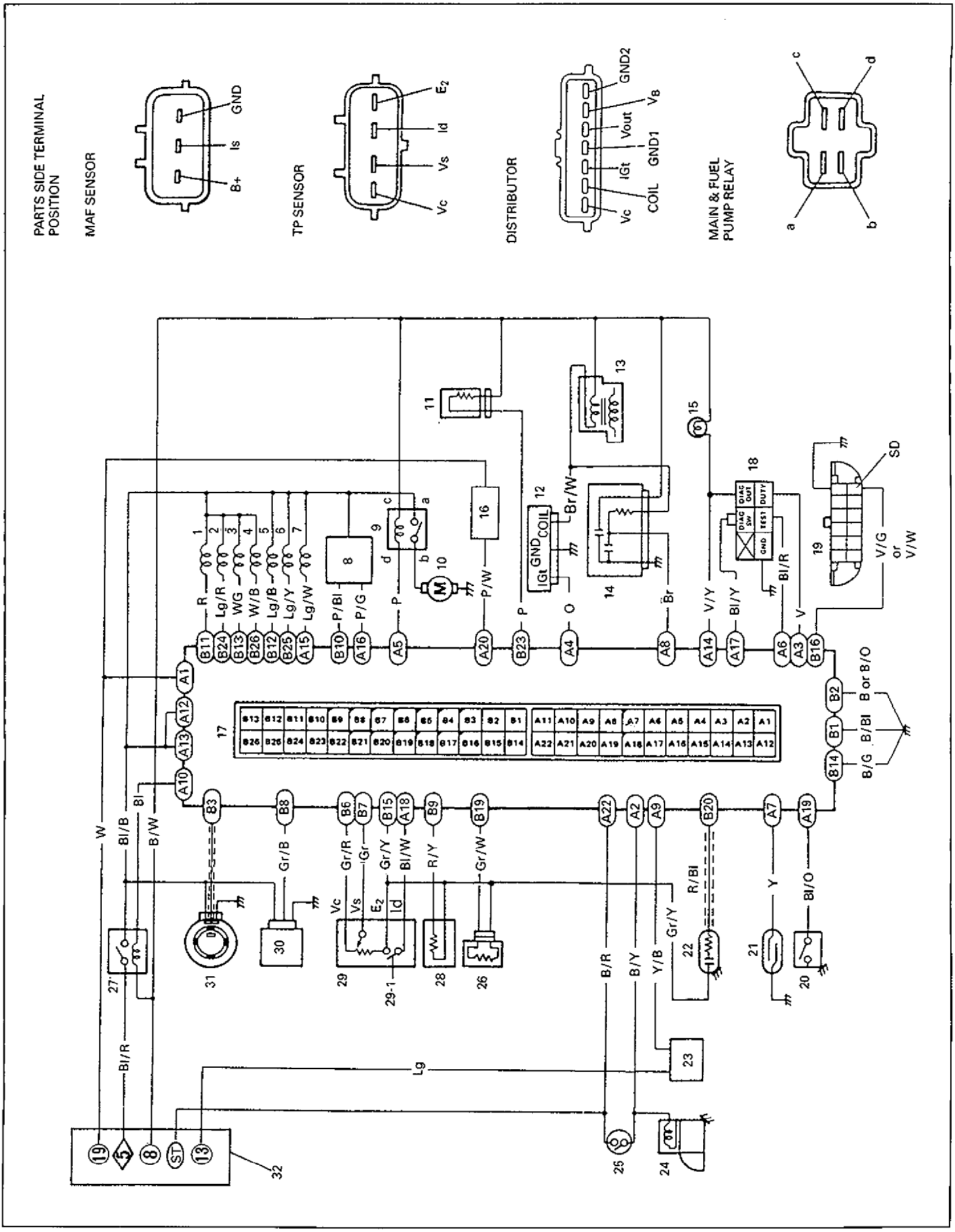
NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

6E1

GENERAL DESCRIPTION

ELECTRONIC CONTROL SYSTEM

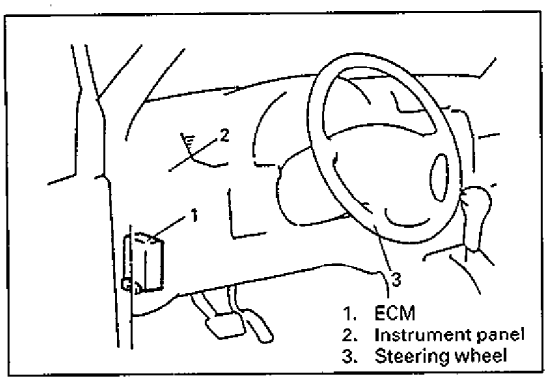


1. No. 1 injector
2. No. 2 injector
3. No. 3 injector
4. No. 4 injector
5. Idle air control valve (IAC valve)
6. EVAP canister purge valve
7. EGR solenoid vacuum valve (if equipped)
8. Transmission control module (4 A/T model)
9. Fuel pump relay
10. Fuel pump
11. Heated oxygen sensor heater (if equipped)
12. Igniter (in distributor)
13. Ignition coil (in distributor)
14. Noise suppressor
15. Malfunction indicator lamp ("CHECK ENGINE" light)
16. ABS control module (if equipped)
17. ECM
18. Monitor coupler
19. Data link connector (Assembly line diag. link)
20. Power steering pressure switch (if equipped)
21. VSS
22. Heated oxygen sensor (if equipped)
23. A/C amplifier (if equipped)
24. Starter magnetic switch
25. Shift switch (4 A/T model)
26. CO adjusting resistor (if equipped)
27. Main relay
28. ECT sensor
29. TP sensor
29-1. Idle switch
30. MAF sensor
31. CMP sensor
32. To fuses

The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM. (Refer to page 8-5, 8-6).

Wire color
B : Black
B/G : Black/Green
B/Bl : Black/Blue
B/O : Black/Orange
B/R : Black/Red
B/Y : Black/Yellow
Bl : Blue
Bl/B : Blue/Black
Bl/O : Blue/Orange
Bl/R : Blue/Red
Bl/W : Blue/White
Bl/Y : Blue/Yellow
Br : Brown
Br/W : Brown/White
Gr : Gray
Gr/B : Gray/Black
Gr/R : Gray/Red
Gr/Y : Gray/Yellow
Gr/W : Gray/White
Lg : Lightgreen
Lg/B : Lightgreen/Black
Lg/R : Lightgreen/Red
Lg/Y : Lightgreen/Yellow
Lg/W : Lightgreen/White
O : Orange
P : Pink
P/Bl : Pink/Blue
P/G : Pink/Green
P/W : Pink/White
R/Bl : Red/Blue
Y : Yellow
Y/B : Yellow/Black
V : Violet
V/G : Violet/Green
V/Y : Violet/Yellow
W : White

TERMINAL	CIRCUIT	TERMINAL	CIRCUIT
A1	Power source	B3	CMP sensor
A2	Engine start switch	B4	Blank
A3	Duty output terminal	B5	Blank
A4	Igniter (IGt)	B6	Power source (for sensor)
A5	Fuel pump relay	B7	TP sensor
A6	Test switch terminal	B8	MAF sensor
A7	VSS	B9	ECT sensor
A8	Ignition coil (IGf)	B10 (4 A/T model)	Transmission control module (throttle valve opening signal)
A9	A/C amplifier (if equipped)	B11	Injector No. 1
A10	Main relay	B12	Idle air control valve
A11	Blank	B13	Injector No. 3
A12	Power source	B14	Ground
A13	Power source	B15	Sensor ground
A14	Malfunction indicator lamp ("CHECK ENGINE" light)	B16	Data link connector
A15	EGR SV valve (if equipped)	B17	Blank
A16 (4 A/T only)	Transmission control module (Coolant temp. signal)	B18	Blank
A17	Diag. switch terminal	B19	CO adjusting resistor (for vehicle without oxygen sensor)
A18	Idle switch (in TP sensor)	B20	Heated oxygen sensor (if equipped)
A19	Power steering pressure switch (if equipped)	B21	Blank
A20	ABS control module (if equipped)	B22	Blank
A21	Blank	B23	Heated oxygen sensor heater (if equipped)
A22 (4 A/T only)	Shift switch	B24	Injector No. 2
B1	Ground	B25	EVAP canister purge valve
B2	Ground	B26	Injector No. 4

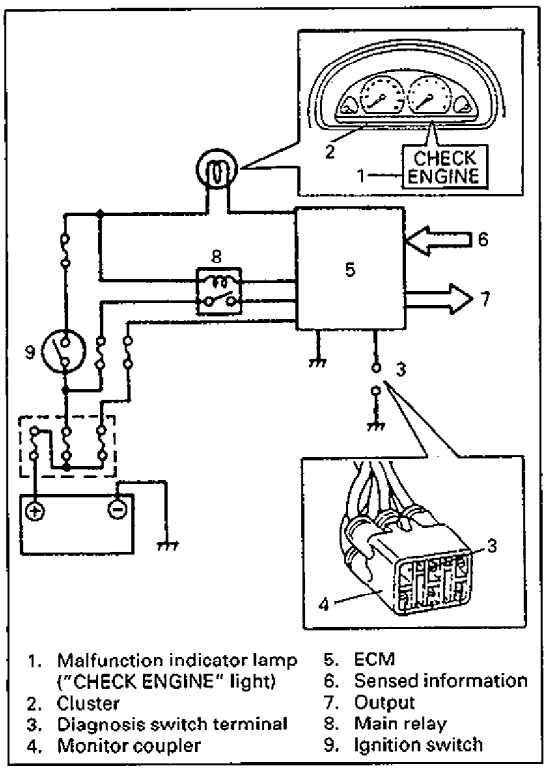


1. ECM
2. Instrument panel
3. Steering wheel

61A10-6E1-4-1

Engine Control Module (ECM)

ECM is installed to the underside of the instrument panel at the driver's seat side.
ECM is a precision unit consisting of microcomputer, A/D (Analog/Digital) converter, I/O (Input/Output) unit and etc..
It is an essential part of the electronic control system, for its functions include not only such a major function as to control fuel injector, idle air control valve, fuel pump relay, etc., but also on-board diagnostic system (self-diagnosis function) as described in the following section.



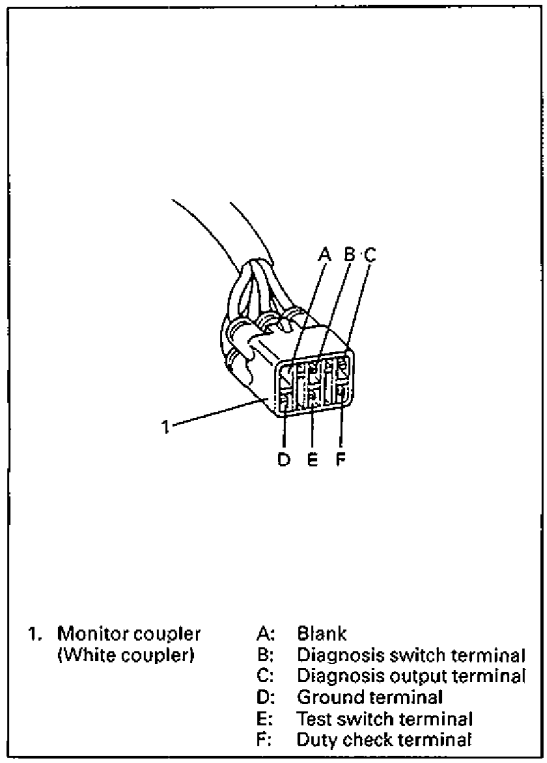
1. Malfunction indicator lamp ("CHECK ENGINE" light)
2. Cluster
3. Diagnosis switch terminal
4. Monitor coupler
5. ECM
6. Sensed information
7. Output
8. Main relay
9. Ignition switch

61A10-6E1-4-2

On-board diagnostic system (Self-diagnosis function)

[Malfunction indicator lamp ("CHECK ENGINE" light)]
Malfunction indicator lamp ("CHECK ENGINE" light) is located among the instrument cluster. It indicates each result of diagnosis done by on-board diagnostic system.
It also lights under the conditions as described below regardless of Electronic Fuel Injection system condition.

- When ignition switch is turned ON, engine is at a stop (When engine speed is lower than 500 r/min.) and diagnosis switch terminal is ungrounded, malfunction indicator lamp ("CHECK ENGINE" light) turns ON for the purpose of light and its circuit check but turns OFF once engine is started (When engine speed is higher than 500 r/min.) as far as Electronic Fuel Injection system is in good condition.



1. Monitor coupler (White coupler)

A: Blank
B: Diagnosis switch terminal
C: Diagnosis output terminal
D: Ground terminal
E: Test switch terminal
F: Duty check terminal

61A10-6E1-4-4

Diagnosis Switch Terminal

The diagnosis switch terminal is included in the monitor coupler behind the right side headlight. When diagnosis switch terminal is grounded, a diagnosis signal is fed to ECM which then outputs diagnostic trouble code and at the same time outputs idle air control duty through duty check terminal.

Test Switch Terminal

The test switch terminal is included in the monitor coupler.
When this terminal is grounded, ECM sets the ignition timing to the initial one.
When both test switch terminal and diagnosis switch terminal are grounded, ECM outputs A/F duty through the duty check terminal.

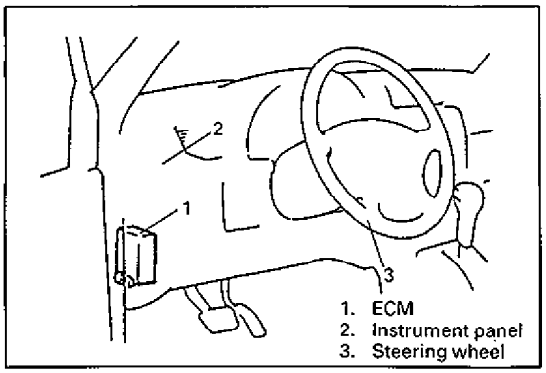
DIAGNOSIS

INSPECTION OF ECM AND ITS CIRCUITS

ECM and its circuits can be checked at ECM wiring couplers by measuring voltage and resistance.

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

61A10-6E1-5-1



61A10-6E1-5-2

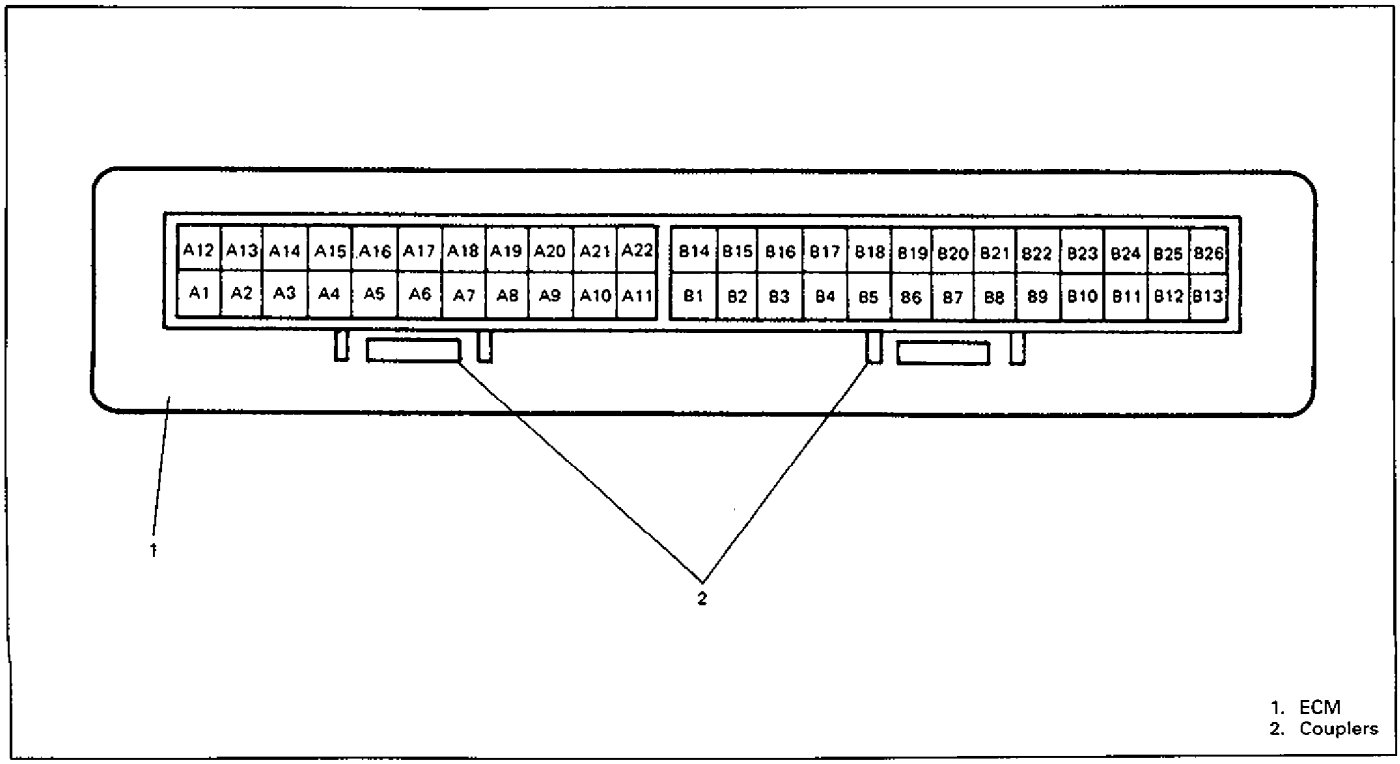
Voltage Check

1) Disconnect battery negative cable from battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air bag System" under "Service Precaution" in Section 9J.
3) Disconnect couplers from ECM.
4) Remove ECM.
5) Connect couplers to ECM securely.
6) Connect battery negative cable to battery.
7) Check voltage at each terminal of couplers connected.

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

8) After cheking, if equipped with air bag system, enable air bag system. Refer to "Enabling Air bag System" under "Service Precaution" in Section 9J.

61A10-6E1-5-3



60A70-6E1-37-3S

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A1	Power source for back-up circuit	10 – 14 V	Ignition switch ON and OFF
A2	Engine start switch (Engine start signal)	6 – 12 V	While engine cranking
		0 V	Other than above
A3	Duty output terminal	———	———
A4	Ignition trigger signal	0 – 1 V	Ignition switch ON
		Between 0 – 1 and 4 – 5 V	While engine cranking
A5	Fuel pump relay	0 – 1 V	For 3 seconds after ignition switch ON
		10 – 14 V	After the above time
A6	Test switch terminal	10 – 14 V	Ignition switch ON
		0 V	Ignition switch ON Test switch terminal grounded
A7	VSS	Indicator deflection repeated between 0 V and 4 – 5 V	Ignition switch ON Rear left tire turned slowly with rear right tire locked
A8	Ignition fail-safe signal	10 – 14 V	Ignition switch ON
A9	Air conditioning circuit (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	With engine running A/C ON
A10	Main relay	0 – 1 V	Ignition switch ON
A11	Blank	———	———
A12 A13	Power source	10 – 14 V	Ignition switch ON
A14	Malfunction indicator lamp ("CHECK ENGINE" light)	0 – 1 V	Ignition switch ON
		10 – 14 V	Engine running
A15	EGR SV valve (if equipped)	10 – 14 V	Ignition switch ON
A16 (4 A/T only)	Transmission control module (coolant temp. switch signal)	0 – 1 V	Ignition switch ON Engine coolant temp.: below 25°C (77°F)
		10 – 14 V	Ignition switch ON Engine coolant temp.: over 30°C (86°F)
A17	Diag. switch terminal	10 – 14 V	Ignition switch ON
		0 – 1 V	Ignition switch ON Diag. switch terminal grounded

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
A18	Idle switch (in TP sensor)	0 – 1 V	Ignition switch ON Throttle valve at idle position
		3 – 5 V	Ignition switch ON Throttle valve opens larger than idle position
A19	Power steering pressure switch (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	With engine running at idle speed, turning steering wheel to the right or left as far as it stops
A20	ABS control model (if equipped)	10 – 14 V	Ignition switch ON Antilock brake system (ABS) doesn't operate
A21	Blank	———	———
A22 (4 A/T only)	Shift switch	0 – 1 V	Ignition switch ON Selector lever in "P" or "N" range
		10 – 14 V	Ignition switch ON Selector lever in "R", "D", "2" or "L" range
B1 B2	Ground	———	———
B3	CMP sensor	Indicator deflection repeated between 0 – 1 V and 3 – 5 V	Ignition switch ON Crankshaft turned slowly
B4	Blank	———	———
B5	Blank	———	———
B6	Power source for sensors	4.75 – 5.25 V	Ignition switch ON
B7	TP sensor	0.5 – 1.2 V	Ignition switch ON Throttle valve at idle position
		3.4 – 4.7 V	Ignition switch ON Throttle valve at full open position
B8	MAF sensor	1.0 – 1.6 V	Ignition switch ON
		1.7 – 2.0 V	With engine running at idle speed
B9	ECT sensor	0.5 – 0.9 V	Ignition switch ON Engine coolant temp.: 80°C (176°F)
B10 (4 A/T only)	Transmission control module (Throttle valve opening signal)	———	Ignition switch ON Voltage varies as specified at graph in Section 6E1 of the Service Manual mentioned in the FOREWORD of this manual while throttle valve is opened gradually.
B11	Injector No. 1	10 – 14 V	Ignition switch ON
B12	Idle air control valve	10 – 14 V	Ignition switch ON
B13	Injector No. 3	10 – 14 V	Ignition switch ON

TERMINAL	CIRCUIT	NORMAL VOLTAGE	CONDITION
B14	Ground	———	———
B15	Sensor ground	———	———
B16	Data link connector	4 – 5 V	Ignition switch ON
B17	Blank	———	———
B18	Blank	———	———
B19	CO adjusting resistor	About 5 V	Ignition switch ON CO resistor disconnected
B20	Oxygen sensor (if equipped)	Indicator deflection repeated between over and under 0.45 V	While engine running at 2,000 r/min for 1 minute or longer after warmed up
B21	Blank	———	———
B22	Blank	———	———
B23	Heated oxygen sensor heater (if equipped)	10 – 14 V	Ignition switch ON
		0 – 1 V	Over 3 min. after engine start Engine running at idle speed
B24	Injector No. 2	10 – 14 V	Ignition switch ON
B25	EVAP canister purge valve	10 – 14 V	Ignition switch ON
B26	Injector No. 4	10 – 14 V	Ignition switch ON

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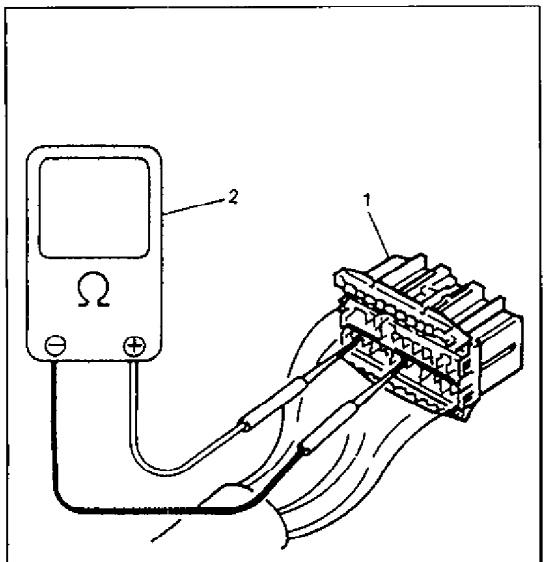


1. ECM coupler disconnected
2. Ohmmeter

60A50-6E1-70-4S

Resistance Check

1) Disconnect ECM couplers from ECM with ignition switch OFF.

> **CAUTION:**
> **Never touch terminals of ECM itself or connect voltmeter or ohmmeter.**

2) Check resistance between each pair of terminals of disconnected couplers as listed in following table.

> **CAUTION:**
> - **Be sure to connect ohmmeter probe from wire harness side of coupler.**
> - **Be sure to turn OFF ignition switch for this check.**
> - **Resistance in table represents that when parts temperature is 20°C (68°F).**

TERMINAL	CIRCUIT	STANDARD RESISTANCE	CONDITION
A5 – A10	Main and fuel pump relay	112 – 168 Ω	———
A7 – Body ground	VSS	Ohmmeter indicator deflect between 0 and ∞	Rear left tire turned slowly with rear right tire locked
A15 – A12	EGR SV valve (if equipped)	30 – 38 Ω	———
A17 – Body ground	Diag. switch terminal	∞ (infinity)	———
A18 – B15	Idle switch	continuity	Throttle valve is at idle position
		∞ (infinity)	Throttle valve opens larger than idle position
A22 – Body ground (4 A/T only)	Shift switch	continuity	Selector lever is "P" or "N" range
		∞ (infinity)	Selector lever in "R", "D", "2" or "L" range
B1 – Body B2 – ground	Ground	continuity	———
B7 – B15	TP sensor	0.3 – 2.0 kΩ	Throttle valve at idle position
		2.0 – 6.5 kΩ	Throttle valve at full open position
B9 – B15	ECT sensor	0.29 – 0.35 kΩ	Engine cooling water temp. 80°C (176°F)
B11 – A12	Fuel injector No. 1	12 – 17 Ω	———
B12 – A12	Idle air control valve	11 – 14 Ω	———
B13 – A12	Fuel injector No. 3	12 – 17 Ω	———
B14 – Body ground	Ground	continuity	———
B19 – B15 (Vehicle without oxygen sensor)	CO adjusting resistor	For standard resistance of CO resistor, refer to IDLE MIXTURE ADJUSTMENT of the same section of Service Manual mentioned in the FOREWORD of this manual	
B24 – A12	Fuel injector No. 2	12 – 17 Ω	———
B25 – A12	EVAP canister purge valve	28 – 36 Ω	———
B26 – A12	Fuel injector No. 4	12 – 17 Ω	———

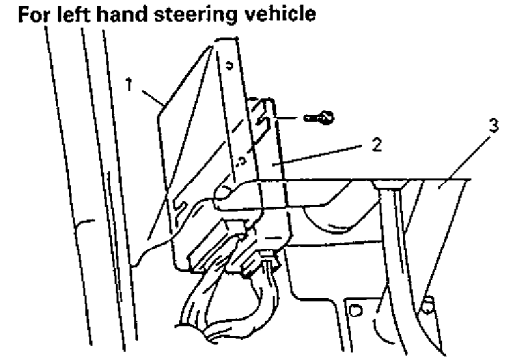
ON VEHICLE SERVICE

ELECTRONIC CONTROL SYSTEM

ENGINE CONTROL MODULE (ECM)

CAUTION:
As ECM consists of precision parts, be careful not to expose it to excessive shock.

61A10-6E1-10-1



1. ECM
2. TCM (4 A/T vehicle)
3. Steering column

Removal

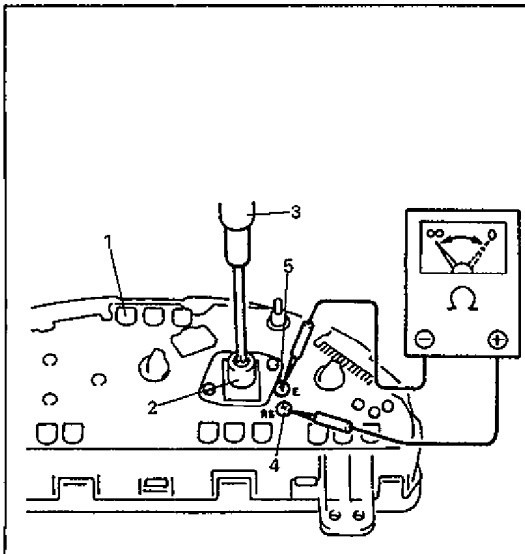
1) Disconnect battery negative cable from battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" under "Service Precaution" in Section 9J.
3) Disconnect couplers from ECM and TCM (if equipped).
4) Remove ECM with TCM.

Installation

Reverse removal procedure noting the following.

- Connect couplers to ECM and TCM securely.
- If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" under "Service Precaution "in Section 9J.

61A10-6E1-10-2



1. Combination meter
2. Speedometer cable joint
3. Screwdriver
4. "RS" screw
5. "E" screw

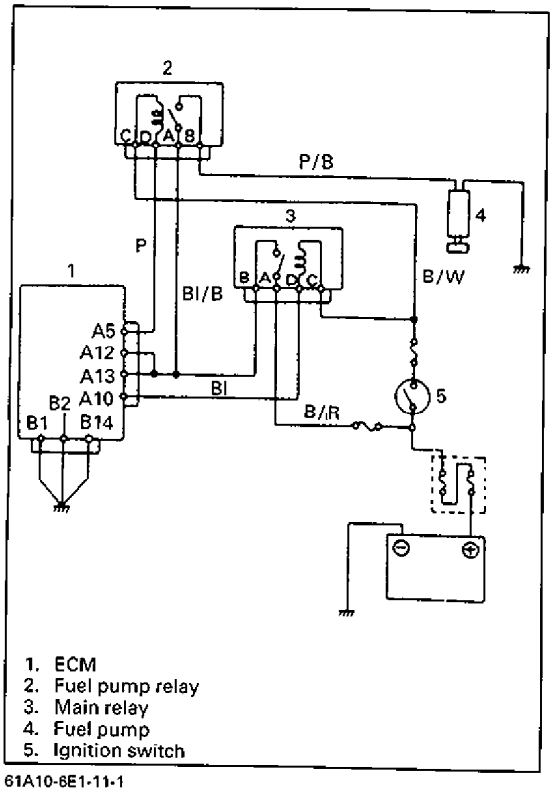
61A10-6E1-10-4

VEHICLE SPEED SENSOR (VSS)

Inspection

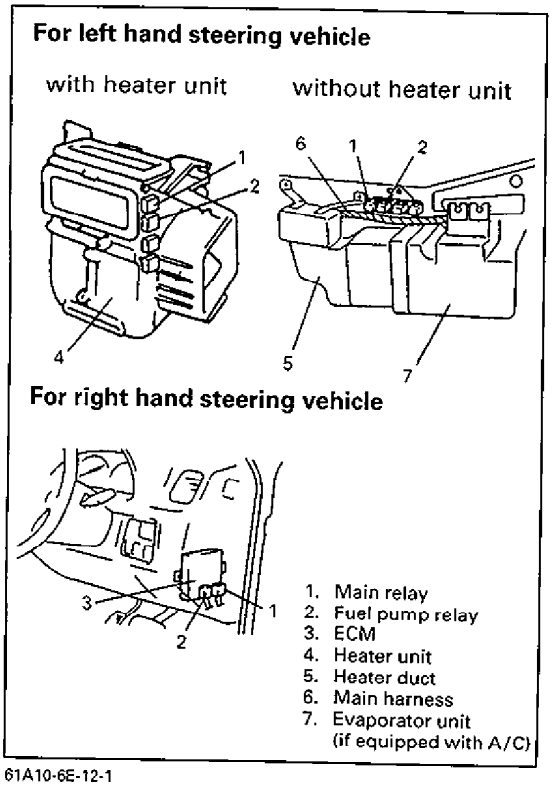
1) Disconnect negative cable at battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" under "Service Precaution" in Section 9J.
3) Remove combination meter from instrument panel.
4) Connect ohmmeter between "RS" screw (VSS signal terminal) and "E" screw (ground terminal) of combination meter and turn cable joint of speedometer with a screwdriver.
   Ohmmeter indicator should move back and forth between O (zero) and ∞ (infinity) 4 times while cable joint is turned one full revolution.

   Replace speedometer if check result is not satisfactory.
5) Install combination meter to instrument panel.
6) Connect negative cable to battery.
7) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" under "Service Precaution "in Section 9J.



1. ECM
2. Fuel pump relay
3. Main relay
4. Fuel pump
5. Ignition switch

61A10-6E1-11-1



1. Main relay
2. Fuel pump relay
3. ECM
4. Heater unit
5. Heater duct
6. Main harness
7. Evaporator unit (if equipped with A/C)

61A10-6E-12-1

MAIN RELAY

NOTE:

- **For left hand steering vehicle with heater unit, main relay and fuel pump relay are installed in front of heater unit.**
- **For left hand steering vehicle without heater unit, main relay and fuel pump relay are installed on dash panel.**
- **For right hand steering vehicle, main relay and fuel pump relay are installed side of ECM.**
- **Distinguish between main relay and fuel pump relay by wire colors.**

Inspection

Refer to "MAIN RELAY" in Section 6E.

FUEL PUMP RELAY

Inspection

1) Remove fuel pump relay in the same way as main relay.
2) Structure of fuel pump relay is the same as that of main relay. Check its resistance and operation using the same procedure as that for main relay.
   If found detective, replace.

SECTION 6F

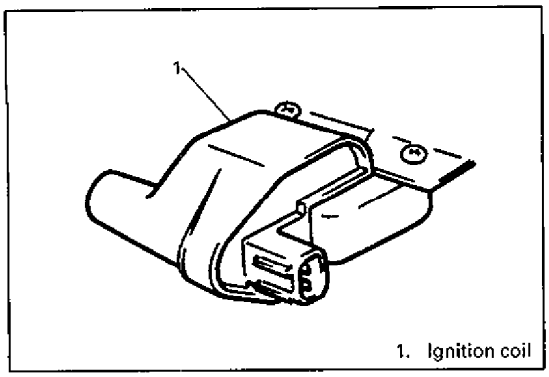
IGNITION SYSTEM (For Carburetor Model)

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

61A10-6F-1-1

CONTENTS

61A10-6F-1-2



1. Ignition coil

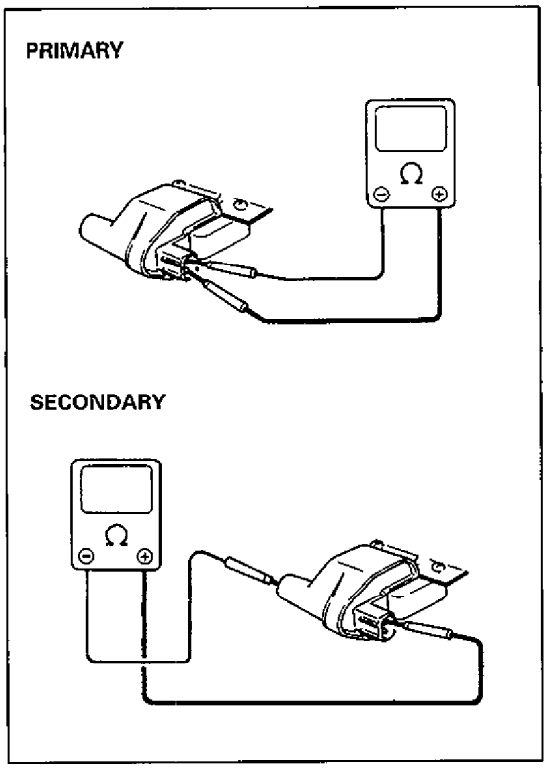
61A10-6F-2-1

ON VEHICLE SERVICE

IGNITION COIL

REMOVAL

1) Pull out high-tension cord by gripping its cap.
2) Disconnect ignition coil coupler.
3) Remove ignition coil.



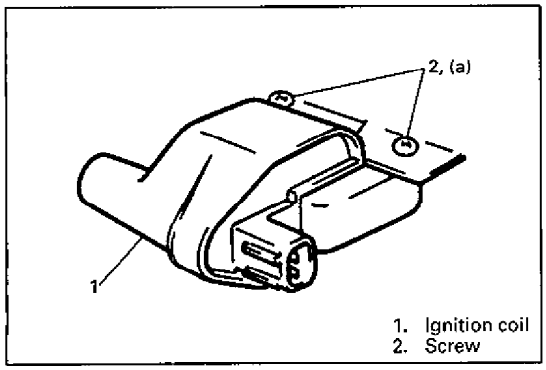
61A10-6F-2-2

INSPECTION

Measure primary and secondary coil resistances.

Ignition coil resistance (at 20°C, 68°F):
Primary: 1.30 ~ 1.58
Secondary: 11.2 ~ 15.2

If resistance is out of specification, replace coil with new one.



1. Ignition coil
2. Screw

61A10-6F-2-4

INSTALLATION

Reverse the removal procedure.

Tightening Torque
(a): 2.5 N·m (0.25 kg-m 1.8 lb-ft)

SECTION 6F1

IGNITION SYSTEM (Fuel Injection Model)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

61A10-6F1-1-1

CONTENTS

61A10-6F1-1-2

GENERAL DESCRIPTION

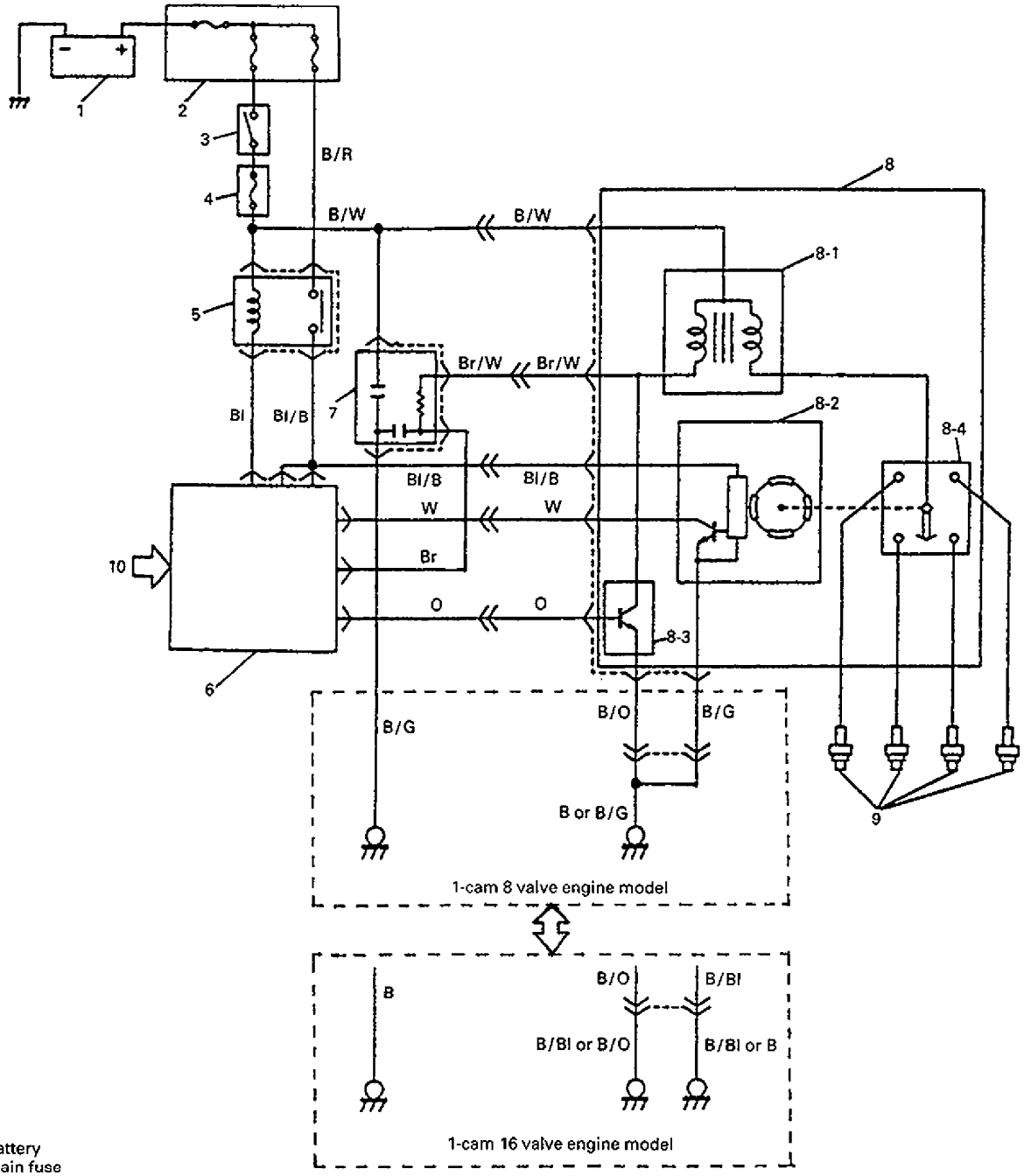
The ignition system used for this vehicle has an ignition control system (ESA, Electronic Spark Advance System) and consists of the following parts.

- ECM
  If detects the engine condition through the signals from the sensors, determines the most suitable ignition timing and time for electricity to flow to the primary coil and sends a signal to the igniter.
- Igniter (Power unit)
  Located in the distributor, it turns ON and OFF the primary current of the ignition coil according to the signal from ECM.
- Ignition coil
  It is located in the distributor.
  When its primary current is turned OFF, a high voltage is induced in the secondary winding.
- Distributor
  It distributes a high voltage current induced by ignition coil to each plug.
- High-tension cords and spark plugs
- CMP sensor (Camshaft Position Sensor)
  Located in the distributor, it converts the crank angle into voltage variation and sends it to ECM.
  For its detail:
  Refer to Section 6E (1-cam 8 valve engine model)
  Refer to Section 6E1 (1-cam 16 valve engine model)

61A10-6F1-2-1

- For 1-cam 8 valve engine model:
  MAP sensor TP sensor, ECT sensor, IAT sensor, engine start switch and test switch terminal.
  For their details, refer to Section 6E.
  For 1-cam 16 valve engine model:
  MAF sensor, TP sensor, ECT sensor, IAT sensor (if equipped), VSS, engine start switch and test switch terminal.
  For their details, refer to Section 6E1.

In ignition control system, the ECM is programmed for the best ignition timing under every engine condition.
Receiving signals which indicate the engine condition from the sensors, e.g., engine revolution, intake air volume, coolant temperature, etc., it selects the most suitable ignition timing from its memory and operates the igniter.
Thus ignition timing is controlled to yield the best engine performance.
For more information:
Refer to Section 6E (1-cam 8 valve engine model)
Refer to Section 6E1 (1-cam 16 valve engine model)



1. Battery
2. Main fuse
3. Ignition switch
4. Fuse box
5. Main relay
6. ECM
7. Noise suppressor
8. Distributor
8-1. Ignition coil
8-2. CMP sensor
8-3. Igniter
8-4. Distributor
9. Spark plug
10. Sensed information
(For 1-cam 8 valve engine model: From MAP sensor, TP sensor, ECT sensor, IAT sensor VSS, engine start switch, test switch terminal and diag switch terminal)
(For 1-cam 16 valve engine model: From MAF sensor, TP sensor, ECT sensor, VSS, engine start switch, test switch terminal and diag switch terminal.)

ON VEHICLE SERVICE

IGNITION TIMING

INSPECTION AND ADJUSTMENT

1) Start engine and warm it up to normal operating temperature.
2) Make sure that:
   - All of electrical loads except ignition are switched off.
   - A/C is OFF, if equipped.
   - M/T is set in neutral (A/T is set in "P" range)
   - Parking brake lever is pulled fully.
3) Check to be sure that idle speed is within specification.
4) Set timing light to No. 1 high tension cord.
5) Remove cap from monitor coupler (white coupler) behind the right side headlight.
   Connect "D" and "E" terminals of monitor coupler by using service wire so that ignition timing is fixed.

   NOTE:
   In this state, observe ignition timing with timing light. If it is varying (if it is not fixed), that indicates ungrounded "E" terminal which prevents accurate inspection and adjustment. Therefore, be sure to ground it securely.
6) Using timing light, check that timing is within specification.

   Initial ignition timing (Test switch terminal grounded):
   1-cam 8-valve engine model:
   8 ± 1° BTDC at 800 r/min

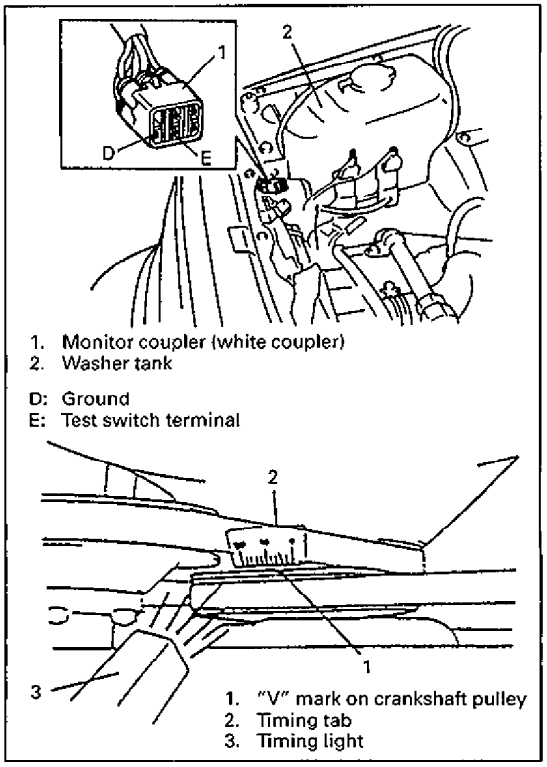
   1-cam 16-valve engine model:
   5 ± 1° BTDC at 800 r/min

   Ignition order: 1 – 3 – 4 – 2
7) If ignition timing is out of specification, loosen flange bolts, adjust timing by turning distributor assembly while engine is running, and then tighten bolts to specified torque.

   Tightening Torque
   (a): 13 N·m (1.3 kg-m, 9.5 lb-ft)
8) After tightening distributor flange bolts, recheck that ignition timing is within specification.
9) After checking and/or adjusting, disconnect service wire from monitor coupler.

   NOTE:
   In this state, ignition timing may vary more or less of initial ignition timing but it is nothing abnormal.
10) Verify that increasing engine speed advances ignition timing.

61A10-6F1-4-1



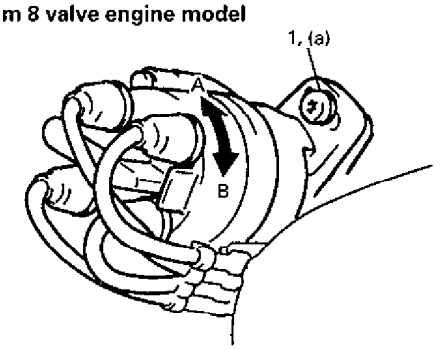
1. Monitor coupler (white coupler)
2. Washer tank

D: Ground
E: Test switch terminal

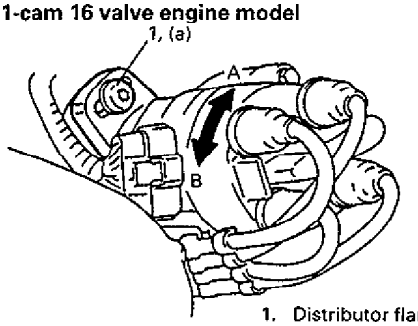
1. "V" mark on crankshaft pulley
2. Timing tab
3. Timing light

61A10-6F1-4-2

1-cam 8 valve engine model



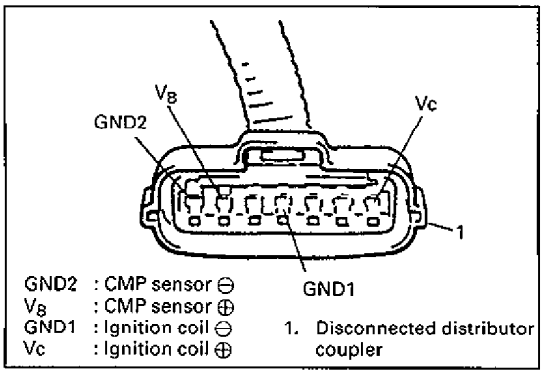
1-cam 16 valve engine model



1. Distributor flange bolt

A: To be advanced
B: To be retarded

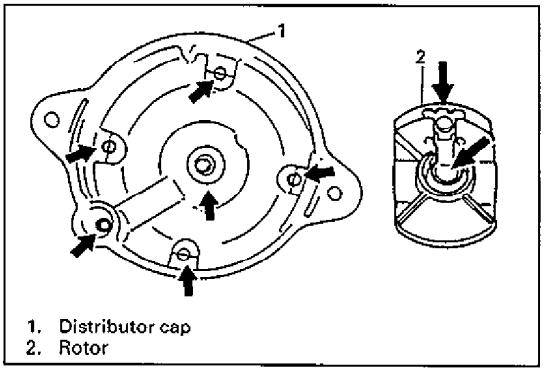
61A10-6F1-4-4



61A10-6F1-5-1

DISTRIBUTOR POWER SUPPLY

1) Disconnect distributor coupler from distributor.
2) Check voltage between "Vc" terminal and "GND1" terminal of disconnected distributor coupler, and "V_B" terminal and "GND2" terminal of the same coupler with ignition switch ON.
   Are both measured voltages 10 – 14 V?
   If not, check wire harness.

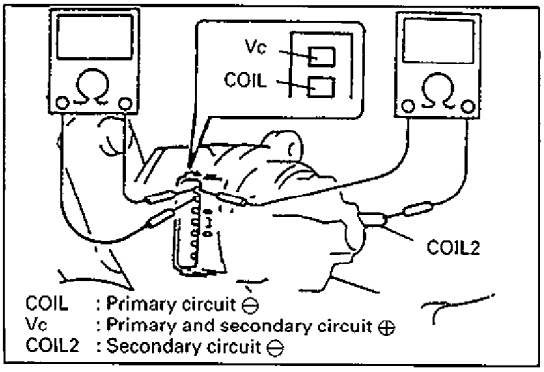


61A10-6F1-5-2

DISTRIBUTOR

Distributor Cap and Rotor

Check cap and rotor for crack and their terminals for corrosion and wear, Replace as necessary.



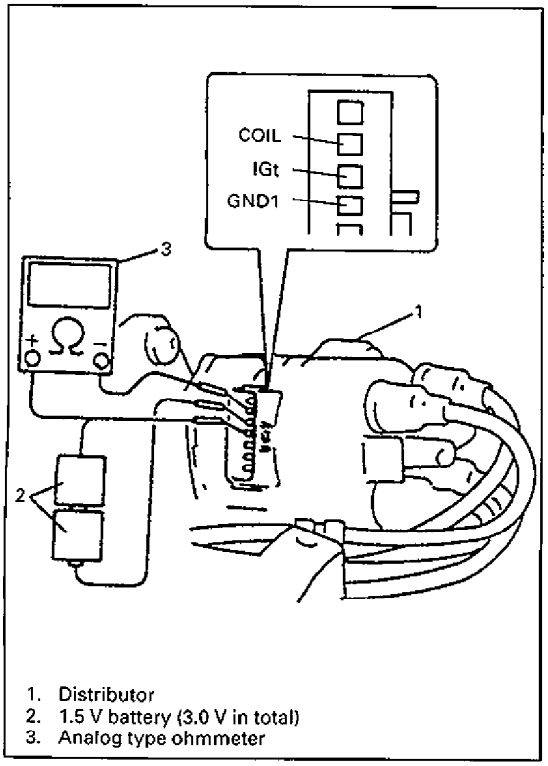
61A10-6F1-5-3

Ignition Coil Circuit

1) Remove distributor cap and disconnect distributor coupler.
2) Measure primary and secondary coil circuit resistances.

Ignition coil resistance at 20°C (68°F)	
Primary circuit (Vc – COIL)	**0.7 – 0.9 Ω**
Secondary circuit (Vc – COIL2)	**13 – 18 kΩ**

If check result is not satisfactory, replace distributor.



61A10-6F1-5-4

Ignitor Circuit

Before this check, prepare 2 new 1.5 V batteries and an analog type ohmmeter.

1) Disconnect distributor coupler from distributor.
2) Arrange 2 new 1.5 V batteries in series (check that total voltage is about 3.0 V).

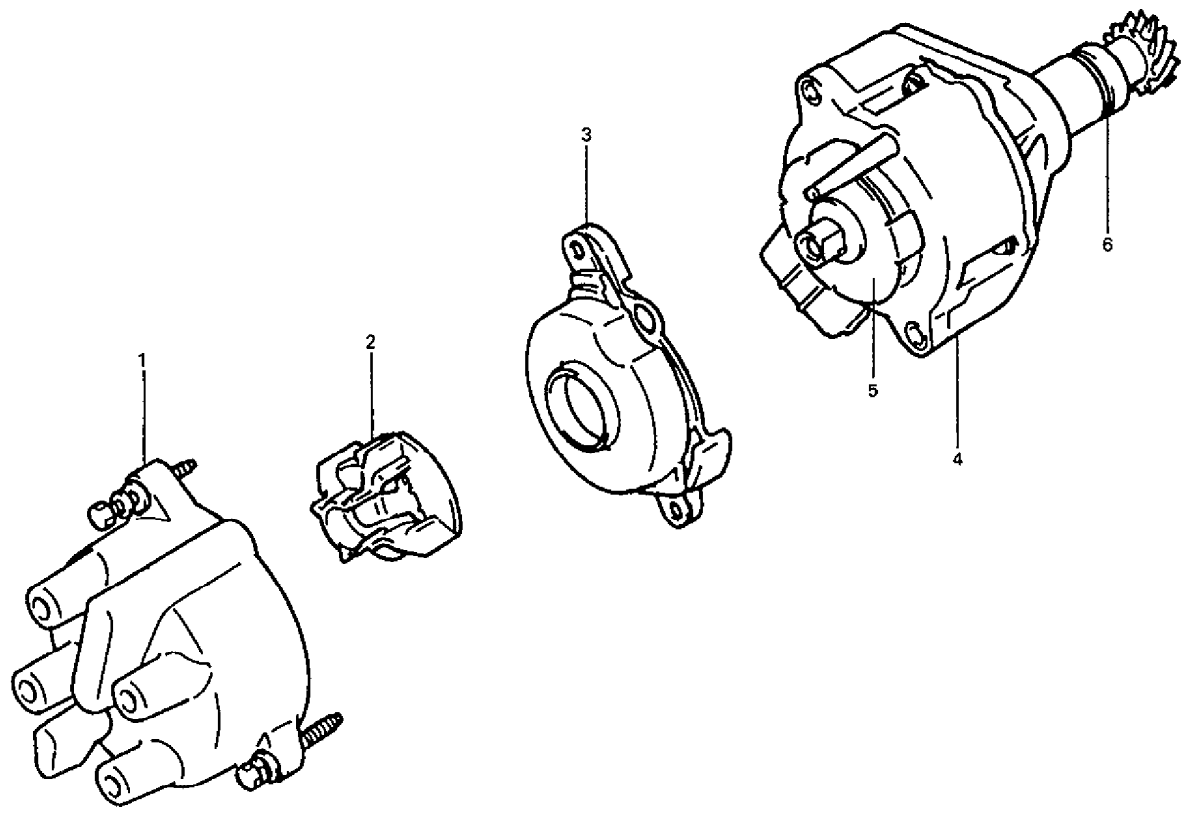
   Connect positive terminal of ohmmeter to "GND1" terminal and negative terminal to "COIL" terminal.

   Check continuity between "GND1" and "COIL" terminals with about 3 V applied to its "IGt" terminal and also none applied.

No voltage applied to "IGt" terminal	No continuity (infinity)
Voltage applied to "IGt" terminal	Continuity

If check result is not satisfactory, replace distributor.

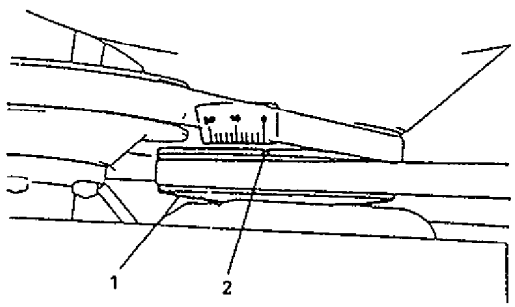
DISTRIBUTOR UNIT



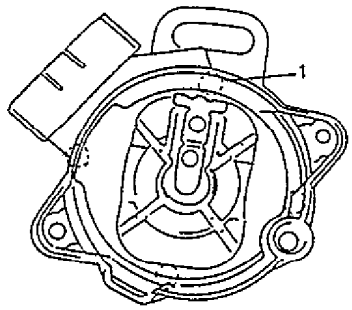
CAUTION:
Don't remove the signal rotor.

1. Cap
2. Rotor
3. Cover
4. Housing assembly
5. Signal rotor
6. O-ring

61A10-6F1-6-1



1. Crankshaft pulley
2. V mark

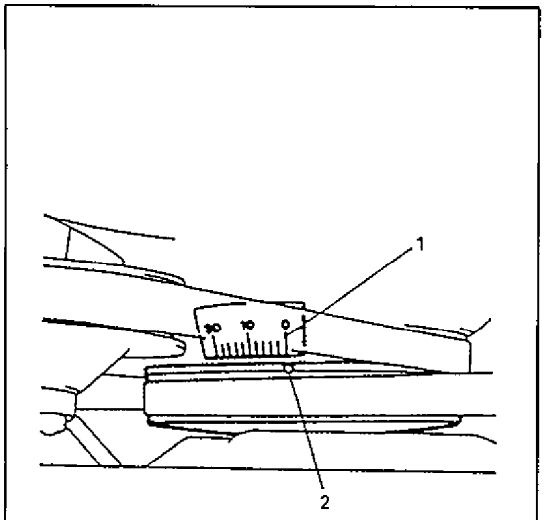


1. No. 1 terminal position

60A50-6F1-8-4

REMOVAL

1) Disconnect negative cable at battery.
2) Disconnect distributor coupler.
3) Remove distributor cap. Then to facilitate reinstallation, turn crankshaft in normal direction (clockwise as viewed from crankshaft pulley side) so that distributor rotor is positioned at No. 1 terminal of distributor cap.
4) Remove distributor flange bolt.
5) Pull out distributor housing assembly.

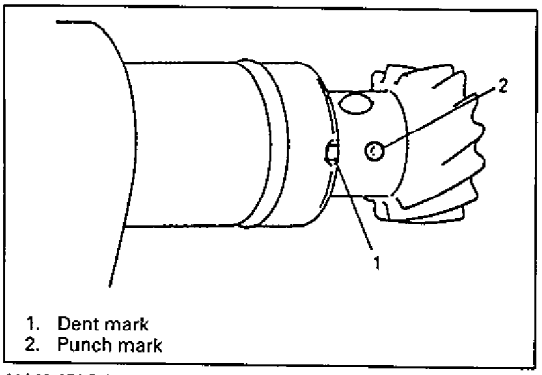


1. "0" mark
2. "V" mark (Timing notch) on crankshaft pulley

60A90-6F1-10-1S

INSTALLATION

1) If distributor rotor has not been positioned at No.1 terminal of distributor cap in distributor removal, perform following step.
   ① Turn over crankshaft in normal direction (clockwise as viewed from crankshaft pulley side) until "V" mark on pulley aligns with timing mark "0" (zero) on timing tab.
   ② After aligning two marks, remove cylinder head cover to visually confirm that the rocker arms are not riding on the camshaft cams at No.1 cylinder. If the arms are found to be riding on the cams, turn over crankshaft 360° to align the two marks anew.



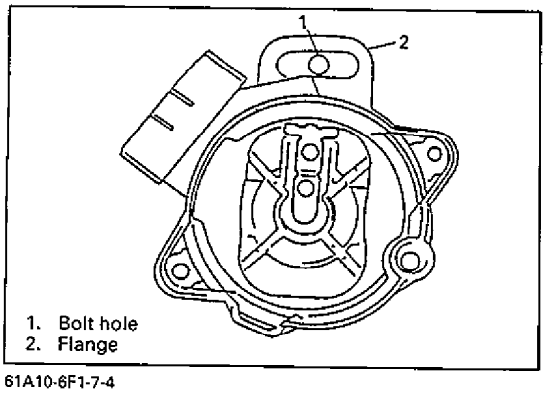
1. Dent mark
2. Punch mark

61A10-6F1-7-3

2) Check O ring for damage and deterioration.
   Replace if necessary.

   NOTE:
   If O ring is installed, apply engine oil to it.

3) Align punch mark on gear with dent mark on housing.



1. Bolt hole
2. Flange

61A10-6F1-7-4

4) Insert distributor into gear case in such a way that the center of distributor flange will coincide with distributor flange bolt hole provided in distributor gear case. When inserting the distributor completely, position of distributor rotor becomes as shown in figure. Secure distributor in place tentatively by making flange bolt finger-tight.

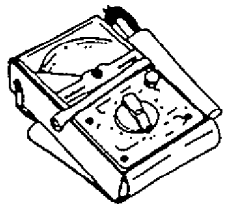
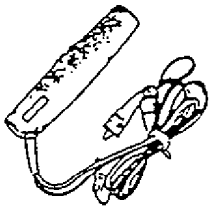
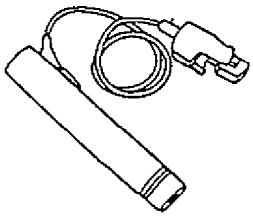
5) Check to make sure that rotor is in good condition.
6) Inspect distributor cap and clean or replace as required.
7) Make sure that distributor cap seal is placed properly and install cap, and then fasten it with screws.
8) Connect distributor coupler.
9 Connect negative cable at battery.
10) Check and adjust ignition timing as previously outlined, refer to "Ignition Timing" in this section.

TIGHTENING TORQUE SPECIFICATION

Fastening portion	Tightening Torque		
	N·m	kg-m	lb-ft
1. Distributor flange bolts	13	1.3	9.5

61A10-6F1-8-1

SPECIAL TOOLS

		
09900-25002 Pocket tester	09900-27301 Timing light (DC 12 V)	09930-76420 Timing light (Dry cell type)

61A10-6F1-8-2

SECTION 6H

CHARGING SYSTEM

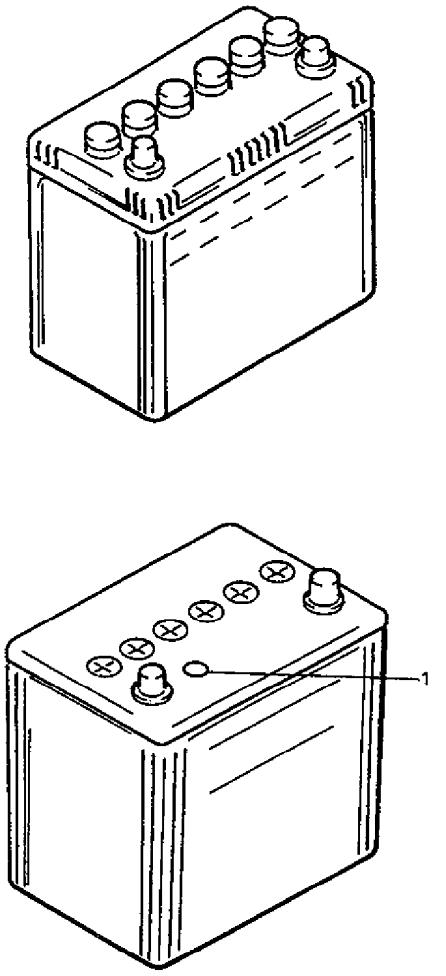
WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNING and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.

CONTENTS

61A10-6H-1-1



1. Indicator

61A10-6H-2-1

BATTERY

GENERAL DESCRIPTION

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 one of the following three types, depending on specification.

55B24L(S) TYPE

Rated capacity	36 AH/5HR, 12 Volts
Electrolyte	3.1 L (6.55/5.46 US/Imp pt)
Electrolyte S.G.	1.28 when fully charged at 20 °C (68 °F)

38B20L TYPE

Rated capacity	28 AH/5HR, 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)

38B20L TYPE (BUILT-IN INDICATOR)

Rated capacity	28 AH/5HR, 12 Volts

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.

85F00-6H-2-4

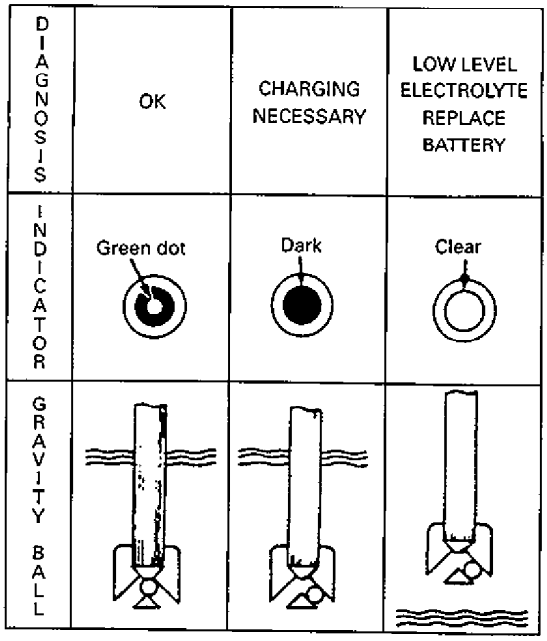
ELECTROLYTE FREEZING

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.

85F00-6H-3-1



BUILT-IN INDICATOR (IF EQUIPPED)

The battery has a built-in temperature compensated indicator in the top of the battery. This indicator is to be used with the following diagnostic procedure. When checking the indicator, make sure that the battery has a clean top. A light may be needed in some poorly-lit areas.
Three types of indication available under normal operation are as follows.

1. **Green Dot**
   Battery is sufficiently charged for testing.

2. **Dark**
   Battery must be charged before testing.
   If there is a cranking complaint, battery should be tested as described in Diagnosis section. Charging and electrical systems should also be checked at this time.

3. **Clear or Light Yellow**
   This means that fluid level is below the bottom of hydrometer. Its possible cause is excessive or prolonged charging, a broken case, excessive tipping or normal battery deterioration.
   When the battery is found in such condition, it is possible that high charging voltage is caused by the faulty charging system and therefore, charging and electrical systems need to be checked. If there is a trouble in cranking and its cause lies in the battery, it should be replaced.

61A10-6H-3-4

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. (For battery without a built-in indicator)

   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.

61A10-6H-3-2

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.

85F00-6H-3-5

3) Be always in the know as to the state of charge of the battery.
   For battery with a built-in indicator:
   Check the indicator. (Refer to "INDICATOR CHECK" in this section.)
   For battery without a built-in indicator:
   The 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.

DIAGNOSIS

BATTERY TEST

1. 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.

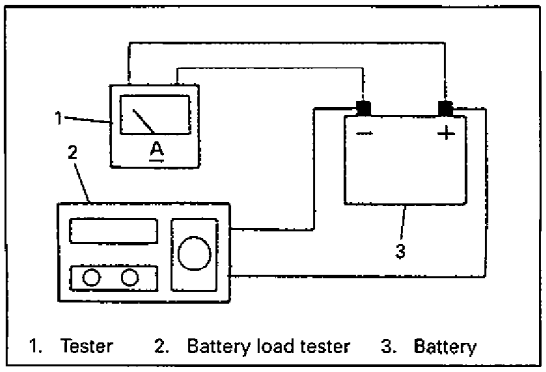
2. INDICATOR CHECK

(FOR BATTERY WITH A BUILT-IN INDICATOR)

– Check the state of indicator.

- **Green Dot**
  Proceed to load test.
- **Dark**
  Charge battery and proceed to load test.
- **Clear or Light Yellow**
  The battery must be replaced.

61A10-6H-5-1



1. Tester 2. Battery load tester 3. Battery

3. LOAD TEST

(FOR BATTERY WITH A BUILT-IN INDICATOR)

1) Connect voltmeter and battery load tester across battery terminals.
2) Apply 130 ampere load for 15 seconds to remove surface charge.
3) Remove the load and wait 15 seconds to let battery recover.
4) Apply 130 ampere load. Read voltage after 15 seconds.
5) Remove the load.

- The voltage does not drop below the minimum as listed in left figure.
  – Battery is good.
- The voltage does drop below the minimum as listed in left figure.
  – Replace the battery.

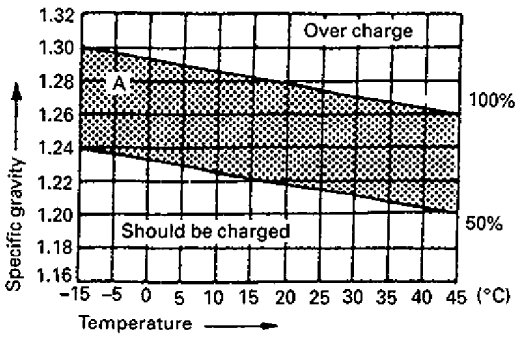
NOTE:

Temperature of battery will affect minimum voltage required to pass load test.
See the left figure and estimate the temperature battery has been exposed to for the last several hours.

61A10-6H-5-3

Battery load test voltage	
Estimated temperature	Minimum required voltage under 15 sec. load
21°C/70°F	9.6
10°C/50°F	9.4
0°C/30°F	9.1
–10°C/15°F	8.8
–18°C/0°F	8.5
Below –18°C/0°F	8.0

61A10-6H-5-4



61A10-6H-6-1

4. HYDROMETER TEST
(FOR BATTERY WITHOUT A BUILT-IN INDICATOR)

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 state-of-charge graph

Suppose your S.G. reading is 1.28 and the battery temperature is –5 °C (23°F). Locate the intersection of the –5 °C 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.

ON VEHICLE SERVICE

JUMP STARTING IN CASE OF EMERGENCY

WITH AUXILIARY (BOOSTER) BATTERY

CAUTION:
If vehicle is manual transmission model and has a catalytic converter, do not push or tow it to start. Damage to its emission system and/or to other parts may result.

Both booster and discharged battery should be treated carefully when using jumper cables. Follow 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.

   For battery with a built-in indicator:
   Check built-in indicator. If it is clear or light yellow, replace the battery.

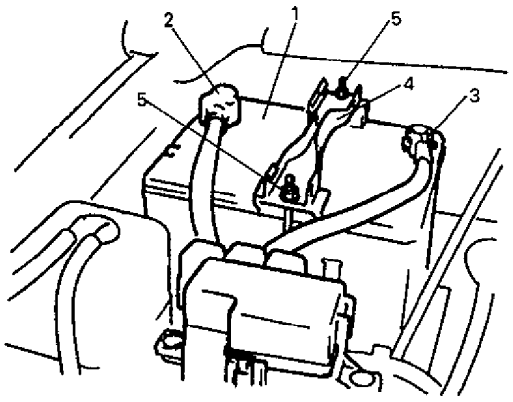
   For battery without a built-in indicator:
   Check electrolyte level. If it is below low level line, add distilled water.
2) Attach end of one jumper cable to positive terminal of booster battery and the other end of the same cable to positive terminal of discharged battery. (Use 12-volt battery only to jump start engine).
3) 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.
4) Start engine of vehicle with booster battery and turn off electrical accessories. Then Start engine of the vehicle with discharged battery.
5) Disconnect jumper cables in the exact reverse order.

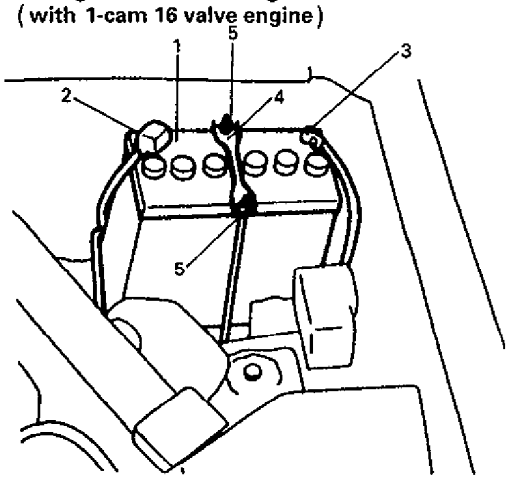
WITH CHARGING EQUIPMENT

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.

85F00-6H-6-1



For right hand steering vehicle
(with 1-cam 16 valve engine)



1. Battery
2. Positive cable
3. Negative cable
4. Retainer
5. Nuts

61A10-6H-8-2

OFF VEHICLE SERVICE

DISMOUNTING

1) Disconnect negative cable.
2) Disconnect positive cable.
3) Remove retainer.
4) 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.

REMOUNTING

Reverse removal procedure.

NOTE:
Check to be sure that ground cable has enough clearance to hood panel by terminal.

SECTION 7B

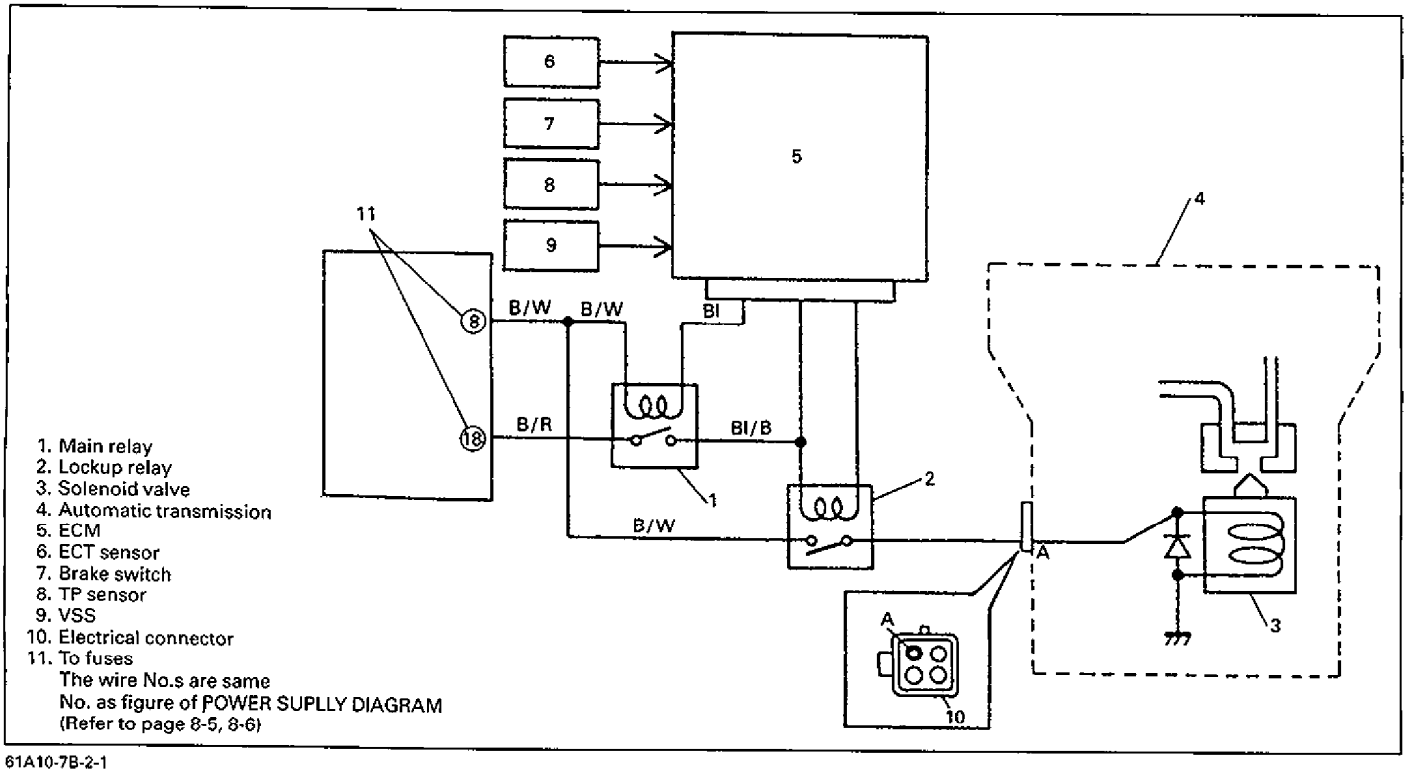
AUTOMATIC TRANSMISSION (3 A/T)

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

CONTENTS

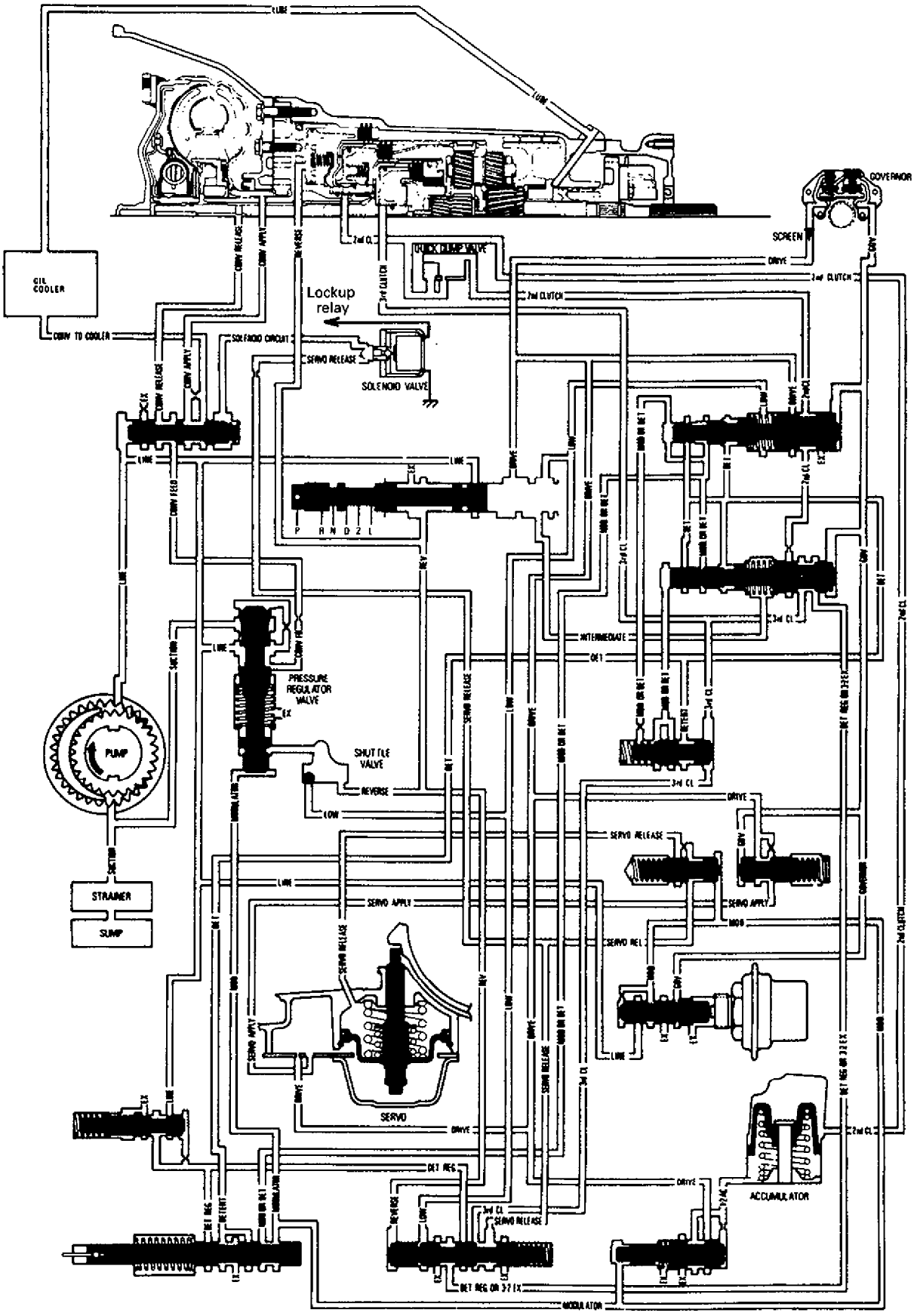
GENERAL DESCRIPTION

For the system and operation of automatic transmission, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.
But the control circuit of torque converter clutch (T.C.C.) is described as follows.

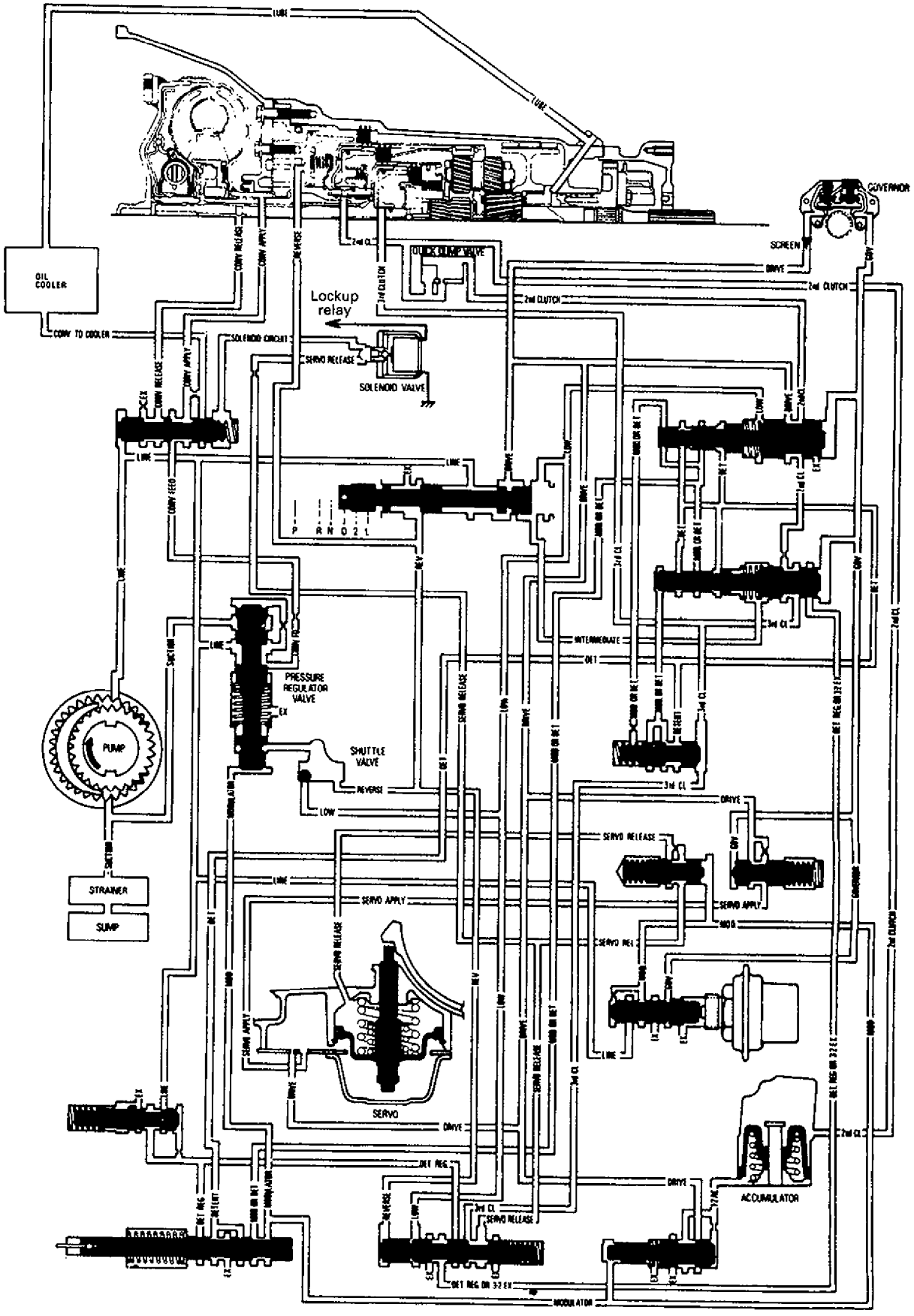


7B

Transmission Oil Circuit-Park-Torque Converter Clutch Off



Transmission Oil Circuit-Drive 3-Torque Converter Clutch On



DIAGNOSIS

Before diagnosis of any transmission complaint is attempted, there must be understanding of fluid checking procedure and what appearance the fluid should have. Many times a transmission malfunction can be traced to low fluid level or improper reading of oil level gauge. Due to the transmission fluid that is now being used it may appear to be darker and have a stronger odor.
This is normal, and not a positive sign of required maintenance or transmission failure.
Also when the oil level gauge is removed, it should be noted whether the fluid is devoid of air bubbles or not. Fluid with air bubbles gives an indication of an air leak in the suction lines, which can cause erratic operation and slippage.
Water in the fluid imparts a milky, pink cast to the fluid and can cause spewing. Water in the fluid can also cause swelling of nylon parts.

61A10-7B-4-1

PRELIMINARY CHECKING PROCEDURE

1) Check and correct fluid level (Refer to "FLUID LEVEL AND CAPACITY").
2) Road test vehicle to verify transmission problem using all selective ranges, noting discrepancies in operation.
3) If engine performance indicates an engine tune-up is required, this should be performed before road testing is completed or transmission correction attempted. Poor engine performance can result in transmission problems.
4) Check kick-down cable adjustment.
5) Check and correct vacuum lines and fittings.
6) Check and correct select cable.
7) Install oil pressure gauge and compare with pressure readings in "LINE PRESSURE TEST".
8) Isolate the unit or circuit involved in the malfunction.

NOTE:
For the conditions not described below, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

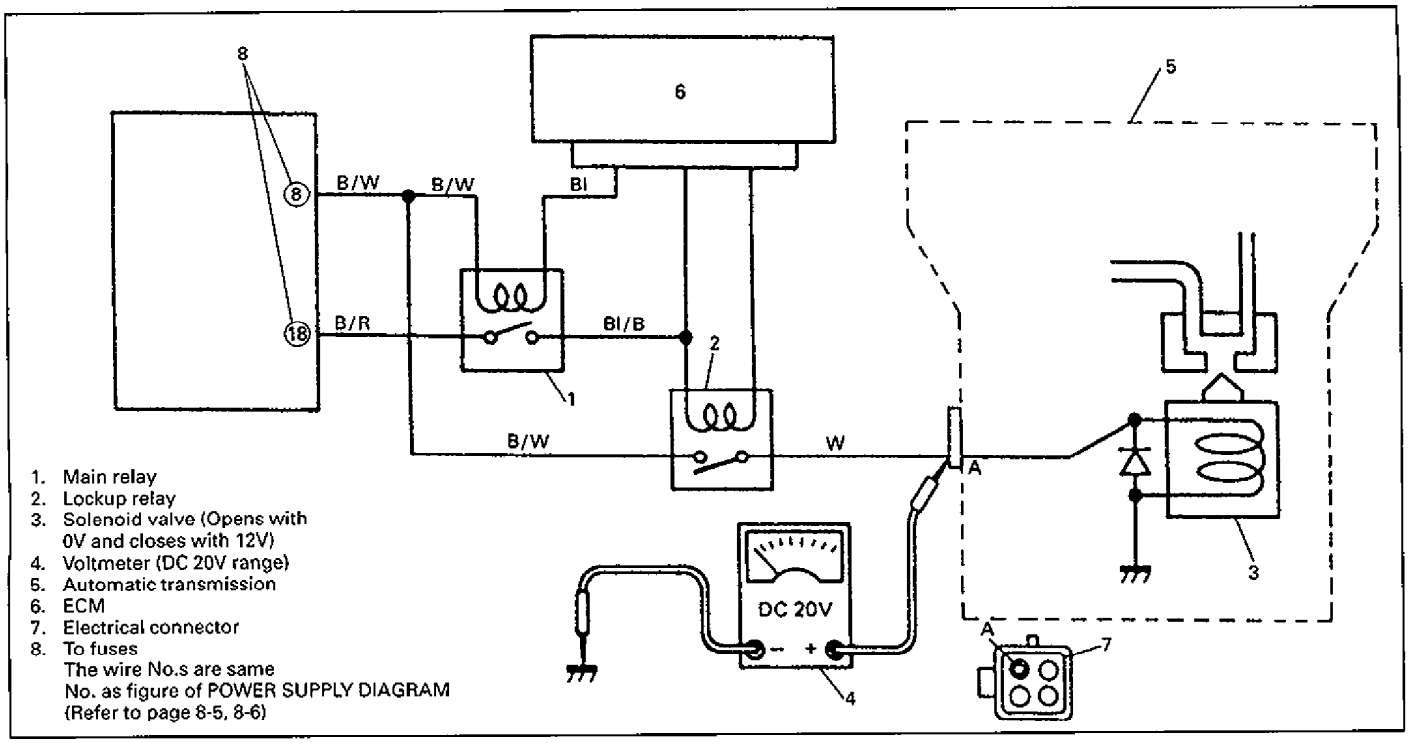
	Condition	Possible cause	Correction
CONCERNS CONVERTER	**No converter clutch applied.**	• 12 volts not being supplied to transmission.	Refer to p. 7B-5.
		• Ground inside of transmission.	Tighten bolt.
		• Defective connector, wiring harness, or solenoid.	Repair or replace.
		• Sticking converter clutch control valve.	Overhaul oil pump.
		• Solenoid O ring cut or leaking.	Replace solenoid.
		• Oil pump wear plate or gasket mispositioned or damaged.	Repair or replace.
		• High or uneven bolt torque on converter housing to oil pump bolts.	Adjust torque.
		• Cut O ring on turbine shaft.	Replace converter.
	No converter clutch release or shudder.	• Sticking converter clutch control valve.	Overhaul oil pump.
		• Restricted converter clutch apply passage.	Overhaul.
		• Low fluid or pressure.	Refer to Section 7B of the Service Manual mentioned in the FOREWORD of this manual.
		• Cut O ring on turbine shaft.	Replace converter.

61A10-7B-4-2

T.C.C. DIAGNOSIS (Fuel Injection Model Only)

ELECTRICAL CHECK

Preliminary checking procedure in page 7B-4 should have been performed prior to using this chart.



61A10-7B-5-1

- Connect voltmeter as illustrated.
- Start engine and warm it up fully.
- Voltage should be 0 with this condition.

Test-drive vehicle with D position at above 65 km/h (41 miles/h) but throttle opening is 10% – 60% on flat road and keep it for 4 seconds, and then make sure voltmeter indicates battery voltage.

- OK
  - Circuit is ellectrically OK.
  - Check solenoid valve reffering to solenoid function test in next page.
    - OK → Check automatic transmission reffering to page 7B-4.
    - NOT OK → Repair or adjust solenoid valve.
- NOT OK → Diagnose lockup relay referring to Section 6E.
  - OK → Check wire harness and connections. If all above are OK, check brake switch circuit to ECM reffering to Section 6E. If OK then, substitute a known-good ECM referring to Section 6 and check.
  - NOT OK → Repair or adjust lockup relay.

61A10-7B-5-2

WARNING:
For safety, test-drive vehicle with an assistant who reads voltmeter.

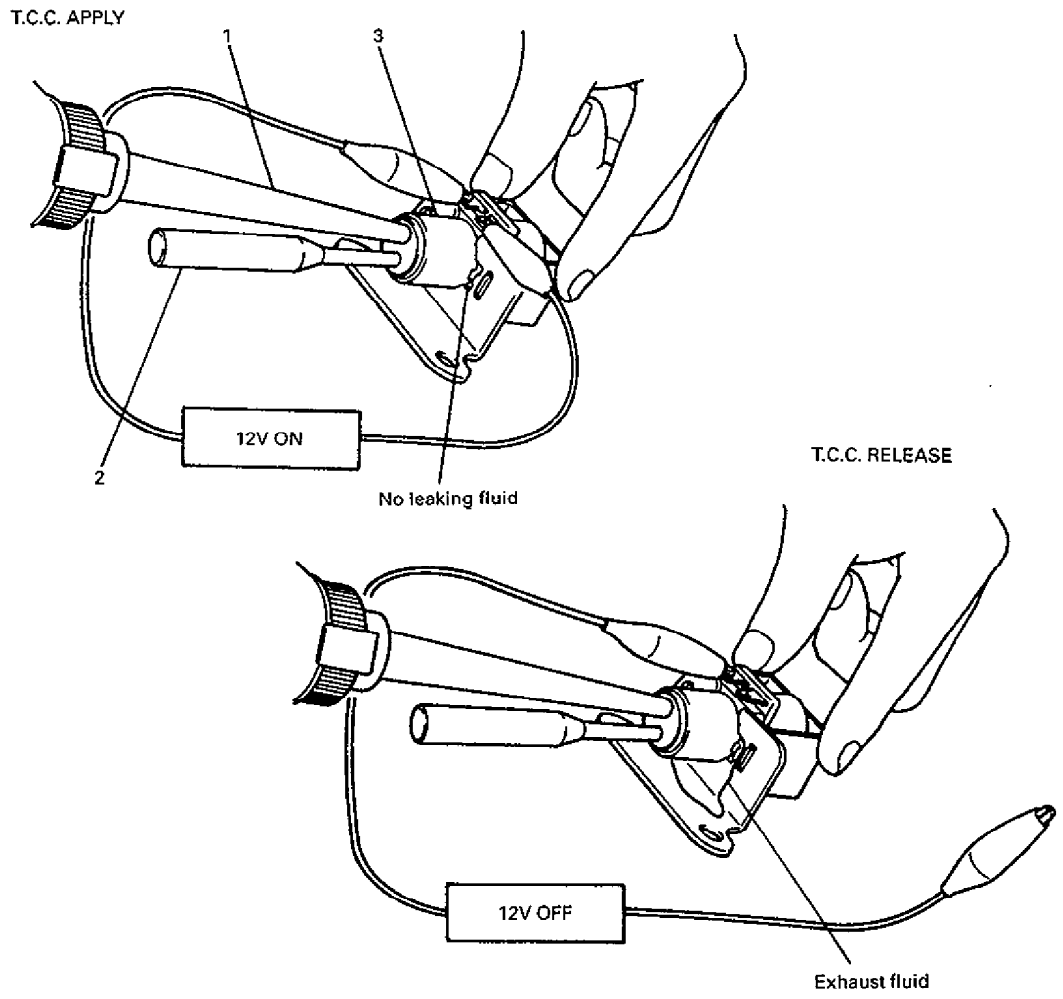
CAUTION:
The circuit test is also available with 4 wheels free on lift using positions of selector D and transfer 4H. However, engine runs extremely high to fulfill throttle valve opening of the system control condition. Therefore, test on lift is not recommendable.

61A10-7B-6-1

SOLENOID VALVE CHECK

Giving battery voltage (12V) to solenoid, valve function would be tested as shown below.

CAUTION:
To avoid mis-wiring and consequential diode damage, do not conduct battery voltage through coupler which is originally installed in the transmission.



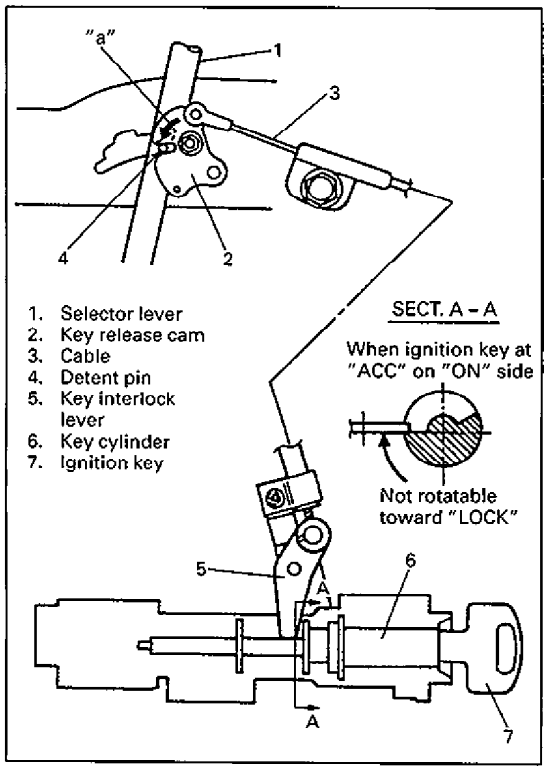
1. Oiler
2. Special tool (Spring pin remover 09922-85811) or the like
3. Solenoid assembly

ON VEHICLE SERVICE

MAINTENANCE SERVICE

Fluid specification
An equivalent of DEXRON®-II, DEXRON®-IIE or DEXRON®-III

61A10-7B-7-1



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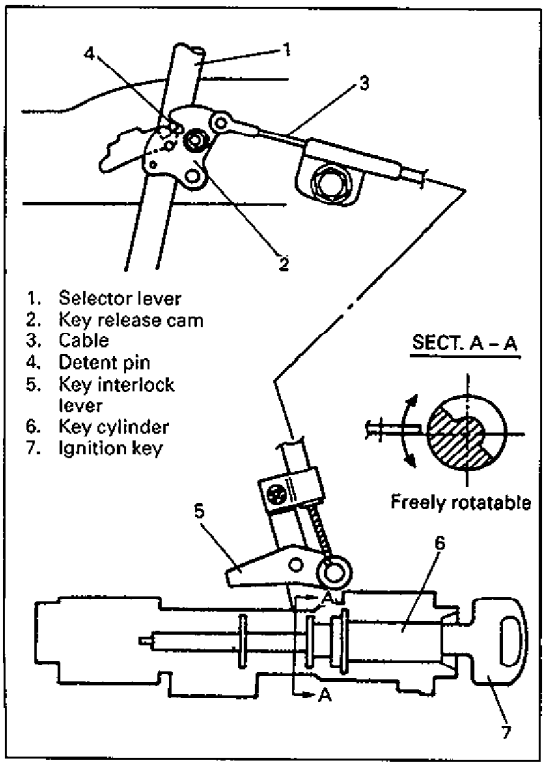


61A10-7B-7-5

BRAKE INTERLOCK SYSTEM (if equipped)

OPERATIONS

INTERLOCK CABLE OPERATION

1) How ignition key is locked

When the selector lever is shifted to any other range than "P" (i.e., R, N, D, 2, L), the key release cam turns in "a" direction as shown in figure.

This means that the cable connecting the key release cam and the key interlock lever is not pushed and therefore, the key interlock lever is pushed into the key cylinder due to cable force and thus the ignition key is locked.

It is impossible to turn the ignition key toward "LOCK" position when it is at "ON" position.

2) How ignition key is released

When the selector lever is shifted to "P" range and released shift knob button, the key release cam turned by the select lever (detent pin) pushes the cable which then pushes key interlock lever out of the key cylinder. Then the key cylinder is allowed to rotate freely and so is the ignition key in it.

ON VEHICLE SERVICE

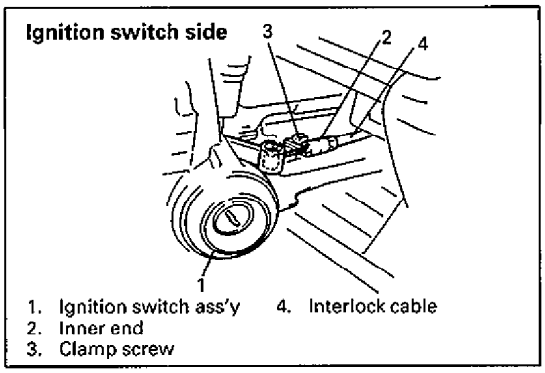
INTERLOCK CABLE

NOTE:
Don't bend interlock cable excessively when removing and installing it, or system will not operate correctly.

Removal

1) Disconnect negative (–) cable from battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air bag System" in Section 9J.
3) Remove steering column hole cover.
4) Remove steering column cover and then meter hood.
5) Remove steering shaft upper joint bolt and steering column mounting bolts.
   For vehicle with air bag system, refer to Section 3C1,
   For vehicle without air bag system, refer to Section 3C2 of Service Manual mentioned in FOREWORD of this manual.

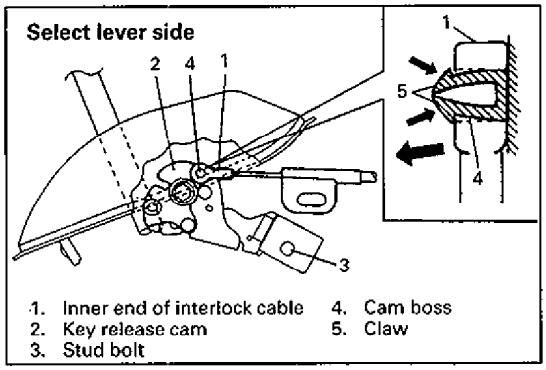
61A10-7B-8-1



1. Ignition switch ass'y
2. Inner end
3. Clamp screw
4. Interlock cable

6) Remove interlock cable clamp screw located at ignition switch ass'y.
7) Remove disconnect interlock cable inner end. (Ignition switch side.)

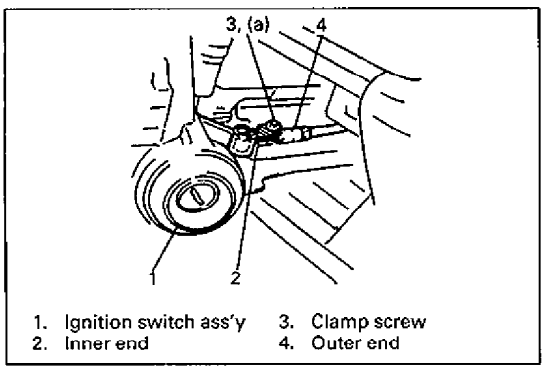
61A10-7B-8-3



1. Inner end of interlock cable
2. Key release cam
3. Stud bolt
4. Cam boss
5. Claw

8) With console box removed, take out interlock cable by loosening lock nuts.
9) Detach cable end from release cam while pressing claws of release cam boss. At this time, be careful not to cause damage to its claws.

61A10-7B-8-4



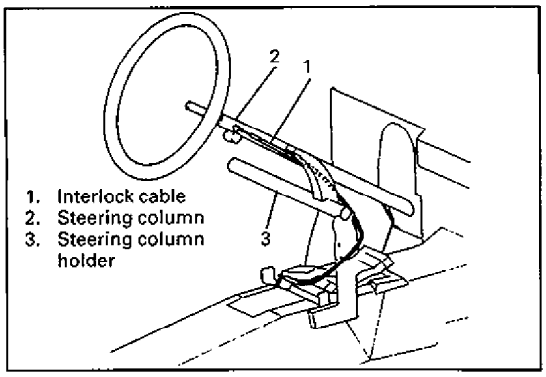
1. Ignition switch ass'y
2. Inner end
3. Clamp screw
4. Outer end

Installation

1) Shift select lever to "N" range (Refer to SHIFT LOCK RELEASE on same section of Service Manual mentioned in FOREWORD of this manual) and turn ignition key to "ACC" position.
2) Connect inner end of interlock cable to key interlock lever (Ignition switch side).
3) Install outer end bracket of interlock cable to ignition switch ass'y, and tighten screw to specified torque.

Tightening Torque
(a): 2.2 N·m (0.22 kg-m, 1.5 lb-ft)

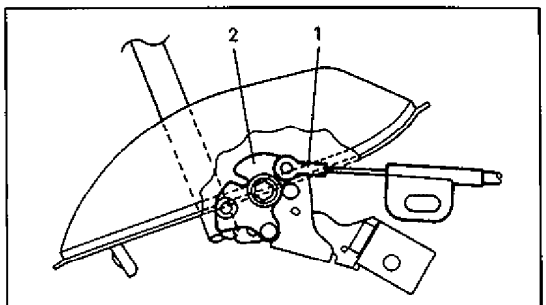
61A10-7B-8-5



1. Interlock cable
2. Steering column
3. Steering column holder

61A10-7B-9-1

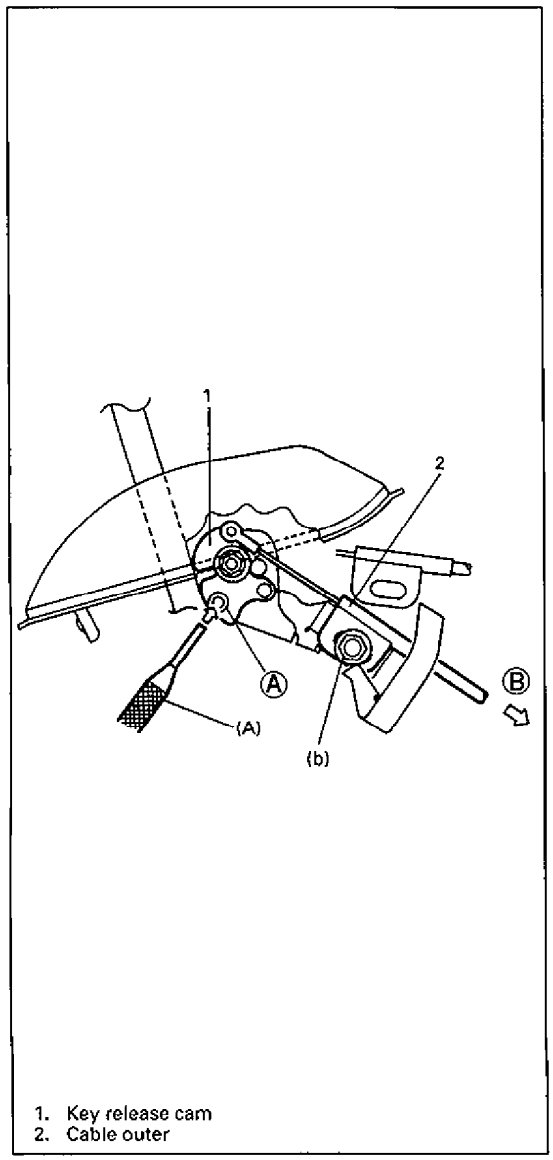
4) Pass and connect interlock cable as shown at the left figure.



1. Inner end of interlock cable
2. Key release cam

61A10-7B-9-2

5) With key release cam set as shown at the left figure, connect inner end of interlock cable to key release cam. (Select lever side)



1. Key release cam
2. Cable outer

61A10-7B-9-3

6) Move key release cam so that it is set at such angle as shown at the left figure and with special tool (A) inserted in hole Ⓐ , fix key release cam.

Special Tool
(A): 09925-78210 (6 mm)

7) With key release cam fixed with special tool (A), install cable outer to bracket and after making sure that cable outer is pushed in arrow direction Ⓑ by leaf spring, tighten mounting nut to specified torque.

Tightening Torque
(b): 13 N·m (1.3 kg-m, 9.5 lb-ft)

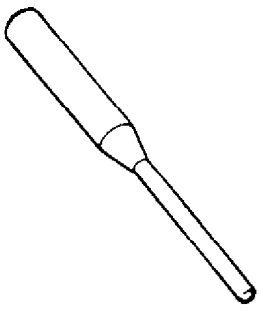
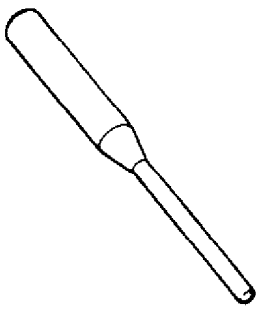
8) With selector lever set at P range, turn ignition key to "ACC" position and then check for following conditions.
   - With knob button released, ignition key can be turned from "ACC" position to "LOCK" position.
   - With knob button pressed, ignition key cannot be turned from "ACC" position to "LOCK" position.
9) Install console box.
10) Install steering column.
    For vehicle with air bag system, refer to Section 3C1.
    For vehicle without air bag system, refer to Section 3C2 of Service Manual mentioned in FOREWORD of this manual.
11) Install meter hood.
12) Install steering column cover and steering column hole cover.
13) If equipped with air bag system, enable air bag system. Refer to "Enabling Air bag System" in Section 9J.

TIGHTENING TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Interlock cable clamp screw	2.2	0.22	1.5
2. Interlock cable outer mounting nut	13	1.3	9.5

61A10-7B-10-1

SPECIAL TOOLS

	
09922-85811 Spring pin remover	09925-78210 Spring pin remover (6 mm)

61A10-7B-10-2

SECTION 7B1

AUTOMATIC TRANSMISSION (4 A/T)

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

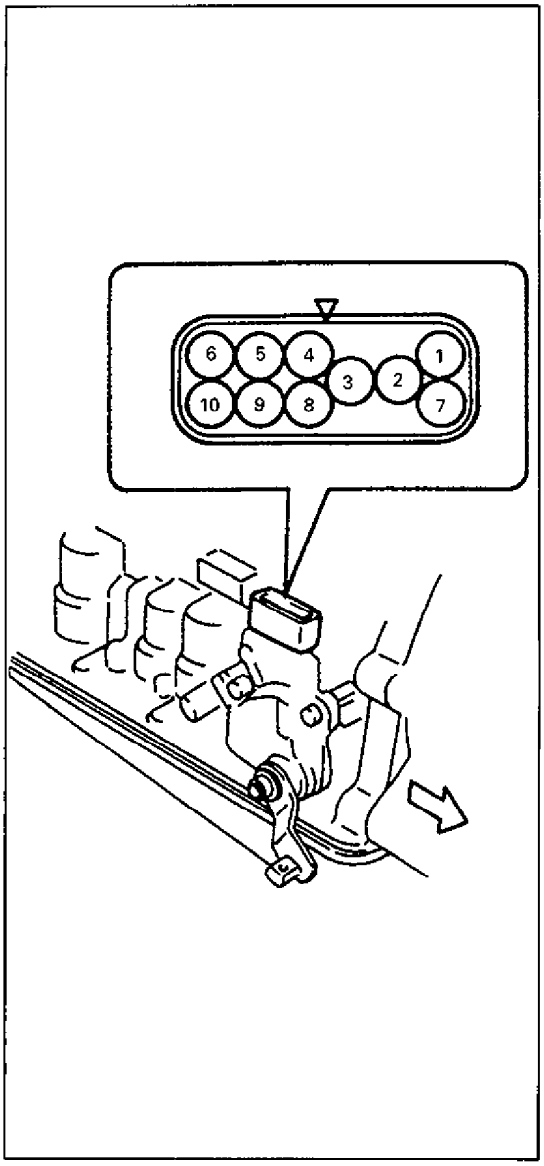
NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in the FOREWORD of this manual.

61A10-7B-1-1

CONTENTS

7B1

61A10-7B1-1-2



61A10-7B1-2-1

GENERAL DESCRIPTION

ELECTRONIC SHIFT CONTROL SYSTEM

TRANSMISSION CONTROL MODULE (TCM)

Shift Switch

A shift switch is provided so that the engine can be started only when the shift lever is in the "P" or "N" position.

Terminal position	2	3	6	7	8	10	9	4	5
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
L			○						○

AUTOMATIC GEAR SHIFT DIAGRAM

Automatic shift schedule as a result of shift control is shown below. In case that select lever is shifted to L at a higher than 52 km/h (32.5 mile/h) speed, 2nd gear is operated and then down shifts to 1st at a speed lower than that. No up shift is available in L.

The same as, the select lever is shifted to 2 at a higher than 100 km/h (62.5 mile/h) speed, 3rd gear is operated and then down shifts to 2nd at a speed lower than that. No up shift is available in 2.

Power Mode

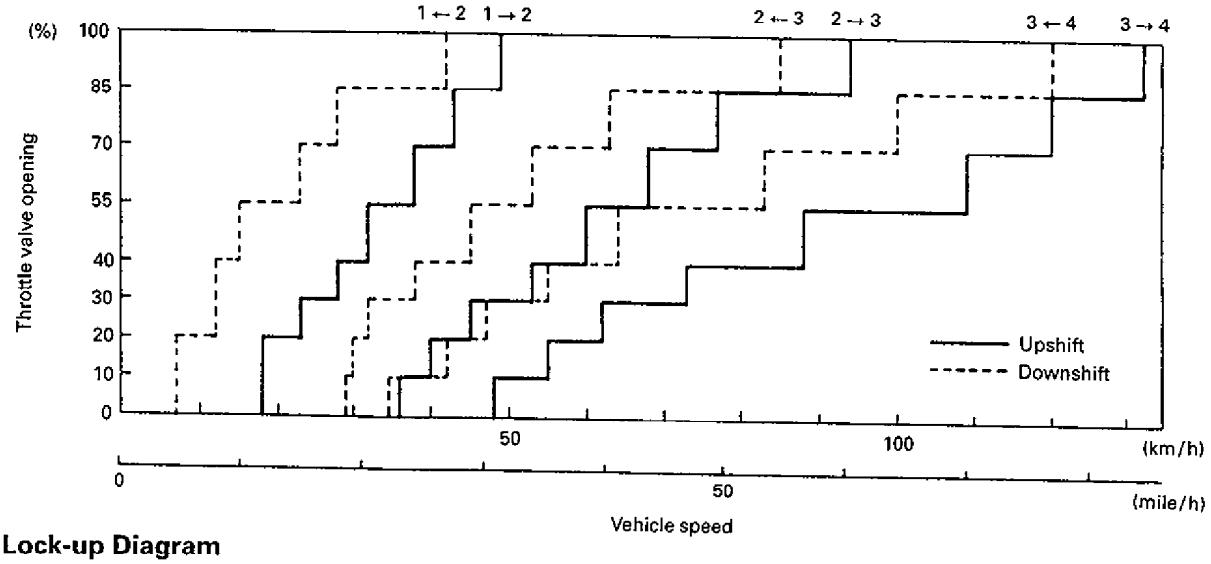
Unit: km/h
(mile/h)

Shift / Throttle opening	1 → 2	2 → 3	3 → 4	4 → 3	3 → 2	2 → 1
Full throttle	49 (31)	94 (59)	132 (83)	120 (75)	85 (53)	42 (26)
Closed throttle	18 (11)	36 (23)	48 (30)	35 (22)	29 (18)	7 (4)

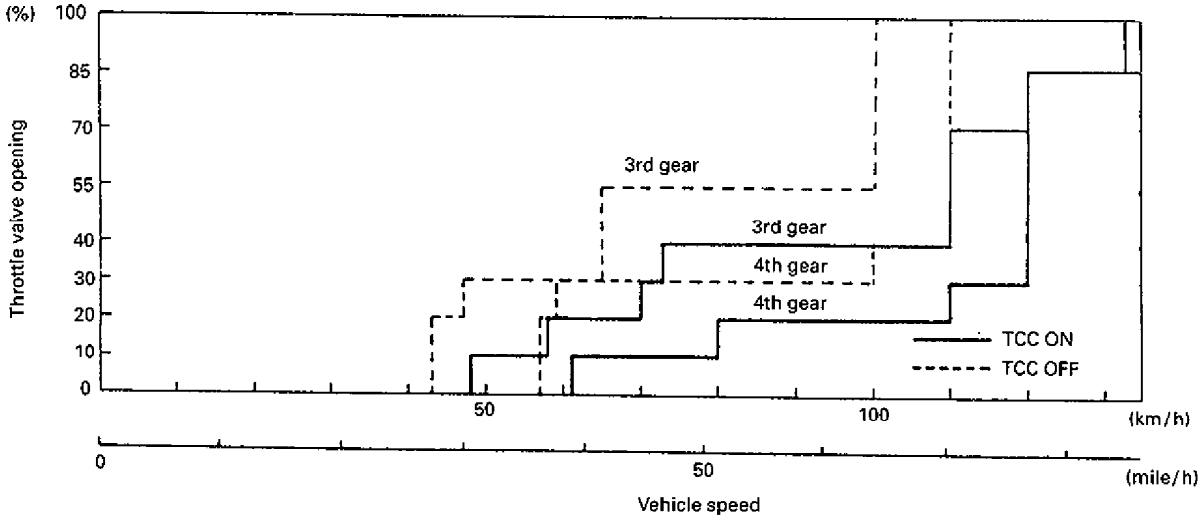
61A10-7B1-2-2

Power Mode

Gear Shift Diagram



TCC Lock-up Diagram



61A10-7B1-3-1

Normal Mode

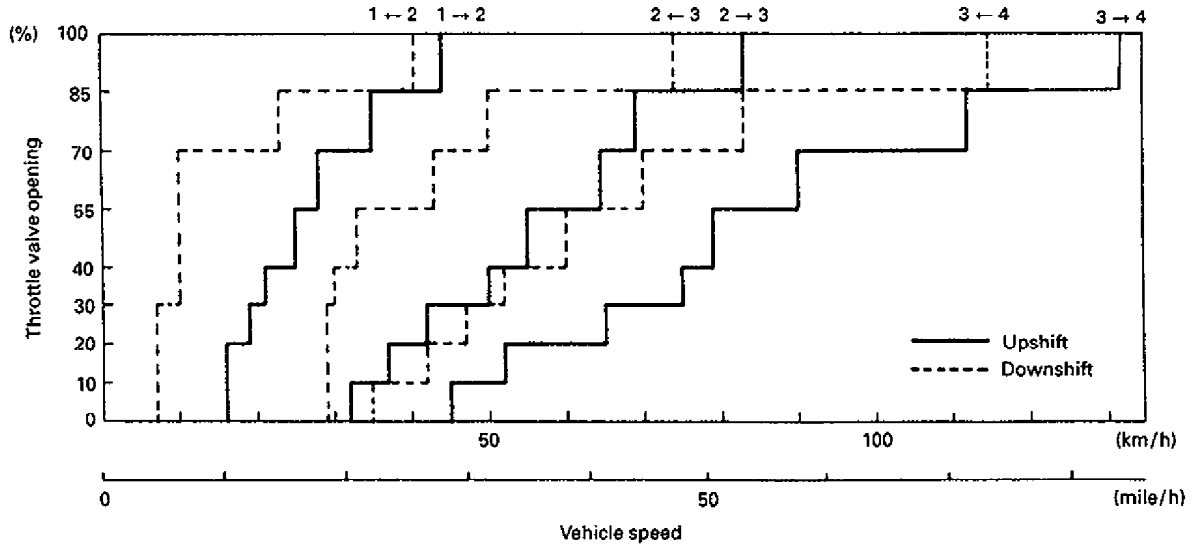
Unit: km/h
(mile/h)

Shift / Throttle opening	1 → 2	2 → 3	3 → 4	4 → 3	3 → 2	2 → 1
Full throttle	44 (28)	83 (52)	130 (81)	115 (72)	74 (46)	39 (23)
Closed throttle	14 (9)	32 (20)	45 (28)	35 (22)	29 (18)	7 (4)

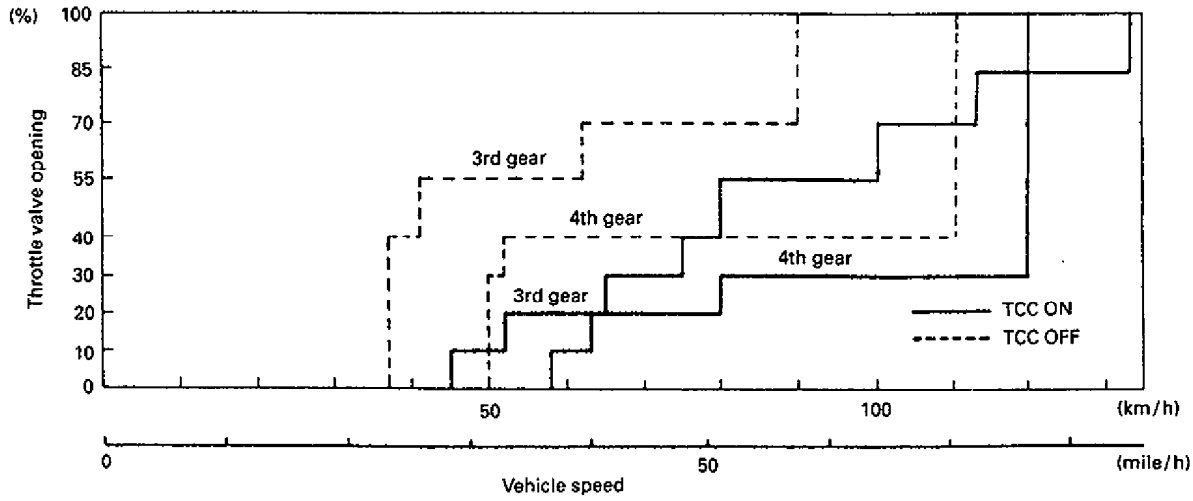
61A10-7B1-3-2

Normal Mode

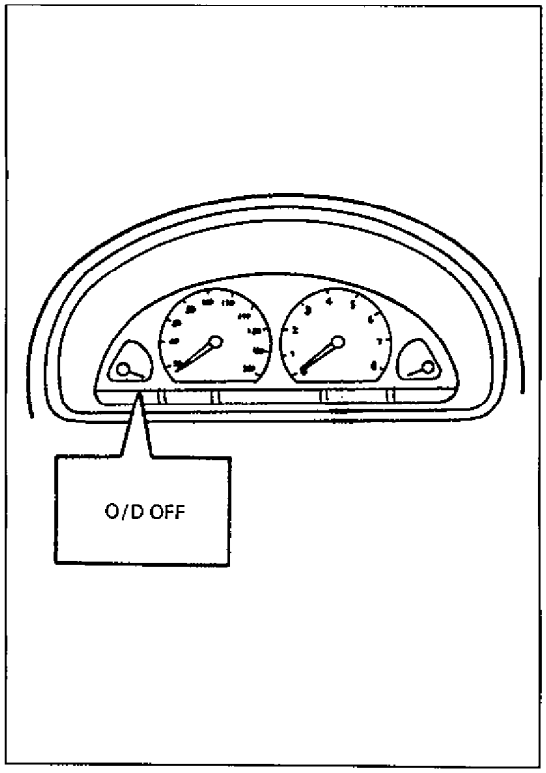
Gear Shift Diagram



TCC Lock-up Diagram



61A10-7B1-4-1



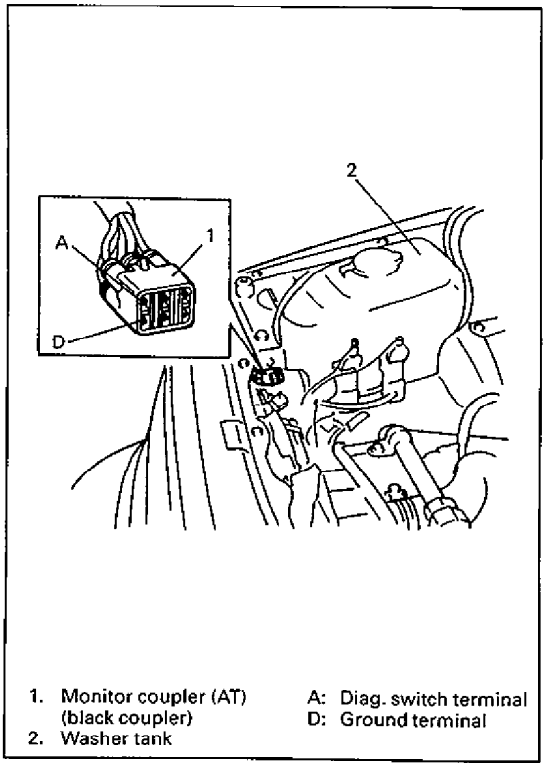
61A10-7B1-5-1

DIAGNOSIS

ELECTRONIC SHIFT CONTROL SYSTEM

ON-BOARD DIAGNOSTIC SYSTEM (SELF-DIAGNOSIS FUNCTION)

- When the engine is OFF and the ignition switch is turned ON, the "O/D OFF" light lights for 4 seconds for its bulb check of "O/D OFF" light. (It remains ON when O/D cut switch is ON.)
- Should an abnormality have occurred in the electronic shift control system while the ignition switch is ON or the engine running, the "O/D OFF" light flashes to warn occurrence of an abnormality to the driver and at the same time the area where the abnormality has occurred is stored in the TCM memory and it remains in the memory even when the ignition switch is turned OFF.



1. Monitor coupler (AT) (black coupler)
2. Washer tank

A: Diag. switch terminal
D: Ground terminal

61A10-7B1-5-3

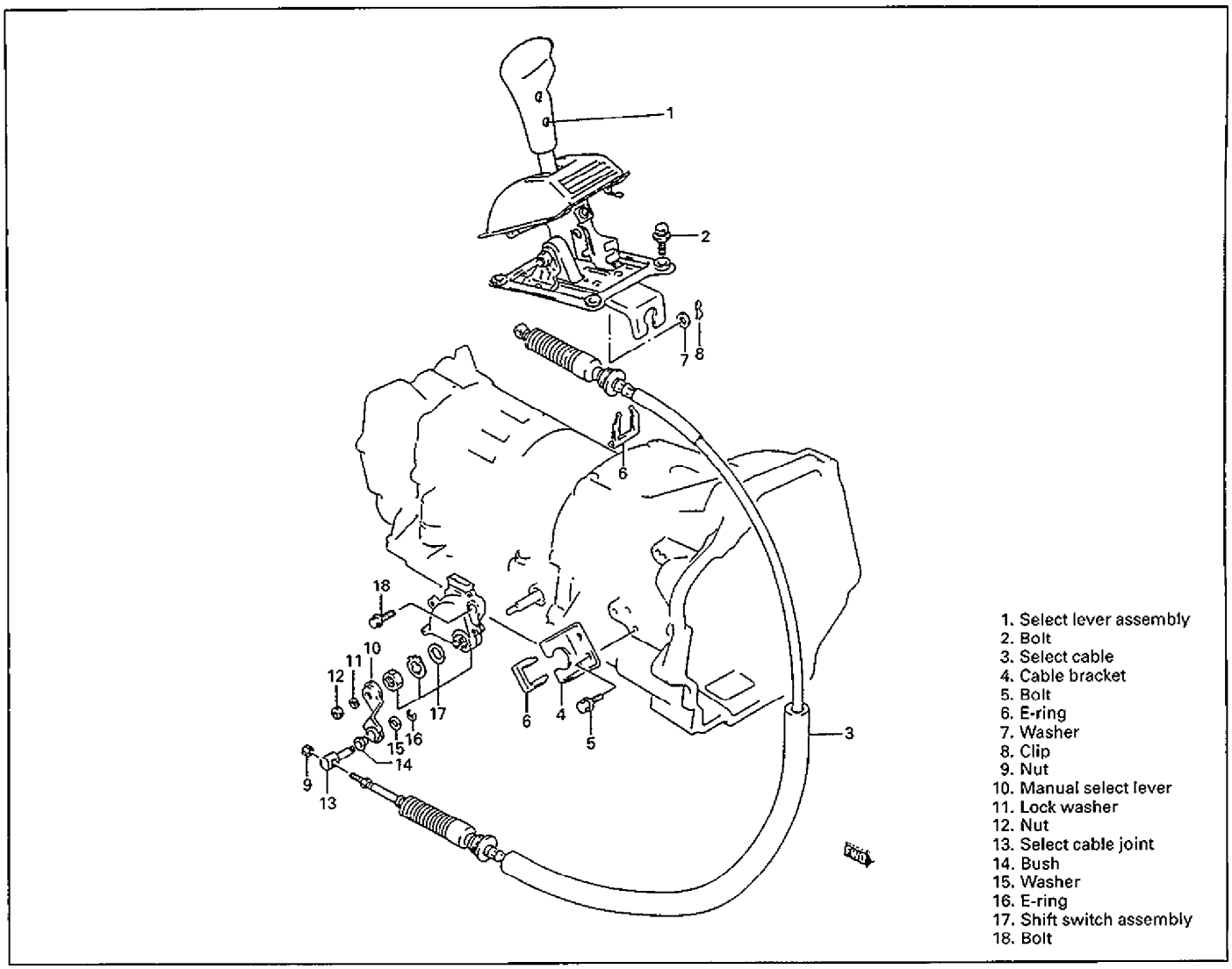
- The affected area in the memory is indicated by flashing of "O/D OFF" light when the diag. switch terminal is grounded.
- Once stored in the TCM, the trouble code will not be erased unless the power to the TCM is turned OFF longer than 10 seconds.

ON VEHICLE SERVICE

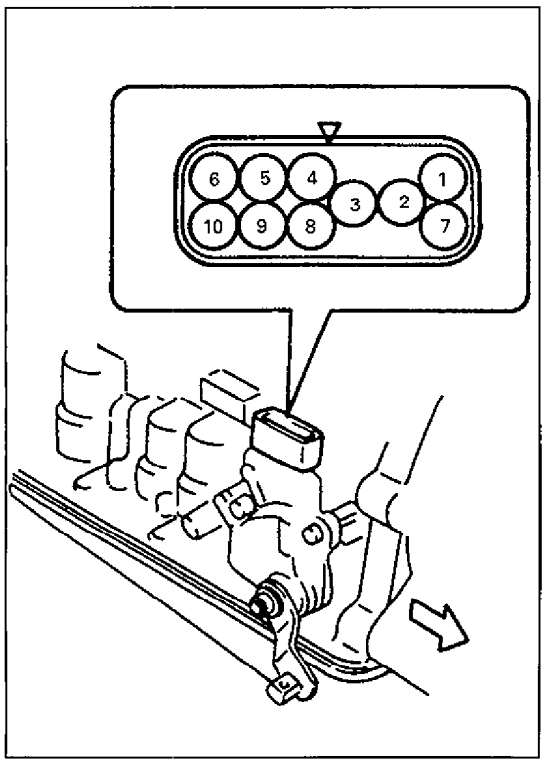
MAINTENANCE SERVICE

Fluid specification
An equivalent of DEXRON®-II, DEXRON®-II E or DEXRON®-III

SELECT CABLE / SHIFT SWITCH



61A10-7B1-6-1



61A10-7B1-6-2

SHIFT SWITCH

INSPECTION & ADJUSTMENT

1) Shift select lever to "N" range.
2) Fix shift switch with groove in shift switch and match mark on shaft aligned.
3) Check that engine starts in "N" and "P" ranges but it doesn't start in "D", "2", "L" or "R" range. Also, check that back-up lamp lights in "R" range.
4) If faulty condition cannot be corrected by adjustment, disconnect shift switch coupler and check that continuity exists as shown below by moving select lever.

Terminal position	2	3	6	7	8	10	9	4	5
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
L			○						○

SECTION 7D

TRANSFER

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

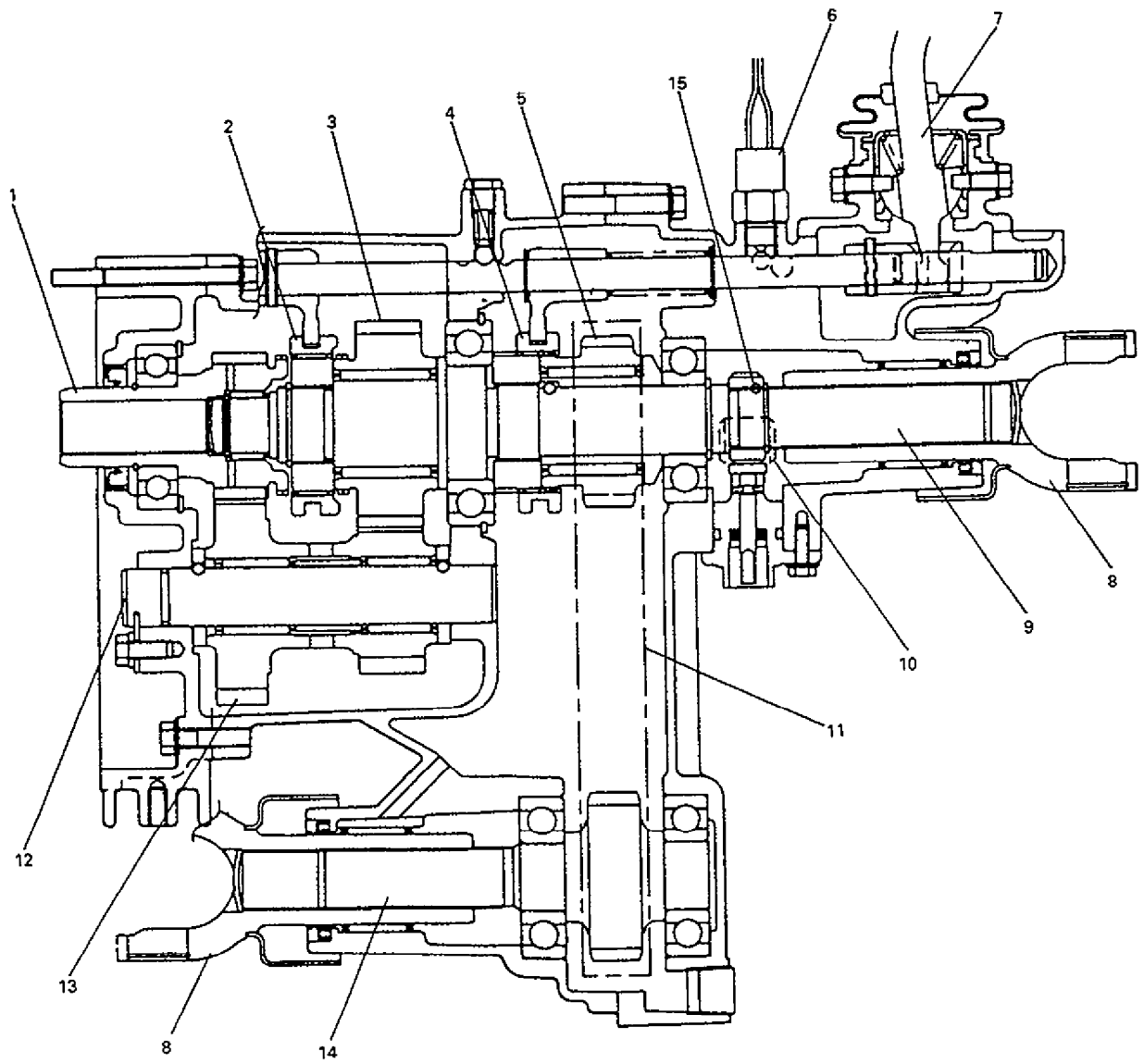
- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNING and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.

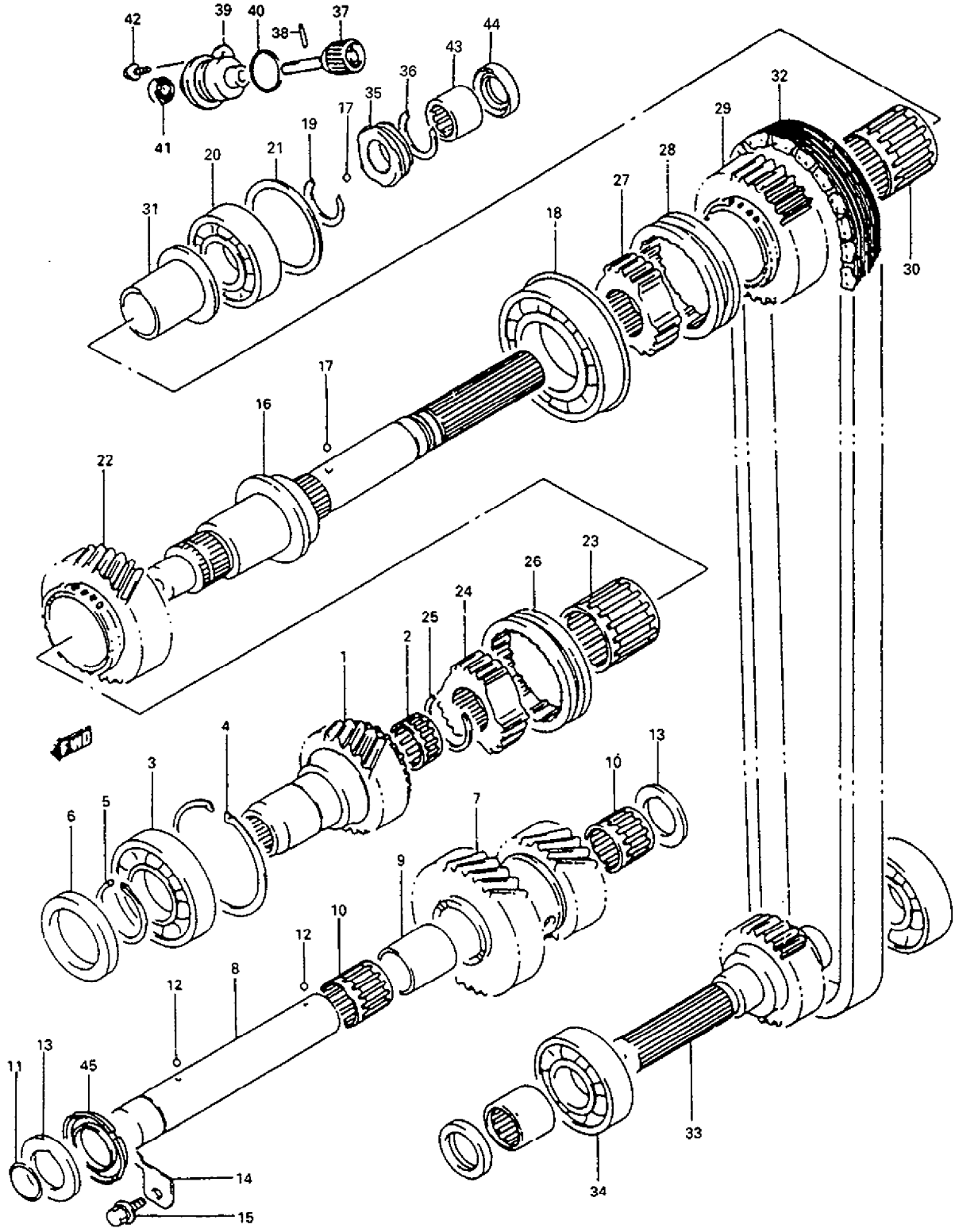
CONTENTS

61A10-7D-1-1

GENERAL DESCRIPTION



1. Transfer input gear
2. Reduction shift sleeve
3. Output low gear
4. Front drive clutch sleeve
5. Drive sprocket
6. 4WD switch
7. Transfer gear shift control lever
8. Sliding yoke
9. Output rear shaft
10. Speedometer driven gear
11. Drive chain
12. Transfer counter shaft
13. Transfer counter gear
14. Output front shaft
15. Ball



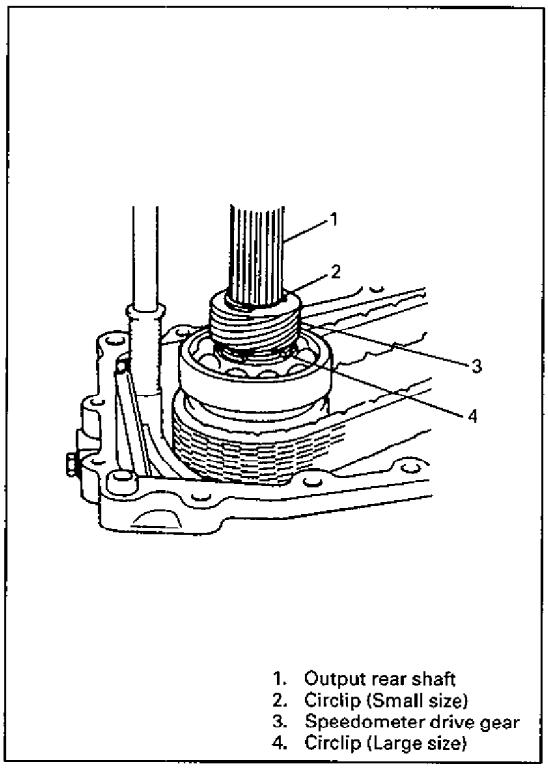
1. Input gear
2. Needle bearing
3. Input gear bearing
4. Input bearing circlip
5. Input gear circlip
6. Oil seal
7. Counter gear
8. Counter shaft
9. Spacer
10. Needle bearing
11. O-ring
12. Ball
13. Washer
14. Plate
15. Bolt
16. Output rear shaft
17. Ball
18. Rear shaft No. 1 bearing
19. Circlip
20. Rear shaft No. 2 bearing
21. Adjusting shim
22. Output low gear
23. Needle bearing
24. Reduction clutch hub
25. Circlip
26. Reduction shift sleeve
27. Front drive clutch hub
28. Front drive clutch sleeve
29. Drive sprocket
30. Needle bearing
31. Sprocket bush
32. Drive chain
33. Output front shaft
34. Bearing
35. Speedometer drive gear
36. Circlip
37. Speedometer driven gear
38. Spring pin
39. Driven gear case
40. O-ring
41. Oil seal
42. Bolt
43. Needle bearing
44. Oil seal
45. Friction ring

UNIT REPAIR OVERHAUL

ASSEMBLING UNIT

For complete assembly procedure, refer to the same section of Service Manual mentioned in FOREWORD of this manual and use steps 1 to 17, 19 to 44 and 46 from there.

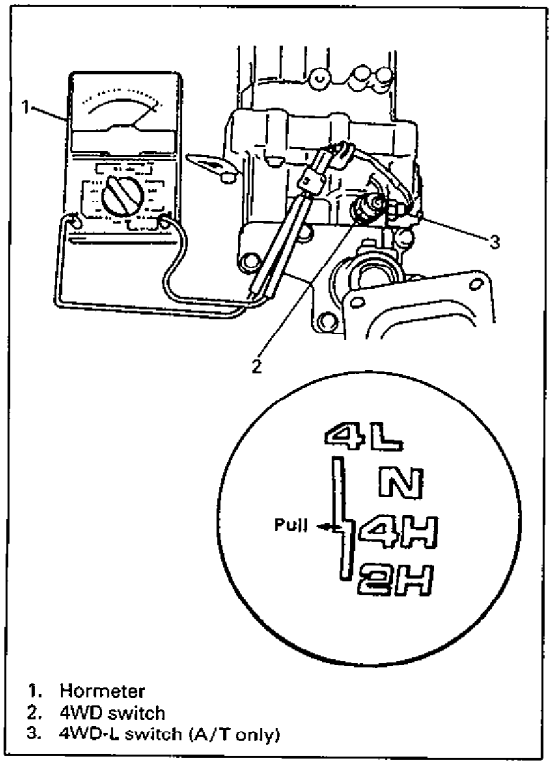
61A10-7D-4-1



1. Output rear shaft
2. Circlip (Small size)
3. Speedometer drive gear
4. Circlip (Large size)

18) After installing large size circlip, install steel ball and speedometer drive gear and secure it with small size circlip.

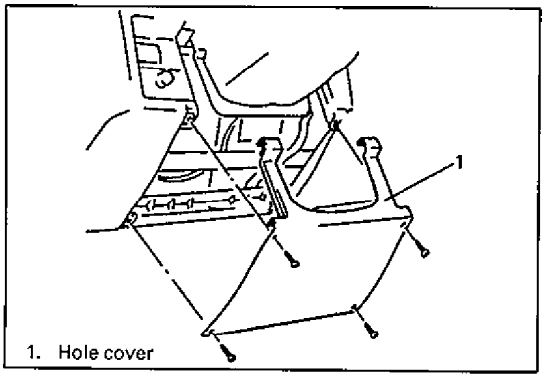
61A10-7D-4-2



1. Hormeter
2. 4WD switch
3. 4WD-L switch (A/T only)

45) 4WD-LOW switch (A/T only)
Make sure that 4WD-LOW switch turns ON at 4L and N position.

61A10-7D-4-4

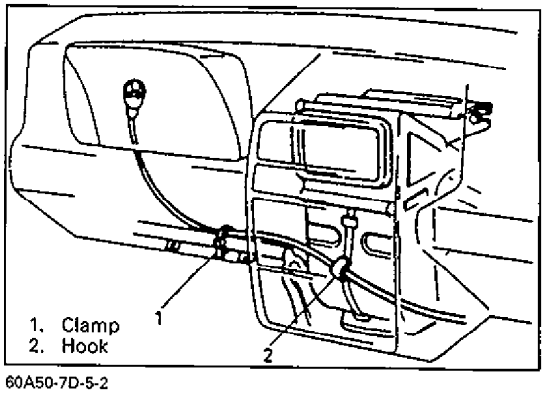


61A10-7D-5-1

SPEEDOMETER CABLE

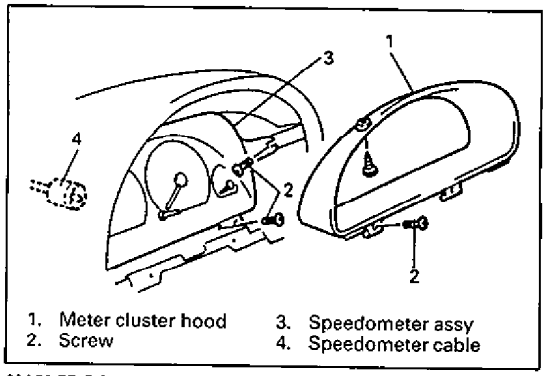
REMOVAL

1) Disconnect negative (–) cable from battery.
2) If equipped with air bag system, disable air bag system. Refer to "Disabling Air Bag System" under "Service Precaution" in Section 9J.
3) Remove steering column hole cover, loosen steering column upper and lower bolts sufficiently but not so much to remove them, then bring down steering column.
4) Remove grommet located on dash panel by forcing it toward engine compartment.



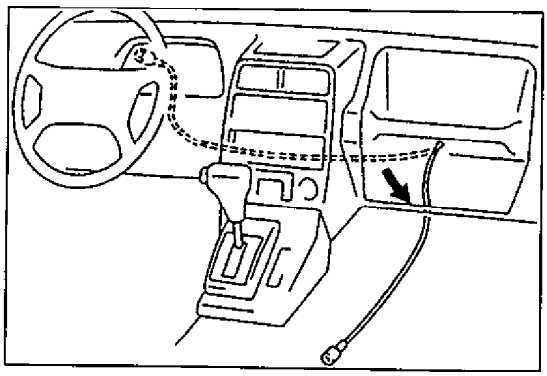
60A50-7D-5-2

5) Detach clamp that fastens speedometer cable.
6) Detach speedometer cable from hook on heater unit.

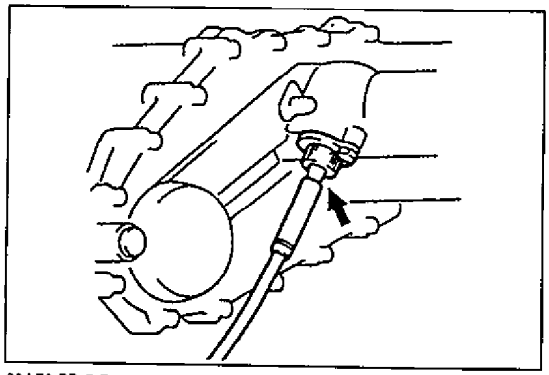


60A50-7D-5-3

7) Remove meter cluster hood by undoing screws.
8) Undo combination meter fixing screws and pull combination meter out.
9) Disconnect speedometer cable from combination meter.


60A50-7D-5-4

10) First pull speedometer cable toward passenger side and then back toward engine compartment to remove it.


60A50-7D-5-5

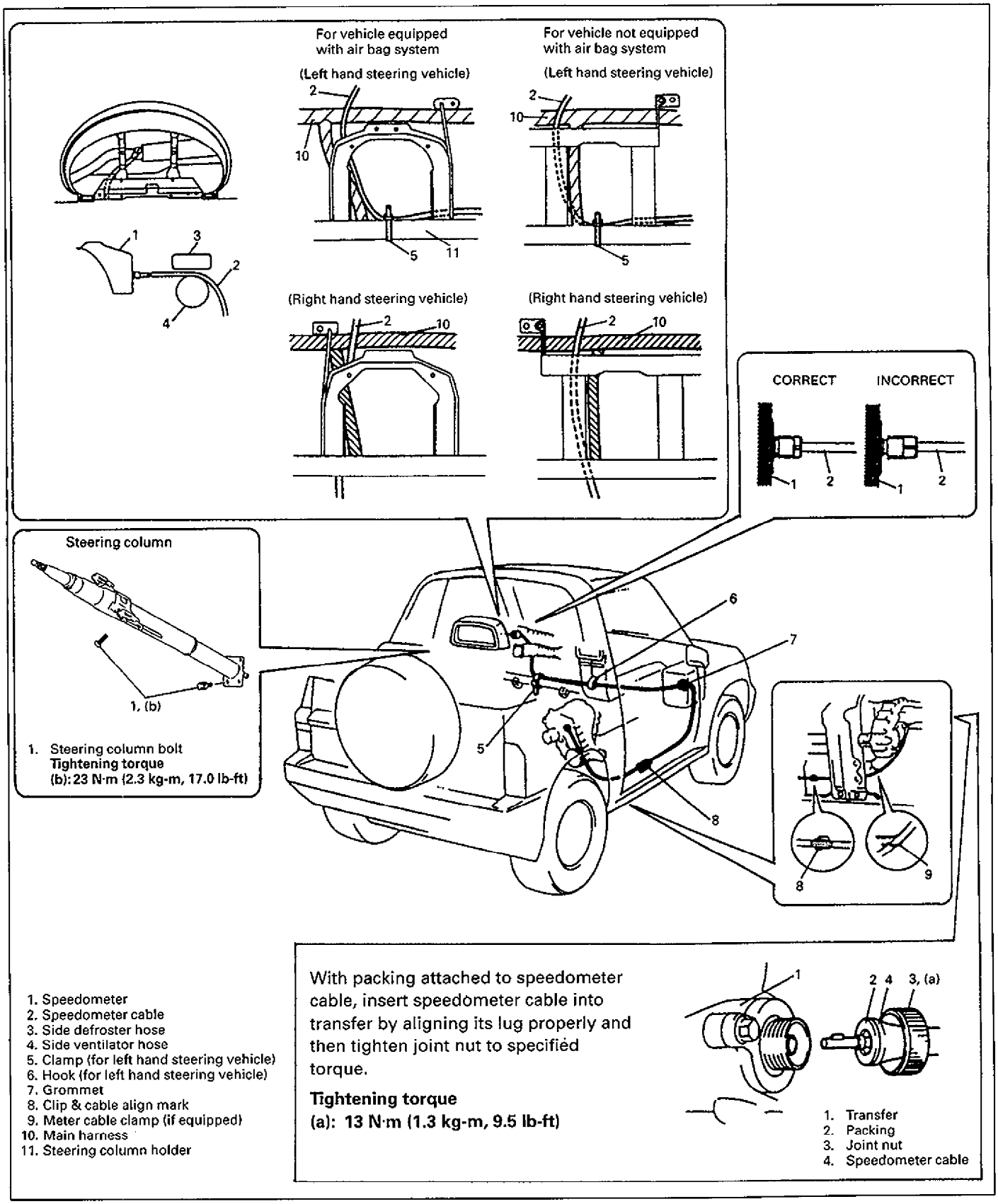
11) Lift up vehicle.
12) Detach speedometer cable from transfer and remove speedometer cable from vehicle.
13) Lower vehicle.

INSTALLATION

Perform the installation procedures in the reverse order of removal. For proper clamp location and cable routing, refer to following illustration.

NOTE:

If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" under "Service Precaution" in section 9J.



SECTION 7E

DIFFERENTIAL (FRONT AND REAR)

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service Manual mentioned in FOREWORD of this manual.

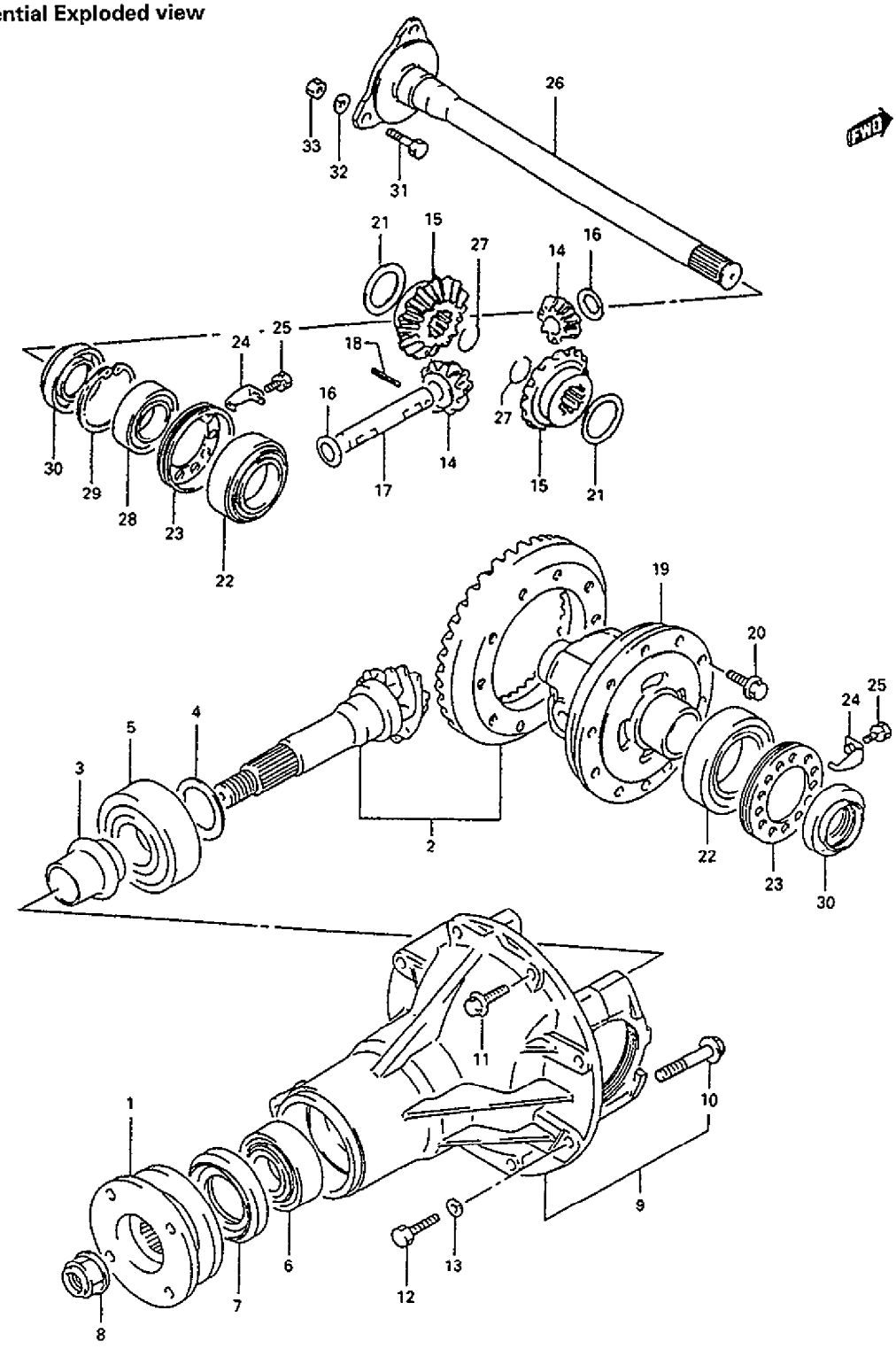
85F00-7E-1-1

CONTENTS

61A10-7E-1-2

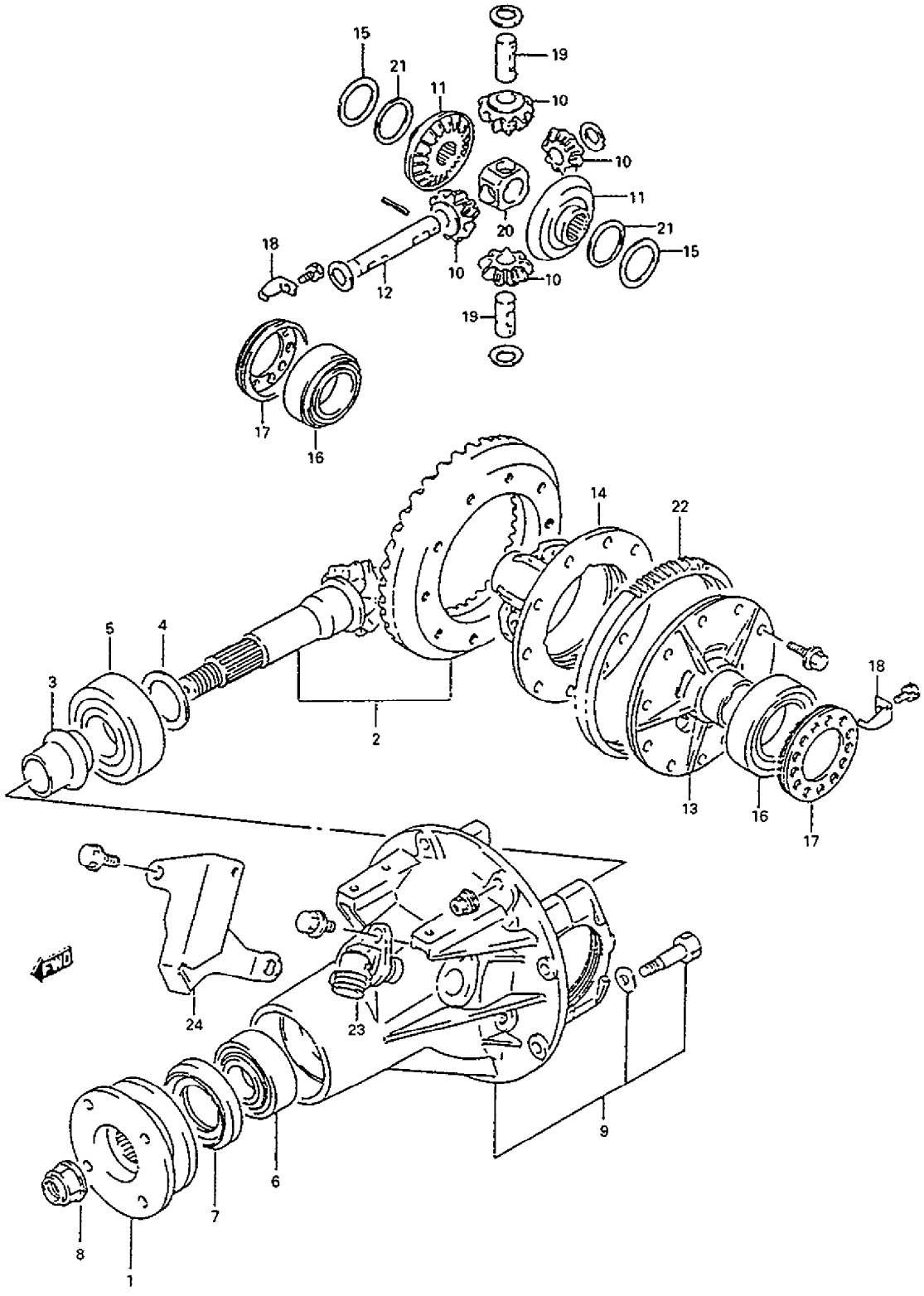
GENERAL DESCRIPTION

Front Differential Exploded view



1. Universal joint flange
2. Bevel pinion gear set
3. Bevel pinion spacer
4. Shim
5. Rear bearing
6. Front bearing
7. Oil seal
8. Flange nut
9. Front diff. carrier ass'y
10. Bolt
11. Bolt
12. Bolt
13. Lock washer
14. Differential pinion
15. Differential gear
16. Washer
17. Pinion shaft
18. Spring pin
19. Differential case
20. Bevel gear bolt
21. Thrust washer
22. Differential side bearing
23. Bearing adjuster
24. Lock plate
25. Bolt
26. Front drive shaft
27. Snap ring
28. Bearing
29. Circlip
30. Oil seal
31. Bolt
32. Lock washer
33. Nut

Rear Differential Exploded view



1. Universal joint flange
2. Bevel pinion gear set
3. Bevel pinion spacer
4. Shim
5. Rear bearing
6. Front bearing
7. Oil seal
8. Flange nut
9. Rear diff. carrier ass'y
10. Differential pinion
11. Differential gear
12. Pinion shaft No.1
13. Differential left case
14. Differential right case
15. Thrust washer
16. Differential side bearing
17. Bearing adjuster
18. Lock plate
19. Pinion shaft No.2
20. Pinion joint
21. Spring washer
22. Exciter ring (if equipped)
23. Rear wheel speed sensor (if equipped)
24. Rear wheel speed sensor cover (if equipped)

ON VEHICLE SERVICE

MAINTENANCE SERVICE

NOTE:

- **When having driven through water, check immediately if water has entered (if so, oil is cloudy). Water mixed oil must be changed at once.**
- **Whenever vehicle is hoisted for any other service work than oil change, also be sure to check for oil leakage and status of breather hoses.**

60A50-7E-4-1

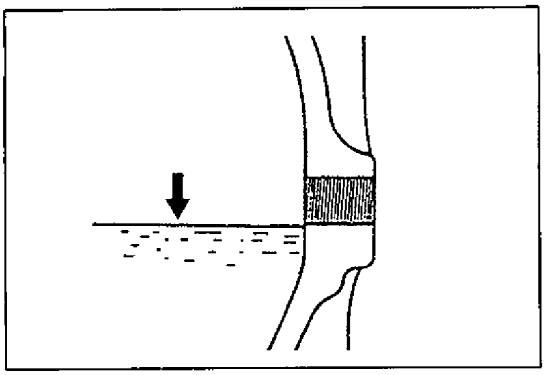
CHANGING OIL

NOTE:

- **Hypoid gear oil must be used for differential.**
- **It is highly recommended to use SAE 80W – 90 viscosity.**

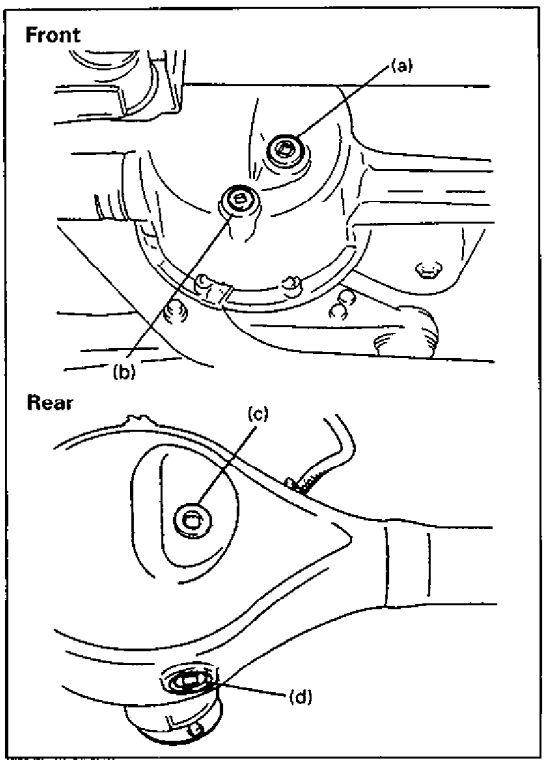
1) Before oil change or inspection, be sure to stop engine and lift up vehicle horizontally.

61A10-7E-4-2



2) Check oil level and existence of leakage. If leakage is found, correct its cause.
3) Drain old oil and pour proper amount of gear oil as specified below (roughly up to level hole).

60A50-7E-4-3

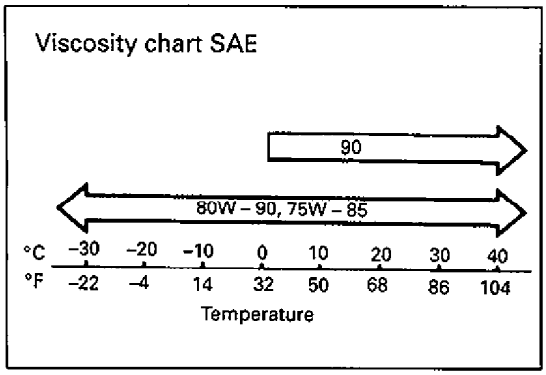


61A10-7E-4-5

4) Apply sealant to thread of drain and level/filler plugs and torque plugs to specification.

Sealant 99000-31110

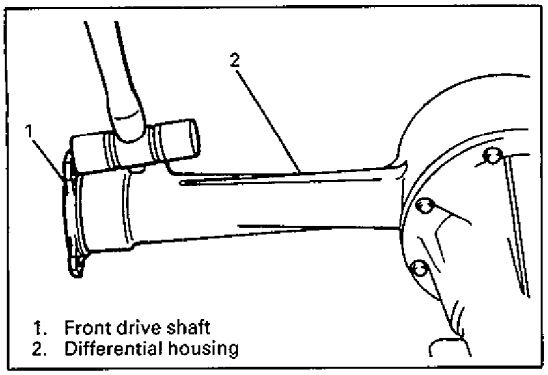
Tightening Torque
(a): 40 N·m (4.0 kg-m, 29.0 lb-ft)
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(c): 43 N·m (4.3 kg-m, 31.5 lb-ft)
(d): 22 N·m (2.2 kg-m, 16.0 lb-ft)



61A10-7E-5-1

Specified gear oil: **Hypoid gear oil API GL-5**
SAE 75W – 85, 90 or 80W – 90
For oil viscosity, refer to left chart.

Oil capacity: **Front**
1.0 liters (2.1 / 1.8 US / Imp. pt)
Rear
2.2 liters (4.6 / 3.9 US / Imp. pt)



1. Front drive shaft
2. Differential housing

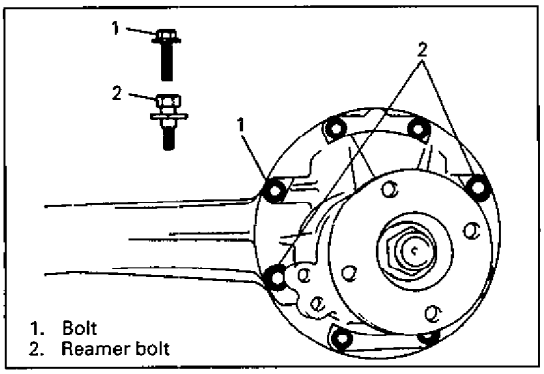
61A10-7E-6-1

UNIT REPAIR OVERHAUL

FRONT DIFFERENTIAL

DISASSEMBLY

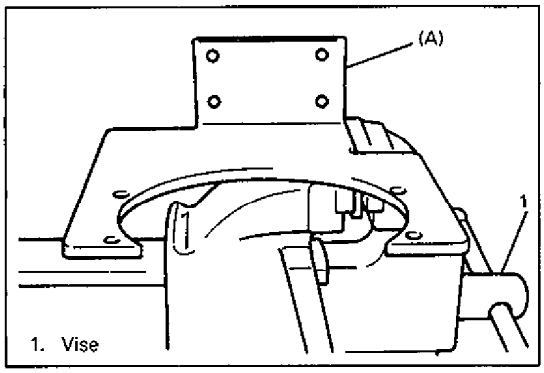
1) Remove front drive shaft by using plastic hammer.



1. Bolt
2. Reamer bolt

60A50-7E-9-2

2) Remove 8 bolts for fastening differential carrier (2 of which are reamer bolts) and then take differential assembly out of housing.

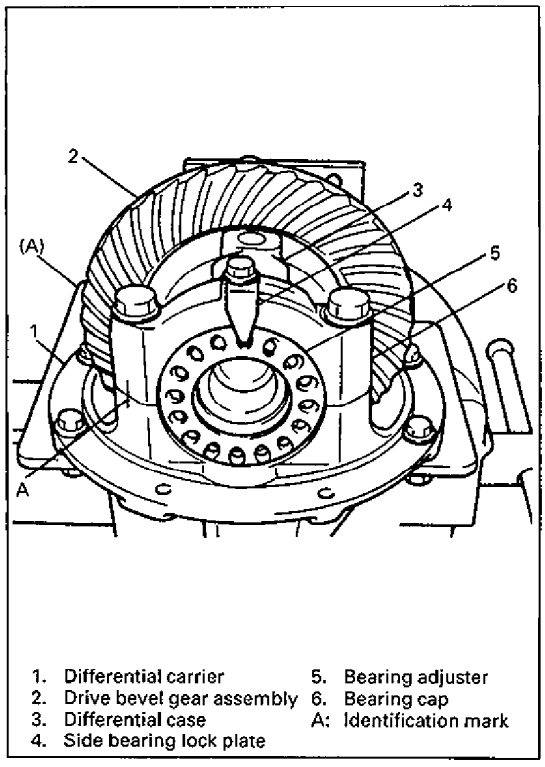


1. Vise

60A50-7E-9-3

3) Set special tool on vise securely.

Special Tool
(A): 09944-76010

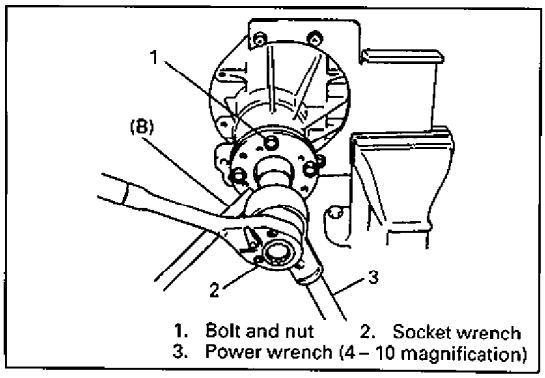


1. Differential carrier
2. Drive bevel gear assembly
3. Differential case
4. Side bearing lock plate
5. Bearing adjuster
6. Bearing cap
A: Identification mark

61A10-7E-6-4

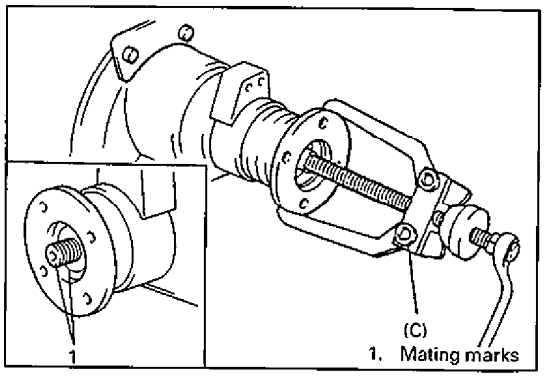
4) Using 4 bolt & nut sets, set differential assembly onto differential carrier holder.
5) Put identification marks on differential side bearing caps.
6) Take off differential side bearing lock plates and differential side bearing caps removing their bolts and then take out bearing adjusters, side bearing outer races and drive bevel gear with differential case.

Special Tool
(A): 09944-76010



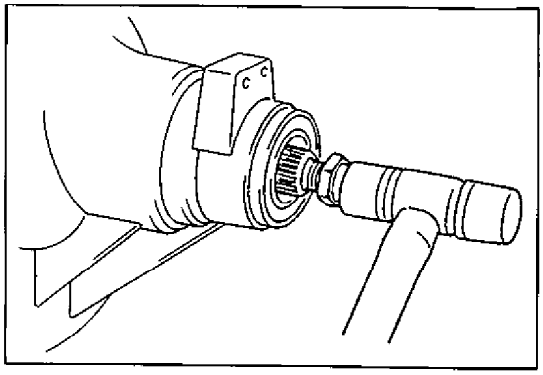
1. Bolt and nut 2. Socket wrench
3. Power wrench (4 – 10 magnification)

61A10-7E-7-1

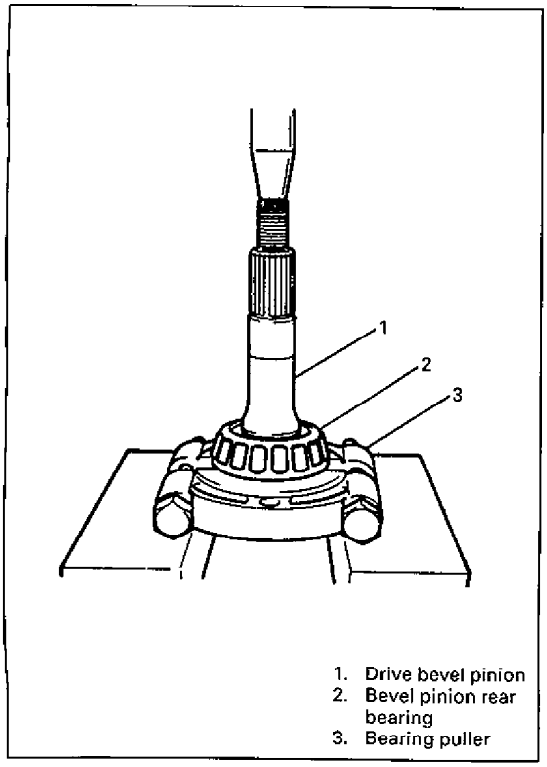


1. Mating marks

61A10-7E-7-2



61A10-7E-7-3



1. Drive bevel pinion
2. Bevel pinion rear bearing
3. Bearing puller

61A10-7E-7-4

7) Turn differential assembly together with special tool (A) by 90 degrees and grip it with vise again.

Special Tool
(A): 09944-76010

8) Hold universal joint flange with special tool and then remove flange nut by using power wrench.

Special Tool
(B): 09922-66020

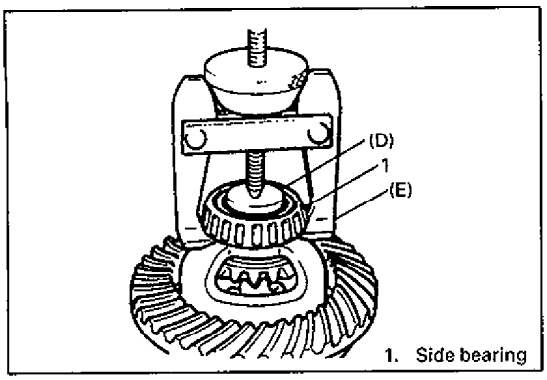
9) Make mating marks on drive bevel pinion and companion flange.

CAUTION:
Don't make mating mark on the coupling surface of the flange.

10) Remove companion flange from pinion. Use special tool if it is hard to remove.
Special Tool
(C): 09913-65135

11) Remove bevel pinion with rear bearing, and spacer from carrier.
If it is hard to remove, screw an used nut into pinion and hammer on that nut with a plastic hammer but never directly on pinion.

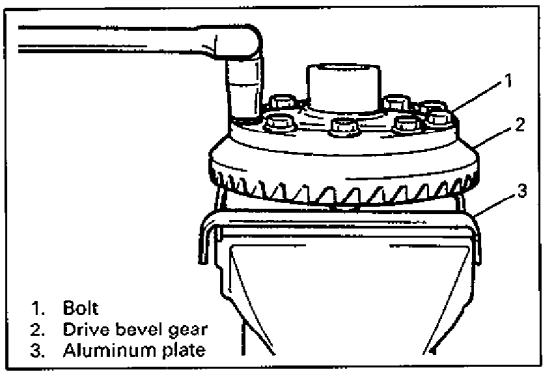
12) Remove bevel pinion rear bearing by using bearing puller and press.



61A10-7E-8-1

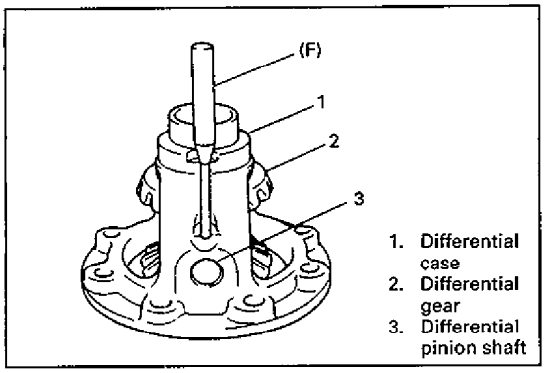
13) Using special tools, pull out differential side bearings.

Special Tool
(D): 09913-85230
(E): 09913-61510



61A10-7E-8-2

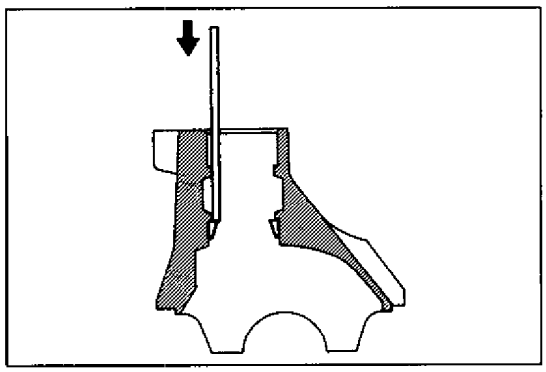
14) With aluminum plates placed on vise first, grip differential case with it and remove bevel gear by removing its 10 bolts.



61A10-7E-8-3

15) Drive out spring pin with special tool and hammer and disassemble differential side gears, pinions, washers and shaft in differential case.

Special Tool
(F): 09922-85811

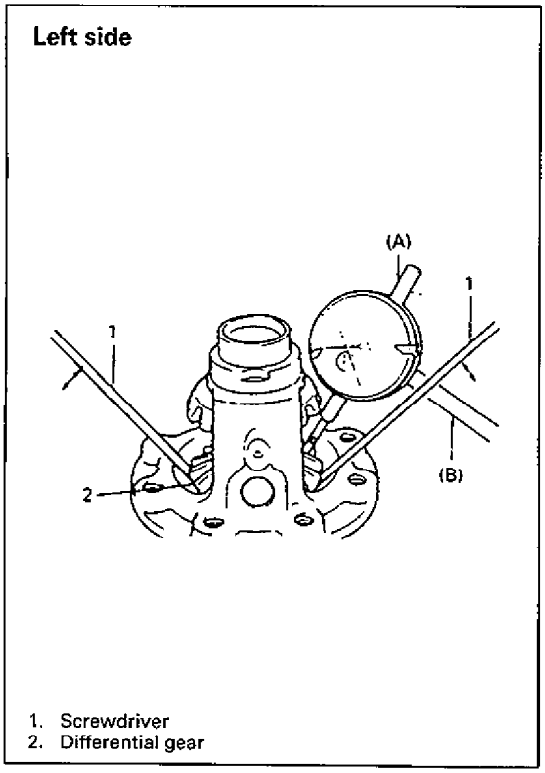


61A10-7E-8-4

16) Drive out bevel pinion bearing outer races in differential carrier by hammering metal stick applied to them.

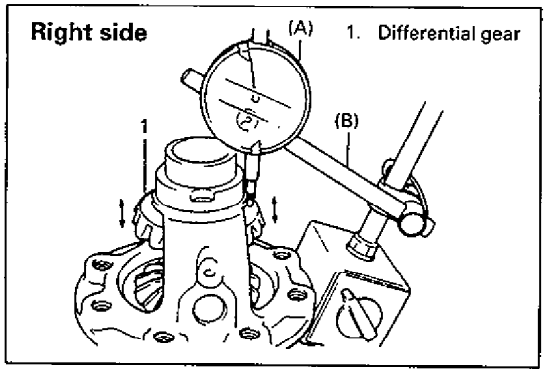
INSPECTION

- Check companion flange for wear or damage.
- Check bearings for wear or discoloration.
- Check differential carrier for cracks.
- Check drive bevel pinion and bevel gear for wear or cracks.
- Check side gears, pinion gears and pinion shaft for wear or damage.
- Check side gear spline for wear or damage.



1. Screwdriver
2. Differential gear

61A10-7E-9-1



60A50-7E-13-3

ADJUSTMENT AND REASSEMBLY

DIFFERENTIAL CASE

Judging from abnormality noted before disassembly and what is found through visual check of component parts after disassembly, prepare replacing parts and proceed to reassembly. Make sure that all parts are clean.

1) Assemble differential gear and measure thrust play of differential gear as follows.

Special Tool
(A): 09900-20606
(B): 09900-20701

Diff. gear thrust play: 0.12 – 0.37 mm (0.005 – 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.

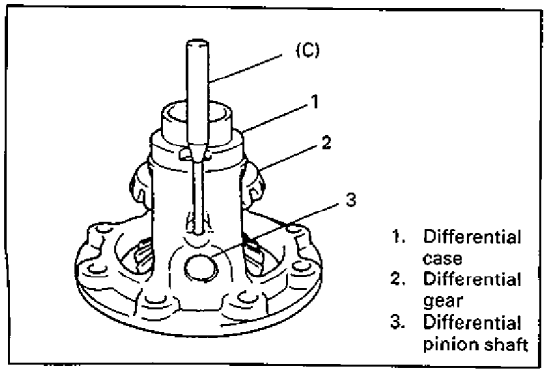
Right side

- Using similar procedure to the above, set dial gauge tip to gear shoulder.
- Move gear up and down by hand and read dial gauge.

2) 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.)

60A50-7E-13-4

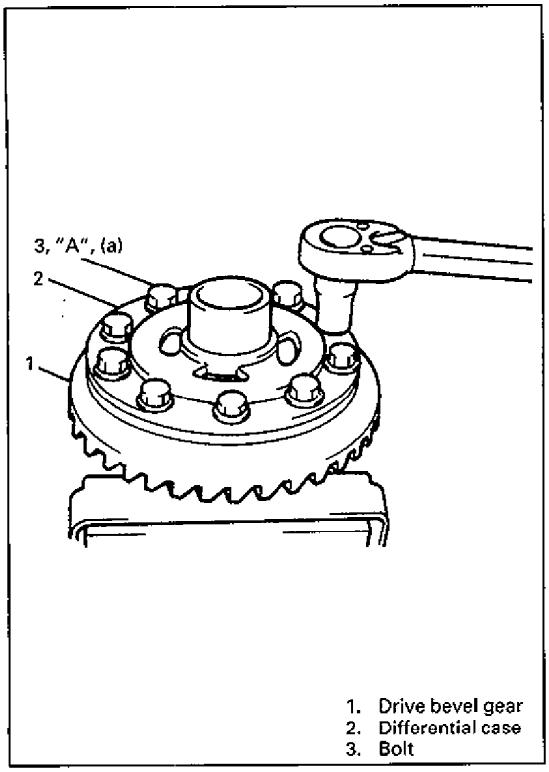


1. Differential case
2. Differential gear
3. Differential pinion shaft

61A10-7E-9-5

3) Drive in spring pin for differential side pinion shaft till it is flush with differential case suface.

Special Tool
(C): 09922-85811



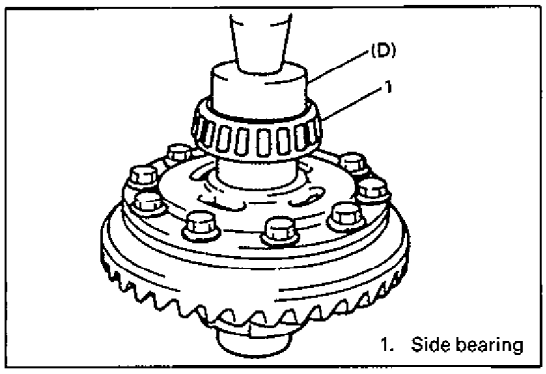
60A50-7E-14-1

4) Put bevel gear on differential case and fasten them with 10 bolts by tightening them to specified torque.
Use thread lock cement for 10 bolts.

CAUTION:
Use of any other bolts than that specified is prohibited.

"A": Thread lock cement 99000-32020

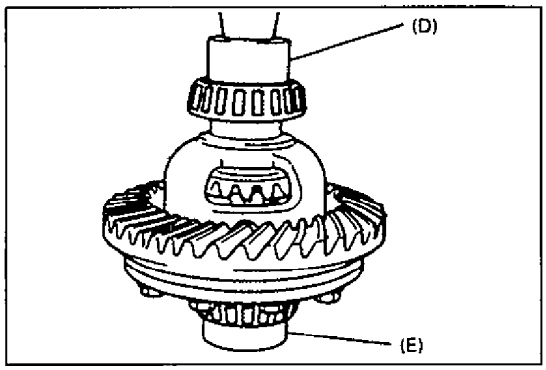
Tightening Torque
(a): 85 N·m (8.5 kg-m, 61.5 lb-ft)



61A10-7E-10-3

5) Press-fit side bearing with special tool and press.

Special Tool
(D): 09944-66020



61A10-7E-10-4

6) Hold bearing press-fitted in step 5) with holder and press-fit side bearing on the other side.

NOTE:
Be sure to use bearing holder for the purpose of protecting lower bearing.

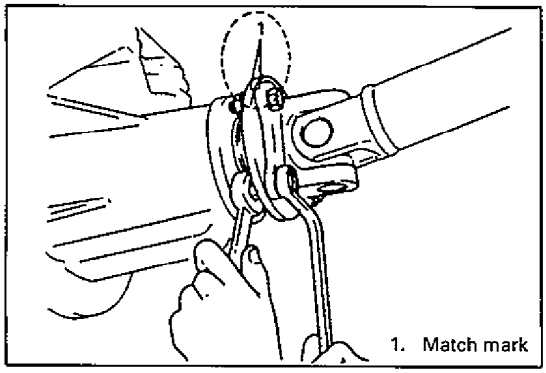
Special Tool
(D): 09944-66020
(E): 09951-16060

REAR DIFFERENTIAL

DISMOUNTING

1) Lift up vehicle and drain oil from rear differential housing.
2) Remove rear brake drums and pull out right and left rear axle shafts. (Refer to REAR AXLE SHAFT REMOVAL of Section 3E.)

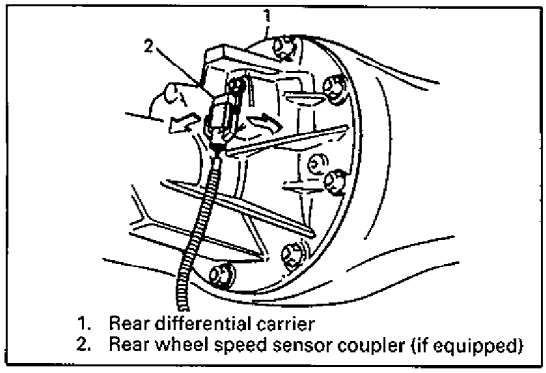
61A10-7E-11-1



1. Match mark

3) Before removing propeller shaft, give match marks on joint flange and propeller shaft as shown.
4) Remove propeller shaft by removing its 4 flange bolts and nuts.

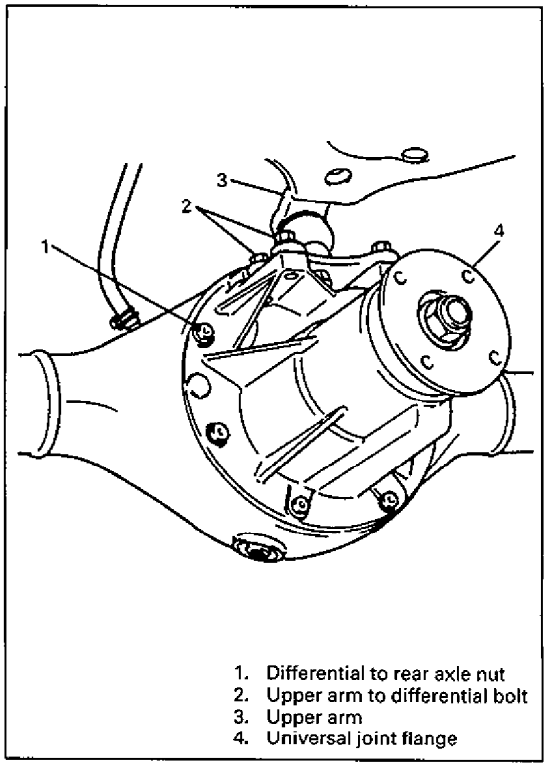
61A10-7E-11-2



1. Rear differential carrier
2. Rear wheel speed sensor coupler (if equipped)

5) If equipped with rear wheel speed sensor, remove rear wheel speed sensor cover from rear differential carrier and disconnect sensor coupler.

61A10-7E-11-3



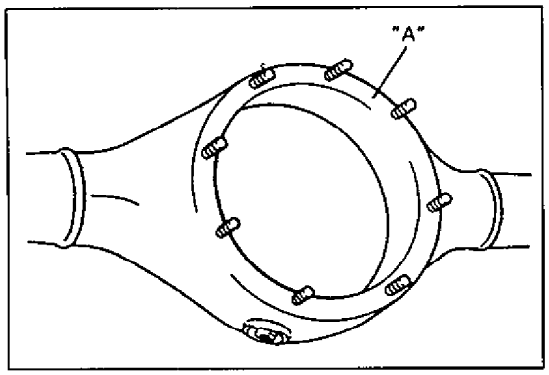
1. Differential to rear axle nut
2. Upper arm to differential bolt
3. Upper arm
4. Universal joint flange

6) Remove 4 upper arm mounting bolts and lower rear axle.

WARNING:
This work must be carried out with rear shock absorbers installed as they are. Without them, axle may fall off and possibly cause personal injury.

7) Remove differential assembly by removing its 8 fastening nuts.

61A10-7E-11-4

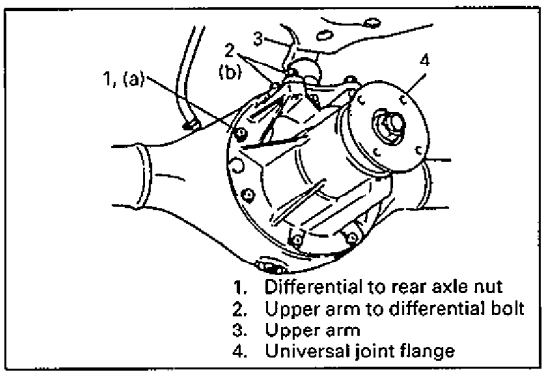


61A10-7E-12-1

REMOUNTING

1) Clean mating surfaces of rear axle and differential assembly and apply sealant (Suzuki bond 1215) to axle side evenly.

"A": Sealant 99000-31110



1. Differential to rear axle nut
2. Upper arm to differential bolt
3. Upper arm
4. Universal joint flange

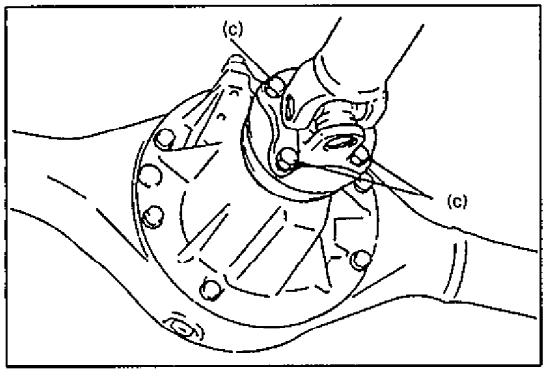
61A10-7E-12-2

2) Install differential assembly to axle and fix it with nuts tightened to specified torque.

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

3) Join differential carrier with upper arm and fasten by bolts.

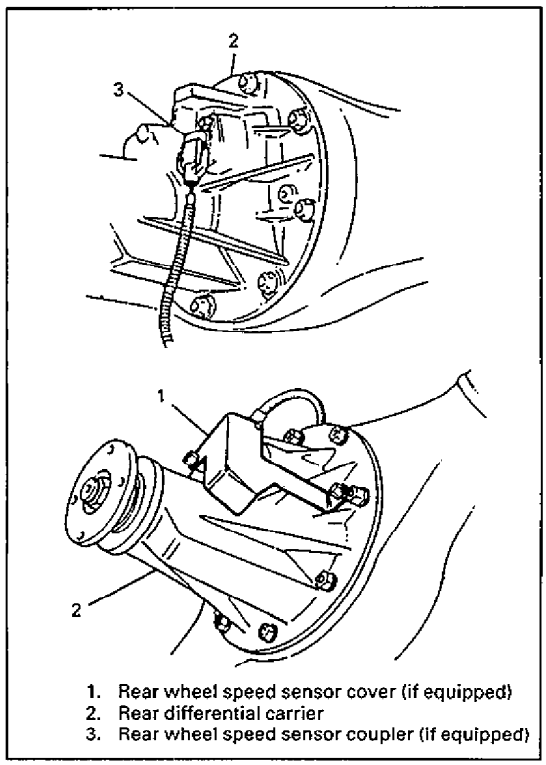
Tightening Torque
(b): 50 N·m (5.0 kg-m, 36.5 lb-ft)



61A10-7E-12-3

4) Install propeller shaft to joint flange aligning match marks and torque flange bolts to specification.

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



1. Rear wheel speed sensor cover (if equipped)
2. Rear differential carrier
3. Rear wheel speed sensor coupler (if equipped)

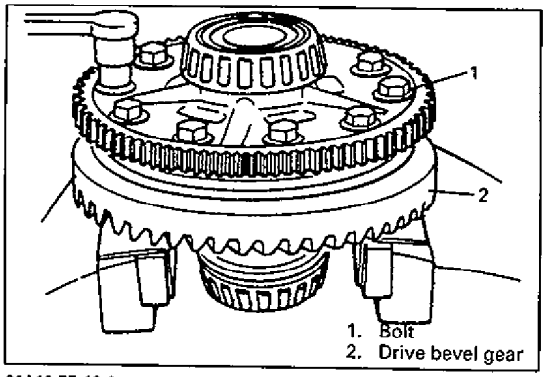
61A10-7E-12-4

5) If equipped with rear wheel speed sensor, connect rear wheel speed sensor coupler and install sensor cover to rear differential carrier.
6) Install right and left rear axle shafts and brake drums. (Refer to REAR AXLE INSTALLATION of Section 3E and REAR BRAKE DRUM INSTALLATION of Section 5.)
7) Install wheels.
8) Fill hypoid gear oil as specified and tighten plug to specification. Lower lift.

DISASSEMBLY

NOTE:
For vehicle equipped with ABS, perform the following steps. For vehicle not equipped with ABS, refer to Service manual mentioned in FOREWORD of this manual.

61A10-7E-13-1

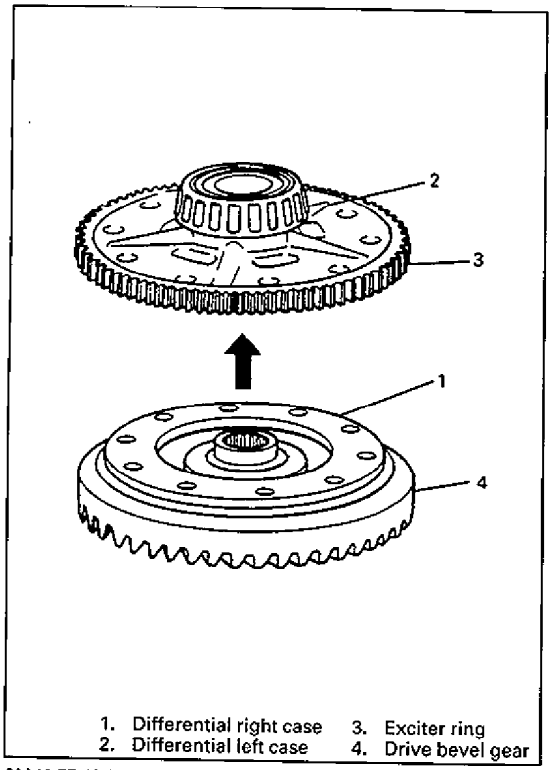


1. Bolt
2. Drive bevel gear

61A10-7E-13-2

For complete disassembly procedure, refer to front differential disassembly in this section and use steps 1) to 13).

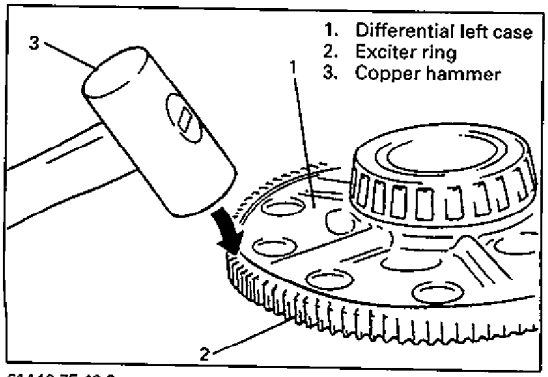
14) With aluminum plates placed on vise first, grip differential case with it and remove bevel gear bolt.



1. Differential right case
2. Differential left case
3. Exciter ring
4. Drive bevel gear

61A10-7E-13-3

15) Remove differential left case with exciter ring from differential right case.

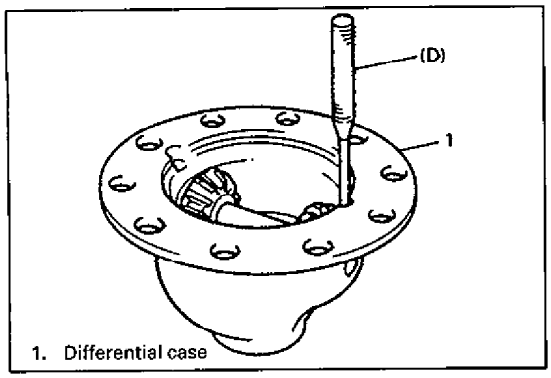


1. Differential left case
2. Exciter ring
3. Copper hammer

61A10-7E-13-5

16) Remove exciter ring from differential left case by using copper hammer.

CAUTION:
Tap all along the exciter ring rim evenly with copper hammer.

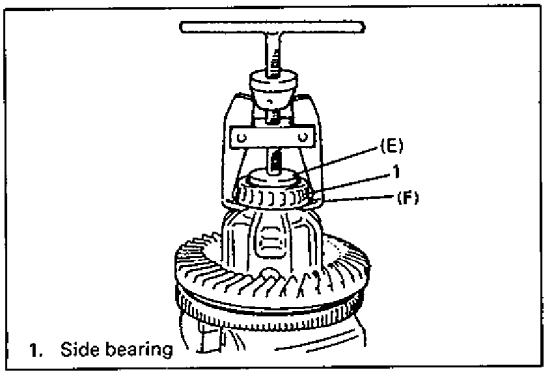


1. Differential case

61A10-7E-14-1

17) Drive out spring pin with special tool (D) and hammer and disassemble differential side gears, pinions, washers and shaft in differential case.

Special Tool
(D): 09922-85811



1. Side bearing

61A10-7E-14-2

18) Remove side bearings
Using special tools (E) & (F), pull out differential side bearings.

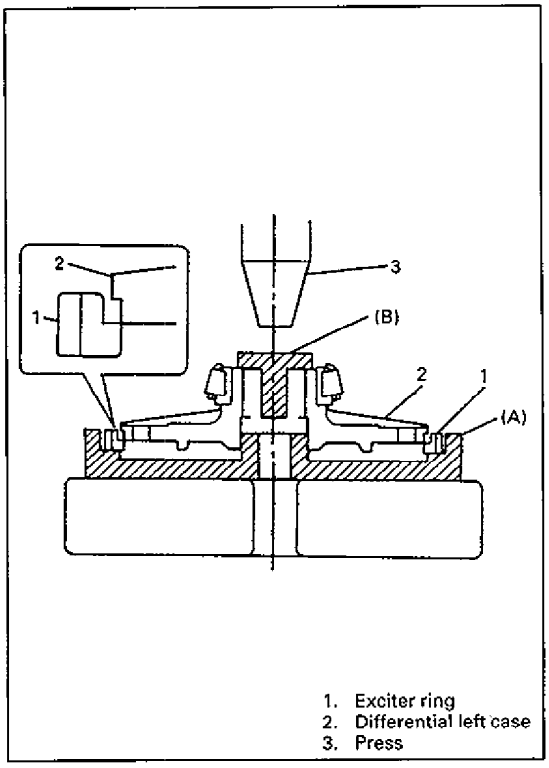
Special Tool
(E): 09913-85230
(F): 09913-61510

ADJUSTMENT AND REASSEMBLY

DIFFERENTIAL EXCITER RING

1) Place special tools (A) & (B), exciter ring and differential left case on press as shown.

Special Tool
(A): 09928-26010
(B): 09913-85230

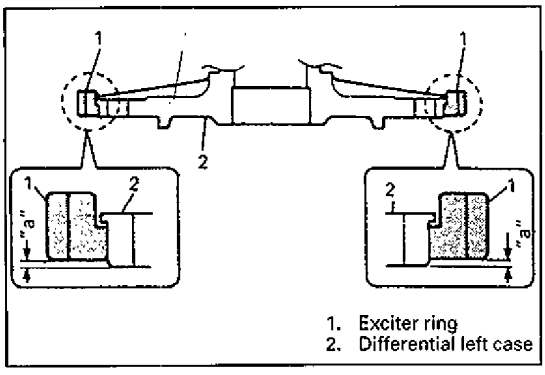


1. Exciter ring
2. Differential left case
3. Press

61A10-7E-14-3

2) Press-fit differential left case into exciter ring.

CAUTION:
- **Pressure applied here should be lower than 500 kg (1102 lbs).**
- **Press-fit all around differential left case evenly without tilt.**
- **If more than 500 kg (1102 lbs) pressure is needed for press-fitting, it is possibly because left case is tilted. In such case, try press-fitting while correcting such tilt.**



1. Exciter ring
2. Differential left case

61A10-7E-14-5

3) Check that end face of differential left case is flush with or higher than end face of exciter ring all the way around as indicated by "a" in figure.

TIGHTENING TORQUE SPECIFICATIONS

Fastening portion (*: Applicable for front and rear)		Tightening torque		
		N·m	kg-m	lb-ft
Front diff. oil filler/level plug		40	4.0	29.0
Rear diff. oil filler/level plug		43	4.3	31.0
Front diff. oil drain plug		23	2.3	17.0
Rear diff. oil drain plug		22	2.2	16.0
Differential mounting front bolts		85	8.5	61.5
Differential mounting bracket bolts		50	5.0	36.5
Differential rear mounting bolts/nuts		50	5.0	36.5
Front drive shaft flange bolts		55	5.5	40.0
*Propeller shaft flange bolts		55	5.5	40.0
*Bevel gear bolts		85	8.5	61.5
*Bearing cap bolts	Front	60	6.0	43.5
	Rear	85	8.5	61.5
*Lock plate bolts		12	1.2	9.0
Front differential carrier bolts		23	2.3	17.0
Rear differential carrier nuts		55	5.5	40.0
Upper arm bolts		50	5.0	36.5

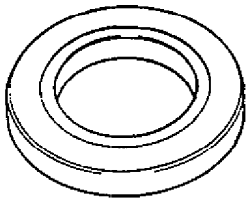
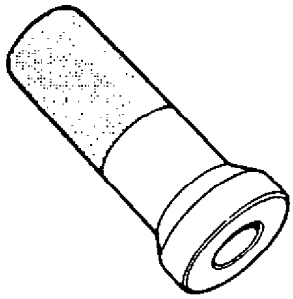
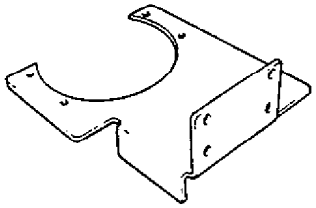
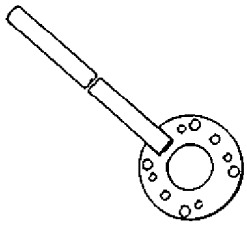
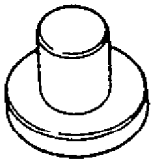
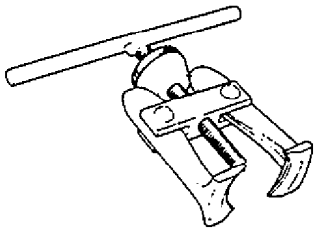
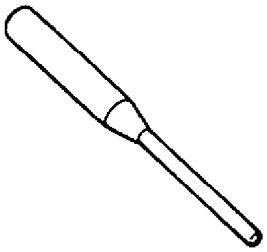
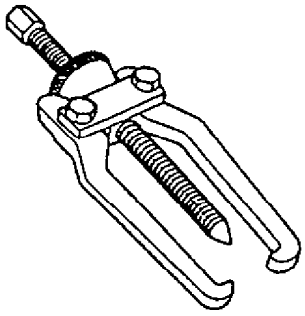
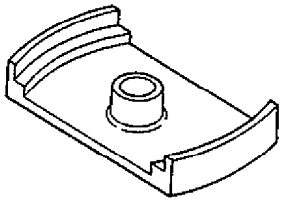
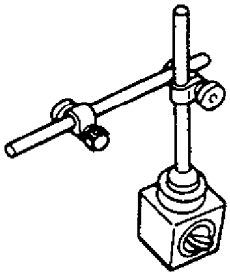
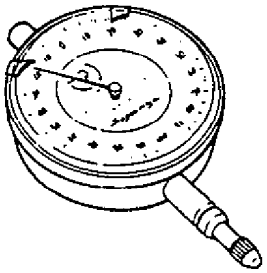
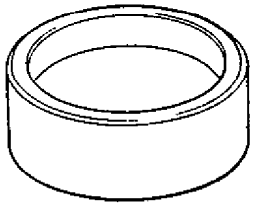
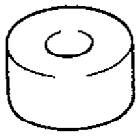
61A10-7E-15-1

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Thread lock cement	THREAD LOCK CEMENT SUPER 1333B (99000-32020)	Bevel gear bolts
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	Oil seal lips
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	• Front differential drain and filler plug • Mating surface of differential housing

60A50-7E-24-2

SPECIAL TOOLS

 09951-26010 Bush remover plate	 09951-16080 Bearing installer	 09944-76010 Differential carrier holder	 09922-66020 Flange holder
 09913-85230 Bearing removing jig	 09913-61510 Bearing puller	 09922-85811 Spring pin remover	 09913-65135 Bearing puller
 09928-26010 Rear differential exciter ring installer	 09900-20701 Magnetic stand	 09900-20606 Dial gauge	 09944-66020 Bearing installer
 09951-16060 Lower arm bush remover			

SECTION 8

BODY ELECTRICAL SYSTEM

WARNING:
For vehicles equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery. Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).**

NOTE:
When the text says "If equipped", the subject vehicle may or may not be equipped with that system depending on models or statutory regulations.

61A10-8-1-1

CONTENTS

8

61A10-8-1-2

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 grounded polarity.

WIRING

All body low voltage wires are insulated. The insulation is color coded for identification of individual body circuit.

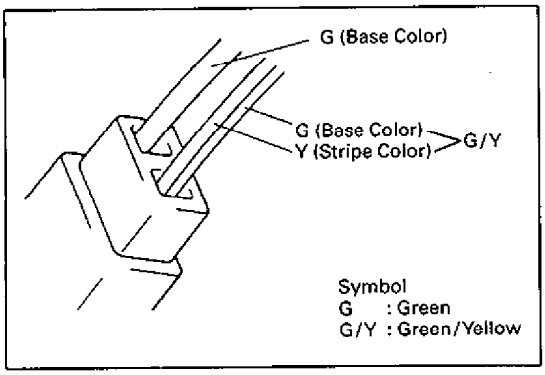
50G00-8-2-1

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

WIRE COLOR SYMBOLS

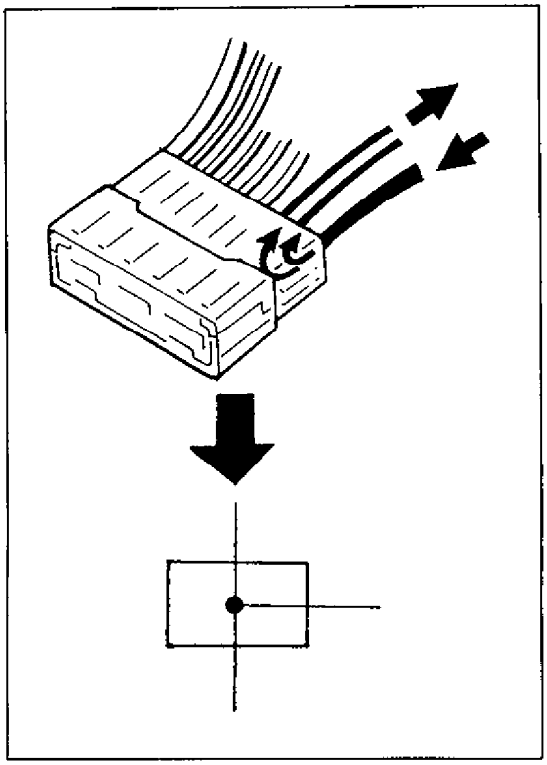
The initial alphabet(s) of the color name is used to represent each color as listed at the left.

61A10-8-2-2



There are two types of wire color: one-color type and 2-color type (with a stripe). In case of 2-color type, the first alphabet ("G" of the example in the figure at the left) represents the basic color (color of wire insulation) and the next alphabet ("Y" of the example) represents the color of stripe.

61A10-8-2-3



JOINT CONNECTOR (J/C)

- Wiring of this vehicle employs joint connectors (J/C) which divide one wire into several different wires or combine several different wires into one wire.
- The joint connector is illustrated left.

61A10-8-2-4

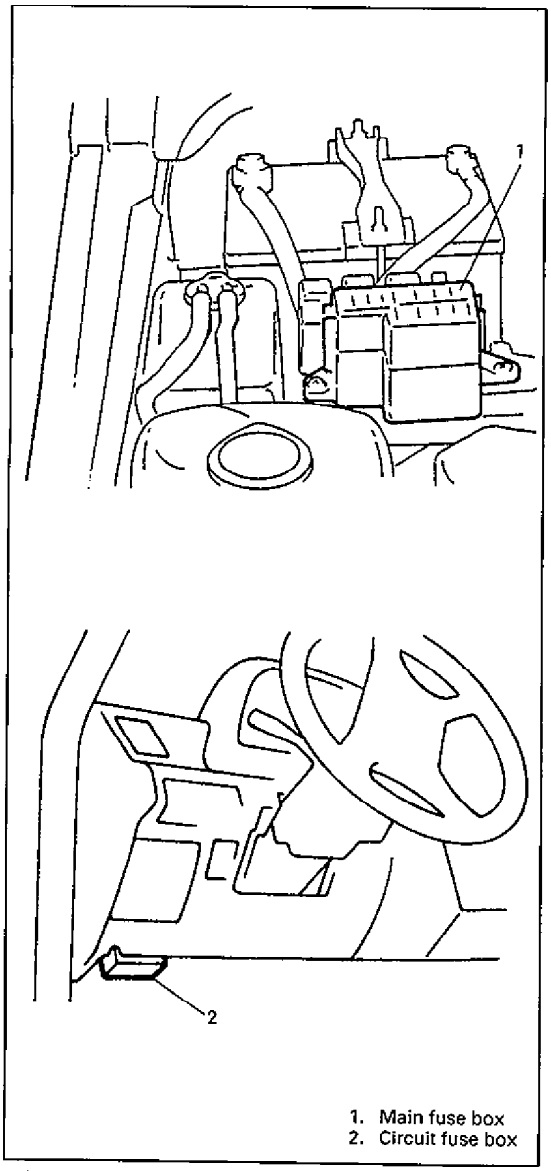
BODY ELECTRICAL SYSTEM

FUSES AND SWITCHES

FUSES

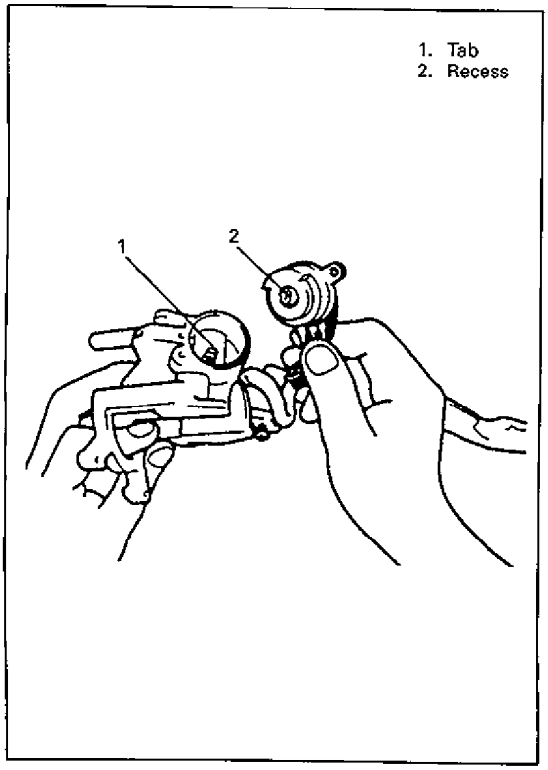
The main fuse box is located on the fender apron panel in the engine room and the fuse box is installed to underside of the instrument cover panel. The data and arrangement of each fuse are as shown to "POWER SUPPLY DIAGRAM" in this section.

CAUTION:
- **When replacing a fuse, be sure to use one having a correct rated amperage.**
- **Before replacing a fuse, turn OFF every switch of electric equipment including main switch.**



1. Main fuse box
2. Circuit fuse box

61A10-8-3-1



1. Tab
2. Recess

61A10-8-3-4

IGNITION (MAIN) SWITCH

Inspection

Remove steering column referring to Steering Section (3C1 or 3C2). And then remove steering lock/main switch from steering column referring to Steering Section (3C1 or 3C2).

Checking continuity between terminals

Use a circuit tester to check continuity at each switch position.

Key \ Wire color	Position	W/Y	Bl	B/W	Y/B	B/Y	B	B	G	G
OUT	LOCK	○								
IN	ACC	○	○							
	ON	○	○	○	○				○	○
	START	○		○		○	○	○		

If any continuity is not obtained, replace main switch.
Reverse removal procedure to install. At installation, position ignition switch so that its recess is mated with tab on bracket.

COMBINATION SWITCH

The turn signal/dimmer switch incorporates the turn signal, hazard warning, dimmer and passing light switches.

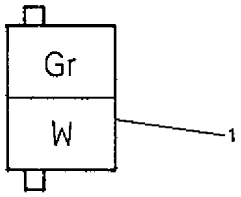
Inspection

1) Disconnect negative (–) cable at battery.
2) Remove steering column hole cover.
3) Disconnect combination switch coupler(s).

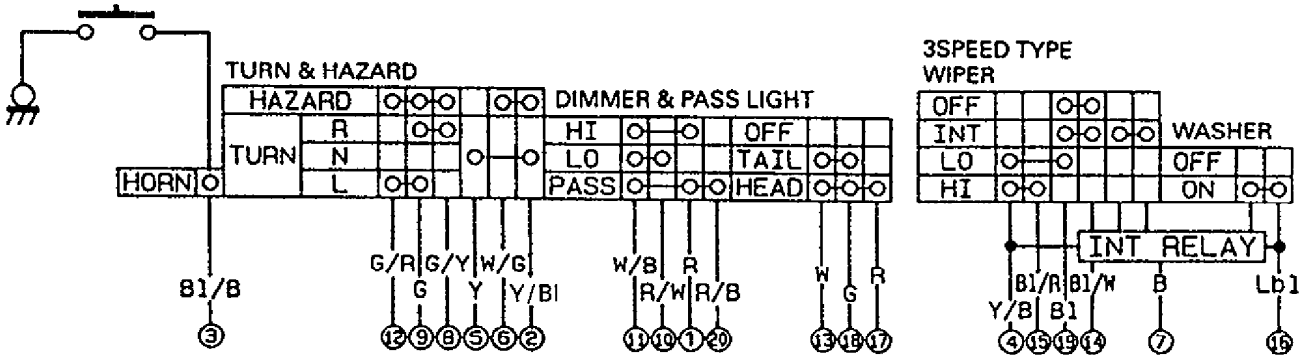
61A10-8-4-1

CONNECTOR

①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
R	Y/Bl	Bl/B	Y/B	Y	W/G	B	G/Y	G	R/W
W/B	G/R	W	Bl/W	Bl/R	Lbl	R	G	Bl	R/B
⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳



Continuity between terminals



B : Black	G/R : Green/Red	W/B : White/Black
Bl : Blue	G/Y : Green/Yellow	W/G : White/Green
Bl/B : Blue/Black	R : Red	Y : Yellow
Bl/R : Blue/Red	R/B : Red/Black	Y/B : Yellow/Black
Bl/W: Blue/White	R/W : Red/White	Y/Bl : Yellow/Blue
G : Green	W : White	Lbl : Light blue
		Gr : Gray

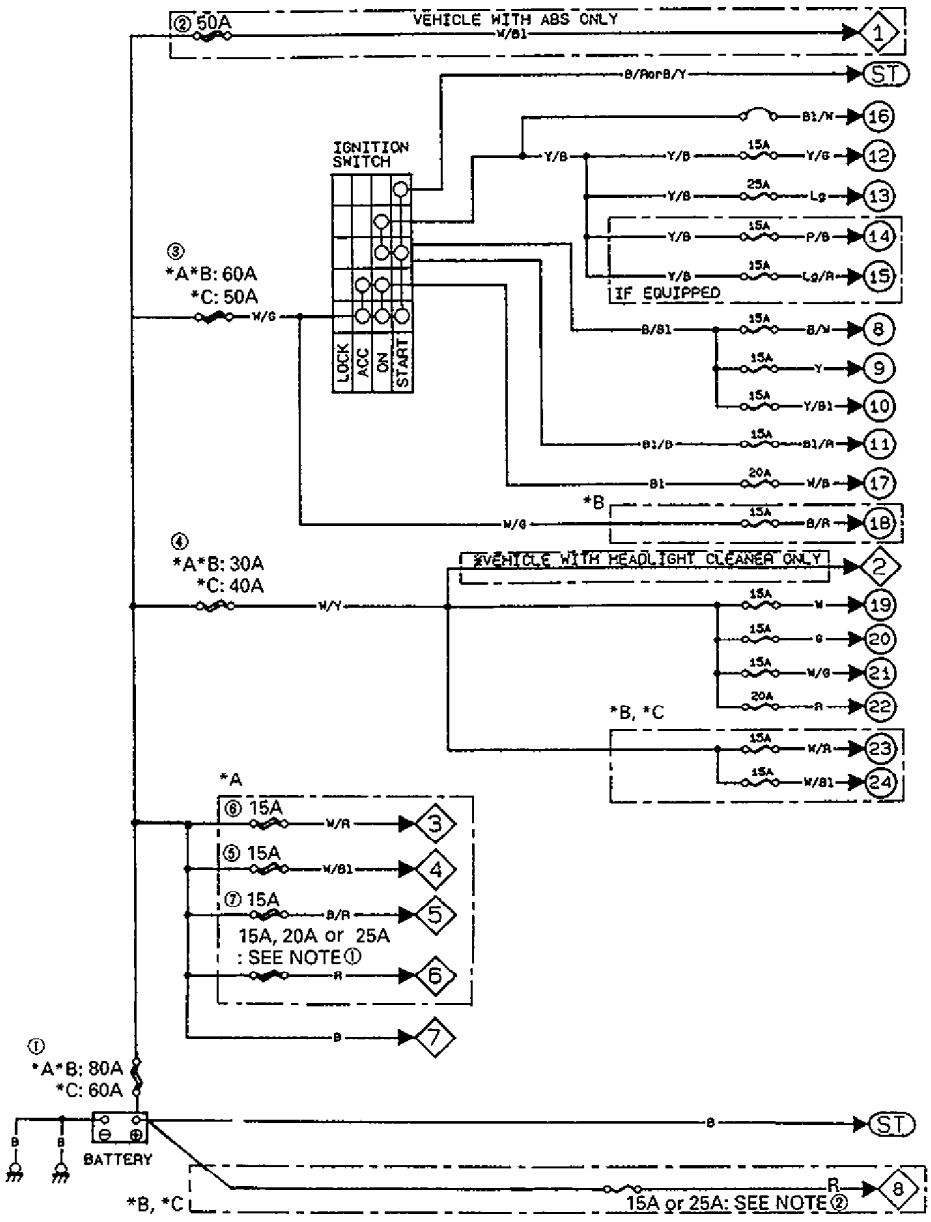
1. For air bag system (If equipped)

61A10-8-5-2

POWER SUPPLY DIAGRAM

For General & European markets
(Except German market)

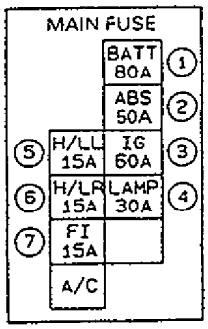
***A: 1-cam 16 valve engine**
***B: 1-cam 8 valve electronic fuel injection engine model**
***C: Carburetor model**



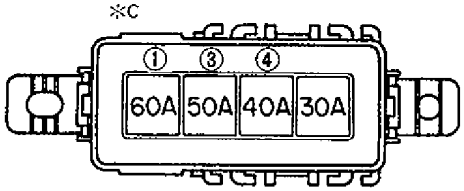
① To ABS system
② To headlight cleaner motor
③ To headlight (RH)
④ To headlight (LH)
⑤ To electronic fuel injection main relay
⑥ To A/C system
⑦ To generator
⑧ To A/C system
⑧ To ignition coil
⑨ To turn signal light & back up light
⑩ To wiper & washer
⑪ To air bag system
⑫ To rear defogger
⑬ To heater
⑭ To sliding roof
⑮ To seat heater
⑯ To power window
⑰ To cigarette lighter & radio
⑱ To electronic fuel injection main relay
⑲ To small, tail & licence plate light
⑳ To stop light & horn
㉑ To hazard
㉒ To door lock
㉓ To headlight (RH)
㉔ To headlight (LH)

NOTE① : 15A ..... Short body model with right hand steering.
20A ..... Long body model with right hand steering.
25A ..... Left hand steering model.
NOTE② : 15A ..... Left hand steering model with caburetor right hand steering model.
25A ..... Left hand steering model with electronic fuel injection.

*A , *B



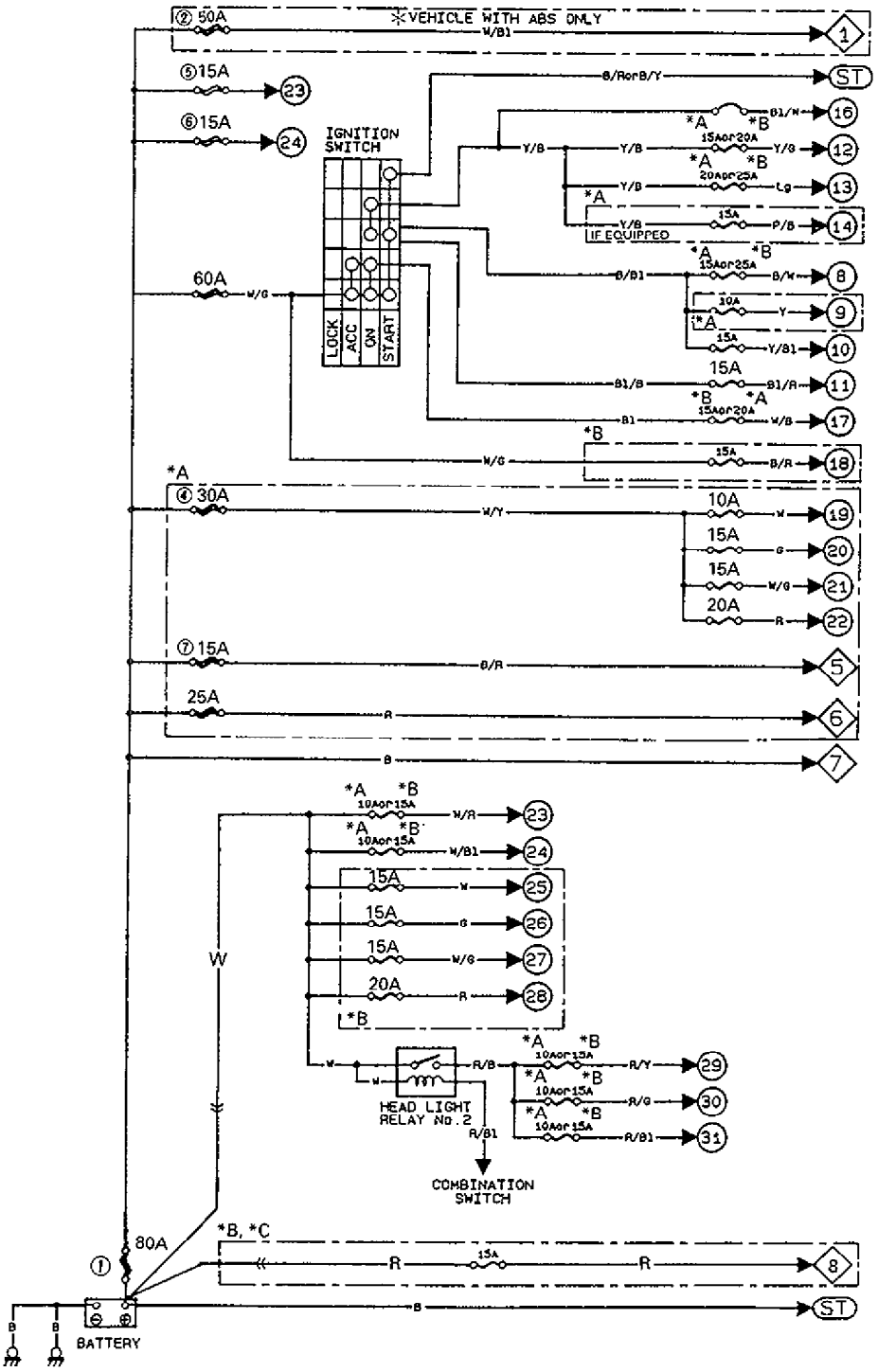
*C



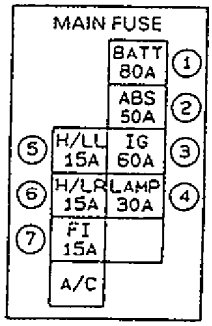
FUSE BOX	⑲	⑳	㉑	㉒	⑰
	15A FOG	15A TAIL DOME	15A STOP HORN	15A HAZARD	20A DOOR LOCK	20A CIGAR RADIO
15A IG COIL METER	15A TURN BACK	15A WIPER WASHER	15A REAR DEFG	25A HEATER	15A SUN ROOF	15A SEAT HEATER
⑧	⑨	⑩	⑫	⑬	⑭	⑮

For German market

*A: 1-cam 16 valve engine
*B: 1-cam 8 valve electronic fuel injection engine model



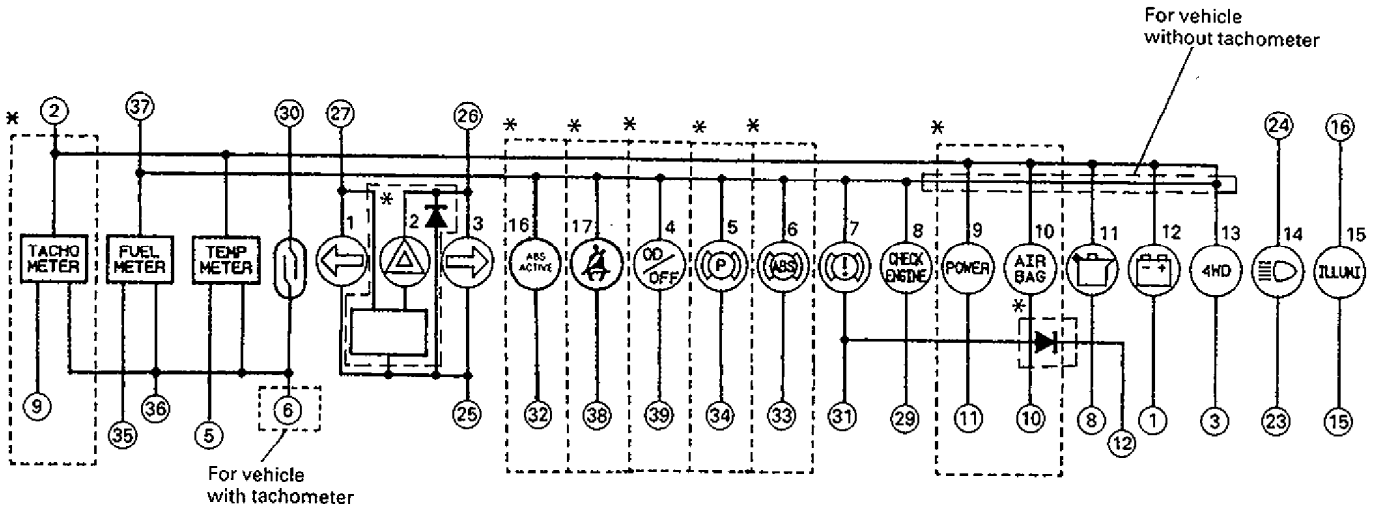
① To ABS system
⑤ To electronic fuel injection main relay
⑥ To A/C system
⑦ To generator
⑧ To A/C system
⑧ To ignition coil
⑨ To turn signal light & back up light
⑩ To wiper & washer
⑪ To air bag system
⑫ To rear defogger
⑬ To heater
⑭ To sliding roof
⑯ To power window
⑰ To cigarette lighter & radio
⑱ To electronic fuel injection main relay
⑲ To interior light
⑳ To stop light & horn
㉑ To hazard
㉒ To door lock
㉓ To headlight (RH)
㉔ To headlight (LH)
㉕ To interior light
㉖ To stop light & horn
㉗ To hazard
㉘ To door lock
㉙ To licence plate light
㉚ To small & tail light(RH)
㉛ To small & tail light (LH)



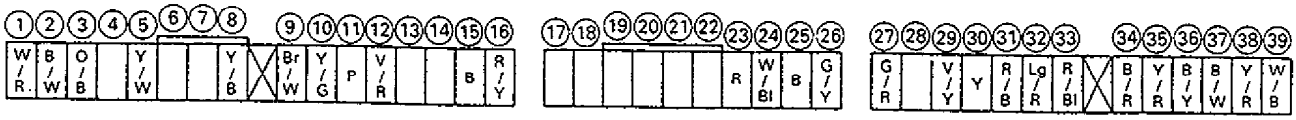
FUSE BOX ㉓	㉔	⑲ or ㉕	⑳ or ㉖	㉑ or ㉗	⑫	⑬
10A	10A	10A DOME	15A STOP HORN	15A HAZARD	15A REAR DEFG	25A HEATER
HEAD R – L						
10A LICENCE	10A TAIL R	10A TAIL L	20A CIGAR RADIO	15A IG. COIL METER	10A TURN BACK	15A WIPER WASHER
㉙	㉚	㉛	⑰	⑧	⑨	⑩

INSTRUMENTS AND GAUGES

COMBINATION METER



Terminal arrangement of instrument harness coupler viewed from harness side.

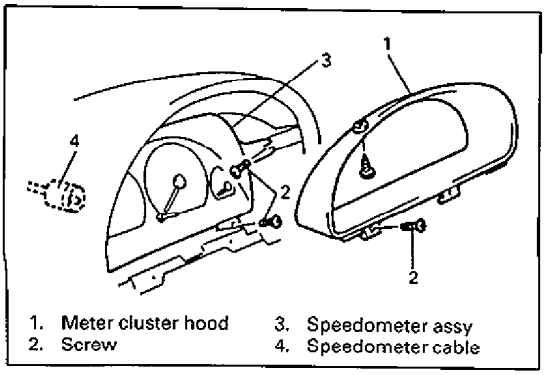


1. Turn signal pilot light (LH)
2. Hazard pilot light
3. Turn signal pilot light (RH)
4. Over drive off indicator light (A/T)
5. Parking brake warning light
6. "ABS" warning light (if equipped)
7. Brake warning light
8. "CHECK ENGINE" light
9. Power select indicator light (A/T)
10. "AIR BAG" warning light (if equipped)
11. Oil pressure light
12. Charge warning light
13. "4WD" light
14. High beam light
15. Illumination light
16. "ABS ACTIVE" light (if equipped)
17. Seat belt (driver side) warning light (if equipped)

(1)	To generator	White/Red
(2)	To ignition switch	Black/White
(3)	To 4WD switch	Orange/Black
(5)	To coolant temp. sensor	Yellow/White
(8)	To oil pressure switch	Yellow/Black
(9)	To ECM	Brown/White
(10)	To AIR BAG controller	Yellow/Green
(11)	To A/T controller	Pink
(12)	To ignition switch	Violet/Red
(15)	To illumination controller	Black
(16)	To light relay	Red/Yellow
(23)	To headlight switch	Red
(24)	To main fuse	White/Blue
(25)	To ground	Black
(26)	To turn signal switch (RH)	Green/Yellow
(27)	To turn signal switch (LH)	Green/Red
(29)	To ECM	Violet/Yellow
(30)	To ECM	Yellow
(31)	To brake fluid level switch	Red/Black
(32)	To ABS controller	Light green/Red
(33)	To ABS controller	Red/Blue
(34)	To parking brake switch	Black/Red
(35)	To fuel level gauge	Yellow/Red
(36)	To ground	Black/Yellow
(37)	To ignition switch	Black/White
(38)	To seat belt switch (driver side)	Yellow/Red
(39)	To A/T controller	White/Black

NOTE:
Whether equipped with * marked parts or not depends on vehicle specification.

61A10-8-7-1



1. Meter cluster hood
2. Screw
3. Speedometer assy
4. Speedometer cable

61A10-7D-25-3

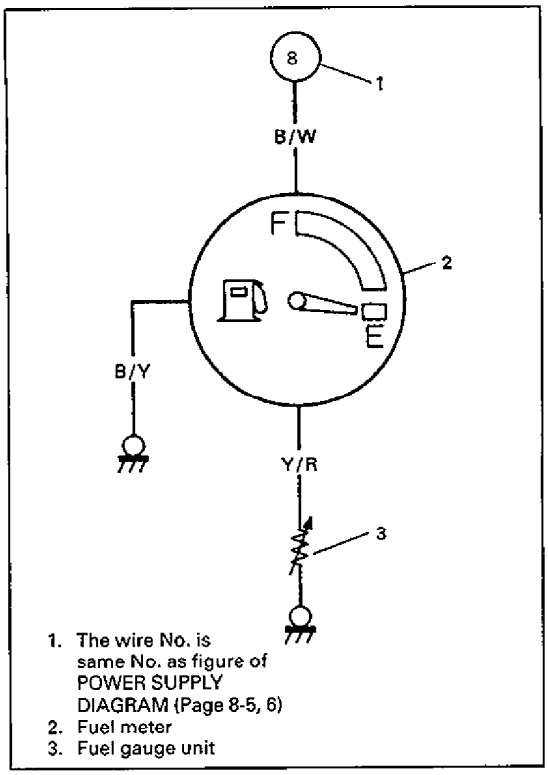
REMOVE AND INSTALLATION

Removal

1) Remove meter cluster hood by undoing screws.
2) Undo combination meter fixing screws and pull out combination meter.
3) Disconnect speedometer cable from combination meter.

Installation

Perform the installation procedures in the reverse order of removal. For proper clamp location and cable routing, refer to Section 7D "SPEEDOMETER CABLE" in this manual.



1. The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Fuel meter
3. Fuel gauge unit

61A10-8-8-1

FUEL METER/FUEL GAUGE UNIT

DESCRIPTION OF CIRCUIT

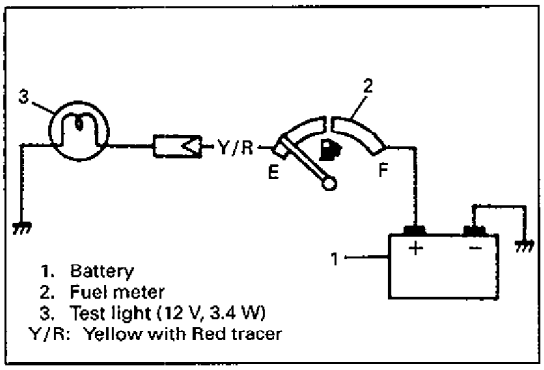
The fuel meter circuit consists of the fuel meter and the fuel gauge unit in the tank. Current flowing through the meter coil is varied to control the movement of the meter pointer.

When the tank is full, the fuel level gauge resistance is decreased allowing more current flow into the meter coil causing the pointer to move to the "F" (FULL) position.

TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Fuel level meter shows no operation.	IG. fuse blown	Replace fuse to check for short.
	Fuel meter faulty	Check meter.
	Fuel level gauge unit faulty	Check gauge unit.
	Wiring or grounding faulty	Repair.

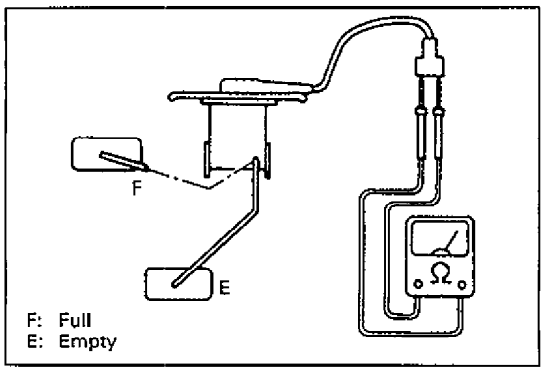
60A50-8-7-3



1. Battery
2. Fuel meter
3. Test light (12 V, 3.4 W)

Y/R: Yellow with Red tracer

85F00-8-8-3



F: Full
E: Empty

85F00-8-8-4

INSPECTION

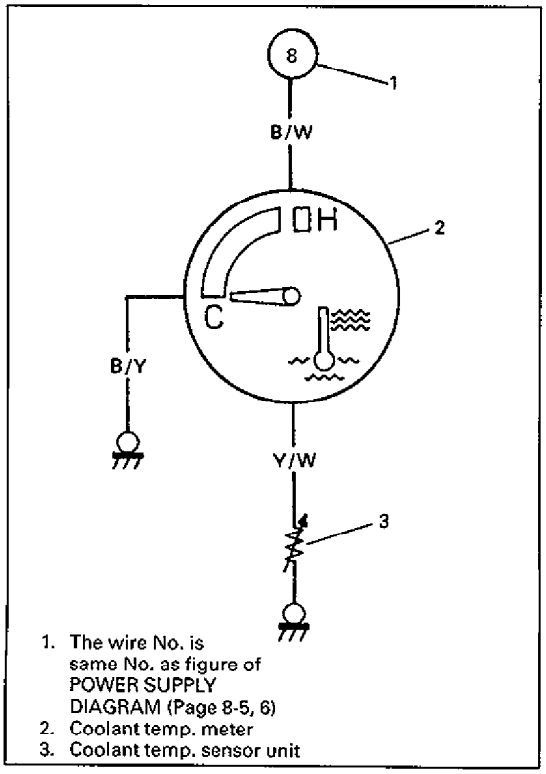
FUEL METER

1) Remove rear bumper.
2) Disconnect Y/R (Yellow with Red tracer) lead wire going to gauge unit.
3) Use bulb (12 V, 3.4 W) in position to ground above lead wire as shown.
4) Turn main switch ON.
5) Make sure bulb is lighted with meter pointer fluctuating several seconds thereafter.
6) If meter is faulty, replace it.

GAUGE UNIT

Use an ohmmeter to confirm that level gauge unit changes in resistance with the change of float position.

Position	Resistance
E	120 ± 2.5Ω
F	3 ± 1.5Ω
1/2	32.5 ± 2.5Ω



1. The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Coolant temp. meter
3. Coolant temp. sensor unit

61A10-8-9-1

COOLANT (WATER) TEMP. METER/SENSOR UNIT

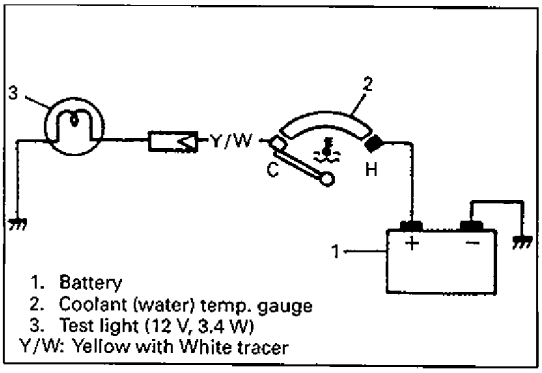
DESCRIPTION OF CIRCUIT

The coolant (water) temp. gauge circuit consists of coolant (water) temp. meter installed in the cluster and the coolant (water) temp. sensor unit on the intake manifold. The sensor unit shows different resistance values depending on the coolant temp. This causes a current flowing, through the temp. sensor coil to change, controlling the sensor pointer. That is, when the coolant temp. rises, the sensor unit resistance is decreased with more current flowing through the gauge coil, raising the gauge pointer upward from the "C" position.

TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Coolant (Water) temp. meter shows no operation.	IG. fuse blown	Replace fuse to check for short.
	Coolant (Water) temp. meter faulty	Check meter.
	Coolant (Water) temp. sensor unit faulty	Check sensor unit.
	Wiring or grounding faulty	Repair.

60A50-8-8-3



1. Battery
2. Coolant (water) temp. gauge
3. Test light (12 V, 3.4 W)

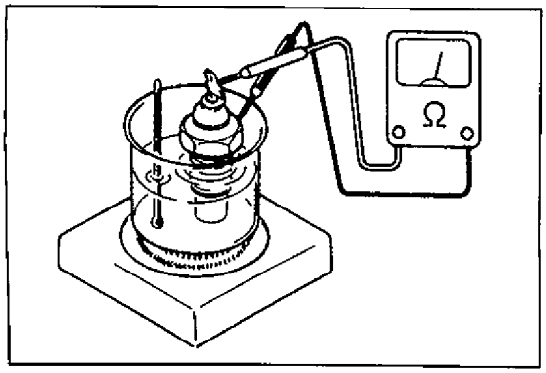
Y/W: Yellow with White tracer

60A40-8-10-4

INSPECTION

COOLANT (WATER) TEMP. METER

1. Disconnect Y/W lead wire going to gauge unit installed to intake manifold.
2. Use a bulb (12 V, 3.4 W) in position to ground above wire as illustrated.
3. Turn main switch ON. Confirm that bulb is lighted with meter pointer fluctuating several seconds thereafter.
   If meter is faulty, replace it.

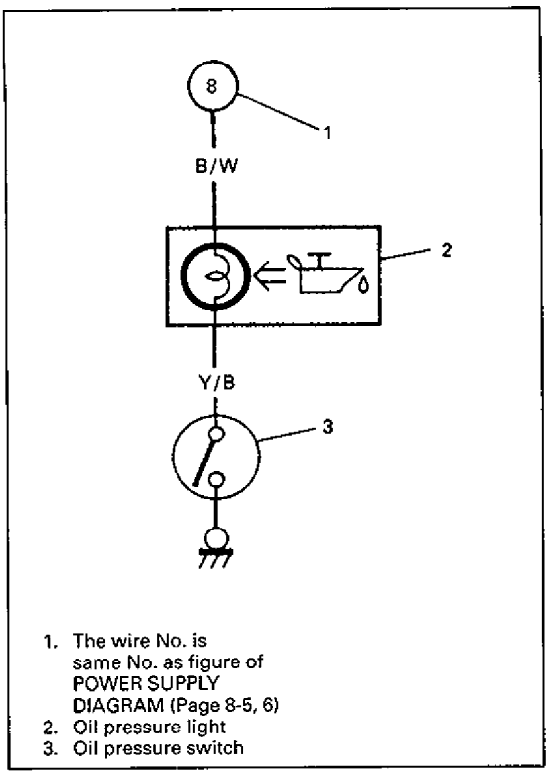


61A10-8-9-5

GAUGE UNIT

Warm up gauge unit. Thus make sure its resistance is decreased with increase of its temperature.

Temperature	Resistance
50°C (122°F)	189.4 – 259.6 Ω
115°C (239°F)	24 – 28 Ω



1. The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Oil pressure light
3. Oil pressure switch

61A10-8-10-1

OIL PRESSURE LIGHT

DESCRIPTION OF CIRCUIT

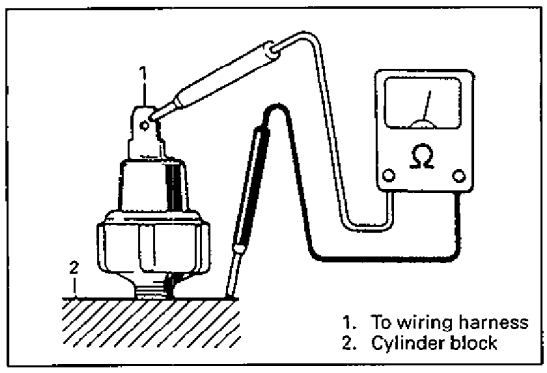
The oil pressure circuit consists of the oil pressure switch installed to the cylinder block and the warning light inside the combination meter.

The oil pressure switch operates in such a way that it is switched OFF when oil pressure is produced by the started engine and then fed to switch.

TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Oil pressure light shows no lighting.	Light fuse blown	Replace fuse to check for short.
	Bulb burnt out	Replace bulb.
	Oil pressure switch faulty	Check switch.
	Wiring or grounding faulty	Repair.

60A50-8-9-3



1. To wiring harness
2. Cylinder block

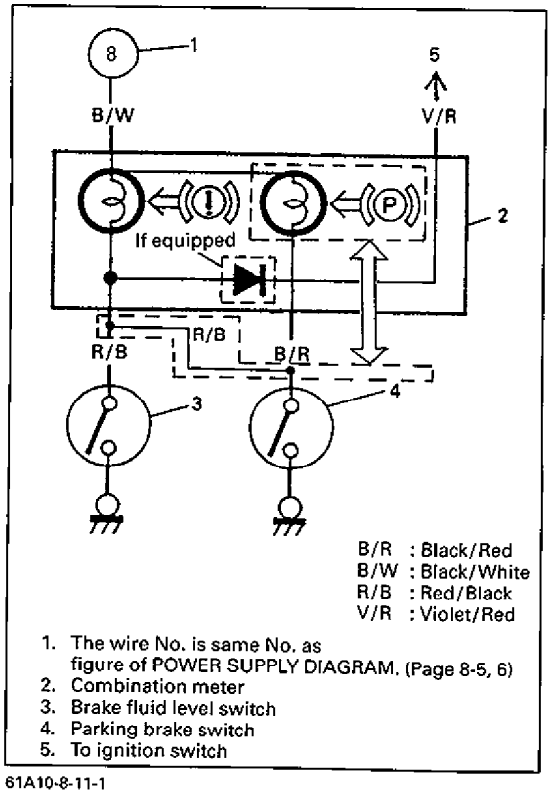
60A20-8-12-4

INSPECTION

OIL PRESSURE SWITCH

Use an ohmmeter to check switch continuity.

During engine running	No continuity obtained (∞ Ω)
At engine stop	Continuity obtained (0 Ω)



61A10-8-11-1

BRAKE WARNING LIGHT (If equipped)

DESCRIPTION OF CIRCUIT

The brake warning light circuit consists of a brake fluid level switch installed in the master cylinder reservoir, and the light (brake warning light) in the gauge cluster. Also, this circuit is additionally provided with the parking brake switch which warns that the parking brake is applied.

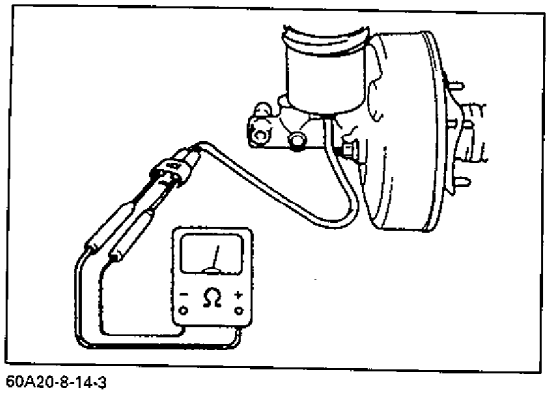
OPERATION OF WARNING LIGHT

1) When the engine is stopped the warning light comes on, if the ignition switch is turned ON and the parking brake is applied.
2) For the bulb check, the warning light comes on briefly during engine starting regardless of the brake fluid level position and the parking brake operation.
3) After the engine is started, release the parking brake. If the light goes off, the brake fluid level is adequate.

TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Brake warning light (parking brake light) shows no lighting.	Light fuse blown Bulb burnt out Parking brake switch faulty Wiring or grounding faulty	Replace fuse to check for short. Replace bulb. Check parking brake switch. Repair

60A50-8-10-3



60A20-8-14-3

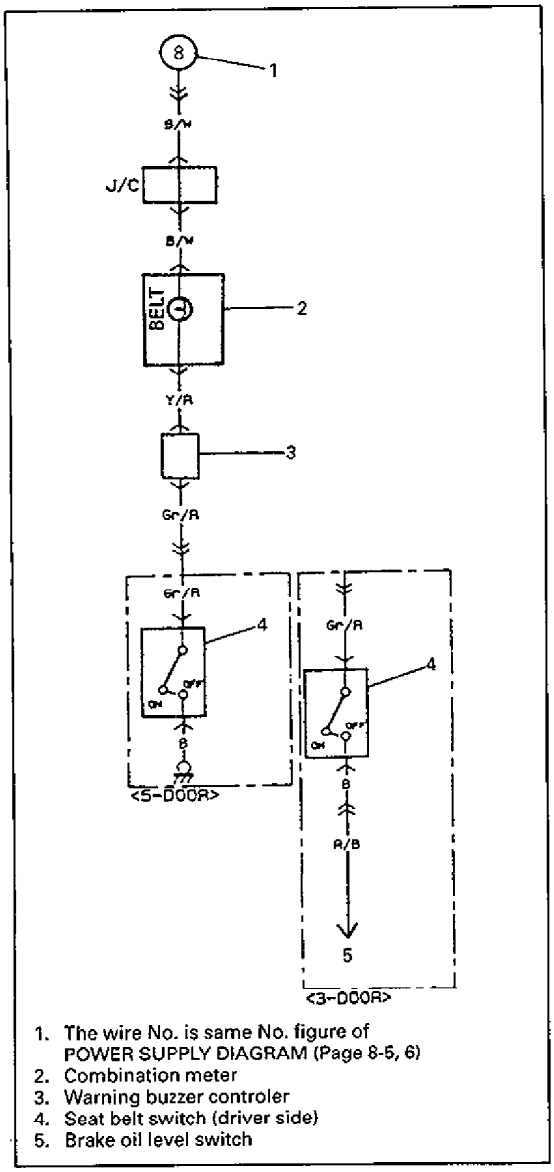
INSPECTION

- BRAKE FLUID LEVEL SWITCH
  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
  Use an ohmmeter to check switch for continuity.
  If found defective, replace switch.

OFF position (release the parking brake)	No continuity
ON position (parking brake lever pulled up)	Continuity



1. The wire No. is same No. figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Combination meter
3. Warning buzzer controler
4. Seat belt switch (driver side)
5. Brake oil level switch

61A10-8-12-1

SEAT BELT WARNING LIGHT/BUZZER (If equipped)

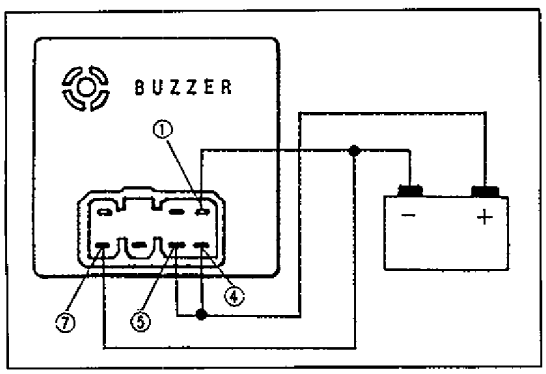
DESCRIPTION OF CIRCUIT

The seat belt warning light/buzzer circuit is a system to light and sound the light and buzzer respectively for several seconds, urging the driver to wear his seat belt. After several seconds passed, the buzzer stops sounding whether the seat belt is worn or not.

TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Seat belt warning light/ buzzer shown no lighting/ sounding.	Light fuse blown	Replace fuse to check for short.
	Bulb burnt out	Replace bulb.
	Buzzer faulty (no sounding)	Replace buzzer.
	Wiring or grounding faulty	Repair.

60A50-8-11-4



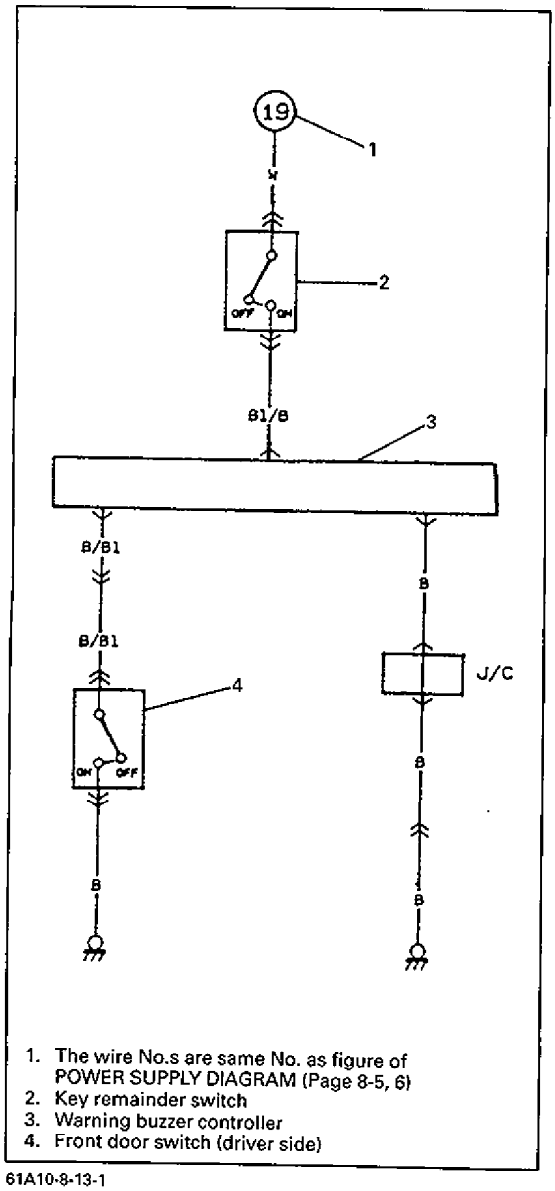
60A20-8-16-5

INSPECTION

When warning light/buzzer do not make lighting/sounding, use above circuit diagram as reference to check bulb, buzzer, wiring, etc.

INSPECTION OF WARNING CONTROLLER

Connect negative (–) terminal of battery to terminals ① and ⑦ of controller and positive (+) terminal of battery to terminals ④ and ⑤ of controller and check that buzzer emits buzzing sound for 4 to 8 seconds. Also, it should operate likewise when the terminals are disconnected and reconnected. If check result is not satisfactory, replace.



1. The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Key remainder switch
3. Warning buzzer controller
4. Front door switch (driver side)

61A10-8-13-1

MAIN SWITCH KEY WARNING BUZZER (If equipped)

DESCRIPTION OF CIRCUIT

The main switch key warning buzzer circuit is a system to sound the buzzer if the driver leaves the vehicle with the main switch key inserted in place, (i.e. the main switch key is turned to ACC or OFF position) urging him to take it out.

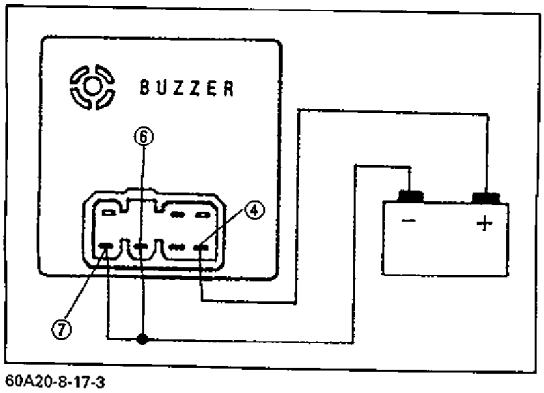
INSPECTION

If main switch key warning buzzer does not sound, use its wiring diagram in figure above as reference to check buzzer, wiring, etc.

TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Main switch key warning buzzer shows no sounding. Applicable to vehicle equipped with buzzer.	Buzzer fuse blown Buzzer faulty Wiring or grounding faulty	Replace fuse to check for short. Replace buzzer. Repair.

60A50-8-12-4



60A20-8-17-3

INSPECTION OF WARNING CONTROLLER

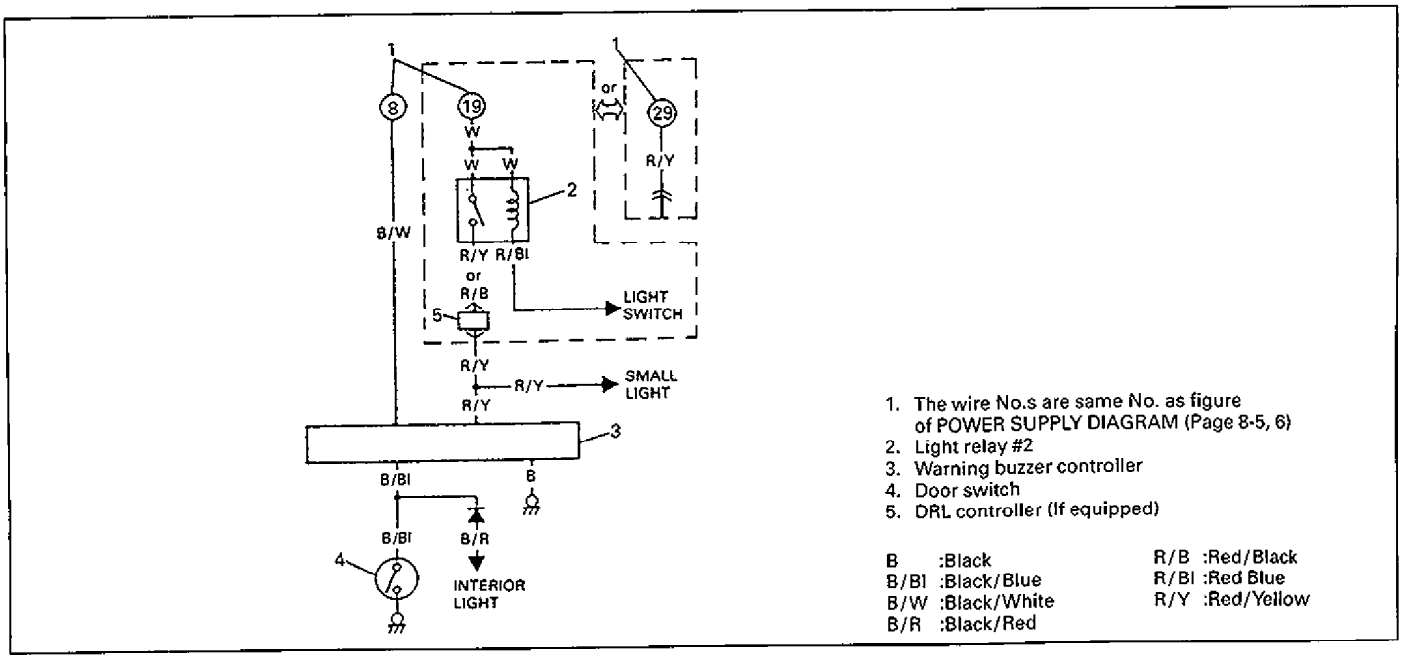
With positive (+) terminal of battery connected to terminal ④ of controller and negative (–) one to ⑦ , also connect negative (–) one to ⑥ as shown in figure.

If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

LIGHT REMAINDER WARNING BUZZER

DESCRIPTION OF CIRCUIT

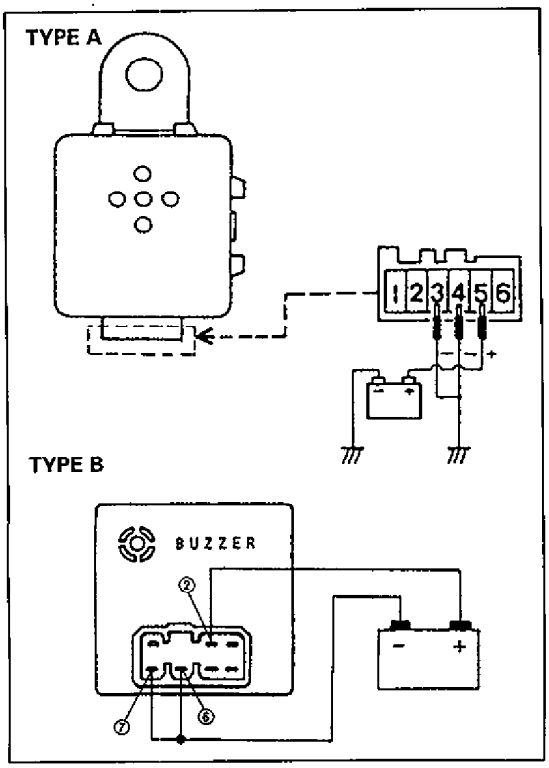
The light warning buzzer circuit is a system to sound the buzzer when the driver turns OFF the ignition and door switch (driver side) turns ON (i.e. driver side door opens) while the lights are still ON, warning driver to turn off the lights.



TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
Light warning buzzer shows no sounding. Applicable to vehicle equipped with buzzer.	Buzzer fuse blown Buzzer faulty Driver side door switch faulty	Replace fuse to check for short. Replace buzzer. Replace door switch.

61A10-8-14-1



61A10-8-14-4

INSPECTION

When the warning buzzer does not make sounding, use the above circuit diagram as reference to check the buzzer, wiring, etc.

INSPECTION OF WARNING CONTROLLER

TYPE A

First, connect positive (+) terminal of battery to terminal ⑤ of controller and negative (–) one to terminals ③ and ④. If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

TYPE B

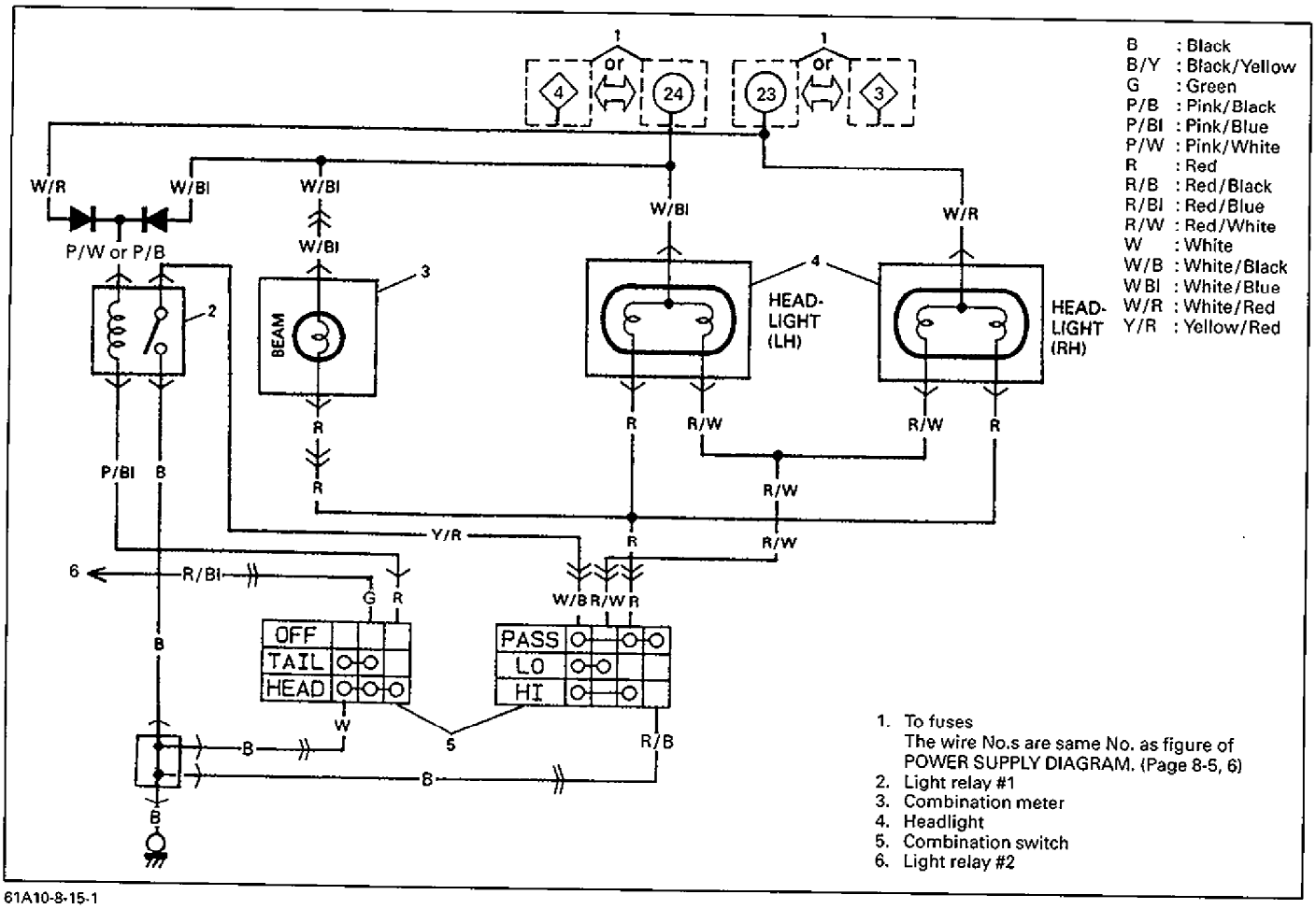
First, connect positive (+) terminal of battery to terminal ② of controller and negative (–) one to terminals ⑥ and ⑦ of controller.
If buzzer emits buzzing sound then, controller is in good condition. If not, replace.

ON VEHICLE SERVICE

LIGHTING SYSTEM

HEADLIGHTS

Wiring Circuit



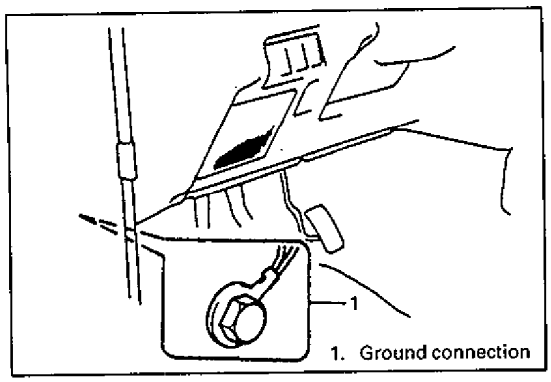
61A10-8-15-1

When the headlights are turned on, so is the small light system. As for the circuit of the small light system, refer to the following pages.

Trouble Diagnosis

Trouble	Possible cause	Correction
Only one light does not light.	• Bulb burnt out	Replace bulb.
	• Fuse blown	Replace fuse.
	• Socket, wiring or grounding faulty	Repair as necessary.
Headlights do not light.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Lighting and dimmer switches faulty	Check switches.
	• Defective light relay	Replace light relay.
	• Defective diode	Replace diode.
	• Wiring or grounding faulty	Repair as necessary.
Only one beam ("Hi" or "Lo") does not light.	• Bulb burn out	Replace bulb.
	• Lighting or dimmer switch faulty	Check switch.

50G00-8-16-1



1. Ground connection

61A10-8-16-1

Inspection

1) Check lighting and dimmer switches for each terminal-to-terminal continuity.
   Refer to "FUSES AND SWITCHES" in this section.
2) The headlight has ground at cowl dash side panel on each side.

SETTING HEADLIGHT BEAMS

(Standard Procedure)

Before setting headlight beams, adjust air pressure of each tire as specified respectively. Bounce each corner of vehicle by hand to settle its balance. Then move it over a flat surface. For headlight beam setting, some different methods and instruments are in use now, e.g., screen method using a focusing tester, etc. But method described here does not use such tester.

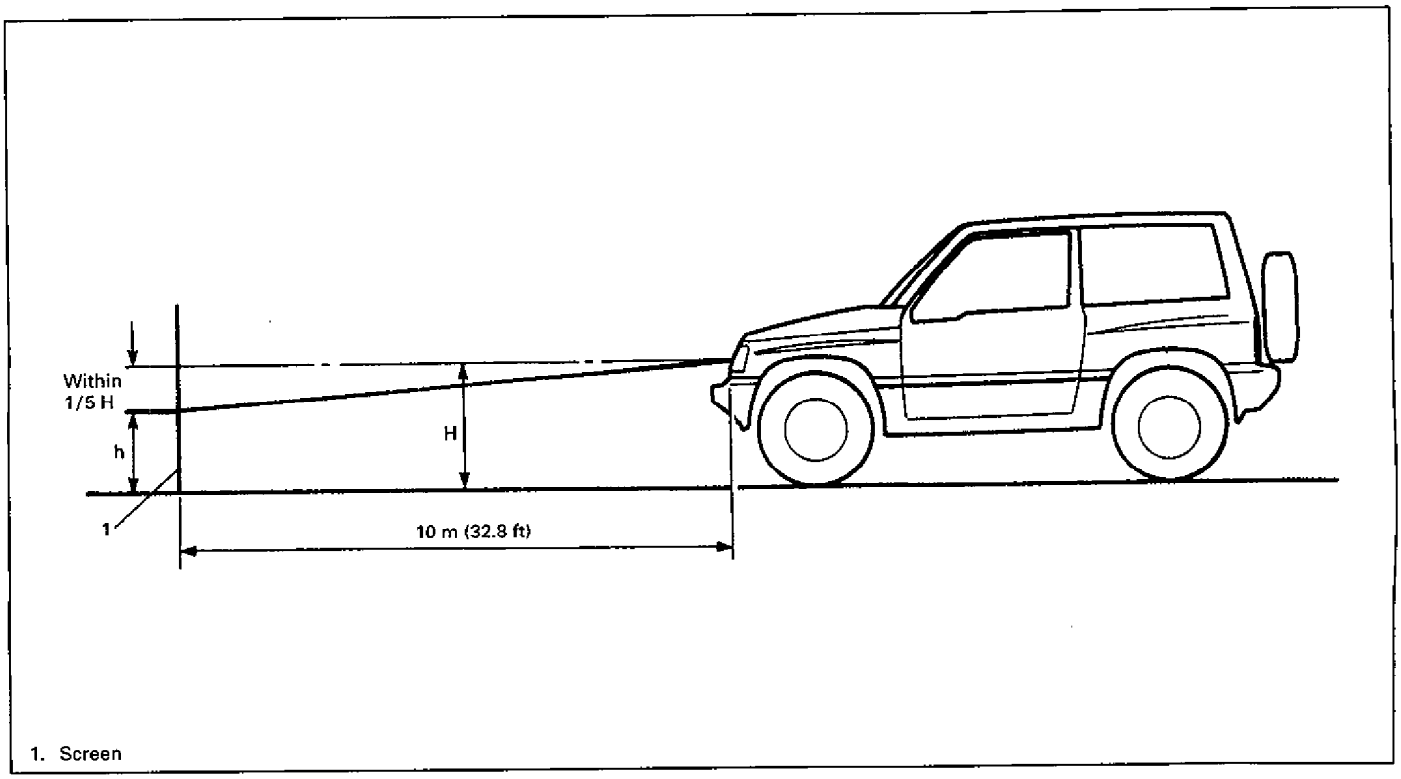
85F00-8-14-2

Inspection

Vertical beam alignment

Unless otherwise obligated by local regulations, align headlight beams according to following procedure.

1) Set a blank wall 10 m (32.8 ft) ahead of headlights.
2) Check where on wall hot spot (high intensity zone) of each main (high) beam falls. It should be within a vertical range on wall from headlight height "H" to height "h" which is 1/5 of H lower thereform as shown below.

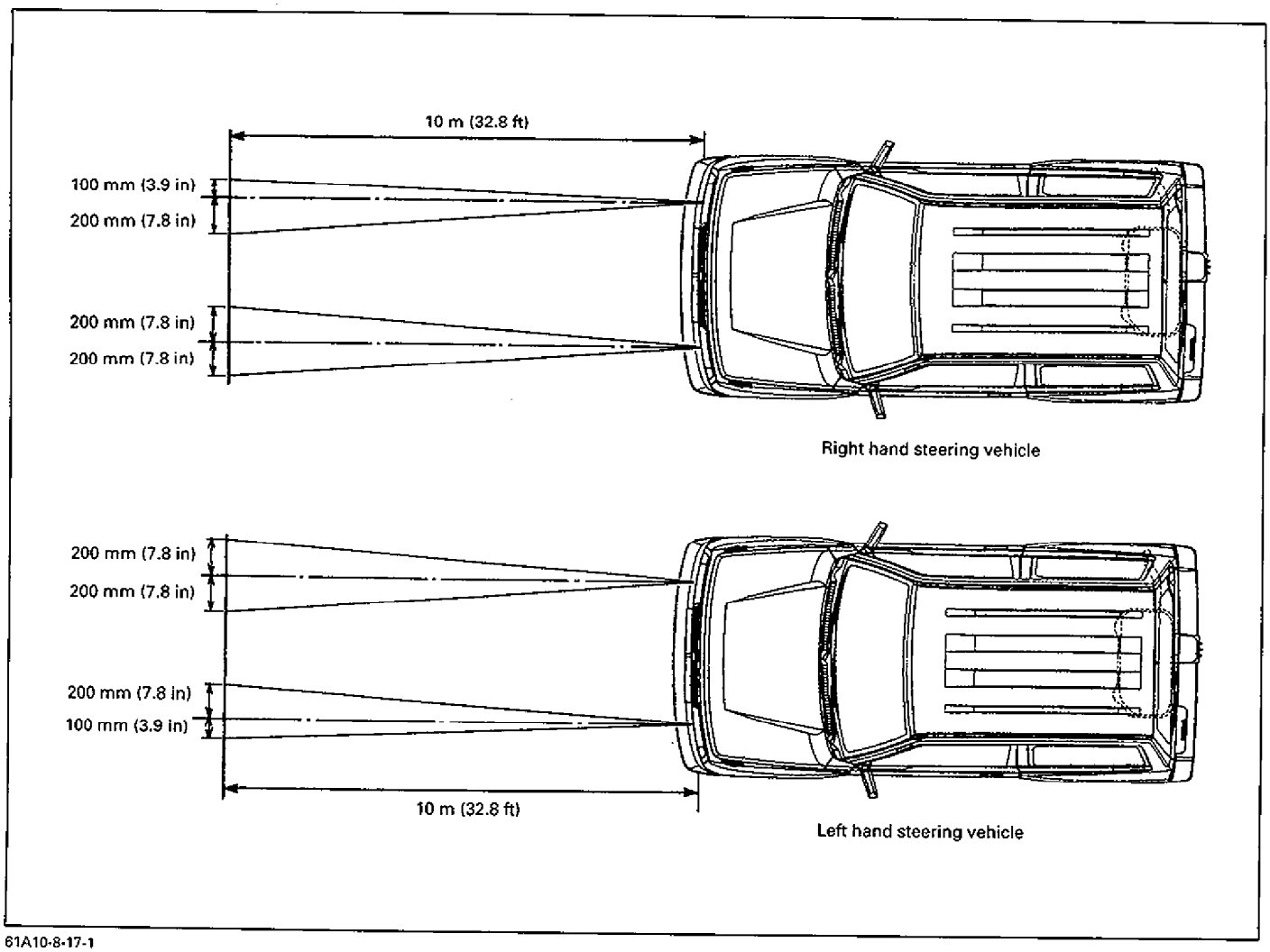


1. Screen

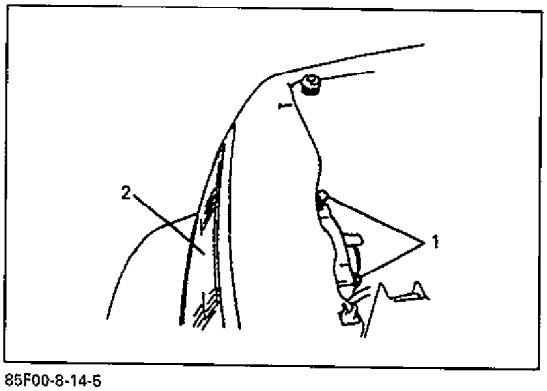
61A10-8-16-4

Horizontal beam alignment

Check that hot spot of each main (high) beam is within a horizontal range on wall as specified below.



61A10-8-17-1



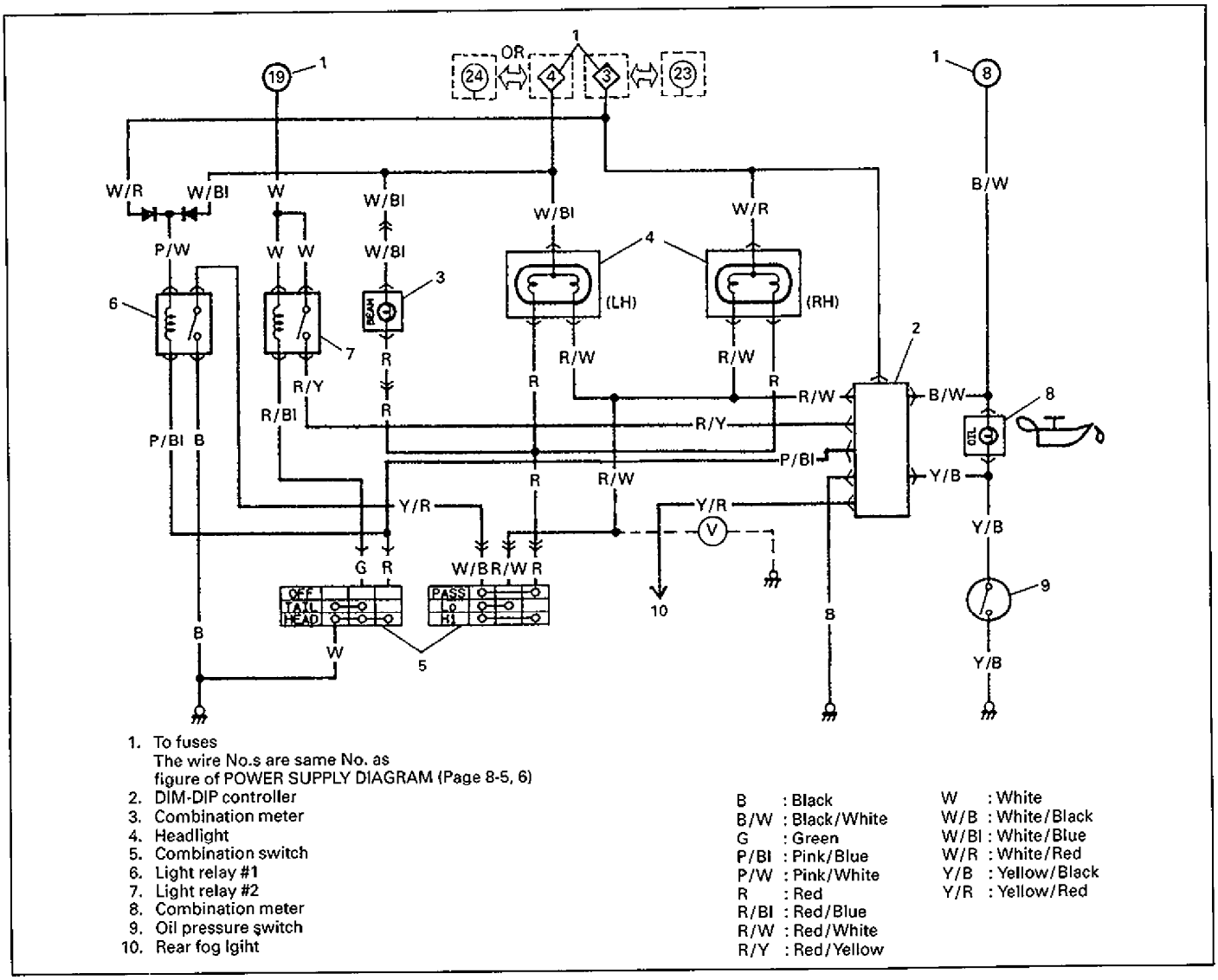
85F00-8-14-5

HEADLIGHT ADJUSTMENT

When adjusting headlight beam (vertical and horizontal), turn adjusting bolts.

DIM-DIP SYSTEM

Wiring Circuit



61A10-8-18-1

Role of this system is to dim out low beam of headlights which light when engine is started and lighting switch is set to small light position.

Should anything go wrong with this system, check controller by measuring D.C. voltage between Red/White lead (headlight low beam side) and ground as shown by broken line in figure above with engine running and lighting switch set to small light position.

If measured voltage is out of specification (about 6V), replace controller.

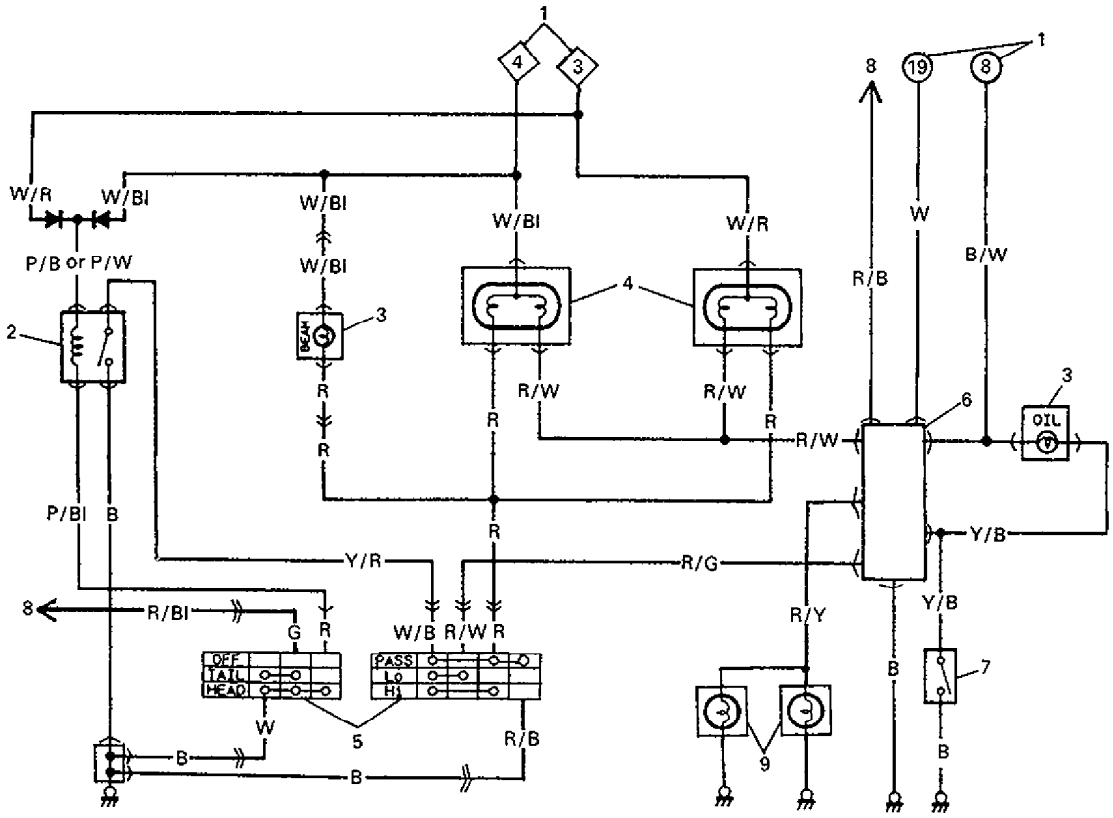
If controller is in good condition (i.e., measured voltage is about 6V), check wiring, etc. while referring to above circuit diagram.

If headlights remain on even when engine is at a stop and lighting switch is turned OFF, replace controller.

NOTE:

Dim-dip controller is located under instrument panel at the right of steering column.

DAYTIME RUNNING LIGHT SYSTEM (If equipped)



1. To fuses
   The wire No.s are same No. as
   figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Light relay #1
3. Indicator light
4. Headlight
5. Combination switch
6. DRL controller
7. Oil pressure switch
8. Light relay #2
9. Clearance light

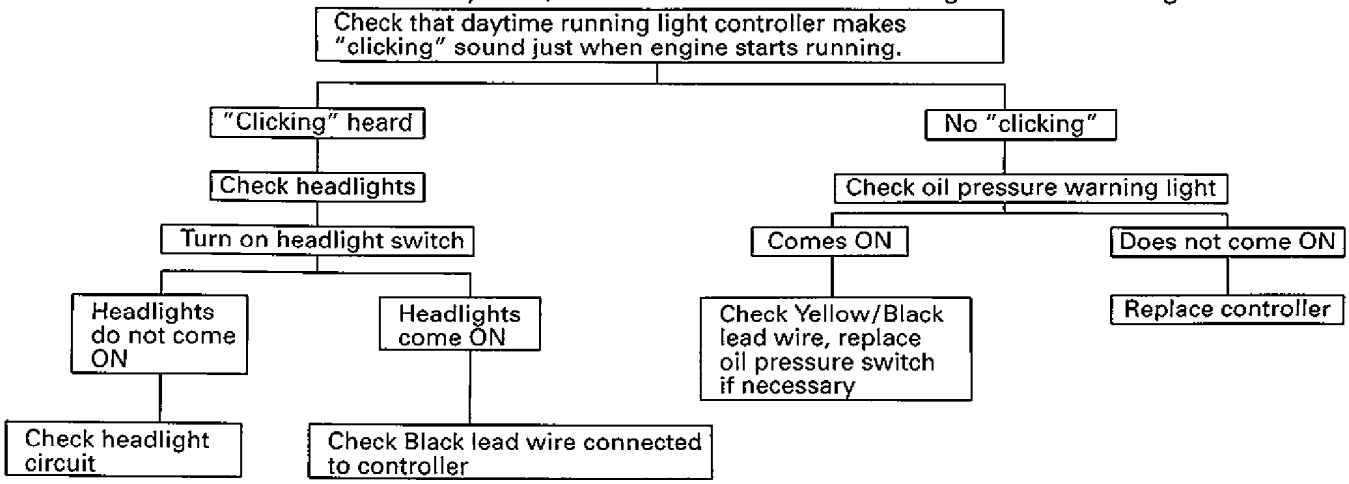
B	: Black	R/Y	: Red/Yellow
B/W	: Black/White	R/G	: Red/Green
G	: Green	R/W	: Red/White
P/B	: Pink/Black	W	: White
P/Bl	: Pink/Blue	W/B	:White/Black
P/W	: Pink/White	W/Bl	: White/Blue
R	: Red	Y/B	:Yellow/Black
R/B	: Red/Black	Y/R	:Yellow/Red
R/Bl	: Red/Blue		

61A10-8-19-1

With this system, low beam of headlights and small lights turn ON when the engine is started and they turn OFF when it is stopped.

This system is so designed that the lighting switch has a priority. That is, when the lighting switch is set to the small light position while the engine is running and this system is at work (headlights and small lights are ON), only small lights remain ON and headlights turn OFF.

When a trouble has occurred in this system, check and correct it according to the following flow chart.



NOTE:

Daytime running light controller is located under instrument panel at the right of steering column.

85F00-8-16-4

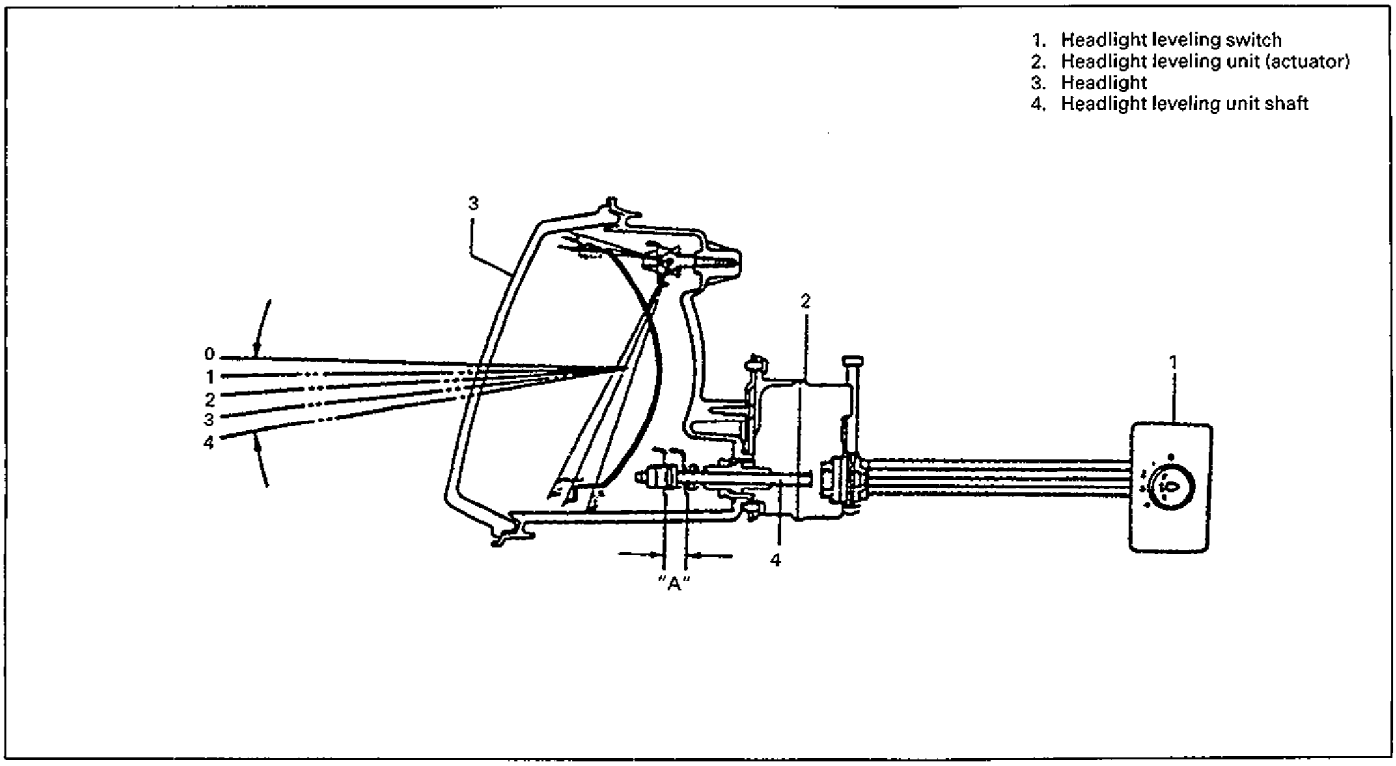
HEADLIGHT BEAM LEVELING SYSTEM (If equipped)

This system consists of the headlight leveling switch and headlight leveling actuator. It is used to lower both headlight aiming angles from the initial setting level by operating the leveling switch on the instrument.

NOTE:
When inspecting and adjusting the headlight beam, make sure to set the leveling switch to the "0" position with the ignition switch "ON", or down stroke from the initial setting level will be reduced.

OPERATION

The headlight leveling actuator is mounted behind headlight assembly and connected to the headlight reflector. When the headlight leveling switch knob is turned, the headlight leveling actuator operates and it changes the headlight aiming angle according to the position selected by the leveling switch knob.

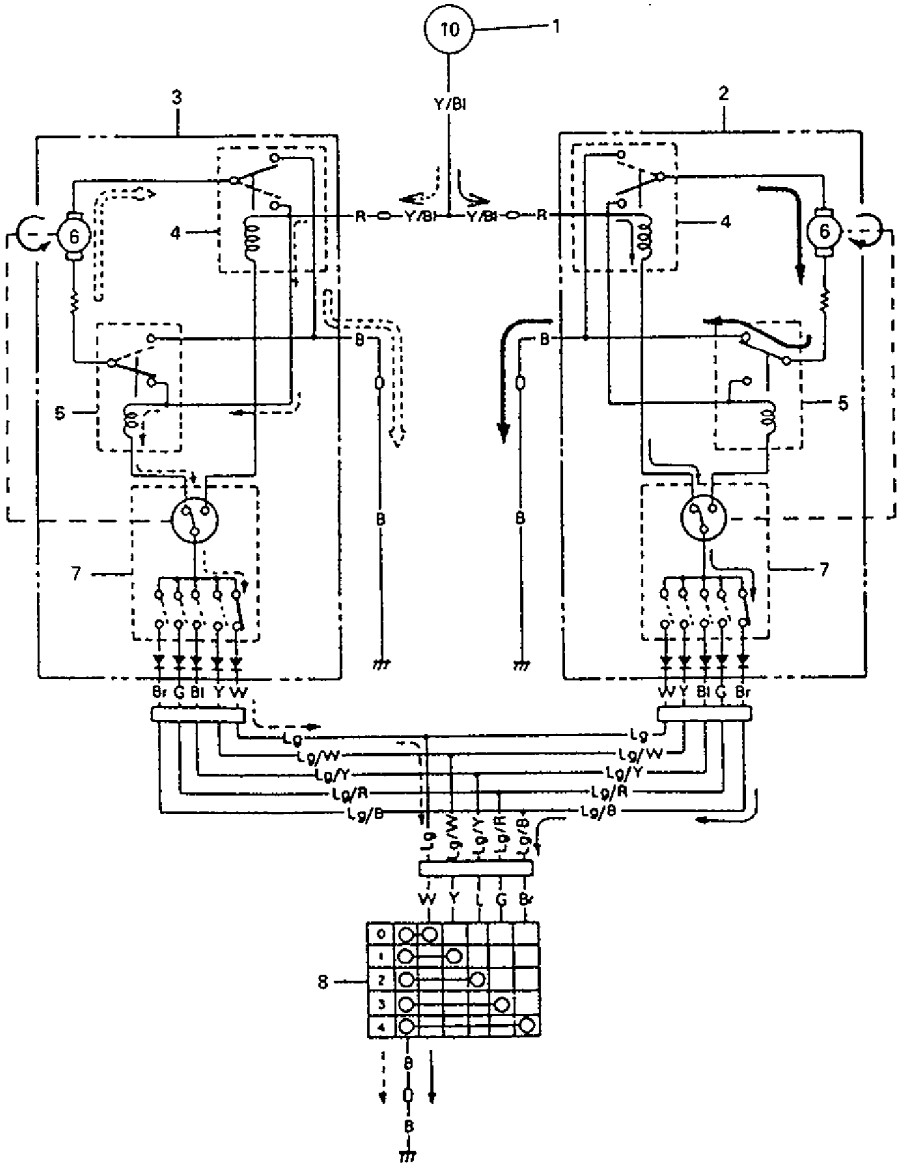


Switch position	Headlight beam level	Stroke "A"
0	Initial setting level	——
1	↓	——
2		——
3		——
4	Max. down level	Max. 3.6 mm (0.14 in)

85F00-8-17-1

HEADLIGHT BEAM LEVELING SYSTEM CIRCUIT

The diagram below shows the headlight beam leveling system circuit. The electric current as shown by fine arrow (⟶) indicates the beam's "down" leveling operation. The electric current as shown by broken arrow (- - ➤) indicates the beam's "up" leveling operation.



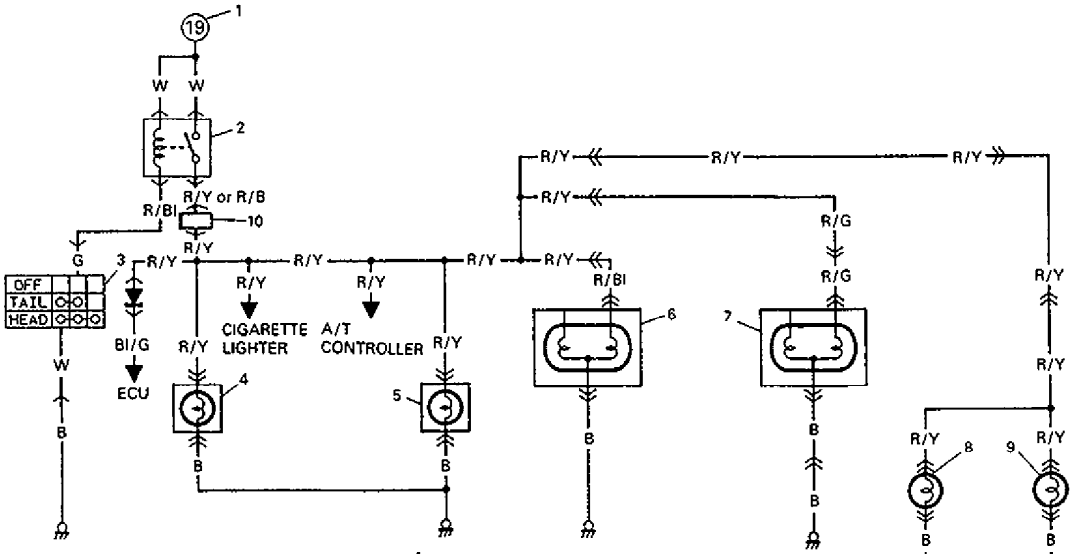
1. To fuse
   The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Headlight leveling actuator (RH)
3. Headlight leveling actuator (LH)
4. Relay
5. Relay
6. Motor
7. Contact switch
8. Headlight leveling switch ass'y

B	:Black
Bl	:Blue
Br	:Brown
G	:Green
Lg	:Light green
R	:Red
W	:White
Y	:Yellow
B/Bl	:Black with Blue tracer
Lg/B	:Light green with Black tracer
Lg/W	:Light green with White tracer
Lg/Y	:Light green with Yellow tracer
W/G	:White with Green tracer
Y/Bl	:Yellow with Blue tracer

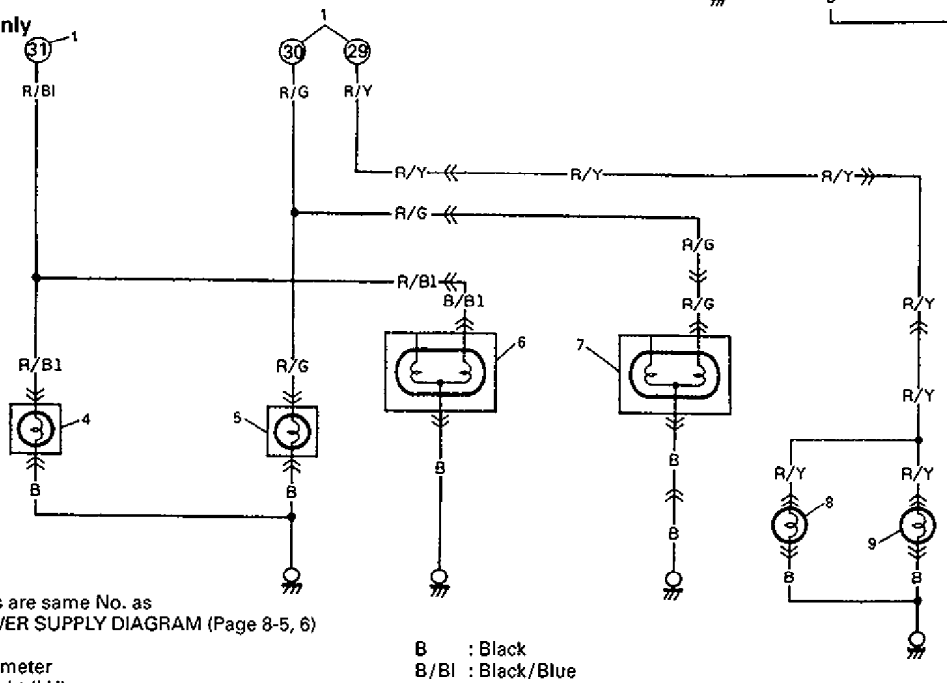
SMALL, TAIL AND LICENSE PLATE LIGHT

WIRING CIRCUIT

For General & European spec. (Except German spec.)



For German spec. only



1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Light relay #2
3. Combination meter
4. Front small light (LH)
5. Front small light (RH)
6. Rear tail light (LH)
7. Rear tail light (RH)
8. License plate light (LH)
9. License plate light (RH)
10. DRL controller (If equipped)

B	: Black
B/Bl	: Black/Blue
Bl/G	: Blue/Green
G	: Green
R/B	: Red/Black
R/Bl	: Red/Blue
R/G	: Red/Green
R/Y	: Red/Yellow
W	: White

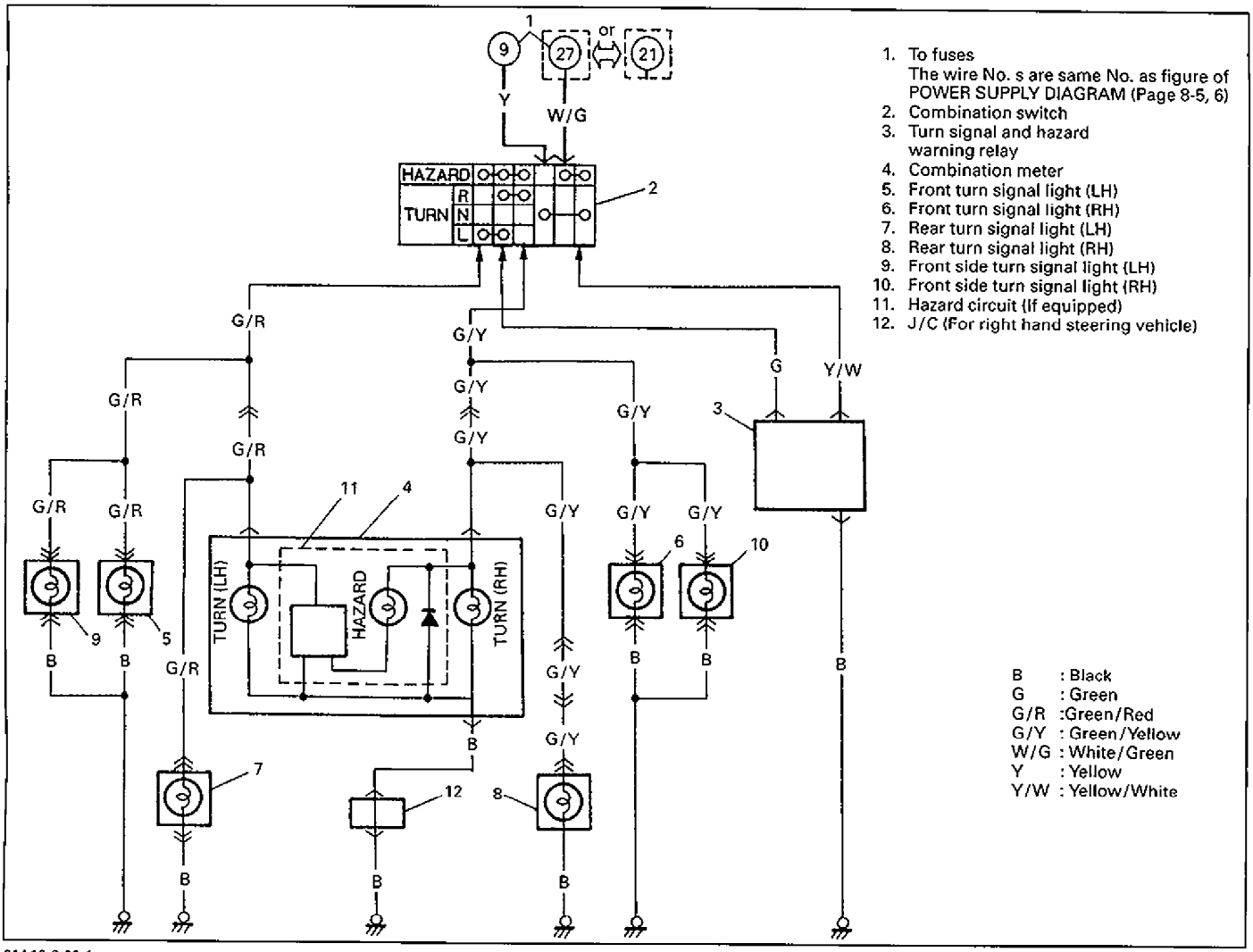
61A10-8-22-1

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Lights do not light.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Light relay faulty	Replace light relay
	• Lighting switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

TURN SIGNAL AND HAZARD WARNING LIGHT

WIRING CIRCUIT



61A10-8-23-1

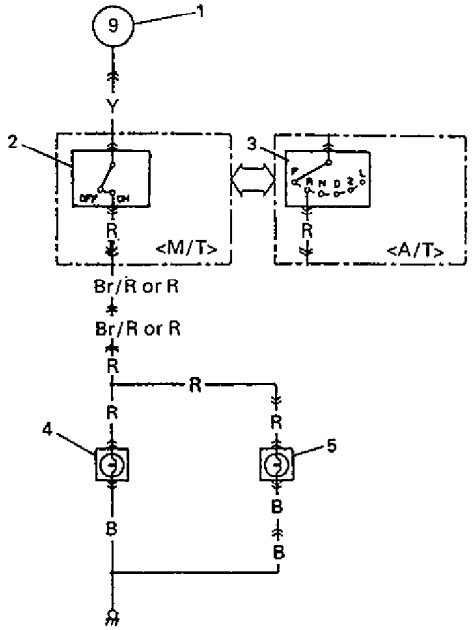
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Flashing rate high or slow, only one side flashes.	• Wiring or grounding faulty	Repair
	• Wrong bulb or setting different wattage bulb	Replace.
	• One of light bulbs burnt out on the right or left side of the front or rear side	Replace.
	• Defective turn signal and hazard warning relay	Replace.
	• Open circuit or high resistance existing between turn signal and hazard warning switch and lights on one side	Repair.
No flashing on either side.	• Blown fuse on turn signal and hazard warning circuit.	Replace.
	• Open circuit or high resistance existing between battery and switch	Repair.
	• Defective relay	Replace.

85F00-8-20-4

BACK UP LIGHTS

WIRING CIRCUIT



1. To fuse
   The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Back up light switch <M/T>
3. Shift switch <A/T>
4. Back up light (LH)
5. Back up light (RH)

B : Black
Br/R : Brown/Red
R : Red
Y : Yellow

61A10-8-24-1

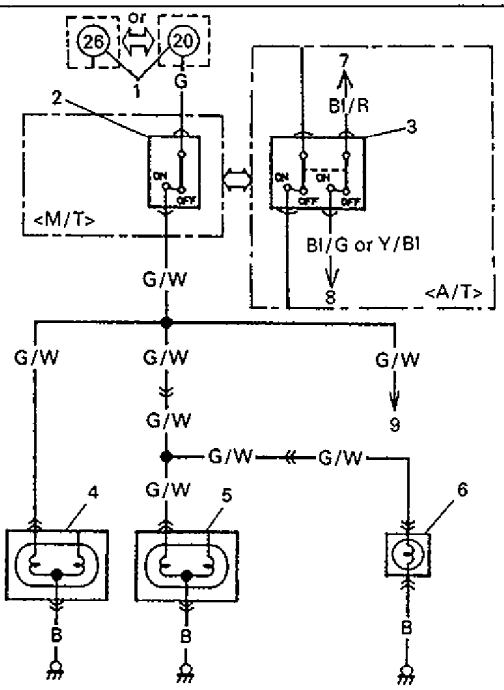
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Back-up lights do not light.	• Fuse blown	Replace fuse to check for short.
	• Back-up light switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

85F00-8-21-3

STOP LIGHTS

WIRING CIRCUIT



1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Stop light switch <M/T>
3. Stop light switch <A/T>
4. Stop light (LH)
5. Stop light (RH)
6. High mounted stop light (If equipped)
7. To shift switch <A/T>
8. To shift solenoid (4 A/T) or to fuse box (3 A/T)
9. To TCM (If equipped)

B : Black
G : Green
G/W : Green/White

61A10-8-24-4

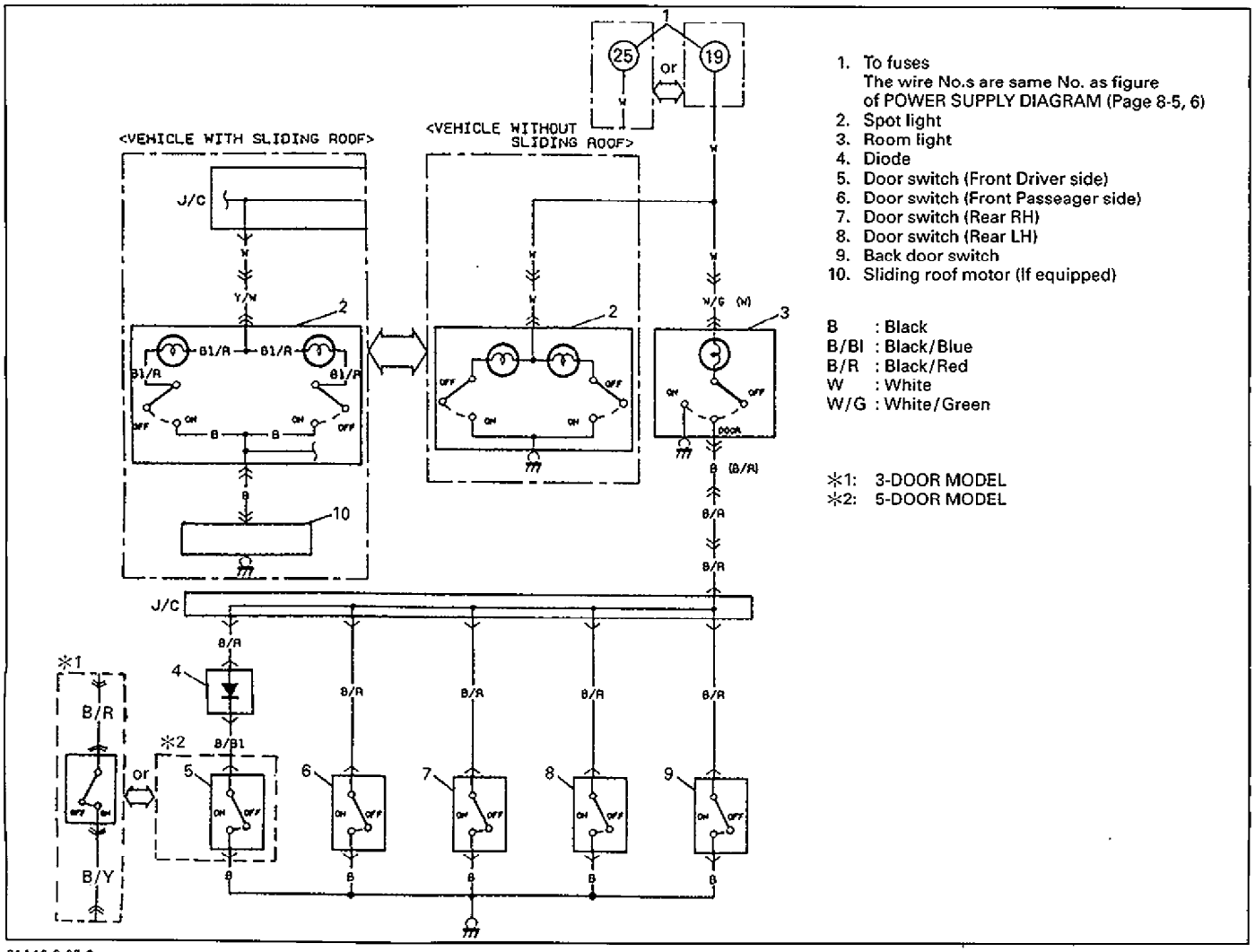
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Stop lights do not light.	• Fuse blown	Replace fuse to check for short.
	• Stop light switch faulty	Adjust or replace switch.
	• Wiring or grounding faulty	Repair as necessary.
Stop lights stay on.	• Stop light switch faulty	Adjust or replace switch.

60A20-8-24-1

INTERIOR LIGHTS

WIRING CIRCUIT



61A10-8-25-2

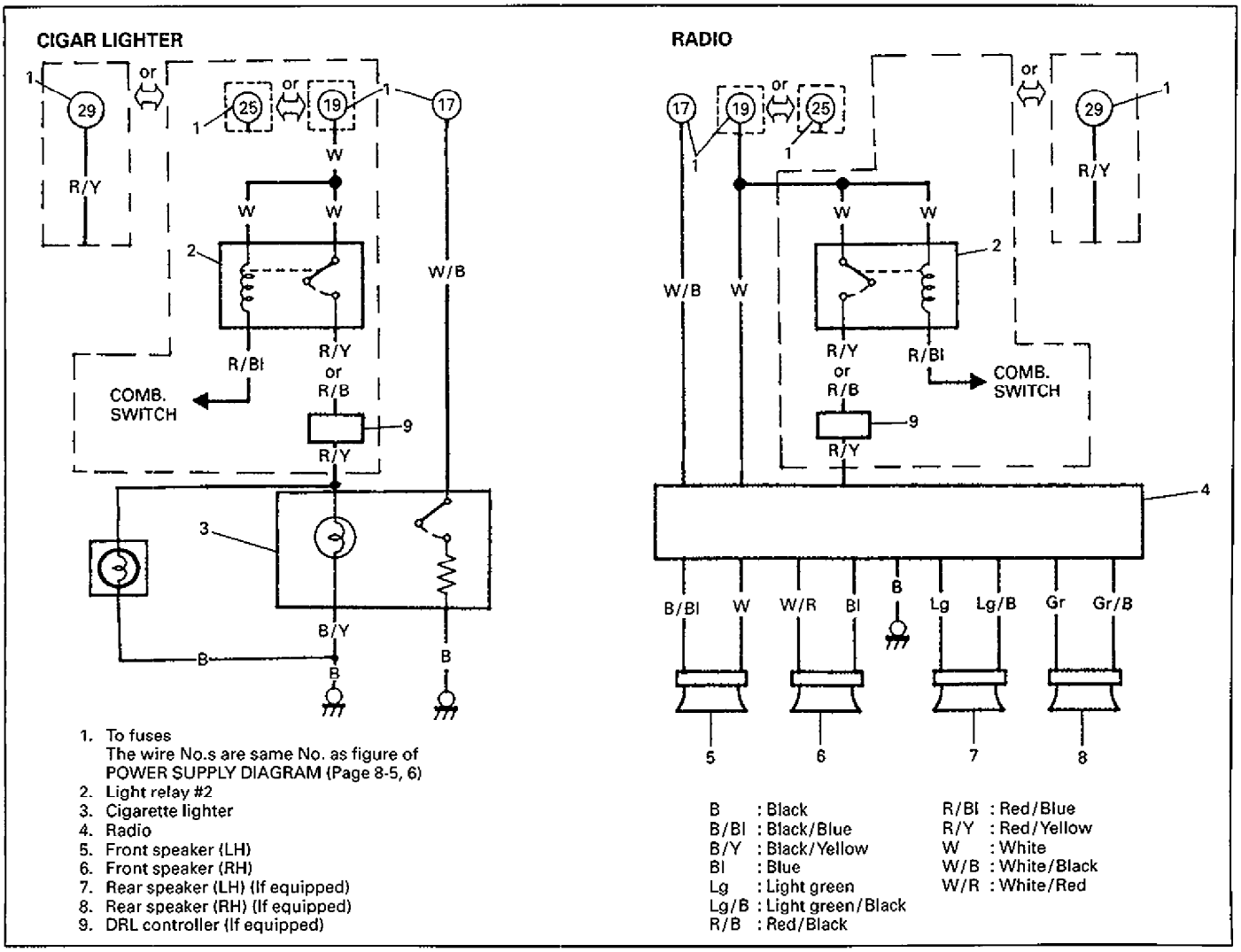
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Interior light does not light.	• Fuse blown	Replace fuse to check for short.
	• Switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

60A20-8-25-2

CIGARETTE LIGHTER AND RADIO (If equipped)

WIRING CIRCUIT



1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Light relay #2
3. Cigarette lighter
4. Radio
5. Front speaker (LH)
6. Front speaker (RH)
7. Rear speaker (LH) (If equipped)
8. Rear speaker (RH) (If equipped)
9. DRL controller (If equipped)

B	: Black	R/Bl	: Red/Blue
B/Bl	: Black/Blue	R/Y	: Red/Yellow
B/Y	: Black/Yellow	W	: White
Bl	: Blue	W/B	: White/Black
Lg	: Light green	W/R	: White/Red
Lg/B	: Light green/Black		
R/B	: Red/Black		

61A10-8-26-1

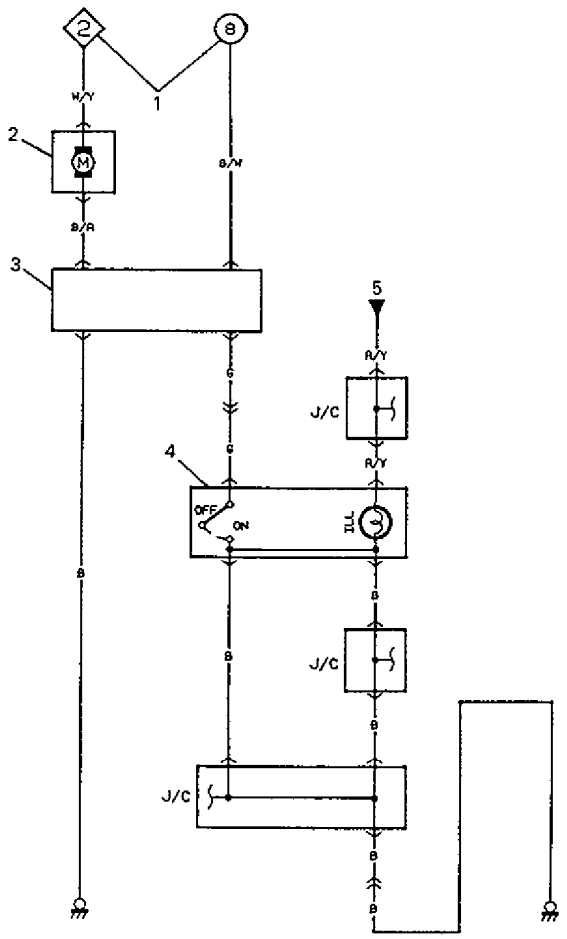
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Cigarette lighter / radio (optional) do not work.	• Fuse blown	Replace fuse to check for short.
	• Ignition switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

85F00-8-23-4

HEADLIGHT WASHER (If equipped)

WIRING CIRCUIT



1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Head light washer motor
3. Head light washer controller
4. Head light washer switch
5. To light relay #2

B : Black
B/R : Black/Red
B/W : Black/White
G : Green
R/Y : Red/Yellow
W/Y : White/Yellow

61A10-8-27-1

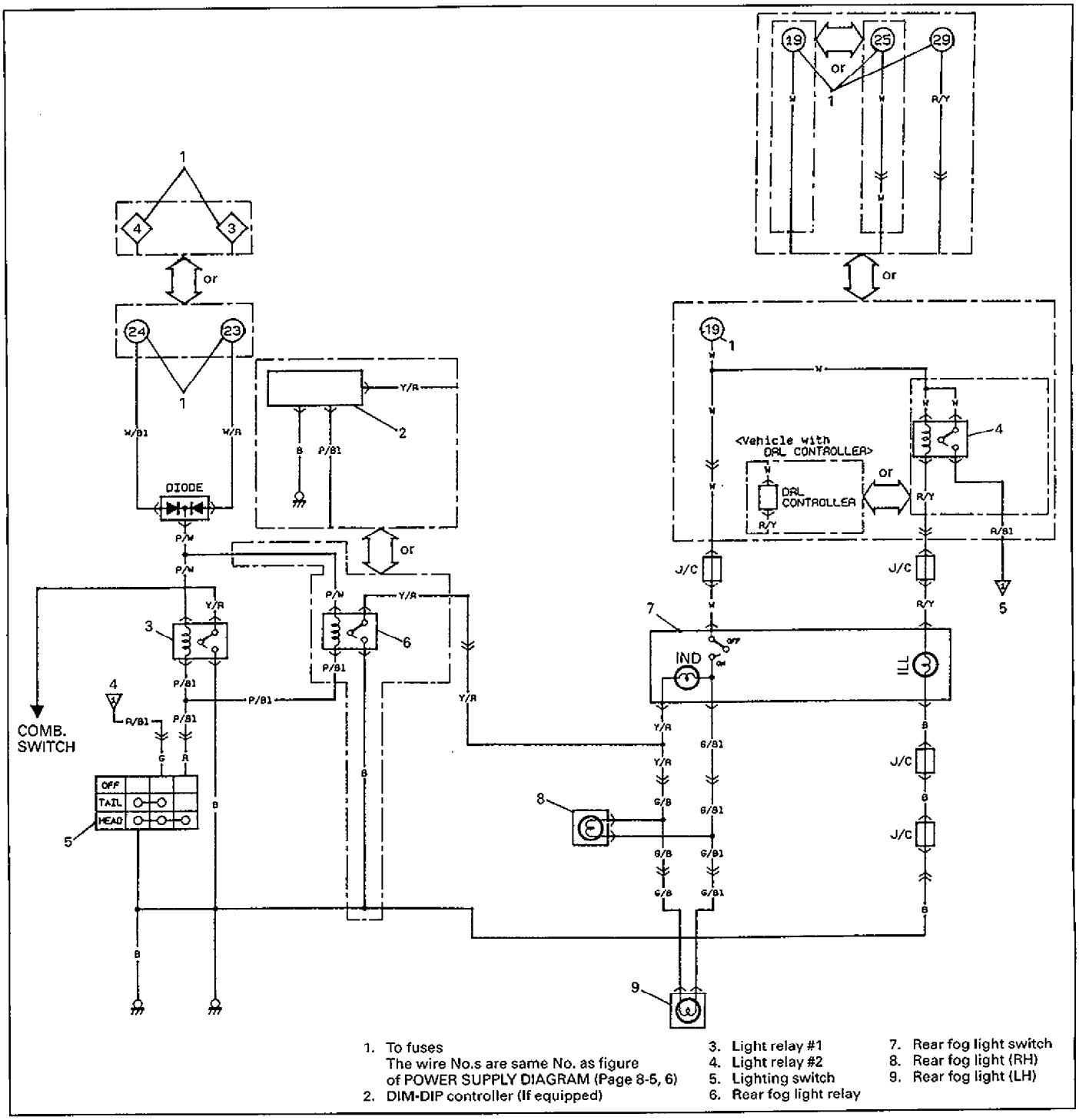
TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Wiper malfunctions or does not return to original position.	• Wiper fuse blown	Replace blown fuse to check for short.
	• Wiper motor faulty	Check motor.
	• Wiper control switch faulty	Check switch.
	• Wiring or grounding faulty	Repair.
Washer malfunctions.	• Washer hose or nozzle clogged	Repair.
	• Washer motor faulty	Check motor.
	• Wiper control switch faulty	Check switch.
	• Wiring faulty	Repair.

61A10-8-27-4

REAR FOG LIGHT (If equipped)

WIRING CIRCUIT



1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. DIM-DIP controller (If equipped)
3. Light relay #1
4. Light relay #2
5. Lighting switch
6. Rear fog light relay
7. Rear fog light switch
8. Rear fog light (RH)
9. Rear fog light (LH)

61A10-8-28-1

TROUBLE DIAGNOSIS

Trouble	Possible cause	Correction
Lights do not light.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Light relay faulty	Replace light relay
	• Lighting switch faulty	Check switch.
	• Wiring or grounding faulty	Repair as necessary.

	W	G/Bl	B	R/Y
OFF			○—⊙—○	
ON	○—⊙—○		○—⊙—○	

B : Black
G/Bl : Green/Blue
R/Y : Red/Yellow
W : White

INSPECTION

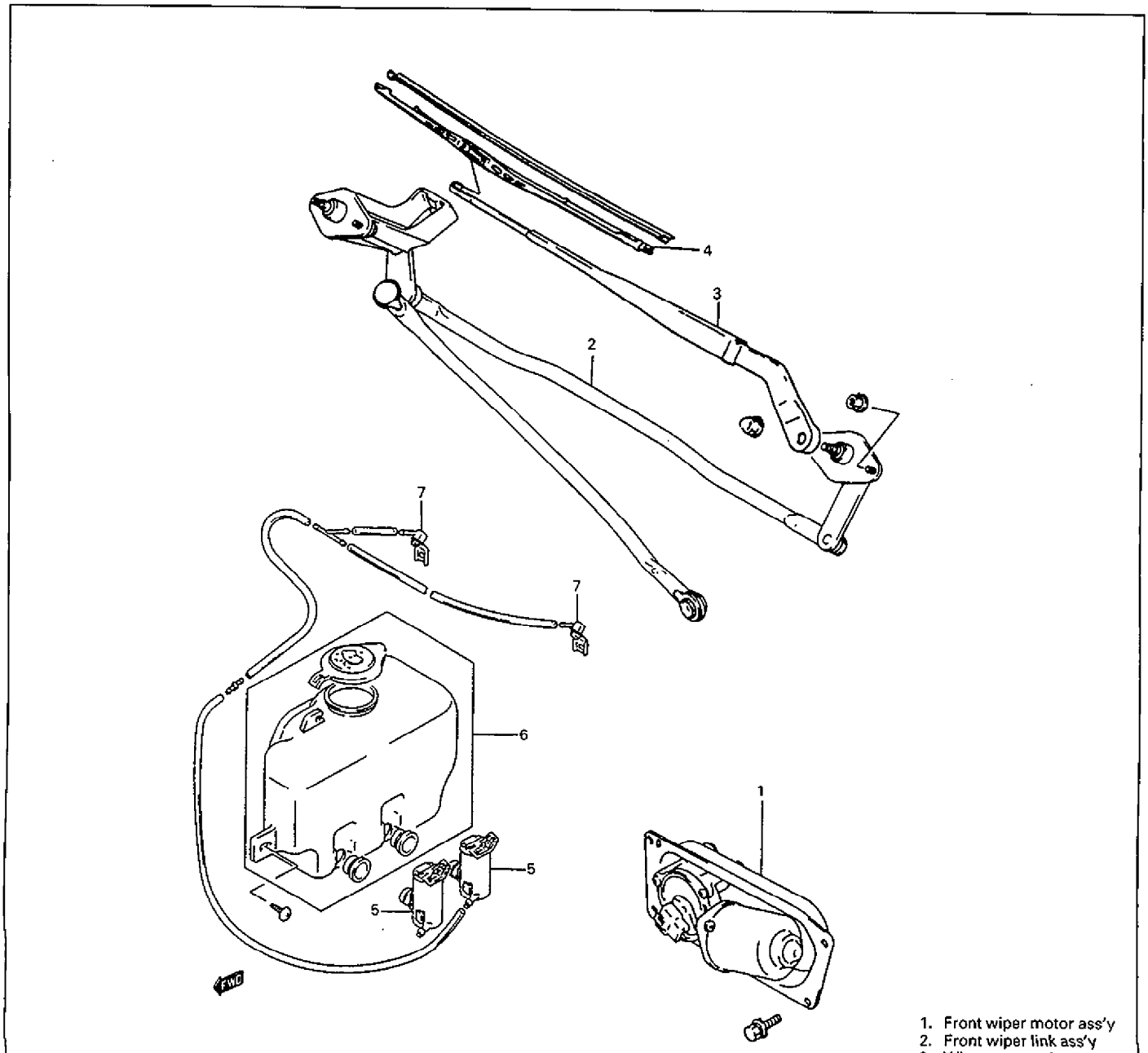
Rear Fog Light

Use a circuit tester to check rear fog light switch for continuity. If switch has no continuity between terminals, replace.

61A10-8-29-1

WINDSHIELD WIPER (FRONT WIPER)

The windshield wiper is 3-speed type and the windshield washer is equipped with a separate-type washer pump.



1. Front wiper motor ass'y
2. Front wiper link ass'y
3. Wiper arm ass'y
4. Wiper blade ass'y
5. Washer pump ass'y
6. Washer tank ass'y
7. Washer nozzle

61A10-8-29-2

DESCRIPTION OF CIRCUIT

The circuit is designed so that when the wiper switch is turned OFF the wiper blades automatically return to their specified rest positions. In figure below, when the wiper switch is turned ON with the ignition switch ON, current is supplied continuously from the battery (via lead Y/Bl–switch–lead Bl or Bl/R) to the motor, running the motor to move the blades.

The gear-and-linkage mechanism, which converts the rotary movement of the motor to the wiping movement of the blades, has a contact plate on the shaft of its output gear.

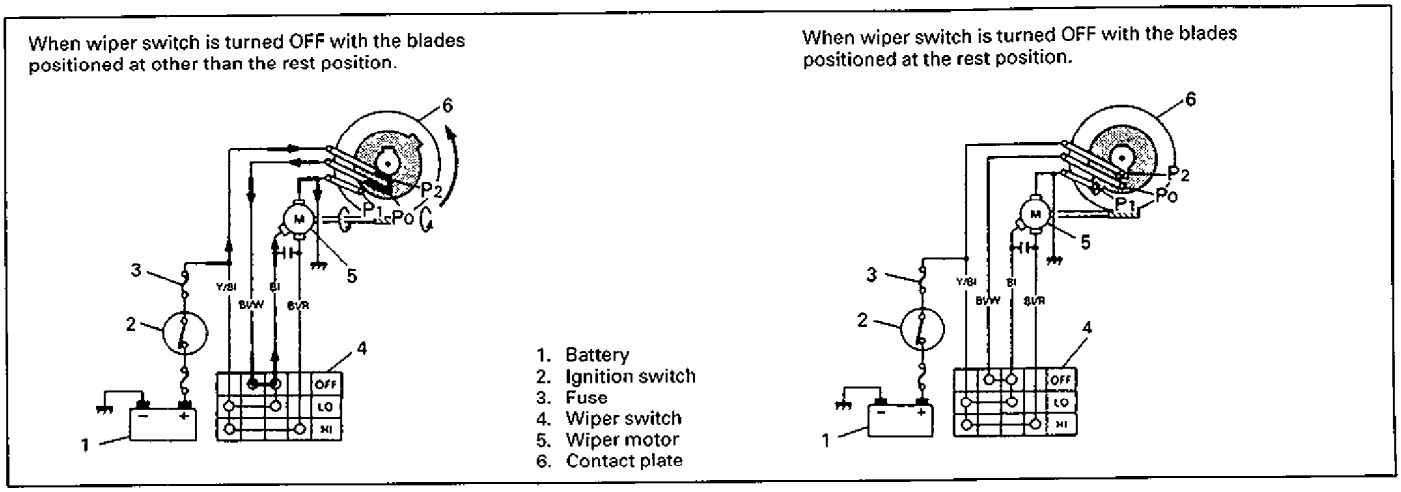
The plate serves to connect the contact P_0 to the contact P_1. Although the plate thus serves to make and break the circuits containing the contacts P_0, P_1 and P_2, the wiper motor makes its rotation completely independent of this plate rotation. When the wiper switch is turned OFF (the switch is set to the OFF position) with the blades positioned at the rest positions, current supply is cut, causing the motor to stop with the blades staying at the same positions.

Even when the wiper switch is turned OFF (the switch is set to the OFF position) with the blades positioned other than at the rest positions, current is still supplied, though intermittently, through a different path from the battery (via lead Y/Bl–contact P_2–contact P_0–lead Bl/W–switch (OFF position)–lead Bl) to the motor.

Thererfore, the motor can still rotate supplied with this intermittent current, causing the blades to return to the rest positions.

As soon as the blades have returned to their rest positions, the plate connects contact P_0 to contact P_1, causing current to be shunted around the motor.

When current is no longer supplied to the motor, a counter electromotive force is generated in the motor armature, causing a current to flow through the motor-and-shunt circuit so that the motor is stopped with the blades staying at the specified rest positions.



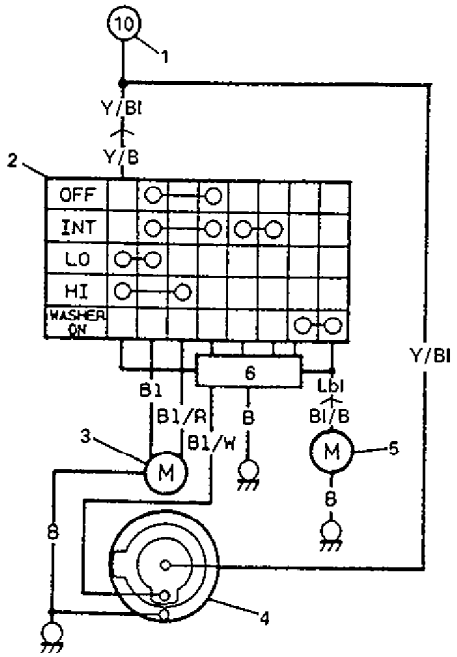
61A10-8-30-1

INTERMITTENT WIPER RELAY CIRCUIT (If equipped)

When the wiper switch is set to the intermittent position with the ignition switch ON (the condenser is charged at this time), current from the battery flows through the Y/Bl wire, generates magnetic force in the coil in the relay and causes the switch in the relay to turn ON. Then current is transmitted in the sequence of Y/Bl, Bl/W, wiper switch and Bl, and causes the wiper motor to rotate (meanwhile, the condenser discharges). By the time the wiper motor makes one rotation and the contact plate in the motor comes to the automatic stop position P_1, the condenser in the relay has finished discharging (no magnetic force in the coil in the relay). Then the switch in the relay turns OFF and the wiper stops. They remain that way until the condenser is fully charged. As soon as the condenser begins discharging after being fully charged, magnetic force generated in the coil in the relay causes the switch to turn ON. As described above, intermittent operation of the wiper motor is controlled by charging and discharging of the condenser.

85F00-8-25-6

WIRING CIRCUIT



1. To fuses
   The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Combination switch
3. Wiper motor
4. Wiper return switch
5. Washer motor
6. Wiper intermittent relay

B : Black
Bl : Blue
Bl/B : Blue/Black
Bl/R : Blue/Red
Bl/W : Blue/White
Lbl : Light blue
Y/B : Yellow/Black
Y/Bl : Yellow/Blue

61A10-8-31-1

TROUBLE DIAGNOSIS

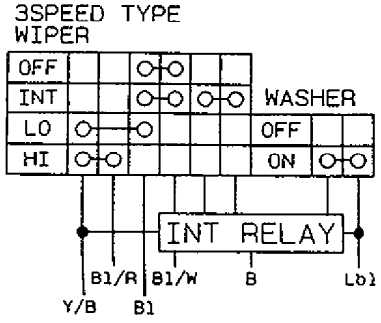
Trouble	Possible cause	Correction
Wiper malfunctions or does not return to original position.	• Wiper fuse blown	Replace blown fuse to check for short.
	• Wiper motor faulty	Check motor.
	• Wiper control switch faulty	Check switch.
	• Wiring or grounding faulty	Repair.
Washer malfunctions.	• Washer hose or nozzle clogged	Repair.
	• Washer motor faulty	Check motor.
	• Wiper control switch faulty	Check switch.
	• Wiring faulty	Repair.

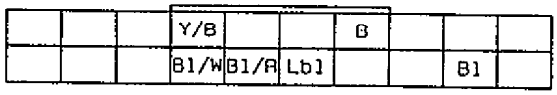
64B40-8-27-1

INSPECTION

A. Wiper / washer Switch

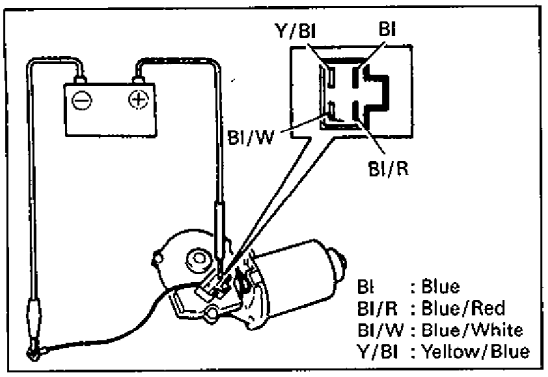
Use a circuit tester to check switch for each terminal-to-terminal continuity.





B : Black
Bl/R : Blue/Red
Bl/W : Blue/White
Lbl : Light Blue
Y/B : Yellow/Black

61A10-8-31-5



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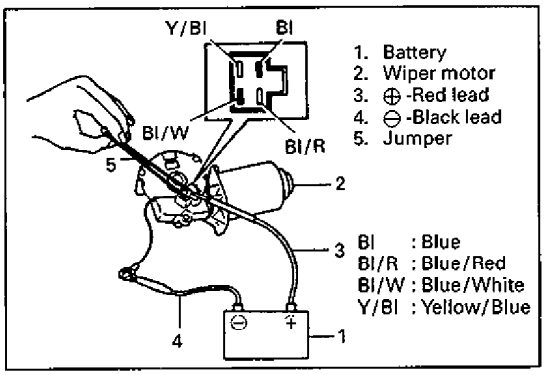
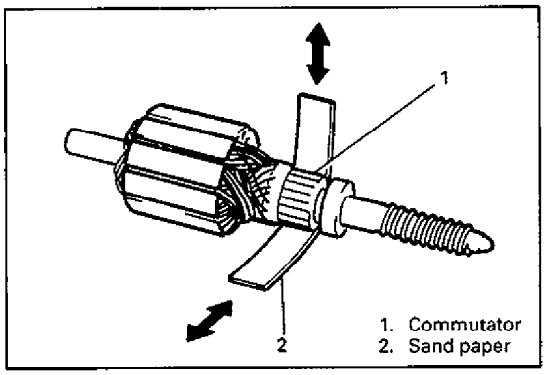
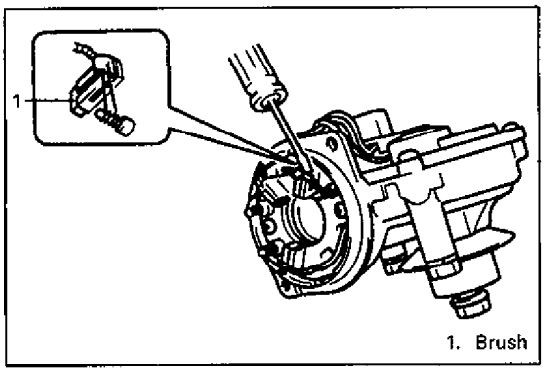


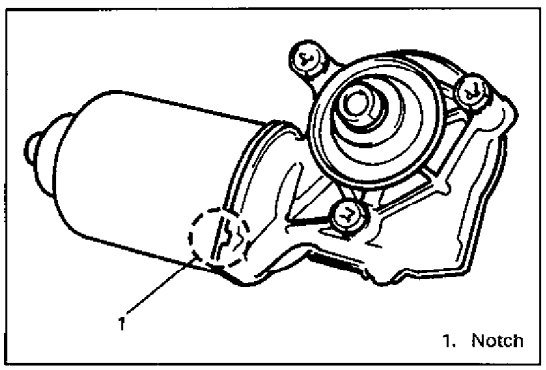
60A20-8-30-2



60A20-8-30-3



61A10-8-32-4



61A10-8-32-5

B. Wiper Motor

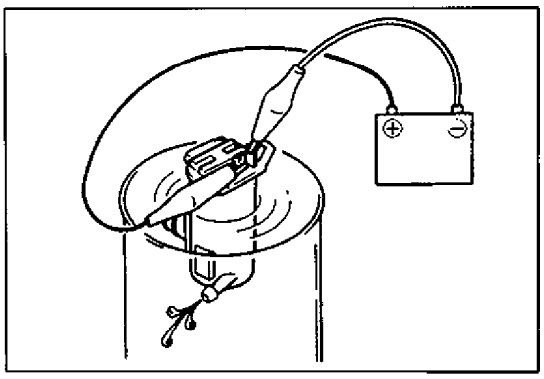
1. As illustrated left, use a 12 V battery to connect its (+) terminal to Blue terminal, and its (–) terminal to Black lead cord. If motor rotates at a low revolution speed of 45 to 55 rpm, it is proper. As for high speed check, connect battery (+) terminal to Blue/Red terminal, and its (–) terminal to Black lead cord. If motor rotates at a high revolution speed of 68 to 78 rpm, it is proper.

2. Testing automatic stop action
   Connect battery (+) terminal to motor Yellow/Blue terminal, and (–) terminal to Black lead cord, respectively. Use a jumper to short Blue/White and Blue terminals to each other to check whether motor shaft stops at a given position. This position must conform to start position. Stop motor again and again with the jumper to confirm that it stops at the same position.

3. Checking brush and commutator
   Use a circuit tester to check Blue terminal-to-Black lead cord continuity. If continuity is poor, check brush-to-commutator contact area for proper condition.
   When the area is fouled, use a cloth wetted with gasoline to clean the area. When surface of the area is coarse or burnt, use a sandpaper to smooth it.

NOTE:
When reinstalling wiper motor, fit brush into each brush holder and hook brush lead wire around holder beforehand. After reinstalling it, release each brush.

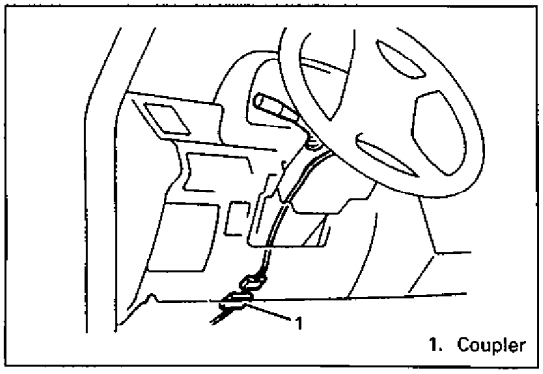
When installing wiper motor cover, be careful of its notch position to assemble it to specified position.



60A20-8-31-1

C. Washer Pump

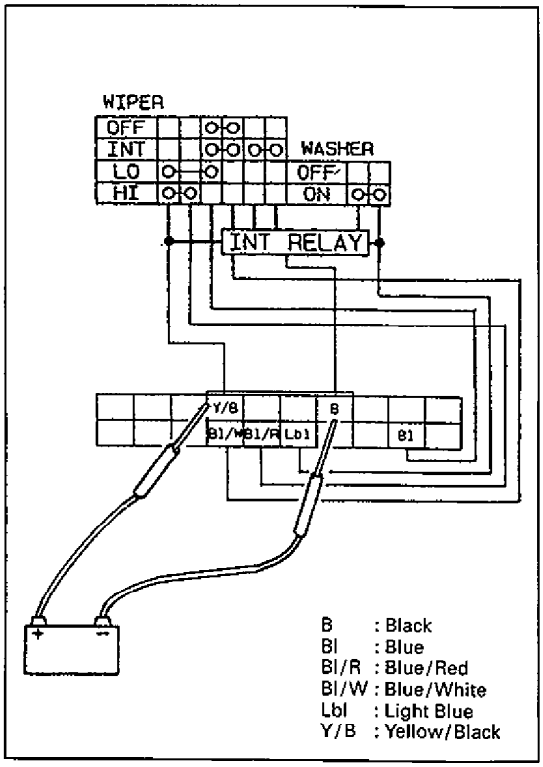
Connect battery (+) and (–) terminals to pump (+) and (–) terminals respectively to check the pumping rate.



85F00-8-28-2

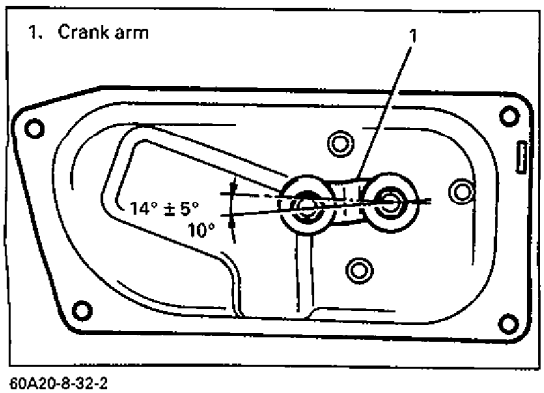
D. Intermittent Wiper Relay Circuit (If equipped)

1) Disconnect wiper & washer switch coupler.



85F00-8-28-3

2) Turn wiper switch to "INT" position.
3) Connect (+) cord and (–) cord of 12 V battery to coupler terminals as shown left. If an operating sound is heard from relay, it is at work properly.



60A20-8-32-2

INSTALLATION

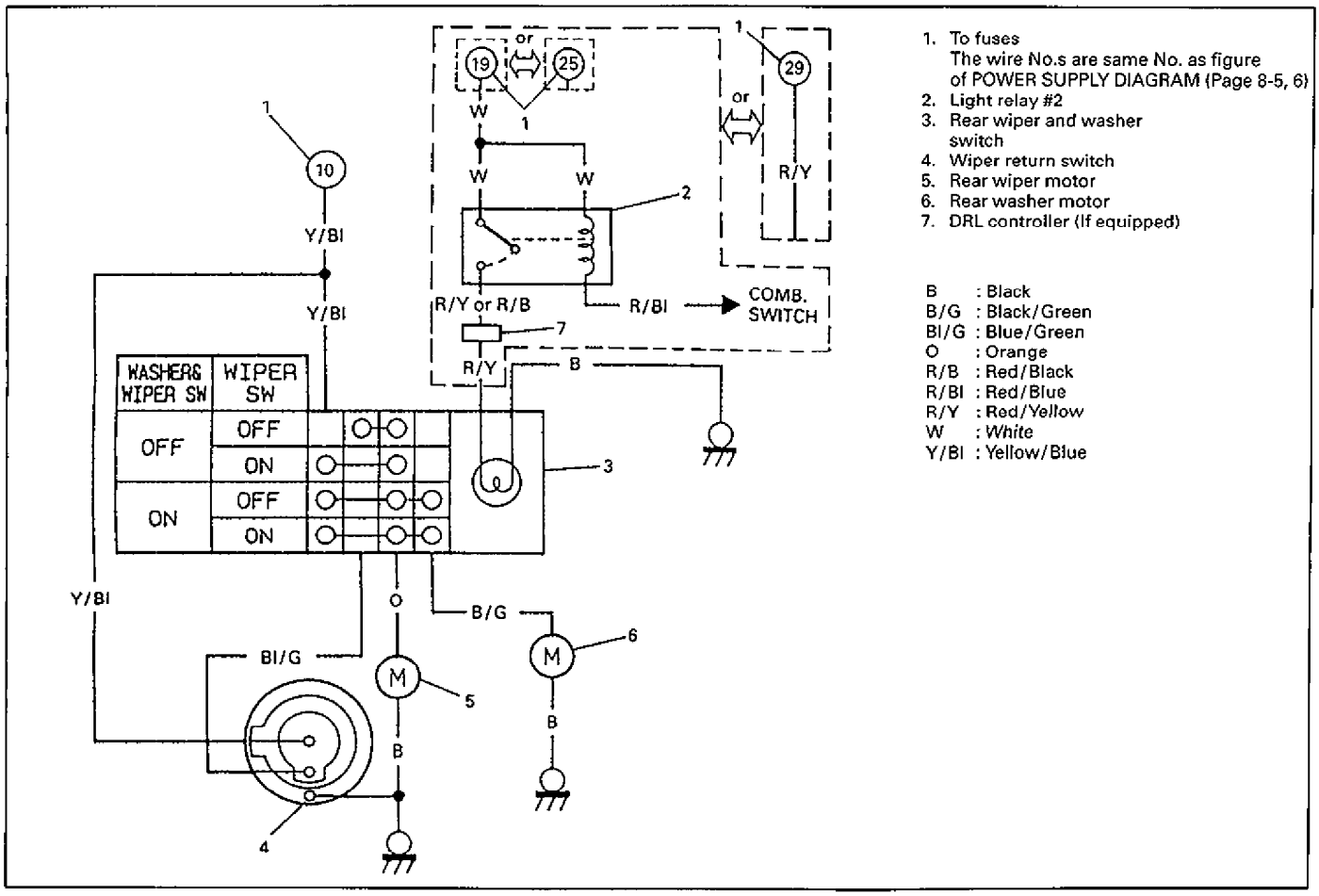
Wiper Motor, Linkage and Arms

1) Install wiper linkage.
2) Install wiper motor into position.
3) Connect electric connector to motor.
4) Turn ignition switch ON. Set wiper switch to ON position, and then to OFF position.
   Thus make sure that crank arm is positioned as shown left.
5) Install wiper arms.

REAR WINDOW WIPER AND WASHER (If equipped)

The rear window wiper is of the one-speed type, and its washer is equipped with a separate-type washer pump.

WIRING CIRCUIT



61A10-8-34-1

DESCRIPTION OF CIRCUIT AND TROUBLE DIAGNOSIS

Refer to "WINDSHIELD WIPER (FRONT WIPER)" in this section.

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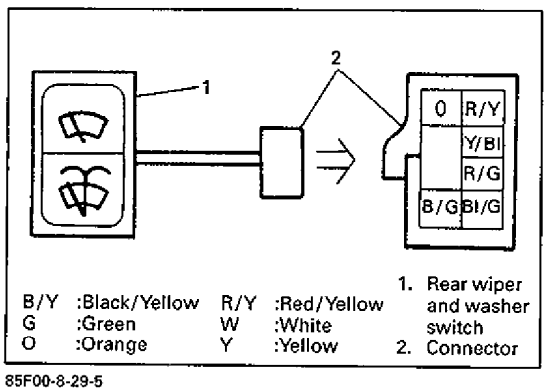


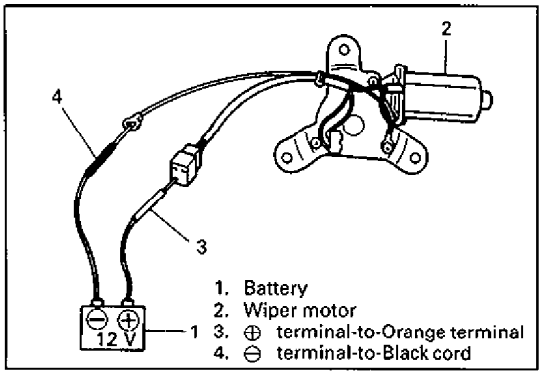
85F00-8-29-5

INSPECTION

A. Wiper And Washer Switches

Use a circuit tester to check switches for continuity.

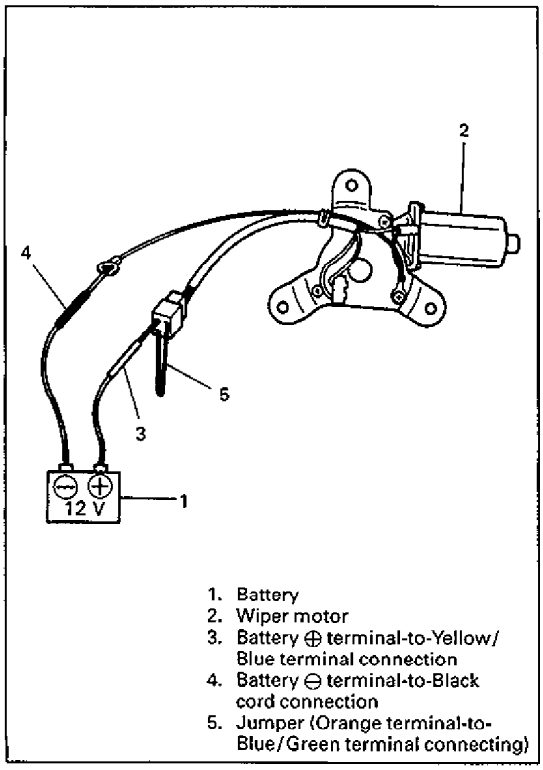
Wahser & Wiper	Wiper	Y/Bl	O	Bl/G	B/G	R/Y	R/G
OFF	OFF		○—○			○	○
	ON	○—○					
ON	OFF	○	○		○		
	ON	○	○		○		



60A20-8-38-1

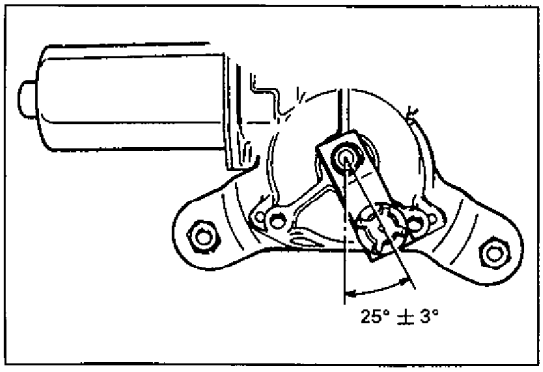
B. Wiper Motor

1. As shown left, use a 12 V battery to connect its (+) and (–) terminals to the Orange terminal and Black lead cord respectively. If motor rotates at a range of 38 to 46 rpm, it is proper.



60A40-8-38-2

2. Testing automatic stop action
   Connect battery (+) and (–) terminals to motor Yellow/Blue terminal and Black lead cord respectively.
   Use a jumper to short Orange and Blue/Green terminals to each other to check whether motor shaft stops at a given position. Use jumper to make sure again and again that shaft stops at the same position.
3. Checking brush and commutator
   Use a circuit tester to check Orange terminal-to-Black lead cord continuity. If continuity is poor, check brush-and-commutator area for proper contact condition.
   If fouled, clean the area with a cloth wetted with gasoline.
   If surface of the area is coarse or burnt, smooth it with a sand-paper.
   (Refer to "FRONT WIPER MOTOR" Section.)



60A20-8-38-4

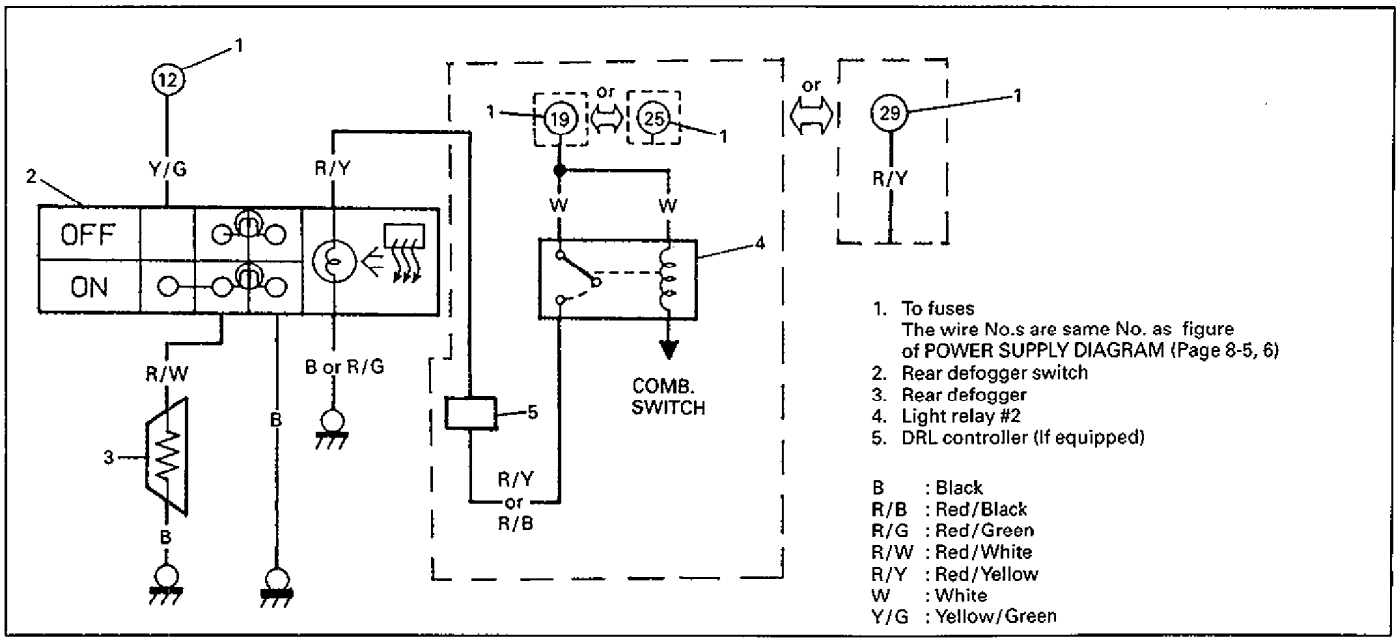
4. Crank arm position
   Make sure that crank arm is positioned as illustrated when switch is set to automatic stop position.
   If not, repair wiper motor.

C. Washer Pump

In the same manner as with the windshield washer pump, check the pumping rate.

REAR WINDOW DEFOGGER (If equipped)

The optional rear window defogger system has horizontal ceramic silver compound elements and two vertical bus bar. The system is operated by the defogger switch in the instrument panel.

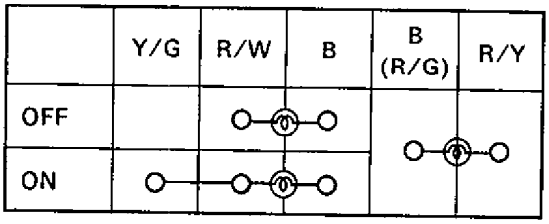


61A10-8-36-1

TROUBLE DIAGNOSIS

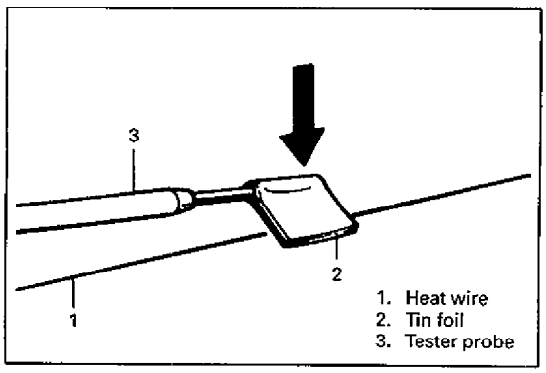
Trouble	Possible cause	Correction
Defogger won't work.	• Defogger switch faulty	Check switch.
	• Defogger heat wire faulty	Check heat wire.
	• Wiring or grounding faulty	Repair as necessary.

60A20-8-32-4



Y/G :Yellow with Green tracer
R/W :Red with White tracer
B :Black
R/G :Red with Green tracer
R/Y :Red with Yellow tracer

60A40-8-33-1



60A20-8-33-2

INSPECTION

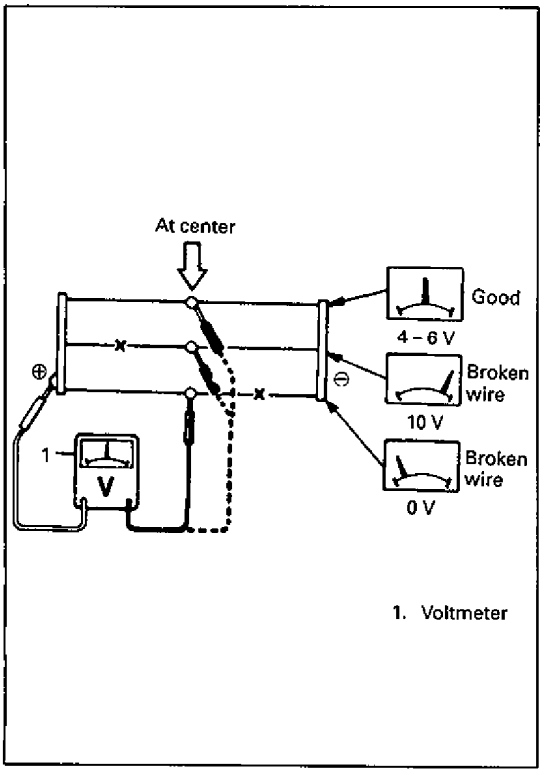
A. Defogger Switch

Use a circuit tester to check defogger switch for continuity. If switch has no continuity between terminals, replace.

B. Defogger wire

NOTE:

- **When cleaning rear window glass, use a dry cloth to wipe it along wire direction.**
- **When cleaning glass, do not use detergent or abrasive – 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.**

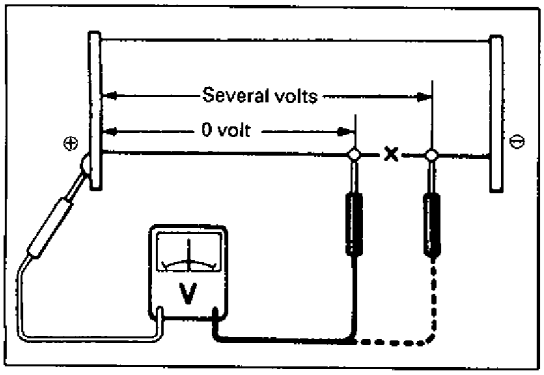


60A20-8-33-3

1. Checking wire damage
   a. Turn main switch ON.
   b. Turn defogger switch ON.
   c. Use a voltmeter to check voltage at the center of each heat wire, as shown.

Voltage	Criteria
Approx. 5 V	Good (No break in wire)
Approx. 10 or 0 V	Broken wire

If measured voltage is 10 V, wire must be damaged between its center and positive end. If voltage is zero, wire must be damaged between its center and ground.

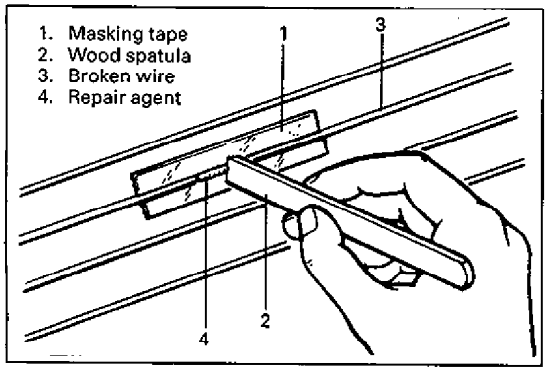


60A20-8-33-5

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 to 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 12 V at the heat wire positive terminal end and its indication should decrease gradually toward zero at the other terminal (ground).

60A20-8-34-1



60A20-8-34-2

REPAIR

Defogger Circuit

1) Use white gasoline for cleaning.
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 the masking tapes previously applied.
5) Leave repaired heat wire as it is for at least 24 hours before operating defogger again.

60A20-8-34-3

INSTALLATION

When installing rear window defogger (optional), have following parts available.

- Back window glass
- Defogger switch
- Defogger lead wires (positive and negative wire)

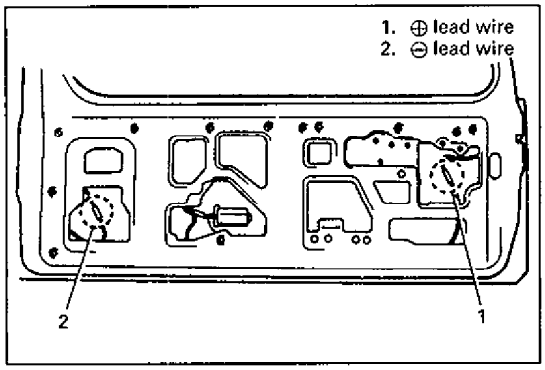
60A20-8-34-4

Removal

Remove following parts:

- Back window glass
  (Refer to Section 9 of Service Manual mentioned in FOREWORD of this manual for removal).
- Back door trim, water proof film

61A10-8-38-3



60A20-8-35-1

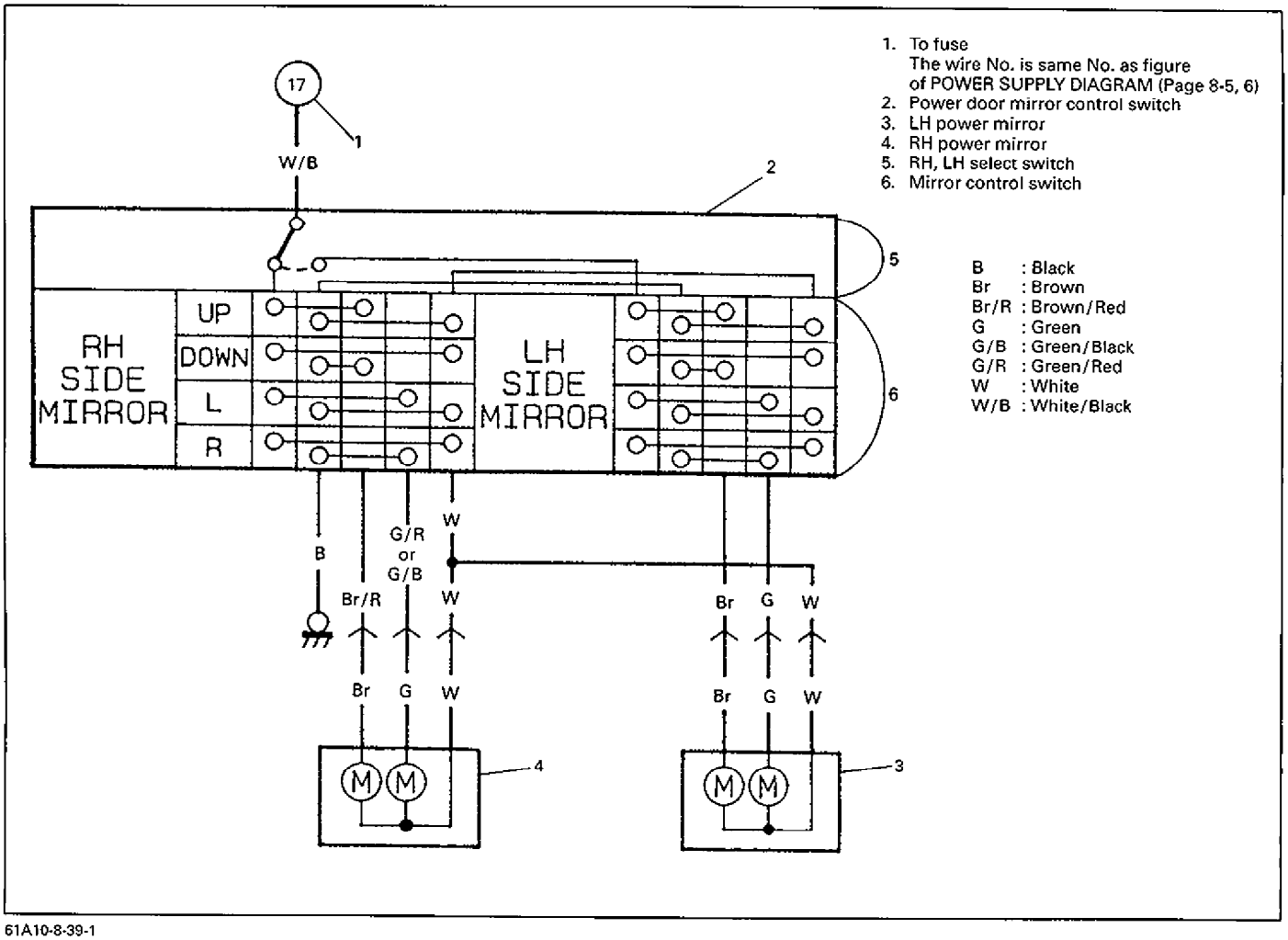
Installation

Before installing, disconnect negative cable at battery.

1) Install back window glass.
2) Connect lead wires to harness connectors.
3) Install defogger switch on instrument panel and connect switch connector to harness connector.

POWER DOOR MIRROR CONTROL SYSTEM (If equipped)

The power door mirror control system consists of the power door mirror control switch, door mirror actuator and related wiring harness.



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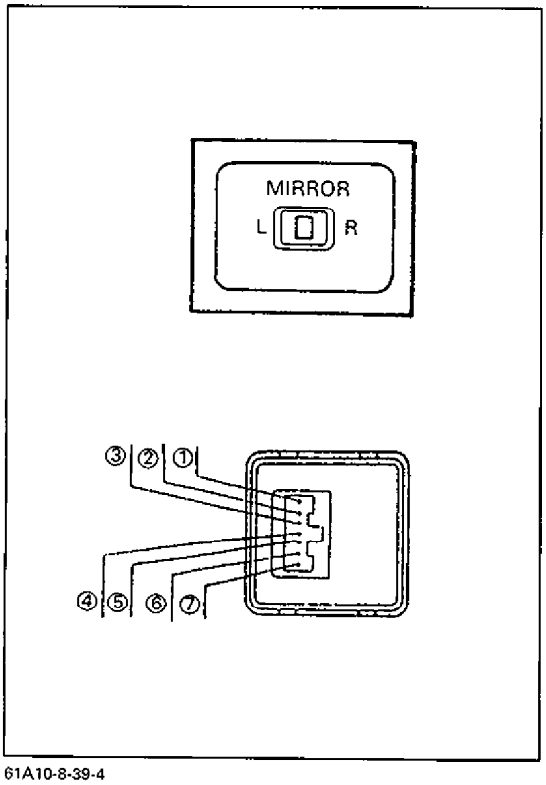


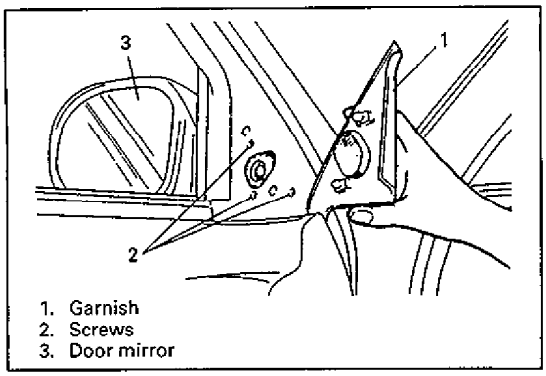
61A10-8-39-4

INSPECTION

Mirror Switch

1) Take out mirror switch from instrument panel.
2) Check continuity at each switch position by using a circuit tester.
   If any continuity is not obtained, replace mirror switch.

LH / RH	①	②	③	④ ⑤	⑦ ⑥
UP	○	○	○	○	
DOWN	○	○	○	○	
LEFT	○	○	○		○
RIGHT	○	○	○		○

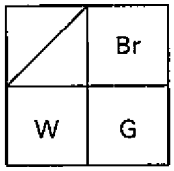


1. Garnish
2. Screws
3. Door mirror

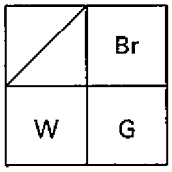
64B40-8-42-1

Door Mirror

1) Remove garnish and screws from door.
2) Remove door mirror from door by disconnecting coupler.



left side



right side

Left side	W	Br	G	Operation
Right side	W	Br	G	
	⊖	⊕		up
	⊕	⊖		down
	⊖		⊕	left
	⊕		⊖	right

Br : Brown
G : Green
W : White

85F00-35-2

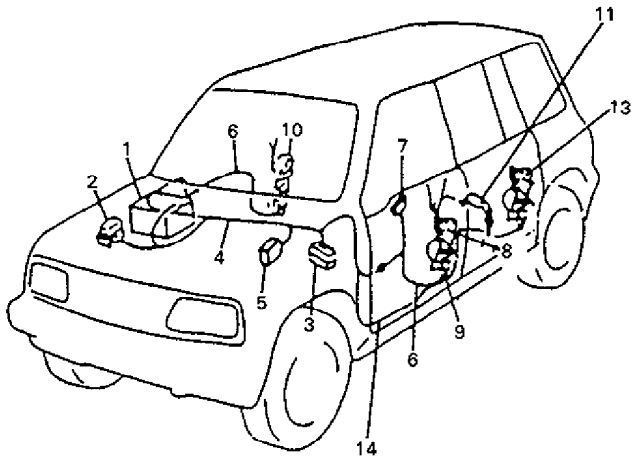
3) Check that door mirror operates properly when battery voltage is applied to connector terminals.

   If malfunction is found, correct or replace.

NOTE:
When installing door mirror to door, be careful not to pinch harness between door and door mirror.

CENTRAL LOCKING SYSTEM (If equipped)

The central locking system consists of the power door lock controller, door lock switch, door latch switch, ignition key & door cylinder, motors and related wiring harness.



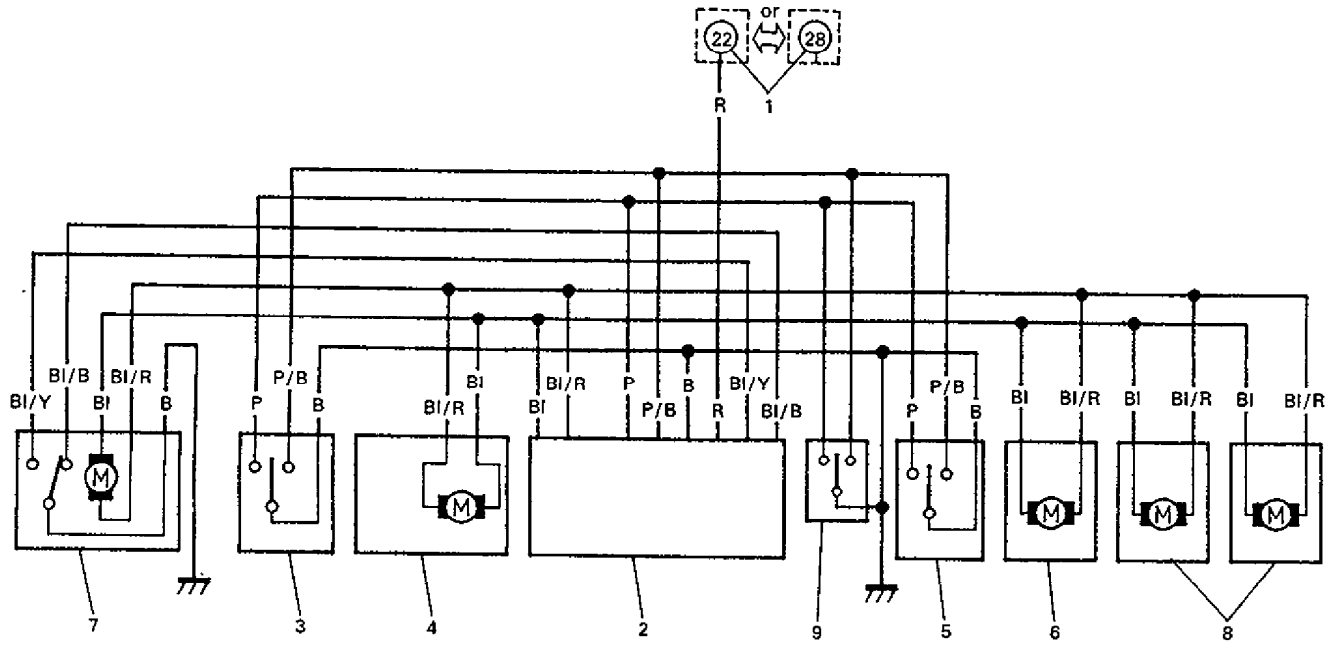
1. Battery
2. Main fuse box ass'y
3. Fuse box ass'y
4. Main wiring harness ass'y
5. Power door lock controller
6. Motor & switch wire
7. Power door lock switch (Power window main switch)
8. Driver side motor
9. Door latch switch
10. Passenger side motor
11. Ignition key & door cylinder
12. Inside lock knob
13. Rear door motor (Left) (5-door model only)
14. Floor wiring harness

61A10-8-41-1

WIRING DIAGRAM

1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Power door lock controller
3. Driver side door latch switch
4. Driver side motor switch
5. Passenger side door latch switch
6. Passenger side motor
7. Back door motor & latch switch
8. Rear door lock motor (5-door model only)
9. Power door lock switch

B : Black
Bl : Blue
Bl/B : Blue/Black
Bl/R : Blue/Red
Bl/y : Blue/Yellow
P : Pink
P/B : Pink/Black
R : Red



61A10-8-41-3

CENTRAL LOCKING SYSTEM CIRCUIT AND OPERATION

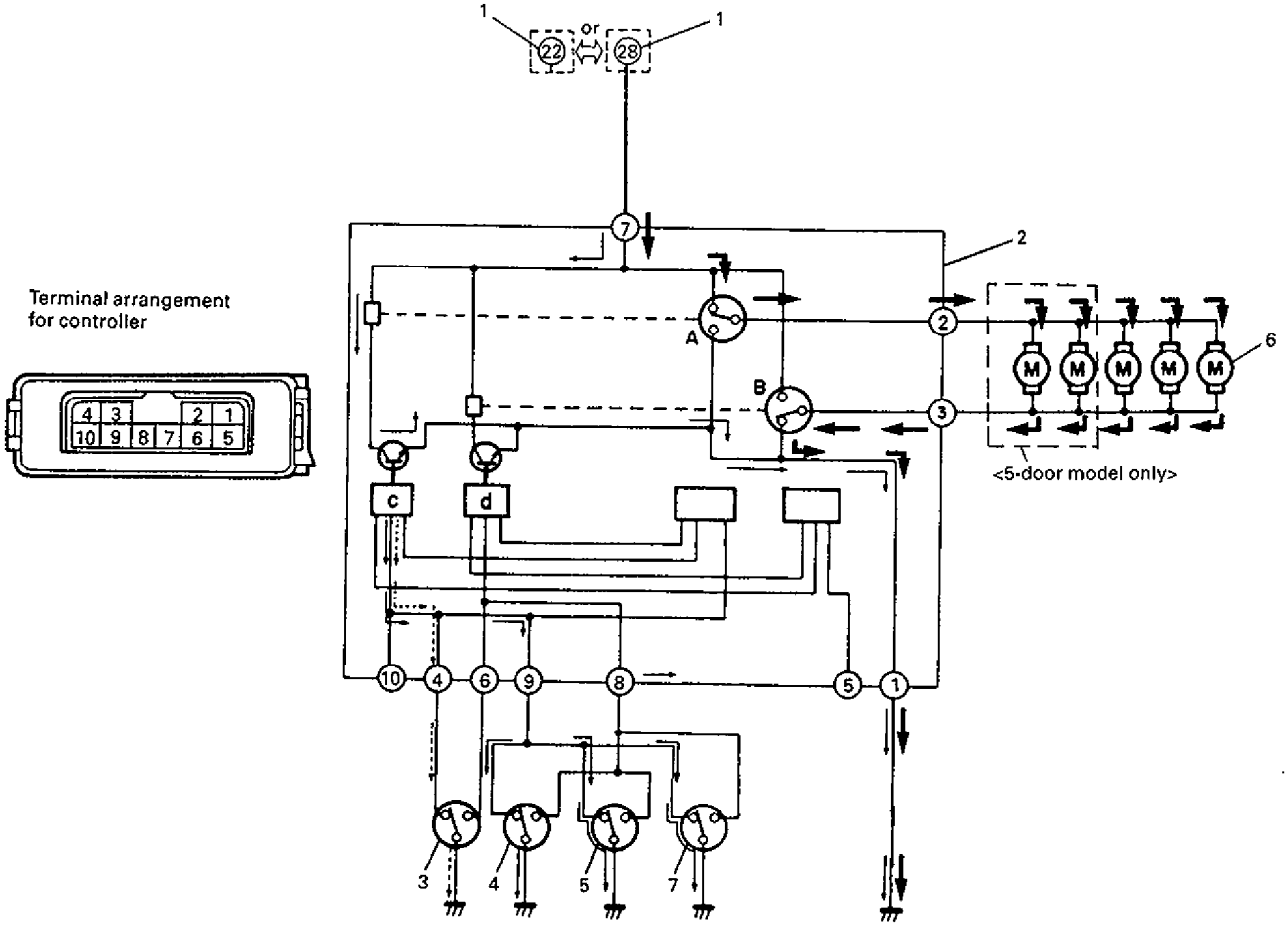
Locking Operation

Figure below shows the central locking system circuit in operation as "LOCK".

1. When the ignition key is used to lock the door or the lock switch is set to the "LOCK" position, the electric current flows as shown by fine arrow (⟶).
2. Then the switch A which is built in the power door lock controlled turn ON for their "LOCK" side and the electric current flows as shown by bold arrow (➡) to cause the motor to operate.
3. The arrow (- - ➝) shows the electric current flow when the back door lock is set to the lock position.
4. As the electric current flowing to motor is controlled by the timer "c" which is built in the power door lock controller, switch A automatically turn OFF and electric current flow stops.

"LOCK"

1. To fuses
   The wire No.s are same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Power door lock controller
3. Back door switch
4. Driver side door latch switch
5. Passenger side door latch switch
6. Door lock motor
7. Door lock switch
c. Lock timer
d. Un-lock timer



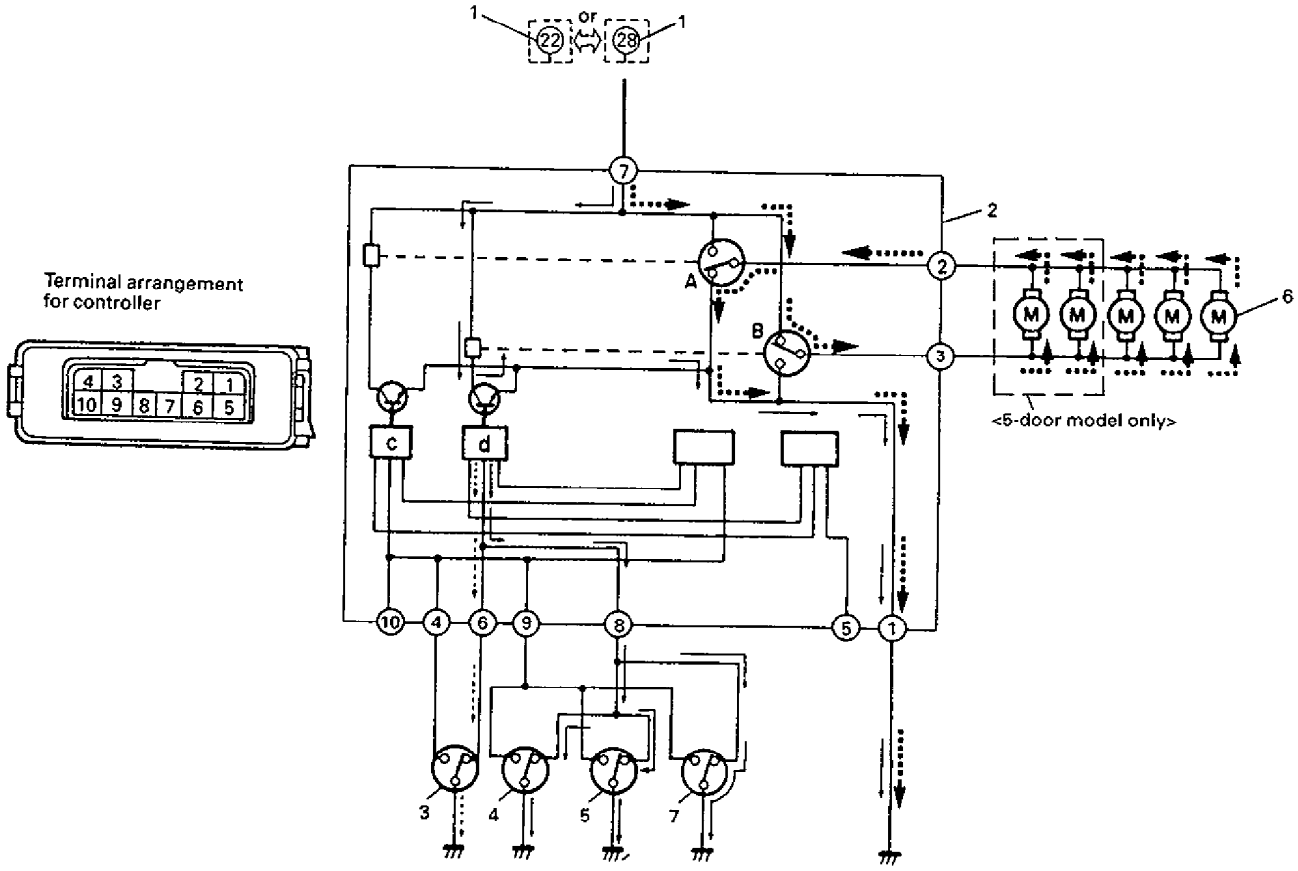
Unlocking Operation

Figure below shows the circuit in operation as "UNLOCK".

1. When the ignition key is used to unlock the door or the door lock switch is set to the "UNLOCK" position, the electric current flows as shown by fine arrow (⟶).
2. Then the switch B which is built in the power door lock controller turn ON for their "UNLOCK" side and the electric current flows as shown by bold broken arrow (⇢) to cause the motor to operate.
3. When the back door lock is set to the unlock position, the electric current flows as shown by the arrow (- - ➝) to unlock the door.
4. As the electric current flowing to motor is controlled by the timer "d" the switch B automatically turns OFF and the electric current flow stops.

"UNLOCK"

1. To fuses
   The wire No.s are same No.s as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Power door lock controller
3. Back door switch
4. Driver side door latch switch
5. Passenger side door latch switch
6. Door lock motor
7. Door lock switch
c. Lock timer
d. Un-lock timer



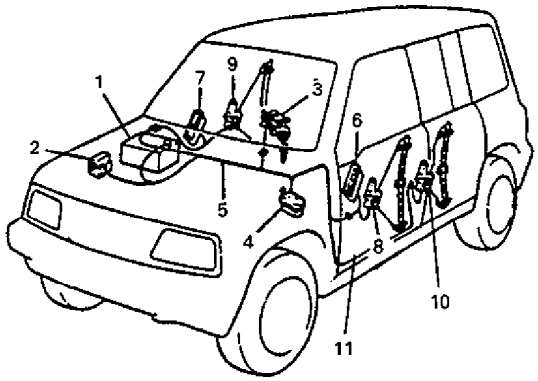
TROUBLE DIAGNOSIS

Condition	Possible cause	Correction
All power door locks do not operate.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Wiring or grounding faulty	Repair as necessary.
	• Power door lock switch, door lock switch, door lock switch or knob switch faulty.	Replace.
	• Controller faulty	Replace.
Only one power door lock does not operate.	• Wiring or socket faulty	Repair as necessary.
	• Actuator (door lock motor) faulty	Replace.

61A10-8-44-1

POWER WINDOW CONTROL SYSTEM (If equipped)

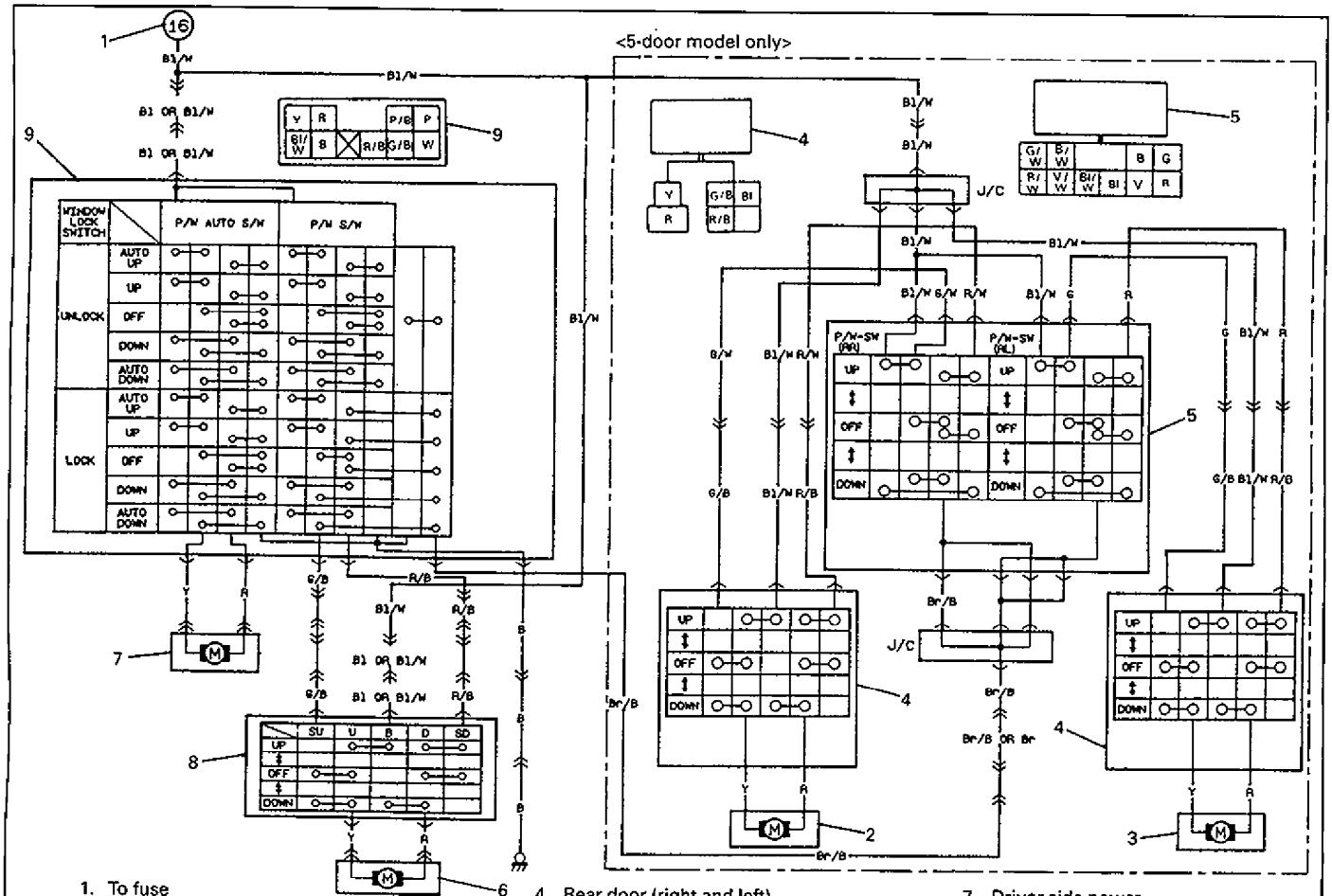
The power window control system is so designed that it electrically controls up & down movement of side door window glass by means of the motor which is installed to the window regulator.
The system consists of the ignition switch, power window switches, window regulator motors and related wiring harness. The figure below shows location of its component parts and wiring diagram.



1. Battery
2. Main fuse box ass'y
3. Ignition switch
4. Fuse box
5. Main wiring harness
6. Power window main switch
7. Power window sub switch
8. Driver side window regulator
9. Passenger side window regulator
10. Rear window regulator (Left) (5-door model only)
11. Floor wiring harness

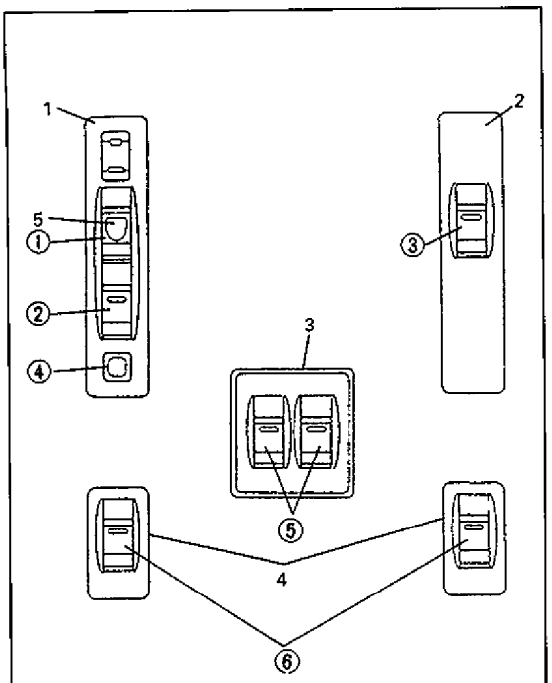
61A10-8-45-1

WIRING DIAGRAM



1. To fuse
The wire No. is same No. as figure of POWER SUPPLY DIAGRAM (Page 8-5, 6)
2. Rear right door power window motor (5-door model only)
3. Rear left door power window motor (5-door model only)
4. Rear door (right and left) and passenger side power window switch (5-door model only)
5. Center console power window switch (5-door model only)
6. Passenger side power window motor
7. Driver side power window motor
8. Passenger side power window assistant switch
9. Driver side power window switch

61A10-8-45-3



1. Driver side power window switch
2. Passenger side power window switch
3. Center console power window switch (5-door model only)
4. Rear door power window switch (5-door model only)
5. Illumination

61A10-8-46-1

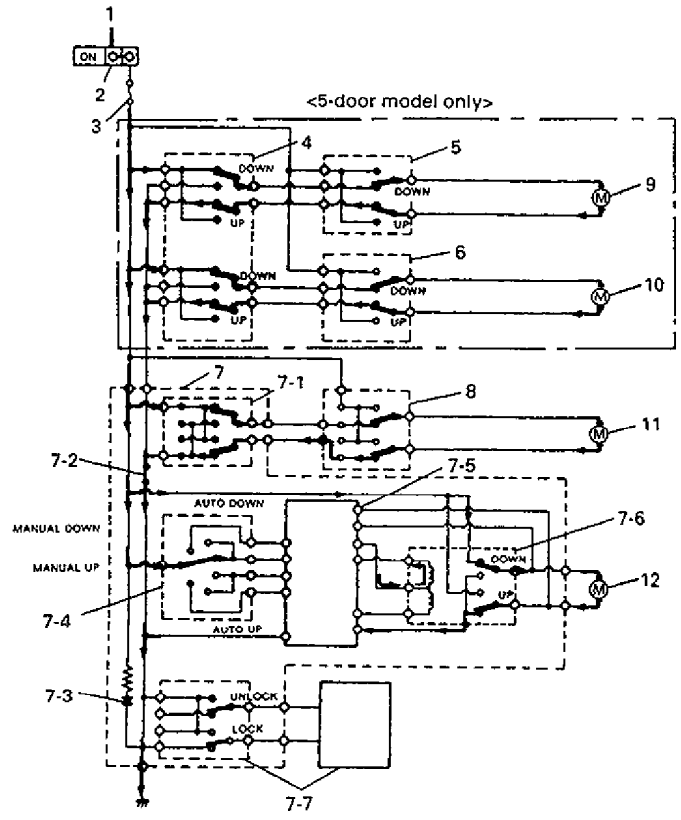
POWER WINDOW SYSTEM CIRCUIT AND OPERATION

The power window main switch in the driver side door trim controls up & down movement of both driver side window by switch ① and passenger side window by switch ② . Also, driver side switch has an auto-up function. The sub switch ③ in the passenger side door trim controls the passenger side window only. The window lock switch ④ also in the power window main switch locks passenger side window and rear windows. As long as this switch is depressed (The switch is turned "OFF" in the circuit), the passenger side window does not move even when the passenger side sub switch ③ or driver side passenger switch ② are operated. Rear window regulator, like passenger side regulator, can be controlled by center console switches ⑤ and rear switches ⑥ when window lock switch is not applied. In this system, up & down movement of the window is done as follows.

Setting center console switch for downward operation when ignition switch is ON and window lock switch is not applied will cause electric current to flow in its circuit as shown by an arrow.

When window lock switch is applied, rear window or passenger side window can not be opened or closed by using center console switch or master switch. With ignition OFF, no power window operation is available and the illumination remains OFF.

Downward operation of window glass by using driver side switch and center console switch.



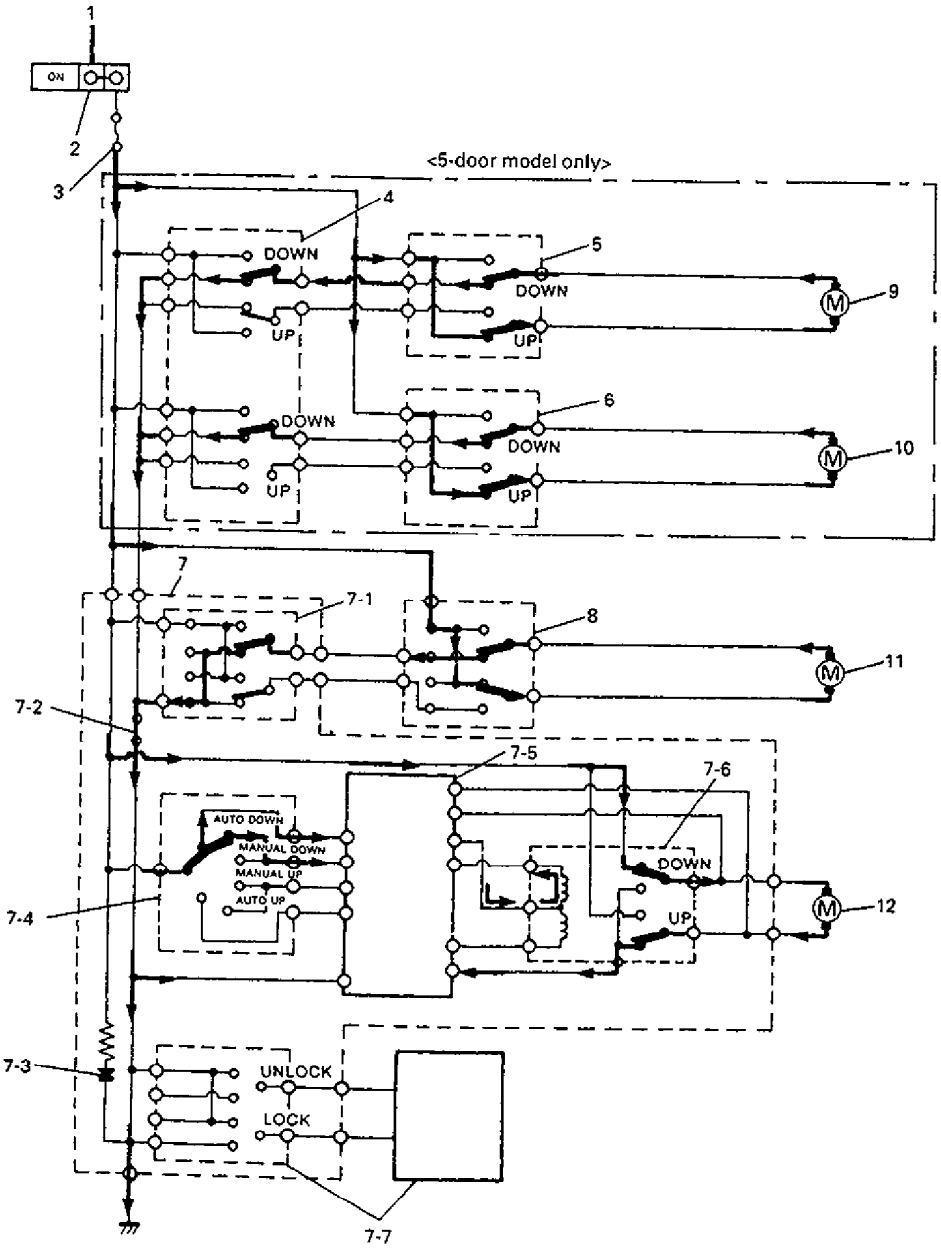
1. From battery
2. Ignition switch
3. Circuit breaker
4. Center console power window switch (5-door model only)
5. Rear right door power window switch (5-door model only)
6. Rear left door power window switch (5-door model only)
7. Driver side power window switch
7-1. Passenger side power window main switch
7-2. Window lock switch
7-3. Illumination to confirm "POWER ON"
7-4. Power window auto switch
7-5. Auto circuit
7-6. Auto relay
7-7. Door lock circuit
8. Passenger side power window assistant switch
9. Rear right door power window motor (5-door model only)
10. Rear left door power window motor (5-door model only)
11. Passenger side power window motor
12. Driver side power window motor

61A10-8-46-3

POWER WINDOW AUTO SYSTEM CIRCUIT AND OPERATION

When rear door sub switch or passenger assist switch is set for upward operation and driver side switch for AUTO down operation, electric current flows in circuit as shown below. AUTO function works when driver side regulator switch is tilted at least 7° but if its tilt angle is less than 7°, the operation is in the manual mode. When the window glass reaches its lower end in the automatic operation mode, the load applied to the motor increases and so does the electric current. Thus the electric current flowing to the solenoid stops and relay turns OFF, resulting the motor to stop.

Automatic downward operation of window glass by using driver side automatic switch.
Upward operation of window glass by using passenger side switch and rear door switch.



1. From battery
2. Ignition switch
3. Fuse
4. Center console power window switch (5-door model only)
5. Rear right door power window switch (5-door model only)
6. Rear left door power window switch (5-door model only)
7. Driver side power window switch
7-1. Passenger side power window main switch
7-2. Window lock switch
7-3. Illumination to confirm "POWER ON"
7-4. Power window auto switch
7-5. Auto circuit
7-6. Auto relay
7-7. Door lock circuit
8. Passenger side power window assistant switch
9. Rear right door power window motor (5-door model only)
10. Rear left door power window motor (5-door model only)
11. Passenger side power window motor
12. Driver side power window motor

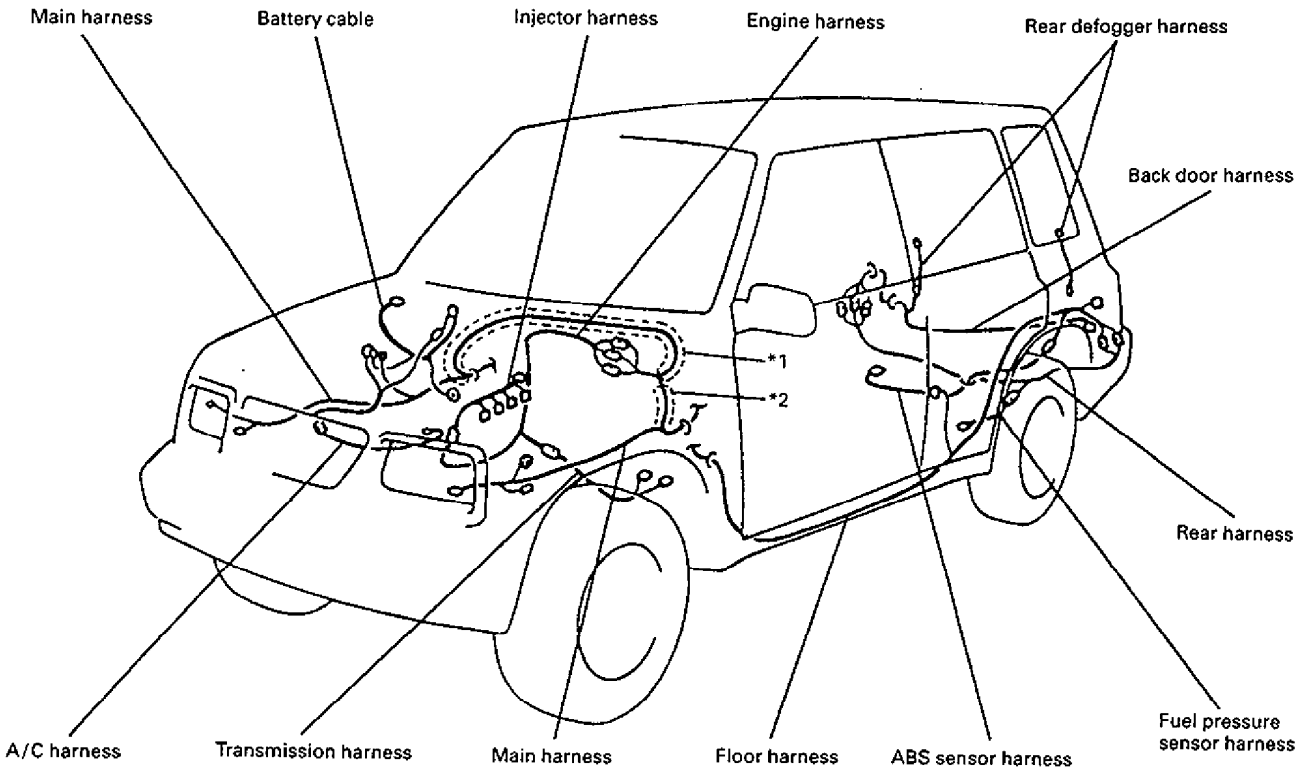
Trouble Diagnosis

Condition	Possible cause	Correction
All power window motors do not operate.	• Main fuse and/or fuses blown	Replace main fuse and/or fuses to check for short.
	• Wiring or grounding faulty	Repair as necessary.
Some switches do not operate.	• Wiring or socket faulty	Repair as necessary.
	• Window lock switch faulty	Replace.
Only one actuator does not function.	• Wiring or socket faulty	Repair as necessary.
	• Actuator faulty	Replace.

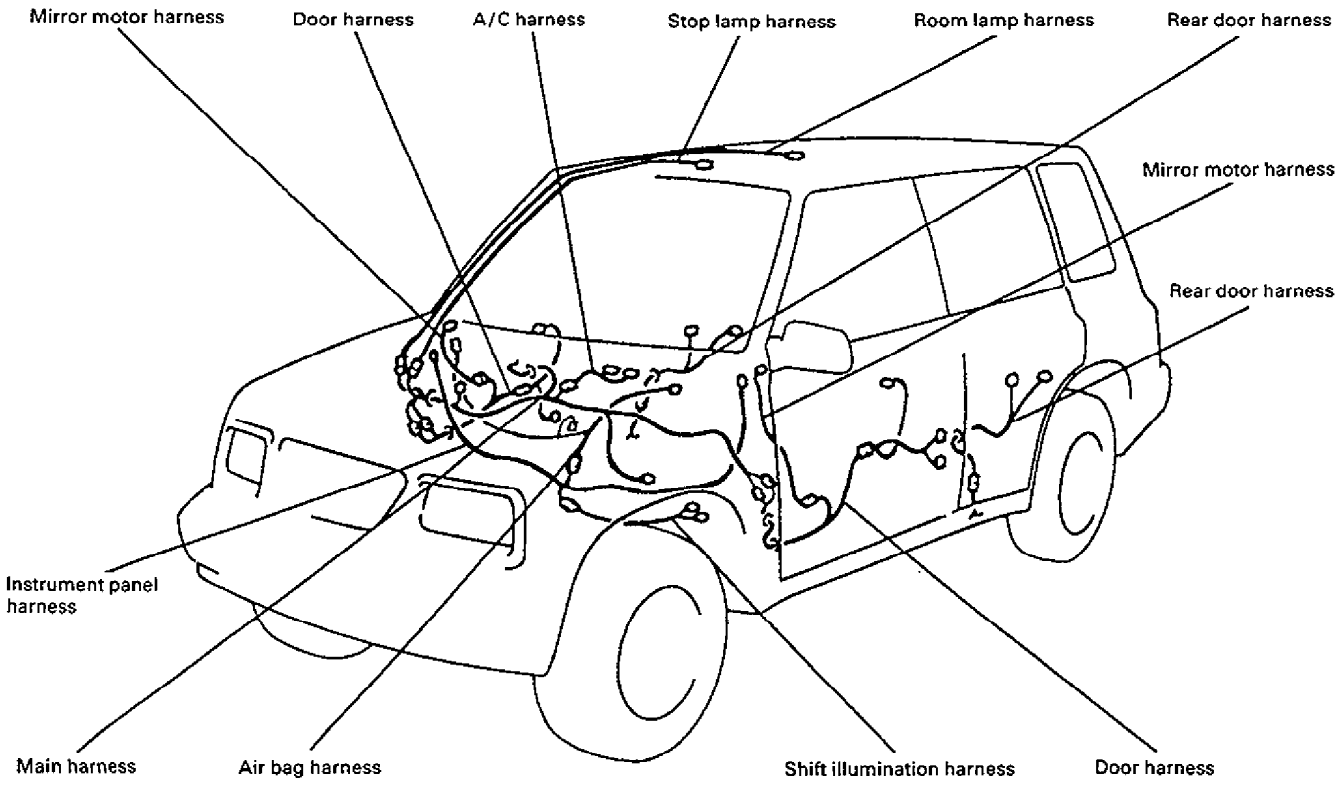
61A50-8-30-1S

WIRING HARNESS ROUTING

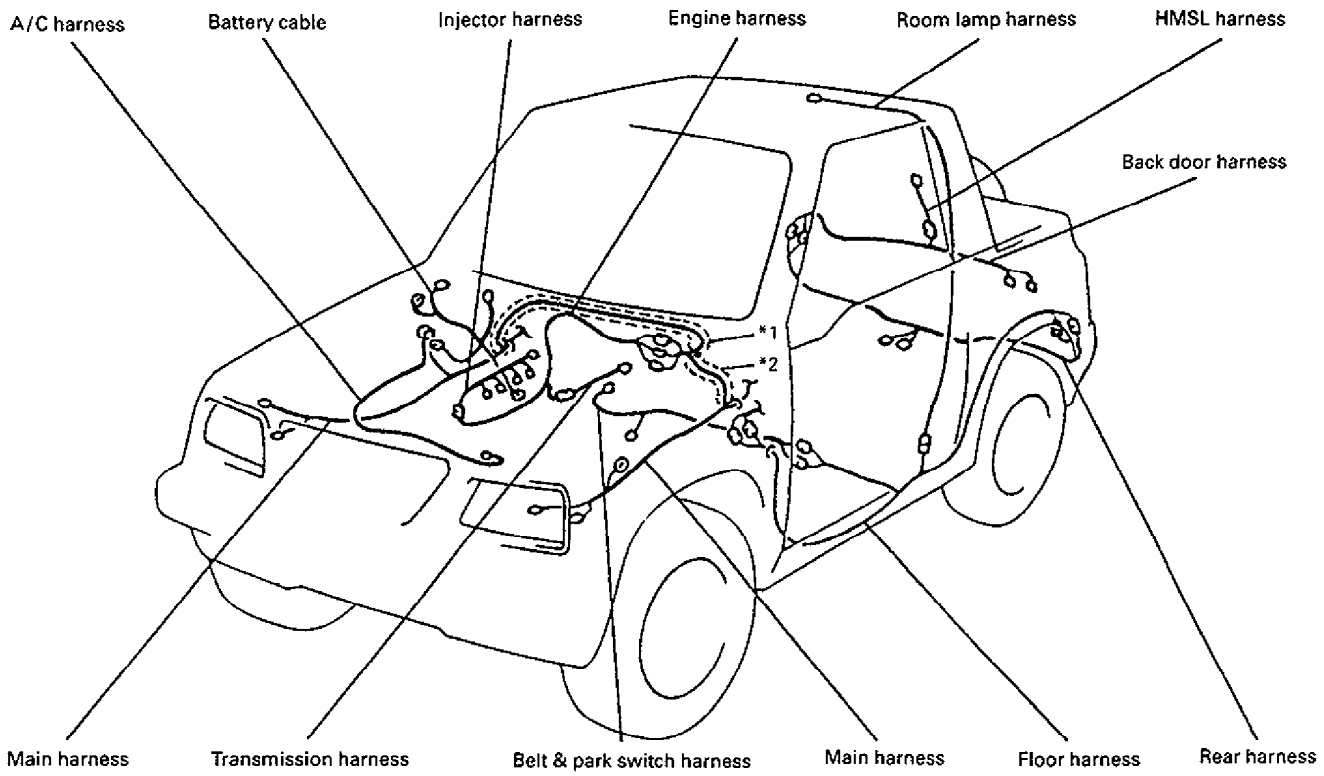
5-DOOR MODEL



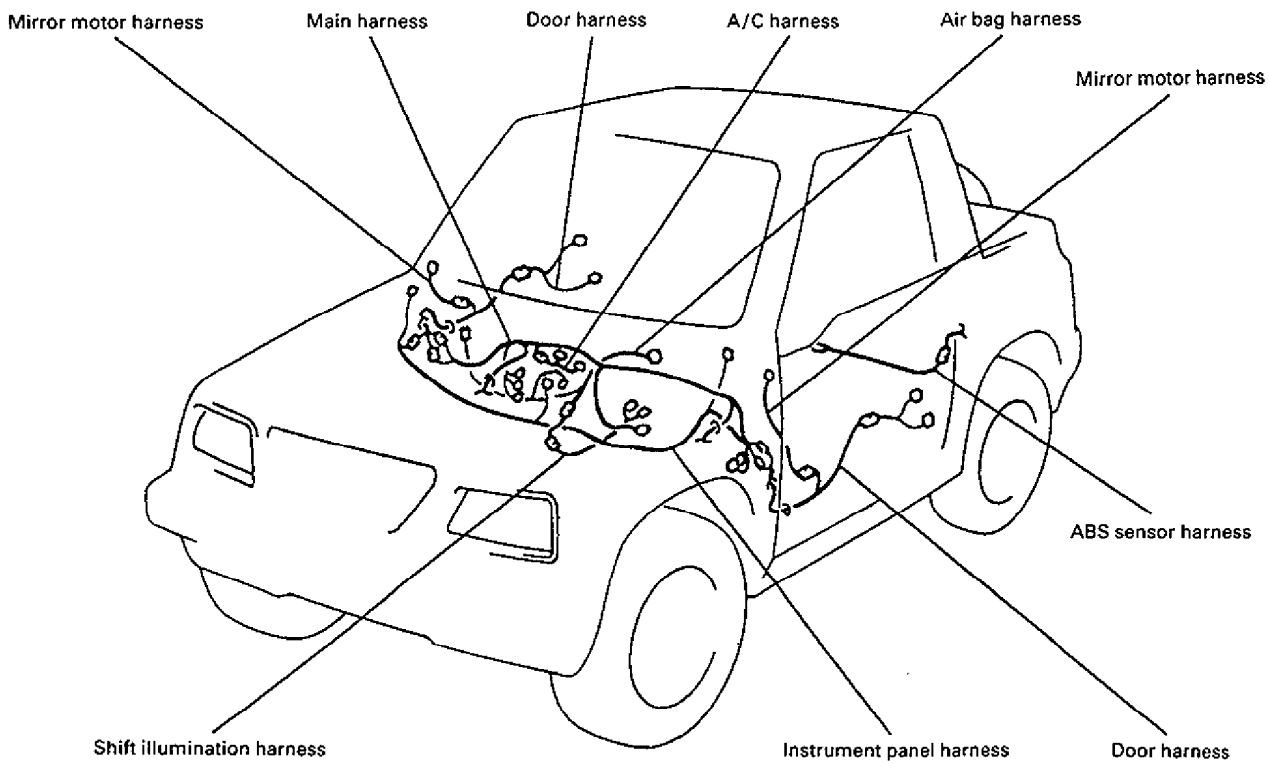
*1: Right hand steering vehicle
*2: Left hand steering vehicle



3-DOOR MODEL



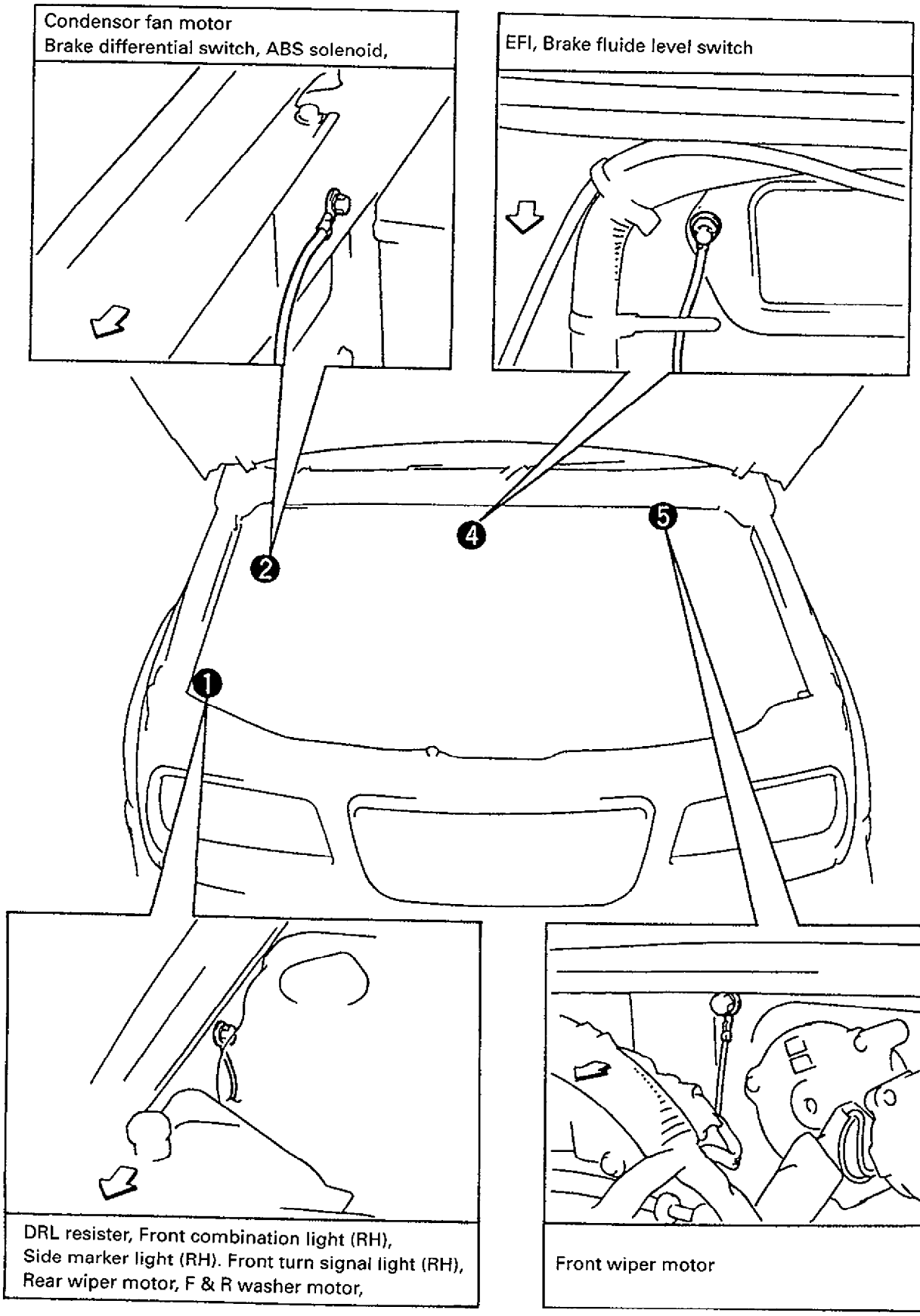
*1: Right hand steering vehicle
*2: Left hand steering vehicle



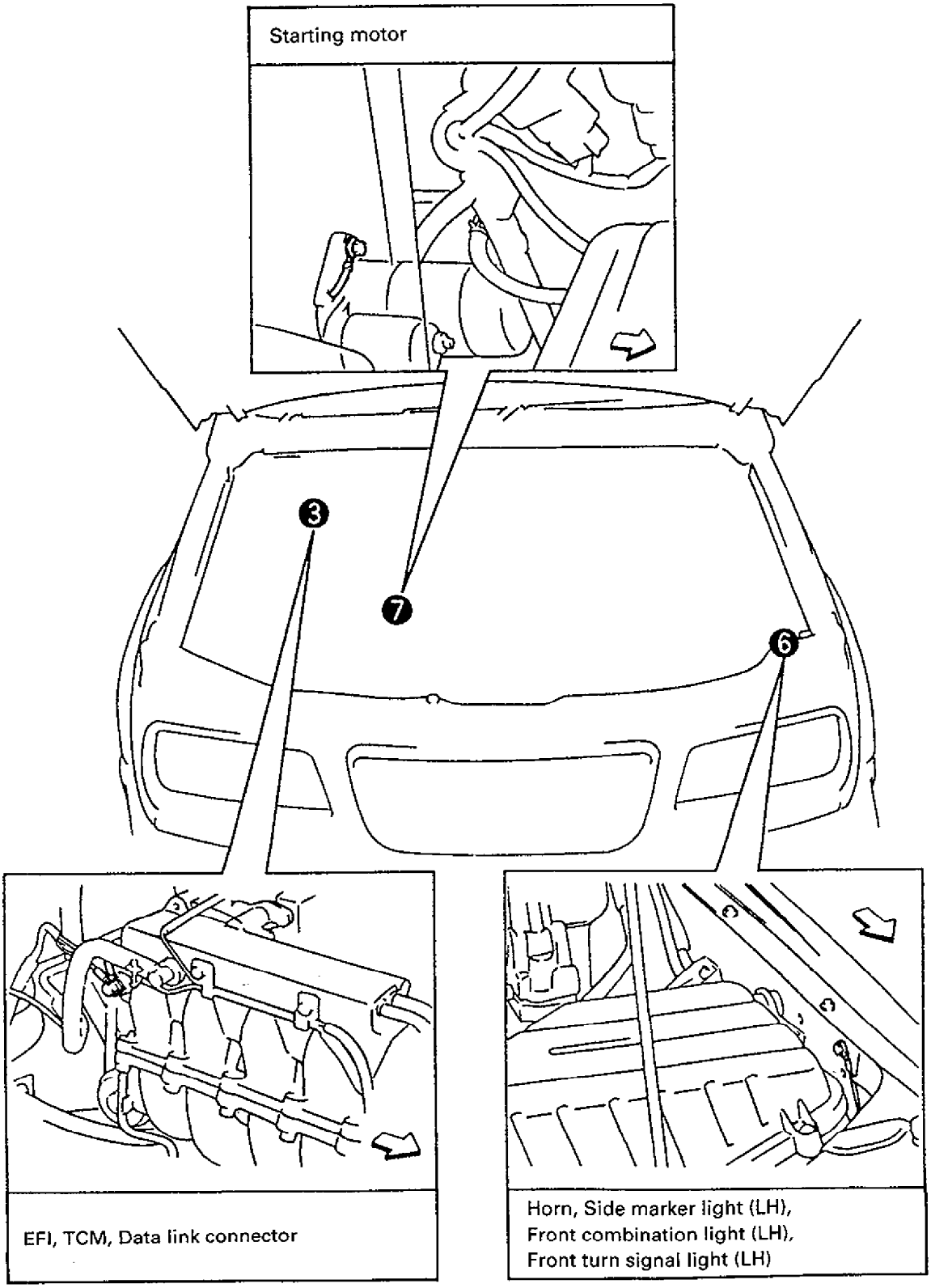
GROUNDING POINTS

ENGINE ROOM

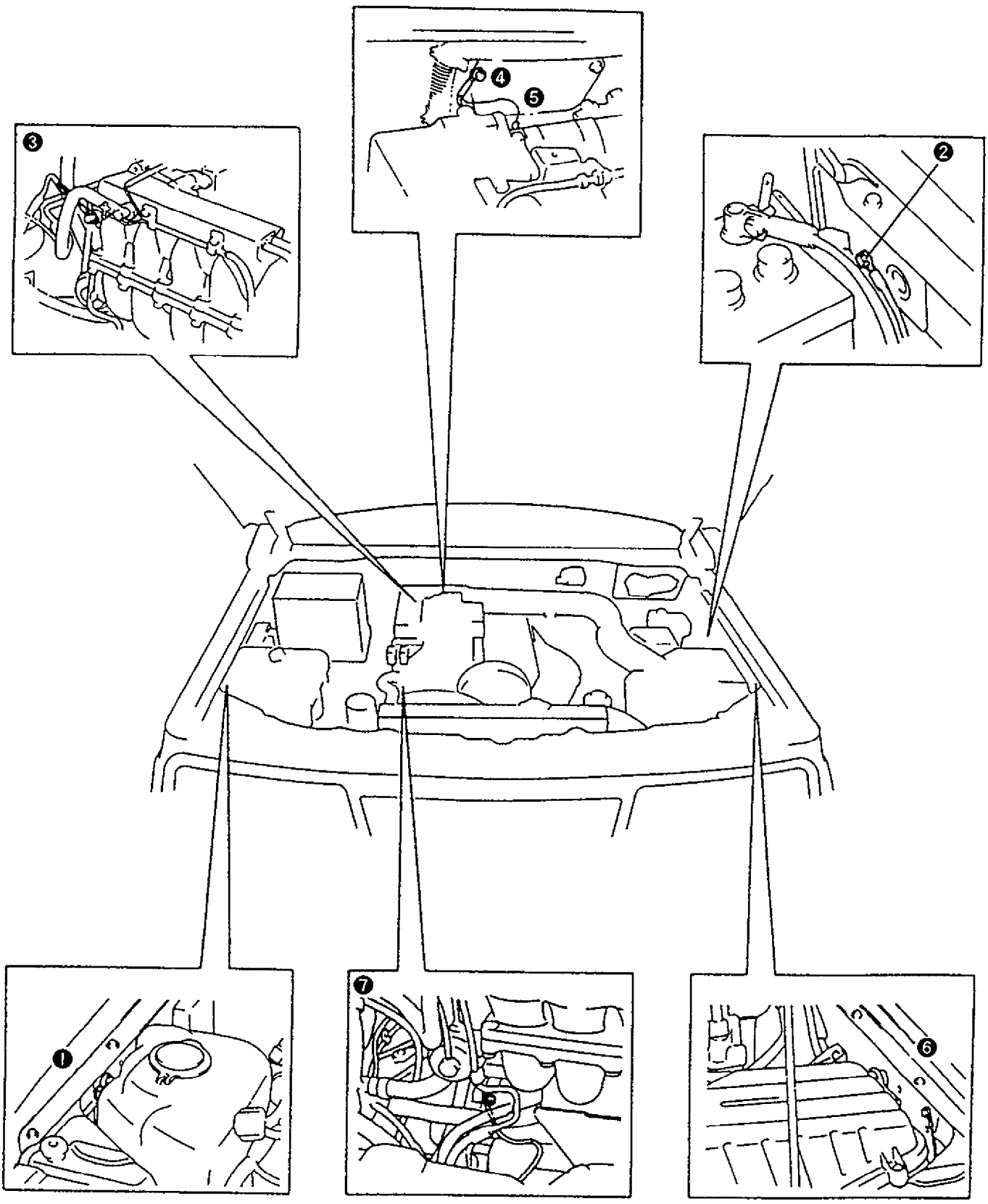
Left hand steering vehicle



Left hand steering vehicle

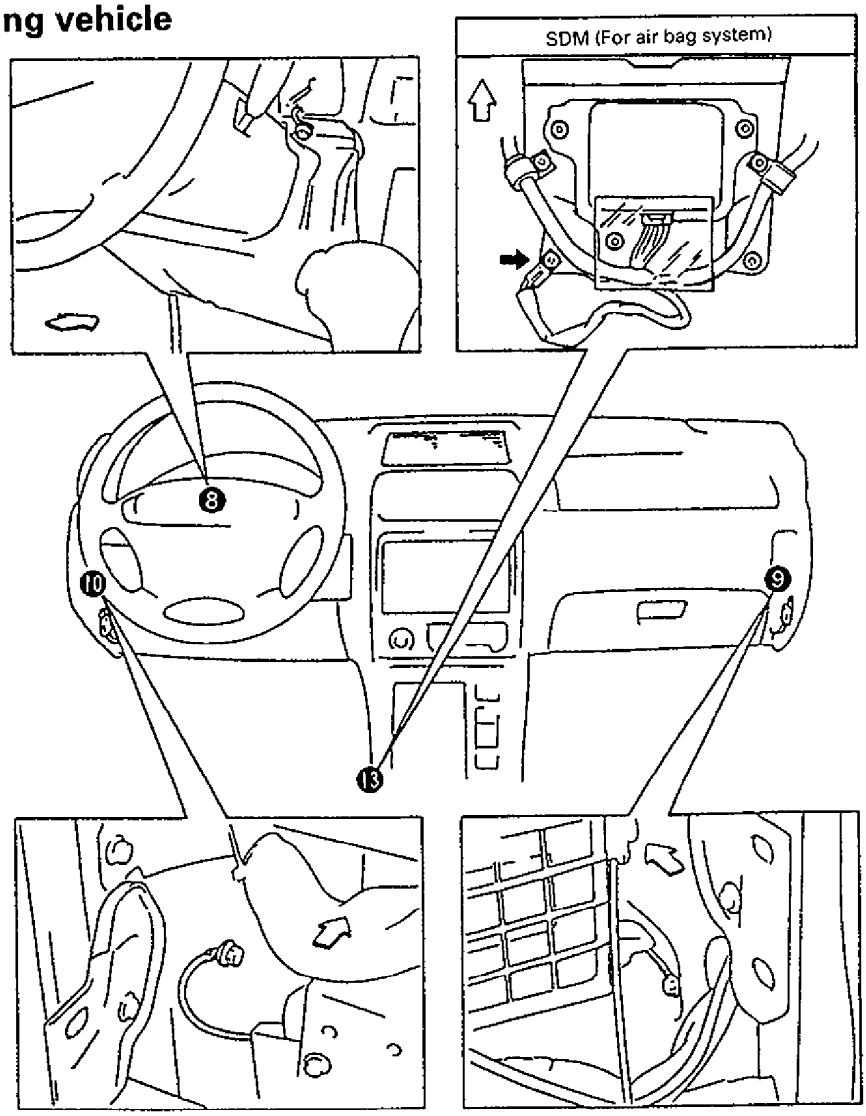


Right hand steering vehicle

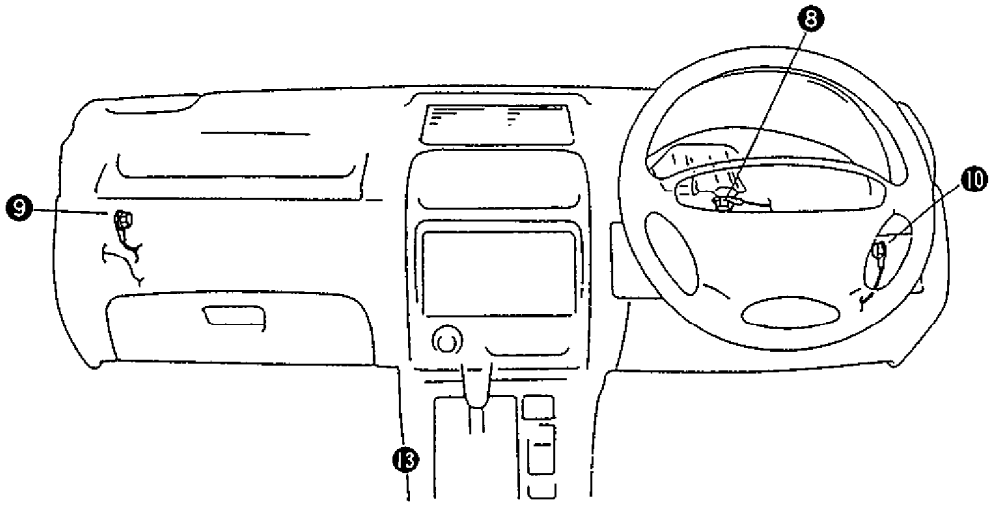


INSTRUMENT PANEL

Left hand steering vehicle



Right hand steering vehicle

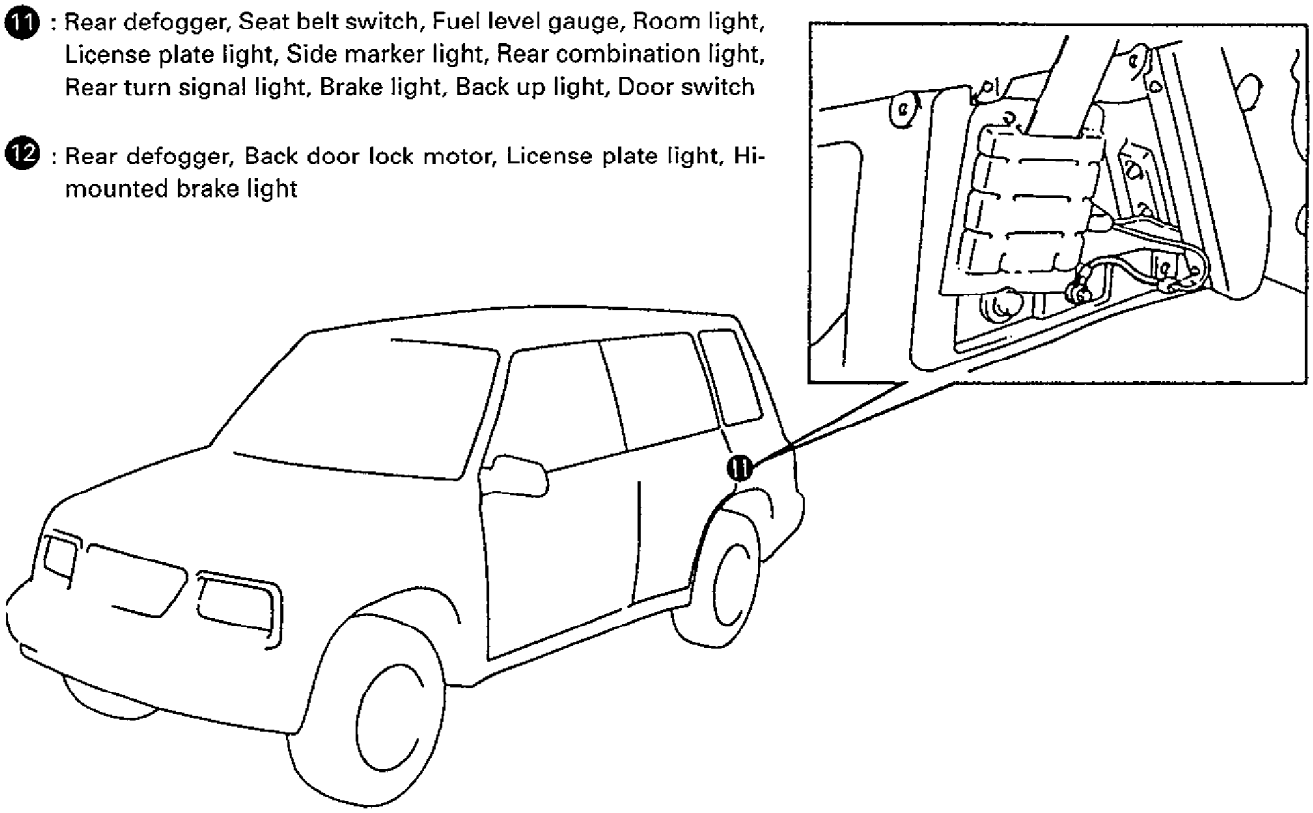


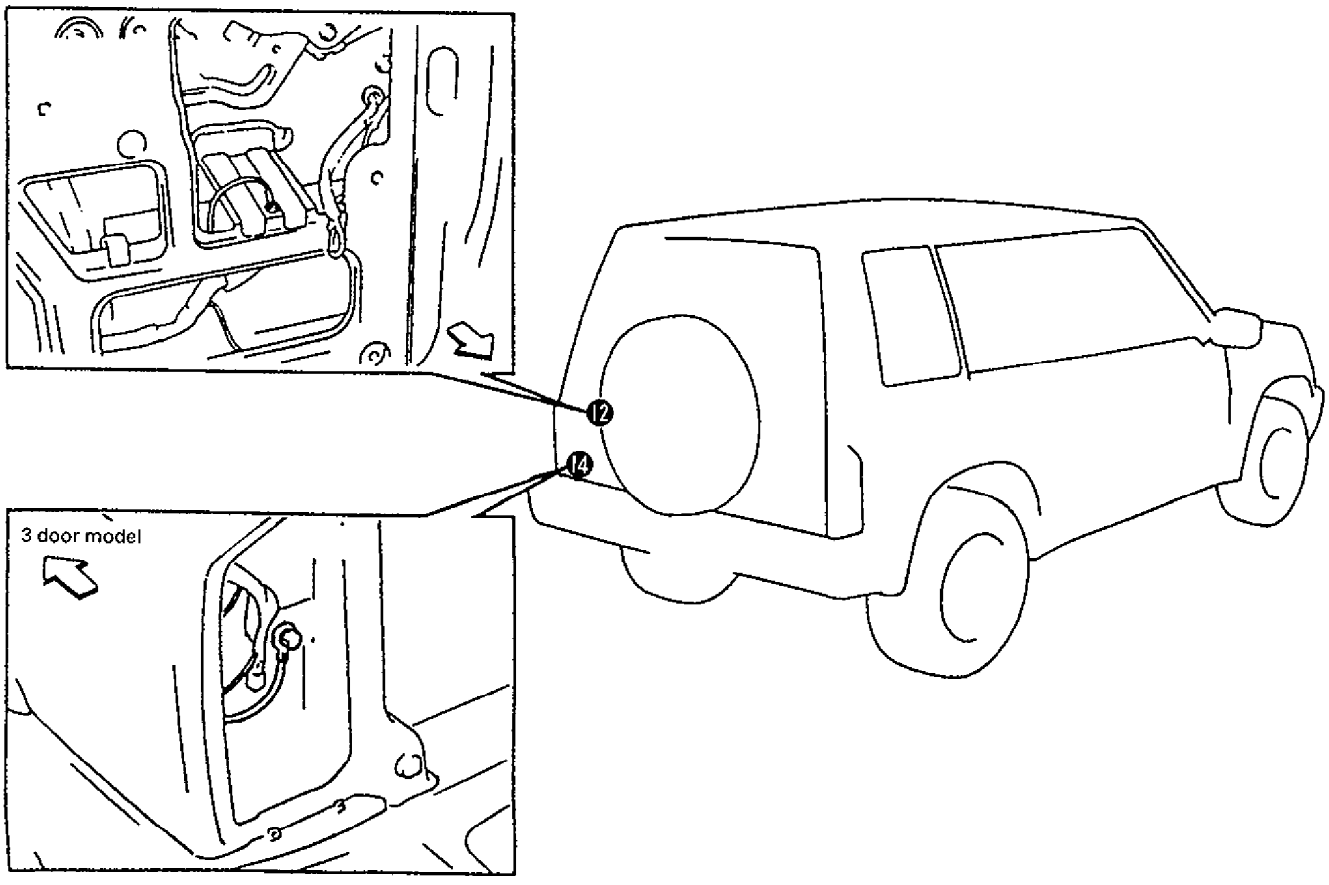
⑧, ⑨, ⑩ :
Transmission range switch, Front and Rear wiper, Turn signal indicator light, Rear defogger, clock, cigarette lighter, ABS check relay, Headlight, door lock controller, 4WD switch, Illumination controller, A/C amplifire, Heter blower motor, DRL controller, DIM-DIP controller, Data link connector, Warning controller, Power window, Remote control mirror, Horn, IG. switch, Water temp. meter,

REAR SECTION

⓫ : Rear defogger, Seat belt switch, Fuel level gauge, Room light, License plate light, Side marker light, Rear combination light, Rear turn signal light, Brake light, Back up light, Door switch

⓬ : Rear defogger, Back door lock motor, License plate light, Hi-mounted brake light





SECTION 9

BODY SERVICE

WARNING:
For vehicle equipped with a Supplemental Inflatable Restraint Air Bag System:

- **Service on or around Air Bag System Components or Wiring must be performed only by an authorized Suzuki dealer. Please observe all WARNINGS and SERVICE PRECAUTIONS in Section 9J under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in Section 9J before performing service on or around Air Bag System Components or Wiring. 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.**
- **Technical service work must be started at least 90 seconds after the ignition switch is turned to the "LOCK" position and the negative cable is disconnected from the battery.**
  Otherwise, the air bags may be deployed by reserve energy in the Sensing and Diagnostic Module (SDM).

NOTE:
For the descriptions (items) not found in this section, refer to the same section of the Service manual mentioned in the FOREWORD of this manual.

CONTENTS

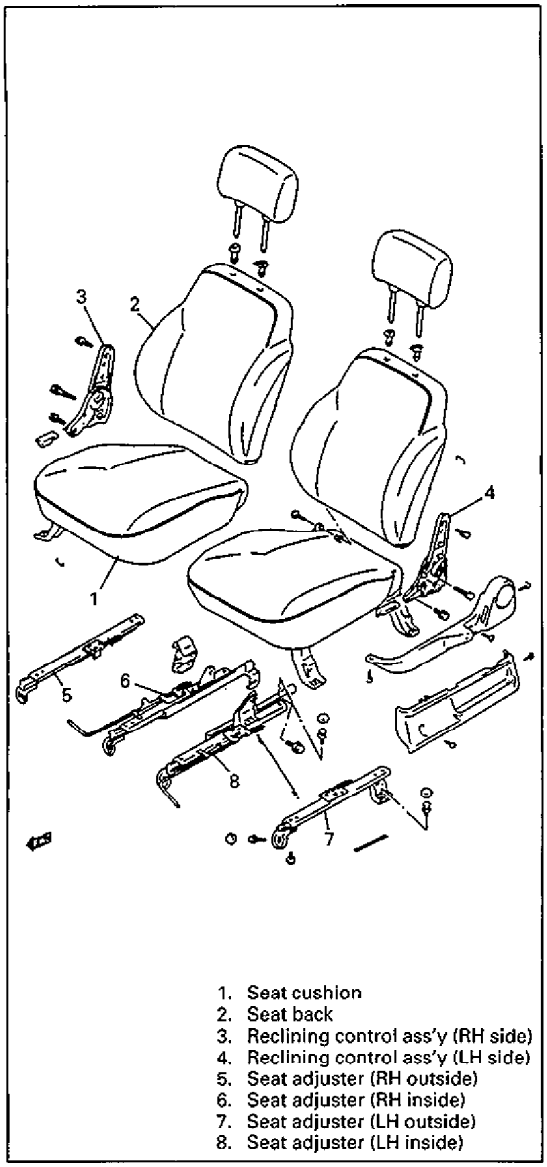
61A10-9-1-1

SEAT

FRONT SEAT

REMOVAL

1) Remove four mounting bolts fixing front seat to seat rail to remove front seat.
2) Disassemble and repair seat as necessary.



1. Seat cushion
2. Seat back
3. Reclining control ass'y (RH side)
4. Reclining control ass'y (LH side)
5. Seat adjuster (RH outside)
6. Seat adjuster (RH inside)
7. Seat adjuster (LH outside)
8. Seat adjuster (LH inside)

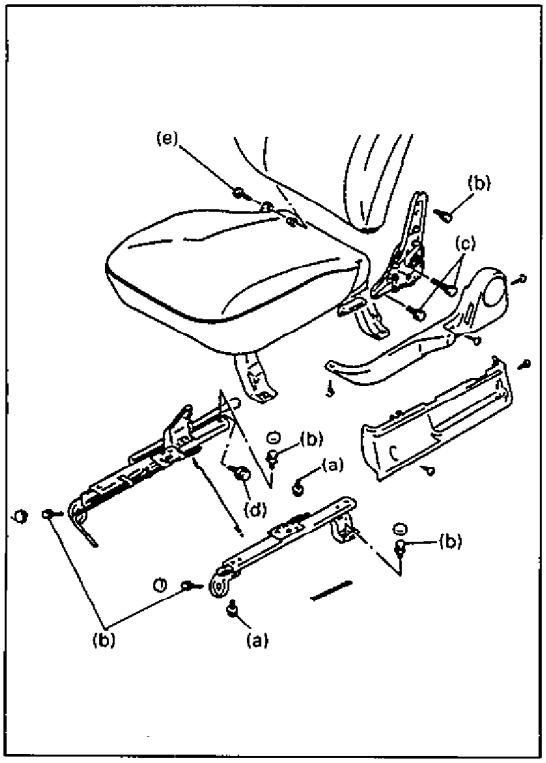
61A10-9-2-1

INSTALLATION

Reverse removal procedure to install front seat.
Torque to specifications, as shown.

Tightening Torque

(a): 13 N·m (1.3 kg-m, 9.5 lb-ft)
(b): 23 N·m (2.3 kg-m, 17.0 lb-ft)
(c): 50 N·m (5.0 kg-m, 36.5 lb-ft)
(d): 40 N·m (4.0 kg-m, 29.0 lb-ft)
(e): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)



61A10-9-2-4

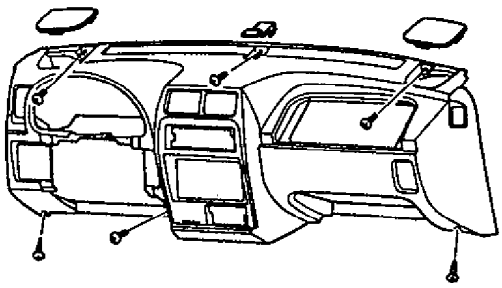
INSTRUMENT PANEL

REMOVAL

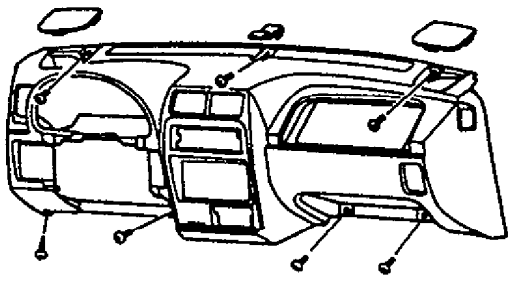
1) Disconnect negative (–) cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System" in Section 9J.
3) Remove console box.
4) Remove glove box and column hole cover.
5) Disconnect wires and cables from heater unit and blower motor assembly.
6) Remove steering column assembly. (For vehicle with air bag system, refer to "Steering Column" in Section 3C1. For vehicle without air bag system, refer to "Steering Column" in Section 3C2.)
7) Disconnect speedometer cable and remove speedometer assembly.
8) Remove engine hood opener.
9) Disconnect couplers which need to be disconnected for removal for instrument panel.

61A10-9-3-1

For vehicle not equipped with air bag system

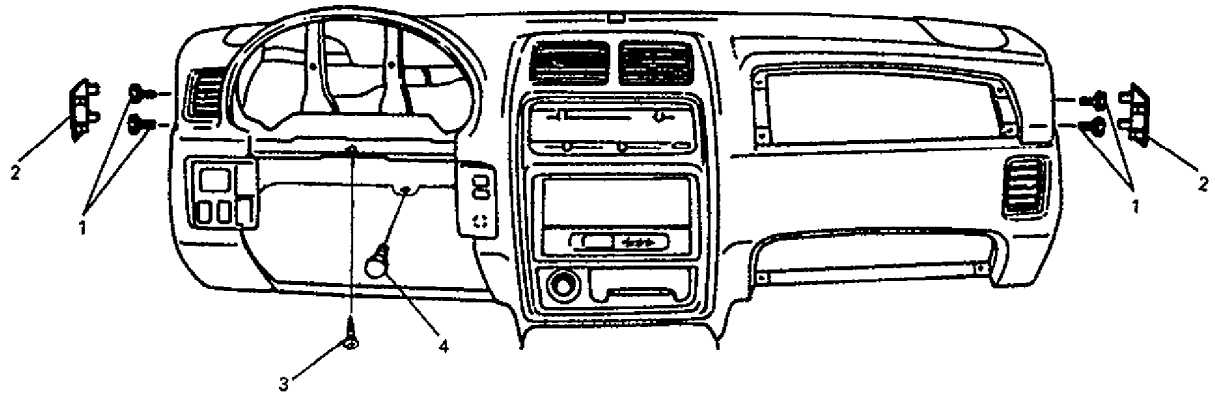


For vehicle equipped with air bag system



61A10-9-3-3

10) Remove instrument panel mounting screws.



1. Bolt
2. Side cap
3. Screw
   (For vehicle not equipped with air bag system)
4. Bolt
   (For vehicle equipped with air bag system)

61A10-9-4-1

11) Remove instrument panel mounting bolts.
12) Remove instrument panel.

61A10-9-4-3

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. (For vehicle with air bag system, refer to "Steering Column" in Section 3C1. For vehicle without air bag system, refer to "Steering Column" in Section 3C2.)

2) Adjust control cables. (Refer to "Control Cables" in Section 1A)
3) Fill engine coolant to radiator.
4) If equipped with air bag system, enable air bag system. Refer to "Enabling Air Bag System" in Section 9J.

61A10-9-4-5

SECTION 9J

AIR BAG SYSTEM (OPTIONAL)

WARNING:
This vehicle is equipped with a Supplemental Inflatable Restraint Air Bag System. Service on or around Air Bag System Components or Wiring must be performed only by and authorized Suzuki dealer. Please observe all WARNINGS, CAUTIONS, SERVICE PRECAUTIONS, HANDLING PRECAUTIONS and DISPOSAL PRECAUTIONS in this section under "On-Vehicle Service" and the Air Bag System Component and Wiring Location view in this section before performing service on or around Air Bag System Components or Wiring. 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.

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.

60G00-9J-1-1

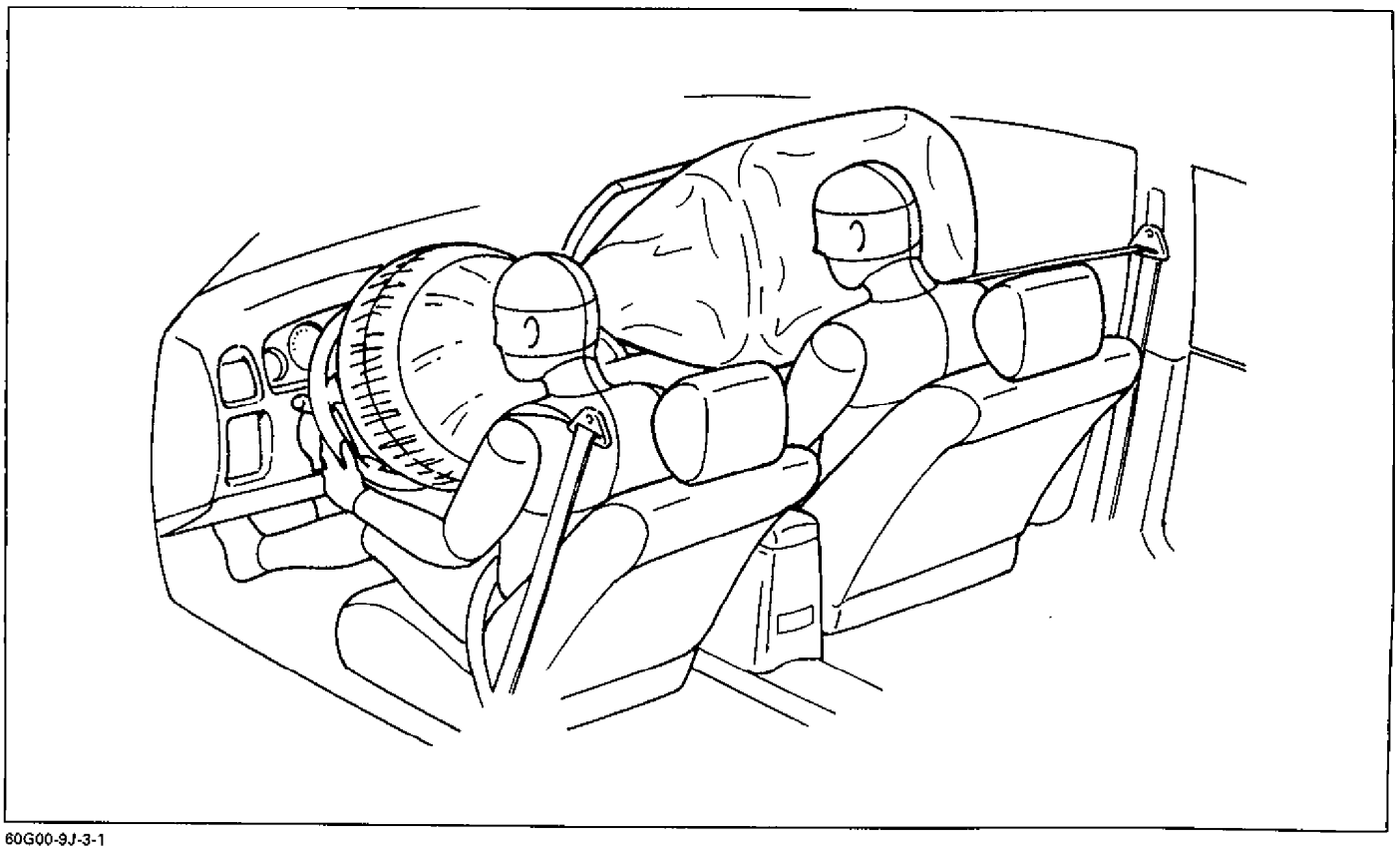
CONTENTS

61A10-9J-1-2

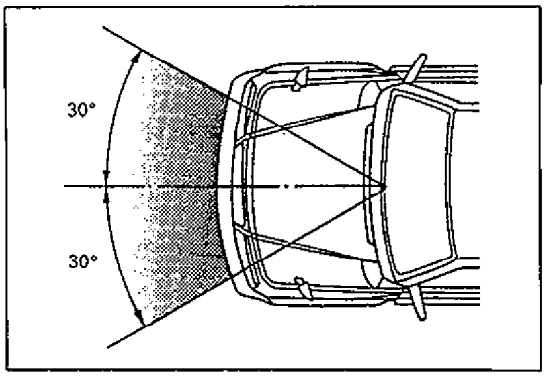
61A10-9J-2-1

GENERAL DESCRIPTION

The Supplemental Inflatable Restraint Air Bag System helps supplement the protection offered by the driver and front passenger seat belts by deploying an air bag from the center of the steering wheel and from the top of the instrument panel in front of passenger.

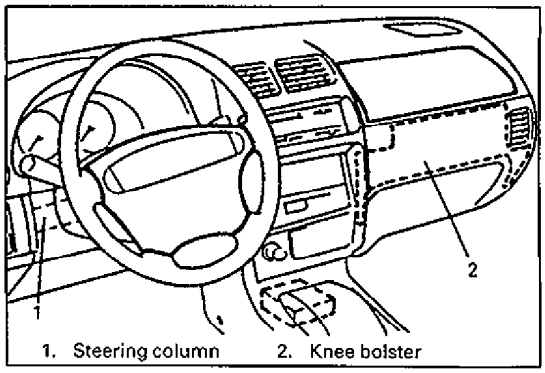


60G00-9J-3-1



61A10-9J-3-4

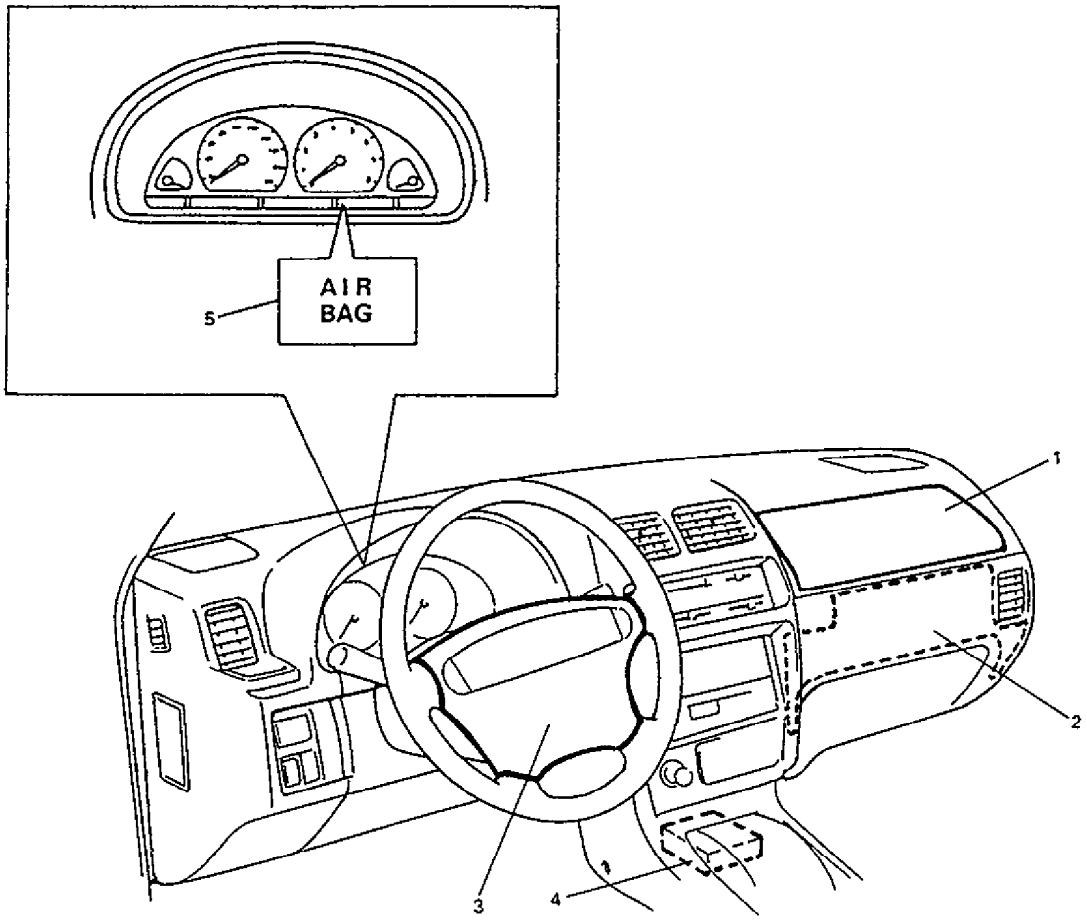
The air bag deploys when the vehicle is involved in a frontal crash of sufficient force up to 30 degrees off the centerline of the vehicle.



61A10-9J-3-2

To further absorb the crash energy there is a knee bolster located beneath the instrument panel for both the driver and passenger and the steering column is collapsible.

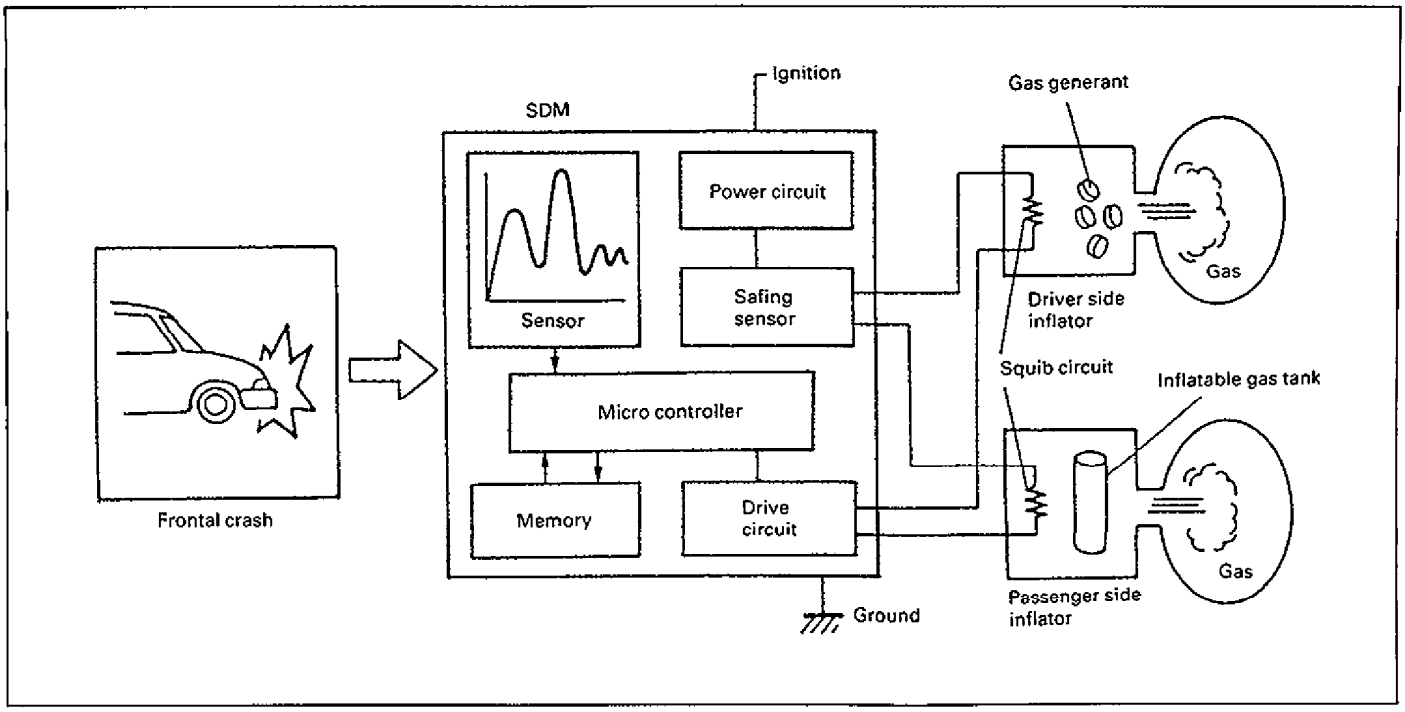
AIR BAG SYSTEM COMPONENTS



1. Passenger air bag (inflator) module
2. Knee bolster
3. Driver air bag (inflator) module
4. SDM
5. "AIR BAG" warning lamp

61A10-9J-3-3

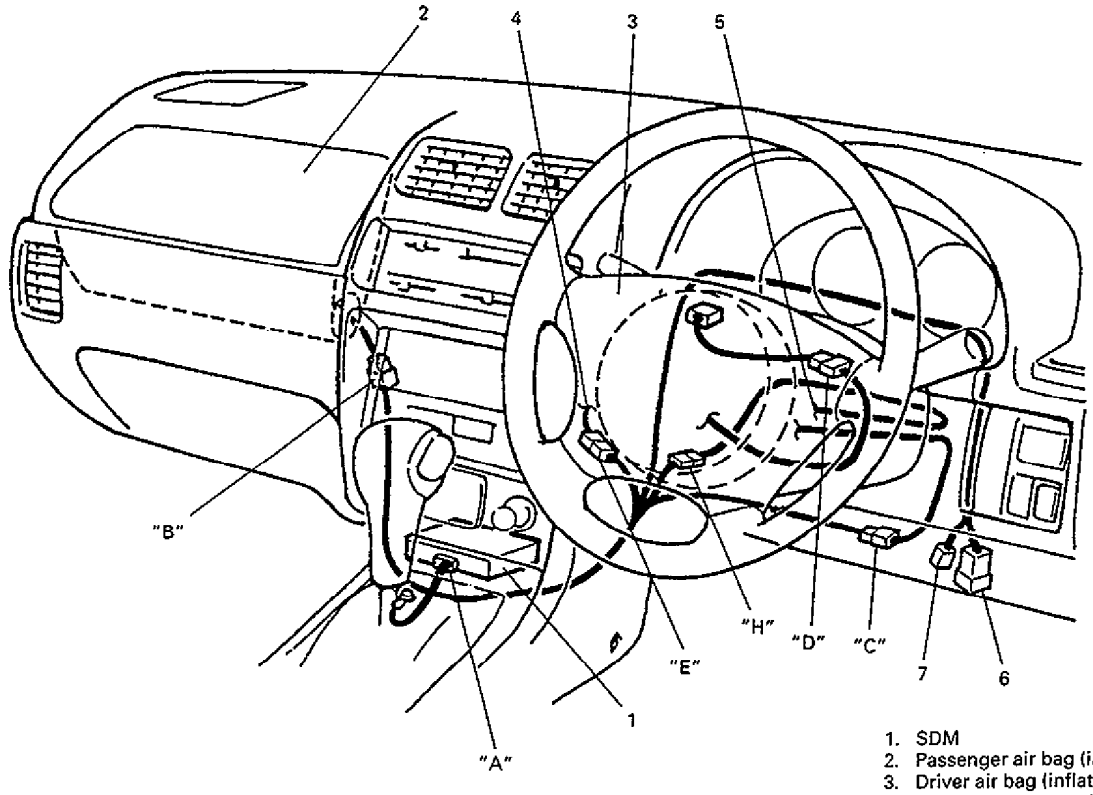
OPERATION OF AIR BAG SYSTEM AT COLLISION



61A10-9J-4-2

SYSTEM WIRING LOCATION VIEW AND CONNECTORS

For Right Hand Steering Vehicle



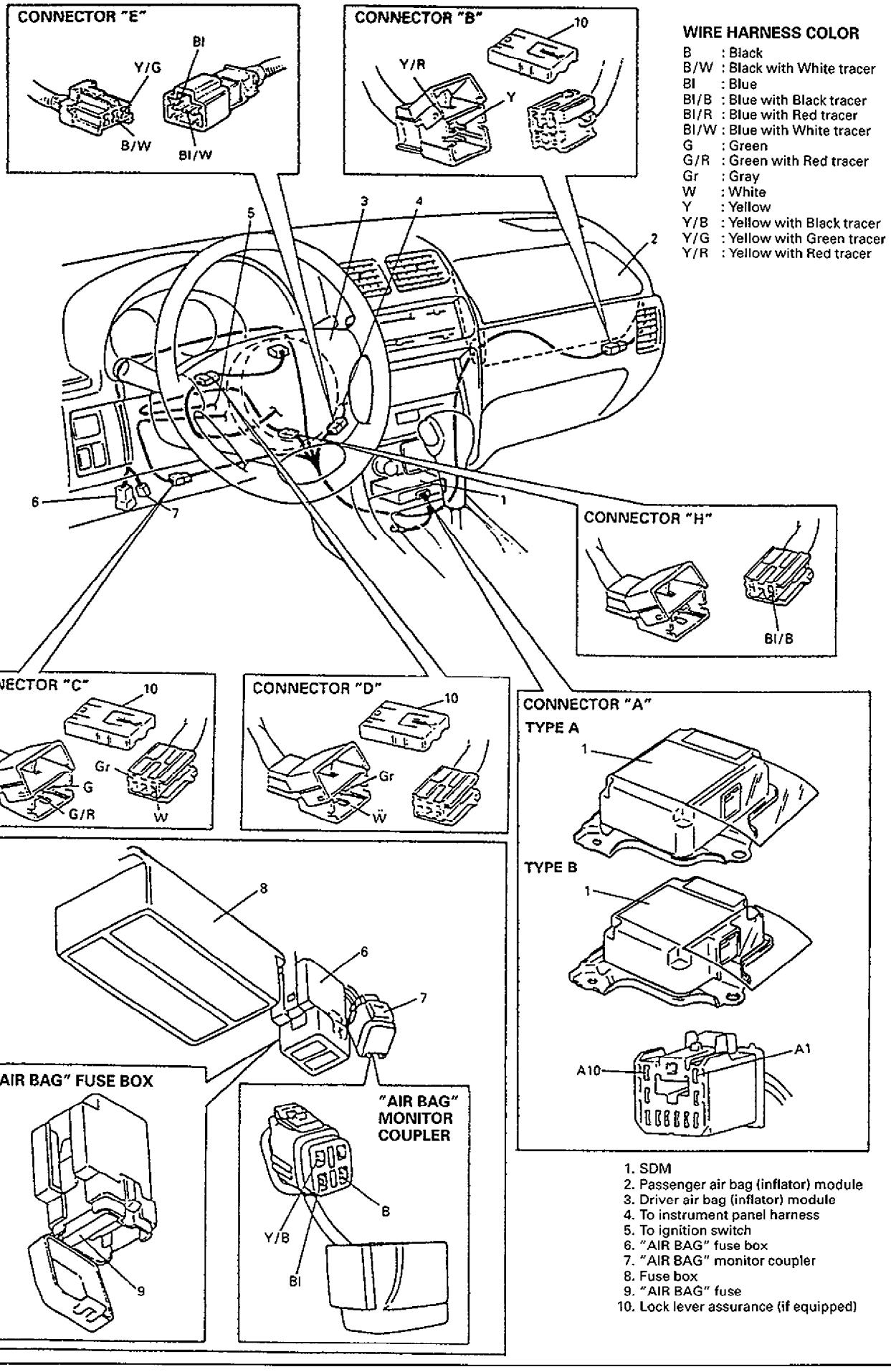
"A"~"E", "H" : Connector

1. SDM
2. Passenger air bag (inflator) module
3. Driver air bag (inflator) module
4. To instrument panel harness
5. To ignition switch
6. "AIR BAG" fuse box
7. "AIR BAG" monitor coupler

NOTE:
For detail of couplers and fuse, refer to next page.

61A10-9J-4-3

For Left Hand Steering Vehicle

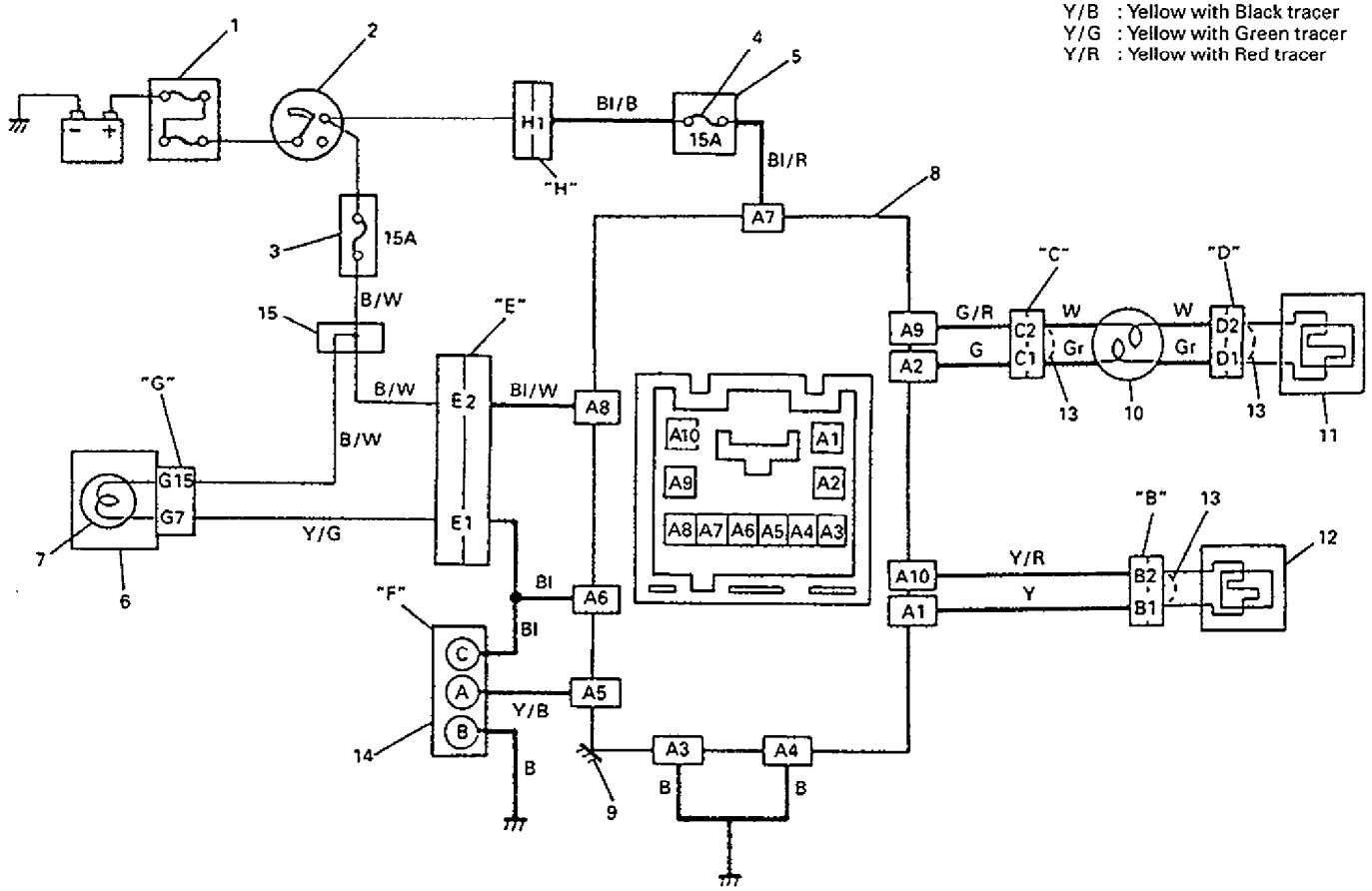


1. SDM
2. Passenger air bag (inflator) module
3. Driver air bag (inflator) module
4. To instrument panel harness
5. To ignition switch
6. "AIR BAG" fuse box
7. "AIR BAG" monitor coupler
8. Fuse box
9. "AIR BAG" fuse
10. Lock lever assurance (if equipped)

SYSTEM WIRING DIAGRAM

WIRE HARNESS COLOR

B : Black
B/W : Black with White tracer
Bl : Blue
Bl/B : Blue with Black tracer
Bl/R : Blue with Red tracer
Bl/W : Blue with White tracer
G : Green
G/R : Green with Red tracer
Gr : Gray
W : White
Y : Yellow
Y/B : Yellow with Black tracer
Y/G : Yellow with Green tracer
Y/R : Yellow with Red tracer

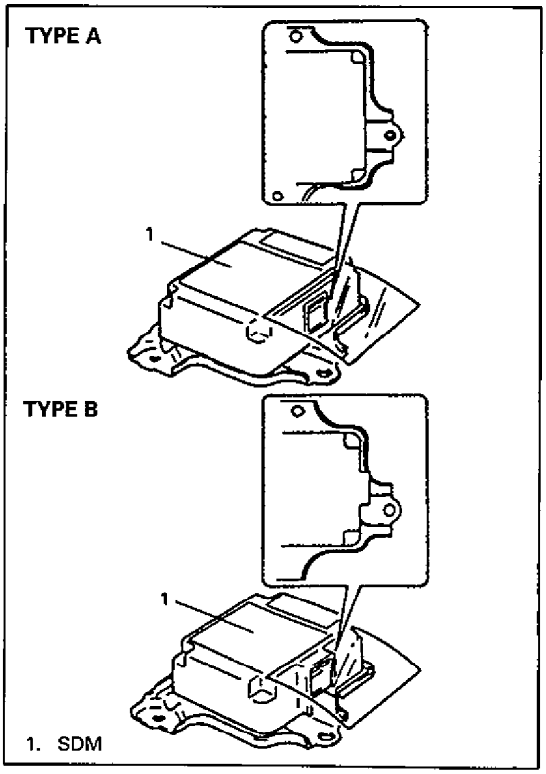


"A" ~ "H" : Connector
—— : Air bag harness (Covered with Yellow tube)

1. Main fuse box
2. Main switch (ignition switch)
3. Fuse box
4. "AIR BAG" fuse
5. "AIR BAG" fuse box
6. Combination meter
7. "AIR BAG" warning lamp
8. SDM
9. Case ground
10. Contact coil
11. Driver air bag (inflator) module
12. Passenger air bag (inflator) module
13. Shorting bar
14. "AIR BAG" monitor coupler
15. Joint connector

CONNECTOR "A"

PIN. NO.	SDM TERMINATION	
A1	Passenger initiator circuit	Low
A2	Driver initiator circuit	Low
A3	Ground	
A4	Ground	
A5	Diag. switch	
A6	"AIR BAG" warning lamp	
A7	Ignition 1 (power source)	
A8	Ignition 2 (power source)	
A9	Driver initiator circuit	High
A10	Passenger initiator circuit	High



61A10-9J-7-1

COMPONENT DESCRIPTION

SDM (SENSING AND DIAGNOSTIC MODULE)

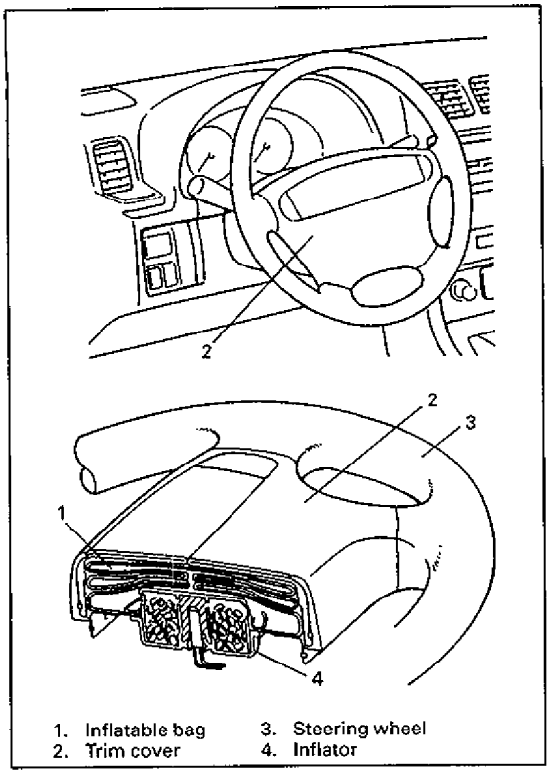
WARNING:
- **During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).**
- **Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" before starting to work and observe every precaution during work. Neglecting them may result in personal injury or undeployment of the air bag when necessary.**

CAUTION:
After detecting one time of such collision as to meet deployment conditions, the SDM must not be used.
Refer to "DIAGNOSIS" when checking the SDM.

The Sensing and Diagnostic Module (SDM) is designed to perform the following functions in the air bag system:

1) Energy Reserve
   - The SDM maintains a Reserve energy supply to provide deployment energy after ignition voltage is lost in a frontal crash.
2) Frontal Crash Detection
   - The SDM monitors vehicle velocity changes to detect frontal crashes which are severe enough to warrant deployment.
3) Air Bag Deployment
   - When a frontal crash of sufficient force is detected, the SDM will cause enough current to flow through the air bag (inflator) modules to deploy the air bags.
4) Frontal Crash Recording
   - The SDM records information regarding the air bag system status during a frontal crash.
5) Malfunction Detection
   - The SDM performs diagnostic monitoring of the air bag system electrical components and sets a diagnostic trouble code when a malfunction is detected.
6) Malfunction Diagnosis
   - The SDM provides air bag diagnostic trouble codes by flashing "AIR BAG" warning lamp when on-board diagnosis function is used.
7) Driver Notification
   - The SDM warns the vehicle driver of air bag system malfunctions by controlling the "AIR BAG" warning lamp.

61A10-9J-7-3



1. Inflatable bag
2. Trim cover
3. Steering wheel
4. Inflator

60A50-9J-8-1

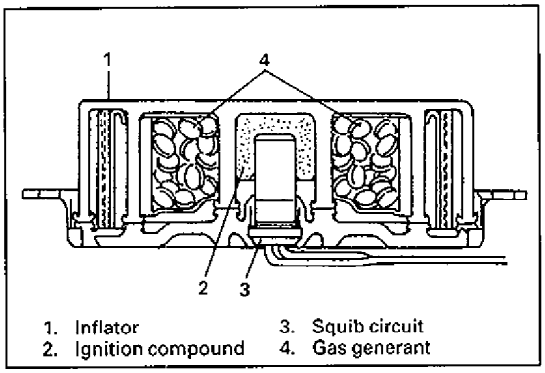
DRIVER AIR BAG (INFLATOR) MODULE

WARNING:

- **Never attempt to disassemble or repair the driver 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" and "HANDLING PRECAUTIONS" 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.**

The driver air bag (inflator) module consists of an inflatable bag, an inflator and a trim cover, and is mounted to the center of the steering wheel.

The driver inflatable bag is made of nylon material and coated with neoprene only on its inside surface.

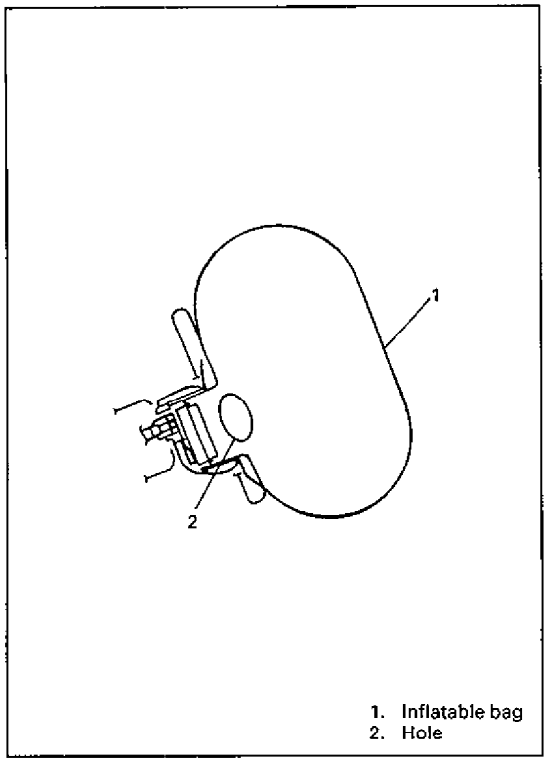


1. Inflator
2. Ignition compound
3. Squib circuit
4. Gas generant

60A50-9J-8-3

The driver inflator consists of a squib circuit. an ignition compound and a gas generant.

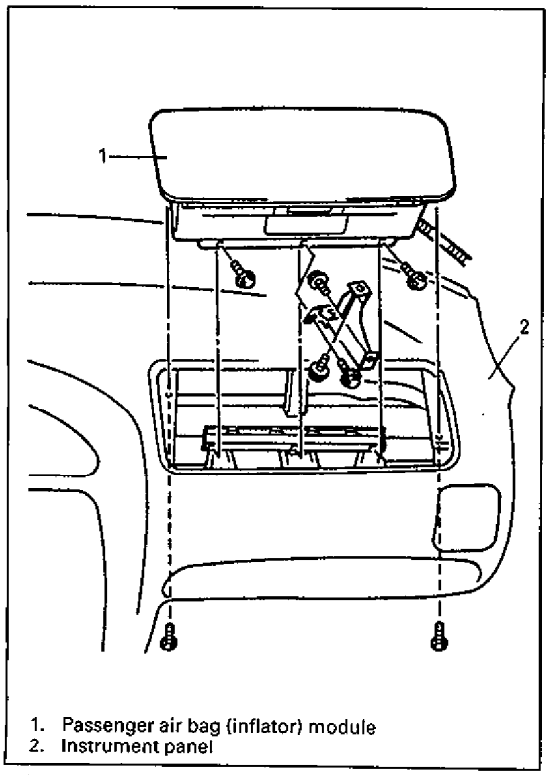
When a collision occurs, the deployment current from SDM flows through the squib circuit to ignite the ignition compound by which the gas generant ignites instantly.
As the gas generant burns, a large amount of nitrogen gas is generated and deploys the inflatable bag quickly.



1. Inflatable bag
2. Hole

60A50-9J-8-4

When the inflatable bag deploys, its expansion force causes the trim cover.
Nitrogen gas in the inflatable bag is let out through two exhaust holes in the back of the bag at the right and left.



1. Passenger air bag (inflator) module
2. Instrument panel

61A10-9J-9-1

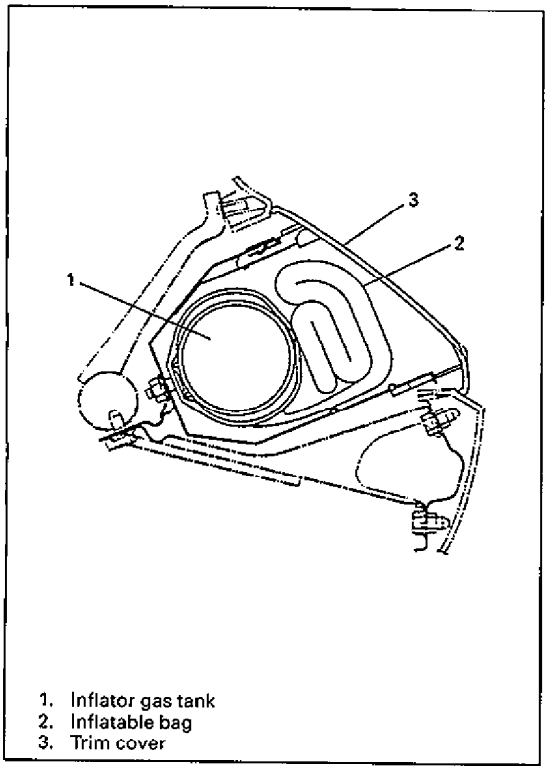
PASSENGER AIR BAG (INFLATOR) MODULE

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" and "HANDLING PRECAUTIONS" 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.**

The passenger air bag (inflator) module consists of an inflatable bag, an inflator, a low pressure sensor and a trim cover, and is mounted above the glove box in the instrument panel on the passenger side.

The passenger inflatable bag is made of nylon material and not coated.

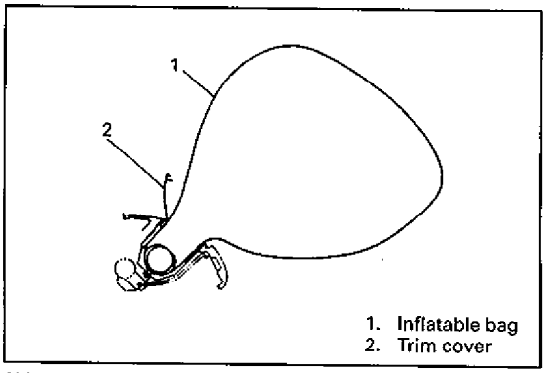


1. Inflator gas tank
2. Inflatable bag
3. Trim cover

61A10-9J-9-3

The passenger inflator consists of squib circuit, ignition compound, piston, burst disk and inflator gas tank.

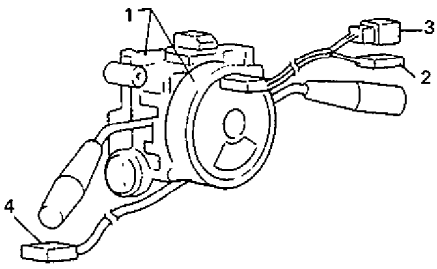
At a collision, deployment current from SDM flows through the squib circuit to ignite the ignition compound which then pushes the piston. The piston ruptures the burst disk and makes a hole in the inflator gas tank. Through that hole, inflator gas (argon gas) filled in the inflator gas tank under a high pressure is discharged to quickly deploy the inflatable bag.



1. Inflatable bag
2. Trim cover

60A50-9J-9-5

Once deployment starts, expansion force of the inflatable bag forces the trim cover and move up.

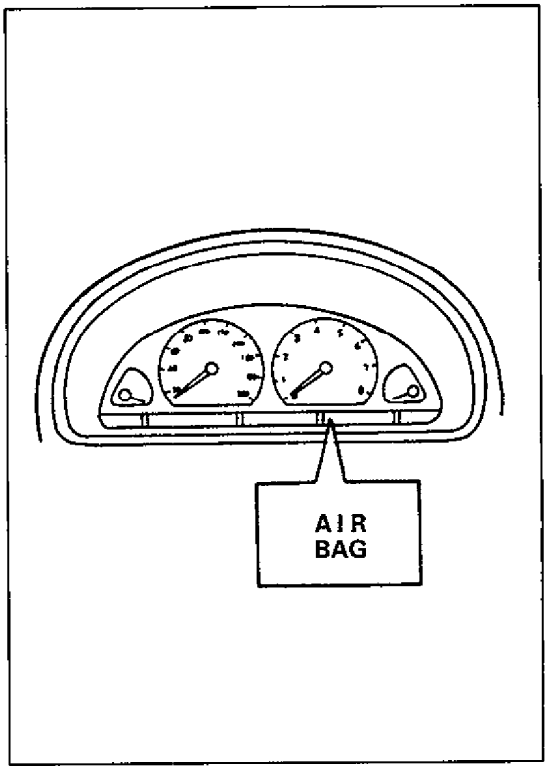


1. Contact coil and combination switch assembly
2. To horn
3. Connector to driver air bag (inflator) module
4. Connector to air bag harness

60A50-9J-10-1

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

The contact coil assembly consists of three current carrying coils; two for the deployment loop and one for the horn circuit. The contact coil assembly is combined with the combination switch assembly and mounted together on the steering column, allowing rotation of the steering wheel while maintaining continuous contact of the driver deployment loop to the driver air bag (inflator) module.



61A10-9J-10-2

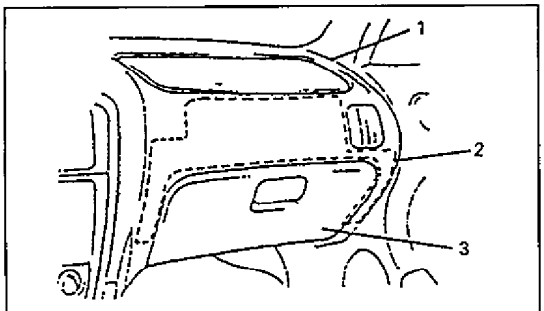
"AIR BAG" WARNING LAMP

The "AIR BAG" warning lamp is located in the combination meter and controlled by SDM.

The "AIR BAG" warning lamp is used in the air bag system to do the following:

- Verify lamp and SDM operation by coming on about 6 seconds when the ignition switch is first turned "ON".
- Warn the vehicle driver of air bag electrical system malfunctions which could potentially affect the operation of the air bag system. These malfunctions could result in undeployment in case of a frontal crash or deployment for conditions less severe than intended.

The "AIR BAG" warning lamp is the key to driver notification of air bag system malfunctions. For proper lamp operation, refer to the "Air Bag Diagnostic System Check" in this section.

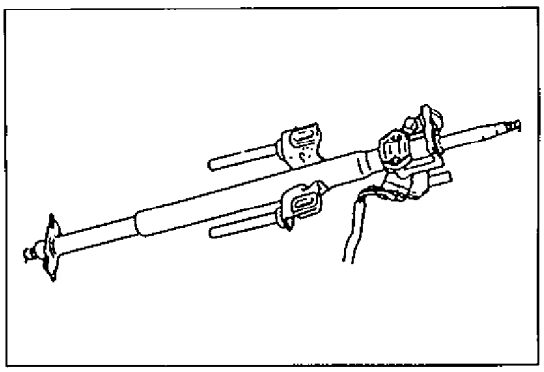


1. Instrument panel
2. Passenger knee bolster panel
3. Glove box

61A10-9J-10-4

KNEE BOLSTER

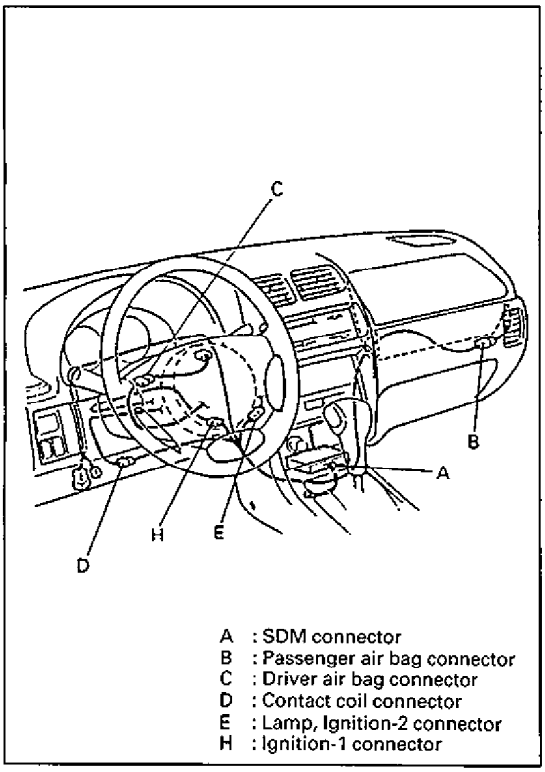
The knee bolster is used to absorb energy and control the forward movement of front passenger during a frontal crash, by limiting leg movement.



60A50-9J-11-1

STEERING COLUMN

The steering column is energy absorbing and is designed to compress in a frontal crash to decrease the chance of injury to the driver.



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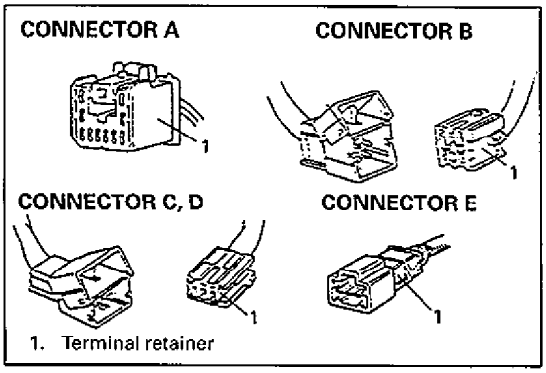

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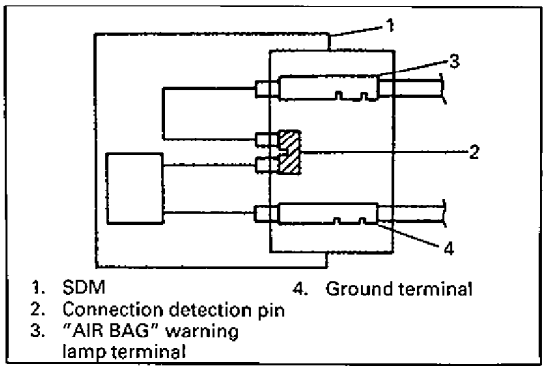


61A10-9J-11-4

AIR BAG WIRE HARNESS AND CONNECTORS

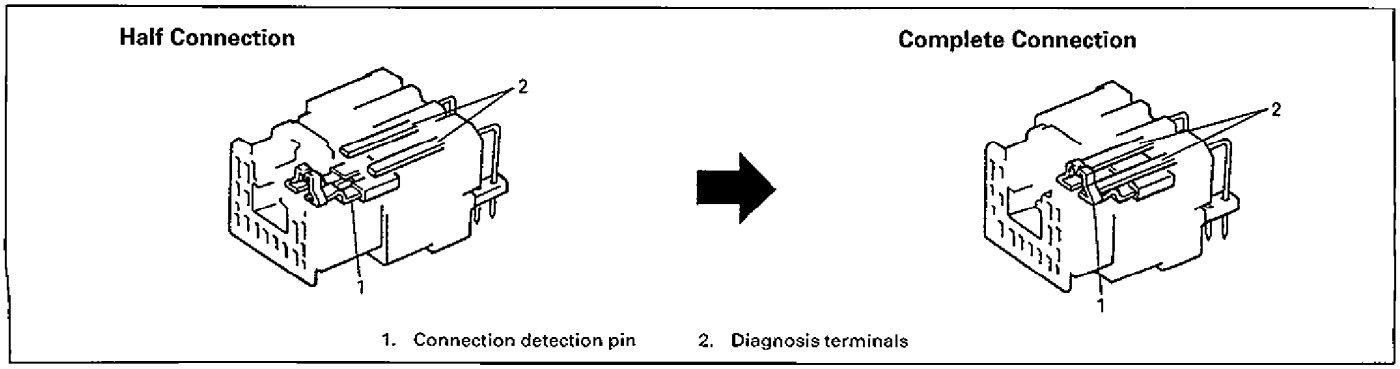
CAUTION:
When an open in wire harness, damaged wire harness, connector or terminals is found, replace wire harness, connectors and terminals as an assemgly.

The air bag wire harness can be identified easily as it is covered with a yellow protection tube. Be very careful when handling it.
Each air bag connector has mechanism as shown below.

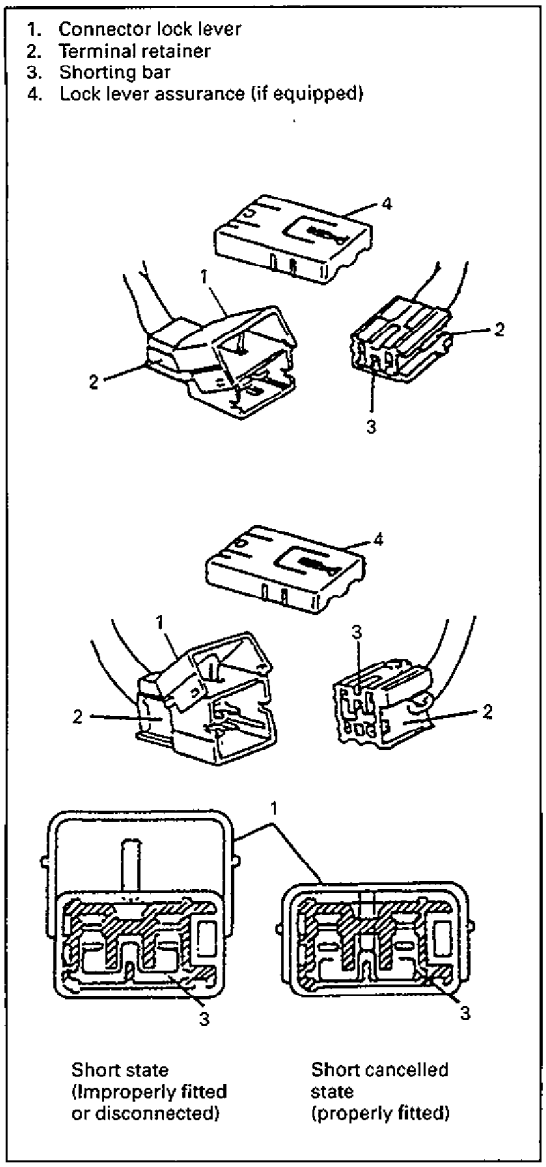
No.	Item	Connector
①	Terminal lock mechanism	A, B, C, D, E, H
②	Electrical connection check mechanism	A
③	Connector lock mechanism	B, C, D, H
④	Double lock mechanism (For system with type A SDM)	B, C, D
⑤	Shorting mechanism	B, C, D

① Terminal retainer (Terminal position assurance: TPA):
The function of the TPA is to keep the terminal securely seated in the connector body. The TPA is not to be removed from the connector body.

② Electrical Connection Check Mechanism:
This mechanism is designed to electrically check if connectors are connected correctly and completely. The electrical connection check mechanism is designed so that the connection detection pin connects with the diagnosis terminals when the connector housing lock is in the locked condition.



61A10-9J-11-5



61A10-9J-12-1

③ Connector lock lever:

Functions of the connector lock lever are: to connect connectors securely, to cancel shorts and to lock connectors against disconnection.

④ Double lock mechanism:

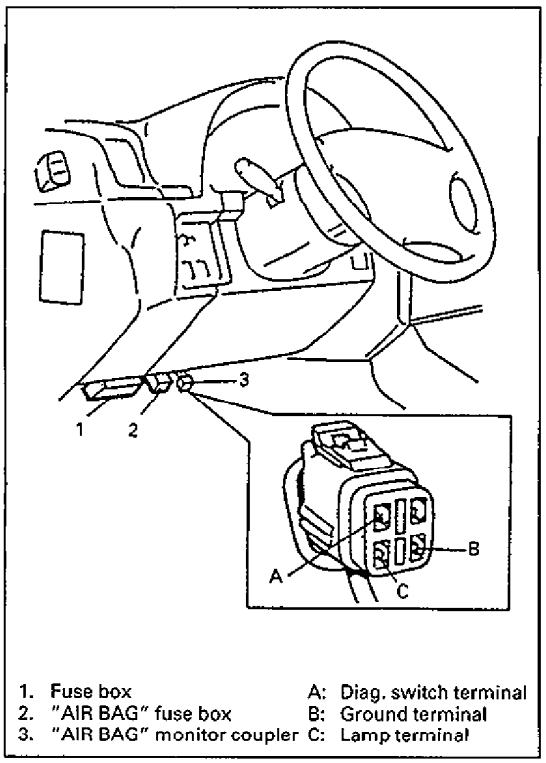
(For system with type A SDM)

With this mechanism the male and female connectors are locked by connector lock lever and lock lever assurance to increase connection reliability.

If the connector lock lever is incomplete, it interferes and prevents the lock lever assurance.

⑤ Shorting bar:

Function of the shorting bar is to short circuit the "HI" and "LO" terminals of the initiator circuit on its module side when the connector is disconnected. This prevents potential difference from occurring between both terminals to avoid malfunction.



61A10-9J-12-4

"AIR BAG" MONITOR COUPLER

"AIR BAG" monitor coupler has a diag. switch terminal, a ground terminal and a lamp terminal.

When diag. switch terminal is grounded, diagnosis signal is fed to SDM and SDM outputs diagnostic trouble code. This code is indicated by flashing "AIR BAG" warning lamp in combination meter and the change of voltage of lamp terminal in "AIR BAG" monitor coupler.

(For details of diagnostic trouble code, refer to 9J-17.)

DEFINITIONS:

AIR BAG – An inflatable cloth cushion designed to deploy in certain frontal crashes. It supplements the protection offered by the seat belts by distributing the impact load more evenly over the vehicle occupant's head and torso.

AIR BAG WIRE HARNESS – The wires and connectors that electrically connect the components in the air bag system.

B+ – Battery voltage, the voltage available at the battery at the time of the indicated measurement. With the key "ON" and the engine not running, the system voltage will likely be between 10 and 14 volts. At idle the voltage may be 14 to 16 volts. The voltage could be as low as 7 to 10 volts during engine cranking.

BULB CHECK – The SDM will cause the "AIR BAG" warning lamp to come on about 6 seconds and then go "OFF" whenever the ignition switch transitions to the "ON" position from any other ignition switch position and no malfunctions are detected.

CKT – Circuit.

DEPLOY – To inflate the air bag.

DEPLOYMENT LOOPS – The circuits which supply current to the air bag (inflator) modules to deploy the air bags.

61A10-9J-13-1

DIAGNOSTIC TROUBLE CODE (DTC) – A numerical designator used by the SDM to indicate specific air bag system malfunctions.

INITIATOR – The electrical component inside the air bag (inflator) module which, when sufficient current flows, sets off the chemical reaction that inflates the air bag.

IGNITION COMPOUND – Compound that ignites instantly when heated by the current flowing through the heat wire.

SAFING SENSOR – This sensor has a function to set the squib circuits in operation whenever deployment is required and out of operation in normal driving states. SDM contains this sensor.

SDM – Sensing and Diagnostic Module which provides reserve energy to the deployment loops, deploys the air bags when required and performs diagnostic monitoring of all air bag system components.

RESERVE VOLTAGE – The reserve energy supply (voltage) from the SDM which provides deployment power when vehicle voltage is lost in a frontal crash.

DIAGNOSIS

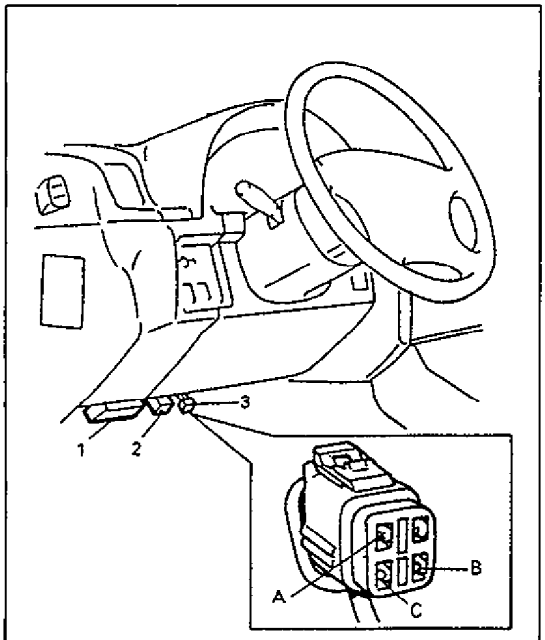
WARNING:
To avoid deployment when troubleshooting the air bag system, do not use electrical test equipment such as a battery powered or AC powered voltmeter, ohmmeter, etc., or any type of electrical equipment other than that specified in this manual. Do not use a non-powered probe type tester.
Instructions in this manual must be followed carefully, otherwise personal injury may result.

50G00-9J-13-1

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 using on-board diagnosis function.

61A10-9J-14-2



1. Fuse box
2. "AIR BAG" fuse box
3. "AIR BAG" monitor coupler
A: Diag. switch terminal
B: Ground terminal
C: Lamp terminal

61A10-9J-14-3

DTC CHECK USING "AIR BAG" WARNING LAMP

1) Turn "ON" ignition switch and wait about 20 seconds.
2) By using service wire, connect diag. switch and ground terminals on "AIR BAG" monitor coupler.
3) To read diagnostic trouble code, watch "AIR BAG" warning lamp. (For frequency of code signal, refer to page 9J-17.)

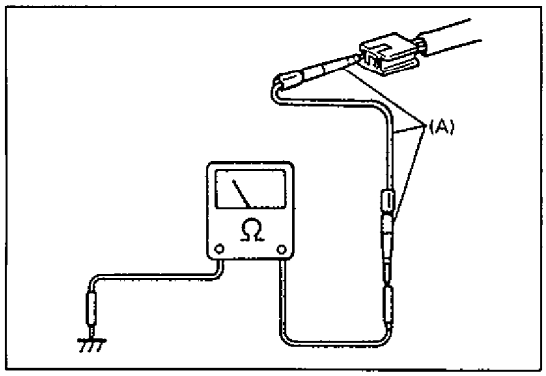
NOTE:
When there are 2 or more diagnostic trouble codes, all applicable code will be indicated from smaller number to large number in order.

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 Driver/Passenger Load Tool, Connector Test Adapter Kit, and the Digital Multimeter.

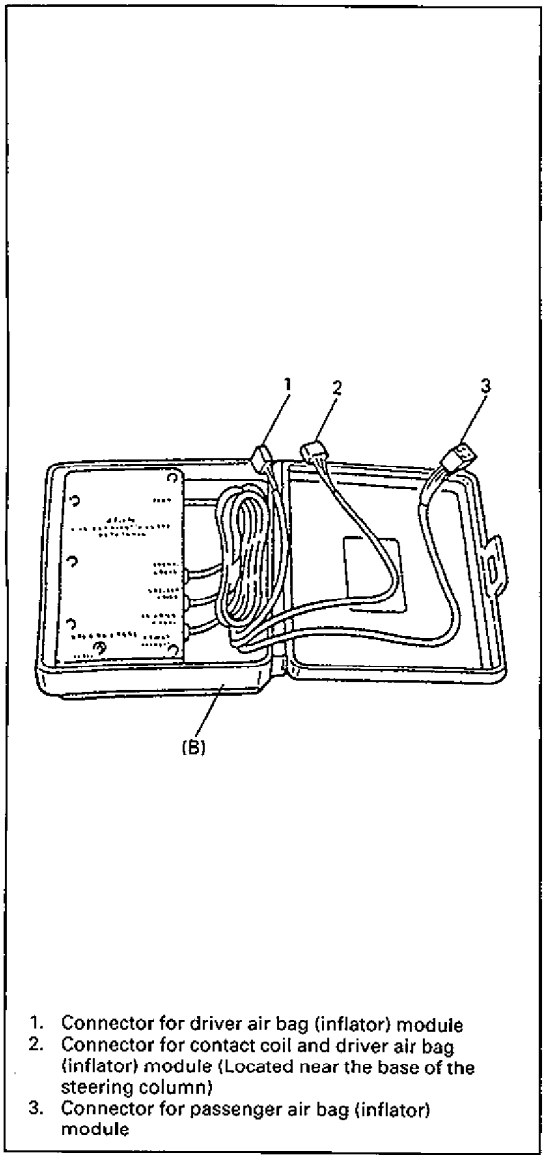
61A10-9J-14-5



61A10-9J-15-1

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 driver air bag (inflator) module
2. Connector for contact coil and driver air bag (inflator) module (Located near the base of the steering column)
3. Connector for passenger air bag (inflator) module

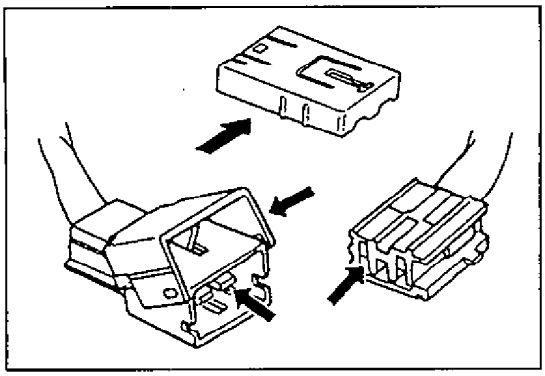
61A10-9J-15-2

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 are electrically functional and serve as resistive load substitutions.
No more than two connectors are used at any time.
One of connectors is used to substitute the load of the driver air bag (inflator) module when it is connected at the top of the column to the contact coil assembly.
Another connector 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 is used to substitute for the load of the passenger air bag (inflator) module when connected to the passenger air bag (inflator) module harness connector.
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.

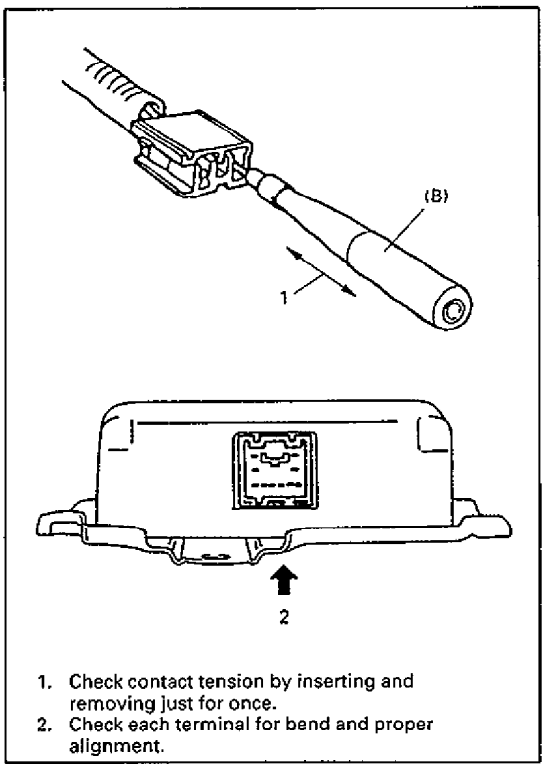
INTERMITTENTS AND POOR CONNECTIONS

Most intermittents are caused by faulty electrical connections or wiring. When a check for proper connection is requested in a diagnostic flow chart, perform careful check of suspect circuits for:



61A10-9J-17-1

- 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.

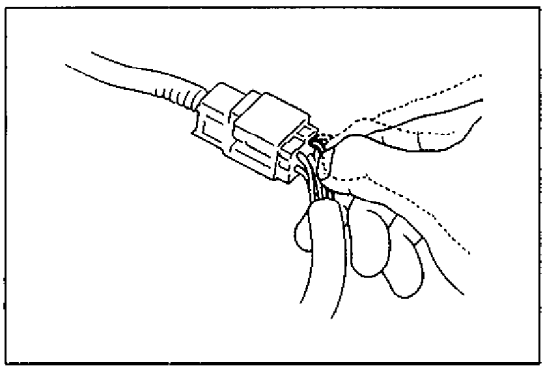


1. Check contact tension by inserting and removing just for once.
2. Check each terminal for bend and proper alignment.

61A10-9J-16-2

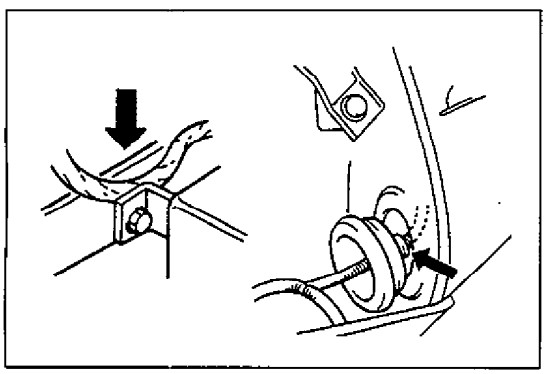
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals.
  Check each connector terminal in problem circuits carefully to ensure good contact tension 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)
(B): 09932-76010



50G00-9J-15-3

- 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.

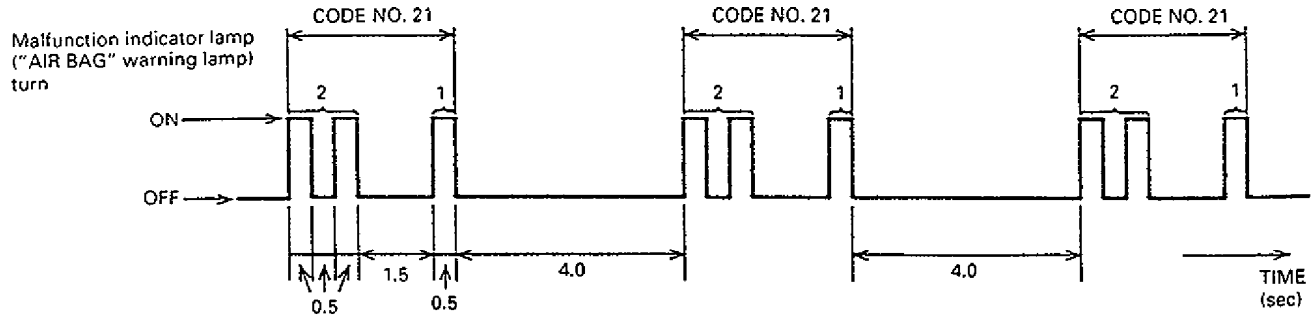


50G00-9J-15-4

- 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 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.

DIAGNOSTIC TROUBLE CODE TABLE

EXAMPLE: DRIVER INITIATOR CIRCUIT OPEN (CODE NO. 21)



DIAGNOSTIC TROUBLE CODE		DIAGNOSIS		"AIR BAG" WARNING LAMP
NO.	MODE			
12	1 2	Normal	——	OFF
		Source voltage drop	Diagnose trouble according to "AIR BAG DIAGNOSTIC SYSTEM CHECK".	ON
*16	1 6	Passenger initiator circuit shorted	Diagnose trouble according to "DIAGNOSTIC FLOW CHART" corresponding to each code No.	ON
17	1 7	Open in passenger initiator circuit		ON
21	2 1	Open in driver initiator circuit		ON
*22	2 2	Driver initiator circuit shorted		ON
24	2 4	Short to ground in initiator circuit		ON
25	2 5	Short to B+ in initiator circuit		ON
71	7 1	SDM failure		ON

NOTE:

- **The codes with "*" are displayed on the system with type B SDM.**
- **When the "AIR BAG" warning lamp remains turned "ON" and the diagnostic trouble code in the normal code, this means a source voltage drop.**
  This malfunction is not stored in memory by the SDM and if the power source voltage returns to normal, after about 10 seconds the "AIR BAG" warning lamp will automatically go out.
- **When 2 or more codes are indicated, the lowest numbered code will appear first.**
- **If a code not listed on the chart is displayed, then the SDM is faulty.**

61A10-9J-17-1

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, etd., 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.

50G00-9J-16-1

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.

60G00-9J-18-1

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 charts and follow the sequence listed below.

A. PERFORM THE "AIR BAG DIAGNOSTIC SYSTEM CHECK".
The "Air Bag Diagnostic System Check" must be the starting point of any air bag system diagnostics. The "Air Bag Diagnostic System Check" checks for proper "AIR BAG" warning lamp operation, the ability of the SDM to communicate through "AIR BAG" warning lamp and whether air bag diagnostic trouble codes exist.

B. REFER TO THE PROPER DIAGNOSTIC CHART AS DIRECTED BY THE "AIR BAG DIAGNOSTIC SYSTEM CHECK".
The "Air Bag Diagnostic System Check" will lead you to the correct chart to diagnose any air bag system malfunctions. Bypassing these procedures may result in extended diagnostic time, incorrect diagnosis and incorrect parts replacement.

C. REPEAT THE "AIR BAG DIAGNOSTIC SYSTEM CHECK" AFTER ANY REPAIR OR DIAGNOSTIC PROCEDURES HAVE BEEN PERFORMED.
Performing the "Air Bag Diagnostic System Check" after all repair or diagnostic procedures will ensure that the repair has been made correctly and that no other malfunctions exist.

61A10-9J-18-3

NOTES ON SYSTEM CHECK CHART:
Number(s) below refer to circled number(s) on the Air Bag Diagnostic System Check Chart.

1) The "AIR BAG" warning lamp should turn on about 6 seconds after ignition is first turned "ON".
2) This test checks for proper operation of the "Diagnosis Switch" line. This test will also identify the stored diagnostic trouble codes.
3) The battery voltage out of standard value would cause the "AIR BAG" warning lamp to come "ON" steady.
4) The voltage at SDM connector in "IG1" and "IG2" circuit out of standard value would cause the "AIR BAG" warning lamp to come "ON" steady.
5) This test checks whether an abnormality is in the SDM or the voltage is intermittently out of standard value.

61A10-9J-18-4

AIR BAG DIAGNOSTIC SYSTEM CHECK

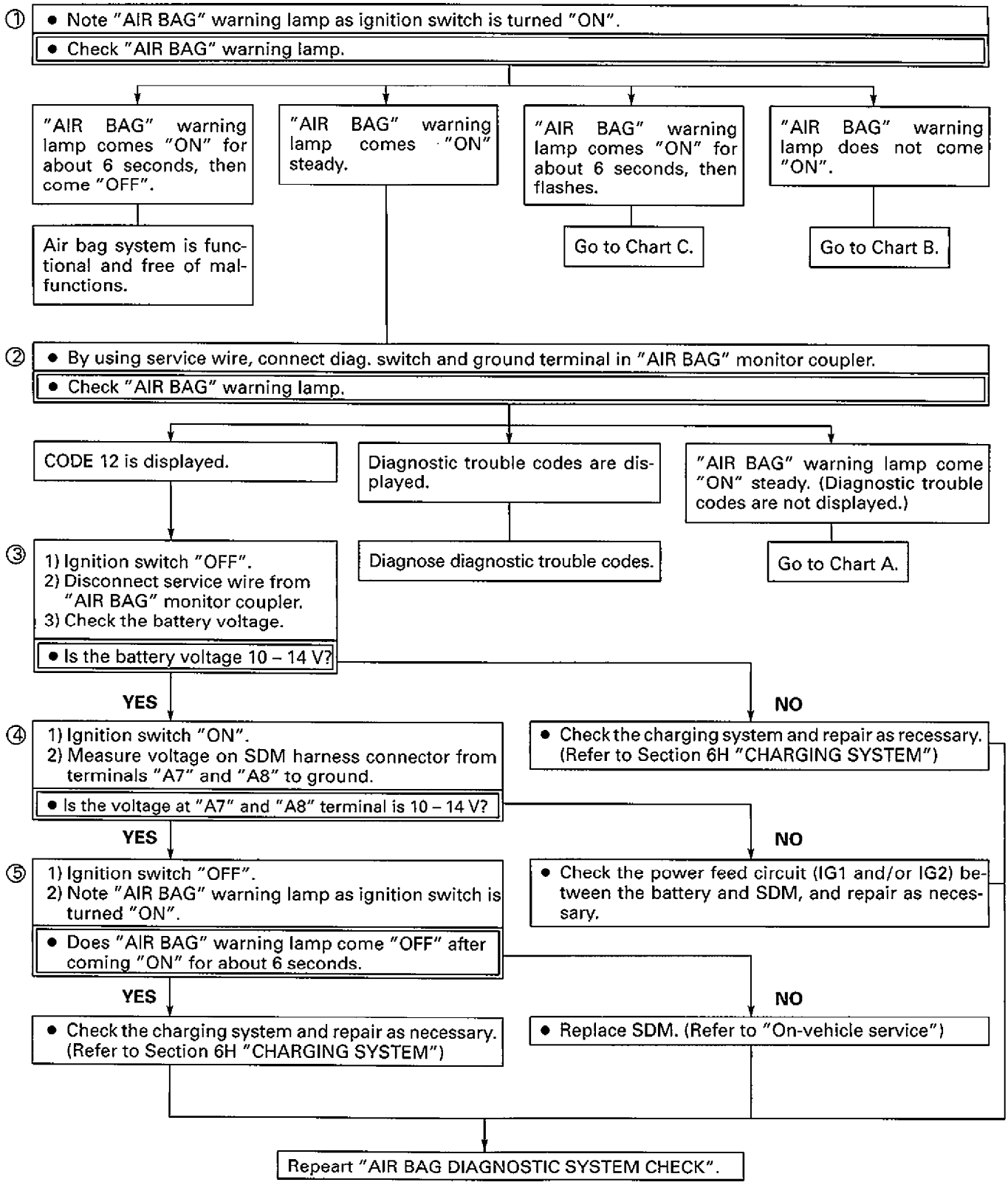
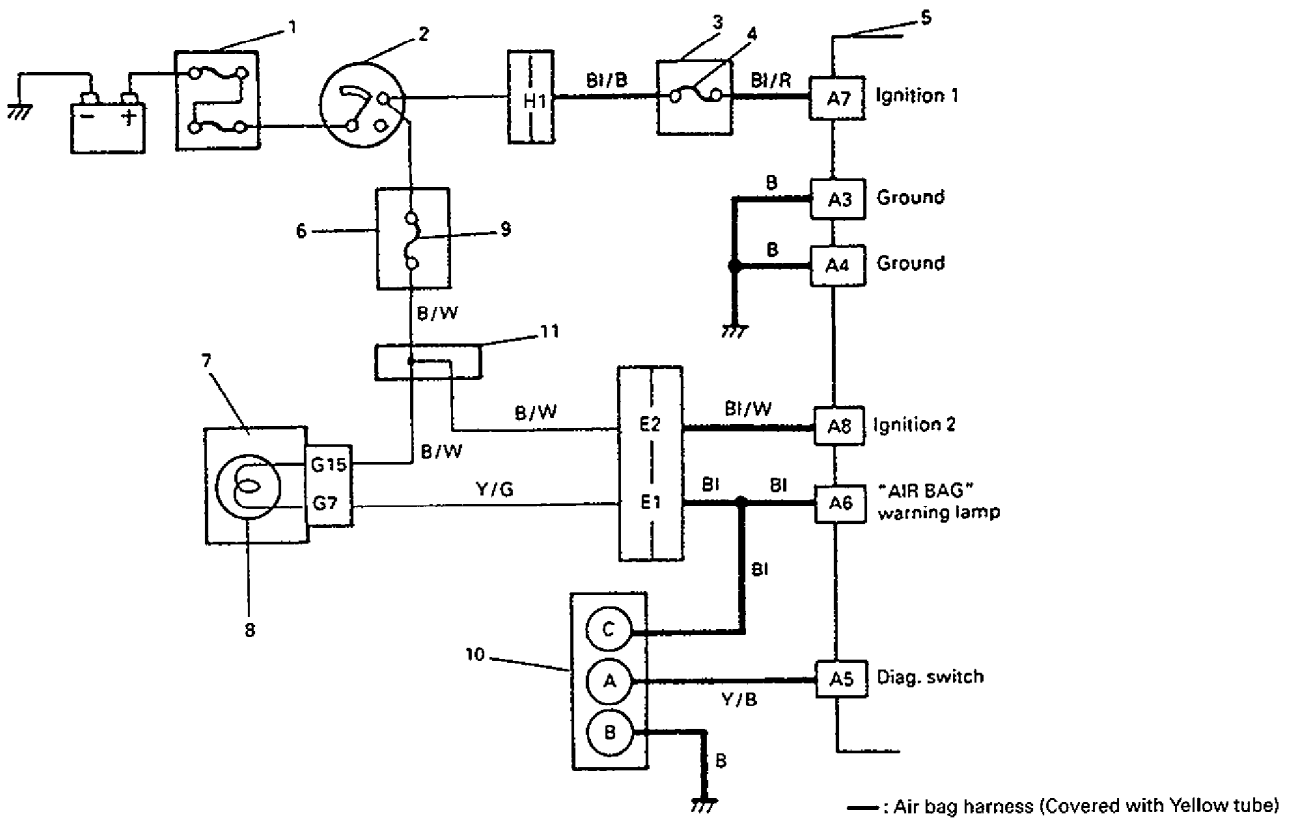


CHART A – "AIR BAG" WARNING LAMP COMES "ON" STEADY



1. Main fuse box
2. Main switch (ignition switch)
3. "AIR BAG" fuse box
4. "AIR BAG" fuse
5. SDM
6. Fuse box
7. Combination meter
8. "AIR BAG" warning lamp
9. "Combination meter" fuse
10. "AIR BAG" monitor coupler
11. Joint connector

CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) An open "Diag. switch" circuit would cause the "AIR BAG" warning lamp to come "ON" steady.
2) This test checks for an open in the ground circuit to the "AIR BAG" monitor coupler.
3) This test checks for a short from the "Diag. switch" circuit to B+.
4) This test checks for a short from the "AIR BAG" warning lamp circuit to ground in air bag harness.
5) This test checks for a short from the "AIR BAG" warning lamp circuit to ground in instrument cluster or instrument panel harness.

CHART A – "AIR BAG" WARNING LAMP COMES "ON" STEADY

① 1) Ignition switch "OFF".
2) Disconnect driver and passenger air bag (inflator) modules, "B" and "D" yellow connectors respectively.
3) Disconnect SDM.
4) Check for proper connection to SDM at terminal "A5".
5) If OK then measure resistance from "AIR BAG" monitor coupler "Y/B" wire terminal "A" to SDM harness connector terminal "A5".

- Does specified digital multimeter display "OL" (infinite)?

NO → ② • Measure resistance from "AIR BAG" monitor coupler "B" wire terminal "B" to ground.

- Does specified digital multimeter display "OL" (infinite)?

NO → ③ 1) Ignition switch "ON".
2) Measure voltage from "AIR BAG" monitor coupler "Y/B" wire terminal "A" to ground.

- Is voltage 1 volt or less?

YES → ④ 1) Ignition switch "OFF".
2) Disconnect "E" yellow connector.
3) Check for proper connection at "E1" terminal.
4) If OK then measure resistance from "E" yellow connector "BI" wire air bag harness side terminal "E1" to ground.

- Does specified digital multimeter display "OL" (infinite)?

YES → ⑤ • Measure resistance from "E" yellow connector "Y/G" wire instrument harness side terminal "E1" to ground.

- Does specified digital multimeter display "OL" (infinite)?

YES → • Replace SDM. (Refer to "On-vehicle service")

NO → • Repair short to ground in CKT "Y/G" or instrument cluster.

NO → • Repair short to ground in CKT "BI".

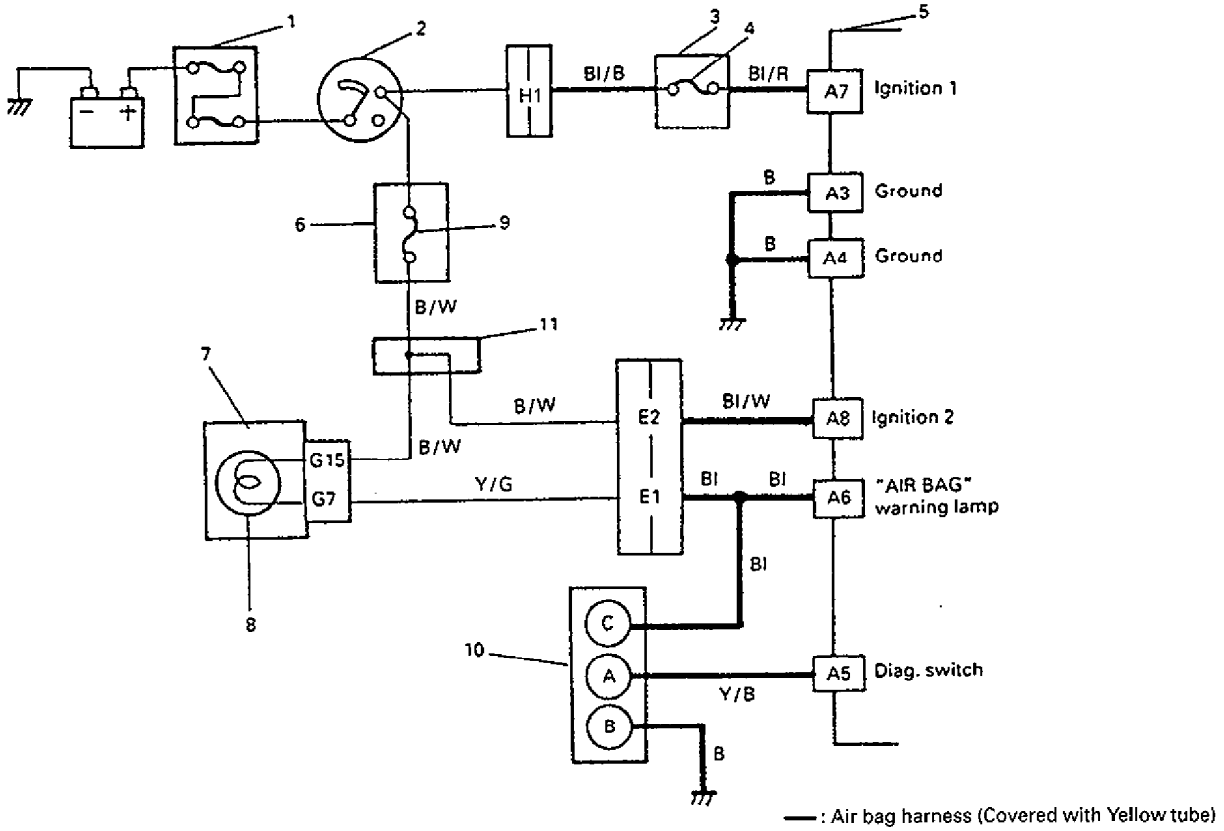
NO → 1) Ignition switch "OFF".
2) Repair short to B+ in CKT "Y/B".

YES → • Repair open in CKT "B".

YES → • Repair open in CKT "Y/B".

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

CHART B – "AIR BAG" WARNING LAMP DOES NOT COME "ON"



1. Main fuse box
2. Main switch (ignition switch)
3. "AIR BAG" fuse box
4. "AIR BAG" fuse
5. SDM
6. Fuse box
7. Combination meter
8. "AIR BAG" warning lamp
9. "Combination meter" fuse
10. "AIR BAG" monitor coupler
11. Joint connector

CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) This test determines whether the malfunction is in the "AIR BAG" warning lamp circuitry or in the instrument cluster power feed circuitry.
2) This test checks whether SDM harness connector is connected properly to SDM.
3) This test checks for the mulfunction in the "Ignition 1" circuit to the SDM.
4) This test checks for the mulfunction in the "AIR BAG" warning lamp circuit to the SDM.
5) This test checks for an open between instrument cluster and SDM in the "AIR BAG" warning lamp circuitry.
6) This test checks for an open in air bag harness.
7) This test determines whether the malfunction is due to a short from the "AIR BAG" warning lamp circuit to B+.
8) This test checks for a short to B+ in air bag harness.
9) This test checks whether "AIR BAG" fuse is an open.

CHART B – "AIR BAG" WARNING LAMP DOES NOT COME "ON"

① • Note instrument cluster (Combination meter) as ignition switch is turned "ON".
• Does the "OIL" and "BATTERY" indicator (warning lamp) come "ON"?

YES

② 1) Ignition switch "OFF".
2) Inspect SDM harness connector connection to SDM.
• Is it correctly and completely connected to the SDM?

NO

• Properly connect to SDM harness connector to SDM.

YES

③ 1) Disconnect SDM.
2) Check for proper connection to SDM at terminal "A6" and "A7".
3) Ignition switch "ON".
4) Measure voltage from SDM harness connector terminal "A7" to ground.
• Is voltage 1 volt or less?

NO

④ • Measure voltage from SDM harness connector terminal "A6" to ground.
• Is voltage 1 volt or less?

NO

Go to CHART B, (C) of next page.

YES

⑤ 1) Ignition switch "OFF".
2) Remove instrument cluster.
3) Check for proper connection to instrument cluster harness 16-P connector "Y/G" terminal "G7", "B/W" terminal "G15".
4) Measure resistance from instrument cluster 16-P connector "Y/G" harness connector terminal "G7" to SDM harness connector terminal "A6".
• Does specified digital multimeter display "OL" (infinite)?

YES

Go to CHART B, (A), of next page.

NO

Go to CHART B, (B), of next page.

YES

1) Ignition switch "OFF".
2) Repair open or short to ground in power feed to SDM harness connector terminal "A7". ("AIR BAG" fuse, "BI/B" or "BI/R" circuit or circuit before air bag harness)
3) Repair open or short to ground in power feed circuit between joint connector and SDM harness connector terminal "A8".

NO

• Repair open or short to ground in power feed to instrument cluster or instrument cluster. (Refer to SECTION 8.)

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

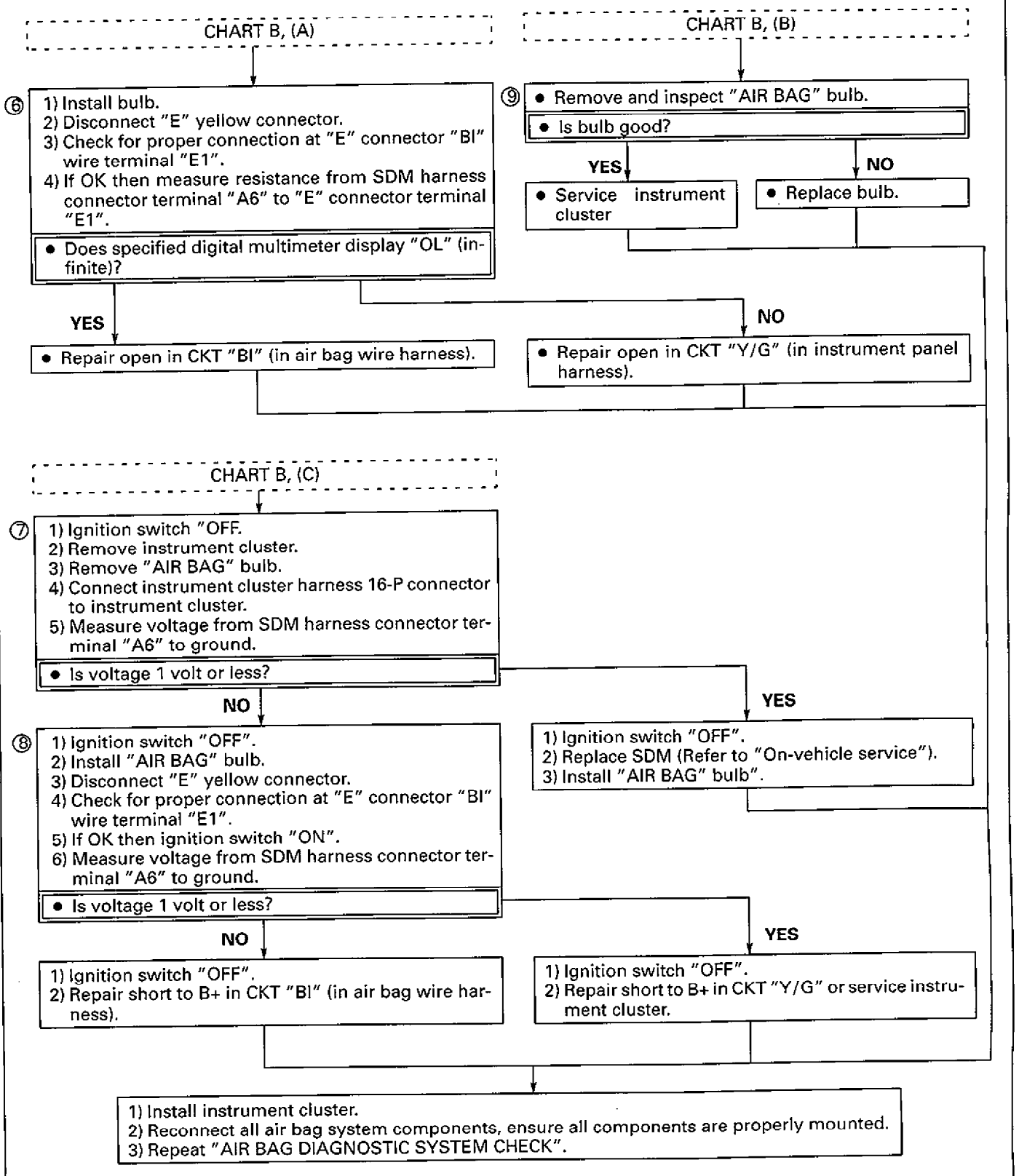
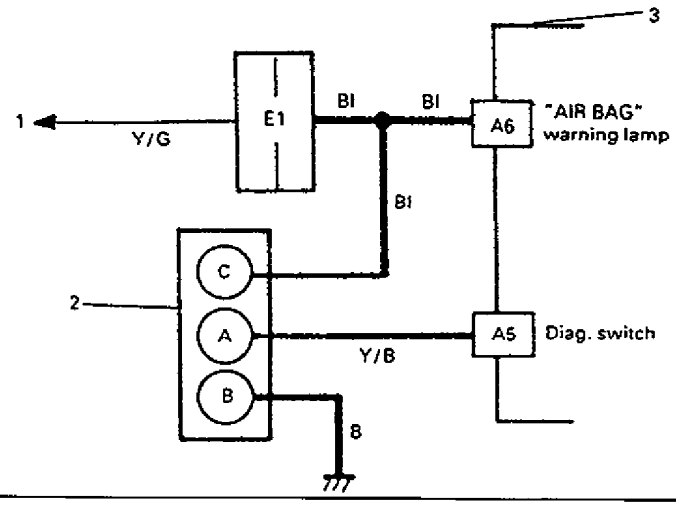


CHART C – "AIR BAG" WARNING LAMP FLASHES



CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) This test checks for a short between "Diag. switch and ground terminals in "AIR BAG" monitor coupler by service wire.
2) This test checks for a short from the "Diag. switch circuit to ground.

CHART C – "AIR BAG" WARNING LAMP FLASHES

① • Check "AIR BAG" monitor coupler.
• Is it connected diag. switch terminal "A" and ground terminal "B" in "AIR BAG" monitor coupler by service wire?

NO

② 1) Ignition switch "OFF".
2) Disconnect driver and passenger air bag (inflator) modules, "B" and "D" yellow connectors respectively.
3) Disconnect SDM.
4) Measure resistance from "AIR BAG" monitor coupler"Y/B" wire terminal "A" to ground.
• Does specified digital multimeter display "OL" (infinite)?

NO

• Repair short from CKT "Y/B" to ground.

YES

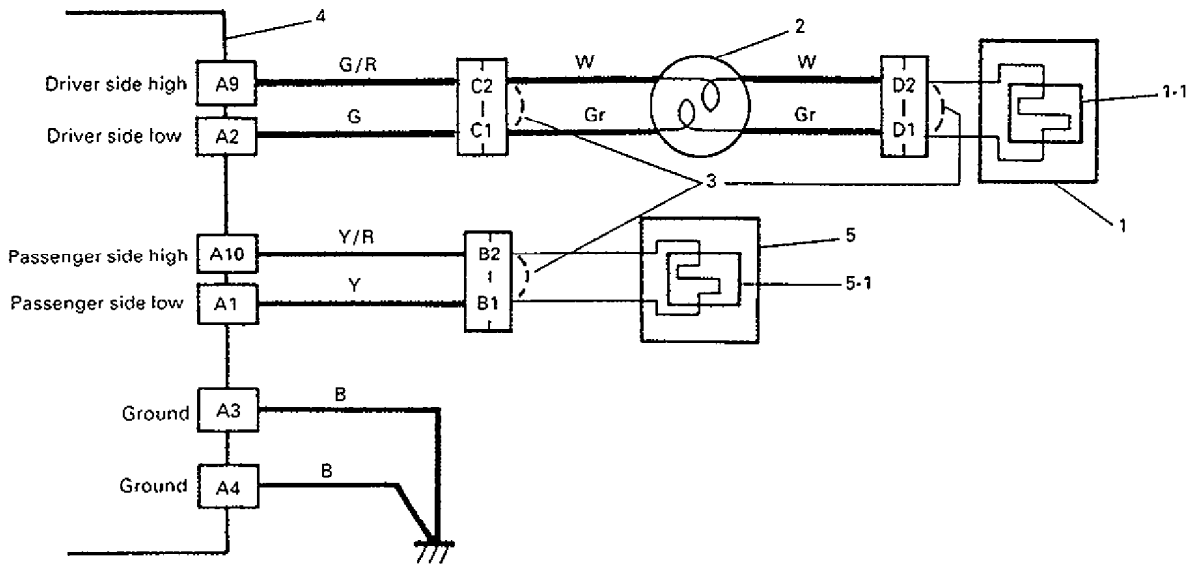
• Replace SDM. (Refer to "On-vehicle service")

YES

• Remove service wire.

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 16 – PASSENGER INITIATOR CIRCUIT SHORTED



—: Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag intiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

DTC WILL SET WHEN:

The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is below a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) DTC 16 and 22 will set simultaneously when the "Driver Side High" circuit is shorted to the "Passenger Side High" circuit due to parallel current paths.
2) This test determines whether the malfunction is in the passenger air bag (inflator) module circuitry or in the SDM wiring harness circuitry.
3) This test checks for a short from the "Passenger Side High" circuit to the "Passenger Side Low" circuit.
4) This test checks for a short from the "Passenger Side High" circuit to the "Driver Side Low" circuit.

61A10-9J-26-1

DTC 16 – PASSENGER INITIATOR CIRCUIT SHORTED

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① • Is DTC 22 also display?

NO

YES

1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Repair short from CKT "G/R" to CKT "Y/R".

② 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check the "B" yellow connector lock lever and shorting bar for short cancelling function.
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

• Is DTC 16 display?

YES

NO

1) Ignition switch "OFF".
2) Replace passenger air bag (inflator) module. (Refer to "On-vehicle service")

③ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Measure resistance on SDM harness connector from terminal "A1" to terminal "A10".

• Does specified digital multimeter display "OL" (infinite)?

YES

NO

④ • Measure resistance on SDM harness connector from terminal "A2" to terminal "A10".

• Does specified digital multimeter display "OL" (infinite)?

YES

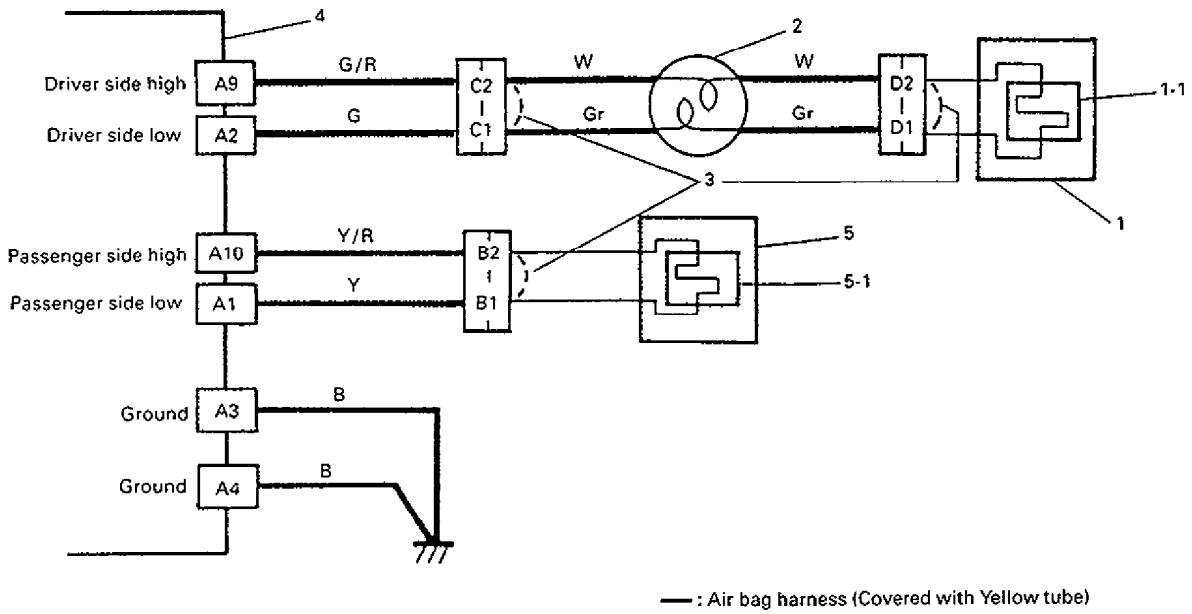
NO

• Replace SDM (Refer to "On-vehicle service").

• Repair short from CKT "Y/R" to CKT "G".

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 17 – PASSENGER INITIATOR CIRCUIT OPEN



1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

DTC WILL SET WHEN:

The combined resistance of the passenger air bag (inflator) module, harness wiring and connector terminal contact is above a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) This test determines whether the malfunction is in the passenger air bag (inflator) module circuitry or in the SDM wiring harness circuitry.
2) This test checks whether the malfunction is due to open in CKT "Y/R".
3) This test checks whether the malfunction is due to open in CKT "Y".

61A10-9J-28-1

DTC 17 – PASSENGER INITIATOR CIRCUIT OPEN

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2 Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check for proper connection to passenger air bag (inflator) module at terminals "B1" and "B2".
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

- Is DTC 17 display?

YES

② 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Check for proper connection to SDM at terminals "A1" and "A10".
5) If OK then measure resistance from SDM harness connector terminal "A10" to passenger air bag (inflator) module harness connector terminal "B2".

- Is resistance 2.0 Ω or less?

YES

③
- Measure resistance from SDM harness connector terminal "A1" to passenger air bag (inflator) module harness connector terminal "B1".
- Is resistance 2.0 Ω or less?

YES

- Replace SDM. (Refer to "On-vehicle service")

NO

- Repair high resistance or open in CKT "Y".

NO

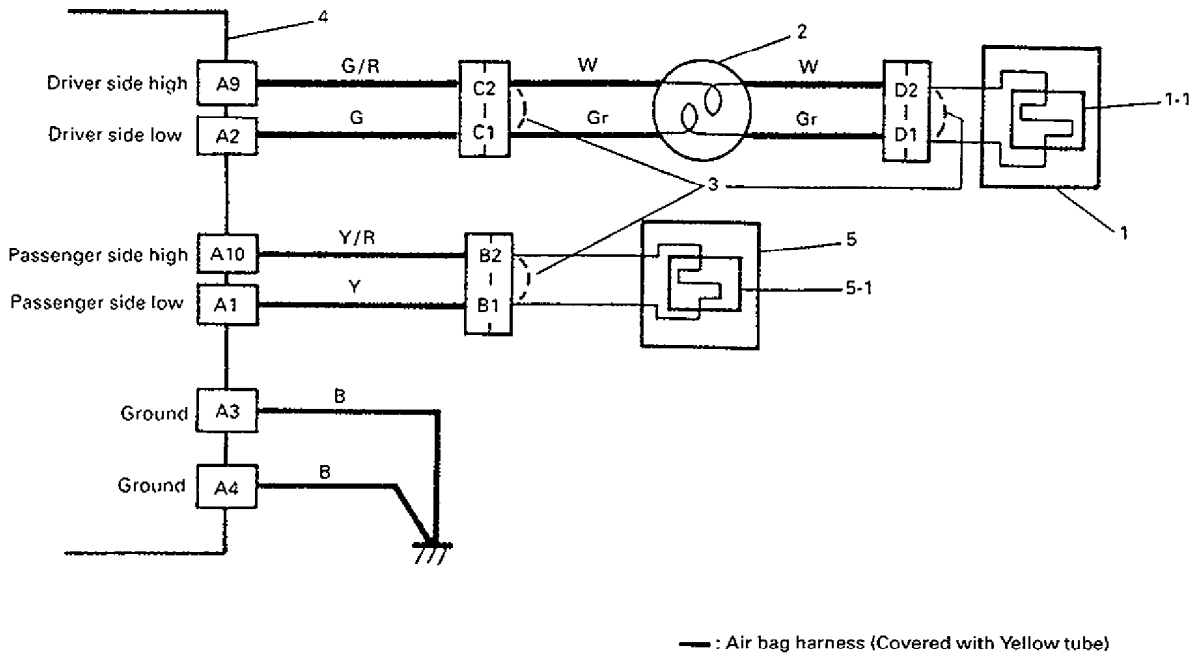
- Repair high resistance or open in CKT "Y/R".

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM HECK".

NO

1) Ignition switch "OFF".
2) Replace passenger air bag (inflator) module. (Refer to "On-vehicle service")

DTC 21 – DRIVER INITIATOR CIRCUIT OPEN



: Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

DTC WILL SET WHEN:

The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is above a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) This test determines whether the malfunction is in the driver air bag (inflator) module circuitry or in the SDM wiring harness circuitry.
2) This test checks whether the malfunction is due to high resistance in CKT "G/R".
3) This test checks whether the malfunction is due to high resistance in CKT "G".
4) This test determines whether the malfunction is in the driver air bag (inflator) module or the contact coil assembly.

61A10-9J-30-1

DTC 21 – DRIVER INITIATOR CIRCUIT OPEN

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check for proper connection to contact coil assembly connector at terminals "C1" and "C2".
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition siwtch "ON" and wait 20 seconds.

- Is DTC 21 displayed?

YES

② 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Check for proper connection to SDM at terminals "A2" and "A9".
5) If OK then measure resistance from SDM harness connector terminal "A9" to driver air bag (inflator) module harness connector terminal "C2".

- Is resistance 2.0 Ω or less?

YES

③
- Measure resistance from SDM harness connector terminal "A2" to driver air bag (inflator) module harness connector terminal "C1".

- Is resistance 2.0 Ω or less?

YES

- Replace SDM. (Refer to "On-vehicle service")

NO

- Repair high resistance or open in CKT "G".

NO

- Repair high resistance or open in CKT "G/R".

NO

④ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool from driver air bag (inflator) module harness connector.
3) Remove air bag (inflator) module from steering wheel. (Refer to Section 3C1)
4) Connect driver/passenger load tool to air bag (inflator) module connector of contact coil on steering column.
5) Reconnect driver air bag (inflator) module harness connector at the base of the steering column.
6) Ignition switch "ON" and wait 20 seconds.

- Is DTC 21 displayed?

YES

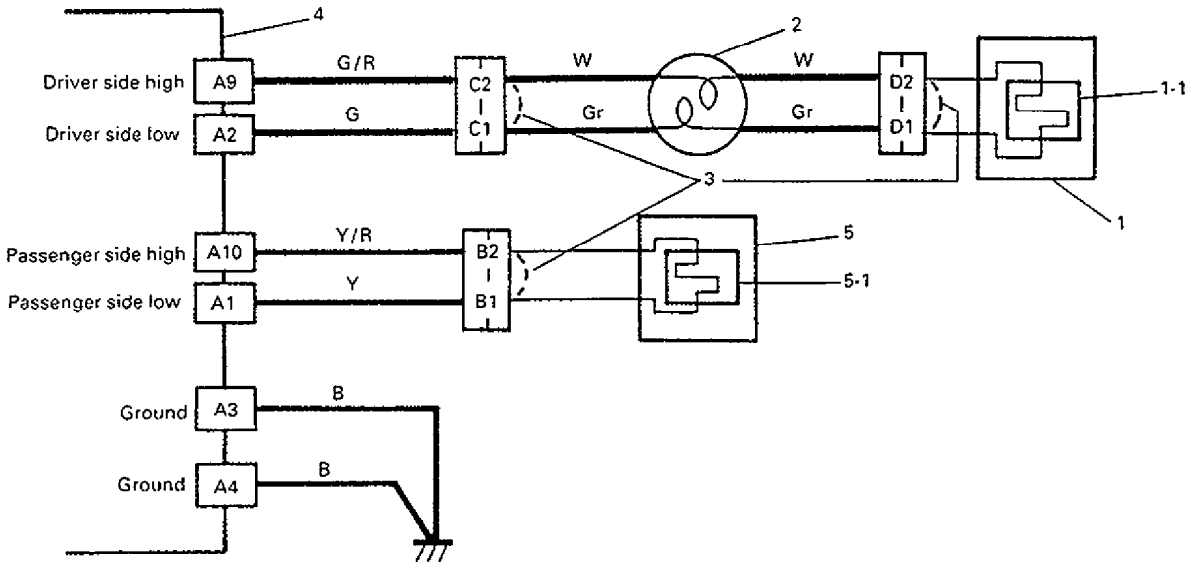
1) Ignition switch "OFF".
2) Replace contact coil assembly. (Refer to Section 3C1)

NO

1) Ignition switch "OFF".
2) Replace driver air bag (inflator) module. (Refer to Section 3C1)

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 22 – DRIVER INITIATOR CIRCUIT SHORTED



—— : Air bag harness (Covered with Yellow tube)

1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:

- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

DTC WILL SET WHEN:

The combined resistance of the driver air bag (inflator) module, contact coil assembly, harness wiring and connector terminal contact is below a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.

1) DTC 16 and 22 will set simultaneously when the "Driver Side High" circuit is shorted to the "Passenger Side High" circuit due to parallel current paths.
2) This test determines whether the malfunction is in the driver air bag (inflator) module circuitry or in the SDM wiring harness circuitry.
3) This test checks for a short from the "Driver Side High" circuit to the "Driver Side Low" circuit.
4) This test checks for a short from the "Driver Side High" circuit to the "Passenger Side Low" circuit.
5) This test determines whether the malfunction is in the driver air bag (inflator) module or the contact coil assembly.

61A10-9J-32-1

DTC 22 – DRIVER INITIATOR CIRCUIT SHORTED

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① • Is DTC 16 also display?

YES

1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Repair short from CKT "G/R" to CKT "Y/R".

NO

② 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column and passenger air bag (inflator) module, "B" yellow connector behind the glove box.
3) Check the "C" yellow connector lock lever and shorting bar for short cancelling function.
4) If OK then connect special tool (driver/passenger load tool) to driver and passenger air bag (inflator) module harness connectors disconnected at the above step respectively.
5) Ignition switch "ON" and wait 20 seconds.

• Is DTC 22 display?

YES

③ 1) Ignitin switch "OFF".
2) Disconnect driver/passenger load tool.
3) Disconnect SDM.
4) Measure resistance on SDM harness connector from terminal "A2" to terminal "A9".

• Does specified digital multimeter display "OL" (infinite)?

YES

④ • Measure resistance on SDM harness connector from terminal "A1" to terminal "A9".

• Does specified digital multimeter display "OL" (infinite)?

YES

• Replace SDM (Refer to "On-vehicle service")

NO

• Repair short from CKT "G/R" to CKT "Y".

NO

• Repari short from CKT "G/R" to CKT "G".

NO

⑤ 1) Ignition switch "OFF".
2) Disconnect driver/passenger load tool from driver air bag (inflator) module harness connector.
3) Remove driver air bag (inflator) module from steering wheel. (Refer to Section 3C1)
4) Check the "D" yellow connector lock lever and shorting bar for short cancelling function.
5) If OK then connect driver/passenger load tool to air bag (inflator) module connector of contact coil on the steering column.
6) Reconnect driver air bag (inflator) module harness connector at the base of the steering column.
7) Ignition switch "ON" and wait 20 seconds.

• Is DTC22 display?

YES

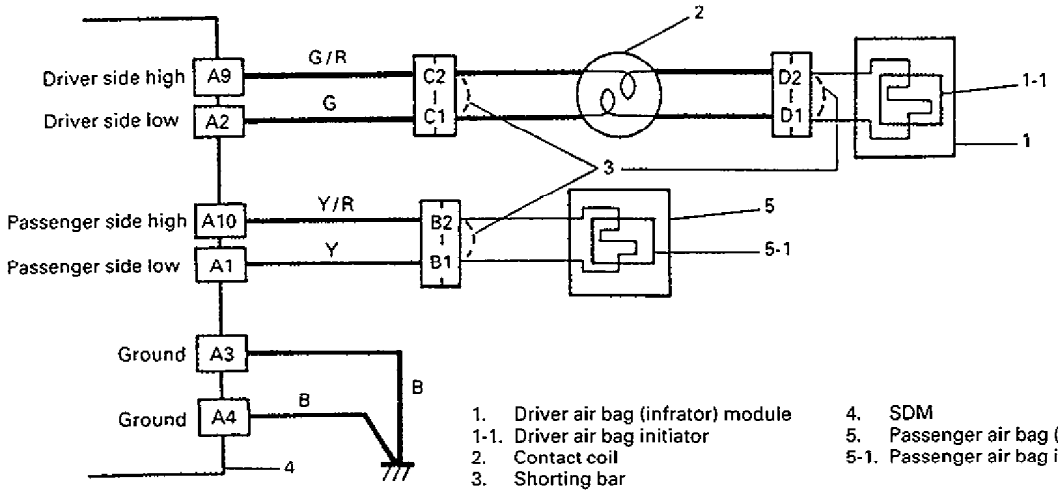
1) Ignition switch "OFF".
2) Replace contact coil assembly. (Refer to Section 3C1)

NO

1) Ignition switch "OFF".
2) Replace driver air bag (inflator) module. (Refer to Section 3C1)

1) Reconnect all air bag system components, ensure all components are properly mounted.
2) Repeat "AIR BAG DIAGNOSTIC SYSTEM CHECK".

DTC 24 – INITIATOR CIRCUIT SHORT TO GROUND



1. Driver air bag (infrator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passenger air bag initiator

CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

DTC WILL SET WHEN:
The voltage measured at "Driver Side Low" and "Passenger Side Low" is below a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.
1) This test determines whether the malfunction is occurring in the driver air bag (inflator) module circuitry.
2) This test determines whether the malfunction is occurring in the passenger air bag (inflator) module circuitry.
3) This test determines whether the malfunction is in the driver air bag (inflator) module or contact coil assembly.
4) This test checks for a short from "Driver Side High" to ground.
5) This test checks for a short from "Driver Side Low" to ground.
6) This test checks for a short from "Passenger Side High" to ground.
7) This test checks for a short from "Passenger Side Low" to ground.

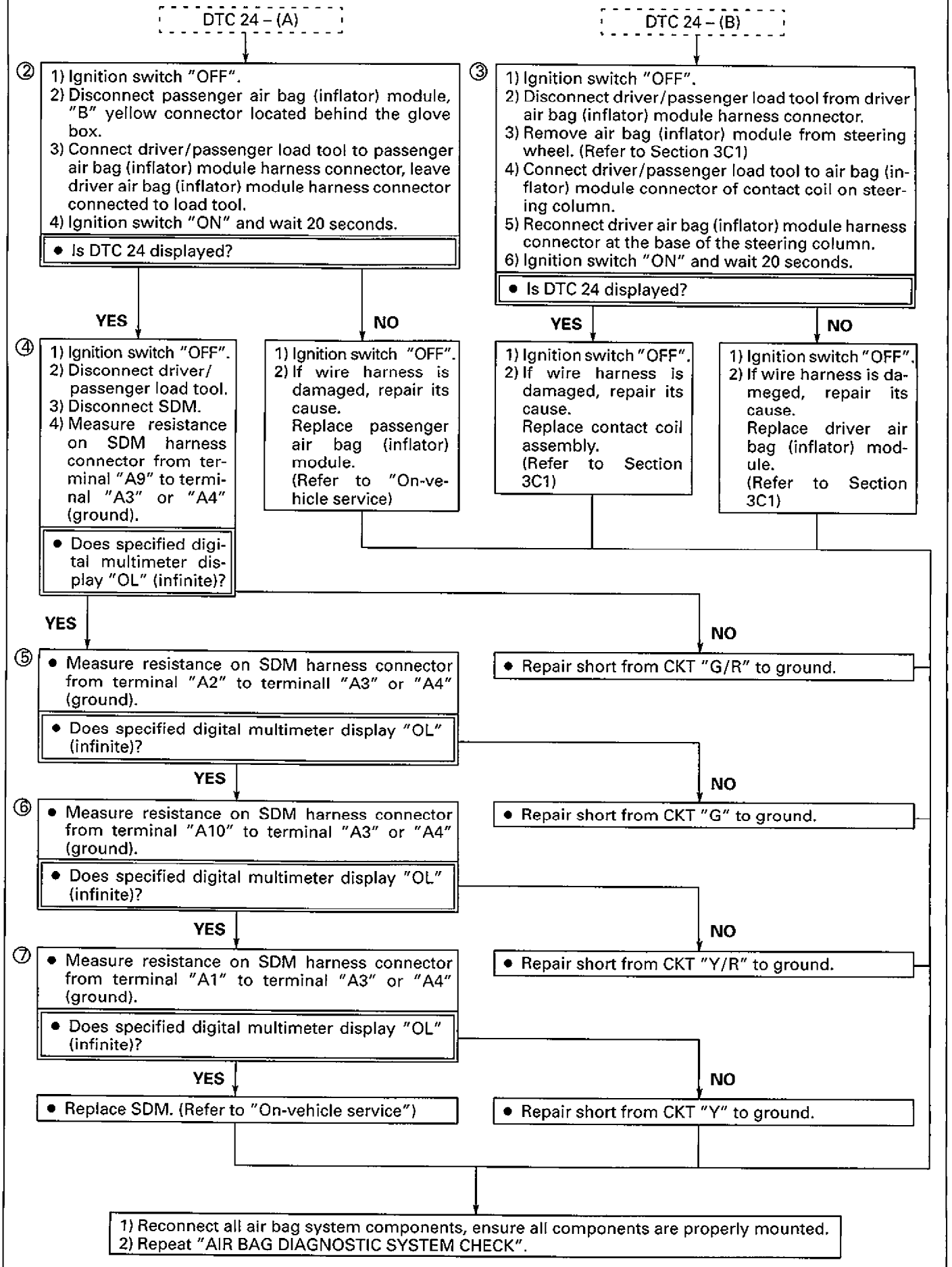
DTC 24 – INITIATOR CIRCUIT SHORT TO GROUND

Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

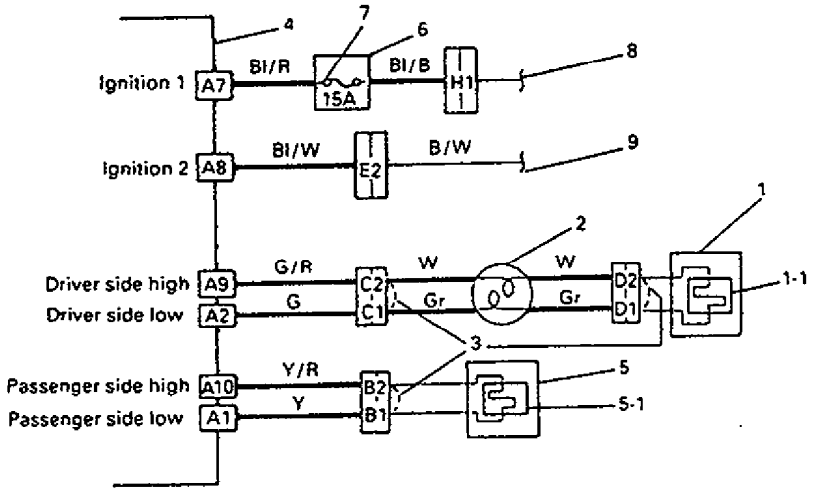
① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column, leave passenger air bag (inflator) module connected.
3) Connect special tool (driver/passenger load tool) to driver air bag (inflator) module harness connector disconnected at the above step.
4) Ignition switch "ON" and wait 20 seconds.

- Is DTC 24 displayed?

YES: Go to DTC 24 – (A) on next page.
NO: Go to DTC 24 – (B) on next page.



DTC 25 – INITIATOR CIRCUIT SHORT TO IGNITION



1. Driver air bag (inflator) module
1-1. Driver air bag initiator
2. Contact coil
3. Shorting bar
4. SDM
5. Passenger air bag (inflator) module
5-1. Passrnger air bag initiator
6. "AIR BAG" fuse box
7. "AIR BAG" fuse
8. To main switch (ignition switch)
9. To fuse box

CAUTION:
- **When measurements are requested in this chart use specified digital multimeter with correct terminal adapter from special tool (Connector test adapter kit).**
- **When a check for proper connection is requested refer to "INTERMITTENTS AND POOR CONNECTIONS" in this section.**
- **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.**

DTC WILL SET WHEN:
The voltage measured at "Driver Side Low" and "Passenger Side Low" is above a specified value for specified time.

DTC CHART TEST DESCRIPTION: Number(s) below refer to circled number(s) on the diagnostic chart.
1) This test determines whether the malfunction is occurring in the driver air bag (inflator) module circuitry.
2) This test determines whether the malfunction is occurring in the passenger air bag (inflator) module circuitry.
3) This test determines whether the malfunction is in the driver air bag (inflator) module or contact coil assembly.
4) This test checks for a short from "Driver Side High" to B+.
5) This test checks for a short from "Driver Side Low" to B+.
6) This test checks for a short from "Passenger Side High" to B+.
7) This test checks for a short from "Passenger Side Low" to B+.

DTC 25 – INITIATOR CIRCUIT SHORT TO IGNITION

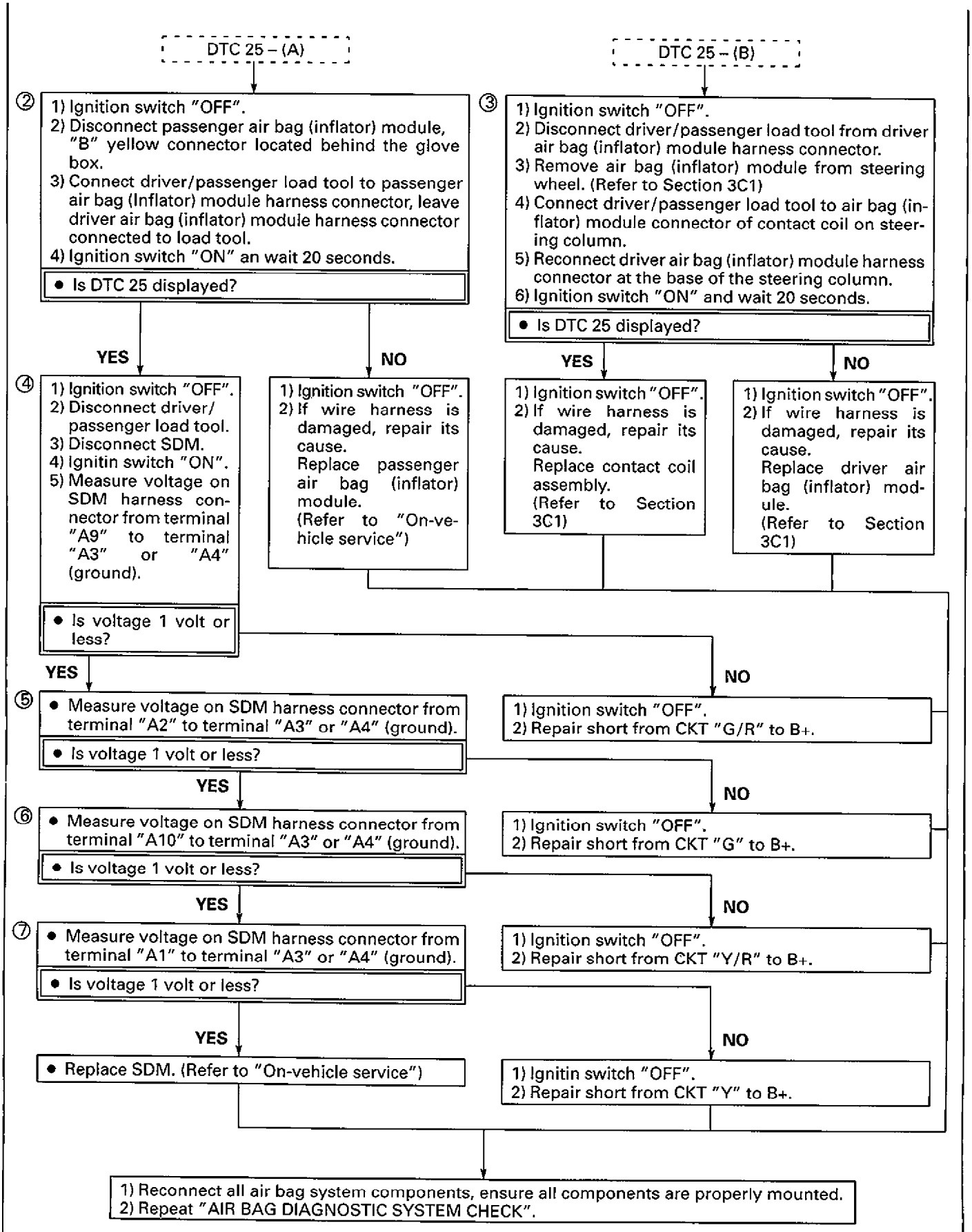
Before executing items in this chart, be sure to perform "AIR BAG DIAGNOSTIC SYSTEM CHECK".

① 1) Ignition switch "OFF".
2) Disconnect driver air bag (inflator) module, "C" yellow connector located near the base of the steering column, leave passenger air bag (inflator) module connected.
3) Connect special tool (driver/passenger load tool) to driver air bag (inflator) module harness connector disconnected at the above step.
4) Ignition switch "ON" and wait 20 seconds.

- Is DTC 25 displayed?

YES ↓ Go to DTC 25 – (A) of next page.

NO ↓ Go to DTC 25 – (B) of next page.

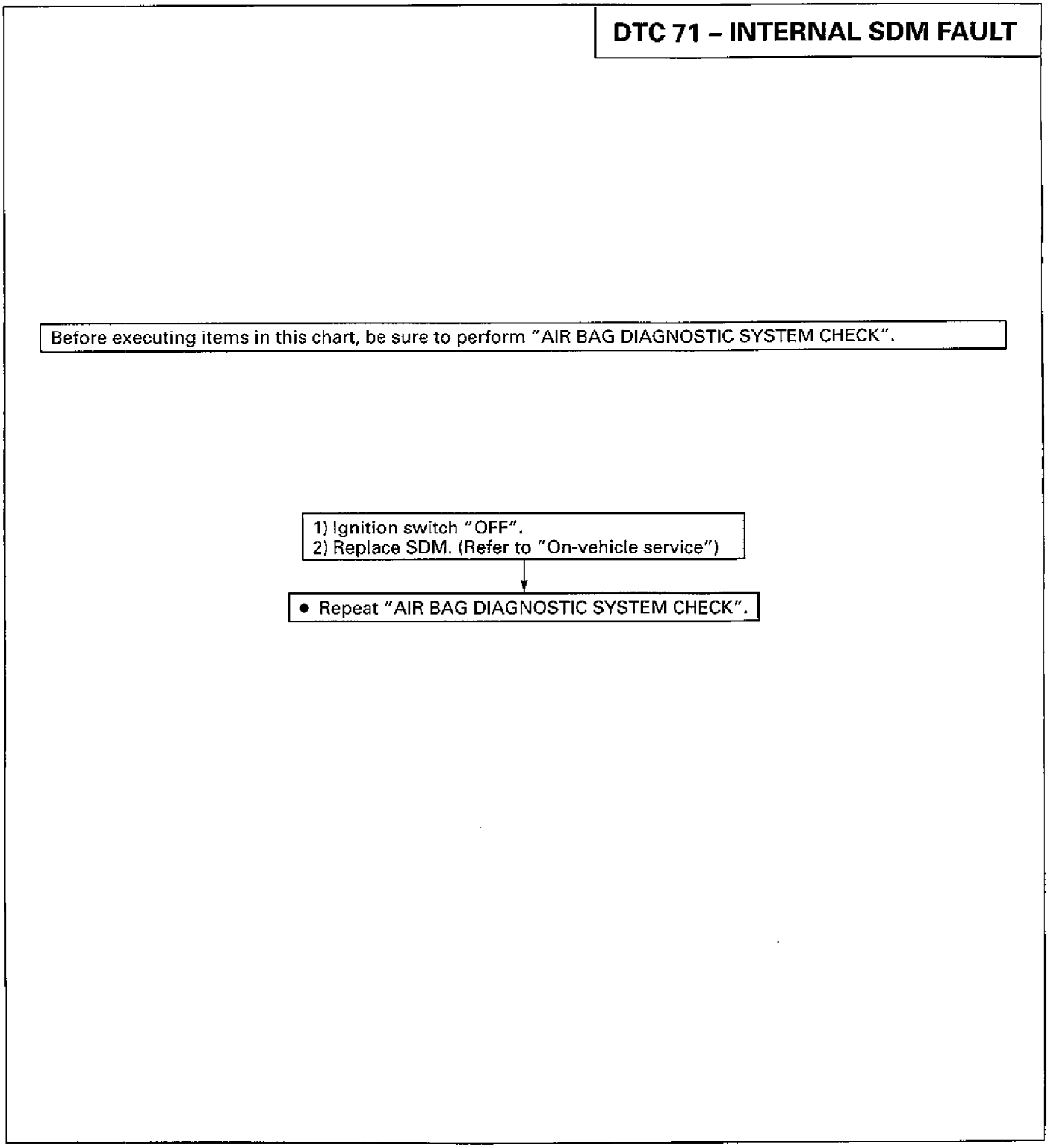


DTC 71 – INTERNAL SDM FAULT

DTC SET WILL WHEN:

An internal SDM fault is detected by the SDM.

61A10-9J-38-1



61A10-9J-38-2

ON-VEHICLE SERVICE

SERVICE PRECAUTIONS

SERVICING

WARNING/CAUTION labels are attached on each part of air bag system components. Be sure to follow the instructions.

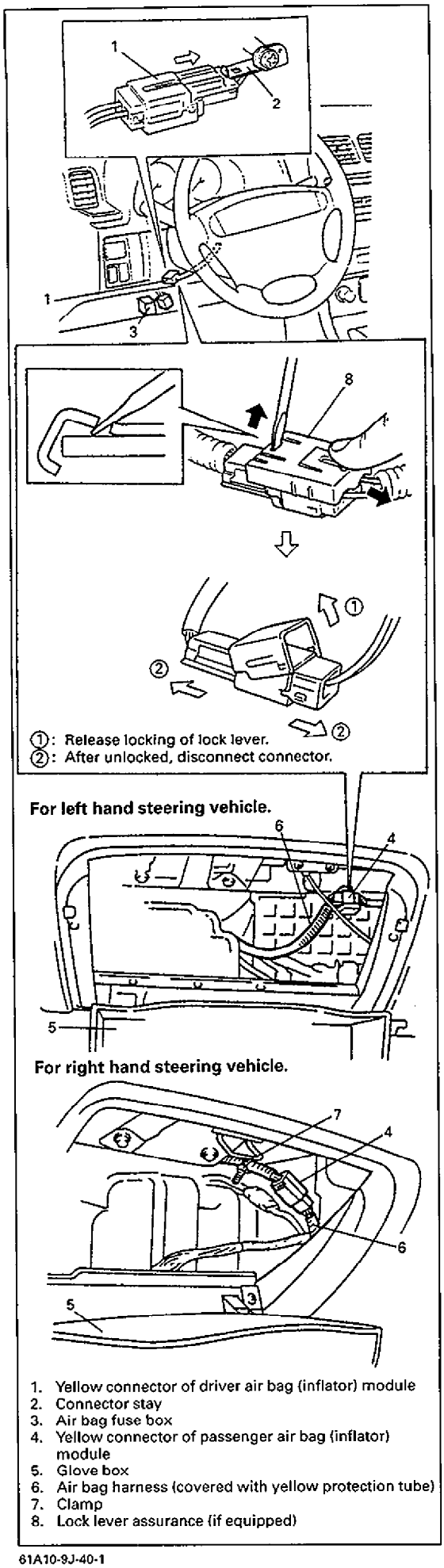
WARNING:
- **If the air bag system and another vehicle system both need repair, Suzuki recommends that the air bag system be repaired first, to help avoid unintended air bag deployment.**
- **Do not modify the steering wheel, dashboard, or any other air bag system component. Modifications can adversely affect air bag system performance and lead to injury.**
- **Failure to follow procedures could result in possible air bag deployment, personal injury or unneeded air bag system repairs.**

- Many of service procedures require disconnection of "AIR BAG" fuse and air bag (inflator) modules (driver and passenger) from deployment loop 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 (air bag (inflator) module, sensing and diagnostic module) beforehand to avoid component damage or unintended deployment.
- When servicing, if shocks may be applied (e.g., dropped from a height of 91.4 cm (3 feet) 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.

61A10-9J-39-1

WARNING:
When performing service on or around air bag system components or air bag wiring, follow the procedures listed in next page to temporarily disable the air bag system. Refer to appropriate service manual procedures. Failure to follow procedures could result in possible air bag deployment, personal injury or unneeded air bag system repairs.

60G00-9J-50-1

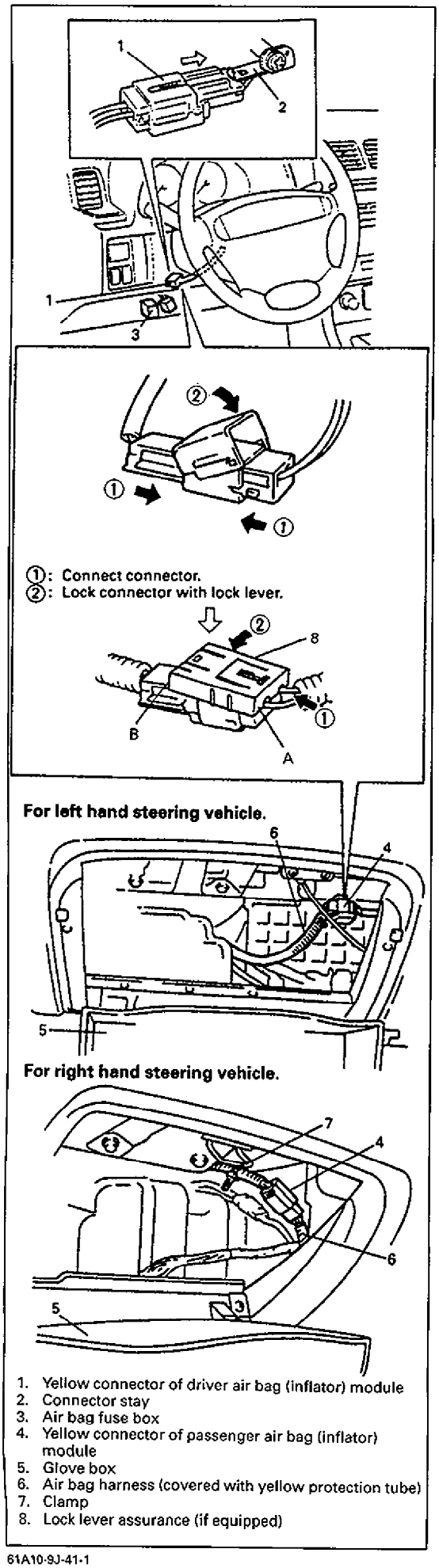


1. Yellow connector of driver air bag (inflator) module
2. Connector stay
3. Air bag fuse box
4. Yellow connector of passenger air bag (inflator) module
5. Glove box
6. Air bag harness (covered with yellow protection tube)
7. Clamp
8. Lock lever assurance (if equipped)

DISABLING AIR BAG SYSTEM

1) Turn steering wheel so that vehicle's wheels (front tires) are pointing straight ahead.
2) Turn ignition switch to "LOCK" position and remove key.
3) Remove "AIR BAG" fuse from the air bag fuse box.
4) Driver side:
   Remove steering wheel side cap (left) and disconnect Yellow connector of driver air bag (inflator) module.
   Passenger side:
   Pull out glove box while pushing its stopper from both right and left sides and disconnect Yellow connector of passenger air bag (inflator) module.

NOTE:
If equipped with lock lever assurance, to release the lock pin of lock lever assurance, use screwdriver as shown in left figure, and remove lock lever assurance.



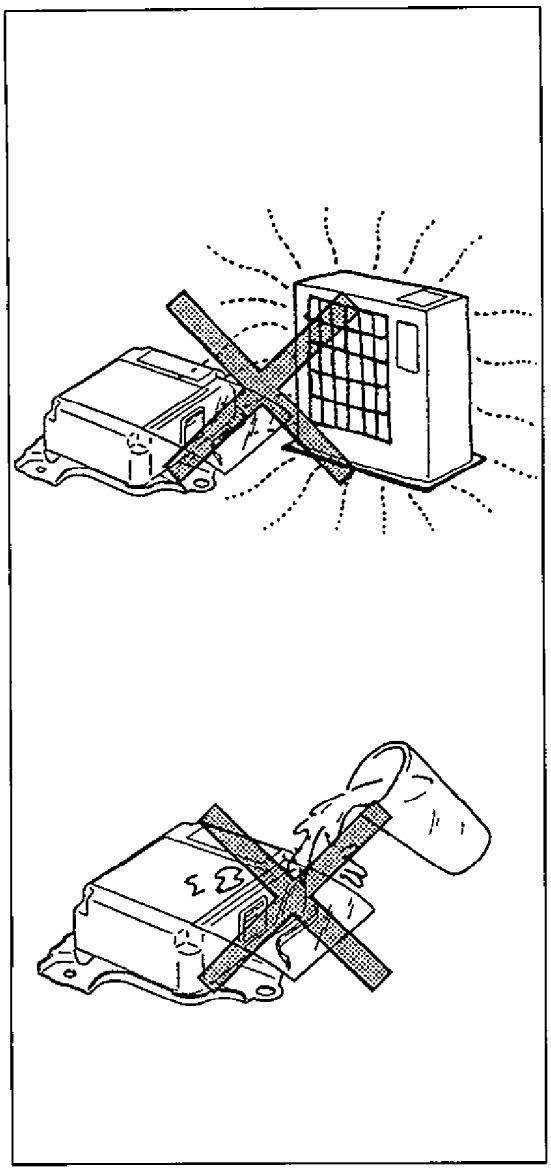
61A10-9J-41-1

ENABLING AIR BAG SYSTEM

1) Turn ignition switch to "LOCK" and remove key.
2) Connect Yellow connector of passenger air bag (inflator) module and yellow connector of driver air bag (inflator) module respectively, and be sure to lock each connector with lock lever and lock lever assurance (if equipped).

NOTE:
If equipped with lock lever assurance, insert pin on A side as shown in left figure into the hole of back of connector and then lock the lock lever with lock pin on B side as shown in left figure.

3) Fix connectors. (driver and passenger) respectively.
   Driver air bag (inflator) module connector :
   Fit onto connector stay.
   Passenger air bag (inflator) module connector :
   For left hand steering vehicle, fit onto connector stay.
   For right hand steering vehicle, Fix air bag harness with clamp.
4) Install glove box and steering wheel side cap.
5) Install "AIR BAG" fuse to air bag fuse box.
6) Turn ignition switch to "ON" and verify that "AIR BAG" warning lamp comes on about 6 seconds and then turns off.
   If it does not operate as described, perform the "Air Bag Diagnostic System Check" in this section.



61A10-9J-42-1

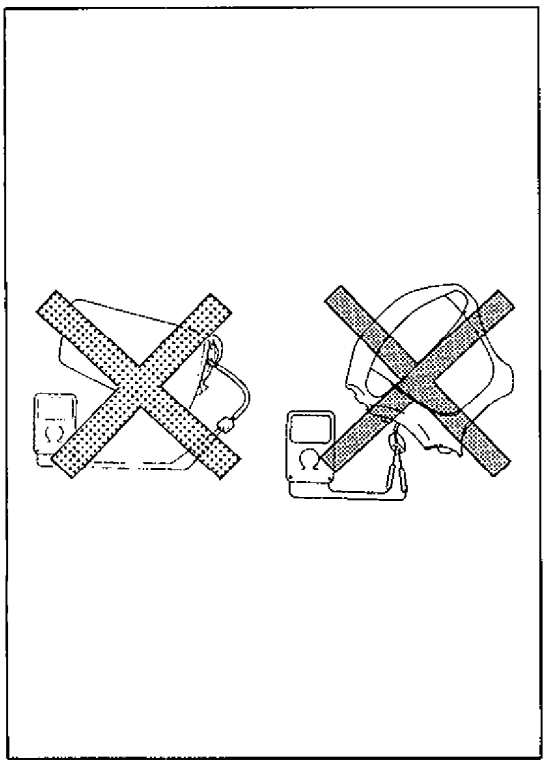
HANDLING PRECAUTIONS

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 "DIAGNOSIS" 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 91.4 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 mast be pointed toward the front of the vehicle to ensure proper operation of the air bag system.



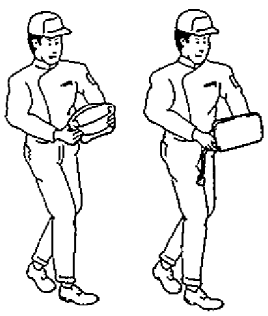
60A50-9J-62-4

LIVE (UNDEPLOYED) AIR BAG (INFLATOR) MODULES (DRIVER AND PASSENGER)

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.

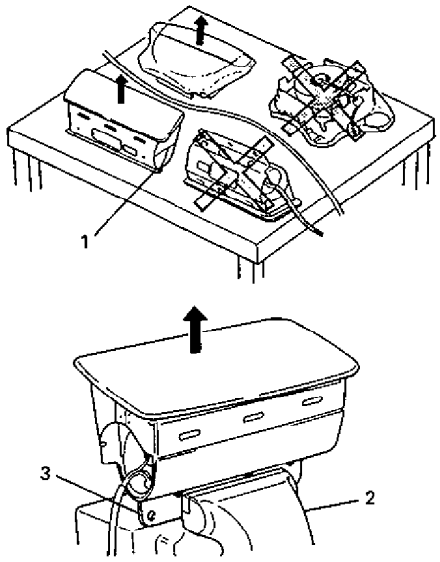
WARNING:
Never attempt to measure the resistance of the air bag (inflator) modules (driver and passenger). It is very dangerous as the electric current from the tester may deploy the air bag.

- Never attempt disassembly of the air bag (inflator) module.
- 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.



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

61A10-9J-43-1

- 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 91.4 cm (3 ft) or more, it should be replaced with a new one.

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.**
- **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.

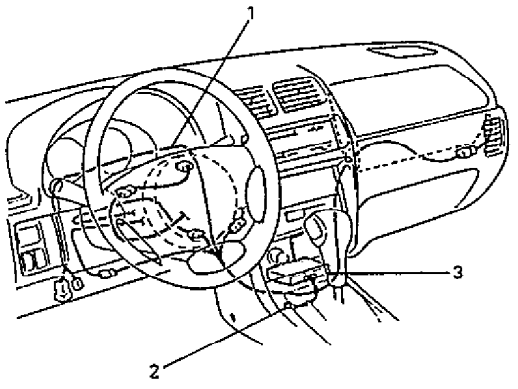
Otherwise, personal injury may result.

DEPLOYED AIR BAG (INFLATOR) MODULES (DRIVER AND PASSENGER)

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

61A10-9J-44-1

AIR BAG WIRE HARNESS AND CONNECTORS

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.
- 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 PRECAUTIONS

Do not dispose of live (undeployed) air bag (inflator) modules (driver and passenger). When disposal is necessary, be sure to deploy the air bag according to deployment procedure described under "Driver/Passenger Air Bag (Inflator) Modules Disposal" in this section.

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) modules 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.

61A10-9J-44-3

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 a deployment did not occur.**
- **Never use air bag system parts from another vehicle.**
- **Do not attempt to service the parts below. Service of these parts is by replacement only.**
  - **Driver/Passenger air bag (inflator) module**
  - **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.**

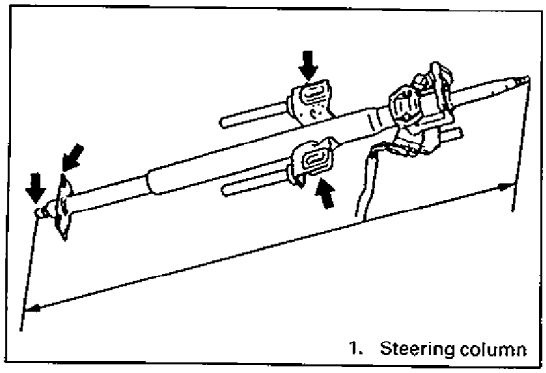
CAUTION:
After detecting one time of such collision as to meet deployment conditions, the SDM must not be used. Refer to "DIAGNOSIS" when checking the SDM.

60A50-9J-67-1

ACCIDENT WITH DEPLOYMENT – COMPONENT REPLACEMENT

Certain air bag system components must be replaced. Those components are:
- Driver and passenger air bag (inflator) modules.
  - Replace with new one.
- SDM after detecting such collision as to meet deployment conditions.
  - Replace with new one.

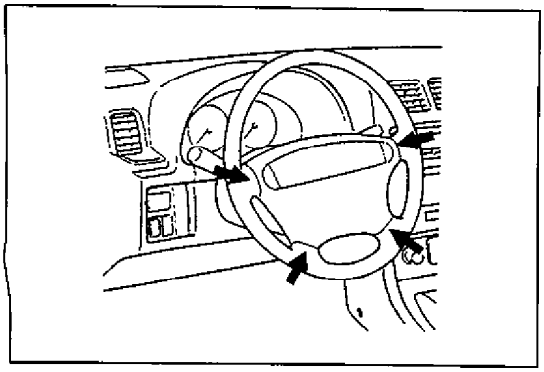
60A50-9J-67-3



60A50-9J-67-4

ACCIDENT WITH OR WITHOUT DEPLOYMENT – COMPONENT INSPECTIONS

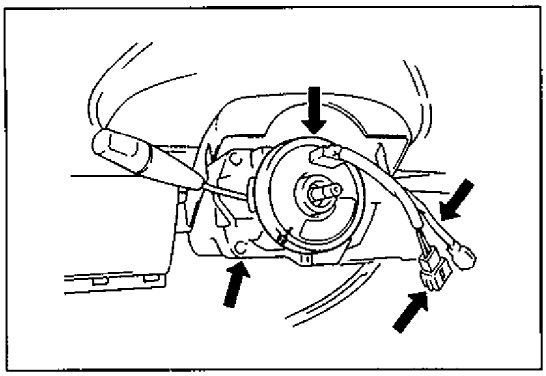
Certain air bag and restraint system components must be inspected after any crash, whether the air bag deployed or not. Those components are:
- Steering column and shaft joints.
  - Check for length, damage and bend according to "Inspection" under Steering Column in Section 3C1.
- Steering column bracket.
  - Check for damage and bent. If any, replace.



60A50-9J-67-5

- 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.

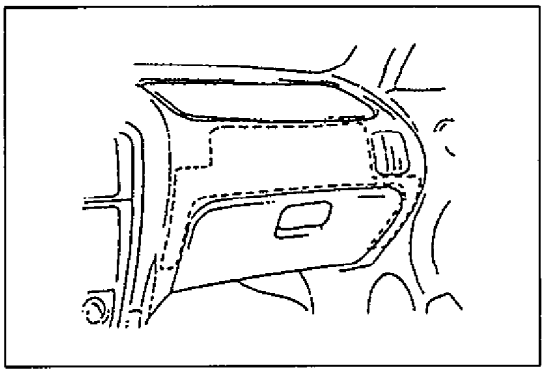
  If any faulty condition is found in above checks, replace faulty part.



60A50-9J-68-1

- Contact coil & combination switch assembly.
  - Check wire harness and connectors for damage or tightness.
  - Check contact coil case for damage.

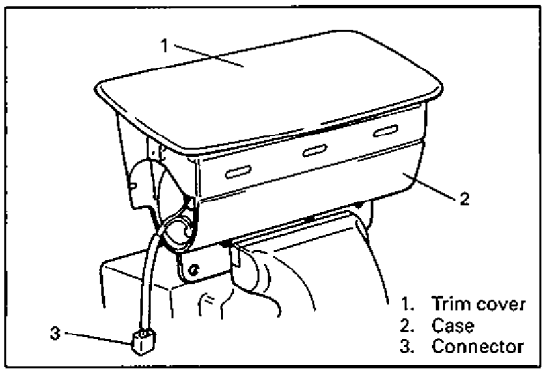
  If any faulty condition is found in above checks, replace.



61A10-9J-46-2

- Instrument panel member, reinforcement and knee bolster & panel.
  - Check for any distortion, bending, cracking or other damage.

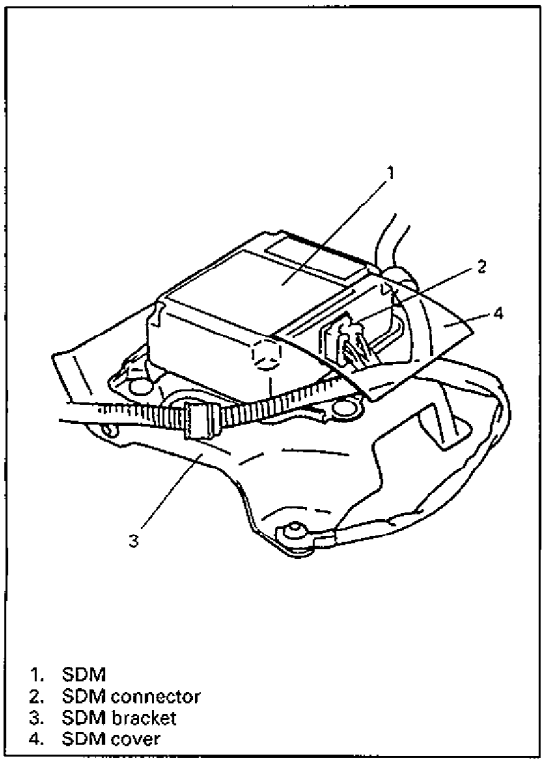
  If any, repair or replace.



61A10-9J-46-3

- Passenger air bag (inflator) module.
  - Check for dents, cracks, damage or fitness.
  - Check trim cover for cracks or deformities.
  - Check harness and connector for damage or tightness.

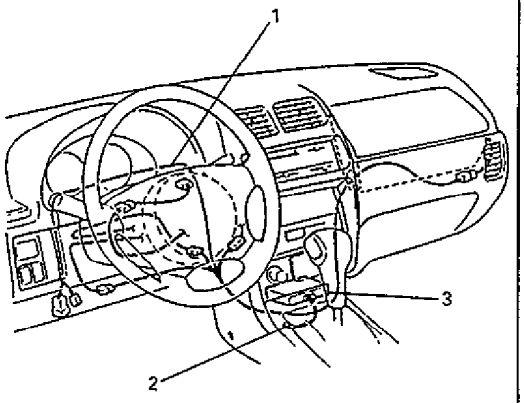
  If any, repair or replace.



61A10-9J-46-4

- SDM and SDM bracket.
  - Check for external damage such as deformation, scratch, crack, peeled paint, etc..
  - Check whether SDM can installed properly due to a cause in itself. (There is a gap between SDM and SDM bracket, or it cannot be fixed securely.)
  - Check whether connector or lead wire of SDM has a scorching, melting or damage.
  - Check whether connector can be connected securely or locked.
  - Check SDM connector and terminals for tightness.
  - Check SDM sets a diagnostic trouble code and the diagnostic chart leads to a malfunctioning SDM.

  If any faulty condition is found in above checks, replace.



1. Air bag wire harness
2. Ground
3. SDM case ground

61A10-9J-47-1

- 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.

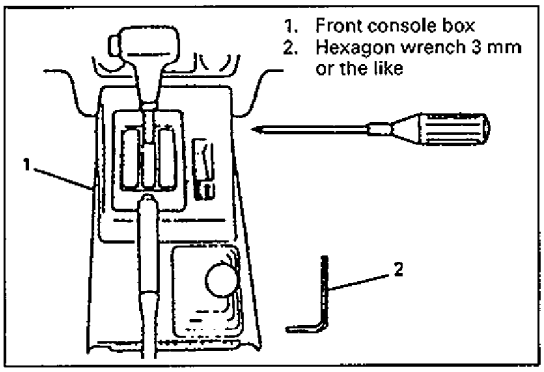
- Seat belts and mounting points.
  - Refer to "Seat Belt" in Section 9 of the Service Manual mentioned in the FOREWORD of this manual.
- "AIR BAG" warning lamp (air bag system).
  - After vehicle is completely repaired, perform "Air Bag Diagnostic System Check" described in diagnosis section.

61A10-9J-47-3

SDM

WARNING:
During service procedures, be very careful when handling a Sensing and Diagnostic Module (SDM).
Be sure to read "SERVICE PRECAUTIONS" and "HANDLING PRECAUTIONS" 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.

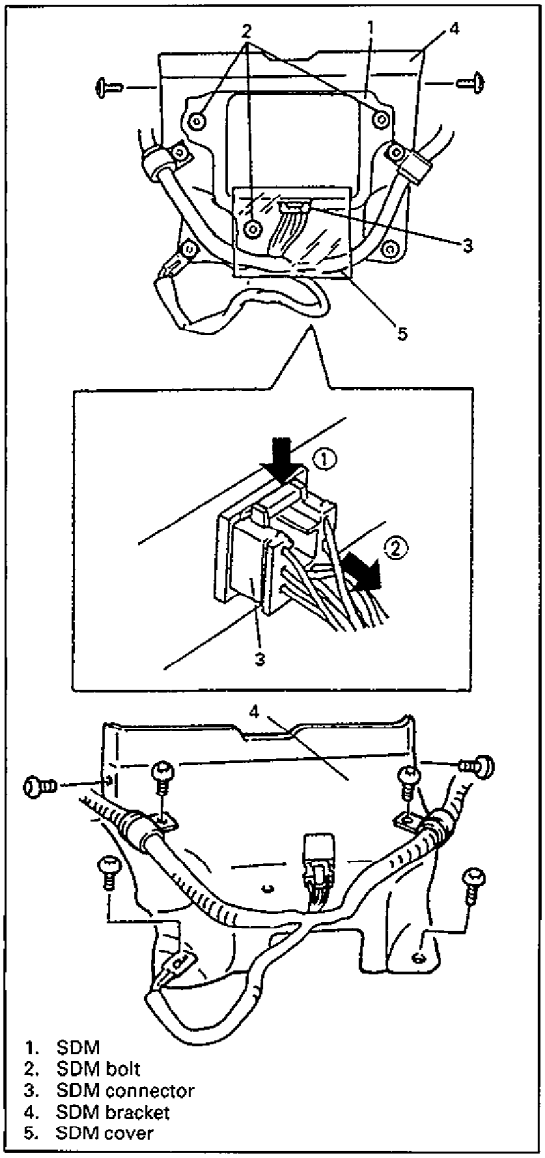
60A50-9J-70-1



REMOVAL

1) Disconnect negative cable at battery.
2) Disable air bag system. Refer to "Disabling Air Bag System" earlier in this section.
3) Remove rear console box first and then front console box by removing screws and clips.

60A50-9J-70-2



4) Disconnect SDM connector from SDM.
5) Remove SDM and SDM bracket from vehicle.

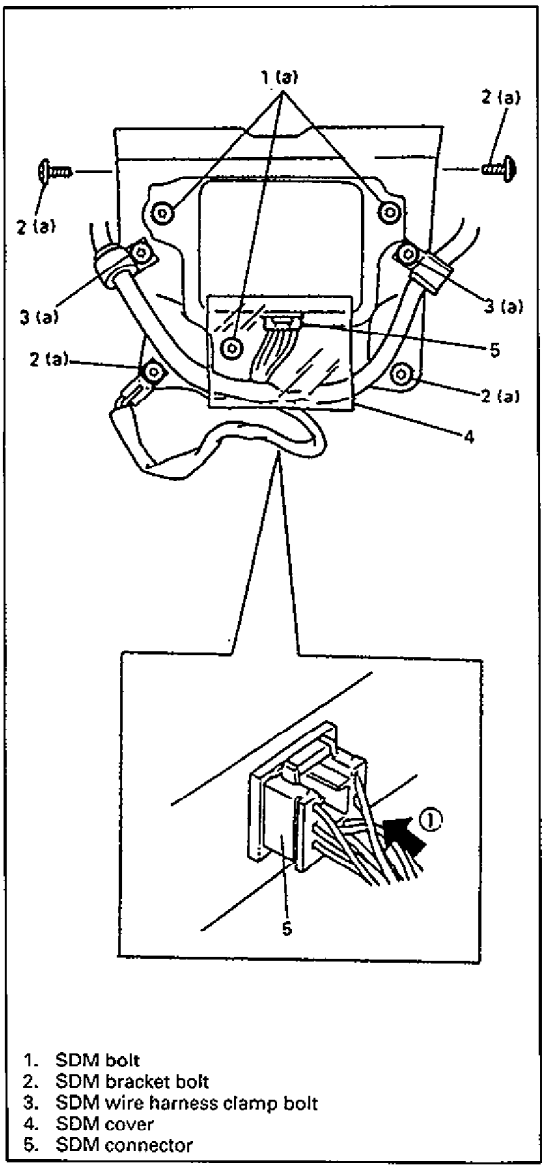
INSPECTION

CAUTION:
- **Do not connect a tester whatever type it may be.**
- **Never repair or disassemble SDM.**
- **If SDM was dropped from a height of 91.4 cm (3 ft) or more, it should be replaced.**

- Check SDM and SDM bracket 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.

61A10-9J-48-3



1. SDM bolt
2. SDM bracket bolt
3. SDM wire harness clamp bolt
4. SDM cover
5. SDM connector

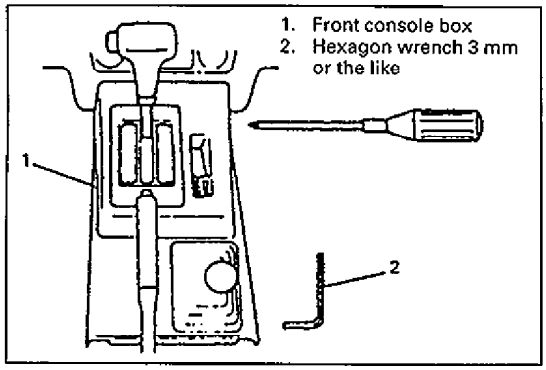
61A10-9J-43-1

INSTALLATION

1) Check that none of following faulty conditions exists.
   - Bend, scratch, deformity in SDM bracket
   - Foreign matter or rust on mating surface of SDM bracket with SDM
   - Loosened SDM bracket bolts
2) Install SDM and SDM bracket to vehicle.
3) Tighten SDM, SDM bracket and SDM wire harness clamp bolts to specified torque.

Tightening Torque
(a): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

4) Connect SDM connector to SDM securely.



1. Front console box
2. Hexagon wrench 3 mm or the like

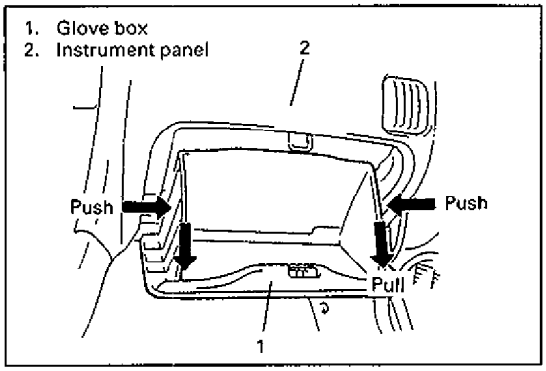
60A50-9J-71-4

5) Install front console box first and then rear console box by installing screws and clips.
6) Connect negative cable to battery.
7) Enable air bag system. Refer to "Enabling Air Bag System" earlier in this section.

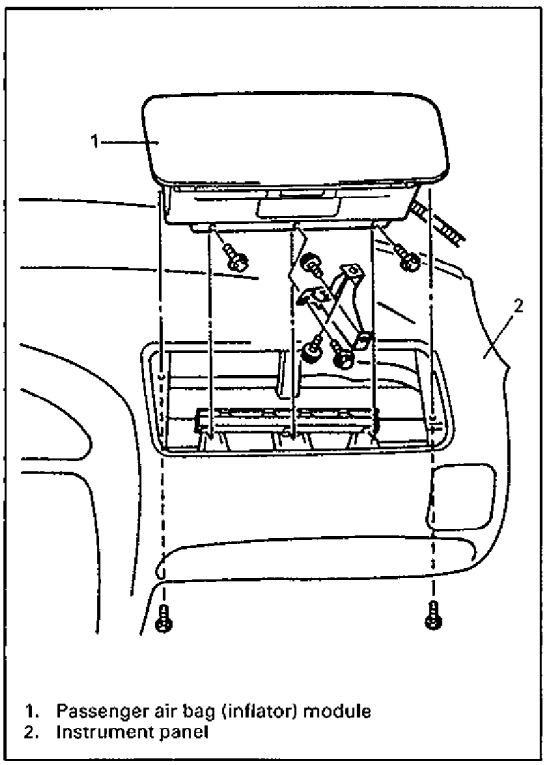
PASSENGER AIR BAG (INFLATION) MODULE

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" and "HANDLING PRECAUTIONS" 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.**

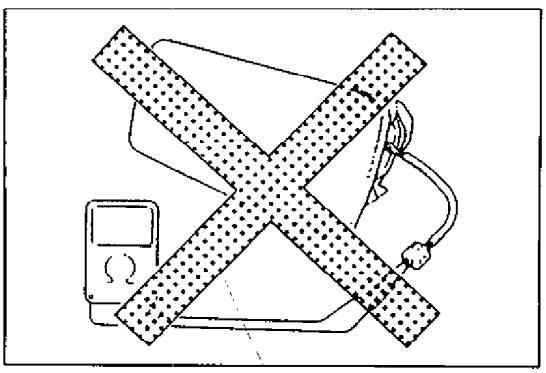
60G00-9J-60-1



60G00-9J-60-2



61A10-9J-50-3



60A50-9J-72-5

REMOVAL

1) Disconnect negative battery cable from battery.
2) Open glove box, then while pressing glove box stopper, pull out glove box from instrument panel.
3) Disable air bag system. Refer to "Disabling Air Bag System" earlier in this section.
4) Remove passenger air bag (inflator) module attaching bolts and screws, and passenger air bag (inflator) module from vehicle.

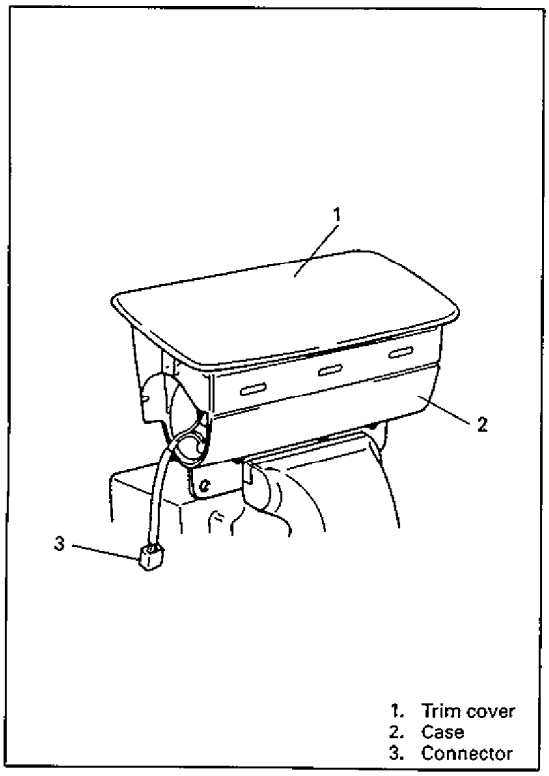
WARNING:
- **When carrying a live air bag (inflator) module, make sure the bag opening is pointed away from you. Never carry air bag (inflator) module by wires or connector on the side of the module. In case of an accidental deployment, the bag will then deploy with minimal chance of injury.**
- **As the live passenger air bag (inflator) module must be kept with its bag (trim cover) facing up while being stored or left standing, place it on the workbench with a slit or use the workbench vise to hold it securely at its lower mounting bracket. This is necessary so that a free space is provided to allow the air bag to expand in the unlikely event of accidental deployment.**
- **Observe "Handling Precautions" earlier in this section for handling and storing it.**

Otherwise personal injury may result.

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 of 91.4 mm (3 ft) or more, it should be replaced.

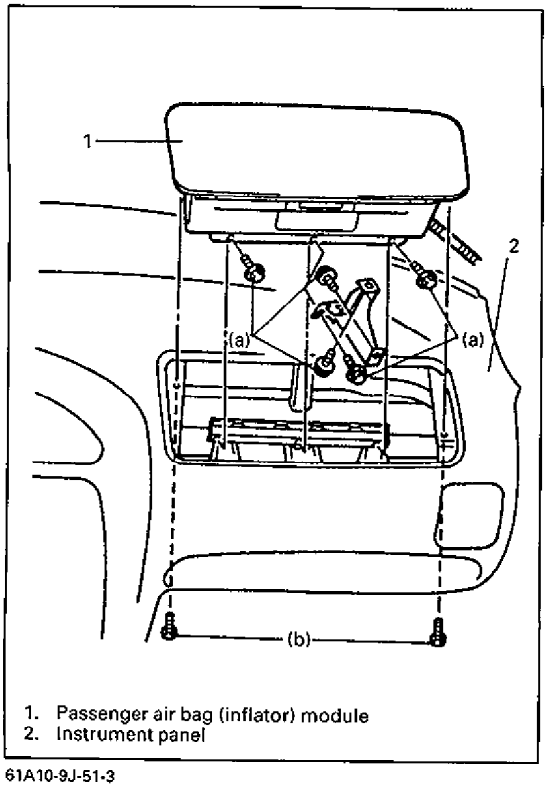


1. Trim cover
2. Case
3. Connector

60G00-9J-61-1

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

61A10-9J-51-3

INSTALLATION

1) Install passenger air bag (inflator) module to vehicle.
2) Tighten passenger air bag (inflator) module attaching bolts and screws to specified torque.

Tightening Torque
(a): 23 N·m (2.3 kg-m, 16.5 lb-ft)
(b): 5.5 N·m (0.55 kg-m, 4.0 lb-ft)

3) Connect negative battery cable to battery.
4) Enable air bag system. Refer to "Enabling Air Bag System" earlier in this section.

DRIVER AIR BAG (INFLATOR) MODULE

Refer to SECTION 3C1 for removal, inspection and installation.

CONTACT COIL AND COMBINATION SWITCH ASSEMBLY

Refer to SECTION 3C1 for removal, inspection and installation.

"AIR BAG" WARNING LAMP

Refer to SECTION 8 for removal and installation.

DRIVER/PASSENGER AIR BAG (INFLATOR) MODULES 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) modules 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.

Do not dispose of the live (undeployed) air bag (inflator) modules (driver/passenger). When disposal of the air bag (inflator) module(s) or entire vehicle including the air bag (inflator) module(s) is necessary, deploy the air bag according to the procedure described under "Deployment Outside Vehicle" or "Deployment Inside Vehicle".

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).

60G00-9J-62-1

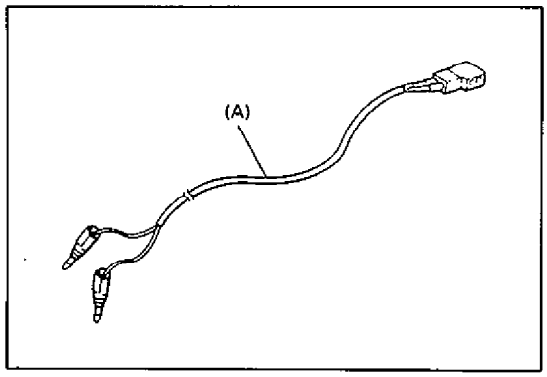
DEPLOYMENT OUTSIDE VEHICLE

Use this procedure when the vehicle itself is used again (only the air bag (inflator) module(s) are disposed of).

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 "Handling Precautions" for the air bag (inflator) module 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 a large amount of smoke is produced when air bag is deployed, select a well-ventilated area.**
- **The air bag (infaltor) module will immediately deploy the air bag when a power source is connected to it. Wear safety glasses throughout this entire depoyment 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 driver and passenger air bag (inflator) modules at the same time.**

The following procedure requires use of special tool(s) (deployment harness and/or passenger air bag (inflator) module deployment fixture). Do not attempt procedure without it (them).

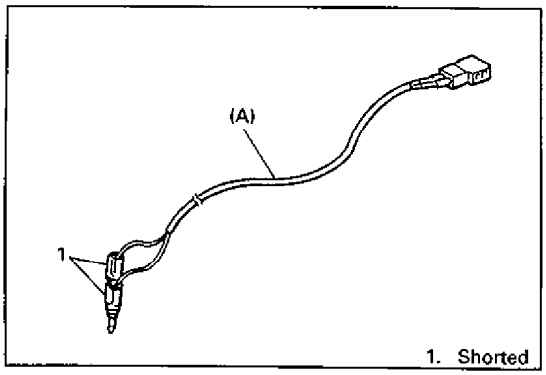
60A50-9J-74-2



60G00-9J-63-1

1) Turn ignition switch to "LOCK", 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.

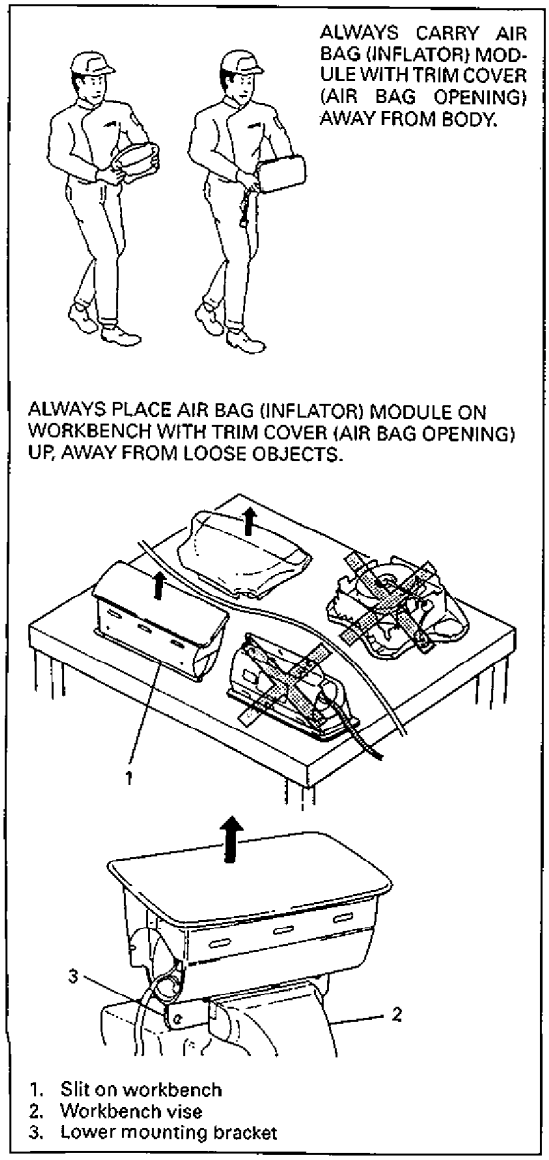
Special Tool (Deployment harness)
(A): 09932-75030



60G00-9J-63-2

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.



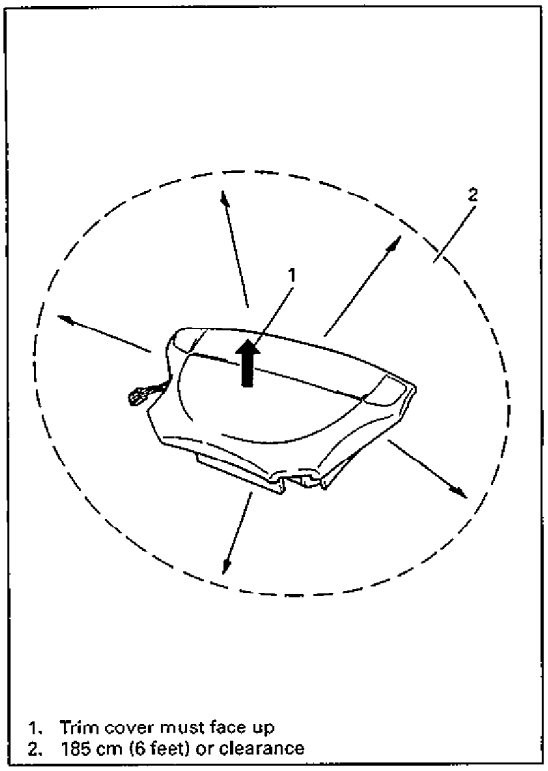
60A50-9J-75-5

4) Remove driver or passenger air bag (inflator) module from vehicle referring to SECTION 3C1 or 9J.
5) With driver air bag (inflator) module, remove horn lead, horn buttons and clamp from driver air bag (inflator) module.

WARNING:
- **Always carry a 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.

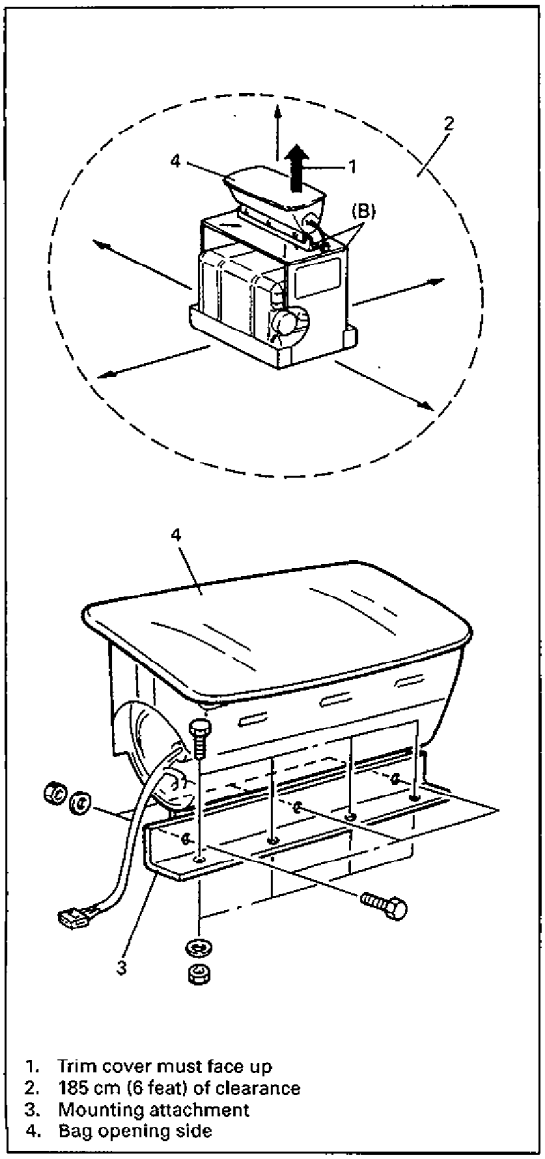
6) Temporarily place driver or passenger air bag (inflator) module on the workbench or the vise according to above WARNING.



1. Trim cover must face up
2. 185 cm (6 feet) or clearance

60G00-9J-64-1

7) In case of Driver Air Bag (Inflator) Module
   ① 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.
   ② 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 feat) of clearance
3. Mounting attachment
4. Bag opening side

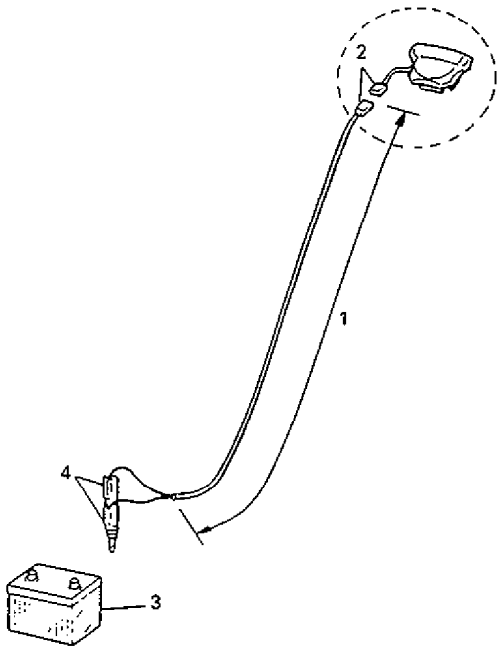
60G00-9J-64-3

7) In case of Passenger Air Bag (Inflator) Module
   ① Clear a space on the ground approximately 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.
   ② Place spcial tool (passenger air bag (inflator) module deployment fixture) on the ground in the space cleared in Step ①, if it has not already been placed there.

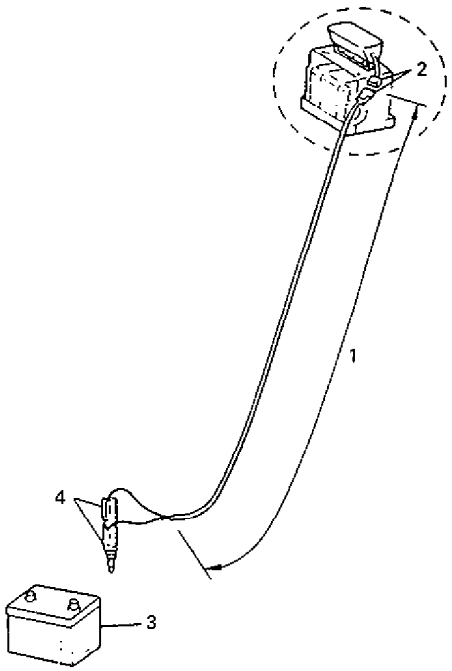
Special Tool
(Passenger air bag (inflator) module deployment fixture)
(B): 09932-75040

   ③ Fill plastic reservoir in fixture (special tool) with water or sand. This is necessary to provide sufficient stabilization of the fixture during deployment.
   ④ Attach the passenger air bag (inflator) module in the fixture (special tool) using mounting attachment and hold-down bolts and nuts.
   Air bag (inflator) module must be mounted such that the bag will deploy upward. Securely *hand-tighten all fas*teners prior to deployment.

Driver (Inflator) Module



Passenger (Inflator) Module



1. Stretch deployment harness to full length 10 m (33 ft)
2. Connect connectors
3. Power source (12 V vehicle battery)
4. Short the two deployment harness leads

8) Stretch the deployment harness from the driver or passenger air bag (inflator) module to its full length 10 m (33 ft).
9) Place a power source near the shorted end or the deployment harness. Recommended application: 12 Volts minimum, 2 amps minimum. A vehicle battery is suggested.
10) Verify that the area around the driver or passenger air bag (inflator) module is clear or all people and loose or flammable objects.
11) Verify that the driver air bag (inflator) module is resting with its vinyl trim cover facing up.
Verify that the passenger air bag (inflator) module is firmly and properly secured in passenger air bag (inflator) module deployment fixture (special tool).
12) Connect the driver or passenger air bag (inflator) module to the deployment harness connector and lock connector with lock lever.
13) Notify all people in the immediate area that you intend to deploy the air bag (inflator) module.

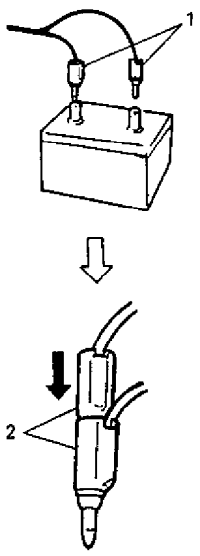
NOTE:

- **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.**
- **When the air bag deploys, the driver air bag (inflator) module may jump about 30 cm (one foot) vertically. This is a normal reaction of the driver air bag (inflator) module 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:
Safety precautions must be observed when handling a deployed air bag (inflator) module.

- **After deployment, the metal surfaces of the air bag (inflator) module will be very hot. Do not touch the metal areas of the driver or passenger air bag (inflator) module 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 by the air bag or vinyl trim.**

Failure to follow procedures may result in fire or personal injury.



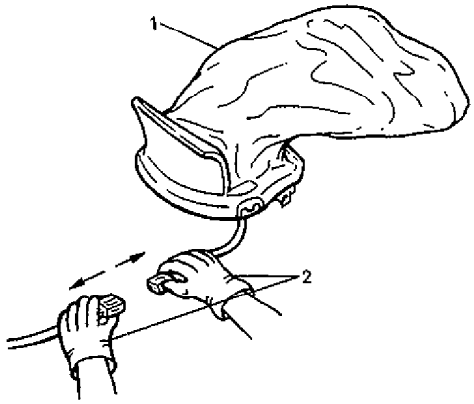
1. Connect one banana plug to positive terminal of power source (12 V vehicle battery) and then the other to negative terminal to immediately deploy.
2. Short the two deployment harness leads.

60G00-9J-66-1

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 driver or passenger air bag.
16) Disconnect the deployment harness from power source (12 V vehicle battery) and short the two deploment harness leads together by fully seating one banana plug into the other.

17) In the unlikely even that the driver or passenger air bag (inflator) module did not deploy after following these procedures, proceed immediately with Steps 22) through 25). If the air bag (inflator) module did deploy, proceed with Steps 18) through 21).

61A10-9J-56-3



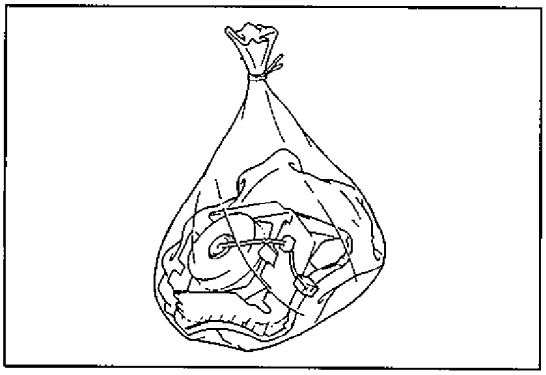
1. Deployed air bag (inflator) module
2. Gloves

60A50-9J-78-5

18) Put on a pair of shop gloves to protect your hands from possible irritation and heat when handling the deployed air bag (inflator) module.

NOTE:
As a precaution, gloves and safety glasses are recommended to prevent any possible irritation of the skin or eyes.

19) 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 canister. The deployment harness are designed to be reused. They should, however, be inspected for damage after each deployment and replaced if necessary.

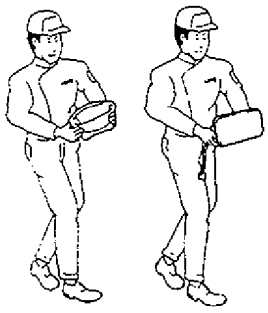


20) Dispose of the deployed air bag (inflator) module through normal refuse channels after it has cooled for at least 30 minutes and tightly seal the air bag (inflator) module in a strong vinyl bag. (Refer to "Deployed Air Bag (Inflator) Modules Disposal" in detail.)
21) Wash your hands with mild soap 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.

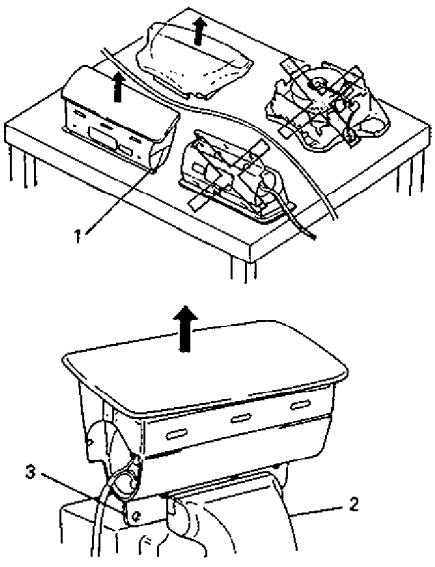
22) Ensure that the deployment harness has been disconnected from the power source and that its two banaba plugs have been shorted together by fully seating one banana plug into the other.
23) Disconnect the deployment harness from the air bag (inflator) module.

60G00-91-67-2



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

60A50-9J-79-5

WARNING:
- **Always carry a 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 (infaltor) 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.

24) Temporarily store the air bag (inflator) module with its vinyl trim cover facing up, away from the surface upon which is rests.
25) Contact your local distributor for further assistance.

DEPLOYMENT INSIDE VEHICLE

Use this procedure when scrapping the entire vehicle including the driver and/or passenger air bag (inflator) module(s).

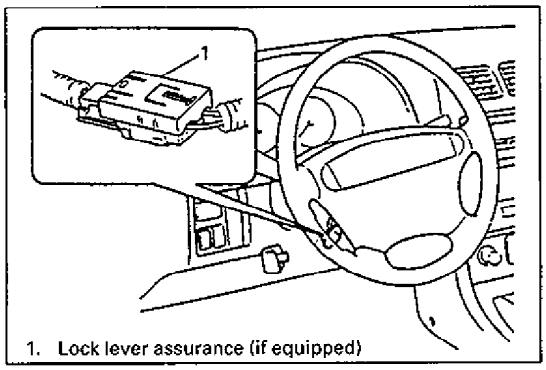
CAUTION:
When vehicle itself will be used again, deploy the air bag module outside vehicle according to "Deployment Outside Vehicle", for deploying it inside will cause the instrument panel, glove box and their vicinity to be deformed.
Failure to observe this CAUTION could cause unneeded vehicle inspection and repair.

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 "Handling Precautions" for the air bag (inflator) module 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.**
- **The air bag (inflator) module will immediately deploy the air bag 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 driver and passenger air bag (inflator) modules at the same time.**

1) Turn ignition switch to "LOCK", remove key and put on safety glasses.
2) Remove all loose objects from front seats and instrument panel.

60G00-9J-68-1

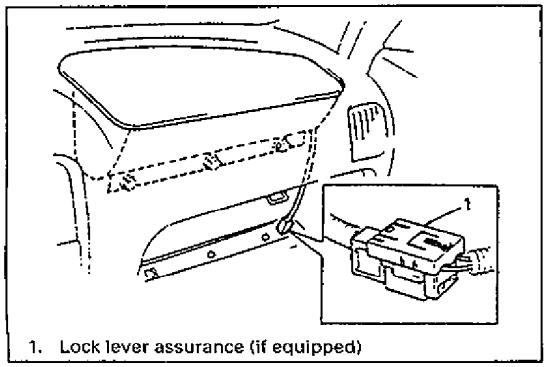


1. Lock lever assurance (if equipped)

61A10-9J-58-4

3) Driver side:
Remove steering wheel side cap (left side) and disconnect air bag (inflator) module connector.

NOTE:
For method of disconnecting connector, refer to "Disabling Air Bag System" in 9J-40.



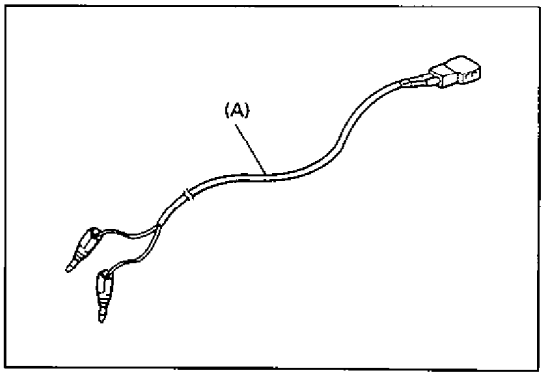
1. Lock lever assurance (if equipped)

61A10-9J-58-5

Passenger side:
Remove glove box from instrument panel and disconnect air bag (inflator) module connector.

NOTE:
For method of disconnecting connector, refer to "Disabling Air Bag System" in 9J-40.

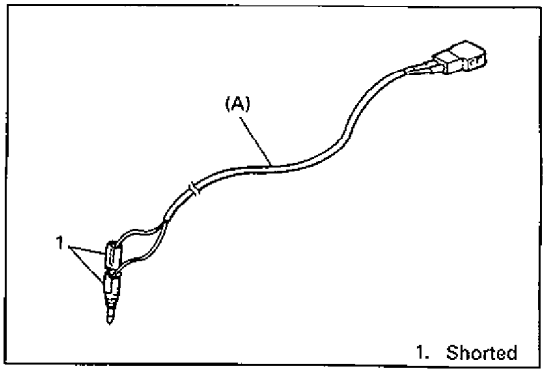
4) Confirm that each air bag (inflator) module is securely mounted.



60G00-9J-69-1

5) 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 (Deployment harness)
(A): 09932-75030

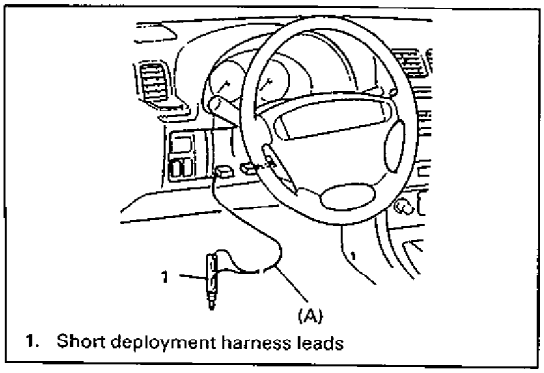


1. Shorted

60G00-9J-69-2

6) Short the two deployment harness leads together by fully seating one banana plug into the other.

WARNING:
Deployment wires shall remain shorted and not be connected to a power source until the air bag is to be deployed.

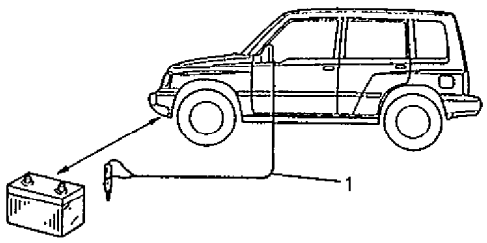


1. Short deployment harness leads

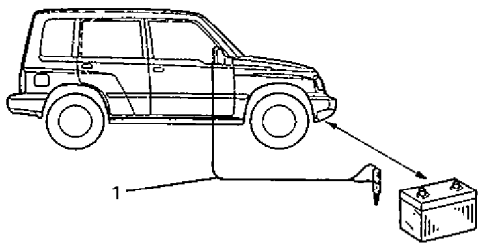
60A50-9J-81-3

7) Connect deployment harness connector to air bag (inflator) module (driver or passenger) and lock connector with lock lever.

Driver side for left hand steering vehicle



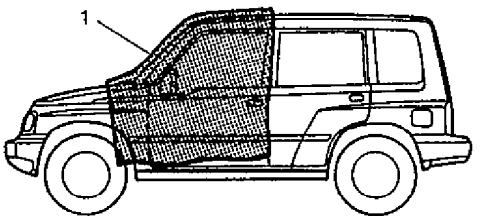
Driver side for right hand steering vehicle



1. Stretch deployment harness to its full length 10 m (33 ft).

60A50-9J-81-5

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).
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.



1. Drop clutch blanket or similar item.

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 vehilce's glass or interior.
13) Notify all people in the immediate area that you intend to deploy the air bag (inflator) module.

NOTE:

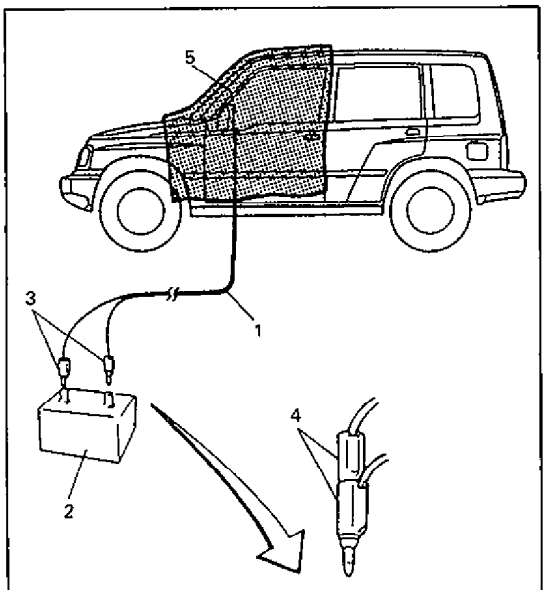
- **When the air bag deploys, the rapid gas expansion will create a substantial report. Wear suitable ear protectioon. Notify all people in the immediate area that you intend to deploy the air bag (inflator) module and suitable ear protection should be worn.**
- **After the air bag (inflator) module 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:
Safety precautions must be observed when handling a deployed air bag (inflator) module.

- **After deployment, the metal surfaces of the air bag (inflator) module will be very hot. Do not touch the metal areas of the air bag (inflator) module for about 30 minutes after deployment.**
- **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 by the air bag or vinyl trim.**

Failure to follow procedures may result in fire or personal injury.

60G00-9J-70-1



1. Stretch it to full length 10 m (33 ft)
2. Power source (12 V vehicle battery)
3. Connect one banana plug to positive terminal of power source (12 V 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

60A50-9J-82-4

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 driver or passenger air bag.
16) Disconnect the deployment harness from the power source (12 V vehicle battery) and short the harness leads together by fully seating one banana plug into the other.

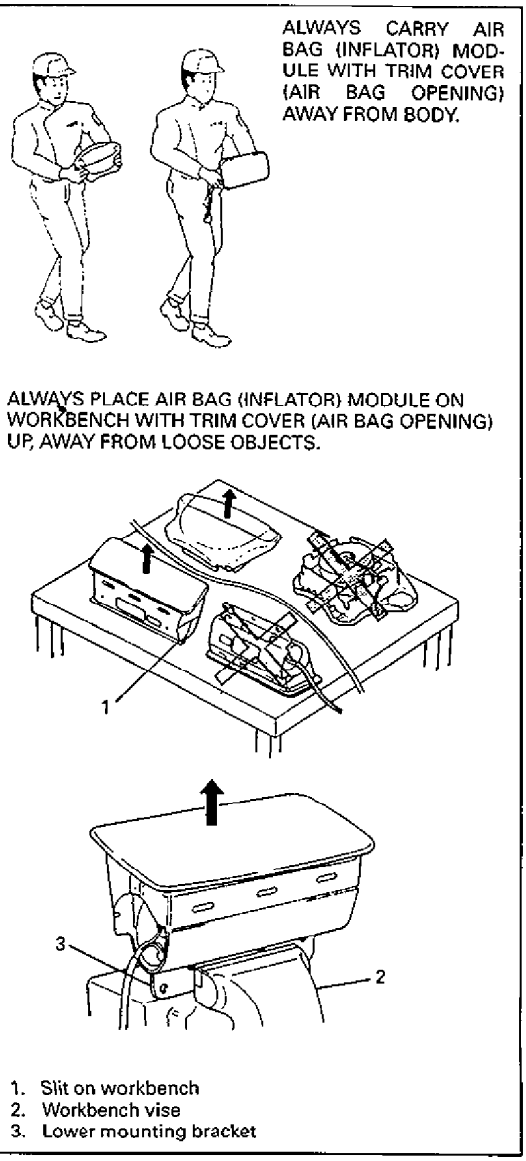
17) Put on a pair of shop gloves to protect your hands from possible irritation and heat when handling the deployed air bag (inflator) module.

NOTE:

As a precaution, gloves and safety glasses are recommended to prevent any possible irritation of the skin or eyes.

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 canister. 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 driver or passenger air bag (inflator) module, if it does not try to deploy.
21) In the unlikely event that either or both of the air bag (inflator) modules proceed immediately with Steps 23) through 25). If the air bag (inflator) module did deploy, proceed with Steps 22).

60G00-9J-71-1



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

60A50-9J-83-3

22) With both air bags deployed the vehicle may be scrapped in the same manner as a non-air bag equipped vehicle.
23) Remove the undeployed air bag (inflator) module(s) from the vehicle. For driver air bag (inflator) module refer to SECTION 3C1, for passenger air bag (inflator) module refer to "On-Vehicle Service" in this section.

WARNING:

- **Always carry a 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 up, away from the surface.**
  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 could result in personal injury.

24) Temporarily store the air bag (inflator) module with the air bag opening facing up, away from the surface upon which it rests. Refer to "Service Precaution" in this section for details.
25) Contact your local distributor for further assistance.

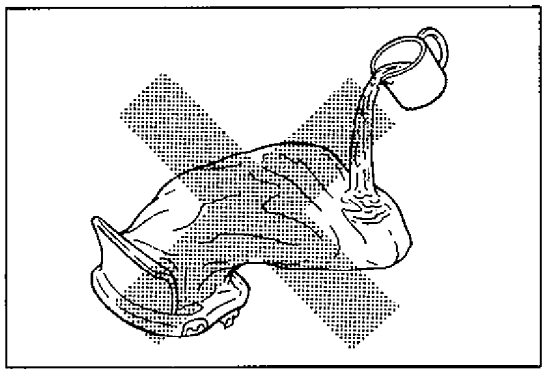
DEPLOYED AIR BAG (INFLATOR) MODULES DISPOSAL

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) modules 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) modules (driver/passenger) can be disposed of through normal refuse channels just like any other parts. For their disposal, however, following points should be noted.

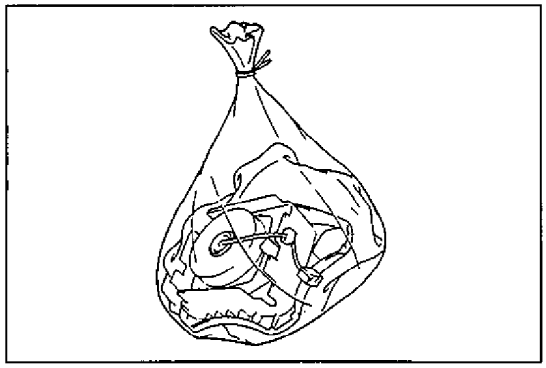
- The air bag (inflator) module immediately after deployment is very hot. Wait for 30 minutes to cool it off before handling it.

60G00-9J-72-1



60G00-9J-72-3

- 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.

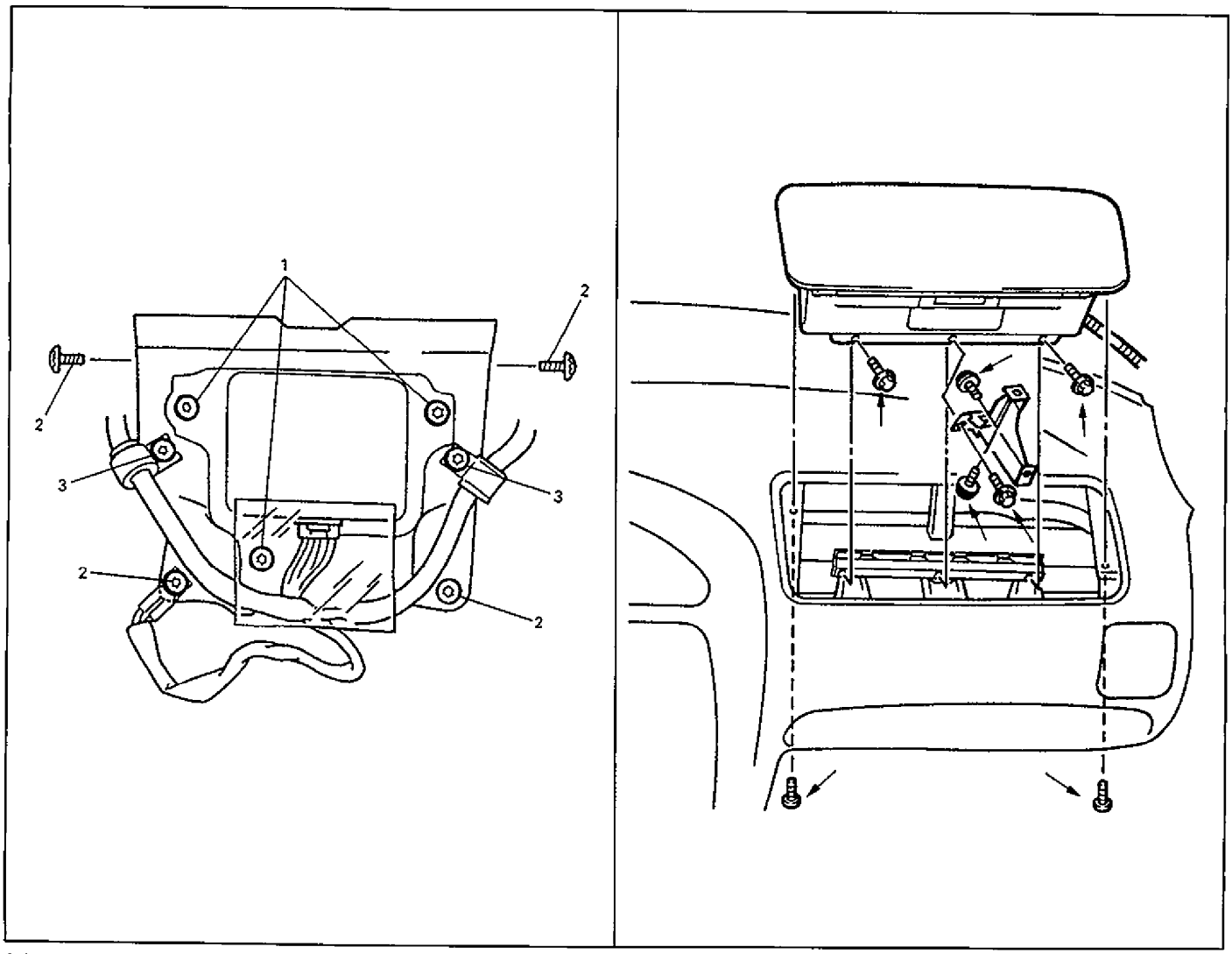


60G00-9J-72-4

- When disposing of the deployed air bag (inflator) module alone, be sure to seal it in a vinyl bag.
- When air bag (inflator) module(s) 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.

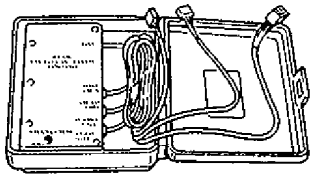
TIGHTENING TORQUE SPECIFICATIONS

Fastening parts		Tightening torque		
		N·m	kg-m	lb-ft
1. SDM bolts		5.5	0.55	4.0
2. SDM bracket bolts				
3. SDM wire harness clamp bolts				
4. Passenger air bag (inflator) module	screws	5.5	0.55	4.0
	bolts	23	2.3	16.5
5. Driver air bag (inflator) module bolts		Refer to Section 3C1.		

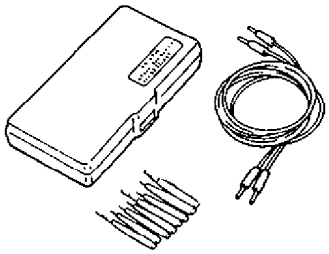


61A10-9J-63-1

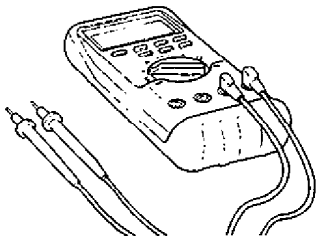
SPECIAL TOOLS



09932-75010
Air bag driver/passenger load tool

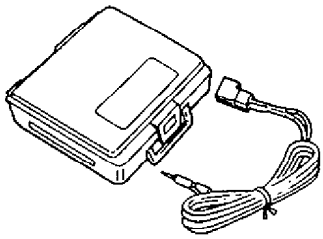


09932-76010
Connector test adaptor kit

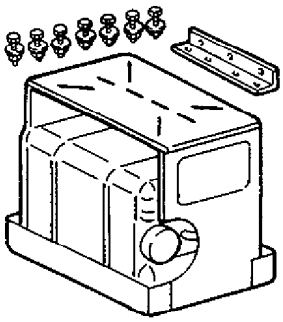


Digital multimeter for which the maximum test current is 10 mA or less at the minimum range of resistance measurement.

WARNING:
Be sure to use the specified digital multimeter.
Otherwise, air bag deployment or personal injury may result.



09932-75030
Air bag deployment harness

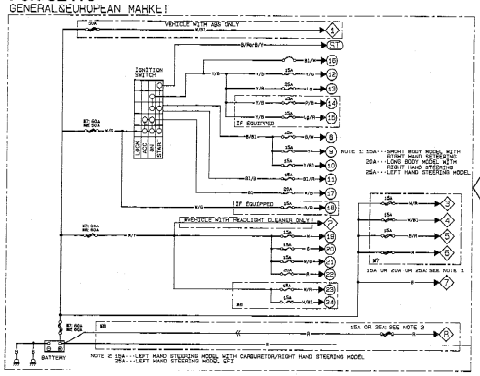


09932-75040
Passenger air bag (inflator) module deployment fixture

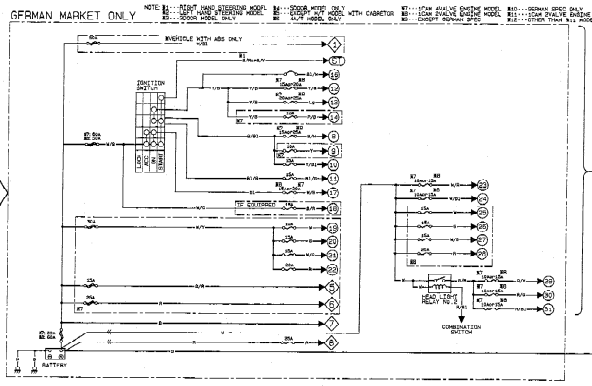
61A10-9J-64-1

FOR SE416

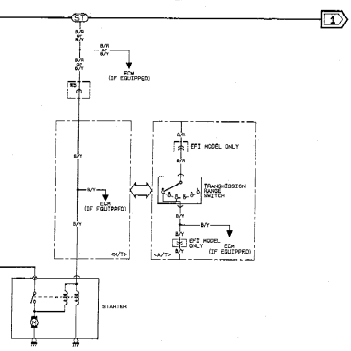
GENERAL/EUROPEAN MARKET



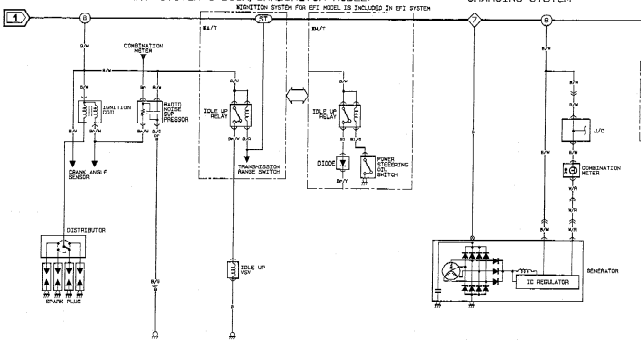
GERMAN MARKET ONLY



CRANKING SYSTEM

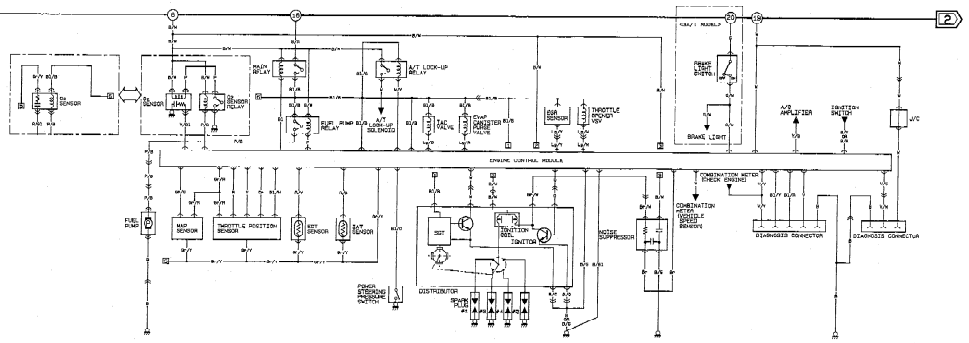


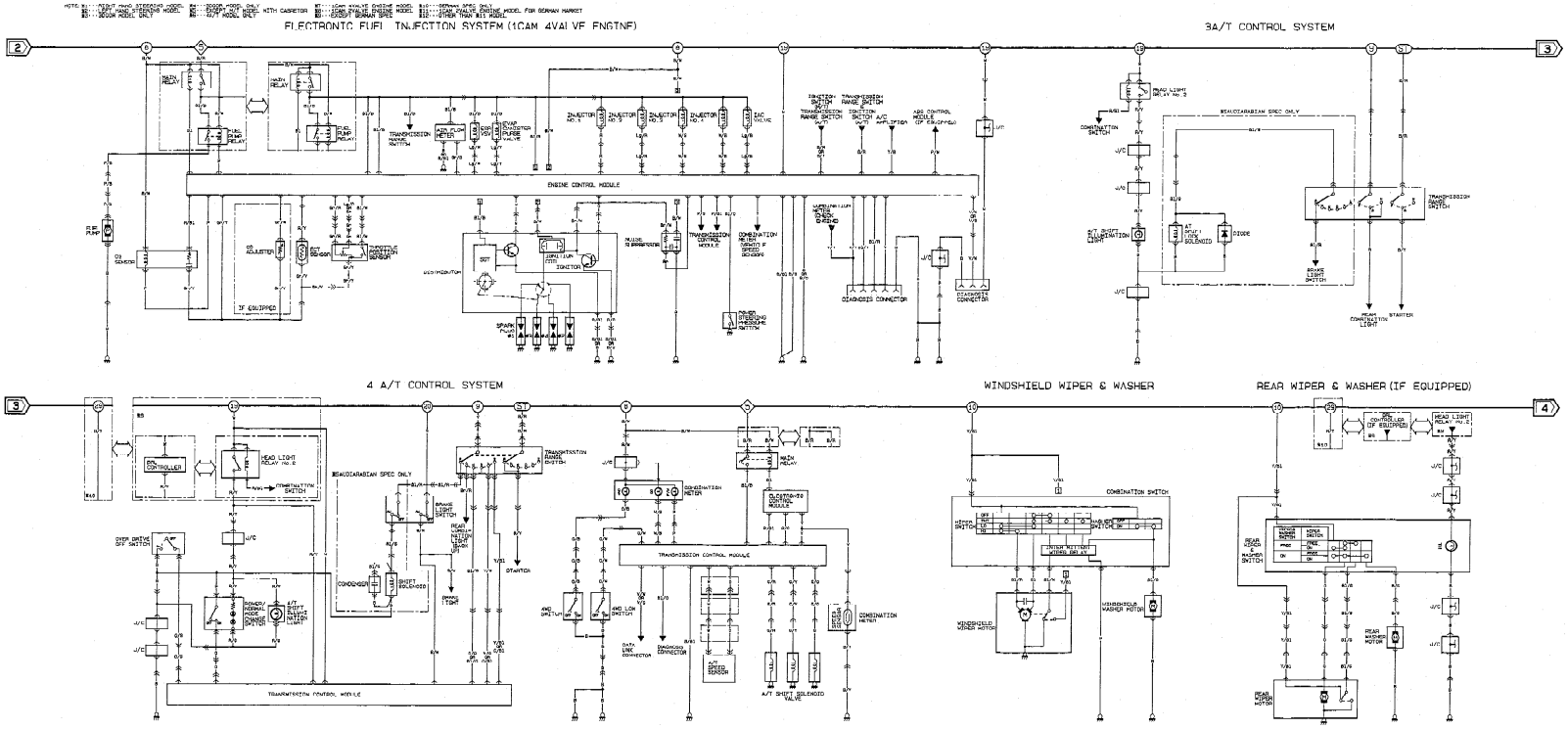
IGNITION SYSTEM<3-DOOR, CARBURETOR MODEL>

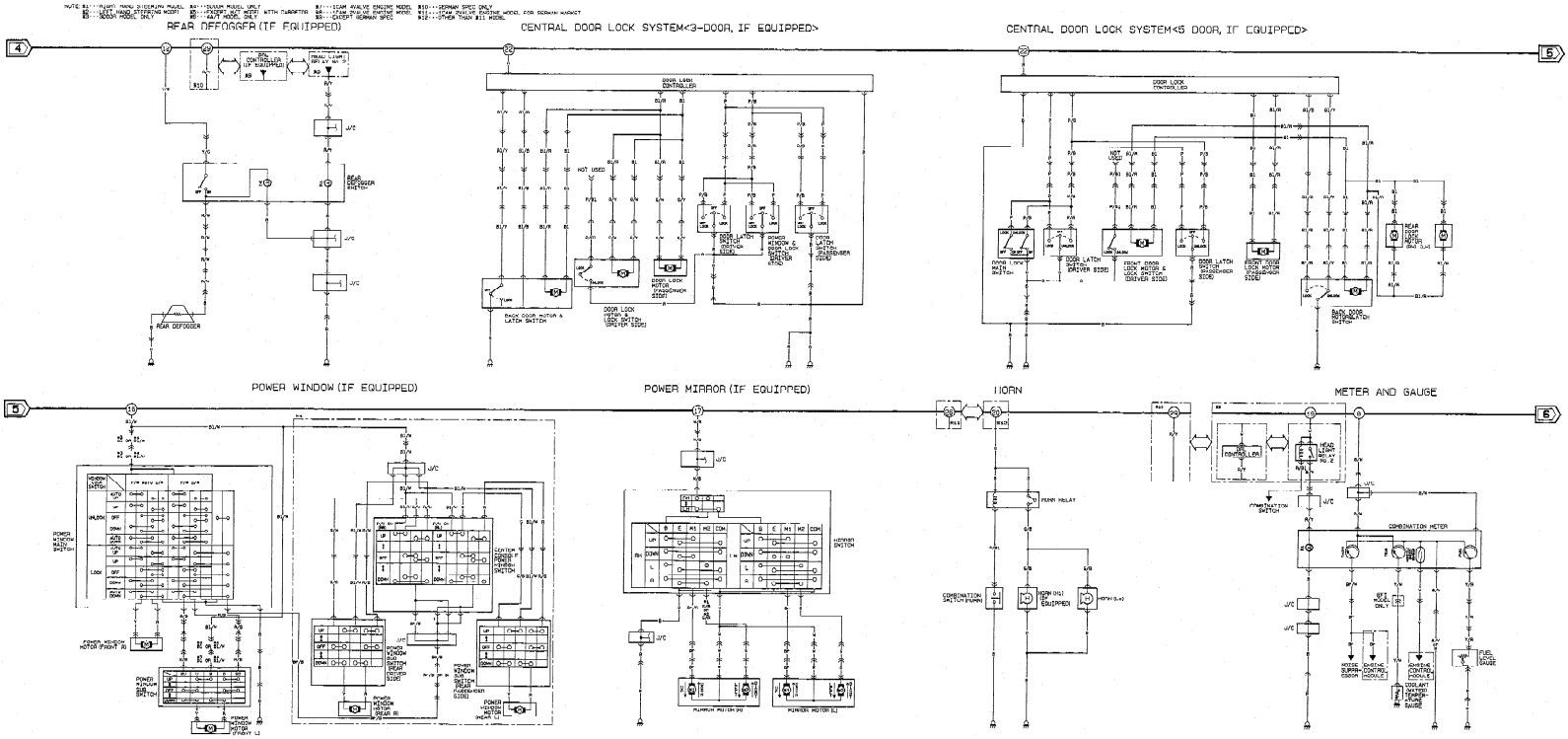


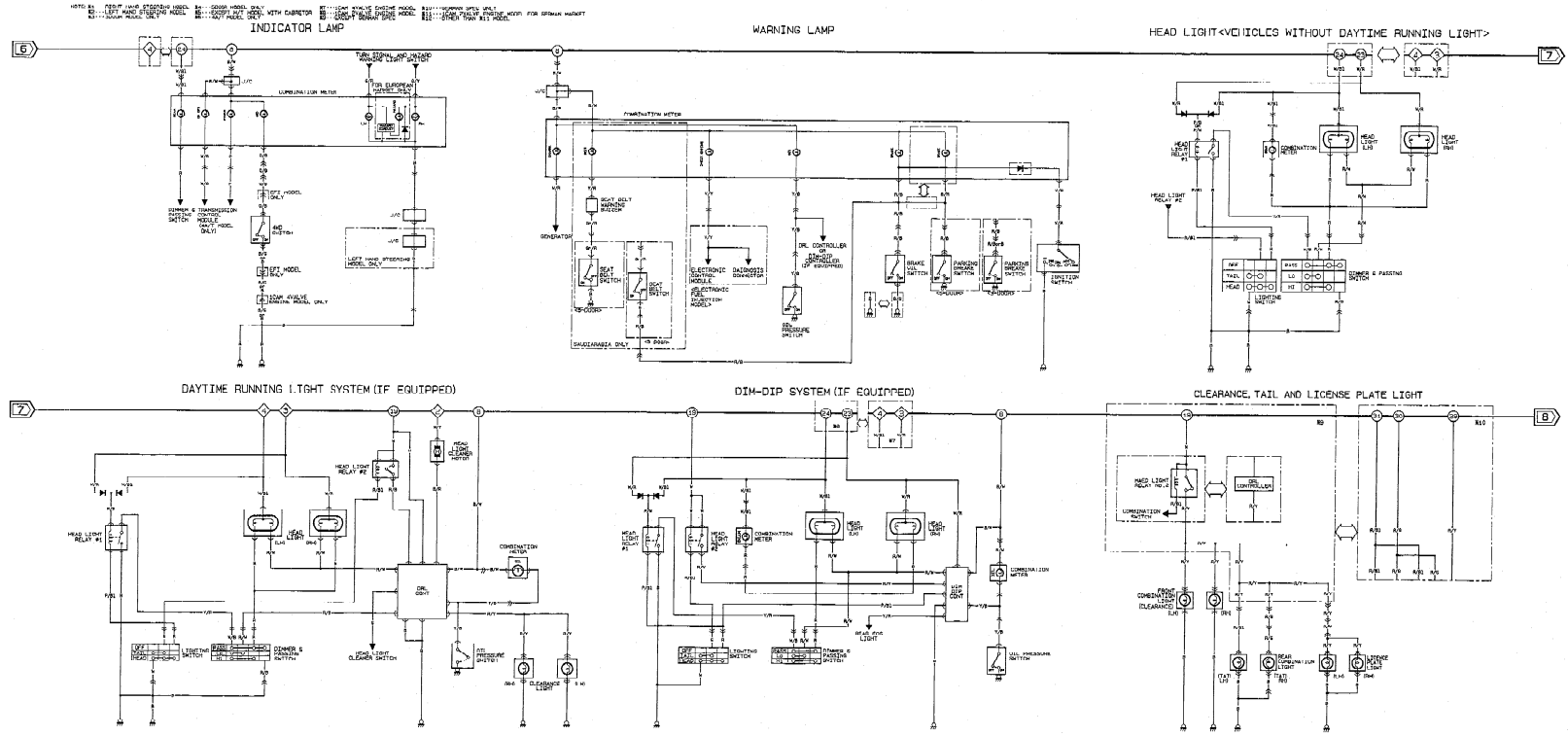
CHARGING SYSTEM

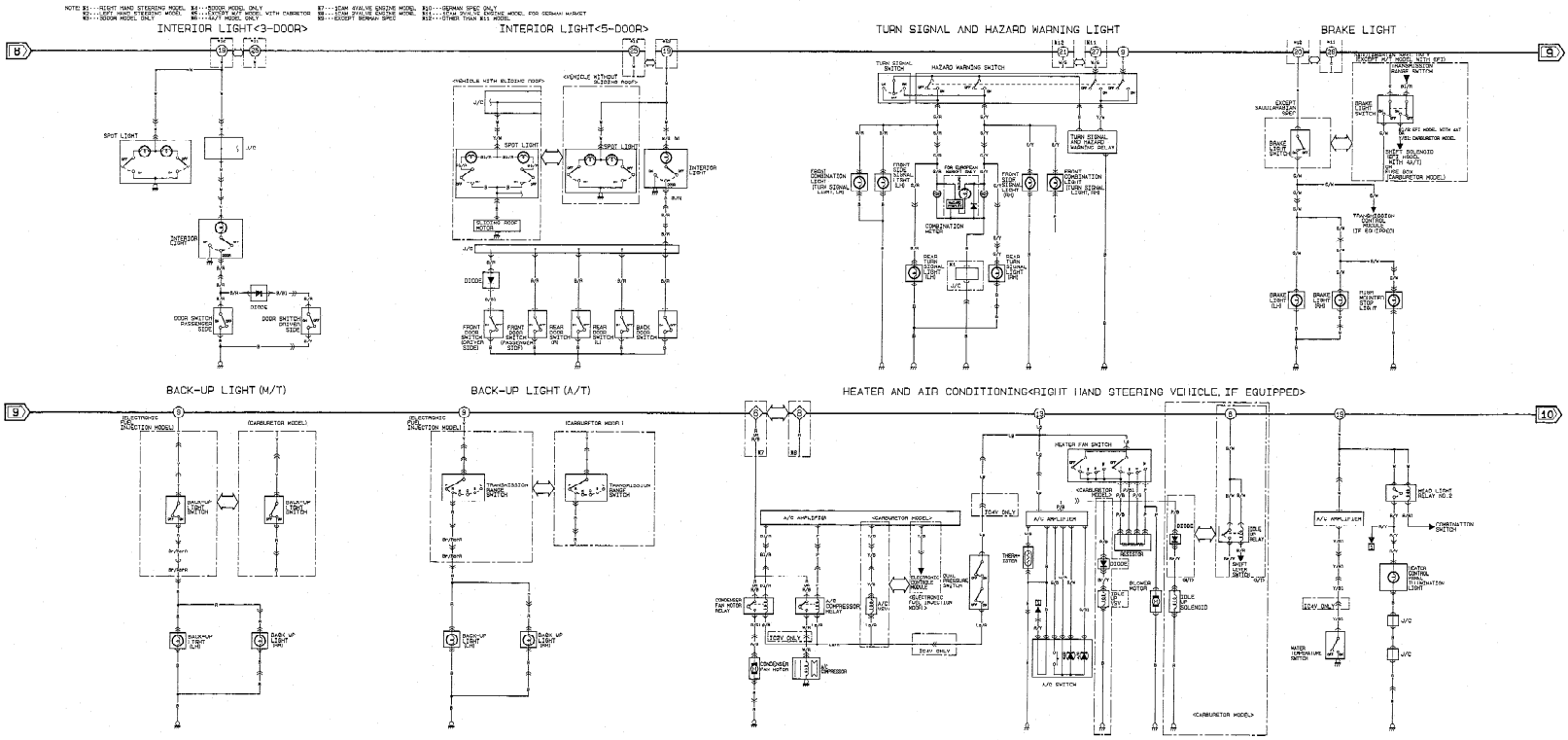
ELECTRONIC FUEL INJECTION SYSTEM(1CAM 2VALVE ENGINE)

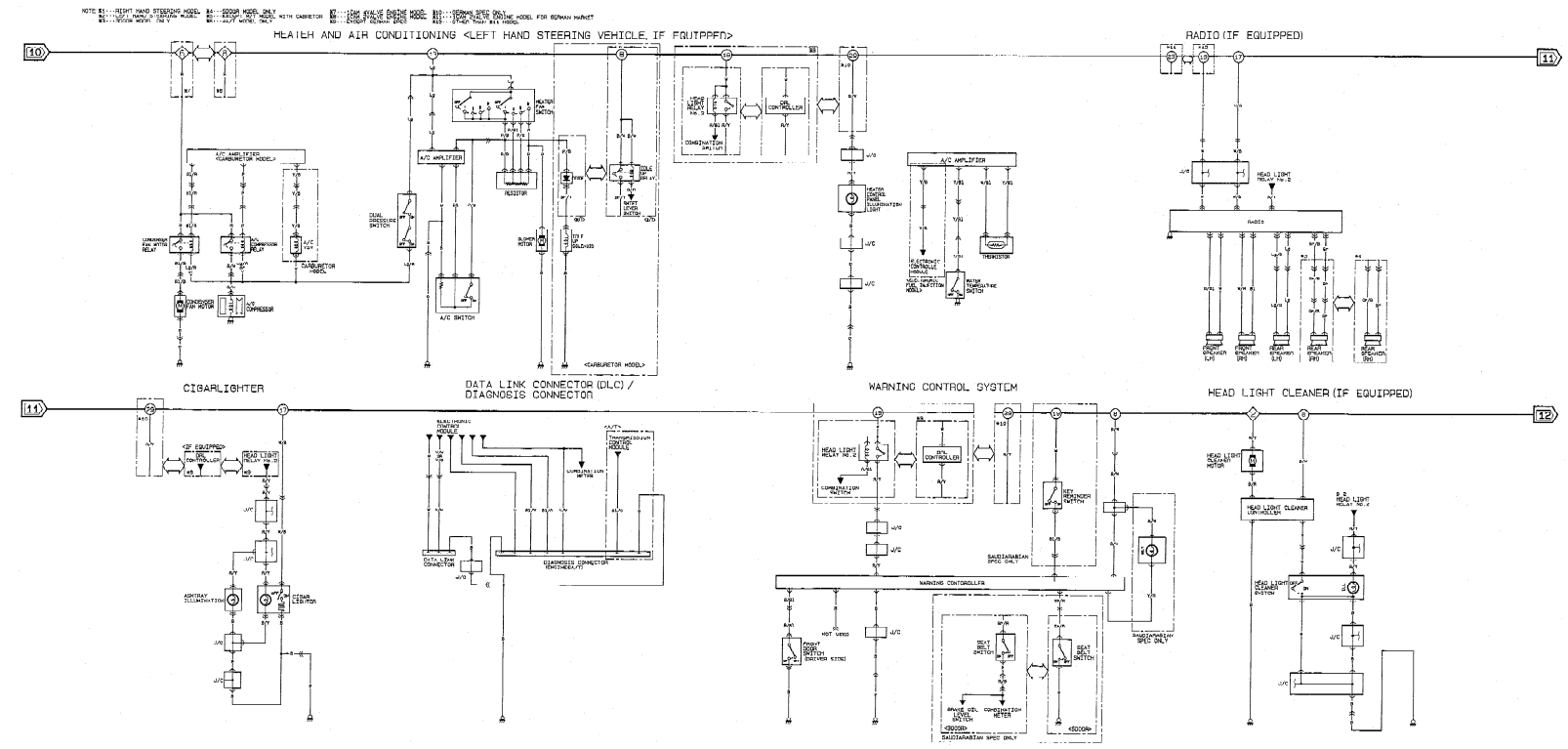


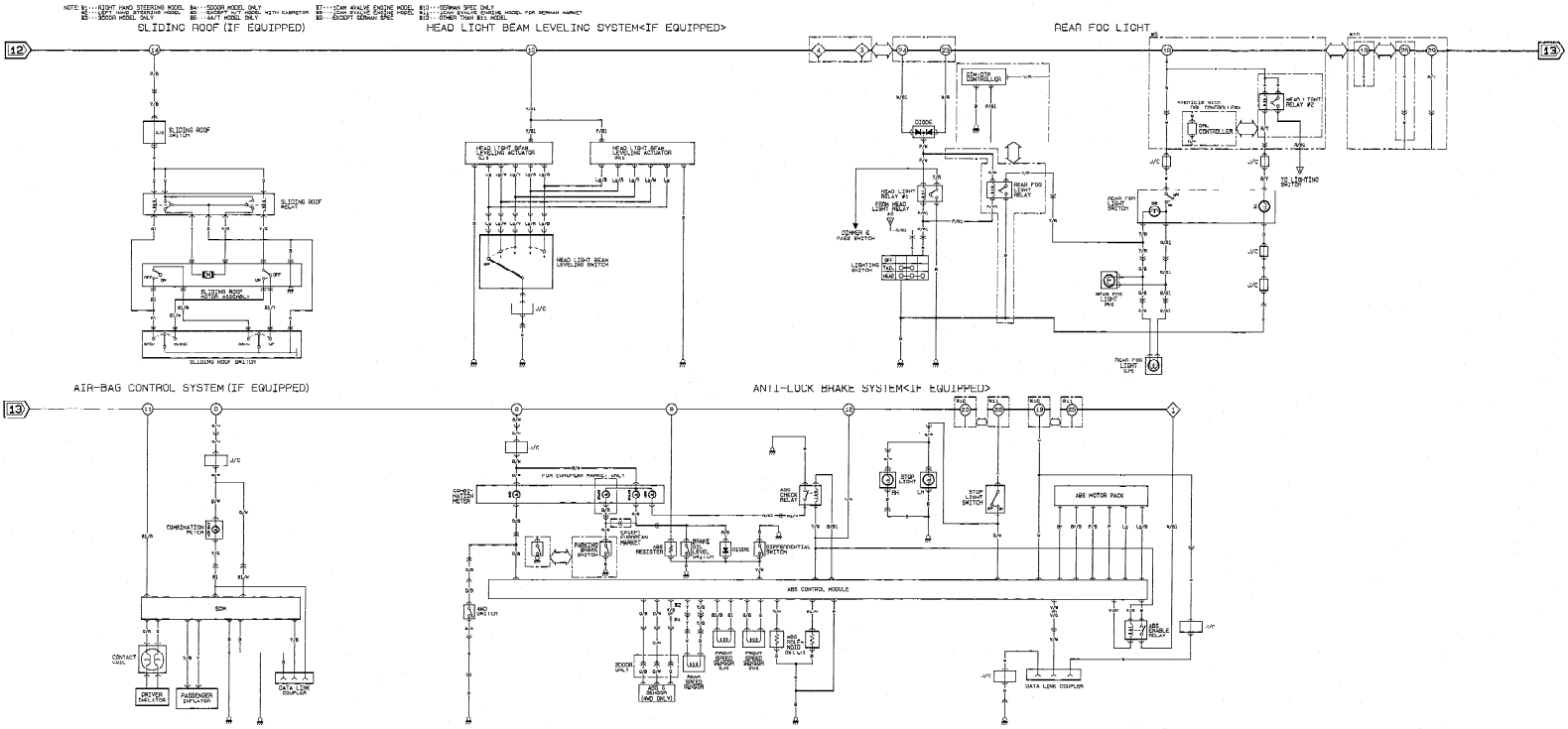




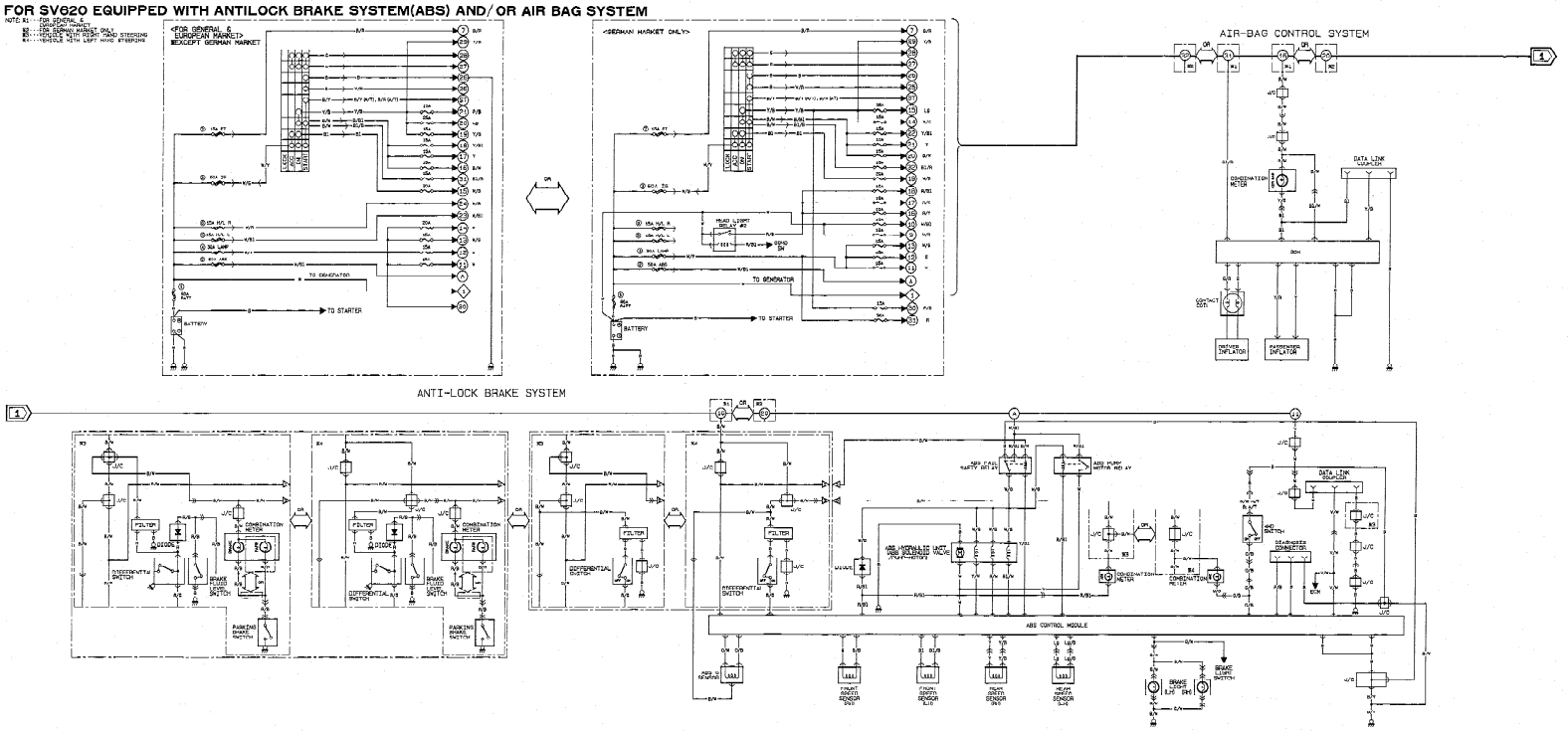








FOR SV620 EQUIPPED WITH ANTILOCK BRAKE SYSTEM(ABS) AND/OR AIR BAG SYSTEM



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